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Item 4 of the provisional agenda

#### Regulation No. 55 (Mechanical couplings)

### **Proposal for amendments to Regulation No. 55 (Mechanical couplings)**

#### **Submitted by the Chair of the informal group on Regulation No. 55\***

The text reproduced below was prepared by the experts of the informal group on UN Regulation No. 55 and introduces amendments on:

- (a) Requirements on remote indication;
- (b) Availability of information on coupling fixing points for A50X couplings;
- (c) On lateral strength of drawbars;
- (d) Includes a new class definition for fully automatic drawbar couplings.

The modifications to the existing text of the Regulation are marked in bold for new or strikethrough for deleted characters.

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\* In accordance with the programme of work of the Inland Transport Committee for 2012–2016 (ECE/TRANS/224, para. 94 and ECE/TRANS/2012/12, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

## I. Proposal 1

### Place of mounting of remote indication shall be defined in a more clear way

*Paragraph 2.9.*, amend to read:

"2.9. Remote indicators are devices and components which give an indication ~~in the vehicle cab~~ that coupling has been affected and that the locking devices have **been positively** engaged."

*Annex 5,*

*Paragraph 12.2.1.*, amend to read:

"12.2.1. For an automatic coupling procedure, remote indication devices shall indicate the closed and doubly locked position of the coupling in an optical manner according to paragraph 12.2.2. Additionally the open position may be indicated. **In this case, the indication shall be performed** as in paragraph 12.2.3.

The remote indication device shall be automatically activated and reset during every opening and closing of the coupling."

*Paragraph 12.2.9.*, amend to read:

"12.2.9. ~~The operating controls and indicators of the remote indication devices shall be mounted within the driver's field of vision and be permanently and clearly identified.~~ **When installed in the vehicle cab, the operating controls and indicators of the remote indication devices shall be mounted within the driver's field of vision. When installed on the side of the vehicle, they shall be visible when operating the remote control, and be permanently and clearly identified.**"

*Paragraph 12.3.1.*, amend to read:

"12.3.1. If a remote control device, as defined in paragraph 2.8. of this Regulation, is employed, there shall also be a remote indication device as described in paragraph 12.2. ~~which shall at least indicate the open condition of the coupling.~~"

## II. Justification 1

1.1. The intention of amending paragraph 2.9. is to redefine "remote indicators" to allow some systems currently on the market, where the remote indication is not in the vehicle cab but on the side of the vehicle (on the chassis), close to the remote control.

1.2. Paragraph 12.2.9. becomes consistent with the amended definition of "remote indicators".

1.3. Paragraph 12.2.1. is slightly modified for clarification.

1.4. Paragraph 12.3.1. is clarified by removing an existing contradiction with paragraph 12.2.1. Moreover, a simple reference to paragraph 12.2. in paragraph 12.3.1. is sufficient to avoid duplication of requirements about remote indicators in several places of the Regulation.

### III. Proposal 2

#### Specification fixing points A50X tow bar or similar couplings

*Paragraph 3.2.8.*, amend to read:

"3.2.8. in the case of a mechanical coupling device or component designed for a specific vehicle type, the manufacturer of the device or component shall also submit the installation data, **according to Annex 2, Appendix 1**, given by the vehicle manufacturer. The approval authority or technical service may also request that a vehicle representative of the type be submitted."

*Paragraph 5.1.*, amend to read:

"5.1. Where a vehicle manufacturer applies for approval of a vehicle fitted with a mechanical coupling device or component or authorises the use of a vehicle for towing any form of trailer, then, at the request of a bona fide applicant for possible type approval for a mechanical coupling device or component, or of the type approval authority or technical service of a Contracting Party, the vehicle manufacturer shall readily make available to that inquirer or authority or technical service, such information as required in ~~paragraph 5.3. below~~ **Annex 2, Appendix 1**, to enable a manufacturer of a coupling device or component to properly design and manufacture a mechanical coupling device or component for that vehicle. At the request of a bona fide applicant for possible type approval for a mechanical coupling device or component, any information given in ~~paragraph 5.3. below~~ **Annex 2, Appendix 1** which is held by the type approval authority shall be released to that applicant."

*Paragraph 5.3.*, amend to read:

"5.3. It shall be accompanied by the following information to enable the type approval authority to complete the communication form given in Annex 2.  
5.3.1. a detailed description of the vehicle type **according to Annex 2, Appendix 1** and of the mechanical coupling device or component and, at the request of the type approval authority or technical service, a copy of the approval form for the device or component;"

*Paragraphs 5.3.2. and 5.3.2.1.*, delete:

~~"5.3.2. The information shall also include the maximum permissible masses of the towing and towed vehicles, the distribution of the maximum permissible mass of the towing vehicle between the axles, the maximum permissible axle masses, the maximum permissible vertical loading to be imposed on the rear of the towing vehicle and details and/or drawings of the installation mounting points for the device or component and of any additional reinforcing plates, support brackets and so on, necessary for safe attachment of the mechanical coupling device or component to the towing vehicle;  
5.3.2.1. the loading condition at which the height of the tow ball of M1 category vehicles is to be measured — see paragraph 2 of annex 7, appendix 1."~~

*Annex 1, paragraphs 10. and 11.*, amend to read:

"10. Instructions for the attachment of the coupling device or component type to the vehicle and photographs or drawings of the mounting points (**see Annex 2, Appendix 1**) given by the vehicle manufacturer:  
.....  
.....

- 11. Information on the fitting of any special reinforcing brackets or plates or spacing components necessary for the attachment of the coupling device or component (see Annex 2, Appendix 1):

.....  
....."

Annex 2,

paragraphs 8. and 9., amend to read:

- "8. Instructions for the attachment of the coupling device or component type to the vehicle and photographs or drawings of the mounting points (see Appendix 1 to this Annex):

.....  
.....

- 9. Information on the fitting of any special reinforcing brackets or plates or spacing components necessary for the attachment of the coupling device or component (see Appendix 1 to this Annex):

.....  
....."

Insert new Appendix 1, to read:

"Annex 2 – Appendix 1 \*

**LIST OF INSTALATION DATA FOR A MECHANICAL COUPLING DEVICE OR A COMPONENT DESIGNED FOR A SPECIFIC VEHICLE TYPE**

- 1. **Description of the vehicle type:**
  - 1.1. **Trade name or mark of the vehicle,**
  - 1.2. **Models or trade names of vehicles constituting the vehicle type, if available.**
- 2. **Masses of the towing and towed vehicles:**
  - 2.1. **maximum permissible masses of the towing and towed vehicles,**
  - 2.2. **the distribution of the maximum permissible mass of the towing vehicle between the axles,**
  - 2.3. **the maximum permissible vertical loading to be imposed on the coupling ball/hook of the towing vehicle,**
  - 2.4. **the loading condition at which the height of the tow ball of M1 category vehicles is to be measured - see paragraph 2. of Annex 7, Appendix 1.**
- 3. **Specification of fixing points:**
  - 3.1. **Details and/or drawings of the installation mounting points for the device or component and of any additional reinforcing plates, support brackets and so on, necessary for reliable attachment of the mechanical coupling device or component to the towing vehicle,**
  - 3.2. **The vehicle manufacturer shall specify:**

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\* On the request of (an) applicant(s) for a mechanical coupling device or component designed for a specific vehicle type, the information shall be provided by the vehicle manufacturer either directly or via the type approval authority as listed in Appendix 1 to this Annex.  
However, this information shall not be provided for purposes other than UN Regulation No. 55 approvals.

- (a) the number and location of the fixing points of the coupling device on the motor vehicle;
- (b) the maximum permissible overhang of the coupling point;
- (c) the height of the coupling point above the road surface as specified in Annex 7, paragraph 1.1.1. and the height of the coupling point in relation to the fixing points of the coupling.

3.3. For every fixing point the following shall be specified (if applicable):

- (a) The location of each hole to be drilled in the chassis or the body of the vehicle (specification of the maximum diameter to be drilled);
- (b) The location and size of pre-drilled holes (specification of the diameter of the hole);
- (c) The location and size of captive nuts or bolts (specification of the thread size);
- (d) The material to be used for attachment (e.g. securing bolts, washers etc.);
- (e) Any additional mounting point to be used for the attachment of coupling devices (e.g. the towing eye).
- (f) The specification of the dimensions shall be specified with an accuracy of at least  $\pm 1\text{mm}$ ;
- (g) The vehicle manufacturer may specify other specifications with regard to the fitting of the coupling device (e.g. size and thickness of back plates).

4. Vehicle manufacturer's name and address."

*Annex 5, paragraph 1.2.*, amend to read:

"1.2. The shape and dimensions of towing brackets shall meet the requirements of the vehicle manufacturer concerning the attachment points and additional mounting devices or components ~~if necessary~~, see **Annex 2, Appendix 1**."

*Annex 6, paragraph 3.1.3.*, amend to read:

"3.1.3. The positions of the fixing points for attaching the coupling ball and towing bracket are specified by the vehicle manufacturer (see **Annex 2, Appendix 1** ~~paragraph 5.3.2.~~ of this Regulation)."

*Annex 7, paragraph 1.1.2.*, amend to read:

"1.1.2. For coupling balls and towing brackets the vehicle manufacturer shall supply mounting instructions and state whether any reinforcement of the fixing area is necessary (see **Annex 2, Appendix 1** ~~paragraph 5.3.2.~~ of this Regulation)."

## IV. Justification 2

2.1. Tow bar manufacturers noted problems in obtaining the clear, unmistakable drawings with correct fixing points from the vehicle manufacturer. For technical services it is difficult to interpret the drawings of the fixing points. This resulted in several examples of type-approved tow bars on the market (designed for the same vehicle type) which use different fixing points. Some examples are shown in document R55-02-07 of the informal group

(IWG) on UN Regulation No. 55. To minimize the problems resulting from unclear fixing points, UN Regulation No. 55 should specify more in detail the requested information.

2.2. The place where the requirements with regard to the fixing points should be put is not too easy. In a first proposal requirements were put in a new paragraph 5.3.3. In a second proposal the requirements were put in an appendix to Annex 7 (installation) analogous to the information for the purpose of a UN Regulation No. 90 approval (replacement brake pads, etc.) asked for in regulation UN Regulation No. 13 (braking systems).

2.3. However the situation in UN Regulation No. 55 differs from the situation in UN Regulation No. 13 and UN Regulation No. 90. Every vehicle manufacturer needs an approval according UN Regulation No. 13 and the vehicle information necessary for the UN Regulation No. 90 approval can be petitioned easily using the appendix to the UN Regulation No. 13 approval communication. Unfortunately not every vehicle manufacturer applies for a UN Regulation No. 55 approval. In the European Union (EU) the information of the fixing point for tow bars is obtained via the directive masses and dimensions. The UNECE does not have such a Regulation. Nevertheless it is believed that with good specified requirements, with regard to the fixing points for tow bars and the like, in UN Regulation No. 55 the goal (better information for the coupling manufacturer and the technical services) will be achieved.

2.4. The set-up of the proposed Annex 2, Appendix 1 is similar to UN Regulation No. 13-H Annex 1, Appendix 1 (list of vehicle data for the purpose of UN Regulation No. 90 approvals). This proposal is basically the same as the proposal in document R55-05-12 of the IWG however the place for the appendix with the information about the fixing points is changed from Annex 7 (installation) to Annex 2 (communication) to be more in line with UN Regulation No. 13-H and UN Regulation No. 90. The data asked for is copied from the current paragraph 5.3.2.

2.5. The introduction of an appendix is preferred above putting the requirements in the existing text. In the form of an appendix the information can be easily referred to and the information can be easily supplied to the coupling-manufacturer by the vehicle manufacturer or by the Approval Authority.

## V. Proposal 3

### Concerning $A_v$ values on Drawbars

*Annex 4, Table 1, amend to read:*

Description of mechanical coupling device or component	Relevant characteristic values to be marked					
	Class	D	$D_c$	S	U	V
Coupling balls and towing brackets – see annex 5 para. 1 of this regulation	★	★		★		
Coupling heads	★	★		★		
Drawbar couplings	★	★	★	★		★
Drawbar eyes	★	★	★	★		★
Drawbars*	★	★	★	★		★
Drawbeams	★	★	★	★		★
Fifth wheel couplings	★	★			★	
Fifth wheel pins	★	★				
Fifth wheel mounting plates	★	★			★	
Hook type couplings	★	★	★	★		★

\*  
**Hinged drawbars shall in addition have the  $A_v$ -value marked on the type plate**

*Annex 6, paragraph 3.6.3., amend to read:*

"3.6.3. In the case of steered axles, the resistance to bending shall be verified by theoretical calculations or by a bending test. A horizontal, lateral static force shall be applied in the centre of the coupling point. The magnitude of this force shall be chosen so that a moment of  $0.6 \times A_v \times g$  (kNm) is exerted about the front axle centre. The permissible stresses shall be in accordance with paragraph 5.3. of ISO 7641/1:1983.

~~However, in the case where the steered axles form a twin, tandem, axle front carriage (steered bogie) the moment shall be increased to  $0.95 \times A_v \times g$  (kNm)."~~

## VI. Justification 3

3.1. Annex 6, paragraph 3.6.3. concerns the test criteria for the lateral strength of drawbars for vehicles with steered front axle. The factor of 0.95 in the formula given for tandem axle in this regulation UN Regulation No. 55 represents a much higher load criterion than the factor 0.6, specified in Directive 94/20/EU for the same or similar vehicle configurations.

3.2. This excessive requirement of 0.95, would lead to disproportionally heavier and much more expensive drawbars than those being homologated according to Directive 94/20/EU for the same applications. The Directive 94/20/EU strength level has been operated in the field without any technical problems over the last decades. Also for vehicles with very high  $A_v$  values and even in combination with short drawbars, representing a worst case for the lateral forces.

3.3. The high factor of 0.95 given in this regulation UN Regulation No. 55 for tandem axle has no real technical justification and should be eliminated.

3.4. Document R55-09-02 contains, at the end, calculations for different vehicle configurations operated under extreme adverse conditions, showing that even under these worst case circumstances a load factor of 0.6 is sufficient.

3.5. This document helps to understand why drawbars, being homologated with a 0.6 factor, have been successfully used in severe applications and confirms the correctness of Directive 94/20/EU. Calculations based on measured forces, as shown in document R55-05-03, lead to a load factor of 0.43 and supports the results.

## VII. Proposal 4

### Definition of the Class W for fully automatic couplings

*Add new paragraph 2.6.14., to read:*

"2.6.14. **Class W Non-standard miscellaneous, automatic drawbar coupling clevis type, including its adapted trailer part, with an integrated automated electric and pneumatic connector between the towing vehicle and towed vehicle. The both mechanical parts shall be approved as a matched pair.**"

*Annex 5,*

*Insert new paragraph 12., to read:*

- "12. DRAWBAR TYPE COUPLINGS - CLASS W**
- 12.1.1. Class W couplings shall as part of an automated sequence of actions automatically mechanically connect the two vehicles and establish the electric and pneumatic braking transmission connection.**
- 12.1.2. Class W couplings shall, as part of an automated sequence of actions, automatically break the electric and pneumatic braking transmission connection and mechanically disconnect the two vehicles.**
- 12.2. Class W couplings shall satisfy the relevant test requirements given in annex 6, paragraph 3.3., with the exception of paragraph 3.3.4. The closure and any locking devices shall be tested by means of a static force of 0.25 D acting in the direction of opening. The test shall not cause the closure to open. The locking device shall be fully functional after the test. A test force of 0.1 D is sufficient in the case of cylindrical coupling pins.**
- 12.3. The following minimum and simultaneous angles of articulation shall be possible with the coupling not fitted to a vehicle but assembled, coupled, and in the same normal position as when fitted to a vehicle:**
- 12.3.1. ± 90° horizontally about the vertical axis;**
- 12.3.2. ± 20° vertically about the horizontal transverse axis;**
- 12.3.3. ± 25° axial rotation about the horizontal longitudinal axis.**
- 12.4 Class W coupling equipped with a remote control shall fulfil requirements of paragraph 13. of this Annex.**
- 12.5. Class W coupling shall have a remote indication according to paragraph 13. of this annex."**

*Renumber former paragraphs 12. to 12.3.7. as 13. to 13.3.7.*

## **VIII. Justification 4**

4.1. Fully automatic couplings may be envisioned in different topologies. It is possible to have a topology where the automated electric and pneumatic connector is embodied completely outside a standard mechanical coupling, e.g. class G and class H or class C and D. In these cases, the coupling from the perspective of UN Regulation No. 55, will be the original class, e.g. class G and class H or class C and D. In other cases the embodiment is such that the electric and pneumatic connector is fully integrated into the interface of the mechanical coupling. In such cases drawbar couplings are classified in class W. In those cases special requirements apply. These requirements resemble those applied to Class T couplings. Hence a specific class is justified. The class W text draws on the text of Class T. Class S is commonly used for a large variety of coupling designs. Introducing the Class W cleans some of the odd usages of Class S away.

4.2. Comment on new paragraph 2.6.14.: The proposed wording is based on definition class T and definition "automated connector" in the proposal for an amendment of UN Regulation No. 13 (brakes) from Informal Working Group on Modular Vehicles Combination (MVC).



(a) From UN Regulation No. 55:

2.6.13. Class T Non-standard, non-automatic dedicated drawbar type couplings which are able to be separated only by the use of tools and are typically used for trailers of car transporters. They shall be approved as a matched pair.

(b) From UN Regulation No. 13:

2.40. "Automated Connector" means a system through which at least the brake electric and brake pneumatic connection, between the towing vehicle and towed vehicle is made automatically without direct intervention of a human operator.

4.3. Comment on Annex 5, new paragraph 12.1.2.: In analogy to class T.

4.4. Comment on Annex 5, new paragraph 12.2.: In the draft proposal for UN Regulation No. 13 with regard to MVC the electric and pneumatic connections must be combined.

4.5. Comment on Annex 5, new paragraph 12.3.: For class T, paragraph 3.3.4. is excluded because there is no locking device in a class T coupling. However a class W has a locking device and there should be a similar general requirement:

"3.3.4. Static test on ~~coupling pin locking device~~ ~~With drawbar couplings it is also necessary to test~~ the closure and any locking devices **shall be tested** by means of a static force of 0.25 D acting in the direction of opening. The test shall not cause the closure to open and it shall not cause any damage. A test force of 0.1 D is sufficient in the case of cylindrical coupling pins."

4.5. Comment on Annex 5, new paragraph 12.5.: This paragraph makes it clear that a class W coupling shall with respect to indication be treated as a remotely operated standard coupling.

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