U.S. Department
of Transportation

**Research and
Special Programs
Administration**

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

OCT 2 8 2002

Mr. Scott W. Chapman
Boeing - Long Beach Division
19270 Western Avenue
Torrance, CA 90501

Ref. No. 02-0224

Dear Mr. Chapman:

This is in response to your August 26, 2002 letter concerning package testing requirements under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Specifically, you requested clarification concerning the relative humidity requirements for testing paper and fiberboard packagings in § 178.602. You state that while the HMR requires margin of error of ±2% in determining relative humidity, the machine you use has a margin of error of ±5%.

Section 178.602 (d) requires the packaging to be maintained at least 24 hours prior to testing in an environment with 50% relative humidity, plus or minus 2%. In addition, the requirements allow for up to a ±5% deviation (45% or 55% relative humidity) for short term fluctuations in this minimum 24-hour period. The average relative humidity would be calculated for at least 24 hours before the test, and would allow for ±5% deviation spikes, but the average relative humidity must remain between 48% and 52%.

You equipment will need to be accurate enough to ensure that the pre-test environment falls within these specifications. Your equipment and subsequent data display may be of any number of technologies or styles, but it is the responsibility of the equipment owner to be able to read and verify that the packaging was in an environment that meets these criteria for at least 24 hours prior to testing. If you feel this criteria is too restrictive, then you may petition RSPA for a change to the regulations under the process outlined in § 106.31 of the 49 CFR.

I hope this satisfies your request.

Sincerely,

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

020224

178.602

Johnsen
§178.602
Testing
02-0924

BOEING®
Long Beach Division,
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PACKAGING ENGINEERING

August 26, 2002

To Edward T. Mazzullo;

I was hoping you could give me a response in writing that our humidity tolerances maintained by our test equipment are acceptable as recorded for our fibreboard sample conditioning. See excerpted requirement for IATA and CFR49 below.

IATA **Dangerous Goods Regulations**

so long as they are placed so that the test results are not invalidated.

6.3.2.2 In the drop tests for liquids, when another substance is used, it must be of similar relative density (specific gravity) and viscosity should be similar to those of the substance being transported. Water may also be used for the liquid drop test under the conditions set forth in 6.3.3.4.

6.3.2.3 Paper or fiberboard packagings must be conditioned for at least 24 hours in an atmosphere having a controlled temperature and relative humidity (RH). There are three options, one of which must be chosen. The preferred atmosphere is 23°C ± 2°C (73°F ± 3.6°F) and 50% ± 2% RH. The two alternatives are 20°C ± 2°C (68°F ± 3.6°F) and 65% ± 2% RH or 27°C ± 2°C (80°F ± 3.6°F) and 65% ± 2% RH.

Note: Average values must 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.

§178.602 Preparation of packagings and packages for testing.

(a) Except as otherwise provided in this subchapter, each packaging and package must be closed in preparation for testing and tests must be carried out in the same manner as if prepared for transportation, including inner packagings in the case of combination packagings.

(b) For the drop and stacking test, inner and single-unit receptacles must be filled to not less than 95 percent of maximum capacity (see §171.8 of this subchapter) in the case of solids and not less than 98 percent of maximum capacity in the case of liquids. The material to be transported in the packagings may be replaced by a non- hazardous material, except for chemical compatibility testing or where this would invalidate the results of the tests.

(c) If the material to be transported is replaced for test purposes by a non- hazardous material, the material used must be of the same or higher specific gravity as the material to be carried, and its other physical properties (grain, size, viscosity) which might influence the results of the required tests must correspond as closely as possible to those of the hazardous material to be transported. Water may also be used for the liquid drop test under the conditions specified in §178.603(e) of this subpart. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total package mass, so long as they are placed so that the test results are not affected.

(d) Paper or fiberboard packagings must be conditioned for at least 24 hours immediately prior to testing in an atmosphere maintained—

(1) At 50 percent ± 2 percent relative humidity, and at a temperature of 23° C ± 2° C (73° F ± 4° F). Average values should fall within these limits. Short-term fluctuations and measurement limitations may cause individual measurements to vary by up to ± 5 percent relative humidity without significant impairment of test reproducibility;

(2) At 65 percent ± 2 percent relative humidity, and at a temperature of 20° C ± 2° C (68° F ± 4° F), or 27° C ± 2° C (81° F ± 4° F). Average values should fall within these limits. Short-term fluctuations and measurement limitations may cause individual measurements to vary by up to ± 5 percent relative humidity without significant impair ment of test reproducibility; or

(3) For testing at periodic intervals only (i.e., other than initial design qualification testing), at ambient conditions.

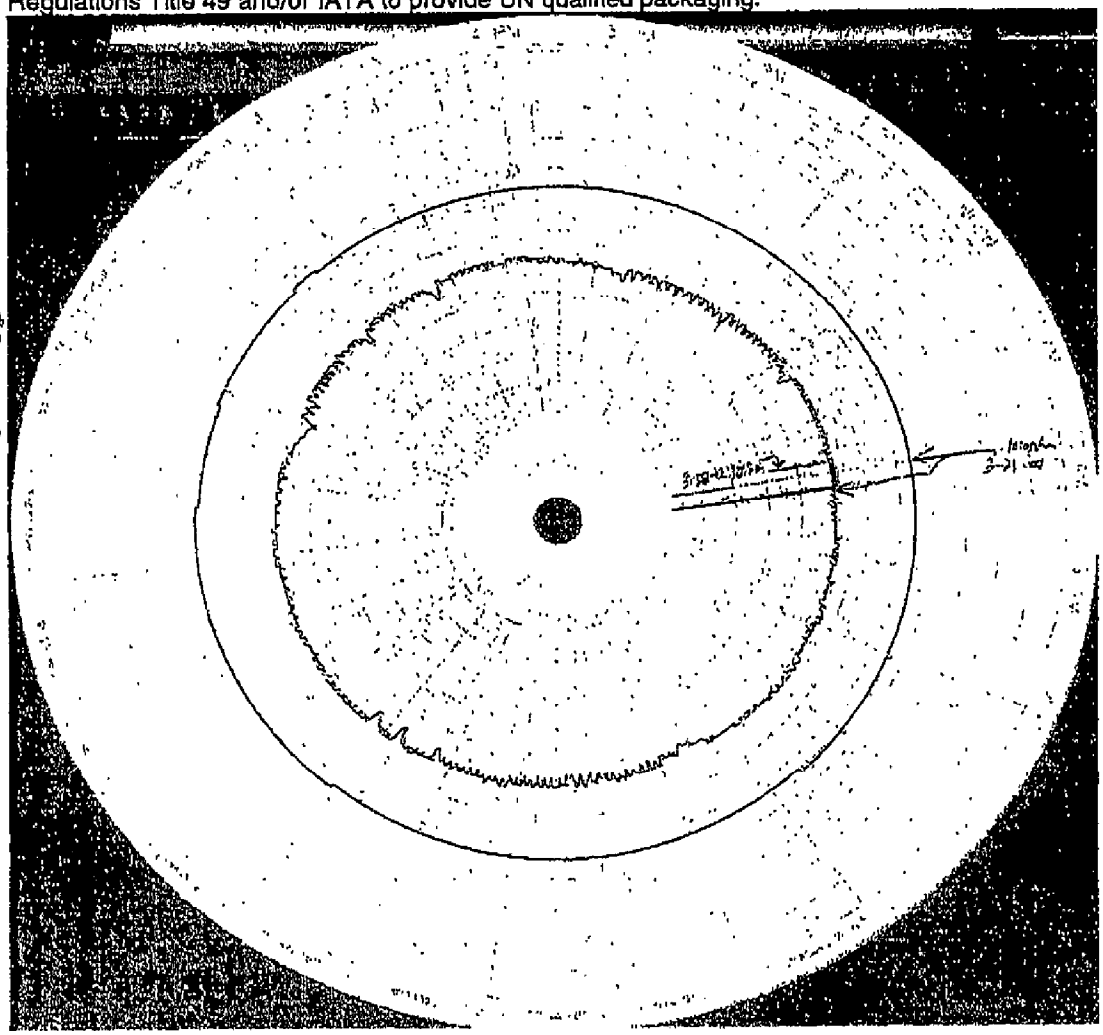
I am hearing from our metrology group the tolerances as written in both regulations are too tight and the equipment and setup required to measure to these tolerances would be fairly elaborate. Over time we have corresponded with many third party labs and never determined any special setups, as described by our metrology, existed for their equipment and I have not heard of any rulings over this matter from D.O.T. or IATA authority. According to my contact in our Metrology group, when using Test to Accuracy Ratio (TAR), which should usually be 10:1 optimally but 4:1 is more realistic, we then are required to have a measuring instrument that is +/- 0.2 to 0.5 %RH which leads to the not possible to the not feasible when measuring in Humidity. What we see in our data shows, based on our recording equipment calibration and configuration, that we are properly conditioning our fiberboard samples. Our equipment is calibrated to +/- 5 RH but both the digital and graphic presentation of our data has limited resolution.

Since the recorder is not calibrated to measure at +/- 2%, is our data qualified per the regulations?

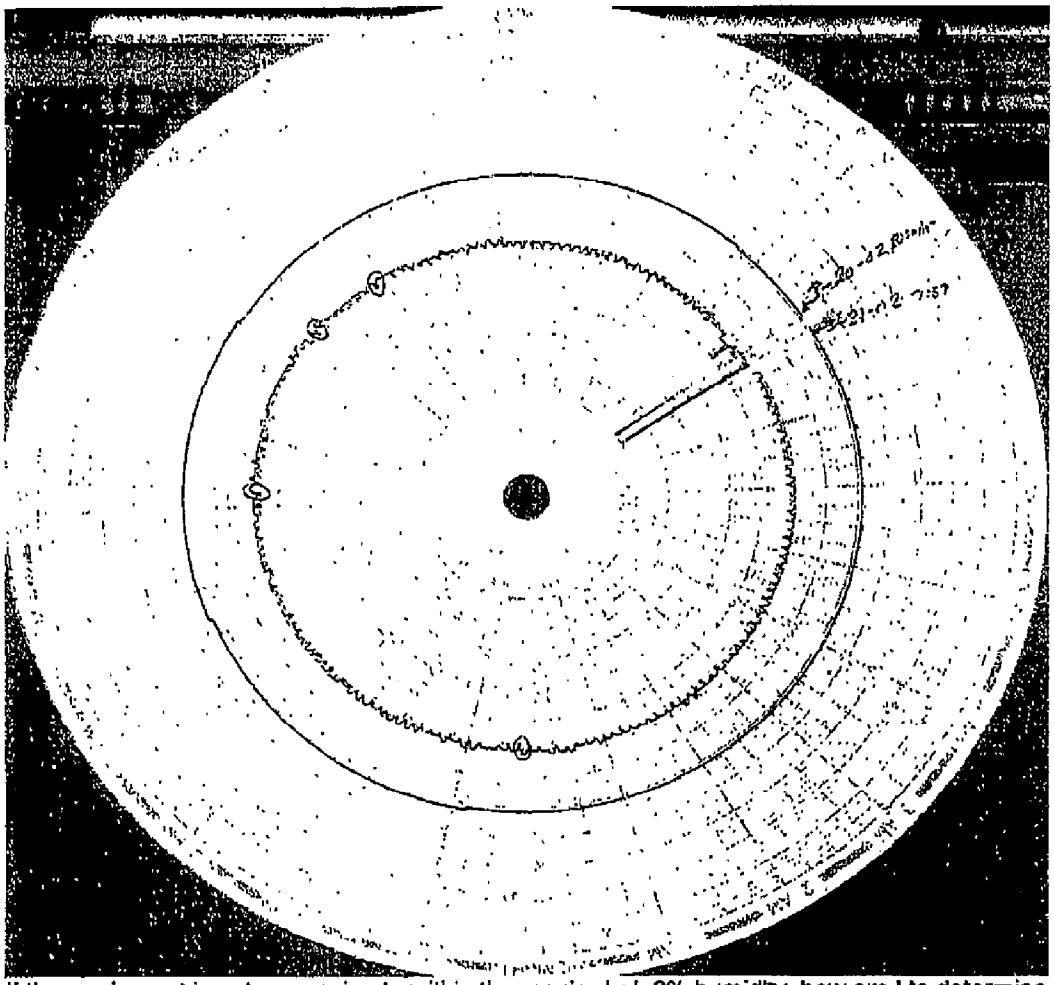
I believe these recordings to be typical in the industry. Our equipment also measures as coupled to a sensor that is very good at what it is specified for, but may be considered poor in relation to the restrictions noted in CFR and IATA specifications.

Can you provide approval in writing that the data shown below is representative of acceptable fiberboard sample conditioning for UN testing using calibrated equipment that has a limited calibration +/- 5% RH?

See attached actual recorded data indicating temp and humidity tolerance held within our environmental chamber over a 24 hr period. This was recorded with our chart recorder calibrated to read with a tolerance of +/- 5% humidity. We are running evaluations on our chamber and were looking for a qualified opinion as to whether these readings show we hold the tolerance required per Code of Federal Regulations Title 49 and/or IATA to provide UN qualified packaging.



Please review below additional 24 hr recording, particularly the Humidity, (circled areas) which in my opinion show swings in humidity between 3 & 4 %. I consider these temporary fluctuations to be below 5% humidity, but our equipment is calibrated for +/- 5% accuracy.



If the equipment is not measuring to within the required +/- 2% humidity, how am I to determine swings in humidity are limited to only 5%?
Also how is "average" value calculated for this requirement as written in both regulations and when using a chart recorder?
Is it acceptable to use a chart recorder and file these readings with the test report?
Must average be calculated or digitally converted?
Is this simply a visual interpretation for average?
Can our chart recorder be used if it is calibrated to an accuracy of +/- 5%?
How must we consider "short term fluctuations"?
Is short term visual or defined by time?

Thank You,

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