

H O R I Z O N P T S

UN/CAO/IMDG Approval Certificate Including Air Transport

Horizon Package Testing Service Inc. is a current DOT UN Third Party Certification Agency under §107.403
Project ID: #2832-B **Certificate Number: +CA0001**
Page 1 of 17

Requesting Party: **Mr. John Fosse**
SFB Plastics, Inc.
1819 W. Harry Street
Wichita, KS 67213

Packaging Description

NOTE: Packagings submitted are for **Periodic Retesting** and were tested at ambient conditions per 49 CFR 178.602 (3) Designated Packaging Code: 4G . Tested To: Packing Group II (Y)

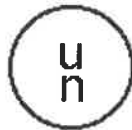
A combination package (JG10-4-UN25.9-K) comprising four (4) 1-gallon (3.8 liter) blow molded round industrial style jugs tested with Reliable 38-400 Polypropylene screw cap closures and laminated coated foam liner, inserted within a double wall Kraft/Kraft Regular slotted Fiberboard Carton Bottom and D/C Special Top outer packaging. Outer closure method tested with one (1) strip of 76mm wide pressure sensitive plastic tape top flap seam and one (1) strip of 48mm wide pressure sensitive plastic tape bottom flap seam. *The use of other packaging methods or components may render this report invalid.*

Packaging Performance Tests

TEST	SPEC	TEST LEVEL	RESULT
COBB TEST	UN Para 6.1.4.12.1	102.2 g/m ²	Pass
DROP TEST	UN Para 6.1.5.3	1.2 meter	Pass
STACKING TEST	UN Para 6.1.5.6	209.5 kg	Pass
HYDROSTATIC TEST	UN Para 6.1.5.5	100 kPa	Pass
VIBRATION STANDARD	49CFR 178.608	1 hour	Pass

UN/DOT Package Marking

In accordance with the US Code of Federal Regulations Volume 49 Section 178.601, I certify that the samples of the Package, prepared as for transport, described herein and tested in the manner summarized above, successfully pass the tests according to the criteria specified in paragraphs 6.1.4.12.1, 6.1.5.3, 6.1.5.5 and 6.1.5.6 as set forth in the UN Recommendations of the Committee of Experts on the Transportation of Dangerous Goods, Chapter 6, and US 49CFR Section 178.601 (1) and 178.608, that the packages may bear the marking:



4G / Y 25.9 / S / *
USA/+CA0001

* Year of Manufacture

By _____ Date: April 10, 2017

JAMES A. STEVENS
HORIZON PACKAGE TESTING SERVICE, INC. CERTIFICATION OFFICER

H O R I Z O N P T S

April 10, 2017

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SFB Plastics, Inc.
1819 W. Harry Street
Wichita, KS 67213
316-262-0400

Attn: Mr. John Fosse

Gentlemen/Mesdames:

RE: Summary of Packaging Performance for UN/IACO/IMDG Including Air Transport Certification
Transport of Dangerous Goods, Packing Group II Liquid
Corrugated Box Containing Four (4) 1-Gallon Industrial Round Style Plastic Jugs
Tested Box Closure Method: one (1) strip of 76mm pressure sensitive plastic tape top flap seam
and one (1) strip of 48mm pressure sensitive plastic tape bottom flap seam
Certification: +CA0001
Project ID: #2832-B
Customer ID: JG10-4-UN25.9-K

Tests performed to certify compliance with the UN Recommendations of the Committee of Experts on the Transport of Dangerous Goods, Chapter 6, Twelfth Revised Edition and US 49CFR Section 178.608, as follows:

TEST	SPEC	TEST LEVEL	RESULT
COBB TEST	UN Para 6.1.4.12.1	102.2 g/m ²	Pass
DROP TEST	UN Para 6.1.5.3	1.2 meter	Pass
STACKING TEST	UN Para 6.1.5.6	209.5 kg	Pass
HYDROSTATIC TEST	UN Para 6.1.5.5	100 kPa	Pass
VIBRATION STANDARD	49CFR 178.608	1 hour	Pass

The packages satisfy the requirements for a fiberboard box (4G) outer packaging tested to Packing Group II specifications for a Type Y certificate. *The use of other packaging methods or components may render this report invalid.*

NOTE: 49CFR 178.601 (e) For combination packaging, periodic retests must be conducted at least once every 24-months. Re-certification due date is April 10, 2019

Respectfully submitted,
Horizon Package Testing Service



James A. Stevens
Certification Officer
JS
Encl.

Packages Tested

Four (4) 1-gallon (3.8 liter) blow molded round industrial style jugs tested with Reliable 38-400 Polypropylene screw cap closures and laminated coated foam liner, inserted within a double wall Kraft/Kraft Regular slotted Fiberboard Carton Bottom and D/C Special Top outer packaging. Outer closure method tested with one (1) strip of 76mm wide pressure sensitive plastic tape top flap seam and one (1) strip of 48mm wide pressure sensitive plastic tape bottom flap seam.

TEST	SPEC	Test Weight	Sample Number
DROP TEST	UN Para 6.1.5.3	25.9 kg	1, 2, 3, 4 and 5
STACKING TEST	UN Para 6.1.5.6	Tested on Empty Cartons	6, 7 and 8
VIBRATION STANDARD	49CFR 178.608	25.9 kg	9, 10 and 11

ID: JG10-4-UN25.9-K with Reliable 38-400 Polypropylene Screw Cap



View of Shipper and Inner Packagings

NOTE: Tested Box Closure Method: one (1) strip of 76mm wide pressure sensitive plastic tape top flap seam and one (1) strip of 48mm wide pressure sensitive plastic tape bottom flap seam

JG10-4-UN25.9-K, 38-400 HW Screw Cap Packing Overview
Page 1 of 1

ITEM	Part Number
Shipper Box	JG10-4-UN25.9-K
48mm Tape	HP300
76mm Tape	HP200
1-Gallon Jug	JG10
Screw Cap	38-400 HW

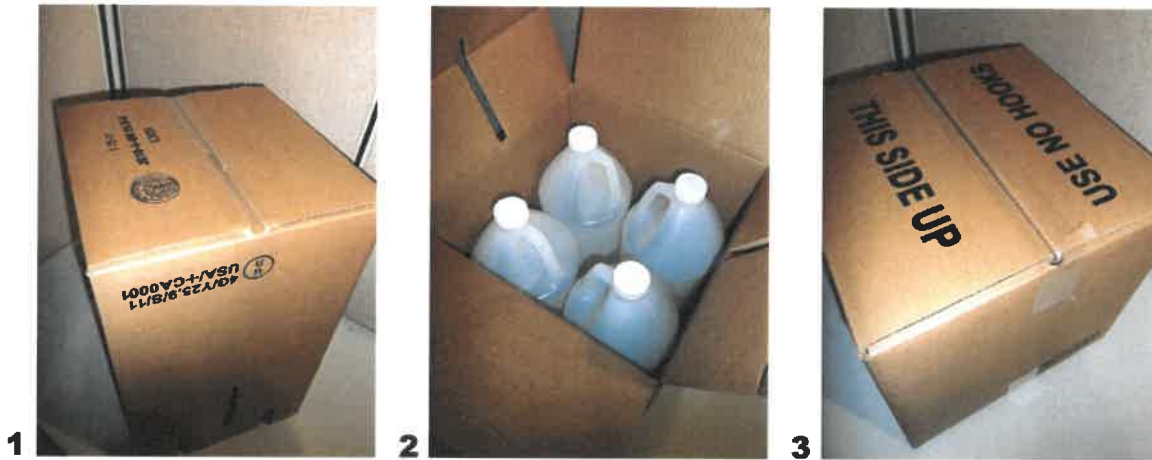
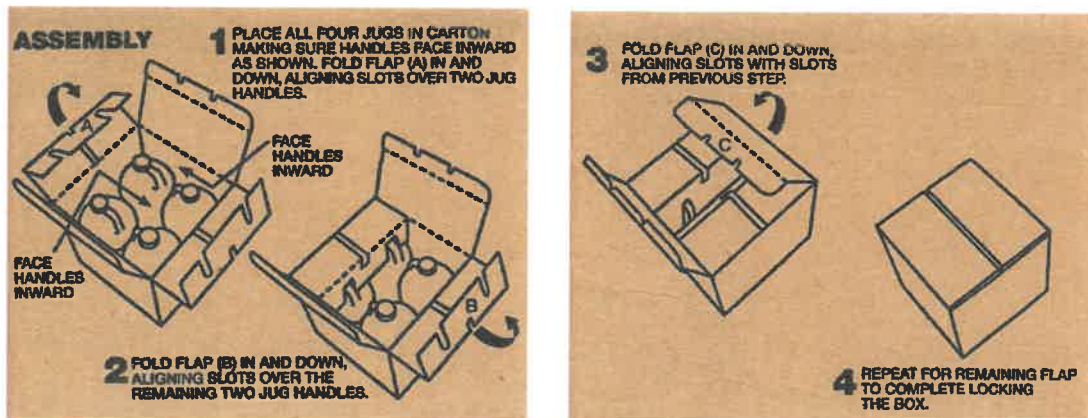


Photo 1: Apply 48mm wide pressure sensitive plastic tape, single strip **bottom**, centered both longitudinally along and spanning the flap seam, extending a minimum of 2-inches onto sides of carton with tape adhered firmly in place. Bottom minor flaps have a 12mm gap when closed, bottom major flaps have a 7mm gap when closed.

Photo 2: Insert four (4) filled and closed 1-gallon jugs with the handles facing center. Screw cap application torque 20 in/lbs.

Photo 3: Complete assembly by applying 76mm wide pressure sensitive plastic tape, single strip **top**, centered both longitudinally along and spanning the flap seams, extending a minimum of 2-inches onto sides of carton with tape adhered firmly in place. Top flaps are multi-fold and interlocking leaving a 3mm gap when closed.



Cobb Test

Guidelines: ISO 535:1991; UN Para 6.1.4.12.1; ASTM 4919 (13.1)

Methods: The absorption of water over a 30-minute period must not be greater than 155 g/m². Average the results from five (5) test specimens. Weigh each specimen before testing and place under the test apparatus consisting of a metal ring (cross-sectional area of 100 square cm) clamped to a flat base plate. Pour 100 ml of water into the ring and let stand for the 30-minute period. Pour the water from the ring 15 seconds before the expiration of the test period, blot the surface with blotting paper and roller, and immediately weigh. The difference between the original and final weight, multiplied by 100, is the weight of water absorbed, in grams per square meter. Samples were conditioned at +23°C and 50% RH for 24 hours prior to testing.

Results: Pass (*top photo, **bottom photo)

Sample	Original Weight, gr	Final Weight, gr	Difference, g/m ²
1	*19.41	**20.38	97
2	19.74	20.78	104
3	19.79	20.79	100
4	18.98	20.02	104
5	19.77	20.83	106

- Five (5) samples reveal an average Cobb of 102.2 g/m²
 Customer ID: JG10-4-UN25.9-K



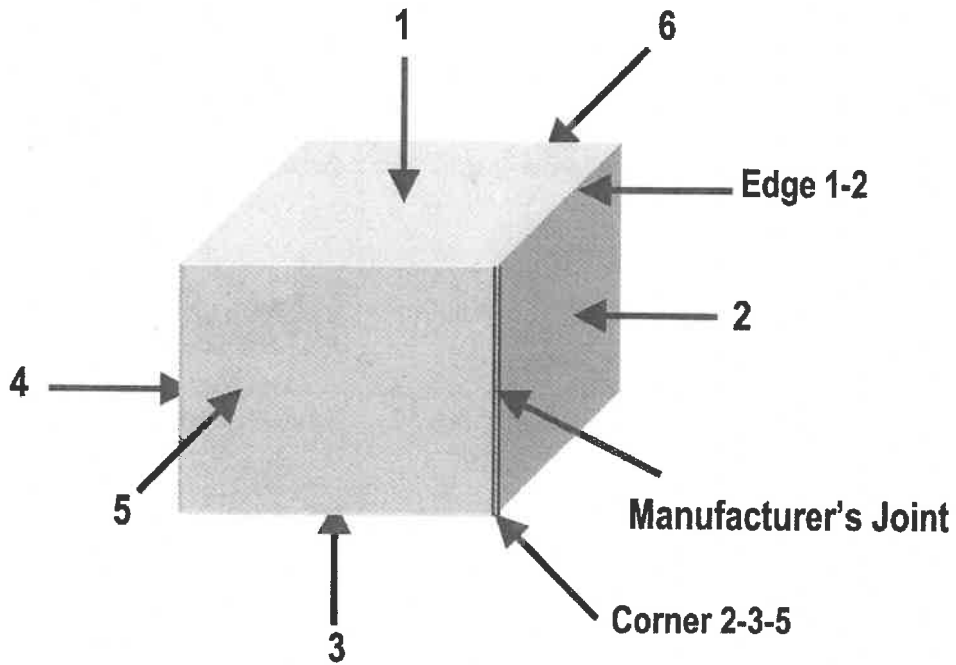
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Testing Orientation

1. **Identify Faces** according to the diagram below:



2. **Identify Edges** using the numbers of the two faces forming that edge.
Example: Edge 1-2 is the edge formed by face 1 and face 2 of the package.
3. **Identify Corners** using the numbers of the three faces that meet to form that corner.
Example: corner 2-3-5 is the corner formed by face 2, face 3 and face 5 of the package.

FACES TESTED

Drop:
 #1 _____ 3 _____
 #2 _____ 1 _____
 #3 _____ 2 _____
 #4 _____ 6 _____
 #5 _____ 1-2-5 _____

Stack:
 #6 _____ 1&3 _____
 #7 _____ 1&3 _____
 #8 _____ 1&3 _____

Vibration:
 #9 _____ 3 _____
 #10 _____ 3 _____
 #11 _____ 3 _____

Drop Test

Guidelines: Code of Federal Regulations 49, Section 178.603; UN Para 6.1.5.3; ASTM D4919 (7.1)

Methods: Five samples, one for each drop, are required for testing. First drop: Flat on bottom (using 1st sample). Second drop: Flat on top (using 2nd sample). Third drop: Flat on the long side (using 3rd sample). Fourth drop: Flat on short side (using 4th sample). Fifth drop: On a corner (using 5th sample). Testing of 4G combination packagings with plastic inner receptacles is performed when the inner packagings have been filled to 98% of overflow capacity and the completed packagings have been reduced to -18°C prior to testing.

Criteria for passing the test: For combination packagings, there is no damage to the outer packaging likely to adversely affect safety during transport, and there is no leakage of the filling substance from the inner packaging. The package/product is dropped from 1.2 meter.

Results:

TEST with Photo

- Sample #1 is impacted flat on the #3 face.
- Sample #2 is impacted flat on the #1 face.
- Sample #3 is impacted flat on the #2 face.
- Sample #4 is impacted flat on the #6 face.
- Sample #5 is impacted diagonally on the #1-2-5 corner.
(top mfr's joint corner sustained minor deformation)

RESULT

No breakage/leakage
No breakage/leakage
No breakage/leakage
No breakage/leakage

No breakage/leakage

After completion of the drop test, samples #1 thru #5 were placed on their sides and observed for any leakage, each were then opened and inspected, samples #1 thru #4 sustained no damage, sample #5 sustained minor deformation on the 1-2-5 corner.

1.2 Meters



1



2



3



4



5

Stacking Test

Guidelines: Code of Federal Regulations 49, Section 178.606, UN 6.1.5.6; ASTM 4919 (10.1)

Methods: Three test containers are subjected to a force applied to the top surface equal to the total weight of identical packages stacked on it in transit. The minimum height of the stack is 3-meters. Three (3) filled containers are closed as for shipment and subjected to a free standing compression load of **209.5 kg**, equivalent to a 3-meter high stack of identical packages, continuously for 24 hours. Packagings submitted are for **Periodic Retesting** and were tested at ambient conditions per 49 CFR 178.602 (3).

Stack tests were conducted on empty outer shippers per 49 CFR 178.606 (b)

Free Standing X
Guided Load

Criteria for passing the test: No test sample may leak. No sample may show any deterioration, which would adversely affect transportation safety or any distortion likely to reduce its strength or cause instability in stacks of packages. The following details the compressive load applied in the stacking test:

Stacking height = SH = (3 meter = 3000mm)
Height of Package = PH (mm)
Number of Packages = n
Maximum gross weight of the package = MGW (kg)

$$\text{Stacking Load} = [(SH/PH) = n - 1] \times \text{MGW}$$
$$[(3000\text{mm}/330\text{mm}) = 9.09 - 1] 8.09 \times 25.9 \text{ kg} = 209.5 \text{ kg (461.8 lbs)}$$

TEST: Samples #6 - #8 are subjected to an actual top load of 215.4 kg

RESULTS: After completion of the stack test samples #6 thru #8 were placed on their sides, each were then opened and inspected, each sample, after completion has shown 4mm ±2 compression after 24 hours.

NOTE: Stacking stability was not assessed since a guided load test was not performed

Stack Test (sample #7 photo)



Actual Stack Load of 215.4 kg (475.0 lbs)

Hydrostatic Pressure Test

Guidelines: Code of Federal Regulations 49, Section 178.605, and 173.199 (b) (4), ASTM D4919 (9.1)

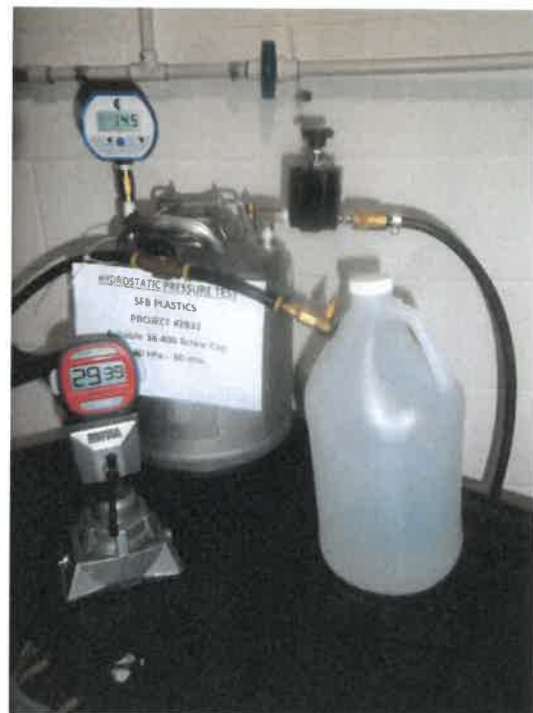
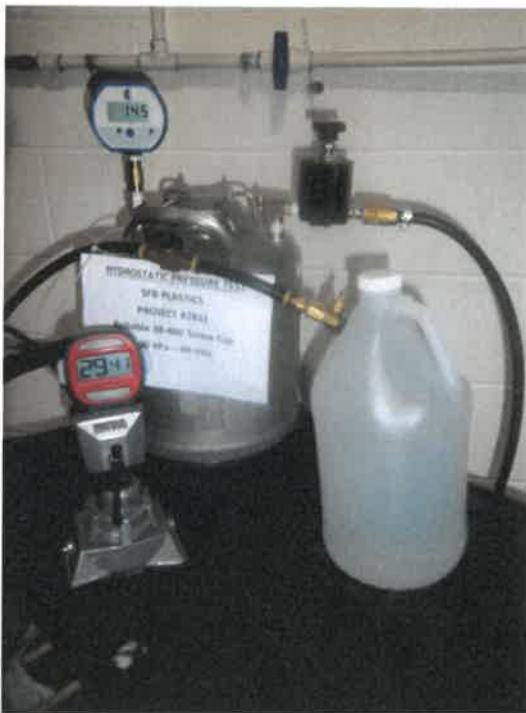
Methods: Plastic receptacles are subjected to the test pressure for 30 minutes. The hydraulic pressure is applied through a leak-proof fitting to three (3) inner receptacles. The receptacles must be supported in a manner that does not invalidate the test. The test pressure must be applied continuously and evenly, and it must be kept constant throughout test period. The units are subjected to the test pressure for thirty (30) minutes each at not less than 95 kPa.

Criteria for Passing the Test: The receptacle passes the test if, for each sample tested, there is no leakage of liquid from the receptacle.

Results: Each samples (3) body expanded as the pressure was applied, no leakage occurred

TEST	RESULT
Samples receptacles are subjected to an internal pressure of 100 kPa (14.5 psi) for 30 minutes.	No rupture/leakage

Hydrostatic Pressure Test



Gallon Jug ID: JG10
Screw Cap ID: 38-400 HW

Vibration Standard

Guidelines: Code of Federal Regulations 49, Section 178.608. ASTM D4919 (11.1)

Methods: Three packages are filled and closed as for shipment. Testing is performed for 1 hour at a frequency that causes the package to be raised from the vibrating platform 1.6 mm. The packages are left free to move vertically, bounce and rotate in their normal shipping orientation. Packagings submitted are for **Periodic Retesting** and were tested at ambient conditions per 49 CFR 178.602 (3).

Rotary Vibration Table X
Vertical Linier Vibration Table _____

Criteria for Passing the Test: A packaging passes the Vibration Standard if there is no rupture or leakage from any of the packages. No test sample should show any deterioration, which could adversely affect transportation safety, or any distortion liable to reduce packaging strength.

Immediately following the test, each package must be removed from the platform, turned on its side and observed for any evidence of leakage.

TEST: Samples #9 - #11 are vibrated for 1 hour at 200 CPM (cycles per minute)

RESULTS: No damage/leakage, each sample was opened and inspected after completion, inner packagings were intact, outer packaging did show minor scuffing on the bottom panel, inner packagings sustained no damage, outer packaging closure was intact.

Vibration Standard



Conclusions

The packages were tested according to Paragraphs 6.1.5.3, 6.1.5.5, 6.1.5.6 and 6.1.4.12.1 of the Recommendations of the United Nations Committee of Experts on the Transport of Dangerous Goods, Chapter 6, 12th Revision and 49CFR Section 178.601 (1) and 178.608 for Group II products. The package met the test requirements and it is recommended that a UN certificate be issued with the mark Y, to wit:



* Year of Manufacture

where: 4G is the packaging type code
 Y is the packing group
 25.9 is the gross mass in kg
 S is for combination packaging
 * year of manufacture
 USA is the country of testing
 +CA0001 is test number of certifying agency

The use of other packaging methods or components may render this report invalid.

HPTS ID No	Equipment	Manufacturer	Model No.	Calibration Date	Calibration Due
1035	TAPPI Room	Horizon PTS	CH 1	N/A	
1020	Walk-in Freezer	Nor-Lake	6x8	N/A	
1001	Scale	ScoutPro	400 grams	21 Feb 2017	21 Feb 2018
1039	Scale	ScoutPro	400 grams	21 Feb 2017	21 Feb 2018
1086	Digital Hygro-Anemometer	Omega	HHC261	02 Mar 2017	03 Mar 2018
1076	Digital Temp. Meter	Omega	HHC201	02 Mar 2017	02 Mar 2018
1003	Shipping Scale	CAS PB	300 lb capacity	21 Feb 2017	21 Feb 2018
1002	Bench Top Scale	CAS SW	20 lb Capacity	21 Feb 2017	21 Feb 2018
1013	Metric Ruler	Johnson	M391	Verify	
1076	Digital Caliper	Fowler	54-100-112	22 Feb 2016	22 Feb 2017
1030	33-Ft Tape Measure	Master Mechanic	33-Ft	Verify	
1036	Cobb Sizer	Gurly Precision Instruments	4.25 inch	N/A	
1038	Cobb Roller	Gurly Precision Instruments	4.25 inch	N/A	
1017	Drop Tower	Lansmont	PDT56ED	Verify	
1044	Weight Stands	Lansmont	125	Verify	
1018	Transport Simulator	Gaynes	RPM 300	Verify	
1000	Cap Torque Tester	Mark-10	MTT01-50	20 Feb 2015	20 Feb 2016
1078	Hydro Tank	Alloy Products	205 PSI	N/A	
1079	Pressure Gauge	Cecomp Electronics	MTT 01-50	15 Feb 2016	15 Feb 2017

APPENDIX A

Inner Packaging

Four (4) 1-gallon (3.8 liter) blow molded round industrial style jugs tested with Reliable 38-400 Polypropylene screw cap closures and laminated coated foam liner

Product Information: Tested Specific Gravity \leq 1.6 for a Packing Group II Liquid

INNER PACKAGING:

Manufacturer	SFB Plastics, Inc. (316-262-0409) 1819 W. Harry Street Wichita, KS 67213
ID	JG10
Style	Blow Molded Industrial Round Jug
Nominal Capacity	3.8-liters (1-gallon)
Overflow Capacity	3.9-liters
Tare Weight	120.7 grams
Size (mm, OD)	156 X 304 (D x H)
Size (in, OD)	6.14 X 11.96 (D x H)
Material	High Density Polyethylene (HDPE), copolymer natural plastic 0.83mm average wall thickness (0.033 inch) 1.96mm average bottom center thickness (0.077 inch) 0.058mm average bottom edge thickness (0.023 inch)
Handle	Integral molded handle, top side
Count	Four (4) per tested outer shipper
Fill Material	Water = Vibration Standard and Hydrostatic Pressure tests Glycol solution = Drop Test
Closure	38-400 HW
Manufacturer	Reliable Caps and Closures (800-356-8483) 1001 West Highway 56 Olathe, KS 66061
Drawing No.	C38-06
Tare Weight	3.54 grams
Application Torque	Tested at 20 in/lbs Manufacturer recommended 19-23 in/lbs
Method	Torque applied using a Mark-10 Cap Torque Tester
Size (mm, OD)	41.10 X 11.66 (D x H)
Size (in, OD)	1.61 X 0.459 (D x H)
Material	Polypropylene
Liner	F-217 LDPE Foam
Tare Weight	0.40 grams
Size (mm, OD)	34.91 X 0.89 (D x thickness)
Size (in, OD)	1.37 X 0.035 (D x thickness)

APPENDIX B

Outer Packaging

A double wall Kraft/Kraft Regular slotted Fiberboard Carton bottom and D/C special top outer packaging. Outer closure method tested with one (1) strip of 76mm wide pressure sensitive plastic tape top flap seam and one (1) strip of 48mm wide pressure sensitive plastic tape bottom flap seam.

OUTER PACKAGING:

UN Code	4G
Manufacturer	Green Bay Packaging Incorporated (918-446-3341) 6106 W. 68 th Street Tulsa, OK 74131
ID	JG10-4-UN25.9-K
Style	Regular Slotted Fiberboard Carton Bottom and D/C Special Top
Tare Weight	880.0 grams
Size (mm, OD)	335 X 327 X 330 (L x W x H)
Size (in, ID)	12 +7/16 X 12+3/8 X 12+3/16 (L x W x H)
Board Grade	BMC 350 lbs/in Burst Strength; <i>Tests to:</i> 126 (42/26/40/26/42)lb./1000 ft ²
Corrugations	Vertical "B-C" flute
Caliper	6.82mm (0.268 inch)
Facings	Kraft/Kraft
Mfr's Joint	Glued inside corner, 38mm tab (1+1/2 inch)
Bottom Flaps	Minor = 12mm gap when closed Major = 7mm gap when closed
Top Flaps	Inter locking die-cut multi-fold
Printing	None
<u>Top Closure</u>	HP200 Shurtape 76mm Pressure Sensitive Plastic Tape
Manufacture	Pratt Industries (316 832 3560) 700 E. 37 th Street Wichita, KS 67219
Application	76mm pressure sensitive plastic tape, single strip top and centered longitudinally along and spanning the flap seam, extending a minimum of 2-inches onto sides of carton with tape adhered firmly in place
Method	Tape was applied using a Uline hand held pistol grip applicator
<u>Bottom Closure</u>	HP300 Shurtape 48mm Pressure Sensitive Plastic Tape
Manufacture	Pratt Industries (316 832 3560) 700 E. 37 th Street Wichita, KS 67219
Application	48 mm pressure sensitive plastic tape, single strip bottom, centered longitudinally along and spanning the flap seams, extending a minimum of 2-inches onto sides of carton with tape adhered firmly in place
Method	Tape was applied using a Uline hand held pistol grip applicator

APPENDIX C

Calculations

The following section details: (A) the method of calculating the gross weight of the packaging as indicated in the UN Mark; and, (B) the compressive load applied in the stacking test.

- A. Gross weight of package, as tested = TW (kg)
 Overflow volume of inner packaging = OV (liter) or (kg of H2O)
 Number of Inner Packaging = N
 Specific Gravity = SG
 Weight of Empty Package = T (kg)
 Specific Gravity of Water = 1
 Tested Volume = 0.98

1)Packagings as Tested: **tare weight in grams**

Article	Tare Wght. gr.	NO. of Articles	Total gr.
1-gallon jug	120.7	4	482.8
Cap	3.54	4	14.16
Liner	0.40	4	1.6
RSC	880.0	1	880.0
Total	N/A	N/A	1,377.96

Additional weight added for Drop Test:

6.2 kg of bagged BB shot was added to the void space within each sample (#1-#5 Drop Test) to achieve the marked weight of 25.9 kg (57.0 lbs).

Additional weight added for Vibration Standard:

10.6 kg of bagged BB shot was added to the void space within each sample (#9-#11, Vibration Standard) to achieve the marked weight of 25.9 kg (57.0 lbs).

2) $[T + (SG \times OV \times N \times 1 \times 0.98)]$
 $[1.37 \text{ kg} + (1.2 \times 3.9 \times 4 \times 1 \times 0.98)] = 25.94 \text{ kg (57.0 lbs)}$

Maximum Gross Weight = 25.9 kg Mark = Y 25.9

- B. Stacking height = SH = (3 meter = 3000mm)
 Height of Package = PH (mm)
 Number of Packages = n
 Maximum gross weight of the package = MGW (kg)

a) Stacking Load = $[(SH/PH) = n - 1] \times MGW$
 $[(3000\text{mm}/330\text{mm}) = 9.09 - 1] 8.09 \times 25.9 \text{ kg} = 209.5 \text{ kg}$

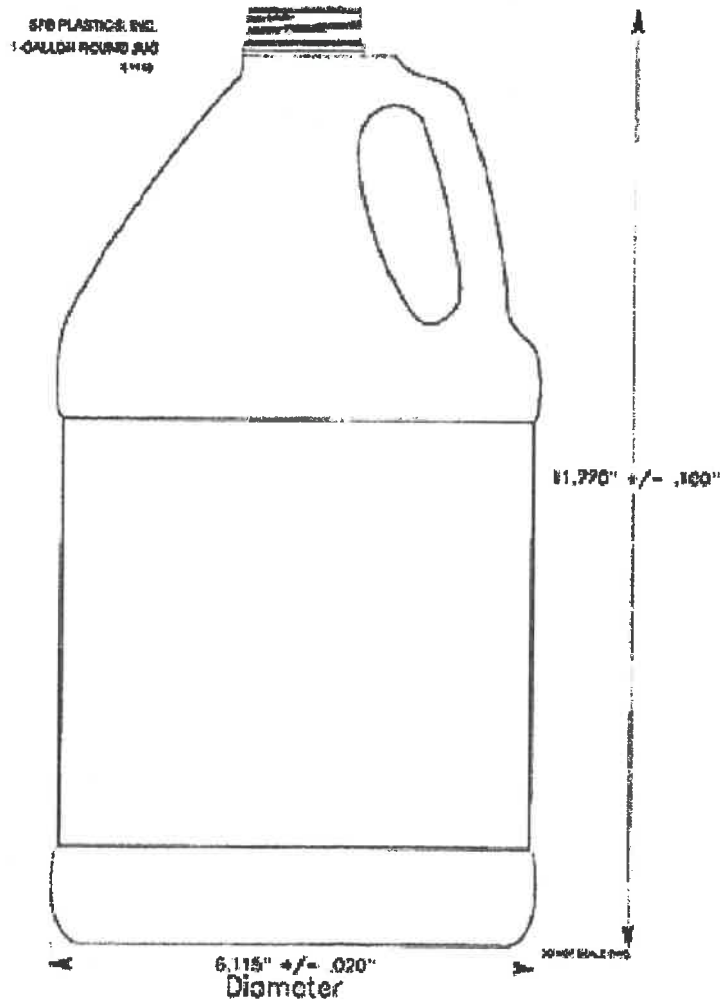
Stacking Load Minimum = 209.5 kg (461.8 lbs)

Actual Stacking Load = 215.4 kg (475.0 lbs)



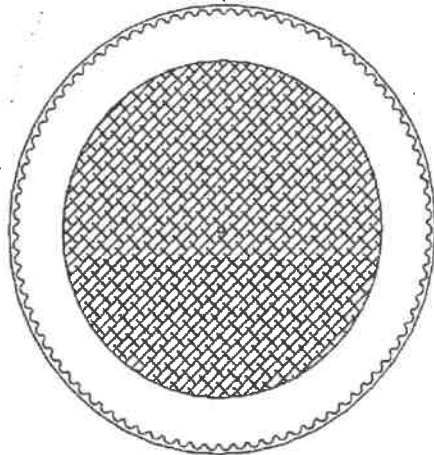
Dimensions can vary slightly due to processing conditions.

1 Gallon Industrial Round	
Material	Copolymer HDPE
Height (appx.) (varies by neck finish)	11.770"
Diameter	6.115"
Weight	100-150 grams
Finishes	38 OCT 38 NBO
Overflow	135 oz.
Label Panel	5.300" x 18.730" Circumference

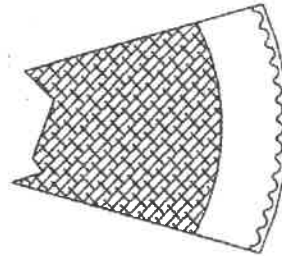


RELIABLE CAPS LLC

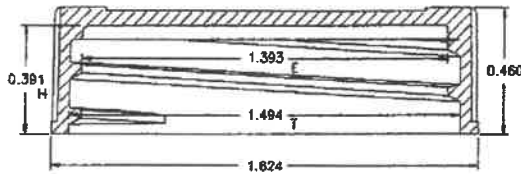
38-400HW



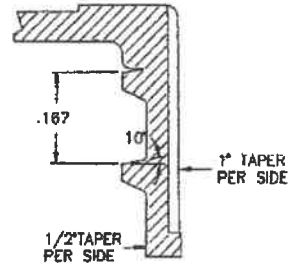
TOP VIEW
 SCALE: 2=1



90 RIBS
 EQUALLY SPACED
 RIB DETAIL
 SCALE: 2.5=1



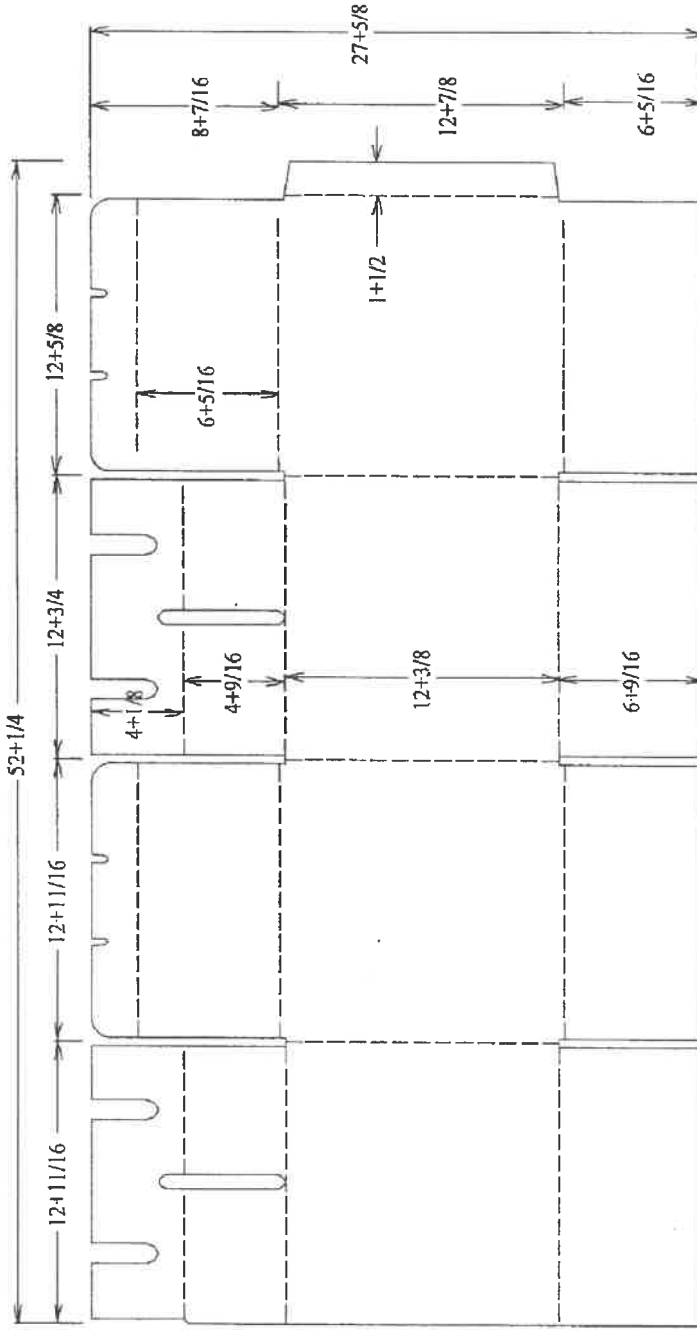
CAP SECTION
 SCALE: 2=1



6 THREADS PER INCH
 .167 LEAD
 THREAD DETAIL
 SCALE: 4=1

RELIABLE CAPS LLC	
ORDER DESK: 800-356-8483 / FAX: 913-764-049	
DESCRIPTION: 38-400HW	MATERIAL: POLYPROPYLENE STANDARD COPOLY
COLOR: CUSTOMER SPECIFY	LAST UPDATE: 03-24-2004
DIM. TOLERANCE: ± .005	DWG. # C38-06
TOP CONCAVE 0.025	DWG. BY: D.R.P
REVISIONS:	

Green Bay Packaging, Inc. - Spec. Sheet Drawing



**** DRAWING SHOWS INSIDE OF SHEET ****

Inches Of Rule:	497.628	Corr. Dir.:	Vertical	Design Number	2853.ARD	Designer:	GOLEMAN	Salesman:	SOERGEL	Date Created:	2006-09-22
Revision:	ADJUST BTM FLAPS			Revision #:	0					Date Revised:	09/22/2006
Customer:	SFB PLASTICS			Joint:	G/I	Sheet Size:	62+1/4 x 27+5/8			Square Footage:	10.024
Style:	DRSC W/OFFSET SCORES			Box Size:	12+7/16 x 12+3/8 x 12+3/16					%Waste	3.85%
Box No.:	JG10-4-UN 26-9K			Board Contribution:	42Kx26Mx42Kx26Mx42K	Flute:	BC			Approved By:	