International Standard 4171

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Interline air cargo pallets

Palettes pour le transport aérien

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Foreword

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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 4171 was developed by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, and was circulated to the member bodies in September 1978.

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

Australia	Germany, F. R.	Netherlands
Austria	India	New Zealand
Belgium	Ireland	Romania
Brazil	Italy	South Africa, Rep. of
Canada	Japan	Spain
China	Korea, Rep. of	United Kingdom
Czechoslovakia	Libyan Arab Jamahiriya	USA
France	Mexico	USSR

No member body expressed disapproval of the document.

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Interline air cargo pallets

1 Scope and field of application

This International Standard establishes dimensional, structural and environmental requirements for pallets used to transport cargo in aircraft using nets meeting the requirements of ISO 4170.

2 References

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

ISO 4170, *Interline air cargo pallet nets.*[1]

NAS[2] 3610, *Minimum air worthiness requirements and test conditions for air cargo unit load devices*, Aerospace Industries Association of America, Inc., 1725 DeSales Street, N.W., Washington D.C. 20036, USA.

United States Federal Test Method Standard, No. 406, *Plastics — Methods of testing.*[3]

3 Dimensions

3.1 Basic pallet sizes

The three basic pallet sizes are as follows :

NAS 3610 size code	Dimensions
A	2 235 mm × 3 175 mm (88 in × 125 in) figure 1
B	2 235 mm × 2 743 mm (88 in × 108 in) figure 2
M	2 438 mm × 3 175 mm (96 in × 125 in) figure 3

3.2 Basic pallet configuration

The pallet consists of two basic components, a core and edge rails, forming an essentially flat panel designed to transport cargo on aircraft systems. The aircraft systems are defined as follows :

a) Ball mat

- ball diameter 25,4 mm (1 in)
- basic ball pitch 127 mm (5 in)

b) Roller system

- pallet maximum overhang on major axis 362 mm (14.25 in)
- pallet maximum overhang on minor axis 254 mm (10 in)
- roller maximum pitch on major axis 673 mm (26.5 in)
- roller maximum pitch on minor axis 254 mm (10 in)
- minimum roller diameter 25,4 mm (1 in)
- minimum roller length 50,8 mm (2 in)

c) Swivel castor

- minimum wheel diameter 25,4 mm (1 in)
- minimum contact length 50,8 mm (2 in)
- maximum castor pitch 305 mm (12 in)

3.3 Clearance dimensions

For pallet lock and side vertical restraint overlap, see figure 4.

1) At present at the stage of draft.

2) National Aerospace Standard.

3) Available from Specification Sales (3 frsbs) Bldg. 197, Washington Navy Yard, General Services Administration, Washington D.C. 20407.

4 Construction

4.1 General

4.1.1 Design, materials and construction

The design, materials and construction of the pallet shall be of aircraft quality. The design shall be such as to minimize the need for maintenance and to ease and minimize the cost of maintenance and repair.

4.1.2 Surfaces and edges

The pallet surfaces and edges shall present no roughness or sharp edges potentially injurious to personnel or liable to damage cargo.

4.1.3 Bottom surface

The bottom surface of the pallet shall be nominally flat and continuous.

4.1.4 Load capacity, operational criteria and performance requirements

The pallet assembly shall meet the requirements of clauses 5 to 12.

4.2 Pallet core

The pallet core shall be enclosed on all four sides by an edge rail. If the pallet core is of sandwich-type construction, the upper and lower skins shall be enclosed by the edge extrusion. In all cases, the design of the edge rail/core connection and the edge rail corner connection shall be adequate to ensure the integrity of the assembly under the impact and bridging loads expected in service.

4.3 Pallet edge rails and corners

4.3.1 Lower edge

The lower edge of the pallet, including corner sections, shall be as shown in figure 4. The pallet lower edge rail shall have a ramp angle not greater than 21° from the horizontal. The rise at 21° (or less) shall be 4,75 mm (0.187 in) minimum from the bottom surface of the pallet. The overhang resulting from the ramp shall not exceed 57,15 mm (2.250 in).

4.3.2 Outer edge

The pallet edge rail shall conform to figure 4. The pallet outside edge shall have a vertical flat of 4,9 mm (0.193 in) minimum.

4.3.3 Seat track

The edge rail shall incorporate a continuous seat track having dimensions complying with ISO/R 837, as shown in figures 1, 2 and 3.

4.3.4 Corners

The pallet corners shall have a 63 mm (2.5 in) ± 12,7 mm (0.50 in) radius in plan view, or alternatively both edges at the corners shall be tapered off 9,5 mm (0.375 in) over a 152,4 mm (6 in) length, and the intersection of the tapers blended with a 25,4 mm (1 in) radius. Each type of corner shall have the vertical dimensions shown in figure 4.

5 Design loads

5.1 Table of loads

The pallet, used in conjunction with a net, shall be able to support the loads listed below :

NAS 3610 size code	Maximum gross mass of load
A	6 033 kg (13 300 lb)
B	3 629 kg (8 000 lb)
M	6 804 kg (15 000 lb)

5.2 Pallet net

The net assembly required to restrain these loads shall be constructed so that it adequately encompasses the pallet load with all fittings attached to the pallet in the locations shown in figures 1, 2 or 3, as appropriate. (See ISO 4170.)

5.3 NAS 3610 requirements

The pallet shall meet the critical performance design and test requirements in accordance with NAS 3610 for Class II systems defined therein.

6 Operational criteria

6.1 Impact against locks

The pallet assembly shall withstand, without damage, an impact of a fully loaded pallet striking the locks as defined in NAS 3610, figures 8 and 10.

6.2 Core stiffness

The minimum core stiffness shall be 644 $N \cdot m^2$* per metre width of core.

* 1 N ≈ 0,1 kgf ≈ 0.225 lbf
1 kN = 10^3 N

6.3 Temperature resistance

The pallet assembly shall maintain its structural and operational integrity in a temperature range from − 54 and + 71 °C.

6.4 Protection against deterioration

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

6.5 Skin hardness

Skin hardness shall be such that both upper and lower surfaces are capable of supporting a force of 1,33 kN exercised by a 25,4 mm (1 in) diameter steel ball.

7 Resistance to local indentation

7.1 Test procedure

7.1.1 Apply a force of 8,9 kN by a steel roller, 50,8 mm (2 in) long by 25,4 mm (1 in) diameter as shown in figure 5.

7.1.2 Apply a force of 26,7 kN parallel to the base over an area 50,8 mm (2 in) long by 4,90 mm (0.193 in) wide.

7.1.3 Apply a force of 8,9 kN parallel to the base over an area 5,08 mm (0.2 in) long by 4,90 mm (0.193 in) wide. [This is required because the vertical face of the edge rail is 4,90 mm (0.193 in) minimum].

7.2 Test result

The maximum indentation (permanent set) allowed at any location of the base is 0,254 mm (0.01 in).

8 Resistance to bridging and cresting

8.1 Test procedure

Conduct these tests on an aircraft equivalent system meeting the requirements defined in 3.2. Roller bed bridging and cresting points shall be located at least one pallet length apart.

Load the pallet to its maximum uniformly distributed gross mass. Move the pallet on a roller bed through separate 10° bridging and 10° cresting conditions with a velocity of 0,61 m/s (2 ft/s), for 250 cycles for each of the following conditions :

a) move parallel to the major dimension of the pallet through the bridging and cresting conditions (1 cycle);

b) move parallel to the minor dimension of the pallet through the bridging and cresting conditions (1 cycle).

8.2 Test result

The maximum allowable permanent deformation after any series of 250 cycles is 9,65 mm (0.38 in). There shall be no failure of the pallet core or of the core to edge rail connection.

9 Resistance to impact loads

9.1 Test procedure

Load the pallet to its maximum uniformly distributed gross mass. Move the pallet on a roller bed to impact against solid stops with a velocity of 0,61 m/s (2 ft/s); the size and position of the stops shall be as described in NAS 3610, figures 8 and 10. Do this for 250 impacts for each of the following test conditions :

a) move parallel to the major dimension of the pallet and impact against the base;

b) move parallel to the minor dimension of the pallet and impact against the base.

9.2 Test result

The maximum allowable permanent deformation after any series of 250 impact tests is 9,65 mm (0.38 in).

10 Ball load capacity

10.1 Test procedure

Subject the pallet base surface, or a representative portion thereof, to a force of 4 kN exercised by a 25,4 mm (1 in) diameter steel ball.

10.2 Test result

There shall be no permanent indentation in excess of 0,51 mm (0.020 in).

11 Performance on ball units

11.1 Test procedure

Subject the base, or a representative portion thereof, to a uniformly distributed load having a mass of 95,5 kg (210 lb) supported by four 25,4 mm (1 in) diameter steel ball units on a 127 mm (5 in) grid pattern. The base shall be moved over the units for a minimum of 5 000 passes along a fixed line in each of two mutually perpendicular intersecting directions. The length of the stroke shall be approximately 305 mm (12 in).

11.2 Test result

At the conclusion of the test, there shall be no evidence of deterioration of the base/ball unit interface surface.

12 Abrasion resistance for plastic-coated or magnesium-base materials

12.1 Test procedure

Subject three samples of the pallet assembly material to a test method equivalent to United States Federal Test Method Standard No. 406, Method 1091, but use the abrasion wheel for all tests.

12.2 Test results

The average loss of mass shall not exceed the following values :

— after 1 000 revolutions : 0,015 g

— after 2 000 revolutions : an additional 0,005 g

— after 5 000 revolutions : an additional 0,030 g up to a total of 0,050 g.

13 Execution of tests

Pallets shall be subjected to each of the tests specified in clauses 7 to 12, unless evidence can be shown that the subject unit is equivalent to other units which have performed satisfactorily in these tests. The tests shall be made in the first instance in conjunction with the pallet net specified in ISO 4170.

14 Markings

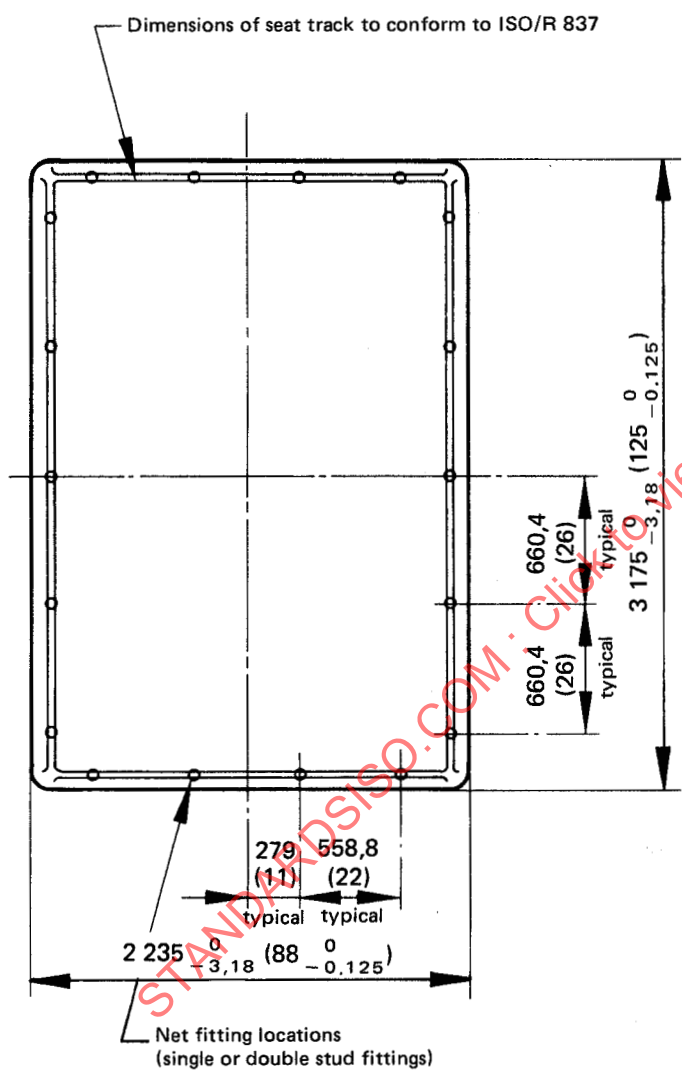
All pallets covered by this International Standard shall be permanently marked on the top surface, not more than 25,4 mm (1 in) from the outer edge of the pallet at two positions diagonally opposite within 305 mm (12 in) of the corner, with the following information :

— manufacturer's name and country;

— part number;

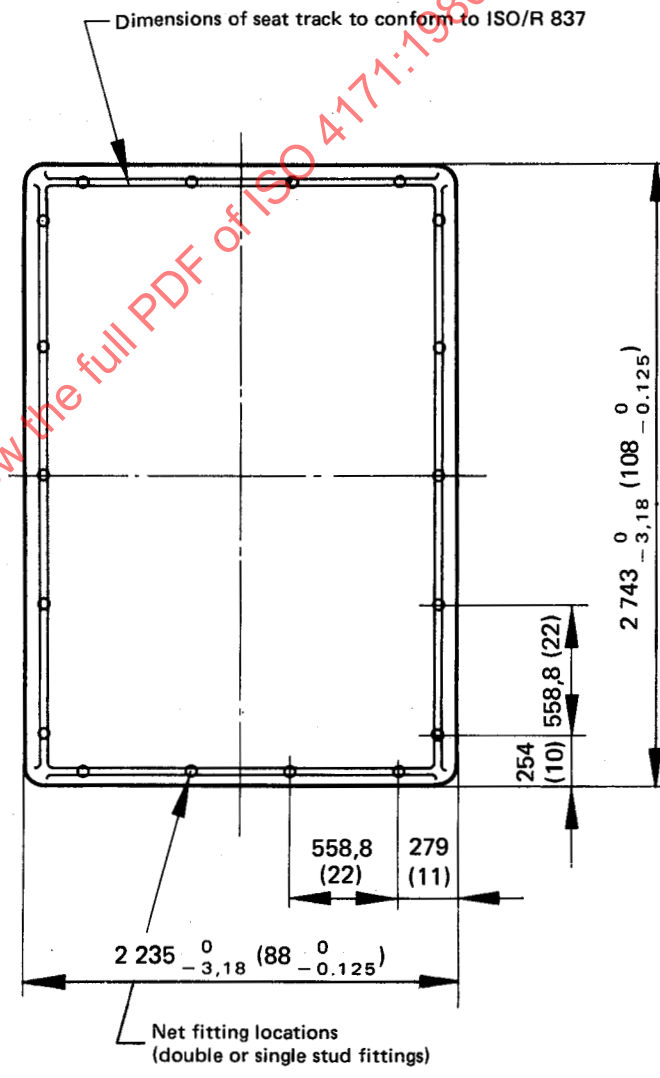
— tare mass.

Dimensions in millimetres
(inch values in parentheses)



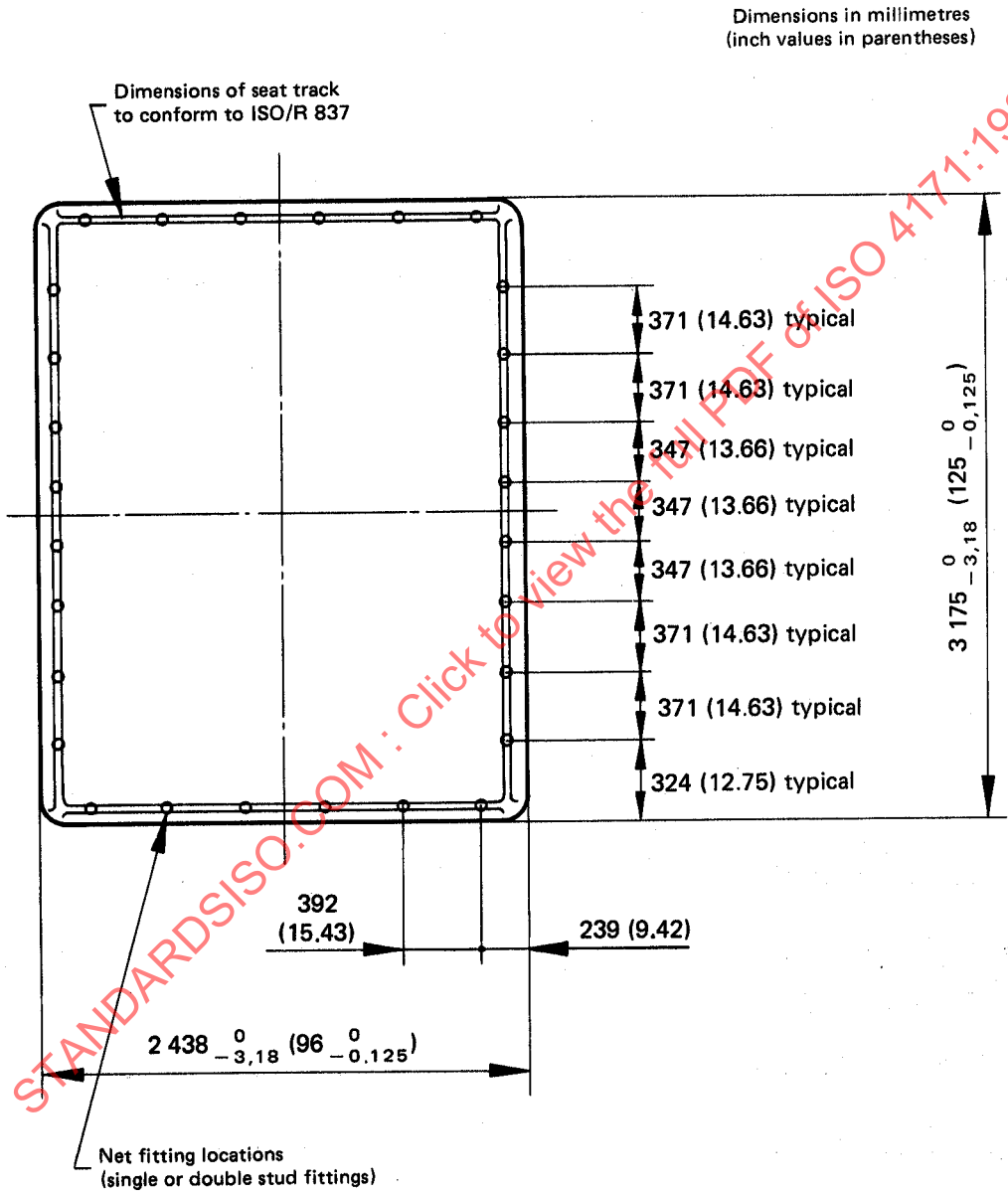
Variation in opposite diagonal dimensions across corners not to exceed 3,175 (0.125)

Figure 1 — 2 235 mm × 3 175 mm (88 in × 125 in) pallet



Variation in opposite diagonal dimensions across corners not to exceed 3,175 (0.125)

Figure 2 — 2 235 mm × 2 743 mm (88 in × 108 in) pallet



Variation in opposite diagonal dimensions across corners not to exceed 3,175 (0.125)

Figure 3 — 2 438 mm × 3 175 mm (96 in × 125 in) pallet