

GSI Lumonics

Supplier Packaging Requirements Handbook

Statement of Purpose

This handbook outlines the expectations of suppliers to GSI Lumonics' facilities in North America and the United Kingdom.

Suppliers must ensure that their employees and contractors understand the requirements of this handbook. GSI Lumonics reserves the right to update this handbook as business needs or conditions warrant.

1.0 PURPOSE

This Quality Procedure establishes packaging requirements and provides guidelines for all piece parts and subassemblies that are delivered to GSI Lumonics, Inc.

2.0 SCOPE

- 2.1 This document provides packaging requirements and packaging guidelines.
- 2.2 Requirements of this document shall apply to all parts and subassemblies (hereafter referred to as material) that is:
 - 2.2.1 Provided to GSI Lumonics, Inc by any contracted supplier.
- 2.3 Guidelines contained within this document are intended to serve as a reference to good packaging practices.

3.0 REFERENCES

N/A

4.0 DEFINITIONS

N/A

5.0 RESPONSIBILITY

It is the responsibility of the supplier to conform to all requirements outlined within this procedure. It is the responsibility of the GSI Lumonics Quality Department to monitor compliance to this procedure.

6.0 PROCEDURE-LIST OF TABLES, DIAGRAMS, EXHIBITS

- 6.1 Table 1: Edge Crush Test specifications
- 6.2 Figure 1: Alignment/loading of cartons on a pallet
- 6.3 Diagram 1: Stabilization – Top banding (1/4)
- 6.4 Diagram 2: Stabilization – Top banding (2/4)
- 6.5 Diagram 3: Stabilization – Top banding (3/4)
- 6.6 Diagram 4: Stabilization – Top banding (3/4)
- 6.7 Diagram 5: Unitization – Cross Top wrapping
- 6.8 Diagram 6: Unitization – X-wrapping (1/2)
- 6.9 Diagram 6[cont'd]: Unitization – X-wrapping (2/2)
- 6.10 Exhibit 1: Improper packaging (1/5): Inadequate packing
- 6.11 Exhibit 2: Improper packaging (2/5): Lack of hardware capping
- 6.12 Exhibit 3: Improper packaging (3/5): Kraft paper usage
- 6.13 Exhibit 4: Improper packaging (4/5): Panel stacking
- 6.14 Exhibit 5: Improper packaging (5/5): Pieces not individually wrapped

7.0 GENERAL

- 7.1 **NOTE:** *GSI Lumonics, Inc reserves the right to refuse receipt of material that does not conform to the requirements of this document.*
- 7.2 **Guideline** - It is expected that packaging will perform a number of functions during transportation, storage and point-of-use, including:
- ◆ Containment of the product to ensure integrity and safety
 - ◆ Protection of the product from physical damage
 - ◆ Convenience of use and ease of handling by users
 - ◆ Compliance to legal and regulatory requirements
 - ◆ Communication of information
 - ◆ Environmental acceptability and ease of disposal and/or recycling
- 7.3 **Guideline** - It is recognized that returnable containers represent the best environmental packaging solution. Thus, if a supplier obtains GSI Lumonics, Inc agreement to use returnable container(s), then those agreements take precedence over the guidelines and standards otherwise contained within the body of this specification.
- 7.4 **Guideline** - Consideration should be given to eliminating all unnecessary packaging materials wherever possible. A priority should be placed on reducing material by weight and volume.
- 7.5 **Guideline** - Suppliers are encouraged to determine where and how much recycled material can be incorporated into packaging designs while also providing adequate performance.

8.0 REQUIREMENTS

8.1 Requirement (section 6.1 in its entirety) - General

- 8.1.1 In case of conflict between this specification and packaging requirements noted on GSIL Lumonics, Inc engineering drawing, the engineering drawing shall take precedence.
- 8.1.2 Purchase orders for all material that is referenced in paragraph 2.2.1 of this document shall refer to this document as a condition of that purchase order.
- NOTE:** *GSI Lumonics, Inc reserves the right to refuse receipt of material that does not conform with the requirements of this document.*
- 8.1.3 Unique packaging requirements dictated by part characteristics such as rust prevention, weight, fragility and surface appearance which are not otherwise covered by this document are the responsibility of the GSI Lumonics, Inc supplier. Guidelines that govern in such cases are provided in Para. 5.2 of this document.
- 8.1.4 Products that are required to have a certificate of compliance, data, or other form of certification shipped with such products, shall place all required information on the outside shipping container in a sealed pouch with the packing slip or separately.
- 8.1.5 Products that are date sensitive (shelf life) or that have an establish life cycle, shall be individually labeled or marked to display an expiration date.
- 8.1.6 Material that is transferred between GSI Lumonics, Inc locations shall comply with the applicable requirements of this document.

- 8.1.7 All Field Replaceable units (FRU's) and/or spare parts that are destined for shipment to GSI Lumonics customers', repair depots, logistic centers, etc, whether to or from, as shipped from GSIL manufacturing facilities, shall be repackaged for shipment in such a manner that prohibits the the Original Equipment Manufacturer's (OEM) logo, trademark, etc from being displayed on or within the shipping container. If applicable, all products described within this paragraph, will have a specified GSIL label attached to the contents and/or shipping container. Instructions regarding label requirements/placement will be contained under separate document.
- 8.1.8 The GSI Lumonics, Inc part number shall be marked on the outermost package of each crate or box.
- 8.1.9 Packaging systems and packaging materials shall be consistent with regulations established by Federal, State, Provincial or local governments wherever packaging is discarded (i.e. recycled, reused, disposed of etc.).
- 8.1.10 Import shipments shall comply with regulations set forth as established within the country of origin.
- Requirement (section 6.2 in its entirety) - Handling and Ergonomics**
- 8.1.11 All containers and packaging must be designed with consideration given to ergonomics and ease of part removal. Appropriate consideration must be given to unit load height restrictions, weight restrictions, carton disassembly and other requirements, which may affect ergonomics and worker safety.
- 8.1.12 Any package, which is designed to be manually lifted, should not exceed standard dimensions of 30" length by 20" width by 18" depth. This includes packages unitized on pallets, which are moved by fork truck but are manually placed onto the pallet.
- 8.1.13 Large boxes or bins, which are used to hold more than one part, should not be higher than 24 inches from the floor in order to allow easy accessibility to the center of the package when reaching for an item.
All containers designed to allow manual handling must not exceed 75 lbs. maximum weight, even if palletized.
- 8.1.14 Packages, which are greater than 75 lbs in weight, should be designed in such a way that they will enhance mechanical movement and discourage any manual handling.

9.0 PART PROTECTION CONSIDERATIONS

9.1 Electrostatic Discharge Components

- 9.1.1 **Scope** – The requirements of this section shall apply to the following parts and subassemblies:
- 9.1.1.1 All printed circuit board (PCB) assemblies at all stages of assembly
- 9.1.1.2 All semiconductors including integrated circuits (ICs), diodes and transistors.
- 9.1.1.3 Hybrid and surface mount chip assemblies
- 9.1.1.4 Chip resistors
- 9.1.1.5 All subassemblies incorporating any of the above up to the point where ESD-sensitive components therein are no longer exposed in routine handling.

9.1.2 **Requirement** – Assemblies that include electro sensitive material (for example Printed Circuit Assemblies) shall be protected by placing them within metal-in (buried metal) shielding bags and sealing them with an ESD label.

9.1.3 **Requirement** – Electro sensitive components (for example integrated circuits) shall be packaged using static-dissipative protection (for example, by placing them in static-dissipative tubes or by implanting them in static-dissipative foam which is enclosed in a metal-in shielding bag and sealed with an ESD label).

9.2 **Requirement** - Acceptable Methods for the Protection of Parts having Painted or Plated Surfaces

9.2.1 Parts wrapped individually using either bubblewrap or foam wrap. See reference exhibit # 5 for example of material that is not properly packaged (not individually wrapped).

9.2.2 Back-to-back placement of parts within fiber-based cells

9.2.3 Top-to-bottom placement of parts within fiber based cells

9.2.4 Die cuts, as applicable for more precise parts locations and to maximize part/package density

9.3 **Requirement** - Corrugated Packing

Material that is packaged within corrugated containers shall have voids filled on all sides of that containerized material. See reference exhibit # 1 for example of a container that has inadequate void fill.

9.4 **Requirement** - Hardware Capping

Hardware that is at risk of damage during transportation shall be capped or otherwise protected from misalignment damage due to material handling. See reference exhibit # 2 for example of misalignment damage due to inadequate (capping) hardware protection.

9.5 **Requirement** – Panel assembly wrapping

Panels shall be individually wrapped using either bubblewrap or foam wrap protection. Unless GSI Lumonics, Inc has provided specific authorization; the use of Kraft paper wrapping is unacceptable. See reference exhibit # 3 for example of panels that are not properly packaged (use of Kraft paper).

9.6 **Requirement** - Panel Stacking

Panels over 36” in length shall have horizontal separators between individual panels in order to prevent bowing. See reference exhibit # 4 for example of panels that do not have separators (results in bowing).

9.7 Pallets

9.7.1 Pallet Size Requirements

9.7.1.1 **Requirement** - Material-weighing 1,000lbs. Or greater shall be placed on a pallet constructed of 4" x 4" runners and 1½" thick (nominal) deck boards. Other modifications may be required to maintain the integrity of the package.

9.7.1.2 **Requirement** - A minimum of 3½" under clearance on all sides is required to facilitate use of a 28" wide pallet jack.

9.7.1.3 **Guideline** - Standard pallet sizes where part size permits are:

Length		Width
48"	x	40"
48"	x	42"
48"	x	48"

9.7.1.4 **Guideline** - Where the part size permits, containers should be designed in a modular fashion to fit on standard pallet sizes. If the size of the part is greater than 48", the pallet must be designed to accommodate the part length and weight, keeping the material within the confines of the pallet (i.e., material shall not overhang the footprint dimensions of the pallet).

9.7.1.5 **Guideline** - Unique sized pallets may be required to accommodate shipment of large parts or subassemblies. In general, the pallet length should be sized to the part length.

9.7.1.6 **Guideline** - 2" x 4" runners are preferred unless weight restrictions apply

9.7.1.7 **Guideline** - When the weight of the load does not exceed 1,000lbs, four-way fork entry pallets are preferred.

9.7.2 Wood Pallets

9.7.2.1 **Requirement** - Used as the base of a packaging system, the wood pallet must:

- Have the capability to be engineered to ensure product protection
- Be recyclable
- Be manufactured and repairable to the standards of the National Wooden Pallet and Container Association's "Uniform Standard For Wood Pallets"
- Conform to the emergency measures as outlined by the Commission of the European Communities for coniferous non-manufactured wood packing material (NMWP).
- Be structurally sound, square, have no missing or broken boards or loose nails and not be distorted.

9.7.2.2 **Guideline** - Where pallets are applicable, the use of wooden pallets for transport of material is encouraged but is not required. Plastic pallets are allowed.

9.8 Crates

9.8.1 **Guideline** - Wooden Pallet Boxes/Crates Standard pallet boxes and crates are used for heavy material, which may exceed the pallet carton limits, but only need minimum protection such as castings, forgings, special bolts or other bulk items.

9.8.2 **Guideline** - Corrugated Pallet Boxes/Crates and Containers Suppliers are encouraged to provide corrugated containers, which provide for improved stacking strength, increase the recycled content of corrugated paper and reduce the overall amount of fiber used per shipping container.

10.0 **Guideline** - Edge Crush Test (ECT) Specifications Significant environmental benefits can be obtained when designing corrugated containers based on ECT specifications. In general, use of the ECT specification allows for equivalent stacking performance using less paper and more recycled content. Refer to Table 1 to determine proper container for a given load.

Maximum Weight Box/Contents (lbs.)	Maximum Outside Dimension (L+W+D)	Minimum Burst Test Single Wall, Double Wall, or Solid Fiber Board (lbs. per sq. in.) or Minimum Puncture Test Triple Wall Board (ln oz. per ln. tear)	Minimum Combined Weight of Facings, Including Center Facing(s) of Double Wall and Triple Wall Board or Minimum Combined Weight of Piles, Solid Fiberboard (lbs per 1000 sf)	Minimum Edge Crush Test (lbs per in width)
SINGLE WALL CORRUGATED FIBERBOARD BOXES				
20	40	125	52	23
35	50	150	66	26
50	60	175	75	29
65	75	200	84	32
80	85	250	111	40
95	95	275	138	44
120	105	350	180	55
DOUBLE WALL CORRUGATED FIBERBOARD BOXES				
80	85	200	92	42
100	95	275	110	48
120	105	350	126	51
140	110	400	180	61
160	115	500	222	71
180	120	600	270	82
TRIPLE WALL CORRUGATED FIBERBOARD BOXES				
240	110	700	168	67
260	115	900	222	80
280	120	1100	264	90
300	125	1300	360	112
SOLID FIBERBOARD BOXES				
20	40	125	114	N/A
40	60	175	149	N/A
65	75	200	190	N/A
90	90	275	237	N/A
120	100	350	283	N/A



11.0 Unit Load Containment & Palletization

11.1 **Requirement** - Metallic Strapping although the use of plastic strapping is generally preferred, steel strapping shall be used in the case of very heavy components or metal castings with sharp edges.

11.2 Plastic Strapping

11.2.1 **Requirement** - Any plastic strapping used must satisfy requirements of tensile strength, elongation and recovery.

11.2.2 **Guideline** - Three commonly used plastic strappings are:

- Polypropylene, which has low break strength, high elongation and good elongation recovery over short periods of time.
- Polyester, which has high break strength, low elongation and high-retained tension over time.
- Nylon, which is the most expensive plastic strapping with high break strength, high elongation and high elongation recovery.

12.0 Application Techniques

12.1 **Requirement** - Size cartons modularly to the pallet to eliminate voids and minimize shifting of packages on pallets.

12.2 **Requirement** - Strapping should be used only in vertical alignment. The use of horizontal banding is a poor packaging practice and may require an upgrade of the corrugated paperboard and/or the addition of corner supports.

12.3 **Requirement** - Plastic and metal banding must be applied using proper tension settings. Excessive tension can lead to container failure and poor load containment as well as pallet failure.

12.4 **Requirement** - When banding to corrugated cartons, use of corner or edge protectors is required as necessary to prevent the collapse of carton edges.

12.5 Use of Plastic (Stretch) Film for Unitization.

- **Requirement** - Use Linear Low Density PolyEthylene (LLDPE) stretch film
- **Requirement** - PolyVinyl Chloride (PVC) film is not to be used.

12.6 Use of Shrink Film

- **Guideline** - Shrink film offers some unique advantages for specific packaging applications and is considered an acceptable material if it provides the essential packaging functions required for the commodity handled.

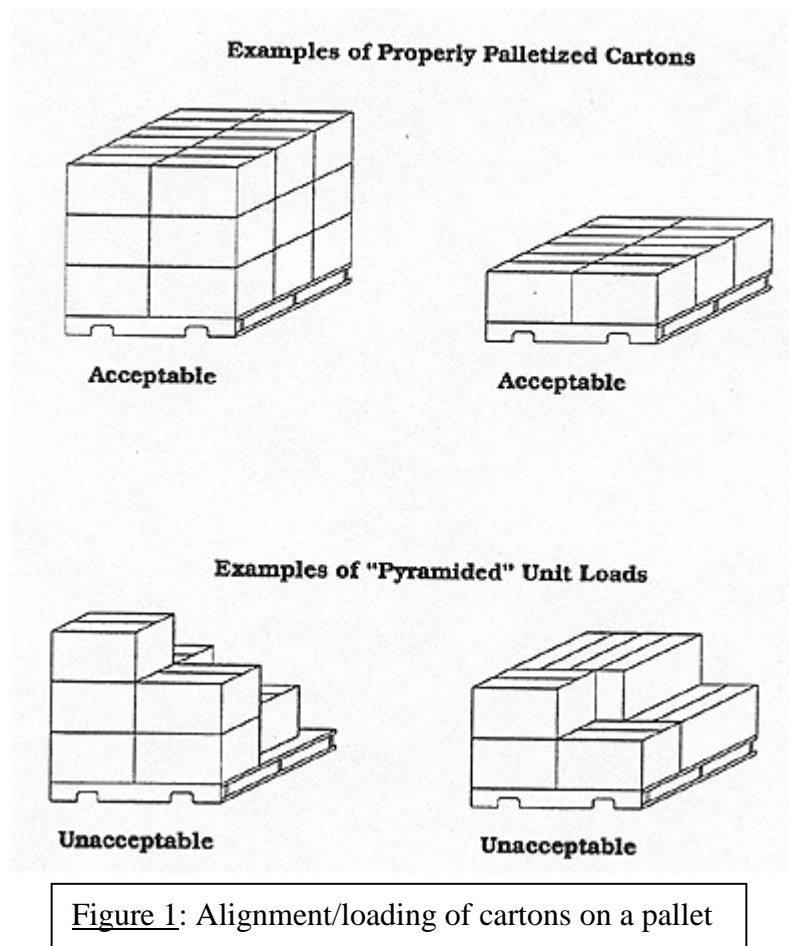
12.7 Use of Unitizing Adhesives

- **Guideline** - Unitizing adhesives are encouraged as a replacement for stretch wrap or strapping because it is the best environmental option. The benefits include:

- Elimination of wrap time
- Equipment/floor space savings
- Load integrity, appearance
- Inspect/repack ease
- Unit load increased, nothing stretches or moves

12.8 Proper Alignment and Compression Strength of Corrugated Fiberboard Cartons

- **Requirement** - Pyramid loading of cartons on a pallet is prohibited.



13.0 **Guideline (section 11 in its entirety) - PACKAGING METHODS**

13.1 **Method:** To anchor the narrow widths either slide the end of the film between two boxes (Diagram 1) or tie it to the pallet and pull the film up diagonally to start top banding (Diagram 2).

**STABILIZATION
TOP BANDING**

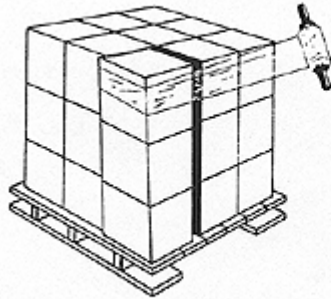


Diagram 1: Slip film between boxes.

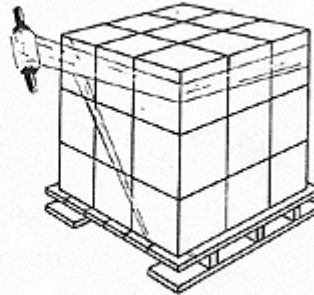


Diagram 2: Tie to pallet and pull film up diagonally.

13.2 **Method:** Pull the film tightly around the upper portion of the pallet creating a tight, secure band of film. End the wrap by catching the film on the corner, pulling the top hand brake towards the floor (Diagram 3) or poke fingers through the film (Diagram 4).

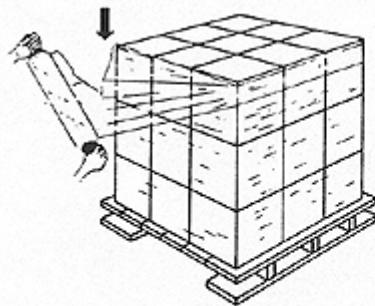


Diagram 3: Squeeze hand brakes when catching film on corner, pull top brake towards floor.

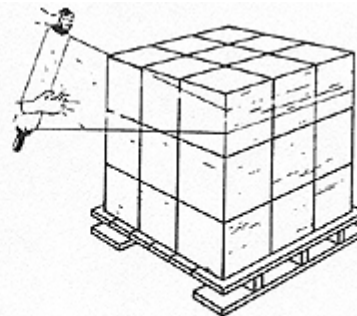
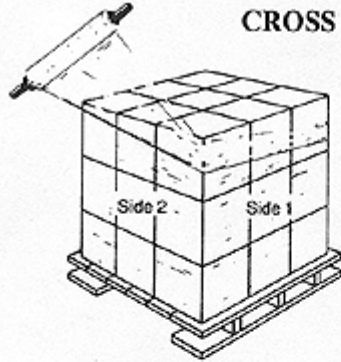


Diagram 4: Poke finger through film.

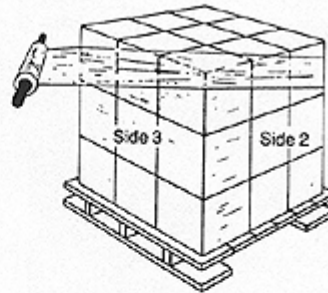
- 13.3 **Method:** Pull the stretch film diagonally across one top corner of the pallet, holding the hand brake closest to the pallet center higher than the hand brake closest to the floor (Diagram 1). Once pulled diagonally over the top corner, dip the higher hand brake below the next corner (Diagram 2). Raise the roll up over the following corner (Diagram 3) and dip it below the next corner. Continue the process - each time moving towards the center of the load until the top is completely wrapped (Diagram 4).

DIAGRAM 5

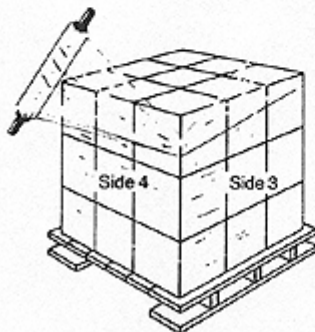
**UNITIZATION
CROSS TOP WRAPPING**



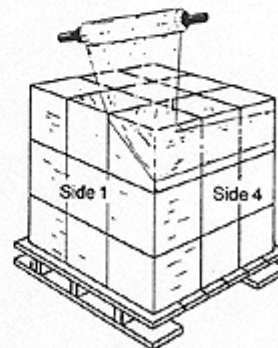
1. Pull film diagonally across top corner.



2. Dip below next corner, catching film on corner.



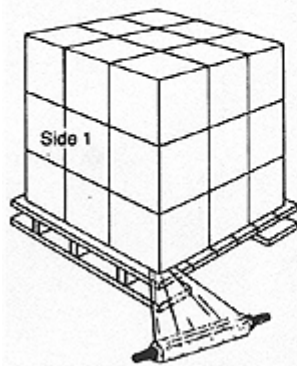
3. Pull film diagonally over next top corner.



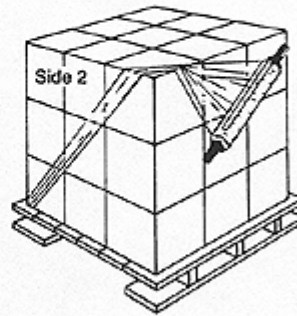
4. Pattern obtained by continuing process.

- 13.4 **Method:** Anchor the stretch film to the bottom of the pallet either by sliding the film between the load and pallet (Diagram 6-1) or tying it to the deck boards. Then pull the film diagonally up to the top corner of the load (Diagram 6-2).

DIAGRAM 6 UNITIZATION
X-WRAPPING

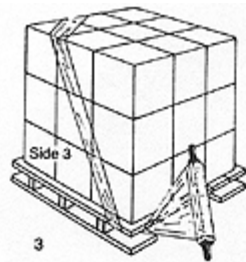


1. Anchor film to pallet.

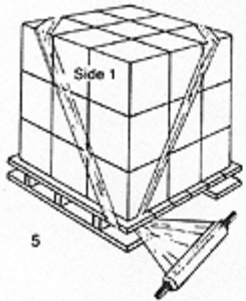


2. Pull roll diagonally up to top of load.

11.4 [cont'd] Unitization X-wrapping - Double-winged pallets serve this purpose best. Bring the film down and catch it on the diagonal winged pallet corner (Diagram 6-3). Once the film is caught under the pallet bring it diagonally up to the top of the load (Diagram 6-4). Then bring the film down diagonally to the next pallet corner (Diagram 6-5). Repeat this as many times as necessary. To complete the X-pattern on the remaining two corners skip a top corner and take the film across the bottom of the pallet (Diagram 6-6). After catching the film under the winged pallet, proceed diagonally up to the next top corner (Diagram 6-7). Continuing this process on the remaining corners forms an X-pattern on the four sides of the pallet, securely holding the load.

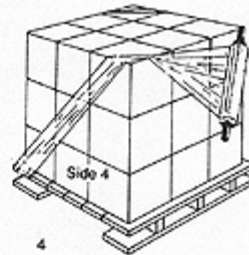


3. Pull roll down and catch on pallet.

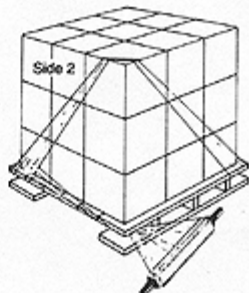


5. Pull roll down and catch on pallet.

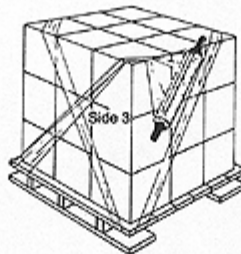
UNITIZATION
X-WRAPPING



4. Pull roll diagonally up to top of load.



6. Skip going up to top of pallet and go across bottom, catching film on next corner.



7. Continue the process.

14.0 **Guideline(section 12.0 in its entirety) - EXAMPLES OF IMPROPER PACKAGING**



Exhibit 1: No side protection provided to material within container, can lead to material damage through penetration of the wall into void



Exhibit 2: Assembly hardware does not have adequate protection (capping). This can lead to hardware deformation through material mishandling

12.0 EXAMPLES OF IMPROPER PACKAGING [cont'd]



Exhibit 3: Panel assemblies are separated only with Kraft paper. Once the assemblies are deunitized and subsequently delivered to GSI Lumonics inventory, they are at risk of surface damage through normal material

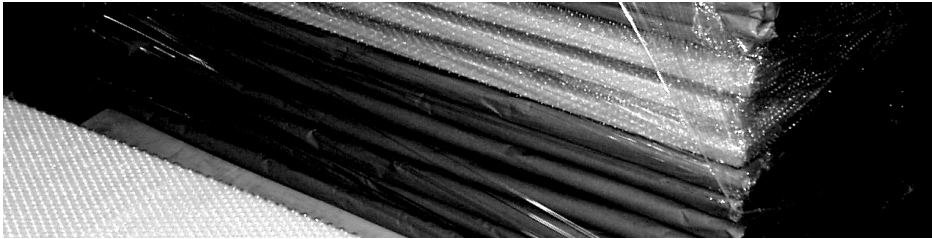


Exhibit 4: Panel assemblies are stacked without benefit of braces to separate individual pieces. This places the entire lot of material (especially lower pieces) at risk of bowing.

12.0 EXAMPLES OF IMPROPER PACKAGING [cont'd]



Exhibit 5: Assemblies are not individually wrapped. This places these pieces at high risk to surface damage through contact with adjoining pieces.

15.0 **Requirement - QUALITY CONTROL PROVISIONS**

GSI Lumonics, Inc Quality Department shall verify that the requirements of this specification are met.

Deviation from the requirements of this specification must have prior written approval from the GSI Lumonics Quality Department.

16.0 **RECORDS**

N/A