BRITISH STANDARD

BS EN
1898:2001

Specifications for flexible intermediate bulk containers (FIBCs) for non-dangerous goods

The European Standard EN 1898:2000 has the status of a British Standard

ICS 55.080

National foreword

This British Standard is the official English language version of EN 1898:2000. It supersedes BS 6382-1:1993 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee PKW/3, Distribution packaging, transport packaging and unit loads, to Subcommittee PKW/3/7, Intermedate bulk containers which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 35 and a back cover.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1898

November 2000

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English version

Specifications for flexible intermediate bulk containers (FIBCs) for non-dangerous goods

Spécifications relatives aux grands récipients vrac souples (GRVS) pour matières non-dangereuses

Festlegungen für flexible Großpackmittel (FIBCs) für nicht-gefährliche Güter

This European Standard was approved by CEN on 15 June 2000.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 1898:2000 E

Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 261, Packaging, the Secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2001, and conflicting national standards shall be withdrawn at the latest by May 2001.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies materials, construction and design requirements, type test, certification and marking requirements for flexible intermediate bulk containers (FIBCs) intended to contain non-dangerous solid materials in powder, granular or paste form, and designed to be lifted from above by integral or detachable devices.

Guidance is also provided on the selection and safe usage of FIBCs.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 45001, *General criteria for the operation of testing laboratories*

EN 45002, *General criteria for the assessment of testing laboratories*

EN 45003, *Calibration and testing laboratory accreditation systems – General requirements for operation and recognition*

EN 45011, *General criteria for certification bodies operating product certification*

ISO 2872, *Packaging – Complete, filled transport packages – Compression test*

ISO 2874, *Packaging – Complete, filled transport packages – Stacking test using compression tester*

ISO 5081, *Textiles – Woven fabrics – Determination of breaking strength and elongation (Strip method)*

3 Terms and definitions

For the purposes of this standard the following definitions apply.

3.1 General

3.1.1
flexible intermediate bulk container (FIBC)
intermediate bulk container having the body made of flexible material such as woven fabric, plastics film or paper, designed to be in contact with the contents, either directly or through an inner liner, and collapsible when empty

3.1.1.1
heavy duty reusable flexible intermediate bulk container
an FIBC designed and intended to be used for a multitude of fillings and discharges, and both factory and field repairable in such a way that the tensile strength across a repair is at least as great as that of the original

3.1.1.2
standard duty reusable flexible intermediate bulk container
an FIBC designed and intended to be used for a limited number of fillings and discharges. An FIBC of this category cannot be reused if damaged, i.e. is not repairable

NOTE The replacement of a removable inner liner is not considered a repair.

3.1.1.3
single-trip flexible intermediate bulk container
an FIBC designed and intended to be used for one filling only

NOTE An FIBC of this category cannot be reused. Neither replacement of an inner liner nor repair of the FIBC is relevant to this category.

3.1.2
FIBC type
FIBCs of like design, manufactured using like materials and methods of construction (giving at least equal performance) to the same nominal cross-sectional dimensions

NOTE Within a type, by comparison with samples passing a type test, the circumference may be increased by up to 10 % provided the same geometry is maintained. Where the type has a base discharge spout, smaller diameter discharge spouts of like design may be used. The presence or absence of an inner liner does not constitute a change of type.

3.1.3
safe working load (SWL)
the maximum load which the FIBC may carry in service, as certified

3.1.4
safety factor (SF)
the integer quotient between the final test load in the cyclic top lift test and the SWL value rounded down

NOTE Safety factors may be illustrated as follows (See also annex B.3.3):

	Example 1	Example 2
Designated SWL	500 kg	500 kg
Final load, cyclic test	2 400 kgf	2 600 kgf
Quotient	4,8	5,2
Integer quotient rounded down	4	5

The results in Example 1 above indicate a single trip FIBC which does not meet the requirements of this standard, whilst those in Example 2 indicate a single trip FIBC which meets the requirements.

3.1.5
lifting device
integral and/or fixed lifting devices which form part of the FIBC and are tested with it

NOTE Detachable lifting devices are regarded as lifting tools.

3.2 FIBC parts

3.2.1
walls
tube of one or more layers, seamless or made out of one or more panels joined together

3.2.2
base
that part of the FIBC which is connected to or integral with the walls and forms the base of the standing FIBC

3.2.2.1
plain base
base without an opening

3.2.2.2
base with opening
flat, conical or in another way formed base with an opening

3.2.2.3
full open base
extensions to the wall(s), forming the base of the FIBC after closing

3.2.3
top
upper part of the FIBC, excluding handling devices, forming the top of the FIBC after closing

3.2.4
body
the walls and base of the FIBC

3.2.5
inner liner
integral or removable container which fits into the FIBC

3.3 Operating devices

3.3.1 Filling devices

3.3.1.1
filling opening
opening for filling the FIBC

3.3.1.2
filling spout
tube-shaped part at the top for filling the FIBC

3.3.1.3
filling slit
slit-shaped opening at the top for filling the FIBC

3.3.2 Discharging devices

3.3.2.1
outlet
opening for discharging the FIBC

3.3.2.2
discharging spout
tube-shaped part at the base for discharging the FIBC

3.3.3
closing parts
webbing, cords, straps, etc. which are used to close the filling and discharging devices

3.4 Handling devices

3.4.1
supporting and lifting devices
webbing, loops, ropes, eyes, frames or other devices formed from a continuation of the walls of the FIBC or are integral or detachable, and are used to support or lift the FIBC

3.4.1.1
four point lifting
four lifting devices used simultaneously to lift the FIBC

3.4.1.2
two point lifting
two lifting devices used simultaneously to lift the FIBC

3.4.1.3
one point lifting
one point lifting device, or more lifting devices brought to one point for lifting

3.5
safety and protection devices
valves, ventilation devices and additional parts which protect the filling, discharging or handling devices

3.6
coated and laminated materials
materials having a surface coating or comprising two or more layers laminated together to protect the contents of the filled FIBC or to protect the environment against the effects of leakage of the contents

3.7 Special treatments

3.7.1
stabilization
modification of the FIBC materials to give better resistance against weathering and ageing, e.g. by the addition of an ultra violet (UV) absorber and/or an antioxidant

3.7.2
electrostatic conductivity treatment
treatment for modifying the electrostatic behaviour of the FIBC

3.7.3
insect repellent treatment
treatment for increasing the ability of the FIBC to protect itself and/or its contents against insect attack

3.7.4
flame retardant treatment
treatment to impart flame resistance to the FIBC

4 Materials, construction and design

4.1 Materials

All categories of FIBC shall be manufactured from flexible materials covered by a written specification. The FIBC manufacturer shall have an authorized statement of conformity for each separate batch of materials.

NOTE 1 The properties of the materials may be modified by additives to improve the resistance of the materials against, e.g. degradation by heat and sunlight, and to reduce the effect of static electricity.

All materials shall be tested for breaking force in accordance with the appropriate European Standards, and shall be capable of retaining at least 85 % of the original breaking force after being completely immersed in water for (25 ± 1) h. This measurement shall be taken after firstly, drying the test specimen then, secondly by conditioning it for (60 ± 5) min at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) %.

All load bearing materials of the FIBC shall, after being tested in accordance with the test described in annex A, retain at least 50 % of the original values of the breaking force and elongation of the materials.

NOTE 2 Materials should be chosen, and joined together in such a way that recovery is promoted.

4.2 Construction

All stitched seams and joints shall be locked off and/or back sewn or provided with a minimum 20 mm tail. All stitched seam-ends shall be secured. The surfaces to be joined by welding, gluing or heat-sealing shall be clean.

4.3 Design filling height

The designed filling height of the FIBC shall be between 0,5 times and 2 times the shortest horizontal dimension of the FIBC.

NOTE For FIBCs with a circular cross-section the shortest horizontal dimension is normally the diameter of the FIBC base. For FIBCs with a rectangular base the shortest horizontal dimension is normally the shortest side.

5 Performance

5.1 Type-testing

All FIBC types shall be subjected to the tests as follows:

a) cyclic top lift;

b) compression/stacking test.

At least three specimens of each FIBC type shall be submitted for testing leading to certification. The specimens shall tested as follows:

— Specimen 1: cyclic top lift test using the FIBC having the shortest vertical dimension;

— Specimen 2: cyclic top lift test using the FIBC having the greatest vertical dimension;

— Specimen 3: compression test using the FIBC having the greatest vertical dimension.

To comply with this standard the three specimens shall withstand the tests.

When the FIBC type has only one fixed vertical dimension, only Specimens 1 and 3 need be submitted, and tested to withstand the tests.

One tested sample shall be durably identified and retained for reference in any later complaint or arbitration.

The tests shall be carried out in a laboratory working under the operational provisions of EN 45001, EN 45002 and EN 45003.

5.2 Preparation of FIBC for test

5.2.1 Filling

For both the top lift and compression/stacking test, the FIBC shall be filled to the level specified in accordance with 4.3 by the manufacturer/supplier with a tolerance of −0 % and +5 % of that height. The FIBC shall be filled with either:

a) a material, e.g. plastics granules, having the following mechanical properties:

— bulk density, 500 kg/m^3 to 900 kg/m^3;

— mesh size, 3 mm to 12 mm;

— angle of repose, 30° to 35°;

or:

b) the actual contents to be carried, when these are known, and where their use will not itself be a hazard.

NOTE When option b) is chosen, the FIBC type is certified in relation to that specific product only.

5.2.2 Conditioning

The filled FIBC shall be conditioned before testing at ambient temperature and relative humidity. However, in the event of dispute, testing shall be carried out after conditioning under standard conditions of (23 ± 2) °C and (50 ± 5) % relative humidity.

5.3 Test requirements

5.3.1 Cyclic top lift test(s)

Cyclic top lift test(s) shall be carried out in accordance with annex B and the following criteria shall apply:

a) no breakage of any lifting devices to the extent that any of the lifting devices ceases to support its load; and

b) when tested with an inner liner, no protrusion of the latter beyond the outer surface of the FIBC, except through the closure(s), where this is a design feature; and

c) no loss of contents; and

d) no deterioration of the body which renders the FIBC unsafe for transport or storage.

NOTE A slight discharge during the test, e.g. from closures or stitch holes, should not be considered to be a failure of the FIBC, provided that no further leakage occurs after the FIBC has been raised clear of the ground.

5.3.2 Compression/stacking test

The compression/stack test shall be carried out in accordance with annex C and the following criteria shall apply:

a) no loss of contents; and

b) no deterioration of the body which renders the FIBC unsafe for transport or storage.

NOTE A slight discharge during the test, e.g. from closures or stitch holes, should not be considered to be a failure of the FIBC, provided that no further leakage occurs after the FIBC has been raised clear of the ground.

6 Certification

An FIBC type which conforms to the requirements of this standard shall be certified by a body working under the operational provisions (such as EN 45011) with a certificate of conformity based on a successful test report(s). EN 45011 may often be used but it is not a requirement of this standard that it has to be used. Where, however, testing and certification are carried out by the same organization, separate individuals shall be responsible for the tests and for the certification based on them and shall be clearly identified in the documentation.

The certificate shall contain the data shown for the marking in clause 7 a) to i) and 7 k) to m), together with:

a) the name(s) and address(es) of the test station(s), together with the reference(s) and date(s) of the relevant test report(s);

b) the material used as contents in the cyclic top lift and compression/stacking tests.

A certificate for an FIBC type shall be valid for a period of three years from the date of issue.

An FIBC certified and marked as a single trip FIBC in conformity with this standard shall not be reused.

An FIBC certified and marked as a reusable (heavy or standard duty) FIBC in conformity with this standard shall be reused only with the same type of contents as in the first use.

NOTE Reuse of FIBCs with contents differing from those of the first use is not in accordance with this standard.

7 Marking

All FIBCs shall be durably marked by means of a permanently attached and easily visible and readable label or durably printed on the body so that it is easily visible and read after the FIBC has been filled, with the following data:

a) name and address of the manufacturer;

b) manufacturer's reference which shall be unique to any one FIBC type;

c) name and address of the supplier if required;

d) safe working load (SWL) in kilograms;

e) safety factor (SF) i.e. 5:1, 6:1 or 8:1 as appropriate;

f) reference to this European Standard;

g) class of FIBC, i.e. "heavy duty reusable", "standard duty reusable" or "single trip";

h) type test certificate number (which shall be unique to any one type) and the month and year in which the type test certificate was issued;

i) name of the approved laboratory;

j) date of manufacture of the FIBC, i.e. month and year;

k) pictograms of the recommended handling methods;

l) details of any special treatments as defined in 3.7;

m) where the FIBC is certified in relation to a specific product, the description of that product.

The layout of the label shall be as in Figure 1.

<table>
<tr><td colspan="2">Manufacturer's Name and Address

MANUFACTURER'S Reference</td></tr>
<tr><td colspan="2">S.W.L. .....kg SAFETY FACTOR .....:1</td></tr>
<tr><td rowspan="8"></td><td>TEST CERTIFICATE No:</td></tr>
<tr><td>TEST CERTIFICATE Date:</td></tr>
<tr><td>APPROVED LABORATORY:</td></tr>
<tr><td>TEST STANDARD:</td></tr>
<tr><td>FIBC CLASS</td></tr>
<tr><td>DATE FIBC MANUFACTURED:</td></tr>
<tr><td>SPECIFIC TREATMENTS (if required)</td></tr>
<tr><td>CERTIFIED ONLY FOR (if required)</td></tr>
<tr><td colspan="2">Handling Recommendations/Pictograms</td></tr>
<tr><td colspan="2">Suppliers name and address (if required)</td></tr>
</table>

Figure 1 — FIBC label

Annex A
(normative)

UV resistance test

A.1 General

Materials often undergo rapid photochemical degradation under the influence of sunlight, unless they have been stabilized in a durable fashion. An accelerated ageing that simulates ageing caused by sunlight may be brought about by irradiation with light of a UV type. Samples cut from the load bearing materials of the FIBC, e.g. fabric, webbing, rope, sewing thread, glues, are subjected for a certain period of time to irradiation from a light source of the UV type with specified spectral distribution. A number of factors of uncertainty are inherent in the procedure, so comparisons should be available between the method used and exposures in the environment in which the product is to be used.

NOTE 1 Certain types of UV stabilizing additives are rapidly leached out, especially in an alkaline environment, which should be taken into consideration in applicable situations.

NOTE 2 The performance of UV stabilizing additives may be affected by colour and the type of pigment used. Therefore, each combination of UV stabilizing additive and pigment should be tested separately.

A.2 Principle

Test specimens are alternately exposed to UV light alone and to condensation alone in a repetitive cycle.

A.3 Apparatus

The apparatus should be in accordance with ASTM G154-98 [1] using a UV-B lamp.

A.4 Procedure

Expose a test specimen to a fluorescent UV lamp for at least 200 h using a test cycle of 8 h at 60 °C with UV radiation alternating with 4 h at 50 °C with condensation.

After exposure is complete, test the specimen for breaking force and elongation at break in accordance with ISO 5081 using the conditioning requirements as described in 5.2.2. Compare the values with results performed on simultaneously cut test specimens that have been stored under dark and cool conditions.

A.5 Expression of results

Express the results for breaking force in Newton’s on test specimens tested before and after exposure to the UV radiation.

Annex B
(normative)

Cyclic top lift test

B.1 Principle

The filled FIBC is suspended by its lifting devices with a flat pressure plate positioned on top of the contents. This is done in one of two alternative ways:

a) the pressure plate is restrained either from above or below. The FIBC is suspended from a frame to which an upward force is applied progressively against the resistance of the pressure plate; or

b) the FIBC is suspended from a frame fixed at the time of test then a downward force is applied progressively to the pressure plate.

The filled FIBC is subjected to a repeated loading, unloading, and dwell cycle. The force is recorded and the FIBC is observed for breakage of any lifting device, other damage, or leakage of contents.

B.2 Apparatus

B.2.1 The pressure plate shall be flat except that flanges may be fitted to its underside to prevent lateral displacement. The plate shall be of such a size that it covers between 60 % and 80 % of the surface area of the contents.

B.2.2 The suspension frame shall be such that, during the test, the filled FIBC can be suspended clear of the ground with its lifting devices positioned as recommended by the manufacturer. For FIBCs designed for four point lifting, the suspension frame shall have the cross section shown in Figure B.1. For FIBCs designed for single point lifting, the suspension frame shall have the cross section shown in Figure B.2. For FIBCs designed for two point lifting, the suspension frame shall have the cross section shown in Figure B.1 or B.2.

B.2.3 The means of applying the force (upward or downward) shall be:

a) capable of at least the required test load;

b) capable of a rate of (70 ± 20) kN/min;

c) fitted with a means of registering the applied force.

B.2.4 The suspension frame, the pressure plate (and any restraint used for the latter) shall be capable of resisting the forces applied during the test with minimal deformation.

B.2.5 Apparatus for use when an upward force is applied.

B.2.5.1 Apparatus of the appropriate type illustrated in one of Figures B.3 to B.9 shall be used for FIBCs being subjected to top lift testing using top or base restraint and an upward force as in B.1 a).

Figure B.3 Perspective view of an FIBC with four lifting devices using top restraint.

Figure B.4 Elevation of an FIBC with two lifting devices using top restraint.

Figure B.5 Elevation of an FIBC with the lifting devices formed by extensions of the body and using top restraint.

Figure B.6 Elevation of a single-point lift FIBC with base restraint using one member restraining the pressure plate.

Figure B.7 Similar to Figure B.6 but with two members restraining the pressure plate.

Figure B.8 Elevation of an FIBC with two lifting devices using base restraint and one member restraining the pressure plate.

Figure B.9 As Figure B.8 but with two members restraining the pressure plate.

B.2.5.2 Use of the apparatus illustrated in Figures B.6 to B.9 with base restraint involves connections passing through the body of the FIBC and its test contents. Rods are a suitable method of making such connections.

Considerable care shall be taken:

a) with woven fabrics that the threads shall be separated rather than be cut to permit passage of a rod;

b) to ensure that any rod passes through the base no closer than 20 mm to any base seams or joins. When, as with an FIBC having a seam or join running across the centre of the base, a single rod would need to pass within 20 mm of a seam or join then two rods should be used as shown in Figures B.7 and B.9.

NOTE It is recommended that:

a) a conical adaptor be screwed to the top of any restraining rod and removed once the FIBC is in position for test;

b) nuts be used to connect the rod(s) to the pressure plate and to a restraint.

B.2.6 Apparatus for use when a downward force is used.

Apparatus of the type illustrated in Figure B.10 shall be used for FIBCs being subjected to top lift testing using a downward force as in B.1 b).

B.3 Procedure

B.3.1 Select, fill and condition each FIBC for cyclic top lift testing in accordance with 5.1, 5.2 and 5.3.

NOTE Any top panel not designed to contribute to the overall strength of the FIBC may be removed to allow the entry of the test apparatus. The area removed should be the minimum commensurate with efficient operation of the test apparatus.

B.3.2 Select any appropriate size of pressure plate in accordance with B.2.1 and position it above the contents. This size shall be sufficiently small, and the positioning such, so that there will be no contact between the edge of the plate and the material of the FIBC during the test.

B.3.3 Apply upwards or downwards force as appropriate. Increase the force at the rate of (70 ± 20) kN/minute until the total force equivalent to the specified test load is registered. Remove the applied force.

Allow a dwell period of not more than 30 seconds before repeating the cycle. Repeat the test cycle until the specified number of cycles has been completed. Carry out a further test cycle to the appropriate load specified for the final test cycle.

Use the appropriate cycle from the following:

Heavy-duty reusable FIBC types:	70 cycles at a test load of 6 x SWL and a final cycle at a test load of 8 x SWL.
Standard duty reusable FIBC types:	70 cycles at a test load of 4 x SWL and a final cycle at a test load of 6 x SWL.
Single-trip FIBC types:	30 cycles at a test load of 2 x SWL and a final cycle at a test load of 5 x SWL.

NOTE After this test is complete, further loading may be applied until failure of the FIBC, to provide additional information. When this is done, the load at failure should, together with other relevant test observations be recorded in a test report. There is no requirement, however, for the load at failure, if it is greater than the specified test load, to be noted in the certificate or reflected in the marking of the FIBC.

B.4 Expression of results

Express the results of the test, including whether leakage of contents, breakage or loosening of lifting devices, or protrusion of the inner liner, if fitted, took place.

In Figures B. 1 and B. 2 all dimensions are in millimetres and are nominal where they are not toleranced.

In Figure B.1 all radii marked → are to be 1,0 mm with a tolerance of +0,5 mm and –0 mm. The horizontal dimension is to be 50 mm ± 0,5 mm.

In Figure B.2 all radii marked → are to be 1 mm with a tolerance of +0,5 mm and –0 mm.

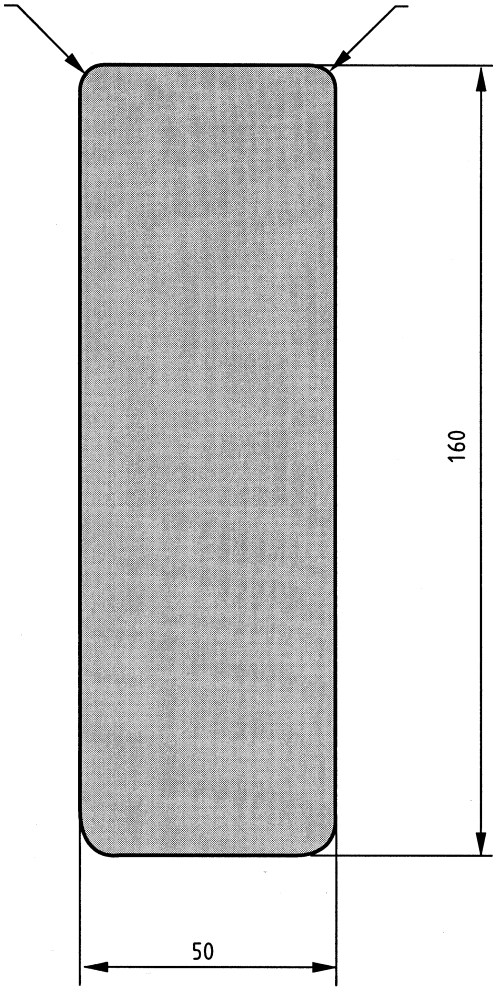


Figure B.1 — Cross section of suspension frame, Top lift test, FIBCs for four and. two point lifting

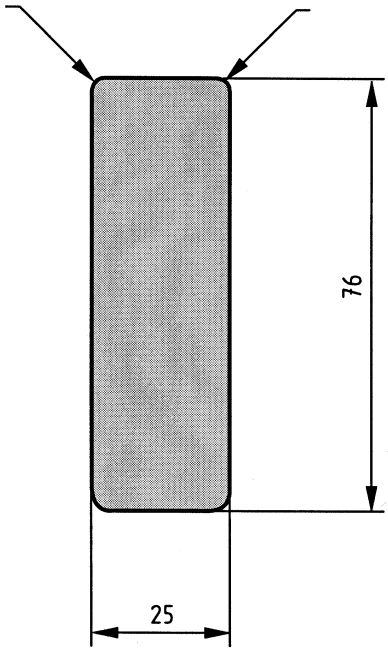
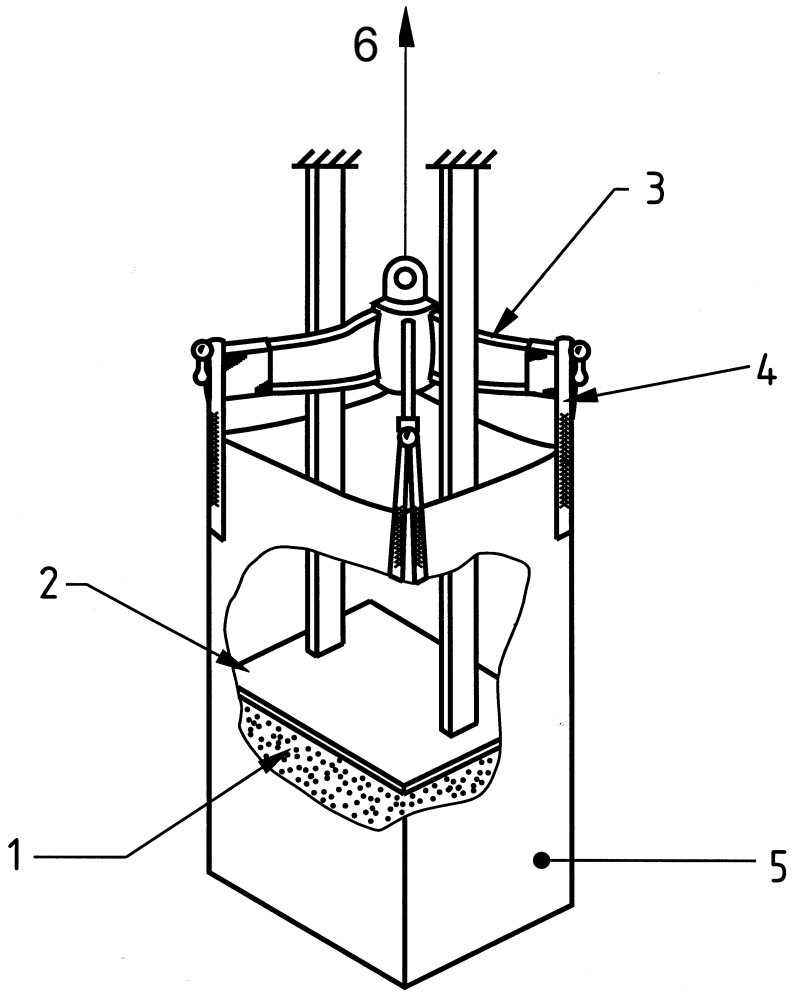


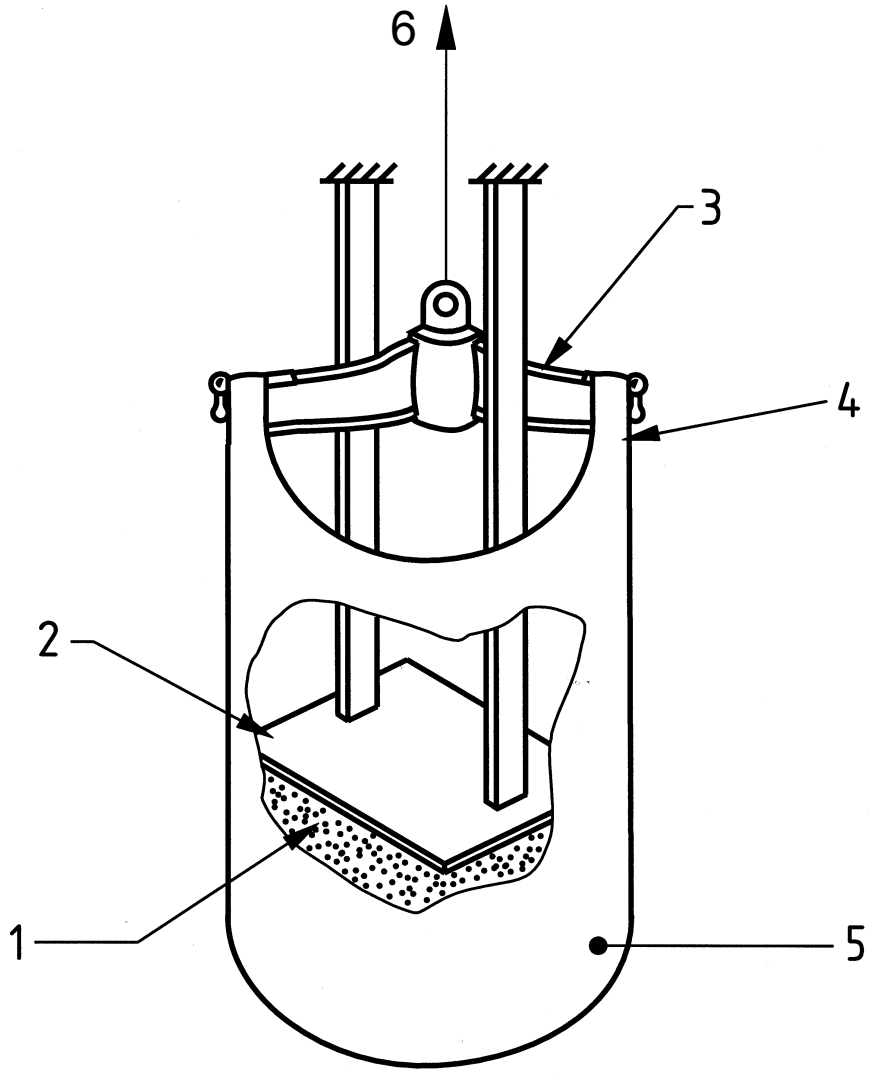
Figure B.2 — Cross section of suspension frame, Top lift test, FIBCs for single and. two point lifting



Key

1 Filler material
2 Pressure plate
3 Suspension frame
4 FIBC lifting device
5 FIBC
6 Hoisting device

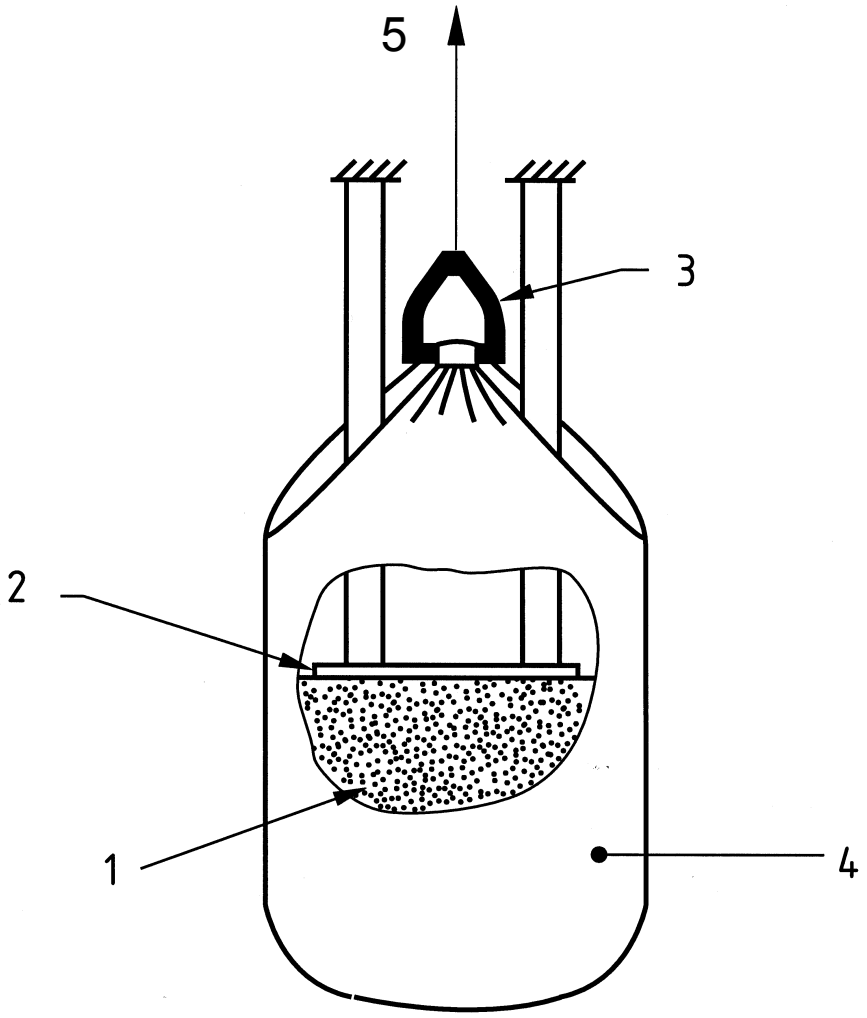
Figure B.3 — Perspective view of an FIBC with four lifting devices being tested using top restraint



Key

1 Filler material
2 Pressure plate
3 Suspension frame
4 FIBC lifting device
5 FIBC
6 Hoisting device

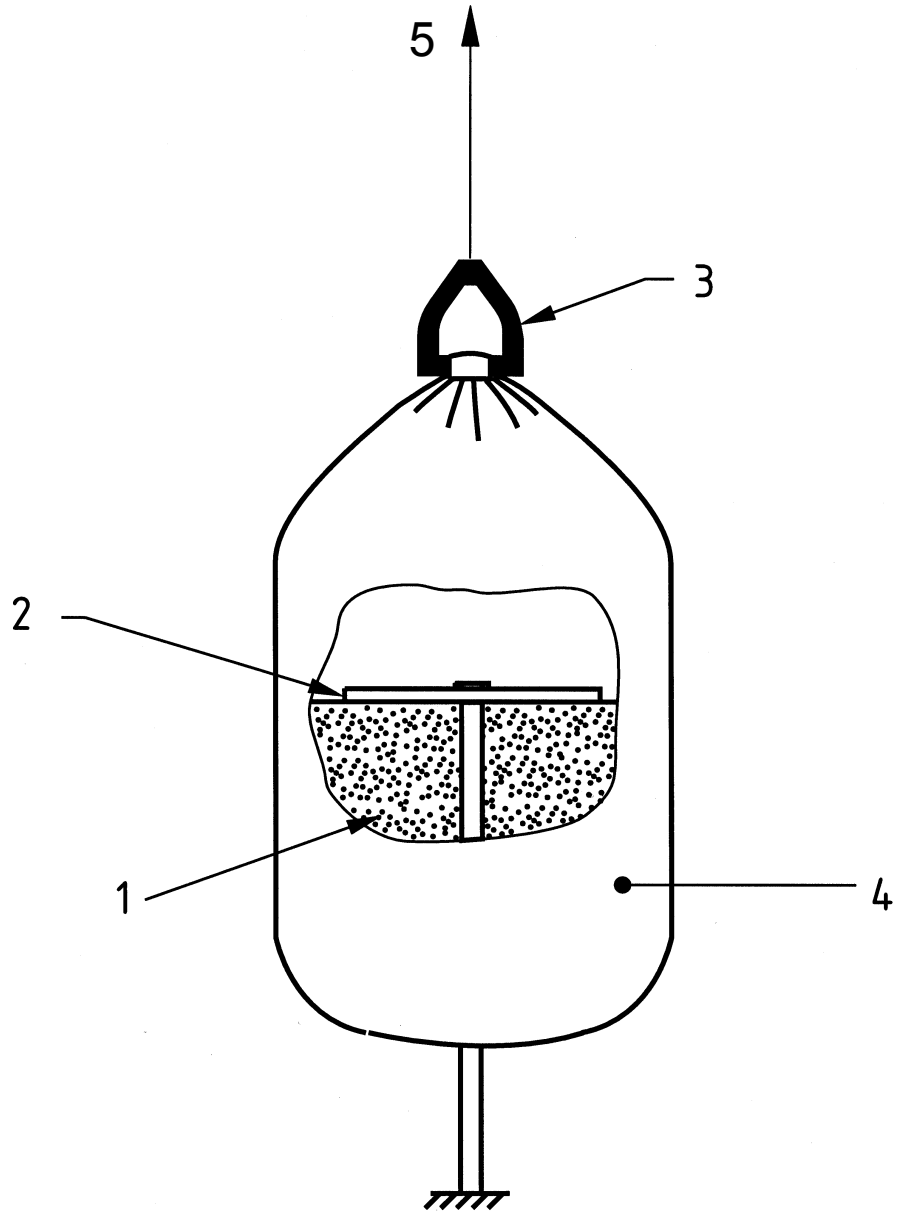
Figure B.4 — Elevation of an FIBC (with cut-out) with two lifting devices using top restraint



Key

1 Filler material
2 Pressure plate
3 Suspension frame
4 FIBC
5 Hoisting device

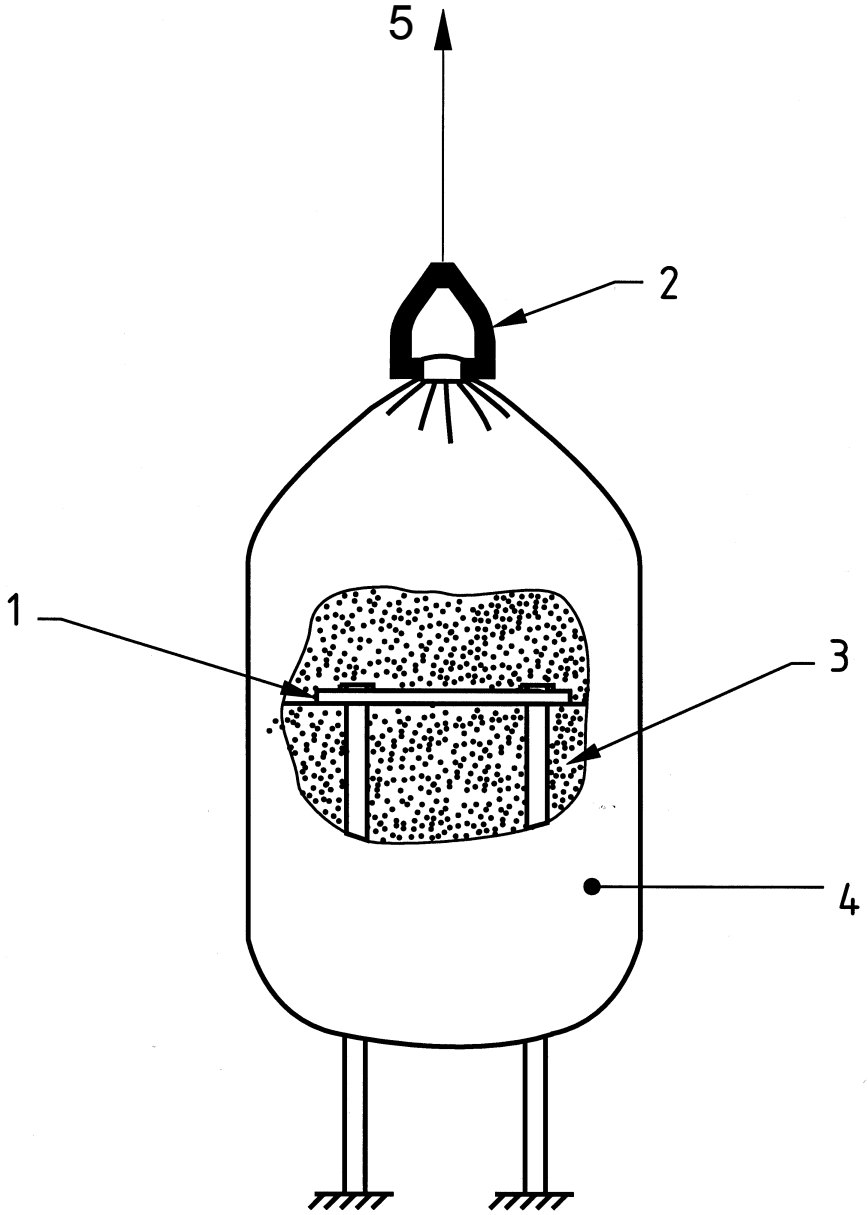
Figure B.5 — Elevation of an FIBC with the lifting devices formed by extensions of the body and using top restraint



Key

1 Filler material
2 Pressure plate
3 Suspension frame
4 FIBC
5 Hoisting device

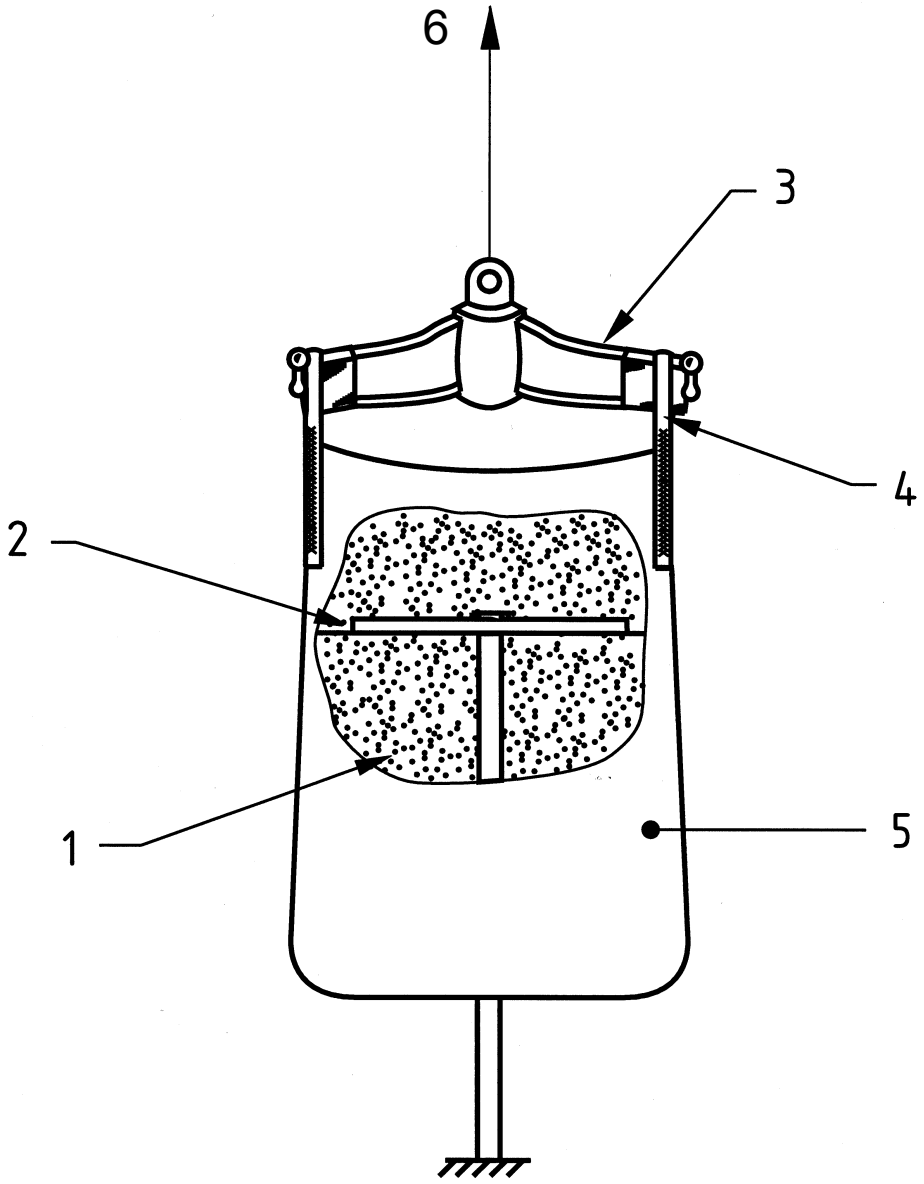
Figure B.6 — Elevation of a single-point lift FIBC with base restraint using one member restraining the pressure plate



Key

1 Pressure plate
2 Suspension frame
3 Filler material
4 FIBC
5 Hoisting device

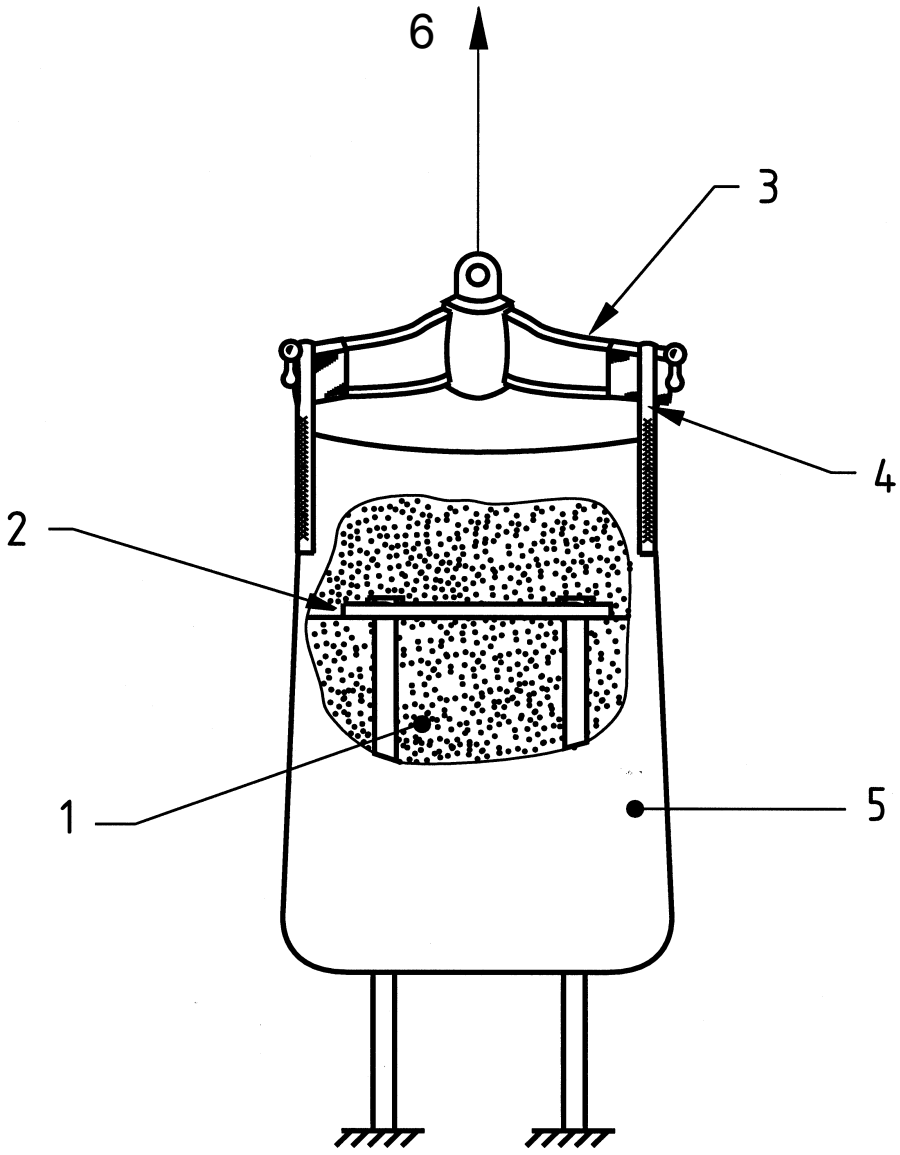
Figure B.7 — Similar to Figure B.6 but with two members restraining the pressure plate



Key

1 Filler material
2 Pressure plate
3 Suspension frame
4 FIBC lifting device
5 FIBC
6 Hoisting device

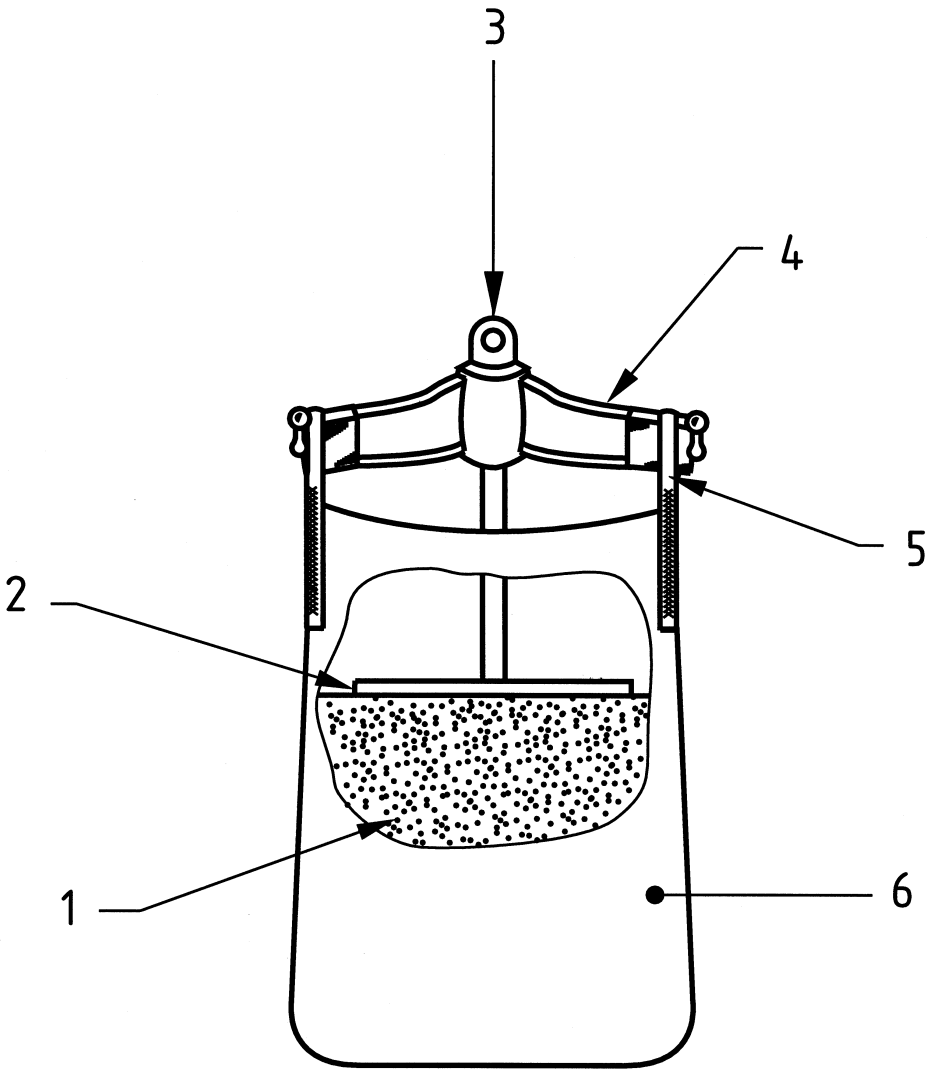
Figure B.8 — Elevation of an FIBC with two lifting devices using base restraint and one member restraining the pressure plate



Key

1 Filler material
2 Pressure plate
3 Suspension frame
4 FIBC lifting device
5 FIBC
6 Hoisting device

Figure B.9 — As Figure B.8 but with two members restraining the pressure plate



Key

1 Filler material
2 Pressure plate
3 Download force
4 Suspension frame
5 FIBC lifting device
6 FIBC

Figure B.10 — Elevation of an FIBC with two lifting devices being top lift tested using a downward force

Annex C
(normative)

Compression/stacking test

C.1 Principle

The filled FIBC is loaded to the specified test load using either a compression tester or a dead load and, at the end of the test period, is checked for loss of contents and for deterioration of the body which renders the FIBC unsafe for transport and storage.

C.2 Apparatus

Apparatus described in ISO 2872 or ISO 2874 or a flat plate with the appropriate dead load.

C.3 Procedure

Fill and condition the FIBC under test in accordance with 5.2.1 and 5.2.2. Use the method described in ISO 2872 or ISO 2874, as appropriate, or apply the load by appropriate weights loaded to a flat plate placed on top of the FIBC.

C.4 Calculation of the load to be applied

The load to be placed on the FIBC shall be 4 times its SWL. The compression load of 4 times SWL shall not be taken as the allowable stacking load in service. Other factors that affect stacking are the actual contents used in service, FIBC dimensions and design, stacking method etc.

C.5 Duration of the test

The duration of loading shall be 6 hours.

C.6 Expression of results

Express the results of the test including whether loss of contents or deterioration of the body of the FIBC occurred.

Annex D
(informative)

Guidance on selection and use of FIBCs

D.1 General

There are many different designs of FIBCs in common use, but these may be divided into three main categories:

a) heavy duty reusable, made for example of polymeric fabric continuously coated on one or both sides with plastics material, e.g. polyvinyl chloride;

b) standard duty reusable, made for example of polyolefin fabric, coated or uncoated, with or without an inner liner of plastics film, and used mainly in closed loop between filler and discharge of the FIBC;

c) single-trip, made for example of polyolefin fabrics or paper, coated or uncoated with or without an inner liner of plastics film.

Seaming or joining of the materials is usually by means of stitching, gluing, and/or welding, although other means may be used.

An FIBC may be so designed that when filled and raised by its top lift device(s), the resultant forces may be either:

— absorbed by the body and the lifting devices, where the walls are extended to form a lifting loop(s), or where other lifting devices are attached to the upper part of the walls; or

— partially absorbed by separate or integral lifting devices which pass the bag to form the support.

NOTE Table 1 gives an essential checklist to be undertaken before selecting an FIBC for use.

D.2 Selection of FIBCs

When selecting an FIBC for use, consideration should be given to:

a) the physical and chemical properties of the intended contents of the FIBC, such as:

1) bulk density;

2) flow characteristics;

3) degree of aeration;

4) particle size and shape;

5) compatibility with the materials used for the construction of the FIBC;

6) fill temperature;

7) whether the intended contents are foodstuffs, when special conditions normally apply.

b) the methods to be used for filling, handling, transporting, storing and emptying the FIBC;

c) the number of trips required, the number of times the bag is lifted on each trip, and the environmental conditions likely to be encountered;

d) general environmental considerations.

D.3 Storage of empty FIBCs

Empty FIBCs and liners should be stored in such a manner that accidental damage, exposure to sunlight, extreme climatic conditions and contact with substances likely to degrade the materials are avoided.

Where liners are supplied with the FIBCs they may be delivered either fitted inside the FIBCs or separately. In both cases, care should be taken to avoid contamination.

Liners are vulnerable to damage which may not always be visibly obvious, and therefore should be given particularly careful handling and storage.

D.4 Filling FIBCs

FIBCs are normally filled suspended using the lifting device(s) and with the base of the bag on or near the ground or a pallet. Other methods may be applicable in consultation with the manufacturer or supplier.

If the FIBC has a discharge spout or other discharging device this should be tied off or closed before filling.

Before filling with material at temperatures above 60 °C, the manufacturer or supplier should be consulted.

D.5 Stability of filled FIBCs

The FIBCs should be filled so that the ratio of filled height to base is between 0,5 and 2,0 using as base dimension:

a) the diameter of FIBCs with a circular cross-section;

b) the length of the shorter side for FIBCs with a rectangular cross-section.

NOTE 1 Other major factors which affect the stability of filled FIBCs are the flow characteristics of the contents, free space and air entrapment.

NOTE 2 Stability may be often improved by vibration during or after filling to remove entrapped air and cause compaction.

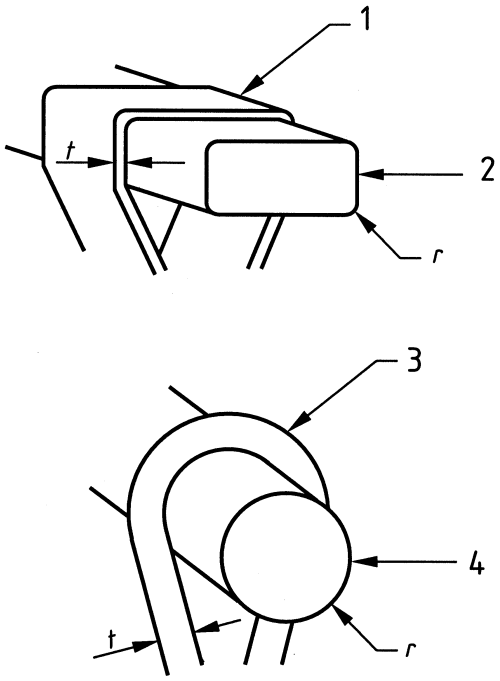
D.6 Lifting of filled FIBCs

Before lifting any FIBC:

a) it should be inspected for any damage which may render it unsafe;

b) the lifting loops or other lifting devices should be positioned according to the manufacturer's or supplier's instructions;

c) the hooks, bars or fork lift arms employed for lifting should be inspected to ensure that they have rounded edges with a radius greater than the diameter or thickness of the suspension of the FIBC and/or be protected by wrapping. The rounded edges should have a minimum radius of 5 mm. The necessary characteristics are shown in Figure D.1.



Key

1 FIBC suspension e.g. webbing loop
2 Lifting device e.g. fork lift arm
3 FIBC suspension e.g. rope
4 Lifting device e.g. fork lift arm or crane

r should be greater than t

r minimum is 5 mm

NOTE When the FIBC is suspended, personnel should be excluded from the area under the FIBC.

Figure D.1 — Lifting of FIBCs

D.7 Storage of filled FIBCs

Storage of filled FIBCs at temperatures above 50 °C should be avoided, except with the approval of the manufacturer or supplier.

Filled FIBCs should have any top closures properly closed before storage.

Except for FIBCs that have been specifically designed for outdoor storage all FIBCs stored outdoors:

a) should be sheeted over to prevent water collection on the tops of FIBCs;

b) should not be stored in standing water;

c) should be protected against rays of sunshine.

D.8 Emptying of filled FIBCs

FIBCs may be emptied by suction, and by certain types of blowing, but they are usually emptied by gravity. The flow characteristics of the contents and the cost of ancillary equipment will generally dictate which method is chosen.

When emptying by gravity, personnel should not stand under the FIBC, nor put their arms between the base of the FIBC and a receiving vessel, or similar, except where the FIBC is supported.

D.9 Inspection of heavy duty and standard duty FIBCs

Before reuse of FIBCs, consideration should be given to the possibility of contamination from previous contents.

Before reuse, FIBCs should be thoroughly examined for damage to stitching/gluing/welding, and for surface abrasion, cuts, tears or any other damage to the bag. Particular attention should be paid to the lifting loops or devices and their attachments. The examination should look for signs of the following:

a) Abrasion. The effects of abrasion are variable, but some loss in strength is to be expected. In extreme cases, the fabric becomes so worn that the outer yarns of the weave are severed. On lifting loops or devices, localized areas of abrasion may be present caused by handling equipment with sharp edges, and these areas may result in a serious loss in strength;

b) Cuts, contusions. Cuts, particularly in the lifting loops or devices, may result in a serious loss of strength.

c) Ultra violet degradation and/or chemical attack. These may be indicated by the softening of the material (sometimes with discoloration), so that the outer surface may be rubbed off or plucked off, and in extreme cases, the outer surface may become powdered.

d) Damage to coatings. Some FIBCs are manufactured from coated polyolefin fabric, and the coating may be on the inside and/or outside of the bag. Consideration should be given to the possible contamination of the contents by an unacceptable level of coating fragments if an inside coating is damaged, and to the increased possibility of moisture ingress (particularly, if the contents are hygroscopic) when damage occurs to either the inside and/or outside coatings.

When damage affecting the strength of the FIBC is discovered, the FIBC should be taken out of service immediately.

D.10 Repair of heavy duty FIBCs

Repairs should be carried out so that the repaired FIBC is capable of meeting the requirements of new FIBCs as marked on the label.

Before undertaking any repairs, the manufacturer or supplier should always be consulted. Factors which should be taken into account in deciding whether the FIBC is field repairable, factory repairable or not repairable include:

a) the materials of construction;

b) the type and area of damage;

c) the age of the FIBC;

d) the conditions to which the FIBC has been subjected during service;

e) the location of the damage.

Table D.1 — How to use FIBCs

Do	Don't
Do select the right FIBC for the job in consultation with the manufacturer or supplier	Don't choose FIBCs without consulting the manufacturer or supplier
Do read the instruction label on the FIBC	Don't exceed the SWL in any circumstances
Do inspect re-usable FIBCs before refilling	Don't fill the FIBCs unevenly
Do check that the discharge spout is closed off before filling	Don't stop or start suddenly during transportation
Do ensure that the filled FIBC is stable	Don't subject FIBCs to snatchlift and/or jerk stops
Do close the top inlet correctly	Don't drag FIBCs
Do use lifting gear of sufficient capacity to take the suspended load	Don't allow personnel under suspended FIBCs
Do adjust the distance between fork lift arms to the correct width for the FIBC being handled	Don't allow FIBCs to project over the side of a vehicle or pallet
Do tilt the mast of the fork lift truck rearwards to an appropriate angle	Don't tilt the mast of the forklift forward
Do ensure that crane hooks, bars or forklift arms used for lifting are of adequate size and are rounded to at least the thickness of the sling, belt or rope suspension, with a minimum radius of 5 mm	Don't withdraw the fork lift arms prior to relieving all the load on the lifting devices
Do take appropriate measures in regard to dust control	Don't stack FIBCs unless sure of stability
Do consider the possibility of static electricity hazards	Don't use FIBCs in new conditions without consulting the manufacturer or supplier
Do protect the FIBCs from rain and/or prolonged sunlight	Don't reuse single-trip FIBCs
Do ensure the FIBCs are adequately secured in transportation	Don't repair heavy duty reusable FIBCs unless the new requirements can be met

Annex E
(informative)

Design of FIBCs

This annex shows some designs of FIBC. It does not illustrate all designs, nor imply that designs not illustrated are in any way inferior to those shown.

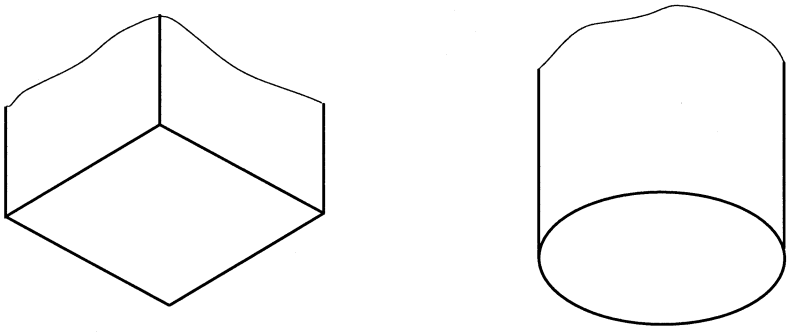


Figure E.1 — Examples of FIBC with a plain base

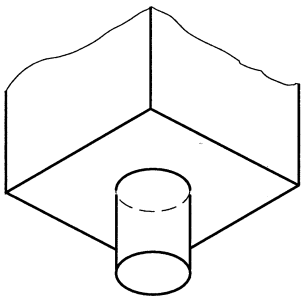


Figure E.2 — Base with spout

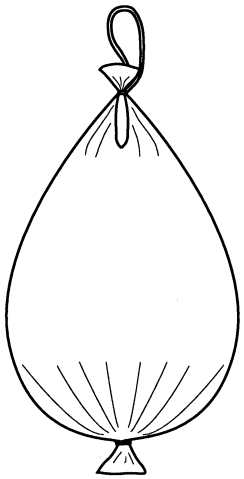


Figure E.3 — Base formed out of narrowed walls

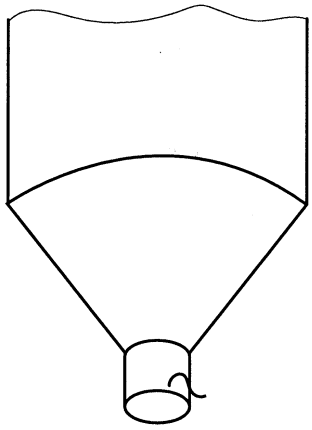


Figure E.4 — Conical base with spout

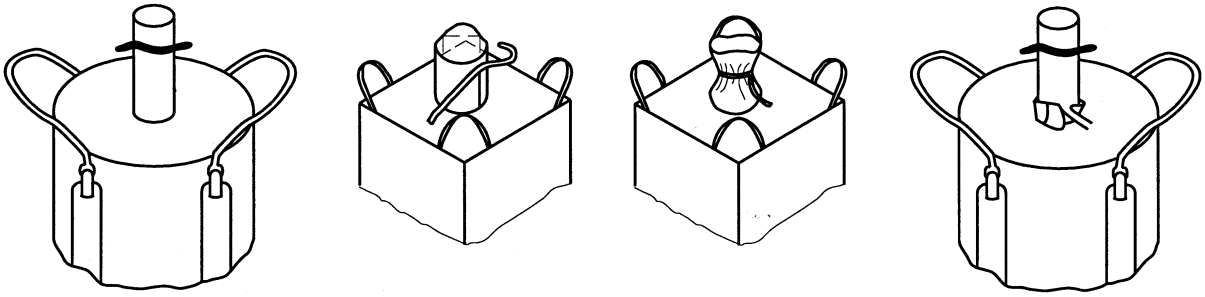


Figure E.5 — Top with filling spout

Figure E.6 — Top with filling slit

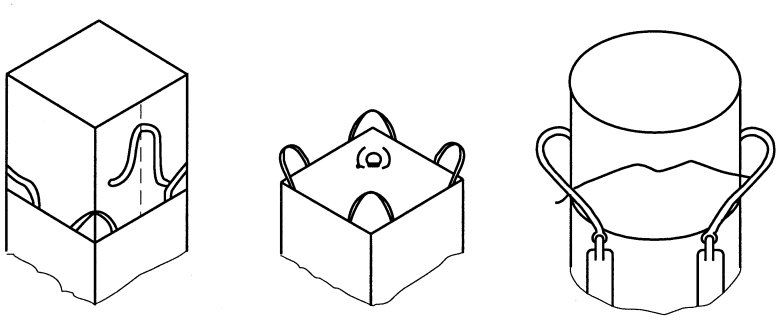
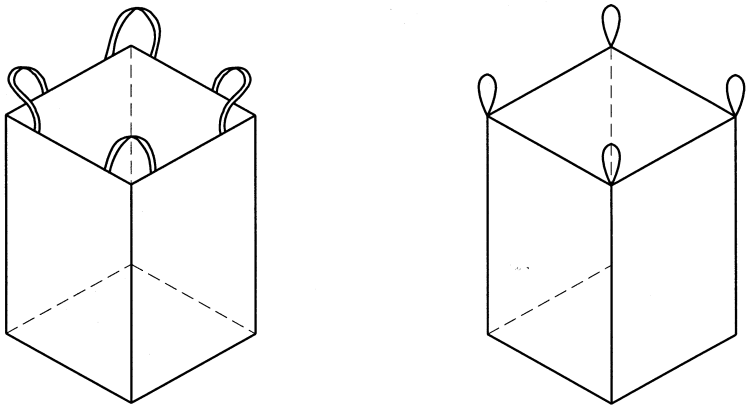
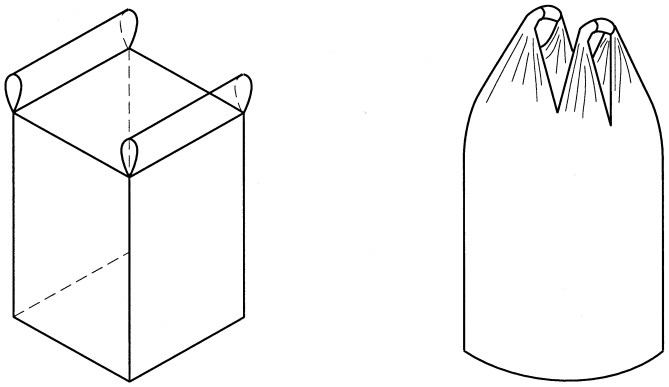


Figure E.7 — Top with skirt



Each lifting device fixed at two points **Each lifting device fixed at one point**

Figure E.8 — Four point lifting



Two tubular lifting device **Lifting devices formed out of the walls**

Figure E.9 — Two point lifting

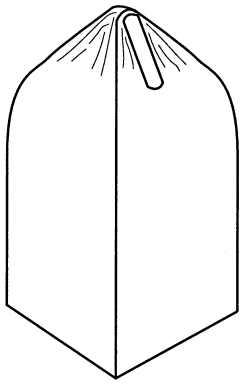


Figure E.10 — Single point lifting - Lifting devices formed out of the walls

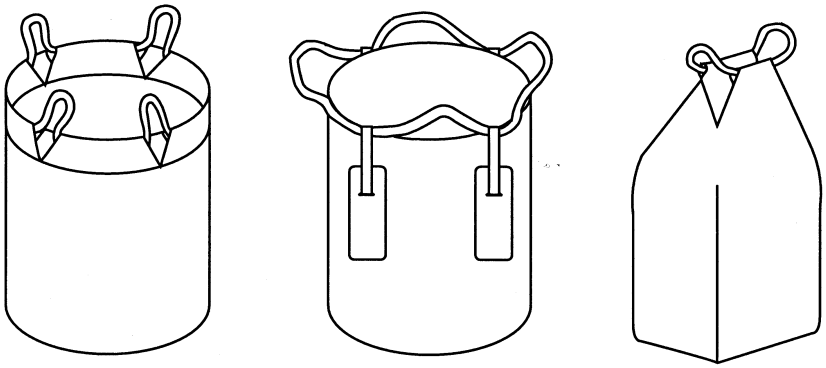
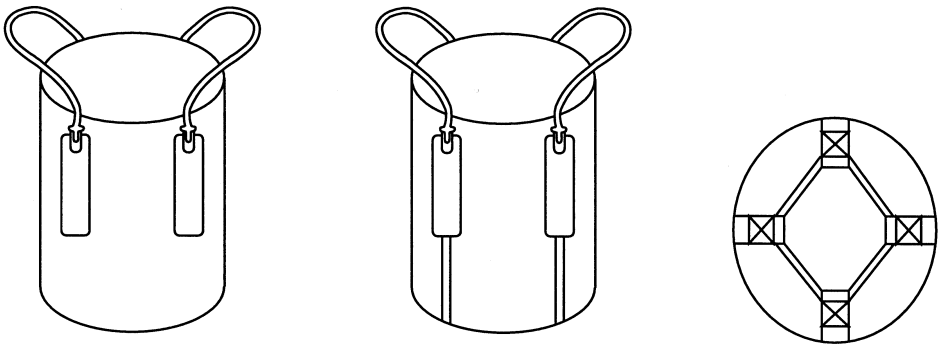


Figure E.11 — Rope lifting devices



Two lifting devices fixed on side walls **Two lifting devices fixed on**

Figure E.12 — Two lifting devices

Bibliography

[1] ASTM G154-98, *UV resistance test*

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