



HP OEM/ODM Packaging Requirements



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1.0 INTRODUCTION

This purpose of this manual is to provide general guidelines and information to qualify HP package products. The document details the requirements for testing, graphics, material marking, labeling and palletization, to help determine the package's ability to provide the desired product protection and visual clarity during distribution and shipment to customers.

This document is intended to be used by HP packaging engineers, HP product teams, suppliers, Original Equipment Manufacturers (OEM's), Original Design Manufacturers (ODM's) and anyone else that designs, tests, qualifies or approves HP packaging.

It is unlikely that every section of the manual will apply to every work package. The following checklist should assist you to determine those sections which are relevant to your particular project.

(Please turn to the next page)



Packaging Guide Check List

SECTION		FOR CONSIDERATION	Check (✓)
2.0	General Requirements		
i)		New shipping package design meets requirements	
ii)		Package design accommodates accessory items	
iii)		Bags used where appropriate	
iv)		Modifications approved by HP Engineer	
3.0	Shipping Container Requirements		
i)		Container size is suitable for shipment	
ii)		A third party has a suitable package/carton design	
iii)		Outer corrugated fiberboard is Kraft	
iv)		HP graphics printed on all outer shipping cartons	
v)		Recycled material will not adversely affect carton	
vi)		Carton is sealed with suitable clear tape	
4.0	Cushion Requirements		
i)		Cushions are made of homogenous material	
ii)		Recycled material will not adversely affect cushion	
iii)		Design optimizes protection and minimizes cost	
iv)		Design utilizes resilient materials if required	
5.0	Protective Package Testing		
i)		Tests and test levels determined and completed	
ii)		Damage occurring in testing compared with actual damage during distribution	
iii)		Alternative tests and test levels determined and completed (if appropriate)	
iv)		Package provides acceptable levels of protection in accordance with acceptance and damage criteria	



SECTION		FOR CONSIDERATION	Check (✓)
6.0	Graphic Requirements (Direct-Ship Containers)		
i)		Identify the major graphics panels and end panels	
ii)		Identify the container dimensions	
iii)		Size the HP Invent signature	
iv)		Position the HP Invent signature	
v)		All elements required by the design are printed on the container in accordance with specifications and acceptance criteria	
7.0	Material Marking Requirements		
i)		Plastic resin identification mark embossed on material in accordance with specification	
ii)		Polybags suffocation hazard warning symbols embossed on material in accordance with specification	
8.0	Labeling Requirements		
i)		Bar code printed in accordance with specification	
ii)		Country of origin identified	
iii)		Shipping labels produced in accordance with specifications	
iv)		Shipping label bar codes printed in accordance with specifications	



	SECTION	FOR CONSIDERATION	Check (✓)
9.0	Palletized Shipment Requirement		
i)		Pallets unitized for shipment	
ii)		Stretch wrapping secures load and protects from dust	
iii)		Plastic banding to stabilize load	
iv)		Pallet material is treated in accordance with specifications	
v)		Pallet material is marked in accordance with specifications	
vi)		Pallet material is classified in accordance with requirements	
vii)		Supplier/Manufacturing facility designation identified	
viii)		Pallet part number embossed in accordance with specification	
ix)		Engineering change number embossed in accordance with specification	
x)		Reusable pool system symbol embossed on pallet	
xi)		EIPS certification symbol/logo - pallet tested and certified to this specification	
xii)		Pest free symbol – pallet fully complies to all relevant international regulations	
xiii)		Pallet meets core requirements	
xiv)		Pallet meets durability requirements for reusable (pool type) pallets	
xv)		Pallet meets durability requirements for expendable pallets	
xvi)		Pallet meets “Use Conditions”	

2.0 GENERAL REQUIRMENTS

- i) If a shipping package design does not exist at the time of HP's project initiation, a shipping package design must be produced which addresses all the HP design, manufacturing, service, reseller, marketing, environmental, sustainment and distribution objectives.
- ii) The shipping package design must accommodate all accessory items as identified on the Bill of Materials, i.e. manuals, hardware, cables, ESD ship kit, wrist strap, rack mounting rails.
- iii) Bags should be used where appropriate, i.e. containment of small parts, reduce dusting or abrasion. Antistatic bags must be used where appropriate, and be amine-free. Blue static dissipative bags are to be used if the component to be packaged has cosmetic plastic (i.e. ABS) surfaces. Static shielding (metallized) bags to be used for all highly ESD sensitive components.
- iv) Any modification or alteration of any of the packaging components during the life span of the product must be reviewed and approved by HP Packaging Engineering.

3.0 SHIPPING CONTAINER REQUIREMENTS

- i) The final container size must take into consideration the optimization of shipment by all modes of transportation (surface, water and air) worldwide, including palletized shipments.
- ii) If a third party has an existing package/carton design already in place for a particular product component, utilizing the package/carton design may increase efficiency.
- iii) The outer corrugated fiberboard shipping container to be Kraft (brown).
- iv) HP specific graphics must be printed on all outer shipping cartons.
- v) Recycled material used in the shipping container is desirable as long as it will not adversely affect the carton performance.
- vi) Clear tape, of appropriate size and tensile strength, is required for sealing the shipping container.

4.0 CUSHION REQUIREMENTS

- i) Cushions, if required, must be of a homogenous material to promote ease of recycling.



- ii) Recycled material added to the virgin cushion material is desirable providing it will not adversely affect the cushion performance.
- iii) Cushion design will optimize protection, and minimize material usage and cost.
- iv) Cushions designed for systems that are distributed through resellers, must utilize resilient material (i.e. expanded polypropylene, extruded polyethylene).

5.0 PROTECTIVE PACKAGE TESTING

Hewlett-Packard manufactures a variety of products that vary in size, weight, and price. The package must provide acceptable levels of product protection from the distribution environment. All testing methods, procedures, and qualification can be found in document number 5971-3628 located at:
<http://packaging.hp.com/testing/index.htm>

The test levels specified in 5971-3628 are based on HP experience, current industry standards and HP competitors' benchmarking information. The tests to be conducted and the appropriate test levels will be determined by the responsible person contracting with ODM/OEM. Please refer to check list at Appendix A.

The type and quantity of damage that occurs during package testing should be compared with the damage that actually occurs during distribution for similar products. This information will help to determine if alternative packaging tests and test levels are required.

5.1 Acceptance And Damage Criteria

The package must provide acceptable levels of product protection from the distribution environment and also withstand storage stresses.

Examples of general acceptance criteria are as follows:

- Product is damage-free; no structural damage including no detached, loose, fractured or deformed materials beyond allowable manufacturing tolerances.
- Product cosmetic areas are not degraded beyond manufacturing or final acceptance criteria. Cosmetic damage is any abnormality that makes the product unacceptable to the customer.
- No conductive particles should be generated as a result of the testing.
- The product should meet all product data sheet and manufacturing specifications and tolerances after testing. The product functions to specification.



Unacceptable package degradation may be defined as, but is not limited to:

- Any change in package condition, including fractured or deformed materials that result in product damage or permanent displacement of the product and accessories from their intended position.
- No conductive particles should be present from abrasion or other sources.
- Some cushion deformation and cracking is acceptable. Complete cushion material fracture and/or cushion damage such that adequate product protection is absent is unacceptable. Multiple fractured cushion pieces may cause customer concerns, dissatisfaction and possibly product returns (even if the product still functions to specification).

Severe damage to packaging materials/mediums is not acceptable.



Table 1 provides examples of acceptable and unacceptable containment type damage.

SHIPPING UNIT TYPE	DAMAGE LOCATION	UNACCEPTABLE PACKAGE DAMAGE	ACCEPTABLE PACKAGE DAMAGE
Type 1 (Boxed)	Container (External)	Edge ruptures to the extent that it can no longer contain the product or support the product's weight Failure of closure such that one or more flaps are free to open or cannot support the weight of the product.	Dented corners and edges from impacts on those areas. Localized rupture of edges near impacted corner. Localized failures in closure in area of impact (carton is still effectively closed).
	Cushioning (Internal)	Failure of bonded joints or surfaces which results in internal packaging to lose original configuration. Fractured or deformed material which no longer maintains product position.	Small fracture or permanent deformation that still permits internal packaging to maintain product position.
Type 2 (Single Product Palletized)	External	Fractured wood members on pallet. Ruptured straps that were used to hold a corrugated cover down. Fractured bolts or other hardware used in pallet construction.	Dents in wooden pallet along impacted edges.
	Internal	Same as Type 1.	Same as Type 1.
Type 3 (Multiple Product Palletized)	Pallet and Retainer (External)	Unitization method (i.e. straps) allows individual cartons to leave the load.	Carton or load shift, where carton edges are no longer aligned but load configuration is stable for transport
	Internal	Same as Type 1.	Same as Type 1.

Table 1 – Acceptable & Unacceptable Containment Damage



6.0 GRAPHIC REQUIREMENTS

The HP has 3 segments of packaging graphics, which are **High Visibility** for retail applications, **Low Visibility** for commercial products that may be displayed occasionally and **Direct Ship**, where there is no retail presence. The HP operation you are working with will advise on packaging that uses the **High & Low Visibility** design system or will provide more detailed information. Information on the **Direct Ship Graphics** for packaging can be found at:
<http://packaging.hp.com/documents.htm>.

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6.1 Acceptance Criteria for Graphics

The table below (table 2) identifies acceptable and unacceptable cosmetic defects as they relate to printing of Direct-Ship containers.

TYPE OF FLAW	ACCEPTABLE	UNACCEPTABLE
Print Registration	Misregistration of artwork to scores up to 6 mm.	Misregistration between colors more than 0.2 mm or two rows of dots.
Hickies and Spots (Dirt, Ink, Dry Grease)	Up to three defects ≤ 1 mm in size per panel if no graphic distortion. One defect > 1 mm but < 3 per panel if no graphic distortion On minor flaps.	Any defect in the HP logo.
Wet Grease and Water Damage	No.	Any trace.
Scratches, Smears and Streaks	One defect ≤ 1 mm x the length of the panel or major flap per box if no graphic distortion. One defect ≤ 1 mm x 10 mm per panel or major flap if no graphic distortion. Defect ≤ 1 mm x the length of the flap on minor flaps.	Any defect in the HP logo.
Glue Tracks	Clear glue tracks if no graphic distortion. One track with any color, Kraft, or foreign particles ≤ 1 mm in width if no graphic distortion	Any tracks in HP logo.
Score Checking and Score Cracking	Score checking along the length of the score when box is set up. Score cracking if ≤ 2 mm for no more than 50% of the score when then box is set up, on no more than two outside edges of the box.	Score cracking is > 2 mm or ≤ 2 mm for more than 50% of the score when the box is set up.
Wrinkles	One wrinkle per box if no graphic distortion. Defects on minor flaps.	Defect in HP logo.
Label Tears	One defect ≤ 5 mm x 10mm where Kraft shows through per box if no graphic distortion. One defect where Kraft shows through ≤ 20 mm x 5mm on each minor flap.	Defect in HP logo.
Label Delamination	One area of label delamination that exposes the Kraft ≤ 25 mm x 5mm on the edge of each major flaps long as does not interfere with automated taping equipment. Two areas of delamination that expose Kraft ≤ 90 mm x 20mm on each minor flap.	Defect at manufacturer' joint.
Corrugated Delamination	One area of liner separation ≤ 20 mm x 5mm on each minor flap and inside surfaces of box.	Separation of liner from medium on all panels and major flaps.



TYPE OF FLAW	ACCEPTABLE	UNACCEPTABLE
Bent or Crushed Flaps	<p>One area of damage $\leq 20\text{mm} \times 120\text{mm}$ on one major flap if it does not interfere with automated taping equipment.</p> <p>One area of damage $\leq 20\text{mm} \times 120\text{mm}$ on each minor flap.</p> <p>Bent hand holes.</p>	
Exposed Kraft at Manufacturer's Joint	<p>$\leq 2\text{mm}$ x the length of the joint.</p> <p>$\leq 3\text{mm}$ up to $\frac{1}{2}$ the length of the joint.</p>	
Excess Glue at Manufacturer's Joint	<p>Clear glue $\leq 2\text{mm}$ in width the length of the joint.</p> <p>Glue with any color, Kraft, or foreign particles $\leq 1\text{mm}$ in width the length of the joint, or $\leq 2\text{mm}$ in width up to $\frac{1}{3}$ the length of the joint.</p> <p>There should be sufficient glue to hold the manufacturer's joint together when the box is set up.</p>	Excess glue seepage that causes the box to be glued shut or boxes to be glued together is unacceptable
Variance in the Manufacturer's Joint	<p>The amount of gap at the manufacturer's joint, when measured at the flap score lines, shall not vary more than \bar{n} one board thickness from the specified slot gap.</p> <p>Variations in the width of gap at the manufacturer's joint on the same box (skew, top to bottom) shall not exceed 3mm when measured at the two flap score lines.</p>	
Incomplete Die Cut	<p>One area of uncut top corrugated liner $\leq 5\text{mm} \times 2\text{mm}$ on the manufacturer's joint.</p> <p>One area of uncut label and/or top corrugated liner $\leq 25\text{mm} \times 5\text{mm}$ on each major flap.</p> <p>Two areas of uncut label and/or top corrugated liner $\leq 40\text{mm} \times 10\text{mm}$ on each minor flap.</p>	
Strapping Marks	<p>The outer liner is not cut through more than 2mm.</p> <p>Damage due to insufficient dunnage on the pallet if the outer liner is not cut through more than 2mm and meets the criteria stated above regarding hickies, spots, scratches, smears and streaks.</p>	
Warp	<p>Maximum is 6mm per 300mm, 12mm per 600mm, etc. The container will be measured on a flat surface as a blank so the warp rises in the middle. The distance from the middle of the container to the flat surface will then be measured.</p>	
False Scores	No.	Any trace.

Table 2 Acceptable and Unacceptable Cosmetic Defects

7.0 MATERIAL MARKING REQUIREMENTS

7.1 Plastic Resin Identification Marking

ISO 1043 (the code for resin recycling) and the SPI resin-recycling symbol and numbering must be embossed on the material.

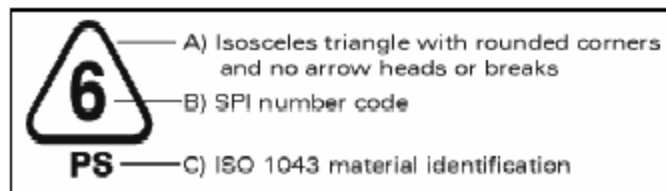


Figure 1 Recycling Symbol

- i) The outline figure is an isosceles triangle with rounded corners.
- ii) The SPI number code is located inside the triangle.
- iii) The ISO 1043 material identification acronym is located underneath the triangle. In cases where hybrid resin materials are used but are not covered or identified by ISO 1043, the base monomer or standard industry acronyms should be used, for example, RPET, PETG and HIPS.

Material	ISO 1043 Acronym	SPI Number
Polyethylene Terephthalate	PET	1
Polyethylene – High Density (HDPE)	PE-HD	2
Polyvinyl Chloride (vinyl)	PVC	3
Polyethylene – Low Density (LDPE)	PE-LD	4
Polypropylene	PP	5
Polystyrene	PS	6
Polycarbonate	PC	
Acrylonitrile/budadiene/styrene	ABS	

Table 3 Materials Identification

7.2 Polybags Suffocation Hazard Warning Symbols

HP's products do not require suffocation hazards labeling on polybag (plastic bags). However, many of our products are going into the home environment where a polybag could become a hazard to the children of the household. Therefore, from a Citizenship perspective, we are recommending to our operations and manufacturing partners to use both symbols below on polybags which surround products that may go into the home environment. Specifications related to the usage of these symbols are:

1. minimum size on each symbol is a 2.0 inch diameter

2. symbols to be placed on bags with a surface of 6.0 x6.0 inches or larger
3. color: black
4. polybag mfg. to provide artwork

See HP Part number [7121-8000-1](http://packaging.hp.com) at <http://packaging.hp.com>.



Figure 2 Polybags Suffocation Hazard Warning Symbols

8.0 LABELING REQUIREMENTS

Product labels are distinct from product information, which can be included in the printed graphics, by virtue of being data that is known at or after manufacturing. Product labels include such things as product number, version, date code, options, and serial number.

8.1 Bar Code Specification

8.1.1 Symbology

The alphanumeric “3 of 9 code”, also known as “Code 39”, is used by HP’s worldwide distribution entities, and also by industrial customers. Retail channels use UPC codes for product identification and UPC Shipping Container Codes for identification of multi-unit packaging.

8.1.2 UPC Number Assignment

All UPC number assignments are made centrally from the Product Identification function within CMIS (Corporate Marketing and International Services). Requests for number assignments can be made via phone or Desk message. All assignments of UPC numbers are managed in a central database. UPC information for released products is made available to all users on DMS.

8.1.3 Bar Code Format

The objective of having bar coded labels on supplier shipments is a functional one. Utilization of data identifiers with Code 39 bar codes eliminates the necessity of applying rigid format requirements. Therefore, the format and layout of the label is flexible and at the discretion of the supplier as long as the required content is provided. The exhibit provides an example as guidance to those who do not have requirements from their distributors. The vertical “building block” format was developed by the EIA and ANSI because of its flexibility. Figure 3, to the right, is an example of the label layout.

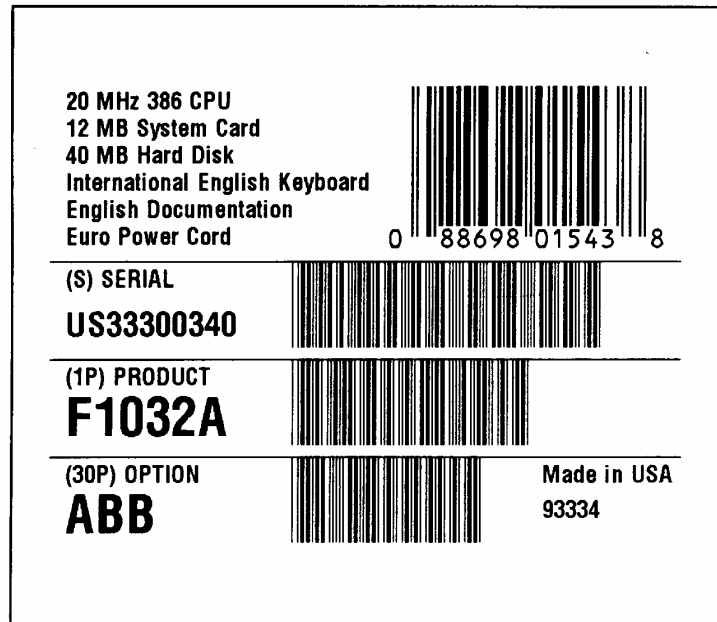


Figure 3 Bar Code Label Format

8.1.4 Bar Code Requirements

Each HP product package is to have a label consistent with ANSI/EIA-556, with the following elements appearing in bar code form. The Data Identifier precedes the data in the bar code symbol, and appears in parenthesis on the text line containing the field name.

- Product Number - for all products (Data Identifier '1P')
- Option Number(s) - for products with one of more “feature codes”. If the product has more than one feature code, the feature codes shall be concatenated into a single string of data (Data Identifier '30P')
- Serial Number - for serialized products where the serial number is to be tracked beyond the point of manufacture. Not required for multi-unit packages (Data Identifier 'S')
- UPC Number - for retail channel products. UPC symbols have a standardized format, with the 12 digits of the number recessed into the bottom of the bar code symbol. No other field identification is necessary.

For multi-unit packages, a quantity must be identified in one of the following ways:

- Quantity - for HP distribution and industrial customers, the actual quantity must be bar coded using code 39 (Data Identifier 'Q')
- Packaging Indicator - for retail channel products the packaging indicator is a number from 1 to 7, embedded in the UPC Shipping Container Code (case code). The Shipping Container Code is a 14-digit Interleaved-2-of-5 symbol (ITF-14) containing both the packaging indicator and the UPC product number. The quantity associated with each packaging indicator for a product is assigned by the supplier and must not



change. The case code should appear on one or two sides of the box, preferably 1.25 inches from the base of the box.

8.1.5 Product/Shipping Container

A product container can become the shipping container, in which case the requirements of both the product and shipping containers apply.

It is recognized that these requirements for bar coding data on unit containers may not fit on certain container sizes. In these situations the data elements must remain in text form and the bar coding may be eliminated if agreed to by supplier and customer.

8.2 Country of Origin

Customs regulation and other laws require marking products with their country of origin. For products not easily marked, or, not visible and intended for retail sales, the marking is to be on the product package. This can be included in the carton graphics or on the product label as appropriate.

8.3 Shipping Labels

Customers desire and expect clear and consistent labeling and documents in order to easily receive and pay for our products. To this end, a Shipment Documentation Standard was developed in 1987 and defines the information to be presented and format for each of the shipment documents. The HP Bar Code Standard for Shipping Labels provides the technical details of bar coding in support of the documentation standards. Likewise, the graphics standards provide for the position marks to locate this label on the cartons.

8.3.1 Graphics

The shipping label is a pressure-sensitive label that should be positioned within the shipping information block on most containers and used instead of a printed HP company logotype or a company logotype label on small containers and tubes.

Shipping labels are defined and controlled by Worldwide Shipment Documentation Standards from the Financial Compliance & Quality Department of HP Customs.

8.3.2 Position Marks

The shipping information block is a printed graphic that provides an area for the shipping label and incorporates ISO symbols. The shipping information block should be centered on an end panel. The block should be separated from the container volume and positioned so that tape used to seal the container will not cover the block. The block should be printed in GCM1 No. 31 Blue.

Film masters for two versions of the shipping information block are available in the two sizes listed below.

Standard, 10-1/16 in X 4-5/16 in, (256 mm X 109 mm), 5955-6674

Large, 10-27/32 in X 6-1/2 in, (275 mm X 165 mm), 5955-6675



8.4 Bar Code Specification

This section applies to all shipping labels produced at any HP shipping point, or third party provider shipping point representing HP, throughout the world. This section describes the requirements for format, content, bar code symbol quality and placement, data identifiers and addition of unique data elements.

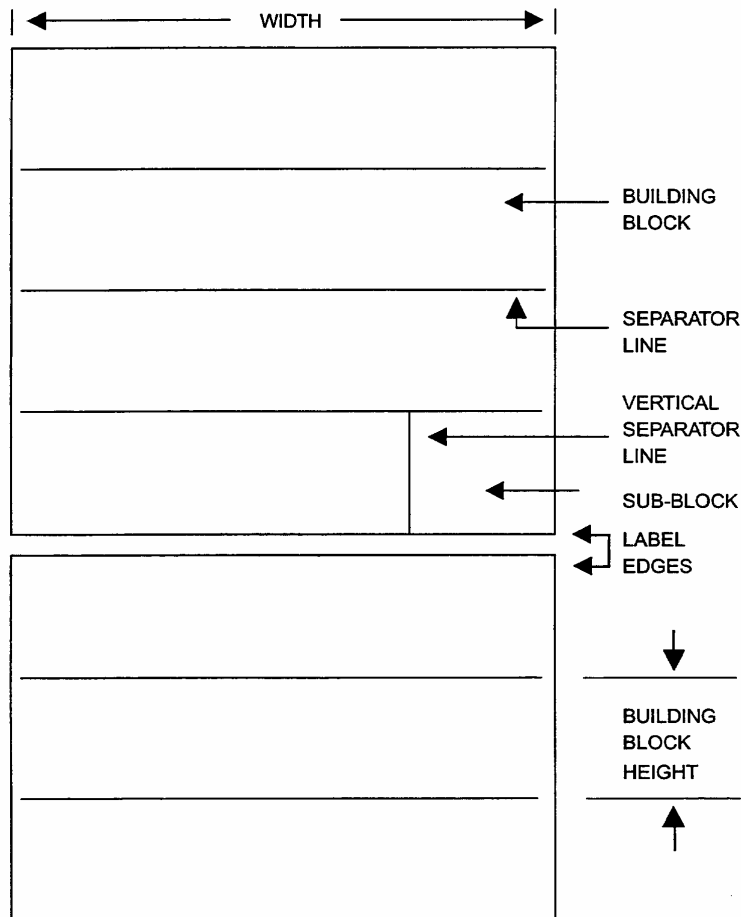
8.4.1 Label Design: Segments

The label is constructed of Segments which are groupings of information meeting the needs of the trading partners using the label. The standard three segments making up the HP label are, in sequence: Carrier Segment, Customer Segment, and Supplier Segment.

8.4.2 Label Design: Building Blocks

Building blocks are the standard unit of the label format and make up the Segments. A building block can contain text or graphics (text block), a bar code field with human readable translation (bar code block), or blank (empty). Each building block may be produced separately or in combination with other building blocks (used when printing data as it becomes known). Building blocks shall be stacked vertically and shall be separated from each other by a horizontal line.

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Common Label Elements

Figure 4

Building blocks shall be no greater than 1.0 inches (25 mm) in height except, where the shipper and a trading partner(s) mutually agree there shall be a deviation from the standard height. A half height bar code block may be added to the standard bar code block to satisfy requirements of trading partners using automated conveyor scanning or long range scanning in their distribution process. A double height bar code block may also be used for the same reason. Half height bar code block may be stacked on a standard size bar code block making a 1.5 inch (37.5 mm) bar code block. Only one 1.5 inch (37.5 mm) bar code block per segment may be used. Double height bar code blocks shall be 2 inches (50 mm) in height. Only one double height bar code block per segment may be used.

Building blocks can be divided into sub-blocks. The minimum width of the sub-blocks shall be 1 inch (25 mm) and shall be the full height of the building block. Vertical lines shall be used to designate the sub-blocks (see Figure 4).



Carrier segment:

Building Block 1 - Text Block

- Return Address
- Hewlett-Packard Logo 3.5 mm height
- Ship To Address
- Attn: (also known as M/F or Mark For)

Building Block 2 - Bar Code Block and Text Sub-Block

- Postal Code
- Standard Carrier Authorization Code (SCAC) (text sub-block)

Building Block 3 - Bar Code Block

- Carrier Reference Number (i.e. waybill, pro number), or
- Shipper Reference Number (SRN)

Customer Segment:

Building Block 4 - Bar Code Block and Text Sub-Block

- Package ID (same as HP Box Number)
- Package Count (text sub-block)

Building Block 5 - Bar Code Block

- Customer Purchase Order Number

Supplier Segment:

Building Block 6 - Text Block and Text Sub-Block

- HP Sales Order Number or I/O Number
- Shipment Reference Number
- HP Destination Code
- Package Weight (text sub-block)

8.4.3 Label Dimensions

The label shall be 4 inches (100 mm) in width by 6 inches (150 mm) in height except where the shipper and a trading partner(s) mutually agree to the addition of unique data.

8.4.4 Bar Code Specifications

Code 39 with ANS FACT-1 Data Identifiers shall be used for all bar coded data except Carrier Ref No which shall be Code 128. When shipping via Federal Express Interleaved 2-of-5 shall be used.

A bar code may be designated for either a building block or sub-block. A building block shall contain no more than one bar code symbol. The bar code sub-block shall be the leftmost sub-block within a building block. A title shall be used that describes the contents of the bar code symbol. The title shall be printed in upper case characters and shall include the DI in parenthesis to the immediate left of the title. The title and DI shall conform with the ANS FACT-1 Data Identifier Standard. The bar code symbol shall be placed in the lower portion of the bar code building block and be left justified and take into account the Quiet Zone. The minimum quiet zones are 0.25 inch (6.4 mm).



The shipping label uses a Code 39 with ANS FACT-1 Data Identifiers per our industry standard (EIA) and is acceptable across other industries as specified by the ANSI Common Label Standard. Code 128 shall be used to bar code the Carrier Ref No except when using Federal Express as the carrier, at which time Interleaved 2-of-5 shall be used. The standard bar code height shall be .5 inches (13 mm), except where the shipper and a trading partner(s) mutually agree there shall be a deviation from the standard height to a larger height. The standard bar code height for the Carrier Ref No shall be a minimum of 1.0 inches (25 mm). Code 39 allows for a maximum of 19 characters, non including the stop/start characters and DI, per bar coded symbol. In the case of bar coded data exceeding 19 characters (i.e. P.O.#), a bar code block will be added in order to continue the data. The continued bar coded data shall use the Continuation DI (see section 2.2.9 Data Identifiers). The narrow element dimension (X dimension), which determines the length of the bar code symbol, should be 0.010 inch (.0254 mm) to .013 inch (0.330 mm).

8.4.5 Text Block

A text block or sub-block may be composed of text or graphics, or both, but shall not contain a bar code symbol. The ANSI standard does not specify font size but rather Lines Per Block (LPB). Eight sizes are specified ranging from one to eight (LPB). We, the labeler, can assign a font size that represents the LPB. All text shall be printed in Helvetica except when the trading partners agree to an alternative font. A title shall be used that describes the contents of each text block. The title shall be printed in the upper left corner of the text block or sub-block. The title shall be printed in upper case characters. The text (human readable) contained in the building blocks shall meet the following criteria:

Upper Case

Helvetica

- Titles - 6 pt.
- Return Address - 6 pt.
- Ship To Address and Attn: - 8 pt.
- Literal (text and/or bar code interpretation) - 14 pt. Bold
- SCAC - 24 pt. Bold
- DEST CODE - 24 pt. Bold

8.4.6 Human Readable Interpretation

The human readable interpretation of a bar code symbol shall be located above the bar code symbol, shall be in upper case characters, shall be left justified and approximately 1.0 to 1.5 inches (25 to 38 mm) from the left edge of the bar code block, leaving room for the title. The DI and start/stop characters are not part of the data and shall not be

shown in the interpretation. The DI shall be shown in parenthesis in the title line to the immediate left of the title.

8.4.7 Adding Unique Data

A data element(s) that is unique to a trading partner and not included in the standard data, can be added to the shipping label at the discretion of the shipper. To maintain the consistency of the common label format, unique data shall be added as the last building block of the trading partner's segment. For example, if a customer requires the Product Number be present on the shipping label, the building block containing this data shall follow building block 5, which contains the customer's purchase order number.






FROM: Hewlett-Packard Company, Corporate Offices 3000 Hanover St. Palo Alto, California 94304			
TO: Any Customer 1234 west any street ANYTOWN,STAT 95018-0000 USA			
ATTN: JOHN DOE XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX			
<S2L> POSTAL CODE 95018		SCAC	
		UPSM	
UPS GROUNDTRAC			
<I2> CARRIER REF NO 9564800301304932			
			
<3S> PACKAGE ID 0000-12345		PKG COUNT	
		1 OF 3	
<K> P.O.# 012345678912345678			
			
S/O# 442412345001	DEST. CODE	PKG WT	
SRN 123456789012	SFO	25 LBS	

Figure 5
Displaying Unique Data

Label

8.4.8 Data Identifiers

A data identifier (DI) is a specified character or characters that designate the use of the data that follows. The following data identifiers shall be used to identify the standard bar coded data on the shipping label.



<u>Data Description</u>	<u>Data Identifier</u>
Continuation of purchase order number	4C
Order number assigned by Customer to identify a Purchasing Transaction (purchase order number)	K
Shipment Identification Code assigned by Supplier/ Shipper (Shipment Reference Number)	2K
Bill of Lading/Waybill/Shipment Identification code assigned by Carrier (including pre-assigned blocks of numbers or algorithms for determining a Carrier Bill of Lading/Waybill/etc.).	3K
UPS Tracking Number	1Z
“Ship To” location, used for shipments within the jurisdiction of a single postal authority.	52L
“Ship To” location, used for shipments between locations governed by different postal authorities. Postal code followed by ISO 3166 country code.	55L
Unique package identification assigned by the supplier.	3S

When adding unique bar coded data to the shipping label, refer to the FACT Data Identifier Standard ANS FACT-1 to determine the correct DI for the trading partner has not included the appropriate DI in their specification.



8.4.9 Label Placement and Orientation

The following considerations should be addressed when determining the most appropriate location for the label:

Interference with preprinted graphics (on the carton);
Accessibility of location;
Type of container (e.g. carton, pallet, truck);
Survivability of the label;
Label application (manual/automatic, label/tag/direct marking).

Labels should be placed no closer than 1.25 inches (32 mm) from any package edge. Label placement towards the center of the sides of rectangular, corrugated packages should be avoided due to risk of excessive abrasion damage during transportation effectively making the label useless. Labels shall be applied to the container and shall not be placed in or on the poly-pouch containing the packing list.

9.0 PALLETIZED SHIPMENT REQUIREMENT

The palletization requirements for inbound/outbound HP and/or 3rd party shipments are detailed below. The supplier is responsible for providing HP with a shipping container which is free of damage and cosmetic imperfections.

9.1 Unitization, Wrapping and Banding

- i) Pallets must be unitized to provide HP with a shipping container free of damage and cosmetic imperfections allowing for reshipment in the original packaging.

Unitize: Bringing several cartons together to form a single stable load.

- ii) Stretch wrapping is required to secure the load and provide protection from dirt.

- iii) In addition to stretch wrapping, one or more of the following methods may be required depending on the distribution environment, to ensure a damage free delivery.

- Top pallet caps shall be used to provide protection from dirt and promote better stacking of pallets
- Plastic banding shall be used to stabilize the load and to prevent carriers from breaking down the pallet load. If banding is used without a top pallet cap, edge guards shall be used to prevent the banding from damaging the load
- Corner guards shall be used to provide additional compressive strength and to protect the carton corners from damage.

9.2 Pallet Material Treatment

If any non-manufactured wood is used in the construction of the pallet, it must meet the following requirements to be certified for international use. These requirements may be superseded by International Regulations. The use of slipsheets for all trans-ocean shipments eliminates the costs and needs for pallet treatment and helps progress toward regional pallet pooling systems.

All wood components must be bark free, and otherwise meet or exceed the quality criteria of “multiple-use” as described in ASME MH1-Part 3 “Wood Pallets.”

Non-Manufactured Wood Packaging (NMWP) made from Coniferous Species (trade term “Softwood”) and/or Non-Coniferous Species (trade term “Hardwood”): If the pallet contains any amount of non-manufactured wood (regardless of species), those components must be heat treated to a minimum temperature of 56 degrees C (133 degrees F) for a minimum of 30 minutes.

9.3 Pallet Material Marking

9.3.1 Marking Procedure

- i) The marking shall consist of the pest free symbol where justified (HT only at this time), (or bug free symbol), the country of manufacture, and the supplier /facility designation.
- ii) Mark the pallet, skid, crate or other wooden packaging assembly a minimum of one time on an exterior vertical surface. Duplicate information on the opposite exterior surface is recommended.
- iii) Use 19mm (0.75”) minimum characters. Printing may be done with ink jet printing, heat stamping, paint stencil, or other similar permanent and indelible method. The default color should be black or other maximum contrasting color if appropriate. Do not use red or orange since these colors are used with labeling of dangerous goods.
- iv) If vertical surfaces provide insufficient space for the markings then scale the characters accordingly or apply them to a top horizontal surface provided that at a minimum the treatment initials and pest free symbol (if appropriate) is repeated on two opposite vertical surfaces. It is also permitted to print the information on multiple lines or break up the information, for instance spread across three separate blocks on a block style pallet.

9.3.2 Material Classification Requirements

An item must only carry one classification regardless of how many different materials are included in the construction. Follow the list below in sequence; the item should carry

the marking of the first scenario that matches exactly. Careful consideration must be given for assemblies which contain a mixture of materials as explained further:

i) Untreated NMWP or if Material Composition is Unknown (XX)

Must Contain: ANY amount of non-manufactured wood components which have definitely been untreated or the treatment history is unknown. Example: old pallets or crates or those which have been refurbished with a variety of reused pallet components.

May Contain: Any amount less than 100% to total composition of treated wood of any species, MWPM, and/or non-wooden material.

Must NOT Contain: Not Applicable.

Example:



***Important:** EIPS does not accept untreated non-manufactured wood in packaging used for shipments regardless of origin or destination. This is so that any pallet could be reused and re-exported if needed. Thus, this mark (XX or no mark) should only exist on inventory that predates this specification.*

***Important:** Painted over symbols or no symbols at all are signals that the particular item requires additional treatment prior to export.*

ii) Non-Manufactured Wood (NMWP), Heat Treated (HT or HT-DB)

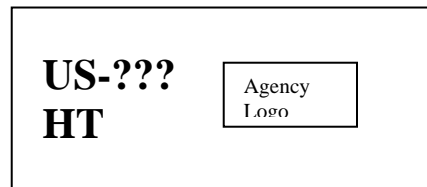
Must Contain: ANY amount of properly heat treated non-manufactured wood which by definition has been heated to a core temperature of at least 56C (133F) for a minimum of 30 minutes and that documentation certifying that fact

has been provided by the treatment facility to the package/pallet manufacturer and can be traced to the production of that specific package, pallet, etc.

May Contain: Any amount of MWPM and/or non-wooden material.

Must NOT Contain: Any amount of untreated non-manufactured wood (Coniferous or Non-Coniferous).

Example:



Important: The “???” is to be replaced by the officially assigned facility code or supplier initials. Do not actually mark “???”.

Secondary Qualification Marking: The initials “DB” should follow the mandatory treatment marking for all wood that has been “debarked” (ex: “HT-DB”). This should always be the case for EIPS wooden pallets

Note: Use of kiln dried lumbar is acceptable provided that it meets the temperature and duration requirements (56C for 30 minutes) to meet the definition of “heat treated”. Such materials are usually mill stamped “KD-HT” or “HT”. Dry lumber alone is not a reliable indication of proper heat treatment nor are materials mill stamped “KD”.

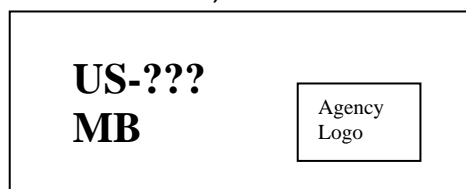
iii) Non-Manufactured Wood (NMWP), Fumigated with Methyl Bromide (MB or MB-DB)

Must Contain: ANY amount of properly fumigated non-manufactured wood and that documentation certifying that fact has been provided by the treatment facility to the package/pallet manufacturer and can be traced to the production of that specific package, pallet, etc.

May Contain: Any amount of MWPM and/or non-wooden material.

Must NOT Contain: Any amount of untreated non-manufactured wood (Coniferous or Non-coniferous)

Example:



Important: The “???” is to be replaced by the officially assigned facility code or supplier initials. Do not actually mark “???”.

Secondary Qualification Marking: The initials “DB” should follow the mandatory marking “MB” if the wood has been “debarked” prior to prior to treatment.

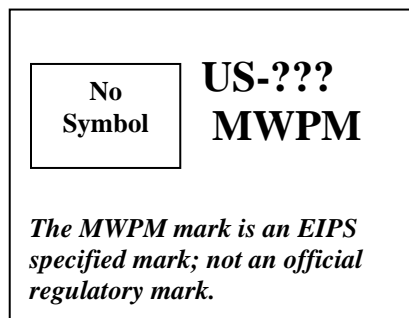
iv) **Manufactured Wood Packaging Material (MWPM)**

Must Contain: ANY amount of manufactured/processed wood components. Example, a pallet or crate made with any amount of Oriented Strandboard (OSB), plywood, strawboard, masonite, particle board, paper overlaid veneer (POV), laminated veneer lumber (LVL) or combination of these. These all meet the definition of manufactured wood packing materials as defined by the Animal and Plant Health Inspection Service (APHIS). Such materials are not regulated.

May Contain: Any amount of non-wooden material.

Must NOT Contain: Any amount of non-manufactured wood of any type whether treated or not.

Example:



Note: Plywood/OSB/Masonite, and so on are considered “manufactured wood” because it has been processed under extreme heat and pressure. It is irrelevant what wood species is used in the manufacture of these materials (can be coniferous and/or non-coniferous). Assembling a pallet from cut lumber is not considered “manufactured” with regard to pest migration regulations.

Important: The “???” is to be replaced by the officially assigned facility code or supplier initials. Do not actually mark “???”.

9.3.3 Additional Requirements

i) **Supplier/Manufacturing Facility Designation**

An official facility registration number (3 characters) provided by the National Plant Protection Organization must be used if available. If this process is not yet established in your country or location, one of the following must be used instead:

- A minimum 5 character abbreviation of the supplier's name.
- A minimum 3 digit abbreviation followed by 2 numeric digits to distinguish unique manufacturing facilities of that supplier.
- The supplier's logo if this can be easily distinguished. The logo may also be followed by a 2 digit number to identify a specific facility of that supplier.
- The full name of the supplier if this can be accommodated in the space available.

The name shall be that of the final assembly location which built the pallet or package and shipped it for use.

Caution: *The code chosen must not resemble one of the material classifications.*

ii) **Part Number**

The alpha-numeric part number of the pallet (usually 7 characters) which is specified by the pallet purchaser/user. The part number should be 19mm (0.75") characters.

iii) **Engineering Change Number (Optional)**

The 6 digit alpha-numeric "EC" number which may distinguish a different design for items with the same part number. This may be important to some locations and it is their prerogative to specify it if they wish. If the EC level is included, use the prefix "EC" in front of the number to identify it. The EC number may be smaller in size using 13mm (0.50") characters.

iv) **Reusable Pool System Symbol (Optional/Restricted)**

For example, the "EUR" symbol associated with the European pool system. This marking to be placed as specified by that system. Only pallets meeting the design and construction requirements of the marked pool system are to carry the symbol.

Note: *Unless the material type and treatment is marked on a "Euro Pallet" it should not be exported to a regulated country.*

v) **EIPS Certification Symbol/Logo**

Graphical symbol provided by the EIPS committee of the Institute of Packaging Professionals (IoPP). This applies to all pallets tested and certified to this specification regardless of material composition.



vi) Pest Free Symbol

The approved marking for regulated non-manufactured wood packing materials (NMWP) that have been properly treated by an authorized agent. Its appearance on a pallet indicates full compliance to all international regulations aimed at preventing pest migration. It shall be printed as large as practical but at least 38mm (equivalent to the total height of the test portion of the markings).

Important: *This symbol is NOT to be used at this time for non-regulated materials even if they are inherently pest free.*

(Please turn to the next page)



9.4 Pallet Performance – Minimum Requirements

9.4.1 Core requirements – applicable to all standard pallets.

1	Pallet Size	1.0 x 1.2m	0.8 x 1.2m
2	Preferred Base Configuration	Unidirectional	Unidirectional Only
3	Accessibility (Fork Lifts, Pallet Jacks)	Full 4-way entry	Full 4-way entry
4	Top Deck Coverage	60% min.	60% min.
5	Bottom Deck Coverage	35% min.	35% min.
6	Minimum Vertical Clearance Under Top Deck per ISO-6780	95mm (3.75")	95mm (3.75")
7	Maximum Vertical Clearance Under Top Deck per ISO-6780	156mm (6.14")	156mm (6.14")
8	Maximum Width of Center Posts or Stringers per ISO-6780	160mm (6.3"), 100mm (4" preferred if possible)	160mm (6.3"), 100mm (4" preferred if possible)
9	Minimum Width between out Posts/Stringers per ISO-6780	720mm (28.3")	720mm (28.3") on 1.2m 590mm (23.2") on 0.8m
10	Maximum Overall Height per ISO-6780	165mm (6.5")	165mm (6.5")
11	Target Maximum Gross Weight	22.7kg (50lbs)	22.7kg (50lbs)
12	Fasteners (if used)	Meet minimum criteria in ASME, MH1, part 3	Meet minimum criteria in ASME, MH1, part 3
13	Racking performance per ASTM D1185 (Racked across length and width)	454kg (1000lbs), Max. Deflection 13mm (0.5")	454kg (1000lbs), Max. Deflection 13mm (0.5")
14	Forklift Tine Performance per ASTM D1185	454kg (1000lbs), Max. Deflection 13mm (0.5")	454kg (1000lbs), Max. Deflection 13mm (0.5")
15	Static Stacking Performance (Warehouse) per ASTM D1185. Stacked 4 high, 454kg (1000lbs) per pallet.	1800kg (4000lbs), Max. Deck Deflection 6mm (0.25")	1800kg (4000lbs), Max. Deck Deflection 6mm (0.25")
16	Conveyor Performance per ASTM D1185	454kg (1000lbs), Max. Deck Deflection 6mm (0.25")	454kg (1000lbs), Max. Deck Deflection 6mm (0.25")
17	Coefficient of Friction: Top Deck with Cartons	0.40 minimum (VTU Test)	0.40 minimum (VTU Test)
18	Coefficient of Friction: Under Deck with Forks	0.40 minimum (VTU Test)	0.40 minimum (VTU Test)
19	Coefficient of Friction: Bottom Deck on Steel	0.40 minimum (VTU Test)	0.40 minimum (VTU Test)
20	Coefficient of Friction: Stacked Empty Pallets	0.40 minimum (VTU Test)	0.40 minimum (VTU Test)
21	Inertness (related to Infestation Problems) Preference is for constructions not requiring chemical treatments or APHIS certifications to comply with international pest regulations	Required	Required
22	Fire Safety (related to Fire Marshal Reqmts): Preference is for constructions not requiring unusual facilities requirements for fire safety. This can be an issue with plastic pallets. Ref. Factory Mutual 4995.	a) No halogenated flame retardants. b) Identify special storage requirements or commodity classifications if applicable	a) No halogenated flame retardants. b) Identify special storage requirements or commodity classifications if applicable
Note: The suggested load for all strength tests is corrugated boxes (400x600mm) to fill out the pallet completely and stacked 5 layers high. Dead loads may be used for the stack test.			

Table 4 Core Requirements of Standard Pallets



9.4.2 Durability Requirements for Reusable (Pool Type) Pallets

Wood pallets assessed with the PDS computer program must meet a durability ratings shown below which is equivalent to 10 or more trips (or 50 individual handlings) to first repair. Non-wood pallets or those not assessed with the PDS program must meet the requirements in b, c, and d.

Requirement	1.0m x 1.2m	0.8m x 1.2m
a. Durability rating (PDS score if used)	25 or more	25 or more
b. Corner Drop per ASTM D1185	12 drops at 1m (40"), Maximum Diagonal Deformation of 1.5%	12 drops at 1m (40"), Maximum Diagonal Deformation of 1.5%
c. Tine Tip Impacts on Block or Stringer Ends per ASTM D1185	3 impacts at 30cm (12"), no failures	3 impacts at 30cm (12"), no failures
d. Tine Heel Impacts on Lead Edges per ASTM D1185	3 impacts at 120cm (48"), no failures	3 impacts at 120cm (48"), no failures
Notes:		
<ol style="list-style-type: none"> The suggested load for all strength tests is corrugated boxes (400x600mm) to fill out the pallet completely and stacked 5 layers high. Dead loads may be used for the stack test. The "European Pool Pallet" (i.e. "Euro Pallet", 0.8x1.2m) meets the physical performance requirements of this specification and may be used whenever an EIPS-2 pallet of that size is specified. However, additional treatments may be required if intending to use these pallets for exports. 		

Table 5 Durability Requirements for Reusable Pallets

9.4.3 Durability Requirements for Expendable Pallets

Wood pallets assessed with the PDS computer program must meet a durability rating of between 1 and 19 which is equivalent to 1 to 9 trips (or less than 50 individual handlings) to first repair. Non-wood pallets or those not assessed with the PDS program must meet the requirements in b, c, and d.

Requirement	1.0m x 1.2m	0.8m x 1.2m
a. Durability rating (PDS score if used)	< 25	< 25
b. Corner Drop per ASTM D1185	3 drops at 1m (40"), Maximum Diagonal Deformation of 1.5%	3 drops at 1m (40"), Maximum Diagonal Deformation of 1.5%
c. Tine Tip Impacts on Block or Stringer Ends per ASTM D1185	3 impacts at 15cm (6"), no failures	3 impacts at 15cm (6"), no failures
d. Tine Heel Impacts on Lead Edges per ASTM D1185	3 impacts at 60cm (24"), no failures	3 impacts at 60cm (24"), no failures
Note: The suggested load for all strength tests is corrugated boxes (400x600m) to fill out the pallet completely and stacked 5 layers high. Dead loads may be used for the stack test.		

Table 6 Durability Requirements for Expendable Pallets



9.4.4 Pallet Use Conditions – applicable to all standard pallets

Requirement	1.0m x 1.2m	0.8m x 1.2m
Temperature (Distribution Environment) ¹	-25C to +45C (-13F to +113F)	-25C to +45C (-13F to +113F)
Stacking (Dynamic / In Transit)	2.5m (100 inches)	2.5m (100 inches)
Stacking (Static / Warehouse Storage)	5.0m (200 inches)	5.0m (200 inches)
Transportation Modes	Air, Ocean, Truck	Air, Ocean, Truck
Food Contact / Refrigerated Storage	No	No
Material Handling: Conveyors	Yes	Yes
Material Handling: Crane/ ASRS	Yes	Yes
Material Handling: Lift Equipment	Yes	Yes
Warehouse Storage: Open Racks	Yes	Yes
Note ¹ : Temperatures ranging from –25C to –40C or from 45C to 60C may be encountered at rare times in the distribution network. However, for purposes of practicality testing will not be required at these extremes. Users requiring test to those extremes must conduct those tests separate from EIPS certification testing.		

Table 7 Pallet Use Conditions for Standard Pallets

Useful Websites:

For further information you may find the following websites helpful:

1. <http://packaging.corp.HP.com/> (internal HP Web)
2. <http://www.HP.com/info/packaging> (Ext. Web)
3. <http://www.aphis.usda.gov/ppq/swp>
4. <http://www.nwpc.com>



Appendix A Protective Package Test Check List

Product:		Date:	
No. of Units:		Mass:	()kg ()lb
ODM/OEM Name & Contact Details:			
Test Requester:		Tel:	
(Check one)	<input type="checkbox"/>	Type 1 – Boxed product, not palletized	
	<input type="checkbox"/>	Type 2 – Single product, palletized	
	<input type="checkbox"/>	Type 3 – Multiple products, unitized	
Tests Required:	Level:	Comments:	
Random Vibration			
Swept Sine Vibration			
Impact			
Compression			
Stability			
Tip Over			
Lay Over			
Flexure			
Tab			
Field Shipment			
Horizontal Shock – Pallet Marshaling			
Horizontal Shock - Rail			
Other:			

Appendix B. Sample Size Considerations

During final qualification testing it is recommended that multiple like products be subjected to each test. The number of products to be tested should be based on the confidence level desired to expose a failure mode in a product. If every failure mechanism were present in every product, testing only one unit would be sufficient to detect and correct all of them. Due to component and manufacturing process variability, every product is not identical and more than one must be tested to prove the absence of serious failure mechanisms. In testing, some products will fail while others will not. Assuming that the failure mechanism is present in only a small percentage of the units, testing with small sample sizes may be risky. Assuming a normal distribution, a sample size of 2 produces only a 20% probability of detecting a defect that occurs in 10% of the products. Testing 10 units only raises the probability to approximately 65%. The equation below shows how to estimate sample size.

$$N = \frac{\ln\beta}{\ln(1 - p_+)}$$

where:

N = number of test specimens

\ln = natural log

β = 1 - confidence level

p_+ = upper confidence limit or failure probability

Example: how many systems must be tested without failure to demonstrate that the probability of failure is less than 0.1 (10%) with 90% confidence?

$$N = \frac{\ln(1 - 0.9)}{\ln(1 - 0.1)} \quad N = \frac{\ln(0.1)}{\ln(0.9)} \quad N = \frac{-2.30}{-0.105} \quad N = 21.8 = 22$$

Sample size estimation equation from Introduction to Reliability Engineering by E.E. Lewis.

Based on the binomial distribution, a sample size of 22 is necessary to achieve 90% probability of detecting a defect that occurs in 10% of the population. If you are concerned with achieving very low defect densities, say 1% or less, the sample sizes become very large.

Appendix C. Margins Random Vibration Test

Introduction

The standard Random Vibration Test utilizes an overall vibration level that mimics levels expected in actual shipments. While the standard test provides a good screening process, it does not accelerate defects and allow product and package designers to include margin in the product/package system. The Margins Vibration Test allows for an accelerated test with a small sample size which will discover defects that may be seen in the field in small numbers. Resolving these defects will then provide a product with high vibration resistance and a respective low AFR rate associated with vibration or low-level repetitive shock.

Specification: Margins Random Vibration Test

Random vibration testing is performed in an attempt to mimic the combination of overlying vibration frequencies that occur simultaneously in transportation. Test acceleration and vibration margin may be obtained by increasing the overall Grms levels above the levels expected in actual distribution. An effective test may be accomplished with a small sample size in a short amount of time using accelerated test methods. Be aware of false failures that may be induced or created by using elevated Grms levels.

- 1) Perform in accordance with ASTM D-4728 procedure 10.1.1, or IEC 68-2-34.
- 2) Test Axes. Test all of the package's axes potentially subject to vertical transportation vibration.
- 3) Physical Evaluation. Conduct a physical evaluation of the shipping container and the product. A performance test of the product prior to testing is recommended.
- 4) Mounting. For Type 1 products attach the shipping unit to the vibration table in a manner that will prevent the specimen from leaving the test surface during vibration. For Types 2 and 3 shipping units, restrain horizontal motion without vertical hold-down.
- 5) Random Vibration Test.
 - a. Deviation from the PSD test level should not exceed the following at any point:
 - $\pm 3\text{dB}$ for small units
 - $\pm 6\text{ dB}$ for large units
 - b. Deviation from the overall Grms level should not exceed $\pm 5\%$.
 - c. Test each shipping axis for 30 minutes for the multi-axis test and 1 hour for the single-axis test.



d. All tests should start at least 6dB below full test level and be gradually increased in one or more subsequent steps to the full test level. This process allows for electronic controllers to properly equalize prior to full force testing.

Note: Total elapsed time to reach the full test level should not exceed 3 minutes and should not be considered part of the full test level time.

e. Subject the shipping unit to the random vibration spectrum as specified on the following table:

Margins Random Vibration Test

Shipping Unit Type	Boxed Products (Type 1)	Palletized Products (Type 2 >150 lbs)	Palletized Products (Type 3)								
Configuration	Both the product and packaging should be representative of the final product and be Configured for shipping.										
Orientation	Package will be tested in all 3 axes	Palletized or slip sheet unit will be tested in vertical axis only.									
Mounting	Attached to the vibration table in a manner that will prevent the package from leaving the table during testing. Typically the box is strapped or clamped to the vibration table.	Shipping unit will be attached to the table in a manner that restrains the horizontal motion. In the case of a Type 3, no vertical hold down restraint shall be used over the top of the load.									
Vibration Profile. Test for 30 min. per test axis for multi-axis test or 1 hour for single-axis test.	<table border="1"> <thead> <tr> <th>Hz</th> <th>PSD, g²/Hz</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>0.015</td> </tr> <tr> <td>100</td> <td>0.015</td> </tr> <tr> <td>200</td> <td>0.0038</td> </tr> </tbody> </table> <p>Overall Level \cong 1.47 g_{rms}</p>	Hz	PSD, g ² /Hz	3	0.015	100	0.015	200	0.0038	<p>PSD, g²/hz</p> <p>frequency, Hz</p>	
Hz	PSD, g ² /Hz										
3	0.015										
100	0.015										
200	0.0038										



Appendix D. Product Shock Test

Product Damage Boundary Test

Unless otherwise instructed by HP, the ODM shall be responsible for undertaking and reporting the results of this test.

It is important to understand the mechanical-shock fragility of bare products (without packaging) whenever possible and/or feasible. This information is also referred to as a product's damage boundary information. This information is very helpful to assess and compare the bare product fragility of current and future HP products. It provides information that allows for cost effective packaging solutions as well as identifying opportunities to increase HP product ruggedness.

ASTM D3332 "Standard Test Methods for Mechanical-Shock Fragility of Products, Using Shock Machines" is highly recommended. This industry standard test is being used successfully by several HP divisions to identify opportunities to improve bare product fragility and to develop lower cost packaging solutions.

A summary of the ASTM D3332 test is as follows:

- Twelve production representative products will be required for this test.
- Determine the critical velocity (V_c) for each (six) axis
- Determine the critical acceleration (A_c) for each (six) axis
- Plot the critical velocity and critical acceleration for each axis onto a damage boundary plot.

See ASTM 3332 for specific details on this test. It is important to understand the bare product fragility for the following reasons:

- Find opportunities to improve HP product ruggedness. This helps reduce potential product damage at customers as well as identifying packaging and/or logistics cost reduction opportunities.
- Develop a baseline for comparison of current and future bare product fragility levels.

To compare products manufactured at/from different locations and to monitor/audit and ensure ongoing product quality.

Appendix E. Product Shock Test

Product Shock Within The Shipping Package

Introduction and Test Rationale

This specification is being introduced to ensure the product can withstand mechanical shock environments anticipated during its shipment. Although conducted on the “bare” or unpackaged product, it represents the shock environment the product will experience within its shipping package, particularly freefall drop events. The premise of the test is to subject the bare product to a shock pulse that results from an optimally designed cushion. In other words, the product receives the shock input as if it were cushioned in a typical package design. This test is not intended to replace or mimic the traditional damage boundary testing of ASTM D3332 (Appendix B).

This specification reflects the philosophy that different electronic products (i.e., size, mass, and design complexity) have different optimal levels of product robustness or fragility, even though they may experience a similar distribution environment.

This test is conducted on a shock machine to maximize accuracy and repeatability of waveform (Figure 1 below); and, unlike prior testing which required a trapezoidal waveform, this test specifies a half-sine waveform which:

- More closely represents the typical waveform produced in a shipping package during impact,
- More closely simulates the product responses that occur in a shipping package (i.e., shock response spectrum), and
- Is less likely to induce false failures than is a trapezoidal waveform.



Figure 1. Fixtured LaserJet on Shock Machine Table



Figure 2. Detail of LaserJet Base Fixture



Application:

Table 1 below outlines the parameters for the shock pulses based on product weight and the corresponding anticipated freefall drop height. The parameters assume an idealized half sine shape. (Note: If the size of the product exceeds the size or load capacity of the shock machine, the default test will be to evaluate in a package free fall drop test.)

Specification:

- Product is powered off (non-operating) during test.
- Product should be tested on all faces which would be subjected to drop impacts in distribution.
- Product should be tested on a rigid fixture whose contact areas with the product simulate those in the final package design (Figures 1 and 2).
- Test to the levels indicated in Table 1 below.
- Half-Sine Waveform using plastic programmers. Use felt or other material to alter shock pulse to meet the parameters in Table 1 below.
- Velocity change tolerance: $\pm 5\%$

Product Weight, W, lb (kg)	Package Drop Height, inches (cm)	Velocity Change, Δv , ips (cm/s)	Acceleration, g's (Recommended unless historical data available)	Pulse Duration (ms)
0 < W ≤ 25 lb (0 < W ≤ 11.3 kg)	36" (92cm)	225 ips (571 cm/s)	105	8.7
25 < W ≤ 40 lb (11.3 < W ≤ 18.1 kg)	30" (76cm)	205 ips (521 cm/s)	72	11.6
40 < W ≤ 60 lb (18.1 < W ≤ 27.2 kg)	30" (76cm)	205 ips (521 cm/s)	56	14.9
60 < W ≤ 90 lb (27.2 < W ≤ 40.8kg)	24" (61cm)	184 ips (467 cm/s)	42	17.8
90 < W ≤ 150 lb (40.8 < W ≤ 68.0 kg)	18" (46cm)	159 ips (404 cm/s)	27	23.9
150 lb < W (68.0 kg < W)	9" (23cm)	112 ips (285 cm/s)	25, Type 2 Horizontal 14, Type 2 Drop	18.2, 32.6

Table 1. Shock Pulse Specification

- **Important Test Tip:** Regarding test approach, it is recommended that if there are no prior test results or knowledge for a product, that the test start at an acceleration level less than the goal limit (i.e., 50%) and step up incrementally to the goal level (i.e., 17% increments). This approach can, of course, induce some fatigue related failures. However, the overriding advantage is that hopefully the test is begun at non-damaging levels and that if the product's fragility is less than the goal level, this approach allows the determination of "first failure modes and levels". Once there is adequate test history, one can proceed directly to the goal level (100% which at this point should be non-damaging) and avoid fatigue effects.

i) Conformance

Product damage is any condition that causes the product not to meet its performance or cosmetic specification. The product must perform to specification after the test. It is also any change in physical condition (i.e., cracked plastic case parts, bent sheet metal, fractured components, etc.) which makes the product unacceptable for sale. Damage caused by test preparation or fixturing is not a failure.

ii) Equipment

Any manufacturer's test equipment which can satisfactorily perform the above tests is acceptable. The most common equipment will be a shock table utilizing plastic programmers and the necessary material on the programmers to produce the waveforms and pulse durations from Table 1.

iii) Background Information

This specification prescribes a half-sine waveform rather than the trapezoidal waveform more traditionally used to determine/verify critical acceleration of a product's fragility (reference ASTM D-3332, "Mechanical-Shock Fragility of Products, Using Shock Machines"). This specification is not a replacement to, or an enhancement of ASTM D-3332. Instead the intent of this specification is to provide a simple method for generating simulated/representative shocks resulting from idealized and optimized cushion designs. Ideally if the product withstands the shock pulse from Table 1, the product will be protected in the real cushion design for the corresponding drop height.

This specification, in using the half-sine pulse, supports the philosophy that built-in conservatism is not a goal. It implies that we do not want to deliberately "underrate" the product's shock fragility, and that we want to design packaging that more closely matches the real protective properties required by the product. The primary disadvantage, of course, is that the shock response of the half-sine has a shape which is much more frequency dependent. It is critical, then, that to use a half-sine pulse which has representative damage potential relative to the package environment that the appropriate pulse duration be used.



The shock pulse parameters are based on an idealized half-sine waveform shape. The representative equation is:

$$\Delta V = (\text{shape factor}) \times (\text{duration}) \times (\text{peak acceleration})$$

Where:

ΔV = velocity change

shape factor = 0.636 for half sine.



Appendix F. Example 10 unit Package Drop Test

For Low Exposure – Type 1 Products

Purpose: This test is intended to verify the product and package will survive impact and shock events expected in the distribution environment.

Performance criteria: Each product must perform to specification after all tests and shall not have incurred any critical damage as a result of this test. Critical damage is defined as anything that would result in customer returns, support phone calls or gross customer dissatisfaction. This includes cosmetic damage which makes the product unacceptable for sale. The same standards that are used at manufacturing product final inspection should be used to determine cosmetic damage. Cosmetic damage caused by test preparation such as mechanical fixturing, instrumentation, and prior handling should not be considered a failure. No conductive particles should be present from abrasion or other sources. The product should be able to meet all data sheet and manufacturing specifications and tolerances after testing¹.

Unacceptable package damage is defined as: (1) Any change in package condition that results in product damage or (2) inability of the package to contain the product in its intended position. The package's purpose is to absorb or modify the energy imparted by the environment, to sustain ordinary degradation as a result, and to protect and preserve the product in its original or undamaged condition. Thus, some package degradation is expected and is acceptable².

The drop test equipment shall permit the shipping unit to be placed in a position, prior to release, that will assume correct orientation within 2 degrees for flat-face drops and within 10 degrees for edge and corner drops upon impact³.

Reference Standards: ¹HP Product Assurance, Environmental Tests, Corporate Standards and Regulations, Section 762. ²HP Product Assurance, Environmental Tests, Corporate Standards and Regulations, Section 762.

³HP Product Assurance, Environmental Tests, Corporate Standards and Regulations, Appendix B.

Specification: Each unit will be packaged as intended for final shipment including all accessories, restraints and box contents. Each test sample is to be subjected to a series of 8 controlled freefall impacts onto a steel base plate from a drop height as specified in Table 2.

Package drop orientation is defined with respect to the product itself. Standard abbreviations used in this procedure are given in the following table.

Faces	Corners	Edges
Ft → Front	Tp-Ft-Lt → Top, Front, Left	Ft-Bt → Front, Bottom



Bt → Bottom	Tp-Ft-Rt → Top, Front, Right	Ft-Lt → Front, Left
Tp → Top	Tp-Rr-Lt → Top, Rear, Left	Ft-Rt → Front, Right
Rr → Rear	Tp-Rr-Rt → Top, Rear, Right	Tp-Ft → Top, Front
Rt → Right	Bt-Ft-Lt → Bottom, Front, Left	Tp-Lt → Top, Left
Lt → Left	Bt-Ft-Rt → Bottom, Front, Right	Tp-Rt → Top, Right
	Bt-Rr-Lt → Bottom, Rear, Left	Tp-Rr → Top, Rear
	Bt-Rr-Rt → Bottom, Rear, Right	Rr-Lt → Rear, Left
		Rr-Rt → Rear, Right
		Rr-Bt → Rear, Bottom
		Lt-Bt → Left, Bottom
		Rt-Bt → Right, Bottom

Each sequence of 8 drops will consist of the following two sequences in random order:

- A) Four drops made up of random faces.
- B) Four drops made up of random corners and edges.

Two sets of package cushions and two boxes (per test sample) may be used for this test if the cushions are degraded through impacts during testing. One box and set of cushion is used for the first four drops. The other box and set of cushions is to be used for the second four drops as required. All drops may be conducted on units and packaging previously tested or preconditioned in Random Vibration provided the PSD level was 0.54 Grms or lower. This vibration followed by the drop procedure may be desirable for cases where cumulative damage is a possible environmental factor.

Before testing a pretest visual and functional inspection is done to establish a baseline. Following the drops each test sample will be visually and functionally inspected following the first four and second four drops. A sample size of 10 will allow each face to receive a minimum of six impacts and each corner/edge to receive a minimum of two impacts during the test suite of 80 drops. The drop sequence is given in the following table.

Unit	Drop 1	Drop 2	Drop 3	Drop 4	----	Drop 5	Drop 6	Drop 7	Drop 8	-
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1	Bt	Lt	Tp	Ft	i, X	Ft-Bt	Tp-Rr- Rt	Tp-Rt	Lt-Bt	i
2	Bt-Rr- Lt	Tp-Ft- Lt	Rr-Lt	Tp- Rr	i, X	Rr	Rt	Ft	Lt	i
3	Bt-Ft- Lt	Rr-Bt	Tp-Rr- Lt	Ft-Rt	i, X	Rr	Tp	Rt	Bt	i
4	Ft	Lt	Tp	Bt	i, X	Bt-Ft- Rt	Tp-Ft- Rt	Ft-Lt	Tp-Ft	i
5	Bt-Rr- Rt	Rt-Bt	Rr-Rt	Lt-Bt	i, X	Ft	Rr	Lt	Rt	i
6	Rr	Tp	Bt	Ft	i, X	Bt-Rr- Rt	Tp-Rr- Lt	Ft-Bt	Tp-Ft	i
7	Bt-Ft- Rt	Ft-Lt	Tp-Rr- Rt	Tp-Lt	i, X	Lt	Rt	Rr	Bt	i
8	Bt-Ft- Lt	Rt-Bt	Ft-Rt	Tp- Rt	i, X	Rt	Lt	Bt	Tp	i
9	Ft	Lt	Bt	Rt	i, X	Rr-Rt	Rr-Bt	Tp-Ft- Rt	Bt-Rr- Lt	i
10	Rr-Lt	Tp-Ft- Lt	Tp-Lt	Tp- Rr	i, X	Rt	Tp	Ft	Rr	i
i = Inspection of product and packaging X = Replace cushion and box as required (optional).										

Sample size: The minimum number of units required for a qualification test is ten (10).

Note: HP has not reached company wide agreement on a specific drop test sequence. This drop test sequence is included as an example to consider when qualifying low exposure – Type 1 products. Each division/entity will specify their specific drop test requirements and drop test sequence depending on their specific product requirements and needs.

Appendix G

Polybag Hazard Warning Symbols

