International Standard ISO 8323

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Freight containers — Air/surface (intermodal) general purpose containers — Specification and tests

Conteneurs pour le transport de marchandises — Conteneurs air/surface (intermodaux) pour usage général — Spécifications et essais

First edition — 1985-07-15

"The American National Standards Institute (ANSI) is the primary source and official sales agent for ISO standards in the United States ANSI was granted an exclusive license to distribute and sell ISO standards, technical reports, drafts and other priced publications within the U S A Under this license agreement ISO has granted to ANSI the right to reproduce ISO standards and drafts within the territories of the United States"

UDC 621.869.88 **Ref. No. ISO 8323-1985 (E)**

Descriptors : freight transport, containers, freight containers, specifications, dimensions, ratings, design, tests.

ISO 8323-1985 (E)

Documents
Price based on 40 pages
Document Sharing Hub

Full document details: ISO 8323-1985

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8323 was prepared jointly by Technical Committees ISO/TC 104, *Freight containers*, and ISO/TC 20, *Aircraft and space vehicles*. It replaces ISO 1496/7-1974, withdrawn in 1984.

© International Organization for Standardization, 1985 ●

Documents
Document Sharing Hub

Full document details: ISO 8323-1985

Contents

Page

0 Introduction 1

0.1 General 1

0.2 Definition of container type 1

1 Scope and field of application 1

2 References 1

3 General characteristics 2

3.1 Airworthiness 2

3.2 Tare weight 2

3.3 Customs sealing 2

4 Dimensions and ratings 2

4.1 External dimensions 2

4.2 Minimal internal dimensions 2

4.3 Ratings 2

4.4 Maximum gross weight, R_a, and distributed load for air/surface (intermodal) containers 3

4.5 Centre of gravity 3

5 Basic design requirements 3

5.1 General 3

5.2 Aircraft restraint loads 4

5.3 Container assembly 5

5.4 Container base 5

5.5 Closures and doors 6

5.6 Optional features 6

AVA Documents
Document Sharing Hub

Full document details: ISO 8323-1985

Page

6 Testing 6

6.1 General 6

6.2 Test No. 1 — Stacking 7

6.3 Test No. 2 — Lifting from the four top corner fittings 7

6.4 Test No. 3 — Lifting from the four bottom corner fittings 7

6.5 Test No. 4 — Longitudinal restraint 8

6.6 Tests No. 5 — Strength of end wall/door 8

6.7 Tests No. 6 — Strength of side walls 9

6.8 Tests No. 7 — Roof strength 9

6.9 Tests No. 8 — Floor strength 10

6.10 Test No. 9 — Lifting from fork-lift pockets 11

6.11 Test No. 10 — Weatherproofness 11

6.12 Test No. 11 — Bridging and cresting 11

6.13 Test No. 12 — Base restraint on roller bed vehicles 12

Figures 1 to 11f) ..... 13 to 29

Annexes

A Detailed design requirements 30

B.1 Overall external dimensions and tolerances — ISO 668 32

B.2 Top corner fittings — ISO 1161 34

B.3 Marking requirements — ISO 6346 37

B.4 Ultimate load criteria — ISO 8097 40

Documents
Document Sharing Hub

Full document details: ISO 8323-1985

Freight containers — Air/surface (intermodal) general purpose containers — Specification and tests

0 Introduction

0.1 General

The basic requirements for the air/surface (intermodal) container are presented in clauses 1 to 6, while the detailed design requirements are laid down in annex A. Annex B sets out the sections of other International Standards which apply to the air/surface container.

ISO 4128 presents the requirements for air mode general purpose containers.

Requirements for containers to be transported by rotary-wing aircraft are excluded from these International Standards. When required, an International Standard will be developed for this type of container.

NOTE — The essential basic and detail criteria are identified by use of the key word "shall". Recommended basic and detail criteria are identified by use of the key word "should", and, while not mandatory, are considered to be of primary importance in providing serviceable, economical and practical air/surface containers

0.2 Definition of container type

air/surface (intermodal) container : An article of transport equipment having an internal volume of 1 m^3 or more, fitted with top and bottom corner fittings, with restraint provisions compatible with an aircraft restraint system, and an entirely flush base bottom to allow handling on rollerized cargo handling systems.

The container is primarily intended for transport by air and interchange with surface transport modes (road, rail and sea).

1 Scope and field of application

1.1 This International Standard sets out the basic requirements for the specification and testing of air/surface (intermodal) containers for general cargo, which are suitable for international exchange and for conveyance by road, rail and sea as well as by freighter versions of high capacity fixed-wing aircraft, including interchange between these modes of transport.

1.2 The coding, identification and marking of these containers shall be in accordance with ISO 6346. To denote the container as an air/surface (intermodal) container, the symbol illustrated in figure 1 shall be located at the top left-hand corner of the end walls and side walls and, as appropriate, on the roof, complying with the requirements of ISO 6346 (see annex B.3 of this International Standard).

NOTE — If any other markings are used on the container, they shall in no way interfere with the location of the marks required by ISO 6346

1.3 The container types covered by this International Standard are :

Type	Marking code identification
Air/surface intermodal (general cargo)	90 to 99 : Fixed wing

2 References

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

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

ISO 1496/1, *Series 1 freight containers — Specification and testing — Part 1 : General cargo containers for general purposes.*

ISO 3874, *Series 1 freight containers — Handling and securing.*

ISO 4116, *Ground equipment requirements for compatible with aircraft unit load devices.*

ISO 4128, *Aircraft — Air mode modular containers.*

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

ISO 8097, *Aircraft — Minimum airworthiness requirements and test conditions for certified air cargo unit load devices.* [1]

1) At present at the stage of draft (*de facto* NAS 3610).

AVA Documents Document Sharing Hub

Full document details: ISO 8323-1985

3 General characteristics

3.1 Airworthiness

Airworthiness requirements laid down by the applicable authorities shall be recognized for container design features such as ultimate loads (see 5.2.1), rapid decompression (see 5.3.2), fire protection and markings.

For this purpose, ISO 8097 shall be applied.

3.2 Tare weight

Taking into consideration the unique aircraft requirements, container design should utilize the combination of design and material which results in as low a tare weight as possible.

3.3 Customs sealing

Since air/surface (intermodal) containers are expected to travel mostly on international routes under customs control, container design shall meet the appropriate requirements of the following international conventions :

a) UN/IMO : (International Maritime Organization) *Customs convention on containers,* Geneva, 1972-12-02.

b) UN/ECE (Economic Commission for Europe) : *Customs convention on the international transport of goods under cover of TIR carnets (TIR Convention),* Geneva, 1975-11-14.

The requirements affecting container design appear in annex 4 of the convention quoted in a) and in annex 2 of the convention quoted in b), *Regulations on technical conditions applicable to containers which may be accepted for international transport under customs seal.*

The main items to be taken into consideration for container design appear in clause A.5 of annex A of this International Standard.

In accordance with annex 5 of the convention quoted in a) and with annex 3 of the convention quoted in b), an approval certificate should be issued by a competent national authority, and an approval plate as specified [minimum dimensions 200 mm × 100 mm (8 in × 4 in)] should be affixed accordingly in the vicinity of the lower edge of the container door.

4 Dimensions and ratings

4.1 External dimensions

The overall external dimensions and tolerances of the containers, covered by this International Standard, are those established for series 1A, 1B, 1C and 1D freight containers in ISO 668 (see annex B.1 of this International Standard). No part of the container shall project beyond these specified overall external dimensions.

4.2 Minimum internal dimensions

Internal dimensions of containers shall be as large as possible, but at least equal to those values given in table 1.

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

Where a corner fitting projects into the internal space, as specified by table 1, that part of the corner fitting projecting into the container shall not be considered as reducing the size of the container.

4.2.1 Door opening

The container shall be designed to make the maximum possible internal cross-section available for loading.

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

Door openings shall be as large as possible, but not less than :

— minimum door height : 2 134 mm (84 in)

— minimum door width : 2 286 mm (90 in)

4.3 Ratings

For the ratings of containers suitable for air and surface transport, the following definitions apply.

Table 1 — Minimum internal dimensions

Freight container designation	Minimum height	Minimum width		Minimum length		
		mm	in	mm	ft	in
1A	2 197 mm (7 ft 2 1/2 in)	2 330	91 3/4	11 998	39	4 3/8
1B				8 931	29	3 5/8
1C				5 867	19	3
1D				2 802	9	2 5/16

Documents
Document Sharing Hub
Full document details: ISO 8323-1985

4.3.1 maximum gross weight[1] : The maximum allowable combined weight of the container and its cargo :

R_a : maximum gross weight of an air/surface container

R_s : maximum gross weight of a surface container (stacking only)

4.3.2 tare weight[1], T : The weight of the empty container, including its normal complement of loading restraint devices.

4.4 Maximum gross weight, R_a[1], and distributed load for air/surface (intermodal) containers

The container shall not be used, in any transport system, at gross weights in excess of those given in table 2a).

Table 2a) — Maximum gross weight of container, R_a

Air/surface intermodal container designation	Maximum gross weight, R_a	
	kg	lb
1A	20 412	45 000
1B	15 876	35 000
1C	11 340	25 000
1D	5 670	12 500

However, a uniformly distributed load up to 6 759 kg (14 900 lb) may be placed in any 3 m (10 ft) linear length for 1A, 1B and 1C containers.

4.5 Centre of gravity

Cargo placement shall limit the centre of gravity to within the envelope indicated below :

a) ± 10 % of the external width, measured from the geometric centre;

b) ± 5 % of the external length, measured from the geometric centre;

c) between a height of 356 mm (14 in) to 1 219 mm (48 in), measured from the bottom of the base.

To obtain the above asymmetric conditions, cargo density is assumed to vary linearly.

5 Basic design requirements[2]

5.1 General

All containers shall be weatherproof.

Containers, when loaded to maximum gross weight, shall be capable of fulfilling the operating requirements specified in 5.1.1 to 5.1.4.

5.1.1 Stacking

Air/surface (intermodal) containers shall be capable of being stacked in position as follows (see table 3) :

— terminal storage : beneath two general cargo containers of the same size loaded to their ratings, as laid down in ISO 668 — $2R_s$

— ship transport, below deck only : beneath one general cargo container of the same size loaded to its rating, as laid down in ISO 668 — R_s

For stacking, the maximum gross weight, R_s, for surface mode (intermodal) general cargo containers shall not exceed the values given in table 2b).

Table 2b) — Maximum gross weight of container, R_s

Surface container designation	Maximum gross weight, R_s	
	kg	lb
1A	30 480	67 200
1B	25 400	56 000
1C	20 320[1]	44 800
1D	10 160	22 400

1) A weight of 24 000 kg (52 920 lb) is contemplated for the 1C container as a future increase to this rating in ISO 668 is envisaged.

5.1.2 Lifting from top corner fittings

Series 1A, 1B and 1C containers shall be capable of being lifted, from the four top corner fittings, with the lifting force applied vertically. The 1D container shall be capable of being lifted, from the four top corner fittings, with the lifting forces applied at any angle between the vertical and 60° to the horizontal (see 6.3 — test No. 2).

5.1.3 Lifting from bottom corner fittings

Series 1A, 1B, 1C and 1D containers shall be capable of being lifted, from the bottom corner fittings, by means of lifting devices exerting force on the bottom corner fittings only and attached to a single transverse central spreader beam above the container (see 6.4 — test No. 3).

5.1.4 Ground handling

5.1.4.1 Vertical movements

The ground handling equipment will subject the container to certain loads that shall be taken into account by the designer. The lifting and lowering of containers onto supports is assumed to produce a dynamic load. The combined effect of this dynamic load, the varying centre of gravity of load within the container and gravity is assumed to produce an equivalent vertical load not greater than $2{,}0R_a$ (see 6.2 — test No. 1, 6.3 — test No. 2, 6.4 — test No. 3).

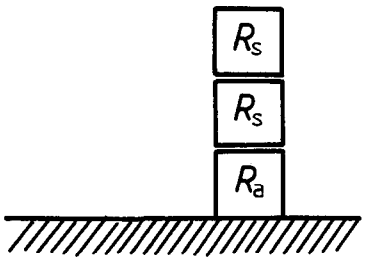
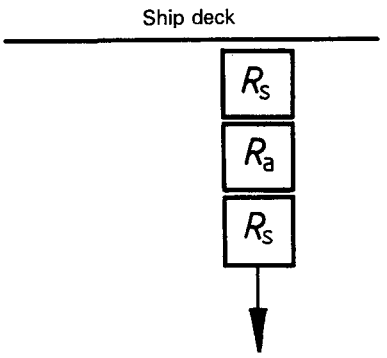
1) The term "weight" is retained here, instead of the correct technical term "mass", in order to conform to current commercial usage

2) For supplementary detailed design requirements, see annex A

AVA Documents
Document Sharing Hub

Full document details: ISO 8323-1985

Table 3 — Stacking

Terminal storage	Ship transport, below deck only
	

Due to the flat bottom configuration, for terminal storage, compatible ISO interlayer fittings or other separator means may be attached to the applicable corner fittings.

For stacking in ship cells (that is, the top two tiers), interlayer fittings shall be attached to each of the four bottom corner fittings (see ISO 3874).

5.1.4.2 Horizontal movements

The design of the container shall take into account the longitudinal external restraint conditions which may be experienced during transportation by rail, so that the container shall be capable of withstanding a horizontal acceleration of $2g$ through the base, while being supported and restrained only at the four bottom corner fittings (see 6.5 — test No. 4).

The design of the container shall also take into account the maximum operational forward forces which may be experienced during surface transportation, so that the container shall be capable of withstanding a horizontal acceleration of $0{,}4g$ through the end walls or doors (see 6.6.2 — test No. 5.1).

Account shall also be taken, in the design of the container, of the maximum operational side forces which may be experienced during surface transportation, so that the container shall be capable of withstanding a horizontal acceleration of $0{,}6g$ through the side walls (see 6.7.2 — test No. 6.1).

5.1.4.3 Bridging and cresting

The container shall be capable of negotiating a crest or bridge, when being moved along a rollerized conveyor system, without suffering permanent deformation or damage (see 6.12 — test No. 11).

5.1.4.4 Roof strength (walking loads)

The container roof shall be capable of withstanding a uniformly distributed mass of not less than 300 kg (660 lb), over an area of 600 mm × 300 mm (24 in × 12 in), applied vertically downwards (see 6.8.2 — test No. 7.1).

5.1.4.5 Deck lashing

No requirements for deck lashing are laid down, as air/surface containers shall be carried below deck only (top two positions) for ship transport.

5.1.4.6 Base restraint on roller bed vehicles

Slots to be used for ground transport restraint on roller bed vehicles, not equipped with twistlock fittings, shall be provided, as shown in figure 7. The inner face of each outward slot (or block) shall be capable of restraining, laterally, 33 % of the maximum gross weight (R_a).

The container lower edge member shall be capable of restraining an upward load of 20 % of the maximum gross weight (R_a) in the slot area. These loads shall be applied simultaneously (see 6.13 — test No. 12).

5.1.4.7 Grappler arms

No optional provision is made for handling containers by means of grappler arms or similar devices.

5.1.4.8 Loading by trucks or similar devices

The container floor shall withstand the concentrated dynamic loads imposed while being loaded by powered industrial trucks or similar devices (see 6.9 — test No. 8).

5.2 Aircraft restraint loads

5.2.1 Ultimate loads

Air containers differ from their surface counterparts in that they play an integral part in the aircraft restraint system, and are,

AVA Documents
Document Sharing Hub
Full document details: ISO 8323-1985

therefore, subject to additional design complexity, imposed by aircraft certification requirements. For this reason, this International Standard specifies design parameters not normally included in International Standards.

The container shall be designed to bear the ultimate loads given in ISO 8097 (see annex B.4 of this International Standard), while being supported on a roller system, in accordance with 5.4.6, base restrained, in accordance with 5.2.2 and 5.2.3, and with the centre of gravity of the cargo located at any point in the envelope, specified in 4.5.

Under these loads, the container may exhibit permanent deformation, but it shall not break up to the extent of discharging cargo.

5.2.2 Base restraint loads

Side loads shall be exerted on the container base. Upward, forward and aft loads shall be exerted by a fitting, as shown in figure 4, inserted into the restraint slots, shown in figures 2 and 3. The design shall allow the forward and aft loads to be exerted on the following number of load-bearing slots :

- 1A (40 ft) container : 11 slots
- 1B (30 ft) container : 8 slots
- 1C (20 ft) container : 5 slots
- 1D (10 ft) container : 2 slots

The ultimate forward and aft loads for each slot shall be 8 340 daN (18 750 lb), imparted by a restraint latch, as shown in figure 4, acting on the abutment face. For forward and aft loads, the load-bearing slots shall be considered effective either on one or both sides of the container.

The container shall be designed to be restrained in spite of vertical loads exerted by 50 to 60 % of the total number of slots, equally distributed on each side. The upward load shall be exerted by a minimum fitting, as shown in figure 4, inserted in the side restraint slots (see 6.6.3, 6.6.4, 6.7.3, 6.7.4, 6.8.3 and 6.8.4).

5.2.3 Base restraint loads — 1D containers

In addition to the requirements of 5.2.2, end restraint slots shall be designed to restrain a 1D container against ultimate forward, aft and vertical upward loads, when used in conjunction with restraint fittings, located as shown in figure 5 and in the configuration illustrated in figure 6. The container end slot dimensions and location are shown in figure 7.

5.3 Container assembly

5.3.1 Container body construction shall be rugged and weatherproof.

5.3.2 A minimum total of 77,4 cm^2 (12 in^2) of vent area for each 3 m (10 ft) length of container shall be provided, if the door seal area is not sufficient to fulfil this venting requirement. Each vent shall be adequately protected from cargo load shift to ensure that the required vent area is available during rapid depressurization in an aircraft.

5.3.3 The container body shall incorporate fittings at its top four corners in accordance with ISO 1161 (see annex B.2 of this International Standard). The protrusion of the upper faces of the top corner fittings shall be kept to a minimum of 6 mm (1/4 in) above the roof of the container.

The bottom four corners shall incorporate fittings in accordance with figure 10.

Dimensions and tolerances between corner fittings shall be in accordance with ISO 668 (see annex B.1 of this International Standard).

5.4 Container base

5.4.1 The container shall have a smooth bottom below which there shall be no protrusions. The lower surface of the edge members and the bottom corner fittings shall be flush with the bottom surface of the base (see figure 9).

5.4.2 Along the length of the container, the bottom surface shall be flat to within 3 mm (0.125 in). This shall allow for a waviness factor, crest to crest, at a minimum pitch of 915 mm (36 in).

5.4.3 The base edge shall have the restraint slots which conform to figures 2 and 3. End slots shall be provided in accordance with figure 7. The vertical surface of the base edge between the restraint slots shall be smooth and continuous, in order to provide a suitable interface for the automatic aircraft restraint latches. The lower profile of the edges shall be as shown in figures 3 and 7.

5.4.4 Securing points shall be provided internally for the attachment of devices for the lashing of cargo, and these points shall be located on 600 mm (24 in) centres around the periphery of the base, excluding the door sill area. These points shall be "D" rings, or equivalent, each capable of imparting a force of 1 776 daN (4 000 lb) in any direction.

5.4.5 So that the container conforms to the aircraft system deflected shape, the 1A and 1B container base, loaded to the rated maximum gross weight (see table 2), shall be free to deflect ± 9,5 mm (± 3/8 in), without rigid restraint by the side walls. Base stiffness in the forward and aft direction in the plane of the base shall have a maximum value of 339 075 $N \cdot m^2/m$ (3×10^6 $lbf \cdot in^2/in$) or 824 000 Pa per 25,4 mm.

NOTE — These 1A and 1B container requirements relate to current aircraft and may be amended for future aircraft.

5.4.6 The base shall provide for support and ease of movement when loaded to the rated maximum gross weight on the following minimum conveyor systems :

- Four rows of rollers, approximately equally spaced over a width of 1 930 mm (76 in), measured between the centres of rows. Each row comprises 38 mm (1.5 in) diameter parallel rollers, 76 mm (3 in) long, uncrowned, with an edge radius of 1,5 mm (0.06 in), spaced 254 mm (10 in) apart. The container travels perpendicular to the roller centrelines.

AVA Documents Document Sharing Hub

Full document details: ISO 8323-1985

— Swivel castors, with 25,4 mm (1 in) diameter wheels, having a contact length of 51 mm (2 in), located on a 305 mm × 305 mm (12 in × 12 in) grid pattern. The container travels in all directions across the grid.

— Ball transfer units, with 25,4 mm (1 in) diameter balls, located on a 127 mm × 127 mm (5 in × 5 in) grid pattern. The container travels in all directions across the grid.

(See 6.9.2 — test No. 8.2.)

5.4.7 The base design shall allow for deflections of no more than the thickness of the interlayer adaptor fittings in ground handling nor than the combined dimensions of the adaptor and the proud location of the upper fittings of the surface container which it is stacked on in ship-cell handling. For design purposes, this combined dimension is assumed to be 19 mm (0.75 in).

Accordingly, under dynamic conditions, or the static equivalent thereof, no part of the base shall deflect more than 19 mm (0.75 in.) (see 6.2 — test No. 1).

5.5 Closures and doors

5.5.1 Any closure in the container which, if unsecured, could be hazardous, shall be provided with an adequate securing system having some indication outside the container that the closure is secured in the appropriate operating position. In particular, doors should be capable of being securely fastened in the open and closed position, while the container is being supported solely by the lower corner fittings or on the minimum conveyor systems, as described in ISO 4116.

5.5.2 The lower edge of the door and its attached hardware shall not encroach on the mandatory restraint slot areas as shown in figure 7.

5.5.3 The door latches shall be designed to allow the opening and shutting of the door, when the container is on an uneven surface that varies up to 12,7 mm (0.5 in.) over the width of the door opening.

5.5.4 Provision shall be made for a mechanical device to indicate that doors are positively locked.

5.5.5 Particular attention should be given to the prevention of water leaking through door-to-body interface areas (see 6.11 — test No. 10).

5.5.6 Handles, straps, or handholds shall be provided on the door of the 1D container to assist manual movement of the container. These devices shall withstand a 450 daN (1 000 lb) pull in any direction, and should provide an area equivalent to 152 mm (6 in) wide by 76 mm (3 in) deep for gripping with a gloved hand.

5.6 Optional features

5.6.1 Fork-lift pockets

5.6.1.1 Fork-lift pockets used for handling 1C and 1D containers in the loaded or unloaded condition may be provided as optional features. The fork-lift pockets, where provided, shall comply with the dimensional requirements specified in figure 8. The pockets shall pass completely through the base structure of the container so that lifting devices may be inserted from either side (see 6.10 — test No. 9).

Pocket design shall take into account that fork-lift tynes will not extend the full width of the container. Tilt backwards up to 10°, and lifting and load support equivalent to 1,25 R will be imparted by the upper tunnel structure against the two tyne blades, neither of which are more than 200 mm (8 in) wide nor less than 1 828 mm (72 in) in length. In selecting the material used for pocket faces and tunnels, consideration shall be given to the fact that tynes are steel blades which will be inserted ± 3° to the centreline of the pocket.

5.6.2 Provisions for internal hanging devices

Transport of cargo by means of hanging devices may be considered as an optional feature. It should be borne in mind, however, that such features may have a considerable influence on container design and testing, due to the load path imparted by hanging loads. Therefore, standards and requirements for this feature are subject to further study and definition.

6 Testing

6.1 General

Air/surface (intermodal) containers, complying with the design requirements specified in clause 5, shall not be inferior to containers which have passed the tests specified in 6.2 to 6.13 inclusive. It is recommended that the test for weatherproofness (test No. 10) be carried out last.

Unless otherwise stated, operational design loads are used in all tests. For substantiation of analytical data, when required, tests, in selected cases, may be repeated under ultimate load conditions. If this becomes necessary, the container tested in this way shall not be used in service, until structural and design parameters have been completely restored. Where a test is not stipulated, the design requirements specified in clause 5 may be verified either by calculation or testing.

6.1.1 The symbol R_a denotes the maximum gross weight of the air/surface (intermodal) container [see table 2a)] and the symbol P denotes the maximum payload of the container under test, that is the tare weight, T, subtracted from the maximum gross weight :

$$R_a = P + T$$

$$P = R_a - T$$

The symbol R_s denotes the assumed maximum gross weight of the surface container [see table 2b)].

6.1.2 The test load within the container shall be uniformly distributed, unless otherwise specified. The maximum variations in the centre of gravity, as specified in 4.5, shall be considered for tests Nos. 5.2, 5.3, 6.2, 6.3, 7.2, 7.3, 8.2 and 11.

AVA Documents
Document Sharing Hub

Full document details: ISO 8323-1985

6.1.3 Test equipment and methods of testing described are not intended to be restrictive. Alternative equivalent methods to achieve the desired result may be used.

6.1.4 When restraint or movement on an aircraft system is used, the test system shall be in accordance with 5.4.6. Suitable latches and guide-rails shall be provided to guide the container along the conveyor and secure it at its latch points. The test system shall be of sufficient length to permit cycling of the longest container to be tested.

6.1.5 The diagrams in figures 11a) to 11f) (tests Nos. 1 to 12) show the test loads and reaction forces applied to a 6 m (20 ft) container (drawn approximately to scale). Variations in the geometrical layout of restraint means and test methods are stated underneath the diagram, where appropriate.

6.2 Test No. 1 — Stacking

6.2.1 General

This test shall be carried out to prove the ability of an air/surface (intermodal) container on the ground to support two fully loaded surface containers ($2R_s$) of the same length.

This test also proves the ability of the air/surface (intermodal) container to support one fully loaded surface container (R_s), when placed in ship-cell structures.

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 weight of the container and the uniformly distributed test load is equal to $1{,}8R_a$. For the purposes of the test, a uniform load shall be defined as $1{,}8R_a - T$.

The container shall have a test load applied vertically to each of the four top corner fittings simultaneously, in such a manner that the planes of the container remain horizontal throughout the test. The load shall be applied through a corner fitting or a pad not less than 25,4 mm (1 in) thick of the same plan area as the corner fitting. Each pad shall be offset in the same direction by 25,4 mm (1 in) laterally and 38 mm (1.5 in) longitudinally.

The test load value on each corner fitting shall be determined from table 4.

Table 4 — Corner fitting test load

Container designation	Test load per corner[1]	
	daN	lb
1A	16 169	36 350
1B	13 678	30 750
1C	11 187	25 150
1D	6 205	13 950

1) The test load values allow for an assumed lifting device weight of 5 000 kg (11 000 lb), when the container is lowered

6.2.3 Requirements

Throughout the test, the maximum downward deflection of the base shall not exceed 19 mm (0.75 in).

On 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 to withstand being lifted, from its four top corner fittings, by means of lifting devices bearing on the top corner fittings.

6.3.2 Procedure

The container shall have a load uniformly distributed over the floor in such a way that the combined weight of the container and the uniformly distributed test load is equal to $2R_a$. It shall be carefully lifted from all four top corners in such a way that no significant acceleration or deceleration forces are applied. For the purposes of the test, a uniform load shall be defined as $2R_a - T$. No portion of the container shall touch the ground during the test.

For series 1A, 1B and 1C containers, the lifting forces shall be applied vertically. For the 1D container, lifting shall be by means of slings, each leg being at an angle of 60° to the horizontal.

After lifting, the container shall be suspended for not less than 5 min and then lowered to the ground.

6.3.3 Requirements

On 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 weight of the container

AVA Documents
Document Sharing Hub

Full document details: ISO 8323-1985

and the uniformly distributed test load is equal to $2R_a$. 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. For the purposes of the test, a uniform load shall be defined as $2R_a - T$.

Lifting forces shall be applied at

30° to the horizontal for 1A containers,

37° to the horizontal for 1B containers,

45° to the horizontal for 1C containers,

60° to the horizontal for 1D 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 (1.5 in). 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

On 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 — Longitudinal restraint

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 equivalent to a load of $2R_a$ exerted horizontally.

6.5.2 Procedure

The container shall have a load uniformly distributed over the floor in such a way that the combined weight of the container and the uniformly distributed test load is equal to R_a. It shall be secured longitudinally to rigid anchor points through the bottom apertures of the bottom corner fittings at one end of the container. For the purposes of the test, a uniform load shall be defined as $R_a - T$.

A load equivalent to a load of $2R_a$ 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

While the container is being subjected to the internal downwards load of R_a and is being supported by the bottom corner fittings, and after the removal of the horizontal loads, check that the doors and latches function normally.

On 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 Tests No. 5 — Strength of end wall/door

6.6.1 General

These tests shall be carried out to prove the ability of the container end walls or door to withstand the maximum operational forward forces which may be experienced during surface transportation or air transportation, while secured by means of the bottom corner fittings or the appropriate aircraft restraint system.

6.6.2 Test No. 5.1 — Surface mode

6.6.2.1 Procedure

The container shall be secured to rigid anchor points through the bottom apertures of the four bottom corner fittings. A test load of 0,4 $(R_a - T)$ shall be applied horizontally to one end of the container.

The test shall be repeated at the opposite end of the container unless the ends are identical.

6.6.2.2 Requirements

On completion of the tests, 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.

6.6.3 Test No. 5.2 — Air mode

6.6.3.1 Procedure

The container shall be secured to the aircraft restraint system, or its equivalent. The number of latches indicated in 5.2.2 shall be engaged on one side of the container and the latches adjusted, by a suitable means, to ensure contact with the end of the side latch receptacle slot. The container shall have a test load of $R_a - T$ applied horizontally to one end wall. A similar test load of $R_a - T$ may be applied downwards, simultaneously, to the top surface of the container base.

The test shall be repeated at the opposite end of the container unless the ends are identical.

6.6.3.2 Requirements

On completion of the tests, 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.

AVA Documents
Document Sharing Hub

Full document details: ISO 8323-1985

6.6.4 Test No. 5.3 — Air mode, 1D container only

6.6.4.1 Procedure

The container shall be secured to the aircraft restraint system, or its equivalent, using only restraints in the fore and aft end slots, in accordance with figures 5 and 6.

The container shall have a test load of $R_a - T$ applied horizontally to one end wall. A similar test load of $R_a - T$ may be applied downwards, simultaneously, to the top surface of the container base.

The test shall be repeated at the opposite end of the container unless the ends are identical.

6.6.4.2 Requirements

On 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 Tests No. 6 — Strength of side walls

6.7.1 General

These tests shall be carried out to prove the ability of the container side walls to withstand the maximum operational side forces that may be experienced during surface transportation or air transportation, while secured by means of the bottom corner fittings or the appropriate aircraft restraint system.

6.7.2 Test No. 6.1 — Surface mode

6.7.2.1 Procedure

The container shall be secured to rigid anchor points through the bottom apertures of the four bottom corner fittings. A test load of 0,6 ($R_a - T$) shall be applied horizontally to the side wall of the container.

The test shall be repeated on the opposite side wall unless the walls are identical.

6.7.2.2 Requirements

On completion of the tests, 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.

6.7.3 Test No. 6.2 — Air mode

6.7.3.1 Procedure

The container shall be secured to the aircraft restraint system, or its equivalent. The number of latches indicated in 5.2.2, equally spaced on both container sides, shall be engaged in the side slots and the latches adjusted, by suitable means, to ensure vertical restraint.

The container shall have a test load of $R_a - T$ applied horizontally to one side wall. A similar test load of $R_a - T$ may be applied downwards, simultaneously, to the top surface of the container base.

The test shall be repeated on the opposite side wall unless the walls are identical.

6.7.3.2 Requirements

Throughout the tests, the maximum permitted lateral deflection of the container roof, with respect to the container base, shall not exceed 38 mm (1.5 in).

On 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.

6.7.4 Test No. 6.3 — Air mode, 1D container only

6.7.4.1 Procedure

The container shall be secured to the aircraft restraint system, ot its equivalent, using only restraints in the fore and aft end slots, in accordance with figures 5 and 6.

The container shall have a test load of $R_a - T$ applied horizontally to one side wall. A similar test load of $R_a - T$ may be applied downwards, simultaneously, to the top surface of the container base.

The test shall be repeated on the opposite side wall unless the walls are identical.

6.7.4.2 Requirements

Throughout the tests, the maximum permitted lateral deflection of the container roof, with respect to the container base, shall not exceed 38 mm (1.5 in).

On completion of the tests, 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.

6.8 Tests No. 7 — Roof strength

6.8.1 General

These tests shall be carried out to prove the ability of the container roof to withstand the force imposed by persons working on it and to withstand the maximum operational load which may be experienced during air transportation.

AVA Documents
Document Sharing Hub

Full document details: ISO 8323-1985

6.8.2 Test No. 7.1 — Surface mode

6.8.2.1 Procedure

A load of 300 daN (660 lb) shall be uniformly distributed over an area of 600 mm × 300 mm (24 in × 12 in), located at the weakest area of the rigid container roof.

6.8.2.2 Requirements

On 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.

6.8.3 Test No. 7.2 — Air mode

6.8.3.1 Procedure

The container shall be secured to the aircraft restraint system, or its equivalent. The container shall have a test load of $R_a - T$ applied upwards to the underside of the roof.

The total number of restraint latches shall be as given in table 5 and the latches shall be equally distributed between both sides and equally spaced along the full length of the container.

Table 5 — Total number of restraint latches

Air/surface (intermodal) container designation	Total number of restraint latches
1A	24
1B	18
1C	12
1D	6

6.8.3.2 Requirements

On 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.

6.8.4 Test No. 7.3 — Air mode, 1D container only

6.8.4.1 Procedure

The container shall be secured to the aircraft restraint system, or its equivalent, using only restraints in the fore and aft end slots, in accordance with figures 5 and 6. The container shall have a test load of $R_a - T$ applied upwards to the underside of the roof.

6.8.4.2 Requirements

On 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.

6.9 Tests No. 8 — Floor strength

6.9.1 Test No. 8.1 — Surface mode (cyclic loading)

6.9.1.1 General

This test shall be carried out to prove the ability of a container floor to withstand the concentrated dynamic loads imposed during cyclic loading operations by powered industrial trucks or similar devices.

6.9.1.2 Procedure

The test shall be carried out using a test vehicle equipped with tyres, and loaded to an axle weight of 5 460 kg (12 000 lb), that is 2 730 kg[1] (6 000 lb) on each of the two wheels. The vehicle shall be positioned so that all points of contact between each wheel and the flat continuous surface lie within a rectangular envelope measuring 185 mm (7 1/4 in) (in a direction parallel to the axle of the wheel) by 100 mm (4 in), and so that each wheel makes physical contact over an area within this envelope of not more than 142 cm^2 (22 in^2). The wheel width shall be nominally 180 mm (7 in) and the wheel centres shall be nominally 760 mm (30 in).

The path of the test vehicle shall be patterned over the entire floor area of the container. One cycle is defined as the test vehicle entering the container, travelling its entire length along various paths and then leaving the container. This manœuvre shall be repeated for 100 cycles. The test shall be made with the container resting on four level supports under its four bottom corner fittings, with its base structure free to deflect.

The test shall be repeated with the container supported on unidirectional and multi-directional conveyor systems, as described in ISO 4116.

6.9.1.3 Requirements

On completion of the tests, 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.

1) The values of 5 460 kg and 2 730 kg are in conformity with the requirements of the CSC (*International Convention for Safe Containers*, UN/IMO) floor strength test.

AVA Documents
Document Sharing Hub
Full document details: ISO 8323-1985