

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 1958<sup>1</sup>

ENTRY INTO FORCE of Regulation No. 32 (*Uniform provisions concerning the approval of vehicles with regard to the behaviour of the structure of the impacted vehicle in a rear-end collision*) as an annex to the above-mentioned Agreement

The said Regulation came into force on 1 July 1975 in respect of Sweden and the United Kingdom of Great Britain and Northern Ireland, in accordance with article 1 (5) of the Agreement.

*Regulation No. 32*

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF VEHICLES WITH REGARD TO THE BEHAVIOUR OF THE STRUCTURE OF THE IMPACTED VEHICLE IN A REAR-END COLLISION

1. SCOPE

This Regulation applies to the behaviour of the structure of the passenger compartment of private (passenger) cars when subjected to a rear-end collision.

2. DEFINITIONS

2.1. In defining the dimensions the following simplified terminology is used:

2.1.1. a "transverse plane" is a vertical plane perpendicular to the median longitudinal plane of the vehicle;

2.1.2. a "longitudinal plane" is a plane parallel to the median longitudinal plane of the vehicle;

2.1.3. the vehicle's "reference plane" is a plane related to the vehicle and horizontal when the vehicle in the state defined in paragraph 2.2.4. below rests on a horizontal plane.

2.2. For the purposes of this Regulation:

2.2.1. "approval of a vehicle" means the approval of a vehicle type with regard to the behaviour of the structure of the passenger compartment in a rear-end collision;

2.2.2. "vehicle type" means a category of power-driven vehicles which do not differ in such essential respects as:

2.2.2.1. the length and width of the vehicle in so far as they have an effect on the results of the impact test prescribed in this Regulation;

2.2.2.2. the structure, dimensions, lines and materials of the part of the vehicle rearward of the transverse plane through the "R" point of the rearmost seat;

2.2.2.3. the lines and inside dimensions of the passenger compartment in so far as they have an effect on the results of the impact test prescribed in this Regulation;

2.2.2.4. the siting of the engine (front, rear, centre);

2.2.3. "passenger compartment" means the space for occupant accommodation, bounded by the roof, floor, side walls, doors, outside glazing, front bulkhead, and the plane of the rear compartment bulkhead or the plane of the rear seat back support;

2.2.4. "unladen kerb weight" means the weight of the vehicle in running order, unoccupied and unladen but complete with fuel, coolant, lubricant, tools and a spare wheel (if provided as standard equipment by the vehicle manufacturer);

2.2.5. "capacity of the fuel tank" means the fuel-tank capacity as specified by the manufacturer.

<sup>1</sup> United Nations, *Treaty Series*, vol. 335, p. 211; for subsequent actions, see references in Cumulative Indexes Nos. 4 to 11, as well as annex A in volumes 752, 754, 756, 759, 764, 768, 771, 772, 774, 777, 778, 779, 787, 788, 797, 801, 802, 808, 811, 814, 815, 818, 820, 825, 826, 829, 830, 834, 835, 848, 850, 854, 856, 857, 858, 860, 861, 865, 866, 871, 872, 882, 887, 891, 892, 893, 897, 899, 915, 917, 926, 932, 940, 943, 945, 950, 951, 955, 958, 960, 961, 963 and 966.

### 3. APPLICATION FOR APPROVAL

- 3.1. The application for approval of a vehicle type with regard to the behaviour of the structure of the passenger compartment in a rear-end collision shall be submitted by the vehicle manufacturer or by his duly accredited representative.
- 3.2. It shall be accompanied by the undermentioned documents in triplicate and by the following particulars:
  - 3.2.1. a detailed description of the vehicle type with respect to its structure, dimensions, lines and constituent materials;
  - 3.2.2. drawings of the vehicle showing the vehicle type in front, side and rear elevation and design details of the rear part of the structure; and
  - 3.2.3. particulars of the vehicle's unladen kerb weight.
- 3.3. A vehicle representative of the type to be approved shall be submitted to the technical service responsible for conducting the approval tests.
  - 3.3.1. A vehicle not comprising all the components proper to the type may be accepted for test provided that it can be shown that the absence of the components omitted has no detrimental effect on the results of the test, so far as the requirements of this Regulation are concerned.
  - 3.3.2. It shall be the responsibility of the applicant for approval to show that acceptance of the variants referred to in paragraph 3.3.1. is compatible with compliance with the requirements of this Regulation.

### 4. APPROVAL

- 4.1. If the vehicle submitted for approval pursuant to this Regulation meets the requirements of paragraphs 5. and 6. below, approval of that vehicle type shall be granted.
- 4.2. An approval number shall be assigned to each type approved. The same Contracting Party may not assign the same number to another vehicle type within the meaning of paragraph 2.2.2. above.
- 4.3. Notice of approval or of refusal of approval of a vehicle type 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 I to this Regulation and of dimensioned drawings of the vehicle structure (supplied by the applicant for approval) in a format not exceeding A 4 (210 × 297 mm) or folded to that format and on an appropriate scale.
- 4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation
  - 4.4.1. an international approval mark consisting of:
    - 4.4.1.1. a circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval,\* and
    - 4.4.1.2. the number of this Regulation, to the right of the circle prescribed in paragraph 4.4.1.1.
- 4.5. If the vehicle conforms to a vehicle type approved, under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1.1. need not be repeated; in such a case the additional numbers and symbols of all the Regulations under which approval has been granted in the country which has granted approval

\* 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 and 16 for Norway; 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 that Agreement, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.1.

- 4.6. The approval mark shall be clearly legible and be indelible.
- 4.7. The approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.
- 4.8. Annex 2 to this Regulation gives examples of arrangements of approval marks.

#### 5. REQUIREMENTS

- 5.1. When the vehicle has undergone the test referred to in paragraph 6. below, the lengthwise displacement of the reference point referred to in annex 4, paragraph 3, to this Regulation shall not exceed 75 mm.
- 5.2. After the test, no rigid component in the passenger compartment shall constitute a risk of serious injury to the vehicle's occupants.
- 5.3. In addition, the side doors of the vehicle shall not open under the effect of the impact.
- 5.4. Except in the case of a vehicle not having a roof of rigid construction, the opening of a number of doors sufficient to enable all the occupants to emerge shall, after the impact, continue to be possible without the use of tools.

#### 6. TEST

- 6.1. The vehicle's compliance with the requirements of paragraph 5. above shall be checked by the method set out in annexes 3 and 4 to this Regulation.

#### 7. MODIFICATIONS OF THE VEHICLE TYPE

- 7.1. Every modification of the vehicle type shall be notified to the administrative department which approved that vehicle type. The department may then either:
  - 7.1.1. consider that the modifications made are unlikely to have appreciable adverse effects, and that in any case the vehicle still meets the requirements; or
  - 7.1.2. require a further test report from the technical service responsible for conducting the tests.
- 7.2. Without prejudice to the provisions of paragraph 7.1. above, a variant of the vehicle whose unladen kerb weight is lower than the weight of the vehicle submitted for approval shall not be regarded as a modification of the vehicle type.
- 7.3. Notice of confirmation of approval or of refusal of approval, specifying the modifications shall be communicated by the procedure specified in paragraph 4.3. above to the Parties to the Agreement which apply this Regulation.

#### 8. CONFORMITY OF PRODUCTION

- 8.1. Every vehicle bearing an approval mark as prescribed under this Regulation shall conform to the vehicle type approved, more particularly as regards features affecting the behaviour of the structure of the passenger compartment in a rear-end collision.
- 8.2. In order to verify conformity as prescribed in paragraph 8.1. above, a sufficient number of serially-produced vehicles bearing the approval mark required by this Regulation shall be subjected to random checks.
- 8.3. As a general rule, the checks aforesaid shall be confined to the taking of measurements. However, the vehicles shall if necessary be subjected to the checks prescribed in paragraph 6. above.

#### 9. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

- 9.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirement laid down in paragraph 8.1. above is not complied with or if a vehicle has failed to pass the tests prescribed in paragraph 6. above.
- 9.2. If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith notify 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 "APPROVAL WITHDRAWN"

10. NAMES AND ADDRESSES OF TECHNICAL SERVICES CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

The Parties to the Agreement which apply this Regulation shall communicate to the Secretariat of the United Nations the names and addresses of the technical services 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 the other countries, are to be sent.

ANNEX 1

(Maximum format: A 4 (210 mm × 297 mm))



NAME OF ADMINISTRATION

Communication concerning the approval (or refusal or withdrawal of approval) of a vehicle type with regard to the behaviour of the structure of the passenger compartment in a rear-end collision, pursuant to Regulation No. 32

- Approval No. . . . .
1. Trade name or mark of the motor vehicle . . . . .
2. Vehicle type . . . . .
3. Manufacturer's name and address . . . . .
4. If applicable, name and address of manufacturer's representative . . . . .
5. Brief description of the vehicle type as regards its structure, dimensions, lines and constituent materials . . . . .
6. Weight of vehicle when tested:
front axle: . . . . .
rear axle: . . . . .
total: . . . . .
7. Vehicle submitted for approval on . . . . .
8. Technical service responsible for conducting approval tests . . . . .
9. Date of report issued by that service . . . . .
10. Number of report issued by that service . . . . .
11. Approval granted/refused\* . . . . .
12. Position of approval mark on the vehicle . . . . .
13. Place . . . . .

\* Strike out what does not apply.

- 14. Date . . . . .
- 15. Signature . . . . .
- 16. The following documents, bearing the approval number shown above, are annexed to this communication:  
 . . . . . drawings, diagrams and lay-out plans of the passenger compartment and of the components of the structure considered to be of importance for the purposes of this Regulation.

ANNEX 2

ARRANGEMENTS OF APPROVAL MARKS

Model A

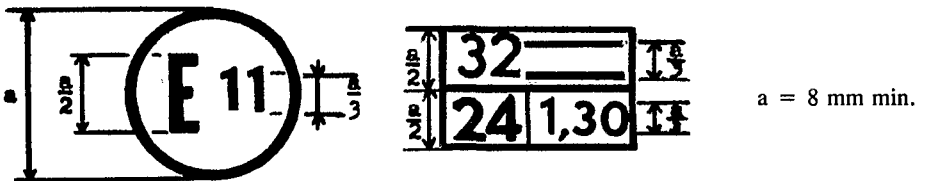
(See paragraph 4.4. of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has, with regard to the behaviour of the structure of the passenger compartment in a rear-end collision, been approved in the United Kingdom (E 11) pursuant to Regulation No. 32.

Model B

(See paragraph 4.5 of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the United Kingdom (E 11) pursuant to Regulations Nos. 32 and 24. In the case of the latter Regulation the corrected absorption coefficient is 1.30 m<sup>-1</sup>.

## ANNEX 3

## PROCEDURE FOR DETERMINING THE "H" POINT AND THE ACTUAL SEAT-BACK ANGLE AND FOR VERIFYING THEIR RELATIONSHIP TO THE "R" POINT AND THE DESIGN SEAT-BACK ANGLE

1. DEFINITIONS
  - 1.1. The "H" point, which indicates the position of a seated occupant in the passenger compartment, is the trace, in a longitudinal vertical plane, of the theoretical axis of rotation between the legs and the torso of a human body represented by the manikin described in paragraph 3. below.
  - 1.2. The "R" point or "seating reference point" is the reference point specified by the manufacturer which
    - 1.2.1. has co-ordinates determined in relation to the vehicle structure;
    - 1.2.2. corresponds to the theoretical position of the point of torso/legs rotation ("H" point) for the lowest and most rearward normal driving position or position of use given to each seat provided by the vehicle manufacturer.
  - 1.3. "Seat-back angle" means the inclination of the seat back in relation to the vertical.
  - 1.4. "Actual seat-back angle" means the angle formed by the vertical through the "H" point with the torso reference line of the human body represented by the manikin described in paragraph 3. below.
  - 1.5. "Design seat-back angle" means the angle prescribed by the manufacturer which
    - 1.5.1. determines the seat-back angle for the lowest and most rearward normal driving position or position of use given to each seat by the vehicle manufacturer;
    - 1.5.2. is formed at the "R" point by the vertical and the torso reference line;
    - 1.5.3. corresponds theoretically to the actual seat-back angle.
2. DETERMINATION OF "H" POINTS AND ACTUAL SEAT-BACK ANGLES
  - 2.1. An "H" point and an "actual seat-back angle" shall be determined for each seat provided by the manufacturer. If the seats in the same row can be regarded as similar (bench seat, identical seats, etc.), only one "H" point and one "actual seat-back angle" shall be determined for each row of seats, the manikin described in paragraph 3. below being seated in a place regarded as representative for the row. This place shall be:
    - 2.1.1. in the case of the front row, the driver's seat;
    - 2.1.2. in the case of the rear row or rows, an outer seat.
  - 2.2. When an "H" point and an "actual seat-back angle" are being determined, the seat considered shall be placed in the lowest and most rearward normal driving position or position of use provided for it by the manufacturer. The seat back shall if its inclination is adjustable be locked as specified by the manufacturer or in the absence of any specification to an actual seat-back angle of as nearly as possible 25° from the vertical.
3. DESCRIPTION OF THE MANIKIN
  - 3.1. A three-dimensional manikin of a weight and contour corresponding to those of an adult male of average height shall be used. Such a manikin is depicted in figures 1 and 2 of the appendix to this annex.
  - 3.2. The manikin shall comprise:
    - 3.2.1. two components, one simulating the back and the other the seat of the body, pivoting on an axis representing the axis of rotation between the torso and the thigh. The trace of this axis on the side of the manikin is the manikin's "H" point;
    - 3.2.2. two components simulating the legs and pivotally attached to the component simulating the seat; and
    - 3.2.3. two components simulating the feet and connected to the legs by pivotal joints simulating ankles.

- 3.2.4. In addition, the component simulating the seat of the body shall be provided with a level enabling its transverse orientation to be verified.
- 3.3. Body-segment weights shall be attached at appropriate points corresponding to the relevant centres of gravity, so as to bring the total weight of the manikin up to about 75.6 kg. Details of the various weights are given in the table in figure 2 of the appendix to this annex.
- 3.4. The torso reference line of the manikin is taken into account by a straight line passing through the joint between the leg and the pelvis and the theoretical joint between the neck and the thorax (see the appendix to this annex, figure 1).

#### 4. SETTING UP THE MANIKIN

The three-dimensional manikin shall be set up in the following manner:

- 4.1. the vehicle shall be placed on a horizontal plane and the seats adjusted as prescribed in paragraph 2.2. above;
- 4.2. the seat to be tested shall be covered with a piece of cloth to facilitate correct setting up of the manikin;
- 4.3. the manikin shall be placed on the seat concerned, its pivotal axis being perpendicular to the longitudinal plane of symmetry of the vehicle;
- 4.4. the feet of the manikin shall be placed as follows:
  - 4.4.1. in the front seats, in such a way that the level verifying the transverse orientation of the seat of the manikin is brought to the horizontal;
  - 4.4.2. in the rear seats, so far as possible in such a way as to be in contact with the front seats. If the feet then rest on parts of the floor which are at different levels, the foot which first comes into contact with the front seat shall serve as a reference point and the other foot shall be so arranged that the level enabling the transverse orientation of the seat of the manikin to be verified is brought to the horizontal;
  - 4.4.3. if the "H" point is being determined at a centre seat, the feet shall be placed one on each side of the tunnel;
- 4.5. the weights shall be placed on the thighs, the level verifying the transverse orientation of the seat of the manikin shall be brought to the horizontal, and the weights shall be placed on the component representing the seat of the manikin;
- 4.6. the manikin shall be moved away from the seat back by means of the knee-pivot bar and the back of the manikin shall be pivoted forwards. The manikin shall be repositioned on the seat of the vehicle by being slid backwards on its seat until resistance is encountered, the back of the manikin then being replaced against the seat back;
- 4.7. a horizontal load of approximately  $10 \pm 1$  daN ( $10 \pm 1$  kgf) shall be applied to the manikin twice. The direction and point of application of the load are shown by a black arrow in figure 2 of the appendix;
- 4.8. the weights shall be installed on the right and left sides, and the torso weights shall then be placed in position. The transverse level of the manikin shall be kept horizontal;
- 4.9. the transverse level of the manikin being kept horizontal, the back of the manikin shall be pivoted forwards until the torso weights are above the "H" point, so as to eliminate any friction with the seat back;
- 4.10. the back of the manikin shall be gently moved rearwards so as to complete the setting-up operation. The transverse level of the manikin shall be horizontal. If it is not, the procedure described above shall be repeated.

#### 5. RESULTS

- 5.1. When the manikin has been set up as described in paragraph 4. above, the "H" point and the actual seat-back angle of the vehicle seat considered are constituted by the "H" point and the angle of inclination of the manikin's torso reference line.

- 5.2. The co-ordinates of the "H" point in relation to three mutually perpendicular planes, and the actual seat-back angle, shall be measured for comparison with the data supplied by the vehicle manufacturer.
6. VERIFYING THE RELATIVE POSITIONS OF THE "R" AND "H" POINTS AND THE RELATIONSHIP BETWEEN THE DESIGN SEAT-BACK ANGLE AND THE ACTUAL SEAT-BACK ANGLE
  - 6.1. The results of the measurements carried out in conformity with paragraph 5.2. for the "H" point and the actual seat-back angle shall be compared with the co-ordinates of the "R" point and the design seat-back angle as supplied by the vehicle manufacturer.
  - 6.2. The relative positions of the "R" point and the "H" point and the relationship between the design seat-back angle and the actual seat-back angle shall be considered to be satisfactory for the seat in question if the "H" point, as defined by its co-ordinates, lies within a longitudinal rectangle whose horizontal and vertical sides are 30 mm and 20 mm long respectively and whose diagonals intersect at the "R" point, and if the actual seat-back angle is within 3° of the design seat-back angle.
    - 6.2.1. If these conditions are met, the "R" point and the design seat-back angle shall be used for the test and, if necessary, the manikin shall be so adjusted that the "H" point coincides with the "R" point and the actual seat-back angle coincides with the design seat-back angle.
  - 6.3. If the "H" point or the actual seat-back angle does not satisfy the requirements of paragraph 6.2. above, the "H" point or the actual seat-back angle shall be determined twice more (three times in all). If the results of two of these three operations satisfy the requirements the result of the test shall be considered to be satisfactory.
  - 6.4. If at least two of the three test results do not satisfy the requirements of paragraph 6.2., the result of the test shall be considered to be not satisfactory.
  - 6.5. If the situation described in paragraph 6.4. above arises, or if verification cannot be effected because the manufacturer has failed to supply information regarding the position of the "R" point or regarding the design seat-back angle, the average of the results of the three determinations may be used and be regarded as applicable in all cases where the "R" point or the design seat-back angle is referred to in this Regulation.
  - 6.6. For verifying the relative positions of the "R" point and the "H" point and the relationship between the design seat-back angle and the actual seat-back angle in a serially-produced vehicle the rectangle referred to in paragraph 6.2. above shall be replaced by a square of 50 mm side and the actual seat-back angle shall not differ by more than  $\pm 5^\circ$  from the design seat-back angle.



ANNEX 3 — Appendix

COMPONENTS OF THREE-DIMENSIONAL MANIKIN

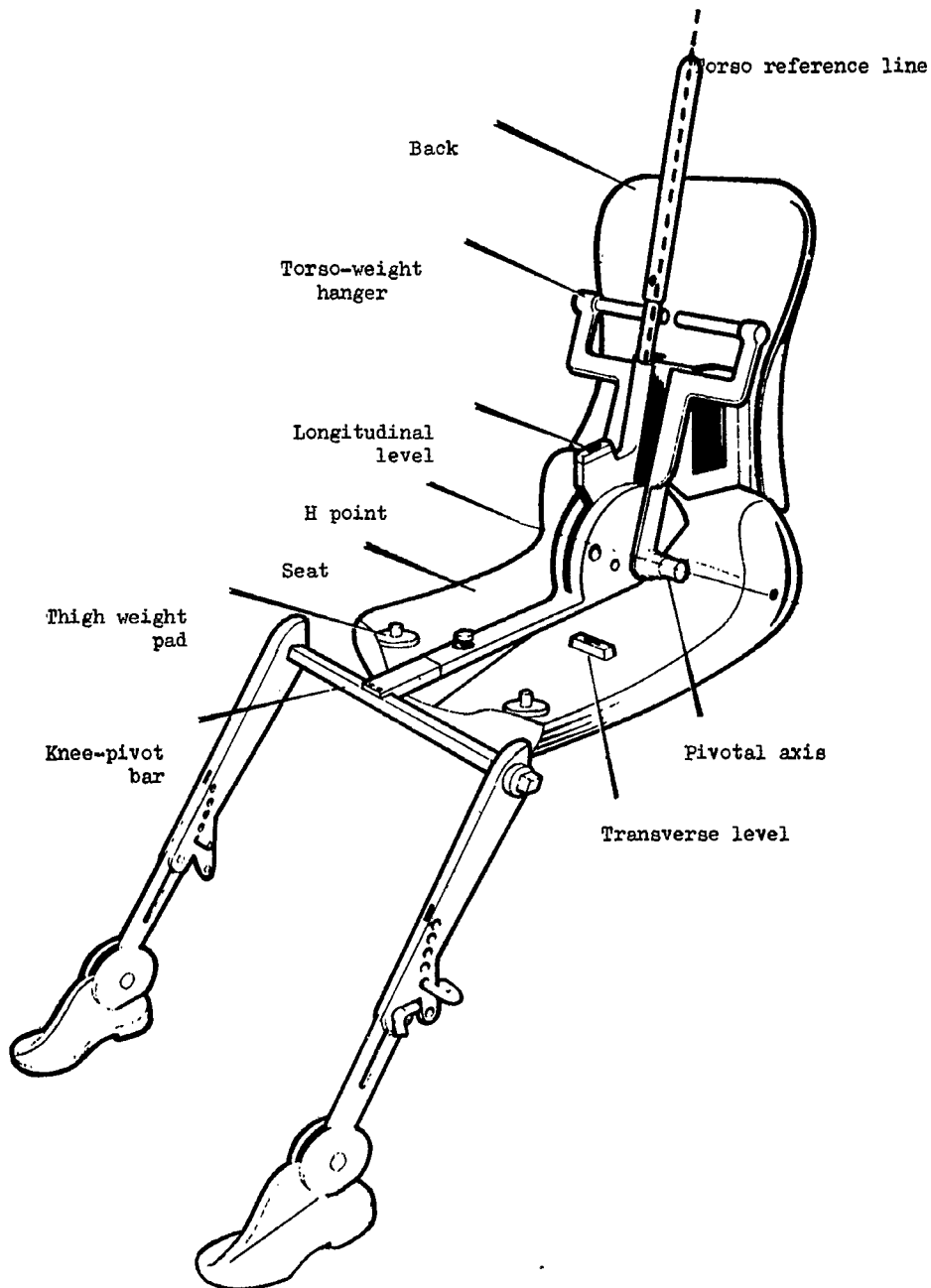


Fig. 1

DIMENSIONS AND WEIGHT OF MANIKIN

<u>Mass of manikin</u>	<u>kg</u>
Components simulating back and seat of body	16.6
Torso weights	31.2
Seat weights	7.8
Thigh weights	6.8
Leg weights	<u>13.2</u>
Total	75.6

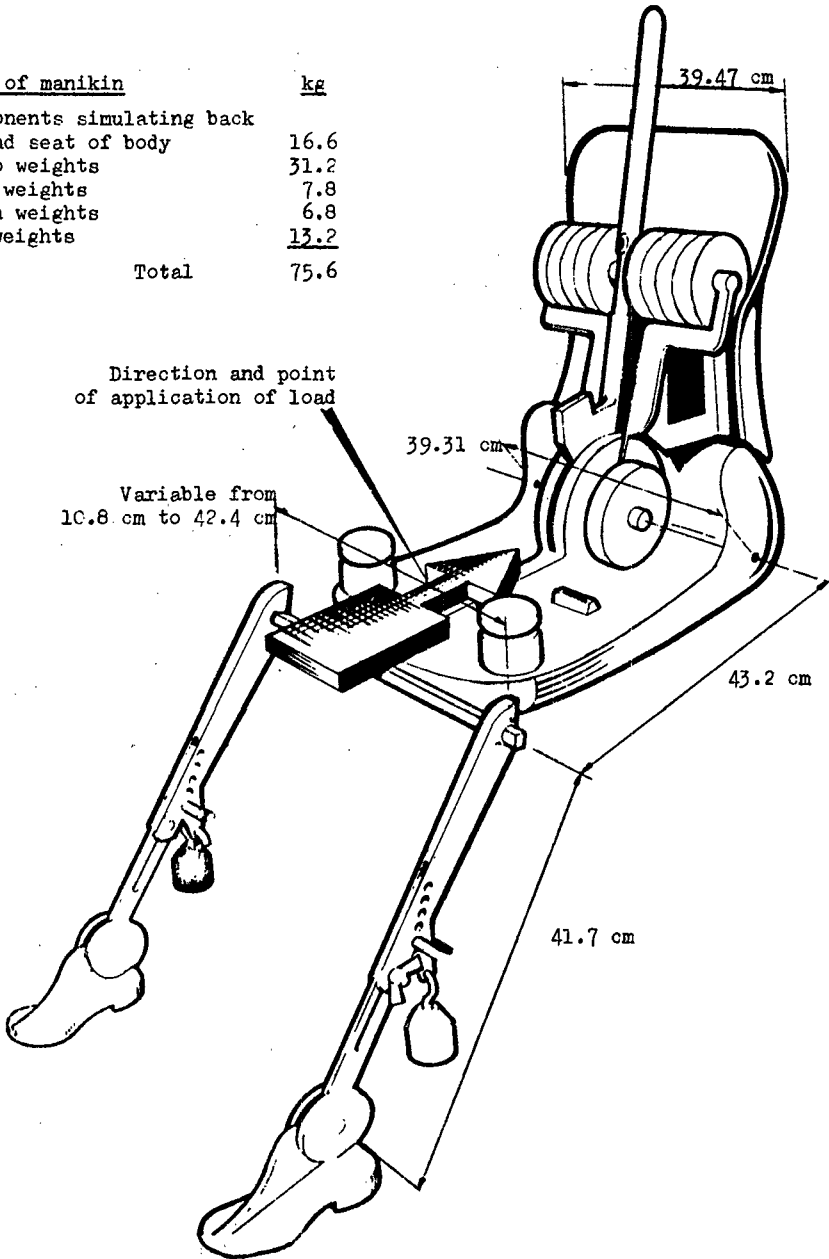


Fig. 2

## ANNEX 4

## PROCEDURE FOR REAR-END IMPACT TEST

1. PURPOSE AND SCOPE
  - 1.1. The purpose of the test is to simulate the conditions of rear-end impact by another vehicle in motion. The test should make it possible to verify whether the vehicles referred to in paragraph 1 of this Regulation meet the requirements defined in paragraph 5 hereof concerning the behaviour of the structure of the passenger compartment in a rear-end collision.
2. INSTALLATIONS, PROCEDURES AND MEASURING INSTRUMENTS
  - 2.1. *Testing ground*

The test area shall be large enough to accommodate the impactor (striker) propulsion system 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, flat and smooth and have a coefficient of friction of not less than 0.5.
  - 2.2. *Impactor (striker)*
    - 2.2.1. The impactor shall be of steel and of rigid construction.
    - 2.2.2. The impacting surface shall be flat, not less than 2,500 mm wide, and 800 mm high, and 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 mm thick.
    - 2.2.3. At the moment of impact the following requirements shall be met:
      - 2.2.3.1. the impacting surface shall be vertical and perpendicular to the median longitudinal plane of the impacted vehicle;
      - 2.2.3.2. the direction of movement of the impactor shall be substantially horizontal and parallel to the median longitudinal plane of the impacted vehicle;
      - 2.2.3.3. the maximum lateral deviation tolerated 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;
      - 2.2.3.4. the ground clearance of the lower edge of the impacting surface shall be  $175 \pm 25$  mm.
  - 2.3. *Propulsion of the impactor*

The impactor may either be secured to a carriage (moving barrier) or form part of a pendulum.
  - 2.4. *Special provisions applicable where a moving barrier is used*
    - 2.4.1. 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.
    - 2.4.2. The velocity of impact shall be between 35 and 38 km/h.
    - 2.4.3. The aggregate weight (mass) of carriage and impactor shall be  $1,100 \pm 20$  kg.
  - 2.5. *Special provisions applicable where a pendulum is used*
    - 2.5.1. The distance between the centre of the impacting surface and the axis of rotation of the pendulum shall be not less than 5 m.
    - 2.5.2. 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.
    - 2.5.3. Arresting gear shall be incorporated in the pendulum to prevent any secondary impact by the impactor on the test vehicle.
    - 2.5.4. At the moment of impact the velocity of the centre of percussion of the pendulum shall be between 35 and 38 km/h.

- 2.5.5. 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 “ $a$ ”<sup>\*</sup> 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:

$$m_r = m \cdot \frac{l}{a}$$

- 2.5.6. The reduced mass “ $m_r$ ” shall be  $1,100 \pm 20$  kg.

2.6. *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 paragraphs 2.4.2. and 2.5.4. and/or with a mass greater than those prescribed in paragraphs 2.4.3. or 2.5.6. and the vehicle has met the requirements prescribed, the test shall be considered satisfactory.

2.7. *State of vehicle under test*

- 2.7.1. The vehicle under test shall either be fitted with all the normal components and equipment included in its unladen kerb weight or be in such condition as to fulfil this requirement so far as the components and equipment of concern to the passenger compartment and the distribution of the weight of the vehicle as a whole, in running order, are concerned.
- 2.7.2. The fuel tank must be filled to at least 90 per cent of its capacity with a liquid having a density close to that of the fuel normally used. All other systems (brake-fluid, header tanks, radiator, etc.) may be empty.
- 2.7.3. A gear may be engaged and the brakes may be applied.
- 2.7.4. If the manufacturer so requests, the following derogations shall be permitted:
- 2.7.4.1. The technical service responsible for conducting the test 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.
- 2.7.4.2. The vehicle may be weighted to an extent not exceeding 10 per cent of its unladen kerb weight with additional weights rigidly secured to the structure in such a way as not to affect the behaviour of the structure of the passenger compartment during the test.

2.8. *Measuring instruments*

The instruments used to record the speed referred to in paragraphs 2.4.2. and 2.5.4. above shall be accurate to within one per cent.

3. RESULTS

- 3.1. To measure the residual longitudinal space, the amount of longitudinal displacement of the vertical projection on the floor of the “R” point of the vehicle’s rearmost seat in relation to a reference point on a non-deformed part of the vehicle structure shall be determined.

4. EQUIVALENT TEST METHODS

- 4.1. Equivalent test methods are permitted provided that the conditions referred to in this Regulation can be observed either entirely by means of the substitute test or by calculation from the results of the substitute test.
- 4.2. If a method other than that described in paragraph 2 above is used, its equivalence must be demonstrated.

*Authentic tests of the Regulation: English and French.*

*Registered ex officio on 1 July 1975.*

<sup>\*</sup> It is recalled that the distance “ $a$ ” is equal to the length of the synchronous pendulum of the pendulum under consideration.

ENTRY INTO FORCE of Regulation No. 33 (*Uniform provisions concerning the approval of vehicles with regard to the behaviour of the structure of the impacted vehicle in a head-on collision*) as an annex to the 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 1958<sup>1</sup>

The said Regulation came into force on 1 July 1975 in respect of Sweden and the United Kingdom of Great Britain and Northern Ireland, in accordance with article 1 (5) of the Agreement.

### *Regulation No. 33*

#### UNIFORM PROVISIONS CONCERNING THE APPROVAL OF VEHICLES WITH REGARD TO THE BEHAVIOUR OF THE STRUCTURE OF THE IMPACTED VEHICLE IN A HEAD-ON COLLISION

##### 1. SCOPE

This Regulation applies to the behaviour of the structure of the passenger compartment of private (passenger) cars (other than forward-control vehicles) when subjected to a head-on collision.

##### 2. DEFINITIONS

2.1. In defining the dimensions the following simplified terminology is used:

2.1.1. a "transverse plane" is a vertical plane perpendicular to the median longitudinal plane of the vehicle;

2.1.2. a "longitudinal plane" is a plane parallel to the median longitudinal plane of the vehicle;

2.1.3. the "vehicle's reference plane" is a plane related to the vehicle and horizontal when the vehicle in the state defined in paragraph 2.2.5. below rests on a horizontal plane.

2.2. For the purposes of this Regulation,

2.2.1. "approval of a vehicle" means the approval of a vehicle type with regard to the behaviour of the structure of the passenger compartment in a head-on collision;

2.2.2. "vehicle type" means a category of power-driven vehicles which do not differ in such essential respects as:

2.2.2.1. the length and width of the vehicle in so far as they have an effect on the results of the impact test prescribed in this Regulation;

2.2.2.2. the structure, dimensions, lines and materials of the part of the vehicle forward of the transverse plane through the "R" point of the driver's seat;

2.2.2.3. the lines and inside dimensions of the passenger compartment in so far as they have an effect on the results of the impact test prescribed in this Regulation;

2.2.2.4. the siting of the engine (front, rear or centre);

2.2.3. "forward-control vehicle" means a vehicle in which the centre of the steering wheel is in the forward quarter of the vehicle's total length (including bumpers and over-riders, if any);

2.2.4. "passenger compartment" means the space for occupant accommodation, bounded by the roof, floor, side walls, doors, outside glazing, front bulkhead, and the plane of the rear compartment bulkhead or the plane of the rear seat back support;

2.2.5. "unladen kerb weight" means the weight of the vehicle in running order, unoccupied and unladen but complete with fuel, coolant, lubricant, tools and a spare wheel (if provided as standard equipment by the vehicle manufacturer);

2.2.6. "capacity of the fuel tank" means the fuel-tank capacity as specified by the manufacturer.

<sup>1</sup> United Nations, *Treaty Series*, vol. 335, p. 211.

### 3. APPLICATION FOR APPROVAL

- 3.1. The application for approval of a vehicle type with regard to the behaviour of the structure of the passenger compartment in a head-on collision shall be submitted by the vehicle manufacturer or by his duly accredited representative.
- 3.2. It shall be accompanied by the undermentioned documents in triplicate and by the following particulars:
  - 3.2.1. a detailed description of the vehicle type with respect to its structure, dimensions, lines and constituent materials;
  - 3.2.2. drawings of the vehicle showing the vehicle type in front, side and rear elevation and design details of the forward part of the structure; and
  - 3.2.3. particulars of the vehicle's unladen kerb weight.
- 3.3. A vehicle representative of the type to be approved shall be submitted to the technical service responsible for conducting the approval tests.
  - 3.3.1. A vehicle not comprising all the components proper to the type may be accepted for test provided that it can be shown that the absence of the components omitted has no detrimental effect on the results of the test, so far as the requirements of this Regulation are concerned.
  - 3.3.2. It shall be the responsibility of the applicant for approval to show that acceptance of the variants referred to in paragraph 3.3.1. is compatible with compliance with the requirements of this Regulation.

### 4. APPROVAL

- 4.1. If the vehicle submitted for approval pursuant to this Regulation meets the requirements of paragraphs 5. and 6. below, approval of that vehicle type shall be granted.
- 4.2. An approval number shall be assigned to each type approved. The same Contracting Party may not assign the same number to another vehicle type within the meaning of paragraph 2.2.2. above.
- 4.3. Notice of approval or of refusal of approval of a vehicle type 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 dimensioned drawings of the vehicle structure (supplied by the applicant for approval) in a format not exceeding A 4 (210 × 297 mm) or folded to that format and on an appropriate scale.
- 4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation:
  - 4.4.1. an international approval mark consisting of:
    - 4.4.1.1. a circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval,\* and
    - 4.4.1.2. the number of this Regulation, to the right of the circle prescribed in paragraph 4.4.1.1.
  - 4.5. If the vehicle conforms to a vehicle type approved, under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1.1. need not be repeated; in such a case the additional numbers and symbols of all the Regulations under which approval has been granted in the country which has granted approval

\* 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 and 16 for Norway. 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 that Agreement, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.1.

- 4.6. The approval mark shall be clearly legible and be indelible.
- 4.7. The approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.
- 4.8. Annex 2 to this Regulation gives examples of arrangements of the approval mark.

#### 5. REQUIREMENTS

- 5.1. After the unladen vehicle without a manikin has been collision-tested forwards against a barrier at a speed of 48.3 km/h, the interior space of the passenger compartment shall satisfy the requirements of paragraphs 5.2. to 5.9. below.
  - 5.2. For each front seat as defined by the manufacturer the distance after impact shall be determined between two transverse planes, one passing through the corresponding "R" point and the other through the rearmost projection of the lines of the instrument panel (switches and controls being disregarded) over a width of 150 mm to each side of the longitudinal plane passing through the centre of the seat. This distance shall be not less than 450 mm.
  - 5.3. Before impact, the straight line formed for each front seat by the intersection of the longitudinal plane passing through the centre of the seat with the horizontal plane passing through the centre of the service brake pedal in the position of rest shall be determined. The distance between the point of intersection of the said straight line with the front of the passenger compartment and its point of intersection with the transverse plane passing through the corresponding "R" point shall then be determined. After impact, this distance shall be not less than 650 mm.
  - 5.4. The width of the footwell shall be determined as follows:
    - 5.4.1. before impact, the points shall be determined at which a transverse horizontal axis passing through the centre of the service brake pedal in the position of rest meets the side walls of the footwell;
    - 5.4.2. after impact, the distance separating two longitudinal vertical planes passing through the same points shall be measured. This distance shall be not less than 250 mm for each front seat.
  - 5.5. The distance from floor to roof shall be determined along a vertical passing through the "R" point and situated in the longitudinal plane passing through the centre of each front seat. After impact, this distance shall not be reduced by more than 10 per cent.
  - 5.6.6. For measuring the distances referred to in paragraphs 5.2., 5.3., 5.4. and 5.5., compression corresponding to a force of 10 daN applied over a surface of  $5 \times 5$  cm may be exerted in the direction of measurement.
  - 5.7. After the test, no rigid component in the passenger compartment shall constitute a risk of serious injury to the vehicle's occupants.
  - 5.8. In addition, the side doors of the vehicle shall not open under the effect of the impact.
  - 5.9. Except in the case of a vehicle not having a roof of rigid construction, the opening of a number of doors sufficient to enable all the occupants to get out must be possible after the impact without the use of tools.
- #### 6. TESTS
- The vehicle's compliance with the requirements of paragraph 5. above shall be checked by the methods set out in annexes 3 and 4 to this Regulation.
- #### 7. MODIFICATIONS OF THE VEHICLE TYPE
- 7.1. Every modification of the vehicle type shall be notified to the administrative department which approved the vehicle type. The department may then either:
    - 7.1.1. consider that the modifications made are unlikely to have appreciable adverse effects, and that in any case the vehicle still meets the requirements; or

- 7.1.2. require a further test report from the technical service responsible for conducting the tests.
- 7.2. Without prejudice to the provisions of paragraph 7.1. above, a variant of the vehicle which meets the requirements of paragraph 3.3. of annex 4 to this Regulation, shall not be regarded as a modification of the vehicle type.
- 7.3. Notice of confirmation of approval or of refusal of approval, specifying the modifications, shall be communicated by the procedure specified in paragraph 4.3. above to the Parties to the Agreement which apply this Regulation.
8. CONFORMITY OF PRODUCTION
- 8.1. Every vehicle bearing an approval mark as prescribed under this Regulation shall conform to the vehicle type approved, more particularly as regards features affecting the behaviour of the structure of the passenger compartment in a head-on collision.
- 8.2. In order to verify conformity as prescribed in paragraph 8.1. above, a sufficient number of serially-produced vehicles bearing the approval mark required by this Regulation shall be subjected to random checks.
- 8.3. As a general rule, the checks aforesaid shall be confined to the taking of measurements. However, the vehicles shall if necessary be subjected to the checks prescribed in paragraph 6. above.
9. PENALTIES FOR NON-CONFORMITY OF PRODUCTION
- 9.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirement laid down in paragraph 8.1. above is not complied with or if the vehicle has failed to pass the tests prescribed in paragraph 6. above.
- 9.2. If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith notify 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 "APPROVAL WITHDRAWN".
10. NAMES AND ADDRESSES OF TECHNICAL SERVICES CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS
- The Parties to the Agreement which apply this Regulation shall communicate to the Secretariat of the United Nations the names and addresses of the technical services 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: A 4 (210 × 297 mm))



NAME OF ADMINISTRATION
---------------------------



*Communication concerning the approval (or refusal or withdrawal of approval) of a vehicle type with regard to the behaviour of the structure of the passenger compartment in a head-on collision, pursuant to Regulation No. 33*

Approval No. . . . .

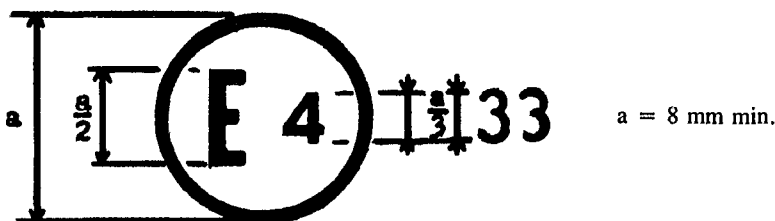
1. Trade name or mark of the power-driven vehicle . . . . .
2. Vehicle type . . . . .
3. Manufacturer's name and address . . . . .
4. If applicable, name and address of manufacturer's representative . . . . .
5. Brief description of the vehicle type as regards its structure, dimensions, lines and constituent materials . . . . .
6. Weight of vehicle when tested
  - front axle: . . . . .
  - rear axle: . . . . .
  - total: . . . . .
7. Vehicle submitted for approval on . . . . .
8. Technical service responsible for conducting approval tests . . . . .
9. Date of report issued by that service . . . . .
10. Number of report issued by that service . . . . .
11. Approval granted/refused\* . . . . .
12. Position of approval mark on the vehicle . . . . .
13. Place . . . . .
14. Date . . . . .
15. Signature . . . . .
16. The following documents, bearing the approval number shown above, are annexed to this communication:
  - . . . . . drawings, diagrams and lay-out plans of the passenger compartment and of the components of the structure considered to be of importance for the purposes of this Regulation.

ANNEX 2

ARRANGEMENTS OF THE APPROVAL MARK

*Model A*

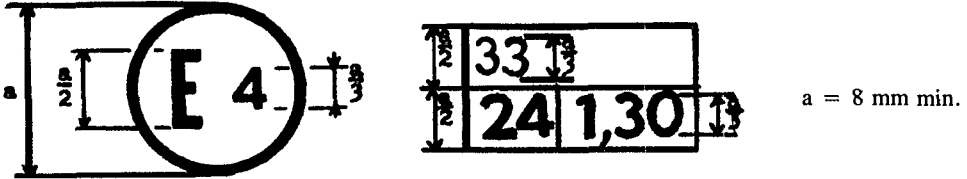
(See paragraph 4.4. of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has, with regard to the behaviour of the structure of the passenger compartment in a head-on collision, been approved in the Netherlands (E 4) pursuant to Regulation No. 33.

\* Strike out what does not apply.

*Model B*  
(See paragraph 4.5. of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) pursuant to Regulations Nos. 33 and 24. (In the case of the latter Regulation the corrected absorption coefficient is 1.30 m<sup>-1</sup>.)

### ANNEX 3

#### PROCEDURE FOR DETERMINING THE "H" POINT AND THE ACTUAL SEAT-BACK ANGLE AND FOR VERIFYING THEIR RELATIONSHIP TO THE "R" POINT AND THE DESIGN SEAT-BACK ANGLE

##### 1. DEFINITIONS

- 1.1. The "H" point, which indicates the position of a seated occupant in the passenger compartment, is the trace, in a longitudinal vertical plane, of the theoretical axis of rotation between the legs and the torso of a human body represented by the manikin described in paragraph 3 below.
- 1.2. The "R" point or "seating reference point" is the reference point specified by the manufacturer which
  - 1.2.1. has co-ordinates determined in relation to the vehicle structure;
  - 1.2.2. corresponds to the theoretical position of the point of torso/legs rotation ("H" point) for the lowest and most rearward normal driving position or position of use given to each seat provided by the vehicle manufacturer.
- 1.3. "Seat-back angle" means the inclination of the seat back in relation to the vertical.
- 1.4. "Actual seat-back angle" means the angle formed by the vertical through the "H" point with the torso reference line of the human body represented by the manikin described in paragraph 3. below.
- 1.5. "Design seat-back angle" means the angle prescribed by the manufacturer which
  - 1.5.1. determines the seat-back angle for the lowest and most rearward normal driving position or position of use given to each seat by the vehicle manufacturer;
  - 1.5.2. is formed at the "R" point by the vertical and the torso reference line;
  - 1.5.3. corresponds theoretically to the actual seat-back angle.

##### 2. DETERMINATION OF "H" POINTS AND ACTUAL SEAT-BACK ANGLES

- 2.1. An "H" point and an "actual seat-back angle" shall be determined for each seat provided by the manufacturer. If the seats in the same row can be regarded as similar (bench seat, identical seats, etc.) only one "H" point and one "actual seat-back angle" shall be determined for each row of seats, the manikin described in paragraph 3. below being seated in a place regarded as representative for the row. This place shall be:
  - 2.1.1. in the case of the front row, the driver's seat;
  - 2.1.2. in the case of the rear row or rows, an outer seat.

- 2.2. When an "H" point and an "actual seat-back angle" are being determined, the seat considered shall be placed in the lowest and most rearward normal driving position or position of use provided for it by the manufacturer. The seat back shall if its inclination is adjustable be locked as specified by the manufacturer or in the absence of any specification to an actual seat-back angle of as nearly as possible 25° from the vertical.
3. DESCRIPTION OF THE MANIKIN
  - 3.1. A three-dimensional manikin of a weight and contour corresponding to those of an adult male of average height shall be used. Such a manikin is depicted in figs. 1 and 2 of the appendix to this annex.
  - 3.2. The manikin shall comprise:
    - 3.2.1. two components, one simulating the back and the other the seat of the body, pivoting on an axis representing the axis of rotation between the torso and the thigh. The trace of this axis on the side of the manikin is the manikin's "H" point;
    - 3.2.2. Two components simulating the legs and pivotally attached to the component simulating the seat; and
    - 3.2.3. two components simulating the feet and connected to the legs by pivotal joints simulating ankles.
  - 3.2.4. In addition, the component simulating the seat of the body shall be provided with a level enabling its transverse orientation to be verified.
  - 3.3. Body-segment weights shall be attached at appropriate points corresponding to the relevant centres of gravity, so as to bring the total weight of the manikin up to about 75.6 kg. Details of the various weights are given in the table in fig. 2 of the appendix to this annex.
  - 3.4. The torso reference line of the manikin is taken into account by a straight line passing through the joint between the leg and the pelvis and the theoretical joint between the neck and the thorax (see the appendix to this annex, fig. 1).
4. SETTING UP THE MANIKIN

The three-dimensional manikin shall be set up in the following manner:

  - 4.1. the vehicle shall be placed on a horizontal plane and the seats adjusted as prescribed in paragraph 2.2. above;
  - 4.2. the seat to be tested shall be covered with a piece of cloth to facilitate correct setting up of the manikin;
  - 4.3. the manikin shall be placed on the seat concerned, its pivotal axis being perpendicular to the longitudinal plane of symmetry of the vehicle;
  - 4.4. the feet of the manikin shall be placed as follows:
    - 4.4.1. in the front seats, in such a way that the level verifying the transverse orientation of the seat of the manikin is brought to the horizontal;
    - 4.4.2. in the rear seats, so far as possible in such a way as to be in contact with the front seats. If the feet then rest on parts of the floor which are at different levels, the foot which first comes into contact with the front seat shall serve as a reference point and the other foot shall be so arranged that the level enabling the transverse orientation of the seat of the manikin to be verified is brought to the horizontal;
    - 4.4.3. if the "H" point is being determined at a centre seat, the feet shall be placed one on each side of the tunnel;
  - 4.5. the weights shall be placed on the thighs, the level verifying the transverse orientation of the seat of the manikin shall be brought to the horizontal, and the weights shall be placed on the component representing the seat of the manikin;
  - 4.6. the manikin shall be moved away from the seat back by means of the knee-pivot bar and the back of the manikin shall be pivoted forwards. The manikin shall be repositioned on the seat of the vehicle by being slid backwards on its seat until resistance is encountered, the back of the manikin then being replaced against the seat back;

- 4.7. a horizontal load of approximately  $10 \pm 1$  daN ( $10 \pm 1$  kgf) shall be applied to the manikin twice. The direction and point of application of the load are shown by a black arrow in figure 2 of the appendix;
- 4.8. the weights shall be installed on the right and left sides, and the torso weights shall then be placed in position. The transverse level of the manikin shall be kept horizontal;
- 4.9. the transverse level of the manikin being kept horizontal, the back of the manikin shall be pivoted forwards until the torso weights are above the "H" point, so as to eliminate any friction with the seat back;
- 4.10. the back of the manikin shall be gently moved rearwards so as to complete the setting-up operation. The transverse level of the manikin shall be horizontal. If it is not, the procedure described above shall be repeated.

## 5. RESULTS

- 5.1. When the manikin has been set up as described in paragraph 4. above, the "H" point and the actual seat-back angle of the vehicle seat considered are constituted by the "H" point and the angle of inclination of the manikin's torso reference line.
- 5.2. The co-ordinates of the "H" point in relation to three mutually perpendicular planes, and the actual seat-back angle, shall be measured for comparison with the data supplied by the vehicle manufacturer.
6. VERIFYING THE RELATIVE POSITIONS OF THE "R" AND "H" POINTS AND THE RELATIONSHIP BETWEEN THE DESIGN SEAT-BACK ANGLE AND THE ACTUAL SEAT-BACK ANGLE
  - 6.1. The results of the measurements carried out in conformity with paragraph 5.2. for the "H" point and the actual seat-back angle shall be compared with the co-ordinates of the "R" point and the design seat-back angle as supplied by the vehicle manufacturer.
  - 6.2. The relative positions of the "R" point and the "H" point and the relationship between the design seat-back angle and the actual real seat-back angle shall be considered to be satisfactory for the seat in question if the "H" point, as defined by its co-ordinates, lies within a longitudinal rectangle whose horizontal and vertical sides are 30 mm and 20 mm long respectively and whose diagonals intersect at the "R" point, and if the actual seat-back angle is within  $3^\circ$  of the design seat-back angle.
    - 6.2.1. If these conditions are met, the "R" point and the design seat-back angle shall be used for the test and, if necessary, the manikin shall be so adjusted that the "H" point coincides with the "R" point and the actual seat-back angle coincides with the design seat-back angle.
  - 6.3. If the "H" point or the actual seat-back angle does not satisfy the requirements of paragraph 6.2. above, the "H" point or the actual seat-back angle shall be determined twice more (three times in all). If the results of two of these three operations satisfy the requirements the result of the test shall be considered to be satisfactory.
  - 6.4. If at least two of the three test results do not satisfy the requirements of paragraph 6.2., the result of the test shall be considered to be not satisfactory.
  - 6.5. If the situation described in paragraph 6.4. above arises, or if verification cannot be effected because the manufacturer has failed to supply information regarding the position of the "R" point or regarding the design seat-back angle, the average of the results of the three determinations may be used and be regarded as applicable in all cases where the "R" point or the design seat-back angle is referred to in this Regulation.
  - 6.6. For verifying the relative positions of the "R" point and the "H" point and the relationship between the design seat-back angle and the actual seat-back angle in a serially-produced vehicle the rectangle referred to in paragraph 6.2. above shall be replaced by a square of 50 mm side and the actual seat-back angle shall not differ by more than  $\pm 5^\circ$  from the design seat-back angle.

ANNEX 3 — Appendix

COMPONENTS OF THREE-DIMENSIONAL MANIKIN

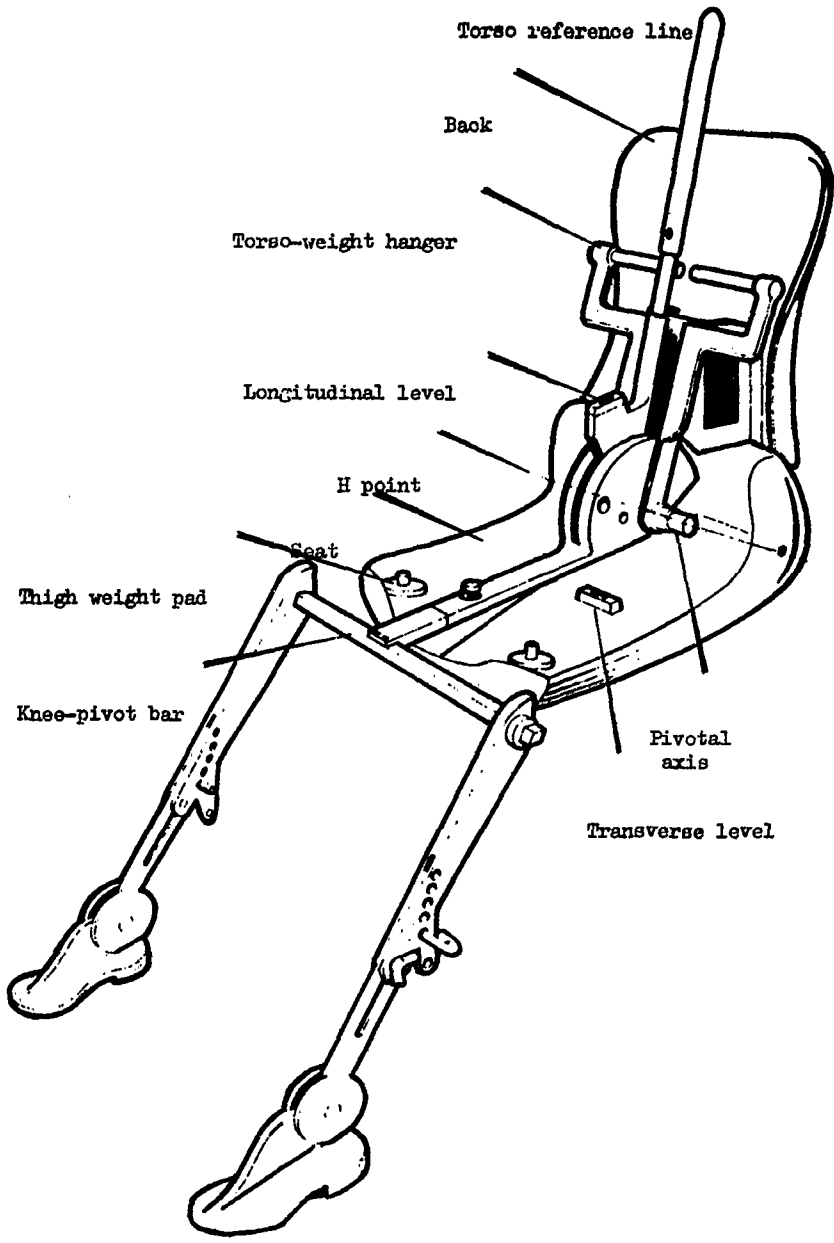


Fig. 1

DIMENSIONS AND WEIGHT OF MANIKIN

Weight of manikin

Components simulating back and seat of body	kg
seat of body	16.6
Torso weights	31.2
Seat weights	7.8
Thigh weights	6.8
Leg weights	13.2
Total:	<u>75.6</u>

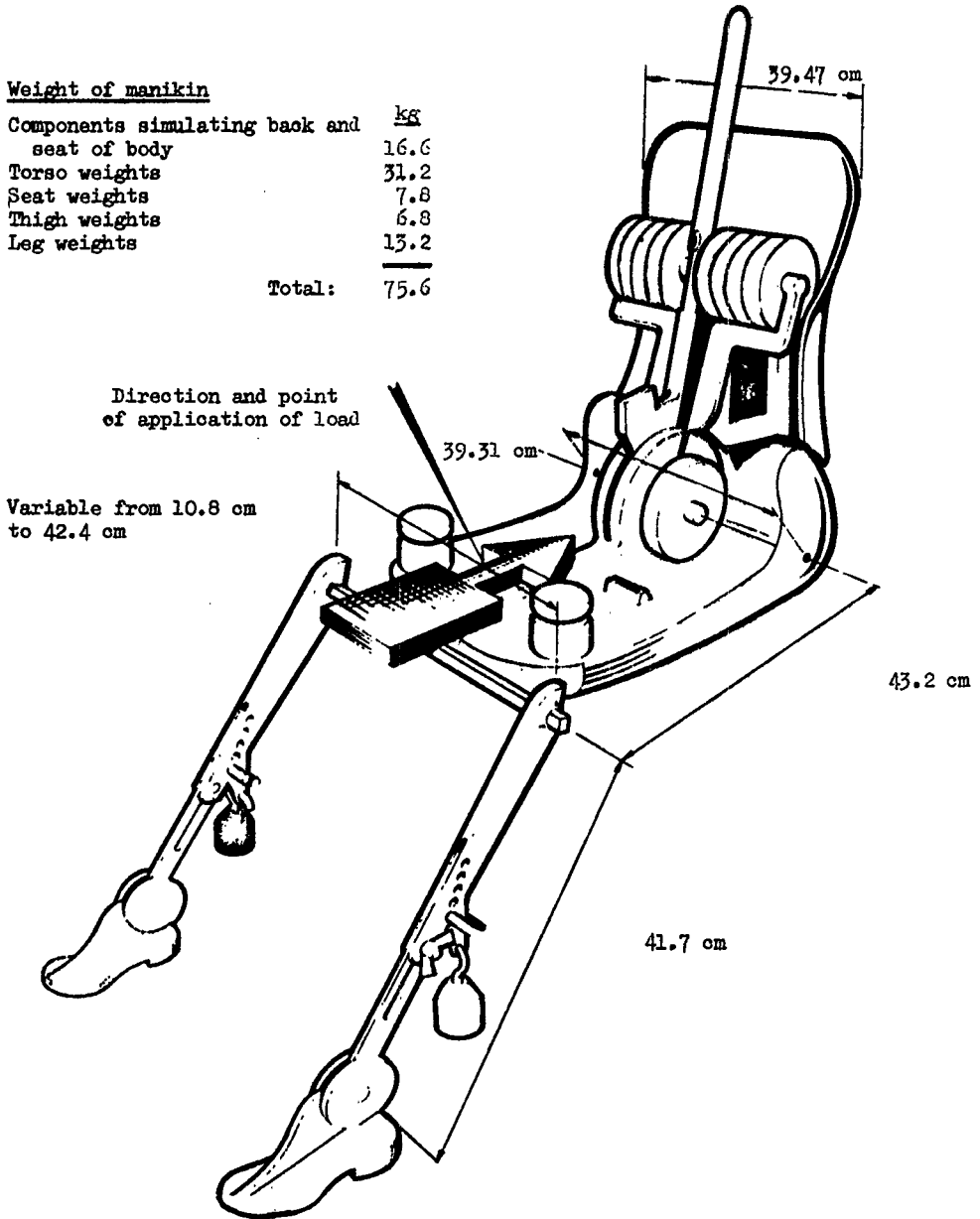


Fig. 2

## ANNEX 4

## 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 in front and not less than 1.5 m high. The barrier must be of such thickness that it weighs at least 70 tons. 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 vehicle*

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

1.4. *State of vehicle*

1.4.1. The vehicle under test must either be fitted with all the normal components and equipment included in its unladen kerb weight or be in such a condition as to fulfil this requirement so far as the components and equipment of concern to the passenger compartment and the distribution of the weight of the vehicle as a whole, in running order, 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 header tanks, radiator, etc.) may 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 may 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. *Velocity on impact*

The velocity on impact must be between 48.3 km/h higher and 53.1 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 one per cent.

## 2. RESULTS

Before and after impact, the dimensions specified in paragraph 5. of this Regulation shall be measured and recorded.

\* This method is not applicable to vehicles weighing more than 3.5 metric tons.

## 3. CORRECTION FACTORS

## 3.1. Notation

- V Recorded speed in km/h;  
 $m_0$  Weight mass of prototype in state defined in paragraph 1.4. of this annex;  
 m Weight mass of prototype with testing apparatus;  
 $D_0$  Residual dimensions measured after the impact, as defined in paragraph 5. of this Regulation;  
 $D_1$  Corrected residual dimensions used to determine results of test;  
 $K_1$  = the greater of  $\left(\frac{48 \cdot 3}{V}\right)^2$  and 0.83;  
 $K_2$  = the greater of  $\frac{m_0}{m}$  and 0.8.

- 3.2. The corrected dimensions  $D_1$  used to check the conformity of the prototype with the requirements of this Regulation shall be calculated by the following formula:

$$D_1 = D_0 \cdot K_1 \cdot K_2$$

- 3.3. A front impact test against a barrier is not needed in the case of a vehicle which is identical to the prototype considered as regards the characteristics specified in paragraph 2.2.2.1. of this Regulation but whose weight (mass)  $m_1$  is greater than  $m_0$ , if  $m_1$  is not more than 1.25  $m_0$  and if the corrected dimensions  $D_2$  obtained from the dimensions  $D_1$  by the formula  $D_2 = \frac{m_1}{m_0} \cdot D_1$  are such as to show that the new vehicle still meets the requirements of paragraph 5. of this Regulation.

## 4. EQUIVALENT TEST METHODS

- 4.1. Equivalent test methods are permitted provided that the conditions referred to in this Regulation can be observed either entirely by means of the substitute test or by calculation from the results of the substitute test.
- 4.2. If a method other than that described in paragraph 1. above is used its equivalence must be demonstrated.

*Authentic texts of the Regulation: English and French.*

*Registered ex officio on 1 July 1975.*



ENTRY INTO FORCE of Regulation No. 34 (*Uniform provisions concerning the approval of vehicles with regard to the prevention of fire risks*) as an annex to the 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 1958<sup>1</sup>

The said Regulation came into force on 1 July 1975 in respect of Sweden and the United Kingdom of Great Britain and Northern Ireland, in accordance with article 1 (5) of the Agreement.

*Regulation No. 34*

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF VEHICLES  
WITH REGARD TO THE PREVENTION OF FIRE RISKS

1. SCOPE

This Regulation applies to private (passenger) cars whose engine uses a liquid fuel.

2. DEFINITIONS

For the purposes of this Regulation

- 2.1. "approval of a vehicle" means the approval of a vehicle type with regard to the prevention of fire risks;
- 2.2. "vehicle type" means a category of power-driven vehicles which do not differ in such essential respects as:
  - 2.2.1. the length and width of the vehicle in so far as they have an effect on the results of the impact tests prescribed in this Regulation;
  - 2.2.2. the structure, dimensions, lines and materials of the part of the vehicle forward of the transverse plane through the "R" point of the driver's seat and rearward of the transverse plane through the "R" point of the rearmost seat;
  - 2.2.3. the lines and inside dimensions of the passenger compartment in so far as they have an effect on the results of the impact tests prescribed in this Regulation;
  - 2.2.4. the siting of the engine (front, rear, centre);
  - 2.2.5. the kind of engine (positive-ignition (spark-ignition) or diesel (compression-ignition));
  - 2.2.6. the characteristics of the fuel tank and its siting in the vehicle;
  - 2.2.7. the characteristics and siting of the fuel feed system (pump, filters, etc.); and
  - 2.2.8. the characteristics and siting of the electrical installation in so far as they have an effect on the results of the impact tests prescribed in this Regulation;
- 2.3. "transverse plane" means the vertical transverse plane perpendicular to the median longitudinal plane of the vehicle;
- 2.4. "passenger compartment" means the space for occupant accommodation, bounded by the roof, floor, side walls, doors, outside glazing, front bulkhead, and the plane of the rear compartment bulkhead or the plane of the rear seat back support;
- 2.5. "unladen kerb weight" means the weight of the vehicle in running order, unoccupied and unladen but complete with fuel, coolant, lubricant, tools and a spare wheel (if provided as standard equipment by the vehicle manufacturer);
- 2.6. "capacity of the fuel tank" means the fuel-tank capacity as specified by the manufacturer; and
- 2.7. "liquid fuel" means a fuel which is liquid in normal conditions of temperature and pressure.

3. APPLICATION FOR APPROVAL

- 3.1. The application for approval of a vehicle type with regard to the prevention of fire risks shall be submitted by the vehicle manufacturer or by his duly accredited representative.

<sup>1</sup> United Nations, *Treaty Series*, vol. 332, p. 211.

- 3.2. It shall be accompanied by the undermentioned documents in triplicate and by the following particulars:
  - 3.2.1. a detailed description of the vehicle type with respect to the items specified in paragraph 2.2. above. The numbers and/or symbols identifying the engine type and the vehicle type must be specified;
  - 3.2.2. drawing(s) showing the characteristics of the fuel tank and specifying the material from which it is made;
  - 3.2.3. a diagram of the entire fuel feed system, showing the site of each component on the vehicle; and
  - 3.2.4. a diagram of the electrical installation, showing its siting and its mode of attachment to the vehicle.
- 3.3. A vehicle representative of the vehicle type to be approved shall be submitted to the technical service responsible for conducting the approval tests.
  - 3.3.1. A vehicle not comprising all the components proper to the type may be accepted for test provided that it can be shown that the absence of the components omitted has no detrimental effect on the results of the test, so far as the requirements of this Regulation are concerned.
  - 3.3.2. It shall be the responsibility of the applicant for approval to show that acceptance of the variants referred to in paragraph 3.3.1. is compatible with compliance with the requirements of this Regulation.
4. APPROVAL
  - 4.1. If the vehicle submitted for approval pursuant to this Regulation meets the requirements of paragraphs 5. and 6. below, approval of that vehicle type shall be granted.
  - 4.2. An approval number shall be assigned to each type approved. The same Contracting Party may not assign the same number to another vehicle type within the meaning of paragraph 2.2. above.
  - 4.3. Notice of approval or of refusal of approval of a vehicle type 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 drawings, giving the particulars referred to in paragraphs 3.2.2., 3.2.3. and 3.2.4. above (supplied by the applicant for approval) in a format not exceeding A 4 (210 × 297 mm) or folded to that format and on an appropriate scale.
  - 4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation an international approval mark consisting of:
    - 4.4.1. a circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval;\* and
    - 4.4.2. the number of this Regulation, to the right of the circle prescribed in paragraph 4.4.1.
  - 4.5. If the vehicle conforms to a vehicle type approved, under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1. need not be repeated; in such a case the additional numbers and symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.

\* 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 and 16 for Norway. 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 that Agreement, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

- 4.6. The approval mark shall be clearly legible and be indelible.
- 4.7. The approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.
- 4.8. Annex 2 to this Regulation gives examples of arrangements of the approval mark.

## 5. REQUIREMENTS

### 5.1. *Fuel installation*

- 5.1.1. The components of the fuel installation shall be adequately protected by parts of the frame or bodywork against contact with possible obstacles on the ground. Such protection shall not be required if the components beneath the vehicle are further from the ground than the part of the frame or bodywork in front of them.
- 5.1.2. The fuel installation shall be so designed, constructed and fitted that its components are able to resist the internal and external corrosion phenomena to which they are exposed.
- 5.1.3. The pipes and all other parts of the fuel installation shall be accommodated on the vehicle at sites protected to the fullest possible extent. Twisting and bending movements, and vibrations of the vehicle's structure or drive unit, shall not subject the components of the fuel installation to friction, compression or any other abnormal stress.
- 5.1.4. The connexions of pliable or flexible pipes with rigid parts of components of the fuel installation shall be so designed and constructed as to remain leak-proof under the various conditions of use of the vehicle, despite twisting and bending movements and despite vibrations of the vehicle's structure or drive unit.
- 5.1.5. The fuel tank (tanks) shall be made of a fire-resistant metallic material. It (they) may be made of a plastics material, provided the requirements of annex 5 are complied with.
- 5.1.6. The fuel tank (tanks) shall not be situated in or form a bulkhead of the passenger compartment.
- 5.1.7. A bulkhead shall be provided to separate the passenger compartment from the fuel tank (tanks). It shall be capable of withstanding an open petrol fire for two minutes when placed horizontally 20 cm above the liquid level. The bulkhead may be traversed by apertures (e.g. to accommodate cables) provided they are so arranged that fuel cannot flow freely into the passenger compartment.
- 5.1.8. The fuel tank shall be securely fixed and so placed as to ensure that any fuel leaking from the tank, its filler hole or its pipe connexions will escape to the ground and outside the vehicle.
- 5.1.9. The fuel tank and the accessories connected to it shall be so made and installed that they cannot acquire a static electrical charge in relation to the vehicle.
- 5.1.10. The filler hold shall not be situated in the passenger compartment, in the luggage compartment or in the engine compartment.
- 5.1.11. If the filler hole is situated on the side of the vehicle, the filler cap shall not, when closed, project beyond the adjacent surfaces of the bodywork.
- 5.1.12. Any fuel which may leak when the fuel tank (tanks) is (are) being filled shall not be able to fall on to the exhaust system. It shall be channelled to the ground.

### 5.2. *Electrical installation*

- 5.2.1. Electric wires other than wires accommodated in hollow components shall be attached to the vehicle's structure or walls or partitions near which they lead. The points at which they pass through walls or partitions shall be satisfactorily protected to prevent cutting of the insulation.
- 5.2.2. The electrical installation shall be so designed, constructed and fitted that its components are able to resist the corrosion phenomena to which they are exposed.

## 6. TESTS

### 6.1. *Hydraulic test of the fuel tank*

The tank shall be subjected to a hydraulic internal-pressure test, which shall be carried out on an isolated unit complete with standard filler pipe, filler neck and cap. The tank shall be completely filled with water. After all communication with the outside has been cut off, the pressure shall be gradually increased, through the pipe connexion through which fuel is fed to the engine, to a relative pressure of 0.3 kg/cm<sup>2</sup>, which shall be maintained for one minute. During this time the tank shell must not crack or leak; however, it may be permanently distorted.

### 6.2. *Tests on the vehicle*

In the frontal-impact test against a barrier carried out by the procedure specified in annex 3 to this Regulation, and in the rear-end impact test carried out by the procedure specified in annex 4 hereto,

- 6.2.1. no more than a slight leakage of liquid in the fuel installation shall occur on collision;
- 6.2.2. if there is continuous leakage in the fuel installation after the collision, the rate of leakage must not exceed 30 g/min; if the liquid from the fuel installation mixes with liquids from the other systems, and if the several liquids cannot be easily separated and identified, the continuous leakage shall be evaluated from all the fluids collected;
- 6.2.3. no fire maintained by the fuel shall occur.
- 6.2.4. During and after the impacts described in paragraph 6.2. above, the battery must be kept in position by its securing device.

## 7. MODIFICATIONS OF THE VEHICLE TYPE

- 7.1. Every modification of the vehicle type shall be notified to the administrative department which approved the vehicle type. The department may then either:
  - 7.1.1. consider that the modifications made are unlikely to have appreciable adverse effects, and that in any case the vehicle still meets the requirements; or
  - 7.1.2. require a further test report from the technical service responsible for conducting the tests.
- 7.2. Without prejudice to the provisions of paragraph 7.1. above, a variant of the vehicle whose unladen kerb weight does not differ by more than  $\pm 20$  per cent from that of the approval-tested vehicle shall not be regarded as a modification of the vehicle type.
- 7.3. Notice of confirmation of approval or of refusal of approval, specifying the modifications, shall be communicated by the procedure specified in paragraph 4.3. above to the Parties to the Agreement which apply this Regulation.

## 8. CONFORMITY OF PRODUCTION

- 8.1. Every vehicle bearing an approval mark as prescribed under this Regulation shall conform to the vehicle type approved and satisfy the requirements of paragraph 5. above.
- 8.2. In order to verify conformity as prescribed in paragraph 8.1. above, a sufficient number of serially-produced vehicles bearing the approval mark required by this Regulation shall be subjected to random checks.
- 8.3. As a general rule, the conformity of the vehicle with the approved type shall be checked on the basis of the description given in the approval form and its annexes. However, the vehicle shall if necessary be subjected to the checks prescribed in paragraph 6. above.

## 9. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

- 9.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirement laid down in paragraph 8.1. above is not complied

with or if the vehicle has failed to pass the checks prescribed in paragraph 6. above.

- 9.2. If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith notify 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 "APPROVAL WITHDRAWN".

10. NAMES AND ADDRESSES OF TECHNICAL SERVICES CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

The Parties to the Agreement which apply this Regulation shall communicate to the Secretariat of the United Nations the names and addresses of the technical services 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: A 4 (210 × 297 mm))



NAME OF ADMINISTRATION
---------------------------

*Communication concerning the approval (or refusal or withdrawal of approval) of a vehicle type with regard to the prevention of fire risks, pursuant to Regulation No. 34*

- Approval No. . . . .
- 1. Trade name or mark of the power-driven vehicle . . . . .
  - 2. Vehicle type . . . . .
  - 3. Manufacturer's name and address . . . . .
  - 4. If applicable, name and address of manufacturer's representative . . . . .
  - 5. Kind of engine: positive-ignition diesel\*
  - 6. Site of engine: front/rear/centre\*

---

\* Strike out what does not apply.

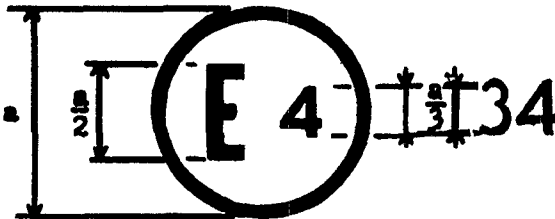
- 7. Brief description of fuel tank and fuel installation . . . . .
- 7.1. Characteristics and site of fuel tank . . . . .
- 7.2. For fuel tanks made of a plastics material, state material and trade name or mark: . .
- 7.3. Characteristics of fuel installation (site, connexions, etc.) . . . . .
- 8. Description of electrical installation (site, attachment, protection, etc.) . . . . .
- 9. Vehicle submitted for approval on . . . . .
- 10. Technical service responsible for conducting approval tests . . . . .
- 11. Date of report issued by that service . . . . .
- 12. Number of report issued by that service . . . . .
- 13. Approval granted/refused\*
- 14. Position of approval mark on the vehicle . . . . .
- 15. Place . . . . .
- 16. Date . . . . .
- 17. Signature . . . . .
- 18. The following documents, bearing the approval number shown above, are annexed to this communication:  
 . . . . . drawings and layout diagrams of the fuel tank, the fuel installation, the electrical installation, and other components of importance for the purposes of this Regulation.

ANNEX 2

ARRANGEMENTS OF THE APPROVAL MARK

Model A

(See paragraph 4.4. of this Regulation)

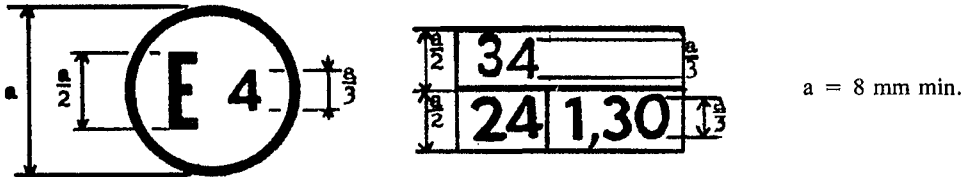


a = 8 mm min.

The above approval mark affixed to a vehicle shows that the vehicle type concerned has, with regard to the prevention of fire risks, been approved in the Netherlands (E 4) pursuant to Regulation No. 34.

\* Strike out what does not apply.

*Model B*  
(See paragraph 4.5. of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) pursuant to Regulations Nos. 34 and 24. (In the case of the latter Regulation the corrected absorption coefficient is  $1.30 \text{ m}^{-1}$ .)

### ANNEX 3

#### FRONTAL-IMPACT TEST AGAINST A BARRIER

1. PURPOSE AND SCOPE

The purpose of this test is to simulate the conditions of frontal impact against a fixed obstacle or by another vehicle approaching from the opposite direction.

2. INSTALLATIONS, PROCEDURES AND MEASURING INSTRUMENTS

2.1. *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.

2.2. *Barrier*

The barrier consists of a block of reinforced concrete not less than 3 m wide in front and not less than 1.5 m high. The barrier must be of such thickness that it weighs at least 70 tons. 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.

2.3. *Propulsion of vehicle*

At the moment of impact, the vehicle must no longer be subject to the action of any additional steering or propelling device. It must reach the obstacle on a course perpendicular to the collision wall; the maximum lateral disalignment tolerated between the vertical median line of the front of the vehicle and the vertical median line of the collision wall is  $\pm 30 \text{ cm}$ .

2.4. *State of vehicle*

- 2.4.1. The vehicle under test shall either be fitted with all the normal components and equipment included in its unladen kerb weight or be in such condition as to fulfil this requirement so far as the components and equipment affecting fire risks are concerned.

- 2.4.2. 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 header tanks, radiator, etc.) may be empty.
- 2.4.3. 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 may be filled to capacity.
- 2.4.4. 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.
- 2.5. *Velocity on impact*  
The velocity on impact must be between 48.3 km/h and 53.1 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 shall be considered satisfactory.
- 2.6. *Measuring instruments*  
The instrument used to record the speed referred to in paragraph 2.5. above shall be accurate to within one per cent.
3. EQUIVALENT TEST METHODS
- 3.1. Equivalent test methods are permitted provided that the conditions referred to in this Regulation can be observed either entirely by means of the substitute test or by calculation from the results of the substitute test.
- 3.2. If a method other than that described in paragraph 2. above is used its equivalence must be demonstrated.

## ANNEX 4

### PROCEDURE FOR REAR-END IMPACT TEST

1. PURPOSE AND SCOPE
- 1.1. The purpose of the test is to simulate the conditions of rear-end impact by another vehicle in motion.
2. INSTALLATIONS, PROCEDURES AND MEASURING INSTRUMENTS
- 2.1. *Testing ground*  
The test area shall be large enough to accommodate the impactor (striker) propulsion system and to permit after-impact displacement of the vehicle struck and installation of the test equipment. The part in which vehicle impact and displacement occur shall be horizontal, flat and smooth and have a coefficient of friction of not less than 0.5.
- 2.2. *Impactor (striker)*
- 2.2.1. The impactor shall be of steel and of rigid construction.
- 2.2.2. The impacting surface shall be flat, not less than 2,500 mm wide, and 800 mm high, and 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 mm thick.
- 2.2.3. At the moment of impact the following requirements shall be met:
- 2.2.3.1. the impacting surface shall be vertical and perpendicular to the median longitudinal plane of the vehicle struck;
- 2.2.3.2. the direction of movement of the impactor shall be substantially horizontal and parallel to the median longitudinal plane of the vehicle struck;
- 2.2.3.3. the maximum lateral deviation tolerated between the median vertical line of the surface of the impactor and the median longitudinal plane of the vehicle struck



- shall be 300 mm. In addition, the impacting surface shall extend over the entire width of the vehicle struck;
- 2.2.3.4. the ground clearance of the lower edge of the impacting surface shall be  $175 \pm 25$  mm.
- 2.3. *Propulsion of the impactor*  
The impactor may either be secured to a carriage (moving barrier) or form part of a pendulum.
- 2.4. *Special provisions applicable where a moving barrier is used*
- 2.4.1. 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.
- 2.4.2. The velocity of impact shall be between 35 and 38 km/h.
- 2.4.3. The aggregate weight (mass) of carriage and impactor shall be  $1,100 \pm 20$  kg.
- 2.5. *Special provisions applicable where a pendulum is used*
- 2.5.1. The distance between the centre of the impacting face and the axis of rotation of the pendulum shall be not less than 5 m.
- 2.5.2. 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.
- 2.5.3. Arresting gear shall be incorporated in the pendulum to prevent any secondary impact by the impactor on the test vehicle.
- 2.5.4. At the moment of impact the velocity of the centre of percussion of the pendulum shall be between 35 and 38 km/h.
- 2.5.5. 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:

$$m_r = m \cdot \frac{l}{a}$$

- 2.5.6. The reduced mass  $m_r$  shall be  $1,100 \pm 20$  kg.
- 2.6. *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 paragraphs 2.4.2. and 2.5.4. and/or with a mass greater than those prescribed in paragraphs 2.4.3. and 2.5.6., and the vehicle has met the requirements prescribed, the test shall be considered satisfactory.
- 2.7. *State of vehicle under test*
- 2.7.1. The vehicle under test shall either be fitted with all the normal components and equipment included in its unladen kerb weight or be in such condition as to fulfil this requirement so far as the components and equipment affecting fire risks are concerned.
- 2.7.2. The fuel tank 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 header tanks, radiator, etc.) may be empty.
- 2.7.3. A gear may be engaged and the brakes may be applied.

\* It is recalled that the distance " $a$ " is equal to the length of the synchronous pendulum of the pendulum under consideration.

- 2.7.4. If the manufacturer so requests, the following derogations shall be permitted:
- 2.7.4.1. 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; and
- 2.7.4.2. the vehicle may be weighted to an extent not exceeding 10 per cent of its unladen kerb weight with additional weights rigidly secured to the structure in such a way as not to affect the behaviour of the structure of the passenger compartment during the test.
- 2.8. *Measuring instruments*
- The instruments used to record the speed referred to in paragraphs 2.4.2. and 2.5.4. above shall be accurate to within one per cent.
3. EQUIVALENT TEST METHODS
- 3.1. Equivalent test methods are permitted provided that the conditions referred to in this Regulation can be observed either entirely by means of the substitute test or by calculation from the results of the substitute test.
- 3.2. If a method other than that described in paragraph 2. above is used, its equivalence must be demonstrated.

## ANNEX 5

### TESTING OF FUEL TANKS MADE OF A PLASTICS MATERIAL

1. IMPACT RESISTANCE
- 1.1. The tank shall be filled to its rated capacity with a water-glycol mixture or with another liquid having a low freezing point which does not change the properties of the tank material, and shall then be subjected to a perforation test.
- 1.2. During this test the tank temperature shall be  $-40 \pm 2^{\circ}\text{C}$ .
- 1.3. A pendulum impact testing fixture shall be used for the test. The impact body shall be of steel and have the shape of a pyramid with equilateral-triangle faces and a square base, the summit and the edges being rounded to a radius of 3 mm. The centre of percussion of the pendulum shall coincide with the centre of gravity of the pyramid; its distance from the axis of rotation of the pendulum shall be 1 m. The total mass of the pendulum referred to its centre of percussion shall be 15 kg. The energy of the pendulum at the moment of impact shall be not less than 30 Nm (3.1 mkg) and as close to that value as possible.
- 1.4. The tests shall be made on the points of the tank which are regarded as vulnerable. The points regarded as vulnerable are those which are most exposed or weakest having regard to the shape of the tank and/or the way in which it is installed on the vehicle. The points selected by the laboratories shall be indicated in the test report.
- 1.5. During the test, the tank shall be held in position by the fittings on the side or sides opposite the side of impact. No leaks shall result from the test.
- 1.6. At the choice of the manufacturer, all the impact tests may be carried out on one tank or each may be carried out on a different tank.
2. MECHANICAL STRENGTH
- The tank shall, under the conditions prescribed in paragraph 6.1. of this Regulation, be tested for leakproofness and for rigidity of shape. Water at  $53^{\circ}\text{C}$  shall be used as the testing fluid and shall fill the tank to its rated capacity. The tank shall be subjected to a relative internal pressure of 0.3 bar (0.3 kg/cm<sup>2</sup>) at a temperature of  $53^{\circ}\text{C} \pm 2^{\circ}\text{C}$  for a period of five hours. During the test the tank shall not leak or crack; however, it may be permanently deformed.

3. FUEL PERMEABILITY
  - 3.1. The fuel used for the permeability test shall be either the reference fuel specified in Regulation No. 15, annex 7, or a commercial premium-grade fuel.
  - 3.2. Prior to the test, the tank shall be filled to 50 per cent of its rated capacity with testing fuel and stored, without being sealed, at an ambient temperature of  $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$  until the weight loss per unit time becomes constant, but for not more than four weeks (preliminary storage time).
  - 3.3. The tank shall then be emptied and be refilled to 50 per cent of its rated capacity with test fuel, after which it shall be hermetically sealed and be stored at a temperature of  $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . The pressure shall be adjusted when the contents of the tank have reached the testing temperature. During the ensuing test period of eight weeks, the loss of weight due to diffusion during the test period shall be determined. The maximum permissible average loss of fuel shall be 20 g per 24 hours of testing time.
  - 3.4. If the loss due to diffusion exceeds the value indicated in paragraph 3.3. above, the test described in that paragraph shall be carried out again, on the same tank, to determine the loss by diffusion at  $23^{\circ} \pm 2^{\circ}\text{C}$ , but under the same conditions otherwise.
4. RESISTANCE TO FUEL

After the test referred to in paragraph 3. above, the tank shall still meet the requirements set out in paragraphs 1. and 2.
5. RESISTANCE TO FIRE

The tank shall be subjected to the following test:

  - 5.1. For two minutes the tank, fixed as on the vehicle, shall be exposed to flame. There shall be no leakage of liquid fuel from the tank.
  - 5.2. Three tests shall be made on different tanks. For each test the tank shall be installed in a testing fixture simulating actual installation conditions as far as possible. The method whereby the tank is fixed in the fixture shall correspond to the relevant specifications for the vehicle. Vehicle parts which protect the tank against exposure to flame or which affect the course of the fire in any way, as well as specified components installed on the tank and plugs, shall be taken into consideration. All openings shall be closed during the test, but venting systems shall remain operative. Immediately prior to the test the tank shall be filled with the specified fuel to 50 per cent of its rated capacity.
  - 5.3. The flame to which the tank is exposed shall be obtained by burning commercial fuel for carburetor engines (hereafter called "fuel") in a pan. The quantity of fuel poured into the pan shall be sufficient to permit the flame, under free burning conditions, to burn for at least five minutes.\*
  - 5.4. The pan dimensions shall be chosen so as to ensure that the sides of the fuel tank are exposed to the flame. The length and width of the pan shall therefore exceed the fuel tank projection on a horizontal plane by at least 20 cm, but by not more than 50 cm. The side walls of the pan shall not project more than 8 cm above the level of the fuel.
  - 5.5. The pan filled with fuel shall be placed under the tank in such a way that the distance between the level of the fuel and the tank bottom corresponds to the design height of the fuel tank above the road surface at unladen kerb weight (see paragraph 2.5. of this Regulation). The pan shall be freely movable.
  - 5.6. During phase C of the test, the pan shall be covered with a screen placed 2 cm above the fuel level. The screen shall be made of a refractory material 7 cm thick. It shall comprise holes measuring 15 mm  $\times$  30 mm, the total area of the holes being equal to 60 per cent of the surface area of the liquid in the pan.

---

\* Tests have shown that for this purpose 15 l of fuel are needed per m<sup>2</sup> of pan area.

- 5.7. When the test is carried out in the open air, sufficient wind protection shall be provided.
- 5.8. The test shall comprise four phases (see appendix):
  - 5.8.1. Phase A: Pre-heating (fig. 1)  
The fuel in the pan shall be ignited at a distance of at least 3 m from the tank being tested. After 60 seconds' pre-heating, the pan shall be placed under the tank.
  - 5.8.2. Phase B: Direct exposure to flame (fig. 2)  
For 60 seconds the tank shall be exposed to the flame from the freely burning fuel.
  - 5.8.3. Phase C: Indirect exposure to flame (fig. 3)  
As soon as phase B has been completed, the screen shall be placed between the burning pan and the tank. The tank shall then be exposed to this reduced flame for a further 60 seconds.
  - 5.8.4. Phase D: End of test (fig. 4)  
The burning pan covered with the screen shall be moved back to its original position (phase A). If, at the end of the test, the fuel tank is burning, the fire shall be extinguished forthwith.
- 5.9. The results of the test shall be considered satisfactory if no liquid fuel is leaking from the tank.
6. RESISTANCE TO HIGH TEMPERATURES
  - 6.1. The fixture used for the test shall match the manner of installation of the fuel tank on the vehicle, including the way in which the tank vent works.
  - 6.2. The tank, filled to 50 per cent of its rated capacity with water at 20°C, shall be subjected for one hour to an ambient temperature of  $95^{\circ} \pm 2^{\circ}\text{C}$ .
  - 6.3. The results of the test shall be considered satisfactory if, after the test, the tank is not leaking or seriously deformed.
7. MARKINGS ON THE FUEL TANK  
The trade name or mark shall be affixed to the fuel tank; it shall be indelible and clearly legible on the tank when the latter is installed on the vehicle.

ANNEX 5 — Appendix

TEST OF RESISTANCE TO FIRE

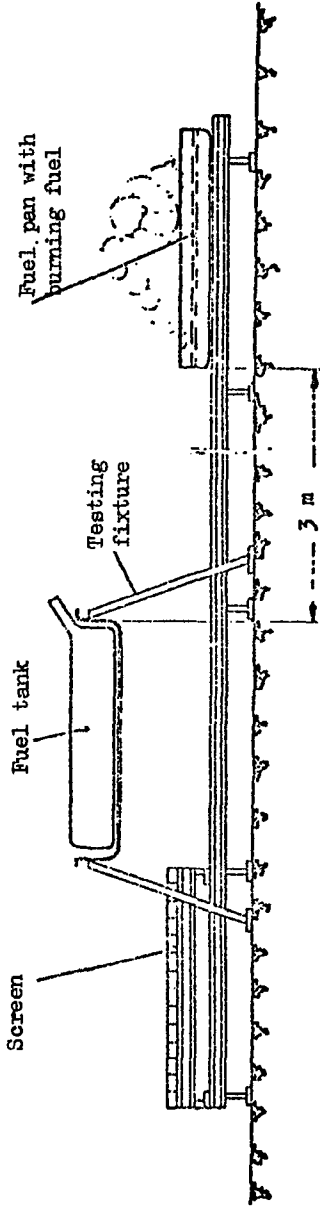


Fig. 1. Phase A: Pre-heating

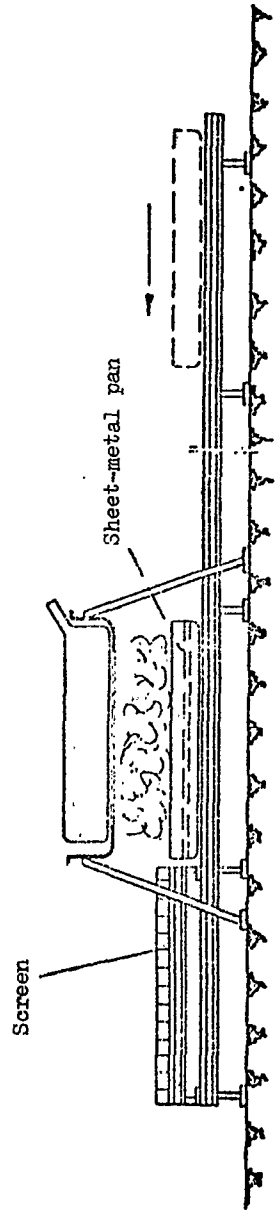


Fig. 2. Phase B: Direct exposure to flame

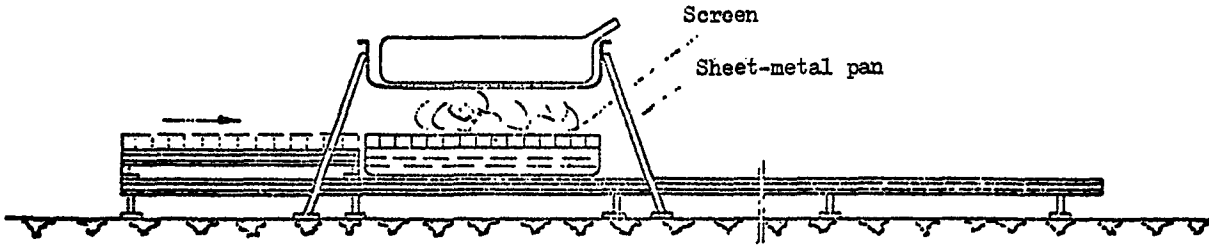


Fig. 3. Phase C: Indirect exposure to the flame

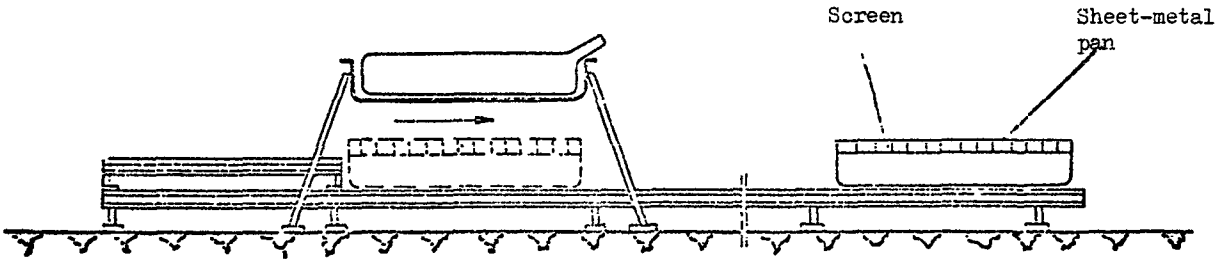


Fig. 4. Phase D: End of test

DECLARATION relating to the declaration made upon accession by the German Democratic Republic,<sup>1</sup> concerning application to Berlin (West) of the 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 1958<sup>2</sup>

*Received on:*

8 July 1975

FRANCE

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

UNITED STATES OF AMERICA

“The Governments of France, the United Kingdom and the United States wish to point out that the [German Democratic Republic is not a party] to the Quadripartite Agreement of 3 September 1971,<sup>3</sup> which was concluded in Berlin by the Governments of the French Republic, the Union of the Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, and the United States of America, and [is] not therefore competent to comment authoritatively on its provisions.

“The Quadripartite Agreement does not impose any requirement regarding terminology to be used by the Federal Republic of Germany when extending to the Western Sectors of Berlin treaties or agreements to which it has become a party nor, of course, does the Agreement affect terminology used in the past.

“In any case the use by the Federal Republic of Germany of the terminology mentioned in the [communication] under reference can in no way affect quadripartite agreements or decisions relating to Berlin.

“Consequently the validity of the Berlin Declaration made by the Federal Republic of Germany is unaffected by the use of this terminology.

“The Governments of France, the United Kingdom and the United States do not consider it necessary to respond to any further communications of a similar nature by States which are not signatories to the Quadripartite Agreement. This should not be taken to imply any change in the position of those Governments in this matter.”

*Registered ex officio on 8 July 1975.*

---

<sup>1</sup> United Nations, *Treaty Series*, vol. 950, A-4789.

<sup>2</sup> *Ibid.*, vol. 335, p. 211.

<sup>3</sup> United Nations, *Treaty Series*, vol. 880, p. 115.