

HITACHI Inspire the Next QMS PROCEDURE  Hitachi Global Air Power US, LLC	REV. #	12		DOCUMENT NUMBER:
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	OWNER:		EFFECTIVE DATE:	
	2/3/2026			

1.0 PURPOSE: To assure the effective packaging of incoming material such that goods are protected from damage in transit, storage, and handling, to reduce/eliminate waste to landfill and unnecessary material costs in packaging.

2.0 SCOPE: Hitachi Global Air Power (HGAP), Michigan City

3.0 RESPONSIBLE PARTIES: Purchasing, Quality and all Suppliers

4.0 DEFINITIONS: NA

5.0 LABELING PROCEDURE:

- A. HGAP Engineering has identified marking/tagging requirements per part family based on traceability requirements, assembly location in the compressor, and size of component.
- B. Marking/tagging requirements are noted on HGAP drawings.
 - a. Based on part family, the HGAP drawing may call out specific location for the part marking to be located on individual components (i.e., frames, heat exchangers, fabricated components, and machined components.)
 - b. Based on part family, additional part information may be required per HGAP drawing to be included on the part label/tag (i.e., Pressure, Temperature, Part Serial Number, Compliance Information, and Supplier Identification).
- C. Marking/tagging requirements will follow one of the following:
 - a. Mark/tag component with HGAP Part Number and Revision
 - b. Mark/tag container with HGAP Part Number and Revision (if parts are too small to legibly accommodate labeling)
 - c. Mark/tag component and/or container with Part Number and Revision
 - d. When drawing requires part identification and direct labeling may interfere with assembly or handling, labels shall be applied to the primary protective packaging (e.g., sealed plastic bag) containing the part, unless otherwise specified on the drawing
- D. During the quoting, initial P.O. process and First Article Process, it is the Suppliers' responsibility to review HGAP drawings for marking/tagging requirements and location on the individual component. If questions or exceptions are noted for the marking/tagging, the Supplier is responsible for contacting HGAP Supply Chain to discuss appropriate next actions (Supplier Deviation, HGAP drawing change, etc.)
- E. The method of applying Marking/Tags:
 - a. Marking/tags shall be in a method that is permanent, visual or in accordance with the specifications detailed on the HGAP drawings.

6.0 PACKAGING PROCEDURE: Review of procedural requirements by all responsible parties

- A. Review options for returnable packaging. If returnable packaging is not an option, provide containers that can be recycled, i.e., cardboard, or wooden boxes.

If wood boxes are used,

- a. Steel corners need to be eliminated to allow recycling of wood boxes.
- b. Metal Fasteners cannot be larger than 7/16-inch bolts.
- c. Use of glue is approved for containers.



Example of steel corners that need to be eliminated



Example of strips of steel used to support the container/corners that need to be eliminated.

Figure 1

Figure 2

- B. Review dimensions of all items being shipped to determine if all items can ship on a standard 48" x 40", 4-way entry pallet. Skids must be designed or built to accommodate four-way entry for forklift. If alternative pallets are required, they must follow the standard pallet dimension guidelines. See Appendix A for Pallet Specifications.
- C. To enhance the efficiency and safety of material processing all skids shall be provided as follows:
 - Skids and pallets must be larger than the overall dimension of the part. At a minimum, the skid must exceed the part dimension in length and width by 2 inches allowing 1" clearance on all sides and a maximum of 6" longer than the part itself for custom skids.
 - Where practical only one part number should be on a given skid.
 - Where multiple small parts are provided, they can be placed on a single skid in separate box or returnable containers, with respective part numbers, so they can be easily dispersed to their respective location within the HGAP production facility.
 - When packaging parts for manual material handling, packaging considerations include minimizing the risk of injury for workers as well as protecting the parts from damage. Keep weight low enough for a single worker to lift comfortably. As shown in the lifting chart in Appendix B for manual material handling, the optimal weight is 35 pounds or less for boxed or containerized material under ideal conditions (lift between shoulder and knees).
- D. Build a stable base layer for your pallet by placing heaviest items on bottom with flat edge in contact with pallet (avoids tipping and load shift).
- E. Protection and/or separation is required on all parts that are painted, coated, machined, or otherwise critical parts (e.g., sealing surfaces, cosmetic surfaces, or non-metallic structural components such as fiber-glass, Fan shrouds). Parts on the skid must be **individually protected** to prevent scratches during shipment, storage, and handling. Protection can be accomplished on those **metal surfaces** and **non-metal parts** deemed critical by use of **corrugated blocks, rubber channels, rubber squares, foam sheets or Styrofoam corner protectors** that provide suitable separation. **Foam sheets** are required to be secured

around the product it is intended to protect to ensure it transfers with the product during handling throughout its storage life to consumption. Also, panels can arrive from suppliers and be received on protective panel carts. The policy allows discretion of the HGAP purchasing agent to determine the most effective and practical material for the varied applications. Buyers will ensure that the selected method of packaging is communicated to suppliers for each commodity.

Example: Product separation and machined surface protection



Figure 3



Figure 4



Figure 5



Figure 6

Example: Separated freestanding mufflers with robust wooden box to prevent fall hazard, separated lift bails and axles to prevent tipping after banding is removed.



Figure 7



Figure 8



Figure 9

Example: Individually wrapped painted product with foam sheets



Figure 10



Figure 11

NOTE: Panels should ALWAYS BE STACKED CONCAVE DOWN to prevent water accumulation when outside.

Examples: Authorized panel stacking orientation – Prevents water from collecting inside the panels
Ensure that a cardboard layer is placed on the top panel to prevent shrink wrap from bonding to the painted surface.



Figure 12

Not pictured (required) – cardboard layer on the top panel to prevent sun damage and shrink wrap from bonding to the painted surface.



Figure 13

Examples: Unauthorized panel stacking – Inverting panels to maximize height is not permitted without express permission from HGAP.



Figure 14

These panels save on skid height and dividers but the bottom panels will collect water



Figure 15

These panels save on skid height and dividers but the bottom panels will collect water

Strap
on
wood



Figure 16

Bolted
to Skid



Figure 17

Bolt and band the pressure tank securely to the skid to ensure zero movement during transportation.



Figure 18

If vessel diameter exceeds 4' pallet width, lay vessel on side, center, and strap to a modified pallet (4' + vessel diameter + 2" gap (from edges) with cardboard protectors and foam on sides.

NOTE: Small and Medium frames should ALWAYS BE STACKED CONCAVE UP to prevent the need to FLIP the frames during Operations.

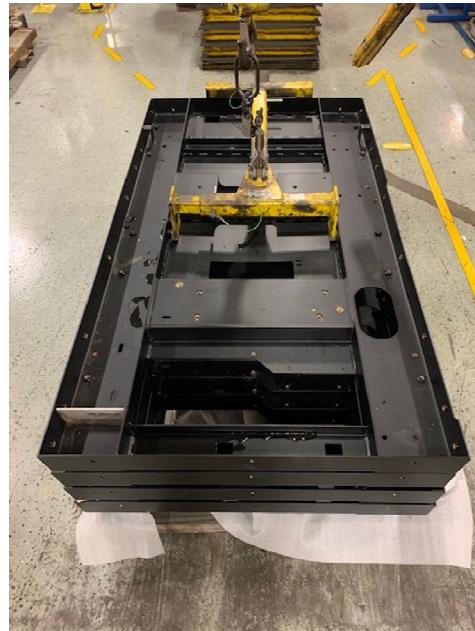


Figure 19

Suppliers - If Questions arise on packaging, please contact your buyer



- F. Sharp edges must be covered or protected to ensure that there is no damaging contact between the parts in the package and to minimize safety hazards to those handling the material.
- G. Parts must be positioned on a skid in a manner that will minimize water retention should the skid be exposed to the weather for any length of time (i.e., concave down) unless specifically noted on the DWG or in this document. Water retention can bring damage from rust and corrosion, which results in expensive rework or scrap.
 - a. Sample exception – Frames shown in Figure 19 for small and medium frames.
- H. Skids must be identified as to the owner / supplier to assure they are returned to the proper place when empty. This will enhance our ability to recycle packaging and handling material as well as increase the useful life of the skid.
- I. When to use Stretch Wrap vs Banding?
 - a. Stretch Wrap
 - i. Light to Medium weight pallets (0 to 750 lbs.)
 - ii. Pallets with many small to medium sizes boxes that could slide out of place
 - iii. Secure uneven layers/loads
 - b. Banding
 - i. Medium to Heavy Weight pallet (751 & over)
 - ii. Pallets with corrugated pallet bins or sleeves to contain the boxes.
 - iii. Odd shaped items on pallets
 - c. Banding & Wrap
 - i. Air shipments
 - ii. Heavy weight shipments of many small boxes that cannot be secured by banding
 - d. Ratchet straps
 - i. Ratchet straps can be used instead of banding for packaging materials on pallets when securing heavy, bulky, or rigid items to prevent movement during transport. Ratchet straps provide far greater tension and holding force than stretch wrap alone.
 - ii. **Check the Load Limit:** Ensure the total weight of the cargo does not exceed the working load limit (WLL) of the ratchet strap, or use multiple straps to distribute the tension if necessary.
 - iii. Working Load Limit (WLL): The combined WLL of all straps must be at least 50% of the total weight of the cargo.
 - iv. Strap count:

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1. A minimum of two straps is required. Use at least two straps, one passing through the base of the pallet and over the goods, and another strap going through the other fork entry area
2. Unstable Goods: If the items on the pallet are unstable or prone to shifting, you will need additional straps and more layers of stretch wrap to keep them secured.
- v. Strap count by length:
 1. Less than 5 ft (and under 1,100 lbs): One strap is sufficient.
 2. Over 5 ft (and over 1,100 lbs): At least two straps are required.
 3. Over 10 ft: Add one additional strap for every extra 10 feet of cargo length.
- vi. Go under the pallet: Always run the straps through the underside of the pallet, not just around the outside. This anchors the load directly to the base.
- vii. Placement: Use a combination of vertical straps (over the top of the load and through the pallet runners) and horizontal straps (wrapping around the sides). This criss-cross pattern, sometimes called a "basket weave," increases stability.
- viii. Edge protection: Place edge protectors under the straps at corners to prevent them from cutting into the cargo or becoming damaged from abrasion.
- ix. Tension: Ensure the straps are properly tightened with the ratchet mechanism to prevent any shifting. Avoid overtightening, which can damage the cargo. Move the load back and forth slightly to check for rattling.
- x. Combine with other methods: For most applications, the combination of stretch wrap and ratchet straps provides the optimal balance of containment and stability.

J. Stretch Wrap Requirements:

- a. Wrap used must be transparent.
- b. Wrap must prevent the load from sliding off the pallet base.
- c. A minimum of two wraps at the base and the top of the pallet should be used.
- d. Wrap should overlap to secure all boxes from shifting.
- e. See additional information below for reference on gauge of shrink wrap.

Thickness	12"-20" Hand Grade
37 Gauge	Great for bundling two light uniform objects together. Users can easily apply the film with minimal exertion
47 Gauge	No products with sharp edges or corners. Excellent for box and case wrapping up to 1800 lbs.
60 Gauge	Ideal for lighter, smaller objects, small boxes, and banding light items together. Ideal for loads up to approx. 1800 lbs.
63 Gauge	Bundle and wrap heavier products with minimal sharp edges. Products up to 2200 lbs with minimal sharp edges.
70 Gauge	Often used to bundle multiple long cylindrical products. For loads up to approx. 2200-2400 lbs.
80 Gauge	The most common gauge in all stretch wrap. Known to be very versatile and handle a variety of applications. Ideal for loads up to approx. 2200-2400 lbs.
90 Gauge	Used to wrap bundle firewood, angle iron, and a variety of other heavier objects. Ideal for loads up to approx. 2400-2600 lbs.
100 Gauge	Medium-heavy boxes and medium-heavy items such as light lumber are ideal. Ideal for loads up to approx 2800-3000 lbs.
115 Gauge	Used for smaller heavy objects, commonly used for banding sets of heavy products together. Ideal for loads up to approx. 3000-3200 lbs.
150 Gauge	Greater strength and puncture resistance, great for regular and irregular shaped boxes. Ideal for securing steel, metal, and other heavy-duty items.

K. Banding Requirements

- a. When parts are banded, vinyl banding is preferred over metal except where the weight and/or balance of the parts will cause the vinyl to stretch and loosen the packaging. All parts should be protected from damage at stress points when the banding is tightened. Foam, cardboard, plastic, or other appropriate material shall be placed between the band and the part. If it is a viable option due to material used and location of the Supplier, HGAP will work with the supplier to return dunnage to the supplier for re-use.

L. All shipments that do not meet these requirements will be entered into Gensuite for tracking and assigned to the buyer for corrective action.

M. All product packaging must contain recycling markings. These markings are used to indicate what type of material the packaging is and how it can be recycled. These markings are in accordance with [European Parliament and Council Directive 94/62/EC on packaging and packaging waste](#). The marking should include

a Recycling Triangle, Recycling number inside the triangle and Abbreviation of the material as indicated in the tables in the regulation.

See the red square below showing an example of the marking.

Low-density polyethylene (LDPE)



Cling-film, sandwich bags, squeezable bottles and plastic grocery bags

a. Tables indicating the material, material abbreviation and the corresponding number are shown in the following tables:

ANNEX I

Numbering and abbreviation system (') for plastics

Material	Abbreviations	Numbering
Polyethylene terephthalate	PET	1
High density polyethylene	HDPE	2
Polyvinyl chloride	PVC	3
Low density polyethylene	LDPE	4
Polypropylene	PP	5
Polystyrene	PS	6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16
		17
		18
		19

(') Only capital letters shall be used.

ANNEX II

Numbering and abbreviation system (i) for paper and fibreboard

Material	Abbreviation	Numbering
Corrugated fibreboard	PAP	20
Non-corrugated fibreboard	PAP	21
Paper	PAP	22
		23
		24
		25
		26
		27
		28
		29
		30
		31
		32
		33
		34
		35
		36
		37
		38
		39

(i) Only capital letters shall be used.

ANNEX III

Numbering and abbreviation system for metals

Material	Abbreviation	Numbering
Steel	FE	40
Aluminium	ALU	41
		42
		43
		44
		45
		46
		47
		48
		49

*ANNEX IV***Numbering and abbreviation system (') for wood materials**

Material	Abbreviation	Numbering
Wood	FOR	50
Cork	FOR	51
		52
		53
		54
		55
		56
		57
		58
		59

(') Only capital letters shall be used.

*ANNEX V***Number and abbreviation system (') for textile materials**

Material	Abbreviation	Numbering
Cotton	TEX	60
Jute	TEX	61
		62
		63
		64
		65
		66
		67
		68
		69

(') Only capital letters shall be used.

*ANNEX VI***Numbering and abbreviation system (1) for glass**

Material	Abbreviation	Numbering
Colourless glass	GL	70
Green glass	GL	71
Brown glass	GL	72
		73
		74
		75
		76
		77
		78
		79

6.0 RECORDS: NA**7.0 FORMS:** NA**8.0 REFERENCES:** 94/62/EC - [European Parliament and Council Directive 94/62/EC on packaging and packaging waste](#)

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Appendix A: Pallet Specifications

The standard pallet used is the **Grocery Manufacturers Association (GMA) pallet**, now managed by the **Consumer Brands Association (CBA)**.

Required pallet size: **48 in. x 40 in.**

Forklift access: **4-way entry**

Pallet construction must allow safe access for all forklift equipment to support handling throughout the entire distribution process.

Pallet Design Specifications

General Requirements

- Footprint: 48 in. x 40 in.
- 4-way forklift entry with two side notches
- Top and bottom deck boards: minimum 0.5 in. thickness
- Typical pallet height: approximately 6.5 in.

Load Support Requirements

Pallet board thickness must be appropriate for the applied load to ensure stability and safe stacking:

- Light loads (<500 lbs): minimum 1x4 boards
- Medium loads (500–1,500 lbs): minimum 2x4 boards
- Heavy loads (>1,500 lbs, including tanks): minimum 2x6 boards

*Always assess weight of load to determine load support requirements

Top Deck Configuration

- Seven (7) top deck boards in good condition:
 - Two (2) boards measuring 5.5 in. x 40 in. on each end
 - Five (5) boards measuring 3.5 in. x 40 in. in the center

Bottom Deck Configuration

- Five (5) bottom deck boards in good condition:
 - Two (2) boards measuring 5.5 in. x 40 in. on each end
 - Three (3) boards measuring 3.5 in. x 40 in. between the notches

Export Pallet Requirements

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Pallets used for export shipments must be:

- Heat-treated in accordance with international shipping requirements, or
- Constructed from hardwood lumber.

Pallet Grade Acceptance Criteria

Acceptable Pallets

Grade A / #1:

New or like-new pallets in good structural condition.

Grade B / #2:

Reworked pallets with metal plate or stringer repairs that maintain structural integrity. These pallets may include companion (double or block) stringers, with a maximum of two repaired stringers.

Unacceptable Pallets

Grade C / #3:

Pallets in poor condition, repaired multiple times, with inconsistent deck boards or multiple companion stringers. These pallets are not permitted for use.

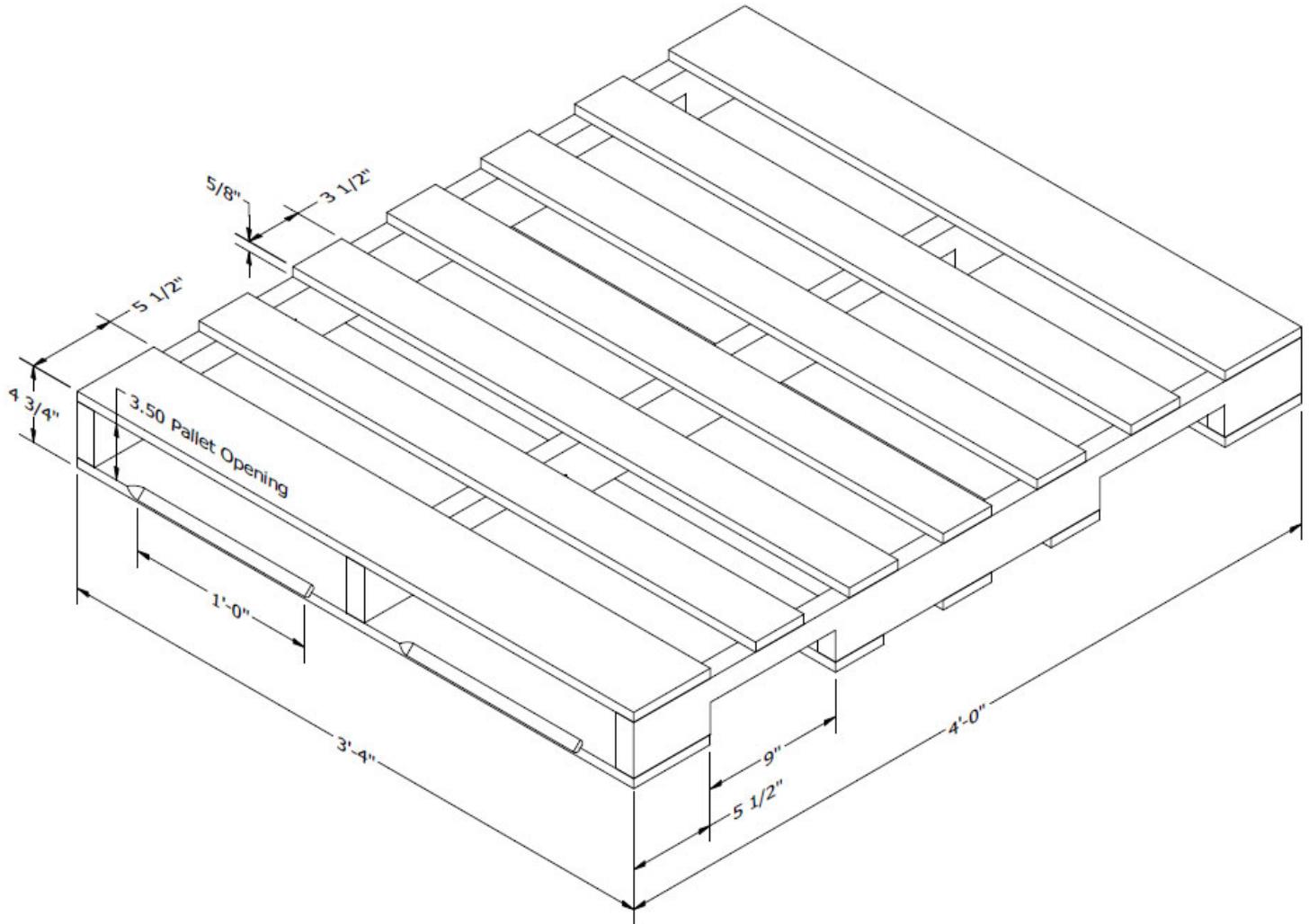
This requirement supports compliance with:

- **OSHA 29 CFR 1910.176(b)** — Stored materials must be stable and secure.
- **ISO 8611-1:2011** — Pallet load performance testing methodology.

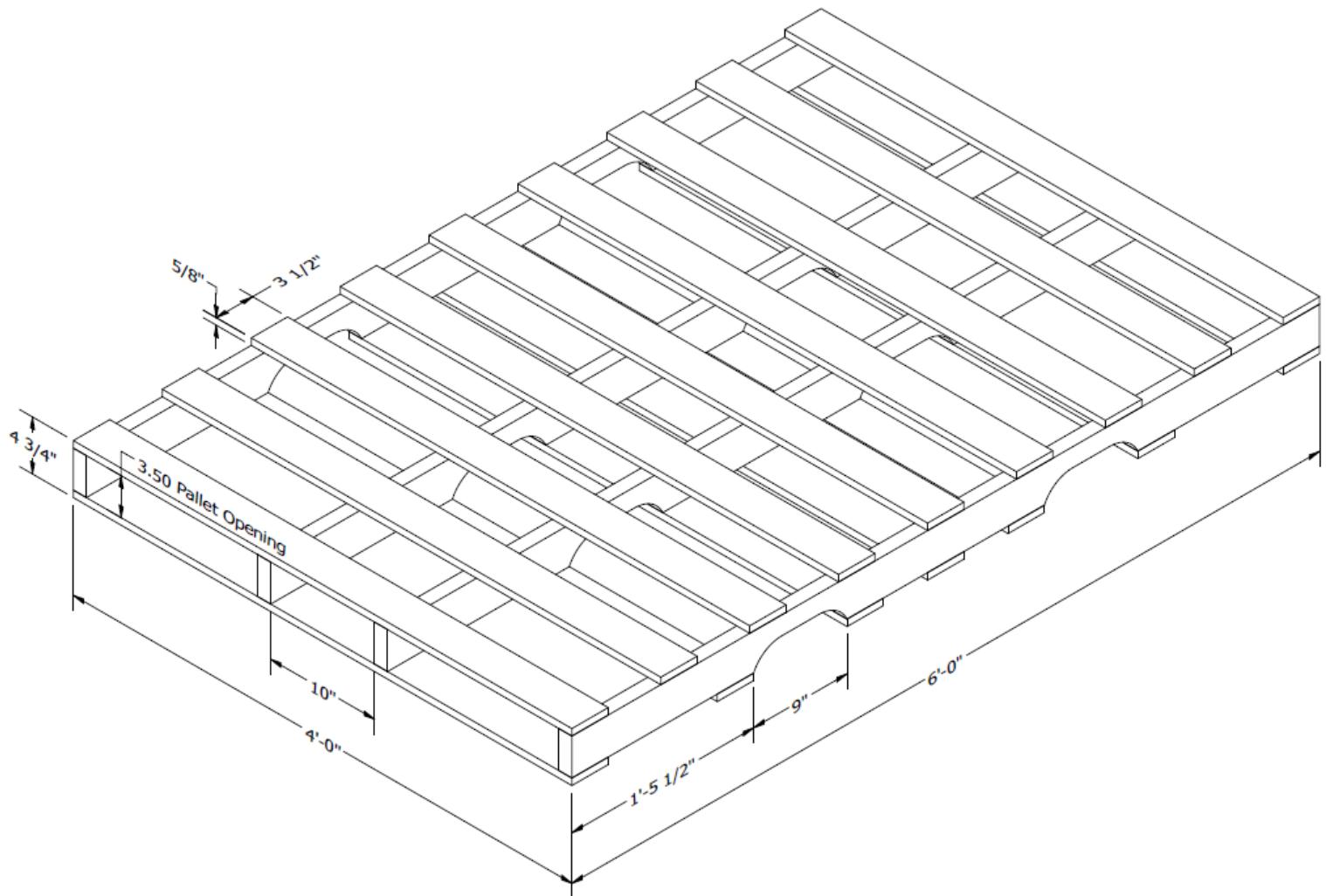
NOTE: Shipments arriving on a pallet of unacceptable quality may be refused and returned to vendor at vendor's expense or if reworked by HGAP due to production needs there will be a charge back to the supplier.

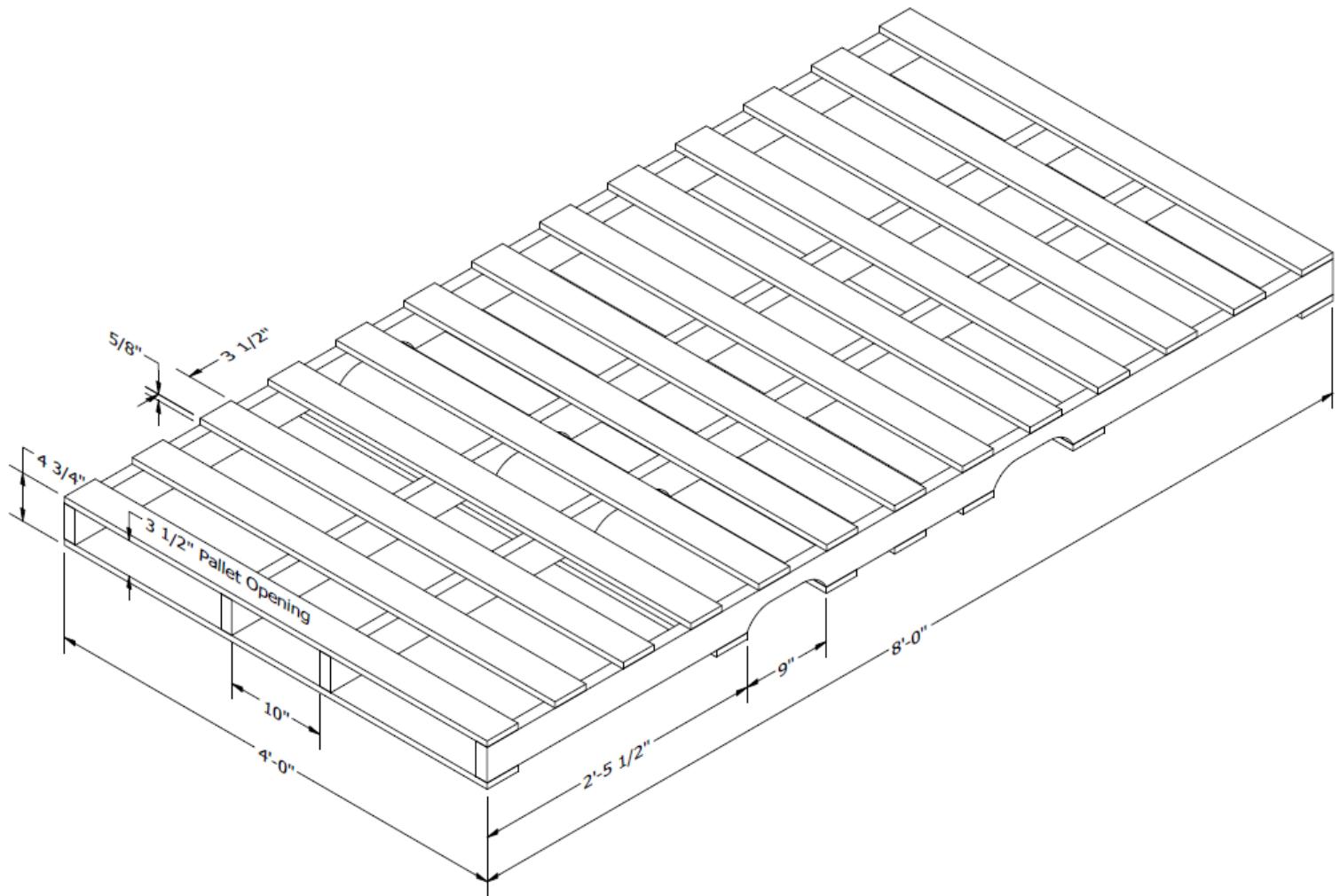
For materials that do not fit this standard model, exceptions will be approved on an individual basis.

Acceptable Standard Pallet Definition and Example



(see below additional examples (pages 16,17) of larger pallets that should follow the same design specifications)





Example of an Unacceptable Pallet

Wood pallets *without* bottom boards (skids) are not acceptable because wood pallets without bottom boards (commonly known as skids) don't distribute weight evenly, they can be challenging to lift, and the stringers are easily compromised or damaged. This style of pallet does not meet the requirements for transportation and must not be used.

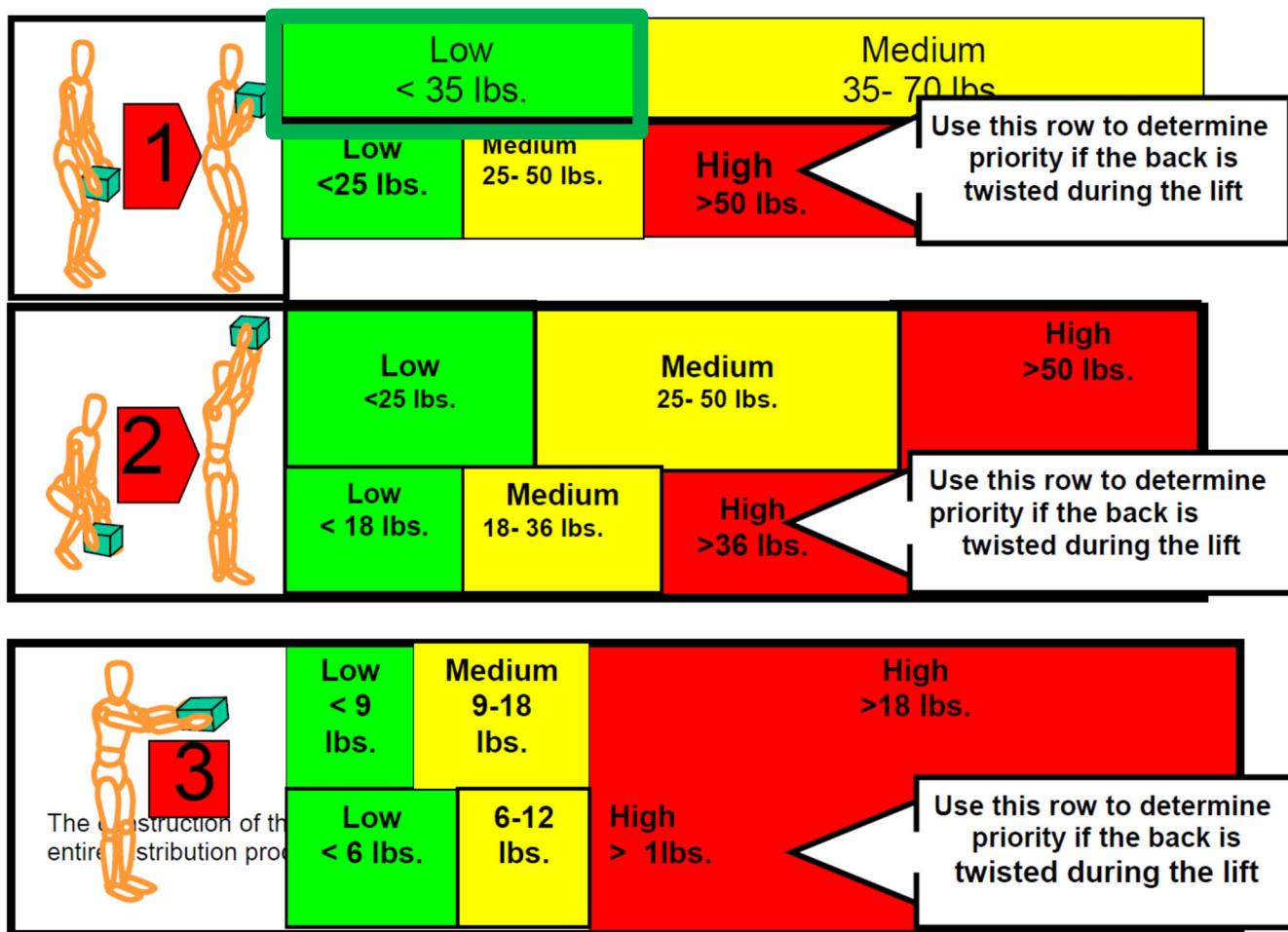


Not Allowed: Damaged pallets without the required **number of deck and bottom boards**

Appendix B - Packaging Ergonomics Risk Levels

The Lifting Chart

This chart is used to establish priorities for redesigning lifting tasks. The priority for redesign is based on the weight and the way an object is lifted. Note that there are two rows for each type of lift on the chart. Use the bottom row as marked when a lift requires twisting the back during lifting or lowering of an object.



Approval Signatures On File

(Note: Approval by a Manager or designate from all functional areas listed in section #3 Responsible Parties is required)

Department: (include all depts. listed in section #3)	Manager/Designate Approval:	Date:
Purchasing/Sourcing	Shelley Kaser	2/3/2026

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ISO Revision Log

Rev	Date	Revised By	Approved By	Description
02	03/04/2008	S. Kosakowski	G. Kelly	Added Pictures and updated to current process
03	12/03/2014	J. Downs	M. Bubik	Updated to include pallet requirements
04	01/09/2018	J. Downs	B. Dowsett	Updated to include additional requirements for the allowable size of pallets, see Item C bullet 1, to include a maximum of 6 inches longer than the part itself, for a custom skid.
05	01/09/2018	J. Downs	B. Dowsett	Updated to include additional requirements for the allowable size of pallets, see Item C bullet 1, to include a maximum of 6 inches longer than the part itself, for a custom skid.
06	09/11/2020	Michael Mitchell	Shelley Kaser	Added 6' and 8' examples of properly supplied skids to ensure standard packaging is adhered to for optimal storage and EHS concerns. Added additional information on shrink wrap vs. banding.
07	12/10/2020	Michael Mitchell	Brad Nusbaum	Added clarification on the requirement to secure foam sheets around painted product to ensure consistency within vendors. Added requirement to stack ALL panels that can hold water to be concave down.
08	08/16/2021	Michael Mitchell	Barb Kopko	Added Frame stacking requirement and added Figures # 's to photos.
09	06/01/2023	Jeanie Downs and Jason Stone	Barb Kopko	JD: Updated to include additional direction to avoid wood containers that cannot be recycled. JS: Added Section 6.M. for privately labeled product in accordance with EU requirements. Added Reference to the EU packaging requirements in Section 8.
10	07/06/2023	Ramiro D. Aguilar	Barb Kopko	Template change.
11	3/14/2024	Heidi Steinhiser	Shelley Kaser	Removed reference to Sullair and replaced with HGAP
12	10/01/2025	Avinash Chaudhary	Jose Vazquez Shelley Kaser Jeanie Downs	Added pressure tank packaging requirements. Added pallet requirements. Change of wording on page 2 Item C when packaging parts for manual material handling. Added instructions on ratchet straps. Updated the pallet specification in Appendix A with current GMA standard and information on Grade A, B and C pallets. Added individual protection requirements for fiber-glass fan shrouds to page 2 e.