



**NOTE**

This leaflet is part of a set which also includes :

541-1 : Brake - Regulations concerning the construction of the various brake components.

830-1 : Technical specification for the supply of hoses in reinforced elastomer for compressed air brake couplings.

This leaflet is published by the OSJD under number 536.

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## 1 - GENERAL INFORMATION

The present leaflet applies :

to European Member Railways of one or both of the two Railway Organisations, except for Soviet Railways which are governed by other regulations.

The leaflet applies to wagons and coaches fitted with UIC and OSJD type automatic couplers.

1-7-82  
All provisions of UIC Leaflet 541-1 which are inconsistent with those of this leaflet shall not apply. Special provisions shall be applicable regarding the electric heating connection.

All other provisions of UIC Leaflet 541-1 shall remain valid, without amendment, for vehicles fitted with automatic couplers.

\* Amendments or additions to this leaflet must be covered by an agreement between the UIC and the OSJD.

## 2 - PNEUMATIC CONNECTIONS AND HOSE CONNECTIONS FOR THE TRAIN PIPE AND MAIN AIR-SUPPLY PIPE

\* 2.1 - The shape and dimensions of pneumatic connections on the vehicle side (sleeve and pipe end) and on the coupler side (sleeve and end of air line-connector insert) are given in Appendix 1.

\* 2.2- The shape and dimensions of the hose connection (hose and hose sleeve) are given in Appendix 1.

The Railways are free to choose the type of fastener they wish for fixing the hose to the hose sleeve.

\*2.3 - The position of the pipe end must be chosen so that :

- taking account of the maximum possible angle and travel of the coupler body (until contact is made with fixed parts of the vehicle),

- but taking account, at least, of the conditions of Appendices 9 and 10 to Leaflet 530-1 (UIC) for wagons and/or of the conditions of Appendix 7 to Leaflet 567-3 (UIC) for coaches,

any deterioration of the hose connection is avoided.

Appendices 2 to 8 show practical examples.

\* The hose connection must be arranged without presenting any low points (water pockets).

For special type coaches and wagons, every attempt must be made to ensure that the hose connection has no low points.

A hose support may be used to keep the hose connection in the required position.

2.4 - Pipe elbows may be inserted between the air line-connector insert and the stop cock in order to ensure effective clearance for the automatic coupler, including the corresponding traction and compression strokes, without damage to the hose connection, and/or avoid obstruction between the pipe end (connection on the vehicle side) and the stop cock.

The minimum curve radius permitted for pipe elbows is 100 mm (1) (2).

\* In addition to the 100 mm - radius elbow (1) one extra elbow of 200 mm - radius (2) may be used. Exceptions will only be permitted if construction difficulties arise.

\* If the elbow used is positioned on the coupler side, it must be arranged in accordance with Appendix 1.

### 3- COUPLER ELECTRIC-LINE CONNECTOR

\*3.1 - The coupler cable shall be joined to the train cable by a plug connection.

\*3.2 - The position of the junction box for wagons must be chosen on the basis of examples given in Appendices 9 or 10, and for coaches on the basis of examples given in Appendices 11 or 12, so that, with the total length of the «electric connector insert with coupler cable and plug sub-assembly», defined in Appendix 13.2, and taking into account operating conditions stipulated in 3.4, any damage to the electric line connector of the automatic coupler is avoided.

On wagons with end unloading by tipping, the plugs must be carefully protected against mechanical damage during dumping of bulk goods.

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(1) Exception : the elbow placed on the coupler side as in Appendix 1.

(2) Applies to train pipe only.

\*3.3 - There should be no continuous friction between the coupler cable and other constituent parts (hose connections, operating shafts, bogies etc...).

\*3.4 - The position of the coupler cable should vary as little as possible during horizontal and vertical coupler-head movements and also during simultaneous traction and compression strokes.

\*3.5 - Technical conditions for electric connector inserts, plugs, junction boxes and conductors are given in Appendix 13.

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### APPENDICES

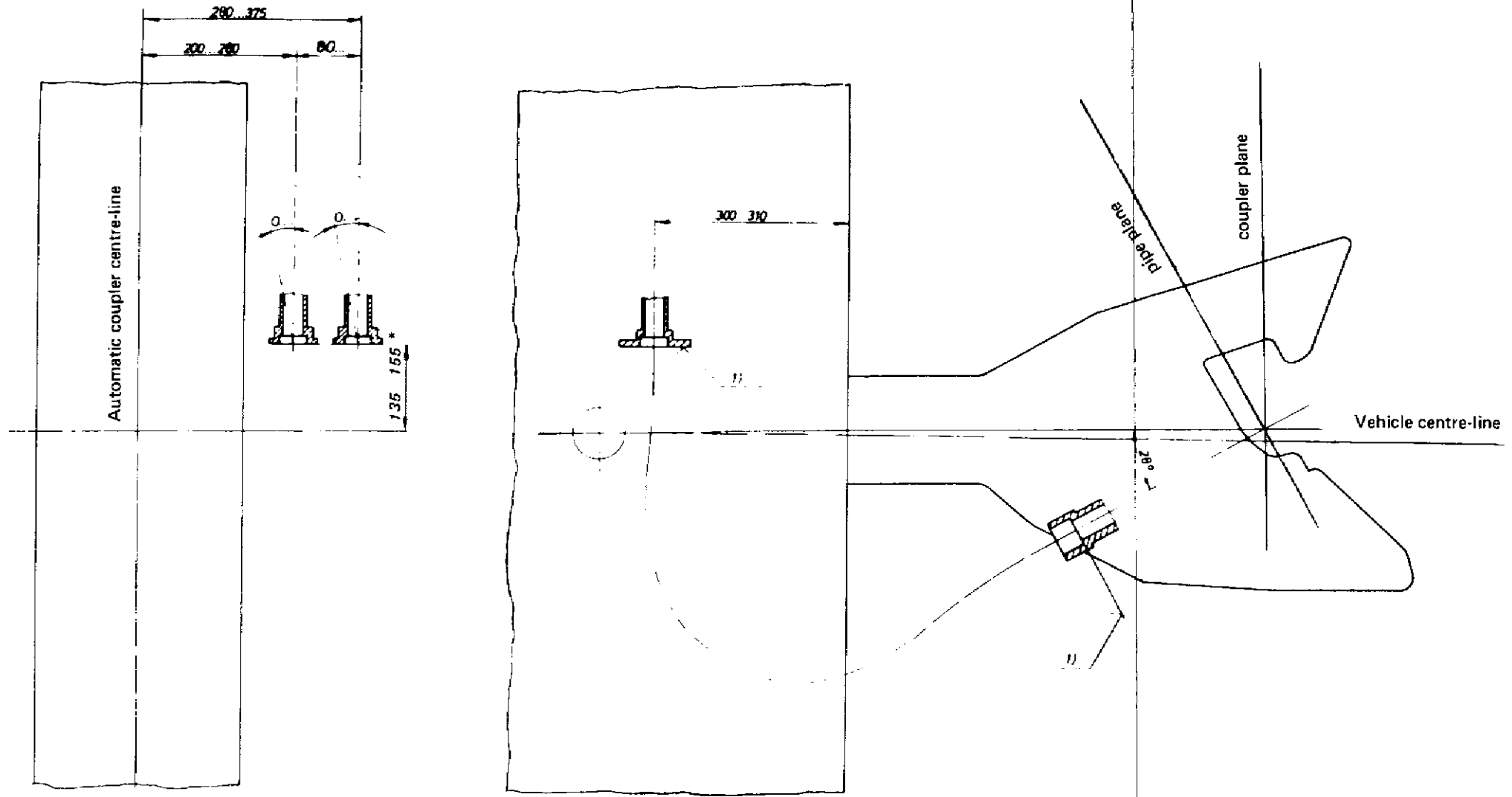
The dimensions given in the practical examples (Appendices 2 to 8) and the areas for the positioning of the junction box given in Appendices 9 to 12 were determined as optimum values during studies on the most common types of vehicle. Dimensions marked by an asterisk (\*) must be regarded as notional values for the manufacturer, who is free to depart from them if this were to result in better connecting conditions; all the same, the conditions given in the leaflet must be taken into consideration.



POSITION OF PNEUMATIC CONNECTIONS ON WAGONS WITH TYPE 2 UIC/OSJD SUSPENSION (TELESCOPIC-LEG SUSPENSION)

541-2  
OR  
APPENDIX 2

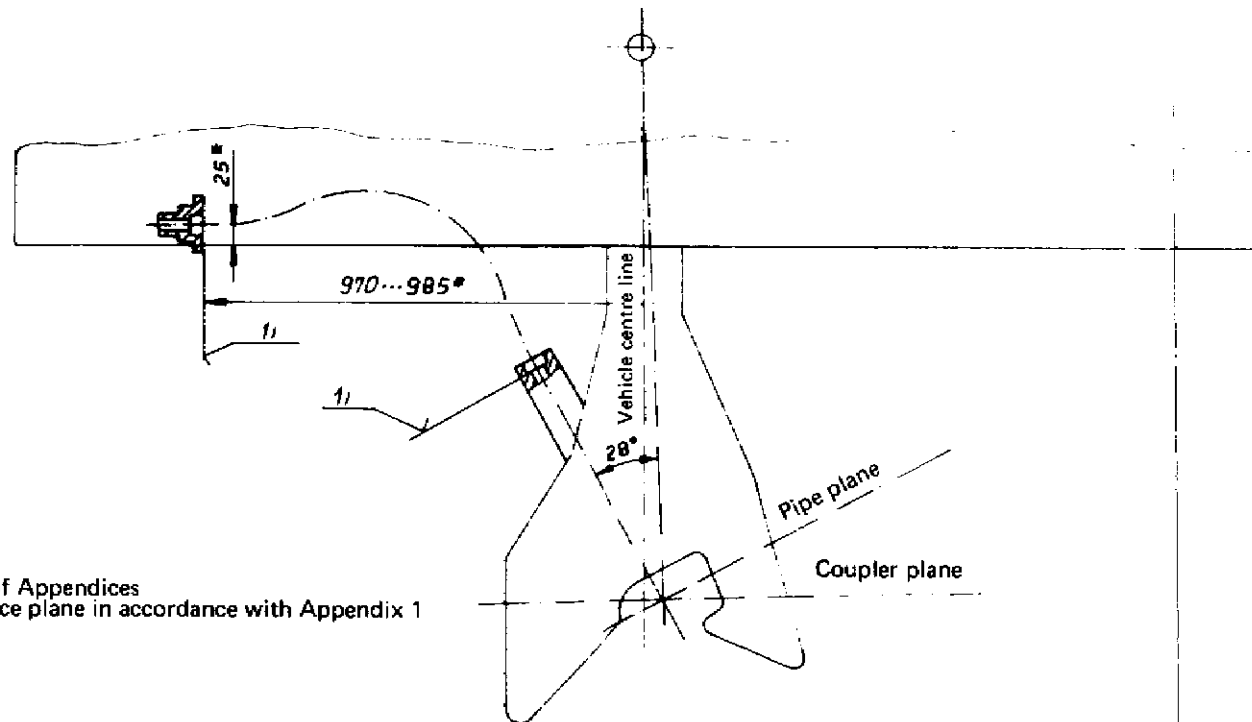
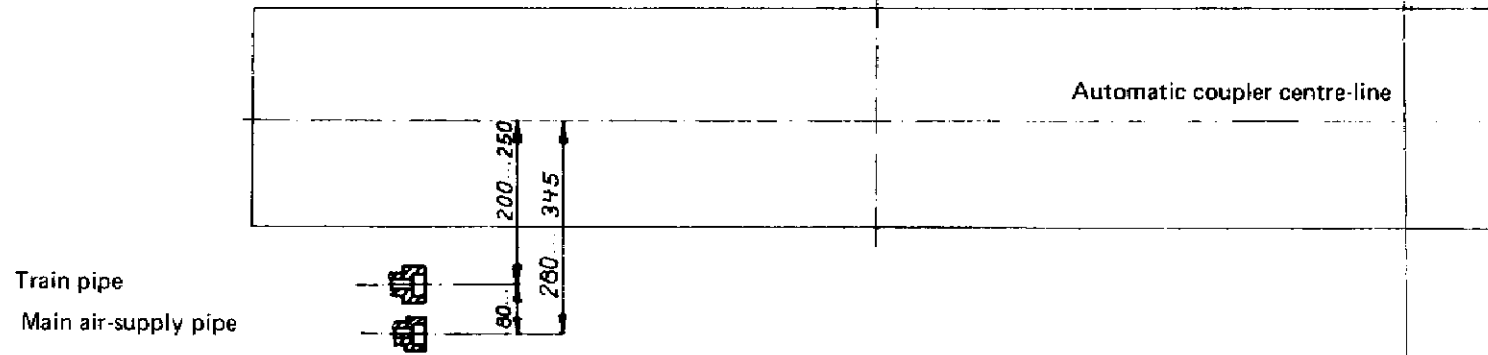
- Practical example -



\* See list of Appendices  
1) Reference plane in accordance with Appendix 1

POSITION OF PNEUMATIC CONNECTIONS ON WAGONS WITH TYPE 2 UIC/OSJD SUSPENSION (TELESCOPIC-LEG SUSPENSION)

- Practical example -



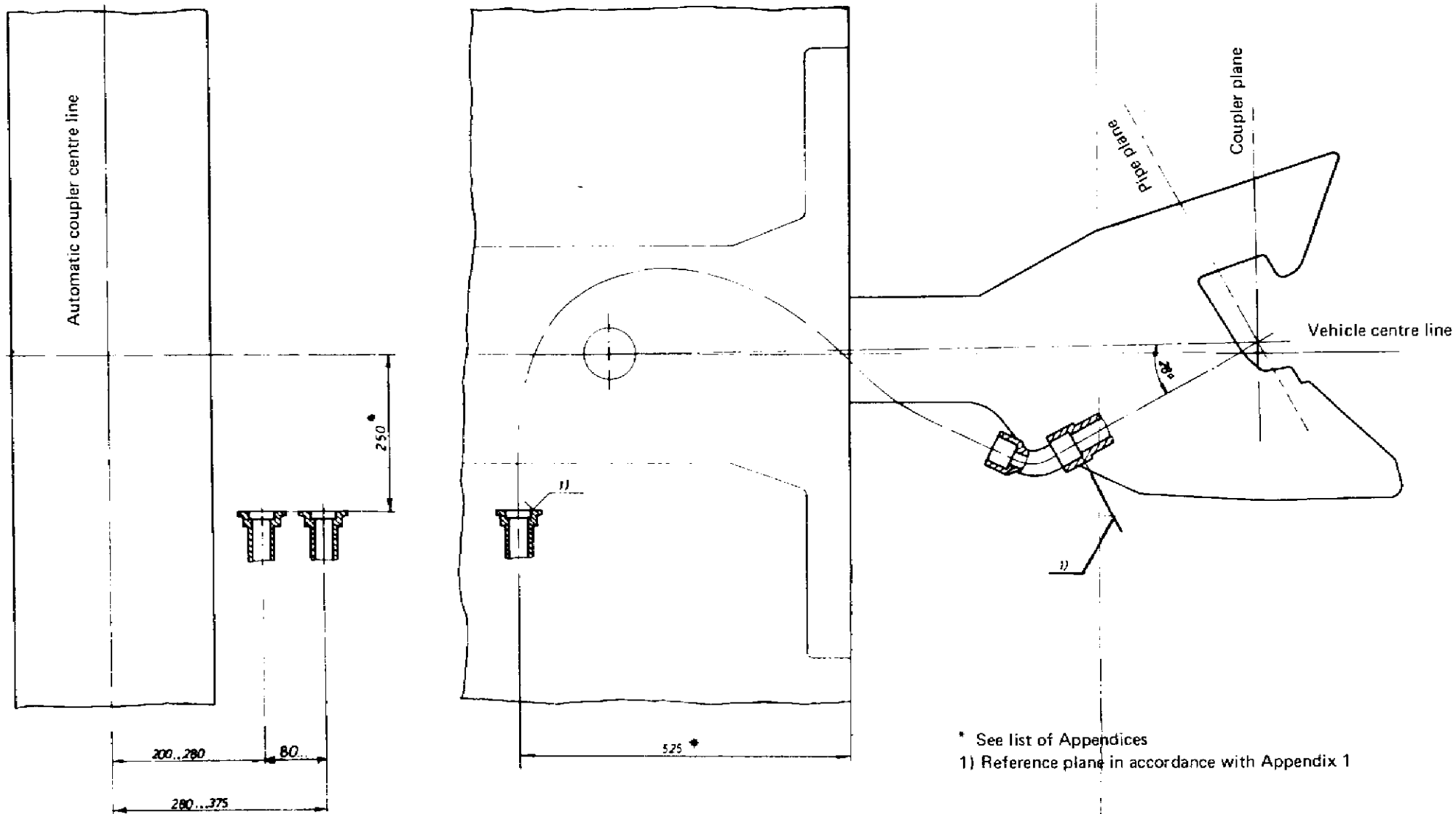
\* See list of Appendices

1) Reference plane in accordance with Appendix 1



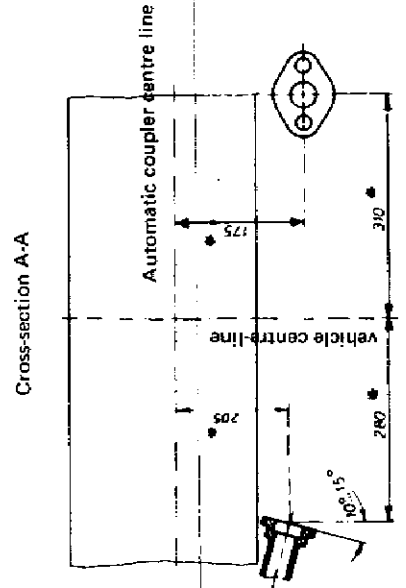
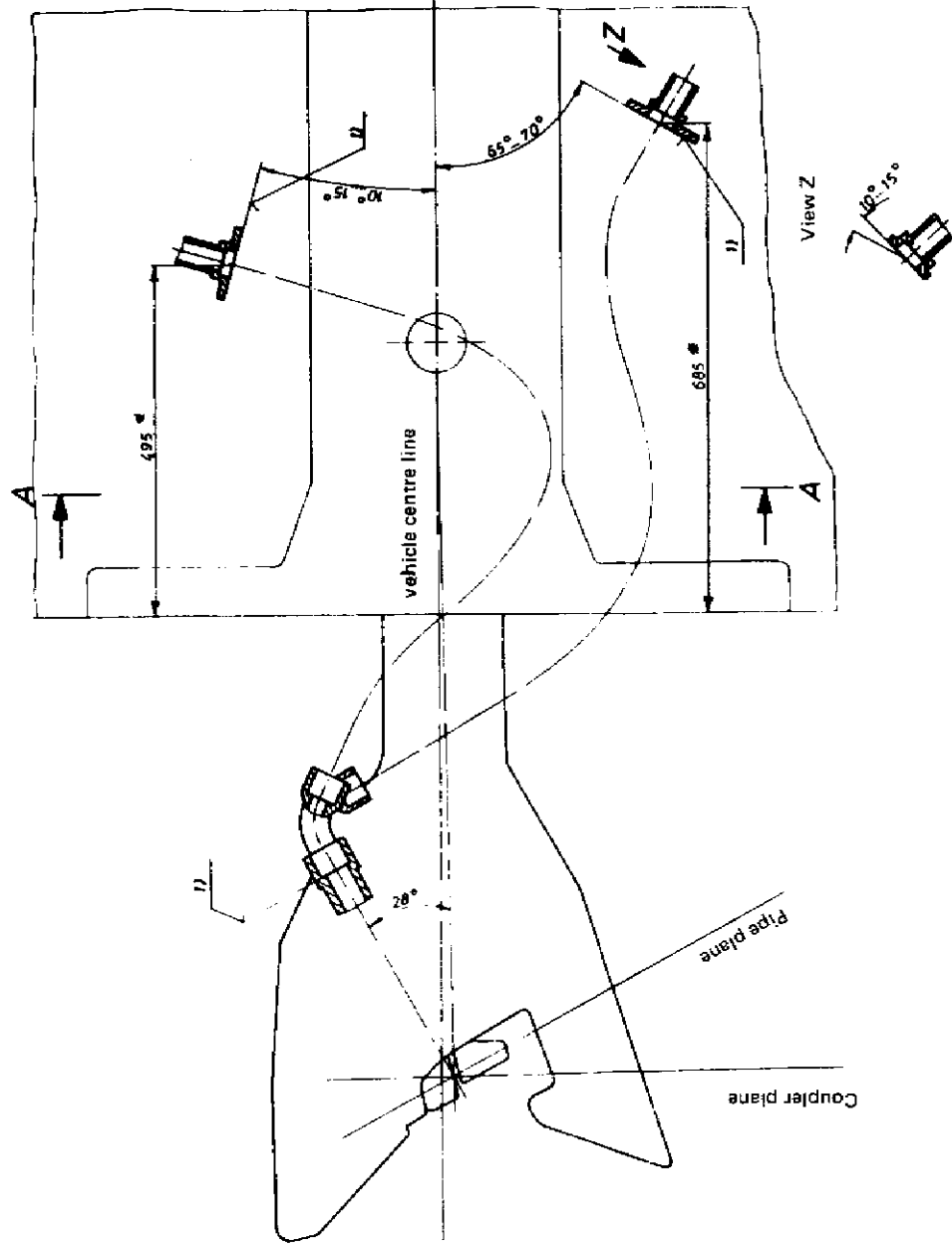
POSITION OF PNEUMATIC CONNECTIONS ON WAGONS WITH TYPE 1 UIC/OSJD SUSPENSION (CROSS-BEAM SUSPENSION)

- Practical example -



POSITION OF PNEUMATIC CONNECTIONS ON WAGONS WITH TYPE 1 UIC/OSJD SUSPENSION  
(CROSS-BEAM SUSPENSION)

- Practical example -



\* See list of Appendices  
1) Reference plane in accordance with Appendix 1

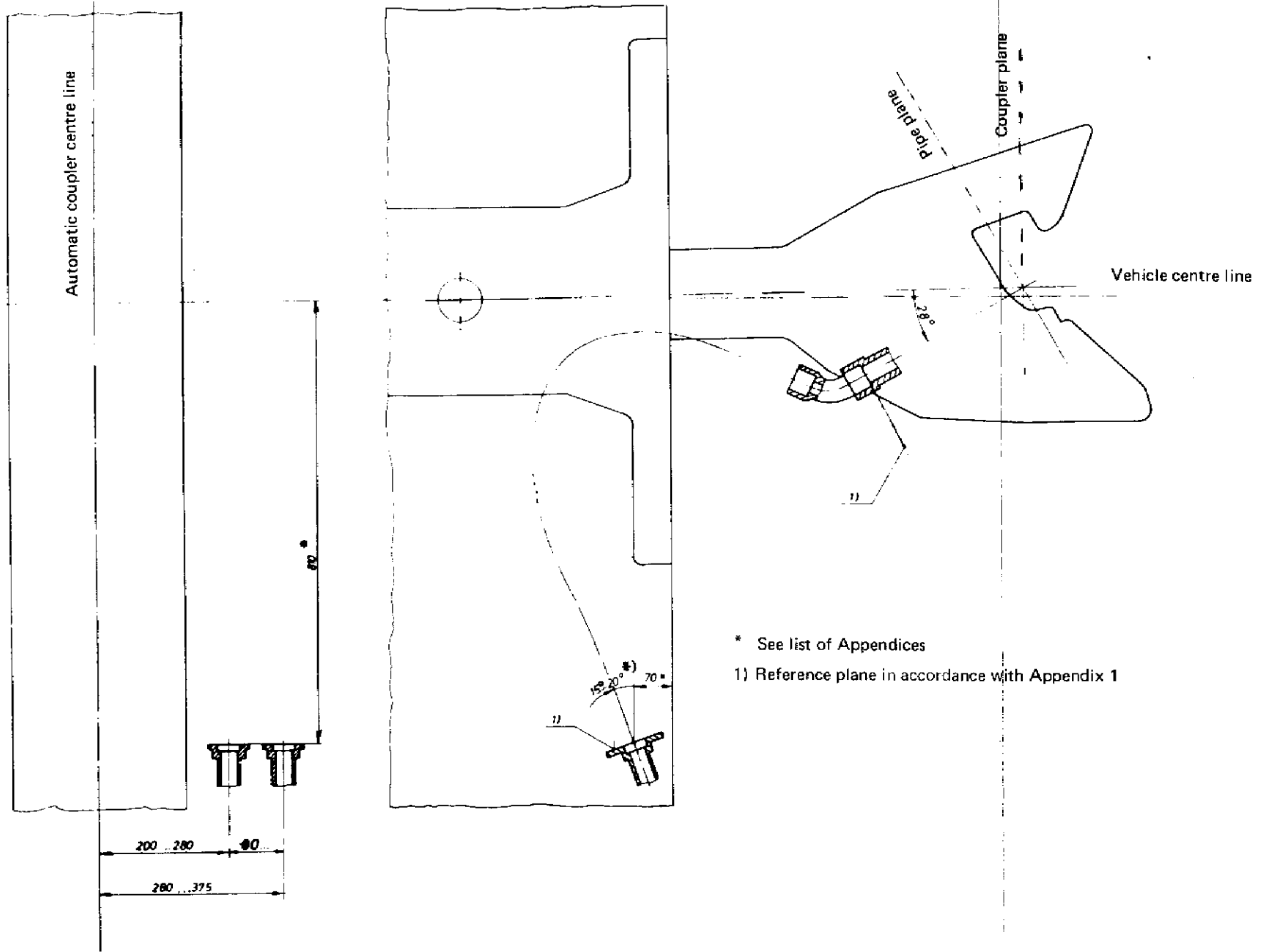
POSITION OF PNEUMATIC CONNECTIONS ON WAGONS WITH TYPE 1 UIC/OSJD SUSPENSION (CROSS-BEAM SUSPENSION)

- Practical example -

541-2

OR

APPENDIX 6

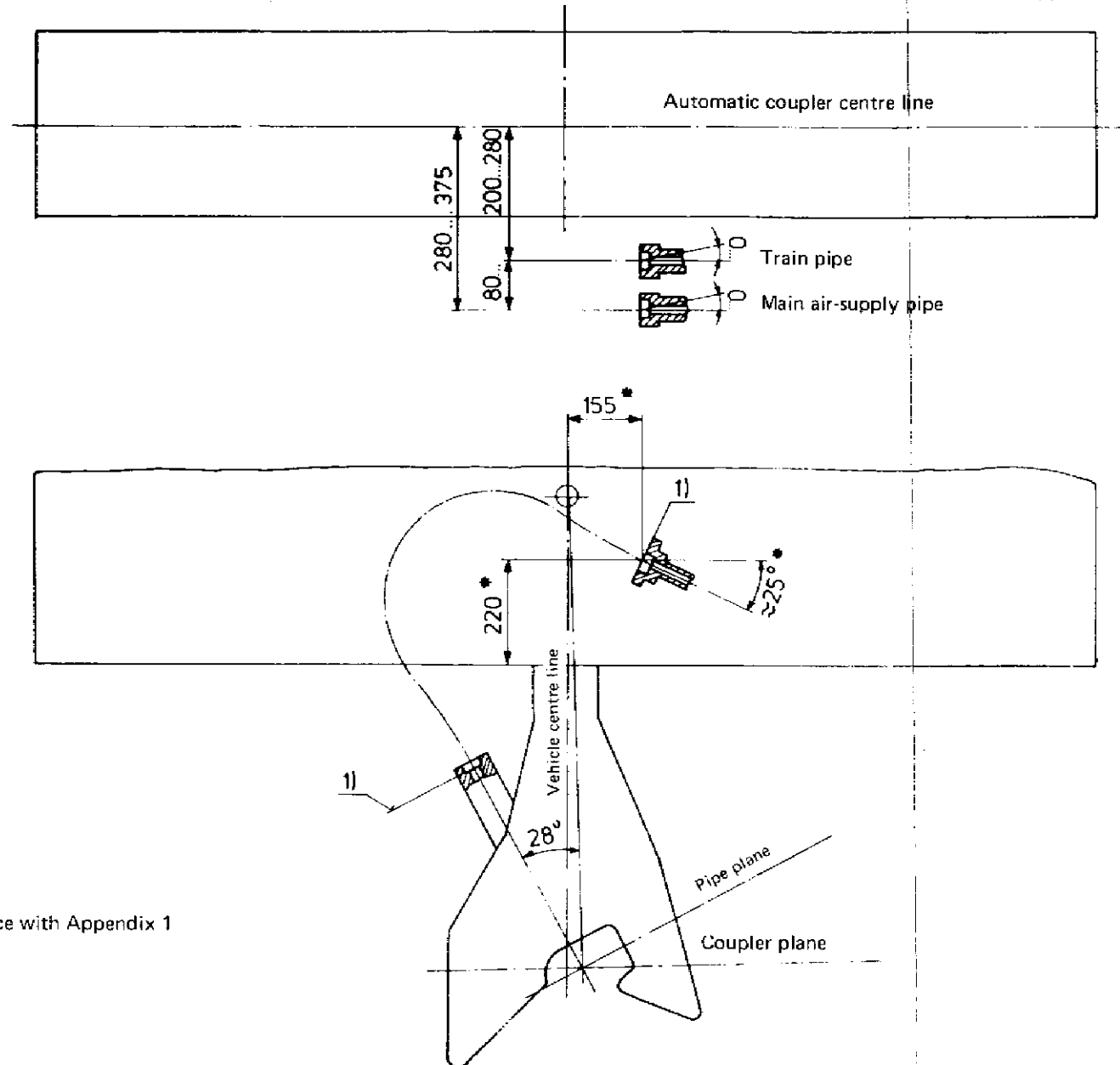


POSITION OF PNEUMATIC CONNECTIONS ON COACHES WITH TYPE 2 UIC/OSJD SUSPENSION (TELESCOPIC-LEG SUSPENSION)

— Practical example —

(applies to coaches with a short distance between the bogie head-stock and the buffer fixing plane)

(For coaches with a long distance between the bogie head-stock and the buffer fixing plane, pipes shall be positioned in accordance with Appendix 2)

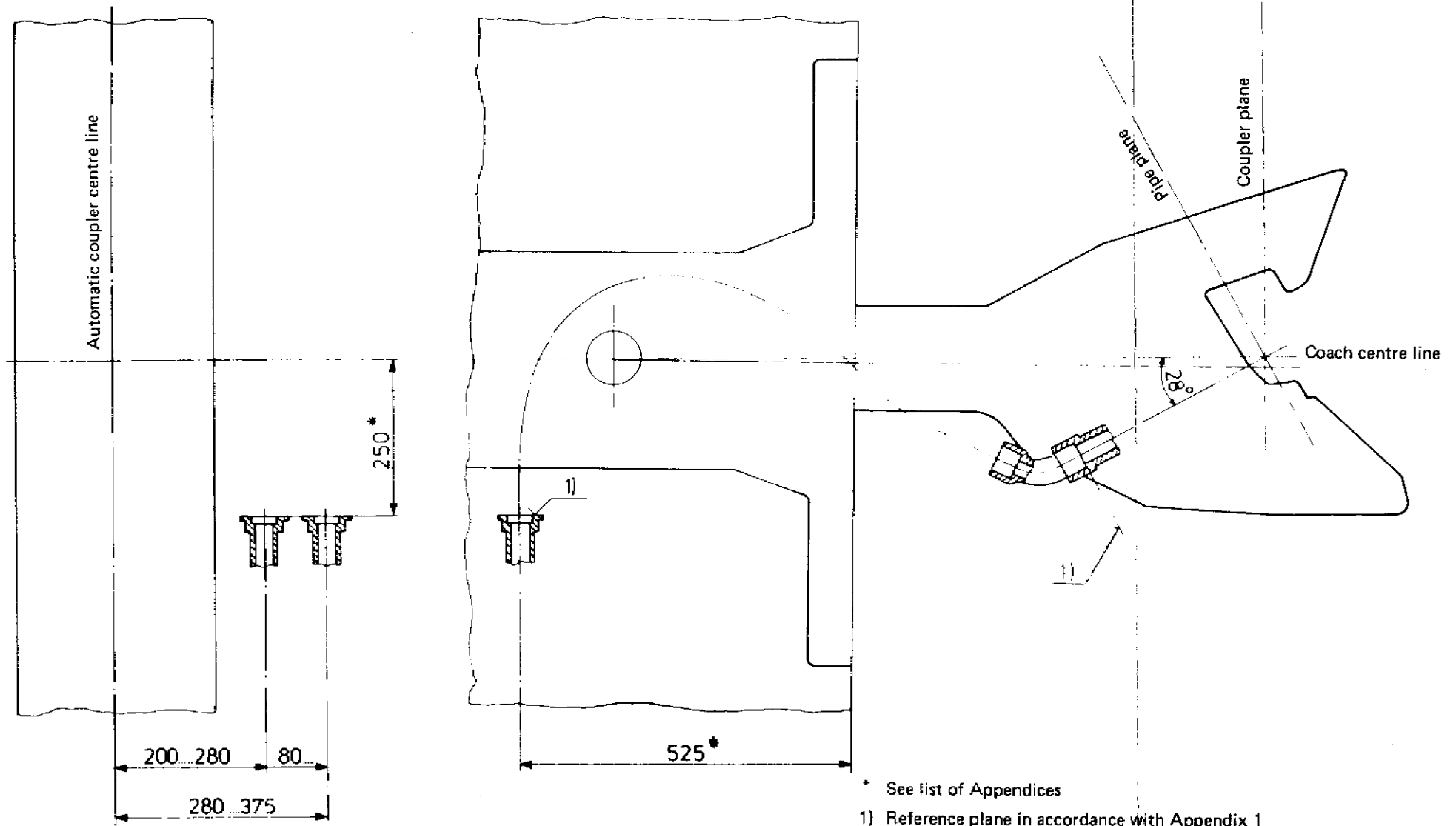


\* See list of Appendices

1) Reference plane in accordance with Appendix 1

POSITION OF PNEUMATIC CONNECTIONS ON COACHES WITH TYPE 1 UIC/OSJD SUSPENSION (CROSS-BEAM SUSPENSION)

- Practical example -



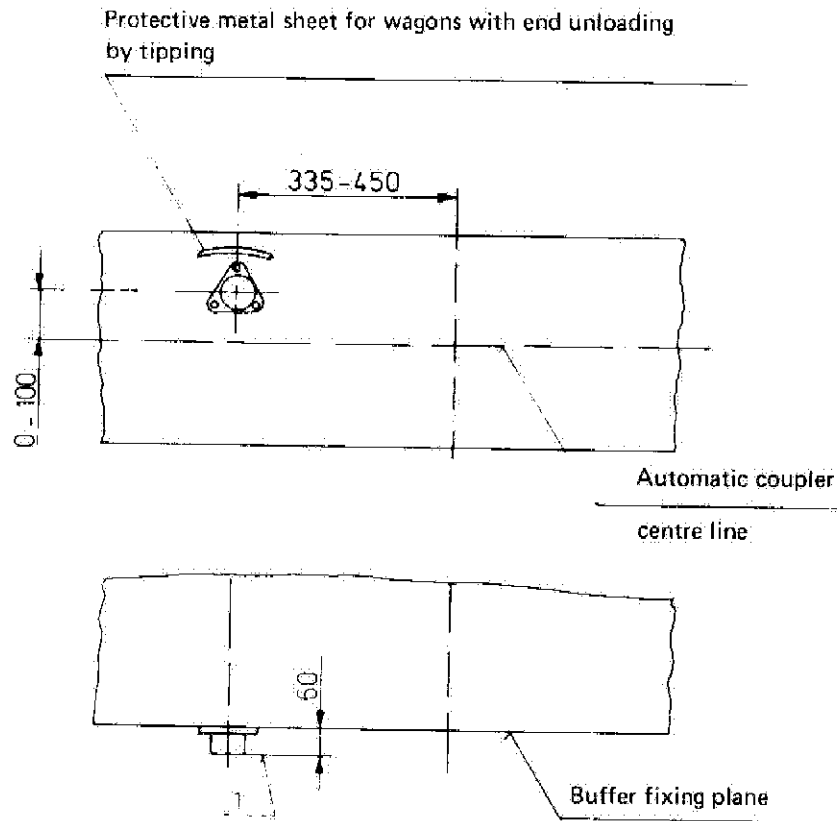
\* See list of Appendices

1) Reference plane in accordance with Appendix 1

541-2  
OR  
APPENDIX 9

POSITION OF THE JUNCTION BOX ON THE HEAD STOCK  
OF WAGONS WITH TYPE 2 UIC/OSJD SUSPENSION  
(TELESCOPIC-LEG SUSPENSION)

- Practical example -

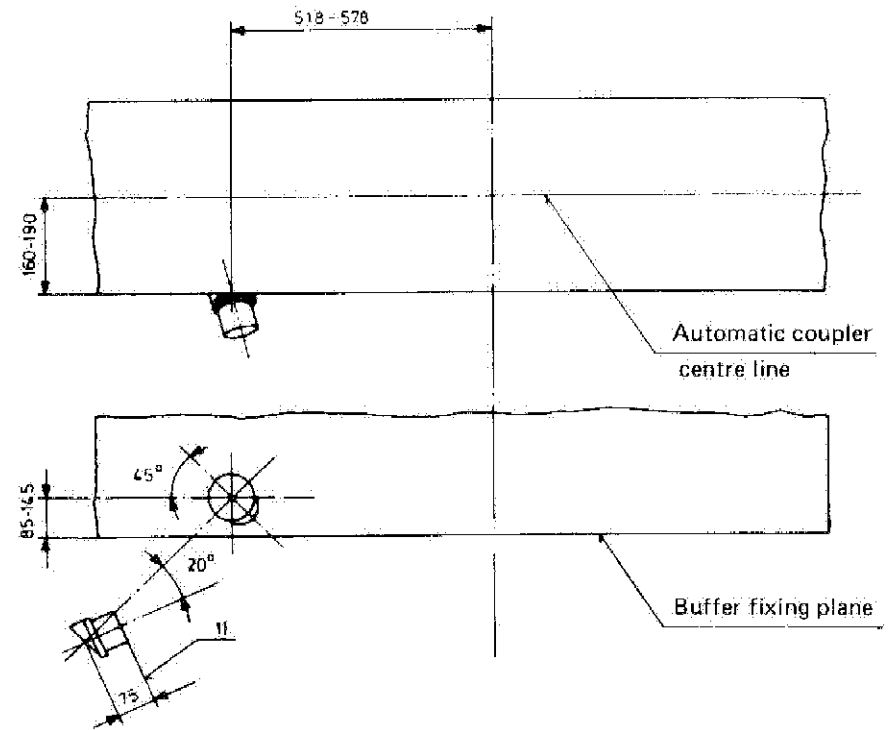


1) Reference plane in accordance with Appendix 13.2

541-2  
OR  
APPENDIX 10

POSITION OF THE JUNCTION BOX UNDER THE  
HEAD STOCK OF WAGONS WITH UIC/OSJD  
SUSPENSION : TYPE 1 (CROSS-BEAM SUSPENSION)  
TYPE 2 (TELESCOPIC-LEG SUSPENSION)

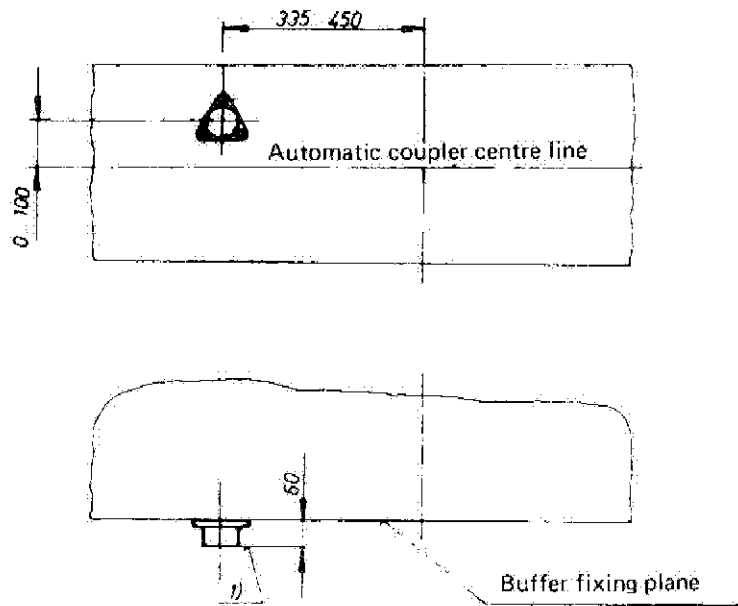
- Practical example -



1) Reference plane in accordance with Appendix 13.2

POSITION OF THE JUNCTION BOX ON THE HEAD STOCK  
OF COACHES WITH TYPE 2 UIC/OSJD SUSPENSION  
(TELESCOPIC-LEG SUSPENSION)

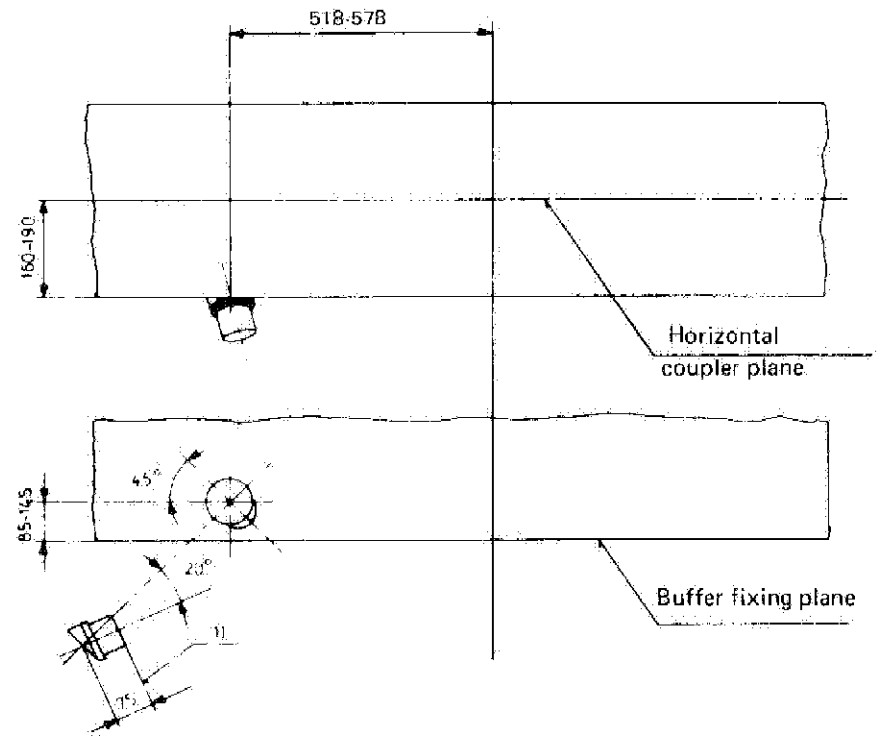
- Practical example -



1) Reference plane in accordance with Appendix 13.2

POSITION OF THE JUNCTION BOX UNDER THE HEAD STOCK  
ON COACHES WITH UIC/OSJD SUSPENSION :  
TYPE 1 (CROSS-BEAM SUSPENSION)  
TYPE 2 (TELESCOPIC-LEG SUSPENSION)

- Practical example -



1) Reference plane in accordance with Appendix 13.2

### TECHNICAL CONDITIONS

Technical conditions with which the electric connector inserts, plugs, junction boxes and conductors, approved by the Automatic Coupling Technical Working Party, must comply for automatic couplers of the UIC and OSJD Member Railways.

(Shortened description : «Technical conditions for the coupler electric-line connector»).

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### 1 - Preliminary remarks and application

In the event of UIC and OSJD type couplers, and more particularly the electrical sub-assemblies, being used in combination on the basis of a partially-unified technical arrangement, these technical conditions are designed to guarantee safe and correct functioning of the two Railway Organisations' operating and control systems, the control circuits of which are automatically linked through the electric parts of the automatic coupler, and to ensure interchangeability of the two types of coupler as units.

The application comprises the following : electric connector insert,  
plug,  
junction box,  
coupler cable.

Furthermore, all electric parts must comply with the technical conditions and safety regulations of the railway organisation which has the responsibility of approving the use of these parts.

### 2 - Technical conditions

#### 2.1 - Electric-line connector and plug connection

##### 2.1.2 - Cables and description of contacts

The contacts in the electric-line connector and the plug connection must be marked and fitted according to the instructions given in Appendix 13.1. The markings on the contacts must be identifiable from the outside.



2.1.2 - Technical data and dimensions

The electric connector insert and the plug connection must be designed according to the following technical criteria :

Nominal voltage	220 V DC and AC	(1)
Nominal current	20 A for contacts 1-8	(2)
	4 A for contacts 9-10	
Number of poles - electric connector insert	10	
- plug connection	8/2 + S + A	(3)

The electric connector insert must comply with the dimensions defined in Appendix 10 of the leaflet "Technical conditions with which automatic couplers of the OSJD and UIC Member Railways must comply in order to ensure compatibility of couplers", and the plug connection with those defined in Appendix 13.2.

The pressure of contacts must be such that the plug connections of the UIC and OSJD railway organisations can be plugged together and unplugged without difficulty and without causing any functional disturbance. If parallel contacts are used, they must be equipped, both in the electric connector insert and the plug connection (plug and junction box), with bridges large enough to guarantee a load of 20A per contact even if one of the circuit conductors in a parallel cable is out of order (4).

2.1.3 - Dielectric strength and insulation resistance

The electric connector insert and the plug connection when new must have a dielectric strength of  $U_p \text{ nom} = 2500 \text{ V AC}, 50 \text{ Hz}$ .

- (1) Voltages in use will be fixed at a later date.
- (2) To be verified.
- (3) S = protection cable, A = sheathing.
- (4) This indication has only a provisional notional value. A final decision will be made after the results of the corresponding tests become available.

The dielectric strength in service should not fall below  $0.7 \cdot U_p \text{ nom} = 1750 \text{ V AC}, 50 \text{ Hz}$ . The insulation resistances, when new, should be at least  $10 \cdot 10^6$  ohms and should not fall below  $1 \cdot 10^6$  ohms in service.

2.1.4 - Voltage drops and temperature rise in the contacts

Voltage drops, under a load corresponding to the nominal current, must not exceed :

- in dismantled mode, the value of 50 mV (1) in a pair of contacts (pin-sockets),
- in service, the value of 350 mV (1) in a pair of contacts for two coupled-up electric connector inserts with plug connections (between plug of connection 1 and plug of connection 2).

Temperature rise in a pair of contacts (pin-socket) in two electric connector inserts coupled together or a plug connection must not exceed the maximum value of 90° C (1) for a permanent load equal to the value of the nominal current and for an atmospheric temperature of 70° C.

2.1.5 - Protective measures

This paragraph will be completed after agreement has been reached.

2.1.6 - Marking

The electric connector insert and the plug connection must bear, at least, the following markings :

- manufacturer,
- designation of type or model.

- (1) This is only intended to serve as a provisional guide. The final decision will be made when the corresponding test results become available.

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## 2.2 - Conductors (1)

A practical example of coupler cable is given in Appendix 13.3.

The following technical specifications are obligatory for the coupler cable :

*Control circuit*

Nominal voltage	:	1 000 V
Layout	:	Cabled strands
Resistance of conductors at 20° C :		
- 6 mm <sup>2</sup> conductor section	:	3.39 Ω /km (maximum value)
- 16 mm <sup>2</sup> conductor section	:	1.24 Ω /km (maximum value)
Insulation resistance	:	10 . 10 <sup>6</sup> Ω/km (minimum value)

*Multiplex circuit*

Nominal voltage	:	250 V
Layout	:	Cabled strands
Screen resistance	:	5 Ω/km (notional value)
Density of screen	:	... %
(2)		
Resistance of conductors at 20° C	:	13.3 Ω/km (maximum value)
Insulation resistance at 20° C	:	1 . 10 <sup>9</sup> Ω /km (minimum value)

(Conductor/conductor and conductor/screen)

In service capacity at 800 Hz	:	110 pF/m
Characteristic impedance	:	75 Ω

Circuit attenuation

(notional values at 20°)

f = 1 kHz	90 mNeper/km
f = 5 kHz	155 mNeper/km
f = 10 kHz	200 mNeper/km
f = 50 kHz	400 mNeper/km
f = 100 kHz	600 mNeper/km

(1) These figures are only intended to serve as a provisional guide. The final decision will be taken when the corresponding test results are available. Other values may be added during the development stage.

(2) Other parameters for the screen may be added here, after agreement has been reached.

## 2.3 - Degrees of protection

The following degrees of protection are required :

	Coupling plane	Adjacent area
- electric connector insert, coupled	IP 44	IP 55
- electric connector insert, uncoupled	IP 00	IP 55
- plug connection, coupled	IP 55	IP 55
- junction box with cover screwed on	IP 55	IP 55

For operating conditions where the value IP 00 is proposed for the electric connector insert and for those cases where the plug is not in position, there must be a guarantee that all the conductor and accessible parts (contact pins) with a voltage of more than 42 V AC or 60 V DC shall be automatically switched off. Moreover, coupling and uncoupling are prohibited when the current is on (1).

## 2.4 - Climatic conditions

This equipment must be operational in temperatures ranging from -40° C inclusive to +70° C inclusive.

## 2.5 - Resistance to vibrations

All the parts listed in point 1 must have sufficient resistance to vibrations to be able to withstand the impacts and vibrations of the vehicle in railway operating conditions without the different parts being damaged, or functional difficulties arising. In particular, the screwed-on cover should not become loose under the influence of the above-mentioned vibrations. The safety precautions to guard against untimely or accidental opening must comply with the provisions of Appendix 13.2.

## 3 - Other conditions

(Will be laid down if required):

(1) The technical details relating to an adequate protection device shall be determined at a later date.

### COUPLER ELECTRIC LINE CONNECTOR

Cabling of contacts ; description of contacts and connection sections

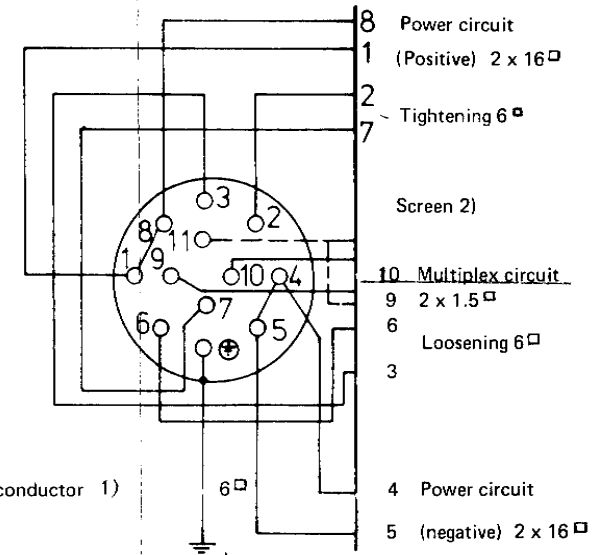
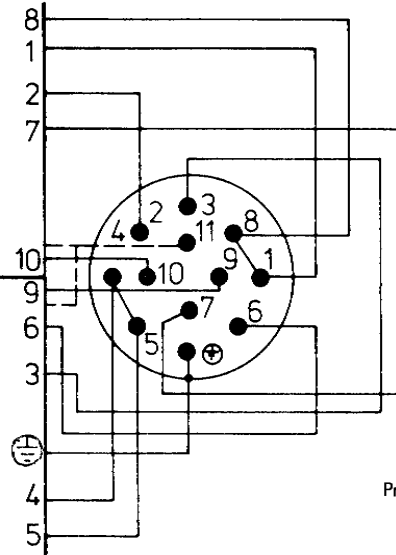
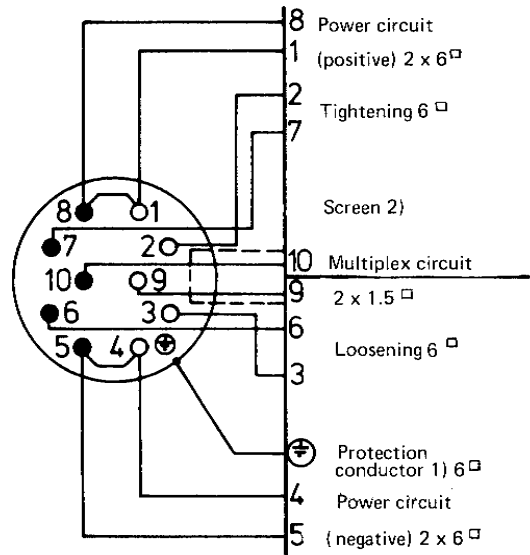
Automatic coupler electric connector insert

Sections of connections for the coupler cable

Plug for connection to the vehicle head stock

Junction box on the vehicle head stock

Sections of connections for the train cable



Protection conductor 1)

Position of the protection contact : 6<sup>h</sup> or towards the middle of the vehicle

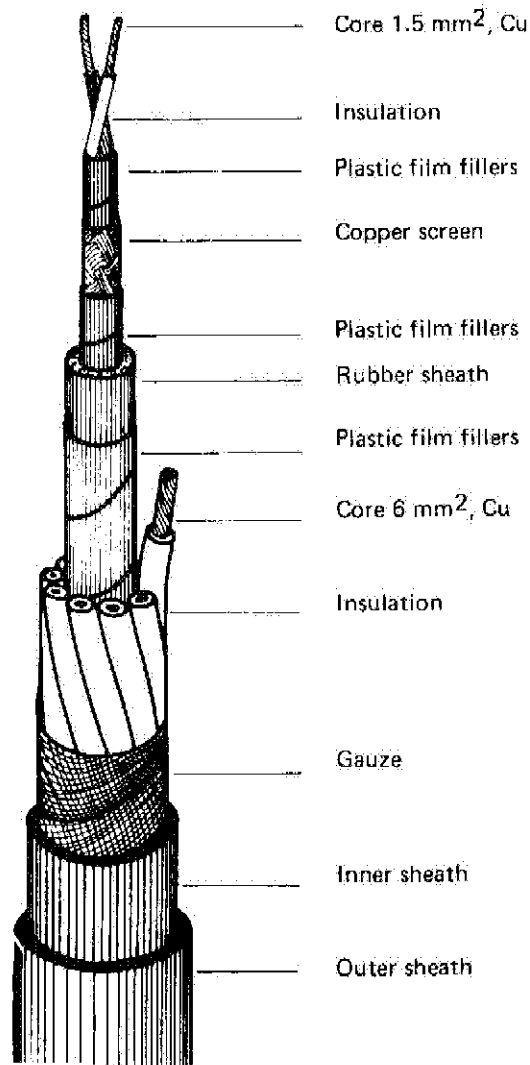
- (1) The metal parts of the electric connector insert and the plug connection must be earthed at each end of the vehicle
- (2) The screen must be earthed at one single point on the vehicle
- Plug contacts
- Socket contacts



COUPLER ELECTRIC LINE CONNECTOR

Structure of the coupler cable 9 x 6 (J) + 2 x 1.5 (C) mm

Practical example



APPLICATION

With effect from 1 July 1981.

All European Railways in the Union.

RECORD REFERENCES

*Headings under which the question has been dealt with :*

*Question 5/T/43 : Automatic coupling — Joint UIC/OSJD leaflet on dimensions for brake hose connections and electric cables, on types of air and electric connections and their positioning on wagons equipped with automatic couplers. (Traction and Rolling Stock Committee : Edinburg, June 1975).*

*Question 5/U/FIC : Revision of Leaflet 541-2 in accordance with proposals made by the UIC/OSJD Technical Working Party «Automatic Coupler». (Sub-Committee for Buffing and Draw Gear : Paris, January 1981). Jan 82*

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*- Question 45/B/FIC - Revision of Leaflet 541-2 in the light of proposals submitted by the UIC/OSJD Technical Working Party for Automatic Coupling. (Joint Sub-Committee for Wagons, Paris, September 1985).*