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Contents

Acts whose titles are printed in light type are those relating to day-to-day management of agricultural matters, and are generally valid for a limited period.

The titles of all other Acts are printed in bold type and preceded by an asterisk.

II

(Acts whose publication is not obligatory)

COUNCIL

COUNCIL DIRECTIVE

of 25 June 1987

on roll-over protection structures mounted in front of the driver's seat on narrow-track wheeled agricultural and forestry tractors

(87/402/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100 thereof,

Having regard to the proposal from the Commission (1),

Having regard to the opinion of the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas Council Directive 74/150/EEC of 4 March 1984 on the approximation of the laws of the Member States relating to the type-approval of wheeled agricultural or forestory tractors (4), as last amended by the Act of Accession of Spain and Portugal, lays down that the necessary provisions for the implementation of the EEC type-approval procedure in respect of individual tractor parts or characteristics should be specified in special directives; whereas the provisions relating to roll-over protection structures and their attachments to tractors were laid down by Directives 77/536/EEC (5) and 79/622/EEC (6), as last amended by the Act of Accession of Spain and Portugal; whereas these two Directives cover respectively dynamic and static testing procedures — either of which may be employed by manufacturers for the present — and relate to standard tractors, that is, tractors having a maximum ground clearance of 1 000 mm and a fixed or adjustable track width of one of the driving axles of not less than 1 150 mm and weighing between 1,5 and 4,5 tonnes in the case of tractors covered by the 'dynamic testing' directive and not less than 800 kilograms in the case of tractors covered by the 'static testing' directive;

Whereas the tractors covered by this Directive have a maximum ground clearance of 600 mm, affixed or adjustable minimum track width with one of the axles less than 1 150 mm fitted with tyres of a larger size and a mass greater than 600 but less than 3 000 kilograms; whereas the roll-over protection structures of these tractors, which are used for specific activities, can be made subject to specific requirement or requirements other than those of Directive 77/536/EEC and 79/622/EEC;

Whereas the technical requirements with which such 'narrow track' tractors must comply pursuant to national laws relate, *inter alia*, to roll-over protection structures and to their attachment to the tractor; whereas those requirements differ from one Member State to another; whereas it is therefore necessary that all Member States adopt the same requirements either in addition to, or in place of, their existing rules in order, in particular, to allow the EEC type-approval procedure which was the subjet of Directive 74/150/EEC to be introduced in respect of each type of tractor;

(1) OJ No C 222, 2. 9. 1985, p. 1.
(2) OJ No C 190, 20. 7. 1987.
(3) OJ No C 169, 8. 7. 1985, p. 5.
(4) OJ No L 84, 28. 3. 1974, p. 10.
(5) OJ No L 220, 29. 8. 1977, p. 1.
(6) OJ No L 179, 17. 7 1979, p. 1.

Whereas this Directive covers roll-over protection structures of the dual-pillar type mounted in front of the driver's seat and characterized by a reduced zone of clearance attributable to the tractor silhouette, thus rendering it inadvisable, under any circumstances, to impede access to the driving position but worthwhile retaining these structures (fold-down or not) in view of their undoubted ease of use; whereas rear mounted roll-over protection structures of narrow track wheeled agricultural and forestry tractors have been the subject of Directive 86/298/EEC [1];

Whereas a harmonized component type-approval procedure for roll-over protection structures and their attachment to the tractor makes it possible for each Member State to check compliance with the common construction and testing requirements and to inform the other Member States of its findings by sending them copies of the component type-approval certificate completed for each type of roll-over protection structure and its attachment to the tractor; whereas the placing of an EEC component type-approval mark on all structures manufactured in conformity with the approved type obviates any need for technical checks on those structures in the other Member States; whereas common requirements concerning other elements and characteristics of the roll-over protection structure will be laid down at a later date;

Whereas the harmonized requirements are intended principally to ensure safety at work and safety on the road throughout the Community; whereas, for this reason, it is necessary to introduce the obligation for tractors covered by this Directive to be fitted with roll-over protection structures;

Whereas the approximation of the national laws relating to these tractors entails reciprocal recognition by Member States of the checks carried out by each of them on the basis of the common requirements,

HAS ADOPTED THIS DIRECTIVE,

Article 1

This Directive shall apply to tractors as defined in Article 1 of Directive 74/150/EEC having the following characteristics:

— ground clearance of not more than 600 mm beneath the lowest points of the front and rear axles, allowing for the differential,

— fixed or adjustable minimum track width with one of the axles less than 1 150 mm fitted with tyres of a larger size. It is assumed that the axle mounted with the wider tyres is set at a track width of not more than 1 150 mm. It must be possible to set the track width of the other axle in such a way that the outer edges of the narrower tyres do not go beyond the outer edges of the tyres of the other axle. Where the two axles are fitted with rims and tyres of the same size, the fixed or adjustable track width of the two axles must be less than 1 150 mm,

— mass of 600 and 3 000 kilograms, corresponding to the unladen weight of the tractor as defined in section 2.4 of Annex I to Directive 74/150/EEC, including the roll-over protection structure fitted in compliance with this Directive and tyres of the largest size recommended by the manufacturer.

Article 2

1. Each Member State shall grant component type-approval for any type of roll-over protection structure and its tractor attachment which satisfies the construction and testing requirements laid down in Annexes I to IV.

2. A Member State which has granted EEC component type-approval shall take the measures required to verify, in so far as is necessary and if need be in cooperation with the competent authorities in the other Member States, that production models conform to the approved type. Such verification shall be limited to spot checks.

Article 3

Member States shall, for each type of roll-over protection structure and its tractor attachment which they approve pursuant to Article 2, issue to the manufacturer of the tractor or of the roll-over protection structure, or to his authorized representative, an EEC component type-approval mark conforming to the model shown in Annex VII.

Member States shall take all appropriate measures to prevent the use of marks liable to create confusion between roll-over protection structures which have been component type-approved pursuant to Article 2 and other devices.

Article 4

1. No Member State may prohibit the placing on the market of roll-over protection structures or their tractor attachments on grounds relating to their construction if they bear the EEC component type-approval mark.

2. Nevertheless, a Member State may prohibit the placing on the market of roll-over protection structures bearing the

[1] OJ No L 186, 8. 7. 1986, p. 26.

EEC component type-approval mark which fail to conform to the approved type.

That State shall forthwith inform the other Member States and the Commission of the measures taken, specifying the reasons for its decision.

Article 5

The competent authorities of each Member State shall within one month send to the competent authorities of the other Member States copies of the component type-approval certificates, an example of which is given in Annex VIII, completed for each type of roll-over protection structure which they approve or refuse to approve.

Article 6

1. If the Member State which has granted EEC component type-approval finds that a number of roll-over protection structures and their tractor attachments bearing the same EEC component type-approval mark do not conform to the type which it has approved, it shall take the necessary measures to ensure that production models conform to the approved type. The competent authorities of that State shall advise those of the other Member States of the measures taken which may, where there is serious and repeated failure to conform, extend to withdrawal of EEC component type-approval. The said authorities shall take the same measures if they are informed by the competent authorities of another Member State of such failure to conform.

2. The competent authorities of the Member States shall within one month inform each other of any withdrawal of EEC component type-approval and of the reasons for any such measure.

Article 7

Any decision taken pursuant to the provisions adopted in implementation of this Directive to refuse or withdraw component type-approval for roll-over protection structures and their tractor attachments, or to prohibit their placing on the market or their use, shall set out in detail the reasons on which it is based. Such decision shall be notified to the party concerned, who shall at the same time be informed of the remedies available to him under the laws in force in the Member States and of the time limits allowed for the exercise of such remedies.

Article 8

No Member State may refuse to grant EEC type-approval or national type-approval in respect of a tractor on grounds relating to the roll-over protection structure or its tractor attachment if these bear the EEC component type-approval mark and if the requirements laid down in Annex IX have been satisfied.

Article 9

1. No Member State may refuse or prohibit the sale, registration, entry into service or use of any tractor on grounds relating to the roll-over protection structure and its tractor attachment if these bear the EEC component type-approval mark and if the requirements laid down in Annex IX have been met.

However, Member States may, in compliance with the Treaty, impose restrictions on the use of tractors referred to in this Directive in certain areas where safety so dictates, owing to the specific nature of certain terrains or crops. Member States shall inform the Commission of any such restrictions before they are implemented and of the reasons for their adoption.

2. This Directive shall not affect the right of Member States to specify — in due compliance with the Treaty — the requirements they deem necessary to ensure that workers are protected when using the tractors in question, provided this does not mean that the protection structures are modified in a way unspecified in this Directive.

Article 10

1. In connection with EEC type-approval, any tractor to which Article 1 refers must be fitted with a roll-over protection structure.

2. The structure, referred to in paragraph 1, unless it is a rear-mounted protection structure, must comply with the requirements laid down in Annexes I to V to this Directive, or in Directives 77/536/EEC or 79/622/EEC.

Article 11

Any amendments which are necessary in order to adapt the requirements of the Annexes to this Directive so as to take account of technical progress shall be adopted in accordance with the procedure laid down in Article 13 of Directive 74/150/EEC.

Article 12

Within 18 months following notification of this Directive, the Council, acting on a proposal from the Commission, on the basis of the provisions of the Treaty, shall adopt a Directive supplementing this Directive with provisions introducing additional impact tests into the dynamic test procedure.

Article 13

1. Member States shall bring into force the provisions necessary to comply with this Directive within 24 months of its notification [1] and shall forthwith inform the Commission thereof.

2. Member States shall communicate to the Commission the texts of the main provisions of national law which they adopt in the field covered by this Directive.

Article 14

This Directive is addressed to the Member States.

Done at Luxembourg, 25 June 1987.

For the Council

The President

H. DE CROO

[1] This Directive was notified to the Member States on 26 June 1987.

ANNEX I

CONDITIONS FOR EEC COMPONENT TYPE-APPROVAL

1. DEFINITION

1.1. 'Roll-over protection structure', hereinafter called 'protection structure', means the structure on a tractor the essential purpose of which is to avoid or limit risks to the driver resulting from roll-over of the tractor during normal use.

1.2. The structures mentioned in 1.1 display the following characteristics:

— the principal structures are mounted in front of the centre of the steering wheel,

— the structures have a zone of clearance as defined in Annex IV-A, section 2.

2. GENERAL REQUIREMENTS

2.1. Every protection structure and its attachment to a tractor must be so designed and constructed as to fulfil the essential purpose laid down in section 1.1.

2.2. This condition is considered to be fulfilled if the requirements of Annexes II, III and IV are complied with.

3. APPLICATION FOR EEC COMPONENT TYPE-APPROVAL

3.1. The application for EEC component type-approval with regard to the strength of a protection structure and the strength of its attachment to a tractor must be submitted by the tractor manufacturer or by the manufacturer of the protection structure or by their authorized representatives.

3.2. The application must be accompanied by the undermentioned documents in triplicate and by the following particulars:

— a drawing, either to scale or with indication of the principal dimensions, showing the general arrangement of the protection structure. This drawing must, in particular, show details of the mounting components,

— photographs from side and front showing mounting details,

— a brief description of the protection structure, including type of construction, method of mounting on the tractor and, where necessary, details of cladding and interior padding,

— details of materials used in the structure and in the roll-over protection structure mountings (see Annex VI).

3.3. A tractor representative of the tractor type for which the protection structure to be approved is intended must be submitted to the technical service responsible for conducting the component type-approval tests. This tractor must be equipped with the protection structure.

Furthermore, the manufacturer must indicate the sizes of tyres fitting or able to fit the front and rear axles.

3.4. The holder of EEC component type-approval may request its extension to other tractor types. The competent authority which has granted the original EEC component type-approval must grant the extension if the approved protection structure and the type(s) of tractor for which the extension is requested comply with the following conditions:

— the mass of the unballasted tractor, as defined in section 1.4 of Annex III, does not exceed by more than 5 % the reference mass used in the test;

— the method of attachment and the points of attachment to the tractor are identical,

— any components such as mudguards and bonnet which may provide support for the protection structure have identical strength and are identically situated with respect to the protection structure,

— the critical dimensions and the position of the seat and steering wheel relative to the protection structure, and the position relative to the protection structure of the points deemed rigid and taken into consideration for the purpose of verifying that the zone of clearance is protected, are such that the zone of clearance continues to be protected by the structure after the latter has undergone the deformation resulting from the various tests.

4. MARKINGS

4.1. Every protection structure conforming to the approved type must bear the following markings:

4.1.1. The trade mark or name;

4.1.2. A component type-approval mark conforming to the model in Annex VII;

4.1.3. Serial number of the protection structure;

4.1.4. Make and type(s) of tractor(s) for which the protection structure is intended.

4.2. All these particulars must appear on a small plate.

4.3. These markings must be visible, legible and indelible.

ANNEX II

PRIOR CONDITIONS FOR THE STRENGTH TESTS LAID DOWN IN ANNEXES III AND IV

1. PREPARATION FOR THE PRELIMINARY TEST

The tractor must be equipped with the protection structure in its safety position. The tractor must be fitted with tyres having the greatest diameter indicated by the manufacturer and the smallest cross-section for tyres of that diameter. The tyres must not be liquid-ballasted and must be inflated to the pressure recommended for field work.

The rear whells must be set to the narrowest track width; the front wheels must be set as closely as possible to the same track width. If it is possible to have two front track settings which differ equally from the narrowest rear track setting, the wider of these two front track settings must be selected.

All the tractor's tanks must be filled or the liquids must be replaced by an equivalent mass in the corresponding position.

2. LATERAL STABILITY TEST

Place the tractor, prepared as specified above, on a horizontal plane so that the tractor font-axle pivot point or, in the case of an articulated tractor, the horizontal pivot point between the two axles can move freely.

Using any appropriate means, such as a jack or a hoist, tilt the part of the tractor which is rigidly connected to the axle that bears more than 50 % of the tractor's weight, while constantly measuring the angle of inclination. This angle must be at least 38° at the moment when the tractor is resting in a state of unstable equilibrium on the wheels touching the ground.

Perform the test once with the steering wheel turned to full right lock and once with the steering wheel turned to full left lock.

3. NON-CONTINUOUS ROLLING TEST

3.1. General remarks

This test is intended to check whether a structure fitted to the tractor for the protection of the driver can satisfactorily prevent continuous roll-over of the tractor in the event of its overturning laterally on a slope with a gradient of 1 in 1,5.

Evidence of non-continuous rolling can be provided in accordance with one of the two methods described in 3.2 and 3.3 below.

3.2. Demonstration of non-continuous rolling behaviour by means of the overturning test

The overturning test must be carried out on a test slope at least four metres long (see Annex V, Figure 1). The surface must be covered with an 18 cm layer of a material which — measured in accordance with ASAE Recommendation No R 313, section 1 has a cone penetration index of A (235 ± 20) or B (335 ± 20).

The tractor is tilted laterally with zero initial speed; for this purpose it is placed at the start of the test slope in such a way that the wheels on the downhill side rest on the slope and the tractor's medium plane is parallel with the contour lines.

After striking the surface of the test slope, the tractor may lift itself from the surface by pivoting about the upper corner of the protection structure, but it must not roll over. It must fall back on the side which it first struck.

3.3. Demonstration of non-continuous rolling behaviour by calculation

3.3.1. For the purpose of verifying non-continuous rolling behaviour by calculation, the following characteristic tractor data must be ascertained (see Figure in Appendix 2):

H 1 (m): Height of centre of gravity.

L 3 (m): Horizontal distance between the centre of gravity and rear axle.

L 2 (m):	Horizontal distance between the centre of gravity and the front axle.
D 3 (m):	Height of rear tyres.
D 2 (m):	Height of front tyres.
H 6 (m):	Overall height (point-of-impact height).
L 6 (m):	Horizontal distance between the centre of gravity and the leading point of intersection of the protection structure (to be preceded by a minus sign if this point lies in front of the plane of the centre of gravity).
B 6 (m):	Width of protection structure.
H 7 (m):	Height of engine bonnet.
B 7 (m):	Width of engine bonnet.
L 7 (m):	Horizontal distance between the centre of gravity and the front corner of the engine bonnet.
H 0 (m):	Height of the front-axle pivot point.
S (m):	Rear track width.
B 0 (m):	Rear tyre width.
D 0 (rad):	Front-axle swing angle (from zero position to end of travel).
M (kg):	Tractor mass.
Q (kgm^2):	Moment of inertia about the longitudinal axis through the centre of gravity.

The sum of the track width S and tyre B 0 must be greater than the width B 6 of the protection structure.

3.3.2. For the purposes of calculation, the following simplifying assumptions can be made:

— the stationary tractor overturns on a slope with a 1 in 1,5 gradient with a balanced front axle, as soon as the centre of gravity is vertically above the axis of rotation,

— the axis of rotation is parallel to the tractor's longitudinal axis and passes through the centre of the contact surfaces of the downhill front and rear wheel,

— the tractor does not slide downhill,

— impact on the slope is partly elastic, with a coefficient of elasticity of U = 0,2,

— the depth of penetration into the slope and the deformation of the protection structure together amount to T = 0,2 m,

— no other componentes of the tractor penetrate into the slope.

4. CONDITIONS GOVERNING STRENGTH TESTS

The protection structure may only be subjected to the strength tests described in Annexes III and IV if both of the tests described in sections 2 and 3 of the present Annex have been satisfactorily completed.

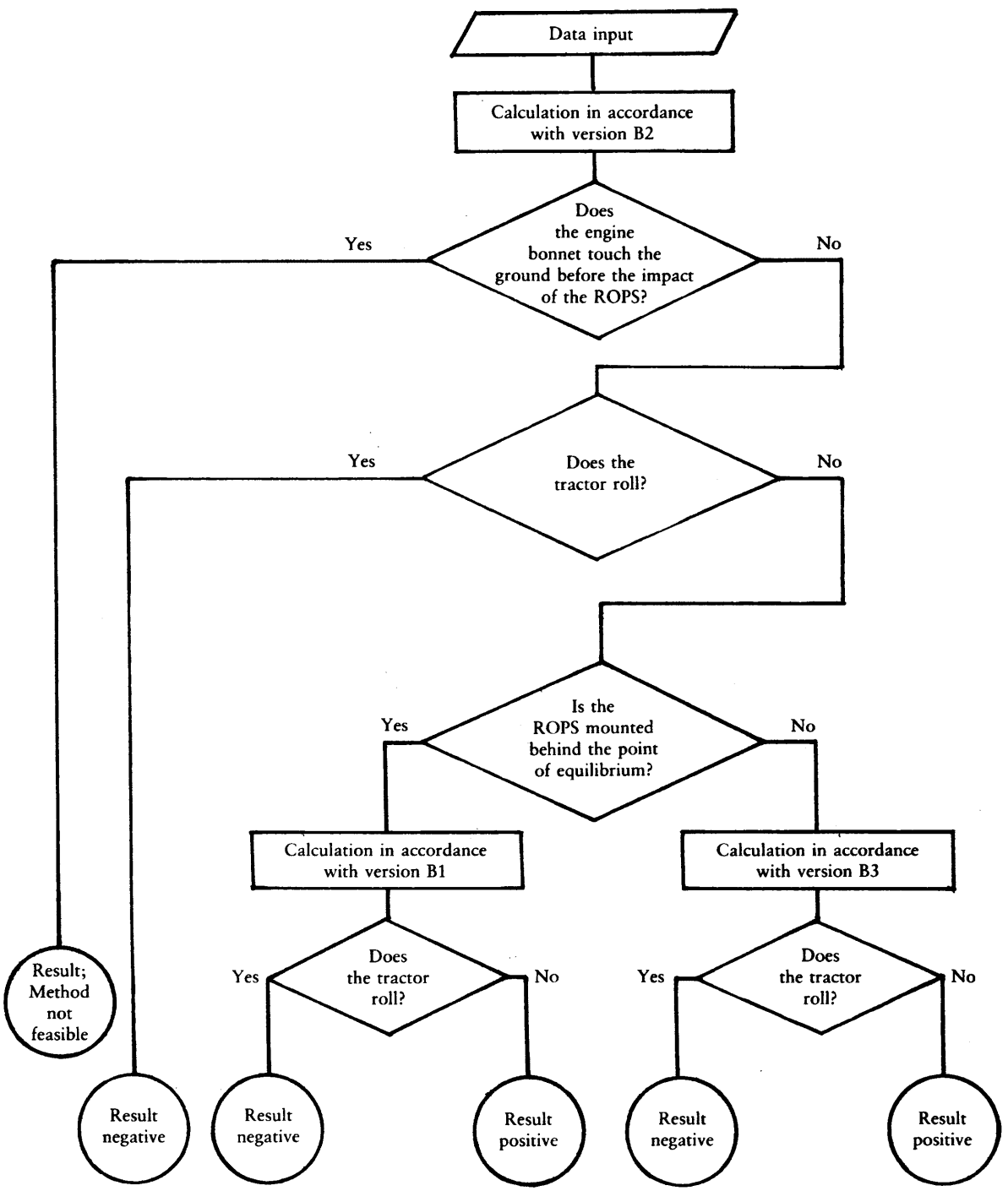
Appendix 1

Flow diagram for determining the continuous roll-over behaviour of a laterally overturning tractor with a front, centre or rear-mounted roll-over protection structure (ROPS)

Version B1: Point of impact of ROPS behind longitudinally unstable equilibrium point

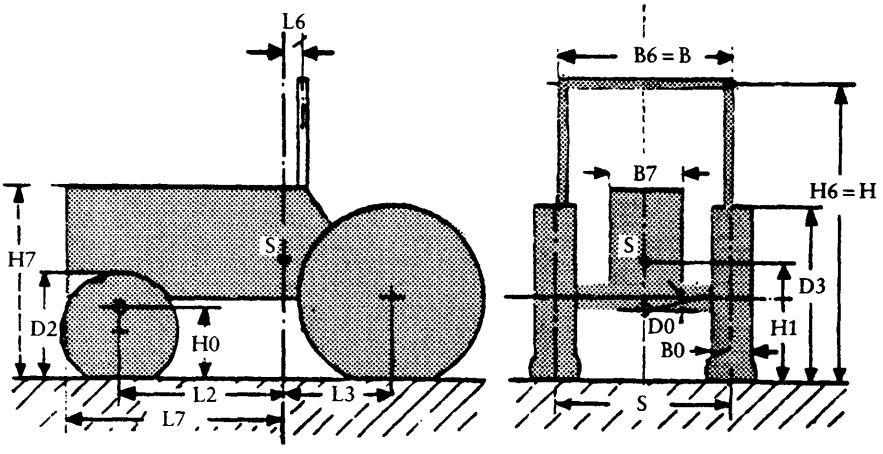
Version B2: Point of impact of ROPS near longitudinally unstable equilibrium point

Version B3: Point of impact of ROPS in front of longitudinally unstable equilibrium point



Appendix 2

Figures relating to non-continous roll-over



Mass M	.... kg
Front tyres	 v
Rear tyres	.... h
Moment of inertia Q	.... kgm²

Data required for calculating the overturn of a tractor with triaxial rolling behaviour.

ANNEX III

CONDITIONS FOR TESTING THE STRENGTH OF PROTECTION STRUCTURES AND OF THEIR ATTACHMENT TO TRACTORS

1. GENERAL REQUIREMENTS

1.1. Test purposes

Tests made using special rigs are intended to simulate such loads as are imposed on a protection structure, when the tractor overturns. These tests, described in Annex IV, enable observations to be made on the strength of the protection structure and any brackets attaching it to the tractor and any parts of the tractor which transmit the test load.

1.2. Test methods

Tests may be performed in accordance with the dynamic procedure (see Annexes III A and IV A) or the static procedure (see Annexes III B and IV B), the choice being left to the manufacturer.

The two methods are equivalent.

1.3. General rules governing preparation for tests

1.3.1. The protection structure must conform to the series production specifications. It must be attached in accordance with the manufacturer's recommended method to one of the tractors for which it is designed.

A complete tractor is not required for the static strength test; however, the protection structure and parts of the tractor to which it is attached represent an operating installation, hereinafter referred to as 'the assembly'.

1.3.2. For both the static test and the dynamic test the tractor as assembled must be fitted with all series production components which may affect the strength of the protection structure or which may be necessary for the strength test.

Components which may create a hazard in the zone of clearance must also be fitted so that they may be examined to see whether the requirements of 3.1 and 3.2 of this Annex have been fulfilled.

All components of the tractor or the protection structure including weather protection must be supplied or described on drawings.

1.3.3. For the strength test, all panels and detachable non-structural components must be removed so that they may not contribute to the strengthening of the protection structure.

1.3.4. *Track width*

The track width must be adjusted so that the protection structure will as far as possible not be supported by the tyres during the strength tests. If these tests are conducted in accordance with the static procedure, it must be possible to remove the wheels.

1.4. Tractor reference mass

The reference mass m_t, used in the formulae (see Annexes IV A and IV B) to calculate the height of the fall of the pendulum block, the loading energies and the crushing forces, must be at least that defined in section 2.4 of Annex I to Council Directive 74/150/EEC (i.e., excluding optional accessories but including coolant, oils, fuel, tools and driver) plus the protection structure and less 75 kilograms. Not included are optional front or rear weights, tyre ballast, mounted implements, mounted equipment or any specialized components.

2. TESTS

2.1. Sequence of tests

The sequence of tests is as follows, without prejudice to the additional tests mentioned in sections 1.6 of Annex IV A and 1.6/1.7 of Annex IV B:

2.1.1. Impact (dynamic tests) or loading (static test) at the rear of the structure (see section 1.1 of Annexes IV A and IV B).

2.1.2. Rear crushing test (dynamic or static tests) (see section 1.4 of Annexes IV A and IV B).

2.1.3. Impact (dynamic tests) or loading (static tests) at the front of the structure (see section 1.2 of Annexes IV A and IV B).

2.1.4. Impact (dynamic tests) or loading (static tests) at the side of the structure (see section 1.3 of Annexes IV A and IV B).

2.1.5. Crushing at the front of the structure (dynamic or static tests) (see section 1.5 of Annexes IV A and IV B).

2.2. **General requirements**

2.2.1. If, during the test, any part of the restraining equipment breaks or moves, the test must be restarted.

2.2.2. No repairs or adjustments of the tractor or protection structure may be carried out during the tests.

2.2.3. The tractor gear box must be in neutral and the brakes off during the tests.

2.2.4. If the tractor is fitted with a suspension system, between the tractor body and the wheels, it must be blocked during the tests.

2.2.5. The side chosen for application of the first impact on the rear of the structure (in the case of dynamic tests) or the first load on the rear of the structure (in the case of static tests) must be that which, in the opinion of the testing authorities, will result in the application of the series of impacts or loads under the most unfavourable conditions for the structure. The side impact or load and the rear impact or load must be applied on both sides of the median longitudinal plane of the protection structure. The front impact or load must be applied on the same side of the median longitudinal plane of the protection structure as the side impact or load.

2.3. **Mesurement tolerances**

2.3.1. Linear dimensions: ± 3 mm

except for:

— tyre deflection: ± 1 mm,

— structure deflection during horizontal loadings: ± 1 mm,

— each of the two measurements for the height of fall of the pendulum block: ± 1 mm

2.3.2. Masses: ± 1 %

2.3.3. Forces: ± 2 %

2.3.4. Angles: ± 2 degrees.

3. ACCEPTANCE CONDITIONS

3.1. A protection structure submitted for EEC component type-approval is regarded as having satisfied the strength requirements if it fulfils the following conditions:

3.1.1. After each part-test it must be free from cracks or tears within the meaning of section 3.1 of Annexes IV A and IV B. If, during one of the tests, significant cracks or tears appear, an additional test, in accordance with Annex IV A or Annex IV B must be applied immediately.

3.1.2. During the tests, no part of the protection structure must enter the zone of clearance as defined in section 2 of Annexes IV A and IV B.

3.1.3. During the tests no part of the zone of clearance must be outside the protection of the structure, in accordance with section 3.2 of Annexes IV A and IV B.

3.1.4. The elastic deflection, measured in accordance with section 3.3 of Annexes IV and IV B, must be less than 250 mm.

3.2. There must be no accessories presenting a hazard for the driver. There must be no projecting accessory or part which is liable to injure the driver should the tractor overturn, or any accessory or part which is liable to trap him — for example by the leg or the foot — as a result of the deflections of the structure.

4. TEST REPORT

4.1. The test report is attached to the EEC component type-approval certificate referred to in Annex VIII.

The presentation of the report is as shown in Annex VI.

The report must include:

4.1.1. A general description of the protection structure's shape and construction (normally at least a scale of 1 : 20 for the general drawings and 1 : 2,5 for drawing of the attachments). The main dimensions must figure on the drawings; external dimensions of tractor with protection structure fitted; main interior dimensions and details of provisions for normal entry and exit and for escape where appropriate; and details of heating and ventilation system, where appropriate.

4.1.3. A brief description of any interior padding.

4.2. The report must identify clearly the tractor type (make, type, trade-name, etc.) used for testing and the types for which the protection structure is intended.

4.3. If EEC component type-approval is being extended to other tractor types, the report must include the exact reference of the report of the original EEC component type-approval as well as precise indications regarding the requirements laid down in section 3.4 of Annex I.

A. Apparatus and equipment for dynamic tests

1. PENDULUM BLOCK

1.1. A pendulum block must be suspended by two chains or wire ropes from pivot points not less than six metres above the ground. Means must be provided for adjusting independently the suspended height of the block and the angle between the block and the supporting chains or wire ropes.

1.2. The mass must be 2 000 ± 20 kilograms excluding the mass of the chains or wire ropes which themselves must not exceed 100 kilograms. The length of the sides of the impact face must be 680 ± 20 mm (see Figure 4, of Annex V). The block must be filled in such a way that the position of its centre of gravity is constant and coincides with the geometrical centre of the parallelepiped.

1.3. The parallelepiped must be connected to the system which pulls it backwards by an instantaneous release mechanism which is so designed and located as to enable the pendulum block to be released without causing the parallelepiped to oscillate about its horizontal axis perpendicular to the pendulum's plane of oscillation.

2. PENDULUM SUPPORTS

The pendulum pivot points must be rigidly fixed so that their displacement in any direction does not exceed 1 % of the height of fall.

3. LASHINGS

3.1. Anchoring rails with the requisite track width and covering the necessary area for lashing the tractor in all the cases illustrated (see Figures 5, 6, and 7, Annex V) must be rigidly attached to a non-yielding base beneath the pendulum.

3.2. The tractor must be lashed to the rails by means of wire rope with round strand, fibre core, construction 6 × 19 in accordance with ISO 2408 and a nominal diameter of 13 mm. The metal strands must have an ultimate tensile strength of 1 770 MPa.

3.3. The central pivot of an articulated tractor must be supported and lashed down as appropriate for all tests. For the side impact test, the pivot must also be propped from the side opposite the impact. The front and rear wheels need not be in line if this facilitates the attachment of the wire ropes in the appropriate manner.

4. WHEEL PROP AND BEAM

4.1. A softwood beam of 150 mm square must be used as a prop for the wheels during the impact tests (see Figures 5, 6 and 7, Annex V).

4.2. A softwood beam must be clamped to the floor to brace the rim of the wheel opposite the side impact as shown in Figure 7, Annex V.

5. PROPS AND LASHINGS FOR ARTICULATED TRACTORS

5.1. Additional props and lashings must be used for articulated tractors. Their purpose is to ensure that the section of the tractor on which the protection structure is fitted is as rigid as that of a rigid tractor.

5.2. Additional specific details are given in Annex IV A for the impact and crushing tests.

6. TYRE PRESSURES AND DEFLECTIONS

6.1. The tractor tyres must not be liquid-ballasted and must be inflated to the pressures prescribed by the tractor manufacturer for field work.

6.2. The lashings must be tensioned in each particular case that the tyres undergo a deflection equal to 12 % of the tyre wall height before tensioning.

7. CRUSHING RIG

A rig as shown in Figure 8, Annex V, must be capable of exerting a downward force on a protection structure through a rigid beam approximately 250 mm wide connected to the load-applying mechanism by means of universal joints. Suitable axle stands must be provided so that the tractor tyres do not bear the crushing force.

8. MEASURING APPARATUS

8.1. A device such as that illustrated in Annex V, Figure 9, for measuring the elastic deflection (the difference between the maximum momentary deflection and the permanent deflection).

8.2. A device for checking that the protection structure has not entered the zone of clearance and that the latter has remained within the structure's protection during the test (see section 3.2 of Annex IV A).

B. **Apparatus and equipment for static tests**

1. STATIC TESTING RIG

1.1. The static testing rig must be designed in such a way as to permit thrusts or 'loads' to be applied to the protection structure.

1.2. Provision must be made so that the load can be uniformly distributed normal to the direction of loading and along a flange having a length of one of the exact multiples of 50 between 250 and 700 mm. The stiff flange must have a vertical face dimension of 150 mm. The edges of the flange in contact with the protection structure must be curved with a maximum radius of 50 mm.

1.3. The pad must be capable of being adjusted to any angle in relation to the load direction, in order to be able to follow the angular variations of the structure's load-bearing surface as the structure deflects.

1.4. Direction of loading (deviation from horizontal and from vertical):

— at start of test, under zero load: ± 2°

— during test, under load: 10° above and 20° below the horizontal.

These variations must be kept to a minimum.

1.5. The deflection rate must be sufficiently slow (less than 5 mm/s) for the load at all moments to be considered as 'static'.

2. APPARATUS FOR MEASURING THE ENERGY ABSORBED BY THE STRUCTURE

2.1. The 'force versus deflection' curve must be plotted in order to determine the energy absorbed by the structure. There is no need to measure the force and deflection at the point where the load is applied to the structure; however, 'force' and 'deflection' must be measured simultaneously and co-linearly.

2.2. The point of origin of deflection measurements must be selected so as to take account only of the energy absorbed by the structure and/or by the deflection of certain parts of the tractor. The energy absorbed by the deflection and/or the slipping of the anchoring must be ignored.

3. MEANS OF ANCHORING THE TRACTOR TO THE GROUND

3.1. Anchoring rails with the requisite track width and covering the necessary area for anchoring the tractor in all the cases illustrated must be rigidly attached to a non-yielding base near the testing rig.

3.2. The tractor must be anchored to the rails by any suitable means (plates, wedges, wire ropes, jacks, etc.) so that it cannot move during the tests. This requirement must be checked during the test, by means of the usual devices for measuring length.

If the tractor moves, the entire test must be repeated, unless the system for measuring the deflections taken into account for plotting the 'force versus deflection' curve is connected to the tractor.

4. CRUSHING RIG

4.1. A rig as shown in Figure 8 of Annex V must be capable of exerting a downward force on a protection structure through a rigid beam approximately 250 mm wide connected to the load-applying mechanism by means of universal joints. Suitable axle stand must be provided so that the tractor tyres do not bear crushing force.

5. OTHER MEASURING APPARATUS

5.1. A device such as that illustrated in Figure 9 of Annex V, for measuring the elastic deflection (the difference between the maximum momentary deflection and the permanent deflection).

5.2. A device for checking that the protection structure has not entered the zone of clearance and that the latter has remained within the structure's protection during the test (see section 3.2 of Annex IV B).

C. Symbols

m_t (kg):	tractor reference mass, as defined in section 1.4 of this Annex.
$D_{(mm)}$:	deflection of the structure at the point of impact (dynamic tests) or at the point of, and in line with, the load application (static tests).
$H_{(mm)}$:	falling height of the pendulum block.
F (N) (Newton):	static load force.
F_{max}:	maximum static load force occurring during loading, (N) with the exception of the overload.
F′ (N):	loading force corresponding to E'_i
F-D:	force/deflection diagram.
E_{is} (J) (Joule):	energy input to be absorbed during side loading.
E_{ii} (J):	energy input to be absorbed during longitudinal loading.
F_v (N):	vertical crushing force.
E_i (J):	strain energy absorbed. Area under F-D curve (see Figure 10a, Annex V).
E'_i (J):	strain energy absorbed after additional loading following a crack or tear (see Figures 10b and 10c, Annex V).
E_a (J):	strain energy absorbed at point when load is removed. Area contained within F-D curve (see Figure 10b, Annex V).
E''_i (J):	strain energy absorbed in overload test in the event of the load having been removed before starting this overload test. Area under F-D curve (see Figure 10c, Annex V).

ANNEX IV

TEST PROCEDURES

A. Dynamic tests

1. IMPACT AND CRUSHING TESTS

1.1. **Impact at the rear**

1.1.1. The tractor must be so placed in relation to the pendulum block that the block will strike the protection structure when the impact face of the block and the supporting chains or wire ropes are at an angle with the vertical plane equal to $m_t/100$ with a 20° maximum, unless, during deflection, the protection structure at the point of contact forms a greater angle to the vertical. In this case the impact face of the block must be adjusted by means of an additional support so that it is parallel to the protection structure at the point of impact at the moment of maximum deflection, the supporting chains or wire ropes remaining at the angle defined above.

The suspended height of the block must be adjusted and necessary steps taken so as to prevent the block from turning about the point of impact.

The point of impact is that part of the protection structure likely to hit the ground first in a rearward overturning accident, normally the upper edge. The position of the centre of gravity of the block is one-sixth of the width of the top of the protection structure inwards from a vertical plane parallel to the median plane of the tractor touching the outside extremity of the top of the protection structure.

If the structure is curved or protruding at this point, wedges enabling the impact to be applied thereon must be added, without thereby reinforcing the structure.

1.1.2. The tractor must be lashed to the ground by means of four wire ropes, one at each end of both axles, arranged as indicated in Figure 5 of Annex V. The spacing between the front and rear lashing points must be such that the wire ropes make an angle of less than 30° with the ground. The rear lashings must in addition be so arranged that the point of convergence of the two wire ropes is located in the vertical plane in which the centre of gravity of the block travels.

The wire ropes must be tensioned so that the tyres undergo the deflections given in section 6.2 of Annex III A.

With the wire ropes tensioned, the wedging beam must be placed in front of and tight against the rear wheels and then fixed to the ground.

1.1.3. If the tractor is of the articulated type, the point of articulation must in addition be supported by a wooden block at least 100 mm square and firmly lashed to the ground.

1.1.4. The pendulum block must be pulled back so that the height of its centre of gravity above that at the point of impact is given by one of the following two formulae, to be chosen according to the reference mass of the assembly subjected to the tests:

$H = 25 + 0{,}07\ m_t$ for assemblies with a reference mass of less than 2 000 kilograms,

$H = 125 + 0{,}02\ m_t$ for assemblies with a reference mass of more than 2 000 kilograms.

The block is then released and strikes the protection structure.

1.2. **Impact at the front**

1.2.1. The tractor must be so placed in relation to the pendulum block that the block will strike the protection structure when the impact face of the block and the supporting chains or wire ropes are at an angle with the vertical plane equal to $m_t/100$ with a 20° maximum, unless, during deflection, the protection structure at the point of contact forms a greater angle to the vertical. In this case the

impact face of the block must be adjusted by means of an additional support so that it is parallel to the protection structure at the point of impact at the moment of maximum deflection, the supporting chains or wire ropes remaining at the angle defined above.

The suspended height of the pendulum block must be adjusted and the necessary steps taken so as to prevent the block from turning about the point of impact.

The point of impact is that part of the protection structure likely to hit the ground first if the tractor overturned sideways while travelling forward, normally the upper edge. The position of the centre of gravity of the weight is one-sixth of the width of the top of the protection structure inwards from a vertical plane parallel to the median plane of the tractor touching the outside extremity of the top of the protection structure.

If the structure is curved or protruding at this point, wedges enabling the impact to be applied thereon must be added, without thereby reinforcing the structure.

1.2.2. The tractor must be lashed to the ground by means of four wire ropes, one at each end of both axles, arranged as indicated in Figure 6 of Annex V. The spacing between the front and rear lashing points must be such that the wire ropes make an angle of less than 30° with the ground. The rear lashings must in addition be so arranged that the point of convergence of the two wire ropes is located in the vertical plane in which the centre of gravity of the pendulum blocks travels. The wire ropes must be tensioned so that the tyres undergo the deflections given in section 6.2 of Annex III A. With the wire ropes tensioned, the wedging beam must be placed behind and tight against the rear wheels and then fixed to the ground.

1.2.3. If the tractor is of the articulated type, the point of articulation must in addition be supported by a wooden block at least 100 mm square and firmly lashed to the ground.

1.2.4. The pendulum block must be pulled back so that the height of its centre of gravity above that at the point of impact is given by one of the following two formulae, to be chosen according to the reference mass of the assembly subjected to the tests:

$H = 25 + 0{,}07\ m_t$ for assemblies with a reference mass of less than 2 000 kilograms,

$H = 125 + 0{,}02\ m_t$ for assemblies with a reference mass of more than 2 000 kilograms.

The pendulum block is then released and strikes the protection structure.

1.3. **Impact from the side**

1.3.1. The tractor must be so placed in relation to the pendulum block that the block will strike the protection structure when the impact face of the weight and the supporting chains or wire ropes are vertical unless, during deflection, the protection structure at the point of contact forms an angle of less than 20° to the vertical.

In this case the impact face of the block must be adjusted by means of an additional support so that it is parallel to the protection structure at the point of impact at the moment of maximum deflection, the supporting chains or wire ropes remaining vertical on impact.

The suspended height of the pendulum block must be adjusted and necessary steps taken so as to prevent the block from turning about the point of impact.

The point of impact must be that part of the protection structure likely to hit the ground first in a sideways overturning accident.

1.3.2. The tractor wheels on the side which is to receive the impact must be lashed to the ground by means of wire ropes passing over the corresponding ends of the front and rear axles. The wire ropes must be tensioned to produce the tyre deflection values given in section 6.2 of Annex III A.

With the wire ropes tensioned, the wedging beam must be placed on the ground, pushed tight against the tyres on the side opposite that which is to receive the impact and then fixed to the ground. It may be necessary to use two beams or wedges if the outer sides of the front and rear tyres are not in the same vertical plane.

The prop must then be placed as indicated in Figure 7 of Annex V, against the rim of the most heavily loaded wheel opposite to the point of impact, pushed firmly against the rim and then fixed at its base.

The length of the prop must be such that it makes an angle of 30 ± 3° with the ground when in position against the rim. In addition, its length must, if possible, be between 20 and 25 times greater than its thickness and its thickness between two and three times less than its width. The props must be shaped at both ends as shown in the details on Figure 7 of Annex V.

1.3.3. If the tractor is of the articulated type, the point of articulation must in addition be supported by a wooden block at least 100 mm square and laterally supported by a device similar to the prop pushed against the rear wheel. The point of articulation must then be lashed firmly to the ground.

1.3.4. The weight must be pulled back so that the height of its centre of gravity above that at the point of impact is given by one of the following two formulae, to be chosen according to the reference mass of the assembly subjected to the tests:

$H = (25 + 0{,}20\ m_t) \cdot \frac{B_b + B}{2B}$ for assemblies with a reference mass of less than 2 000 kilograms,

$H = (125 + 0{,}15\ m_t) \cdot \frac{B_b + B}{2B}$ for assemblies with a reference mass of more than 2 000 kilograms,

where B_b is the maximum outer width of the protection structure, and B is the minimum overall width of the tractor.

1.4. **Crushing at the rear**

The beam must be positioned over the rear uppermost structural member(s) and the resultant of crushing forces must be located in the tractor's median plant.

A force $F_v = 20\ m_t$ must be applied.

Where the rear part of the protection structure roof will not sustain the full crushing force, the force must be applied until the roof is deflected to coincide with the place joining the upper part of the protection structure with that part of the rear of the tractor capable of supporting the vehicle's mass when overturned. The force must then be removed, and the tractor or loading force repositioned so that the beam is over that point of the protection structure which would then support the tractor when completely overturned.

The force F_v is then applied. The force is applied for a minimum of five seconds following the cessation of any visually detectable deflection.

1.5. **Crushing at the front**

The beam must be positioned across the front uppermost structural member(s) and the resultant of crushing forces must be located in the tractor's median plane.

A force $F_v = 20\ m_t$ must be applied.

Where the front part of the protection structure roof will not sustain the full crushing force, the force must be applied until the roof is deflected to coincide with the plane joining the upper part of the protection structure with that part of the front of the tractor capable of supporting the vehicle's mass when overturned. The force must then be removed, and the tractor or loading force repositioned so that the beam is over that point of the protection structure which would then support the tractor when completely overturned.

The force F_v is then applied. The force is applied for a minimum of five seconds following the cessation of any visually detectable deflection.

1.6. **Additional test**

If cracks or tears which cannot be considered negligible appear during a crushing test, a second similar crushing test, but with a force of 1,2 F_v, must be applied immediately after the crushing test, which caused the cracks or tears to appear.

2. ZONE OF CLEARANCE

2.1. The zone of clearance is shown in Annex V, Figures 2a, 2b, 2c, 2d and 2e.

The zone of clearance is defined on the basis of:

2.1.1. A vertical reference plane, generally longitudinal to the tractor and passing through the seat reference point and the centre of the steering wheel; this plane must be able to move horizontally with the seat and steering wheel during impacts but to remain perpendicular to the floor of the tractor or of the protection structure if this is resiliently mounted.

2.1.2. A reference line contained in the reference plane, which passes through the seat reference point and the first point on the steering wheel rim that it intersects when brought to the horizontal.

2.2. The zone of clearance is bounded by the following planes, the tractor being on a horizontal surface and, where the steering wheel is adjustable, its position adjusted for the middle position for driving.

2.2.1. Two vertical planes 250 mm on either side of the reference plane, these vertical planes extending 300 mm upwards from the horizontal plane passing through the seat reference point and longitudinally at least 550 mm in front of the vertical plane perpendicular to the reference plane passing 350 mm in front of the seat reference point.

2.2.2. Two vertical planes 200 mm on either side of the reference plane, these vertical planes extending 300 mm upwards from the horizontal plane passing through the seat reference point and longitudinally from the surface defined in 2.2.11 to the vertical plane perpendicular to the reference plane passing 350 mm in front of the seat reference point.

2.2.3. An oblique plane perpendicular to the reference plane, parallel with and 400 mm above the reference line, extending backwards to the point where it interesects the vertical plane which is perpendicular to the reference plane and which passes through the seat reference point.

2.2.4. An oblique plane, perpendicular to the reference plane and resting on the top of the seat backrest, which meets the previous plane at its rearmost edge.

2.2.5. A vertical plane perpendicular to the reference plane, passing at least 40 mm forward of the steering wheel and at least 900 mm forward of the seat reference point.

2.2.6. A curvilinear surface with its axis perpendicular to the reference plane, having a radius of 150 mm and meeting the planes defined in 2.2.3 and 2.2.5 at a tangent.

2.2.7. Two parallel oblique planes passing through the upper edges of the planes defined in 2.2.1, with the oblique plane on the side where the impact is applied no closer than 100 mm to the reference plane above the zone of clearance,

2.2.8. A horizontal plane passing through the seat reference point.

2.2.9. Two portions of the vertical plane perpendicular to the reference plane passing 350 mm forward of the seat reference point, both these part planes joining respectively the rearmost limits of the planes defined in 2.2.1 to the foremost limits of the planes defined in 2.2.2.

2.2.10. Two portions of the horizontal plane passing 300 mm above the seat reference point, both these part planes joining respectively the uppermost limits of the vertical planes defined in 2.2.2 to the lowermost limits of the oblique planes defined in 2.2.7.

2.2.11. A curvilinear surface whose generating line is perpendicular to the reference plane and rests on the back of the seat backrest.

2.3. **Seat location and seat reference point**

2.3.1. *Seat reference point*

2.3.1.1. The reference point must be established by means of the apparatus illustrated in Figures 3a and 3b of Annex V. The apparatus consists of a seat pan board and backrest boards. The lower backrest board is jointed in the region of the ischium humps (A) and loin (B), the joint (B) being adjustable in height.

2.3.1.2. The reference point is defined as the point in the median longitudinal plane of the seat where the tangential plane of the lower backrest and a horizontal plane intersect. This horizontal plane cuts the lower surface of the seat pan board 150 mm in front of the abovementioned tangent.

2.3.1.3. The apparatus is positioned on the seat. It is then loaded with a force of 550 N at a point 50 mm in front of joint (A), and the two parts of the backrest board lightly pressed tangentially against the backrest.

2.3.1.4. If it is not possible to determine definite tangents to each area of the backrest (above and below the lumbar region) the following steps must be taken:

2.3.1.4.1. Where no definite tangent to the lower area is possible, the lower part of the backrest board is pressed against the backrest vertically.

2.3.1.4.2. Where no definite tangent to the upper area is possible, the joint (B) is fixed at a height of 230 mm above the lower surface of the seat pan board, the backrest board being perpendicular to the seat pan board. Then the two parts of the backrest board are lightly pressed against the backrest tangentially

2.3.2. *Seat position and adjustment for determining the location of the seat reference point*

2.3.2.1. Where the seat position is adjustable, the seat must be adjusted to its rear uppermost position.

2.3.2.2. Where the inclination of the backrest and seat pan is adjustable, these must be adjusted so that the reference point is in its rear uppermost position.

2.3.2.3. Where the seat is equipped with suspension, the latter must be blocked at mid-travel, unless this is contrary to the instructions clearly laid down by the seat manufacturer. If such instructions exist, they must be complied with.

3. MEASUREMENTS TO BE MADE

3.1. **Fractures and cracks**

After each test all structural members, joints and fastening systems shall be visually examined for fractures or cracks, any small cracks in unimportant parts being ignored.

Any tears caused by the edges of the pendulum weight are to be ignored.

3.2. **Zone of clearance**

3.2.1. During each test the protection structure must be examined to see whether any part of the protection structure has entered a zone of clearance round the driving seat as defined in section 2 of this Annex.

3.2.2. In addition, the protection structure must be examined to determine whether any part of the zone of clearance is outside the protection of the structure. For this purpose it is considered to be outside the protection of the roll-over protection structure if any part of it would have come in contact with the ground plane if the tractor had overturned in the direction from which the impact came. For this purpose the front and rear tyres and track setting are assumed to be the smallest specified by the manufacturer. Moreover, if the tractor is fitted with a rigid section, a housing or other hard fixture

placed behind the driver's seat, this fixture shall be regarded as a protection point, in the event of sideways or rear overturning. However, the height of this rear structure over the seat reference point must be less than 500 mm (see Annex V, figure 2 f).

In addition, it must be sufficiently rigid and firmly attached to the rear of the tractor. This structure mounted on the tractor should withstand, without breaking, a load which will be defined six months before implementation of the Directive, together with any detailed instructions for the testing to be carried out, under the procedure for adaptation to technical progress; this load will be applied horizontally at the point likely to hit the ground first if the tractor up-ends.

3.3. **Elastic deflection**

The elastic deflection is measured 900 mm above the reference point, in the vertical plane passing through the point of impact. For this measurement, apparatus similar to that illustrated in Figure 9, Annex V, must be used.

3.4. **Permanent deflection**

After the final crushing test the permanent deflection of the protection structure is recorded. For this purpose, before the start of the test, the position of the main roll-over protection structure members in relation to the seat reference point must be recorded.

B. Static tests

1. LOADING AND CRUSHING TESTS

1.1. **Loading at the rear**

1.1.1. The load is applied horizontally, in a vertical plane parallel to the tractor's median plane.

The load application point is that part of the roll-over protection structure likely to hit the ground first in a rearward overturning accident, normally the upper edge. The vertical plane in which the load is applied is located at a distance of one-third of the external width of the upper part of the structure from the median plane.

If the structure is curved or protruding at this point, wedges enabling the load to be applied thereon must be added, without thereby reinforcing the structure.

1.1.2. The assembly is lashed to the ground as described in section 3 of Annex III B.

1.1.3. The energy absorbed by the protection structure during the test must be at least

$$E_{il} = 500 + 0{,}5\ m_t.$$

1.2. **Loading at the front**

1.2.1. The load is applied horizontally, in a vertical plane parallel to the tractor's median plane and located at a distance of one-third of the external width of the upper part of the structure therefrom.

The load application point is that part of the roll-over protection structure likely to hit the ground first if the tractor overturned sideways while travelling forward, normally the upper edge.

If the structure is curved or protruding at this point, wedges enabling the load to be applied thereon must be added, without thereby reinforcing the structure.

1.2.2. The assembly is lashed to the ground as described in section 3 of Annex III B.

1.2.3. The energy absorbed by the protection structure during the test must be at least

$$E_{il} = 500 + 0{,}5\ m_t.$$

1.3. **Loading from the side**

1.3.1. The side loading is applied horizontally, in a vertical plane perpendicular to the tractor's median plane.

The load application point is that part of the roll-over protection structure likely to hit the ground first in a sideways overturning accident, normally the upper edge.

1.3.2. The assembly must be lashed to the ground as described in section 3 of Annex III B.

1.3.3. The energy absorbed by the protection structure during the test must be at least

$$E_{is} = 1{,}75\ m_t \frac{B_b + B}{2B}$$

where B_b is the maximum external width of the protection structure and B is the minimum overall width of the tractor.

1.4. **Crushing at the rear**

All provisions identical to those given in section 1.4 of Annex IV A.

1.5. **Crushing at the front**

All provisions identical to those given in section 1.5 of Annex IV A.

1.6. **Overload test** (additional test)

1.6.1. An overload test must be carried out in all cases where the force decreases by more than 3 % during the last 5 % of the deflection reached when the energy required is absorbed by the structure (see Figure 10b).

1.6.2. The overload test involves the gradual increase of the horizontal load by increments of 5 % of the initial energy requirement up to a maximum of 20 % of energy added (see Figure 10c).

1.6.2.1. The overload test is satisfactory if, after each increase by 5, 10, or 15 % in the energy required, the force decreases by less than 3 % for a 5 % increment and remains more than 0,8 $F_{max.}$

1.6.2.2. The overload test is satisfactory if, after the structure has absorbed 20 % of the added energy, the force exceeds 0,8 $F_{max.}$

1.6.2.3. Additional cracks or tears and/or entry into or lack of protection of the zone of clearance due to elastic deflection are permitted during the overload test. However, after the removal of the load, the structure must not enter the zone of clearance, which must be completely protected.

1.7. **Crushing test**

If cracks or tears which cannot be considered as negligible appear during a crushing test, a second, similar crushing, but with a force of 1,2 F_v, must be applied immediately after the crushing test which caused the cracks or tears to appear.

2. ZONE OF CLEARANCE

Identical to the zone of clearance described in section 2 of Annex IV A, except that the word 'impact' is to be replaced by 'load' in the third line of section 2.2.7.

3. MEASUREMENTS TO BE MADE

3.1. **Fractures and cracks**

After each test all structural members, joints and attachment systems must be visually examined for fractures or cracks, any small cracks in unimportant parts being ignored.

3.2. **Zone of clearance**

3.2.1. During each test the protection structure must be examined to see whether any part of the protection structure has entered a zone of clearance as defined in section 2 above.

3.2.2. In addition, the protection structure must be examined to determine whether any part of the zone of clearance is outside the protection of the structure. For this purpose it is considered to be outside the protection of the roll-over protection structure if any part of it would have come in contact with the ground plane if the tractor had overturned in the direction from which the impact came. For this purpose the front and rear tyres and track setting are assumed to be the smallest specified by the manufacturer. Moreover, if the tractor is fitted with a rigid section, a housing or other hard fixture placed behind the driver's seat, this fixture shall be regarded as a protection point, in the event of sideways or rear overturning. However, the height of this rear structure over the seat reference point must be less than 500 mm (see Annex V, Figure 2f).

In addition, it must be sufficiently rigid and firmly attached to the rear of the tractor. This structure mounted on the tractor should withstand, without breaking, a load which will be defined six months before implementation of the Directive, together with any detailed instructions for the testing to be carried out, under the procedure for adaptation to technical progress; this load will be applied horizontally at the point likely to hit the ground first if the tractor up-ends.

3.3. **Elastic deflection** (under side loading)

The elastic deflection is measured 900 mm above the seat reference point, in the vertical plane in which the load is applied. For this measurement, any apparatus similar to that illustrated in Annex V, Figure 9 may be used.

3.4. **Permanent deflections**

After the final crushing test the permanent deflection of the protection structure is recorded. For this purpose, before the start of the test, the position of the main roll-over protection structure members in relation to the seat reference point must be recorded.

ANNEX V

FIGURES

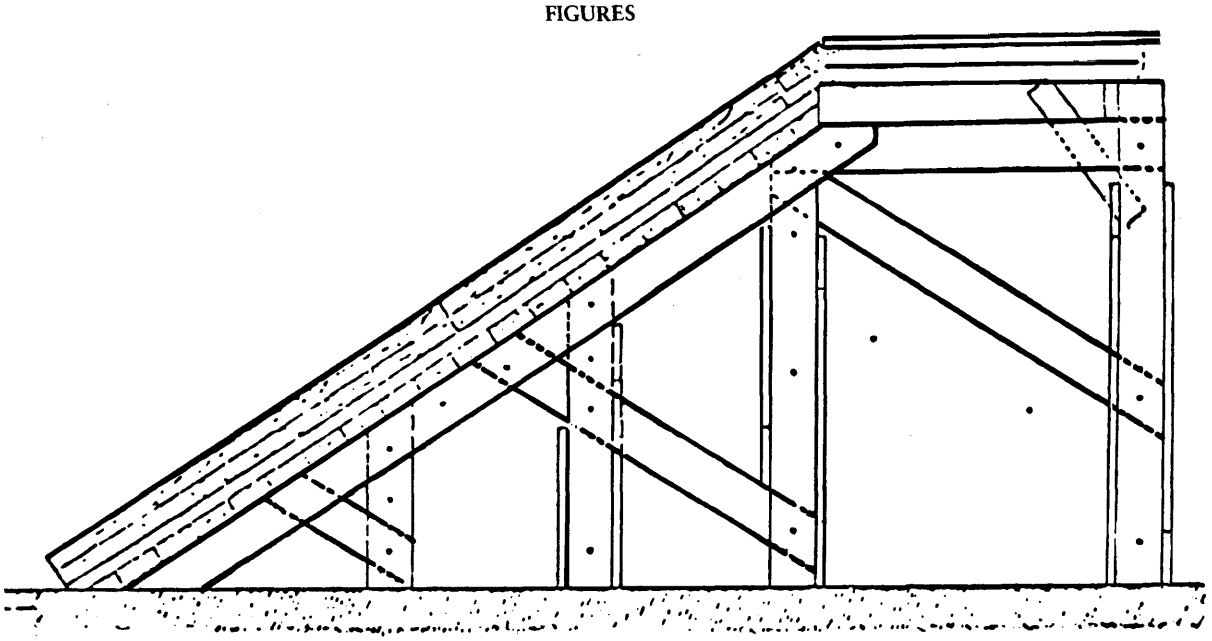


Figure 1

Rig for testing anti-roll properties on 1 in 1,5 gradient

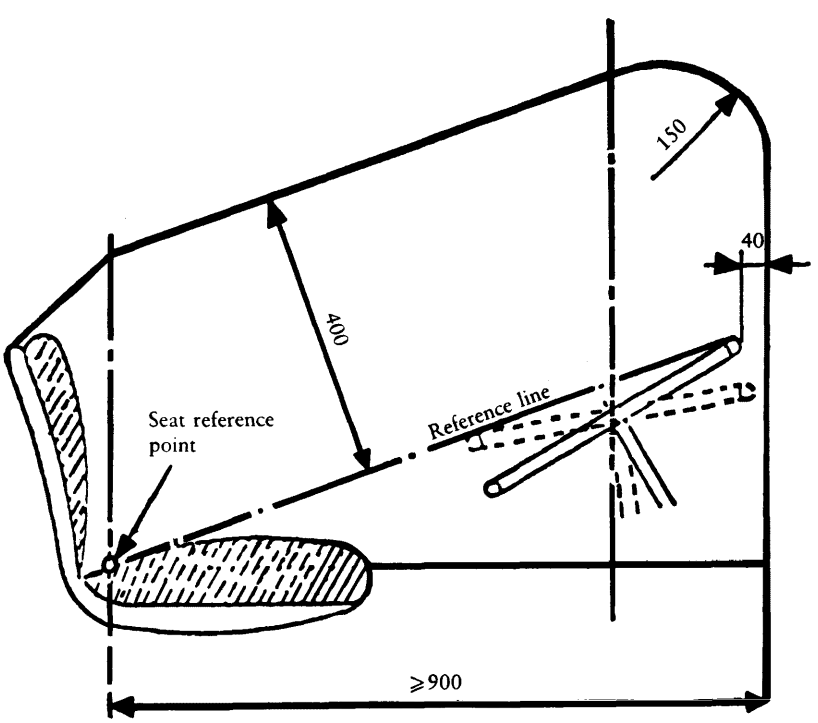


Figure 2a

Zone of clearance — Cross-section through the reference plane

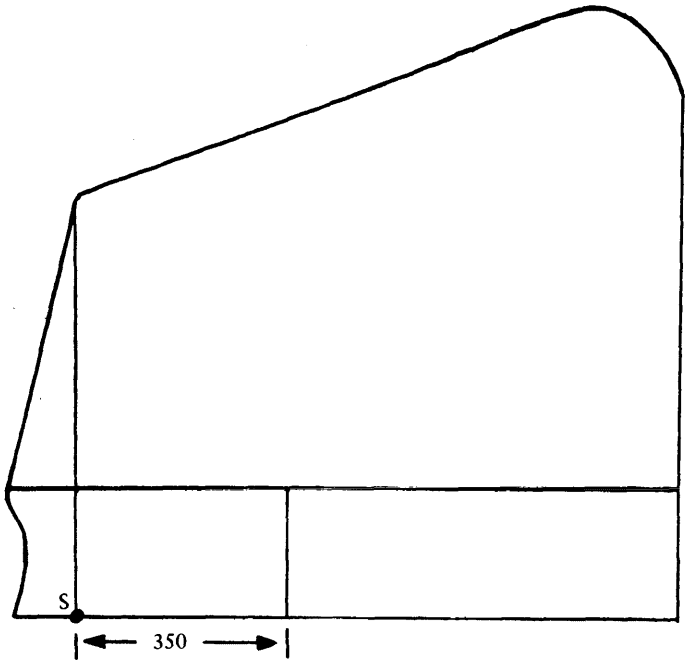


Figure 2b

Zone of clearance — Side view

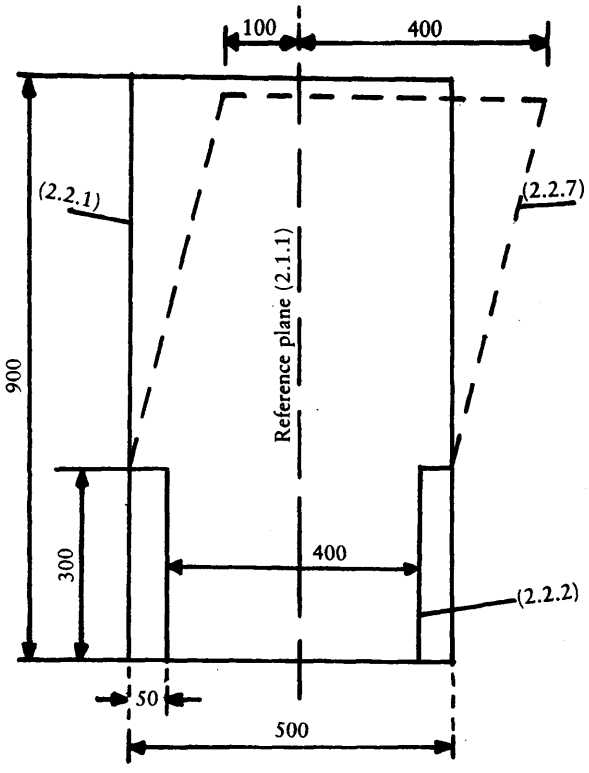


Figure 2c

Zone of clearance — Rear view

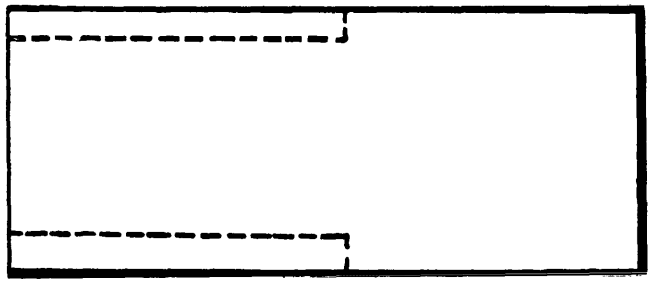


Figure 2d

Zone of clearance — seen from above

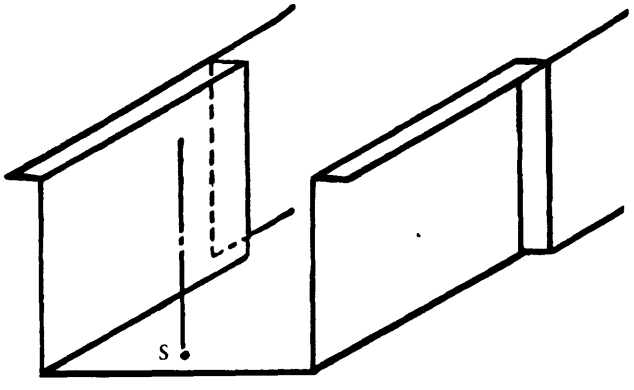


Figure 2e

Lower part of the zone of clearance 3/4 rear view

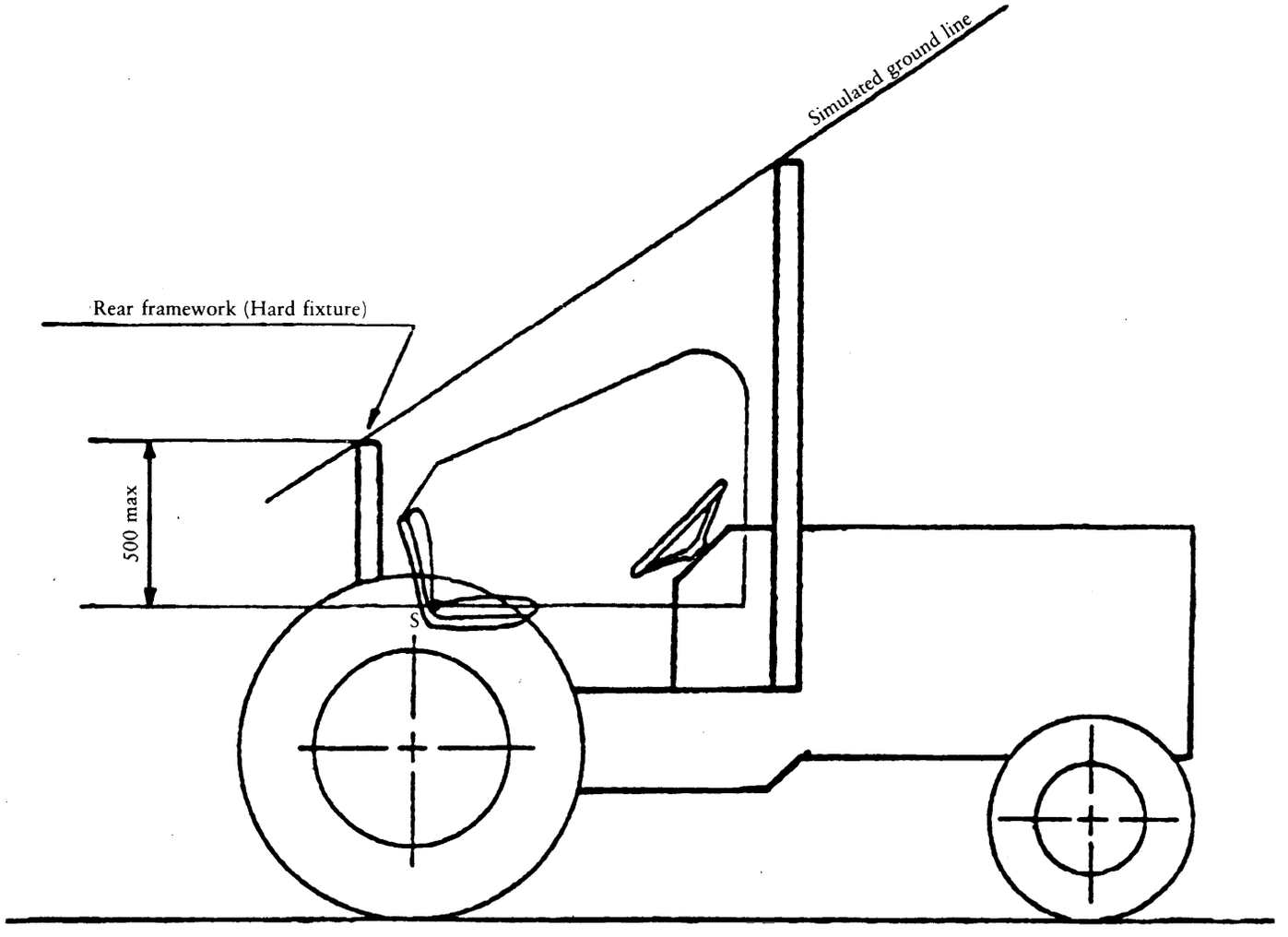

Simulated ground line
Rear framework (Hard fixture)
500 max
S

Figure 2f

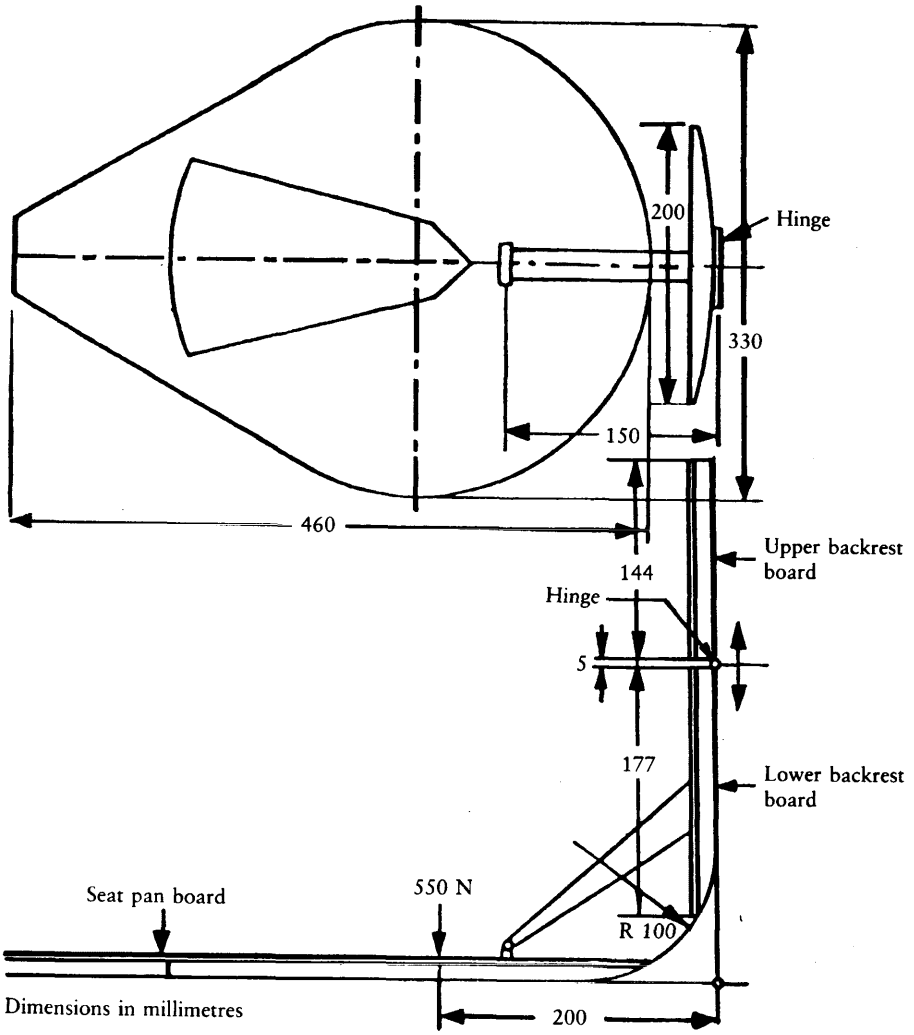


Figure 3a

Apparatus for determination of seat reference point

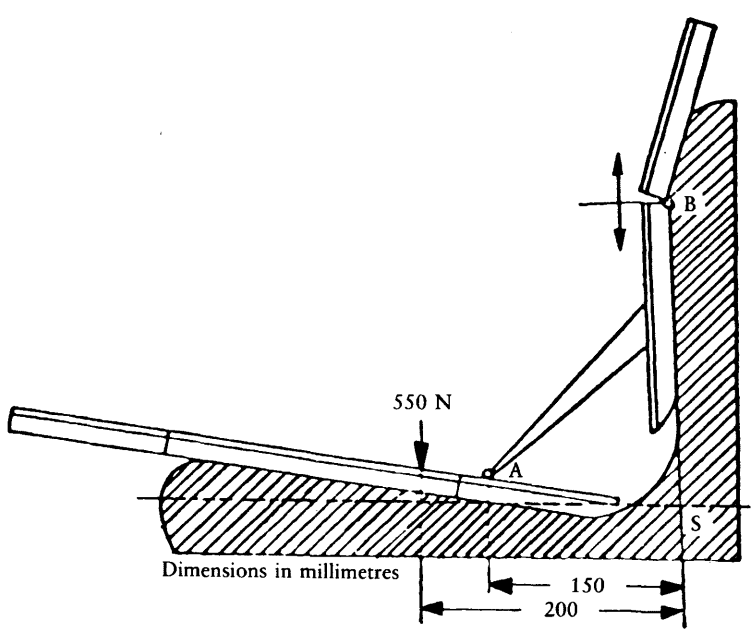


Figure 3b

Method of determining seat reference point

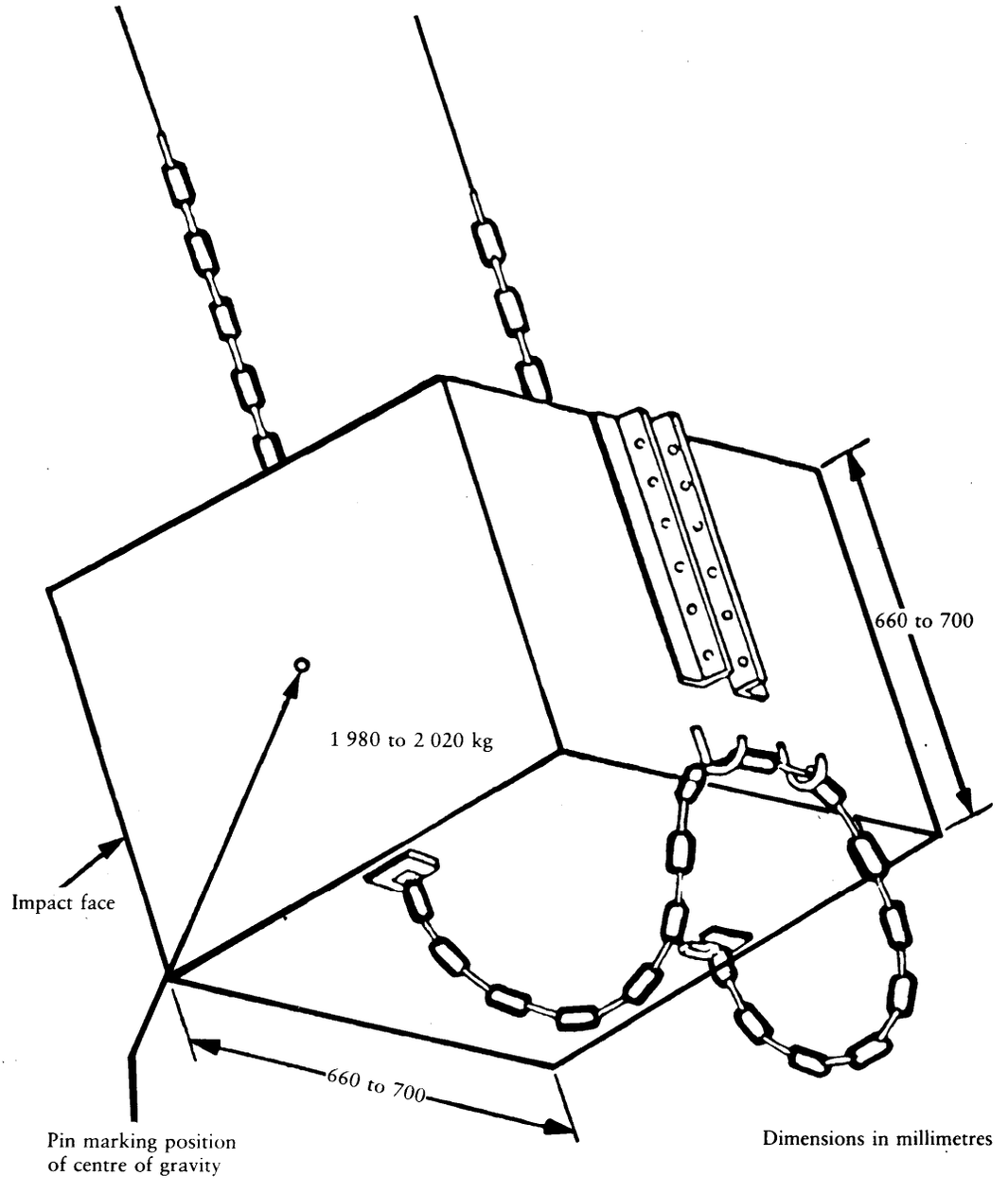


Figure 4

Pendulum block and its suspending chains or wire ropes

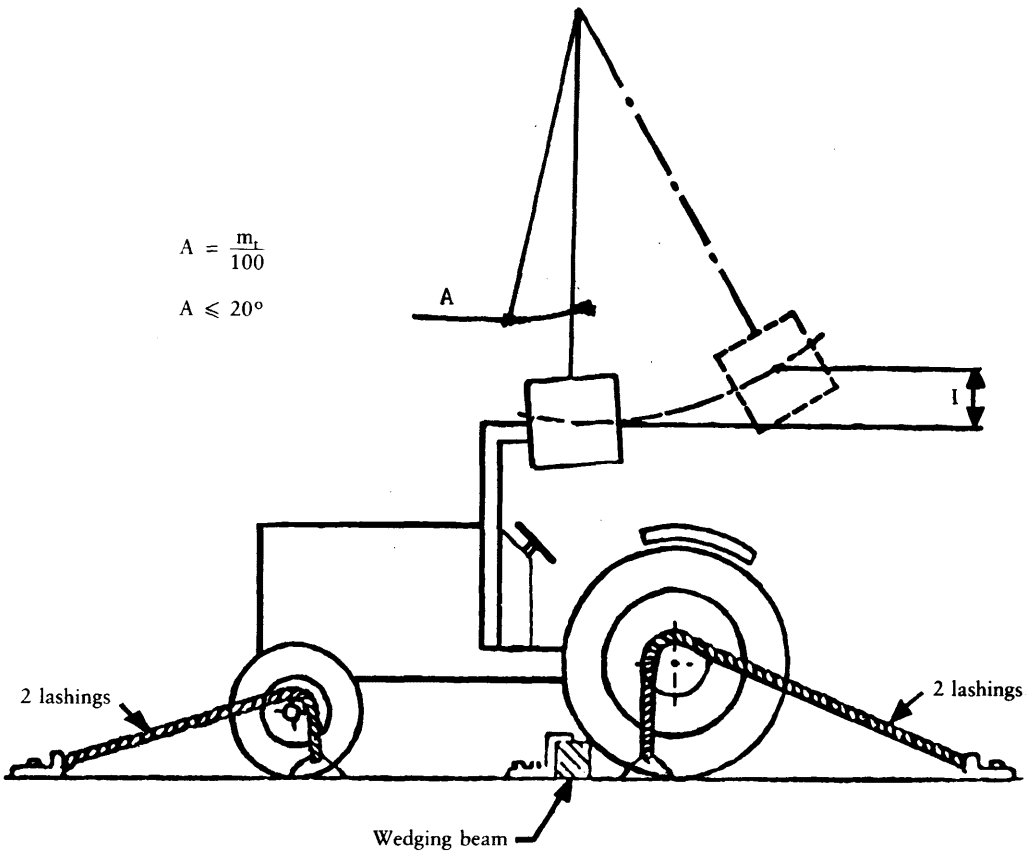


Figure 5

Example of tractor lashing — Rear impact

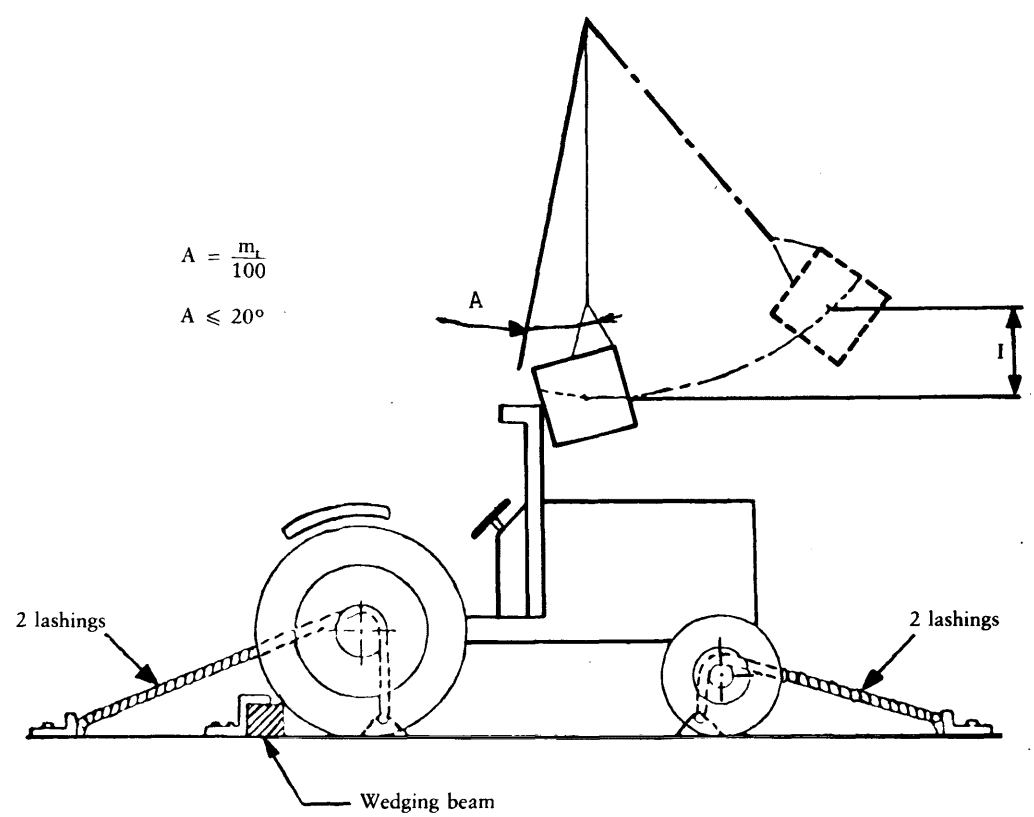


Figure 6

Example of tractor lashing — Front impact

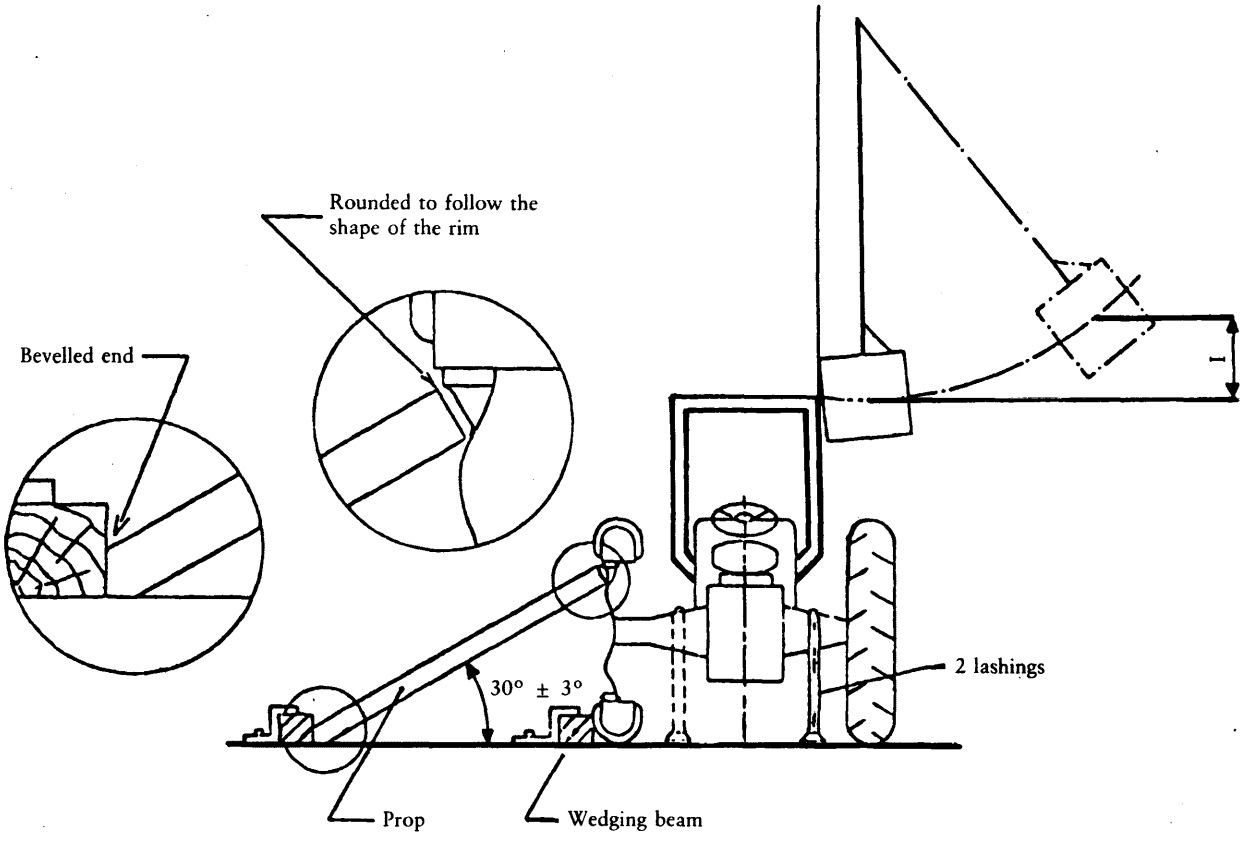


Figure 7

Example of tractor anchorage — Side impact

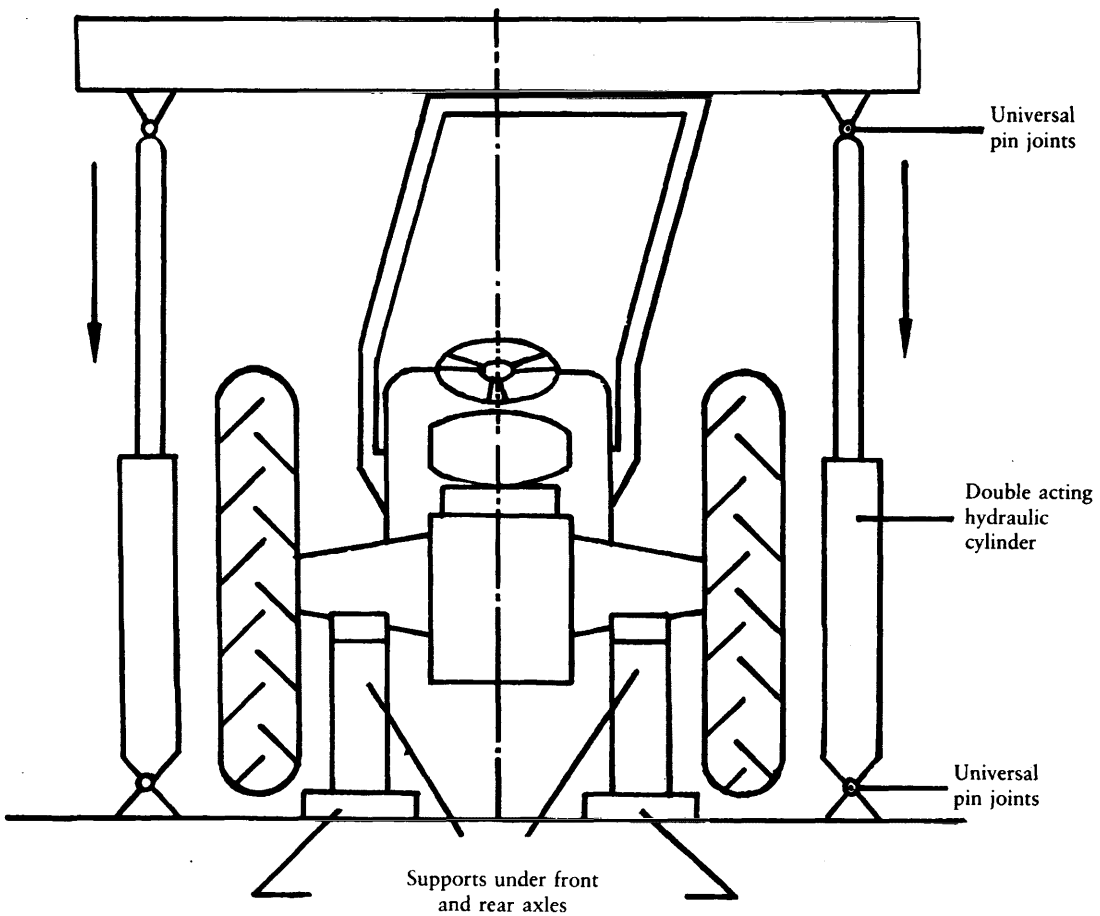
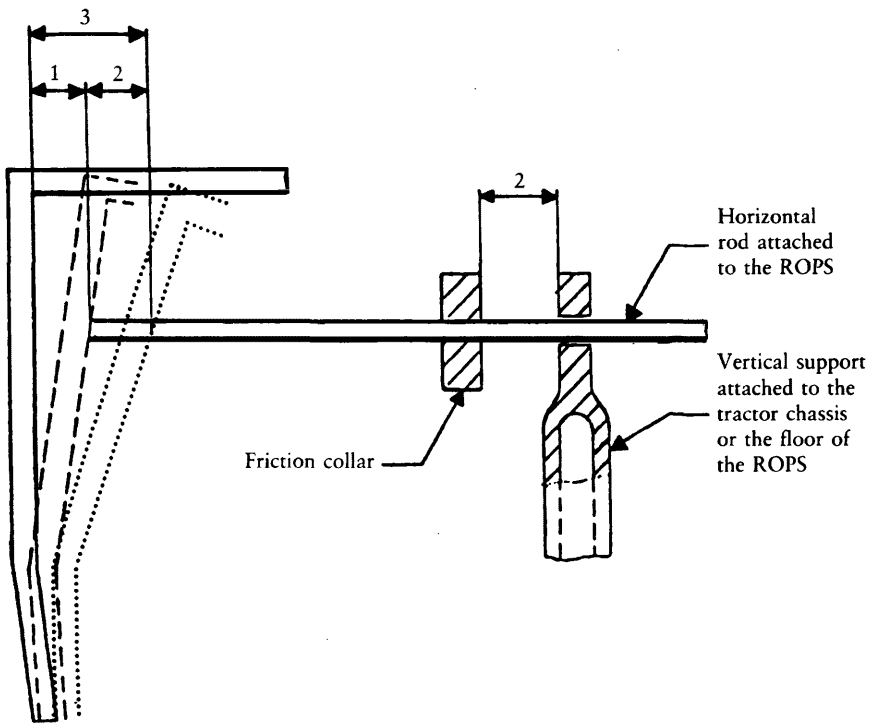


Figure 8

Crushing rig

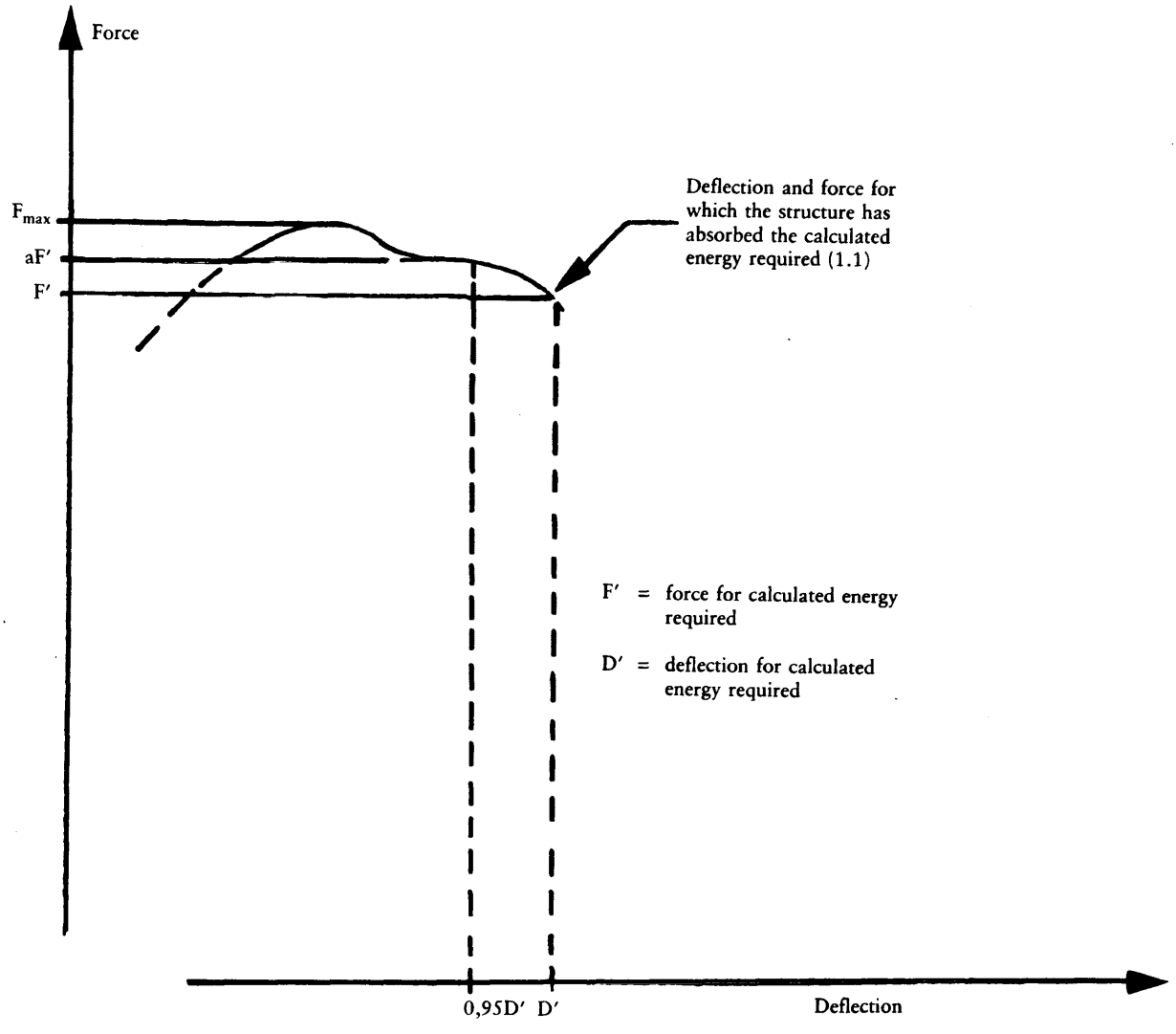
Note: The configuration of the roll-over protection structure shown is solely for the purpose of illustration and for dimensional reference. It does not purport to denote design requirements.



1 — Permanent deflection
2 — Elastic deflection
3 — Total deflection (permanent + elastic deflection)

Figure 9

Example of apparatus for measuring elastic deflection



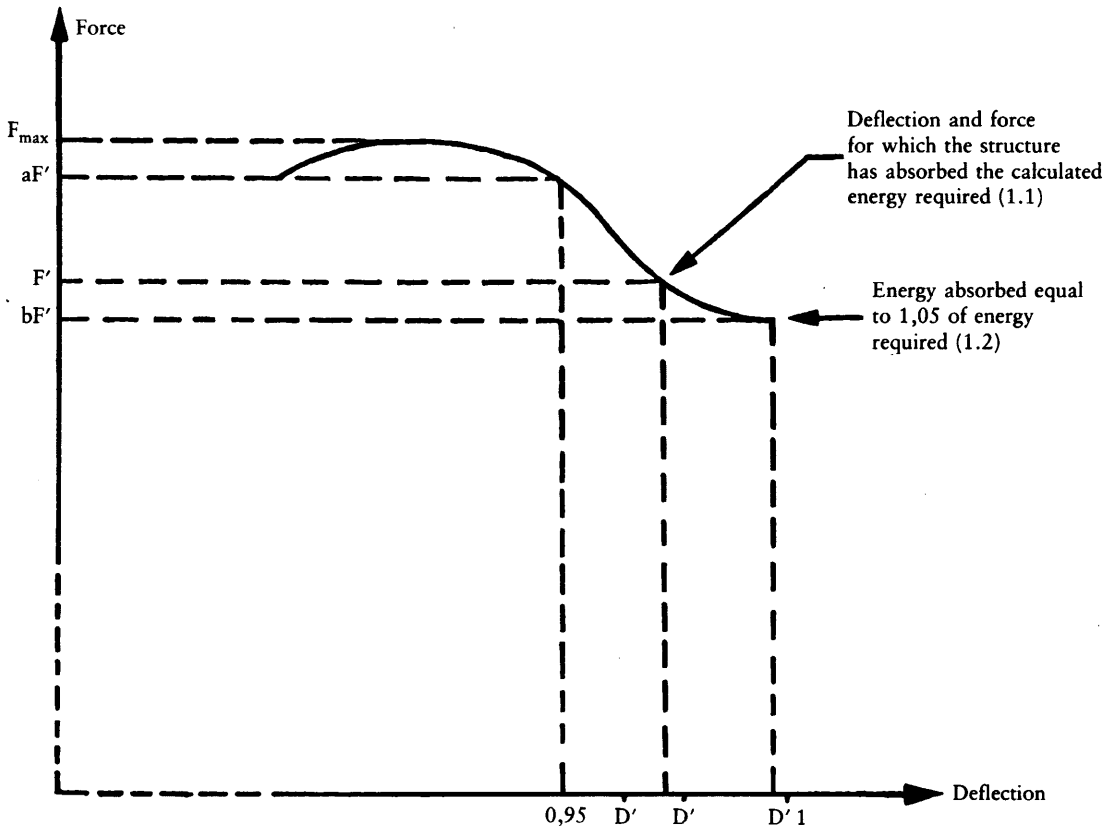
1. Reference aF' corresponding to 0,95 D'.

1.1. Overload test not necessary since aF' < 1,03 F'.

Figure 10a

Force/Deflection curve

Overload test not necessary



1. Reference aF' corresponding to 0,95 D'.

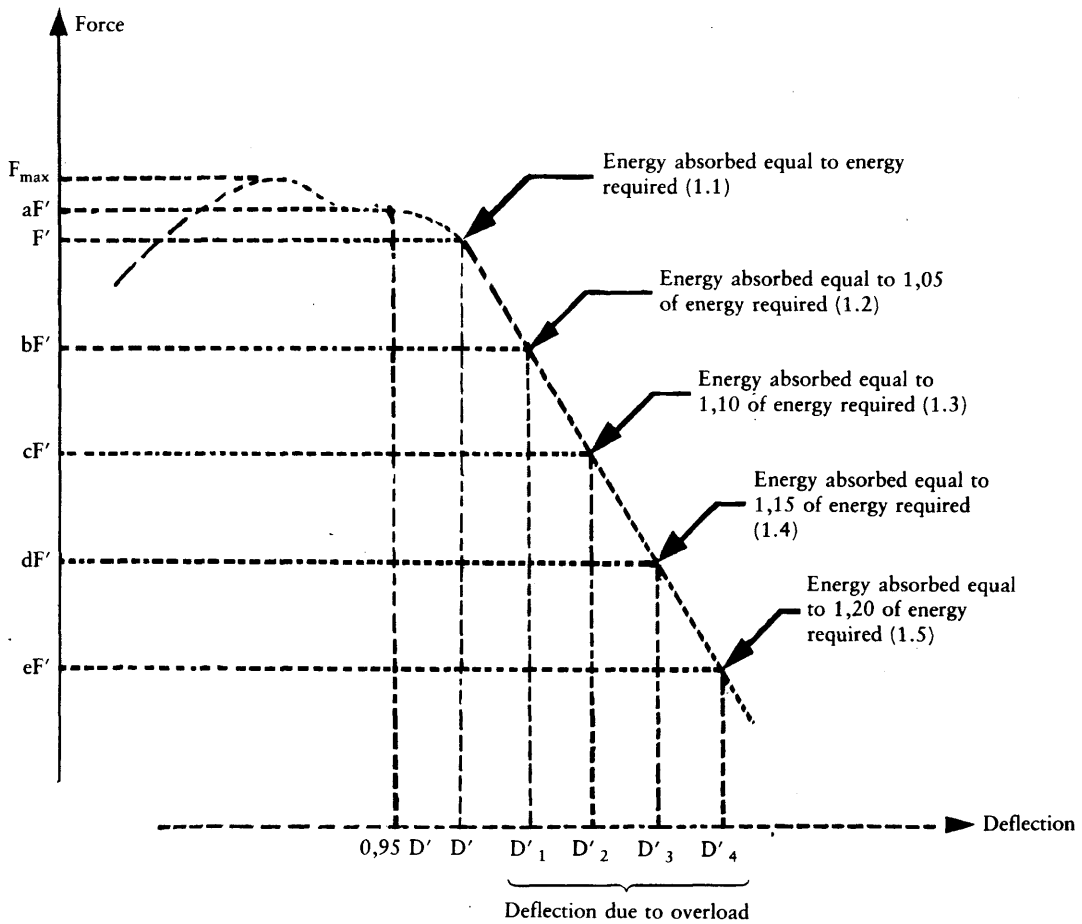
1.1. Overload test necessary since aF' > 1,03 F'.

1.2. Overload test satisfactory since bF' > 0,97 F' and bF' > 0,8 F_{max}.

Figure 10b

Force/Deflection curve

Overload test necessary



1. Reference aF' corresponding to 0,95 D'.

1.1. Overload test necessary since aF' > 1,03 F'.

1.2. Since bF' < 0,97 F', overload test to be continued.

1.3. Since cF' < 0,97 bF', overload test to be continued.

1.4. Since dF' < 0,97 cF', overload test to be continued.

1.5. Overload test satisfactory since eF' > 0,8 F_{max}.

Note: If at any moment F falls below 0,8 F_{max} the structure will be refused.

Figure 10 c

Force/Deflection curve

Overload test to be continued

ANNEX VI

MODEL

REPORT RELATING TO THE EEC COMPONENT TYPE-APPROVAL TEST OF A PROTECTION STRUCTURE (FRONT-MOUNTED BAR) WITH REGARD TO ITS STRENGTH AS WELL AS TO THE STRENGTH OF ITS ATTACHMENT TO THE TRACTOR

Protection structure	
Make	
Type	
Tractor make	
Tractor type	
Test method	I/II (1)

Identification of test station

EEC component type-approval No: .....

1. Trade mark or name of protection structure: .....

.....

2. Name and address of manufacturer of tractor or protection structure: .....

.....

3. If applicable, name and address of tractor or protection structure manufacturer's authorized representative: .....

.....

4. **Specifications of tractor on which the tests are carried out**

4.1. Trade mark or name: .....

4.2. Type: .....

4.3. Serial number: .....

4.4. Wheelbase/moment of inertia (1) ..... mm/kgm² (1)

4.5. Tyre sizes: front: .....

rear: .....

5. **Extension of EEC component type-approval to other tractor types**

5.1. Trade mark or name: .....

5.2. Type: .....

5.3. Mass of unballasted tractor, with roll-over protection structure fitted, without driver: ..... kg

(1) Delete where inapplicable.

5.4. Tyre sizes: front .....

rear .....

6. **Specifications of protection structure**

6.1. General arrangement drawing of both the protection structure and its attachment to the tractor

6.2. Photographs showing mounting details .....

6.3. Brief description of roll-over protection structure including type of construction, details of mounting on the tractor, details of cladding, means of access and escape, details of interior padding and features to prevent continuous rolling .....

6.4. Dimensions

6.4.1. Height of roof members above the loaded tractor seat/above the seat reference point (1) ... mm

6.4.2. Height of roof members above the tractor platform ..... mm

6.4.3. Minimum distance from the steering wheel rim to the protection structure ..... mm

6.4.4. Overall height of the tractor with the protection structure fitted ..... mm

6.4.5. Overall width of the protection structure: ..... mm

6.5. Details and quality of materials used, standards used: .....

Main frame: ..... (material and dimensions)

Mountings: ..... (material and dimensions)

Roof: ..... (material and dimensions)

Interior padding: ..... (material and dimensions)

Assembly and mounting bolts: ..... (grade and dimensions)

7. **Test results**

7.1. Impact/load (1) and crushing tests

Impact/load tests were made to the left/right-hand (2) rear and to the right/left-hand (2) front and right/left-hand side (2). The reference mass used for calculating impact energies and crushing forces was ..... kg

The test requirements concerning fractures or cracks, maximum instantaneous deflection and the zone of clearence were/were not (2) satisfactorily fulfilled.

7.2. Deflection measured after the tests

Permanent deflection:

rear: left-hand: ..... mm

right-hand: ..... mm

front: left-hand: ..... mm

right-hand: ..... mm

(1) Delete where inapplicable, according to the test method used.
(2) Delete where inapplicable.

side sideways:

front: ..... mm

rear: ..... mm

top downwards:

front: ..... mm

rear: ..... mm

Difference between maximum momentary and residual deflection during sideways impact test:

..... mm

8. Report number: .....

9. Report date: .....

10. Signature: .....

ANNEX VII

MARKS

The EEC component type-approval mark consists of:

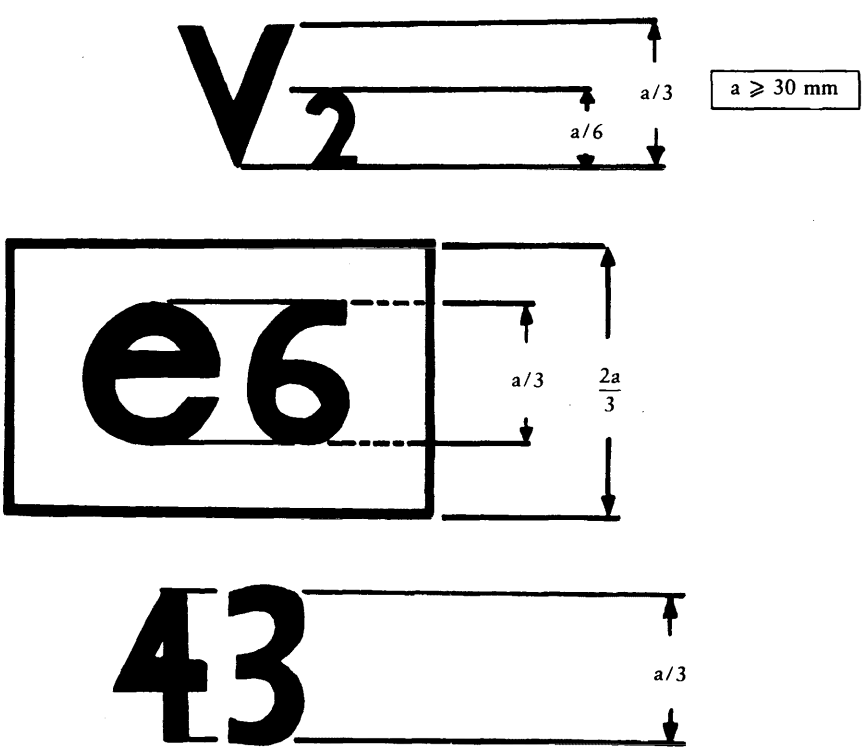
— a rectangle surrounding the lower-case letter 'e' followed by the distinguishing letter(s) or number of the Member State which has granted the component type-approval:

1 for Germany,
2 for France,
3 for Italy,
4 for the Netherlands,
6 for Belgium,
9 for Spain,
11 for the United Kingdom,
13 for Luxembourg,
18 for Denmark,
IRL for Ireland,
EL for Greece,
P for Portugal,

— the EEC component type-approval number which corresponds to the number of the EEC component type-approval certificate issued with regard to the strength of the type of protection structure and its attachment to the tractor placed under and in the vicinity of the retangle,

— the letters V or SV, depending on whether a dynamic (V) or static (SV) test was conducted, followed by the number 2, indicating that this is a protection structure within the meaning of the Directive.

EXAMPLE OF AN EEC COMPONENT TYPE-APPROVAL MARK



Legend: The protection structure bearing the EEC component type-approval mark shown above is a structure of the bar type subjected to a dynamic test with two front-mounted uprights intended for a narrow-track tractor (V2), for which EEC component type-approval was granted in Belgium (e6) under the number 43.

ANNEX VIII

MODEL EEC COMPONENT TYPE-APPROVAL CERTIFICATE

Name of competent authority

NOTIFICATION CONCERNING THE GRANTING, REFUSAL, WITHDRAWAL OR EXTENSION OF EEC COMPONENT TYPE-APPROVAL WITH REGARD TO THE STRENGTH OF A PROTECTION STRUCTURE (FRONT-MOUNTED BAR) AND TO THE STRENGTH OF ITS ATTACHMENT TO THE TRACTOR

EEC component type-approval No: .....

..... extension (1)

1. Trade name or mark and type of protection structure: .....

.....

2. Name and address of manufacturer of protection structure: .....

.....

3. If applicable, name and address of authorized representative of manufacturer of protection structure:

.....

.....

4. Trade mark or name and type of tractor for which protection structure is intended: .....

.....

5. Extension of EEC component type-approval for the following tractor type(s): .....

.....

5.1. The mass of the unballasted tractor, as defined in 1.4 of Annex III, exceeds/does not exceed (2) the reference mass used for the test by more than 5 %

5.2. The method of attachment and points of attachment are/not (2) identical

5.3. All the components likely to serve as supports for the protection structure are/are not (2) identical

6. Date of submission for EEC component type-approval: .....

7. Test station: .....

8. Date and number of the report of the test station: .....

9. Date of granting/refusal/withdrawal of EEC component type-approval (2): .....

10. Date of granting/refusal/withdrawal of the extension of EEC component type-approval (2): .....

11. Place: .....

12. Date: .....

13. The following documents, bearing the component type-approval number shown above, are annexed to this certificate (e.g. report of the test station): .....

14. Remarks, if any: .....

15. Signature: .....

(1) If applicable, state whether this is the first, second, etc. extension of the original EEC component type-approval.
(2) Delete where inapplicable.

ANNEX IX

CONDITIONS FOR EEC TYPE-APPROVAL

1. The application for EEC type-approval of a tractor with regard to the strength of a protection structure and the strength of its attachment to the tractor is submitted by the tractor manufacturer or by his authorized representative.

2. A tractor representative of the tractor type to be approved, on which a protection structure and its attachment, duly approved, are mounted, must be submitted to the technical services responsible for conducting the type-approval tests.

3. The technical service responsible for conducting the type-approval tests checks whether the approved type of protection structure is intended to be mounted on the type of tractor for which the type-approval is requested. In particular, it must ascertain that the attachment of the protection structure corresponds to that which was used when the EEC component type-approval was granted.

4. The holder of the EEC type-approval may ask for its extension for other types of protection structures.

5. The competent authorities grant such extension on the following conditions:

5.1. The new type of protection structure and its tractor attachment must have received EEC component type-approval.

5.2. It is designed to be mounted on the type of tractor for which the extension of the EEC type-approval is requested.

5.3. The attachment of the protection structure to the tractor must correspond to that which was tested when EEC component type-approval was granted.

6. A certificate, of which a model is shown in Annex X, is annexed to the EEC type-approval certificate for each type-approval or type-approval extension which has been granted or refused.

7. If the application for EEC type-approval for a type of tractor is introduced at the same time as the request for EEC component type-approval for a type of roll-over protection structure intended to be mounted on the type of tractor for which EEC type-approval is requested, the checks laid down in 2 and 3 are not applicable.

ANNEX X

MODEL

Name of competent authority

ANNEX TO THE EEC TYPE-APPROVAL CERTIFICATE FOR A TRACTOR TYPE WITH REGARD TO THE STRENGTH OF PROTECTION STRUCTURES (FRONT-MOUNTED BAR) AND THE STRENGTH OF THEIR ATTACHMENT TO THE TRACTOR

(Articles 4 (2) and 10 of Council Directive 74/150/EEC of 4 March 1974 on the approximation of the laws of the Member States relating to the type-approval of wheeled agricultural or forestry tractors)

EEC type-approval No: .....

..... extension (1)

1. Trade name or mark of tractor: .....
2. Tractor type: .....
3. Name and address of tractor manufacturer: .....
   .....
4. If applicable, name and address of manufacturer's authorized representative: .....
   .....
5. Trade name or mark of protection structure: .....
   .....
6. Extension of EEC-approval for the following type(s) of protection structure: .....
   .....
7. Date tractor sumbitted for EEC type-approval: .....
8. Technical service responsible for EEC type-approval conformity control: .....
9. Date of report issued by that service: .....
10. Number of report issued by that service: .....
11. EEC type-approval with regard to the strength of the protection structures and the strength of their attachment to the tractor has been granted/refused (2)
12. The extension of EEC type-approval with regard to the strength of the protection structures and the strength of their attachment to the tractor has been granted/refused (2)
13. Place: .....
14. Date: .....
15. Signature: .....

(1) If applicable, state whether this is the first, second, etc. extension of the original EEC type-approval.
(2) Delete where inapplicable.

COUNCIL DIRECTIVE

of 25 June 1987

supplementing Annex I to Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers

(87/403/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100 thereof,

Having regard to the proposal from the Commission (1),

Having regard to the opinion of the European Parliament (2),

Whereas Directive 70/156/EEC (3), as last amended by Directive 87/358/EEC (4), laid down, in the Notes to Annex I, the classification of motor vehicles and their trailers;

Whereas it is now necessary to define off-road vehicles at Community level with a view in particular to the application of Directive 84/424/EEC (5), Article 1 of which lays down exceptions for these vehicles and more generally for the application of any other Directive in the motor vehicle sector that might need such definition;

Whereas off-road vehicles are defined differently in each Member State and whereas, in order not to hinder intra-Community trade, a common definition, within the international categories set out in the notes to Annex I to Directive 70/156/EEC, is necessary,

HAS ADOPTED THIS DIRECTIVE:

Article 1

Annex I to Directive 70/156/EEC is hereby supplemented as set out in the Annex hereto.

Article 2

Member States shall take the measures necessary to comply with this Directive by 1 October 1988.

They shall forthwith inform the Commission thereof.

Article 3

This Directive is addressed to the Member States.

Done at Luxembourg, 25 June 1987.

For the Council

The President

H. DE CROO

(1) OJ No C 108, 23. 4. 1987, p. 9.
(2) OJ No C 190, 20. 7. 1987.
(3) OJ No L 42, 23. 2. 1970, p. 1.
(4) OJ No L 192, 11. 7. 1987, p. 51.
(5) OJ No L 238, 6. 9. 1984, p. 31.

ANNEX

In the Notes to Annex I the following shall be added at the end of (b):

'4. Vehicles in categories M and N, above, considered to be off-road vehicles under the load and checking conditions set out in point 4.4 and pursuant to the definitions and sketches of point 4.5.

4.1. Vehicles in category N_1 with a maximum mass not exceeding two tonnes and motor vehicles in category M_1 are considered to be off-road vehicles if they have:

at least one front axle and at least one rear axle designed to be driven simultaneously including vehicles where the drive to one axle can be disengaged,

at least one differential locking mechanism or at least one mechanism having a similar effect and

if they can climb a 30 % gradient calculated for a solo vehicle.

In addition, they must satisfy at least five of the following six requirements:

— the front incidence angle must be at least 25°,

— the rear incidence angle must be at least 20°,

— the ramp angle must be at least 20°,

— the ground clearance under the front axle must be at least 180 mm,

— the ground clearance under the rear axle must be at least 180 mm,

— the ground clearance between the axles must be at least 200 mm.

4.2. Vehicles in category N_1 with a maximum mass exceeding two tonnes or in category N_2, M_2 or M_3 with a maximum mass not exceeding 12 tonnes are considered to be off-road vehicles either if all their wheels are designed to be driven simultaneously, including vehicles where the drive to one axle can be disengaged, or if the following three requirements are satisfied:

— at least one front axle and at least one rear axle are designed to be driven simultaneously, including vehicles where the drive to one axle can be disengaged,

— there is at least one differential locking mechanism or at least one mechanism having a similar effect,

— they can climb a 25 % gradient calculated for a solo vehicle.

4.3. Vehicles in category M_3 with a maximum mass exceeding 12 tonnes or in category N_3 are considered to be off-road either if the wheels are designed to be driven simultaneously, including vehicles where the drive to one axle can be disengaged, or if the following requirements are satisfied:

— at least half the wheels are driven,

— there is at least one differential locking mechanism or at least one mechanism having a similar effect,

— they can climb a 25 % gradient calculated for a solo vehicle,

— at least four of the following six requirements are satisfied:

  — the front incidence angle must be at least 25°,

  — the rear incidence angle must be at least 25°,

  — the ramp angle must be at least 25°,

  — the ground clearance under the front axle must be at least 250 mm,

  — the ground clearance between the axles must be at least 300 mm,

  — the ground clearance under the rear axle must be at least 250 mm.

4.4. **Load and checking conditions**

4.4.1. Vehicles in category N_1 with a maximum mass not exceeding two tonnes and vehicles in category M_1 must be in running order, namely with coolant fluid, lubricants, fuel, tools, spare-wheel and a driver considered to weigh a standard 75 kilograms.

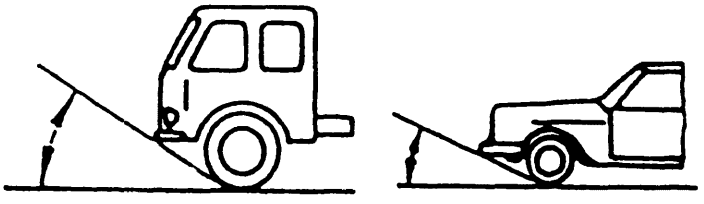
4.4.2. Motor vehicles other than those referred to in 4.4.1 must be loaded to the technically permissible maximum mass stated by the manufacturer.

4.4.3. The ability to climb the required gradients (25 % and 30 %) is verified by simple calculation. In exceptional cases, however, the technical services may ask for a vehicle of the type concerned to be submitted to it for an actual test.

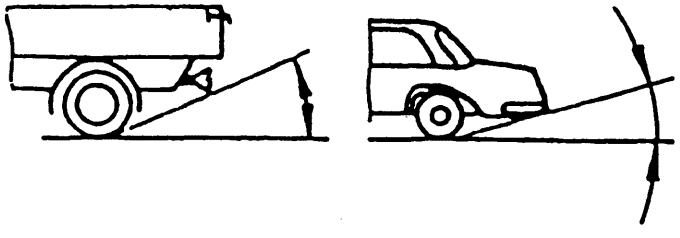
4.4.4. When measuring front and rear incidence angles and ramp angles, no account is taken of underrun protective devices.

4.5. **Definitions and sketches of front and rear incidence angles, ramp angle and ground clearance**

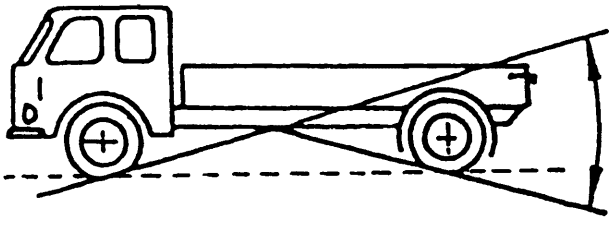
4.5.1. 'Front incidence angle' means the maximum angle between the ground plane and planes tangential to the tyres of the front wheels, under a static load, such that no point of the vehicle ahead of the front axle is situated below these planes and no rigid part of the vehicle, with the exception of any steps, is situated below these planes.



4.5.2. 'Rear incidence angle' means the maximum angle between the ground plane and planes tangential to the tyres of the rear wheels, under a static load, such that no point of the vehicle behind the rearmost axle is situated below these planes and no rigid part of the vehicle is situated below these planes.

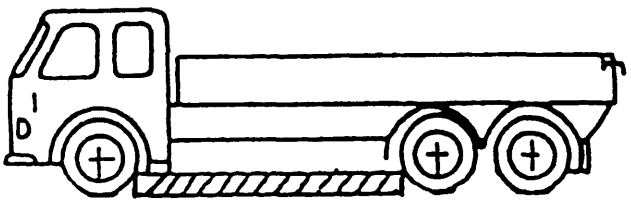


4.5.3. 'Ramp angle' means the minimum acute angle between two planes, perpendicular to the median longitudinal plane of the vehicle, tangential to the tyres of the front wheels and to the tyres of the rear wheels respectively, under a static load, the intersection of which touches the rigid underside of the vehicle apart from the wheels. This angle defines the steepest ramp over which the vehicle can pass.

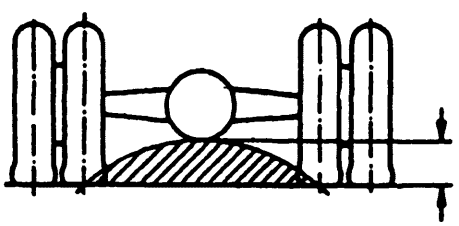


4.5.4. 'Ground clearance between the axles' means the shortest distance between the ground plane and the lowest fixed point of the vehicle.

Multi-axle bogies are considered to be a single axle.



'Ground clearance beneath one axle' means the distance beneath the highest point of the arc of a circle passing through the centre of the tyre footprint of the wheels on one axle (the inner wheels in the case of twin tyres) and touching the lowest fixed point of the vehicle between the wheels. No rigid part of the vehicle may project into the shaded area of the diagram. Where appropriate, the ground clearance of several axles is indicated in accordance with their arrangement, for example 280/250/250.



COUNCIL DIRECTIVE

of 25 June 1987

on the harmonization of the laws of the Member States relating to simple pressure vessels

(87/404/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100 thereof,

Having regard to the proposal from the Commission (1),

Having regard to the opinion of the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas Member States have the responsibility of ensuring the safety on their territory of persons, domestic animals and property with regard to the hazards resulting from the leakage or bursting of simple pressure vessels;

Whereas, in each Member State, mandatory provisions define in particular the safety level required of simple pressure vessels by specifying design and operating characteristics, conditions of installation and use and inspection procedures before and after placing on the market; whereas these mandatory provisions do not necessarily lead to different safety levels from one Member State to another but do, by their disparity, hinder trade within the Community;

Whereas the national provisions ensuring such safety must be harmonized in order to guarantee the free movement of simple pressure vessels without lowering existing and justified levels of protection in the Member States;

Whereas Community legislation as it stands at present provides that, notwithstanding one of the fundamental rules of the Community, namely the free movement of goods, barriers to intra-Community movement resulting from disparities in national laws on the marketing of products have to be accepted in so far as those provisions may be recognized as necessary to satisfy essential requirements; whereas the harmonization of laws in the present case must therefore be confined to those provisions needed to satisfy the essential safety requirements for simple pressure vessels; whereas, because they are essential, these requirements must replace the corresponding national provisions;

Whereas this Directive therefore contains only mandatory and essential requirements; whereas, to facilitate proof of conformity with the essential requirements, it is necessary to have harmonized standards at European level in particular as to the design, operation and installation of simple pressure vessels so that products complying with them may be assumed to conform to the safety requirements; whereas these standards harmonized at European level are drawn up by private bodies and must remain non-mandatory texts; whereas for that purpose the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC) are recognized as the competent bodies for the adoption of harmonized standards in accordance with the general guidelines for cooperation between the Commission and those two bodies signed on 13 November 1984; whereas, for the purposes of this Directive, a harmonized standard is a technical specification (European standard or harmonization document) adopted by one or both of those bodies upon a remit from the Commission in accordance with the provisions of Council Directive 83/189/EEC of 28 March 1983 laying down a procedure for the provision of information in the field of technical standards and regulations (4) and the abovementioned general guidelines;

Whereas a check on compliance with the relevant technical requirements is necessary to provide effective protection for users and third parties; whereas the existing inspection procedures differ from one Member State to another; whereas, in order to avoid multiple inspections, which are in effect barriers to the free movement of vessels, arrangements should be made for the mutual recognition of inspection procedures by the Member States; whereas, in order to facilitate the mutual recognition of inspection procedures, harmonized Community procedures should be set up and the criteria for appointing the bodies responsible for carrying out tests, surveillance and verification should be harmonized;

(1) OJ No C 89, 15. 4. 1986, p. 2.
(2) OJ No C 190, 20. 7. 1987.
(3) OJ No C 328, 22. 12. 1986, p. 20.

(4) OJ No L 109, 26. 4. 1983, p. 8.

Whereas the presence on a simple pressure vessel of the EC mark indicates that it satisfies the provisions of this Directive and therefore makes it unnecessary, on import and placing into service of the vessel, to repeat the inspections already carried out; whereas nevertheless simple pressure vessels might represent a safety hazard; whereas provision should therefore be made for a procedure to reduce this hazard,

HAS ADOPTED THIS DIRECTIVE:

CHAPTER I

Scope, placing on the market and free movement

Article 1

1. This Directive applies to simple pressure vessels manufactured in series.

2. For the purposes of this Directive, 'simple pressure vessel' means any welded vessel subjected to an internal gauge pressure greater than 0,5 bar which is intended to contain air or nitrogen and which is not intended to be fired.

Moreover,

- the parts and assemblies contributing to the strength of the vessel under pressure shall be made either of non-alloy quality steel or of non-alloy aluminium or non-age hardening aluminium alloys,
- the vessel shall be made of:
  - either a cylindrical part of circular cross-section closed by outwardly dished and/or flat ends which revolve around the same axis as the cylindrical part,
  - or two dished ends revolving around the same axis,
- the maximum working pressure of the vessel shall not exceed 30 bar and the product of that pressure and the capacity of the vessel (PS.V) shall not exceed 10 000 bar/litre,
- the minimum working temperature must be no lower than − 50 °C and the maximum working temperature shall not be higher than 300 °C for steel and 100 °C for aluminium or aluminium alloy vessels.

3. The following vessels shall be excluded from the scope of the Directive:

- vessels specifically designed for nuclear use, failure of which may cause an emission of radioactivity,
- vessels specifically intended for installation in or the propulsion of ships and aircraft,
- fire extinguishers.

Article 2

1. Member States shall take all necessary steps to ensure that the vessels referred to in Article 1, hereinafter referred to as 'vessels', may be placed on the market and taken into service only if they do not compromise the safety of persons, domestic animals or property when properly installed and maintained and when used for the purposes for which they are intended.

2. The provisions of this Directive do not affect the right of Member States to specify — with due observance of the Treaty — the requirements they deem necessary to ensure that workers are protected when using vessels, provided it does not mean the vessels are modified in a way unspecified in this Directive.

Article 3

1. Vessels in respect of which the product of PS and V exceeds 50 bar/litre must satisfy the essential safety requirements set out in Annex I.

2. Vessels in respect of which the product of PS and V is 50 bar/litre or less must be manufactured in accordance with sound engineering practice in one of the Member States and bear markings as laid down in section 1 of Annex II, with the exception of the EC mark referred to in Article 16.

Article 4

Member States shall not impede the placing on the market and the taking into service in their territory of vessels which satisfy the requirements of this Directive.

Article 5

1. Member States shall presume compliance with the essential safety requirements referred to in Article 3 in respect of vessels bearing the EC mark denoting conformity with the relevant national standards incorporating the harmonized standards whose reference numbers have been published in the *Official Journal of the European Communities*. Member States shall publish the reference numbers of such national standards.

2. Member States shall presume that vessels in respect of which the manufacturer has not applied, or has applied only in part, the standards referred to in paragraph 1, or for which no such standards exist, comply with the

essential requirements referred to in Article 3 where, after receipt of an EEC type-examination certificate, their conformity with the approved model has been certified by the affixation of the EC mark.

Article 6

1. Where a Member State or the Commission considers that the harmonized standards referred to in Article 5 (1) do not entirely meet the essential requirements referred to in Article 3, the Commission or the Member State concerned shall bring the matter before the Standing Committee set up under Directive 83/189/EEC, hereinafter referred to as 'the committee', giving the reasons therefor. The committee shall deliver an opinion without delay. In the light of the committee's opinion, the Commission shall inform the Member States whether or not it is necessary to withdraw those standards from the publications referred to in Article 5 (1).

Article 7

1. Where a Member State finds that vessels bearing the EC mark and used in accordance with their intended purpose might compromise the safety of persons, domestic animals or property, it shall take all appropriate measures to withdraw those products from the market or to prohibit or restrict their being placed on the market.

The Member State concerned shall immediately inform the Commission of any such measure, indicating the reasons for its decision, and in particular whether non-conformity is due to:

(a) failure to meet the essential requirements referred to in Article 3, where the vessel does not meet the standards referred to in Article 5 (1);

(b) incorrect application of the standards referred to in Article 5 (1);

(c) shortcomings in the standards referred to in Article 5 (1) themselves.

2. The Commission shall enter into consultation with the parties concerned as soon as possible. Where, after such consultation, the Commission finds that any measure as referred to in paragraph 1 is justified, it shall immediately so inform the Member State that took the action and the other Member States. Where the decision referred to in paragraph 1 is attributed to shortcomings in the standards, the Commission, after consulting the parties concerned, shall bring the matter before the Committee within two months if the Member State which has taken the measures intends to maintain them and shall initiate the procedures referred to in Article 6.

3. Where a vessel which does not comply bears the EC mark, the competent Member State shall take appropriate action against whomsoever has affixed the mark and shall inform the Commission and the other Member States thereof.

4. The Commission shall ensure that the Member States are kept informed of the progress and outcome of this procedure.

CHAPTER II

Certification procedures

Article 8

1. Prior to production of pressure vessels of which the product of PS and V exceeds 50 bar/litre, manufactured:

(a) in accordance with the standards referred to in Article 5 (1), the manufacturer, or his authorized representative established within the Community, shall at his own choice:

— either inform an approved inspection body as referred to in Article 9, which after examining the design and manufacturing schedule referred to in Annex II 3, shall draw up a certificate of adequacy attesting that the schedule is satisfactory, or

— submit a prototype vessel for the EC type-examination referred to in Article 10;

(b) not, or only partly, in accordance with the standards referred to in Article 5 (1), the manufacturer, or his authorized representative established within the Community, must submit a prototype vessel for the EC type-examination referred to in Article 10.

2. Vessels manufactured in accordance with the standards referred to in Article 5 (1) or with the approved prototype shall, prior to their being placed on the market, be subject:

(a) to the EC verification referred to in Article 11 where the product of PS and V exceeds 3 000 bar/litre;

(b) at the choice of the manufacturer, where the product of PS and V does not exceed 3 000 bar/litre but exceeds 50 bar/litre:

— either to the EC declaration of conformity referred to in Article 12, or

— to the EC verification referred to in Article 11.

3. The records and correspondence relating to the certification procedures referred to in paragraphs 1 and 2 shall be drafted in an official language of the Member State in which the approved body is established or in a language accepted by that body.

Article 9

1. Each Member State shall notify the Commission and the other Member States of the approved bodies

responsible for carrying out the certification procedures referred to in Article 8 (1) and (2). The Commission shall publish a list of these bodies and the distinguishing number it has allotted them, for information purposes, in the *Official Journal of the European Communities* and shall ensure that the list is kept up to date.

2. Annex III sets out the minimum criteria which Member States must meet as regards approval of these bodies.

3. A Member State which has approved a body must withdraw approval if it finds that the body no longer meets the criteria listed in Annex III. It shall immediately inform the Commission and the other Member States accordingly.

EC type-examination

Article 10

1. EC type-examination is the procedure by which an approved inspection body ascertains and certifies that a prototype vessel satisfies the provisions of this Directive which apply to it.

2. The application for EC type-examination shall be lodged by the manufacturer or by his authorized representative with a single approved inspection body in respect of a prototype vessel or of a prototype representing a family of vessels. That authorized representative must be established in the Community.

The application shall include:

— the name and address of the manufacturer or of his authorized representative and the place of manufacture of the vessels,

— the design and manufacturing schedule referred to in Annex II 3.

It shall be accompanied by a vessel which is representative of the production envisaged.

3. The approved body shall carry out the EC type-examination in the manner described below.

It shall examine not only the design and manufacturing schedule in order to check its conformity, but also the vessel submitted.

When examining the vessel, the body shall:

(a) verify that the vessel has been manufactured in conformity with the design and manufacturing schedule and may safely be used under its intended working conditions;

(b) perform appropriate examinations and tests to check that the vessel complies with the essential requirements applicable to it.

4. If the prototype complies with the provisions applicable to it the body shall draw up an EC type-examination certificate which shall be forwarded to the applicant. That certificate shall state the conclusions of the examination, indicate any conditions to which its issue may be subject and be accompanied by the descriptions and drawings necessary for identification of the approved prototype.

The Commission, the other approved bodies and the other Member States may obtain a copy of the certificate and, on a reasoned request, a copy of the design and manufacturing schedule and the reports on the examinations and tests carried out.

5. A body which refuses to issue an EC type-examination certificate shall so inform the other approved bodies. A body which withdraws an EC type-examination certificate shall so inform the Member State which approved it. The latter shall inform the other Member States and the Commission thereof, giving the reasons for the decision.

EC verification

Article 11

1. The purpose of EC verification is to check and certify that series-manufactured vessels comply with the standards referred to in Article 5 (1) or with the approved prototype. It shall be performed by an approved inspection body in accordance with the provisions set out below. That body shall issue an EC verification certificate and affix the mark of conformity provided for in Article 16.

2. Verification shall be performed on the batches of vessels submitted by their manufacturer or by his authorized representative established within the Community. Batches shall be accompanied by the EC type-examination certificate referred to in Article 10, or, if the vessels are not manufactured in accordance with an approved prototype, by the design and manufacturing schedule referred to in Annex II section 3. In the latter case the approved body shall, prior to EC verification, examine the schedule in order to certify its conformity.

3. When a batch is examined, the inspection body shall ensure that the vessels have been manufactured and checked in accordance with the design and manufacturing schedule and shall perform a hydrostatic test or a pneumatic test of equivalent effect on each vessel in the batch at a pressure Ph equal to 1,5 times the vessel's design pressure in order to check its soundness. The premature test shall be subject to acceptance of the test safety procedures by the Member States in which the test is performed. Moreover, the inspection body shall carry out

tests on test-pieces taken from a representative production test-piece or from a vessel, as the manufacturer chooses, in order to examine weld quality. The tests shall be carried out on longitudinal welds. However, where differing welding techniques are used for longitudinal and circular welds, the tests shall be repeated on the circular welds.

4. For the vessels referred to in section 2.1.2 of Annex I, these tests on test-pieces shall be replaced by a hydrostatic test on five vessels taken at random from each batch, in order to check that they conform to the requirements of section 2.1.2 of Annex I.

EC declaration of conformity

Article 12

1. A manufacturer fulfilling the obligations arising out of Article 13 shall affix the EC mark provided for in Article 16 to vessels which he declares to be in conformity with the standards, referred to in Article 5 (1) or with an approved prototype. By this EC declaration of conformity procedure the manufacturer becomes subject to EC surveillance, in cases where the product of PS and V exceeds 200 bar/litre.

2. The purpose of EC surveillance is to ensure, as required by Article 14 (2), that the manufacturer duly fulfils the obligations arising out of Article 13 (2). Surveillance shall be performed by the approved body which issued the EC type-examination certificate referred to in Article 10 where the vessels have been manufactured in accordance with an approved prototype or, if this is not the case, by the approved body to which the design and manufacturing schedule was sent in accordance with Article 8 (1) (a), first indent.

Article 13

1. Where a manufacturer makes use of the procedure referred to in Article 12, he must, before commencing manufacture, send the approved body which issued the EC type-examination certificate or the certificate of adequacy a document describing the manufacturing processes and all of the pre-determined systematic measures taken to ensure conformity of the pressure vessels to the standards referred to in Article 5 (1) or the approved prototype.

This document shall include:

(a) a description of the means of manufacture and checking appropriate to the construction of the vessels:

(b) an inspection document describing the appropriate examinations and tests to be carried out during manufacture, together with the procedures therefor and the frequency with which they are to be performed;

(c) an undertaking to carry out the examinations and tests in accordance with the inspection document referred to above and to have a hydrostatic test or, subject to the agreement of the Member State, a pneumatic test carried out on each vessel manufactured at a test pressure equal to 1,5 times the design pressure.

These examinations and tests shall be carried out under the responsibility of qualified staff who are sufficiently independent from production personnel, and shall be covered by a report;

(d) the addresses of the places of manufacture and storage and the date on which manufacture is to commence.

2. In addition, when the product of PS and V exceeds 200 bar/litre, manufacturers shall authorize access to the said places of manufacture and storage by the body responsible for EC surveillance, for inspection purposes, and shall allow that body to select sample vessels and shall provide it with all necessary information, and in particular:

— the design and manufacturing schedule,

— the inspection report,

— the EC type-examination certificate or certificate of adequacy, where appropriate,

— a report on the examinations and tests carried out.

Article 14

1. The approved body which issued the EC type-examination certificate or certificate of adequacy must, before the date on which any manufacture begins, examine both the document referred to in Article 13 (1) and the design and manufacturing schedule referred to in Annex II, section 3, in order to certify their conformity where vessels are not manufactured in accordance with an approved prototype.

2. In addition, where the product of PS and V exceeds 200 bar/litre, that body must during manufacture:

— ensure that the manufacturer actually checks series-produced vessels in accordance with Article 13 (1) (c),

— take random samples at the places of manufacture or at the place of storage of vessels for inspection purposes.

The body shall supply the Member State which approved it, and, on request, the other approved bodies, the other Member States and the Commission, with a copy of the inspection report.

CHAPTER III

EC mark

Article 15

Where it is established that the EC mark has been wrongly affixed to vessels because:

— they do not conform to the approved prototype,

— they conform to an approved prototype which does not meet the essential requirements referred to in Article 3,

— they do not conform, in respect of the vessels referred to in Article 8 (1) (a), to the relevant standards referred to in Article 5 (1).

— the manufacturer has failed to fulfil his obligations under Article 13,

the body responsible for EC surveillance must report to the Member State concerned and, where appropriate, withdraw the EC type-examination certificate.

Article 16

1. The EC mark and the inscriptions provided for in Annex II, section 1, shall be affixed in a visible, easily legible and indelible form to the vessel or to a data plate attached to the vessel in such a way that it cannot be removed.

The EC mark shall consist of the symbol CE, the last two digits of the year in which the mark was affixed, and the distinguishing number referred to in Article 9 (1) of the approved inspection body responsible for EC verification or EC surveillance.

2. The affixing to vessels of marks or inscriptions which are likely to be confused with the EC mark shall be prohibited.

CHAPTER IV

Final provisions

Article 17

Any decision taken pursuant to this Directive and resulting in restrictions on the placing on the market and/or taking into service of a vessel shall state the exact grounds on which it is based. Such a decision shall be notified without delay to the party concerned, who shall at the same time be informed of the judicial remedies available to him under the laws in force in the Member State in question and of the time limits to which such remedies are subject.

Article 18

1. Before 1 January 1990, Member States shall adopt and publish the laws, regulations and administrative provisions necessary in order to comply with this Directive. They shall forthwith inform the Commission thereof.

They shall apply such provisions from 1 July 1990.

2. Member States shall communicate to the Commission the texts of the provisions of national law which they adopt in the field covered by this Directive.

Article 19

This Directive is addressed to the Member States.

Done at Luxembourg, 25 June 1987.

For the Council

The President

H. DE CROO

ANNEX I

The essential safety requirements for the vessels are set out below:

1. MATERIALS

Materials must be selected according to the intended use of the vessels and in accordance with 1.1 to 1.4.

1.1. **Pressurized parts**

The materials referred to in Article 1 used for manufacturing the pressurized parts must be:

— capable of being welded,

— ductile and tough, so that a rupture at minimum working temperature does not give rise to either fragmentation or brittle-type fracture,

— not adversely affected by ageing.

For steel vessels, the materials must in addition meet the requirements set out in section 1.1.1 and, for aluminium or aluminium alloy vessels, those set out in section 1.1.2.

They must be accompanied by an inspection slip drawn up by the producer of the materials as described in Annex II.

1.1.1. *Steel vessels*

Non-alloy quality steels meet the following requirements:

(a) they must be non-effervescent and be supplied after normalization treatment, or in an equivalent state;

(b) the content per product of carbon must be less than 0,25 % and that of sulphur and phosphorus must each be less than 0,05 %.

(c) they must have the following mechanical properties per product:

— the maximum tensile strength $R_{m,max}$ must be less than 580 N/mm²,

— the elongation after rupture must be:

— if test pieces are taken parallel to the direction of rolling:

thickness ≥ 3 mm: A ≥ 22 %,
thickness < 3 mm: $A_{80\ mm}$ ≥ 17 %,

— if test pieces are taken perpendicular to the direction of rolling:

thickness ≥ 3 mm: A ≥ 20 %,
thickness < 3 mm: $A_{80\ mm}$ ≥ 15 %,

— the average failure energy KCV for three longitudinal test pieces at minimum working temperature must not be less than 35 J/cm². Not more than one of the three figures may be less than 35 J/cm², with a minimum of 25 J/cm².

In the case of steels used in the manufacture of vessels whose minimum working temperature is lower than − 10 °C and whose wall thickness exceeds five mm, this property must be checked.

1.1.2. *Aluminium vessels*

Non-alloy aluminium must have an aluminium content of at least 99,5 % and those alloys described in Article 1 (2) must display adequate resistance to intercrystalline corrosion at maximum working temperature.

Moreover these materials must satisfy the following requirements:

(a) they must be supplied in an annealed state; and

(b) must have the following mechanical characteristics per product:

— the maximum tensile strength $R_{m,max}$ must be no more than 350 N/mm²,

— the elongation after rupture must be:

— A ≥ 16 % if the test piece is taken parallel to the direction of rolling,

— A ≥ 14 % if the test piece is taken perpendicular to the direction of rolling,

1.2. **Welding materials**

The welding materials used to manufacture the welds on or of the vessel must be appropriate to and compatible with the materials to be welded.

1.3. **Accessories contributing towards the strength of the vessel**

These accessories (e. g. bolts and nuts) must be made of a material specified in 1.1 or of other kinds of steel, aluminium or an appropriate aluminium alloy compatible with materials used for the manufacture of pressurized parts.

The latter materials must at minimum working temperature have an appropriate elongation after rupture and toughness.

1.4. **Non-pressurized parts**

All unpressurized parts of welded vessels must be of materials which are compatible with that of the components to which they are welded.

2. VESSEL DESIGN

The manufacturer must, when designing the vessel, define the use to which it will be put, and select:

— the minimum working temperature T_{min},

— the maximum working temperature T_{max},

— the maximum working pressure PS.

However, should a minimum working temperature exceeding – 10 °C be selected, the qualities required of the materials must be satisfied at – 10 °C.

The manufacturer must also take account of the following provisions:

— it must be possible to inspect the inside of vessels,

— it must be possible to drain the vessels,

— the mechanical qualities shall be maintained throughout the period of use of the vessel for the intended purpose,

— the vessels shall, bearing in mind their prescribed use, be adequately protected against corrosion,

and the fact that under the conditions of use envisaged

— the vessels will not be subjected to stresses likely to impair their safety in use,

— internal pressure will not permanently exceed the maximum working pressure PS; however, it may momentarily do so by up to 10 %.

Circular and longitudinal seams must be made using full penetration welds or welds of equivalent effectiveness. Convex ends other than hemispherical ones shall have a cylindrical edge.

2.1. **Wall thickness**

If the product PS.V is not more than 3 000 bar/litre, the manufacturer must select one of the methods described in 2.1.1 and 2.1.2 for determining vessel wall thickness; if the product of PS and V is more than 3 000 bar/litre, or if the maximum working temperature exceeds 100 °C, such thickness must be determined by the method described in 2.1.1.

The actual wall thickness of the cylindrical section and ends shall, however, be not less than 2 mm in the case of steel vessels and not less than 3 mm in the case of aluminium or aluminium alloy vessels.

2.1.1. *Calculation method*

The minimum thickness of pressurized parts must be calculated having regard to the intensity of the stresses and to the following provisions:

— the calculation pressure to be taken into account must not be less than the maximum working pressure selected,

— the permissible general membrane stress must not exceed the lower of the values 0,6 R_{ET} or 0,3 R_m. The manufacturer must use the R_{ET} and R_m minimum values guaranteed by the material manufacturer in order to determine the permissible stress.

However, where the cylindrical portion of the vessel has one or more longitudinal welds made using a non-automatic welding process, the thickness calculated as above must be multiplied by the coefficient 1,15.

2.1.2. *Experimental method*

Wall thickness must be so determined as to enable the vessels to resist at ambient temperature a pressure equal to at least five times the maximum working pressure, with a permanent circumferential deformation factor of no more than 1 %.

3. MANUFACTURING PROCESSES

Vessels shall be constructed and subjected to production checks in accordance with the design and manufacturing record referred to in Annex II, section 3.

3.1. **Preparation of the component parts**

Preparation of the component parts (e.g. forming and chamfering) must not give rise to surface defects or cracks or changes in the mechanical characteristics likely to be detrimental to the safety of the vessels.

3.2. **Welds on pressurized parts**

The characteristics of welds and adjacent zones must be similar to those of the welded materials and shall be free of any surface or internal defects detrimental to the safety of the vessels.

Welds must be performed by qualified welders or operators possessing the appropriate level of competence, in accordance with approved welding processes. Such approval and qualification tests must be carried out by approved inspection bodies.

The manufacturer must also, during manufacture, ensure consistent weld quality by conducting appropriate tests using adequate procedures. These tests must be the subject of a report.

4. PLACING IN SERVICES OF THE VESSELS

Vessels must be accompanied by the instructions drawn up by the manufacturer, as referred to in Annex II, section 2.

ANNEX II

1. EC MARK AND INSCRIPTIONS

The vessel or data plate must bear the EC mark provided for in Article 16, together with at least the following information:

— the maximum working pressure PS in bar
— the maximum working temperature T_{max} in °C
— the minimum working temperature T_{min} in °C
— the capacity of the vessel V in L
— the name or mark of the manufacturer
— the type and serial or batch identification of the vessel.

Where a data plate is used, it must be so designed that it cannot be re-used and must include a vacant space to enable other information to be provided.

2. INSTRUCTIONS

The instructions must provide the following information:

— the particulars given in 1 above except for the vessel's serial identification,
— the intended use of the vessel,
— the maintenance and installation requirements for vessel safety.

They must be in the official language or languages of the country of destination.

3. DESIGN AND MANUFACTURING SCHEDULES

The design and manufacturing schedules must contain a description of the techniques and operations employed in order to meet the essential requirements referred to in Article 3 or the standards referred to in article 5 (1) and in particular:

(a) a detailed manufacturing drawing of the vessel type;

(b) the instructions;

(c) a document describing:
— the materials selected,
— the welding processes selected,
— the checks selected,
— any pertinent details as to the vessel design.

When the procedures laid down in Articles 11 to 14 are used, the schedule must also include:

(i) the certificates relating to the suitable qualification of the welding operations and of the welders or operators;

(ii) the inspection slip for the materials used in the manufacture of parts and assemblies contributing to the strength of the pressure vessel;

(iii) a report on the examinations and tests performed or a description of the proposed checks.

4. DEFINITIONS AND SYMBOLS

4.1. Definitions

(a) The design pressure 'P' is the gauge pressure chosen by the manufacturer and used to determine the thickness of the pressurized parts.

(b) The maximum working pressure 'PS' is the maximum gauge pressure which may be exerted under normal conditions of use.

(c) The minimum working temperature T_{min} is the lowest stabilized temperature in the wall of the vessel under normal conditions of use.

(d) The maximum working temperature T_{max} is the highest stabilized temperature which the wall of the vessel may attain under normal conditions of use.

(e) The yield strength 'R_{ET}' is the value at the maximum working temperature T_{max}

— of the upper yield point ReH, for a material with both a lower and an upper yield point,

— or of the proof stress $R_p0,2$,

— or of the proof stress $R_p1,0$ in the case of non-alloy aluminium.

(f) Families of vessels:

Vessels form part of the same family if they differ from the prototype only in diameter, provided that the permissible requirements referred to in sections 2.1.1 or 2.1.2 of Annex I are complied with and/or in the length of their cylindrical portion within the following limits:

— where a prototype has one or more shell rings in addition to the ends, variants in the family must have at least one shell ring,

— where a prototype has just two dished ends, variants in the family must have no shell rings.

Variations in length causing the apertures and/or penetrations to be modified must be shown in the drawing for each variant.

(g) A batch of vessels consists at the most of 3 000 vessels of the model of the same type.

(h) There is series manufacture within the meaning of this Directive if more than one vessel of the same type is manufactured during a given period by a continuous manufacturing process, in accordance with a common design and using the same manufacturing processes.

(i) Inspection slip: document by which the producer certifies that the products delivered meet the requirements of the order and in which he sets out the results of the routine in-plant inspection test, in particular chemical composition and mechanical characteristics performed on products made by the same production process as the supply, but not necessarily on the products delivered.

4.2. Symbols

A	elongation after rupture ($L_o = 5,65\sqrt{S_o}$)	%
A 80 mm	elongation after rupture (L_o = 80 mm)	%
KCV	rupture energy	J/cm²
P	design pressure	bar
PS	working pressure	bar
P_h	hydrostatic or pneumatic test pressure	bar
$R_p0,2$	proof stress at 0,2 %	N/mm²
R_{ET}	yield strength at maximum working temperature	N/mm²
R_{eH}	upper yield point	N/mm²
R_m	tensile strength	N/mm²
T_{max}	maximum working temperature	°C
T_{min}	minimum working temperature	°C
V	capacity of the vessel	L
$R_{m,\,max}$	maximum tensile strength	N/mm²
$R_p1,0$	proof stress at 1,0 %	N/mm²

ANNEX III

MINIMUM CRITERIA TO BE TAKEN INTO ACCOUNT BY MEMBER STATES WHEN APPOINTING INSPECTION BODIES

1. The inspection body, its director and the staff responsible for carrying out the verification tests shall not be the designer, manufacturer, supplier or installer of vessels which they inspect, nor the authorized representative of any of those parties. They shall not become directly involved in the design, construction, marketing or maintenance of the vessels, nor represent the parties engaged in these activities. This does not preclude the possibility of exchanges of technical information between the manufacturer and the inspection body.

2. The inspection body and its staff must carry out the verification tests with the highest degree of professional integrity and technical competence and must be free from all pressures and inducements, particularly financial, which might influence their judgment or the results of the inspection, especially from persons or groups of persons with an interest in the result of verifications.

3. The inspection body must have at its disposal the necessary staff and possess the necessary facilities to enable it to perform properly the administrative and technical tasks connected with verification; it must also have access to the equipment required for special verification.

4. The staff responsible for inspection must have:

   — sound technical and professional training,

   — satisfactory knowledge of the requirements of the tests they carry out and adequate experience of such tests.

   — the ability to draw up the certificates, records and reports required to authenticate the performance of the tests.

5. The impartiality of inspection staff must be guaranteed. Their remuneration must not depend on the number of tests carried out nor on the results of such tests.

6. The inspection body must take out liability insurance unless its liability is assumed by the State in accordance with national law, or the Member State itself is directly responsible for the tests.

7. The staff of the inspection body is bound to observe professional secrecy with regard to all information gained in carrying out its tasks (except *vis-à-vis* the competent administrative authorities of the State in which its activities are carried out) under this Directive or any provision of national law giving effect to it.

COUNCIL DIRECTIVE

of 25 June 1987

amending Directive 84/534/EEC on the approximation of the laws of the Member States relating to the permissible sound power level of tower cranes

(87/405/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100 thereof,

Having regard to the proposal from the Commission (1),

Having regard to the opinion of the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas provisions, the purpose of which is to limit noise at operators' positions, and methods of measuring airborne noise differ from one Member State to another, which means that, when applied to tower cranes, they constitute a barrier to trade in such cranes; whereas such provisions should therefore be approximated;

Whereas Council Directive 79/113/EEC of 19 December 1978 on the approximation of the laws of the Member States relating to the determination of the noise emissions of construction plant and equipment (4), as last amended by Directive 85/405/EEC (5), laid down, in particular, the method to be used for determining airborne noise emitted at the operator's position by a tower crane;

Whereas Article 8 of Council Directive 86/188/EEC of 12 May 1986 on the protection of workers from the risks related to exposure to noise at work (6) lays down that Member States shall take appropriate measures in this field;

Whereas, at the Council meeting held on 18 and 19 December 1978, the Ministers for the Environment stated that the technical provisions for the measurement of airborne noise emitted at the operator's position should appear in the Annexes to the separate directives for each machine in question;

Whereas all the technical provisions required to determine the noise emission of tower cranes should be consolidated in one directive; whereas Directive 84/534/EEC (7) should be amended accordingly,

HAS ADOPTED THIS DIRECTIVE:

Article 1

Directive 84/534/EEC is hereby amended as follows:

1. Article 1 (1) is replaced by the following text:

   '1. This Directive shall apply to the permissible sound power level of airborne noise emitted into the environment and the permissible sould pressure level of airborne noise emitted at the operator's position for tower cranes used to perform work on industrial and building sites.'

2. Article 3 (1) shall be replaced by the following:

   '1. The approved bodies shall issue an EEC-type examination certificate for

   — each type of tower crane for which the sound power level of airborne noise emitted into the environment, measured under the conditions set out in Annex I to Directive 79/113/EEC, as amended by Annex I to this Directive, does not exceed the permissible sound power levels given in the following table:

(1) OJ No C 267, 23. 10. 1986, p. 4.
(2) OJ No C 76, 23. 3. 1987, p. 197.
(3) OJ No C 83, 30. 3. 1987, p. 11.
(4) OJ No L 33, 8. 2. 1979, p. 15.
(5) OJ No L 233, 30. 8. 1985, p. 9.
(6) OJ No L 137, 24. 5. 1986, p. 28.
(7) OJ No L 300, 19. 11. 1984, p. 130.

	Permissible sound power level in dB(A)/1 pW as from	
	18 months after notification of the Directive	5 years after notification of the Directive
Lifting mechanism	102	100
Energy generator	Levels laid down in the Directive on power generators according to the power generated	
Assembly comprising lifting mechanism and energy generator	Highest values of the two components	

— each type of tower crane with an operator's position fixed to the structure of the tower crane, for which the sound pressure level of airborne noise, in dB(A), measured at the operator's position under the conditions set out in Annex II to Council Directive 79/113/EEC, as supplemented by Annex Ia to this Directive, does not exceed the permissible level given in the following table:

Permissible sound pressure level in dB(A)/20 μPa at the operator's position as from	
24 months after notification of the Directive	5 years after notification of the Directive
85	80'

3. Article 3 (7) is replaced by the following:

'7. Each tower crane built in accordance with the type certified by EEC type-examination shall bear a clear and permanent mark indicating the sound power level in dB(A) referenced to 1pW and, in the case of a type of tower crane with an operator's position fixed to the structure of the tower crane, the sound pressure level in dB (A) referenced to 20 μPa, both as guaranteed by the manufacturer and determined as laid down in Annexes I and II to Directive 79/113/EEC, as last amended by Directive 85/405/EEC and supplemented by Annexes I and IIa to this directive, together with the symbol CE (epsilon). The models for these marks are given in Annex III to this Directive.'

4. Article 7 is replaced by the following:

'*Article 7*

Before the second stage enters into force, the Council shall act on the proposal for a reduction, as from 1 July 1995, in noise levels at the operator's position, which the Commission will submit in due course.'

5. A new Annex Ia is added, the text of which is given in Annex I to this Directive.

6. Annex III is replaced by the text in Annex II to this Directive.

Article 2

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive upon expiry of a period of 24 months following its notification (1). They shall forthwith inform the Commission thereof.

2. Member States shall communicate to the Commission the texts of the provisions of national law which they adopt in the field governed by this Directive.

Article 3

This Directive is addressed to the Member States.

Done at Luxembourg, 25 June 1987.

For the Council

The President

H. DE CROO

(1) This Directive was notified to the Member States on 26 June 1987.

'ANNEX I

'ANNEX Ia

METHOD OF MEASURING AIRBORNE NOISE EMITTED BY TOWER CRANES AT THE OPERATOR'S POSITIONS

This method is applicable to tower cranes with an operator's position fixed to the structure of the tower crane.

These technical procedures comply with the requirements of Annex II to Directive 79/113/EEC, as last amended by Directive 85/405/EEC, and the provisions of that Annex apply to tower cranes subject to the following amendments and conditions:

6. OPERATOR

An operator must occupy the operator's position.

6.2.1. *Operator standing*

If the operator's position does not have a seat, the measurements are to be taken with the operator standing.

6.2.2. *Operator seated*

If the operator's position does have a seat, the measurements are to be taken with the operator seated.

NB:

The position of the operator, whether standing or seated, is to be indicated in the test report.

7.1. **General**

The microphone is located as specified in 7.3.

9. GENERAL

The conditions for installing and operating the tower crane are as laid down in section 6.2 of Annex I. In the case of tower cranes with the lifting mechanism on the jib stay the measurements are to be taken in that configuration.

9.2. **Operation of a tower crane with adjustable features (e.g. windows which can be opened)**

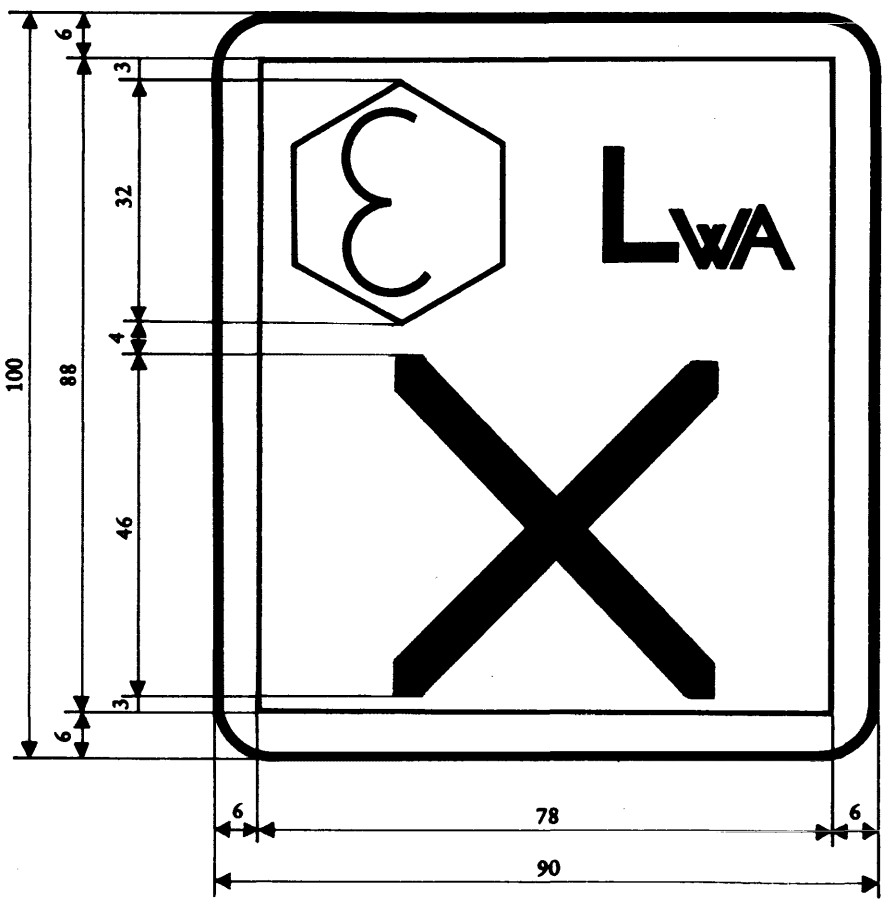
None of the adjustable features referred to in 9.2.1, other than those mentioned in 9.2.2, is to be taken into consideration.

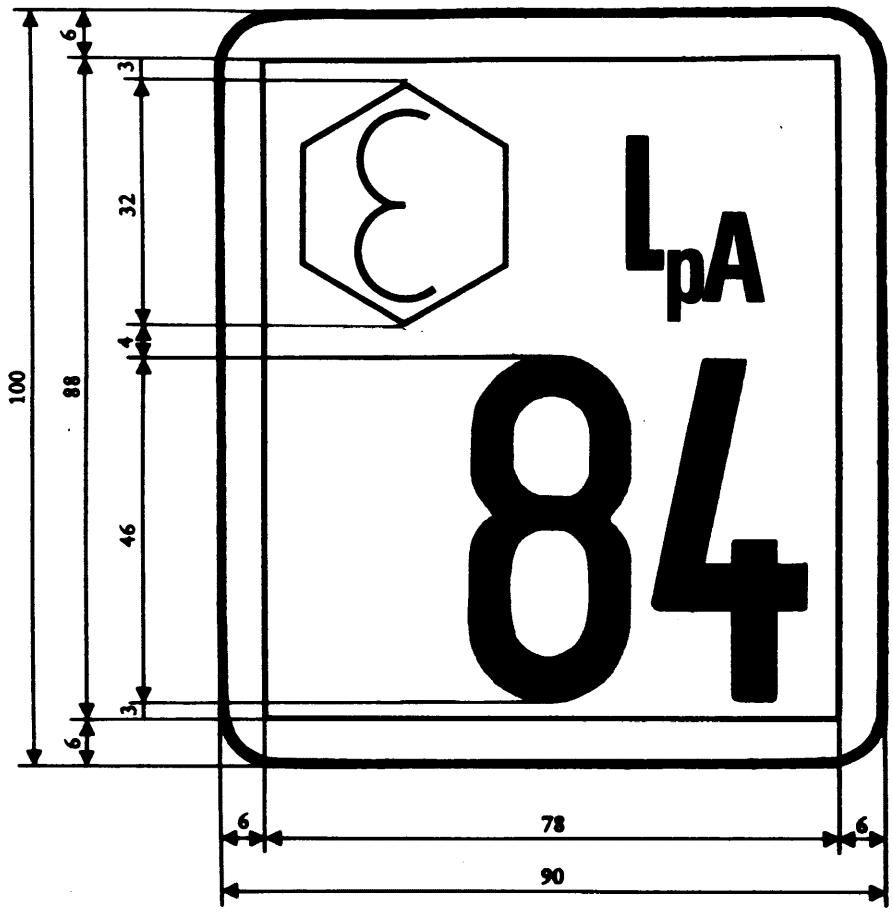
10.2.2. Using the A-weighted sound pressure levels L_{pA}. This section is not to be taken into consideration.

ANNEX II

'ANNEX III

MODELS FOR MARK STATING THE SOUND POWER AND PRESSURE LEVEL AT OPERATOR'S POSITION AS GUARANTEED BY THE MANUFACTURER




6
3
32
4
46
3
6
100
88
L_{pA}
84
6
78
6
90