

BLUE ORIGIN

Supplier Packaging Requirements

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1. INTRODUCTION

This standard establishes the general requirements and guidelines of the packaging of commodities for domestic and international shipments and storage for a minimum of 90 days from the time of receipt. This standard shall be used when referenced on documents of procurement, part specifications, drawings, and other packaging standards or specifications.

1.1. Terminology

The following acronyms, abbreviations, and terms are used in this document as defined herein:

Nomenclature	Definition
CoG	Center of Gravity
FOD	Foreign Object Debris
GC	Gross Cleaned
GN2	Gaseous Nitrogen
PO	Purchase Order
Shall or must	Indicates items of a mandatory nature
Should, may, or can	Indicates items of a non-mandatory nature

2. REFERENCES

The references listed below form a part of this document to the extent specified herein. Unless otherwise specified, the latest issue of the reference should be used.

2.1. U.S. Government

49 CFR	Title 49. Code of Federal Regulations
NAS853	Field Force, Protection From

3. REQUIREMENTS

3.1. General Supplier Packaging Requirements

The packaging materials and equipment shall meet or exceed the requirements specified herein.

Each package shall provide adequate protection, preservation, and labeling to prevent damage or deterioration of the item during shipment and storage, given normal environmental conditions and commercial transportation modes.

Each unit pack shall be designed with minimum weight and cube in mind while maintaining the protection performance required and consistent with best commercial practices. The gross weight and dimensions of each container type and size shall not exceed its design specification.

Each component of the unit pack must allow its contents to be removed and replaced without functional damage or deterioration to the item or its protective system.

The packaging materials, procedures, and handling shall be of commercial quality and practice to ensure the materials are protected against corrosion and deterioration, physical, chemical, and mechanical damage, degradation during storage, and multiple handling.

Any referenced documents under notes or appendix of a packaging standard is to be used as instruction and guide in the selection of methods, materials, and designs.

If the total purchase order quantity of the item is not applicable or lend itself for greater than the quantity labeled in the unit pack, the additional quantity shall be packaged and marked separately. Natural and/or synthetic rubber items must be enclosed in opaque protection.

Packaging must satisfy application regulations by carrier. The package must also be able to withstand common vibration, shock, and environmental requirements based on selected carrier transport method. Packaging must be able to protect the part and prevent any nonconformances exceeding design requirements while remaining intact to the final destination.

Items that are to be mounted on a skid must be only attached to the skid. The cover, if used, must be demountable. Blocks shall be used to position the cover and prevent lateral movement relative to the skid. Hardware shall also be secured to prevent vertical movement relative to the skid via use of straps/banding/mechanical hard-mount in a method that will not slip off the part or cause additional damage during transit. The cover must be held in position to prevent any vertical or lateral movement relative to the skid. The cover must be secured by methods other than nailing. Instructions for removing the item must be visible and shall be printed on or affixed to outer container.

Projecting parts of items can greatly increase the overall cube and cost of the shipment. If an item has a projecting part and that projecting part can be removed and re-assembled without the use of special tools, re-assembly instructions must be enclosed and marked in the package with this package method. If possible, all associated disassembled parts shall be placed in the same unit pack as the assembly from which they were removed.

Aluminum foil used as packaging material must not be in direct contact with metals other than cadmium, magnesium, aluminum, or zinc in applications which there they may be exposed to any form of water, including water vapor and condensate, to prevent corrosion.

NAS853, the standard for the protection of items, components, and assemblies, e.g., field effect transistors, micro diodes, etc., shall be used where protection from force fields is needed (electrostatic, electromagnetic, magnetic, or radioactive).

3.2. Unit Packaging

Items and materials enclosed in the unit pack must be clean and FOD free. Plastic crates and pallets are preferred when possible over wood to further the reduction of FOD.

The quantity of item(s) to be included in a unit pack, unless specified in the item purchase order, contract, or specification shall be determined by best commercial practices based on considerations to the item characteristics, configuration, size, weight, density, fragility, value, criticality, packaging economics, and supplier's standards, unless otherwise specified.

Any accessory hardware to the item shall be assembled to the item if possible, or secured within or to the unit pack, with clear labeling. Items with protrusions or sharp points must be protected in a manner that prevents any punctures or ruptures to the barriers or containers to prevent damage and any moisture entry.

Unit package closure must prevent accidental opening during shipment, handling, and storage.

3.3. Cleanliness

Any cleaning, drying, and preservation process of the unit pack may be used as long no damage occurs to the item or the packaging materials. All cleaning processes performed must not cause damage, deterioration, or reduce the effectiveness of any preservative compound, and must be

able to prevent its corrosion for a minimum of 90 days of indoor storage. The selection of the preservation materials shall be based on their compatibility with the item and the ease of removal. Cleanliness requirements of part must be met through use of proper cover plates, vinyl caps, fittings. Items may require to be bagged, or double-bagged and GN2 backfilled, or vacuum sealed per requirements in Table 1 below.

Table 1. Packaging for Cleanliness

Cleanliness Requirement	Packaging technique and Material Requirements
GC-cleaned items	No precision packaging is required. Protective packaging as required for storage, shipping, and preservation.
Items not precision-cleaned	Shall be single-bagged. Bags will be antistatic polyethylene film and a minimum thickness of 51 μm (2 mils).
All packaged items	Antistatic polyethylene film (pink polyethylene, purple polyethylene or similar film) shall not contain tertiary amine compounds, which may cause metal corrosion. Anti-static films shall never be used on polycarbonate. Only low residue easy remove white cleanroom tape should be used when packaging precision cleaned hardware. The color white is reserved to indicate the hardware has been precision cleaned. Use of plastic caps to protect sealing surfaces on precision cleaned fluid system lines and fittings is discouraged. They can generate FOD if the metal threads abrade the plastic. If plastic caps are used, a nylon bag with low residue easy remove white cleanroom tape (specified in CMSP-02291) should be used under the cap.

3.4. Hardware Securement

Part must be secured to the base of the crate by one or more of the following methods:

- Lighter parts may be secured by use of multiple layers of foam to fill gaps between part and side-walls and lid of container with maximum allowable gap of 1/2"
- Foam-in-place and other approved dunnage materials must be used to fill open corners to prevent parts from shifting during transit
- Heavier parts must be blocked in place by means of 2x dimensional lumber and screws to secure them to the base platform to prevent horizontal movement
- Bracing blocks must be secured directly to dimensional lumber base, or through plywood to 4x4 supporting stringer blocks at a minimum of 2 locations

Parts must also be secured to prevent vertical movement. This can be achieved through use nylon straps connected to D-rings which are mounted directly to the crate/pallet base, which must be secured directly to dimensional lumber base, or through to 4x4 stringer blocks.

3.5. Workmanship Requirements

Screws must be countersunk into lumber to prevent metal-to-metal contact with parts. If this is not easily achievable, be sure to utilize additional dunnage materials to isolate part from potential contact.

All hardware used must be rated to a minimum working strength of 1.5x the part weight.

Floor may be lined with foam depending on surface area/weight.

To determine static loading - Take total weight of part divided by surface area of the part that contacts the surface of the pallet or crate (Total part weight/surface area making contact).

For non-fragile items 2" - 1.7# PE layers may be used until the contact surface / weight of the part exceeds 2 lbs. / sq.in (2 PSI) of static loading.

Fragile items shall use 3" of 2# Cross-linked Polyethylene as padding below items with a static loading of 0.65-1.5 PSI based on the weight per surface area calculation above to safely transport items requiring 40G as the maximum permitted shock loads during transit if the parts are properly secured. 3" of 4# Cross-linked Polyethylene shall be used as padding below items in the range of 0.75-2.25 PSI static loading, and will also maintain the 40G shock threshold through transit when the parts are properly secured.

Supporting pallet must not allow part to be free hanging. Minimum of 2" under-hang from pallet edges.

Refer to "Uniform Standard for Wood Containers" and "Uniform Standard for Wood Pallets" for recommendations of crate and pallet styles, terminology, and defect identification.

All crates must contain provisions for handling access through use of common forklift or pallet jack with minimum of 3.5" clearance from ground to bottom of deck.

Crate opening must be clearly marked to allow for crate to be opened without use of excessive force which may cause damage to the crate or its contents.

ASTM D 6251 Style A is preferred, but other styles may be used as deemed appropriate based on the contents.

Figure 1. ASTM D 6251-A



Position pallet support blocks appropriately to gain vertical support between ground and part.

<= 150 lbs. = 3/4" ACX plywood base platform / no base support directly under part needed.

151 lbs. < Part < 300 lbs. = dimensional lumber (2" x X") full deck boards / no direct support under part required.

>301 lbs. = dimensional lumber full deck + direct 4x4 support beneath part at minimum of 2 locations depending on size and weight of component.

Items greater than 500 lbs. or larger than 60"x60" footprint will require additional support structure.

3.6. Intermediate Packaging

Intermediate packages shall be used when unit packs require additional protection or to consolidate items for ease in shipping, handling, and storage.

Parts must be wrapped/padded/braced/separated to prevent any metal-to-metal contact. Part must be positioned in the most stable orientation while maintaining the lowest possible center of gravity. All critical surfaces must be protected with cover plates or vinyl caps.

3.7. Packing

Any number of unit or intermediate packages shall be loaded uniformly into each shipping container. Maximize the use of the carrier's shipping container by loading uniformly any unit or intermediate packages, where cost effective and possible.

Packing in shipping containers must provide adequate protection during the shipment, handling and storage under normal, anticipated environmental conditions, and must meet the minimum packaging design and fabrication requirements. Part must be positioned in the most stable orientation while maintaining the lowest possible center of gravity.

3.8. Marking

Markings must include:

- Supplier's Name and Address
- Ship-To Address
- Blue Origin Purchase Order Number (or a Point of Contact, if no PO exists)
- Individual PO Line-Item References or package contents
- Supplier Part Number
- Description / Nomenclature
- Quantity Contained in this Shipment

If center of gravity is more than 6" offset from center of crate, labels must be applied to all 4 sides and lid to indicate the approximate CoG (Center of Gravity) for safe handling.

Please utilize 'Do Not Stack', 'Fragile' and other common handling markings/images in large bold letters on a minimum of two opposing sides in an unobstructed location as it is deemed necessary.

3.9. Quality Assurance

The quality assurance and inspection requirements applicable to the item contract apply to the materials and services outlined in this standard.

Upon arrival, Receiving shall inspect the shipment for any visible damages to the packaging and hardware before signing for the shipment. If a shipment's packaging or hardware is determined to be damaged, Supplier Quality will notify the responsible party for corrective action as applicable. Pictures will be taken and provided to establish proof of damage.