ista | OVERVIEW

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Packaged-Products for Parcel Delivery System Shipment 70 kg (150 lb) or Less

3A 2018

ISTA 3 Series General Simulation Performance Test Procedure

VERSION DATE
Last TECHNICAL Change: MARCH 2018

Last EDITORIAL Change: MARCH 2018

For complete listing of Procedure Changes and Version Dates go to www.ista.org

ISTA, Distributing Confidence, Worldwide™

ISTA 3 Series tests are advanced tests and are designed to:

- Challenge the capability of the package and product to withstand transport hazards, **but**
- Utilize general simulation of actual transport hazards, **and**
- Do not necessarily comply with carrier packaging regulations.

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

- Product to market time reduction
- Confidence in product launch
- Reduction in damages and product loss
- Balanced distribution costs
- Customer satisfaction contributing to increased market share

There are three sections to this Procedure: Overview, Testing and Reporting

- **Overview** provides general knowledge required before testing **and**
- **Testing** presents the specific instructions to do laboratory testing **and**
- **Reporting** 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: SI (Metric) or English system (Inch-Pound). Metric units are shown first followed by the Inch-Pound units in parentheses; there are exceptions in some tables (when shown separately).

Familiarity with the following units and symbols used in this document is required:

For measuring	Metric units and symbols	English units and symbols
Weight	kilograms (kg) or grams (gm)	pounds (lb)
Distance	meters (m) or millimeters (mm)	feet (ft) or inches (in)
Volume	Cubic centimeters (cm^3)	Cubic inches (in^3)
Density	kilograms per cubic meter (kg/m^3)	pounds per cubic inch (lb/in^3)
Temperature	Centigrade (°C)	Fahrenheit (°F)
Absolute Pressure	Kilopascal (kPa)	Pounds per square inch (psi)

- 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.

NOTE:
In other ISTA Test Procedures 68 kilograms is used as the conversion from 150 pounds. In 3A, 70 kilograms and 150 pounds are used because it's a common dividing point found in parcel delivery systems from countries that use either metric (SI) or English (inch-pounds) units of measure.

VERY IMPORTANT:

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

OVERVIEW OF PROCEDURE 3A

Test Procedure 3A is a general simulation test for individual packaged-products shipped through a parcel delivery system. The test is appropriate for four different types of packages commonly distributed as individual packages, either by air or ground. The types include standard, small, flat and elongated packages. 3A includes an optional test combining Random Vibration Under Low Pressure (simulated high altitude). This tests the container's (whether primary package or transport package) ability to hold a seal or closure and the retention of contents (liquid, powder or gas) without leaking.

STANDARD packaged-products shall be defined as any packaged-product that does not meet any of the definitions below for a small, flat or elongated packaged-product. A Standard packaged-product may be packages such as traditional fiberboard cartons, as well as plastic, wooden or cylindrical containers. Examples shown below:



SMALL packaged-products shall be defined as any packaged-product where the:

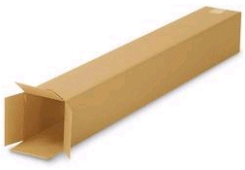
- volume is less than 13,000 cm^3 (800 in^3), **and**
- longest dimension is 350 mm (14 in) or less **and**
- weight is 4.5 kg (10 lb) or less.
- Example shown below:

FLAT packaged-products shall be defined as any packaged-product where the:

- shortest dimension is 200 mm (8 in) or less **and**
- next longest dimension is four (4) or more times larger than the shortest dimension, **and**
- volume is 13,000 cm^3 (800 in^3) or greater.
- Example shown below:

ELONGATED packaged-products shall be defined as any packaged-product where the:

- longest dimension is 900 mm (36 in) or greater **and**
- both of the package's other dimensions are each 20 percent or less of that of the longest dimension.
- Example shown below:




NOTE:
If a packaged-product is both Flat and Elongated, the package should be tested as Elongated.

OVERVIEW OF PROCEDURE 3A

Preface Continued

- Testing can be used to evaluate the protective performance of a packaged-product related to vibrations, shocks and other stresses normally encountered during handling and transportation in a parcel delivery system.
- 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.

NOTE:

Hazardous material packaging that passes this test procedure may not meet international, national or other regulatory requirements for the transport of hazardous materials. **This test is not a substitute** for United Nations and/or any other required test standards for the transport of hazardous materials, but should be used as an additional test in conjunction with them.

Scope

Test Procedure 3A covers testing of individual packaged-products weighing 70 kilograms (150 pounds) or less when prepared for shipment via a parcel delivery carrier.

Product Damage Tolerance and Package 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 test.

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

Samples

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

One (1) sample is required for this test procedure.
To permit an adequate determination of representative performance of the packaged-product, ISTA:

- Requires the procedure to be performed one time, **but**
- Due to the inherent variability of packaging as well as product characteristics, especially for those fragile items or items which contain liquids, it is recommended that Fragile & Liquid product types have two (2) or more packaged-product samples tested.

ISTA encourages performing the procedure five (5) or more times using new samples with each test to improve statistical significance for all package types. Refer to *Guidelines for Selecting and Using ISTA Procedures and Projects* for additional information on statistical sampling.

Definitions:

- **Fragile Products –** *I*tems that could easily break when dropped without having protective packaging; for example- glass, ceramics, porcelains, clay, electronics, etc. See below for ***Liquids*** definition.
- **Liquids -** or semi-liquids or solids that can become liquid at high temperatures (above 70 degrees Fahrenheit) which can leak from a primary vessel during shipment.

NOTE:

In order to ensure testing in perfect condition, products and packages shipped to an ISTA Certified Laboratory for testing shall be:

- Adequately over-packaged for shipment **or**
- Repackaged in new packaging at the laboratory.

NOTE:

It is important to thoroughly document the configuration, materials, and construction of the tested product and package. Significant variations in performance can sometimes be caused by seemingly insignificant differences. Photo documentation is strongly recommended to supplement detailed written descriptions.

OVERVIEW OF PROCEDURE 3A

Basis Weight

Basis Weights of Corrugated Board
When the outer package is a corrugated box, it is strongly recommended that the basis weights of the papers/paperboards used to make the box be determined and documented. If the nominal basis weights change, even if the board is rated for the same performance, a retest is appropriate.

Refer to *Guidelines for Selecting and Using ISTA Procedures and Projects* for additional information on documentation and basis weight determination.

Test Sequence STANDARD, ELONGATED & FLAT

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

3A – STANDARD, ELONGATED & FLAT Packaged-Product Test

Sequence Number	Test Category	Test Type	Test Level	For ISTA Certification
1	Atmospheric Preconditioning TEST BLOCK 1	Temperature and Humidity	Ambient	Required
2	Atmospheric Conditioning TEST BLOCK 1	Controlled Temperature and Humidity	Temperature and Humidity chosen from chart	Optional
3	Shock TEST BLOCK 3	Drop	9 Drops - height varies with packaged-product weight	Required
4	Vibration TEST BLOCKS 4 & 7 for Standard TEST BLOCKS 5 & 7 for Pails and Short Cylinders	Random With and Without Top Load	Overall G_{rms} levels of 0.53 and 0.46	Required
5	Vibration TEST BLOCKS 2 & 8	Random Vibration Under Low Pressure	Truck or Truck & Air dependent	Optional
6	Shock TEST BLOCK 9	Drop	8 Drops - height varies with packaged-product weight. Includes drop on hazard	Required
7	Shock TEST BLOCK 10	Rotational Edge Drop	200 mm (8 in)	Required for FLAT and ELONGATED
8	Shock TEST BLOCK 11	Full Rotational Flat Drop	Varies with packaged-product dimensions	Required for FLAT and ELONGATED
9	Shock TEST BLOCK 12	Concentrated Impact	Hazard Box dropped 400 mm (16 in)	Required for FLAT ONLY
10	Shock TEST BLOCK 13	Bridge Impact	Hazard Box dropped 400 mm (16 in)	Required for ELONGATED ONLY
11	Integrity TEST BLOCK 14	Leak Test	8 hours	Required for LIQUIDS ONLY

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OVERVIEW OF PROCEDURE 3A

3A – SMALL Packaged-Product Test

Test Sequence SMALL

Sequence Number	Test Category	Test Type	Test Level	For ISTA Certification
1	Atmospheric Preconditioning TEST BLOCK 1	Temperature and Humidity	Ambient	Required
2	Atmospheric Conditioning TEST BLOCK 1	Controlled Temperature and Humidity	Temperature and Humidity chosen from chart	Optional
3	Shock TEST BLOCK 3	Drop (not in a bag)	9 Drops - height varies with packaged-product weight	Required
4	Vibration TEST BLOCKS 6 & 7	Random With and Without Top Load	Overall G_{rms} level of 0.53 and 0.46	Required
5	Vibration TEST BLOCKS 2 & 8	Random Vibration Under Low Pressure	Truck or Truck & Air dependent	Optional
6	Shock TEST BLOCK 9	Drop (in a bag)	7 Drops – height varies with packaged-product weight	Required
O 7	Integrity TEST BLOCK 14	Leak Test	8 hours	Required for LIQUIDS ONLY

EQUIPMENT REQUIRED FOR PROCEDURE 3A

Equipment Required Atmospheric Conditioning

Atmospheric Conditioning:

- Humidity recorder complying with the apparatus section of ISO 2233 or ASTM D 4332.
- Temperature recorder complying with the apparatus section of ISO 2233 or ASTM D 4332.

Optional Atmospheric Conditioning

- Chamber and Control apparatus complying with the apparatus section of ISO 2233 or ASTM D 4332.

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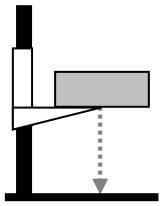
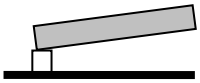
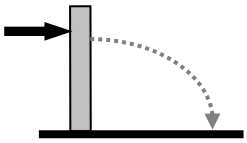
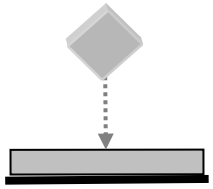
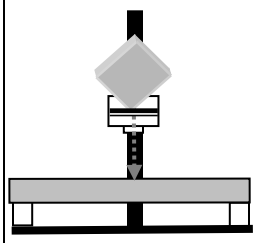
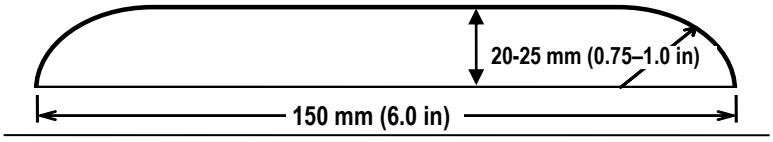
EQUIPMENT REQUIRED FOR PROCEDURE 3A

	All Protocols	Flat and Elongated	Flat	Elongated
Type of Shock Test	Drop Test	Rotational Edge Drop Test Full Rotational Test	Hazard Impact Test	Bridge Impact Test
Type of Equipment	Free-fall drop tester 	1) Support Block  2) 	Hand Drop with Hazard Box 	Free-fall Drop Tester with Hazard Box 
In compliance with the apparatus section of…	ISO 2248 **or** ASTM D 5276	ISO 2876 **or** ASTM D 6179		ASTM D 5265 with the exception of the Hazard Box (Impactor). See below
Additional Required Equipment	**Hazard block** See below.	**Support block** 90 to 100 mm (3.5 to 4.0 in) in height and width and at least 200 mm (8 in) longer than the shortest dimension of face 3.	**Hazard box** 300 x 300 x 300 mm (12 x 12 x 12 in) dense wooden box with a total weight of 4.1 kg (9 lb) The box shall have least one bottom edge covered by angle iron. The box should be filled with a sand bag and void fill to hold the bag in place.	
				Support blocks (2) 90 to 100 mm (3.5 to 4.0 in) in height and width and at least 200 mm (8 in) longer than the shortest dimension of face 3.
	Hazard block: The block shall be made of hardwood or metal. The height shall be 20 to 25 mm (0.75 to 1.0 in) and the width 150 mm (6.0 in). The length shall be at least 200 mm (8.0 in) longer than the second shortest package dimension of the length, width and height. The long top edges of the block shall be rounded to a radius equal to the height of the block ± 2.0 mm (0.0625 in).  			

EQUIPMENT REQUIRED FOR PROCEDURE 3A

Equipment Required Vibration

Random Vibration Test:

- Random Vibration Test System complying with the apparatus section of ISO 13355 or ASTM D 4728.
- A form of column stack fixturing
- Top-Load Apparatus
- Plastic bags
- Sand or other dense, flowable material

Optional Random Vibration Under Low Pressure:

- Low Pressure Chamber: complying with the apparatus section of ISO 2873 or ASTM D 6653; able to fit on the vibration table; able to draw down the internal absolute pressure to 60 kPa (8.7 psi) for the truck and air test, or 70 kPa (10 psi) for the truck-only test; and able to withstand the air and/or truck random vibration input.

Equipment Required Additional

3A - SMALL

- Two (2) large Consolidation Bags, approximately 1.0 x 0.7 m (39 x 27 in), made of canvas, polyolefin film/fabric, or similar strong flexible material, and with a zipper or other suitable closure at one end. The bags shall have sufficient capacity and strength to meet the requirements below, in the "Before You Begin Vibration Under Dynamic Load Testing" section, and in Test Block 6 (Vibration for Small).
  - One bag is the Top Load Bag, filled with 36 kg (80 lb) of sand, or other dense, flowable material, suitably packaged in smaller bags.
  - One bag is the Sample Bag, filled with the Test Specimen and dunnage packages, to simulate a typical pack.
- Three (3) over-night style envelopes, 1-#5 padded mailer and 1-#6 fiberboard mailer.
- Fiberboard containers as described in the table below are to be constructed of C-flute board with any of the following **minimum** values and construction:
  - Burst Test: 1380 kPa or 14 kg/cm^2 or 200 lb/in^2 **or**
  - ECT Value: 7.0 kN/m width or 40 lb/in width
  - RSC style boxes shall be used for any dunnage package 125 mm (5 in) or more in height **and**
  - Book-wrap or telescoping tray may be used for any dunnage package less than 125 mm (5 in) in height.
- Fill each envelope, mailer and corrugated container as indicated in the table below. Corrugated boxes and book wraps are filled until the desired weight is achieved.
  - It is allowable to substitute dunnage packages with Test Specimen packages or envelopes. The dunnage package that most closely represents the Test Specimen shall be substituted. Internal voids of dunnage packages should be filled in order to secure dunnage weight and eliminate concentrated load.

The following describes the numbers and sizes of each dunnage package:

Quantity	Package Type	Approximate Size LxWxH		Contents	Approximate Weight	
		Millimeters (mm)	Inches (in)		Kilograms (kg)	Pounds (lb)
3	Over-night envelope	318 x 242	12 ½ x 9 ½	25-sheets of paper		
1	#5 Padded mailer	268 x 407	10 ½ x 16	50-sheets of paper		
1	#6 Fiberboard mailer	318 x 483	12 ½ x 19	50-sheets of paper		
1	Fiberboard box **or** Book-wrap **or** Telescoping tray	200 x 125 x 50	8 x 5 x 2	Each corrugated package type and size shall be filled with foam, paper, sand, etc until the desired weight indicated in this table is achieved.	0.5	1.0
1		225 x 150 x 50	9 x 6 x 2		0.5	1.0
1		275 x 275 x 100	11 x 11 x 4		1.0	2.0
1		275 x 200 x 100	11 x 8 x 4		1.0	2.0
1		175 x 150 x 100	7 x 6 x 4		1.8	4.0
1		300 x 300 x 75	12 x 12 x 3		1.8	4.0
1	Fiberboard box	200 x 200 x 200	8 x 8 x 8		4.5	10.0
1		150 x 150 x 150	6 x 6 x 6		1.0	2.0
1		250 x 125 x 125	10 x 5 x 5		1.0	2.0