# TECHNICAL REPORT

ISO TR 12776

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# Pallets — Slip sheets

## Palettes — Feuilles intercalaires (dites "slip sheets") iTeh STANDARD PREVIEW (standards.iteh.ai)

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## 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 main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

> (statype 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

- type(2,,when the subject is still under technical development or where https://standards.iteh.ai/forlany.aother/reason there is6the future but not immediate possibility 9a00flan/agreement on and ternational Standard;

> type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

> Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 12776, which is a Technical Report of type 2, was prepared by Technical Committee ISO/TC 51, *Pallets for unit load method of materials handling*.

This document is being issued in the type 2 Technical Report series of publications (according to subclause G.4.2.2 of part 1 of the ISO/IEC Directives, 1992) as a "prospective standard for provisional application" in the field of slip sheets because there is an urgent need for guidance on how standards in this field should be used to meet an identified need.

This document is not to be regarded as an "International Standard". It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the ISO Central Secretariat.

A review of this type 2 Technical Report will be carried out not later than two years after its publication with the options of: extension for another two years; conversion into an International Standard; or withdrawal. Annexes A, B, C, D and E of this Technical Report are for information only.

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## Introduction

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The system of slip-sheet unit-load handling involves the use of a thin sheet of material, the slip sheet, as a base on which items are assembled as a unit load for handling, transport and storage. Slip sheets provide an alternative to the use of pallets for assembling, handling, transporting and sorting goods in unit-load form.

To use slip sheets, a conventional lift truck is equipped with a special attachment for gripping, pulling and pushing the slip-sheeted unit loads. The attachment may be permanent or removable depending on the application and circumstances. If all lift trucks in the distribution cycle are equipped with the proper attachment, a slip sheet is the only material-handling base required. Unit loads on slip sheets may be lifted, stacked and then retrieved and handled as a single unit. The stacking height may be as high as five unit loads, depending on the strength of the packaging. However, the slip sheet may also be used in conjunction with a pallet, if desired, at certain stages in the distribution cycle.

Originally developed in the USA, the slip sheet provides an inexpensive and lightWeight/unit-load base that occupies little shipping cube and is https://standards.itelmoret.easily.disposed of than conventional pallets. If both the shipper and receiver have the appropriate equipment and other basic requirements are met, the full benefits of unitized load handling can be met using slip sheets.

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# Pallets — Slip sheets

### 1 Scope

This Technical Report defines terms related to slip sheets used as bases for the assembly, handling, storing and transporting of products and goods as unit loads, and gives details of typical materials and designs used. It also specifies requirements with relation to dimensions and performance.

The following annexes are included:

- quidelines on uses of slip sheets;
- guidelines on setting-up a slip sheet system;
- correct operating procedures for handling unit loads on slip sheets;
  — correct operating procedures for handling unit loads on slip sheets;
  — correct operating procedures for handling unit loads on slip sheets;
  — set intended for loads on slip sheets;
- push-pull equipment;
- bibliography.

### 2 Normative reference

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

ISO 1924-2:1994, Paper and board — Determination of tensile properties — Part 2: Constant rate of elon-gation method.

### 3 Definitions

For the purposes of this Technical Report, the following definitions apply. Terms relating to push-pull equipment are given in annex D.

**3.1 slip sheet:** Flat sheet of material with a tab on one or more sides, used as a base for assembling, handling, storing and transporting goods and products in unit-load form.

NOTE 1 Slip sheets may be used in conjunction with pallets or may be handled separately.

3.2 expendable slip sheet: Slip sheet intended to

be discarded after a single cycle of use.

**3.4 recyclable slip sheet:** Slip sheet manufactured from material which can be reprocessed.

**3.5 slip-sheet load surface:** That portion of the sheet under the unit load of goods or products.

**3.6 score line:** Impression or crease in the slipsheet material that is provided to locate and facilitate folding to create a tab.

**3.7 slip-sheet tab:** Part of a slip sheet that extends beyond the unit-load dimensions to facilitate handling by a pulling device equipped with a gripper jaw.

**3.8 double-thickness tab:** Tab having twice the thickness of the flat sheet, formed by folding excess sheet material 180° to allow a portion of it to be under the unit load.

NOTE 2 The tab may be secured in place by fastening materials.

**3.9 laminated tab:** Tab whose thickness is increased by fastening paper, plastic, fabric or similar material to the tab and sheet load surface, allowing a portion of it to be under the unit load.

3.11 tensile strength: Resistance to tearing of a slip sheet to an applied pulling force.

#### **Materials** Λ

#### Typical materials 4.1

Typical materials used for the manufacture of slip sheets are described in 4.1.1 to 4.1.3.

### 4.1.1 Corrugated fibreboard

This is a board with paperboard facings bonded to a fluted or corrugated medium. The board is usually referred to in terms of the flute type and board test: e.g. "B flute, 1 900 kPa test". To obtain adequate performance where high-moisture conditions exist, the flutes and paperboard facings, impregnated or coated with a water-repellant material, are bonded to each other using a moisture-resistant adhesive. If additional strength is required, nylon string can be incorporated into the slip sheet during its manufacture, with the lar (mensions.al) nylon string oriented in the pulling direction of the slip sheet

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### 4.1.2 Solid fibreboard

This comprises plies of paperboard laminated together to provide the required tensile strength. Calliper is often expressed in points, with 1 point = 0,025 mm. To obtain adequate performance where high-moisture conditions exist, the plies of the slip sheet, impregnated or coated with a water-repellent material, are bonded to each other using a moisture-resistant adhesive.

### 4.1.3 Plastics

Any kind or combination of polymerized materials in sheet form, including but not limited to polyethylene or polypropylene, may be used, provided that it has adequate tensile strength and meets other requirements for slip sheet. Thickness is often referred to in mils, with 1 mil = 0.025 mm.

### 4.2 Other materials

Other materials (except sheet metal) can be used provided that the required tensile strength and calliper requirements are met, for example, a woven fabric with a laminated tab or paper-overlayed veneer.

9a058b2f7d4b/isq tr-12776 1995 the tabs shall normally be a minimum of 75 mm and a maximum of 105 mm. A shorter tab width makes the sheet difficult to see and grab by the operator. However, shorter and longer tab widths are acceptable if required by the equipment to be used and the circumstances involved.

### 5.4 Overall size

The combination of the base and tab dimensions determines the full size of the slip sheet.

#### 5.5 Tolerances

The overall size of the slip sheet shall be within  $\pm$  7 mm of the dimensions specified by the user.

### 5.6 Thickness of the slip sheet

The minimum calliper of the three common materials used for slip sheets shall be:

- corrugated fibreboard: 3,0 mm for single-wall corrugated fibreboard:
- solid fibreboard: 1.0 mm:

Surface coatings can be applied to fibreboard materials to make them water resistant or slip resistant, or to improve handling and use characteristics.

#### **Dimensions** 5

### 5.1 Base size

The load surface size of a slip sheet [i.e. excluding the tab(s)] shall approximate the plan view (footprint) dimensions of the unit load. The longer of the two dimensions shall be termed the length and the shorter of the two dimensions shall be termed the width. The length shall not be less than the unit-load length but may exceed it by a maximum of 50 mm. The width shall be not less than the unit-load width minus 50 mm but may exceed the unit-load width by 25 mm.

### 5.2 Unit-load size

A Reference should be made to ISO 6780 and ISO 3676 for guidance in selecting appropriate load-surface diplastics: 0,6 mm.

#### 6 Performance requirements

#### **Tensile strength** 6.1

### 6.1.1 General

For a particular unit load, the slip sheet shall possess sufficient tensile strength to avoid rupture when the tab is correctly gripped and pulled by the gripper jaw with the unit load in place.

NOTE 3 Tensile strength cannot be considered a performance determinant by itself. Other factors such as scoring, stiffness, moisture and sheet construction interrelate and affect slip sheet performance. In general, higher tensile strengths are required for heavier unit loads or loads subjected to repeated handling by push-pull equipment.

### 6.1.2 Tensile strength at right angles to the slip-sheet score-line

i'I'eh S'I'ANDAR This property is measured after bending the tab along the score line 90° in either the up or down direction (IS.Iten.al) The test sample of the material shall include the score-line. ISO/TR 12776:1

7.2 Tab configurations

# https://standards.iteh.ai/catalog/standards/sist/177138eg-3ab6-45b2-8051 7.2.1 to 7.2.5 and illustrated in

### 6.1.3 Tensile strength values

Depending on the type of paperboard used, the tensile strength values shall range as shown in table 1, when tested according to the constant rate of elongation method given in ISO 1924-2.

### 6.2 Stiffness

Adequate stiffness of the slip sheet is required for handling certain products such as bagged goods or irregular-shaped materials to avoid excessive deformation of the tab, which can prevent proper clamping by the gripper jaw. Additional stiffness is normally obtained by increasing the thickness of the slip sheet.

Table	1	—	Range	of	tensile	strength values	
					Values	in kilonewtons per metre	e

Type of paperboard	Grain direction of paperboard			
· /po or pupornouru	Machine	Cross		
Corrugated fibreboard	40 to 65	25 to 40		
Solid fibreboard	45 to 95	20 to 40		

### 6.3 Durability of tabs

This is tested by bending the tab along the score-line from the horizontal to the vertical position a minimum of 15 times then returning the tab to the horizontal position prior to application of tension for tensile strength testing. The tab shall remain functional throughout the unit-load distribution cycle of the slip sheet.

#### Friction 6.4

The top surface of the slip sheet should have a relatively high coefficient of friction and the lower surface a low coefficient. The required coefficient will depend on the surfaces it is required to slide upon and whether the product is wet or dry.

#### Design 7

### 7.1 Tabs

Tabs are located on one or more sides of a slip sheet to facilitate handling requirements. Double-thickness or laminated tabs may be provided if required.

9a058b2f7d4b/iso-tr-12 figures 1 to 5 (broken lines represent score-lines).

### 7.2.1 One-tab slip sheet (see figure 1)

This has a single tab at one edge of the sheet. A popular design is a uniform in-a-row loading pattern used in transport vehicles.



Figure 1 — One-tab slip sheet

### 7.2.2 Two-tab slip sheet, opposite (see figure 2)

Tabs are located at opposite edges of the sheet. This design is used for uniform in-a-row loading pattern in transport vehicles. In addition, it provides a safety factor when one tab is damaged.



Figure 2 — Two-tab slip sheet, opposite



Figure 4 — Three-tab slip sheet

### 7.2.5 Four-tab slip sheet (see figure 5)

Tabs are located at all four edges of the sheet. This design is occasionally used to capture the features and advantages of tab locations shown in figures 2 and 3. It is used for a reusable slip sheet. Sometimes, two opposite tabs are folded up against the sides of the unit load for load stability and are secured in place



Figure 3 — Two-tab slip sheet, adjacent

### 7.2.4 Three-tab slip sheet (see figure 4)

Tabs are located at three adjacent edges of the sheet. This design is occasionally used to capture the features and advantages of the tab locations shown in figures 2 and 3.

### 7.3 Tab-corner configurations

They are described in 7.3.1 to 7.3.4 and illustrated in figures 6 to 9, with broken lines representing scorelines. Examples shown are slip sheets with tabs on adjacent edges.

### 7.3.1 Ninety-degree (90°) corner cut out

(see figure 6)

This is a common design which is easily produced and permits tabs to be folded independently of each other. Independent folding is required to avoid crushing or tearing tabs which can result in tab failure.

Figure 6 — Ninety-degree corner cut out

### 7.3.2 Diagonal corner cut out (see figure 7)

The majority of slip sheets have this design which reduces the potential for damage of adjacent tabs. This design also permits tabs to be folded independently of each other.

### 7.3.3 Slit-corner design (see figure 8)

This is used occasionally when adjacent tab(s) are to be folded up against the sides of the unit load.



Figure 8 — Slit corner design

### 7.3.4 Die-cut locking corner design (see figure 9)



Figure 9 — Die-cut locking corner design

# Annex A

(informative)

# Guidelines on uses of slip sheets

	Slip sheet material						
Type of product and condition	Corrugated fibreboard	Corrugated fibreboard sheet with laminated tab	Plastic	Solid fibreboard			
Heavy and wet	Р	Р	G	Р			
Heavy and dry	F	G	G	G			
Lightweight and wet	Р	Р	G	F			
Lightweight and dry	G	G	G	G			
Frozen goods	F	F	G	G			
Refrigerated goods	F	F	G	F			
Bagged goods	eh STAND	<b>ARDFPRF</b>	VEGV	G			
Boxed or cased goods, dry	G	G	G	G			
Crated goods	(standa	ras.igen.ai	G	G			
Steel or fibre drums	P	P	G	G			
Bulk bin	ndards iteh ai/cataloo/st	<u>K 12776:1995</u> andards/sist/1e7138ee-	3ab6-45b2-8051-	G			
Fibreboard sheets	Sa058b2f7d	4b/iso-tr-12776-1995	G	G			
Masonry products	Р	Р	G	F			
Bales	Р	Р	G	G			
Rating method: $G = good$ ; $F = fair$ ; $P = poor$ .							
NOTE — The moisture content of the slip sheet may influence its performance.							