

**THE VOLLRATH COMPANY, L.L.C.**  
**沃华夫有限公司**  
**VOLLRATH SYSTEM WORK INSTRUCTION**  
**沃华夫作业指导书**

<b>SUBJECT 主题</b>  Packaging Test Procedure for Purchased Products 已购产品的包装测试程序		<b>VSWI NUMBER 作业指导书号</b>  VSWI 742.1
		<b>PAGE 页数</b> 1 of 19 共 19 页/第 1 页
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**1.0 PURPOSE**

**目的**

This purpose of this document is to provide general guidelines and information to test and qualify packaged components, accessories and finished products. The tests described herein have been designed to ensure that the packaging used for Vollrath Company products will provides sufficient protection from the hazards encounter in transportation, storage and distribution shipping to the final customer.

本文件旨在为已装箱的零件、部件以及成品提供全面的测试与认证指南和信息。在此所述的测试是被设计用来确保用于沃华夫公司的产品包装能够在运输、存放以及分销运输到终端客户过程中遇到危险灾害时，能够为产品提供足够的保护。

**2.0 SCOPE**

**范围**

This procedure applies to all packaging used by The Vollrath Company for shipping palletized product and non-palletized product thru all distribution environments. Combinations of tests described are used during initial package design and package qualification. Tests are to be performed in the order that they are listed in this specification. Exceptions to this procedure will be documented in the Purchase Order Process. All exceptions to this procedure must be approved by Vollrath Purchasing.

本程序对于沃华夫公司所有分销区域内，使用托盘运输以及非托盘运输的产品包装都适用。组合的测试在最初的包装设计与认证的时候就已开始使用，定单中要求完成的测试在本标准中有罗列。本程序的例外情况在订单流程中有记录，所有的例外情况必须获得沃华夫采购部的认可。

This document shall be used world-wide by Vollrath engineers, product teams, suppliers, OEM's (Original Equipment Manufacturers), and others that design, test, qualify and/or approve Vollrath packaging for shipment.

全球范围内的沃华夫工程师、产品组、供货商、代工（原始设备制造商），用于沃华夫运输包装的设计、测试、认证和/或批准都应当使用本文件。

Any questions or concerns about this document, tests to be conducted, test levels and acceptance criteria should be directed to Vollrath Purchasing or Quality Assurance, who will then escalate to Engineering, as necessary.

对本文件、所需执行的测试，测试级别，以及验收标准等有任何疑问或疑虑，都应当由沃华夫采购或质量保证部相关人员，甚至必要的时候将由工程部来进行指导。

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### 3.0 REFERENCED DOCUMENTS

#### 参考文件

The following documents form a part of this specification to the extent specified herein.

下述的文件在某种程度上构成了本规范的一部分。

ASTM D642 Test Method for Determining Compressive Resistance of Shipping Containers, Components, and Unit Loads, American Society for Testing and Materials

ASTM D642 货运包装箱、组件和成组组装运抗压能力的测试方法，美国材料实验协会

ASTM D 880 Test Method for Impact Testing for Shipping Containers and Systems, American Society for Testing and Materials

ASTM D 880 货运包装箱和系统抗压能力的测试方法，美国材料实验协会

ASTM D951 Standard Test Method for Water Resistance of Shipping Containers by Spray Method, American Society for Testing and Materials

ASTM D951 货运包装箱耐水性的标准喷淋测试方法，美国材料实验协会

ASTM D996 Terminology of Packaging and Distribution Environments, American Society for Testing and Materials

ASTM D996 包装及分销环境术语，美国材料实验协会

ASTM D999 Test Methods for Vibration Testing of Shipping Containers for Shipping Containers and Systems, American Society for Testing and Materials

ASTM D999 货运包装箱和系统震动测试方法，美国材料实验协会

ASTM D4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing, American Society for Testing and Materials

ASTM D4332 试验用调节包装箱、包装件或包装元件的标准操作规程，美国材料实验协会

ASTM D4728 Test Method for Random Vibration Testing of Shipping Containers, American Society for Testing and Materials

ASTM D4728 货运包装箱随机震动测试方法，美国材料实验协会

ASTM D5276 Test Method for Drop Test of Loaded Containers by Free Fall, American Society for Testing and Materials.

ASTM D5276 使用自由落体法的载货包装箱落体试验的测试方法，美国材料实验协会

### 4.0 TERMINOLOGY

#### 术语

4.1 Definitions—General definitions for the packaging and distribution environments are found in Terminology ASTM D996.

定义——包装及分销环境术语的一般定义可在 ASTM D996 的术语中找到。



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## 5.0 SIGNIFICANCE AND USE

### 重要性和使用

This procedure provides a guide for the evaluation of Vollrath packaging in accordance with a uniform system, using established test methods at levels representative of those occurring in actual distribution. The recommended test levels are based on available information on the shipping and handling environment, and current industry/government practice and experience. These tests should be performed sequentially on the same package/Shipping Unit in the order given.

本规程依照统一的系统，提供了沃华夫包装的评估指南，使用已建立的不同级别的测试方法来对可代表实际情况进行测试。推荐的测试级别是基于已有的运输和操作环境信息，以及当前的行业/政府惯例和经验而定的。

应当按已给定的顺序要求对相同的包装/运输件进行测试。

For use as a performance test, this procedure requires that the package/Shipping Unit tested remain unopened until the sequence of tests is completed.

若用于性能测试，本程序要求已测试的包装/运输件 在完成要求的全部测试之前保持不开封状态。

If used for other purposes, such as package development, it may be useful to open and inspect shipping units at various times throughout the sequence. This may, however, prohibit evaluating the influence of the container closure on container performance.

若用于其它目的，如包装开发，有可能在测试顺序过程中多次要求打开运输件并进行检查，不管怎样，这都有可能影响到包装箱性能中对包装摇盖的评估。

## 6.0 SHIPPING UNIT CLASSIFICATION

### 运输件分类

**6.1 Shipping unit type:** The levels of stress encountered by the package in the distribution environment depend on both the distribution environment and the packaging shipping unit type.

运输件类型：包装所处的分销环境所受压力的级别由分销环境和成组装运的运输件的包装来决定。

**6.2** The Vollrath Company has identified three major shipping unit types as follows:

沃华夫公司已认可了下述的三种主要运输件类型：

- Type 1 (Single – Non Palletized Products (Master Pack))
- 类型 1 ( 单件——非托盘运输类产品 ( 外箱包装 ) )
- Type 2 (Single Palletized/Crated Heavy Products)
- 类型 2 ( 单托盘装运/板条箱包装的重型产品 )
- Type 3 (Multiple Product Unitized/Palletized Products – including bulk packs)
- 类型 3 ( 单元化包装产品/托盘装运产品——包括散货包装 )

A product may have several shipping unit types, each for a different portion of its distribution. All must be evaluated. Each shipping unit design to be tested must be classified according to one of the following Type definitions.

一个产品可能会包括多个运输件类型，而每一种都可能是用于不同的分销环境，所有的情况都必须进行评估。所有运输件设计的测试都必须按下述类型的定义进行分类。

**6.2.1 TYPE 1: Single or multiple products boxed - Non-Palletized (Master Pack):** Can be carried by one or two people. An individually packaged product which could be shipped as a single unit to an end user is defined as type 1, even if the packaged product moves in pallet load quantities

during a portion of its physical distribution. This class also represents multiple, like units, combined in a single shipping container, typically non-palletized.

**类型 1：单个或多个盒装产品——非托盘装运（外箱包装）：**必须由一个或两个人搬运，即使包装好的产品，在装卸过程中可能会在托盘上移动，所有单独包装的，且能够作为一个单品发运到终端客户手中的产品都被定义为类型 1。该类型同时也可代表多个，如多件，组合在单个的船运包装箱内的产品，通常为非托盘运输产品。

**6.2.2 TYPE 2: Single Product- Palletized:** This class represents the individual product, packaged or prepared for shipment such that it would only be handled by mechanical equipment and could not normally be carried by two people. Type 2 shipping units could include individually palletized product (i.e., cushioned pallet) or a large cabinet type product shipped unpackaged which would not realistically be carried by two people.

**类型 2：单品——托盘装运：**本类型代表的是单个，已包装好或备好用于运输的产品，如必须由机械设备而不仅仅是由两个人就能够搬运的产品。类型 2 运输件可包括单个托盘装运的产品（如：带垫托盘）或通常不能由两个人能够搬运的未包装的大型柜式产品。

**6.2.3** A special case exists for type 2 units. It is recognized that if a type 2 unit is relatively small or lightweight, it will likely not be handled mechanically but rather manually, similar to a type 1, during its distribution. Therefore if a type 2 unit weighs less than 150 pounds (68 kg), it is to be tested according to the methods, orientations and levels specified for a type 1 shipping unit.

类型 2 有一种特殊的情况，也就是说如果类型 2 单品相对较小或较轻，通常不由机械设备而是人工来进行操作，在其分销环境中与类型 1 的处理相似，因此如果类型 2 单品重量低于 150 磅（68 公斤），则应当按照类型 1 中运输品所述的方法，定向和确定测试级别来进行测试。

**6.2.4 TYPE 3: Multiple products - Unitized/Palletized on pallet:** This class represents multiple products which are unitized and shipped only on pallets. This classification would include “bulk packed” products. “Bulk pack” packaging refers to a design which holds and transport multiples of the same product, shipped as a whole unit, on pallets. Unlike a pallet load of boxed units, where an individual unit could be withdrawn from the unitized load and shipped by itself, a bulk packed unit cannot be shipped in any other configuration. Protection from the distribution environment exists only in the conglomerate bulk pack, as opposed to individual protection around each product. Bulk pack shipping units require mechanical handling and cannot realistically be carried by two people.

该类代表的是多个被成套包装并用托盘运输的产品，这一类也包括“散货包装”的产品。“散货包装”指的是在运输过程中，多个相同的产品放置在同一个托盘上作为一个整体进行运输。与装在同一托盘上的装箱产品不同，单件的产品可以从中取出来，并进行单独运输，而散货包装中的产品则不能抽出来并以其它任何的形式进行运输。这能够为多个产品装在一起的散货在分销环境中提供保护，而不是单独对每一个产品提供保护。散货需要用机械设备来装卸，而在实际情况下则不能由两个人来搬运。

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## 7.0 TEST SPECIMEN

### 测试样件

Test specimens consist of representative samples of a complete shipping unit, including actual contents. Products with blemishes or minor defects may be used if the defective component is not to be studied by the test and if the defect is documented in the report. Dummy test loads are acceptable if testing the actual

product might be hazardous. If a dummy load is used, it should be instrumented to determine if the fragility level of the actual product has been exceeded. Take care to duplicate the load characteristics of the actual product, and avoid unnecessary pre-handling.

测试样件由能够完整代表运输件的样本来组成，包括实际包装内的产品，有瑕疵或少量缺陷的产品，如果测试不对该缺陷部件进行检查，或该缺陷在报告中有述，则该产品尚可使用。如果测试对实际的产品有危害，则可接受模拟测试。如使用了模拟荷载，则应当用仪器装备来确定是否超过了实际产品易碎性的要求。

Care must be taken to ensure that no degradation has occurred to either the product or the package if the test packages have been shipped to the test site. If any doubt exists as to the condition of the package, repack the product in new packaging material before testing.

如果测试包装运到测试场内，则必须小心操作以确保产品和包装未变差。若对包装的情况有任何的疑虑，则应当在测试前重新将产品放入新的包装内再进行测试。

The number of test replications depends on the desired objectives of the testing and the availability of duplicate products and shipping containers. Replicate testing is recommended to improve the reliability of the test results.

测试的重复次数取决于测试的预期目标，以及可以获得的存货和货运包装箱数量。建议进行重复测试以改进测试结果的可靠性。

## 8.0 SPECIFIC TESTS AND TEST LEVELS

### 具体的测试与测试级别

The package must provide acceptable levels of product protection from the distribution environment. Establishing appropriate packaging tests and test levels will help minimize distribution damage.

包装在分销环境中必须能够为产品提供可接受的保护级别，建立适当的包装测试和测试级别可以令危害降到最小。

Vollrath manufactures a variety of products that range in size, weight, and price. The determination of the appropriate test levels is ultimately determined by the Vollrath Company. Several products may have specific additional tests and unique requirements beyond what is covered in this document. Those specific tests required and the test levels are ultimately determined and established by the responsible Vollrath Company.

沃华夫公司生产各种各样的不同大小、重量以及价格的产品，故最后将由沃华夫公司来确定适合的测试级别。

不同的产品可能会要求做额外特定的测试，并满足本文件当中所涵盖的独特的要求。沃华夫公司负责创建这些特定的测试和测试级别，并最终做出决定。

Whenever possible, it is highly recommended to compare the type and quantity of damage that occurs during package testing with the damage that occurs during actual distribution for similar products. That information can be very useful to help determine appropriate packaging tests and test levels for Vollrath's different products and multiple distribution environments.

在可能的时候，强烈建议对包装测试过程中导致的损坏数量及类型与类似产品实际运输过程中出现的损坏情况进行比较。这些信息对于帮助沃华夫对不同的产品以及多种分销环境情况下，确定适当的包装级别是非常有用的。

The test levels specified in this document are based on Vollrath experience, current industry standards and Vollrath competitors' benchmarking information. A more severe test level can be used to lower probability of damage occurrence but usually means higher packaging and logistics costs. Likewise, a test level that is set too low has the potential for higher product damage, higher product return costs and increased customer dissatisfaction.

本文件中所述的测试级别是基于沃华夫的经验，现行的行业标准和沃华夫竞争对手标杆管理信息而来的。可以对危害发生概率较低的产品使用一个更为严格的测试级别，但这通常意味着包装要求和物流成本的增加。同样的，对危害发生概率较高的产品测试级别设置过低，则意味着更高的产品退货并导致客户不满意程度的增加。

## 9.0 TEST SCHEDULE

### 测试一览表

The tests and limits described in this document are designed to evaluate a packaged product's ability to withstand specific levels of dynamic and static stresses it may experience in the distribution environment. However, it does not evaluate package performance relative to unusual and unexpected environmental conditions (i.e., long-term outdoor storage conditions, punctures from lift truck forks, accidental drop from the rear of a truck during transit, etc.). The fragility of the bare product is also a factor in the product's ability to survive the distribution environment and arrive at the final customer without degradation or damage.

本文件中所述的测试以及限制是设计来评估包装产品的性能是否能够承受有可能在分销环境中所遇到的，特定级别的动应力和静应力。然而，这些测试并不能评估在异常或意外环境下包装性能的情况（如：长期户外堆存情况，被叉车刺穿，在运输过程中意外地从卡车的后部跌落下来等）。而裸机的易碎性对于产品在不同分销环境中保存完好的性能，以及在到达终端客户手中时包装未变差或受损来说也是一个影响因素。

The purpose of these tests is to simulate dynamic and static stresses, which can occur in the distribution and warehouse/storage systems. The following test sections will provide the appropriate test method and recommended minimum test levels. Tests are to be used as the final validation of a package design as deemed appropriate for the packaging shipping unit type and the planned/intended distribution system.

这些测试的目的是模拟产品在分销，库房/库存系统中所受到的动应力和静应力，接下来的章节将会提供适当的测试方法与建议的最低测试级别。测试可用来对最终产品设计进行确认，也可以用来确定已计划的/预期分销系统中使用的运输件包装类型的恰当性。

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The test schedule and tests to be preformed are:

测试一览表与待实施的测试有：

### Test Schedule

#### 测试一览表

<b>No</b> 编号	<b>Test Name</b> 测试名称	<b>Shipping Unit Classification</b> 运输件分类	<b>ASTM Test Method</b> 美国材料实验协会 测试方法
13	Impact/Free Fall Drop 冲击/自由落体测试	Type 1 类型 1	D880
14	Compression 抗压测试	Type 1, 2 & 3 类型 1、2 和 3	D642
15	Random Vibration 随机震动测试	Type 1 类型 1	D4728
16	Fixed Displacement Vibration 固定振幅测试	Type 2 & 3 类型 2 和 3	D999
17	Rotational Edge Drop 旋转边跌落测试	Type 2 & 3 类型 2 和 3	D6179 Method A D6179 中方法 A
18	Rotational Corner 旋转角跌落测试	Type 2 & 3 类型 2 和 3	D6179 Method B D6179 中方法 A
19	Rotational Flat Drop 旋转平落测试	Type 2 & 3 类型 2 和 3	D6179 Method C D6179 中方法 C
20	Tip Test 倾斜测试	Type 2 & 3 类型 2 和 3	D6179 Method F D6179 中方法 F
21	Tipover 翻倒测试	Type 2 & 3 类型 2 和 3	D6179 Method G D6179 中方法 G
22	Field Test 实地试验	Type 1, 2 & 3 类型 1、2 和 3	Optional 可选



## 10.0 CONDITIONING

### 情况

- 10.1** Conduct the test at standard conditions and compensate for the effects of any climatic condition. Condition the shipping units to a standard atmosphere of  $73.4 \pm 2^{\circ}\text{F}$  ( $23 \pm 1^{\circ}\text{C}$ ) and  $50 \pm 2\%$  relative humidity. Condition fiberboard/corrugated containers in accordance with Practice D4332. The same atmospheric condition should be used for each test procedure. A conditioning period of 72 hours or sufficient time to reach equilibrium of all parts of the package and product is recommended. Tests should be conducted in the conditioned atmosphere whenever possible. If not possible, conduct the tests as soon after removal from the conditioning atmosphere as practicable. Recondition the shipping units to the standard atmosphere as necessary during the test plan.

测试应当在标准的情况下进行，并对任何气候条件下的影响作出补偿，将运输件置于  $73.4 \pm 2^{\circ}\text{F}$  ( $23 \pm 1^{\circ}\text{C}$ ) 的标准大气温度和  $50 \pm 2\%$  的相对湿度的情况下。按 D4332 中的要求调整纤维板/瓦楞纸包装箱，在每一个测试过程中都应当使用相同的大气状况，建议调节大气时间应持续 72 小时或足够长的时间，以使所有的包装和包装内的产品同处于相同的大气状况之下。在任何可能的情况下，测试都应当在经过调整的大气状况下进行，如没有可能，则测试应当在移出已调整大气状况后尽快进行。在测试计划中，必要的时候应当对运输件重新进行调整。

- 10.2** In some circumstances, it may be necessary to conduct some or all of the tests at special climatic conditions, such as those given in Practice D4332, or Test Method D951, or others (salt, spray, water immersion, humidity, or temperature).

在某些情况下，有必要在特殊天气条件下进行部分或所有的测试：如在 D4332 或 D951 中所述，或其它的（盐雾、喷淋、水浸、湿度或温度测试）测试方法。

## 11.0 ACCEPTANCE CRITERIA

### 验收标准

- 11.1** The package must provide acceptable levels of product protection from the distribution environment and also withstand storage stresses. This section provides a basis for determining what constitutes damage or failure of both the product and the package.

包装必须能够为产品在分销环境中提供认可的产品保护，并能承受存放时产生的压力，本章为确认构成产品和包装损害或失效的情况提供了一个基础。

- 11.2** The representative from the Vollrath Quality Assurance department will establish specific acceptance criteria prior to EACH test procedure. The acceptance criteria must be suitable for their purpose, considering the required condition of both the product and package upon receipt to the final customer. Below are some guidelines for defining PRODUCT and PACKAGING damage.

在每一个测试程序之前，来自沃华夫质量保证部的代表都会创建一个特殊的验收标准。该验收标准必须要考虑到产品和包装到达终端用户时的要求，并与其目标相当。下面是一些产品和包装损坏情况定义的指南。

**11.3 PRODUCT DAMAGE:** this can be any condition which causes the product not to meet its performance specifications. It includes both structural and cosmetic damage which makes the product unacceptable to the customer. It is recommended the same standards for final inspection during manufacturing be used to determine acceptable levels of cosmetic damage. Examples of general acceptance criteria are as follows:

**产品损坏：**这有可能是任何导致产品无法达到其性能规格的情况，这包括不被客户接受的结构和外观的损坏。建议在制造过程中作终检的时候使用相同的标准，以确定外观损坏的验收级别。一般的验收标准范例如下：

- Product is damage-free; no structural damage including no detached, loose, fractured or deformed materials beyond allowable manufacturing tolerances.
- 产品无损坏；无结构性损伤，包括无拆开、松动、断裂或超出制造公差范围的变形材料。
- Product cosmetic areas are not degraded beyond manufacturing or final acceptance criteria.
- 产品外观不得低于制造或终验收标准。
- Cosmetic damage is any abnormality that makes the product unacceptable to the customer.
- 导致客户不接收产品的任何外观损坏的异常情况。
- The product should meet all product data sheet and manufacturing specifications and tolerances after testing.
- 产品在测试之后应当达到所有产品数据表、制造规格和公差的要求。
- The product functions to specification.
- 产品功能与规格要求相符。

**11.4 PACKAGING DAMAGE:** the package's purpose is to absorb or modify the energy imparted by the distribution environment, (sustaining ordinary degradation as a result), and to protect and preserve the product in its original undamaged condition (see 10.2.1 product damage). Some package degradation is expected and is acceptable. Unacceptable package degradation can be defined as, but is not limited to:

**包装损坏：**包装的目的是缓冲或减缓分销环境中所传递的能量（结果是维持平常的变差情况），并保护产品原来未受损的情况（见 10.2.1 产品损坏）。有些包装的变差是可预见也是可接受的，不可接受的包装变差定义如下，但不仅限于下述情况：

- Any change in package condition, including fractured or deformed materials that result in product damage or permanent displacement of the product and accessories from their intended position.
- 任何包装有变化的情况，包括导致产品损坏，或产品和附件从其预期位置发生永久性位移的开裂或变形的材料。
- Edge ruptures to the extent that it can no longer contain the product or support the product's weight.
- 边缘断裂导致不能盛装产品或支撑产品的重量。
- Failure of packaging joints or surfaces which result in internal packaging to lose original configuration.
- 导致内包装回复原始松散状态的包装粘接处或表面开裂。
- No conductive particles should be present from abrasion or other sources.
- 不得有因磨损或其它情况所产生的传导性粒子。
- Some cushion deformation and cracking is acceptable. Complete cushion material fracture and/or cushion damage such that adequate product protection is absent is unacceptable.
- 一些填充物变形或开裂是可以接受的，而整个填充材料断裂和/或填充物损坏导致产品无充分的保护则是不可接受的。
- Multiple fractured cushion pieces may cause customer concerns, dissatisfaction and possibly product returns (even if the product still functions to specification).

- （即使产品的功能性满足规格要求），多个裂开的填充物有可能会引起客户的关注，不满甚至退货。
- Severe damage to packaging materials/mediums is not acceptable.
- 严重的包装材料/介质损坏是不可接受的。

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## 12.0 PROCEDURE

### 程序

**12.1 Define Shipping Unit**—Describe shipping unit in terms of size, weight, and form of construction.

*界定运输件*——对运输件的大小、重量以及制作方式进行描述。

**12.2 Determine Acceptance Criteria**—Acceptance criteria are related to the desired condition of the product and package at the end of the distribution cycle. The responsible WD Branded entity or Mechanical Engineering department must establish specific acceptance criteria prior to each test procedure.

*确定验收标准*——验收标准与产品和包装在分销周期完成时所期望的状况相关，WD 品牌实体或机械工程部门负责人在每一个测试程序前必须创建验收标准。

**12.3 Select Samples for Test**—See Section 6.

*选择测试样件*——见第 6 章。

**12.4 Condition Samples**—See Section 7.

*特殊状态下的样件*——见第 7 章。

**12.5 Perform Tests**— Perform tests as directed in the referenced ASTM standards and as further modified in the special instructions for each test schedule.

*实施测试*——参考 ASTM 标准以及每一个测试一览表中修订过的具体指南进行测试。

**12.6 Evaluate Results**— Evaluate results to determine if the shipping units meet the acceptance criteria. See Section 8.

*评估测试结果*——对测试结果进行评估以确认运输件是否达到了验收标准要求，见第 8 章。

**12.7 Document Test Results**—Document test results by reporting each step. See Section 17.

*记录测试结果*——对每个步骤的测试结果进行记录，见第 17 章。

**12.8 Monitor Shipments**—When possible, obtain feedback by monitoring shipments of the container that was tested to ensure that the type and quantity of damage obtained by the laboratory testing correlates with the damage that occurs in the distribution cycle. This information is very useful for the planning of subsequent tests of similar shipping containers.

*监控运输*——可能的时候，通过对运输进行监控获得已测试过的包装箱的情况，以确保实验室测试所出现的损坏类型和数量与分销周期内所出现的情况有关联性。这一信息对于将来给类似的运输包装箱作系列测试计划来说是非常有用的。

## TEST SCHEDULE:

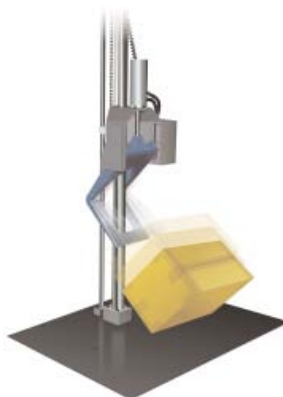
### 测试一览表

#### 13.0 IMPACT/FREE-FALL DROP TEST:

##### 冲击/自由落体测试：

Tests are to be performed on a Free-Fall Drop tester (as seen in the image below and as described in ASTM D5276). The package is to be dropped onto a flat, firm, non-yielding steel base.

测试在自由跌落测试仪来进行（见下所示图片，以及ASTM D5276 中所述）。包裹将会跌落在一个平整、坚硬且不具弹性的铁板上）。



Test rationale: The purpose of this test is to evaluate the ability of a packaged product to withstand sudden shocks due to free fall drops within the distribution system.

测试依据：本实验的目的是评估包装好的产品 在分销系统中承受自由跌落所造成瞬间颠簸的能力。

### 13.1 TEST PROCEDURE: ASTM D880

测试程序：ASTM D880

### 13.2 Condition tests specimens $73.4 \pm 2^{\circ}\text{F}$ ( $23 \pm 1^{\circ}\text{C}$ ), $50 \pm 2\%$ relative humidity in accordance with Practice D4332.

特殊状态下测试样件：与 D4332 气候要求相符的  $2^{\circ}\text{F}$  ( $23 \pm 1^{\circ}\text{C}$ )温度， $0 \pm 2\%$ 相对湿度。

### 13.3 Test Specimen: Both the product and packaging should be representative of the final product and be configured for shipping.

测试样件：产品和包装都应当能够代表最终的产品，并按运输要求进行配置。

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### 13.4 Identify package surfaces: With the packaged product in its most stable shipping position, face one end of the master box with the manufacturer's joint on the right, and identify the surfaces as follows:

**确认包装表面：**包装好的产品放置在最稳定的运输位置，将主包装箱的端面朝制造商粘接处的右边，并如下所述来识别其它面：

#### 13.5 Top as one (1)

顶部为一（1）

#### 13.6 Right side as two (2)

右侧为二（2）

#### 13.7 Bottom as three (3)

底部为三（3）

#### 13.8 Left side as four (4)

左侧为四（4）

13.9 Near end as five (5)

近端为五 ( 5 )

13.10 Far end as six (6)

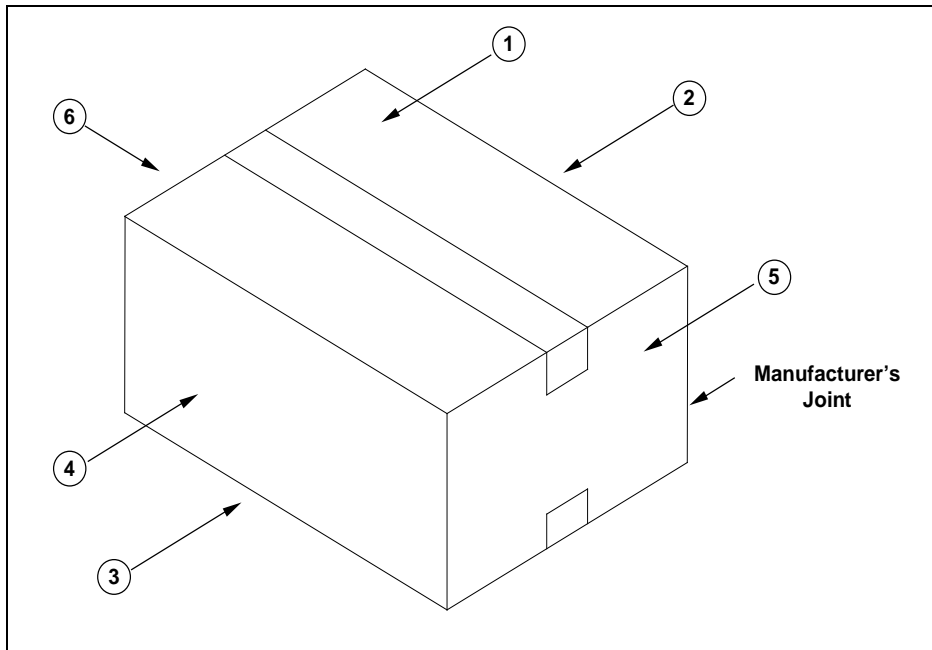
远端为六 ( 6 )

13.11 Identify the corner formed by faces 2, 3, and 5.

确认角由表面 2、3 和 5 形成

13.12 Identify the edges by faces 2-5, 3-5, and 2-3.

确认边缘由表面 2-5 , 3-5 和 2-3 形成



13.13 Drop the packaged product as specified in the following sequence (per ASTM D5276). The drop height for each test specimen varies with package weight as shown in the below.

按下述的顺序跌落已包装的产品 ( 按 ASTM D5276 要求 ) , 每个测试样件的跌落高度因包裹重量的不同而不同 , 具体见下表所述 :

Weight 重量	Drop Height 跌落高度
0 - 20.99 lbs. (0 - 9.54 kg)	30 in. (76.2 cm)
21 - 40.99 lbs. (9.55 – 18.63 kg)	24 in. (60.9 cm)
41 - 60.99lbs. (18.64 – 27.72 kg)	18 in. (45.7 cm)
61- 100 lbs. (27.73 – 45.45 kg)	12 in. (30.5 cm)

**13.14 DO NOT** change out the cushioning. The same set of cushioning should be used throughout the test.

勿调换包装内的填充物，在整个测试过程中都应当使用相同的填充物。

**DROP 1:** 2-3-5 corner.

**跌落1：**2-3-5角



**DROP 2:** 2-5 Edge / shortest edge radiating from drop corner.

**跌落2：**2-5边/自跌落角最短的边



**DROP 6:** End 6 / **opposite** smallest flat face.

**跌落6：**远端6/与最小的平面相对



**DROP 3:** 3-5 Edge / medium edge radiating from drop corner.

**跌落3：**3-5边/自跌落角中间的边



**DROP 7:** Side 2 / Medium flat face.

**跌落7：**侧面2/中间平面



**DROP 4:** 3-2 Edge / longest edge radiating from drop corner.

**跌落4：**3-2边/自跌落角最长的边



**DROP 8:** Side 4 / opposite medium flat face.

**跌落8：**侧面4/与中间平面相对



**DROP 5:** End 5 / smallest flat face.

**跌落5：**近端5/最小的平面

**DROP 9:** Bottom 3 / largest flat face.

**跌落9：**底面3/最大的平面



**DROP 10:** Top 1 / opposite largest flat face.  
**跌落10：** 顶面1/与最大的平面相对



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**13.15** Compile data from all drops, photographs and any other associated test records.

集中所有跌落的数据，照片以及其它任何相关的记录。

**13.16** Perform Pass/Fail Assessment and prepare report.

进行合格/不合格评估并编写报告。

#### **14.0 COMPRESSION TEST:**

##### **抗压测试**

The purpose of this test is to ensure the packaged product will survive compressive loading and maintain load integrity during worldwide warehousing and distribution. All tests are performed on a dynamic compression tester equipped with computerized control system as seen in the image below and described in ASTM D642.

该测试的目的是确保已包装的产品能够经受压缩载荷，并在全球仓储和分销过程中保持其完整性。所有的测试都将在如下图所示的带电脑控制系统的动力压缩测试仪上进行，这在ASTM D642中有述。



**REQUIRED COMPRESSION STRENGTH:** The required compressive strength of a shipping container is based upon the gross weight of one container and the anticipated height of like containers stacked on top.



Unlike standard engineering materials, corrugated board's physical strength becomes unpredictable within its normal range of use. As a result, a safety factor is used to account for variations in relative humidity, stack misalignment, length of storage time and other such conditions. WD recommends a Safety Factor of five (5) for qualifying empty corrugated boxes if 100% of the compressive load is being supported by the corrugated and paper-based interior packaging.

**要求的压缩强度**：运输包装的压缩强度要求是基于包装的总重量，以及在其上面所堆放的包装的总高度来决定的。不同于标准的工程材料，瓦楞纸板的物理强度在正常使用范围内变得不可预测，因此可使用一个安全系数来说明相对湿度的变化，堆放不整齐，存放时间的长短以及其它情况等。WD 推荐在认证空的瓦楞纸箱时，如果由瓦楞纸箱和内部的纸包装来支撑 100%的压缩载荷的情况下，安全系数可为五（5）。

The minimum required compressive strength of an individual container is based upon the following formula:  
 单个包装箱要求的最小压缩强度是基于下述的公式而来的：

$$\text{Compression Load (pounds)} = 0.007 \times (108 - H) \times L \times W \times 5$$

$$\text{压缩载荷 (磅)} = 0.007 \times (108 - H) \times L \times W \times 5$$

#### 14.1 TESTING PROCEDURE: ASTM D642

测试程序：ASTM D642

#### 14.2 Condition test specimens 73.4 ± 2°F (23 ± 1°C), 50 ± 2 % relative humidity in accordance with practice ASTM D4332.

特殊状态下测试样件：与 ASTM D4332 气候要求相符的温度：73.4 ± 2°F (23 ± 1°C)，相对湿度：50 ± 2 %

#### 14.3 Test specimen: both the product and packaging should be representative of the final product and be configured for shipping. For crated or palletized product, a top load hazard - pallet of similar size and shape is required.

测试样件：产品和包装都应当能够代表最终的产品，并按运输要求进行配置。板条箱装或托盘装载的产品，顶载荷危险——要求托盘大小和形状类似。

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#### 14.4 Calculate the compression load required: using the formula above, where:

计算压缩载荷要求：使用上述的公式，其中：

- 0.007 = Average density of freight in pounds per cubic inch (12 lbs. per cubic foot)
- 0.007 =每立方英寸的平均密度 ( 12磅/立方英尺 )

- 108 = Maximum height (inches) of package stack in transit
- 108=在运输过程中包装堆放的最高高度 ( 英寸 )
- H = Height of shipping unit (inches)
- H=运输件的高度 ( 英寸 )
- L = Length of shipping unit (inches)
- L=运输件的长度 ( 英寸 )
- W = Width of shipping unit (inches)
- W=运输件的宽度 ( 英寸 )
- 5 = Safety Factor to account for humidity, time and stacking pattern
- 5=用来说明湿度，堆存时间以及堆放形式的安全系数

**14.5** Set up the compression tester to run at a rate of 0.5 inches (13 mm) per minute. Center the package on the lower platen of the compression tester. Place the top-load pallet hazard device on top of the test sample.

将压缩测试仪设置在 0.5 英寸 ( 13 毫米 ) /分钟的速度，将包裹置于压缩测试仪下板的中间，将顶载荷板放在测试样品上。

**14.6** Run test per ASTM D642 until the calculated target compression load is met or the test package fails. Record maximum compression load obtained.

按 ASTM D642 的要求进行测试，直到达到计算好的预期压缩载荷或包裹失效。记录所获得的最大压缩载荷。

**14.7** Perform pass/fail assessment and prepare report based upon calculated and recorded results.

根据所计算并记录的结果进行合格/不合格评估，并编写报告。

## VIBRATION TESTS:

### 震动测试：

Vibrations are present in all methods of transport and can be a source of damaging input. Vibrational damage can be regarded in two broad categories: (1) Damage due to relative motion of one part against another, most commonly observed as scuffing or abrasion. (2) Damage due to resonance conditions, which may be observed as a range of physical damage. The greater proportion of damage occurs in the frequency ranges of 3 to 30 Hz.

震动在所有的运输方法中都会出现，有可能成为破坏产品的一个因素。震动破损可以被分成两大类：（1）破损可能是由于一个零件与另一个零件的相对运动造成，最常见的例子就是划伤和擦伤。（2）由于共振所导致的破损，有可能看到一系列的物理损坏，损坏发生较高的频率是在 3 至 30 赫兹之间。

The following test methods are to be used for various modes of transportation or product/packaging development purposes. **The responsible Vollrath entity or Engineering department will establish which tests are to be conducted for qualification and the specific acceptance criteria prior to testing.**

下述的测试方法可用于各种运输方法或产品/包装开发的目的。沃华夫公司或工程部门负责人将会在测试之前创建用于认证的测试标准以及具体的验收标准。

#### 15.0 RANDOM VIBRATION TEST:

##### 随机震动测试：

Random vibration tests are performed on computer controlled servo hydraulic vibration table (as seen in the image below and as described in ASTM D4728) in an attempt to mimic the combination of overlying vibration frequencies that occur simultaneously in transportation.

随机震动测试将由带电脑控制的伺服液压震动桌（如下图所示，在 ASTM D4728 中有述）来进行，以力图模拟在运输过程中同时产生的震动频率叠加的情况。



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Shaping the power spectrum by defining power spectral density (PSD) versus frequency breakpoints allows for representative excitation at the dominant forcing frequency ranges found within each mode of transport while avoiding overstress across the entire spectral bandwidth. The fragility of the bare product is also a factor in the product's ability to survive the distribution environment and arrive at the final customer without degradation or damage.

通过定义功率谱密度 ( PSD ) 与频率断点来修整功率谱，可作为在每一种运输方式中出现的主导外力的代表，以避免整个光谱宽带过度受力。产品在分销环境中，以及到达终端客户处时不会变差或受损，其中裸机的易碎性也是一个影响因素。

**15.1** The following power spectral densities, as defined by the mode of transport, frequency and amplitude breakpoints, and test duration are recommended.

下述的功率谱密度由运输的方式，频率以及震幅断点来定义，推荐使用的测试持续时间。

### Truck

### 卡车

Frequency, Hz 频率，Hz	PSD, g <sup>2</sup> /Hz* 功率谱密度，g <sup>2</sup> /Hz*
1	0.0001
4	0.02
16	0.02
40	0.002
80	0.002
200	0.00002
Overall, g rams 总量，克数	0.73
Duration, mines 时间，分钟	180

\*Power Spectral Density Level, g<sup>2</sup>/Hz

\*功率谱密度级别，g<sup>2</sup>/Hz

**15.2** TEST PROCEDURE: ASTM D4728

测试程序：ASTM D4728

**15.3** Condition test specimens 73.4 ± 2°f (23 ± 1°c), 50 ± 2 % relative humidity in accordance with practice ASTM D4332.

特殊状态下测试样件：与 ASTM D4332 气候要求相符的温度：73.4 ± 2°f (23 ± 1°c)，相对湿度：50 ± 2 %。

**15.4** Test specimen: both the product and packaging should be representative of the final product and be configured for shipping.

产品和包装都应当能够代表最终的产品，并按运输要求进行配置。

**15.5 Instrumentation:** when required, instrument a pre-tested functional product on the base – clear of obstructions. Photograph the open package with the instrumented product. Close the container using specified shipping tape.

仪器仪表：当有要求的时候，将待测功能产品放在仪器的基座上——清除障碍。对已开封的包裹与已检测的产品照相。用特殊的打包带将包装箱封装起来。

**15.6 Test orientation:** each package will be tested in all 3 axes. Packages will be attached to the table in a manner that restrains the horizontal motion for each orientation. No vertical hold down restraint shall be used over the top of the load.

测试方向：每一个包裹都将从三个轴向进行测试，包裹将会被附在桌子上，这在一定程度上限制了每个方向上的水平运动，不得从包裹的顶部施加压力以产生垂直限制的力。

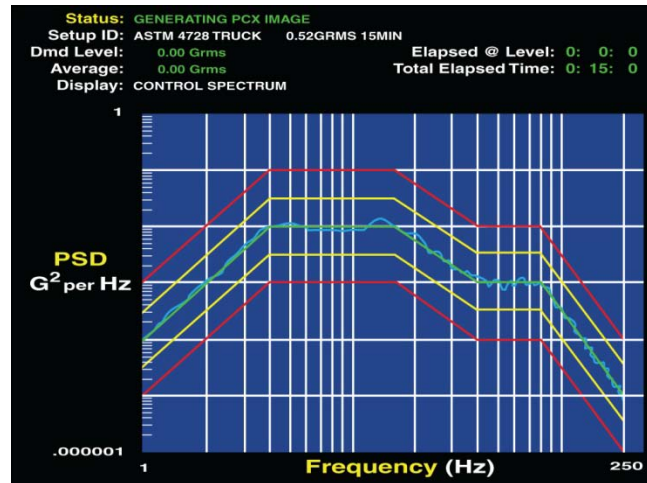
**15.7 Set up:** program the computer controlled servo hydraulic vibration system to reproduce a random truck vibration profile - representing the Vollrath cross country truck distribution environment as indicated in the spectra profile in 13.1.

设置：对电脑进行设置，以使伺服液压震动系统模仿出随机的卡车震动曲线——如 13.1 中所述的光谱曲线以模拟沃华夫越野卡车分销环境的情况。

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The PSD profile for the truck transportation will look similar as shown below:

卡车运输的功率谱密度曲线看起来应当与下图类似：



**15.8** Set the duration for the truck sequence at 60 minutes.

将卡车连续的时间周期设置为 60 分钟。

**15.9** Perform test in accordance with ASTM D4728. Test all of the package's axes which may be subjected to vertical transportation vibration. Total test duration is to be distributed evenly between the orientations tested.

按 ASTM D4728 的要求进行测试，测试所有包裹的轴，这有可能会遭受垂直运输震动。整个测试内的方向分布应当是均衡的。

**15.10** If using instrumentation, record any peculiar frequency/resonance or other note worthy observations that may negatively affect the product.

如果使用仪器，则对任何特殊频率/共振或其它观察到的有可能对产品产生负面影响的情况进行记录。

**15.11** When testing is complete, conduct a complete physical evaluation of the shipping container and the product. Photograph any note worthy or questionable damage.

当测试完成的时候，对运输包装箱实施全面的物理评估，对任何值得记录或有问题的损坏拍照记录。

**15.12** Perform pass/fail assessment and prepare report.

进行合格/不合格评估，并编写报告。

## **16.0 FIXED DISPLACEMENT VIBRATION - REPETITIVE SHOCK TEST:**

### **固定振幅测试——重复冲击测试**

Repetitive Shock tests are suitable for tests of individual containers that are transported unrestrained on the bed of a vehicle. The test level and the test methods of this portion of the distribution cycle are intended to determine the ability of the shipping unit to withstand the repetitive shocks occurring during transportation of bulk or loose loads. The test level and test method account for amplitude, direction, and duration of the repetitive shocks.

重复冲击测试对于所有放置在卡车后箱未固定的单个包装箱来说都是适当的，测试级别和测试方法代表的是分销周期中的部分情况，旨在确认运输件在散货运输或未固定情况下进行运输所能承受重复冲击的能力。测试级别和测试方法中有振幅，方向，以及重复冲击周期的说明。

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Repetitive Shock tests can be performed on a servo hydraulic vibration or a vertical mechanical table (as described in ASTM D999 Method A1) or on a rotary mechanical vibration table (as shown below and described in ASTM D999 Method A2).

重复冲击测试可以在带伺服的液压震动或一个垂直的机械式震动台（见ASTM D999中方法1的描述），或在一个旋转的机械式震动台（如下所示，见ASTM D999中方法2的描述）上进行。



#### 16.1 TEST PROCEDURE: ASTM D999 TEST METHOD A1 OR A2

测试程序：ASTM D999 测试方法 A1 或 A2

#### 16.2 Condition test specimens $73.4 \pm 2^{\circ}\text{f}$ ( $23 \pm 1^{\circ}\text{c}$ ), $50 \pm 2\%$ relative humidity in accordance with practice ASTM D4332.

特殊状态下测试样件：与 ASTM D4332 气候要求相符的温度： $73.4 \pm 2^{\circ}\text{f}$  ( $23 \pm 1^{\circ}\text{c}$ )，相对湿度： $50 \pm 2\%$ 。

#### 16.3 Test specimen: both the product and packaging should be representative of the final product and be configured for shipping.

产品和包装都应当能够代表最终的产品，并按运输要求进行配置。

#### 16.4 Test orientation: each package will be tested in all 3 axes. Packages will be attached to the table in a manner that restrains the horizontal motion for each orientation. No vertical hold down restraint shall be used over the top of the load.

测试方向：每一个包裹都将从三个轴向进行测试，包裹将会被附在桌子上，这在一定程度上限制了每个方向上的水平运动，不得从包裹的顶部施加压力以产生垂直限制的力。



**16.5 Set up:** a metal shim is to be used in methods A1 and A2 for determining when the shipping container is leaving the testing platform by a sufficient amount as described in ASTM D999. Specifications for the metal shim used in methods a1 and a2 are:

设置：在方法 A1 和 A2 中，使用一个金属片，按 ASTM D999 的要求，将运输包装箱搬离测试台。用于方法 A1 和 A2 的金属片规格如下：

- Width: 50 mm (2.0 in.) minimum
- 宽：50 毫米 ( 2.0 英寸 ) 最小值
- Thickness: 1.6 mm (0.063 in.)
- 厚度：1.6毫米 ( 0.063英寸 )
- Length: 254 mm (10.0 in.) minimum
- 长度：254毫米 ( 10.0英寸 ) 最小值

**16.6 Perform Test:** in accordance with ASTM D999, start the vibration of the platform at a frequency of about 2 Hz, and steadily increase the frequency until the metal shim can be inserted under one long edge of the container and moved intermittently along the entire length of the container. When inserted, the shim must be flat, not at an angle. When the shim is inserted a minimum of 100 mm (4in.) under the shipping container, the proper test frequency has been reached. Test all of the package's axes which may be subjected to vertical transportation vibration.

进行测试：按 ASTM D999 的要求，开启震动测试台，频率为 2Hz，稳定地增加频率直到金属片可以插入包装箱的长边，并断续地沿着包装箱的长边移动。插入时金属片必须是平插，不得弯曲，金属片在包装箱底至少插入 100 毫米 (4 英寸)才能达到适当的测试频率要求。按垂直运输震动的情况对包装箱进行所有轴向测试。

**16.7 Total test dwell time** of 60 minutes is to be distributed 50 % along normal vertical shipping axis and remaining 50 % evenly along all other possible shipping orientations.

整个测试停延的 60 分钟测试时间应当分 50%到普通的垂直运输轴向，其余的 50%平均地分配给其它可能的运输方向。

**16.8** When testing is complete, conduct a complete physical evaluation of the shipping container and the product. Photograph any note worthy or questionable damage.

当测试完成的时候，对运输包装箱实施全面的物理评估，对任何值得记录或有问题的损坏拍照记录。

**16.9** Perform pass/fail assessment and prepare report.

进行合格/不合格评估，并编写报告。

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## 17.0 ROTATIONAL EDGE DROP TEST:

### 旋转边跌落测试

#### 17.1 TEST PROCEDURE: ASTM D6179 TEST METHOD A

测试程序：ASTM D6179 测试方法 A

#### 17.2 Condition test specimens $73.4 \pm 2^\circ\text{F}$ ( $23 \pm 1^\circ\text{C}$ ), $50 \pm 2\%$ relative humidity in accordance with practice ASTM D4332.

特殊状态下测试样件：与 ASTM D4332 气候要求相符的温度： $73.4 \pm 2^\circ\text{f}$  ( $23 \pm 1^\circ\text{c}$ )，相对湿度： $50 \pm 2\%$ 。

#### 17.3 Test specimen: both the product and packaging should be representative of the final product and be configured for shipping.

产品和包装都应当能够代表最终的产品，并按运输要求进行配置。

#### 17.4 Raise one end of the case or crate and set it upon a 4" (10 cm) timber or other support, placed at right angles to the length of the case or crate.

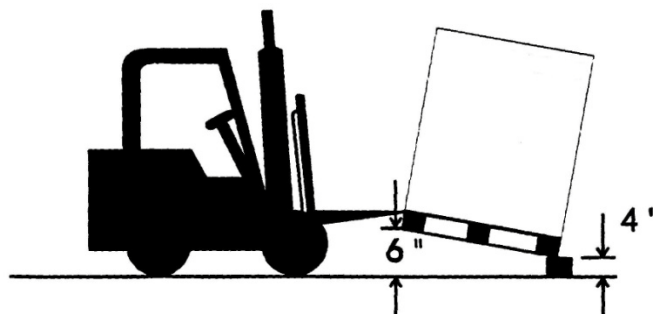
将包装箱或板条箱的一端抬起来，并将其置于高度为 4" (10 cm) 的木料上，与包装箱或板条箱长边成直角放置。

#### 17.5 The height of the support shall be sufficient to ensure that there will be no support for the base between the ends of the test item when dropping takes place, but should not be high enough to cause the test item to slide on the support when the drop end is raised for the drop.

支撑的高度应当足够，以确保测试件在跌落时底部和测试件端之间无支撑力，但也不能过高，导致测试件在跌落端升高实施跌落时从支撑上滑下去。

#### 17.6 Raise the impact edge 6" (15cm) high off impact surface while opposite edge is supported on 4" (10 cm) tall timber. Release case or crate to-fall freely to impact surface. See image below:

将冲击端升至 6" (15cm) 高，而另一端由一个高为 4" (10 cm) 的木料进行支撑，放开包装箱或板条箱，让其自由跌落到冲击表面。见下图所示：



17.7 Repeat drop on each of four edges - specific order is not important.

对四个边都进行重复的跌落测试——是否按顺序并不重要。

17.8 Where test items are tall or top heavy, provision must be made to prevent the test item from tipping over after the drop is made.

在测试件非常高或上部很重的情况下，必须作准备以防止测试件在跌落过程中翻倒。

17.9 Perform pass/fail assessment and prepare report.

进行合格/不合格评估，并编写报告。

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## 18.0 ROTATIONAL CORNER DROP TEST:

### 旋转角跌落测试

18.1 TEST PROCEDURE: ASTM D6179 TEST METHOD B

测试程序：ASTM D6179 测试方法 B

**18.2** Condition test specimens  $73.4 \pm 2^{\circ}\text{F}$  ( $23 \pm 1^{\circ}\text{C}$ ),  $50 \pm 2\%$  relative humidity in accordance with practice ASTM D4332.

特殊状态下测试样件：与 ASTM D4332 气候要求相符的温度： $73.4 \pm 2^{\circ}\text{f}$  ( $23 \pm 1^{\circ}\text{c}$ )，相对湿度： $50 \pm 2\%$ 。

**18.3** Test specimen: both the product and packaging should be representative of the final product and be configured for shipping.

产品和包装都应当能够代表最终的产品，并按运输要求进行配置。

**18.4** Start up by setting up the case or crate as defined for the Rotational Edge Drop Test (section 17).

按旋转角跌落测试（第 17 章）的要求设置包装箱或板条箱并开始测试。

**18.5** Place the 4 in. (10 cm) block flat under one corner of the end already supported in order to raise one corner higher than the other so that impacts on the diagonally opposite corner can be obtained.

在后端的角下放置一个 4 in. (10 cm) 的木块作支撑，以使一个角高于另一个，这样就可以获得相对的对角冲击。

**18.6** Raise the unsupported end of the test item so that the lower corner of that end reaches 6" (15cm) high from the impact surface. Release case or crate to-fall freely to impact surface.

抬高测试件中未支受支撑的一端，故该端中较低的角自冲击面的高度为 6" (15cm)。放开包装箱或板条箱，让其自由跌落到冲击表面。

**18.7** Repeat drop on each of four corners - specific order is not important.

对四个角都进行重复的跌落测试——是否按顺序并不重要。

**18.8** Where test items are tall or top heavy, provision must be made to prevent the test item from tipping over after the drop is made.

在测试件非常高或上部很重的情况下，必须作准备以防止测试件在跌落过程中翻倒。

**18.9** Perform pass/fail assessment and prepare report.

进行合格/不合格评估，并编写报告。

## **19.0 ROTATIONAL FLAT DROP TEST:**

### **旋转平落测试**

**19.1** TEST PROCEDURE: ASTM D6179 TEST METHOD C

测试程序：ASTM D6179 测试方法 C

**19.2** Condition test specimens  $73.4 \pm 2^{\circ}\text{f}$  ( $23 \pm 1^{\circ}\text{c}$ ),  $50 \pm 2\%$  relative humidity in accordance with practice ASTM D4332.

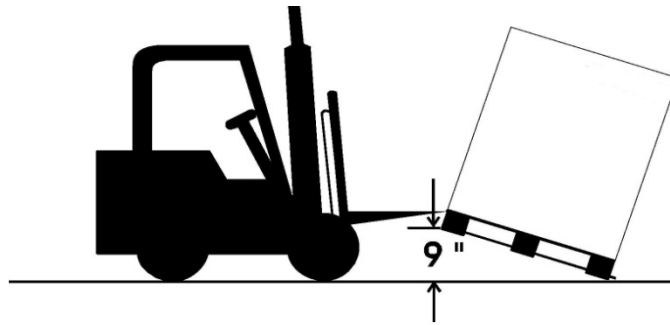
特殊状态下测试样件：与 ASTM D4332 气候要求相符的温度： $73.4 \pm 2^{\circ}\text{f}$  ( $23 \pm 1^{\circ}\text{c}$ )，相对湿度： $50 \pm 2\%$ 。

**19.3** Test specimen: both the product and packaging should be representative of the final product and be configured for shipping.

产品和包装都应当能够代表最终的产品，并按运输要求进行配置。

**19.4** With one edge of the case, crate or unitized load supported by the floor, raise the other end to 9" (23cm) high and release to free fall flat on the impact surface. See image below:

包装箱、板条箱或单元化包装由地板提供支撑，将一端抬至 9" (23cm)高，放开包装箱或板条箱，让其自由跌落到冲击表面。见下图所示：



**19.5** Repeat the drop on each of four sides - specific order is not important.

对四个侧面都进行重复的跌落测试——是否按顺序并不重要。

**19.6** Where test items are tall or top heavy, provision must be made to prevent the test item from tipping over after the drop is made.

在测试件非常高或上部很重的情况下，必须作准备以防止测试件在跌落过程中翻倒。

**19.7** Perform pass/fail assessment and prepare report.

进行合格/不合格评估，并编写报告。

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## **20.0 TIP TEST:**

**倾斜测试：**

**20.1 TEST PROCEDURE: ASTM D6179 TEST METHOD F**

测试程序：ASTM D6179 测试方法 F

**20.2** Condition test specimens  $73.4 \pm 2^{\circ}\text{F}$  ( $23 \pm 1^{\circ}\text{C}$ ),  $50 \pm 2\%$  relative humidity in accordance with practice ASTM D4332.

特殊状态下测试样件：与 ASTM D4332 气候要求相符的温度： $73.4 \pm 2^{\circ}\text{f}$  ( $23 \pm 1^{\circ}\text{c}$ )，相对湿度： $50 \pm 2\%$ 。

**20.3** Test specimen: Use a case, crate, or unitized load of shipping containers each full loaded with the actual contents. If use of actual contents is not practical, a dummy load of the same total mass, size, and weight distribution may be substituted. The contents or dummy load shall be blocked, braced, and cushioned in place. Cases and crates should be closed normally as for shipment. Unitized loads should be stretch-wrapped or strapped onto a pallet as applicable.

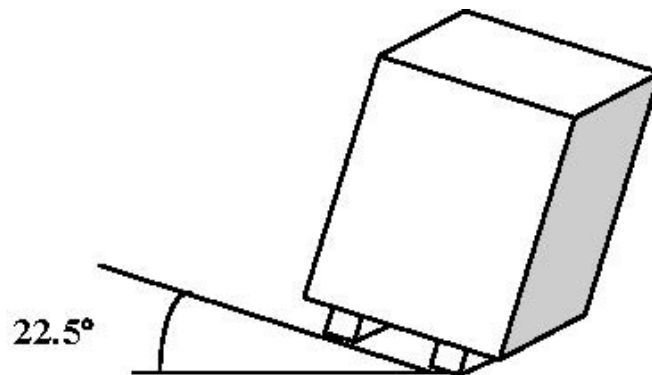
测试样件：使用内部已装满产品的包装箱，板条箱或单元化包装的运输容器。如果使用实际的产品是不可行的，则可用一个总重量，大小和重量分布相当的替代物来作为仿真载荷。内载产品或仿真载荷应当进行封装，捆绑，并提供填充物。包装箱和板条箱按运输时的情况进行封装，载荷均衡的容器则应当尽可能地用弹性裹包或用打包带捆扎在托盘上。

**20.4** Loose chains, slings, or similar restraints shall be positioned around the test item to prevent a complete tipover and impact. These restraints can also provide operator protection during the test.

宽松的链子，吊带或类似的限制装置应当置于测试件的周围，以便防止测试件整个翻倒和发生碰撞。这些限制装置在测试的过程中也可以为操作人员提供保护。

**20.5** Tilt the test item to a  $22^{\circ}$  angle from the vertical position in the most critical direction. After releasing the test item, determine which way the test item begins to move, tip over, or return to base, and then return the test item gently back onto its base.

在最为危险的方向，将测试件自垂直方向倾斜  $22^{\circ}$  的角度。在放开测试件之后，确认测试件有可能向哪个方向移动，翻倒，或返回原地，然后将测试件轻轻放回。



**20.6** The test should be repeated in all potentially unstable directions.

对所有潜在的不稳定的方向进行重复测试。

**20.7** If the test item begins to tip over in any direction when tilted to the specified angle, the center of gravity must be lowered or the dimensions of the base must be increased until the test item does not

begin to tip over, or the case or crate and product must be able to pass the tipover test procedure described in Section 21.

当将测试件倾斜到要求的角度时，如果测试件开始向任何方向翻倒，则必须将重心降低，或增加底部的大小至不会令到测试件翻转为止，包装箱或板条箱以及产品必须能够通过第 21 章中所述的翻转测试。

#### 20.8 Perform pass/fail assessment and prepare report.

进行合格/不合格评估，并编写报告。

#### 21.0 TIPOVER TEST:

##### 翻转测试

##### 21.1 TEST PROCEDURE: ASTM D6179 TEST METHOD G

测试程序：ASTM D6179 测试方法 G

##### 21.2 Condition test specimens $73.4 \pm 2^{\circ}\text{F}$ ( $23 \pm 1^{\circ}\text{C}$ ), $50 \pm 2\%$ relative humidity in accordance with practice ASTM D4332.

特殊状态下测试样件：与 ASTM D4332 气候要求相符的温度： $73.4 \pm 2^{\circ}\text{f}$  ( $23 \pm 1^{\circ}\text{c}$ )，相对湿度： $50 \pm 2\%$ 。

##### 21.3 Test specimen: Use a case or crate fully loaded with the actual contents. If use of actual contents is not practical, a dummy load of the same total mass, size, and weight distribution may be substituted. The contents or dummy load shall be blocked, braced, and cushioned in place and the package closed normally as for shipment.

测试样件：使用充分装载的包装箱或板条箱。如果使用实际的产品是不可行的，则可用一个总重量，大小和重量分布相当的替代物来作为仿真载荷。内载产品或仿真载荷应当进行封装，捆绑，并按平时的运输要求进行包装。

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##### 21.4 Place the test item in the predetermined attitude on the impact surface (such as standing on its base or one of its smaller faces).

将测试件按预测的状态放置在冲击表面（如底部直立，或比自身更小的表面）。

**21.5** The test item shall be slowly tipped until it falls freely without thrust onto the face opposite that of load application.

慢慢地倾斜测试样件，直到其自由地跌落并对相反表面无侧向压力。

**21.6** Examine the test item and record any external signs of damage.

检查测试样件，记录任何外在损坏的迹象。

**21.7** Repeat the test with the test item standing on, or impacting onto other appropriate faces. In the case of tall test items, the repeat tests shall be carried out with the test item standing on its normal base and toppling onto each side face in turn).

测试样本保持直立，或对其其它适当表面进行冲击以进行重复测试，对于高的测试样件，应当保持测试件底部直立，并按顺序向每一侧推倒）。

**21.8** In the case of flat test items (or tall test items where the normal base is not defined), the tests shall be carried out with the test item standing on each smaller face in turn and impacting onto each of the larger faces.

对于扁平的测试件（或高的但通常未定义底面的测试件），测试应当按测试件最小面顺序来进行，并对每一个大面进行冲击。

**21.9** On completion of the test sequence, open the test item and examine the condition of the contents.

在按顺序完成测试之后，打开测试件并检查内部的情况。

**21.10** Perform pass/fail assessment and prepare report.

进行合格/不合格评估，并编写报告。

## **22.0 FIELD TEST**

### **实地测试**

**22.1** This test is designed to determine whether a new packaged product can survive in the planned distribution environment without being damaged. *(Caution: The results obtained from limited field shipment testing may not be statistically significant to assure damage free distribution of products in full production.*

本测试是用来确认产品新包装是否能够在预期的分销环境中不会受损。（注意：从有限的实地运输测试中所获得的结果并不一定会从统计上显著地确保生产的产品在分销环境中全部无损伤）。

**22.2** This test should supplement, not supersede, the tests in the previous sections of this procedure.

本测试仅用于补充，并不能取代本程序前几章中所述的测试。

**22.3 Physical Evaluation:** Conduct a physical evaluation of the shipping container and the product and a performance test of the product prior to testing.

**物理评估：**在测试之前对运输容器和产品进行物理评估并对产品作性能测试。



**22.4 Test Requirements/Procedure:** A round trip/return shipment may be used without inspecting the packaging when it arrives at the destination if there are no local qualified resources to properly evaluate the packaging/product. Shipment must be clearly marked (see image below) and documented as to how and when the shipment was made and received.

**测试要求/程序：**若在产品到达当地没有合格人员对包装/产品作出适当的评估，则应当采用双程/退货的形式来对包装进行检查。该运输件必须清楚地进行标注（见下图所示），对运输和收货的方式和时间等进行记录。



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**22.5 NOTE:** *It will be much more difficult to isolate what portion of the distribution environment caused the damage (if any).* Also, with a return shipment there will be 2-segments of distribution shipment rather than just 1-segment (which is normal for most products). A round trip/return shipment may also provide a first pass indication of the design margin of your package

**注意：**若要导致损坏（如果有）的分销环境分离出来是非常困难的。同时，退货将会有 2 段分销运输，而不仅仅是 1 段（这对于多数的产品来说是很普通的）。双程/退货运输可能为包装的设计余量是否能够初次通过提供了指示。

**22.6** Ship several samples of the package design (single, palletized, and/or bulk) to other locations, using various representative transportation modes, and have the local Packaging Engineer/suppliers evaluate and document the condition of the package and product upon arrival.

将不同的包装设计（单品包装、托盘，和/或散货）样品运到其它的地方，使用各种运输方式，要求当地的包装工程师/供货商作出评估并记录包装和产品在到达时的情况。

**22.7** Have remote locations inspect, photograph and repack the product in its original packaging (repacking instructions or procedures should be provided) and return via the desired transportation mode.

要求进行远程检查，拍照并重新将产品包回原始的包装内（应当提供重新包装作业指导书或程序），并按预定的运输方式退回。

**22.8** Evaluate and Record: Conduct a physical evaluation of the shipping container and the product and a performance test of the product. Record the nature of any damage that occurs.

评估并记录：在测试之前对运输容器和产品进行物理评估并对产品作性能测试。记录任何发生的损坏情况。