

---

---

**Series 1 freight containers —  
Corner and intermediate fittings —  
Specifications**

*Conteneurs de la série 1 — Pièces de coin et pièces de fixation  
intermédiaires — Spécifications*



Reference number  
ISO 1161:2016(E)

© ISO 2016



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Dimensional requirements</b> .....	<b>1</b>
3.1 General.....	1
3.2 Detailed dimensional and manufacturing requirements.....	1
<b>4 Strength requirements</b> .....	<b>2</b>
<b>5 Design requirements</b> .....	<b>2</b>
5.1 Loading.....	2
5.1.1 General.....	2
5.1.2 Stacking.....	3
5.1.3 Lifting.....	3
5.1.4 Longitudinal restraint.....	3
5.1.5 Vertical restraint.....	3
5.1.6 Lashing and securing.....	3
5.1.7 Misgather (offset loading).....	4
5.2 Compulsory features.....	4
<b>6 Minimum bearing area — Top and bottom corner and intermediate fittings</b> .....	<b>4</b>
<b>7 Corner and intermediate fitting marking</b> .....	<b>4</b>
<b>8 Required tests</b> .....	<b>5</b>
8.1 General.....	5
8.2 Casting defect checks.....	5
8.3 Tests.....	5
<b>Annex A (normative) Testing methodology</b> .....	<b>17</b>
<b>Annex B (informative) Typical examples of twistlock lifting devices</b> .....	<b>22</b>
<b>Bibliography</b> .....	<b>24</b>

## 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

The committee responsible for this document is ISO/TC 104, *Freight containers*, Subcommittee SC 1, *General purpose containers*.

This fifth edition cancels and replaces the fourth edition (ISO 1161:1984), which has been technically revised with the following changes:

- added ISO 148-1 in [Clause 2](#);
- added mechanical properties and reference to heat treatment in [Clause 4](#);
- revised design load values for top, bottom and intermediate fittings in [5.1.1](#) to [5.1.3](#) in accordance with the maximum superimposed mass represented in ISO 1496-1;
- added [5.1.4](#);
- added interior walls, top and bottom plates as new compulsory features in [5.2](#);
- added new compulsory markings in [Clause 7](#);
- added [Clause 8](#);
- added interior wall thickness and bottom plate thickness, hitherto unspecified in [Figure 1 a](#));
- added interior wall thickness and bottom plate thickness, hitherto unspecified in [Figure 2 a](#));
- added interior wall thickness and top plate thickness, hitherto unspecified in [Figure 3 a](#));
- added interior wall thickness and top plate thickness, hitherto unspecified in [Figure 4 a](#));
- added wall thickness, hitherto unspecified in [Figure 1 b](#));
- added wall thickness, hitherto unspecified in [Figure 2 b](#));
- added wall thickness, hitherto unspecified in [Figure 3 b](#));

- added wall thickness, hitherto unspecified in [Figure 4 b](#));
- revised diagram for internal lashing in [Figure 5](#);
- removed existing [Annex A](#), “Examples of overall dimensions of box-shaped corner fittings”;
- added new [Annex A](#), “Testing methodology”;
- removed Annex C “Guide on the choice of sizes for, and the positioning of, twistlock tie-down devices for securing series 1 freight containers to carrying vehicles” (intent to transfer to ISO 3874 as more appropriate home for this information).

It also incorporates the Amendment ISO 1161:1984/Amd 1:2007 and the Technical Corrigendum ISO 1161:1984/Cor 1:1990.

## Introduction

This International Standard on corner fittings is the result of the efforts of technical and operational personnel drawn from all phases of the transportation industry. The figures show the fittings for the top and bottom corners of series 1 freight containers which will provide compatibility in interchange between transportation modes. Care has been taken to limit consideration only to those details vital to this function.

The size and configuration of corner and intermediate fitting apertures are specified. The faces of the corner and intermediate fittings having apertures for the engagement of handling and securing devices have specified thickness and tolerances as shown in [Figures 1 to 4](#). The minimum thickness of the blank walls is specified even though they are not involved in the engagement of the handling and securing devices; they can be thicker than the minimum provided that their inner surfaces do not protrude into the corner fitting cavity reserved for the engaging device.

The purpose of this International Standard is to define some details of design vital to container interchange in automatic, semi-automatic and conventional systems.

The strength and testing requirements specified in this International Standard do not take any account of the stresses which can result from the practice of end-to-end coupling of containers.

NOTE The requirements of this International Standard do not preclude the Provision of additional facilities for lifting either from the top or at the base of the freight container.

# Series 1 freight containers — Corner and intermediate fittings — Specifications

## 1 Scope

This International Standard establishes the basic dimensions and the functional and strength requirements of corner and intermediate fittings for series 1 freight containers, i.e. containers which conform to ISO 668 and ISO 1496 (all parts) with the exception of air mode containers (see ISO 8323).

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

## 3 Dimensional requirements

### 3.1 General

**3.1.1** The dimensions and tolerances of the corner and intermediate fittings shall conform to [Figures 1](#) to [4](#).

Each series 1 container shall have two right-hand top corner fittings (on the right as the observer faces either end of the container) and two left-hand top corner fittings which are the mirror image of the right-hand fittings.

The bottom corner fittings shall have a similar configuration except in respect of the end aperture.

Apart from the above, 45 ft containers shall have four top intermediate fittings in the 40 ft position [see [Figures 1](#) b) and [2](#) b)] and four bottom intermediate fittings in the 40 ft position [see [Figures 3](#) b) and [4](#) b)].

The corner fittings shown in [Figures 1](#) to [4](#) illustrate right-hand top and bottom fittings only; for the left-hand corner fittings, the dimensions are simply transposed.

### 3.2 Detailed dimensional and manufacturing requirements

**3.2.2** Where the dimensions are not specified for inner and outer edges of apertures, these edges shall be given a radius of:

$$3^{0}_{-1,5} \text{ mm} \left( 1 / 8^{0}_{-1/16} \text{ in} \right) \quad (1)$$

**3.2.3** At the junction of the two 6 mm (1/4 in) outside edge radii with the 14,5 mm (9/16 in) edge radius, the corner should be rounded by blending the radiused edges, removing minimum amounts of material from the flat outer faces and walls.

**3.2.4** Where a corner or intermediate fitting has an optional inner side wall and is made to the minimum dimension of 149 mm (5 7/8 in), the junction of the mandatory horizontal face to the optional inner side wall may be provided with a radius not exceeding 5,5 mm (7/32 in).

If a greater radius is required, the 149 mm (5 7/8 in) dimensions shall be increased accordingly.

## 4 Strength requirements

The corner or intermediate fittings shall be designed, constructed and tested in such a manner and of such materials as to enable them to pass the operating and testing requirements laid down in ISO 1496-1 and [Clauses 5](#) and [8](#).

The mechanical properties of raw materials used to produce corner fittings shall meet or exceed the following:

Yield Strength:	275 MPa;
Tensile strength:	480 Mpa;
Impact Energy at -20°C	27 KV (Joule) <sup>a</sup> ;
Impact Energy at -40°C:	21 KV (Joule) <sup>a</sup> ;
Elongation:	25 %;
Reduction of area:	40 %.

<sup>a</sup> Impact tests in accordance with ISO 148-1.

The above is to be regarded as the minimum values for strength requirements. Certification societies may approve higher values, but not lower. Testing at temperatures lower than -40 °C may be approved if required.

Manufacturers are responsible for ensuring that quantities of undesirable elements in the raw materials used to produce corner fittings are kept to an absolute minimum and that the composition of the resultant material is such as to ensure good weldability.

All corner or intermediate fittings produced by a casting process are to be suitably heat treated to comply with the specified mechanical properties above. Heat treatment batches are to be limited to the size required so as to ensure that all fittings receive a comparable treatment regime and that there are no cold or hot spots in the batch.

## 5 Design requirements

### 5.1 Loading

#### 5.1.1 General

The following container design loadings and criteria were used in establishing the dimensional design of corner or intermediate fittings specified in this International Standard.

Corner and intermediate fittings for series 1 freight containers shall be capable of withstanding the loads calculated in accordance with the requirements of ISO 1496-1 and the lifting methods of ISO 3874 for 1AA, 1A, 1AX, 1EEE and 1EE containers. The calculated design loads are listed in the following subclauses.

**WARNING — Recognizing that there are containers that have ratings in excess of those specified in ISO 668, special arrangements for certification of corner or intermediate fittings for such containers may be required.**

### 5.1.2 Stacking

	Design loads
Top corner fitting [superimposed load offset 25,4 mm (1 in) laterally and 38 mm (1 1/2 in) longitudinally]	942 kN
Top Intermediate fitting [superimposed load offset 25,4 mm (1 in) laterally and 38 mm (1 1/2 in) longitudinally]	423 kN
Bottom corner fitting (resting on flat support)	1200 kN
Bottom intermediate fitting (resting on flat support)	560 kN
Bottom corner fitting offset 25,4 mm (1 in) laterally and 38 mm (1 1/2 in) longitudinally (to reflect the situation in cell guides)	942 kN

### 5.1.3 Lifting

	Design loads
Top corner or intermediate fitting [twistlock (see also <a href="#">Clause 6</a> ), hook or shackle]	195 kN
Bottom corner or intermediate fitting sling at 30° to horizontal	390 kN

NOTE Lifting from the bottom corner or intermediate fitting:

- the line of action of the sling is assumed to be parallel to and not more than 38 mm (1 1/2 in) from the outer face of the corner fitting;
- the load values quoted are for slings at the angles stated, but it is recognized that slings may be used at any angle between the angle stated and the vertical.

### 5.1.4 Longitudinal restraint

	Design loads
Bottom corner or intermediate fittings (two fittings carrying load)	300 kN ( $2 g \times 1 R$ )

### 5.1.5 Vertical restraint

	Design loads
Top and bottom corner fittings or intermediate top and bottom fittings	250 kN

### 5.1.6 Lashing and securing

The force, or resultant of any combination of forces, imparted on the aperture in the end or the side of a bottom corner or bottom intermediate fitting as a result of the use of a lashing or a securing device, or a combination of such devices, is assumed not to exceed the value indicated by the point on the “envelope” shown in [Figure 5](#) which is appropriate to the angle at which the force, or resultant force, is applied. It is further assumed that the force or resultant force lies in a plane parallel to and no more than 38 mm (1 1/2 in) from the face of the corner or intermediate fitting.

### 5.1.7 Misgather (offset loading)

Localized loading of bottom corner or intermediate fittings caused by lowering of the container onto locating fittings which are not gathered into the hole.

All corner and intermediate fittings shall be capable of withstanding a load of 190 kN applied normally to the contact area of 25 mm (1 in) × 6 mm (1/4 in) on the top and bottom faces (see [Figure 6](#)).

## 5.2 Compulsory features

Minimum thicknesses are prescribed for the following walls or faces in the corner or intermediate fittings:

top corner or intermediate fittings:

- the top face;
- the exterior side wall;
- the exterior end wall;
- the interior side wall;
- the interior end wall;
- the bottom plate;

bottom corner or intermediate fittings:

- the bottom face;
- the exterior side wall;
- the exterior end wall;
- the interior side wall;
- the interior end wall;
- the top plate.

All walls and faces must be of sufficient thickness and strength to withstand the compressive and racking forces expected through normal handling, stowage and transport practices.

## 6 Minimum bearing area — Top and bottom corner and intermediate fittings

It is assumed that lifting or securing devices which only use the top and bottom apertures of the four top or bottom corner or intermediate fittings will have a minimum total bearing area on the horizontal part of the inner top surfaces of the top and bottom corner or intermediate fittings of 800 mm<sup>2</sup> (1,24 in<sup>2</sup>)<sup>1</sup> for each of the top and bottom corner fittings.

Examples of twistlock lifting devices are given in [Annex B](#).

## 7 Corner and intermediate fitting marking

Markings on top and bottom corner or intermediate fittings shall be located at positions where they are clearly visible after assembly of the fittings to freight containers and where they will not interfere with the satisfactory functioning of handling, locating and securing devices used in conjunction with the corner or intermediate fittings.

Each fitting shall be permanently marked such that it can be referenced to the test certificates proving compliance with this International Standard. Markings must include, at a minimum, the following:

- manufacturer's mark;
- heat number or symbol identifying the cast;
- certification mark.

## 8 Required tests

### 8.1 General

The test set forth in [8.3.1](#) to [8.3.12](#) are to be conducted on each fitting except for those produced using a batch process. For a batch process, a minimum of 2 % of the fittings in each batch shall be tested. Test pieces must be randomly selected by the Certification Society from the batch under heat treatment at the time.

At the end of each test, the fitting shall show no permanent deformation.

A full dimensional check to ensure compliance with this International Standard, with respect to aperture dimension, wall thickness and overall dimensions, shall be done on each fitting.

### 8.2 Casting defect checks

**8.2.1** A visual check for defects shall be done on the exterior and interior surfaces of each fitting. All defective fittings shall be destroyed.

**8.2.2** A suitable non-destructive test (e.g. X-ray or ultrasound) shall be performed on one fitting from each casting batch. If defects are found, all fittings in the batch shall be tested. All defective fittings shall be destroyed.

### 8.3 Tests

**8.3.1** The mechanical properties shall be checked and conformance with the minimum material properties set forth in [Clause 4](#) confirmed for each heat and furnace lot of metal used to produce cast fittings. For fabricated fittings, each sheet of material used shall be tested and conformance confirmed.

**8.3.2** Top fitting stacking test — The fitting shall be supported vertically on a typical corner post and horizontally by structures similar to typical cross sections for header and top side rail. The top face of the fitting shall be subjected to the full ISO load (942 kN) + 10 %. The load shall be applied perpendicular to the fitting equally distributed over the fitting's top face. The load shall be applied for a minimum of 2 min.

**8.3.3** Top intermediate fitting stacking test — The fitting shall be supported vertically on a typical intermediate post and horizontally by structures similar to typical cross sections for intermediate headers and top side rails. The top face of the fitting shall be subjected to the full ISO load (423 kN) plus 10 %. The load shall be applied perpendicular to the fitting equally distributed over the fitting's top face. The load shall be applied for a minimum of 2 min.

**8.3.4** Bottom fitting stacking test — The fitting shall be laid flat on a rigid test bed and a compressive force applied vertically downwards onto a typical corner post. The fitting shall be subjected to the full ISO load (1 200 kN) + 10 %. The load shall be applied for a minimum of 2 min.

Fittings not marked so as to differentiate them as being either top or bottom fittings shall be subjected to the bottom fitting stacking test.

**8.3.5** Bottom intermediate fitting stacking test — The fitting shall be laid flat on a rigid test bed and a compressive force applied vertically downwards onto a typical intermediate post. The fitting shall be subjected to the full ISO load (560 kN) + 10 %. The load shall be applied for a minimum of 2 min.

Fittings not marked so as to differentiate them as being either top or bottom intermediate fittings shall be subjected to the bottom intermediate fitting stacking test.

**8.3.6** Twistlock lifting test — The fitting shall be held firmly and a vertical force applied to the underside of the top face (bottom face for bottom fittings). The force shall be distributed over 800 mm<sup>2</sup>, 400 mm<sup>2</sup> on either side of the aperture. The force shall be at least 250 kN. The load shall be applied for a minimum of 2 min.

**8.3.7** Cargo hook lifting test — The top corner fitting shall be held firmly and a vertical force applied using a cargo lifting hook hooked through the top and front aperture and the top and end apertures. The force applied shall be at least 194 kN. The load shall be applied for a minimum of 2 min.

**8.3.8** Cargo hook lifting test 2 — The bottom corner fitting shall be held firmly and an angled force applied using a cargo lifting hook through the side aperture. The angle shall be 30° to the horizontal and the force applied shall be the equivalent of SinØ (194 kN). The load shall be applied for a minimum of 2 min.

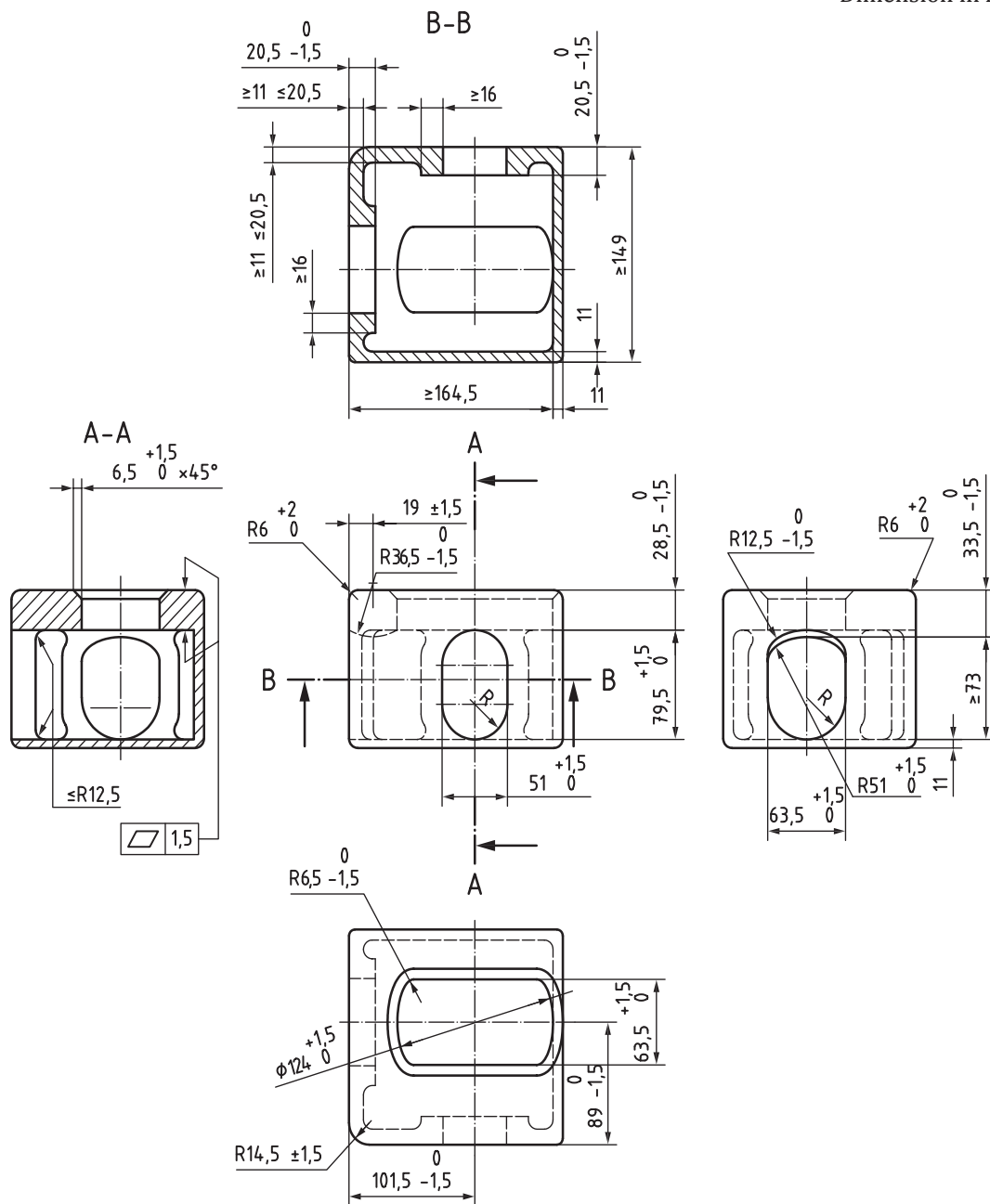
**8.3.9** Impact test — The fitting shall be held firmly and a vertical impact force of 150 kN applied to a 150 mm<sup>2</sup> area on the top face of the fitting centred between the aperture and the nearest side and end walls. The load shall be applied for a minimum of 2 min. The test shall be repeated on the bottom face. Top or bottom faces shall not be bowed or deformed on completion of testing. The testing tool may leave a small depression, which must be no deeper than 0,3 mm.

**8.3.10** Lashing bar test — The bottom corner fitting shall be held firmly and a vertical force applied to the front aperture using a device similar to a lashing bar. The rear end of the fitting shall be left unsupported in a manner that is similar to the current container design. A force of 300 kN shall be applied for a minimum of 2 min.

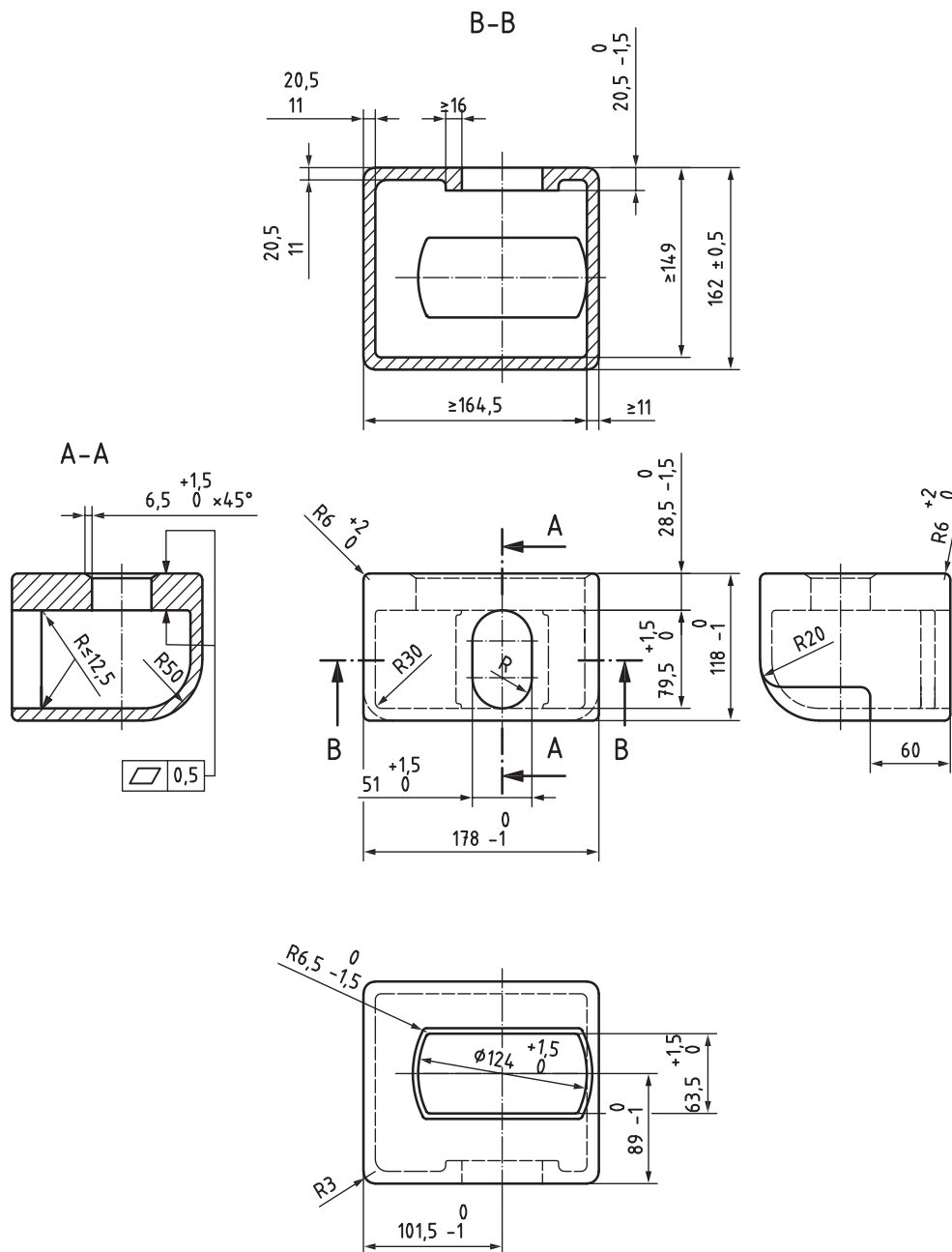
**8.3.11** Misgather test — The bottom and top corner fittings shall be laid flat on a rigid test bed and a compressive force applied vertically downwards. The head of the test device shall simulate a twistlock with a 15 mm radius head onto the area corresponding to that shown in [Figure 6](#). A force of 150 kN shall be applied for a minimum of 2 min.

**8.3.12** Rail securing test — The bottom corner fitting shall be held firmly and a horizontal force applied to the bottom aperture longitudinally in the direction of the front aperture using a device similar to a twistlock. A force of 360 kN shall be applied for a minimum of 2 min.

Dimension in millimetres



a) Corner (see [Clause 3](#))



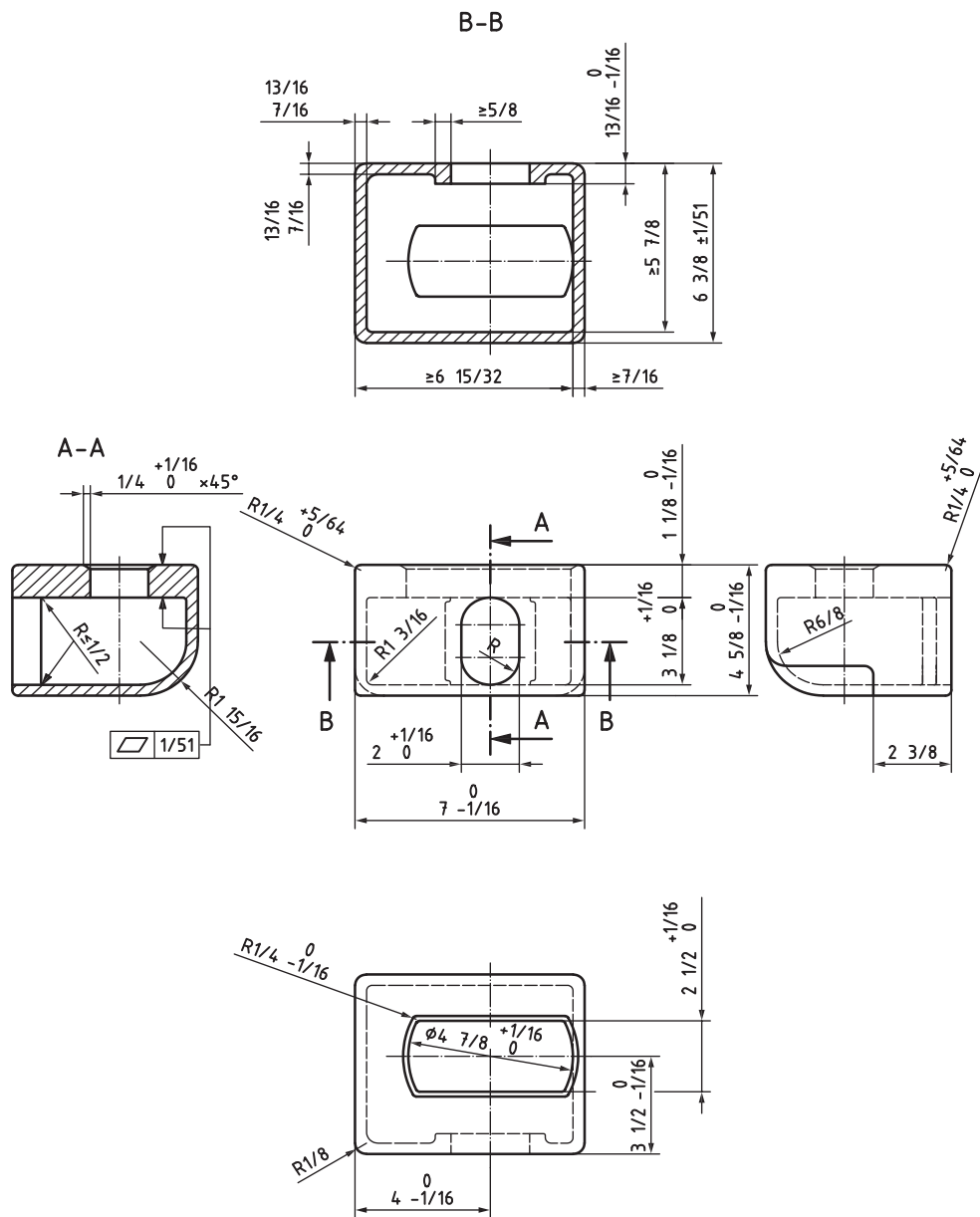
### b) Intermediate

### Key

_____	show surfaces and contours which shall be physically duplicated in the fitting
-----	show surfaces and contours which shall be physically duplicated in the fitting
---x---	show optional walls, which may be used to develop a box-shaped fitting

**Figure 1 — Top fitting**

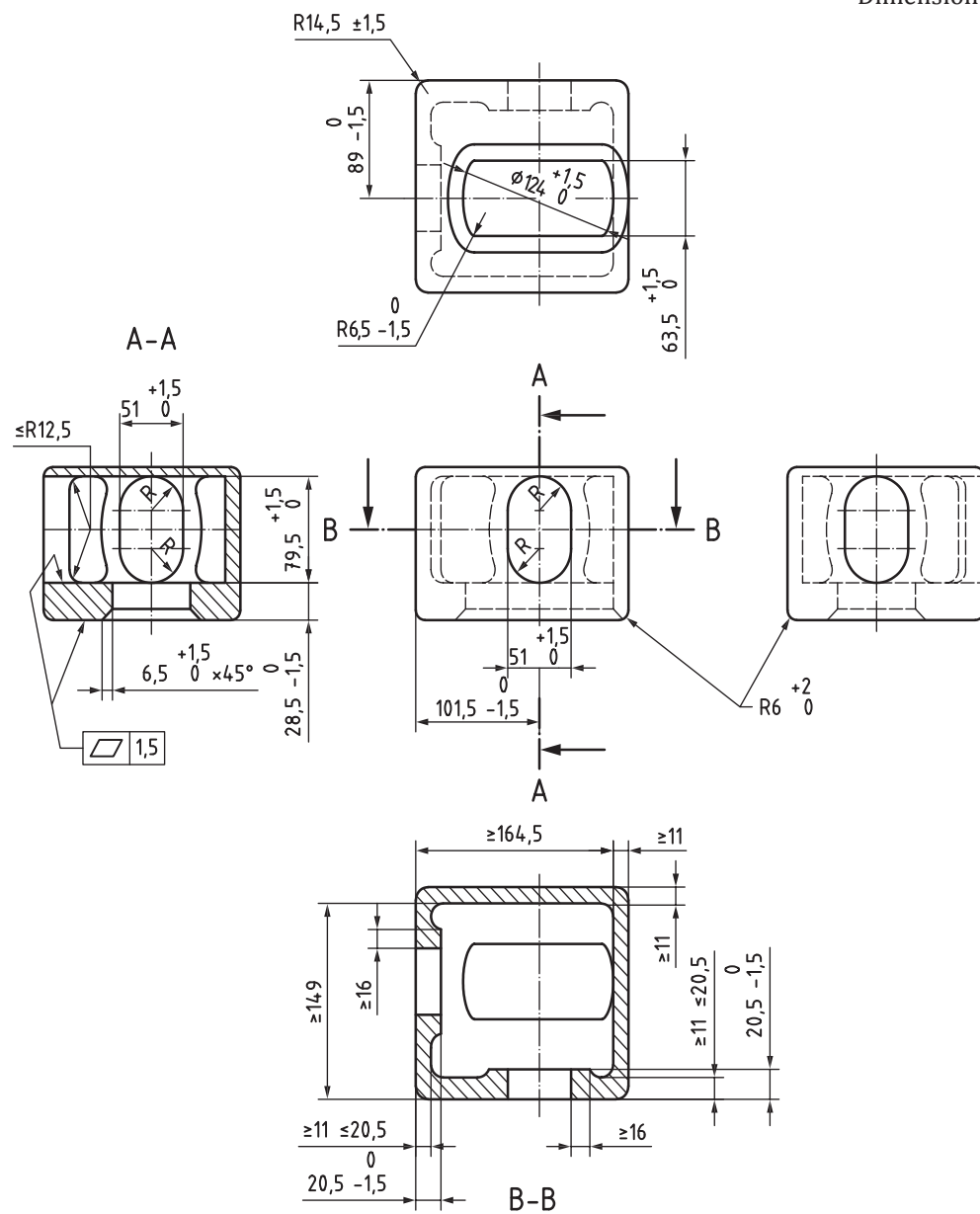




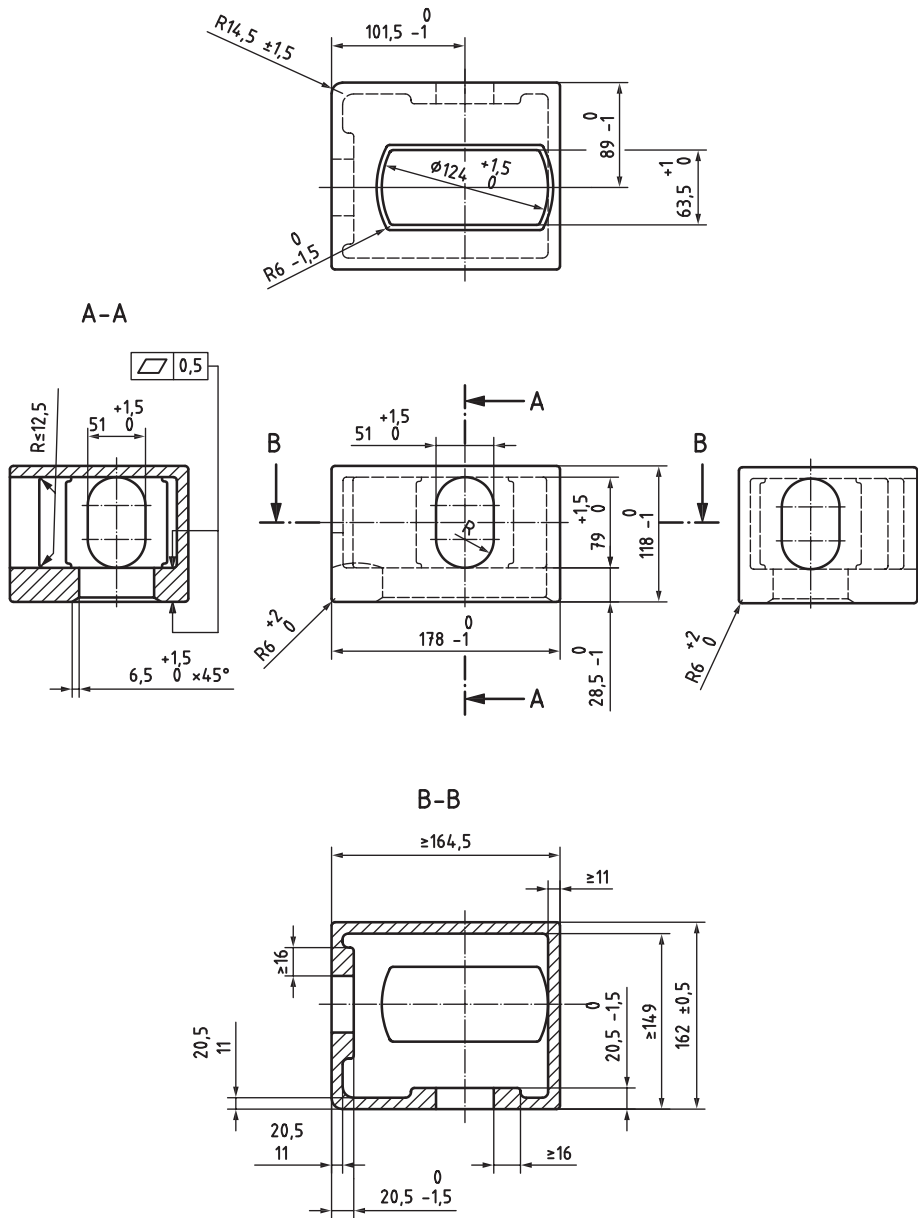
## b) Intermediate

Figure 2 — Top fitting

Dimension in millimetres



a) Corner (see [Clause 3](#))

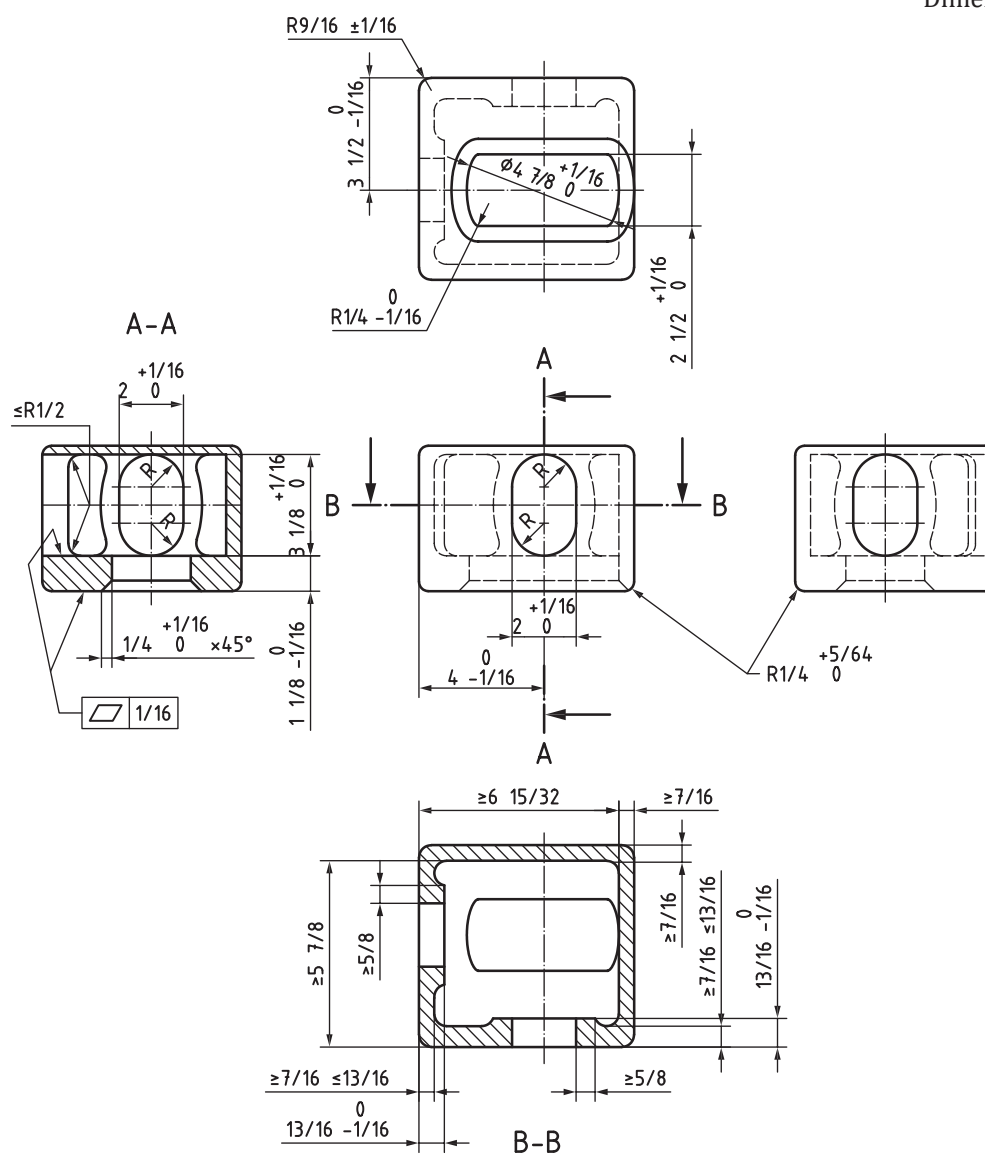


**b) Intermediate**

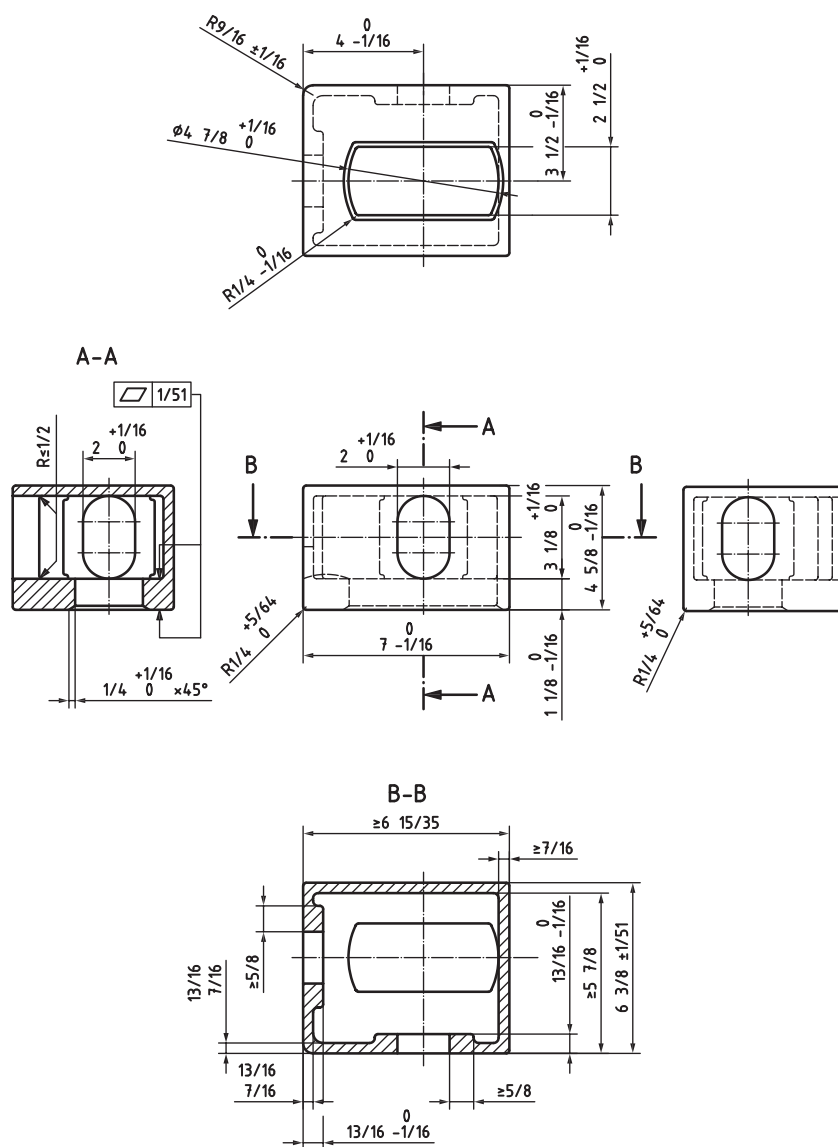
_____	show surfaces and contours which shall be physically duplicated in the fitting
-----	show surfaces and contours which shall be physically duplicated in the fitting
... ..	show optional walls, which may be used to develop a box-shaped fitting

**Figure 3 — Bottom fitting**

Dimension in inches



a) Corner (see [Clause 3](#))

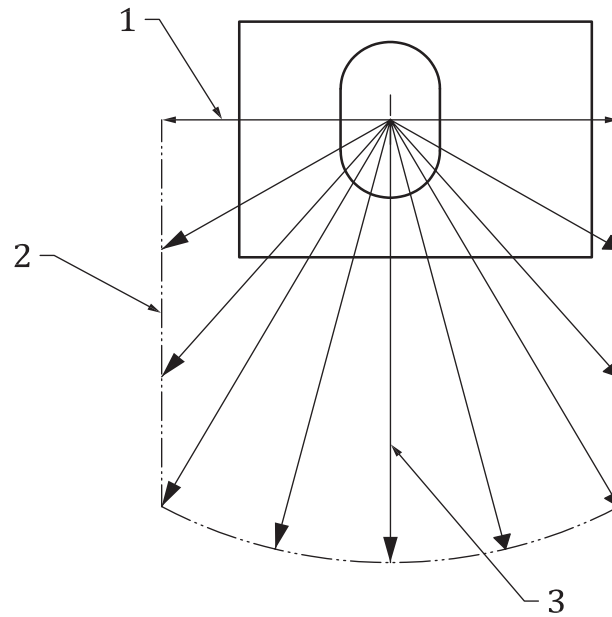


### b) Intermediate

#### Key

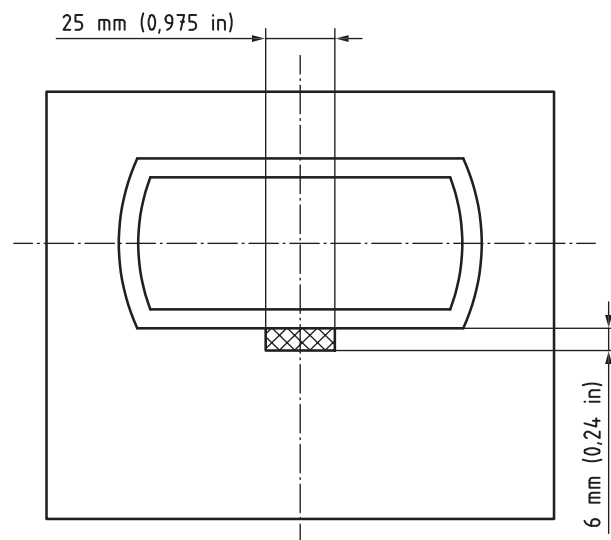
- show surfaces and contours which shall be physically duplicated in the fitting
- show surfaces and contours which shall be physically duplicated in the fitting
- ..... show optional walls, which may be used to develop a box-shaped fitting

Figure 4 — Bottom fitting

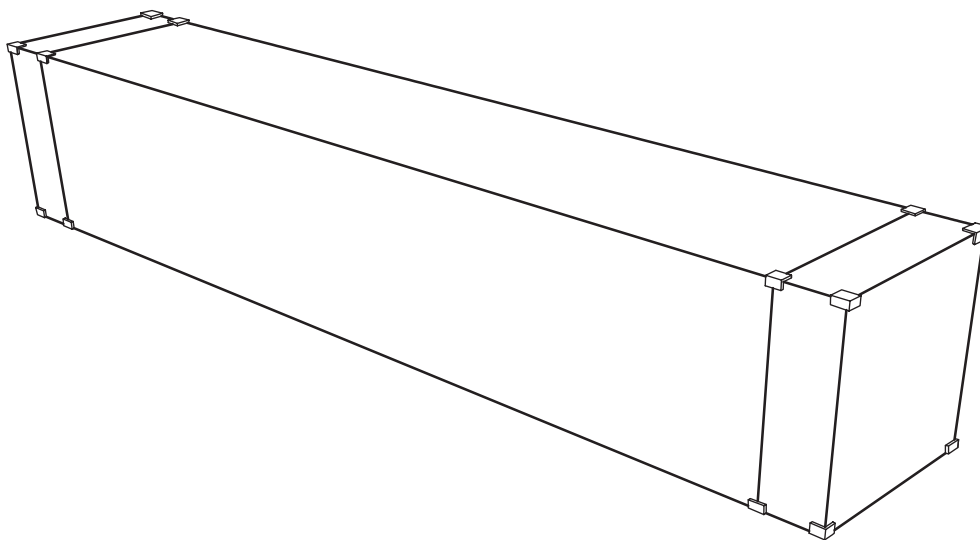
**Key**

- 1 horizontal 150 kN
- 2 boundary of zone of limitation
- 3 vertical 300 kN

**Figure 5 — Limits of loads due to lashing and securing — Bottom corner fittings — Internal Lashing**



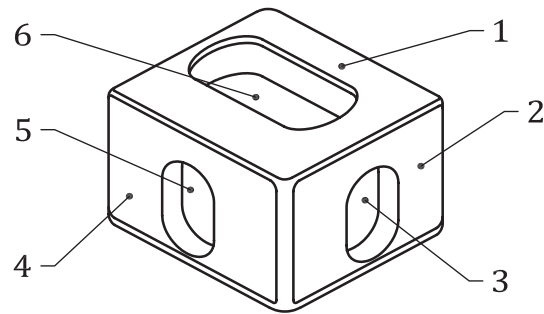
**Figure 6 — Bottom view of bottom corner fitting showing contact area (shaded) for misgather (push-up) load**



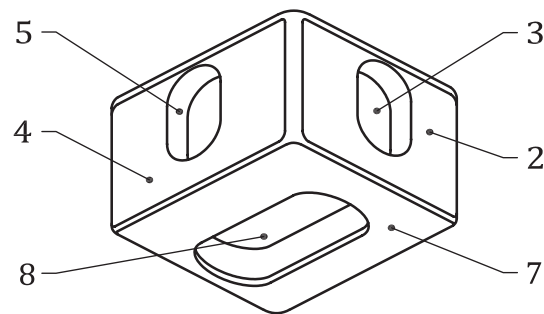
**Figure 7 — 45 ft container with corner and intermediate fittings**

## Annex A (normative)

### Testing methodology



**a) Upper corner fitting**

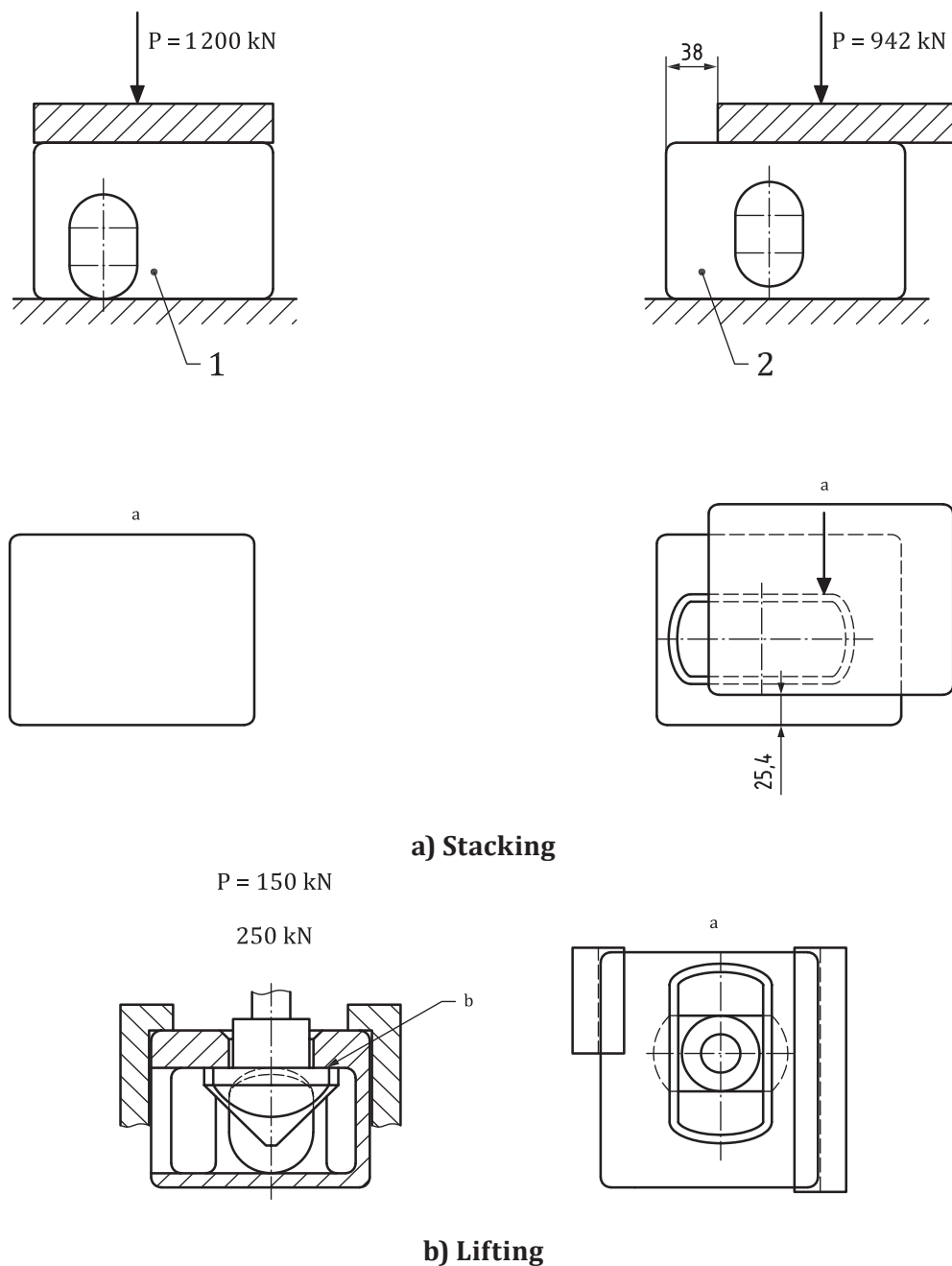


**b) Bottom corner fitting**

#### Key

- 1 top wall
- 2 outer end wall
- 3 end aperture
- 4 outer side wall
- 5 side aperture
- 6 top aperture
- 7 bottom wall
- 8 bottom aperture

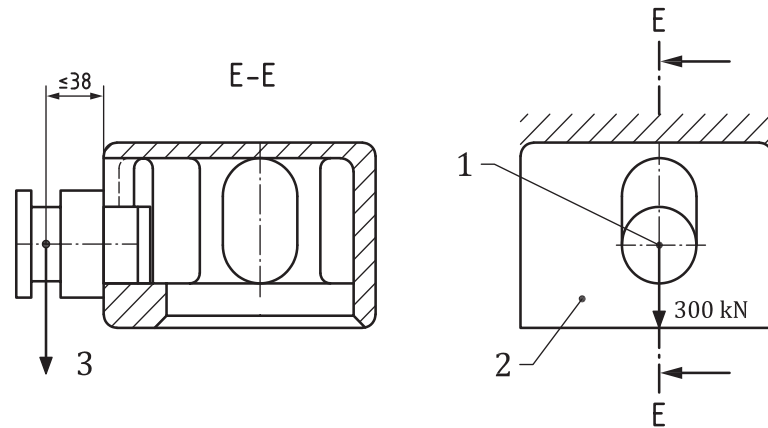
**Figure A.1 — Corner fitting nomenclature**



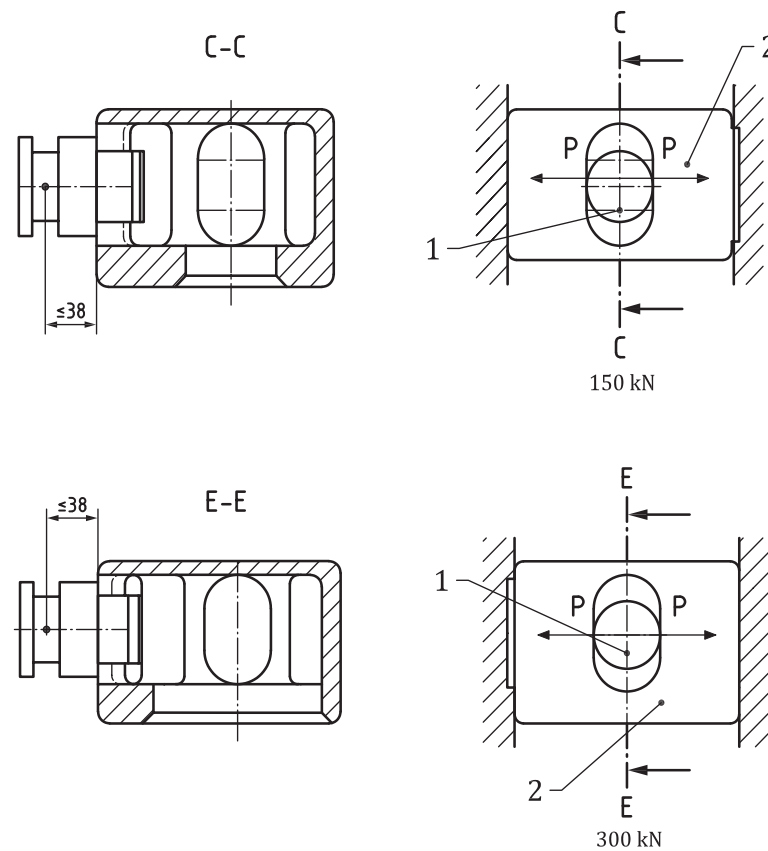
**Key**

- 1 bottom corner fitting
- 2 upper corner fitting
- a Top view.
- b The area of inner contact surface is to be 800 mm<sup>2</sup>.

**Figure A.2 — Representation of stacking and lifting testing schemes**



a) Testing with loads applied to end aperture straight down



b) Testing with loads applied horizontally to side apertures

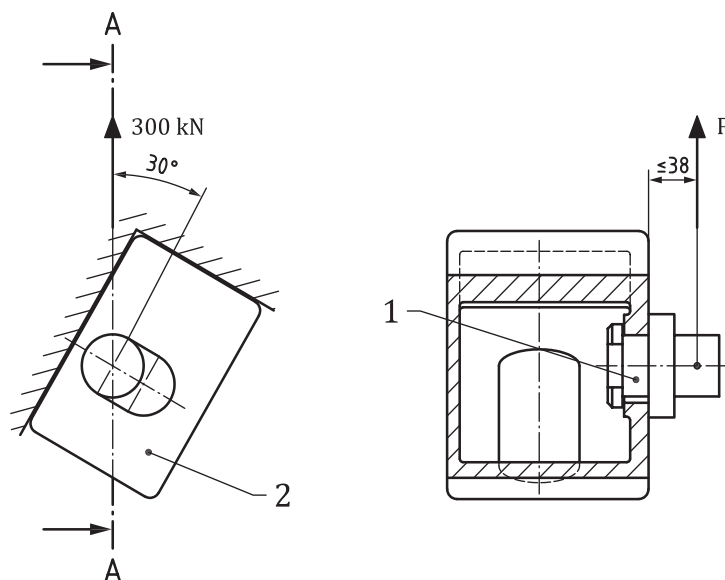
**Key**

- 1 device
- 2 bottom corner fitting
- 3 force

NOTE 1 For a), container securing on transportation, vertically.

NOTE 2 For b), container securing on transportation, horizontally by side/end apertures.

**Figure A.3 — Representation of securing tests**

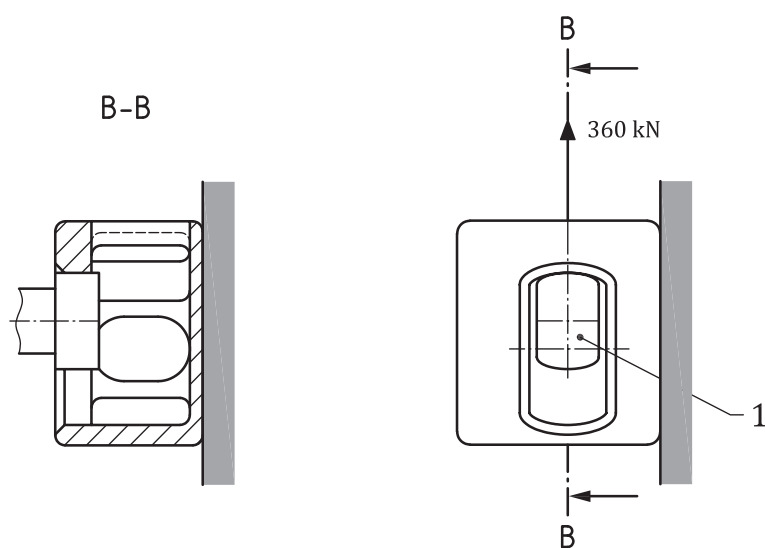


**Key**

- 1 device
- 2 bottom corner fitting

NOTE Lifting by side wall of bottom corner fitting with sling 30° to horizontal.

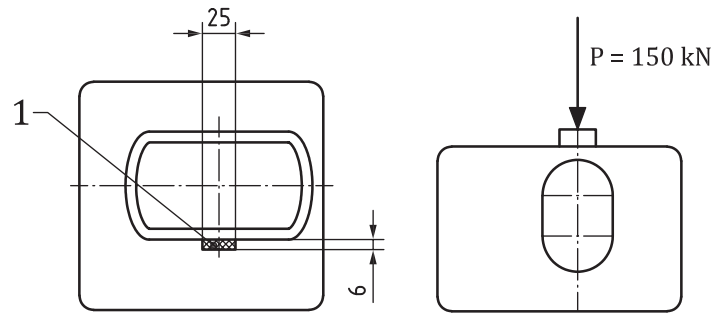
**Figure A.4 — Representation of sling test**



**Key**

- 1 device

**Figure A.5 — Representation of rail securing tests**

**Key**

1 load carrying area

NOTE Bottom corner fitting with contact area for misgather.

**Figure A.6 — Representation of misgather tests**

## Annex B (informative)

### Typical examples of twistlock lifting devices

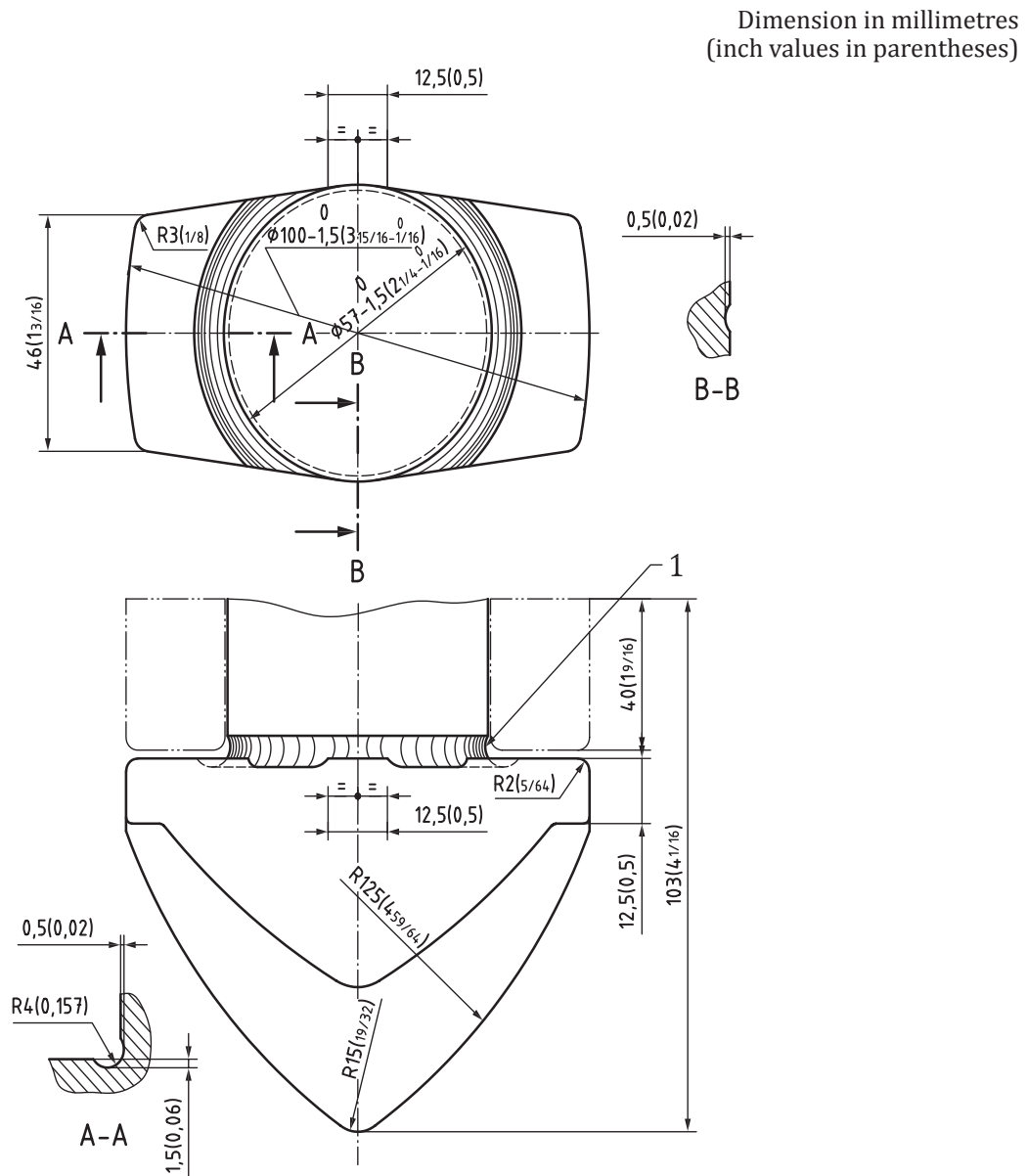


Figure B.1 — Example of taper-sided twistlock

Dimension in millimetres  
(inch values in parentheses)

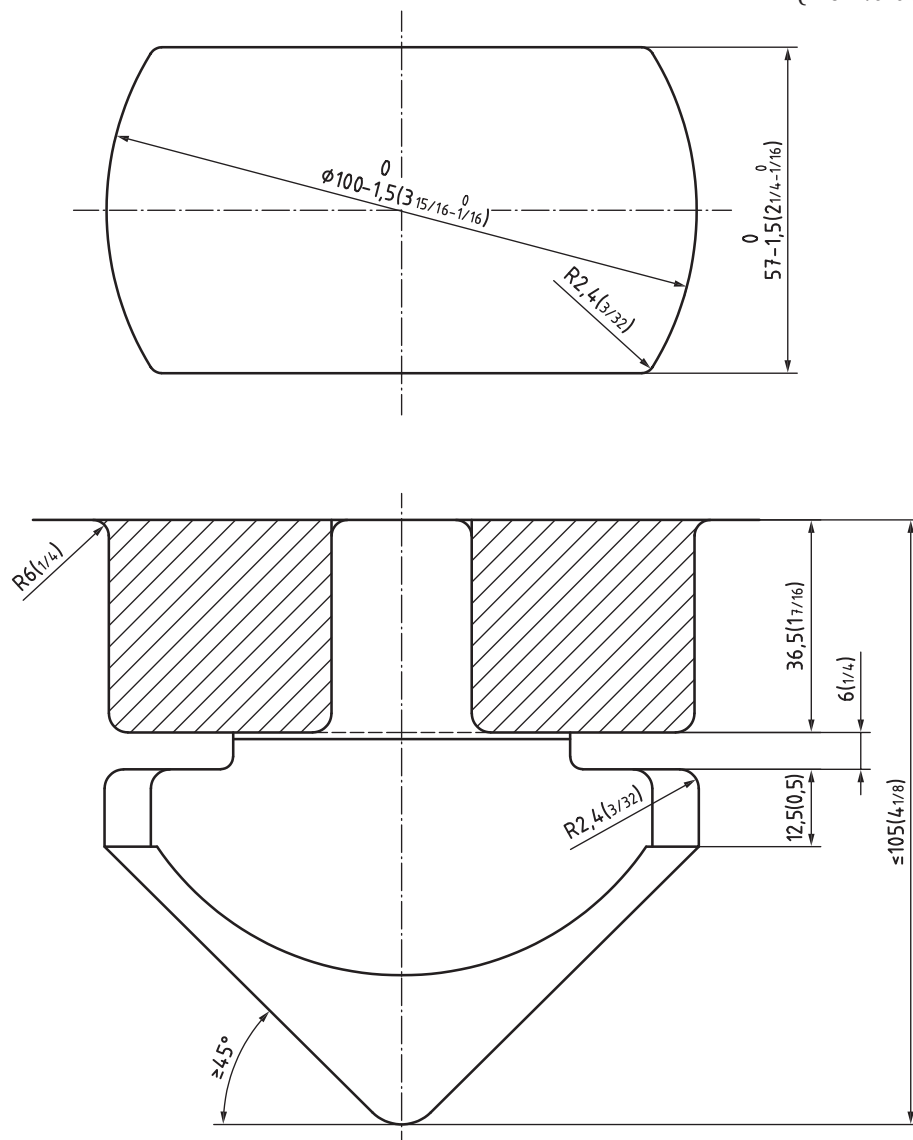


Figure B.2 — Example of parallel-sided twistlock

## Bibliography

- [1] ISO 668, *Series 1 freight containers — Classification, dimensions and ratings*
- [2] ISO 1496-2, *Series 1 freight containers — Specification and testing — Part 2: Thermal containers*
- [3] ISO 1496-3, *Series 1 freight containers — Specification and testing — Part 3: Tank containers for liquids, gases and pressurized dry bulk*
- [4] ISO 1496-4, *Series 1 freight containers — Specification and testing — Part 4: Non-pressurized containers for dry bulk*
- [5] ISO 1496-5, *Series 1 freight containers — Specification and testing — Part 5: Platform and platform-based containers*
- [6] ISO 8323, *Freight containers — Air/surface (intermodal) general purpose containers — Specification and tests*



