UNITED NATIONS / DOT PERFORMANCE CERTIFICATION

4G DESIGN QUALIFICATION

4 x 4 Liter Plastic 160 Gram Bottle Packaging with Two Case Sealing Mechanisms

TEST REPORT #: 21-CA20099

(un) 4G / Y27.1 / S / **
USA / +CC10685

**Insert the year packaging is manufactured

TESTING PERFORMED FOR:

PUREPAK TECHNOLOGY CORPORATION
324 South Bracken Lane Suite 3
Chandler, AZ 85224

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 14, 2021

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4 x 4 Liter Plastic 160 Gram Bottle Packaging with Two Case Sealing Mechanisms		
Option #	**Top Flaps**	**Bottom Flaps**
1	2” 3M #34508 Scotch Tape	2” 3M #34508 Scotch Tape
2	2” 3M #34508 Scotch Tape	Hot Melt Adhesive (Prepared by Client as for Transport) (Three Strips of Thermoset Adhesive – 1/2” x 4”)

SECTION I: CERTIFICATION

Design Qualification of the PurePak Technology Corporation
4 x 4 Liter Plastic 160 Gram Bottle Packaging with 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, ICAO/IATA Regulations 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	CFR REFERENCE	TEST LEVEL	TEST CONTENTS	TEST COMPLETED	TEST RESULTS
Drop	178.603	1.5 m	Methanol/Water Solution	June 11, 2021	PASS
Stacking (#1)	178.606	204.1 Kg – 24 Hours	Empty	June 11, 2021	PASS
Stacking (#2)	178.606	204.1 Kg – 24 Hours	Empty	June 14, 2021	PASS
Pressure	173.27	100 kPa - 30 Minutes	Water	June 11, 2021	PASS
Vibration	178.608	3.2 Hz – 1 Hour	Water	June 8, 2021	PASS
Cobb	178.516	30 Minutes	---	June 14, 2021	PASS

TEST REPORT NUMBER:	**21-CA20099**
UN MARKING: (CFR 49 – 178.503)	(un) 4G / Y27.1 / S / ** USA / +CC10685
PACKAGING IDENTIFICATION CODE:	4G - Fiberboard Box (178.516)
PERFORMANCE STANDARD:	Y (Packaging meets Packing Group II and III tests)
AUTHORIZED GROSS MASS:	27.1 Kg (59.7 Lbs.)
"S" DESIGNATION:	Denotes Inner Packagings
YEAR OF MANUFACTURE:	** Insert year the packaging is manufactured
STATE AUTHORIZING THE MARK:	USA
PACKAGING CERTIFICATION AGENCY:	(+CC) TEN-E Packaging Services, Inc. (Ontario, CA CAA #2006030021)
THIRD PARTY PACKAGING IDENTIFICATION:	+CC10685
PERIODIC RETEST DATE:	June 14, 2023

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.

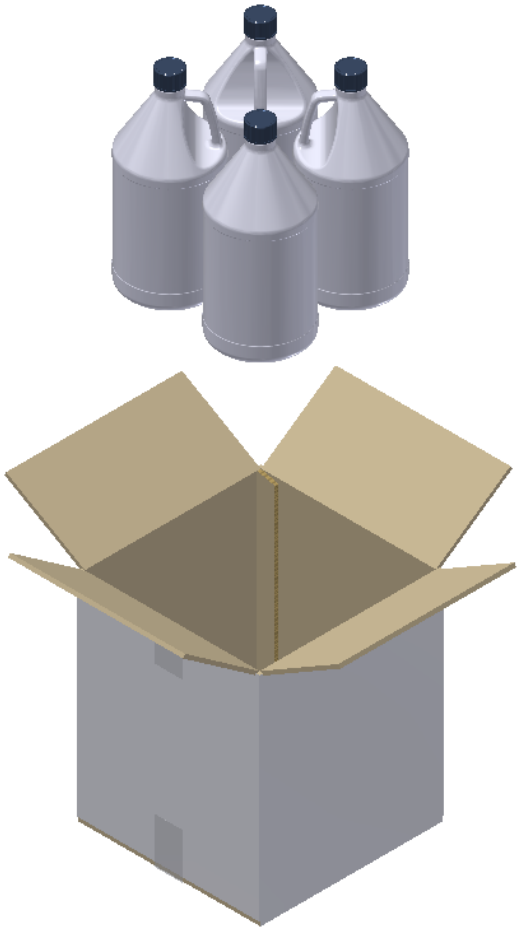
MANUFACTURER:
PurePak Technology Corporation
324 South Bracken Lane Suite 3
Chandler, AZ 85224

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

SECTIONS II & V: PACKAGING DESCRIPTIONS / COMPONENT DRAWINGS

4 x 4 Liter Plastic 160 Gram Bottle Packaging with Taped Top and Bottom Flaps

ASSEMBLY DRAWING

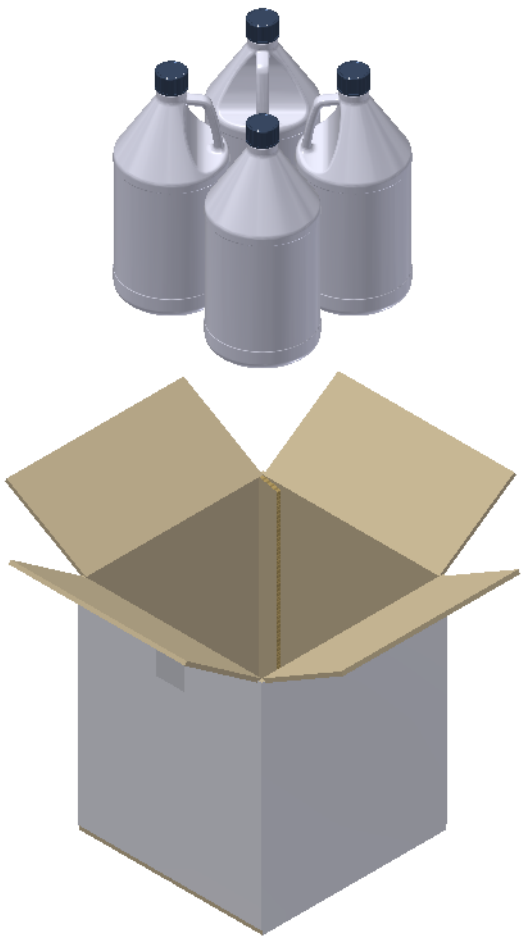


TEST LEVELS

Certification Type:	Design Qualification	
Packaging Code Designation:	4G	
Packing Group:	II	
Specific Gravity:	1.5	
Internal Pressure:	100 kPa	
TEST SAMPLE PREPARATION (Refer to Section IV)		
Overall Packaging Tare Weight:	1,430.0 Grams	
Fill Capacity (98% Maximum Capacity):		
Methanol/Water Solution	4,065.7 Grams	
Water	4,279.7 Grams	
Package Test Weight:		
Methanol/Water Solution	17.6 Kg	38.8 Lbs.
Water	18.5 Kg	40.7 Lbs.
Authorized Package Gross Mass:	27.1 Kg	59.7 Lbs.
CLOSING METHODS – INNER PACKAGING		
Application Torque:	50 In-Lbs	
Equipment:	Kaps All Electronic Torque Tester	
CLOSING METHODS – SHIPPER		
Top Flaps:		
Manufacturer: 3M, St. Paul, MN		
Type:	3M #34508 Pressure Sensitive Tape	
Width:	48 mm (2")	
Overlap:	2" Minimum	
Tape Pattern:	Center Seam	
Bottom Flaps:		
Manufacturer: 3M, St. Paul, MN		
Type:	3M #34508 Pressure Sensitive Tape	
Width:	48 mm (2")	
Overlap:	2" Minimum	
Tape Pattern:	Center Seam	

4 x 4 Liter Plastic 160 Gram Bottle Packaging with Taped Top and Hot Melt Glued Bottom Flaps

ASSEMBLY DRAWING



TEST LEVELS

Certification Type:	Design Qualification
Packaging Code Designation:	4G
Packing Group:	II
Specific Gravity:	1.5
Internal Pressure:	100 kPa

TEST SAMPLE PREPARATION
(Refer to Section IV)

Overall Packaging Tare Weight:	1,430.0 Grams	
Fill Capacity (98% Maximum Capacity):		
Methanol/Water Solution	4,065.7 Grams	
Water	4,279.7 Grams	
Package Test Weight:		
Methanol/Water Solution	17.6 Kg	38.8 Lbs.
Water	18.5 Kg	40.7 Lbs.
Authorized Package Gross Mass:	27.1 Kg	59.7 Lbs.

CLOSING METHODS – INNER PACKAGING

Application Torque:	50 In-Lbs
Equipment:	Kaps All Electronic Torque Tester

CLOSING METHODS – SHIPPER

Top Flaps:

Manufacturer: 3M, St. Paul, MN	
Type:	3M #34508 Pressure Sensitive 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)

COMPONENT INFORMATION

CLOSURE (QIM-317-4937)		DRAWING
Manufacturer: Berry Plastics, Evansville, IN		
Description:	38mm Threaded Closure	
Quantity:	4	
Material:	Polypropylene	
Tare Weight:	10.3 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:	Polyethylene Foam	
Tare Weight:	0.67 Grams	
Thickness:	0.057”	
Diameter:	1.381”	

PLASTIC BOTTLE		DRAWING
Manufacturer: PurePak Technology Corporation, Chandler, AZ		
Description:	4 Liter Plastic 160 Gram Bottle	
Quantity:	4	
Material:	High Density Polyethylene	
Method of Manufacture:	Blow Molded	
Tare Weight:	159.0 Grams	
Capacity:		
• **Rated**	4 Liter	
• **Overflow**	4,367.0 Grams (1.1 Gallons)	
Overall Dimensions:		
• **Height**	13.609”	
• **Diameter**	6.067”	
Thread Dimensions:		
• **T**	1.459”	
• **E**	1.371”	
Wall Thickness:		
• **Minimum**	0.028”	
Markings (QC Audit):	SPI “2” HDPE Recycling Symbol	

SHIPPER (P369-14406-1)		
Manufacturer: PCA, Phoenix, AZ		
Description:	Regular Slotted Container	
Material/Flute (Inner to Outer):	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:	741.0 Grams	
DIMENSIONS		
	Specification Dimensions (Inside)	**Measured Dimensions (Outside)**
• **Length**	12-5/16”	13-1/8”
• **Width**	12-5-16”	13”
• **Height**	13-7/8”	15-1/4”
Board Caliper (Nominal):	0.282”	
Manufacturer’s Joint:	Inside Glued, 1-3/8” Lap	
No Box Manufacturer’s Certification		
Markings (QC Audit):	None	

SECTION III: TEST PROCEDURES AND RESULTS

DROP TESTS Design #1

TEST INFORMATION		TEST CRITERIA
TEST CONTENTS:	Methanol/Water Solution (0.950 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.:	-18.7°C (-1.6°F)	
DROP HEIGHT:	1.5 Meters (60.0") (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 to impact location.	**PASS:** No leakage. Slight deformation to impact location.

*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	Design #2

TEST INFORMATION		TEST CRITERIA
TEST CONTENTS:	Methanol/Water Solution (0.950 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.:	-18.7°C (-1.6°F)	
DROP HEIGHT:	1.5 Meters (60.0”) (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 to impact location.	**PASS:** No leakage. Slight deformation to impact location.

*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	Design #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:	204.1 Kg (450.0 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	0"	**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	Design #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:	204.1 Kg (450.0 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	1/16"	**PASS**
21	0"	**PASS**
22	1/16"	**PASS**

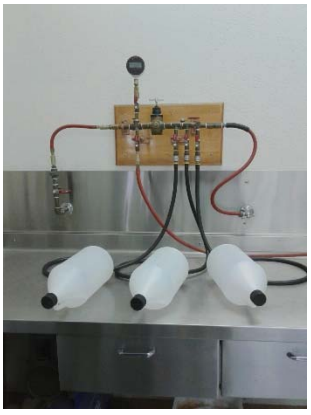
Comments/Observations: Following the 24-hour stack test, there was no damage likely to affect the performance of the packaging.

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

PRESSURE DIFFERENTIAL TEST

TEST INFORMATION		TEST CRITERIA
TEST CONTENTS:	Water	• Packaging for which retention of liquid is a basic function must be capable of withstanding the pressure requirements without leakage. (§173.27(c))
WATER TEMPERATURE:	(74.7°F)	
FILL CAPACITY:	Maximum Capacity	
CLOSURE APPLICATION:	Refer to Section II	
CONDITIONING:	Ambient	
TEST PRESSURE:	100 kPa	
TEST DURATION:	30 Minutes	
AREA OF PRESSURIZATION:	Through the Bottom	
TEST EQUIPMENT:	Regulated Water Source Digital Pressure Gauge	

HYDROSTATIC PRESSURE TEST SET-UP AND RESULTS



Sample #	Results
1	PASS
2	PASS
3	PASS

Comments/Observations

All three samples maintained the 100 kPa test pressure for 30 minutes without leakage.

VIBRATION TEST	Design #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:	3.2 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	Design #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:	3.2 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**	137.0 g/m²
	2	126.0 g/m²
	3	128.0 g/m²
	4	130.0 g/m²
	5	121.0 g/m²
	AVERAGE:	**128.4 g/m²**
	RESULT	**PASS**

REGULATORY AND INDUSTRY STANDARD REFERENCES

REGULATORY REFERENCES					
TEST	**49 CFR①**	**UN②**	**IMDG③**	**ICAO④**	**IATA⑤**
	October 2020 Edition	**21st Edition**	**2020 Edition**	**2021-2022 Edition**	**62nd Edition**
Drop:	178.603	6.1.5.3	6.1.5.3	6;4.3	6.3.3
Stacking:	178.606	6.1.5.6	6.1.5.6	6;4.6	6.3.6
Pressure:	173.27(c)	4.1.1.4.1	---	4;1.1.6	5.0.2.9
Vibration:	178.608	---	---	4;1.1.1 & 4;1.1.4	5.0.2.7
Cobb:	178.516(b)(1)	6.1.4.12.1	6.1.4.12.1	6;3.1.11.1	6.2.12.2

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)
④ Technical Instructions for the Safe Transport of Dangerous Good by Air (ICAO)
⑤ International Air Transport Association (IATA) Dangerous Goods Regulations

INDUSTRY STANDARD REFERENCES		
Drop:	ASTM⑥ D5276:	Standard Test Method for Drop Test of Loaded Containers by Free Fall
	ASTM⑥ D7790	Standard Test Method for the Preparation of Plastic Packagings Containing Liquids for United Nations (UN) Drop Testing
	ISO⑦ 2248:	Packaging – Complete, Filled Transport Packages – Vertical Impact Test by Dropping
Stacking:	ASTM⑥ D4577:	Standard Test Method for Compression Resistance of a Container Under Constant Load
	ISO⑦ 2234:	Packaging – Complete, Filled Transport Packages – Stacking Test using Static Load
Hydrostatic Pressure:	ASTM⑥ D7660:	Standard Guide for Conducting Internal Pressure Tests on United Nations (UN) Packagings
Vibration:	ASTM⑥ D999:	Standard Test Method for Vibration Testing of Shipping Containers
	ISO⑦ 2247:	Packaging – Complete, Filled Transport Packages – Vibration Test at Fixed Low Frequency
Cobb:	ISO⑦ 535:	Paper and Board – Determination of Water Absorption – Cobb Method

⑥ American Society for Testing and Materials (ASTM)
⑦ 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):	1,430.0	Grams	
Overflow Capacity (OFC):			Methanol/Water
Methanol/Water	4,148.6	Grams	SG: 0.950
Water	4,367.0	Grams	
Number of Inner Packagings (# IP):	4		
Packing Group	II		
Product Specific Gravity (PSG):	1.500		
Packing Group Multiplication Factor (MF):	1.00		
Overall Height of one Package (OH):	15.25	Inches	
Stack Test-# of Samples Tested Simultaneously:	1		

98% OF OVERFLOW

Overflow Capacity (OFC) x 98%

OFC	x	98%			
4,148.6	x	98% =	4,065.7	Grams	Methanol/Water
4,367.0	x	98% =	4,279.7	Grams	Water

PACKAGE TEST WEIGHTS

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

PTW	+	(98% OFC	x	# IP)	
1,430.0	+	4,065.7	x	4	Methanol/Water
1,430.0	+	4,279.7	x	4	Water

Methanol/Water:	17.6	Kg	38.8	Lbs.
Water:	18.5	Kg	40.7	Lbs.

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)
1,430.0	+	1.5	x	4,279.7	x	4

	27.1	Kg	59.7	Lbs.

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
1.5	x	1.00		Required Drop Height	Actual Drop Height
		1.50	Meter	59.1 Inches	60 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	/	15.25	-1	=	6.8

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
27.1	x	6.8

184.3 Kg 406.3 Lbs.