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APTU Uniform Rules (Appendix F to COTIF 1999)

Uniform Technical Prescriptions (UTP) relating to the Subsystem Rolling Stock

FREIGHT WAGONS - ANNEX R

VEHICLE TRACK INTERACTION AND GAUGING

LONGITUDINAL COMPRESSIVE FORCES

Explanatory note:

The texts of this UTP which appear without columns are identical with corresponding texts of the European Union regulations. Texts which appear in two columns differ; left-hand column contains the UTP regulations, right-hand column shows the text in the corresponding EU regulations. The text in the right hand column is for information only and not part of the OTIF regulations.

OTIF UTP

| Corresponding text in EU regulations ¹

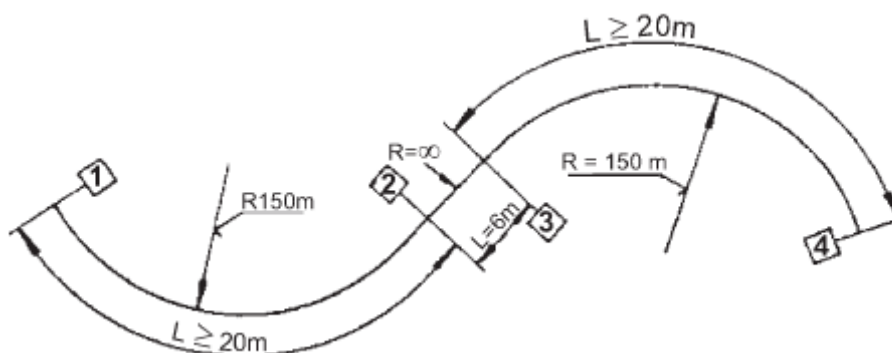
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R.1 TESTS CONDITIONS

R.1.1 TRACK

The track for the tests shall consist in an S-format curve of $R = 150$ m. Curves are separated by a section of straight track measuring 6 m in length.

Fig. R1



The track for the tests shall have - 0-cant. The average gauge is between 1450 and 1465 mm.


R.1.2 TEST TRAIN

Standard configuration

Use of slave wagons with the following characteristics:

¹ TSI Freight Wagons – The Annex to the Commission Decision 2006/861/EC published in the EU Official Journal L344 on 08.12.2006 as amended by Commission Decision 2009/107/EC published in EU Official Journal L45 on 14.02.2009.

² If no EU reference is indicated, it means that the chapter/section number is the same as in the OTIF text.

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	Front wagon	Tail wagon
Type:	Fc or Tds	Rs
Length over buffer (Lob):	9,64 m	19,90 m
Wheelbase:	6,00 m	13,00 m

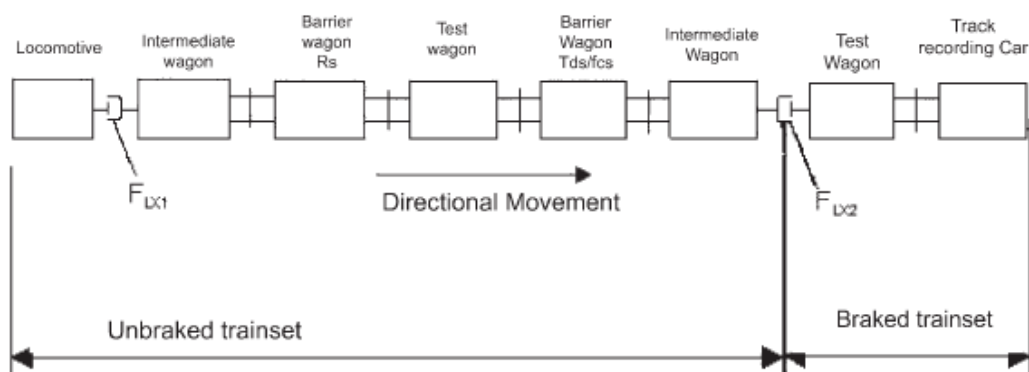
The fig. R2 is an example of a test train with the above-mentioned standard configurations.

The slave wagon must be laden (20 tons axle load) and the test wagon shall be empty.

Complete configuration

By long two axles freight wagons with Lob ≥ 15,75 m is a special test in a three wagon train configuration necessary (test wagon and two slave wagons with the same geometrical parameters).

Fig. R2



To calculate the longitudinal compressive force, use shall be made of 2 or 4 axle intermediate wagons fitted at one end with central-buffer coupling (incorporating a stress recorder) ⁽³⁾.

R.1.3 BUFFER TYPE

The slave wagons must be fitted with category A non-pivoting buffers (590 kN end-stroke force) which have already been used in revenue service. The buffers on the slave wagons shall have spherical bearing surfaces of R = 1500 mm. The test wagon shall be fitted with the same buffer type as the model to be used in its future operating.

When starting the tests, the buffer bearing surfaces shall show no signs of wear.

R.1.4 CARRYING OUT THE TESTS


The screw couplers between the test wagon and the slave wagons are to be tightened in such ways that when on the straight track the buffer plates are in contact without pre-tensioning.

The vertical offset of buffer centre-lines between the slave wagons and the test wagon will need to be approximately 80 mm ⁽⁴⁾.

The buffer plates shall have a low friction surface, such as lightly greased steel. Any building up of material as a result of scratches must be removed after each test. Buffer-plate pairs shall be replaced where, as a result of scratches or deformation, results obtained differs considerably from those already recorded.

⁽³⁾ Other measuring systems giving the same results may also be used.

⁽⁴⁾ Conditional type of construction tolerances are authorised.

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The test train shall reverse back along an S-shaped curve at a speed of 4 to 8 km/h with a longitudinal compressive force that remains virtually constant. The longitudinal compressive force will steadily increase until one of the evaluation criteria mentioned under point 4 is reached or exceeded. Until 280 kN it will not reach any evaluation criteria and so does not need to be increased.

In order to determine the linear comparison, at least 20 tests shall be carried out for analysis, with different longitudinal compressive forces. On this occasion, the average longitudinal compressive force (2-axle wagons 200 kN and bogie wagons 240 kN) should be exceeded of about 10 % in at least 10 of the tests.

In the course of the 20 tests, at 5 consecutive tests of the longitudinal compressive force must be carried out without changing the buffers or buffer plates maintenance. According to point 4, no evaluation criterion shall be exceeded.

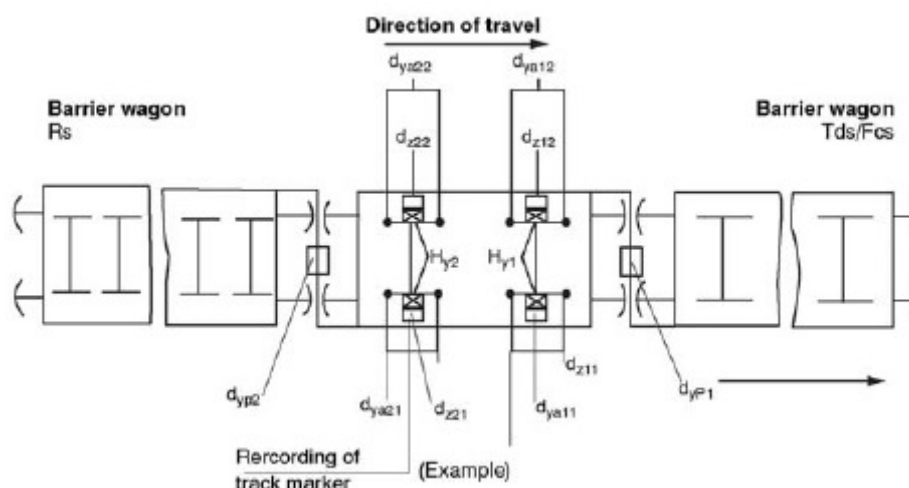
R.2 SCOPE OF MEASUREMENTS

R.2.1 MEASUREMENTS DURING THE TESTS

As a minimum, the following values shall be measured during the tests and recorded:


- Longitudinal Compressive Force F_{Lxi}
- Wheel elevation d_{zij} of all wheels
- Lateral forces on axle-boxes H_{yj} of all wheels
- Deformation of axle guards d_{Aijy} of all wheels (of goods wagons fitted with axle guards only)
- Lateral movements d_{yP1} , d_{yP2} of the buffers between the slave wagons and test wagon
- Recording of track markers (Fig. R1)
- Distance covered (e.g. 1 m marker)

Fig. R3



R.2.2 MEASUREMENTS/CALCULATIONS TO BE MADE

- Measurement of the torsional stiffness (c_t^*) of the slave wagons of the tested wagon.
- Measurement of the characteristic static curve on the buffers of the slave wagons and test wagon.
- Measurements of the track geometry before and after the tests
- Measurements of the lateral and longitudinal play between the axle box and axle guard on the test wagon before and after the tests

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- Measurements of the buffer height above the rail top on the slave wagons and test wagon.

R.3 EVALUATION CRITERIA USED TO CALCULATE THE PERMISSIBLE LONGITUDINAL COMPRESSIVE FORCE.

- Evaluation of a non-guide wheel $d_{zij} \geq 50$ mm over a distance of ≥ 2 m.
- Climbing of the guide wheel $d_{zij} \geq 5$ mm for wheel load $Q_{ij} < 0$; guide wheels are wheels 11 and 12 in 2 axle wagons. This criterion is to be checked in the case of the complete configuration of test trains (cf. chapter R.1.2).
- Axle-guard deformation $d_{yAij} \geq 22$ mm (1), measured 380 mm from the lower edge of the sole-bar.
- Stabilised track stress H_{lim} (2 m) = $25 + 0,6 \times 2 \times Q_0$ (kN) Q_0 = middle wheel force on rail
- Minimum horizontal overlap of buffer plates ≥ 25 mm.

R.4 ANALYSIS

For each test, it is necessary to calculate:

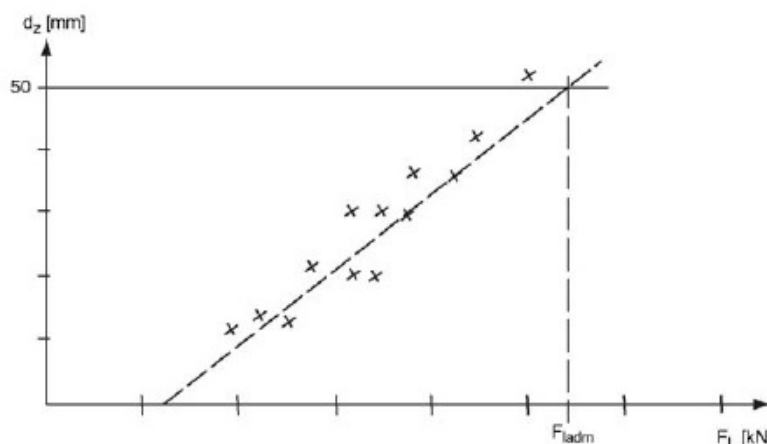
- $H_{y,i}$, $D_{z,i,j}$ value over a distance of 2 m
- d_{zij} as a value of the climbing of the guide wheel. Analysis to be checked only with test trains in complete configuration (s. chapter R.1.2)
- F_{LX}
- d_{yAij} (for 2-axle wagons with guards)
- d_{yp}

The values calculated shall be presented in graphic form as a function of the longitudinal compressive force F_{LX} .


In order to calculate the permissible longitudinal compressive force, the straight regression line equations shall be defined for the quantities to be measured d_{zij} , d_{yAij} and H_{yi} .

The permissible longitudinal compressive force shall be defined as the value found on the abscissa for the point of intersection between the straight regression line and the evaluation criterion (see fig. R4).

Fig. R4



The evaluation criterion giving the lowest value for F_{Lert} shall determine the permissible longitudinal compressive forces. A report shall be drawn up, describing the tests carried

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out and presenting a summary of the most important data in table form.

R.5 CONDITIONS FOR TEST EXEMPTION

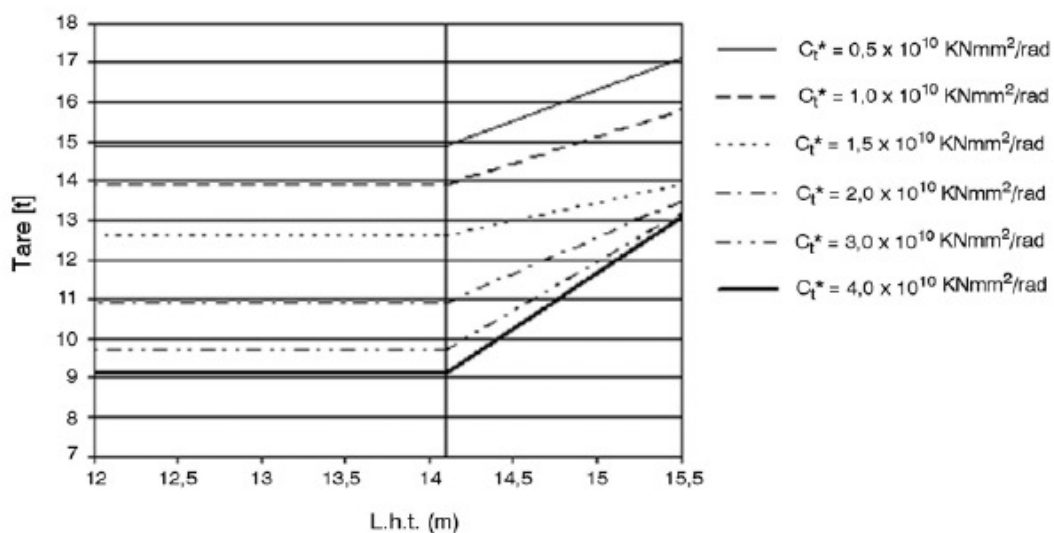
2axle wagons: in dependence of tare weight, length over buffers and torsional stiffness acc. the following diagram:

Fig. R5

Minimum tare of 2-axle long wagon with side buffers and screw coupling

$$14,1 \text{ m} \leq L_{ob} \leq 15,5 \text{ m and } 9 \text{ m} \leq 2a^* \leq 10 \text{ m}$$


Longitudinal force $F_L = 200 \text{ kN}$ and buffer plates $R = 2750 \text{ mm}$



4axle wagons:

- tare weight $\geq 16 \text{ t}$
- rate tare weight / $L_{ob} \geq 1,0 \text{ t/m}$
- length of overhang in accordance with the conditions in Fig. R6 for wagons with steering axle bogies and in Fig. R7 for wagons with bogie type Y25.

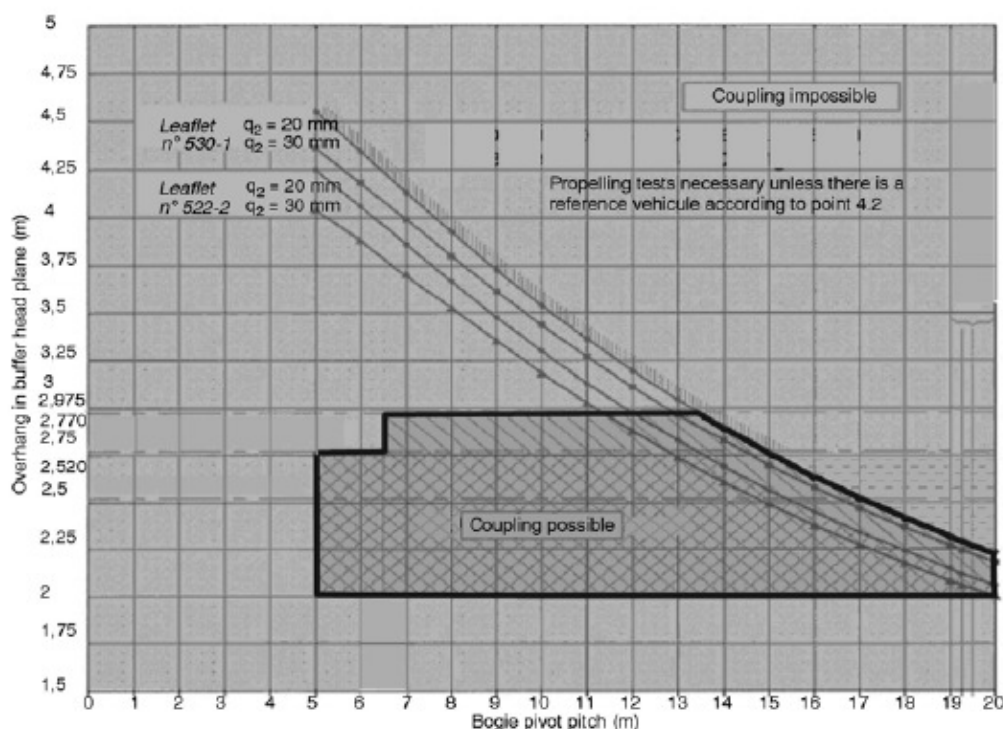
Fig. R6

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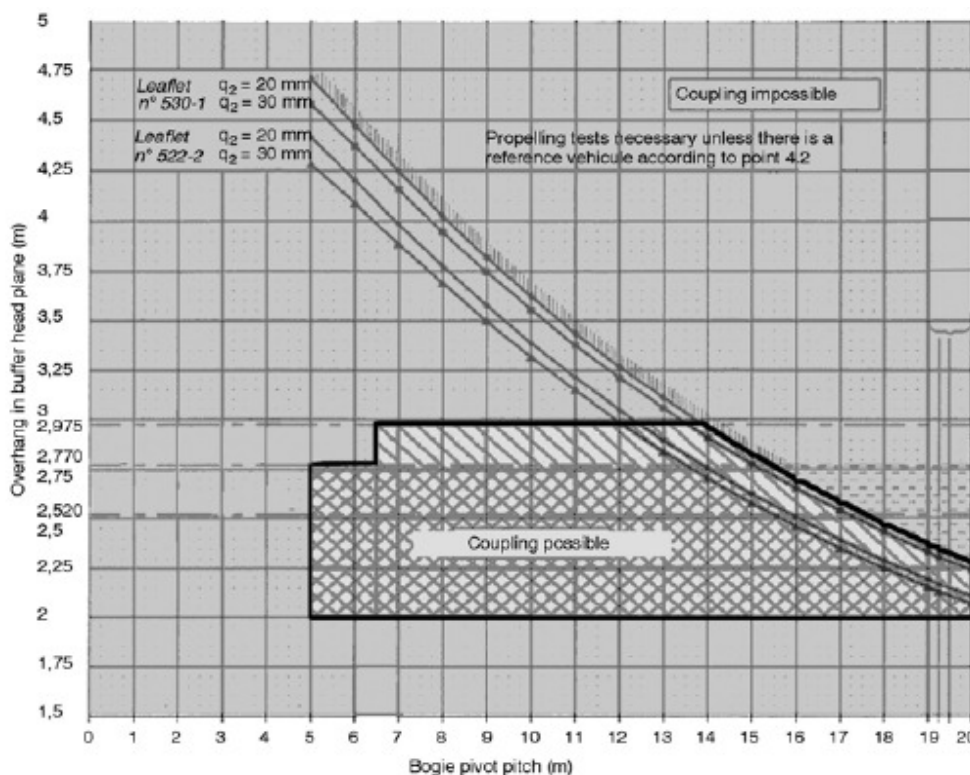
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Permitted areas and wagon dimensions for horizontal coupling on 2-axle two-bogie wagons (especially for the 65-type bogie)

Fig. R7



Permitted areas and wagon dimensions for horizontal coupling on 2-axle two-bogie wagons (especially for the Y25-type bogie)