distributing confidence, worldwide.™

Guidelines for Selecting and Using ISTA® Test Procedures and Projects

These Guidelines are intended to provide the user of ISTA® Test Procedures and Projects and other ISTA documents with insight and information on the protocols, and what factors to consider in selection, use, and results interpretation.

PREFACE

The International Safe Transit Association (ISTA) is a global alliance of shippers, carriers, suppliers, testing laboratories, and educational and research institutions focused on the specific concerns of transport packaging. We help our members control costs, damage, and resources during the distribution of packaged-products by:

1. Creating and publishing laboratory preshipment Testing Procedures
2. Certifying Packaging Laboratories
3. Certifying Packaging Laboratory Professionals
4. Certifying packaged-products
5. Providing education, training, and support

GETTING STARTED

Following are four straightforward suggestions to improve protective packaging effectiveness and move toward the ISTA Vision.

1. Test the Package.
If you are not regularly using a laboratory package performance test, start now. Even a simple lab test used wisely is preferable to trial and error or total reliance on field experience.

2. Know Your Distribution Environment.
Find out more about how products move, including the variety of channels used to move your goods. If you are a supplier to shippers, help them explore this information. Use this knowledge to identify sources of distribution hazards and observe or measure them. Use this knowledge to reduce exposure to hazards of distribution, to help specify the performance of packages, and to select an appropriate laboratory test protocol.

3. Continuously Review and Improve.
Distribution hazards change, as do packaging materials. Review and retest even the most successful designs periodically. Rapid situation changes, such as new markets or distribution strategies, require immediate attention.

4. Stay Up to Date.
Take every opportunity to learn more about your products and distribution, learn about new technologies and procedures, and exchange knowledge with others who have similar concerns. Educational opportunities, such as ISTA's annual TransPack Forum™, are a good source of update. The ISTA® Certified Packaging Laboratory Professional (CPLP) program and the Responsible Packaging by Design program are excellent educational and recognition tools. Find out more from ISTA Headquarters or visit www.ista.org.

TESTING RATIONALE

The need for testing comes from the difficulty of predicting what will happen in large-scale operations, coupled with the requirement to make decisions prior to implementation. Essentially, every test comes from the need to make a decision. The test results provide the decision-maker with information to help maximize correct decisions. The decisions supported by preshipment performance testing of transport packaging are typically about how well the package will protect the contents during distribution.

Testing can also be a mandated activity as part of a package development, new product release, or engineering modification. This testing may be driven by organizational policy (corporate specification, for example), by regulatory application (testing of packaging for hazardous materials and dangerous goods, for example), or by customer requirements (purchase specification, for example). While these situations usually have little flexibility in test selection, they are still in the broad category of supporting decisions on packaging suitability.

Other types of tests are available but a detailed treatment is outside of the scope of this document. Material tests seek to characterize material performance for the use in design and development, such as cushion curves. Engineering tests seek to find a specific performance quantity, such as the deceleration experienced by a product in a package when dropped from some height, as in an instrumented drop test.

TESTING EXPECTATIONS AND OBJECTIVES

An important consideration in the selection of a test protocol is the objective of running the test, i.e., what information is needed to make the decision associated with this test. Broadly put, these specific objectives for each test might be categorized simply as *screening* or *prediction*.

A *screening* test would be used to avoid serious problems in shipment, usually damage to the product. This test objective category is a common one, and can adequately fill the needs of many users. Screening tests give the user confidence that the chances of serious transport damage have been minimized and have the following general characteristics:

- *simple and inexpensive to perform*
- *widely available and accepted*
- *utilize simple equipment*
- *accommodate known and suspected severe hazards*
- *are not necessarily a simulation of the hazards of distribution*
- *achieve damage resistance by challenging the strength and robustness of the product and package (a strong product/package resists damage).*

Prediction is a more difficult expectation for a preshipment performance test. While screening seeks to avoid serious problems, prediction must allow the user to foresee more subtle effects, such as minor damage, occasional damage, or non-functional problems with the package. In an ideal prediction situation, the tested samples and representative samples of distributed products would be indistinguishable. This is not always entirely possible given the technology mix available today, but it is approachable.

Prediction allows the user to fine-tune cost and environmental impact as well as helping to avoid damage of all types. By testing incrementally reduced cost and material-content designs, the near-optimum configuration could be achieved. Prediction might also allow the user to design a package for a repeatable low level of damage, consistent with an objective of lowest overall system cost. Without a good prediction test to represent field performance, this trade-off of package cost and damage cost would be largely guesswork.

TESTING AS A DEMONSTRATION OF MINIMUM USE OF PACKAGING

ISTA tests establish lower limits for packaged-product performance, but in general do not set upper limits. Therefore, used in their most straightforward pass/fail fashion, ISTA tests do little to detect over-packaging situations. However, with the addition of a "reduce to damage" or "pass with minimum margin" approach, ISTA testing can be used for the demonstration of minimum use of packaging. "Reduce to damage" means that if a packaged-product passes the test it must be redesigned with less packaging and tested again until an optimum level is reached. The “Reduce to Damage” approach is an essential component of an effort to make packaging more sustainable (as described in the Responsible Packaging by Design process guideline. "Pass with minimum margin" might involve subjecting a packaged-product which has passed the test to increased severity levels, determining when damage does occur, and then verifying that those levels are not overly excessive.

A "reduce to damage" or "pass with minimum margin" protocol employing screening tests should be used with extreme caution. Since screening tests may not well represent actual field exposure in either intensity or type, the tests cannot be readily shown or proven to have a good relationship to the field damage. Using screening tests can perhaps be effective if coupled with a program of field monitoring and feedback after package redesign. But the far better approach is to use tests which provide a good actual simulation of the distribution hazards.

LABORATORY TESTS AND DISTRIBUTION HAZARDS

Four basic categories of hazards exist in distribution: Shock, Vibration, Compression, and Atmospheric. Each hazard category is reflected in a laboratory test method, although not all ISTA® Procedures and Projects include all test methods. Within each test method are more specific tests that are used to simulate specific hazards in distribution. The following table summarizes these relationships.

Distribution Hazard	Major Test Category	Associated Test Types
Handling Drop and Impact	Shock	**Drop** • free-fall • rotational • on hazard • hazard impact **Incline Impact** **Horizontal Impact** **Vertical Impact**
Transportation Vibration	Vibration	**Fixed Displacement** • rotary • vertical linear **Variable Displacement** • vertical • horizontal **Random** • vertical • horizontal • multi-axis
Stacking Load	Compression	**Static (dead load)** **Machine** • apply & release • apply & hold **Dynamic Load Under Vibration**
Atmospheric Conditions	Atmospheric	**Temperature** • constant • cycle **Humidity** • constant • cycle **Pressure** • constant • cycle

Table 1 Hazard Categories and Test Types

It is important to note that test protocols can evaluate the effectiveness of packaging only for hazards represented in the protocol. For example, a test procedure that does not include a compression test is unable to evaluate a packaged product's resistance to warehouse stacking loads. By knowing the distribution environment in detail (see Getting Started, above), users can select an appropriate test to evaluate the performance of packaging in light of all known hazards. Without this selection process, real hazards may not be addressed as part of a package's protective ability, and significant damage could result in spite of a test being passed.