JNS Normal Procedure
“Accident Gotthard base tunnel - broken wheels"

Final report| version 3.0 | 04.04.2025

Outcome of the Joint Network Secretariat Normal Procedure “Accident Gotthard base tunnel - broken wheels”

Part I : Introduction
Part II : Outcome

Version history:

Version	Date	Comments
2.0	11.07.2024	Contains outcome of JNS Normal Procedure “Accident Gotthard base tunnel – broken wheels”. Published July 2024. The improved risk control measures from the JNS NP 2024 replace entirely the risk control measures from the JNS NP Broken Wheels 2017-2019 for BA 004 (“crack in the rim”)
3.0	04.04.2025	General review 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.

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Part I - Introduction

Chapter 1: explanation JNS

Content

Part I, Chapter 1. : Explanation JNS
What is the JNS?

Joint Network Secretariat (JNS)

- Triggered by accident Viareggio 2009 ➔ Joint Sector Group at ERA
- National Safety Authorities (NSA network) + 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
- From 2025[1)]: Legal basis in CSM ASLP (Assessment of Safety level and Safety Performance)

1) Depends on the adoption of the Regulation on these Common Safety Methods

Part I, Chapter 1. : Explanation JNS
JNS in the EU safety framework
Roles of actors

Role of JNS procedures 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**, including manufacturers, maintenance suppliers, keepers, service providers, contracting entities, carriers, consignors, consignees, loaders, unloaders, fillers and unfillers 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.

*) DIRECTIVE (EU) 2016/798 (Railway Safety Directive), Article 4

Part I, Chapter 1. : Explanation JNS
JNS in the EU safety framework

Roles of actors

Role of JNS procedures in the EU safety framework*)

- After incidents and accidents the **National Safety Authority (NSA) supervises** stakeholder´s immediate actions aiming at assessing whether the measures taken by the companies involved sufficiently prevent any related danger (at European level).

- If not, the **NSA shall intervene** respecting the responsibility of all actors. These immediate measures might increase costs for the sector and may harm interoperability

- **NSAs** have to share relevant information within the SIS system to allow other NSAs to react appropriately in order to ensure safety. This is usually done in the form of a **Safety Alert**

*) DIRECTIVE (EU) 2016/798 (Railway Safety Directive), Article 4

Part I, Chapter 1. : Explanation JNS
JNS in the EU safety framework
Roles of actors

- In parallel the **National Investigation Body (NIB) may run an independent investigation** of the incident or accident with the objective to find the causes and to give recommendations to the different actors involved within one year*).

- 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).

*) DIRECTIVE (EU) 2016/798 (Railway Safety Directive), Articles 20 to 24

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

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:**
  - identification of research needs,
  - improvement of regulation, standardisation and other rules,
  - update of the measures from the Urgent Procedure

- **Timeline:** maximum 2 years

Part I, Chapter 1. : Explanation JNS
JNS in the EU safety framework
JNS Panel and 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
  - Michael SCHMITZ (NSA DE)
  - Benjamin STEINBACHER-PUSNJAK (NSA SI)
  - Marcel DE LA HAYE (CER)
  - Gilles PETERHANS (UIP)
- The networks of National Safety Authorities and Representative Bodies 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
JNS in the EU safety framework
Sharing of information

- 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** (e.g. action plan, conclusions, final report) will be published in an appropriate way agreed among the task force members and have the character of a recommendation

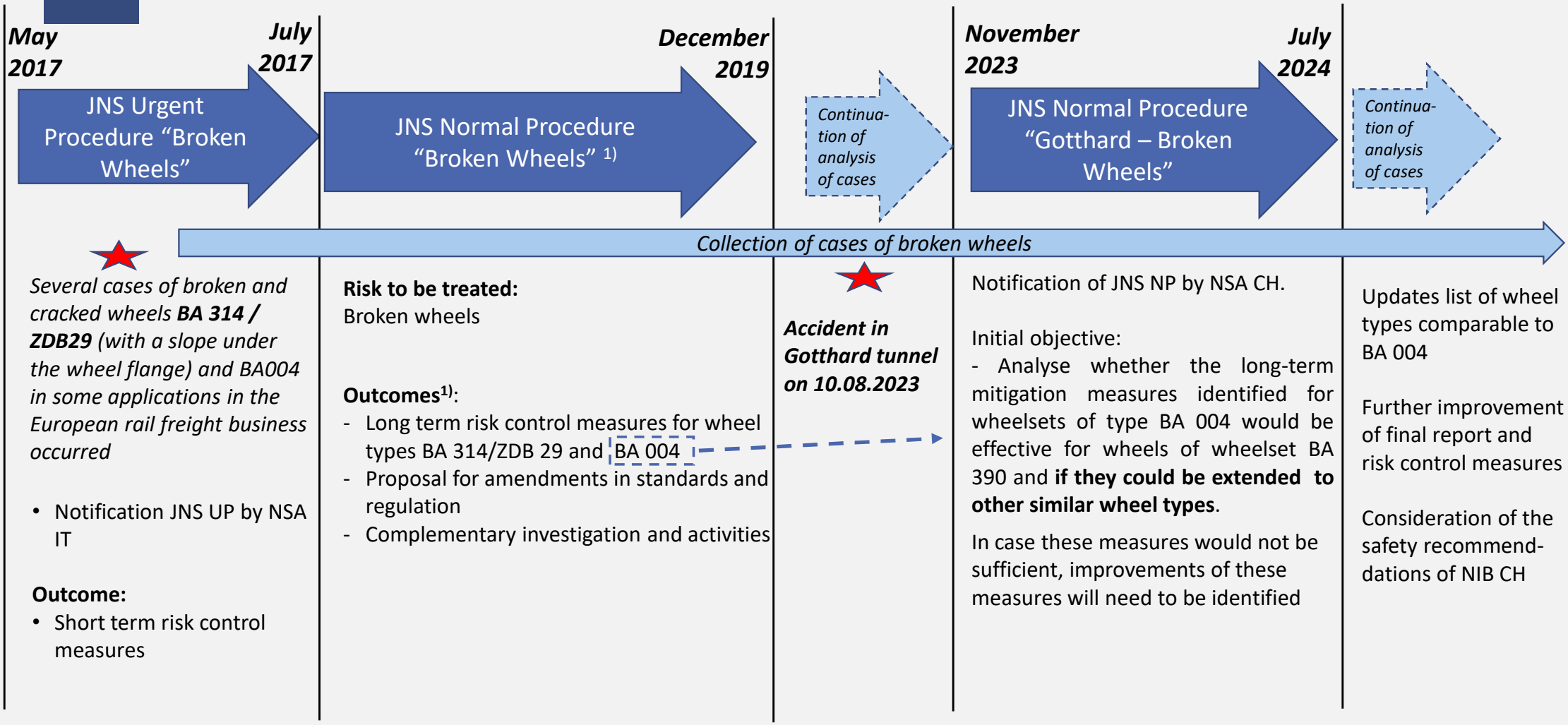
Part I - Introduction

Chapter 2: background and risk to be tackled

Content

Part I, Chapter 2. : Background and risk to be tackled

Background



*Several cases of broken and cracked wheels **BA 314 / ZDB29** (with a slope under the wheel flange) and BA004 in some applications in the European rail freight business occurred*

- Notification JNS UP by NSA IT

Outcome:

- Short term risk control measures

Risk to be treated:
Broken wheels

Outcomes[1)]:

- Long term risk control measures for wheel types BA 314/ZDB 29 and BA 004
- Proposal for amendments in standards and regulation
- Complementary investigation and activities

Accident in Gotthard tunnel on 10.08.2023

Notification of JNS NP by NSA CH.

Initial objective:

- Analyse whether the long-term mitigation measures identified for wheelsets of type BA 004 would be effective for wheels of wheelset 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

Updates list of wheel types comparable to BA 004

Further improvement of final report and risk control measures

Consideration of the safety recommend-dations of NIB CH

1) See report of JNS Urgent Procedure: Short Term measures agreed und proposed by UIC, ERFA, UIP dated 13/07/2017 (europa.eu)

Part I, Chapter 2. : Background and risk to be tackled
Risk to be tackled in the Normal Procedure

Manufacturing
- Geometry
- Material
- Production
- Limits and conditions of use

Maintenance
- Intervals
- Non destructive testing
- Minimum wheel diameter

Vehicle operations
- Correct use of the wheel
- Correct use of the brake
- Visual checks

Infra maintenance
- Track conditions

Correct use of detectors
- Hot wheel detection
- Other detectors (acoustic measurements, vibrations, ..)

Damaged wheel/ derailment detection
- Correct use of detectors' limit values

Broken wheel
(crack in the rim)

Crash with tunnel / station / opposite traffic / ..

1.7 Derailment of train

RSD Appendix point 1.7 "derailment of train" means any case in which at least one wheel of a train leaves the rails;

This risk analysis is based on the existing Fault Tree Analysis from the JNS NP Broken Wheels 2017-2019 (for "crack in the rim" cases)

Part I - Introduction

Chapter 3: organization of work

Content

Part I, Chapter 3 : Organization of work
Administrative background (1/2)

- 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. The final report is expected by the end of 2024. In its intermediate report of 28 September 2023, the NIB CH provided details of the accident and made two safety recommendations:

  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.

- 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."

1) the Transport Safety Investigation Board (STSB)

Part I, Chapter 3. : Organization of work
Administrative background (2/2)

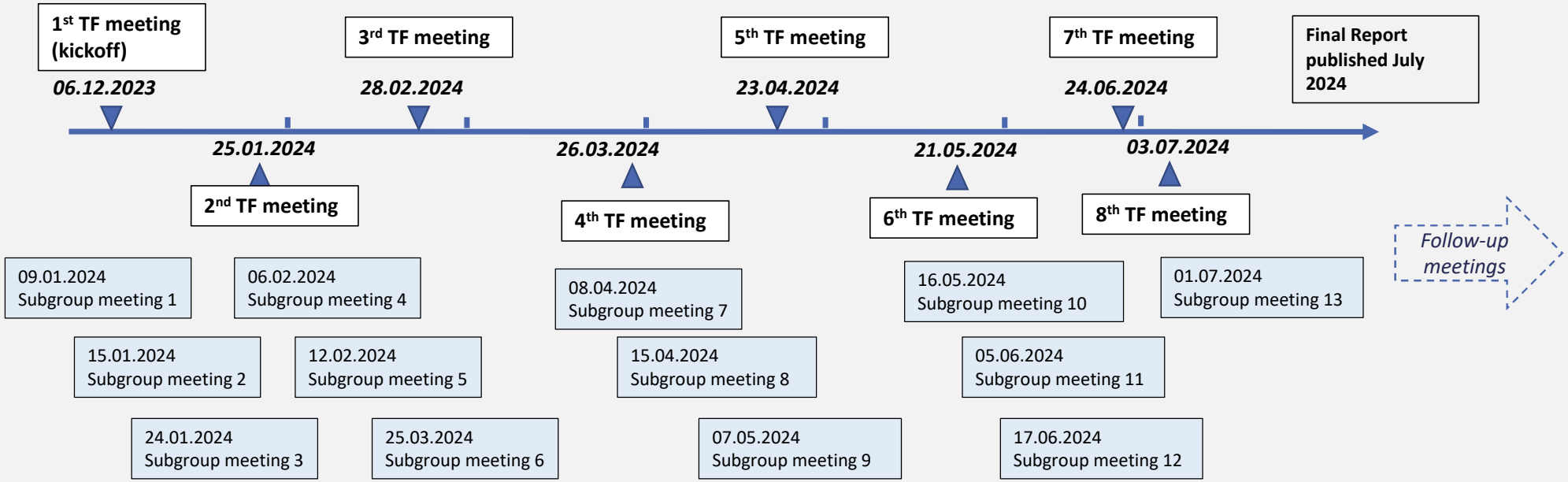
- A Task Force of experts nominated by the NSAs and the European Representative Bodies was assembled;

- In its kickoff meeting on 6 December 2023, the experts 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 was focused among others on wheels of type BA 004 where cracks have been initiated in the rim;

- Similar to the “Joint Sector Group” that was created in the previous JNS Broken Wheels procedures, the Task Force members decided to create a Subgroup of experts that worked on the different tasks and reported in the meetings of the plenary Task Force. Contrary to the former Joint Sector Group, the new Subgroup included also representatives from the NSAs and the European Union Agency for Railways;

- Next slide shows an overview of the Task Force and Subgroup meetings held. Until July 2024, thirteen Task Force meetings took place within the frame of the Normal Procedure. After the publication of the final report, follow-up meetings are planned in order to:
  - Analyse possible newly reported cases;
  - Collect feedback from NSAs and actors, if any;
  - Update the risk control measures and improve the final report accordingly;
  - Consider the safety recommendations from NIB CH.

Part I, Chapter 3. : Organization of work
Overview of meetings



Until July 2024:

- 8 plenary Task Force meetings held
- 13 Subgroup meetings held

+ Further meetings on specific topics

Part II - Outcome

Chapter 0: Summary and orientation

Part II, chapter 0 : Summary and orientation (1/4)

- 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 broken wheels which occurred after 2019 and followed-up the implementation of the identified risk control measures and recommended changes to legislation, standardization and company rules;
- The experts of the new JNS Task Force analysed the accident in the Gotthard base tunnel based on
  - the intermediate report of the NIB CH of 28 September 2023;
  - the recurrent updates of the NIB CH's representative in the Task Force and Subgroup meetings;
  - The metallurgical investigation by QualiTech, initiated by NIB CH.
- Based on this, the experts confirmed that the risk to be treated is covered by the fault tree analysis of broken wheels with crack initiation in the rim, as undertaken during the previous JNS Normal Procedure (see **slide 14**).
- As in the Gotthard base tunnel accident, for the first time a wheel type other than BA 004 experienced crack initiation in the rim, questions arise if the risk control measures of 2019
  - shall be, next to the BA 390 (accident Gotthard), also extended to further wheel types comparable to BA 004, and
  - if these measures of 2019 control the risk sufficiently or need to improved;

Part II, chapter 0 : Summary and orientation (2/4)

- The Task Force members developed an assessment scheme to identify wheel types comparable to BA 004 (see **slides 30-37**);
- In respect of the urgency, the Task Force applied this scheme to wheel types covering the vast majority of wheels currently in operation. In April 2024, the Task Force informed via SAIT and SIS about the intermediate results of this assessments. The three wheel types comparable to BA 004[1)] were :
  - BA 390 (involved in the accident in the Gotthard tunnel);
  - Db-004sa;
  - RI 025.

  The Task Force also stressed to immediately apply the risk control measures from 2019 to these wheel types.
- Afterwards, the Task Force further analysed the effectiveness of the measures from 2019.
- At the end of the JNS normal procedure, the following five 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.

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 (3/4)

- For all wheel types not covered by the assessment by the JNS Task Force, actors shall use the assessment scheme to clarify if these wheel types are also comparable to BA 004;
- The Task Force analysed the list of new cases that occurred after 2019 to evaluate whether the measures of 2019 control the risk sufficiently or need to be improved. As a result, it must be stated that in most of the cases, the risk control measures of 2019 have not been (fully) applied. Nevertheless, the Task Force identified improvements of these measures and increased their clarity and readability (see **slides 39-54**);
- **For all wheel types identified as comparable to BA 004, all actors involved shall either implement fully the improved JNS risk control measures (see slides 39-54) or, implement measures justified by a risk assessment that guarantees at least the same level of safety.** This risk assessment shall be done according to the process described in the Appendix of Commission Implementing Regulation (EU) no. 402/2013, and shall include the demonstration of compliance with the safety requirements;
- The improved risk control measures from the JNS NP 2024 replace entirely the risk control measures from the JNS NP Broken Wheels 2017-2019 for BA 004 (“crack in the rim”). The measures for “crack in the web” (wheel types BA 314 old/ZDB29) remain valid;
- The Task Force members developed proposals to incorporate the JNS risk control measures 2024 in the General Contract of Use (GCU) (see **slides 56-63**).

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

- The Task Force members agreed to summarize in the 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 (see **slide 63**). 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 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" of March 2024 (see **slide 65**) (https://www.era.europa.eu/system/files/202403/JNS%20NP%20LL%20brake%20blocks_Final%20report_v2.0.pdf)
  - recommend to follow-up development in Project "Brake Blocks/Wheel Interaction" and the "UIC Project 'NETWORK MONITOR' that aims at harmonizing requirements for trackside detection systems (see **slide 65**);
- All actors are reminded to report new cases of broken wheels, independently of the wheel type involved, using the template available on the website of the European Union Agency for Railways (www.era.europa.eu/jns).
- Finally, ERA, together with the Task Force members, developed a Light Impact Assessment. The outcomes of this JNS Normal Procedure will further reduce the probability of potentially tremendously costly accidents caused by broken wheels and therefore justify the additional costs (see **slide 67** and the full document on the ERA website www.era.europa.eu/jns).

Part II

Chapter 1: Risk control measures

Part II, chapter 1 : Risk Control Measures
Important general information

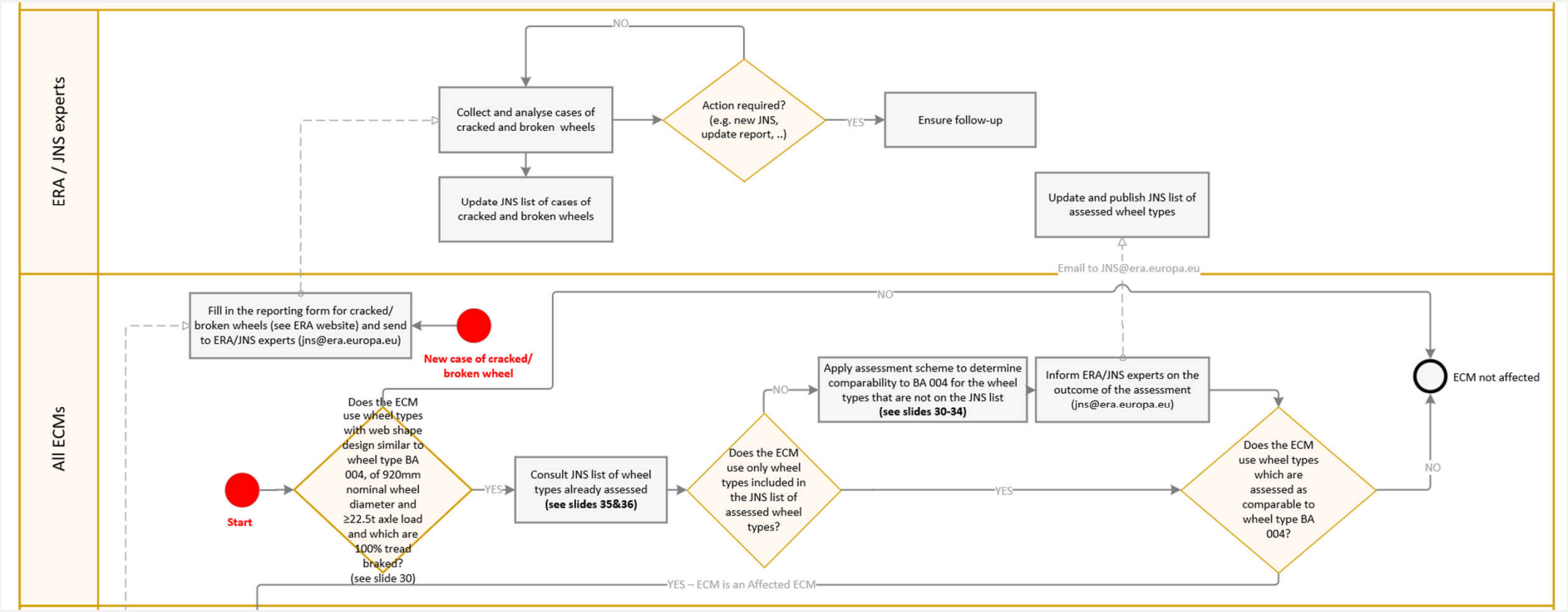
1. All ECMs shall assess whether they are an “affected ECM” by following the flowchart of slide 26.
2. Affected ECMs and all freight RUs shall apply the risk control measures and monitor their effectiveness by following the flowchart of slide 27.
3. Affected ECMs shall inform their respective workshops on the implementation of the risk control measures.
4. The ECM certification bodies and NSAs shall survey/supervise the correct application of the risk control measures by following the flowchart of slide 28.
5. The JNS risk control measures from the JNS NP “Gotthard accident/Broken wheels” from 2024 as set out in slides 39 to 54 **entirely replace** the risk control measures for the risk “crack in the rim” from the previous JNS NP “Broken Wheels” from 2017-2019. They apply to wheel type BA 004 and comparable wheel types (see slides 30-37).
6. The risk control measures for the risk “crack in the web” from the JNS NP “Broken Wheels” from 2017-2019 remain valid. They apply to wheel types BA 314 old/ZDB29.
7. The general requirements for the maintenance of wheels remain applicable, as described in EN 15313*).
8. All actors shall implement the respective measures without delay.

*) This is considered in e.g. GCU Appendix 9 and 10, such as Handling of Brake block protruding (Appendix 9, 3.2.3) and Wheel profile (Appendix 9, 1.4.x).

EUROPEAN UNION AGENCY FOR RAILWAYS

Chapter 1 : Risk Control Measures

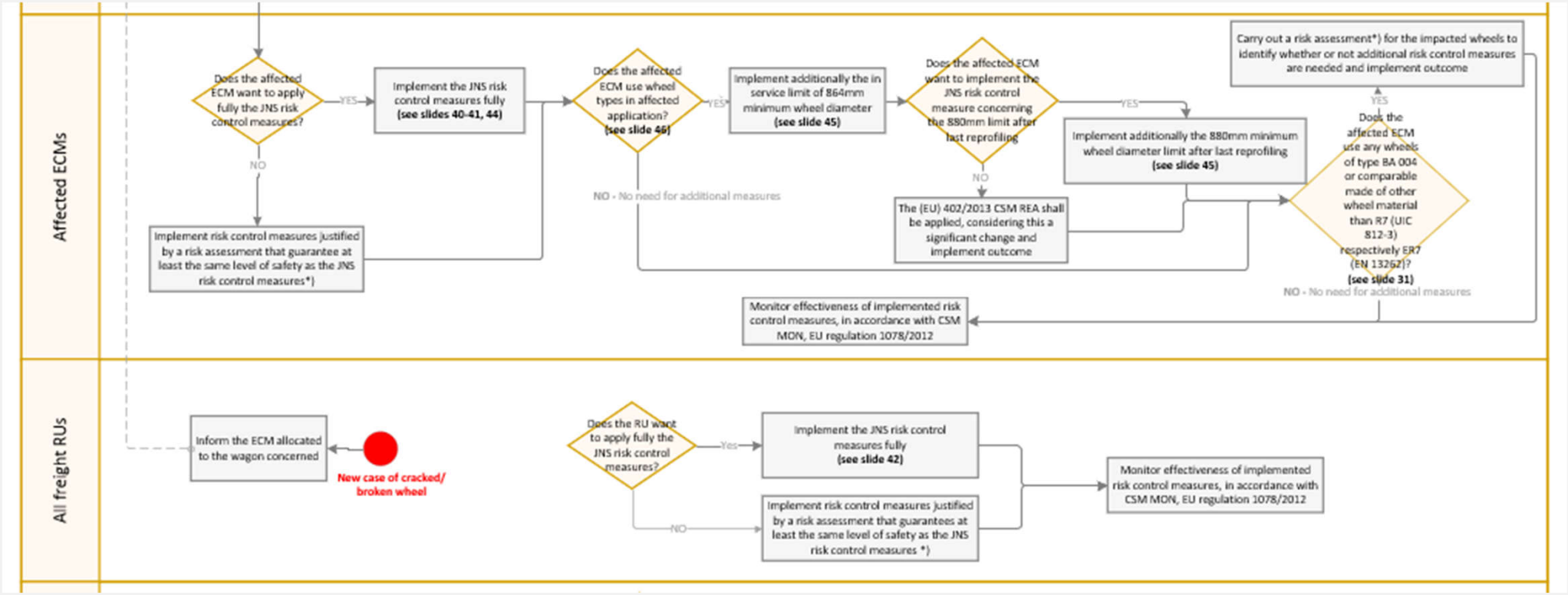
Flowchart JNS normal procedure “Accident Gotthard tunnel - broken wheels” 2024 (1/3)



EUROPEAN UNION AGENCY FOR RAILWAYS

Chapter 1 : Risk Control Measures

Flowchart JNS normal procedure “Accident Gotthard tunnel - broken wheels” 2024 (2/3)

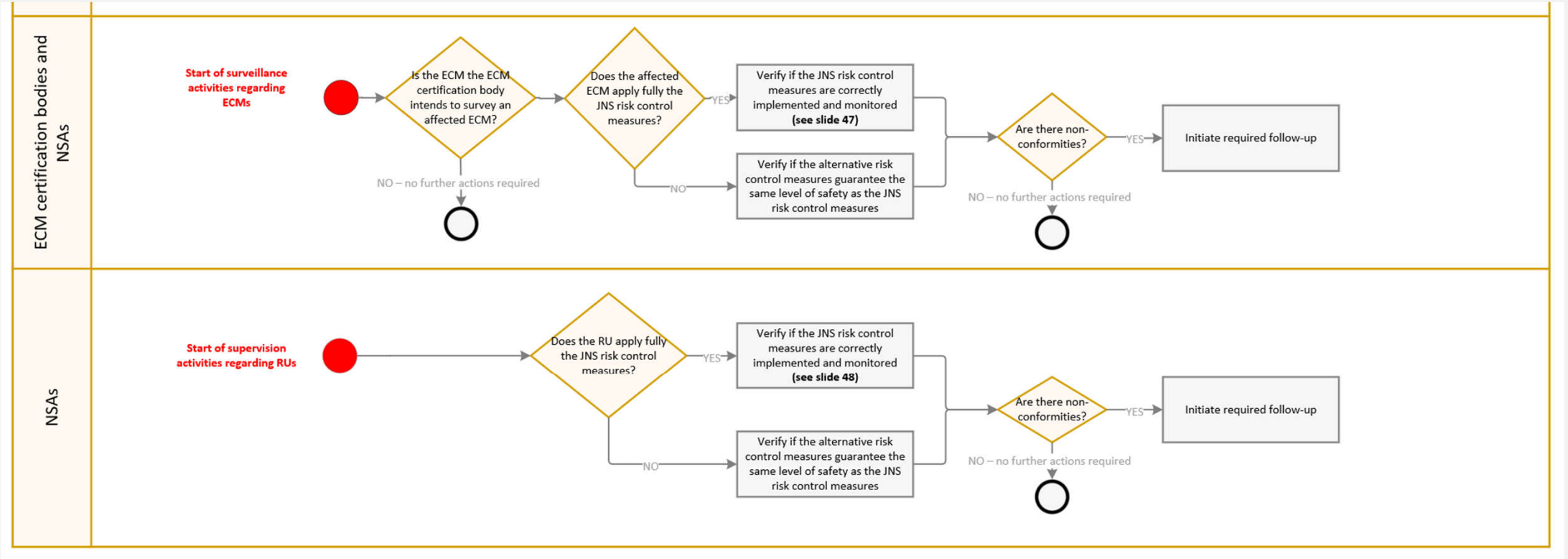


*) This risk assessment shall be done according to the process described in the Appendix of Commission Implementing Regulation (EU) no. 402/2013, and shall include the demonstration of compliance with the safety requirements

EUROPEAN UNION AGENCY FOR RAILWAYS

Chapter 1. : Risk Control Measures

Flowchart JNS normal procedure “Accident Gotthard tunnel - broken wheels” 2024 (3/3)



Part II

Chapter 1: Risk control measures

Chapter 0: summary and orientation

Chapter 1: risk control measures

- **1a: identification of comparable wheel types**
- **1b: risk control measures 2024**

Chapter 2: changes to legislation, standards and company rules

Chapter 3: related non-JNS analyses

Chapter 4: impact assessment

Part II, chapter 1a : identification of comparable wheel types

General criteria regarding the applicability of the JNS risk control measures

The thermally initiated cracks in the wheel rim occurred in **freight transport** on mainly wheel types with web shape design similar to wheel type BA 004 (see slide 32) with the following properties:

- **100 % tread braked with cast iron or composite brake blocks:**
  Reason:
  - Cracked rim was thermally initiated and happened with all types of brake blocks.
- **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;
- **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.

Only those ECMs which use wheel types in freight transport where **all the three properties** are applicable are “affected ECMs” and are concerned by the outcome of this JNS report.

Part II, chapter 1a : identification of comparable wheel types

Reflections on identification of wheel types comparable to BA 004

A scientific 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.

Up to 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 showed, however, that also other wheel types might be affected. For this reason, the assessment scheme to identify other concerned wheel types than BA 004 has been developed in a phenomenological way;

The criteria selected to identify other concerned wheel types are listed 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;

The identification of other concerned wheel types, so called “wheel types comparable to BA 004” takes also into account the results obtained during the JNS Broken Wheels Normal Procedure 2017 - 2019.

In case other wheel materials than R7 (UIC 812-3) respectively ER7 (EN13262) are used, a risk assessment*) has to be carried out for the impacted wheels to identify whether or not additional risk control measures are needed and implement outcome;

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

Part II, chapter 1a : identification of comparable wheel types

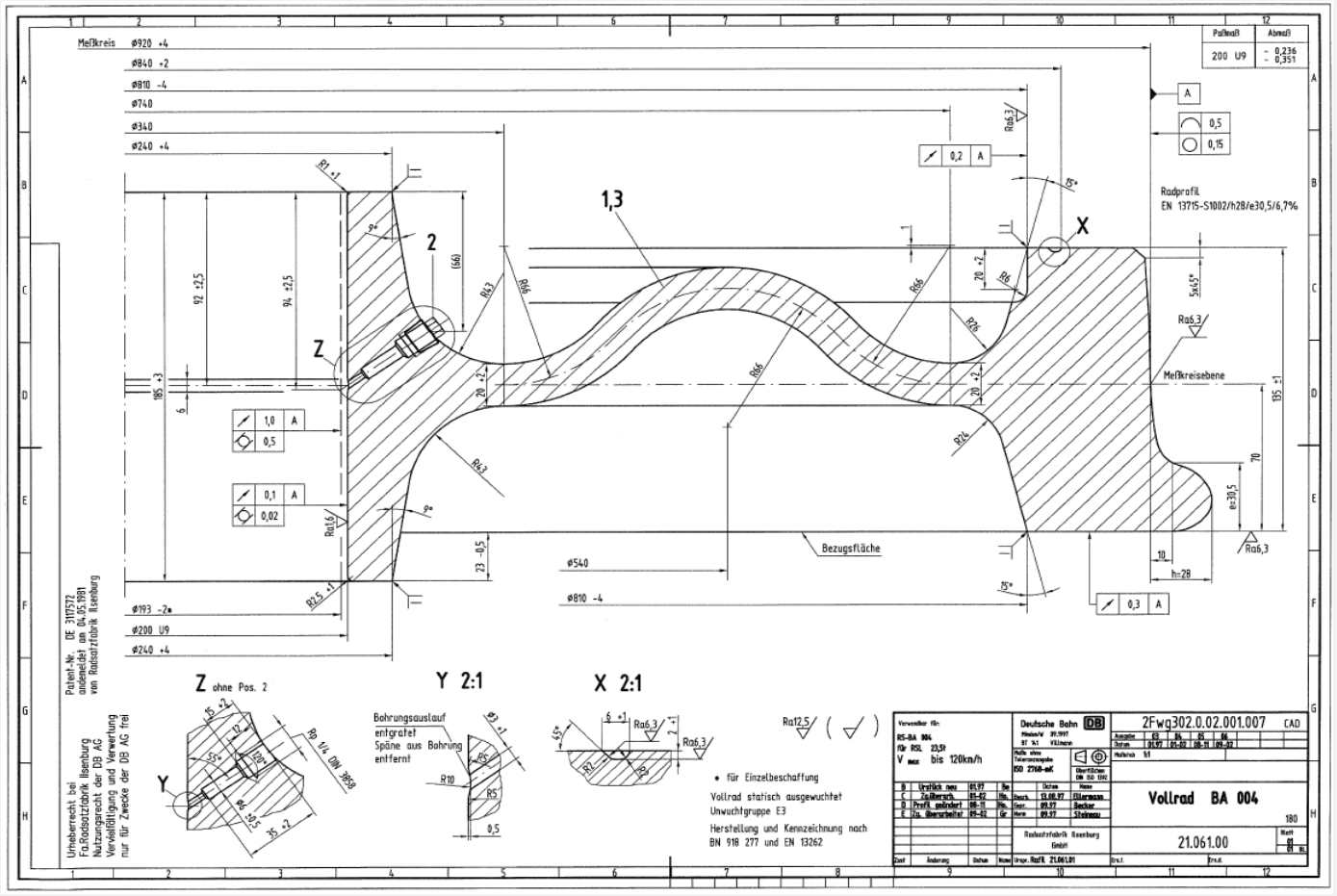
Reference for identification of comparable wheel types : BA 004

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 of comparable wheel types

Specific criteria to identify wheel types comparable to BA 004

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 known 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.

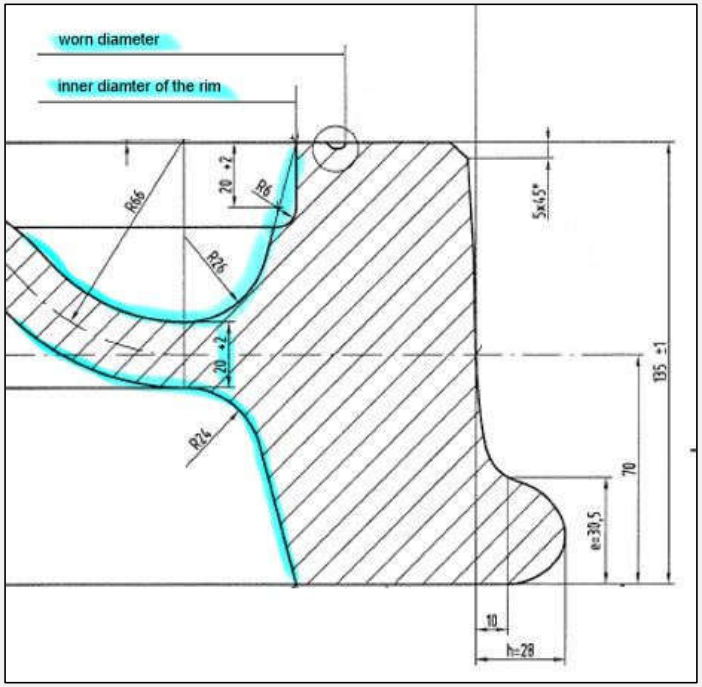


Figure: drawing of BA 004 showing design features referred to in the criteria

Part II, chapter 1a : identification of comparable wheel types

Assessment scheme

Interpretation of the assessment results:

Only if **all** the results are “applicable”, the wheel type is considered comparable to BA 004 and:

- The JNS risk control measures 2024 shall be applied (see Chapter 1b), or
- Alternative measures that guarantee at least the same level of safety, justified by a risk assessment*), shall be applied.

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

➔ JNS risk control measures or alternative measures **shall be applied**

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

➔ JNS risk control measures or alternative measures **do not need to be applied**

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

Part II, chapter 1a : identification of comparable wheel types

Identification of wheel types comparable to BA 004

- In the European freight sector, many wheel types are used. The European maintenance guideline (EMG) from the Verband der Privatwagen Interessenten (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 on the next slide includes the results of this JNS assessment. It will be made 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 30-37) of wheel types not included in this table 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 of comparable wheel types

JNS list of assessed wheel types

												Special design features (see figure slide 33)								
Nr. from VPI EMC	additional wheel type from JNS	wheel type	Drawing Number	nominal wheel diameter [mm]	outer diameter of the wear groove [mm]	inner diameter of the rim - outer side of the wheel [mm]	inner diameter of the rim - inner side of the wheel [mm]	axle load in the wheelset [t]	web thickness near the rim [mm]	residual rim area (like definition in prEN13979-1:2022) [dm²]	residual rim area (like definition in prEN13979-1:2022, but considering clamping side inner rim diameter only) [dm²]	shape of web geometrie comparable to BA 004 (yes/no)	Minimum residual rim cross section area (in fully worn st	Radii in the transition between rim and web comparable to wheel BA 00	Position of the web nearly in the middle of	Allowed thickness of the web near the rim from 20 to 22 mm incled	Decision JNS - relevant (yes/no)	Detailed anlysis in JNS backup presen o	Remark
1		002	1Fwg 665.0.02.001.007	320	854	820	N/A	22.5	20	N/A	0.23	no	no further assessment				no	-	
2		◊ 004	2Fwg 302.0.02.001.007	320	840	810	810	22.5	20	0.20	0.20	yes	applicable	applicable	applicable	applicable	Reference for comparison	-	
3		102	Fw 0600.02.001.05.87	320	840	810	N/A	22.5	19	N/A	0.20	no	no further assessment				no	-	
14		302	1Fwg 665.0.02.003.302	320	880	820	N/A	22.5	22	N/A	0.41	no	no further assessment				no	-	
15		• 303	2Fwg 302.0.02.003.303	320	840	796	800	25	20	0.28	0.30	yes	not applicable	applicable	applicable	applicable	no	yes	
16		• 304	3Fwg 302.0.02.003.304	320	854	810	810	25	20	0.30	0.30	yes	not applicable	applicable	applicable	applicable	yes	yes	taken in account because similar to BA 330
17		• 306	2Fwg 000.0.02.003.013	320	840	775	775	22.5	22	0.44	0.44	no	no further assessment				no	-	
18		• 307	2Fwg 000.0.02.003.014	320	840	775	775	25	22	0.44	0.44	no	no further assessment				no	-	
	x	• 309	21.724.01	320	840	780	775	25	25	0.42	0.41	yes	not applicable	applicable	applicable	not applicable	no	yes	
	x	• 310	21.724.00	320	840	780	775	25	25	0.42	0.41	yes	not applicable	applicable	applicable	not applicable	no	yes	
	x	• 313		320	840	800	800	25	17	0.27	0.27	yes	not applicable	applicable	not applicable	applicable	no	yes	DB Number, manufacturer CAF
19		• 313	455.0.215.000.36	320	840	800	800	25	20	0.27	0.27	partially	not applicable	applicable	not applicable	not applicable	no	yes	VPI Number, manufacturer Bonatrans, Bona 313
20		• 314	2Fwg 000.0.02.003.002	320	840	805	810.5	25	20	0.22	0.24	no	no further assessment				no	-	Crack in the web case - JNS Broken wheels 2019
21		• 315	2Fwg 000.0.02.003.001	320	840	800	N/A	25	22	N/A	0.27	no	no further assessment				no	-	
22		• 318	455.0.215.000.07	320	840	800	800	22.5	22	0.27	0.27	no	no further assessment				no	-	
	x	• 319		320	840	800	800	25	22	0.27	0.27	no	no further assessment				no	-	
23		• 324	2Fwg 000.0.02.003.003	320	840	805	810.5	22.5	20	0.22	0.24	no	no further assessment				no	-	Crack in the web case - JNS Broken wheels 2019
24		• 325	2Fwg 000.0.02.003.004	320	854	820	820	22.5	17	0.23	0.23	no	no further assessment				no	-	
29		428	455.0.217.000.07	320	854	820	N/A	22.5	22	N/A	0.23	no	no further assessment				no	-	
30		• 706	X.03.00706	320	840	800	800	25	17	0.27	0.27	partially	not applicable	not applicable	not applicable	not applicable	no	yes	
32		• ESFA	455.0.215.000.41	320	840	800	800	25	20	0.27	0.27	partially	not applicable	applicable	applicable	applicable	no	yes	same like ZDB 34
34		• RI 027	21.738.00	320	840	780	775	25	25	0.42	0.41	partially	not applicable	applicable	applicable	not applicable	no	yes	
35		VRY	038-0122/00020445-00.41	320	854	820	N/A	22.5	22	N/A	0.23	no	no further assessment				no	-	
36		VRY	-01Z3/00022325-02.11	320	840	810	N/A	22.5	20	N/A	0.20	yes	applicable	applicable	applicable	applicable	yes	see BA 004	The wheel type BA 004 could also be used in some versions of wheelset type VRY
39		• RI 025	21.061.56	320	840	810	N/A	25	20	N/A	0.20	yes	applicable	applicable	applicable	applicable	yes	yes	
41		803	X094400-1-01	320	854	820	N/A	22.5	22	N/A	0.23	no	no further assessment				no	-	ORE Standard wheel
46		3054	10.4005 784 Rep. 1	320	850	N/A	N/A	22.5	N/A	N/A	N/A	overview drawing					depends from wheel: individual assesment	yes	4 wheel designs, no further information
47		• 3054B	10.4018.602	320	850	820	820	22.5	17	0.20	0.20	overview drawing	applicable	not applicable	not applicable	not applicable	no	yes	4 wheel designs based on BA 318, 3067301, Valdunes Drawing 10-4018 602/ 70 751-30 and CAF
	x	• 3054B		320	850	820	820	22.5	17	0.20	0.20	partially	applicable				no	yes	
50		• 3071	70.761	320	830	800	800	25	17	0.20	0.20	overview drawing	applicable				depends from wheel: individual assesment	yes	3 wheel designs, no further information
	x	• 3071 CAF		320	830	800	800	25	17	0.20	0.20	no	no further assessment				no	yes	Wheel from CAF
51		• 3074B	10 4017 647	320	830	800	800	22.5	17	0.20	0.20	overview drawing	applicable				no	yes	3 wheel types based on BA 318, Valdunes Drawing 10-4018 602/ 70 751-30 and CAF
	x	• 3074B		320	830	800	800	22.5	17	0.20	0.20	no	applicable				no	yes	Wheel from CAF
59		B46UR/m	103123	320	854	820	820	22.5	22	0.23	0.23	no	no further assessment				no	-	
61		SURA25	11000001179	320	840	775	775	25	22	0.44	0.44	no	no further assessment				no	-	
62		LF26	11000001210	320	840	785	785	25	19	0.37	0.37	no	no further assessment				no	-	
63		◊ZDB23	455.0.212.000.03	320	840	810	845	25	20	0.08	0.20	no	no further assessment				no	-	not relevant, old JNS Crack in the web case
64		ZB34	455.0.215.000.41	320	840	800	800	25	20	0.27	0.27	partially	not applicable				no	yes	same like ZDB 34
	x	330	21.061.28	320	840	810	N/A	22.5	20	N/A	0.20	yes	applicable	applicable	applicable	applicable	yes	yes	
	x	VALD25+	VDI0277	320	830	782	784	25	16	0.32	0.32	no	no further assessment				no	-	
	x	ULT25	KP-0050-16 /CV	320	840	790	790	25	31,6 (20)	0.34	0.34	partially	not applicable	not applicable	applicable	not applicable	no	yes	
	x	ULT23	KP-0050-16 /CV	320	840	790	790	22.5	31,6 (20)	0.34	0.34	partially	not applicable	not applicable	applicable	not applicable	no	yes	
	x	LiTheS CAF		320	840	783	783	25	16	0.38	0.38	no	no further assessment				no	yes	
	x	RI 028	21.740.00	320	840	796	808	25	21	0.26	0.30	partially	not applicable	applicable	applicable	applicable	no	yes	
	x	Db-004sa	21.061.43	320	840	810	810	22.5	20	0.20	0.20	yes	applicable	applicable	applicable	applicable	yes	yes	
	x	Db-10sa		320	854	open	open	22.5	open	N/A	N/A	overview drawing					depends from wheel: individual assesment	yes	
	x	Db-10sa	RM 411.00.551.2	320	854	800	800	22.5	25	0.36	0.36	partially	not applicable	applicable	applicable	not applicable	no	yes	Wheel from RAFIL/ BVV
	x	Db-10sa		320	852	820	825	22.5	22	0.20	0.22	no	no further assessment				no	yes	Wheel from Bonatrans
	x	Db-10	ZfW 411.00.525.2	320	854	820	820	22.5	22	0.23	0.23	no	no further assessment				no	-	ORE Standard wheel
	x	RI 101		320	840	796	800	22.5	20	0.26	0.30	yes	not applicable	applicable	applicable	applicable	no	yes	same like BA 303
	x	R32	A68.0AZ0.07.102b	320	840	810	810	22.50	20	0.2025	0.2025	yes	applicable	applicable	applicable	applicable	yes	yes	

Part II, chapter 1a : identification of comparable wheel types

Wheel types assessed as comparable to BA 004

July 2024: The following wheel types were identified by the JNS Task Force as comparable to BA 004*):

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

*) 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.

Part II

Chapter 1: Risk control measures

Chapter 1b. : Risk Control Measures 2024
overview of risk control measures

	Risk Control Measures			
	Visual inspections	**Off vehicle maintenance**	**Increased minimum wheel diameter**	**Supervision**
Affected ECMs	Slides 40-41	Slide 44	Slide 45	
All freight RUs	Slides 42			
ECM Certification Bodies				Slide 47
NSAs				Slide 48

Part II, Chapter 1b: Risk Control Measures 2024
Visual inspections by affected ECMs

Measure	When/where to apply
Visual wheel inspection of the visible part of the wheel and, if necessary, sound checks to detect • single cracks on the wheel tread (see **slides 49-51**) • cracks in rim and web (see **slides 52-53**) • any indication of thermal overload of the wheel (see **slide 43**) Additional sound checks in case of limited visibility of the wheel tread and rim (see **slide 54**). In case of detections, • dispatch wagon to workshop • carry out off vehicle wheelset maintenance (see **slide 44**) Removal of white marks on axle box cover if environmental conditions allow (wheels of type BA 004 and comparable are not anymore considered thermostable wheels).	During change of brake blocks in- and outside of workshops.

Part II, Chapter 1b: Risk Control Measures 2024
Visual inspections by affected ECMs

Measure	When/where to apply
Visual wheel inspection complementary to European Visual Inspection Catalogue (EVIC) (see chapter 6.5.13.2 of EN 15313 *), to detect • single cracks on the wheel tread (see **slides 49-51**) • cracks in rim and web (see **slides 52-53**) • any indication of thermal overload of the wheel (see **slide 43**) In case of detections, • carry out off vehicle wheelset maintenance (see **slide 44**) Removal of white marks on axle box cover. (wheels of type BA 004 and comparable are not anymore considered thermostable wheels).	When a wagon needs to undergo an inspection according to the EVIC planning

*) This is considered and further detailed in GCU Appendix 10, Annex 3)

Part II, Chapter 1b: Risk Control Measures 2024
Visual inspections by all freight RUs

Measure	When/where to apply
Visual inspection of the visible part of the wheels to detect: • single cracks on the wheel tread (see **slides 49-51**) • cracks in rim and web (see **slides 52-53**) • any indication of thermal overload of the wheel (see **slide 43**) In case of detections, • dispatch wagon to workshop (in order for ECM to carry out off-vehicle wheelset maintenance (see **slide 44**)) In addition, before the train departure unreleased handbrakes shall be released	Before train departure (pre-departure checks)
Visual wheel inspection of the visible part of the wheels to detect: • single cracks on the wheel tread (see **slides 49-51**) • cracks in rim and web (see **slides 52-53**) • any indication of thermal overload of the wheel (see **slide 43**) In case of detections, • dispatch wagon to workshop (in order for ECM to carry out off-vehicle wheelset maintenance (see **slide 44))**	During change of brake blocks in- and outside of workshops.

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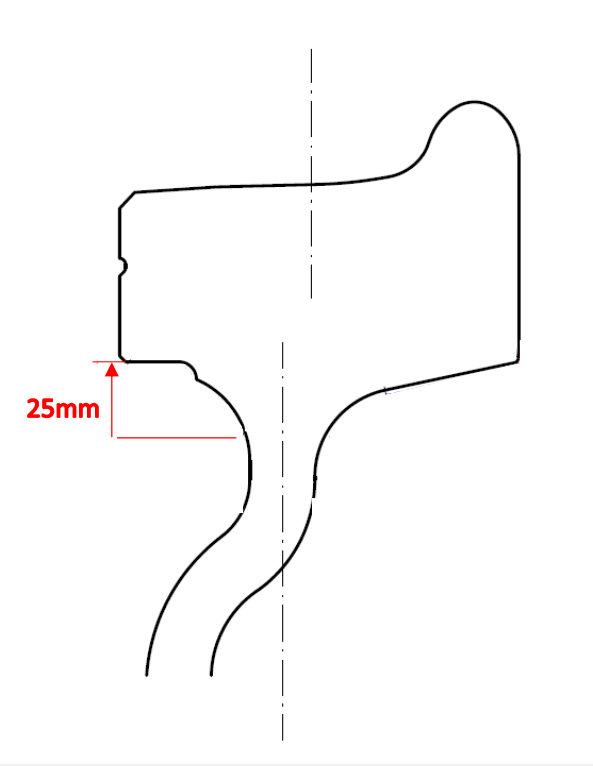
Part II, Chapter 1b: Risk Control Measures 2024
Indications of thermal overload

Affected ECMs and all freight Railway Undertakings shall visually inspect the wheels for the following indications of thermal overload:

- Burnt paint (cracks or shelling on paint) or no paint or corrosion (trace of rust) of more than approximately 25 mm measured along the wheel radius, starting from the edge of the wheel rim towards the wheel web (see blue marking of figure to the right)
- Fusion of brake blocks
- Deterioration of wheel tread with build-up of metal
- Uneven blueish appearance on the rim



Affected ECMs and all freight Railway Undertakings shall consider any available data from detection devices (e.g. hot wheel detectors, ..) that might indicate thermal overload.

Part II, Chapter 1b: Risk Control Measures 2024
Off-vehicle maintenance by affected ECMs

Measure	When/where to apply
Removal of white marks on axle box cover (wheels of type BA 004 and comparable are not anymore considered thermostable wheels).	After detections following a visual inspection (see **slides 40 to 42**) and as part of scheduled maintenance activities
Residual stress measurement : first check after entering the off-vehicle maintenance and after thermal overload Follow-up actions in case of non-conformities: standard procedures	During the first visit to workshop of a wheel after implementation of JNS measures
Intensified measures and stronger criteria after findings in operation and wagon maintenance : • Residual stress measurement with reduced limit of 300 MPa instead of 400 MPa* • Non Destructive Testing (NDT) of the tread* • Measurement back to back distance between the wheels *alternative : systematic reprofiling of large depth in diameter and visual inspection of the tread according to service experience Follow-up actions in case of non-conformities: standard procedures	After detections following a visual inspection (see **slides 40 to 42**) and as part of scheduled maintenance activities

Part II, Chapter 1b: Risk Control Measures 2024
Increased minimum wheel diameter in affected application by affected ECM

Measure	When/where to apply
Increased minimum in service wheel diameter of 864 mm. The JNS TF recommends a minimum wheel diameter after the last reprofiling of 880 mm**.	In case operation has been identified as “affected application”. For a definition of “affected application”, see **slide 46**.

** 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.

Part II, chapter 1b : Risk control measures 2024

Definition of affected application

If one or more of the below mentioned conditions apply to the use of the wheel, the wheel shall be considered to be used within an “affected application” and the JNS risk control measure “Increased minimum in service wheel diameter of 864 mm” (see **slide 45**) applies.

- 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 2024
Surveillance by ECM certification bodies and NSAs

Measure	When/where to apply
Surveillance of the affected Entities in Charge of Maintenance. Special attention shall be drawn to correct assessment of whether the ECM is an affected ECM or not. In case of affected ECM: • Correct implementation of the JNS NP risk control measures 2024, • 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 (Risk Evaluation and Assessment), if required, • Correct application of the CSM REA in case a use of wheels is in “affected application” and a wheel diameter of less than 880mm is chosen after reprofiling • The monitoring of the risk control measures in accordance with (EU) 1078/2012 CSM MON (Monitoring).	During surveillance activities

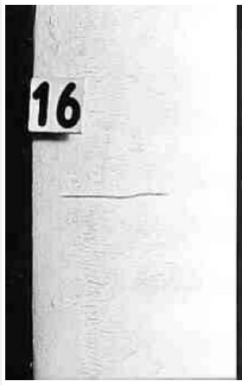
Part II, Chapter 1b: Risk Control Measures 2024
Supervision by national safety authorities

Measure	When/where to apply
Supervision of the Railway Undertakings. Special attention shall be drawn to: • Correct implementation of the JNS NP risk control measures 2024, • Correct implementation of alternative risk control measures that the RU 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 risk control measures in accordance with (EU) 1078/2012 CSM MON (Monitoring).	During supervision activities

Part II, chapter 1b : Risk control measures 2024

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]

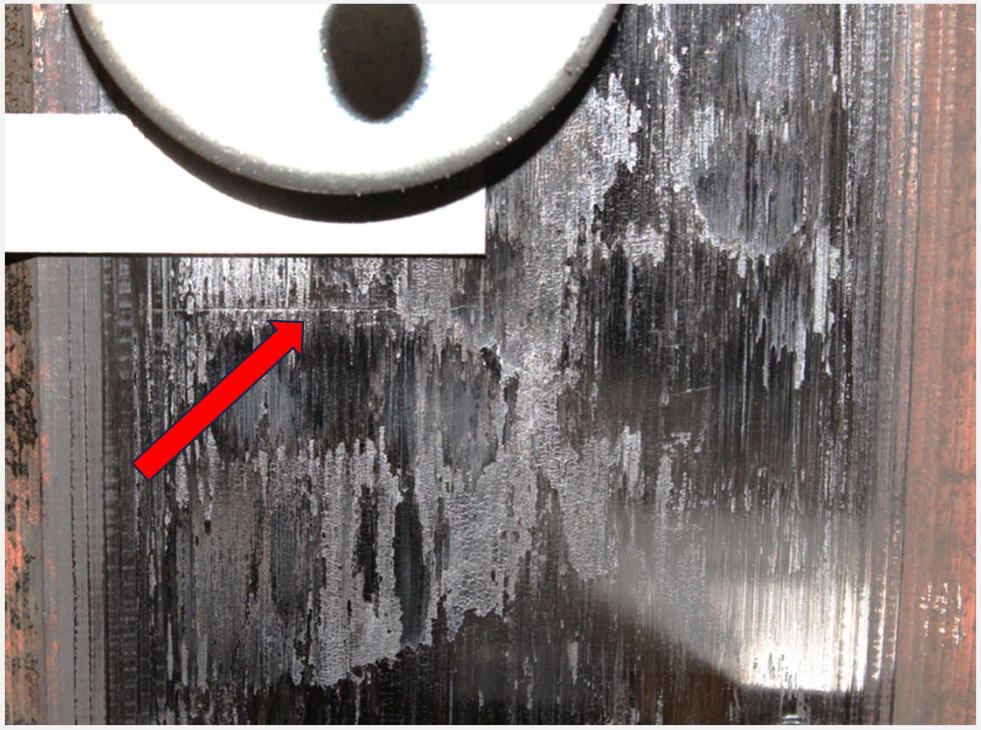
Example for single cracks on the wheel tread by visual inspection

Part II, chapter 1b : Risk control measures 2024

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

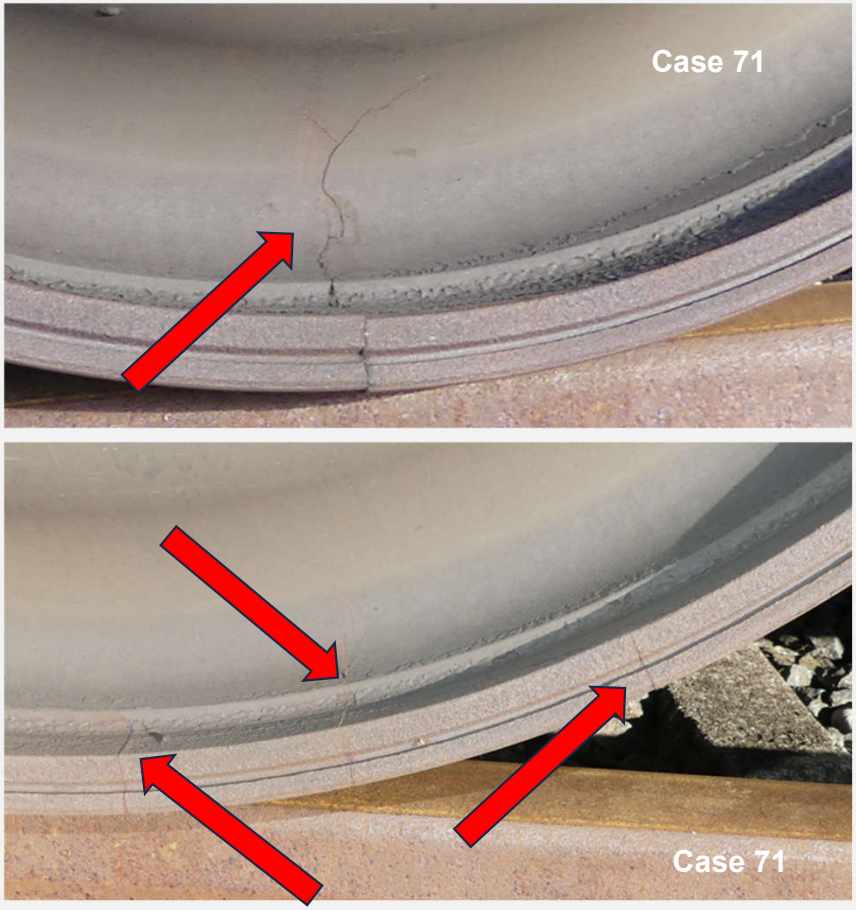
Part II, chapter 1b : Risk control measures 2024

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



Part II, chapter 1b : Risk control measures 2024

Reference “cracked rim/web” (1/2)



Part II, chapter 1b : Risk control measures 2024

Reference “cracked rim/web” (2/2)

Part II, chapter 1b : Risk control measures 2024

Sound test (hammer test) of the wheels

Instructions:

- The sound test shall be done by qualified staff, e.g. wagon inspector;
- The sound test shall be done with a metal hammer;
- The sound test shall be done with fully released brakes;
- The sound test shall be done at the outer side of the rim's circumference 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 2: Changes to legislation, standards and company rules

Part II, chapter 2 : Changes to legislation, standards, company rules

Proposal for GCU amendments – Introduction

- The respective actors shall without delay implement either…
  - ... fully the JNS risk control measures described in Part II, chapter 1, or
  - … alternative risk control measures that guarantee at least the same level of safety as achieved with the JNS risk control measures, justified by a risk assessment*).
- In case any actor decides to use the provisions set out in the General Contract of Use (GCU) to fulfill its legal obligations, it shall verify whether they are…
  - … applicable, and
  - … sufficient.
- The following slides contain proposals to incorporate the JNS risk control measures 2024 in the General Contract of Use (GCU). These proposed changes are addressed to the GCU Joint Committee.

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

Part II, chapter 2 : Changes to legislation, standards, company rules

Proposal for GCU amendments – explanation (1/3)

GCU: Signs of thermal overload

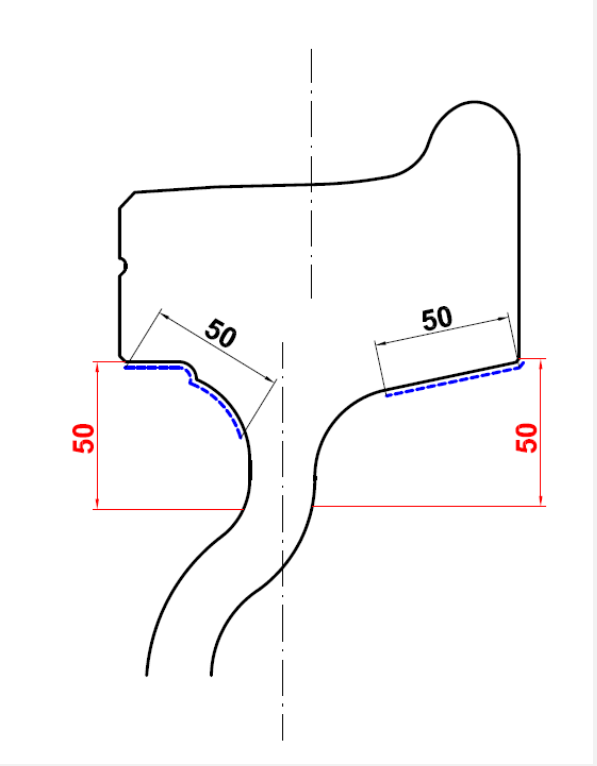
In the GCU, Appendix 9, Annex 1 the size of burned paint is defined with “50 mm or more”. Different interpretations are possible.

- Definition 1: Measurement along the contour of the wheel web, starting from the outer/inner lower edge of the wheel rim into the wheel web (see blue marking, greater than or equal to 50 mm) = close to the contour
- Definition 2: Vertical distance from the outer/inner lower edge of the wheel rim (see dimensioning greater than or equal to 50 mm) = vertical distance

Recommendation: Apply definition 1 or adapted proposal and prepare proposal for GCU amendment

Possible solutions and content of the analysis:

- reduce the red length from 50 to e.g. 25 mm *=> comparison of the radial length for existing wheels*
- Better radial direction as near the contour, because different wheel designs
- Or use only “marked bunt paint” like JNS proposal 2019



Part II, chapter 2 : Changes to legislation, standards, company rules

Proposal for GCU amendments – explanation (2/3)

GCU: Signs of thermal overload

Reason for the need of an amendment:

- Clear definition necessary
- For traces of rust exists no length definition
- In line with the findings in the list of cases (e.g. case 67 - Denmark)
- No reliable relationship between size of the paint burn and the level of residual stress in the rim. However, solid wheels exhibiting marked paint burn also exhibit high residual stresses in the rim [ORE B169 RP 5]
- Temperature in the intersection rim – wheel web depends on the wheel type, diameter and thickness of the rim, brake application => different definitions of the size of burnt paint not practical applicable

Thermally overloaded wheelsets with burnt paint shall receive the appropriate maintenance measures when removed, regardless of the size of the burnt paint.

1.3 *Observations regarding the method*

The stress measurements taken in the rim of solid wheels and the classification of the size of the paint burn have shown, however, that there is no reliable relationship between the size of the paint burn and the level of residual stresses in the rim. However, solid wheels exhibiting marked paint burn, also exhibit high residual tensile stresses[1)] in the rim (see Appendix A, Figs 1, 2, and 3 in this connection). It is possible that thin rims or rims which have been worn down to the limit will exhibit clearly visibly paint burn[1)] on account of their greater flexibility and deflection and because of the more rapid heat transmission and lower heat-absorption capacity in the rim; but all the same the residual tensile stresses are relatively low.

In order to enable a reliable conclusion to be drawn in all cases concerning the stress condition, it is advisable to check the stresses using a non-destructive method.

[ORE B169 RP 5, Standardization of wheelsets, Methods of monitoring solid wheelsets]

Part II, chapter 2 : Changes to legislation, standards, company rules

Proposal for GCU amendments – explanation (3/3)

GCU: Actions after detection of thermal overload by track side detection systems

- Actions after detection of thermal overload by track side detection systems are not integrated in the GCU 2024
- Proposal: Add in GCU a similar requirement like for axle box in 1.8.3.2

Component	Code no.	Irregularities/Criteria/Notes	Action to be taken	Irregularity class
Solid wheel	1.2			
	1.2.1	Groove marking the minimum thickness is no longer fully visible in cross-section[2]	Detach wagon	4
	1.2.2	Thermal overload due to braking • obviously recent paint burns of 50 mm or more at connection between rim and wheel plate (cracks or shelling on paint) • traces of rust on rim (plate not painted) • fusion of brake blocks • deterioration of wheel tread with build-up of metal (see also no. 1.3.4) • Uneven blueish appearance on rim due to the effect of thermal overload	Proceed in accordance with Annex 8, point 4	
	1.2.2.1	– without gauge widening of the inner faces	K + R1 (isolate brake)	4

		• traces of rust		
	1.8.3.2[4]	Confirmation by the RU of box overheating during transport	Detach wagon	5
Hard manganese wear plate on axle box of Y bogie or derivative designs	1.8.4	Displaced or missing	Detach wagon	4

[4] Hot box: Observation by automatic detection – Observation outside the scope of TI by special inspection.

Part II, chapter 2 : Changes to legislation, standards, company rules

Proposal for GCU amendments – changes (1/3)

Proposal for Appendix 9, Annex 1: Technical Conditions for Wagon Transfers between Railway Undertakings

In the GCU the possibilities to detect thermal overloaded wheels with Hot Wheel Detection Systems are not mentioned and the definition of signs of thermal overload needs to be improved.

GCU 2024

1.2.2	Thermal overload due to braking • obviously recent paint burns of 50 mm or more at connection between rim and wheel plate (cracks or shelling on paint) • traces of rust on rim (plate not painted) • fusion of brake blocks • deterioration of wheel tread with build-up of metal (see also no. 1.3.4) • Uneven blueish appearance on rim due to the effect of thermal overload	Proceed in accordance with Annex 8, point 4	
1.2.2.1	– without gauge widening of the inner faces	K + R1 (isolate brake)	4
1.2.2.2	– with gauge widening of the inner faces	Detach wagon	5

Proposal for a revised GCU text:

1.2.2:
Thermal overload due to braking

- burned paint (cracks or shelling on paint) or no paint or corrosion (trace of rust) more than approximately 25 mm, radial from the rim at the edge between rim and wheel web
- fusion of brake blocks
- deterioration of wheel tread with build-up of metal (see also no. 1.3.4)
- Uneven blueish appearance on rim due to the effect of thermal overload
- measuring or diagnostic devices (e.g Hot Wheel Detection System)

Part II, chapter 2 : Changes to legislation, standards, company rules

Proposal for GCU amendments – changes (2/3)

Proposal for Appendix 9, Annex 1: Technical Conditions for Wagon Transfers between Railway Undertakings

Cracked or broken wheel rims are not explicitly listed in the GCU. We therefore propose the inclusion of a separate damage code comparable to Appendix 9, Annex 1, 1.1.6 for tyred wheels.

GCU 2024

Component	Code no.	Irregularities/Criteria/Notes	Action to be taken	Irregularity class
Solid wheel	1.2			
	1.2.1	Groove marking the minimum thickness is no longer fully visible in cross-section[2]	Detach wagon	4
	1.2.2	Thermal overload due to braking • obviously recent paint burns of 50 mm or more at connection between rim and wheel plate (cracks or shelling on paint) • traces of rust on rim (plate not painted) • fusion of brake blocks • deterioration of wheel tread with build-up of metal (see also no. 1.3.4) • Uneven blueish appearance on rim due to the effect of thermal overload	Proceed in accordance with Annex 8, point 4	
	1.2.2.1	– without gauge widening of the inner faces	K + R1 (isolate brake)	4
	1.2.2.2	– with gauge widening of the inner faces	Detach wagon	5

Proposal for a new GCU text:

Add new item after 1.2.2:

Component	Code No.	Irregularities/Criteria/Notes	Action to be taken	Irregularity class
Solid wheel	1.2.3	Damage to the rim or web: • cracked • broken	Detach wagon	5

The JNS slides 52 and 53 contain examples and can be included in the GCU.

Part II, chapter 2 : Changes to legislation, standards, company rules

Proposal for GCU amendments – changes (3/3)

Proposal for Appendix 10, Annex 1: MINIMUM CONDITION AND MEASURES TO RESTORE FITNESS TO RUN OF WAGONS

Cracked or broken wheel rims are not explicitly listed in the GCU. We therefore propose the inclusion of a separate damage code comparable to Appendix 9, Annex 1, 1.1.6 for tyred wheels.

GCU 2024

1.10.2	The tyre must show no signs of sideways movement (a tyre can only move sideways if the tyre clip is missing or has become loose, broken or clearly deformed),
1.10.3	The tyre clip must not be cracked. When the tyre clip is held in place with a wedge, the wedge must not be missing,
1.10.4	Tyres must not be cracked or fissured in the transverse or longitudinal directions.
1.11	The wheel hub must not be cracked.
1.12	The rim of a spoked wheel must not be broken across.
1.13	None of the spokes of a wheel may be broken or cracked.
1.14	A solid or monobloc wheel must not show: – any defects repaired by welding and – any cracks. Minor defects in the wheel body resulting from the casting process are acceptable.

Proposal for amendment GCU

Add in 1.14

A solid or monobloc wheel must not show:

- any defects repaired by welding and
- any cracks (e.g. cracked rim or web).

The JNS slides 52 and 53 contain examples and can be included in the GCU.

Part II, chapter 2 : Changes to legislation, standards, company rules

Responsibilities and related liability of the actors

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 of the accident journey, despite the fact that the defined JNS risk control measures are supposed to be applied by many other actors:

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

Recommendations:

- Representative Bodies or 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

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”** of March 2024 (https://www.era.europa.eu/system/files/2024-03/JNS%20NP%20LL%20brake%20blocks_Final%20report_v2.0.pdf);

- 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

Part II, chapter 4 : Impact Assessment
Light Impact Assessment

For this JNS procedure, a Light Impact Assessment (LIA) was carried out (similar to the 2024 JNS “Consequences of unintended brake applications with LL blocks”)

- Following options were considered:
  - Option 0: apply outcome of the JNS NP “Broken Wheels” of 2019
  - Option 1: apply outcome of the current JNS NP procedure “Accident Gotthard base tunnel - broken wheels“ of 2024
- Main findings:
  - Option 1 is preferred to Option 0.
  - Questionnaire with 10 answers from TF members confirmed to some extent cost figures from 2019 JNS NP although some cost increases could materialize.
  - Follow-up monitoring (similar to the consideration of 2024 in the JNS NP “Consequences of unintended brake applications with LL blocks”) could be relevant to analyse the implementation and JNS risk control measures and their effectiveness.

END OF REPORT