



Proterra Packaging and Labeling Requirements

SQ-WI-008

1.0 Introduction

The following packaging and shipping guidelines are required for all production materials entering Proterra facilities.

Developed in conjunction with ASTM and AIAG standards, the packaging guidelines detailed below, are specific to Proterra and may be directly applied to the ATSM and AIAG standards.

The labeling requirements described herein will take effect upon receipt of this document. The packaging requirements described herein, for new suppliers or product, will take effect upon receipt of this document. For current suppliers and current product, this standard is effective August 01, 2018.

- For parts which exhibit substandard packaging as received at Proterra, this standard is effective within 30 days of a Packaging Related Non-Conformance Report (NCR). This applies to NCRs issued for packaging within the last 60 days of receipt of this document.

1.1 Compliance

Compliance to these guidelines is mandatory and will be continuously monitored. Non-compliance is subject to rejection by Proterra receiving locations with charges for repackaging, disposal, or return shipment billed back to the shipping location. Recurring violations will be referred to the appropriate Proterra buyer for corrective action.

Suppliers are responsible for designing their own expendable packaging. This includes the expendable packaging for the primary container, expendable dunnage used within expendable and returnable containers, and expendable back-up packaging for returnable container systems. If there are specialized design requirements, Proterra may choose to assume responsibility for the packaging design.

Suppliers may receive assistance from Proterra. This does not relieve them of their responsibility to provide a quality part.

When a returnable container system is required by Proterra, suppliers are responsible to provide a design that meets all Proterra requirements, while ensuring part integrity during shipment.

1.2 Guidelines

Proterra supports compliance to the following American Society for Testing and Materials (ATSM) and Automotive Industry Action Group (AIAG) packaging standards for all production parts to Proterra manufacturing locations. Copies of these publications may be obtained by contacting American Society for Testing and Materials (ATSM) at 1-877-909-2786 & Automotive Industry Action Group (AIAG) at 1-248-358-3003 or through their websites www.atsm.org & www.aiag.org.

- ATSM D-3951: Solid Waste Management Packaging Material Guideline
- ATSM D-5639 Standard Practice for Selection of Corrugated Fiberboard Materials and Box Construction Based on Performance Requirements



- AIAG B-10: Trading Partners Labels Implementation Guideline

2.0 Packing

The supplier must ensure that all items are packaged and reserved adequately to guarantee that the hardware is delivered to Proterra damage and corrosion free. Unless conditions require that Proterra select the packing method, the supplier will be responsible for ensuring that packing conforms to this standard, is economical for the parts involved, and is rugged enough to withstand the rigors of transportation. The supplier will also be responsible for the packing method to be in compliance with regulations of the Department of Transportation (DOT), the Occupational Safety and Health Act (OSHA), the Environmental Protection Agency (EPA), and applicable state regulations.

2.1 Packaging Specific Requirements

Suppliers are responsible for the design and validation of their own packaging for parts supplied to Proterra. Proterra will assist in developing acceptable packaging systems on request or in other certain circumstances. Please note that Proterra's agreement with the specification submitted by the supplier does not relieve the supplier of responsibility for package performance.

Suppliers must design packaging for maximum density and quality. In addition, suppliers should pack, label, and ship materials under requirements of common carriers in a manner that will secure the lowest transportation costs.

All features and surfaces considered critical to the quality or operation of the part (e.g. finished surfaces, machined surfaces, clips, brackets, etc.) must be adequately protected to withstand damage, rust, dirt, moisture, wood chips, or other debris through the duration shipping and handling.

Products without specific packaging & labeling requirements must be packed to withstand logistical handling under "normal" conditions. Proterra expects the packaging of goods from the suppliers to be durable enough for multiple handling. Products must arrive free from contamination and damage. Besides protection, supplier packaging should enable easy handling and part removal

Packaging is to be considered part of the supplier's manufacturing/distribution process and shall be included in their Process Flow Diagram, Process FMEA, and Control Plan for PPAP/Corrective Action/Continuous Improvement procedures.

3.0 Testing and Validation

Packaging testing is the most efficient means of ensuring the integrity and safety of contents and performance of the pack. It is the suppliers' responsibility to ensure part integrity during transportation and subsequent handling and storage through point of use. The supplier should test the pack design under simulated and/or real-life conditions utilizing industry standards to include: ASTM / International Safe Transit Association (ISTA) / and National Motor Freight Classification (NMFC) guidelines. The approval by Proterra of the packaging system does not



relieve the suppliers of their responsibility for part integrity. The supplier should be able to provide Proterra with validation results and testing documentation as they become available.

- ASTM D1185 Standard Test Methods for Pallets and Related Structures Employed in Materials Handling and Shipping
- ASTM D3580 Standard Test Methods for Vibration (Vertical Linear Motion) Test of Products
- ASTM D4169 Standard Practice for Performance Testing of Shipping Containers and Systems
- ISTA 2F Performance Testing of Shipping Containers for LTL Shipment (NMFC) Item 180

4.0 Expendable Packaging

The package design is the supplier's responsibility, and the supplier must ensure that the parts and all packaging shipments are received in acceptable (damage free) condition. The primary container will carry the part from shipping to assembly where it is presented to the operator. It must maintain part quality through transit and multiple handlings.

4.1 Pallet Size and Construction

Construction: The pallet must have the minimum strength to withstand the static and dynamic forces foreseen for the distribution environment. Pallet design criteria must be incorporated to prevent pallet deformations, damages and structural failures which detrimentally affect the functionality of the unit load. Refer to ASTM D1185 designation – Standard Test Methods for Pallets and Related Structures Employed in Materials Handling and Shipping – for testing details and pallet acceptance criteria.

All pallets must comply to ISPM#15 regarding non-manufactured wood products (NMWP) regardless of country origin or destination. These requirements provide guidance on the treatment and marking of coniferous and non-coniferous wooden packaging products.

Pallets may be new, reconditioned or reconstructed. However, if reconstructed must be retreated and show markings that indicate conformance to ISPM #15. The use of corrugated, salvage, and other pallet alternatives are prohibited

North American Standards (Grocery) Pallet 48" x 40" is the preferred footprint

- In addition, North American Standard (Automotive) Pallet 48" x 45" may be used when shipment size exceeds the 40" width.

Proterra storage racking system height is 48" which will accommodate a maximum 44" load height with pallet height included.

If a unique size pallet is required, the pallet length should be sized to accommodate the part length while maintaining the 48" pallet dimension for proper trailer utilization.

4.1.2 General Construction Pallet Specifications

- Four-way entry stringer design.
- Double face non-reversible.
- Flush stringer with both deckboards (no winged pallets).



- Stringer size cannot be less than 1-1/8" x 3-1/2" and 48" length.
- Pallet height cannot exceed 5" and cannot be less than 4".
- If nails are used no more than one split per board will be allowed.

4.1.3 Specific Construction Pallet Specifications

Deckboard Specification:

- Top deckboards no less than 5 - Top deckboards may be random width, but no less than 3-5/8". Spacing between boards, not less than 3" and no more than 4". Deckboards shall not be less than 7/16" in thickness.
- Bottom deckboards no less than 3 - Extreme bottom deck end boards shall be flush with the end of the stringer. Extreme and centerboards will not be less than 3-5/8" in width.

Stringer Specification:

- Stringer notch dimensions and placement notch opening shall be 9" wide, and outside notches shall not be closer than 6" from the end of the stringer.

4.1.4 Permissible Pallet Defects and Characteristics:

Knots:

- The diameter of sound knots shall be no greater than one-third the width of the piece in which they occur.
- There shall be no more than two such maximum diameter knots in any one piece.
- Loose or hollow knots shall not exceed one-half of the sound knots.
- No knots over 1/2" shall be allowed in the stringer immediately over notched areas.

Splits and Cracks:

- Length of crack or grain separation must not be longer than two-thirds the width.
- The width of the piece in the end of the deckboards can be no longer than twice the width of the stringer and inside boards. Splits running through full thickness of the piece (not to be confused with nail splits) are permitted in any number, except when appearing in end boards which must be straddled by nails.

4.2 Case Packaging Standard Guideline (Overpacking)

Right-sized expendable packaging is considered mainstream. Suppliers are responsible for designing their own expendable packaging.

Expendable container systems based on paper products, paperboard, fiberboard or similar materials must be designed to withstand an environmental atmosphere of 40°C +/- 2°C (104°F +/- 4°F) with an 85% +/- 5% relative humidity. Suggested pre-condition environment considers a temperature of 23°C +/- 1.0°C (73°F +/- 2°F) with a 50% +/- 2% relative humidity. Refer to ASTM D685 designation – Standard Practice for Conditioning Paper and Paper Products for Testing – and ASTM D4332 designation – Standard Practice for Conditioning Containers, Packages or Packing Components for Testing – for additional details.

5.0 Palletization Requirements



Pallet load sizes MUST comply with Proterra standard size and design unless otherwise specified. It is the supplier's responsibility to ensure that all pallets provide the protection necessary to deliver the product at the shipment destination in a damage-free condition.

Unique requirements or concerns may exist and be required by individual plants.

5.1 Container Palletization

Containers must be palletized in individual level layers (tiers) on the pallet. No "pyramid" unit loads. If material release quantities do not permit shipment of individual level layers of containers, investigate and explore alternative methods of containerization and/or contact Proterra Quality Engineering for assistance. Guidelines for shipping partial layers:

- If a layer is $> 2/3$ filled, the partial layer is to be completed using empty boxes. Empties may only be on top layer and must be identified as EMPTY. A mixed load label is required if there are full and empty boxes on the same pallet.
- If the material is $< 2/3$ of a layer, the boxes must be removed and palletized separately leaving the remaining layers complete and level.
- Single partial layered pallets must be leveled and boxes centered and secured using stretch film. These pallets may be stacked on top of full-layered pallets.
- If a pallet layer is $< 1/3$ full, boxes may be shipped loose if:
 - Carrier is not LTL.
 - Material is on a designated "milk run" carrier and a loose box crate/bin is available.
 - Material flows through a designated cross dock to allow consolidation with other loose boxes.

Do not mix bulk and manually handled containers on the same pallet. Partial loads should be shipped centered on the pallet with no voids.

No material is to extend beyond the pallet edge, nor be more than 2" less than pallet footprint on any side; it can reduce a compression loss between 20 and 40 percent. Underhang is allowed if the best fit pallet size is selected. In this case stack the boxes on the outer pallet edges when possible, make sure the free space is well secured. This creates a stable level surface when double stack.

Containers must be aligned and fully utilize the length and width of the pallet due to compression strength loss. Brick stacking of containers is prohibited.

Pallet loads must be interlocked when possible. If the palletized load will not interlock, use corrugated layer separation, cap the load with corrugated material and secure.

Pallets must be placed in the carrier's equipment so that the load does not shift in transit. Stacking of product should enable the load to be double stacked within the trailer during transit. It is the supplier's responsibility to use adequate load separators and load caps to provide transit protection. Heavy items should always be marked and identified so that they ride as a bottom load and are not top tiered.

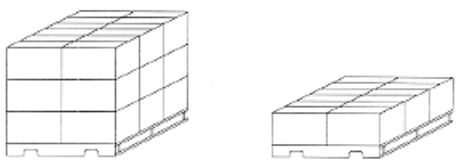
When stacking pallet loads, labeling information must face the outside perimeter of the pallet so that part number information is visible.

All shipping containers, pallets, etc., must be of sufficient strength to withstand in-transit and in-house handling. Dynamic loading (in-transit) is typically three times the static load and must be considered in the design of all packaging.

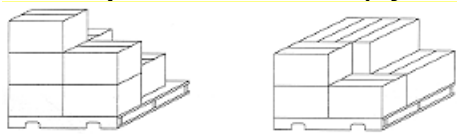
Special airfreight shipments may require reinforced packaging protection due to potential rougher handling.

5.1a Container Palletization Diagrams

Properly Palletized Cartons (Level Layer)



Unacceptable Unit Loads (Pyramid)



Brick stacking is prohibited.



5.1 Pallet Load Securement (If Applicable)

Banding should be adequate for retaining all parts and/or containers on the pallets during normal handling and transportation. Four bands, 2 in each direction, should be used to secure the load to the pallet. Plastic strapping is acceptable for light loads. Steel banding is more appropriate for heavier loads. The application of metal, fiberboard or heavy corrugated edge protectors is required to prevent banding, strapping or wrapping damage.

The use of plastic shrink or stretch wrap is an acceptable method of retaining loads as long as retaining ability is equivalent to banding. The plastic stretch or shrink-wrap must be securely fastened to the pallet base on opposite corners to discourage breakdown of the load.



Additionally, stretch wrap can also be applied to material that has been banded to pallets. Corner boards and top protectors are recommended with the use of wrapping as a way to ensure that the pallet remains structurally sound and secure during shipment.

5.2 Mixed Loads

Realizing that it may be unavoidable due to low volumes and/or shipping/handling expense, the mixing of part numbers in a container or pallet is discouraged, and is not the preferred manner of shipping, or receiving, product. When shipping a mixed load, the following requirements must be met:

- A mixed load label must be affixed to the load on all four corners alongside where the shipping label is normally attached.
- In addition, a mixed load manifest or packing slip must be attached to the load that indicates the part numbers shipped and how many containers are associated with each part number. Palletize by like part number, if at all possible. The default policy of Proterra is to not mix loads, and to not load right and left-hand parts on the same pallet.

7.0 Acceptance & Rejection Criteria

The provisions of this specification shall provide the basis for acceptance or rejection of incoming material.

- Refuse delivery of the entire load. In this case the vendor will be responsible for filing a freight claim if appropriate.
- Accept delivery of the load, but reject some of the parts and place the material into a containment area pending resolution. In this case Proterra will be responsible for filing a freight claim if appropriate.