
**Air cargo — Fire resistant containers
— Design, performance and testing
requirements**

*Fret aérien — Conteneurs résistant au feu — Exigences de conception,
performances et essais*

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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 procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#).

The committee responsible for this document is ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 9, *Air cargo and ground equipment*.

[Annex A](#) and [Annex B](#) are normative.

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Introduction

Fatal accidents have emphasized the risk to transport aircraft of uncontrolled fires occurring within cargo, and evidence that the use of fire protecting devices can improve flight safety.

This International Standard specifies the design and performance criteria and testing methods for fire resistant containers intended to be used in order to provide enhanced protection against cargo fires in civil transport aircraft cargo compartments.

Throughout this International Standard, 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 fire resistant containers meeting the applicable regulatory requirements and ensuring effective protection against fires. Deviation from recommended criteria should only occur after careful consideration, extensive testing, and thorough service evaluation have shown alternate methods to be satisfactory.

The requirements of this International Standard are expressed in the applicable SI units, with approximate inch-pound unit conversion between brackets for convenience in those countries using that system. Where it is deemed necessary to use exact values, the SI unit ones are to be used.

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Air cargo — Fire resistant containers — Design, performance and testing requirements

1 Scope

This International Standard specifies the minimum design and performance criteria and testing methods of passive fire resistant containers (FRCs) for carriage on aircraft main deck, to be used on either of the following:

- a) in those cargo compartments of civil transport aircraft where they constitute one means of complying with applicable airworthiness regulations;
- b) on a voluntary basis, when deemed appropriate by operators to improve fire protection in aircraft cargo compartments where airworthiness regulations do not currently mandate their use.

The fire resistant containers (FRCs) specified by this International Standard are intended to be used to contain and restrain unitized cargo for loading into either of the following aircraft main deck cargo compartments:

- a) Class B aircraft cargo compartments according to CS-25, CCAR-25, JAS Part 3 or 14CFR Part 25.857 (b), in accordance a) or b) above;
- b) Class E aircraft cargo compartments according to CS-25, CCAR-25, JAS Part 3 or 14CFR Part 25.857 (e), in accordance with b) above;
- c) Class F aircraft cargo compartments according to CS-25 § 25.857(f) and AMC to CS-25.855 and 25.857, or 14CFR Part 25 § 25.857(f) and FAA Advisory Circular AC25.857-X, in accordance with a) above.

NOTE 1 Though nothing formally prevents a fire resistant container (FRC) from being carried in a lower deck Class C aircraft cargo compartment, it is not intended for this use since its fire containment capability would be redundant with that of the aircraft's fire detection and suppression system, which it could hamper. Consult current regulatory guidance materials and aircraft type's Weight and Balance Manual whenever available.

Containers are specified in this International Standard only insofar as their flammability requirements and fire resistance performance are concerned. They are not otherwise specified in this International Standard, but still require meeting the applicable general standards.

NOTE 2 See [Clause 2](#) and [4.1](#) and [4.2](#) for applicable containers airworthiness approval and general design standards.

This International Standard does not cover requirements for fire detection or suppression devices. The specified fire resistant containers (FRCs) are passive devices capable of containing a fire for the specified duration by themselves.

NOTE 3 Nothing, however, prevents additional use of self-contained fire detection or suppression devices within fire resistant containers (FRCs), but such devices are not specified herein (see [4.5.5](#)).

This International Standard does not cover requirements for other types of fire resistant containers not specified therein.

The use of fire resistant containers meeting the requirements of this International Standard is not alone sufficient to ensure flight safety: this International Standard is based on the assumption that the approved fire resistant containers will be built up, installed, and checked prior to aircraft loading in accordance with appropriate operating instructions, by competent, suitably trained, personnel as defined for example in ISO 9001:2008, 6.2.2 (see [9.3](#)).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 877-1, *Plastics — Methods of exposure to solar radiation — Part 1: General guidance*

ISO 4892-1, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance*

ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

ISO 8097, *Aircraft — Minimum airworthiness requirements and test conditions for certified air cargo unit load devices*

ISO 10046, *Aircraft — Methodology of calculating cargo compartment volumes*

ISO 10254, *Air cargo and ground equipment — Vocabulary*

ISO 10327, *Air cargo — Main deck containers — Design and testing*

ISO 11242, *Aircraft — Pressure equalization requirements for cargo containers*

ISO 12236, *Geosynthetics — Static puncture test (CBR test)*

ISO 14186, *Air cargo — Fire containment covers — Design, performance and testing requirements*

ISO 21100,¹⁾ *Air cargo unit load devices — Performance requirements and test parameters*

CAAC CCAR-25, *Airworthiness Standards — Transport Category Airplanes*²⁾

CAAC Chinese Technical Standard Order CTSO C90, *Cargo pallets, nets and containers*

EASA CS-25, *Certification Specifications for Large Aeroplanes*³⁾

EASA Acceptable Means of Compliance (AMC) to CS-25.855/25.857, *Cargo or baggage compartments*³⁾

EASA Technical Standard Order ETSO C90, *Cargo pallets, nets and containers (Unit Load Devices)*³⁾

Japanese Airworthiness Standard (JAS) Part 3 (*Civil Aeronautics Law Article 10 §2*)⁴⁾

USA. Code of Federal Regulations (CFR) Title 14 Part 25 — *Airworthiness Standards: Transport Category Airplanes ("14 CFR Part 25")*^{2) 5)}

US. FAA Advisory Circular AC 25.857-X, *Class B and F Cargo Compartments*⁵⁾

US. FAA Technical Standard Order TSO C90, *Cargo pallets, nets and containers (Unit Load Devices)*⁵⁾

1) AS 36100^[9] is an equivalent standard.

2) See 25.855, 25.857 and Appendix F.

3) EASA CS-25, abbreviated throughout this International Standard as “CS-25”, constitutes the European government’s transport aircraft airworthiness approval regulations and can be obtained, as well as its AMC, from the European Aviation safety Agency (EASA), Otto Platz 1, Postfach 101253, D-50452 Cologne, Germany, or its website at www.easa.europa.eu.

4) The Japanese Airworthiness Standard Part 3 (ISBN 4-89279-661-1) constitutes the Japanese government transport aircraft airworthiness approval Regulations, and can be obtained from the Civil Aviation Bureau (CAB) of the Ministry of Land, Infrastructure, Tourism and Transport, Tokyo, Japan, or its web site at www.mlit.go.jp/en.

5) Code of Federal Regulations (CFR) Title 14 Part 25, abbreviated throughout this standard as “14 CFR Part 25”, constitutes the U.S.A. government transport aircraft airworthiness approval Regulations, and can be obtained from the U.S. Government Printing Office, Mail Stop SSOP, Washington DC 20402-9328, U.S.A., or its website at www.gpoaccess.gov. FAA Advisory Circulars and other documents can be obtained from its www.faa.gov web site.

EUROCAE ED-14G, *Environmental conditions and test procedures for airborne equipment*⁶⁾

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10254 and the following apply.

3.1

fire containment fire control

ensuring that a fire does not grow to a state where damage to the aeroplane or harm to passengers or crew occurs during the time for which the fire containment system is demonstrated to be effective

3.2

fire resistant container FRC

completely enclosed container, airworthiness approved under applicable general performance criteria, with a demonstrated additional capability to contain a possible cargo fire within it for a rated period

Note 1 to entry: Guidance addressing the use of FRCs is provided in airworthiness regulatory guidance documents when they are one allowable means of compliance with *fire containment* (3.1) requirements in certain classes of aircraft cargo compartments

3.3

unit load device ULD

device for grouping, transferring, and restraining cargo for transit

Note 1 to entry: It may consist of a pallet with a net or it may be a container.

Note 2 to entry: Within this International Standard, synonym of "container".

3.4

active unit load device

unit load device (3.3) incorporating energy systems operating during flight, e.g. in the case of FRC self-contained fire detection and/or fire extinguishing systems

3.5

passive unit load device

unit load device (3.3) (e.g. FRC) or accessory thereto (e.g. FCC) that includes neither fire detection nor fire extinguishing systems, and ensures *fire containment* (3.1) by its use of *fire resistant* (3.8) or *fire proof* (3.9) material and limiting the supply of air

Note 1 to entry: Antonym of *active unit load device* (3.4).

3.6

fire containment cover FCC

passive device meeting the performance requirements of ISO 14186, used in conjunction with an air cargo pallet and net in order to contain for a rated period a possible cargo fire beneath it

3.7

class A fire

fire in ordinary combustible materials, such as wood, cloth, paper, rubber, and plastics, for which the quenching and cooling effects of quantities of water, or of solutions containing a large percentage of water, are of prime importance

6) EUROCAE ED-14G can be obtained from the European Organisation for Civil Aviation Equipment, 102 rue Etienne Dolet, 92240 Malakoff, France, or its website at www.eurocae.eu. RTCA DO-160G^[2] is equivalent. Both are recognized by ISO 7137.

3.8
fire resistant

grade designating components, equipment and structures capable of withstanding application of heat by a defined flame for 5 min, as opposed to *fire proof* (3.9)

Note 1 to entry: Not to be mistaken for *fire resistant container* (3.2), for which performance requirements are differently specified, for a longer duration, by the present International Standard.

Note 2 to entry: See ISO 2685 and EUROCAE ED-14G section 26.

3.9
fire proof

grade designating components, equipment, and structures capable of withstanding the application of heat by a defined flame for 15 min

Note 1 to entry: See ISO 2685 and EUROCAE ED-14G section 26.

3.10
burn length

distance from the original edge to the farthest evidence of damage on a test specimen due to flame impingement, including areas of partial or complete consumption, charring or embrittlement, but not including areas sooted, stained, warped, or discoloured, nor areas where material has shrunk or melted away from the heat source

4 General requirements

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4.1 Approval

4.1.1 The fire resistant container's type design shall be approved for this purpose on the basis of demonstration of compliance with the present International Standard and a Certificate of Conformity shall accordingly be delivered by the manufacturer. Where the fire resistant container is intended to constitute a means of complying with applicable airworthiness regulations as indicated in the Scope, container type approval shall be sought from the airworthiness authority concerned, which may include additional requirements.

4.1.2 The fire resistant container shall, in addition, be airworthiness approved under the ultimate load criteria of TSO/CTSO/ETSO/JTSC C90 in accordance with ISO 21100, or ISO 8097 if its size is not contained therein. TSO/ETSO C90 ultimate load requirements and the fire resistance requirements are not required to be met simultaneously because it is highly improbable that a cargo fire and maximum flight load condition would simultaneously occur. Any Authority approval as a fire resistant container, if required, shall be applied for by the responsible manufacturer (OEM) in addition to, or including, the approval of the container model concerned under TSO C90.

4.1.3 Amendments to the Aircraft Flight Manual (AFM) (see 9.2.6) are required and shall be approved even if FRCs are used on a voluntary basis in accordance with 1.1 b) by the airworthiness authority overseeing the operator (carrier). The authority can express additional requirements from the operator to ensure compliance with the relevant CS-25, CCAR-25 or 14 CFR Part 25 § 25.857 paragraph(s) in the aircraft compartment(s) concerned.

4.2 Construction

4.2.1 The fire resistant container may be constructed as either of the following:

- container designed and built on purpose with appropriate fire resistant or fire proof materials and door(s);

- conventional materials standard air cargo container that received (including the door(s) and, where necessary, the base) an appropriate additional inner fire resistant or fire proof coating or protective material.

Other construction methods may be used to achieve the fire containment performance requirements.

4.2.2 In the latter case, the expression “fire resistant container” exclusively designates throughout the present International Standard the complete assembly fully fitted with intended coating, protections, or other appurtenances. The coating or protective material shall be exclusively applied on new containers prior to delivery. The container’s manufacturer shall be solely responsible for required testing and issuance of the Certificate of Conformity, and/or substantiation with the authority. See [4.3.1](#) NOTE with regard to applicable approval procedures.

In this case, inner coatings or protective materials are exposed to interference from stacking cargo in the container. Specific inner damage limits are required and can present container inspection and damage assessment difficulties, see applicable requirements in [5.3.5](#).

4.2.3 In either case, the minimum performance requirements to be met are identical, defined by the relevant clauses of the present International Standard, and the container shall satisfy all general design and testing requirements of ISO 10327 for main deck containers.

4.2.4 The present International Standard does not cover the possibility of placing over a container a Fire Containment Cover (FCC) meeting the requirements of ISO 14186.

4.2.5 The fire resistant container’s dimensions and outer contour shall be within maximum allowable in accordance with ISO 10046, appropriate to the aircraft type(s) and loading positions it is designed for.

All other aspects shall meet the applicable requirements of ISO 10327 for main deck containers.

NOTE Industry standard maximum ULD contours applicable to containers are defined in Reference [4] and identified by alphabetic codes in its Appendix E.

4.3 Materials

4.3.1 The fire resistant container shall be constructed of fire proof or fire resistant materials meeting the fire resistance (flammability and flame penetration) requirements specified in [5.1](#).

NOTE With regard to container bases, bases consisting in a single aluminium alloy sheet are sufficient to meet the regulatory requirements [CS-25/14 CFR Part 25 Appendix F Part I (a)(2) (iii)] in [5.1.2](#) by themselves, and can be exempted from the testing requirements of [6.1.1.6](#), while subject to the FRC full scale test in [6.3](#).

4.3.2 Any other elements of the fire resistant container’s construction or equipment (e.g. joints of sidewalls, roof and base panels, closure devices, seals, etc.) the failure of which would affect the capability of the container to safely contain a fire shall meet the requirements specified for them in [5.1.1](#).

4.3.3 Materials selection should ensure the highest possible wear, abrasion, shearing, tearing, and puncture resistance. See [6.1.2](#) for environmental tests, including puncture resistance, U.V. and humidity, and abrasion, applicable for non-metallic materials where used, e.g. flexible materials for doors.

4.3.4 During materials selection, preference shall be given to recyclable materials where this does not compromise best fire protection performance. Asbestos or asbestos compounds shall not be used. Other materials shall be assessed prior to selection as to potential detrimental effects on human health.

4.3.5 Where a composite material of a non-permanently attached component, e.g. closure, is such that one side shall be the inner one to withstand fire, the inner and outer colours shall be different to prevent inverted installation (see [7.4](#)).