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SPECIFICATIONS AND TESTING
OF SERIES 1 FREIGHT CONTAINERS

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SPECIFICATIONS AND TESTING OF SERIES 1 FREIGHT CONTAINERS

1. SCOPE

This ISO Recommendation sets out basic requirements for the specifications and testing of ISO series 1 freight containers (designated 1AA, 1A, 1B, 1C, 1D, 1E and 1F in ISO Recommendation R 668, *Dimensions and ratings of freight containers**), which are suitable for international exchange and for conveyance by road, rail and sea, including interchange between these forms of transport.

This ISO Recommendation should be read in conjunction with ISO Recommendations R 790, *Marking of series 1 and series 2 freight containers*, R 1161, *Specification of corner fittings for series 1 freight containers*, and R 1894, *General purpose series 1 freight containers – Minimum internal dimensions*.

2. DIMENSIONS AND RATINGS

The overall external dimensions and tolerances and the maximum gross weight of the freight containers covered by this ISO Recommendation are those established in ISO Recommendation R 668.

No part of the container should project beyond these overall external dimensions.

3. DESIGN FEATURES

3.1 General

Each freight container should be weatherproof and, when carrying its maximum permissible load, should be capable of fulfilling the following operating requirements :

3.1.1 *Stacking* : Being stacked six high, within overall limits of eccentricity of 25.4 mm (1 in) laterally and 38 mm (1 1/2 in) longitudinally.

3.1.2 *Lifting from top corners* :

– For series 1AA, 1A, 1B and 1C containers, the lifting forces applied vertically.

– For series 1D, 1E and 1F containers, the lifting forces applied at any angle between the vertical and 30° to the vertical.

3.1.3 *Lifting from bottom corners* : For series 1AA, 1A, 1B, 1C and 1D containers, being lifted from the bottom at the corners with the lifting forces applied at any angle between the vertical and 30° to the horizontal. The lifting should be performed in such a manner that the side walls are not loaded by the lifting device.

The line of action of the lifting load and the outer face of the corner fitting should be no further apart than 38 mm (1 1/2 in).

3.1.4 *Restraint (in transit)* : External restraint under dynamic load conditions of 2 g (that is, 19.62 m/s² or 64.4 ft/s²) applied in a horizontal plane, longitudinally in the case of containers designated 1AA, 1A, 1B, 1C and 1D. For containers designated 1E and 1F, the load should be applied in a horizontal plane both longitudinally and transversely.

* 2nd edition, 1970.

3.2 Floor

The floor of the freight container should be capable of withstanding a uniformly distributed load of not less than the maximum gross weight of the container.

For series 1AA, 1A, 1B, 1C and 1D containers, the floor should, in addition, be capable of withstanding a wheel load of not less than 2730 kg (6000 lb) per wheel, applied to a contact area not greater than 142 cm² (22 in²), assuming a wheel width of not less than 180 mm (7 in) and a distance between wheel centres of 760 mm (30 in).

3.3 Roof

The roof of the freight container should be capable of withstanding a uniformly distributed load of not less than 200 kg (440 lb) on an area of 600 mm × 300 mm (24 in × 12 in). The load includes a dynamic factor of 50 % applied to the static requirement.

3.4 Walls

Each end wall of series 1AA, 1A, 1B, 1C and 1D freight containers should be capable of withstanding a uniformly distributed load of not less than 0.4 times the maximum payload. Each side wall (length dimension) should be capable of withstanding a uniformly distributed load of not less than 0.6 times the maximum payload. For series 1E and 1F freight containers, both end and side walls should be capable of withstanding a uniformly distributed load of not less than 0.6 times the maximum payload.

3.5 Corner fittings

All series 1 freight containers should be equipped with corner fittings at the top corners. Series 1AA, 1A, 1B, 1C and 1D containers should, in addition, be equipped with corner fittings at the bottom corners.

The upper faces of top corner fittings should protrude above the top of the container by a minimum of 6 mm (1/4 in).

The container structure should not protrude below the base plane of the bottom corner fittings at the time of maximum deflection under maximum payload.

NOTE. — The dimensional requirements for corner fittings for series 1 freight containers are given in ISO Recommendation R 1161.

3.6 Fork lift pockets

Fork lift pockets may be provided as optional features in series 1D, 1E and 1F freight containers. The dimensional requirements for such pockets are specified in Appendix Y.

NOTE. — Fork pockets for containers 1AA, 1A, 1B and 1C are being studied within TC 104, where the view is held that fork pockets are not recommended for 1AA, 1A and 1B containers and when installed in 1C containers may only be employed when the containers are unladen.

3.7 Provisions for bottom lifting by means of straddle carriers and similar equipment

Provisions for bottom lifting all series 1 freight containers by means of straddle carriers and similar equipment may be provided as optional features. The dimensional requirements for such provisions are specified in Appendix Z.

NOTE. — The requirements of section 3 do not preclude the provision of additional facilities for lifting, either from the top, or at the base of the freight container.

3.8 Door opening

Each freight container should be provided with a door opening at least at one end, except in the case of series 1E and 1F containers, where the opening may be provided in a side wall.

Door openings should be as large as possible.

General freight containers designated 1AA, 1A, 1B, 1C and 1D should have a door opening preferably having dimensions equal to those of the internal cross-section of the container, and in any case not less than :

Door height : nominal container external height, minus 305 mm (12 in).

Door width : 2286 mm (90 in).

For the 2435 mm (8 ft) nominal height container (1A, 1B, 1C and 1D), the minimum door height should be 2134 mm (84 in).

For the 2590 mm (8 ft 6 in) nominal height container (1AA) of nominal 12 000 mm (40 ft) length, the minimum door height should be 2286 mm (90 in).

4. TESTING

4.1 General

Freight containers complying with the operating requirements described in section 3 should not be inferior to containers which have met the tests described in clauses 4.2 to 4.10 inclusive. It is recommended that the test for weatherproofness (Test No. 9) be made last.

Unless otherwise stated, the following test requirements should apply :

- 4.1.1 The symbol R denotes the maximum gross weight of the freight container, and the symbol P denotes the maximum payload of the container under test, i.e. the tare weight subtracted from the maximum gross weight.
- 4.1.2 The test load within the container should be uniformly distributed.

4.2 Test No. 1 – Stacking

- 4.2.1 *Procedure.* The freight container under test should be placed on four level pads, one under each bottom corner fitting or equivalent corner structure. The pads should be centralized under the fittings and be substantially of the same plan dimensions as the fittings. The container should be loaded so that its total weight is equal to $1.8 R$.
 - 4.2.1.1 Five containers of the same dimensions and maximum gross weight, and each uniformly loaded so that its total weight is equal to $1.8 R$, should be stacked on top of the container under test. The five containers should be stacked flush in relation to each other, but offset from the container under test by 25.4 mm (1 in) laterally and 38 mm (1 1/2 in) longitudinally.
 - 4.2.1.2 Alternatively, the container under test as specified in clause 4.2.1.1 may be subjected to a load of $9 R$ applied through four pads of the same plan area as the corner fittings, the load being equally divided among the four corner fittings. Each pad should be offset in the same direction by 25.4 mm (1 in) laterally and 38 mm (1 1/2 in) longitudinally.
- 4.2.2 *Requirements.* After completion of the test the container should not show any permanent deformation or abnormality which would make it unsuitable for use, and the tolerance requirements affecting handling, securing and interchange should be satisfied.

4.3 Test No. 2 – Lifting from the top

- 4.3.1 *Procedure.* The freight container under test should be loaded so that its total weight is equal to $2 R$, and carefully lifted from all four top corners in such a way that no noticeable acceleration or deceleration forces are applied.

For series 1AA, 1A, 1B and 1C containers, the lifting forces should be applied vertically.

For containers designated 1D, 1E and 1F, lifting should be by means of slings, the angle of each leg being at 30° from the vertical.

After lifting, the container should be suspended for not less than 5 minutes and then lowered to the ground.
- 4.3.2 *Requirements.* After completion of the test the container should not show any permanent deformation or abnormality which would make it unsuitable for use, and the tolerance requirements affecting handling, securing and interchange should be satisfied.

4.4 Test No. 3 – Lifting from the bottom

- 4.4.1 *General.* This test should be carried out on series 1AA, 1A, 1B, 1C and 1D containers. It should also be carried out on series 1E and 1F containers if they are equipped with bottom corner fittings.

4.4.2 *Procedure.* The container under test should be loaded so that its total weight is equal to $2R$ and carefully lifted from all four bottom corners in such a way that no noticeable acceleration or deceleration forces are applied.

As far as possible, lifting forces should be applied using one spreader above the roof.

For series 1AA, 1A, 1B, 1C and 1D containers, the angle of the lifting force should be 30° from the horizontal.

For series 1E and 1F containers, lifting should be by means of slings, the angle of the slings being at 30° from the vertical.

Lifting containers at the bottom should be performed in such a way that the side walls are not subjected to lifting forces. The container should be suspended for not less than 5 minutes and then lowered to the ground.

NOTE. - The container should not be lifted using rings fitted for restraint purposes only.

4.4.3 *Requirements.* After completion of the test the container should not show any permanent deformation or abnormality which would make it unsuitable for use, and the tolerance requirements affecting handling, securing and interchange should be satisfied.

4.5 Test No. 4 - Restraint

NOTE. - The following test is to meet the operating requirements for restraint in transit as specified in clause 3.1.4.

4.5.1 *Procedures.* The freight container should be restrained longitudinally by securing the bottom corner fittings at one end to suitable anchor points. Each end should be tested.

4.5.1.1 *STATIC TEST.* The freight container, loaded so that its total weight is equal to R , should be secured to rigid anchor points through the bottom apertures of the bottom corner fittings at one end of the container. A force equivalent to a load of $2.5R$ should be applied longitudinally to the container, equally divided through the bottom aperture of the other bottom corner fittings, first in compression and then in tension.

4.5.1.2 *DYNAMIC TEST**

4.5.2 *Requirements.* After completion of the test the container should not show any permanent deformation or abnormality which would make it unsuitable for use, and the tolerance requirements affecting handling, securing and interchange should be satisfied.

4.6 Test No. 5 - End wall strength

4.6.1 *Procedures.* The freight container should have each end wall tested when one end wall is blind and the other equipped with doors.

4.6.1.1 *STATIC TEST.* Series 1AA, 1A, 1B, 1C and 1D freight containers should be loaded with a weight equal to $0.4P$. Series 1E and 1F freight containers should be loaded with a weight equal to $0.6P$.

It is recommended that water be used as the test load for static testing.

The container should be placed face down on the wall being tested, with the load applied to the full cross-section of the wall and uniformly distributed as far as practical.

NOTE. - This test procedure covers both the end and side wall strength of the series 1E and 1F freight containers.

4.6.1.2 *DYNAMIC TEST**

4.6.2 *Requirements.* After completion of the test the container should not show any permanent deformation or abnormality which would make it unsuitable for use, and the tolerance requirements affecting handling, securing and interchange should be satisfied.

* A dynamic form of test has not been included in this ISO Recommendation pending further development of specifications for a satisfactory and reproducible test as an alternative to the static test.

4.7 Test No. 6 – Side wall strength (Series 1AA, 1A, 1B, 1C and 1D)

4.7.1 *Procedure.* The freight container should be loaded to its maximum payload with material which as far as possible occupies the whole internal capacity. It is recommended that water be used as the test load for static testing. The container should then be tilted first to one side and then to the other side to an angle of 45°.

Alternatively, the above procedure may also be met if a side load, uniformly distributed and equivalent to 0.6 *P*, is applied by mechanical means.

4.7.2 *Requirements.* After completion of the test the container should not show any permanent deformation or abnormality which would make it unsuitable for use, and the tolerance requirements affecting handling, securing and interchange should be satisfied.

4.8 Test No. 7 – Roof strength

4.8.1 *Procedure.* A load of 300 kg (660 lb) should be uniformly distributed over an area of 600 mm × 300 mm (24 in × 12 in) located at the weakest area of the roof of the freight container.

4.8.2 *Requirements.* After completion of the test the container should not show any permanent deformation or abnormality which would make it unsuitable for use, and the tolerance requirements affecting handling, securing and interchange should be satisfied.

4.9 Test No. 8 – Floor strength

4.9.1 *General.* The test applies only to series 1AA, 1A, 1B, 1C and 1D freight containers.

4.9.2 *Procedure.* An industrial truck equipped with tyres loaded to an axle weight of 5460 kg (12 000 lb), including the weight of the truck, or 2730 kg (6000 lb) per wheel applied to a contact area of 142 cm² (22 in²) assuming a wheel width of 180 mm (7 in) and a distance between wheel centres of 760 mm (30 in), should be manoeuvred over the entire floor area of the freight container in a longitudinal direction. The test should be made with the base of the container resting on firm level ground.

4.9.3 *Requirements.* After completion of the test the container should not show any permanent deformation or abnormality which would make it unsuitable for use, and the tolerance requirements affecting handling, securing and interchange should be satisfied.

4.10 Test No. 9 – Weatherproofness

4.10.1 *Procedure.* A stream of water should be applied on all exterior joints and seams of the freight container from a nozzle of 12.5 mm (0.5 in) inside diameter, at a pressure of about 1.0 bar (corresponding to a head of about 10 m (33 ft) of water). The nozzle should be held at a distance of 1.5 m (5 ft) from the container exterior joints and seams, and have a rate of travel of 100 mm (4 in) per second.

4.10.2 *Requirements.* After completion of the test, the container should be free from penetration of water.

APPENDIX Y

**OPTIONAL PROVISIONS FOR HANDLING
BY MEANS OF FORK LIFT TRUCKS**

(See clause 3.6)

Figure 1 illustrates two alternative fork lift pocket arrangements for series 1 and 2 freight containers. The dimensions of the pockets, which are optional features on series 1D, 1E and 1F containers, should be as follows :

- height of opening – 100 mm (4 in approx.) minimum
- width of opening – $\begin{cases} 300 \text{ mm (12 in approx.) minimum} \\ 350 \text{ mm (14 in approx.) maximum} \end{cases}$

The distance between the outer edge of the opening and the centreline of the container should be 625 mm (24 1/2 in approx.).

The fork lift pockets may be enclosed or open at the bottom, but in each case should be located below the level of the floor. For the closed design, the distance between the bottom of the container and the bottom edge of the pocket should be 20 mm (3/4 in) minimum. For the open design, the distance from the top edge of the pocket to the bottom of the container should be 120 mm (4 3/4 in) minimum.

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Dimensions in millimetres

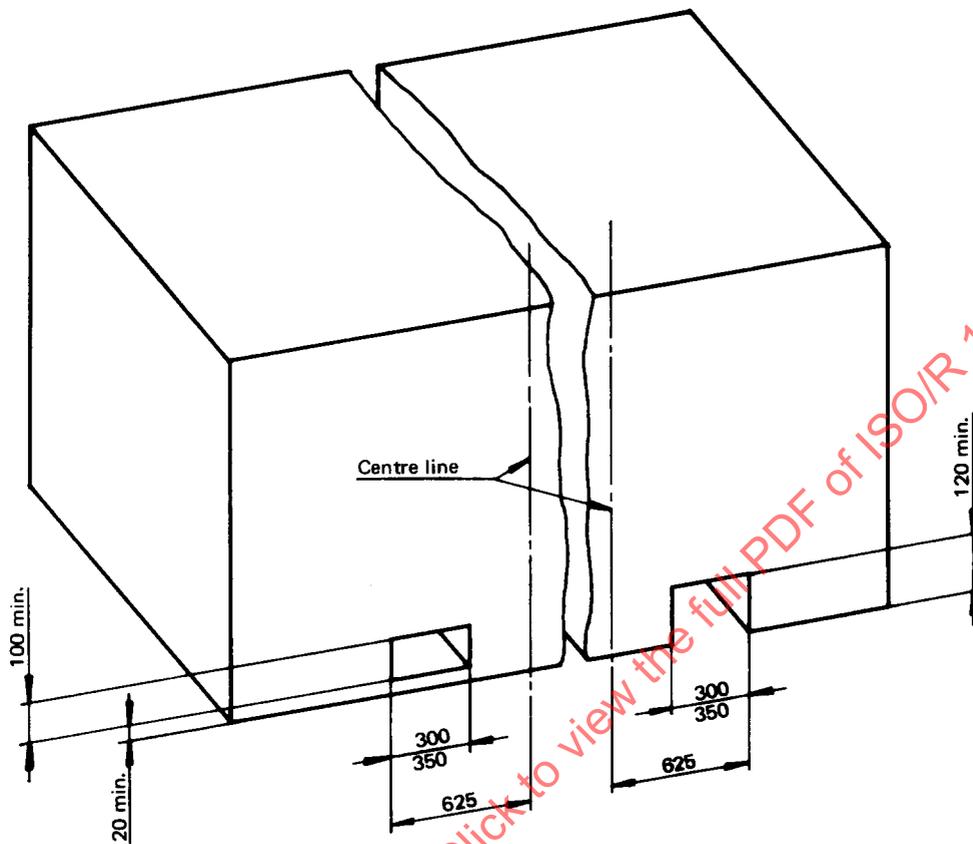


FIG. 1 - Alternative pocket arrangements

Dimension conversion table

mm	in
20	0.79
100	3.94
120	4.72
300	11.81
350	13.78
625	24.61