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# **Sustainable Packaging Specification Recommendations for Automotive Manufacturing Operations**

**Guidance Document**

Version 2.0  
May 2022

**Established Scope:** The Suppliers Partnership for the Environment (SP) Sustainable Materials Work Group works to promote collaboration amongst automotive manufacturers and suppliers to increase use of sustainable practices, processes, and materials in the production and content of vehicles, and to incentivize sustainable innovation.

SP's Sustainable Packaging Sub-Team is working to minimize automotive packaging waste and address barriers to packaging recyclability / reuse.

The purpose of this guidance document is to provide straightforward industry-supported guidance to help automakers and their suppliers source sustainable packaging designs for use in automotive manufacturing operations.

**Acknowledgements:** This guidance document was produced through a collaborative process by the Suppliers Partnership for the Environment (SP) Sustainable Materials Work Group Sustainable Packaging Sub-Team.

- The [original 2020 guidance document](#) was developed by John Bradburn, on behalf of ERA Environmental Management Solutions, with input from representatives of SP member companies including Ford Motor Company, General Motors, Honda Development & Manufacturing America, Stellantis and Toyota Motor North America.
- This 2022 version included input and review from representatives of Action Wood 360, AI Trading, ARPLANK Direct, Avangard Innovative, DENSO, Doug Brown Packaging Products, Ford Motor Company, General Motors, Green Processing Company, Honda Development & Manufacturing America, JSP, Lear Corp, Magna International, Mustang Innovation, Primex Design & Fabrication, Real Quality Services, Stellantis, Toyota Motor North America, Toyota Tsusho America, and UGN.

**Disclaimer:** This document is intended to provide information for automakers, their suppliers and the general public on sourcing sustainable packaging designs. The information included in this document is based on the professional judgment of the individual authors and reviewers and may be used at a company's discretion. SP and its member companies make no warranty, expressed or implied, and assume no liability for any form of damage that may result from the application of the information contained in this document.

**Next Steps:** Going forward, the SP Sustainable Packaging Sub-team intends to build on learnings from this process to promote further alignment on sustainable packaging practices within the automotive industry and identify targeted opportunities to improve packaging sustainability in support of industry sustainability goals. The guidance document will continue to be reviewed on a regular basis.





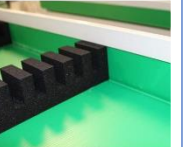

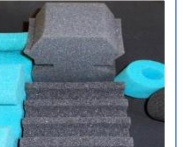








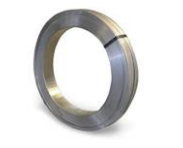














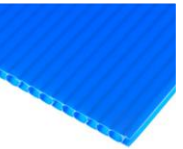



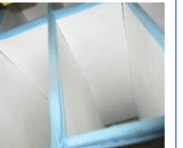
**Contact:** Please submit any feedback on this guidance or suggestions for future improvements to [info@supplierspartnership.org](mailto:info@supplierspartnership.org).

## Executive Summary

This guidance document focuses on best practice recommendations intended to help automotive original equipment manufacturers (OEMs) and their suppliers to source sustainable packaging designs for use in automotive manufacturing operations.

1. When building business cases for packaging design and logistics, include and communicate to procurement / supply chain managers a total enterprise financial scope that considers all corporate goals and strategies including health, safety, and the environment.
2. Whenever possible, source parts, modules and other products using returnable packaging and base this decision on life cycle factors.
3. Avoid using foams in packages that include spacers and dunnage, if possible, as most foams (polystyrene, polyurethane and other thermoset products) are difficult to recycle.
4. Use of expanding polyurethane foam in packages should be avoided, especially when formed within plastic bags. This package material creates a significant challenge for recycling and reuse.
5. If a foam packaging product is sourced, expanded polypropylene (EPP) may be more recyclable than other foam options.
6. Combination packaging (specifically incorporating multiple materials) should be avoided whenever possible. When unavoidable, materials should be able to be segregated without requiring significant time or force.
7. Pallet and container separation ease improves reuse and recycling potential. Avoid using screw fasteners, nails or staples to attach corrugated board / old corrugated container (OCC) boxes to wood pallets.
8. Avoid using metal clips on plastic banding. Plastic banding should be secured using plastic weld (sonic) technology.
9. Avoid using metal brackets and wood to reinforce corrugated board / OCC boxes. Oftentimes corrugated brackets and spacers can reinforce boxes where needed.
10. Whenever possible, avoid one-time use packaging and assembly aids.
11. Plastic corrugate, multidirectional board and straight walled totes, which many times are made of polypropylene or polyethylene, should not be sourced with mixed plastics as dunnage or metal fasteners, except for the plastic pallets with seatbelts. This material, when clean and used without fasteners, can be processed for recycling as well.
12. LDPE plastic bags and bubble wrap and other film can be reused or baled and placed into a plant recyclable film program. These materials can also be reused internally, or sent to non-profits, small local businesses as well as sent back to the supplier for reuse if clean and in good condition.
13. Polypropylene and polyester fabric bags that may be used to protect class A surface parts from mutilation such as lighting fixtures, fascias, chrome parts, etc. can be placed in the container and sent back to the supplier for reuse where feasible.
14. If a Logistics Optimization Center (LOC) is used to service nearby manufacturing operation(s), then efforts to concentrate and manage expendables for reuse and recycling at this location should be done. Aftermarket parts locations can also help consolidate materials for this purpose. These strategies create consolidation points for improved material management.
15. Wood pallets sourced in the US should be 40" X 48", 42" x 48", or 45" X 48" whenever possible, with the auto industry using 45" x 48" for production and 42" x 48" for service. The food and beverage industry uses 40" X 48 primarily. These sizes greatly improve the possibility for these pallets to be reused as compared to off-spec sizes.
16. Use of OSB (Oriented Strand Board) pallet planks and risers will likely limit recycling options and should only be used if local rules and international issues prohibit alternatives.
17. Wooden crates, even for small batch shipping use, should be designed with ease of disassembly for reuse and/or shredding for recyclability in mind. Often, wooden crates are assembled using plate steel and bolts that unnecessarily make recycling very laborious and costly.
18. Whenever possible, hook-and-loop fasteners, glue and double-sided tape should be avoided in securing interior dunnage to a container. These materials can create a challenge for recycling. Polypropylene or polyethylene-based fasteners (e.g. zip ties), or sonic welding, can be used to secure interior dunnage to a container as an alternative.

## Executive Summary: Recyclability of Common Automotive Packaging Materials in U.S.

 <p>Class A</p> <p>Cross-linked polyethylene (XLPE)</p> <p>Generally not viably recycled</p>	 <p>Extruded polyethylene (PE)</p> <p>Can be viably recycled</p>	 <p>Class A</p> <p>Expanded polyethylene (EPE)</p> <p>Can be viably recycled</p>	 <p>Class A</p> <p>Molded expanded polypropylene (EPP)</p> <p>Can be viably recycled</p>	 <p>Cut plank expanded polypropylene (EPP)</p> <p>Can be viably recycled</p>	 <p>Expanded polystyrene (EPS)</p> <p>Generally not viably recycled</p>	 <p>Polyurethane foam (PU)</p> <p>Generally not viably recycled</p>
 <p>Expanding PU foam formed within plastic bags</p> <p>Generally not viably recycled</p>	 <p>Air-filled paper</p> <p>Can be viably recycled</p>	 <p>Class A</p> <p>One-sided synthetic flash spun high density polyethylene fiber coating</p> <p>Can be viably recycled</p>	 <p>Class A</p> <p>Two-sided synthetic flash spun high density polyethylene fiber coating</p> <p>Generally not viably recycled</p>	 <p>Class A</p> <p>Brushed nylon</p> <p>Generally not viably recycled</p>	 <p>Corrugated attached to wood pallets with screws, nails or staples</p> <p>Detrimental to recycling</p>	 <p>Corrugated attached to wood pallets with plastic banding</p> <p>Can be viably recycled</p>
 <p>Metal clips on plastic banding</p> <p>Detrimental to recycling</p>	 <p>Metal banding</p> <p>Generally not allowed by industry specifications</p>	 <p>Corrugated reinforced with metal brackets and/or wood</p> <p>Detrimental to recycling</p>	 <p>Corrugated reinforced with cardboard brackets</p> <p>Can be viably recycled</p>	 <p>Single-use tape (plastic with adhesive)</p> <p>Generally not viably recycled</p>	 <p>Dunnage with laminates, labels, PVC, glues, foam, and/or wire</p> <p>Detrimental to recycling</p>	 <p>LDPE / LLDPE</p> <p>Can be viably recycled</p>
 <p>Class A</p> <p>Polypropylene and polyester fabric bags</p> <p>Generally not viably recycled</p>	 <p>Wood pallets</p> <p>Can be viably recycled</p>	 <p>Oriented strand board (OSB)</p> <p>Generally not viably recycled</p>	 <p>Polypropylene and polyethylene sleeve packs</p> <p>Can be viably recycled</p>	 <p>Triple wall corrugated board sleeve packs</p> <p>Can be viably recycled</p>	 <p>Wooden crates assembled with large steel bolts / plates</p> <p>Detrimental to recycling</p>	 <p>Wooden crates assembled with removable clips</p> <p>Can be viably recycled</p>
 <p>Dunnage secured with hook-and-loop fasteners, glue and/or tape</p> <p>Detrimental to recycling</p>	 <p>High Density Polyethylene (HDPE) Totes</p> <p>Can be viably recycled</p>	 <p>Polypropylene (PP) corrugated plastic sheet</p> <p>Can be viably recycled</p>	 <p>HDPE corrugated plastic sheet</p> <p>Can be viably recycled</p>	 <p>Corrugated plastic with PU Foam attached</p> <p>Generally not viably recycled</p>	 <p>Corrugated plastic insert with Fabric</p> <p>Generally not viably recycled</p>	 <p>Corrugated plastic covered with fabric</p> <p>Generally not viably recycled</p>

## Executive Summary: Recyclability of Common Automotive Packaging Materials in U.S.

Packaging Material / Design Type	Viable Recyclability Classification	Class A Protection	Reference
Base packaging material type and/or design feature.	Under normal conditions, is this material generally viably recycled in the U.S. today?	Is this material suitable for Class A surfaces, where required?	Reference to SP Sustainable Packaging guidance document for more information.
Cross-linked polyethylene (XLPE)	✗ Generally not viably recycled	✓	<a href="#">Learn More</a>
Extruded polyethylene (PE)	✓ Can be viably recycled		<a href="#">Learn More</a>
Expanded polyethylene (EPE)	✓ Can be viably recycled	✓	<a href="#">Learn More</a>
Molded expanded polypropylene (EPP)	✓ Can be viably recycled	✓	<a href="#">Learn More</a>
Cut plank expanded polypropylene (EPP)	✓ Can be viably recycled		<a href="#">Learn More</a>
Expanded polystyrene (EPS)	✗ Generally not viably recycled		<a href="#">Learn More</a>
Polyurethane foam (PU)	✗ Generally not viably recycled		<a href="#">Learn More</a>
Expanding polyurethane foam formed within plastic bags	✗ Generally not viably recycled		<a href="#">Learn More</a>
Air-filled paper	✓ Can be viably recycled		<a href="#">Learn More</a>
One-sided synthetic flash spun high density polyethylene fiber coating	✓ Can be viably recycled	✓	<a href="#">Learn More</a>
Two-sided synthetic flash spun high density polyethylene fiber coating	✗ Detrimental to recycling	✓	<a href="#">Learn More</a>
Brushed nylon	✗ Detrimental to recycling	✓	<a href="#">Learn More</a>
Corrugated board /old corrugated container (OCC) boxes attached to wood pallets with screw fasteners, nails or staples	✗ Detrimental to recycling		<a href="#">Learn More</a>
Corrugated board /old corrugated container (OCC) boxes attached to wood pallets with plastic banding	✓ Can be viably recycled		<a href="#">Learn More</a>
Metal clips on plastic banding	✗ Detrimental to recycling		<a href="#">Learn More</a>
Metal bandings	✗ Generally not allowed by industry specifications due to safety concerns		<a href="#">Learn More</a>
Corrugated board/OCC boxes reinforced with <u>metal brackets and/or wood</u>	✗ Detrimental to recycling		<a href="#">Learn More</a>
Corrugated board/OCC boxes reinforced with <u>cardboard brackets and / or spacers</u>	✓ Can be viably recycled		<a href="#">Learn More</a>
Single-use tape (plastic with adhesive)	✗ Generally not viably recycled		<a href="#">Learn More</a>
Dunnage with laminates, vinyl labels, PVC components, glues, foam, and/or wire	✗ Detrimental to recycling		<a href="#">Learn More</a>
Low density polyethylene (LDPE) / Linear low-density polyethylene (LLDPE)	✓ Can be viably recycled		<a href="#">Learn More</a>
Polypropylene and polyester fabric bags	✗ Generally not viably recycled	✓	<a href="#">Learn More</a>
Wood pallets	✓ Can be viably recycled		<a href="#">Learn More</a>
Oriented strand board (OSB)	✗ Generally not viably recycled		<a href="#">Learn More</a>
Polypropylene and polyethylene sleeve packs	✓ Can be viably recycled		<a href="#">Learn More</a>
Triple wall corrugated board sleeve packs	✓ Can be viably recycled		<a href="#">Learn More</a>
Wooden crates assembled with large steel bolts / plates	✗ Detrimental to recycling		<a href="#">Learn More</a>
Wooden crates assembled with removable clips	✓ Can be viably recycled		<a href="#">Learn More</a>
Dunnage secured with hook-and-loop fasteners, glue and/or double-sided tape	✗ Detrimental to recycling		<a href="#">Learn More</a>
High Density Polyethylene (HDPE) Totes	✓ Can be viably recycled		<a href="#">Learn More</a>
Polypropylene corrugated plastic sheet	✓ Can be viably recycled		<a href="#">Learn More</a>
HDPE corrugated plastic sheet	✓ Can be viably recycled		<a href="#">Learn More</a>
Corrugated plastic with PU Foam attached	✗ Generally not viably recycled		<a href="#">Learn More</a>
Corrugated plastic insert with Fabric	✗ Generally not viably recycled		<a href="#">Learn More</a>
Corrugated plastic covered with fabric	✗ Generally not viably recycled		<a href="#">Learn More</a>

## I. Introduction

Following are recommendations that are intended to help automotive original equipment manufacturers (OEMs) and their suppliers source sustainable packaging designs for use in automotive manufacturing operations.

These recommendations focus on opportunities to minimize automotive packaging waste and address barriers to recyclability in the design phase. Detailed guidance on sustainable management of packaging waste streams at the site level is outside the scope of this document.

Please note, additional recommendations and design variations can vary, based on business goal alignment, package material availability, and reuse as well as recycling infrastructure issues based on geographic location. Companies should be aware of national and local regulations that may dictate packaging selections in certain instances, such as hazardous materials regulations which are outside the scope of this document.

It is recommended that these specifications are entered into sourcing packages and other product sourcing documents as needed, typically described as Statement of Requirements (SORs) or Terms and Conditions to influence conformance.

In order to assure conformance to a sustainable packaging system, an internal monitoring program should be in place to track, measure and formally approve package design conformance by environmental or sustainability team personnel.

## Key Definitions

- **Viably Recycled.** For the purposes of this guidance, a material is considered to be viably recycled where established systems are in place with capability to technically, and economically, recycle the material in major automotive operating regions in the United States. To be considered economically sustainable, the material must have a market value that typically meets or exceeds the cost to collect, transport and process the material for recycling. Consideration of materials that can be processed into resin for use back into the same or similar application is typically preferred where possible, however materials that are downcycled for use in other industries may be suitable where economically sustainable recycling systems exist.
- **Detrimental to Recycling.** For the purposes of this guidance, packaging materials or designs that require separation or other pre-processing in order to be acceptable into established recycling systems are considered to be detrimental. While the challenges presented by these materials can often technically be overcome, the additional time, labor and other costs required to do so may outweigh the recycling value thereby increasingly the likelihood that the material may be sent to landfill.



## II. Sustainable Packaging Recommendations

1. **When building business cases for packaging design and logistics, include and communicate to procurement / supply chain managers a total enterprise financial scope that considers all corporate goals and strategies including health, safety, and the environment.**
  - a. In order to continually improve the life cycle management of containers and packages entering manufacturing operations, enlist the participation of environmental / sustainability professionals located at the first point of package use and at the destination point after first use during the packaging design phase so local considerations can be incorporated into package designs.
  - b. A packaging bill of materials (BOM) including information on all materials used within the finished pack should be defined during the packaging design process. This information may be used by packaging engineers and environmental professionals to evaluate the recyclability and sustainability of the materials incorporated in the package.
  - c. The cost to dispose of non-recyclable packaging materials, including labor, handling and transportation, should be included in the total business case for packaging design.
  - d. It is recommended that each of the following functions be included throughout the packaging design and decision-making process.
    1. Packaging Engineer
    2. Plant Manager
    3. Health & Safety
    4. Design Engineering
    5. Sustainability
    6. Material Handling
  - e. It is recommended that the packaging engineer, or the individual responsible for the final sign off on the packaging design, review the following recommendations to assess conformance with industry best practice for sustainable packaging design.
2. **Whenever possible, source parts, modules and other products using returnable packaging and base this decision on life cycle factors.**
  - a. Returnable packaging should be designed to withstand the full life cycle of the product to minimize returnable packaging waste.
  - b. It is recommended to focus on large, high-volume parts which will max trailer cubing on return route.
  - c. The expected financial value of returnable packaging compared to expendable packaging may be estimated based on expected production and logistics factors. For example:
    1.  $\text{Returnable Cost} = (\text{Daily Prod Volume} / \text{Pack Qty}) \times \text{Days in System}^* \times \text{Pack Cost} + \text{Transportation Cost Per Container}$ 
      - a. This calculation assumes the pack will last entire life cycle of product.
      - b. \*Days in System is the sum of days the packaging will take to move all the way through the supply chain during normal conditions.
    2.  $\text{Expendable Cost} = (\text{Daily Prod Volume} / \text{Box Qty}) \times \text{Annual Prod Days} \times \text{Life cycle in Years}$

- d. The expected environmental value of a reduction in packaging waste can be calculated using established models, such as the [US EPA's Waste Reduction Model \(WARM\)](#).
- e. Other factors to be considered may include: Return Route cost, non-recyclable material in expendable needed for part quality, Repack Cost, Ease of removal, Damage Reductions, trailer cubing, warehouse stacking, and production fluctuations.

**3. Avoid using foams in packages that include spacers and dunnage, if possible, as most foams (polystyrene, polyurethane and other thermoset products) are difficult to recycle.**



- a. Crosslink foam (XLPE) should be avoided where possible, as it is a thermoset and typically does not get recycled in the United States.
- b. Governmental regulations and environmental NGO plastic standards may discourage or disallow the use of certain single-use foam packaging materials, such as expanded polystyrene (EPS), in certain regions. As the volume of such materials in use continues to decrease, the economics of viably recycling the materials has become increasingly challenging.
- c. Where Class A product protection is required and added protection is necessary in the form of inserts, non-crosslinked and recyclable foams should be specified, such as expanded polyethylene (EPE). This may prevent the use of additional plastic bags and other secondary coverings used to prevent scratching and damage during transport.



**4. Use of expanding polyurethane foam in packages should be avoided, especially when formed within plastic bags. This package material creates a significant challenge for recycling and reuse.**



- a. Consideration should be given to using bio-based or polypropylene and polyethylene foams if a local reuse or recycle solution is available. Although many reuse options exist, expanding polyurethane foams are typically a challenge to recycle.
- b. Consider the use of viably recyclable alternatives, such as air-filled paper products.



**5. If a foam packaging product is sourced, expanded polypropylene (EPP) may be more recyclable than other foam options.**

- a. EPP foam containers are commonly used for products in need of surface protection and nesting within the container and is used as a returnable container option over a product's entire life cycle.
- b. Reuse options for EPP foam formed containers are limited outside of the original packaging application. EPP foam second use options can include densification and resin creation for new products.
- c. The Recyclability of EPP is a matter of supply and demand. Usually purchased as spot buys rather than contracts. Specifications to recycle include melt flow and ethylene content.
- d. It is recommended to source EPP foams with recycled content where possible.
- e. It is recommended that manufacturers provide contact information for suppliers and end users of EPP foams at program launch to support recycling of foams at end of the program. EPP manufacturers may have the ability and desire to reclaim their products for recycling but often do not have visibility to the end user.
- f. The addition of a flame retardant should be considered when sourcing EPP to address potential fire safety requirements. Flame retardants generally do not adversely affect the recyclability of EPP for use in packaging products.



**6. Combination packaging (specifically incorporating multiple materials) should be avoided whenever possible. When unavoidable, materials should be able to be segregated without requiring significant time or force.**

- a. Up to 5% contamination of non-conformance materials may be allowable for recycling, assuming those contaminants do not create risk of damage for the recycler.
- b. Consider opportunities to reduce the use of two-sided synthetic flash spun high density polyethylene fiber, and brushed nylon, or use alternate coatings to improve recyclability.

**7. Pallet and container separation ease improves reuse and recycling potential. Avoid using screw fasteners, nails or staples to attach corrugated board / old corrugated container (OCC) boxes to wood pallets.**

- a. Alternatively, secure the box to the pallet using recyclable polyethylene plastic banding that wraps around the box and secures to the pallet through the fork spaces or polyethylene-based stretch film. Putting banding through the bottom side of the corrugated box to the pallet before it is loaded may be another alternative.
- b. Also, consider sourcing OCC pallets that are fastened to the boxes or manufactured as part of the container. These designs improve the recyclability of the entire package. Please note, some OCC pallets have limitations based on moisture compromise, weight capacity and stacking limits.

**8. Avoid using metal clips on plastic banding. Plastic banding should be secured using plastic weld (sonic) technology.**

- a. The use of polyethylene banding is preferred where possible to improve recyclability.
- b. The use of metal banding should be avoided where possible. The disassembly and separation of metal banded packaging can be a safety concern, and increases the time and labor required to prepare materials for recycling.

**9. Avoid using metal brackets and wood to reinforce cardboard/OCC boxes. Oftentimes cardboard brackets and spacers can reinforce boxes where needed.**

- a. Material must be dry for recycling.
- b. Baled is the preferred method of handling and shipping to achieve the best volume for shipping.
- c. Use glued joints and avoid metal staples whenever possible to improve recyclability.
- d. When using a corner support system, any water-based glue is generally acceptable to secure to the package. Metal or Velcro attachments should be avoided where possible. There are designs now in place where slits are made in the sleeve in order to slide in a corner support where no other attachments are needed.
- e. When securing a sleeve to a wood pallet, avoid nailing or stapling to the pallet and use plastic stretch film or banding instead where possible.
- f. Cardboard /OCC boxes sourced for use in automotive industry packaging should be sustainably sourced with documentation of Sustainable Forestry Initiative (SFI), Forest Stewardship Council (FSC) or an equivalent certification.



*Sleeve designed  
with removable  
wood support*

**10. Whenever possible, avoid one-time use packaging and assembly aids.**

- a. These packaging aids, commonly called caps and plugs, can be cleaned, inspected and reused to protect fittings, threaded fasteners and ports.
- b. Whenever possible source in neutral colored polyethylene packaging aids. Please note that sometimes colors are used as visual aids, where possible consider the use of alternative options to achieve the same goal.
- c. Single-use tape (plastic with adhesive) is also to be avoided.

**11. Plastic corrugate, multidirectional board and straight walled totes, which many times are made of polypropylene or polyethylene, should not be sourced with mixed plastics as dunnage or metal fasteners, except for the plastic pallets with seatbelts. This material, when clean and used without fasteners, can be processed for recycling as well.**

- a. In addition to rivets, recyclability challenges can include dunnage that also has laminates, vinyl labels, PVC components, glues, foam, and/or wire. While many of these challenges can be addressed, doing so takes time and labor that may negate the cost advantage of recycling the material.

**12. LDPE plastic bags and bubble wrap and other film can be reused or baled and placed into a plant recyclable film program. These materials can also be reused internally, or sent to non-profits, small local businesses as well as sent back to the supplier for reuse if clean and in good condition.**

- a. When preparing materials for recycling, baled material is preferred for storage and transportation whenever possible. Material may also be collected and sent offsite to a central baling location where available.
- b. Clean films tend to have higher value for recycling and higher potential for recycled materials to go back into similar packaging applications.
- c. Dirty films (e.g., those with oily residues from parts) are typically acceptable for recycling into other industries. Dirty materials should be segregated where possible to avoid contaminating an otherwise clean bale.
- d. Other non-conforming materials (e.g. plastic banding, labels, adhesives, etc.) should be separated from the film recycling stream to extent possible and should represent no more than 5% of the bale.
- e. Consideration should be given to sourcing LDPE bags / films using recycled or bio-based content where possible to improve overall sustainability of materials.

**13. Polypropylene and polyester fabric bags that may be used to protect class A surface parts from mutilation such as lighting fixtures, fascias, chrome parts, etc. can be placed in the container and sent back to the supplier for reuse where feasible.**

- a. EPP and/or multi-directional dunnage materials may be considered as an alternative to fabric bags for protecting Class A parts to improve recyclability where feasible.

**14. If a Logistics Optimization Center (LOC) is used to service nearby manufacturing operation(s), then efforts to concentrate and manage expendables for reuse and recycling at this location should be done. Aftermarket parts locations can also help consolidate materials for this purpose. These strategies create consolidation points for improved material management.**

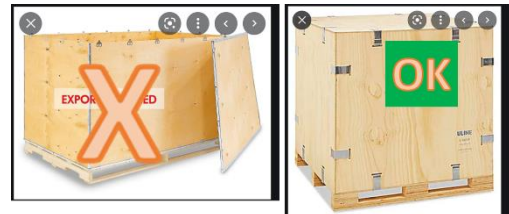
**15. Wood pallets sourced in the US should be 40" X 48", 42" x 48", or 45" X 48" whenever possible, with the auto industry using 45" x 48" for production and 42" x 48" for service. The food and beverage industry uses 40" X 48 primarily. These sizes greatly improve the possibility for these pallets to be reused as compared to off-spec sizes.**

- a. Wood pallets sourced for use in automotive industry packaging should be sustainably sourced with documentation of Sustainable Forestry Initiative (SFI), Forest Stewardship Council (FSC) or an equivalent certification, and be compliant with the Lacey Act.

**16. Use of OSB (Oriented Strand Board) pallet planks and risers will likely limit recycling options and should only be used if local rules and international issues prohibit alternatives.**

- a. Consider the use of viably recyclable alternatives, such as triple wall corrugated board sleeve packs, corrugated plastic sleeve packs, or sustainably sourced wood.

**17. Wooden crates, even for small batch shipping use, should be designed with ease of disassembly for reuse and/or shredding for recyclability in mind. Often, wooden crates are assembled using plate steel and bolts that unnecessarily make recycling very laborious and costly.**



- a. Wood crates sourced for use in automotive industry packaging should be sustainably sourced with documentation of Sustainable Forestry Initiative (SFI), Forest Stewardship Council (FSC) or an equivalent certification, and be compliant with the Lacey Act.

**18. Whenever possible, hook-and-loop fasteners, glue and double-sided tape should be avoided in securing interior dunnage to a container. These materials can create a challenge for recycling. Polypropylene or polyethylene-based fasteners (e.g. zip ties), or sonic welding, can be used to secure interior dunnage to a container as an alternative.**

- a. Many zip ties are composed of nylon which is a recyclable material on its own. However, a nylon zip tie comingled with a PP or PE container can impact the recyclability of the full container and require additional time and labor to separate the materials for recycling. Use of like-to-like materials in securing interior dunnage (e.g., PE-based fasteners together with a PE-based containers) is preferred whenever possible to improve recyclability.
- b. It is not recommended to use metal fasteners or metal reinforcement on containers, if possible, to improve recyclability.

## Acknowledgements

This guidance document was produced through a collaborative process by the Suppliers Partnership for the Environment (SP) Sustainable Materials Work Group Sustainable Packaging Sub-Team.

The project was co-chaired by: Bridget Grewal, Magna International; and, Matt Marshall, Toyota Motor North America.

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<i>Joe Stalnaker</i>	Avangard Innovative	<i>Bridget Grewal</i>	Magna International
<i>Zach McDowell</i>	Avangard Innovative	<i>William Jones</i>	Mustang Innovation
<i>Cody Leonard</i>	DENSO	<i>Chris Helms</i>	Primex Design & Fabrication
<i>Brian Dynda</i>	Doug Brown Packaging Products	<i>Linda Balwinski</i>	Primex Design & Fabrication
<i>Laura Melton</i>	Doug Brown Packaging Products	<i>JoAnne Harris</i>	Real Quality Services
<i>Russell Brown</i>	Doug Brown Packaging Products	<i>Brooke Ervin</i>	Stellantis
<i>Dan Esch</i>	Ford Motor Company	<i>Krystal Brown</i>	Stellantis
<i>Carol Apfel</i>	General Motors	<i>Matt Peterson</i>	Stellantis
<i>Evan McCarthy</i>	General Motors	<i>Darrell Bentley</i>	Toyota Motor North America
<i>Jeremy Galanty</i>	General Motors	<i>Matt Marshall</i>	Toyota Motor North America
<i>Jim Katikos</i>	General Motors	<i>John Jager</i>	Toyota Tsusho America
<i>Michael Kehoe</i>	General Motors	<i>Thi Sithivong</i>	Toyota Tsusho America
<i>Jeremy Berger</i>	Green Processing Company	<i>Ernesto Ortiz</i>	UGN
<i>Jim O'Neill</i>	Green Processing Company	<i>Vickie Lewis</i>	VMX International
<i>Ryan Albers</i>	Honda Development & Manufacturing of America	<i>Sam Qureshi</i>	WM
<i>Ryan Eberhart</i>	Honda Development & Manufacturing of America	<i>Steve Hellem</i>	Suppliers Partnership for the Environment
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