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AEROSPACE STANDARD

AS 1677
Superseding AIR 1677

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GENERAL REQUIREMENTS FOR NON-CERTIFIED LD-2, LD-4 & LD-8 CARGO/BAGGAGE CONTAINERS

1. PURPOSE:

This Aerospace Standard (AS) provides dimensional, structural and environmental criteria for cargo/baggage containers tailored to meet the lower deck configuration of the 767 airplane. See AIR 1869 for information relative to lower deck container configurations. These containers can also be transported on wide body aircraft such as the 747, DC-10, L1011 A300 & A310, but may require additional restraint or conveyance equipment. The minimum essential criteria are identified by the 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 should occur only after careful consideration, extensive testing and thorough service evaluation have shown alternate methods to be satisfactory.

1.1 Reference Documents:

1.1.1 IATA Technical Standard Specification Number 50/0, Condition Requirements for Interlining of ULDs, International Air Transport Assoc., 2000 Peel Street, Montreal, Quebec, Canada H3A 2R4.

1.1.2 IATA Technical Standard Specification number 50/7, General Specification for Non-Certified Aircraft Containers, International Air Transport Assoc., 2000 Peel Street, Montreal, Quebec, Canada H3A 3R4.

1.1.3 SAE AS 1825, Methodology of Calculating Aircraft Cargo Volumes.

1.1.4 SAE AIR 1869, Wide-Body and Standard-Body Aircraft Lower Lobe Cargo Compartment ULD Capacities.

1.1.5 IATA Technical Standard Specification number 40/0 marking of Unit Load Devices, International Air Transport Assoc., 2000 Peel Street, Montreal, Quebec, Canada H3A 2R4.

1.1.6 SAE ARP 1334, Ground Equipment Requirements for Compatibility with Aircraft Unit Load Devices.

2. SCOPE:

2.1 This AS covers the requirements for three sizes of compartment restrained lower deck containers (Unit Load Devices) for the 767 airplane and which do not require airworthiness certification.

NOTE: IATA Specificaton 50/0, General Technical Requirements and Serviceability limits, should also be taken into account when designing and making equipment according to this Specification as certain provisions contained therein will also be applicable.

3. CONTAINER SIZES:

3.1 The various container sizes are shown in the following appendices:

Appendix A - LD-2 Contoured Container base dimension
60.4 x 47 in. (1534 x 1194 mm)

Appendix B - LD-4 Full Size Rectangular Container base dimension
60.4 x 96 in. (1534 x 2438 mm)

Appendix C - LD-8 Full Width Contoured Container base dimension
60.4 x 96 in. (1534 x 2438 mm)

4. BASIC CONTAINER CONFIGURATION:

4.1 The basic container shall consist of a complete enclosure (base, top and sides) with access.

4.2 The structure shall be designed to provide the maximum usable internal volume available within the limit of structural design including access closures. The volumes shown in Fig 2, 4 and & 6 are in accordance with AS 1825.

4.3 Tare weight should be as light as possible consistent with good design practice and serviceability and should be within the design tare weights shown in paragraph 2 of Appendices A, B and C.

5. REQUIREMENTS:

5.1 Basic Requirements for Design:

5.1.1 The maximum gross weight for each container size is as shown in the appropriate Appendix.

5.1.2 Robustness, reliability and maintainability shall be major factors in the design, commensurate with planned service life.

5.1.3 The center of gravity of the load can vary laterally and longitudinally within the dimensions shown in the Appendices.

5.1.4 Stacking capability is not required.

5.2 Materials:

5.2.1 The materials and processes selected shall be capable of accepting extremely hard usage for a cost related life. Materials shall be suitably sealed against liquid absorption to ensure no deterioration in strength when subjected to normal environmental conditions.

5.2.2 Materials used shall be flame resistant.

5.3 Base:

5.3.1 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 construction will 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 box to the base is required, this shall be accomplished by the use of normal hand tools.

5.3.2 Care must be exercised in the design and construction of the base to ensure that flatness of the lower surface can be maintained in service and is of adequate strength to minimize bowing.

5.3.3 All base corners shall have dimensions shown in Figure 1.

5.3.3.1 The base thickness shown in Figures 3, 5, and 7 shall be the buyer's selection within the allowable range of .77 to 1.00 in (19.6 to 25.4 mm).

5.3.4 The base design shall provide for support and ease of movement at the rated distributed gross weight on minimum conveyor systems defined below:

5.3.4.1 For Half-Width Containers:

a) A roller system with an overall width of 47 in. (1194 mm) with two rows at the extreme edges and the third row not more than 30 in. (762 mm) from the outer row measured between centerlines of rollers. Rollers should be 1.5 in. (38 mm) diameter, 2.5 in. (63.5 mm) uncrowned with an edge radius of .06 in. (1.5 mm) and spaced on 11 in. (279 mm) centers.

5.3.4.1 (Continued):

b) Ball transfer units with 1 in. (25.4 mm) diameter balls located on 5 x 5 in. (127 x 127 mm) grid pattern.

c) Swivel casters with 1 in. (25.4 mm) diameter wheels having a contact length of 2 in. (50.8 mm) located on a 12 x 12 in. (305 x 305 mm) grid pattern.

5.3.4.2 For full-width containers when moved in direction of the 60.4 in. (1534 mm) dimension, only the number of rows of rollers change from the requirements shown in 5.3.4.1 above; namely, six rows of rollers shall be assumed with two edge supporting rows and four intermediate rows spaced a maximum of 30 in. (762 mm) apart.

5.4 Body:

5.4.1 The sides, roof and access closure shall be of a minimum weight to provide maximum stability during both ground and airborne handling. Any attachments between the base and the container box shall have a minimum intrusion into the base area with no sharp edges or bolts. The top of the container shall be smooth, self draining and designed for easy snow clearance.

5.4.2 Means for the manual movement of the container shall be provided.

5.5 Access Closures:

5.5.1 Closures shall be designed to avoid finger-pinching hazards and be of sufficient strength to contain the load during air and ground transportation.

5.5.2 The closures shall have the minimum number of securing devices to withstand the handling loads at maximum gross weight without unlocking. These devices are required to positively secure the access closures in the closed position. They should be so located that they cannot damage, or become damaged by adjacent containers. No tools shall be required to operate the closures or the securing devices.

5.5.3 Positive means should be considered to restrain the access closure(s) in the open position.

5.6 Tie-Down Fittings: Provision may be made for internal securing of the load such as ring tie-down fittings preferably attached to the base at the sidewall joints. Each tie-down shall be capable of a 2,000 lb (907 kg) load in any direction.

5.7 Placard Holders: To accept destination cards 8 1/4 in. (209 mm) by 5 7/8 in. (149 mm) placard holders should be provided.

5.8 Performance:

5.8.1 Bridging and Cresting: The container shall be capable of traversing from one item of handling equipment to another when the level of the conveyor surfaces are not in the same plane. At the point where the container balances on the end of the higher surface, the entire load is supported by one row of rollers per ARP 1334.

5.8.2 Decompression Loads: The container shall be compatible with the aircraft lower compartments when rapid decompression is incurred. Relief areas, the equivalent of at least 10 sq. in. (64.5 cm^2), shall be provided.

5.8.3 Impact Loads: The containers must be able to withstand repeated impact load of 1 ft/sec. (.3 m/s) related to its gross weight reacted by the base assembly. Under these impact loads the container will not discharge its contents nor exhibit permanent set in excess of that established in the applicable Appendix covering the particular size.

5.9 Environmental Criteria:

5.9.1 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 +71.1°C to -53.9°C (+160°F to -65°F) with relative humidity from 20 percent to 85 percent. These are the mean temperature and humidity figures world-wide without taking into account extremes in temperatures such as those experienced in arctic, sub-polar, or desert regions. This, however, is not a test requirement.

5.9.2 All components of the container 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. CUSTOMS REQUIREMENTS: It is recommended that provisions be made for closing and sealing the container to meet Customs clearance and Security requirements.

7. ADDITIONAL DESIGN OPTIONS: The following may be added as design options required by a particular airline or shipper:

(a) Knock-down Capability (The capability of a container to be disassembled and its components stacked).

(b) Component and Sub-Assembly Interchangeability

(c) Shelf Capability

8. TEST LIMITS:

8.1 Impact Test:

8.1.1.1 The container loaded to its maximum gross weight, shall be impacted at the base of the unit at the rate of 1 ft/sec. (.3 m/s) against a vertical rigid solid bar 2 in. (50.8 mm) high and the maximum length of the base of the unit to be tested.

8.1.2 The container shall be impacted against the stop described in 8.1.1.1 for the number of cycles established in the supplementary specification for the applicable container configuration. Twenty-five percent of these impacts shall be initiated with the container moving at 15° offset to the leading edge in the direction of travel. Tests shall be repeated on each of the four base edges. Deflection measurements shall be made after each test and cumulatively. To insure corner contact, an additional 25 percent of these impacts shall be on the other corner.

8.1.3 On the completion of these tests the permanent set of the container shall not exceed 0.75 in. (19 mm) from the top of the container to the maximum vertical center of gravity and decreasing linearly to .12 in. (3 mm) at the base.

8.2 Rain Test: The container is to be designed to prevent the ingress of water such as might be experienced in heavy driving rain. It shall be demonstrated that in these conditions water will not enter the container.

8.3 Bridging & Cresting Test: The container loaded to maximum gross weight, with a central c.g. position, shall be traversed on a roller system compatible with the minimum requirements of ARP 1334, and made to pass across a stepped junction with another similar roller system. The height difference at the junction shall not be less than 6 in. (150 mm). At the point of balance (cresting) on the edge of the higher platform, hold the container in this positon for a minimum period of 5 seconds. The rear end of the container shall then be allowed to drop from the higher platform onto the lower roller platform.

Upon completion of the test the container shall show neither permanent deformation nor abnormality that will render it unsuitable for use and those dimensional requirements affecting handling, securing and interchange shall be met.

9. MARKINGS:

9.1 All containers covered by this specification shall be marked with the following information:

(1) Name and address of the manufacturer.

(2) The actual tare weight of the container to the nearest kilogram and pound.

9.1 (Continued):

(3) The maximum gross weight in kilograms and pounds.

(4) The serial number or date of manufacture or both.

The letter size shall be large enough to insure good readability and shall not be less than 1 in. (25 mm) high for the maximum gross weight and tare weight.

9.2 The following additional markings should also be included. The manufacturing part number and date manufactured letter sizes should be large enough to insure good readability. The I.D. code shall be not less than 4 in. (100 mm) high and shall be located at the top on the outboard and inboard panels at a height of not less than 45 in. (1150 mm) as well as optionally on both sides of the container.

I.D. Code _____

Mfg. Part No. _____ Date Mfg. _____

NOTE: The I.D. code is an international unit marking system consisting of:

1. 3 digits (alpha) for the type and code size.

2. 4 digits (numeric) for the individual serial number.

3. 3 digits (alpha) for owner code (airline and non-airline).

I.D. codes are assigned by the U.L.D. Registrar, International Air Transport Association, 2000 Peel St., Montreal, Quebec, Canada H3A 2R4.

PREPARED BY
SAE SUBCOMMITTEE AGE-2A,
CARGO HANDLING OF SAE
COMMITTEE AGE-2, AIR CARGO
AND AIRCRAFT GROUND EQUIPMENT AND SYSTEMS

Sponsor: Ray V. Riggs

Appendix "A"

DIMENSIONS AND DESIGN REQUIREMENTS FOR
NON-CERTIFIED LD-2 CONTOURED CONTAINERS

1. SIZE: Dimensions shall be as shown in Figures 2 and 3.

2. TARE WEIGHT: The design tare weight for this container should be 130 to 165 lbs. (60 to 75 kg) for the basic container and 200 to 220 lbs (90 to 100 kg) for the fork-liftable type.

3. REQUIREMENTS:

3.1 Basic Maximum loaded gross weight: 2700 lbs. (1225 kg).

3.2 The center of gravity range shall be as shown in Figure 2.

4. MATERIALS AND CONSTRUCTION:

4.1 Base:

4.1.1 No particular materials or methods of construction are specified, but those used in general industrial practice are recommended.

4.1.2 Optional: Fork-lift entry may be provided on at least two sides, although 3-way entry is preferred. The fork accesses should be protected if possible, and chamfers at least are recommended.

4.2 Body: It is essential that the container integrity is maintained throughout its transporation because the container interfaces directly with the aircraft systems. The materials and methods of construction must therefore be adequate for this task.

4.3 Access Closures:

4.3.1 Access shall be provided on the 61.5 in. (1562 mm) side for maximum loadability.

4.3.2 Closure should be accomplished by not more than two interchangeable (reversible) panels. Security lockings on customs sealing shall be accomplished at a single point and shall ensure the integrity of the closure.

4.3.3 The option for a flip-up top feature should lock/seal at the same common point on the panels.

4.4 Placard Holders:

4.4.1 One or more placard holders should be fitted. The upper end shall not be higher than 40 in. (1016 mm) from the bottom of the base.

4.4.2 It is suggested that the placard holders have the alternate capability of being used as a board of chalk or grease pencil markings.

5. IMPACT LOADS:

5.1 The impact survival test shall consist of at least 50 test impacts on each side of the container base in accordance with 8.1 of the General Specification.

Appendix "B"

DIMENSIONS AND DESIGN REQUIREMENTS FOR
NON-CERTIFIED LD-4 FULL-SIZE RECTANGULAR CONTAINERS

1. SIZE: Dimensions shall be as shown in Figs. 4 and 5.

2. TARE WEIGHT: The design tare weight for this container should be 225 to 250 lbs (102 to 113 kg) for the basic container and 325 to 380 lbs (147 to 172 kg) for the fork-liftable type.

3. REQUIREMENTS:

3.1 Basic Maximum loaded gross weight: 5,400 lbs. (2449 kg)

3.2 The center of gravity shall be as shown in Fig. 4.

4. MATERIALS AND CONSTRUCTION:

4.1 Base:

4.1.1 Consideration must be given to the operational environment anticipated for this class of container in selecting materials and method of construction.

4.1.2 Optional: Fork-lift entry may be provided on at least two sides, although 4-way entry is preferred. The fork accesses should be protected, if possible, and chamfers at least are recommended.

4.2 Body: It is essential that the container integrity is maintained throughout its transportation because the container interfaces directly with the aircraft system. The materials and methods of construction must therefore be adequate for this task.

4.3 Access Closures:

4.3.1 Access shall be provided on the 96 in. (2438 mm) side for maximum loadability.

4.3.2 Closure should be accomplished by not more than two interchangeable (reversible) panels. Security lockings on customs sealing shall be accomplished at a single point and shall ensure the integrity of the closure.

4.3.3 The option for a flip-up top feature should lock/seal at the same common point on the panels.

4.4 Destination Placards:

4.4.1 One or more placard holders should be fitted. The upper end shall not be higher than 40 in. (1016 mm) from the bottom of the base.

4.4.2 It is suggested that the placard holders have the alternate capability of being used as a board for chalk or grease pencil markings.

5. IMPACT LOADS: The container must be able to withstand 50 test impact cycles on each side having a design variance (i.e., access slide, back wall, one end wall) in accordance with 8.1 of the General Specification.

Appendix "C"

DIMENSIONS AND DESIGN REQUIREMENTS FOR
NON-CERTIFIED LD-8 FULL WIDTH
CONTOURED CONTAINERS

1. SIZE: Dimensions shall be as shown in Figures 6 and 7.

2. TARE WEIGHT: The design tare weight for this container should be 225 to 275 lbs (115 to 125 kg) for the basic container and 325 to 380 lbs (147 to 172 kg) for the fork liftable type.

3. REQUIREMENTS:

3.1 Basic maximum loaded gross weight: 5,400 lbs. (2449 kg)

3.2 The center of gravity range shall be shown in Figure 6.

4. MATERIALS AND CONSTRUCTION:

4.1 Base:

4.1.1 No particular materials or methods of construction are specified, but those used in general industrial practice are recommended.

4.1.2 Optional: Forklift entry may be provided on at least two sides, although 4-way entry is preferred. The fork accesses should be protected if possible, and chamfers at least are recommended.

4.2 Body: It is essential that the container integrity is maintained throughout its transportation because the container interfaces directly with the aircraft system. The materials and methods of construction must therefore be adequate for this task.

4.3 Access Closures:

4.3.1 Access shall be provided on the 125 in. (3175 mm) side for maximum loadability.

4.3.2 Closure should be accomplished by not more than two interchangeable (reversible) panels. Security lockings on customs sealing shall be accomplished at a single point and shall ensure the integrity of the closure.

4.3.3 The option for a flip-up top feature should lock/seal at the same common point on the panels.

4.4 Placard Holders:

4.4.1 One or more placard holders should be fitted. The upper end shall not be higher than 40 in. (1016 mm) from the bottom of the base.

4.4.2 It is suggested that the placard holders have the alternate capability of being used as a board for chalk or grease pencil markings.

5. IMPACT LOADS: The impact survival test shall consist of at least 50 test impacts on each side of the container base in accordance with 8.1 of the General Specification.

CONTAINER BASE CORNER DETAIL

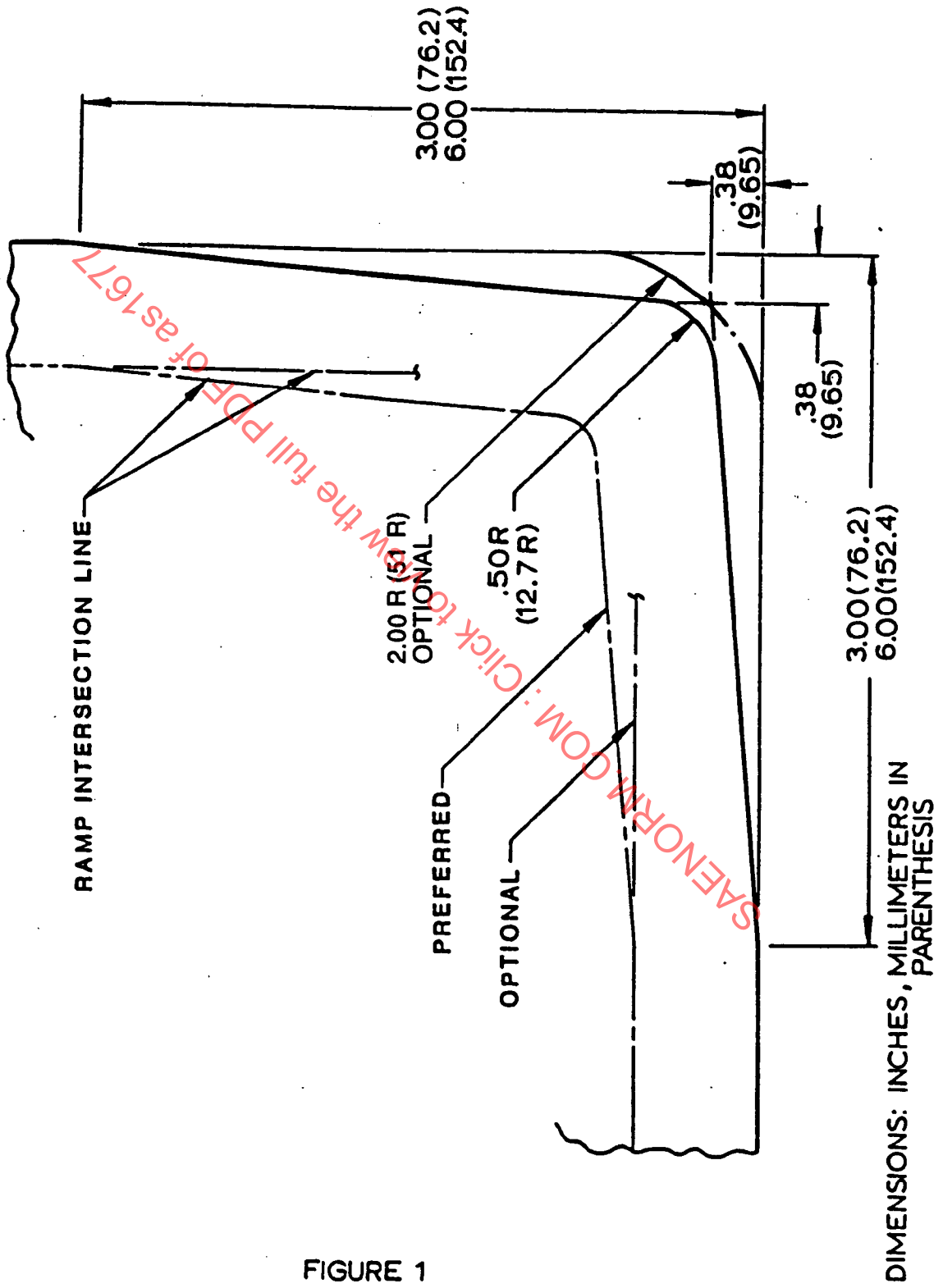
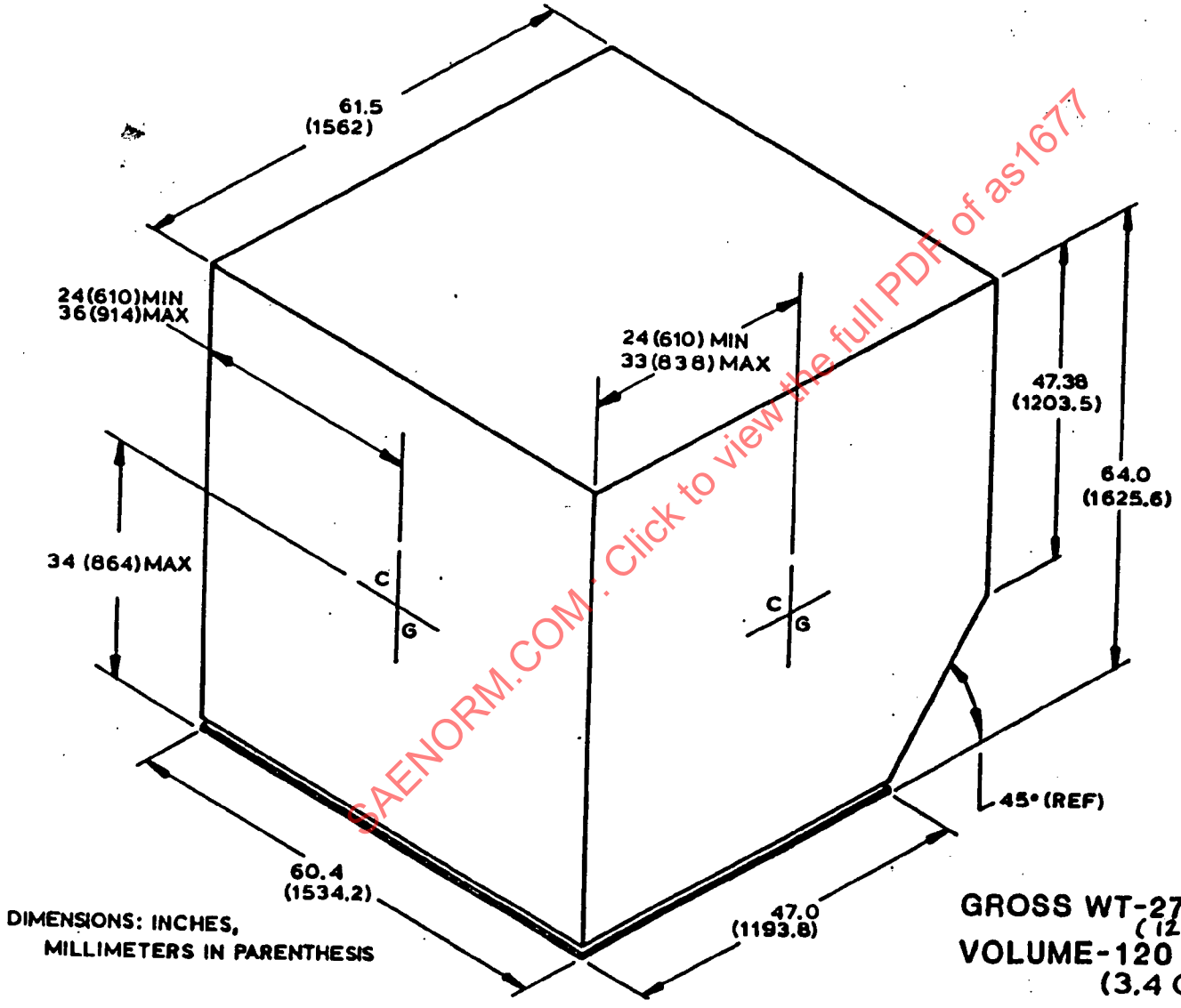


FIGURE 1

LD-2 CARGO/BAGGAGE CONTAINER

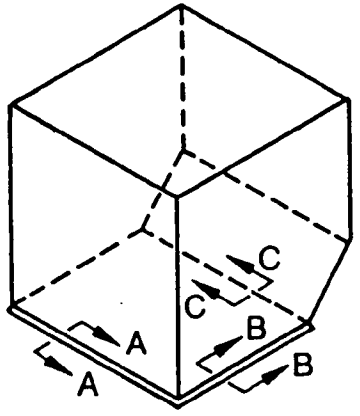


DIMENSIONS: INCHES,
MILLIMETERS IN PARENTHESIS

GROSS WT-2700 LBS
(1225 kg)
VOLUME-120 CU. FT.
(3.4 CU METERS)

FIGURE 2

LD-2 CARGO/BAGGAGE CONTAINER



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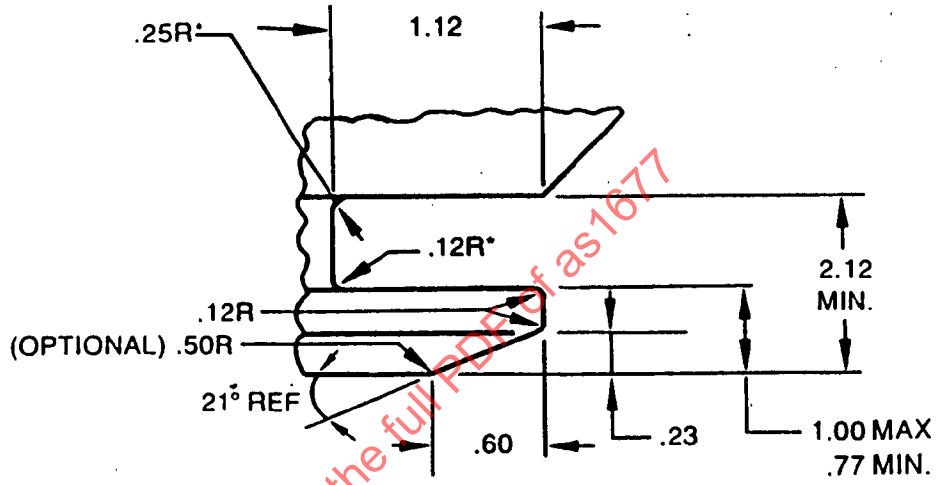
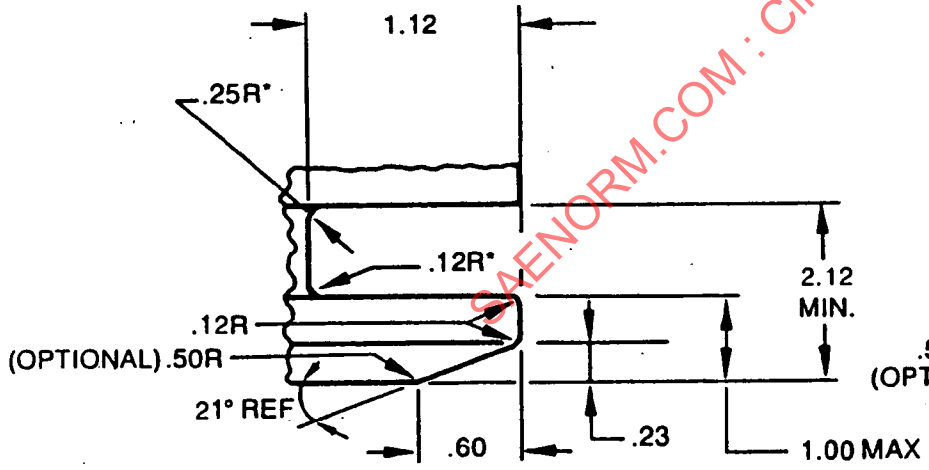
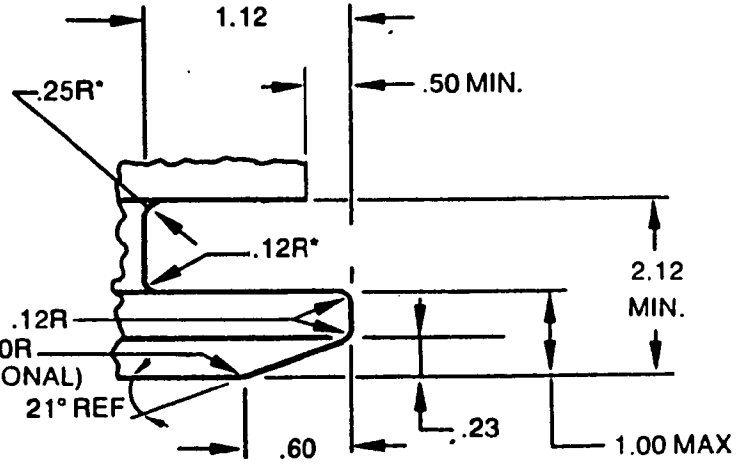


DETAIL C-C



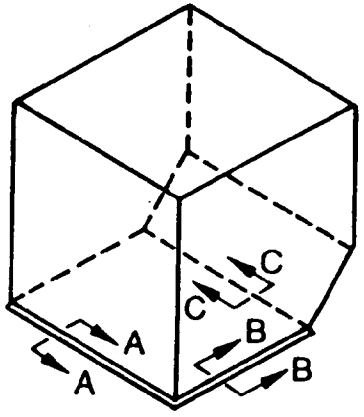
DETAIL A-A



DETAIL B-B

FIGURE 3

LD-2 CARGO/BAGGAGE CONTAINER



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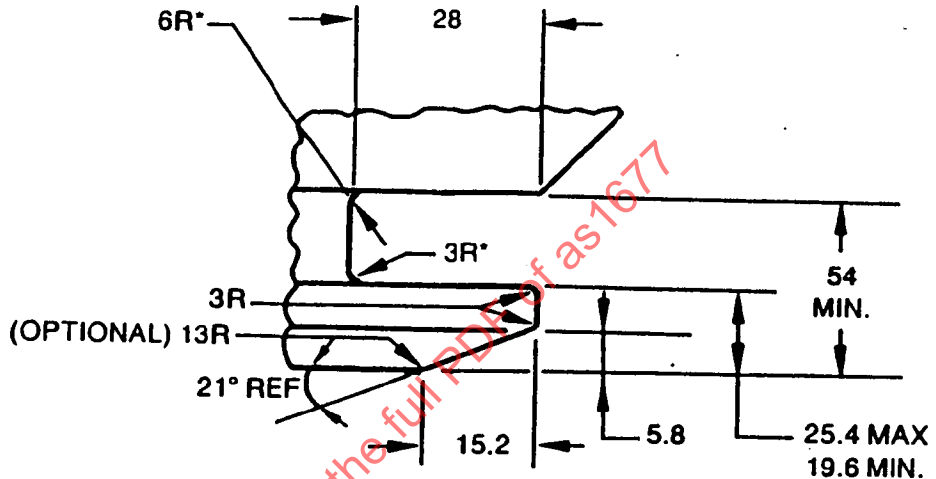
DIMENSIONS: MILLIMETERS



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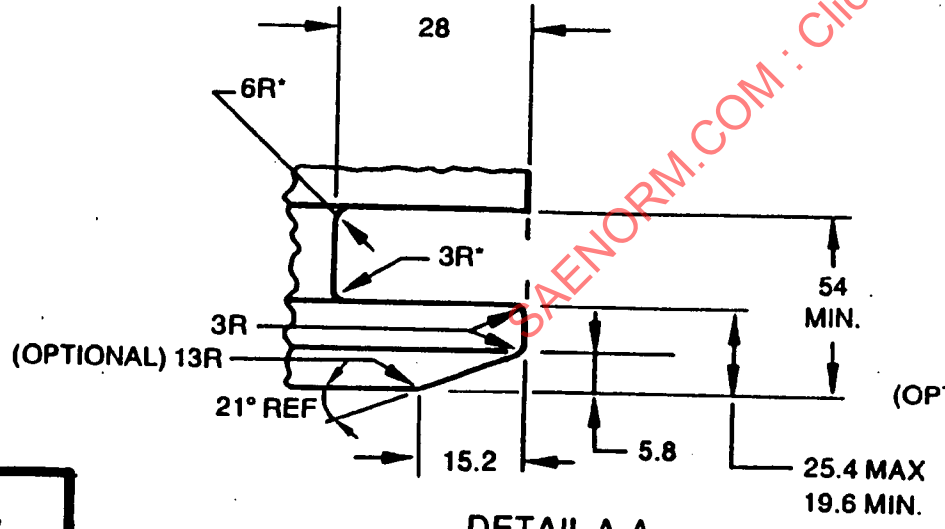
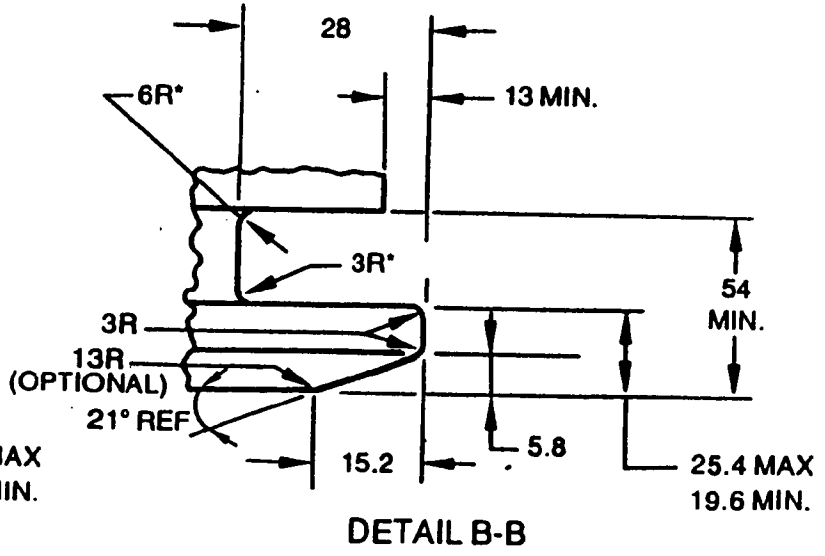


DETAIL A-A



DETAIL B-B

FIGURE 3 (S1)

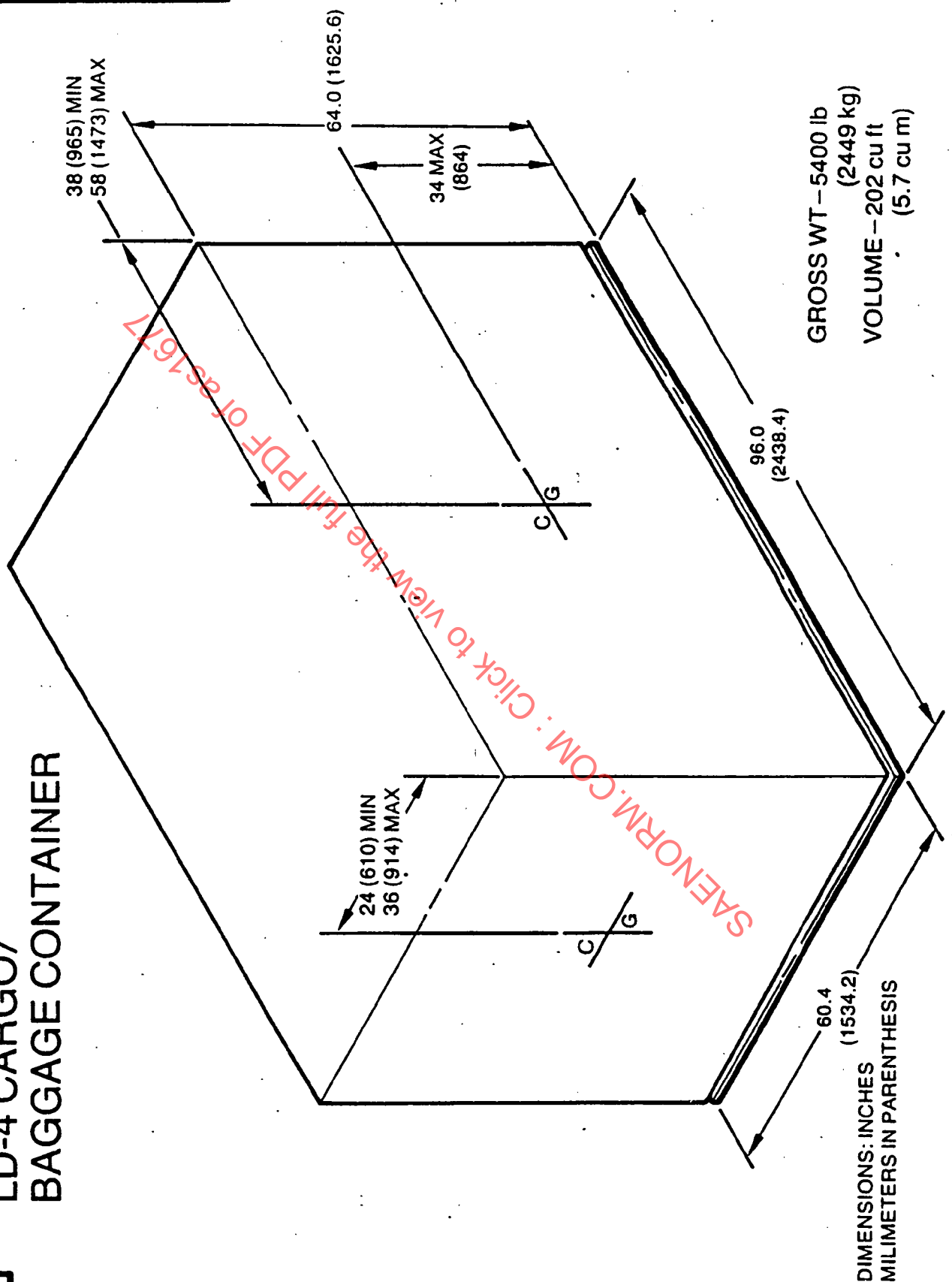


FIGURE 4