

TC 104

# International Standard



# 3874

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

## Series 1 freight containers — Handling and securing

*Conteneurs de la série 1 — Manutention et fixation*

Third edition — 1984-08-01

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**Descriptors :** containers, freight containers, lifting, fastenings, safety requirements, safety measures.

Price based on 13 pages

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized 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.

International Standard ISO 3874 was developed by Technical Committee ISO/TC 104, *Freight containers*, and was circulated to the member bodies in May 1983.

It has been approved by the member bodies of the following countries:

|                |                     |                       |
|----------------|---------------------|-----------------------|
| Australia      | Egypt, Arab Rep. of | Romania               |
| Austria        | Germany, F.R.       | South Africa, Rep. of |
| Belgium        | Hungary             | Switzerland           |
| Bulgaria       | India               | Thailand              |
| Canada         | Iran                | Turkey                |
| China          | Japan               | USA                   |
| Cuba           | Malaysia            | USSR                  |
| Czechoslovakia | New Zealand         | Yugoslavia            |
| Denmark        | Poland              |                       |

The member bodies of the following countries expressed disapproval of the document on technical grounds:

|        |                |
|--------|----------------|
| France | Sweden         |
| Italy  | United Kingdom |

This third edition cancels and replaces the second edition (i.e. ISO 3874-1979).

## Series 1 freight containers — Handling and securing

### 1 Scope and field of application

**1.1** This International Standard lays down methods of handling and securing series 1 freight containers constructed in accordance with ISO 668 and ISO 1161.

**1.2** This International Standard defines basic principles and procedures to increase safe operation of containers in all surface modes of transport.

**1.3** The methods of handling and securing described are for both laden (loaded) and empty containers unless otherwise stated.

### 2 References

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

ISO 830, *Freight containers — Terminology.*

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

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

ISO 2329, *Fork lift trucks — Fork arms — Dimensions.*

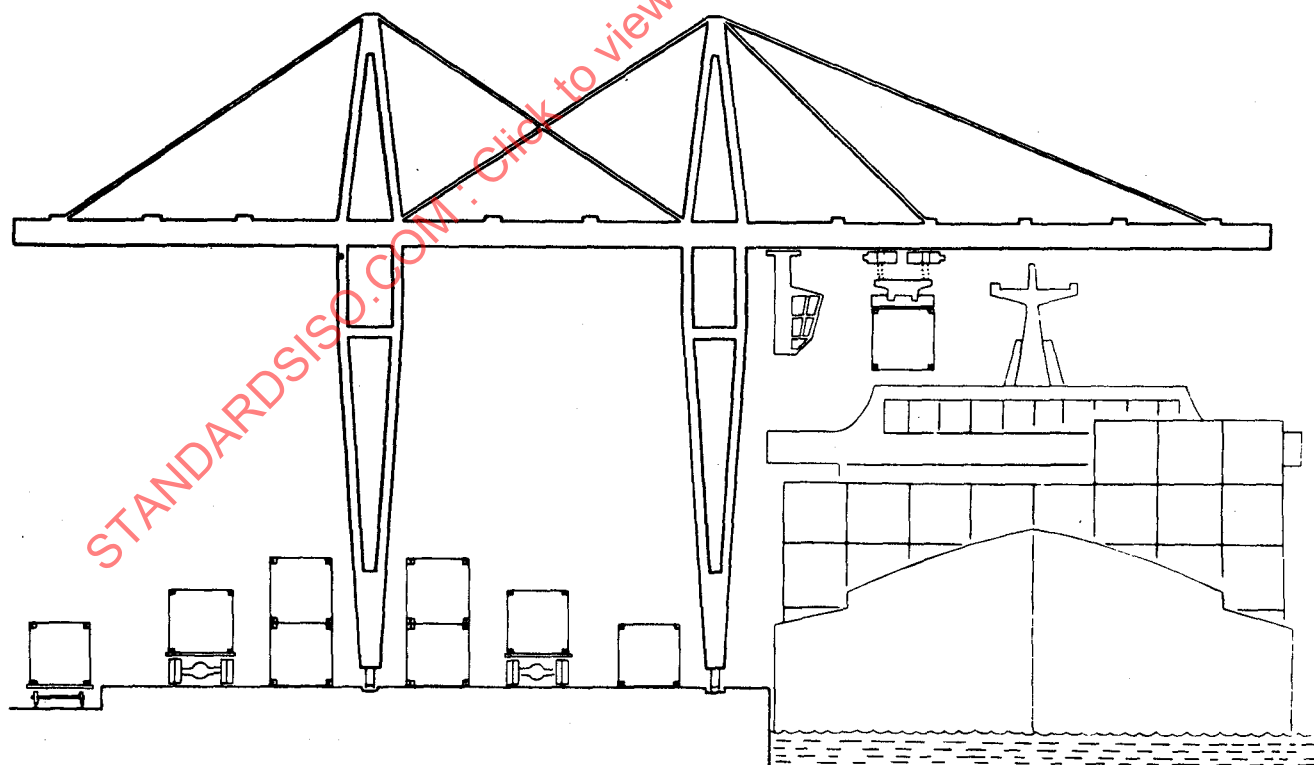


Figure 1 — Example of loading/unloading containers

1) At present at the stage of draft. (Revision of ISO 1496/1-1978.)

### 3 General

**3.1** In the clauses which follow it is assumed that:

**3.1.1** The requirements of all relevant national and international regulations have been met.

**3.1.2** The container and any equipment which may be used in its operation have been adequately maintained.

**3.1.3** Doors, lids, closures, removable or foldable parts and any loose equipment, etc. are properly secured before any lifting, moving and stacking operation is undertaken.

**3.1.4** All personnel engaged in handling and securing operations have received proper instructions, especially with regard to safety matters.

**3.2** It is further assumed that the cargo within the container has been loaded, or packed and secured where necessary, in accordance with the recommended practices of the trade so that the cargo does not impose upon the container forces in excess of those for which it has been designed.

This last assumption implies in particular that:

**3.2.1** The equipment used for packing and emptying the container only imposes loads which are not in excess of those for which the container was designed.

**3.2.2** The total mass of all items loaded or packed into the container, including dunnage, securing equipment, etc. does not exceed the maximum permitted payload, i.e. the maximum permissible operating gross mass minus the tare.

**3.2.3** Cargo has been distributed over the length and width of the floor of the container as evenly as practicable in order that no part of the container is overstressed.

**3.2.4** Special care has been taken (for example by the use of load-spreading dunnage) to distribute loads from cargo which could otherwise, under dynamic conditions, subject the floor to local pressures in excess of those for which it was designed.

**3.2.5** The centre of gravity is sufficiently low and central to give safe and satisfactory handling and transportation characteristics, i.e. to avoid such problems as:

- excessive tilting and/or overstressing of container and handling equipment;
- unacceptable vehicle axle loading and lack of vehicle stability.

**3.2.6** Cargo has been so stowed and/or so secured as to prevent damage which might otherwise result from dynamic conditions encountered in handling and transportation.

### 4 Handling

#### 4.1 General

In every lifting operation care shall be taken to ensure that the equipment is suitable for the load and is safely attached to the container.

In the case of a single point lift (see for example figure 9), special attention should be paid to the risk of the container tilting owing to eccentricity of cargo loading.

NOTE — Furthermore, care should be taken when handling a container whose centre of gravity is mobile or eccentric, for example a tank container, a bulk container, a container with a liquid bulk bag, a container with hanging cargo, or a thermal container with a refrigerating unit (integral or clip-on).

#### 4.2 Lifting from top corner fittings

The top corner fittings are the recommended lifting points.

##### 4.2.1 Container sizes 1AA, 1A, 1AX, 1BB, 1B, 1BX, 1CC, 1C and 1CX

NOTE — ISO 668 gives designations of container sizes.

The lifting forces should always be applied vertically, engaging all four corner fittings. (See figures 2, 3, 4 and 5.)

##### 4.2.1.1 Lifting by means of a spreader with built-in twistlocks

The spreader may be suspended from a crane (see figure 2), straddle carrier or other suitable equipment.

The proper engagement and disengagement of the twistlocks should be checked, as far as possible. The operation of safety interlocks, when provided, should be verified visually or automatically.

Exterior gather devices should impinge on corner fittings only.

##### 4.2.1.2 Lifting from top corner fittings by means of a spreader equipped with hooks or shackles or hand-engaged twistlocks

The proper engagement or attachment of such devices should be checked (see examples in figures 3, 4 and 5).

An ordinary hook shall always be placed in an inward-to-outward direction [see figure 4a)].

For a safety hook, placement in an outward-to-inward direction is acceptable, because of its special construction [see figure 4b)].

Hand-engaged twistlocks shall be impossible to turn while containers are suspended from them [see figure 4d)].

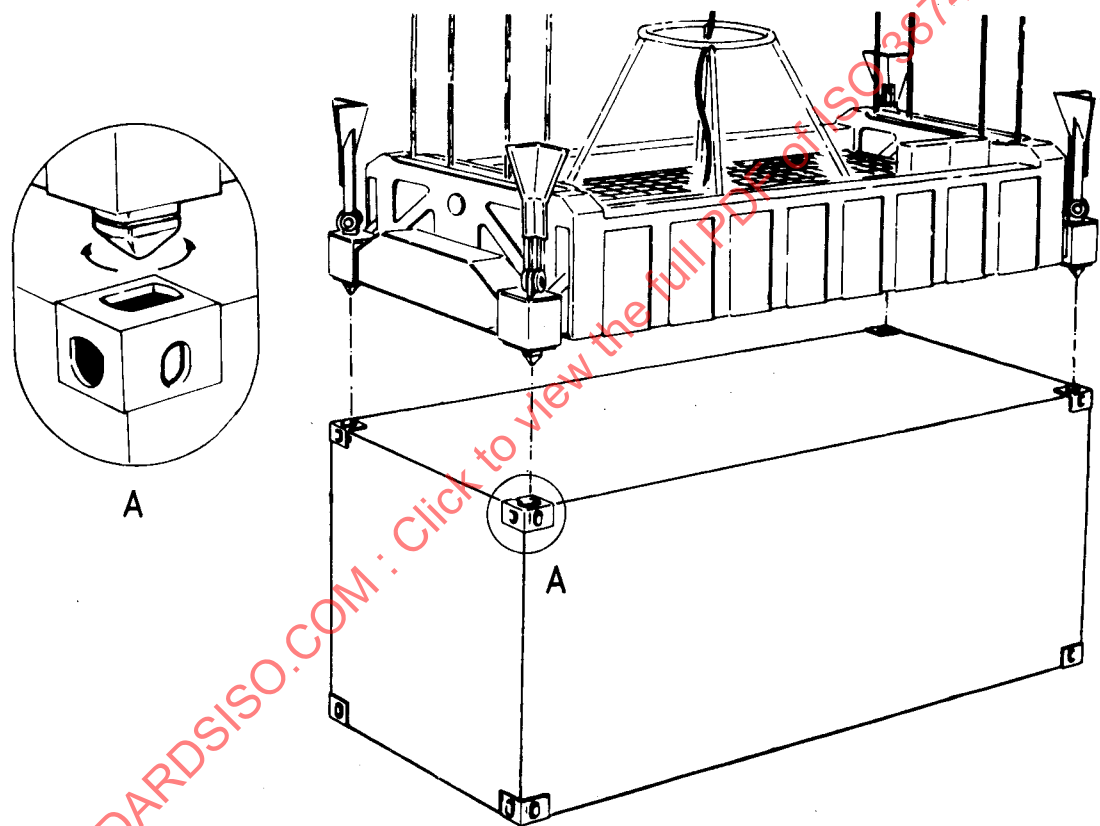


Figure 2 — Example of lift by crane spreader with built-in twistlocks

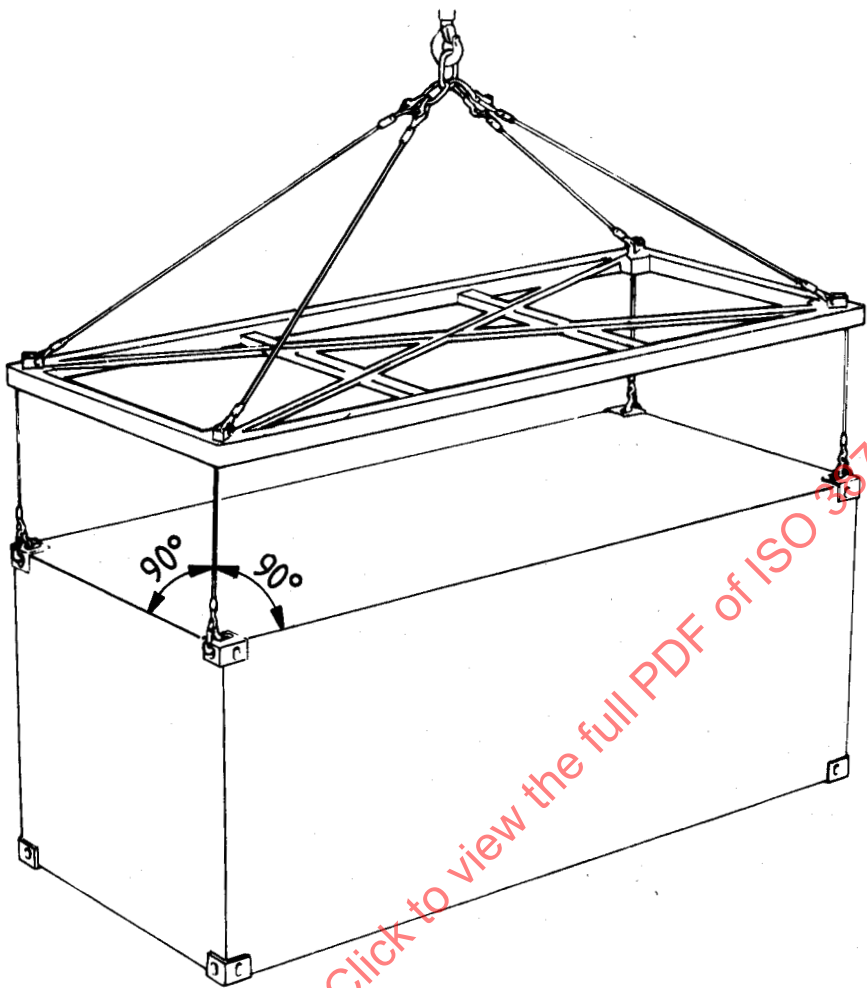


Figure 3 — Example of lifting by spreader equipped with hooks, shackles or hand-engaged twistlock attachment

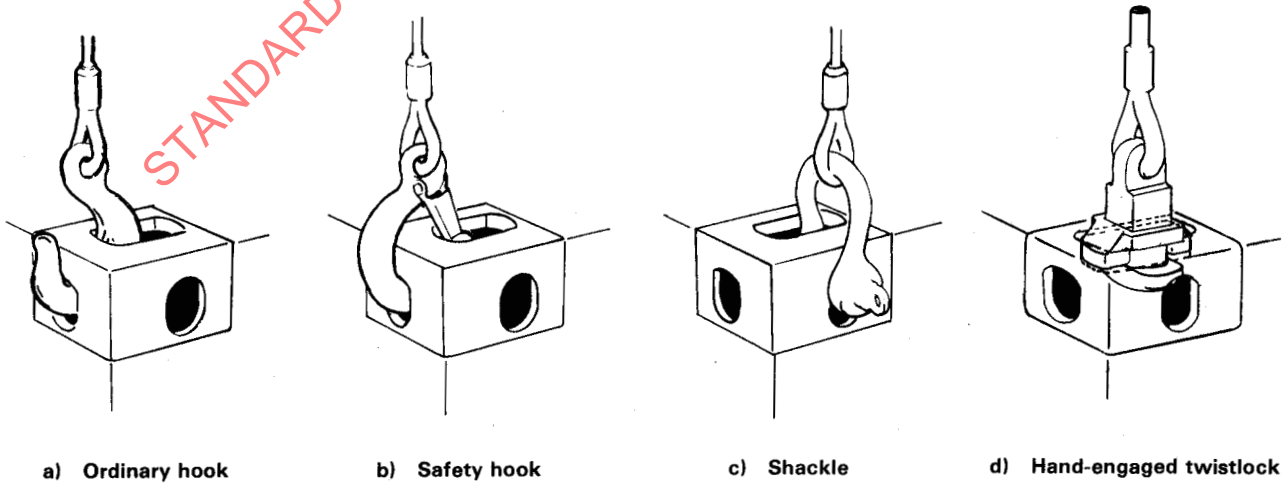


Figure 4 — Examples of attachments

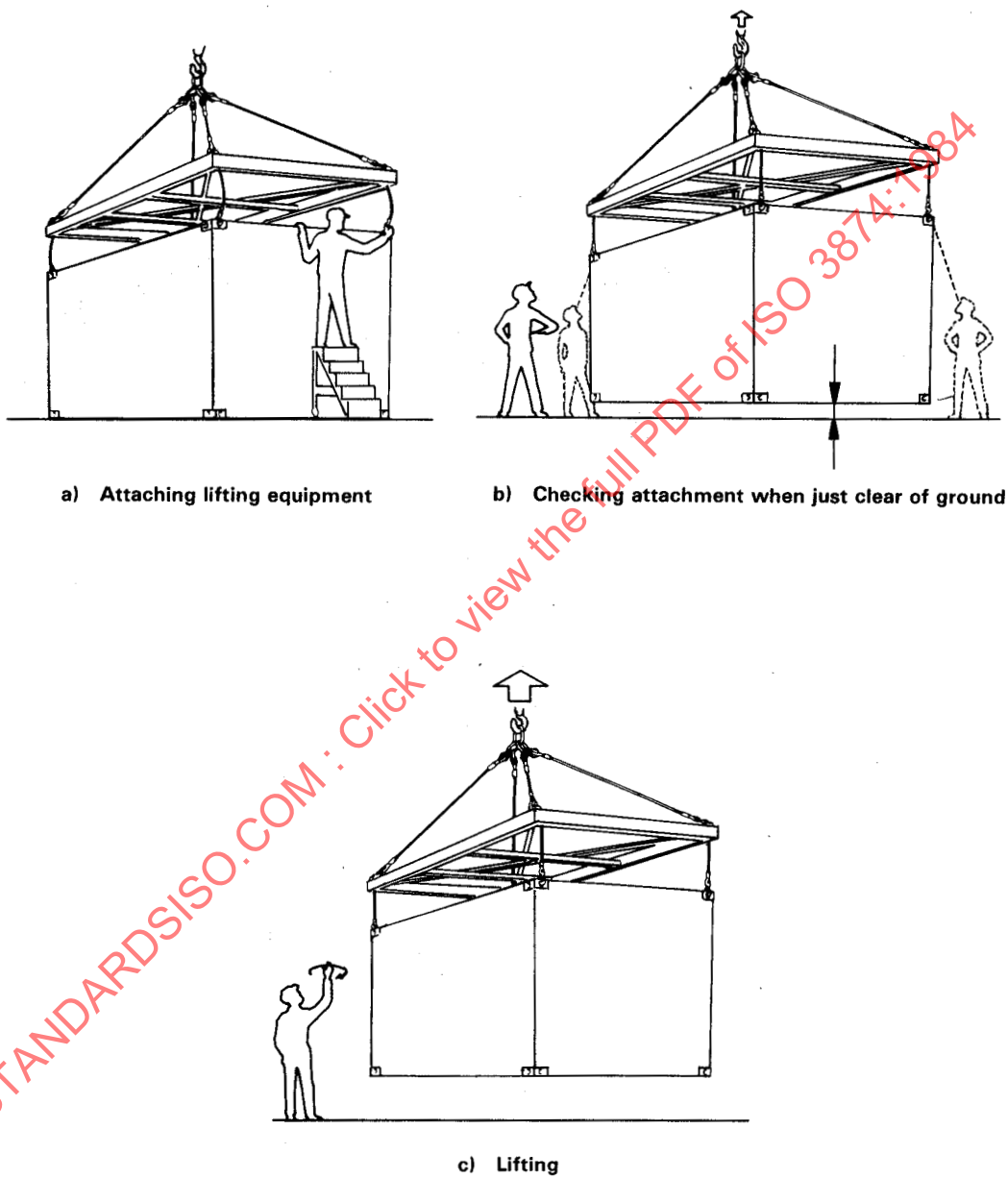


Figure 5 — Process of lifting

4.2.1.3 Lifting from top corner fittings by means of angled slings

This method of handling is not permitted for laden (loaded) containers (see figure 6). Empty containers only are suitable for lifting by this method, with a minimum sling angle to the horizontal of 45° for 1AA, 1A and 1AX containers, 37° for 1BB, 1B and 1BX containers and 30° for 1CC, 1C and 1CX containers.

The sling angle for lifting empty containers from the top corner fittings should not be confused with the sling angles of different degrees (see 4.3.4), used for lifting laden (loaded) or empty containers from bottom corner fittings.

4.2.2 Container size 1D

The requirements outlined in 4.2.1 are applicable, but the lifting forces may also be applied at an angle not less than 60° to the horizontal (see figure 7).

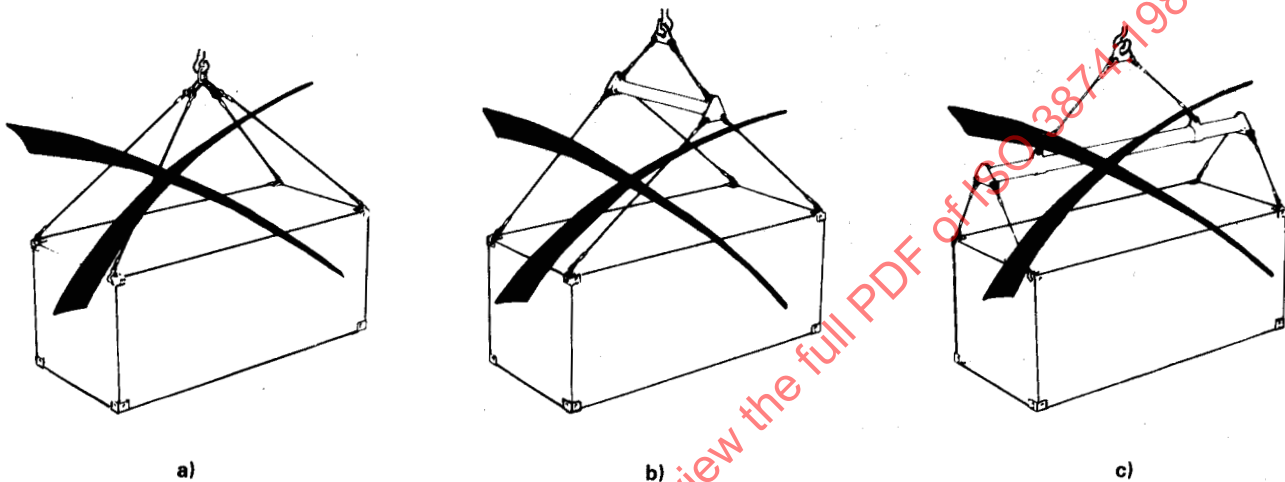


Figure 6 — Examples of lifting methods which shall not be used on laden (loaded) containers

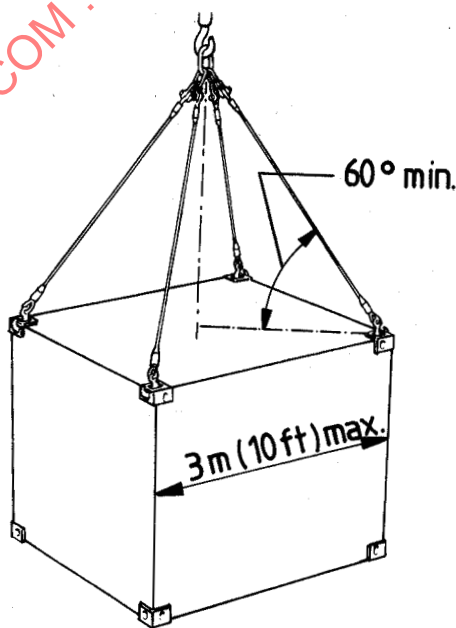


Figure 7 — Example of lifting 1D container

4.3 Lifting from bottom corner fittings

4.3.1 When lifting containers by the bottom corner fittings, the lifting devices should bear on the four bottom corner fittings only and should not make any other contact with the container (see figure 8).

4.3.2 Attachment devices should be so used that the lifting forces are exerted parallel to the side walls and not more than 38 mm<sup>1)</sup> away from the face of the corner fitting (see detail in figure 8).

4.3.3 Before lifting from bottom corner fittings the correct engagement of sling terminal fittings with corner fittings should be checked.

4.3.4 The lifting angle,  $V$ , shown in figure 9, should not be less than the minimum values shown in the following table.

| Container size | 1AA, 1A and 1AX | 1BB, 1B and 1BX | 1CC, 1C and 1CX | 1D and 1DX |
|----------------|-----------------|-----------------|-----------------|------------|
| $V$ min.       | 30°             | 37°             | 45°             | 60°        |

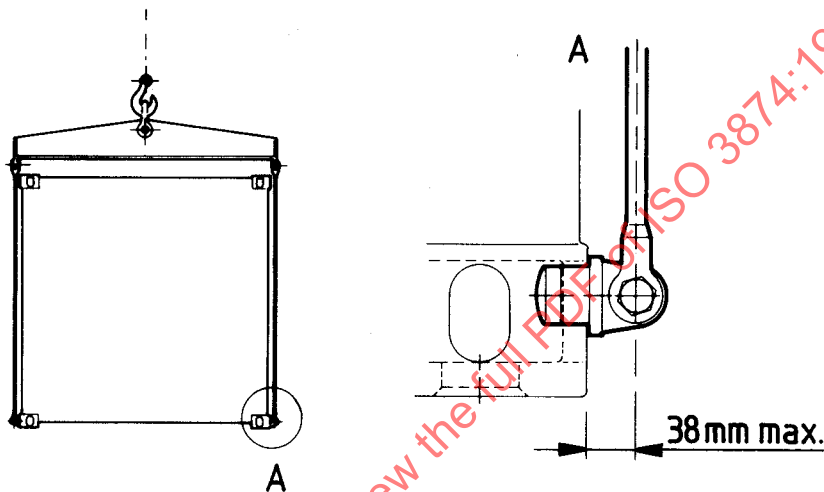


Figure 8 — Lifting devices make contact with the bottom corner fittings only

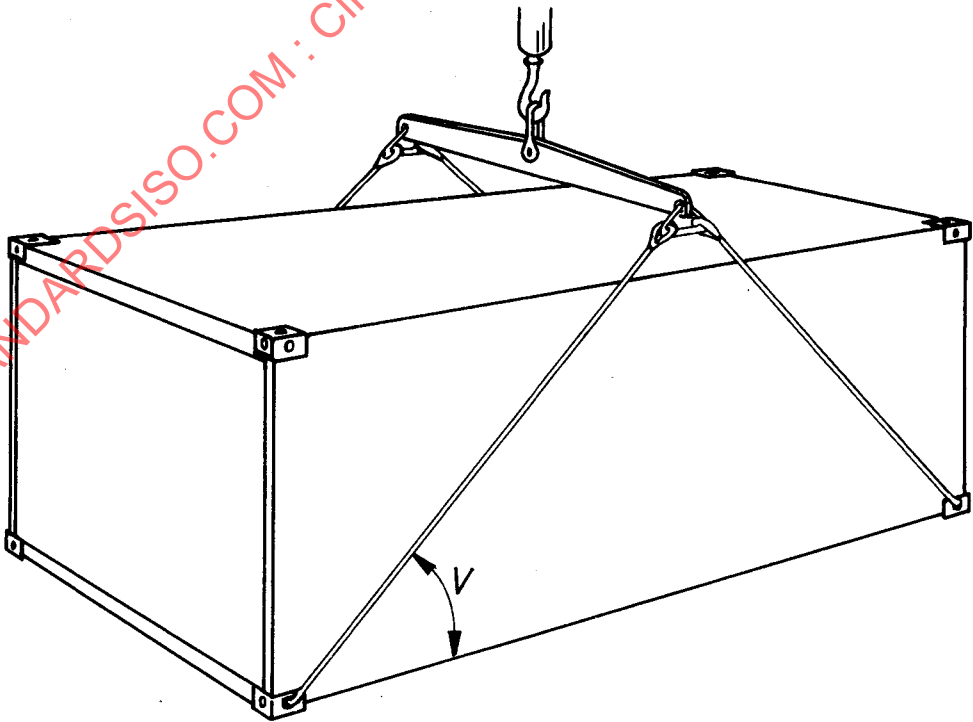


Figure 9 — Example of lifting container from bottom corner fittings

1) 38 mm = 1½ in

4.4 Other methods of handling by corner fittings

4.4.1 General

Handling of containers by corner fittings by methods other than those mentioned in 4.2 and 4.3, for example using the corner fittings of one side of the container, should be done only after careful evaluation of the equipment by which the container is to be handled and of the methods of operation envisaged, with respect to the container standards.

NOTE — Old containers may have limited racking strength.

4.4.2 Handling by side lift frames

The handling of containers by side lift frames which engage the corner fittings on one side of a container can be done in the following methods:<sup>1) 2)</sup>

- a) by side lift frames so designed that lifting and “push out” forces are applied to the bottom corner fittings on one side of the container and “hold back” forces are applied to the top corner fittings on the same side (see figure 10);
- b) by side lift frames so designed that lifting and “hold back” forces are applied at the top corner fittings on one side and “push out” forces are applied to the bottom corner fittings on the same side or to suitable corner posts areas immediately above those corner fittings (see figure 11);
- c) by side lift frames so designed that lifting and “hold back” forces are applied to the top corner fittings on one side of the container and a “push out” force applied on the bottom side rail on the same side (see figure 12).

Empty containers may be handled by this method provided that an adequate bottom support bears on a bottom side rail. Under no circumstances shall this “push out” force be applied to the side panel.

4.5 Handling by means of standardized optional features

4.5.1 Fork lift pockets

For container sizes 1CC, 1C, 1CX, 1D and 1DX, but excluding tank containers, lifting and handling may be done by means of forks inserted into fork lift pockets<sup>3)</sup> which are specifically designed for this practice in accordance with ISO 1496/1 and ISO 2329 (see figure 13).

Ideally, forks should extend the whole width of the container but in no circumstances should they extend less than 1 825 mm<sup>4)</sup> into these pockets.

Containers with or without fork lift pockets shall not, under any circumstances, be directly lifted by forks under the base of the containers (see figure 14).

When 1CC, 1C and 1CX containers are fitted with a second (inner) set of fork lift pockets, particular care should be taken to ensure that the capabilities of these pockets, which are provided for empty handling only, are not exceeded.

4.5.2 Grappler lift points

Handling may be done by means of grappler arms<sup>3)</sup> being engaged at the base of containers only at those points which are specifically designed for this practice in accordance with ISO 1496/1 (see figure 15).

4.6 Methods of handling not envisaged above

Handling of containers by methods other than those mentioned in 4.2, 4.3, 4.4 and 4.5 should be done only after careful evaluation of the equipment by which the container is to be handled and the methods of operation envisaged, with respect to container standards.

1) Platform (type code 60) and platform based container with incomplete superstructure with free standing posts (type code 62) shall not be handled by side lift frames.  
2) For information purposes, the conditions for handling and lifting containers by side lift frames are given in the following table.

| Container size  | Container empty | Container laden (loaded) |
|-----------------|-----------------|--------------------------|
| 1AA, 1A and 1AX | Not permitted*  | Not permitted            |
| 1BB, 1B and 1BX | Not permitted*  | Not permitted            |
| 1CC, 1C and 1CX | Permitted       | Not permitted*           |
| 1DD, 1D and 1DX | Permitted       | Not permitted*           |

\* Under study by ISO/TC 104.

3) These are defined in ISO 830.  
4) 1 825 mm = 71½ in

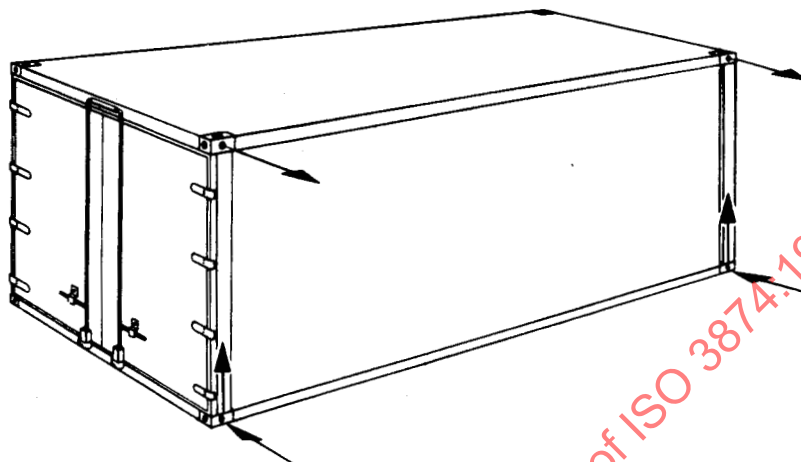
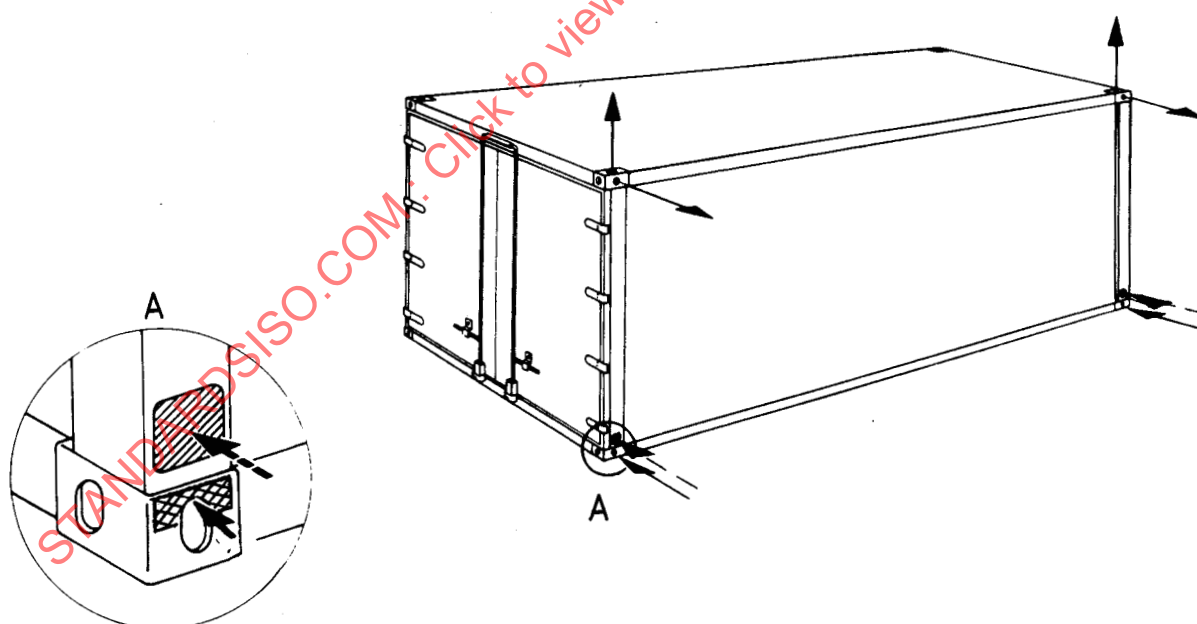


Figure 10 — Side-lift from bottom corner fittings of one side and "hold back" on top corners



NOTE — The "push out" forces should be applied over a minimum bearing area of  $10^4 \text{ mm}^2$  at each side of the container.

Figure 11 — Side lift and "hold back" on the top corner fittings on one side, "push out" forces on the bottom corner fittings or the corner posts area immediately above

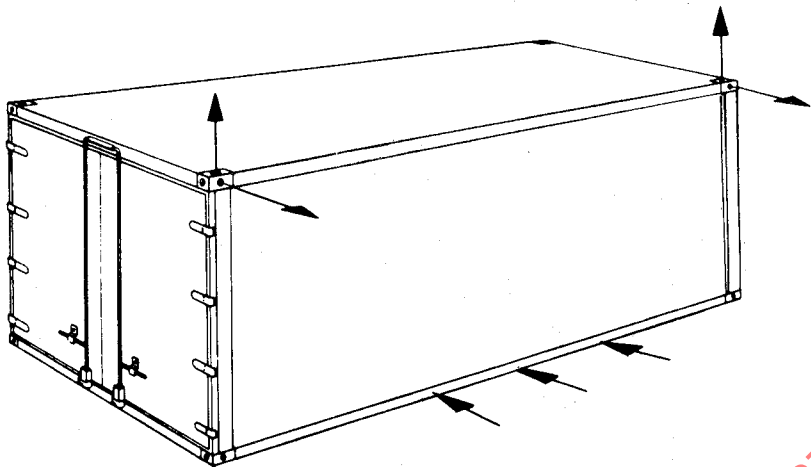


Figure 12 — Example of sidelift method which shall not be used on laden (loaded) containers [see 4.4.2c)]

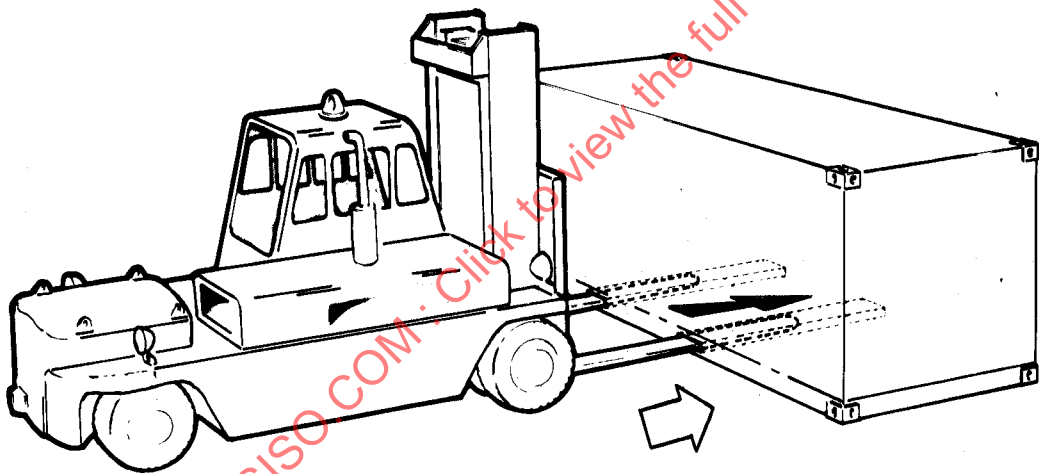
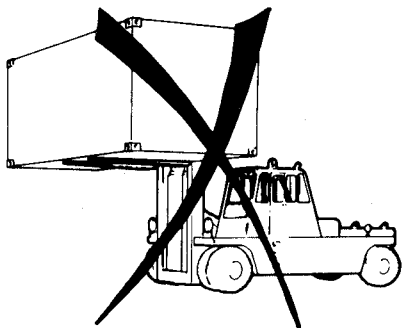


Figure 13 — Example of correct method of handling (see 4.5.1)



No fork lift pockets

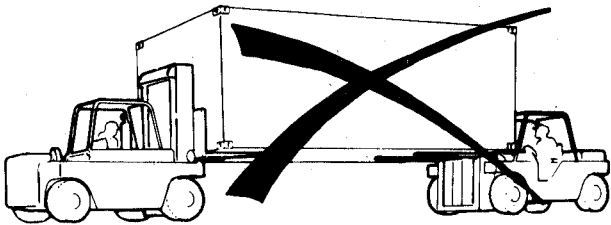


Figure 14 — Examples of methods of handling which shall not be used