# COMMISSION DIRECTIVE 1999/98/EC

## of 15 December 1999

## adapting to technical progress Directive 96/79/EC of the European Parliament and of the Council on the protection of occupants of motor vehicles in the event of a frontal impact

**(Text with EEA relevance)**

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

Having regard to Council Directive 70/156/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the type approval of motor vehicles and their trailer ([1]) as, last amended by Directive 98/91/EC of the European Parliament and of the Council ([2]) and in particular Article 13 (2) thereof,

Having regard to Directive 96/79/EC of the European Parliament and of the Council of 16 December 1996 on the protection of occupants, of motor vehicles in the event of a frontal impact and amending Directive 70/156/EEC ([3]),

Whereas:

(1) Directive 96/79/EC is one of the separate directives under the Community approval procedure introduced by Concil Directive 70/156/EEC. The provisions of Directive 70/156/EEC concerning vehicle systems, components and separate technical units thus apply to the present Directive.

(2) In implementation of Article 4(b) of Directive 96/79/EC, the Commission was to re-examine and, if appropriate, amend Appendix 7 to Annex II to that same Directive in order to take account of the assessment tests on the heel of the Hybrid III dummy, including the tests on vehicles.

(3) The measures provided for in this Directive are in accordance with the opinion of the Committee on Adaptation to Technical Progress set up by Directive 70/156/EEC,

HAS ADOPTED THIS DIRECTIVE:

*Article 1*

Annex II to Directive 96/79/EC is amended in accordance with the Annex to this Directive.

*Article 2*

1. From 1 October 2000, Member States may not, for reasons relating to the tests to assess the heel of the Hybrid III dummy:

— either refuse EC approval for a new type of vehicle,

— or prohibit the registration, sale or placing in service of a vehicle,

if the tests to assess the heel of the Hybrid III dummy meet the requirements of Directive 96/79/EC, as amended by this Directive.

2. From 1 April 2001, Member States may no longer grant EC approval for a type of vehicle in pursuance of Article 4 of Directive 70/156/EEC if the provisions of Directive 96/79/EC, as amended by this Directive, are not complied with.

*Article 3*

1. Member States shall bring into force the laws, regulations and administrative provisions necessary in order to comply with this Directive by 30 September 2000 at the latest. They shall forthwith inform the Commission thereof.

When Member States adopt those provisions, they shall contain a reference to this Directive or be accompanied by such a reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

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

*Article 4*

This Directive shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Communities*.

*Article 5*

This Directive is addressed to the Member States.

Done at Brussels, 15 December 1999.

*For the Commission*

Erkki LIIKANEN

*Member of the Commission*

([1]) OJ L 42, 23.2.1970, p. 1.
([2]) OJ L 11, 16.1.1999, p. 25.
([3]) OJ L 18, 21.1.1997, p. 7.

*ANNEX*

Annex II to Directive 96/79/EC is amended as follows:

1. Item 2.9.2 of Appendix 3 shall be replaced by the following:

'2.9.2. A size 11XW shoe, which meets the configuration size, sole and heel thickness specifications of the US military standard MIL-S 13192, change "P" and whose weight is 0,57 ± 0,1 kg, shall be placed and fastened on each foot of the test dummies.'

2. Appendix 7 shall be replaced by the following:

'*Appendix 7*

**CERTIFICATION PROCEDURE FOR THE DUMMY LOWER LEG AND FOOT**

1. UPPER FOOT IMPACT TEST

1.1. The objective of this test is to measure the response of the Hybrid III foot and ankle to well-defined, hard faced pendulum impacts.

1.2. The complete Hybrid III lower leg assembly, left (86-5001-001 ) and right (86-5001-002), equipped with the foot and ankle assembly, left (78051-614) and right (78051-615), shall be used, including the knee assembly. The load cell simulator (78051-319 Rev A) shall be used to secure the knee assembly (78051-16 Rev B) to the test fixture.

1.3. **Test procedure**

1.3.1. Each leg assembly shall be maintained (soaked) for four hours prior to the test at a temperature of 22 °C ± 3 °C and a relative humidity of 40 (± 30 %). The soak period shall not include the time required to reach steady state conditions.

1.3.2. Clean the impact surface of the skin and also the impactor face with isopropyl alcohol or equivalent prior to the test. Dust with talc.

1.3.3. Align the impactor accelerometer with its sensitive axis parallel to the direction of impact at contact with the foot.

1.3.4. Mount the leg assembly to the fixture shown in Figure 1. The test fixture shall be rigidly secured to prevent movement during impact. The centre line of the femur load cell simulator (78051-319) shall be vertical (± 0,5°). Adjust the mount such that the line joining the knee clevis joint and the ankle attachment bolt is horizontal (± 3°) with the heel resting on two sheets of a flat low friction (PTFE sheet) surface. Ensure that the tibia flesh is located fully towards the knee end of the tibia. Adjust the ankle such that the plane of the underside of the foot is vertical and perpendicular to the direction of impact (± 3°) and such that the mid sagittal plane of the foot is aligned with the pendulum arm. Adjust the knee joint to 1,5 (± 0,5) g range before each test. Adjust the ankle joint so that it is free and then tighten just sufficiently to keep the foot stable on the PTFE sheet.

1.3.5. The rigid impactor comprises a horizontal cylinder diameter 50 (± 2) mm and a pendulum support arm diameter 19 ± 1 mm (Figure 4). The cylinder has a mass of 1,25 (± 0,02) kg including instrumentation and any part of the support arm within the cylinder. The pendulum arm has a mass of 285 (± 5) g. The mass of any rotating part of the axle to which the support arm is attached should not be greater than 100 g. The length between the central horizontal axis of the impactor cylinder and the axis of rotation of the whole pendulum shall be 125 (± 1) mm. The impact cylinder is mounted with its longitudinal axis horizontal and perpendicular to the direction of impact. The pendulum shall impact the underside of the foot, at a distance of 185 (± 2) mm from the base of the heel resting on the rigid horizontal platform, so that the longitudinal centre line of the pendulum arm falls within 1° of a vertical line at impact. The impactor shall be guided to exclude significant lateral, vertical or rotational movement.

1.3.6. Allow a period of at least 30 minutes between successive tests on the same leg.

1.3.7. The data acquisition system, including transducers, shall conform to the specifications for CFC 600, as described in Appendix 5 of this Annex.

1.4. **Performance specification**

1.4.1. When each ball of the foot is impacted at 6,7 (± 0,1) m/s in accordance with paragraph 1.3, the maximum lower tibia bending momentum about the y-axis ($M_y$) shall be 120 ± 25 Nm.

2. LOWER FOOT IMPACT TEST WITHOUT SHOE

2.1. The objective of this test is to measure the response of the Hybrid III foot skin and insert to well-defined, hard faced pendulum impacts.

2.2. The complete Hybrid III lower leg assembly, left (86-5001-001 ) and right (86-5001-002), equipped with the foot and ankle assembly, left (78051-614) and right (78051-615), shall be used, including the knee assembly. The load cell simulator (78051-319 Rev A) shall be used to secure the knee assembly (78051-16 Rev B) to the test fixture.

2.3. **Test procedure**

2.3.1. Each leg assembly shall be maintained (soaked) for four hours prior to the test at a temperature of 22 (± 3 °C) and a relative humidity of 40 (± 30 %). The soak period shall not include the time required to reach steady state conditions.

2.3.2. Clean the impact surface of the skin and also the impactor face with isopropyl alcohol or equivalent prior to the test. Dust with talc. Check that there is no visible damage to the energy absorbing insert to the heel.

2.3.3. Align the impactor accelerometer with its sensitive axis parallel to the impactor longitudinal centre line.

2.3.4. Mount the leg assembly to the fixture shown in Figure 2. The test fixture shall be rigidly secured to prevent movement during impact. The centre line of the femur load cell simulator (78051-319) shall be vertical (±0,5°). Adjust the mount such that the line joining the knee clevis joint and the ankle attachment bolt is horizontal (± 3°) with the heel resting on two sheets of a flat low friction (PTFE sheet) surface. Ensure that the tibia flesh is located fully towards the knee end of the tibia. Adjust the ankle such that the plane of the underside of the foot is vertical and perpendicular to the direction of impact and such that the mid sagittal plane of the foot is aligned with the pendulum arm. Adjust the knee joint to 1,5 (± 0,5) g range before each test. Adjust the ankle joint so that it is free and then tighten just sufficiently to keep the foot stable on the PTFE sheet.

2.3.5. The rigid impactor comprises a horizontal cylinder diameter 50 (± 2) mm and a pendulum support arm diameter 19 (± 1) mm (Figure 4). The cylinder has a mass of 1,25 (±0,02) kg including instrumentation and any part of the support arm within the cylinder. The pendulum arm has a mass of 285 (± 5) g. The mass of any rotating part of the axle to which the support arm is attached should not be greater than 100 g. The length between the central horizontal axis of the impactor cylinder and the axis of rotation of the whole pendulum shall be 1 250 (± 1) mm. The impact cylinder is mounted with its longitudinal axis horizontal and perpendicular to the direction of impact. The pendulum shall impact the underside of the foot, at a distance of 62 (± 2) mm from the base of the heel resting on the rigid horizontal platform, so that the longitudinal centre line of the pendulum arm falls within 1° of a vertical line at impact. The impactor shall be guided to exclude significant lateral, vertical or rotational movement.

2.3.6. Allow a period of at least 30 minutes between successive tests on the same leg.

2.3.7. The data acquisition system, including transducers, shall conform to the specifications for CFC 600, as described in Appendix 5 of this Annex.

2.4. **Performance specification**

2.4.1. When each heel of the foot is impacted at 4,4 ± 0,1 m/s in accordance with paragraph 2.3, the maximum impactor acceleration shall be 295 ± 50 g.

3. LOWER FOOT IMPACT TEST (WITH SHOE)

3.1. The objective of this test is to control the response of the Shoe and Hybrid III heel flesh and ankle joint to well-defined hard faced pendulum impacts.

3.2. The complete Hybrid III lower leg assembly, left (86-5001-001 ) and right (86-5001-002), equipped with the foot and ankle assembly, left (78051-614) and right (78051-615), shall be used, including the knee assembly. The load cell simulator (78051-319 Rev A) shall be used to secure the knee assembly (78051-16 Rev B) to the test fixture. The foot shall be fitted with the shoe specified in Annex 2; Appendix 3, paragraph 2.9.2.

3.3. **Test procedure**

3.3.1. Each leg assembly shall be maintained (soaked) for four hours prior to the test at a temperature of 22 (± 3) °C and a relative humidity of 40 (± 30) %. The soak period shall not include the time required to reach steady state conditions.

3.3.2. Clean the impact surface of the underside of the shoe with a clean cloth and the impactor face with isopropyl alcohol or equivalent prior to the test. Check that there is no visible damage to the energy absorbing insert to the heel.

3.3.3. Align the impactor accelerometer with its sensitive axis parallel to the impactor longitudinal centre line.

3.3.4. Mount the leg assembly to the fixture shown in Figure 3. The test fixture shall be rigidly secured to prevent movement during impact. The centre line of the femur load cell simulator (78051-319) shall be vertical (±0,5). Adjust the mount such that the line joining the knee clevis joint and the ankle attachment bolt is horizontal (± 3°) with the heel of the shoe resting on two sheets of a flat low friction (PTFE sheet) surface. Ensure that the tibia flesh is located fully towards the knee end of the tibia. Adjust the ankle such that a plane in contact with the heel and sole of the underside of the shoe is vertical and perpendicular to the direction of impact (± 3°) and such that the mid sagittal plane of the foot,and shoe is aligned with the pendulum arm. Adjust the knee joint to 1,5 (± 0,5) g range before each test. Adjust the ankle joint so that it is free and then tighten just sufficiently to keep the foot stable on the PTFE sheet.

3.3.5. The rigid impactor comprises a horizontal cylinder diameter 50 (± 2) mm and a pendulum support arm diameter 19 (± 1) mm (Figure 4). The cylinder has a mass of 1,25 (± 0,02) kg including instrumentation and any part of the support arm within the cylinder. The pendulum arm has a mass of 285 (± 5) g. The mass of any rotating part of the axle to which the support arm is attached should not be greater than 100 g. The length between the central horizontal axis of the impactor cylinder and the axis of rotation of the whole pendulum shall be 1 250 ± 1 mm. The impact cylinder is mounted with its longitudinal axis horizontal and perpendicular to the direction of impact. The pendulum shall impact the heel of the shoe in a horizontal plane which is a distance of 62 ± 2 mm above the base of the dummy heel when the shoe is resting on the rigid horizontal platform, so that the longitudinal centre line of the pendulum arm falls within one degree of a vertical line at impact. The impactor shall be guided to exclude.

3.3.6. Allow a period of at least 30 minutes between successive tests on the same leg.

3.3.7. The data acquisition system, including transducers, shall conform to the specifications for CFC 600, as described in Appendix 5 of this Annex.

3.4. **Performance specification**

3.4.1. When the heel of the shoe is impacted at 6,7 (± 0,1) m/s in accordance with paragraph 3.3, the maximum Tibia compressive force (Fz) shall be 3,3 (± 0,5) kN.

*Figure 1*

**Upper foot impact test**

**Test set-up specifications**

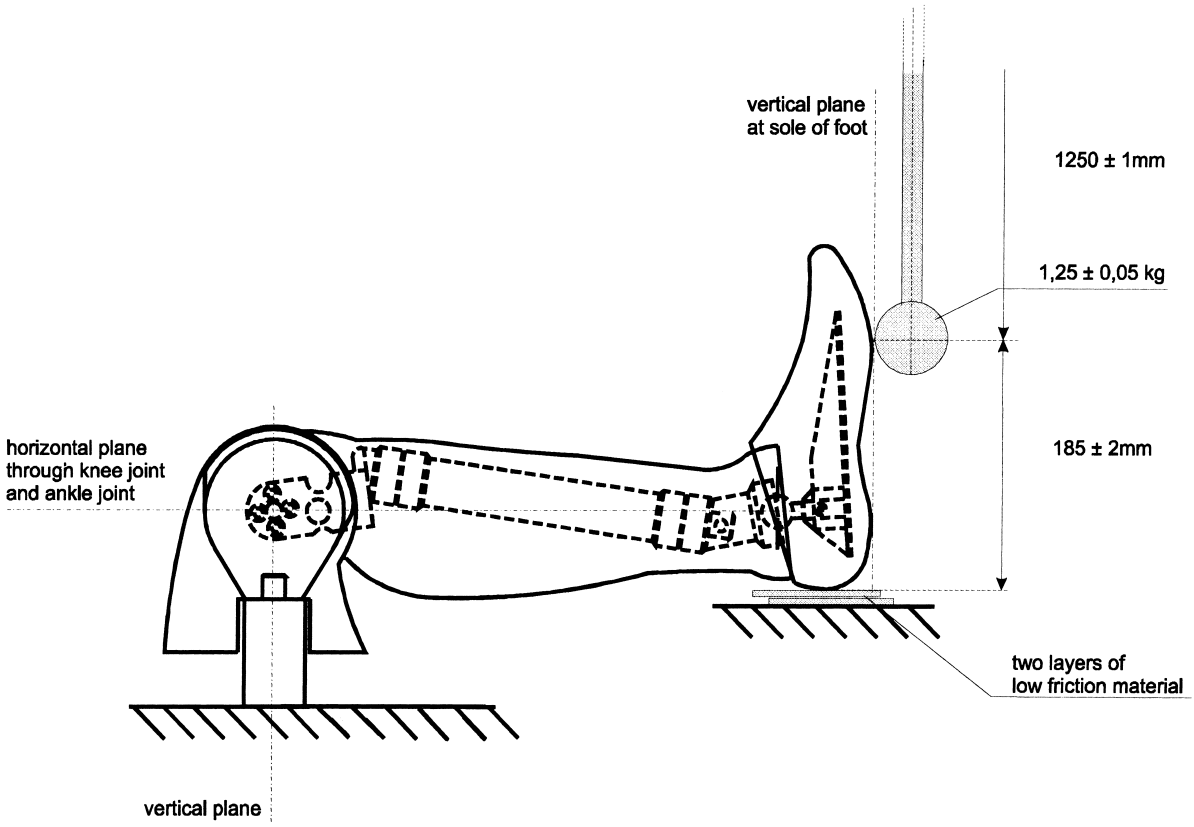

*Figure 2*

**Lower foot impact test (without shoe)**

**Test set-up specifications**

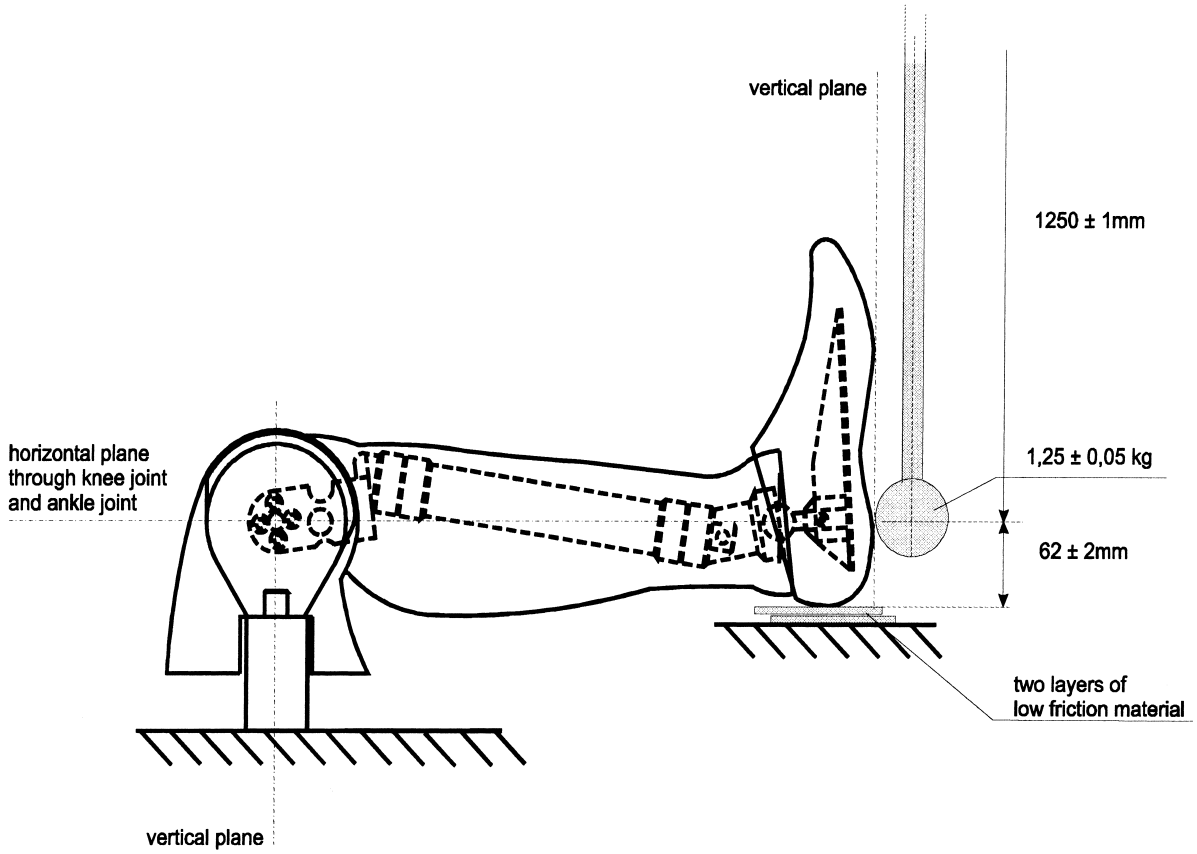

*Figure 3*

**Lower foot impact test (with shoe)**

**Test set-up specifications**

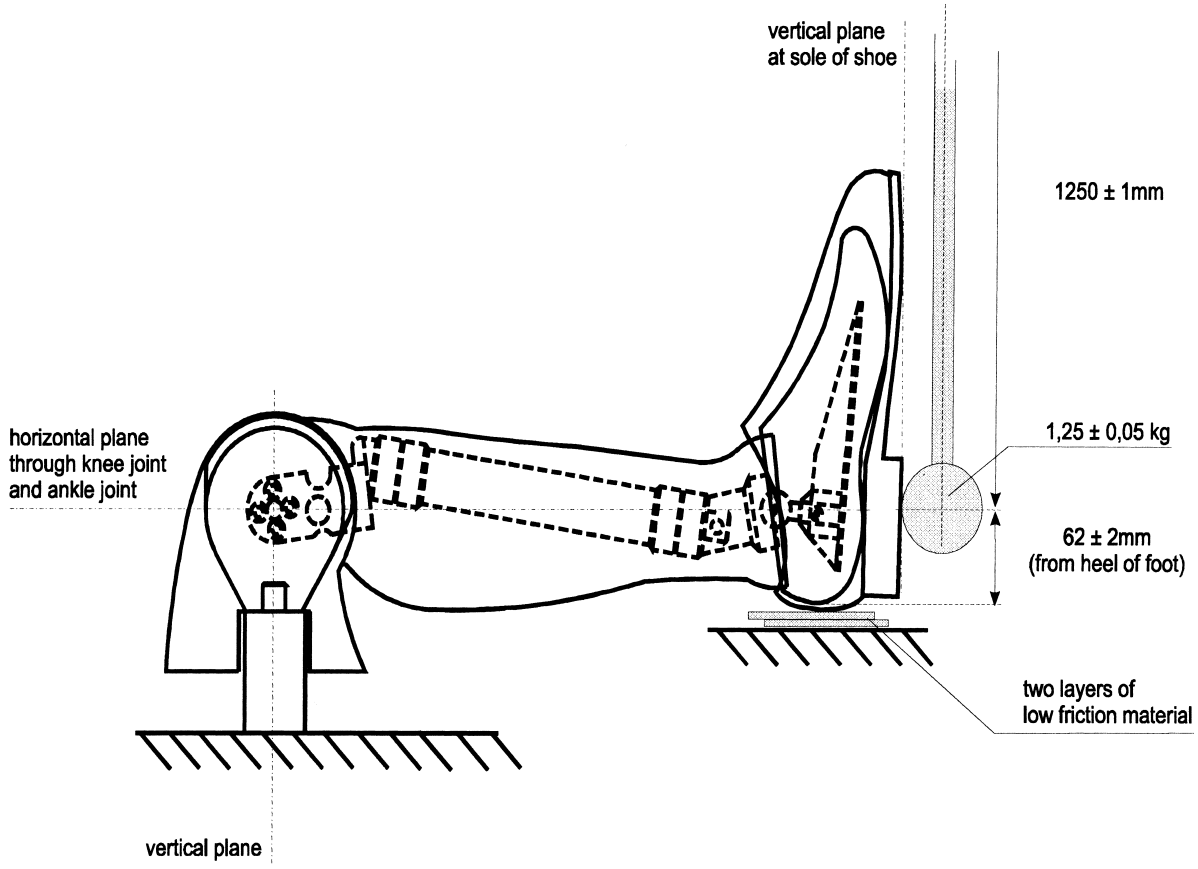

*Figure 4*

**Pendulum impactor**