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Analysis of the feasibility of developing specific UTP requirements for vehicles that can be used freely in international traffic

1. INTRODUCTION

At its 14th session (Bern, 14-15 June 2022), the Committee of Technical Experts (CTE) decided, inter alia, that for the next session an analysis of the feasibility of developing specific UTPs, or parts thereof, dedicated to vehicles that can be used freely in international traffic (to replace the former technical provisions of RIC) should be prepared. This document provides a preliminary proposal for the analysis requested by CTE.

[The first version of this document was reviewed at the 47th session of WG TECH \(Bern, 7 September 2022\). Modifications in this document compared to its previous version are indicated using track-changes mode.](#)

1.1 VEHICLES SUITABLE FOR FREE CIRCULATION

A vehicle suitable for free circulation means that its admission to international traffic is valid in all Contracting States. With regard to free circulation, Article 6 § 3 of the ATMF UR lays down the following:

Without prejudice to Article 3a an admission to operation issued for a vehicle which is in conformity with all applicable UTP shall be valid on the territories of other Contracting States provided that

- a) all essential requirements are covered in these UTP and*
- b) the vehicle is not subject to*
 - a specific case which affects the technical compatibility with the network of the Contracting State concerned, or*
 - open points in the UTP that are related to technical compatibility with the infrastructure, or*
 - a derogation.*

The conditions for the free circulation may also be specified in the relevant UTP.

Within the scope and aims of COTIF, it is important that vehicles can be used in free circulation in international traffic. Free circulation does not mean that the vehicle can literally be used on every line of each network; it always remains subject to route compatibility checks. These checks are ~~in~~ the responsibility of the railway undertaking that uses the vehicle, on the basis of information provided by the infrastructure manager.

1.2 VEHICLES SUITABLE FOR GENERAL OPERATION

Free circulation does not guarantee that a vehicle can be easily exchanged between railway undertakings. For particular use cases, harmonised inter-vehicle interfaces are required. Most freight wagons and, to a certain extent, passenger coaches as well, have harmonised inter-vehicle interfaces so that they can be easily integrated into trains, together with other vehicles with similar interfaces.

Point 2.2.1 of the UTP concerning locomotives and passenger rolling stock (LOC&PAS) defines that *a unit is designed for general operation when the unit is intended to be coupled with other unit(s) in a train formation which is not defined at design stage.* Point 4.2.4.3 of the same UTP adds that *general operation concerns various formations of vehicles from different origins; train formation not defined at design stage.*

1.3 FROM RIV AND RIC TO COTIF

For roughly 100 years, the construction and use of passenger coaches for general operation was governed by the “Regolamento Internazionale delle Carrozze” (RIC) and the construction and use of freight wagons for general operation by the “Regolamento Internazionale Veicoli” (RIV). The RIV agreement no longer exists. [The RIC agreement still exists as a multilateral contract between railway undertakings for the use of passenger coaches.](#) ~~and~~ The RIC agreement is no longer a basis on which authorities approve vehicles. The technical provisions for RIC and RIV have been replaced by the COTIF provisions.

In particular, Article 11 § 2 of the APTU UR states as follows:

With the entry into force of the UTP, adopted by the Committee of Technical Experts in accordance with Article 6 § 1, these Uniform Rules as well as the technical standards and the UTP, shall take precedence, in the Contracting States, over the technical provisions

- a) *of the Regulation governing the reciprocal use of carriages and brake vans in international traffic (RIC),*
- b) *of the Regulation governing the reciprocal use of wagons in international traffic (RIV).*

On that basis, the COTIF provisions, in particular the UTP [for freight wagons](#) (WAG), the UTP LOC&PAS, the UTP Noise and the UTP [for people with disabilities and people with reduced mobility](#) (PRM) are the legal successors to the technical provisions of RIC and RIV.

2. THE EXISTING UTP REQUIREMENTS

2.1 THE UTP FOR FREIGHT WAGONS

The UTP ~~for freight wagons~~ (UTP-WAG) is based on the EU TSI for freight wagons (TSI WAG). Therefore, to understand the rationale of the structure of the UTP, it is ~~relevant~~ [useful](#) to look back at some of the discussions that took place at EU level concerning the TSI,

At the development stages of the TSI WAG at EU level, over a decade ago, there was debate as to whether the specifications for inter-vehicle interfaces (i.e. compatibility within the rolling stock subsystem) belonged in the legal (TSI) domain or rather in the domain of voluntary standards/harmonisation, which is controlled by the sector. One of the arguments against legally mandating interfaces within a subsystem (i.e. between vehicles) in the TSI was that these were not strictly necessary for interoperability. [The sector nevertheless requested legal certainty and a legal alternative to the comprehensive specifications offered by the RIV.](#) A compromise was found by specifying three layers of requirements:

1. The **basic parameters** set out in chapters 4 (for subsystems) and 5 (for interoperability constituents) of the TSI and sometimes referred to as the ‘core TSI’. Basic parameters set out the requirements that are strictly necessary for interoperability. However, they do not form a comprehensive description of how to design or construct a vehicle. Compliance with these basic parameters is compulsory. These basic parameters are, where possible, defined by functional/performance requirements, [and only describe technical solutions where necessary to ensure compatibility between subsystems \(e.g. the wheel thread profile, to fit the rail head profile\)](#) ~~or, where necessary, by technical solutions.~~
2. **Specifications for free circulation** described in section 7.1.2 of the TSI concerning the mutual recognition of the first authorisation of placing in service (later renamed “[first authorisation of placing on the market](#)”). Chapter 7.1.2 lists technical solutions that ensure compliance with some of the provisions of chapter 4.2 of the TSI (the functional and technical specifications of

the subsystem). Compliance with chapter 7.1.2 is optional; however, if the applicant chooses to apply the provisions of Chapter 7.1.2, it must be applied in its entirety.

3. **Specifications for general operation** are described in appendix C of the TSI that sets out additional optional provisions, which are mainly intended to facilitate the exchange of wagons between railway undertakings. Applying Appendix C allows new wagons to be used in a pool together with older wagons built in accordance with the former RIV agreement.

For OTIF, not only the first, but also the second and third levels of these specifications serve the core purpose of the Organisation; to facilitate international traffic by rail. All three levels have been included in the UTP WAG.

~~Below Annex 1 of this document is contains~~ a summary of the provisions for ~~levels two and these~~ three levels, for a wagon that is suitable for general operation on the 1435 mm network. Such a wagon has to comply with the basic parameters, with the provisions for free circulation and with the provisions for general operation. For several elements of the wagon, the provisions for general operations mandate a specific technical solution (e.g. UIC pneumatic brake system, established running gear). Using this technical solution provides a means of compliance with the basic parameters of chapter 4.2. There is therefore a strong correlation between these three levels of specifications.

Annex 1 could serve as a basis for a specific UTP, or part of an existing UTP, or guidance related to UTPs, dedicated to vehicles that can be used freely in international traffic.

~~Provisions for free circulation in section 7.1.2 of the UTP WAG include requirements for:~~

- ~~— Forged and rolled wheels;~~
- ~~— Recording in the technical file whether or not there is compatibility with line side axle bearing monitoring;~~
- ~~— Gauge G1, GA, GB or GC;~~
- ~~— Compatibility with train detection systems based on track circuits, on axle counters and on loop equipment;~~
- ~~— The coupling system;~~
- ~~— The brake system;~~
- ~~— Marking.~~

~~Provisions for general operation from Appendix C of the UTP WAG include requirements for:~~

- ~~— Standardised buffer and draw gear (this will in future be complemented or replaced by the specifications for the digital automatic coupler);~~
- ~~— Standardised footsteps and handrails;~~
- ~~— Ability to be hump shunted;~~
- ~~— Free space under lifting points;~~
- ~~— Marking;~~
- ~~— The vehicle fitting within the G1 gauge;~~
- ~~— Tests concerning longitudinal compressive forces;~~
- ~~— Standardised brake system and interfaces;~~
- ~~— Location of the parking brake handle;~~
- ~~— Temperature ranges for air reservoirs, hoses and grease;~~
- ~~— Welding standards;~~

- ~~— Compatibility with 1435 mm track gauge;~~
- ~~— Thermal capacity of the brake system;~~
- ~~— Wheel properties;~~
- ~~— Tow hooks;~~
- ~~— Protective devices on protruding parts;~~
- ~~— Label holders and attachment devices for rear end signal;~~
- ~~— Compatibility with line side axle bearing monitoring;~~
- ~~— Running dynamic behaviour.~~

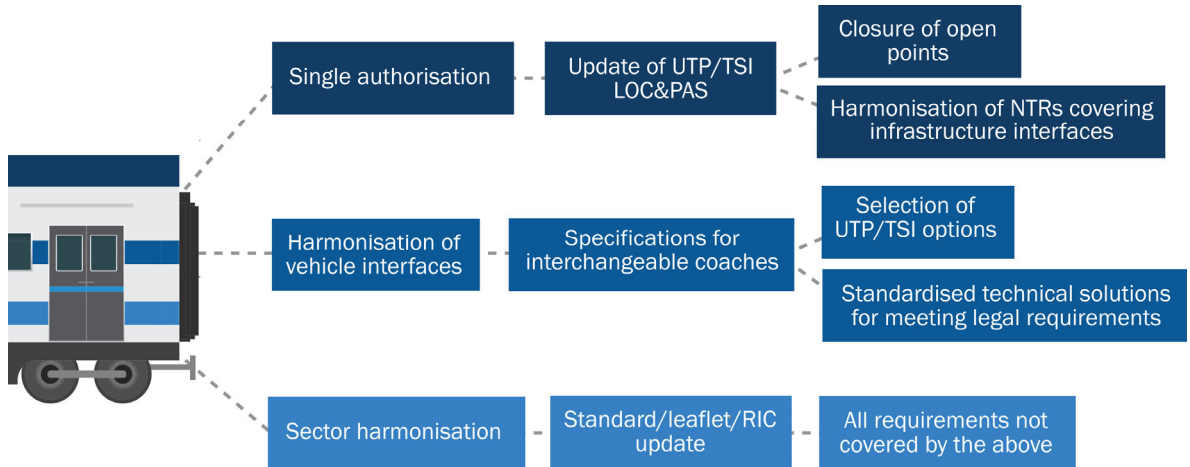
2.2 THE UTP FOR LOCOMOTIVES AND PASSENGER ROLLING STOCK

The UTP LOC&PAS is based on the EU TSI LOC&PAS. From its inception, the UTP LOC&PAS did not provide the full specifications needed for free circulation or general operation. Firstly, the UTP LOC&PAS contains open points and specific cases that prevent admission in all CSs. Secondly, the UTP LOC&PAS does not yet contain provisions that standardise the interfaces and protocols for train-level communication. Without such provisions, it will not be possible to compose a train with random coaches for general operation that will fulfil all required functions at train level (e.g. for passenger alarms).

2.2.1 PROVISIONS FOR PASSENGER COACHES

The UTP LOC&PAS contains several provisions which specifically apply to units for use ~~of vehicles~~ in general operation. The UTP does not limit the concept of general operation to coaches only, but in practice, only vehicles without a cab and without traction, i.e. coaches, can meet the requirements. In 2014 and 2015, OTIF promoted the development of further provisions for the general operation and free circulation of coaches. The latest update on these efforts ~~were~~ was described in working document [TECH-16012](#), which was prepared for the 9th session of the Committee of Technical Experts in 2016. The working document identified the following three levels of harmonisation required for passenger coaches in order for them to be suitable for general operation:

1. Unique admission/authorisation: the vehicle must not be subject to specific cases which affect compatibility with the network, ~~and~~
2. Harmonised inter-vehicle interfaces: there should be no open points in the UTP/TSI relating to compatibility with the infrastructure, and
3. Agreements between railway undertakings and/or manufacturers to use, e.g., harmonised operational and communications concepts.



As a result of the discussions at within OTIF level, the subject was placed on the EU agenda for inclusion in the TSI. Commission Implementing Regulation (EU) 2019/776 of 16 May 2019 added a new section 6.2.7a to the TSI LOC&PAS, which lists optional requirements for units intended to be used in general operation. On 1 January 2022, a revised version of the UTP LOC&PAS entered into force, which also contains section 6.2.7a.

Section 6.2.7a of the UTP LOC&PAS includes requirements for:

- A manual coupling system;
- A standardised brake system;
- A temperature range within which the vehicle should function;
- Fixed tail lights;
- A gangway, if one is fitted on the vehicle;
- Power supply;
- Standardised 18-conductor cable at the interfaces with other vehicles;
- Marking.

Discussions at EU level are still ongoing to include further specifications that will facilitate or enable the free circulation of passenger coaches. The OTIF Secretariat is involved in these discussions and supports the objectives. Once these specifications are ready, the Secretariat will prepare proposals to include them in the UTP LOC&PAS.

2.2.2 PROVISIONS FOR LOCOMOTIVES AND MULTIPLE-UNITS (TRAINSETS)

Vehicles with electric traction and driving cabs have additional and more complex interfaces with the infrastructure (signalling, traction power supply, electromagnetic compatibility) than wagons and coaches have. Currently, it is not feasible to define a comprehensive set of requirements that would make locomotives or trainsets suitable for free circulation.

Nevertheless, there are currently several examples of locomotives and trainsets that operate in cross border traffic between several Contracting States. Efforts could be made to capture the technical solutions selected for such locomotives and trainsets and list them as optional requirements in a UTP.

The proposed concept is possibly best illustrated by an example of how the requirement could be formulated:

Requirements A, B and C are optional and compliance with them shall be additional to compliance with the requirements in the UTP LOC&PAS. If requirements A, B and C are complied with, the area of use of the vehicle will include States X, Y and Z.

Some of the technical solutions may be intellectual property of the manufacturer, which could stand in the way of describing the solutions in UTPs. This is why such optional specifications should be defined with help of the sector (e.g. UIC, CER, UNIFE).

It is worth noting that proposals for UTPs can be made by the Secretary General, Contracting States, ~~r~~Regional ~~o~~rganisations (i.e. the EU) and by *representative international associations* for whose members the existence of UTP relating to railway material is indispensable for reasons of safety and economy in the exercise of their activity.

3. GIVING MORE PROMINENCE TO THE PROVISIONS FOR GENERAL OPERATION ~~IDEAS FOR A NEW UTP~~

In accordance with the considerations in this paper, vehicles that can be easily used or exchanged in international traffic are of major importance to the scope and aims of OTIF. The UTPs are the legal instruments of OTIF ~~to~~ that ensure this. In the current structure of the UTPs, the provisions allowing vehicles free circulation and the provisions allowing them to be used in general operation are currently either not prominent, or incomplete or do not exist at all.

It is therefore proposed to give more prominence in COTIF to the provisions for free circulation and to the specifications that facilitate the use of vehicles in general operation.

~~For these reasons, the Secretariat suggests creating a new UTP for vehicles suitable for free circulation and for vehicles suitable for general operation. WG TECH 47 was supportive of this aim and identified three possibilities to achieve it:~~

1. A new UTP that gathers together or refers to all specifications for all types of vehicles suitable for free circulation and for vehicles suitable for general operation, or
2. Include specific requirements or guidance in chapter 0 of the UTP or as an annex to UTPs, or
3. Develop specific guidance as a separate document.

The ~~new UTP~~ provisions or guidance should cover all types of vehicles; wagons, passenger rolling stock and locomotives. ~~This new UTP~~ It should contain or refer to the existing provisions from section 7.1.2 and Annex C of the UTP WAG and from section 7.2.6a of the UTP LOC&PAS, but also anticipate the development of further new provisions.

The ~~new UTP~~ provisions or guidance could contain or refer to two levels of optional specifications for each type of rolling stock, in addition to the basic parameters laid down in chapter 4.2 of each UTP; one level for free circulation, allowing a wide area of use during the first admission of a vehicle, and one level for general operation, facilitating the use and exchange of vehicles by railway undertakings. Annex 1 of this document, which is based on the UTP WAG, illustrates this structure for freight wagons.

Currently, a full set of specifications for both free circulation and general operation is only available for freight wagons. It is suggested that these provisions be moved to ~~the~~ a new UTP, or that their coherence be clarified in the form of guidance.

Application of the optional provisions should always be additional to compliance with the other applicable UTPs. Compliance with either the UTP WAG or the UTP LOC&PAS therefore remains the basis. ~~There~~ In the event that a new UTP were to be created, should be cross references between the new UTP and the ~~applicable~~ relevant applicable UTPs would be required.

The relevant specifications for passenger coaches are being drafted at EU level. A full set of specifications for locomotives and trainsets is pending. The new UTP would therefore be subject to gradual completion.

The ~~new UTP would bring several benefits~~ chosen solution should:

- Underline the importance of these rules for free circulation and the general operation of vehicles;
- Make ~~T~~ the structure of the rules ~~would be~~ clearer for (aspirant) non-EU Contracting States, which do not currently implement full interoperability;
- Open the possibility to ~~The UTP could be complemented by~~ refer to harmonised optional provisions at the request of the sector, to cover elements that would not ~~normally~~ necessarily be covered in TSIs at EU level. ~~It is usually faster to update a UTP than to create or amend an international standard.~~

Annex 1

Summary of the provisions for the three levels for a wagon that is suitable for general operation on the 1435 mm network. Such a wagon has to comply with the basic parameters (chapter 4.2 of the UTP WAG), with the provisions for free circulation (7.1.2) and with the provisions for general operation (Appendix C).

In each row, compliance with the provisions in bold, also ensures compliance with the other provisions in the same row.

<u><i>Basic parameters as per chapter 4.2, which would apply to a wagon suitable for free circulation:</i></u>	<u><i>Optional provisions for free circulation of section 7.1.2:</i></u>	<u><i>Optional provisions for general operation of Appendix C:</i></u>
<u>An end coupling in accordance with Appendix C provides presumption of conformity with the provisions of chapter 4.2.</u>	<u>The unit must be equipped with the manual coupling system in accordance with the prescriptions set out in Appendix C, or an automatic standardised coupling system.</u>	<u>Standardised draw gear as per EN 15566:2009+A1:2010 (except 4.4) and buffer as per EN 15551:2009+A1:20210 fitted at position as defined in Appendix C.</u> <u>(This will in future be complemented or replaced by the specifications for the digital automatic coupler.)</u>
<u>Strength of unit in accordance with chapter 5 of EN 12663-2:2010.</u>	=	<u>Ability to be hump shunted. In addition to chapter 5, clause 8 of EN 12663-2:2010 applies and classified category F1.</u> <u>Welding shall be carried out in accordance with EN 15085-1:2007+A1:2013, EN 15085-2:2007, EN 15085- 3:2007, EN 15085-4:2007 and EN 15085-5:2007.</u>
<u>Marking of lifting and jacking points: EN 15877-1:2012.</u>	=	=
<u>Gauge in accordance with Appendix C provides presumption of conformity with the provisions of chapter 4.2.</u>	<u>Gauge G1 in accordance with Appendix C (for free circulation alone on one of the following gauges is also accepted: GA, GB or GC).</u>	<u>The vehicle fitting within the G1 gauge according to kinematic method EN 15273-2:2013+A1:2016.</u>

<p><u>Permissible payload to be defined according to EN 15528:2015 (6.1 and 6.2).</u></p>	-	-
<p><u>If the unit is intended to be compatible with one or more of the train detection systems, this compatibility shall be established in accordance with the provisions of Appendix H of UTP WAG.</u></p> <p><u>This means, inter alia, specific:</u></p> <ul style="list-style-type: none"> - <u>Maximum distance between axles;</u> - <u>Minimum wheel diameter;</u> - <u>Minimum axle loads;</u> - <u>Vehicle dimensions in relation to the track.</u> 	<p><u>Compatibility with train detection systems based on track circuits, on axle counters and on loop equipment.</u></p>	-
<p><u>It shall be possible to monitor the axle bearing condition either by</u></p> <ul style="list-style-type: none"> - <u>line side detection equipment or</u> - <u>on-board equipment.</u> <p><u>Line side detection equipment according to EN 15437-1:2009 (5.1 and 5.2).</u></p>	<p><u>Recording in the technical file whether or not there is compatibility with line side axle bearing monitoring;</u></p>	<p><u>It shall be possible to monitor the axle bearing condition of the unit by means of line side detection.</u></p>
<p><u>Units equipped with an established running gear as described in chapter 6 of EN 16235:2013 are presumed to be in conformity with the relevant requirement, provided that the running gears are operated within their established area of use.</u></p> <p><u>The assessment of the bogie frame strength shall be based on clause 6.2 of EN 13749:2011.</u></p>	-	<p><u>The combination of maximum operating speed and maximum admissible cant deficiency shall be as shown in table H.1 of EN 14363:2016. Units equipped with established running gear as described in chapter 6 of EN 16235:2013 are presumed to be in conformity with this requirement.</u></p>

=	=	<u>The verification of safe running under longitudinal compressive forces shall be in accordance with EN 15839:2012+A1:2015.</u>
<u>Mechanical and thermomechanical characteristics of wheels according to EN 13979-1:2003+A1:2009+A2:2011 (6.2 for type test, 7 for mechanical characteristics).</u>	<u>The unit shall be equipped with forged and rolled wheels.</u>	<u>The wheels shall be in accordance with EN 13262:2004+A1:2008+A2:2011 and EN 13979-1:2003+A1:2009+A2:2011.</u> <u>The thermal mechanical type test shall be carried out in accordance with table C.4 when the complete brake system is acting directly on the wheel tread.</u>
<u>Geometry of wheelsets within the limit values specified in tables 3 and 4 of the UTP;</u>	=	=
<u>Mechanical resistance and fatigue of axles according to EN 13103:2009A2:2012 (4, 5 and 6);</u>	=	=
<u>Mechanical resistance and fatigue of axle bearings according to EN 12082:2007+A1:2010 (6);</u>	=	=
<u>The braking system contributes to the safety level of the railway system. Therefore, the design of the braking system of a unit has to undergo a risk assessment in accordance with UTP GEN-G Risk Evaluation and Assessment, considering the hazard of complete loss of the brake capability of the unit. The severity level shall be deemed as catastrophic when:</u> <ul style="list-style-type: none"> - <u>it affects the unit alone (combination of failures) or,</u> - <u>it affects the brake capability of more than the unit (single fault).</u> 	<u>The brake system must be in accordance with Appendix C.</u>	<u>Standardised ‘UIC’ brake system and interfaces shall be according to the detailed provisions in Appendix C.</u>

<u>Brake system in accordance with Appendix C provides presumption of conformity with the provisions of chapter 4.2.</u>		
<u>Brake performance calculated according to EN 14531-6:2009 or UIC 544-1:2014.</u>	=	<u>Minimum brake performance in accordance with table C.3.</u>
<u>Thermal capacity of the brake system shall be determined in terms of speed, axle load gradient and brake distance.</u>	=	<u>Thermal capacity of the brake system must comply with the reference case of a 2.1% downward slope over 40 km distance at constant speed of 70 km/h at maximum load.</u>
<u>If a parking brake is fitted, it shall be able to immobilise the vehicle and the force must be calculated according to EN 14531-6:2009 (6).</u>		<u>Parking brake is optional, but if fitted the, each side must be fitted with a parking brake handle;</u>
<u>Units equipped with disc brakes and/or with composite brake blocks, for which the maximum mean utilisation of adhesion is more than 0.11 shall be fitted with wheel slide protection in accordance with Appendix C;</u>	=	<u>If the unit is equipped with a wheel slide protection system (WSP) it shall be in accordance with EN 15595:2009+A1:2011.</u>
<u>The unit shall be designed to function in one or more external air temperature ranges T1 (-25°C to +40°C), T2 (-40°C to +35°C) or T3 (-25°C to +45°C).</u> <u>Steel properties shall be determined down to -20°C.</u>	=	<u>Air reservoirs, brake cylinders, brake couplings, hoses and air supply shall be designed for temperatures of -40°C to +70°C. Grease for the lubrication of roller bearings shall be specified for ambient temperatures down to -20°C.</u>
<u>If attachment devices for rear-end signals are fitted, these shall permit two lamps or two reflective plates to be attached as per Appendix E of the UTP WAG.</u>	=	<u>Vehicles shall be equipped with a label holder in accordance with clause 1 of UIC 575:1995 and at both ends with attachment devices as set out in point 4.2.6.3.</u>

<u>Dimensions and clearance per EN 16116-2:2013 figure 11.</u>		
=	<u>Markings in accordance with EN 15877-1:2012.</u>	=
=	=	<u>Footsteps and handrails per EN 16116-2:2013 (4, 5 and 6.2.2).</u>
=	=	<u>Free space under lifting points (for rerailing).</u>
=	=	<u>Vehicles complying with all requirements of chapter 4.2, 7.1.2 and Appendix C may be marked 'GE'.</u> <u>Vehicles complying with all these requirements, except G1 gauge, <17500 mm axle distance, or which cannot be hump shunted, may be marked 'CW'.</u>
=	=	<u>Compatible with 1435 mm track gauge.</u>
=	=	<u>Units shall be provided with tow hooks, each one being fixed to the side of the unit underframe in accordance with clause 1.4 of UIC 535-2:2006. Alternative technical solutions are allowed as far as conditions 1.4.2 to 1.4.9 of UIC 535-2:2006 are respected. If the alternative solution is a cable eye bracket, it shall in addition have a minimum diameter of 85 mm.</u>
=	=	<u>To ensure the safety of staff, protruding (e.g. angular or pointed) parts of the unit located up to 2 m above rail level or above passageways, working surfaces or tow hooks which are liable to cause accidents, shall be fitted with protective</u>

		<u>devices as described in clause 1.3 of UIC 535-2:2006.</u>
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