Regulation UNECE 55 is changed:

Change Annex 6 paragraph 1.1. to read:

1.1. Samples of coupling devices shall be tested for both strength and function. Physical testing shall be carried out wherever possible**.** But unless stated otherwise the type approval authority or technical service may **in cases where a calculation procedure validated according to Appendix 1 of this Annex exists base the approval on calculated results. e** ~~waive a physical strength test if the simple design of a component makes a theoretical check possible~~ . Theoretical checks may be carried out to determine worst case conditions. In all cases, theoretical checks shall ensure the same quality of results as with dynamic or static testing. In cases of doubt it is the results of physical testing that are overriding.

Change Annex 6 paragraph 3.6.1. to read:

3.6.1. Drawbars shall be tested in the same way as drawbar eyes (see paragraph 3.4.). The type approval authority or technical service may **in cases where a calculation procedure validated according to Appendix 1 of this Annex exists base the approval on calculated results.**  ~~waive an endurance test if the simple design of a component makes a theoretical check of its strength possible. The design forces for the theoretical verification of the drawbar of centre axle trailers with a mass, C, of up to and including 3.5 tonnes shall be taken from ISO 7641/1:1983.~~ The design forces for the theoretical verification of drawbars for centre axle trailers having a mass, C, over 3.5 tonnes shall be calculated as follows:

Fsp = (g × S/1000) + **0.6x**V

where the force amplitude V is that given in paragraph 2.11.4. of this Regulation.

~~The permissible stresses based on the design masses for trailers having a total mass, C, over 3.5 tonnes shall be in accordance with paragraph 5.3. of ISO 7641/1:1983. For bent drawbars (e. g. swan neck) and for the drawbars of full trailers, the horizontal force component Fhp = 1.0 × D shall be taken into consideration.~~

Insert new Appendix 1 to Annex 6 to read:

**Appendix 1**

**Calculation procedure validation**

**General conditions required from virtual testing methods 1.**

1. ***Virtual test pattern***

**The following scheme shall be used as basis structure for describing and conducting virtual testing:**

1. **purpose;**
2. **structure model;**
3. **boundary conditions;**
4. **load assumptions;**
5. **calculation;**
6. **assessment;**
7. **documentation.**
8. **2. Fundamentals of computer simulation and calculation** 
   1. ***Mathematical model***

**The mathematical model shall be supplied by the manufacturer. It shall reflect the complexity of the structure of the system and components to be tested in relation to the requirements of this regulatory act and its boundary conditions. There shall be one validation report for each geometry topology.**

**The same provisions shall apply mutatis mutandis for testing components or technical units independently from the vehicle.**

* 1. ***Validation process of the mathematical model***

**The mathematical model shall be validated in comparison with the actual test conditions.**

**To that effect a physical test shall be conducted for the purposes of comparing the results obtained when using the mathematical model with the results of a physical test. Comparability of the test results shall be proven. A validation report shall be drafted by the manufacturer or by the**

**technical service and submitted to the approval authority.**

**Any change made to the mathematical model or to the software likely to invalidate the validation report shall be brought to the attention of the approval authority which may require that a new validation process is conducted.**

**The flow chart of the validation process is shown in Figure z.**

* + 1. **Validation with respect to fatigue**

**The calculations results shall be assessed using any the fatigue evaluation code of a internationally recognized welding code for steel structure. The prediction shall**

* **show the correct failure location in comparison to the physical validation test**
* **show a life expectancy of at least [2.5] Mc.**

**[Two] physical validation tests shall**

* **a life longer than the predicted life expectancy**
  + 1. **Validation with respect to static test including any instability effects, e.g. buckling.**

**The calculation model shall account for the geometry deviating from the nominal through manufacturing imperfections and installation deformations due to tolerance spread. In general this means that the calculation model needs to account at least for non-linear large deformations.**

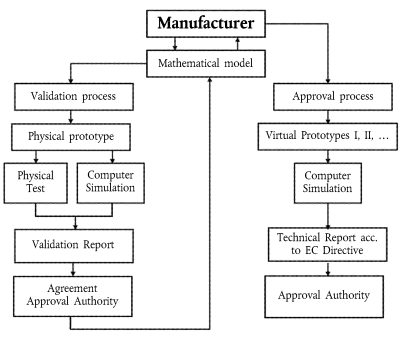
**[Two] physical validation test shall show the same deformations within [15%] as the calculation model.**

* 1. ***Documentation***

**The data and auxiliary tools used for the simulation and calculation shall be made available by the manufacturer and be documented in a suitable way.**

1. **Tools and support**

**At the request of the technical service, the manufacturer shall supply or provide access to the necessary tools including appropriate software. In addition he shall provide appropriate support to the technical service. Providing access and support to a technical service does not remove any obligation of the technical service regarding the skills of its personnel, the payment of license rights and respect of confidentiality.**



**Figure z**

Justification

Changes Annex 6 paragraph 1.1. and Annex 6 paragraph 3.6.1..

A simple design does very seldom exist. Criteria defining a “simple” design have proven to be hard to establish. Hence the treatment of a safety related component such as coupling equipment includes a component of hazard. The reason for the concept of a simple design is to allow for such designs to be assessed through the use of calculations models. Knowing this it is more safe and with less hazard to apply a validated calculation model.

Insert new Appendix 1 to Annex 6

The calculation model validation is proposed to follow the same scheme as proposed in the European frame directive 2007/46/EC Annex XVI. That procedure has been elaborated a bit to account for the fatigue and instability nature of the applications covered by UNECE regulation 55.