



Titan IBC
Test Report: 41117
April 4th, 2017

31A TEST SEQUENCE

One IBC design type was subjected to the tests in the order presented below:

- | | |
|---------------------|------------------------------|
| 1- Vibration Test | 5- Leakproofness Test |
| 2- Bottom Lift Test | 6- Hydrostatic Pressure Test |
| 3- Top Lift Test- | 7- Drop Test |
| 4- Stack | |

IBC SAMPLE PREPARATION

Titan IBC 550 Gallon Stainless Steel

	SAMPLE #1	
PERFORMANCE TESTS USED FOR:	<ul style="list-style-type: none"> • Vibration • Bottom Lift • Top Lift • Stack 	<ul style="list-style-type: none"> • Leakproofness • Hydrostatic Pressure • Drop
SAMPLE PREPARATION AND PACKAGE WEIGHT INFORMATION		
	CONTAINER USED FOR TESTING	
Filling Substance(1):	Water	
Package Tare Weight:	<ul style="list-style-type: none"> • 283 Kg (624 lbs.) 	
Overflow Capacity: (Net wt of water to overflow tank)	<ul style="list-style-type: none"> • 2205 Kg (4862 lbs.) 	
Net Fill Weight(2): (98% of Maximum Capacity)	<ul style="list-style-type: none"> • 2161 Kg (4765 lbs.) 	
Package Test Weight: (Tare + 98% (overflow Capacity))	<ul style="list-style-type: none"> • 2444 Kg (5389 lbs.) 	
Authorized Gross Mass (Tare + SG(98% (overflow capacity)))	<ul style="list-style-type: none"> • 4389 Kg (9677 lbs.)* 	
	* Gross Mass is based on 1.9 Specific Gravity Product	
Closing Instructions:	<ul style="list-style-type: none"> • Bolted Clamp Ring • 3” Metal Cap • 2” Bung Plug • Bottom Discharge Valve 	
Notes:	<ul style="list-style-type: none"> • (1) For Leakproofness Test; IBC was tested empty. • (2) For Hydrostatic Pressure Test; IBC was filled to overflow capacity. 	
Conditioning:	<ul style="list-style-type: none"> • Ambient 	



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TEST PROCEDURES AND RESULTS – REPETITIVE SHOCK VIBRATION TESTS	
SAMPLE PREPARATION/CONDITIONING	FREQUENCY:
<ul style="list-style-type: none"> Refer to Sample Preparation Page 	<ul style="list-style-type: none"> 3.9 Hz
TABLE DISPLACEMENT:	TEST DURATION:
<ul style="list-style-type: none"> 1” 	<ul style="list-style-type: none"> 1 Hour
VIBRATION TEST EQUIPMENT:	
<ul style="list-style-type: none"> Plymouth Industries Vibration Table with Reliance Electric Controller 	
REGULATORY REFERENCES:	INDUSTRY STANDARD REFERENCE:
<ul style="list-style-type: none"> 49CFR 178.819 	<ul style="list-style-type: none"> 49CFR 178.819

REPETITIVE SHOCK VIBRATION TEST RESULTS – SAMPLE #1		
VIBRATION SET-UP	RESULTS	COMMENTS/OBSERVATIONS
<p>Plymouth Industries LLC Vibration Table with Reliance controller Series-A Model #6MB20007 MD AC Drive</p> <p>Tank restrained horizontally free to bounce vertically</p>	<p>PASS</p> 	<ul style="list-style-type: none"> No leakage of contents No rupture of IBC

<p style="color: red; margin: 0;">CRITERIA FOR PASSING THE TEST</p> <p style="margin: 0;">An IBC passes the vibration test if there is no rupture or leakage.</p>
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TEST PROCEDURES AND RESULTS – BOTTOM LIFT TEST

SAMPLE PREPARATION/CONDITIONING	BOTTOM LIFT TEST EQUIPMENT:
<ul style="list-style-type: none"> Refer to Sample Preparation Page 	<ul style="list-style-type: none"> Fork Lift Truck/Dead Load Steel Weights

NUMBER OF LIFTS	
<ul style="list-style-type: none"> 4 (Two-Way Frame) 2 Lifts/ Directions of Entry 	<ul style="list-style-type: none"> Sides 1 & 2: 31.5” Sides 3 & 4: 36”

*PREPARATION FOR BOTTOM LIFT TEST:	
<ul style="list-style-type: none"> Package Test Weight: Dead Load Steel Weight Applied: Combined Gross Mass Lifted: 	2444 Kg (5389 lbs.) 3022 Kg (6708 lbs.) 5486 Kg (12097 lbs.)

REGULATORY REFERENCES:	INDUSTRY STANDARD REFERENCE:
<ul style="list-style-type: none"> 49CFR 178.811 	<ul style="list-style-type: none"> 49CFR 178.811

***DETERMINATION OF REQUIRED LOADING FOR BOTTOM LIFT TEST**

The IBC must be loaded to **1.25 times** its maximum permissible gross mass.

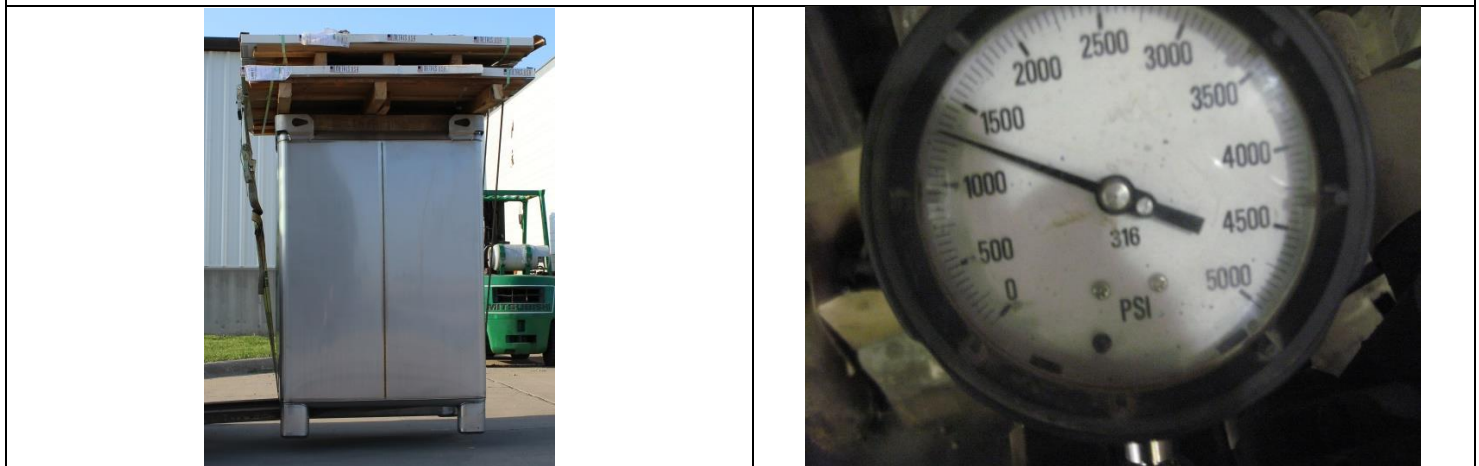
Minimum Load Determination Calculation

$4389 \text{ Kg (IBC Gross Mass)} \times 1.25 = 5486 \text{ Kg (12097 lbs.)}$

BOTTOM LIFT TEST RESULTS- SAMPLE # 1

Side #1	Side #2	Comments/Observations
Lift 1: Pass	Lift 3: Pass	Following the Bottom Lift Test there was no leakage or permanent IBC deformation.
Lift 2: Pass	Lift 4: Pass	

BOTTOM LIFT TEST SET-UPS



CRITERIA FOR PASSING THE TEST

There may be no permanent deformation, which renders the IBC unsafe for transportation, and no loss of contents.



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TEST PROCEDURES AND RESULTS – TOP LIFT TEST—

SAMPLE PREPARATION/CONDITIONING	TOP LIFT TEST EQUIPMENT:
<ul style="list-style-type: none"> • Refer to Sample Preparation Page 	<ul style="list-style-type: none"> • 20,000 lb. Overhead Crane Lift

*PREPARATION FOR TOP LIFT TEST:	
<ul style="list-style-type: none"> • IBC Package Test Weight: • <u>Dead Load Steel Weight Applied:</u> • Combined Gross Mass Lifted: 	2313 Kg (5100 lbs.) 6509 Kg (14352 lbs.) 8822 Kg (19449 lbs.)

REGULATORY REFERENCES:	INDUSTRY STANDARD REFERENCE:
<ul style="list-style-type: none"> • 49CFR 178.812 	<ul style="list-style-type: none"> • 49CFR 178.812

***DETERMINATION OF REQUIRED LOADING FOR TOP LIFT TEST**

Test Requirement: The IBC must be loaded to **2.0 times** its maximum permissible gross mass with the load being evenly distributed.

Minimum Load Determination Calculation



Package Gross Mass x 2.0 = Minimum Load Required
 4389 Kg (based on 1.9 SG) x 2.0 = **8778 Kg (19355 lbs.)**

TEST PROCEDURE:
<ul style="list-style-type: none"> • 5 Minutes Per Lift • Loaded with dead load of 14352 lbs • IBC must be lifted in the manner for which it is designed until clear of the floor.

TOP LIFT TEST RESULTS – SAMPLE #1

Lift Test	Test Results	COMMENTS/OBSERVATIONS
Vertical	Pass	The IBC was lifted using vertical lifting devices. NO leakage or permanent deformation or rupture was evident during the top lift test.

TOP LIFT TEST SET-UPS

 <p>1600 psi = 21,608 lbs</p>	
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CRITERIA FOR PASSING THE TEST

For all IBC design types designed to be lifted from the top, there may be no permanent deformation which renders the IBC unsafe for transportation. There can be no loss of contents.




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TEST PROCEDURES AND RESULTS –STACK TEST

SAMPLE PREPARATION/CONDITIONING	STACK DURATION:
<ul style="list-style-type: none"> Refer to Sample Preparation Page 	<ul style="list-style-type: none"> 5 Minutes

TEST LOAD APPLIED*:	STACK TEST EQUIPMENT:
<ul style="list-style-type: none"> 7927 Kg (17480 lbs.) 	<ul style="list-style-type: none"> Dead Load Weights on pallet frames

REGULATORY REFERENCES:	INDUSTRY STANDARD REFERENCE:
<ul style="list-style-type: none"> 49CFR 178.815 	<ul style="list-style-type: none"> 49CFR 178.815

STACK SET-UP	*DETERMINATION OF REQUIRED LOADING FOR STACK TEST	
	<p>The IBC must be loaded to 1.8 times the combined maximum permissible gross mass of the number of similar IBC's that may be stacked on top of the IBC during transportation.</p>	
	<ul style="list-style-type: none"> IBC Maximum Permissible Gross Mass: Number of Similar IBC's Stacked on Top of the IBC during transportation 	<p>4389 Kg (9677 lbs.)</p> <p>1</p>
	<p>Minimum Required Top Load: $4389 \text{ Kg} \times 1 \times 1.8 = 7900 \text{ Kg (17420 lbs.)}$</p>	

STACK TEST RESULTS- SAMPLE #1

MAXIMUM RECORDED TOP-TO-BOTTOM DEFLECTION AFTER 5 Minutes	RESULTS	COMMENTS
0.00"	Pass	Following the 5-minute stack test, there was no leakage of contents and no permanent IBC deformation.

CRITERIA FOR PASSING THE TEST

There may be no permanent deformation which renders the IBC unsafe for transportation and no loss of contents.



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TEST PROCEDURES AND RESULTS – LEAKPROOFNESS TESTS	
SAMPLE PREPARATION/CONDITIONING	TEST PRESSURE:
<ul style="list-style-type: none"> • Refer to Sample Preparation Page 	<ul style="list-style-type: none"> • 20 KPa (2.9 psi)

DURATION:	AREA OF IBC PRESSURIZATION:
<ul style="list-style-type: none"> • 10 Minutes 	<ul style="list-style-type: none"> • Top ¾” Ball Valve Fitted with ¼” Pressure Fitting.

LEAKPROOFNESS TEST EQUIPMENT:	
<ul style="list-style-type: none"> • Regulated Air Source • Calibrated Pressure Gauge 	

REGULATORY REFERENCES:	INDUSTRY STANDARD REFERENCE:
<ul style="list-style-type: none"> • 49CPR 178.813 	<ul style="list-style-type: none"> • 49CPR 178.813

LEAKPROOFNESS TEST RESULTS		
LEAKPROOFNESS SET-UP	RESULTS	COMMENTS/OBSERVATIONS
<p>Calibrated pressure gauge attached to a regulated air source entered through 2” top bung. Air pressure run up to 2.9 PSI. All joints coated with soap solution.</p>	<p>Pass</p>	<p>The IBC maintained the 20 kPa (2.9 PSI) test pressure for 10 minutes without leakage of air.</p>

<p style="color: red;">CRITERIA FOR PASSING THE TEST</p> <p>The IBC design types intended to contain liquids or intended to contain solids that are loaded or discharged under pressure, there may be no leakage of air from the intermediate bulk container.</p>
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TEST PROCEDURES AND RESULTS – HYDROSTATIC PRESSURE TESTS

SAMPLE PREPARATION/CONDITIONING	TEST PRESSURE:
<ul style="list-style-type: none"> Refer to Sample Preparation Page 	<ul style="list-style-type: none"> 65 kPa (9.4 psi) 200 kPa (29 psi)

DURATION:	AREA OF IBC PRESSURIZATION:
<ul style="list-style-type: none"> 10 Minutes for each test 	<ul style="list-style-type: none"> Top 3/4” Ball Valve Fitted with 1/4” Pressure Fitting

HYDROSTATIC PRESSURE TEST EQUIPMENT:
<ul style="list-style-type: none"> Regulated Air Source Calibrated Pressure Gauge

REGULATORY REFERENCES:	INDUSTRY STANDARD REFERENCE:
<ul style="list-style-type: none"> 49CFR 178.814 	<ul style="list-style-type: none"> 49CFR 178.814

HYDROSTATIC PRESSURE TEST RESULTS – SAMPLE #1

HYDROSTATIC PRESSURE TEST SET-UP	RESULTS	COMMENTS/OBSERVATIONS
<p>Calibrated Pressure Gauge attached to the regulated air source entered through 2” top bung. Air pressure run up to 9.4 PSIG. Held for 10 minutes. Air pressure then run up to 29 PSIG.</p>	Pass	<p>The IBC maintained the 20 kPa test pressure for 10 minutes without leakage of air.</p> <p>The IBC maintained the 29 PSIG with no leakage.</p>



CRITERIA FOR PASSING THE TEST

IBC subjected to 9.4 PSIG test pressure, there may be no of air or permanent deformation that would make the IBC unsafe for transportation.
 For IBC’s intended to contain liquids, subjected to the 29 PSIG test pressure, there may be no leakage.




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TEST PROCEDURES AND RESULTS – DROP TESTS	
SAMPLE PREPARATION/CONDITIONING	DROP HEIGHT:
<ul style="list-style-type: none"> Refer to Sample Preparation Page 	<ul style="list-style-type: none"> 1.9 m (74")

DROP HEIGHT CALCULATION:	AREA OF IBC PRESSURIZATION:
<ul style="list-style-type: none"> Packing Group II Materials 	<ul style="list-style-type: none"> Flat on Base

DROP EQUIPMENT:	
<ul style="list-style-type: none"> Quick Release Hook Mechanism 	

REGULATORY REFERENCES:	INDUSTRY STANDARD REFERENCE:
<ul style="list-style-type: none"> 49CFR 178.810 	<ul style="list-style-type: none"> 49CFR 178.810

DROP TEST RESULTS		
DROP TEST SET-UP	RESULTS	COMMENTS/OBSERVATIONS
<p>The IBC was rigged to the lifting hook of a 10 ton overhead crane with a quick release hook device. Lifted to 74 inches above the floor and dropped, landing on a steel plate imbedded in the floor.</p>	<p>Pass</p> 	<p>No leakage or rupture occurred as a result of the drop test. The IBC was in good condition following the drop test.</p>

CRITERIA FOR PASSING THE TEST
<p>The IBC design types intended to contain liquids or intended to contain solids that are loaded or discharged under pressure, there may be no leakage of air from the intermediate bulk container.</p>