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Packaging First Article Inspection Reporting (FAIR)

Document Number and Revision: 923-3763 Rev 04

Overview

This document provides Oracle and Oracle authorized suppliers with the process details required to carry out packaging material first article inspections (FAIs) and reporting for all Oracle Finished Goods Packaging (Systems and Storage products, X-Options, and FRU's).

Audience

This document is for Oracle Packaging Design Engineering, Oracle Operations Engineering, Oracle Operations Project Management, Oracle Supplier Management, and Oracle Authorized Suppliers.

Table of Contents

Overview	**1**
Audience	**1**
Scope	**2**
Applicable Documents	**2**
General Requirements	**2**
Definitions	**3**
Procedure	**3**
Deviations	**4**
Appendix A Sample Forms	**5**
Appendix B Packaging Technical Guide	**12**
General Requirements	**12**
Corrugated Material	**13**
Measuring a Container (Set-up)	**23**
Measuring non-Containers	**26**
Measuring Corrugated Material with Assembled and Flat Dimensions	**28**
Manufacturer's Joints	**29**
Printing	**30**

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Special Materials 31
Foam or Cushion Materials 32
Density 37
Identification Force Deflection (IFD) 39
Foam Dimensions 39
Measuring Convoluted Foam 41
Assembled Dinmensions 43
Wood Materials and Pallets 43
Printing and Heating Treatment 48
Bags and Plastic Films 50
Appendix C International Box Codes 57
Appendix D Packaging Terminology 59
Related Information 61

Scope

This specification defines the packaging FAI procedure and first article inspection reporting (FAIR) for use with all Oracle finished goods (systems and storage products, X-options, and FRUs).

Applicable Documents

The following documents form a part of this specification to the extent specified herein:

- *Specification for Packaging Manufacturing and Inspection*, 425-1020-xx
- *Specification for Package Material Identification Marking*, 425-1228-xx

In the event of a conflict between this specification and the above references, this document takes precedence.

General Requirements

This procedure was created to ensure the receipt of packaging materials, which are within specification and are compatible with products and operation's processes. It is also to ensure that both the drawings and the actual production parts match.

FAI is required under the following circumstances:

- A new design or package component is manufactured for the first time.
- The form, fit, or function of a packaging component changes as indicated by a change to the part number, dash level, or revision level. Only the changed dimensions must be evaluated.

- An existing part or design is manufactured for the first time by a new supplier, or by the same supplier but in a new location.
- The parts which are subjected to FAI must be samples taken from a normal production environment (that is they must be production part samples and NOT pre-production samples).
- Hand made samples or samples made on a sample table are not acceptable for FAI.
- 2 piece samples need to be provided to Oracle along with the FAI report.

Definitions

FAI: Is a complete inspection of the packaging component(s) characteristics in contrast with the Oracle specification drawings, notes and dimensions, as well as a form, fit, and function check with the physical product.

FAIR: Is a formal report which details all part dimensions, material characteristics, notes, and related tolerances. For sample forms and examples on how to complete the forms, refer to *Appendix A*, , on page 4. This report indicates whether or not part characteristics are within Oracle specifications and tolerances, and must correlate with a 'mapped' the component specification drawing which is attached and cross-referenced with the parts.

Procedure

1. The External Manufacturer or Internal Oracle manufacturing must either perform the FAI or verify that a FAI was performed by the packaging material supplier, and that such a FAI meets the requirements in this document. Oracle reserves the right to audit any or all aspects detailed in the FAIR.
2. The individual(s) performing the FAI must examine all specifications, drawings, and other applicable documents to become familiar with the item(s).
3. The inspector(s) must perform a detailed inspection of the items to determine compliance to Oracle's specifications, as defined by the Engineering documentation.
4. A Mullen Test or Edge Crush Test (ECT) must be performed on the system carton and all major corrugate components according to the latest TAPPI standards (Mullen: T-810 and T-803, ECT: T-811).
5. A Manufacturing Joint Test must be performed on the system carton and all major corrugate components. For details refer to *Appendix B*, , on page 12.
6. A Form and Fit Test must be performed with the product, all accessories, and first article package components to ensure proper product and package compatibility.
7. The inspector must record the findings in a FAIR. The report lists all dimensions and notes with tolerances and indicates whether each dimension is in or out of the specified tolerance. The size and location of the graphics, applied labels, and pouches on containers must also be examined and reported. Documented Mullen, ECT, and Manufacturers Joint Test samples must be included in the FAIR for validation.

8. If any dimensions are found to be 'out of tolerance', and/or the product is not properly contained in the package as designed, the discrepancy must be noted in the comments section of the FAIR. The rejected First Article sample(s) along with the FAIR must be forwarded to the responsible Oracle Operations Engineer.

Status	***Reason***	***Action***
Reject (critical product fault)	Sample does not comply with the critical dimensions, drawings, and specification.	1. Note the fault(s) within the FAIR. 2. Determine the root-cause and corrective action (note within the FAIR). 3. Submit new FAIR and samples with corrective actions completed.
Reject (minor product fault)	Sample does not comply with minor dimensions, drawings, and specification.	1. Note the fault(s) within the FAIR. 2. Determine the root-cause and corrective action (note within the FAIR). 3. Oracle Operations Engineer provides a formal written approval to use rejected packaging in parallel with the corrective action. 4. Submit a new FAIR and samples with the corrective actions completed.
Reject (product design fault)	Fault found with the BOM, drawings and/or specification.	1. Note the fault(s) within the FAIR. 2. Oracle Operations Engineer notifies the Packaging Design Engineer for corrective action. 3. The packaging Engineer makes the appropriate changes to the BOM, drawings and/or specification and re-release those changes and corrections through ECO process. 4. Oracle Operation Engineer and Packaging Engineer decide if the samples can be used in parallel with the corrective action steps and/or if new samples and FAIR is required.

9. If the First Article is acceptable, the completed First Article sample and FAIR must be forwarded to the responsible Oracle Operations Engineer who provides a formal written approval back to the EM.

10. All FAI Data per build will be archived on Beehive. Operations Program Managers will set up both Internal and External Beehive locations by Supplier. Folder creations titled FAI Packaging.

Deviations

Deviations require an Engineering change order in Fusion PD (product development). This will capture the reason for the Deviation and the duration and quantity subject to the Deviation's needs.

Appendix A Sample Forms

Figure A-1 FAI Report Template

Part Number:	Date: (mm/dd/yyyy)	First Article Inspection Report
Revision:	Vendor:	
Part Name:	Inspected by:	

Notes:

Item Number	Note Number	Note	Accept / Reject	Remarks

Comments:

Figure A-2 FAI Report Sample

Part Number: 401-3909-03	Date: (mm/dd/yyyy) 01/04/2002	First Article Inspection Report
Revision: 50	Vendor: ABC	
Part Name: HSC,30.38,22.88,18.13,DW,PSG,K	Inspected by: John Doe	

Notes:

Item Number	Note Number	Note	Accept / Reject	Remarks
1	1-1	Cartons shall be manufactured and inspected per packaging manufacturing and inpsection requirements (425-1020-XX)	Accept	
2	1-2-1	Container Style: Half Slotted Container (HSC)	Accept	
3	1-2-2	Type of Fiberboard: Corrugated	Accept	
4	1-2-3	Material Construction: DW	Accept	
5	1-2-4	Flute: BC	Accept	
6	1-2-5	Minimum Bursting Strength or ECT Value: 500	Accept	Test samples provided
7	1-2-6	Container Color: Kraft	Accept	
8	1-2-7	Manufacturer's Joint: Glued (Pref.) / Stitched	Accept	Test samples provided
9	1-2-8	Manufacturer's joint may be positioned off length or w idth panel	Accept	
10	1-2-9	Inside Dimensions	Accept	See Dimensions Page, Item Numbers 17 - 19
11	1-2-10	Outside Dimensions	Accept	See Dimensions Page, Item Numbers 20 - 22
12	1-2-11	Corro Clip Hole: Located in length panels as per above dimensions	Accept	
13	1-3-1	Part Number / Revision Level (XXX-XXXX-XX-XX) and Run Date (MM/DD/YY) (Locate approx. w here show n), Die height: .50 [12.7] Color: 100% Black (Ref GCMI #90)	Accept	
14	1-3-2	Box Makers Certificate (Locate approx. w here show n), Max Die Height: 3.00 [76.2] Color: 100% Black (Ref GCMI #90)	Accept	
15	1-3-3	Product ICON Printed per Sun Artw ork: 412-1567-02-01 Color: Black (Ref GCMI #90) and White (Ref GCMI #91)	Accept	
16		Corrugation Direction	Accept	

Comments:

Figure A-3 FAI Dimensions and Tolerances Report Template

Part Number:	Date: (mm/dd/yyyy)	First Article Inspection Report
Revision:	Vendor:	
Part Name:	Inspected by:	

Dimensions/Tolerances (As noted on component drawing):							
Item Number	Grid Location	Drawing Dim (mm)	Actual Dim (mm)	Lower Limit (mm)	Upper Limit (mm)	Accept / Reject	Remarks
Comments:							

Figure A-4 FAI Dimensions and Tolerances Report Sample

Part Number: 401-3909-03	Date: (mm/dd/yyyy) 01/04/2002	First Article Inspection Report
Revision: 50	Vendor: ABC	
Part Name: HSC,30.38,22.88,18.13,DW,PSG,K	Inspected by: John Doe	

Dimensions/Tolerances (As noted on component drawing):

Item Number	Grid Location	Drawing Dim (mm)	Actual Dim (mm)	Lower Limit (mm)	Upper Limit (mm)	Accept / Reject	Remarks
17	B7	30.38	30.44	30.25	30.50	Accept	
18	B6	22.88	22.81	22.75	23.00	Accept	
19	B5	18.13	18.13	18.00	18.25	Accept	
20	B7	31.00	31.06	30.88	31.13	Accept	
21	B6	23.50	23.44	23.38	23.63	Accept	
22	B5	18.75	18.69	18.63	18.88	Accept	
23	C6	1.72	1.70	1.60	1.85	Accept	
24	C6	2.50	2.50	2.38	2.63	Accept	
25	C4	2.63	2.69	2.50	2.75	Accept	
26	C4	1.63	1.69	1.50	1.75	Accept	

Comments:

Figure A-5 FAI Material Type and Weight Report Template

Part Number:	Date: (mm/dd/yy)		First Article Inspection Report
Revision:	Vendor:		
Part Name:	Inspected by:		

Material Type & Weight (As noted on component drawing):								
Item Number	Paper/ Corrugate (grams)	Plastic/ Foam (grams)	Wood (grams)	Metal (grams)	Glass (grams)	Other (grams)	Other (type)	Remarks
Comments:								

Figure A-6 FAI Material Type and Weight Report Sample

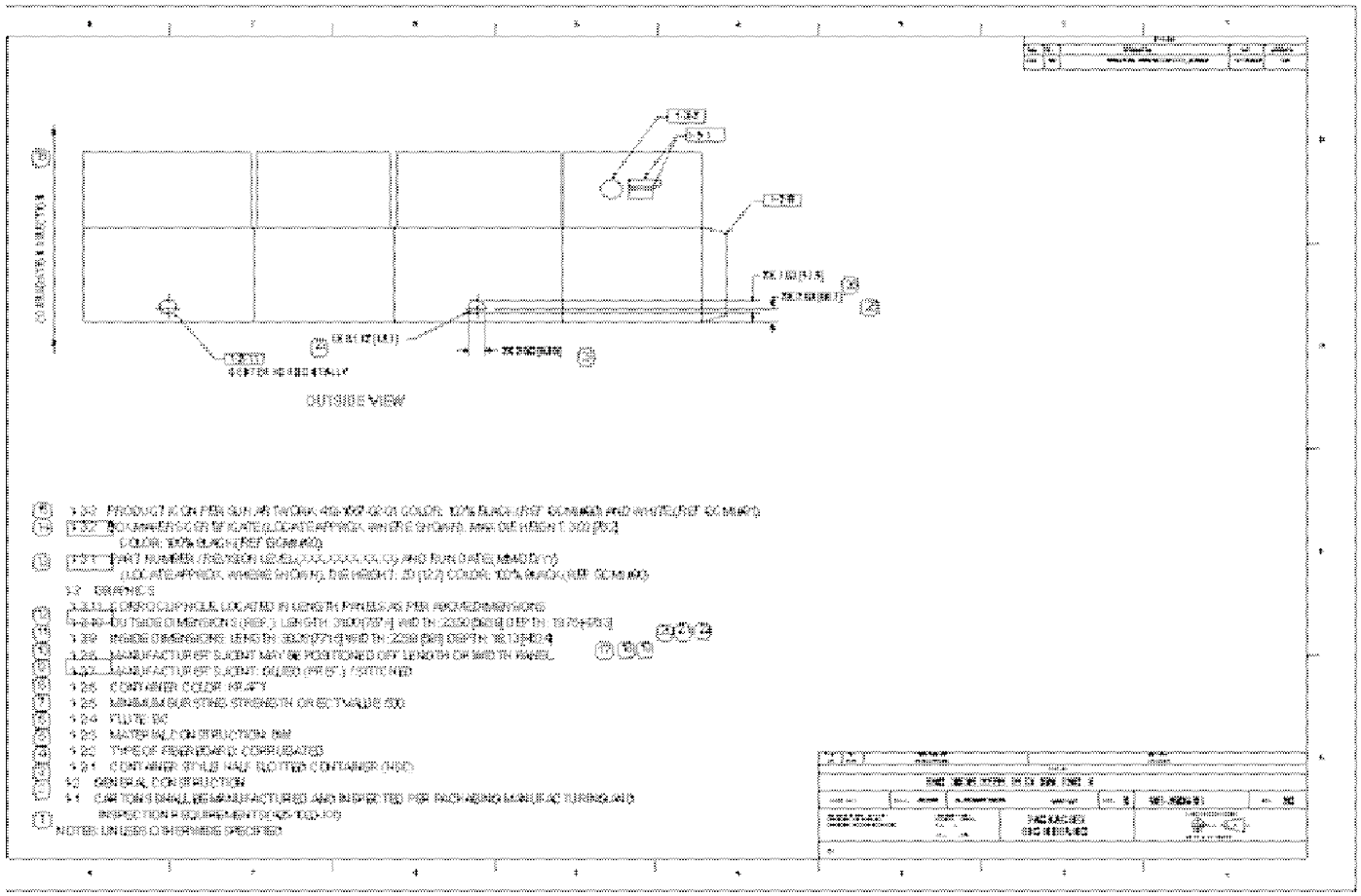
Part Number: 401-3909-03	Date: (mm/dd/yyyy)	01/04/2002	First Article Inspection Report
Revision: 50	Vendor:	ABC	
Part Name: HSC,30.38,22.88,18.13,DW,PSG,K	Inspected by:	John Doe	

Material Type & Weight (As noted on component drawing):

Item Number	Paper/ Corrugate (grams)	Plastic/ Foam (grams)	Wood (grams)	Metal (grams)	Glass (grams)	Other (grams)	Other (type)	Remarks
401-3909-03	200							

Comments:

Figure A-7 Sample Drawing



Appendix B Packaging Technical Guide

The following appendix assists in presenting guidelines and technical information to properly conduct a FAI on packaging materials. This appendix does not override any requirements defined in the material specification. Nor it is all inclusive, additional inspection may be required not listed in this appendix.

General Requirements

General Packaging Requirements

Specification for Manufacturing and Inspection of Packaging Materials, 425-1020-xx defines the required documents that form the complete requirements for packaging materials. Refer to this specification for the required documents to understand the full requirements that apply to packaging materials. These documents clarify the acceptable conditions for new packaging materials, graphic criteria, packaging manufacturing, and inspection.

Standard Temperature and Humidity

All packaging materials must be allowed to acclimate or climatize to standard temperature and humidity before inspection.

Material Quality

The overall quality of the packaging material must be examined. Refer to *Specification* 425-1020-xx for acceptable quality including but not limited to cracks, warp, punctures, de-lamination, stains, and moisture content.

Packaging Material Identification

All packaging materials must have the material identification symbol printed or labeled according to *Packaging Material Identification Marking*, 425-1228-xx. However on the outer package component/container (corrugated box, envelope mailer) the Packaging Material Identification Mark may be included on the 950-1419 Product Finished Goods Bar Code label rather than marked on the packaging material itself.

Corrugated Material

Container Style

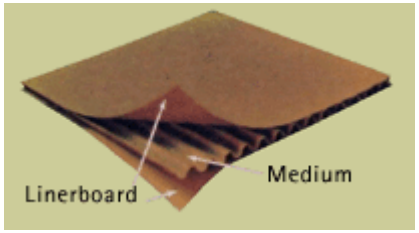
When an international box code is defined in a container specification, the style of the container must be compared to the style, as defined by the International Fibreboard Case Code. To confirm the style of some containers it may be required to dis-assemble the manufacturing joint. Do NOT disassemble the container until all set-up dimensions are measured.

Corrugated Construction

The following six factors must be inspected to ensure the acceptable construction:

- **Paper quality:** The overall quality of the paper must be examined. Refer to *Specification for Rejectable New Packaging Materials*, 425-1016-xx to define the acceptable quality of paper including, but not limited to, de-lamination, stains, score skewing, creasing, dents, and punctures.
- **Flute types:** A corrugated sheet consists of two major components: linerboard and corrugated medium. Linerboard is the flat paper that covers both sides of the sheet and the medium is the 'fluted' or arched paper found between both liners. The flute, when anchored to the linerboards with a starched-based adhesive, resists bending and pressure from all directions. When placed vertically on its ends, the flutes form vertical columns are capable of supporting considerable amounts of weight.

Figure B-1 Corrugated Fiberboard Construction



NOTE 1: Flutes come in five basic heights and shapes. The height of the flutes must be measured to ensure compliance. For flute types refer to , , on page 15.

Table B-1 Flute Types

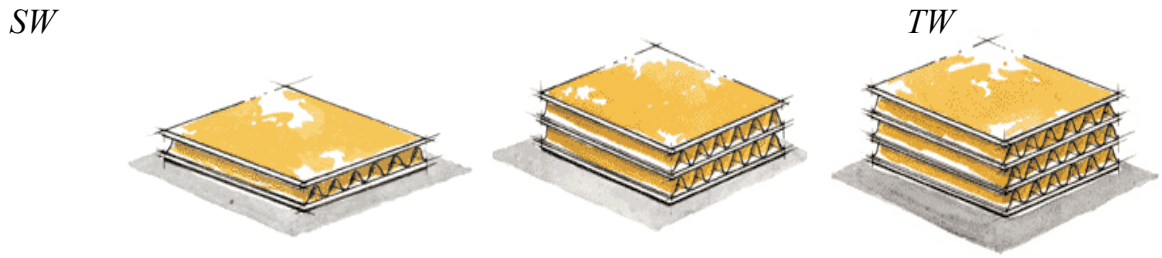
	Flute Height	Quality per Distance
F-flute	0.045 inch	96 ±3 flutes/ft
	0.114 cm	315 ±10 flutes/m
E-flute	0.062 inch	90 ±3 flutes/ft
	0.157 cm	295 ±10 flutes/m
C-flute	0.142 inch	39 ±3 flutes/ft
	0.361 cm	130 ±10 flutes/m
B-flute	0.097 inch	47 ±3 flutes/ft
	0.246 cm	155 ±10 flutes/m
A-flute	0.184 inch	33 ± 3 flutes/ft
	0.467 cm	110 ±10 flutes/m

- **Wall types:** Linerboards and corrugated mediums can be combined to form multiple wall board construction. Count the linerboards and mediums to determine wall type from the table below. Additionally, flute types can be combined and must be verified. The first flute letter given must be the outside of the finished container. For example, BC double-wall (DW) must have three linerboards and two mediums and have a flute height of 0.097 and 0.142 with the 'B' flute on the outside of the container.

Table B-2 Wall Types

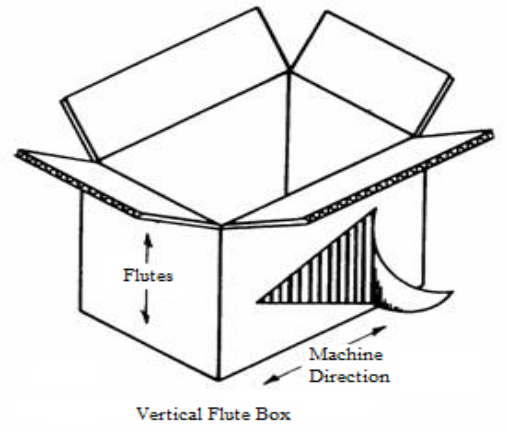
Wall Type	***Description***
Single-Wall (SW)	Two flat facings of linerboard, one glued to each side of a corrugated medium.
Double-Wall (DW)	Three flat facings of linerboard, with two interleaved and glued corrugated mediums.
Triple-Wall (TW)	Four flat facings of linerboard with three interleaved and glued corrugated mediums.

Figure B-2 Wall Types



- **Flute (or corrugated) direction:** The flute direction must be confirmed when specified on the part specification. The flute direction is the direction parallel to the flutes. The normal direction of flutes is parallel to the depth of the container, so that they are vertical when the container is stacked for shipment.

Figure B-3 Flute Direction



- **Material strength:** The material strength of corrugated fibreboard can be measured in three different ways: with Burst Strength/Mullen Test, Puncture Test, and Edge Crush Test (ECT). The material strength must be greater than or equal to the specified material strength. Most of Oracle corrugated specifications require burst strength.
    - **Burst/Mullen in contrast to edge crush:** Burst/mullen and edge crush materials are NOT equivalent. Edge crush can only be used when stated on the specification. The Burst/Mullen Test measures the bursting strength of the corrugated linerboard while the ECT measures linerboard stacking strength. The 200 lb. mullen container and the 32 edge crush container are comparable in stacking strength. But that is where the similarity ends. The Burst/Mullen Test container is better suited for the protection of heavier contents while the ECT container provides lighter weight containers with good stacking characteristics.

Oracle Packaging Engineering prefers and recommends the use of Burst Test Corrugated Fibreboard as it is a more durable material within a dynamic distribution environment compared to the ones of Oracle. Where ECT is designed with a primary purpose of static stacking strength protection; while ECT is cheaper, increased levels of product damage can occur. If the Burst Test Corrugated Fibreboard is not available, the ECT Corrugated Fibreboard must conform to the conversion in
, , on page 20, (unless no ECT fiberboard is defined on the specification).

NOTE 2: The table is different to the Fibrebox Handbook's table because the Fibrebox Handbook only considers stacking strength equivalents.

Table B-3 Burst/Mullen Conversion

Burst/Mullen	ECT
200 SW	44 SW
250 SW	55 SW
275 SW	42 DW
350 SW	48 DW
200 DW	51 DW
275 DW	61 DW
350 DW	71 DW
400 DW	82 DW
500 DW	67 TW
600 DW	80 TW
1100 TW	112 TW

- **Mullen Test Method:** Burst Strength must be measured by using the Mullen Test Method according to TAPPI T-810. This test consist of taking 20 measurements on five 12 x 12 inch samples with equal measures on both sides of the sample. The TAPPI T-810 test procedure must be closely followed to ensure accuracy.

NOTE 3: Mullen testing can be preformed on SW and DW materials only. When measuring DW materials, simultaneous bursts of the multiple facings can not occur. Therefore the pass/fail criteria is that at least 16 out of the 20 tests must be above the stated burst strength. The tests must NOT be averaged. Puncture testing is required for TW material.

- **Edge Crush Test Method:** Edgewise compression strength must be measured using the test method according to TAPPI T-811. This test consists of taking 10 measurements on 10 2 x 1 1/4 inch samples. See: TAPPI T-811 for details.

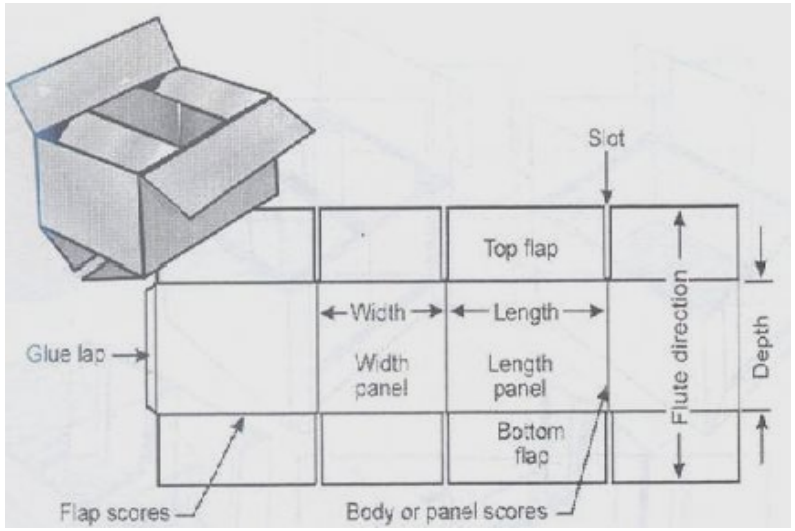
- **Puncture Test Method:** The Puncture Test must be measured according to TAPPI T-803. This test consists of taking 16 measurements on four 12 x 12 inch samples with equal measures on both sides of the sample, and parallel and perpendicular to the flute direction. See: TAPPI T-803 for details.

- **Color:** Most corrugated material specification define color. Corrugated can be supplied in one of three colors: kraft (brown), number 1 pure white (bleached white), and number 3 white (mottled white). Confirm that the color meets the specification.

Container Dimensions

The dimensions of corrugated containers can be specified by inside dimensions, outside dimensions, or flat dimensions. Each dimension must be taken from at least three different locations and the values are averaged. Typically Oracle specifies the dimensions of containers using inside dimensions and the outside dimensions included as reference dimensions. In this case, the outside dimensions must be measured in the First Article Report but are not rejectable. If inside and/or outside dimensions are not defined, the dimensions must be treated as inside dimensions. Containers that are dimensioned as a blank or flat must typically be dis-assembled to be measured. If the manufacturer's joint requires dis-assembly see *Appendix B*, ***Error! Reference source not found.***, on page **Error! Bookmark not defined.**.

Figure B-4 Container Construction



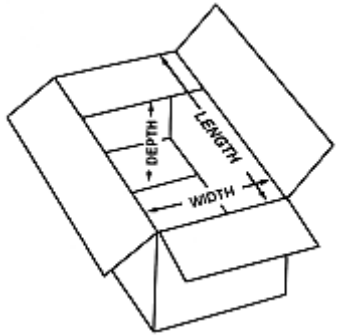
Measuring a Container (Set-up)

Corrugated Containers

Corrugated containers are specified by their length, width, and depth. For all shipping containers, such as regular slotted containers (RSCs), container measurements are given in the following sequence: length, width, and depth. The dimensions are defined in relation to the open face of a container; the longer side of the opening is the length, the shorter side is the width, and the side that runs perpendicular to the two is the depth.

1. Looking at the opening of the container, measure the longest or length panel first. The inside dimension is the distance between the inner most surfaces of the container. Measure from inside of flap to inside of flap on containers with flaps inside.
2. ASTM D-2658 defines the proper method for measuring a container. For length measurement, measure from left to right in the bottom of the container approximately one inch from the back wall.
3. Repeat the process for the shorter width panel.
4. Folding a side flap inward until it is perpendicular to its vertical side wall, place the tape measure at the end of the flap, and extend it downward until it rests on the inner flap at the bottom of the container. This gives you the depth dimension of the container. For details refer to , , on page24.

Figure B-5 Inside Dimensions of a RSC



One Piece, Die-Cut Containers

One-piece, die-cut containers, such as the roll-end tuck folders (RTFs) or one piece folders (OPFs) may not have flaps when assembled, but the measuring procedure is basically the same.

1. Partially assemble container so that the inside dimensions can be measured.
2. Measure from inner most surface (dust flaps).
3. Rotate flaps, panels, or lids inward until it is perpendicular to a side wall. For the container depth, use the inside front panel or inside rear panel because it has a visible score line (crease separating rear panel from lid); in this case, scoring allowance must be subtracted from measurement.

Figure B-6 Roll End Truck Folder

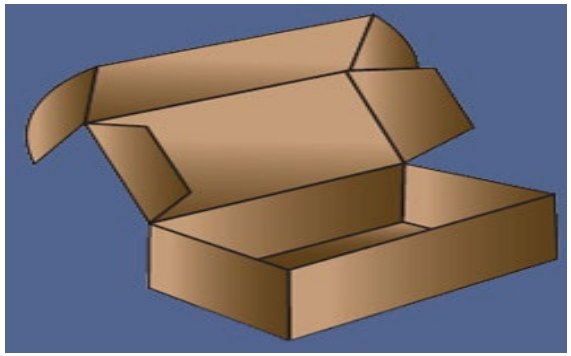
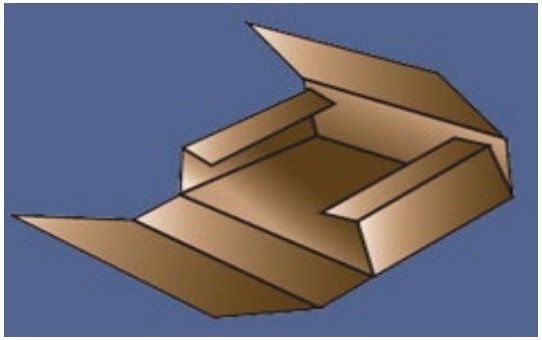


Figure B-7 One Piece Folder



Trays and caps having tabs folded to the inside, setup must be measured as follows:

- The length is the distance between the inside of the opposite walls not containing the corner tabs.
- The width is the distance between the inside of the opposite walls containing the corner tabs. The distance is measured from the inside of the tabs.
- The depth is the distance between the edge and the inside of the bottom of the cap.

Measuring non-Containers

Typically corrugated materials, which are not containers, are shown in the flat or blank configuration. Measurements must be taken from the edge of the corrugated sheet to the center of the score or where specified, center of score to center of score. In some cases these items must be dis-assembled to be measured. Care must be taken when dis-assembling manufacturer's joints and tabs.

Figure B-8 Roll End Tuck Folder

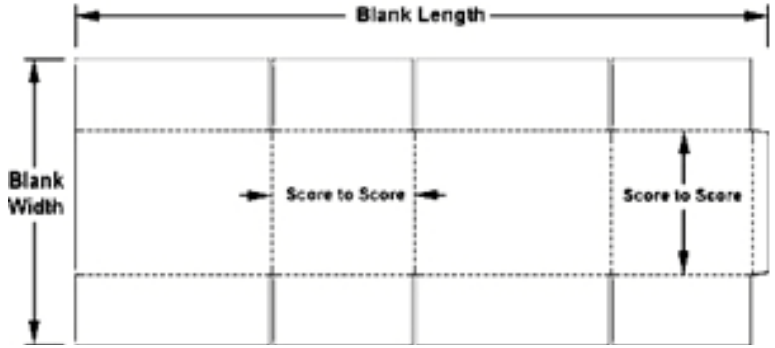
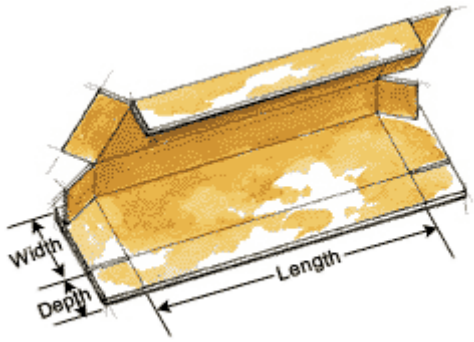


Figure B-9 One Piece Folder



Measuring Corrugated Material with Assembled and Flat Dimensions

How to Measure

Some containers can be specified with both inside dimensions and dimensions shown flat. Measure the inside dimensions first, then disassemble the container and measure the flat dimensions. Flat dimension typically locate special features or printing. It is preferred to measure to the closest scoreline because scoring allowances can influence the measurement.

Score Depth

The depth of the score is upon the type of corrugated to be scored. The score must be deep enough so that the folding of the board can be done with a minimum effort. The fold must follow the straight line of the score without migrating to either side more than 0.25 inches nor creating a false score. No visual surface breaks must be observed.

Folding Alignment

The folding alignment of the container is confirmed by measuring the variance between the leading and trailing edge of the container at the manufacturer's joints. This distance must be less than one material thickness.

Flap Overlap or Gap

On containers or corrugated sheets where the flaps are intended to meet, the gap cannot exceed 3/8 inch and no overlap of the flaps is permitted. Refer to *Specification for Rejectable New Packaging Materials*, 425-1016-xx for details.

Edges

The edges of the corrugated must be cut cleanly such that more than two tears longer than 0.25 inch per foot cannot be found. The edge must be 90° ±10° to the adjacent face.

Manufacturer's Joints

All Manufacturer's Joints

- **Location:** Manufacturer's joints can be located off either the length or width panel if not defined otherwise.
- **Tab Length:** The length of the tab must be minimum 1.25 inch (31.7 mm)
- **Slot width opening at manufacturer's joint:** When assembled, the distance at the bottom of the slot must be within one material thickness of the slot at the outer edge of the container.
- **Inside and Outside:** Determine if the manufacturer's joint is on the inside or outside of the container and compare it to the specification.

Type of Joint

The Inspection of the manufacturer's joints depends on the type of joint, which can be the following:

- **Glue Joints:** Carefully separate the body of the container from the tab of the manufacturer's joint. Measure the percent of the total joint area which is covered with adhesive.
- St**itch or Stapled Joints:** Measure the distance between stitches and distance from scorelines. Stitches must be evenly spaced, no

more than 1.50 inch (38.1 mm) apart, first and last stitch within placed 1.00 inch (25.4 mm) of the horizontal scorelines, approximately 45 degrees to the score line. Stitches must have evenly formed legs and not extend more than ¼ inch on inside of container. Stitches must not be on the outer top or bottom flaps.

Printing

Artwork Specifications

Graphic elements, which are printed on containers or corrugated materials, are defined by artwork specifications. One piece of artwork can be specified for the complete container or many pieces of artwork cam be specified with the location of the artwork defined. *Specification for Rejectable Packaging Graphics*, 425-1018-xx defines the quality and legibility of the printing.

- **Single Artwork:** To inspect artwork that is defined as one piece of art, a full scale (100%) overlay must be used. Place the overlay on top of the flat container, and determine if the correct graphic elements are placed in the correct locations. To account for scoring allowances, the overlay can be re-aligned with the scorelines on each panel. An alternative to a full scale overlay is to compare the flat container to the artwork. Confirm that the graphic elements match the artwork and each location is correct in relation to the other graphic elements and the scorelines. Graphic elements must align with each other. For example, the bottom of one international symbol must align with the international symbol next to it.
- **Multiple Artwork:** To inspect a container that has multiple artwork specified, compare each graphic element to the artwork defined. Measure the height of the graphic element and its location.
- **Box Manufacturer's Certificate (BMC):** When defined in the specification, BMC must be printed on the container. The certificate must conform to rail and truck regulations and contain the suppliers' name, location, material type and material strength (Burst Test or ECT).

Figure B10- BMC Examples

Part Information

Confirm the height, location, and format of the part information.

Material Identification

Compare the graphic element to the defined artwork. Measure the height of the graphic element and its location.

Special Materials

Some corrugated materials specifications require specially treated materials, for example, conductive corrugated. The supplier or convertor must be able to provide evidence that the material meets the special requirements from the raw material supplier. Measurements, such as surface resistivity, must be conducted by the raw material supplier, and must be available upon request.

Foam or Cushion Materials

Foam or Cushion Quality

The overall quality of the foam must be examined. Refer to *Specification* 425-1020-xx which defines the acceptable quality of foam including, but not limited to cracks, rips, punctures, stains, cleanliness, and moisture content.

Material Type

The material type is specified on the specification. Many packaging foams can appear similar in texture, surface finish, appearance, luster, cell structure, or cell size; therefore the supplier must be able to provide evidence that the material meets the requirements from the raw material supplier (material certification). Some drawings can require a specific foam manufacturer (for example, Sealed Air Stratocell), in this case the supplier must provide evidence that this material is used.

Polyethylene (PE or PEN): Polyethylene foams are 'closed cell', made from low-density polyethylene (LDPE) featuring superb durability, shock absorption, and abrasion resistance characteristics, and is odorless. Polyethylene foam can be extruded or laminated. Extruded foam is made from one thickness of foam whereas laminated foam is constructed of layers of foam heat bonded together. Polyethylene foams are easily fabricated and can be worked by a variety of methods including die-cutting, sawing, hot-knifing, water jet cutting, and welding. Polyethylene foams are typically fabricated but can also be molded. Polyethylene foams are offered in a broad range of densities ranging from 1.2 pcf (pounds per cubic foot) to 9 pcf. Foam density is expressed as the weight per cubic foot of material. Polyethylene foams are typically white, but can be any color. It is preferred (but not required) that anti static foam is pink.

Figure B-11 Polyethylene Foam

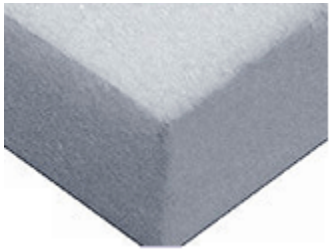
Figure B-12 Polyethylene Foam Laminated

Polyurethane (U or PUT): Polyurethane foams are characterized by an open cell construction and have a softer feel, especially in the lower density and firmness ranges. It is easily fabricated for many general applications. They can be fabricated in numerous ways, including sawing and die-cutting. Unlike polyethylene foams, however, polyurethane foams cannot be welded; joints must be glued. Polyurethane foams are typically NOT molded. Polyurethane foams are readily available in a wide range of densities, firmness, and colors. Foam density is expressed as the weight per cubic foot of material. Firmness is expressed numerically as indentation force deflection (IFD), and it is completely independent of density. Typically the color is independent of the performance of the foam. It is preferred (but not required) that anti-static foam is pink.

Figure B-13 Polyurethane Cushions

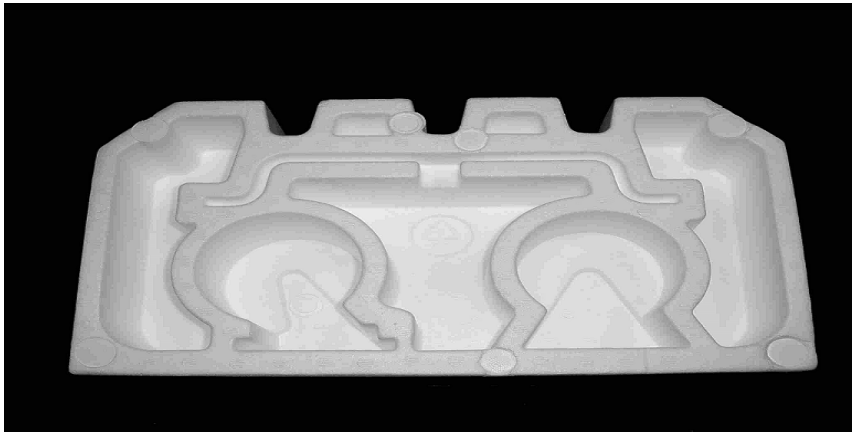
Polypropylene (PP, EPP, or PPN): Expanded polypropylene is a closed cell foam made from 'beads'. Polypropylene foams can be molded or fabricated for packaging applications. Polypropylene foams can be fabricated in similar methods as polyethylene foams, including die-cutting and sawing. Expanded polypropylene is the preferred material for Oracle's molded cushions. Polypropylene foams are readily available in a wide range of densities. Foam density is expressed as the weight per cubic foot of material. Polypropylene foams are typically white, but can be any color.

Figure B-14 Polypropylene Cushion



Expanded Polystyrene (EPS): Expanded polystyrene is a closed cell foam made from 'beads'. Polystyrene foams can be molded or fabricated for packaging applications. Generally Oracle only uses molded EPS. EPS cushions have limited application at Oracle because EPS cushioning properties are not as good as polyethylene, polypropylene or polyurethane foams. Expanded polystyrene foams are readily available in a wide range of densities and colors. Foam density is expressed as the weight per cubic foot of material. Typically expanded polystyrene is white.

Figure B-15 EPS Cushion



Density

The density of the foam must be confirmed in two ways; first by observing the material data (certification) provided by the supplier and secondly by taking the following physical measurement.

To calculate the density of foam cut the largest sample from the cushion as possible that does not contain glue joints or heat welds. The sample must be a rectangular, solid with the all angles at 90°. Before cutting the foam cushion for density measurement, complete all dimensional measurements and examine the construction glue joints or heat welds. For details refer to *Section 0*, , on page 39.

Density (D) in PCF = Weight of Sample in pounds x [1728 in^3/Volume of Sample in in^3]

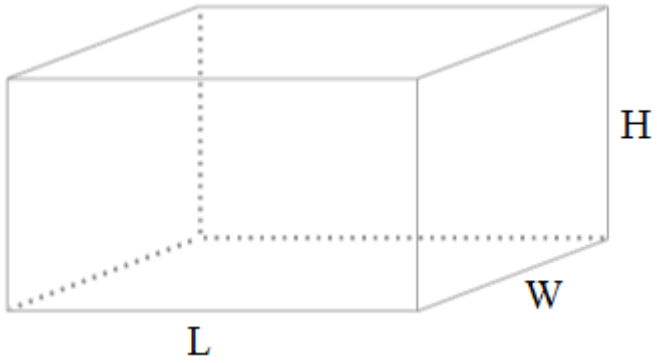
Example: A 10.0 x 10.0 x 2.25 sample weighs 0.18 pounds

D = 0.18 pounds x [1728 in^3/(10.0 in x 10.0 in x 2.25 in)]

D = 0.18 pounds x [1728 in^3/225 in^3]

D = 1.38 PCF

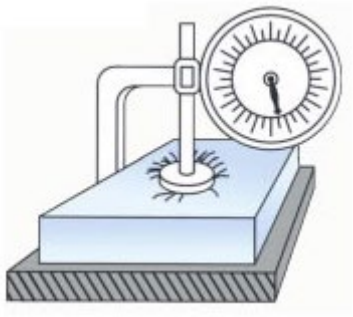
Figure B-16 Rectangular Solid



Identification Force Deflection (IFD)

IFD is a method to measure the firmness of polyurethane foam. Older drawings may define firmness using indentation load deflection (ILD). IFD and ILD are interchangeable. The IFD must be confirmed from the material data (certification) provided by the supplier.

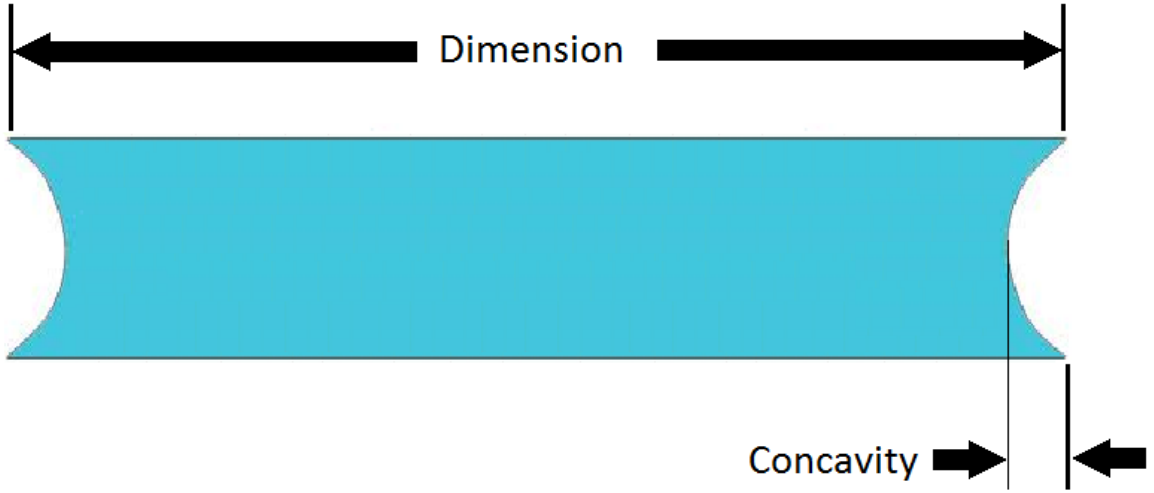
Figure B-17 IDF Tester



Foam Dimensions

- **Specified Dimensions:** Dimensions for foam materials must be measured with a steel rule (not with a tape measure). Tape measures can compress the foam when measurements are taken. All dimensions specified on the drawing must be measured. Each dimension must be taken from at least three different locations and the values are averaged.
- **Nominal Dimensions:** Typically fabricated polyethylene cushions are cut or stamped from stock materials typically called 'planks' where as fabricated polyurethane cushions are cut to dimension from a large 'buns' of foam. The thickness of the polyethylene plank can vary based on whether it is extruded or laminated; therefore, nominal dimensions are typically used for the thickness of polyurethane foam. Drawings show this as a reference dimension (xx.xx) or 'NOM'. The thickness must be measured to ensure that it is within industry standards for nominal thickness. For example, if a thickness is specified as 2.0 inch nominal and measures 1.25 inches, the cushion was made from the wrong plank stock.

Figure B-18 Measuring the Concavity of Foam



Concavity: The die-cutting process compresses the foam before it is cut. This compression causes the foam to be concave in its shape. Measurements must be taken from the outer edge to the outer edge of the foam. In addition, the concavity must be measured and compared to , , below.

Table B-4 Acceptable Concavity of Foam

Foam Thickness		Acceptable Concavity	
Inch	MM	Inch	MM
1.0 Inch	25.4	± 0.13 Inch	3.18
2.0 Inch	50.8	± 0.25 Inch	6.35
3.0 Inch	76.2	± 0.38 Inch	9.53
4.0 Inch	101.6	± 0.50 Inch	12.7

Measuring Convoluted Foam

If a foam material is convoluted, the convolution requirement is specified as peak height over base thickness. For example, 2.00 over 0.75. In addition, convoluted foam is typically defined in sets with the overall dimension of the set specified.

Figure B-19 Convoluted Polyurethane Foam- Side View

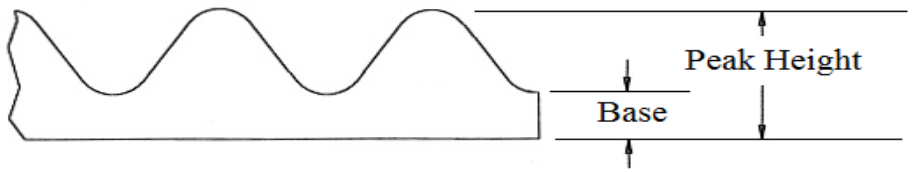


Figure B-20 Convoluted Polyurethane Foam- Side View of Set

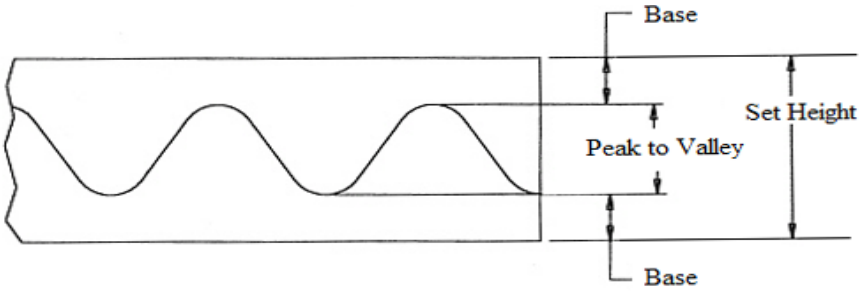
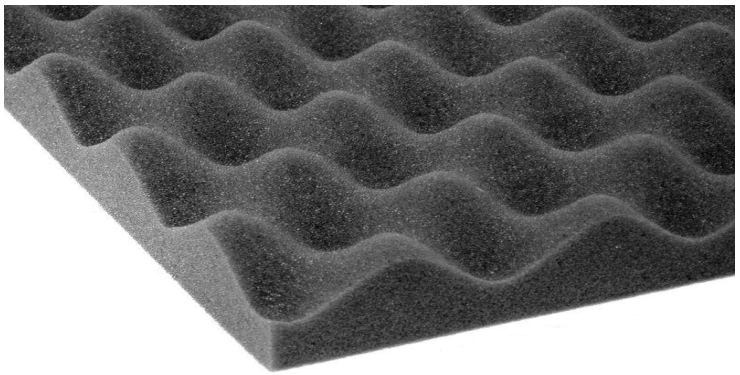


Figure B-21 Convoluted Foam



Assembled Dinmensions

Some of the overall dimensions of an assembled cushion can be called out as reference dimensions. This is because of the potential tolerance build up or nominal thickness foam is used. All components of the assembly must be within tolerance, but the combined overall reference dimension can be out of tolerance.

- **Component placement** dimensions must be treated like any other dimension and must be within tolerance. The foam assembly components must be aligned. When components are stacked or align, they must be within tolerance (that is 0.125 inch).
- **Assembly:** Glue joints and heat welds must be inspected. It may be required to cut the foam material at or near the assembly point to examine the complete joint. Verify that the joint coverage area (percentage) meets the specification. An acceptable joint is stronger than the surrounding material and may tear; this is not cause for rejection.
- **Printing:** Confirm that the foam material identification meets the requirements of *Specification for Rejectable Packaging Graphics*, 425-1018-xx, and that the printing is legible.

Special Materials

Some foam material specifications require specially treated materials, for example anti-static. The supplier must be able to provide evidence that the material meets the special requirements from the raw material supplier. Measurements such as surface resistivity must be conducted by the raw material supplier and be available upon request.

Wood Materials and Pallets

Wood Quality

The overall quality of the wood must be examined. Refer to *Specification* 425-1020-xx to define the acceptable quality of wood, including but not limited to cracks, warp, de-lamination, stains, and moisture content. If wood grade is defined on the specification it must be confirmed using the Western Wood Products Association Grading Rules. For more details, refer to http://www2.wwpa.org/.

Materials

Most pallet specifications have a detailed material list. Confirm that each item listed meet the material and dimensional requirements. Wood is supplied in the following two different types:

- **Dimensional lumber:** Also referred as solid wood materials or sawn wood products. These terms are used for lumber that is finished

or planed and cut to standardized width and depth specified in inches from a single wood source not involving glue, heat, or pressure. Examples of common sizes are 2×4 (actual dimension 1.5 x 3.5), 2×6 (actual dimension 1.5 x 5.5), and 4×4 (actual dimension 3.5 x 3.5). The common size naming is derived from the unfinished dimension of the wood.

Figure B-22 Dimensional Lumber

- **Manufactured wood products (Plywood):** Material comprised wholly of wood-based products such as plywood, particle board, and orient stand board which is created using glue, heat pressure or a combination thereof. Plywood, the preferred material for cushioned pallets, is made from thin sheets of wood. The layers are glued together so that adjacent plies have their wood grain direction at right angles to each other for greater strength. There are an odd number of plies, as symmetry makes the board less prone to warping.

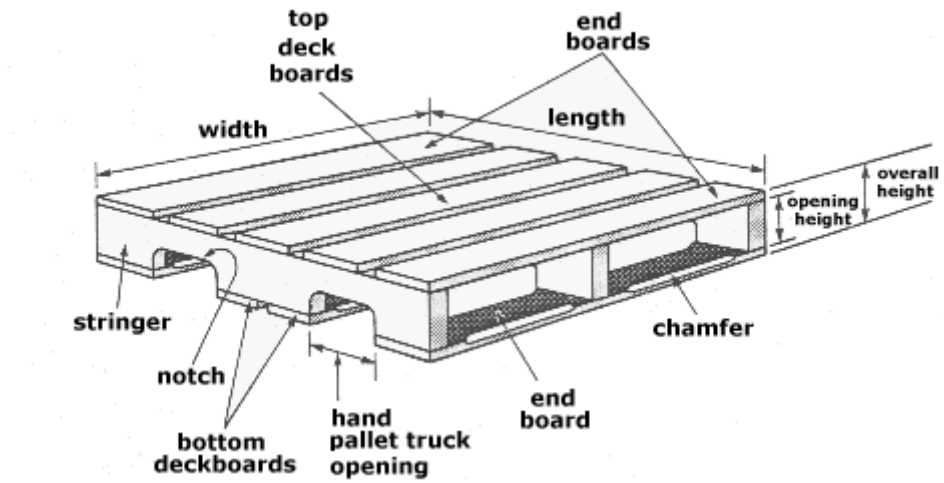
Figure B-23 Manufactured Wood Products

Wood and Pallet Dimensions

- **Specified Dimensions:** Dimensions for wood materials can be measured with a steel rule or tape measure. All dimensions specified on the drawing must be measured. Each dimension must be taken from at least three different locations and the values are averaged. Measurements must be taken as specified on the drawing, and are typically outside dimensions.

- **Nominal Dimensions**: Dimensional lumber is supplied in nominal dimensions and the common size does NOT match the actual dimension of the wood. The actual dimensions may differ depending upon whether softwood or hardwood is used or in different geographic regions. Typically dimensional lumber is specified in actual and/or nominal dimensions, but if called out in nominal dimensions only, the actual dimensions must be determined by the standard industry practice for the geographic region where the wood is manufactured.

Figure B-24 Pallet Construction



- **All Pallets (Standard):** Confirm the following according to specified requirements:
  - Dimensions and materials of all items used in the construction of the pallet
  - Notch location and size

- Chamfer location and size
- Other requirements according to the specification

- **Cushioned Pallets:** In addition to the item in standard pallets confirm the following according to specified requirements:
  - Foam Density (For details, refer to *Appendix B*, , on page 37.)
  - Hardware material, size, and location

Figure B-25 Cushioned Pallet

Assembly

It must be inspected how the pallet is constructed. Most pallet specifications have a detailed assembly procedure. Confirm that all assembly steps are followed.

All pallets (standard): Confirm the following according to specified requirements:

- Distance (gap) between the top deck boards

- Nail location, quantity, and depth
- Grain direction
- Flush: When placed on a flat surface, assembled pallet must rest with no corner raised more than ¼ inch (6.4 mm) from that surface.
- Bowing: The bowing of the assembled pieces must not exceed ½ inch (12.7 mm) perpendicular displacement per 18 linear inches (457.2 mm).

Cushioned Pallets: In addition to the item in standard pallets, confirm the following according to specified requirements:

- Foam Orientation: Foam pieces used for the pallet structure and support must be oriented such that cut surfaces are perpendicular to the pallet deck, and the bonding surfaces between the foam pieces are parallel to the pallet deck.
- Foam Adhesion: Foam pieces must be joined to wood, using hot melt adhesive such that bond strength is greater than the material strength. Foam to foam adhesion must be heat welded.

Printing and Heating Treatment

Part number, date of manufacture, supplier, material identification, and other printed information is required. Confirm that all printing have the correct size, location, and that they are legible. In addition, all solid wood materials are required to display an officially approved heat-heated, kiln-dried, or fumigation marking according to ISPM-15.

Figure B-26 Heat Treatment Marking

Bags and Plastic Films

Bags and Plastic Film Quality

The overall quality of the bag or film must be examined. Refer to *Specification* 425-1020-xx, to define the acceptable quality of bag or film including but not limited to rips, punctures, clarity, cleanliness, de-lamination, stains, and moisture content.

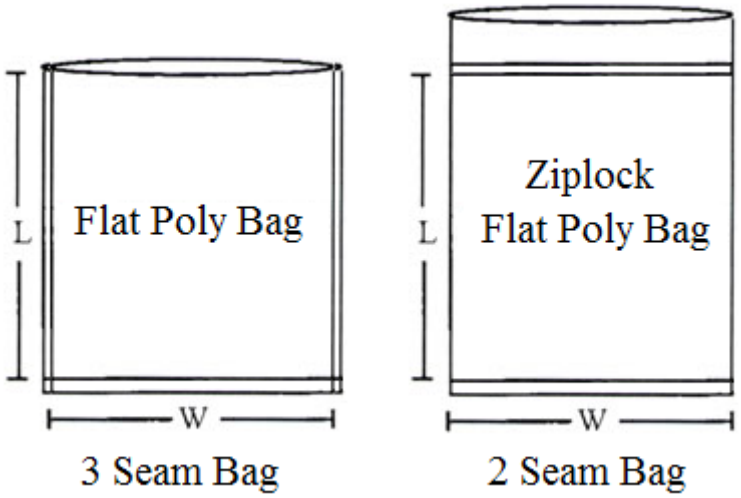
Measuring Bags

Bags are defined by inside dimensions and gauge (thickness of material) which is defined in Mils. A Mil is a unit of measurement that is equal to .001 inch (also referred to as 'one one-thousandth of an inch.') 1 mil = .001 inch (0.0254 mm). Each dimension must be taken from multiple locations, and the values are averaged.

Flat Bag

Flat bags are described as width-length-gauge. The first dimension, width, is the open side of the bag. Measure inside dimensions (seam to seam).

Figure B-27 Measuring Flat Bags



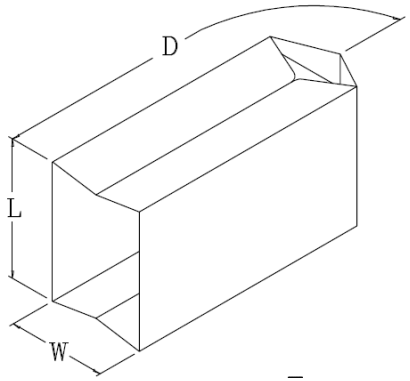
Gusset Style Bag

A gusset style bag is created by blowing film into a seamless tube. The tube diameter is equal to 2x the bag width + 2x the bag length. The depth dimension of the bag is the depth of the tube (plus an allowance to create the manufactures seam). The tube is then folded on each side to create the gussets (gusset dimension is equal to ½ the bag width). Next one end of the folded tube is heat welded with a single, continuous manufactures seam, bonding all layers of film, including gusset folds (2-4 layers of film bonded together).

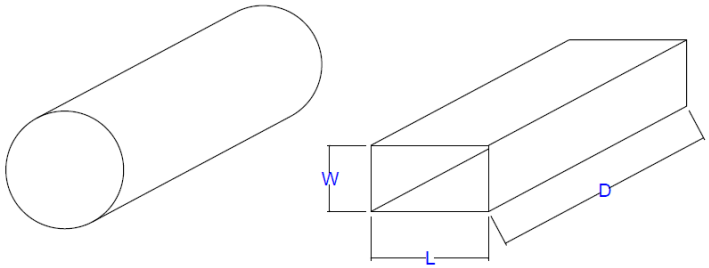
A gusset style bag depth dimension is measured with the gussets folded and the bag laid out flat.

The 'actual depth' of a gusset style bag when it is opened up (as it would be when covering a product), is the specified 'flat' bag depth minus ½ the bag width dimension.

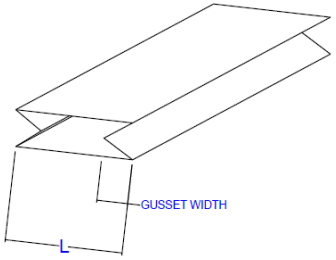
The width of a gusset fold is equal to ½ the bag width.



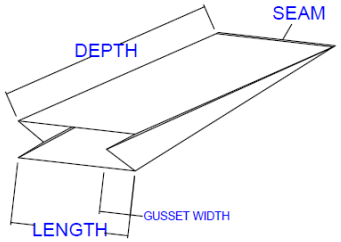
See steps 1-3 below for creating a Gusset style bag:



STEP 1:
BLOW FILM INTO A SEAMLESS TUBE
TUBE DIAMETER = 2X BAG WIDTH + 2X BAG LENGTH
TUBE LENGTH = BAG DEPTH + ALLOWANCE FOR MANUFACTURERS SEAM



STEP 2:
FOLD TUBE TO CREATE 2 GUSSETS
EACH GUSSET WIDTH = 0.5 X BAG WIDTH



STEP 3:
HEAT WELD END OF FOLDED TUBE TO CREATE GUSSET STYLE BAG USING A SINGLE MANUFACTURES SEAM ACROSS BAG LENGTH THAT BONDS ALL LAYERS OF PE FILM INCLUDING GUSSET FOLDS (2-4 LAYERS OF FILM BONDED TOGETHER).

Film and Sheets

Plastic film and sheets must be measure edge to edge.

Special Materials

Plastic materials specifications typically require specially treated materials, for example static dissipative or shielded. The supplier must be able to provide evidence that the material meets the special requirements from the raw material supplier. Measurements such as surface resistivity must be conducted by the raw material supplier and be available upon request.

Color

Typically color is independent of the performance of the bag or film. Additives can be added by the raw material suppliers to distinguish between different materials. Unless specified on the specification, color is optional. Preferred colors are the following:

- Made from 100% Virgin Polyethylene resin color: crystal clear
- Plain polyethylene: clear
- Static dissipative: pink or red
- Static dissipative and amine free: blue
- Conductive: black
- Static shielding: metallic silver/gray

Figure B-30 Bag Colors: 1-Pink Static Dissipative, 2-Blue Static Dissipative, 3-Gray Static Shielding

Appendix C International Box Codes

Slotted Containers – 02 Series

0200 Half Slotted Container (http://www.boxgeek.com)
0201 Regular Slotted Container (http://www.boxgeek.com)
0202 Overlap Slotted Container
0203 Full Overlap Slotted Container (http://www.boxgeek.com)
0204 Center Special Slotted Container
0205 Center Special Overlap Slotted Container
0206 Center Special Full Overlap Slotted Container
0215 Snap or 1-2-3 Bottom Container with Tuck Top
0216 Snap or 1-2-3 Bottom Container with RSC Top
0225 Full Bottom File Box, Hamper Style, Ft. Wayne Bottom, or Anderson Lock Bottom
0226 Bellows Style Top and Bottom Container
0228 Integral Divider Container, RSC with Internal Divider, or Self Divider Box

Telescope Boxes – 03 Series

0301 Full Telescope Design Style Container
0306 Design Style Container with Cover
0310 Double Cover Container
0320 Full Telescope Half Slotted container
0325 Interlocking Double Cover Container
0351 Octagonal Double Cover Container

Folders – 04 Series

0401 One Piece Folders (http://www.boxgeek.com)
0403 One Piece Folder with Air Cell/End Buffers, Protect All or Bookwrap
0406 Wrap Around Blank
0410 Five Panel Folder (FPF) or Harness Style Five Panel Folder (http://www.boxgeek.com)
0411 Center Seam Five Panel Folder
0415 One Piece Folder with Dust Flaps

0416 One Piece folder, Die Cut with Dust and Tuck Flaps
0422 Roll End Tray, Walker Lock Tray, or Tray with Self Locking Ends
0427 Roll End Tray with Locking cover
0457 Self Locking Tray, Joint-less Tray
0460 Display Tray or High Wall Tray
0470 Roll End Tray with Tuck Top and Interior Bottom Flaps

Rigid Boxes (Bliss Boxes) – 06 Series

0601A Bliss Style Container with End Flaps
0601B Bliss Style Container with End Flaps and End Panel Lags
0606A Bliss Style Container
0606B Bliss Style Container with End Panel Legs

Self-Erecting Boxes – 07 Series

0711 Pre-glued Auto Bottom with RSC Top Flaps
0760 Self Erecting Six Corner Tray

Appendix D Packaging Terminology

Box: A rigid container having closed faces and completely enclosing its contents.

Boxboard: The types of paperboard used to manufacture folding cartons and set-up boxes.

Cardboard: A thin, stiff pasteboard, sometimes used for playing cards or signs. Misuse extended the layman's definition to included boxboard, which can be similar in appearance, and containerboard, which is a totally different material.

Carton: A folding box made from boxboard, used for consumer quantities of product. A carton is not recognized as a shipping container.

Containerboard: The paperboard components (linerboard, corrugating material, and chipboard) used to manufacture corrugated and solid fibreboard.

Corrugated fibreboard: The structure formed by gluing one or more sheets of fluted corrugating medium to one or more flat facings of linerboard.

Container: A receptacle used to contain or hold products. In shipping, usually the outer protection is used to package goods.

Microfoam: A thin cushioning material (polyethylene foam) typically used for cosmetic protection.

Package: A small to moderate-sized container.

Packaging: the science, art and technology of enclosing or protecting products for distribution, storage, sale, and use. Packaging also refers to the process of design, evaluation, and production of packages. Packaging can be described as a coordinated system of preparing goods for transport, warehousing, logistics, sale, and end use. Packaging contains, protects, preserves, transports, informs, and sells. (For details, refer to *Soroka*: *Fundamentals of Packaging Technology*, Institute of Packaging Professionals, 2002.)

Score: A crease or impression in a piece of corrugated sheet that is designed to facilitate and control the position of folds.

Score sheet: A sheet of corrugated board or cardboard that was scored in appropriate places to control how and where the sheet folds. Often used as void fill. Scored sheets are versatile and can add protection or increase the strength of the container.

Shipping container: A container with strength, suitable to withstand shipment, storage, and handling.

Slit: A cut made in a sheet of corrugated or combined board that does not require the removal of any material.

Slit-score: A partial cut made in the corrugated sheet that extends through only a portion of the thickness. Slit-scores are commonly used to allow thick material such as triple wall or honeycomb to be easily folded.

Slot: The wide cuts made in a sheet of corrugated board that usually form the container flaps. The wide cuts result in the removal of narrow strips of material, which allow the container to close neatly, without bulges caused by the thickness of the corrugated material.

Related Information

Reference Documents and Records

Document Title [1]	*Number*	*ESO Controlled* [2]		*Quality Record* [3]	
		Yes	*No*	*Yes*	*No*
Specification for Manufacturing and Inspection of Packaging Materials	425-1020-xx		x		x
Packaging Material Identification Marking	425-1228-xx		x		x
Oracle Standard Packaging Practices	425-1234-xx		x		x
Customer Information Sheet	950-1647-xx		x		x
Materials to Close, Seal, and Secure Containers	950-1685-xx		x		x
General Bagging Guidelines	950-3918-xx		x		x
ASTM D-2658	N/A		x		x
Box Code References: http://www.boxgeek.com/	N/A		x		x
Corrugated Fiberboard Workmanship 13010218	N/A		x		x
Fibre Box Handbook, Fibre Box Association: http://www.fibrebox.org/	N/A		x		x
ISPM-15	N/A		x		x
Soroka: *Fundamentals of Packaging Technology*, Institute of Packaging Professionals, 2002.)	N/A		x		x
TAPPI standards, Mullen: T-803, T-810, T-811	N/A		x		x
Western Lumber Grading Rules, Western Wood Products Association: www.wwpa.org/	N/A		x		x

1 See Fusion for controlled documents.

2All references to documents controlled by Engineering Services were current when this document was released.

All hard copies of this document are to be used for reference only.

3All FAI Data per build will be archived on Beehive. Operations Program Managers will set up both Internal and External Beehive locations by Supplier. Folder creations titled FAI Packaging

Document History and Approvals

Dash	Rev	Date	Description of Change	Originator
01	A	26 Jan 2011	Initial release.	N/A
Agile History				
Rev		***Date***	***Description of Change***	***Originator***
02		30 Sept 2014	Added 2 sample requirements along with the FAI report. Provided the beehive location for report archives. Deleted all inactive links and inactive spec's.	N/A
Fusion History				
03		March 27 2020	Replaced Agile reference with Fusion PD (product development) reference. Updated document title. Updated links. Removed fefco.com reference.	N/A
04		Dec 12 2023	Updated Applicable Documents, updated Gusset bag	N/A

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