

SUPPLYING U.N.CERTIFIABLE BOXES

PRESENTED TO

**AICC CONFERENCE
APRIL 23, 1993**

**(REVISED MAY 14, 2004
TO REFLECT UPDATED REGULATIONS)**

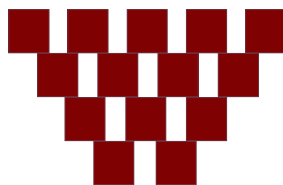
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CERTIFIED OR CERTIFIABLE—THAT IS THE QUESTION

With the issuance of the Docket 181 final rule in October, 1991, the requirements for hazardous material packaging have changed dramatically. These wide sweeping changes were driven by the need for improved reliability and internationally recognizable emergency response information. It was the need for improved package reliability and standardization that is responsible for the switch to performance oriented packaging—“POP” design.

This new philosophy requires that all packages be tested as complete systems in the manner of their intended use. In other words, if a single box design is to be used to ship a variety of inner packagings or articles, it must be tested (and certified) in each packed configuration. Each configuration is referred to as a “design type”.

BASIC BOX MAKING RULES

The rules for making a box, from the box maker’s point of view, have gotten simpler in terms of detailed material and process specifications. But the general rules have become more definitive with more emphasis on shipper responsibility. Yet, many box makers have failed to recognize the key elements of simplicity (or should I say complexity) in the new system.

The specification for a 4G Fibreboard box is only four short paragraphs long. Compare this to an old DOT-12B or 12A box specification which is considerably longer.

The 12A, for instance, was limited to two grades of singlewall fibreboard.. 4G has no limits on the grade of board. 12A requires both liners to be water resistant. 4G requires only one to be water resistant. 12A requires a glued manufacturer’s joint to be glued throughout the area of the lap. 4G does not specify so long as it performs.

About the only new requirement imposed on a 4G box is the test for water resistance of the outer liner (Thirty minute Cobb moisture absorption test in accordance with ISO 535). Although the old DOT spec boxes had to have water resistant liners, no test was called for to establish good from bad.

See the appendix for the complete 4G specification as presented in 49 CFR Code of Federal Regulations.

SO WHEREIN LIES THE DIFFICULTY?

The difficulty starts when your customer asks for a UN “CERTIFIED” box as opposed to a UN certifiable box. Under the rules you simply cannot supply an empty box with a UN mark on it (analogous to a BMC). Your box must participate in a performance test after having been packed with something—and pass. The mark then represents certification of a complete “package” or packaging system. Now this was true of the old DOT-12A, but the more commonly used DOT-12B had no specific testing called for in 49CFR.

In the normal scheme of things, it is the shipper who should be testing the box. It is the shipper who should be specifying all the detailed requirements for the box. Only the shipper knows what

will be shipped in the box and what the transportation environment is. The smart shipper knows what he needs to be in compliance with the regulations. The smart shipper will ask you to provide certifiable test specimens and will provide you with the certification mark to be printed on production boxes when he places the order. The not-so-smart shipper will ask you to design the box for him. The not-so-smart shipper will ask you to also certify it for him. You know, the old “turn key” design approach because he can’t be bothered. The not-so-smart shipper thinks he can skip the development phase and jump right into the qualification (certification) phase.

Let’s face it. It is almost impossible for you to ensure complete compliance for a customer who does not know for sure what he needs. If he doesn’t know, how can you possibly know. For instance, there may be requirements for design features that will affect fit predicated on the products being shipped or the mode of transportation that you have no knowledge of. So, it is one thing to assist the customer in doing his job and quite another to assume responsibility for his job as a hazmat shipper.

KNOWLEDGE, EXPERIENCE AND QUALITY CONTROL

In the real world the box maker rarely receives a complete specification. So how does he protect himself? With knowledge, experience and quality control. (Indeed DOT requires employees of manufacturers of hazmat packaging to be trained in the regulations. Training requirements are found in paragraph 172.700 and included general awareness as well as function specific training.)

When you are asked to supply certification samples, how you go about it is key to your success.

- First** Make certain the box complies with those four little paragraphs in the 4G specification—particularly the moisture resistance requirement and the quality of the manufacturers joint. (Cobb testing will be checked by 3rd party Certifiers, and some manufactures are inclined to use a different adhesive on prototype box joints).

- Second** Make sure all samples are uniform. They should be production if possible. If they come from the sample room, it is your responsibility to ensure that they are equivalent to production boxes. (i.e. same board (same liner mfg if possible), same size, same joint etc. It is your responsibility to ensure that they are “the same as” production boxes.

- Third** Make certain the quality of sample boxes are no better than you are willing to supply 100% of the time for production. This is the best way to protect yourself from noncompliance exposure. Once the test boxes are certified, they automatically set the standard for all production box materials and workmanship that follow. DOT expects every production box to be capable of passing the certification test protocol as it was applied to the test articles.

(Here comes the experience)

You should know and document the source, make up, % recycle, density, Cobb, ECT value, tear strength, Mullin and any other trait of the board used in the test boxes as well as production boxes. The more documentation the better. The materials in a production box should be traceable to their source through a production coding system.

If any physical characteristic should change that would cause an already marginal design type to fail, you may be caught holding the bag (a recall of a large production order). Of course, you may be forced to change liner board or even liner board suppliers during the course of production. This can be a significant change. Your best bet is to retest (or recommend your customer retest) when this happens. Indeed, DOT expects you to have a suitable QC program in place to ensure reliability of all production hazmat boxes.

Ask for the certification test report from the shipper, It can be very valuable to have the test report on the package design type so you can determine for yourself whether the design is conservative or marginal with respect to your boxes. Your QC program may not need to be as critical if the design is conservative. The test report sets the standard in determining if you or the shipper violates the design type rules of equivalency that mandates retesting, or any other attribute of the package that may cause it to fail periodic retesting.

THE TEST PROTOCOL

By all means be familiar with the test protocol for 4G fibreboard boxes. Any production verification testing you perform should be based on the protocol applicable to the design type.

There are three primary tests for 4G boxes design types: Drop, Stack, and Vibration. Environmental conditioning is require for official qualification. The required drop height is a function of the Packing Group for which the box is to be certified to.

Certification testing requires an absolute minimum of five (5) test specimens. As many as eight (8) may be required for a critical design since a single specimen need only be subjected to a single test.

- Drop Test (178.603): Five (5) specimens required. Five drops (one box for each drop). One bottom, one top, one side, one end, and one on the most susceptible corner.
 - » Drop height: 1.8 m for PG I, 1.2 m for PG II , 0.8 m for PG III
 - » Conditioning (178.602): 23 °C and 50% RH for 24 hrs prior to test.
 - If inner packagings are plastic or other material that is temperature sensitive, conditioning must be to -18°C or lower.*
 - » Criteria for failure: No leakage from inner packagings. No damage to packaging likely to adversely affect safety during transport.

- Stack Test (178.606): Three (3) specimens required. Stack load based on test specimen weight and equivalent stack 3 m high. Each specimen dead weighted for 24 hrs. minimum.
 - » Criteria for failure: No leakage. No significant collapse. Test boxes must be capable of supporting three high free standing stack for one hour without falling.
- Vibration Test (178.608): Three (3) specimens required. Each must be capable of withstanding one hour repetitive shock applied either by vertical or rotary motion, at one inch double amplitude and a frequency that causes them to just leave the table (1.6mm).
 - » Criteria for failure: No leakage when tipped onto its side. No deterioration to outer packaging likely to adversely affect safety during transport.

Keep in mind that this protocol is applied to all boxes regardless of size and wt. (up to 400 kg net wt). It therefore does not serve as a distribution environment test protocol. The shipper is expected to ensure that the design type will also survive the distribution environment the package is anticipated to see. This is covered under the general rules for hazmat package design. Appropriate distribution test protocols include a variety published by ISTA, ASTM D4169 and various military test standards.

Note: It is possible for a design type to pass the DOT protocol and fail an appropriate distribution protocol. Distribution protocol testing is recommended if sufficient shipping experience is not available to assess performance in the distribution environment.

THE CERTIFICATION MARK

Criteria for printing the mark can be found in 178.3 Marking of Packagings. Markings must be 12 mm high except for small packagings where no less than 6 mm may be used.

The marking may be located anywhere but must be readily accessible, unobstructed, permanent, readily apparent and readable. For packages over 30 kg rating the mark must not be on the bottom or else must be duplicated on a side, end or top.

The mark must include the UN symbol and the required details prescribed by the Certifiers. 178.502 defines package codes while 178.503 provides arrangement of the coded information. The information includes: Package Code, Packing Group, Maximum Allowable Gross Wt, Year of Manufacture, State of Origin and Mark of the Certifiers.

Certification may be accomplished under self certification rules or by a Third Party Certifiers approved by DOT/RSPA. Third Parties are assigned a two digit code and must serialize each design type they certify for traceability.

CONCLUSION

UN certified packaging is based on a methodical performance oriented design approach intended to ensure any country in the world can produce sufficiently safe hazmat packaging to satisfy every other country in the world, thus facilitating international trade in hazardous materials with acceptable safety levels and uniform hazard communication.

Encourage your customer to put specifications in writing—even if you have to spoon feed them to him. They should come from the customer. It is the customer's responsibility.

Limiting your responsibilities to supplying only a box will greatly reduce your non compliance exposure. Your exposure is limited to the box as opposed to the complete package system (or a part of it over which you have no manufacturing control).

Responsibility for the complete package system should clearly lie with the shipper.

APPENDIX

THE 4G SPECIFICATION

49 CFR--178.516 Standards for fibreboard boxes.

(A) The identification code for a fibreboard box is 4G.

(B) Construction requirements for fibreboard boxes are as follows:

(1) Strong, solid or double-faced corrugated fibreboard (single or multi-wall) must be used, appropriate to the capacity and intended use of the box. The water resistance of the outer surface must be such that the increase in mass, as determined in a test carried out over a period of 30 minutes by the Cobb method of determining water absorption, is not greater than 155 g per square meter (0.0316 pounds per square foot)—see ISO 535 (IBR, see Para. 171.7 of this subchapter). Fibreboard must have proper bending qualities. Fibreboard must be cut, creased without cutting through any thickness of fibreboard, and slotted so as to permit assembly without cracking, surface breaks, or undue bending. The fluting of corrugated fibreboard must be firmly glued to the facings.

(2) The ends of boxes may have a wooden frame or be entirely of wood. Reinforcements of wooden battens may be used.

(3) Manufacturing joints.

(i) Manufacturing joints in the bodies of boxes must be:

(a) Taped;

(b) Lapped and glued; or

(c) Lapped and stitched with metal staples.

(ii) Lapped joints must have an appropriate overlap.

(iii) Where closing is effected by gluing or taping, a water resistant adhesive must be used.

(4) Boxes must be designed so as to provide a snug fit to the contents.

(5) Maximum net mass: 400 kg (882 pounds).

TYPICAL CERTIFICATION MARK

