
International Standard



4115

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Air-land cargo pallet nets — Specification and testing

Filets de palettes pour le transport aérien et de surface — Spécification et essais

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (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 set up 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 4115 was developed by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, and was circulated to the member bodies in November 1977.

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

Australia	Germany, F.R.	Romania
Austria	India	South Africa, Rep. of
Belgium	Israel	Spain
Brazil	Italy	Turkey
Canada	Japan	USA
Chile	Mexico	USSR
France	Netherlands	Yugoslavia

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

Czechoslovakia
United Kingdom

Air-land cargo pallet nets — Specification and testing

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0 Introduction

In this International Standard, the minimum essential criteria are expressed by use of the word "shall". Recommended criteria are identified by use of the word "should", and while not mandatory, are considered to be primary importance in providing serviceable, economical and practical air transport pallet nets. Deviation from recommended criteria should occur only after careful consideration, extensive testing and thorough service evaluation have shown alternate methods to be satisfactory.

1 Scope and field of application

This International Standard specifies dimensional, structural and environmental requirements for 2,44 m (8 ft) high pallet nets to be used in freighter versions of high-capacity fixed wing aircraft and is intended to be used in conjunction with 2,44 m (8 ft) wide air only and air-land pallets described in ISO 4117.

This International Standard establishes four basic sizes of pallet nets as follows :

Size F 3 m (10 ft) — To restrain a maximum load of dimensions
2,44 × 2,99 × 2,44 m (96 × 117.75 × 96 in).

Size G 6 m (20 ft) — To restrain a maximum load of dimensions
2,44 × 6,05 × 2,44 m (96 × 238.50 × 96 in).

Size H 9 m (30 ft) — To restrain a maximum load of dimensions

2,44 × 9,12 × 2,44 m (96 × 359.25 × 96 in).

Size J 12 m (40 ft) — To restrain a maximum load of dimensions

2,44 × 12,19 × 2,44 m (96 × 480 × 96 in).

2 References

ISO/R 837, *Aircraft seat rails and pins*.¹⁾

ISO 4117, *Air-land cargo pallets — Specification and testing*.

For airworthiness requirements, the following document should be consulted :

USA — FAA — Technical Standard Order (TSO) — C — 90 (NAS 3610), Specification for Cargo Unit-Load Devices or other Appropriate Regulatory Specifications.

This International Standard also takes into account the following documents :

SAE AS 1130, Specification for Air-Land Cargo Pallets.

SAE AS 1131, Specification for Air-Land Cargo Pallet Nets.

1) A proposed revision of this Recommendation is being prepared.

3 Basic requirements

3.1 The net assembly shall include netting, adjustment hardware and pallet attachment fittings. Configuration and details shall be as specified in figure 1 and ISO/R 837.

3.2 Construction

3.2.1 Net construction shall be rugged, weather-proof, minimizing maintenance and original cost having no moving parts other than net attachment and adjustment fittings.

3.2.2 All fittings and appurtenances shall be within the maximum outside dimensions of the net.

3.2.3 Net construction shall have sufficient structural strength to withstand without permanent deformation the static and dynamic loads and impact shock encountered in normal carrier service.

3.2.4 The net assembly shall be so constructed that it adequately encompasses the pallet load and attaches to fittings on all four edges of the pallet as shown in figure 2.

3.2.5 Hardware

3.2.5.1 The net hardware shall be so designed and constructed so that it can be easily operated in confined areas.

3.2.5.2 All hardware shall be securely sewn or otherwise attached to preclude loss.

3.2.5.3 Free ends that pass through adjusting buckles shall be equipped with stops.

3.2.5.4 Tensioning mechanisms shall be capable of applying tension loads of not less than 155 N (35 lbf) by manual application of a force of 225 N (50 lbf). To release a 1 000 N (225 lbf) tension load in any strap shall require an operating force of 155 N (35 lbf) or less.

3.2.6 Netting mesh and configuration

3.2.6.1 The net design shall ensure a minimum installation time and shall be of a configuration such as to minimize the possibility of improper installation.

3.2.6.2 The net shall be constructed in such a manner that entanglement during installation and storage is minimized.

3.2.6.3 Nets shall be adequately treated to minimize shrinkage.

3.2.6.4 All netting ends shall be suitably prepared to prevent fraying.

3.2.6.5 The material used for netting shall meet the appropriate regulatory standards for nylon web and treatment. If material other than nylon webbing is used, it shall meet equivalent standards for material and treatment.

3.2.6.6 If netting is made from nylon or an equivalent material, consideration should be given for strength degradation resulting from wear and exposure to ultraviolet radiation.

3.2.7 Reefing adjustment

The net shall be so constructed as to provide adjustment at vertical intervals for a stacked height of from approximately 600 mm (24 in) to a maximum allowable height of 2,4 m (96 in).

3.2.8 Colour

The colour of the net material and hardware shall be optional. However, contrasting colours may be used to distinguish net components for simplifying attachment of the net to the pallet.

3.2.9 Special marking

The net shall be clearly marked to facilitate rigging on the pallet. If the net operation is not omnidirectional, top and bottom, inside and outside shall be indicated. Character markings or colour coding may be used to facilitate rapid attachment of net fittings to the pallet.

3.3 Ratings

The net, when attached to the pallet, shall be designed to restrain the following gross weights¹⁾:

3.3.1 3 m (10 ft) pallet : 5 670 kg (12 500 lb)

3.3.2 6 m (20 ft) pallet : 11 340 kg (25 000 lb)

3.3.3 9 m (30 ft) pallet : 15 875 kg (35 000 lb)

3.3.4 12 m (40 ft) pallet : 20 410 kg (45 000 lb)

1) The term "weight" is used throughout this International Standard instead of the correct technical term "mass", in order to conform to current commercial usage (see clause 6).

3.4 Design loads

3.4.1 Operational loads

3.4.1.1 The net assembly shall be designed for the operational loads specified in table 1, when attached to a pallet complying with ISO 4117 and with the cargo centre of gravity located at any point in the range specified in 3.4.4. Under these loads the net shall not exhibit any permanent deformation.

3.4.2 Ultimate loads

The net assembly shall be designed for the ultimate loads specified in table 2, when attached to a pallet complying with ISO 4117 and with the cargo centre of gravity located at any point in the range specified in 3.4.4. Under these loads the net may exhibit permanent deformation but shall not rupture to the extent of discharging cargo.

3.4.3 All loads are mutually exclusive except that a down load equal to the maximum unit gross weight may be considered to act concurrently with the forward, aft and side loads.

3.4.4 Centre of gravity

3.4.4.1 The centre of gravity shall be assumed to vary :

3.4.4.1.1 $\pm 10\%$ of the net/pallet width measured from the centreline.

3.4.4.1.2 $\pm 5\%$ of the net/pallet length measured from the centreline.

3.4.4.1.3 1,2 m (48 in) vertically measured from the pallet bottom surface.

3.4.4.1.4 To achieve the above asymmetric conditions, cargo density shall be assumed to vary linearly.

4 Environmental criteria

4.1 Materials

4.1.1 The net assembly should be designed and constructed using materials which will provide maximum serviceability and protection of the contents under the intended environmental conditions.

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Table 1

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Net size		Maximum unit gross weight		Operational loads							
				Forward		Aft		Side		Up	
m	ft	daN	lbf	daN	lbf	daN	lbf	daN	lbf	daN	lbf
3	10	5 560	12 500	5 560	12 500	5 560	12 500	5 560	12 500	5 560	12 500
6	20	11 120	25 000	11 120	25 000	11 120	25 000	11 120	25 000	11 120	25 000
9	30	15 570	35 000	15 570	35 000	15 570	35 000	15 570	35 000	15 570	35 000
12	40	20 020	45 000	20 020	45 000	20 020	45 000	20 020	45 000	20 020	45 000

Table 2

Net size		Maximum unit gross weight		Ultimate loads							
				Forward		Aft		Side		Up	
m	ft	daN	lbf	daN	lbf	daN	lbf	daN	lbf	daN	lbf
3	10	8 340	12 500	8 340	18 750	8 340	18 750	8 340	18 750	13 900	31 250
6	20	16 680	25 000	16 680	37 500	16 680	37 500	16 680	37 500	27 800	62 500
9	30	23 350	35 000	23 350	52 500	23 350	52 500	23 350	52 500	38 900	87 500
12	40	30 000	45 000	30 000	67 500	30 000	67 500	30 000	67 500	50 050	112 500

4.1.2 The structural and operational integrity of the net shall be maintained at temperatures from $- 55$ to $+ 70$ °C ($- 65$ to $+ 160$ °F).

4.1.3 All components of the net shall be protected against deterioration or loss of strength in service due to weathering, corrosion or other causes where the type of material used requires such protection.

4.1.4 The net shall be so designed that it will withstand handling common to air/land freight terminal and ramp operations.

4.2 Weight limits

The tare weight of the net assembly shall be a minimum consistent with the requirements and limits of sound design practices.

4.3 Materials and processes

4.3.1 The materials and processes used in the construction should give consideration to the extremely hard usage to which the net will be subjected to provide for maximum service life. All metal parts should be suitably protected against corrosion. All non-metallic materials which are liquid absorbent should be sealed or treated to prevent liquid absorption.

4.3.2 The materials used shall be flame resistant in accordance with appropriate regulatory requirements.

4.3.3 All fasteners should be of aircraft standard and the number of sizes, styles and strengths shall be kept to a minimum. No slotted head screws shall be used.

5 Testing requirements

5.1 Scope

5.1.1 The tests are static in nature to minimize the complexity and cost of the required testing facilities. As far as practical, applied static loads take into account the combined static and dynamic loads anticipated in service.

5.1.2 It is intended that tests shall be non-destructive in nature and shall not result in damage to the pallet unless ultimate load conditions are employed.

5.1.3 The test equipment and methods of testing described are meant to demonstrate that the net meets the requirements of this International Standard. Other equivalent methods may be employed to obtain the desired result.

5.1.4 In selected cases, tests may be repeated under ultimate load conditions when required for substantiation of analytical data. If this becomes necessary, the net so tested may not be used in service until all its component parts have been inspected and those that exhibit permanent deformation have been replaced.

5.2 Test criteria

5.2.1 A net assembly shall be considered to be satisfactory if, upon inspection before and after testing, its dimensions fall within those specified in figure 1 and in the applicable manufacturing drawings.

5.2.2 Permanent deformation, if evident, is acceptable at completion of testing to show that the ultimate loads can be restrained, but there shall be no failure to the extent that allows discharge of cargo or allows the net to break free from the attachment fittings.

5.3 Recommended test equipment

5.3.1 Handling and securing

5.3.1.1 A pallet complying with ISO 4117 or a base with equivalent net attachments shall be used.

5.3.1.2 A crane or lifting means with capacity to lift the gross weight of the loaded pallet, lift fixture and net assembly shall be provided. Sufficient height shall exist under the hook to permit positioning of the pallet, lift fixture and net assembly vertically on either side or end.

5.3.1.3 When carrying out the structural test, sufficient payload to meet the test load requirements shall be provided. Where appropriate, load producing devices or water may be used.

5.4 Test procedure — Operational loads

5.4.1 Test 1 — Net strength, upload

Attach the net assembly to a pallet complying with ISO 4117 or an equivalent base. Load the assembly with a uniformly distributed load equal to the gross weight and suspend it upside down as shown in figure 3. After lifting, allow the net assembly to remain suspended for not less than 5 min and then lower the assembly to the ground. No permanent deformation or failure shall occur.

5.4.2 Test 2 — Net strength, forward load

Attach the net assembly to a pallet complying with ISO 4117 or an equivalent base. Apply a uniformly distributed load equal to the gross weight for not less than 5 min to one 2,4 m (96 in) end of the net. The centre of gravity of the load shall be at a height of 1,2 m (48 in), measured vertically from the pallet bottom surface and shall be within the lateral and longitudinal limits specified in 3.4.4. No permanent deformation or failure shall occur.

5.4.3 Test 3 — Net strength, side load

Attach the net assembly to a pallet complying with ISO 4117 or an equivalent base. Apply a uniformly distributed load equal to the gross weight for not less than 5 min to one side of the net. The centre of gravity of the load shall be at a height of 1,2 m (48 in) measured vertically from the pallet bottom surface and shall be within the lateral and longitudinal limits specified in 3.4.4. No permanent deformation or failure shall occur.

5.5 Test procedure — Environmental

5.5.1 Subject any parts that cannot be adequately protected against corrosion to a test duplicating the anticipated environment. Subsequent corrosion shall not preclude the parts from performing their design functions nor shall it cause failure of a pallet net during the design life of the net.

5.5.2 Place the empty net assembly in a suitable test chamber at 70 °C (160 °F) ambient temperature for 48 h.

5.5.2.1 At the end of 48 h, evaluate its condition while the structure is at or near the test temperature. There shall be no evidence of net degradation.

5.5.2.2 Then place the empty net assembly in a suitable test chamber at - 55 °C (- 65 °F) ambient temperature for 48 h.

5.5.2.3 At the end of 48 h, evaluate its condition while the structure is at or near the test temperature. There shall be no evidence of net degradation.

5.6 Production nets

To show compliance with its specification standard, commercial inspection and quality control methods and practices shall be used to assure that production units are not inferior to the article tested. Where changes are made to production units and product similarity cannot be clearly established, the first product so changed shall be retested to show compliance with its specification.

6 Marking requirements

6.1 All nets covered by this International Standard shall be marked in accordance with the following minimum requirements. The markings shall be shown on the outside of the net in such a manner that good readability is ensured under all phases of handling.

Actual weight, tare kg lb

NOTE — All weights to be rounded off to the next highest 0,5 kg or full pound.

6.2 The following additional manufacturer's marking shall be indicated on the net. The positioning of such markings is optional and the letter size should be approximately 6,35 mm (0,25 in) high.

Manufacturer.....
 (Name) (Country)
 Part number.....

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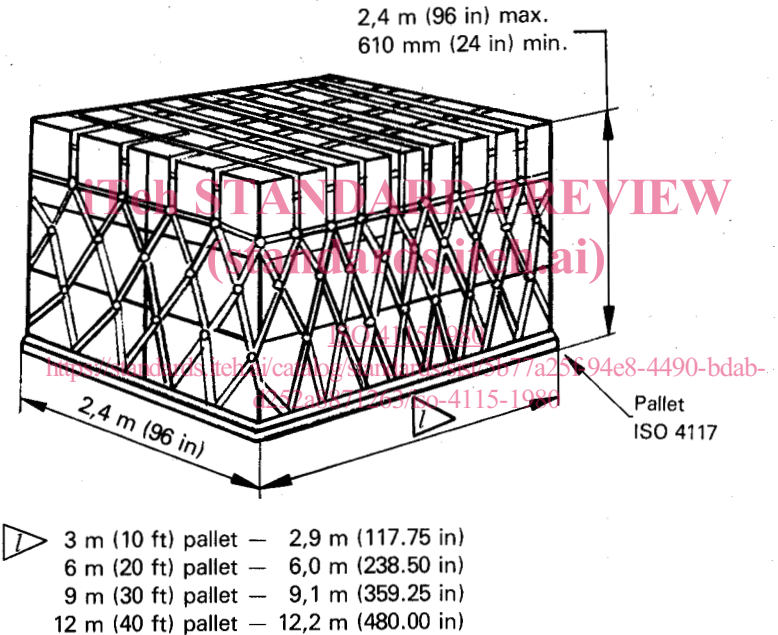
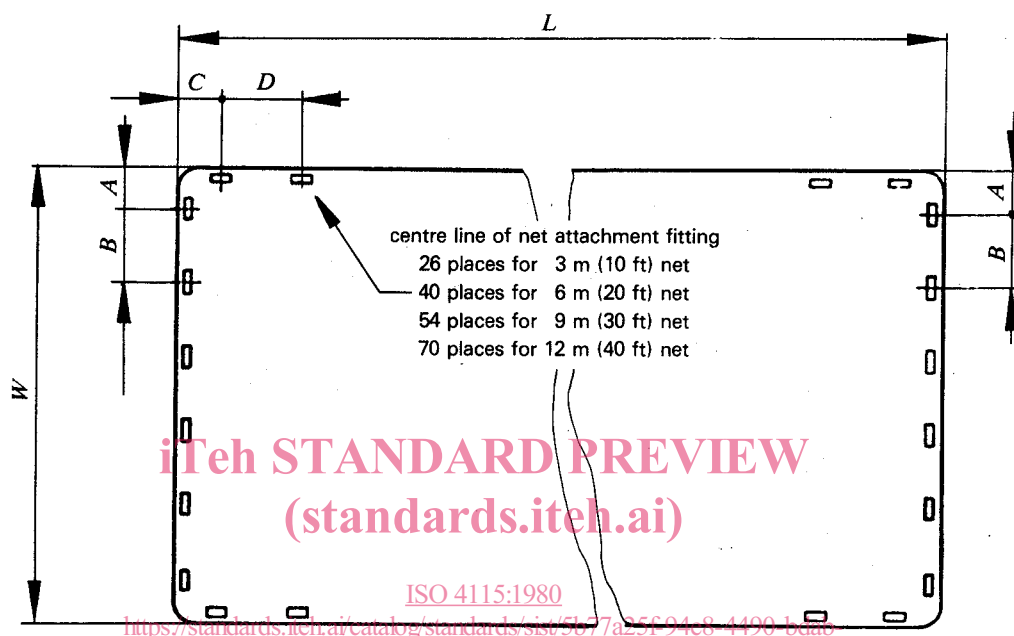


Figure 1 — Net assembly (typical-pattern optional)



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Overall Length L		Overall Width W		Dimensions							
				A		B		C		D	
m	in	m	in	mm	in	mm	in	mm	in	mm	in
12,2	480	2,4	96	239,27	9.42	391,92	15.43	238	9.37	419,10	16.50
9,1	359 1/4	2,4	96	239,27	9.42	391,92	15.43	238	9.37	429,26	16.90
6,0	238 1/2	2,4	96	239,27	9.42	391,92	15.43	238	9.37	436,88	17.02
2,9	117 3/4	2,4	96	239,27	9.42	391,92	15.43	238	9.37	418,34	16.47

Figure 2 — Tie-down fitting locations