



ISTA-6 系列标准解析

WHEN YOU NEED TO BE SURE



■ 运输中主要的危险来自于以下方面

1. 大气环境（温度Atmospheric condition （Change in temperature & humidity）湿度变化）

包装材料（纸类与木材对天气变化，特别对湿度变化表现敏感）

Packaging material (such as paper and wood are sensitive to climate change, especially moisture)

2. 冲击（重力引发的跌落及其他外力引起的碰撞）

Shock (Drop caused by gravity & impact by other force)

3. 压力（堆码与夹持）

Compression (stacking and clamping)

4. 振动（不同条件下低频到高频）

Vibration (Low frequency to high frequency under different condition)



ISTA 6 系列测试

ISTA 6 SAMS CLUB

ISTA 6 Fedex

ISTA 6-Amazon.com

Why Do Transit Test

为什么做运输测试

- Project 6-series test is a general simulation test for packaged-products shipped through the **Specified Client** distribution system to final destinations in the U.S. It was developed from an extensive survey, observation, and field measurement program of the actual **Specified Client** system. The program involved personal visits to various Distribution Centers, overseas suppliers and ports,. Ocean containers, trucks, and fork lifts were instrumented for acceleration and other data.
6-系列测试 是针对 特定 客户 整个供应流通过程的产品的运输模拟测试标准，是特定客户联合ISTA开发的针对客户自己的测试标准。这份标准的编写是通过大量的调查，数据采集分析，包括流通过程，装载方式，搬运方式等的分析处理。
- More approach to Clients Distribution System Shipment
更贴近客户产品流通环境，符合性更好
- Need more information about the Handling detail for testing测试需要了解更多有关操作和运输的细节信息
- Impact all the hazard in environment different packages may be suffered. 考察包装在不同状态不同环境中有可能遇到的各种风险情况

Example 实例

- Received at the DC. 产品运至 DC（分销中心）。
- Moved “crossdock” to the outbound area. Product will not stored in DC, and packing type can be changed here. 从“交叉站台”转移至出货口，产品不会储存在DC，但是包装方式在这里可能会改变。
- Shipped as mixed loads to the club. 混装运至门店



Handling 搬运



Clamp Test
夹持测试

Clamp Truck for floor loaded with out slipsheet
夹车用来搬运没有slipsheet的包装件

Handling 搬运



Impact Test 冲击测试



Rotational Drop Test
旋转跌落测试

Push/pull trucks-slipsheets 推拉搬运车

Handling 搬运



Impact Test 冲击测试

Rotational Drop Test 旋转跌落测试

Fork truck handing test 叉车搬运测试

Flat Push 平推测试

Fork Truck for Pallet Load 叉车用来搬运托盘包装

Package Type (包装类型)

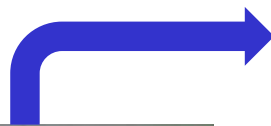
Floor loaded package (接地单个包装) :
products are initially shipped without being unitized or palletized, initially loaded directly into a transport vehicle or ocean container. (产品没有进行组合或者托盘化, 直接接触运输货车或者海运集装箱进行运输)



In Sam's DC

Package Type (包装类型)

Club Ready Pack 托盘包装



Storing area in
Sam's club山姆
店存储区



Display areas in
Sam's club山姆店
展示区

Pallet Configuration (托盘结构)



No assembly required in Club. Shipping material are easily removed and are recyclable Pallet is ready for display on the Club floor

托盘包装产品到达山姆店的时候不需要重新组装，包装很容易去除掉，整托盘产品可以直接放在山姆店地板上作为货架展产品品。



Club Ready Pack 托盘包装

■ Club Ready Pallet Design (组合包装设计)

- Standard pallet size is 45~48.5" x 37-40.5"
标准托盘尺寸： 45~48.5" x 37-40.5"
- Custom Pallet: it depends on what item and size, whatever to fit for the product size. For example: 45 x 45" for Planter....

定制托盘：取决于尺寸和型号，但是需要与产品的尺寸相符合。
比如：尺寸为45 x 45" 的托盘，产品为花盆。

- Packaging should be easily removed and readable 托盘包装易于拆解，产品包装并易于识别
- Should be no overhang and 组合包装不能超出托盘边缘

Club Ready Pack 托盘包装

■ Safety 安全

- Main Objective -Ensure safety through the entire supply chain主要目标是保证流通过程的安全
 - All Pallets will be double stacked所有托盘在运输时都会堆叠的
 - All Pallet should be support the relative load when stacked.
所有托盘包装都要能承受要求的负载重量
 - All Pallet should be stacked on the second layer of the storage rack所有的托盘会堆叠在货架第二层上。

■ Maximize Operations Efficiency 最大化操作效益

- Main Objective -Reduce handling touch points & reduce waste主要目标是减少操作和浪费
 - No assembly required in Club 在Club不需要装配
 - Shipping material are easily removed and are recyclable.运输包装材料容易去除且可回收
 - Pallet is ready for display on the Club floor托盘为Club展卖包装
 - Without packaging approval, no overhang 产品包装不能超过托盘尺寸 ...



■ Create Self-Selling Packaging 开发自我推销包装

- Main Objective -improve product merchandising to drive sales
主要目标是改进产品销售策略，促进销售

---Utilize entire pallet as billboard for items 利用整个托盘作为广告牌

--- Should be able to easily identify in a faraway distance.
在远距离就容易辨认

--- Communication Hierarchy 传达产品信息

--- 2-side shoppable minimum; 3 side shoppable preferred
包装至少相邻两面可售最好三面可售，



Shoppable means:

1. members can see what is displayed easily. 2, the selling unit can be taken out easily

可售包含 2 个意思：

1. 可以很容易的看见产品是什么。2. 销售包装可以很容易的取出来。



Sustainability 可持续发展

- **Main Objective -Environmentally-friendly packaging & processes**
主要目的是包装绿色环保和可持续发展 ...

7 R of Sustainability 7R包装可持续发展

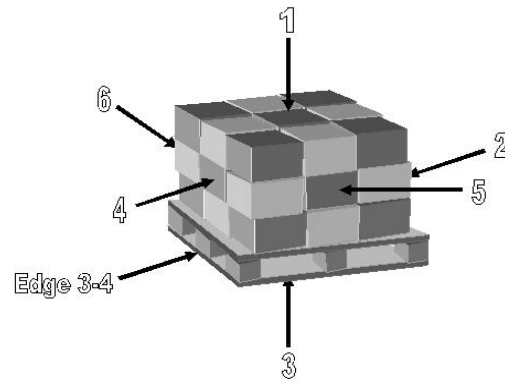
- Remove- 容易去除（包装）
- Reduce- 减量化
- Reuse- 重复利用 –合成料托盘、周转箱
- Renew (able)-可再生-可再生资源
- Recycle (able)-循环利用 –可回收
- Revenue-回收创收
- Read (able)– 易识别

Reduction of waste is the goal and represents one of most visible opportunities

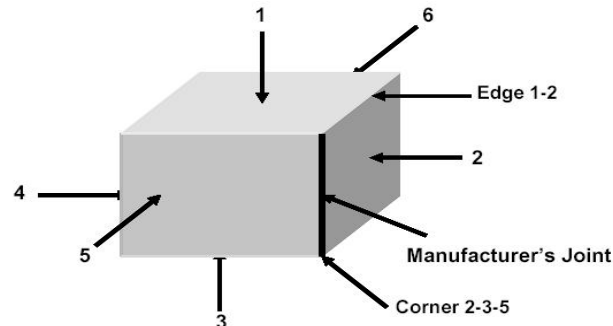
减少废弃物排放是7R宗旨，并且是一个显而易见的机遇和趋势

Shipping Method(运输方式)

- Non-Perishable, initially Shipped On Pallet or slipsheet-type A 不易腐烂的产品，直接通过托盘或者滑托进行搬运的包装进行A类型测试流程



- Non-Perishable ,initially Shipped Floor Loaded-type B (large type) & C (small type) (不易腐烂的产品直接接地运输的包装，大包装进行B类测试，小包装进行C类测试)



Test Procedure-type A A类测试流程

Vertical compression
垂直抗压



**The bottom
layer最底层**

- ✓ Pallet weighing < 749 lbs. (339.74 kg) - bottom layer must support 1500 lbs (680.39 kg). 托盘包装重量小于749磅时，最底层必须要能承受1500磅的压力
- ✓ Pallets weighing 750 lbs (340.19) or more – bottom layer must support 2500 lbs (1133.98 kg). 托盘包装重量大于或等于750磅的时候，最底层必须能承受2500磅的压力



Test Procedure-type A

A类测试流程

Vertical compression垂直抗压

Table A (For product 750 lb or less 小于或等于750磅的产品)

Example 1: Total: Length : 50 inches Width: 39-3/4 inches H: 37-1/2 inches WG: 431.00lbs L=3 NL=12 WC = 10.9 lbs		
Trial Calculation 预算公式	:	Trial (lbf) = $\{[(108-H)/H] \times WG \times M\} + [(L-1) \times WC \times NL]$ = $\{[(108-37.5)/37.5] \times 431.00 \times 3.0\} + [(3-1) \times 10.9 \times 12]$ =2692
If trial calculation is 1500 lbf or over for packaged product 750 lb or less 产 品小于或等于750磅如果预算值大于或 等于 1500磅	:	Use the formula to calculate Test Load (lbf): =$\{[(108-H)/H] \times WG \times M\}$ = $[(108-37.5)/37.5] \times 431.00 \times 3.0$ =2431
Example 2: Total: Length : 50 inches Width: 39-3/4 inches H: 37-1/2 inches WG: 170.00lbs L=3 NL=12 WC = 4.5 lbs		
Trial Calculation 预算公式	:	Trial (lbf) = $\{[(108-H)/H] \times WG \times M\} + [(L-1) \times WC \times NL]$ = $\{[(108-37.5)/37.5] \times 170.00 \times 3.0\} + [(3-1) \times 4.5 \times 12]$ =1067
If trial calculation is less than 1500 lbf for packaged product 750 lb or less 产 品小于或等于750磅如果预算值小于 1500磅	:	Use the formula to calculate Test Load (lbf): =1500- $[(L-1) \times WC \times NL]$ = $1500-[(3-1) \times 4.5 \times 12]$ =1392





Test Procedure-type A

A类测试流程

Vertical compression垂直抗压

Table B (For product over 750lb产品大于750磅)

Example 3: Total: Length : 50 inches Width: 39-3/4 inches H: 37-1/2 inches WG: 891.00lbs L=3 NL=12 WC = 24.2 lbs		
Trial Calculation预算公式	:	$\begin{aligned} \text{Trial (lbf)} &= \{[(108-H)/H] \times WG \times M\} + [(L-1) \times WC \times NL] \\ &= \{[(108-37.5)/37.5] \times 891.00 \times 3.0\} + [(3-1) \times 24.2 \times 12] \\ &= 5606 \end{aligned}$
If trial calculation is 2500 lbf or over for packaged product over 750 lb 产品大于750磅如果预算值大于或等于 2500磅	:	$\begin{aligned} \text{Use the formula to calculate Test Load (lbf):} \\ &= \{[(108-H)/H] \times WG \times M\} \\ &= [(108-37.5)/37.5] \times 891 \times 3.0 \\ &= 5025 \end{aligned}$
Example 4: Total: Length : 50 inches Width: 39-3/4 inches H: 69 inches WG: 760.00lbs L=3 NL=12 WC = 20.0 lbs		
Trial Calculation预算公式	:	$\begin{aligned} \text{Trial (lbf)} &= \{[(108-H)/H] \times WG \times M\} + [(L-1) \times WC \times NL] \\ &= \{[(108-69)/69] \times 760.00 \times 3.0\} + [(3-1) \times 20 \times 12] \\ &= 1769 \end{aligned}$
If trial calculation is less than 2500 lbf for packaged product over 750 lb 产品大于750磅如果预算值小于 2500磅	:	$\begin{aligned} \text{Use the formula to calculate Test Load (lbf):} \\ &= 2500 - [(L-1) \times WC \times NL] \\ &= 2500 - [(3-1) \times 20 \times 12] \\ &= 2020 \end{aligned}$



Test Procedure-type A A类测试流程

Vertical vibration
垂直振动



Maintain for 3 hours without top
load

无负载振动保持3小时



Test Procedure-type A

A类测试流程

Rotational edge drop
旋转边跌落



6 inches
6英寸。



Test Procedure-type A

A类测试流程

Flat push for custom pallet only
针对定制托盘的托盘平推测试



Push 40 in in 2-3 sec
在2-3秒内平推40英寸
的距离



Test Procedure-type A

A类测试流程

Additional test – push test, clamp test and handling test for custom pallet (except planter) 额外测试-针对非花盆产品做平推，夹持和搬运测试。

TEST RESULTS:

Package Dimension
Gross Weight

: 58-3/4"x30-1/2"x51-3/4"
: 397.9 Lbs.

One unit on custom pallet
(non-planter)
定制托盘上的产品（非花盆）



Push, clamp and handling test
做平推，夹持和搬运测试





Test Procedure-type A

A类测试流程

Additional test – push test and handling test only for custom pallet (planter)

针对定制托盘额外需要的平推和搬运测试(花盆产品)。

Package Dimension : 47-7/8" x 29-3/4" x 48-1/2"
Gross Weight : 689.2 Lbs



Planter
花盆



Push and handling test
only, no need clamp test
做平推和搬运测试，不需要夹持测试





Fork truck handing test 叉车搬运测试

Additional test for custom pallet-针对定制托盘的额外附加测试。

Use the fork truck to lift the sample only 12 inches off the ground, run the obstacle course. (The velocity in the turn: 3-1/4 ft/s maximum; in transport areas: uniform, not to exceed 5 ft/s). Run the course a total of 5 times checking the package integrity during and after each test cycle. The carton may shift it's position during the test, no need to re-center the carton on the pallet. 使用叉车搬运产品，抬离地面12英寸，进行穿越障碍物测试。（在转弯的位置最大速度为3-1/4 ft/s，在运输段，保持匀速，并且不超过5 ft/s的速度）整个过程重复共5个循环。在测试后和测试过程中检查产品的完整性。测试过程中纸箱可能会偏离原来的位置，不要调整到中心位置。

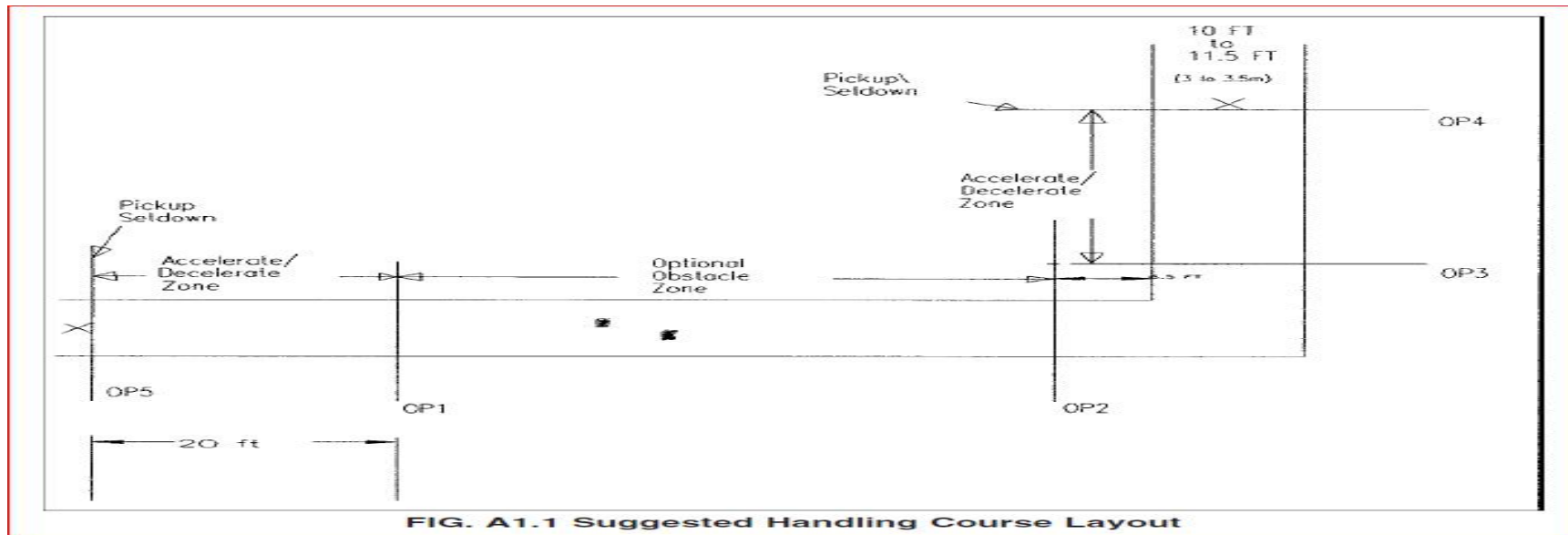


FIG. A1.1 Suggested Handling Course Layout



Type B & C

类别B&C

Type B: Floor-Loaded Single Case or ---Large type

类型B: 单个的接地包装-大件的包装

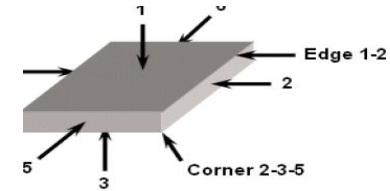
- Weighs 50 lb (23 kg) or more ,or重量为50磅或以上或者
- The longest dimension is 24 in (610 mm) or greater and the next-longest dimension is 20 in (510 mm) or greater and the shortest dimension is 20 in (510 mm) or greater, or最长尺寸为24英寸或以上并且第二长边尺寸为20英寸或以上并且最短边为20英寸或以上或者
- Any of the length, width, or height dimensions are 30 in (760 mm) or greater任意一边的尺寸为30英寸或者以上

Type C: Floor-Loaded Single Case or ---Small type

类型C: 单个的接地包装-小件的包装

- If it does not meet the definition of large above不满足大包装条件的单个接地包装

Type B & C 类别B&C

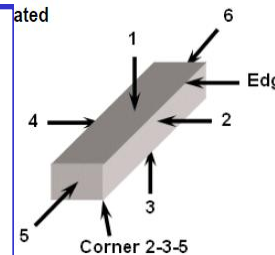


Elongated Packaged-product长条包装

- A packaged-product where the longest dimension is 36 in (910 mm) or greater and both of the other dimensions are each 20 percent or less of the longest dimension
包装产品的最长尺寸为36英寸（910mm）或以上，并且其他2条边的尺寸小于最长边尺寸的20%

Flat Packaged-product扁平包装

- A packaged-product where the shortest dimension is 8 in (200 mm) or less and包装产品的最短边尺寸小于等于8英寸（200mm）
- the next longest dimension is four (4) or more times larger than the shortest dimension, and并且第二长边的尺寸为最短边的4倍或以上。
- the volume is 800 in³ (13,000 cm³) or greater包装产品体积为800立方英寸（13000cm³）或以上





Test Procedure-type B

B 类测试流程

Test Type 实验项目	Test Level 实验参数	Remarks 备注
Temperature and humidity 温湿度预处理	Lab ambient, 12 hours 室温, 12小时	Required 必选
Incline impact 斜台冲击	42 in/sec impact velocity 冲击速度42英寸每秒	Required 必选
Rotational flat drop 旋转面跌落	9 in 9 英寸	Required 必选
Vertical compression 垂直抗压	Calculated from formula 根据公式计算	Required 必选
Vertical vibration 垂直振动	Vibration with top load for 3 hours 负载振动3小时	Required 必选
Clamp test 夹持测试	Calculated from formula 根据公式计算	Required 必选
Rotational edge drop 旋转边跌落	7 in 7 英寸	Required 必选



Test Procedure-type B

B 类测试流程

Test Type 实验项目	Test Level 实验参数	Remarks 备注
Concentrated Edge impact 集中边冲击测试	Hazard box dropped 15 in 危险物跌落 15 英寸	Required only for flat packages 只针对扁平包装
Bridge impact 桥架冲击测试	Hazard box dropped 15 in 危险物跌落 15 英寸	Required only for elongated packages 只针对长条包装



Test Procedure-type B

B 类测试流程

Incline impact
斜台冲击



4 faces or 6 faces at 42
in/sec impact velocity
冲击速度42英寸每秒, 冲
击4个或6个面



Test Procedure-type B

B 类测试流程

Rotational flat drop
旋转面跌落



9 in
9 英寸

Test Procedure-type B

B 类测试流程

Vertical compression
垂直抗压



Pallet required for upper surface
area $\geq 45 \times 37$ inch

包装顶部尺寸大于等于 45×37 时，
需要在顶部追加托盘。

计算公式

$$F \text{ (lbf.)} = [(108-H)/H] \times W_G \times M$$

$M=3.0$

安全系数M为3.0

The maximum force should not exceed 7500lbs
最大力值不超过7500磅



Test Procedure-type B

B 类测试流程

Vertical vibration
垂直振动



Vibration with top load for 3 hours
负载振动3小时。

计算公式

$$\text{Top load (lbf.)} = [(108-H) \times L \times W \times 0.0035]$$



Test Procedure-type B

B 类测试流程

Clamp test
夹持测试



Test Force (lb)=4 x W x 48/D

W--- the test item weight (lb)

W-产品重量

D---- the smallest dimension based on tested side.

D-包装产品测试 面中的最短尺寸

Min. clamp test force 400 lbf. 最小力值400磅

Max. clamp test force 2000 lbf. 最大力值2000磅



Test Procedure-type B

B 类测试流程

Rotational edge drop
旋转边跌落



7 in
7 英寸

Test Procedure-type B B 类测试流程

Concentrated Edge impact
集中边冲击测试



15 in
15 英寸

Required only for flat packages
只针对扁平包装

Test Procedure-type B B 类测试流程

Bridge impact
桥架冲击测试



15 in
15 英寸

Required only for elongated packages
只针对长条包装



Test Procedure-type C

C 类测试流程

Test Type 实验项目	Test Level 实验参数	Remarks 备注
Temperature and humidity 温湿度预处理	Lab ambient, 12 hours 室温， 12小时	Required 必选
Free –fall drop 自由跌落	18 in max 最大高度18英寸	Required 必选
Vertical compression 垂直抗压	Calculated from formula 根据公式计算	Required 必选
Vertical vibration 垂直振动	Vibration with top load for 3 hours 负载振动3小时	Required 必选
Clamp test 夹持测试	Calculated from formula 根据公式计算	Required 必选
Free –fall drop 自由跌落	32in max 最大高度32英寸	Required 必选



Test Procedure-type C

C 类测试流程

Test Type 实验项目	Test Level 实验参数	Remarks 备注
Concentrated Edge impact 集中边冲击测试	Hazard box dropped 15 in 危险物跌落 15 英寸	Required only for flat packages 只针对扁平包装
Bridge impact 桥架冲击测试	Hazard box dropped 15 in 危险物跌落 15 英寸	Required only for elongated packages 只针对长条包装

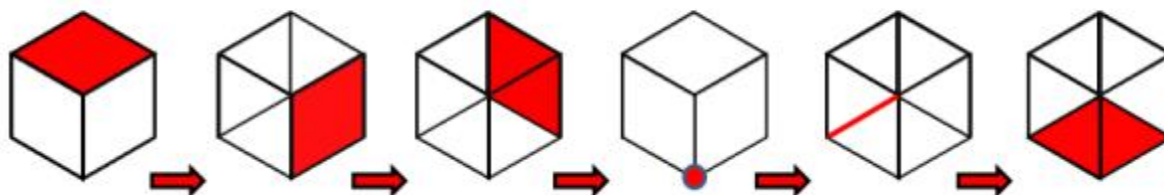
Test Procedure-type C

C 类测试流程

Free –fall drop

自由跌落

Drop Number	Drop Heights for International Shipment (initial origin outside the U.S.)	Drop Heights for Domestic Shipment (initial origin within the U.S.)	Orientation of Drop
1	12 in (300 mm)	10 in (250 mm)	Face 1
2	12 in (300 mm)	10 in (250 mm)	Face 2
3	12 in (300 mm)	10 in (250 mm)	Face 6
4	12 in (300 mm)	10 in (250 mm)	Corner 2-3-5
5	12 in (300 mm)	10 in (250 mm)	Edge 3-4
6	18 in (460 mm)	14 in (360 mm)	Face 3



Test Procedure-type C

C 类测试流程

Vertical compression
垂直抗压



计算公式

$$F \text{ (lbf.)} = [(108-H)/H] \times W_G \times M$$

M=3.0

安全系数M为3.0

The maximum force should not exceed 7500lbs
最大力值不超过7500磅



Test Procedure-type C

C 类测试流程

Vertical vibration
垂直振动



Vibration with top load for 3 hours
负载振动3小时。

计算公式

$$\text{Top load (lbf.)} = [(108-H) \times L \times W \times 0.0035]$$



Test Procedure-type C

C 类测试流程

Clamp test
夹持测试



Test Force (lb)=4 x W x 48/D

W--- the test item weight (lb)

W-产品重量

D---- the smallest dimension based on tested side.

D-包装产品测试 面中的最短尺寸

Min. clamp test force 400 lbf. 最小力值400磅

Max. clamp test force 2000 lbf. 最大力值2000磅

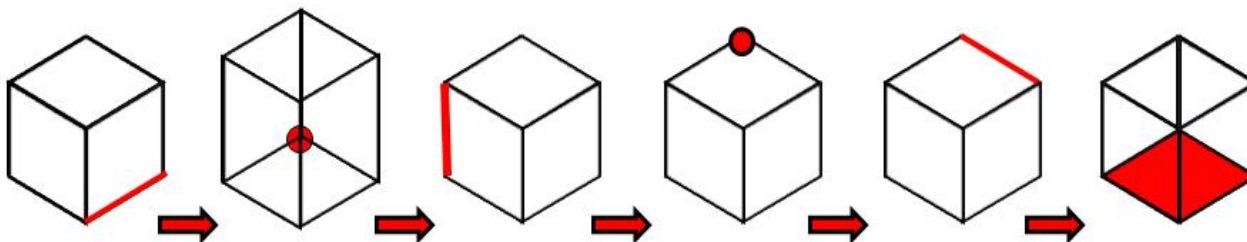
Test Procedure-type C

C 类测试流程

Free –fall drop

自由跌落

Drop Number	Drop Heights for International Shipment (initial origin outside the U.S.)	Drop Heights for Domestic Shipment (initial origin within the U.S.)	Orientation of Drop
1	18 in (460 mm)	14 in (360 mm)	Edge 2-3
2	18 in (460 mm)	14 in (360 mm)	Corner 3-4-6
3	18 in (460 mm)	14 in (360 mm)	Edge 4-5
4	18 in (460 mm)	14 in (360 mm)	Corner 1-4-6
5	18 in (460 mm)	14 in (360 mm)	Edge 1-6
6	32 in (810 mm)	26 in (660 mm)	Face 3



Test Procedure-type C

C 类测试流程

Test procedure for Concentrated Edge impact and Bridge impact test are the same as Type B

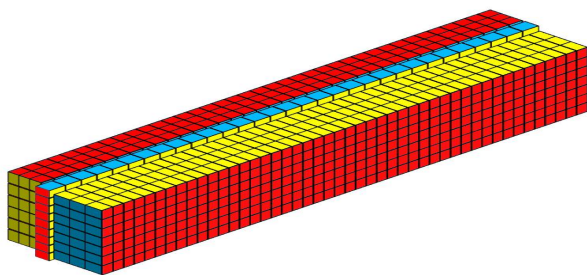
集中边冲击测试与桥架冲击测试与类型B中的相应测试步骤一样



Test Procedure-type B & C (B&C类测试流程)

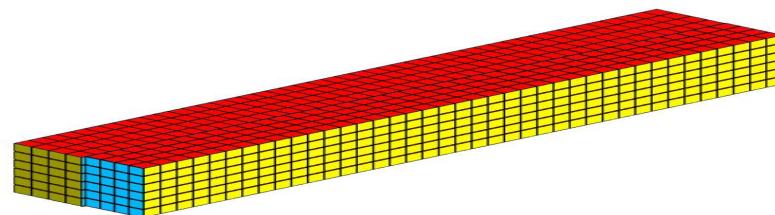
Floor loaded

- different orientation in the container
接地包装，在集装箱中摆放方向不同

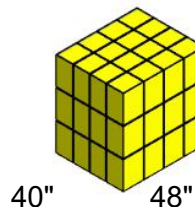
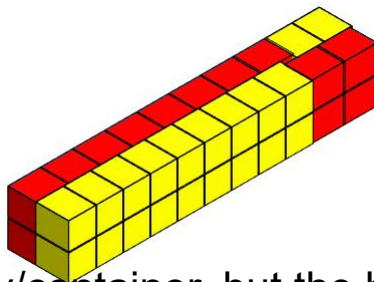


Floor loaded

- same orientation in the container
接地包装，在集装箱中摆放方向相同



Club ready pk 托盘包装



Those are the same qty/container, but the best is Club ready pk, second is same box orientation in the container, all these floor loaded packages should be reassembled to club ready model, then handling by clamp truck. More time and labors are needed for these floor loaded packages. so some orientation in the container will be more convenient than different orientation 这些是相同数量产品的装柜方式。最好的是托盘包装的模式，第二选择是相同摆放方向的接地包装模式，所有的接地包装在搬运过程需要耗费更多的人力和时间去重新组装成组合包装模式再用夹车搬运。相比而言，相同摆放方向比不同摆放方向的在搬运过程中要方便一些。



Part 5: Failure and Suggestions

Fail案例及建议



Key point要点

1. Material of pallet, slipsheet
滑托和托盘的材料
2. Deformation caused by compression test
压力测试造成的变形
3. Scuffs caused by vibration test
振动测试造成的磨损
4. Damage caused by drop test or impact test
跌落或冲击测试造成的破损

Failure and Suggestions

Fail案例及建议

Material of pallet 托盘材料

Weak wooden pallet and paper pallet 差的木托盘和纸托盘



•Requirement: Wooden pallet is not the best optional due to high cost and fumigation requirements. Paper pallet should be used together with slipsheet, or clamp test will be conducted if only paper pallet used. Above all, all pallets should withstand 2500 lbs compression test at least.

•要求：由于费用较高并且有熏蒸要求，木托盘不是最好的选择。使用纸托盘需要额外追加滑脱，否则需要追加夹持测试。最重要的是，托盘需要保证至少能承受2500磅的压力。

Failure and Suggestions

Fail案例及建议

Material of slipsheet 滑托材料

Slip sheet滑托



- Requirement: It must have 4" flaps on two (2) adjacent sides. It should to be strong enough, or additional tests Water Repellency and Tensile Strength will be conducted. Do not tie slipsheet together with product.

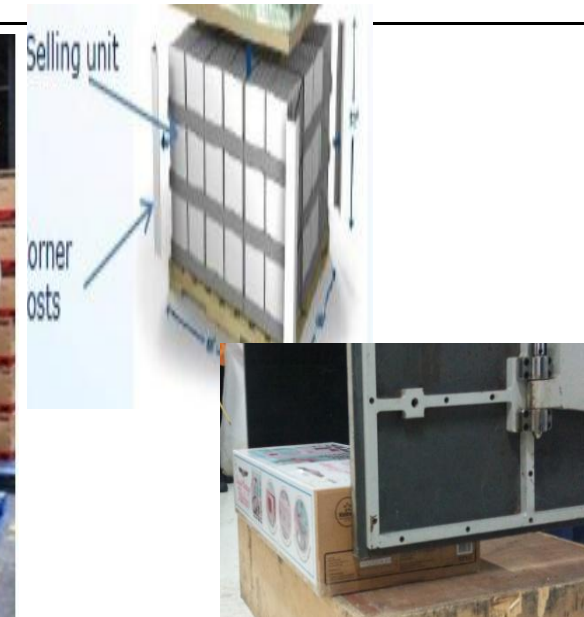
要求：至少在相邻的2边有4英寸的突出。并且需要有足够的强度。或者通过防水测试和抗张强度进行评估。打包的时候不要把滑托和产品捆绑在一起。

Failure and Suggestions

Fail案例及建议

■ Deformation变形

Deformation caused by compression and clamp test 抗压和夹持造成的变形



- Suggestion: A standard pallet should be placed on the top of the test item if the dimensions are equal to or greater than 45×37 inches. Use corner posts to withstand force. fill-up the carton, avoid gap. The packaging also need to be reinforced in the middle to withstand the force when the top size larger than standard pallet. 如果包装顶部尺寸超过 45×37 inch，测试时需要在顶部加标准托盘。在横向和纵向的边上增加纸护角。保证纸箱填满，不要留有空隙。如果包装顶部尺寸大于标准托盘尺寸，，需要在中间位置增加纸护角类的承重材料来分担压力。

Failure and Suggestions

Fail案例及建议

■ Scuffs 磨损

Caused by vibration test 振动测试造成



• Suggestion: Varnishing or add UV procedure. Do not use package with instability printing color to do test. or test result will be fail. Ink Rub Resistance test may be needed for such situation. 印刷表面过光油或者UV处理。送测的样品需要保证印刷效果已经稳定。否则测试结果可能会不能通过，并且可能额外追加摩擦测试来评估这种状况。

Failure and Suggestions

Fail案例及建议

■ Scuffs 磨损

Caused by vibration test 振动测试造成



• Suggestion: The sharp edge of the slotting on the tray scratched the product. Adjust the size and shape of the slotting to avoid product contact sharp edge and Make the edge smooth. or fill sponge sheet into the bottom of the tray to raise product. This can avoid product contact the edge of the slotting and make the product more stable in the whole package. 纸托开槽的边缘锋利，接触产品后导致产品磨损。建议修正开槽位置和形状大小等，避免产品接触边缘并加工边缘保持圆滑。或者在开槽底部添加珍珠棉等缓冲材料，垫高产品是其与边缘隔开并在整体包装中保持更稳定

Failure and Suggestions

Fail案例及建议

■ Split on Carton 纸箱开裂

- Caused by impact test 冲击测试造成



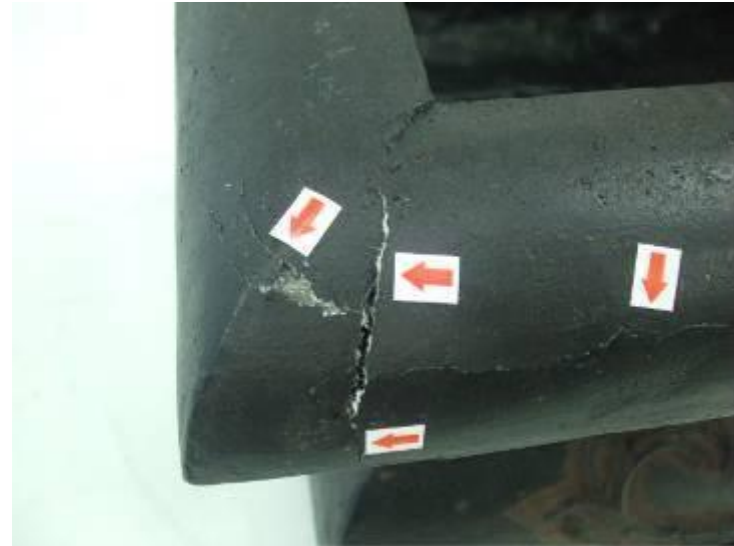
- Suggestion: Reduce gap between product and package, use high viscous brown paper taper and use cross sealing method. Fix every components.
建议：减少包装和产品之间的空隙。使用高强度的封箱胶，或者使用十字封箱方式。固定内部的产品。

Failure and Suggestions

Fail案例及建议

■ Broken破损

- Caused by impact冲击造成



- Suggestion: use cushioning material and paper angle bead to protect fragile corner and edge.

建议：使用缓冲材料，或者使用纸护角去保护易碎的边角位置

Failure and Suggestions

Fail案例及建议

■ Broken破损

- Cause by vibration with top load 负载振动造成



- Suggestion: Use corner posts to withstand force. Please refer to next page for improvement pictures. 使用纸护角承重。请见下页的改进参考图片

Failure and Suggestions

Fail案例及建议

■ Improvement for broken 破损改进图





ISTA FEDEX 运输测试

Testing Packaged Products Weighing Up to 150 lbs.

重量 不超过 150 磅以下货物

分为美国国内运输与国际运输

美国 国内运输 分产品类型，

国际运输 不分产品类型，对包装类型进行区分



ISTA FEDEX 运输测试（重量在 150 磅以上 国际运输 所有类型）

Test Type 实验项目	Regular 常规件	Flat 扁平件	Elongated 延长型包装件
Free fall drop test 跌落测试	X	X	X
Concentrated impact 集中冲击		X	
Bridge Impact 桥式冲击			X
Vertical compression 垂直抗压	X	X	X
Rotary vibration 圆周振动			
Random vibration 随机振动	X	X	X
Second free drop 二次跌落	X	X	X



ISTA FEDEX 运输测试

Testing Packaged Products Weighing Up to 150 lbs.

重量为 150 磅以上 货物，通常为 大型件包装。

分为美国国内运输与国际运输

美国 国内运输 分产品类型，

国际运输 不分产品类型，



ISTA FEDEX 运输测试（重量在 150 磅以下 国际运输 所有类型）

Test Type 实验项目	International shipment all items 国际运输 所有类型
Side impact test 侧面冲击测试	X
Bottom impact test 底面冲击测试	X
Tip test 倾斜测试	X
Raised edge impact test 边跌落测试	X
Raised corner impact test 角跌落测试	X
Vertical compression 垂直抗压测试	X
Random vibration 随机振动	X

底面冲击测试



侧面冲击测试



倾斜测试



边跌落测试



角跌落测试





ISTA 6-Amazon.com-SIOC



Definition

SIOC-ships in own container for Amazon.com distribution system

Project 6-AMAZON.COM is a general simulation test for SIOC (Shipps In Own Container) packaged products shipped through Amazon's distribution system to final customer destinations. would be required.

Definition

Amazon.com outbound shipment method:

- Parcel delivery of individual packaged products
- Less –Than- Truckload (LTL) delivery of individual packaged products
 - packaged product weight greater than 150 lb or
 - any packaged product dimension greater than 108 inches or
 - packaged product girth greater than 165 inches (girth=length +
2*(width +height)) or
 - palletized packaged product or
 - Special delivery requirement by Amazon

Definition

For fragile items, five samples are required for the type A test procedure. Fragile items are defined as items that easily break or could leak during the distribution process. This includes any items **containing**

- Glass / Ceramic / Porcelain / Clay
- Liquids / Semi-liquids / Solids that can become liquid at high temperatures (above 70 degrees Fahrenheit)

只要产品包含玻璃、陶瓷等易碎部件，都算作**fragile items**，如平板电脑，**Type A**类型的此类易碎品包装测试，需要**5**件包装。

For non-fragile items, one sample is required for this test procedure.

非易碎品，只需**1**件包装。

Definition

Parcel delivery（包裹快递邮购运输）: any individual packaged product shipped by amazon.com to the consumer via a parcel delivery system such as UPS, FedEx, etc.

分为 Type A （重量0~50lb之间）

Type B （重量50~100lb之间）

Type C （重量100~150lb之间）

Less than Truckload (LTL): any packaged product shipped by Amazon.com to the consumer via an LTL delivery system.

分为 Type D （重量0~100lb之间）

Type E （重量100lb以上）

Type F （pallet托盘包装）



Definition

TV/Monitor

Parcel delivery of individual packaged products

Weight Less than 150lb (68 kg) & Girth equal to or less than 165" (4.19m)

Type G

TV/Monitor

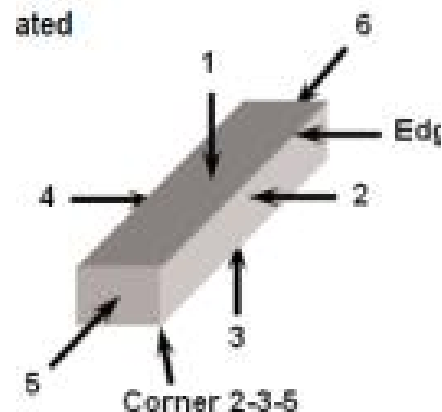
Less than Truckload(LTL) Delivery of Individual Packaged-Products

Weight Less than 150lb (68 kg) & Girth equal to or less than 165" (4.19m)

Type H

A packaged-product where the longest dimension is 36in (910mm) or greater and both of the other dimensions are each 20 percent or less of the longest dimension

包装产品的最长尺寸为36英寸(910mm)或以上，并且其他2条边的尺寸小于最长边尺寸的20%



Flat packaged product 扁平包装

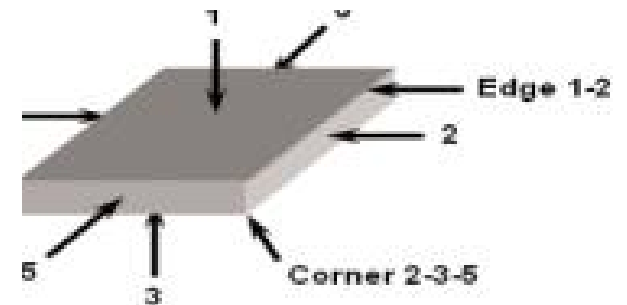
1

- A packaged-product where the shortest dimension is 8in (200mm) or less
- 包装产品的最短边尺寸小于等于8英寸 (200mm)

2

- The next longest dimension is 4 or more times larger than the shortest dimension
- 并且第二长边的尺寸为最短边的4倍或以上。

- The volume is 800in³ (13,000cm³) or greater
- 包装产品体积为800立方英寸(13,000cm³)或以上



TEST PROCEDURE 测试流程

Test category 测试类别	Type A Parcel delivery 快递运输 (0~50lb)	Type B Parcel delivery 快 递运输 (50~100lb)	Type C Parcel delivery 快 递运输 (100~150lb)	Type D LTL 零担运输 (0~100lb)	Type E LTL 零担运输 (100lb及以 上)	Type F pallet托 盘包装
Atmospheric preconditioning 温湿度预处理	√	√	√	√	√	√
Atmospheric conditioning 温湿度测试	×	×	×	×	×	×
Drop test 跌落 测试	√	√	×	√	×	×
Random vibration test 随机振动	√	√	√	√	√	√

TEST PROCEDURE 测试流程

Test category 测试类别	Type A Parcel delivery 快递运输 (0~50lb)	Type B Parcel delivery 快 递运输 (50~100lb)	Type C Parcel delivery 快 递运输 (100~150lb)	Type D LTL 零担运输 (0~100lb)	Type E LTL 零担运输 (100lb 及以上)	Type F pallet托 盘包装
tip/tip over 倾翻 测试	×	√ (特殊包装)	√ (特殊包装)	√ (特殊包 装)	√ (特殊 包装)	√ (特殊 包装)
rotational edge drop 旋转边跌 落	√ (长条和扁 平包装)	√ (长条和扁 平包装)	√	×	√	√
Incline impact test 斜台冲击测 试	×	×	√	×	√	√
rotational flat drop 旋转面跌 落	×	×	√	×	√	√

Special package: package » 48 in. tall and any one base dimension $< 1/2$ height or for package » 30 in. tall and with a center of gravity vertical location $> 1/2$ the package height 包装高度大于48英寸并且任一底边尺寸小于高的一半。或者包装高度大于30英寸并且产品重心在中间以上

Test category 测试类别	Type A Parcel delivery 快递运输 (0~50lb)	Type B Parcel delivery 快 递运输 (50~100lb)	Type C Parcel delivery 快 递运输 (100~150lb)	Type D LTL 零担运输 (0~100lb)	Type E LTL 零担运输 (100lb及以 上)	Type F pallet托 盘包装
rotational corner drop 旋 转角跌落	×	×	×	×	×	×
Compression –vertical 垂直抗压	×	√	√	√	√	√
Compression – horizontal 水平夹持	×	√	√	√	√	×
Full rotational flat drop 全旋转跌落	√ (长条和 扁平包装)	√ (长条和 扁平包装)	√ (长条和 扁平包装)	√ (长条和扁 平包装)	×	×

TEST PROCEDURE测试流程

Test category 测试类别	Type A Parcel delivery 快递运输 (0~50lb)	Type B Parcel delivery 快 递运输 (50~100lb)	Type C Parcel delivery 快 递运输 (100~150lb)	Type D LTL 零担运输 (0~100lb)	Type E LTL 零担运输 (100lb及以 上)	Type F pallet托 盘包装
Bridge impact桥 式冲击	√ (长条包 装)	√ (长条包 装)	√ (长条包装)	√ (长条包 装)	√ (长条包装)	×
concentrated edge impact 集中冲击	√ (扁平包 装)	√ (扁平包 装)	√ (扁平包装)	√ (扁平包 装)	√ (扁平包装)	√ (扁平 包装)
leak test 泄露测试	√ (产品中 含液体)	√ (产品中 含液体)	×	×	×	×
Fork lift simulation 叉车搬运模拟	×	×	×	×	×	√

Test category	测试类别	Type G Parcel delivery TV /monitor (0~150lb)
Atmospheric preconditioning 温湿度预处理		√
Atmospheric conditioning 温湿度测试		×
Compression – horizontal	水平夹持	√
Compression – vertical	垂直抗压	√

Test category	测试类别	Type G Parcel delivery TV /monitor (0~150lb)
Random vibration test 随机振动		√
Inclined or Horizontal Impact 斜面或水平冲击 (仅针对 重量范围 大于等于100磅, 至150 磅的 电视产品)		√
Drop 跌落测试		√
Concentrated edge impact 集中冲击		√



TEST PROCEDURE测试流程

Test category 测试类别	Type H LTL TV /monitor (>150lb) or Girth >165 inch.
Atmospheric preconditioning 温湿度预处理	√
Atmospheric conditioning 温湿度测试	×
tip/tip over 倾翻测试	√
Drop 跌落 (仅针对 重量范围 小于100磅的电视产品)	√

Test category 测试类别	Type H LTL TV /monitor (>150lb) or Girth >165 inch.
Rotational Flat 旋转面跌落	√
Rotational Edge 旋转边跌落	√
Inclined or Horizontal Impact 斜面或水平冲击 (仅针对 重量范围 大于等于100磅, 至150 磅的电视产品)	√
Compression horizontal 水平夹持	√



TEST PROCEDURE测试流程

Test category 测试类别	Type H LTL TV /monitor (>150lb) or Girth >165 inch.
Compression vertical 垂直抗压 按照指示方向。	√
Random vibration test 随机振动	√
Free fall drop 跌落（仅针对 重量范围 小于100磅的电视产品）	√
Inclined or Horizontal Impact 斜面或水平冲击 （仅针对 重量范围 大于等于100磅，至150 磅的电视产品）	√

Test category	测试类别	Type H LTL TV /monitor (>150lb) or Girth >165 inch.
Full rotational flat drop	完全旋转面跌落	√
concentrated edge impact	集中冲击	√

IDENTIFY FACE, EDGE AND CORNER

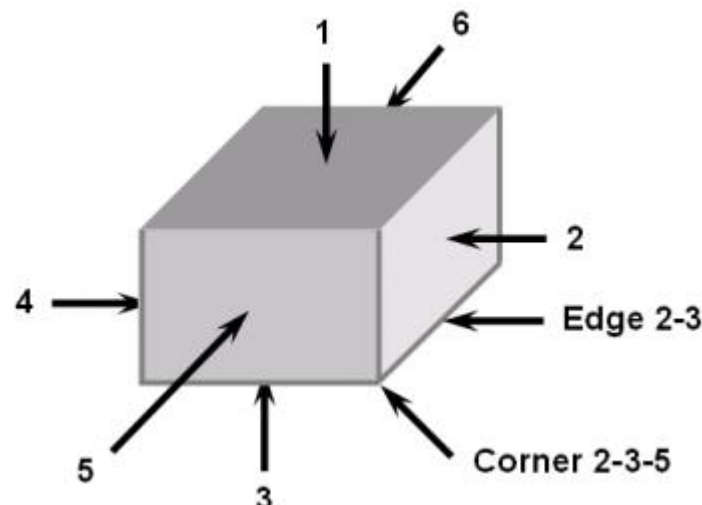
标示边角面

For type A, B, C (parcel delivery) 针对快递运输A,B,C类型

Place the packaged product in its most stable orientation-is generally with one of the largest surface down, and one of the smallest face is directly in front of you.

将包装最大面朝下放置，测试人员正对着包装最小面。接缝在右手

Individual Unit or Case



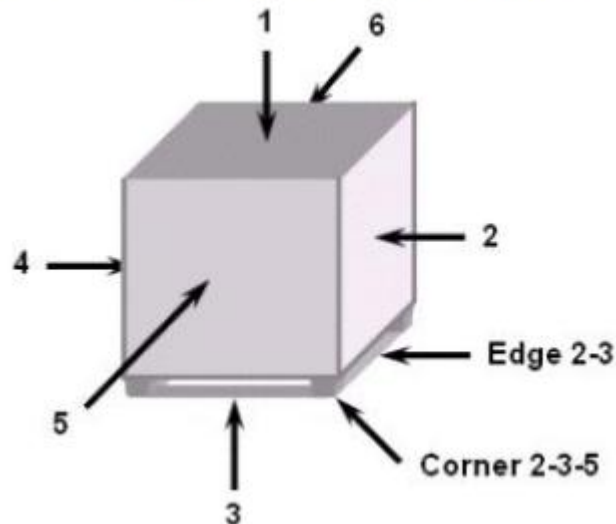


IDENTIFY FACE, EDGE AND CORNER 标示边角面

For type D, E, F (LTL delivery)
针对LTL模式的D,E,F类型

Place the packaged product in its intended shipping orientation or most stable orientation, and one of the smallest face is directly in front of you.
将包装按照运输方向或者最稳定的方向放置，然后测试人员正对着包装最小面

Unitized Load on Standard or Custom Pallet





IDENTIFY FACE, EDGE AND CORNER 标示边角面

For type G, 针对快递运输G 类型

For TV/monitors, Place the Screen side down.
将屏幕面向向下放置。

For type G, 针对LTL 模式运输H 类型

For TV/monitors, Place packaged product in its intended shipping orientation so that the screen side of the sample will be face 4.
按照指示方向进行放置， 屏幕面成为面4。



Test Procedure for Type A

A类产品测试流程

1. Atmospheric Preconditioning

温湿度预处理

The packaged-product shall be preconditioned to laboratory ambient temperature and humidity for twelve (12) hours prior to testing.

包装产品放在实验室的温湿度环境中进行12小时预处理

B,C,D,E,F,G,H类产品也适用



Test Procedure for Type A

A类产品测试流程

2. Atmospheric Conditioning (optional)

温湿度测试（可选-不需要测试）

Optional Conditions	Time in Hours	Temperature in °C ±2°C (°F ±4°F)	Humidity in %
Extreme Cold, Uncontrolled RH	72	-29°C (-20°F)	Uncontrolled RH
Cold, Humid	72	5°C (40°F)	85% RH ± 5%
Controlled Conditions	72	23°C (73°F)	50% RH ± 5%
Hot, Humid	72	38°C (100°F)	85% RH ± 5%
Hot, Humid then Extreme Heat, Moderate RH	72 then 6	38°C (100°F) then 60°C (140°F)	85% RH ± 5% then 30% RH ± 5%
Elevated Temperature, Uncontrolled RH	72	50°C (120°F)	Uncontrolled RH
Extreme Heat, Dry	72	60°C (140°F)	15% RH ± 5%
Severe Cold, Uncontrolled RH	72	-18°C (0°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

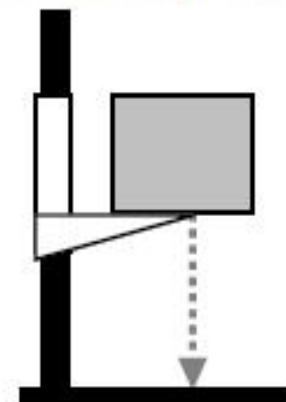
Test Procedure for Type A

A类产品测试流程

3. Drop test-first time 第一次跌落测试

Drop Number	< 70 lb (32 kg)	70-150 lb (32-70 kg)	Orientation
1	18 in (460 mm)	12 in (300 mm)	Edge 3-4
2	18 in (460 mm)	12 in (300 mm)	Edge 3-6
3	18 in (460 mm)	12 in (300 mm)	Edge 4-6
4	18 in (460 mm)	12 in (300 mm)	Corner 3-4-6
5	18 in (460 mm)	12 in (300 mm)	Corner 2-3-5
6	18 in (460 mm)	12 in (300 mm)	Edge 2-3
7	18 in (460 mm)	12 in (300 mm)	Edge 1-2
8	36 in (910 mm)	24 in (600 mm)	Face 3
9	18 in (460 mm)	12 in (300 mm)	Face 3

Free-fall drop tester



B类产品也适用,跌落高度不同, **D**类产品的跌落高度和方向都不同

BROKEN 破损



Suggestion – Change material, use plastic with good quality of strength and flexibility

更换材料，需要增加塑料包装的强度和柔韧性

SPLIT开裂



Suggestions – Reduce gap between product and package.
减少包装和产品之间的空隙

Use high viscous brown paper taper and use cross sealing method.
使用高强度的封箱胶，或者使用十字封箱方式

Fix every components.
固定内部的产品。

Puncture 刺穿



Suggestions – Wrap sharp edge and sharp point with same molded foam or other buffer material.

用成型泡沫块或其他缓冲材料包裹产品的尖角利边

Reduce carton size and fill-up the carton to avoid gap between product and carton.

减小纸箱尺寸并且填满纸箱以避免产品和纸箱之间有空隙

CASE Study 实际案例

Product 产品: Amazon 产品

Finding: Damage on plastic component after dropping test.

问题点: 跌落后造成外部塑料部件破损



CASE Study 实际案例

Product 产品: TV products

Finding: Crack was found on the screen after drop test

问题点: 跌落后造成屏幕开裂



The density of the polyfoam around the product except the corners is too high. Effect of the cushioning is not well.

CASE Study 实际案例

Product 产品: Seating set 座椅

Finding: Damage on component after bottom impact test

问题点: 底部冲击造成部件断裂



CASE Study 实际案例

Product 产品: Storage Cabinet储物柜

Finding: Deformation on the corner after drop test

问题点: 跌落后造成角落变形



CASE Study 实际案例

Product 产品：Amazon空调产品

Finding: liquid leak was found from the product after dropping test.

问题点：跌落测试后，空调产品内部有液体流出。



Test Procedure for Type A

A类产品测试流程

4. Random Vibration test随机振动测试

Face 3	60 minutes	With top load (top load refer to below, not more than 300 lbs)
Face 4	30 minutes	
Face 6	30 minutes	顶部加负重，重量不超过300lbs
Face 3	30 minutes	Without top load 不加负载



B,C类产品也适用，跟D,E,F类振的动时间和方向不同

Top Load (Lbs)=(180-H)×L×W×0.0035 (not exceed 300 lbs) 不超过300 lbs

L- length of the packaged product (inch) 包装产品的长

W- width of the packaged product (inch) 包装产品的宽

H-height of the packaged product (Inch) 包装产品的高

Test Procedure for Type A

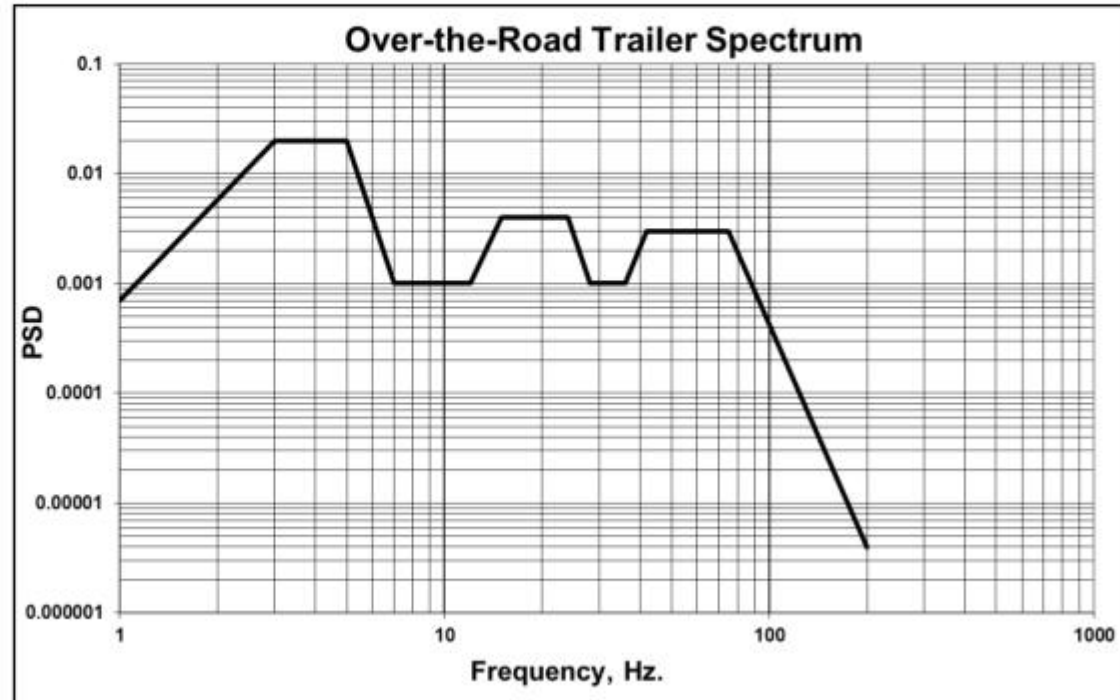
A类产品测试流程

VIBRATION SPECTRA

1. Spectra used for Type A, Type B and Type C test specimens only

The following breakpoints are for an Over-the-Road trailer typical for parcel delivery movement and shall be programmed into the vibration controller to produce the acceleration versus frequency profile (spectrum) with an overall G_{rms} level of 0.53 (see below). The theoretical stroke required to run this vibration profile is 1.855 in (47.12 mm) peak to peak:

Frequency (Hz)	PSD Level, g^2/Hz
1.0	0.0007
3.0	0.02
5.0	0.02
7.0	0.001
12.0	0.001
15.0	0.004
24.0	0.004
28.0	0.001
36.0	0.001
42.0	0.003
75.0	0.003
200.0	0.000004



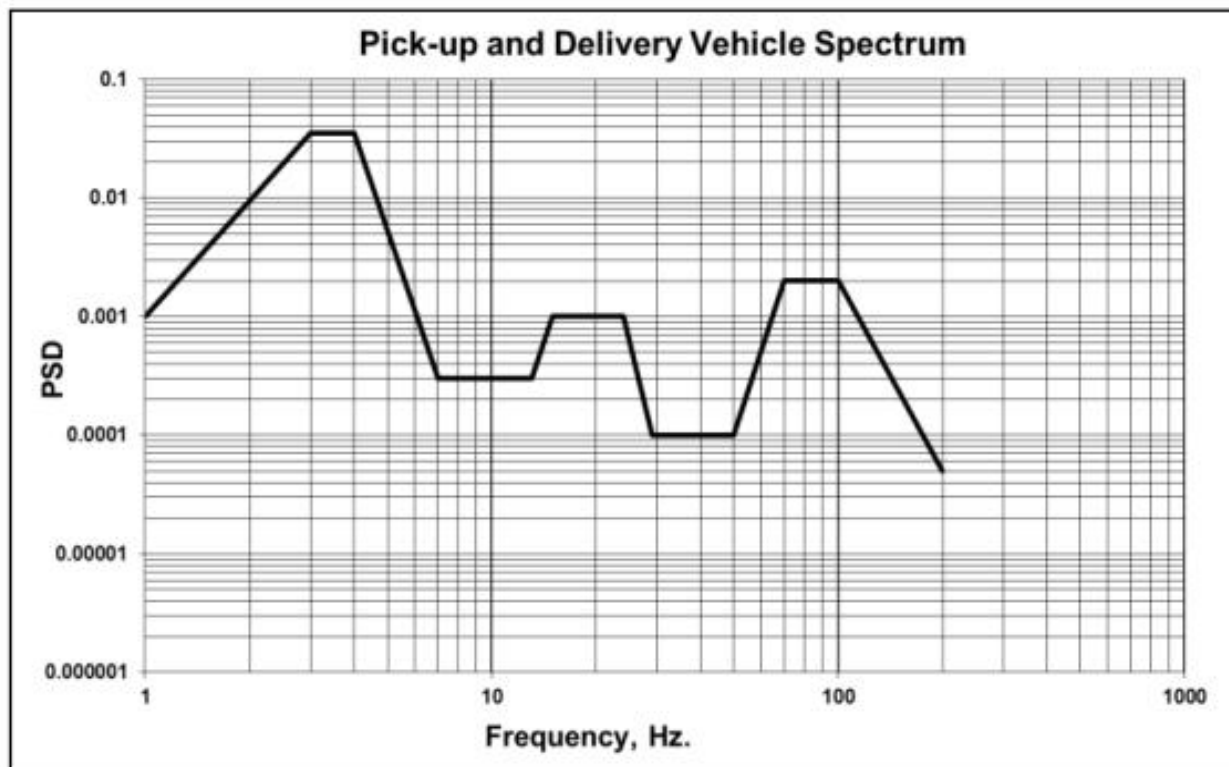
B,C类产品也适用

Test Procedure for Type A

A类产品测试流程

The following breakpoints are for a pick-up and delivery vehicle and shall be programmed into the vibration controller to produce the acceleration versus frequency profile (spectrum) with an overall G_{rms} level of 0.46 (see below). The theoretical stroke required to run this vibration profile is 2.312 in (58.72 mm) peak to peak:

Frequency (Hz)	PSD Level, g^2/Hz
1.0	0.001
3.0	0.035
4.0	0.035
7.0	0.0003
13.0	0.0003
15.0	0.001
24.0	0.001
29.0	0.0001
50.0	0.0001
70.0	0.002
100.0	0.002
200.0	0.00005



B,C类产品也适用

CASE Study 实际案例



Suggestions – The sharp edge of the slotting on the tray scratched the product. Adjust the size and shape of the slotting to avoid product contact sharp edge and make the edge smooth.

纸托开槽的边缘锋利，接触产品后导致产品磨损。建议修正开槽位置和形状大小等，避免产品接触边缘并加工边缘保持圆滑

Or, fill sponge sheet into the bottom of the tray to raise product. This can avoid product contacting the edge of the slotting and make the product more stable in the whole package.

或者在开槽底部添加珍珠棉等缓冲材料，垫高产品是其与边缘隔开并在整体包装中保持更稳定

CASE Study 实际案例

Product 产品: BBQ 烧烤炉

Finding: Screw loose after vibration test

问题点: 振动测试后螺丝松散



CASE Study 实际案例

Product 产品: Amazon 产品

Finding: crush was found on the carton box during loaded vibration test.

问题点: 负载振动过程中, 包装压垮。



CASE Study 实际案例



Suggestions - Varnish or add UV procedure. Do not use package with instable printing color to do test. Otherwise, test result will be FAIL. Ink Rub Resistance test may be required for such situation.

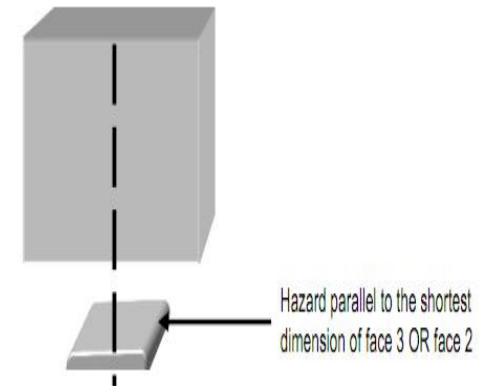
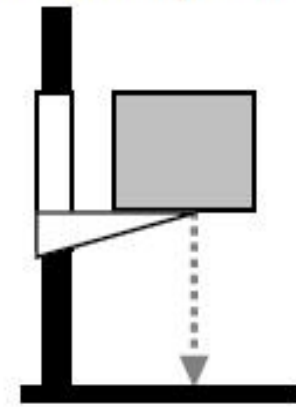
印刷表面过光油或者UV处理。送测的样品需要保证印刷效果已经稳定。否则测试结果会可能不通过，并且需要额外追加摩擦测试来评估这种状况。

Test Procedure for Type A 类产品测试流程

5. Drop test-second time 第二次跌落测试

STEP	ACTION		
1	Follow the table below to determine the height and orientation for the final set of 8 drops		
Drop Number	Drop Height		Test Specimen
	< 70 lb (32 kg)	70 - 150 lb (32 - 70 kg)	Orientation
10	18 in (460 mm)	12 in (300 mm)	Edge 3-4
11	18 in (460 mm)	12 in (300 mm)	Edge 3-6
12	18 in (460 mm)	12 in (300 mm)	Edge 1-5
13	18 in (460 mm)	12 in (300 mm)	Corner 3-4-6
14	18 in (460 mm)	12 in (300 mm)	Corner 1-2-6
15	18 in (460 mm)	12 in (300 mm)	Corner 1-4-5
16	36 in (910 mm)	24 in (600 mm)	Most critical or damage-prone flat orientation
17	18 in (460 mm)	12 in (300 mm)	Standard: Face 3 on hazard Elongated or Flat: Face 2 on hazard

Free-fall drop tester



B类产品也适用，跌落高度不同用，D类产品的跌落高度和方向都不同

Test Procedure for Type A

A类产品测试流程

6. Rotational Edge Drop 旋转边跌落测试

For elongated or flat package only 只是针对长条和扁平包装
Drop Height: 9 inch 跌落高度: 9英寸

Sequence #	Orientation	Specific edge
1	Edge	One of the longest face 3 edges
2	Edge	next longest edge radiating 90° from the edge just tested
3	Edge	The opposite edge tested in Sequence 2.



B,C,E类产品也
适用

Test Procedure for Type A A类产品测试流程

7. Full Rotational Drop Test全旋转跌落测试

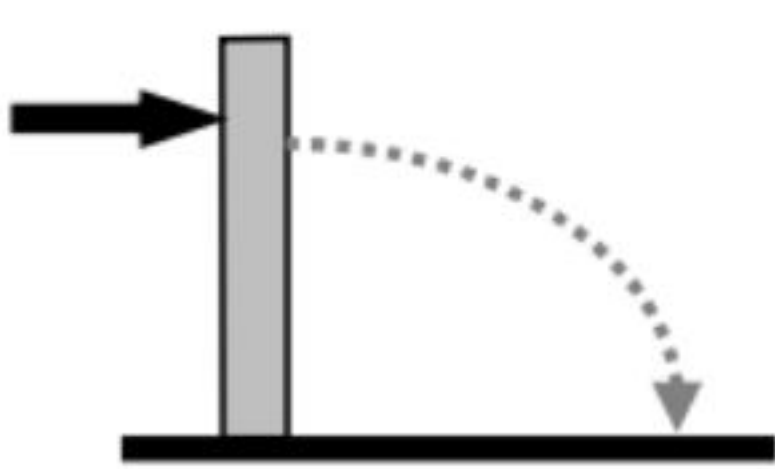
For elongated or flat package only 只是针对长条和扁平包装

- Place one of the smallest face down on the floor, push upper half of face 1 and let face 3 impact floor.

将包装最小面放置在地面，推包装上半部分，让其撞击到地面上

- Place one of the next smallest face down on the floor, push upper half of face 1 and let face 3 impact floor.

将包装第二小的面放置在地面上推包装上半部分，让其撞击到地面上



B,C类产品也适用

Test Procedure for Type A A类产品测试流程

8. Bridge Impact Test 桥式冲击测试

For elongated package only 只是针对长条包装
Drop height: 16 inch 跌落高度: 16英寸



B,C,D,E类产品
也适用

TEST PROCEDURE FOR TYPE A

A类产品测试流程

9. Concentrated Edge Impact Test集中边冲击测试

For Flat package only 只是针对扁平包装
Drop height: 16 inch 跌落高度: 16英寸



B,C,D,E,F类产
品也适用



TEST PROCEDURE FOR TYPE A

A类产品测试流程

11. Leak Test 泄露测试

Required only when liquids are present in the product 当产品中出现液体
体的时候才需要测试

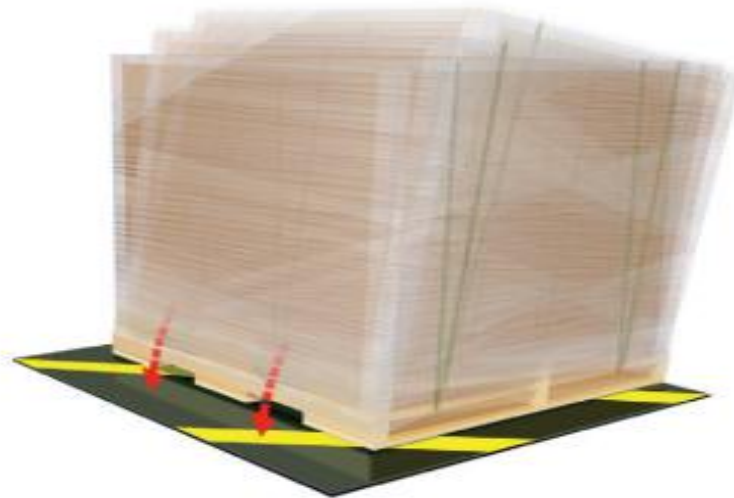
- Open the test sample and remove all primary packages that contain liquids
打开测试产品，取出所有含有液体的初始包装。
 - Place the primary package on the floor with the product horizontal
将产品水平放置在地上
 - After 8 hours, inspect the primary liquid container for any leakage.
8小时后检查是否有泄露
- All primary packages containing liquid from all 5 test samples must be leak free
所有5个产品中的液体包装产品都需要能通过测试

B类产品也适用

TIP/TIP OVER 倾翻测试

For type B, C,D,E,F
针对B, C,D,E,F

Place the packaged product on the floor in its intended shipping orientation. Tip the sample to create a 22 degree angle, then release, perform test in 4 potentially unstable directions. 将包装按照运输方向放置，并使其倾斜22度角，然后释放。所有4个可能翻倒的方向都测试



DROP TEST-跌落测试

For type D-first time D类型的第一次跌落

Perform 6 drop tests of the individual case or unit, in accordance with the table below and in the order listed.

Drop Number	Drop Heights	Orientation of Drop
1	12 in (300 mm)	Face 1
2	12 in (300 mm)	Face 2
3	12 in (300 mm)	Face 6
4	12 in (300 mm)	Corner 2-3-5
5	12 in (300 mm)	Edge 3-4
6	18 in (460 mm)	Face 3

跌落方向和高度都不同
于A,B类产品

DROP TEST跌落测试

For type D-second time D类型的第二次跌落

Step	Action		
1	Perform 6 drop tests of the individual case or unit, in accordance with the table below and in the order listed.		
	Drop Number	Drop Heights	Orientation of Drop
	1	18 in (460 mm)	Edge 2-3
	2	18 in (460 mm)	Corner 3-4-6
	3	18 in (460 mm)	Edge 4-5
	4	18 in (460 mm)	Corner 1-4-6
	5	18 in (460 mm)	Edge 1-6
	6	32 in (810 mm)	Face 3

跌落方向和高度都不同
于A,B类产品

ROTATIONAL FLAT DROP 旋转面跌落

For type C,E,F
针对类型C, E,F

Drop Height: 9 inch 跌落高度: 9英寸

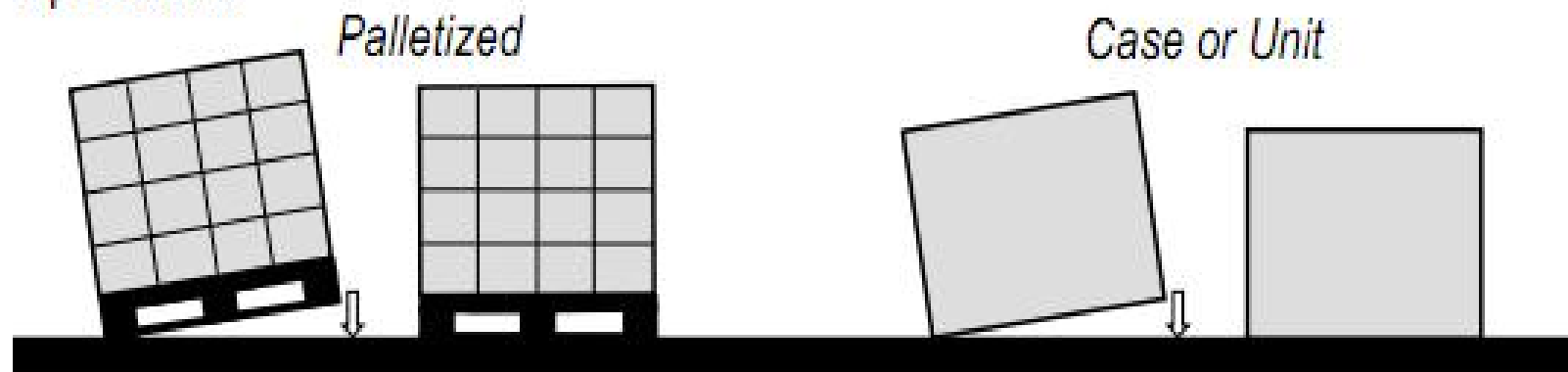
For type C,E. do tests on face 3,2,6 of 2 adjacent edges

针对类型C和E, 在3,2,6 面的相邻2边上测试

For type E, do tests on face 3 of 2 adjacent edges

针对类型E, 在3面的相邻2边上测试

if possible.



For type F
针对类型F

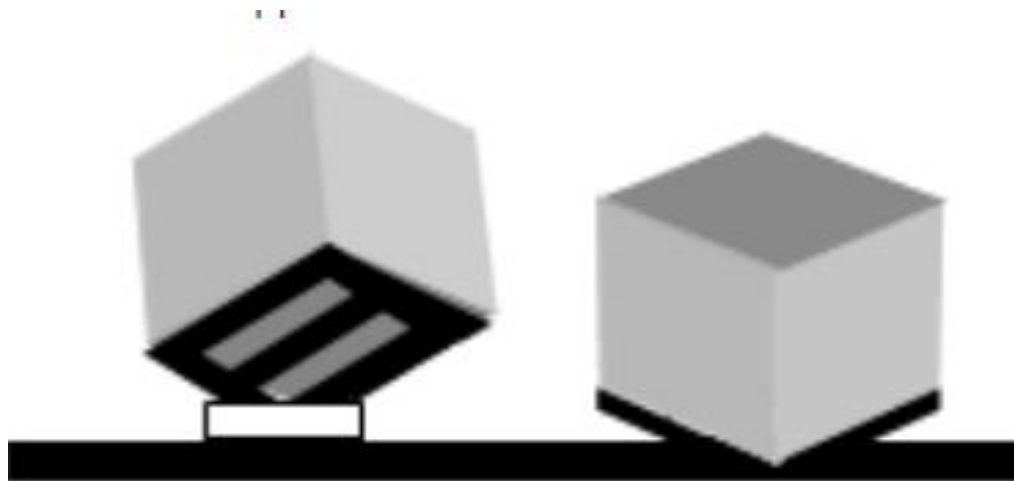
ROTATIONAL CORNER DROP 旋转角跌落

Drop Height: 9 inch

跌落高度： 9 英寸

Do tests on face 3 of 2 adjacent corners

在 3 面的 2 个相邻角上测试



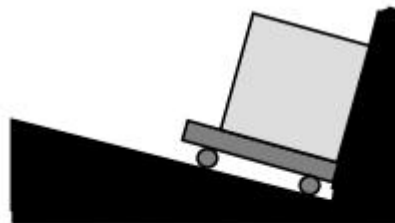
INCLINE IMPACT TEST 斜面冲击测试

For type C,E,F
针对类型C,E,F

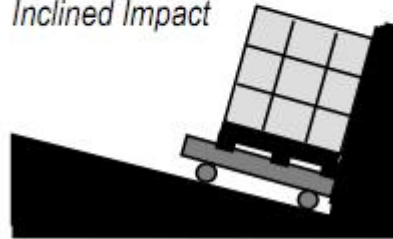
Impact velocity: 48 inch/sec 冲击速度: 48 英寸每秒

For type C,E, do tests on all faces 针对类型C,E, 测试所有面

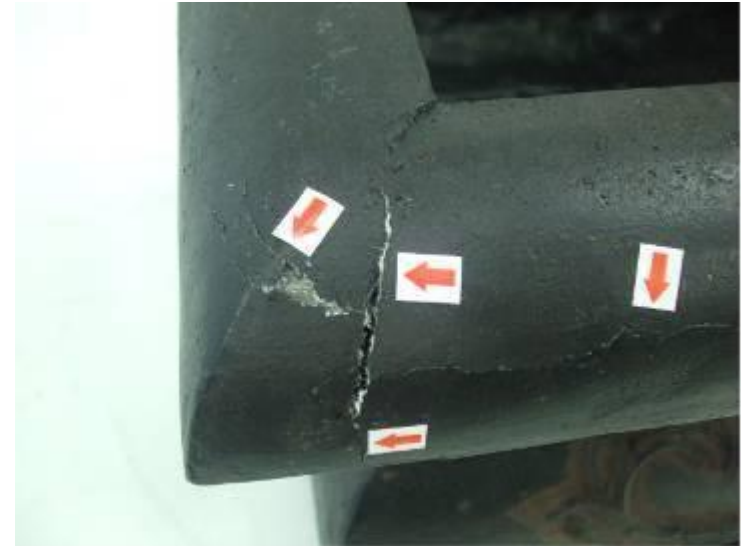
For type F, do tests on face all vertical faces 针对类型F,测试所有侧面



Inclined Impact



BROKEN 破损



Suggestion – Use cushioning materials and paper angle beads to protect fragile corners and edges.

使用缓冲材料，或者使用纸护角去保护易碎的边角位置

For type B,C,D,E,F 针对类型B,C,D,E,F

- Place the packaged product in its intended shipping orientation or most stable orientation 将包装产品按照运输方向或者最稳定的方向放置
- For type F, place a standard pallet on the top, or a custom pallet if custom pallet used during test. 针对Type F, 测试的时候需要在产品顶部加一个托盘

➤ $\text{Test Force} = [(H-V) / V \times Wt \times M]$

H 堆叠高度, 如果包装有标示最高堆叠高度, 按照提供的高度, 否则统一按照144inch 的高度, 不要超过144inch .

V-包装高度

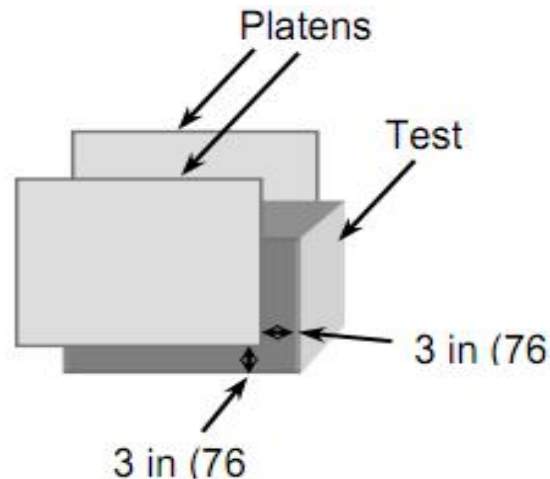
Wt-包装重量 M-安全系数



COMPRESSION – HORIZONTAL 水平夹持

For type B,C,D,E

- Offset 3 inches from bottom and front 包装的前端和下端需要留出3英寸
 - **Test force (lbs) = $4 \times Wt$ (minimum: 200 lbs, maximum: 2000 lbs)**
计算的力值最小不低于200磅，最大不超过2000磅)
- Clamp and raise the sample 12" off the floor and maintain for 30 sec, then lower test sample and release, repeat for total 5 cycles 夹持然后提升12英寸，然后保持30秒，然后降低释放，重复测试5次循环
- Distance between 2 platen should be between 24 inch and 75 inch 针对包装水平方向的尺寸在24英寸和75英寸之间的需要测试。



Deformation 变形



Suggestion 改进建议



Suggestions - Change materials, use carton with good quality with higher bursting strength and grammage. Add paperboard into the carton.

更换纸箱材料，选用耐破度以及克重高一些的纸箱，内部增加可以承重的纸板。

BROKEN 破损



Suggestion – Use corner posts to withstand force. Please refer to next page for improvement pictures.

使用纸护角承重。请见下页的改进参考图片

Deformation 变形



Suggestion 改进建议



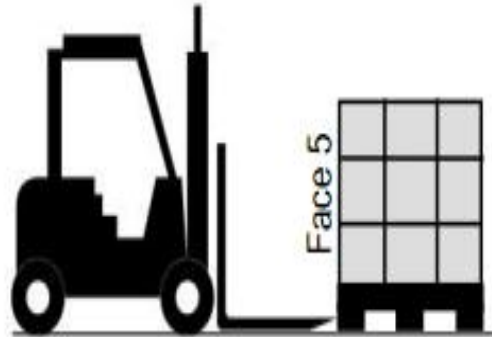
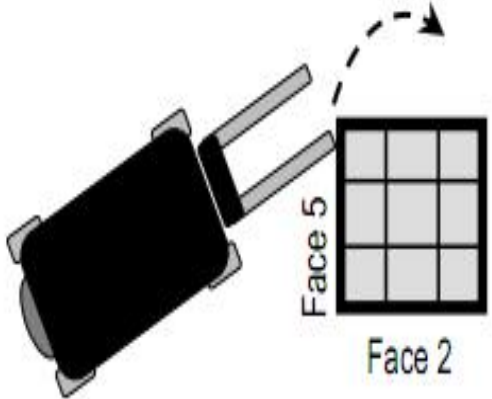
Use corner posts to withstand force / 在横向和纵向的边上增加纸护角

Fill-up the carton, avoid gap / 保证纸箱填满，不要留有空隙

The packaging also needs to be reinforced in the middle to withstand the force when the top size is very large.

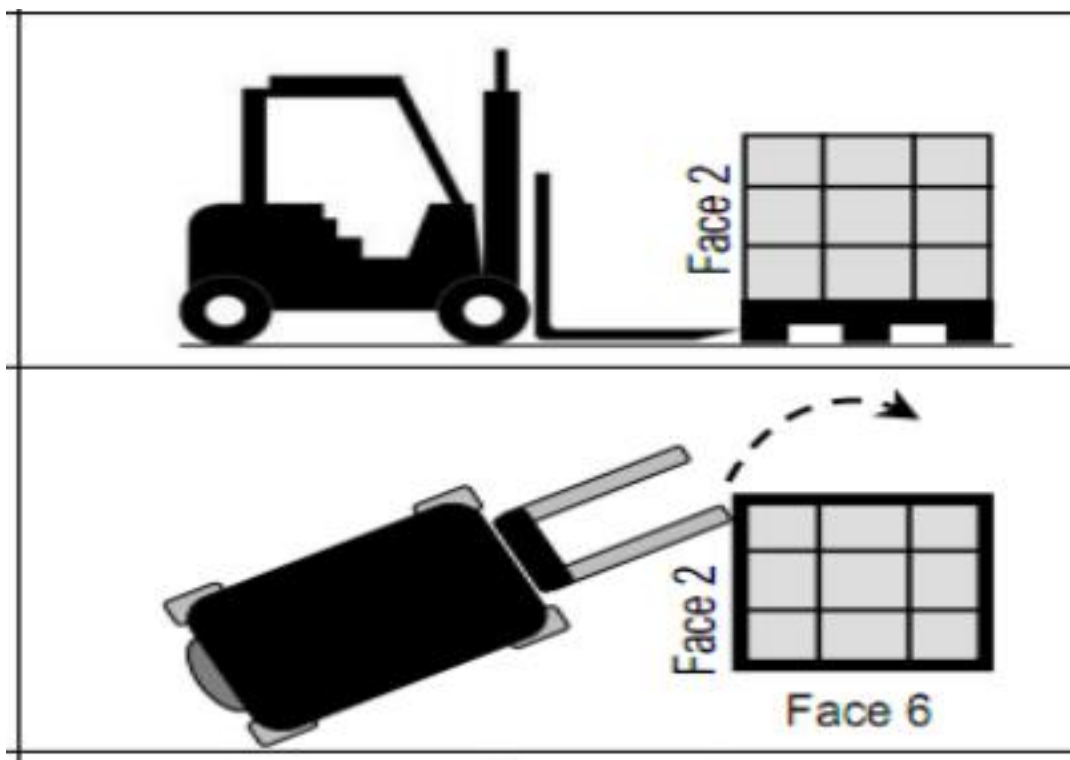
如果包装顶部尺寸很大，需要在中间位置增加纸护角类。

For type F 针对类型F

<p>Starting with the blade tip touching the stringer or block nominally half way up its vertical height, push the pallet/skid straight forward a minimum of 40 in (1 m). Push the required distance in approximately 2 to 3 seconds.</p>	
<p>Contact the pallet/skid with one fork blade at corner 3-4-5. Do not lift the pallet/skid.</p>	
<p>Using the fork blade, rotate the pallet/skid 90 degrees from its original orientation.</p>	

For type F 针对类型F type F

Then repeat on other vertical faces 2, 4, 6



For type F

Elevated push and pull tests

1. Use fork lift to lift the edge a minimum 4 inch of the floor, then **push** the pallet straight forward a minimum of 40 inches distance in 2 to 3 seconds
2. Use fork lift to lift the edge a minimum 4 inch of the floor, then **pull** the pallet straight forward a minimum of 40 inches distance in 2 to 3 seconds
3. Then repeat above for all other possible directions of entry of the pallet.



RANDOM VIBRATION TEST随机振动

For type D,E 针对类型D,E

- With top load (top load refer to below, not more than 600 lbs)
 face 3 on the table: 80 minutes
 face 4 on the table: 80 minutes
 face 6 on the table: 80 minutes



Total Theoretical Top Load Formulas		English Units (in), Load Results in lb	Metric Units (m), Load Results in kg
Theoretical Top Load with face 1 or face 3 down		$(108 - H) \times L \times W \times 0.0035$	$(2.7 - H) \times L \times W \times 96$
Theoretical Top Load with face 2 or face 4 down		$(108 - W) \times L \times H \times 0.0035$	$(2.7 - W) \times L \times H \times 96$
Theoretical Top Load with face 5 or face 6 down		$(108 - L) \times W \times H \times 0.0035$	$(2.7 - L) \times W \times H \times 96$
Where	Represents		
108 and 2.7	Height of typical trailer or ocean container	Inches (in)	Meters (m)
L	Length of shipping unit (test item)	Inches (in)	Meters (m)
W	Width of shipping unit (test item)	Inches (in)	Meters (m)
H	Height of shipping unit (test item)	Inches (in)	Meters (m)
0.0035 and 96	Dynamic loading factor: 50% of the average static density of freight	0.0035 lb/in ³	96 kg/m ³

RANDOM VIBRATION TEST随机振动

For type F 针对类型F

1. With top load (top load refer to below, not more than 600 lbs)
face 3 on the table: 240 minutes

Total Theoretical Top Load Formulas		English Units (in), Load Results in lb	Metric Units (m), Load Results in kg
Theoretical Top Load with face 1 or face 3 down		$(108 - H) \times L \times W \times 0.0035$	$(2.7 - H) \times L \times W \times 96$
Theoretical Top Load with face 2 or face 4 down		$(108 - W) \times L \times H \times 0.0035$	$(2.7 - W) \times L \times H \times 96$
Theoretical Top Load with face 5 or face 6 down		$(108 - L) \times W \times H \times 0.0035$	$(2.7 - L) \times W \times H \times 96$
Where	Represents		
108 and 2.7	Height of typical trailer or ocean container	Inches (in)	Meters (m)
L	Length of shipping unit (test item)	Inches (in)	Meters (m)
W	Width of shipping unit (test item)	Inches (in)	Meters (m)
H	Height of shipping unit (test item)	Inches (in)	Meters (m)
0.0035 and 96	Dynamic loading factor: 50% of the average static density of freight	0.0035 lb/in ³	96 kg/m ³

RANDOM VIBRATION TEST 振动测试

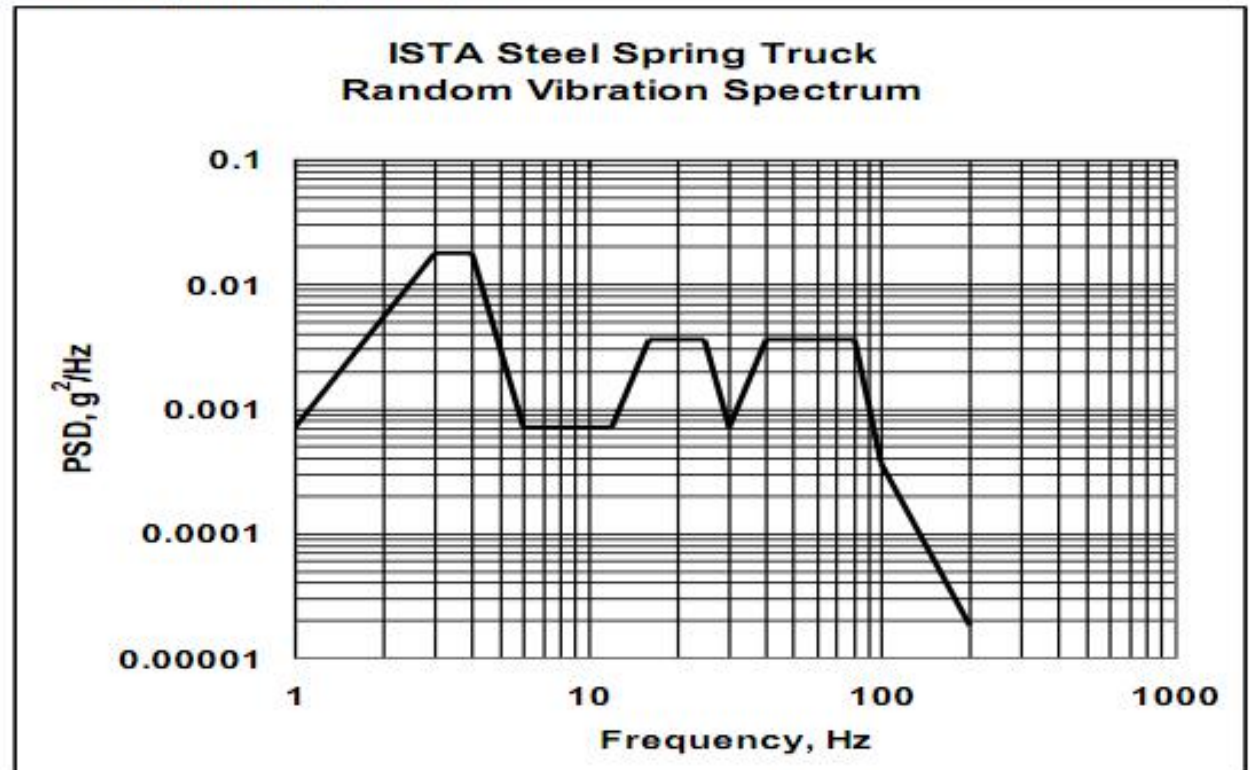
For type D,E,F 针对类型D,E,F

Spectra used for Type D, Type E and Type F test specimens only

The acceleration vs. frequency spectrum to be used for the random vibration tests is shown below. The overall Grms is 0.54 and the theoretical stroke required is 1.777 in (45.13 mm) peak to peak.

Frequency (Hz)	PSD (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

RATION TOP LOAD



THANK YOU !

