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

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

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Ref. No: 01-0115

Mr. H. Perry Hock
Technical Director
gh Package & Product Testing
and Consulting, Inc.
325 Commercial Drive
Fairfield, OH 45014

Dear Mr. Hock:

This is in response to your letter and subsequent telephone conversation with Diane LaValle of my staff, requesting clarification of the requirements for testing of packagings under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Your questions are paraphrased and answered as follows:

Q1. You are testing a combination packaging consisting of 4 one-gallon plastic inner receptacles in a fiberboard box. The manufacturer wants the packaging to be certified at the highest possible maximum gross weight. When you raise the weight of the packaging by adding lead shot or sand, the packagings fail. If they are tested with the actual high specific gravity (SG) material that will be transported, they pass. You ask if you may use the formula provided in § 178.603(e)(2)(ii) but work it backwards to determine the specific gravity to which a packaging may be certified. In other words, you want to determine the maximum height at which a packaging will pass the drop test and then work backwards to determine the corresponding SG. You ask what maximum gross weight should be marked on a packaging where the packaging was filled with water and passed a drop test at a height of 4.416 feet. You propose to perform the necessary calculation as follows:

Packing Group II: SG x 3.3 feet [§ 178.603(e)(2)(ii)]
SG = 4.416 feet ÷ 3.3 feet SG = 1.33

A. You may determine specific gravity by using the equation in § 178.603(e)(2)(ii) in reverse. In your scenario using 1.33 SG, 4 one-gallon containers plus the tare weight of 3 pounds, the packaging may be certified to 23.1 kg. This is calculated by taking the rated capacity of the packaging in liters (4 gallons = 15.14 liters) times the specific gravity (1.33 as calculated above) to get the maximum gross weight in kilograms [§ 173.24(b)(3)]. We note that this calculation does not leave any margin for error; the package failed at an incremental increase in drop height. Since each packaging must be capable of passing all the performance tests at any time during transportation, we recommend that you reduce the authorized specific gravity some reasonable amount so as to provide a greater margin for variation in performance of the production packagings.

178.603

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Q2. May the maximum gross weight of a packaging be marked to 1 decimal place or must it be a whole number rounded down?

A. The maximum gross weight for a packaging may appear as a whole number rounded down or may appear rounded to the first decimal.

Q3. May the specific gravity be marked on a packaging to 2 decimal places? How should it be rounded? Should the actual SG be used to determine drop height or the rounded down SG?

A. As provided by § 178.503(a)(4)(i), single packagings intended to contain liquid are marked with the specific gravity rounded down to the first decimal and may be omitted when the specific gravity does not exceed 1.2. The actual SG should be used to determine drop height.

I hope this information is helpful.

Sincerely,

Edward T. Mazzullo

Edward T. Mazzullo
Director, Office of Hazardous
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gh Package & Product Testing and Consulting, Inc.

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Edmonson
§ 172.312
§ 178.603
Marking + Testing
01-0115

May 3, 2001

To: Mr. Edward T. Mazzullo
Director, Office of Hazardous Materials Standards
U.S. DOT/RSPA (DHM-10)
400 7th Street S.W.
Washington, DC 20590-0001

From: Mr. H. Perry Hock
Technical Director
gh Package & Product Testing and Company

Subject: Non–bulk performance-oriented packaging.

Dear Mr. Mazzullo,

I have several questions regarding marking and the testing of non-bulk packagings.

The pack consists of 4 plastic one-gallon jugs filled with windshield wiper fluid. The client does not know what specific gravity they would like use to certify this pack. They want to certify the pack to the highest possible SG. They would supply us unlimited filled packagings until we reach a failure. They asked us if we could keep increasing the drop height after each of the five packs passed the previous drop tests. After we increase the drop height, we are to use five different filled (and conditioned) packs and drop from the new, higher drop height. This is done until the one of the five packs fail the drop test. The highest drop height all five packs passed would be the passing drop height. Using the formula from 178.603 (ii), can it be worked backwards to find the SG? Is this acceptable, and if not, what is the acceptable approach to determine the highest SG allowed to be placed in it?

E.G. The packs pass at 53 inches but not 54. Since 53 is less than group I but more than group II, We would use the group II formula: SG x 3.3 feet (39.6 inches) = 4.416 feet (53 inches)

we can then rewrite the formula:

$$SG = \frac{4.416\,Feet}{3.3\,Feet}$$

$$SG = 1.33$$

Now using 1.33 SG, and the packaging consists of 4, 1–gallon containers, and the tare weight of the packaging is 3 lbs., what would be the appropriate weight to be marked on the 4G pack?

1.33 x 8.43 (weight of one gallon of water) = 11.21 lbs. per bottle
4 bottles x 11.21 lbs. = 44.84 lbs. just for the contents
44.84 lbs. + 3 lbs. of packaging = 47.84 lbs. (21.7 kg)

Question 2:

May a pack be marked with a weight to one decimal place, such as 21.7 kg or must it be in a whole number rounded down? This decimal place would allow for more accurate description, and testing of non-bulk packs.

Question 3

May the specific gravity of the material be marked on the pack to 2 decimal places? If the SG cannot be marked to two decimal places, how should it be rounded? How should it be tested and to what drop height? Should the actual SG be used for the drop height or the new, rounded SG?

This question may seem like it does not have merit until you consider the impact it has on drums and IBC packs. With the difference of more than 0.8 lbs. per gallon, a 55-gallon drum's contents can weigh up to 550 lbs. marked at 1.2 SG. At 1.3 SG, the 55-gallon drum's contents can weigh up to 596 lbs. If the SG of the product falls between 1.2 and 1.3, what should be marked on the drum? If it is to be marked to a single decimal rounded down, the shipper can loose more than 4 gallons per drum.

Question 4

Same as Q 1

The client submits a pack of 4 metal 1-gallon containers that are filled with water. Water's SG is 1.0. The SG of the product they want to put inside of the pack is 1.18. Both fall under the 1.2 cutoff to use, but the tested pack weighs 5.4 lbs. less than the package with the actual product. What drop height should be used to compensate for the weight difference? If the drop height is not altered, then theoretically the pack must be marked with the weight tested. If the drop height is altered to a higher drop height, then the pack can be marked with the appropriate ship weight – which would be 2.4 kg higher.

Similar scenario:

A client has a 4G combination pack with plastic inners for liquids. They tell us, the third party test lab that their 4G pack will weigh no more than 24 lbs. when shipped. When we receive the samples filled with wiperfluid, the packs weigh 18 lbs. What is the correct way of determining the drop height for this pack? Can a ratio be used?

Example: shipped weight is 40 lbs. but the tested weight is 36 lbs. The drop height for 40 lbs. would be 48 inches.

The ratio would be:

$$\frac{\text{Product Ship Weight}}{\text{Test Pack Weight}} = \frac{\text{New Drop Height}}{\text{Required Drop Height}}$$

And then rewritten as:

$$\frac{\text{Product Ship Weight} \times \text{Required Drop Height}}{\text{Test Pack Weight}} = \text{New Drop Height}$$

$$\frac{40\,lbs. \times 48\,Inches}{36\,lbs.} = 53.3\,Inches$$

I realize the drop height can never be lower than the required drop height but would this be acceptable for determining a pack's drop height when no specific gravity is given?

Special note on non-bulk packagings and their filling and sealing requirements: Some manufacturer's of hazardous material packaging for liquids use types of seals that cannot be duplicated or resealed in the lab, so adding weight to the pack once it has arrived at the lab is not possible. Adding weight using their filling and sealing machines is not possible since these machines will not allow solids to pass through the system.

I look forward to your response. If you need clarification or have questions regarding this letter, please call me at 513.870.0080

Yours Truly,

H. Perry Hock
Technical Director
gh Package & Product Testing and Consulting, Inc.

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