



AEROSPACE STANDARD

AS1677™**REV. D**

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Superseding AS1677C

(R) General Requirements for Noncertified Cargo/Baggage Containers

RATIONALE

AS1677D has been revised from AS1677C in both format and wording to be harmonized with ISO 4118, reference to AS36100A in addition to NAS3610 has been added. Figure 1 has been updated to reflect latest technical changes as defined in IATA Technical Manual, all Appendix drawings have been updated to correspond with IATA Technical Manual forklift openings and AS36100A base dimensions and tolerances. Forklift option was added to Appendix I (DAF) and J (DMF), Appendix M (DAP) and Appendix N (DMP) were added. Sections 6, 7, 8, clarification of Scope, and IATA ULD Code definition have been added.

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1. SCOPE

This SAE Aerospace Standard (AS) covers the design, fabrication, performance and operational testing requirements for lower deck containers for use in main line aircraft which do not require airworthiness certification when loaded under the conditions of compartment restraint and in accordance with the aircraft's Weight and Balance Manual and/or, where applicable according to the aircraft type's approved Weight and Balance Manual, AS36100A or NAS 3610 equivalent base plate restraint for these containers.

Most sizes of containers covered by this document (base sizes K, L, P, and Q) cannot physically be loaded and latched on aircraft main deck cargo systems. Base size A and M containers can, but are not allowed on aircraft main decks, which do not accept non-certified units. Accordingly, all containers covered by this document are to be used/installed exclusively in aircraft lower deck compartments.

IATA 50/0, "ULD General technical requirements", should also be taken into account when designing and making equipment.

1.1 Purpose

This document provides dimensional, structural, and environmental criteria for cargo/baggage containers tailored to meet the lower deck configuration of the main line aircraft. See AIR1869 for information relative to lower deck container configurations. The minimum essential criteria are identified by the use of the key word "shall". Recommended criteria are identified by the 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 containers. Deviation from recommended criteria should occur only after careful consideration, extensive testing, and thorough service evaluation have shown alternate methods to be satisfactory.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

ARP1334	Ground Equipment Requirements for Compatibility with Aircraft Unit Load Devices
AS1825	Methodology of Calculating Aircraft Cargo Volumes
AIR1869	Wide-Body and Standard-Body Aircraft, Lower Deck Cargo Compartment, ULD Capacities
AS36100A	Air Cargo Unit Load Devices - Performance Requirements and Test Parameters

2.1.2 ISO Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ISO 4116 Aircraft ground equipment - Requirements for compatibility with aircraft Unit Load Devices

ISO 4118 Air cargo - Non-certified Lower Deck Containers - Specification and testing

ISO 11242 Aircraft - Pressure equalization requirements for cargo containers

2.1.3 IATA Publications

Available from International Air Transport Association, Publications Assistant, 800 Place Victoria, P.O. Box 113, Montreal, Quebec H4Z 1M1, Canada, Tel: 1-514-874-0202, www.iata.org.

IATA 40/0 Marking of Unit Load Devices

IATA 40/1 IATA Identification Code for Unit Load Devices

IATA 50/0 Requirements for Interlining of ULDs

IATA 50/7 Non-certified aircraft container

IATA 80/2 Container pressure equalisation requirements

2.1.4 U.S. Government Publications

Available from DLA Document Services, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6396, www.ecfr.gov.

FAR 14CFR Part 25 Airworthiness Standard: Transport category airplanes, paragraph 25.855, Compartment interiors

2.1.5 EASA Publications

Available from European Aviation Safety Agency, Postfach 10 12 53, D-50452 Koeln, Germany, Tel: +49-221-8999-000, www.easa.eu.int.

CS-25 Certification Specifications for Large Aeroplanes, paragraph 25.855, Compartment interiors

2.2 Definitions

MAXIMUM GROSS WEIGHT (MGW): It should be noted that this commonly used term for all practical purposes is identical to the technically more correct Maximum Gross Mass, which is the term used in this document.

3. DIMENSIONS AND RATINGS

3.1 External Data

External contours, dimensions, and ratings of applicable containers are shown in Table 1.

TABLE 1 - RATINGS AND CONTOUR DIMENSIONS OF NON-CERTIFIED CONTAINERS

Name of Containers and Nominal Dimensions	Rating (Maximum Gross Mass) ¹	Contours and External Dimensions	IATA/ATA Identification Code (IATA 40/1) ²
Half-width contoured container, 2337 mm (92 inches) wide, with base dimensions 1534.2 mm x 1562.1 mm (60.4 inches x 61.5 inches)	1588 kg (3500 pounds)	Appendix A	DKC
Half-width contoured container, 2007 mm (79 inches) wide, with base dimensions 1534.2 mm x 1562.1 mm (60.4 inches x 61.5 inches)	1588 kg (3500 pounds)	Appendix B	DKE/DKN
Half-width rectangular container, with base dimensions 1534.2 mm x 1562.1 mm (60.4 inches x 61.5 inches)	1588 kg (3500 pounds)	Appendix C	DKP
Full-width contoured container, 4064 mm (160 inches) wide, with base dimensions 1534.2 mm x 3175.0 mm (60.4 inches x 125 inches)	3175 kg (7000 pounds)	Appendix D	DLF
Full-width rectangular container, with base dimensions 1534.2 mm x 3175.0 mm (60.4 inches x 125 inches)	3175 kg (7000 pounds)	Appendix E	DLP
Half-width contoured container, 1562 mm (61.5 inches) wide, with base dimensions 1534.2 mm x 1193.8 mm (60.4 inches x 47 inches)	1225 kg (2700 pounds)	Appendix F	DPE/DPN
Full-width contoured container, 3175 mm (125 inches) wide, with base dimensions 1534.2 mm x 2438.4 mm (60.4 inches x 96 inches)	2449 kg (5400 pounds)	Appendix G	DQF
Full-width rectangular container, with base dimensions 1534.2 mm x 2438.4 mm (60.4 inches x 96 inches)	2449 kg (5400 pounds)	Appendix H	DQP
Full-width contoured container, 4064 mm (160 inches) wide, with base dimensions 2235.2 mm x 3175.0 mm (88 inches x 125 inches)	4627 kg (10 200 pounds)	Appendix I	DAF
Full-width contoured container, 4064 mm (160 inches) wide, with base dimensions 2438.4 mm x 3175.0 mm (96 inches x 125 inches)	5103 kg (11 250 pounds)	Appendix J	DMF
Low-height, full-width contoured container, 2438 mm (96 inches) wide, with base dimensions 1534.2 mm x 1562.1 mm (60.4 inches x 61.5 inches)	1134 kg (2500 pounds) ³	Appendix K	DKH
Low-height, half-width contoured container, 2007 mm (79 inches) wide, with base dimensions 1534.2 mm x 1562.1 mm (60.4 inches x 61.5 inches)	1134 kg (2500 pounds) ³	Appendix L	DKG
Full-width rectangular container, with base dimensions 2235.2 mm x 3175.0 mm (88 inches x 125 inches)	4627 kg (10 200 pounds)	Appendix M	DAP
Full-width rectangular container, with base dimensions 2438.4 mm x 3175.0 mm (96 inches x 125 inches)	5103 kg (11 250 pounds)	Appendix N	DMP

NOTES:

¹ Actual maximum gross mass shall comply with the aircraft's Weight and Balance Manual.² Carriage of non-certified containers in any cargo compartment must be allowed by each individual aircraft type's Weight and Balance Manual.³ Contour G or H Unit Load Device types are limited to 1588 kg (3500 pounds) maximum gross mass on certain aircraft.

The maximum gross mass allowable for a non-certified container in any given position of an aircraft is determined by the aircraft type or sub-type's Authority approved Weight and Balance Manual. Because this value is aircraft type dependent, airlines through IATA have agreed, principally for interlining purposes, to define for each ULD size a container maximum operational gross mass independent from the aircraft type, which may be higher than the maximum allowable one on a given aircraft type.

3.2 Identification Type Code

Containers complying with this document are identified by a type code composed of three letters:

- a. the first letter **D** denoting a non-certified aircraft container;
- b. the second letter denoting the base size as defined in AS36100A;
- c. the third letter denoting the contour (see NOTE).

The identification code shall be prominently marked on two opposite sides of the container (see Section 5).

EXAMPLE

A non-certified aircraft container (D) of base size 3 175 mm x 1 534 mm (125 inches x 60.4 inches) (size L) and of nominal overall width 3175 mm (125 inches) (contour P) shall be designated as follows: **DLP**

NOTE: The container type code's third (contour) digit is subject to change to accommodate evolving airline needs. Check the latest yearly edition of IATA Unit Load Device Technical Manual Standard Specification 40/1 (see 2.1.3) for any code changes.

4. DESIGN REQUIREMENTS

4.1 General

- 4.1.1 Non-certified lower-deck containers for aircraft shall meet the requirements of this Aerospace Standard and, in accordance with airworthiness Authority approved aircraft Weight and Balance Manuals, be constructed in such a manner that neither the container nor its contents can become a hazard or damage the aircraft structure.
- 4.1.2 Provisions should be made for closing and sealing the container to meet customs clearance and security requirements (see Section 6).
- 4.1.3 The container shall consist of a complete enclosure (base, top, four sides) with door(s).
- 4.1.4 The structure shall be designed to provide the maximum usable internal volume available within the limits of structural design, and the space required for latching, including door(s).
- 4.1.5 The tare weight of the container shall be kept to a minimum, consistent with the requirements and within the limits of sound design practice.
- 4.1.6 If required (see 4.8), means of fork-lifting the container shall be provided in accordance with the appropriate appendices.
- 4.1.7 Stacking capability is not required but may be an option for forkliftable models (see 4.8).
- 4.1.8 Robustness, reliability, and maintainability shall be major factors in the design, commensurate with planned service life.
- 4.1.9 The materials and processes used in the construction shall be capable of withstanding extremely hard usage for a cost-related life. Materials shall be suitably sealed against liquid absorption to ensure no deterioration in strength under normal environmental conditions.

- 4.1.10 The materials used shall be fire resistant, in accordance with the regulatory requirements of 14 CFR Part 25 § 25.855 or CS-25.855 Appendix F Part I § (a)(2)(iv) and (a)(1)(v), i.e. may not have a burn rate greater than 100 mm (4 inches) per minute when tested horizontally as specified in Part I § (b)(5).
- 4.1.11 During material selection, preference shall be given to recyclable materials where this does not compromise container performance and weight. The container's components and materials should be selected in order to allow identified recycling methods when out of use. Instructions for recycling should be provided by the manufacturer (see 7.1).
- 4.1.12 Sharp or rough surfaces and edges that could cause injury to personnel or damage to the airplane or cargo shall not be present.
- 4.1.13 Insofar as atmospheric conditions may affect the performance of the container or any part thereof, it should be taken into account that during transportation, these conditions range from -40 °C (-40 °F) to 60 °C (140 °F) in temperature, with relative humidity from 20 to 85%. These are the mean temperature and humidity figures worldwide without taking into account extremes in temperature such as those experienced in arctic, sub-polar, or desert regions. This, however, is not a test requirement.
- 4.1.14 Component parts shall be replaceable by interchange with new or repaired ones. Panel assemblies should be replaceable by interchange with new or repaired ones.

4.2 Base Construction

- 4.2.1 The base shall be smooth and free from rough or sharp edges which may be hazardous to personnel, cargo, airplane, ramp, and terminal handling equipment. The base shall be structurally attached to, and an integral part of, the container assembly. The construction shall be designed for strength and durability to withstand harsh treatment during its service life. It shall have a high resistance to impact and wear. Where attachment of the container body to the base is required, this should be accomplished by the use of normal hand tools.
- 4.2.2 Care must be exercised in the design and construction of the base to ensure that flatness of the lower surface and edge members can be maintained in service. The base must be of adequate strength to minimize deformation/bowing which can become detrimental to conveyance.
- 4.2.3 All base edges, corners, and restraint space shall have dimensions as shown in Figure 1. The recess over the base edge shall be maintained continuous all around the base periphery. The required minimum clearance shall be provided under the sloped (overhanging) panel on the outboard side(s).
- 4.2.4 The base design shall provide for support and ease of movement at the equally distributed rating on minimum conveyor systems as defined in ARP1334. The minimum core stiffness of the base shall be $77 \text{ N}\cdot\text{m}^2/\text{m}$ (680 pound force per square inch/inch) width/length of core. Its stiffness shall aim at not exceeding a maximum area load of $9550 \text{ N}\cdot\text{m}^{-2}$ (200 pound force per square foot) on the underlying conveying system.
- 4.2.5 Where optional forklift capability is provided, the minimum forklift entry size, quantities and positions should be as given in Appendices. As an option, chamfered and/or protected edges should be considered.
- 4.2.6 On L, Q, A, and M sized units, the distance between the inner edges of the optional forklift entries should be minimum 610 mm (24 inches). Larger distance should be considered for increased stability when forklifting.
- 4.2.7 The optional base forklift tine entry and separation should be designed so that the base panel of the unit imparts no more than $9550 \text{ N}/\text{m}^2$ (200 pound force per square foot) to the supporting conveyor.

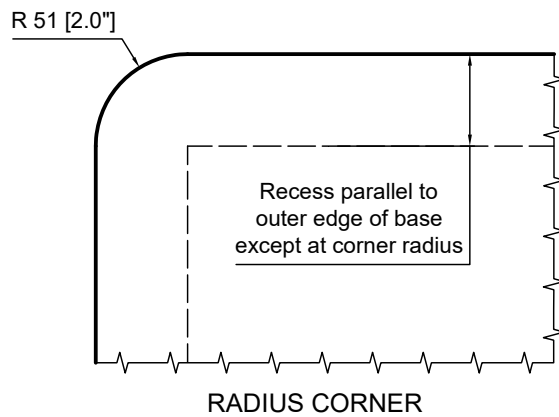
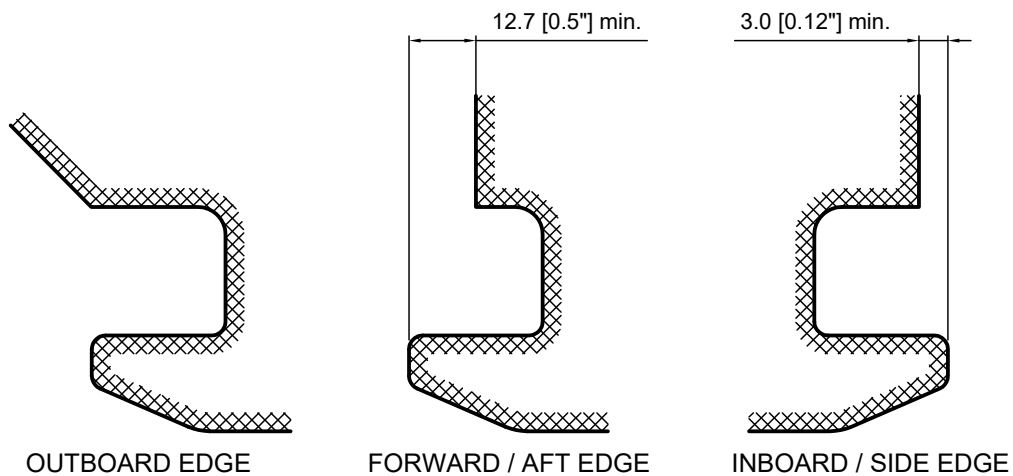
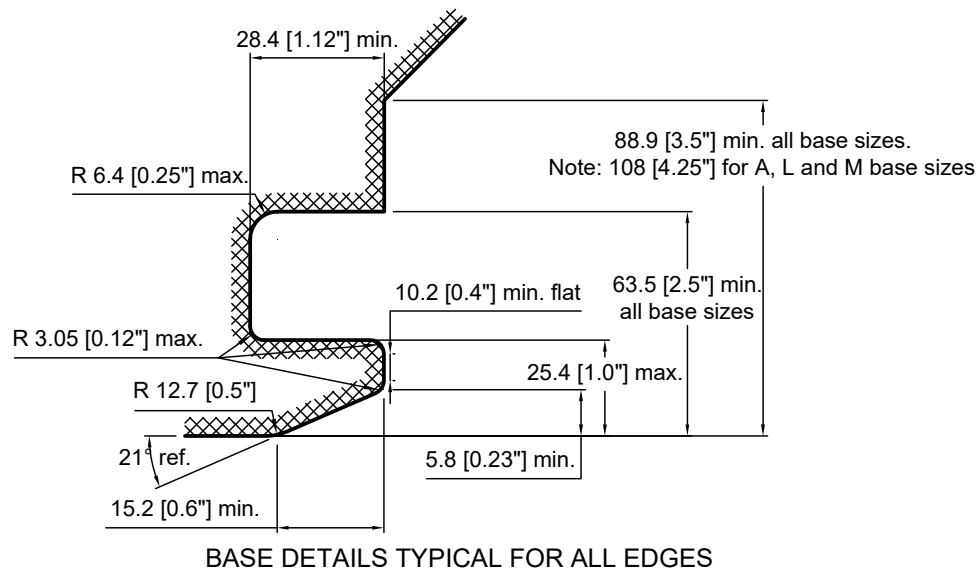


FIGURE 1 - DETAILS OF THE CONTAINER BASE

TABLE 2 - BASE SIZE AND EDGES RECESS/CLEARANCE HEIGHT, DIMENSIONS IN MM (INCH)

Code	Base Size	Recess Height	Clearance Height	Width	Contoured	Rectangular
K	1534.2 x 1562.1 (60.4 x 61.5)	63.5 (2.5)	88.9 (3.5) N/A 88.9 (3.5)	Half Full	DKC, DKE, DKN, DKG DKH	DKP
L	1534.2 x 3175.0 (60.4 x 125)	63.5 (2.5)	108 (4.25) N/A	Full	DLF	DLP
P	1534.2 x 1193.8 (60.4 x 47)	63.5 (2.5)	88.9 (3.5)	Half	DPE, DPN	
Q	1534.2 x 2438.4 (60.4 x 96)	63.5 (2.5)	88.9 (3.5) N/A	Full	DQF	DQP
A	2235.2 x 3175.0 (88 x 125)	63.5 (2.5)	108 (4.25)	Full	DAF	DAP
M	2438.4 x 3175.0 (96 x 125)	63.5 (2.5)	108 (4.25)	Full	DMF	DMP

4.3 Body Construction

- 4.3.1 It is essential that the container integrity is maintained throughout its transportation because the container interfaces directly with the aircraft system. Imposed loads shall be sustained by the base and the body. The materials and methods of construction must, therefore, be adequate for this task.
- 4.3.2 The sides, roof, and door(s) shall be of a minimum weight commensurate with maximum stability during both ground handling and air transportation.
- 4.3.3 Access for loading is generally required on one or both longer sides, although positions may vary to suit individual requirements.
- 4.3.4 The roof shall be flush, such that any protrusions do not cause damage in contact with the aircraft's cargo compartment ceiling. The top of the container shall be self-draining and designed for easy snow removal.
- 4.3.5 There shall be no intrusions between the base edges, as defined in Figure 1 base details typical for all edges, and the container body within a depth of 28.4 mm (1.12 inches) from the base edges.
- 4.3.6 Two nonprotruding handles or straps shall be located on each side panel for manual handling of the container by one person. Each handle shall provide space suitable for gripping with a gloved hand, and shall have a minimum capacity of 445 daN (1000 pound force) pull in any direction.
- 4.3.7 To facilitate repair and assembly, component parts should be readily removable with hand tools and should be interchangeable.
- 4.3.8 Any gussets in the door opening shall be of minimum size, consistent with the strength and/or deflection requirements.
- 4.3.9 The minimum height dimension of the unit load device is 1600 mm (63 inches) for standard height containers (contours C, E, F, N, or P) and 1118 mm (44 inches) for low height (contours G or H) containers.

4.4 Doors

- 4.4.1 Doors shall be designed to avoid finger-pinching hazards and be of sufficient strength to contain the load during air and ground transportation. It shall be possible for one person to open or close the door and any associated net or hardware in no more than 1 minute for full-width units (base sizes A, L, M, and Q), and no more than 15 seconds for half-width units (base sizes K and P).

It shall be possible to open any type of door in an area with 3 m (118 inch) high ceiling when the container is on a 508 mm (20 inch) high dolly. The door shall be stowable on top of the unit, and means of retaining it in the open position should be provided.

The door shall be capable of being opened with a 100 mm (4 inch) high obstacle adjacent to the base.