

Joint Network Secretariat Urgent Procedure Task Force “Extreme effects of thermal overload in special cases of freight operation”

## **Final report –**

## **Part 2: Action plan containing short-term risk control measures**

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Version 1.0

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## 1. Summary

### JNS URGENT PROCEDURE EXTREME EFFECTS OF THERMAL OVERLOAD IN SPECIAL CASES OF FREIGHT OPERATION



#### **Background:**

In 2021 there was a cluster of incidents with burning LL brake blocks after fixed brakes in Italy. In some events of a fixed brake, LL (organic) brake blocks did not dissipate sufficiently to avoid secondary damages.

As a reaction immediate measures to LL-equipped wagons (06. August 2021) from ANSFISA (NSA Italy) were imposed. On 02.11.2021: The measures were complemented by speed restrictions for freight train operated with IB 116\*.

On 30.11.2021 the JNS Urgent Procedure was started to analyze the incidents and to define short-term risk control measures as a replacement for the Italian measures.

#### **Result of the analysis:**

Two types of secondary damages were identified that were further considered in the analysis, namely fire and wheel damage. Note that the latter can, in specific cases, lead to derailment.

The analysis has shown that the risk of fire for vehicles equipped with LL - blocks is not higher than with cast iron. The negative effects of occasional cases of severe tread deformation due to fixed brakes can be further reduced by the short-term risk control measures, which represent the best practices and most common measures and technologies used all over Member States.

#### **Solution: Short term risk control measures**

Introduction short-term risk control measures in operation and wagon maintenance as set out in the following slides.

## 2. Short-term risk control measures

### OVERVIEW

The following short term risk control measures are the result JNS task force:

#### 2.1 Measures to avoid fixed brakes

2.1.1 General use of overcharge/assimilation function in accordance with the description in UIC 541-03, 2nd edition August 2015, clauses 2.1.12 and 2.1.13 or EN 14198

2.1.2 Start up test for freight trains

2.1.3 Start up test performing after emergency braking

2.1.4 Appropriate use of overcharge/assimilation function in accordance with the description in UIC 541-03 2nd edition August 2015, clauses 2.1.12 and 2.1.13 or EN 14198 Appendix E.

2.1.5 Use the automatic traction and braking system (e. g. AFB) after reaching the regular train speed to get feedback about the behavior of the train

#### 2.2 Detection of fixed brake

2.2.1 Use of the hot wheel detection systems with appropriate alarm levels (warm and hot) to detect hot wheels or fixed brakes

2.2.2 Use of the hot axle box detection system, in case of alarm also check of the wheel

2.2.3 Alert the train driver in case of fixed brakes or flaming brake blocks

2.2.4 Detection of consequences of fixed brakes by indicators on the brake blocks

#### 2.3 Check the wheels for extraordinary tread wear / wheel tread deformation

**Detailed explanations on the next slides.**

## 2. Short-term risk control measures

### 2. 1 MEASURES TO AVOID FIXED BRAKES (1/2)

Measure	2.1.1 General use of overcharge/assimilation function in accordance with the description in UIC 541-03, 2 <sup>nd</sup> edition August 2015, clauses 2.1.12 and 2.1.13 or EN 14198 Appendix E at the border.	2.1.2 Start up test for freight trains (see also Slide 7 for more information)	2.1.3 Start up test performing after emergency braking (see also Slide 7 for more information)
To be applied by	All RU	All RU	All RU
Purpose	Avoid and Release an overcharged distributor valve at the border.	Detection of abnormalities concerning the running and braking behavior of the train/wagon.	Detection of abnormalities concerning the running and braking behavior of the train/wagon.
Criteria	<p>After changing the locomotive at or near the border, the brake release condition must be ensured by operating the overcharge/assimilation system <b>and wait on the end of the process</b> before departure to ensure to start the train-running with an assimilated brake system.</p> <p>When using a loco without an integrated assimilation function in the driver's valve be careful not to overcharge the distributor valve.</p>	<p>On the first start-up of a regular freight train after train composition, parking, or locomotive change a start-up test shall be carried out.</p> <p>The start up test shall be carried out, if appropriate conditions (track without slope, sufficient space) are available."</p>	<p>Description see following slide</p> <p>In case of abnormalities carry out extraordinary inspection to the train in the first location for that purpose established in agreement with the Infrastructure Manager</p>
Measures on findings:		See 5a and 5b on slide 7	See 5a and 5b on slide 7

## 2. Short-term risk control measures

### 2. 1 MEASURES TO AVOID FIXED BRAKES (2/2)

Measure	2.1.4 Appropriate use of overcharge/assimilation function in accordance with the description in UIC 541-03 2 <sup>nd</sup> edition August 2015, clauses 2.1.12 and 2.1.13 or EN 14198 Appendix E.	2.1.5 Use the automatic traction and braking system (e. g. AFB) after reaching the regular train speed to get feedback about the behavior of the train
To be applied by	All RU	All RU
Purpose	Avoid and Release an overcharged distributor valve.	Avoiding and detection of any irregular behavior of the train which could be hidden by the automatic traction and braking system (e.g. AFB)
Criteria	<ul style="list-style-type: none"> <li>• If there is a need to remove an overcharging, use the assimilation function, mainly integrated in the driver's brake valve.</li> <li>• When using a loco without an integrated assimilation function in the driver's valve be careful not to overcharge the distributor valve.</li> <li>• The brake release condition must also be ensured by operating the overcharge/assimilation system, <b>when leaving a downhill section.</b></li> </ul> <p>If (by use during driving) the pressure in the main brake pipe has not yet reached 5.0 bar after operating the assimilation system and the brakes have to be applied again, the assimilation system has to be used again after the end of the braking (if it does not start again automatically due to the system).</p>	Smooth running of the train from driver experience up to regular train speed (e. g. absence of emergency brake intervention, absence air leakage in the brake pipe)
Measures on findings:	If a brake of a wagon doesn't release (e. g. with a start up test or a brake test), pulling of the release device	No application of automatic traction and braking system (e. g. AFB). In case of malfunctions to the brake system (e. g. emergency brake intervention, air leakage in the brake pipe, etc.) remove the abnormalities.

## 2. Short-term risk control measures

### 2.1.2 / 2.1.3 MEASURES TO AVOID FIXED BRAKES – DETAILED INFORMATION FOR THE START UP

Start-up test for freight trains  
(Betriebsregelwerk BRW.5333, Abschnitt 3 “Anfahrprobe bei Güterzügen”),

Step	Measure	
1	On the first start-up of a regular freight train after train composition, parking, locomotive change or emergency brake intervention a start-up test shall be carried out.	
2	When all conditions for the departure of the train have been met, the start-up test may begin. The track and signal observation shall not be affected by the following activities.	
3	The start-up test shall be carried out as follows: <ul style="list-style-type: none"> <li>· If the traction unit is operated from the driver's cab, at least one window in the driver's cab shall be opened.</li> <li>· The train shall be set in motion with the lowest possible traction force.</li> <li>· When the train is in motion and has reached walking speed, the traction force shall be switched off.</li> </ul>	
4	The train shall be stopped immediately if any irregularities are detected, and the cause shall be investigated. Characteristics of irregularities may be: <ul style="list-style-type: none"> <li>· significant reduction in speed (braking effects)</li> <li>· unusual jerking or tugging</li> <li>· grinding noises</li> <li>· no run-up of the wagons towards the loco</li> </ul>	
5	a) If <b>no irregularities</b> are <b>detected</b> , the <b>train</b> may <b>continue</b> its <b>journey</b> .	b) If <b>irregularities</b> are detected, the start-up test shall be end and only be repeated after the <b>train has been fully checked</b> for forgotten drag shoe, handbrakes or unreleased brakes.
6		Repeat the start up test

## 2. Short-term risk control measures

### 2.2 DETECTION OF FIXED BRAKE (1/2)

Measures	2.2.1 Use of the hot wheel detection systems with appropriate alarm levels (warm and hot) to detect hot wheels or fixed brakes	2.2.2 Use of the hot axle box detection system, in case of alarm also check of the wheel
To be applied by	IM, RU	IM, RU
purpose	Detection of hot wheels and thermal overload.	Detection of hot wheels and thermal overload in case of hot axle box detection alarm on tread braked freight train.
Criteria	Using 2 different alarm levels (IM), e.g. <ul style="list-style-type: none"> <li>• Warm alarm: less than or equal to 300° C</li> <li>• Hot alarm: between 300° and 500° C</li> </ul> In case of any alarm, stop the train (based on infrastructure rules), (IM, RU):	In case of any alarm, stop the train (based on infrastructure rules), (IM, RU) and in addition to the check of the axle box:
	<ul style="list-style-type: none"> <li>• Check of the wheels for signs of thermal overload (RU),</li> <li>• Check of the wheel for extra ordinary wheel tread deformation (RU)</li> </ul>	
Measures on findings:	<ul style="list-style-type: none"> <li>• In case of thermal overload: Following the GCU requirements,</li> <li>• In case of extraordinary wheel tread deformation: Detach the wagon (RU), Change the wheelset and handover to off vehicle wheelset maintenance. (See Chapter 2.3).</li> </ul>	



## 2. Short-term risk control measures

### 2.2 DETECTION OF FIXED BRAKE

Measures	2.2.3 Alert the train driver in case of fixed brakes or flaming brake blocks	2.2.4 Detection of consequences of fixed brakes by indicators on the brake blocks (examples on slide 10 and 11)
To be applied by	IM, RU	RU
purpose	Detection of hot wheels and thermal overload after fixed brakes or flaming brake blocks.	Indication of former thermal overload by signs on the brake blocks during the wagon inspection.
Criteria	<p>In case of any fixed brake or flaming brake blocks, stop the train (based on infrastructure rules), (IM, RU):</p> <ul style="list-style-type: none"> <li>• All staff in operation (train drivers, maintenance staff, signallers, etc.) who detect flaming brake blocks coming from trains, should activate the procedure to inform the train driver of the train with flaming brake blocks, to inform the problem occurred, to adopt the specific measures</li> <li>• The measure includes the detection of fixed brake directly by the train driver by using systems such as rearview mirrors and cameras (if available).</li> </ul> <p>In case of any irregularities, stop the train (bases on infrastructure rules), (IM, RU)</p>	<ul style="list-style-type: none"> <li>• Change of color on the block at the level of the interface between the block and the wheel tread,</li> <li>• Carbonized or fused brake blocks,</li> <li>• See the pictures next slides</li> </ul> <p>In case of any signs on the brake block:</p>
Measures on findings:	<ul style="list-style-type: none"> <li>• In case of thermal overload: Following the GCU requirements,</li> <li>• In case of extraordinary wheel tread deformation: Detach the wagon (RU), Change the wheelset and handover to off vehicle wheelset maintenance. (See Chapter 2.3).</li> </ul>	

## 2. Short-term risk control measures

### 2.2.4 DETECTION OF FIXED BRAKE – DETECTION OF CONSEQUENCES OF FIXED BRAKES BY INDICATORS ON THE BRAKE BLOCKS



Brake block in normal conditions



Change of color and broken out brake block material



Change of color on the brake block and burned paint on the rim web transition of the wheel



Change of color of the brake block

## 2. Short-term risk control measures

### 2.2.4 DETECTION OF FIXED BRAKE- DETECTION OF CONSEQUENCES OF FIXED BRAKES BY INDICATORS ON THE BRAKE BLOCKS



Fused brake block



Fused brake block



Carbonized brake block

## 2. Short-term risk control measures

### 2.3 CHECK THE WHEELS FOR EXTRAORDINARY TREAD WEAR / WHEEL TREAD DEFORMATION

<b>Measure</b>	2.3.1 Check the wheels for extraordinary tread wear / wheel tread deformation
<b>To be applied by</b>	RU, ECM
<b>Purpose</b>	Removal of wheels with extraordinary tread wear / wheel tread deformation from operations
<b>Criteria</b>	<p>After</p> <ul style="list-style-type: none"><li>• a fixed brake,</li><li>• hot axle box detection alarm</li><li>• hot wheel detection alarm</li><li>• a brake incident (see slides before)</li><li>• detecting flames or being informed about flames on the train</li><li>• or any other signs of thermal overload of a wheel</li></ul> <p>visual check of the wheel tread has to be performed (RU, ECM). Extraordinary wheel tread deformation (see next slide) is not permitted</p>
<b>Measures on findings:</b>	<ul style="list-style-type: none"><li>• Change the wheelset and hand over to off vehicle wheelset maintenance, apply the rules for change the wheelsets like for hot axle boxes</li><li>• Apply the measures after thermal overload, see EN 15313 and GCU (ECM)</li></ul>



## 2. Short-term risk control measures

### 2.3.1 CHECK THE WHEELS FOR EXTRAORDINARY TREAD WEAR / WHEEL TREAD DEFORMATION



Extraordinary wheel tread deformation on the outer side of the tread

The measurement tool is not part of the assessment



Extraordinary wheel tread deformation near the flange



Extraordinary wheel tread deformation on the outer side of the tread and near the flange

### 3. Implementation

#### APPLICATION FOR LL-BLOCKS – SHORT TERM RISK CONTROL MEASURES AND WAY OF IMPLEMENTATION

##### **Application:**

- Task Force to recommend appropriate short-term risk control measures addressed to European railway actors which are affected and as a substitute for the restrictions currently imposed by NSA Italy. These measures will be further developed in within the subsequence normal JNS procedure.
- Definition of affected European railway actor: European railway actors which may be faced with extraordinary events related to flaming LL-brake blocks and extraordinary deformation of the wheel tread in freight wagon operation.
- The implementation of the short-term risk control measure 2.2.1 has the highest priority. Pending this, it requires a particular attention and cooperation between IM/RU in the frame of operations.

##### **Implementation:**

- Urgent procedure TF “Extreme effects of thermal overload in special cases of freight operation” after endorsement by the task members prepares the documentation for the publication/dissemination (on hand presentation).
- Publication of documentation on the ERA website.
- Additional dissemination of documentation by the representative bodies (CER, EIM, ERFA, UIP, EPTTOLA, UNIFE, NB-Rail AISBL, UIRR, UITP, ALE, ETF, FEDECRAIL) and official organizations (OTIF, NIBs, NSAs, OSJD) and ECM certification bodies and UIC.
- The short-term risk control measures are covering conventional wagons and wagons for the transport of dangerous goods.

## 4. Follow up in “Normal Procedure”

The phenomenon of flaming blocks needs to be further investigated in the normal JNS procedure and includes as proposal the following topics:

1. Further analyses of the case evaluation, add cases from all over Europe.
2. Definition of test bench tests for further analyses, under which conditions the blocks will be flamed and / or plastic deformation of the wheel tread.
3. Further fire propagation evaluation.
4. Proposals for amendments in standards and regulation.
5. Analysis of automatic speed control and braking systems (e. g. AFB, ATO).
6. Updating the short-term risk control measures from the urgent procedure.
7. Investigate possible solutions to improve the braking system technologies and its operations.
8. Review the limits and conditions of use for the application of composite brake blocks (Type LL).
9. Review of the TSI requirements for composite brake blocks (Type LL).
10. Possible harmonization of requirements for hot axle box and hot wheel detection systems.
11. Investigate technical solutions to detect directly on the loco braking system abnormalities (e. g. hot wheels, etc.).
12. Investigate possible differences in the production process of composite brake blocks