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EDICT OF GOVERNMENT

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DIN EN 14344 (2004) (English): Child use and care articles - Child seats for cycles - Safety requirements and test methods [Authority: Directive 2001/95/EC]

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ICS 97.190

Supersedes DIN 79120, April 1989 edition.

Child use and care articles

Child seats for cycles

Safety requirements and test methods

English version of DIN EN 14344

Artikel für Säuglinge und Kleinkinder – Kindersitze für Fahrräder – Sicherheitstechnische Anforderungen und Prüfverfahren

A comma is used as the decimal marker.

This standard includes safety requirements within the meaning of the *Geräte- und Produktsicherheitsgesetz* (German Equipment and Consumer Goods Safety Law).

National foreword

This standard has been prepared by CEN/TC 252 'Child use and care articles' (Secretariat: France).

The responsible German body involved in its preparation was the *Normenausschuss Sport- und Freizeitgerät* (Sports Equipment Standards Committee), Technical Committee *Fahrrad-Zubehör.*

Child seats for cycles as specified in this standard fall within the scope of the *Geräte- und Produktsicherheitsgesetz.* Once compliance with the safety requirements specified therein has been verified by an accredited test house designated by the *Bundesminister für Wirtschaft und Arbeit* (German Federal Minister of Labour and Economics), the seats may be marked with the symbol GS (= *geprüfte Sicherheit,* safety tested).

The DIN Standards corresponding to the International Standards referred to in clause 2 of the EN are as follows:

ISO 4628-3	DIN 53210
ISO 9227	DIN 50021
ISO 11243	DIN 79121

Amendments

DIN 79120, April 1989 edition, has been superseded by the specifications of EN 14344.

Previous editions

DIN 79120: 1986-11, 1989-04.

National Annex NA

Standards referred to

(and not included in **Normative references**)

DIN 50021	Corrosion testing – Spray tests with different sodium chloride solutions
DIN 53210	Designation of the degree of rusting of paints, varnishes and similar coatings
DIN 79121	Luggage carriers for bicycles – Terminology, requirements and testing

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English version

Child use and care articles

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Articles de puériculture – Sièges enfants pour bicyclettes – Exigences de sécurité et méthodes d'essai

Artikel für Säuglinge und Kleinkinder – Kindersitze für Fahrräder – Sicherheitstechnische Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 2004-02-02.

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Foreword

This document (EN 14344:2004) has been prepared by Technical Committee CEN/TC 252 "Child use and care articles", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This document specifies requirements for child seats for cycles, which are intended to be mounted on pedal cycles and electrically power assisted bicycles, in order to transport children with a weight from 9 kg up to 22 kg (approximately 9 months up to 5 years) and who are capable of sitting unaided.

NOTE Some European countries have special legislation for child seats for cycles. Compliance with this document may not meet this legislation.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 71-1:1998, *Safety of toys – Part 1: Mechanical and physical properties.*

EN 71-3, *Safety of toys – Part 3: Migration of certain elements.*

EN 1811, *Reference test method for release of nickel from products intended to come into direct and prolonged contact with the skin.*

EN ISO 1043-1, *Plastics – Symbols and abbreviated terms – Part 1: Basic polymers and their special characteristics (ISO 1043-1:2001).*

EN ISO 1043-2, *Plastics – Symbols and abbreviated terms – Part 2: Fillers and reinforcing materials (ISO 1043-2:2000).*

ISO 4628-3, *Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 3: Assessment of degree of rusting.*

ISO 9227, *Corrosion tests in artificial atmospheres – Salt spray tests.*

ISO 11243, *Cycles – Luggage carriers for bicycles – Concepts, classification and testing.*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
seat
child seat intended to be mounted on a cycle

3.2
front seat
child seat intended to be mounted on a cycle in front of the rider (between handlebar and rider)

3.3
rear seat
child seat intended to be mounted on a cycle behind the rider

3.4
reclining seat
front or rear seat that can transport a child either in an upright or in a reclined sitting position

3.5
integral guard
guard that is part of, or pre-assembled with, another essential and major part of the seat (for example a footrest) and cannot be removed or can be removed by the use of tools only

3.6
additional guard
guards that are always provided with the seat, but do not satisfy the definition of an integral guard

3.7
central plane
vertical plane on which lies the centre line of the cycle, seat and the measuring instrument

3.8
reference plane
horizontal plane defined on the seat measuring instrument, above the lowest points of the main sitting area of the seat

3.9
attachment system
structure to attach the child seat to the cycle

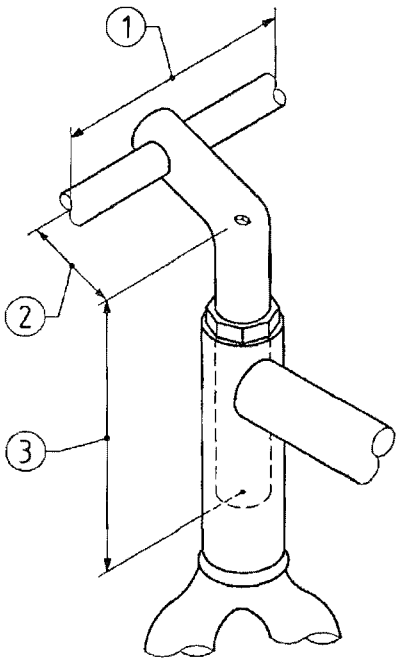
3.10
footrest
structure to support the child's foot

3.11
accessibility zone
zones that are likely to be reached by the hands or toes of the child in the seat

3.12
handlebar and handlebar stem assembly (see Figure 1)
1 handlebar – that is held by rider

2 extension – part of the handlebar stem that positions the handlebar in front of the steering axis

3 quill – part of some designs of the handlebar stem, that is co-axial with the steering axis and that fits partly into the fork steering tube



Key

1 handlebar
2 extension
3 quill

Figure 1 — Handlebar and handlebar stem assembly

3.13
restraint system
device designed to keep the child sitting in a safe position in the seat

3.14
crotch restraint
device designed to pass between the child's legs to prevent the child from sliding forward

4 Classification

Seats are classified according to the weight of the child carried and their mounting position on the cycle (see Table 1).

Table 1 — Classification of seats

Type of seat	Weight/capacity range kg	
	9 – 15	9 – 22
Rear seat	A15	A22
Front seat between handlebar and rider	C15	Not permitted
Front seat in front of handlebar	Not permitted	Not permitted

EXAMPLE Designation of a seat to be mounted behind the rider (A), maximum load 15 kg (15) : Child seat A15.

5 General requirements and test conditions

5.1 Principle of the most onerous condition

Where a test calls for a seat to be mounted on a cycle, the tester shall refer to the purchase information (see 13) and instructions for use (see 14). It is allowed to use any cycle that is suitable according to this information. Each test shall be conducted with the seat in the most onerous condition for that test.

5.2 Tolerances and test conditions

Unless otherwise stated the following tolerances shall be used :

All forces shall have an accuracy of ± 5%.

All masses shall have an accuracy of ± 1 %.

All dimensions shall have an accuracy of ± 1,0 mm.

All time measurements shall have an accuracy of ± 1s.

All angles shall have an accuracy of ± 1°.

All frequencies, amplitudes shall have an accuracy of ± 5 %.

The seat shall be conditioned at a temperature of (23 ± 5) °C for at least 2 h prior to test. All tests shall be carried out at a temperature of (23 ± 5) °C unless otherwise specified.

5.3 Order of tests

The test shall be carried out in the order that they appear in this document. All tests shall be performed on one seat.

6 Construction

6.1 Dimensions

6.1.1 Seating area and footrests

6.1.1.1 Requirements for seating area and footrests

The dimensions of the main child supporting areas of the seat shall comply with items a, b, c, d, e and f in Table 2, when measured in accordance with 6.1.1.3.

NOTE 1 The reference plane of this measuring instrument lies approximately 55 mm above the sitting area, and measurements are made at or relative to this plane. Dimensions c and d in Table 2 are therefore some 55 mm less than the full dimensions of these features, whereas the dimensions in f are greater by a similar amount.

NOTE 2 The items h, i and j are not requirements but necessary points for the measuring instrument.

NOTE 3 For item f : the length of the lower leg is adjustable.

Table 2 — Dimensions

Dimensions in millimetres

Items		Class of seat		
		A15	C15	A22
a	Seat width (inside)	230 ± 30	230 ± 30	250 ± 40
b	Seat length (front to back)	190 ± 30	190 ± 30	200 ± 30
c	Minimum height of backrest	385	160	400
d	Minimum height of seat side	65	45	85
e	Minimum footrest overall width × length	75 × 100	75 × 100	75 × 115
f	Minimum range of footrest adjustment (height)	180 – 250	180 – 220	180 – 290
g	Minimum length of seat side	105	105	105
h	Corresponding knee point settings	154 – 244	154 – 244	154 – 294
i	Maximum lower leg length	270	270	340
j	Half maximum foot length	80	80	100

6.1.1.2 Mounting method for measuring instrument

The dimensions of the seat shall be checked using the measuring instrument described in Annex A. Mount the seat on a cycle or similar fixture, with any padding supplied with the seat fitted in accordance with the manufacturer's instructions. Place the measuring instrument in the seat with the point A touching the centre of the lower backrest area. Load the measuring instrument with a mass of 5 kg centred above point C and adjust the orientation of the seat until the reference plane of the instrument becomes horizontal.

NOTE When measuring the padded areas it is permitted that the measuring instrument is loaded to compress any padding in a similar way to a child sitting in the seat.

6.1.1.3 Test method for seating area and footrest

Take measurements relative to the points on the reference plane of the measuring instrument as follows (see Figure A.2) :

a) measure the inside width of the seat, through point B ; check that this complies with the requirements given in Table 2, line a ;

b) slide the 60 mm by 15 mm diameter pillar along the thigh scale until it touches the edge of the seat. The seat length is the distance between the edge of this pillar and point A ; check that this complies with the requirements given in Table 2, line b ;

c) measure to the top centre of the backrest from point A. Take the linear distance between these two points using a calliper, or, if using the measuring instrument as shown, calculate from the vertical and horizontal displacement relative to point A ; check that this distance complies with the requirements given in Table 2, line c. If the child seat is fitted with an adjustable headrest measure to the top centre of the headrest, the headrest being in the lowest position ;

d) measure vertically above point B to a horizontal straightedge laid across the seat sides ; check that this distance complies with the requirement given in Table 2, line d ;

e) measure the maximum overall width and length of the area intended to support the child's foot, and check that the dimensions comply with the requirements, given in Table 2, line e ;

f) set the end of the thigh scale – the knee point E – to the shorter of the two distances h from point D, as specified in Table 2, line h. Adjust the footrest to its highest position. Using the leg and foot component of the measuring instrument with the heel against the back of the footrest, check that the distance from E to F is not more than the smaller value of f (given in Table 2, line f). Re-set the knee point to the longer of the two distances h, adjust the footrest to its lowest position and check that the distance E to F is not less than the larger value of f (given in Table 2, line f) ;

g) place a vertical straightedge on the reference plane touching the front edges of the seat sides. Check whether point C is between the straightedge and backrest of the seat.

6.1.1.4 Requirement for footrest adjustment

The height of the footrests shall be adjustable, either continuously or in steps of 40 mm or less, throughout a range of positions equal to or exceeding the range defined by 6.1.1.3 f).

6.1.1.5 Test method for footrest adjustment

Take the difference between the maximum and the minimum distances E to F found by the method stated in 6.1.1.3 f), and divide by the number of possible footrest positions minus one to find the average adjustment step. Check that this does not exceed the maximum specified in 6.1.1.4.

6.1.2 Centre of gravity mark for rear seats

6.1.2.1 Requirements for the centre of gravity mark for rear seats

Rear seats shall have a centre of gravity mark(s). This centre of gravity mark(s) shall be located on the same vertical and transverse plane as the centre of gravity for the seat with a child of maximum weight sat in it. When tested in accordance with 6.1.2.2 this centre of gravity mark shall be behind or no more than 10 mm in front of the theoretical centre of gravity.

6.1.2.2 Test method for the centre of gravity mark for rear seats

Find the position of the centre of gravity of the seat (e.g. by suspending it from a plumbline, twice from different points) and its mass, complete with mounting hardware.

If the seat is a reclining seat it shall be adjusted so that the centre of gravity of the seat and the child is as far to the rear of the bicycle as possible.

Assume that a child of weight equal to the load class of the seat, see Table 1, is seated so that the centre of this added mass is located on the central plane, 150 mm above the reference plane and 130 mm in front of the backrest (measured horizontally at this height) for seats of class A15, or at the same height and 150 mm in front of the backrest for class A22.

Calculate the theoretical position of the centre of gravity of the combined mass of the seat and this child, and check that the centre of gravity marked by the manufacturer on the seat complies with the requirements of 12.2.1

6.2 Edges, corners and projections

Edges, corners and projections shall conform to either the minimum radii given in Figure 2 a), 2 b) or 2 c) or, if arising from a wall thickness smaller than 4 mm, to at least one of the following requirements :

— they shall be rounded; or

— they shall be folded, rolled or spiralled as given in Figure 2 d), 2 e) or 2 f); or

— they shall be protected with a plastic coating or other adequate means as given in Figure 2 g).

These requirements do not apply to small components such as hinges, brackets and catches.

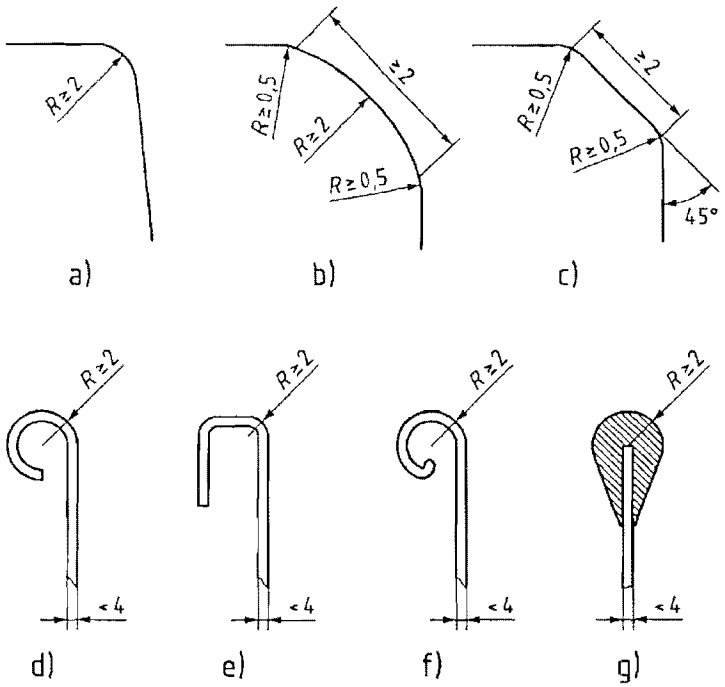


Figure 2 — Examples for minimum radii of edges and corners

6.3 Entrapment

There shall be no gaps in the accessibility zone of the assembled seat between 5 mm and 12 mm. The accessibility zone includes any part that is visible when looking at the product from the outside. Excluded from this requirement is an area of 200 mm width from the front of the seat going to the back of the seat to the height of the reference plane. Padding, restraint system and buckles are excluded.

6.4 Small parts

6.4.1 Requirements for detachable and non-detachable components

In order to avoid ingestion or inhalation of small parts, components shall conform to the following requirements :

a) detachable components shall not, whatever orientation and without compressing, fit entirely within the cylinder according to Figure 3 ;

b) non-detachable components, i.e. those parts which are not intended to be removed, shall conform to one of the following requirements :

   1) the components shall be so embedded that the child cannot grip them with its teeth or fingers ; or

   2) the components shall be so fixed to the product that they cannot become detached when a tensile test is carried out in accordance with EN 71-1:1998, 8.4.2.1, with the apparatus described in EN 71-1:1998, 8.4.1 and a torque test is carried out in accordance with Clause 6.4.3; or

   3) any components that become detached when the tensile test is carried out shall comply with the requirement for detachable components.

6.4.2 Test equipment

6.4.2.1 Small parts cylinder

Small parts cylinder – see Figure 3.

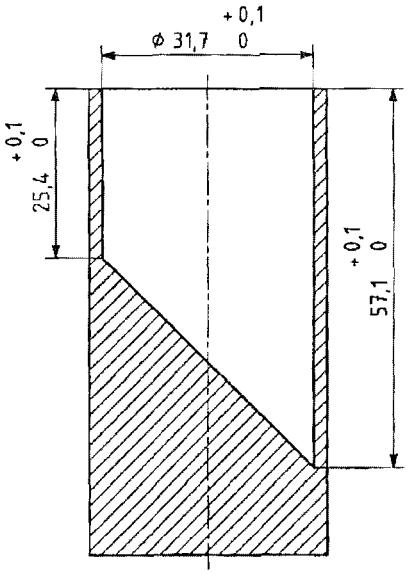


Figure 3 — Small parts cylinder

6.4.3 Torque test for non-detachable components

Apply a torque gradually to the component within a period of 5 s in a clockwise direction until either :

a) a rotation of 180° from the original position has been attained ; or

b) a torque of 0,34 Nm is reached.

The maximum rotation or required torque shall be applied for 10 s. The component shall then be allowed to return to a relaxed condition and the procedure repeated in an anticlockwise direction. Where projections, components or assemblies are rigidly mounted on an accessible rod or shaft designed to rotate together with the projections, components or assemblies, during the test the rod or shaft shall be clamped to prevent rotation. If a component which is attached by a screw thread that becomes loosened during application of the required torque, the torque shall continue to be applied until the required torque is exceeded or the component disassembles or it becomes apparent that the component will not disassemble. When using clamps and test equipment care shall be taken not to damage the attachment mechanism or body of the component. Check whether any component or part of a component that is removed during the test fits wholly within the small parts cylinder specified in Figure 3.

6.5 Decals

6.5.1 Requirements for decals

When tested in accordance with 6.5.3.1 soaking test, 6.5.3.2 adhesion test and 6.5.3.3 tension test plastic decals or plastic sheeting shall not be removed or loosened from the product. If plastic decals or plastic sheeting is removed it shall have an area greater than 100 mm x 100 mm and an average thickness more than 0,038 mm when tested in accordance with 6.5.3.4, plastic sheeting thickness. If the detached plastic decal or plastic sheeting has any dimension less than 100 mm (except thickness) it shall not fit wholly within the small parts cylinder as specified in Figure 3 in its unfolded condition.

6.5.2 Test equipment

6.5.2.1 Feeler gauge

Feeler gauge – see Figure 4.

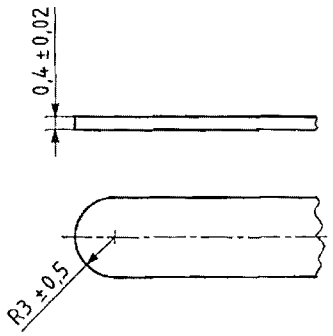


Figure 4 — Feeler gauge

6.5.3 Test method for decals

The following tests shall be conducted at a temperature of (20 ± 5) °C.

6.5.3.1 Soaking test

Submerge the plastic decal or plastic sheeting to be tested completely in a container of demineralised water at a temperature of (20 ± 5)°C for 4 min. Remove the plastic decal or plastic sheeting from the demineralised water, allowing any excess water to run off. Maintain the plastic decal or plastic sheeting at room temperature for 10 min. Then repeat the test a further three times so that the component is submerged a total of four times.

6.5.3.2 Adhesion test

Using a force of (25 ± 2) N insert the feeler gauge between the plastic decal or plastic sheeting and the underlying layer of the product at any angle between 0° and 10° from the surface. Repeat this for a further 29 times so that the feeler gauge is pushed between the plastic decal or plastic sheeting and the product for a total of 30 times. The feeler gauge shall be pushed between the plastic decal or plastic sheeting and the product at the same position each time.

6.5.3.3 Tension test

Attach a suitable clamp to the plastic decal or plastic sheeting that has lifted away from the product after testing in accordance with 6.5.3.1 soaking test and 6.5.3.2 adhesion test. Take care not to damage the plastic decal or plastic sheeting. Apply a tensile force of up to 90 N gradually within a period of 5 s to the plastic decal or plastic sheeting and maintain for 10 s.

6.5.3.4 Measuring the thickness

Measure the thickness at 10 equidistant points across the diagonal of any area having dimensions of at least 100 mm × 100 mm.

7 Strength and durability

7.1 Requirements for strength and durability

All structural components shall be assembled in accordance with the manufacturer's instructions (see Clause 14).

After testing the seat in accordance with 7.4.1 high temperature test, 7.4.2 low temperature test and low temperature drop test, 7.4.3 static load test for footrest strength, 7.4.4 fatigue test, 7.4.5 transverse rigidity test, 7.4.6 backrest dynamic test, the tested parts or attachment points shall:

— not be broken, nor present visible cracks or splits ;

— still perform its function ;

— not be moved in any direction more than 3 mm compared with the test fixture.

The seat, tested parts or attachment points shall be checked after each test.

7.2 Mounting method for strength and durability

7.2.1 Mounting method for non-luggage carrier rear seats

Mount the seat on a rigid fixture. This mounting fixture shall embody features that resemble the parts of a bicycle to which the seat is designed to be fitted, but shall be much more rigid than a bicycle. For example : those parts of the fixture that resemble frame tubes, to which some designs of child seat may be clamped, shall instead be constructed from solid steel bar of similar outer diameter. These bicycle-like features shall be rigidly fixed to the frame of reference from which measurements of seat deflection are made.

The seat shall be mounted with any adjustable means of attachment fully extended and any other adjustable parts (e.g. footrest, reclining backrest) adjusted to whatever position the tester considers likely to make the test most onerous. All fasteners shall be tightened according to the manufacturer's instructions.

Mark or note the position of the seat and its attachment clamps or brackets on the fixture.

The position and orientation shall be set with the aid of the measuring instrument described in Annex A. The fixture shall be adjusted so that the reference plane of this measuring instrument becomes horizontal and also complies with any positional requirements of the test. The measuring instrument shall be removed before applying any loads.

7.2.2 Mounting method for luggage carrier mounted rear seats

For rear seats designed to be fitted to a luggage carrier, the part of the fixture resembling the carrier platform shall be horizontal.

7.3 Test equipment for strength and durability

7.3.1 Loading pad

The test equipment is a rigid circular loading pad, 60 mm in diameter, having a convex loading surface of (300 ± 10) mm spherical radius covered in a (2 ± 0,1) mm layer of material with a hardness of 55° Shore A (see Figure 5). The loading pad is fitted with a spherical joint which allows it to align with the footrest or the backrest.

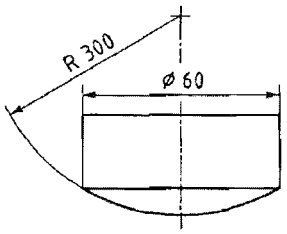


Figure 5 — Loading pad

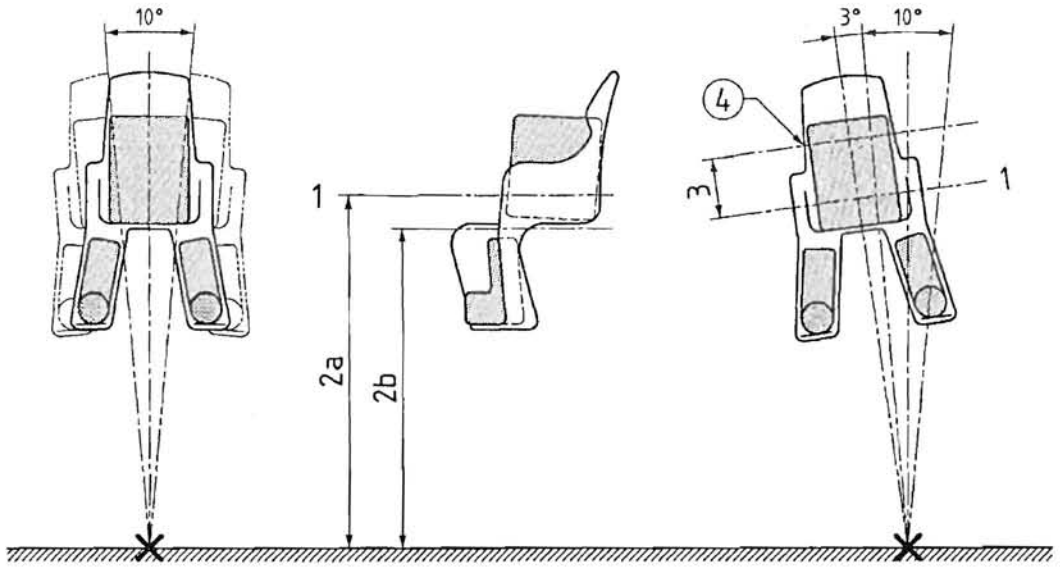
7.3.2 Vibration apparatus

Mount the fixture on an apparatus, which is capable of providing the motion described in 7.4.4 and/or 7.4.5.

Load the seat and its footrests with test bags, as described in Annex B, arranged according to Figure 6, to represent the weight of a child.

Secure these test bags with the straps provided with the seat. Additional straps, belts and/or adhesive tape, padding material, all of negligible weight as may be used to prevent excess free movement of the test bags during the tests.

NOTE If the natural vibration frequency of the seat corresponds to either of the frequencies imposed during the tests in 7.4.4 and 7.4.5, so that resonance occurs, the frequency can be reduced by 10 % and the amplitude increased by 23 %.



Key

1 Reference plane
2a Distance below reference plane to lateral swing axis
2b Distance below carrier platform to the lateral swing axis
3 Height of the measuring points above the reference plane
4 Measuring points

Figure 6 — Vibration apparatus

7.3.3 Limiting device

Examples of limiting devices are a micro-switch or infrared sensor to detect excess movement of the seat during the transverse rigidity test.

7.4 Test methodology for strength and durability

For the testing of strength and durability all seats shall be subjected to 7.4.1 high temperature test, 7.4.2 low temperature test and low temperature drop test, 7.4.3 footrest strength test, 7.4.4 fatigue test, 7.4.5 transverse rigidity test, 7.4.6 backrest dynamic test :

7.4.1 High temperature test

Store the seat for (4 ± 1) h in a chamber at a temperature of (65 ± 5) °C. Remove the seat from the chamber.

7.4.2 Low temperature test and low temperature drop test

Store the seat for (4 ± 1) h in a chamber at a temperature of (– 20 ± 1) °C. Remove the seat from the chamber and within 15 s drop the seat from a height of 1 m onto a smooth, level, concrete floor. Drop the seat in such a way that the side hits the floor.

7.4.3 Footrest strength test

Mount the seat according to 7.2 and apply a force equal to the maximum weight of the child that the seat is designed to carry vertically downwards onto the centre of one of the footrests for 1 min. Apply the force using the test equipment of 7.3.1.

7.4.4 Fatigue tests

7.4.4.1 Preparation for fatigue test, mounting method

Mount the seat according to 7.2 on the vibration apparatus of 7.3.2.

7.4.4.2 Vertical dynamic test

Vibrate the seat with a sinusoidal motion in a vertical direction at 7 Hz with an amplitude of 5 mm (total stroke of 10 mm) for 50 000 cycles.

7.4.4.3 Lateral dynamic test

Vibrate the seat from side to side with a sinusoidal motion about a horizontal axis representing the line of contact between the cycle tyres and the road positioned at a distance 2a or 2b below the seat (see Table 3 and Figure 6). Set the arc of travel at 10° and continue the test for 50 000 cycles at a frequency of 1 Hz.

Table 3 — Distance below seat of lateral swing axis

Class of seat	Mounting	Reference	2a	2b
A15, A22	Luggage carrier	Carrier platform	–	750
A15, A22	Cycle frame	Reference plane	810	–
C15	Cycle frame	Reference plane	900	–
C15	Quill	Reference plane	910	–

7.4.5 Transverse rigidity test

7.4.5.1 Requirements for transverse rigidity

During testing in accordance with 7.4.5.2, the measuring points on the seat (see 4 in Figure 6) shall not swing beyond the points set by the limiting devices (see 7.3.3).

7.4.5.2 Test method for transverse rigidity test

This test shall be performed at the end of the lateral dynamic test described in 7.4.4.3 using the same test conditions. Ensure that the test bags are tightly secured to prevent them hitting the sides of the seat during the oscillations.

Determine two measuring points at the outer most edges of the seat at the following height above the reference plane (see 3 in Figure 6) :

— 100 mm for class A15 and C15 seats ;

— 150 mm for class A22.

Tilt the seat gradually to one side, to the limit of the arc set in 7.4.4.3 and then tilt another (3 + 0,1/– 0)° beyond this position (see Figure 6). Set a limiting device against the measuring points so as to detect excess movement of the seat during the transverse rigidity test. Repeat for the other side.

Repeat the conditions of the lateral dynamic test in 7.4.4.3 for a total of 100 cycles.

7.4.6 Backrest dynamic test

7.4.6.1 Preparation for backrest dynamic test, mounting method

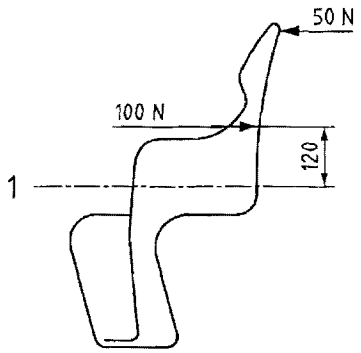
Mount the seat according to 7.2, but for this test it is not necessary for the orientation of the seat to be horizontal.

7.4.6.2 Backrest dynamic test for all seats

Apply a repeated rearward force (parallel to the reference plane) of 100 N to a point on the backrest 120 mm above the seat reference plane at any frequency below 1 Hz for 10 000 cycles or until failure, whichever occurs first (see Figure 7). The force shall be applied using the test equipment of 7.3.1. The force shall be applied to the constructive parts.

7.4.6.3 Backrest dynamic test for rear seats

Additionally rear seats shall have a repeated forward force (parallel to the reference plane) of 50 N using the test equipment of 7.3.1 applied to the top of the backrest (see Figure 7) at any frequency below 1 Hz for 10 000 cycles or until failure, whichever occurs first.



Key

1 Reference plane

Figure 7 — Backrest dynamic tests

8 Attachment of the seat to the cycle

8.1 General requirements for all seats

To avoid inadvertent release of the seat from the cycle the locking or attachment mechanism shall require :

a) the use of a tool (e.g. spanner or screwdriver) for at least one of the locking or attachment mechanism ; or

b) two independent locking mechanisms that are operated simultaneously ; or

c) two or more automatically engaging locking mechanisms that cannot be simultaneously released by one unintentional action ; or

d) two consecutive actions, the first of which must be maintained while the second is carried out.

Examples of methods of attachment of the seat to the cycle are: a spring force; bolts and lock nuts; bolts and nuts with spring-washers.

8.2 Additional requirements and test method for rear seats attached to luggage carriers

8.2.1 Requirements for rear seats attached to luggage carriers

Rear seats that are fixed to the luggage carrier shall have an additional fastening, not removable from the seat, which shall be attached to another part of the cycle and limits rearward movement of the seat. When tested in accordance with 8.2.2 the rearward displacement shall not be greater than 50 mm and angular displacement shall not be greater than 15° in rearward direction.

Seats designed to be attached to a luggage carrier shall fit carriers with a width from 120 mm to 175 mm.

Seats may alternatively be designed for special luggage carriers of different width, in which case these carriers shall be specified as per subclause 13.2.1 and a suitable carrier, chosen by the tester, shall be supplied for testing.

8.2.2 Test method for rear seats attached to luggage carriers

Where additional fastening is provided with the seat it shall withstand a tensile force of twice the maximum allowable weight of the child plus the weight of the seat.

8.3 Additional requirements for front seats

Front seats shall have at least one attachment point to the cycle, which shall not be the handlebar or the extension of the handlebar stem.

9 Restraint system

9.1 General

The seat shall be provided with adjustable belts, or equivalent close-fitting retention devices, designed to keep the child sitting in a safe position in the seat.

All seats shall restrain the child either :

— at the shoulders and crotch ; or

— at the shoulders and waist if the seat has a between-legs hump or pommel of minimum height 20 mm above the reference plane ; or

— at the shoulders, waist and crotch.

All belts that are provided to retain the child in the seat shall be at least 20 mm wide.

9.2 Effectiveness of restraint system, roll-over test

9.2.1 Requirements for effectiveness of restraint system, roll-over test

When tested in accordance with 9.2.3, the test dummy 9.2.2, shall not completely fall out of the restraint system. It shall be noted that any partial movement of the test dummy is not considered a failure.

9.2.2 Test dummy for roll-over test

Test dummy made of a rigid material with a smooth finish and a total mass of (9 ± 0,1) kg, see Figure 8.

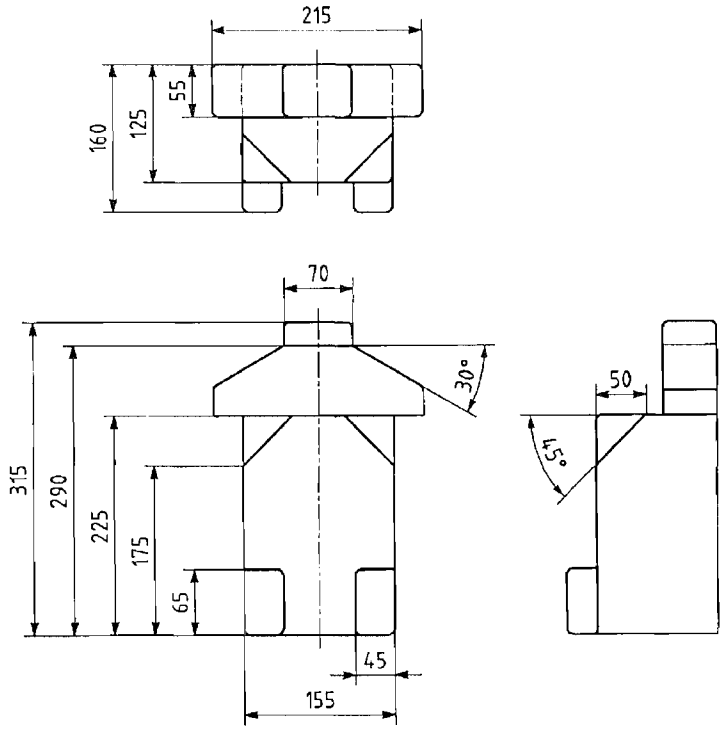


Figure 8 — Test dummy

9.2.3 Test method for effectiveness of restraint system, roll-over test

Initially place the test dummy centrally on the seat unit with the 225 mm axis against the backrest and attach the restraint system in accordance with the manufacturer's instructions. Fasten any waist restraints around the torso section of the test dummy so that any slackness is removed and the waist is positioned above the leg stumps. If the crotch restraint is adjustable, adjust it so that any slackness is removed. Where shoulder straps are fitted, place a 30 mm cuboid spacer block, made of a hard smooth material, on each shoulder of the test dummy. Adjust each shoulder strap so that any slackness is removed. Remove the spacers.

A means of rotation is used to rotate the product smoothly through 360° at a speed of (4 ± 0,5) RPM in a forward and reverse direction.

Rotate the seat through 360° in a forward direction. If necessary reposition the test dummy to its initial position without altering the adjusters on the restraint system.

Rotate the seat through 360° in the reverse direction. If necessary reposition the test dummy to its initial position without altering the adjusters on the restraint system.

Repeat the forward and reverse rotation cycles for two more sequences, giving a total of 3 forward and 3 reverse rotations. If necessary, after each rotation, reposition the test dummy to its initial position without altering the adjusters to the restraint system.

9.3 Attachment of restraint system to the seat

9.3.1 Requirements for the attachment of the restraint system

When tested in accordance with 9.3.2 the attachment of the restraint system shall not break, deform, work loose or become torn or displaced.

9.3.2 Test method for the attachment of the restraint system to the seat

Gradually apply (150 ± 2) N to each point of attachment of the restraint system in the most onerous direction. Maintain this force for 1 min.

If more than one strap is attached at the same position the (150 ± 2) N shall be applied to each strap simultaneously.

9.4 Strength of fasteners

9.4.1 Requirements for the strength of the fasteners

When tested in accordance with 9.4.2 in any orientation, fasteners shall not be released or have suffered damage, which impairs their normal operation and function.

9.4.2 Test method for the strength of the fastener

A tensile force of 200 N shall be gradually applied to the straps at either side of the fastener. Maintain this force for 1 min.

9.5 Micro-slip and strength of adjusting devices

9.5.1 Requirements for the micro-slip and strength of the adjusting devices

When tested in accordance with 9.5.2 the slip in the belt adjusting devices shall not exceed 25 mm for each such device. The closed restraint system shall withstand a horizontal force equal to 1,5 × the maximum of the weight/capacity range for the seat (see Table 1) during 1 min.

9.5.2 Test method for the micro-slip and strength test of the adjusting devices

The components or devices to be subjected to the micro-slip test shall be kept for a minimum of 24 h before testing in an atmosphere having a temperature of (20 ± 5) °C and a relative humidity of (65 ± 5) %.

The test shall be carried out at a temperature between 15 °C and 30 °C.

The free end of the strap shall be arranged in the same configuration as when the device is in use on the cycle and shall not be attached to any other part (see Figure 9).

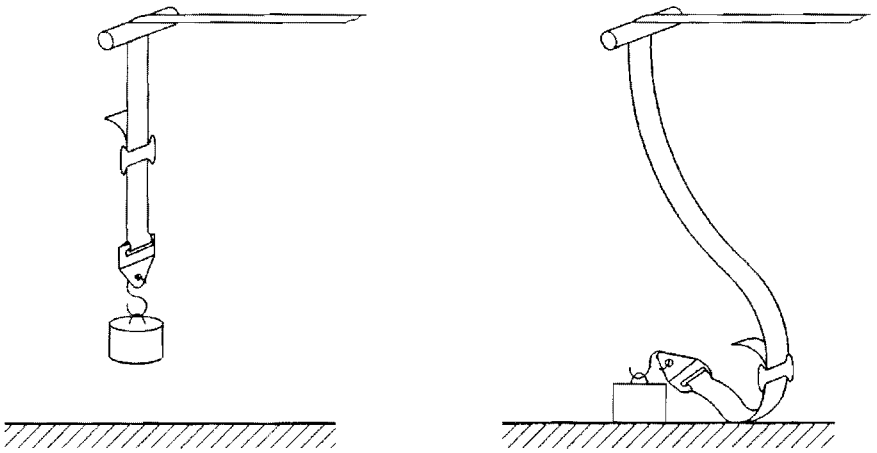


Figure 9 — Micro-slip test

The adjusting device shall be placed on a vertical piece of strap one end of which bears a 5 kg load (guided in a manner which prevents the load from swinging and the strap from twisting). The free end of the strap from the adjusting device shall be mounted vertically upwards or downwards as it is on the seat. The other end shall pass over a deflector roller with its horizontal axis parallel to the plane of the section of the strap supporting the load, the section passing over the roller being horizontal.

The device being tested shall be arranged in such a way that its centre, in the highest position to which it can be raised, is (300 ± 5) mm from a support table and the load of 5 kg shall be 100 mm from that support table.

Twenty pre-test cycles shall be completed and 1 000 cycles shall be completed at a frequency of 0,5 Hz, the total amplitude being (300 ± 20). Where there is insufficient strap to provide this amplitude, the test may be applied over a shorter length subject to a minimum of 200 mm. The 5 kg load shall be applied only during the time corresponding to a shift of (100 ± 20) mm for each half period. Micro-slip shall be measured from the position at the end of the 20 pre-test cycles.

9.6 Closure of restraint system

9.6.1 Requirements and test for closure of restraint system

If not fully closed the closure of the restraint system shall disengage when a force of not more than 10 N is applied in the direction of the engagement.

9.7 Child-proof retention

9.7.1 Requirements and test for child proof retention

The enclosure of any belt or restraint device shall be of a childproof safety-quick-release type, requiring either two independent actions, the first of which must be maintained while the second is carried out or a force of at least 40 N to open the enclosure, with a maximum of 60 N.

10 Foot guarding and retention

10.1 Methodology of foot guarding

The seat shall be designed so that contact between the child's feet and cycle wheels is prevented. This contact shall be prevented either by design or by the provision of additional guards.

With the seat mounted on a cycle without additional guarding it shall not be possible for a child to come into contact with the wheel of the cycle. This is assessed by the wheel contact test (see 10.1.1), which is a performance test unaffected by the design of the guard. As it is not always possible to stop the child contacting the wheel with only the integral guard additional guarding is allowed when the wheel contact test shows that it is possible for a child to come into contact with the wheel of the cycle. The size of the integral guard shall comply with the requirements of 10.1.2 and additional guard shall be provided.

Integral and additional guards shall comply with the requirements of 10.1.3.

10.1.1 Wheel contact test

The potential for interference between feet and cycle wheels shall be checked.

10.1.1.1 Requirements for all seats, wheel contact test

The test in 10.1.1.2 shall be performed without fitting any additional guarding. When tested in accordance with 10.1.1.2, without fitting any additional guarding, check whether the test equipment, Annex A, contacts the wheel.

If no contact with the wheel is made the integral guard is acceptable and is exempt from the requirements of 10.1.2.

If contact is made with the cycle wheel any additional guarding that is always with the seat shall be fitted and the test shall be repeated in accordance with 10.1.1.2 and the test equipment, Annex A, shall not contact the cycle wheel.

10.1.1.2 Test method for wheel contact test

Mount the seat upon a cycle. Leave any foot retention straps or similar devices disconnected. Place the measuring instrument in the seat as described in 6.1.1.2.

Check the possibility of contact with the wheel using the leg and foot component of the measuring instrument. Position this component at the end of the thigh scale at point E (as when measuring footrest depth) and twist and rotate it to any orientation, while hinging the foot part between 30° upwards and 90° downwards relative to the normal orientation of a foot: perpendicular to the leg.

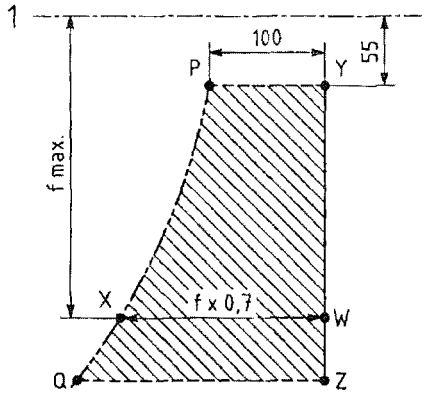
During the test, the thigh scale may be adjusted on any length h between the appropriate minimum and maximum values given in Table 2, and the distance point E to F of Annex A may be set to any value up to a maximum of i. The front section of the foot part shall be adjusted to length j.

10.1.2 Integral foot guards

If additional guards are required in order to comply with 10.1.1. the requirements of 10.1.2.1 or 10.1.2.2 shall apply.

10.1.2.1 Requirements for integral foot guards, rear seats

Rear seats shall be equipped with integral guards adjacent to each footrest. Each of these integral guards shall cover a minimum area as indicated by the hatched area in Figure 10.



Key

Line P-Q is the path described by the rear corner of the footrest as it is adjusted from its lowest to its highest position and extended in a straight line from its highest position to within 55 mm of the reference plane

Point Y is 100 mm in front of point P measured parallel to the reference plane

Point X is at a position on line P-Q at a distance equal to the maximum value of f in Table 2

Point W is a distance 70 % of f maximum forward from point X and parallel to the reference plane

Line Y-Z is a straight line through point W to the same distance below the reference plane as point Q

Figure 10 —Integral guards

10.1.2.2 Requirements for integral foot guards, front seats

Front seats shall be equipped with integral guards adjacent to each footrest either according to the requirements for rear seats or covering a minimum area measured 100 mm above the footrest in each of its possible positions.

10.1.3 Strength and durability of the foot guarding

10.1.3.1 Requirements for strength and durability of foot guarding

All parts of the seat, including any additional parts, with which a child's foot may come into contact, shall be capable of withstanding an impact energy of 5 joules. After testing in accordance with 10.1.3.2 :

— no part of the seat shall be broken and there shall be no visible cracks ;

— any permanent displacement shall be less than 15 mm.

10.1.3.2 Test method for strength and durability of foot guarding, dynamic test

Mount the seat on a suitable bicycle. Carry out an impact on the foot guarding using a striker having a hemispherical striking area with 25 mm radius and a hardness of (55 ± 3)° Shore A . The impact energy is 5 joules ± 5 %. The impact point shall be determined by assessing with the measuring instrument (see Annex A) where a foot may strike the guard.

10.2 Foot retention

10.2.1 Requirements for footrests

The seat shall be provided with footrests. Unless the design of the seat is such the child's legs are enclosed, foot retention straps shall be provided. Any such foot retention straps shall be at least 15 mm wide and adjustable.

10.2.2 Requirements for foot retention straps

The foot retention straps shall withstand a pulling force of 100 N applied at an angle of 45° between upward and forward directions.

11 Requirements for materials

11.1 Chemical hazards

The seat shall comply with the requirements of EN 71-3.

Nickel shall not be used in parts of the seat which may come into direct contact with the skin, if the rate of nickel release from these parts is greater than 0,5 mg/cm^2/week when tested in accordance with EN 1811.

11.2 Corrosion

11.2.1 Requirements for protection against corrosion

All metal parts shall be protected against corrosion.

After testing in accordance with 11.2.2, no part of the seat shall exhibit corrosion greater than that indicated in ISO 4628-3 by Ri2 in the case of ferrous metal parts (either painted or plated) or Ri3 in the case of non-ferrous or Zn plated parts (those tending to produce "white" corrosion).

NOTE It is recommended that the seating area and footrests are self-draining. Any non-removable padding should be either of closed cell material or wholly encased in a waterproof covering material.

11.2.2 Test method for protection against corrosion, salt spray test

Subject the seat to a 48 h neutral salt spray test according to ISO 9227.

11.3 Decay and insect attack

Wood, wood based materials and materials of vegetable origin shall be free from decay and insect attack.

12 Marking

12.1 General requirements for marking

The seat shall be marked with the following information, positioned in a location that is visible when assembled :

a) maximum weight of the child that may be transported (in accordance with the classification of Clause 4) ;

b) name or trademark of the manufacturer ;

c) year and month of manufacturer ;

d) number of this document ; EN 14344 ;

e) plastic parts (excepting textile fabrics) that have two perpendicular overall dimensions greater than 15 mm shall also be marked with a recognized material identification symbol, for the purposes of recycling. Reference shall be made to the relevant parts of EN ISO 1043 ;

f) all marking shall withstand the test as described in 12.4.

12.2 Marking requirements for rear seats

12.2.1 Centre of gravity mark

Rear seats shall be durably marked with the symbol as shown in Figure 11, as referred to in 14.2.5, to enable the user to locate the centre of gravity of the seat with a child sat in the seat. This centre of gravity mark shall be clearly visible on the outside of the seat.

NOTE This is the projection of the centre of gravity mark on the seat.

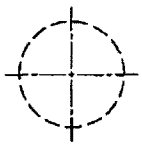


Figure 11 — Centre of gravity mark

12.3 Marking requirements for rear seats attached to luggage carriers

Rear seats fitted on luggage carriers shall have the following warning :

WARNING — Additional security devices shall always be fastened

12.4 Marking, test method

The marking shall be rubbed by hand for 20 s with a piece of cloth soaked in water. After the test marking shall remain easily legible. It shall not be possible to remove any labels nor shall any label show any sign of curling.

13 Purchase information

13.1 General requirements for purchase information

Purchase information shall be visible at the point of sale either on the outside of the packaging or on a label clearly visible and attached to the seat so that it can be consulted without any unpacking.

The seat shall be supplied with information for mounting onto the cycle and for its safe use. This information shall be presented in the language(s) of the country where the seat will be sold.

13.2 Specific purchase information

a) Seats shall be supplied with clear information on the maximum weight of the child. Additionally the types of cycle with which the seat may or may not be used safely (with particular regard to foot protection) shall be indicated. For frame mounted seats the frame diameter and the type of cross-section shall be indicated.

b) Any required tools that are not provided with the seat shall be indicated.

13.2.1 Rear seats for attachments to a luggage carrier

An additional warning shall be supplied with rear seats that are designed to be attached to a luggage carrier of load class 25 kg, which indicates that a suitable luggage carrier according to ISO 11243 is required. This warning shall be as follows :

WARNING — For safety reasons this seat shall only be fitted to luggage carriers conforming to ISO 11243.

13.2.2 Front seats

An additional warning shall be supplied with front seats.

WARNING — Front seats reduce the manoeuvrability of the bicycle

14 Instructions for use

14.1 General

The following warnings, instructions, information, and advice shall be supplied with the seat. In the instructions a clear separation shall be made between mounting instructions and instructions for use :

14.2 Specific instructions for installation and use

14.2.1 Installation

a) Information on how and where the seat and accessories are to be attached to the cycle, including how to tighten the fasteners and a recommendation to check the security of fasteners frequently ;

b) instructions only to fit the seat to a suitable cycle, which is of an appropriate type for the attachment of such additional loads, including advice to check any information supplied with the cycle, or seek the advice of its manufacturer or supplier ;

c) instructions regarding the correct adjustment of the seat and its component parts, where it is possible, for optimum comfort and safety of the child: including an instruction to ensure that the seat does not slope forwards, so that the child does not tend to slide out of it, with a recommendation that the backrest should slope backwards slightly ;

d) instruction to check whether all parts of the bike function correctly with the seat mounted.

14.2.2 Use

a) Advice to the user to check whether there are any laws specific to the carrying of children in seats attached to cycles that apply in the country in which the seat is used ;

b) instruction not to carry a child that is too young to sit safely in the seat as well as advice regarding the minimum age or size of the child for which the seat is designed. Carry only children that are able to sit unaided for a longer period of time, at least as long as the intended cycle journey ;

c) an instruction to ensure initially and to re-check from time to time that the child's weight and size do not exceed the maximum capacity of the seat ;

d) instruction to ensure that it is not possible for any part of the child's body or clothing to come into contact with any moving part of the seat or cycle and to re-check as the child grows. This instruction shall refer to the particular dangers of entrapment of feet in the wheel and of the fingers in brake mechanisms and sprung saddles ;

e) instruction to ensure that there are no sharp objects which the child can touch, e.g. frayed cables ;

f) instruction to ensure that the restraint system is not loose or able to become trapped in any moving parts particularly the wheels, including when the cycle is ridden without a child in the seat ;

g) instructions always to use the restraint system, ensuring the child is restrained in the seat ;

h) advice that children in seats need to be more warmly clothed than riders of cycles and should be protected from rain ;

i) advice that children in seats should be fitted with a suitable safety helmet ;

j) instruction to check any excessive temperature (e.g. due to direct exposure to sun) of the seat before placing the child in it ;

k) when transporting the bicycle by car (outside the car) remove the seat. Air turbulence might damage the seat or loosen its fastenings to the cycle, which could result in an accident.

14.2.3 Warnings

a) WARNING : Do not attach additional luggage to the child carrier

This warning shall include a recommendation to carry such loads at the opposite end of the cycle, e.g. in the case of a rear seat, to use a front luggage carrier.

b) WARNING : Do not modify the seat

c) WARNING : The cycle may behave differently with a child in the seat

Particularly with regard to balance, steering and braking.

d) WARNING : Never leave the cycle parked with a child in the seat unattended

e) WARNING : Do not use the seat if any part is broken

14.2.4 Maintenance

a) Instructions for cleaning shall be given

b) Information on how to replace any broken or damaged parts

14.2.5 Instructions for use for rear seats

Additional instructions shall be supplied with rear seats as follows :

a) Instruction to identify the centre of gravity mark and to mount the seats as far forward as practicable : preferably with this mark in front of the rear wheel axis, but on no account more than a stated distance behind a point vertically above the rear wheel axle. This stated distance is to be not more than 100 mm in the case of class A22 seats, but may be up to 150 mm for class A15

b) Instruction to cover any exposed rear saddle springs

14.2.6 Instructions for use for rear seats for attachment to a luggage carrier

Additional instructions shall be supplied with rear seats that are designed to be attached to a luggage carrier as follows :

a) Instruction to ensure that the load capacity of the carrier is not exceeded. This instruction shall refer to the appropriate load class designation(s) of ISO 11243

b) Rear seats fitted on luggage carriers shall have a warning notice instructing the user to fasten the additional fastening, required by 8.2.1, at all times

14.2.7 Instructions for use for front seats

Additional instructions shall be supplied with front seats as follows :

a) Warning that the movability of the handle bar may be reduced by the seat

b) Instruction to change the type of handlebar when the reduced steering angle to each side is less than 45°

Annex A
(normative)

Seat measuring instrument

A measuring instrument shall be constructed according to the dimensions given in Figure A.1. All dimensions are ± 0,5 mm unless otherwise stated.

The basis of this measuring instrument is a flat plate, the upper surface of which defines the horizontal reference plane of the seat. The rear extremity of this plate, at point A, shall be curved with a 20 mm radius and the plate shall be between 3 mm and 5 mm thick in this area. The rest of the periphery of this plate shall not project more than 20 mm beyond the studs described below.

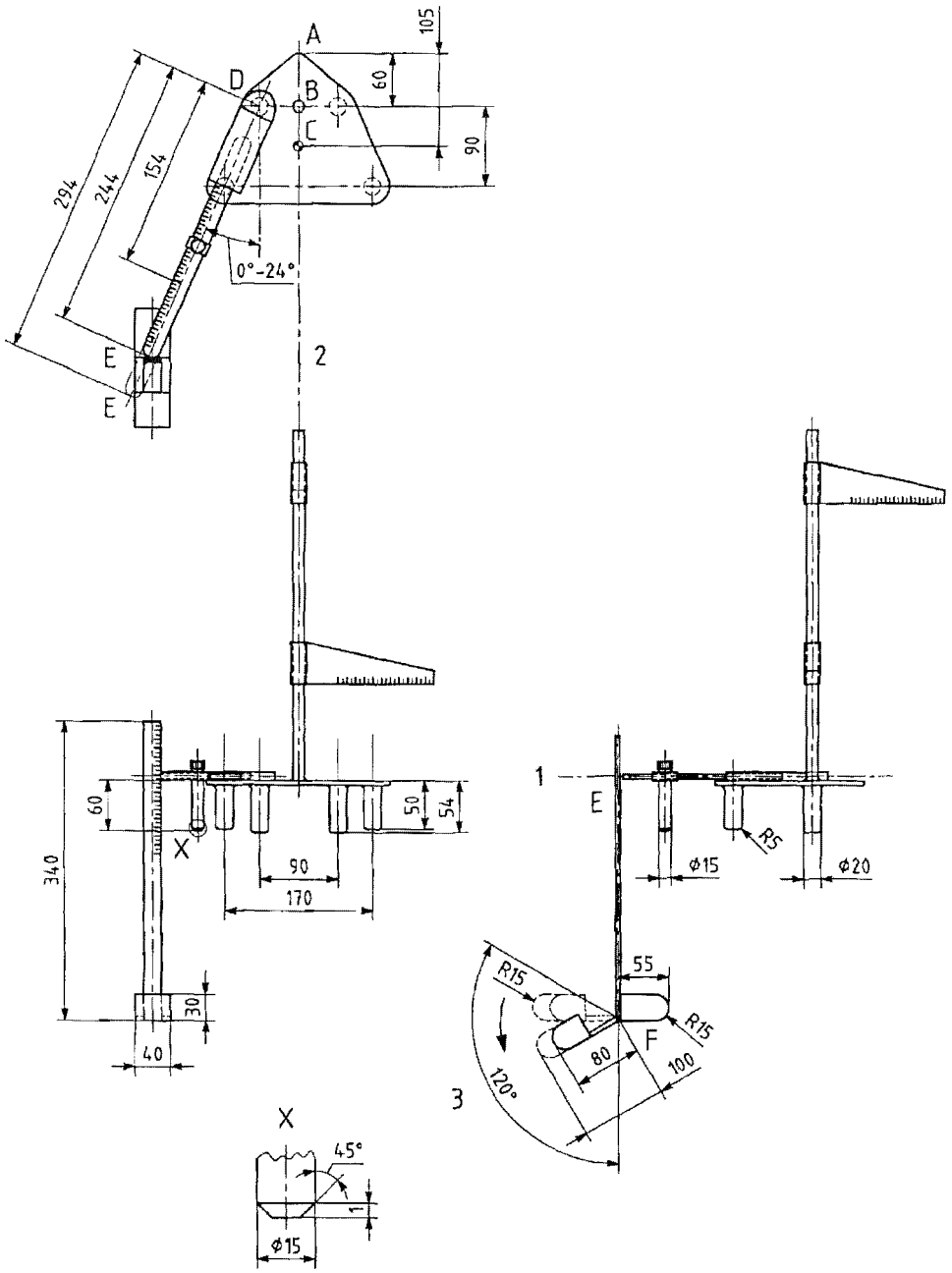
At point B, 60 mm in front of A, the measuring instrument may be provided with a vertical measuring pillar (this feature is optional) to facilitate the measurement of dimensions c and d in Table 2. Point C is 105 mm in front of A. The underside of this plate shall be equipped with four cylindrical studs, 20 mm in diameter, with flat ends radiused at 5 mm round the edges. The rear pair of studs shall project 54 mm below the reference plane and be set 90 mm apart, equi-spaced each side of point B. The front pair of studs shall project 50 mm below the reference plane and be set 170 mm apart, 90 mm in front of the rear pair.

The centre-line of the thigh scale referred to in Clause 11 shall pass through the axes of the front and rear studs (on one side or the other of the measuring instrument) which sets it between 0° and 24° relative to centre-line of the measuring instrument. Provision shall be made for this scale to be extended, retracted or interchanged so that its tip, the knee point E, can be set to the distances specified in Table 2 h from point D. The intersection of the thigh scale centre-line with a perpendicular dropped onto the measuring instrument centre-line at A. The underside of this scale shall lie on the reference plane and its tip shall be chamfered at 45° and radiused at 5 mm as shown. It is suggested that a reference point is taken at the front stud, as shown in the drawing: the distance between the stud and D being 164,1 mm. This can then be made from a scale with the first 164 mm cut off (so that point E is by the 164 mm graduation) so that its extension may simply be read at this reference point.

The thigh scale shall be provided with a 15 mm diameter pillar that can be slid along it and projects 60 mm downwards from its centre-line and the reference plane. If mounted on a 15 mm wide slider and if measurements can be taken to a reference point at the front stud, as suggested and illustrated above, then, if the distance between the slider and this reference point is z mm, the seat length $h = 150 + 0{,}914\ z$.

The foot and leg component may also conveniently be based upon a graduated scale, 340 mm long as shown, which can then be placed centrally against E as required. The foot part shall be 40 mm wide and 30 mm thick, radiused at 15 mm vertically at toe and heel. The heel section shall project from the rear of the leg scale by 55 mm. The toe section shall be adjustable, or be provided with two interchangeable parts, to project forward from the rear of the leg scale by 80 mm and/or 100 mm. This section shall also be hinged about a transverse axis at or less than 5 mm above the lower extremity of the leg scale, so that its lower surface may align with the back of the leg scale or swing upwards through 120° relative to this position. When the toe section is at 90°, this component shall present a flat lower surface, i.e. the hinge shall not protrude.

Dimensions in millimetres



Key

1 Reference plane
2 Central plane
3 Rotate 120°

Figure A.1 — Child seat measuring instrument

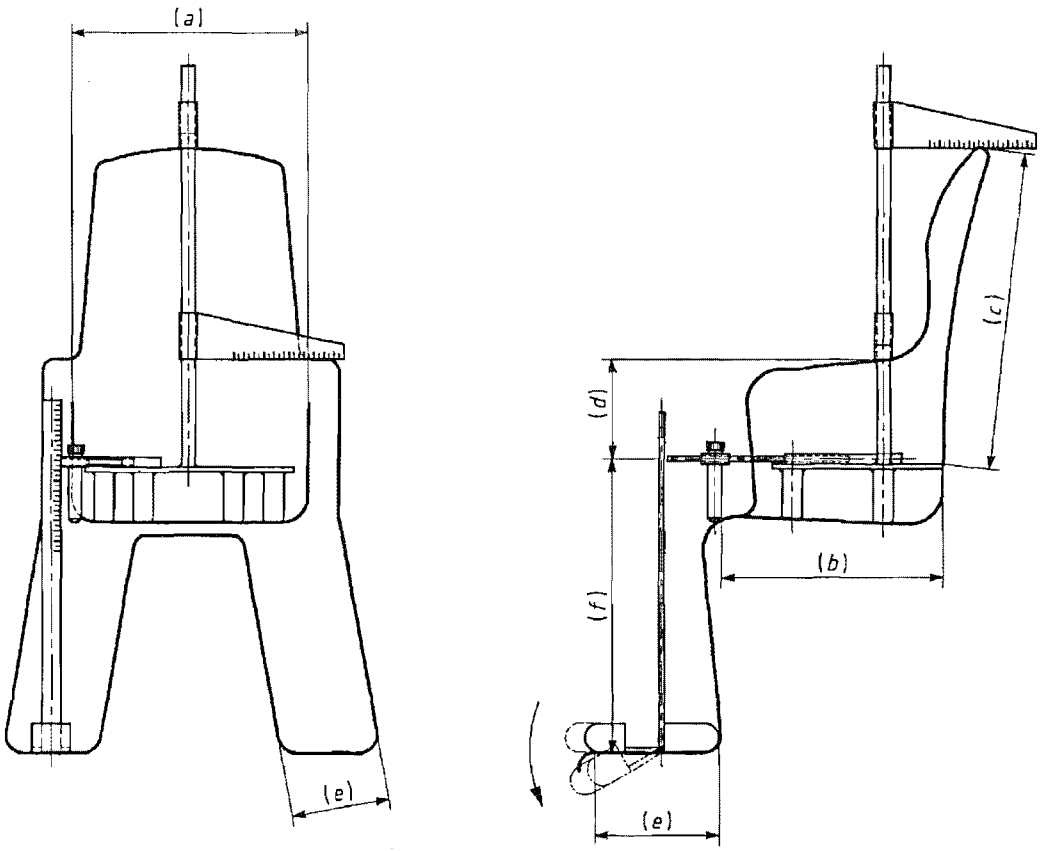


Figure A.2 — Measuring instrument in child seat

Annex B
(normative)

Test bags

These bags shall be constructed from a material that is strong enough to prevent slump to the contents, so that they still comply with the specified dimensions at the end of the tests, but are sufficiently flexible to conform to the parts of the seat, which support them. They shall be completely filled to the specified mass with any suitable inert, granular, homogenous material (not necessary sand). The body bag (B) shall be a cylinder of diameter d_1, length l_1 and mass m_1, and the two foot bags (F) shall each be L-shaped, 90° bent cylinders of diameter d_2, length l_2, height h_2 and mass m_2. Values for theses dimensions and masses are given in Table B.1. Mark the position of the seat on the fixture.

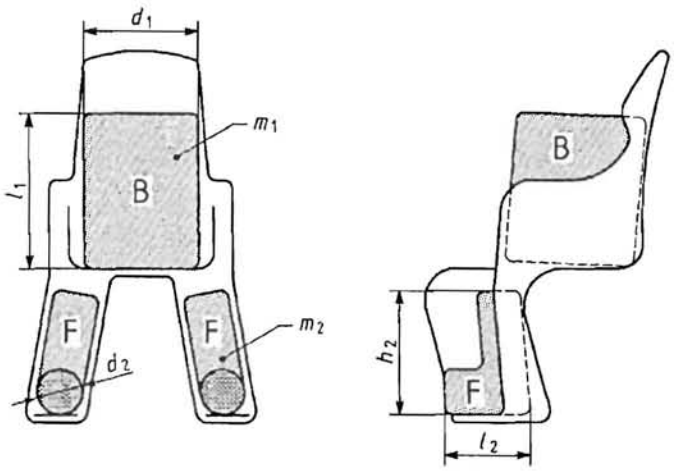


Figure B.1 — Arrangement of test bags in seat

Table B.1 — Test bag dimensions and masses

Class of seat	Body bag (B)			Foot bag (F)			
	d_1 mm	l_1 mm	m_1 kg	d_2 mm	l_2 mm	h_2 mm	m_2 kg
A15, C15	175 ± 40	225 ± 50	12 ± 0,1	70 ± 20	140 ± 20	175 ± 40	2 ± 0,1
A22	200 ± 40	260 ± 50	18 ± 0,1	80 ± 20	160 ± 30	200 ± 40	3 ± 0,1

Annex C
(informative)

Rationale

C.1 Rationale

C.1.1 Background and rationale

For most of the requirements the hazard which is addressed is explained below together with a background and/or rationale.

C.1.2 Scope (see Clause 1)

A child must be capable of sitting unaided for at least as long as the intended cycle journey. When the child is capable of sitting unaided for a longer period of time, it means the child is able to support its head, which is an indication that the structures in the neck are strong enough.

C.1.3 Classification (see 4)

Front seats in front of the handlebar are not permitted. Rearward facing seats in front of the handlebar need to have a backrest that reaches above the shoulders in order to prevent the child from falling out backwards when the cyclist suddenly brakes. But a high backrest prevents that the driver has no clear sight anymore and a hazardous situation is created. Forward facing seats in front of the handlebar should also have a high backrest to give enough support to the child. The same sight problem occurs as described above. Experts feel that in order to be safe the seat should not be put in front of the handle bar.

In case of a seat with a low backrest between handlebar and driver, the driver gives the support to the child.

C.1.4 Dimension (see 6.1)

Rationale for the dimensions in Table 2, most are anthropometric based a few are hazard based.

All seats can be used for a child that can sit unaided. This will be approximately around 9 months. The maximum a child can use a seat of category A15 or C15 is when the child weighs up to 15 kg, this is approximately 3 years.

Seats in the category A22 can be used for a child up to 22 kg, this is approximately 5 years. This seat can also be used from the age of 9 months, but most of the time it will be used by children from 2 years and up.

Seat width

The seat width is most of all important for comfort. Children must be able to wear thick clothes while sitting in the seat. The anthropometric data for hip breadth in sitting position is for children of 3 years 191 mm for children of 5 years is this 220 mm.

Seat length

The seat length is important for comfort and safety. The smallest children must be able to bend their knees, otherwise they will not have good support for their feet. Older children must have good support for their upper legs. The anthropometric data for small children are the most important for safety.

The smallest anthropometric data available for the length from buttock to popliteal in the sitting position is for children aged 9 months 168 mm and for children aged 24 months 219 mm.

Height of backrest

The height of the backrest is important for the limitation of rearward movement of the head and forward movement of the torso and support. To prevent forward movement of the torso the seat should be higher than the shoulders so the restraint system can be attached above the shoulders. To prevent backward movement of the head the backrest has to give a height approximately equal to the child's eye height. Eye height data for children are as follows :

3 years 450 mm

5 years 500 mm

Due to the measuring instrument and its reference plane, the measurements from Table 2 line c must be increased with 55 mm to compare them with the anthropometric data given above.

For the front seat C15 a lower backrest may be permitted because the bicycle driver can function as backrest. And the driver must be able to have a clear view. The minimum height of the backrest for C15 seats should be minimum the height of the centre of gravity when the child is sitting.

The height of the centre of gravity in the sitting position measured from the buttocks is :

24 – 36 months : = 214 mm

Minimum height of seat side

The child must be protected for falling out of the seat sideways and for comfort it must be able to use the seat side to lean their lower arm on the side.

There is a difference in A15 and C15 because the driver can see what the child is doing when it sits in front of him in a C15 seat.

The smallest anthropometric data available is for a 12 months old child. The height from the sitting surface to the elbow in the sitting position is 145 mm. For a 2 year old child this is 152 mm. Due to the measuring instrument and its reference plane, the measurements from Table 2 line d must be increased with 55 mm to compare them with the anthropometric data given above.

Footrest width x length

There must be a good support for the feet to prevent the feet sliding off and getting stuck between the spokes of the wheels. For rear seats the footrest cannot be to long otherwise the heel of the cyclist will hit the footrest whilst cycling. A front seat attached to the frame of the cycle with long footrests can influence the steering.

A footrest of approximately 2/3 of the foot gives good support. The foot length of a 3 year old is 155 mm and of a 5 year old is 175 mm.

The foot of a 48 months old child is 60 mm breadth. The width of the footrest should be enough for a shoe and accessibility of the retention straps.

C.1.5 Edges, corners and projections (see 6.2)

Seats are to be designed such that components with which a child and rider can come into contact may not cause cuts, lacerations and abrasions to the skin. It should either be ensured that the surface is free from burrs, sharp edges and pointed portions or protective caps should be placed over such protrusions.

C.1.6 Entrapment (see 6.3)

Entrapment of fingers occurs when a child's finger becomes stuck in openings and gaps which may cause the flow of blood to the finger to be reduced. Additionally the weight or movement of the child may cause dislocation or displacement of a finger joint. The hazard can be avoided by limiting the size of openings and gaps.

The zone that is excluded is needed for the installation of the seat to the cycle.

C.1.7 Small parts (see 6.4)

Choking is potentially a serious hazard to young children. If air cannot pass into a child's lungs irreversible brain damage can occur. Choking occurs when the child's internal airways are blocked and its breathing is impeded. If a child swallows small objects they can enter the airways and the trachea.

Children between the age of 0 and 36 months spend time exploring their environment. This exploration includes them twisting and pulling small objects/parts with their fingers, hands or teeth. They may therefore remove components and put them in their mouths. It is important therefore that any components or parts of components are sufficiently large not to cause a choking hazard by blocking the throat if placed in the child's mouth. Components not designed to be removed should be firmly attached to the seat. Components should be tested to ensure that they are firmly attached or that if they are not firmly attached do not break into pieces sufficiently small to cause a choking hazard.

The small parts cylinder used for testing is designed to replicate a child's throat.

C.1.8 Decals (see 6.5)

Suffocation is potentially a serious hazard to young children. If air cannot pass into a child's lungs irreversible brain damage can occur.

Suffocation can occur if the child's external airways, the nose and mouth are blocked simultaneously. The most likely cause of this blocking is if a thin piece of plastic sufficiently large to cover the nose and mouth molding itself to the child's face.

The risk of suffocation is more likely to occur with thin plastic decals, sheeting and wrapping as thicker ones will not be able to mould themselves to the child's face. Therefore the thickness of plastic decals, sheeting and wrapping should be controlled.

Plastic decals is taken to include transfers, plastic labels, adhesive labels etc. Decals should be securely attached to the seat to prevent a child removing them with its fingers, even after continuous picking at the edges and corners of decals. Decals should also remain securely attached in damp and wet situations. If there is any possibility that the decal would become detached from the seat, it should be sufficiently small so that it would not cover both the mouth and nasal airways of a child.

The hazard is determined through a sequence of tests that represent a child sucking and picking at a plastic decal or plastic sheeting. The first test is to soak the plastic decal or plastic sheeting to check that it does not become loosened when wet. This is then followed by the adhesion test to replicate the child picking at the plastic decal or plastic sheeting. Then a tensile force is applied to any part of the plastic decal or plastic sheeting that has lifted away from the product.

C.1.9 Strength and durability (see Clause 7)

The strength and durability of the seat should be sufficient to withstand all foreseen use of the seat. If the seat fails through inadequate strength or durability during use the child using the seat will be placed in a hazardous situation. The strength and durability of the seat is determined through a sequence of tests.

C.1.10 Low temperature drop test (see 7.4.2)

This test is designed to simulate the impact of the seat against the ground when the cycle it is fitted to falls over. The first object that will hit the ground will be the pedal. Therefore the impact energy of the test is not so high.

C.1.11 Static load footrest (see 7.4.3)

When getting in the seat a child will stand on one footrest. Therefore in the test the maximum weight of a child is applied to one footrest, to ensure the footrest is strong enough to bare the weight of a child.

C.1.12 Transverse rigidity (see 7.4.5)

It is strongly recommended that the attachment of the seat to the cycle be sufficiently rigid to prevent the seat swaying excessively and generating stability problems for the driver.

C.1.13 Backrest dynamic test (see 7.4.6)

The backrest dynamic test is intended to reproduce the effects upon a seat of a restless child thrusting rearwards upon the backrest. This also reproduces the rider pulling forwards on the backrest of a rear seat when wheeling (not riding) a cycle with seat attached, especially when pulling it up kerbs and steps.

C.1.14 Attachment of the seat to the cycle (see 8.1)

The attachment of the seat to the cycle should be sufficient to avoid inadvertent release to prevent the child using the seat will be placed in a hazardous situation.

C.1.15 Rear seats attached to luggage carriers (see 8.2)

Rear seats that are not fixed directly to the cycle should have an additional fastening. In case of failure of the upper attachment of the luggage carrier to the cycle frame, the luggage carrier with seat will rotate backwards and fall on the ground. The additional fastening limits the rearward movement of the seat and prevents the seat hitting the floor.

C.1.16 Attachment of front seats (see 8.3)

The handlebar or the extension of the handlebar are not considered to be sufficiently strong to carry a child in a seat. Therefore these parts of the cycle should not be the only attachment points.

C.1.17 Restraint system (see 9.1)

It is hazardous for a child to climb out of the seat, therefore a restraint system is required to limit the child's movement. The restraint system should retain the child sitting in a safe position in the seat.

The value of the restraint system is determined through a sequence of tests. The first test determines if a child can wriggle out of the seat. The test is not what happens in real life. But research showed that this test is a good alternative.

Besides the effectiveness of the restraint system it should also be securely attached to the seat. The fasteners should be of sufficient strength and the adjusting devices should not slip. Also a child should not open the closure of the restraint system and when the closure is not fully closed it should disengage so that it will be clear for the parent to put on the restraint system correct.

To prevent the child of 'submarining' the seat should have a hump between the legs or a crotch strap.

C.1.18 Foot guarding (see Clause 10)

Entrapment of the children's feet is the most hazardous situation when transporting a child on a bike. The injuries can be very severe and last for a long time, which can cause problems in developing motoric ability to walk. Therefore the seat should be designed so that contact between the child's feet and cycle wheels is prevented. This contact should be prevented either by designing the seat so that such contact is physically impossible when the child is secured in the seat by the retention system or by the provision of additional guards for attachment to the seat and/or the cycle together with the seat.

C.1.19 Integral footrest guards (see 10.1.2)

When a seat does not prevent spoke entrapment by design as a minimum, those seats should be equipped with integral guards on each footrest. Those integral guards must prevent inward movement of the feet and make it harder for a child to reach the spokes. Additional guards must make it safe for 100 %. It is known that parents do not always mount the additional guards to the cycle. Therefore the integral guard should be as big as possible. But the cyclist must still be able to steer and peddle.

C.1.20 Foot retention straps (see 10.2.2)

The foot retention straps do not prevent spoke entrapment, they prevent the child from sticking their feet out and hit a side barrier or from kicking the driver.

C.1.21 Limitation of forward movement

Due to the fact that the backrest of a C15 seat is lower than the shoulders of a child, the restraint system will not prevent the child from moving forwards. There is a possibility that a child can bump with its head on the handle bar when there is a hole in the street or road, which throws the child forward. In the available accident data this kind of scenario does not seem to be very common. For future work this hazard needs to be considered. The questions that should be addressed are :

— Is this scenario common and/or severe ?

— How can the forward movement be limited or the child protected from injury ?

C.1.22 Finger guarding

To prevent entrapment of fingers between the sprungs of the saddle, the saddle sprungs should be covered. It was not possible to insert a requirement for universal saddle sprung protectors. Therefore a warning is included. For future work research should be undertaken to define the size of the problem, the possibility of universal protectors and requirements for saddle sprung protectors.