

No. 4789. AGREEMENT CONCERNING THE ADOPTION OF UNIFORM CONDITIONS OF APPROVAL AND RECIPROCAL RECOGNITION OF APPROVAL FOR MOTOR VEHICLE EQUIPMENT AND PARTS. DONE AT GENEVA ON 20 MARCH 1958¹

ENTRY INTO FORCE of Regulation No. 44 (*Uniform provisions concerning the approval of restraining devices for child occupants of power-driven vehicles ("child restraints")*) as an annex to the above-mentioned Agreement of 20 March 1958

The said Regulation came into force on 1 February 1981 in respect of the Netherlands and the United Kingdom of Great Britain and Northern Ireland, in accordance with article 1 (5) of the Agreement.

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¹ United Nations, *Treaty Series*, vol. 335, p. 211; for subsequent actions, see references in Cumulative Indexes Nos. 4 to 14, as well as annex A in volumes 915, 917, 926, 932, 940, 943, 945, 950, 951, 955, 958, 960, 961, 963, 966, 973, 974, 978, 981, 982, 985, 986, 993, 995, 997, 1003, 1006, 1010, 1015, 1019, 1020, 1021, 1024, 1026, 1031, 1035, 1037 to 1040, 1046, 1048, 1050, 1051, 1055, 1059, 1060, 1065, 1066, 1073, 1078, 1079, 1088, 1092, 1095, 1097, 1098, 1106, 1110 to 1112, 1122, 1126, 1130, 1135, 1136, 1138, 1139, 1143 to 1147, 1150, 1153, 1156, 1157, 1162, 1177, 1181, 1196 to 1199, 1205 and 1211.

Regulation No. 44

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF RESTRAINING DEVICES FOR CHILD OCCUPANTS OF POWER-DRIVEN VEHICLES (“CHILD RESTRAINTS”)

1. SCOPE

- 1.1. This Regulation applies to child restraints which are suitable for installation in power-driven vehicles having three or more wheels and meeting the requirements of Regulation No. 14, *Safety Belt Anchorages on Passenger Cars*, and Regulation No. 17, *Strength of the Seats and of their Anchorages*, and which are not intended for use with folding (tip-up) seats or with side-facing or rearward-facing seats.

2. DEFINITIONS

For the purpose of this Regulation:

- 2.1. “*Child restraint*” means an arrangement of components which may comprise a combination of straps or flexible components with a securing buckle, adjusting devices, attachments, and in some cases a supplementary chair and/or an impact shield, capable of being anchored to a power-driven vehicle. It is so designed as to diminish the risk of injury to the wearer, in the event of a collision or of abrupt deceleration of the vehicle, by limiting the mobility of the wearer’s body;
- 2.1.1. Child restraints fall into three “*mass groups*”:
- 2.1.1.1. Group I for children of mass from 9 kg to 18 kg;
- 2.1.1.2. Group II for children of mass from 15 kg to 25 kg;
- 2.1.1.3. Group III for children of mass from 22 kg to 36 kg;
- 2.1.2. Child restraints fall into three “*categories*”:
- 2.1.2.1. A “*universal*” category for use on all types of vehicle;
- 2.1.2.2. A “*semi-universal*” category for use on certain specified types of vehicle;
- 2.1.2.3. A “*specific-vehicle*” category for use on one single type of vehicle;
- 2.2. “*Child-safety chair*” means a child restraint incorporating a chair in which the child is held;
- 2.3. “*Belt*” means a child restraint comprising a combination of straps with a securing buckle, adjusting devices and attachments;
- 2.4. “*Chair*” means a structure which is a constituent part of the child restraint and is intended to accommodate a child in a seated position;
- 2.5. “*Chair support*” means that part of a child restraint by which the chair can be raised;
- 2.6. “*Child support*” means that part of a child restraint by which the child can be raised within the child restraint;
- 2.7. “*Impact shield*” means a device secured in front of the child and designed to distribute the restraining forces over the greater part of the height of the child’s body in the event of a frontal impact;
- 2.8. “*Strap*” means a flexible component designed to transmit forces;
- 2.8.1. “*Lap strap*” means a strap which, either in the form of a complete belt or in the form of a component of such a belt, passes across the front of, and restrains, the child’s pelvic region;
- 2.8.2. “*Shoulder restraint*” means that part of a belt which restrains the child’s upper torso;
- 2.8.3. “*Crotch strap*” means a strap which is attached to the child restraint and is so positioned as to pass between the child’s thighs; it is designed to prevent upward movement of the lap strap in normal use;

- 2.8.4. “*Child-restraining strap*” means a strap which is a constituent part of the belt and restrains only the body of the child;
- 2.8.5. “*Child-restraint attachment strap*” means a strap which attaches the child restraint to the structure of the vehicle and may be a part of the vehicle-seat retaining device;
- 2.9. “*Buckle*” means a quick release device which enables the child to be held by the restraint and can be quickly opened. The buckle may incorporate the adjusting device;
- 2.10. “*Adjusting device*” means a device enabling the restraint or its attachments to be adjusted to the physique of the wearer, the configuration of the vehicle, or both. The adjusting device may be a constituent part of the buckle or of the attachments or be a retractor;
- 2.10.1. “*Quick adjuster*” means an adjusting device which can be operated by one hand in one smooth movement;
- 2.11. “*Attachments*” means parts of the child restraint, including securing components, which enable the child restraint to be firmly secured to the vehicle structure either directly or through the vehicle seat;
- 2.12. “*Energy absorber*” means a device which is designed to dissipate energy independently of or jointly with the strap and forms part of a child restraint;
- 2.13. “*Retractor*” means a device designed to accommodate a part or the whole of the strap of a child restraint. The term covers the following devices:
 - 2.13.1. *An automatically-locking retractor*, a retractor which allows extraction of the desired length of a strap and, when the buckle is fastened, automatically adjusts the strap to the wearer’s physique, further extraction of the strap without voluntary intervention by the wearer being prevented;
 - 2.13.2. *An emergency-locking retractor*, a retractor which does not restrict the belt wearer’s freedom of movement in normal driving conditions. Such a device has length-adjusting devices which automatically adjust the strap to the wearer’s physique, and a locking mechanism actuated in an emergency by:
 - 2.13.2.1. Deceleration of the vehicle, extraction of the strap from the retractor, or any other automatic means (single sensitivity); or
 - 2.13.2.2. A combination of any of these means (multiple sensitivity);
- 2.14. “*Restraint anchorages*” means those parts of the vehicle structure or seat structure to which the child-restraint attachments are secured;
- 2.14.1. “*Additional anchorage*” means a part of the vehicle structure or of the seat structure, or any other part of the vehicle, to which a child restraint is intended to be secured and which is additional to the anchorages approved under Regulation No. 14;
- 2.15. “*Forward-facing*” means facing in the normal direction of travel of the vehicle;
- 2.16. “*Rearward-facing*” means facing in the direction opposite to the normal direction of travel of the vehicle;
- 2.17. “*Inclined position*” means a special position of the chair which allows the child to recline;
- 2.18. “*Child-restraint type*” means child restraints which do not differ in such essential respects as:
 - 2.18.1. The category, and the mass group(s) for which and the position and orientation (as defined in paragraphs 2.15 and 2.16) in which the restraint is intended to be used;
 - 2.18.2. The geometry of the child restraint;

- 2.18.3. The dimensions, mass, material and colour of: the seat;
the padding; and
the impact shield;
- 2.18.4. The material, weave, dimensions and colour of the straps;
- 2.18.5. The rigid components (buckle, attachments, etc.);
- 2.19. “*Vehicle seat*” means a structure, which may or may not be integral with the vehicle structure, complete with trim and intended to seat one adult person. In this connexion,
- 2.19.1. “*Group of vehicle seats*” means either a bench seat or a plurality of seats which are separate but side by side (i.e., so fixed that the front anchorages of one seat are in line with the front or rear anchorages of another seat or on a line passing between those anchorages), each seat accommodating one or more seated adult persons;
- 2.19.2. “*Vehicle bench seat*” means a structure complete with trim and intended to seat more than one adult person;
- 2.19.3. “*Vehicle front seats*” means the group of seats situated foremost in the passenger compartment, i.e., having no other seat directly in front of them;
- 2.19.4. “*Vehicle rear seats*” are fixed, forward-facing seats situated behind another group of vehicle seats;
- 2.20. “*Adjustment system*” means the complete device by which the vehicle seat or its parts can be adjusted to suit the physique of the seat’s adult occupant; this device may, in particular, permit:
- 2.20.1. Longitudinal displacement, and/or
- 2.20.2. Vertical displacement, and/or
- 2.20.3. Angular displacement;
- 2.21. “*Vehicle seat anchorage*” means the system, including the affected parts of the vehicle structure, by which the adult seat as a whole is secured to the vehicle structure;
- 2.22. “*Seat type*” means a category of adult seats which do not differ in such essential respects as:
- 2.22.1. The shape, dimensions and materials of the seat structure,
- 2.22.2. The types and dimensions of the seat-lock adjustment and locking systems, and
- 2.22.3. The type and dimensions of the adult safety-belt anchorage on the seat, of the seat anchorage, and of the affected parts of the vehicle structure;
- 2.23. “*Displacement system*” means a device enabling the adult seat or one of its parts to be displaced angularly or longitudinally, without a fixed intermediate position, to facilitate the entry and exit of passengers and the loading and unloading of objects;
- 2.24. “*Locking system*” means a device ensuring that the adult seat and its parts are maintained in the position of use.
3. APPLICATION FOR APPROVAL
- 3.1. The application for approval of a type of child restraint shall be submitted by the holder of the trade mark or by his duly accredited representative.
- 3.2. The application for approval, relating to each type of child restraint, shall be accompanied by:
- 3.2.1. A technical description of the child restraint, specifying the straps and other materials used, and accompanied by drawings of the parts making up the child restraint and in the case of retractors, instructions for the sensing device; the

- drawing must show the position intended for the approval number and additional symbol(s) in relation to the circle of the approval mark. The description shall mention the colour of the model submitted for approval,
- 3.2.2. Four samples of the child restraint,
 - 3.2.3. A 10-metre length of each category of strap used in the child restraint, except the crotch strap (two metres only), and
 - 3.2.4. Additional samples shall be supplied at the request of the technical service responsible for conducting the test,
 - 3.2.5. Instructions in accordance with paragraph 14 below.
- 3.3. Where an approved adult safety belt is used to secure the child restraint, the application must stipulate the category of adult safety belt to be used, e.g., static lap belts.
 - 3.4. The technical service responsible for conducting the test may require a suitable adult safety belt to be supplied with the child restraint for which approval is being sought.
4. MARKINGS
 - 4.1. The samples of child restraint submitted for approval in conformity with the provisions of paragraphs 3.2.2 and 3.2.3 above shall be clearly and indelibly marked with the manufacturer's name, initials or trade mark.
5. APPROVAL
 - 5.1. Each sample submitted in conformity with paragraphs 3.2.2 and 3.2.3 above shall meet the specifications set forth in paragraphs 6 to 8 of this Regulation in every respect before approval can be granted.
 - 5.2. An approval number shall be assigned to each child restraint approved. Its first two digits shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party may not assign the same number to another type of child restraint covered by this Regulation.
 - 5.3. Notice of approval or of refusal of approval of a child restraint pursuant to this Regulation shall be communicated to the Parties to the Agreement which apply this Regulation by means of a form conforming to the model in annex 1 to this Regulation and of a drawing of the restraint, supplied by the applicant for approval, in a format not exceeding A4 (210 × 297 mm) or folded to that format and on an appropriate scale.
 - 5.4. In addition to the marks prescribed in paragraph 4 above, the following particulars shall be affixed in a suitable space to every child restraint conforming to a type approved under this Regulation:
 - 5.4.1. An international approval mark consisting of:
 - 5.4.1.1. A circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval;*
 - 5.4.1.2. An approval number;
 - 5.4.2. The following additional symbols:
 - 5.4.2.1. The word "universal" for the universal category, and "non-universal" for the other categories;

* 1 for the Federal Republic of Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for Czechoslovakia, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 for the German Democratic Republic, 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland and 21 for Portugal. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, or in which they accede to the Agreement, and the number thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

- 5.4.2.2. The mass range for which the child restraint has been designed, namely: 9-18 kg; 15-25 kg; 22-36 kg; 9-25 kg; 15-36 kg; 9-36 kg.
- 5.5. Annex 2 to this Regulation gives an example of the arrangement of the approval mark.
- 5.6. The particulars referred to in paragraph 5.4 above shall be clearly legible and be indelible, and may be affixed either by means of a label or by direct marking. The label or marking shall be resistant to wear.
- 5.7. The labels referred to in paragraph 5.6 above may be issued either by the authority which has granted the approval or, subject to that authority's authorization, by the manufacturer.

6. GENERAL SPECIFICATIONS

6.1. *Positioning and securing on the vehicle*

- 6.1.1. The use of child restraints of the “universal” and “specific-vehicle” categories is permitted in front and rear seating positions if the restraints are fitted in conformity with the manufacturer's instructions.
- 6.1.2. The use of child restraints of the “semi-universal” category is permitted as prescribed in paragraphs 6.1.2.1 and 6.1.2.2 below:
 - 6.1.2.1. In the case of forward-facing devices, in the rear adult-seating positions;
 - 6.1.2.2. In the case of rearward-facing devices, in the front adult-seating positions.
- 6.1.3. According to the category which it belongs to, the child restraint shall be secured to the vehicle structure or to the seat structure.
 - 6.1.3.1. For the “universal” category: only by means of the anchorages prescribed in Regulation No. 14;
 - 6.1.3.2. For the “semi-universal” category: by means of the lower anchorages prescribed in Regulation No. 14 and additional anchorages meeting the recommendation of annex 11 to this Regulation;
 - 6.1.3.3. For the “specific vehicle” category: by means of the anchorages designed by the manufacturer of the vehicle or the manufacturer of the child restraint.
- 6.1.4. The child restraint may itself be restrained by an adult seat belt with or without a retractor, but such adult seat belt shall meet the requirements of ECE Regulation No. 16 or of any equivalent standard in force.

6.2. *Configuration*

- 6.2.1. The configuration of the restraint shall be such that
 - 6.2.1.1. During normal movement of the vehicle the child, whether awake or asleep, is in a comfortable position and kept so positioned as to derive the maximum benefit from the protection afforded by the restraint in the event of a collision;
 - 6.2.1.2. The child is easily and quickly installed and removed;
 - 6.2.1.3. Setting of the restraint in the inclined position, if possible, can be performed without readjusting the straps.
- 6.2.2. All restraint devices must support the pelvis in the event of collision.
- 6.2.3. All straps of the restraint shall be so placed that they cannot cause discomfort to the wearer in normal use or assume a dangerous configuration.
- 6.2.4. The assembly shall not subject weak parts of the child's body (abdomen, crotch, etc.) to excessive stresses.
- 6.2.5. The child restraint shall be so designed and installed as:
 - 6.2.5.1. To minimize the danger of injury to the child or to other occupants of the vehicle through sharp edges or protrusions (as defined in Regulation No. 21, for example);
 - 6.2.5.2. Not to exhibit sharp edges or protrusions liable to cause damage to vehicle-seat covers or to occupants' clothing;

- 6.2.5.3. Not to subject weak parts of the child's body (abdomen, crotch, etc.) to supplementary inertial forces it sets up;
 - 6.2.5.4. To ensure that its rigid parts do not, at points where they are in contact with straps, exhibit sharp edges capable of abrading the straps.
 - 6.2.6. Any part made separable to enable components to be fixed and detached shall be so designed as to avoid any risk of incorrect assembly and use so far as possible.
 - 6.2.7. Where a child restraint intended for groups I and II includes a chair back, the internal height of the latter, determined in accordance with the diagram in annex 12, shall be not less than 500 mm.
 - 6.2.8. Only automatically-locking retractors or emergency-locking retractors may be used.
 - 6.2.9. For devices intended for use in group I, that part of a restraint which restrains the pelvis shall not be connected to a retractor.
 - 6.2.10. A child restraint may be designed for use in more than one weight group, provided that it is able to satisfy the requirements laid down for each of the groups concerned.
7. PARTICULAR SPECIFICATIONS
 - 7.1. *Provisions applicable to the assembled restraint*
 - 7.1.1. *Resistance to corrosion*
 - 7.1.1.1. A complete child restraint, or the parts thereof that are liable to corrosion, shall be subject to the corrosion test specified in paragraph 8.1.1 below.
 - 7.1.1.2. After the corrosion test as prescribed in paragraphs 8.1.1.1 and 8.1.1.2, no signs of deterioration likely to impair the proper functioning of the child restraint, and no significant corrosion, shall be visible to the unaided eye of a qualified observer.
 - 7.1.2. *Energy absorption*
 - 7.1.2.1. All surfaces liable to be impacted by the head or face shall be covered as a minimum with material in conformity with the energy absorbing requirements of annex 4 of Regulation No. 21.
 - 7.1.3. *Overturning*
 - 7.1.3.1. The child restraint shall be tested as prescribed in paragraph 8.1.2; the manikin shall not fall out of the device and, when the test seat is in the upside down position the manikin's head shall not move more than 300 mm from its original position in a vertical direction relative to the test seat.
 - 7.1.4. *Dynamic test*
 - 7.1.4.1. *General.* The child restraint shall be subjected to a dynamic test in conformity with paragraph 8.1.3 below.
 - 7.1.4.1.1. Child restraints of the "universal" and "semi-universal" categories shall be tested on the test trolley by means of the test seat prescribed in annex 6, and in conformity with paragraph 8.1.3.1.
 - 7.1.4.1.2. Child restraints of the "specific vehicle" category shall be tested either in a vehicle body shell on the test trolley, as prescribed in paragraph 8.1.3.2 below, or on a complete vehicle, as prescribed in paragraph 8.1.3.3.
 - 7.1.4.1.3. The dynamic test shall be performed on child restraints which have not previously been under load.
 - 7.1.4.1.4. During the dynamic tests, no part of the child restraint actually helping to keep the child in position shall break, and no buckles or locking system or displacement system shall release.
 - 7.1.4.2. *Chest acceleration*
 - 7.1.4.2.1. The resultant chest acceleration shall not exceed 50 g except during periods whose sum does not exceed 3 ms.

7.1.4.2.2. The vertical component of the acceleration from the abdomen towards the head shall not exceed 30 g except during periods whose sum does not exceed 3 ms.

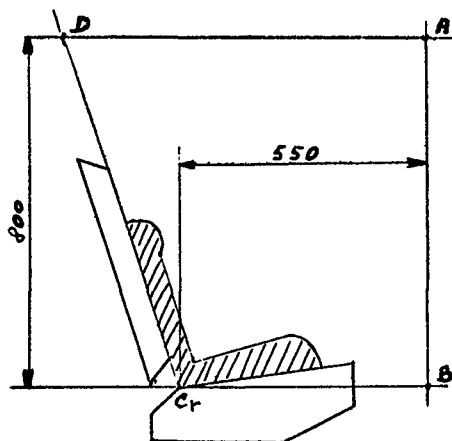
7.1.4.3. *Abdominal penetration*

7.1.4.3.1. During the verification described in annex 8, paragraph 5.3, there shall be no visible signs of penetration of the modelling clay of the abdomen caused by any part of the restraining device.

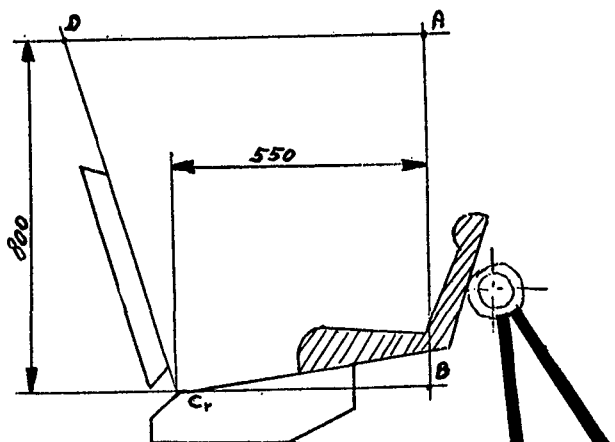
7.1.4.4. *Head displacement*

7.1.4.4.1. Child restraints of the “universal” and “semi-universal” categories:

7.1.4.4.1.1. *Forward-facing devices*: the head of the manikin shall not pass beyond the planes BA and DA, as defined in the figure below:



7.1.4.4.1.2. *Rearward-facing devices*: the head of the manikin shall not pass beyond the planes AD and DCr, as defined in the figure below:



- 7.1.4.4.2. Child restraints of the “specific vehicle” category: when tested in a complete vehicle or a vehicle body shell, the head shall not come into contact with any part of the vehicle. However, if there is contact, the speed of impact of the head shall be less than 24 km/h and the part contacted shall meet the requirements of the energy absorption test laid down in Regulation No. 21, annex 4.
- 7.2. *Provisions applicable to individual components of the restraint*
- 7.2.1. *Buckle*
- 7.2.1.1. The buckle shall be so designed as to preclude any possibility of incorrect manipulation. This means, *inter alia*, that it must not be possible for the buckle to be left in a partially-closed position. Wherever the buckle is in contact with the child, it shall not be narrower than the minimum width of strap as specified in paragraph 7.2.4.1.1 below.
- 7.2.1.2. The buckle, even when not under tension, shall remain closed whatever its position. It shall be easy to operate and to grasp. It shall be possible to open it by pressure on a button or on a similar device. The surface to which the opening pressure is applied shall, in the position of unlocking, have
- 7.2.1.2.1. In enclosed devices an area of not less than 4.5 cm² and a width of not less than 15 mm; and
- 7.2.1.2.2. In non-enclosed devices an area of not less than 2.5 cm² and a width of not less than 10 mm.
- 7.2.1.3. The buckle release area shall be coloured red; no other part of the buckle shall be of this colour.
- 7.2.1.4. It shall be possible to release the child from the restraint by a single operation on a single buckle.
- 7.2.1.5. For groups II and III the buckle shall be so placed that the child occupant can reach it. In addition it shall for all groups be so placed that its purpose and mode of operation are immediately obvious to a rescuer in an emergency.
- 7.2.1.6. Opening of the buckle shall enable the child to be removed independently of the “chair”, “chair support” or “impact shield”, if fitted, and if the device includes a crotch strap the crotch strap shall be released by operation of the same buckle.
- 7.2.1.7. The buckle shall be capable of withstanding repeated operation and shall, before the dynamic test prescribed in paragraph 8.1.3 undergo a test comprising 500 opening and closing cycles. The buckle activating springs shall in addition be operated 4,500 times in normal conditions of use.
- 7.2.1.8. The buckle shall be subjected to the following tests of opening:
- 7.2.1.8.1. Test under load
- 7.2.1.8.1.1. A child restraint having already undergone the dynamic test prescribed in paragraph 8.1.3 below shall be used for this test.
- 7.2.1.8.1.2. The force required to open the buckle in the test prescribed in paragraph 8.2.1.1 below shall not exceed 60 N.
- 7.2.1.8.2. No-load test
- 7.2.1.8.2.1. A buckle which has not previously been subjected to a load shall be used for this test. The force needed to open the buckle when it is not under load shall be not less than 10 N in the tests prescribed in paragraph 8.2.1.2 below.
- 7.2.2. *Adjusting device*
- 7.2.2.1. The range of adjustment shall be sufficient to permit correct adjustment of the child restraint throughout the weight group for which the device is intended and to permit satisfactory installation in all specified vehicle models.

- 7.2.2.2. All adjusting devices shall be of the “quick adjuster” type, except that adjusting devices used only for the initial installation of the restraint in the vehicle may be of other than the “quick adjuster” type.
- 7.2.2.3. Devices of the “quick adjuster” type shall be easy to reach when the child restraint is correctly installed and the child or manikin is in position.
- 7.2.2.4. A device of the “quick adjuster” type shall be easily adjustable to the child’s physique. In particular, in a test performed in accordance with paragraph 8.2.2.1, the force required to operate a manual adjusting device shall not exceed 50 N.
- 7.2.2.5. Two samples of the child-restraint adjusting devices shall be tested as prescribed in paragraph 8.2.3 below.
- 7.2.2.5.1. The amount of strap slip shall not exceed 25 mm for one adjusting device or 40 mm for all adjusting devices.
- 7.2.2.6. The device must not break or become detached when tested as prescribed in paragraph 8.2.2.1 below.
- 7.2.3. *Retractors*
 - 7.2.3.1. Automatically-locking retractors
 - 7.2.3.1.1. The strap of a safety belt equipped with an automatically-locking retractor shall not unwind by more than 30 mm between locking positions of the retractor. After a rearward movement of the wearer the belt must either remain in its initial position or return to that position automatically on subsequent forward movement of the wearer.
 - 7.2.3.1.2. If the retractor is part of a lap belt, the retracting force of the strap shall be not less than 7 N as measured in the free length between the manikin and the retractor as prescribed in paragraph 8.2.4.1 below. If the retractor is part of a chest restraint, the retracting force of the strap shall be not less than 2 N or more than 7 N as similarly measured. If the strap passes through a guide or pulley, the retracting force shall be measured in the free length between the manikin and the guide or pulley. If the assembly incorporates a device, manually or automatically operated, that prevents the strap from being completely retracted, that device shall not be in operation when these measurements are effected.
 - 7.2.3.1.3. The strap shall be repeatedly withdrawn from the retractor and allowed to retract, in the conditions prescribed in paragraph 8.2.4.2 below, until 5,000 cycles have been completed. The retractor shall then be subjected to the corrosion test described in paragraph 8.1.1 and to the dust-resistance test described in paragraph 8.2.4.5. It shall then satisfactorily complete a further 5,000 cycles of withdrawal and retraction. After the above tests the retractor shall continue to operate correctly and to meet the requirements of paragraphs 7.2.3.1.1 and 7.2.3.1.2 above.
 - 7.2.3.2. Emergency-locking retractors
 - 7.2.3.2.1. An emergency-locking retractor shall when tested as prescribed in paragraph 8.2.4.3 satisfy the conditions below:
 - 7.2.3.2.1.1. It shall be locked when the deceleration of the vehicle reaches 0.45 g.
 - 7.2.3.2.1.2. It shall not lock for strap accelerations of less than 0.8 g as measured in the axis of strap extraction.
 - 7.2.3.2.1.3. It shall not lock when its sensing device is tilted by not more than 12° in any direction from the installation position specified by its manufacturer.
 - 7.2.3.2.1.4. It shall lock when its sensing device is tilted by more than 27° in any direction from the installation position specified by its manufacturer.

- 7.2.3.2.2. Where the operation of a retractor depends on an external signal or power source, the design shall ensure that the retractor locks automatically upon failure or interruption of that signal or power source.
- 7.2.3.2.3. A multiple-sensitivity emergency-locking retractor shall meet the requirements set out above. In addition, if one of the sensitivity factors relates to strap extraction, locking must have occurred at a strap acceleration of 1.5 g as measured in the axis of strap extraction.
- 7.2.3.2.4. In the tests referred to in paragraphs 7.2.3.2.1.1 and 7.2.3.2.3 above, the amount of strap extraction occurring before the retractor locks shall not exceed 50 mm, starting at the length of unwinding specified in paragraph 8.2.4.3.1. In the test referred to in paragraph 7.2.3.2.1.2 above, locking shall not occur during the 50 mm of strap extraction starting at the length of unwinding specified in paragraph 8.2.4.3.1 below.
- 7.2.3.2.5. If the retractor is part of a lap belt, the retracting force of the strap shall be not less than 7 N as measured in the free length between the manikin and the retractor as prescribed in paragraph 8.2.4.1. If the retractor is part of a chest restraint, the retracting force of the strap shall be not less than 2 N or more than 7 N as similarly measured. If the strap passes through a guide or pulley, the retracting force shall be measured in the free length between the manikin and the guide or pulley. If the assembly incorporates a device, manually or automatically operated, that prevents the strap from being completely retracted, that device shall not be in operation when these measurements are effected.
- 7.2.3.2.6. The strap shall be repeatedly withdrawn from the retractor and allowed to retract, in the conditions prescribed in paragraph 8.2.4.2, until 40,000 cycles have been completed. The retractor shall then be subjected to the corrosion test described in paragraph 8.1.1 and to the dust-resistance test described in paragraph 8.2.4.5. It shall then satisfactorily complete a further 5,000 cycles of withdrawal and retraction (making 45,000 in all). After the above tests the retractor shall continue to operate correctly and to meet the requirements of paragraphs 7.2.3.2.1 to 7.2.3.2.5 above.

7.2.4. *Straps*

7.2.4.1. Width

- 7.2.4.1.1. The minimum width of the child-restraint straps shall be 25 mm for group I and 38 mm for groups II and III. These dimensions shall be measured during the strap strength test prescribed in paragraph 8.2.5.1, without stopping the machine and under a load equal to 75 per cent of the breaking load of the strap.

7.2.4.2. Strength after room conditioning

- 7.2.4.2.1. On two sample straps conditioned as prescribed in paragraph 8.2.5.2.1, the breaking load of the strap shall be determined as prescribed in paragraph 8.2.5.1.2 below.
- 7.2.4.2.2. The difference between the breaking loads of the two samples shall not exceed 10 per cent of the greater of the two breaking loads measured.

7.2.4.3. Strength after special conditioning

- 7.2.4.3.1. On two straps conditioned as prescribed in one of the provisions of paragraph 8.2.5.2 (except paragraph 8.2.5.2.1), the breaking load of the strap shall be not less than 75 percent of the average of the loads determined in the test referred to in paragraph 8.2.5.1 below.
- 7.2.4.3.2. In addition, the breaking load shall be not less than 3.6 kN for restraints of group I, 5 kN for those of group II, and 7.2 kN for those of group III.

- 7.2.4.3.3. The competent authority may dispense with one or more of these tests if the composition of the material used, or information already available, renders the test or tests superfluous.
- 7.2.4.3.4. The abrasion conditioning test of type 1 defined in paragraph 8.2.5.2.6 shall only be performed when the microslip test defined in paragraph 8.2.3 below gives a result above 50 percent of the limit prescribed in paragraph 7.2.2.5.1 above.
- 7.2.4.4. The child restraint shall be so designed that the crotch strap, if any, is not required to withstand significant stresses in the normal functioning of the restraint in an accident.
- 7.2.4.5. The crotch strap shall break or disconnect from its fitting at a static load of not more than 50 N applied in the longitudinal direction of the straps.
- 7.2.4.6. Below the breaking load the crotch strap may elongate either as a result of stretch of the webbing or because the fitting of the strap to the chair is designed to provide an extra length of webbing, provided that the permanent static tension so generated does not exceed 6 N as measured in the longitudinal direction of the straps.
8. DESCRIPTION OF TESTS
- 8.1. *Tests of the assembled restraint*
- 8.1.1. *Corrosion*
- 8.1.1.1. The metal items of the child restraint shall be positioned in a test chamber as prescribed in annex 4. In the case of a child restraint incorporating a retractor, the strap shall be unwound to full length less 100 ± 3 mm. Except for short interruptions that may be necessary, for example, to check and replenish the salt solution, the exposure test shall proceed continuously for a period of 50 hours.
- 8.1.1.2. On completion of the exposure test the metal items of the child restraint shall be gently washed, or dipped, in clean running water with a temperature not higher than 38°C to remove any salt deposit that may have formed and then allowed to dry at room temperature for 24 hours before inspection in accordance with paragraph 7.1.1.2 above.
- 8.1.2. *Overturning*
- 8.1.2.1. The manikin shall be placed in the restraints installed in accordance with the manufacturer's instructions and with the standard slack as specified in paragraph 8.1.3.5.3 below.
- 8.1.2.2. The restraint shall be fastened to the test seat or vehicle seat. The whole seat shall be rotated around a horizontal axis contained in the median longitudinal plane of the seat through an angle of 360° at a speed of 2-5 degrees/second. For the purposes of this test, devices intended for use in specific cars may be attached to the test seat described in annex 6.
- 8.1.2.3. This test shall be carried out again rotating in the reverse direction after having replaced, if necessary, the manikin in its initial position. With the rotational axis in the horizontal plane and at 90° to that of the two earlier tests, the procedure shall be repeated in the two directions of rotation.
- 8.1.2.4. These tests shall be carried out using both the smallest and the largest appropriate manikin of the group or groups for which the restraining device is intended.
- 8.1.3. *Dynamic tests*
- 8.1.3.1. Tests on the trolley and test seat
- 8.1.3.1.1. Forward-facing
- 8.1.3.1.1.1. The trolley and test seat used in the dynamic test shall meet the requirements of annex 6.

8.1.3.1.1.2. The trolley shall remain horizontal throughout deceleration.

8.1.3.1.1.3. The deceleration of the trolley shall be achieved by using the apparatus prescribed in annex 6 to this Regulation or any other device giving equivalent results. This apparatus shall be capable of the performance specified in paragraph 8.1.3.4 and annex 7 of this Regulation.

8.1.3.1.1.4. The following measurements shall be made:

8.1.3.1.1.4.1. The trolley speed immediately before impact;

8.1.3.1.1.4.2. The stopping distance;

8.1.3.1.1.4.3. The displacement of the manikin's head in the vertical and horizontal planes;

8.1.3.1.1.4.4. The chest acceleration in three mutually perpendicular directions;

8.1.3.1.1.4.5. Any visible signs of penetration of the modelling clay in the abdomen (see paragraph 7.1.4.3.1).

8.1.3.1.1.5. The tests shall be filmed at a frequency of at least 500 f/sec.

8.1.3.1.1.6. After impact, the child restraint shall be inspected visually, without opening the buckle, to determine whether there has been any failure or breakage.

8.1.3.1.2. Rearward-facing

8.1.3.1.2.1. The test seat shall be rotated 180° when testing in compliance with the requirements of the rear impact test.

8.1.3.1.2.2. When testing a rearward-facing child restraint intended for use in the front seating position, the vehicle fascia shall be represented by a rigid bar attached to the trolley in such a way that all the energy absorption takes place in the child restraint.

8.1.3.1.2.3. The deceleration conditions shall satisfy the requirements of paragraph 8.1.3.4 below.

8.1.3.1.2.4. The measurements to be made shall be similar to those listed in paragraphs 8.1.3.1.1.4 to 8.1.3.1.1.4.5 above.

8.1.3.1.2.5. The tests shall be filmed at a frequency of at least 500 f/sec.

8.1.3.1.2.6. After impact, the child restraint shall be inspected visually without opening the buckle, to determine whether there has been any failure or breakage.

8.1.3.2. Test on trolley and vehicle body shell

8.1.3.2.1. Forward-facing

8.1.3.2.1.1. The method used to secure the vehicle during the test shall not be such as to strengthen the anchorages of the vehicle seats, adult safety belts and any additional anchorages required to secure the child restraint or to lessen the normal deformation of the structure. No part of the vehicle shall be present which, by limiting the movement of the manikin, would reduce the load imposed on the child restraint during the test. The parts of the structure eliminated may be replaced by parts of equivalent strength, provided they do not hinder the movement of the manikin.

8.1.3.2.1.2. A securing device shall be regarded as satisfactory if it produces no effect on an area extending over the whole width of the structure and if the vehicle or structure is blocked or fixed in front at a distance of not less than 500 mm from the anchorage of the restraint system. At the rear the structure shall be secured at a sufficient distance behind the anchorages to ensure that all requirements of paragraph 8.1.3.2.1.1 above are fulfilled.

8.1.3.2.1.3. The vehicle seat and child restraint shall be fitted and shall be placed in a position chosen by the technical service conducting approval tests to give the most adverse conditions in respect of strength, compatible with installing the manikin in the vehicle. The position of the vehicle seat-back and child restraint shall be stated in the report. The vehicle seat-back, if adjustable for inclination, shall be locked as specified by the manufacturer or, in the absence of any specification, at an actual seat-back angle as near as possible to 25°.

- 8.1.3.2.1.4. Unless the instructions for fitting and use require otherwise, the front seat shall be placed in the most forward normally used position for child restraints intended for use in the front seating position, and in the rearmost normally used position for child restraints intended for use in the rear seating position.
- 8.1.3.2.1.5. The deceleration conditions shall satisfy the requirements of paragraph 8.1.3.4 below. The test seat will be the seat of the actual vehicle.
- 8.1.3.2.1.6. The following measurements shall be made:
- 8.1.3.2.1.6.1. The trolley speed immediately before impact;
- 8.1.3.2.1.6.2. The stopping distance;
- 8.1.3.2.1.6.3. Any contact of the manikin's head with the interior of the vehicle body shell;
- 8.1.3.2.1.6.4. The chest deceleration in three mutually perpendicular directions;
- 8.1.3.2.1.6.5. Any visible signs of penetration of the modelling clay in the abdomen (see paragraph 7.1.4.3.1).
- 8.1.3.2.1.7. The tests shall be filmed at a frequency of at least 500 f/sec.
- 8.1.3.2.1.8. After impact, the child restraint shall be inspected visually, without opening the buckle, to determine whether there has been any failure.
- 8.1.3.2.2. Rearward-facing
- 8.1.3.2.2.1. For rear impact tests the vehicle body shall be rotated 180° on the test trolley.
- 8.1.3.2.2.2. Same requirements as for frontal impact.
- 8.1.3.3. Test with complete vehicle
- 8.1.3.3.1. The deceleration conditions shall satisfy the requirements of paragraph 6.1.3.4 below.
- 8.1.3.3.2. For frontal impact tests the procedure shall be that set out in annex 9 to this Regulation.
- 8.1.3.3.3. For rear impact tests the procedure shall be that set out in annex 10 to this Regulation.
- 8.1.3.3.4. The following measurements shall be made:
- 8.1.3.3.4.1. The speed of the vehicle/impactor immediately before impact;
- 8.1.3.3.4.2. Any contact of the manikin's head with the interior of the vehicle;
- 8.1.3.3.4.3. The chest acceleration in three mutually perpendicular directions;
- 8.1.3.3.4.4. Any visible signs of penetration of the modelling clay in the abdomen (see paragraph 7.1.4.3.1).
- 8.1.3.3.5. The tests shall be filmed at a frequency of at least 500 f/sec.
- 8.1.3.3.6. The front seats, if adjustable for inclination, shall be locked as specified by the manufacturer or, in the absence of any specification, at an actual seat-back angle as near as possible to 25°.
- 8.1.3.3.7. After impact, the child restraint shall be inspected visually, without opening the buckle, to determine whether there has been any failure or breakage.
- 8.1.3.4. The conditions for dynamic test are summarized in the table below:

Test	Restraint	Frontal impact			Rearward Impact		
		Speed (km/h)	Test pulse (No.)	Stopping distance during test (mm)	Speed (km/h)	Test pulse (No.)	Stopping distance (mm)
Trolley with test seat	Forward-facing, rear seat*	50 + 0 - 2	1	650 ± 50			
	Rearward-facing, front seat**	50 + 0 - 2	1	650 ± 50	30 + 2 - 0	2	275 ± 25

Test	Restraint	Frontal impact			Rearward Impact		
		Speed (km/h)	Test pulse (No.)	Stopping distance during test (mm)	Speed (km/h)	Test pulse (No.)	Stopping distance (mm)
Vehicle body on trolley	Forward-facing, front and rear seats*	50+0 -2	1	650 ± 50			
	Rearward-facing, front and rear seats**	50+0 -2	1	650 ± 50	30+2 -0	2	275 ± 25
Whole vehicle barrier test	Forward-facing, front and rear seats	50+0 -2	3	not specified			
	Rearward-facing, front and rear seats	50+0 -2	3	not specified	30+2 -0	4	not specified

LEGEND:

Test Pulse No. 1: As prescribed in annex 7 — frontal impact.

Test Pulse No. 2: As prescribed in annex 7 — rear impact.

Test Pulse No. 3: Deceleration pulse of vehicle subjected to frontal impact.

Test Pulse No. 4: Deceleration pulse of vehicle subjected to rear impact.

* During calibration, the stopping distance should be 650 ± 30 mm.

** During calibration, the stopping distance should be 275 ± 20mm.

- 8.1.3.5. Child restraints incorporating the use of additional anchorages
- 8.1.3.5.1. In the case of child restraints intended for use as specified in paragraph 2.1.2.2 and incorporating the use of additional anchorages, the requirement for a frontal impact test, in accordance with paragraph 8.1.3.4, shall be carried out as follows:
- 8.1.3.5.2. For devices with short upper attachment straps, e.g., intended to be attached to the rear parcel shelf, the upper anchorage configuration on the test trolley shall be as prescribed in annex 6, appendix 4.
- 8.1.3.5.3. For devices with long upper attachment straps, e.g., intended for use where there is no rigid parcel shelf and where the upper anchorage straps are attached to the vehicle floor, the anchorages on the test trolley shall be as prescribed in annex 6, appendix 4.
- 8.1.3.5.4. For devices, intended for use in both configurations, the tests prescribed in paragraphs 8.1.3.5.2 and 8.1.3.5.3 shall be carried out with the exception that, in case of the test carried out in accordance with the requirements of paragraph 8.1.3.5.3 above, only the heavier manikin shall be used.
- 8.1.3.5.5. For rearward-facing devices, the lower anchorage of configuration on the test trolley shall be as prescribed in annex 6, appendix 4.
- 8.1.3.6. Test manikins
- 8.1.3.6.1. The child restraint and manikins shall be installed in such a way that the requirements of paragraph 8.1.3.6.3.1 are met.
- 8.1.3.6.2. Installation of the manikin
- 8.1.3.6.3. The child restraint shall be tested using the manikins prescribed in annex 8 to this Regulation.
- 8.1.3.6.3.1. For frontal impact with forward-facing devices and rear impact with rear-facing devices the manikin shall be placed in such a way that the gap is between the front of the manikin and the restraint; for forward impact with rear-facing devices

the manikin shall be placed so that the gap is between the rear of the manikin and the restraint.

8.1.3.6.3.2. Child restraint without a chair

- Place the manikin in the vehicle seat or test seat,
- Place a board 2.5 cm thick and 10 cm wide between the back of the manikin and the back rest of the vehicle seat or test seat,
- Adjust the belt in such a way that the compression of the vehicle seat or test seat cushion is not more than 1 cm,
- Remove the board.

8.1.3.6.3.3. Child restraint with a separately anchored chair

- Place the child chair on the vehicle seat and fasten the chair in such a way that the compression of the vehicle seat or test seat cushion is not more than 1 cm,
- Place the manikin in the child chair,
- Place a board 2.5 cm thick and 10 cm wide between the back of the manikin and the back of the child chair,
- Adjust the belt firmly to the manikin,
- Remove the board.

8.1.3.7. Category of manikin to be used

8.1.3.7.1. Group I device: Tests using a manikin of mass 9 kg and 15 kg respectively.

8.1.3.7.2. Group II device: Tests using a manikin of mass 15 kg and 22 kg respectively.

8.1.3.7.3. Group III device: Tests using a manikin of mass 22 kg and 32 kg respectively.

8.1.3.7.4. If the restraining device is suitable for two or more mass groups, the tests shall be carried out using the lightest and heaviest manikins specified above for all the groups concerned. However, if the configuration of the device alters considerably from one group to the next, the laboratory conducting the tests may, if it deems it advisable, add a test with a manikin of intermediate weight.

8.2. *Tests of individual components*

8.2.1. *Buckle*

8.2.1.1. Opening test under load

8.2.1.1.1. A child restraint already having been subjected to the dynamic test specified in paragraph 8.1.3 shall be used for this test.

8.2.1.1.2. The child restraint shall be removed from the test trolley or the vehicle without opening the buckle. A tension of 200 N shall be applied to the buckle. If the buckle is attached to a rigid part, the force shall be applied reproducing the angle formed between the buckle and that rigid part during the dynamic test.

8.2.1.1.3. A normal force shall be applied at a speed of 400 ± 20 mm/min at the geometric centre of the button operating the buckle release. The buckle shall be secured against a rigid support during the application of the opening force.

8.2.1.1.4. The buckle opening force shall be applied, using a dynamometer or similar device in the manner and direction of normal use. The contact end shall be a polished metal hemisphere with radius 2.5 ± 0.1 mm.

8.2.1.1.5. The buckle opening force shall be measured and any failure noted.

8.2.1.2. Opening test under zero load

8.2.1.2.1. A buckle assembly which has not previously been subjected to a load shall be mounted and positioned under a "no load" condition.

8.2.1.2.2. The method of measuring the buckle opening force shall be as prescribed in paragraphs 8.2.1.1.3 and 8.2.1.1.4.

- 8.2.1.2.3. The buckle opening force shall be measured.
- 8.2.2. *Adjusting device*
- 8.2.2.1. Ease of adjustment
- 8.2.2.1.1. When testing a manual adjusting device, the strap shall be drawn steadily through the adjusting device, having regard for the normal conditions of use, at a rate of approximately 100 mm/sec and the maximum force measured to the nearest N after the first 25 mm of strap movement.
- 8.2.2.1.2. The test shall be carried out in both directions of strap travel through the device, the strap being subjected to the full travel cycle 10 times prior to the measurement.
- 8.2.3. *Microslip test* (see annex 5, figure 3)
- 8.2.3.1. The components or devices to be subjected to the microslip test shall be kept for a minimum of 24 hours before testing in an atmosphere having a temperature of 20 ± 5 °C and a relative humidity of 65 ± 5 per cent. The test shall be carried out at a temperature between 15 and 30 °C.
- 8.2.3.2. The free end of the strap shall be arranged in the same configuration as when the device is in use in the vehicle, and shall not be attached to any other part.
- 8.2.3.3. The adjusting device shall be placed on a vertical piece of strap one end of which bears a 50 N load (guided in a manner which prevents the load from swinging and the strap from twisting). The free end of the strap from the adjusting device shall be mounted vertically upwards or downwards as it is in the vehicle. The other end shall pass over a deflector roller with its horizontal axis parallel to the plane of the section of strap supporting the load, the section passing over the roller being horizontal.
- 8.2.3.4. The device being tested shall be arranged in such a way that its centre, in the highest position to which it can be raised, is 300 ± 5 mm from a support table, and the load of 50 N shall be 100 ± 5 mm from that support table.
- 8.2.3.5. Twenty pre-test cycles shall be completed and 1,000 cycles shall then be completed at a frequency of 0.5 cycles per second, the total amplitude being 300 ± 20 mm or as specified in paragraph 8.2.5.2.6.2. The 50 N load shall be applied only during the time corresponding to a shift of 100 ± 20 mm for each half period. Microslip shall be measured from the position at the end of the 20 pre-test cycles.
- 8.2.4. *Retractor*
- 8.2.4.1. Withdrawal and retracting forces
- 8.2.4.1.1. The withdrawal and retracting forces shall be measured with the safety belt assembly, fitted to a manikin as for the dynamic test prescribed in paragraph 8.1.3. The strap tension shall be measured at the point of contact with (but just clear of) the manikin while the strap is being withdrawn or retracted at the approximate rate of 0.6 m/min.
- 8.2.4.2. Durability of retractor mechanism
- 8.2.4.2.1. The strap shall be withdrawn and allowed to retract for the required number of cycles at a rate of not more than 30 cycles per minute. In the case of emergency-locking retractors, a jolt to lock the retractor shall be introduced at each fifth cycle. The jolts occur in equal numbers at each of five different extractions, namely, 90, 80, 75, 70 and 65 per cent of the total length of the strap on the retractor. However, where the length of the strap exceeds 900 mm the above percentages shall be related to the final 900 mm of strap which can be withdrawn from the retractor.
- 8.2.4.3. Locking of emergency-locking retractors
- 8.2.4.3.1. The retractor shall be tested once for locking, when the strap has been unwound to its full length less 300 ± 3 mm.

- 8.2.4.3.2. In the case of a retractor actuated by strap movement, the extraction shall be in the direction in which it normally occurs when the retractor is installed in a vehicle.
- 8.2.4.3.3. When retractors are being tested for sensitivity to vehicle accelerations, they shall be tested at the above extraction length in both directions along two mutually perpendicular axes which are horizontal if the retractors are to be installed in a vehicle as specified by the child restraint manufacturer. When this position is not specified, the testing authority shall consult the child restraint manufacturer. One of these test directions shall be chosen by the technical service conducting the approval test to give the most adverse conditions with respect to actuation of the locking mechanism.
- 8.2.4.3.4. The design of the apparatus used shall be such that the required acceleration is given at an average rate of increase of acceleration of at least 10 g/sec.
- 8.2.4.3.5. For testing compliance with the requirements of paragraphs 7.2.3.2.1.3 and 7.2.3.2.1.4, the retractor shall be mounted on a horizontal table and the table tilted at a speed not exceeding 2° per second until locking has occurred. The test shall be repeated with tilting in other directions to ensure that the requirements are fulfilled.
- 8.2.4.4. Corrosion test
- 8.2.4.4.1. The corrosion test is described in paragraph 8.1.1 above.
- 8.2.4.5. Dust resistance test
- 8.2.4.5.1. The retractor shall be positioned in a test chamber as described in annex 3 to this Regulation. It shall be mounted in an orientation similar to that in which it is mounted in the vehicle. The test chamber shall contain dust as specified in paragraph 8.2.4.5.2 below. A length of 500 mm of the strap shall be extracted from the retractor and kept extracted, except that it shall be subjected to 10 complete cycles of retraction and withdrawal within one or two minutes after each agitation of the dust. For a period of five hours, the dust shall be agitated every 20 minutes for five seconds by compressed air free of oil and moisture at a gauge pressure of 5.5 ± 0.5 bars entering through an orifice 1.5 ± 0.1 mm in diameter.
- 8.2.4.5.2. The dust used in the test described in paragraph 8.2.4.5.1 shall consist of about 1 kg of dry quartz. The particle size distribution shall be as follows:
- (a) Passing 150 μm aperture, 104 μm wire diameter: 99 to 100 per cent;
 - (b) Passing 105 μm aperture, 64 μm wire diameter: 76 to 86 per cent;
 - (c) Passing 75 μm aperture, 52 μm wire diameter: 60 to 70 per cent.
- 8.2.5. *Static test for straps*
- 8.2.5.1. Strap strength test
- 8.2.5.1.1. Each test shall be carried out on two new samples of strap, conditioned as specified in paragraph 7.2.4.
- 8.2.5.1.2. Each strap shall be gripped between the clamps of a tensile strength-testing machine. The clamps shall be so designed as to avoid breakage of the strap at or near them. The speed of traverse shall be about 100 mm/min. The free length of the specimen between the clamps of the machine at the start of the test shall be 200 mm \pm 40 mm.
- 8.2.5.1.3. The tension shall be increased until the strap breaks and the breaking load noted.
- 8.2.5.1.4. If the strap slips or breaks at or within 10 mm of either of the clamps, the test shall be invalid and a new test shall be carried out on another specimen.
- 8.2.5.2. Samples cut from straps, as referred to in paragraph 3.2.3, shall be conditioned as follows:
- 8.2.5.2.1. Room conditioning

- 8.2.5.2.1.1. The strap shall be kept for 24 hours in an atmosphere having a temperature of 20 ± 5 °C and a relative humidity of 65 ± 5 per cent. If the test is not carried out immediately after conditioning, the specimen shall be placed in a hermetically closed receptacle until the test begins. The breaking load shall be determined within five minutes after removal of the strap from the conditioning atmosphere or from the receptacle.
- 8.2.5.2.2. Light conditioning
- 8.2.5.2.2.1. The provisions of Recommendation ISO/R105-1959, "Tests for colour fastness of textiles", as amended by Addendum I (ISO/R105-1959/A1-1963) and Addendum II (ISO/R105/II-1963), shall apply. The strap shall be exposed to light for the time necessary to produce fading of Standard Blue Dye No. 7 to a contrast equal to grade 4 on the grey scale.
- 8.2.5.2.2.2. After exposure, the strap shall be kept for a minimum of 24 hours in an atmosphere having a temperature of 20 ± 5 °C and a relative humidity of 65 ± 5 per cent. The breaking load shall be determined within five minutes after the removal of the strap from the conditioning installation.
- 8.2.5.2.3. Cold conditioning
- 8.2.5.2.3.1. The strap shall be kept for a minimum of 24 hours in an atmosphere having a temperature of 20 ± 5 °C and a relative humidity of 65 ± 5 per cent.
- 8.2.5.2.3.2. The strap shall then be kept for one and a half hours on a plain surface in a low-temperature chamber in which the air temperature is -30 ± 5 °C. It shall then be folded and the fold shall be loaded with a weight of 2 kg previously cooled to -30 ± 5 °C. When the strap has been kept under load for 30 minutes in the same low-temperature chamber, the weight shall be removed and the breaking load shall be measured within five minutes after removal of the strap from the low-temperature chamber.
- 8.2.5.2.4. Heat conditioning
- 8.2.5.2.4.1. The strap shall be kept for three hours in a heating-cabinet atmosphere having a temperature of 60 ± 5 °C and a relative humidity 65 ± 5 per cent.
- 8.2.5.2.4.2. The breaking load shall be determined within five minutes after removal of the strap from the heating cabinet.
- 8.2.5.2.5. Exposure to water
- 8.2.5.2.5.1. The strap shall be kept fully immersed for three hours in distilled water, at a temperature of 20 ± 5 °C, to which a trace of wetting agent has been added. Any wetting agent suitable for the fibre being tested may be used.
- 8.2.5.2.5.2. The breaking load shall be determined within 10 minutes after removal of the strap from the water.
- 8.2.5.2.6. Abrasion conditioning
- 8.2.5.2.6.1. The components or devices to be submitted to the abrasion test shall be kept for a minimum of 24 hours before testing in an atmosphere having a temperature of 20 ± 5 °C and relative humidity of 65 ± 5 per cent. The room temperature during the testing shall be between 15 and 30 °C.
- 8.2.5.2.6.2. The table below sets out the general conditions for each test:

	Load (N)	Frequency (Hz)	Cycles (No.)	Shift (mm)
Type 1 test.	10	0.5	1 000	300 ± 20
Type 2 test.	5	0.5	5 000	300 ± 20

Where there is insufficient strap to test over 300 mm of shift, the test may be applied over a shorter length subject to a minimum of 100 mm.

- 8.2.5.2.6.3. Particular test conditions
- 8.2.5.2.6.3.1. Type 1 test: for cases where the strap slides through the quick adjusting device. The 10 N load shall be vertically and permanently applied on one of the straps. The other strap, set horizontally, shall be attached to a device, giving the webbing a back and forth motion. The adjusting device shall be so placed that the horizontal strap of the webbing remains under tension (see annex 5, figure 1).
- 8.2.5.2.6.3.2. Type 2 test: for cases where the strap changes direction in passing through a rigid part. During this test, the angles of both webbing straps shall be as shown in annex 5, figure 2. The 5 N load shall be permanently applied.
- 8.3. *Child restraints with retractor*
In the case of a child restraint incorporating a retractor, the retractor shall have met the requirements of paragraph 7.2.3 above.
- 8.4. *High-speed films*
- 8.4.1. The behaviour of the manikin and its displacement shall be determined by means of a high-speed camera.
- 8.4.2. A calibration screen shall be mounted firmly on the trolley or in the vehicle structure so that the displacement of the manikin can be determined.
9. TEST REPORT
- 9.1. The test report shall record the results of all tests and measurements and the trolley speeds, the place occupied by the buckle during the test, if it can be varied, and any failure or breakage.
- 9.2. If provisions relating to anchorages contained in annex 6, appendix 4, to this Regulation have not been respected, the test report shall describe how the child restraint is installed and shall specify important angles and dimensions.
- 9.3. When the child restraint is tested in a vehicle or vehicle structure, the test report shall specify the manner of attaching the vehicle structure to the trolley, the position of the child restraint and vehicle seat and the inclination of the vehicle seat-back.
10. MODIFICATION OF A CHILD RESTRAINT
- 10.1. Every modification of a child restraint shall be notified to the administrative department which approved the child restraint. The department may then either:
- 10.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the child restraint still complies with the requirements; or
- 10.1.2. Require a further test report from the technical service responsible for conducting the tests.
- 10.2. Confirmation or refusal of approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 5.3 above to the Parties to the Agreement applying this Regulation.
11. CONFORMITY OF PRODUCTION
- 11.1. Every child restraint bearing the particulars referred to in paragraph 5.4 above shall conform to the approved type and comply with the conditions prescribed in paragraphs 6 to 8 above.
- 11.2. Quality-control procedures, which the manufacturer of child restraints shall comply with, are laid down in paragraph 11.3; minimum requirements for spot checks made by technical services are prescribed in paragraph 11.4.
- 11.3. Minimum requirements for verification of conformity
- 11.3.1. The manufacturer or his authorized representative holding the ECE type approval mark shall be obliged to carry out continuous quality control, or see that it is

carried out, so as to ensure that production of child restraints is uniform and conforms to the provisions of this Regulation.

- 11.3.2. The manufacturer or his authorized representative shall be held responsible for:
- the existence of quality control procedures;
 - The availability of equipment necessary for the verification of conformity;
 - Keeping records of test results, test reports and any documents attached;
 - The use of the test results to verify and ensure the consistency of the child restraints manufactured, allowing for the variation admissible in industrial production.
- 11.3.3. The samples selected for verification of conformity shall undergo such tests as may be chosen by agreement with the competent authority from among those described in paragraphs 7.1.4 and 8 above.
- 11.4. Minimum requirements for spot checks
- 11.4.1. In order to verify such conformity, spot checks shall be carried out at a rate such that the tests prescribed in paragraph 11.4.3 below are effected on at least one in 2,500 child restraints produced of each approved type, with a minimum frequency of one and a maximum frequency of 50 for any 12 months of production.
- 11.4.2. Child restraints offered or to be offered for sale shall be used for the tests.
- 11.4.3. The child restraints selected for verification of conformity with an approved type shall undergo such tests as may be chosen by the competent authority from among those described in paragraphs 7.1.4 and 8 above. At least 10 per cent of the child restraints selected shall be subjected to the dynamic tests described in paragraph 7.1.4 above. Even in the smallest series of production, at least one child restraint must undergo the dynamic tests.
- 11.4.4. If one of the samples fails the test to which it has been subjected, the test shall be repeated on three new samples. In the event of any one of these failing, the approving authority shall withdraw the approval until it is satisfied that the defect has been rectified.

12. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

- 12.1. The approval granted in respect of a child restraint pursuant to this Regulation may be withdrawn if a child restraint bearing the particulars referred to in paragraph 5.4 fails to pass the random checks described in paragraph 11 or does not conform to the type approved.
- 12.2. If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation, by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation "APPROVAL WITHDRAWN".

13. PRODUCTION DEFINITELY DISCONTINUED

- 13.1. If the holder of the approval completely ceases to manufacture a specific type of child restraint under this Regulation, he shall inform thereof the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform the other Parties to the Agreement which apply this Regulation thereof by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation "PRODUCTION DISCONTINUED".

14. INSTRUCTIONS

- 14.1. Each child restraint shall be accompanied by instructions in the language of the country where the device is sold with the following content:

- 14.2. *Instructions on installation* shall include the following points:
- 14.2.1. The list of vehicles and vehicle models for which the device is intended;
 - 14.2.2. The method of installation illustrated by photographs and/or very clear drawings;
 - 14.2.3. The user shall be advised that the rigid items and plastic parts of a child restraint must be so located and installed that they are not liable, during everyday use of the vehicle, to become trapped by a movable seat or in a door of the vehicle.
- 14.3. *The instructions for use* shall include the following points:
- 14.3.1. The weight groups for which the device is intended;
 - 14.3.2. When the device is used in combination with an adult safety belt, the type of the safety belt to be used;
 - 14.3.3. The method of use shall be shown by photographs and/or very clear drawings;
 - 14.3.4. The operation of the buckle and adjusting devices shall be explained clearly;
 - 14.3.5. It shall be recommended that any straps holding the restraint to the vehicle should be tight, that any straps restraining the child should be adjusted to the child's body, and that straps should not be twisted;
 - 14.3.6. The importance of ensuring that any lap strap is worn low down, so that the pelvis is firmly engaged, shall be stressed;
 - 14.3.7. It shall be recommended that the device should be changed when it has been subject to violent stresses in an accident;
 - 14.3.8. Instructions for cleaning shall be given;
 - 14.3.9. A general warning shall be given to the user concerning the danger of making any alterations or additions to the device without the approval of the competent authority;
 - 14.3.10. When the chair is not provided with a textile cover, it shall be recommended that the chair should be kept away from sunlight, otherwise it may be too hot for the child's skin.
15. NAMES AND ADDRESS OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS
- 15.1. The Parties to the Agreement which apply this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and of the administrative departments which grant approval and to which forms certifying approval or refusal or withdrawal of approval, issued in other countries, are to be sent.

ANNEX 1

(Maximum format: A4 (210 × 297 mm))



Name of administration

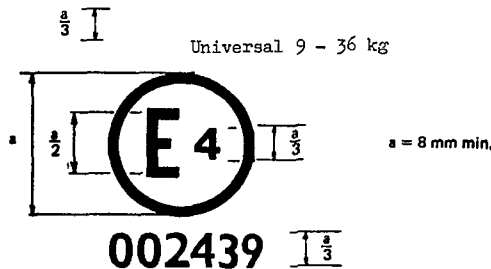
Communication concerning the approval (or refusal or withdrawal of approval or production definitely discontinued) of restraining devices for child occupants of power-driven vehicles, pursuant to Regulation No. 44.

Approval No.

1. Forward-facing/rearward-facing child restraint incorporating three-point belt/lap belt/special type belt* retractor/chair assembly/impact shield**
2. Trade name or mark
3. Manufacturer's designation of the child restraint
4. Manufacturer's name
5. If applicable, name of his representative
6. Address
7. Submitted for approval on
8. Technical service conducting approval tests
9. Date of test report issued by that service
10. Number of test report issued by that service
11. Approval granted/refused** for use in group I, II or III and for universal use/for multiple-vehicle use or use in a specific vehicle, position in vehicle**
12. Position and nature of the marking
13. Place
14. Date
15. Signature
16. The following documents, bearing the approval number shown above, are attached to this communication:
 - Drawings, diagrams and plans of the child restraint, including any retractor, chair assembly, impact shield fitted;
 - Drawings, diagrams and plans of the vehicle structure and the seat structure, as well as of the adjustment system and the attachments, including any energy absorber fitted;
 - Photographs of the child restraint and/or vehicle structure and seat structure;
 - Instructions for fitting and use;
 - List of vehicle models for which the restraint is intended.

ANNEX 2

ARRANGEMENT OF THE APPROVAL MARK



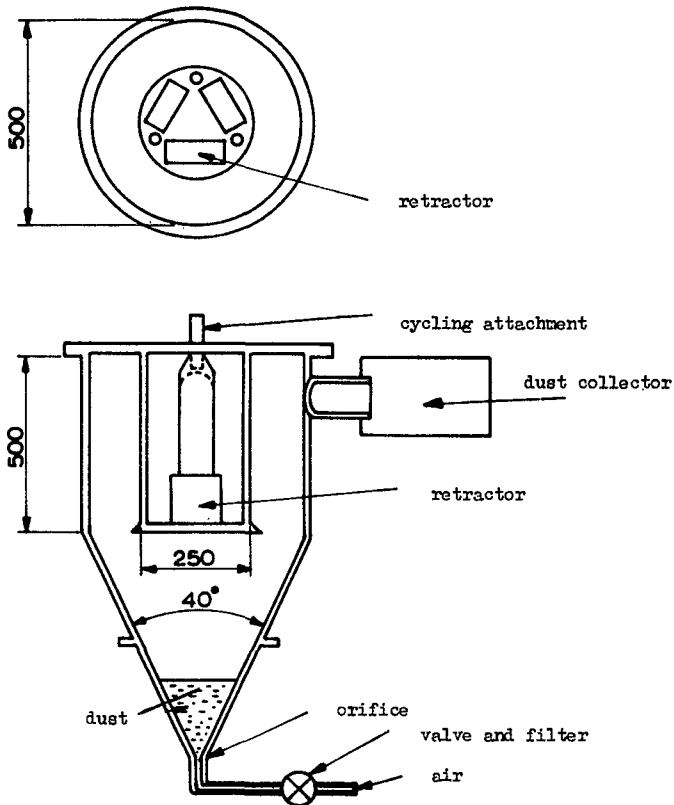
* Indicate type, and whether it complies with Regulation No. 16 or with the requirements of this Regulation.
 ** Strike out where inapplicable.

The child restraint bearing the above approval mark is a device capable of being fitted in any vehicle and of being used for the 9 kg-36 kg mass range (groups I-III); it is approved in the Netherlands (E4) under the number 002439. The approval number indicates that the approval was granted in accordance with the requirements of the Regulation concerning the approval of restraining devices for child occupants of power-driven vehicles ("child restraints") in its original form.

NOTE: The approval number and additional symbol(s) must be placed close to the circle and either above or below the "E" or to left or right of it. The digits of the approval number must be on the same side of the "E" and orientated in the same direction. The additional symbol(s) must be diametrically opposite the approval number. The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with other symbols.

ANNEX 3

ARRANGEMENT OF APPARATUS FOR DUST RESISTANCE TEST
(Dimensions in millimetres)



ANNEX 4

CORROSION TEST

1. *Test Apparatus*
 - 1.1. The apparatus shall consist of a mist chamber, a salt solution reservoir, a supply of suitably conditioned compressed air, one or more atomizing nozzles, sample supports, provision for heating the chamber, and necessary means of control. The size and detailed construction of the apparatus shall be optional, provided that the test conditions are met.
 - 1.2. It is important to ensure that drops of solution accumulated on the ceiling or cover of the chamber do not fall on test samples.
 - 1.3. Drops of solution which fall from test samples shall not be returned to the reservoir for respraying.
 - 1.4. The apparatus shall not be constructed of materials that will affect the corrosiveness of the mist.

2. *Location of test samples in the mist cabinet*
 - 2.1. Samples, except retractors, shall be supported or suspended between 15° and 30° from the vertical and preferably parallel to the principal direction of horizontal flow of mist through the chamber, based upon the dominant surface being tested.
 - 2.2. Retractors shall be supported or suspended so that the axes of the reel for storing the strap shall be perpendicular to the principal direction of horizontal flow of mist through the chamber. The strap opening in the retractor shall also be facing in this principal direction.
 - 2.3. Each sample shall be so placed as to permit free settling of mist on all samples.
 - 2.4. Each sample shall be so placed as to prevent salt solution from one sample dripping on to any other sample.

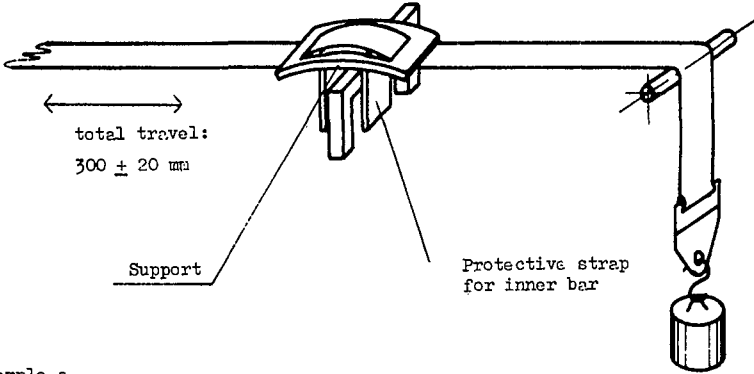
3. *Salt solution*
 - 3.1. The salt solution shall be prepared by dissolving 5 ± 1 parts by mass of sodium chloride in 95 parts of distilled water. The salt shall be sodium chloride substantially free of nickel and copper and containing not more than 0.1 per cent of sodium iodide and not more than 0.3 per cent of total impurities in the dry state.
 - 3.2. The solution shall be such that, when atomized at 35°C, the collected solution is in the pH range of 6.5 to 7.2.

4. *Compressed air*
 - 4.1. The compressed air supply to the nozzle or nozzles for atomizing the salt solution shall be free of oil and dirt, and maintained at a pressure between 70 kN/m² and 170 kN/m².

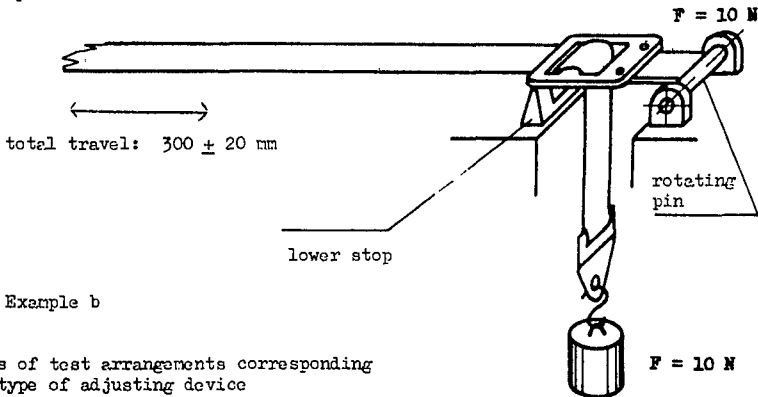
5. *Conditions in the mist chamber*
 - 5.1. The exposure zone of the mist chamber shall be maintained at $35 \pm 5^\circ\text{C}$. At least two clean mist collectors shall be placed within the exposure zone, so that no drops of solution from the test samples or any other sources are collected. The collectors shall be placed near the test samples, one as near as possible to any nozzle and one as far as possible from all nozzles. The mist shall be such that, for each 80 cm² of horizontal collecting area, from 1.0 to 2.0 ml of solution per hour, when measured over an average of at least 16 hours, is collected in each collector.
 - 5.2. The nozzle or nozzles shall be directed or baffled, so that the spray does not impinge directly on the test samples.

ANNEX 5

ABRASION AND MICROSILIP TEST



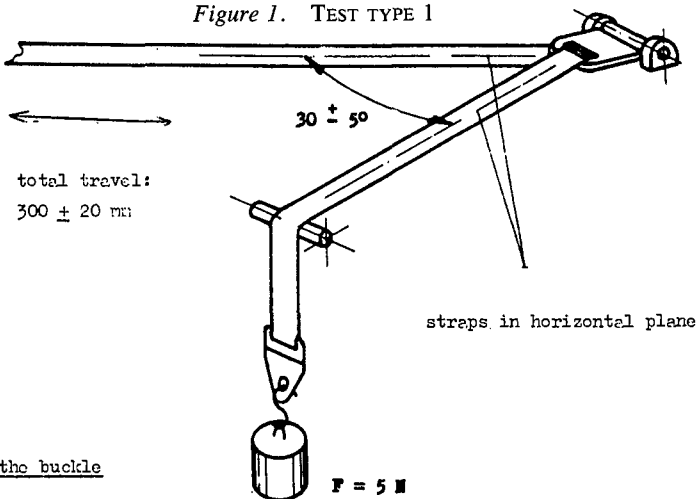
Example a.



Example b

Examples of test arrangements corresponding to the type of adjusting device

Figure 1. TEST TYPE 1



Test in the buckle

Figure 2. TEST TYPE 2

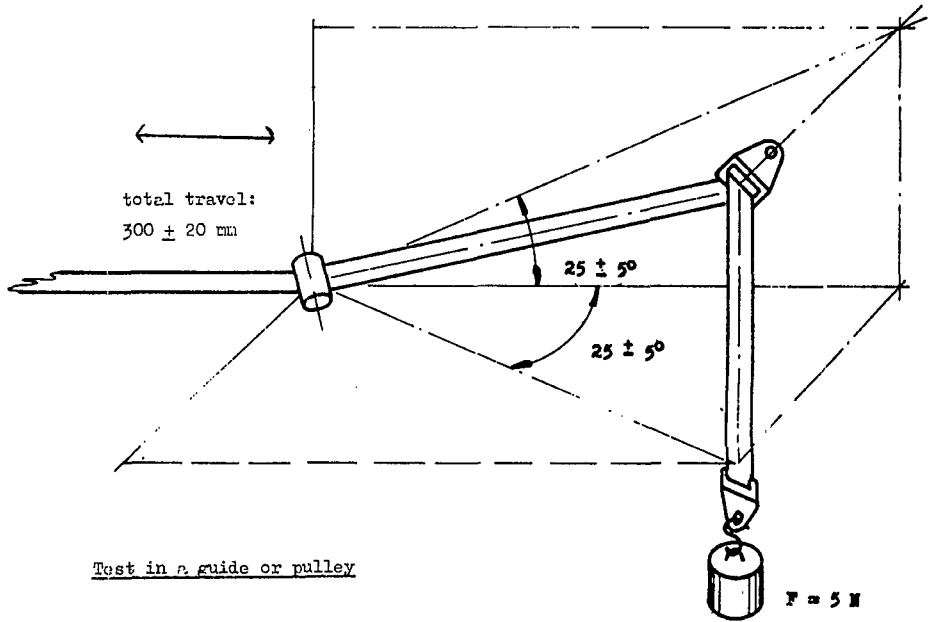
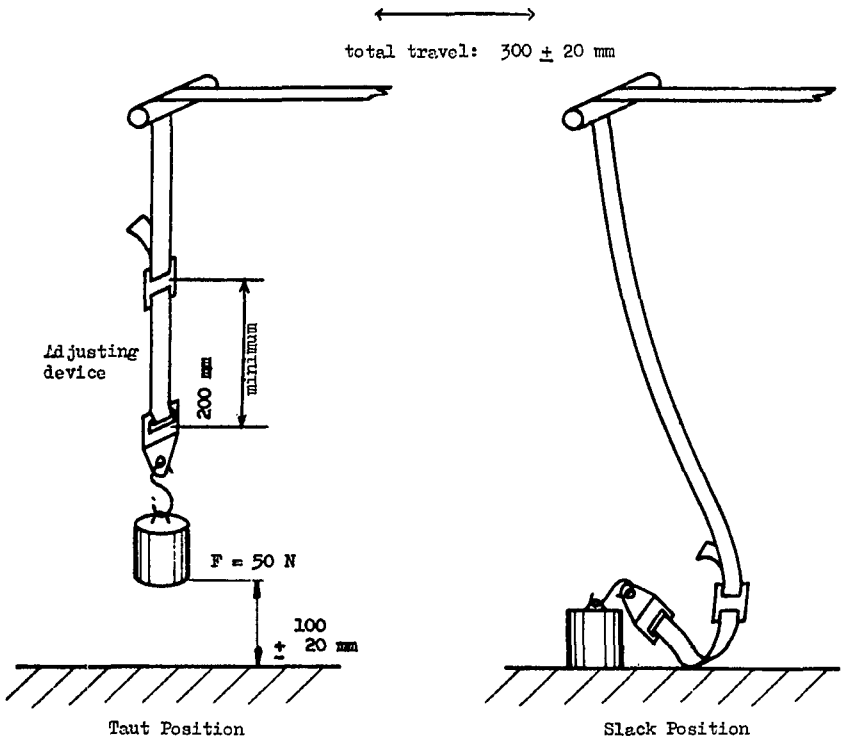


Figure 3. MICROSLIP TEST



The load of 50 N on the testing device shall be vertically guided in such a way as to prevent load-swing and twisting of the strap.

The attaching device shall be fixed to the load of 50 N in the same manner as in the vehicle.

ANNEX 6

DESCRIPTION OF TROLLEY

1. *Trolley*
 - 1.1. For tests on safety belts, the trolley, carrying the seat only, shall have a mass of 400 ± 20 kg. For tests on restraint systems, the trolley with the attached vehicle structure shall have a mass of 800 kg. However, the total mass of the trolley and vehicle structure may, if necessary, be increased by increments of 200 kg. In no case shall the total mass differ from the nominal value by more than ± 40 kg.
2. *Calibration screen*
 - 2.1. A calibration screen shall be attached firmly to the trolley with a movement limit line plainly marked on it to enable compliance with forward movement criteria to be determined from photographic records.
3. *Seat*
 - 3.1. The seat shall be constructed as follows:
 - 3.1.1. A rigid back of 500 mm height, fixed, covered with polyurethane foam of 70 mm thickness, whose characteristics are given in the table below, (paragraph 3.1.5) tilted 20° rearwards. The lower part of the back is made of a 20 mm diameter tube;
 - 3.1.2. A seating, made from the material described in tables 1 and 2 of this annex. The rear part of the seating is made from a rigid sheet metal, whose upper edge is a 20 mm diameter tube. For the tests, the seating shall be covered with a light cloth not liable to change the rigidity;
 - 3.1.3. An opening shall be made between the back and the cushion of the seat as prescribed in appendix 1 to this annex;
 - 3.1.4. The width of the seat shall be 800 mm;
 - 3.1.5. *Characteristics of polyurethane foam filling*

Density (kg/m^3)	35-45
Bearing strength in N/cm^2 p-25%	0.25 ± 0.05
p-50%	0.37 ± 0.05
p-65%	0.50 ± 0.05
Bearing strength factor p-65%/p-25%	< 2.5
Compression set	$< 15\%$
Tear strength (N/cm)	≥ 5
Breaking strength (N/cm^2)	≥ 10
Elongation at rupture (%)	≥ 100
 - 3.2. Test of rearward-facing devices
 - 3.2.1. A special frame shall be fitted on the trolley in order to support the child restraint as shown in figure 1.
 - 3.2.2. A steel tube shall be attached firmly to the trolley in such a way that a load of 5,000 N applied horizontally to the centre of the tube does not cause a movement greater than 2 mm.
 - 3.2.3. The dimensions of the tube shall be: $500 \times 100 \times 90$ mm.

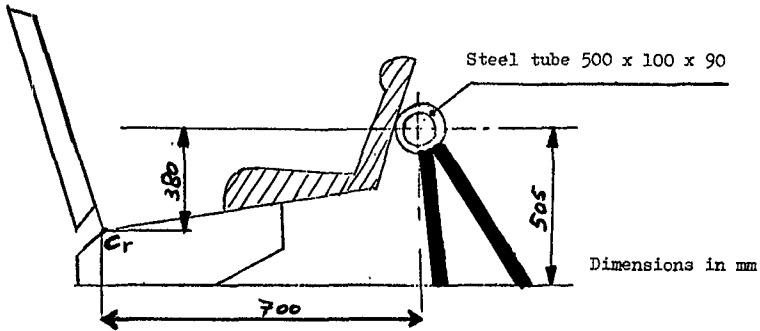


Figure 1. ARRANGEMENT FOR TESTING A REARWARD-FACING DEVICE

4. Stopping device

- 4.1. The device consists of two identical absorbers mounted in parallel.
- 4.2. If necessary, an additional absorber shall be used for each 200 kg increase in nominal mass. Each absorber shall comprise:
 - 4.2.1. An outer casing formed from a steel tube;
 - 4.2.2. A polyurethane energy-absorber tube;
 - 4.2.3. A polished-steel olive-shaped knob penetrating into the absorber; and
 - 4.2.4. A shaft and an impact plate.
- 4.3. The dimensions of the various parts of this absorber are shown in the diagram reproduced in appendices 2 and 3 to this annex.
- 4.4. The characteristics of the absorbing material are given in table 1 and table 2 of this annex.
- 4.5. The stopping device assembly shall be maintained for at least 12 hours at a temperature not exceeding 25 °C before being used for the calibration tests described in annex 7 to this Regulation. The stopping device shall, for each type of test, meet the performance requirements laid down in annex 7, appendices 1 and 2. For dynamic tests of a child restraint, the stopping device assembly shall be maintained for at least 12 hours at the same temperature, to within 2 °C, as that of the calibration test. Any other device giving equivalent results can be accepted.

Table 1. CHARACTERISTICS OF THE ABSORBING MATERIAL "A"
(ASTM Method D 735 unless otherwise stated)

Shore hardness A:	95 ± 2 at 20 ± 5 °C temperature
Breaking strength:	$R_0 > 350$ kg/cm ²
Minimum elongation:	$A_0 > 400\%$
Module at 100% elongation:	> 100 kg/cm ²
at 300% elongation:	≥ 240 kg/cm ²
Low temperature brittleness (ASTM Method D 736):	5 hours at -55 °C
Compression set (Method B):	22 hours at 70 °C $\leq 45\%$
Density at 25 °C:	1.05 to 1.10

Ageing in air

(ASTM Method D 573):

70 hours at 100 °C: Shore hardness: max. variation ± 3
 breaking strength: decrease $<10\%$ of R_0
 elongation: decrease $<10\%$ of A_0
 weight: decrease $<1\%$

Immersion in oil

(ASTM Method No. 1 Oil):

70 hours at 100 °C: Shore hardness: max. variation ± 4
 breaking strength: decrease $<15\%$ of R_0
 elongation: decrease $<10\%$ of A_0
 volume: swelling $<5\%$

Immersion in oil

(ASTM Method No. 3 Oil):

70 hours at 100 °C: breaking strength: decrease $<15\%$ of R_0
 elongation: decrease $<15\%$ of A_0
 volume: swelling $<20\%$

Immersion in distilled

water:

1 week at 70 °C: breaking strength: decrease $<35\%$ of R_0
 elongation: increase $<20\%$ of A_0

Table 2. CHARACTERISTICS OF THE ABSORBING MATERIAL "B"
 (ASTM Method D 735 unless otherwise stated)

Shore hardness A:	88 ± 2 at 20 ± 5 °C temperature
Breaking strength:	$R_0 > 300$ kg/cm ²
Minimum elongation:	$A_0 > 400\%$
Module at 100% elongation:	≥ 70 kg/cm ²
at 300% elongation:	≥ 130 kg/cm ²
Low temperature brittleness (ASTM Method D 736):	5 hours at -55 °C
Compression set (Method B):	22 hours at 70 °C $\leq 45\%$
Density at 25 °C	1.08 to 1.12
Ageing in air (ASTM Method D 573):	
70 hours at 100 °C:	Shore hardness: max variation ± 3 breaking strength: decrease $<10\%$ of R_0 elongation: decrease $<10\%$ of A_0 weight: decrease $<1\%$
Immersion in oil (ASTM Method No. 1 Oil):	
70 hours at 100 °C:	Shore hardness: max variation ± 4 breaking strength: decrease $<15\%$ of R_0 elongation: decrease $<10\%$ of A_0 volume: swelling $<5\%$

Immersion in oil (ASTM
Method No. 3 Oil):

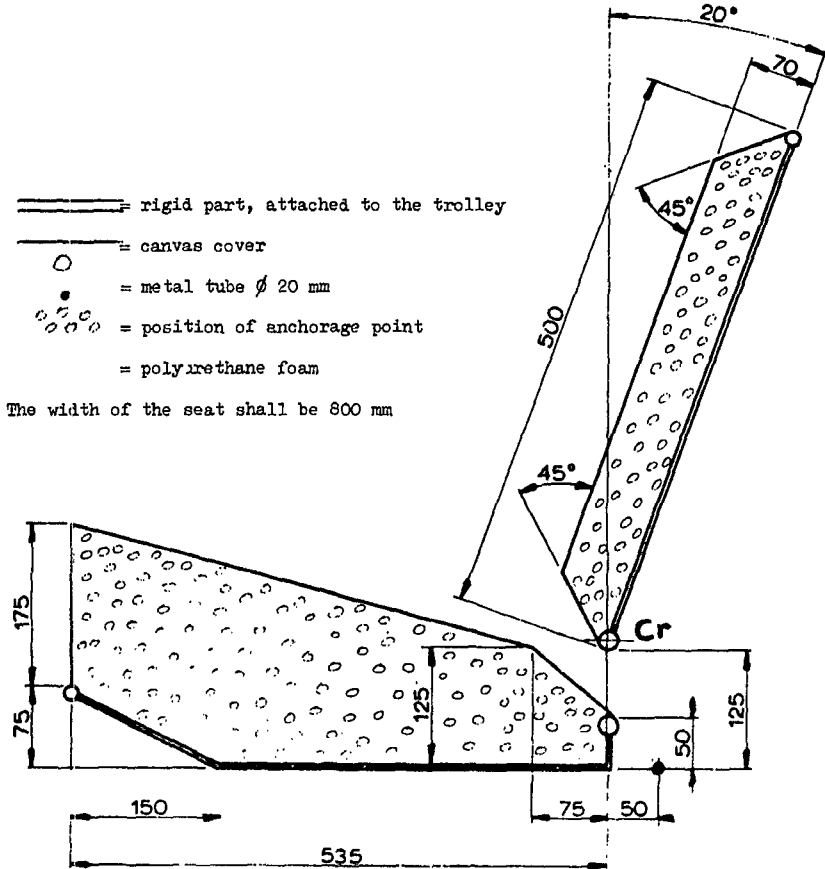
70 hours at 100 °C: breaking strength: decrease < 15% of R₀
elongation: decrease < 15% of A₀
volume: swelling < 20%

Immersion in distilled
water:

1 week at 70 °C breaking strength: decrease < 35% of R₀
elongation: increase < 20% of A₀

Annex 6 — Appendix 1

DIMENSIONS OF THE SEAT ON THE TROLLEY (IN MM)



Annex 6 — Appendix 2
STOPPING DEVICE
Frontal impact dimensions (in mm)

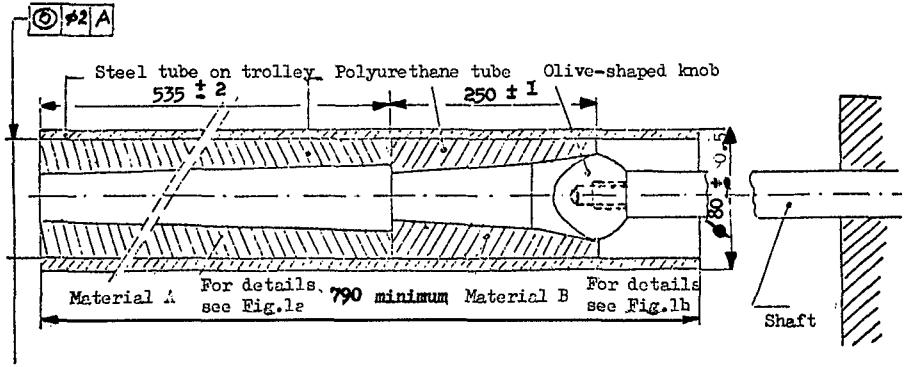


Figure 1

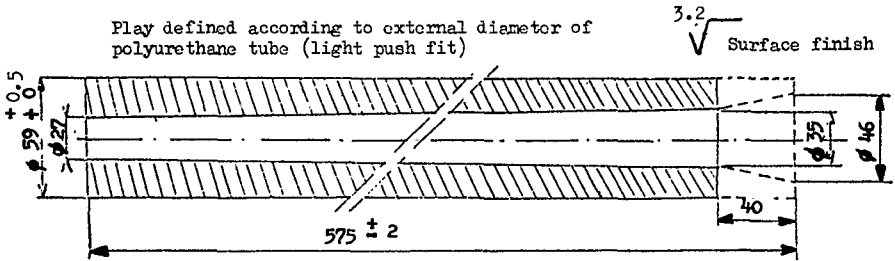


Figure 1 (a). MATERIAL A

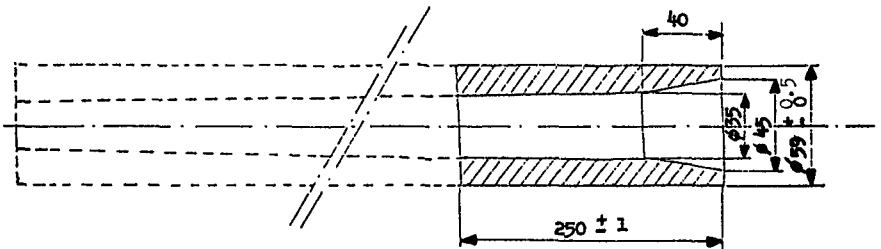


Figure 1 (b). MATERIAL B

Annex 6 — Appendix 2
 STOPPING DEVICE: OLIVE SHAPED KNOB
 Frontal impact (dimensions in mm)

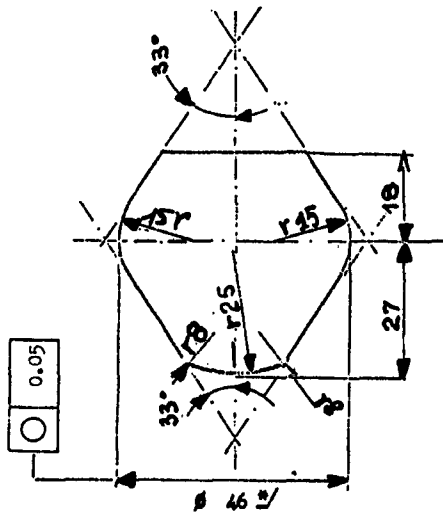


Figure 2

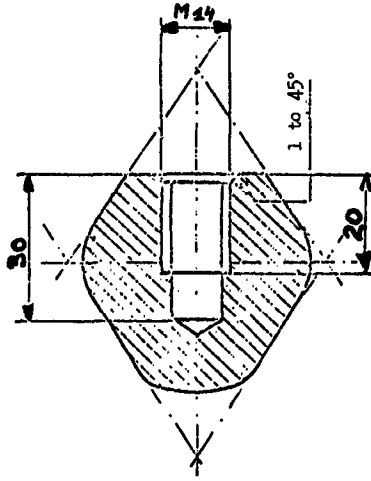


Figure 3

* This dimension may vary slightly as a result of tolerances in the manufacture of polyurethane tubes.

Annex 6 — Appendix 3

STOPPING DEVICE (ASSEMBLED)

Rear impact (dimensions in mm)

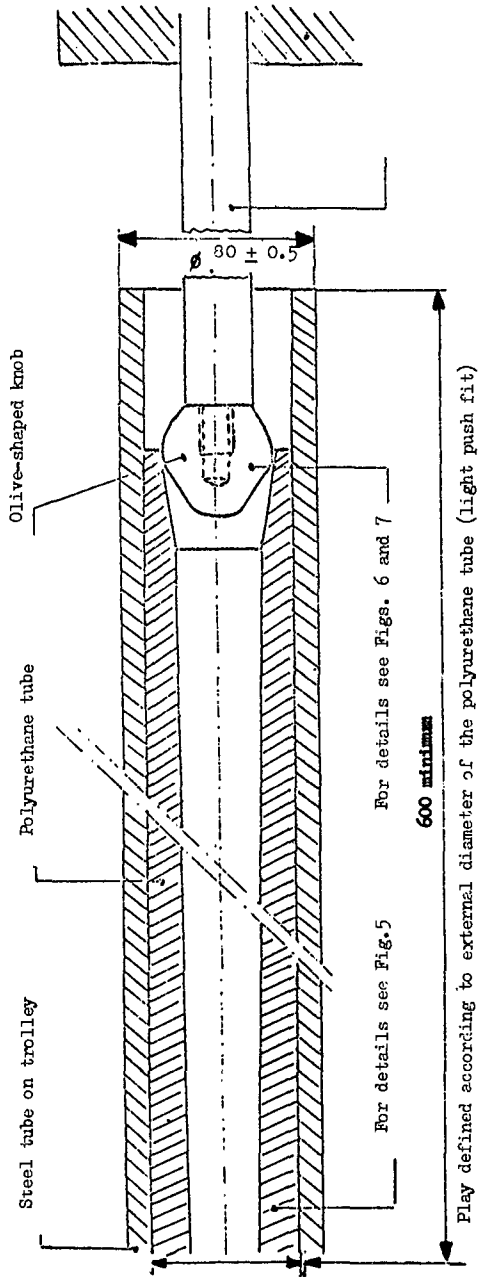


Figure 4

Annex 6 — Appendix 3

STOPPING DEVICE: POLYURETHANE TUBE

Rear impact (dimensions in mm)

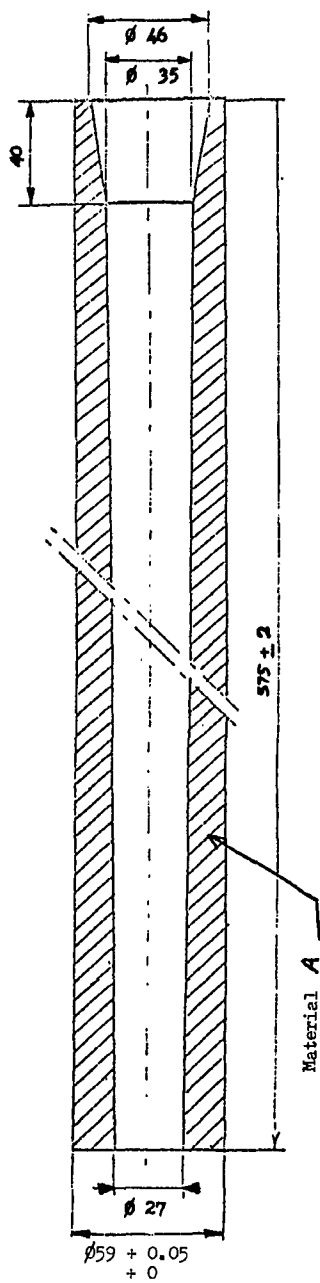


Figure 5

Annex 6 — Appendix 3

STOPPING DEVICE: OLIVE SHAPED KNOB

Rear impact (dimensions in mm)

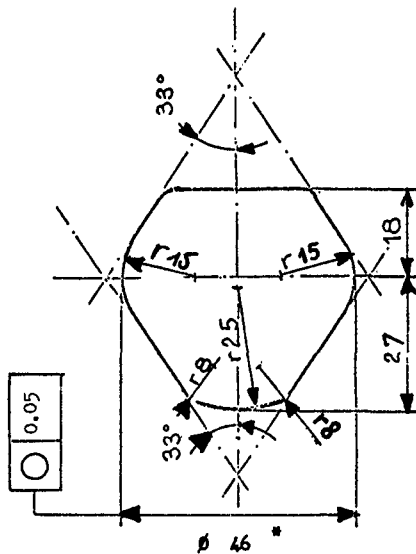


Figure 6

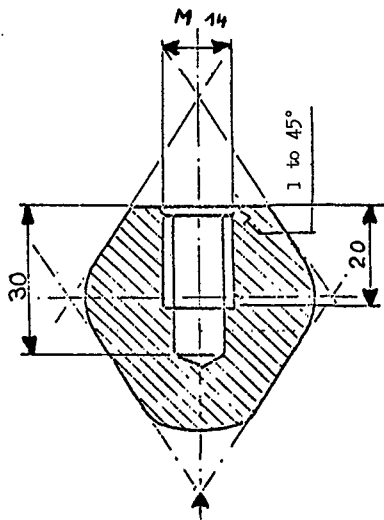


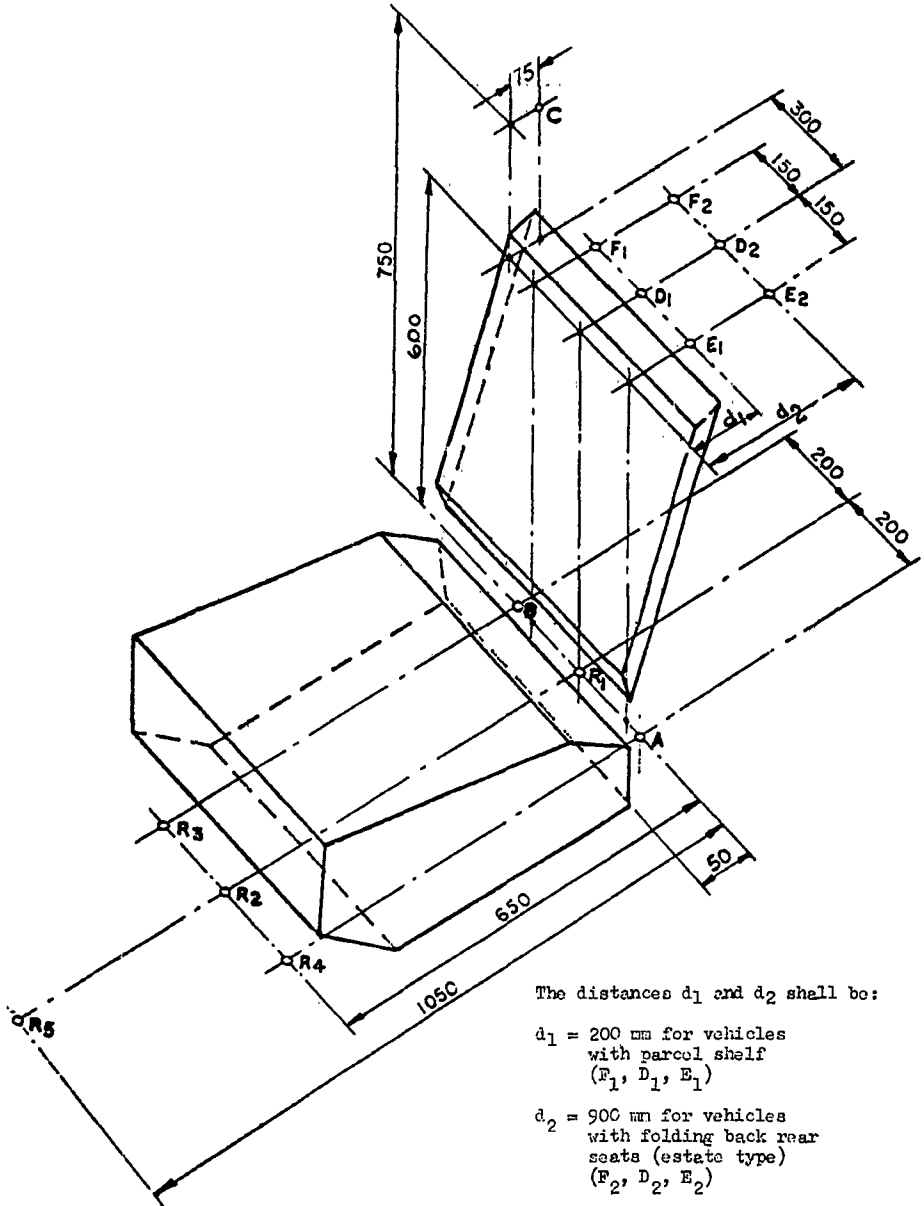
Figure 7

* This dimension may vary slightly as a result of tolerances in the manufacture of polyurethane tubes.

Annex 6 — Appendix 4

ARRANGEMENT AND USE OF ANCHORAGES ON THE TEST TROLLEY

1. The anchorages shall be positioned as shown in the figure below.



2. Anchorages A, B and C (C optional) meeting the requirements of Regulation No. 14, shall be used for child restraints in the "universal" category.
3. Anchorages A, B and D shall be used for child restraints in the "semi-universal" category having only one additional upper anchorage.
4. Anchorages A, B, E and F shall be used for child restraints in the "semi-universal" category having two additional upper anchorages.
5. Anchorage points R₁, R₂, R₃, R₄ and R₅ are the additional anchorage points for rearward-facing child restraint systems in the "semi-universal" category having one or more additional anchorages (see paragraph 8.1.3.5.5.).
6. The points, which correspond to the arrangement of the anchorages show where the ends of the belt are to be connected to the trolley or to the load transducer, as the case may be. The structure carrying the anchorages shall be rigid. The upper anchorages must not be displaced by more than 0.2 mm in the longitudinal direction when a load of 980 N is applied to them in that direction. The trolley shall be so constructed that no permanent deformation shall occur in the parts bearing the anchorages during the test.

ANNEX 7

CURVE OF THE TROLLEY'S DECELERATION AS A FUNCTION OF TIME

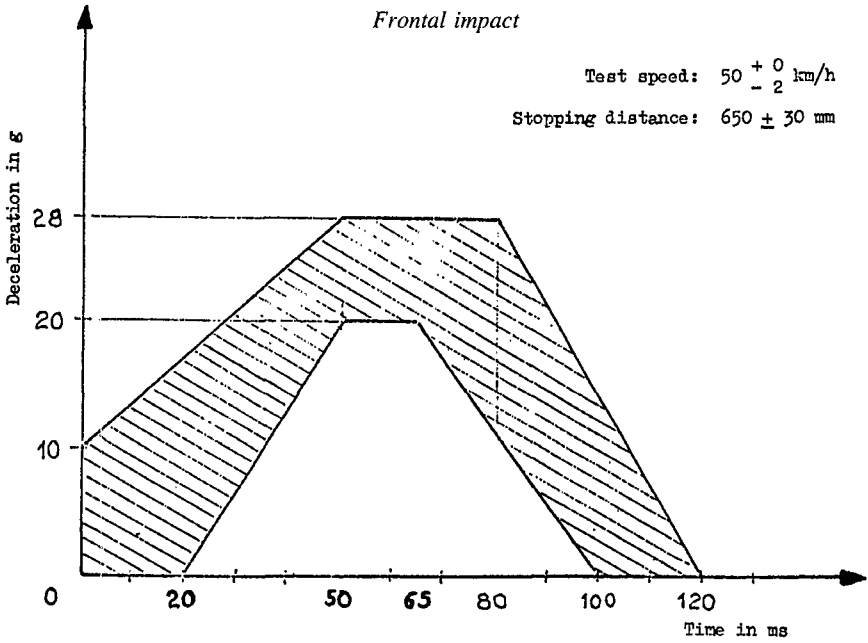
1. The deceleration curve of the trolley weighted with inert masses to produce a total mass of 455 ± 20 kg in the case of child restraint tests performed in accordance with paragraph 8.1.3.1 of this Regulation, and of 910 ± 40 kg in the case of child restraint tests performed in accordance with paragraph 8.1.3.2 of this Regulation, where the nominal mass of the trolley and vehicle structure is 800 kg, must remain, in the case of frontal impact, within the hatched area shown in appendix 1 to this annex, and, in the case of rear impact, within the hatched area shown in appendix 2 to this annex.
2. If necessary, the nominal mass of the trolley and attached vehicle structure may be increased for each increment of 200 kg by an additional inert mass of 28 kg. In no case shall the total mass of the trolley and the vehicle structure and inert masses differ from the nominal value for calibration tests by more than ± 40 kg. During calibration of the stopping device, the stopping distance shall be 650 ± 30 mm for frontal impact, and 275 ± 20 mm for rear impact.
3. For the calibration test, the measurement equipment shall have a response which is more or less flat up to 60 Hz with a roll off at 100 Hz. Mechanical resonances associated with transducer mounting should not cause additional distortion. Consideration should be given to the effect of cable length and temperature on frequency response.*

* These requirements are in accordance with SAE recommended practice J 211a, and will be replaced later by a reference to an ISO standard at present in preparation.

Annex 7 — Appendix 1

CURVES OF THE TROLLEY'S DECELERATION AS A FUNCTION OF TIME
(CURVE FOR CALIBRATING STOPPING DEVICE)

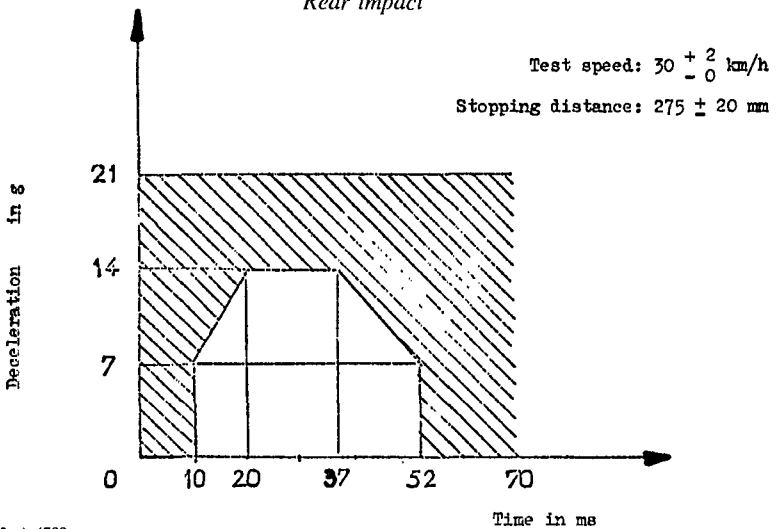
Frontal impact



Annex 7 — Appendix 2

CURVES OF THE TROLLEY'S DECELERATION AS A FUNCTION OF TIME
(CURVE FOR CALIBRATING STOPPING DEVICE)

Rear impact



ANNEX 8

DESCRIPTION OF MANIKINS

1. *General*

- 1.1. The dimensions and masses of the manikins are based on children of the 50th percentile of nine months, 3, 6 and 10 years.
- 1.2. The manikins consist of a metal and polyester skeleton with cast polyurethane body components.
- 1.3. The manikins prescribed in this Regulation are described in technical drawings produced by the TNO (Research Institute for Road Vehicles), Schoemakerstraat 97, 2628 VK Delft, The Netherlands. For an exploded view of the manikin see appendix to this annex.

2. *Construction*2.1. *Head*

- 2.1.1. The head is made of polyurethane and reinforced by metal strips. Inside the head it is possible to install measuring equipment on a polyamide block at the centre of gravity.

2.2. *Vertebrae*2.2.1. *Neck vertebrae*

- 2.2.1.1. The neck is made of 5 rings of polyurethane containing a core of polyamide elements. The Atlas-Axis block is made of polyamide.

2.2.2. *Lumbar vertebrae*

- 2.2.2.1. The five lumbar vertebrae are made of polyamide.

2.3. *Chest*

- 2.3.1. The skeleton of the chest consists of a tubular steel frame on which the arm joints are mounted. The spine consists of a steel cable with four threaded terminals.
- 2.3.2. The skeleton is coated with polyurethane. Measuring equipment can be housed in the chest cavity.

2.4. *Limbs*

- 2.4.1. The arms and legs are also made of polyurethane, reinforced by metal elements in the form of square tubes, strips and plates. The knees and elbows are provided with adjustable hinge joints. The joints of the upper arm and upper leg consist of adjustable ball and socket joints.

2.5. *Pelvis*

- 2.5.1. The pelvis is made of glass reinforced polyester also coated with polyurethane.
- 2.5.2. The shape of the upper side of the pelvis, which is important for determining sensitivity to abdominal loading, is simulated as far as possible from the shape of a child's pelvis.
- 2.5.3. The hip joints are situated just below the pelvis.

2.6. *Assembly of the manikin*2.6.1. *Neck-chest-pelvis*

- 2.6.1.1. The lumbar vertebrae and the pelvis are threaded on to the steel cable and their tension is adjusted by a nut. The neck vertebrae are mounted and adjusted in the same way. Since the steel cable must not be free to move through the chest, it must not be possible to adjust the tension of lumbar vertebrae from the neck or vice-versa.

2.6.2. *Head-neck*

- 2.6.2.1. The head may be mounted and adjusted by means of a bolt and nut through the Atlas-Axis block.

2.6.3. *Torso-limbs*

- 2.6.3.1. The arms and legs may be mounted and adjusted to the torso by means of ball and socket joints.

2.6.3.2. For the arm joints the balls are connected to the torso; in the case of the leg joints, they are connected to the legs.

3. *Main characteristics*

3.1. *Mass*

Table 1

Component	Mass in kg by age group			
	9 months	3 years	6 years	10 years
Head + neck	2.20 ± 0.10	2.70 ± 0.10	3.45 ± 0.10	3.60 ± 0.10
Torso	3.40 ± 0.10	5.80 ± 0.15	8.45 ± 0.20	12.30 ± 0.30
Upper arm (2x)	0.70 ± 0.05	1.10 ± 0.05	1.85 ± 0.10	2.00 ± 0.10
Lower arm (2x)	0.45 ± 0.05	0.70 ± 0.05	1.15 ± 0.05	1.60 ± 0.10
Upper leg (2x)	1.40 ± 0.05	3.00 ± 0.10	4.10 ± 0.15	7.50 ± 0.15
Lower leg (2x)	0.85 ± 0.05	1.70 ± 0.10	3.00 ± 0.10	5.00 ± 0.15
TOTAL	9.00 ± 0.20	15.00 ± 0.30	22.00 ± 0.50	32.00 ± 0.70

3.2. *Principal dimensions*

3.2.1. The principal dimensions, based on figure 1 of this annex, are given in table 2.

PRINCIPAL DIMENSIONS OF MANIKINS

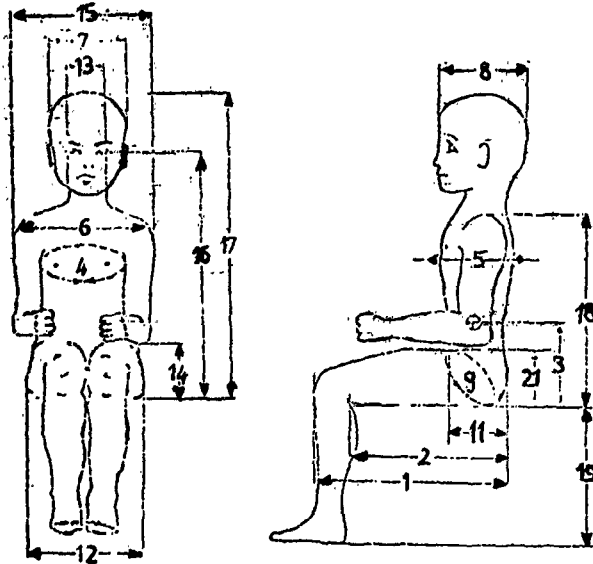


Figure 1

Table 2

No.	Dimension	Dimensions in mm by age group			
		9 months	3 years	6 years	10 years
1	Back of buttocks to front knee	195	334	378	456
2	Back of buttocks to popliteus, sitting	145	262	312	376
3	Centre of gravity to seat	180	190	190	200
4	Chest circumference	440	510	580	660
5	Chest depth	102	125	135	142
6	Distance between shoulder blades	170	215	250	295
7	Head width	125	137	141	141
8	Head length	166	174	175	181
9	Hip circumference, sitting	510	590	668	780
10	Hip circumference, standing (not shown)	470	550	628	740
11	Hip depth, sitting	125	147	168	180
12	Hip width, sitting	166	206	229	255
13	Neck width	60	71	79	89
14	Seat to elbow	135	153	155	186
15	Shoulder width	216	249	295	345
16	Eye height, sitting	350	460	536	625
17	Height, sitting	450	560	636	725
18	Shoulder height, sitting	280	335	403	483
19	Sole to popliteus, sitting	125	205	283	355
20	Stature (not shown)	708	980	1 166	1 376
21	Thigh height, sitting	70	85	95	106

4. Adjustment of joints

4.1. General

- 4.1.1. In order to achieve reproducible results using the manikins, it is essential to specify and adjust the friction in the various joints, the tension in the neck and lumbar cables, and the stiffness of the abdominal insert.

4.2. Adjustment of the neck cable

- 4.2.1. Place the torso on its back in a horizontal plane.
 4.2.2. Mount the complete neck assembly without the head.
 4.2.3. Tighten the tensioner nut on the Atlas-Axis block.
 4.2.4. Place a suitable bar or bolt through the Atlas-Axis block.
 4.2.5. Loosen the tensioner nut until the Atlas-Axis block is lowered by 10 ± 1 mm when a load of 50 N directed downwards is applied to the bar or bolt through the Atlas-Axis block (see figure 2).

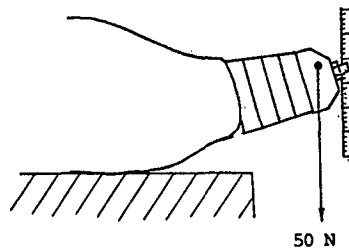


Figure 2

4.3. *Atlas-Axis joint*

- 4.3.1. Place the torso on its back in a horizontal plane.
- 4.3.2. Mount the complete neck and head assembly.
- 4.3.3. Tighten the bolt and adjustment nut through the head and the Atlas-Axis block with the head in a horizontal position.
- 4.3.4. Loosen the adjustment nut until the head starts moving (see figure 3).

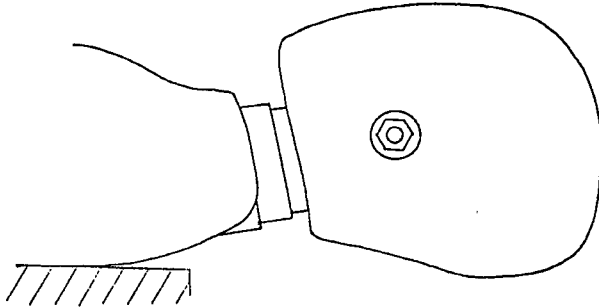


Figure 3

4.4. *Hip joint*

- 4.4.1. Place the pelvis on its front in a horizontal plane.
- 4.4.2. Mount the upper leg without the lower leg.
- 4.4.3. Tighten the adjustment nut with the upper leg in a horizontal position.
- 4.4.4. Loosen the adjustment nut until the upper leg starts moving.
- 4.4.5. The hip joints should be checked frequently in the initial stages because of "running-in" problems (see figure 4).

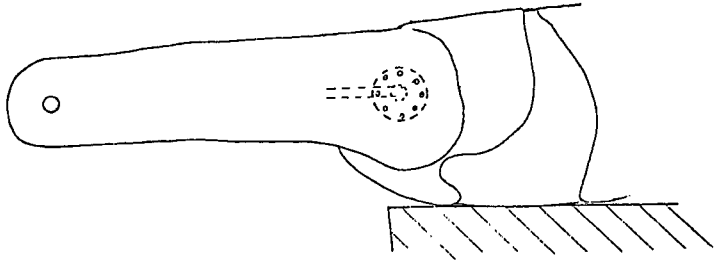


Figure 4

4.5. *Knee joint*

- 4.5.1. Place the upper leg in a horizontal position.
- 4.5.2. Mount the lower leg.
- 4.5.3. Tighten the adjustment nut of the knee joint with the lower leg in a horizontal position.
- 4.5.4. Loosen the adjustment nut until the lower leg starts moving (see figure 5).

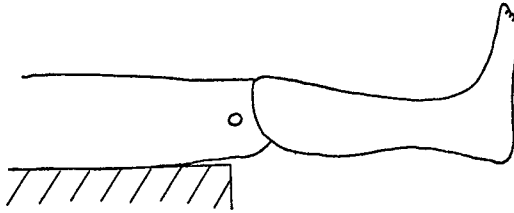


Figure 5

4.6. *Shoulder joint*

- 4.6.1. Place the torso upright.
- 4.6.2. Mount the upper arm without the lower arm.
- 4.6.3. Tighten the adjustment nuts of the shoulder with the upper arm in a horizontal position.
- 4.6.4. Loosen the adjustment nuts until the upper arm starts moving (see figure 6).
- 4.6.5. The shoulder joints should be checked frequently in the initial stages because of "running-in" problems.

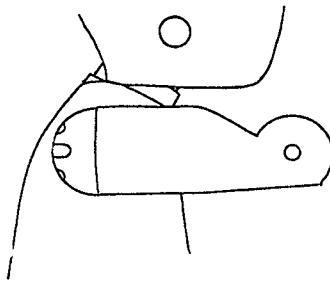


Figure 6

4.7. *Elbow joint*

- 4.7.1. Place the upper arm in a vertical position.
- 4.7.2. Mount the lower arm.
- 4.7.3. Tighten the adjustment nut of the elbow with the lower arm in a horizontal position.
- 4.7.4. Loosen the adjustment nut until the lower arm starts moving (see figure 7).

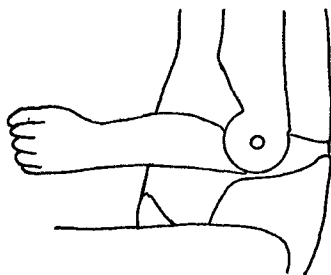


Figure 7

4.8. *Lumbar cable*

- 4.8.1. Assemble the upper torso, lumbar vertebrae, lower torso, abdominal insert, cable and spring.
- 4.8.2. Tighten the cable adjustment nut in the lower torso until the spring is compressed to $\frac{2}{3}$ of its unloaded length (see figure 8).

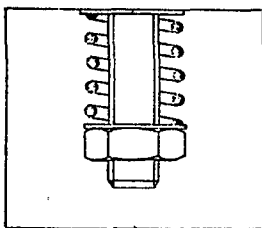


Figure 8

4.9. *Calibration of the abdominal insert*

4.9.1. *General*

- 4.9.1.1. The test shall be carried out by means of a suitable tension-producing machine.
- 4.9.2. Place the abdominal insert on a rigid block with the same length and width as the lumbar spinal column. The thickness of this block shall be at least twice the thickness of the lumbar spinal column (see figure 9).
- 4.9.3. An initial load of 20 N shall be applied.
- 4.9.4. A constant load of 50 N shall be applied.
- 4.9.5. The deflection of the abdominal insert after 2 minutes shall be:

For the 9 months dummy	: 11.5 ± 2.0 mm
3 years dummy	: 11.5 ± 2.0 mm
6 years dummy	: 13.0 ± 2.0 mm
10 years dummy	: 13.0 ± 2.0 mm

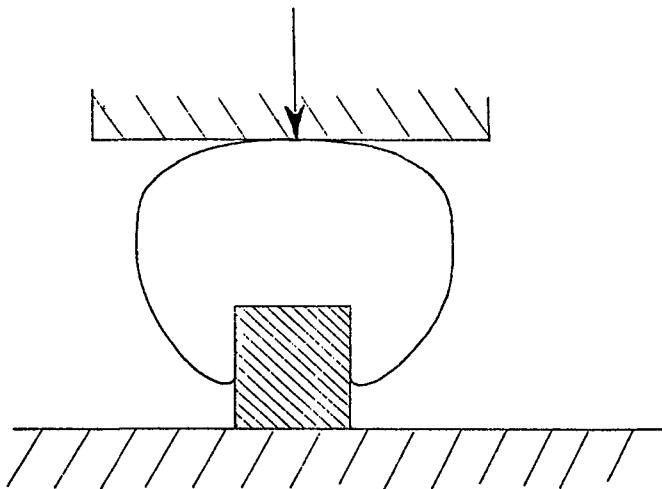


Figure 9

5. Instrumentation

5.1. General

5.1.1. The calibration and measuring procedures shall be based upon SAE Recommendation J 211a.*

5.2. Installation of the accelerometer in the chest

The accelerometer shall be mounted in the protected cavity in the chest.

5.3. Indication of abdominal penetration

5.3.1. A sample of modelling clay shall be vertically connected to the front of the lumbar vertebrae by means of thin adhesive tape.

5.3.2. A deflection of the modelling clay does not necessarily mean that penetration has taken place.

5.3.3. The modelling clay samples shall be of the same length and width as the lumbar spinal column; the thickness of the samples shall be 50 ± 2 mm.

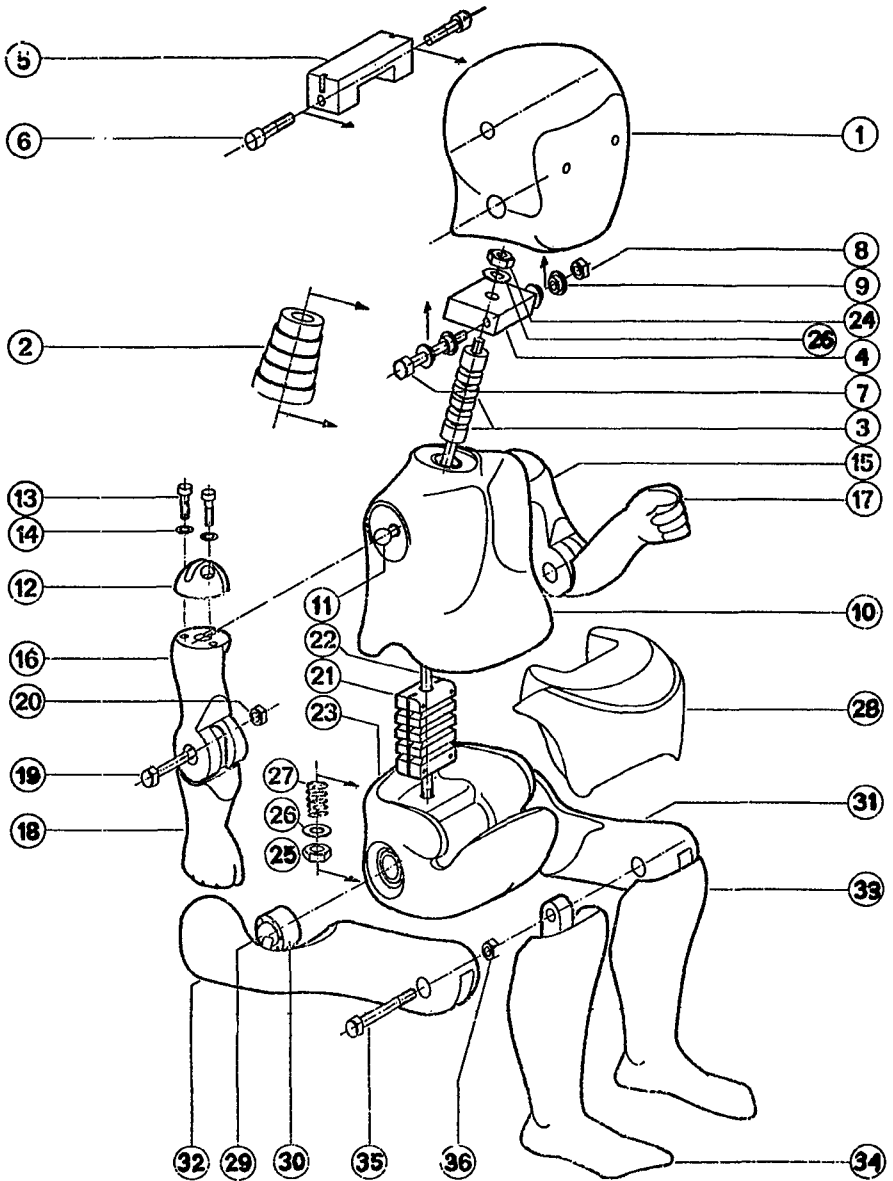
5.3.4. Only the modelling clay supplied with the manikins shall be used.

5.3.5. The temperature of the modelling clay during the test shall be 30 ± 5 °C.

* This reference will later be substituted by the reference to an ISO standard at present under preparation (see document ISO/TC22/SC12/No. 175, August 1977).

Annex 8 — Appendix

EXPLODED VIEW OF THE MANIKIN



<i>Part no.</i>	<i>Description</i>	<i>Number</i>
1	Head	1
2	Neck elements	5
3	Neck core elements (polyamide)	6
4	Atlas-Axis block	1
5	Transducer mounting block	1
6	Transducer mounting block attachment bolt	2
7	Head bolt	1
8	Nut	1
9	Washer	4
10	Upper torso	1
11	Shoulder-joint ball	2
12	Shoulder-joint socket half	2
13	Adjustment bolt for shoulder joint	4
14	Spring washer	4
15	Upper arm left	1
16	Upper arm right	1
17	Fore arm left	1
18	Fore arm right	1
19	Elbow-hinge bolt	2
20	Elbow-hinge nut	2
21	Lumbar vertebrae	5
22	Spine cable	1
23	Lower torso	1
24	Adjustment nut for neck	1
25	Adjustment nut for lumbar vertebrae	1
26	Washer	3
27	Spring	1
28	Abdominal insert	1
29	Hip joint ball	2
30	Hip joint adjustment nut	2
31	Upper leg left	1
32	Upper leg right	1
33	Lower leg left	1
34	Lower leg right	1
35	Knee hinge bolt	2
36	Knee hinge nut	2
	Accessories:	
37	Plasticine	1
38	Jacket	1
39	Trousers, pair of	1

ANNEX 9

FRONTAL IMPACT TEST AGAINST A BARRIER

1. *Installations, procedure and measuring instruments*1.1. *Testing ground*

The test area shall be large enough to accommodate the run-up track, barrier and technical installations necessary for the test. The last part of the track, for at least 5 m before the barrier, must be horizontal, flat and smooth.

1.2. *Barrier*

The barrier consists of a block of reinforced concrete not less than 3 m wide at the front and not less than 1.5 m high. The barrier must be of such thickness that it weighs at least 70 tonnes. The front face must be vertical, perpendicular to the axis of the run-up track, and covered with plywood boards 2 cm thick in good condition. The barrier shall

be either anchored in the ground or placed on the ground with, if necessary, additional arresting devices to limit its displacement. A barrier with different characteristics, but giving results at least equally conclusive, may likewise be used.

1.3. *Propulsion of the vehicle*

At the moment of impact, the vehicle must no longer be subjected to the action of any additional steering or propelling device or devices. It must reach the obstacle on a course perpendicular to the collision wall; the maximum lateral disalignment permitted between the vertical median line of the front of the vehicle and the vertical median line of the collision wall is ± 30 cm.

1.4. *State of the vehicle*

1.4.1. The vehicle under test must either be fitted with all the normal components and equipment included in its unladen service weight or be in such a condition as to fulfil this requirement in so far as the components and equipment of concern to the passenger compartment and the distribution of the service weight of the vehicle as a whole are concerned.

1.4.2. If the vehicle is driven by external means, the fuel installation must be filled to at least 90 per cent of its capacity, either with fuel or with a non-inflammable liquid, having a density and a viscosity close to those of the fuel normally used. All other systems (brake-fluid containers, radiator, etc.) must be empty.

1.4.3. If the vehicle is driven by its own engine, the fuel tank must be at least 90 per cent full. All other liquid-holding tanks must be filled to capacity.

1.4.4. If the manufacturer so requests, the technical service responsible for conducting the tests may allow the same vehicle as is used for tests prescribed by other Regulations (including tests capable of affecting its structure) to be used also for the tests prescribed by this Regulation.

1.5. *Impact velocity*

The impact velocity must be $50 \pm \frac{0}{2}$ km/h. However, if the test has been carried out at a higher impact velocity and the vehicle has satisfied the conditions prescribed, the test is considered satisfactory.

1.6. *Measuring instruments*

The instrument used to record the speed referred to in paragraph 1.5 above shall be accurate to within 1 per cent.

ANNEX 10

REAR IMPACT TEST PROCEDURE

1. *Installations, procedures and measuring instruments*

1.1. *Testing ground*

The test area shall be large enough to accommodate the propulsion system of the impactor and to permit after-impact displacement of the vehicle impacted and installation of the test equipment. The part in which vehicle impact and displacement occur shall be horizontal. (The slope shall be less than 3 per cent measured over any length of one metre).

1.2. *Impactor*

1.2.1. The impactor shall be of steel and of rigid construction.

1.2.2. The impacting surface shall be flat and at least 2,500 mm wide and 800 mm high. Its edges shall be rounded to a radius of curvature of between 40 and 50 mm. It shall be clad with a layer of plywood 20 ± 1 mm thick.

1.2.3. At the moment of impact the following requirements shall be met:

1.2.3.1. The impacting surface shall be vertical and perpendicular to the median longitudinal plane of the impacted vehicle;

- 1.2.3.2. The direction of movement of the impactor shall be substantially horizontal and parallel to the median longitudinal plane of the impacted vehicle;
- 1.2.3.3. The maximum lateral deviation permitted between the median vertical line of the surface of the impactor and the median longitudinal plane of the impacted vehicle shall be 300 mm. In addition, the impacting surface shall extend over the entire width of the impacted vehicle;
- 1.2.3.4. The ground clearance of the lower edge of the impacting surface shall be 175 ± 25 mm.
- 1.3. *Propulsion of the impactor*
The impactor may either be secured to a carriage (moving barrier) or form part of a pendulum.
- 1.4. *Special provisions applicable where a moving barrier is used*
- 1.4.1. If the impactor is secured to a carriage (moving barrier) by a restraining element, the latter must be rigid and be incapable of being deformed by the impact; the carriage shall, at the moment of impact, be capable of moving freely and no longer be subject to the action of the propelling device.
- 1.4.2. The combined mass of carriage and impactor shall be $1,100 \pm 20$ kg.
- 1.5. *Special provisions applicable where a pendulum is used*
- 1.5.1. The distance between the centre of the impacting surface and the axis of rotation of the pendulum shall be not less than 5 m.
- 1.5.2. The impactor shall be freely suspended by rigid arms, rigidly secured to it. The pendulum so constituted shall be substantially incapable of being deformed by the impact.
- 1.5.3. A stopping device shall be incorporated in the pendulum to prevent any secondary impact by the impactor on the test vehicle.
- 1.5.4. At the moment of impact, the velocity of the centre of percussion of the pendulum shall be between 30 and 32 km/h.
- 1.5.5. The reduced mass " m_r " at the centre of percussion of the pendulum is defined as a function of the total mass " m ", of the distance " a "* between the centre of percussion and the axis of rotation, and of the distance " l " between the centre of gravity and the axis of rotation, by the following equation:
- $$m_r = m \cdot \frac{l}{a}$$
- 1.5.6. The reduced mass " m_r " shall be $1,100 \pm 20$ kg.
- 1.6. *General provisions relating to the mass and velocity of the impactor*
If the test has been conducted at an impact velocity higher than those prescribed in paragraph 1.5.4 and/or with a mass greater than those prescribed in paragraphs 1.5.3 or 1.5.6, and the vehicle has met the requirements prescribed, the test shall be considered satisfactory.
- 1.7. *State of the vehicle during the test*
The vehicle being tested shall either be fitted with all the normal components and equipment included in its unladen service weight or be in such condition as to fulfil this requirement in so far as the distribution of the service weight of the vehicle as a whole is concerned.
- 1.8. The complete vehicle with the child restraint installed in accordance with the fitting instructions shall be placed on a hard, flat and level surface, with the handbrake off and in neutral gear. More than one child restraint may be tested in the same impact test.

* The distance " a " is equal to the length of the synchronous pendulum under consideration.

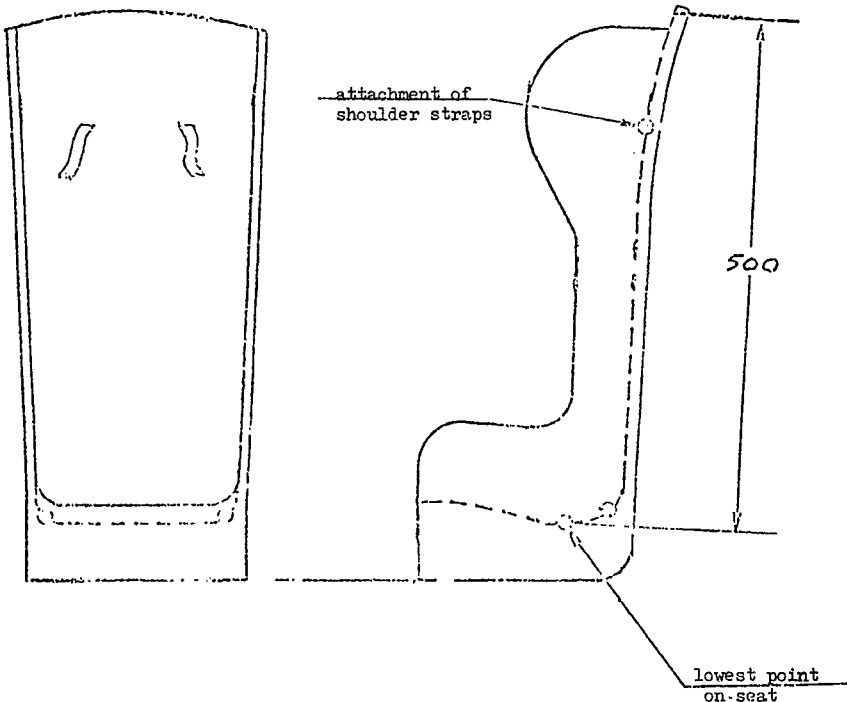
ANNEX 11

ADDITIONAL ANCHORAGES REQUIRED FOR ATTACHING CHILD RESTRAINTS
IN THE SEMI-UNIVERSAL CATEGORY TO MOTOR VEHICLES

1. This annex applies only to the additional anchorages for attaching child restraints in the "semi-universal" category.
2. The anchorages shall be determined by the manufacturer of the child restraint in agreement with the vehicle manufacturer and details shall be submitted for approval to the technical services conducting the tests.
3. The manufacturer of the child restraint shall provide the necessary parts for fitting the anchorages and a special plan for each vehicle showing their exact location.
4. The user shall be responsible for fitting the anchorages to the vehicle in accordance with the instructions provided by the manufacturer of the child restraint.

ANNEX 12

CHAIR



dimensions in mm

United Nations, New York, 28 August 1981

Authentic texts: English and French.

Registered ex officio on 1 February 1981.