EUROPEAN UNION AGENCY FOR RAILWAYS

Making the railway system work better for society.

TECHNICAL ADVICE

ERA/ADV/2017-2

OF THE EUROPEAN UNION AGENCY FOR RAILWAYS

for

THE EUROPEAN COMMISSION

regarding

Interoperability Constituent – 'running gear' - structural design of bogie frame

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1. General context

In its letter Ares (2017)1572789 from 12th April 2017 addressed to the European Union Agency for Railways (The Agency), the European Commission — Directorate C Land — requested the Agency to prepare a technical advice regarding a question put forward by NB Rail in its document QC-RST-020.

This document requests a clarification concerning the conformity assessment of the structural design of the bogie frame of a running gear, as defined in section 6.1.2.1 (b) of TSI WAG.

2. Legal background

Article 41 of Regulation (EU) 2016/796[1] of the European Parliament and of the Council of 11 May 2016 on the European Union Agency for Railways and repealing Regulation (EC) No 881/2004[2] (Agency Regulation), provides the Commission with the possibility to request an advice from the Agency *"in matters requiring specific knowledge"*, such as the afore-mentioned question of NB Rail.

The NB Rail request concerns the technical specification for interoperability relating to the subsystem 'rolling stock — freight wagons' of the rail system in the European Union (TSI WAG). The *'current TSI WAG'* was adopted by Commission Regulation (EU) No 321/2013[1] of 13 March 2013, and subsequently amended by Commission Regulation (EU) No 1236/2013[2] and Commission Regulation (EU) 2015/924[3]. The Commission Regulation (EU) No 321/2013 has repealed the 'former TSI WAG', adopted by the Commission Decision 2006/861/EC[4] of 28 July 2006.

3. Technical considerations

3.1. The request QC-RST-020

The QC - RST - 020 analyses the requirements for the structural design of the bogie frame of the running gear set out in the former TSI WAG. Main points of this analysis are:

- *"Bogies with existing approval under former UIC/RIV-regulation are considered as IC, provided the range of applicable parameters in the new application (including those of the vehicle body) remains within the range already proved by an existing application."* (Annex Y of former TSI WAG). This annex includes several tables with bogie designs for which the sentence above is applicable. In particular, the Y25 bogie family.

- The existing UIC/RIV regulations above don't require any simulation or test on strength of the bogie frame.

In addition, the QC - RST - 020 notes that the current TSI WAG requires to assess the strength of the bogie frame in accordance with clause 6.2 of EN 13749:2011. This clause defines a general approach to assess the bogie structure based on 4 steps (analysis, laboratory static tests, laboratory fatigue tests and track tests).

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[1] OJ L 104, 12.4.2013, p. 1–56.
[2] OJ L 322, 03.12.2013, p. 23-28
[3] OJ L 150, 17.06.2015, p. 10-16

The QC - RST - 020 further states that the EN Standard *"[...] also permits the use of appropriate other methods without defining these in much detail. This may be largely based on the fact that EN 13749 is predominantly focussed on 'new designs'"*

The QC - RST - 020 states that new bogies holding a certificate against the former TSI WAG and which were not subject of any simulation or test assessing the strength of its bogie frame are no longer acceptable even if these bogies are intended to be operated under the same range of parameters as set out in the former TSI WAG. At the same time, it recognises that there is no clear procedure in the EN 13749 to deal with existing and proven in use bogies.

The QC - RST - 020 proposes the following two possibilities for the conformity assessment:

- At least the analysis, laboratory static tests and laboratory fatigue tests set out in point 6.2.1 of EN 13749 have to be performed for each bogie design (new or established, with "old" TSI certificate or not, with national approval or not, with modifications versus original design or not) by each manufacturer/holder of a certificate.
- The manufacturer/holder of a certificate can give other evidence as set out in EN 13749:2011 point 6.2, i.e. partial laboratory tests, Finite Element Analysis, based on a bogie from UIC reference drawing set with changes made to the design. The evidence required varies based on the impact of changes and if the range of approved use is changed.

3.2. Requirements on strength of the bogie frame in current TSI WAG and former TSI WAG

3.2.1. Former TSI WAG

The requirements in the former TSI WAG are well reflected by the QC – RST - 020 (see point 3.1, 1st bullet point).

3.2.2. Current TSI WAG

The relevant requirements are set out in point 4.2.3.6.1 and 6.1.2.1:

"4.2.3.6.1 Structural design of bogie frame
The integrity of the structure of a bogie frame, all attached equipment and body to bogie connection shall be demonstrated based on methods as set out in point 6.2 of EN 13749:2011.

The integrity of the structure of a bogie frame is permitted to be assessed at interoperability constituent level in accordance with point 6.1.2.1. In this case a specific test or simulation at subsystem level is not required."

6.1.2.1 Running gear

[...]

The assessment of the bogie frame strength shall be based on clause 6.2 of EN 13749:2011."

3.3. Requirements in clause 6.2 of EN 13749:2011

Clause 6.2 of the EN 13749:2011 contains a validation plan of the structural strength of the bogie frame. The content is detailed in clause 6.2.1:

"

6.2.1 Content

[...]
The procedure for the validation of the mechanical strength of a bogie frame against the acceptance criteria shall be established on the basis of:

- *analysis;*
- *laboratory static tests;*
- *laboratory fatigue tests;*
- *track tests"*

[...]
Where the design is a development of an earlier product any previous data, or other evidence of satisfactory performance that is still applicable, can be offered as validation of the revised product.
In the case of an existing design of bogie frame intended for a new application, or a modification to an existing design, a reduced programme can be used, depending on the significance of the differences. If the differences are small, analysis, supported if necessary by measurements made during a limited test programme, will be sufficient to validate the design."

4. Analysis

The last paragraph of point 3 above shows that EN 13749:2011 allows a simplified validation plan for:

- Bogie frames which are a development of existing ones and
- Existing bogie frames intended for new applications

Regarding the first bullet point, the standard specifies that *'any previous data, or other evidence of satisfactory performance that is still applicable, can be offered as validation of the revised product'*.

In the case of bogies certified as ICs under the Annex Y of the former TSI WAG, data from operation and maintenance could be certainly used for the validation against the requirements of the current TSI WAG and the EN 13749:2011 of a bogie frame identical or slightly modified. These data should not substitute the validation process of the EN, but they can be used to set out a simplified validation plan.

In case of bogie designs in which a partial validation of the strength of the bogie frame has been carried out, its results can also be used to set out a simplified validation plan.

As stated in the QC - RST - 020, the simplified validation plan could consist on partial laboratory tests, finite element analysis based on a bogie from UIC reference drawing set with changes made to the design, etc.

5. The advice

The advice of the Agency applies to bogies holding an IC certificate issued according to the former TSI WAG, without assessment of the strength of the bogie frame.

For these bogies, when evaluating compliance with the requirement 'Structural design of bogie frame' set out in point 4.2.3.6.1 of the current TSI WAG, the simplified validation plan described in clause 6.2 of EN 13749:2011 for bogie frames which are a development of existing ones is applicable.

The use of the simplified validation plan can be justified on the basis of any evidence provided by the applicant and resulting from experience on maintenance and operation.

In case of bogie designs for which a partial validation of the strength of the bogie frame has been carried out, its results can also be used to set out a simplified validation plan.

Valenciennes, 21.12.2017

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Executive Director

ANNEXES

1. Request for technical advice – Question and clarification NB-Rail –QC-RST-020: move.ddg2.c.4(2017)1572789
2. QC-RST-020