BLUE ORIGIN

Supplier Packaging Requirements

CMCD-00481-G

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1. INTRODUCTION

This standard establishes the general requirements and guidelines of supplier packaging 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. Scope

The scope of these requirements is limited to drawings, purchase orders, and electronic communications which reference this document as a requirement.

This specification is to be limited to components which can tolerate 50+ G shock loads during transportation, are not ESD sensitive, and contain no hazardous materials. Any components which do not meet these requirements, you must contact the PHS&T (Packaging, Handling, Storage & Transportation) team to have them either develop a custom package or help to prescribe a solution which will meet DOT (Department of Transportation)/IATA (International Air Transport Association) requirements.

1.2. Terminology

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

Nomenclature	Definition
Caution	If not adhered to, could cause damage to hardware or GSE (Ground Support Equipment)
CoG	Center of Gravity
Crate	A portable platform with walls and a lid, within which goods can be moved, stacked, and stored, especially with the aid of a forklift
DOT	Department of Transportation
ESDS	Electrostatic Discharge Sensitive
FOD	Foreign Object Debris
GC	Gross Cleaned
GN2	Gaseous Nitrogen
IATA	International Air Transport Association
ISPM	International Standard for Phytosanitary Measures
Pallet	A portable platform on which goods can be moved, stacked, and stored, especially with the aid of a forklift. May or may not have walls and lid
PHS&T	Packaging, Handling, Storage & Transportation
PO	Purchase Order
RE	Responsible Engineer
SCE	Supply Chain Engineer
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. Blue Origin Referenced Documents

The references listed below form a part of this document to the extent specified herein.

CMSP-06225	Workmanship Standard

2.2. U.S. Government

49 CFR	Title 49. Code of Federal Regulations
MIL-STD-1660	Design Criteria for Palletized Unit Loads
MIL-STD-2073-1	Standard Practice for Military Packaging
NAS853	Field Force, Protection From
NASA NPR 6000.1H	Requirements for Packaging, Handling, and Transportation for Aeronautical and Space Systems, Equipment, and Associated Components

2.3. International

ASTM D3951	Standard Practice for Commercial Packaging
ASTM D6251	Standard Specification for Wood-Cleated Panelboard Shipping Boxes

2.4. Other Publications

ISPM Publication 15	Regulation of Wood Packaging Material in International Trade
IEST-STD-CC1246	

3. REQUIREMENTS

3.1. General

The Supplier is responsible for utilizing commercial best practices for all packaging. Packaging materials and methods shall protect items against corrosion, deterioration, and physical, chemical, or mechanical damage during all anticipated transit and storage conditions.

Unless otherwise specified in the Purchase Order (PO), parts shall be packaged using, at a minimum, Method 10 preservation per MIL-STD-2073-1, *Standard Practice for Military Packaging*. For additional guidance on preservation and packaging methods, consult ASTM D3951.

3.2. Part Preparation and Handling

3.2.1. Cleanliness

- **Cleanliness Standard:** When specified, parts shall meet cleanliness requirements in accordance with IEST-STD-CC1246 at the level indicated on the Purchase Order.
- **Packaging Cleanliness:** For cleanliness-controlled parts, the primary packaging material in direct contact with the part shall be equal to or cleaner than the part's specified cleanliness level.
- **Implementation Support:** For specific clean packaging methods, materials, or verification procedures, contact Blue Origin PHS&T.

3.2.2. Hardware Securement

- **General Protection:** Hardware shall be secured to prevent shifting in any direction during transport. Adequate dunnage shall be utilized to ensure no component-to-component contact occurs within the container.
- **Attachment Methods:** Items shall be secured to the base of the container using one or more of the following methods:
    - **Wooden Blocking:** When using dimensional lumber for restraint, secure with a minimum of two wood screws at a minimum of two locations. Screws shall penetrate directly into the lumber base or through plywood into supporting 4×4 stringer blocks.
    - **Strapping Systems:** Nylon straps with D-ring anchors may be used for securing components. D-rings shall be mounted directly to the dimensional lumber base or through plywood to 4×4 stringer blocks.
    - **Heavy Component Requirement:** Components exceeding 50 lbs (23 kg) shall be secured with restraints in three axes: vertically and in two lateral directions.
    - **Banding Protection:** When metal banding is used to secure forgings, appropriate corner and edge protection shall be applied. If edge protection alone is insufficient, corrugated material shall be used as a separator between the forging and banding.
- **Prohibited Practices:**
    - Foam-in-place/Instapak cushioning materials shall not be reused. These materials are single-use only.

3.2.3. Parts Containing Fluids

- **Leak Containment:** Packaging for fluid-containing parts shall incorporate a sealed, leak-proof barrier capable of containing 150% of the total fluid volume in the event of a complete release.
- **Secondary Containment:** The fluid containment system shall be designed to prevent any leakage from contaminating adjacent parts, shipping documents, or the exterior package.
- **Orientation Marking:** Packages containing fluids shall be clearly marked with orientation indicators to ensure proper handling during transport.

3.2.4. ESD Sensitive Device Protection

Protection from electrostatic, electromagnetic, magnetic, or radioactive fields shall be provided for susceptible items in accordance with NAS853.

- The use of anti-static 'Pink Poly' as a primary ESD barrier or for intimate contact with the part is prohibited.
- Shielding materials, such as conductive Velostat, are the preferred primary barrier.
- For detailed methods concerning Electrostatic Discharge Sensitive (ESDS) devices, refer to MIL-STD-2073-1, Paragraph 5.2.4.1.

3.3. Packaging

3.3.1. Primary Packaging

The primary packaging layer provides intimate protection for the part. It shall be designed to prevent damage from handling, contact, and environmental factors.

- All critical surfaces shall be protected using approved covers, vinyl caps, or protective film and tape.
- Items shall be sufficiently wrapped, padded, and braced to prevent part-to-part contact and ensure immobilization.
- Parts shall be positioned in their most stable orientation to maintain the lowest possible center of gravity within the package.
- Package closures shall be secure to prevent accidental opening during transit and handling.
- Material compatibility inquiries shall be directed to the Buyer for resolution with the responsible Supply Chain or Design Engineer.
- Unless otherwise specified, Quantity per Unit Pack (QUP) shall be determined in accordance with MIL-STD-2073-1, Appendix B.

3.3.2. Secondary Packaging

Secondary packaging is used to consolidate one or more primary packages into a single assembly. Its purpose is to simplify handling and provide an additional layer of protection.

- The secondary package shall group items into a manageable unit for ease of handling, storage, and transit.
- It must be robust enough to safeguard the enclosed primary package(s) from physical damage during all subsequent handling and shipping operations.

3.3.3. Tertiary Packaging

Tertiary packaging is the outermost layer, designed for bulk material handling and protecting shipments during transit (e.g., pallets, shipping crates, stretch wrap).

- **Material Preference:** To reduce Foreign Object Debris (FOD) risk, especially for production floor deliveries, plastic containers (e.g., ABS, HDPE, PP) are preferred over wood.
- **Wood Container Construction:**
    - Wooden shipping containers shall be constructed in accordance with applicable ASTM and military specifications.
    - The use of particle board or Oriented Strand Board (OSB) is prohibited.
- **Wood Treatment (ISPM 15):** All Wood Packaging Material (WPM) used for domestic or international shipments shall comply with ISPM 15. All such WPM must bear the official ISPM 15 certification stamp indicating treatment.
- **Palletizing Requirement:** Shipments shall be palletized and securely restrained if they meet either of the following criteria:
    - The single component weight exceeds 50 lbs (23 kg).
    - The final packaged weight exceeds 50 lbs (23 kg) **and** its dimensions are greater than 24 inches (610 mm) in any two directions.
    - **Exception:** This requirement is waived if the package is inherently accessible by forklift or pallet jack and meets all carrier requirements for unpalletized shipment.
- **Security & ITAR:** All shipments shall be fully enclosed or covered with opaque material (e.g., non-clear shrink wrap) to obscure contents from view. This is a mandatory ITAR compliance measure.
- **Custom Packaging Reuse:** Custom-fabricated packaging shall be reused for the return shipment of its corresponding item. If an item's configuration prevents its reuse, the empty custom packaging shall be returned separately to Blue Origin.
- **Guidance:** Please consult MIL-STD-1660, *Design Criteria for Palletized Unit Loads*, for additional information on pallet design and construction standards to ensure items are able to move safely and efficiently through logistics networks. Direct questions regarding unique physical handling or storage needs to the designated Blue Origin PHS&T contact through your buyer or supplier quality engineer.

3.3.3.1. Raw Materials (e.g. Flat Plate)

- **Consistent dunnage/runner dimensions**: All runners must have uniform dimensions (height, width, length) within a stack.
- **Proper dunnage/runner placement**:
    - Position one runner at the absolute center along the plate length
    - Place two additional runners 30" away from center (one on each side)
    - Place one runner 12" from each end
    - For extremely large plates, consider additional runners at 60" intervals from center
- **Vertical alignment**: Ensure all dunnage within stacks is aligned within ½ inch of center to prevent bending moments that cause warpage.
- **Full-width support**: Runners must fully span the width of the plates (edge to edge) to provide complete support.

- **Uniform sizing**: Do not stack plates of different sizes on top of each other due to weight differences and variable moment arms.
- **Maximum stack height**: Limit stack heights to 4 feet when able (or manufacturer's recommendation when possible) to prevent excessive weight on bottom plates

3.4. Marking and Identification

Two packing slips are required (one in a waterproof sleeve affixed to the outside of the container, and the other copy inside), and should contain at minimum, the information listed below:

- 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 20% 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 deemed necessary.

3.4.1. Packaged Part Labeling

All parts, regardless of drawing marking requirements, must be labeled on the outside of the individual protective packaging to enable identification at receiving, preserve part integrity, and reduce safety risk. This requirement applies to all shipments including freight. At minimum, each label must include the part number, and when applicable, the serial number.

Raw material labels must be affixed to the exterior of the crate and must include the quantity expressed in the same unit of measure (UOM) specified on the purchase order.

3.5. Quality Assurance Provisions

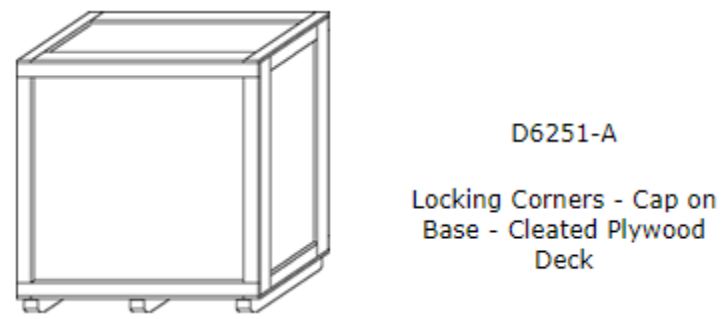
3.5.1. Workmanship Requirements

This section defines critical quality standards for packaging fabrication, assembly, and implementation.

- **Container Preparation:** Prior to loading hardware, ensure all containers are clean, dry, and free of Foreign Object Debris (FOD), including water and packaging waste materials.
- **Structural Integrity Requirements:**
    - **Load Rating:** All straps, tie-downs, and securing devices shall have a Working Load Limit (WLL) of at least 2× the weight of the secured item.
    - **Pallet Sizing:** All palletized items shall be fully supported by the pallet deck with no overhang. A minimum clearance of 2 inches (51 mm) from the item to any pallet edge is required.
    - **Forklift Access:** All crates, containers, and pallets shall provide a minimum of 3.5 inches (89 mm) ground clearance to accommodate handling by forklifts and pallet jacks.

- **Stability:** Parts shall be positioned in their most stable orientation while maintaining the lowest possible center of gravity within the container.
- **Accessibility:**
    - **Opening Design:** Crate panels intended for opening shall be clearly marked to facilitate access without requiring excessive force that may damage the contents or container.
    - **Container Style:** ASTM D6251 Style A is the preferred container design, though alternative styles may be used when appropriate for specific content protection requirements.
- **Additional Guidance:** For recommended weight and size limits for shipping containers, refer to ASTM D3951, Table 1.

Figure 1. ASTM D 6251-A



3.5.2. Receiving Inspection & Nonconformance

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 is damaged and hardware is suspected of damage, pictures will be taken, Blue Origin Quality will be notified and the Quality process CMMF-PR0054 (Control of Nonconforming Material) will be followed. Supplier Quality will notify the responsible party for corrective action as applicable.