

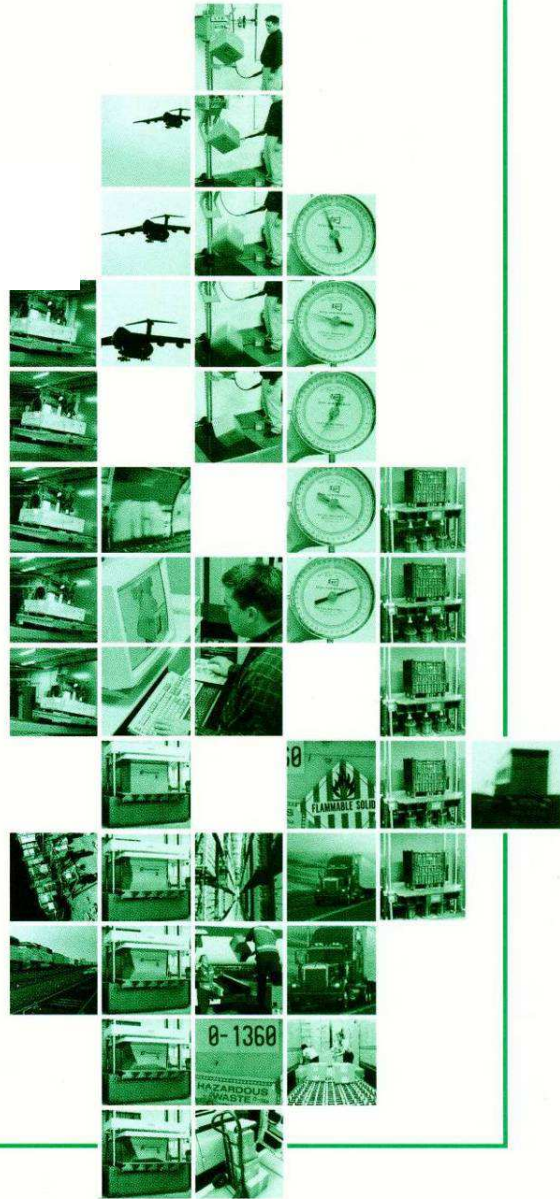


**Package & Product  
Testing and  
Consulting, Inc.**

4090 Thunderbird Lane  
Fairfield, OH 45014  
Phone (513) 870-0080  
Fax (513) 870-0017  
**ISO 17025 accredited**

**Hemi  
Packing  
Concept  
packaging  
system**

**Laboratory  
Report**



***Prepared For:***      ***Action Wood***  
*44500 Reynolds Drive*  
*Clinton Township, MI 48036*

Test requested by: Christopher Grobbel  
Date Prepared: March 19, 2014



**gh Package  
& Product  
Testing and  
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**ISO/IEC 17025**  
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**Test Report**

United Nations Testing of Hazardous Materials Pack  
Non Bulk Packaging  
March 19, 2014  
Laboratory ID: Q012314P1

Customer:

***Action Wood***  
*44500 Reynolds Drive*  
*Clinton Township, MI 48036*

Test requested by: Christopher Grobbel

Testing Performed by:

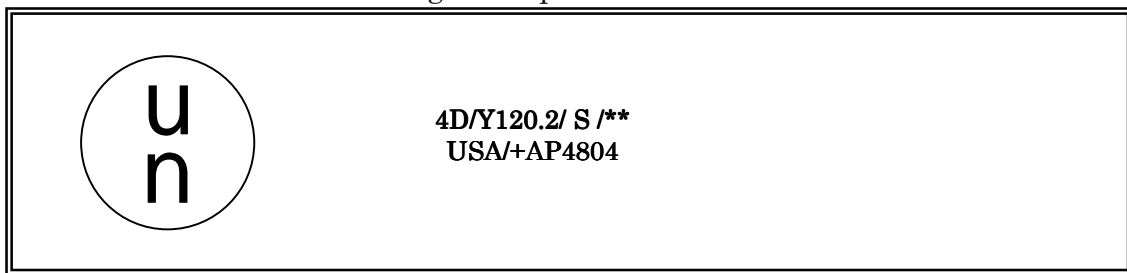
**gh Package & Product Testing  
and Consulting, Inc.**  
4090 Thunderbird Lane  
Fairfield, Ohio 45014

Test Date(s):

March 3<sup>rd</sup> Thru March 14<sup>th</sup> , 2014

Pack Identification:

Hemi Packing Concept



Note: Replace \*\* with the last two digits of the year of manufacture. If the pack was manufactured and marked in 1999, then 99 should be inserted. If the pack was manufactured and marked in 2001, then 01 should be used.

**FOR SURFACE SHIPMENT <sup>(1)</sup> and AIR SHIPMENT, where authorized <sup>(2)</sup>**

1. gh Package & Product Testing and Consulting, Inc. cannot verify or validate any or all of the hazardous materials that could be placed into the packaging, ability to be shipped in this packaging. No compatibility testing has been performed.
2. It is the shipper's responsibility to determine if the material is authorized for both cargo and passenger aircraft or cargo aircraft only. All testing for air shipment has been completed. For liquids, if absorbent material or leak proof liner is not noted in the pack description, the pack may not conform to ICAO Part 4-1-2, 1.1.10.1. It is the shipper's responsibility to meet all applicable ICAO regulations, packaging requirements, and the requirements of any and all approvals and special provisions.

Authorized Signature:   
Title: Test Engineer

Date: March 19, 2014

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### Approval Authorization

The testing conducted on subject U.N. Hazardous Materials packaging complies with applicable hazardous materials regulations, provisions, and/or special permits and/or approvals.

gh Package / Product Testing and consulting, Inc. (Ohio) is a current DOT UN Third Party Certification Agency under §107.403.

### Test Purpose

The purpose of this testing conducted on subject U.N. Hazardous Materials packaging was to qualify/certify this packaging based on United Nations Test Requirements for Packaging Group II Criteria. The package product is listed as a 4D package - Group II

### Personnel Present During Testing

H. Perry Hock, President and Technical Director, gh Package & Product Testing and Consulting, Inc.  
 D. Kevin Dayton, Manager of Sales and Design, gh Package & Product Testing and Consulting, Inc.  
 Carol Metz, Supervisor, Materials Testing, gh Package & Product Testing and Consulting, Inc.  
 Timothy Glasmeier, Manager of Testing Operations, gh Package & Product Testing and Consulting, Inc.  
 Ronald Sorrell, Test Engineer, gh Package & Product Testing and Consulting, Inc.  
 Carin Galish, Laboratory technician, gh Package & Product Testing and Consulting, Inc.  
 Anthony Oliver, Laboratory technician, gh Package & Product Testing and Consulting, Inc.

### Test Equipment


Micrometer (Digital): Chem. Instruments	m/n: MI1000	s/n: 004257	Cal. Date: 10-26-13
Caliper: 6"	s/n: F535461		Cal. Date: 6-1-13
Scale: Acculab 120g	m/n: V1-1mg	s/n: 70CM045	Cal. Date: 7-11-13
Scale: Ohaus 2000g	SP 2001	s/n: 7124090950	Cal. Date: 7-11-13
Scale: 30,000 g Acculab	m/n VA-30KG	s/n: 19012211	Cal. Date: 7-11-13
Scale: 20,000 lb Inscale	m/n TI-600E-SS Class III	s/n: 5D90550000379	Cal. Date: 7-11-13
Vibration Table 8,000 lb. (Oscillatory): LAB	s/n: G241027		Cal. Date: 12-9-13
Photo/Tachometer	Backup for both oscillatory tables	Ex 2017s/n: L161344	Cal. Date: 5-18-13




## Section 2 – Package Description

### Design Type: 4D



The Hemi wood crate consists of a 4D (non-bulk ply-wood box) that consists of ply-wood panels for the top and four sides. The base is ply-wood fastened to two notched 4" x 4"s to form a mechanically handled base. All six sides of the ply-wood crate are held together by steel spring clips. The package system components are described in detail below

### Exterior: Ply- Wood Crate

<p><b>Style:</b></p> 	<b>Properties:</b>	
	Manufacturer:	Action Wood
Manufacturer Location:	MI	
Material:	Plywood	
Supplier:	Relco Products	
Supplier Location:	Anderson, IN	
Ply:	7	
Wood species:	Elliottis pine	
Grade:	C+C	
Drawing # / Reference:	None/HEMI	
Dimension external (L x W x H):	27.32" x 27.32" x 20.25"	
Dimension internal (L x W x H):	26.0" x 26.0" x 15.75"	
Stacking height:	Same	
Number of cleats:	None	
Top seams:	Butted together	
Corner seams:	Butted together	
Bottom seams:	Butted together	
Handle:	none	
Method of joining panels:	As follows	
Top:	8 Steel clips with Rabbit joint	
Sides:	8 Steel clips with Rabbit joints each side	
Front:	8 Steel clips	
Rear:	8 Steel clips	
Base:	8 Steel clips with rabbit joints	
Weight:	55.0 lb (with lid)	
Closure method of box:	24 Steel clips total for whole crate	

<p><b>Style:</b></p>  <p>top</p>  <p>Front &amp; Back panel</p>  <p>Left &amp; Right panel</p>	<b>Properties: Clip lok cut outs in crate</b>	
	Manufacturer:	Action Wood
	Manufacturer Location:	MI
	Material:	Plywood
	Clip lok holds in top & base:	As follows
	Size of holds:	3.0" long x 0.5" wide. All holds are the same size on all panels.
	Location of holds :	Around perimeter of top, 2 for each vertical face of crate 3.75" centered in from edge & 8.0" centered from adjacent edge
	How many in top:	8 each , 16 total
	Clip lok holds in front & back:	As follows
	Location of holds :	Around perimeter of panel, 2 for each face of crate. 3.75" centered in from edge & 8.0" centered from adjacent edge going horizontal and 4.0" centered from adjacent edges going vertical.
	How many in top:	8 each , 16 total
	Clip lok holds in Left & right:	As follows
	Location of holds :	Around perimeter of panel, 2 for each face of crate. 3.75" centered in from edge & 8.0" centered from adjacent edge going horizontal and 4.0" centered from adjacent edges going vertical.
	How many in top:	8 each , 16 total

Closure:

	<b>Location and style</b>	<b>Properties</b>
	Box closure (pattern):	24 Steel clips
	Specification:	50 mm Clip lok (1CLIPK50)
	Material:	steel
	Supplier: (Clips)	Universal Clips CC
	Supplier location:	Newville, South Africa
	Weight:	0.33 lb each
	Dimensions:	As follows
	Long face: (has hole)	4.5"
	Short face:	4.0"
	Width:	2.0"
	Thickness:	0.066" min / 0.068" max
	Screws description:	None
	Stitches:	None
	Nails:	Yes
	Specification:	Air Drive, Screw blunt diamond
	Material:	Steel
	Supplier:	Stanley Bostich
	Supplier location:	North Kingstown, RI
	Nail description:	As follows
	Head:	Flat
	Length:	2.75"
	Shank type:	Quarter twisted
	Weight:	4.4 g
	Total used:	20
	Locations:	In base to hold runners for pallet base
	Sides:	None
	Front:	None
	Rear:	None
	Base:	20
Top:	None	
Carriage Bolts:	None	

**Intermediate Packaging: None**



**Articles or Goods**

<b>Type:</b>	<b>Dummy mass</b>
Manufacturer:	gh testing
Manufacturer location:	Ohio
Drawing:	Not disclosed
Name:	Dummy mass
Part number:	Not disclosed
Overall dimensions:	13" x 24"
Orientation in pack:	Lay in base of wood crate.
Material:	Poly bag filled with sand
Tare weight:	40.0 lb each (total weight = 200.0 lb)
Quantity in exterior	5 per pack
Top closure:	Poly zip tie
Bottom closure:	Heat seal
Side closure:	Heat seal

**Test Specimen Characteristics**

Density:	100 lb/ft <sup>3</sup>
Substance:	Dummy mass/ poly bag filled with fine play sand
State:	solid
Grain size:	To fine to measure, resembles size of table salt.
Complete Pack Tare Weight (empty), lbs.	60.0 lb (27.2 kg)
Gross Weight (as tested), lbs.	260.0 lb (117.93 kg)



## Package System Assembly Instructions

The Packaging instructions for HEMI Packaging Concept as tested.

- 1) Place base of crate down on the floor and place product to be shipped on the pallet base.



- 2) Next place a Front or back panel (longer panels with rabbit cuts on the ends) onto the base. The panels should be flush with the ends of pallet base. The 8 cut outs are on the outside and the rabbit cuts on the ends of the panel face to the interior of the crate.



- 3) Now take one clip lok and place the end with the hole in the face and hang it in the bottom cut out as shown below.



- 4) Now place the heel of the palm of your hand on the bent part of the clip lok and push inward until it clicks into the cut on the base.



- 5) Repeat this for the other base cut out for a total of 2 clip lok per panel around the whole crate. The ends or right and left panels have no rabbit joints in the inside of the panels and the 8 cut outs in panels face outward. Work around the crate on these two panels.



- 6) Next the corner clip loks need to be installed. The clip loks are installed the same way as before, just place the clip lok end with hole in it into the cutouts on the ends panels (end panels have no rabbit joints on the inside and they are shorter than the front and back panels).



- 7) Now work around the crate to install the other 2 sides with 2 clips loks on each vertical corner and 2 clip loks on each base the all four panels.



- 8) Now place the lid onto the assembled pallet. Make sure the lid rabbit joints are facing inside the crate and are fully seated or the clip loks will not seat. The crate should look like the photo below.



- 9) Affix any labeling which is necessary for shipment.

The Hemi Packaging Concept is now ready for shipment.

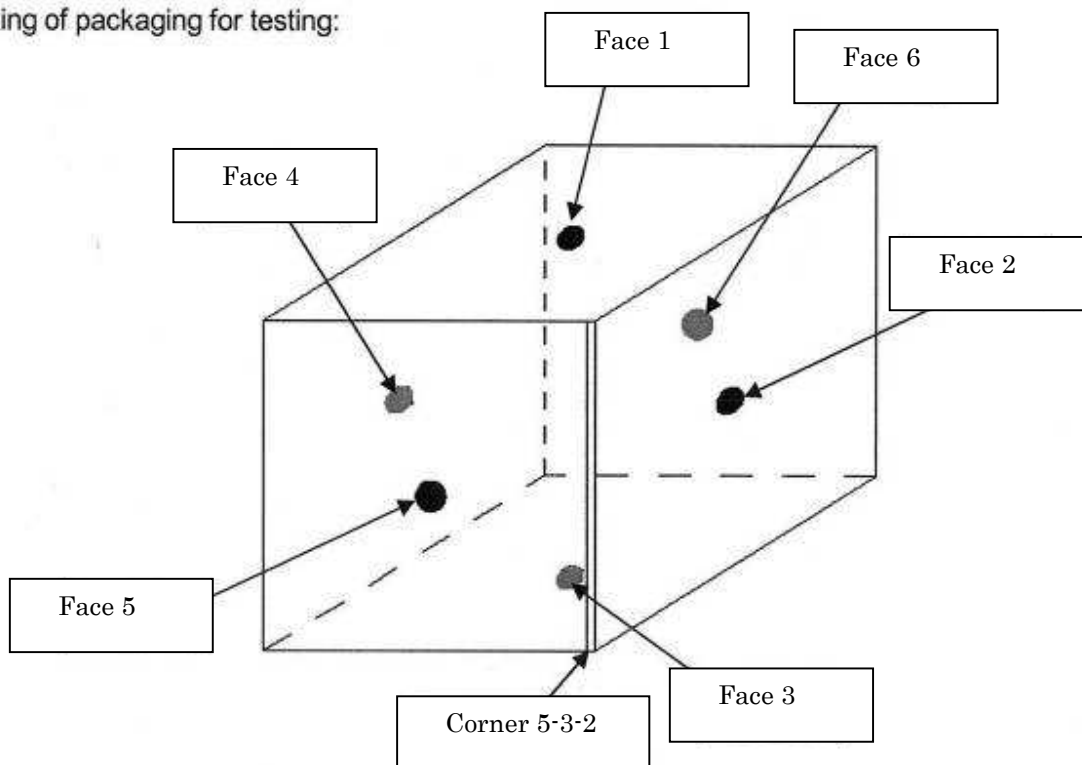
### Section 3 - Testing Procedure

The following test procedures were those designated by United Nations for testing and is utilized during the package test certification process.

Test Report: CFR 49 (178.602) requires Name/Address of Test Facility and Test Applicant, Test Report Identifier, Report Date, Complete Package Design Type Description, Maximum Capacity, Characteristics of Test Contents, Test Description and Results and signed with name and title of signatory.

Test Standard: CFR 49 §178.601 - §178.609, as they pertain, as well as A.S.T.M. D4919 entitled "Standard Specification for Testing of Hazardous Materials Packaging's".

Marking of packaging for testing:



Note: the gray areas are the hidden faces on the box

**a. Conditioning** (CFR 178.602) – Subject packs to standard conditions at 73 degrees (F) at 50% R.H. for a period of 24 hours prior to testing. For material analysis, vibration, drops and stacking each receptacle has been filled not less than 95% its total limit for Solids.

### Section 3 - Testing Procedure Continued

- f. **Vibration Test** (CFR 178.608) – Subject 3 random, filled, packaging's for vibration on a rotary vibration table that has peak to peak amplitude of 1 inch. The packages are allowed to move freely on the table and are only restrained from being able to fall off of the table. The frequency at which the vibration is performed is the frequency that causes the package to be raised up from the vibrating platform to such a degree that a piece of material of approx. 1.6 mm thickness can be passed between the bottom of any package and the platform. This test shall last for 60 minutes. Three (3) packages were subjected to one hour of vibration at an input of 1.1 g. at 4 Hertz. All three (3) packages were run simultaneously. (Packaging's were subjected to the required pre-conditioning of 73° F at 50% RH for a minimum of 24 hours):

*Requirement for passing:* No leakage after equilibrium, no spillage, no rupture, no damage to outer packaging that effects the safety during transport.

- g. **Drop Test** (CFR 178.603) – Subject five (5) filled combination packages to five free fall impacts. Packagings of plastic drums, plastic jerricans, plastic boxes, plastic composite packs, or combination packs with plastic inners (excluding bags for solids), were conditioned in accordance with CFR 178.603 (c). Test five (5) boxes, one for each drop. Drop individual boxes flat on bottom, top, one long side, and one short side. Drop box diagonally on the manufacturer's joint bottom corner (5-2-3 corner). Perform drop tests in accordance with Test Method D775. Per Group Level II, the packs were dropped from a height of 1.2 meters (Primary) (48 inches).

**IATA 6.3.3 Drop Test:** The temperature of the test sample and its contents must be reduced to -18°C (-4°F) or lower for combination packaging's with plastic inner packaging's, other than plastic bags intended to contain solids or articles. Removable head packaging's for liquids must not be dropped until at least 24 hours after filling and closing to allow for any possible gasket relaxation. The target must be a rigid, non-resilient, flat and horizontal surface. The term water includes water/antifreeze solutions with a minimum specific gravity of 0.95 for testing at -18°C.

*Requirement for passing:* No leakage after equilibrium, no spillage, no rupture, no damage to outer packaging that effects the safety during transport. For combination packs – there is no damage to the exterior to adversely affect safety and no leakage from the inner packagings. Any discharge from a closure is slight and ceases immediately after impact without any further leakage. No rupture is permitted in packagings for materials in Class 1 which would permit spillage of loose explosive substances or articles from the outer packaging

### Section 3 - Testing Procedure Continued

**h. Stacking (Compression) Test** (§178.606): Subject three (3) Full containers to a comparable load of three meters high (or greater) for a period of twenty four (24) hours (unguided method). Three (3) dead load stack tests performed pursuant to CFR 49 § 178.606 and one (1) machine compression. For machine compression, the box was subjected to the load for one hour. After one hour, the box is taken to the ultimate load. Packagings were subjected to the required conditioning of 73° F at 50% RH for a minimum of 24 hours:

*Note:* Pursuant to 178.606, combination packagings may be subjected to the stacking test without their inner packaging's, except where this would invalidate the results of the test. The exterior box closed as for shipment and the stack load was applied.

**IATA 6.3.6 Stacking Test** - All design types of packagings other than bags must be subjected to a stacking test. Three test samples per design type and manufacturer shall be tested. The test sample must be subjected to a force applied to the top surface of the test sample equivalent to the total weight of identical packages which might be stacked on it during transport: where the contents of the test samples are liquids with a relative density different from that of the liquid to be transported, the force must be calculated in relation to the latter. The minimum height of the stack including the test sample must be 3 m (10 ft). The duration of the test must be 24 hours except that plastic drums, Jerricans and composite packaging's (6HH1 and 6HH2) intended for liquids must be subjected to the stacking test for a period of 28 days at a temperature of not less than 40°C (104°F).

*Requirement for passing:* The test sample must not leak. In composite packagings or combination packagings, there must be no leakage of the filling substance from the inner receptacle or inner packaging. No test sample must show any deterioration, which could adversely affect transport safety or any distortion liable to reduce its strength or cause instability in stacks of packages, or cause damage to the inner receptacle(s). Plastic packagings must be cooled to ambient temperature before the assessment. For (ii): no buckling of the side walls sufficient enough to cause damage to expected contents, and in no case may deflection exceed 1 inch total

Compression Calculation Formula use for testing:

$$Load = \frac{120 \text{ inches} - h}{h} \times W \times 1.5$$

Load = (W) lbs.

120 inches = 10 Feet requirement (178.607 (c) (1)) (3 meters)

W = Gross weight of one pack = 00.0 lbs

h = Exterior packaging height = 00.00 inches

1.5 = Safety factor (Not required by CFR 49 (178.606) *gh Testing recommendation*)

## Testing Results, Inspection, and Analysis

Laboratory Conditions at the start of testing: 72.1° Fahrenheit, at 52% Relative Humidity

Laboratory Conditions at the end of testing: 72.6° Fahrenheit, at 51% Relative Humidity

The following test procedures were those designated by United Nations for testing and is utilized during the package test certification process.

Test Standard: CFR 49 §178.601 - §178.609, as they pertain, as well as A.S.T.M. D4919 entitled "Standard Specification for Testing of Hazardous Materials Packaging's".

**a. Conditioning** (CFR 178.602) – Subject packs to standard conditions at 73 degrees (F) at 50% R.H. for a period of 24 hours prior to testing. For drops and vibration, each receptacle has been filled not less than 95% its total limit for Solids.

The results of conducted testing and condition of packages and contents are provided below: (Packing Group II).

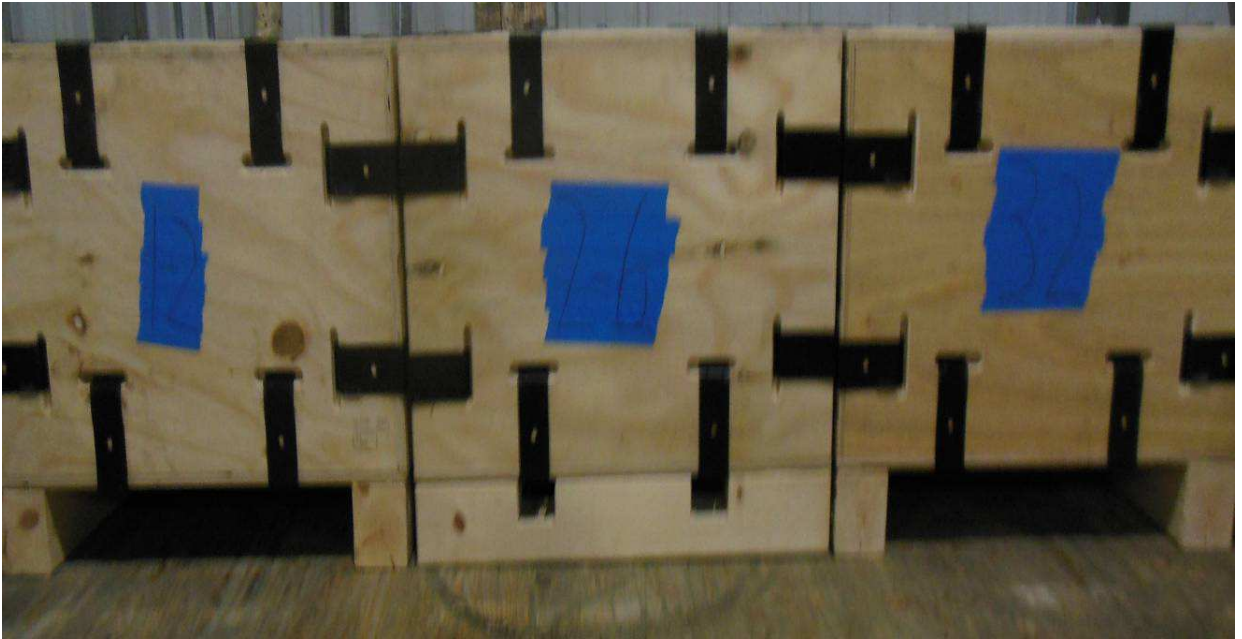
**b. Vibration Test** (CFR 178.608) – Subject 3 random, filled, packaging's for vibration on a rotary vibration table that has peak to peak amplitude of 1 inch. The packages are allowed to move freely on the table and are only restrained from being able to fall off of the table. The frequency at which the vibration is performed is the frequency that causes the package to be raised up from the vibrating platform to such a degree that a piece of material of approx. 1.6 mm thickness can be passed between the bottom of any package and the platform. This test shall last for 60 minutes. Three (3) packages were subjected to one hour of vibration at an input of 1.1 g. at 4 Hertz. The three (3) packagings were tested simultaneously. (packaging's were subjected to the required pre-conditioning of 73° F at 50% RH for a minimum of 24 hours):

*Requirement for passing:* No leakage after equilibrium, no spillage, no rupture, no damage to outer packaging that effects the safety during transport

Packaging Number	Face	RPM width	Time	Results
1	3	251	60 minutes	Pass
2	3	251	60 minutes	Pass
3	3	251	60 minutes	Pass

**Results:** All packs were in good condition with no structural damage or loss of inner contents that would affect safe transport after a period of 60 minutes of vibration testing and then 60 minutes of lying on their sides. Some scuffing to the base boards after testing. The test samples #1, #2 & #3 have passed the rotary vibration testing. Photo of testing on next page.





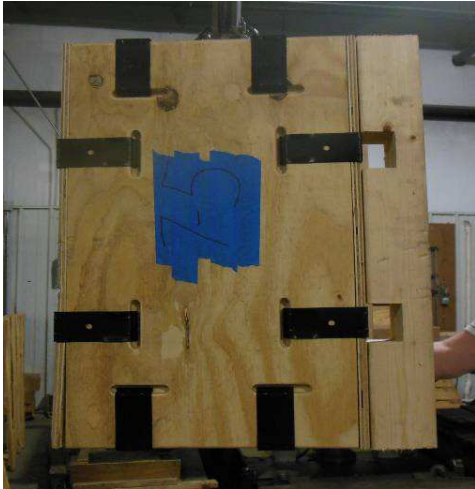
Rotary vibration, from left to right, Test sample 1 face 2 showing, test sample #2 face 6 showing & Test sample #3 face 2 showing are the marking on the crates.

**g. Drop Test (CFR 178.603)** – Subject five (5) filled combination packages to five free fall impacts. Packagings of plastic drums, plastic jerricans, plastic boxes, plastic composite packs, or combination packs with plastic inners (excluding bags for solids), were conditioned in accordance with CFR 178.603 (c). The final temperature reading before drop testing was carried out was – 19.9°C. All test samples used for drop testing was pulled one at a time from conditioning chamber and drop tested within 5 minutes from removal from conditioning chamber. Test five (5) boxes, one for each drop. Drop individual boxes flat on bottom, top, one long side, and one short side. Drop box diagonally on the manufacturer's joint bottom corner (5-2-3 corner). Perform drop tests in accordance with Test Method D775. Per Group Level II, the packs were dropped from a height of 1.2 meters (Primary) (48 inches).

*Requirement for passing:* No leakage after equilibrium, no spillage, no rupture, no damage to outer packaging that effects the safety during transport. For combination packs – there is no damage to the exterior to adversely affect safety and no leakage from the inner packagings. Any discharge from a closure is slight and ceases immediately after impact without any further leakage. No rupture is permitted in packagings for materials in Class 1 which would permit spillage of loose explosive substances or articles from the outer packaging

<b>Drop Test Results</b>				
<b>Package</b>	<b>Face</b>	<b>Orientation</b>	<b>Results</b>	<b>Notes</b>
4	3	Bottom (flat on Face )	Pass	Nothing to note
5	1	Top (flat on Face )	Pass	Nothing to note
6	2	Long Side (flat on Face)	Pass	2 boards on impact face cracked
7	4	Short Side-End (flat on Face)	Pass	Nothing to note
8	5-3-2	Long-Short-Bottom Corner On Manufacturer's Joint (Diagonal on corner )	Pass	Slight denting on impact corner A one double 2x4 moved 2" opposite of impact.

**Drop Testing Photo's**



**End drop (Face 4) Test sample 7**



**Side Drop (face 2) Test sample 6**



**Top Drop (Face 1) Test sample 5**



**Bottom Drop (Face 3) Test sample 4**



**Bottom MFG Joint Corner Drop (Corner 5-3-2) Test sample 8**

**Results:** All Packs passed the drop testing. There was some slight denting on the bottom MFG joint corner drop and the wood in general cracked and moved as noted above, but there was no leakage from the inner sand bags used for dead load and nothing came out of the crates. The crates stayed sealed.

**h. Stacking (Compression) Test** (§178.606): Subject three (3) Empty containers to a comparable load of three meters high (or greater) for a period of twenty four (24) hours (unguided method). Three (3) dead load stack tests performed pursuant to CFR 49 § 178.606 and one (1) machine compression. For machine compression, the box was subjected to the load for one hour. After one hour, the box is taken to the ultimate load. Packagings were subjected to the required conditioning of 73° F at 50% RH for a minimum of 24 hours:

*Note:* Pursuant to 178.606, combination packagings may be subjected to the stacking test without their inner packaging's, except where this would invalidate the results of the test. The exterior box closed as for shipment and the stack load was applied.

**Criteria for Passing the Test**

The test sample must not leak. In composite packagings or combination packagings, there must be no leakage of the filling substance from the inner receptacle or inner packaging. No test sample must show any deterioration, which could adversely affect transport safety or any distortion liable to reduce its strength or cause instability in stacks of packages, or cause damage to the inner receptacle(s). Plastic packagings must be cooled to ambient temperature before the assessment. For (ii): no buckling of the side walls sufficient enough to cause damage to expected contents, and in no case may deflection exceed 1 inch total

<b>Stacking (Compression) Test</b>					
<b>Package</b>	<b>Face</b>	<b>Required Dead Load</b>	<b>Ultimate Load</b>	<b>Results</b>	<b>Notes</b>
<b>8</b>	<b>1</b>	3,293.0 lb	N/A	Pass	No damage to packaging
<b>9</b>	<b>1</b>	3,293.0 lb	N/A	Pass	No damage to packaging
<b>10</b>	<b>1</b>	3,293.0 lb	N/A	Pass	No damage to packaging

Compression Calculation Formula:

$$Load = \frac{120 \text{ inches} - h}{h} \times W \times 1.5$$

Load = 3,293.0 lb

120 inches = 10 Feet requirement (178.607 (c) (1)) (3 meters)

W = Gross weight of one pack = 265.0 lb

h = Exterior packaging height = 20.25 inches

2.522 = Safety factor (Not required by CFR 49 (178.606) *Customer request.*

*Note:* The stack load is performed this way due to timing and a lack of available weight. Test samples 8 & 10 are over tested beyond customer's request.

**Result:** Test samples maintained load without significant deflection for at least a 24 hour period. The wood crates showed no signs of cracking, buckling and no panel movement during or after the testing was complete.

*Note:* Test sample #8 was used for stack load testing after being used for drop testing for the corner drop. The crate was in great shape after drops and showed no signs fatigue after drop testing and it was therefore used for stack load testing.





Stack load testing

**Hydrostatic Pressure Test** not required on this pack or product.

## Section 4 – Calculations performed for conducted testing

Stack Test Calculation:  
*English*

$$\text{Actual load calculation: } Load = \frac{120 \text{ inches} - h}{h} \times weight \times 1.8 + 234.45 \text{ lb}$$

gh Testing uses 120 inches = 10 Feet requirement (178.607 (c) (1)) (3 meters or 120 inches required)

h = 20.25 inches = Exterior packaging stack height in inches

Weight = 265.0 lbs. = mass in lbs.

2.522 = Safety factor

*Required load: 1,305.37 lb.*

*Actual load: 3,293.0 lb*

Calculating the Specific Gravity based on a given gross mass (265.0 lb.) by the customer:

210.0 lb of sand bags / 8.34 lb/gal of water = 25.179 gallons

Gross Mass =(Total Volume) X mass of water (8.34 lb/gal) X 98% Fill X Specific Gravity + Empty pack weight

$$265.0 \text{ lbs.} = 25.179 \text{ gal} \times 8.34 \text{ lb/gal} \times 98\% \times \text{Specific Gravity} + 55.0 \text{ lbs.}$$

$$265.0 \text{ lb.} - 135.0 \text{ Empty pack weight} = 205.79 \text{ lb} \times \text{Specific Gravity} + 55.0 \text{ lbs} - 55.0 \text{ lbs}$$

$$210.0 \text{ lb.} = 205.79 \text{ lb} \times \text{Specific Gravity}$$

$$1.02 = \text{Specific Gravity}$$

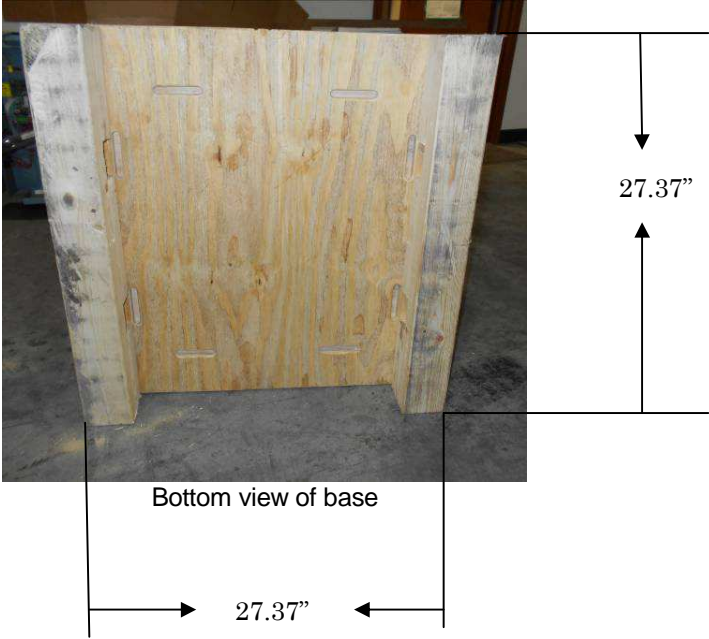
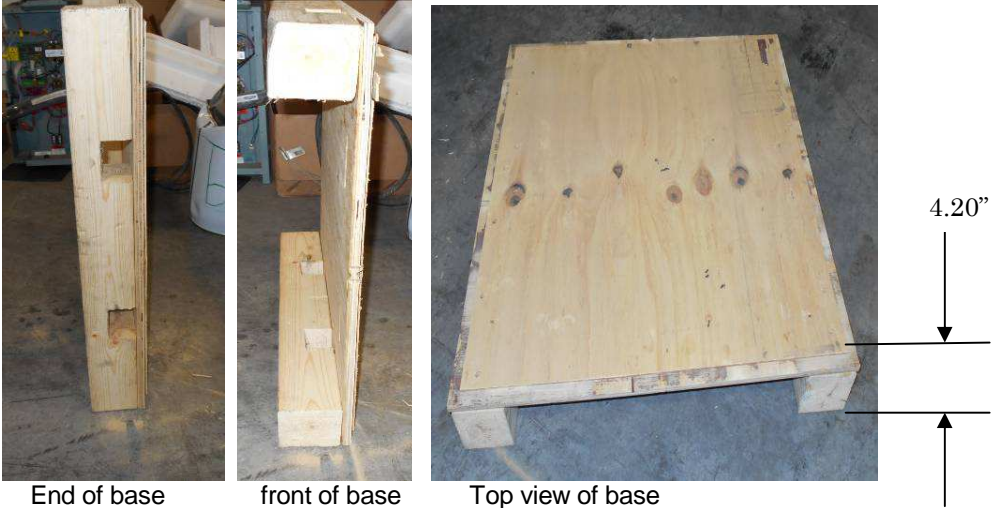
1.02 = Specific Gravity rounded up for test purposes

*Marked gross mass based on tested gross mass of the package.*

The certifying weight is 265.0 lb, (120.2 kg)

**Section 5 – Packaging design drawings**

External container base:

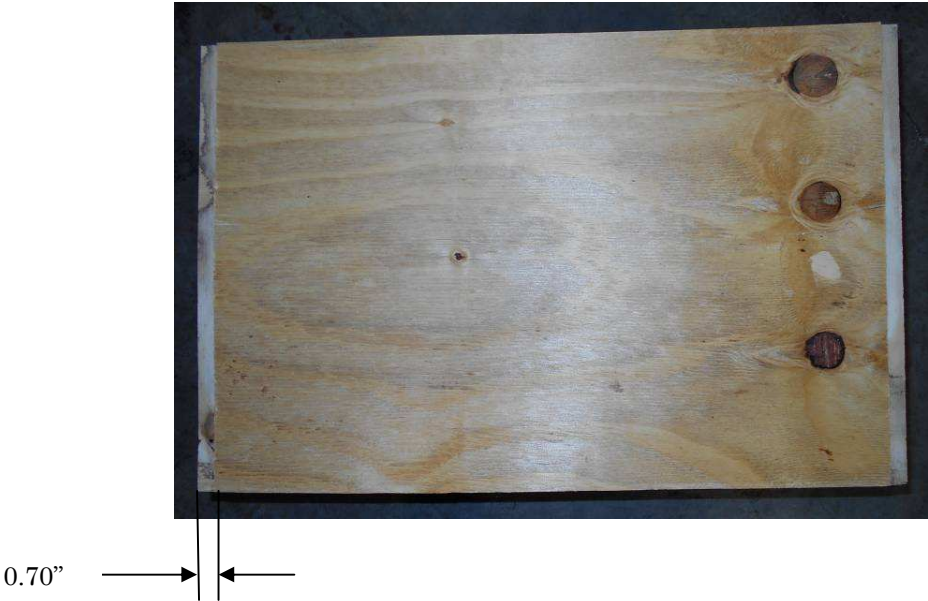
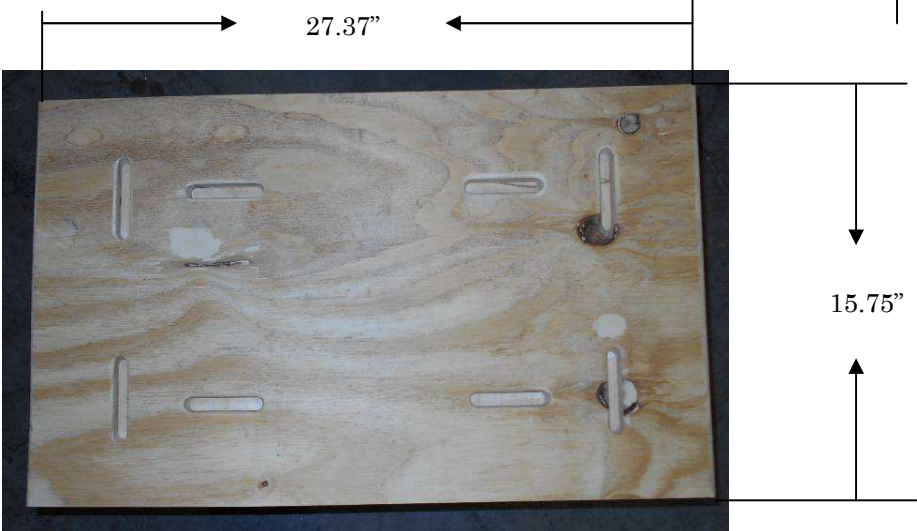




Front and Back panels of crate: Both front and back panels are identical

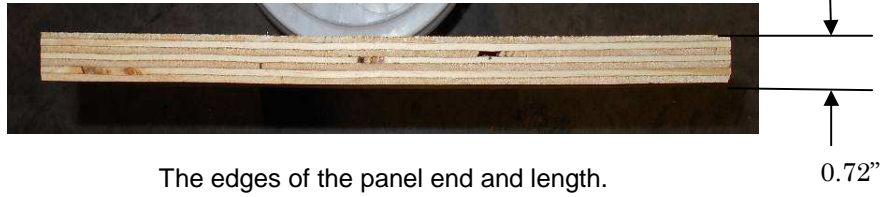


The edges of the panels (End & Length)

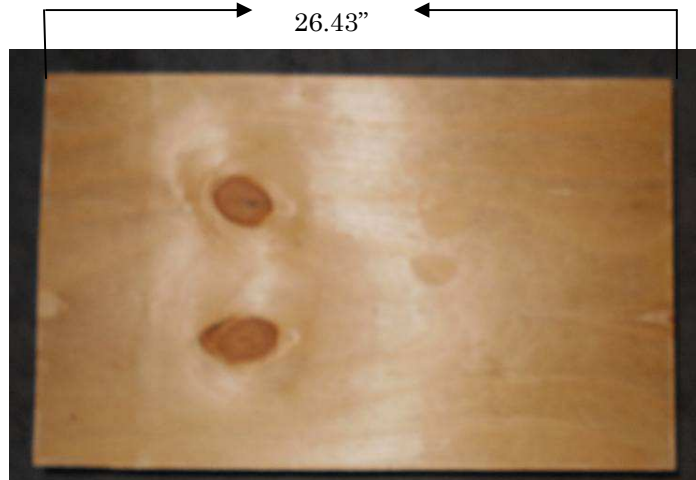




The ends of Right and left panels: Both panels are identical

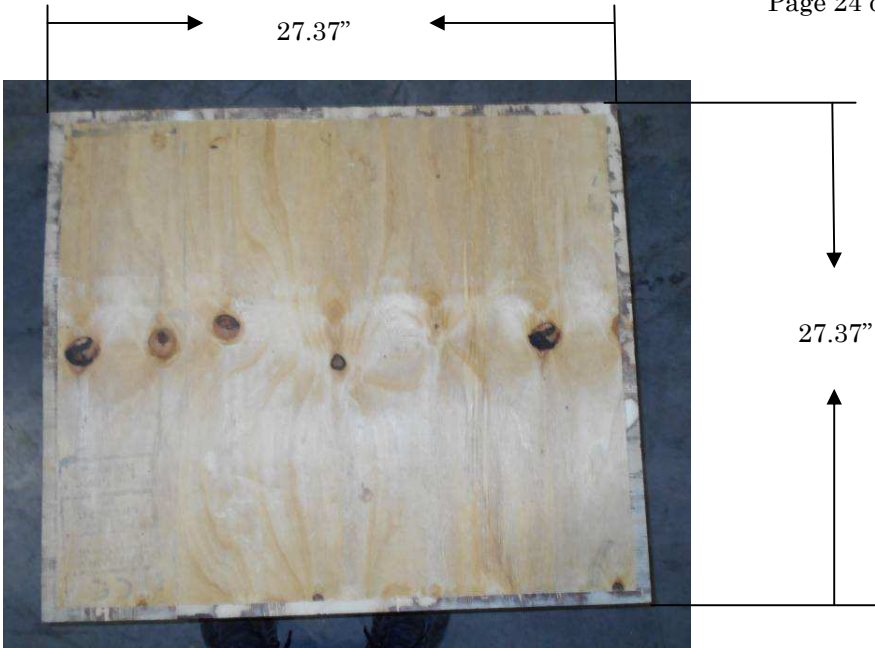


Outside face



Inner face

The lid:



Inside face

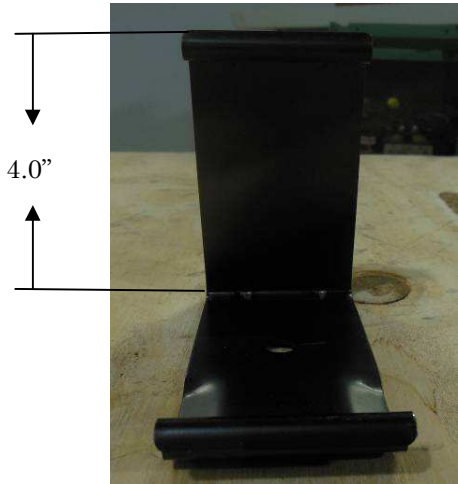


Outer face



The edge of lid

The Clip lok:



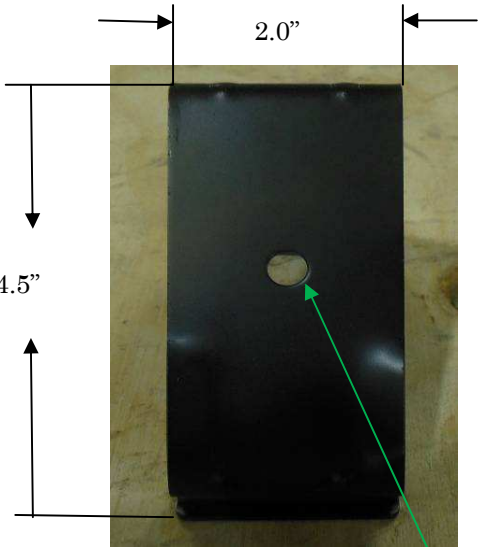
Short end inside



Long end inside



Short end outside



Long end outside



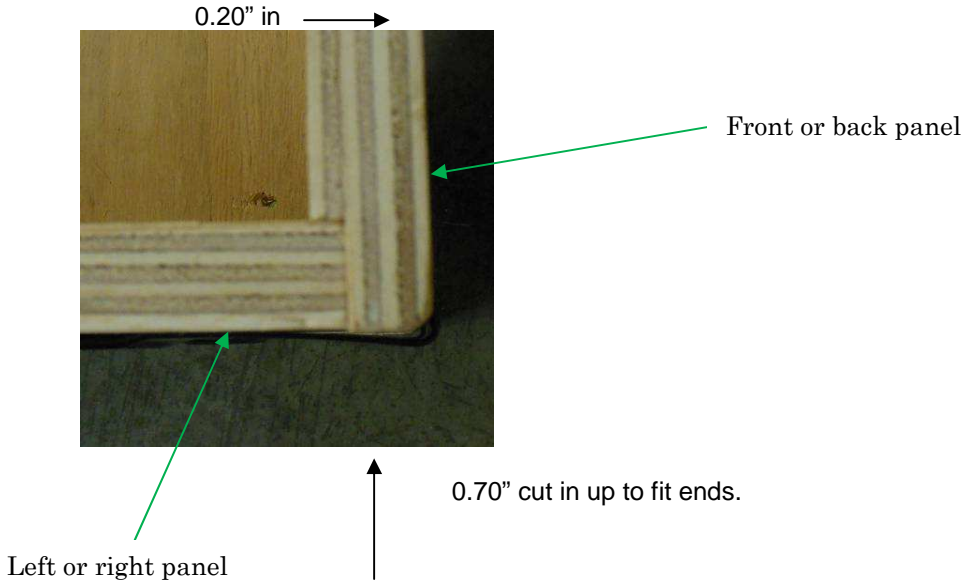
Top view of angle up



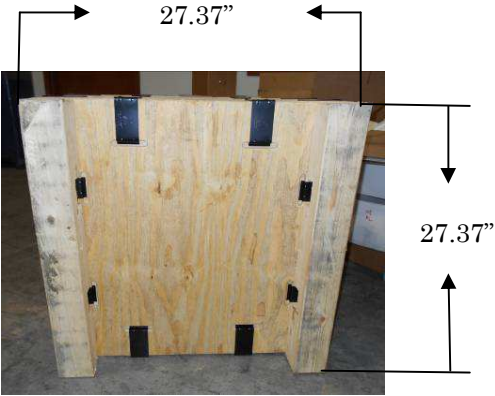
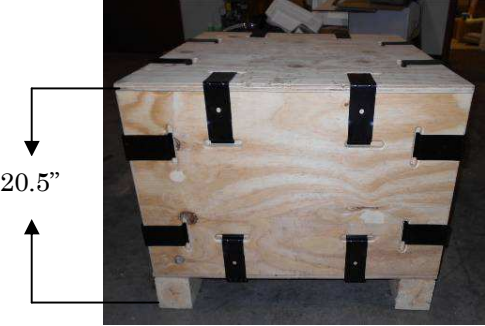
side view

0.33" Diameter

Rabbit joint: All four corners have rabbit joint, the top inside and base topside are cut the same



Assembled crate:





## Section 6 – Reportable Test Failures

None.

## Section 7 - Certification and Recertification

### § 178.955 General requirements.

(a) *General.* The test procedures prescribed in this subpart are intended to ensure that Large Packagings containing hazardous materials can withstand normal conditions of transportation. These test procedures are considered minimum requirements. Each packaging must be manufactured and assembled so as to be capable of successfully passing the prescribed tests and to conform to the requirements of §173.24 of this subchapter while in transportation.

(b) *Responsibility.* The Large Packaging manufacturer is responsible for ensuring each Large Packaging is capable of passing the prescribed tests. To the extent a Large Packaging's assembly function, including final closure, is performed by the person who offers a hazardous material for transportation, that person is responsible for performing the function in accordance with §§173.22 and 178.2 of this subchapter.

(c) *Definitions.* For the purpose of this subpart:

(1) *Large packaging design type* refers to a Large Packaging which does not differ in structural design, size, material of construction and packing.

(2) *Design qualification testing* is the performance of the drop, stacking, and bottom-lift or top-lift tests, as applicable, prescribed in this subpart, for each different Large Packaging design type, at the start of production of that packaging.

(3) *Periodic design requalification test* is the performance of the applicable tests specified in paragraph (c)(2) of this section on a Large Packaging design type, to requalify the design for continued production at the frequency specified in paragraph (e) of this section.

(4) *Production inspection* is the inspection, which must initially be conducted on each newly manufactured Large Packaging.

(5) *Different Large Packaging design type* is one which differs from a previously qualified Large Packaging design type in structural design, size, material of construction, wall thickness, or manner of construction, but does not include:

(i) A packaging which differs in surface treatment;

(ii) A rigid plastic Large Packaging, which differs with regard to additives used to comply with §178.925(b) or §178.940(b);

(iii) A packaging which differs only in its lesser external dimensions ( *i.e.*, height, width, length) provided materials of construction and material thickness or fabric weight remain the same;

(6) *Remanufactured Large Packaging* is a metal or rigid Large Packaging that is produced as a UN type from a non-UN type or is converted from one UN design type to another UN design type. Remanufactured Large Packagings are subject to the same requirements of this subchapter that apply to new Large Packagings of the same type.

(7) *Reused Large Packaging* is a Large Packaging intended to be refilled and has been examined and found free of defects affecting its ability to withstand the performance tests. See also §173.36(c) of this subchapter.

(d) *Design qualification testing.* The packaging manufacturer must achieve successful test results for the design qualification testing at the start of production of each new or different Large Packaging design type. Application of the certification mark by the manufacturer constitutes certification that the Large Packaging design type passed the prescribed tests in this subpart.

(e) *Periodic design requalification testing.* (1) Periodic design requalification must be conducted on each qualified Large Packaging design type if the manufacturer is to maintain authorization for continued production. The Large Packaging manufacturer must achieve successful test results for the periodic design requalification at sufficient frequency to ensure each packaging produced by the manufacturer is capable of passing the design qualification tests. **Design requalification tests must be conducted at least once every 24 months.**

(2) Changes in the frequency of design requalification testing specified in paragraph (e) (1) of this section are authorized if approved by the Associate Administrator.

(f) *Test samples.* The manufacturer must conduct the design qualification and periodic tests prescribed in this subpart using random samples of packagings, in the numbers specified in the appropriate test section.

*All re-certification dates are based on the date of the report.*

## section 8 - Testing Compliance and Accreditation

Unless otherwise noted, the testing stated above complies with the above stated procedure.

The completed testing above was in compliance with ISO/IEC 17025 and was in compliance with the customer requested test(s) and requirements. All reference and data logging materials used in the above testing are traceable to NIST. The testing performed above was performed at gh Package & Product Testing and Consulting, Inc., in Cincinnati. This test report cannot be reproduced, except in full, without written permission from gh Package & Product Testing and Consulting, Inc. If the measurement uncertainty calculations are listed in the report, the measurement uncertainties represent an expanded uncertainties expressed at approximately 95% confidence level using a coverage factor of K=2.

Compliance of the tested packaging to meeting the required packaging and component specifications is implied by the packaging's ability to pass all the required testing for CFR 49, Parts 178.500 through 178.819 as well as ICAO/IATA regulations. Such compliance may include the outer packaging, as well as the inner packagings. Compliance of aerosol canisters to IP7, IP7A, IP7B, IP7C requires additional testing not performed by gh Testing. Chemical compatibility with outer and/or inner packagings must be ascertained by the shipper since they must possess sufficient knowledge about the characteristics of the substance they'd like to ship and the packaging materials used.

## Section 9 - Legal

### United Nations (UN) Test Understanding and Disclaimer Notice

This notice advises package manufacturers and package users regarding the use of United Nations Approved Certification Packs.

A "pack" as used herein, means the specific package or container submitted to gh Testing for testing and UN certification that the package or container meets the requirements of the Code of Federal Regulations, Title 49, §100 through §180. A pack, therefore, has specific components, including the package in which the containers are arranged for shipping, the containers, the contents of the containers, and all internal packaging elements designed to prevent the containers from moving and/or damage. Each component has unique specifications and characteristics, including, but not limited to, the material, shape, and weight of the package and containers and the internal packaging elements, and the material, specific gravity/density, shape, etc. of the contents of each container.

Herein, the use of singular means plural and the use of plural means singular.

- A. Each pack type (complete individual specification pack) when successfully tested pursuant to the appropriate regulations (Code of Federal Regulations, Title 49, IATA/ICAO, IMDG) is assigned a certification number specifically for the submitted pack. This number represents the report that references the tested pack's specifications and the characteristics of the hazardous material (i.e. specific gravity, particle size) to be placed in the package. gh Testing disclaims any and all responsibility for any substitutions and/or changes in the package or each component thereof, and for any and all variations of use of the package and its contents made by any user/client/customer/other party from the package and its components and contents as tested by gh Testing. The regulations require that design type qualification testing be performed on "identical" and "virtually identical" packs. gh Testing shall not be responsible for any use of variations not tested by gh Testing.
- B. The original tests are based on submitted pack/specifications of submitted packs. It is the shipper's responsibility to ensure that the packs have the same liner board combinations as the pack that was tested and that each pack shipped is capable of meeting the Cobb Test, Drop Test, Hydraulic Pressure Test, Leak proof Test, Stack Test and all other required criteria set forth in the regulations once the pack certification is being used. All inner packs must be the same as those specifications submitted and tested.

- C. Only the materials originally certified are approved for use. If the shipper changes manufacturers, it must ensure that the pack is virtually identical to the pack previously tested. If changes or substitutions become necessary, it is at the discretion of the shipper if a variation applies – gh Testing does not endorse the use of untested variations. Use of other packaging methods or components may render the pack invalid.
- D. Material Safety Data Sheets (MSDS), submitted pack descriptions, specifications and drawings will be retained by gh Testing. Alterations to the pack invalidate the certification.
- E. It is the shipper's responsibility to ensure that any combination or composite packs it ships are recertified every two years. Single packs must be recertified every year.
- F. The responsibility of the container markings, compatibility testing between the hazard and packaging, shipping documentation, packing and closing of the packaging are that of the shipper.
- G. Hazardous materials employees are required by the Code of Federal Regulations, Title 49, Part 172, Subpart H to have recurrent training at a minimum of every three years. ICAO (International Civil Air Organization) requires recurrent training every two years.

The US DOT is mandating enforcement of its regulations and will periodically review various compliances of all activities involved with a given certification. Be advised that civil and/or criminal action can be brought against those parties who ship packs which are not in compliance with the pack originally tested and certified.

#### **Permitted and prohibited uses of the UN Marking assigned by gh Package & Product Testing and Consulting, Inc.**

The Certification Number(s) issued by gh Package/Product Testing & Consulting, Inc. ("gh Testing") shall be used only by gh Testing's customer on hazardous packages certified by gh Testing and shall remain applicable only so long as the certification remains current, through the recertification at gh Testing, and has not expired, or only so long as gh Testing's customer prepares and uses packages prepared for shipment in virtually and substantially identical packages to those tested and listed by gh Testing in this test report and certification.

Any use of Certification Number(s) issued by gh Testing in this report by its customer which is inconsistent with such permitted use (such as, and including where any part of the package is changed according to CFR 49, subtitle B, Chapter 1, Subchapter C, Parts 171-180) or by persons or entities who are not gh Testing's customer for whom this report and certification were made, whether in a recertification or otherwise, is strictly prohibited, and gh Testing, for itself, its successors, officers, shareholders, directors, and all others acting on its behalf, hereby disclaims any and all liability for claims, causes of action, damages and demands of whatsoever nature arising directly or indirectly out of or in any way based upon any such prohibited use. The certification Number(s) issued by gh Testing in this report shall expire and terminate immediately whereas and if a prohibited use occurs.

All reasonable efforts will have been exercised to provide accurate data from resultant tests or consultation. Test methods utilized and followed in conducting various tests involve standards established by ASTM, TAPPI, DOT, IATA/ICAO, Federal Spec., Mil-Spec., ISTA, as well as private company test standards and procedures. gh Testing assumes no responsibility for nor does it guarantee or warrant any specifically expressed or implied performance and only assumes responsibility for the test data presented by it as derived from specifications, drawings, and information submitted to it for testing. Responsibilities involving alterations and/or changes to the packages and/or product beyond item(s) originally tested are those solely of the user/supplier/client, of which, gh testing assumes no responsibility.

gh Testing will hold submitted material for a period of one (1) week after testing is completed (unless otherwise instructed by the client). After this time, gh Testing may dispose of the material or equipment to its discretion or a storage charge at a rate of \$3.25 per square foot per month will be charged.

gh Testing shall not be liable for any incomplete, inaccurate, misrepresented, or inadequate specifications, drawings, details, or other information pertinent to the proper testing and description of the pack or contents. Should lack of such information supplied to gh Testing give cause to penalty, gh Testing may seek financial reimbursement for any fines, legal fees, and lost billing and the undersigned shall indemnify gh Testing for all such fines and costs.



**Section 10 – Revisions**

None

**Section 11 - Test Criteria, Understanding and Product Disposition****Test Criteria and Understanding**

All reasonable efforts have been exercised to provide accurate data from resultant tests or consultation. Test methods utilized and followed in conducting various tests involve standards established by A.S.T.M., T.A.P.P.I., D.O.T., Federal Spec. and Mil-Spec., I.S.T.A. as well as private company test standards and procedures. gh Testing assumes no responsibility or guarantees/warranties regarding (specifically stated or implied) performance and only assumes responsibility for the test data presented by it. Responsibilities involving alterations and/or changes to the packages and/or product beyond item(s) originally tested are those of the user/supplier/client, of which, gh testing assumes no responsibility.

**Post Package/Product Disposition**

gh Testing will hold material for a period of one (1) week after testing is completed (unless otherwise instructed by the client). After this time, gh Testing will dispose of the material or equipment to their discretion or a storage charge at a rate of \$3.25 per square foot per month will be charged.

Please contact me should you have questions regarding this testing.

This report respectfully submitted by:



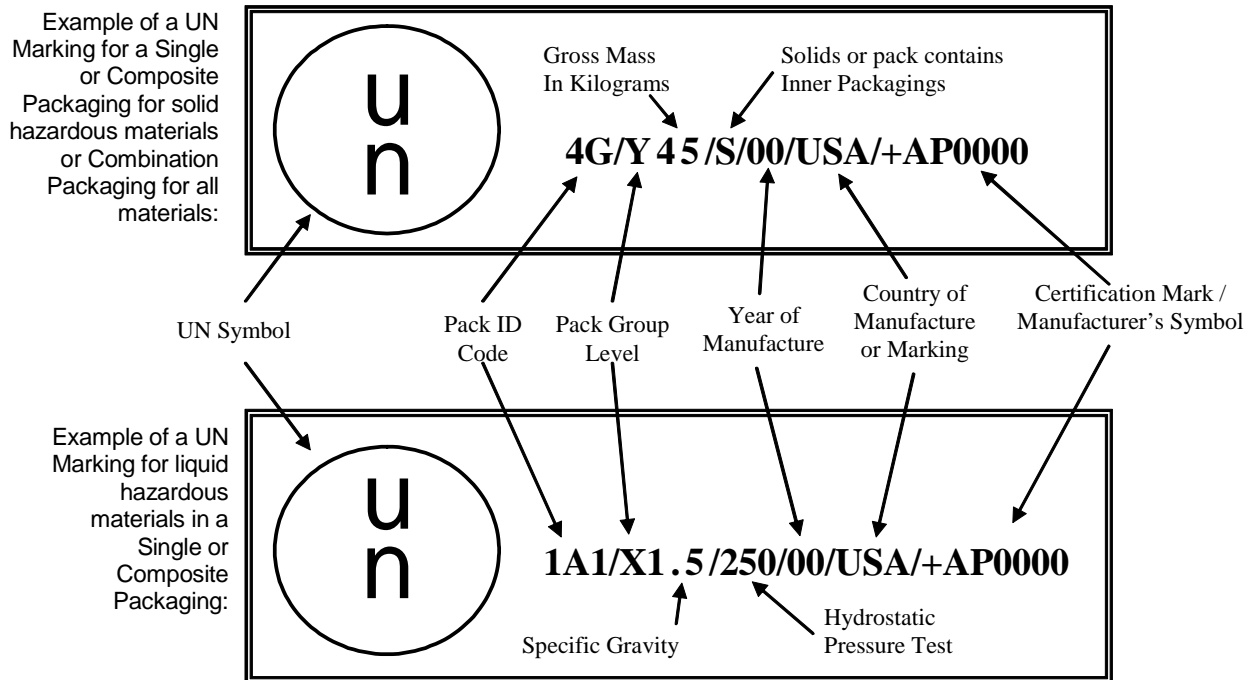
Mr. Ronald Sorrell  
Test Engineer, gh Package & Product Testing and Consulting, Inc.

Attachments

### Example UN Marking

## 49 CFR / United Nations Markings

Each packaging that is manufactured and tested in accordance with the performance oriented packaging standards of 49 CFR must include a marking on the packaging which indicates that the packaging has been tested. The following examples describe the marking and what each portion of the UN marking means.



Group Levels: X = Group Level I  
 Y = Group Level II  
 Z = Group Level III

Packaging Marking Identification Codes		
Type of Packaging		
1 – Drum	5 – Bag	
2 – Wooden Barrel	6 – Composite Packaging	
3 – Jerrican	7 – Pressure Receptacle	
4 – Box		
Material of Construction		
A – Steel	H – Plastic	
B – Aluminum	L – Textile	
C – Natural Wood	M – Paper, Multi-wall	
D – Plywood	N – Other Metal	
F – Reconstituted Wood	P – Glass, Porcelain, Stoneware	
G – Fiberboard		
Sub Category		
Drums:	1 – Non-Removable Head	2 – Removable Head
Bags:	5M1 – Multi-Wall Bags	5M2 – Multi-Wall Bags, Water Resistant

