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# OPINION

*OPI 2020-11*

OF THE EUROPEAN UNION AGENCY FOR RAILWAYS

for

THE EUROPEAN COMMISSION

regarding

LOC&PAS TSI 1302/2014 potential deficiency – Evacuation tests

## Disclaimer:

The present document is a non-legally binding opinion of the European Union Agency for Railways. It does not represent the view of other EU institutions and bodies, and is without prejudice to the decision-making processes foreseen by the applicable EU legislation. Furthermore, a binding interpretation of EU law is the sole competence of the Court of Justice of the European Union.

## 1. General Context

- 1.1. In its letter Ref. Ares(2020)2644310 of 20 May 2020, the European Commission asked the Agency to provide an opinion about possible alternative solutions to demonstrate conformity to clause 4.2.10.5.1(12) of the LOC&PAS TSI<sup>1</sup> during the application of specific health protection measures in many Member States due to COVID-19.
- 1.2. The Agency is asked to analyse possible alternative solutions that could constitute temporary acceptable means of compliance during the restrictions imposed by COVID-19, and also in normal circumstances as permanent acceptable means of compliance.
- 1.3. In parallel, in the context of the revision of the LOC&PAS TSI planned for 2022, the Agency has also received the task to review that clause on the physical evacuation test with the objective to allow for simulations instead.
- 1.4. As per its procedure on the development of opinions, the Agency organised a consultation of NSAs, Representative Bodies and OTIF via the consultation of the Working Party on the revision of TSIs between 23<sup>rd</sup> June and 7<sup>th</sup> July. The comments received during the consultation and the answers from the Agency are listed in Annex 4.

## 2. Legal Background

- 2.1. According to the provisions of Article 10 (2) of Regulation (EU) 2016/796<sup>2</sup>, the Agency shall issue opinions at the request of the Commission on amendments to any act adopted on the basis of Directive (EU) 2016/797<sup>3</sup>, especially where any alleged deficiency is signalled. This is the legal background under which this opinion is prepared.
- 2.2. According to Article 19(1) of Regulation (EU) 2016/796, the Agency shall issue opinions which constitute acceptable means of compliance concerning deficiencies in TSIs and provide those opinions to the Commission.

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<sup>1</sup> Commission Regulation (EU) No 1302/2014 of 18 November 2014 concerning a technical specification for interoperability relating to the 'rolling stock — locomotives and passenger rolling stock' subsystem of the rail system in the European Union - OJ L 356, 12.12.2014, p. 228–393.

<sup>2</sup> Regulation (EU) 2016/796 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, OJ L 138, 26.5.2016, p. 1.

<sup>3</sup> Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union, OJ L 138, 26.5.2016, p. 44.

### 3. Analysis

#### 3.1. Impact of the COVID-19 on the verification of the requirement on evacuation

- 3.1.1. Clause 4.2.10.5.1 (12) of the LOC&PAS TSI is relative to the number of passenger emergency exits. It requires the following: *“the number of the doors and their dimensions shall allow the complete evacuation within three minutes by passengers without their baggage. It is permitted to consider that passengers with reduced mobility are to be assisted by other passengers or staff, and that wheelchair users are evacuated without their wheelchair. **Verification of this requirement shall be made by a physical test under normal operating conditions**”*.
- 3.1.2. The national measures taken by many governments of Member States to fight against the spread of COVID-19 often forbid to gather more than a certain number of persons and always require the application of physical distance rules. This leads to the impossibility to carry out the physical evacuation test as long as such national measures remain in force. Confronted to such situation, applicants for vehicle (type) authorisations have difficulties to reconcile their legal duties and obligations under such national measures and those under the Clause 4.2.10.5.1 (12) of the LOC&PAS TSI.
- 3.1.3. This impossibility is temporary. Under normal sanitary conditions, the physical evacuation test is performed on a regular basis by Rolling Stock Applicants: therefore this requirement can be considered a temporary deficiency in the TSI in the sense of Art. 6 of Directive (EU) 2016/797.
- 3.1.4. The Agency issued on 5 May 2020 the clarification note ERA1209/088 V1.1<sup>4</sup> about the temporary measures during COVID-19 pandemic, which cover the case of *“COVID-19 emergency measures temporarily preventing an applicant to gather all the necessary information from a supplier that is needed to build and submit the file accompanying the application for authorisation, or to answer issues raised by the assessors for an on-going application”*.
- 3.1.5. As stated in the clarification note, *“the Agency, when acting as an authorising entity, will analyse the alternative evidence provided. When this alternative evidence, together with the rest of required documentation, provides reasonable assurance that the applicant and the actors supporting the applicant have fulfilled their obligations and responsibilities despite the deviations imposed by the current exceptional circumstances, the Agency may include a time limit in the authorisation”*.
- 3.1.6. About the requirement on evacuation, an incorrect verification may have catastrophic consequences. In addition, at the date of this Technical Opinion, the duration of the national measures in Member States is still unknown. Therefore, it is necessary to specify the alternative evidence to provide for the verification of the requirement.

#### 3.2. Alternative evidences to demonstrate conformity to the requirement on evacuation

- 3.2.1. Alternative evidences can either be based on analogies with already tested rolling stock or on simulations.
- 3.2.2. Verifying the requirement by an analogy with an already tested rolling stock consists in performing a comparison of the characteristics impacting the evacuation of a rolling stock under evaluation with the same characteristics of a reference rolling stock which successfully passed the physical test. When the characteristics of the rolling stock under evaluation offer equivalent or better conditions for evacuation than the reference rolling stock, it can be assumed that the evacuation time will be at least equivalent. Therefore, the requirement is verified without having to perform the physical evacuation test. The conditions under which a verification by analogy can be performed are specified in annex 2 of this opinion.

- 3.2.3. On simulations, the Agency organised a meeting with representatives of UNIFE and CER in order to gain confidence in their accuracy and representativeness. During the meeting, several presentations of simulations performed with different tools and models, by different people and on different types of rolling stock were made. In all cases, the results proved to be very similar to the results obtained during physical tests. In addition, simulations are performed already for the evacuation of cruise ships, high buildings, stadiums, etc. Compared to those simulations, simulating the evacuation of a rolling stock does not represent a big challenge, it is even simpler.
- 3.2.4. Verifying the requirement by simulation consists in performing a calculation of the evacuation time on the basis of mathematical models implemented in suitable tools. Some pre-conditions are necessary before the calculation or simulation can be considered as an acceptable means of compliance to the requirement.
- 3.2.5. The first pre-condition is the **verification of the tool**. In the context of simulations, verification is the process of determining that a simulation in its tool environment produces expected results according to the underlying model. Verification of the tool is the first step of this activity and doesn't require a model to be made.
- 3.2.6. The second pre-condition is the **verification and validation of the model**. Verification of the model is the second step of determining that a simulation in its tool environment produces expected results and involves verifying the consistency of the different choices of modelling. It includes checking the individual sub models of the system and its environment, the full model of the system in its environment and the simulation method and its numerical convergence. Validation of the model serves to determine if a model is a sufficiently accurate representation of the real system in its environment. This is usually achieved by comparing against a reference case.
- 3.2.7. Once the simulation tool and model have been verified and the model has been validated, a simulation can be considered as an acceptable means of compliance of the requirement on evacuation. The conditions under which a simulation can be accepted as an alternative evidence are specified in annex 3 of this document.
- 3.2.8. The compliance of the rolling stock subsystem with the alternative evidence(s) shall be subject to a NoBo assessment and be part of the technical files accompanying the "EC declaration of verification".

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<sup>4</sup>[https://www.era.europa.eu/sites/default/files/applicants/docs/era1209-088\\_clarification\\_about\\_exceptional\\_measures\\_during\\_covid-19.pdf](https://www.era.europa.eu/sites/default/files/applicants/docs/era1209-088_clarification_about_exceptional_measures_during_covid-19.pdf)

#### 4. The opinion

- 4.1. The Agency is of the opinion that the physical test required to demonstrate conformity to clause 4.2.10.5.1 (12) of the LOC&PAS TSI can be considered as a temporary deficiency in the TSI as long as sanitary measures prevent the gathering of groups of persons and require physical distance. Under normal sanitary circumstances, this requirement is not a deficiency.
- 4.2. The Agency considers that, given the unknown duration of the sanitary measures required by the COVID-19 pandemic and the possibly catastrophic consequences of an incorrect verification of the requirement on evacuation, the necessary alternative evidences to the physical test need to be specified: those evidences can either be analogies with a reference subsystem, numerical simulations or a combination of both.
- 4.3. The Agency is of the opinion that analogies with a reference subsystem performed as specified in Annex 2 or numerical simulations performed as specified in Annex 3 constitute acceptable means of compliance to demonstrate conformity to clause 4.2.10.5.1 (12) of the LOC&PAS TSI 1302/2104.
- 4.4. The Agency is of the opinion that point 4.3 should apply in the context of COVID-19, and should remain applicable when the sanitary situation reverts back to normal, i.e. after the end of the application of COVID-19 sanitary measures.
- 4.5. The Commission Delegated Decision (EU) 2017/1474<sup>5</sup>, setting out the specific objectives according to which existing TSIs shall be amended, requires in its Art. 3 (5) that TSIs shall include provisions which take into account research and innovation activities and integrate them when they reach the appropriate level of maturity. Referring to that article, the Commission list of actions of the Digital rail and Green freight TSI revision package for 2022 specifically requires the Agency to review requirement 4.2.10.5.1 of the LOC&PAS TSI to allow for simulations for evacuation tests.
- 4.6. The Agency is of the opinion that the LOC&PAS TSI should be revised according to this Technical Opinion, in particular to include the text of annex 3 on simulations.

Valenciennes, 09/07/2020



Josef DOPPELBAUER  
Executive Director

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*5 Commission Delegated Decision (EU) 2017/1474 of 8 June 2017 supplementing Directive (EU) 2016/797 of the European Parliament and of the Council with regard to specific objectives for the drafting, adoption and review of technical specifications for interoperability (notified under document C(2017) 3800) OJ L 210, 15.8.2017, p. 5–15.*

**ANNEX 1 : request from the Commission**

EUROPEAN COMMISSION  
DIRECTORATE-GENERAL FOR MOBILITY AND TRANSPORT  
Directorate C - Land  
The Director

Ref. Ares(2020)2644310 - 20/05/2020

Brussels,  
MOVE.C4/BC/tg(2019) 5647260

**NOTE TO MR J. DOPPELBAUER  
EXECUTIVE DIRECTOR – EUROPEAN UNION AGENCY FOR RAILWAYS**

**Subject: Request for technical opinion –LOC&PAS TSI 1302/2014 potential deficiency – Evacuation tests (Clause 4.2.10.5.1, paragraph 12 of the Annex to the TSI)**

Please find enclosed a request form for technical opinion regarding a potential deficiency in the LOC&PAS TSI (Commission Regulation (EU) No 1302/2014, as amended).

Clause 4.2.10.5.1(12) of the annex to LOC&PAS TSI 1302/2014 requires to perform a physical evacuation test under normal operating conditions, i.e. with a high number of participants (corresponding to the nominal capacity of the train) and without respecting the social distance. This is currently not possible in many Member States due to COVID-19 circumstances and a case can be made for virtual testing more generally..

I would thus ask you to analyse possible alternative solutions that could constitute an acceptable means of compliance:

1. In the context of COVID-19, and
2. As permanent means of compliance, also in normal circumstances.

I would be grateful if you could provide the Agency's technical opinion as soon as possible and latest within two months from receipt of the present letter. We will aim at its inclusion in the 2022 TSI revision package beyond the COVID-19 context.

Yours sincerely,

/e-signed/

Elisabeth Werner

Encl: Request form for technical opinion.  
cc: K. Fitch, B. Collignon

Commission européenne/ Europese Commissie, 1049 Bruxelles/ Brussel, BELGIQUE/ BELGIE. - Tel. (+32-2) 299.11.11.  
Office: DM28 04/102. - Tel. direct line (+32-2) 295.95.06 - E-Mail: [elisabeth.werner@ec.europa.eu](mailto:elisabeth.werner@ec.europa.eu)

Electronically signed on 20/05/2020 11:28 (UTC+02) in accordance with article 4.2 (Validity of electronic documents) of Commission Decision 2004/563

## **ANNEX 2: specification for the application of analogies with a reference subsystem having passed successfully the physical test**

On the basis of a rolling stock subsystem having passed successfully the physical test (reference subsystem), it is possible to deduct by analogy that another rolling stock subsystem (subsystem under evaluation) is also compliant to the requirement on evacuation.

As a prerequisite, the reference subsystem and the subsystem under evaluation shall both have some characteristics in common. It is assumed that no analogy can be made between rolling stock subsystems that do not share at least these characteristics:

- Intended type of operation (commuter, regional, intercity, high speed, rolling stock with passenger compartments, etc.). The type of operation also defines the passenger capacity to take into account
- Number of bogies per vehicle (i.e. vehicle self-supported on its bogies or Jacobs bogies)
- Number of decks (single, double or a combination of both)

The other parameters influencing the evacuation time for which the analogy can be made are:

- Number of passengers under normal operating conditions
- Type, number and size of the passenger access doors, and the relative number of passengers per available length of door
- Number of steps from the vestibule to the platform
- Interior configuration (e.g. width of the vestibules and corridors, number of seats and seats per row, presence of toilets, luggage racks, bicycle racks or other specific areas requiring a change of direction, presence of internal steps or slopes, presence of internal doors and their type, gangways and gangway doors, presence of compartments, etc.)

That list isn't exhaustive and other specific parameters can exist for some rolling stock configurations.

The subsystem under evaluation can be considered compliant to the requirement when, based on a comparison of these parameters influencing the evacuation time, the applicant can demonstrate that the conditions for evacuation will be equivalent or better than those of the reference subsystem.

For example : compared to the reference subsystem, the subsystem under evaluation has the following characteristics:

- higher total length of exterior doors per side per passenger and/or
- less steps from the vestibule to the platform and/or
- the evacuation path for passengers is more favorable (less internal doors, less internal steps, larger corridor or vestibule, less changes of direction)

In case some characteristics are more favourable and some characteristics are less favourable, the demonstration of conformity by analogy shall be agreed with the Notified Body.

## ANNEX 3: specification for the application of simulations

In order to consider simulations as acceptable alternative evidence, the following shall be performed:

1. Verification of the simulation tool:
  - a tool verified for other applications than railway (e.g. ship or building evacuation) is acceptable without further verification
  - a tool developed in-house or not yet verified needs to be verified (for instance by the application of the procedure developed by the International Maritime Organisation<sup>6</sup> or of the annex 1 of the Richtlinie für Mikroskopische Entfluchtungsanalysen – RiMEA Guidelines<sup>7</sup>)
  
2. Verification and validation of the simulation model:
  - when using a tool verified for other applications than railway, comparable models need to be verified by comparison of the evacuation time with real physical tests of rolling stock (a difference of +/- 5% is acceptable)
  - when using a tool developed in-house or not yet verified, the model verification should include several different rolling stock architectures (for instance single deck and double deck)

The following elements should be included in the documentation:

- A simulation report including in particular
  - A summary of the verification and validation of the simulation (tool and models)
  - The hypothesis and parameters used for the simulation (passengers data, walking speed, etc....)
  - The results of an appropriate number of simulation runs allowing a statistically sound statement

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<sup>6</sup> An example of a verification and validation procedure for evacuation simulation exists already in the maritime sector. The Guidelines For Evacuation Analysis For New And Existing Passenger Ships define in their annex 3 the necessary steps for verification and validation in the context of evacuation simulation: they consist in a series of tests including component testing, functional verification, qualitative verification and quantitative verification. <https://nsof.no/media/1129/imo-msc-guidelines-for-evacuation-etc.pdf>

<sup>7</sup> The RiMEA guideline is very well known, especially in the German speaking areas of Europe, and also available in English and French. A verification procedure – similar to the one from IMO – is mentioned in Annex 1. Link to the current version 3.0.0: [https://rimeaweb.files.wordpress.com/2016/06/rimea\\_richtlinie\\_3-0-0\\_-\\_d-e.pdf](https://rimeaweb.files.wordpress.com/2016/06/rimea_richtlinie_3-0-0_-_d-e.pdf)



**ANNEX 4: outputs of the consultations**

This technical opinion took into consideration some of the remarks provided on the first draft. All comments received are listed in the table below.

<i>N°</i>	<i>Reference</i>	<i>Reviewer</i>	<i>Reviewer's Comments, Questions, Proposals</i>	<i>Reply</i>	<i>Proposal for the correction or justification for the rejection</i>
1.	3.2.4	NSA CH	Are different framework conditions taken into account for the simulations?  -> Depending on whether a train is in a station, on an open route or in the railway tunnel, there are different heights and space conditions, which can influence the duration of an evacuation.	Noted without change	The technical opinion refers only to the physical test required in the TSI, which “shall be carried out in front of an obstacle-free platform for which the vehicle is designed” (text from the application guide of the TSI).
2.	4.2	NSA CH	“reference subsystem or numerical simulations”: could be also a combination of the two	Accepted	“those evidences can either be analogies with a reference subsystem, numerical simulations or a combination of both”
3.	3.2.2 and Annex 2	NB-Rail	Why can the new vehicle not be “equivalent or better”? It would be reasonable to say “equivalent or better” and not only “better”.	Accepted	“better” replaced by “equivalent or better”
4	4.4	NB-Rail	An application of point 4.3 in the context of COVID-19 is comprehensible and absolutely reasonable. The further application of point 4.3 after reverting the sanitary situation back to normal should, however, be reassessed on the basis of the experience gained from the application of point 4.3 in the context of COVID-19 and a separate decision should be taken on it.	Rejected	The T.O proposes to consider the alternative evidences (analogies and simulations) as acceptable means of compliance during and after the COVID-19 situation.  However, the inclusion of these acceptable means of compliance into the regulation (TSI and/or guide) will be reassessed by the Working Party and the experience gained by then will be a relevant source of information.

<i>N°</i>	<i>Reference</i>	<i>Reviewer</i>	<i>Reviewer's Comments, Questions, Proposals</i>	<i>Reply</i>	<i>Proposal for the correction or justification for the rejection</i>
5	Annex 2 Annex 3	NSA FR	<p>We suggest here not to detail all aspects for which an analogy can be considered or not.</p> <p>The formulation of the simulation guide being written by CEN/TC 256 may be an alternative:</p> <p>“For some design evolutions, where physical tests on the real system have already been conducted in a previous similar case, conformity can be fully proven by simulation if changes to the system subject to testing remain within certain limits. For changes exceeding these limits, a partial proof by simulation can be feasible.”</p> <p>Then it is the responsibility of the applicant to check how sensitive are the differences between reference vehicle and the vehicle to be tested regarding evacuation aspects.</p> <p>The details regarding type of vehicle, inner configuration etc. may be part of a guide but not of regulation.</p>	Noted without change	<p>Agreed in principle: the content of annexes 2 and 3 of the technical opinion shouldn't be entirely transferred to the TSI.</p> <p>This will be discussed by the Working Party on the revision of TSIs in order to define the best possible formulation and destination of the text (i.e. TSI and/or application guide)</p>

6	General	NSA AT	<p>We would like to emphasize that the task of passenger evacuation is a very important safety issue and as also mentioned in the technical opinion, an incorrect verification may have catastrophic consequences! It is not only that a crowd of people flows correct through the tubeshaped passenger area of a train and its associated openings. Important is also to discover the imponderabilities of human behaviour in the tested emergency situation. These imponderabilities are routinely noticed and are a valuable source of information for the staff and related experts.</p> <p>The Technical Opinion 2020-11 can be subdivided into 2 topics, possible alternative solutions in the context of COVID-19 and possible alternative solutions as permanent means of compliance in normal circumstances. As for the first point, already clarifications exists (ERA1209/088 V1.1) we see the focus of the Technical Opinion on the permanent alternative solutions. We support to develop the TSI Loc&amp;Pas in the sense that TSIs shall include provisions which take into account research and innovation activities and integrate them when they reach the appropriate level of maturity in this topic to allow simulations or a reference by analogies to an existing subsystem with an already successfully evacuation test, but therefore we see no potential deficiency in the TSI. Loc&amp;Pas 1302/2014.</p> <p>In Annex 3 “specification for the application of simulations” of the Technical opinion is specified, that a tool verified for other applications than railway (e.g. ship or building evacuation) is acceptable without further verification. This also could be read as any other application than railway has to be accepted. Without any further clarification we have a critical view on this.</p> <p>In the Technical Opinion no reference is made to the aviation sector. Especially this sector could also serve as ideal for the railway sector and "modern railways". What concerns passenger evacuation there are a lot of parallelism between airplanes and railway vehicles like a small aisle, many seat rows, unforeseeable lighting conditions, and so on. This could also be taken into account.</p>	Noted without change	<p>We take note of your comments.</p> <p>Regarding the imponderabilities of human behaviour in the tested emergency situation, it is probably as difficult to assess them with a physical test than with a simulation (if not even more difficult). In addition, this is not the objective of the physical evacuation test.</p> <p>Noted, but given that the TSI expresses a requirement for a test that is (temporarily) not possible perform, the Agency considers that this is (temporarily) a deficiency.</p> <p>A tool from another application than railway can be accepted only under the condition that it has been verified first. The applicant shall demonstrate to the NoBo that the verification was made.</p>
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N°	Reference	Reviewer	Reviewer's Comments, Questions, Proposals	Reply	Proposal for the correction or justification for the rejection
			<p>Regarding to the TSI Loc&amp;Pas 2014 the requirement in 4.2.10.5.1 (12) is specified with the following assumptions:</p> <p>“number of passengers corresponds at least to the load case ‘design mass under normal payload’; passengers with reduced mobility are to be assisted by other passengers or staff and that wheelchair users are evacuated without their wheelchair”</p> <p>A benefit would be, to develop also a model for railways resp. to specify the requirement in 4.2.10.5.1 (12) of the TSI more precisely, like to take into account the population’s composition of the passengers.</p> <p><b>In general we support the technical opinion that the TSIs shall include provisions which take into account research and innovation activities and integrate them by developing alternative solutions, but we also think that it is very import to keep the practical evacuation tests to verify these alternative solutions.</b></p>		<p>Evacuation of buildings and ships are given as examples. In case verified tools also exist for simulating the evacuation of airplanes, they can also be used.</p> <p>It is probably not in a TSI that such model should be specified. But it is certain that introducing simulations for this requirement will open a number of possibilities for the assessment of parameters influencing the time to evacuate</p> <p>We take note of the concluding remark: simulations shall always be supported by at least one evacuation test for the verification of the model (see annex 3, point 2).</p>
7	3.2.3	UNIFE	During the meeting, several presentations of simulations performed with different tools <a href="#">and models</a>	Accepted	

N°	Reference	Reviewer	Reviewer's Comments, Questions, Proposals	Reply	Proposal for the correction or justification for the rejection
8	3.2.4	UNIFE	Verifying the requirement by simulation consists in performing a calculation of the evacuation time on the basis of mathematical <del>tools</del> <u>and models implemented in suitable tools</u>	Accepted	
9	3.2.5	UNIFE	Replace the reference to PLASA-2 with the definition from the draft CEN/CENELEC Technical Report: In the context of simulations, verification is the process of determining that a simulation in its tool environment produces expected results according to the underlying model. Verification of the tool is the first step of this activity and doesn't require a model to be made.	Accepted	
10	3.2.6	UNIFE	The reference to the Guidelines For Evacuation Analysis For New And Existing Passenger Ships shouldn't be placed there as the that the terminology used in the reference is slightly different from that in the Opinion	Accepted	The reference is moved to a footnote in Annex 3 as an example
11	3.2.7	UNIFE	Replace the reference to PLASA-2 with the definition from the draft CEN/CENELEC Technical Report: Verification of the model is the second step of determining that a simulation in its tool environment produces expected results and involves verifying the consistency of the different choices of modelling. It includes checking the individual sub models of the system and its environment, the full model of the system in its environment and the simulation method and its numerical convergence. Validation of the model serves to determine if a model is a sufficiently accurate representation of the real system in its environment. This is usually achieved by comparing against a reference case.	Accepted	

N°	Reference	Reviewer	Reviewer's Comments, Questions, Proposals	Reply	Proposal for the correction or justification for the rejection
12	Annex 3	UNIFE	<p>2 Verification <u>and Validation</u> of the simulation model:</p> <ul style="list-style-type: none"> <li>when using a tool verified for other applications than railway, <u>only one comparable models</u> needs to be verified by comparison of -the evacuation time with- a real physical tests <u>of rolling stock</u> (a difference of +/- 5% is acceptable)</li> </ul>	Accepted	
13	Annex 3	UNIFE	<p><del>A summary of the verification and validation of the simulation (tool and models) The validation of the specific model made for the simulation, which can be based on the model used for the verification</del></p>	Accepted	
14	3.2.6	NSA DE	<p>There is also another possibility which should be mentioned in the text. The RiMEA guideline is very well known , especially in the German speaking areas of Europe, and also available in English and French.</p> <p>A verification procedure – similar to the one from IMO – is mentioned in Annex 1.</p> <p>Link to the current version 3.0.0: <a href="https://rimeaweb.files.wordpress.com/2016/06/rimea_richtlinie_3-0-0 - d-e.pdf">https://rimeaweb.files.wordpress.com/2016/06/rimea_ richtlinie 3-0-0 - d-e.pdf</a></p>	Accepted	The link to the guideline is added as another example. The reference to the IMO being removed from the core text and made only in the annex 3, the reference to the RiMEA guidelines is also in annex 3.
15	Annex 2	NSA DE	The “Number of bogies per vehicle (i.e. vehicle self-supported on its bogies or Jacobs bogies)” is not relevant for for comparing passenger evacuation. Therefore, it shall be deleted.	Rejected	This parameter impacts several other parameters relevant for the evacuation, such as: type and width of the gangway, aisle width, vertical difference between the floor level at the gangway and at the threshold of the access door, length of the vehicle, etc...

<i>N°</i>	<i>Reference</i>	<i>Reviewer</i>	<i>Reviewer's Comments, Questions, Proposals</i>	<i>Reply</i>	<i>Proposal for the correction or justification for the rejection</i>
16	Annex 3	NSA DE	<p>The following should be added in point 1:</p> <p>“When using simulations as alternative to real evacuation tests, all basic parameters (e.g. distribution of passengers, walking speeds etc.) must be provided to the NoBo, as well as geometries/models used. In addition to that, validated tools are mandatory to be used and evidence for such validation needs to be provided to the NoBo, as well.”</p> <p>Quality and reliability of the simulation depends to large extend on input parameters and the mapped geometry. Thus, requirement for simulation tool is as follows:</p> <ul style="list-style-type: none"> <li>• all fundamental parameters must be known,</li> <li>• it is possible to submit all fundamental parameters,</li> <li>• all fundamental parameters were calculated on basis of accepted/validated tool,</li> <li>• geometry matches the project.</li> </ul>	Noted without change	<p>This statement is present already in annex 3 with less details. The text says that the following should be provided:</p> <p>“A simulation report including in particular</p> <ul style="list-style-type: none"> <li>• A summary of the verification and validation of the simulation (tool and models)</li> <li>• The hypothesis and parameters used for the simulation (passengers data, walking speed, etc....)</li> <li>• The results of the simulation”</li> </ul> <p>It is also stated in point 3.2.8 that: “The compliance of the rolling stock subsystem with the alternative evidence(s) shall be subject to a NoBo assessment and be part of the technical files accompanying the “EC declaration of verification”.</p>

<i>N°</i>	<i>Reference</i>	<i>Reviewer</i>	<i>Reviewer's Comments, Questions, Proposals</i>	<i>Reply</i>	<i>Proposal for the correction or justification for the rejection</i>
17	Annex 3	NSA DE	<p>New point to be added:</p> <p>“3. Conducting of the simulation:</p> <p>In order to mitigate numerical uncertainties to a reasonable level, an appropriate number of simulation runs (at least 10) should be carried out. This provides 10 total evacuation times for each scenario. Depending on the statistical distribution of the (total) evacuation times, a larger number of simulation runs may be necessary in order to allow a statistically sound statement.”</p> <p>When using simulation software numerical uncertainties / marginal errors are common. Depending on the used mathematical model uncertainties of low two-digit percentages may occur. Therefore, a minimum amount of simulation runs shall be required in order to get statistically sound results.</p> <p>Mentioned paragraph is copied from RiMEA guideline, chapter 4.3 No. 4</p> <p><a href="https://rimeaweb.files.wordpress.com/2016/06/rimea_richtlinie_3-0-0 - d-e.pdf">https://rimeaweb.files.wordpress.com/2016/06/rimea_richtlinie_3-0-0 - d-e.pdf</a></p>	Partly Accepted	<p>This paragraph may be too detailed. It is proposed to add in the required simulation report ‘The results of an appropriate number of simulation runs allowing a statistically sound statement’.</p> <p>In case further details are necessary, they could be provided in the TSI application guide during the next revision.</p>