

**IMPRESSE FERROVIARIE con certificato di
sicurezza per traffico merci**

Loro SEDI

**AZIENDE FERROVIARIE DI CUI AL D.M.
5/8/2016**

(solo gestori infrastruttura elenco
allegato)

Loro sedi

**Soggetti Responsabili della Manutenzione
carri merci**

Loro SEDI

Detentori carri merci

Loro SEDI

**RETE FERROVIARIA ITALIANA S.p.A.
Direzione Tecnica**

Piazza della Croce Rossa, 1

00161 Roma

**ASSOFERR - Associazione Operatori
Ferroviari e Intermodali**

c/o ASSTRA

Piazza Cola di Rienzo, 80/a

00192 Roma

p.c. **MINISTERO DELLE INFRASTRUTTURE E DEI
TRASPORTI**

**Direzione Generale per le investigazioni
ferroviarie e marittime**

Via Nomentana, 2

00144 Roma

Oggetto: Safety Alert relativo a carri container della serie Laagrss.

Allegato: Safety Alert inviato dal National Investigation Body portoghese (GPIAAF – Gabinete de Prevenção e Investigação de Acidentes com Aeronaves e de Acidentes Ferroviários) e relativo report.

Si trasmette in allegato il Safety Alert inviato dal NIB PT (National Investigation Body portoghese) attraverso il Safety Information System dell'ERA, a cui si rimanda per gli ulteriori dettagli sulla problematica in oggetto.

Il NIB PT fa presente che dal 2014 in poi in Portogallo sono stati registrati diversi deragliamenti che hanno coinvolto carri container della serie Laagrss. Questo ha portato ad indagare su tal eventi. Tipicamente i deragliamenti si sono verificati a basse velocità (pari o inferiore a 30 km/h) coinvolgendo un solo asse e sono sempre associati a un difetto di torsione (sopra o sotto i limiti consentiti). Le prove raccolte durante l'inchiesta, compresi i dati dei test dinamici, indicano che vi è un guasto precoce ed incontrollato della sospensione a causa dell'affaticamento e che il comportamento dinamico dei carri può superare i limiti accettati, a seconda delle condizioni operative. Ciò si traduce in un rischio di deragliamenti che non è adeguatamente valutato e controllato.

Codesti Soggetti devono adottare, ognuno per quanto di propria competenza, i provvedimenti ritenuti necessari sui carri della propria flotta della serie Laagrss e similari che dovranno comunque tener conto di quanto segnalato nel documento allegato e di quanto eventualmente fatto presente dal costruttore e dal soggetto responsabile della manutenzione.

Si invitano i Soggetti in indirizzo ad attivarsi nel rispetto dell'art. 5, comma 5 del Regolamento Europeo n. 445/2011, scambiando le informazioni necessarie ad evitare che gli eventi possano ripetersi e fornendo riscontro alla scrivente Agenzia.

Il Dirigente
Ing. Giovanni Caruso



1914

Dear Mother
I received your letter of the 15th and was glad to hear from you. I am well and hope these few lines will find you all the same. I have not much news to write at present. I am still in the same place and doing the same work. I have not seen any of the old friends here. I have not much news to write at present. I am still in the same place and doing the same work. I have not seen any of the old friends here.

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SAFETY ALERT

SYSTEM/ EQUIPMENT	43 71 437 8 001-642, 43 71 437 8 643-672 and 41 71 437 8 000-074 series Laagrss container wagons	
SAFETY ISSUE DESCRIPTION	<p>From 2014 onwards there have been several derailments in Portugal involving these wagons. This led NIB PT to investigate the events. Typically, the derailments occurred at low speeds (at or below 30 km/h) and involved only the derailment of one axle. It was found that the derailments were always associated to a twist defect on the track (either above or below the allowed limits). However, during the investigations it was also found that suspension elements showed evidence of fracture with clear signs of fatigue. Wagons suspension does not comply with UIC517 for 2-axle wagons and evaluation and tests required by standards were not performed, based on the wrong assumption that the suspension did comply to UIC517. See attachment for further detail.</p>	
CIRCUMSTANCES <i>(e.g. special weather conditions)</i>	The issue seems to be especially relevant when running on track close to immediate action limits, especially in sections with importante twist defects. See attachment for further detail.	
REASON FOR ISSUE	<p>Evidence gathered during the investigation, including dynamic test data, indicates that there is uncontrolled premature failure of suspension due to fatigue and that the dynamic behavior of the wagons may exceed the accepted limits, depending on the operating conditions. This results in a derailment risk that is not adequately assessed and controlled. See attachment for further detail. Wagons are authorized to run in A, B, BG, CZ, D, E, F, H, HR, L, P, RO, SLO, SK, CH, TR, BIH, YU [country codes as per UIC 438-2] and the Channel Tunnel. While the investigation report is not finished, the intention of this alert is to make the issue known so that the relevant interested parties can take what actions they may consider adequate, taking into account their experience from the use of the vehicles.</p>	
LIST OF SUPPORTING DOCUMENTS <i>(e.g. PHOTOS, LINKS)</i>	Document attached.	
LINKED WITH OCCURRENCE NOTIFIED TO ERA DATABASE?	Choose an item.	LINK TO ERA NOTIFICATION Click here to enter text.
	OCCURRENCE DATE Click here to enter a date.	

ISSUER

ORGANISATION	GPIAAF – Gabinete de Prevenção e Investigação de Acidentes com Aeronaves e de Acidentes Ferroviários (NIB PT)
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CONTACT DATA		Click here to enter text.		nelson.oliveira@gpiaaf.gov.pt
ISSUE DATE	22/03/2018			



Office for the Prevention and Investigation of Accidents
in Civil Aviation and Rail (SIA/NIB PT)



Rail Accidents Unit

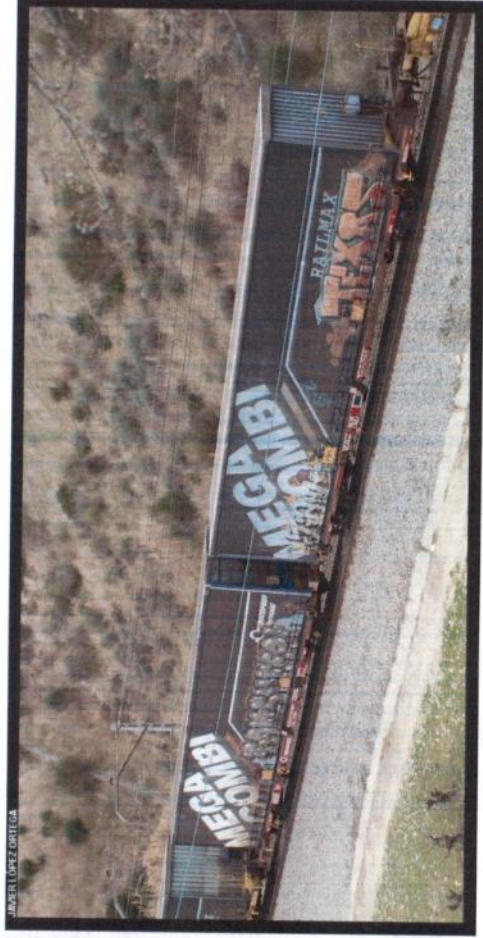
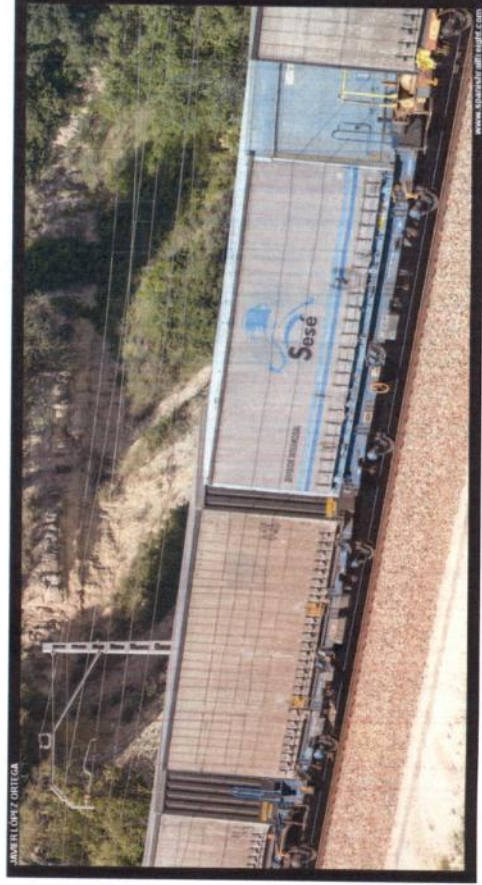
SAFETY ISSUES REGARDING WAGONS

Laagrss

43 71 437 8 001-642 (TRANSFESA)

43 71 437 8 643-672 (GMF)

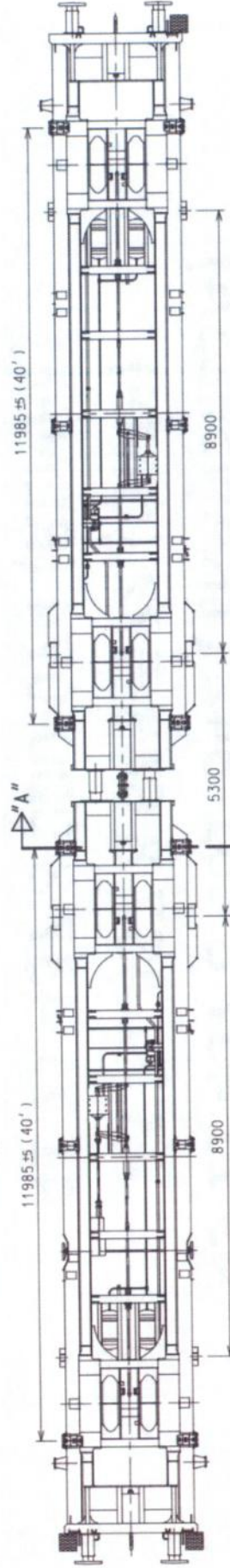
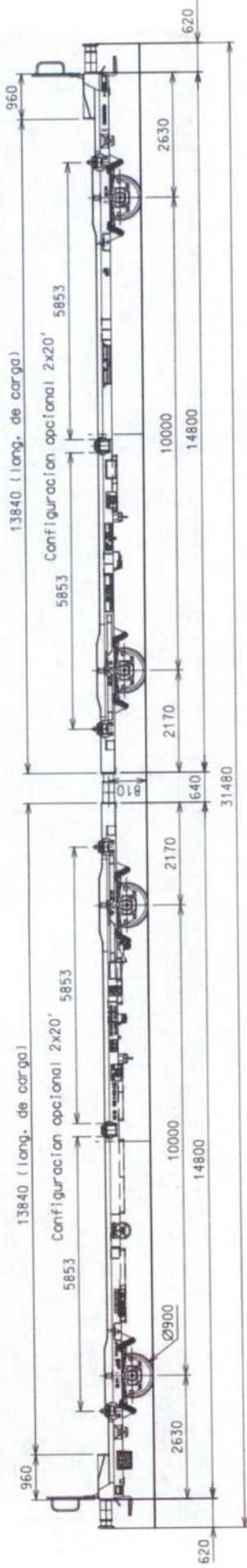
41 71 437 8 000-074 (RENFE)





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THE WAGONS



- Permanently coupled double platform wagon.
- Designed and built by TAFESA* (Spain):
 - 1997/2005 - TRANSFESA: 642 wagons
 - 2009 - COMSA: 30 wagons
 - 2009 - RENFE: 75 wagons

* - Closed in 2014.

Approved to run on international traffic in most of Europe, from Portugal to Turkey, including the Channel Tunnel.





BACKGROUND

From 2014 onwards there have been several derailments in Portugal involving these wagons. This led NIB PT to investigate the events.

Typically, the derailments occurred at low speeds (at or below 30 km/h) and involved only the derailment of one axle.

It was found that the derailments were always associated to a twist defect on the track (either above or below the allowed limits). However, during the investigations it was also found that suspension elements showed evidence of fracture with clear signs of fatigue.

In some cases it was possible to determine that the suspension of the derailed axle was fractured before the derailment and thus was a causal factor in the derailment; in other cases it is still not possible to determine if the suspension was fractured before or because of the derailment.

NIB PT has also been informed that derailments with these wagons also occurred in other countries, in similar circumstances.

During the investigation it has come to light a fundamental issue in the design and authorization/certification process of these wagons which results in a safety risk that evidence suggests is not being adequately controlled.

While the investigation report is not finished, the intention of this document is to make the issue known so that the relevant interested parties can take what actions they consider adequate to control the risk and avoid recurrence.



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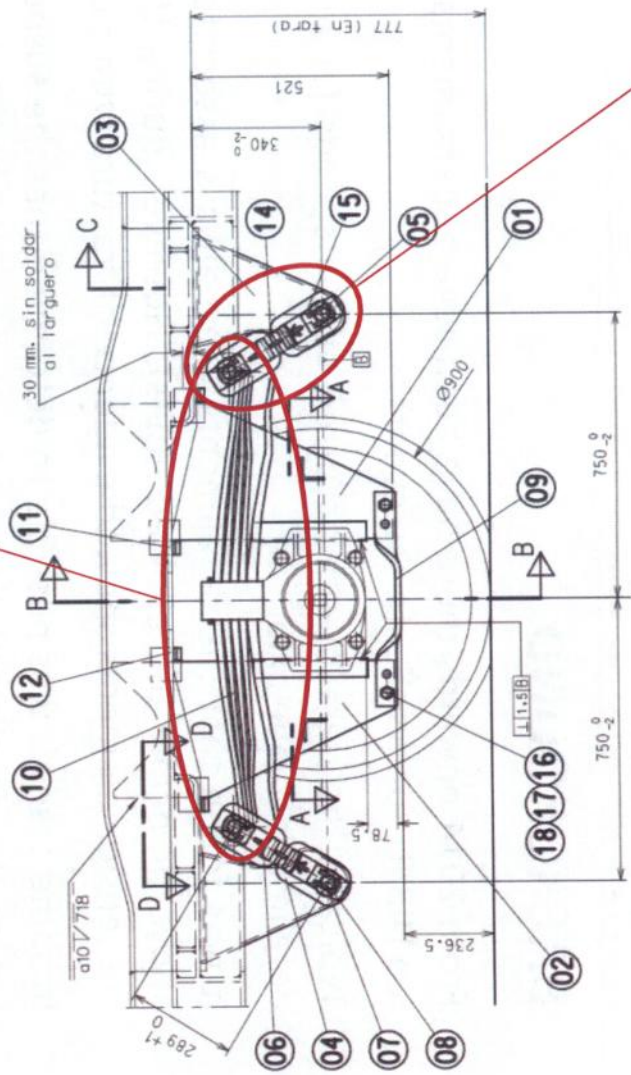


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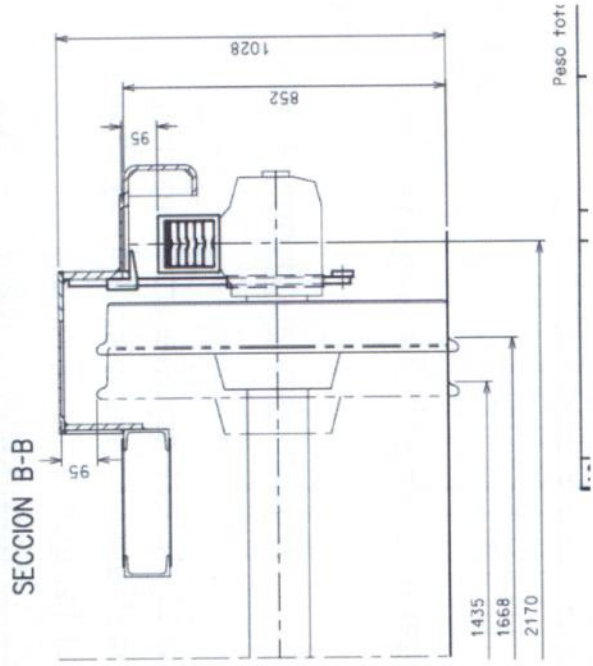
WAGON SUSPENSION

The wagon suspension is as follows:

UIC parabolic spring for bogies



UIC double link suspension





WAGON SUSPENSION

The design documents [Tafesa, 1997] declare that:

Suspensión:

Suspensión de doble anilla con muelle parabólico de 5 hojas apto para 22,5 t/eje s/anexo 9b de la ficha UIC 517.

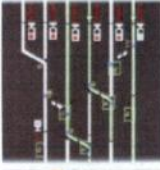
Suspension:

Double link suspension with 5-leaf parabolic spring for 22,5 ton per axle, according to annex 9b of UIC 517 leaflet. [Note: 1989 version]



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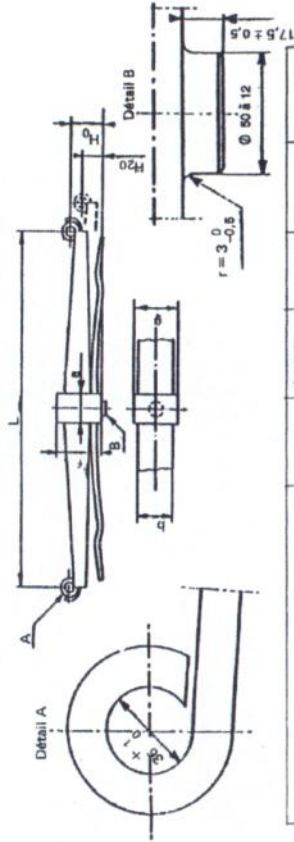
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WAGON SUSPENSION

UIC 517 [1989] annex 9b refers to a parabolic spring for bogies:

1-1-89

RESSORT PARABOLIQUE A RAIDEUR PROGRESSIVE POUR BOGIES STANDARDISATION UIC 517



Caractéristiques	Types de ressorts		Parabolique Type 10 e cf. annexes : 10 d
	Symboles	Unités	
Masses admissibles par essieu : - en régime ordinaire et S - en régime SS	P	t	22,5 (1) 22,5 (1)
Longueur de la lame métrée (mesurée entre les axes des rouleaux de la lame supportée droite)	L	mm	1200 ± 3
Hauteur du ressort sous charge nulle	H ₀	mm	116
Hauteur du ressort sous charge de 200kN appliquée dans le montage à chariot (S)	H ₂₀	mm	82 ± 3
Section des lames : - du 1 ^{er} filetage - du 2 ^{ème} filetage	b x h ₀ b x h ₁	mm mm	120 x 21 120 x 28
Nombre de lames : - du 1 ^{er} filetage - du 2 ^{ème} filetage	n ₀ n ₁	pièces pièces	4 1
Dimensions de la bride : Largeur	e	mm	100 ± 4 100 ± 2
Hauteur	f	mm	183 ± 3,5
Longueur	g	mm	150 ± 3,5
Masses	m	kg	85
Dessin standard ORE n° :			100 M 1340 00 11 (3)

(1) La charge par essieu admise en trafic international est toutefois limitée à 20 t en régimes S et SS.

(2) H₂₀ : valeur moyenne entre la hauteur obtenue à charge croissante et la hauteur obtenue à charge décroissante (voir fiche UIC n° 821).

(3) Les ressorts paraboliques standard font l'objet de bords dont les références et les conditions d'utilisation sont précisées par le document ORE DO 4.1 - Annex 4 (la libre usage des dessins de ces ressorts est accordée aux réseaux membres de l'UIC conformément pour leurs propres besoins).

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517
OR
ANNEXE 9b



WAGON SUSPENSION

For two axle wagons, UIC 517 [1989] defines the following:

1.1 - Ressorts à lames pour wagons à 2 essieux

* 1.1.1 - Sur les wagons à construire à 2 essieux, aptes à une masse par essieu de 20 t (ou éventuellement, une masse supérieure), les ressorts à lames à utiliser, sauf si ce n'est pas possible pour des raisons d'ordre technique, sont d'un des types suivant :

- ressort standard à raideur constante type A, défini à l'Annexe 1;
- ressorts unifiés à raideur constante type B, définis à l'Annexe 1;
- ressorts standard à raideur progressive définis aux Annexes 9a, 9c, 9d, 10a, 10c, 11a et 11b;

Spring in annex 9b is not included

1.1.2 - Si, pour des raisons d'ordre technique, des ressorts à lames autres que ceux indiqués au point 1.1.1 doivent être utilisés, il convient d'observer les recommandations de l'Annexe 15.

Dynamic tests and stress calculations for other springs (i.e. the spring in annex 9b)

1.1.3 - Par ailleurs, les ressorts à lames définis ci-après peuvent être utilisés sur les wagons existants à 2 essieux pour une masse par essieu de 20 t, à savoir :

- ressort trapézoïdal unifié à raideur constante défini à l'Annexe 2,
- ressort standard à raideur progressive défini aux Annexes 9a, 9c, 9d, 10a et 10b.



WAGON SUSPENSION

According to 1.1.2, for using annex 9b springs on 2-axle wagons the following should be done:

517

- 63 -

OR
ANNEXE 15

**CONDITIONS A REMPLIR POUR L'AGREMENT,
PAR LE RESEAU IMMATICULATEUR,
DE RESSORTS A LAMES NON UNIFIES POUR WAGONS**

Recommandation

1 - Pour l'agrément d'un ressort à lames non unifié, destiné au trafic ferroviaire, il y a lieu de présenter l'ensemble des caractéristiques du ressort sous forme de tableaux analogues à ceux des Annexes 9a et 9c précédentes et d'établir les dessins de construction.

2 - Les indications relatives au matériau et à la fabrication sont à fournir dans un tableau analogue à celui de l'Annexe 9d précédente.

Par ailleurs, des directives pour l'entretien dans les ateliers sont à établir.

3 - Il y a lieu de procéder à un calcul du ressort (suivant B 12/RP 25, dans le cas de ressorts trapézoïdaux), complété par un état comparatif des contraintes maximales calculées et des contraintes admissibles.

4 - Des essais sont à effectuer en laboratoire, en ligne et au tamponnement, comme dans le cas des ressorts standard (B 12/RP 34).

Les contraintes dans le ressort sont à comparer avec celles subies par un ressort standardisé connu de conception voisine, monté sur un véhicule comparable.

Lorsque les contraintes sont trop élevées par comparaison avec le ressort standardisé correspondant, il convient d'effectuer des essais de fatigue. Dans ce cas, 1 million de cycles de charge sont à effectuer avec une charge de base correspondant à la charge totale du véhicule et une variation de charge de $\pm 25\%$ d'amplitude.

Les Réseaux sont libres d'élargir le programme d'essais.

5 - Il est rappelé que la qualité de marche des wagons équipés dudit ressort doit satisfaire aux conditions de la fiche UIC N° 432.



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WAGON SUSPENSION

During the authorization process of the wagons, for justifying the exemption of dynamic tests for compliance with UIC 432 and UIC 518 leaflets, the designer declared that “**the wagons comply with section 4 of UIC 517**”.

Section 4 of UIC 517 leaflet states that:

*** 4 - Suspension à anneaux doubles et supports de suspension**

4.1 - La suspension à anneaux doubles doit être appliquée sur les wagons à deux essieux définis aux fiches N°s 571-1, 571-3 et 571-4.

4.2 - L'ensemble des organes de roulement avec suspension à anneaux doubles est représenté à l'Annexe 4.

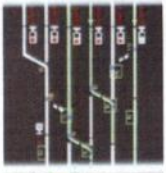
La distance entre les axes des alésages des supports de suspension est égale à la longueur développée L de la lame maîtresse (mesurée entre les axes des rouleaux de la lame supposée droite) augmentée de 300 mm.

L'amplitude des oscillations transversales des anneaux intérieurs doit être limitée à partir de la position médiane à 10 mm.



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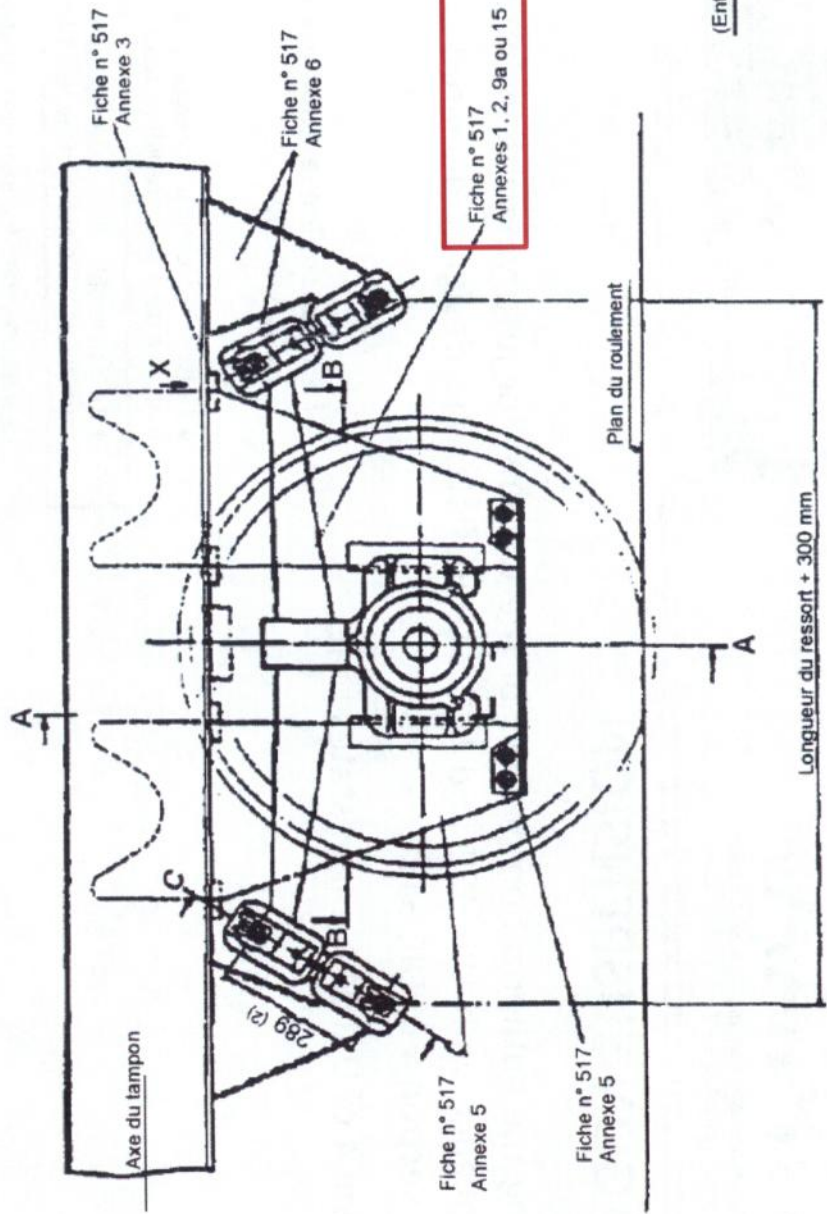


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WAGON SUSPENSION

Annex 4 of UIC 517 leaflet defines the double ring suspension components:

Organes de roulement et de suspension des wagons à 2 essieux





WAGON SUSPENSION

Conclusions:

- Running gear suspension **does not comply** with UIC 517 standard for 2 axle wagons;
- Parabolic spring for bogies could be used only if subjected to tests prescribed in UIC 517 Annex 15 (annex M in present version of leaflet);
- Wagon **could not be exempted** from dynamic tests for compliance with UIC 432 and UIC 518 leaflets



WAGON AUTHORIZATION/CERTIFICATION

Designer declared that the suspension complied with UIC 517 and that, because of that (among other criteria), it was exempted from dynamic tests.

Based on this, the wagon type was authorized by the Spanish network and authorities and, based on cross-acceptance principles and mutual agreements, authorized in many other countries, Subsequent batches were all authorized based on the (full or partial) type continuity principle.

A Spanish notified body issued TSI compliance certificate for the wagon type in 2009. In what regards the suspension, the verification report states that “suspension complies with section 4 of UIC 517” based on the designer declaration, with no check being done.

A Portuguese notified body issued in 2010 an evaluation report for the purpose of CE compliance certificate for the wagon type. In what regards the suspension, the report states that “suspension complies with section 4 of UIC 517” based on the designer declaration, with no check being done.

The original authorizer of the wagon and the NoBos later involved did not identify that the running gear suspension was non-standard and that supplementary tests and analysis were required.



CONSEQUENCES

- From the evidence gathered during the investigation, it was found that the suspension elements are heavily stressed, reaching levels near the limit strength and resulting in their premature failure due to fatigue.
- The dynamic behaviour of the wagon, under certain operating conditions, exceeds the limits allowed by the applicable standards and regulations.
- The relevance of these facts depend on the magnitude and type of forces exerting in the wheelsets' suspension, being critical factors for its importance the track geometrical defects and the associated running speed, as well as the loading of the wagon.



CONSEQUENCES

High stresses and fatigue in suspension components





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High stresses and fatigue in suspension components





CONSEQUENCES

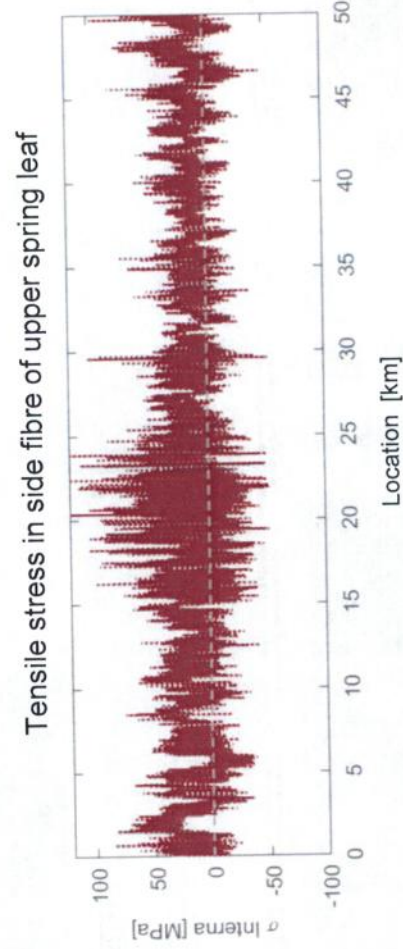
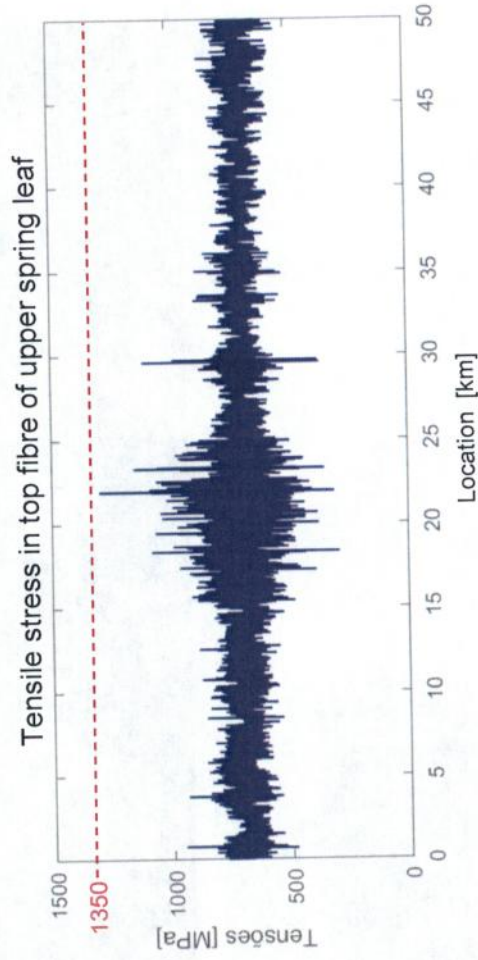
High stresses and fatigue in suspension components

Evidence indicates that the suspension elements are subjected to heavy stresses and that the fatigue limit is reached much sooner than expected.

The spring develops high tensile stresses both in the normal flexing plane and in the transversal plane of the leaves.

On a normal run with an instrumented wagon, NIB PT observed that the maximum permitted stress of 1350 MPa on the top fibre of the upper spring leaf was nearly reached, indicating that in some fibres of the metal this value is frequently exceeded when combined with the bending stress in the lateral plane.

NOTE: The dynamic test data was taken on a commercial run with a wagon loaded at 20,6 t/axle, so it is not representative of all operating conditions of this type of wagon.





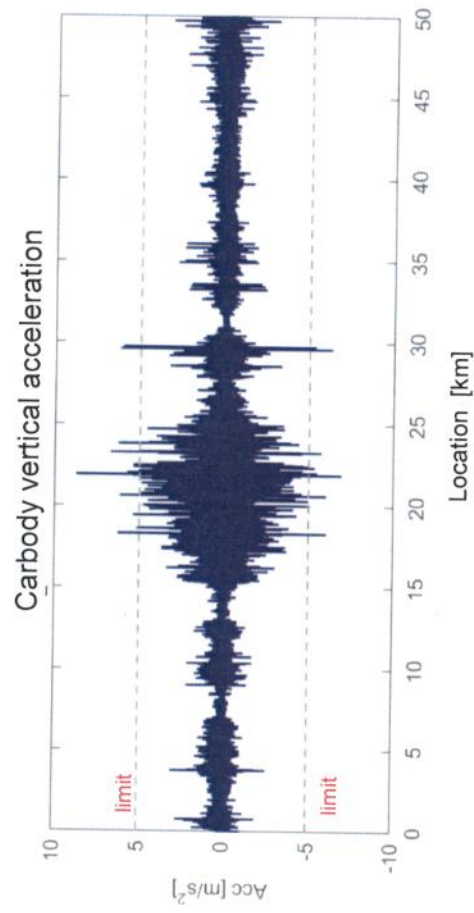
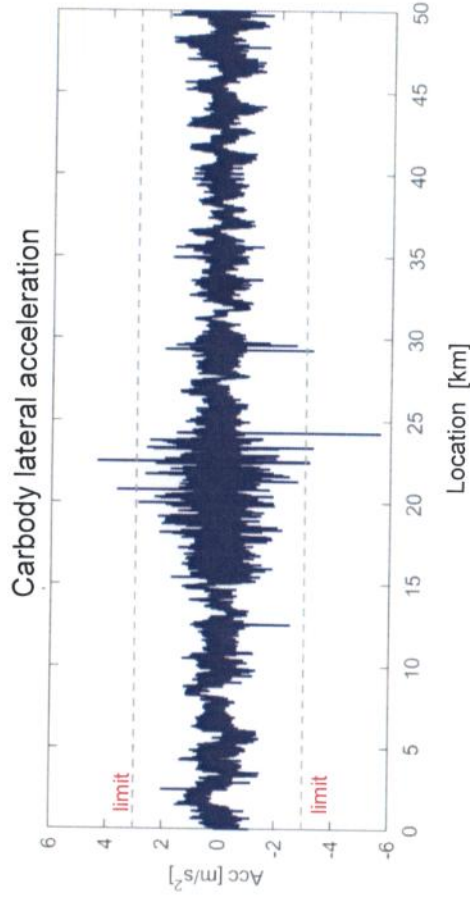
CONSEQUENCES

Dynamic behaviour

Measurements performed during the investigation, indicate that the dynamic behaviour of the wagon **exceeds the normative limits for lateral and vertical accelerations**, at least when running on track close to immediate action limits.

On a normal run with an instrumented wagon loaded at 20,6 t/axle, NIB PT observed that the vertical accelerations attained maximums of +0,9g and -0,7g, meaning that there are wheel loads applied to the track well above the dynamic coefficient expected, as well as reductions in the vertical wheel load that can favour a derailment by the corresponding increase in the Y/Q ratio.

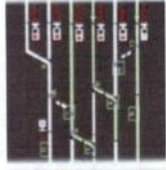
(A full test report is available from NIB PT [in portuguese] and will be included in the investigation report, but can be supplied by request to any interested party.)





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OTHER ASPECTS

- Evidence collected from the investigation suggests that the wheels in the inner wheelsets (i.e: those wheelsets near to the permanent coupling) tend to have a higher wear rate in the flange and rolling surface than the extreme wheelsets.
- Observations made in the stub buffers and permanent coupler have detected high wear and there have been some occurrences of permanent coupler fracture.
- These two observations combined, suggest that the interface between the two vehicles that constitute the wagon is heavily strained and that it may influence the tracking behaviour of the double wagon when negotiating curves.



SAFETY ISSUES THAT NEED TO BE ADDRESSED

In the investigation report, NIB PT, among others topics, will recommend that the following safety issues need to be addressed:

- The suspension and the safety of the wagon against derailment should be rechecked accordingly to the original requirements in the applicable standards, as the original statement of compliance with section 4 of UIC 517 has proven inaccurate;
- According to the results of the tests above and taking into consideration the return of experience from the years of use of these wagons, measures relating to operation conditions, changes in the design and/or the maintenance plans, should be put in place to minimize the risks of derailments due to premature suspension failure and/or dynamic behaviour of the wagons;
- The possible influence of the inner coupler arrangement in the tracking behaviour of the wagon should be studied, taking in to account the experience of maintaining these wagons;
- At least for safety critical aspects, NoBos should effectively check the accuracy of information and declarations provided by the submitter, and not just making a processual verification of documentation.



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SAFETY ISSUES THAT NEED TO BE ADDRESSED

The reduction of the period between maintenance cycles and frequent visits to the wagons already systematically taken by at least one of the wagons' ECM appear to have reduced the risk associated to fractured suspension elements. But these measures are only experimental attempts to control one risk, not based on a clear understanding of the factors involved, and do not suppress or address the root issues here presented.

Considering the potential Union wide relevance of the findings here presented and the fact that, while Directive 2016/798 is not transposed into National Legislations, some of the organizations to whom the recommendations should be addressed are out of the scope of NIB PT because of being in another Member State, it was felt that the findings contained in this document should be known to relevant parties through the mechanisms available at the European Union Agency for Railways even before the publication of the investigation report, so that appropriate measures can be taken, if considered needed by the responsible organizations.

These have already been transmitted to NSA PT, PT IM and PT RUs using these wagons.

NIB PT is available to provide further explanations if needed.

END