

# INTERNATIONAL STANDARD

# ISO 1496-1

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1990-08-15

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## Series 1 freight containers — Specification and testing —

### Part 1: General cargo containers for general purposes

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*Conteneurs de la série 1 — Spécifications et essais —*

*Partie 1: Conteneurs d'usage général pour marchandises diverses*

ISO 1496-1:1990

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 1496-1 was prepared by Technical Committee ISO/TC 104, *Freight containers*.

This fifth edition cancels and replaces the fourth edition (ISO 1496-1 : 1984). It incorporates Amendment 1 and Draft Amendment 2.

ISO 1496 will consist of the following parts, under the general title *Series 1 freight containers — Specification and testing*:

- *Part 1: General cargo containers for general purposes*
- *Part 2: Thermal containers*
- *Part 3: Tank containers for liquids, gases and pressurized dry bulk*
- *Part 4: Non-pressurized containers for dry bulk*
- *Part 5: Platform and platform-based containers*

Annexes A to F form an integral part of this part of ISO 1496. Annex G is for information only.

## Introduction

The following grouping of container types is used for specification purposes in ISO 1496:

### Part 1

General purposes	00 to 09
Specific purposes	
— closed, vented/ventilated	10 to 19
— open top	50 to 59

### Part 2

Thermal	30 to 49
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### Part 3

Tank	70 to 79
Bulk, pressurized	85 to 89

### Part 4

Bulk, non-pressurized (box type)	20 to 24
Bulk, non-pressurized (hopper type)	80 to 84

### Part 5

Platform (container)	60
Platform-based with incomplete superstructure and fixed ends	61 and 62
Platform-based with incomplete superstructure and folding ends	63 and 64
Platform-based with complete superstructure	65 to 69

NOTE — Container types 90 to 99 are reserved for air/surface containers: see ISO 8323.

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# Series 1 freight containers — Specification and testing —

## Part 1: General cargo containers for general purposes

### 1 Scope

**1.1** This part of ISO 1496 specifies the basic specifications and testing requirements for ISO series 1 freight containers of the totally enclosed general purpose types and certain specific purpose types (closed, vented, ventilated or open top) which are suitable for international exchange and for conveyance by road, rail and sea, including interchange between these forms of transport.

**1.2** The container types covered by this part of ISO 1496 are given in table 1.

Table 1 — Container types

Type code designation <sup>1)</sup>	Type
00 to 04	Closed, including opening roof
10, 11	Closed, vented
13, 15, 17	Closed, ventilated
50 to 53	Open-top

1) In accordance with ISO 6346.

This part of ISO 1496 does not cover ventilation arrangements, either vented or ventilated.

**1.3** The marking requirements for these containers are given in ISO 6346.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 1496. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 1496 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 668 : 1988, *Series 1 freight containers — Classification, dimensions and ratings*.

ISO 830 : 1981, *Freight containers — Terminology*.

ISO 1161 : 1984, *Series 1 freight containers — Corner fittings — Specification*.

ISO 6346 : 1984, *Freight containers — Coding, identification and marking*.

### 3 Definitions

For the purposes of this part of ISO 1496, the definitions given in ISO 830 apply.

### 4 Dimensions and ratings

#### 4.1 External dimensions

The overall external dimensions and tolerances of the freight containers covered by this part of ISO 1496 shall be those established in ISO 668 except that open-top containers may be of reduced height, in which case they shall be designated 1AX, 1BX, 1CX and 1DX. No part of the container shall project beyond these specified overall external dimensions.

#### 4.2 Internal dimensions

Internal dimensions of containers shall be as large as possible, but, in any case:

- closed containers type 00 shall comply with the requirements for minimum internal length, width and height given in 4.3;
- containers type 02, having partial opening(s) in the side(s), shall comply with the requirements for minimum internal length and height given in 4.3;
- containers type 03, having an opening roof, shall comply with the requirements for minimum internal length and width given in 4.3;
- containers types 01 and 04, having openings in the side(s) and/or roof, shall comply with the requirements for minimum internal length given in 4.3;
- closed, vented containers types 10 and 11 shall comply with the requirements for minimum internal length, width and height given in 4.3;

— closed, ventilated containers type 13 shall comply with the requirements for minimum internal length, width and height given in 4.3.

**4.3 Minimum internal dimensions**

The minimum internal dimensions for ISO series 1 general purpose cargo containers are specified in table 2.

The dimensions apply when measured at a temperature of 20 °C (68 °F). Measurements taken at other temperatures shall be adjusted accordingly.

Where a top corner fitting projects into the internal space specified by table 2, that part of the corner fitting projecting into the container shall not be considered as reducing the size of the container.

**4.4 Ratings**

The values of the rating *R*, being the gross mass of the container, are those given in ISO 668.

**5 Design requirements**

**5.1 General**

All containers shall be capable of fulfilling the following requirements.

The strength requirements for containers are given in diagrammatic form in annex A (these requirements are applicable to all containers except where otherwise stated). They apply to containers as complete units.

The strength requirements for corner fittings (see also 5.2) are given in ISO 1161.

The container shall be capable of withstanding the loads and loadings detailed in clause 6.

As the effects of loads encountered under any dynamic operating condition should only approach, but not exceed, the effects of the corresponding test loads, it is implicit that the capabilities of containers indicated in annex A and demonstrated by the test described in clause 6 shall not be exceeded in any mode of operation.

Any closure in a container which, if unsecured, could lead to a hazardous situation, shall be provided with an adequate securing system having external indication of the positive securement of that closure in the appropriate operating position.

In particular, doors should be capable of being securely fastened in the open or closed position.

Any removable roof or roof section shall be fitted with locking devices such that an observer at ground level can check (when the container is on a rail or highway carrying vehicle) that its roof is secured.

All closed containers and all open containers fitted with covers which were designed for them, shall be weatherproof as required by test No. 13 (see 6.14).

**5.2 Corner fittings**

All containers shall be equipped with top and bottom corner fittings. The requirements and positioning of the corner fittings are given in ISO 1161. The upper faces of the top corner fittings shall protrude above the top of the container by a minimum of 6 mm<sup>1)</sup> (see 5.3.4). The "top of the container" means the highest level of the cover of the container, for example the level of the top of a soft cover. However, if reinforced zones or doubler plates are provided to afford protection to the roof in the vicinity of the top corner fittings, such plates and their securements shall not protrude above the upper faces of the top corner fittings. These plates shall not extend more than 750 mm<sup>1)</sup> from either end of the container but may extend the full width.

**5.3 Base structure**

**5.3.1** All containers shall be capable of being supported by their bottom corner fittings only.

**5.3.2** All containers, other than 1D and 1DX, shall also be capable of being supported only by load transfer areas in their base structure.

**5.3.2.1** Consequently, these containers shall have end transverse members and sufficient intermediate load transfer areas (or a flat underside) of sufficient strength to permit ver-

**Table 2 – Minimum internal dimensions**

Freight container designation	Minimum height	Minimum width		Minimum length		
		mm	in	mm	ft	in
1 A	Nominal container external height minus 241 mm (9 1/2 in)	2 330	91 3/4	11 998	39	4 3/8
1 AA				11 998	39	4 3/8
1 B				8 931	29	3 5/8
1 BB				8 931	29	3 5/8
1 C				5 867	19	3
1 CC				5 867	19	3
1 D				2 802	9	2 5/16

1) 6 mm = 1/4 in  
750 mm = 29 1/4 in



tical load transfer to or from the longitudinal member of a carrying vehicle. Such longitudinal members are assumed to lie within the two 250 mm<sup>1)</sup> wide zones defined by the broken lines in figure B.1.

**5.3.2.2** The lower faces of the load transfer areas, including those of the end transverse members, shall be in one plane located

$$12,5 \text{ mm } \begin{matrix} +5 \\ -1,5 \end{matrix} \text{ mm}^1)$$

above the plane of the bottom faces of the lower corner fittings of the container. Apart from the bottom corner fittings and bottom side rails, no part of the container shall project below this plane.

However, doubler plates may be provided in the vicinity of the bottom corner fittings to afford protection to the understructure.

Such plates shall not extend more than 550 mm<sup>1)</sup> from the outer end and not more than 470 mm<sup>1)</sup> from the side faces of the bottom corner fittings, and their lower faces shall be at least 5 mm<sup>1)</sup> above the lower faces of the bottom corner fittings of the container.

**5.3.2.3** The transfer of load between the underside of the bottom side rails and carrying vehicles is not envisaged.

The transfer of load between side rails and handling equipment should only occur when provisions have been made in accordance with 5.8.1 and 5.8.2.

**5.3.2.4** Containers having all their intermediate transverse members spaced at 1 000 mm<sup>1)</sup> apart or less (or having a flat underside) shall be deemed to comply with the requirements laid down in 5.3.2.1.

**5.3.2.5** Requirements for containers not having transverse members spaced 1 000 mm<sup>1)</sup> apart or less (and not having a flat underside) are given in annex B.

**5.3.3** For containers 1D and 1DX, the level of the underside of the base structure is not specified, except in so far as it is implied in 5.3.4.

**5.3.4** For all containers under dynamic conditions, or the static equivalent thereof, with the container having a load uniformly distributed over the floor in such a way that the combined mass of the container and test load is equal to 1,8 R, no

part of the base of the container shall deflect more than 6 mm<sup>1)</sup> below the base plane (bottom faces of the lower corner fittings).

**5.3.5** The base structure shall be designed to withstand all forces, particularly lateral forces, induced by the cargo in service. This is particularly important where provisions are made for securement of cargo to the base structure of the container.

**5.4 End structure**

For all containers other than 1D and 1DX, the sideways deflection of the top of the container with respect to the bottom of the container, at the time it is under full transverse rigidity test conditions, shall not cause the sum of the changes in length of the two diagonals to exceed 60 mm<sup>1)</sup>.

**5.5 Side structure**

For all containers other than 1D and 1DX, the longitudinal deflection of the top of the container with respect to the bottom of the container, at the time it is under full longitudinal rigidity test conditions, shall not exceed 25 mm<sup>1)</sup>.

**5.6 Walls**

Where openings are provided in end or side walls, the ability of these walls to withstand tests Nos. 5 and 6 shall not be impaired.

**5.7 Door opening**

Each container shall be provide with a door opening at least at one end.

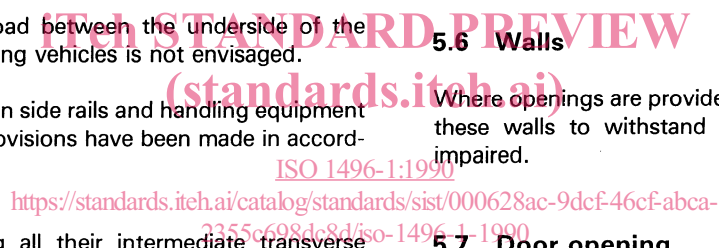
All door openings and end openings shall be as large as possible.

Closed-type containers designated 1A, 1B, 1C and 1D (types 00 and 02) shall have a door opening, preferably having dimensions equal to those of the internal cross-section of the containers and, in any case, not less than 2 134 mm<sup>1)</sup> high and 2 286 mm<sup>1)</sup> wide.

Closed-type containers designated 1AA, 1BB and 1CC (types 00 and 02) shall have a door opening, preferably having dimensions equal to those of the internal cross-section of the containers, and, in any case, not less than 2 261 mm<sup>1)</sup> high, and 2 286 mm<sup>1)</sup> wide.

1) 250 mm = 10 in  
 12,5 mm  $\begin{matrix} +5 \\ -1,5 \end{matrix}$  mm = 1/2 in  $\begin{matrix} +3/16 \\ -1/16 \end{matrix}$  in  
 550 mm = 22 in  
 470 mm = 18 1/2 in  
 5 mm = 3/16 in  
 1 000 mm = 39 3/8 in

6 mm = 1/4 in  
 60 mm = 2 3/8 in  
 25 mm = 1 in  
 2 134 mm = 7 ft  
 2 261 mm = 7 ft 5 in  
 2 286 mm = 7 ft 6 in



## 5.8 Requirements — Optional features

### 5.8.1 Fork-lift pockets

5.8.1.1 Fork-lift pockets used for handling 1CC, 1C, 1CX, 1D and 1DX containers in the loaded or unloaded condition may be provided as optional features.

Fork-lift pockets shall not be provided on 1AA, 1A, 1AX, 1BB, 1B and 1BX containers.

5.8.1.2 Where a set of fork-lift pockets has been fitted as in 5.8.1.1, a second set of fork-lift pockets may, in addition, be provided on 1CC, 1C and 1CX containers for empty handling only.

5.8.1.3 The fork-lift pockets, where provided, shall meet the dimensional requirements specified in annex C and shall pass completely through the base structure of the container so that lifting devices may be inserted from either side. It is not necessary for the base of the fork-lift pockets to be the full width of the container but it shall be provided in the vicinity of each end of the fork pockets.

### 5.8.2 Grappler arms or similar devices

Fixtures for handling all containers by means of grappler arms or similar devices may be provided as optional features. The dimensional requirements for such fixtures are specified in annex D.

### 5.8.3 Gooseneck tunnels

Gooseneck tunnels may be provided as optional features in containers 1AA, 1A and 1AX. The dimensional requirements are specified in annex E and, in addition, all other parts of the base structure shall be as specified in 5.3.

### 5.8.4 Cargo securing devices

Cargo securing devices may be provided as optional features in all series 1 general purpose containers. The requirements for such devices are specified in annex F.

## 6 Testing

### 6.1 General

Unless otherwise stated, containers complying with the design requirements specified in clause 5 shall, in addition, be capable of withstanding the tests specified in 6.2 to 6.14, as applicable. Containers shall be tested in the condition in which they are designed to be operated. Also, containers equipped with removable structural items shall be tested with these items in position. It is recommended that the test for weatherproofness (test No. 13) be carried out last.

6.1.1 The symbol  $P$  denotes the maximum payload of the container to be tested, that is:

$$P = R - T$$

where

$R$  is the rating;

$T$  is the tare.

NOTE —  $R$ ,  $P$  and  $T$ , by definition, are in units of mass. Where test requirements are based on the gravitational forces derived from these values, those forces, which are inertial forces, are indicated thus:

$$Rg, Pg, Tg$$

the units of which are in newtons or multiples thereof.

The word "load", when used to describe a physical quantity to which units may be ascribed, implies mass.

The word "loading", for example as in "internal loading", implies force.

6.1.2 The test loads or loadings within the container shall be uniformly distributed.

6.1.3 The test load or loading specified in all of the following tests are the minimum requirements.

6.1.4 The dimensional requirements to which reference is made in the requirements sub-clause after each test are those specified in:

- the dimensional and design requirement clauses of this part of ISO 1496;
- ISO 668;
- ISO 1161.

## 6.2 Test No. 1 — Stacking

### 6.2.1 General

This test shall be carried out to prove the ability of a fully loaded container to support a superimposed mass of containers, taking into account conditions aboard ships at sea and the relative eccentricities between superimposed containers.

Table 3 specifies the force to be applied as a test to each pair of corner fittings and the superimposed mass that the test force represents.

### 6.2.2 Procedure

The container shall be placed on four level pads, one under each bottom corner fitting.

The pads shall be centralized under the fittings, and shall be substantially of the same plan dimensions as the fittings. The container shall have a load uniformly distributed over the floor in such a way that the combined mass of the container and the test load is equal to  $1,8 R$ .

The container shall be subjected to vertical forces, applied either to all four corner fittings simultaneously or to each pair of end fittings, at the appropriate level specified in table 3. The

Table 3 — Forces to be applied in stacking test

Container designation	Test force per container (all four corners simultaneously)		Test force per pair of end fittings		Superimposed mass represented by test force	
	kN	lbf	kN	lbf	kg	lb
1A, 1AA and 1AX	3 392	762 550	1 696	381 275	192 000	423 290
1B, 1BB and 1BX	3 392	762 550	1 696	381 275	192 000	423 290
1C, 1CC and 1CX	3 392	762 550	1 696	381 275	192 000	423 290
1D and 1DX	896	201 600	448	100 800	50 800	112 000

NOTE — The test force of 3 392 kN per container is derived from the superimposed mass of nine-high stacking, i.e. eight containers stacked on top of one container, all being rated to 24 000 kg, and an acceleration force of 1,8 g. [The corner posts of such containers are known to have been tested to 86 400 kg (190 480 lb).]

forces shall be applied through a test fixture equipped with corner fittings as specified in ISO 1161, or equivalent fittings which have imprints of the same geometry (i.e. with the same external dimensions, chamfered aperture and rounded edges) as the bottom face of the bottom corner fitting specified in ISO 1161. If equivalent fittings are used, they shall be designed to produce the same effect on the container under the test loads as when corner fittings are used.

In all cases, the forces shall be applied in such a manner that rotation of the planes through which the forces are applied and on which the container is supported is minimized.

Each corner fitting or equivalent test fitting shall be offset in the same direction by 25,4 mm<sup>1)</sup> laterally and 38 mm<sup>1)</sup> longitudinally.

### 6.2.3 Requirements

Upon completion of the test, the container shall show neither permanent deformation which will render it unsuitable for use nor abnormality which will render it unsuitable for use, and the dimensional requirements affecting handling, securing and interchange shall be satisfied.

## 6.3 Test No. 2 — Lifting from the four top corner fittings

### 6.3.1 General

This test shall be carried out to prove the ability of a container, other than a 1D or a 1DX container, to withstand being lifted, from the four top corner fittings, with the lifting forces applied vertically, and the ability of a 1D or a 1DX container to withstand being lifted from the top corner fittings with the lifting forces applied at any angle between the vertical and 60° to the horizontal, these being the only recognized methods of lifting these containers by the four top corner fittings.

1) 25,4 mm = 1 in  
38 mm = 1 1/2 in

This test shall also be regarded as proving the ability of the floor and base structure to withstand the forces arising from acceleration of the payload in lifting operations.

### 6.3.2 Procedure

The container shall have a load uniformly distributed over the floor in such a way that the combined mass of the container and test load is equal to 2 R, and it shall be carefully lifted from all four top corners in such a way that no significant acceleration or deceleration forces are applied.

For a container other than a 1D or a 1DX container, the lifting forces shall be applied vertically.

For a 1D or a 1DX container, lifting shall be carried out by means of slings, the angle of each leg being at 60° from the horizontal.

After lifting, the container shall be suspended for 5 min and then lowered to the ground.

### 6.3.3 Requirements

Upon completion of the test, the container shall show neither permanent deformation which will render it unsuitable for use nor abnormality which will render it unsuitable for use, and the dimensional requirements affecting handling, securing and interchange shall be satisfied.

## 6.4 Test No. 3 — Lifting from the four bottom corner fittings

### 6.4.1 General

This test shall be carried out to prove the ability of a container to withstand being lifted, from its four bottom corner fittings, by means of lifting devices bearing on the bottom corner fittings only and attached to a single transverse central spreader beam, above the container.

#### 6.4.2 Procedure

The container shall have a load uniformly distributed over the floor in such a way that the combined mass of container and test load is equal to  $2R$ , and it shall be carefully lifted from the side apertures of all four bottom corner fittings in such a way that no significant acceleration or deceleration forces are applied.

Lifting forces shall be applied at

30° to the horizontal for 1AA, 1A and 1AX containers;

37° to the horizontal for 1BB, 1B and 1BX containers;

45° to the horizontal for 1CC, 1C and 1CX containers;

60° to the horizontal for 1D and 1DX containers.

In each case, the line of action of the lifting force and the outer face of the corner fitting shall be no farther apart than 38 mm<sup>1)</sup>. The lifting shall be carried out in such a manner that the lifting devices bear on the four bottom corner fittings only.

The container shall be suspended for 5 min and then lowered to the ground.

#### 6.4.3 Requirements

Upon completion of the test, the container shall show neither permanent deformation which will render it unsuitable for use nor abnormality which will render it unsuitable for use, and the dimensional requirements affecting handling, securing and interchange shall be satisfied.

### 6.5 Test No. 4 — Restraint (longitudinal)

#### 6.5.1 General

This test shall be carried out to prove the ability of a container to withstand longitudinal external restraint under dynamic conditions of railway operations, which implies acceleration of 2 g.

#### 6.5.2 Procedure

The container shall have a load uniformly distributed over the floor in such a way that the combined mass of the container and the uniformly distributed test load is equal to  $R$ , and it shall be secured longitudinally to rigid anchor points through the bottom apertures of the bottom corner fittings at one end of the container.

A force of  $2Rg$  shall be applied horizontally to the container through the bottom apertures of the other bottom corner fittings, first towards and then away from the anchor points.

#### 6.5.3 Requirements

Upon completion of the test, the container shall show neither permanent deformation which will render it unsuitable for use nor abnormality which will render it unsuitable for use, and the dimensional requirements affecting handling, securing and interchange shall be satisfied.

### 6.6 Test No. 5 — Strength of end walls

#### 6.6.1 General

This test shall be carried out to prove the ability of a container to withstand forces under the dynamic conditions referred to in 6.5.1.

#### 6.6.2 Procedure

The container shall have each end tested when one end is blind and the other equipped with doors. In the case of symmetrical construction, one end only need be tested. The container shall be subjected to an internal loading of  $0,4Pg$ . The internal loading shall be uniformly distributed over the wall under test and arranged to allow free deflection of the wall.

#### 6.6.3 Requirements

Upon completion of the test, the container shall show neither permanent deformation which will render it unsuitable for use nor abnormality which will render it unsuitable for use, and the dimensional requirements affecting handling, securing and interchange shall be satisfied.

### 6.7 Test No. 6 — Strength of side walls

#### 6.7.1 General

This test shall be carried out to prove the ability of a container to withstand the forces resulting from ship movement.

#### 6.7.2 Procedure

The container shall have each side wall tested. In the case of symmetrical construction, one side only need be tested.

Each side wall of the container shall be subjected to an internal loading of  $0,6Pg$ . The internal loading shall be uniformly distributed, applied to each wall separately and arranged to allow free deflection of the side wall and its longitudinal members.

Open-top containers fitted with roof bows (types 50 to 53) shall be tested with the roof bows in position.

1) 38 mm = 1 1/2 in