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

ISTA 3 Series tests are advanced tests.

- They challenge the capability of the package and product to withstand transport hazards, but
- They use general simulation of 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 3H

Preface

Test Procedure 3H is a general simulation test for mechanically handled bulk loads.

- It is intended for bulk loads of the same product but it can also be considered for mixed loads.
- It can be used to evaluate the protective performance of bulk transport systems related to vibrations, shocks and other stresses normally encountered during handling and transportation.
- It can be used to evaluate interior dunnage.
- The test levels are based on general data and may not represent any specific distribution system.
- 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.

OVERVIEW OF PROCEDURE 3H

Scope

Test Procedure 3H covers testing of bulk loads made up of one transport container or system consisting of the same product that because of their size and/or weight must be handled by mechanical means, for example, automotive parts in reusable racks.

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 container 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*.

Samples

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

Number of samples required:
One sample (bulk load) is required for the tests in this procedure. Additional product maybe required depending on sequence followed.

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.

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

- Requires the procedure to be performed a minimum of one time, but
- Recommends performing the procedure five or more times.

OVERVIEW OF PROCEDURE 3H

Test Sequence

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	Optional
3	Shock	Horizontal Impact	2 mph (0.9 m/s) 15 ms half sine	Required
4	Shock	Rotational Flat Drop	4 inch (100 mm)	Required
5	Shock	Rotational Edge Drop	4 inch (100 mm)	Required
6	Shock	Rotational Flat Drop	4 inch (100 mm)	Required
7	Shock	Rotational Edge Drop	4 inch (100 mm)	Required
8	Vibration	Random	Overall G_{rms} level varies with Mode of Transport	Required
9	Shock	Horizontal Impact	4 and 6 mph (1.8 and 2.7 m/s) 300 ms Trapezoidal	Required for Rail Shipments Only
10	Shock	Horizontal Impact		Required for Rail Shipments Only
11	Shock	Rotational Flat Drop	4 inch (100 mm)	Required
12	Shock	Rotational Edge Drop	4 inch (100 mm)	Required
13	Shock	Rotational Flat Drop	4 inch (100 mm)	Required
14	Shock	Rotational Edge Drop	4 inch (100 mm)	Required
15	Compression	Machine Apply and Release	Calculated Test Force x 1.4	Optional
		Machine Apply and Hold	Calculated Test Force	
		Weight and load Spreader	Calculated Test Load	

EQUIPMENT REQUIRED FOR PROCEDURE 3H

Equipment Required Atmospheric Conditioning

Atmospheric Conditioning:

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

Optional Atmospheric Conditioning

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

Equipment Required Shock

Horizontal Impact Test:

- Horizontal Impact Test System complying with the apparatus section of ASTM D 4003-98.

Rotational Edge Drop Test:

- Rotational Edge Drop Test System complying with of the apparatus section of ASTM D 6179-97.

Equipment Required Vibration

Random Vibration Test:

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

Equipment Required Compression

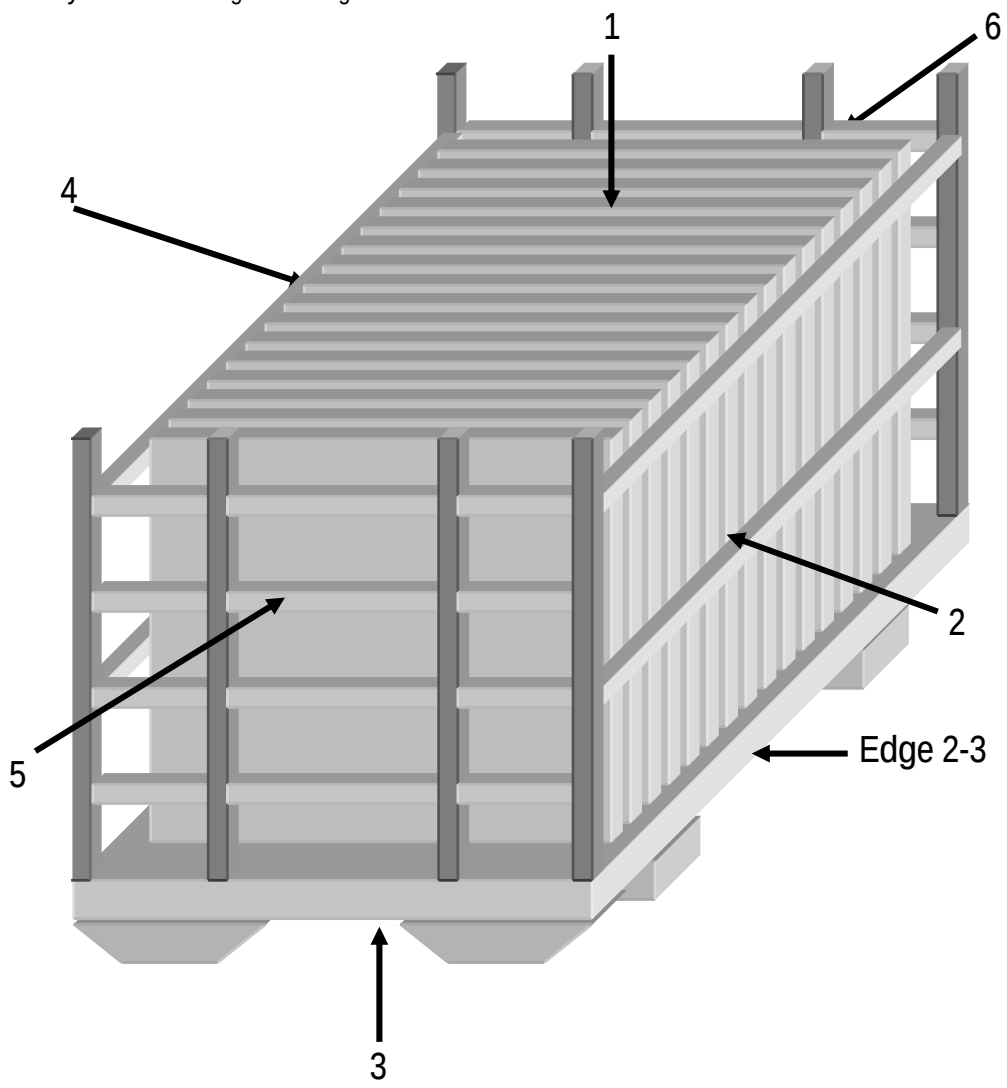
The following alternatives are acceptable for the equipment required for the Compression Test:

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

Identification of Faces and Edges

BEFORE YOU BEGIN PROCEDURE 3H

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

Step	Action
1	Place the bulk container in its normal shipping position.
2	Position one of the smallest width faces of the container directly in front of you.
3	**Identify faces** according to the diagram below. 
4	**Identify edges** using the numbers of the two faces forming that edge. Example: Edge 2-3 is the edge formed by face 2 and face 3 of the packaged-product.

BEFORE YOU BEGIN PROCEDURE 3H

Unit Load Weight and Size Measurement

You shall know the bulk containers:

- 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 twelve (12) hours.

Optional Conditioning Recommended: After the required precondition
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 shall be used, but
- Recommends that both the highest and lowest atmospheric conditions be used.

A separate 3H test sequence should be conducted following each atmospheric condition selected from the table below:

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)	85% 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 Shock Testing

The following determinations must be made:

- Determine if the mechanically handled bulk container and products will be shipped by rail.

For rail shipments there are two possible loading orientations (axes) for a bulk container. Possible loading orientations are based upon variables such as size of the bulk container and size of the transport trailer, container, or railcar that will be used. It also depends are on whether or not the shipper can insure that only one orientation is ever used.

- Determine if the bulk container could and would be loaded with the:
  - Longest faces parallel to the end walls of the vehicle only or
  - Shortest faces parallel to the end walls of the vehicle only or
  - Either the longest or shortest face parallel to the end walls of the vehicle

NOTE:
A general inspection of the bulk load may be performed after each impact test. However, do not change the condition of the bulk load or any of the products before completion of entire sequence of tests. If you stop testing at this point, it is a failure.

BEFORE YOU BEGIN PROCEDURE 3H

CAUTION:

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

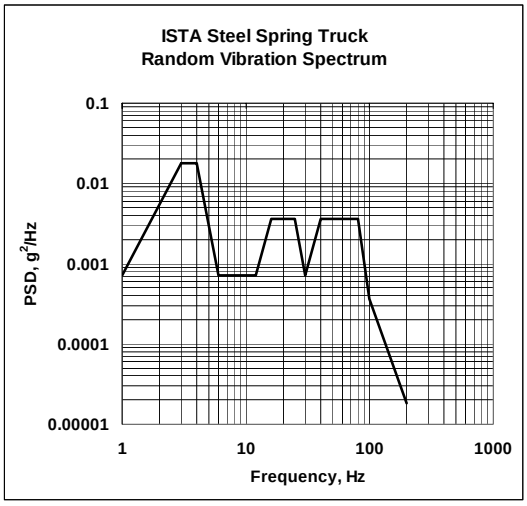
- Prevent the test specimen from moving off the platform and
- Maintain test orientation of the packaged-product or stack, but
- The restraining device or devices shall not restrict the vertical motion of the test specimen during the test.

The following determination must be made:
Determine if the mechanically handled bulk container and products will be shipped via railcar, steel spring truck trailers or air-ride truck trailers. If only one type of transport is possible, then use the random spectrum associated with that mode from the following spectra. If more than one mode is possible use the spectrum with the highest G_{rms} value from the potential modes.

For Steel Spring Truck Random Vibration:

The following breakpoints shall be programmed into the vibration controller to produce the acceleration versus frequency profile (spectrum) below with an overall G_{rms} level of 0.54

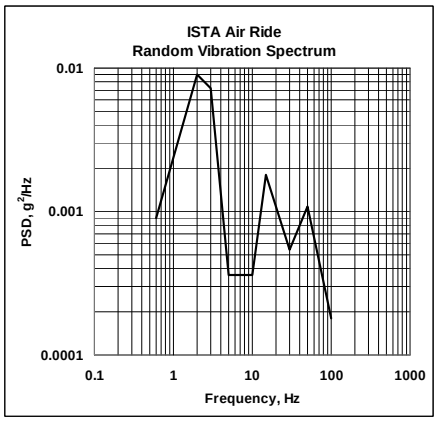
Frequency (Hz)	PSD Level, g^2/Hz
1.0	0.00072
3.0	0.018
4.0	0.018
6.0	0.00072
12.0	0.00072
16.0	0.0036
25.0	0.0036
30.0	0.00072
40.0	0.0036
80.0	0.0036
100.0	0.00036
200.0	0.000018



For Air-Ride Truck Random Vibration:

The following breakpoints shall be programmed into the vibration controller to produce the acceleration versus frequency profile (spectrum) below with an overall G_{rms} level of 0.28

Frequency (Hz)	PSD Level, g^2/Hz
0.6	0.0009
2.0	0.009
3.0	0.0072
5.0	0.00036
10.0	0.00036
15.0	0.0018
30.0	0.00054
50.0	0.00108
100.0	0.00018



Continued

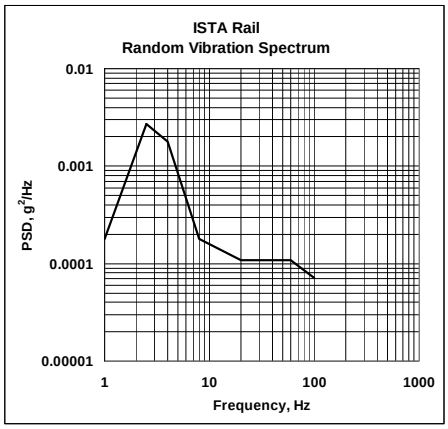
BEFORE YOU BEGIN PROCEDURE 3H

Before You Begin Vibration Testing Continued

For Railcar Random Vibration:

The following breakpoints shall be programmed into the vibration controller to produce the acceleration versus frequency profile (spectrum) below with an overall G_{rms} level of 0.13

Frequency (Hz)	PSD Level, g^2/Hz
1.0	0.00018
2.5	0.0027
4.0	0.0018
8.0	0.00018
20.0	0.000108
60.0	0.000108
100.0	0.000072



Estimate the anticipated total miles of the ground shipment the packaged-product may encounter during distribution to determine a test time from the table below:

Transport Miles	Transport Kilometers	Test Time (minutes)
Below 300	Below 500	45
300-600	500-1000	60
600-900	1000-1500	90
900-1200	1500-2000	120
1200-1500	2000-2500	180
Above 1500	Above 2400	240

BEFORE YOU BEGIN PROCEDURE 3H

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

NOTE:
Each of the formula has a numerical factor that compensates for other hazards that are not simulated in the test protocol.

Familiarity with the following formulas is required for unitized loads that will be warehoused for more than 48 hours prior to shipment:

Warehousing Compression (W)		English Units	Metric Units
Compression Test System	Test Force	Pounds Force (lbf)	Newtons (N)
Apply and Release (AR) Test Force	W-AR-C	W_t x (S –1) x 3 x 1.4	W_t x (S –1) x 3 x 9.8 x 1.4
Apply and Hold (AH) Test Force	W-AH-C	W_t x (S –1) x 3	W_t x (S –1) x 3 x 9.8
Weight and Load Spreader	Test Load	Pounds (lb)	Kilograms (kg)
Apply and Hold (AH) Dead Weight Test Load	W- AH - DW	W_t x (S –1) x 3	W_t x (S –1) x 3 x 9.8

Where	
W	Warehouse Compression
C	Compression Test System
DW	Dead Weight and Load Spreader
AR	Test Load for Apply and Release
AH	Test Load Apply and Hold
W_t	Gross weight of the unitized load
S	Total number of unitized loads in a warehouse stack
1.4	Compensating factor for time of compression
3	Compensating factor for a unitized load warehoused for more than 48 hours prior to shipment
9.8	Metric conversion factor

Continued

BEFORE YOU BEGIN PROCEDURE 3H

Familiarity with the following formulas is required:

Vehicle Compression (V)			
Unitized load height = 55 inches (1.4 m) or over		English Units	Metric Units
Compression Test System	Test Force	Pounds Force (lbf)	Newtons (N)
Apply and Release (AR) Test Force	V-AR-C	W_t x 1.5 x 1.4	W_t x 1.5 x 9.8
Apply and Hold (AH) Test Force	V-AH-C	W_t x 1.5	W_t x 1.5 x 9.8
Weight and Load Spreader	Test Load	Pounds (lb)	Kilograms (kg)
Apply and Hold (AH) Dead Weight Test Load	V- AH - DW	W_t x 1.5	W_t x 1.5 x 9.8
Unitized load height = less than 55 inches (1.4 m)		English Units	Metric Units
Compression Test System	Test Force	Pounds Force (lbf)	Newtons (N)
Apply and Release (AR) Test Force	V-AR-C	W_t x 3 x 1.4	W_t x 3 x 9.8 x 1.4
Apply and Hold (AH) Test Force	V-AH-C	W_t x 3	W_t x 3 x 9.8
Weight and Load Spreader	Test Load	Pounds (lb)	Kilograms (kg)
Apply and Hold (AH) Dead Weight Test Load	V- AH - DW	W_t x 3	W_t x 3 x 9.8

Where	
V	Vehicle Compression
C	Compression Test System
DW	Dead Weight and Load Spreader
AR	Test Load for Apply and Release
AH	Test Load Apply and Hold
W_t	Gross weight of the unitized load
S	Total number of unitized loads in a warehouse stack
1.4	Compensating factor for time of compression
1.5	Compensating factor for a unitized load with a of height 55 inches (1.4 m) or over
3	Compensating factor for a unitized load that is 55 inches (1.4 m) or less in height
9.8	Metric conversion factor

Continued

BEFORE YOU BEGIN PROCEDURE 3H

Use the following table to determine which Load Force and what calculated test load to use in the Compression Test Block.

<table>
<tr><th>Step</th><th colspan="3">Action</th></tr>
<tr><td>1</td><td colspan="3">Calculate a test force/load using the appropriate formula from the tables above as indicated in the table below:</td></tr>
<tr><td></td><td>Unitized Load with a height ...</td><td colspan="2">Use the Formula for ...</td></tr>
<tr><td></td><td>55 inches (1.4 m) or over.</td><td colspan="2">Vehicle Force/Load - load height 55 inches (1.4 m) or over.</td></tr>
<tr><td></td><td>Less than 55 inches (1.4 m).</td><td colspan="2">Vehicle Force/Load - load height less than 55 inches (1.4 m).</td></tr>
<tr><td>2</td><td colspan="3">Determine if the Unitized Load will be subjected to stacking in a warehouse for more than 48 hours before being shipped?
• If Yes, then continue with the next Step.
• If No, then Vehicle Force/Load determined in Step 1 will be used in the Compression Test Block.</td></tr>
<tr><td>3</td><td colspan="3">Calculate a test force/load using the formula Warehousing Force/Load formula from the table above.</td></tr>
<tr><td>4</td><td colspan="3">Determine the test force/load to be used by performing the appropriate action as indicated in the table below:</td></tr>
<tr><td></td><td colspan="2">IF the calculated Warehousing Force/Load from Step 3 is ...</td><td>Then use...</td></tr>
<tr><td></td><td colspan="2">Less than the calculated Vehicle Force/Load from Step 1</td><td>the Vehicle Force/Load calculated test load from Step 1 as the test load in the Compression Test Block.</td></tr>
<tr><td></td><td colspan="2">Equal to or greater than the calculated Vehicle Force/Load from Step 1</td><td>the Warehousing Force/Load calculated test load from Step 3 as the test load in the Compression Test Block.</td></tr>
</table>

TEST SEQUENCE FOR PROCEDURE 3H

Atmospheric Conditioning Test Block

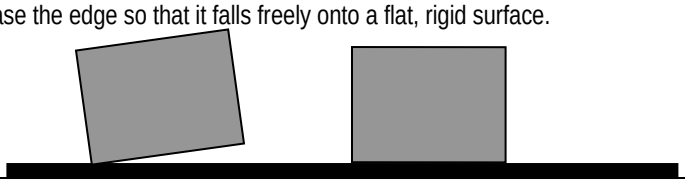
TEMPERATURE AND HUMIDITY	
Step	Action
1	The packaged-product should be stored at laboratory ambient temperature and humidity for twelve (12) hours.
2	Is optional conditioning going to be performed? • If Yes, go to Step 6. • If No, go to the next Step.
3	Record the ambient laboratory temperature and humidity when testing starts.
4	At the end of all testing record temperature and humidity.
5	Go to the next First Shock Test Block.
6	Select an anticipated condition from the Before You Begin Block.
7	Check the conditioning apparatus to insure that the temperature and humidity are at the required levels.
8	Place the packaged-product in the conditioning.
9	At the completion of the required conditioning time remove the packaged-product from the conditioning apparatus.
10	Record the ambient laboratory temperature and humidity when testing starts. Go to the First Shock Test Block and perform the remaining test sequence as quickly as possible.

Shock Test Block

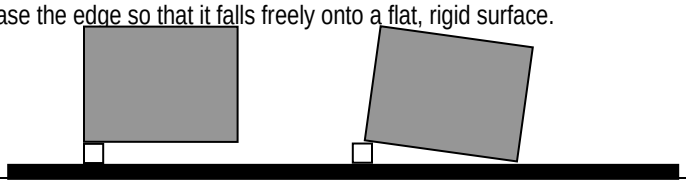
HORIZONTAL IMPACT						
Step	Action					
1	Conduct a horizontal Impact test on the bulk container according to the levels and sequence in the table below.					
	Sequence #	Pulse Shape	Duration in milliseconds	Velocity Change in mph (m/s)	Surface to be Shocked	Gap in inches (mm)
	1	Half Sine	15	2 (0.9)	2	0
	2	Half Sine	15	2 (0.9)	5	0
	3	Half Sine	15	2 (0.9)	4	0
	4	Half Sine	15	2 (0.9)	6	0
2	Testing is now complete. Go to the next Shock Test Block.					

TEST SEQUENCE FOR PROCEDURE 3H

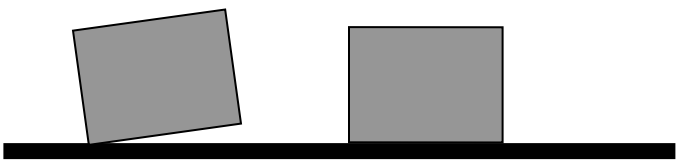
Shock Test Block

ROTATIONAL FLAT DROP		
Step	Action	
1	Perform a rotational flat drop.	
	Sequence #	Action
	1	Place the unitized load onto a flat, rigid surface such as steel or concrete.
	2	Lift edge 3-4 four inches (100 mm) off the surface.
	3	Release the edge so that it falls freely onto a flat, rigid surface. 
2	Testing is complete. Go to the next Shock Test Block.	

Shock Test Block

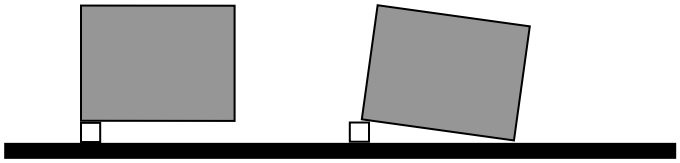
ROTATIONAL EDGE DROP		
Step	Action	
1	Perform a rotational edge drop. Follow the sequence in the table below.	
	Sequence #	Action
	1	Place the unitized load onto a flat, rigid surface such as steel or concrete.
	2	Support edge 2-3 with a timber or support 3.5 to 4.0 inches (90 to 100 mm) in height and width.
	3	Lift the edge 3-4 four inches (100 mm) off the surface.
	4	Release the edge so that it falls freely onto a flat, rigid surface. 
2	Testing is now complete. Go to the next Shock Block.	

Shock Test Block

ROTATIONAL FLAT DROP		
Step	Action	
1	Perform a rotational flat drop.	
	Sequence #	Action
	1	Place the unitized load onto a flat, rigid surface such as steel or concrete.
	2	Lift edge 3-6 four inches (100 mm) off the surface.
	3	Release the edge so that it falls freely onto a flat, rigid surface. 
2	Testing is complete. Go to the next Shock Test Block.	

TEST SEQUENCE FOR PROCEDURE 3H

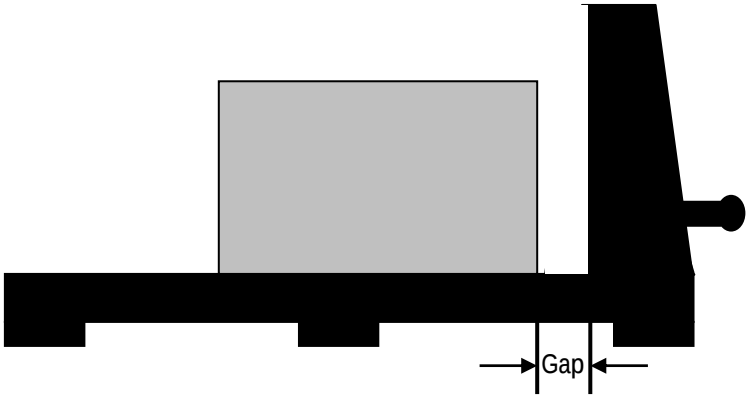
Shock Test Block

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 edge 3-5 with a timber or support 3.5 to 4.0 inches (90 to 100 mm) in height and width.
	3	Lift the edge 3-6 four inches (100 mm) off the surface.
	4	Release the edge so that it falls freely onto a flat, rigid surface. 
2	Testing is now complete. Go to the next Block.	

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 system to produce the random vibration spectrum determined in the Before You Begin Block.
3	Stop the vibration testing at the end of the test time indicated in the anticipated transport miles chart in the Before You Begin Block.
4	Vibration testing is now complete. Go to the Shock Test Block.

TEST SEQUENCE FOR PROCEDURE 3H

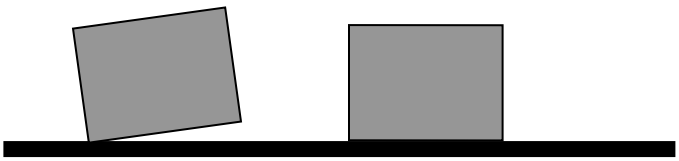
<table>
<tr><th colspan="2">HORIIZONTAL IMPACT</th></tr>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Will the mechanically handled bulk container with products be shipped via rail?
• If Yes, go to the next Step.
• If No, then go to next Shock Test Block.</td></tr>
<tr><td>2</td><td>Determine the possible loading orientations from the Before You Begin Block and perform the appropriate action as indicated in the table below:
<table>
<tr><th>Could and would the only loading orientation for the bulk container be with the ...</th><th>Then in the next Step use the column labeled ...</th></tr>
<tr><td>Longest faces (2 and 4) parallel to the end walls of the trailer, container or railcar.</td><td>Longest Face to be Shocked</td></tr>
<tr><td>Shortest faces (5 and 6) parallel to the end walls of the trailer, container or railcar.</td><td>Shortest Face to be Shocked</td></tr>
<tr><td>Longest or shortest faces parallel to the end walls of the trailer, container or railcar.</td><td>Longest Face to be Shocked and then the Shortest Face to Shocked
ALTERNATIVE:
If only the longest faces are tested now, then at the conclusion of the tests, a new bulk container or the one previously tested filled with product that has no damage shall be tested by performing the atmospheric conditioning and all shock tests in the same sequence.</td></tr>
</table></td></tr>
<tr><td>3</td><td>Conduct a horizontal test on the bulk container according to the levels and sequence in the table below.
<table>
<tr><th>Sequence #</th><th>Pulse Shape</th><th>Duration in milliseconds</th><th>Velocity Change in mph (m/s)</th><th>Longest Face to be Shocked</th><th>Shortest Face to be Shocked</th><th>Gap* in inches (mm)</th></tr>
<tr><td>1</td><td>Trapezoidal</td><td>300</td><td>4 (1.8)</td><td>2</td><td>5</td><td>0</td></tr>
<tr><td>2</td><td>Trapezoidal</td><td>300</td><td>4 (1.8)</td><td>4</td><td>6</td><td>0</td></tr>
<tr><td>3</td><td>Trapezoidal</td><td>300</td><td>6 (2.7)</td><td>4</td><td>5</td><td>4 (100)</td></tr>
<tr><td>4</td><td>Trapezoidal</td><td>300</td><td>6 (2.7)</td><td>2</td><td>6</td><td>4 (100)</td></tr>
</table>
*Gapped pulses are used to simulate void space that may be present in rail shipments. Gap is defined as the distance in inches between the test sample and the bulkhead sail prior to the actual shock. The test face of the container should be parallel to the bulkhead sail. See below:
 
</td></tr>
<tr><td>4</td><td>Testing is now complete. Go to the next Shock Test Block.</td></tr>
</table>

TEST SEQUENCE FOR PROCEDURE 3H

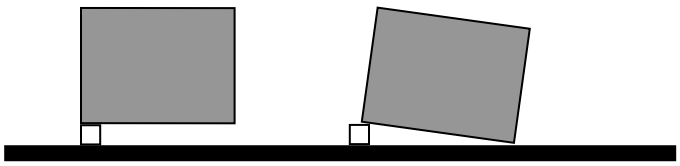
Shock Test Block

HORIZONTAL IMPACT						
Step	Action					
1	Conduct a horizontal test on the bulk container according to the levels and sequence in the table below.					
	Sequence #	Pulse Shape	Duration in milliseconds	Velocity Change in mph (m/s)	Surface to be Shocked	Gap in inches (mm)
	1	Half Sine	15	2 (0.9)	2	0
	2	Half Sine	15	2 (0.9)	5	0
	3	Half Sine	15	2 (0.9)	4	0
	4	Half Sine	15	2 (0.9)	6	0
2	Testing is now complete. Go to the next Shock Test Block.					

Shock Test Block

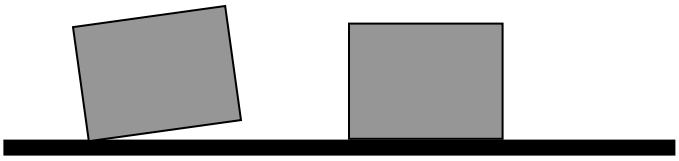
ROTATIONAL FLAT DROP		
Step	Action	
1	Perform a rotational flat drop.	
	Sequence #	Action
	1	Place the unitized load onto a flat, rigid surface such as steel or concrete.
	2	Lift edge 3-4 four inches (100 mm) off the surface.
	3	Release the edge so that it falls freely onto a flat, rigid surface. 
2	Testing is complete. Go to the next Shock Test Block.	

Shock Test Block

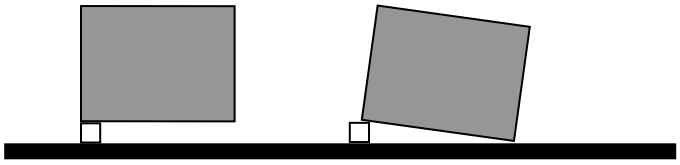
ROTATIONAL EDGE DROP		
Step	Action	
1	Perform a rotational edge drop. Follow the sequence in the table below.	
	Sequence #	Action
	1	Place the unitized load onto a flat, rigid surface such as steel or concrete.
	2	Support edge 2-3 with a timber or support 3.5 to 4.0 inches (90 to 100 mm) in height and width.
	3	Lift the edge 3-4 four inches (100 mm) off the surface.
	4	Release the edge so that it falls freely onto a flat, rigid surface. 
2	Testing is now complete. Go to the next Shock Test Block.	

TEST SEQUENCE FOP PROCEDURE 3H

Shock Test Block

ROTATIONAL FLAT DROP		
Step	Action	
1	Perform a rotational flat drop.	
	Sequence #	Action
	1	Place the unitized load onto a flat, rigid surface such as steel or concrete.
	2	Lift edge 3-6 four inches (100 mm) off the surface.
	3	Release the edge so that it falls freely onto a flat, rigid surface. 
2	Testing is complete. Go to the next Shock Test Block.	

Shock Test Block

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 edge 3-5 with a timber or support 3.5 to 4.0 inches (90 to 100 mm) in height and width.
	3	Lift the edge 3-6 four inches (100 mm) off the surface.
	4	Release the edge so that it falls freely onto a flat, rigid surface. 
2	Shock testing is now complete. Go to the Optional Compression Test Block or the Test Report Block.	

TEST SEQUENCE FOR PROCEDURE 3H

Optional Compression Test Block

COMPRESSION		
Step	Action	
1	Testing is to be conducted using the test load from the Before You Begin Compression Testing 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 Machine	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 Optional 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 Optional Compression Testing block. Then go to Step 6.
5	Release the force. Go to the Step 11.	
6	Maintain the force for one (1) hour, and then release the force. Go to the 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	Apply the necessary weight to bring the total of the load spreader and weights up to the test load determined in Step 1 and maintain for one (1) hour.	
10	Remove the weight and load spreader.	
11	Is the product damaged? • If Yes, then the packaged-product has failed the test, go the Test Report Block. • If No, then go to the Vibration Test Block.	

TEST REPORT FOR PROCEDURE 3H

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 Procedures and Projects*.

ISTA Transit Tested Program

The ISTA Transit Tested Certification Mark as shown is a:
- registered certification mark 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 include changes in:
- Design or
- Size or
- Materials.

Changes in the process include changes in:
- Manufacturing or
- Assembly or
- Filling.

Changes in the package include changes in:
- Configuration or
- Dimensions or
- Weight or
- Materials or
- Components.

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

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Order Information: Additional copies of this Test Procedure, the ISTA RESOURCE BOOK (in print or on CD ROM) may be ordered online at www.ista.org or by contacting ISTA at (+1) 517.333.3437.