Abstract

This Standard establishes requirements for supplier production parts packaging to Cummins manufacturing plants globally.
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1. Scope

The Standard provides requirements for all production and pre-production parts and materials supplied to Cummins sites worldwide, including all intercompany sales.

Specific procedures and/or requirements may exist in each plant and may not be included within this document so it is critical that suppliers work to understand any specific Cummins receiving plant requirements. Suppliers shall submit their packaging proposal for approval to each of the specific Cummins receiving plants packaging representative.

Cummins New & ReCon Parts entities have different packaging requirements. Reference the Cummins Global Packaging Standard-New and ReCon Parts.

2. Applicable Documents

Applicable documents listed below may be obtained from the respective organizations listed.

   a. AIAG B1, Bar Code Symbology
   b. AIAG B3, Shipping/Parts Identification Label Application
   c. ANSI ASC X12.3, Data Element Dictionary
   d. ASTM D4169, Standard Practice for Performance Testing of Shipping Containers and Systems
   e. ISPM 15, Regulation of Wood Packaging Material in International Trade

3. Definitions

Terms used in this standard are listed in Section 7.4. Label Specific Glossary of Terms on page 33 and Appendix A: Packaging Glossary of Terms on page 50.
4. Introduction and General Information

4.1. Introduction

The Cummins Global Packaging Standard-Production Parts, hereinafter “the Standard” has been created with the goal to standardize packaging, reduce waste, and improve quality and packaging sustainability while providing parts at the lowest total cost. Packaging is a key element in the supply chain which can impact safety, environment, quality, line side delivery, order quantities, inventory levels, freight utilization and customer satisfaction.

Packaging shall be designed with a focus on safety including such considerations as: ergonomics, unit load integrity in transit & through-out the decanting process, elimination of steel strapping and the need for cutting tools/knives. Specific guidance on materials and methods are outlined here-in.

In this document the word “should” indicates a Cummins recommendation, the word “shall” indicates a Cummins requirement and the word “must” indicates a requirement by law or statute. It is the intent of Cummins that all suppliers shall comply with the requirements in this document. The chapters within this document will provide suppliers with the necessary information to meet Cummins expectations for component part delivery.

4.2. Purpose

This document specifies packaging practices and standards for all suppliers of component parts to any and all Cummins manufacturing facilities. For Suppliers of parts to any and all Cummins Parts Distribution Centers (PDC) reference the Global Packaging Standard-New & ReCon Parts. This Standard is the foundation for Suppliers to develop their part specific packaging specifications and ensure that all incoming component(s) are adequately protected at the lowest total cost with due consideration of sustainability and the entire supply chain flow. Supplier packaging shall preserve part quality through the entire distribution chain up to and including the point of use regardless of the freight terms or mode of transport.

The Global Packaging Standard-Production Parts and the Global Packaging Standard-New & ReCon Parts may be accessed through the following link:

http://supplier.cummins.com/wps/portal/SupplierPortal/SupplierHome/StandardsAndProcesses
4.3. Supplier Compliance

Cummins will randomly inspect incoming packaging to determine compliance per the Standard. Where additional regulatory or other packaging requirements exist, or are not covered in this Standard, the supplier is responsible to obtain and assure compliance.

In the event of noncompliance to the specifications within this document, Cummins reserves the right to:

4.3.1. Issue a Non-Conforming Material Report or Process Non-Conformance (NCMR or PNC) to document the non-conformance and notify the supplier of corrective action required.

4.3.2. Issue a Supplier Corrective Action Report (SCAR) to document and drive corrective action through an SQIE led 7-Step process.

4.3.3. Reject and request a Return Material Authorization (RMA) to return any shipment(s) received that are improperly packaged and/or identified at the supplier’s expense.

4.3.4. Charge the supplier for any cost due to non-compliance to the Standard. (e.g. may include the cost of material and/or labor for any repackaging, sorting, rework or replacement of damaged parts, etc.) After the first warning and a ten day grace period to implement corrective actions, Cummins may debit your Company $200 per additional infraction.

4.3.5. Consider removing the supplier as a supplier to Cummins.

4.4. Key Contacts

Beyond the global requirements provided for here-in, Suppliers are required to understand and comply with Cummins receiving plant specific requirements and thus facilitate a prompt approval of their packaging proposal.

Questions specific to this Packaging Standard should be submitted in writing to any member of the Cummins Global Packaging Council for Council consideration.

In using or applying the Cummins Global Packaging Standard you may have recommendations or questions requiring clarification or change.

Recommendations or questions are to be submitted to the GPC using the Stakeholder Input Form as follows:

a. Stakeholder queries Global Packaging Council Member
4.4. Key Contacts (Continued)

b. GPC Member provides Stakeholder Input Form to Stakeholder
c. Stakeholder returns completed Form to GPC Member
d. GPC Member vets Stakeholder input
e. GPC Member forwards completed form to GPC Packaging Leader

4.5. Revisions and Responsibilities

The Cummins Global Packaging Council is a group of packaging engineering functional leaders from multiple Cummins Business Units (BU's). The Council's objective is to assist Cummins Corporate Supply Chain in developing and maintaining global cross BU packaging standards, common processes, and create functional excellence in the Cummins packaging function.

Revisions to the Standard will be controlled and authorized by the Cummins Global Packaging Council.

In using or applying the Cummins Global Packaging Standard you may have recommendations or questions requiring clarification or change.

Recommendations or questions are to be submitted to the GPC using the Stakeholder Input Form as follows:

a. Stakeholder queries Global Packaging Council Member
   b. GPC Member provides Stakeholder Input Form to Stakeholder
   c. Stakeholder returns completed Form to GPC Member
   d. GPC Member vets Stakeholder input
   e. GPC Member forwards completed form to GPC Packaging Leader

The supplier is responsible to monitor the Standard and Standard Revision History. See Appendix D: Revision Log Sheet on page 67.

4.6. Packaging Specification Approval Process

Internal and external Suppliers shall follow the process below in order to assure that their packaging meets the Standard and the plant specific packaging parameters.

Expendable packaging price per unit shall be defined as a separate line item in all piece part price quotations to Cummins Purchasing and in the Packaging Specification Data Sheet (PSDS) referenced in Appendix C: Packaging Specification Data Sheet on page 63.
4.6.1. Plant Packaging or Materials Representatives are responsible for establishing their specific receiving plant packaging parameters for the Supplier. For example:

   a. Foot Print restrictions
   b. Weight & Height limitations
   c. Quantity per container limits
   d. Special Quality requirements
   e. Line side presentation orientation requirements

4.6.2. Suppliers shall contact the Packaging Representative or Materials Representative from each specific Cummins receiving plant to inquire about specific plant related packaging parameters.

4.6.3. Supplier shall develop their packaging proposal based on the Standard and the Cummins receiving plant specific requirements and submit to Cummins Sourcing Manager using the Packaging Specification Data Sheet provided herein as Appendix C: Packaging Specification Data Sheet on page 63.

4.6.4. Where a part is used in both production and aftermarket/service applications the PSDS approval process is required for both manufacturing plants and PDC’s.

4.6.5. Each receiving plant shall review the Suppliers proposed packaging from the Packaging Specification Data Sheets and route internally for approval.

4.6.6. Once approved, the receiving plant Packaging or Materials Representative will forward the approved Packaging Specification Data Sheet to the Supplier.

4.6.7. If the Packaging Specification Data Sheet proposal is rejected, the plant Packaging or Materials Representative shall work with Supplier to make the necessary corrections to obtain approval.

4.6.8. All individual part packaging specifications and related costs shall be defined prior to shipment of parts to a Cummins receiving plant. No changes shall be made except those authorized by the Cummins receiving plant Packaging or Materials Representative.

4.6.9. See Figure 1: Packaging Specification Data Sheet (PSDS) flow chart on page 10 for packaging approval process.
Figure 1: Packaging Specification Data Sheet (PSDS) flow chart
Figure 2: Packaging Specification Data Sheet (PSDS) flow chart (Continued)
5. General Packaging Requirements

Supplier is responsible for packaging quality to assure proper component protection while in shipment from point of origin through point of use with consideration of all carrier modes used to transport freight.

5.1. Part Protection

Parts and materials shall be packed so as to provide adequate protection during shipment and handling, up to and including the point of use.

5.1.1. Plan the packaging such that parts may be removed without unnecessary handling.

5.1.2. Nested parts may be sequentially packed but shall be easily removed from the packaging.

5.1.3. Plan the packaging such that a safe and stable unit load is maintained in the "as packed" condition when the closure is removed.

5.1.4. Protect open holes of functional parts which may be adversely affected by contaminants.

5.1.5. When plugs and caps are used they shall be easy to remove, but shall remain intact during transportation and handling.

5.1.6. Protect functional and pre-calibrated parts to the extent necessary to insure print specification compliance.

5.1.7. Protect special surfaces such as:

a. Machined Surfaces
b. Finish painted or to be painted
c. Finish plated or to be plated
5.2. Failsafing

Packaging may be designed to failsafe our manufacturing processes and/or to facilitate assembly through the incorporation of a mistake-proofing function to the packaging and/or through part presentation.

Examples:

a. Matched parts packaged as sets with a clear association of mating parts.
b. Scanning of the bar code parts identification labels can failsafe part introduction to the manufacturing process.
c. Where possible match packaging counts to assembly unit requirements.

5.3. Part Cleanliness

Supplier packaging and preservation methods shall protect for print specified part cleanliness requirements.

5.4. Preservation and Shelf Life

The requirements below are general and may be supplemented by order of the Cummins Supplier Quality Improvement Engineer (SQIE) as required for specific parts.

Preservation is the action required to prevent corrosion and is normally independent of the packaging.

Preservation shall be sufficient to protect the product from any corrosion for a period of 6 months for production parts, under normal warehouse storage and transportation conditions. The 6 month period begins when Cummins assumes title to the goods.

It is Cummins preference for the corrosion prevention material used to provide a dry-to-touch component whenever possible.

The Supplier shall, upon request, provide a copy of a Material Safety Data Sheet (MSDS) for preservatives used.

5.5. Environmental Impact

The supplier is responsible to comply with Cummins initiatives to continually reduce our waste, disposal cost and to increase our recycling efforts.
5.5.1. Packaging must be created with consideration of all governmental regulations and environmental impact from packaging material selection through the end of life cycle.

5.5.1.1. Acceptable packaging materials include, but are not limited to:

a. Wooden pallets/boxes/crates:

Note 1: Must comply with International Standards for Phytosanitary Measures (ISPM-15) as required.

Note 2: Manufactured wood packaging materials must comply with Cummins exposure limits of 0.016 ppm [0.02 mg/m$^3$ of formaldehyde per cubic meter of air (mg/m$^3$)] as an 8 hour total weighted average and 0.1 ppm (0.15 mg/m$^3$) as a ceiling concentration determined in any 15 minute sampling.

b. Clean corrugated/fiberboard
c. Molded pulp
d. Clean Kraft Paper
e. Paper (VCI treated)
f. Polyethylene film/bags (VCI treated)
g. Polyethylene bags (clear only)
h. Bubble wrap (clear only)
i. Stretch wrap (clear only)
j. Steel

5.5.1.2. Allowable packaging materials with Cummins receiving plant approval:

a. Polyethylene (e.g. partitions, layer trays and pads)
b. Michelman coated corrugated
c. Foams (Ethylene, Propylene, Styrene, Urethane, etc)

5.5.1.3. Prohibited packaging materials include:

b. Soiled Corrugated (oil soaked).
c. Wax coated corrugated.
d. Microfoam laminated corrugated.
5.5.1.4. All packaging materials shall display the appropriate re-cycling symbol as applicable and prudent.

5.5.1.5. Design packaging to minimize the environmental impact by:

a. Reducing the amount of material needed for the packaging and avoiding the use of non-renewable resources.
b. Reusing the packaging material in a manner that is safe and cost-effective with special attention to transportation distances necessary to complete the cycle.
c. Maximizing the use of renewable or recycled packaging materials.

![Figure 3: Environmental Impact](image)

Figure 3: Environmental Impact
5.6. Lean Principles in Containerization

The following guidelines shall be used in establishing the right-sized container, type and part orientation.

a. Containerization and packaging methods shall optimize pack density with consideration for part quality, ergonomics and cost.
b. Part orientation for ergonomic presentation shall optimize the operators grasp, lift, manipulation and part transfer to the work.
c. Part orientation in the container shall utilize the relative location to the container label as a reference for consistent presentation at line-side.
d. Where dunnage is required, its orientation within the container shall be consistently applied such that the part-to-shipping label relationship is maintained.
e. Manually handled containers are the preferred method when an ergonomic advantage can be realized by a decreased reach or lift distance.
f. The Gross Weight Limit (GWL) for manually handled containers to any given Cummins facility shall not exceed 15kg or 33 lbs.
g. Manually handled containers are indicated when the part dimensions, features, and weight will allow the container to safely house in an ergonomically favorable orientation a maximum gross weight of 15kg., with a target quantity of one third (1/3) to one hour’s production.
h. Where plant usage dictates, manually handled containers shall be sized such that the Standard Pack Quantity (SPQ) does not exceed one day’s production – with the exception of high-density commodity items such as fasteners.

5.7. Packaging Materials

5.7.1. Packaging Design and Material Selection.

The supplier shall consider the following general practices in establishing packaging design and material selection.

5.7.1.1. The supplier shall utilize materials of sufficient strength and integrity to provide for the safe transport of quality parts to the point of use.

5.7.1.2. The supplier shall apply proper packaging principles in container and dunnage design with considerations for both static and dynamic conditions.
5.7.1.3. The supplier shall apply proper packaging principles in palletization and unit load securement.

a. Polyester strapping is preferred.

b. Metal strapping shall not be used without express written permission from the Cummins Receiving Plant Packaging Representative.

5.7.1.4. Containers are to be sized such that solid foundational support is derived from the pallet (no pallet overhang).

5.7.1.5. Use of corner posts and angle board are acceptable means of enhancing unit-load performance as required.

5.7.2. Pallet Construction

The following defines minimum material and construction criteria for acceptable pallet types. Pallet construction shall support the unit load through normal material handling including use with forklifts.

5.7.2.1. Pallet Styles

5.7.2.1.1. Acceptable Pallet Styles

a. Block Style: Block style pallets shall have a minimum of 9 block risers with minimum 4.0 in (102 mm) height.

b. Flush Style Stringer 2Way Entry.

c. Flush Style Stringer 4Way Entry.

d. Single Wing Stringer: It is recommended that deck boards not extend beyond the stringer greater than 1 in (25.4 mm).
Figure 4: Acceptable Pallet Styles

5.7.2.1.2. Non-Acceptable Pallet Styles:

a. Double Wing Stringer
b. Single Faced Stringer
c. Pressed Wood
### Figure 5: Non-Acceptable Pallet Styles

#### 5.7.2.2. Pallet Construction

- **a.** Pallets 40 in L x 40 in W (1016 mm x 1016 mm) and larger shall have 4-way entry.
- **b.** Deck Boards shall be 0.5 in (13 mm) thickness minimum.
- **c.** Open space between top deck boards shall not exceed 3 in (76.2 mm).
- **d.** Top and bottom edge deck boards shall be flush with stringer ends.
- **e.** Stringers shall have the minimum height of 3.5 in (88.9 mm) minimum width of 1.25 in (38.1 mm).
- **f.** Notched stringers on 4 way entry pallets shall have an opening height of 2.5 in (63.5 mm).
- **g.** Notched opening shall be 9 in (228.6 mm) wide, with radial cut top corners and placed on 16 in to 24 in (406.4 mm to 609.6 mm) centers.
- **h.** Pallet strength shall be capable of bridging the 32 in (812.8 mm) open distance between front and rear load beam of warehouse storage racks.
- **i.** Pallets and all solid timber packaging must comply with ISPM-15 for all international shipments including freight shipped to Cummins international freight forwarders. (see **Figure 6: ISPM-15 Certification Mark on page 20**.)
5.7.2.3. Recycled Wood Pallets

Recycled/Reconditioned wood pallet construction standards and requirements shall follow the National Wooden Pallet and Container Association (NWPCA) Uniform Standard for Wood Pallets.


5.8. Package Closure

Container styles and methods of closure that require the use of knives or other tools are discouraged.

5.8.1. Acceptable methods of closure are:

a. Adhesives
b. Sealing Tape
c. Polyester or Nylon Strapping (Banding)

5.8.2. The following methods of closure are prohibited:

a. Metal Stitches and Staples
b. Steel Strapping (Banding)

Exceptions for utilization of prohibited methods of closure shall be requested of the Cummins receiving plant Packaging Engineer.
5.9. Modularity

The following general guidelines shall be used in establishing the unit load footprint/cube. Where deviations are justified, the Supplier shall provide supporting rationalization upon request.

a. The unit load should be modular to the mode of transport from the supplier location to point of use.

b. Where multiple modes of transport are utilized, the unit load modularity should be optimized to the mode of transport resulting in the lowest total logistics cost.

c. Where multiple modes of transport are utilized and total logistics cost does not favor one mode over another, the unit load shall utilize the standards applicable to the global region of the receiving customer facility.

d. Where manually handled containers are determined to be the appropriate packaging method, the containers shall be modular to the unit load.

e. The supplier shall define carton dimensions to be modular to Unit Load cube appropriate to the method of transport, see Figure 7: Modularity on page 21 for examples of carton modularity.

![Figure 7: Modularity](image-url)
## 5.10. Unit Load Stability and Stack-ability

### 5.10.1. Unit Load Integrity

The unit load shall be designed to maintain integrity during normal handling, transportation & storage.

- a. The unit load shall safely stack up to 100” (2540 mm) in a dynamic environment (in transit) on a stable level plane of like freight (foot print & weight).
- b. The unit load shall safely stack to the greater of three high or 10’6” (3200 mm), in a static environment (in warehouse).
- c. To ensure maximum stacking strength, cartons unitized on a pallet shall be column stacked.
- d. The maximum gross weight of loads shipped to Cummins locations shall not exceed 4,000 pounds per unit load unless authorized by the Cummins receiving plant.
- e. The unit load height to width ratio (h:w) shall be equal to or less than 1:1.
- f. Unit loads shall be structured to maximize stability such that the center of gravity is located centrally to the container footprint and at the lowest elevation possible.
- g. Cummins shall make every effort to order in multiples of the SPQ as defined in the Supplier Agreement.
- h. Cummins should make every effort to order in even layer quantities (even layer multiples of the SPQ).
- i. Cummins should make every effort to order Standard Unit Load Quantities (SULQ) when schedules allow.

Note: Where Cummins is not compliant with these order quantity protocols (compromising value in the supply chain), it is incumbent on the supplier to formally communicate the concern and actively seek resolution.

- j. Whenever possible, the unit load should contain parts of the same part number however, mixed loads are accepted as allowed by the Cummins Supply Chain Agreement specific to those parts and that Cummins receiving plant.
- k. When mixed loads are appropriate due to product mix and release quantity, the supplier shall apply proper packaging principles in palletization.
- l. All unit loads shall be equalized to full layer orientation whenever possible. Stacking cartons in a pyramid configuration on a unit load is not permitted. Exceptions will require written deviation from the Cummins receiving plant.
5.10.2. Special Purpose Export and Over-pack Guidelines

This section covers approved crating specifications to be used for international shipments where a robust export pack is required. These specifications are derived from research of various packaging styles, regionally available materials, manufacturing capabilities and transportation conditions.

Specifications are defined through the appendices listed below. These specifications are provided as recommendation to suppliers with limited Packaging Engineering resource to develop application specific containers suitable to protect their parts through the global distribution environment.

Note: Solid Timber Closed Crating, see Appendix B: Production Component Packaging Guideline - Solid Timber Closed Crating on page 57.

5.11. Extreme Distribution Conditions

Extreme distribution conditions require more robust packaging protection than standard domestic highway freight. Examples include Less-Than-Truck-Load (LTL) vs. Full-Truck-Load (FTL) highway freight, air freight, ocean freight, rail, and parcel package shipments.

a. Less-Than-Container-Load (LCL) vs. Full Container Load (FCL) ocean freight transport methods may require further refinements to packaging design.

b. Weather conditions and freight handling methods in different parts of the world require additional protection from the elements.

c. The supplier shall be responsible for adequately protecting the product and packaging from moisture through the inclusion of Volatile Corrosion Inhibitor (VCI), Desiccants, and an appropriate closure method.

d. Closure methods should include covering and/or sealing the unit load with a poly-bag or stretch wrap film. This is particularly critical when LCL transportation methods are used.

Deviating from the normal mode of transportation may require additional measures.

a. The Supplier should be required to “Over-pack” the unit load to assure a quality part to the point of use.

b. This requirement also applies to Cummins International Freight Forwarders.

The supplier is responsible to understand and comply with the prevailing packaging and transportation regulations for the global regions through which their goods will ship.

5.13. Packaging Trial Shipments

Packaging trials may be required by the Cummins receiving plant Packaging Representative to confirm the Supplier packaging proposal(s) as defined by the supplier PSDS submission. The Supplier shall provide advance notice shipping/delivery coordination and follow-up. Trial shipment planning and coordination shall include the following:

Trial shipment identification labeling shall be on an approximately 8.5 in x 11 in (216 mm x 279 mm) plain white label as sample shown in Figure 8: Trial shipment identification label on page 24.

![Figure 8: Trial shipment identification label](image)

Advanced notification to the Packaging Representative shall contain:

a. Photos of the packaging prior to shipment
b. Quantity shipped
c. PSDS Form
d. Planned delivery date
e. Carrier
f. Bill of Lading and/or Tracking Number

The supplier shall establish and maintain a 'Packaging Process' document linking the Cummins part number to the required packaging components (Bill of Materials) and work instructions.

a. The Packaging Process document shall use the Cummins part number as the primary reference.
b. The Packaging Process document shall include the packaging part numbers, quantities, and descriptions of all packaging components required to assemble the unit load.
c. The Packaging Process document shall include the packaging operation sequence considering part and dunnage orientation, and palletization layout.
d. The Palletization Layout shall establish container orientation such that all possible container labels are visible around the perimeter of the unit load.

The Packaging Process and Work Instructions document shall be under document control and readily accessible to the Supplier packaging operator and Cummins upon request.

5.15. Packaging Plan

A graphic representation or ‘Packaging Plan’ is not a requirement but is a component of our vision for functional excellence in Supplier packaging. A functionally excellent ‘Packaging Plan’, in addition to the above requirements, would include the following in an exploded isometric format.

a. Part Description (Noun name).
b. Dunnage* (*if applicable) - with description notated.
c. Part orientation - as packed including interface with dunnage* (*if applicable).
d. Part orientation - to the primary container label location.
e. Primary container - with description & SPQ notated.
f. Palletization layout of the unit load with label location indicated.
g. Reference dimensions and weights of packaging components.
h. Packaging Plan revision level / date of each document.
Figure 9: Example Packaging Plan
5.16. Packaging Test Standards

The supplier shall ensure part packaging performance complies with Cummins requirements. Cummins does not require Suppliers to perform laboratory validation testing of their packaging. Cummins recommends, especially in the instance of critical, high cost, sensitive or fragile parts, that testing be performed in a certified packaging test lab. The decision to perform validation testing, the selection of the appropriate test standard and assurance level is the responsibility of the Supplier.

6. Dedicated Returnable Packaging

6.1. Introduction

Returnable Containers are used to maximize the economics of product flow between Supplier and Cummins manufacturing facilities. Further, these containers are utilized to reduce the collective use of expendable packaging and advance our achievement of shared environmental initiatives. Although the ambition, it is not the specific mandate of a returnable container program to completely eliminate the use of expendable material in conjunction with the use of the returnable containers. In some instances, expendable dunnage and/or strapping is necessary to effectively and economically perform the appropriate container function.

6.2. Returnable Packaging Policy

To ensure that product shipments are uninterrupted, the supplier shall always quote an expendable packaging solution that complies with the same containerization and configuration as the returnable packaging.

In NO Instance is the supplier to purchase returnable containers with the intent that they will be used to supply Cummins or with the belief that the supplier will be reimbursed for any such expenditure, without express written authorization from the responsible Cummins receiving plant Packaging Representative and the responsible Cummins Sourcing Manager.

The responsible Cummins receiving plant Packaging Representative will be the only acceptable source to approve and validate all returnable packaging proposals based on total cost of ownership. Unless provided by our Suppliers, the returnable containers are assets owned by Cummins and are accounted for as such.
6.3.  Returnable Packaging Justification

Justification of returnable packaging is a function of multiple cost variables including but not limited to expendable packaging cost, logistics and investment. Returnable containers are deemed a viable alternative to expendable packaging only after a thorough costing, Return on Investment (ROI) and an environmental impact analysis is performed.

Note: Cummins Suppliers shall actively participate in the provision of data required to perform the justification analysis.

6.4.  Returnable Packaging Funding and Ownership

6.4.1.  Ownership
a. The Cummins preferred method is for the Cummins receiving plant to own/lease the returnable packaging.
b. Supplier owned returnable packaging may be an acceptable alternative, but shall be negotiated and agreed upon by the Cummins receiving plant.

6.4.2.  Funding/Purchasing

The method of returnable packaging investment is determined by the Cummins receiving plant and is typically supported by a reduction in Supplier’s component piece price.

6.5.  Cummins Responsibility

6.5.1.  Cummins will determine the viability of the returnable packaging program and responsible party to provide the container fleet.

6.5.1.1.  The supplier shall not assume that returnable “container” implies returnable dunnage. In certain circumstances returnable containers may be provided with the assumption that the supplier will provide expendable dunnage.

6.5.1.2.  For Cummins owned returnable packaging, the Cummins Packaging Engineer will lead container/dunnage development and validation.

6.5.1.3.  For Supplier owned returnable packaging, the Supplier will lead container/dunnage development and validation.

6.5.1.4.  Returnable containers shall be outfitted with label placards, holders or clips as appropriate for the container size and type.
6.5.1.5. Cummins returnable container fleet may be managed by a Third Party Logistics (3PL) Provider. The returnable container fleet size and Container Logistics Plan will be agreed to jointly by the Cummins Supplier, Cummins receiving plant and 3PL provider if applicable.

6.5.1.6. A Container Logistics Plan shall provide definition of the following as agreed upon by the Supplier and the Cummins receiving entity.

a. Dunnage Return Configuration or Methodology.
b. Utilization of Collapsibility Features and Return Configuration.
c. Container Cleaning and Maintenance Frequency/Plan.
d. Storage/reapplication container disposition plan at end-of-program.

6.5.2. Logistics Cost

All inbound and return logistics costs are the responsibility of the Cummins receiving plant unless specifically stated in the Supply Chain Agreement between Cummins and the Supplier. The known exception to this policy is in the event of an expedited freight situation where Supplier is at fault. In this case, the Supplier will be responsible.

6.5.3. Returnable Container Maintenance

For Cummins owned returnable containers, the Cummins receiving plant or 3PL provider is responsible for the performance of regular maintenance and cleaning of the containers unless other provisions are established in the Supplier/Cummins returnable packaging contract.

6.6. Supplier Responsibilities

Maintenance, cleaning, replacement, and purchase of additional containers due to demand are the responsibility of the owner of the returnable packaging. Cummins Suppliers are required to actively participate in the fleet management of returnable containers.

6.6.1. General Requirements

Suppliers are responsible for the following general requirements while the containers are within their control and/or possession:

a. Shall utilize containers only for shipment of the Cummins part and site for which they are intended.
b. Protect against theft and misuse by ensuring that returnable containers are handled properly and are secure at all times.
6.6.1. General Requirements (Continued)

c. Provide a clean, dry and organized space for container storage that will not expose containers to the environment and with ready access and visibility to facilitate physical inventory upon request.

d. Ensure that returnable containers are not used for long-term, work-in-process (WIP), or any form of use that extends the days of use of the container beyond the agreed upon allowable possession time or ‘float’ days.

e. Suppliers shall have a backup expendable package solution, and meet the same parameters as the returnable package (footprint, quantity).

f. Suppliers shall have an approved PSDS for both the returnable and back-up expendable packaging.

g. Where the need for backup expendable packaging is directly attributable to Supplier not adhering to the agreed upon float days, the Supplier will bear the cost.

h. Provide 6 months advance notification to Cummins receiving plant(s) of changes in volume or logistics that will impact the agreed upon float days and/or fleet size requirements.

i. Shall not modify the containers in any way.

j. Shall apply shipping labels to containers in the designated locations using the methods (placard, holder or clip) provided.

k. Shall apply no other labels, marks or deface the containers in any way.

l. When requested by Cummins, suppliers are required to track containers at the receiving and shipping transaction level. When requested by Cummins, Supplier are required to perform an inventory reconciliation of assigned containers at the frequency agreed upon with the Cummins receiving plant or the 3PL provider.

m. Will incur charges for container loss deemed to be the result of poor practices or neglect by the Supplier.

n. The Supplier may be required to store containers during periods of reduced demand and at end-of-program pending the reapplication/disposition plan, for the period agreed upon by the Supplier and the Cummins receiving plant.
6.6.2. Returnable Container Maintenance and Cleaning

For Cummins owned returnable containers, the Cummins receiving plant or 3PL provider is responsible for the performance of regular maintenance and cleaning of the containers unless other provisions are established in the Supplier/Cummins contract.

Suppliers are required to:

a. Isolate any damaged or suspect containers.

b. Identify all damaged or suspect containers utilizing Supplier’s own non-conforming material tags.

c. Include specific detailed information as to the defect type and location on the container.

d. Return damaged or suspect containers immediately to the Cummins receiving plant or 3PL provider.

Suppliers may be charged with the cost of maintenance when it is conclusive that the damage or defect was caused by the negligent actions of the Supplier and/or its representatives.

Suppliers shall confirm all returned containers have all expired Shipping/Parts Identification Labels removed, are free of debris, and in safe usable condition.

For Supplier owned returnable containers, the Supplier is responsible for the performance of regular maintenance and cleaning of the containers unless other provisions are established in the Supplier/Cummins contract.
7. Bar Code Shipping/Parts Label Specifications

7.1. Purpose

To standardize the requirements for packaged material identification from point of origin to point of use.

7.2. Scope

These requirements pertain to all production parts and/or materials including samples shipping to all Cummins global manufacturing facilities. These requirements do not pertain to New & ReCon Parts and do not address content identification which may be required by governing tariffs, special handling instructions or the labeling of hazardous materials.

7.3. Introduction

The Cummins Labeling Standard is a derivative from the AIAG Shipping/Parts Identification Label Standards (AIAG B3) developed by the Automotive Industry Action Group (AIAG). The ODETTE bar code labeling standard is a European labeling standard and is also an acceptable parts identification labeling format.

Permission to print portions of the AIAG Shipping/Parts Identification Label Standard (AIAG B3 1984) has been granted by the AIAG Board of Directors.

These labels are designed to improve supplier and customer productivity and controls of suppliers and customers by allowing effective and efficient capture of data for production counts, warehouse input/output, cycle counting, shipper generation, forwarding, freight transfer control, receiving and other inventory controls. It is the responsibility of the supplier to provide bar coded labels that meet these specifications. Strict adherence to these specifications will be enforced.
7.4. Label Specific Glossary of Terms

a. Item- A single part of material purchased, manufactured, and/or distributed.
b. Standard Quantity Pack- A pack which always contains a standard quantity of like items.
c. Non-Standard Quantity Pack- A pack which contains variable quantities of like items.
d. Common Item Pack- A pack which contains all like items, i.e. same part/item numbers.
e. Mixed Item Pack- A pack containing items with different part/item numbers.
f. Subpack-One of the smaller packs (which may be a standard quantity or non-standard quantity pack) that make up a larger multiple pack.
g. Shipping Pack- A pack used for shipping items from one plant to another and can be any of the packs described above.
h. Label- A card, strip of paper, etc. marked and attached to an object to indicate its nature, contents, ownership, destination, etc.
i. Tag- A label that is hung from an object, usually with a wire placed through a reinforced eyelet in the label/tag.
j. Shipping/Parts Identification Label- A label used to identify the contents of a shipping pack.
k. Master Label- A label used to identify and summarize the total contents of a shipping pack.
l. Mixed Load Label- A label used to designate mixed contents on the same unit load.
m. Pack, Package or Load- A unit which provides protection and containment of items plus ease of handling by manual or mechanical means. Examples of containers or packs which normally are disposable bags, cartons, cartons on pallets, pallet boxes and metal tubs, and metal racks/skids.

n. Receiving Location Code - A unique code assigned by Cummins for each plant receiving dock location. (e.g. R/L 022 for Columbus Midrange Engine Plant)

7.5. Shipping/Parts Identification Label Size and Material

Label size and Label Data Area field dimensions shall be as displayed in Figure 10: Shipping/Parts Identification Label on page 34. The label paper shall be white in color with black printing. Adhesive types can be pressure sensitive or dry gummed as long as adherence to the package substrate is assured and application is wrinkle-free. If the specified label can’t be affixed to packaging/container because of container size or design, special arrangements will be required. (See Sections 7.8. Special Labels on page 41)
Figure 10: Shipping/Parts Identification Label

7.5.1. Shipping/Parts Identification Label Hang Tag Size and Material

The tag size shall be the same as described above, plus the material necessary to add a reinforced eyelet to the tag. The tag shall be durable enough to assure readability at its destination. (see Figure 11: Shipping/Parts Identification Label Hang Tag on page 35.)
Figure 11: Shipping/Parts Identification Label Hang Tag
7.6. Bar Code Shipping/Parts Label Data Area Characteristics

The part number, quantity, supplier number, and label serial number shall be included on each label in the designated data areas and shall be displayed in both human readable characters and bar code symbols. The purchase order number on individual carton labels can be an exception if you are pulling packaged labeled product from stock that you ship to multiple Cummins locations, however, the Master Label shall have the purchase order displayed in human readable characters and bar code symbols. All data may vary in length.

7.6.1. Label Data Areas and Titles: There are six data areas for each label.

a. Part Number (PART NO.)
b. Quantity (QUANTITY)
c. Purchase Order Number (P.O.NO.)
d. Supplier Number (SUPPLIER)
e. Label Serial Number
f. Special Data Area

Each data area shall be separated by thin lines and contain its title in the upper left hand corner, as shown in the Figure 10: Shipping/Parts Identification Label on page 34 and Figure 11: Shipping/Parts Identification Label Hang Tag on page 35. Outer border lines are not required. Titles shall be printed in 0.06 in (1.5 mm) high letters. The data area titles are: Part No., Quantity, Serial, Description, and Purchase Order No.

7.6.1.1. Label Part Number Area

The human readable part number characters shall be bold and a minimum 0.5 in (13 mm) high. The bar code symbol of the part number shall be directly below the human readable characters and shall be a minimum 0.5 in (13 mm) high. Depending on the nominal dimension of the narrow bar code elements, part numbers of varying lengths can be printed on one line. The maximum length of any bar code symbol shall not exceed 5.5 in (140 mm). The part number shall be designated by the Customer.

7.6.1.2. Label Quantity Area

The human readable quantity characters shall be a minimum 0.5 in (13 mm) high. The bar code symbol for quantity shall be directly below the human readable characters and shall be a minimum 0.5 in (13 mm) high. The maximum length for quantity is six (6) numeric characters plus the data identifier (Q). The length of this area (the line separating the Quantity Area from the Special Area) may be adjusted to handle specific needs of the supplying location.
7.6.1.2. Label Quantity Area (Continued)

When the unit of measure is pieces, no notation is required. When the unit of measure is not pieces (e.g., pounds, pairs, feet, etc.), it shall be noted in human readable quantity and shall be a minimum of 0.2 in (5 mm) high. The unit of measure shall not be bar coded. Unit of measure abbreviations as defined in the American National Standards Institute (ANSI) ASC X12.3-1984 Data Element Dictionary shall be used.

7.6.1.3. Purchase Order Number Area

The purchase order number is a required field by Cummins for Master Label. The human readable purchase order number shall be a minimum of 0.2 in (5 mm) high. The bar code symbol of the purchase order number shall be directly below the human readable characters and shall be a minimum of 0.5 in (13 mm) high. The maximum length anticipated for the purchase order number is eight (8) characters plus the data identifier (K).

7.6.1.4. Label Supplier Number Area

The human readable supplier number characters shall be a minimum 0.2 in (5 mm) high. The bar code symbol for the supplier number shall be directly below the human readable characters and shall be a minimum 0.5 in (13 mm) high. The maximum length anticipated for the supplier number is nine (9) characters plus the data identifier (V). The supplier number shall be designated by the Customer.

7.6.1.5. Label Serial Number Area

The human readable serial number characters shall be a minimum of 0.2 in (5 mm) high. The bar code symbol for the serial number shall be directly below the human readable characters and be a minimum 0.5 in (13 mm) high. The maximum length of the serial number shall be nine (9) alphanumeric characters plus the data identifier (S). The serial number shall be a unique number (not necessarily in sequential order) assigned by the Supplier, not the Customer. Suppliers shall avoid repeating serial numbers within any calendar year. Each shipping container or pack bearing a Shipping/Parts Identification label shall have a unique serial number. In this way each container, regardless of content or destination, can be differentiated from others. The supplier name, city, state, country and Zip Code shall be directly below the bar code symbol and be 0.1 in (2.5 mm) high.

7.6.1.6. Label Special Data Area

The Special Data Area located in the bottom right hand corner of the label is an open text area whose content, including Supplier specific information, shall be agreed upon by the Customer and the Supplier. See Figure 10: Shipping/Parts Identification Label on page 34, Figure 11: Shipping/Parts Identification Label Hang Tag on page 35 and Figure 12: Special Label on page 41.
7.6.1.6.1. Purchase Order Release Number: The purchase order release number is to be located in the lower right hand text box of the label. The human readable purchase order release number shall be a minimum of 0.2 in (5 mm) high. The bar code symbol of the purchase order release number shall be placed directly below the human readable characters and shall be a minimum of 0.2 in (5 mm) high. The maximum length anticipated for the purchase order release number is (8) characters plus the data identifier (5K).

7.6.1.6.2. Part Description: The description shall be aligned with the part name on the engineering drawing and agreed upon by the Customer and the Supplier. Long descriptions may be abbreviated. The human readable description shall be a minimum of 0.2 in. (5 mm) high. The description shall not be bar coded.

7.6.1.6.3. Receiving Location Code shall be entered in this area and be human readable at a minimum of 0.2 in (5 mm) high. The Receiving Location Code shall not be bar coded.

7.6.1.6.4. Country of Origin shall be entered in this area and be human readable at a minimum of 0.2 in. (5 mm) high. The Country of Origin shall not be bar coded. The Supplier shall follow the ISO 3166-1 two letter ISO Country Code Stds. Reference these standards at the following link:


7.6.1.7. Label Shipment Notifications (SN)

The data contained in the label shall be consistent with data transmitted in the advanced shipment notification.

7.7. Bar Code Symbology

7.7.1. Label Identifier Codes

A data identifier code in the first position following the start code of the bar code symbol shall be used to identify the information to follow. This character is not to be included in the human readable line, but is shown in the human readable characters under the title for the appropriate data area. Using additional bar code symbols on shipping packages is not encouraged, but may be appropriate in some circumstances. To prevent reading wrong data into a system, and to differentiate among all bar code symbols, any added bar code symbols placed on the Shipping / Parts Identification Label shall have data identifiers. Any added bar code symbols placed elsewhere on a shipping package shall also contain a data identifier. The following data identifier codes are assigned for the different types of data:*
7.7.1. Label Identifier Codes (Continued)

P: Part Number
C: Continuation of Long Part Numbers, if required
Q: Quantity
V: Supplier Number
S: Unique Serial Number – Shipping/Parts Identification Label
M: Unique Serial Number – Master Label
G: Unique Serial Number – Mixed Load Label
K: Purchase Order Number
5K: Purchase Order Release Number
B: Container Identification
D: Assigned by Customer Locations
E: Assigned by Supplier Locations
F: Assigned by Transportation Company

Note that the identifiers ‘D’ and ‘E’ are reserved for assignments to data that can be made by the Customer and Supplier locations. If a Supplier or Customer wishes to assign different identifiers to more than one data item, double data identifiers can be used, e.g., ‘EA’ for Supplier’s product number, ‘EB’ for Supplier’s inspector number, etc.

Bar codes shall be the 3-of-9 (Code 39) type and conform to the “Bar Code Symbology Standard for 3-of-9 Bar Codes” published by the Automotive Industry Action Group (AIAG B1). In addition to these symbology specifications, specific requirements for the Shipping/Parts Identification label are covered below.
7.7.2. Code Configuration

The four (4) characters ($, /, +, %) of the 3-of-9 symbology shall not be used on the Shipping/Parts Identification Label.

7.7.3. Code Density and Dimensions

The bar heights shall be a minimum of 0.5 in (13 mm). For each bar code symbol, the average width of the narrow elements shall be within the range of 0.13 and 0.17 in (0.33 - 0.43 mm). The ratio of the normal width of the wide elements of the nominal width of the narrow elements shall be 3:1, with an allowable range of 2.8:1 to 3.2:1.

For optimum scanning, the leading and trailing quiet zone should be at least 0.25 inch (6.4mm). Inter-character gap width should be the same as the width of the average narrow tolerance, plus or minus the element width tolerance. See AIAG B-1 for definition of tolerance, element widths and quiet zones.

7.7.4. Check Digits

Check digits shall not be added in the bar codes.

7.7.5. Reflectivity and Contrast

The printed bar code symbols shall meet the reflectivity and contrast requirements, specified in AIAG B1, at all electromagnetic wave lengths from B633 to B900 nanometers.

7.7.6. Quality Assurance Requirements

It is the responsibility of the supplier to provide bar coded labels that meet these specifications. Equipment is available to verify that bar code symbols meet these requirements. Barcode labeling solutions are available on line by purchasing their software or services to print labels to minimize hardware investment costs.
7.8. Special Labels

While these specifications will cover most situations, there will be circumstances where requirements will dictate special arrangements between Customers and Suppliers. Every effort to minimize these situations should be a goal of all so that complexities and costs are not added.

Two (2) situations where special labels may be needed for better handling are multiple and mixed item packs. They are to be used only when supplier and customer mutually agree.

When multiple or paired part numbers are shipped in the same container, the human readable part numbers for each part packed shall be printed in the Part Number area and the bar code symbols for these part numbers shall not be printed. (See Figure 12: Special Label on page 41.)

---

**Figure 12: Special Label**

<table>
<thead>
<tr>
<th>PART NO. (P)</th>
<th>QUANTITY (Q)</th>
<th>P.O.NO. (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>202667B</td>
<td>8 st</td>
<td>LB4547</td>
</tr>
<tr>
<td>202667C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>202667D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>202667E</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SUPPLIER (V)</th>
<th>SERIAL (S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N560B</td>
<td>1234321123</td>
</tr>
</tbody>
</table>

Cummins Emission Solutions, Mineral Point, WI 53565 USA

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7.8.1. Multiple, Common Item Packs

A Master Label, as shown in Figure 13: Master Label on page 43, shall be used when the total contents of a multiple, common item pack is to be identified. Each sub-pack of the multiple pack shall be identified with a Shipping/Parts Identification Label. The total multiple pack shall be identified with a Master Label on 2 sides of the unit load. To the extent possible, the label should be placed on a pack in such a manner that when the pack is broken apart the label is discarded (e.g., hang Master Label from banding or stretch wrap, shrinkwrap or on outside of an over-pack pallet carton.)

At the top of this label, the heading “Master Label” shall be printed in bold 1.0 in (25.4 mm) letters. The balance of the label format shall conform to the specifications of the Shipping/Parts Identification Label except that the data identifier for the serial number shall be (M) instead of (S). The serial number, preceded by an “M” in the bar code form only shall be a unique number, not to be repeated over the course of a year. The quantity on the master label shall be the total in all the subpacks.

Purchase Order Number is a required field by Cummins Inc. for “Master Label”. The human readable purchase order number shall be a minimum of 0.2 in (5 mm) high. The bar code symbol of the purchase order number shall be directly below the human readable characters and shall be a minimum of 0.5 in (13 mm) high. The maximum length anticipated for the purchase order number is eight (8) characters plus the data identifier (K).
Figure 13: Master Label
7.8.2. Mixed Item Loads

Mixed Item loads shall have a label with the words “Mixed Load” in bold 1.0 in (25.4 mm) letters attached in a noticeable location on the pack/container. Two alternative label designs are specified. See Figure 14: Mixed Load Identification on page 44 and Figure 15: Mixed Load Label on page 45. Each sub-pack or item shall be identified with a Shipping/Parts Identification Label as referenced in Figure 10: Shipping/Parts Identification Label on page 34. When label design Figure 15: Mixed Load Label on page 45 is used, supplier and serial numbers as specified in previous paragraph titled Label Serial Number Area same requirements also apply to this label design.

Figure 14: Mixed Load Identification
Figure 15: Mixed Load Label

7.8.3. Odette Bar Code Labeling Alternative

Cummins preferred AIAG-B-3 bar code label format may be replaced by the Odette transport label when required of the Cummins plant specific packaging requirements. The AIAG-B-3 and Odette label must satisfy the informational requirements set forth herein. The illustration in Figure 16: Sample Odette Barcode Label on page 46 (not actual size) shows an example of the label as applied within CAR IND. CORP. England.
Figure 16: Sample Odette Barcode Label
7.9. Label Location

Illustrations of the most common shipping packs and recommended label locations are shown in Figure 17: Label Location on page 47 to Figure 19: Label Location (Continued) on page 49. In most cases two labels are specified. The bottom edge of the label shall be parallel to the base of the package/container.

To facilitate automatic reading of bar code symbols, the top edge of the label, where possible, should be no closer than 0.5 inches from the top of the container. Wraparound labels are acceptable as long as quiet zones are within specifications.

Box or Carton

Identical label should be located on two adjacent sides (wraparound label acceptable).

Carton on Pallet

Each carton shall be individually labeled as directed above. One Master Label may be used as described in Figure 13: Master Label on page 43, or one Mixed Load Label described Figure 15: Mixed Load Label on page 45.

Drums, Barrels or Cylindrical Containers

Identical labels shall be located on the top and near the center of the side.

Bales

Identical labels shall be located on two (2) adjacent sides.

Figure 17: Label Location
Figure 18: Label Location (Continued)

**Baskets, Wire Mesh Container**

Identical labels shall be located on two (2) adjacent sides.

**Metal Bin or Tub**

Tag one visible piece near top, or use a label holder.

**Pallet Box**

Identical labels should be located on two (2) adjacent sides (wraparound label acceptable).

**Telescopic or Set-up Containers**

Identical labels should be located on two (2) adjacent sides of the outer box. Some applications may also require identification of the inner box.

**Bundle**

Identical labels should be located on each end.
Bag
Place one (1) label at the center of the face of the bag.

Roll
Hang one (1) tag 2.0 in (51 mm) from end of the material.

Rack
Tag one (1) visible piece near top, or use a label holder.

Figure 19: Label Location (Continued)
## Appendix A: Packaging Glossary of Terms

Table 1: Packaging Glossary of Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>3PL</td>
<td>Third Part Logistics Services</td>
</tr>
<tr>
<td>4-way entry</td>
<td>A pallet whose configuration permits insertion and withdrawal of handling equipment from all sides of the pallet.</td>
</tr>
<tr>
<td>Adhesives</td>
<td>Materials capable of adhering one surface to another. As used in connection with fiber boxes: a material to glue piles of solid fiberboard, to glue facings to corrugating medium in combined corrugated board, to glue the overlapping sides of a box forming the manufacturer’s joint or to glue the flaps in closing a slotted box.</td>
</tr>
<tr>
<td>AIAG</td>
<td>Automotive Industry Action Group</td>
</tr>
<tr>
<td>Angle Board</td>
<td>Corner Board or Angle Board used to protect packaged products during storage or shipment. They are used to protect freight from dents, strapping, stretch film, and other shipping and handling damage. Also to improve stack strength.</td>
</tr>
<tr>
<td>APQP</td>
<td>Advanced Production Quality Planning, a methodical process used to introduce new or changed products &amp; processes.</td>
</tr>
<tr>
<td>Assurance Level</td>
<td>The test intensity for packaging based on the level one wants to achieve in package performance. For an average level of assurance, one may use Level II with medium test intensities; for highest level of assurance, Level I; and for the lowest level of assurance, Level III.</td>
</tr>
<tr>
<td>Bill of Lading</td>
<td>A detailed list of a shipment of goods in the form of a receipt given by the carrier to the person consigning the goods.</td>
</tr>
</tbody>
</table>
Appendix A: Packaging Glossary of Terms (Continued)

Table 1: Packaging Glossary of Terms (Continued)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block Risers</td>
<td>Rectangular, square or cylindrical deck spacer, or blocks between the pallet decks or beneath the top deck, often identified by its location within the pallet as corner block, end block, edge block, inner block, center or middle blocks.</td>
</tr>
<tr>
<td>Bulk Pack</td>
<td>A container in or on which multiple like parts are packaged and used as a single container and does not contain multiple primary containers of parts.</td>
</tr>
<tr>
<td>Class “A” Surfaces</td>
<td>Term used in automotive design to describe a set of free form surfaces of high efficiency and quality.</td>
</tr>
<tr>
<td>Closed Crating</td>
<td>A container with structural framework and panel members fastened together to form a rigid enclosure. The panels used to create this enclosure can be made of corrugated paper, plywood, OSB or any product strong enough to perform containment of given products. Closed crating boxes are fully enclosed and can have any section (i.e. side, end, top, base and cap) removable for filling.</td>
</tr>
<tr>
<td>Closure</td>
<td>A means of closing a container to secure the contents.</td>
</tr>
<tr>
<td>Container fleet size</td>
<td>Number of containers necessary to support a given returnable system flow from and return to point of origin.</td>
</tr>
<tr>
<td>Corner Posts</td>
<td>A structural support member placed inside or outside of the corners of unit load or carton to improve stacking capacity.</td>
</tr>
<tr>
<td>Corrosion Inhibitors</td>
<td>A media used to inhibit oxidation of ferrous and non-ferrous metals.</td>
</tr>
<tr>
<td>Corrugated packaging material</td>
<td>The structure formed by gluing one or more sheets of fluted corrugating medium to one or more flat facings of liner board. Sometimes inaccurately called cardboard.</td>
</tr>
</tbody>
</table>
Appendix A: Packaging Glossary of Terms (Continued)

Table 1: Packaging Glossary of Terms (Continued)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cummins receiving plant</td>
<td>The Cummins plant location specifically receiving the parts that are supplied by the Supplier.</td>
</tr>
<tr>
<td>Cycle counting</td>
<td>A cycle count is an inventory management procedure where a small subset of inventory is counted on specified intervals to validate physical counts match system balances.</td>
</tr>
<tr>
<td>Deck board</td>
<td>Element or component of a pallet deck, oriented perpendicular to the stringer or stringer board.</td>
</tr>
<tr>
<td>Deck board spacing</td>
<td>Distance between adjacent deck boards.</td>
</tr>
<tr>
<td>Desiccants</td>
<td>A drying agent used to quickly reduce the humidity inside a closed container to a predetermined lower value, and then to keep the humidity at that lower level for a period of time.</td>
</tr>
<tr>
<td>Double Wing</td>
<td>Pallet style that has top and bottom deck boards that extend over the stringers of a pallet.</td>
</tr>
<tr>
<td>Dunnage</td>
<td>Devices or materials used to orient, secure and/or protect goods during shipment.</td>
</tr>
<tr>
<td>Dynamic environment</td>
<td>State in which product is in motion such as in a freight transport event.</td>
</tr>
<tr>
<td>Expendable packaging</td>
<td>Packaging material intended primarily for a one-time use, then disposition as; reuse, recycle or discard.</td>
</tr>
<tr>
<td>Failsafing</td>
<td>Method for inherently error proofing an action or result.</td>
</tr>
<tr>
<td>Fleet Size</td>
<td>The number of container days in a returnable container system allocated to the combined Supplier and Cummins receiving plant flows.</td>
</tr>
</tbody>
</table>
## Appendix A: Packaging Glossary of Terms (Continued)

### Table 1: Packaging Glossary of Terms (Continued)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Float days</td>
<td>The number of container days in a returnable container system allocated specifically to the Supplier side flows.</td>
</tr>
<tr>
<td>Foot Print</td>
<td>The length and width dimensions of a specific package or unit load.</td>
</tr>
<tr>
<td>GPS Website</td>
<td>Global Purchasing System Website where Suppliers can access information and requirements regarding Purchasing and Packaging Standards.</td>
</tr>
<tr>
<td>Isometric</td>
<td>A method of technical drawing projection in which a three-dimensional object is represented.</td>
</tr>
<tr>
<td>ISPM-15</td>
<td>International Standard for Phytosanitary Measure No.15. An International Plant Protection Commission's (IPPC) global regulation governing approved measure for insect eradication from solid timber packaging materials used in international trade. Usually done through an approved Heat Treat or Fumigation process.</td>
</tr>
<tr>
<td>JISK0303</td>
<td>Japanese Industrial Standard for regulation of formaldehyde air born concentration threshold for manufactured wood materials.</td>
</tr>
<tr>
<td>Label placards</td>
<td>A device providing a reusable label holding surface, where one-time use labels can be quickly applied and removed with no label residuals.</td>
</tr>
<tr>
<td>Line side presentation</td>
<td>Method of part and/or packaging is introduced to the assembly line or a lean manufacturing assembly station for use.</td>
</tr>
<tr>
<td>Manufactured wood</td>
<td>Wood materials produced from a man made process using raw timbers to create plywood, Oriented Strand Board (OSB), Layered Veneered Lumber, Layered Strand Board, Pressed Wood, etc.</td>
</tr>
<tr>
<td>Metal Stitches</td>
<td>Machined formed fastening device using wire drawn from a spool.</td>
</tr>
</tbody>
</table>
### Appendix A: Packaging Glossary of Terms (Continued)

Table 1: Packaging Glossary of Terms (Continued)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Load</td>
<td>A unit load consisting of more than one part number of packaged parts.</td>
</tr>
<tr>
<td>Modularity</td>
<td>The concept of joining together standardized packaging units to form larger compositions that will provide efficiency in the packaged unit and mode of transportation.</td>
</tr>
<tr>
<td>Nested</td>
<td>The configuration of stacked items such that each successive item is contained to some degree within the next.</td>
</tr>
<tr>
<td>NIOSH</td>
<td>National Institute for Occupational Safety and Health, a United States governing body covering occupational, health and safety regulations.</td>
</tr>
<tr>
<td>NWPCA</td>
<td>National Wood Pallet and Container Association, a North American organization that set and governs standards for wood pallet and wood container construction and materials.</td>
</tr>
<tr>
<td>Open Crating</td>
<td>A wood container with structural framework fastened together to form a rigid support structure.</td>
</tr>
<tr>
<td>Overhang</td>
<td>That portion of the part/carton/unit load that extends beyond the width or length dimension of pallet. (Not allowable.)</td>
</tr>
<tr>
<td>Over-pack</td>
<td>A large/secondary container into which smaller primary container(s) are packaged.</td>
</tr>
<tr>
<td>Palletization</td>
<td>Stacking and securing of containers on pallets for shipment as a unit load.</td>
</tr>
<tr>
<td>Phytosanitary</td>
<td>Free from harmful pests and plant diseases. Reference ISPM15.</td>
</tr>
</tbody>
</table>
### Appendix A: Packaging Glossary of Terms (Continued)

Table 1: Packaging Glossary of Terms (Continued)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan-For-Every-Part (PFEP)</td>
<td>A process that defines and optimizes the containerization and material flow characteristics of a packaged part, including part orientation, standard pack quantity (right sized pack), pack dimensions &amp; weight, lineside presentation, delivery frequency, etc.</td>
</tr>
<tr>
<td>Point of origin</td>
<td>Location or station where Cummins takes ownership of the goods.</td>
</tr>
<tr>
<td>Point of use</td>
<td>Location or station where a product or component will be consumed.</td>
</tr>
<tr>
<td>Poly-bag</td>
<td>Plastic film bag consisting of any thermal plastic polymer or combinations thereof.</td>
</tr>
<tr>
<td>Production Parts Approval Process (PPAP)</td>
<td>A process to document the initial quality planning work required to prevent problems from occurring during production.</td>
</tr>
<tr>
<td>Primary container</td>
<td>The smallest unit of containerization of the packaged part.</td>
</tr>
<tr>
<td>Recyclable Material</td>
<td>Material that may be reprocessed for use as raw material.</td>
</tr>
<tr>
<td>Returnable Containers</td>
<td>A shipping container specifically designed for long term return and reuse over the product life cycle.</td>
</tr>
<tr>
<td>Reusable Packaging</td>
<td>Packaging that may be safely reapplied for a limited number of use cycles without compromising its protective function.</td>
</tr>
<tr>
<td>Right-sized container</td>
<td>Pack quantity and container size to optimize material flows and lineside presentation.</td>
</tr>
<tr>
<td>S Review</td>
<td>Purchasing Readiness Review Process when sourcing a new supplier.</td>
</tr>
<tr>
<td>Secondary Container</td>
<td>A container in which one or more primary containers are packaged.</td>
</tr>
</tbody>
</table>
## Appendix A: Packaging Glossary of Terms (Continued)

### Table 1: Packaging Glossary of Terms (Continued)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shiner</td>
<td>Protruding fastener with points that extends outside the wood pallet, crate or box.</td>
</tr>
<tr>
<td>Shrink wrap</td>
<td>Plastic film that is applied to a package or product that is then passed through an oven or other heating device to shrink the plastic film around the item.</td>
</tr>
<tr>
<td>Solid timber</td>
<td>Homogeneous raw wood packaging material (e.g. solid boards or planks).</td>
</tr>
<tr>
<td>Static environment</td>
<td>State in which product is motionless such as in a warehouse environment.</td>
</tr>
<tr>
<td>Stretch wrap</td>
<td>Plastic film that is applied to a package/product that is elongated and wrapped around a unit load in several overlapping revolutions to securely unitize a pallet load of product.</td>
</tr>
<tr>
<td>Stringer</td>
<td>A continuous longitudinal member that supports the decks of a pallet.</td>
</tr>
<tr>
<td>Unit load</td>
<td>Multiple cartons or bulk packaged items assembled into a single packaged container or structure for handling, storage, and transportation.</td>
</tr>
<tr>
<td>VCI</td>
<td>A chemical vaporization process used to retard or prevent corrosion of ferrous and non-ferrous metals. Commonly referred to as “Volatile Corrosive Inhibitor”.</td>
</tr>
</tbody>
</table>
Appendix B: Production Component Packaging Guideline - Solid Timber Closed Crating

B1. Scope

This document specifies recommended construction and dimensional standards for solid timber crate packaging for both US domestic and international applications. The intent of these standards is to provide standardization, reduce product damage, and prevent safety-related incidents resulting from pack failures. This document contains guidelines that will navigate the user to select the optimal packaging solution recognized by Cummins. The guidelines will take various parameters (e.g. size, weight, containment) into account to reach the end solution.

B2. Methodology

These guidelines were formulated as a result of combined research of various packaging styles, regionally available materials and manufacturing capabilities, transportation conditions, and industry recognized testing procedures. Once acceptable solutions were defined, these solutions were subjected to rigorous transport testing (ASTM D4169, Assurance Level 1– Drop/ Vibration/ Impact) and reviewed with multiple stakeholders to ensure successful implementation.

B3. Construction Details

The details below include all reference information necessary to navigate through the guidelines when selecting the required packaging solution.

B3.1. Material – All solid wood used must adhere to the ISPM 15 requirements and contain no more than 14% moisture. The following material is acceptable to use during the construction of the packaging solutions:

a. Hardwood Species – (e.g. – oak, aspen, maple, poplar, ash, cottonwood, locust).
c. Plywood – E0 or E1 grade plywood is acceptable to use for the wall components only (sides, ends and tops). If plywood is chosen for wall component, it does not need to be slatted. (see Figure B1: Plywood on page 58.)
Appendix B: Cummins Production Component Packaging Guidelines - Solid Timber Closed Crating (Continued)

Figure B1: Plywood

B3.2. Fasteners

a. Type – Helical, smooth shank, and ring shank nails are acceptable fasteners to use during the construction. Screws are also allowed as long as they meet the engagement requirement. Staples are not acceptable fasteners.

CAUTION: Protruding nails or screws are called “Shiners”. From a Safety Standpoint “Shiners” are not permitted in order to avoid personal injury during handling.

b. Engagement – The fastener engagement of two members shall be at least 75%. (E.G. when nailing a 0.75” (19.05 mm) thick panel to a 1.5” (38.1 mm) cleat, the minimum length of the fastener shall be 1.5” (38.1 mm) to provide adequate engagement.

c. Tops shall be fastened with screws for ease of unpacking and customs inspection.

d. Fastening product to base – If product is to be fastened to base, the supplier shall use deck material with a minimum thickness of 1.5” (38.1 mm) and shall not protrude the deck which can cause stripping.
Appendix B: Cummins Production Component Packaging Guidelines - Solid Timber Closed Crating (Continued)

B3.2. Fasteners (Continued)

Footprint Sizes – In order to maximize transportation cube utilization and minimize lateral impact while in transit, the footprint of the crate shall contain at least one of the following dimensions (see Table B1: Footprint Sizes on page 59). In the event this requirement cannot be met, the supplier will be required to contact its Cummins packaging representative for approval prior to implementation.

Table B1: Footprint Sizes

<table>
<thead>
<tr>
<th>International (90” wide Ocean Container)</th>
<th>US Domestic (96” wide Van)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Imperial (inch)</strong></td>
<td><strong>Metric (mm)</strong></td>
</tr>
<tr>
<td>15</td>
<td>381</td>
</tr>
<tr>
<td>18</td>
<td>457.2</td>
</tr>
<tr>
<td>22.5</td>
<td>571.5</td>
</tr>
<tr>
<td>30</td>
<td>762</td>
</tr>
<tr>
<td>45</td>
<td>1143</td>
</tr>
<tr>
<td>90</td>
<td>2286</td>
</tr>
</tbody>
</table>

B3.3. Banding – One way banding is required on all crates. Banding material shall be polyester strapping with a minimum width of .75”. No steel banding permitted. Banding shall be aligned on cleats and battens if present. If lack of wall strength over a large span is a concern, a center band can be placed to either side of the center runner.

B3.4. Crate capacity – The following three duty levels are to be followed:

a. Light Duty (<1000 lbs/ 453 KG)
b. Medium Duty (1000-2500 lbs/ 453-1133 KG)
c. Heavy Duty (2500-4000 lbs/ 1133-1812 KG)
Appendix B: Cummins Production Component Packaging Guidelines - Solid Timber Closed Crating (Continued)

B3.5. Component Details

a. Walls (top, side and end members) – Wall boards should have a minimum width of 3.5” (88.9 mm) A combination of various widths are acceptable as long as there are no gaps between slats. If there are concerns with wall strength with a large span, a center cleat can be placed to provide additional lateral support.

b. Cleats – Cleats integrate with the walls that parallel with the runners. Sides and tops shall be secured by fasteners to the end of the cleats, and the cleats shall be fastened to the side of the runners.

c. Decks – If the crate has a large span and there are concerns with the deck strength utilizing the specific deck size board thickness specified per the weight class chart in Figure B3: Crate Components Size on page 61, the supplier shall utilize a larger size deck board thickness to accommodate the application.

d. Battens – Battens strengthen the girth of the crate parallel with the runners. Banding straps shall be placed over the battens. Battens are to be placed no more than 2” (50.8 mm) from the edge of the runner to prevent band sheering from fork tines.

e. Runner Strips – Runner strips (lower deck boards) are required if the supplier chooses to use a runner with a thickness less than 2.5” (63.5 mm) to prevent runner sheering/buckling. Runner strips shall be a minimum of 0.5” (12.7 mm). (see Figure B2: Runner Strips on page 60.)

Figure B2: Runner Strips

Runner strips integrate runners, preventing sheering/buckling
Appendix B: Cummins Production Component Packaging Guidelines - Solid Timber Closed Crating (Continued)

B3.6. Crate Components

<table>
<thead>
<tr>
<th>Crate Duty</th>
<th>Light (≤ 1000 lbs)</th>
<th>Medium (1000-2500 lbs)</th>
<th>Heavy (2500-4000 lbs)</th>
<th>(1133-1812 KG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall (min)</td>
<td>.5 x 3.5&quot;</td>
<td>12.7 x 88.9 mm</td>
<td>.75 x 5.5&quot;</td>
<td>19.05 x 139.7 mm</td>
</tr>
<tr>
<td>Deck (min)</td>
<td>.5 x 3.5&quot;</td>
<td>12.7 x 88.9 mm</td>
<td>1 x 3.5&quot;</td>
<td>25.4 x 88.9 mm</td>
</tr>
<tr>
<td>Runner (min)</td>
<td>1.5 x 3.5&quot;</td>
<td>38.1 x 88.9 mm</td>
<td>2.5 x 3.5&quot;</td>
<td>63.5 x 88.9 mm</td>
</tr>
<tr>
<td>Cleat (min)</td>
<td>1 x 2&quot;</td>
<td>25.4 x 50.8 mm</td>
<td>1.25 x 2.5&quot;</td>
<td>31.75 x 63.5 mm</td>
</tr>
<tr>
<td>Batten (min)</td>
<td>.75 x 2.5&quot;</td>
<td>19.05 x 63.5 mm</td>
<td>.75 x 2.5&quot;</td>
<td>19.05 x 63.5 mm</td>
</tr>
</tbody>
</table>

Figure B3: Crate Components Size

Figure B4: Crate Components
Appendix B: Cummins Production Component Packaging Guidelines - Solid Timber Closed Crating (Continued)

B3.7. Construction Method

Figure B5: Construction Method
Appendix C: Packaging Specification Data Sheet

The Packaging Specification Data Sheet (PSDS) is to be filled out and returned to each Cummins receiving plant Packaging Engineer. Example graphics of PSDS form may not be to the latest revision level. Suppliers are to obtain an electronic copy of the current PSDS blank in the Cummins Supplier Portal via the following link:

http://supplier.cummins.com/wps/portal/SupplierPortal/SupplierHome/StandardsAndProcesses

Figure C1: Packaging Specification Data Sheet
### Appendix C: Packaging Specification Data Sheet (Continued)

#### Supplier Instructions

- **PSDS Filename**: Name the PSDS file using the following convention: Cummins Part No.: (NNNNNNN), Underscore, Supplier ID No.: (SSSSSSSSS), Underscore, Pack Type: (AAA) where pack type is defined as Expendable (EXP), Returnable (RET) & Backup Expendable (BUE). Underscore, Submission Date (YYMMDD), Underscore, Renamed Supplier Company Name.

- **Example**: For Part Q12345, Supplier # 678987, Expendable, 17MAR08, Abc Company.

- **Special Instructions**: For the normal function 'Insert' Picture is defined by the selection 'Copy' picture to the source window and 'Paste' into the destination field.

#### Component Part - Proposal Information

- **Supplier Instructions**: Remove the PSDS file using the following convention: Cummins Part No.: (NNNNNNN), Underscore, Supplier ID No.: (SSSSSSSSS), Underscore, Pack Type: (AAA) where pack type is defined as Expendable (EXP), Returnable (RET) & Backup Expendable (BUE). Underscore, Submission Date (YYMMDD), Underscore, Renamed Supplier Company Name.

- **Example**: For Part Q12345, Supplier # 678987, Expendable, 17MAR08, Abc Company.

- **Special Instructions**: For the normal function 'Insert' Picture is defined by the selection 'Copy' picture to the source window and 'Paste' into the destination field.

#### Packing Data

- **Part**: Insert a digital photo or graphic of a single Part displayed in the 'As-Packed' orientation.
- **Part Number**: Indicate the Part Number from the Cummins Engineering Drawing using proper naming convention (Name - Number - Qualifier).
- **Part Name**: Indicate the Part Name from the Cummins Engineering Drawing using proper naming convention (Name - Number - Qualifier).
- **Container Dimensions**: Indicate the Outside Dimensions of a single container.
- **Dunnage Dimensions**: Indicate the Outside Dimensions of a single piece of dunnage.
- **Unit Load Dimensions**: Indicate the Outside Dimensions of Unit Load as shipped.

#### Quantity & Weight Calculations

- **Pc/Container**: Indicate the Quantity of a single container.
- **Container Layer**: Indicate the Quantity of containers required to cube out one full layer on a secondary container/pallet (as applicable).
- **Layer/Pallet**: Indicate the number of layers required to cube out the secondary container/pallet (as applicable).
- **Unit Load Weight**: Indicate the Gross Weight of the entire Unit Load Ready for shipment.

#### Method of Load Securement

- **Stackability**: Indicate if Stackability is confirmed.
- **Approved**: Indicate if the method of Unit Load Stackability is confirmed.

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Appendix C: Packaging Specification Data Sheet (Continued)

![Image of Packaging Specification Data Sheet]

**Figure C3: Packaging Specification Data Sheet (Continued)**
### Appendix C: Packaging Specification Data Sheet (Continued)

#### SUPPLIER INSTRUCTIONS

**COMPONENT PART - PROPOSAL INFORMATION**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>REV LEVEL</th>
<th>PART NAME</th>
<th>ANNUAL VOLUME</th>
<th>PTEP PROVIDED</th>
<th>PROPOSAL LEVEL</th>
<th>SUBMISSION DATE</th>
<th>REV LEVEL</th>
<th>SOURCES MANAGER</th>
</tr>
</thead>
</table>

**SUPPLIER INFORMATION**

<table>
<thead>
<tr>
<th>COMPANY NAME</th>
<th>SUPPLIER ID NO.</th>
<th>SUPPLIER ADDRESS</th>
<th>PHONE NUMBER</th>
<th>EMAIL ADDRESS</th>
</tr>
</thead>
</table>

**PRIMARY CONTAINER INFORMATION**

<table>
<thead>
<tr>
<th>CONTAINER TYPE</th>
<th>MATERIAL TYPE</th>
<th>FLUTE CONFIGURATION</th>
<th>BURST / ECT</th>
<th>COST PER CONTAINER</th>
</tr>
</thead>
</table>

**INTERNAL DUNNAGE INFORMATION**

<table>
<thead>
<tr>
<th>DUNNAGE TYPE</th>
<th>DESCRIPTION/QUALIFIER</th>
<th>MATERIAL</th>
<th>QUANTITY PER CONTAINER</th>
<th>COST PER CONTAINER</th>
</tr>
</thead>
</table>

**SECONDARY CONTAINER / Pallet Information**

<table>
<thead>
<tr>
<th>CONTAINER TYPE</th>
<th>DESCRIPTION/QUALIFIER</th>
<th>MATERIAL</th>
<th>QUANTITY PER CONTAINER</th>
<th>COST PER CONTAINER</th>
</tr>
</thead>
</table>

**CLOSURE MATERIAL INFORMATION**

<table>
<thead>
<tr>
<th>MATERIAL TYPE</th>
<th>DESCRIPTION</th>
<th>QUANTITY PER CONTAINER</th>
</tr>
</thead>
</table>

**COST SUMMARY**

<table>
<thead>
<tr>
<th>CONTAINER QUANTITY</th>
<th>COST PER CONTAINER</th>
</tr>
</thead>
</table>

### CHECK YOUR WORK - CONFIRM CALCULATED FIELDS ACCURATE

- Ensure all fields are complete and accurate.
- Cross-check calculations for any discrepancies.

This document is the property of Cummins Inc. and cannot be revised without permission of the Cummins Global Packaging Council.
Appendix D: Revision Log Sheet

<table>
<thead>
<tr>
<th>Date</th>
<th>Page No.</th>
<th>What was changed or updated</th>
<th>By Whom</th>
</tr>
</thead>
<tbody>
<tr>
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Figure D1: Revision Log Sheet