3.1.4.5 Maximum capacity of jerrican: 60 L.

3.1.4.6 Maximum net mass: 120 kg.

3.1.5 Plywood drums
1D

3.1.5.1 The wood used must be well seasoned, commercially dry and free from any defect likely to lessen the effectiveness of the drum for the purpose intended. If a material other than plywood is used for the manufacture of the heads, it must be of a quality equivalent to the plywood.

3.1.5.2 At least two-ply plywood must be used for the body and at least three-ply plywood for the heads; the plies must be firmly glued together by a water-resistant adhesive with their grain crosswise.

3.1.5.3 The body and heads of the drum and their joins must be of a design appropriate to the capacity of the drum and to its intended use.

3.1.5.4 In order to prevent sifting of the contents, lids must be lined with kraft paper or some other equivalent material which must be securely fastened to the lid and extend to the outside along its full circumference.

3.1.5.5 Maximum capacity of drum: 250 L.

3.1.5.6 Maximum net mass: 400 kg.

3.1.6 Fibre drums
1G

3.1.6.1 The body of the drum must consist of multiple plies of heavy paper or fibreboard (without corrugations) firmly glued or laminated together and may include one or more protective layers of bitumen, waxed kraft paper, metal foil, plastic material, etc.

3.1.6.2 Heads must be of natural wood, fibreboard, metal, plywood, plastic or other suitable material and may include one or more protective layers of bitumen, waxed kraft paper, metal foil, plastic material, etc.

3.1.6.3 The body and heads of the drum and their joins must be of a design appropriate to the capacity of the drum and to its intended use.

3.1.6.4 The assembled packaging must be sufficiently water-resistant so as not to delaminate under normal conditions of transport.

3.1.6.5 Maximum capacity of drum: 450 L.

3.1.6.6 Maximum net mass: 400 kg.

3.1.7 Plastic drums and jerricans
1H1 drums, non-removable head
1H2 drums, removable head
3H1 jerricans, non-removable head
3H2 jerricans, removable head

3.1.7.1 The packaging must be manufactured from suitable plastic material and be of adequate strength in relation to its capacity and intended use. Except for recycled plastic material as defined in 1;3, no used material other than production residues or regrind from the same manufacturing process may be used. The packaging must be adequately resistant to aging and to degradation caused either by the substance contained or by ultraviolet radiation. Any permeation of the substance contained must not constitute a danger under normal conditions of transport.

3.1.7.2 If protection against ultraviolet radiation is required, it must be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives must be compatible with the contents and remain effective throughout the life of the packaging. Where use is made of carbon black, pigments or inhibitors other than those used in the manufacture of the tested design type, retesting may be waived if the carbon black content does not exceed 2 per cent by mass or if the pigment content does not exceed 3 per cent by mass; the content of inhibitors of ultraviolet radiation is not limited.

3.1.7.3 Additives serving purposes other than protection against ultraviolet radiation may be included in the composition of the plastic material provided that they do not adversely affect the chemical and physical properties of the material of the packaging. In such circumstances retesting may be waived.

3.1.7.4 The wall thickness at every point of the packaging must be appropriate to its capacity and intended use, taking into account the stresses to which each point is liable to be exposed.

3.1.7.5 Openings for filling, emptying and venting in the bodies or heads of non-removable head drums (1H1) and jerricans (3H1) must not exceed 7 cm in diameter. Drums and jerricans with larger openings are considered to be of the removable head type (1H2 and 3H2). Closures for openings in the bodies or heads of drums and jerricans must be so designed and applied that they will remain secure and leakproof under normal conditions of transport. Gaskets or other sealing elements must be used with closures unless the closure is inherently leakproof.

3.1.7.6 Closure devices for removable head drums and jerricans must be so designed and applied that they will remain secure and leakproof under normal conditions of transport. Gaskets must be used with all removable heads unless the drum or jerrican design is such that, where the removable head is properly secured, the drum or jerrican is inherently leakproof.

3.1.7.7 Maximum capacity of drums and jerricans:

1H1, 1H2: 450 L;
3H1, 3H2: 60 L.

3.1.7.8 Maximum net mass:

1H1, 1H2: 400 kg;
3H1, 3H2: 120 kg.

3.1.8 Boxes of natural wood

4C1 ordinary
4C2 with siftproof walls

3.1.8.1 The wood used must be well seasoned, commercially dry and free from defects that would materially lessen the strength of any part of the box. The strength of the material used and the method of construction must be appropriate to the capacity and intended use of the box. The tops and bottoms may be made of water-resistant reconstituted wood such as hardboard, particle board or other suitable type.

3.1.8.2 Fastenings must be resistant to vibration experienced under normal conditions of transport. End grain nailing must be avoided whenever practicable. Joins which are likely to be highly stressed must be made using clenched or annular ring nails or equivalent fastenings.

3.1.8.3 Box 4C2: each part must consist of one piece or be equivalent thereto. Parts are considered equivalent to one piece when one of the following methods of glued assembly is used: Lindermann joint, tongue and groove joint, ship lap or rabbet joint or butt joint with at least two corrugated metal fasteners at each joint.

3.1.8.4 Maximum net mass: 400 kg.

3.1.9 Plywood boxes

4D

3.1.9.1 Plywood used must be at least 3-ply. It must be made from well seasoned rotary cut, sliced or sawn veneer, commercially dry and free from defects that would materially lessen the strength of the box. The strength of the material used and the method of construction must be appropriate to the capacity and intended use of the box. All adjacent plies must be glued with water-resistant adhesive. Other suitable materials may be used together with plywood in the construction of boxes. Boxes must be firmly nailed or screwed to corner posts or ends or be assembled by equally suitable devices.

3.1.9.2 Maximum net mass: 400 kg.

3.1.10 Reconstituted wood boxes

4F

3.1.10.1 The walls of boxes must be made of water-resistant reconstituted wood such as hardboard, particle board or other suitable type. The strength of the material used and the method of construction must be appropriate to the capacity of the boxes and their intended use.

3.1.10.2 Other parts of the boxes may be made of other suitable material.

3.1.10.3 Boxes must be securely assembled by means of suitable devices.

3.1.10.4 Maximum net mass: 400 kg.

3.1.11 Fibreboard boxes

4G

3.1.11.1 Strong and good quality solid or double-faced corrugated fibreboard (single or multiwall) must be used, appropriate to the capacity of the box and to its intended use. The water resistance of the outer surface must be such that the

increase in mass, as determined in a test carried out over a period of 30 minutes by the Cobb method of determining water absorption, is not greater than 155 g/m^2 — see ISO 535:1991. It must have proper bending qualities. Fibreboard must be cut, creased without scoring, and slotted so as to permit assembly without cracking, surface breaks or undue bending. The fluting of corrugated fibreboard must be firmly glued to the facings.

3.1.11.2 The ends of boxes may have a wooden frame or be entirely of wood or other suitable material. Reinforcements of wooden battens or other suitable material may be used.

3.1.11.3 Manufacturing joins in the body of boxes must be taped, lapped and glued or lapped and stitched with metal staples. Lapped joins must have an appropriate overlap.

3.1.11.4 Where closing is effected by gluing or taping, a water-resistant adhesive must be used.

3.1.11.5 Boxes must be designed so as to provide a good fit to the contents.

3.1.11.6 Maximum net mass: 400 kg.

3.1.12 Plastic boxes

4H1 expanded plastic boxes
4H2 solid plastic boxes

3.1.12.1 The box must be manufactured from suitable plastic material and be of adequate strength in relation to its capacity and intended use. The box must be adequately resistant to aging and to degradation caused either by the substance contained or by ultraviolet radiation.

3.1.12.2 An expanded plastic box must comprise two parts made of a moulded expanded plastic material, a bottom section containing cavities for the inner packagings and a top section covering and interlocking with the bottom section. The top and bottom sections must be designed so that the inner packagings fit snugly. The closure cap for any inner packaging must not be in contact with the inside of the top section of this box.

3.1.12.3 For dispatch, an expanded plastic box must be closed with a self-adhesive tape having sufficient tensile strength to prevent the box from opening. The adhesive tape must be weather-resistant and its adhesive compatible with the expanded plastic material of the box. Other closing devices at least equally effective may be used.

3.1.12.4 For solid plastic boxes, protection against ultraviolet radiation, if required, must be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives must be compatible with the contents and remain effective throughout the life of the box. Where use is made of carbon black, pigments or inhibitors other than those used in the manufacture of the tested design type, re-testing may be waived if the carbon black content does not exceed 2 per cent by mass or if the pigment content does not exceed 3 per cent by mass; the content of inhibitors of ultraviolet radiation is not limited.

3.1.12.5 Additives serving purposes other than protection against ultraviolet radiation may be included in the composition of the plastic material provided that they do not adversely affect the chemical or physical properties of the material of the box. Under such circumstances re-testing may be waived.

3.1.12.6 Solid plastic boxes must have closure devices made of a suitable material, of adequate strength and so designed as to prevent the box from unintentional opening.

3.1.12.7 Maximum net mass:

4H1 box: 60 kg;
4H2 box: 400 kg.

3.1.13 Steel, aluminium or other metal boxes

4A steel
4B aluminium
4N metal, other than steel or aluminium

3.1.13.1 The strength of the metal and the construction of the box must be appropriate to the capacity of the box and to its intended use.

3.1.13.2 Boxes must be lined with fibreboard or felt packing pieces or must have an inner liner or coating of suitable material as required. If a double seamed metal liner is used, steps must be taken to prevent the ingress of substances, particularly explosives, into the recesses of the seams.

3.1.13.3 Closures may be of any suitable type; they must remain secured under normal conditions of transport.

3.1.13.4 Maximum net mass: 400 kg.

3.1.14 Textile bags
5L2 siftproof
5L3 water-resistant

3.1.14.1 The textiles used must be of good quality. The strength of the fabric and the construction of the bag must be appropriate to the capacity of the bag and to its intended use.

3.1.14.2 Bags, siftproof, 5L2: the bag must be made siftproof, for example by the use of:

— paper bonded to the inner surface of the bag by a water-resistant adhesive such as bitumen; or

— plastic film bonded to the inner surface of the bag; or

— one or more inner liners made of paper or plastic material.

3.1.14.3 Bags, water-resistant, 5L3: to prevent the entry of moisture the bag must be made waterproof, for example by the use of:

— separate inner liners of water-resistant paper (e.g. waxed kraft paper, tarred paper or plastic-coated kraft paper); or

— plastic film bonded to the inner surface of the bag; or

— one or more inner liners made of plastic material.

3.1.14.4 Maximum net mass: 50 kg.

3.1.15 Woven plastic bags
5H1 without inner lining or coating
5H2 siftproof
5H3 water-resistant

3.1.15.1 Bags must be made from stretched tapes or monofilaments of a suitable plastic material. The strength of the material used and the construction of the bag must be appropriate to the capacity of the bag and to its intended use.

3.1.15.2 If the fabric is woven flat, the bags must be made by sewing or some other method ensuring closure of the bottom and one side. If the fabric is tubular, the bag must be closed by sewing, weaving or some other equally strong method of closure.

3.1.15.3 Bags, siftproof, 5H2: The bag must be made siftproof, for example by means of:

— paper or a plastic film bonded to the inner surface of the bag; or

— one or more separate inner liners made of paper or plastic material.

3.1.15.4 Bags, water-resistant, 5H3: To prevent the entry of moisture, the bag must be made waterproof, for example by means of:

— separate inner liners of water-resistant paper (e.g. waxed kraft paper, double-tarred kraft paper or plastic-coated kraft paper); or

— plastic film bonded to the inner or outer surface of the bag; or

— one or more inner plastic liners.

3.1.15.5 Maximum net mass: 50 kg.

3.1.16 Plastic film bags
5H4

3.1.16.1 Bags must be made of a suitable plastic material. The strength of the material used and the construction of the bag must be appropriate to the capacity of the bag and to its intended use. Joins and closures must withstand pressures and impacts liable to occur under normal conditions of transport.

3.1.16.2 Maximum net mass: 50 kg.

3.1.17 Paper bags

5M1 multiwall
5M2 multiwall, water-resistant

3.1.17.1 Bags must be made of a suitable kraft paper or of an equivalent paper with at least three plies, the middle ply of which may be net-cloth and adhesive bonding to the outer paper plies. The strength of the paper and the construction of the bags must be appropriate to the capacity of the bag and to its intended use. Joins and closures must be siftproof.

3.1.17.2 To prevent the entry of moisture, a bag of four plies or more must be made waterproof by the use of either a water-resistant ply as one of the two outermost plies or a water-resistant barrier made of a suitable protective material between the two outermost plies. A bag of three plies must be made waterproof by the use of a water-resistant ply as the outermost ply. Where there is a danger of the substance contained reacting with moisture or where it is packed damp, a waterproof ply or barrier, such as double-tarred kraft paper, plastic-coated kraft paper, plastic film bonded to the inner surface of the bag, or one or more inner plastic liners, must also be placed next to the substance. Joins and closures must be waterproof.

3.1.17.3 Maximum net mass: 50 kg.

3.1.18 Composite packagings (plastic material)

6HA1 plastic receptacle with outer steel drum
6HA2 plastic receptacle with outer steel crate*/or box
6HB1 plastic receptacle with outer aluminium drum
6HB2 plastic receptacle with outer aluminium crate*/or box
6HC plastic receptacle with outer wooden box
6HD1 plastic receptacle with outer plywood drum
6HD2 plastic receptacle with outer plywood box
6HG1 plastic receptacle with outer fibre drum
6HG2 plastic receptacle with outer fibreboard box
6HH1 plastic receptacle with outer plastic drum
6HH2 plastic receptacle with outer solid plastic box

3.1.18.1 *Inner receptacle*

3.1.18.1.1 The provisions of 3.1.7.1 and 3.1.7.3 to 3.1.7.6 apply to inner plastic receptacles.

3.1.18.1.2 The inner plastic receptacle must fit snugly inside the outer packaging, which must be free of any projection that might abrade the plastic material.

3.1.18.1.3 Maximum capacity of inner receptacles:

6HA1, 6HB1, 6HD1, 6HG1, 6HH1: 250 L;
6HA2, 6HB2, 6HC, 6HD2, 6HG2, 6HH2: 60 L.

3.1.18.1.4 Maximum net mass:

6HA1, 6HB1, 6HD1, 6HG1, 6HH1: 400 kg;
6HA2, 6HB2, 6HC, 6HD2, 6HG2, 6HH2: 75 kg.

3.1.18.2 *Outer packaging*

3.1.18.2.1 Plastic receptacle with outer steel or aluminium drum 6HA1 or 6HB1; the relevant provisions of 3.1.1 or 3.1.2, as appropriate, apply to the construction of the outer packaging.

3.1.18.2.2 Plastic receptacle with outer steel or aluminium box 6HA2 or 6HB2; the relevant provisions of 3.1.13 apply to the construction of the outer packaging.

3.1.18.2.3 Plastic receptacle with outer wooden box 6HC; the relevant provisions of 3.1.8 apply to the construction of the outer packaging.

3.1.18.2.4 Plastic receptacle with outer plywood drum 6HD1; the relevant provisions of 3.1.5 apply to the construction of the outer packaging.

3.1.18.2.5 Plastic receptacle with outer plywood box 6HD2; the relevant provisions of 3.1.9 apply to the construction of the outer packaging.

3.1.18.2.6 Plastic receptacle with outer fibre drum 6HG1; the provisions of 3.1.6.1 to 3.1.6.4 apply to the construction of the outer packaging.

* Crates are outer packagings with incomplete surfaces. For air transport, crates may not be used as outer packagings of composite packagings.

3.1.18.2.7 Plastic receptacle with outer fibreboard box 6HG2; the relevant provisions of 3.1.11 apply to the construction of the outer packaging.

3.1.18.2.8 Plastic receptacle with outer plastic drum 6HH1; the provisions of 3.1.7.1 and 3.1.7.3 to 3.1.7.7 apply to the construction of the outer packaging.

3.1.18.2.9 Plastic receptacle with outer solid plastic box (including corrugated plastic material) 6HH2; the provisions of 3.1.12.1 and 3.1.12.4 to 3.1.12.6 apply to the construction of the outer packaging.

3.2 REQUIREMENTS FOR INNER PACKAGINGS

3.2.1 Glass

Packagings must be well constructed. The materials of which these packagings and closures are made must be of good quality and, where in contact with the substance or article, not liable to react with it. Closures must be sufficiently tight to prevent leaking and sifting. Stoppers or corks must be held securely in position with wire, adhesive tape, or other positive means. Packagings having necks with moulded screw-threads must have threaded-type caps having a resilient liner completely resistant to the contents.

Glass ampoules must be heat-sealed, gas- and liquid-tight and they must not react chemically when coming into contact with the contents. If glass tubes are also permitted by the appropriate national authority for liquefied gases, they must be thick-walled and free of defects.

3.2.2 Plastic

Packagings must be well constructed. The materials of which these packagings and closures are made must be of good quality polyethylene or other suitable plastic and, where in contact with the substance, resistant to it. Closures must be sufficiently tight to prevent leaking and sifting. Stoppers or corks must be held securely in position with wire, adhesive tape, or other positive means.

3.2.3 Metal cans, tins or tubes

Packagings must be well constructed. The materials of which the packagings and closures are made must be of good quality and, where in contact with the substance, not liable to react with it. Closures must be sufficiently tight to prevent leaking and sifting and threaded-type caps must be equipped with a resilient liner completely resistant to the contents of the packagings.

3.2.4 Paper bags

Shipping sack kraft paper, or equivalent, of at least two sheets of paper must be used.

3.2.5 Plastic bags

The weld-seams and closures of such bags must be siftproof. Plastic bags must have a minimum thickness of 0.1 mm.

3.2.6 Fibre cans or boxes

Packagings must be well constructed and the material of which they are made must be of good quality. Metal tops, bottoms and connections, of suitable thickness, are authorized.

3.2.7 Metal receptacles (aerosols), non-refillable (IP.7, IP.7A, IP.7B)

3.2.7.1 *Receptacles (aerosols) IP.7 and IP.7A*

3.2.7.1.1 *Materials and construction.* Uniform quality steel plate or non-ferrous metal of uniform drawing quality must be used:

— IP.7 receptacles must have a minimum wall thickness of 0.18 mm;
— IP.7A receptacles must have a minimum wall thickness of 0.20 mm.

The receptacles may be seamless or with seams welded, soldered, brazed, double-seamed or swaged. The ends must be of pressure design. Maximum capacity must not exceed 820 mL and the maximum inner diameter must not exceed 76 mm.

3.2.7.1.2 *Performance test.* One out of each lot of 25 000 or less receptacles successively produced per day must be pressure-tested to destruction:

— IP.7 receptacles must not burst below 1 650 kPa gauge pressure;
— IP.7A receptacles must not burst below 1 860 kPa gauge pressure.

3.2.7.2 *Receptacles (aerosols) IP.7B*

3.2.7.2.1 *Materials and construction.* Uniform quality steel plate or non-ferrous metal of uniform drawing quality must be used. The receptacles may be seamless or with seams welded, soldered, brazed, double-seamed or swaged. The ends must be of pressure design. Maximum capacity must not exceed 1 000 mL and the maximum inner diameter must not exceed 76 mm. The aerosol, including its valve, must be virtually hermetically sealed under normal conditions of transport and the valve must be suitably protected to prevent actuation during transport.

3.2.7.2.2 Performance tests required:

— hydraulic pressure test;
— bursting test;
— leakage test.

3.2.7.2.3 *Hydraulic pressure test.* Number of samples: six receptacles.

Method of testing and pressure applied: the pressure must be applied slowly. The test pressure must be 50 per cent higher than the internal pressure at 50°C but at least 1 000 kPa. The test pressure must be applied for 25 seconds.

Criteria for passing the test successfully: the receptacle must not show major distortions, leaks or similar faults, but a slight symmetrical distortion of the base, or one affecting the profile of the top end shall be allowed, provided that the receptacle passes the bursting test.

3.2.7.2.4 *Bursting test.* Number of samples: six receptacles; these may be the same receptacles used in the hydraulic pressure test.

Method of testing and pressures applied: a hydraulic pressure at least 20 per cent higher than the test pressure as mentioned in 3.2.7.2.3 must be applied.

Criteria for passing the test successfully: no receptacle may leak.

3.2.7.2.5 *Leakage test.* Number of samples: every aerosol.

Method of testing: each aerosol must be immersed in a bath of water. The temperature of the water and the duration of the test must be such that the internal pressure reaches that which would be reached at 55°C, or 50°C if the liquid phase does not exceed 95 per cent of the capacity of the aerosol at 50°C. When an aerosol is sensitive to heat, the temperature of the bath may be set at between 20°C and 30°C in which case one receptacle in 2 000 must be tested at the higher temperature.

Equally effective methods of testing may also be used.

Criteria for passing the test successfully: the aerosol must not show visible permanent distortions or any leakage.

3.2.8 Plastic receptacles (aerosols) non-refillable (IP.7C)

3.2.8.1 *Receptacles (aerosols) IP.7C*

3.2.8.1.1 *Materials and construction*. The receptacle must be of polyethylene terephthalate (PET), polyethylene napthalate (PEN), polyamide (Nylon), or a blend containing some combination of PET, PEN, ethyl vinyl alcohol (EVOH) and Nylon. Thermoplastic processes ensuring uniformity of the completed container shall be applied. No used material other than production residues or re-grind from the same manufacturing process may be used. The packaging shall be adequately resistant to aging and to degradation caused either by the substance contained or by ultraviolet radiation. Maximum capacity must not exceed 500 mL.

3.2.8.1.2 Performance tests required:

— drop test;
— hydraulic pressure test;
— bursting test;
— leakage test.

3.2.8.1.3 *Drop test*. Method of testing: to ensure that creep does not affect the ability of the receptacle type to retain the contents the receptacles shall be dropped as follows: three groups of twenty-five filled receptacles shall be dropped from 1.8 m on to a rigid, non-resilient, flat and horizontal surface. One group must be conditioned at 38°C for 26 weeks, the second group for 100 hours at 50°C and the third group for 18 hours at 55°C, prior to the drop test.

Criteria for passing the test successfully: the receptacle must not break or leak.

3.2.8.1.4 *Hydraulic pressure test.* Number of samples: six receptacles.

Method of testing: receptacles must resist a test pressure equal to at least 1 200 kPa.

Criteria for passing the test successfully: the receptacle must not show major distortions, leaks or similar faults, but a slight symmetrical distortion of the base, or one affecting the profile of the top end, shall be allowed, provided that the receptacle passes the bursting test.

3.2.8.1.5 *Bursting test*. Number of samples: six. These may be the same receptacles used in the hydraulic pressure test.

Method of testing and pressures applied: a hydraulic pressure at least 20 per cent higher than the test pressure as mentioned in 3.2.8.1.4 must be applied.

Criteria for passing the test successfully: the receptacle must not leak.

3.2.8.1.6 *Leakage test*. Every aerosol. A leakage test in accordance with 6;5.4.1.2 or 6;5.4.3 approved by the competent authority must be used.

3.2.9 Metal or plastic flexible tubes

The materials of construction of flexible tubes and their closures must, where in contact with the organic peroxide, not affect the thermal stability.

Chapter 4

PACKAGING PERFORMANCE TESTS

Introductory Notes

Note 1.— The performance tests specified in this Chapter take account of the material used, and constructional design of packagings. They also take into account whether the goods to be transported are liquid or solid.

Note 2.— The performance tests are designed to ensure that there will be no loss of contents under normal transport conditions. The severity of the tests on a packaging is dependent on the intended contents, taking account of the degree of danger (i.e. packing group), relative density and vapour pressure (for liquids).

4.1 PERFORMANCE AND FREQUENCY OF TESTS

4.1.1 The design type of each packaging must be tested as provided for in this Chapter in accordance with procedures established by the appropriate national authority.

4.1.2 Each packaging design type must successfully pass the tests prescribed in this chapter before being used. A packaging design type is defined by the design, size, material and thickness, manner of construction and packing, but may include various surface treatments. It also includes packagings which differ from the design type only in their lesser design height.

4.1.3 Tests must be repeated on production samples at intervals established by the appropriate national authority. For such tests on paper or fibreboard packagings, preparation at ambient conditions is considered equivalent to the provisions of 4.2.3.

4.1.4 Tests must also be repeated after each modification which alters the design, material or manner of construction of a packaging.

4.1.5 The appropriate national authority may permit the selective testing of packagings that differ only in minor respects from a tested type, e.g. smaller sizes of inner packagings or inner packagings of lower net mass; and packagings such as drums, bags and boxes which are produced with small reductions in external dimension(s).

4.1.6 Reserved.

Note.— For the conditions for assembling different inner packagings in an outer packaging and permissible variations in inner packagings, see 4;1.1.10.1.

4.1.7 Articles or inner packagings of any type for solids or liquids may be assembled and transported, without testing, in an outer packaging under the following conditions:

a) The outer packaging must have been successfully tested in accordance with 4.3 with fragile (e.g. glass) inner packagings containing liquids using the Packing Group I drop height.

b) The total combined gross mass of inner packagings must not exceed one-half the gross mass of inner packagings used for the drop test in a) above.

c) The thickness of cushioning material between inner packagings and between inner packagings and the outside of the packaging must not be reduced below the corresponding thicknesses in the originally tested packaging; and if a single inner packaging was used in the original test, the thicknesses of cushioning between inner packagings must not be less than the thickness of cushioning between the outside of the packaging and the inner packaging in the original test. If either fewer or smaller inner packagings are used (as compared to the inner packagings used in the drop test), sufficient additional cushioning material must be used to take up void spaces.

d) The outer packaging must have passed successfully the stacking test in 4.6 while empty. The total mass of identical packages must be based on the combined mass of inner packagings used for the drop test in a) above.

e) Inner packagings containing liquids must be completely surrounded with a sufficient quantity of absorbent material to absorb the entire liquid contents of the inner packagings.

f) If the outer packaging is intended to contain inner packagings for liquids and is not leakproof, or is intended to contain inner packagings for solids and is not siftproof, a means of containing any liquid or solid contents in the event of leakage must be provided in the form of a leakproof liner, plastic bag or other equally efficient means of containment. For packagings containing liquids, the absorbent material required by e) above must be placed inside the means of containing the liquid contents.

g) Inner packagings containing liquids must comply with 4;1.1.6.

h) Packagings must be marked in accordance with Part 6;2 as having been tested to Packing Group I performance for combination packagings. The marked gross mass in kilograms must be the sum of the mass of the outer packaging plus one half of the mass of the inner packaging(s) as used for the drop test referred to in a) above. Such a packaging mark must also contain a letter "V" as described in 1.2.6.

4.1.8 The appropriate national authority may at any time require proof, by tests in accordance with this Chapter, that serially produced packagings meet the requirements of the design type tests.

4.1.9 If an inner treatment or coating is required for safety reasons, it must retain its protective properties even after the tests.

4.1.10 Provided the validity of the test results is not affected, and with the approval of the appropriate national authority, several tests may be made on one sample.

4.2 PREPARATION OF PACKAGINGS FOR TESTING

4.2.1 Tests must be carried out on packagings prepared as for transport including, with respect to combination packagings, the inner packagings used. Inner or single receptacles or packagings must be filled to not less than 98 per cent of their maximum capacity for liquids or 95 per cent for solids. Bags must only be filled to the maximum mass at which they may be used. For other than bags, combination packagings where the inner packaging is designed to carry liquids and solids, separate testing is required for both liquid and solid contents. The substances or articles to be transported in the packaging may be replaced by other substances or articles except where this would invalidate the results of the tests. For solids, when another substance is used it must have the same physical characteristics (mass, grain size, etc.) as the substance to be carried. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total package mass, so long as they are placed so that the test results are not invalidated.

4.2.2 In the drop tests for liquids, when another substance is used, it must be of similar relative density and viscosity to those of the substance being transported. Water may also be used for the liquid drop test under the conditions set forth in 4.3.5.

4.2.3 Paper or fibreboard packagings must be conditioned for at least 24 hours in an atmosphere having a controlled temperature and relative humidity (r.h.). There are three options, one of which must be chosen. The preferred atmosphere is 23°C ± 2°C and 50 per cent ± 2 per cent r.h. The two other options are 20°C ± 2°C and 65 per cent ± 2 per cent r.h., or 27°C ± 2°C and 65 per cent ± 2 per cent r.h.

Note.— Average values must fall within these limits. Short-term fluctuations and measurement limitations may cause individual measurements to vary by up to ±5 per cent relative humidity without significant impairment of test reproducibility.

4.2.4 Additional steps must be taken to ascertain that the plastic material used in the manufacture of plastic drums, plastic jerricans and composite packagings (plastic material) intended to contain liquid complies with the provisions in 3.1.7.1, 3.1.7.3 and 4;1.1.3. This may be done, for example, by submitting sample receptacles or packagings to a preliminary test extending over a long period, for example six months, during which the samples would remain filled with the substances they are intended to contain, and after which the samples must be submitted to the applicable tests listed in 4.3, 4.4, 4.5 and 4.6. For substances which may cause stress-cracking or weakening in plastic drums or jerricans, the sample, filled with the substance or another substance that is known to have at least as severe a stress-cracking influence on the plastic materials in question, must be subjected to a superimposed load equivalent to the total mass of identical packages which might be stacked on it during transport. The minimum stacking height, including the test sample, must be 3 m.

4.3 DROP TEST

4.3.1 Number of test samples (per design type and manufacturer) and drop orientation

For other than flat drops, the centre of gravity must be vertically over the point of impact. Where more than one orientation is possible for a given drop, the orientation most likely to result in failure of the packaging must be used.