U.S. Department
of Transportation
**Research and
Special Programs
Administration**

400 Seventh St., S.W.
Washington, D.C. 20590

JUL 11 2002

Mr. John H. Rutherford
Manager, Testing Solutions Lab
Inland Paperboard and Packaging, Inc.
8501 Moller Road
Indianapolis, IN 46268

Reference No.: 02-0124

Dear Mr. Rutherford:

This is in response to your letter requesting clarification of selective testing Variation 2 under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180).

Your customer has asked you to test and certify a combination package where the inner packagings are plastic bottles containing liquids as a Variation 2 packaging. Your customer has interpreted § 178.601(g)(2)(i) to mean that glass is an example of a "fragile inner packaging."

Your questions are paraphrased and answered as follows:

Q1. Is it permissible to use plastic inner receptacles conditioned to -18 °C (0 °F) in lieu of glass for the drop test required in § 178.601(g)(2)(i)?

A1. The answer is yes. Drop testing of combination packagings with plastic inner packagings intended to contain liquids must be carried out when the temperature of the test sample and its contents has been reduced to -18 °C (0 °F) (see § 178.603(c).

Q2. Can we certify our combination packagings for Variation 2 using plastic inner packagings?

A2. The answer is yes, provided the specific conditions of the variation are met.

Q3. Assuming we can test to Variation 2, should a statement be included in the certification report that the packaging qualifies under § 178.601(g)(2) for selective testing of combination packagings as long as no inner packagings more fragile than plastic at -18 °C (0 °F) are used?

A3. Such a statement is permissible, but not required. Variation 2 allows inner packagings of any type in an outer packaging without retesting if the specific conditions of the variation are met.

I hope this information is helpful. If you have further questions, please do not hesitate to contact this office.

Sincerely,

Hattie L. Mitchell

Hattie L. Mitchell
Chief, Regulatory Review and Reinvention
Office of Hazardous Materials Standards

U.S. Department
of Transportation
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MAY 20 2003

400 Seventh St., S.W.
Washington, D.C. 20590

Mr. John Rutherford
Manager, Testing Solutions Lab
Inland Paperboard and Packaging, Inc.
8501 Moller Road
Indianapolis, IN 46268

Reference No.: 02-0124

Dear Mr. Rutherford:

This letter replaces our July 11, 2002 response to your request for a clarification of selective testing, Variation 2, under § 178.601(g)(2)(i) of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Variation 2 allows inner packagings of any type in an outer packaging without retesting if the specific conditions of the variation are met.

You stated that your customer asked you to test and certify a combination package where the inner packagings are plastic bottles containing liquids as a Variation 2 packaging. Variation 2 states that the outer packaging must be tested "with fragile (e.g. glass) inner packagings containing liquids."

Our responses to your paraphrased questions are as follows:

Q1. Is it permissible to use plastic inner receptacles conditioned to -18 °C (0 °F) in lieu of glass for the drop test required in § 178.601(g)(2)(i)?

A1. Under the HMR, the drop test required in § 178.601(g)(2)(i) may be conducted using inner receptacles made of "fragile" plastic material. The intent of Variation 2 is to conduct the test with the most fragile inner packaging. Drop testing of combination packagings with plastic inner packagings intended to contain liquids must be carried out when the temperature of the test sample and its contents have been reduced to -18 °C (0 °F) (see § 178.603(c)). However, you should be aware that some Competent Authorities deem only glass as fragile.

A proposal, ISO 16104:2002(E), currently before the United Nation's Committee of Experts on the Transport of Dangerous Goods would require the inner packagings for "V" marked packagings to be of glass, porcelain, or stoneware. If approved by the United Nations, we may propose a revision to the requirements in § 178.601(g)(2)(i) of the HMR to make them consistent with the international regulations.

Q2. Can we certify our combination packagings for Variation 2 using plastic inner packagings?

A2. The answer is yes, provided the specific conditions of the variation are met, including the use of a plastic inner packaging that is considered to be "fragile."

Q3. Assuming we can test to Variation 2, should a statement be included in the certification report that the packaging qualifies under § 178.601(g)(2) for selective testing of combination packagings as long as no inner packagings more fragile than plastic at -18 °C (0 °F) are used?

A3. Such a statement is not required under the HMR, but we recommend that the Notification required by § 178.2(c) inform distributors and users of the type of inner packagings used in the certification test and advise that inner packagings that are more fragile may not be used.

I hope this information is helpful. If you have further questions, please do not hesitate to contact this office.

Sincerely,

Hattie L. Mitchell

Hattie L. Mitchell
Chief, Regulatory Review and Reinvention
Office of Hazardous Materials Standards

package is simply an extension of the original import movement, with the package retaining its identity as one authorized and used under the § 171.12(b) IMDG Code import provisions. Thus, the packaging is not being "reused" (i.e., used more than once) - the return can be viewed a continuation, indeed, the completion, of the transport cycle for the package. So, in this regard the DOT letter is quite correct - not withstanding what might initially be viewed as a possible inconsistency in terms of the conditions imposed under § 171.12(b)(6).

At the same time, however, it is unclear why DOT states that the requirement in §§ 173.24 and 173.24a would apply only if the packaging is subsequently returned to the United States - as these requirements would appear to apply equally *either* to any package exported under the provisions of § 171.12(b), or to any foreign-manufactured and marked UN packaging used under the provisions of § 173.24(d).

An issue not raised by the questioner, and not addressed by DOT in its response, is relevant to the scenario described. This concerns the manner in which the package, after being emptied, is reclosed by the customer for return to Germany. Whether shipped for return under the provisions of § 171.12(b) in conformance with IMDG Code requirements, or as a foreign-manufactured package authorized for use within the United States under § 173.24(d), the package would be required to be reclosed in such a manner as to conform to the manner in which the packagings subjected to the UN design qualification tests were closed. It remains unclear whether, or how, this information is to be provided to the customer closing the package for return to Germany.

One final comment. While the forgoing discussion is offered in the context of the IMDG Code "import" provisions appearing in § 171.12(b), much of it would be equally applicable to UN packagings transported under the ICAO Technical Instructions pursuant to § 171.11. Interestingly, however, § 171.11 differs from § 171.12(b) in that it *does not* impose as a condition that packages being exported must comply with the applicable requirements in §§ 173.24, 173.24a and 173.28.

Selective Testing of Variation 2 Packaging

Reference §178.601, found on page 53 of this issue.

Letter dated July 11, 2002 to Mr. John H. Rutherford, Testing Solutions Lab.

I find DOT's responses in this letter quite curious. Having worked very closely in 1990 at the United Nations Committee with the then-DOT International Standards Coordinator when what is now "Variation 2" in § 178.601(g) was first developed and incorporated into the UN Recommendations, I recall rather clearly that the intent of these provisions was to use glass or something of similar fragility for the design qualification tests for "V-marked" packages. In fact, I would say not just glass, but fragile glass!

The fundamental underlying the V-marked packaging was that it could be used with any inner packaging because the design qualification tests and packaging configuration (for example, in terms of quantity and thickness of absorbent material) demanded a very high level of performance. For example, as far as the tests were concerned, fragile inner packagings had to be used and with the drop always from the Packing Group I drop height *and* with the mass of inner packagings twice that which would be authorized for use in

the field. It would appear that use of plastic inner packagings to qualify a V-marked package could seriously undermine this underlying philosophy - unless, of course, the plastic inner packagings, used when conditioned to -18°C, become more fragile than glass!

Moreover, the statement - which DOT acknowledges is "permissible, but not required" - suggested for inclusion in the packaging test report that the packaging is suitable provided no inner packaging used is "more fragile than plastic at -18°C" (what kind of plastic?) appears also to run counter to this underlying philosophy. That is, the V-marked packaging is supposed to be authorized for *any* inner packaging - with no "strings" attached.

It is entirely possible that my recollection of discussions that took place at the UN Committee so many years ago is flawed. Nevertheless, I have some concern (but no direct knowledge) that the view stated by DOT in this letter would *not* be shared by other national "competent authorities" when interpreting the corresponding provisions in the UN Recommendations, ICAO Technical Instructions, ADR. etc. And even if simply based on the need to ensure a very high level of performance with V-marked package in actual transport - as opposed to strictly satisfying the minimum requirements of the HMR - I would personally be reluctant to encourage the design qualification testing of a V-marked package with any inner packaging other than one of glass. And fragile glass (whatever that may be) at that!

Fiberboard Packaging Properties, Design Qualification Testing

Reference §§ 178.601 and 178.516, found on page 53 of this issue. Letters dated August 2, 2002 to Mr. Tony Senzel of Corrugated Supplies Corporation and to Mr. Richard M. Thomas of Smurfit-Stone Container Corporation.

An issue that frequently arises in connection with UN "4G" fibreboard combination packagings, is what degree of variation in the properties of fibreboard can be tolerated before the fibreboard is viewed as a "different" material from that used in packaging design qualification tests, and, consequently, packagings manufactured from that fibreboard considered to be of a "different" design type. DOT has typically held that the fibreboard must be "virtually identical" - but what, exactly does that mean?

Each of these letters touches in one way or another on that issue. In the first (to Mr. Senzel) it is not in any way surprising that DOT states that fibreboard with a basis weight different from that of the board used in the design qualification tests is a different material, and the packagings made from it are a "different packaging [design type]". In the second letter, in response to concerns expressed by the writer that, since "each run of corrugated board may provide different [Cobb test] results" a certification requested by customers that all board produced can "pass" the Cobb test should be viewed as "unacceptable", DOT acknowledges that no such "blanket statement" is required by the HMR. Curiously (and almost humorously), however, DOT fails to go on to state that it is nevertheless a requirement (blanket statement to customers or not) of the HMR that *all* fibreboard used in the manufacture of UN certified 4G outer packagings be capable of "passing" that test!

So, it may be concluded that "identical" in terms of fibreboard properties means at least the same basis weight and capable of meeting the same minimum performance level in the Cobb test. But it means even more, and it is important to take all relevant factors into account in assessing whether fiberboard used in production packagings is "virtually identical" to that used in the packagings subjected to the design qualification tests. In this regard, DOT has previously stated in various interpretations that to be "virtually identical" to one another fibreboards must have the same burst strength, edge crush resistance, water absorption rate, board weights, manner of construction, flute and caliper. Moreover, DOT has always prefaced such listings of properties by the words "such as" - implying that other characteristics may be relevant to the determination of what is "virtually identical" (but, unfortunately, never explicitly stating what these additional characteristics might be!).

HAZMAT Packager & Shipper

HAZMATIPS

1. *What is the intent of "Variation 2" in 49 CFR 178.601(g)(2)?*

This variation was agreed to by the UN to permit, without a full requalification design test, the conditional substitution of inner packagings different from those tested in the original design tests. This is to be accomplished by drop testing a decidedly most fragile inner packaging at a greater total combined package weight than would be authorized for actual shipment by the markings. The theory was that by using a combination of fragile inner packagings in a combined heavier unit in a successful drop test, it would be safe, without repeating complete design testing, for the modified combination packaging to be used with any suitably protected inner packagings.

2. *Can DOT authorize the use of "non-glass" inner packaging by using in the Variation 2 drop test, an inner packaging that might not be "as fragile as fragile can be" and then qualifying its "lesser fragility"?*

That DOT appears to have adopted this concept is clear based on one of its "clarification" letters. But the author points out that some doubt may exist about this approach in view of the history of this exception and consequently its potential unacceptability by other competent authorities. There might be a question whether DOT has exceeded the authority agreed upon by the international community. The author believes that any person using such an approach should do so very cautiously. [Editor's NOTE: Fragile is not a defined term in the UN and DOT may feel that it has more precisely limited what is being authorized.]

§ 178.516 August 2, 2002

This responds to your January 29, 2002 letter requesting clarification on package testing under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Specifically, you ask if your box plant can be required to sign a blanket statement guaranteeing that fiberboard used in the outer packaging will always "pass" the 30-minute Cobb Water Absorbency Test. You also ask what must pass the Cobb Test, the "combined" (corrugated fiberboard material) or the "base material" (outer liner component only), and, what results to use, an individual result or average of test results as indicated in the ISO International Standard 535 provisions?

According to your letter, 3rd party and/or self-certified labs are requesting that your box plants sign blanket statements guaranteeing the fiberboard that is used in their outer packaging always "pass" the 30-minute Cobb Test. You believe that this type of practice is unacceptable since each run of corrugated board may provide different results. The HMR do not require blanket statements guaranteeing that the fiberboard will always pass the Cobb Test. Decisions regarding such business practices should be negotiated between your company and your customers.

In your package testing scenario, the Cobb Test is conducted on the "combined" (corrugated fiberboard material) and it fails to pass the Cobb Test. If the Cobb Test was then conducted on the actual "base materials" (outer liner component only) that was actually used in the box and the base material passes, you ask which set of results should you use. Section 178.516(b)(1) requires the outer surface of the combined board to be tested, not the "base materials" or outer liner component. ISO International Standard 535 specifies using the average, therefore, the average test results determine whether the fiberboard passes or fails the Cobb Test.

I hope this answers your inquiry.

Sincerely,

Delmer F. Billings
Chief, Standards Development
Office of Hazardous Materials Standards

§ 178.601 July 11, 2002

This is in response to your letter requesting clarification of selective testing Variation 2 under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180).

Your customer has asked you to test and certify a combination package where the inner packagings are plastic bottles containing liquids as a Variation 2 packaging. Your customer has interpreted § 178.601(g)(2)(i) to mean that glass is an example of a "fragile inner packaging."

Your questions are paraphrased and answered as follows:

Q1. Is it permissible to use plastic inner receptacles conditioned to -18°C (0°F) in lieu of glass for the drop test required in § 178.601(g)(2)(i)?

A1. The answer is yes. Drop testing of combination packagings with plastic inner packagings intended to contain liquids must be carried out when the temperature of the test sample and its contents has been reduced to -18°C (0°F) (see § 178.603(c).

Q2. Can we certify our combination packagings for Variation 2 using plastic inner packagings?

A2. The answer is yes, provided the specific conditions of the variation are met.

Q3. Assuming we can test to Variation 2, should a statement be included in the certification report that the packaging qualifies under § 178.601(g)(2) for selective testing of combination packagings as long as no inner packagings more fragile than plastic at -18 ∞C (0 ∞F) are used?

A3. Such a statement is permissible, but not required. Variation 2 allows inner packagings of any type in an outer packaging without retesting if the specific conditions of the variation are met.

I hope this information is helpful. If you have further questions, please do not hesitate to contact this office.

Sincerely,

Hattie L. Mitchell
Chief, Regulatory Review and Reinvention
Office of Hazardous Materials Standards

§ 178.602 July 17, 2002

This responds to your April 25, 2002 letter requesting we consider alternative testing procedures to those under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Specifically, you ask that we consider two options that you are recommending for retesting of previously certified UN hazardous material packages. You state that these recommended testing procedures will help the environment and reduce waste and costs involved with UN hazardous materials testing. You further state that these recommended options are to be used only when agreed upon by the customer and testing laboratory performing the test.

You propose the following options: Option #1 - The quantity of packs required for drop tests be reduced to three (3) packs with multiple drops performed on two (2) packs, and Option #2 - Use only two (2) complete filled packs for stack, vibration and drop testing. You recommend these procedures for: (1) retest only when no substantial change in supplier or material has been made

HAZMAT Q&A

By Andy Altemos, Technical Advisor

Q: Could you clarify what requirements must be met relative to using V-marked packagings for hazardous materials? My understanding is that the performance capabilities of this product may present the opportunity to package a wide range of hazardous materials by the various modes. Have shipper's overestimated how these packagings can be used, and what precautions must I take with them? Can they be reused?

A: Certainly, the "V-marked" packaging is a packaging designed and intended to be used to achieve compliance with the packaging requirements for many different materials in a variety of inner packagings and under a wide array of circumstances. At the same time, it is my experience that in many cases there has been an "overestimation" of the ability of such packagings to be used in a compliant manner owing to a misunderstanding of the conditions and limitations that attach to the use of such packagings.

While this discussion of "V-marked" packagings will focus on the applicable requirements in the DOT Hazardous Materials Regulations ("HMR"), readers are advised that essentially the same provisions exist in the UN Model Regulation and in international regulations based on that standard - for example, the IMDG Code and the ICAO Technical Instructions (and the associated IATA Dangerous Goods Regulations). In the HMR, the basic requirements for the "V-marked" packaging are found in § 178.601(g)(2) as "Variation 2" on the "Selective testing of combination packagings". Packagings conforming to this "selective testing variation" are frequently referred to as "V-marked" packagings because §§ 178.503(a)(2) and 178.601(g)(2)(vii) require packagings conforming to the variation to be marked with the letter "V" following the applicable UN packaging code (for example, "4GV" or "1A2V" for conforming combination packagings with a fiberboard box or removable head steel drum outer packaging, respectively).

As stated in the introductory sentence to § 178.601(g)(2), the underlying purpose of the variation is to allow articles or inner packagings of any type to be assembled as a combination packaging and transported without need for testing that *specific* configuration of inner packaging and outer packaging (including related packaging components). This allows a variety of inner packagings that have not been tested in the outer packaging as a defined "design type" to be assembled and offered for transport in compliance with the regulations. To ensure safety in the transport of these untested configurations of combination packagings, the underlying philosophy of the V-marked packaging is to perform the design qualification tests on the package with "fragile" inner packaging(s) under exceedingly conservative conditions (e.g., from the Packing Group I drop height, with the inner packagings filled to twice the gross mass that will be allowed under actual transport, etc.) - thereby allowing different, less fragile inner packagings of lesser filled weight to be substituted for the inner packaging(s) used in the design qualification tests.

Having said this, however, there are still a number of conditions and limitations that apply to the use of V-marked packagings that must be borne in mind when packing inner packagings in V-marked packages in order to ensure the package is used in compliance with the regulations. As with any UN Specification, performance-oriented packaging, it is imperative to adhere to any relevant conditions or limitations arising from the manner in which the package was configured for testing. These are as identified in the test report or certification for the packaging, and/or the manufacturer's "closure" instructions (required under § 178.2(c) of the HMR to be provided by the manufacturer to each person to whom the packaging is transferred). In addition, in the case of V-marked packagings, any applicable conditions and limita-

Andy Altemos is Technical Adviser to HAZMAT Packager & Shipper, and is a partner in the firm, HMT Associates, L.C.C., Alexandria, VA. Mr. Altemos was formerly Secretariat to the International Civil Aviation Organization's (ICAO) Dangerous Goods Panel. Prior to that assignment he was International Standards Coordinator in the U.S. DOT Research & Special Programs Administration, in which expert capacity he represented the United States at the meetings of the United Nations (UN) Committee of Experts on the Transport of Dangerous Goods and its subsidiary bodies, the International Maritime Organization's Sub-Committee on the Carriage of Dangerous Goods and served as the United States' member on the ICAO Dangerous Goods Panel. He may be contacted by telephone at 1 (703) 549-0727, or fax at 1 (703) 549-0728.

tions imposed by § 178.601(g)(2) must also be satisfied. Some examples of considerations in the use of V-marked packagings arising from these conditions and limitations are outlined below.

One area commonly overlooked in the use of V-marked packagings is the requirement governing the thickness of cushioning material between inner packagings and between inner packagings and outer packagings (see § 178.601 (g)(2)(iii) on page 13). Here, the regulations require the cushioning material thickness to be not less than that used in the design qualification test. So, it is necessary for the user to consult the packaging test report and/or manufacturers instructions to determine the minimum thickness required, *and* to ensure that this minimum thickness of cushioning material is *always* maintained between inner packagings and between inner packagings and the outer packaging in each V-marked package offered for transport. In addition, if a single inner packaging was used in the design qualification test but the V-marked packaging is to be used to transport more than one inner packaging, the thickness of cushioning material between inner packagings must always be at least that existing between the inner packaging and outer packaging in the design qualification test.

The V-marked packaging requirements specifically address the use of few or smaller inner packagings than used in the tested design type - in which case sufficient additional cushioning material must always be used to take up all void spaces. The regulations clearly imply that *more* inner packagings may be used than were used in the design qualification test (see discussion in § 178.601(g)(2)(iii) and above regarding required cushioning thickness between inner packagings when only one inner packaging was used in the design qualification tests) - provided the applicable requirements are met.

Selective Testing of Combination Packagings. Variation 2. Section 178.601(g)(2)

Articles or inner packagings of any type, for solids or liquids, may be assembled and transported without testing in an outer packaging under the following conditions:

(i) The outer packaging must have been successfully tested in accordance with §178.603 with fragile (e.g. glass) inner packagings containing liquids at the Packing Group I drop height;

(ii) The total combined gross mass of inner packagings may not exceed one-half the gross mass of inner packagings used for the drop test;

(iii) The thickness of cushioning material between inner packagings and between inner packagings and the outside of the packaging may not be reduced below corresponding thickness in the originally tested packaging; and when a single inner packaging was used in the original test, the thickness of cushioning between inner packagings may not be less than the thickness of cushioning between the outside of the packaging and the inner packaging in the original test. When either fewer or smaller inner packagings are used (as compared to the inner packagings used in the drop test), sufficient additional cushioning material must be used to take up void spaces.

(iv) The outer packaging must have successfully passed the stacking test set forth in §178.606 of this subpart when empty, i.e., without either inner packagings or cushioning materials. The total mass of identical packages must be based on the combined mass of inner packagings used for the drop test;

(v) Inner packagings containing liquids must be completely surrounded with a sufficient quantity of absorbent materials to absorb the entire liquid contents of the inner packagings;

(vi) When the outer packaging is intended to contain inner packagings for liquids and is not leakproof, or is intended to contain inner packagings for solids and is not siftproof, a means of containing any liquid or solid contents in the event of leakage must be provided in the form of a leakproof liner, plastic bag, or other equally efficient means of containment. For packagings containing liquids, the absorbent material required in paragraph (g)(2)(v) of this section must be placed inside the means of containing the liquid contents; and

(vii) Packagings must be marked in accordance with §178.603 of this part as having been tested to Packing Group I Performance for combination packagings. The marked maximum gross mass may not exceed the sum of the mass of the outer packaging plus one half the mass of the filled inner packagings of the tested combination packaging. In addition, the marking required by §178.603(a)(2) of this part must include the letter "V".

But what about using fewer *larger* inner packagings than were used in the design qualification tests? The regulations are silent on this, but a DOT interpretation letter written in July 2001 suggests that this is permissible *provided* the weight of the larger inner packaging(s) does not exceed one-half the aggregate gross weight of the inner packagings used in the design qualification tests (as provided in § 178.601(g)(2)(ii)). Unfortunately, the DOT interpretation is silent on the question of the thickness of required cushioning material in such a case. It may be assumed that the thickness of cushioning material between the larger inner packagings and between the larger inner packaging(s) and the outer packaging must always be at least that existing between the inner packagings and between the inner packagings and outer packaging in the design qualification test. However, it may be questioned whether this would ensure sufficient protection for a larger, heavier inner packaging.

When V-marked packagings are used for the transport of liquids, inner packagings must be surrounded with a sufficient quantity of absorbent material to absorb the *entire* liquid contents of the inner packagings. This includes when "larger" inner packagings are used, as discussed above.

And, of course, as is the case with any UN Specification combination packaging, the manner of closing the packaging must conform to the manufacturer's closure instructions - for example, in the case of a fibreboard box combination packaging, box flaps must be closed and the box sealed with the *same* type of tape or method of closure as specified by the packaging manufacturer. Moreover, the gross weight of a filled packaging may never exceed the gross mass indicated in the UN packaging certification markings applied to the package.

If the V-marked package is to be transported by air, all the general requirements for air transport must be satisfied - including, for example, inner packaging and net package quantity limits, and the capability of inner packagings containing liquids to withstand the prescribed pressure differential without leakage. With regard to the latter point, it is emphasized that the authorized use of a V-marked packaging to transport "untested" inner packagings does not extend to relief from ensuring the inner packaging is capable of withstanding the necessary pressure differential.

Finally, with regard to reuse of V-marked packagings, nothing in the HMR prohibits this practice - with only packagings made of paper, plastic film or textile being specifically prohibited from reuse by § 173.28(b)(3) of the HMR ("fiberboard" not being considered by DOT as "paper" for purposes of this prohibition). However, for practical reasons the possibility of reusing fibreboard packagings in compliance with the regulations is highly problematic. The reuse requirements for non-bulk packagings in §§ 173.28(a) and (b) would apply. Thus, any packaging showing evidence of reduction in integrity (including punctures, tears, de-lamination, etc., in sides or flaps) may not be reused. Closure of the reused packaging would have to be in accordance with the manufacturer's instructions - and it is questionable whether, for example, retaping or resealing flaps from which previous means of closure had been removed (or even not removed) would comply with the closure method specified by the manufacturer for a "new" packaging of the same design type.

So, while the V-marked packaging is an extremely valuable tool to ensure compliance in the packaging of a wide variety hazardous materials in many different inner packagings, there nevertheless are conditions and limitations associated with the use of these packagings that must be observed. Readers employing these packagings in their transport operations are encouraged to review the applicable requirements, conditions and limitations as prescribed in the regulations and by the packaging manufacturer, and to take appropriate steps to ensure employees utilizing these packagings are properly trained in their authorized use.

HAZMAT Packager & Shipper

Hazmat Tips

Use of V-marked Packagings

What is a V-marked packaging?

This is a special type of UN specification packaging designed and intended to be used to meet packaging requirements for many different materials in a variety of inner packagings under a wide array of circumstances. It allows for a variety of inner packagings that have not been tested in the outer packaging as a defined "design type" nevertheless to be assembled and offered for transport.

Where do I find the requirements for V-marked packaging?

See § 178.601(g)(2) in the DOT Hazmat regulations, noted as "Variation 2"(see page 13).

Do V-marked packagings require special markings and where do I find these rules for how to mark them?

See §§ 178.503(a)(2) and 178.601(g)(2)(vii) of the DOT regulations.

Go to Andy Altemos' presentation in HAZMAT Q&A, page 12, titled, "Could you clarify what requirements must be met relative to using V-marked packagings for hazardous materials?" for an in depth look at V-marked packaging.

Letter to: Mr. John Rutherford 7/11/02 02-0124

Corbin, Gigi (DHM12)

From: Burger, Donald
Sent: Wednesday, November 13, 2002 10:45 AM
To: Corbin, Gigi (DHM12)
Cc: Mazzullo, Ed; Wybenga, Frits; Hochman, Charles; Mitchell, Hattie
Subject: RE: Interpretation relative to the V marked package

Gigi,
The as we discussed the only issue with the letter that I see is that we failed to mention that "the plastic inner packages need to be 'fragile' in accordance with 178.601(g)(2)." But with that said, if the package were to be certified in accordance with that section, the person or laboratory performing the test would already know that the inners need to be "fragile" and the need to restate that requirement is redundant.

If using the "most fragile" inner package was the intent of the variation, it is not conveyed by the way the variation is written, it only requires the inner package to be "fragile" not the "most fragile".

Additionally, it is impossible to make a blanket statement about the fragility of one material in comparison to another. We can not say that glass is always more fragile that plastic or vice versa; it is all related to the type of glass or plastic and the design of the package. Thus we rely on the vague term fragile to define when this variation can be used. Fragile is defined as likely to break if not protected.

Finally, the intro to 178.601(g)(2) makes no mention of maintaining an equivalent level of safety; it is specifically addressed in each of the other variations bit absent from variation 2. We can only infer that an equivalent level of safety is maintained through the testing of the "fragile" packages and replacing them with other inner packages.

Don B

-----Original Message-----
From: Corbin, Gigi (DHM12)
Sent: Wednesday, November 13, 2002 10:28 AM
To: Burger, Donald
Subject: FW: Interpretation relative to the V marked package

Don,
Would you care to comment on Frits' e-mail. The UN Recommendations do not refer to the "most fragile" and they do not have the statement about an "equivalent level of packaging."
Thanks.
Gigi

-----Original Message-----
From: Mitchell, Hattie
Sent: Wednesday, October 30, 2002 9:21 AM
To: Corbin, Gigi (DHM12)
Subject: FW: Interpretation relative to the V marked package

Please resolve. Thanks.

-----Original Message-----
From: **Wybenga, Frits**
Sent: Wednesday, October 30, 2002 8:28 AM
To: Mazzullo, Ed; Mitchell, Hattie
Cc: Burger, Donald; Hochman, Charles; Richard, Bob; Pfund, Duane
Subject: Interpretation relative to the V marked package

Ed, Hattie - there is an interpretation to the V marked packaging requirement that was written up in the latest Hazmat packager and shipper. I tend to agree with Andy's evaluation that we missed the mark on this and are somewhat out of sinc with the way other competent authorities would view the question.

The intent of the V marked packaging requirements was to take the most fragile inner packaging one could imagine and put it in the package and subject it to testing more severe than normally required. The thought was by qualifying the package with the most fragile inners anticipated the package it would then be suitable for all inner packagings. This thought is lost in the interpretation provided on 1786.601, July 11, 2002. We allow a plastic package but fail to mention that the tested inner must be fragile - the response does not cover the fragility of the plastic inner relative to other inners that may be used. The intro to all the variations emphasizes that an equivalent level of safety must be maintained - we don't mention this either. I haven't read the requirement on manufacturers having to report shortages to package fillers recently but would it be unreasonable to put some notation in there what the limitations on the use of the V marked packaging are?

Please take another look at this interp - thanks.

Frits Wybenga
Deputy Associate Administrator for Hazardous Materials Safety
Research and Special Programs Administration
U.S. Department of Transportation
400 7th Street, S.W., Room 8321
Washington, D.C. 20590-0001

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Department of Transportation
Federal Aviation Administration

Office of Security and Investigations
Indianapolis Field Office
5420 West Southern Avenue, Suite 203
Indianapolis, Indiana 46241

Office: 317-390-6900
Fax: 317-390-6921

FAX

Date: 3/17/03 **Time:** 1520 **Number of pages to follow:** 8

Recipient: Hattie Mitchell
Agency: RSPA
Fax No:

Sender: Reginald McDaniel
Agency: FAA
Title: Special Agent

Message

Confidentiality Notice

Inland Paperboard and Packaging, Inc.
8501 Moller Road
Indianapolis, Indiana 46268
Phone 317.875.4101 Fax 317.875.4145

INLAND
A Temple-Inland Company

July 10, 2002

George Cornell
Roche Diagnostics
9115 Hague Road
Indianapolis, IN 46250

Dear George:

Attached is the UN/DOT Certification for the Variation 2 Plastic Container Large Package shipped by Roche Diagnostics as described in this document. This package has passed the hazardous material performance oriented packaging criteria, Packing Group I. It should be understood by Roche Diagnostic personnel and by Inland Paperboard and Packaging, Inc. personnel that no changes in the packaging, as tested, can be tolerated, except as permitted by Variation 2. Any modifications of the packaging involving inner containers, outer containers or case sealing method must be re-tested.

This certificate, or a copy, needs to be present at the packaging and shipping site(s) and should be reviewed with the packaging people.

You will, most likely, receive a visit from a Hazardous Materials Enforcement Specialist in the near future to review your documents and procedures.

Copies of this certification have been provided to Inland's Indianapolis, Indiana Box Plant, also a candidate for an inspection.

You should remember that a retest of this packaging must be conducted before July 10, 2004 in order for you to maintain compliance. The attached Ten-E report for internal hydrostatic pressure test will expire August 25, 2002.

Please contact me with any questions. My telephone number is 317-875-4130.

Sincerely,

John H. Rutherford

John H. Rutherford
Manager, Testing Solutions Group

cc: G.D. Bowman - Inland Paperboard and Packaging, Inc. Legal Department
Ken Benbow - Inland Paperboard and Packaging, Inc., Indianapolis Box Plant
Joe Chaille' - Inland Paperboard and Packaging, Inc., Indianapolis Box Plant

UNITED NATIONS PERFORMANCE TEST

RESULTS FOR CODE 4G CONTAINERS

LARGE PACKAGE FOR VARIATION 2

FOR

Roche Diagnostics
9115 Hague Road
Indianapolis, IN 46250
Attn.: George Cornell

7/10/02

PA#14602

Inland Paperboard and Packaging, Inc.
8501 Moller Road
Indianapolis, Indiana 46268
Phone 317.875.4101 Fax 317.875.4145

REPORT NO.: PA# 14602
Current Date: 7/10/02
Page 1 of 6

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Large Package for Variation 2 – Packing Group I

The package described herein was tested for Roche Diagnostics and found to conform to all of the applicable requirements for packagings in Chapter 9 of the United Nations Recommendations on the Transport of Dangerous Goods, ST/SG/AC.10/1/Rev. 9 (Orange Book) and UN/DOT Code of Federal Regulations (CFR) Title 49 Part 107 through 180.

This package is certified for rail and truck transport by this report. This package has been certified for air transport by testing conducted by Ten-E Packaging (See attached report). The attached Ten-E report will expire August 25, 2002.

A summary of the test results is as follows:

TEST	INTENSITY	RESULTS
Drop Test	72 in.	Passed
Stacking Test	699 lb., 317.7 kg	Passed
Vibration Test	60 min. @ 4.3 Hz	Passed

All test materials were conditioned in accordance with Section 178.602 (d) (1) unless otherwise noted in the Test Procedures and Report Form.

This sample passed the drop, stacking, vibration, and Cobb size tests, and the packaging design type is considered to meet the performance requirements. The packaging qualifies under Section 178.601(g)(2) for selective testing of combination packagings as long as no inner packaging more fragile than plastic at 0°F is used. On the basis of these results, Roche Diagnostics may certify this packaging using the markings shown below. If any change is made to the packaging (such as in design or manufacture), it must be re-tested.

(u n) 4GV/X17.6/S/**
USA/Roche Diagnostics, Indianapolis, IN
**Last two (2) digits of year of manufacture

Date: 7-10-02

John H. Rutherford
Testing Official

Company Name: Inland Paperboard and Packaging, Inc.
Address: 8501 Moller Road
Indianapolis, IN 46268

Inland Paperboard and Packaging, Inc.
8501 Moller Road
Indianapolis, Indiana 46268
Phone 317.875.4101 Fax 317.875.4145

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TEST SAMPLE DESCRIPTION

Closure Description: 28 mm thread, 28/400 finish, 250 ml Natural octagonal cap, made by Heinz, Roche Part No. 0509109.
Material: Polypropylene, Pigment Natural.
Liner: N/A Closure Torque: Snug by hand.

Bottle Description: 28/400 Buttress, 2 liter bottle with integral handle made by Owens-Brockway. Method of manufacture extrusion blow molding. Part No. 189907400 Minimum wall thickness is .020 inches. Material: Natural High Density Polyethylene
Rated Capacity: 2 Liters Maximum fill capacity 2249mL (98% = 2204 mL)
Tare Weight: 170 grams with cap
Product Specific Gravity: < 1.2
Dimensions:

O.D. Height: 240 mm O.D. Length: 147 mm O.D. Width: 80 mm

Inner Packaging: One plastic bag 23 inches x 18 inches x 34 inches LLDPE, Clear, .002 Mil. Three sheets of (Universal PIG Absorbents (grey in color) made by New Pig Corporation) absorbent material. Two sheets placed in the bottom of the plastic bag, and one sheet placed on the top of the two small boxes. Sheet size is 19 ¾ inches by 16 ½ inches.

Overpack: Large RSC, 22 inches x 13 ¾ inches x 12 ½ inches, outside dimensions.

Manufacturer/Location: Inland Paperboard and Packaging, Inc. Indianapolis, IN

Style & Grade: Large RSC, 42-23-35-26-42 C/B Flute (42-X23-L70-M28-42). Average caliper of six samples for the large RSC = .269 inches. Small RSC, 42-23-35-26-42 C/B Flute (42-X23-L70-M28-42). Average caliper of six samples for the small RSC = .268 inches.

Manufacturers Joint: 1 ½ inches, inside glued (Both Large and Small RSC)

Closure Method Description: Both top and bottom flaps, 3 inch wide reinforced remoistenable paper tape manufactured by Central Tape Products. (Both Large and Small RSC)

Top Flaps: One strip down the center where the major flaps meet on Small RSC and two strips down center of Large RSC.
Bottom Flaps: One strip down the center where the major flaps meet

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TEST PROCEDURES AND RESULTS

DROP TEST

Test Conditions: 0° F

Container Gross Weight – Tested Weight: 77.6 lbs., 35.2 kg
(Shipping weight will be 38.8 lbs. (17.6 kg))

Filling Substance: 50:50 Ethylene Glycol/Water plus lead shot

Drop Height: 72 inches

Drop Height Calculation if Specific Gravity over 1.2 (unless actual product is used):

Drop Orientations & Results:

CASE	DROP ORIENTATION	RESULTS	COMMENTS
1	Flat on Bottom	Passed	
2	Flat on Top	Passed	
3	Flat on Long Side	Passed	
4	Flat on Short Side	Passed	
5	Bottom Corner (Use Mfg. Joint)	Passed	

Test standard followed was Section 9.7.3 of the United Nations Recommendations on the Transport of Dangerous Goods (Orange Book) and UN/DOT Code of Federal Regulations (CFR) Title 49 Section 178.603.

Passing Criteria: There cannot be any leakage from the inner packagings. The outer packaging should not be damaged to the extent that further transport or safety will be affected.

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TEST PROCEDURES AND RESULTS

STACK TEST

TEST RESULTS:

Test Conditions: Ambient unless otherwise noted

Container Gross Weight – Tested Weight: 77.6 lbs., 35.2 kg
(Shipping weight will be 38.8 lbs. (17.6 kg))

Filling Substance: Empty Boxes

Maximum Stack Height: 3 meters

Test Duration: 24 hours

Calculated Required Test Load:
120 in. per 3 meters ÷ 12 ½ in. per box = 9.6 boxes per 3 meters
9 boxes x 77.6 lbs. per box = 698.4 lbs.

Used Emerson 8510 static load for 24 hours. All three boxes put on tester at one time. Load (699 lbs.) for one box was taken times 3 (2097 lbs.).

Test Load Applied: 699 lbs., 317.7 kg

Tests conducted in accordance with United Nations Recommendations of the Transport of Dangerous Goods; Chapter 9 General Recommendations on Packaging, Section 9.7.6 and UN/DOT Code of Federal Regulations (CFR) Title 49 Section 178.606.

Acceptance Criteria: Test samples should not show any signs of deterioration, which would lead to package instability while stacked.

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TEST PROCEDURES AND RESULTS

VIBRATION TEST

Test Conditions: Ambient unless otherwise noted

Container Gross Weight – Tested Weight: 77.6 lbs., 35.2 kg
(Shipping weight will be 38.8 lbs. (17.6 kg))

Filling Substance: 50:50 Ethylene Glycol/Water plus lead shot

Package Orientation: Top-to-bottom

Vibration Frequency: 4.3 Hz @ .95 G's input energy

Test Duration: 60 Minutes

Leak Test Results: Pass X Fail___

Test standard followed was Section 178.608 of the UN/DOT Code of Federal Regulations (CFR) Title 49. Currently only the United States requires the vibration test.

Passing Criteria: Following the one hour vibration each container is placed on its side for one hour and if no evidence of leakage occurs the package is considered to have passed.

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Marketing/Technical Center
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TEST PROCEDURES AND RESULTS

COBB TEST

Test Conditions: 73° F, 50 % R.H.

Test Length: 30 minutes per sample

Test Equipment: Gurley Cobb Water Absorption Apparatus

Sample Size: 5 ¼ x 5 ¼ inch, container outer surface

COBB TEST ABSORPTION RESULTS		
Average (5 samples)	129 (g/m^2)	Passed

I.S.O. International Standards 535-1976 (E)

Test standard followed was Section 9.6.11.1 of the United Nations Recommendations on the Transport of Dangerous Goods (Orange Book) and UN/DOT Code of Federal Regulations (CFR) Title 49 Section 178.516.

Passing Criteria: There cannot be an increase in mass averaging greater than 155 g/m^2 of water absorbed over a 30 minute period.

Mr. John Rutherford
Manager, Testing Solutions Lab
Inland Paperboard and Packaging. Inc.
8501 Moller Road
Indianapolis, IN 46268

Reference No.: 02-0124

Dear Mr. Rutherford:

This letter replaces our letter dated July 11, 2002 which responded to your request for clarification of selective testing Variation 2 under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Our response to "Q1" is revised for clarity.

You stated that your customer has asked you to test and certify a combination package where the inner packagings are plastic bottles containing liquids as a Variation 2 packaging. Your customer has interpreted § 178.601(g)(2)(i) to mean that glass is an example of a "fragile inner packaging."

Your questions are paraphrased and answered as follows:

Q1. Is it permissible to use plastic inner receptacles conditioned to -18 °C (0 °F) in lieu of glass for the drop test required in § 178.601(g)(2)(i)?

A1. The answer is yes, provided the inner receptacles are made of "fragile" plastic material. Drop testing of combination packagings with plastic inner packagings intended to contain liquids must be carried out when the temperature of the test sample and its contents has been reduced to -18 °C (0 °F) (see § 178.603(c)). Plastic packagings manufactured from plastics normally used for hazardous materials, i.e. high density polyethylene, may not be considered as fragile packagings.

Q2. Can we certify our combination packagings for Variation 2 using plastic inner packagings?

A2. The answer is yes, provided the specific conditions of the variation are met, including the use of a plastic inner packaging that is considered to be "fragile."

Reggie McDaniel
FAA
317-390-6914

Q3. Assuming we can test to Variation 2, should a statement be included in the certification report that the packaging qualifies under § 178.601(g)(2) for selective testing of combination packagings as long as no inner packagings more fragile than plastic at -18 °C (0 °F) are used?

A3. Such a statement is permissible, but not required. Variation 2 allows inner packagings of any type in an outer packaging without retesting if the specific conditions of the variation are met.

I hope this information is helpful. If you have further questions, please do not hesitate to contact this office.

Sincerely,

Hattie L. Mitchell
Chief, Regulatory Review and Reinvention
Office of Hazardous Materials Standards

Corbin:DHM-12:05/31/02
Rewritten:Corbin:DHM-12:11/15/02:cdd
Revised:Burger:DHM-20:12/09/02:cdd
File: 178.601
SC: Testing

CEN TC 261

Date: 2002-07

EN ISO 16104:2002

CEN TC 261

Secretariat: AFNOR

Packaging — Transport packaging for dangerous goods — Test methods (ISO 16104:2002(E))

Verpackung — Verpackungen zur Beförderung gefährlicher Güter — Prüfanforderungen

Emballage — Emballage de transport pour marchandises dangereuses — Méthodes d'essai

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Contents

Foreword

This document has been prepared by CEN /TC 261, "Packaging" in collaboration with ISO/TC 122 "Packaging".

This document has to be implemented at national level, either by publication of an identical text or by endorsement, by **month year**, and conflicting national standards have to be withdrawn by **month year**.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this document: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This European Standard has been submitted for reference into the RID and/or in the technical annexes of the ADR. Therefore in this context the standards listed in the normative references and covering basic requirements of the RID/ADR not addressed within the present standard are normative only when the standards themselves are referred to in the RID and/or in the technical annexes of the ADR.

Annexes A, B, D and F are informative.

Annexes C, E and G are normative.

This standard includes a Bibliography.

Introduction

This Standard was developed to provide requirements and test procedures to meet the multi-modal United Nations Recommendations on the Transport of Dangerous Goods [1] and successful passing of the tests may lead to the allocation of an appropriate packaging mark (e.g. UN, RID/ADR). The UN Recommendations have been developed by the United Nations Committee of Experts on the Transport of Dangerous Goods as a "model regulation" (referred to in this document as the UN Recommendations) in the light of technical progress, the advent of new substances and materials, the exigencies of modern transport systems and, above all, the need to ensure the safety of people, property and the environment. Amongst other aspects, the UN Recommendations cover principles of classification and definition of classes, listing of the principal dangerous goods, general packing requirements, testing procedures, marking, labelling or placarding, and shipping documents. There are in addition special recommendations related to particular classes of goods.

The UN Recommendations are given legal entity by the provisions of a series of international modal agreements and national legislation for the transport of dangerous goods. The international agreements include:

- The European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) (covering most of Europe). [2]

- Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) (covering most of Europe, parts of North Africa and the Middle East). [3]

- The International Maritime Dangerous Goods Code (IMDG Code) (worldwide). [4]

- The International Civil Aviation Organization's Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO TIs) (worldwide). [5]

The application of this Standard will need to take account of the requirements of these international agreements and the relevant national regulations for domestic transport of dangerous goods.

Occasionally during adoption as a modal regulation the text has been modified; RID/ADR permit some variations to tests for light gauge metal packagings and these are included in annex A.

The cross references between this Standard, the UN Recommendations and the International Agreements are summarized in annex B.

It is important to note that there will be certain modal differences from the UN Recommendations and that the schedule for revision of the Recommendations and modal provisions may lead to temporary inconsistencies with this Standard, which is regularly updated to the latest version of the UN Recommendations.

It is noted that success in the tests and the allocation of an official UN mark do not on their own authorize the use of a packaging for any dangerous goods, which are subject to the packing instructions published in the various modal regulations.

This Standard is based on Revision 12 of the UN Recommendations.

1 Scope

This Standard specifies the design type test requirements for packagings as described in 3.6 of this standard and intended for use in the transport of dangerous goods.

NOTE This Standard should be used in conjunction with one or more of the international regulations set out in the Bibliography.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 22206, *Packaging — Complete filled transport packages — Identification of parts when testing (ISO 2206:1987)*

ISO 2137, *Petroleum products — Lubricating grease and petroleum — Determination of cone penetration*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

EN ISO 2431, *Paints and varnishes - Determination of flow time by use of flow caps (ISO 2431:1993, including Technical Corrigendum 1:1994)*

3 Terms and definitions

For the purposes of this European Standard the following terms and definitions apply.

3.1
competent authority
any national regulatory body or authority designated or otherwise recognized as such for any purpose in connection with the regulations specified in the Bibliography

3.2
packaging design type
packaging of one design, size, material and thickness, manner of construction and packing, but may include various surface treatments together with packagings which differ from the design type only in their lesser design height

3.3
liquids and solids
(see annex B)

3.4
capacity

3.4.1
brimful (overflow, maximum) capacity
maximum volume of water in litres held by the packaging when filled through the designed filling orifice to the point of overflowing in its normal position of filling

3.4.2
nominal capacity
capacity in litres which, by convention, is used to represent a class of packagings of similar brimful capacities

3.5
packing group
group to which substances and articles of most classes of dangerous goods are assigned according to the degree of danger presented:

Packing group I	**Packing group II**	**Packing group III**
High danger	medium danger	low danger

NOTE The severity of a packaging test (e.g. the drop height) varies with the packing group of the substance or article. The allocation of packing groups to substances and articles may be found in the dangerous goods list of the UN Recommendations.

3.6
packaging
receptacle and any other components or materials necessary for the receptacle to perform its containment function and are:

- designed to contain a net mass not exceeding 400 kg;
- designed with a capacity not exceeding 450 l;
- not intended to transport most gases;
- not intended to transport most infectious substances;
- not intended to transport most radioactive materials;
- not Intermediate Bulk Containers as defined in the UN Recommendations 6.5.

NOTE 1 Other definitions relevant to this standard may be found in 1.2.1 of the UN Recommendations.

NOTE 2 Annex B contains useful data on packaging types and other identifying codes with references to the regulations.

NOTE 3 Unless otherwise stated both the 400kg and 450 litre limits apply to all packages irrespective of the contents.

3.7
"V"-marked packaging
outer packaging conforming to the appropriate requirements from the UN Recommendations 6.1.5.1.7 (see annex C)

3.8
special packagings
collective term for V-marked packaging and salvage packagings (defined in the UN Recommendations 1.2.1)(see annex C)

3.9
single packaging

means of packaging that does not require an inner packaging to be capable of performing its containment function and it includes composite packaging

3.10
light gauge metal packaging - (see annex A)

NOTE Other definitions that may be relevant to this standard may be found in the UN Recommendations.

4 Test requirements

4.1 General

Before the packaging is used for dangerous goods, tests shall be carried out successfully on each packaging design type (see 3.2), which may lead to the issuing of a UN packaging mark. The tests shall be successfully repeated after any modification which alters the packaging design type. With the exception of special packagings (see 3.8), all packagings for dangerous goods shall be tested in accordance with Table 1 and shall meet the requirements contained in 4.2 to 4.6. Special packagings shall meet the requirements set out in annex C.

Where an inner treatment or coating is applied for safety reasons it shall retain its protective properties even after tests.

NOTE Provided the validity of the test results is not affected and with the approval of the competent authority, several tests may be made on one packaging. This may be necessary, for example, with very costly or scarce packagings. This may be accomplished by:

a) using one set of packagings for more than one of the tests. For example five tests are required on a drum for liquids, each requiring a set of three packagings, namely first drop, second drop, leakproofness, internal pressure and stack. Subjecting one set to more than one of the five tests is considered equivalent;

b) using one packaging for the tests. For example using one fibreboard box for all five drops is considered equivalent to carrying out 1 drop on each of five boxes.

Approval should be sought from the competent authority before employing method a) or when subjecting any one packaging to more than two tests (including investigatory drops) under method b).

The use of smaller numbers should be indicated in the test report. This is normally apparent from the serial numbers of the packagings used for the various tests but explanatory text is also desirable.

Table 1 — Allocation of test conditions to packaging types

Drop test								Stacking test (see annex D for variations)					Leakproofness test		Hydraulic pressure test		
Table 1	Contents	Inner packaging			Temperature			Temperature									
Packaging type	Liquid/ Other	Plastics	Other or none	No. of packagings	Ambient	23°C / 50 % rh	-18 °C	No. of packagings	Time	Ambient	23°C / 50 % rh	40° C	No. of packagings	Time	No. of packagings	Time	Total no. of packagings
Table footnotes		h	h			a	be		d		a	c		d		d	
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)	(R)
1. Metal packagings [k]	Liquid			6	Y			3	24 h	Y			3	5m	3	5m	15
2. Metal packagings [k]	Solid		Y	6	Y			3	24 h	Y			0		0	0	9
3. Metal packagings [k]	Solid	Y		6			Y	3	24 h	Y			0		0	0	9
4. Plastics packagings [k]	Solid		Y	6			Y	3	24 h	Y			0		0	0	9[g]
5. Plastics packagings [k]	Solid	Y		6			Y	3	24 h	Y			0		0	0	9[g]
6. Plastics packagings [k]	Liquid			6			Y	3	28 d			Y	3	5m	3	30m	15[g]
7. Composite packagings — plastics [m]	Solid	Y	Y	6			Y	3	24 h[l]	Y[l]			0		0	0	9[g]
8. Composite packagings plastics [m]	Liquid			6			Y	3	24 h[l]	Y[l]			3	5m	3	30m[l]	15[g]
9. Composite packagings — glass, stoneware and porcelain [m]	Liquid			6		Y[l]	Y	3	24 h[l]	Y[l]			3	5	3	5	15

Drop test								Stacking test (see annex D for variations)					Leakproofness test		Hydraulic pressure test		
Table 1	Contents	Inner packaging			Temperature			Temperature									
Packaging type	Liquid/ Other	Plastics	Other or none	No. of packagings	Ambient	23°C / 50 % rh	-18 °C	No. of packagings	Time	Ambient	23°C / 50 % rh	40° C	No. of packagings	Time	No. of packagings	Time	Total no. of packagings
Table footnotes		h	h			a	be		d		a	c		d		d	
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)	(R)
9a. Composite packagings – glass, stoneware and porcelain [m]	Solid	Y		6				3	24 h [l]	Y [l]			0		0		9
9b. Composite packagings – glass, stoneware and porcelain [m]	Solid		Y	6	Y			3	24 h [l]	Y [l]			0		0		9
10. Fibre/ plywood drums	Solid		Y	6		Y [l]		3	24 h	Y [l]			0		0	0	9
11. Fibre/ plywood drums	Solid	Y		6			Y	3	24 h	Y [l]			0		0	0	9
12. Plastics boxes	Solid	Y	Y	5			Y [f]	3	24 h	Y			0		0	0	8 [g]
13. Fibreboard boxes	Solid	Y		5			Y	3	24 h		Y		0		0	0	8
14. Fibreboard boxes	Solid		Y	5		Y		3	24 h		Y		0		0	0	8
15. Other boxes	Solid	Y		5			Y	3	24 h	Y			0		0	0	8
16. Other boxes	Solid		Y	5	Y			3	24 h	Y			0		0	0	8
17. Bags (paper)	Solid		Y	3		Y		0	0				0		0	0	3
18. Bags (other)	Solid		Y	3	Y			0	0				0		0	0	3

NOTE 1 Annex B Table B.2 shows the relationship between this table and UN packaging codes.

NOTE 2 Y indicates a requirement

[a] Column (G) and (L): Paper or fibreboard packagings shall be conditioned for at least 24 h in an atmosphere having a controlled temperature and relative humidity (r.h.) unless -18 °C conditioning for plastics inner packagings or receptacles takes precedence. The preferred atmosphere is 23 °C ± 2 °C and 50 % ± 2 % r.h.

NOTE 1 The two other options are 20 °C ± 2 °C and 65 % ± 2 % r.h. or 27 °C ± 2 °C and 65 % ± 2 % r.h

NOTE 2 Average values should fall within these limits. Short term fluctuations and measurement limitations may cause individual measurements to vary by up to ± 5 % relative humidity without significant impairment of test reproducibility.

NOTE 3 Conditioning may be carried out immediately before, or after filling the package with the test contents provided such a procedure would not affect the test results.

[b] Column (H):

1) The following plastics packagings shall undergo the cold drop test:

   — -plastics drums and jerricans;

   — -plastics boxes other than expanded polystyrene boxes;

   — -composite packagings (plastics materials);

   — -combination packagings with plastics inner packagings other than plastics bags intended to contain solids or articles;

2) The temperature shall be -18 °C or lower as measured immediately after the drop test;

3) Test liquids shall be kept in the liquid state by the addition of antifreeze if necessary;

NOTE Temperatures outside the range -18° to -22 °C should be pre-arranged and recorded in the test report;

[c] Column (M): The temperature shall be at least 40°C.

NOTE Temperatures outside the range 40°C to 44 °C should be pre-arranged and recorded in the test report.

[d] h = hours d = days m = minutes

[e] Column (H): Metal packagings with plastics closures not exceeding 7 cm shall not undergo the drop test at -18 °C as required for plastics packagings.

[f] Column (H): Expanded polystyrene boxes, unless inner packagings are of plastics material, shall not undergo a drop test at -18 °C; the drop shall be at ambient.

[g] Column (R): Packagings shall be at least 48 h old.

[h] Contents of inner packagings can be solid or liquid.

[i] Column (J):

— Composites with plastics outers shall be tested for 28 days at 40 °C;

— Composites with outers other than plastics shall be tested for 24 h at ambient temperature.

[j] Column (Q): Plastics packagings and Composite packagings (plastics materials) shall be tested for 30 min. Other composites shall be tested for 5 min.

[k] Column (A): Other than boxes.

[l] Column (G) and (K): where the outer is fibre/fibreboard the drop and stacking test shall be undertaken following conditioning at 23 °C ± 2 °C and 50 % ± 2 % r.h.

[m] Column (A): where a composite packaging (plastics materials) is in the shape of a box only 5 samples are required for the drop test which shall be carried out in accordance with the procedures for boxes see Table 2.

4.2 Drop test

When tested in accordance with 7.1:

a) the packaging shall be leakproof subsequent to any slight discharge from the closure(s) that may be apparent at the moment of impact and, in the case of packaging containing liquids, subsequent to the equalization of internal and external pressures (except for inner packagings of combination packagings when it is not necessary for the pressure to be equalized);

b) the packaging shall not exhibit any damage liable to affect safety during transport, for example the package cannot be moved without leaking;

c) the packagings that are to be tested for use with goods of Class 1 (explosives) shall be identified as such in the test report. When tested, they shall not display any rupture that would permit the spillage of loose explosive substances or articles from the outer packaging;

d) the outer ply of a bag shall not exhibit damage liable to affect safety during transport;

e) the outer of a combination packaging shall not exhibit damage liable to affect safety during transport.

4.3 Stacking test

When tested in accordance with 7.2 the packaging shall not:

a) show any sign of leakage (this includes inner packaging and any inner receptacle);

b) show any deterioration which could adversely affect transport safety nor any distortion liable to reduce its strength or reduce stability in stacks of packages.

4.4 Leakproofness test

When tested in accordance with 7.3, packagings intended to contain liquids (except inner packagings of combination packagings) shall be leakproof.

4.5 Hydraulic pressure test

When tested in accordance with 7.4, packagings intended to contain liquids (except inner packagings of combination packagings) shall not leak.

Inner packagings of combination packagings containing liquids, which are likely to be shipped by air, shall be capable of withstanding an internal pressure without leakage (see UN Recommendations 4.1.1.4.1.)

4.6 Test report

All packaging tests performed in conformity with this standard shall be the subject of a test report and will include a specification check prepared in accordance with annex E. It shall be possible to specifically identify the packaging relative to each test report, either by the retention of uniquely referenced packagings or by inclusion of sufficient photographs and/or drawings with unique references to enable identification of the packaging and all its components.

The test report shall be available to the users of the packaging.

NOTE The complete test report may not be required by the user. Manufacturers and subsequent distributors of packagings should provide information regarding procedures to be followed and a description of the types and dimensions of closures (included required gaskets and any other components needed to ensure that packages as presented for transport are capable of passing the applicable tests).

5 Selection and preparation of test packagings

5.1 Selection of packagings

Sufficient packagings per design type shall be selected/submitted for testing in accordance with columns E, I, N and P of Table 1 and shall be:

a) marked with a test reference which shall also be entered on the test record and later used on the test report;

b) marked on each face where the packaging is in the shape of a box in accordance with EN 22206;

c) individually weighed to establish the tare or filled mass;

d) NOTE The form of such weighing may be varied to correspond to whether the packagings have been supplied full or empty to the test station. Where the masses of individual empty packagings are recorded, it is necessary to record only a typical filled mass (or vice versa);

e) examined for damage which might invalidate the tests, in which event the packaging shall be replaced.

NOTE Under some circumstances it may be desirable to have a range of packagings tested in a number of different sizes but of the same construction. In such situations it may not be necessary to carry out testing for every possible permutation. This selective testing procedure is recognized but only after agreement with the competent authority who will advise on options available. Guidelines are set out in annex F.

5.2 Information to be provided with packagings

5.2.1 General

Each packaging type shall be accompanied by specification(s) for that design type containing the data set out in annex G and by the following additional information as relevant.

5.2.2 Test Contents- Using water and non-dangerous substances

Where the tests are to be carried out using water or other non-dangerous substances a statement of the packing group for which the packaging is to be tested shall be provided, together with data enabling appropriate selection of inert test contents. For liquids such data will normally include the required maximum relative density for the tests together with data on, for instance, the internal pressure test required. For solids such data shall include mass, grain size and any other relevant characteristic, for example, bulk density, angle of repose etc., to clearly show equivalence of physical characteristics.

5.2.3 Test Contents - Using the dangerous substance

Where the tests are to be carried out using the dangerous substance(s) to be transported, a statement of their packing group and their physical characteristics shall be provided. Liquids shall be defined by their relative density together with viscosity and method of determination. Solids shall be defined by their mass and grain size and any other relevant characteristic, for example, bulk density, angle of repose etc. to ensure physical characteristics are sufficiently identified and included. This data shall be recorded in the test report (see annex E);

NOTE Where tests are carried out using the actual substance to be transported then the test report should be applicable for other substances having the same or equivalent characteristics.

5.2.4 Test Contents- Using Articles

Where the packaging is intended for the transport of an article(s), a statement of the packing group, an appropriate description and drawing(s) of the article(s) and or photographs and details of the way in which dummy articles were filled for the purpose of testing.

5.2.5 Vapour pressure

For liquids the vapour pressure of the substance to be carried or the hydraulic pressure to be achieved during the tests.

5.2.6 Special instructions

Any special filling or closing instructions including, where relevant, for example the closure torque (EN 26789).

5.3 Selection of contents and filling of packaging prior to testing

5.3.1 General

Single packagings and the inner packagings of combination packagings shall be filled for drop and stacking tests to not less than:

— 98% of brimful capacity for liquids;

— 95% of brimful capacity for solids.

NOTE There are two exceptions, some flexible packagings (see 5.3.5) and some packagings designed to be transported part full (see 5.3.6).

Packagings for liquids, or those capable of containing them, shall have their capacity determined as in 5.3.3 or 5.3.4. Otherwise the capacity shall be determined by other suitable means e.g. by calculation.

5.3.2 Test Contents

Where non-dangerous substances are to be used as test contents they shall be selected to accord with the data referred to in 5.3.5. Water or a water/anti-freeze mixture may be used to represent any liquid.

For solids, additives such as bags of lead shot may be used to adjust the mass if required, but if used they shall be placed in such a manner that the test results are not affected. Dangerous articles shall be replaced by dummy articles and these shall be of the same size, shape, mass and centre of gravity as the articles to be transported.

The test contents used shall be recorded in the test report.

5.3.3 Rigid packaging to contain liquids

5.3.3.1 Determination of brimful capacity

A packaging intended to contain liquids shall be filled to not less than 98 % of the brimful capacity. The brimful (overflow) capacity is determined for example by: weighing the empty packaging including closures (mass empty (m) in kg) and weighing the packaging full (mass brimful (W) in kg). The packaging shall be filled with water until the water just overflows and then fitting the closure and any surplus mopped up. No steps shall be taken, e.g. by tilting or tapping the packaging, to enable water to penetrate into a hollow handle or other design feature above the closure.

$$b = \frac{W - m}{d}$$

where:

b is the brimful capacity in litres

W is the mass in kg, of packaging when brimful with water

m is the mass in kg, of the empty packaging

d is the density of water (=1) in kg/litre

5.3.3.2 Filling of the packaging

When filling test packagings with liquids, at least one packaging shall have its capacity and filling level determined as for example below. Further packagings of that design type shall be filled using a dipstick calibrated on the first packaging or, in the case of small packagings, by mass or volume. When the capacity of the packaging is established with a liquid other than water (e.g. anti-freeze solution), the density of that liquid shall be taken into account, in order to obtain the correct volume of fill (at least 98 % of brimful capacity).

The calculation of required volume of liquids for testing shall be:

$$C = \frac{b \times 98}{100}$$

where:

C is the required volume of water in litres;

b is the brimful capacity in litres

5.3.4 Rigid packaging to contain solids

Packaging intended to contain solids shall be filled to not less than 95 % of the brimful capacity. Where the packaging is capable of containing liquids the capacity shall be determined as in **5.3.3.1**

The calculation of required mass of solids for testing shall be:

$$M = \frac{(b \times d) \times 95}{100}$$

where:

M is the required mass in kg, of solids;

b is the brimful capacity either measured or calculated in litres ;

d is the bulk density of the test contents in g/cm ^{3}

Alternatively, for cylindrical packagings the level of fill required to fill the package to at least 95 % of its brimful capacity shall be calculated from its internal height, taking into account any reduction in height caused by the fitting of the closure.

This procedure is not suitable for bags (see 5.3.5 below).

5.3.5 Flexible packagings to contain solids

Flexible packagings (bags) shall be filled to the required testing mass at which the designer of the packaging intends it to be used or, if known, to the capacity which the user intends to employ using either the substance to be transported or solids of similar characteristics in respect of mass, grain size and flow characteristics; the test contents used shall be recorded in the test report.

NOTE Bags do not have a capacity which is measured in the same way as for rigid packagings. The test report should therefore specify the quantity by mass and bulk density of that solid substance, as tested, for which the bag may be used.

5.3.6 Packaging designed to be used part full

Packaging designed to be transported with filling test levels less than 98 % for liquids or less than 95 % for solids shall be filled as prepared for transport to the capacity the user intends to employ. The filled volume and mass shall be recorded in the test report.

5.4 Closing packagings

The packagings shall be closed as for transport in accordance with any special instructions.

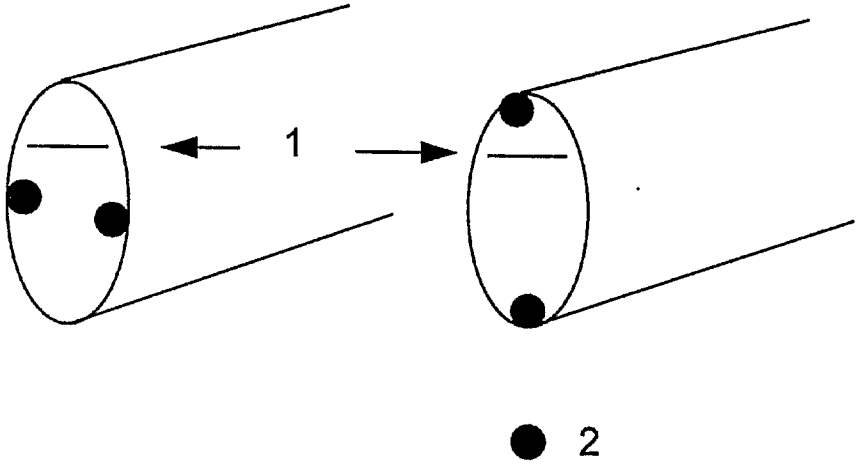
5.4.1 Drums, jerricans, composites and inner packagings

Screw type closures shall be tightened to the torque specified by the applicant where appropriate, which shall be recorded in the test report.

Closure torque shall not differ from one test to another in the test report. If it is necessary to revise a closure torque following a failure in one test, then all tests shall be completed using that torque setting.

Screw type closures shall be tightened to an appropriate torque before conditioning, or when specified during or after the conditioning period. The closure torque shall be recorded in the test report.

Where vented closures are intended for use in the packaging they shall be fitted for drop and stacking tests. Packagings fitted with vented closures shall after closing be inverted or laid on their side (see Figure 1) and observed for leakage for a period of 5 min. Leakage from the closure vent shall be regarded as a failure.



a) Acceptable b) Unacceptable

Key

1 Liquid level 2 Closure

Figure 1 — Packagings fitted with vented closure, laid on their side

5.4.2 Bags

The packagings shall be closed as they would be for transport.

NOTE To ensure that the test packagings are closed in a manner representative of production packagings, the same equipment and the same filling time should be used whenever practicable.

5.4.3 Other packaging

Packaging for solids shall be filled as in 5.3.4 and closed in accordance with any special instructions including any fitments, cushioning etc.

The closure elements used to secure the packagings (e.g closure tape, where applicable), shall be defined in accordance with the specifications (see annex G)

5.4.4 Removable head drums and jerricans

Removable head drums and jerricans for liquids shall not be tested for 24 h after being filled and closed to allow for gasket relaxation.

6 Facilities for testing

6.1 General Requirements

Tests shall be carried out at a testing facility capable of meeting the operational provisions of ISO/IEC 17025.

NOTE 1 This does not imply a requirement for third party certification or accreditation but if appropriate such external approval may be obtained from either a national accreditation body or from the competent authority.

NOTE 2 Testing staff should have a knowledge of the principles of the dangerous goods regulations as set out in the UN Recommendations.

6.2 Accuracy of measurement equipment

The accuracy of measuring equipment shall be more precise than the accuracy of the measurements in testing, as specified in 6.3, unless otherwise approved by the competent authority. The measuring equipment shall be calibrated in accordance with the relevant provisions of ISO/IEC 17025.

6.3 Accuracy of measurements in testing

Measurement equipment shall be selected such that individual measurement results including errors in reading and calibration shall not exceed the following tolerances:

Mass in kilograms (kg):	± 2 %
Pressure in kilopascals (kPa):	± 3 %
Distance/ length in millimetres (mm):	± 2 %
Temperature in degrees Celsius (°C):	± 1 °C
Humidity in percentage (%):	Tolerances are as specified in the agreed test methods
Time in minutes (min):	± 3 %
Torque in newton metres (Nm):	± 3 Nm or 10% whichever is the greater

NOTE For some measurements the tolerances may be lower in order to have meaningful measurements, e.g. when measuring masses or dimensions of empty packagings.

Where only maximum or minimum values are specified in the text, tolerances are one-sided, e.g. in 7.3.3 the test pressure may exceed 30 kPa for packing group I but shall not be less.

6.4 Climatic conditions

There shall be adequate climatic facilities to meet the requirements in Table 1.

6.5 Impact surfaces for drop tests

The drop test area impact surface shall be horizontal and flat, massive enough to be immovable and rigid enough to be non-deformable under test conditions and sufficiently large to ensure that the test package falls entirely upon the surface.

7 Test procedures

7.1 Drop test

7.1.1 Conditioning

Where climatic conditions are critical to the performance of the materials or to the application of the package, the tests shall be carried out in conditions identical to those used for conditioning (see Table 1). In other circumstances, the tests shall be carried out in atmospheric conditions which approximate to those used for conditioning. The elapsed time between the removal of the packaging from conditioning and its submission to the test shall be kept as short as possible and in any event not more than 5 min.

7.1.2 Drop heights

7.1.2.1 For solids and liquids

For solids and liquids, if the test is performed with the solid or liquid to be carried or with another substance essentially having the same characteristics, the drop height shall be that specified below:

Packing group I	Packing group II	Packing group III
1,8 m	1,2 m	0,8 m

7.1.2.2 For liquids if the test is performed with water

7.1.2.2.1 Relative density not exceeding 1,2

For liquids if the test is performed with water and where the substances to be transported have a relative density not exceeding 1,2, the drop height shall be that specified below:

NOTE The term water includes water/antifreeze mixtures for testing at -18°C

Packing group I	Packing group II	Packing group III
1,8 m	1,2 m	0,8 m

7.1.2.2.2 Relative density exceeding 1,2

Where the substances to be transported have a relative density exceeding 1,2, the drop height shall be calculated on the basis of the relative density (d) of the substance to be carried, rounded up to the first decimal. The drop height shall be:

Packing group I	Packing group II	Packing group III
$d \times 1{,}5$ m	$d \times 1{,}0$ m	$d \times 0{,}67$ m

7.1.2.3 Corrections to the drop height for packagings with the density of solids

There shall be no correction of drop height with density of solids.

7.1.2.4 Corrections to the drop height for packagings with various densities

Where the inner packagings contain liquid substances of various densities the drop test shall be based on the most severe packing group (of the liquid substances to be transported) and the average density. The average density shall be calculated by multiplying the fill volume of each inner packaging by the relative density of the contents of that inner packaging and aggregating the results and 7.1.2.2.2 shall be applied.

NOTE Light gauge metal packaging referred to in European road and international railway regulations may be subjected to different drop tests set out in annex A.

Table 2 — Drop orientation

Packaging	No. of test samples	Drop orientation	Explanatory notes
Steel drums Aluminium drums Steel jerricans Aluminium jerricans Including light gauge metal packaging - see annex A Drums of metal other than steel or aluminium Plywood drums Fibre drums Plastics drums and jerricans Composite packagings which are in the shape of a drum	Six (three for the first drop and three for the second drop)	First drop (using three packagings): the packaging shall strike the target diagonally on the chime or, if the packaging has no chime, on a circumferential seam or an edge. Second drop (using the other three packagings): the packaging shall strike the target on the weakest part not tested by the first drop, for example a closure or, for some cylindrical drums, the welded longitudinal seam of the drum body	Non-removable head drums strike the target diagonally on the top chime. Open head drums strike the target on the bottom chime. In either case it is on a circumferential seam or an edge adjacent, where possible, to a closure or junction of top and side seams, such that the closure, closure flange or junction of the top and side seams is within or intersected by the crush pattern. The second drop orientation is selected taking account of the results of the information drops, (see 7.1.4) and/or any previous experience or knowledge of the package type.
Boxes of natural wood Plywood boxes Reconstituted wood boxes Fibreboard boxes Plastics boxes Steel or aluminium boxes Composite packagings which are in the shape of a box	Five (one for each drop)	First drop: flat on the bottom Second drop: flat on the top Third drop: flat on the long side Fourth drop: flat on the short side Fifth drop: on a corner	1. The third and fourth drops are conducted on the faces which are judged most likely to cause failure of either the box, inner packagings or articles. It may be necessary to conduct an investigatory drop with one or more of the other packagings. A failure following an investigatory drop is not deemed a failure of the test. The test report indicates the face on which the packaging has been dropped. This is indicated by using the procedure in EN 22206. 2. The fifth drop is conducted on the corner which is judged most likely to cause failure of either the box, inner packagings or articles. It may be necessary to conduct an investigatory drop (see 7.1.4) with one or more of the other packagings. A failure following an investigatory drop is not deemed a failure of the test. The test report indicates the corner which the packaging has been dropped. This is indicated by using the procedure in EN 22206.
Bags: single-ply with a side seam	Three (three drops per bag)	First drop: flat on a wide face Second drop: flat on a narrow face Third drop: on an end of the bag	Following each drop the contents of the bag are redistributed.
Bags: single-ply without a side seam, or multi-ply	Three (two drops per bag)	First drop: flat on a wide face Second drop: on an end of the bag	Following each drop the contents of the bag are redistributed.

7.1.3 Test method

The test package shall be lifted and held in the predetermined orientation at the drop height as defined by the distance between the lowest point on the package at the time of release and the nearest point on the impact surface.

For other than flat drops the centre of gravity shall be vertically over the centre of impact.

Prior to carrying out the test ensure that the drop area is clean and dry.

Release the test package from its predetermined orientation.

7.1.4 Information drops

Drop orientations for individual packaging types are set out in Table 2. To assess the weakest point, information drops may be performed. Where such investigation drops are undertaken they may be with packagings already used in earlier tests. Each packaging shall strike the target in an orientation designed to investigate the weakest part. The orientations to be taken into account vary with designs. The exact orientation chosen should take into account the following impacts:

a) directly onto a closure;

b) onto a chime such that the crush pattern passes through the closure, closure flange or junction of the top and side seams;

c) flat onto the body;

d) onto different corners.

NOTE 1 Failure in an information drop does not constitute failure of the design type test.

NOTE 2 When packagings are available there is no objection to information drops being carried out on other packagings than those used for the first drop.

NOTE 3 When packagings under test are of a new or significantly modified design, more than three investigatory drops may be conducted.

NOTE 4 The drop should take place on an area of the packaging not already tested.

NOTE 5 Where information drops have been undertaken they may be reported in the test records.

7.1.5 Method of assessment

Following each drop there shall be an assessment of the result. Single packagings containing liquids or solids shall be assessed according to procedures in 7.1.5.1 and combination packagings or packagings containing articles shall be assessed according to 7.1.5.2.

7.1.5.1 Single packagings for liquids or solids

At the time of impact the packaging shall be observed for discharge. If such a discharge is observed it shall be recorded in the test report with an indication of the amount and the source of the discharge and whether or not it could lead to further leakage.

The packaging shall be visually examined for leakage and rupture.

Any packaging containing liquids shall have the internal pressure equalized with the atmospheric pressure, normally by loosening then retightening a closure, or by making a small hole in the body or end of the packaging.

Impacted closures or closures suspected of leaking during the drop shall not be disturbed. When there is only one closure and it is suspected of leakage, pressure equalization shall be achieved by making a small hole in the body or end of the packaging.

If there is dampness in the dropping area the packaging may be moved carefully to a suitable place and maintained in the same orientation for examination of any leakage which may occur (e.g. moved so that it is on a surface such as clean fibreboard where drips will be apparent). Examination shall continue for a period of 5 min to10 min.

Where a packaging for solids undergoes a drop test, the packaging shall pass the test if the entire contents are retained by an inner receptacle (e.g. a plastics bag), even if the closure is no longer siftproof.

Where a packaging undergoes a drop test at -18 °C, immediately after dropping the first specimen the temperature of the package and/or its contents shall be checked and recorded in the test report. Subsequent packagings shall not need the temperature checked unless the first sample had not achieved at least -18 °C.

7.1.5.2 Combination packagings and packagings containing articles

At the time of impact observe the packaging for discharge.

NOTE 1 For inner packagings or articles discharge might appear as dampness in the drop test area, or on the outer packaging (e.g. a stain).

NOTE 2 For inner packagings or articles containing solids discharge might appear as loose solid in the drop test area or within the outer packaging.

The packaging shall be visually examined for leakage and rupture e.g. escape of the inner packagings / articles.

Where a packaging containing inner packagings or articles undergoes a drop test, the packaging shall pass the test if the entire contents are retained by the inner packaging or inner receptacle (e.g. plastics bag) even if the closure is no longer sift proof.

If there is dampness in the dropping area, the packaging shall be moved carefully to a suitable place for examination of any leakage that may occur (e.g. moved so that it is on a surface such as clean fibreboard where drips will be apparent). Examination shall continue for a period of 5 min to 10 minutes.

Where a packaging undergoes a drop test at -18 °C, immediately after dropping the first packaging, the temperature of the package and/or its contents shall be checked and recorded in the test report. Subsequent packagings do not need the temperature checked unless the first sample had not achieved at least -18 °C.

7.2 Stacking test

7.2.1 General

Stacking tests are required for packagings other than bags (e.g. drum/jerrican or box). Aspects such as number of packagings, calculation of stacking loads, methods of test etc. are dealt with here; aspects such as conditioning and period of test being dealt with in Table 1. In the following calculations, where the design type has an interstacking feature an appropriate allowance shall be made. This normally takes the form of a small reduction in effective packaging height.

7.2.2 Calculation of the stacking load

7.2.2.1 Solids, articles, or the actual liquids

Where the contents are solids, articles, or the actual liquids to be transported the stacking load to be superimposed on each packaging shall be calculated as follows:

$$M_1 = M((H/h) - 1)$$

where:

M_1 Is the stacking load in kilograms (kg); (with closure included) (See Note)

M Is the mass in kilograms (kg) of the complete, filled and closed packaging as prepared for transport;

H Is the relevant stack height in millimetres (mm) (minimum 3000 mm);

h Is the overall height in millimetres (mm) of packaging to be tested, allowing for any interstacking features (see 7.2.1).

NOTE The newton as a unit of force may be used.

7.2.2.2 Water

Where water is used as test contents, the stacking load to be superimposed on each packaging shall be calculated from the following:

$$M_1 = ((H/h) - 1)(C.d.n+m)$$

where:

M_1 Is the stacking load in kilograms (kg) (see note);

H Is the relevant stack height in millimetres (mm) (minimum 3000 mm);

h Is the overall height of the packaging in millimetres (mm), allowing for any interstacking features (see 7.2.1);

C Is the volume of water in litres (l) required to occupy 98 % of the brimful capacity or, for combination packagings, 98 % of the brimful capacity of one inner packaging (see 5.3.3.1)

d Is the relative density of the substance to be transported;

m Is the mass in kilograms (kg) of the empty packaging (including its closures) or, for combination packagings, the mass of all the components of one package, including empty inner packagings (see 7.2.1);

n Is the one or a number of inner packagings (combination packaging only).

NOTE The newton as a unit of force may be used.

7.2.3 Test methods and criteria

7.2.3.1 General

Any one of three methods shall be used by agreement between the test laboratory and client:

a) an unguided load on an individual packaging;

b) a guided load on packaging(s);

c) an unguided load on three packagings forming one layer,

NOTE Where a packaging has an interstacking feature the stack loading may be applied using a reproduction of the packaging base shape as the lowest component of the stack.

The method used shall be stated in the test report.

7.2.3.2 Unguided load on an individual packaging

The packaging shall be placed on a firm level surface. The predetermined load (calculated in accordance with 7.2.2) shall be placed centrally on the top for the period of time stated in Table 1 for the particular packaging type.

The load shall typically be made up of concrete or steel masses. Except where the inter-stacking design is being taken into account, the load shall be applied via a rigid top plate extending beyond the outermost edges of the packagings.

The load shall be free to move when and if the packaging collapses.

NOTE For safety reasons, however, the load may have restricted movement, e.g. suspended by chains from overhead but with sufficient slack in the chains not to affect the integrity of the test. Measurements of the deflection and angle of the plate with horizontal are normally made:

a) immediately before and after placing the load on the plate
b) where appropriate, at intervals throughout the duration of the test ;
c) on completion of the test

7.2.3.3 Guided load on packaging(s)

A suitable guided load rig shall be used. Such a rig shall take the form of:

— a conventional compression testing machine with the facility of maintaining a constant load (as calculated in 7.2.2) for the required period;

NOTE Such equipment may have short term fluctuations of ± 4% in accordance with EN ISO 12048;

— a purpose-made rig, e.g. two frameworks with the upper framework being free to move vertically and with a minimum of friction in relation to the lower framework and to take the appropriate load.

For each test the upper framework shall be loaded so that its total mass is that calculated as in 7.2.2.

7.2.3.4 Unguided load on three packagings forming one layer

Packagings shall be placed in the same direction on a firm level surface as illustrated in Figure 1.

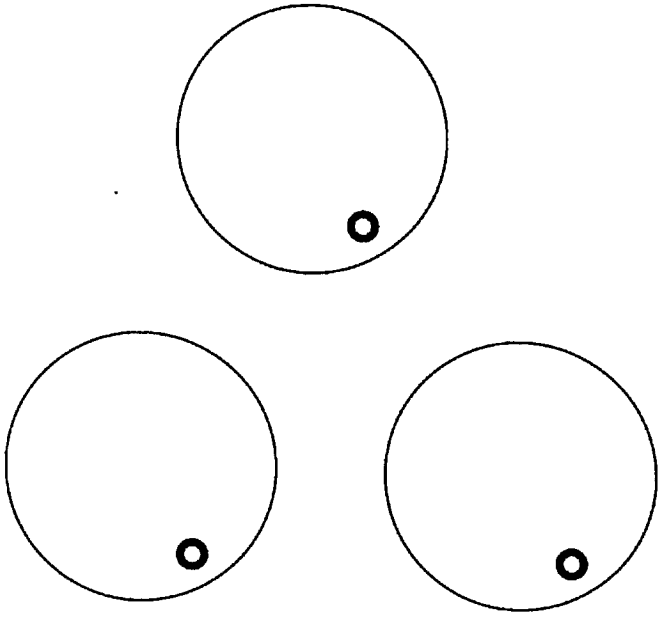


Figure 2 — Plan view of drums stacked as in 7.2.3.4

The spacing between the packagings shall be as close as possible but sufficiently separated to ensure that they cannot come into contact with one another when deformed.

A steel plate shall be placed over the packagings, its position shall be carefully checked. The load consists of the plate and suitable masses evenly distributed on it. The load shall have mass of three times that as in 7.2.2 for one packaging (i.e. $M_1 \times 3$).

NOTE Measurements of the deflection and angle of the plate with horizontal are normally made:

a) immediately before and after placing the load on the plate;

b) where appropriate, at intervals throughout the duration of the test;

c) on completion of the test.

7.2.3.5 Methods of assessment:

a) There shall be no leakage from the packaging, any inner packaging or any inner receptacle.

b) The packaging shall not show any deterioration which could adversely affect transport safety nor any distortion liable to reduce its strength or reduce stability in stacks of packages. (See Notes below)

Plastics packagings shall be cooled to ambient temperature before assessment.

NOTE 1 Where unguided loads have been used this may be assessed by the angle of the top plate which should not exceed 5°. The 5° criterion has been found to accord with the UN requirements in relation to stack stability.

NOTE 2 Where guided loads have been used, the packagings are removed from the stack rig. Two filled packagings of the same type should be placed centrally on the tested packaging. These two packagings should maintain their position for one hour.

7.3 Leakproofness test

7.3.1 Applicability

All packages intended to contain liquids except the inner packagings of combination packagings.

7.3.2 Preparation

The method of making pressure connections shall not affect the results of the test e.g. a connection through a closure shall not reinforce that part of the package. There are two methods as follows:

a) Drill two holes into the body or head of each packaging. One hole shall be used to connect the packaging to an adequate air supply, the second hole shall be used to connect a pressure gauge reading the test pressure in the packaging; or

b) Drill one hole in the body or the closure of each packaging. The gauge shall be connected to the air supply line between the source of the air supply and the packaging and as near as possible to the packaging; the gauge shall only be read under no flow conditions.

Each packaging shall be closed according to any special instructions. When relevant, closures shall be tightened to the appropriate torque.

Vented closures shall be replaced by similar non-vented closures or the vent shall be sealed.

7.3.3 Test pressure

The following minimum test pressures shall be used:

Packing group I	Packing group II	Packing group III
30 kPa	20 kPa	20 kPa

7.3.4 Test method

Each packaging shall be placed in a tank of water and shall be restrained just below the surface (the method of restraint shall not affect the test results). Air shall be applied continuously and gradually up to the required pressure which shall remain at or slightly above the predetermined level for a period of 5 min.

7.3.5 Method of assessment

Each packaging shall be visually monitored throughout the test. No packaging shall leak.

NOTE Air bubbles considered to arise from entrained air (e.g. air held initially which do not appear regularly in seams or in the thread of closures) should not be considered as leakage: these include any bubbles produced at intervals exceeding 1 min. If necessary, the test period should be extended to allow entrained air to be expelled.

7.4 Hydraulic pressure test

7.4.1 Applicability

All packages intended to contain liquids except the inner packagings of combination packagings.

NOTE 1 The internal pressure test may be carried out on packagings which have successfully undergone the leakproofness test or stacking test.

NOTE 2 This test method would meet the UN requirements for assessing inner packagings for air transport.

7.4.2 Preparation for the internal pressure test

Each packaging shall be prepared as described in 7.3.2 and completely filled with water.

NOTE Steps should be taken to ensure that no air remains inside the packagings above the level of the closure by, for example, tilting the packaging when filling.

Vented closures shall be replaced by similar non-vented closures or the vent shall be sealed.

7.4.3 Determination of test pressure

The hydraulic gauge pressure shall be applied, determined by one of the following methods:

a) not less than the total gauge pressure measured in the packaging (i.e. the vapour pressure of the filling liquid and the partial pressure of the air or other inert gases, minus 100 kPa) at 55 °C, multiplied by a safety factor of 1.5; this total gauge pressure shall be determined on the basis of a maximum degree of filling in accordance with UN Recommendations Part 4.1.1.4 and a filling temperature of 15 °C;

b) not less than 1,75 times the vapour pressure at 50 °C of the liquid to be transported, minus 100 kPa but with a minimum test pressure of 100 kPa;

c) not less than 1,5 times the vapour pressure at 55 °C of the liquid to be transported, minus 100 kPa but with a minimum test pressure of 100 kPa.

For packagings to transport packing group I liquid, the minimum test pressure is 250 kPa (gauge)

7.4.4 Test method

The packagings shall be pressurized continuously and gradually up to the required test pressure.

NOTE This should be within the time of not less than 2 min and not greater than 15 min.

The pressure in the packaging shall be held continuously and evenly for the appropriate period shown in column Q of Table 1. The pressure in the packaging shall remain at or slightly above the predetermined level. The manner in which packagings are supported shall not invalidate the test.

7.4.5 Fillings for plastics drums and jerricans

For plastics drums, jerricans and composite packagings (plastics) each packaging shall be filled with water and the temperature of the water measured. Water at the same temperature shall be used to pressurize the container. If the water temperature is outside the limits 12 ± 2 °C, a factor shall be applied from Table 3 to adjust the test pressure.

Where the water temperature is (12 ± 2) °C the pressurization factor is 1.000.

Outside these limits the temperature shall be rounded to the nearest 1 °C (0,5 °C goes up to the next whole number) and the pressurization factor shall be read from the table below:

Example:

For a required test pressure of 250 kPa, tested at a water temperature of 6,1 °C

Applied test pressure = 250 × 1,078 kPa
= 269 kPa

The temperature of the water from one sample and the applied test pressure shall be recorded in the test report for plastics drums, plastics jerricans and composite packagings (plastics)

Table 3 — Water temperature adjustment factors for plastics packagings

Water temperature °C	Pressurization factor
2	1,132
3	1,119
4	1,105
5	1,092
6	1,078
7	1,065
8	1,051
9	1,038
<10	1,025
12 ± 2	1,000
>14	0,976
15	0,964
16	0,952
17	0,940
18	0,928
19	0,917
20	0,906

NOTE For temperatures above 20 °C use a pressurisation factor of 0,906.

7.4.6 Method of assessment

Each packaging shall be visually monitored throughout the test. No packaging shall leak.

NOTE Water drops originating from water held initially in seams in the thread or in gaskets should not be considered as leakage – as a guide 1 drop of water every two minutes.

7.5 Reassessment when failure occurs

If failure occurs, the tests on the packagings submitted shall be ended unless one of the reassessment procedures set out below is used:

a) The tests shall be repeated at a lower level of intensity. For example, if two packagings pass and one fails, the hydraulic pressure test at 200 kPa, a fourth packaging shall be tested at 150 kPa and the design type shall be regarded as passing at the latter level;

b) Where only one packaging fails on one test, that test shall be repeated on twice the normal number of identical packagings for that test. If they all pass, the design type shall be regarded as meeting the test requirements;

The use of this procedure can be illustrated by the following example:

Where one of the three test packagings fails the drop test in the second orientation, but all the other test packagings have passed the drop test in the first orientation and the other tests (namely leakproofness, internal pressure and stacking), then six packagings shall be tested in the second orientation.

7.6 Recording of reassessment

Where a reassessment procedure is used, this shall be fully recorded in the test report.

7.7 Equivalent testing

The test methods described in this standard shall be considered to be the reference test methods.

NOTE Alternative methods may be used to demonstrate compliance with relevant regulations provided that:

- their equivalency to the reference test method can be demonstrated
- their use is recorded in the test report
- prior approval is obtained from the competent authority

Annex A
(informative)

Light gauge metal packagings

A.1 European considerations

The European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) and the Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID) permit certain types of dangerous goods to be transported in light gauge metal packagings which are not required to meet the same level of performance as set out in the body of the standard. These are intended for the carriage of substances having a viscosity greater than 200mm^2/s at 23°C. This corresponds to a flow time of 30 s for an ISO flow cup with a jet orifice of 6 mm diameter, in accordance with EN ISO 2431.

Drop heights for light gauge metal packagings for use under RID/ADR shall be as follows:

a) if the relative density of the substances to be carried does not exceed 1,2, the drop height should not be less than that specified below:

Packing group II	Packing group III
0,6 m	0,4 m

b) if the substances to be carried have a relative density exceeding 1,2, the drop height should be calculated on the basis of the relative density (d) of the substance to be carried, rounded up to the first decimal place. The drop height should not be less than that specified below:

Packing group II	Packing group III
Relative density × 0,5 m	Relative density × 0,33 m

NOTE 1 The use of these tests is optional.

NOTE 2 The mark allocated to such packagings is not a UN mark but a RID/ADR mark.

NOTE 3 To avoid confusion packages marked with an RID/ADR mark should not include a UN mark. Manufacturers should make it clear to customers of light gauge metal packagings that they are forbidden as a single packaging outside the countries of RID and ADR and they are not permitted on ships or aircraft.

Annex B
(informative)

Packaging types, codes and references

B.1 Packaging types, codes and references

The packaging type definitions are given in the UN Recommendations and the various regulations. Tables B.1 give the appropriate references from each of the publications (full details are set out in the Bibliography).

Table B.1 — Packaging definitions

Packaging type	UN Recommendations RID/ADR — IMDG Code— ICAO TIs	
	Chapter 6.1	ICAO
Steel drums	6.1.4.1	6.3.1.1
Aluminium drums	6.1.4.2	6.3.1.2
Drums of metal other than aluminium or steel	6.1.4.3	6.3.1.3
Steel and aluminium jerricans	6.1.4.4	6.3.1.4
Plywood drums	6.1.4.5	6.3.1.5
Wooden barrels	6.1.4.6	N/A
Fibre drums	6.1.4.7	6.3.1.6
Plastics drums and jerricans	6.1.4.8	6.3.1.7
Boxes of natural wood	6.1.4.9	6.3.1.8
Plywood boxes	6.1.4.10	6.3.1.9
Reconstituted wood boxes	6.1.4.11	6.3.1.10
Fibreboard boxes	6.1.4.12	6.3.1.11
Plastics boxes	6.1.4.13	6.3.1.12
Steel or aluminium boxes	6.1.4.14	6.3.1.13
Textile bags	6.1.4.15	6.3.1.14
Woven plastics bags	6.1.4.16	6.3.1.15
Plastics film bags	6.1.4.17	6.3.1.16
Paper bags	6.1.4.18	6.3.1.17
Composite packagings (plastics material)	6.1.4.19	6.3.1.18
Composite packagings (glass, porcelain or stoneware)	6.1.4.20	Not permitted
Combination packagings	6.1.4.21 RID/ADR only	
Light gauge metal packagings	6.1.4.22 RID/ADR only	

B.2 Relationship between Table B.1 and UN packaging codes

Table B.2 shows the relationship between Table B.1 and the UN packaging code.

NOTE Table B.2 may not cover every permutation and if in doubt advice from the competent authority should be sought.

Table B.2 — Relationship between Table 1 and UN packaging codes

Column A	Description	UN packaging codes that may be included in this category
1	Metal packagings for liquids	1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 3A1, 3A2, 3B1, 3B2
2	Metal packagings for solids or inner packagings other than plastics	1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 3A1, 3A2, 3B1, 3B2
3	Metal packagings for solids with plastics inner packagings (for solids or liquids)	1A1, 1A2, 1B2, 1N2, 3A2, 3B2
4	Plastics packagings for solids or inner packagings other than plastics	1H1, 1H2, 3H1, 3H2
5	Plastics packagings with plastics inner packagings (for solids or liquids)	1H2, 3H2
6	Plastics packagings for liquids	1H1, 1H2, 3H1, 3H2
7	Composite packagings with a plastics inner for solids or inner packagings	6HA1, 6HA2, 6HB1, 6HB2, 6HC, 6HD1, 6HD2, 6HG1, 6HG2, 6HH1, 6HH2
8	Composite packagings with a plastics inner for liquids	6HA1, 6HA2, 6HB1, 6HB2, 6HC, 6HD1, 6HD2, 6HG1, 6HG2, 6HH1, 6HH2
9	Composite packagings (glass, stoneware and porcelain)	6PA1, 6PA2, 6PB1, 6PB2, 6PC, 6PD1, 6PD 2, 6PG1, 6PG2, 6PH1, 6PH2
10	Fibre or plywood drums for solids or inner packagings other than plastics	1G, 1D
11	Fibre or plywood drums for solids with plastics inner packagings	1G, 1D
12	Plastics boxes for solids or inner packagings	4H1, 4H2
13	Fibreboard boxes for solids or inner packagings other than plastics	4G
14	Fibreboard boxes for solids or with plastics inner packagings	4G
15	Other boxes for solids or inner packagings other than plastics	4A, 4B, 4C1, 4C2
16	Other boxes for solids or with plastics inner packagings	4A, 4B, 4C1, 4C2
17	Bags (paper)	5M1, 5M2
18	Bags	5H1, 5H2, 5H3, 5H4, 5L1, 5L2

NOTE The letters "T", "V" and "W" may follow the codes in the table e.g. "1A1W". Where applied these signify the following;

"T" a salvage packaging see C.2

"V" a special packaging see C.1

"W" a packaging of the same type indicated by the code but it is manufactured to a different specification than that set down in the regulations, such a packaging should always be approved by the competent authority.

B.3 Comparision of all provisions

Table B.3 is intended to assist readers in comparing the provisions of this Standard with the requirements of the UN Recommendations and RID/ADR, ICAO TIs and the IMDG Code.

Table B.3 — Comparison of all provisions

UN Recommendations		CEN/ISO Reference
RID/ADR IMDG Code	ICAO TIs	
Performance and frequency of tests		
6.1.5.1	6.4.1	-
6.1.5.1.1	6.4.1.1	**5.1, 5.2**
6.1.5.1.2	6.4.1.2	**3.1, 4.1**
6.1.5.1.3	6.4.1.3	Quality assurance Not part of standard
6.1.5.1.4	6.4.1.4	**4.1**
6.1.5.1.5	6.4.1.5	**5.1**, Annex D
6.1.5.1.6	6.4.1.6	Not part of testing
6.1.5.1.7	6.4.1.7	**4.1**, Annex C.1
6.1.5.1.8	6.4.1.8	Quality assurance
6.1.5.1.9	6.4.1.9	
6.1.5.1.10	6.4.1.10	**5.1**
6.1.5.1.11	6.4.8	4.1 Annex C.2
Preparation of packagings for testing		
6.1.5.2	6.4.2	-
6.1.5.2.1	6.4.2.1	**5.3, 5.4, 5.5**
6.1.5.2.2	6.2.2.2	**5.3**
6.1.5.2.3	6.2.2.3	Table 1(Col. 7, 12)
6.1.5.2.4	N/A	Not addressed
6.1.5.2.5	6.2.2.4	Compatibility separate std see ENISO16101. Note: RID/ADR includes 6.1.5.2.6 – 6.1.5.2.8 which refer to compatibility testing see ENISO16104
Drop test		
6.1.5.3	6.4.3	7.1
6.1.5.3.1	6.4.3.1	7.1 Table 2
6.1.5.3.2	6.4.3.2	4.1 Table 1(Col 8 Notes 2, 5)
6.1.5.3.3	6.4.3.3	**6.5**
6.1.5.3.4	6.4.3.4	**7.1.2**

6.1.5.3.5	6.4.3.5	-
6.1.5.3.5.1	6.4.3.5.1	**4.2**a)
6.1.5.3.5.2	6.4.3.5.2	**7.1.7**
6.1.5.3.5.3	6.4.3.5.3	**4.2**b)
6.1.5.3.5.4	6.4.3.5.4	**4.2**b)
6.1.5.3.5.5	6.4.3.5.5	**4.2**a)
6.1.5.3.5.6	6.4.3.5.6	**4.2**b)
Leakproofness test		
6.1.5.4	6.4.4	7.3
6.1.5.4.1	6.4.4.1	4.1 Table 1(Col 14)
6.1.5.4.2	6.4.4.2	**7.3.3**
6.1.5.4.3	6.4.4.3	4.1 Table 1(Col 15), **7.3.4, 7.3.5**
6.1.5.4.4	6.4.4.4	**4.4.2**
Internal pressure (hydraulic) test		
6.1.5.5		7.4
6.1.5.5.1	6.4.5.1	4.1 Table 1 (Col 16)
6.1.5.5.2	6.4.5.2	4.1 Table 1 (Col 16)
6.1.5.5.3	N/A	**7.4.3 (7.3.3)**
6.1.5.5.4	6.4.5.3	4.1 Table 1(Col 17)
6.1.5.5.5	6.4.5.4	**7.4.4**
6.1.5.5.6	N/A	7.4.1 Note 2 (Unique to Air) In RID/ADR and IMDG Code this is 6.1.5.5.6
6.1.5.5.7	6.4.5.5	**4.5**
Stacking test		
6.1.5.6	6.4.6.1	4.1 Table 1
6.1.5.6.1	6.4.6.2	4.1 Table 1(Col 9)
6.1.5.6.2	6.4.6.3	4.1 Table 1 (Col 12, 13), **7.2**
6.1.5.6.3	6.4.6.4	**4.3**
Cooperage test		
6.1.5.7	N/A	Not addressed
Test report		
6.1.5.8	6.4.7	Annex E (see note below)
6.1.5.8.1	6.4.7.1	Annex E
6.1.5.8.2	6.4.7.2 and 6.4.7.3	Annex E
NOTE Note in RID/ADR 6.1.5.8 addresses compatibility and is dealt with in EN ISO 16101 and the test report is in paragraph 6.1.5.9		

B.4 Liquids

Unless there is an explicit or implicit indication to the contrary in the UN Recommendations, dangerous goods with a melting point or initial melting point of 20°C or lower at a pressure of 101,3 kPa can be considered to be liquids. A viscous substance for which a specific melting point cannot be determined should be subjected to the test in ASTM D 4359-90 or to the test for determining fluidity (penetrometer test) prescribed in the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), annex A, appendix A.3, with the modifications that the penetrometer should conform to ISO 2137 and that the test should be used for viscous substances of any class.

NOTE The substances packed in packagings include free-flowing liquids, pastes, viscous substances, powders and granules. The choice of tests for any packaging depends crucially on whether the design type is to be tested for liquids or solids. There is, however, no simple, absolute and natural distinction between the two. Moreover, some substances which are solids at say 20 °C become liquid at 55 °C which is the reference temperature for that which may be experienced in transport. General guidance on whether a design type should be tested for liquids or solids is provided in a) of this note with specific advice on substances which may become liquid during a journey in b) and on phlegmatized substances in c).

a) As indicated, the UN Recommendations and the international agreements contain definitions making the distinction between liquids and solids from measurements of specific melting point or by penetrometer testing. Such measurements are rarely necessary in relation to packaging testing which may be carried out in a facility not equipped to make such measurements. In most instances there will be little difficulty in choosing between testing for liquid or for solid contents. In many instances a packaging will be designed for liquids and tested using water as contents without reference to any specific dangerous liquid to be carried. Similarly, a packaging will be designed for solids and tested using, for example, a mixture of plastics granules and fine powder without reference to any specific dangerous solid to be carried. In such circumstances it is appropriate for each user of the packaging to check that the testing has been suitable for the dangerous substance. In other instances, however, the design type tests for a packaging will be undertaken in relation to a specific dangerous substance; if that substance should be borderline between a liquid and a solid, then it is recommended that the appropriate data on it should be obtained before tests are selected and commenced.

b) Packagings being tested for solids which are likely to melt during the intended journey should be tested as for liquids.

c) Packagings being tested for solids which require phlegmatizing with a liquid for safe transport, such that there is free liquid in the packaging, should be subjected to the appropriate tests for liquids with the test contents being a representative mixture of solids and liquids.

Annex C
(normative)

Special packagings

C.1 "V" marked packagings

C.1.1 Introduction

The UN Recommendations provide for the use of a special packaging which will not be tested as prepared for transport. This is known as the "V" marked packaging (relating to the mark issued by the competent authority). Where such a packaging is developed the following procedures shall be followed. Articles or inner packagings of any type for solids or liquids may be assembled and transported without testing in an outer packaging under the conditions set out below.

C.1.2 Requirements

C.1.2.1 Drop Test

The outer packaging shall have been successfully tested in accordance with 7.1 with fragile (e.g. glass) inner packagings containing liquids using the packing group I drop height.

C.1.2.2 Stacking Test

The outer packaging shall have successfully passed the stacking test in 7.2 while empty. The total mass of identical packagings shall be based on the combined mass of inner packagings used for the drop test.

$$M_1 = \left(\frac{3000}{h} - 1\right) \times m$$

where:

M_1 is the required mass in kg

h is the height of outer packagings (in mm)

m is the mass of packaging as drop tested in kg

C.1.3 Selection and preparation of test packagings

The provisions of 5.1 and 5.2 shall apply. The packaging shall be filled as follows:

a) The inner packagings shall be of glass, porcelain or stoneware and the type and thickness of cushioning material shall be noted in the test report along with the number and arrangement of the inner packagings.

b) Inner packagings containing liquids shall be completely surrounded with a sufficient quantity of absorbent material to absorb the entire liquid contents of the inner packagings.

c) If the outer packaging is intended to contain inner packagings for liquids and is not leakproof, or is intended to contain inner packagings for solids and is not siftproof, a means of containing any liquid or solid contents in the event of leakage shall be provided in the form of a leakproof liner, plastics bag or other equally efficient means of containment. For packagings containing liquids, the absorbent material required in b) above shall be placed inside the means of containing the liquid contents.

d) the thickness and identification of the cushioning material (e.g. vermiculite) between inner packagings and between inner packagings and the outer packaging shall be measured and the relevant minimum thickness(es) recorded in the test report.

C.1.4 Test procedures

The procedures set out in clause 7 of this Standard shall be followed.

C.1.5 Test report

A test report in accordance with annex E shall be prepared.

NOTE Included in the test report there should be an additional calculation showing the gross mass permitted for this packaging type. The UN Recommendations require the total combined gross mass of inner packagings should not exceed one-half the gross mass of inner packagings used for the drop testing. This information should be used by the competent authority to determine the final mark.

The calculation for the mark should be as follows:

$$M = m + \frac{1}{2}p$$

where:

M is the mass mark to be applied to the packaging in kg

m is the mass of the outer packaging in kg

p is the mass of the inner packagings including contents used for the drop test in Kg.

The UN mark allocated shows that the packaging has been tested to packing group I level for combination packagings.

Packagings tested under this procedure have a special marking which includes the letter "V".

C.2 Salvage packagings ("T" marked packaging)

C.2.1 Introduction

Damaged, defective or leaking dangerous goods packagings, or dangerous goods that have spilled or leaked are transported in special salvage packagings. This does not prevent the use of a bigger size packagings of appropriate type and performance level tested in accordance with this standard.

C.2.2 Requirements

Salvage packagings shall be tested as follows:

C.2.2.1 Drop test

The packaging shall be filled with water in accordance with 5.3.3. The addition of lead shot or other additives is permitted to achieve the requisite packaging mass provided they are placed so that the test results are not affected (see 5.3.2.)

The packaging shall be dropped in accordance with 7.1.3 from a height of 1,2 m.

Alternatively the drop height shall be adjusted in accordance with 7.1.2.2.2.

C.2.2.2 Stacking test

The stacking test shall be carried out in accordance with the provision 4.3 and tested in accordance with 7.2.

C.2.2.3 Leakproofness test

The packaging shall be treated in accordance with the provision of 4.4 and tested in accordance with 7.3. The pressure to be applied shall be 30 kPa.

C.2.3 Test procedures

The procedures set out in clause 7 of this Standard shall be followed.

C.2.4 Test report

A test report in accordance with 4.6 and annex E shall be completed.

Packagings tested under this procedure have a special marking which includes the letter "T".

Annex D
(informative)

Special test requirements

D.1 Metal drums and jerricans and composites with a metal outer body

In certain circumstances stacking tests can be waived when the test has been carried out on an equivalent design type.

Stack testing is not normally required when the design type can be assimilated to a design type previously certified from the same manufacturer (referred to here as the "previous design type"). Compared with the previous design type, the packagings being tested may have changes to the head and the base, including changes to closures providing no closure is subject to stack loads, but should meet the conditions set out in a) to e) as follows:

a) the cross section should be identical and the height of packagings to be tested may be slightly less than that of the previous design type;

b) the body construction should be identical. This includes general configuration e.g. seams, rolling hoops and corrugations;

c) the body metal thickness should not be less than that of the previous design type;

d) the stack load required should be equal to or less than the load for which the previous design type has been certified;

e) test reports should contain the following wording in the results section on stack testing "already covered by Test Report(s) ****** ", together with a note of the applied load recorded in the report to which reference is made and the calculated load required for the packaging for which the new mark is being sought.

Annex E
(normative)

Test report and specifications

E.1 Introduction

Every test shall be accompanied by a test report, the contents of which are set out below.

E.1.1 Test facility (name and address)

This shall be the organization that undertook the actual testing. The front page of the report shall be on the headed paper of the test facility. If headed paper is not available the report shall be clearly traceable to the author and the test facility.

E.1.2 Applicant (name and address)

The applicant can be the manufacturer, the user of the packaging or any person in the packaging chain.

NOTE In some instances the test facility and applicant address may be the same.

E.1.3 Report number

This shall be a number which enables full traceability back to the original test facility working documents that refer to the original test. The report number shall appear on every page of the report and any annexes. Any subsequent amendments shall include the number and clearly show it is an amendment to or an addition to the original report.

E.1.4 Date

This shall be the date the report was completed, rather than the date that testing was completed. The report shall also include the date of the start and completion of the tests and the date of receipt of test items.

E.1.5 Manufacturer

Because packaging specifications (see annex G) are a part of the report, the manufacturer's name in the main body of the report may not be necessary provided this is clearly stated in one of the annexes which can be clearly linked to the main report.

E.1.6 Packaging description

The description of the packaging design type (including dimensions, closures) shall include the method of manufacture (e.g. blow moulding).

The main report shall include a general description of the packaging. Full details of the packaging components and material shall be included either in the specification (see annex G) (provided there is a clear link between it and the main report) or in the main report. A check for conformity with the relevant definition in the regulations shall be included (see annex B).

NOTE It may also include drawing(s) and/or photographs.

E.1.7 Capacities

The test report shall include the nominal capacity and the maximum capacity (brimful/overflow capacity) as defined in 3.4 in litres. For packagings for liquids, the test report shall include brimful (overflow) capacity in litres. For packagings for solids (including inner packagings and articles) the test report shall include the gross mass in kg.

E.1.8 Test contents

Characteristics of test contents, which shall include for example viscosity and relative density for liquids and bulk density, particle size for solids and angle of repose.

E.1.9 Test description and results

The report shall identify the number of packagings. Each packaging sample shall have its own identification number which shall be documented. At least one packaging shall be weighed full or empty.

There shall be a description of each test and how it was performed.

The report shall include a conclusion clearly indicating the packaging group to which the tests belong and the test levels achieved, particularly hydraulic pressure for liquid packagings and the maximum gross mass and density for combination packagings.

Where a competent authority has agreed to deviations from the standard methods set out in this standard, reference to such authorization shall be included in the test report.

E.1.10 Signature

The test report shall be signed with the name and status of the signatory.

The person who was responsible for the testing, shall sign the report against his or her typed name and position in the laboratory. That person might be the tester or his/her supervisor.

The report shall include the following statements:

"This packaging was tested as prepared for transport in accordance with the provisions of part 6.1.5 of Chapter 6.1 of the UN Recommendations in particular sections .....

" The use of other packaging methods or components shall render it invalid.

A copy of the test report shall be available to the competent authority.

NOTE 1 The competent authority may require the test report to be retained for a specified period of time.

NOTE 2 The competent authority may require the reference to relevant regulations

E.2 Specification checking detail

The test report shall include the results of the specification check by the test laboratory. Items which shall be included in the check are marked with an asterisk in the tables in annex G.

Where further explanatory notes are given these are indicated by a letter in the tables in annex G and are listed below:

A Thickness only shall be checked;

B Combined grammage only shall be checked;

S Technical data shall be checked.

Annex F
(informative)

Selective testing

F.1 General

Some consignors may wish to have a range of packagings tested in a number of different sizes but of the same construction and material. In such situations it may not be necessary to carry out testing for every possible permutation. This selective testing procedure is recognized, but only after agreement with the competent authority who will advise which combinations are to be tested.

F.2 Metal drums and jerricans

When selective testing is undertaken in respect of a range of packagings, provided it can be demonstrated that the packaging can meet the test levels in the weakest construction case using the same test medium, the criteria that may be considered for metal packagings are as follows:

a) variations in head design, e.g. convex or concave;

b) variations in closure systems due to alternative suppliers, provided interchangeability criteria have been met;

c) variations in the number of closures and their location in the drum;

d) variations in material of closure plug(s) e.g. steel or plastics plugs;

e) minor variations in closures e.g. vent fitting;

f) variation in gasket or washer materials of the closure(s) e.g. rubber or plastics;

g) addition of pressed out beads with or without internal or external corrugations;

h) variations in the thickness of ends;

i) addition of filling and emptying devices (as closed for transport).

F.3 Plastics drums and jerricans for liquids

When selective testing is undertaken in respect of a range of packagings, provided it can be demonstrated that the drum and jerrican can meet the test levels in the weakest construction case using the same test medium, the criteria that may be considered for plastics packagings for liquids, are as follows:

a) variations in the number of closures and their location in the drum;

b) variations in closure material;

c) variations in closure types, e.g. plain, combination, vented, external or internal thread, etc;

d) variations in overseal material;

e) variations in gasket material;

f) addition of fitted filling or emptying devices (as closed for transport);

variations in panels where marks are embossed.

F.4Plastics drums and jerricans for solids

Where selective testing is undertaken in respect of a range of packagings, provided that it can be demonstrated that the drum and jerricans can meet the test levels in the weakest construction case using the same test medium, the criteria that may be considered for plastics drums for solids, inner packagings or articles, are as follows:

a) variations in head material and design;

b) variations in closure systems due to alternative suppliers;

c) variation in gasket or washer materials of the closure system;

d) variations in the number of closures and their location in the drum;

e) variations in overseal material.

F.5Fibre drums

When selective testing is undertaken in respect of a range of packagings, provided that it can be demonstrated that the drum can meet the test levels in the weakest construction case using the same test medium, the criteria that may be considered for fibre drums for solids, inner packagings or articles, are as follows:

a) variations in head material and design;

b) variations in closure systems due to alternative suppliers, provided interchangeability criteria have been met;

c) variation in gasket or washer materials of the closure system;

d) addition of lined barrier;

e) minor variation in number of plies within sidewall, lid or base provided the minimum material thickness is maintained.

Annex G
(normative)

Packaging specifications

G.1 Specification data

To assist in the identification of a packaging, following the issue of a test report, it is necessary to have a detailed specification.

The attached table matrices, G.1.1 to G.5.2, correlate the different packaging types with data which are necessary for the identification of test packagings by users, test facilities and competent authorities.

There are five parts to this annex:

1) drums, jerricans, bottles, jars etc — Tables G.1.1 and G.1.2;

2) boxes — Tables Tables G.2.1 and G.2.2;

3) bags — Tables G.3.1 and G.3.2;

4) inner receptacles of composite packagings — Table G.4;

5) inner packagings of combination packagings — Tables G.5.1 and G.5.2.

Tables G1, G.2, G.3 and G.5 are in two parts. The first table shall apply to all packagings in that category. The second table shall be applicable only to particular packaging types when indicated by an "S".

Each item in the table is numbered and in G.2 at the end of this Annex there are explanatory notes for many of the numbers to assist in interpretation.

The following symbols relate to procedures in relation to checking specifications on completion of testing by the test laboratory):

* = item to be checked;

A = thickness only;

B = combined grammage;

S = technical data.

The specification check shall be done visually and, where relevant, by measuring main dimensions and thicknesses.

The specification check data as measured on the test samples shall be recorded and compared with the design type specification including manufacturing tolerances. The measured data of the test samples should be within the stated tolerances.

Table G.1.1— Drums, jerricans, bottles and jars etc. — Packaging specification detail applicable to all

No	Specification check requirement ↓		No	Specification check requirement ↓	
1	Packaging description (code and trade name)		17	Closure(s), (or neck(s)) position(s)	*
2	Manufacturer's name and address		18	Closure(s), material(s) and grade	
3	Method of construction		19	Closure(s), type, identification	*
4	Nominal capacity		20	Closure(s), thread, type and pitch	*
5	Brimful capacity	*	21	Closure(s) mass	*
6	Diameter, nominal (cylindrical) internal		22	Closure manufacturer's name and address	
7	Diameter, external at widest point	*	23	Closure torque(s)	
8	Nominal diameters (conical i.e. pails)		24	Type of overseal	*
9	Body/section dimensions (non-round)	*	25	Closure(s) seal, material	*
10	Recess of ends	*	26	Neck internal diameter	*
11	Height overall	*	27	Height to neck face	*
12	Stacking height	*	28	Neck height (external)	*
13	End seams type	*	29	Neck thread, type and pitch	*
14	Side seam type	*	30	Neck thread number of starts	*
15	Handles, material type, number and position	*	31	Tare mass	*
16	Closure(s), diameter(s) and design	*			

Table G1.2 — Drums, jerricans, bottles and jars etc — Packaging specification detail applicable as indicated

No.		Specification check requirement	Non-removable head metal	Removable head metal	Non-removable head plastics	Removable head plastics	Fibreboard	Plywood	Glass and other materials
32	Nominal thickness and material type and grade head or lid	*A	S	S			S	S	S
33	Nominal thickness and material type and grade body	*A	S	S			S	S	S
34	Nominal thickness and material type and grade base	*A	S	S		S	S	S	
35	Material type, grade (polymer) body				S	S			
36	Material type, grade (polymer) base				S	S			
37	Material type, grade (polymer) lid/head				S	S	S		S
38	Material lid gasket			S		S	S	S	S
39	Body corrugations, number	*	S	S					
40	Body corrugation, heights	*	S	S					
41	Rolling hoops, number, height and location	*	S	S	S	S	S	S	
42	Closing ring type	*		S		S	S	S	
43	Closing ring material			S		S	S	S	
44	Thickness closing ring	*		S		S	S	S	
45	Number of plies (body)	*					S		
46	Grammage per ply body, and combined	*B					S		
47	Inner lining or coating material						S		
48	Chime reinforcement		S	S			S	S	
49	Method of lid retention (other than closing ring)			S		S	S	S	S
50	Mass body	*			S	S			S

NOTE * = required on specification checks (see G.2); A = thickness to be measured for specification check (see G.2); B = combined grammage shall be checked (see G.2), S = required data for that packaging type.

Table G2.1— Boxes packaging specification detail — Applicable to all

No	Specification check requirement ↓	
1	Packaging description (code and trade name)	
2	Manufacturer's name and address	
51	Design standard, drawing, or style	*
3	Method of construction	*
31	Mass empty box	*
52	Dimension external (l x b x h)	*
9	Dimension internal (l x b x h)	
12	Stacking height	*
15	Handles, material type, number and position	*
53	Closures, number, type, position and materials	*
54	Reinforcements, type, position and materials	*
NOTE l x b x h is length, breadth, height		

Table G2.2— Boxes packaging specification detail — Applicable as indicated

No.		Specification check requirement	Metal	Natural wood	Plywood and reconstituted wood	Fibreboard	Expanded plastics	Plastics
38	Material lid gasket		S				S	S
55	Material ends				S	S		
32	Nominal thickness, material type and grade head or lid	*A	S	S	S	S	S	
33	Nominal thickness, material type and grade side walls	*A	S	S	S	S	S	
34	Nominal thickness, material type and grade base	*A	S	S	S	S	S	
56	Method of joining panels	*		S	S			
57	Manufacturer's join body	*				S		
58	Grammage by paper and paper type	*				S		
59	Corrugated flute type	*				S		
60	Corrugated combined grammage	*				S		
61	Corrugated edge crush	*				S		
62	Burst strength	*				S		
91	Puncture	*				S		
35	Material type, grade (polymer) body							S
36	Material type, grade (polymer) base							S
37	Material type, grade (polymer) lid							S
63	Density	*					S	
64	Top flap inner gap or meet					S		
65	Top flap outer meet or overlap					S		
66	Bottom flap inner gap or meet					S		
67	Bottom flap outer meet or overlap					S		

NOTE * = required on specification checks (see G.2); A = thickness to be measured for specification check (see G.2); B = combined grammage shall be checked (see G.2); S = required data for that packaging type.

Table G3.1— Bags packaging specification detail — Applicable to all

No	Specification check requirement ↓	
1	Packaging description, (code and trade name)	
2	Manufacturer's name and address	
4	Nominal capacity	
51	Design standard or drawing	
5	Method of construction	*
68	Style	
52	Dimensions flat unopened	*
69	Gusset, open width	*
70	Bottom width, flat unopened	*
71	Valve width	*
73	Closure method (top, base, side)	*
74	Perforations	
75	Sewing, style and density of stitches	*
76	Type of thread and minimum breaking load	
77	Filter cord	
78	Adhesive, type	

Table G3.2— Bags packaging specification detail — Applicable as indicated

No.		Specification check requirement	Unlined/uncoated woven plastics	Other woven plastics	Plastics film	Unlined/uncoated textile	Other textile	Paper
32	Material type and grade		S	S		S	S	S
35	Type of film grade				S			
33	Nominal thickness, material type and grade	*A			S			
79	Fabric (warp/weft), tapes per 100 mm	*	S	S		S	S	
82	Coating, material, thickness/weight			S			S	S
83	Liner, material, thickness	*		S			S	S
45	Number of plies	*						S
46	Grammage of plies	*	S	S				S
84	Material strength elongation		S	S	S			
85	Material strength tensile (energy absorption)							S

NOTE * = required on specification checks (see G.2); A = thickness to be measured for specification check (see G.2); B = combined grammage shall be checked (see G.2), S = required data for that packaging type.

Table G4— Inner receptacles of composites packaging specification detail — Applicable to all

No.		Specification check requirement ↓
1a	Description	
2	Manufacturer's name and address	
4	Nominal capacity	
5	Brimful capacity	*
30	Material type and grade	
32	Nominal thickness body	*A
33	Nominal thickness base	*A
34	Nominal thickness head	*A
31	Tare (mass)	*
86	Assembler of complete container	

NOTE * = required on specification checks (see G.2); A = thickness to be measured for specification check (see G.2); B = combined grammage shall be checked (see G.2), S = required data for that packaging type.

Table G5.1— Inner packaging of combination packaging specification detail — Removable fittings

No.		Specification check requirement ↓
30	Material type (and grade)	
1	Description	*
51	Design standard or drawing	
87	Quantity or number	*
52	Dimensions	*
27	Tare mass	*
32	Nominal thickness	*
58	Grammage by paper and paper type	*
60	Corrugated combined grammage	*B
90	Orientation and arrangement of inner Packagings	

NOTE * = Required on specification checks (see G.2); A = thickness to be measured for specification check (see G.2); B = combined grammage shall be checked (see G.2); S = required data for that packaging type

Table G5.2— Inner packaging of combination packaging specification detail — Permanent fittings

No.		Specification check requirement ↓
1	Description	
30	Material type and grade	
51	Design standard or drawing	
87	Number	*
88	Location(s)	*
89	Means of fixing to packaging	*

NOTE * = Required on specification checks (see G.2); A = thickness to be measured for specification check (see G.2); B = combined grammage shall be checked (see G.2); S = required data for that packaging type.

G.2 Notes to packaging specification detail applicable to Tables G.1 to G.5.2.

1. Packaging description i.e. steel drum, code where appropriate i.e. 1A1 (see Table B.2) and trade name.
2. Name and address of manufacturer of packaging or appropriate component.
3. Method of construction i.e. welded; glued and stitched; nailed etc.
4. Nominal capacity: see 3.4.2.

5 Brimful capacity: see 3.4.1.

8. Smallest and largest for conical shaped packagings.
9. For non-circular packagings.
10. Usually found on drums.
11. From ground to highest point, however the dimensions may be less than that specified in the test report.
12. Adjusted height to allow for any interlocking features of packaging; may also include battens on boxes.
13. Where applicable.
14. Where applicable.
15. Also indicate if an optional extra.
16. Required for each closure and variant.
17. Position on drum.
18. Required for each one and variant, including plastics polymer details.
19. May include trade name and any features or marks on closure.
21. Mass of individual closure with gasket/wad.
22. For each closure.
23. For each closure.
24. If fitted.
25. Gasket details.
31. Mass of container and closures and associated fittings.
32. All materials other than plastics.
33. All materials other than plastics.
34. All materials other than plastics.
35. Plastics materials only.
36. Plastics materials only.
37. Plastics materials only.
38. When lid or head fitted with gasket, washer or seal.
46. Combined grammage will include an allowance for the glues between the paper plies.
49. To allow for large screw caps, pill box lids, etc.
50. Particularly plastics.
51. Include FEFCO/ASSCO code for fibreboard boxes if applicable.
53. This is to include taping patterns and any additional means of closing such as straps.
54. Battens, corner posts etc.
68. Valved, gussetted etc. Some of this may be covered by 1.
86. This may not be the same as any of the manufacturers of the parts of a composite packaging.

Bibliography

Standards publications

EN 22234, *Packaging — Complete filled transport packages — Stacking test using static load (ISO 2234:1985)*

EN ISO 9001, *Quality management systems — Requirements (ISO 9001:2000)*

EN ISO 12048, *Packaging — Complete filled transport packages — Compression and stacking tests using a compression tester (ISO 12048:1994)*

prEN ISO 16101, *Packaging – Transport packaging for dangerous goods – Plastics compatibility testing (ISO/DIS 16101:1999)*

ASTM-D-4359-90, *Test methods for determining whether a material is a liquid or a solid.*

Other documents

The UN Recommendations have been developed by the United Nations Committee of experts on the transport of dangerous goods, in the light of technical progress, the advent of new substances and materials, the exigencies of modern transport systems and, above all, the need to ensure the safety of people, property and the environment. Amongst other aspects, the recommendations cover principles of classification and definition of classes, listing of the principal dangerous goods, general packing requirements, testing procedures, marking, labelling or placarding, and shipping documents. There are in addition special recommendations related to particular classes of goods (in particular Explosives).

Though written in technical terms, the testing procedures still include areas of interpretation which may lead to international inconsistencies in application. This standard gives guidance with respect to uniform interpretation and application of the UN testing procedures.

The following regulations are referred to in the text of the standard. Each edition is revised regularly and the latest one should be used. Test facilities should be in possession of at least one of the documents or alternatively their national law where it includes the relevant UN provisions.

[1] The United Nations Recommendations on the Transport of Dangerous Goods — Model Regulations. ST/SG/A.C. 10/1/Rev.12. Geneva : United Nations, 1997, ISBN 92-1-139074-5.

[2] The European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) Geneva: United Nations 1999, ISBN 92-1-139070-2 and ISBN 92-1-139071-0.

[3] Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID). Berne:Organisation intergouvernementale pour les transports ferroviaires (OTIF), 1999.

[4] International Maritime Dangerous Goods Code (IMDG). London: International Maritime Organisation, ISBN 92-801-5090-1.

[5] Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO TI/2001/2002). DOC 9284. AN/905. Montreal: International Civil Aviation Organization

The directives of the European Community require the member states to apply the provisions of RID/ADR to all dangerous goods traffic in their territories:

Council Directive 94/55EC on the approximation of the laws of the Member States with regard to the transport of dangerous goods by road. OJ L319.

Council Directive 96/49EC on the approximation of the laws of the Member States with regard to the transport of dangerous goods by rail. OJ L235.

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Testing
02-0124

INLAND
A Temple-Inland Company

April 12, 2002

Mr. Edward Mazzullo, Director
Office of Hazardous Materials Standards
U.S. DOT/RSPA (DHM-10)
400 7th St. SW
Washington, D.C. 20590

Dear Mr. Mazzullo:

Thank you for discussing the questions I had about 49 CFR, 178.601(g)(2), Selective testing of combination packagings, Variation 2. It has been a little while since we had our phone conversation, so let me re-state the question to you for an official Letter of Interpretation.

My company has a customer who manufactures liquid chemicals. In the certification in question, the chemicals are packed in plastic bottles. The bottles are of different shapes, and do not conform to Variation 1 requirements. The customer wants to test the packaging to Variation 2.

In 178.601(g)(2)(i) it states that "The outer packaging must have been successfully tested in accordance with [part] 178.603 with fragile (e.g. glass) inner packagings containing liquids at the Packing Group I drop height". Our customer has interpreted "e.g." to mean "for example". They requested that we test to Variation 2 using their plastic containers, because at 0°F plastic is fragile as well.

In our phone conversation, I learned that the statement about the use of fragile material such as glass was directed more toward brokers, because they sell certified boxes to various customers who may use any kind of inner packaging. As we discussed, an individual customer like ours, who plans to use nothing more fragile than the plastic containers that are tested, could be allowed to certify to Variation 2 by testing with the plastic containers. Is this indeed acceptable?

In a situation such as this one, assuming that we can test to Variation 2 as discussed above, should a statement be included in the certification report such as: "The packaging qualifies under Section 178.601(g)(2) for selective testing of combination packagings as long as no inner packaging more fragile than plastic at 0°F is used." Would a statement like this satisfy the requirements of that section, or is it necessary at all?

I look forward to your response. Thank you for your help.

Sincerely,

John H. Rutherford

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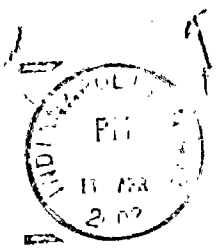

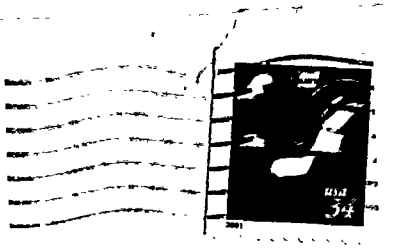

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