ISTA 2 Series Partial-Simulation Performance Test Procedure

ISTA, Your Alliance in Transport Packaging, is the world leader in Performance Tests for Packaged-Products.

ISTA 2 Series tests are a combination of basic test elements from ISTA 1 Series (Non-Simulation Integrity Performance Testing) and advanced test elements from ISTA 3 Series (General Simulation Performance Testing).

- They challenge the capability of the package and product to withstand transport hazards, but
- They only simulate some actual transport hazards, and
- They do not necessarily comply with carrier packaging regulations.

When properly applied, ISTA procedures will provide tangible benefits of:

- Shortened packaged development time and confidence in product launch
- Protection of products and profits with reduced damage and product loss
- Economically balanced distribution costs
- Customer satisfaction and continued business.

There are three sections: Overview, Testing and Report

- Overview provides the general knowledge required before going into the testing laboratory and
- Testing presents the specific instructions to do the testing in the laboratory and
- Report indicates what data shall be recorded to submit a test report to ISTA.

Two systems of weights and measures are presented in ISTA test procedures. They are the English system (Inch-Pound) and the international system SI (Metric). Inch-Pound units are shown first with Metric units in brackets, except in some tables where they are shown separately.

- Either system may be used as the unit of measure (standard units), but
- The standard units chosen shall be used consistently throughout the procedure.
- Units are converted to two significant figures and
- Not exact equivalents.

VERY IMPORTANT:

The entire document shall be read and understood before proceeding with a test.

OVERVIEW OF PROCEDURE 2B

Preface

Test Procedure 2B is a partial simulation test for individual packaged-products.

- It can be used to evaluate the performance of a packaged-product.
- It can be used to compare relative performance of package and product design alternatives.
- It should be considered for the evaluation of packaged-products intended for international distribution.
- The package and product are considered together and not separately.
- Some conditions of transit, such as moisture, pressure or unusual handling, may not be covered.

Other ISTA Procedures may be appropriate for different conditions or to meet different objectives.
Refer to *Guidelines for Selecting and Using ISTA Procedures and Projects* for additional information.

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OVERVIEW OF PROCEDURE 2B

Scope

Test Procedure 2B covers testing of individual packaged-products weighing more than 150 lb (68 kg) when prepared for shipment.

EXCEPTION:
Individual packaged-products on a visible skid or pallet may be tested according to ISTA Non-Simulation Integrity Performance Test Procedure 1E or ISTA General Simulation Performance Test Procedure 3E.

Product Damage Tolerance and Degradation Allowance

The shipper shall determine the following prior to testing:

- what constitutes damage to the product and
- what damage tolerance level is allowable, if any, and
- the correct methodology to determine product condition at the conclusion of the test and
- the acceptable package condition at the conclusion of the compression test and
- the acceptable package condition at the conclusion of the test.

For additional information on this determination process refer to *Guidelines for Selecting and Using ISTA Procedures and Projects.*

NOTE:
When conducting the Compression Test:

- box failure that could result in a stacking failure is considered a failed test, if
- the packaged-product may be warehoused in a stack for more than 24 hours during distribution.
- box failure is allowed if the packaged-product provided is not stacked for more than 24 hours, and
- at the conclusion of all testing, the product is not damaged according the Product Damage Tolerance established and
- the package still meets the acceptable package condition, both of which are determined above.

For additional information on this determination process refer to *Guidelines for Selecting and Using ISTA Procedures and Projects*.

Samples

Samples should be the untested actual package and product, but if one or both are not available, the substitutes shall be as identical as possible to actual items.

Number of samples required:
One sample is required for the tests in this procedure.

Replicate Testing Recommended:
To permit an adequate determination of representative performance of the packaged-product, ISTA:

- Requires the procedure to be performed one time, but
- Recommends performing the procedure five or more times using new samples with each test.

NOTE:
Packages that have already been subjected to the rigors of transportation cannot be assumed to represent standard conditions. In order to insure testing in perfect condition, products and packages shipped to certified laboratories for testing must be:

- over-packaged for shipment to the laboratory or
- repackaged in new packaging at the laboratory.

OVERVIEW OF PROCEDURE 2B

The tests shall be performed on each test sample in the sequence indicated in the following table:

Sequence #	Test Category	Test Type	Test Level	For ISTA Certification
1	Atmospheric Preconditioning	Temperature and Humidity	Ambient	Required
2	Atmospheric Conditioning	Controlled Temperature and Humidity	Temperature and humidity chosen from chart	Required
3	Compression (Alternative methods allowed – select one test type)	Machine Apply and Release	Calculated Test Force x 1.4	Required
		Machine Apply and Hold	Calculated Test Force	
		Weight and Load Spreader	Calculated Test Load	
4	Vibration (Alternative methods allowed – select one test type)	Fixed Displacement	1 in (25mm) peak to peak at a freq. to be determined	Required
		Random	Overall G_{rms} level of 1.15	
5	Shock (Alternative methods allowed – select one test type)	Drop	6 in (150 mm)	Required
		Incline Impact (Conbur)	69 in (1.7 m) per second impact velocity	
		Horizontal Impact	69 in (1.7 m) per second velocity change	
6	Shock	Rotational Edge Drop	8 in (200 mm)	Required when not testing face 1
7	Vibration (Alternative methods allowed – select one test type)	Fixed Displacement	1 in (25mm) peak to peak at a freq. to be determined	Required
		Random	Overall G_{rms} level of 1.15	

EQUIPMENT REQUIRED FOR PROCEDURE 2B

Equipment Required Atmospheric Conditioning

Atmospheric Conditioning:

- Chamber and Control apparatus complying with the apparatus section of ASTM D 4332-01.
- Humidity recording apparatus complying with the apparatus section of ASTM D 4332-01.
- Temperature recording apparatus complying with the apparatus section of ASTM D 4332-01.

Equipment Required Compression

The following alternatives are acceptable for the equipment required for the Compression Test:

Type of Compression Test	Equipment	In compliance with the apparatus section of:
Apply and Release Test	Compression test system	ASTM D 642-00
Apply and Hold Test	Compression test system	ASTM D 642-00
Apply and Hold Test	Weight and load spreader	NA

Equipment Required Vibration

The following alternatives are acceptable for the equipment required for the Vibration Test:

Fixed Displacement Vibration Test:

- Vibration Test System with a 1 in (25 mm) fixed or controlled displacement complying with Method A1 or A2 of the apparatus section of ASTM D 999-01.
  Rotary or vertical linear motion of the platform is acceptable.
- Metal shim 0.06 in (1.5 mm), thick approximately 2 in (50 mm) wide and at a convenient length.
- Tachometer or suitable indicator for determining vibration frequency in cycles per second (Hz) or cycles per minute (CPM).
- Automatic timer or stopwatch.

Random Vibration Test:

- Random Vibration Test System complying with the apparatus section of ASTM D 4728-01.

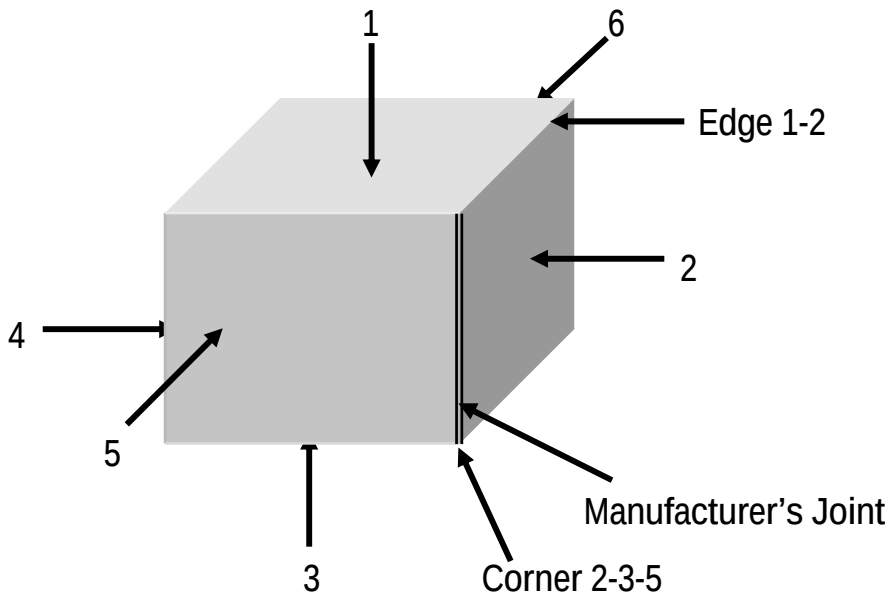
Equipment Required Shock

The following alternatives are acceptable for the equipment required for the Shock Test:

Type of Shock Test	Equipment	In compliance with the apparatus section of:
Drop Test	Free fall drop tester	ASTM D 5276-98
Vertical Shock Test	Shock test machine	ASTM D 5487-98
Incline Test	Incline impact tester (conbur)	ASTM D 880-92(02)
Horizontal Test	Horizontal impact test system	ASTM D 4003-98
Rotational Test	Rotational drop	ASTM D 6179-97

BEFORE YOU BEGIN PROCEDURE 2B

Prior to beginning the tests identify the faces, edges and corners according to the procedure below.

Step	Action
1	Place the packaged-product in its intended shipping position as determined by shipper. If the shipping position can be variable, place the packaged-product so that the primary shipping label location is on the top face.
2	Does the packaged-product have only six faces (2 sides, 2 ends, top and bottom)? • If Yes, then go to Step 5. • If No, continue to next Step.
3	Develop a method to identify each face, edge and corner and document with a diagram.
4	Go to the next Block.
5	Is the package a corrugated container? • If Yes, continue to next Step. • If No, then go to Step 8.
6	Does the package have a manufacturer's joint connecting a side and an end face? • If Yes, continue to next Step. • If No, then go to Step 8.
7	Turn the packaged-product so that you are looking directly at a face with the manufacturer's joint on the observer's right and go to Step 9.
8	Position one of the smallest width faces of the packaged-product directly in front of you.
9	Identify faces according to the diagram below. 
10	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 packaged-product.
11	Go to next Block

BEFORE YOU BEGIN PROCEDURE 2B

Packaged-Product Weight and Size Measurement

You shall know the packaged-product's:

- gross weight in pounds (kg), and
- outside dimensions of Length, Width and Height (L x W x H) in inches (mm or m)

Before You Begin Atmospheric Conditioning

Required Preconditioning:
The packaged-product should be stored prior to climate conditioning at laboratory ambient temperature and humidity for six (6) hours.

Required Conditioning (to be performed after the required preconditioning):
To permit an adequate determination of packaged-product performance at anticipated atmospheric limits and where it is known that the atmospheric extremes are detrimental to the product, ISTA:

- Requires the highest temperature and humidity limits of the product be used, but
- Recommends that both the highest and lowest atmospheric conditions be used.

Condition packaged-products according to one or more of the conditions listed in the table below. Remaining test requirements should be performed as soon as possible after removing the packaged-product from environmental conditioning apparatus. If more than one conditioning sequence is selected, a new and complete test should be performed following each sequence.

Anticipated Conditions	Time in Hours	Temperature in °C ±2°C (°F ±4°F)		Humidity in %
Frozen or winter ambient	72	-29°C	(-20°F)	uncontrolled RH
Refrigerated packages	72	5°C	(40°F)	85% RH ±5%
Controlled temperature	72	23°C	(72°F)	50% RH ±5%
Tropical (Wet) climate	72	38°C	(100°F)	85% RH ±5%
Tropical (Wet) then desert (Dry):	72 then 6	38°C then 60°C	(100°F) (140°F)	85% RH ±5% then 30% RH ±5%
Desert or summer ambient	72	50°C	(120°F)	uncontrolled RH
User Defined High Limit	72	Based upon known conditions		Known conditions
User Defined Low Limit	72	Based upon known conditions		Known conditions
User Defined Cycle	72	Based upon known conditions		Known conditions

Before You Begin Compression Testing

CAUTION:

When using weights and a load-spreader use extreme care to prevent injury.

Familiarity with the following formula is required:

Compression Test System	Test Force	English Units - Pounds Force (lbf)	Metric Units - Newtons(N)
Apply and Release Test Force	AR	$[W_t \times (S - 1) \times F] \times 1.4$	$[W_t \times (S- 1) \times F \times 9.8] \times 1.4$
Apply and Hold Test Force	AH	$W_t \times (S - 1) \times F$	$W_t \times (S- 1) \times F \times 9.8$
Weight & Load Spreader	**Test Load**	**English Units Pounds (lb)**	**Metric Units – Kilograms (kg)**
Dead Weight AH Test Load	DW-AH	$W_t \times (S - 1) \times F$	$W_t \times (S- 1) \times F$

Where			
AR	Test Load for Apply and Release	Pounds Force (lbf)	Newtons
AH	Test Load for Apply and Hold -Machine	Pounds Force (lbf)	Newtons
DW-AH	Test Load for Apply and Hold –Dead Weight	Pounds (lb)	Kilograms (kg)
W_t	Total weight of the packaged-product	Pounds	Kilograms
S	Total number of packaged-products in a stack		
1	Represents the bottom container in a Stack	1	1
F	Compensating factor	Typical range 3-6, ISTA recommends a minimum of 5 if the packaged-product may be warehoused in a stack for more than 24 hours during distribution, otherwise a minimum of 4 is recommended.	
1.4	Compensating Factor for time of compression	1.4	1.4
9.8	Metric conversion factor (Kilograms to Newtons)	NA	9.8

BEFORE YOU BEGIN PROCEDURE 2B

Before You Begin Compression Testing Continued

In you do not know the number of packaged-products that may be in a stack (S) determine the number to use by performing the appropriate action as indicated below:

Step	Action
1	Will the packaged-product be stacked for more than 24 hours during distribution? For example: in a warehouse or cross docking • If Yes, then go to the next Step. • If No, then go to Step 3.
2	Divide 270 inches (6.9 m) by the height of one packaged-product in inches (m). Round the value calculated up to a whole number and use the number just determined as "S" in the appropriate formula above. $S = 270 \text{ in.} \div H$ (Metric: $S = 6.9 \text{ m} \div H$)
3	Divide 90 inches (2.3 m) by the height of one packaged-product in inches (m). Round the value calculated up to a whole number and use the number just determined as "S" in the appropriate formula above. $S = 90 \text{ in.} \div H$ (Metric: $S = 2.3 \text{ m} \div H$)

Before You Begin Vibration Testing

CAUTION:

A restraining device or devices shall be used with the vibration test system to:

- Prevent the test specimen from moving off the platform and
- Maintain test orientation of the packaged-product, but
- The device or devices shall not restrict the vertical motion of the test specimen during the test.

Select Fixed Displacement Vibration or Random Vibration as a test method.

For Fixed Displacement Vibration:

Familiarity with the following formula is required to determine the test duration:

$$\text{Test Duration in Minutes} = \frac{\text{11,800 Vibratory Impacts}}{\text{Cycles Per Minute (CPM) or [Cycles Per Second (Hz) x 60]}}$$

NOTE:

The test duration for the Second Vibration Test Block may be different from that calculated for the First Vibration Test Block because the frequency required to bounce the packaged-product in the Second Vibration Test Block may be different.

Continued

BEFORE YOU BEGIN PROCEDURE 2B

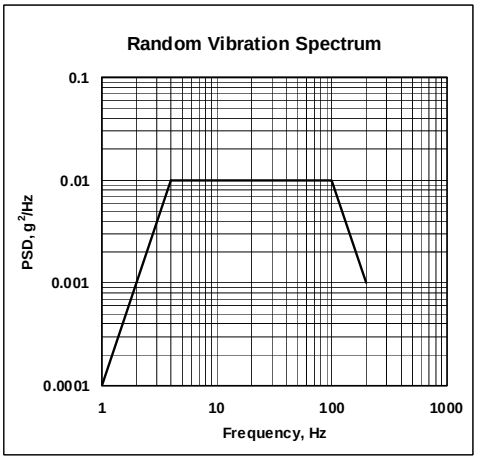
The example chart below shows Test Duration's calculated for several frequencies:

CPM	Hz	Test Duration in Minutes
150	2.5	79
180	3.0	66
210	3.5	57
240	4.0	50
270	4.5	44
300	5.0	40

For Random Vibration:

The following breakpoints shall be programmed into the vibration controller to produce the acceleration versus frequency profile (spectrum) below with an overall Grms level of 1.15

Frequency (Hz)	PSD Level, g^2/Hz
1.0	0.0001
4.0	0.01
100.0	0.01
200.0	0.001



Before You Begin Shock Testing

Select Drop, Incline or Horizontal as a test method.

For Drop Test Method the drop height shall be 6 in (150 mm) for Free Fall Drop, Shock Machine Equivalent Free Fall Drop, or Sling Drops.

For Incline Test Method the minimum impact velocity is 69 in per second (1.7 m per second).

For Horizontal Test Method the minimum velocity change is 69 in per second (1.7 m per second).

NOTE:
69 in per second is equal to 5.75 ft per second.

When using impact velocity or velocity change, if any velocity in a Test Sequence is below the required minimum level, that sequence event must be repeated until the test velocity meets the minimum.

EXCEPTION:
You do not have to conduct a shock test on face 1 (top) if:

- the packaged-product has a visible skid or pallet, or
- positioning or testing the packaged-product in this orientation would be unsafe.

CAUTION:
If the test item is large and:

- has a length equal to or greater than twice the width and
- has a center of gravity above the midpoint of the height.
- there is the possibility that it could tip over when testing one of the longest edges, therefore
- you may conduct the Rotational Edge Drop test on both of the shortest edges.

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TEST SEQUENCE FOR PROCEDURE 2B

The test blocks that follow contain tables that indicate the required steps for each test in the procedure.

Atmospheric Conditioning Test Block

TEMPERATURE AND HUMIDITY	
Step	Action
1	The packaged-product should be stored prior to climate conditioning at laboratory ambient temperature and humidity for six (6) hours.
2	Select an anticipated condition from the Before You Begin Block.
3	Check the conditioning apparatus to insure that the temperature and humidity are at the required levels.
4	Place the packaged-product in the conditioning.
5	At the completion of the required conditioning time period remove the packaged-product from the conditioning apparatus.
6	Record the ambient laboratory temperature and humidity when testing starts. Go to the next Test Block and perform the remaining test sequence as quickly as possible.

Compression Test Block

COMPRESSION		
Step	Action	
1	Testing is to be conducted using the test force or load from the Before You Begin Test Block and by performing the appropriate action as indicated in the table below:	
	IF the testing equipment to be used is a ...	THEN go to ...
	Compression Test System	Step 2.
	Weight and load spreader	Step 7.
2	Center the packaged-product with face 3 resting on the lower platen of the compression tester.	
3	Start the test machine and bring the platens together at the rate of one-half (0.5) inch (13 mm) per minute.	
4	Perform the appropriate action as indicated in the table below:	
	IF the compression test is a...	THEN ...
	Apply and Release Test	Increase the force until it reaches the AR Test Force value determined in the Before You Begin Compression Testing block. Then go to Step 5.
	Apply and Hold Test	Increase the force until it reaches the AH Test Force value determined in the Before You Begin Compression Testing block. Then go to Step 6.
5	Release the force. Go to Step 11.	
6	Maintain the force for one (1) hour, and then release the force. Go to Step 11.	
7	Place the packaged-product with face 3 resting on a smooth, flat, rigid surface.	
8	Place a rigid load spreader that is larger than the top face of the test specimen on the packaged-product.	
9	Add weight to the load spreader to bring the total weight up to the DW-AH Test Load determined in the Before You Begin Compression Testing block and maintain for one (1) hour.	
10	Remove the weight and load spreader.	
11	Is the product damaged or the package degraded according to the Product Damage Tolerance and Package degradation Allowance? • If Yes, then the packaged-product has failed the test, go to the Test Report. • If No, then go to the Vibration Test Block.	

TEST SEQUENCE FOR PROCEDURE 2B

<table>
<tr><th colspan="3">FIXED DISPLACEMENT</th></tr>
<tr><th>Step</th><th colspan="2">Action</th></tr>
<tr><td>1</td><td colspan="2">Determine if testing is going to be Fixed Displacement or Random Vibration.</td></tr>
<tr><td></td><td>IF Vibration testing is going to be ...</td><td>THEN go to ...</td></tr>
<tr><td></td><td>Fixed Displacement</td><td>Step 2.</td></tr>
<tr><td></td><td>Random</td><td>the Random Vibration Test Block.</td></tr>
<tr><td>2</td><td colspan="2">Put the packaged-product on the vibration table so that face 3 rests on the platform.</td></tr>
<tr><td>3</td><td colspan="2">Start the vibration system to vibrate at 1 in (25 mm) total displacement at the machine's lowest frequency.</td></tr>
<tr><td>4</td><td colspan="2">Maintain a fixed displacement at 1 in (25 mm) and slowly increase the frequency (speed) of the vibration table until the packaged-product begins to momentarily leave the surface of the platform.</td></tr>
<tr><td>5</td><td colspan="2">Hold the vibration frequency to that determined in Step 4.</td></tr>
<tr><td>6</td><td colspan="2">Can a metal shim be intermittently moved between the bottom of the longest dimension of the packaged-product and the surface of the platform?
• If Yes, hold that frequency and then continue to next Step.
• If No, then increase the frequency until the requirement of Step 6 is met and hold that vibration frequency.</td></tr>
<tr><td>7</td><td colspan="2">Determine the test duration in minutes using the formula indicated in the Before You Begin Block and the CPM or Hz frequency identified in Step 6.</td></tr>
<tr><td>8</td><td colspan="2">Begin vibration duration.</td></tr>
<tr><td>9</td><td colspan="2">Are you using a vertical linear motion on the vibration system?
• If Yes, then go to Step 13.
• If No, then continue with the next Step.</td></tr>
<tr><td>10</td><td colspan="2">Stop the vibration test half way through the vibration duration and perform the appropriate action as indicated in the table below:</td></tr>
<tr><td></td><td>IF a single 90º horizontal rotation is...</td><td>THEN perform a horizontal rotation of ...</td></tr>
<tr><td></td><td>Possible</td><td>90º as the specimen rests on the platform.</td></tr>
<tr><td></td><td>Not practical because of the size of the packaged-product or the stability of the packaged-product.</td><td>180º as the specimen rests on the platform.</td></tr>
<tr><td>11</td><td colspan="2">Start the vibration system and continue the vibration test at the frequency used in Step 8.</td></tr>
<tr><td>12</td><td colspan="2">Can a metal shim be intermittently moved between the bottom of the longest dimension of the packaged-product and the surface of the platform?
• If Yes, then continue to next Step.
• If No, then slowly increase the frequency until the requirement of Step 12 is met.</td></tr>
<tr><td>13</td><td colspan="2">Complete vibration duration.</td></tr>
<tr><td>14</td><td colspan="2">Inspection of the package-product for visible damage is allowed, provided inspection does not alter, in any way, the current condition of the package or the condition or position of the product(s).</td></tr>
<tr><td>15</td><td colspan="2">Vibration testing is now complete. Go to the Shock Test Block.</td></tr>
</table>

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TEST SEQUENCE FOR PROCEDURE 2B

Random Vibration Test Block

RANDOM	
Step	Action
1	Put the packaged-product on the vibration table so that face 3 rests on the platform.
2	Start the vibration machine to produce the random vibration spectrum indicated in the Before You Begin Block.
3	Stop the vibration testing at the end of 60 minutes.
4	Inspection of the packaged-product for visible damage is allowed, provided inspection does not alter, in any way, the current condition of the package or the condition or position of the product(s).
5	Vibration testing is now complete. Go to the Shock Test Block.

Shock Test Block

IMPACT TEST			
Step	Action		
1	Did you determine in the Before You Begin Shock Testing **not** to shock test face 1 (top)? • If Yes, then perform impacts on faces 2, 4, 5 and 6 only and then proceed to next test block. • If No, go to the next Step.		
2	Determine the drop height, impact velocity or velocity change using the Before You Begin Block.		
3	Test the packaged-product according to the level in Step 2. Follow the sequence in the table below.		
	Sequence #	**Orientation**	**Specific face**
	1	Face	one of the smallest faces
	2	Face	opposite small face
	3	Face	one of the medium faces
	4	Face	opposite medium face
	5	Face	one of the largest faces
	6	Face	opposite large face
4	Is the packaged-product shipped in a Containerized Shipment? • If Yes, Impact testing is now complete. Go to the Second Vibration Test Block. • If No, conduct a second sequence of tests by repeating Step 3 and then go to Step 5.		
5	Testing is now complete. Go to the Second Vibration Test Block.		

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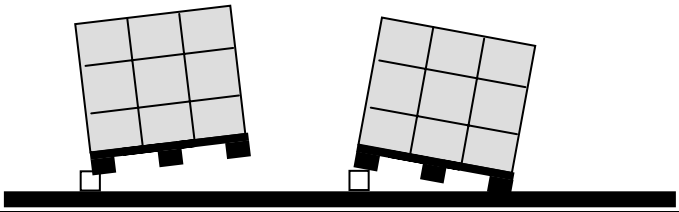
TEST SEQUENCE FOR PROCEDURE 2B

Shock Test Block

IMPACT AND ROTATIONAL EDGE DROP		
Step	Action	
1	Perform a rotational edge drop. Follow the sequence in the table below.	
	Sequence #	Action
	1	Place the unitized load onto a flat, rigid surface such as steel or concrete.
	2	Support one of the shortest face 3 edges with a timber or support 3.5 to 4.0 in (90 to 100 mm) in height and width.
	3	Lift the opposite face 3 edge to 8 in (200 mm) off the surface.
	4	Release the edge so that it falls freely onto the flat, rigid surface. 
2	Does the Unit Load have a length equal to or greater than twice the width and a center of gravity above the midpoint of the height? • If Yes, then go to Step 4. • If No, then continue with the next step.	
3	Repeat Step 1 on one of the face 3 edges radiating 90° from the edge just tested in Step 1 Sequence 4. Then go to Step 5.	
4	Repeat Step 1 on the face 3 edge opposite the edge just tested in Step 1 Sequence 4. Then go to the next Step.	
5	This rotational edge drop testing is now complete. Go to the Second Vibration Test Block.	

Second Vibration Test Block

FIXED DISPLACEMENT		
Step	Action	
1	Determine if testing is going to be Fixed Displacement or Random Vibration.	
	IF Vibration testing is going to be ...	THEN go to ...
	Fixed Displacement	Step 2.
	Random	the Random Vibration Test Block.
2	Put the packaged-product on the vibration table so that face 3 rests on the platform.	
3	Start the vibration system to vibrate at 1 in (25 mm) total displacement at the machine's lowest frequency.	
4	Maintain a fixed displacement at 1 in (25 mm) and slowly increase the frequency (speed) of the vibration table until the packaged-product begins to momentarily leave the surface of the platform.	
5	Hold the vibration frequency to that determined in Step 4.	

Continued

TEST SEQUENCE FOR PROCEDURE 2B

6	Can a metal shim be intermittently moved between the bottom of the longest dimension of the packaged-product and the surface of the platform? • If Yes, hold that frequency and then continue to next Step. • If No, then increase the frequency until the requirement of Step 6 is met and hold that vibration frequency.
7	Determine the test duration in minutes using the formula indicated in the Before You Begin Block and the CPM or Hz frequency identified in Step 6.
8	Begin vibration duration.
9	Are you using a vertical linear motion on the vibration system? • If Yes, then go to Step 13. • If No, then continue with the next Step.
10	Stop the vibration test half way through the vibration duration and perform the appropriate action as indicated in the table below:

IF a single 90º horizontal rotation is...	THEN perform a horizontal rotation of ...
Possible	90º as the specimen rests on the platform.
Not practical because of the size of the packaged-product or the stability of the packaged-product.	180º as the specimen rests on the platform.

11	Start the vibration system and continue the vibration test at the frequency used in Step 8.
12	Can a metal shim be intermittently moved between the bottom of the longest dimension of the packaged-product and the surface of the platform? • If Yes, then continue to next Step. • If No, then slowly increase the frequency until the requirement of Step 12 is met.
13	Complete vibration duration.
14	Inspection of the package-product for visible damage is allowed, provided inspection does not alter, in any way, the current condition of the package or the condition or position of the product(s).
15	All testing is now complete. Go to the Test Report Block.

Second Vibration Test Block (Random)

RANDOM	
Step	Action
1	Put the packaged-product on the vibration table so that face 3 rests on the platform.
2	Start the vibration machine to produce the random vibration spectrum indicated in the Before You Begin Block.
3	Stop the vibration testing at the end of 60 minutes.
4	Inspection of the packaged-product for visible damage is allowed, provided inspection does not alter, in any way, the current condition of the package or the condition or position of the product(s).
5	All testing is now complete. Go to the Test Report Block.

TEST REPORT FOR PROCEDURE 2B

The packaged-product has satisfactorily passed the test if, upon examination, it meets the Product Damage Tolerance and Package Degradation Allowance.

ISTA Certified Testing Laboratories:

- Should file a test report on all ISTA Test Procedures or Projects conducted.
- Shall file a test report on all ISTA Test Procedures or Projects conducted to obtain Transit Tested Package Certification or Acknowledgement.

For additional information, refer to *Guidelines for Selecting and Using ISTA Test Procedures and Projects.*

ISTA Transit Tested Program

The ISTA Transit Tested Certification Mark as shown is a:

- registered certification mark and
- can only be printed on certified packages and
- can only be used by license agreement and
- by a member of the International Safe Transit Association.

When a member prints this certification mark on a packaged-product, with their license number, they are showing their customer and the carrier that it has passed the requirements of ISTA preshipment testing.

In order to maintain its certified status and eligibility for identification with the TRANSIT TESTED Certification Mark, each packaged-product must be re-tested whenever a change is made in the:

- Product or
- Process or
- Package.

Changes in the product can include changes in:

- Design (configuration, components, accessories, etc.) or
- Size / weight (dimensions, shape, mass, center of gravity, etc.) or
- Materials (type, construction, fabrication, gage, etc.)

Changes in the process can include changes in:

- Manufacturing / assembly (vendor, location, automation, etc.) or
- Filling (equipment, speed, automation, etc.) or
- Distribution system (parcel delivery, LTL, intermodal, etc.)

Changes in the package can include changes in:

- Configuration (individual package or unit load, container type and sub-type, style, design, interior packaging, etc.) or
- Size / weight (dimensions, shape, mass, caliper, gage etc.) or
- Materials (corrugated, plastic, metal, glass, etc.) or
- Components (closures, labels, straps, pallets, skids, wraps, etc.)

If corrugated packaging is used, it is recommended that the basis weights of the constituent papers/paperboards be determined after testing and documented to provide the best indicator of equivalence or change.

As a quality control procedure, packaged-products should be re-tested frequently, for example, yearly.

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