NATO STANDARD

AEPP-1

NATO REQUIREMENTS FOR REUSABLE CONTAINERS

Edition B Version 1

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NORTH ATLANTIC TREATY ORGANIZATION

ALLIED ENGINEERING PRACTICES PUBLICATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

17 April 2019

1. The enclosed Allied Engineering Practices Publication AEPP-1, Edition B, Version 1, NATO REQUIREMENTS FOR REUSABLE CONTAINERS, which has been approved by the nations in the MCLSB, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 4398.

2. AEPP-1, Edition B, Version 1, is effective upon receipt and supersedes AEPP-1, Edition 1, which shall be destroyed in accordance with the local procedure for the destruction of documents.

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4. This publication shall be handled in accordance with C-M(2002)60.

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS

Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
FRA	Reference documents will be implemented in accordance with reservations made during their ratification.
LVA	LVA continues to use existing equipment, STANAG requirements will be used for new procurements.
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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CHAPTER 1 INTRODUCTION

1.1 REFERENCES

Publications that are referred to in this document are listed at Annex C:

1.2 AIM

This publication establishes general and test requirements and design criteria relating to reusable containers for the military forces of the NATO nations.

1.3 AGREEMENT

Participating nations agree to adopt the characteristics and test criteria for reusable containers contained in this document.

1.4 TERMS AND DEFINITIONS

The terms used throughout this publication and their interpretation shall be in accordance with the definitions listed at Annex D. Other terms are defined in AAP-23.

1.5 GENERAL

Reusable containers are used for transport and storage of those items of supply which are known or required to undergo repeated or frequent repair, maintenance, recalibration, etc., during their life cycle.
Reusable containers are both unit and shipping containers.

1.6 DETAILS OF THE AGREEMENT

Reusable containers are used for transport and storage. Their design have to be consistent with requirements and criteria as specified in this document:

- Handling equipment,
- Design for loading (lorry, rail, air and ship),
- Protection of the content,
- Superimposed load.

1.7 IMPLEMENTATION

This document is implemented when the necessary orders/instructions have been issued for the production of the equipment in accordance with the characteristics laid down in this agreement.

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CHAPTER 2 REQUIREMENTS / CRITERIA

2.1 GENERAL REQUIREMENTS

Reusable containers shall be designated to be consistent with:
The specified NATO packaging level or equivalent national packaging level in accordance with STANAG 4280;
The maintenance concept for the contents;
The planned distribution logistics of the contents;
And to provide reliable protection at lowest life cycle costs to the contents.

2.1.1 Handling equipment

The container shall be designed to be compatible with:
The handling equipment according to STANAG 2829;
All other designated handling equipment used throughout the logistic system including that used to pack and unpack the container;
As well as for handling in the field in accordance with STANAG 2827.

2.1.2 Distribution network

The container shall be designer to move without restriction, special routing, or special escort throughout the material distribution system whenever possible.

2.1.3 Unit load compatibility

Reusable container designs which are to be forms unto unit loads as part of the logistic distribution plan shall have features which permit ready assembly into such unit loads.

2.1.4 Configuration management

Configuration management practices shall be consistent with the requirements of STANAG 4159.

2.2 TRANSPORTABILITY REQUIREMENTS

Reusable container designs shall reflect consideration of techniques for lorry, rail, air and ship loading, to ensure that applicable nation and/or international transportation requirements are met, and that transportation costs are minimized consistent with safety considerations and container integrity.

2.3 VOLUME AND MASS

Containers shall be designed for smallest volume and lightest mass consistent with protection of contents, durability, intended use, safety, and economy.

2.4 MATERIALS AND MANUFACTURING METHODS

Commercially available standard materials and manufacturing processes are preferred whenever feasible. The application of technological advancements in materials and processes is encouraged where economically justified.

2.4.1 Environmental requirements

Where possible, low-ecological impact materials which can be recycled shall be used. Cadmium plating is not acceptable.

2.4.2 Dissimilar metals

Dissimilar metal combinations causing corrosion should be avoided.

2.4.3 Rubber and synthetic rubber parts

All rubber and synthetic rubber parts of shock mounts shall bear a cure date in addition to any other required markings. The maximum age of rubber and synthetic rubber parts shall not exceed one year from date of cure when installed in the container.

2.4.4 Standard parts

Standard parts shall be used unless they are technically or economically impractical.

2.4.5 Material stability

All material used shall be stable after prolonged exposure to extremes of temperature and humidity which may be reasonably encountered during the expected logistic life cycle. In this sense, stability shall be considered after return to room conditions and shall be construed as freedom from the following defects:

(a) Change of state of the material, e.g. crystallization, hydrolytic conversion, etc.
(b) Permanent cracking or any damage which would impair the functional performance of the container.
(c) Significant changes in physical properties, e.g., modulus of elasticity.

The environmental extremes to which the container shall be exposed during storage and transportation are described in the definitions of the NATO levels of packaging. STANAG 4280 defines these NATO levels of packaging and provides information on the equivalence of the NATO levels with nation levels.

2.5 INTERNAL PACKAGING MATERIALS

2.5.1 Materials compatibility

Internal packaging materials shall not adversely affect the contents because of incompatibility of chemical and hygroscopic properties. Internal materials shall not be placed in direct contact with contents surfaces sensitive to ruggedness or abrasion.

2.5.2 Cushioning materials

Whenever practical, materials conforming to nations' specifications shall be used. In selecting a cushioning material for a specific application, consideration shall be given to the following:

(a) Cushion assemblies shall be suitably located in or attached to the interior of the containers so that cushioning is applied at the intended areas. The attachment shall not be so permanent as to prevent replacement of the cushion.

(b) Moulded cushioning shapes having a skin shall only be in contact with the packaged item if material compatibility exists and if consistent with other objectives of the cushion.
(c) Cushion creep shall be consistent with the life cycle of the container.

2.5.3 Resilient mounts

Resilient mounts shall be designed to meet the specified shock and vibration requirements. The resilient materials shall be resistant to ageing and deterioration and shall be capable of meeting all performance requirements following exposure to the tests of paragraph 3.7.

2.5.4 Dynamic characteristics

Materials for use in shock or vibration attenuation systems (see definition in ANNEX D) shall protect the contents to fragility levels established by the designer of the contents. Testing of the container and of the internal shock/vibration attenuation system shall be performed to ensure that the contents will be adequately protected to the fragility level requirements of paragraph 3.5 and 3.6.

2.5.5 Interchangeability

All parts of one specific type of container shall be directly and completely interchangeable with the respective parts of another container of the same type with respect to installation and performance.

2.5.6 Support fasteners

All fasteners used in the primary support structure shall have provisions to prevent loosening, such as self-locking nuts, safety wiring, or other suitable devices.

2.5.7 Fire resistance

Containers intended for use aboard ships shall be constructed from noncarcinogenic flame retardant materials.

2.6 DRAINAGE

When applicable, free drainage shall be provided in the normal storage position. All pockets on the exterior of containers in which water can collect shall gave provisions for drainage. Where a metal or plastic container is of such size that water cannot be conveniently poured out of the bottom, a drain plug shall be provided.
Metal containers shall have all faying surfaces. Discontinuous welds filled with sealing compound are not permitted.

2.7 VENTILATION

(a) Where applicable and suitable, ventilators shall be placed in the ends of non-watertight and non-water-vapourtight containers, but in such a fashion as not to interfere with primary structural members. Louvred metal ventilators, slotted ventilators, or drilled hole ventilators shall be screened on the inside with galvanized or aluminium wire mesh with apertures of less than 10 mm. slotted ventilators (without external louvres) and drilled hole ventilators shall also be

furnished with an exterior baffle structure designed to trap driving rain, draining to the outside. Except for timber sheathed crates, total surface area of ventilating openings shall be not less than 35 cm^2 per m^3 of container volume. Maximum size of any slot on a ventilator shall be 100mm x 300 mm.

(b) For timber sheathed crates, drilled hole ventilators may be used, with each hole drilled upward as viewed from the outside at a 45° angle. Holes shall be 20 mm ± 2 mm in diameter. The number of holes shall be not less than one hole per 0.6 m3 of the container volume. Holes may be clustered in each end or may be uniformly spaced about the periphery of the container. Containers with cross ventilation should have at least one opening on two opposite sides.

2.8 CLOSURE DEVICES

(a) Whenever possible, latches or other closure fasteners shall permit rapid opening and closing as well as rapid packaging and unpackaging preferably without the use of tools.

(b) All fasteners shall be captive and shall be either recessed or provided with a protective guard. The requirement for rapid opening and closing may be waived for those containers which will not be opened frequently for maintenance or inspection of the contents and which contain items not likely to be urgently needed.

2.9 PRESERVATION

Containers shall be designed to be compatible with methods of preservation selected to afford the level of packaging specified for the contents.

2.10 CLEAN ROOM REQUIREMENTS

When required, the container system shall be designed to be compatible with nationally defined clean-room requirements and to maintain required component cleanliness during shipment and storage.

2.11 CLASSIFIED CONTENTS

When the contents of a container are classified, the container shall be designed to enable detection of unauthorized entry, as for example by lead wire security seals.

2.12 TYPE OF CONTAINERS

The nature of the contents and the expected logistic environment determine the type of container and its closure and sealing requirements. Design criteria for the various classes of container sealing are provided in the following sub-paragraphs.

2.12.1 Closed containers without auxiliary barriers

These are boxes or sheathed crates. They do not provide climatic but only physical and mechanical protection.

2.12.2 Closed containers with inside barriers

These containers are boxes and sheathed crates fitted with an inside waterproof or watervapourproof barrier sealed on all sides, bottom, and top, and dehumidified by desiccants contained therein, or nor dehumidified and shall provide preservation in accordance with methods of preservation 3, 5 and 6 as defined in STANAG 4272.

2.12.3 Integral-barrier containers

Theses containers use their walls to form the protective barrier. The choice of a specific form of integral barrier (non-breathing, controlled-breathing, free-breathing, or dynamic dehumidification) depends on the total-size of the container, the expected logistic flow, and cost effectiveness.
The controlled breathing type shall be used unless otherwise specified. The following features shall be provided in all integral barrier containers:

(a) Mating surfaces resistant to mechanical damage and prevent gasket overloading
(b) Assembly guides when appropriate to ensure alignment of mating surfaces and to prevent shear action on gasket surfaces.
(c) Preformed gaskets or seals that can be readily replaced and which are retained in place by the structure.
(d) Gaskets compatible with any contents of the container, service liquid lubricants, or liquid fuels shipped therewith. Moulded one-piece gaskets are preferred but joints may be cemented or joined by vulcanizing, provided the joints are of the same dimensions.
(e) Container design to permit sufficient seal compression to achieve required sealing and shall limit compression to preclude unacceptable compression set on the seal material. Current solid silicone seal gasket designs require 15 to 25 percent compression for proper sealing, and 30 percent maximum compression to limit compression set over 15 years' lifetime.
(f) Containers structure, closure devices, and similar equipment designed to meet the pressure and test requirements of paragraph 3.8.
(g) Container watertightness. The leakage integrity shall meet the test requirements of paragraph 3.9. The test container shall therefore be provided with a pressurizing for pressure testing.

2.13 CONTAINER ACCESSORIES

Valves (except drain valves), humidity indicators, document receptacles, desiccant receptacles, and pressure fitting that are subject to routine inspection shall be grouped in one end of the container, location. All covers for such features shall be captive and replaceable without removal of the primary container cover.

2.13.1 Humidity indicator

A humidity indicator shall be provided in all dehumidified packages. The inside of the container shall be configured to provide free access of the enclosed air to the indicator. Electrical humidity-indicating devices may be used provided the logistic flow indicates prolonged storage in one place or use of dynamic dehumidification. The humidity indicator must be readable from outside. In case of closed containers with auxiliary

barriers, a corresponding opening in the container wall with a readily openable cover shall be provided.

2.13.2 Desiccant receptacle

A refillable enclosure for bagged descant shall be provided when specified. The size of the enclosure shall allow room for a minimum of one 8 unit[(1)] bag of desiccant. Ensure that air enclosed in the container has free access to the desiccant bed. The receptacle shall be easily refillable from the outside of the container. Therefore, a rectangular or circular opening of the minimum dimension of 100 mm is recommended. The desiccant receptacle shall be located as far away as possible from the humidity indicator.

2.13.3 Documents receptacle

When the contents are to be accompanied by pertinent documents, a suitably-sized watertight receptacle shall be provided. The contents of the document receptacle shall be accessible from outside without opening the container.

2.14 SPECIAL REQUIREMENTS FOR NON-BREATHING INTEGRAL BARRIER CONTAINERS

A simple, manually-operated bleeder valve to equalize pressure before opening shall be provided.

2.15 SPECIAL REQUIREMENTS FOR CONTROLLED-BREATHING INTEGRAL BARRIER CONTAINERS

Unless otherwise specified, each container shall be provided with a pressure and a vacuum relied valve in accordance with ANNEX A. A simple, manually-operated bleeder valve shall also be provided to equalize pressure before opening. This valve may be integral with any required automatic relief valve. The valve shall have cracking pressures of 17.2 ± 1.72 kPa and -10.34 ± 1.03 kPa for pressure and vacuum relief, respectively. Reseal pressure shall be 13.8 ± 1.72 kPa for pressure relief and -7.0 ± 1.72 kPa for vacuum relief. Container design requirements must comply with the design testing requirements in paragraph 3.9. When justified by operational requirements, cracking and reseal pressures may be adjusted accordingly.

2.16 SPECIAL REQUIREMENTS FOR FREE-BREATHING INTEGRAL BARRIER CONTAINERS

Free-breathing should be considered only for very large structures where pressure tightness of the order of 7.0 kPa (700 mm water) is not a practical design solution. A refillable desiccant breather unit for each container shall be provided. The breather unit shall have the following general characteristics:

(a) Designed to accommodate 1 kg of desiccant per m^3 of empty container volume.
(b) A breather valve incorporated into the desiccant port cover so that the inlet air is forced over the desiccant bed.

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(1) US unit of desiccant

(c) A sight glass on the container side of the desiccant with colored desiccant or humidity indicator card to indicator desiccant saturation.
(d) End filters and plenum chambers to ensure air-flow distribution over the full surface of the bed. Filter characteristics shall be determined by cleanliness requirements of internal voids and desiccant particle size.
(e) Spring-loaded devices or their equivalent to prevent development of voids in the breather charge resulting from packing or reduction of charge particle size.
(f) Openings to the ambient environment that face downward and have a length-to-diameter ratio of at least 10 to 1.
(g) Minimum flow rate through the breather of 6 percent of contained volume-per-minute at ambient pressure.

2.17 DYNAMIC DEHUMIDIFICATION

Dynamic dehumidification shall be used only when necessary power sources will be available throughout the logistic system applicable to the contents. Capacity shall be such as to remove not less than 23 mg of water per hour for each 1 m^3 of container capacity on the assumption that the container air is at 21° C and 35 percent relative humidity.

2.18 STACKING

Containers shall be capable of being stacked for prolonged periods and of meeting the specified test requirements.

2.18.1 Stacking stability

Design features shall ensure a stable stacking configuration. Stacking stability provisions shall, in general, include positive means for restricting relative displacement under impact loads encountered in the shipment of multiple packages. Where the interface between like containers is wood-to-wood, fiberboard-to-fiberboard, or combinations of these two materials, reliance may be placed on friction and palletizing or carloading procedures. Metal and plastic containers shall be provided with interlocking dimples, ribs, or panels. Provision shall be made for banding which prevents movement of staked containers.

Stacking brackets with lips for lateral restraint shall be provided. The design shall allow for the application of tie bars that secure containers together for carloading or truckloading.

2.18.2 Stackability/stacking strength

Unless justified by logistic considerations, each container shall be designed to support a load of like containers placed thereon. The container shall be designed for a load equivalent to a stacking height:

- Of 2 m for containers up to 15 kg gross mass;
- Of 4 m for containers over 15 kg gross mass;

Except that a safety factor of 1.5 shall be used for NATO packaging level 1 and 2 containers to be stowed or transported aboard ships.

The stacking strength shall be tested in accordance with paragraph 3.10.1 and 3.10.2.

2.18.3 Distributed load

The top structure of large, flat-topped containers, such as sheathed crates, shall be designed to carry a uniformly-distributed, long-term static equivalent to that required in paragraph 2.18.2 and shall be tested in accordance with paragraph 3.10.1 and 3.10.2

2.19 HANDLING

Containers shall be provided with lifting, hoisting, and tiedown provisions commensurate with their gross mass, size and intended mode of transportation to ensure safe and efficient movement. Riveted connections shall be used only in pure shear applications.

2.19.1 Handles

Handles shall be provided on all containers between 20 and 75 kg gross mass. If four handles are required, they shall be located conveniently above the center of gravity on the long side for two-man lifting. If two handles are used, they shall be located on the short side perpendicularly above the center of gravity. When required by the design activity, handles or handholds may be put on containers of under 20 kg gross mass to permit convenient one-man handling. Containers may employ moulded-in or structurally integral handles. Where applicable, handles should be recessed within the structural element of the container to provide protection from impact damage. Handles shall be tested in accordance with paragraph 3.11.1, 3.11.2 and 3.11.3.

2.19.2 Handles characteristics

Handles shall have the following and design features:

(a) They shall fold down against the side of the container to prevent accidental impact damage when not in use and stop open at approximately a 90° angle when extend.
(b) The grip diameter for handle loads in excess of 18 kg shall be a minimum of 13 mm. The clear inside dimension shall be a minimum of 133 mm in length and 76 mm in depth. The use of wire rope handles is unacceptable.
(c) When handles are used to lift the loaded container, each handle shall be capable of lifting three times the total gross mass by single-point suspension.
(d) Handles used to lift unloaded containers or covers shall be clearly labeled to avoid misuse, and strength requirements shall be relate only the gross mass of the object to be lifted.

2.19.3 Hoisting

Means shall be provided for hoisting all containers weighing more than 75 kg gross mass. Hoisting provisions shall result in safe and stable handling compatible with the intended logistic cycle. Containers intended for transfer at sea shall be compatible with the transfer system. Containers intended for shipboard use shall have provisions to make them compatible with common shipboard handling equipment used in limited-

access storage areas. Lifting eyes and multipurpose eyes on containers intended for external lift by rotary-wing aircraft shall be provided if required. Hoisting provisions shall have the following characteristics and be located as follows:

(a) Hoisting provisions shall meet the minimum hoisting strength requirements. Each hoisting point shall be capable of lifting three times the total gross mass of the container.
(b) Hoisting provisions which are to be used as tiedown provisions shall meet the strength requirements of tiedown provisions.
(c) Where containers are to be assembled into unit loads without pallets, the set of hoisting provisions shall be capable of supporting five times the total gross mass of the unit load.
(d) Hoisting provisions shall be placed as far from the loaded center of balance as practical to provide the greatest handling stability. Consideration shall be given to specific hoisting sling configuration which may be used so that the spacing of the hoisting provisions will not result in sling leg angles with the horizontal of less than 30 degrees.
(e) Unless the configuration of the hoisting sling is known, the strength of the fitting and supporting structure shall be based on sling leg angles of 30 degrees to the horizontal.
(f) Hoisting provision design shall prevent protrusion beyond the container envelope when not in use.
(g) Hoisting provisions shall not be placed at locations which require the container closure fitting to carry the lifting loads; i.e., containers having a removable section or cover shall not have the hoisting provisions located on this section or cover.
(h) Rings or eyes shall have a clear inside diameter of at least 64 mm where feasible. The use of wire rope cables and straps for lifting devices is inacceptable. The lifting device shall use a solid piece of material.

The hoisting provisions shall be tested in accordance with paragraph 3.11.1, 3.11.2 and 3.11.3, and additionally when also serving as tiedown provisions, in accordance with paragraph 3.11.6.

2.19.4 Tiedown

A minimum of four tiedown provisions shall be provided on all containers having a gross mass of 450 kg or more.

Tiedown attachment design shall be guided by the following:

(a) Tiedown provision for containers to be shipped by air shall be compatible with the attachment points on aircraft floors which, in general, have a capacity of 2270 kg or greater and are placed on 510 mm ± 3 mm centers.
(b) Where tiedown provisions are required, not less than two each on the longest sides shall be used.
(c) Tiedown provisions shall be located as high on the container structure as practical to provide optimum balance of restraint vectors. Clear inside diameter of the tiedown provisions shall be the same as that required for the hoisting provisions (see paragraph 2.19.3).

Tiedown provisions shall be tested in accordance with paragraph 3.111, 3.11.2 and 3.11.6.

2.19.5 Skids

(a) Skids or rubbing strips shall be provided on all containers of over 1 m in the longest dimension or exceeding 75kg gross mass. They shall be arranged to permit handling by forklift trucks and shall permit easy blocking and bracing in carloading and truckloading. Preferred orientation of skids is parallel to the long dimension of the container base if consistent with meeting capability requirements.
(b) Skids attachments shall be tested in accordance with paragraph 3.5.1, 3.5.2, 3.5.8 and 3.5.9, and paragraph 3.12 as applicable.

2.19.6 Forklift truck compatibility

Provisions shall be made to permit access and handling by forklift truck. The following features shall be provided:

(a) Containers of over 1 m in the longest dimension or over 75 kg gross mass shall be capable of being handled safely from at least two sides (four-way entry is preferred but limited to 1200 mm container length and with respectively) by fork-lift trucks of rated capacity appropriate to the gross mass and geometry of the container.
(b) Container with a length greater than 2.44 m which are handled aboard ship must have enclosed fork tine pockets at the opening only. Unless otherwise specified, the dimensions of each pocket (height and width) shall be 100 mm x 150 mm +10/-0 mm. When specified for containers intended for use on ships or in other areas having restricted movement, the dimensions shall be 100 mm x 380 mm +10/ -0 mm. the openings shall be spaced 760 mm +20/ -0 mm apart with the center of gravity located between the inside edge of the forklift pockets.
(c) If the container fork pockets are to be used for unitizing or tiedown, special consideration should be given to the loads and forces which are involved. The maximum inside-to-inside dimension shall be 508 mm. Wooden or wood-reinforced containers may have a single opening 1000 mm wide or more to provide forklift access.

Forklift truck compatibility shall be tested in accordance with paragraph 3.11.1, 3.11.2 and 3.11.3 and paragraph 3.12 as applicable.

2.19.7 Shipboard handling

Containers of over 135 kg gross mass or 90 cm length which are intended to be end-handled by mechanical means aboard combatant or auxiliary naval shops shall have special provisions for handling and stowage in confined and limited access storage areas:

(a) A fitting at each end of the container shall be provided to permit handlift truck handling. Each container fitting shall be capable of supporting three times the maximum mass that it is required to support. The container structure shall be sufficiently stiff to permit a minimum clearance of 75 mm between the bottom of the container and a level deck with the handlift truck in its fully elevated position

and, when tested, in the configuration in which it will be used, i.e., with or without cover applied. The fitting and container structure shall meet the specified strength and test requirements.

(b) Additionally, the container must include features for the sling lifting of the container from the center of balance at two points. The center lift points shall be located on the container base which eliminates the possibility of loading/lifting the entire load through the latches/fasteners. Sling lifting features shall be tested in accordance with paragraph 3.11.1, 3.11.2 and 3.11.4.

2.20 SPECIAL PROTECTION DEVICES

2.20.1 Temperature control

Special provisions for controlling or limiting the extremes of temperature within a container shall be avoided. In those cases where such provisions may be justified and specifically required by the design activity, they shall be as simple and as light-weight as possible. Detailed design requirements shall be established on a case-by-case basis by the design activity by consideration of the thermal properties of the item to be protected and the temperature environment in which it must survive.

2.20.2 Protection against the effects of static electricity

The container intended for the protection of contents sensitive to the effects of static electricity shall be designed to comply with the requirements of AEPP-2 and with the rules provided therein for loading and unloading such containers and handling the contents. In particular, the effect of static electricity on the contents of the container and the environments in which it will be unloaded shall be considered in the design of the containers. Solid propellant motors normally do not require bonding to the container or grounding while in the container. In those instances where a potential hazard exists, the design shall prevent build-up of a static charge or provide a conducting path to ground by one or more of the following practices:

(a) Firm metal-to-metal contact to provide an acceptable ground.

(b) Items suspended in a shock-mounted cradle are grounded to the container structure. If the container structure is non-metallic, a clearly identified metallic external grounding connection shall be provided. Maximum resistance of the ground path shall be 1 Ohm.

(c) Materials in contact with the package contents (bare idem) shall satisfy the requirements of AEPP-2.

2.20.3 Field force protection

When the contained item is susceptible to damage from electrostatic, electromagnetic, magnetic, or radioactive forces, the container shall be designed to provide the required protection from the appropriate field force.

2.20.4 Magnetic shielding

Containers for items which are considered magnetic and which may be shipped by air shall be provided with appropriate shielding.

2.21 CONTAINERS SURFACES PROTECTION

(a) Painting, when required, e.g., for protection against corrosion or against emission of infra-red emission, or to provide camouflage, shall meet health and environmental protection guidelines.
(b) Exterior surfaces, when applicable, may be painted with a chemical agent resistant coating (CARC). For aluminium containers, glass bead blasting may be considered as a means to reduce life cycle maintenance costs of the containers in lieu of painting.
(c) Interior surfaces of closed containers need to be painted with primer only.

2.22 CONTAINER MARKINGS

2.22.1 Container identification markings

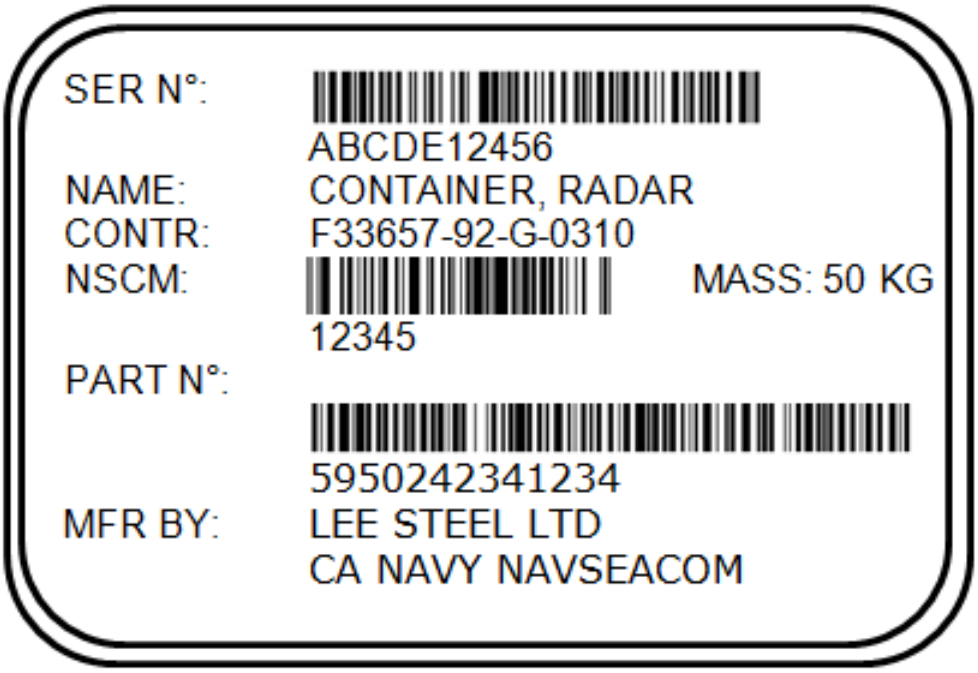
(a) The identification marking may include the marking listed in Figure 1. The marking may be applied to an identification plate (Figure 1) whenever suitable. The identification plate shall be securely fastened to the container wall such a manner as to allow its being visible during storage, handling and transportation operations. Marking methods and criteria for their selection are contained in TABLES I and II.
(b) Additional information may be integrated into the identification plate or may be applied adjacent.
(c) Permanent information including bar coding may be included on a plate separate from the variable information (Figure 2).

1 Configuration item identification
2 Bar coded – serial number
3 Serial number
4 Acquisition instrument identification number
5 Nomenclature (item name & type designation)
6 Special characteristics
7 Design activity (NSCM)
8 Bar codes – identification part number (when NATO stock number not available)
9 Identification part number
10 Bar coded – manufacturer identification (NSCM)
11 Manufacturer NSCM
12 Bar coded – NATO stock number
13 NATO stock number
14 Packaging level (PL)
15 Government ownership designation

NOTES:

1: This example is given only as a guide and should not be considered a mandatory format
2: Ear code density will be 2.56 to 3.70 cpcm height minimum 3.175
3: Item 3, 9, 11 and 13 shall be used for human readable interpretation (HRI) purposes for the associated bar code

FIGURE 2-1: Example of identification plate



NOTE:

All bar codes contain “START/STOP” characters that are not printed in the human readable interpretation. Therefore, a bar code that appears to be 13 characters long is actually 15.

FIGURE 2-2: Example of bar code marking identification plate

Table 2-I: MARKING METHODS

(This table is given as a guide and these methods are not mandatory.)

Marking Methods	Depth of Marking (mm)	Recommended use
Metal stamp	0.30	Metal or nonmetal parts that will not deform under the stamping pressure required. Also, the alternation of the surface roughness finish will not be detrimental to proper functioning.
Engraving	0.10 – 0.30 0.30 – 0.40	Sheet metal fabrication that will deform if metal stamped. Functional markings with coloured filler.
Electric arc pencil	0.20	Sheet metal fabrication that will deform if metal stamped, irregular surfaces.
Cast of forged	0.30 – 1.0	Castings or forgings – characters raised or depressed depending on method of manufacture, unless otherwise specified on the drawing. Markings should be used on non-machined surfaces only.
Moulded	0.10 – 0.30	Usually plastic or rubber parts, may be either raised or depressed, unless otherwise specified.
Electro-chemical etch (electrolytic process)	0.001	Characters normally depressed, but may be raised. Used on fine surface finishes without protective coatings, also high hardness parts (RC 50 or higher)
Rubber stamp stencil		Fabrics, woods, plastics. On metal parts with protective finishes (i.e., phosphate) cover with clear lacquer. Apply before oiling. Also temporary markings; work in progress.
Decalcomania		Instructional plates, part identification, when other methods are not suitable, temporary marking – protect with clear lacquer. Apply before oiling.
Metal or plastic tags		When other methods are not suitable.

NOTES:
For bar code application, reference STANAG 4329.
Polymerizing inks, paints, epoxies, or urethane may be used without an overcoat when specified by the contract or controlling specification. Apply any of these methods before oiling.

Table 2-II: Criteria in selection of marking methods.

(This table is given as a guide and these criteria should not be considered as mandatory.)

Protective finish	Surface roughness	Marking method	Remarks
Not protective finish or coating of light oil applied after marking	3.2 mm or coarser	Cast, forged, moulded	Specify raised or depressed only when necessary, use nonmachined surfaces.
		Metal stamp	On machined surfaces.
	Less than 3.2 mm to 1.6 mm	Moulded. Engraved metal stamp. Electro arc pencil	Remove raised metal or burrs by light stoning if necessary for satisfactory functioning.
	Finer than 1.6 mm	Electro-chemical etch (electrolytic process)	Specify depressed when marking a functional surface.
Phosphate, dry film, anodize or plating	3.2 mm or coarser	Cast, forged, moulded, metal stamp	As above, plus mark prior to application of finish
	Less than 3.2 mm to 1.6 mm	Moulded, engraved metal stamp. Electric arc pencil	As above, plus mark prior to application of finish
	Finer than 1.6 mm	Decalcomania	Apply over protective coating. Before oiling, cover with clear lacquer.
	All surfaces	Rubber stamp. Stencil	Apply over protective coating. Before oiling, cover with clear lacquer.
Paint	All surfaces	Rubber stamp. Stencil. Decalcomania	Apply over protective coating. Before oiling, cover with clear lacquer.
Epoxy or urethane coating	All surfaces	Rubber stamp. Stencil. Marking machine. Decalcomania. Hand brush	For marking of printed wiring boards and assemblies. Epoxy base fungus resistant, nonconducting ink may be used.

2.22.2 Elucidation of identification markings

(a) Acquisition instrument identification number

The Government acquiring activity's contract or purchase order number. When an order shows both a contract number and a purchase order number, the number shall be as specified by the acquiring activity.

(b) Bar code

An array of rectangular bars and spaces in a predetermined pattern.

(c) Configuration item identification (CII number)

The alpha number assigned to identify a configuration item. When assigned, it is the unchanging base number to which serial numbers are assigned.

(d) Design activity

The activity having responsibility for the design of an item. It may be a Government activity, contractor, vendor, or others.

(e) Identifying number

The number used to identify an item. It is assigned by the design activity whose engineering drawings, specifications, standards, and inspection requirements control the design of the item. It may be a specification, drawing, part, model, type, catalog, etc., number depending on the numbering system of the design activity.

(f) Manufacturer's identification (NSCM)

The actual manufacturer's name.

(g) NATO stock number (NSN)

The NSN is a 13-digit number divided into two parts:

Federal supply classification (FSC) number. The first four digits are the FSC number and establish its relationship to other items identified within the same FSC.

National item identification number (NIIN). The last nine digits are the NIIN. This is a semi significant number of which the first two digits are the National Codification Bureau code identifying the country assigning the number. The remaining seven numbers are non-significant serially assigned number. The NIIN fixes the identity of an item of supply and differentiates it from all other items of supply.

(h) NATO supply code for manufacturer (NSCM)

The five character alpha numeric code that is assigned to an organizational entity, located in a country other than the United States or Canada, that maintains design control or is a source of supply for items acquired by agencies of the NATO member nations and other participating friendly governments.

(i) Nomenclature

Unless otherwise specified by the acquiring activity, the nomenclature shall be the approved item name listed in the Government type designation (if assigned by the acquiring activity) plus such additional words as may be necessary for identification.

Where space precludes the spelling out of the nomenclature, abbreviations may be used except that the basic noun or noun phrase shall be spelled out.

(j) Serial number (SER NO)

The unique notation which identifies a single unit of a family of like units, normally assigned sequentially. The identifier “SERNO” may be used to avoid confusion with other identifiers, where marking space allows.

(k) Special characteristics

The pertinent rating operating characteristics, and other information necessary for identification of the item.

2.22.3 Markings for shipment and storage

All markings shall be applied in accordance with STANAG 4282. As required, all basic instructional and operating caution marking for safe, expeditious handling and use of the container shall be provided.

These markings may include:

- Center of balance,
- Forklift and stacking points,
- Identification of any special sling needed,
- Document receptacle,
- Desiccant receptacle,
- Pressure relief valves,
- Humidity indicator,
- Hoisting and tiedown attachment points,
- Warning notes,
- Instructions for opening, closing and repressurizing the container.

CHAPTER 3 TEST REQUIREMENTS

3.1 GENERAL

The complete container shall be tested in order to confirm the required properties. A test programme shall be developed which reflects the constraints of that environment in which the container will be later used. The following chapter contains:

- The criteria for the selection and application of the test methods to be applied,
- The test severity requirements,
- The criteria for the acceptance of test results.

The test requirements defined below apply to all containers except containers for special purposes or special contents such as ammunition, nuclear weapons, etc.

3.2 DUMMY LOADS

(a) Dummy loads may be used during container development and testing when:

- Items of supply are not available,
- Items are very sensitive to the testing constraints and damage to these items must be anticipated,
- Items are too expensive to be used as test package contents.

(b) The dummy characteristics specified below shall be identical to those of the object (item) being simulated (within the tolerance envelope of the real end items):

- Envelope dimensions,
- Mounting points or external hard area geometry and strength,
- Mass, centre of gravity, and radii of gyration in the three principal axes.

3.3 INSTRUMENTAL REQUIREMENTS

When required, the contained item shall be suitably instrumented and date shall be collected during testing to ensure established fragility levels are not exceeded. Unless otherwise specified, shock spectra in the major directions assuming not more than 5 percent damping shall be obtained either at the centre of gravity, at the extremities of the dummy load, or at points at which the fragility is clearly defined.

3.4 FIT AN COMPATIBILITY

3.4.1 General

The container shall be designed to be compatible with the contained item. It shall permit easy loading and unloading. It shall be compatible with the normal logistic patterns for its contents as well as with any special requirements being specified as design constraints. The container shall be designed so that the intended load will fit securely but without interference or binding. It shall support and restrain the item at points and by methods which are not likely to result in damage due to careless

manipulating or handling. Loading and unloading shall be a simple process by the handling equipment intended to be available at the points of use.

3.4.2 Fit test

(a) This test shall be conducted by bringing together the container and the intended contents (load). The loads shall be placed in position and the container shall be assembled in its normal shipping condition by fitting the cover, fastening all restraining devices, putting desiccant in place, and otherwise completely securing the container for shipment. The container shall then be unloaded.
(b) Only the normal handling equipment likely to be available at points of loading and unloading may be used. Care shall be exercised to ensure that both the container and the load are representative of the final configuration and that normal dimensional variations are considered.
(c) A lack of “fit” or extreme awkwardness during the necessary loading and unloading process is cause for rejection. Loading and unloading times shall be recorded if such times are a specified design constraint. Not meeting specified loading or unloading times with the specified number of appropriately qualified personnel shall be cause for rejection.

3.5 MECHANICAL SHOCK

3.5.1 General

Containers shall be designed to protect their contents from damage resulting from exposure to different kinds of mechanical shocks likely to be encountered during transport and handling. These shocks shall be simulated by the following tests.

3.5.2 Acceptance criteria

The function of a container shall not be impaired by the shock test. Significant evidence of one or more failures of the following shall be cause for rejection:

(a) Damage to the contents of container. (Visible damage or failure of the function of the item to be protected, recorded in a test run).
(b) Failure of the container’s energy-absorbing system (cushioning system/shock isolation system) to protect the contents to the fragility level required as a design constraint for the container.
(The fragility level can be expressed as a maximum permissible shock spectrum or as a maximum permissible shock acceleration level (g level) along with resonant frequencies of sensitive elements of the container contents.)
(c) Failure of a water-vapourproof or waterproof container to prevent water vapour transmission or water leakage within the specified limits.
(d) Failure of the container to retain the contents.
(e) Failure of the container to permit continued handling.
(f) Loosening of retraining material or devices which may permit contents to be damaged if further handling experienced.

(g) Permanent deformation of any portion of the container that affects its functional performance throughout the anticipated logistic cycle.
(h) Evidence of the contents striking the container walls.

3.5.3 Temperature combined with shock

Container designs using materials which may be affected by temperature variations should be subjected to shock tests, described in the following, at the extremes temperatures which may be expected in service. Temperatures extremes may be:

(a) For normal climatic (such as in Europe):
63°C ±3°C / -33°C ± 3°C
(b) For extreme climatic conditions (such as in desert, tropical and artic zones):
71°C ± 3°C / -51°C ± 3°C.

3.5.4 Drop test

This test is primarily intended to verify the effectiveness of the protection against the occurrence of drops to be anticipated during handling and transportation and may also reveal weaknesses of the container structure, closure devices and the shock isolation within the container.

The test shall be conducted in accordance with AEPP-3, procedures C, D and E.

3.5.5 Topple test

This test shall be applied to containers of which the contents are vulnerable to bending. The test may also be applied when the position of the centre of gravity is higher than the geometric centre such that the container has a tendency to topple when transported or stored.
The test shall be conducted in accordance with AEPP-3, procedure G.

3.5.6 Bending test

This test shall be applied to containers with contents which are vulnerable to damage through bending when lifting, or when the ability to withstand compressive loads across their section is required in storage and in transportation.
The test shall be conducted in accordance with AEPP-3, procedure B

3.5.7 Flexing (racking) test

This test shall be applied to containers when their contents are liable to become damaged through twisting when lifted or transported under conditions which would produce twisting.
The test shall be conducted in accordance with AEPP-3 procedure F

3.5.8 Horizontal impact test

Containers are exposed to side and end impacts arising during handling operations and transportation. These impacts occur in crane lifting, during shunting and violent braking operations and other abrupt movements of the transporting vehicle. This test, to be conducted in accordance with AEPP-3, procedure J simulates these movements and is intended to assess the effectiveness of the physical protection provided by the

container and by the method of location, i.e., by the shock isolation system within the container.

3.5.9 Impact (horizontal) test stacked

Containers likely to be stacked and shipped in rail cars shall be designed to survive shunting operations. The test shall be identical to the impact test of 3.5.8 except that the normal number of containers shall be unitized in the stacked shipping configuration. One impact shall be made on each end of the bottom container. Dummy contents may be used. Evidence of failure of the connecting structures which would permit any of the containers to become unattached shall be cause for rejection.

3.5.10 Transfer-at-sea shock test

Containers planned for transfer-at-sea for horizontal or vertical replenishment shall be designed to withstand the shocks associated with the mode of transfer to be anticipated. The loaded container shall be subjected to a 460 mm flat drop on the bottom in accordance with AEPP-3, procedure C and one horizontal impact on each of the four sides at in accordance with AEPP-3, procedure J. Following this test, the container shall continue to protect the contents and shall not be damaged in any way that would prevent continued safe handling.

3.5.11 Bounce (wheeled vehicle transportation) test

(a) This test shall be performed in accordance with AEPP-3, procedure M, and unless otherwise specified, be conducted at ambient temperature. The temperature of the resilient mounts shall not be allowed to exceed the safe operating temperature of the elastomer.
(b) When containers are likely to be shipped by truck or railway in stacked position two or more layers high, they shall be tested using a superimposed load and an interface equivalent to the anticipated superimposed mass of like containers.

3.6 VIBRATION TEST

3.6.1 General

Containers which may employ energy-absorbing devices for shock isolation purposes, or which have sufficient structural flexibility that resonances below 50 Hz may be created, shall be designed to satisfactorily survive exposure to an appropriate vibration fatigue test. Dummy loads, as defined in paragraph 3.2, may be used. The isolation system should meet the requirements of the paragraph 3.5 and the following:

(a) Peak transmission across the isolators in the major translational modes of vibration (as measured during resonance search portion of the test of paragraph 3.6.3) should not exceed 5.0 if the resonant frequency is less than 15 Hz, 8.0 if the natural frequency in the major translation is between 15 Hz and 25 Hz, and 10.0 from 25 Hz to 50 Hz.
(b) If consistent with the shock requirements of paragraph 405 and other design considerations, the resonant frequency in the major translation modes of vibration should be above 7.5 Hz.

3.6.2 Acceptance criteria

The container and the vibration isolation system shall continue to perform their function following the vibration test. Evidence of any following shall be cause for rejection:

(a) Damage to the contents of the container (visible damage or failure of the functions of the item to be recorded during function tests).
(b) Structural failure of the vibration isolation system.
(c) Failure of the isolation system to meet the transmissibility or resonant frequency requirements specified.
(d) Excessive looseness of the contents in the devices of the vibration isolation system.
(e) Failure of the isolation system to prevent contents from striking container walls.
(f) Leakage according to the criteria given in table III If the container is intended to be leakproof.
(g) Excessive rotation or shifting of the contents which would cause damage or prohibits easy removal of the contents out of the container.

3.6.3 Resonance strength and dwell test

(a) The container, in its normal position, shall be rigidly attached to a vibration exciter. Suitable instrumentation shall be used to obtain transmissibility data at the points of interest. A search for resonance shall be conducted by applying sinusoidal vibration or other forms of vibration excitation in the vertical direction. Transmissibility data shall be obtained for the fundamental translational vibration mode over a frequency range of 5 Hz to 50Hz minimum.
(b) Input vibration within a frequency range of 5 Hz to 350 Hz shall follow a schedule level associated with the intended logistic cycle as defined by the design activity. The sweep rate shall be approximately one half octave per minute, and the total time shall be 7.5 minutes.
(c) A dwell test of 30 min. total duration (the test may be interrupted if necessary to prevent excessive temperature rise of resilient materials) shall be conducted at the predominant resonance. The input excitation for the dwell test shall be equal to that used during the sweep test at that frequency. Adjustment in frequency may be necessary during the course of the test to compensate for shifts in resonant frequency due to temperature rise of the elastomer. If the logistic environment is undefined, the input vibration for the search and dwell tests shall be 3.2 mm double amplitude or 1 g (0 to peak) whichever is the lesser value.

3.7 SHOCK MOUNT AGEING

Shock mounts in free-breathing containers shall be capable to withstand the influence of the atmosphere and shall be, dependent on the materials used, exposed to the following tests.
The shock mounts shall pass these tests without any damage.

3.7.1 Salt fog test

The shock mount shall be tested in accordance with AECTP 300, method 309 “salt fog”. The mount shall be alternately exposed to salt fog and standard ambient (drying) conditions for a minimum of four 24-hour periods (2 wet and 2 dry).

3.7.2 Ozone resistance test

The shock mount consisting of elastomers shall be tested in accordance with ISO 1431, part I “Static strain test”. The mount shall be subjected to an ozone concentration of 50 parts per hundred million at 40°C. The test period shall be 168 hours.

3.7.3 Air-heat ageing test

The shock mount shall be tested under 20 percent strain in accordance with AECTP-300, method 302, test procedure I “High temperature storage”. The shock mount shall be subjected to this test at a constant temperature of 80°C ± 1°C for an ageing of 168 hours.

3.8 STRUCTURAL INTEGRITY

3.8.1 General

Integral barrier containers (non-breathing, controlled-breathing, free-breathing, or dynamic dehumidification) shall be designed to withstand internal pressures or vacuum as indicated by the design pressure of table III.

3.8.2 Pressure test

The container shall be prepared and tested in accordance with AEPP-3, procedure R, “Pneumatic pressure method”. The test shall be conducted by raising the internal pressure so that the required pressure differential (Table III) is obtained.

WARNING

Container may explode or fasteners may fail during this test! Use protective barriers to avoid injury to personnel.

3.8.3 Vacuum test

The test shall be conducted in accordance with AEPP-3, procedure R, “Vacuum retention method”, except that the internal pressure shall be reduced so that the pressure differential exceeds the rated no-leak pressure of the vacuum relief valve by 3 kPa.
Permanent structural deformation shall be cause for rejection.

3.9 LEAKAGE INTEGRITY

3.9.1 General

Integral barrier containers shall be designed to prevent leakage from the inside of the container when subject to the pressure drop criteria given in Table III. Leakage requirements apply following shock, vibration, and handling tests.

3.9.2 Leak test

The container shall be prepared for testing by sealing all breathing devices and inserting suitable pressurizing fittings and gauges. The container shall be closed and sealed as it would be in service. The containers shall be pressurized, and/or a vacuum shall be accomplished in accordance with the requirements of Table III.

The leakage of air shall be tested in accordance with AEPP-3, procedure R, “Vacuum retention method” or “Pneumatic pressure method” as applicable.

Table 3-I: Pressure, vacuum, and leakage requirements
For integral barrier containers.

Barrier type container	Structural integrity		Leakage integrity	
	Design and test pressure (see para 3.8.2)	Rejection criteria (see para 3.9.2)	Leak test pressure	Rejection criteria
Non-breathing	103 kPa -21 kPa	See note (3)	34 ± 3 kPa	Continuous formation of bubbles (by either immersion or soap solution test method)
Controlled-breathing	24 kPa (1) -17 kPa (1)	See note (3)	17 ± 1.7 kPa (2) -10 ± 1.7 kPa (2)	Pressure drop exceeds 0.3 kPa per hour (corrected for variations in air temperature and ambient pressure)
Free-breathing	3 kPa	See note (3)	1.7 kPa +0.9 - 0.0	Pressure drop of greater than 95% per hour
Dynamic dehumidification	1 kPa	See note (3)	0.25 kPa +0.03 -0.01	Pressure drop of 95% in less than 24 hours

Notes:

(1) This is a design objective. The design pressure may be modified and also reduced in specific cases if fully justified by either the size of the container or its logistical and operational environment. In no case shall the design pressure be less than the pressure at which the minimum flow rate of the relief valve was established.

(2) Based on the use of a pressure relief valve in accordance with ANNEX A, having cracking pressures of 17 kPa for pressure relief and -10 kPa for vacuum relief. If a valve having different characteristics is used, the leak tests shall be performed at the cracking pressure of the relief valve.

(3) Rejection criteria:

(a) Failures of any part of the container structure, especially permanent deformations.
(b) Failure of closure devices, such as loosening or breaking.
(c) Displacement of lid or cover.

3.10 SUPERIMPOSED LOAD

3.10.1 General

Containers shall be designed to permit the stacking of a like or uniformly distributed load, without structural failure of the stacking features or damage to the contents. Deformation resulting in damage to the contents or in any unsafe stacking shall be cause for rejection.

3.10.2 Stacking test

Proof of adequate stacking strength shall be tested in accordance with AEPP-3, procedure A and with the requirements of paragraph 2.18.2. If the principal container structure is a plastic or other material with a tendency to creep or deteriorate when exposed to elevated temperatures and/or very humid conditions, the stacking test shall be conducted at a temperature of 49°C ±3°C and 90 percent relative humidity for a period of 168 hours.

3.10.3 Distributed load test

Containers required or expected to support a uniformity distributed load in storage or transport shall be tested in accordance with ANNEX B.

3.11 HOISTING AND LIFTING PROVISIONS, TIEDOWN ATTACHMENT POINTS, SLING LIFTING FEATURES

3.11.1 General

Containers requiring handling by crane or fork lift because of their size and gross mass shall be equipped with a set of hoisting or lifting provisions. If the containers require tiedown to the cargo platform of rail carriages and lorries and/or to the cargo floor of transport planes they shall be fitted with tiedown attachment points.

3.11.2 Acceptance criteria

Each hoisting or lifting provision or set of provisions and each attachment point shall be identified and shall be capable of safely supporting the required test load. Evidence that the hoisting or lifting provisions or attachment point show the following conditions shall be cause for rejection:

(a) Failure of any part of the hoisting, lifting or tie down structure.
(b) Creation of any unsafe handling condition.
(c) Permanent deformation of any part of the hoisting, lifting or tiedown provisions or supporting structure.
(d) Creation of awkward handling, excessive time consuming or potentially dangerous handling practices.

3.11.3 Hoisting provisions strength test

Each set of hoisting provisions or handles, each single hoisting provision or handle shall be tested in accordance with AEPP-3, procedure L, test “Sling handling with attachments” and paragraph 2.19.1, 2.19.2 and 2.19.3. If any part of the hoisting or handle structure is a plastic or a non-metallic, the test duration shall be 1 hour.

3.11.4 Container hoisting strength test

Containers without hoisting provisions shall be tested in accordance with AEPP-3, procedure L, test “Underslung handling” and paragraph 2.19.7.(b).

3.11.5 Lifting provisions strength test

Lifting provisions for fork lifting and use of grabs shall be tested in accordance with AEPP-3, procedure L, test “Lifting and transporting by forklift truck” and test “Hoisting with grabs” and paragraph 2.19.6.

3.11.6 Tiedown strength test

The tiedown provisions/attachments shall be tested in accordance with AECTP 400, method 407 “Tiedown” and paragraph 2.19.4. The test load shall be specified according to ANNEX A to the above method taking into account the rules / specifications / standards for military transport planes, rail carriages and lorries in which the container is intended to be transported.

3.12 FORKLIFT COMPATIBILITY TEST

(a) Containers requiring transportation and handling because of mass and size shall be tested in accordance with AEPP-3, procedure L, tests “Lifting and transporting forklift truck”, “Pushing” and “Towing”.
(b) When the container is more than 1150 mm wide or more than 2300 mm long, the tests “Pushing” and “Towing” shall be repeated with one end of the container lifted off the ground 150 mm by the tips of the forks between the lids.
(c) The container structure and the skids shall survive the tests without failure or permanent deformation. The handling provisions shall be convenient to use and shall generate no unsafe condition or practice.
(d) When the container is fitted with fully captive fork tine enclosures, the test “Lifting and transporting by forklift truck” shall be modified to require a first pass with fork tines in the back-tilt position over nominal 50 mm x 100 mm instead of 25 mm x 100 mm boards carrying the specimen(s) in the handling configuration prescribed by the cognizant procuring activity followed by a prompt turn-around maintaining the required speed and proceeding with a second pass in the opposite direction with fork tines in the level position over the 30 m course.

ANNEX A Valve, pressure equalizing, gaseous products

(Direct extract from MIL-V-27166C, metrication excluded)

A.1. SCOPE AND CLASSIFICATION

A.1.1. Scope

This annex covers the requirements for low pressure relief valves for use in containers:

A.1.2. Classification

Type I – Vacuum relief

Reseal pressure 3400 Pa (1/2 psig)
Reseal pressure 6900 Pa (1 psig)
Reseal pressure 13800 Pa (2 psig)
Reseal pressure 20700 Pa (3 psig)

Type II – Pressure relief

Reseal pressure 1700 Pa (1/4 psig)
Reseal pressure 3400 Pa (1/2 psig)
Reseal pressure 6900 Pa (1 psig)
Reseal pressure 13800 Pa (2 psig)
Reseal pressure 20700 Pa (3 psig)
Reseal pressure 34500 Pa (5 psig)

Type III – Pressure and vacuum relief

Reseal pressure 3400 Pa (1/2 psig) pressure 3400 Pa (1/2 psig) vacuum
Reseal pressure 6900 Pa (1 psig) pressure 3400 Pa (1/2 psig) vacuum
Reseal pressure 6900 Pa (1 psig) pressure 6900 Pa (1 psig) vacuum
Reseal pressure 13800 Pa (2 psig) pressure 6900 Pa (1 psig) vacuum
Reseal pressure 13800 Pa (2 psig) pressure 13800 Pa (2 psig) vacuum
Reseal pressure 20700 Pa (3 psig) pressure 13800 Pa (2 psig) vacuum
Reseal pressure 34500 Pa (5 psig) pressure 13800 Pa (2 psig) vacuum

A.2. APPLICABLE DOCUMENTS

A.2.1. Issues of documents

The following documents of the latest issue specification apply to the extent specified herein.

STANDARDS & SPECIFICATIONS
Military

MIL-S-7742	Screw threads, standard, optimum selected series, general specification for (INACTIVE)
MIL-STD-130	Identification marking of U.S. military property
MIL-STD-810	Environmental test methods and engineering guideline
MIL-HDBK-831	Preparation of Test reports (handbook)
MIL-STD-889	Dissimilar metals
MIL-STD-3010	Test procedures for packaging materials and containers

STANDARDS
Military

ANSI / ASQ Z1.4	Sampling procedures and tablesfor inspection by attributes
ISO-10012	Calibration systems requirements
ANSI-Z540-3	
SAE-AS71051	Pipe threads, taper, aeronautical national form, symbol ANPT, design and inspection standard

A.2.2 Other publications

The following documents form a part of this specification to the extent specified herein.

The American Society of Mechanical Engineers (ASME) ASME Y14.5 - 2009 dimensioning and tolerancing (Application for copies of ASME Y14.5 - 2009 should be addressed to ASME International, 02 Park Avenue, New York, NY 10016-5990)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using federal agencies).

A.3 REQUIREMENTS

A.3.1. First article

This specification makes provisions for first article testing (see A.4.2).

A.3.2. Selection of specifications and standards

Specifications and standards for necessary commodities not specified herein shall be selected as specified in paragraphs A.3.2.1 and A.3.2.2.

A.3.2.1. Commercial parts

Commercial parts having suitable properties may be used where, on the date of invitation for bids, there are no suitable standards parts. In any case, commercial utility

parts, such as screws, bolts, nuts, and cotter pins, having suitable properties may be used provided:
They can be replaced by the standard parts (MS or AN without alteration)
The corresponding standard part numbers are referenced in the parts list, and, if practicable, on the contractor's drawings.

A.3.2.2. AN and MS standard parts

With the exception specified in A.3.2.1, AN and MS standard parts shall be used where they suit the purpose. They shall be identified on the drawings by their part numbers.

A.3.2.3. Part numbering of interchangeable parts

All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of MIL-STD-3100 shall govern manufacture's part numbers and changes thereto.

A.3.3. Materials

All materials shall be as specified herein. Materials not specified shall be of the best quality used for the purpose in commercial practice. The materials shall be free from all defects or imperfections that might affect the serviceability of the finished product. Recovered or recycled materials may be used provided the end product is capable of passing the first article tests.

A.3.3.1. Metals

Metals shall be of the corrosion-resistant type or suitably treated to resist corrosion or atmospheric conditions likely to be met in storage or normal service. MIL-STD-889 shall be utilized to determine compatibility of metals from which the valves are fabricated.

A.3.3.2. Protective treatment

When materials used in the construction of the valves are subject to deterioration when exposed to climatic and environmental conditions likely to occur during service use, they shall be protected against such deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification. The use of any protective coating that will crack, chip, or scale with age or extremes of climatic and dynamic conditions shall be avoided.

A.3.3.3. Non-metals

When utilized, non-metallic part such as packings, interior gaskets, and valve seats shall be of the oil-resistant type.

A.3.3.4. Exterior gaskets

Exterior gaskets for sealing valves to the container shall be made of rubber conforming to MIL-R-6855, class 2, grade 60. No additional sealing material shall be required.

A.3.4. Construction

A.3.4.1 Gasket seat

Valves employing exterior gaskets for sealing to containers shall provide grooves for seating of the gaskets. The depth of the groove shall not be less than 65 percent nor more than 85 percent of the original gasket thickness.

A.3.4.2. Castings

When used, castings, shall be of high quality, clean, sound, end free of blow-holes, porosity, cracks, and other defects which may adversely affect the valve performance.

A.3.4.3. Valve body

Unless specifically approved by the procuring agency, non-metallic materials shall not be used in the construction of the valve body.

A.3.4.4. Mounting devices

Locknuts or other suitable devices shall be provided for the installation of valves with self-contained locking devices.

A.3.5. Design

A.3.5.1. Maintenance

The design of the valve shall be such that installation and removal from containers may be accomplished with common hand tools.

A.3.5.2. Special features

Special features, such as manual relief devices, to permit equalization of pressure prior to opening the container, or filters to limit the entrance of sand or dust, may be used, provided they do not interfere with the other requirements of this specification.

A.3.5.3. Lubrication

The design of the valve shall be such that lubrication shall not be required for operating during the service life.

A.3.5.4. Screw threads

All screw threads shall be in accordance with ISO 68-1 (metric screw threads) & ISO 68-2 (inch screw threads).

A.3.5.5. Locking of parts

All internal and external threaded parts shall be capable of being locked.

A.3.5.6. Pipe threads

Pipe threads shall be in accordance with SAE-AS71051.

A.3.5.7. Dimensions

Dimensions and tolerances shall be in accordance with ASME Y14.5-2009. Where dimensions and tolerances may affect interchangeability, consistent operation, or performance of the valve, they shall be limited accordingly.

A.3.5.8. Weight and size

Weight and size of the valve shall be as small as possible consistent with the requirements specified herein.

A.3.6. Performance

A.3.6.1. Reseal

The valve reseal pressure shall be specified by the using activity (see A.6.2). Valve reseal pressure shall be within ±1700 Pa (± 25 psig) of the specified value when 6900 Pa (1 psig), or more, and within + 1700 Pa (+ 25 psig) and – 0 Pa of the specified value when less than 6900 Pa (1 psig). The valve shall not leak at a rate of 1 cm^3 of standard air per minute or more in the flow direction at the specified reseal pressure when tested as specified in paragraph A.4.6.1.2.

A.3.6.1.1. Leakage

Type I and 2 valve shall not leak at a rate of 1 cm^3 of standard air per minute or more in the reverse flow direction at a pressure differential of 68900 Pa (10 psig) when tested as specified in paragraph A.4.6.1.2.

A.3.6.2. Minimum flow rate

The valve minimum flow rate shall be specified by the using activity (see paragraph A.3.6.3). When tested as specified in paragraph A.4.6.1.2, valve minimum flow rate shall be determined at a differential pressure 10300 Pa (1.5 psig) greater than the reseal pressure in the flow direction.

A.3.6.3. Minimum flow rate calculations

Calculations shall be made as follows by the valve using activity, to determine the minimum flow rate required to protect the container:
Minimum flow rate m^3/min. (ft^3) = (Vc-Vm)0.12
Where Vc = volume of container m^3 (ft^3)
Vm = volume of material in container m^3 (ft^3)

A.3.6.4. Operating life

The valves shall withstand 2500 cycles, at ambient conditions, from the closed position to the open position for either or both positive and negative differentials, as applicable for the type concerned.

A.3.6.5. Environmental tests

The valves shall be capable of withstanding without degradation of performance attributes the following environmental conditions when tested as specified in paragraph A.4.6.3.

A.3.6.5.1. Temperature

Temperatures ranging from - 62.2°C to +71.1°C (- 80°F to +160°F) during operation and nonoperation.

A.3.6.5.2. Humidity

Relative humidity up to 95 percent at 71.1°C (160°F) during operation and nonoperation.

A.3.6.5.3. Vibration

Vibration incident to service use during operation and nonoperation.

A.3.6.5.4. Sand and dust

Sand and dust particles encountered in desert areas and conditions during operation and nonoperation.

A.3.6.5.5. Rough handling

Rough handling which may be encountered during shipping and service life.

A.3.6.5.6. Salt fog

Exposure to salt atmosphere as encountered in coastal areas.

A.3.7. Identification of product

The valves shall be marked for identification in accordance with MIL-STD-130.

A.3.8. Workmanship

All parts of each valve shall be constructed and finished in accordance with good commercial practice. Particular attention shall be given to the machining of mating parts, finish of sealing surfaces, freedom of parts from burrs and sharp edges, and the removal of chips and other foreign material prior to and following assembly.

A.4. QUALITY ASSURANCE PROVISIONS

A.4.1. Responsibility for inspection

Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein.

A.4.2. Classification of inspections

The inspection and testing of valves shall be classified as follows:

(a) First article inspection (see paragraph A.4.3)

(b) Quality conformance inspection (see paragraph A.4.4)

TABLE I. First article inspection tests		
Test	Requirement	Method
Quality conformance		4.6.1
a. Cycling		4.6.1.1.
b. Reseal	3.6.1	4.6.1.2
c. Leakage	3.6.1.1	4.1.6.2
d. Flow rate	3.6.2	4.1.6.2
Operating life	3.6.4	4.6.2
Environmental	3.6.5	4.6.3
a. High temperature	3.6.5.1	4.6.3.1
b. Low temperature	3.6.5.1	4.6.3.2
c. Humidity	3.6.5.2	4.6.3.3
d. Vibration	3.6.5.3	4.6.3.4
e. Sand and dust	3.6.5.4	4.6.3.5
f. Rough handling	3.6.5.5	4.6.3.6
g. Salt fog	3.6.5.6	4.6.3.7

TABLE II. Quality, conformance, inspection tests		
Test	Requirement	Method
Cycling		4.6.1.1.
Reseal	3.6.1	4.6.1.2
Leakage	3.6.1.1	4.1.6.2
Flow rate	3.6.2	4.1.6.2

A.4.3. First article inspection

First article inspection shall be performed by the contractor, after award of contract and prior to production. First article inspection shall be performed on sample units which have been produced with equipment and procedures normally used in production. First article approval is valid only on the contract under which it is granted. A certified test report in accordance with MIL-STD-831 shall be submitted to the cognizant engineering activity.

A.4.3.1. Waiver of first article tests

If a particular valve has been delivered and a certified first article test report for that valve has been submitted to the cognizant engineering activity, first article for like

valves shall be waived. When the first article tests have been waived, the contractor shall certify that the valve will conform to the requirements of this specification.

A.4.3.2. Test samples

The first article test samples shall consist of 3 valves of each manufacturer's part number to be tested, and shall be representative of the production valves. For valves employing filters (see paragraph A.3.5.2), the filters shall be used during all tests to which the valve is subject.

A.4.3.3. Test sequence

The 3 test samples shall be subjected to the following specified tests:

	Valve 1	Valve 2	Valve 3
a.	Cycling, reseal, leakage, flow rate (4.6.1)	Cycling, reseal, leakage, flow rate (4.6.1)	Cycling, reseal, leakage, flow rate (4.6.1)
b.	Humidity (4.6.3.3)	High temperature (4.6.3.1)	Rough handling (4.6.3.6)
c.	Salt fog (4.6.3.7)	Low temperature (4.6.3.2)	Vibration (4.6.3.4)
d.		Sand and dust (4.6.3.5)	Operating life (4.6.2)

A.4.3.4. Failures

One or more failures shall be cause for refusal to grant first article approval.

A.4.4. Quality conformance inspection

Quality conformance inspection shall be performed on sample valves chosen from a lot to determine conformance of said lot with the requirements set forth in this specification prior to acceptance. Quality conformance inspection shall consist of the cycling, reseal, leakage, and flow rate test in paragraph A.4.6.1.

A.4.4.1. Sampling

Samples shall be selected at random and sampling shall be conducted in accordance with MIL-STD-1916 and ANSI / ASQ Z1.4, inspection level II, AQL 1.5.

A.4.4.1.1. Inspection lot

An inspection lot shall consist of all valves of the same type, and reseal pressure that is produced under essentially the same conditions, and offered for inspection at one time.

A.4.4.1.2. Examination

Each sample valve shall be suitable to an examination to determine conformance to the manufacturer's drawings and the requirements of this annex.

A.4.4.1.3. Sample tests

Each sample valve chosen as specified in A.4.4.1 shall be tested as specified in A.4.6.1.

A.4.4.1.3.1. Lot rejection

Failure of the inspection lot to pass quality conformance inspection at MIL-STD-1916 and ANSI / ASQ Z1.4, inspection level II, AQL 1.5 shall be cause for rejection.

A.4.4.1.3.2. Rejected lots

If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separated from new lots, and shall be clearly identified.

A.4.4.2. Test equipment and inspection facilities

Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit the quality conformance inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with ISO 10012-1.

A.4.5. Test conditions

A.4.5.1. Pressure

Pressures specified are gauge pressures ±689 Pa (± 0.1 psi).

A.4.5.2. Temperature

Unless otherwise specified, tests shall be conducted at ambient temperatures of from 21.1°C to 32.2°C (70°F to 90°F)

A.4.5.3. Flow

Unless otherwise specified, all flow rates specified are m3/min. taken at standard ambient conditions as defined in MIL-STD-810, and are minimum required values for container protection (see paragraph A.3.6.2).

A.4.6. Performance tests

A.4.6.1. Cycling, reseal, leakage, and flow rate

The following tests shall be performed for each sample valve in the order listed.

A.4.6.1.1. Cycling

The valves shall be cycled 10 times as follows.

A.4.6.1.1.1. Types I and II

Air pressure shall be applied to the inlet port of the valve with the outlet port open to the atmosphere or suitable vented. The pressure shall be uniformly increased until an air flow of at least 20 percent of the rated flow rate is reached. The air pressure shall then be reduced until the air flow is 2.0 percent or less of the rated flow of the valve. The cycle shall be accomplished in 3 seconds to 10 seconds.

A.4.6.1.1.2. Type III

One complete cycle shall consist of the cycle detailed in A.4.6.1.1.1 accomplished in each direction of flow.

A.4.6.1.2. Reseal, leakage, and flow rate

The valve shall be placed in a test cell so that required pressure differentials can be applied. Suitable gauges or manometers shall be connected to the cell to determine the pressure differential across the valve to within ±5 percent of the actual values. For reseal and leak testing, a gas flowmeter capable of measuring a flow rate of 1.0 cm^3 ±0.1 cm^3 of standard air per minute. (Gilmont #3210 microflowmeter or equivalent) shall be connected in series with the valve test cell, so that all air flowing through the valve flows through the flowmeter. For valve flow rate testing, a flowmeter capable of measuring the specified valve flow rate ± 5 percent (Gilmont #3205-30 bypass flowmeter or equivalent) shall be connected in series with the valve test cell. A suitable regulator or throttling valve shall be used to control test pressures so that test conditions are maintained to within ± 5 percent of specified values during test. Test result shall be reported in standard air conditions. For reseal and leakage tests, a flow of 1.0 cm3 of standard air per minute through the valve shall be an indication of failure and cause for rejection. For flow rate tests, failure to develop at least the specified flow rate at a differential pressure of 10300 Pa (1.5 psig) greater than the reseal pressure across the valve in the flow direction shall be indication of failure and cause for rejection.

A.4.6.1.2.1. Types I and II reseal

The valve shall be subjected to the specified reseal pressure deferential which tends to produce flow in the flow direction. Observation for leakage shall then be made.

A.4.6.1.2.2. Types I and II leakage

The valve shall be subjected to a pressure differential of 68900 Pa (10 psi) which tends to produce flow in the non-flow direction. Observation for leakage shall then be made.

A.4.6.1.2.3. Type III reseal

The valve shall be subjected to the specified reseal pressure differential which tends to produce flow in the pressure relief flow direction. Observation for leakage shall then be made. The valve shall then be tested in the vacuum relied flow direction. Observation for leakage shall then be made.

A.4.6.1.2.4. Flow rate

For each flow direction, the valve shall be subjected to a pressure differential of 10300 Pa (1.5 psig) greater than the specified reseal pressure which tends to produce flow in that respective flow direction. The flow rate through the valve shall then be measured. For valves using filters, the filters shall be installed during the flow rate test.

A.4.6.2. Operating life

While at room temperature, the valve shall be subjected to 2500 cycles as specified in A.4.6.1.1.1 or A.4.6.1.1.2. After completion of the test, the valve shall be tested as specified in A.4.6.1.2 and applicable sub-paragraphs.

A.4.6.3. Environmental tests

The valve shall be subjected to the following tests in accordance with the applicable procedures of MIL-STD-810.

A.4.6.3.1. High temperature

Method 501.5, procedure II, operation shall be used, except the during the 71.1°C (+160°F) exposure period the valve shall be operated through 1000 cycles. After completion of the test, the valve shall be tested as specified in paragraph A.4.6.1.2 and applicable sub-paragraphs.

A.4.6.3.2. Low temperature

Method 502.5, procedure II operation shall be used, except that during the - 62.2°C (-80°F) exposure period the valve shall be operated through 1000 cycles. The duration of the test will be 72 hours. After completion of the test, the valves shall be tested as specified in A.4.6.1.2 and applicable sub-paragraph.

A.4.6.3.3. Humidity

Method 507.5, procedure III shall be used. The valve shall be mounted in receptacle for cycling. Cycling shall be performed periodically during the test. At least 2 complete cycles shall be accomplished each hour. After completion of the test, the valves shall then be tested as specified in paragraph A.4.6.1.2 and applicable sub-paragraphs.

A.4.6.3.4. Vibration

MIL-STD-3010, see method 5020 shall be used. After completion of the test, the valves shall be tested as specified in paragraph A.4.6.1.2 and applicable sub-paragraphs.

A.4.6.3.5. Sand andust

Method 510.5 procedure I shall be used except that the air velocity during all steps shall be 1.52 m/s ± 0.5 m/s (300 ± 100 feet per minute) through the test chamber and removal of accumulated dust from the test item by brushing, wiping, shaking, air blast or vacuum cleaning prior to functional testing shall not be permitted. At least 2 complete functional cycles shall be accomplished each hour during the test. After completing the test, the valves shall be tested as specified in paragraph A.4.6.1.2 and applicable sub-paragraphs.

A.4.6.3.6. Rough handling

The valve shall be mounted in a container conforming to Figure A-1. The container shall be dropped 3 times on each the 3 mutually perpendicular faces, for a total of 9 drops, from a height of 91 cm (3 feet) onto concrete surface. Valve shall then be tested as specified in paragraph A.4.6.1.2 and applicable sub-paragraphs.

A.4.6.3.7. Salt fog

Method 509.5, procedure I shall be used. After completion of the test, the valves shall be tested as specified in paragraph A.4.6.1.2 and applicable sub-paragraphs.

A.5. NOTES

A.5.1. Intended use

The air relief valves covered by this specification are intended for use in shipping containers as a protective device against excessive internal and external pressures encountered during air lift and extreme temperature changes. Type I and type II valves

are intended to be used in sets of one each type where a separation of the inlet and outlet ports is desirable.

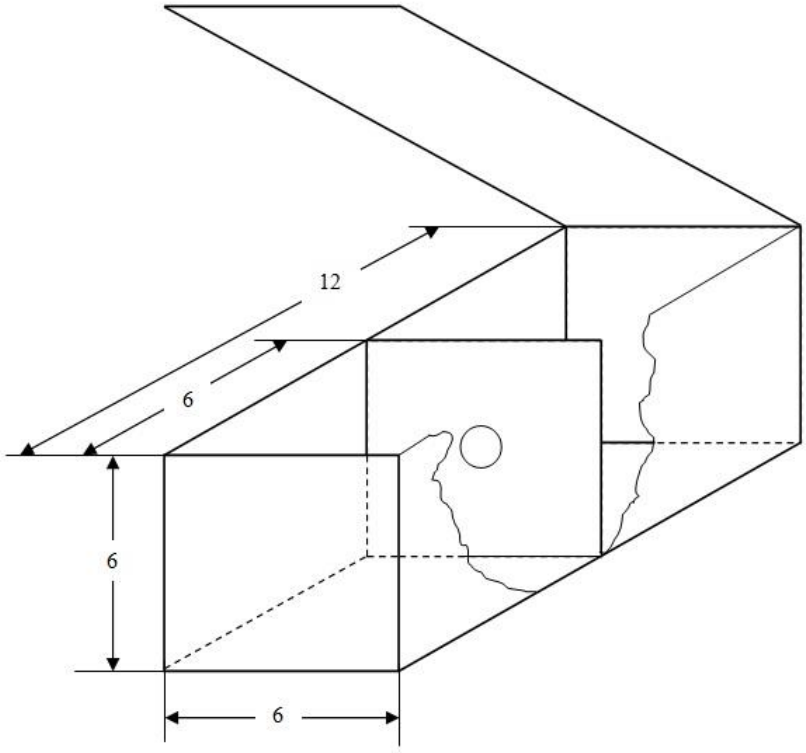
A.5.1.1. Use recommendations

The relief valves are intended to allow significant container weight reductions by limiting container gas pressure differential loads that the container must support; however; the valve flow rating pressure should not cause gas pressure differential loads to exceed container design allowances. When a valve-equipped, controlled-humidity container is to be in a tropical outdoor storage environment, the pressure and vacuum reseal pressures should not be less than 20700 Pa (3 psig), i.e. 13800 Pa (2 psig) for pressure and 6900 Pa (1 psig) for vacuum in order to prevent rapid desiccant depletion caused by cyclic breathing resulting from daily solar heating and night-time cooling.

A.5.2. Disposability

The preferred methods of disposing of valves are recycling, bailing, and sanitary landfill.

Figure A-1: container for rough handling test



Box Material: 19 mm plywood
Mounting plate material:

Steel plate – 165 mm x 165 mm x 12, 7 mm
Groove plywood 6 mm to accept mounting plate

ANNEX B SUPERIMPOSED LOAD TEST

(UNIFORMLY DISTRIBUTED, WITHOUT TOP DUNNAGE)

B.1. SCOPE

The following procedure is applicable for determining the ability of a container to resist loads superimposed on its top. This is accomplished by stacking many small, heavy packages on a container, without the use of top dunnage. This procedure also determines the ability of the packaging and packaging methods to provide adequate protection to the contents of the container during superimposed loading.

B.2. DEFINITIONS

Top dunnage: relatively stiff material, usually wood, laid across the top of a container or layer of containers to carry the weight of superimposed loading to the sides of the containers.

B.3. APPARATUS

In conducting the top superimposed-load test, any convenient method may be used for placing the load on top of the container, such as a hoist, a block and tackle, or by hand. A sufficient quantity of weights not greater than 250 mm x 250 mm in outside length and width shall be provided. Weights may be boxes loaded with lead or other material.

B.4. SPECIMEN

One container and its contents shall constitute a single specimen. The container shall be loaded for the test with the interior packing and the actual contents for which it was designed. If use of the actual contents is not practical, a dummy load shall be substituted to simulate such contents in weight, shape, and position in the container. The contents, or dummy load, shall be blocked braced, and cushioned in place as for shipment.

B.5. CONDIOTIONING OF SPECIMEN

Unless otherwise specified, no special conditioning of the test specimen shall be necessary.

B.6. PROCEDURE

B.6.1. The specimen shall be placed on its bottom on a flat, level, rigid floor. Weight shall be placed on top of the container in a symmetrical pattern approximating uniform loading, so that they do not extend over the sides or ends of the top surface. There shall be one weight to each 900 cm^2 of top surface and each weight shall be whatever is necessary to attain the prescribed load for the top area. The load shall be allowed to remain in place for a prescribed period of time. When the test is conducted to determine satisfactory performance of a container and unless otherwise specified, the prescribed period of time of loading shall be one hour and the prescribed load shall be as follows:

$$W = A\ [cm^2] \times 0.0244\ \frac{(kg)}{[cm^2]} \times S,$$

Where:
W = prescribed top superimposed load in kg
A = top area in cm^2

$$0.0244\ \frac{(kg)}{[cm^2]} = \text{specific bearing load}$$

S = specific bearing load
S = packaging level factor
S = 2 for NATO packaging levels 1[1] and 2[1]
S = 1.5 for NATO packaging level 3[1]

B.6.2. Measurements of distortion shall be made and recorded immediately before the load is removed, and of any changes or breaks in the container, such as apparent buckling or failure of members in the tops, sides or ends. Any vertical deflections of the sides and ends shall be measured from taut horizontal string lines stretched between nails in the top corners of each side and end. In addition, bulging of the side and end panels shall be measured from a vertical straightedge. The cupping of the top shall be measured similarly by using a straightedge across the top at mid-length of the specimen (see figure B-1). Observations shall also be made and recorded to determine if the distortions are sufficient to damage or dislodge any portion of the container, the interior packing, or contents. After removal of the load, the extent of recovery from distortions shall be observed and recorded.

B.7. REPORT

Following the test, a report shall be written which shall include the following:

(a) A statement that the test was conducted in compliance with this procedure, or a description of the deviation from this procedure? The report shall include all options selected and “otherwise specified” details that were as permitted in paragraphs B.5 and B.6.1.

(b) Dimensions of the container, its structural details, kind of materials, spacing, size and type of fasteners, methods of closing and strapping, and the net and gross masses.

(c) A description of the contents of the container including blocking, bracing, and cushioning.

(d) The results of the test, describing the final conditions of both container and contents, and a record of the deflections under load.

[1] See STANAG 4280 « NATO levels of packaging"

(e) When the test is conducted to determine satisfactory performance of a container or pack, the report shall include a statement that the container or pack either attained or did not attain the specified performance. If not specified elsewhere, it is suggested that satisfactory performance shall consist of:

When subject to the top superimposed-load test, the contents (except a dummy load) shall show no functional or physical damage, and the container and packing shall show no functional damage. Damage to the exterior shipping container which is the result of improper interior packaging, blocking, or bracing shall be cause for rejection. Structural damage to the exterior shipping container which would result in either spilling of the contents or failure of the container in subsequent handling is cause for rejection. There shall be no evidence of a substantial amount of shitting of the contents within the exterior shipping container that would create conditions likely to cause damage during shipment, storage and re-shipment of the container.

(f) The report shall include a statement of any observations that might help in improving the container or the methods of packing.

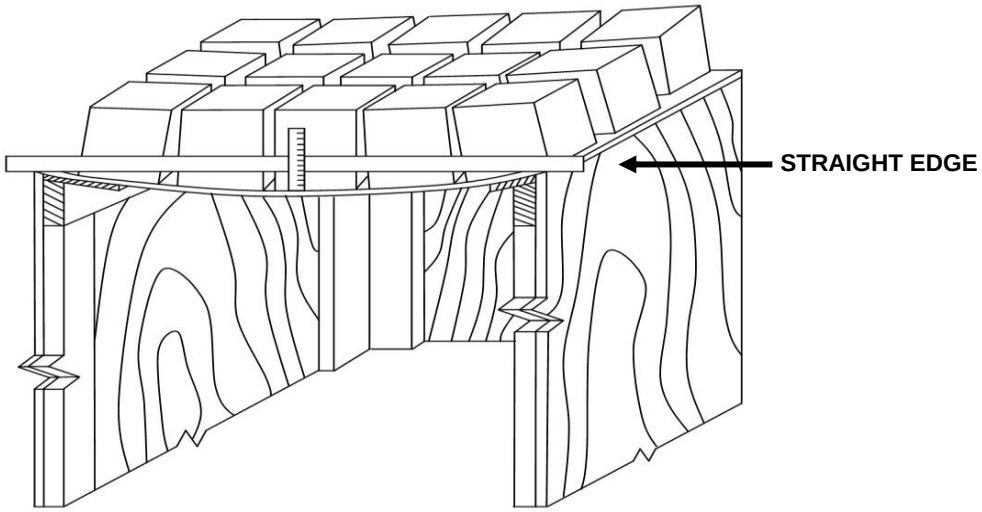
B.8. NOTES

(a) This test is meant to simulate top superimposed loads as imposed by piling without dunnage many small, heavy packages on a container. It is intended that this test be used only on containers that are likely to be stressed in this manner. Details are given with the qualification, “unless otherwise specified”, in paragraphs regarding:

Conditions of specimens (B.5)
Load and duration of load (B.6.1)

(b) Although the recommended period of time for the top superimposed load test is only one hour, the use of the factors for NATO packaging levels 1, 2 and 3 to ensures a load-carrying capacity adequate for long-time loading and an occasional application of impact loads.

Figure B-1: Top superimposed load test



ANNEX C REFERENCES

AAP-23 - NATO glossary of packaging terms and definitions.
AEPP-2 - NATO standard packaging for materials susceptible to damage by electrostatic discharge.
AEPP-3 - NATO standard packaging test procedures.
ISO 1431- Rubber, vulcanized or plastics, resistant to ozone cracking; part I “static strain test”.
STANAG 2827 - Materials handling in the field.
STANAG 2829 - Materials handling equipment.
STANAG 4159 - NATO materiel configuration management policy and procedures for multi-national joint projects.
STANAG 4183 - NATO metrication policy.
STANAG 4280 - NATO levels of packaging.
STANAG 4281 - NATO standard marking for shipment and storage.
STANAG 4329 - NATO standard bar code symbology.
STANAG 4340 - NATO standard packaging test procedures.
STANAG 4370 - Environmental testing

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ANNEX D GLOSSARY, TERMS AND DEFINITION

This annex contains terms and definitions that are used in this document for the purpose of this agreement.

Cracking pressure (relief valve)
The pressure(s) at which the containers' relief valve first opens when subjected to a pressure differential, either pressure or vacuum.

Minimum flow rate (relief valve)
The minimum rate of flow (expressed in m^3/min) required to allow a sufficient exchange of air through the relief valve in order to prevent damage to the container during handling, transportation and storage. (Minimum flow rate calculations shall be made in accordance with ANNEX A, paragraph A.3.6.3.)

Reseal pressure (relief valve)
The pressure(s) at which the container's relief valve reseals after being open (NOTE: in general, this pressure is lower than the cracking pressure).

Energy absorbing device
For the purpose of this publication, energy absorbing devices are defined as container components employed to provide shock and/or vibration isolation. They may be composed of elastomers bonded to metal parts, metals, plastic foams or spring assemblies, and are commonly referred to as shock, elastomeric, or resilient mounts or isolators, and cushioning.

Reliability
The ability of an item to perform a required function under stated conditions for a specified period of time, i.e., two, ten, or one hundred physical trips.

Reusable container(1)
A shipping and storage container designed for reuse without impairment of its protective function and which may be repaired and/or refitted.

(1) See AAP-23 "NATO glossary of packaging terms and definitions"

AEPP-1(B)(1)