



# AEROSPACE STANDARD

Society of Automotive Engineers, Inc.

400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

## AS 1131A

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|---------|----------|
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### AIR-LAND DEMOUNTABLE CARGO PALLET NETS

#### 1. PURPOSE

- Ø This Aerospace Standard provides dimensional, structural and environmental requirements for 8 ft (2,43 m) high pallet nets to be used in freighter versions of high capacity fixed wing aircraft and is intended to be used in conjunction with 8 ft (2,43 m) wide pallets described in AS 1130. The minimum essential criteria are identified by use of the key word "shall". Recommended criteria are identified by use of the key word "should", and while not mandatory, are considered to be of primary importance in providing serviceable, economical and practical air transport pallet nets. Deviation from recommended criteria should occur only after careful, considerable, extensive testing and thorough service evaluation have shown alternate methods to be satisfactory.

#### 2. SCOPE

- 2.1 This document establishes four sizes of basic pallet nets as follows:

Size F (10 ft) - To restrain a 96 x 117.75 x 96 in. (2,43 x 2,99 x 2,43 m) high (maximum) load.  
Size G (20 ft) - To restrain a 96 x 238.500 x 96 in. (2,43 x 6,05 x 2,43 m) high (maximum) load.  
Size H (30 ft) - To restrain a 96 x 359.25 x 96 in. (2,43 x 9,12 x 2,43 m) high (maximum) load.  
Size J (40 ft) - To restrain a 96 x 480 x 96 in. (2,43 x 12,19 x 2,43 m) high (maximum) load.

#### 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 Fig. 1 and 2.

##### 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 Fig 3.

##### 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.

SAE Technical Board rules provide that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against infringement of patents."

3.2.5.4 Tensioning mechanisms shall be capable of applying tension loads of not less than 35 lb (15.87 kg) by manual application of a 50 lb (22.68 kg) force. To release a 225 lb (10.04 kg) tension load in any strap shall require an operating force of 35 lb (15.87 kg) or less.

3.2.6 Color: The color of the net material and hardware shall be optional. However, contrasting colors may be used to distinguish net components for simplifying installation of the net to the pallet.

3.2.7 Netting Mesh & Configuration:

3.2.7.1 The maximum opening in the material shall retain a box with a 10 x 12 x 12 in. (254 x 304,8 x 304,8 mm) size.

3.2.7.2 The net design shall provide a minimum installation time and configuration such as to minimize the possibility of improper installation.

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

3.2.7.4 Nets shall be adequately treated to minimize shrinkage.

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

3.2.7.6 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 of material and treatment.

3.2.7.7 If netting is made from nylon or equivalent, consideration should be given for strength degradation resulting from exposure to ultraviolet.

3.2.8 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 color coding may be used to facilitate rapid attachment of net fittings to pallet.

3.2.9 Reeving Adjustment: The net shall be constructed to provide adjustment at vertical intervals for stacked height from approximately 24 in. (610 mm) to a maximum allowable height of 96 in. (2,43 m).

3.3 Ratings: The net when attached to the pallet shall be designed for the following gross weights:

- |       |                          |             |
|-------|--------------------------|-------------|
| 3.3.1 | 10 ft pallet - 12,500 lb | (5 670 kg)  |
| 3.3.2 | 20 ft pallet - 25,000 lb | (11 340 kg) |
| 3.3.3 | 30 ft pallet - 35,000 lb | (15 876 kg) |
| 3.3.4 | 40 ft pallet - 45,000 lb | (20 412 kg) |

3.4 Design Loads:

3.4.1 Operational Loads:

3.4.1.1 The net assembly shall be designed to the following operational loads when attached to a pallet per AS 1130 and with the cargo center of gravity located at any point in the range specified in 3.4.4. Under these loads the net shall exhibit no permanent deformation.

| NET<br>SIZE | MAXIMUM<br>UNIT<br>GROSS<br>WEIGHT<br>LB | OPERATIONAL LOADS |        |        |        |        |        |        |        |
|-------------|------------------------------------------|-------------------|--------|--------|--------|--------|--------|--------|--------|
|             |                                          | FORWARD           |        | AFT    |        | SIDE   |        | UP     |        |
|             |                                          | Lb                | kg     | Lb     | kg     | Lb     | kg     | Lb     | kg     |
| 10 ft       | 12,500                                   | 12,500            | 5 670  | 12,500 | 5 670  | 12,500 | 5 670  | 12,500 | 5 670  |
| 20 ft       | 25,000                                   | 25,000            | 11 340 | 25,000 | 11 340 | 25,000 | 11 340 | 25,000 | 11 340 |
| 30 ft       | 35,000                                   | 35,000            | 15 876 | 35,000 | 15 876 | 35,000 | 15 876 | 35,000 | 15 876 |
| 40 ft       | 45,000                                   | 45,000            | 20 412 | 45,000 | 20 412 | 45,000 | 20 412 | 45,000 | 20 412 |

- 3.4.2 **Ultimate Loads:** The net assembly shall be designed to the following ultimate loads when attached to a pallet per AS 1130 and with the cargo center 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.

| NET<br>SIZE | MAXIMUM<br>UNIT<br>GROSS<br>WEIGHT<br>LB | ULTIMATE LOADS |        |        |        |        |        |         |        |
|-------------|------------------------------------------|----------------|--------|--------|--------|--------|--------|---------|--------|
|             |                                          | FORWARD        |        | AFT    |        | SIDE   |        | UP      |        |
|             |                                          | Lb             | kg     | Lb     | kg     | Lb     | kg     | Lb      | kg     |
| 10 ft       | 12,500                                   | 18,750         | 8 505  | 18,750 | 8 505  | 18,750 | 8 505  | 31,250  | 14 175 |
| 20 ft       | 25,000                                   | 37,500         | 17 010 | 37,500 | 17 010 | 37,500 | 17 010 | 62,500  | 28 350 |
| 30 ft       | 35,000                                   | 52,500         | 23 814 | 52,500 | 23 814 | 52,500 | 23 814 | 87,500  | 39 690 |
| 40 ft       | 45,000                                   | 67,500         | 30 618 | 67,500 | 30 618 | 67,500 | 30 618 | 112,500 | 51 030 |

- 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 **Center of Gravity:**

- 3.4.4.1 The center of gravity shall be assumed to vary:

3.4.4.1.1 Plus and minus 10% of the net/pallet width measured from the centerline.

3.4.4.1.2 Plus and minus 5% of the net/pallet length measured from the centerline.

3.4.4.1.3 Forty-eight in. (1219mm) vertically measured from the pallet bottom surface.

3.4.4.1.4 To achieve 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 built using materials which will provide maximum serviceability and protection of contents under intended environmental conditions.

4.1.2 The structural and operational integrity of the net shall be maintained in a temperature environment from -65°F to +160°F (-54°C to +71°C).

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 required 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 within limits of sound design practices.

4.3 Materials and Processes:

4.3.1 The materials and processes selected 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 nonmetallic materials which are liquid absorbent should be sealed or treated to prevent liquid absorption.

4.3.2 Materials shall be flame resistant in accordance with the 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 complexity and cost of 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 not result in damage to the pallet unless ultimate load conditions are employed.

5.1.3 Test equipment and methods of testing described are not meant to be restrictive. Alternate equivalent methods to accomplish the desired result may be employed.

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 component parts are inspected and those that exhibit permanent deformation are replaced.

5.2 Test Criteria:

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

5.2.2 Permanent deformation is permitted under ultimate load conditions. The net assembly shall be considered within acceptable limits if it exhibits permanent deformation but does not rupture to the extent of discharging cargo or break free from the attachment fittings.

5.3 Recommended Test Equipment:

5.3.1 Handling & Securing:

5.3.1.1 A pallet per AS 1130 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 the pallet, lift fixture and net assembly vertically on either side or end.

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

5.4 Test Procedure - Operational Loads:

- 5.4.1 Test #1 - Net Strength, Upload: The net assembly attached to a pallet per AS 1130 or equivalent base shall be loaded with a uniformly distributed load equal to the gross weight and suspended upside down per Fig. 4. After lifting, the net assembly shall be suspended for not less than five minutes and then lowered to the ground. No permanent deformation or failure shall occur.

- 5.4.2 Test #2 - Net Strength, Forward Load: With the net assembly attached to a pallet per AS 1130 or equivalent base, a uniformly distributed load equal to the gross weight shall be applied for not less than five minutes to one 96-in. (2,43-m) end of the net. The center of gravity of the load shall be 48 in. (1,21 m) vertically measured from the pallet bottom surface and 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: With the net assembly attached to a pallet per AS 1130 or equivalent base, a uniformly distributed load equal to the gross weight shall be applied for not less than five minutes to one side of the net. The center of gravity of the load shall be 48 in. (1,21 m) vertically measured from the pallet bottom surface and 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 or incur failure of container during the design life of the container.
- 5.5.2 The net assembly shall be placed empty in a suitable test chamber at 160°F (71°C) ambient temperature for 48 hours.
- 5.5.2.1 At the end of 48 hr, its condition shall be evaluated while the structure is at or near the test temperature.
- 5.5.2.2 The net assembly shall then be placed empty in a suitable test chamber in a -65°F (-54°C) ambient temperature for 48 hours.
- 5.5.2.3 At the end of 48 hr, its condition shall be evaluated while the structure is at or near the test temperature.
- 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 specification 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.

Reg. No. \_\_\_\_\_  
(IATA/ATA) (COUNTRY OF OWNERSHIP)

Actual Weight Tare \_\_\_\_\_ kg \_\_\_\_\_ Lb

Certification(s) \_\_\_\_\_  
(AUTHORITY)

I. D. Code: \_\_\_\_\_  
(OWNER NAME AND SERIAL NO.)

NOTES: (i) The IATA registration describes the type and size of the net and for member airline owned equipment includes two letter carrier abbreviations.

(ii) All weights to be rounded off to the next highest one-half kilogram or full pound.

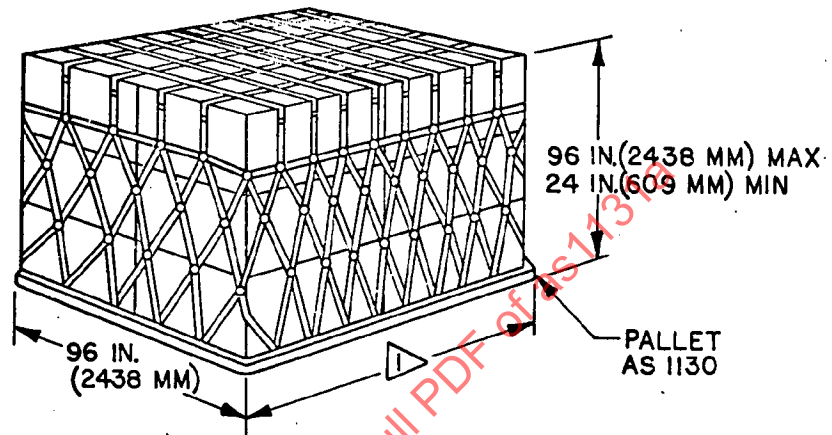
(iii) Certification shall be indicated by listing this specification number (AS 1131) and other standards under which the net has been approved.

- 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 0.25 in. (6.35 mm) high.

Manufacturer \_\_\_\_\_  
(NAME) (COUNTRY)

Part Number \_\_\_\_\_

PREPARED BY  
SUBCOMMITTEE AGE-2A, CARGO HANDLING, OF  
SAE COMMITTEE AGE-2, CIVIL AIRCRAFT GROUND SUPPORT EQUIPMENT



- ▶ 10 FT PALLET - 117.75 IN. (2,991 MM)  
20 FT PALLET - 238.50 IN. (6,058 MM)  
30 FT PALLET - 359.25 IN. (9,120 MM)  
40 FT PALLET - 480.00 IN. (12,192 MM)

FIGURE 1  
NET ASSEMBLY  
(TYPICAL-PATTERN OPTIONAL)

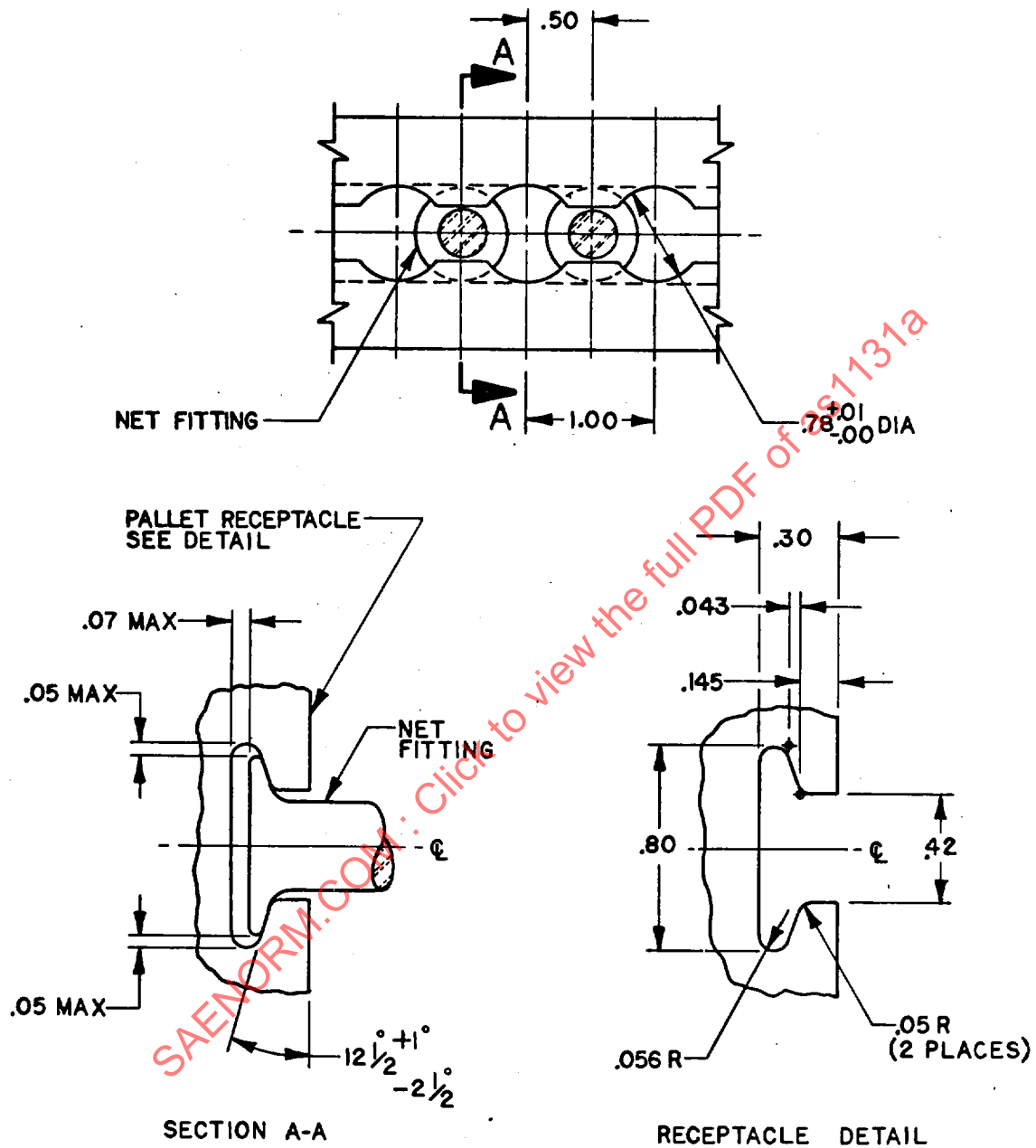


FIGURE 2  
CARGO NET TIE-DOWN FITTING  
DIMENSIONS IN INCHES