

---

# **TGCS PACKAGING and HANDLING**

## **Supplier and Interplant Requirements**

**This booklet is the property of TGCS. Its use is only authorized for responding to a request for quotation, or for the performance of work for TGCS. All questions must be referred to the TGCS Purchasing Department Buyer responsible for the order.**

---

**First Edition, May 2015** (initial TGCS release converted from the IBM version. Please note that the web links are not correct and will need to be updated as the information is added to the TGCS internet portal. The list of changes has been left in the document for historical purposed. They will be removed with the next release and at that point will only include TGCS updates.)

Changes are periodically made to the information herein. If you are reading this in hard copy form, it may be down level. The on-line version is always the most current. If you have any questions, refer to your TGCS Purchasing representative. Editing changes which are not deemed significant enough for a complete review will be highlighted in blue for clarity and the document number indexed with an alpha suffix to differentiate the latest version. Also, the date in the upper left corner will be revised accordingly.

It is understood that TGCS and its affiliated companies shall have the nonexclusive and irrevocable right, in their discretion, to use, disclose, copy, and distribute all submitted information or material, in any form and for any and all purposes, without any obligation to the submitter, and that such readers have the unqualified right to submit such comments or suggestions upon such basis.

---

## How to use this manual online

**Suppliers:** If you are reading a hard copy (printed) version of this document, go to **Internet URL** <http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States~Information+for+suppliers> to ensure that you have the latest version. Some of the document links are not accessible directly by suppliers. The preferred method for suppliers to access these documents is via the password controlled EGI-Net system. EGI-net provides access to TGCS Engineering Specifications and TGCS Corporate Standards. Contact your TGCS Purchasing Representative to request access to EGI-Net. Until EGI-Net access is obtained, request that your TGCS Procurement Representative provide the documents to you by e-mail.

For convenience, web links in this document will be identified as follows:

**Intranet:** Accessible only within TGCS, contact your TGCS Procurement Representative or EGI-Net to get a copy (these links usually start with “w3”).

**Internet:** Fully accessible by anyone via the web (these links usually start with “www”).

See table on the next page for a list of links contained in the document. Please also report any broken links to your Procurement representative or [Global logistics](#) (e-mail: [tbd](#)).

**TGCS Procurement Representatives:** Since all documents are not approved for Internet distribution you may get requests for documents that are linked herein. All of these documents will be posted to the [Global logistics](#) intranet site.

**Intranet:** <http://w3-9006.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-home>

You can access, download, and e-mail requested documents to authorized suppliers as attachments. However, you should encourage suppliers who request these documents to request access to EGI-Net. A hard copy version of this manual is no longer available. The document will exist solely on the Internet to facilitate time updates. The document (pdf format) can be viewed and printed using Adobe Acrobat 3.0 or later. This program can be downloaded free from the **Internet** at <http://www.adobe.com> Document indexes are not provided since it is possible to search the document directly for key words when viewing it on-line.

Summary of Internet (www) and Intranet (w3) Links		
Description	Link	Page
This Document (Intranet only)	<a href="http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-GA21-9261-11b">http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-GA21-9261-11b</a>	3
This Document (Internet Accessible)	<a href="http://www-1.tgcs.com/procurement/html/downloads/ga21_9261_11_final.pdf">http://www-1.tgcs.com/procurement/html/downloads/ga21_9261_11_final.pdf</a>	33, 38
To get Adobe Acrobat Reader	<a href="http://www.adobe.com">http://www.adobe.com</a>	3
TGCS Procurement Internet Site	<a href="http://www-1.tgcs.com/procurement/html/pubs_docs.html">http://www-1.tgcs.com/procurement/html/pubs_docs.html</a>	3, 33, 38
Software Packaging Guide	<a href="http://antero.boulder.tgcs.com/w3sdf.nsf/ContentDocsByTitle/Publishing+and+Packaging">http://antero.boulder.tgcs.com/w3sdf.nsf/ContentDocsByTitle/Publishing+and+Packaging</a>	9, 39
Hazardous Materials	<a href="http://w3-9006.tgcs.com/isc/distribution/hazmat3.nsf">http://w3-9006.tgcs.com/isc/distribution/hazmat3.nsf</a>	9
Prohibited Expansion Agents for Foams	<a href="http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-1041126">http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-1041126</a>	11, 52
Restricted Heavy Metals Specification	<a href="http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-5897660">http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-5897660</a>	11, 52
Recyclable Packaging Materials Spec.	<a href="http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-5897661">http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-5897661</a>	12

National. Motor Freight Classification	<a href="http://www.nmfta.org">http://www.nmfta.org</a>	17
American Society for Testing & Matls.	<a href="http://www.astm.org">http://www.astm.org</a>	17
International Safe Transit Association	<a href="http://www.ista.org/testpro.htm">http://www.ista.org/testpro.htm</a>	17
TGCS ESD Requirements	<a href="http://w3.rchland.tgcs.com/projects/esdp">http://w3.rchland.tgcs.com/projects/esdp</a>	17
TGCS Package Test Standard	<a href="http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-ch19711005">http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-ch19711005</a>	17
Inter modal (ocean) Container Sizes	<a href="http://www.maersksealand.com">http://www.maersksealand.com</a> Then Click on “Equipment”	27
Security Packaging / Tamper Sealing	<a href="http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-cb03700000">http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-cb03700000</a>	28
Wooden Packaging Marking Procedure	<a href="http://www-1.tgcs.com/procurement/html/downloads/wooden_packaging_materials_marking_req.pdf">http://www-1.tgcs.com/procurement/html/downloads/wooden_packaging_materials_marking_req.pdf</a>	26, 32
TGCS Global Labeling Guide	<a href="http://www-1.tgcs.com/procurement/html/globallabeling.html">http://www-1.tgcs.com/procurement/html/globallabeling.html</a>	32, 38
Country of Origin Markings	<a href="http://www-1.tgcs.com/procurement/html/coomarking.html">http://www-1.tgcs.com/procurement/html/coomarking.html</a>	32
Solid Wood Packaging Regulations	<a href="http://www.aphis.usda.gov/ppq/swp">http://www.aphis.usda.gov/ppq/swp</a>	51
Shipping Procedural Instructions (SPI's)	<a href="http://www-1.tgcs.com/procurement/www/spi/globalspis.nsf">http://www-1.tgcs.com/procurement/www/spi/globalspis.nsf</a>	50
Natl. Wooden Pallet & Cntr. Assoc.	<a href="http://www.nwpc.com">http://www.nwpc.com</a>	51
TGCS Graphics Standard	<a href="http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-cs11120000">http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-cs11120000</a>	52
<b>Note:</b> All sites prefaced with “www” or “www-1” are Internet sites. All others are TGCS Intranet sites, accessible via EGI-Net.		

## Table of Contents

<b>1.0 Introduction</b> .....	7
1.1 Summary of Major Changes (version GA21-9261-11) .....	7
1.1.1 Additions .....	7
1.1.2 Revisions .....	7
1.1.3 Deletions .....	7
1.2 Scope .....	9
1.3 Responsibility .....	9
1.4 Application .....	9
1.5 Communication .....	10
1.6 Compliance .....	10
1.7 Document Administration .....	10
<b>2.0 General Packaging Requirements</b> .....	11
2.1 Consistency .....	11
2.2 Environmental Packaging .....	11

2.3 Environmental Packaging Selection Criteria	12
<b>3.0 Shipping Environment Hazards</b>	<b>14</b>
3.1 Moisture	14
3.2 Electrostatic Discharge (ESD)	15
3.3 Package Testing	17
<b>4.0 Containers (Primary Packaging)</b>	<b>18</b>
4.1 Selection of Bulk versus Individual Style Packaging	19
4.2 Unit Load Shippers (Double Cover Style)	19
4.3 TGCS Modular Containers	20
4.4 Edge Crush Test (ECT) vs. Mullen Equivalentents	21
4.5 Minimum Corrugated Board Strength	22
4.6 Getting the most out of the Corrugated Cartons and Inserts	23
4.7 Carton Closure Methods	23
<b>5.0 Palletization (Transport Packaging)</b>	<b>24</b>
5.1 Pallet Size and Style Requirements	26
5.2 Unit Load Size and Capacity Requirements	27
5.3 Unit Load Shippers (ULS)	27
5.4 Key Dimensional Considerations for Transportation Efficiency	27
5.5 Security Shipments	28
<b>6.0 Marking and Labeling</b>	<b>32</b>
6.1 Country of Origin Markings	32
6.2 Wooden Package Assembly Markings	32
6.3 Markings for Reusable Containers	33
6.4 Policy on Use of TGCS Logo on Packaging	33
<b>7.0 Field Replacement Unit (FRU) Packaging Requirements</b>	<b>34</b>
7.1 Applicability	34
7.2 Field Replacement Unit (FRU) Packaging Checklists	34
7.3 FRU Basic Requirements Checklist	35
7.4 FRU Special Requirements Checklist	36
7.5 FRU Classification	37
7.6 Special FRU Marking and Labeling	38

---

7.7 Packaging Design Guidelines . . . . .	38
7.8 FRU Package Design Approval . . . . .	41
<b>8.0 Quality Seal Program . . . . .</b>	<b>42</b>
8.1 Quality Seals, Requirements . . . . .	42
8.2 Q Seals and Logo Seals, Application Guidelines . . . . .	43
8.3 Suggested Sources of Tamper Evident Seals . . . . .	43
<b>9.0 Requirements for Heavy Packages . . . . .</b>	<b>46</b>
9.1 Summarizing . . . . .	46
9.2 Heavy Packages, Handling Features . . . . .	46
9.3 Heavy Packages, Marking and Labeling . . . . .	47
<b>10.0 Export . . . . .</b>	<b>50</b>
10.1 Core Shipping Procedural Instructions (SPI) for Packaging . . . . .	50
10.2 Export Shipments — General Packaging Requirements . . . . .	50
10.3 Export Shipments — Proper Case Preparation . . . . .	50
10.4 Export Shipments — Prohibited or Restricted Materials . . . . .	51
10.5 Export Shipments — Packing Consolidations . . . . .	52
10.6 Export Shipments — Special Marking Requirements . . . . .	52
<b>Appendix A. Improper Packaging Report . . . . .</b>	<b>53</b>

---

## 1.0 Introduction

### 1.1 Summary of Major Changes (version GA21-9261-11)

The following are some of the more significant changes. Incidental editing changes are not listed. [Minor web link repairs, miscellaneous minor editing occurred in -11b version \(highlighted in blue\).](#)

#### 1.1.1 Additions

- Many web links. Also assigned TGCS Engineering Spec number 31L5345 for EC release purposes
  - Executive summary of requirements for ease of use with references to more detailed information
  - Policy statement on materials resource conservation and sustainable forestry
  - Table of packaging materials evaluated on environmental criteria for use in materials selections.
  - Rust prevention including proper use of desiccants and Volatile Corrosion Inhibitors (VCI's)
  - Right to audit supplier package designs
  - Surface protection for painted metal or textured parts
-

- Edge Crush Test (ECT) vs. burst strength as primary specification for corrugated
- Use ISO 780 or ASTM D5445 approved symbology for printed handling symbols
- Summary of key dimensions for transportation efficiency (air, ocean, surface)
- Marking procedures for wooden items (infestation) and reusable containers (country of origin)
- Links to TGCS Software Packaging Guidelines
- New minimum requirements for solid wood packing materials used for export

### 1.1.2 Revisions

- "Metal Out" style is the only approved bag for Electrostatic Discharge Sensitive (ESDS) items
- Metric block style pallets preferred worldwide vs. stringer style pallets (still acceptable in US)
- Use the "H" style sealing method for all express and Inter-continental shipments >10kg (22 lbs.) • 2-way banding plus stretch wrap required for inter-continental, air, and LTL palletized shipments.
- Properly applied stretch wrap alone is acceptable for intra-continental full truckload shipments
- All numeric date code format YYYY-MM-DD to comply with Y2K requirements
- "Serviceable Used Part" seals replace green signature seals on Field Replacement Units (FRUs) • Outside placement of packing lists is required, a duplicate copy inside the carton is recommended.
- Conversion of sections with many paragraphs into table style summaries to reduce page count.
- Metric units as primary, imperial units (inch / pound) are secondary.
- Clarification of TGCS's policy on the use of the TGCS logo on packaging

### 1.1.3 Deletions

- References to Book Manager online viewing and hard copy ordering instructions.
- Standard Modular Half Slotted Containers (HSC's) and Full Overlap Containers (FOL's).
- Removed all pallet drawings but provided links to them to ensure latest level is available.
- Plant or supplier codes and names on Q seals are no longer required.
- Use of Foam-in-place polyurethane cushioning is strongly discouraged.
- Use of Polyvinyl Chloride (PVC) for disposable packaging is no longer approved.
- Most requirements for marking and labeling have been moved to a separate document (ref. 6.0).

**Table 1. Executive Summary**

This is a summary of the major areas of concern regarding packaging. The rest of the document and links provide additional details.

Description	Executive Summary of Minimum General Packaging Requirements	Ref Section
Scope	The document includes the minimum packaging requirements for all shippers to and from TGCS.	1.2
Compliance	The most important is to ensure damage free shipment. We know that following this guide will work.	1.3, 1.6
Environmentally Conscious Packaging	Design packaging materials to Reduce, Reuse, and Recycle (the 3 R's, in that order). Also, avoid CFC's, HCFC's, Heavy Metals, Halogenated Flame Retardants, PVC, materials procured from old growth or temperate rain forests, and permanently commingled dissimilar materials. Included is a table of packaging materials evaluated for environmental attributes. Use the material which provides the best overall performance and value which also has the least adverse effect on the environment.	2.2, 2.3
Consistency	The same packaging should be used for the same item on an ongoing basis. Bulk packaging for Manufacturing use and individual packaging for spare parts unless otherwise specified.	2.1, 3.1
ESD Sensitive Items	Use only TGCS approved materials. The package assembly must consist of a static dissipative material closest to the part and a conductive/shielding layer somewhere in the package assembly. "Metal In" style ESD shielding bags (which are usually less expensive) are NOT approved for quality reasons.	3.3
Package Testing	All packages for critical or fragile items must be designed and tested by qualified individuals using either TGCS's Corporate Test Standard (for TGCS shipments) or ASTM or ISTA test protocols.	3.4

Primary Packaging	Use modularly dimensioned cartons where possible but don't grossly misfit the item in order to do so. Design packaging to fit the item, smaller is better. Also, do not use labels in an attempt to avoid a hazardous environment for the item. Such warning or attention labels are supplementary to necessary packaging not a replacement for it.	4.0
Secondary Packaging	Use over packs (or "power- packs") when consolidating orders and when more than 4 layers of cartons are stacked. This improves protection and avoids shifting loads. See also the summary of key dimensions for transportation efficiencies by air, ocean, or surface transit.	4.1, 5.3, 5.4
Metrication	All TGCS modular containers and power-packs are now designed for the 1.2x1.0m pallet footprint	4.1, 4.2
Carton Taping	Use "I" style taping (2 strips) for lightweight items and domestic shipments. Use "H" style (6 strips) for items over 10 kg (22 lbs) and for all express and inter-continental shipments.	4.6
Palletization	Use metric dimensioned block style pallets worldwide. 1.2x1.0m is the default standard. Use custom sizes for specific routings if this will improve shipping density. Stretch wrap alone is acceptable for <u>intra</u> -continental full truckload or full container load shipments. 4-way banding or mechanically applied stretch wrap with 2-way banding for all <u>inter</u> -continental, LTL, and air shipments. Also, use alternatives to solid wood if possible.	5.0 and Figures 3, 4, 5
Marking and Labeling	With few exceptions, all references to marking and labeling requirements have been removed from this document and included in the Global Labeling Implementation Guides. Use only labels that are essential. Where handling instructions are needed, favor those that do so pictorially (language free).	6.0
Wooden Packaging	A new marking procedure is required for all wooden packaging assemblies due to infestation risks. In addition, guidelines for the use of alternatives to solid wood are provided. In the very near future, untreated lumber commonly used in pallets and crates will likely be prohibited for export.	6.1
Field Service Parts	Field Replacement Units (FRU's) require superior protection due to frequent reuse and redistribution of these parts and packages. Individual packaging is the default method unless otherwise arranged.	7.0
Quality Seals	Virtually all packages require some form of tamper evident quality sealing (tape or labels). This program is currently being re-engineered and therefore this section will soon change.	8.0
Heavy Packages  Style of Symbols has been updated	All packages in excess of 12kg (26 lbs) are considered heavy <a href="#">from a manual handling safety perspective</a> . Special marking and design requirements apply to heavy packages depending on the weight range. The target limit for manually handled packages is 16 kg (35 lbs) for shipments to TGCS Manufacturing areas. Do not palletize singly a carton weighing less than 32 kg (70 lbs) for shipment since the pallet adds unnecessary size and weight to the item. However, pallets may be used for internal handling convenience.	9.0
Exports	The document now includes the core requirements applicable to virtually all countries. However, additional country specific requirements may still apply.	10.0

## 1.2 Scope

This specification defines the **minimum general** requirements for the preparation and packaging of all parts, subassemblies, products and materials which will be shipped to any worldwide TGCS manufacturing, distribution center or customer from either suppliers or other TGCS locations. This version, GA21-9261-11(b), applies whenever it or a previous version is referenced in a purchase order. All previous versions are obsolete and should be discarded.

From this point on "suppliers and TGCS locations" will be referred to collectively as "shippers".

## 1.3 Responsibility

It is the shipper's responsibility:

1. to ensure their packaging methods and materials comply with all applicable laws and regulations. This is especially important for materials classified as hazardous or dangerous. If you are shipping any dangerous or otherwise regulated materials such as chemicals, gas springs, batteries, magnetized materials, and so on refer to [Engineering Spec 92F6933](#):

**Intranet:** <http://d25dbw15.mkm.can.tgcs.com/isc/distribution/w3wwdams.nsf/pages/hazmathomepage>



Internet: [http://www-03.tgcs.com/procurement/proweb.nsf/objectdocswebview/filetgcs+es+92f6933,+packaging+requirements+for+dangerous+goods/\\$file/92f6933.j21618+.r0.wordpro.pdf](http://www-03.tgcs.com/procurement/proweb.nsf/objectdocswebview/filetgcs+es+92f6933,+packaging+requirements+for+dangerous+goods/$file/92f6933.j21618+.r0.wordpro.pdf)

2. to ensure shipments are packaged in a manner such that the containers and their contents arrive at their destination **free from damage**.
3. to ensure shipments are economically packaged in a manner which also minimizes adverse effects on the environment and solid waste.
4. to ensure export shipments are packaged, labeled and marked in compliance with TGCS guidelines.

**Note:** This export responsibility remains with the TGCS site as identified by the export case prefix and/or division/plant code even if the shipment is made from another location, including a supplier as required by law.

5. to ensure packaged products meet or surpass the minimum TGCS test requirements as defined by this specification. See section 3.4, "Package Testing" for details.

## 1.4 Application

Adherence to the requirements of this specification is necessary to minimize shipping damage, streamline TGCS's receiving process and reduce costs.

When a special packaging specification is called out on a request for quotation or purchase order, that specification will take precedence over this document if the specifications are in conflict.

International shipments must additionally conform to unique export requirements. Ref. 10.0 "Export".

Materials which are purchased by Electronic Component Procurement (ECP) are required to be packaged and shipped in accordance with TGCS Engineering Specification 873444. This specification covers items like modules, capacitors, oscillators, discrete crystals, and other electronic components. It specifies packaging, handling, labeling, and bar-coding requirements for these uniquely sensitive items. Specifications 78G9129 and 873589 are also related to these types of electronic devices.

**Software packaging** is treated separately. Visit *intranet*:

<http://w3-03.tgcs.com/software/sdf/w3sdf.nsf/webpages/Publications+Services>

## 1.5 Communication

All shipper's packaging questions and communications are to be coordinated through TGCS Purchasing.

In the event a shipment is received which does not conform to this specification the receiving location will initiate corrective action using the *Improper Packaging Report (IPR)*, or local equivalent. A sample form is contained on page 54. All future shipments are expected to be received in compliance.

First time shipments should be audited by the shipper using the IPR checklist to verify the pallet loads conform and do not exhibit any of the common errors referenced in the Improper Packaging Report.

### Ideas for Improvement

It is the intent of this document to reduce total operating costs for TGCS and extended throughout the supply chain by reducing damage and waste. We understand that inefficiencies in your process caused by these requirements may eventually adversely affect total supply chain costs. If requirements herein appear to be particularly onerous please bring this to our attention via your TGCS Purchasing representative for prompt consideration.

---

## 1.6 Compliance

Compliance to the TGCS packaging requirements, safety guidelines, and legal regulations contained in this specification will be enforced as a condition of purchase per TGCS purchase contracts.

At any time, TGCS reserves the right to:

- **Reject and return** any shipments received that are improperly packaged or identified.
- **Charge the shipper** for the cost of labor and materials for any repackaging resulting from noncompliance with this or any other specification referenced on the Purchase Order.
- **Remove from its list of approved supplier sources** any supplier that, after notice, repeatedly fails to comply with its packaging requirements.

Any shipper requiring deviation from requirements contained in this specification, GA21-9261-11, must receive authorization from the receiving location *prior to shipment*. Packing slips of approved nonconforming shipments must be noted with the name of the authorizing TGCS Purchasing Agent and the date of authorization.

## 1.7 Document Administration

This specification was originated by the Standards Project Authority (SPA) for SIRS 142 (Distribution Engineering). [Global Logistics Operations Support \(GLOS\)](#) has maintenance responsibility.

TGCS Corporate Packaging Programs, 3039 Cornwallis Road (VQZ-205)  
Research Triangle Park, North Carolina 27709-2195  
Or by E-mail (recommended): [btsander@us.tgcs.com](mailto:btsander@us.tgcs.com)

---

## 2.0 General Packaging Requirements

The general requirements listed in this section must be met for all shipments and purchases. Unless additional requirements are identified in this or other TGCS packaging specifications, all other packaging decisions are left to the shipper's discretion.

**Note:** Packaging costs must be included in all part quotations provided to TGCS Purchasing.

### 2.1 Consistency

Parts must be packaged consistently, both in terms of the containers used and quantity of parts per container for a given part number. If the total delivered quantity is not evenly divisible, the remaining parts shall be packaged, identified with quantity, and marked "partial." However, it is our intent to avoid partials where possible to increase overall efficiency. Suppliers and TGCS Procurement should work together to set order quantities consistent with carton, pallet layer, full pallet, or truckload quantities.

Shippers must get approval of TGCS Purchasing **prior** to initiating a change to the container size or quantity.

---

## 2.2 Environmental Packaging

TGCS is very concerned about the effect packaging waste has on the environment. When choosing materials to package items to be purchased by TGCS, shippers must consider the impact on the environment of discarded packing materials. TGCS's strategy for solid waste and overall environmental management can best be achieved by acting upon the focus items identified below.

*Table 2. Environmental Packaging.*

This is a summary of the major areas of concern regarding environmental attributes of packaging. v

Description	Requirements
<p><b>Ozone Depleting Substances (ODS's)</b></p>	<ul style="list-style-type: none"> <li>• Halogenated chlorofluorocarbons (CFCs) and hydrogenated chlorofluorocarbons (HCFCs) must not be used to manufacture materials used to package parts or products being shipped to TGCS.</li> <li>• Halogenated flame retardants are also not to be used unless required for a specific application.</li> <li>• Steps shall be taken to minimize the use of Methyl Bromide (commonly used as a fumigant for solid wood packing materials) through the use of alternative packaging materials where feasible.</li> </ul> <p>TGCS has developed Engineering Specification <b>1041126</b> for information on ozone depleting chemicals.</p> <p><i>Internet:</i> <a href="http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States~Information+for+suppliers">http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States~Information+for+suppliers</a></p>
<p><b>Packaging Materials Essential Requirements - Restricted Heavy Metals and other Materials of Concern</b></p> <p><b>Packaging Data Collection and Reporting</b></p>	<p>The sum concentration level of incidental amounts of lead, cadmium, mercury, hexavalent chromium and brominated flame retardants (PBB's and PBDE's) present in any packaging material, component or sub-component shall not exceed 100 parts per million (100 ppm) by weight (0.01%) of that material, component or sub-component. These limits apply globally for all packaging used for products brought to market by TGCS.</p> <p>TGCS has revised Engineering Specification <b>5897660</b> to reflect these updated requirements and to provide an online mechanism for reporting packaging related data for non-restricted materials and certifications for compliance regarding restricted substances.</p> <p><i>Internet:</i> <a href="http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States~Information+for+suppliers">http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States~Information+for+suppliers</a></p>
<p><b>Source Reduction</b></p>	<p>TGCS encourages the source reduction (minimization) of packaging materials used to package and ship our products, parts and supplies, provided safety and product protection are not compromised.</p>
Description	Requirements
<p><b>Reusable Packaging Systems</b></p>	<p>TGCS favors reusable package designs over expendable or recyclable ones provided total costs are equivalent or less. The design of a reusable container system is a <b>joint effort</b> between all parties to the reuse system (usually the supplier and the TGCS manufacturing location). The full involvement and approval of each is necessary to succeed with reusable container programs.</p>

<p><b>Recyclable Packaging</b></p>	<ul style="list-style-type: none"> <li>• Use paper based packaging materials that are easily recycled like corrugated fiberboard, molded pulp, etc.</li> <li>• Minimize ink coverage and use water-based and soy based inks or inks which are FDA/USDA approved.</li> <li>• Use tapes and starch glues that do not inhibit recycling (adhesive remains with the tape when removed).</li> <li>• Avoid coatings or impregnating of corrugated unless these are of a type which do not adversely affect recycling operations.</li> <li>• Design packages so that components can be easily separated prior to recycling:                         <ul style="list-style-type: none"> <li>– Do not bond two or more dissimilar materials together (e.g. foam pads glued to corrugated) in any disposable packaging design. Exceptions may be made for some types of reusable packaging but this should still be minimized.</li> <li>– Do not use free-rise polyurethane based foam-in-place or foam-in-bag materials.</li> <li>– Do not use Polyvinyl Chloride (PVC) for any packaging application.</li> <li>– Do not use free flowing dunnage materials regardless of material composition (loose “peanuts” etc.)</li> </ul> </li> </ul> <p><b>Note:</b> Depending upon the country of manufacture an appropriate recycling symbol may be used. Multiple symbols are permissible but not recommended. In all cases, these symbols shall appear on a minor surface, generally the bottom of the carton.</p> <p>TGCS has developed Engineering Specification <b>5897661</b> to promote the use of materials which are recyclable and/or can be recycled: <b>Internet:</b> <a href="http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States-Information+for+suppliers">http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States-Information+for+suppliers</a></p>
<p><b>Conserving Natural Resources</b></p>	<p>In procuring paper and paper based packaging, one of TGCS's objectives is the conservation of natural resources, including rain forests and so-called "old growth" forests. To help conserve these natural resources, it is TGCS's intent to only consider paper and paper based packaging materials that are procured from forests that are managed in an ecologically sound and sustainable manner.</p> <p>Sustainable forestry is an evolving area, and considerable progress is being made in developing and implementing sustainable forestry practices. Buyers should communicate TGCS's goal with regard to procuring from forests that are managed in an ecologically sound and sustainable manner.</p>

## 2.3 Environmental Packaging Selection Criteria

Table 3 (next page) shows a list of the most commonly used packaging materials. Each is evaluated on a variety of environmental criteria. Shippers are required to use materials which provide the best overall product protection and value but when all else is equal, choose the material that has the least possible adverse effect on the environment. TGCS does not wish to debate the merits of each material listed. This is based on practical and regulatory experience and also customer feedback

**Table 3. Packaging Materials Environmental Selection Criteria.**

This table lists most commonly used packaging materials. Materials listed by overall score (G,Y,R,B) but no particular order within groupings. G=Green (positive), Y=Yellow (caution), R=Red (warning), B=Black (stop). See LEGEND at bottom for instructions.

Material Description	OS	WA	SR	RP	WR	DC	Comments/Suggested Substitutes
Corrugated Fiberboard	G	G	G	Y	G	G	Good recycling and value, poor for reuse
Recycled and remolded HDPE	G	Y	G	G	G	G	Can replace expanded foam cushions
Paperboard / Chipboard	G	G	G	Y	G	G	This is 100% recycled content material
Paper Dunnage / Wraps	G	G	G	Y	G	G	Preferred over bubble due to recycling
Molded Starch Peanuts in Bags	G	Y	G	Y	G	G	Preferred over foam-in-place polyurethane
Padded 100% Paper Bags	G	G	G	Y	G	G	Preferred over paper/bubble combinations
Suspension Style Packaging	G	G	G	Y	G	G	Can replace expanded foam cushions

EPU: Polyurethane Foam	Y	G	Y	G	Y	G	Good recycling market (US only)
Plywood Crates	Y	G	Y	G	Y	R	Good reusability, essential for some items
Wooden Pallets	Y	G	Y	G	Y	Y	Fumigation may be required (bad for env.)
EPS: Polystyrene Foam	Y	G	Y	Y	Y	Y	Very inexpensive but poor reusability
EPE: Polyethylene Foam	Y	Y	Y	G	Y	Y	Capable of reuse but expensive to return
EPP: Polypropylene Foam	Y	Y	Y	G	Y	Y	Capable of reuse but expensive to return
Plastic Bubble Wrap	Y	G	G	G	R	R	Good performance but not recyclable
Stretch / Shrink Wrap, Bags	Y	Y	Y	R	Y	Y	No good substitutes for these
Pressure Sensitive Tape	Y	G	Y	R	Y	Y	Carriers prefer this over gummed tape
Corrugated Plastic	Y	Y	Y	G	R	R	Excellent durability reuse potential
Commingled Foam / Corrugate	R	G	G	Y	R	R	Not approved unless package is reused
Commingled Foam / Wood	R	G	Y	G	R	R	Not approved unless package is reused
ESD Static Shielding Bags	R	G	R	Y	R	R	Technically required for ESD items
Foam-in-place, Foam-in-bag	R	Y	R	R	R	R	Suggest molded starch as a substitute
Padded bags with plastic bubble core	R	G	Y	Y	R	R	Suggest 100% paper construction instead
PVC Plastics	B	B	B	B	B	B	Legal and customer concerns in some areas
Foams with CFCs, HCFCs	B	B	B	B	B	B	Prohibited by Montreal Protocol
All loose fill type materials (peanuts)	B	B	B	B	B	B	Banned due to nuisance factor (scattering)
<b>Legend</b>							
<b>Overall Score (OS)</b>	Green (G)=Preferred, no restrictions, Yellow (Y)=Acceptable, it may be a concern in some countries or to some customers, Red (R)=Restricted, use is approved only where technically required and no G or Y alternative exists. Black (B)=Unacceptable in all situations.						
<b>Worldwide Availability (WA)</b>	Green (G)=Globally available, Yellow (Y)=available in some countries, Red (R)=very limited availability around the world						
<b>Source Reduction (SR)</b>	Green (G)=Contains significant amount of recycled content (>20%), Yellow (Y)=some recycled content (<20%) is possible, Red (R)=includes no recycled content typically						
<b>Reuse Potential (RP)</b>	Green (G)=capable of >5 reuses, Yellow (Y)=capable of 1-5 reuses, R=Incapable of reuse						
<b>Worldwide Recyclability (WR)</b>	Green (G)=commonly recycled worldwide, Yellow (Y)=technically capable of being recycled but not done in most places. Red (R)=recycling channels severely limited or not available.						
<b>Disposition Cost (DC)</b>	Green (G)=earns money when recycled/disposed, Yellow (Y)=breaks even when recycled/disposed, Red (R)=costs money to recycle or dispose.						

### 3.0 Shipping Environment Hazards

Consideration must be given to all hazards encountered in the distribution environment. The following terms represent some of the most common hazards which must be considered.

**Table 4. Shipping Hazards; Shock, Vibration, Compression, Temperature, and Contamination.**

These are some of the most common hazards. See also Table 5 “Moisture” and Tables 6-7 “ESD” for additional hazards.

Term	Definition / Usage Notes
<b>Shock</b>	Intermittent forces caused by dropping the package to the floor, stacks tipping over, bumps in the road, or any number of other causes. Express carrier or small package delivery systems represent the most severe environment for shock.
<b>Vibration</b>	Continuous forces applied to the package whenever it is physically transported. Airplanes, trucks, and conveyors will always impart some level of vibration to the package. Vibration causes abrasion which can be especially damaging to painted and/or textured external machine covers and can fatigue electrical connections.
<b>Compression</b>	<p>During shipping, handling, and storage packages will be subjected to dynamic and static compression due to stacking. Compression strength diminishes considerably in humid/moist environments and when the stacks are not aligned. Small packages (&lt;70kg or 150 lbs.) must withstand dynamic compressive forces <i>in all directions</i>.</p> <p>Packages or containers must withstand <b>dynamic</b> stack heights of at least 2.5 m (or 100 inches) since this is how high they will be stacked in trucks and other vehicles. Furthermore, packages or containers stored in a warehouse must be able to withstand <b>static</b> stack heights of 5.0 m (or 200 inches), measured from floor to top of stack, for a period of 30 days (including humid areas) without visible degradation to any package or its contents.</p> <p><b>Note:</b> If for some reason the packaging cannot be stacked to these limits for safety (stability) reasons then the maximum stack quantity shall be marked on the package using the ISO-780 symbol for stack height limitations. However, this approach should not be used as a way to get away with a weak package which could otherwise be made to comply with the 5.0m (200 inch) stack height standard.</p>
<b>Temperature</b>	<p>Products may encounter temperature extremes ranging from -40°C (-40°F) to +60°C (+140°F) in the distribution environment. Packaging materials and methods must therefore be effective at these extremes as well.</p> <p><b>Note:</b> As an example, the performance of EPS foam does not vary greatly at these temperature extremes. Conversely, the performance of EPE and EPP foams can vary ±20% or more. Interestingly, EPE and EPP foams actually get stiffer as temperatures rise since the air in the cells expands.</p>
<b>Contamination: Including Clean room Quality Packaging</b>	<p>Where applicable, this usually means double bagging in materials procured from approved clean room material suppliers. Clean room quality extends beyond particulate free packaging. Tight limits on organic contamination, nonvolatile residue, and out gassing also apply. Do not confuse "surgical grade" packaging with clean room grade. These are not equivalent. <i>Sterile</i> does not equal <i>clean</i> from a contamination perspective.</p> <p><b>TGCS Engineering Specification 00F6584: Surface Cleanliness Verification</b></p> <p><b>TGCS Engineering Specification 00F6585: Materials and Procedures for Packaging Clean Parts</b></p> <p>Important: Contamination is also a concern in non-clean room applications. Exports to third world countries including China, India, and most parts of Asia and Africa should be sealed to prevent the intrusion of dust and dirt. It is very important to customers to receive a clean looking product even if the dust would not necessarily damage the product functionally.</p>

### 3.1 Moisture

There are several ways to protect moisture sensitive items. Electronic assemblies which require moisture protection because of special needs should be packaged in hermetically (heat) sealed metal style barrier materials with desiccant inside. Conversely, if bags are being used primarily for dust or surface protection only (not for moisture) then it is best not to seal the bags hermetically and not use desiccant.

Bare sheet metal is best protected with volatile corrosion inhibitors (VCI's) instead of barrier materials but do not use VCI's to package anything containing hard disk drives.

As with temperature extremes, it is also important to consider the effect moisture may have on the performance of the packaging materials used. Moisture has little effect on closed cell foams (EPS, EPE, EPP) but can affect all paper based materials. Of course, paper generally softens with increased moisture content reducing compression strength and altering, but not necessarily reducing, the cushioning performance of molded pulp.

Table 5. Shipping Environment Hazards, Moisture.

Types of Materials	Definition / Usage Notes
<b>Barrier Materials</b>	<p>Barrier materials used in moisture controlled packaging are:</p> <ul style="list-style-type: none"> <li>• <b>Good:</b> Materials which are made to MIL B-131-F (Military Std). These are metal/polyethylene combinations with various types of outside layers (scrim fabric, polyester, Tyvek™, or Kraft paper). The Water Vapor Transmission Rates (WVTR's) for these materials is 0.02 grams of water/24hours/100in<sup>2</sup>.</li> <li>• <b>Better:</b> Materials which combine polyethylene with a sputtered metal layer. These minimize pinholes and can achieve WVTRs as low as 0.002 grams of water/24hours/100in<sup>2</sup>. Materials achieving WVTRs this low should be used for long term storage of highly valuable parts.</li> </ul>
<b>Desiccant Use and Handling</b>	<p>Silica gel or activated clay type desiccants are suggested. Desiccants are packaged in multiple units which define their moisture absorbing capacity not their volume. Use 1 unit of desiccant for every 562cm<sup>2</sup> (90 in<sup>2</sup>) of barrier surface area or 0.03m<sup>3</sup> (0.83 ft<sup>3</sup>) of volume inside the barrier. This amount can be increased or decreased depending on the WVTR of the barrier and the intended storage time. TGCS generally uses desiccant in 2, 4, or 16 unit pouches depending on the size of the item.</p> <p>Desiccant must be carefully handled prior to use. It can become saturated in a matter of hours if left exposed, even in an air conditioned room. It must therefore always be sealed inside air tight drums or sealed barrier bags prior to use. Humidity indicating cards or small 1 gram size indicating silica gel pouches can be used inside the drum as needed to monitor the fitness of the desiccant. Indicating silica gel pouches change from blue (dry) to pink (when saturated) and therefore no longer capable of absorbing more moisture.</p> <p><b>Note:</b> The indicating cards only indicate if the desiccant is still active. It is possible that the desiccant is 99% saturated but still active. Do not assume that a positive indication on the card (blue) means that the full capacity of the desiccant still exists. This can only be determined by weighing it on a precision calibrated gram scale.</p> <p>Activated clay type desiccant is reusable. It can be reactivated in an oven by baking it at 96C ± 5C for 6 hours. This will restore approximately 90% of its capacity. Do not exceed this temperature as it may melt the tyvek pouch material. Silica gel cannot be reactivated in this manner.</p>
<b>Vapor Phase Corrosion Inhibitors (VpCI's)</b>	<p>Bare sheet metal parts such as chassis, brackets, or other pre plated steel parts not containing disk drives <b>must</b> be wrapped in a volatile corrosion inhibiting (VpCI) bag or paper. This will prevent corrosion on the parts. Use 930cm<sup>2</sup> (1 ft<sup>2</sup>) of VpCI paper for every 0.03m<sup>3</sup> (1 ft<sup>3</sup>) of air space in the package. VpCI bags are also available.</p> <p><b>IMPORTANT: VpCI's should not be used for assemblies containing hard disk drives at this time.</b></p>

Table 6. ESD Definitions.

Some of the terms below are often incorrectly used as equivalents. There are some important distinctions described below.

Term	Definition / Usage Notes
<b>ESDS</b>	Electrostatic Discharge Sensitive (or simply ESD sensitive).

## <sup>1</sup>.2 Electrostatic Discharge (ESD)

ESD is one of the most common hazards for electronic components. Static discharges of less than 50 volts can destroy or weaken (latent damage) electronic components. As a point of reference, people cannot feel a static discharge of less than 3000 volts. This is why it is critical to consistently handle these parts in a static safe manner and use packaging materials that can protect against these hazards.

<b>Static Dissipative</b>	Materials with surface resistivity of $1 \times 10^5$ to $1 \times 10^{12}$ ohms/square. Materials of this type should be the closest in proximity to the ESD sensitive parts.
<b>Conductive</b>	Materials with surface resistivity less than $1 \times 10^5$ ohms/square. Materials of this type will provide the necessary <i>faraday cage</i> but should generally not be in direct contact with the ESD sensitive part.

**Table 7. ESD Packaging Requirements.**

Description	Requirements
<b>Applicability</b>	<ul style="list-style-type: none"> <li>All electronic parts will be treated as <i>ESD Sensitive</i> regardless of the part's actual level of ESD sensitivity. This will eliminate confusion when to apply proper protective techniques.</li> </ul>
<b>Fundamental Requirements</b>	<ul style="list-style-type: none"> <li>The best method for packaging ESD sensitive parts is to use a <i>static dissipative</i> material closest to the ESD sensitive part. A <i>conductive</i> material is then used to surround the ESD sensitive item, outside of the dissipative layer, to provide an electrostatic shield (<i>faraday cage</i>).  <b>Note:</b> Our approved ESD shielding bags combine the dissipative material on the inside with a conductive metal layer on the outside to achieve complete protection. Thermoformed blister style packages alone do not provide this dual protection.</li> <li>Cushioning and outer packaging should also be static dissipative if there is potential for the ESD sensitive part to come into direct contact with it after unpacking from the bag. In general, plain Kraft corrugated board is not considered a major ESD threat when combined with the use of an approved shielding bag. However, all materials and containers used within an ESD controlled manufacturing environment must be static dissipative.</li> </ul>
<b>Testing and Approval of ESD Packaging Materials</b>	<ul style="list-style-type: none"> <li>All packaging materials used for ESD protection must be thoroughly tested and approved by the TGCS ESD Laboratory in Rochester, Minnesota before being used with TGCS parts or products. • ESD material testing and approval may be initiated through the TGCS ESD Material Laboratory:                      TGCS Corporation                      Dept. JHA/106-1                      Highway 52 and 37th Street NW                      Rochester, Minnesota                      USA 55901-7829 Phone: 507-253-2806                      E-mail: <a href="mailto:dparkin@us.tgcs.com">dparkin@us.tgcs.com</a> <a href="http://w3.rchland.tgcs.com/projects/esdp">http://w3.rchland.tgcs.com/projects/esdp</a></li> </ul>
<b>Points of Emphasis</b>	<ol style="list-style-type: none"> <li>Unauthorized materials pose a direct quality hazard to ESD sensitive items.</li> <li>Use of only TGCS approved ESD materials is REQUIRED FOR TGCS AND ITS SUPPLIERS.</li> <li>Conversely, use of non-TGCS approved materials is PROHIBITED. It is also possible that previously approved materials have failed recent requalification testing.</li> <li>A material approved for one application does NOT mean that it is necessarily approved for all applications. For instance, some ESD approved materials may not meet stringent contamination requirements for some types of components.</li> <li>To ensure use of the approved materials, simply specify them on the applicable TGCS specification with the statement "no substitutions".</li> <li>There are no "buried metal" or "metal-in" style bags on the approved list. All approved bags are of the "metal-out" style which unfortunately usually cost more than "metal in" types.</li> </ol>

**Table 8. Approved ESD Packaging Methods.**

These are examples of approved packaging methods for ESD sensitive parts provided that approved materials are used.

Package Type	Definition / Usage Notes
<b>Static Shielding Bags</b>	<p>A multi-layer bag which consists of a static dissipative material next to the ESD sensitive item along with a thin outer metallic layer. Only TGCS approved static shielding bags may be used.</p> <p><b>Note:</b> Reminder, only "metal out" style bags have been approved at this point.</p>



<b>Unit Card Boxes (UCB's)</b>	These containers consist of an external conductive molded case with an interior static dissipative foam insert. These containers should only be used for parts that fit the available containers exactly.
<b>Static Dissipative Cartons</b>	An ordinary Kraft corrugated container with static dissipative foam may be used to contain the ESD sensitive item <b>provided</b> the part is first placed in a static shielding bag. If a static shielding bag is not used, the outer box must be manufactured from an approved conductive corrugated board and have static dissipative cushioning.
<b>Thermoformed Blister Style Packages</b>	This style of packaging is acceptable if the material which contacts the part is manufactured from an approved static dissipative material <b>and</b> is inside a conductive outer container. For Field Service the individual outer carton will be required to provide physical strength; this too must be made from approved conductive material unless the part is placed in an approved ESD shielding bag.
<b>Reusable Tote Style Boxes for Bulk Handling</b>	Reusable tote boxes manufactured from conductive corrugated or plastic materials may be used for interplant, supplier, or intra plant shipments to Manufacturing areas. Tote style boxes cannot be used for parts bound for retail, channel business partners (AAP), field service or field service distribution locations.
<b>Approved ESD Packaging Materials Listing</b>	The approved materials list is the result of extensive testing and requalification of the materials. It is important to note that there are many materials marketed as ESD qualified which have not survived TGCS's strenuous testing process. For this reason, it is critical to continually monitor this list since previously approved materials may have failed requalification. Parts suppliers to TGCS are also required to use materials from the approved ESD supplier list. Suppliers should contact their TGCS Purchasing representative to ensure compliance. <b>Intranet:</b> <a href="http://w3.rchland.tgcs.com/projects/esdp">http://w3.rchland.tgcs.com/projects/esdp</a>

### 3.3 Package Testing

The package must provide enough protection to ensure its contents arrive damage free. TGCS reserves the right to audit a supplier package design for conformance to these standards. Individual Supplier Quality Plans should address package verification/approval methods. Any of the following specifications or an equivalent may be used. Contact TGCS Purchasing if more information is required.

- *American Society for Testing & Materials—ASTM D-4196 Performance Testing of Shipping Containers and Systems.* **Internet:** <http://www.astm.org>
- *TGCS Specification C-H 1-9711-005, Packaged Product Tests.* **Intranet:** <http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-ch19711005>
- *International Safe Transit Association—ISTA Pre-Shipment Test Procedures.* **Internet:** <http://www.ista.org/testpro.htm>
- *National Motor Freight Classification Item 180 — Performance Testing of Shipping Containers. This method applies for shipments via the Less Than Truckload (LTL) common carrier environment in the US.* **Internet:** <http://www.nmfta.org>

## 4.0 Containers (Primary Packaging)

**Table 9. Primary Packaging Do's and Don'ts.**

This table summarizes the basic requirements for the use of containers. Exceptions may apply for specific situations.

Item	DO	DO NOT !
------	----	----------

<b>General</b>	<ul style="list-style-type: none"> <li>Do protect parts from:             <ol style="list-style-type: none"> <li>dust, dirt, and abrasion</li> <li>all reasonable hazards during shipping, handling and storage, such as shock, vibration, compression, moisture and ESD.</li> <li>Provide packaging that permits safe handling, shipping and storage.</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>Do NOT use crates, wire bound boxes or expendable wooden containers, unless corrugated containers will not provide adequate protection (crates are required for shipments to China).</li> <li>Do NOT pack different part numbers in the same package.</li> <li>Do NOT pack different order numbers in the same package.</li> </ul>
<b>Containers</b>	<ul style="list-style-type: none"> <li>Do use TGCS recommended modular boxes.</li> <li>Do use boxes of sufficient strength to permit stacking during shipment and storage.</li> <li>Do use nonstandard containers when part size, fragility, and so on dictates. Smaller is better.</li> </ul>	<ul style="list-style-type: none"> <li>Do NOT use boxes less than 190 mm x 150 mm x 25 mm (7.5" x 6" x 1") in size.</li> <li>Do NOT use envelopes as a part shipping container.</li> <li>Do NOT use container's flaps to extend the height of the container.</li> </ul>
<b>Closure</b>	<ul style="list-style-type: none"> <li>Do use pressure sensitive film tapes (polyester or polypropylene) or reinforced water activated gummed tape for corrugated containers.</li> <li>Do use tape which is a minimum of 50 mm (2") wide.</li> <li>Do use tape or heat sealing to close poly bags.</li> <li>Do use strapping/banding for half slotted, telescoping or double cover (cap &amp; tube) containers.</li> <li>Do use the "H" style taping method to reinforce the flaps of heavy containers (ref. Figure 1).</li> </ul>	<ul style="list-style-type: none"> <li>Do NOT use staples as part of the package closure; that is, where the customer must open the package to gain access to the contents. This includes all packages including bags, envelopes, or cartons. Stitched manufacturer's joints are not preferred but they are acceptable since this is not where the container is opened. This is primarily a safety concern, not an environmental concern.</li> </ul>
<b>Markings</b>	<ul style="list-style-type: none"> <li>Do use "heavy" symbols on containers exceeding 12 kg (26 lbs). Refer to 9.0, "Requirements for Heavy Packages".</li> <li>Old labels and markings on used packing material must be removed or permanently and indelibly covered up if they do not apply to the current shipment.</li> <li>Do use essential safety warnings or symbols where applicable. Example: the graphic "Top Heavy" symbol.</li> </ul>	<ul style="list-style-type: none"> <li>Do NOT attempt to use labels as a means to get away with a less than adequate package design. Example: "Do not TOP LOAD". When these types of labels are used it is an indication that more work is needed to improve the package. Such labels are no guarantee that the instruction provided by the label will be observed and followed by carriers.</li> <li>Do NOT routinely put TGCS logo's on cartons unless part of a specific marketing design. This is intended to reduce cost and theft in distribution.</li> </ul>
<b>Dunnage</b>	<ul style="list-style-type: none"> <li>Do use corrugated inserts and dividers.</li> <li>Do select the right size container/carton for the parts to minimize the use of dunnage material.</li> <li>Do minimize internal part vibration, especially on painted and/or textured surfaces by reducing internal pack or partition cell void space.</li> </ul>	<ul style="list-style-type: none"> <li>Do NOT use or specify others to use any form of "free flow or loose fill" dunnage material (aka "peanuts", "popcorn", or similar) regardless of material type.</li> <li>Do NOT use newspaper as dunnage material.</li> <li>Do NOT stuff wrong sized cartons with excess dunnage, get a smaller carton instead.</li> </ul>

## 4.1 Selection of Bulk versus Individual Style Packaging

Inbound parts to support manufacturing applications are packaged in bulk (multiple parts per package). Parts which are destined for field service are ultimately packaged individually but may in some cases be packaged in bulk from suppliers to TGCS's parts centers (Mechanicsburg, Amsterdam, or Singapore) to reduce transit costs and to give TGCS more control of the single unit packaging method. Suppliers of spare parts must coordinate this with these parts centers. The default method is individual packaging unless otherwise instructed.

Spare parts shipped to the field for servicing TGCS equipment are called "field replacement units" (FRUs) and should conform to additional requirements contained in 7.0, "FRU Packaging Requirements". FRUs are typically packaged as single units in very rugged packaging suitable for multiple shipments via express carriers.

Parts which are destined for AAP (Authorized Assembler Program) or AFI (Advanced Fulfillment Initiative) distributors or solution providers, may need to be packaged individually. This packaging may consist of a kit including the primary assembly (such as a disk drive) as well as the installation instructions and any required hardware items just as an individual customer would use. FRU (plain) or options style packaging (with retail graphics) may be used to meet this criteria. TGCS fulfillment must work closely with these business partners to design packaging which is most efficient considering the total supply chain.

## 4.2 Unit Load Shippers (Double Cover Style)

**Table 10. Standard Metric Unit Load Shippers for Worldwide Use.**

All ULS's (or "Power-Packs") have been modified for compatibility with metric pallets and air cargo dimensions. Container specifications control the outside dimensions to ensure proper fit to the pallet without overhang. A conservative estimate of the resulting INSIDE dimensions is included to assist designers. The id. can vary since we are using a performance specification. These containers will fit existing TGCS stringer pallets.

Description (Footprint/Ht.)	Inside Dimensions (ref) mm (inches)	Tested compression	Maximum gross weight	Tube part number	Cap part number	Door part number
Full/Tall with door	1156 x 930 x 787 (45.50 x 36.63 x 31.00")	28.5 kN (6400 lbf)	682 kg (1500 lbs)	09L3601	09L3602	09L3603
Full/Short no door	1156 x 943 x 527 (45.50 x 37.13 x 20.75")	32.0 kN (7200 lbf)	682 kg (1500 lbs)	09L3600	09L3602	-
Euro/Tall with door	1156 x 730 x 787 (45.50 x 28.75 x 31.00")	23.1 kN (5200 lbf)	545 kg (1200 lbs)	62G1832	62G1833	62G1834
Euro/Short no door	1156 x 743 x 527 (45.50 x 29.25 x 20.75")	25.8 kN (5800 lbf)	545 kg (1200 lbs)	62G1831	62G1833	-
Half/Tall no door	943 x 556 x 787 (37.13 x 21.88 x 31.00")	14.2 kN (3200 lbf)	409 kg (900 lbs)	09L3605	09L3606	-
Half/Short no door	943 x 556 x 527 (37.13 x 21.88 x 20.75")	16.0 kN (3600 lbf)	409 kg (900 lbs)	09L3604	09L3606	-

**Note:**

Footprints (outside dimensions, with cap): Full = 1200 x 1000 mm, Euro = 1200 x 800 mm, Half = 1000 x 600 mm

Heights (tube id): Tall = 787 mm, Short = 527 mm

### 4.3 TGCS Modular Containers

**Table 11. Metric Modular Containers for Worldwide Use**

These boxes are designed to fit the new metric unit load shippers but will also fit the original family of ULS's. The container specifications control the INSIDE dimensions as derived from section. An estimate of the resulting OUTSIDE dimensions is included also.

New Code	Old Code (ref) <sup>1</sup>	New P/N	Derived from	Inside Dimensions (ID) mm (inches)	Outside Dimensions (OD) mm (inches)	Box Style	Edge Crush Test (ECT)
M01	SA	62G1802	7351378	152 x 117 x 92 (6.00 x 4.63 x 3.63)	162 x 127 x 108 (6.38 x 5.00 x 4.25)	RSC	7.71 kN/m 44 lb/in, SW
M02	MA	62G1803	6038678	171 x 140 x 111 (6.75 x 5.50 x 4.38)	181 x 149 x 127 (7.13 x 5.88 x 5.00)	RSC	7.71 kN/m 44 lb/in, SW
M03	MB	62G1804	6038677	216 x 171 x 111 (8.50 x 6.75 x 4.38)	225 x 181 x 127 (8.88 x 7.13 x 5.00)	RSC	7.71 kN/m 44 lb/in, SW
M04	SB	62G1805	7351379	260 x 140 x 111 (10.25 x 5.50 x 4.38)	270 x 149 x 127 (10.63 x 5.88 x 5.00)	RSC	7.71 kN/m 44 lb/in, SW
M05	MC	62G1806	6038676	260 x 216 x 111 (10.25 x 8.50 x 4.38)	270 x 225 x 127 (10.63 x 8.88 x 5.00)	RSC	7.71 kN/m 44 lb/in, SW
M06	MD	62G1807	6038675	260 x 216 x 137 (10.25 x 8.50 x 5.38)	270 x 225 x 152 (10.63 x 8.88 x 6.00)	RSC	7.71 kN/m 44 lb/in, SW
M07	SC	62G1808	7351370	292 x 260 x 92 (11.50 x 10.25 x 3.63)	302 x 270 x 108 (11.88 x 10.63 x 4.25)	RSC	7.71 kN/m 44 lb/in, SW
M08	SD	62G1809	7351371	292 x 260 x 175 (11.50 x 10.25 x 6.88)	302 x 270 x 191 (11.88 x 10.63 x 7.50)	RSC	7.71 kN/m 44 lb/in, SW
M09	SE	62G1810	7351372	292 x 260 x 238 (11.50 x 10.25 x 9.38)	302 x 270 x 254 (11.88 x 10.63 x 10.00)	RSC	7.71 kN/m 44 lb/in, SW
M10	MT	62G1811	6038862	365 x 216 x 175 (14.38 x 8.50 x 6.88)	375 x 225 x 191 (14.75 x 8.88 x 7.50)	RSC	7.71 kN/m 44 lb/in, SW
M11	SF	62G1812	7351373	365 x 292 x 137 (14.38 x 11.50 x 5.38)	375 x 302 x 152 (14.75 x 11.88 x 6.00)	RSC	7.71 kN/m 44 lb/in, SW
M12	SG	62G1813	7351374	365 x 292 x 238 (14.38 x 11.50 x 9.38)	375 x 302 x 254 (14.75 x 11.88 x 10.00)	RSC	7.71 kN/m 44 lb/in, SW
M13	ME	62G1814	6038674	441 x 260 x 137 (17.38 x 10.25 x 5.38)	451 x 270 x 152 (17.75 x 10.63 x 6.00)	RSC	7.71 kN/m 44 lb/in, SW
M14	MS	62G1815	6038861	441 x 260 x 175 (17.38 x 10.25 x 6.88)	451 x 270 x 191 (17.75 x 10.63 x 7.50)	RSC	7.71 kN/m 44 lb/in, SW
M15	MF	62G1816	6038673	441 x 260 x 238 (17.38 x 10.25 x 9.38)	451 x 270 x 254 (17.75 x 10.63 x 10.00)	RSC	7.71 kN/m 44 lb/in, SW
M16	MQ	62G1817	6038863	441 x 365 x 137 (17.38 x 14.38 x 5.38)	451 x 375 x 152 (17.75 x 14.75 x 6.00)	RSC	7.71 kN/m 44 lb/in, SW
M17	SH	62G1818	7351375	441 x 365 x 175 (17.38 x 14.38 x 6.88)	451 x 375 x 191 (17.75 x 14.75 x 7.50)	RSC	7.71 kN/m 44 lb/in, SW
M18	MG	62G1819	6038672	441 x 365 x 365 (17.38 x 14.38 x 14.38)	451 x 375 x 381 (17.75 x 14.75 x 15.00)	RSC	7.71 kN/m 44 lb/in, SW
M19	MH	62G1820	6038671	533 x 216 x 111 (21.00 x 8.50 x 4.38)	543 x 225 x 127 (21.38 x 8.88 x 5.00)	RSC	7.71 kN/m 44 lb/in, SW
M20	MJ	62G1821	6038670	533 x 216 x 238 (21.00 x 8.50 x 9.38)	543 x 225 x 254 (21.38 x 8.88 x 10.00)	RSC	7.71 kN/m 44 lb/in, SW
M21	MR	62G1822	92F6927	533 x 441 x 111 (21.00 x 17.38 x 4.38)	543 x 451 x 127 (21.38 x 17.75 x 5.00)	RSC	7.71 kN/m 44 lb/in, SW
M22	MK	62G1823	6038669	533 x 441 x 175	543 x 451 x 191	RSC	7.71 kN/m

				(21.00 x 17.38 x 6.88)	(21.38 x 17.75 x 7.50)		44 lb/in, SW
M23	ML	62G1824	6038668	530 x 432 x 225 (20.88 x 17.00 x 8.88)	543 x 451 x 254 (21.38 x 17.75 x 10.00)	RSC	8.93 kN/m 51 lb/in, DW
M24	MM	62G1825	6038667	530 x 432 x 352 (20.88 x 17.00 x 13.88)	543 x 451 x 381 (21.38 x 17.75 x 15.00)	RSC	8.93 kN/m 51 lb/in, DW
M25	SI	62G1826	7351376	530 x 432 x 479 (20.88 x 17.00 x 18.88)	543 x 451 x 508 (21.38 x 17.75 x 20.00)	RSC	8.93 kN/m 51 lb/in, DW
M26	SJ	62G1827	7351377	895 x 171 x 111 (35.25 x 6.75 x 4.38)	905 x 181 x 127 (35.63 x 7.13 x 5.00)	RSC	7.71 kN/m 44 lb/in, SW
M27	SK	62G1828	7351378	886 x 257 x 162 (34.88 x 10.13 x 6.38)	905 x 270 x 191 (35.63 x 10.63 x 7.50)	RSC	8.93 kN/m 51 lb/in, DW
M28	SL	62G1829	7351379	886 x 365 x 225 (34.88 x 14.38 x 8.88)	905 x 375 x 254 (35.63 x 14.75 x 10.00)	RSC	8.93 kN/m 51 lb/in, DW

#### 4.4 Edge Crush Test (ECT) vs. Mullen Equivalents

Either method of specifying corrugate can be used for packages of equal size and gross weight according to their respective rules. However, they may not perform exactly the same in practice because the materials are made differently. See Table 12 for equivalency values. In general, compression strength is more important to TGCS than bursting strength. Therefore, all corrugate will be specified by its ECT as the primary requirement. An acceptable burst strength (Mullen) alternate is also provided.

**Table 12. Edge Crush Test (ECT) vs. Mullen Test Equivalency Chart.**

The following defines rule equivalents not necessarily performance equivalents.

Single Wall			Double Wall		
ECT (lb./inch)	ECT (kN/m)	Mullen (lb./in <sup>2</sup> )	ECT (lb./inch)	ECT (kN/m)	Mullen (lb./in <sup>2</sup> )
32	5.60	200			
40	7.00	250			
44	7.71	275	48	8.41	275
55	9.63	350	51	8.93	350
			61	10.68	400
			71	12.43	500
			82	14.36	600

## 4.5 Minimum Corrugated Board Strength

The following table provides minimum board strength for cartons of various sizes and weight ranges. Exceptions to these requirements are approved only if tests are conducted which verify that the package design provides equivalent compression strength.

**Table 13. Minimum Board Strength for Corrugated Containers.** ECT = Edge Crush Test, SW = Single wall, DW = Double wall

Container Style	Sum of container Length + Width + Depth			
	0 - 762 mm 0 - 30"	763 - 1270 30.1 - 50	1271 - 2286 50.1 - 90	Over 2286 Over 90
Regular Slotted Container (RSC)	44 ECT 1896 kPa 275 psi, SW	48 ECT 1896 kPa 275 psi, DW	51 ECT 2413 kPa 350 psi, DW	51 ECT 2413 kPa 350 psi, DW
Half Slotted Container (HSC)	44 ECT 1896 kPa 275 psi, SW	48 ECT 1896 kPa 275 psi, DW	51 ECT 2413 kPa 350 psi, DW	N/R <sup>1</sup>
Half Slotted Container (Palletized)	N/R <sup>1</sup>	N/R <sup>1</sup>	71 ECT 3447 kPa 500 psi, DW	Triple wall
Full Telescoping Style (FTHSC)	44 ECT 1896 kPa 275 psi, SW	44 ECT 1896 kPa 275 psi, SW	55 ECT 2413 kPa 350 psi, SW	51 ECT 2413 kPa 350 psi, DW
Tube and Cap Style	N/R <sup>1</sup>	N/R <sup>1</sup>	71 ECT 3447 kPa 500 psi, DW	Triple wall
Roll-end Tuck Top Mailers	44 ECT 1896 kPa 275 psi, SW	55 ECT 2413 kPa 350 psi, SW	55 ECT 2413 kPa 350 psi, SW	N/R <sup>1</sup>
All Other Styles	44 ECT 1896 kPa 275 psi, SW	48 ECT 1896 kPa 275 psi, DW	51 ECT 2413 kPa 350 psi, DW	51 ECT 2413 kPa 350 psi, DW

**Notes:** N/R<sup>1</sup> = Package style Not Recommended for this size container.

ECT = Edge Crush Test

SW = Single wall

DW = Double wall

## 4.6 Getting the most out of the Corrugated Cartons and Inserts

1. The flute direction in the outer carton should always run vertically.
2. Specify that corrugated inserts are to be 1.5 - 3.0mm (0.06 - 0.12") **taller** than the specified inside depth (height) of the carton. This ensures that the divider contributes to overall carton strength.

3. Double wall materials with lower board strength will usually provide more compression strength than single wall materials with higher burst values. Double wall also offers the best overall value relative to its enhanced performance.
4. When using corrugated sleeves inside cartons align the flutes *horizontally* for the sleeve. The corners will add strength vertically and the horizontal flutes will add strength laterally. This improves overall compression strength. Cartons will be oriented in any direction during most phases of the distribution network.

## 4.7 Carton Closure Methods

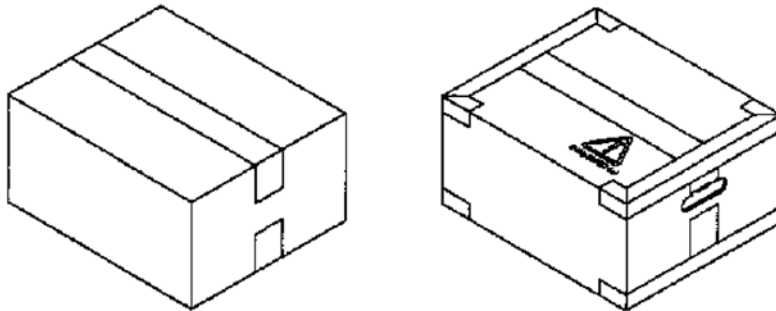


Figure 1. Carton taping methods.

Lightweight cartons (left). Heavier cartons (right) weighing more than 10 kg (22 lbs.) using the "H" method (right). The "H" method should be used for all express parcels and international shipments

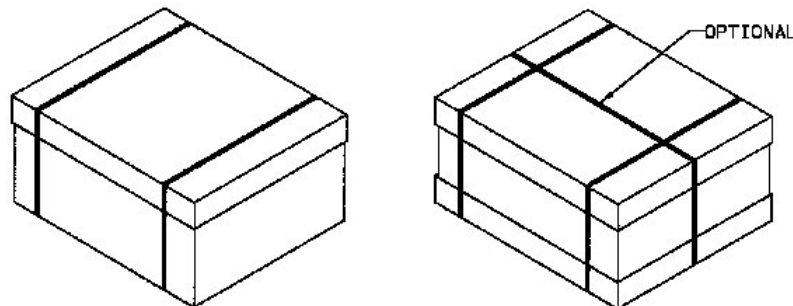


Figure 2. Carton banding methods.

Single cover boxes (left) and double cover boxes (right) should be *banded*, not taped. Edge protectors may be omitted when banding automatically and not attaching the carton to a pallet. **Note:** Where possible, designs like this should be switched to regular slotted containers (ref. Fig. 1) when shipping individually via parcel post. Two piece containers like these are best suited for internal handling or manufacturing operations and shipped only in an over packed condition.

## 5.0 Palletization (Transport Packaging)

Table 14. Palletization, Unitization, and Securement

This table summarizes the basic requirements. Exceptions allowed only if otherwise specified by the responsible Packaging Engineer.

Item	DO	DO NOT !
------	----	----------

<p><b>Pallets</b></p>	<ul style="list-style-type: none"> <li>Use the new TGCS Standard metric pallets if possible, 1.0x1.2m (7310275) or 1.0x0.6m (7373961). However, TGCS stringer pallets, 40x48" (6038887) and 40x24" (6038888) may also be used for now.</li> <li>On custom sized machine pallets provide a minimum 711 x 95 mm (28 x 3.75") minimum inside dimension for pallet jack access on two opposite sides.</li> <li>Use TGCS approved non-solid wood pallets (plastic or plywood) for shipments to countries regulating solid wood due to pest migration problems or properly heat treated and certified solid wood pallets (ref 10.4).</li> <li>Use a center block or stringer if the span between blocks or stringers would otherwise exceed 500mm (20").</li> </ul>	<ul style="list-style-type: none"> <li>Do NOT use pallets which have bark visible on the wood.</li> <li>Do NOT use pallets which have evidence of insect damage on them (such as grub holes).</li> <li>Do NOT use broken wood pallets.</li> <li>Do NOT accept substandard pallets from your suppliers (TGCS and suppliers).</li> <li>Do NOT use pallets without bottom deck boards (skids) for shipping.</li> <li>Do NOT use alternate pallet materials (paper, plastic, metal) without prior TGCS approval.</li> </ul>
<p><b>Packaging</b></p>	<ul style="list-style-type: none"> <li>Use unit load shippers (over packs) where possible.</li> <li>Cut down unit load shippers if head space is greater than 76 mm (3.0"). This reduces dimensional weight, prevents collapsing of the lid, and prevents pooling of water on top.</li> <li>Fill only <i>lateral</i> voids in unit load shippers.</li> <li>Use setup empty cartons marked "<i>filler box</i>" to fill lateral voids to stabilize partial loads.</li> <li>Use unit load shippers if the pallet consists of 5 or more layers of cartons.</li> <li>Use top caps sized for the load when palletizing.</li> <li>Always use unit load shippers whenever TGCS modular cartons are used.</li> </ul>	<ul style="list-style-type: none"> <li>Do NOT use top caps on top of cartons if the cap is too big or too small (use a top pad instead).</li> <li>Do NOT stack cartons into unit load shippers higher than the top surface of the ULS.</li> <li>Do NOT use free-flow dunnage materials to fill voids in over packs.</li> <li>Do NOT fill voids on top of cartons in a unit load shipper (cut the ULS down instead).</li> <li>Do NOT extend unit load shipper height by adding a second tube on top of the first.</li> <li>Do NOT allow containers to overhang pallet.</li> </ul>
<p><b>Palletization, Unitization</b></p>	<ul style="list-style-type: none"> <li>Build only cubic, stackable loads (no hay stacking).</li> <li>Occupy at least 80% of the pallet surface.</li> <li>Staple bottom caps to pallet to reduce movement.</li> <li>Use plastic film between wet pallets and cartons.</li> <li>Fill vertical voids between stacked cartons so that the load occupies the entire surface.</li> <li>Palletize shipments consisting of a single package weighing in excess of 32 kg (70 lbs.). Pallet size should match package size (minimum 80% coverage).</li> <li>Palletize multiple purchase orders of one part number on a pallet.</li> </ul>	<ul style="list-style-type: none"> <li>Do NOT mix production and non-production material.</li> <li>Do NOT haystack or pyramid stack cartons on pallets.</li> <li>Do NOT exceed 4 layers when stacking cartons if unit load shippers are not being used.</li> <li>Do NOT palletize a shipment consisting of a single carton weighing less than 32 kg (70 lbs.).</li> <li>Do NOT bulk fill ULS's with <i>unpacked</i> small parts.</li> <li>Do NOT pack multiple case numbers inside a unit load shipper.</li> </ul>

Item	DO	DO NOT !
------	----	----------



<p><b>Stretch Wrap</b></p>	<ul style="list-style-type: none"> <li>• Use mechanically applied stretch wrap. Stretch wrap alone when properly applied is sufficient for intra-continental full truckload surface shipments only. 2-way banding alone is approved for less than truckload (LTL) shipments.</li> <li>• Start with a properly adjusted machine which pre-stretches the 80 gauge film.</li> <li>• For inter-continental and all air shipments use 2-way banding in combination with mechanically applied stretch wrap. Band first, then wrap for best results.</li> <li>• Tie the stretch wrap to the pallet directly, cover all corners. Covering the areas for fork access is OK.</li> <li>• Use 5 mm (.180") fiberboard 50 mm x 50 mm (2" x 2") vertical corner posts to keep cartons aligned under the film.</li> <li>• Tie the wrap to the pallet like a rope around the base.</li> <li>• Use a top cap outside of the vertical corner boards (under stretch wrap).</li> <li>• Clear stretch wrap with unique markings or shrink wrap may be used for security purposes.</li> </ul>	<ul style="list-style-type: none"> <li>• Do NOT use hand applied stretch wrap unless combined with 4-way banding for inter-continental shipments or 2-way banding for intra-continental surface shipments.</li> <li>• Do NOT use pass-thru style stretch wrapping unless supplemented with banding or spiral wraps.</li> <li>• Do NOT use black opaque stretch wrap for security purposes (use corrugated over packs instead).</li> <li>• <b>Note:</b> Do not confuse Shrink Wrap with Stretch Wrap. Shrink wrap is applied with heat to form a tight load. Stretch wrap is applied from a roll and is pre-stretched by the applicator.</li> </ul>
<p><b>Banding, Strapping</b></p>	<ul style="list-style-type: none"> <li>• Whenever banding is used, use at least two bands.</li> <li>• Use polyester banding—13mm (.50") wide and 0.5mm (.020") thick for general use.</li> <li>• Use steel banding only for loads over 363 kg (800 lbs.) If the band is being used to hold the load to the pallet.</li> <li>• Use crimp or heat seal banding closures with the new padlock symbol..</li> <li>• Use the banding notches (not the fork notch) for cross bands on stringer style pallets.</li> <li>• Use angle board style edge protectors under bands. Some exceptions may apply with automated banding applications.</li> <li>• For inter-continental and air shipments of palletized loads of multiple cartons, 4-way banding is an approved alternative to 2-way banding with mechanically applied stretch wrap.</li> <li>• For machines, the stretch wrap or banding that would otherwise be required may be eliminated if the machine is bolted to the pallet provided that the banding or wrap is not needed to keep the package together. If it is, use wrap or banding as needed to maintain package integrity.</li> <li>• Use the padlock symbol on banding and clips for security purposes.</li> <li>• Permanent steel banding used for reinforcement of wooden crates must be accompanied with a pictorial "do not cut" graphical symbol.</li> </ul>	<ul style="list-style-type: none"> <li>• Do NOT use small plastic clips (load spreaders) as edge protectors unless the band is threaded through the clip to keep it from falling off.</li> <li>• Do NOT use polypropylene or nylon banding for pallet securement.</li> <li>• Do NOT use metallic banding for loads less than 363 kg (800 lbs.).</li> <li>• Do NOT use buckle style hand applied banding fasteners except in field use applications where banding tensioners are not available.</li> <li>• Do NOT staple or nail through the bands. Staples may be used to "frame" bands used for permanent reinforcement of crates. However, the staple itself should not puncture the bands. Whenever such bands are used, also mark these containers with a graphical symbol which indicates "Do not cut this band".</li> </ul>

## 5.1 Pallet Size and Style Requirements

This revision begins the migration to a worldwide standard utilizing metric dimensioned block style pallets. However, for an interim transition period (expiration date to be determined) stringer style pallets may still be used for shipments outside of Europe. In addition, we will accept 48x40" GMA style stringer pallets (vs. traditional TGCS standard 40x48") if this results in a significant cost reduction to TGCS and is approved by the receiving location. [The GMA style pallet is preferred by many business partners.](#)

**Table 15. Summary of Acceptable Pallet Sizes and Styles for General Use.**

See also TGCS Engineering Specification 37L8024 for treatment and marking requirements for all wooden packaging items.

Internet: <http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States~Information+for+suppliers>

Shipments from all shippers TO:	Footprint SIZE	Material Type	Pallet Style or Trade Description	TGCS Spec.
All of TGCS*	1000x1200mm (39.4x47.3")	HT Softwood, or Hardwood <sup>2</sup>	Full size, 9 block style, full perimeter base, 4-way entry. *Do not use for shipments to TGCS Mechanicsburg.	7310275
TGCS Europe	1000x600mm (39.4x23.6")	HT Softwood, or Hardwood <sup>2</sup>	Half size, stringer style, 2-way entry	7373961
North America	1219x1016mm (48x40") GMA	HT Softwood, or Hardwood <sup>2</sup>	Full size, stringer style, partial 4-way entry. Required for shipments to many Business Partners (VAD's)	32R0158
North America	1016x1219mm (40x48")	HT Softwood, or Hardwood <sup>2</sup>	Full size, stringer style, partial 4-way entry. Required for shipments to TGCS Mechanicsburg.	6038887
North America	610x1016mm (40x24")	HT Softwood, or Hardwood <sup>2</sup>	Half size, stringer style, partial 4-way entry	6038888
European Customers	1200x800mm (47.3x31.5")	HT Softwood, or Hardwood <sup>2</sup>	Official "Euro Pallet", 9 block style, full 4-way entry, unidirectional base style.	7312658
All of TGCS	1000x1200mm (39.4x47.3")	Plywood <sup>1</sup>	Full size, 9 block style, full perimeter base, 4-way entry	25P1098
All of TGCS	1000x1200mm (39.4x47.3")	Plywood <sup>1</sup>	Half size, 6 block style, full perimeter base, 4-way entry	25P1099
All of TGCS	1016x610mm (40x24")	Plywood <sup>1</sup>	Half size, 6 block style, full perimeter base, 4-way entry	25P1097
All of TGCS	1016x1219mm (40x48")	Plywood <sup>1</sup>	Full size, 9 block style, full perimeter base, 4-way entry	25P1096
All of TGCS	600x800mm (23.6x31.5")	Plywood <sup>1</sup>	Half EURO Size, 6 block style, full perimeter base, 4-way entry	32R1094
TGCS Endicott	914 x 1200 mm (36 x 48")	HT Softwood, or Hardwood <sup>2</sup>	Custom size, stringer style pallet, partial 4-way entry used for automated warehouse. Maximum weight 454 kg (1000 lbs)	39Y7466

**Notes:**

(<sup>1</sup>) Indicates that this pallet does not contain Solid Wood Packing Material (SWPM) and is therefore not subject to infestation.

(<sup>2</sup>) Indicates that this pallet is made from solid wood and must be properly treated for exports to many countries.

**Terminology:**

- **HT = Heat Treated:** By definition has achieved a core temperature of 56C (133F) for a minimum of 30 minutes.
- **Unidirectional Base:** Has runners (bottom deck boards) in one direction only and the base is open to the floor on two sides.
- **Full Perimeter Base:** Has bottom deck boards in both directions touching the ground.
- **Stringer Style:** Constructed from beams ("stringers"), typically 2 for half size or 3 for full size to which deck boards are attached.
- **Block Style:** Constructed from blocks to which deck boards are attached. 6 blocks for half size and 9 blocks for full size typically.
- **2-way entry:** Fork lift and pallet jack access on 2 opposite sides only (stringer style without fork notches in the stringers).
- **Partial 4-way entry:** Fork lift access on 4 sides but pallet jack access on only 2 opposite sides (stringer style with fork notches).
- **Full 4-way entry:** Full fork lift and pallet jack access on all four sides - possible only with block style pallets..
- **Softwood:** Constructed from timbers from **coniferous** or needle bearing species of trees (pine, cedar, spruce, fir, etc.).
- **Hardwood:** Constructed from timbers from **non-coniferous** or leaf bearing species of trees (oak, maple, poplar, alder, aspen, etc.).
- **Composite:** A pallet constructed from a variety of processed wood, paper, or other materials. These are not subject to infestation.

## 5.2 Unit Load Size and Capacity Requirements

- **Load Height Requirement:** Most TGCS locations have flexibility in storage heights.
- **Load Weight Maximum:** 910 kg (2000 lbs) for a full pallet and 455 kg (1000 lbs) for a half pallet.

### 5.3 Unit Load Shippers (ULS)

Pallet loads should be over packed when loads are heavy, consist of many layers, or are transported inter-continental. Descriptions of TGCS unit load shippers appear in table 10.

**Note:** For air shipments, savings of roughly \$5US per cm (\$12US per inch) can be achieved by cutting down full size (1000x1200mm) unit load shippers to reduce voids.

### 5.4 Key Dimensional Considerations for Transportation Efficiency

While these guidelines are useful for all shipments, the benefits are most pronounced on inter-continental shipments. To ensure the lowest possible shipping cost as well as minimum delivery cycle time, it is important to prepare loads which physically fit the transportation vehicles that will be used such as airplanes or inter modal containers. The following table provides some “rules of thumb” in this regard which apply to most shipping situations. Of course, there may be variances depending on the exact routing or carrier utilized.

When multiple modes of transportation are used and where dimensions cannot be optimized for all modes it is advisable to optimize on the most expensive portion of the journey. In most cases this would be the AIR portion which can cost 7-10 times more on a per unit basis than ocean or surface shipment. A key height dimension to consider for all modes of transportation is 750cm (29.5”) since this fits 2 high in belly positions on wide body aircraft and 3 high in inter modal and surface vehicles.

Nominal Air pallet (“cookie sheet”) sizes are: 274 x 223cm (108 x 88”), 318 x 223cm (125 x 88”), and 318 x 244cm (125 x 96”). The dimensions in the table account for clearances needed for cargo netting and so on. For full details on air cargo dimensions, get a copy of the IATA ULD Technical Manual. This is available for purchase from the International Air Transport Association (IATA) located in Montreal, Canada (+1-514-844-6311) and Geneva, Switzerland (+41-22-799-2523). ULD means “Unit Load Device” which are the containers that can be loaded onto aircraft for cargo purposes.

For additional specifics on inter modal (ocean) containers visit **Internet**

[Http://www.export911.com/e911/ship/dimen.htm](http://www.export911.com/e911/ship/dimen.htm)

One of many convenient web based references for transportation and logistical data.

**Table 16. Key Dimensional Considerations for Transportation Vehicles**

Shipment Mode	Transport Vehicle Type	Try to Make Package Dimensions Modular to:			Comments
		Length	Width	Height	
Air	“Narrow Body” Aircraft, Lower Deck or “Belly” Positions (B707, B727, B737, DC8, DC9)	varies	varies	varies	* Belly positions are used for manually handled loose cartons and luggage.
	“Narrow Body” Aircraft, Upper Main Deck Positions (B707, B727, B737, DC8, DC9)	300 cm (118”), 258 cm (101”)	213 cm (84”)	193 cm (76”) to 208 cm (82”)  Design for 203 cm (80”)	Height limitation varies depending on the specific airplane and how it was configured for cargo.
	“Wide Body” Aircraft, Lower Deck or “Belly” Positions (B747, B767, DC10, MD11)	300 cm (118”)	234 cm (92”), 213 cm (84”)	160 cm (63”)	Items sized for lower deck “belly” positions enjoy lower costs and increased flight availability globally.

	“Wide Body” Aircraft, Upper Main Deck Positions (B747, B767, DC10, MD11)	300 cm (118”)	234 cm (92”), 213 cm (84”)	238 cm (94”), or 300 cm (118”) B747 cargo only	Wide body, upper deck positions are not available to all destinations.
<b>Ocean</b>	Standard Inter modal Dry Cntrs (Nominal 20’, 40’, and 45’)	592 cm (233”), 1201 cm (472”), 1358 cm (533”)	234 cm (92”)	228 cm (89”)	Aluminum dry containers are lined with plywood, steel containers are not.
	“High Cube” Inter modal Dry Cntr (Nominal 40’ and 45’ only)	1201 cm (472”), 1358 cm (533”)	234 cm (92”)	258 cm (101”)	Available on special request
<b>Surface</b>	Typical North American Trucks (Nominal 28’, 40’, 45’, 48’, 53’)	Nominal length less 20 cm (8”)	244cm (96”)	264 cm (104”)	Heights up to 279 cm (110”) are available.
	Typical European Trucks (Nom. 6m, 8m, 12m, 14m, and 16m)	Nominal length less 20 cm (8”)	244cm (96”)	229 cm (90”)	Soft sided is typical
	Typical Asian Trucks (Nominal 3m, 6m, and 9m)	Nominal length less 20 cm (8”)	213 cm (84”), 244cm (96”)	218 cm (86”), 244cm (96”)	Soft sided is typical

## 5.5 Security Shipments

Serialized seals are required for container closure, pallet strapping, and/or trailer sealing when shipping proprietary materials. Serial numbers must be recorded on the shipping documentation. Banding should be placed far enough from the edge of the package to prevent anyone from slipping the banding over the package edge or corner and replacing it undetected. Contact TGCS Traffic or Security Department for complete information.

Refer also to TGCS Corporate Bulletin C-B 0-3700-000 “Packing and Sealing of TGCS or Customer Assets” for more detailed requirements regarding tamper evident packaging methods.

**Intranet:** <http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-cb03700000>

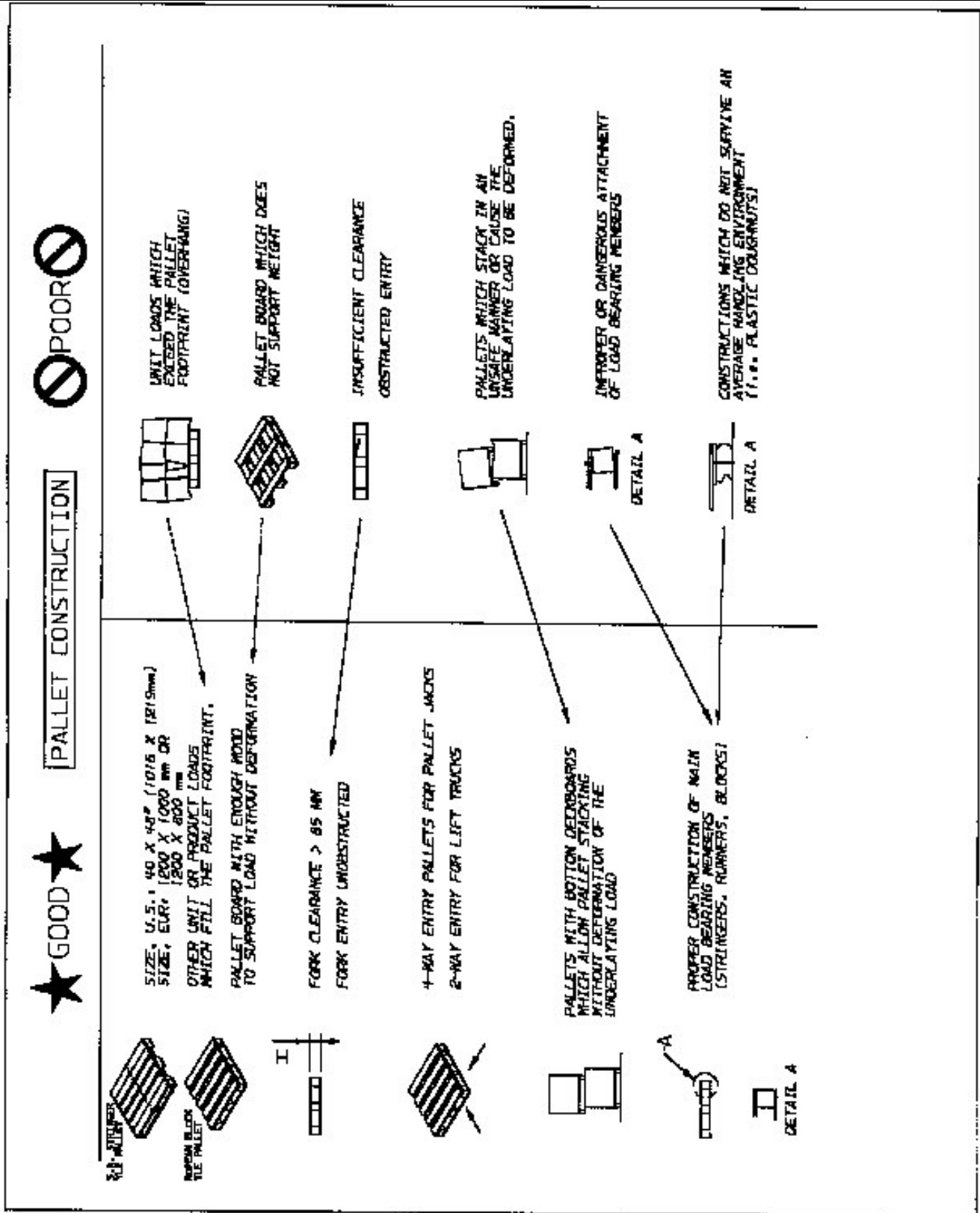


Figure 3. Proper Pallet Construction

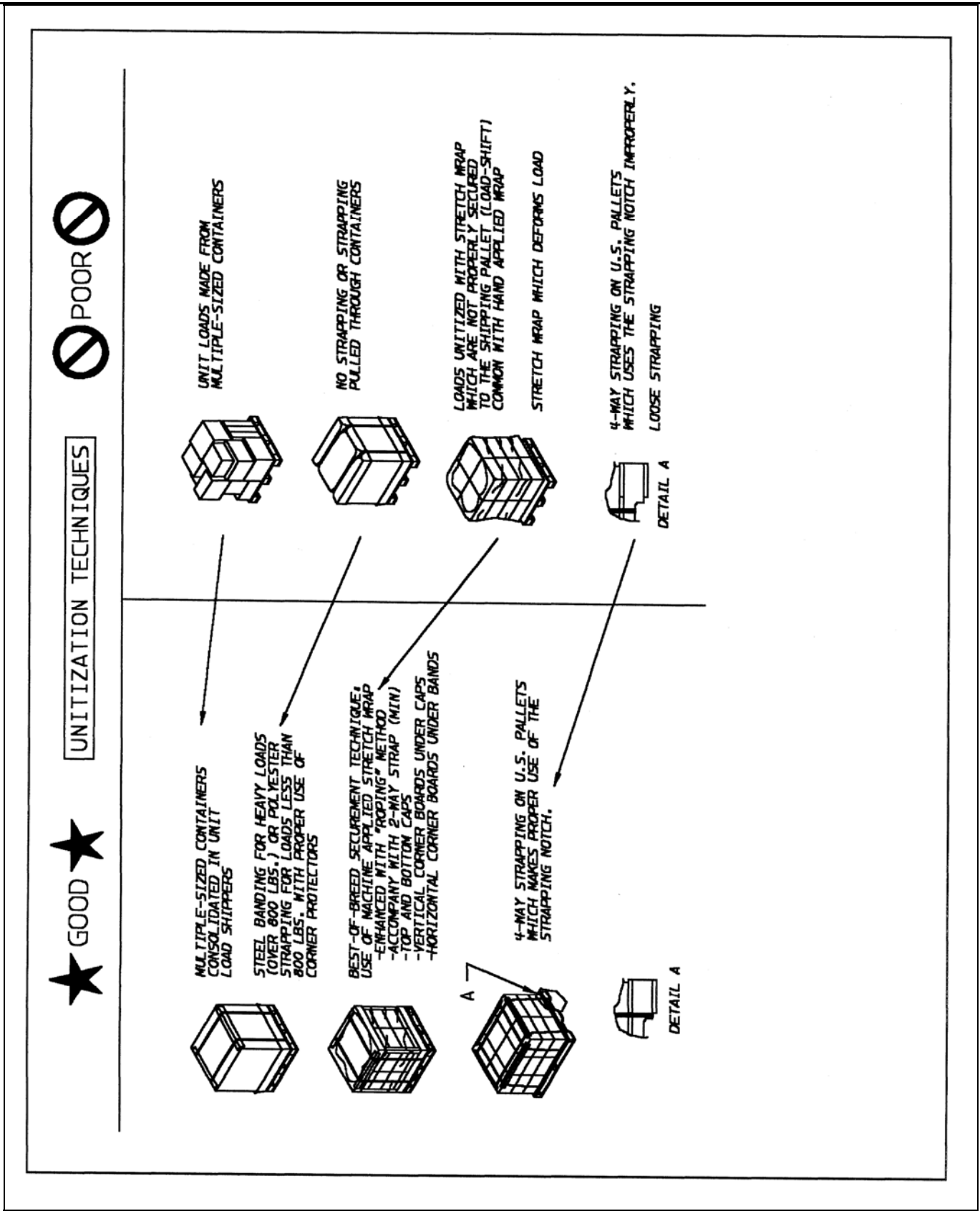


Figure 4. Proper Pallet Load Preparation and Securement

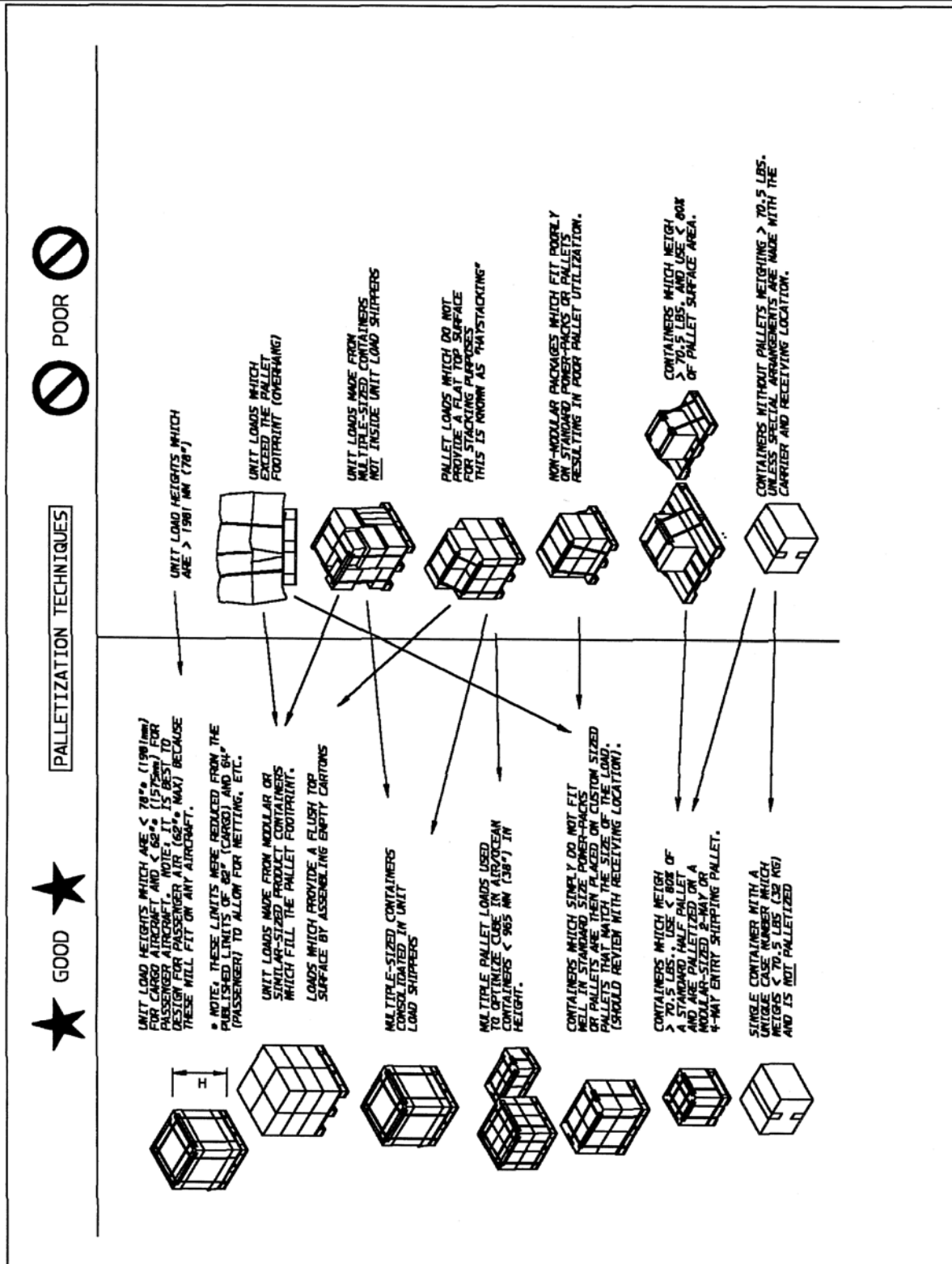


Figure 5. Proper palletization techniques  
 6.0 Marking and Labeling

See the Global Labeling Implementation Guides on the *Internet* :

<http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States-Global-labeling+guides?OpenDocument&Parent=Information+for+suppliers>

---

for TGCS requirements for product package labels, shipping labels, part labels, FRU package labels, case contents labels, and packing lists.

---

## 6.1 Country of Origin Markings

TGCS requires that each article have the full English name of its country of origin marked on the article itself ***and*** on the article's product package (immediate container). The marking must be as conspicuous, legible, indelible, and permanent as the nature of the article and container will permit. Further definition of these terms is provided for convenience:

1. **Conspicuous:** Capable of being easily seen with normal handling of the article or container,
2. **Legible:** Can be easily read by a person with normal eyesight,
3. **Indelible:** Resists fading,
4. **Permanent:** Survives normal distribution and handling

No abbreviations, with the exception of UK for United Kingdom and US or USA for the United States of America, are acceptable. The 2 character ISO 3166 country codes, alone, are not acceptable for country of origin marking on articles or product packages.

For detailed information regarding TGCS's country of origin marking requirements for product packages, shipping labels, packing lists, FRU package labels, and case contents labels, refer to the Global Labeling Implementation Guides at:

**Internet :** <http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States~Global+labeling+guides?OpenDocument&Parent=Information+for+suppliers>

For a broader overview of Country of Origin Issues refer to **Internet:**

<http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States~Country+of+origin+marking+instructions?OpenDocument&Parent=Information+for+suppliers>

## 6.2 Wooden Package Assembly Markings

In order to comply with new regulations restricting the movement of solid wood packing materials, TGCS has devised a pallet marking procedure to assist shipping area personnel. This procedure shall be followed for all wooden type package assemblies such as crates and pallets made from solid wood, plywood, or other wooden composites. It is not necessary to mark each component of the assembly, only the total assembly. For full details refer to TGCS Engineering Specification **37L8024** available on the

**Internet:** <http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States~Information+for+suppliers>

In summary, each wooden assembly is marked with an abbreviation representing the type of wood and its treatment if any, the assembly part number, the supplier name, and date of manufacture. Considerable additional detail applies.

## 6.3 Markings for Reusable Containers

To ensure compliance with marking regulations, proper classification and to reduce duty payments, all reusable containers must be permanently marked as follows a minimum of one time:

**REUSABLE CONTAINER  
CONTAINER MADE IN XXX**

---



---

Where “XXX” is the full country name in English where the reusable container was made. Examples of these would be Arbo crates for large mainframe computers or reusable plastic over packs used for components.

If the reusable container is not empty, and the reusable container is the immediate container (the innermost level of packaging in which an article will be received by the ultimate purchaser), the reusable container must also indicate the country of origin of the contents. For example, a reusable container made in China which is filled with goods with a country of origin of Thailand must be marked as follows. The first two lines would be permanent and the last line temporary if the container may be used for other items from other countries:

**Reusable Container**  
**Container made in China**  
**Contents made in Thailand**

**Important:** Do not use this marking for packages capable of reuse but which in fact are not reused.

## 6.4 Policy on Use of TGCS Logo on Packaging

Do not routinely use TGCS Logo’s on packaging for items which are not destined for retail type display. Examples: All FRU’s, interplant shipments, shipments to manufacturing areas, and E-Commerce type shipments. In each of these cases the purchase decision has already been made and the logo may only serve to attract theft in distribution. Where marketing oriented package graphics exist for retail purposes these packages will most often be and should be overpacked into plain shipping containers wherein the logo will be concealed and protected during shipment (Example: Options by TGCS). This policy is most critical for targeted items like memory, adapter cards, microprocessors, and other highly attractive commodities. Exceptions to this policy must be made by the Brand Manager. Thus, the use of logo’s on packaging is now the exception rather than the rule.

In cases where the TGCS Logo is used, it must be created from original approved artwork provided by the TGCS Graphic Design Department.

## 7.0 Field Replacement Unit (FRU) Packaging Requirements

This appendix addresses the minimum packaging requirements for FRUs. The following terms are also occasionally used to describe FRU’s and are equivalent:

- Customer Replaceable Unit (CRU)
- Field Service Part
- Spare Part

### 7.1 Applicability

The **minimum** requirements that appear in this appendix have been established for the purpose of achieving damage free delivery. Additional measures may be taken to achieve even higher assurance of damage prevention. Conformance to these requirements is **mandatory** for all shippers of Field Replacement Units (FRUs) distributed to TGCS customers.

---

## 7.2 Field Replacement Unit (FRU) Packaging Checklists

It is recommended that users become familiar with this entire appendix. However, for regular use the entire section may not apply in every situation. Two checklists are provided to direct users to the applicable paragraphs of this appendix depending upon the type of part being prepared for field shipment.

- Table 17 is a checklist with considerations applicable to virtually *all* FRU packages.
- Table 18 is a checklist which addresses special requirements which may apply.

To use the checklists, check each item that applies and refer to the brief description and the references for detailed requirements.

## 7.3 FRU Basic Requirements Checklist

**Table 17. FRU Basic Requirements Checklist.**

The following are minimum requirements which will apply to virtually all shipments of Field Replacement Units (FRUs).

	Description	Requirements	Reference
	<b>Package Design</b>	The package must provide superior product protection but must also be designed with the needs of the customer in mind. The package must be easily handled, unpacked, and repackaged repeatedly in the field to be effective. <b>NO PUZZLES PLEASE!</b> The fewer the pieces the better.	7.7, "FRU Packaging Design Guidelines"
	<b>Density</b>	The smaller the package (for a given part), the better its shipping density will be. In general, <b>smaller is better</b> . Of course, this objective must be balanced by the need for sufficient protective cushioning for fragile parts. The <b>first priority must be to provide sufficient protection</b> ; however, if this can be done with a smaller package then this is preferred. The target density established by international air carriers is 166kg/m <sup>3</sup> (10.4 lbs/ft <sup>3</sup> ) or higher. <b>Important:</b> Using the correct minimum board strength for the primary cartons will ensure that unnecessary overpacking can be avoided.	
	<b>Environment</b>	There are several ways to design environmentally friendly packaging. <ol style="list-style-type: none"> <li>1. Source reduce by increasing the recycled material content in the package</li> <li>2. Reduce the size of the package without compromising protection</li> <li>3. Do not permanently commingle (bond together) dissimilar materials</li> <li>4. Use materials that are widely recycled (corrugated and paper based).</li> <li>5. Reusable packaging should be considered only where a <i>closed loop</i> logistics system is practical, <b>established and repeatable in high volume</b>.</li> </ol>	2.2, "Environmental Packaging"
	<b>Carton Strength</b>	FRU packages must provide extra strength to ensure damage free delivery. Double wall regular slotted containers (RSCs) are recommended for most FRU applications. Heavier duty materials are specified depending on the size and nature of the package. <b>All cartons for FRU's should have the board strength marked on the carton either with a boxmaker's certificate or a similar manner.</b>	4.5, "Minimum Corrugated Board Strength"
	<b>Carton Closure</b>	Use pressure sensitive tape -- <b>3" polypropylene (3M 375)</b> for general use. Gummed water activated tapes (reinforced Kraft) may fail in moist environments and are therefore second choice for FRUs. Express parcel carriers discourage the use of gummed tapes because it impairs the operation of conveyors and slides.	Figure 1

<b>Cushioning</b>	Some commonly used cushioning materials are <i>not effective</i> in the Field Service environment. Examples are low density foam-in-place polyurethane's (less than 0.7 lb/ft <sup>3</sup> ), EPS, and all loose-fill cushioning materials. Materials that may be acceptable for one-way product shipments may be ineffective for FRUs.	7.7, "FRU Packaging Design Guidelines"
<b>Package Testing</b>	All packages for fragile parts must be qualified by lab testing.	3.3, "Package Testing"
<b>Quality Seals</b>	All <i>rigid</i> individual FRU packages must be Quality Sealed by the shipper. Use the printed Q tape for normal cartons and the tamper proof Q label for plastic containers. Seal the package such that touching the part requires breaking the seal. <i>Never</i> use Q seals on bulk packages.	8.0, "Quality Seal Program"
<b>Consistency</b>	Once the packaging method is determined for a particular item it is essential to consistently apply that same packaging specification at all sources for that part number (plants, suppliers, vendors, etc.)	7.5, "FRU Classification System*"
* Note: The FRU Classification System only applies to the Mechanicsburg, PA parts distribution center.		

## 7.4 FRU Special Requirements Checklist

Table 18. FRU Special Requirements Checklist.

Check ALL that apply and refer to the brief description that follows below and the paragraph referenced for detailed requirements.

Description	Requirements	Reference
<b>Fragile Parts</b>	Any part which requires special packaging to prevent damage is considered fragile. All fragile parts must be <i>individually</i> packaged by the shipper in <i>rigid</i> containers. These are also known as <i>List 1</i> parts.	7.5, "FRU Classification System*"
<b>Electronic Parts</b>	Many electronic components are susceptible to damage due to electrostatic discharge (ESD) and must be packaged <i>individually</i> by the shipper in ESD protective packaging. All packaging materials for ESD-sensitive items must be TGCS-approved. Generally, there must be a static dissipative material closest to the ESD sensitive part, one conductive or shielding layer used to surround the ESD sensitive item and an ESD warning label in the package structure. There must not be any static generating materials in the package, even if they are outside of the shielding layer.	3.2, "Electrostatic Discharge (ESD)"
<b>Moisture Sensitive</b>	Components or assemblies which are subject to corrosion due to moisture must be packaged in <i>barrier bags</i> (metal lined) with desiccant hermetically sealed inside. If desiccant cannot be used <i>do not</i> seal the bag hermetically since this may trap moisture inside and actually cause corrosion.	3.1, "Moisture"
<b>Heavy Parts</b>	Packages which exceed 12kg (26.4 lbs.) are considered heavy. Special design, marking, and palletization requirements apply to all heavy packages to ensure safe handling in the field. Bulky packages regardless of weight will benefit from these requirements as well (use judgment). The target weight limit for manually handled packages is 16 kg (35 lbs.).	9.0, "Requirements for Heavy Packages"
<b>Non-fragile Parts</b>	Parts which can be effectively sent bulk from the shipper to the Distribution Center (such as Mechanicsburg, Amsterdam, or Singapore) and be safely repackaged in convenient quantities for operational purposes in standard packaging materials. These are known as <i>List 2</i> parts. Parts individually packaged by the shipper in <i>flexible</i> packaging are known as <i>List 4</i> parts.	7.5, "FRU Classification System*"

	<b>Hardware Items</b>	Parts which can be handled safely with little or no packaging aside from packaging used for convenience alone. These are to be packaged in bulk fashion at all stages in the Field Service System. Examples are screws, grommets, spacers, and so on. These are known as <i>List 3</i> parts.	7.5, "FRU Classification System*"
	<b>Liquids and Chemicals</b>	Some supplies such as lubricants, paint, cleaning solvents, and so on must be packaged to meet strict Government regulations. <b><u>Performance Oriented Packaging</u></b> must be used for these items to prevent leakage.	See the URL link shown in 1.3, "Responsibility" or <a href="#">click here</a>
	<b>Other</b>	Contact Packaging Engineering for assistance on parts which have special requirements not listed in this checklist.	

## 7.5 FRU Classification

All FRUs should be classified and assigned to one of four (4) lists before shipments begin. Packaging requirements differ for each list. This system is unique to the Mechanicsburg parts distribution center. At present, it does not apply to Amsterdam and Singapore. For those locations, single unit packaging is the default method for all parts aside from some bulk hardware items.

If a part is not classified prior to shipment it will be assigned a pack code upon receipt in Mechanicsburg based on how it is packaged the first time. All subsequent shipments must be packed identically, assuming that proper methods were employed on the original shipment. To determine if a given part has been previously established on a particular list contact your TGCS Procurement Representative.

Table 19. FRU Classification System

List	Definition	Requirements	Examples
1	All parts which are <b><i>fragile</i></b> , ESD sensitive or already individually packaged in rigid containers.  Note: List 1 is the default in case the proper classification is in question.	All <b><i>fragile</i></b> parts regardless of value must be on List 1. Parts must be individually packaged in rigid containers (usually in plain Kraft unprinted corrugated cartons) by the shipping location. The parts must be packaged in a manner suitable for reshipment and multiple redistribution's in the field network without additional packing. The packages must be Q Sealed and bar-code labeled (with date) by the original shipper in accordance with global labeling requirements. ESD sensitive items must have an ESD warning label sealing the package component that is providing the ESD protection.	Cards, boards, monitors, modules, printers, power supplies, disk drives, and similar items.
2	All <b><i>non-fragile</i></b> parts which do not require individual packaging for shipment to the field but which may be repackaged in convenient quantities (1 or more) by Mechanicsburg for their own purposes.	All List 2 parts which are repackaged individually in rigid packages (by Mbg) must be Q sealed and bar-code labeled (with date) by Mechanicsburg. List 2 is a list of all part numbers meeting this criteria which have been assigned alpha series pack codes (3 letters) by Mechanicsburg.	Durable plastic parts, metal brackets, and similar items.
3	<b><i>Non-fragile</i></b> items including hardware items which require little, if any physical protection.	These parts are bulk packaged at all stages in the field parts network List 3 parts are not Q sealed or dated but may be repackaged by Mechanicsburg in convenient quantities for field stocking purposes.  Only Mechanicsburg and their field stock locations are authorized to assign the List 3 pack code (000).	Nuts, bolts, screws, caps, buttons, grommets, spacers, gears, knobs, and similar items.

4	Parts which are individually packaged by the original shipper in <i>flexible materials</i> (bags, pouches, envelopes, and so on).	The individually packed parts are over packed in bulk fashion and sent to Mechanicsburg. The standard FRU Bar-code label should be used for both the individual package (bag) and the over pack. List 4 parts do not require a Q seal.	Cables, power cords, and similar items.
---	---	--	---

## 7.6 Special FRU Marking and Labeling

For all labeling requirements related to identification of the contents, country of origin, and similar information provided on the product package label refer to Global Labeling Implementation Guide, Volume 6, FRU Product Labels, found at **Internet**:

<http://www-03.tgcs.com/procurement/proweb.nsf/ContentDocsByTitle/United+States-Global+labeling+guides?OpenDocument&Parent=Information+for+suppliers>.

Following are labels which may need to be used for other instructional purposes.

- Parts which are individually packaged for production, but are not intended to be used for field replacement purposes should be identified and marked, **"Manufacturing Use Only; Container not Intended for FRU Shipment."**
- Over packs which contain multiple single unit packages may be labeled with a **"Package contains multiple orders"** message. Note: Multiple orders should not be combined for shipment to TGCS Manufacturing plants.
- Interior packages which are part of a larger cushioned assembly should be marked **"Interior package, not suitable for shipment alone"**. This will help prevent misuse of these interior packages in the field. If only the inner package with no cushioning was shipped, damage would be certain.
- Parts which are individually packaged for sale to consumers in certain countries may need additional marking or labeling. See 10.6, "Export Shipments—Special Labeling Requirements".

## 7.7 Packaging Design Guidelines

The **Design Guide** (tables 20 and 21) provide recommendations in three areas which are applicable to FRU and / or product packaging as applicable:

1. Best Methods (these **SHOULD** be used)
2. Acceptable Methods (these **MAY** be used)
3. Unacceptable Methods (these **SHOULD NOT** be used)

Table 20. Design Guide: Suggested Packaging Methods by Commodity

Commodity	Best	Acceptable	Unacceptable
-----------	------	------------	--------------

<b>Cards and Boards</b>	<ul style="list-style-type: none"> <li>• ESD Shielding bag inside of a rigid corrugated container and wrapped in a way to prevent movement in the carton.</li> <li>• Static dissipative blister (clamshell) inside a rigid conductive lined carton (E-flute or chipboard for retail, heavier materials for FRUs).</li> </ul>	<ul style="list-style-type: none"> <li>• The enhanced hinged mailer style package (pizza box) with ESD shielding bag and picture frame style foam inserts (not glued in). See figure 7 on page 41.</li> <li>• The Unit Card Box for parts that fit the container properly (no wasted space, no tall components).</li> </ul>	<ul style="list-style-type: none"> <li>• Commingled EPU foam on corrugated (or foam-fold) style containers.</li> <li>• Any container with non-ESD materials.</li> <li>• Static dissipative blister packs inside regular non-ESD type cartons.</li> <li>• Any container with commingled (bonded together) foam and corrugate.</li> <li>• Any flexible package without a rigid outer shell</li> </ul>
<b>Disk Drives</b>	Packages made with vacuum formed cushions made from 100% recycled HDPE.	<ul style="list-style-type: none"> <li>• Packages using fabricated EPE or EPU foam cushions. Environmental problems are offset by low cost and good performance.</li> </ul>	Any type of suspension style package. These are favored by customers but they have not passed our shock test for these items. Still worth considering for less fragile commodities of similar size.
<b>Monitors</b>	<ul style="list-style-type: none"> <li>• Resilient cushions of EPP, EPE, or Arcel™ designed in a top/bottom configuration for FRUs (fabricated for low volume, molded for high volume).</li> <li>• Molded Arcel for high volume (bulk palletization) direct product shipments to dealers. Use NEPS to reduce brittleness of the foam.</li> </ul>	<ul style="list-style-type: none"> <li>• EPS for FRUs but designed with <i>constant wall thickness</i> approach to minimize brittleness.</li> </ul>	<ul style="list-style-type: none"> <li>• Any foam-in-place cushion (exception: Low volume refurbishment processes)</li> <li>• Any package utilizing more than two cushions (puzzles)</li> </ul>
<b>Desktop Printers</b>	Arcel end caps for cushioning but only if corrugated or pulp is proven to be insufficient.		Any polyurethane type Foam-in-Place cushion (exception: Low volume refurbishment processes)
<b>Keyboards</b>	Corrugated die-cut packages		Foam-in-Place or any loose dunnage (wraps, fillers, etc.)
<b>Power Supplies</b>	2 piece urethane cushions for lighter weight items and EPE for heavier items.		Foam-in-Place or any loose dunnage
<b>Software</b>	The Software Packaging Design Guide is on the Intranet: <a href="http://w3-03.tgcs.com/software/sdf/w3sdf.nsf/webpages/Publications+Services">http://w3-03.tgcs.com/software/sdf/w3sdf.nsf/webpages/Publications+Services</a>		
<b>Note:</b> The above are general guidelines only and packages should be designed and tested by qualified individuals.			

Table 21. Design Guide: Suggested Packaging Materials Within Types.

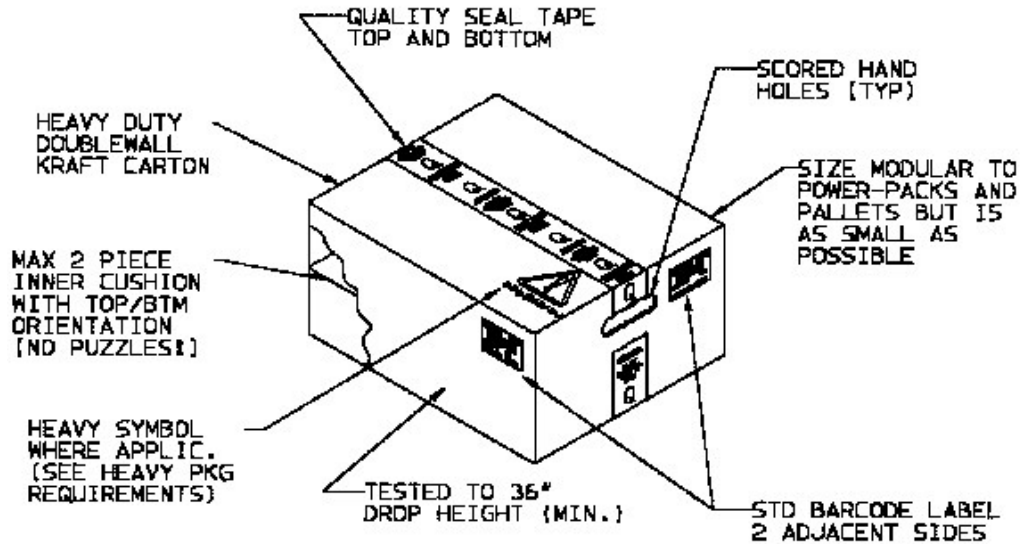
This provides recommendations for selecting among various types of miscellaneous packaging materials and methods.

<b>Material</b>	<b>Best</b>	<b>Acceptable</b>	<b>Unacceptable</b>
-----------------	-------------	-------------------	---------------------

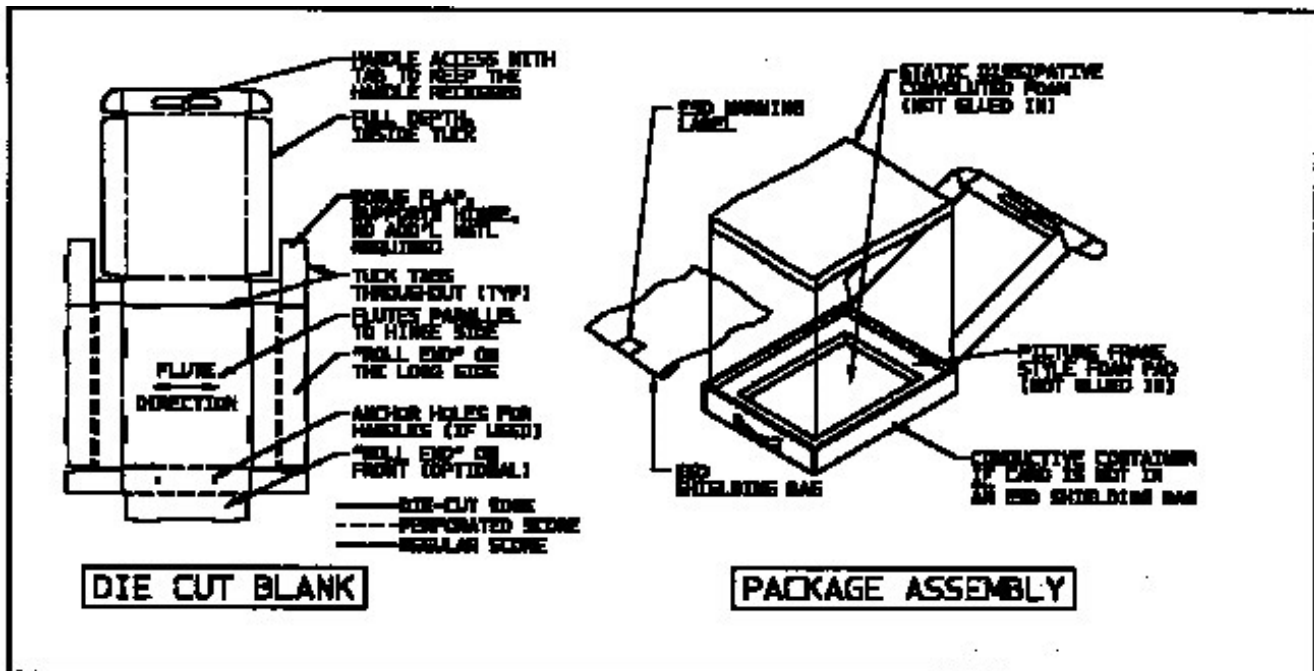
<b>Edge Protectors</b>	Full length pressed fiber type (Angleboard™, V-board™ or similar) where the same piece extends under both bands. They are effective for use under bands (horizontally), for aligning the corners of stacked boxes on pallets (vertically), and for fortifying the stacking strength of cartons. Specify uncoated materials (no metal or clay coat) for environmental benefits.	Plastic banding clips that require the banding to be threaded through the clip to keep it intact.	Metal edge protectors. These are subject to being bent and may present a safety hazard (sharp edges).  Other plastic banding clips. These are less desirable since they are more prone to becoming dislodged and lost.  Scrap pieces of corrugated fiberboard.
<b>Banding</b>	½" or wider steel for loads of 364 kg (800 lbs.) or more and ½" or wider polyester for loads less than 364 kg (800 lbs.). Closure to be accomplished with either crimp or heat seal.	Nylon or polypropylene for use on lightweight individual cartons (automated processes).	Filament tape, rope, twine, and all other plastic banding materials Also, buckle style bands unless used as part of a field kit for returns.
<b>Stretch Wrap</b>	Machine applied using " <i>roping technique</i> " (film bundled and tied to pallet) with at least 50% pre-stretch		All forms of hand applied stretch wrap
<b>Carton Closure</b>	<ul style="list-style-type: none"> <li>• <i>Heavy Duty Polypropylene tape.</i></li> <li>• <i>72 mm (3" nominal) wide for all applications</i></li> </ul>	76 mm (3") wide Kraft gummed reinforced tape (water activated)	<ul style="list-style-type: none"> <li>• Masking tape and all other non-reinforced paper tapes</li> <li>• Staples, stitches, and similar if they must be torn open to access the contents of the package</li> </ul>
<b>Dunnage</b>	<ul style="list-style-type: none"> <li>• Geo-Ami™ expanded paper</li> <li>• Pad Pak™ crimped paper system</li> </ul>	<ul style="list-style-type: none"> <li>• Recycled bubble wrap</li> <li>• Kimpack™ or Kushion Kraft™</li> <li>• Air filled flexible plastic shapes</li> <li>• Clean newsprint wadded</li> </ul>	<ul style="list-style-type: none"> <li>• All forms of <i>free flowing</i> cushioning materials (<i>plastic or paper peanuts, popcorn,</i> and similar materials).</li> <li>• All polyurethane foam-in-place materials.</li> <li>• Printed newspapers.</li> </ul>
<b>Corrugated Clips</b>	Use a new design patented by TGCS engineers. Part Number 37L0511.	Any other Tobutsu™ clip.	

## 7.8 FRU Package Design Approval

Upon passing the required performance tests (see 3.3, "Package Testing") it is highly recommended that packages for critical FRUs be reviewed and approved by a Customer Engineer who specializes in that product family. Approval of the Quality and Engineering representatives is also highly recommended.



**Figure 6. Anatomy of a FRU Package.**  
The main elements of a properly prepared FRU package.



**Figure 7. Enhanced "Pizza Box" Style Carton.**  
Recommended for larger boards. For smaller sizes the handle may be eliminated.

## 8.0 Quality Seal Program

All shippers of items individually packaged in rigid containers are required to seal the containers using one of two standard types of sealing materials. FRU's are sealed with Quality Seal tape or seals (commonly known as *Q Seals or Q Tape*) and retail packages are sealed with *TGCS Logo tape or seals*.

**Note:** This program is in the process of being redesigned which will replace all "Q" and TGCS logo materials with a standard set of color coded seals and tape which will include a padlock graphical symbol to indicate "locked" and "sealed". When complete, this section will be revised accordingly. Users of



---

existing materials are advised not to stock up too much on them to avoid excessive scrap or a long delay in implementing the new program due to excess stock. A generous but not indefinite transition period will be allowed.

## 8.1 Quality Seals, Requirements

1. The quality seals (or Q seals or QQ seals) are to be applied to all **List One** parts by the original shipper and to individually repackaged **List Two** parts by TGCS Mechanicsburg. **List Three** and **List Four** parts do not require quality seals.
2. The quality seals are to be used **only** for parts which are individually packaged in *rigid* containers for shipment. They **must not** be used for sealing over packs which may contain multiple sealed single unit packages. TGCS considers all "Q" sealed packages to be **individual** packages and will stock and disburse them as such.
3. Seal cartons in the normal manner using the appropriate Quality seal or recommended "Q" tape.
4. Corrugated cartons should be sealed with specified **tape** materials (see Figure 12).
5. The tamper evident polyester labels (see Figure 9) are for use on plastic containers. They can also be used on corrugated cartons in conjunction with carton sealing tape.
6. TGCS Logo Seals or Logo Tape are to be used only for **retail** packages.
7. The **Do Not Reseal** seal (see Figure 11) is to be used only for parts which are likely to be damaged if not installed the very first time. Parts secured with these seals must be returned to the plant directly if the seal is broken. These must not be resealed by Customer Engineers and returned to stock. The application of DNR labels is strictly controlled and must be approved by Service Delivery Headquarters at the request of the applicable plant Quality Assurance organization.  
**Note:** Parts sealed with a DNR label do not also need to carry a Q seal.
8. Other types of tamper evident seals that are developed for specific products should not be used within the Sales & Services Network. These only confuse our Customer Engineers who are expecting all parts to carry the approved Q seals or DNR seals.
9. Quality seals no longer need to carry plant initials or codes.

The "Q" seal is meant to imply **"I guarantee the quality and of this part "** as the person applying the seal makes it, packs it, and seals it. The seal should be applied by whomever is responsible for making that generic statement for a given part. It also conveys confidence to the user that the part is "factory fresh".

## 8.2 Q Seals and Logo Seals, Application Guidelines

A properly applied seal:

- will survive normal handling without breaking prematurely
  - is readily visible
  - will seal all openings that the part can fit through
  - breaks permanently when unpacking the part
  - cannot be replaced after breaking without detection
  - ensures that the part inside is truly **factory fresh** and of high quality
-

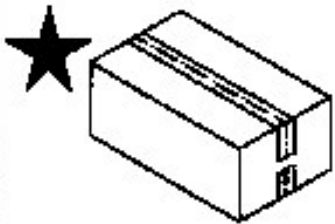



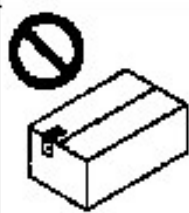
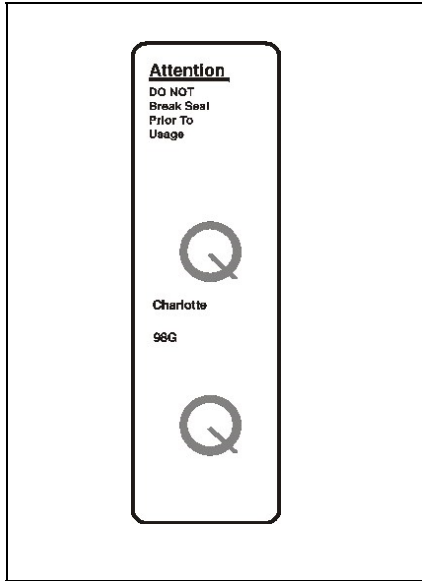
	CORRECT	ACCEPTABLE		WRONG	
CARTONS	 <p>Q TAPE APPLIED NORMALLY. NO Q LABELS REQUIRED.</p>	 <p>PLAIN TAPE PLUS TWO Q SEALS (LESS VISIBLE)</p>	 <p>PLAIN TAPE PLUS TWO Q SEALS (COSTLY)</p>	 <p>Q MATL WASTED ON NON-CLOSURE AREAS</p>	 <p>Q SEAL IS SOLE METHOD OF CLOSURE</p>

Figure 8. Placement of Q (or “QQ”) Seals on normal cartons

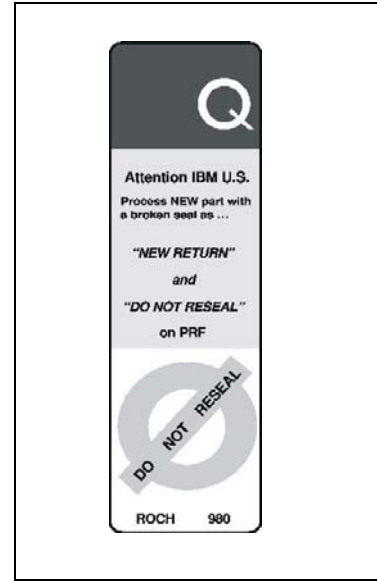
### 8.3 Suggested Sources of Tamper Evident Seals

TGCS has established a few sources for Q Seals (see Table 22). In the US, these materials should be procured from our national distributor **xpedx**. Expect 2 week delivery on orders from stock; new items (first run off of a new printing plate) may take 8-10 weeks. Some suppliers can combine orders and break cases for convenience. Expertise is critical only in the manufacture of the tamper-evident seals and is less important on the tape materials.



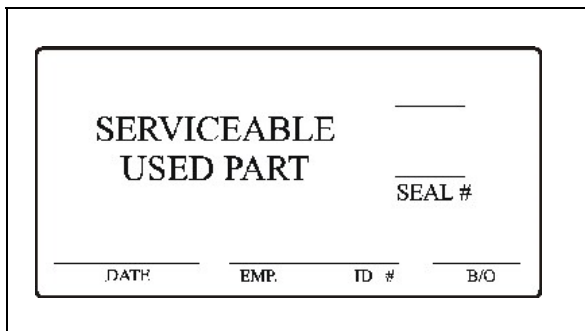
**Figure 9. Tamper Evident Q Seal for FRUs - P/N 92F6934.**

For use on plastic containers. Note: Identification of the plant or supplier as shown above is no longer mandatory.



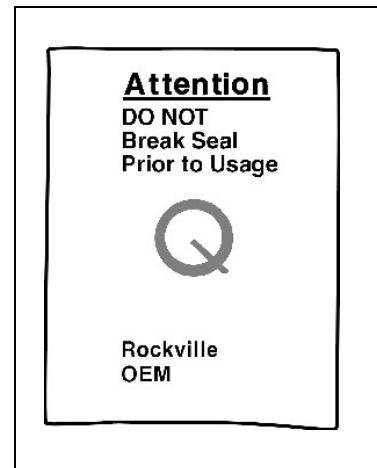
**Figure 11. Tamper Evident "Do Not Reseal" Seal for FRUs - P/N 92F6937.**

Use of this seal tells the CE not to return this part to stock if the seal is broken for any reason. Note: Identification of the plant or supplier as shown above is no longer mandatory.



**Figure 10. Customer Engineer's Reseal for FRUs (7334885).**

CE's must reseal FRU containers that they have opened but did not use the part and are intending to return to stock. Their signature guarantees that the part is still good quality. See also Corporate Standard C-S 0-5103-007 *Reutilization of Parts in TGCS Products* for full details on the use of these labels.



**Figure 12. Quality Tape (or "Q Tape") for FRU Cartons.**

3" Pressure Sensitive Tape - P/N 92F6936, 3" Gummed Reinforced Kraft Tape - P/N 92F6935. Shown actual size. **Note:** Identification of the plant or supplier as shown above is no longer mandatory.

**Table 22. Sources for Quality Seals and TGCS Logo Seals.**

This table lists the commonly used tapes & seals for providing tamper evident seals on packages. Each material may be used only for the application noted.

Material Description	Application		Part Number	Suggested Sources				
	Fin. Goods	FRUs		XP	PF	3M	CGM	4P
Tamper Evident <i>Q Label</i> for Plastic Packages		*	92F6934	*	*			
Tamper Evident <i>Sealed for Quality by TGCS</i> seal	*		13H6475	*	*			
Tamper Evident <i>Do Not Reseal</i> seal		*	92F6937	*	*			
Tamper Evident <i>TGCS Logo</i> seal	*		92F8574	*	*			
3" Kraft Reinforced <i>Q Tape</i>		*	92F6935	*				
Padlock Internal Tamper Seal for Systems	*						*	
7/8" x 180' Pressure Sensitive <i>Q Tape</i>		*	33G6341	*		*		*
3" x 180' Pressure Sensitive <i>Q Tape</i>		*	92F6936	*		*		*
3" x 3000' Pressure Sensitive <i>TGCS LOGO</i> Tape	*		74F5699	*		*		*
3" x 180' Pressure Sensitive <i>TGCS LOGO</i> Tape	*		74F5698	*		*		*

Code	GEO / Loc	Supplier	City, State	Website / Contact Information
XP	N. America	xpedx	Morrisville, NC	<a href="http://www.xpedx.com">http://www.xpedx.com</a>
PF	Europe	Profix Benelux BV	Amsterdam, NL	Email: <a href="mailto:info@profix-international.nl">info@profix-international.nl</a>
3M	Global	3M Corporation	St. Paul, MN	<a href="http://www.3m.com">http://www.3m.com</a>
CGM	Global	CGM Security Solutions	Somerset, NJ	<a href="http://www.cgmsecuritysolutions.com">http://www.cgmsecuritysolutions.com</a>
4P	Asia	Four Pillars	Hong Kong	<a href="http://www.allproducts.com/manufacture10/fourpillars/">http://www.allproducts.com/manufacture10/fourpillars/</a>

## 9.0 Requirements for Heavy Packages

### 9.1 Summarizing

1. Manually handled packages in excess of 12kg (26 lbs.) gross weight are considered *heavy* and must carry one of the four *International Caution Symbols* which illustrate the proper lifting techniques for handling heavy packages. (see [Table 23](#) ).

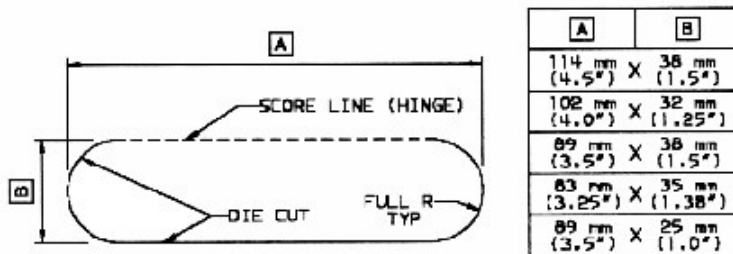
2. Packaged FRUs and products weighing less than 32 kg (70 lbs.) should not be palletized individually *for shipment*. Pallets may be used for internal handling, but do not tender the shipment to the carrier with the pallet. Some express carriers can accept packages up to 68 kg (150 lbs) without pallets. Eliminating the pallet on items like this greatly reduces shipping cost.
3. The acceptable weight limit for inbound parts packages (bound for TGCS Manufacturing) will remain at 16 kg (35 lbs.).
4. Heavy packages should include handles, hand grips, or hand holes to facilitate manual handling (see [Figure 13](#) ) but these must be reinforced to ensure no tear out during handling.

## 9.2 Heavy Packages, Handling Features

Heavy packages should be designed with features to improve safety and convenience when handling. This means **hand holes or integral handles** for packages in the 12kg - 55 kg weight range (26 - 121 lbs.) and others deemed to be **bulky** (use judgment).

Hand holes should be die cut with a scored top line so that the material remains in the hole. This minimizes contamination and improves gripping comfort (see [Figure 13](#)). Fortifying the hole is usually necessary to prevent the carton from ripping out when lifting. Reinforcement in the form of filament tape (Sesame Tape™ or similar) imbedded in the corrugated board is highly recommended for this purpose. Interior cushions should also be designed to align with the hand hole. It is also very important that interior packing materials do not interfere with the hand hole.

Plastic or fabric handles may be used but should be recessed if possible when not in use to prevent snagging on conveyors.



**Figure 13. Typical Hand Hole Design.**

Dimensions vary depending on the size and material of the carton and the equipment used to make it. Your carton supplier will usually select one of the sizes listed.

## 9.3 Heavy Packages, Marking and Labeling

**Table 23. Heavy Symbols, Application Requirements**

Item	Detailed Requirements
Application Options	<p>Preprint the symbols on cartons if possible using the same colors as other graphics on the package. However, when this is impractical you should use one of the peel-n-stick (<i>3M Tape Pad</i>) labels instead. We discourage the use of ink stamps for this application.</p> <p><b>Note:</b> You may preprint the symbol with the <b>actual weight</b> (vs. the weight range) only if you are certain that the weight is exact and unchanging for that package. Seek assistance from the TGCS Graphics Department for proper scaling of the symbols for various containers.</p>



<b>Non-Castered "Build to Order" (BTO) Products</b>	12-18 kg (26.4-39.6 lbs.)																				
	18-32 kg (39.7-70.4 lbs.)																				
	32-55 kg (70.5-121 lbs.)																				
	55-91 kg (122-200 lbs.)																				
	Over 91 kg (Over 200 lbs.)																				
FRU is <12kg (26 lbs.) but is <b>bulky</b> (use judgment)																					
FRU is 12-18 kg and has <b>2 sides</b> >762mm (30")																					
FRU is 18-32 kg and has <b>2 sides</b> >762mm (30")																					
<b>Non-Castered "Customer Setup" (CSU) Products, "Authorized Assembler Program" (AAP) Channels, "Build to Plan" (BTP) Products</b>	0-12 kg (0-26.3 lbs.)																				
	12-18 kg (26.4-39.6 lbs.)																				
	18-32 kg (39.7-70.4 lbs.)																				
	32-55 kg (70.5-121 lbs.)																				
	55-91 kg (122-200 lbs.)																				
Over 91 kg (Over 200 lbs.)																					

**Note:**

<sup>1</sup> Determine the weight of the package without pallet to find the appropriate weight range. If the package exceeds 32 kg (70.5 lbs.) then a pallet will likely be used, in this case add the weight of the pallet to determine which marking is used.

**LEGEND**

- A.** Bulk palletization (multiple units on one pallet), *no individual pallets*, ship singles without a pallet.
- B.** Bulk palletization, ship single packages with an individual pallet the same size as the package.
- C.** Use only individual pallets (*removable type only*) same Length x Width as the package.
- D.** Use only individual pallets (*permanent or removable type*) same Length x Width as the package.
- E.** Heavy symbol *not required* for this weight range and shipment type. **F.** Heavy symbol with 12-18 kg weight range (ref TGCS PN 92F6939).
- G.** Heavy symbol, 18-32 kg weight range, *2-person lift symbol* (ref TGCS PN 92F6940).
- H.** Heavy symbol, 32-55 kg weight range, *3-person lift symbol* (ref TGCS PN 92F6941).
- I.** Heavy symbol, over 55 kg weight range, *fork lift symbol* (ref TGCS PN 92F6942).
- J.** Hand grips (hand holes or handles) must be included in the package.

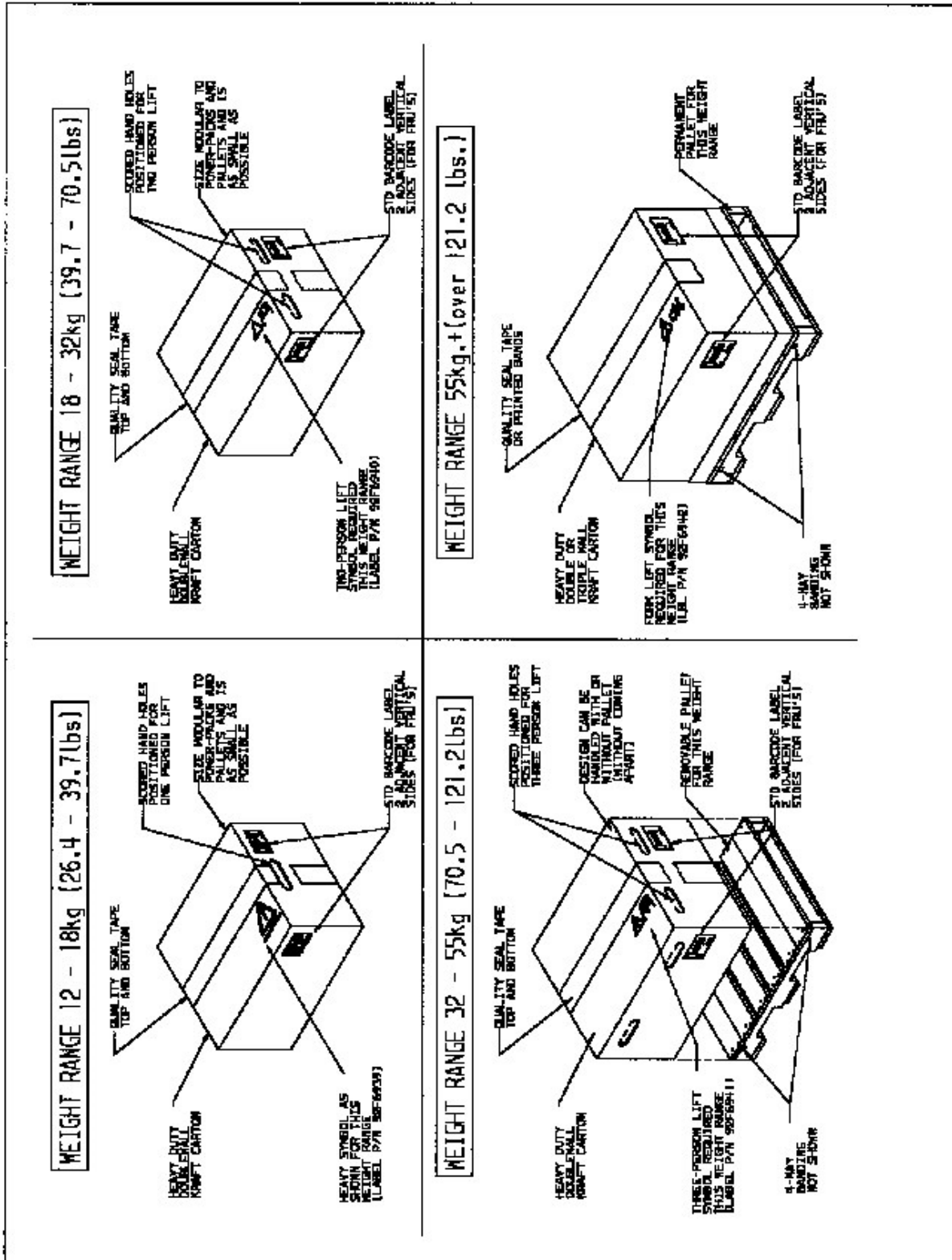


Figure 14. Illustrated Heavy FRU and Product Package Requirements



## 10.0 Export

### 10.1 Core Shipping Procedural Instructions (SPI) for Packaging

Each country has unique Shipping Procedural Instructions (SPI) that include packaging requirements. Some of the general and special packaging requirements and recommendations are summarized below. These are the most important packaging related requirements which will ensure smooth clearance through Customs for any country and also includes a reminder of some of the more important packaging quality considerations applicable to all export shipments. Deviations from these core packaging requirements may be requested but must be approved by TGCS Procurement representatives. See also section 5.4, “Key Dimensions for Transportation Efficiency”.

*Intranet:* <https://www-03.tgcs.com/procurement/wwd/spi/globalspis.nsf>

### 10.2 Export Shipments — General Packaging Requirements

International shipments require the very best, most durable packaging designs and materials in order to survive the journey - up to and including wooden crating, moisture barriers, and other heavy duty methods.

- Ocean Shipments (non-containerized) require:
  - Wooden crates, full containment, no wire bound or open crating
  - Moisture protection, metal barrier bags hermetically sealed with desiccant.
- Ocean Shipments (containerized) should have:
  - Skids or pallets with double wall (minimum) corrugated fiberboard unit load shippers (ULS) or machine shrouds.
  - Moisture protection: VCI bags or wraps required for sheet metal parts and hermetically sealed aluminized barrier bags with desiccant for items containing disk drives.
  - Blocking, bracing or dunnage (including inflatable) to restrict movements of the items inside the ocean container. Repetitive impacts caused by wave action can be very destructive if voids between pallet loads are not filled correctly.
- Surface shipment of castered machines on casters (without a pallet) is only allowed in or between the **USA** and **Canada**. Padded van “mover service” style transportation is required to do this.
- Air Shipments require:
  - Bulk: Skids or pallets with double wall (minimum) corrugate ULSs or machine shrouds.
  - Individual Cartons: No pallet or skid if less than 32 kg (70 lbs.). Use double wall minimum cartons and sealing tape applied in the “H” style top and bottom.

### 10.3 Export Shipments — Proper Case Preparation

- Weights and dimensions must be in metric units (cm, kg); imperial units may also be provided (inches/pounds) as supplemental information.
-

- Old labels and markings already used on packing material must be removed or permanently and indelibly covered up if they do not apply to the current shipment or are unreadable.
- Palletize/unitize any container or over pack that exceeds 32 kg (70 lbs) unless specifically exempted by a particular carrier. Conversely, definitely do NOT palletize any single carton under 32 kg (70 lbs). Check the size and weight limits for the carrier you intend to use and try to avoid the use of a pallet if you can, since this greatly reduces dimensional weight and shipping costs.
- Always palletize power-packs or any carton that consists of two or more pieces (example: tube and cap style) to build the package that is used.
- Palletized loads should be secured to the pallet using a minimum of machine applied stretch wrap plus 2-way banding. If using hand applied stretch wrap, use 4-way banding. Tie the stretch wrap to the pallet like a rope at the base.
- Minimize the package size and overall shipment dimensions. Excess void areas should be eliminated (i.e. do not fill excess void areas with unnecessary dunnage), instead reduce package size. This also reduces dimensional weight and therefore reduces shipping costs.
- Use heavy duty double-wall cartons taped on all seams in the "H" style top and bottom.
- Extremely heavy or top-heavy items should carry appropriate symbols indicating the weight and center of gravity respectively.
- Extraneous labels or markings should be minimized. Where deemed necessary for handling safety, use only International handling symbols.
- Do not routinely use labels such as "fragile", "top load only", etc... , in an attempt to make up for an improperly prepared or weak package.

## 10.4 Export Shipments — Prohibited or Restricted Materials

All shipments, regardless of destination, with packaging components made of solid wood (e.g., skids, pallets, crates) must meet the minimum requirements listed below which are derived from regulations typically being adopted in many countries. For complete details on the frequently changing regulations affecting solid wood packaging go to **Internet URL** <http://www.aphis.usda.gov/ppq/wpm/> or <http://www.nwpc.com> and click on “Tech Talks” or contact an TGCS representative of the foreign trade department or Global Logistics Operations Support.

**Intranet:** <http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkge-hot>

See also section 6.2, “Wooden Package Assembly Markings”.

<p style="text-align: center;"><b>TGCS Solid Wood Requirements</b> <b>(Non-Manufactured Wood)</b></p>	<p style="text-align: center;"><b>Coniferous and Non-Coniferous Species</b></p>
<p>The wood shall be stripped of its bark and shall be free from grub holes defined as those which are larger than 3mm across, and apparently free of live plant pests; <b>[and]</b></p>	<p>Required</p>
<p>A. The wood has undergone a heat treatment to achieve a minimum wood core temperature of 56 degrees centigrade (133F) for 30 minutes; <b>[or]</b></p>	<p>One of these additional treatments <b>is required.</b></p>
<p>B. The wood has been fumigated* with the appropriate chemicals. In the government issued plant health <b>certificate</b> the active agent, lowest temperature of the wood, amount (grams/square meter) and time of exposure (in hours) shall be stated.</p>	

* <b>Note:</b> It is TGCS's policy to seek a remedy other than fumigation due to safety and environmental concerns.	
<b>Reminder: Other Prohibited or Restricted Materials</b>	<b>Reference</b>
Paper based or wood based materials procured from old growth or temperate rainforests	2.2
Packaging made from Polyvinyl Chloride (PVC) plastic	2.2
Materials which use chlorofluorocarbons (CFCs) or fully halogenated chlorofluorocarbons (HCFCs)	1041126
Materials with <a href="#">sum concentration of &gt;100ppm of Cadmium, Hexavalent Chromium, Mercury, Lead or Brominated Flame Retardants (PBB's and PBDE's)</a>	5897660
Loose fill type cushioning regardless of the type of raw material used (prohibited due to scattering effect)	Table 3
Permanently commingled materials (ex: foam glued to corrugate). Exception: Reusable Packaging Designs	Table 3

## 10.5 Export Shipments — Packing Consolidations

In general, keep items for a specific order together in a single package, if possible, to prevent portions of the order from being lost. Packing consolidations which mix any of the following into one package should not be done. When in doubt, pack separately to avoid any potential problems in this regard.

Orders must be packed, invoiced and shipped separately from each other by:

- "Ship To" Code
- "Invoice to" Country
- Method of transportation (air, ocean, etc...)
- Product Code / Type
- Division
- Purchase Order Number
- Emergency identification code which applies (e.g. Code A shipments).
- Service Level (e.g. 1, 2, 3)
- Type of shipment (regular, temporary export, hazardous material etc...)
- Miscellaneous Equipment Specifications (MES) Orders, Field Change Shipping Instruction (FCSI), Field Bill of Material (FBM), Machines, and any specific requests.
- Security Shipments

## 10.6 Export Shipments — Special Marking Requirements

Additional marking requirements are identified in TGCS Corporate Standard *C-S 1-1120-000 Graphics-Basic Packaging, Labeling and Imprinting*. **Intranet:**

<http://w3.tgcs.com/isc/distribution/w3wwdams.nsf/alldocsbytitle/pkg-cs11120000>

## Appendix A. Improper Packaging Report

The improper packaging report is an important means of communication within TGCS. Locations should complete it upon receipt of nonconforming shipments and forward to:

1. The location Packaging Coordinator who provides additional information as necessary and formulates a recommendation for TGCS Purchasing or the Interplant Coordinator to act upon, and/or
2. TGCS Purchasing

Note: Some locations may have automated this process using a different format. This is acceptable..

---

<b>TGCS Improper Packaging Report</b>				
TO	Buyer / Improper Pkg Report Coordinator	Buyer Code	Dept..	Date
Purchase Order No.:		Part Number:		Quantity:
Supplier Name:		Supplier Number:		Lot Number:
Number of Cartons:		Photo Attached: ( ) Yes, ( ) No		AI Number:
Carrier Name:		AWB/Pro. Number:		Received Yr/Mo/Day:

**The following packaging related infractions were found. Please take action within 24 hours to correct the problem and confirm with TGCS Procurement or Receiving:**

PALLET	CONTAINER MARKING	PACKING LIST	INNER CONTAINER
1. q Wrong Size (bad fit)	19. q Too Many Labels	34. q Missing	46. q Lowest Level Pkg.
2. q Damaged Deck Board	20. q Quantity Missing	35. q Inside Carton only	47. q Labels Missing
3. q Weight Over 2000 lbs.	21. q Quantity Incorrect	36. q Quantity Missing	
4. q Exposed Nails, Etc	22. q P/N Missing	37. q Quantity Incorrect	
5. q Containers Overhang	23. q P/N Incorrect	38. q P/N Missing	
6. q Nonstandard Pallet	24. q PO # Missing	39. q P/N Incorrect	
7. q Not Palletized	25. q PO # Incorrect	40. q PO # Missing	
	26. q Week Code Missing	41. q PO # Incorrect	50. q None
<b>CONTAINER</b>			
8. q Crushed	27. q Labels Missing	42. q Week Code Missing	51. q Broken
9. q Sides Damaged/Fork Lift inconsistent with Container	28. q No Country of Origin or is inconsistent with Container	43. q No Country of Origin or is inconsistent with Container	52. q Loose inconsistent with packing list
10. q Exposed Parts	53. q Improper		
11. q Contents Damaged	29. q Plant of Manuf. Missing	44. q No Plant of Manuf.	
12. q Weight Over 16 kg (35 lb.)	30. q Bar Code Missing/Wrong	45. q No "Invoice From"	
13. q Used (Old) Containers	31. q (AI) Auto. Identic. Missing	Time to Fill Out this Report	
q Wrong Size for Item	32. q Tag Label Missing		_____ mins. 14.
15. q Not Sealed	33. q Tag Wrong Address		
16. q No Edge Protectors			
17. q Wet/Water Damage			
18. q Staples/Metal Fasteners			

**Special Comments**

**Disposition**

**Action Taken (Within 24 Hours):**

Supplier Contacted on Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

---

**End of Document**

---