



Testing Packaged Products Weighing More Than 150 Lbs.

We recommend a series of pre-shipment tests to simulate the FedEx Express® Freight shipping environment. Follow our instructions or let us do the testing for you.



Overview of General Testing Procedures

FedEx package testing procedures are based on industry data, as well as international testing procedures and standards, to provide reliable packaging tests for our customers with an active FedEx account number. Here we outline the general simulation procedures for testing packaged products weighing more than 150 lbs.

We use impact, compression and vibration tests to evaluate the integrity and protective performance of the packaging. And because FedEx requires that any shipment weighing more than 150 lbs. contain a base that permits movement with a forklift or standard freight pallet jack, the strength of the shipping unit base is also tested for mechanical handling. Finally, the load integrity and stability in the shipping and handling environment are also tested. If at any point during the testing sequences damage is noted, further testing may not be completed.

Tests for Packaged Products Weighing More Than 150 Lbs. (Same as ISTA6-FedEx-B)

We follow a strict sequence of testing procedures, performing tests on each sample in the sequence indicated in the following table.

Product/Service	U.S. Shipments		International Shipments*
	Electronic, Powered, Medical Items	All Other Items	All Items
Side Impact Test**	X	X	X
Bottom Impact Test**	X	X	X
Tip Test	X	X	X
Raised Edge Impact Test	X	X	X
Raised Corner Impact Test	X	X	X
Compression Test	X	X	X
Rotary Vibration Test***		X	
Random Vibration Test***	X		X

* For international shipments, a second series of impact tests is performed following the vibration test.

** Computer-aided data acquisition and analysis are available upon request.

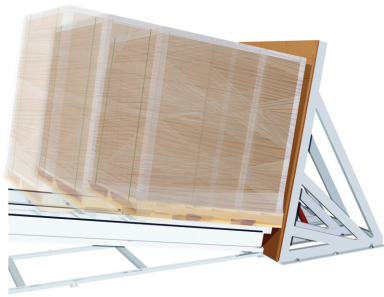
*** The random vibration system can test samples up to 200 lbs., and the rotary vibration table can test samples up to 1,250 lbs. Contact FedEx Packaging Services before sending test samples weighing more than 200 lbs.

The FedEx Packaging Services department reserves the right to alter the test sequence or equipment used to accommodate special package characteristics, commodities or testing equipment limitations to provide the most representative test possible. When package or content conditions are uncertain, or conditional on customer input, a "Post-Test Inspection Notice" will be sent with the report after the test is completed.

For packaged products weighing up to 150 lbs., please refer to the FedEx *Testing Packaged Products Weighing Up to 150 Lbs.* brochure.

Impact Tests

Side Impact Test



Side Impact Test Procedures

We perform the side impact test on an inclined impact tester equipped with a velocity meter. To perform this test, we use the following procedures.

1. Position the test sample on the center of the carriage with the face receiving the impact placed 2" beyond the front edge of the carriage.
2. Position the carriage at the distance necessary to achieve a minimum impact velocity of 5.75' per second at impact.
3. Subject each side of the test sample to a single impact.

Bottom Impact Test

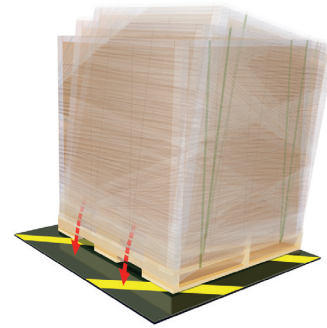


Bottom Impact Test Procedures

We perform the bottom impact test on a free-fall drop tester. We drop the test sample onto a flat, nonyielding surface. To perform this test, we use the following procedures.

1. Raise the base of the test sample 8" above the impact surface.
2. Release the test sample and allow it to fall freely.

Tip Test

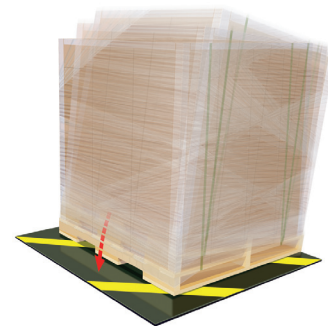


Tip Test Procedures

We perform the tip test with mechanical assistance on a flat, nonyielding surface. To perform this test, we use the following procedures.

1. Tip the test sample to create a 22 degree angle between the impact surface and the bottom of the test sample, then release it.
2. The test sample should return to its initial orientation.
3. Repeat the test on all four sides of the sample.

Raised Edge Impact Test



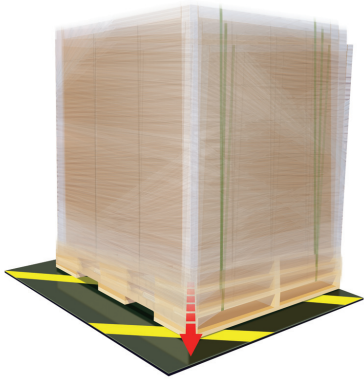
Raised Edge Impact Test Procedures

We perform the raised edge impact test with mechanical assistance on a flat, nonyielding surface. To perform this test, we use the following procedures.

1. With one bottom edge of the test sample supported by the impact surface, raise the opposite bottom edge 10" above the impact surface and release it.
2. The test sample should return to its initial orientation.
3. Repeat the test on all four bottom edges of the sample.

Raised Corner Impact Test Procedures

Raised Corner Impact Test



We perform the raised corner impact test with mechanical assistance on a flat, nonyielding surface. To perform this test, we use the following procedures.

1. With one bottom corner of the test sample supported by the impact surface, raise the diagonal bottom corner 10" above the impact surface and release it.
2. The test sample should return to its initial orientation.
3. Repeat the test on all four bottom corners of the sample.

Evaluation of Impact Tests

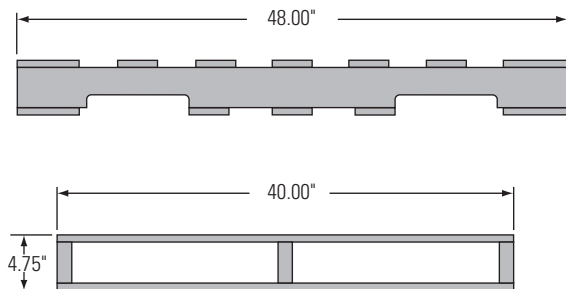
We inspect and report the condition of the test sample and its contents after the sequence of tests. If the contents appear undamaged, we proceed to compression and vibration testing.

Compression Test

Compression Tester With Top Pallet Hazard



Top-Load Pallet Hazard Device Side View and End View



Shipping Unit Construction	F-Factors Assurance Level		
	I	II	III
Corrugated, fiberboard or plastic container that may or may not have stress-bearing interior packaging using these materials, and where the product does not support any of the load.	10.0	7.0	5.0
Corrugated, fiberboard or plastic container that has stress-bearing interior packaging with rigid inserts such as wood.	6.0	4.5	3.0
Containers constructed of materials other than corrugate, fiberboard or plastic that are not temperature- or humidity-sensitive, or when the product supports the load directly.	4.0	3.0	2.0

The F-Factor is normally set to Assurance Level III and may vary as shown.

Compression Test Procedures

We perform the compression test on a dynamic compression tester equipped with a computerized control system. To perform this test, we use the following procedures.

1. Calculate the compression load using this formula:

$$\text{Compression Load (pounds)} = 0.007 \times (108 - H) \times L \times W \times F$$

- 0.007 = Average density of freight in pounds per cubic inch (12 lbs. per cubic foot).
 - 108 = Maximum height (inches) of package stack in transit.
 - H = Height of shipping unit (inches).
 - L = Length of shipping unit (inches).
 - W = Width of shipping unit (inches).
 - F = A factor to account for humidity, time and stacking pattern.
2. Set up the compression tester for the stop force, equivalent to the compression load calculated in step 1, the yield detection percentage (15 percent) and stop deflection (1").
 3. Center the packaged product on the lower platen of the compression tester.
 4. Place the top-load pallet hazard device on top of the test sample.
 5. Compress the test sample at a rate of 0.5" per minute.

6. Conclude the test when one of these conditions is first detected by the compression tester:

- The stop force.
- The yield detection percentage.
- The stop deflection.

Vibration Tests

Rotary Vibration Tester



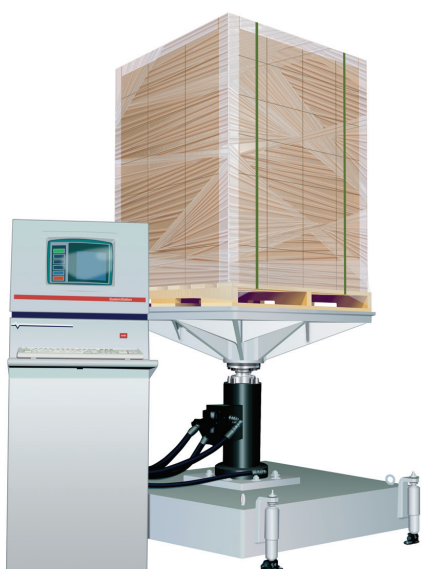
Rotary Vibration Test Procedures

We perform the rotary vibration test on a mechanical rotary vibration machine. The machine will vibrate at 1.0" total vertical displacement. Packages will be subjected to a total of 14,200 vibratory impacts. To perform this test, we use the following procedures.

1. Place the package on the vibration table. Fixtures may be used during testing to prevent the test sample from moving off the table, to prevent unsafe conditions or to maintain test orientation without restricting the vertical movement.
2. Start the vibration table at its lowest speed of frequency. Maintain the 1.0" fixed displacement and slowly increase the speed (frequency) of the vibration table until the test sample begins to momentarily leave the surface of the vibration table. Record the speed in cycles per minute (CPM) or frequency in cycles per second (Hz) and stop the vibration table.
3. Determine the vibration test duration in minutes based on the speed (CPM) or frequency (Hz) identified in step 2, using the following formula:
Test Duration (minutes) =
14,200 Vibratory Impacts ÷ Speed (CPM) or
[Frequency (Hz) x 60]

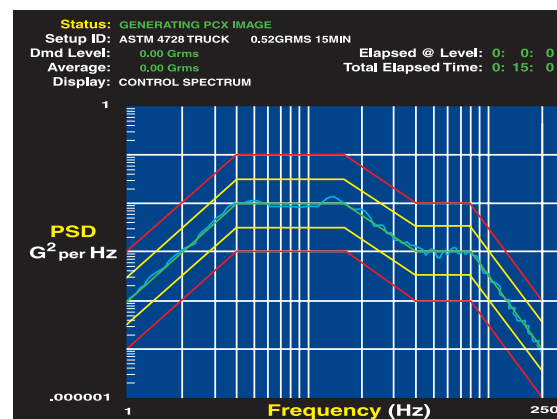
4. Start the vibration table to vibrate at the speed (CPM) or frequency (Hz) identified in step two. Stop the vibration test halfway through the vibration test duration determined in step three.
5. Rotate the test sample 90 degrees horizontally. Resume the vibration speed (CPM) or frequency (Hz) for the remaining vibration test duration. Flat and elongated packages will be vibrated on their smallest and largest surfaces respectively.

Random Vibration Tester

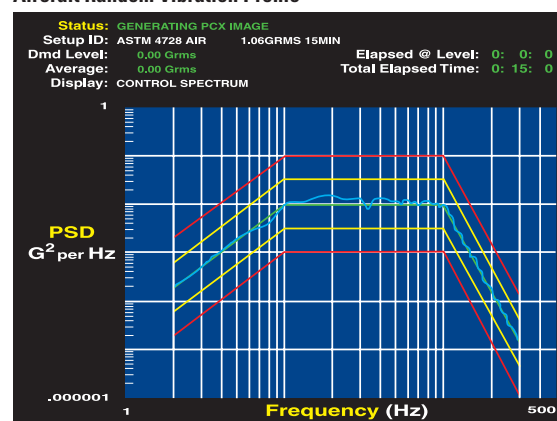


Truck and Aircraft Random Vibration Profiles

Truck Random Vibration Profile



Aircraft Random Vibration Profile



Random Vibration Test Procedures

We perform the random vibration test on a vertical electrohydraulic vibration machine equipped with computerized controls. To perform this test, we use the following procedures.

1. Program the vibration system to reproduce three consecutive sequences of random vibration profiles representing the FedEx distribution environment as indicated in the spectra profiles.
 - Truck vibration at 0.52 Grms (profile one).
 - Air vibration at 1.06 Grms (profile two).
 - Repeat truck vibration at 0.52 Grms (profile one).
2. Set the duration of each sequence at 15 minutes for U.S. shipments, 30 minutes for international shipments.
3. Place the test package on the vibration table. Fixtures may be used during testing to prevent the test sample from moving off the table, to prevent unsafe conditions or to maintain test orientation without restricting the vertical movement.
4. Load the appropriate automatic sequences of random vibration profiles and perform tests.

Testing Request Guidelines

Follow these steps for submitting your packaging for testing. An active FedEx account number is required. You and your FedEx account executive should expect testing results via email in approximately five to seven business days from when FedEx Packaging Services receives your packaging.

1. Obtain a *FedEx Packaging Test Application* at **fedex.com/packaging** or by contacting FedEx Packaging Services at packagingservices@fedex.com or 1.800.633.7019.
2. Complete and sign your application, referencing the name of your FedEx account executive on the form. See the FedEx Packaging Test Application for terms governing testing or design.
3. Prepare a sample shipment including all the packaging components and contents in the exact configuration you intend to send to your customer. Freight shipments must be on a pallet, skid, or other forkliftable and pallet-jackable base.
4. Include your completed application, with your palletized test sample labeled "Test This Shipment."
5. Send your shipment to the address indicated on the FedEx Packaging Test Application.

Shipping Instructions

To send your packaging sample for testing and analysis, we require that you load, stack and secure the freight shipment properly for testing.



Palletized freight shipment with completed application enclosed and "Test This Shipment" marking on the outside. Contact FedEx Packaging Services before sending test shipments weighing more than 200 lbs.

Complimentary Testing and Return Shipping

FedEx Packaging Services will test your shipment at no charge. You simply cover the costs of shipping your test shipment to FedEx Packaging Services.

Then, if you request, we will return freight shipments free of charge via FedEx 2Day® Freight service. Of course, you may request return of your packaging via other FedEx services at your own expense.

No Dangerous Goods Testing for FedEx Express Freight Shipments

FedEx Packaging Services does not test packaging containing dangerous goods or simulated dangerous goods. We can help you find laboratories to perform these specialized testing services.

Contacts and Resources

- *How to Pack* guidelines at **fedex.com/packaging**.
- FedEx Packaging Services lab, packagingservices@fedex.com or 1.800.633.7019.
- FedEx field packaging engineers, pkgfield@corp.ds.fedex.com. Or contact your FedEx account executive for a referral.

NOTICE: This packaging brochure is provided to FedEx customers to help reduce loss or damage due to improper packaging. It is NOT intended to be a comprehensive guide for packaging items we accept for transit. We make no warranties, expressed or implied, regarding this information. Proper packaging is the sole responsibility of the shipper. For more information and additional guidelines, go to the packaging tips page on **fedex.com/packaging**, email packagingservices@fedex.com or contact FedEx Packaging Services at 1.800.633.7019. Refer to the current FedEx Service Guide for terms, conditions and limitations applicable to FedEx® delivery services.

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