TEN-E Packaging Services, Inc.

UNITED NATIONS / DOT PERFORMANCE CERTIFICATION

4G DESIGN QUALIFICATION

4 x 9 Pint Beta Plastic Bottle Packaging with Vented Standard Closure and Two Case Sealing Mechanisms

TEST REPORT #: 25-CA20097

(un) 4G / Y21.4 / S / **
USA / +CC8142

**Insert the last two digits of the year of manufacture

TESTING PERFORMED FOR:

PUREPAK TECHNOLOGY CORPORATION
75 West Baseline Road Suite D44
Gilbert, AZ 85233

ATTN: Michael Dodd

TESTING PERFORMED BY:

TEN-E PACKAGING SERVICES, INC.
326 North Corona Avenue
Ontario, CA 91764
Phone: 909-937-1260
Fax: 909-937-1262

June 26, 2025

TABLE OF CONTENTS

NOTES AND COMMENTS

This report is being issued as a design qualification due to changing the tape to seal the boxes from the previously tested periodic retest report (23-CA20079). This design will retain the +CC8142 identification.

Testing was conducted on the 4 x 9 Pint Beta Plastic Bottle Packaging with Vented Standard Closure with the Following Case Sealing Variables:

- Variable #1: Taped Top and Taped Bottom Flaps
- Variable #2: Taped Top and Hot Melt Glued Bottom Flaps (prepared by client)

SECTION I: CERTIFICATION

Design Qualification of the PurePak Technology Corporation
4 x 9 Pint Beta Plastic Bottle Packaging with Vented Standard Closure and Two Case Sealing Mechanisms

TEN-E Packaging Services, Inc. is a current DOT UN Third-Party Certification Agency under §107.403 and certifies that the **PurePak Technology Corporation** packaging referenced above has passed the standards of the DEPARTMENT OF TRANSPORTATION'S TITLE 49 CFR; Performance Oriented Packaging Standards, Section 178. This package is also certified under IMDG and the UN Recommendations on the Transport of Dangerous Goods. It is the responsibility of the end user to determine authorization for use under these regulations. The use of other packaging methods or components other than those documented in this report may render this certification invalid.

SUMMARY OF PERFORMANCE TESTS

UN / DOT TEST	49 CFR REFERENCE	TEST LEVEL	TEST CONTENTS	TEST COMPLETED	TEST RESULTS
Drop	178.603	1.2 m	Methanol/Water Solution	June 26, 2025	PASS
Stacking (V1)	178.606	272.1 Kg – 24 Hours	Empty	June 5, 2025	PASS
Stacking (V2)	178.606	272.1 Kg – 24 Hours	Empty	June 6, 2025	PASS
Vibration	178.608	3.4 Hz – 1 Hour	Water	June 26, 2025	PASS
Cobb	178.516	30 Minutes	---	June 9, 2025	PASS

TEST REPORT NUMBER:	25-CA20097
UN MARKING: (CFR 49 – 178.503)	(un) 4G / Y21.4 / S / ** USA / +CC8142
PACKAGING IDENTIFICATION CODE:	4G - Fiberboard Box (178.516)
PERFORMANCE STANDARD:	Y (Packaging meets Packing Group II and III tests)
AUTHORIZED GROSS MASS:	21.4 Kg (47.1 Lbs.)
"S" DESIGNATION:	Denotes Inner Packagings
YEAR OF MANUFACTURE:	**Insert the last two digits of the year of manufacture
STATE AUTHORIZING THE MARK:	USA
PACKAGING CERTIFICATION AGENCY:	(+CC) TEN-E Packaging Services, Inc. (Ontario, CA CAA #2006030021)
THIRD PARTY PACKAGING IDENTIFICATION:	+CC8142
PERIODIC RETEST DATE:	June 26, 2027

ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY THAT THE PACKAGING TESTED IS MERCHANTABLE OR FIT FOR A PARTICULAR PURPOSE, ARE DISCLAIMED. In no event shall TEN-E Packaging Services, Inc. liability exceed the total amount paid by **PurePak Technology Corporation** for services rendered. In the event of future changes to the above referenced test standards, it is the responsibility of **PurePak Technology Corporation** to determine whether additional testing or updating of past testing is necessary to verify that the packaging we have tested remains in compliance with those standards.

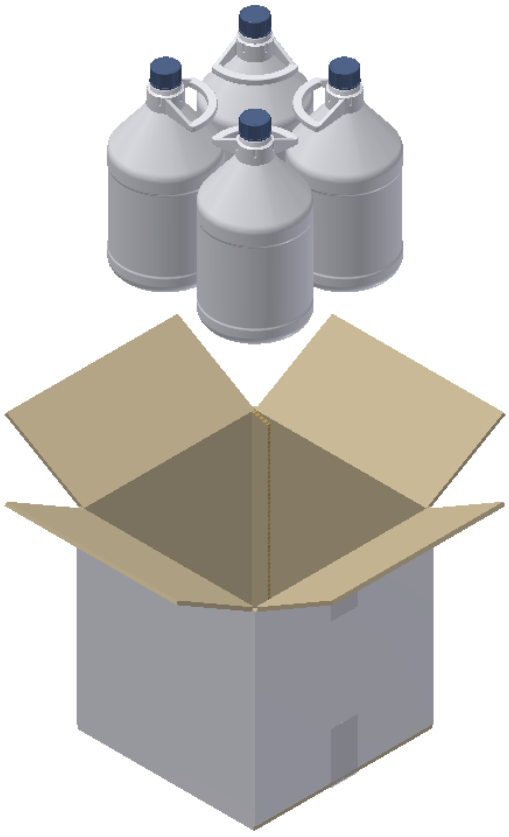
MANUFACTURER:
PurePak Technology
75 West Baseline Road, Suite D44
Gilbert, AZ 85233

Matthew C. Anderson
Project Manager
TEN-E Packaging Services, Inc.
326 North Corona Avenue
Ontario, CA 91764

SECTIONS II & V: PACKAGING DESCRIPTIONS / COMPONENT DRAWINGS

Variable #1: 4 x 9 Pint Beta Plastic Bottle Packaging with Vented Standard Closure (Taped Top and Bottom Flaps)

ASSEMBLY DRAWING



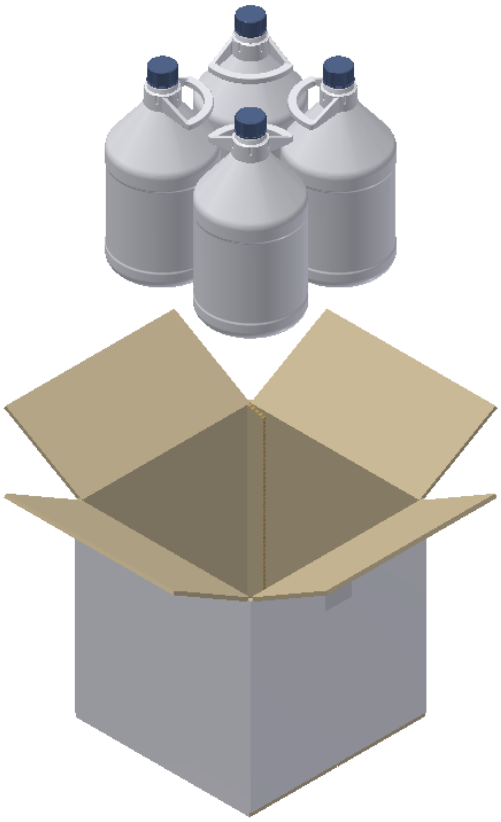
TEST LEVELS		
Certification Type:	Design Qualification	
Packaging Code Designation:	4G	
Packing Group:	II	
Specific Gravity	1.2	
TEST SAMPLE PREPARATION (Refer to Section IV)		
Overall Packaging Tare Weight:	1,765 Grams	
Fill Capacity (98% Maximum Capacity):		
Methanol/Water Solution	3,871 Grams	
Water	4,126 Grams	
Package Test Weight:		
Methanol/Water Solution	17.2 Kg	37.9 Lbs.
Water	18.2 Kg	40.1 Lbs.
Authorized Package Gross Mass:	21.5 Kg	47.3 Lbs.
CLOSING METHODS – INNER PACKAGING		
38mm Polypropylene Vented Closure:		
Application Torque:	50 In-Lbs.	
Equipment:	Torque Wrench #W702	
CLOSING METHODS – SHIPPER		
Top Flaps:		
Manufacturer:	3M, St. Paul, MN	
Type:	3M MMM115894 Pressure Sensivtive Tape	
Width:	48 mm (2")	
Overlap:	2" Minimum	
Tape Pattern:	Center Seam	
Bottom Flaps:		
Manufacturer:	3M, St. Paul, MN	
Type:	3M MMM115894 Pressure Sensivtive Tape	
Width:	48 mm (2")	
Overlap:	2" Minimum	
Tape Pattern:	Center Seam	

For Packaging's with an Established Gross Mass:

If the gross mass calculation in this report exceeds the previously established gross mass, the manufacturer may elect to maintain the current gross mass marking (e.g. the gross mass rating of the UN marking on the packaging may be less than the calculated gross mass indicated in this report) or use the newly established gross mass. In no event shall the gross mass marking on the packaging exceed the gross mass to which the packaging was tested.

Variable #2: 4 x 9 Pint Beta Plastic Bottle Packaging with Vented Standard Closure (Taped Top and Glued Bottom Flaps)

ASSEMBLY DRAWING



TEST LEVELS

Certification Type:	Design Qualification	
Packaging Code Designation:	4G	
Packing Group:	II	
Specific Gravity	1.2	

TEST SAMPLE PREPARATION
(Refer to Section IV)

Overall Packaging Tare Weight:	1,765 Grams	
Fill Capacity (98% Maximum Capacity):		
Methanol/Water Solution	3,871 Grams	
Water	4,126 Grams	
Package Test Weight:		
Methanol/Water Solution	17.2 Kg	37.9 Lbs.
Water	18.2 Kg	40.1 Lbs.
Authorized Package Gross Mass:	21.5 Kg	47.3 Lbs.

CLOSING METHODS – INNER PACKAGING

38mm Polypropylene Vented Closure:	
Application Torque:	50 In-Lbs.
Equipment:	Torque Wrench #W702

CLOSING METHODS – SHIPPER

Top Flaps:

Manufacturer:	3M, St. Paul, MN
Type:	3M MMM115894 Pressure Sensivtive Tape
Width:	48 mm (2")
Overlap:	2" Minimum
Tape Pattern:	Center Seam

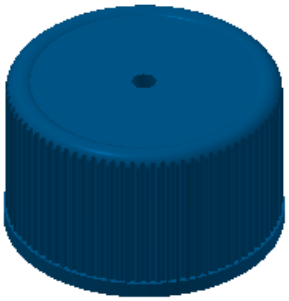
Bottom Flaps:

Type:	(Prepared by Client as for Transport) Hot Melt Adhesive (Three Strips of Thermoset Adhesive – 1/2" x 4") (PHC-9256)

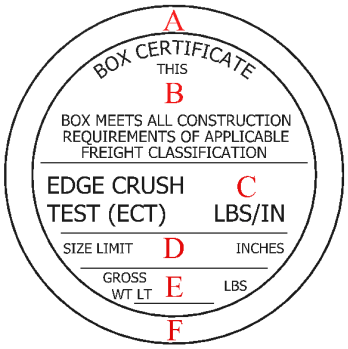
For Packaging's with an Established Gross Mass:

If the gross mass calculation in this report exceeds the previously established gross mass, the manufacturer may elect to maintain the current gross mass marking (e.g. the gross mass rating of the UN marking on the packaging may be less than the calculated gross mass indicated in this report) or use the newly established gross mass. In no event shall the gross mass marking on the packaging exceed the gross mass to which the packaging was tested.

COMPONENT INFORMATION

CLOSURE (QIM-317-4937)		DRAWING
Manufacturer: Berry Plastics, Evansville, IN		
Description:	38mm Ribbed Threaded Vented Closure	
Quantity:	4	
Material:	Polypropylene	
Tare Weight:	10.49 Grams	
Overall Dimensions:		
• **Height**	1.016” ± 0.015”	
• **Diameter**	1.701” ± 0.015”	
Thread Dimensions:		
• **T**	1.481” ± 0.007”	
• **E**	1.389” ± 0.007”	
Markings (QC Audit):	2	
LINER:		
Description:	Perforated Disc with a Non-Woven Teflon Surface Membrane	
Tare Weight:	0.65 Grams	
Thickness:	0.051”	
Diameter:	1.363”	

PLASTIC BOTTLE (ZB38RD9A)		DRAWING
Manufacturer: PurePak Technology Corporation, Gilbert, AZ		
Description:	9 Pint Beta Plastic Bottle with Oval Handle	
Quantity:	4	
Material:	High Density Polyethylene	
Method of Manufacture:	Blow Molded	
Tare Weight:	193.0 Grams + 7.5 Grams / - 5.0 Grams	
Capacity:		
• **Rated**	9 Pint	
• **Overflow**	4.210 Liters (1.112 Gallons)	
Overall Dimensions:		
• **Height**	12.680” ± 0.090”	
• **Diameter**	6.267” ± 0.090”	
Thread Dimensions:		
• **T**	1.461” ± 0.015”	
• **E**	1.367” ± 0.015”	
Wall Thickness:		
• **Minimum**	0.032”	
Markings (QC Audit):	SPI “2” HDPE Recycling Symbol	

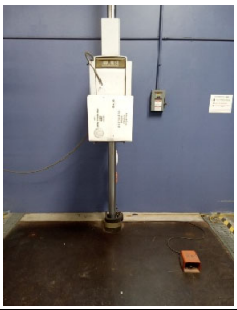
SHIPPER (507089 & 817308)		
Manufacturer: Packaging Corporation of America, Gas City, IN		
Description:	Regular Slotted Container	
Material/Flute (Outer to Inner):	51 ECT Double Wall Mottled White Corrugated Fiberboard; C/B-Flute	
Basis Weight (Outer to Inner) Lbs./MSF:		
• **Specification**	35 / 23 / 35 / 23 / 35	
Tare Weight:	822 Grams	
DIMENSIONS		
	Specification Dimensions (Inside)	**Measured Dimensions (Outside)**
• **Length**	12-3/4”	13-3/8”
• **Width**	12-3/4”	13-3/8”
• **Height**	13”	14”
Board Caliper (Nominal):	0.243”	
Manufacturer’s Joint:	Inside Glued, 1-3/8” Lap	
Markings (QC Audit):	(u n) 4G / X23.2 / S / 25 USA / +CC7640 (u n) 4G / Y33.8 / S / 25 USA / +CC7640 (u n) 4G / Y21.4 / S / 25 USA / +CC8142 Artwork Date: 12/13/24 507089 12 3/4 X 12 3/4 X 13 ID BETA OPEN OTHER END NRC 507089	
BOX CERTIFICATE		
(A) Corrugated Manufacturer:	PACKAGING CORPORATION OF AMERICA	
(B) Structure:	Double Wall	
(C) ECT:	51 Lbs. Per Sq. Inch	
(D) Size Limit:	105”	
(E) Gross Wt. Lt:	120 Lbs.	
(F) Location:	GAS CITY, IN	

SECTION III: TEST PROCEDURES AND RESULTS

DROP TESTS — Variable #1

TEST INFORMATION		TEST CRITERIA
TEST CONTENTS:	Methanol/Water Solution (0.964 SG)	• For packaging containing liquid, each packaging does not leak. • There can be no damage to the outer packaging likely to adversely affect safety during transport. Inner receptacles, inner packagings or articles must remain completely within the outer packaging and there must be no leakage of the filling substance from the inner packaging. • Any discharge from a closure is slight and ceases immediately after impact with no further leakage. (§178.603)
SAMPLE PREPARATION:	Refer to Section II	
CONDITIONING:	-18°C (0°F) Freezer #W201	
CONTENTS TEMP.:	-18.5°C (-1.3°F)	
DROP HEIGHT:	1.2 Meters (48”) (Refer to Section IV)	
TEST EQUIPMENT:	L.A.B. Accu Drop 160	

DROP ORIENTATIONS AND TEST RESULTS

Sample #1: Flat on Bottom	Sample #2: Flat on Top	*Sample #3: Flat on Long Side
		
PASS: No leakage or damage.	**PASS:** No leakage or damage.	**PASS:** No leakage or damage.
***Sample #4: Flat on Short Side**	***Sample #5: Bottom Corner**	****Sample #1: Top Corner**
		
PASS: No leakage or damage.	**PASS:** No leakage. Slight deformation at impact corner.	**PASS:** No leakage. Slight deformation at impact corner.

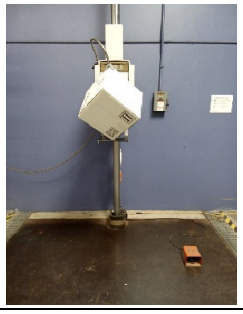
*Side and corner drops were conducted to impact the manufacturer’s joint.

**Flat on bottom drop sample was also used for the top corner drop.

DROP TESTS — Variable #2

TEST INFORMATION		TEST CRITERIA
TEST CONTENTS:	Methanol/Water Solution (0.964 SG)	• For packaging containing liquid, each packaging does not leak. • There can be no damage to the outer packaging likely to adversely affect safety during transport. Inner receptacles, inner packagings or articles must remain completely within the outer packaging and there must be no leakage of the filling substance from the inner packaging. • Any discharge from a closure is slight and ceases immediately after impact with no further leakage. (§178.603)
SAMPLE PREPARATION:	Refer to Section II	
CONDITIONING:	-18°C (0°F) Freezer #W201	
CONTENTS TEMP.:	-18.5°C (-1.3°F)	
DROP HEIGHT:	1.2 Meters (48”) (Refer to Section IV)	
TEST EQUIPMENT:	L.A.B. Accu Drop 160	

DROP ORIENTATIONS AND TEST RESULTS

Sample #12: Flat on Bottom	Sample #13: Flat on Top	*Sample #14: Flat on Long Side
		
PASS: No leakage or damage.	**PASS:** No leakage or damage.	**PASS:** No leakage or damage.
***Sample #15: Flat on Short Side**	***Sample #16: Bottom Corner**	****Sample #12: Top Corner**
		
PASS: No leakage or damage.	**PASS:** No leakage. Slight deformation at impact corner.	**PASS:** No leakage. Slight deformation at impact corner.

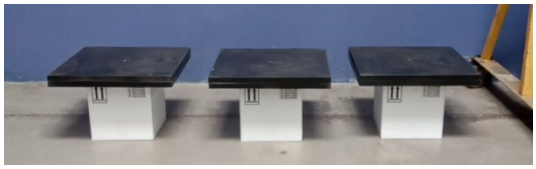
*Side and corner drops were conducted to impact the manufacturer’s joint.

**Flat on bottom drop sample was also used for the top corner drop.

STACKING TEST — Variable #1

TEST INFORMATION		TEST CRITERIA
TEST CONTENTS:	Empty	• There can be no deterioration that could adversely affect transport safety or any distortion liable to reduce the package's strength, cause instability in stacks of packages, or cause damage to inner packagings that is likely to reduce safety in transport. (§178.606)
SAMPLE PREPARATION:	Refer to Section II	
CONDITIONING:	73°F / 50% RH Quality Room #W202	
TEST LOAD APPLIED:	272.1 Kg (600.0 Lbs.) (Refer to Section IV)	
TEST DURATION:	24 Hours	
TEST EQUIPMENT:	Dead Load Weights	

STACKING TEST SET-UP & RESULTS



Sample #	Maximum Deflection After 24 Hours	Results
9	1/8"	**PASS**
10	1/8"	**PASS**
11	1/8"	**PASS**

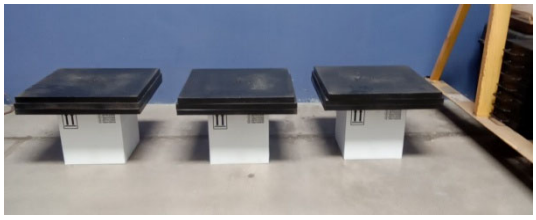
Comments/Observations: Following the 24-hour stack test, there was no damage likely to affect the performance of the packaging.

Stacking Stability: Not conducted; required only for guided load tests.

STACKING TEST — Variable #2

TEST INFORMATION		TEST CRITERIA
TEST CONTENTS:	Empty	• There can be no deterioration that could adversely affect transport safety or any distortion liable to reduce the package's strength, cause instability in stacks of packages, or cause damage to inner packagings that is likely to reduce safety in transport. (§178.606)
SAMPLE PREPARATION:	Refer to Section II	
CONDITIONING:	73°F / 50% RH Quality Room #W202	
TEST LOAD APPLIED:	272.1 Kg (600.0 Lbs.) (Refer to Section IV)	
TEST DURATION:	24 Hours	
TEST EQUIPMENT:	Dead Load Weights	

STACKING TEST SET-UP & RESULTS



Sample #	Maximum Deflection After 24 Hours	Results
20	1/8"	**PASS**
21	1/8"	**PASS**
22	1/8"	**PASS**

Comments/Observations: Following the 24-hour stack test, there was no damage likely to affect the performance of the packaging.

Stacking Stability: Not conducted; required only for guided load tests.

VIBRATION TEST — Variable #1

TEST INFORMATION		TEST CRITERIA
TEST CONTENTS:	Water	• Immediately following the period of vibration, each package must be removed from the platform, turned on its side and observed for any evidence of leakage. • A packaging passes the vibration test 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. (§178.608)
SAMPLE PREPARATION:	Refer to Section II	
CONDITIONING:	73°F / 50% RH Quality Room #W202	
TABLE DISPLACEMENT:	1”	
TEST FREQUENCY:	3.4 Hz	
TEST DURATION:	1 Hour	
TEST EQUIPMENT:	Vertical motion using L.A.B. Palletizer Vibration System	

VIBRATION TEST SET-UP AND RESULTS

Sample #	Results	Comments/Observations
6	PASS	No leakage or damage.
7	PASS	
8	PASS	

VIBRATION TEST — Variable #2

TEST INFORMATION		TEST CRITERIA
TEST CONTENTS:	Water	• Immediately following the period of vibration, each package must be removed from the platform, turned on its side and observed for any evidence of leakage. • A packaging passes the vibration test 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. (§178.608)
SAMPLE PREPARATION:	Refer to Section II	
CONDITIONING:	73°F / 50% RH Quality Room #W202	
TABLE DISPLACEMENT:	1”	
TEST FREQUENCY:	3.4 Hz	
TEST DURATION:	1 Hour	
TEST EQUIPMENT:	Vertical motion using L.A.B. Palletizer Vibration System	

VIBRATION TEST SET-UP AND RESULTS

Sample #	Results	Comments/Observations
17	**PASS**	No leakage or damage.
18	**PASS**	
19	**PASS**	

COBB WATER ABSORPTION TEST

TEST INFORMATION		TEST CRITERIA
NUMBER OF SAMPLES:	5	• An increase in mass greater than 155 g/m² over the 30 minute duration represents an unacceptable level of water resistance. (§178.516)
SAMPLE SIZE:	5” x 5” (Minimum)	
CONDITIONING:	73°F / 50% RH Quality Room #W202	
WATER APPLIED:	100 mL / Sample	
TEST DURATION:	30 Minutes / Sample	
TEST EQUIPMENT:	UWE Analytical Balance Gurley Cobb Water Absorption Fixtures	

COBB WATER ABSORPTION TEST RESULTS		
REPRESENTATIVE SET-UP PHOTO	**Sample #**	**Water Absorbed**
	**1**	126.0 g/m²
	2	119.0 g/m²
	3	120.0 g/m²
	4	129.0 g/m²
	5	123.0 g/m²
	AVERAGE:	**123.4 g/m²**
	RESULT	**PASS**

REGULATORY AND INDUSTRY STANDARD REFERENCES

REGULATORY REFERENCES			
TEST	**49 CFR①**	**UN②**	**IMDG③**
	October 2024 Edition	**23rd Edition**	**2024 Edition**
Drop:	178.603	6.1.5.3	6.1.5.3
Stacking:	178.606	6.1.5.6	6.1.5.6
Vibration:	178.608	---	---
Cobb:	178.516(b)(1)	6.1.4.12.1	6.1.4.12.1

① United States Department of Transportation Code of Federal Regulations (CFR) Title 49, Transportation, Parts 100-185
② The United Nations Recommendations on the Transport of Dangerous Goods – Model Regulations (UN – Orange Book)
③ International Maritime Dangerous Goods Code (IMDG)

INDUSTRY STANDARD REFERENCES		
Drop:	ASTM④ D5276:	Standard Test Method for Drop Test of Loaded Containers by Free Fall
	ASTM④ D7790:	Standard Test Method for the Preparation of Plastic Packagings Containing Liquids for United Nations (UN) Drop Testing
	ISO⑤ 2248:	Packaging – Complete, Filled Transport Packages – Vertical Impact Test by Dropping
Stacking:	ASTM④ D8409:	Standard Guide for Conducting Stacking Tests on UN Packagings Using Guided or Unguided Loads
	ASTM④ D4577:	Standard Test Method for Compression Resistance of a Container Under Constant Load
	ISO⑤ 2234:	Packaging – Complete, Filled Transport Packages – Stacking Test using Static Load
Vibration:	ASTM④ D999:	Standard Test Method for Vibration Testing of Shipping Containers
	ISO⑤ 2247:	Packaging – Complete, Filled Transport Packages – Vibration Test at Fixed Low Frequency
Cobb:	ISO⑤ 535:	Paper and Board – Determination of Water Absorption – Cobb Method

④ American Society for Testing and Materials (ASTM)
⑤ International Organization for Standardization (ISO)

EQUIPMENT

All inspection, measuring and test equipment that can affect product quality is calibrated and adjusted at prescribed intervals, or prior to use, and is traceable to NIST, using ANSI Z540 as an overall guide for calibration certification.

SECTION IV: MATHEMATICAL CALCULATIONS

INFORMATION USED FOR CALCULATIONS

Overall Packaging Tare Weight (PTW):	1,765.0	Grams	
Overflow Capacity (OFC):			Methanol/Water
Methanol/Water	3,950.0	Grams	SG: 0.964
Water	4,210.0	Grams	
Number of Inner Packagings (# IP):	4		
Packing Group	II		
Product Specific Gravity (PSG):	1.200		
Packing Group Multiplication Factor (MF):	0.00		
Overall Height of one Package (OH):	14.00	Inches	
Stack Test-# of Samples Tested Simultaneously:	0		

98% OF OVERFLOW

Overflow Capacity (OFC) x 98%

OFC	x	98%			
3,950.0	x	98%	=	3,871.0 Grams	Methanol/Water
4,210.0	x	98%	=	4,125.8 Grams	Water

PACKAGE TEST WEIGHTS

Overall Pkg Tare Weight (PTW) + (98% Overflow Capacity (OFC) x # of Inner Pkg (# IP)

PTW	+	(98% OFC	x	# IP)	
1,765.0	+	3,871.0	x	4	Methanol/Water
1,765.0	+	4,125.8	x	4	Water

Methanol/Water:	17.2	kg	37.9	lb
Water:	18.2	kg	40.1	lb

AUTHORIZED PACKAGE GROSS MASS CALCULATION (APGM)

Overall Pkg Tare Weight (PTW) + (Product SG (PSG) x 98% Overflow (OFC) x # of Inner Pkg (# IP))

PTW	+	(PSG	x	98% OFC	x	# IP)
1,765.0	+	1.2	x	4,125.8	x	4

21.5	kg	47.3	lb

DROP HEIGHT

Calculation For Product Specific Gravities Exceeding 1.2
Product Specific Gravity (PSG) x Packing Group Multiplication Factor (MF)

PSG	x	MF		Packing Group: II	
				Required Drop Height	Actual Drop Height
1.2	x	0.00			
		0.00	Meter	0.0 Inches	0 Inches

Minimum Drop Heights For Product Specific Gravities not Exceeding 1.2

PG I	1.8 Meter	70.9 Inches	71.0 Inches
PG II	1.2 Meter	47.2 Inches	48.0 Inches
PG III	0.8 Meter	31.5 Inches	32.0 Inches

STACKING TEST MINIMUM LOAD CALCULATIONS

Number of Packages in a 3m High Stack (118.2 / Overall Pkg Height (OH) -1)

118.2 / Overall Height of one Pkg (OH) - 1

(118.2	/	OH)	-1	=	# 3m HS
118.2	/	14.00	-1	=	7.5

Stacking Test Load Calculation (Individual Package)

Authorized Pkg Gross Mass (APGM) x # of Pkg in a 3m High Stack (# 3m HS)

APGM	x	# 3m HS		
21.5	x	7.5		
		161.3 kg		355.6 lb