JNS Normal Procedure

“Accident Gotthard base tunnel - broken wheels"

JNS report | version 5.1

Version history:

Version	Date	Comments
3.0	04.04.2025	General review of version 2.0 of July 2024 without change of content. Part II, Chapter 1 “Risk control measures”: Increased user-friendliness through integration of a flowchart and clarification and further precision without changing the content.
4.0	19.12.2025	Updated JNS final report, including: • risk control measures 2026 • tasks for the continuation of the JNS work • impact assessment.
4.1	14.01.2026	Editorial corrections made. Clarifications on measure 2.1b regarding actions following visual inspections after detection of thermal overload.
5.0	10.08.2026	Updated JNS report, including: • risk control measures 5.0 • tasks for the continuation of the JNS work • impact assessment.
5.1	16.10.2026	Editorial corrections made following Task Force meeting of 14.09.2026 and 28.09.2026 and 16.10.2026.

Photo: Adobe Srock / by Tarasyio

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Part I - Introduction

Chapter 1: explanation JNS

Content

Chapter 1: explanation JNS

Chapter 2: background

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Part I, Chapter 1. : Explanation JNS

What is the JNS?

- Triggered by accident Viareggio 2009 ➔ Joint Sector Group at ERA
- National Safety Authorities (NSA network) and ECM Certification Bodies (working group "Cooperation of ECM CB") + Representative Bodies (NRB network)
- Creation of Task Forces of experts to solve technical issues
  (usually after accidents and dangerous events)
- Urgent (2 months) - and Normal Procedures (max. 2 years)
- Every actor can notifiy a JNS procedure
  Form can be found at https://www.era.europa.eu/activities/joint-network-secretariat_en to be sent to jns@era.europa.eu
- Neutral moderation and chairing by ERA
- European Commission (EC) and the Intergovernmental Organisation for International Carriage by Rail (OTIF) may participate as observers

Part I, Chapter 1. : Explanation JNS

Role of RU, IM and other actors in the EU safety framework

- **Railway Undertaking (RU)** and **Infrastructure Manager (IM)** are together responsible for safe operation.
- In case of incidents and accidents, **RUs and IMs** shall evaluate, where appropriate with **entities in charge of maintenance (ECM) and all other actors having a potential impact on the safe operation of the Union rail system,** if the risk requires measures immediately preventing any related danger and if yes, define and implement them.
- **RUs, IMs and any other actor** involved have to share relevant information (currently in Safety Alert IT (SAIT)) to allow other actors to react appropriately to ensure safety.

In accordance with Article 4 of Directive (EU) 2016/798 (Railway Safety Directive)

Part I, Chapter 1. : Explanation JNS

Role of NSAs and ECM CBs in the EU safety framework

- After incidents and accidents the **National Safety Authority (NSA) supervises** actors' immediate actions aiming at assessing whether the measures taken by the actors involved sufficiently prevent any related danger. If not, the **NSA may intervene** respecting the responsibility of all actors. These immediate measures might increase costs for the sector and may harm interoperability.[1)]
- **NSAs** have to share relevant information within the NSA network and notify the information in the appropriate system to share information (currently the NSAs use the SIS system) to enable other NSAs to react appropriately in order to ensure safety.
- **ECM Certification Bodies (ECM CBs)** perform annual surveillance on the ECMs they have certified[2)], and have to participate in the working group "Cooperation of ECM CBs" and can react on accidents/incidents through Recommendations For Use (RFUs) developed and agreed within this cooperation[3)].

1) In accordance with Article 17 of Directive (EU) 2016/798 (Railway Safety Directive)
2) In accordance with Article 8 (1) of Regulation (EU) 2019/779 (ECM Regulation)
3) In accordance with Article 6 (5) of Regulation (EU) 2019/779 (ECM Regulation)

Part I, Chapter 1. : Explanation JNS

Role of NIBs and the JNS in the EU safety framework

- In parallel the **National Investigation Body (NIB)** may run an independent investigation of the incident or accident with the objective to learn lessons for the future improvement of safety of the railway system and to question the functioning of the existing framework for railway safety. The NIB investigation shall publish the final report of their investigation within one year which shall contain, where appropriate, safety recommendations[1)].
- In case of an incident or accident any entity (preferably the competent NSA) might notify a **Joint Network Secretariat (JNS)** urgent (fast track) or normal procedure by submitting a filled notification form (https://www.era.europa.eu/activities/joint-network-secretariat_en) to ERA (jns@era.europa.eu).

1) In accordance with Chapter V of Directive (EU) 2016/798 (Railway Safety Directive)

Part I, Chapter 1. : Explanation JNS

Urgent (fast track) Procedure

- **Objective:** recommendation of appropriate European-wide harmonised short-term risk control measures in order to :
  - ensure safety,
  - maintain or restore interoperability, and
  - reduce costs for the sector (as far as possible at this stage).

- **Result:**
  - replacement of the often costly and restrictive immediate measures of the actors and/or NSAs

- **Timeline:** maximum 2 months

Part I, Chapter 1. : Explanation JNS

JNS Normal Procedure

- **Objective:** development of mid- and long term measures, to sustainably
  - restore / increase the safety level,
  - ensure interoperability, and
  - return to the previous cost base or lower.

- **Result:**
  - update of the measures from the Urgent Procedure,
  - improvements of regulation and standards,
  - identification of research needs.

- **Timeline:** maximum 2 years

Part I, Chapter 1. : Explanation JNS

JNS Panel and JNS Task Force

- After submission of **the notification form** to ERA, the JNS Panel needs to endorse the proposed JNS procedure.
- The **JNS panel** consists of two NSA and two RB representatives
- The networks of National Safety Authorities, Representative Bodies and ECM CBs nominate **competent experts** for the respective **JNS Task Force**
- The **Agency is moderator/facilitator and secretariat**
- ERA strives for **consensus**.

Part I, Chapter 1. : Explanation JNS

Sharing of information in the JNS

- Only nominated **Task Force members** should participate in the meetings.
- **Information shared** within the task force remain within its members
- **Documents are shared** on dedicated space on the Agency's Extranet. (only accessible to nominated experts)
- The **results** will be published on the ERA website and disseminated by the networks of the Representative Bodies, the National Safety Authorities and the ECM Certification Bodies in an appropriate way (e.g. final report) agreed among the task force members and have the character of a recommendation.
  The network members are requested to assure that all concerned parties are informed.

Part I - Introduction

Chapter 2: background

Content

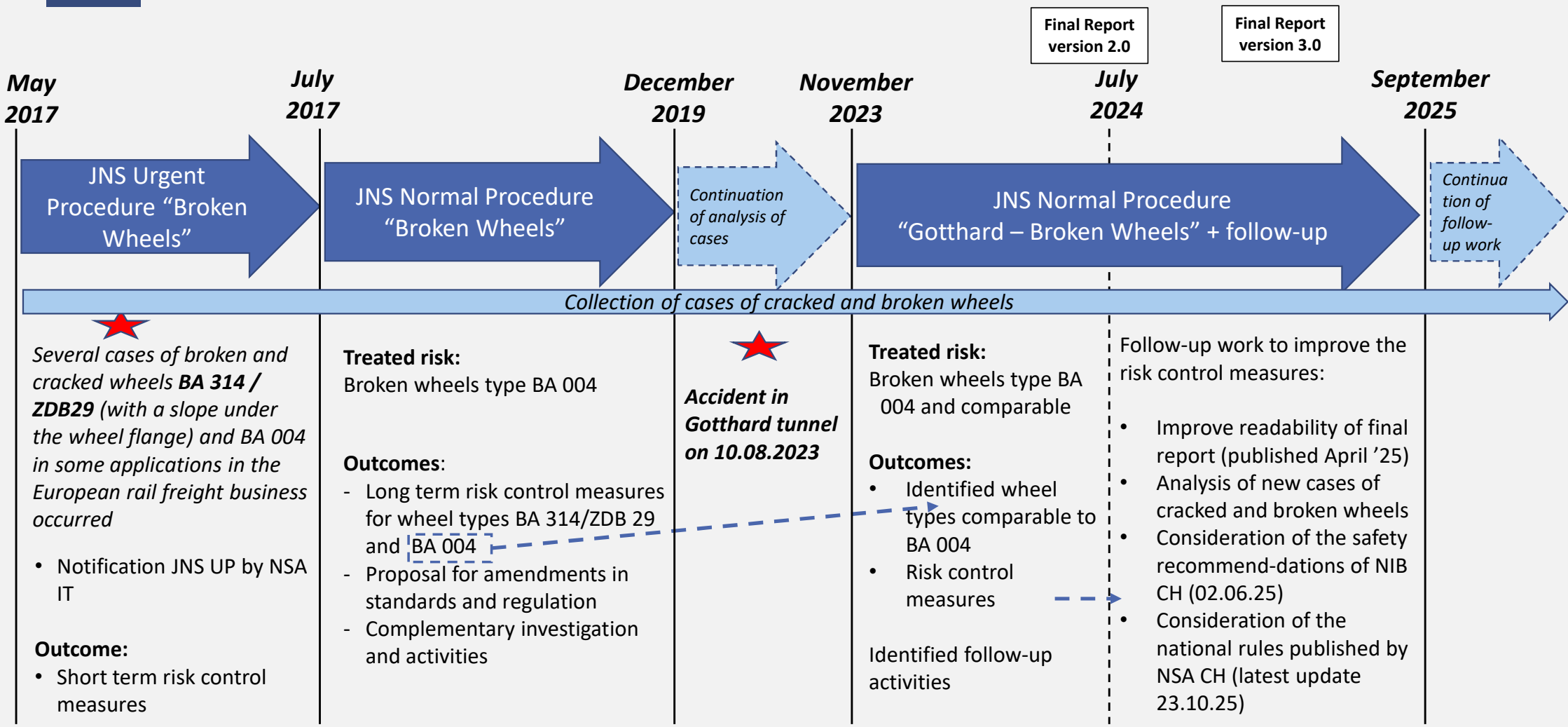
Chapter 1 : explanation JNS

Chapter 2: background

Chapter 3: risk to be tackled

Part I, Chapter 2. : Background

Timeline JNS procedures on broken wheels



Part I, Chapter 2. : Background

History of JNS activities regarding broken wheels

- In the past years, events of broken tread braked wheels have occurred all over Europe. As a response, the experts of the JNS Urgent (2017) and Normal Procedure (2017 - 2019) on Broken Wheels identified risk control measures for the wheel type BA 004 (crack in the rim) and BA 314 old/ZDB29 (crack in the web); (see https://www.era.europa.eu/domains/accident-incident/joint-network-secretariat-jns_en)
- After the conclusion of the Normal Procedure in 2019, the Task Force experts continued to analyse cases of cracked and broken wheels which occurred after 2019 and followed-up the implementation of the identified risk control measures and carried forward the recommended changes to legislation, standardization and company rules;
- On 10 August 2023, a freight train derailed in the Gotthard base tunnel, caused by a broken wheel of type BA 390. The accident led to a damage of infrastructure and rolling stock amounting to around 150 Mio. CHF (ca. 160 Mio. €). For the repair works, one tube of the Gotthard base tunnel had to be closed for more than one year and subsequently the cross alpine traffic was tremendously disturbed;
- On 15 August 2023, the Swiss National Investigation Body (NIB CH)[1)], announced to launch an investigation. In its intermediate report of 28 September 2023, the NIB CH provided details of the accident and made two safety recommendations to the Swiss National Safety Authority:

  183. Extension of risk control measures identified in the JNS procedure on broken wheels of 2019 to the wheel type used in wheelsets BA 390.

  184. Notification of a new JNS procedure.

1) the Transport Safety Investigation Board (STSB)

Part I, Chapter 2. : Background

Start of the JNS NP 'Accident Gotthard base tunnel/broken wheels'

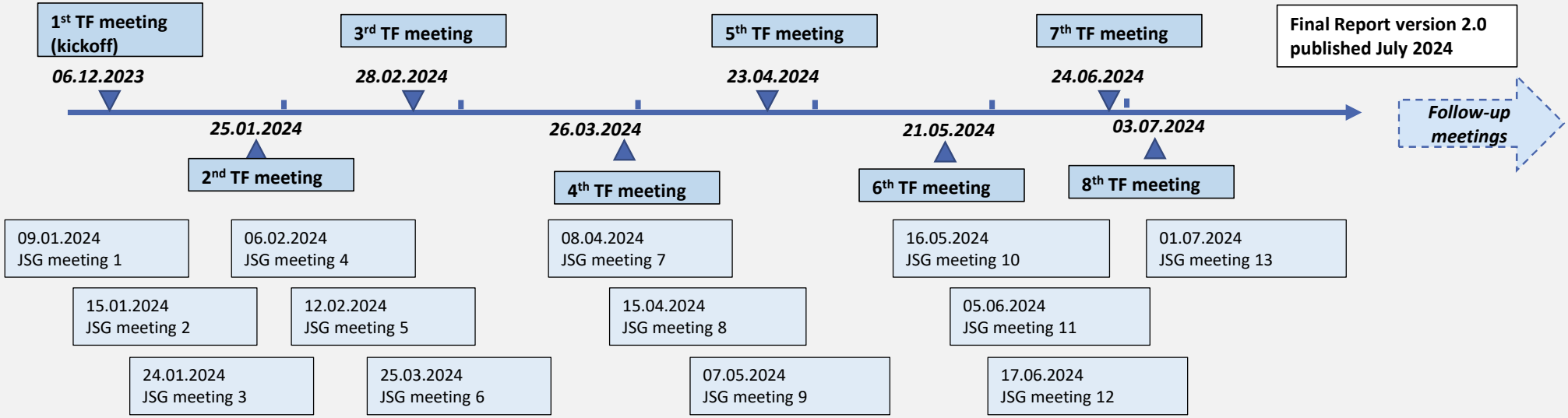
- Accordingly, NSA CH submitted a notification for a JNS Normal Procedure on 17 October 2023, which was subsequently approved by the JNS Panel on 24 October 2023;
- The NSA CH described the expected outcomes in its notification :

  "Analyse whether the long-term mitigation measures identified by the JNS NP on broken wheels for wheelsets of type BA 004 would be effective for the wheel type of wheelset type BA 390 and if they could be extended to other similar wheel types. In case these measures would not be sufficient, improvements of these measures will need to be identified."
- A JNS Task Force of experts nominated by the NSAs and the European Representative Bodies was assembled;
- In its kickoff meeting on 6 December 2023, the experts of the JNS Task Force discussed the scope and objective of the new Normal Procedure and decided to regard it as a continuation of the previous JNS Normal Procedure on Broken Wheels which concluded its works in 2019 and which also dealt with wheels of type BA 004 with cracks initiated in the rim;

Part I, Chapter 2. : Background

Activities up to the publication of first report

- The Task Force members decided to create a Subgroup of JNS experts from the railway actors. This "Joint Sector Group" (JSG) worked on the different tasks and reported in the Task Force meetings on their progress and proposals for risk control measures;
- Eight Task Force meetings and thirteen subgroup meetings took place.



- In July 2024, the Task Force published a final report (version 2.0) containing JNS risk control measures on the website of the Agency. The Task Force continued working (see next slides).

Part I, Chapter 2. : Background

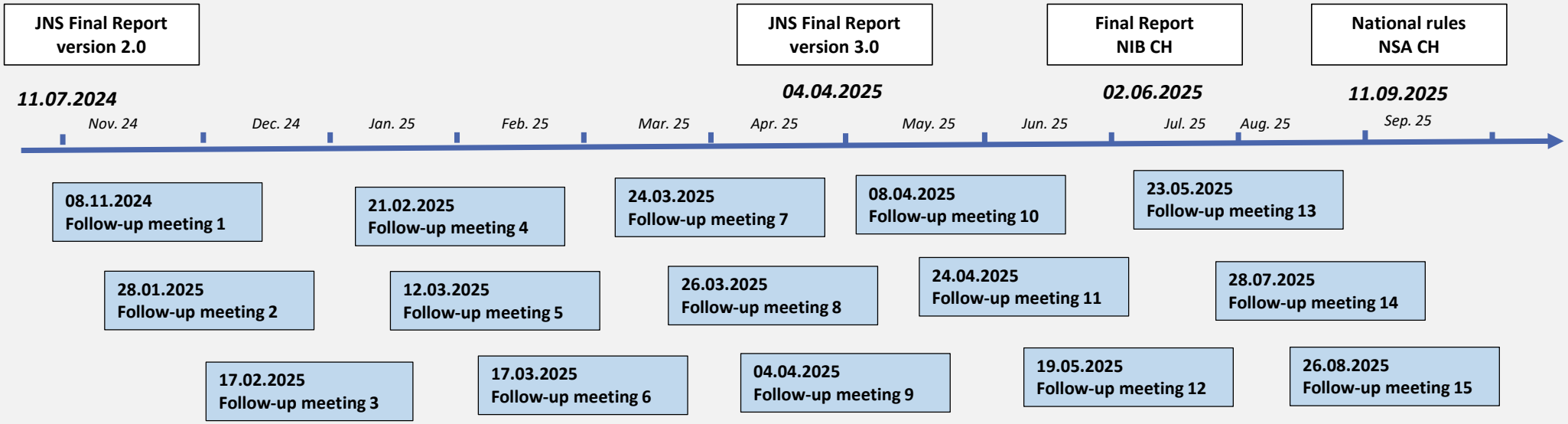
Start of JNS Gotthard follow-up (1/4)

- After the publication of the final report version 2.0 in July 2024, the JNS Task Force identified follow-up tasks:
  - Revision of JNS final report 2.0 of July 2024, in order to facilitate the correct understanding of the JNS risk control measures.
  - Investigation of the need to further improve the JNS risk control measures 2024, based on:
    - The analysis of new cases of cracked and broken wheels;
    - The recurrent updates of the NIB CH's representative in the Task Force;
    - The metallurgical investigation by QualiTech, initiated by NIB CH;
    - The final report published by NIB CH on 02 June 2025;
- On 04.04.2025, the JNS Task Force published the revision of the JNS Final Report version 2.0, as a new version 3.0 on the ERA website. In this new version, the structure and clarity of the risk control measures of the final report version 2.0 were improved but the measures themselves remained unchanged.

Part I, Chapter 2. : Background

Start of JNS Gotthard follow-up (2/4)

- The Task Force held further meetings to discuss new cases of cracked and broken wheels and to discuss intermediate information provided by NIB CH



Accompanied by: numerous meetings of the Joint Sector Group and the NSA Subgroup, bilaterals with Task Force members, a meeting with the so called “Gotthardteam” and ERA presentations to the NSA and NRB networks.

Part I, Chapter 2. : Background

Start of JNS Gotthard follow-up (3/4)

- On 02.06.2025, the Swiss National Investigation Body (SUST) published its final report on the investigation of the accident in the Gotthard base tunnel. Its report contained four safety recommendations, of which three were addressed to the European Union Agency for Railways;
- ERA, responded to these recommendations, stating that the right recipients are the railway actors and that these recommendations therefore need to be dealt with in the JNS Task Force within the follow-up activities;
- On 26.06.2025 and 07.08.2025 NSA CH organized two so called ‘round table meetings’ with representatives of rail freight actors which operate in Switzerland. As a result of these meetings, NSA CH unilaterally published on 11.09.2025 Swiss national rules “*measures relating to the safety of freight wagons*”.

Part I, Chapter 2. : Background

Start of JNS Gotthard follow-up (4/4)

- After 11.09.2025, the JNS Task Force continued to work on the identification of EU-wide harmonized risk control measures, which also apply in Switzerland, in order to
  - improve safety,
  - safeguard interoperability and
  - strengthen the competitiveness of rail versus other transport modes if possible by returning to the previous cost base or lower.

Part II, chapters 0 summarizes the work, and Part II chapter 1 sets out the resulting EU-wide harmonized risk control measures that also apply in Switzerland.

Part I - Introduction

Chapter 3: risk to be tackled

Content

Chapter 1 : explanation JNS

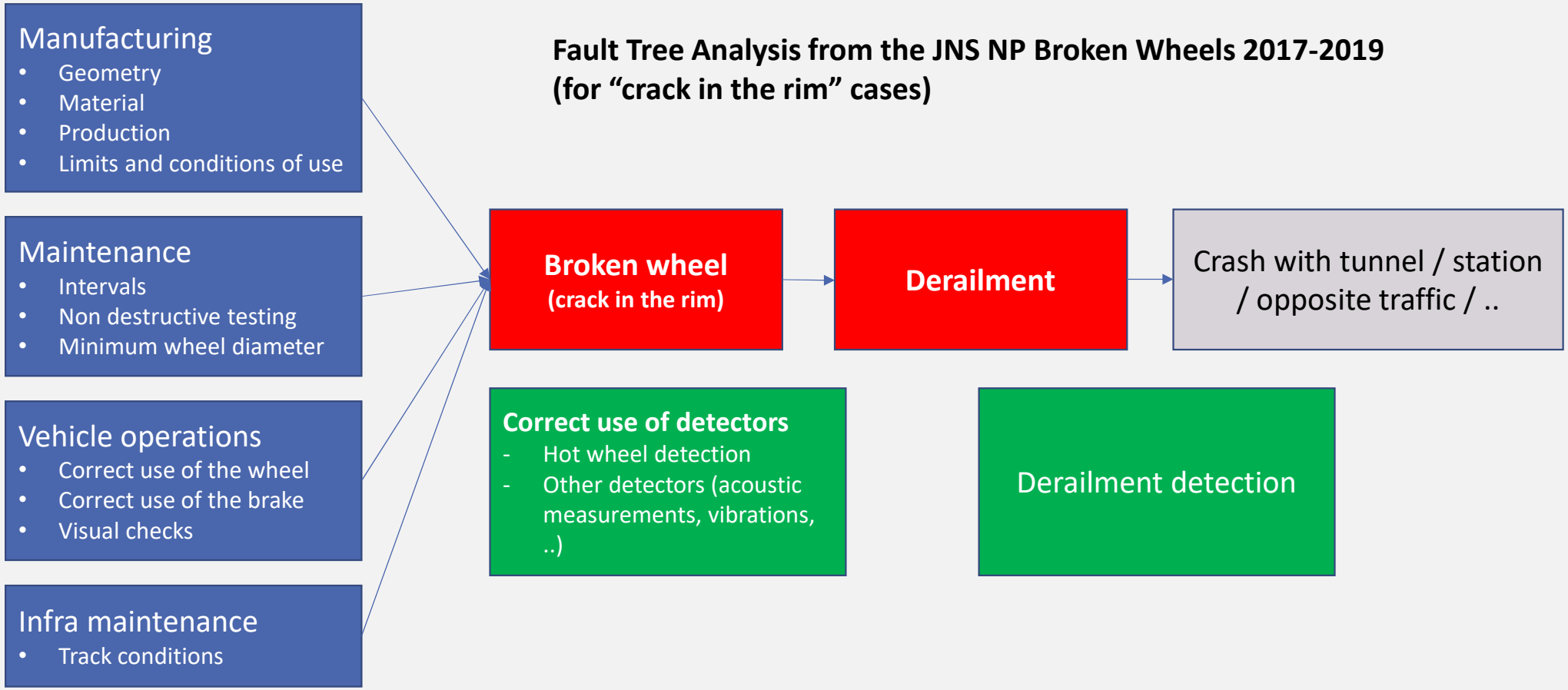
Chapter 2: background

Chapter 3: risk to be tackled

Part I, Chapter 3. : Risk to be tackled

Fault Tree analysis

Fault Tree Analysis from the JNS NP Broken Wheels 2017-2019 (for "crack in the rim" cases)



Part II - Outcome

Chapter 0: Summary and orientation

Chapter 0: summary and orientation

Chapter 1: risk control measures

- **1a: identification of wheel types comparable to BA 004**
- **1b: risk control measures version 5.1**
- **1c: continuation of JNS work**

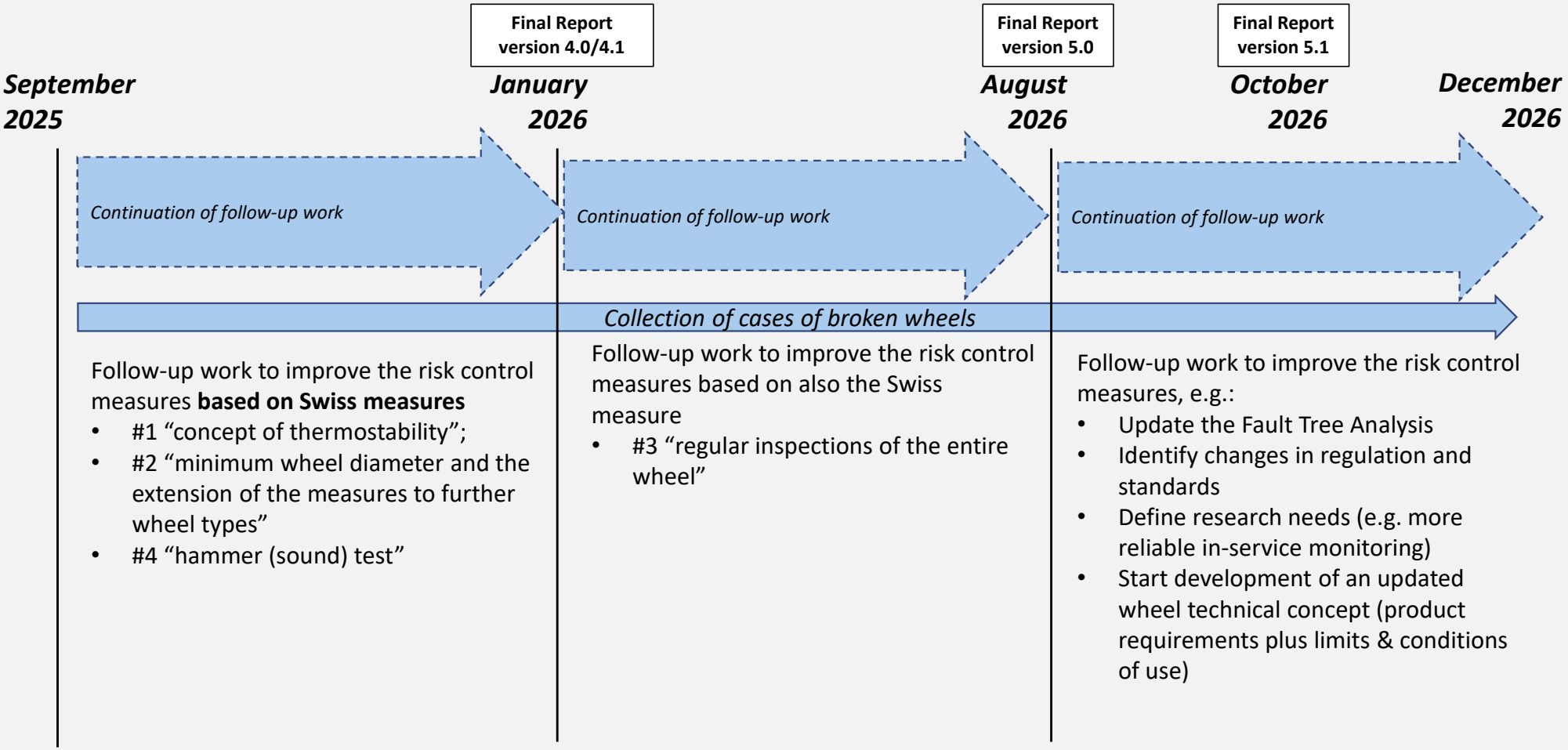
Chapter 2: changes to legislation, standards and company rules

Chapter 3: related non-JNS analyses

Chapter 4: impact assessment

Part II, Chapter 0. : Summary and orientation

Timeline JNS NP from September 2025 on



EUROPEAN UNION AGENCY FOR RAILWAYS

Part II, chapter 0. : Summary and orientation (1/7)

- On 26.06.2025 and 07.08.2025 NSA CH organized two so called 'round table meetings' with representatives of rail freight actors which operate in Switzerland. These meetings took place outside the JNS Task Force. As a result of these meetings, NSA CH unilaterally published on 11.09.2025 Swiss national rules "*measures relating to the safety of freight wagons*".
- These Swiss national rules contain four measures related to freight wagon wheels used on the Swiss railway network:
  - Measure #1 related to the concept of thermostability;
  - Measure #2 related to the minimum wheel diameter and the extension of the measures to further wheel types;
  - Measure #3 related to the regular inspections of the entire wheel;
  - Measure #4 related to the hammer (sound) test.
- NSA CH initially imposed the entry into force of these national rules on 01.01.2026.
- NSA CH however stated in the accompanying letter to ERA that ".. *The FOT […] is committed to continue working actively towards a European solution and is willing to withdraw the implemented measures at national level as soon as a joint approach with the appropriate effectiveness is found.*"
- Further NSAs considered to follow NSA CH with own national rules which threatened to further disrupt rail freight transport in the EU;
- On 22.09.25, ERA sent a letter to the networks of National Safety Authorities, the Representative Bodies and the ECM Certification Bodies asking for the best level of participation and contribution in the JNS Task Force to come to proportionate EU-wide harmonized risk control measures;

EUROPEAN UNION AGENCY FOR RAILWAYS

Part II, chapter 0. : Summary and orientation (2/7)

- On 29.09.2025, the enlarged JNS Task Force started with further meetings to work on the identification of the EU-wide harmonized risk control measures that include Switzerland.
- On 09.10.2025, after further bilateral discussions with railway actors that took place outside the JNS Task Force, NSA CH postponed the entry into force for measure #3 related to the “regular inspections of the entire wheel” by one year to 01.01.2027.
- Because of this, and because of the still valid tight deadline of 01.01.2026 for the other Swiss national rules, the JNS Task Force agreed to:
  - first deal with Swiss measures #1, #2 and #4 and produce an updated version of the JNS Final Report (version 4.0) with intermediate JNS Risk Control Measures;
  - subsequently deal with the Swiss measure #3 between January and mid-2026 and to publish a further update of the JNS Final Report (version 5.0) that contains a final set of JNS risk control measures considering all 4 Swiss national rules.
- In order to achieve these objectives, from September 2025 until July 2026, the JNS Task Force met in 31 further meetings (see next slide). The outcome can be found in Part II, Chapter 1.

Part II, chapter 0. : Summary and orientation (3/7)

National rules by NSA CH — ***11.09.2025***

Final Report version 4.0 — ***19.12.2025***

Final Report version 4.1 — ***14.01.2026***

Final Report version 5.0 — ***10.08.2026***

Sep. 25 | *Oct. 25* | *Nov. 25* | *Dec. 25* | *Jan. 26* | *Feb. 26* | *Mar. 26* | *Apr. 26* | *May. 26* | *June. 26* | *July. 26* | *Aug. 26*

27.10.2025
Follow-up meeting 19

07.11.2025
Follow-up meeting 20

18.11.2025
Follow-up meeting 21

29.09.2025
Follow-up meeting 16

25.11.2025
Follow-up meeting 22

08.10.2025
Follow-up meeting 17

02.12.2025
Follow-up meeting 23

17.10.2025
Follow-up meeting 18

10.12.2025
Follow-up meeting 24

16.12.2025
Follow-up meeting 25

18.12.2025
Follow-up meeting 26

14.01.2026
Follow-up meeting 27

26.01.2026
Follow-up meeting 28

23.02.2026
Follow-up meeting 29

26.03.2026
Follow-up meeting 30

22.04.2026
Follow-up meeting 31

05.05.2026
Follow-up meeting 32

19.05.2026
Follow-up meeting 33

19.05.2026
Follow-up meeting 34

03.06.2026
Follow-up meeting 35

16.06.2026
Follow-up meeting 36

24.06.2026
Follow-up meeting 37

29.06.2026
Follow-up meeting 38

30.06.2026
Follow-up meeting 39

02.07.2026
Follow-up meeting 40

09.07.2026
Follow-up meeting 41

17.07.2026
Follow-up meeting 42

28.07.2026
Follow-up meeting 43

30.07.2026
Follow-up meeting 44

03.08.2026
Follow-up meeting 45

06.08.2026
Follow-up meeting 46

Continu-ation planned (see slide 78)

Accompanied by: numerous meetings of the Joint Sector Group and the NSA Subgroup, bilaterals with Task Force members, a meeting with the so called “Gotthardteam” and ERA presentations to the NSA and NRB networks.

Part II, chapter 0. : Summary and orientation (4/7)

- The JNS Task Force analysed
  - Any available information linked to the accident in the Gotthard base tunnel, e.g.
    - The intermediate report of the NIB CH of 28 September 2023
    - The final report of the NIB CH of 2 June 2025
  - The information reported on new cases of cracked and broken wheels
  - The Swiss national rules published on 11 September 2025 and the explanations by NSA CH;
  - The information exchanged in the meeting with the “Gotthardteam” on 11 November 2025.
  - The presentation “Thermally Induced Fatigue of Railway Wheels” by Dr. Ingo Poschmann (material expert from W.S. Werkstoff Service GmbH) of 22.04.2026

Part II, chapter 0. : Summary and orientation (5/7)

- The JNS Task Force developed an assessment scheme to identify wheel types comparable to BA 004 (**slides 42**);
- In December 2025, the following six wheel types have been identified as comparable to BA 004[1)] :
  - BA 390 (involved in the accident in the Gotthard tunnel);
  - Db-004sa;
  - RI 025;
  - R 32;
  - BA 304;
  - BA 005
- Wheels of wheel type BA 004 and comparable shall be treated as non-thermostable wheels and their white stripe markings shall be removed according to JNS RCM 1.3 (**slides 50**);
- For all wheel types not covered by the assessment by the JNS Task Force, ECMs shall use the assessment scheme to clarify if these wheel types are also comparable to BA 004. ECMs shall inform the JNS Task Force of the outcomes of their assessment. The list of the assessed wheel types is available on the ERA website.

1) Note: The wheel type BA 004 could also be used in some versions of wheelset type VRY.

Part II, chapter 0. : Summary and orientation (6/7)

- Furthermore, the JNS Task Force recognized the fact that
  - the removal of white stripe markings from wheels of wheel type BA 004 and comparable wheel types was not yet completed. Therefore, these wheels cannot reliably be recognized in operation and risk to be wrongly treated as thermostable wheels in case of thermal overload.
  - the in-service monitoring of wheels through visual and/or hammer (sound) checks does not provide sufficient reliability to detect all possible damages.
- Therefore, the Task Force developed further risk control measures 1.1 and 1.2 (**slides 47 to 49**) and 2.1a & 2.1b (**slides 55 to 58**) to mitigate these risks which apply to all tread-braked wheels.
- **All actors involved shall either implement fully the improved JNS risk control measures or, implement measures justified by a risk assessment[1)] that guarantees at least the same level of safety.**
  The general requirements for the maintenance of wheels remain applicable, as described in EN 15313.
- The JNS risk control measures of the report version 5.1 replace entirely the JNS risk control measures of version 5.0 of the JNS report of the JNS NP "Accident Gotthard Base tunnel/Broken Wheels" of 10.08.2026, (which already replaced the measures from the report versions 4.1, 4.0, 3.0 and 2.0);
- The new JNS risk control measures replace the agreed long term risk control measures from the JNS NP Broken Wheels 2017-2019 for BA 004 ("crack in the rim"). However, the measures for "crack in the web" (wheel types BA 314 old/ZDB29) remain valid;

1) This risk assessment shall be done according to the process described in Annex I of Commission Implementing Regulation (EU) no. 402/2013, and shall include the demonstration of compliance with the safety requirements;

Part II, chapter 0. : Summary and orientation (7/7)

- The JNS Task Force members agreed to summarize in this final report the outcome of a discussion on responsibilities in accordance with Article 4 of the Railway Safety Directive and the related liabilities after accidents and incidents (**slide 80**). The Task Force members concerned are encouraged to follow up the outcome;
- The crack in the wheel involved in the accident in the Gotthard base tunnel was probably initiated by a thermal overload that occurred a long time before the accident. Therefore, the Task Force members …
  - remind all actors concerned to consider the JNS risk control measures aiming at reducing the number of fixed brakes and subsequently cases of thermal overload, as identified in the JNS Normal Procedure "Consequences of unintended brake applications with LL blocks". Please consult the most recent version of the JNS final report on ERA's website (link) (**slide 76**) (https://www.era.europa.eu/system/files/202403/JNS%20NP%20LL%20brake%20blocks_Final%20report_v2.0.pdf)
  - recommend to follow-up the developments of the UIC projects "Brake Blocks/Wheel Interaction" and "Network Monitor" that aims at harmonizing requirements for trackside detection systems (see **slide 82**);
- All actors are reminded to report new cases of cracked and broken wheels detected, independently of the wheel type involved, using the template available on the website of the European Union Agency for Railways (https://www.era.europa.eu/domains/accident-incident/joint-network-secretariat-jns_en).
- Finally, ERA, together with the Task Force members, developed a Full Impact Assessment. This qualitative and quantitative assessment shows that the preferred option is to implement the measures from the final report version 5.1 (**slides 84 to 86** and the full document on the ERA website: https://www.era.europa.eu/domains/accident-incident/joint-network-secretariat-jns_en). Note that this report refers to version 5.0, but also covers 5.1.

Part II, chapter 0. : Summary and orientation

Legal obligations for RU and IM

Railway Undertakings (RUs) and Infrastructure Managers (IMs) are required to have a Safety Management System (SMS) that meets the requirements of Commission Delegated Regulation (EU) 2018/762 of 8 March 2018 (establishing common safety methods on safety management system requirements)

This regulation stipulates in Annex I Clause 1.1 (RUs) and Annex II Clause 1.1 (IMs):

"The organisation shall:
….
(c) identify interested parties (e.g. regulatory bodies, authorities, railway undertakings, infrastructure managers, contractors, suppliers, partners), including those parties external to the railway system, that are relevant to the safety management system;
(d) identify and maintain legal and other requirements related to safety from the interested parties referred to in point (c);
(e) ensure that the requirements referred to in point (d) are taken into account in developing, implementing and maintaining the safety management system;"

Part II, chapter 0. : Summary and orientation

Legal obligations for ECM (1/2)

The Entities in Charge of Maintenance (ECMs) are required by the Commission Implementing Regulation (EU) 2019/779 of 16 May 2019 to share information

Article 5.3 of this regulation stipulates:

"All parties involved in the maintenance process such as railway undertakings, infrastructure managers, keepers, entities in charge of maintenance, as well as manufacturers of vehicles, subsystems or components, shall exchange relevant information about maintenance in accordance with the criteria listed in Sections I.7 and I.8 of Annex II."

ECMs should apply any new limits and conditions of use provided by manufacturers.

Furthermore, the Guidance on ECM certification process (see Agency website: https://www.era.europa.eu/domains/trains/certification-entities-charge-maintenance_en) explains further the sharing of information, including the JNS outcomes. See also the figure from this Guidance document (2026 version) on the next slide.

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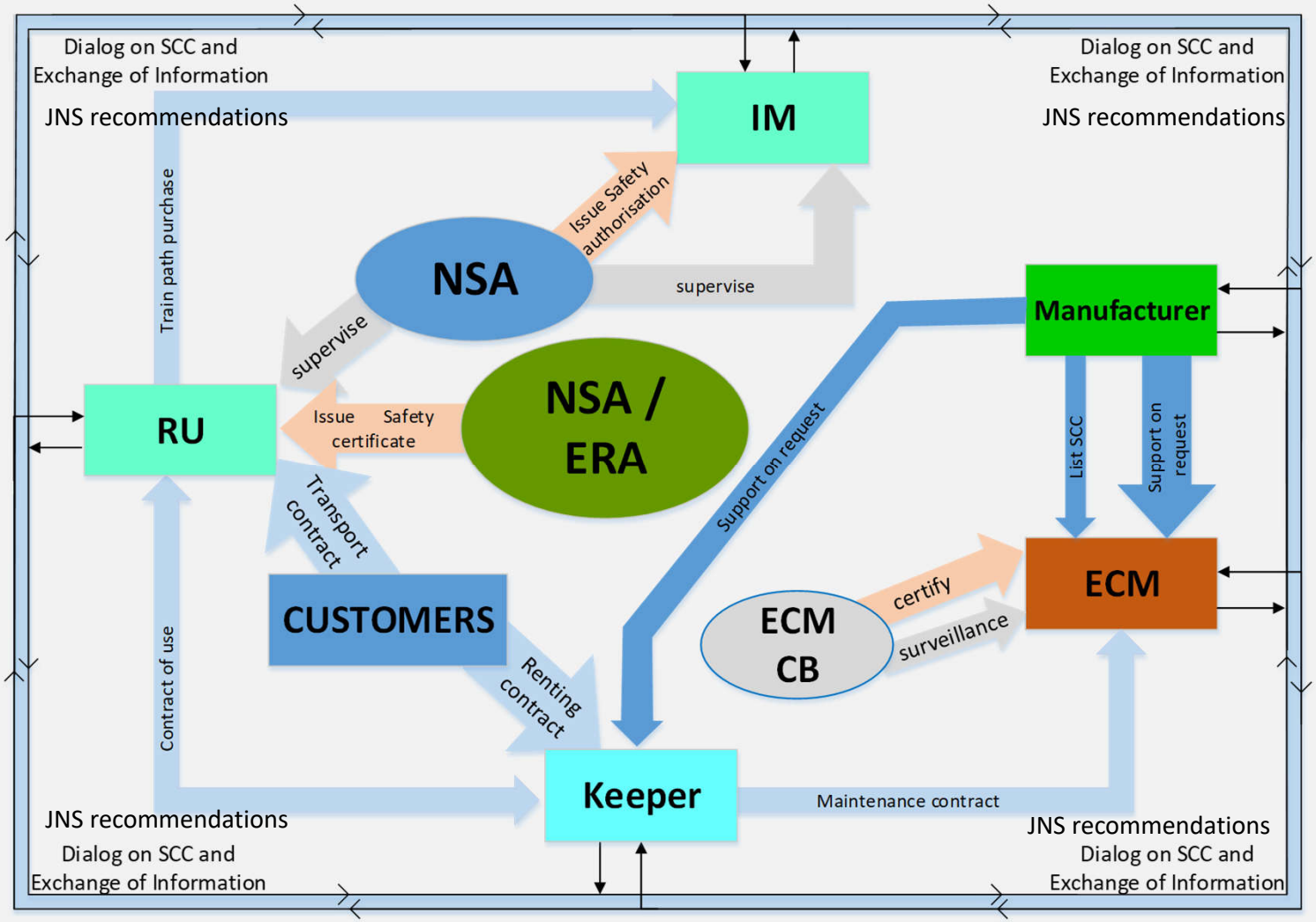
Part II, chapter 0. : Summary and orientation

Legal obligations for ECMs (2/2)



Source: Guidance on ECM certification process 2026, version 10 (published February 2026 on ERA website)

Part II, chapter 0. : Summary and orientation

Legal obligations for manufacturers

- For all wheel types, manufacturers should verify that restrictions on use for wheels certified in accordance with standard EN 13979-1:2023 (including previous standards), not tested with composite brake blocks are indicated in the EC certificates of conformity. These types of wheels should not be considered as thermostable when they are installed on freight wagons equipped with composite brake blocks.

- If manufacturers become aware of discrepancies between the certification process and the limits and conditions of use, they shall inform the relevant parties involved[1)]. This can be done by creating a notification in the SAIT[2)], indicating in the notification form that this should be brought to the attention of the JNS.
  Furthermore, they shall inform the JNS Task Force “Accident Gotthard Base tunnel/Broken Wheels” by sending an email to JNS@era.europa.eu.

1) In accordance article 4 of Directive (EU) 2016/798 (Railway Safety Directive)
2) Please consult https://www.era.europa.eu/content/what-safety-alerts-it-tool-sait for instructions.

Part II

Chapter 1: Risk control measures

Chapter 0: summary and orientation

Chapter 1: risk control measures

1a: identification of wheel types comparable to BA 004

1b: risk control measures version 5.1

1c: continuation of JNS work

Chapter 2: changes to legislation and standards

Chapter 3: related non-JNS analyses

Chapter 4: impact assessment

Part II

Chapter 1: Risk control measures

Chapter 0: summary and orientation

Chapter 1: risk control measures

- 1a: identification of wheel types comparable to BA 004
- 1b: risk control measures version 5.1
- 1c: continuation of JNS work

Chapter 2: changes to legislation and standards

Chapter 3: related non-JNS analyses

Chapter 4: impact assessment

Part II, chapter 1a. : identification wheel types comparable to BA 004

Reflections and justifications

A deterministic justification why crack initiation and propagation of wheels of certain wheel types are more frequent than wheels of other wheel types is currently not possible with the available knowledge and methods.

Until 2019, cracked and broken wheels with cracks originating in the wheel rim concerned only wheels of wheel type BA 004. The accident in the Gotthard tunnel and the subsequently reported cases of cracked and broken wheels showed, however, that also other wheel types are affected. For this reason, the assessment scheme to identify other concerned wheel types than BA 004 has been developed in a phenomenological way based on the analysis in the JNS, that includes the analysis of reported cases of cracked and broken wheels;

The criteria selected to identify other concerned wheel types are set out in the following slides. These criteria are based on similarities with the wheel geometry of wheel type BA 004. Detailed weighting of the different criteria is not feasible;

In case other wheel materials than R7 (UIC 812-3) respectively ER7 (EN13262) are used, a risk assessment* shall be carried out for the impacted wheels to identify whether additional risk control measures are needed;

* In accordance to Art. 4 of the ECM Regulation (EU) 2019/779, the ECM and manufacturers involved shall carry out a risk assessment. This risk assessment shall be done according to the process described in Annex I of Commission Implementing Regulation (EU) no. 402/2013, and shall include the demonstration of compliance with the safety requirements.

Part II, chapter 1a. : identification wheel types comparable to BA 004

General criteria

The assessment scheme (**slide 42**) shall be applied to wheel types used in freight transport which comply with all of the following general criteria:

1. **100 % tread braked with cast iron or composite brake blocks:**

   Reason:
   - Cracked rim was thermally initiated and happened with all types of brake blocks.

2. **Nominal wheel diameter 920 mm:**

   Reasons:
   - In wheel types with a smaller nominal wheel diameter, the reduced distance between hub and rim results in less critical radii of the web contour;
   - In wheel types with a smaller nominal wheel diameter, there is no negative service experience.
   - BA 004 has only this nominal wheel diameter;
   - The vast majority of the other wheel types used in tread braked freight application also have this nominal wheel diameter;

3. **Axle load ≥ 22,5t:**

   Reasons:
   - The calculation of the brake power in accordance with EN 13979-1 shows a direct correlation between an increased braking power and an increased axle load. This is further detailed in the original UIC 510-5:2003.
   - The input of brake power occurs not only during long drag braking, but also during in service brake application.

Part II, chapter 1a. : identification wheel types comparable to BA 004

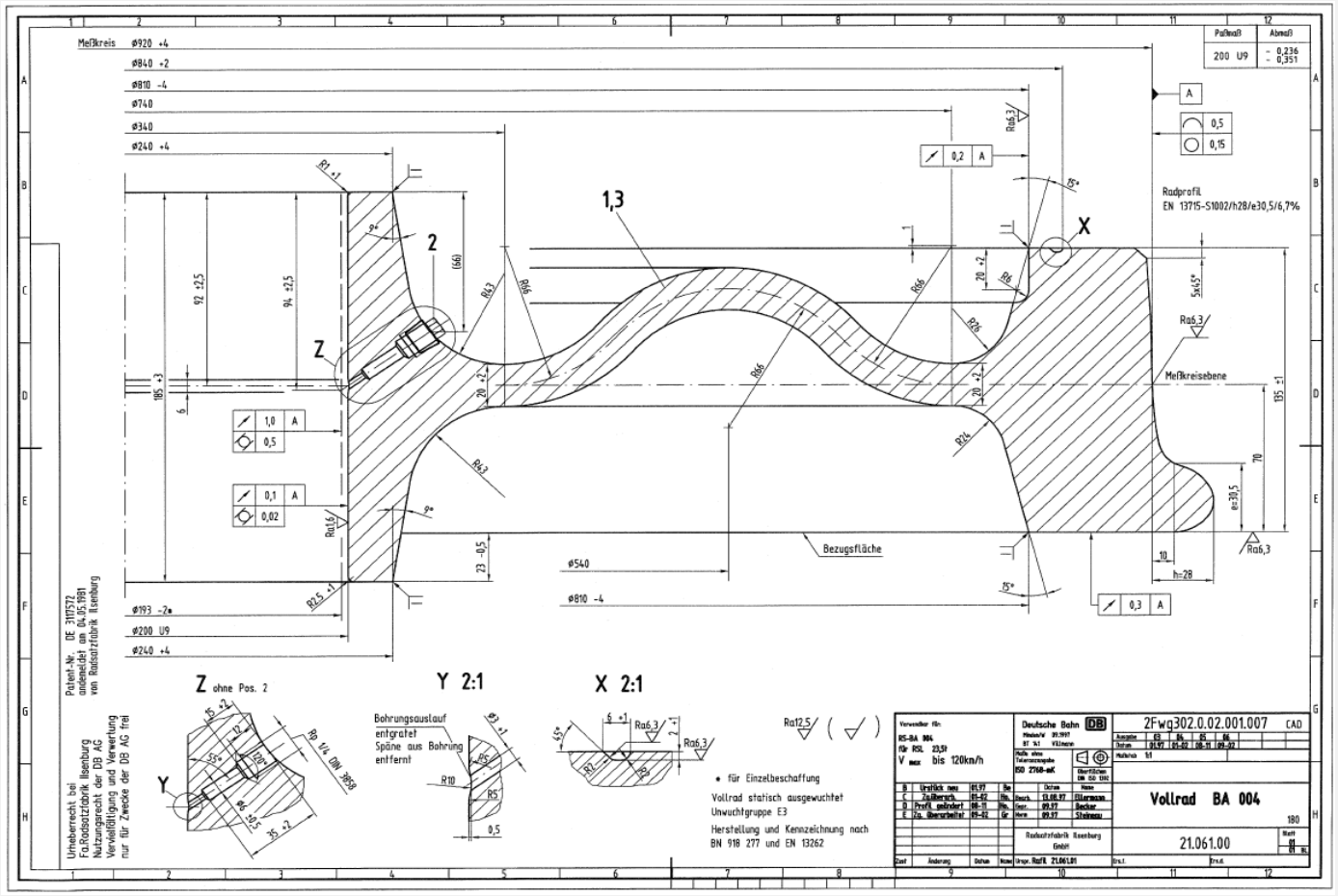
Reference : wheel type BA 004

Main features:

- nominal wheel diameter: 920 mm
- minimum wheel diameter: 840 mm
- inner diameter of the rim: 810 mm
- thickness of the web near the rim: 20 + 2 mm
- axle load up to 23,5t
- tread braked application in freight / cast iron and composite brake blocks
- residual stresses in new and worn conditions fulfill EN 13979-1
- wheel material: R7 (UIC 812-3) / ER7 (EN13262)

Design and delivery:

- introduction of this wheel: 1994
- original design from RAFIL (Radsatzfabrik Ilsenburg, today Bochumer Verein Verkehrstechnik)
- delivered by a great number of suppliers around the world, design possibly adapted



Part II, chapter 1a. : identification wheel types comparable to BA 004

Specific criteria

The criteria concern the combination of three special design features of wheel type BA 004 of the contour in the transition from rim to web and the minimum allowed residual cross section area of the rim, identified within the analysis of the reported cases of cracked and broken wheels.

Criteria
1. Radii in the transition between rim and web comparable to wheel type BA 004 (see figure)
2. Position of the web nearly in the middle of rim (see figure)
3. Allowed thickness of the web near the rim equal to or greater than 20 mm and equal to or smaller than 22 mm (see figure)
4. Minimum residual rim cross section area (in fully worn state) in accordance with chapter 4.3.1 of EN 13979-1 is lower than 0,23 dm^2.

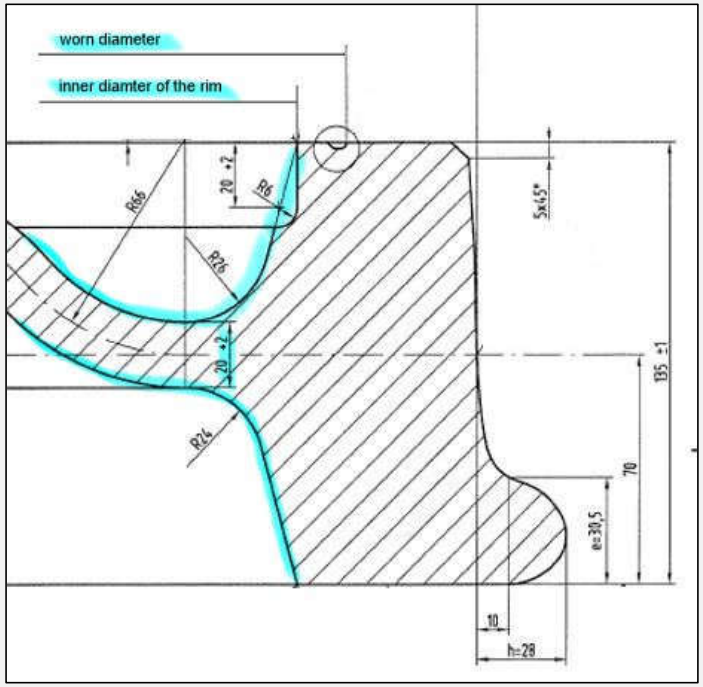


Figure: drawing of BA 004 showing design features referred to in the criteria

Part II, chapter 1a. : identification wheel types comparable to BA 004

Assessment scheme

Interpretation of the assessment results:

Only if **all** the results are "applicable", the wheel type is considered comparable to BA 004.

Example 1:

Criteria and value		Value/ evaluation	result
design of the contour of the wheel web in the transition rim – web like wheel type BA 004	Radii in the transition between rim and web comparable to wheel type BA 004	Yes	applicable
	Position of the web nearly in the middle of rim	yes	applicable
	Allowed thickness of the web near the rim equal to or greater than 20 mm and equal to or smaller than 22 mm	20 mm	applicable
Minimum residual rim cross section area (in fully worn state) in accordance with chapter 4.3.1 of EN 13979-1 is lower than 0,23 dm^2.		0,2025 dm^2	applicable

➔ Wheel type assessed as **comparable** to BA 004

➔ The additional JNS RCMs specifically applicable to wheel type BA 004 and comparable wheel types, or equivalent alternative measures, apply.

Example 2:

Criteria and value		Value/ evaluation	result
design of the contour of the wheel web in the transition rim – web like wheel type BA 004	Radii in the transition between rim and web comparable to wheel type BA 004	no	not applicable
	Position of the web nearly in the middle of rim	yes	applicable
	Allowed thickness of the web near the rim equal to or greater than 20 mm and equal to or smaller than 22 mm	20 mm	applicable
Minimum residual rim cross section area (in fully worn state) in accordance with chapter 4.3.1 of EN 13979-1 is lower than 0,23 dm^2.		0,2025 dm^2	applicable

➔ Wheel type assessed as **not comparable** to BA 004

➔ The additional JNS RCMs specifically applicable to wheel type BA 004 and comparable wheel types do not apply. RCMs having a general scope remain applicable.

*) Or alternative risk control measures that guarantee at least the same level of safety, justified by a risk assessment.This risk assessment shall be done according to the process described in Annex I of Commission Implementing Regulation (EU) no. 402/2013, and shall include the demonstration of compliance with the safety requirements;

Part II, chapter 1a. : identification wheel types comparable to BA 004

Sources for wheel types assessed by the JNS Task Force

- In the European freight sector, many wheel types are used. The European maintenance guideline (EMG) from the Verband der Güterwagenhalter in Deutschland e. V. (VPI) provides a good overview (VPI EMG 04 – 04.02). The JNS experts used this list and added further known wheel types, as a basis for the JNS assessment;
- The list of the assessed wheel types, including the results of the assessment, is available on the ERA website (https://www.era.europa.eu/domains/accident-incident/joint-network-secretariat-jns_en)

The assessment in accordance with the assessment scheme (see slides 42) of wheel types not included in the assessment list published on the ERA website shall be done by all ECMs who use these not yet assessed wheels with support by the respective wheel manufacturers.
The ECMs shall inform ERA and the JNS Task Force experts of the results of their assessment (via jns@era.europa.eu). ERA will update the list accordingly.

In case of doubt when assessing any of the criteria, the experts of the JNS Task Force "Accident Gotthard base tunnel - broken wheels" can be contacted for advice via jns@era.europa.eu.

Part II, chapter 1a. : identification wheel types comparable to BA 004

Wheel types assessed by the JNS Task Force as comparable to BA 004

The following wheel types were identified by the JNS Task Force as comparable to BA 004*) [status July 2026]:

- Db-004sa
- BA 390
- RI 025
- R32
- BA 304
- BA 005**

*) The wheel type BA 004 could also be used in some versions of wheelset type VRY which shall therefore be treated like wheels of type BA 004.

**) Because of identical geometry to BA 004, despite lower axle load of 20t.

Part II

Chapter 1: Risk control measures

Chapter 0: summary and orientation

Chapter 1: risk control measures

- **1a: identification of wheel types comparable to BA 004**
- **1b: risk control measures report v5.1**
- **1c: continuation of JNS work**

Chapter 2: changes to legislation and standards

Chapter 3: related non-JNS analyses

Chapter 4: impact assessment

Part II, Chapter 1b.: Risk Control Measures version 5.1

Overview of JNS risk control (RCMs) and support measures (SMs)

	JNS Risk Control Measures (RCMs)				Support Measures	
	Visual inspections	**Removal of white stripe markings**	**Strengthened measures during off-vehicle maintenance**	**Increased in service limit for minimum wheel diameter**	**Investigations**	**Surveillance / Supervision**
Freight ECMs	RCMs 1.1 and 1.2, **Slides 47-49**	RCM 1.3 **Slide 50**	RCM 1.4 **Slide 51**	RCMs 1.5a & 1.5b **Slides 52-54**	SM 5 **Slide 62**	
All RUs /IMs that operate freight wagons	RCMs 2.1a & 2.1b **Slides 55-58**				SM 4 **Slide 62**	
ECM CBs						SM 1 **Slide 59**
NSAs						SM 2 **Slide 60**
NIBs					SM 3 **Slide 61**	

- ➔ RUs and IMs who operate freight wagons shall declare in their Safety Management System (SMS) that they apply the relevant JNS risk control measures. This declaration shall be made available upon request.
- ➔ ECMs assigned to freight wagons shall declare in their Maintenance Management System (MMS) that they apply the relevant JNS risk control measures. This declaration shall be made available upon request.

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 1.1: Visual inspections of the entire wheel circumference –mileage driven

Who	When/where to apply	What to do
ECM	For all tread-braked wheels with a nominal wheel diameter of 920mm. <u>Implementation deadlines:</u> As soon as possible, but no later than **01.07.2027:** systems to control the mileage limits implemented. By **07.10.2026**, ECMs shall have a plan to bring all vehicles they are in charge of into compliance with RCM 1.1 as soon as possible. It shall contain explanations and justifications for the time needed and made available to ECM CB upon request (deadline from previous report version 5.0). As soon as possible, but no later than **31.12.2027 :** all wheels inspected in accordance with RCM 1.1. (inspections in accordance with RCM 1.2 (**slides 48 & 49**) without the exception and inspections done before the 15.09.2026 in accordance with JNS final report 4.1 are considered as equivalent). The following service limit values for the visual inspection of the entire circumference of the wheel depending on the residual cross section area of the rim after the most recently carried out reprofiling (see Figure 1 from EN 13979-1, chapter 4.3.1- residual area) must be applied. <u>Mileage-based service limit values:</u> Residual rim cross section area > 0,74 dm^2 : 300.000 km Residual rim cross section area > 0,52 dm^2 : 200.000 km Residual rim cross section area > 0,36 dm^2 : 100.000 km Residual rim cross section area < / = 0,36 dm^2 : 50.000 km	Visual inspection of the entire wheel circumference to detect • single cracks on the wheel tread (**slides 64-66**) • cracks in rim and/or web (**slides 67-68**) • any indication of thermal overload of the wheel (**slides 69-72**) In case of any detections: • dispatch wagon to workshop (if not already there) • carry out extended measures during off-vehicle maintenance (RCM 1.4, **slide 51**) Detailed instructions are in the document “ECM Working Instruction for the visual inspection of the component tread braked wheel” on the ERA website (link …). In case of detection of a broken wheel or a cracked wheel with a crack through the inner and/or outer side of the rim and/or web: • report the detection using the template available on the website of the European Union Agency for Railways (https://www.era.europa.eu/domains/accident-incident/joint-network-secretariat-jns_en). The diameter for the mileage-based service limit values depending on the residual rim cross section area after the most recently carried out reprofiling for the different assessed wheel types can be found in document “JNS-NP Gotthard - wheel analyses”, on the ERA website. Only if an inspection covers the <u>entire</u> circumferences of both wheels of one wheelset, then the ECMs may set the counter for the mileage-driven RCM 1.1 for this wheelset to zero kilometres.

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 1.2: Visual inspections of entire wheel circumference – maintenance event driven (1/2)

Who	When/where to apply	What to do

ECM	For all tread-braked wheels.
	
	From latest **07.10.2026** RCM 1.2 shall be fully applied (deadline from previous report version 5.0).
	
	Always when a wagon/wheelset is treated by an ECM in- or outside of a workshop, during:
	• any change of at least one brake block~~;~~
	• axle inspections (e.g. in accordance with the European Visual Inspection Catalogue (EVIC) (see EN 15313, chapter 6.5.13.2));
	• wagon heavy maintenance (revision);
	• off-vehicle maintenance;
	• wagon technical inspection, if the ECM is aware of
	  • Either any indication of thermal overload of the wheel (**slides 69-72**) or the brake blocks (**slide 73-74**);
	  • or a detection of fixed brakes.
		Visual inspection of the entire wheel circumference, to detect
		• single cracks on the wheel tread (**slides 64-66**)
		• cracks in rim and/or web (**slides 67-68**)
		• any indication of thermal overload of the wheel (**slides 69-72**)
		
		Exception
		• In case an inspection of the entire circumference is not possible, only the wheel rail contact may be exempted.
		• In case of brake block exchange outside of a workshop, the ECM may decide, based on a documented risk assessment*, to also exempt the areas covered by the not-removed brake blocks. The increase of the obstructed areas by making use of this exemption shall be taken into account, if necessary, the ECM shall take additional risk control measures.
		
		* Note: This risk assessment shall be done according to the process described in the Annex I of Commission Implementing Regulation (EU) no. 402/2013, and shall include the demonstration of compliance with the safety requirements.
		
		… (continuation on next slide)

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 1.2: Visual inspections of entire wheel circumference – maintenance event driven (2/2)

Who	When/where to apply	What to do
ECM	See previous slide.	… (continuation from previous slide) In case of any detections: • dispatch wagon to workshop (if not already there) • carry out extended measures during off-vehicle maintenance (RCM 1.4, **slide 51**) Detailed instructions are in the document "ECM Working Instruction for the visual inspection of the component tread braked wheel" on the ERA website. In case of detection of a broken wheel or a cracked wheel with a crack through the inner and/or outer side of the rim and/or web: • report the detection using the template available on the website of the European Union Agency for Railways (https://www.era.europa.eu/domains/accident-incident/joint-network-secretariat-jns_en).

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 1.3: Removal of white stripe markings

Who	When/where to apply	What to do
ECM	For wheels of wheel type BA 004 and comparable (**slide 44**). Until **01.02.2026** : finalization of traceable programmes for wheel types Db-004sa, BA 390, RI 025, R32, BA 304 and BA 005. The removal shall be done according to the traceable programmes, during e.g. • Visual inspections, if environmental conditions allow • Off-vehicle maintenance • EVIC • Other occasions defined by the ECM, if environmental conditions allow Until **01.07.2027:** white stripe markings shall be removed.	Removal of white stripe markings on axle box cover (see Chapter 6.2.7.2 in EN 15313:2024).

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 1.4: Strengthened measures during off-vehicle maintenance

Who	When/where to apply	What to do
ECM	For all tread-braked wheels, following any detections after visual inspections (RCMs 1.1, 1.2 (**slides 47-49**), 2.1a and/or 2.1b (**slides 55-58**)) and as part of scheduled maintenance activities on the wheelsets. **In force since 19.12.2025**	• Residual stress measurement, and • Non-Destructive Testing (NDT) of the tread*, and • Measurement of back-to-back distances between the wheels Follow-up actions in case of non-conformities in accordance with standard procedures.
	For wheels of wheel type BA 004 and comparable: • During the first visit to workshop of a wheel after its wheel type has been identified as comparable to BA 004. • following any detections after visual inspections (RCMs 1.1, 1.2 (**slides 47-49**), 2.1a and/or 2.1b (**slides 55-58**)) and as part of scheduled maintenance activities on the wheelsets. **In force since 19.12.2025**	Stronger criteria and intensified measures: • Residual stress measurement with reduced limit value of 300 MPa instead of 400 MPa*, and • Non-Destructive Testing (NDT) of the tread*, and • Measurement of back-to-back distances between the wheels Follow-up actions in case of non-conformities in accordance with standard procedures.

*alternative : reprofile the wheel in accordance with the note in point 6.2.4.3 a) of EN 15313:2024.

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 1.5a: Increased in service limit for minimum wheel diameter

Who	When/where to apply	What to do
ECM	For wheels of wheel type BA 004 and comparable (**slide 44**) used in wagons with nominal axle load > 20t. **In force since 01.02.2026.**	Ensure: • Increased minimum in service wheel diameter of 864 mm; • Minimum wheel diameter after the last reprofiling of 880 mm*; • No re-installation of wheelsets with a wheel diameter of 864mm or less Until **01.02.2026**: all wheels of wheel type BA 004 and comparable with a wheel diameter below 864 mm identified and documented. *In case a lower minimum wheel diameter than 880mm after the last reprofiling is decided, the (EU) 402/2013 CSM REA shall be applied, considering this a significant change.
	Exception 1 - Deadline of 31.12.2026. For wheelsets with wheels of wheel type BA 004 and comparable; • already in service before 01.02.2026 with a wheel diameter below 864 mm that had been identified and documented on 01.02.2026, and; • for that previously a risk assessment had been carried out that demonstrated that they could be used in 'affected application'. That are also used on infrastructure: • where dragged braking over longer distances takes place (i.e. mainly in mountainous region), or; • with shorter brake distances and/or more severe winter conditions (such as is the case in Switzerland, Norway and Sweden).	The wheelsets can be used **up to the deadline of 31.12.2026**.
	Exception 2 - Deadline of 01.01.2029. For wheelsets with wheels of wheel type BA 004 and comparable; • already in service before 01.02.2026 with a wheel diameter below 864 mm that had been identified and documented on 01.02.2026, and; • that do not fall under exception 1. On infrastructures that do not fall under exception 1.	The wheelsets can be used if the following requirements are met **up to the deadline of 01.01.2029**. The minimum in service wheel diameter shall be reviewed and justified with a risk assessment. The risk assessment shall be carried out in accordance with the process described in Annex I of (EU) 402/2013 CSM REA (Risk Evaluation and Assessment).

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 1.5b: Increased in service limit for minimum wheel diameter (1/2)

Who	When/where to apply	What to do
ECM	For wheels of wheel type BA 004 and comparable (**slide 44**) used in wagons with **nominal axle load ≤ 20t and in ss-braking regime** application. general principle in force since **15.07.2026**	Ensure: • Increased minimum in service wheel diameter of 864 mm; • Minimum wheel diameter after the last reprofiling of 880 mm*; • No re-installation of wheelsets with a wheel diameter of 864mm or less * In case a lower minimum wheel diameter than 880mm after the last reprofiling is decided, the (EU) 402/2013 CSM REA shall be applied, considering this a significant change.
	Exception 1, deadline 31.12.2026	JNS report version 4.1 introduced a transition period for these wheels. During the transition period, these wheels can still be used in ss-braking regime application if these wheels are visually inspected (see RCM 1.1 (**slide 47**)) every 50.000 km. In case this transition period is used, a risk assessment shall be carried out in accordance with the process described in Annex I of (EU) 402/2013 CSM REA. Note: This risk assessment shall consider the potential operational scenarios of these vehicle, e.g.: • Where dragged braking over longer distances takes place (i.e. mainly in mountainous region), or; • On infrastructure with shorter brake distances and/or more severe winter conditions (e.g. Switzerland, Norway and Sweden), or; • RID goods carrying wagon. It has to be checked if the existing risk assessment already considers these scenarios, and an update is required when operational scenarios are missing.

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 1.5b: Increased in service limit for minimum wheel diameter (2/2)

Who	When/where to apply	What to do
ECM	For wheels of wheel type BA 004 and comparable (**slide 44**) used in wagons with **nominal axle load ≤ 20t and not used in ss-braking regime** application. Until **31.12.2026**: RCM 1.5b implemented	The use of wheels with • minimum in service wheel diameter < 864 mm, or • minimum wheel diameter after the last reprofiling < 880 mm requires justification by a risk assessment. The risk assessment shall be carried out in accordance with the process described in Annex I of (EU) 402/2013 CSM REA. Note: This risk assessment shall consider the potential operational scenarios of this vehicle, e.g.: • Where dragged braking over longer distances takes place (i.e. mainly in mountainous region), or; • On infrastructure with shorter brake distances and/or more severe winter conditions (e.g. Switzerland, Norway and Sweden), or; • RID goods carrying wagon. The assessment shall be carried out by the ECM and the manufacturers shall provide technical and engineering support for safety-critical component "wheel" and their safe integration. Based on the result of the risk assessment the application of adequate measures is up to the ECM.

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 2.1a: Visual inspections

Who	When/where to apply	What to do
RUs/IMs that operate freight wagons	For all tread-braked wheels. In force since **01.02.2026:** • Before train departure (pre-departure checks) • In case of detection of thermal overload on the brake block (**slides 73-74**) • During the train journey: as soon as possible after any indication of malfunction of wheel-brake-system or thermal overload of the wheel (e.g. by a loco driver or trackside detection systems) Note: any change of at least one brake block is considered as a task of the ECM and captured by RCM 1.2 (**slides 48-49**)	Visual inspection of the visible part of the wheel to detect: • single cracks on the wheel tread (**slides 64-66**) • cracks in rim and/or web (**slides 67-68**) • any indication of thermal overload of the wheel (**slides 69-72**). A hammer test/sound test may be of help in detecting cracked rim/web of the wheel and can be carried out as an extra measure when the operational conditions are favourable (**slide 75).** In case of • Single cracks on the wheel tread or cracks in rim and/or web : dispatch wagon to ECM maintenance for strengthened measures during off-vehicle maintenance (RCM 1.4, **slide 51**). • any indication of thermal overload of the wheel, apply RCM 2.1.b (**slides 56-58**).

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 2.1b: Follow-up actions after detection of thermal overload (1/3)

Who	When/where to apply	What to do

RUs/IMs that operate freight wagons	For all tread-braked wheels **without** white stripe marking on the axle box cover
	
	In force since **01.02.2026:**
	
	• In case of detection of any indication of thermal overload of the wheel, following the application of RCM 2.1a (**slide 55**).
		Visually inspect the wheel in accordance with RCM 2.1.a (**slide 55**)
		• In case of cracks* ➔ detach wagon
		• In case of no cracks* ➔ measure widening of inner faces (E-value)
		  • If E-value inside tolerance ➔ switch off brake, wagon can complete the journey
		  ➔ no reloading and dispatch wagon to ECM maintenance according to RCM 1.4 (**slide 51)**
		  • If E-value outside tolerance ➔ detach wagon
		
		Inform the Keeper/ECM, ensure traceability of detections and actions taken (e.g. by filling standard international forms such as GCU appendix 4 and appendix 9, annex 12).
		
		* cracks = single cracks on the wheel tread or cracks in rim and/or web (RCM 2.1.a, **slide 55**)

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 2.1b: Follow-up actions after detection of thermal overload (2/3)

Who	When/where to apply	What to do
RUs/IMs that operate freight wagons	For all tread-braked wheels **with** white stripe marking on the axle box cover In force since **01.02.2026, and until 01.07.2027** (deadline for the removal of the white stripe markings on wheels of wheel type BA 004 and comparable – according to RCM 1.3, **slide 50**) • In case of detection of any indication of thermal overload of the wheel, following the application of RCM 2.1a (**slide 55**).	Visually inspect the wheel according to RCM 2.1.a (**slide 55**) • In case of cracks* ➔ detach wagon • In case of no cracks* ➔ switch off brake, wagon can complete the journey ➔ no reloading and dispatch wagon to ECM maintenance according to RCM 1.4 (**slide 51)** Inform the Keeper/ECM, ensure traceability of detections and actions taken (e.g by filling standard international forms such as GCU appendix 4) * cracks = single cracks on the wheel tread or cracks in rim and/or web (RCM 2.1.a, **slide 55**)

Part II, Chapter 1b.: Risk Control Measures version 5.1

RCM 2.1b: Follow-up actions after detection of thermal overload (3/3)

Who	When/where to apply	What to do
RUs/IMs that operate freight wagons	For all tread-braked wheels **with** white stripe marking on the axle box cover From **01.07.2027:** • In case of detection of any indication of thermal overload of the wheel, following the application of RCM 2.1a (**slide 55**).	Visually inspect the wheel according to RCM 2.1.a (**slide 55**) • In case of cracks* ➔ detach wagon • In case of no cracks* ➔ wagon can run without restrictions Inform the Keeper/ECM, ensure traceability of detections and actions taken (e.g by filling standard international forms such as GCU appendix 4) * cracks = single cracks on the wheel tread or cracks in rim and/or web (see RCM 2.1.a, **slide 55**)

Part II, Chapter 1b.: Risk Control Measures version 5.1

SM 1: Surveillance of freight ECMs

Who	When/where to apply	What to do
ECM certification bodies (ECM CB)	In force since **04.04.2025**. During surveillance activities	Surveillance of the freight ECMs. Special attention shall be drawn to whether the ECM is using wheels of wheel type BA 004 and comparable or not. The ECM CB shall check: • Correct implementation of the JNS risk control measures report v5.1 (**slides 47-54 and 62**) also for outsourced maintenance function activities; • Correct implementation of alternative risk control measures that the ECM has identified in risk assessments in accordance with the process described in Annex I of (EU) 402/2013 CSM REA, if required; • In particular, correct application of the CSM REA in case of applying the RCMs 1.5a and 1.5b (**slides 52-54**); • The monitoring of the risk control measures in accordance with (EU) 1078/2012 CSM MON (Monitoring) to verify the effectiveness of the JNS risk control measures 2026. If during the surveillance the ECM CB becomes aware of a case of cracked/broken wheels : check if the ECM has reported the case to the JNS Task Force, in accordance with the ECM's Maintenance Management System (MMS).

Part II, Chapter 1b.: Risk Control Measures version 5.1

SM 2: Supervision of railway actors

Who	When/where to apply	What to do
National Safety Authorities (NSAs)	In force since **04.04.2025**. During surveillance activities	Supervision of the RUs and IMs that operate freight wagons. Special attention shall be drawn to: • Correct implementation of the JNS RCM report v5.1 (RCMs 2.1a & 2.1b, **slides 55-58** and RCM 6.1 (**slide 62**)), • Correct implementation of alternative RCM that the RU/IM has identified in risk assessments in accordance with the process described in Annex I of (EU) 402/2013 CSM REA (Risk Evaluation and Assessment), if required, • The monitoring of the RCM in accordance with (EU) 1078/2012 CSM MON (Monitoring) to verify the effectiveness of the JNS RCM report v5.1. If during the supervision the NSA becomes aware of cases of cracked / broken wheels: check if the involved RU or the IM that operates freight wagons has reported the case to the assigned ECM, according to the RU's/IM's Safety Management System (SMS). Also the NSA shall check that subsequently the information on the case has been delivered by the ECM to the JNS Task Force. To check this, the NSA may contact the Task Force using the email address jns@era.europa.eu.

Part II, Chapter 1b.: Risk Control Measures version 5.1

SM 3: Investigations by NIB

Who	When/where to apply	What to do
National Investigation Bodies (NIBs)	During investigations of accidents or incidents involving a cracked or broken wheel. From **01.08.2026**	National Investigation Bodies (NIBs) are tasked under Directive (EU) 2016/798 with investigating serious accidents and may also investigate other accidents and incidents which, under slightly different conditions, might have led to serious accidents. Investigation reports prepared in accordance with the reporting structure laid down in Regulation (EU) 2020/572 shall include verification of whether the relevant JNS RCMs had been correctly implemented at the time of the event. Should the NIB detect any irregularity, it shall identify the causes and consider them in their conclusions and recommendations. If, during the investigations, the national investigating body detects a lack of effectiveness in one or more JNS RCMs, it shall provide the necessary details to ERA using the email address jns@era.europa.eu.

Part II, Chapter 1b.: Risk Control Measures version 5.1

SM 4: Investigations of the effectiveness of the JNS risk control measures

Who	When/where to apply	What to do
ECMs, RUs/IMs that operate freight wagons	Following accidents or incidents involving a broken wheel or a cracked wheel with a crack through the inner and/or outer side of the rim and/or web.	ECMs, RUs and IMs, pursuant to the provisions of the Common Safety Methods for SMS requirements (Regulation (EU) 2018/762 (point 7.1 et seq .)) and point 4 of Annex II to Regulation (EU) 2019/779, must verify whether the relevant risk control measures from the JNS report v5.1 or alternative risk control measures had been applied. They must identify the reasons for any failure to apply them or, if they were applied, evaluate their effectiveness. In accordance with Article 4 of Regulation (EU) 1078/2012, infrastructure managers, railway undertakings and entities in charge of maintenance, including their contractors, shall ensure through contractual clauses the mutual exchange of all relevant safety-related information resulting from the application of the monitoring process established in the Annex of this Regulation. This is to enable the counterparty to adopt all necessary corrective actions aimed at continuously ensuring the safety performance of the railway system. Upon completion of their investigations, infrastructure managers, railway undertakings and entities in charge of maintenance shall report without delay to the JNS Task Force any cases where the proposed measures were correctly adopted but proved to be ineffective using the specific mail address (jns@era.europa.eu) given by ERA in order to collect this information.

Part II, Chapter 1b.: Risk Control Measures version 5.1

Definition of affected application from previous JNS final report v3.0

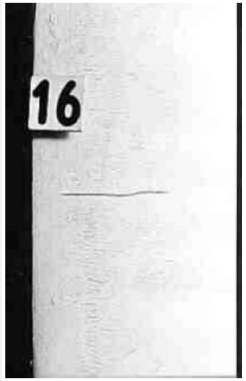
In the previous JNS final report version 3.0 (published on the website of ERA on 04.04.2025 – and replaced by the JNS final report version 4.1), a wheel was considered to be used in “affected application” if **one or more** of the below mentioned conditions applied:

- Wheel used in combined traffic
- Wheel used in the middle bogie of an articulated waggon
- Wheel braked under regime “ss”
- Wheel used in wheelset with a calculated brake weight per axle > 15,25t
  (according to UIC 544-1 6th Edition)
- Wheel used in transport taking place fully or partially within the mountainous region where dragged braking over longer distances takes place
- Wheel used in transport taking place in infrastructure with shorter brake distances and/or more severe winter conditions (such as is the case in Norway and Sweden)

Part II, Chapter 1b.: Risk Control Measures version 5.1

Reference “single cracks on the wheel tread” (1/3)

Description: The tread exhibits cracks at an angle of approximately 90° to the circumference of the wheel and have a typical length of 30mm or more. Transverse cracks generally develop at the surface in either straight or slightly crooked lines and can penetrate radially (usually of thermal origin in these cases) or branch out in a circumferential direction (usually of mechanical origin in this case). They occur individually and can be distributed at several points around the circumference. [EN 15313, §C.2.6]



Transverse crack revealed by magnetic particle testing [EN 15313, §C.2.6]

Example for single cracks on the wheel tread by visual inspection

[Source: EN 15313]

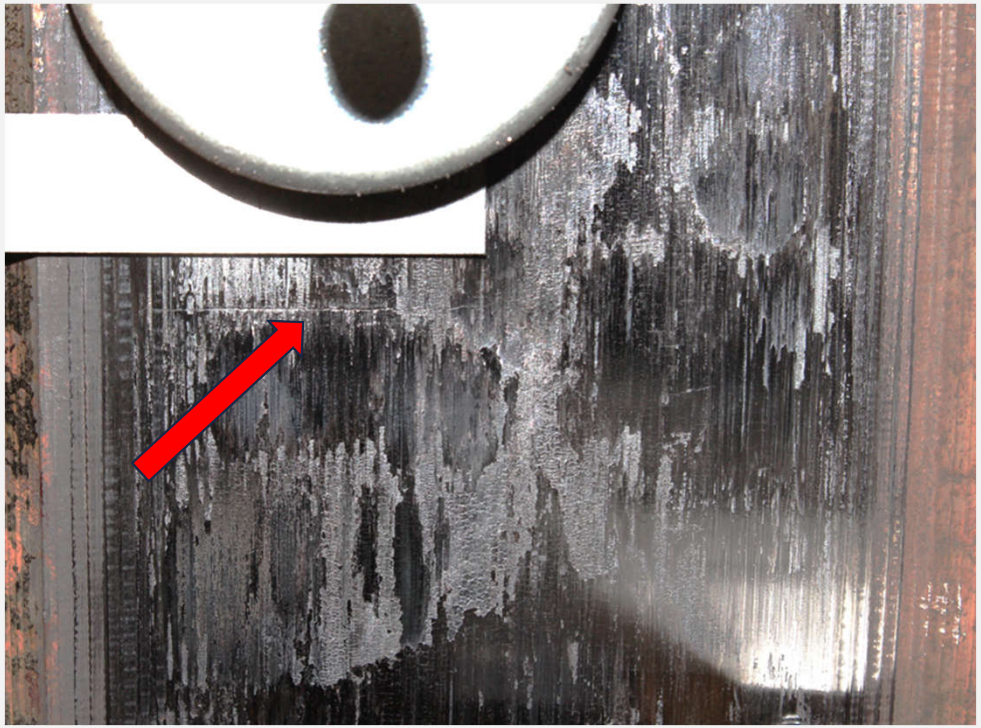
Part II, Chapter 1b.: Risk Control Measures version 5.1

Reference “single cracks on the wheel tread” (2/3)

[Source: JNS Broken wheels]

Part II, Chapter 1b.: Risk Control Measures version 5.1

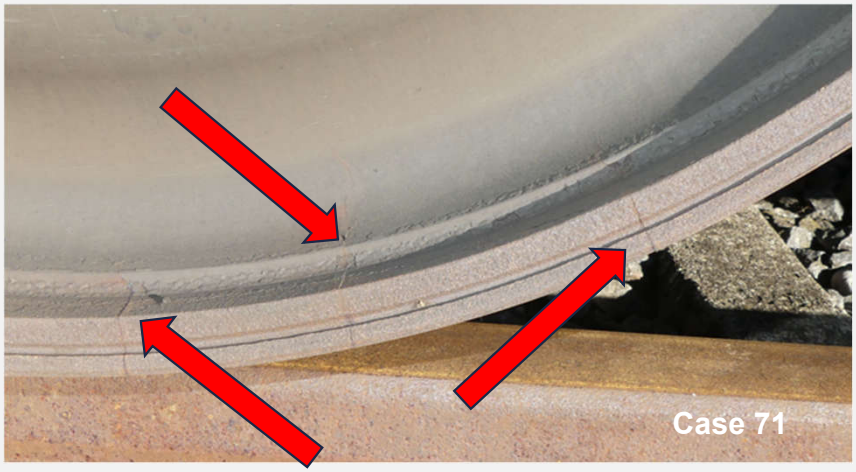
Reference “single cracks on the wheel tread” (3/3)



[Source: JNS Broken wheels]

Part II, Chapter 1b.: Risk Control Measures version 5.1

Reference “cracked rim/web” (1/2)



[Source: JNS Broken wheels]

Part II, Chapter 1b.: Risk Control Measures version 5.1

Reference “cracked rim/web” (2/2)

[Source: JNS Broken wheels]

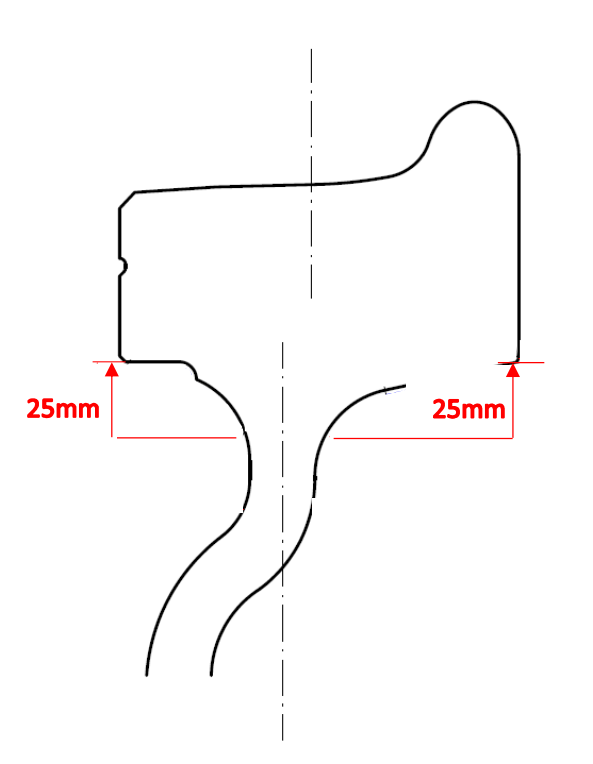
Part II, Chapter 1b.: Risk Control Measures version 5.1

Indications of thermal overload

ECMs and all RUs and IMs that operate freight wagons shall visually inspect all tread braked wheels for all the following indications of thermal overload:

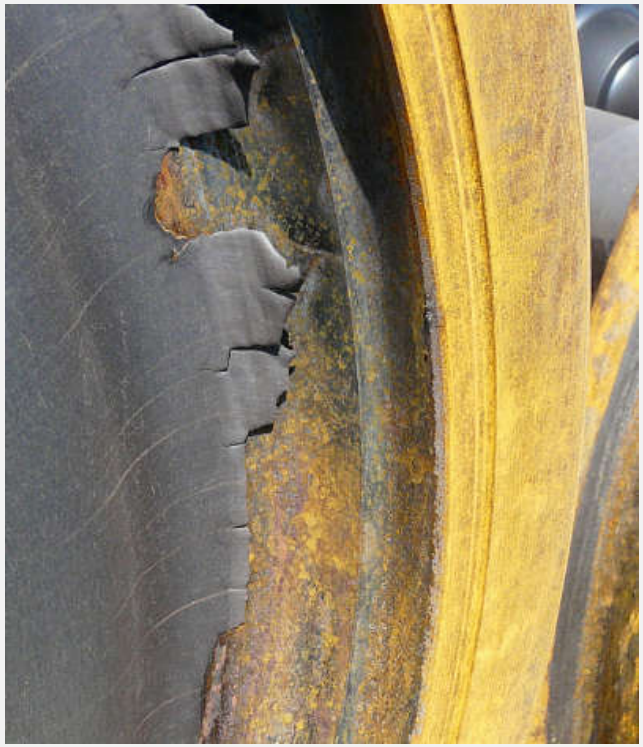
- Obvious burnt paint (cracks or shelling on paint) or no paint or corrosion (traces of rust) >25 mm between rim and wheel plate(see red marking of figure to the right and Annex C.3.2.2 of EN15313:2024)
- Fusion of brake blocks
- Deterioration of wheel tread with build-up of metal (see Annex C.2.2 of EN15313:2024)
- Uneven bluish coloured rim from overheating

ECMs and all RUs and IMs that operate freight wagons shall also consider any available data from detection devices (e.g. hot wheel detectors, ..) that might indicate thermal overload.



Part II, Chapter 1b.: Risk Control Measures version 5.1

Reference “Thermal overload of the wheel” (1/3)



- burnt paint at connection between rim and wheel web;
- traces of rust at connection between rim and wheel web;

[Source: EN 15313]

Part II, Chapter 1b.: Risk Control Measures version 5.1

Reference “Thermal overload of the wheel” (2/3)

- burnt paint at connection between rim and wheel web;
- traces of rust at connection between rim and wheel web;

[Source: EN 15313 and JNS “Broken wheels”]

Part II, Chapter 1b.: Risk Control Measures version 5.1

Reference “Thermal overload of the wheel” (3/3)

Metal built-up on
the tread

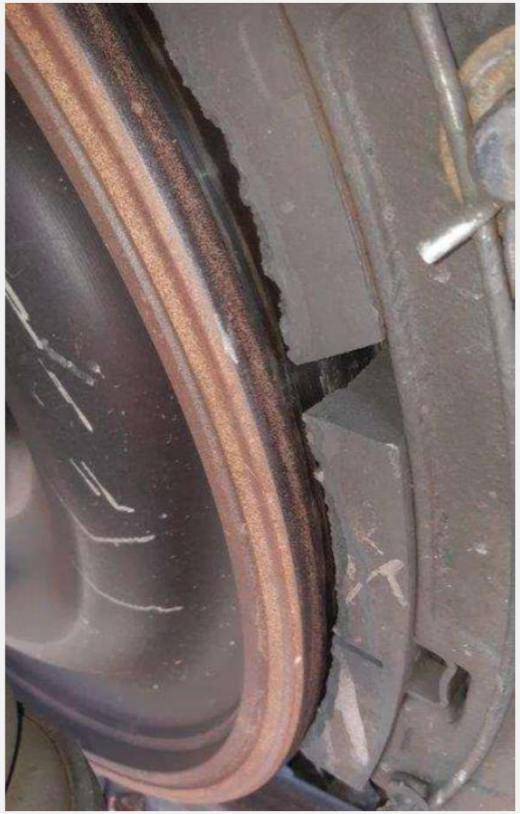
bluish coloured rim from overheating

[Source: EN 15313]

Part II, Chapter 1b.: Risk Control Measures version 5.1

Reference “Thermal overload brake blocks” (1/2)

Organic composite brake block with white layer in the rubbing surface near to the surface area, friction carbon deposits, and crumbled rubbing surface



All type of composite brake blocks: Crumbled the rubbing surface, friction carbon deposits high

Sintered composite brake blocks: White-blue layer in the rubbing surface

[Source: UIC Leaflet e541-4, 3. Edition]

Part II, Chapter 1b.: Risk Control Measures version 5.1

Reference “Thermal overload brake blocks” (2/2)

Organic brake blocks: White layer in the rubbing surface near to the surface area, friction carbon deposits

Organic brake blocks: Red layer in the rubbing surface

[Source: UIC Leaflet e541-4, 3. Edition]

Part II, Chapter 1b.: Risk Control Measures version 5.1

Hammer (sound) test of the wheels

Instructions:

- The hammer (sound) test shall be done by qualified staff;
- The hammer (sound) test shall be done with a metal hammer;
- The hammer (sound) test shall be done with fully released brakes;
- The hammer (sound) test shall be done at the outer side of the rim's circumfere in the following areas (see photo) expressed in terms of clock time:
  - between 1 and 5;
  - Between 7 and 11;

Interpretation of results:

- Wheel responds with a thud-like/damped sound: crack from the rim to the web (independently from the position of the cracks over the circumference);
  Important: defects on the tread (without cracks propagated to the web) cannot be detected;
- Wheel responds with a ringing sound: no cracks from rim to web (independently from the wheel type (web shape) and wheel diameter).

Part II, Chapter 1b.: Risk Control Measures version 5.1

Reminder: JNS RCM related to the use of LL composite brake blocks

All actors concerned (RUs; IMs that operate freight wagons; freight wagon ECMs; locomotive ECMs, freight wagon manufacturers, locomotive manufacturers, loaders/terminals) are reminded to consider the JNS risk control measures aiming at reducing the number of fixed brakes and subsequently cases of thermal overload, as identified in the JNS Normal Procedure "Consequences of unintended brake applications with LL blocks".

These RCM aim to

- reduce the number of fixed brakes,
- detect fixed brakes and
- check wheels for extraordinary tread wear and deformations

These RCM are set out in Part II, sections 1.1, 1.2 and 1.3 of the JNS final report "Consequences of unintended brake applications with LL blocks".

Please consult the most recent version of the JNS final report on ERA's website (https://www.era.europa.eu/domains/accident-incident/joint-network-secretariat-jns_en)

Part II

Chapter 1: Risk control measures

Chapter 0: summary and orientation

Chapter 1: risk control measures

1a: identification of wheel types comparable to BA 004

1b: risk control measures 2026

1c: continuation of JNS work

Chapter 2: changes to legislation and standards

Chapter 3: related non-JNS analyses

Chapter 4: impact assessment

Part II, chapter 1c. : continuation of JNS work

Draft tasks

- Correct editorial mistakes in report version 5.0, if any (and create version 5.1)
- Feasibility study on workshop capacity – linked to JNS risk control measure 1.1:
  - JSG to provide a first proposal for the methodology
  - ERA to review the proposed methodology / provide input for the methodology
  - JNS Task Force to approve the final methodology
  - Figures to be collected by actors
  - JSG to analyse data with ERA review
  - JNS Task Force to approve final results and discuss next steps if needed
- Update the impact assessment
- Fault tree analysis / deeper analyses of the root causes (e.g more stop braking, driving method of the train , influence of the infrastructur - e.g. conditions of the rail, wheel - rail interaction)
- Follow discussions on harmonized levels of risk acceptability
- Identify changes in regulation and standards (e.g. EN 13979-1, EN 15313, ..) (taking into account the concept of safety critical component - of Directive (EU) 2016/798 (the Railway Safety Directive) article 29, paragraph 3)
- Define research needs (e.g. more reliable in-service monitoring and design and technological improvements)
- Start development of an updated wheel technical concept (product requirements plus limits & conditions of use)
- Explore possible requirements for exchange of wheel information

Part II

Chapter 2: Changes to legislation and standards

Chapter 0: summary and orientation

Chapter 1: risk control measures

Chapter 2: changes to legislation and standards

Chapter 3: related non-JNS analyses

Chapter 4: impact assessment

Outcome of a discussion in the JNS Task Force

Current situation:
The accident in the Gotthard tunnel in August 2023 resulted in an enormous damage to infrastructure and rolling stock and has caused severe operating restrictions on the important transit line between North and South Europe over a period of more than one year.
The accident was caused by a broken wheel which was probably triggered by a thermal overload several months before the accident.

In the current claims settlement, the responsibility lies probably with the Railway Undertaking, despite the fact that the relevant JNS risk control measures are also assigned to other actors:

- Other Railway Undertakings;
- ECMs;
- NSAs and ECM Certification Bodies;
- Infrastructure Managers.

Recommendations:

- Representative Bodies and EU member states resp. EFTA member states should initiate a discussion to clarify responsibilities and liability of the different actors, in particular the Entity in Charge of Maintenance, with the European Commission;
- Representative Bodies should consider to notify a JNS procedure to give guidance to railway undertakings regarding the correct involvement of third parties, in particular Entities in Charge of Maintenance, in their operational activities. Subsequently, the need for modifications to the legal framework shall be analysed and proposals for improvement shall be formulated, if any.

Part II

Chapter 3: Related non-JNS analyses

Content

Chapter 0: summary and orientation

Chapter 1: risk control measures

Chapter 2: changes to legislation and standards

Chapter 3: related non-JNS analyses

Chapter 4: impact assessment

Part II, chapter 3. : Related non-JNS analyses

JNS Normal Procedure "Consequences of unintended brake …", Sector projects

The crack(s) in the wheel involved in the accident in the Gotthard base tunnel was probably initiated by a thermal overload that occurred a long time before the accident. Therefore, the Task Force members recommend..

- The concerned actors to implement the risk control measures aiming at reducing the number of fixed brakes and subsequently cases of thermal overload, as identified in the already concluded **JNS Normal Procedure "Consequences of unintended brake applications with LL blocks"**. Please find the most recent version of the JNS Final Report on ERA's website (https://www.era.europa.eu/domains/accident-incident/joint-network-secretariat-jns_en).

- That the Task Force members closely follow the **Sector Project "Brake Blocks/Wheel Interaction"** and in case the outcome has an impact on the risk control measures, a new JNS procedure shall be notified;

- That the Task Force members closely follow the **UIC Project 'Network Monitor'** that addresses track side Hot Axle Box Detection Systems and Hot Wheel Detection Systems and in case the outcome has an impact on the risk control measures, a new JNS procedure shall be notified.

Part II

Chapter 4: Impact assessment

Content

Chapter 0: summary and orientation

Chapter 1: risk control measures

Chapter 2: changes to legislation and standards

Chapter 3: related non-JNS analyses

Chapter 4: impact assessment

Part II, chapter 4. : Impact Assessment

Full Impact Assessment - options

- For this JNS procedure, a Full Impact Assessment (FIA) was carried out and published in December 2025. This FIA was built on the Light Impact Assessment (LIA) accompanying the JNS report v2.0/v3.0 of 2024. The FIA has been updated to accompany the JNS report v5.0/v5.1.
- The following options were considered:
  - **Option 0**: Use the status quo in which RCMs are in place as recommended by the "JNS 2025" (Report 4.0 / Report 4.1);
  - **Option 1**: The situation where the Swiss national rules of 11 September 2025 and updated in October 2025 are implemented on a European level;
  - **Option 2**: The situation where the JNS 2025 measures are updated along with replacing the Swiss National rules (JNS report v5.0/v5.1).
  - **It should be noted that for both Options 1 and 2 there would be variation over time (especially distinguishing between 2026 and 2027+)**

Part II, chapter 4. : Impact Assessment

Full Impact Assessment – assumptions and main findings

Assumptions:

- Impacts considered in analysis: costs of measures, external costs and safety gains associated with the different options;
- Quantitative assessment of impacts for Option 2 and Option 1 focused on the implications associated with mileage based visual inspections;

Main findings:

- Option 2 is preferred to Option 1 on the basis of qualitative and quantitative assessments (quantitative assessment considers costs or cost-effectiveness);
- Strong recommendation to steer further JNS work to identify improved long-term approaches for in-service monitoring and maintenance using digital tools with high potential for cost savings.

For more information, see the document “Full Impact Assessment JNS Normal Procedure “Accident in the Gotthard base tunnel with focus on broken wheels” – Follow-up from 2024 reporting” on the ERA website (https://www.era.europa.eu/domains/accident-incident/joint-network-secretariat-jns_en)

Part II, chapter 4. : Impact Assessment

Full Impact Assessment – recommended next steps

Recommended next steps:

- The update of the Impact Assessment will include results of monitoring (if available). For IA updates from 2027 onwards additional monitoring information will be available, as it is foreseen to launch a survey on the effectiveness of the risk control measures in Q3 2027.

- It is also planned to explore further in the impact assessment updates the extent to which the risk for broken wheels has been reduced due to the RCMs put in place as part of the JNS NP “Consequences of unintended brake applications with LL blocks”. This would draw on the recently (May 2026) completed survey on the effectiveness of those RCMs.

END OF REPORT