International Standard 4128

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION●МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ●ORGANISATION INTERNATIONALE DE NORMALISATION

Aircraft — Air mode modular containers

Aéronefs — Conteneurs pour le fret aérien

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Foreword

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Aircraft — Air mode modular containers

0 Introduction

This International Standard specifies dimensional, structural and environmental requirements for 2,44 m × 2,44 m (8 ft × 8 ft) cross-section containers to be used in freighter versions of high-capacity fixed-wing aircraft.

NOTE — For the purposes of 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 serviceable, economical and practical air transport containers. Deviation from recommended criteria shall occur only after careful consideration, extensive testing and thorough service evaluation have shown alternative methods to be satisfactory.

1 Scope and field of application

1.1 This International Standard lays down the dimensions and specifies the basic requirements for the specification and testing of containers to be used exclusively in conjunction with the air mode in freighter versions of high-capacity fixed-wing aircraft.

1.2 The containers will have nominal dimensions of 2,44 m × 2,44 m (8 ft × 8 ft) cross-sections and lengths of 3, 6, 9 and 12 m (10, 20, 30 and 40 ft).

1.3 Air mode containers will normally be on aircraft equivalent roller conveying systems and/or on similarly equipped ancillary ground handling devices.

1.4 Containers suitable for fully air/surface (intermodal) handling are specified in ISO 8323.

2 References

ISO 6346, *Freight containers — Coding, identification and marking.*

ISO 8097, *Aircraft — Minimum air worthiness requirements and test conditions for certified air cargo unit load devices.* 1)

ISO 8323, *Freight containers — Air/surface (intermodal) general purpose containers — Specification and tests.* 2)

United States Federal Test Method Standard No. 406, *Plastics — Methods of testing — Method 1091 : Abrasion wear (loss in weight).* 3)

3 Basic requirements

3.1 Dimensions

External dimensions and minimum internal volume and door opening shall be as shown in table 1. Diagonal tolerances shall be as specified in table 2.

Table 1 — External dimensions, internal volume and door opening

Overall length		Overall width		Overall height		Minimum door width		Minimum door height		Minimum internal volume	
mm	in	mm	in	mm	in	mm	in	mm	in	m³	ft³
12 192 $^{0}_{-10}$	480 $^{0}_{-0.375}$	2 438 $^{0}_{-5}$	96 $^{0}_{-0.187}$	2 438 $^{0}_{-5}$	96 $^{0}_{-0.187}$	2 286	90	2 134	84	59,189	2 090
9 125 $^{0}_{-10}$	359.25 $^{0}_{-0.375}$	2 438 $^{0}_{-5}$	96 $^{0}_{-0.187}$	2 438 $^{0}_{-5}$	96 $^{0}_{-0.187}$	2 286	90	2 134	84	44,179	1 560
6 058 $^{0}_{-6}$	238.50 $^{0}_{-0.25}$	2 438 $^{0}_{-5}$	96 $^{0}_{-0.187}$	2 438 $^{0}_{-5}$	96 $^{0}_{-0.187}$	2 286	90	2 134	84	29,453	1 040
2 991 $^{0}_{-5}$	117.75 $^{0}_{-0.187}$	2 438 $^{0}_{-5}$	96 $^{0}_{-0.187}$	2 438 $^{0}_{-5}$	96 $^{0}_{-0.187}$	2 286	90	2 134	84	13,877	490

1) *De facto* NAS 3610.

2) At present at the stage of draft.

3) This reference will be replaced by an ISO reference when an International Standard on the subject is available. In the meantime the American Standard can be obtained, without charge, from : United States General Services Administration, 18th and F Streets, N.W., Washington, DC 20405, USA.

Table 2 — Diagonal tolerances (see figure 3)

Overall length		K_1 max.[1)]		K_2 max.[2)]	
mm	in	mm	in	mm	in
12 192	480	19	0.75	12,7	0.50
9 125	359.25	9,5	0.375	12,7	0.50
6 058	238.50	14,3	0.563	12,7	0.50
2 991	117.75	12,7	0.50	12,7	0.50

1) $K_1 = D_1 - D_2$ or $D_2 - D_1$ or $D_3 - D_4$ or $D_4 - D_3$

2) $K_2 = D_5 - D_6$ or $D_6 - D_5$

3.2 Construction

3.2.1 Body or box

3.2.1.1 Body construction shall be rugged, weather-tight, minimizing maintenance and original cost by having the doors, latches and locks as the only moving parts.

3.2.1.2 All fittings and attachments shall be within the maximum external dimensions of the container (see table 1).

3.2.1.2.1 Mating devices that support, transfer, position and secure containers shall be provided by transportation carriers, transferring equipment or terminal facilities.

3.2.1.3 Container construction shall have sufficient structural strength to withstand, without permanent deformation, the static and dynamic loads and the impact shock and racking stresses encountered in normal carrier service.

3.2.1.4 At least a total of 77,4 cm² (12 in²) of vent area for each 3 048 mm (10 ft) length, or fraction thereof, of container shall be provided for pressure equalization.

3.2.1.4.1 This vent shall be adequately protected from cargo load shift to ensure that no less than 77,4 cm²/3 048 mm (12 in²/10 ft) is available during emergency operation.

3.2.1.5 The container roof shall withstand, without permanent deformation, a down load of 294 daN (660 lb) applied to any 305 mm × 610 mm (12 in × 24 in) area.

3.2.2 Base

3.2.2.1 The bottom surface of the base shall be flat and continuous.

3.2.2.1.1 For the length of the container, the bottom surface shall be flat to within 1,6 mm (0.062 5 in). This shall allow for a waviness factor, crest to crest, at a minimum pitch of 914 mm (36 in).

3.2.2.2 No structure shall protrude below the bottom surface of the base.

3.2.2.3 Construction

3.2.2.3.1 The base shall have a nominal thickness of 50,8 mm (2 in) from the bottom surface. This thickness may be varied when the base design employed results in a lighter and more durable structure capable of accepting uniform loading of 1 916 daN/m² (400 lb/ft²) when supported on the conveying system described in 3.2.2.3.5.

3.2.2.3.2 The base shall be enclosed on all four sides by an edge member conforming to figures 4, 5 and 6. The vertical surface of the container base between the restraint provisions, shown in figures 4 and 5, shall be smooth and continuous so as to provide an automatically latching aircraft restraint system interface.

The base bottom skin should be enclosed by its edge member. The bottom surface shall be flush with the edge member. The lower edge of the edge members shall be as shown in figure 5. The base corners shall be a 76,2 mm (3 in) radius in the plane of the panel. Corners should be readily replaceable or shall be repairable.

3.2.2.3.3 The base should be structurally attached to the body by means of a minimum number of fittings which shall be easily removable and interchangeable.

3.2.2.3.4 So that the container conforms to the aircraft system deflected shape, the 9 m (30 ft) or 12 m (40 ft) long container bases, when loaded to the rated gross weight load shown in 3.3.1, shall be free to deflect ± 9,5 mm (± 0.375 in), without rigid restraint by the side walls. Base stiffness in the forward and aft direction in the plane of the base shall not exceed 338,954 N·m²/m (3 × 10⁶ lb·in²/in).

These 9 m (30 ft) and 12 m (40 ft) container requirements relate to present-day aircraft and may be relaxed for future aircraft.

3.2.2.3.5 The base design shall provide for support and ease of movement at the rated distributed load on the following minimum conveyor systems:

— Four rows of rollers, approximately equally spaced over a minimum width of 1 930 mm (76 in) measured between centres. Each row comprises 38 mm (1.5 in) diameter rollers, 76 mm (3 in) long, uncrowned, with an edge radius of 1,5 mm (0.06 in), spaced on 254 mm (10 in) centres. The container travels perpendicularly to the roller centrelines.

— Swivel castors, with 25,4 mm (1 in) diameter wheels, having a contact length of 50,8 mm (2 in), located on a 305 mm × 305 mm (12 in × 12 in) grid pattern. The container travel is in all directions across the grid.

— Ball transfer units, with 25,4 mm (1 in) diameter balls, located on a 127 mm × 127 mm (5 in × 5 in) grid pattern. The container travel is in all directions across the grid.

For design purposes, it may be assumed that while supported on these systems and being transported over the road, the container will be subjected to vertical loads of approximately 1,8*g* (dynamic) with a frequency of 180 cycles/min and an amplitude of 76 mm (3 in).

3.2.2.3.6 The base shall comply with the following conditions :

- ball indentation in accordance with 4.2;
- ball castors in accordance with 4.3;
- abrasion in accordance with 4.4;
- base strength in accordance with 5.4.4.

3.2.3 Aircraft restraint provision

Restraint provision as shown in figures 4, 5 and 6 shall be provided.

3.2.4 Doors

3.2.4.1 The container shall be designed to make maximum possible internal cross-section available for loading (see table 1).

3.2.4.2 It should be possible for one man to open and close the door in no more than 30 s.

3.2.4.3 The lower edge of the door shall not encroach on the restraint slot area shown in figure 6.

3.2.4.4 The door should have the minimum number of position latches and restraint attachments that will withstand the ultimate load (see 3.4.2) without unlatching or releasing the container contents.

3.2.4.4.1 Latches shall be located so that they cannot damage or be damaged by adjacent units should they inadvertently be left open or come open in flight.

3.2.4.4.2 No tools should be required to open or close the doors or latches.

3.2.4.4.3 The door latches and installation mechanisms should be designed to allow the opening and shutting of the door while the container is on uneven surfaces that vary up to 12,7 mm (0.5 in) over the width of the door opening.

3.2.4.4.4 Means should be provided to give mechanical indication that the door is positively locked.

3.2.4.5 Door assemblies and components should be interchangeable.

3.2.4.6 It should be possible to lock (in order to discourage entry) and seal the door so that there shall be some visual indication of unauthorized entry.

3.2.4.7 Particular design attention should be given to preventing water from leaking through door-to-body interface areas.

3.2.4.8 Handles, straps or handholds shall be provided on the door on the 3 m (10 ft) container to assist manual movement of the container.

3.2.4.8.1 These devices should withstand a 445 daN (1 000 lb) pull in any direction.

3.2.4.8.2 They should provide an area equivalent to 152 mm wide by 76 mm deep (6 in × 3 in).

3.2.5 Complete assembly

3.2.5.1 The container shall be capable of traversing a 2° (0,034 rad) crest or valley with no permanent deformation or damage.

3.2.5.1.1 To meet this condition, containers uniformly loaded to gross weight shall be capable of being supported at the cresting point through a roller contact of 2 032 mm (80 in) minimum width on a roller with a maximum diameter of 38 mm (1.5 in).

3.2.5.2 There shall be provision for "D" rings or equivalent, each capable of reacting a 2 225 daN (4 000 lb) operating load, applied in any direction, and spaced at approximately 610 mm (24 in) centres around the internal periphery of the container.

3.2.5.3 In order to prevent tampering or pilferage of shipments moving under customs control (TIR), a sealing system shall be used and shall be positioned so that the sealing unit will be held firmly in place when the seal is affixed.

3.2.5.3.1 Doors shall be fitted with a device to permit simple effective customs sealing. This device shall either be welded in the sides of doors or secured by at least two bolts, rivetted or welded to the nuts on the inside.

3.2.5.3.2 Hinges shall be made and fitted so that doors, once shut, cannot be lifted off the hinge pins. Screws, bolts, hinge pins or other fasteners shall be welded to the outer parts of the hinges, unless the closure system has locking devices, inaccessible from the outside, which, when applied, prevent the doors from being lifted off the hinge pins.

3.2.5.3.3 The container construction shall be designed so that the customs seal is adequately protected.

3.2.5.3.4 The container construction shall be free of any recesses or voids in which cargo (or other material) can be concealed.

3.2.5.3.5 Pressure equalization devices (see 3.2.1.4) shall be constructed so as to prevent access to the contents.

3.2.5.4 In order to meet agricultural requirements, exterior and interior surfaces should be as free as possible of recesses, railings and protuberances, where pests could hide or where soil or other residues could accumulate.

3.3 Ratings

3.3.1 The container shall be designed for the following gross weights[1] :

— 3 m (10 ft) container : 5 670 kg (12 500 lb);

— 6 m (20 ft) container : 11 340 kg (25 000 lb);

— 9 m (30 ft) container : 15 875 kg (35 000 lb);

— 12 m (40 ft) container : 20 410 kg (45 000 lb).

3.3.2 Containers over 3 m (10 ft) in length shall be designed for a gross weight of 6 759 kg (14 900 lb) in any 3 m (10 ft) section of container.

3.4 Design loads

3.4.1 Operational loads

3.4.1.1 With the container supported on a roller system, in accordance with 3.2.2.3.5, the container shall be designed to withstand the operational loads as given in table 3, distributed over the container base, with the cargo centre of gravity located at any point in the range specified in 3.4.7. After these loads have been applied, the container shall exhibit no permanent deformation.

3.4.1.2 Under these operational loads, the maximum deflection permitted, measured at the intersection of the top and side panels of the container with the base restrained by the latches as described in figure 7, is 38 mm (1.5 in).

3.4.2 Ultimate loads

Supported on a roller system, in accordance with 3.2.2.3.5, the container shall be designed to withstand the ultimate loads as given in table 4, with the cargo centre of gravity located at any point in the range specified in 3.4.7. After these loads have been applied, the container may exhibit permanent deformation, but shall not rupture to the extent of discharging contents.

Table 3 — Operational load distribution

Container size		Maximum unit gross weight		Operational loads									
				Forward		Aft		Side		Up		Down	
m	ft	kg	lb	daN	lb	daN	lb	daN	lb	daN	lb	daN	lb
3	10	5 670	12 500	5 560	12 500	5 560	12 500	5 560	12 500	5 560	12 500	16 680	37 500
6	20	11 340	25 000	11 120	25 000	11 120	25 000	11 120	25 000	11 120	25 000	33 360	75 000
9	30	15 875	35 000	15 570	35 000	15 570	35 000	15 570	35 000	15 570	35 000	46 710	105 000
12	40	20 410	45 000	20 020	45 000	20 020	45 000	20 020	45 000	20 020	45 000	60 060	135 000

Table 4 — Ultimate loads

Container size		Maximum unit gross weight		Ultimate loads									
				Forward		Aft		Side		Up		Down	
m	ft	kg	lb	daN	lb	daN	lb	daN	lb	daN	lb	daN	lb
3	10	5 670	12 500	8 340	18 750	8 340	18 750	8 340	18 750	13 900	31 250	27 800	62 500
6	20	11 340	25 000	16 680	37 500	16 680	37 500	16 680	37 500	27 800	62 500	55 600	125 000
9	30	15 875	35 000	23 355	52 500	23 355	52 500	23 355	52 500	38 925	87 500	77 850	175 000
12	40	20 410	45 000	30 030	67 500	30 030	67 500	30 030	67 500	50 050	112 500	100 100	225 000

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.

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 Side loads shall be supported at the container base.

3.4.5 Up, fore and aft loads shall be reacted by a fitting, as shown in figure 7, inserted in the restraint slots located along the side of the container.

3.4.5.1 The design shall allow the fore and aft loads to be reacted by the following number of load bearing slots :

- 3 m (10 ft) container : 2 slots;
- 6 m (20 ft) container : 5 slots;
- 9 m (30 ft) container : 8 slots;
- 12 m (40 ft) container : 11 slots.

3.4.5.2 The ultimate fore and aft load for any single slot shall be 8 340 daN (18 750 lb).

3.4.5.3 The design of the fore and aft load bearing slot shall take into account reaction of the load occurring through fittings, shown in figure 7, located primarily on one side and secondarily on both sides of the container.

3.4.5.4 Up load shall be reacted by fittings, as shown in figure 7, inserted in the side restraint slots.

3.4.5.4.1 The container shall be designed to be restrained against vertical loads by between 50 and 60 % of the total number of slots equally distributed on each side.

3.4.6 End slots shall be provided in accordance with figure 6.

3.4.6.1 Slots shall be designed to restrain a 3 m (10 ft) container for ultimate forward, aft and vertical up loads when used in conjunction with restraint fittings in accordance with figure 8.

3.4.6.2 The inner face of each outward slot (or block) shall be capable of restraining laterally 33 % of the maximum gross weight when used for ground transport restraint on roller bed vehicles.

3.4.7 The centre of gravity shall be assumed to vary :

- ± 10 % of internal width, measured from the geometric centre of the enclosed space;
- ± 5 % of internal length, measured from the geometric centre of the enclosed space;
- between a height of 356 mm (14 in) and 1 219 mm (48 in), measured from the bottom of the base.

NOTE — In order to achieve the above asymmetric design conditions, the cargo density shall be assumed to vary linearly.

4 Environmental criteria

4.1 Materials

4.1.1 The container 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 container shall be maintained in a temperature environment from − 54 to + 71 °C (− 65 to + 160 °F).

4.1.3 All components of the container 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 container shall be designed so that it will withstand handling common to air/land freight terminal and ramp operations.

4.2 Ball load capability

The container base surface, or a representative portion thereof, shall be subjected to 400 daN (900 lb) on a 25,4 mm (1 in) diameter steel ball; no permanent indentation in excess of 0,51 mm (0.020 in) shall occur.

4.3 Ball castor load capability

The base, or a representative portion thereof, shall be subjected to a uniformly distributed load of 93 daN (210 lb), supported by four 25,4 mm (1 in) diameter steel ball castors on a 127 mm (5 in) grid pattern. The base shall be moved over the castors for a minimum of 5 000 passes along a fixed line in each of two directions, perpendicular to and intersecting one another. The length of the stroke shall be approximately 305 mm (12 in). At the conclusion of the test, there shall be no evidence of deterioration of the base/ball castor interface surface.

4.4 Abrasion resistance for plastic coated or magnesium base materials

Three samples of the container base assembly material shall be subjected to a test method equivalent to the United States Federal Test Method Standard No. 406, Method 1091, except that the abrasion wheel shall be dressed every 1 000 cycles. A CS-10 wheel with a load of 500 g shall be used for all tests. The average weight loss 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.

4.5 Rain requirements

4.5.1 Water shall be directed over the container and around the door and vents to simulate heavy, driving rain equivalent to what would be experienced by a container secured to an open truck and being transported at 80 km/h (50 mph).

4.5.2 Upon completion of the test as described in 5.4.6, no water shall have leaked into the container.

4.6 Weight limits

4.6.1 The tare weight of the container assembly (base plus body) shall be a minimum consistent with the requirements and within limits of sound design practices.

4.6.2 The tare weight objective for the container should range from 19,22 to 28,83 kg/m^3 (1.2 to 1.8 lb/ft^3) based on external volumes.

4.7 Materials and processes

4.7.1 The materials and processes selected should give consideration to the extremely hard usage to which the container will be subjected, so as 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.

4.7.2 Materials shall be flame resistant in accordance with the regulatory requirements.

4.7.3 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 so as to minimize complexity and the 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 container except when ultimate load conditions are evaluated.

5.1.3 Test equipment and methods of testing described are not meant to be restrictive. Alternative equivalent methods may be used to accomplish 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 container so tested may not be used in service until all components parts have been inspected and those that exhibit permanent deformation have been replaced.

5.2 Test criteria

5.2.1 A container shall be considered satisfactory if, following an inspection before and after testing, its dimensions fall within those specified in tables 1 and 2 and in applicable manufacturing drawings.

5.2.1.1 In the "Test procedure" sub-clauses, the words "no permanent deformation shall occur" are intended to mean that on completion of the subject test(s), the container shall show neither permanent deformation nor abnormality which will render it unsuitable for use and the dimensional requirements affecting handling, securing and/or interchange shall be satisfied.

5.2.2 Permanent deformation is permitted under ultimate load conditions. A container shall be considered within acceptable limits if it exhibits permanent deformation but does not rupture to the extent of discharging cargo nor breaks free from the restraint system.

5.3 Recommended test equipment

5.3.1 When restraint or movement on an aircraft system is evaluated, the test system shall be in accordance with 3.2.2.3.5. Latches and guide-rails of suitable strength shall be provided to guide the container along the conveyor and secure it at its latch points. The test system shall be of sufficient length to permit cycling of the longest container to be tested.

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

5.3.3 An industrial truck or equivalent equipment capable of a maximum weight of 5 440 kg (12 000 lb) on one axle with a minimum wheel width of 180 mm (7 in) and a maximum footprint area of 142 cm^2 (22 in^2) per wheel on 762 mm (30 in) wheel centres shall be provided.

5.4 Test procedure — Operational loads

5.4.1 End panel strength and longitudinal restraint

5.4.1.1 The container under test shall be latched to the aircraft system or its equivalent.

5.4.1.1.1 The number of latches shown in 3.4.5.1 shall be engaged on one side and adjusted by suitable means to ensure contact with the end of the latch receptacle slot.

5.4.1.1.2 A longitudinal force equal to the maximum payload shall be evenly distributed over the inner surface of the end panel.

5.4.1.1.3 Should both container end structures not be identical, for door access for example, both ends shall be tested for restraint and panel strength.

5.4.1.1.4 No permanent deformation or failure shall occur.

5.4.1.2 For 3 m (10 ft) containers, repeat the test given in 5.4.1.1, using end restraints with three latches located in slots in accordance with figure 8.

5.4.2 Side panel strength and lateral restraint

5.4.2.1 With the container on the aircraft system or its equivalent, 50 to 60 % of all the latches, equally distributed on both sides, shall be engaged and adjusted by suitable means to ensure vertical restraint.

5.4.2.1.1 A lateral force equal to maximum payload shall be applied uniformly over the inner surface of the side panel.

5.4.2.2 Should their structure not be identical, both sides shall be tested.

5.4.2.3 No permanent deformation or damage shall occur.

5.4.2.4 The deflection at the intersection of the top and side panel shall not exceed 38 mm (1.5 in).

5.4.3 Roof panel strength and vertical restraint

5.4.3.1 The container shall be suspended upside down from the aircraft loading system or its equivalent.

5.4.3.1.1 Between 50 and 60 % of the total number of latches, equally distributed on both sides, shall be engaged and adjusted by suitable means to ensure contact when the load is applied.

5.4.3.1.2 The container shall have a load equal to the maximum payload uniformly distributed over the inside of the roof.

5.4.3.1.3 No permanent deformation or damage shall occur.

5.4.3.2 This test shall be repeated for 3 m (10 ft) containers using only end restraint in accordance with figure 8.

5.4.3.3 A uniformly distributed load of 249 daN (660 lb) bearing down on the top of the container shall be applied to any 305 mm × 610 mm (12 in × 24 in) area of the roof.

5.4.3.3.1 No permanent deformation shall occur.

5.4.4 Base strength

5.4.4.1 The base of the container shall rest on a surface of sufficient strength and continuity to support the container floor adequately.

5.4.4.1.1 An industrial truck, loaded to an axle weight of not less than 5 440 kg (12 000 lb) (including the weight of the truck) or 2 720 kg (6 000 lb) per wheel, applied to a contact area not greater than 142 cm^2 (22 in^2), assuming a wheel width of not less than 180 mm (7 in) and wheel centres of 762 mm (30 in), shall then be manœuvred over the entire floor of the container to load the container to maximum gross weight. Repeat the test for 100 cycles.

5.4.4.1.2 An industrial truck loaded to 4 080 kg (9 000 lb) per wheel shall then be manœuvred over the area extending 457 mm (1.5 ft) from inside the door.

5.4.4.1.3 Containers of 9 m and 12 m (30 ft and 40 ft) length shall be loaded to their maximum gross weight in accordance with 3.3.1 and shall be supported on bars placed on a smooth floor. A bar with a 19 mm (0.75 in) radius and 9,5 mm (0.375 in) in height shall support the container across the width at each end and a third bar with a 19 mm (0.75 in) radius and 19 mm (0.75 in) in height shall support the container across the width at the centre of the container length. The container base shall contact the floor at a distance of 1,8 ± 0,3 m (6 ± 1 ft) from the end supporting bars.

5.4.4.1.4 No permanent deformation shall occur.

5.4.4.2 While retained on the aircraft loading system or its equivalent (see 3.2.2.3.5), the floor shall be uniformly loaded to 5 748 daN/m^2 (1 200 lb/ft^2).

5.4.4.2.1 The load shall be applied to an area 1 524 mm (5 ft) wide centred in the container and the load shall equal, but not exceed, three times the maximum payload.

5.4.4.3 The container shall be uniformly loaded to gross weight and cycled one hundred times over a substantially level test system, in accordance with 3.2.2.3.5, at a minimum rate of 18,3 m/min (60 ft/min).

5.4.4.3.1 The test section shall be supported on a rigid welded steel, wood or concrete structure.

5.4.4.3.2 The rollers used in the test section shall conform to 3.2.2.3.5. The shell of the roller shall be of a high quality aluminium alloy. The bearing used in the rollers shall be selected to ensure that the coefficient of friction set up in the test does not exceed 0,02 at 1 g loading.

5.4.4.3.3 The maximum displacement of the roller top from a theoretical plane should be varied randomly to a maximum of ± 0,76 mm (± 0.03 in).

5.4.4.3.4 Each cycle shall be equal to twice the container length.

5.4.4.3.5 During the test, the maximum draw bar pull shall not exceed 3 % of container gross weight at test speed or 5 % of container gross weight at breakaway. The maximum increase in draw bar pull during cycling shall not exceed 0,5 % of gross weight.

5.4.4.4 When the container is loaded to gross weight and supported on an aircraft system having an uneven surface varying by at least 12,7 mm (0.50 in), the doors shall be fully opened or closed for three complete cycles.