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Tea sacks — Specification —

Part 2:
Performance specification for sacks for palletized and containerized transport of tea

Sacs à thé — Spécifications —

Partie 2: Spécifications de performance des sacs utilisés pour le transport palettisé et conteneurisé du thé

Reference number
ISO 9884-2:1999(E)

Foreword

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

International Standard ISO 9884-2 was prepared by Technical Committee ISO/TC 34, *Agricultural food products*, Subcommittee SC 8, *Tea*.

ISO 9884 consists of the following parts, under the general title *Tea sacks — Specification*:

— *Part 1: Reference sack for palletized and containerized transport of tea*

— *Part 2: Performance specification for sacks for palletized and containerized transport of tea*

Annexes A and B form an integral part of this part of ISO 9884. Annex C is for information only.

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Introduction

ISO 9884-1 specifies the materials, construction and dimensions of a reference sack which has been demonstrated by rigorous transport and storage trials to be suitable for the palletized and containerized transport of tea. Continuing development of improved materials is resulting in the availability of sacks of different materials and construction to serve this purpose. This part of ISO 9884 sets minimum requirements and performance tests to ensure that such sacks are equivalent or superior in performance to the reference sack. Guidance on the filling of tea sacks is given in annex C, for information only.

INTERNATIONAL STANDARD © ISO **ISO 9884-2:1999(E)**

Tea sacks — Specification —

Part 2:
Performance specification for sacks for palletized and containerized transport of tea

1 Scope

This part of ISO 9884 specifies requirements and tests to determine the suitability of sacks for the palletized and containerized transport of tea on standard pallets of standard unit load size in standard containers (see ISO 9884-1).

2 Normative references

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

ISO 1573:1980, *Tea — Determination of loss in mass at 103 °C*.

ISO 2758:—[1], *Paper — Determination of bursting strength*.

ISO 4120:1983, *Sensory analysis — Methodology — Triangular test*.

ISO 4121:1987, *Sensory analysis — Methodology — Evaluation of food products by methods using scales.*

ISO 6590-1:1983, *Packaging — Sacks — Vocabulary and types — Part 1: Paper sacks*.

ISO 7965-1:1984, *Packaging — Sacks — Drop test — Part 1: Paper sacks.*

ISO 9884-1:1994, *Tea sacks — Specification — Part 1: Reference sack for palletized and containerized transport of tea.*

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[1] To be published. (Revision of ISO 2758:1983)

3 Definitions

For the purposes of this part of ISO 9884, the definitions given in ISO 6590-1 apply.

4 Requirements

4.1 Sack type

Sacks shall be constructed with flat hexagonal ends and shall consist of at least two plies.

4.2 Dimensions

The filled sack dimensions shall be as given in table 1 of ISO 9884-1:1994.

4.3 Construction materials

4.3.1 General

All materials used in the construction of the sack (paper, plastics, adhesive, barrier ply) shall be free from taint and/or odour. No materials containing chlorophenols or their derivatives shall be used.

4.3.2 Outer ply

The outer-ply material shall have a minimum wet burst index of 1,2 kN/g, when tested in accordance with ISO 2758.

4.3.3 Innermost ply

The inner ply shall be an aluminium-foil-coated barrier ply with the aluminium facing inwards, complying with ISO 9884-1, or of a material having a permeability to chlorophenol or chloroanisole not greater than that of the inner ply of a sack complying with ISO 9884-1, when tested by the method given in annex B.

4.4 Performance requirements

4.4.1 Drop test

When a minimum of three sacks filled with 60 kg of tea are dropped three times (once each on a face, butt and side) from a constant height of 3 m, in accordance with the method given in ISO 7965-1, there shall be no rupture of sacks resulting in loss of contents.

4.4.2 Transport trials

Sacks shall match or surpass the performance of reference sacks (see ISO 9884-1) throughout a minimum of 6 months of intercontinental transport trials carried out in accordance with annex A.

5 Test report

The test report may be used by a sack manufacturer to certify that a sack conforms to the requirements of this specification. It shall specify the following details.

a) Sack specification:

   1) materials;

   2) construction (number and type of plies);

   3) dimensions.

b) Drop test results:

   1) number of sacks tested and date(s) of the test;

   2) mass and type of tea;

   3) name of organization performing the test.

c) Transport trials:

   1) place and date of production, grades and invoice/bulk numbers of the tea;

   2) moisture content of the tea at point of packing;

   3) number and mass of the reference sacks and the trial sacks packed for each bulk/invoice;

   4) place and date of packing/palletization;

   5) date and means/route of transport to port of loading;

   6) port and date of departure;

   7) vessel and details of

      — stowage of the test and reference pallets,

      — other cargo carried;

   8) route of the voyage and the date of arrival in the terminal port;

   9) means of transport to, and place and date of opening the containers;

   10) condition on receipt (see A.2.4);

   11) numbers of sample sacks and mass of samples taken;

   12) moisture contents of the samples and the name of the organization carrying out the analysis;

   13) names and affiliations of the tea tasters carrying out the organoleptic assessments, the dates of the assessments and the results.

Annex A
(normative)

Transport trials

A.1 General procedure

Trial sacks shall be compared with reference sacks (see ISO 9884-1) filled with the same bulk or invoice of tea at the same time under identical conditions, transported together and opened at the same time under identical conditions.

At least 1 000 filled test sacks shall be shipped in a minimum of four vessels over a minimum period of 6 months in a minimum of two containers per vessel. Each test container shall hold at least 100 trial sacks and 100 reference sacks.

The test and reference sacks shall be compared on the basis of:

- incidence and extent of sack damage;
- incidence and extent of product spillage/loss;
- moisture content of tea on arrival;
- organoleptic quality of tea on arrival.

A.2 Specific procedures

A.2.1 Tea from the same bulk or invoice shall be used to fill equal numbers of trial and reference sacks.

NOTE Several bulks may be used to make up paired pallet loads of trial and reference sacks to fill the test containers.

A.2.2 A minimum of three samples of each bulk of tea shall be taken during the sack-filling operation. The moisture content of each sample shall be determined in accordance with the method given in ISO 1573.

A.2.3 Paired pallets of trial sacks and reference sacks shall be placed adjacently in the test container, alternating in position to achieve an even distribution from side to side and top to bottom.

EXAMPLE

T R T T R

R T R R T

where T is a trial sack and R is a reference sack.

A.2.4 On arrrival at the destination, the condition of the contents of each test container shall be examined as they are removed and stored in the warehouse. An inspection record shall be completed (with photographs illustrating damage) setting out:

- dates of arrival and unpacking;
- the condition, appearance and stability of each pallet load (test and reference sacks);

- the damage incurred by both test and reference sacks;
- the extent of any product spillage/loss.

A.2.5 Samples shall be taken on arrival from undamaged trial sacks and reference sacks at the top, middle and bottom of each pallet, and these samples shall be bulked. The moisture contents of the bulked samples shall be determined in accordance with the method given in ISO 1573. The moisture contents of samples from trial pallets shall not exceed those of samples from the paired reference pallets.

A.2.6 At least two consignments of tea, having successfully completed a transport trial from producing factory to purchaser's warehouse, shall be subjected to a comparative taste assessment. This shall be carried out by a minimum of four professional tea tasters (at least two of whom shall be independent of the producer and the purchaser) on bulked samples from reference and test pallets containing the same original bulk tea.

The first step in this assessment shall be a difference test carried out according to the method given in ISO 4120. If no significant difference (P less than 0,05) is found, the trial sack shall be deemed to have passed the test. If a significant difference is found, a preference test shall be carried out in accordance with the method given in ISO 4121 to determine which sample(s) is (are) of the higher quality. The trial sack shall be deemed to have passed the test if the contents of the reference sacks are not significantly preferred over the contents of the trial sacks (P less than 0,05).

Annex B
(normative)

Measurement of permeability of tea sack barrier ply material — Determination of chlorophenols and chloroanisoles by gas chromatography

B.1 General

Multi-wall paper sacks used for the bulk transport of tea include an inner aluminium-coated barrier ply to protect the contents from contamination arising from the permeation of organic vapours such as chlorophenols and chloroanisoles.

The method described in this annex is applicable to tea sack barrier ply materials (e.g. multilayer laminates) to establish rates of chlorophenol and chloroanisole permeation through a material under test. This procedure may also be considered applicable to determine rates of permeation of other organic vapours through similar barrier materials.

B.2 Principle

A gas-tight cell is divided into two chambers by the test ply material. On one side (i.e. the outer surface of the test material) is generated a saturated vapour of chlorophenol/chloroanisole. The other side (i.e. inner surface of the test material) is purged with an inert gas (e.g. oxygen-free nitrogen) at a known constant rate. Organic vapours permeating across the barrier are collected at the purged outlet of the cell onto an absorbent trap. After the elapsed sampling period the trap is removed from the cell for chromatographic analysis of the collected sample.

B.3 Reagents and materials

Use only reagents of recognized analytical grade.

B.3.1 Standard stock solutions

B.3.1.1 2,6-Dichlorophenol

Dissolve 100 mg of of 2,6-dichlorophenol in methanol and dilute to volume with methanol in a 100 ml volumetric flask.

B.3.1.2 2,4,6-Trichlorophenol

Dissolve 100 mg of of 2,4,6-trichlorophenol in methanol and dilute to volume with methanol in a 100 ml volumetric flask.

B.3.1.3 Pentachloroanisole

Dissolve 100 mg of pentachloroanisole in methanol and dilute to volume with methanol in a 100 ml volumetric flask.

B.3.2 Standard working solutions

Prepare concentrations of 100 ng/µl, 10 ng/µl, and 1 ng/µl, by serial dilution from the standard stock solutions (B.3.1).

B.3.3 Tenax TA beads[2], mesh size 20 µm to 35 µm.

Tenax is a porous polymer based on 2,6-diphenyl-*p*-phenylene oxide.

B.4 Apparatus

Usual laboratory equipment and, in particular, the following.

B.4.1 Barrier material permeability test cell, see figure B.1.

The cell is constructed from two borosilica glass domes with flat flange and sockets (ground glass, size DA4/100, socket size 29/32), with an external diameter of 150 mm. A disc of the test material is cut to size, and placed between the two flanges, which are secured to form a gas-tight seal. The volume in which the saturated organic vapour will be generated is sealed with a 29/32 ground glass stopper. A Drechsel adaptor consisting of an inlet tube for the purging gas and an outlet to which the absorption tube will be attached is placed in the other socket of the test cell.

B.4.2 Absorbent trap, consisting of a tube packed with the appropriate quantity of Tenax TA beads (B.3.3).

EXAMPLE

A borosilicate glass tube 160 mm long, having an external diameter of 6 mm and an internal diameter of 3 mm, plugged towards one end with glass wool. Then 100 mg of Tenax TA beads (B.3.3) are packed into the tube, which is closed with a glass wool plug.

B.4.3 Thermodesorption cold trap injector, for the transfer of the sample from the absorbent trap (B.4.2) to the gas chromatograph (B.4.4) (see figure B.2).

B.4.4 Gas chromatograph, with electron-capture detector and integrator, and a non-polar type capillary column.

The column is typically 12 m long with 0,2 mm internal diameter, coated with a film of 0,33 µm thickness of 100 % (*m/m*) dimethylpolysiloxane.

B.5 Procedure

B.5.1 Preparation of glassware

Clean all glassware by heating to 200 °C for at least 30 min, then allow to cool to ambient temperature before use.

B.5.2 Preparation of test sample

B.5.2.1 Cut a 150 mm diameter circular disc of the test material.

B.5.2.2 Position the disc between the two flanged domes of the test cell (B.4.1) with the outer surface facing the volume to be saturated with the organic vapour. Secure the two flanges and ensure that they are gas tight.

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[2] Tenax TA is an example of a suitable product available commercially. This information is given for the convenience of users of this part of ISO 9884 and does not constitute an endorsement by ISO of this product.

B.5.3 Preparation of absorbent trap

B.5.3.1 Pass oxygen-free nitrogen through the trap at a flow rate of 20 ml/min. Heat the trap to 250 °C for 15 min, and allow it to cool to ambient temperature.

B.5.3.2 Using a microlitre syringe, inject 1 μl of the standard working solution (B.3.2) onto the glass wool plug which will be adjacent to the test cell outlet when the trap is in place (B.5.5.2).

B.5.4 Assembly of permeability test cell

B.5.4.1 Insert the Drechsel adaptor so that the end of the inlet tube carrying the purging gas is about 1 cm above the surface of the test material.

B.5.4.2 Place a small beaker containing the permeability test compound (e.g. a chlorophenol) on the stopper used to close the saturated volume chamber (A) and secure the stopper in place.

B.5.5 Collection of the sample

B.5.5.1 Attach a supply of oxygen-free nitrogen to the inlet tube and set the gas flowrate at 60 ml/min. Allow time for the permeated vapour to reach a steady state in the purged volume chamber (B).

NOTE As an example, for an aluminium/polyethylene/kraft paper laminate, the time taken to reach steady state is 3 days to 7 days for chlorophenols, and 7 days to 14 days for chloroanisoles.

B.5.5.2 Connect the absorbent trap (B.5.3) to the outlet and leave in place for a measured time interval of at least 4 h.

B.5.6 Transfer of sample

B.5.6.1 Remove the absorbent trap and connect it to the thermodesorption cold trap injector (B.4.3), cooled with liquid nitrogen.

B.5.6.2 Connect an oxygen-free nitrogen supply at a flow rate of 4 ml/min to the absorbent trap. Raise the temperature of the desorption oven to 250 °C, with the cold trap at –100 °C.

B.5.7 Analysis by capillary gas chromatography

B.5.7.1 Setting up the apparatus

B.5.7.1.1 Injector

Close the cooling supply to the thermodesorption cold trap injector, and heat the cold trap up to a temperature of 260 °C. The sample passes in the gas stream into the gas chromatograph column at an injector temperature of 250 °C.

The heating rate for the cold trap is typically 10 °C to 15 °C per second.

B.5.7.1.2 Oven and column

The oven temperature cycle on the gas chromatograph is started at the same time as the cold trap heating on the injector.

It is essential that a temperature programme be used to achieve a baseline separation between the peaks which are to be measured.

A typical temperature programme is 120 °C for 1 minute, followed by an increase at 10 °C per minute to 250 °C, with a carrier gas flow through the thermodesorption equipment of 4 ml/min.

B.5.7.2 Determination

The retention times on the capillary column for each of the test compounds and internal standards are determined by injecting standard solutions onto the Tenax absorbent trap, and transferring them by the method described to the gas chromatograph.

B.5.7.3 Examination of chromatograms

When the gas chromatograph is operated under the conditions given in B.5.7.1.2, the retention times should typically be as follows:

Minutes	**Peak**
0,96	air
2,71	2,6-dichlorophenol
4,41	2,4,6-trichlorophenol
8,56	pentachloroanisole

B.6 Expression of results

B.6.1 The method allows the quantitative determination of the amount of organic vapour passing through the barrier ply material over the sampling time.

The response of the detector is a function of the chlorine content of each compound. The 1 ng samples of the compounds used give peak areas with the following relative values:

2,6-dichlorophenol	26
2,4,6-trichlorophenol	192
pentachloroanisole	388

B.6.2 The transmission rate of the barrier ply material is calculated as follows:

B.6.2.1 The mass of the test compound transmitted, m_t, expressed in grams, is given by

$$m_t = \frac{A_t}{A_s} \times \frac{R_s}{R_t}$$

where

A_t is the peak area of the test sample;

A_s is the peak area of the standard;

R_s is the relative response of the standard;

R_t is the relative response of the test sample.

B.6.2.2 The transmission rate, TR, expressed in grams per square metre per 24 h, is given by

$$\mathrm{TR} = \frac{m_\mathrm{t}}{\frac{t}{24} \times A_\mathrm{e}}$$

where

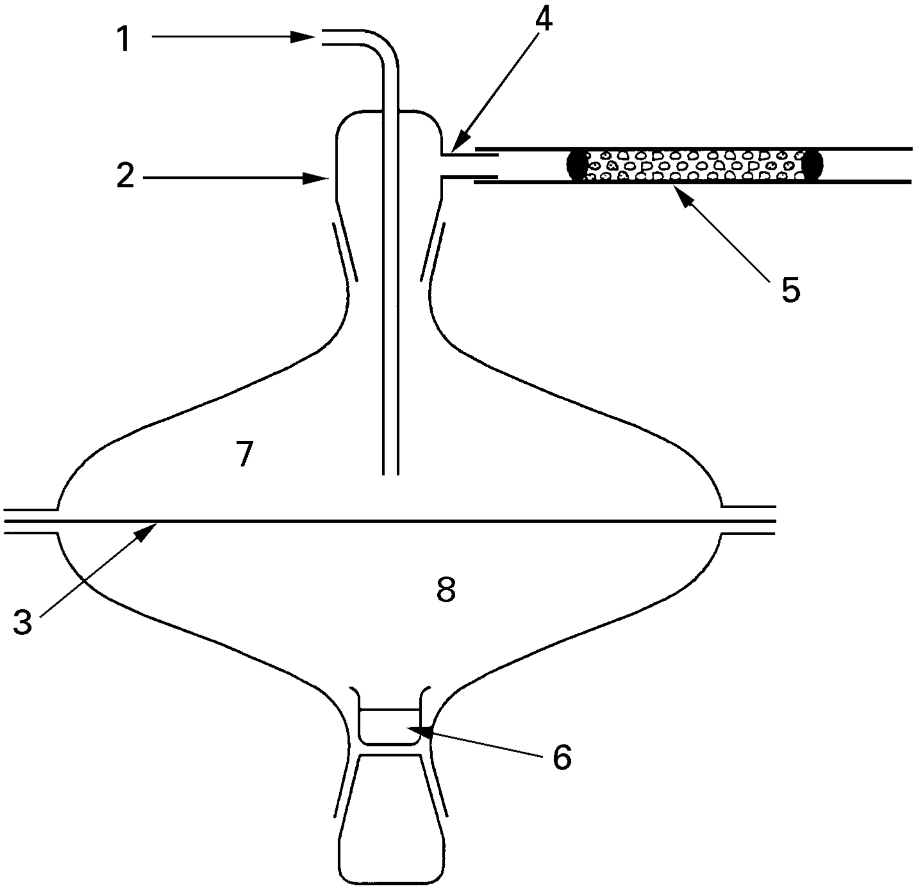
t is the time, in hours, over which the sample was collected;

A_e is the exposed area, in square metres, of the test sample.

B.7 Test report

The test report shall specify:

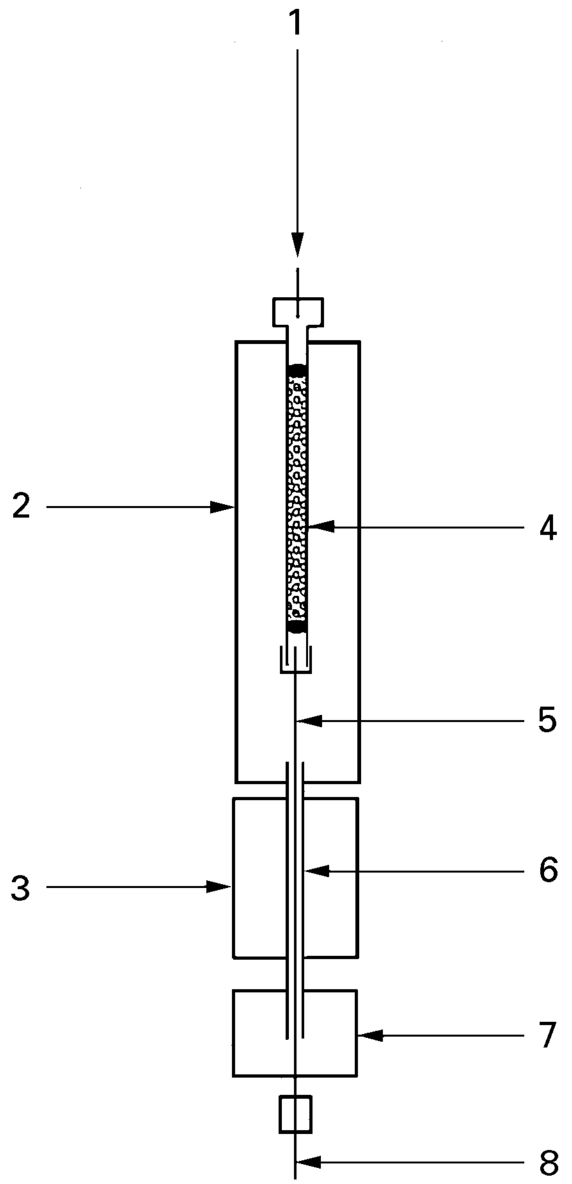
- all information necessary for the complete identification of the sample;
- the sampling method used, if known,
- the test method used, with reference to this part of ISO 9884;
- all operating details not specified in this annex, or regarded as optional, together with details of any incidents which may have influenced the test result(s);
- the test result(s) obtained, expressed in accordance with B.6.2.



Key

1 Purge gas inlet	5 Tenax TA absorption tube
2 Drechsel adaptor	6 Permeability test compound
3 Tea sack barrier ply material	7 Purged volume chamber (B)
4 Purge gas outlet	8 Saturated volume chamber (A)

Figure B.1 — Diagram of the permeability test cell



Key

1 Carrier gas

2 Thermal desorption oven

3 Trap cooling system

4 Tenax TA absorption tube

5 Transfer tube

6 Electrically heated metal capillary

7 Gas chromatograph injection port

8 GC capillary column

Figure B.2 — Schematic diagram of the thermodesorption cold trap injector

Annex C
(informative)

Guidance on the filling of tea sacks

C.1 Objectives

It is important when filling tea sacks to ensure that the sacks are packed at their optimum weights, taking account of the different bulk densities of tea grades. Correct filling should

- ensure that sacks stacked on pallets or slip-sheets can be easily loaded into and unloaded from containers without damage or loss of tea;
- achieve safe and stable pallet or slip-sheet loads.

C.2 Optimum packing weight

Because the bulk density of the tea will vary from grade to grade, optimum packing weights should be determined before packing a consignment of tea.

NOTE Overfilled sacks lead to bulging, instability and possible damage to the sack with loss of tea, particularly when they are being loaded into a container from pallets. Underfilled sacks may lead to excessive movement and separation of leaf which may result in unstable sacks, and overall packaging and freight costs will be higher.

C.3 Method of filling

There are a variety of different methods for filling sacks; these range from manual methods to fully automated operations. For each method, the optimum weight that can be filled should be set on the scale, taking into account the tare weight of the sack.

C.4 Vibration

The sealed sack should be placed horizontally in a former attached to a vibrator.

Whilst vibration is necessary, this process can contribute to leaf damage and separation, and just suffficient vibration should be used to obtain the required sack shape.

It is inappropriate to propose a vibration time as a range of variables exist. If, however, sacks require more than 1 min on the vibrator, the tea weights selected should be re-checked (see C.2 and C.3).

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