WHAT'S NEW IN PACKAGING TEST METHODS & STANDARDS

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INTRODUCTION

• What “Test Methods & Standards” are we talking about?
  ▪ Testing related to *complete, finished* packaged-products, to assess their suitability for shipping/distribution

  • ISTA
  • ASTM
  • ISO
  • NMFTA

www.ista.org
INTERNATIONAL SAFE TRANSIT ASSN.

- A non-profit technical trade association, focused entirely on issues related to transport packaging and distribution
- 775 member companies in 32 countries
- “Provide economic and environmental benefits by helping to control product damage and over-packaging during the physical distribution of products”

www.ista.org
International Safe Transit Assn.

- By creating, maintaining, providing, and advocating...
  - Performance testing procedures
    - Currently 30 different test procedures
  - Certification
    - Labs
    - People
    - Packages
  - Education and training
  - Member support

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WHAT’S NEW?

- Released May 2009
  - Covers
    - Standard packages weighing 200 lbs. or less
    - Standard packages weighing over 200 lbs.
    - Cylindrical packages
    - Palletized or skidded loads
    - Flat and elongated packages
WHAT’S NEW?

- New aspects
  - Tip/tipover tests

Tip/Tipover Tests

22° angle
### WHAT’S NEW?

- New aspects
  - Concentrated corner impacts

<table>
<thead>
<tr>
<th></th>
<th>Concentrated Corner Impact Tests</th>
<th>Free-fall drop tester with corner hazard box</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternate tests</td>
<td>Concentrated Corner Impact Tests (Alternate)</td>
<td>Pendulum with corner hazard box</td>
</tr>
</tbody>
</table>

[www.ista.org](http://www.ista.org)
WHAT’S NEW?

• New aspects
  ▪ Concentrated corner impacts
INTERNATIONAL SAFE TRANSIT ASSN.

WHAT’S NEW?

- New aspects
  - Fork lift handling tests

Flat push and rotate

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NEW ASPECTS

- Fork lift handling tests

- Elevated push/pull

- Elevated rotate

www.ista.org
WHAT’S NEW?

- New aspects
  - Fork lift handling tests
WHAT'S NEW?

• New aspects

VIDEO

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WHAT’S ELSE IS NEW?

- Released February 8, 2010
  - Developed in cooperation with Sam’s Club
  - Covers
    - Non-perishables, shipped palletized
    - Non-perishables, shipped floor-loaded
    - Perishables

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WHAT’S ELSE IS NEW?

• Very thorough development process
  ▪ Observation and measurement of the Sam’s Club distribution environment
  ▪ Analysis of the information and data
  ▪ Creation of draft test methods
  ▪ Test validation
  ▪ Writing of ISTA “Project” protocol
The club store distribution system has a number of unique aspects. In such systems, packaged-products are typically shipped from a manufacturer or producer anywhere in the world, through one or more ports, terminals, and Distribution Centers (DCs), and then to the clubs or stores. Different modes of transportation and vehicles are used. Various types of handling may occur in the DCs, including manual, fork lift, clamp truck, slipsheet, etc. The original shipment configuration may be altered at a DC to fit the needs of the system and the requirements of the stores. Final shipment to the club or store, regardless of the original configuration, is typically on a pallet.
Observation

- Visited 6 distribution centers (DCs)
  - Two “dry” DCs in the U.S.
  - Two “perishables” DCs in the U.S.
  - Two import DCs (U.S., 2 visits ea.)
- Visited 2 overseas suppliers and ports
  - India, China
- Visited a number of Sam’s Club stores
Observation

- Over 2200 photographs
  - Facilities and equipment
  - Operations
  - Products and packages
- Almost 20 hours of video
  - Above, plus lift trucks
- Over 50 pages of notes and documentation
Measurement

- Instrumented 3 containers and recorded shipments to U.S. DCs
  - India, China
- Instrumented a domestic truck-trailer
- Instrumented a DC fork lift
WHAT’S ELSE IS NEW?

Information Analysis and Protocol Drafts

- Meetings, meetings, meetings
  - In-person
  - Telephone
  - Web

- Went through 8 drafts of test protocols
WHAT’S ELSE IS NEW?

Validation Testing

- Tested
  - Non-perishable grocery items (several)
  - Frozen foods (several)
  - Housewares (several)
  - Furniture (several)
  - Small appliance
  - Personal care (shampoo)
  - Laundry products (detergent, fabric softener)
New aspects

- Clamp testing
  - Forces based on test item weight and dimensions
  - Platens offset 3 inches

www.ista.org
• New aspects
  ▪ Compression testing
    ▪ Pallet on top
    ▪ Forces take layer and case weights into account
New aspects
- Vibration profiles linked to data
WHAT’S ELSE IS NEW?

- New aspects
  - 3-package stacked vibration
INTERNATIONAL SAFE TRANSIT ASSN.

ANYTHING ELSE?

• Check the website at www.ista.org

• Upcoming Transport Packaging Forum
• Big standards-writing organization
• Committee D10 on Packaging
  ▪ About 100 years old
• Two package performance standards, supported by “Test Method” standards
  ▪ D4169-09, November 2009
  ▪ D7386-08, March 2008
WHAT’S NEW?

- D4169
  - Concentrated impact hazard element
  - Low pressure hazard element

9. Hazard Elements and Test Schedules

9.1 Hazard Elements and Test Schedules are categorized as follows:

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Hazard Element</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Handling—manual and mechanical</td>
<td>drop, impact, stability</td>
</tr>
<tr>
<td>B</td>
<td>Warehouse Stacking</td>
<td>compression</td>
</tr>
<tr>
<td>C</td>
<td>Vehicle Stacking</td>
<td>compression</td>
</tr>
<tr>
<td>D</td>
<td>Stacked Vibration</td>
<td>vibration</td>
</tr>
<tr>
<td>E</td>
<td>Vehicle Vibration</td>
<td>vibration</td>
</tr>
<tr>
<td>F</td>
<td>Loose Load Vibration</td>
<td>repetitive shock</td>
</tr>
<tr>
<td>G</td>
<td>Rail Switching</td>
<td>longitudinal shock</td>
</tr>
<tr>
<td>H</td>
<td>Environmental Hazard</td>
<td>cyclic exposure</td>
</tr>
<tr>
<td>I</td>
<td>Low Pressure Hazard</td>
<td>vacuum</td>
</tr>
<tr>
<td>J</td>
<td>Concentrated Impact</td>
<td>impact</td>
</tr>
</tbody>
</table>
WHAT’S NEW?

• D4169
  ▪ Bridge impact hazard element
• D4169
  - Good examples in Appendixes

APPENDIXES

(Nonmandatory Information)

X1. EXAMPLE TEST PLANS

X1.1 The following examples will serve to illustrate the use of this practice:

X2. USING THE DC-2 DISTRIBUTION CYCLE

X2.1 The DC-2 distribution cycle is used when an anticipated distribution is well understood and other cycles, DC-3 through DC-18, are not sufficiently descriptive. The understanding of distribution may be developed in several ways, including: measurement of the environment with appropriate instrumentation; careful observation of the various hazard elements in distribution; reference to published authoritative information; product damage reports; or a combination thereof.
D7386
  - For “Single Parcel Delivery Systems”
  - Four Test Plan Schedules, depending on
    - Standard
    - Small
    - Flat
    - Elongated

<table>
<thead>
<tr>
<th>Test Specimen</th>
<th>Description</th>
<th>Performance Test Schedule Sequence (see Section 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS-1</td>
<td>Small packaged-products bagged for transport</td>
<td>A1&lt;sup&gt;A&lt;/sup&gt;  D2&lt;sup&gt;B&lt;/sup&gt;  K&lt;sup&gt;A,C&lt;/sup&gt;  A4&lt;sup&gt;B&lt;/sup&gt;  D3&lt;sup&gt;A&lt;/sup&gt;  A3&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
<tr>
<td>TS-2</td>
<td>Large flat packaged products</td>
<td>A1  D1  K&lt;sup&gt;C&lt;/sup&gt;  A2  M  N  J  D3  A3  L</td>
</tr>
<tr>
<td>TS-3</td>
<td>Long narrow packaged products</td>
<td>A1  D1  K&lt;sup&gt;C&lt;/sup&gt;  A2  M  N  I  D3  A3  L</td>
</tr>
<tr>
<td>TS-4</td>
<td>All other packaged-products</td>
<td>A1  D1  K&lt;sup&gt;C&lt;/sup&gt;  A2  D3  A3  L</td>
</tr>
</tbody>
</table>

Notes:
- A = Handling
- D = Vibration
- K = High Altitude
- L = Concentrated Impacts
- M = Tip Over
- N = Rotational Edge Drop

www.ista.org
WHAT’S NEW?

• D7386
  ▪ Much like ISTA 3A
    • Same basic concepts
    • Same exact vibration profiles
    • Many detail differences
  ▪ Use D7386 if you or your company prefers ASTM standards
  ▪ Use ISTA 3A if your carrier is UPS
“Packages must be so packed or wrapped as to meet UPS’s published standards related thereto set forth in the Service Guide, or on ups.com, \textit{and as to pass tests set forth} in the International Safe Transit Association ("ISTA") \textit{Procedure 3A}, Procedure for Testing Packaged Products, published by ISTA.”
• ASTM may be starting a certification program

“The ASTM Board of Directors in October, 2009 authorized development of the capability to offer ASTM Certification Programs for products (material, products, systems and services) and personnel. This was the result of having received several inquires… [from] industries desiring an independent third party demonstration of compliance to standards and from industries facing regulatory pressures to prove compliance to standards.”

“At this time, ASTM has not developed any certification programs…”
ASTM INTERNATIONAL

WHAT’S NEW?

• ASTM may re-organizing Committee D10

“After discussion and approval at the Executive Web meeting on January 14, the attached reorganizational proposal is being circulated for your vote. Please note that voting in favor of this reorganization is the first step, then modifying scopes and possibly switching the jurisdiction of certain standards would follow.”
ISO

- International Organization for Standardization
- Similar to ASTM in many ways
  - Big standards-writing organization
  - Small committee (TC 122) concerned with packaging
  - One package performance standard, ISO 4180, supported by “Test Method” standards
- Revised 4180 after 29 years (!)
Packaging — Complete, filled transport packages — General rules for the compilation of performance test schedules
ISO 4180

Some interesting information
- Damage and acceptance criteria
- Quantifying the extent of damage
- Mounting of test items to the vibration table

Very poor with regard to specifics
- In 24 pages, only 3 charts of actual test plans
- Insufficient detail
### Table 21 — Test schedules and intensities for packages of gross mass > 100 kg

<table>
<thead>
<tr>
<th>Basic sequence</th>
<th>Test type</th>
<th>Reference standard</th>
<th>Intensity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditioning</td>
<td>Atmospheric</td>
<td>ISO 2233</td>
<td>lowest 3</td>
<td>23 °C at 50% Relative Humidity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>lowest 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>highest 1</td>
<td></td>
</tr>
<tr>
<td>Shock</td>
<td>Horizontal impact test</td>
<td>ISO 2244</td>
<td></td>
<td>Apply impact once on each side face</td>
</tr>
<tr>
<td>Compression</td>
<td>Static load</td>
<td>ISO 12048</td>
<td>Maximum load</td>
<td>Maximum load x 2</td>
</tr>
<tr>
<td>Transport vibration</td>
<td>Vibration</td>
<td>Random PSD ISO 13355</td>
<td>Nominal PSD 15 min</td>
<td>Nominal PSD 90 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISO 8318 sinusoidal</td>
<td>7 m/s² 15 min</td>
<td>7 m/s² 90 min</td>
</tr>
<tr>
<td>Transport vibration</td>
<td>Repetitive shock</td>
<td>Random PSD ISO 13355</td>
<td>Nominal PSD 10 min</td>
<td>Nominal PSD 20 min</td>
</tr>
<tr>
<td>Compression</td>
<td>Static load</td>
<td>ISO 12048</td>
<td></td>
<td>Apply maximum load for 24 h</td>
</tr>
<tr>
<td>Shock</td>
<td>Drop tests</td>
<td>ISO 14149</td>
<td>10 cm</td>
<td>20 cm</td>
</tr>
</tbody>
</table>
NAT’L MOTOR FREIGHT TRAFFIC ASSN.

• Administers the National Motor Freight Classification
  ▪ …commodity descriptions; classes; rules; packaging definitions, specifications or requirements; bill of lading formats, terms and conditions…

• Item (Rule) 180, “Performance Test for Shipping Containers”

• Item (Rule) 181, “Furniture Package Performance Testing”
• Items 180 and 181 are alternatives to the Test Shipment Permit program (Item 689)
  "Recommended for solving chronic damage problems and for providing an acceptable assurance level of packaging…"
• Both Items were revised in October of 2009
  • No technical changes
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QUESTIONS?