

Report of the Laws and Regulations (L&R) Committee

Tim Lloyd, Committee Chair
Montana

200 INTRODUCTION

This is the report of the Laws and Regulations (L&R) Committee (hereinafter referred to as the “Committee”) for the 100th Annual Meeting of the National Conference on Weights and Measures (NCWM). This report is based on the Interim Report offered in the NCWM Publication 16, “Committee Reports,” testimony at public hearings, comments received from the regional weights and measures associations and other parties, the addendum sheets issued at the Annual Meeting, and actions taken by the membership at the voting session of the Annual Meeting. The voting items shown below were adopted as presented when this report was approved. This report contains those recommendations to amend the National Institute of Standards and Technology (NIST) Handbook 130 (2015), “Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality,” and the NIST Handbook 133, “Checking the Net Contents of Packaged Goods (2015).”

Table A identifies the agenda and appendix items by reference key, title of item, page number, and the appendices by appendix designations. The acronyms for organizations and technical terms used throughout the agenda are identified in Table B. The first three digits of the Reference Key Numbers of the items are assigned from the Subject Series List. The status of each item contained in the report is designated as one of the following: **(D) Developing Item:** the Committee determined the item has merit; however, the item was returned to the submitter or other designated party for further development before any action can be taken at the national level; **(I) Informational Item:** the item is under consideration by the Committee but not proposed for Voting; **(V) Voting Item:** the Committee is making recommendations requiring a vote by the active members of NCWM; **(W) Withdrawn Item:** the item has been removed from consideration by the Committee.

Table C provides a summary of the results of the voting on the Committee’s items and the report in its entirety. Some Voting Items are considered individually; others may be grouped in a consent calendar. Consent calendar items are Voting Items that the Committee has assembled as a single Voting Item during their deliberation after the Open Hearings on the assumption that the items are without opposition and will not require discussion. The Voting Items that have been grouped into consent calendar items will be listed on the addendum sheets. Prior to adoption of the consent calendar, the Committee entertains any requests from the floor to remove specific items from the consent calendar to be discussed and voted upon individually.

Proposed revisions to the handbook(s) are shown as follows. 1) deleted language is indicated with a **bold face font using strikeouts** (e.g., ~~this report~~), and 2) proposed new language is indicated with an **underscore bold faced font** (e.g., new items). When used in this report the term “weight” means “mass”.

Note: The policy of NIST is to use metric units of measurement in all of its publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references to inch-pound units.

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Table B
Glossary of Terms and Acronyms

| Acronym | Term | Acronym | Term |
|---------|------------------------------------|---------|---|
| AAP | Average Adjusted Purge | HB 44 | NIST Handbook 44, “Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices” |
| AKI | Minimum Antiknock Index | IRS | Internal Revenue Service |
| ASTM | ASTM International | LNG | Liquefied Natural Gas |
| ATC | Automatic Temperature Compensation | MATG | Moisture Allowance Task Group |
| BTU | British Thermal Unit | MON | Motor Octane Number |
| CFR | Code of Federal Regulations | MAV | Maximum Allowable Variation |
| DGE | Diesel Gallon Equivalent | NIST | National Institute of Standards and Technology |
| DLE | Diesel Liter Equivalent | OWM | Office of Weights and Measures |
| DOE | Department of Energy | PALS | Packaging and Labeling Subcommittee |

| Acronym | Term | Acronym | Term |
|----------------|---|----------------|---|
| EPA | Environmental Protection Agency | RMFD | Retail Motor Fuel Dispenser |
| FALS | Fuels and Lubricants Subcommittee | S&T | Specifications and Tolerances |
| FDA | Food and Drug Administration | SCF | Sample Correction Factor |
| FPLA | Fair Packaging and Labeling Act | SEL | Sample Error Limit |
| FSIS | Food Safety and Inspection Service | SP | Special Publication |
| FTC | Federal Trade Commission | SWMA | Southern Weights and Measures |
| GGE | Gasoline Gallon Equivalent | TG | Task Group |
| GLE | Gasoline Liter Equivalent | UPLR | Uniform Packaging and Labeling Regulation |
| GM | General Motors | USNWG | U.S. National Work Group |
| L&R | Laws and Regulations | WG | Work Group |
| HB 133 | NIST Handbook 133, " <i>Checking the Net Contents of Packaged Goods</i> " | WWMA | Western Weights and Measures Association |

Table C
Voting Results

| Reference Key Number | House of State Representatives | | House of Delegates | | Results |
|-----------------------------|---------------------------------------|-------------|---------------------------|-------------|-----------------------|
| | Yeas | Nays | Yeas | Nays | |
| 231-1 | 39 | 0 | 62 | 0 | Adopted |
| 260-1 | 37 | 0 | 65 | 0 | Adopted |
| 260-2 | 39 | 0 | 67 | 0 | Adopted |
| 232-4* | 32 | 8 | 26 | 31 | Returned to Committee |
| 237-1* | 32 | 8 | 26 | 31 | Returned to Committee |
| 237-3 | 16 | 16 | 50 | 9 | Returned to Committee |

* Items 232-4, 237-1 and 337-1 were voted upon as a block.

Details of All Items
(In order by Reference Key)

221 NIST HANDBOOK 130 – UNIFORM WEIGHTS AND MEASURES LAW**221-1 W Section 1.8. Net “Mass” or Net “Weight.”**

(This item was Withdrawn.)

Source:

The Kind Group (2015)

Purpose:

Amend the definition of “net weight” to include the normally/easily deliverable quantity.

Item Under Consideration:

Amend NIST Handbook 130, Uniform Weights and Measures Law as follows:

1.8. Net “Mass” or Net “Weight.” – The term “net mass” or “net weight” means the weight ^[NOTE 1, page 21] of a commodity excluding any materials, substances, or items not considered to be part of the commodity **and is limited to the amount easily (normally) available to the consumer.** Materials, substances, or items not considered to be part of the commodity include, but are not limited to, containers, conveyances, bags, wrappers, packaging materials, labels, individual piece coverings, decorative accompaniments, and coupons, except that, depending on the type of service rendered, packaging materials may be considered to be part of the service. For example, the service of shipping includes the weight of packing materials. **Materials or substances, whose evacuation is substantially constrained by platforms, tube limitations or other elements, are not considered to be part of the commodity.**

(Added 1998) (Amended 1989, 1991, ~~and~~ 1993, and 20XX)

Background/Discussion:

For a number of products, such as toothpaste, makeup and certain lip balms, the easily (normally) available quantity is less than the net weight; sometimes significantly so. As a result, consumers lose untold commodities that are largely inaccessible in these products.

The following are Committee Reports from 1990 and 1993 on a similar item.

1990 L&R Committee Report:**10.X. Mechanical Pump Dispensers**

(This item was Informational.)

Sealed mechanical pumps are a relatively new dispensing mechanism for toothpaste. They dispense dentifrice through a sealed mechanism that will always retain a minimum amount of product. Only on aerosol containers must the net contents declaration be the amount that is delivered to the purchaser (see Section 10.3 of the UPLR). The Western Weights and Measures Association recommended that a new section be added to the UPLR requiring these new types of packages to declare on their labels the total weight of product that will be delivered. The proposal was:

10.X. Mechanical Pump Dispensers. – The declaration of quantity on packages that deliver product through a nonremovable mechanical pump shall disclose the net quantity of the commodity that will be expelled when the instructions for use, as shown on the container, are followed.

At the present time, two problems are associated with this type of container:

- (1) The dispensing head will always retain a certain amount of product in it, which cannot be obtained using normal dispensing methods. However, the package label declares the contained net weight, not the delivered net weight.
- (2) Compliance testing officials are not sure what method to use to determine the amount of product contained (as opposed to the amount delivered). Unlike aerosol packages, there are no warning statements on the package prohibiting the opening of the package. However, if emptied in the manner simulating use, the net weight will be less than the net weight determined by means which bypass the mechanical pump head.

The Cosmetics, Toiletries, and Fragrance Association (CTFA) met with the Committee and outlined how the mechanical pumps could be tested by regulatory officials to determine the amount of product contained. They also pointed out that studies showed mechanical pumps delivered comparable amounts of product as compared with tubes or other dispensing mechanisms, such as plastic squeeze bottles or hand pumps. (CTFA member firms found that other types of containers retain from 4.2 to 10.1 percent of labeled amounts without resorting to such extraordinary measures as cutting the containers apart, disassembling them, or waiting excessive periods of time for them to empty.) Another study showed that when consumers were asked to return tubes and mechanical pumps of toothpaste that they thought were "empty," pumps retained 4 to 5 percent of the labeled contents, while tubes retained 8 to 9 percent. Even though aggressive consumers *can* cut into a tube (but cannot do that to a pump), this study showed that they did not cut into the tube.

CTFA expressed concern that another declaration indicating the amount delivered in addition to the declaration presently on the packages (the amount contained) would be confusing. The Committee had not intended to require two declarations, but had interpreted the proposal as changing the net contents declaration, rather than adding one. Since such a requirement would be at variance with the traditional interpretation of the required net contents declaration (except for aerosols), the Committee is aware that the proposed section might be a solution that might require changes or additions to FDA regulations. However, it should be pointed out that certain segments of industry already provide a net contents statement that is the delivered amount; for example, many stick deodorant packages are labeled on the back declaring "(so many) ounces plus enough extra to secure the product to the base (of the dispenser)." The Committee will be carrying this item over for further study. See also Item 232-18 for further discussion.

Data collected in California indicated that mechanical pumps delivered from 89.5 to 100 percent of their declared net weights. The CTFA acknowledged that the various pumps now on the market have somewhat different dispensing characteristics. Mr. Ken Appell, Colgate-Palmolive Co., presented information concerning the possible causes of difference between California's and CTFA's data. They included the temperature at the time of measurement, the age of the product, the rate of use (fast, total dispensing vs. normal unit daily dosing), and container size (the size of the reservoir on the mechanical pump head compared with the size of the container, as well as the particular mechanical pump design). Other jurisdictions are urged to test both mechanical pumps and tubes and report their findings to the Committee. Data should include lot code information, temperature of test, and method of emptying the container, as well as container and package information, such as brand, product, and container net contents. It would be useful for the jurisdiction to test two samples of the same product, one to determine the delivered contents and one to determine the contained contents. Please contact the Office of Weights and Measures, Ms. Carroll Brickenkamp, (301) 975-4005, for information on determining the contained net contents.

**1993 L&R Committee Report:
Mechanical Pump Dispensers**
(This item was Withdrawn.)

Background: This was Item 231-13 in the Report of the 75th NCWM, 1990, pages 89-90, Item 231-6 in the “Report of the 76th NCWM,” 1991, page 200; and Item 231-3 in the “Report of the 77th NCWM,” 1992, page 135. See these reports for a full discussion of the issue. The Committee considered submitting a petition to the Food and Drug Administration (FDA) and the Federal Trade Commission (FTC) to request changes in Federal regulations to require mechanical pump package systems to dispense the labeled weight. Prior to the 77th NCWM Annual Meeting, the Committee received comments from industry and weights and measures officials expressing concern over the possible impact of a “to deliver” requirement on other types of packaging, including toothpaste tubes and hand-pump dispensers (such as those used for hand lotions) that are currently only required to contain the labeled quantity. Several people questioned how far the requirement would reach and whether the economic impact would benefit consumers or lessen the competitive position of manufacturers who use this type of packaging. The Committee did not hear any comments on this item *at* the Interim Meeting that indicated a significant problem with this type of packaging or that there is national support for further action on the issue. The Committee sought industry participation in further studies due to its concern about product retained by the package delivery system of mechanical pump dispensers, but only one firm expressed concern about the issue. Therefore, the Committee is withdrawing this item from its agenda. The Committee would welcome information on this item in the future. Such information could include the results of investigations into consumer complaints or results of actual product testing or recent net content studies on a wide variety of consumer products that use this type of container.

For additional information, contact Mr. Jonathan Teller, The Kind Group via e-mail: Jonathon@thekindgroup.com or Mr. Mike Sikula, New York State Weights and Measures at (518) 457-3452.

NCWM 2015 Interim Meeting: A comment was made that this item was addressed by the Conference in the 1990s and packaged commodities have not changed in how they are packaged or dispensed. Adoption of this proposal would create confusion in the marketplace for consumers. If accepted the Conference would need to consult with other federal agencies to see if it conflicts with their regulations. There is not enough data or support to move this item forward. The Committee agrees that, if adopted, defining the term “to deliver” would be difficult. This would also impact the current test procedures in NIST Handbook 133. The L&R Committee believes that packaging has not changed since this was reviewed by the Conference in the 1990s. There was also no evidence or data from other manufacturers that this is an issue. Two regional associations did not forward this item to the Conference for consideration. For these reasons the Committee Withdrew this item.

Regional Association Comments:

CWMA: The CWMA discussed the meaning of “normally/easily.” It is an ambiguous term and can be interpreted differently by individuals. The CWMA requested clarification on whether the residual contents would be considered as tare. Individuals from both the regulatory community and industry expressed some concern about the concept of “normally/easily deliverable.” One suggestion by a regulator was to amend the language from “contains” net weight to “delivered” net weight. Several examples of residual substances were discussed. One regulator suggested leaving the proposal as a developing item as referenced in the proposal from 1993. One regulator said it would be overwhelming to try to determine what the “cling” or residual would be on all package checking. The CWMA forwarded the item to NCWM recommending it as a Developing item.

WWMA: The WWMA noted that adoption of this item would necessitate changes to NIST Handbook 133. A manufacturer stated that if this proposal is adopted, manufacturers would have difficulty complying with the standard created by the new definition. A regulator stated that the proposed change is not necessary and that it would be difficult for regulators to enforce. One regulator agreed with the concept of net weight being defined “to deliver” but that this would create difficulty with test procedures currently documented, and that this is similar to the discussion about the difference between wet and used dry tare.

A similar item was considered by the NCWM in the early 1990s and ultimately Withdrawn due to enforcement

difficulty for regulators and difficulty of compliance by manufacturers. Since then, packaging technology has not changed significantly and the WWMA wondered what new problem it is that needs to be addressed. Currently, there is only one manufacturer seeking this change. It was also noted that the NCWM and NIST would have to consult with other federal agencies (e.g., FTC, FDA, and EPA to ensure this change would not conflict with other agencies' definitions). The WWMA did not forward this item to the NCWM.

NEWMA: NEWMA received an explanation from the submitter of this item justifying the need for this proposal. He explained that the product in question has content weight that is not intended for consumption. The submitter is asking to change the definition of net weight to include only the consumable contents of the product. The Committee Chair cited the federal regulation that lists the definition for net content, and asked how the submitter would reconcile this proposal with the federal regulation. The submitter indicated he did not believe there was a conflict with federal regulation. The submitter said that the upper half of the container is for packaging purposes, not for consumption purposes, so it should not be included in the weight. A regulator asked if other manufacturers were looking at this issue differently than the submitter. The submitter stated that there is confusion, but no manufacturer opposes the idea to his knowledge. The regulator feels it is a legitimate issue and merits further consideration. The Chairman commented that two other regions Withdrew the item, and one made it informational. A regulator stated that as a consumer, she would want to know what content is in the dispenser that is usable. Two additional regulators believed it should go forward as an Informational item for further consideration, which was the overall consensus at the NEWMA 2014 Interim Meeting. NEWMA forwarded the item to the NCWM and recommended that it be an Informational item.

SWMA: At the SWMA 2014 Annual Meeting, the Committee heard comments from industry that they believed this was a step backwards and would require multiple changes in test procedures. Comments were heard that multiple test procedures would have to be drafted to test many different items. The SWMA did not forward this item to NCWM.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

231 NIST HANDBOOK 130 – UNIFORM PACKAGING AND LABELING REGULATION

231-1 V Sections 6.4., 6.5., and 6.7. Addition of Tables

(This item was Adopted.)

Source:

NCWM Packaging and Labeling Subcommittee (2014)

Purpose:

Add tables to Handbook 130, Uniform Packaging and Labeling Regulation to help clarify requirements.

Item Under Consideration:

Amend NIST Handbook 130, Uniform Packaging and Labeling Regulation as follows:

6.4. Terms: Weight, Measure, Volume, or Count. – The declaration of the quantity ~~of a particular commodity~~ shall be expressed in terms of **Table 6.4.:**

- ~~(a) weight if the commodity is solid, semisolid, viscous, or a mixture of solid and liquid;~~
- ~~(b) volume measure if the commodity is liquid or dry, if the commodity is dry;~~
- ~~(c) linear measure or area; or~~

~~(d) numerical count.~~

| Table 6.4. Weight, Measure, Volume, or Count | |
|---|---|
| <u>If the commodity is:</u> | <u>The declaration of the quantity of a particular commodity shall be expressed in terms of:</u> |
| (a) <u>solid, semisolid, viscous, or a mixture of solid and liquid</u> | <u>weight or mass</u> |
| (b) <u>liquid</u> | <u>fluid volume measure</u> |
| (c) <u>dry</u> | <u>dry measure</u> |
| (d) <u>or labeled by linear measure or area</u> | <u>linear measure or area</u> |
| (e) <u>or labeled by numerical units (count)</u> | <u>numerical count</u> |

However, if there exists a firmly established general consumer usage and trade custom with respect to the terms used in expressing a declaration of quantity of a particular commodity, such a declaration of quantity may be expressed in its traditional terms, provided such traditional declaration gives accurate and adequate information as to the quantity of the commodity. Any net content statement that does not permit price and quantity comparisons is forbidden.

(Amended 1989 **and 2015**)

6.5. SI Units: Mass, Measure. ^[NOTE 3, page 64] – A declaration of quantity **shall be expressed in terms of Table 6.5. and the requirements in 6.5.(f), 6.5.(g), and 6.5.(h):**

| Table 6.5. SI Units: Mass, Measure | |
|--|---|
| <u>If a declaration of quantity is in units of:</u> | <u>The units shall be in:</u> |
| (a) <u>mass</u> | <u>kilogram, gram or milligram</u> |
| (b) <u>liquid measure</u> | <u>liter or milliliter and shall express the volume at 20 °C, except for:</u> <u>petroleum products or distilled spirits for which the declaration shall express the volume at 15.6 °C, and</u> <u>a commodity that is normally sold and consumed while frozen for which the declaration shall express the volume at the frozen temperature, and</u> <u>malt beverages or a commodity that must be maintained in the refrigerated state, for which the declaration shall express the volume at 4 °C.</u> |
| (c) <u>linear measure</u> | <u>meter, centimeter, or millimeter</u> |
| (d) <u>area measure</u> | <u>square meter, square decimeter, square centimeter, or square millimeter</u> |

| Table 6.5. SI Units: Mass, Measure | |
|--|---|
| <u>If a declaration of quantity is in units of:</u> | <u>The units shall be in:</u> |
| (e) <u>volume other than liquid measure</u> | <u>liter or milliliter, except that units cubic meter and cubic centimeter shall be used only when specifically designated as a method of sale</u> |

(Amended 1985, 1990, and 2015)

- ~~(a) in units of mass shall be the kilogram, gram, or milligram;~~
- ~~(b) in units of liquid measure shall be the liter or milliliter and shall express the volume at 20 °C, except in the case of petroleum products or distilled spirits, for which the declaration shall express the volume at 15.6 °C, and except also in the case of a commodity that is normally sold and consumed while frozen, for which the declaration shall express the volume at the frozen temperature, and except also in the case of malt beverages or a commodity that must be maintained in the refrigerated state, for which the declaration shall express the volume at 4 °C;~~

~~(Amended 1985 and 1990)~~

- ~~(c) in units of linear measure shall be the meter, centimeter, or millimeter;~~
- ~~(d) in units of area measure shall be the square meter, square decimeters, square centimeter, or square millimeter;~~
- ~~(e) in units of volume other than liquid measure shall be the liter and milliliter, except that the units cubic meter and cubic centimeter shall be used only when specifically designated as a method of sale;~~
- (f) Rule of 1000. – The selected multiple or submultiple prefixes for SI units shall result in numerical values between 1 and 1000. This rule allows centimeters or millimeters to be used where a length declaration is less than 100 centimeters.

Examples:

500 g, not 0.5 kg;
 1.96 kg, not 1960 g;
 750 mL, not 0.75 L; or
 750 mm or 75 cm, not 0.75 m

(Added 1993)

- (g) SI declarations should be shown in three digits except where the quantity is below 100 grams, case, any final zero appearing to the right of the decimal point need not be shown; and milliliters, centimeters, square centimeters, or cubic centimeters, where it may be shown in two digits. In either
- (Added 1993)
- (h) the declaration of net quantity of contents shall not be expressed in mixed units.

Example:

1.5 kg, not 1 kg 500 g.

(Added 1993)

6.7. U.S. Customary Units: Weight, Measure. – A declaration of quantity shall be expressed in terms of Table 6.7.:

- ~~(a) in units of weight shall be in terms of the avoirdupois pound or ounce;~~
- ~~(b) in units of liquid measure shall be in terms of the United States gallon of 231 in³ or liquid quart, liquid pint, or fluid-ounce subdivisions of the gallon and shall express the volume at 68 °F, except in the case of petroleum products and distilled spirits, for which the declaration shall express the volume at 60 °F, and except also in the case of a commodity that is normally sold and consumed while frozen, for which the declaration shall express the volume at the frozen temperature, and except also in the case of a commodity that must be maintained in the refrigerated state, for which the declaration shall express the volume at 40 °F, and except also in the case of malt beverages, for which the declaration shall express the volume at 39.1 °F;~~
- ~~(Amended 1985 and 1990)~~
- ~~(c) in units of linear measure shall be in terms of the yard, foot, or inch;~~
- ~~(d) in units of area measure shall be in terms of the square yard, square foot, or square inch;~~
- ~~(e) in units of volume measure shall be in terms of the cubic yard, cubic foot, or cubic inch; and~~
- ~~(f) in units of dry measure shall be in terms of the United States bushel of 2150.42 in³, or peck, dry quart, and dry pint subdivisions of the bushel.~~

| <u>Table 6.7.</u> <u>U.S. Customary Units: Weight, Measure</u> | |
|---|---|
| <u>If a declaration of quantity is in units of:</u> | <u>The units shall be in:</u> |
| (a) <u>weight</u> | <u>avoirdupois pound or ounce</u> |
| (b) <u>liquid measure</u> | <p><u>U.S. gallon of 231 in³ or liquid quart, liquid pint or fluid-ounce subdivisions of the gallon and shall express the volume at 68 °F, except in cases of:</u></p> <p><u>petroleum products or distilled spirits for which the declaration shall express the volume at 60 °F;</u></p> <p><u>a commodity that is normally sold and consumed while frozen, for which the declaration shall express the volume at the frozen temperature;</u></p> <p><u>a commodity that must be maintained in the refrigerated state, for which the declaration shall express the volume at 40 °F; and</u></p> <p><u>malt beverages for which the declaration shall express the volume at 39.1 °F.</u></p> |
| (c) <u>linear measure</u> | <u>yard, foot, or inch</u> |
| (d) <u>area measure</u> | <u>square yard, square foot, or square inch</u> |
| (e) <u>volume measure</u> | <u>cubic yard, cubic foot, or cubic inch</u> |

| <u>Table 6.7.</u> <u>U.S. Customary Units: Weight, Measure</u> | |
|---|---|
| <u>If a declaration of quantity is in units of:</u> | <u>The units shall be in:</u> |
| (f) <u>dry measure</u> | <u>U.S. bushel of 2150.42 in³, or peck, dry quart, and dry pint subdivisions of the bushel</u> |

(Amended 1985, ~~and~~ 1990, and 2015)

Background/Discussion:

The tables were developed from a PowerPoint presentation provided at a NIST Packaging and Labeling Training Seminar for industry and regulators. Attendees found the tables to be an excellent reference source as they were challenged to evaluate various packaged commodities for compliance with the Uniform Packaging and Labeling Regulation (UPLR). These individuals represented a wide range of businesses, and could be considered a good representation of industry in general.

The addition of tables to NIST Handbook 130, UPLR, would be useful to industry and regulators in interpreting requirements. No revisions of current requirements would be necessary. Marketing and art departments, amongst others, are challenged with developing the packaging and labeling for products being distributed by their companies or clients, and individuals in those professions would find it helpful to have the additional examples provided in the tables for reference.

Several other tables are already provided in NIST Handbook 130, and these new tables are viewed as being equally helpful. For example, in NIST Handbook 130 (2014), UPLR, Table 1. Rounding Rules (page 98) describes rounding rules and Table 2. Examples (page 100) provides conversions tables.

NCWM 2014 Interim Meeting: It was mentioned that there are numerous technical and typographical errors within the submitted charts. The subsections in the tables do not coincide with the language printed within NIST Handbook 130, UPLR. During Committee work session it was mentioned that developing tables for items within the NIST handbooks could set a precedence for all items to have a table. NIST commented that they do provide a publication, NIST SP 1020 Series, *Consumer Packaging Labeling Guides*. The NIST SP 1020 Guides are quite popular and extremely user-friendly. The Committee would like to have feedback from the Regions on this item. They also requested the PALS (original submitter) correct the tables to align with the language as it appears with the handbook.

NCWM 2015 Interim Meeting: The PALS Chair submitted modifications to the Item Under Consideration. PALS decided not to add tables for Sections 6.8.1., 6.8.2., and 6.9. The PALS Chair remarked that the Subcommittee has completed their review on this section and will not develop additional tables in this section of the handbook. The NIST Technical Advisor will review for technical and editorial clarity, so that members will have a finalized version for the NCWM Annual Meeting. The Committee encourages NIST, OWM to proceed with updating the NIST SP 1020 Series, “*Consumer Packaging and Labeling Guides*.” The 2015 L&R Committee is designating this as a Voting item.

NCWM 2015 Annual Meeting: During Open Hearings, Mr. Kurt Floren (Director, Los Angeles County) remarked that this has been reviewed by a large group of California sealers and they see no conflict. There is concern that if this language is directly from the Fair Packaging and Labeling Act (FPLA) and federal regulations, any omission of words could be a conflict. Mr. Guay (PALS Chair) clarified that the current NIST Handbook 130, UPLR language is not identical to the language in the FPLA.

Regional Association Comments:

CWMA 2014 Interim Meeting: The CWMA heard no comments were heard during the L&R Committee Open Hearings. The CWMA believes this item has merit but agrees the PALS needs to further Develop the item. At the 2015 CWMA Annual Meeting, it was reported that the item has been fully developed and two other regions have recommended that the item be a Voting item. There were no additional comments from the Central region.

WWMA: WWMA noted that replacing text with tables in NIST Handbook 130, UPLR has merit, but the tables should be vetted for technical accuracy and consistency with the language and intent of the FTC's FPLA.

WWMA 2014 Annual Meeting: The Committee recommended this item be Informational and encouraged the PALS to finish its amendments to the UPLR and submit one complete package; this would prevent the NCWM and regional committees from having to consider similar proposals over multiple years. WWMA also encouraged NIST to market its NIST SP 1020 series publications (guidebooks based upon the UPLR) to weights and measures stakeholders. There is no change to existing language in the UPLR. This proposal is taking existing language and placing it in a readable table format. The tables are supplemental and not intended to replace what is currently published. The PALS Chair added that the intent is to be content neutral, noting that putting it in a table format is user-friendly.

SWMA 2014 Meeting: The PALS Chair commented that he submitted a modification that differs from language that appears in the agenda as Item under Consideration. SWMA recommended that the item be a Voting item.

NEWMA 2014 Interim Meeting: The amended language from PALS was considered and the proposal was considered fully developed. NEWMA recommended that this item be a Voting item.

2015 NEWMA and CWMA Annual Meeting: The item was reviewed as it appeared in Publication 16. Both regions consider this proposal fully developed and recommend that it be a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

232 NIST HANDBOOK 130 – UNIFORM REGULATION FOR THE METHOD OF SALE COMMODITIES

232-1 I Section 1.5. Meat, Poultry, Fish, and Seafood.

Source:

Massachusetts Division of Standards (2015)

Purpose:

To allow the retail sale of meat, poultry and fish by count with adequate consumer information.

Item Under Consideration:

Amend NIST Handbook 130 Uniform Regulation for the Method of Sale of Commodities as follows:

1.5. Meat, Poultry, Fish, and Seafood. ^[NOTE 3, page 110] – Shall be sold by weight or count, except that whole shellfish in the shell may also be sold by ~~weight, measure, and/or count~~. Shellfish are aquatic animals having a shell, such as mollusks (for example, scallops) or crustaceans (for example, lobster or shrimp). **If sold by count, the net weight and the corresponding unit price shall be displayed on the principal display panel of the product. The unit price when sold by count shall also be advertised or displayed in terms of whole weight units of kilograms, pounds or ounces only, not in common or decimal fractions.**

(Amended 20XX)

Background/Discussion:

Several jurisdictions have reported that meat and meat products are routinely being sold by count both with and without a net weight declaration or unit price, many times alongside meat products that are being sold by weight. This approach does not give the consumer enough information to make value comparisons and may be misleading; however, it is believed this amendment will remedy this. Retailers will benefit from this amendment by having more options for the method of sale of these products; consumers will benefit from this amendment because they will be

able to make informed value comparisons; and weights and measures officials will be able to ensure accuracy of net weight declarations and unit price calculations.

NCWM 2015 Interim Meeting: A regulator remarked that the regulations are clearly defined in the handbook and any changes would cause confusion. Several states opposed this item as written. The NIST Technical Advisor remarked that this item was posted on the NIST State Director List Server and several states expressed concern on labeling issues in the marketplace. The State of Florida commented that they had an issue in their marketplace but worked directly with the grocers to clarify. The NIST Technical Advisor presented the following to the Committee for review:

1.5 Meat, Poultry, Fish, and Seafood. ^[NOTE 3, page 110] – Shall be sold by weight, except that whole shellfish in the shell may be sold by weight, measure, and/or count. Shellfish are aquatic animals having a shell, such as mollusks (for example, scallops) or crustaceans (for example, lobster or shrimp). **The net weight declaration for meat, poultry, fish and seafood shall be by the kilogram, gram or pound and not by portion or piece except as permitted below:**

(Amended 1998 **and 20XX**)

(a) If meat, poultry, fish, and seafood is kept, offered or exposed for sale or sold at the retail store level in standard weight packages (refer to the Uniform Packaging and Labeling Regulation (UPLR), Section 6.16., Random Packages) the net weight, total price and unit price must appear on the principal display panel of each package and must conform to all of the applicable requirements of the UPLR. This section does not apply to packages of meat or poultry that bear a USDA Inspection Seal and plant identity and a label that conform to the net weight labeling requirements of the USDA Food Safety and Inspection Service (FSIS).

(b) If meat, poultry, fish, and seafood is kept, offered or exposed for sale from bulk (e.g., direct service counters) by the portion or piece, the product identity and net weight shall be displayed along with the unit price at which it is offered for sale. This information shall appear on a label or sign adjacent to the meat, poultry, fish or seafood and must be presented in an easy-to-read type style and color and must appear on a single-color contrasting background.

(c) The unit prices required under Sections 1.5.(a) and 1.5.(b) shall be in terms of the unit price-per-kilogram; or unit price-per-100 grams; or unit price-per-pound, and not in any other unit or denomination or in common or decimal fractions of the permitted units.

(Added 20XX)

The traditional method of sale for meat and poultry at retail has been to sell by the pound in decimal units (i.e., 1.59 lb). In NIST Handbook 44, S.1.8.4., Customer Indications in the 2.20. Scale Code it requires the display of the whole units of weight but permits unit pricing for metric units to appear as price per kilogram or price per 100 g. Any proposal in the method of sale should be consistent with the scale code or retailers will not have the equipment they need to do the job.

NIST, OWM understands that retailers are attempting to shift from the traditional method of sale of decimal pounds over to the sale of meat by the piece, but still by weight (but in ounces). This is currently acceptable; however, as this practice is emerging in many states, it appears to hinder or frustrate the consumer's ability to make value comparisons between packaged meat and sales from bulk.

At least one state has obtained a court ruling that prohibits the sale of the same product by different methods of sale within the same retail location, specifically because it hinders value comparison.

In the example given below, the consumer will have to divide the price by ounces to obtain a price per ounce and multiply that value by 16 to obtain a price per pound, to compare the unit price offered in the bulk sales counter to the unit price of the same identical type of meat offered for sale in a random weight prepackage by the decimal pound.

For example: $\$5.99 \div 5 = \1.198 per ounce $\times 16 = \$19.16$ per pound

It appears that to maintain the traditional method of sale and pricing (i.e., offered by sale by decimal pounds and unit pricing by the pound) the Method of Sale Regulation (and, because not all states adopt the method of sale regulation, perhaps the UPLR) should be revised to only permit sales by the decimal pound or kilogram, and unit prices be revised to only appear in terms of price per pound or kilogram (or price per 100 grams [per NIST Handbook 44]). For sales of food from bulk, unit price advertising by the ounce should be prohibited in Sections 1.9.1 and 1.9.2.

Another suggestion provided by NIST, OWM is to change the title of Section 1.9. Advertising and Price Computing of Bulk Food Commodities to read:

1.9. Advertising and Price Computing of Bulk Food and Prepackaged Food Commodities.

1.9.1. Total Price Computing. – The total price of food commodities sold from bulk and in packages shall be by weight and the total price shall be computed in terms of whole units of weight (i.e., price per 100 grams, or price per kilogram, or price per pound, ~~ounces~~, etc.) and not in common or decimal fractions.

1.9.2. Unit Price Advertising. – The unit price of food commodities sold from bulk and in packages shall be advertised or displayed in terms of whole units of weight in kilograms, (or price per 100 grams) or pounds only, not in common or decimal fractions. ~~or in ounces~~. A supplemental declaration is permitted in print no larger than the whole unit price. This supplemental declaration may be expressed in common or decimal fractions. ~~or in ounces~~.

1.9.3. Individual Piece Advertising. – The unit price and net weight of food commodities offered or exposed for sale by the each from bulk shall include a declaration of the individual item price, a unit price in terms of decimal kilograms or pounds or price per 100 grams and net weight in terms of decimal kilograms or pounds. The net weight and unit price declaration shall be presented adjacent to the item price in type size no less than one-half the height of the item price and shall be displayed as clear and conspicuous as the item price.

For example: Tuna Steaks
 \$5.99 each

NET WT 0.31 LB
\$19.16 PER LB

Various pricing schemes found in the marketplace by the states:



Being Sold by Each.



Identifier on the Label States "5 oz bnl's pork chops." The Random Pack Label has a Net Weight that Differs from Package to Package.

NCWM 2015 Interim Meeting: The Committee heard comments to withdraw this item. The Committee would like to receive additional feedback from all the Regions. For these reasons, the Committee is recommending this be an Informational item.

NCWM 2015 Annual Meeting: The NIST Technical Advisor remarked that states have different interpretations for Section 1.5. Meat Poultry, Fish and Seafood. Some states believe this is a non-issue and does not need to be addressed through the Conference. Some states were able to work directly with retailers in resolving any issues. A primary concern is there needs to be uniformity in the marketplace. There are two separate issues; one being the method of sale on prepackaged products and the second being the method of sale when sold by bulk. NIST Handbook 130 does not provide guidance for some of the marketing practices seen in today's marketplace. NIST also has been in contact with a state that is having issues with markdown labels. If the NCWM approves the Committee's request that a work group (WG) be formed, NIST will facilitate a WG that consists of regulatory officials and retailers working together to review this item and provide a recommendation at the NCWM 2016 Interim Meeting.

Regional Associations Comments:

NEWMA 2014 Interim Meeting: During the meeting the submitter of this item commented that cuts of meat, poultry, and fish are being sold by count rather than the weight. He believes the pound comparison should be required so consumers can make educated price comparisons. Another regulator agreed. An industry representative from a supermarket asked if cuts could still be sold individually for a fixed amount if both the cost per pound and the cost per item are posted. The submitter explained that in his state, the price per pound should be the primary price listing. However, a supplemental statement would not be prohibited. The Chairman proposed alternative language to avoid a conflict with the Federal Packaging and Labeling Act (FPLA). The submitter asked the Chairman to confirm whether or not the new language would be in violation. An industry representative asked what the package labeling had to contain. The submitter answered that all packaging for meat, poultry, fish, and seafood in his state has to include the net weight, total price, and price per pound. NEWMA forwarded the item as submitted to NCWM and recommended that this be an Informational item. During the 2015 NEWMA Annual Meeting, a NIST Technical Advisor commented that this item came from regulators in Massachusetts and Florida. States have concerns there is not adequate regulation in addressing this section and the national L&R Committee is seeking comments from regions. NEWMA is recommending this be an Informational item pending comments from the states.

CWMA 2015 Annual Meeting: Several regulators commented that products are being sold by "each," but they also require the weight to be posted on the item. A NIST representative rose to provide clarification on the item for consideration and discussed that retailers are selling product by random weight, standard pack, and by bulk as count alone or by fixed weight. This item should be considered if states believe there is a need for a consistent pricing method (sold by pound only). The CWMA agrees this item has merit and should be kept as Informational.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

232-2 W Section 2.20.3. Street Sign Prices and Advertising

(This item was Withdrawn.)

Source:

Retail Motor Fuel Dispenser Price Posting and Computing Capabilities Task Group (2014)

Purpose:

Ensure that consumers are not charged a higher price per gallon for motor fuel than what is advertised on a street sign.

Item Under Consideration:

Amend Handbook 130, Uniform Regulation for the Method of Sale of Commodities as follows:

2.20. Gasoline-Oxygenate Blends.

2.20.1. Method of Retail Sale. – Type of Oxygenate must be Disclosed – All automotive gasoline or automotive gasoline-oxygenate blends kept, offered, or exposed for sale, or sold at retail containing at least 1.5 mass percent oxygen shall be identified as “with” or “containing” (or similar wording) the predominant oxygenate in the engine fuel. For example, the label may read “contains ethanol” or “with MTBE.” The oxygenate contributing the largest mass percent oxygen to the blend shall be considered the predominant oxygenate. Where mixtures of only ethers are present, the retailer may post the predominant oxygenate followed by the phrase “or other ethers” or alternatively post the phrase “contains MTBE or other ethers.” In addition, gasoline-methanol blend fuels containing more than 0.15 mass percent oxygen from methanol shall be identified as “with” or “containing” methanol. This information shall be posted on the upper 50 % of the dispenser front panel in a position clear and conspicuous from the driver’s position in a type at least 12.7 mm (½ in) in height, 1.5 mm (1/16 in) stroke (width of type).

(Amended 1996)

2.20.2. Documentation for Dispenser Labeling Purposes. – At the time of delivery of the fuel, the retailer shall be provided, on an invoice, bill of lading, shipping paper, or other documentation, a declaration of the predominant oxygenate or combination of oxygenates present in concentrations sufficient to yield an oxygen content of at least 1.5 mass percent in the fuel. Where mixtures of only ethers are present, the fuel supplier may identify either the predominant oxygenate in the fuel (i.e., the oxygenate contributing the largest mass percent oxygen) or, alternatively, use the phrase “contains MTBE or other ethers.” In addition, any gasoline containing more than 0.15 mass percent oxygen from methanol shall be identified as “with” or “containing” methanol. This documentation is only for dispenser labeling purposes; it is the responsibility of any potential blender to determine the total oxygen content of the engine fuel before blending.

(Added 1984) (Amended 1985, 1986, 1991, and 1996)

2.20.3. Street Sign Prices and Advertising.

(a) The unit price must be in terms of price per gallon in 1/10 cents.

(b) When the price of fuel increases, the street sign must be changed before or simultaneous when the price at the pump is changed. When the price of fuel decreases, the price at the pump must be changed before or simultaneous when the street sign price is changed.

(Added 20XX)

Background/Discussion:

The consumer should never pay more for fuel than the advertised price. A street sign price posting that is lower than the price at the pump could unfairly draw business from a competitor.

NCWM 2014 Interim Meeting: The Committee heard from Mr. Hornbach (Chevron) who spoke in regards to electronic price signs that have the capability to change pumps and signs simultaneously. He recommends that the word “simultaneous” be added into the proposal. Ms. Elson-Houston (Chair of the Retail Motor Fuel Dispenser Price Posting and Computing Capabilities Task Group [TG]) concurs with this change. The Committee does not feel this item is developed enough and requests that the TG ensure that all sections of the method of sale are addressed in regards to price posting, multi-tier and dual pricing with fuels. The Committee would like the regions to review and comment on this item. Ms. Elson-Houston informed the Committee that the Price Posting TG will be disbanding in July 2014. At the 2014 NCWM Annual Meeting, the Committee agreed this item had merit and recommended that the submitter continue to develop.

NCWM 2015 Interim Meeting: The Chair of the Retail Motor Fuel Dispenser Price Posting and Computing Capabilities TG recommended to the Committee that this item be Withdrawn. Many regulators and state directors concurred with the decision of the TG Chair. The 2015 L&R Committee is designating this as a Withdrawn item.

Regional Associations Comments:

This item was submitted directly to the Standing Committee from the NCWM Price Posting TG after the deadlines for submitting to the regional associations.

NEWMA 2014 Annual Meeting: There were no comments heard and the recommendation was to maintain this as Developing. During the 2014 NEWMA Interim Meeting, a regulator had concern with this proposal because it could be conflicting with state and local language. Two other regulators stated that it is of ultimate importance to disclose non-confusing pricing including advertising signs, but had also concerns that it would conflict with local consumer protection ordinances. NEWMA recommended that this item be Withdrawn.

CWMA 2014 Annual Meeting: It was reported a Missouri regulator suggested eliminating the words, “in $\frac{1}{10}$ cents” in Section 2.20.3. A Minnesota regulator supported the suggestion to eliminate the wording and explained this would allow some retailers in Minnesota who are selling specialty fuels being sold in small locations with older equipment to move the decimal point on that equipment. There was discussion that NCWM has never required this language for fuel sales. Ms. Fran Elson-Houston, Chair of the RMFD Price Posting and Computing Capabilities TG, stated that while the TG completed their work, more development should be done on this item. An industry representative stated the main focus of this item has been the issue of posted pricing on advertising signs never being lower than the pump price. A Minnesota regulator also suggested the wording “unit price per gallon or per liter” be considered. An Illinois regulator asked if there was clarification needed for the requirement of street signs. The group agreed clarification was needed. The Committee recommended the changes below and believes with these changes, the item is fully developed and recommends that it be a Voting item.

2.20.3. Street Sign Prices and Advertising

- (a) The unit price must be in terms of price per gallon **or liter**.
- (b) **In the event a street sign is used**, ~~When~~ the price of fuel increases, the street sign must be changed before or simultaneously when the price at the pump is changed. When the price of fuel decreases, the price at the pump must be changed before simultaneously when the street sign price is changed.

WWMA 2014 Annual Meeting: There were questions from industry and regulators about the need to have $\frac{1}{10}$ cent pricing and advertising. One regulator said that many states already have their own laws to address street sign pricing and advertising. Several other regulators agreed and said it is not necessary to include in the Method of Sale Regulation in NIST Handbook 130. There was consensus among all stakeholders attending the 2014 WWMA meeting that this section is not needed in the NIST Handbook 130, Method of Sale Regulation. WWMA recommended that this item be Withdrawn.

2014 SWMA: The Committee heard from an industry representative that this proposal would codify that pricing will be required in $\frac{1}{10}$ cents and that making signage and dispensers agree simultaneously would be impossible in some instances. The SWMA recommended this item be Withdrawn.

Additional letters, presentations, and data may have been part of the Committee’s consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

232-3 V Section 2.23. Animal Bedding

(This item was returned to Informational.)

Source:

NIST Office of Weights and Measures (2015)

Purpose:

Provide a uniform method of sale for animal bedding that will enhance the ability of consumers to make value comparisons and will ensure fair competition.

Item Under Consideration:

Amend the NIST Handbook 130, Method of Sale Regulation as follows:

~~2.23. Animal Bedding. —Packaged animal bedding of all kinds, except for baled straw, shall be sold by volume, that is, by the cubic meter, liter, or milliliter and by the cubic yard, cubic foot, or cubic inch. If the commodity is packaged in a compressed state, the quantity declaration shall include both the quantity in the compressed state and the usable quantity that can be recovered. Compressed animal bedding packages shall not include pre-compression volume statements.~~

Example:

~~250 mL expands to 500 mL (500 in³ expands to 1000 in³).~~

(Added 1990) (Amended 2012 and 20XX)

2.23.1. Definitions.

- (a) Animal Bedding – Packaged animal bedding of all kinds, except for baled straw.
- (b) Usable Volume – the volume of the product that can be recovered from the package by the consumer after it is unwrapped and uncompressed.

(Added 20XX)

2.23.2. Method of Sale.

- (a) Packaged animal bedding shall be advertised, labeled, offered and exposed for sale and sold on the basis of the usable volume. If unit pricing is offered to retail consumers, it shall be in terms of the price per liter.
- (b) The quantity declaration shall include the terms “Usable Volume” or wording of similar import that expresses the facts, and shall be in terms of the largest whole unit of the milliliter, liter or cubic meter. A declaration may also include the quantity in terms of largest whole unit of cubic inches, cubic foot, or cubic yard only.

Examples:

Usable Volume 41 Liters (1.4 Cubic Feet)

Usable Volume 1.4 Cubic Feet (41 Liters)

Usable Volume 27.9 Liters (1700 Cubic Inches)

Usable Volume 113 L (4 Cubic Feet)

Usable Volume 8 Cubic Feet (226 L)

- (c) The display of pre-compression volume, compressed volume or supplementary dry measure units (e.g., dry quart, bushel) anywhere on the package is prohibited.

(Added 20XX)

2.23.1.3. Exemption. - Non-Consumer Packages of Animal Bedding Sold to Laboratory Animal Research Industry. – Packaged Animal Bedding consisting of granular corncobs and other dry (8 % or less moisture), pelleted, and/or non-compressible Bedding materials that are sold to commercial (non-retail) end users in the laboratory animal research industry (government, medical, university, preclinical, pharmaceutical, research, biotech, and research institutions) may be sold on the basis of weight. (Added 1990) (Amended 2012 and 20XX)

Note: This method of sale for animal bedding shall be enforceable after January 1, 2018.
(Added 20XX)

Background/Discussion:

This proposal provides amendments to NIST Handbook 130, Uniform Method of Sale, Section 2.23. Animal Bedding. These changes were determined when a proposal was drafted to revise the test procedures within NIST Handbook 133, Chapter 3., Section 3.9. **Dimensional Test Procedure for Verifying the Compressed Quantity Declaration on Packages of Peat Moss and Animal Bedding**, and a new proposal was created to add **Section 3.15. Test Procedure for Verifying the Expanded Volume Declaration on Packages of Animal Bedding** (refer to Items 260-2 and 260-3).

NCWM 2015 Interim Meeting: Support was heard in favor of this proposal. It was agreed that the compressed statement is meaningless to the end users. The NIST Technical Advisor noted that if this item moved forward to remove the term compressed it would impact the language in Item 260-2, NIST Handbook 133, Section **3.9. Dimensional Test Procedure for Verifying the Compressed Quantity Declaration on Packages of Peat Moss and Animal Bedding**. The NIST Technical Advisor remarked that the background information is being reviewed by the office publication coordinator and advised that no technical changes were being made and that it would be resubmitted with NCWM Publication 16 (2015). The Committee agreed to move this forward as a Voting item.

NCWM 2015 Annual Meeting: The NIST Technical Advisor submitted the following changes to the Item under Consideration:

- added the language to Section 2.23.1.(a): **including pet or stall bedding, cat or pet litter, or simply bedding;**
- change the term “expanded volume” to read “usable volume;”
- moved the examples in Section 2.23.2.(c) to 2.23.2.(b);
- add the term **or weight** to Section 2.23.2.(c); and
- add the following: **Note: This method of sale for animal bedding shall be enforceable after January 1, 2018.**

During Open Hearings, it was discussed that adding the term “cat litter” to the definition of animal bedding may not be appropriate. It was suggested that only wood shaving and paper products be considered animal bedding under this method of sale and test procedure. Along with the method of sale for kitty litter there were questions regarding the MAV and the test procedure for cat litter. The Committee modified two areas of the Item Under Consideration:

- **2.23.1. Definitions.**
Animal Bedding – Packaged animal bedding of all kinds, except for baled straw. ~~any material, except for baled straw kept, offered or exposed for sale or sold for primary use as a medium for any companion or livestock animal to nest or eliminate waste, including pet or stall bedding, cat or pet litter, or simply bedding.~~
- Section 2.23.2.(c) strike the term **or weight**.

The Committee changed the status of this item to Informational and is recommending further development of the following:

- Section 2.23.1.(b) – Review the definition of “Usable” volume for ALL types of animal bedding, including uncompressed. Substrate type products may not be the correct term for this section.
- Need to define the term “compressed form.”
- Section 2.23.2.(c) add the term “or weight” to supplemental units.
- Does the enforceable date work for manufacturers?
- Review of the test procedure (Item 260-3).

Refer to Appendix C for the Executive Summary on “Testing Packages of Animal Bedding and Peat Moss with Compressed and Expanded Volume Declarations” and additional background information.

Regional Association Comments:

NEWMA 2014 Interim Meeting: The L&R Chairman stated that NIST, OWM had submitted considerable information to the region for review. This is one of a number of proposals that represents a large amount of work done by NIST to provide consistent standards. An industry representative commented that he participated in the development of this proposal, and said industry has had a long-term struggle with various standards for both compressed and non-compressed packaging. He said these new procedures would allow for accurate and easier testing in the field. He indicated removal of the term “compressed” as a descriptor is important, because a consumer needs to know the usable amount of volume inside the package. These new procedures will minimize destructive testing, and will cover testing of new products in the marketplace. He strongly supports the proposal. A regulator asked if this procedure would include pelletized product. The industry representative indicated it would cover those products. Another regulator asked if compressed product would be broken up or crushed in the compressing process, and would, therefore, settle out to net a different volume. The industry representative explained that there is a certain amount of destruction, so the usable volume will generally be slightly less than the volume statement. A regulator expressed support for this item to allow for clear and easy understanding by the consumer. Another regulator asked a question about the chute design, use, and handling of various types of products during the test procedure. The industry representative explained that one of the challenges in testing volume is the amount of variability, depending on the raw material you are starting with. He further explained that the chute allowed for consistency among and between products and repeatability when testing. NEWMA forwarded the item to NCWM and recommended that it be a Voting item.

NEWMA 2015 Annual Meeting: This item was considered along with Items 260-2 and 260-3 and is considered fully developed with the editorial changes noted; the word “tentative” as it applies to MAV (maximum allowable variation) as stated in the executive summary should be stricken. Under the Method of Sale, Section 2.23.2.(c), the examples reflected shall be moved to Section 2.23.2.(b). If this item is adopted, an effective date needs to be determined for when manufacturers must use the new labeling requirements

SWMA 2014 Annual Meeting: The Committee heard an overview of the changes being suggested by NIST. The Committee also heard that the requirement to put a compressed statement on a package was unnecessary and not useful to the end user. The recoverable volume was what the customer uses. The changes also further define animal bedding. The SWMA forwarded the item to the NCWM and recommended that it be a Voting item.

CWMA 2015 Annual Meeting: An industry representative from American Wood Fiber (AWF) rose in support of the proposal. The definition change within the proposal is more inclusive and provides better clarification. Cat litter, which has traditionally been sold by weight in the past, would be sold by volume as a quantity declaration if it is not declared an exception. AWF also supports the disallowance of the word “compressed.” The reduction in the number of tests involved is also an improvement. Expanded vessel sizes will increase the accuracy of results, even though it will be a bit more onerous for inspectors. He commented that during their quality analysis testing, they found no correlation between weight and volume, so having a method that is repeatable is reassuring to the industry. The

CWMA would like clarification as to whether cat litter is exempted, and indicated this should move forward as a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

232-4 V Section 2.27. Retail Sales of Natural Gas Sold as a Vehicle Fuel

(This item was returned to Committee.)

Source:

Clean Vehicle Education Foundation (2014)

Purpose:

Since natural gas is sold in the retail market place as compressed natural gas (CNG) to be an alternative fuel to gasoline and diesel fuel and as liquefied natural gas (LNG) to be an alternative fuel to diesel, the proposed additions and edits to NIST Handbook 130 will provide definitions for natural gas equivalents for diesel liters and diesel gallons so that end users can readily compare cost and fuel economy. At present only CNG equivalents for gasoline are included in the handbooks.

Item Under Consideration:

Amend the NIST Handbook 130, Method of Sale Regulation as follows:

2.27. Retail Sales of Natural Gas Sold as a Vehicle Fuel.

2.27.1. Definitions.

2.27.1.1. Compressed Natural Gas (CNG). – A gaseous fuel composed primarily of methane that is suitable for compression and dispensing into a fuel storage container(s) for use as an engine fuel.

~~2.27.1.2. Gasoline Liter Equivalent (GLE). – Gasoline liter equivalent (GLE) means 0.678 kg of natural gas.~~

~~2.27.1.2.3 Gasoline Gallon Equivalent (GGE). – Gasoline gallon equivalent (GGE) means 2.567 kg (5.660 lb) of compressed natural gas.~~

2.27.1.3. Diesel Gallon Equivalent (DGE). - Diesel gallon equivalent means 6.384 lb of compressed natural gas or 6.059 lb of liquefied natural gas.

2.27.1.4. Liquefied Natural Gas (LNG). – Natural gas which is predominantly methane that has been – 162 °C (– 260 °F) at 14.696 psia and stored in insulated cryogenic fuel storage tanks for use as an engine fuel.

2.27.2. Method of Retail Sale and Dispenser Labeling.

2.27.2.1. Method of Retail Sale. – All compressed natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be measured in terms of mass, and indicated in the gasoline ~~liter equivalent (GLE), or gasoline~~ gallon equivalent (GGE), diesel gallon equivalent (DGE) units or mass.

2.27.2.2. Dispenser Labeling Compressed Natural Gas. – All retail compressed natural gas dispensers shall be labeled with the equivalent conversion factor in terms of ~~kilograms or~~ pounds (lb). The label shall be permanently and conspicuously displayed on the face of the dispenser and

shall have ~~either~~ the statement “1 Gasoline Gallon Equivalent (GGE) ~~is equal to means~~ 5.660 lb of Compressed Natural Gas” ~~or~~ “1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas” consistent with the method of sale used.

2.27.2.3. Method of Retail Sale. – All liquefied natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be measured in mass, and indicated in diesel 1 gallon equivalent (DGE) units, or mass.

2.27.2.4. Dispenser Labeling of Retail Liquefied Natural Gas. – All retail liquefied natural gas dispensers shall be labeled with the equivalent conversion factor in terms of pounds (lb). The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have the statement “1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas”.

(Amended 20XX)

Background/Discussion:

The gasoline gallon equivalent (GGE) unit was defined by NCWM in 1994 to allow users of compressed natural gas (CNG) vehicles to readily compare costs and fuel economy of light-duty natural gas vehicles with equivalent gasoline powered vehicles. For the medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit for both Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) (already in widespread use) allowing a comparison of cost and fuel economy with diesel powered vehicles. Natural gas is sold as a vehicle fuel as either Compressed Natural Gas (CNG) or Liquefied Natural Gas (LNG), and both products are measured in mass. The submitter stated the official definition of a DLE and a DGE will likely provide justification for California, Wisconsin, and many other states to permit retail sales of LNG for heavy-duty vehicles in these convenient units. (refer to the *Report of the 99th National Conference on Weights and Measures* [SP1193, 2014] for the mathematics justifying the specific quantity (mass) of natural gas in a DLE and DGE.)

NCWM 2014 Interim Meeting: Mr. Mahesh Albuquerque (Chair, National Gas Steering Committee [NGSC]) notified the Committee that this item is being developed by the NGSC. The Committee noted that the factor in 2.27.1.6. Liquefied Natural Gas should not read – 126.1 °C but rather – 162 °C.

The L&R Committee in responded to the NGSC’s June 10, 2014, request to change the NGSC’s March 2014 recommendation for DGE units to the following: The L&R Committee has agreed that the CNG and LNG conversion factors proposed for use in converting these gases to DGE units should be revised in the 2014 Interim Report so that their numerical values are expressed to three decimal places rather than two decimal places. These changes are reflected in the following proposed modifications within Section 2.27. Retail Sales of Natural Gas Sold as Vehicle Fuel to read: 1 Diesel Gallon Equivalent (DGE) is ~~6.380~~ 6.384 lb of Compressed Natural Gas and 1 Diesel Gallon Equivalent of Liquefied Natural Gas is ~~6.060~~ 6.059 lb.

NCWM 2014 Annual Meeting: A joint session was held with the L&R and S&T Committees to hear comments on this Item. It was noted that if the L&R did not move Item 232-3 forward then there would be no reason to proceed with Item 237-2 and S&T Item 337-2 as it appeared in the “Report of the 98th National Conference on Weights and Measures.” There was discussion regarding the term “approximately equal” in Sections 2.27.2.2. and 2.27.2.4. It was noted this term was not a measurement equivalency but equal to an energy content. It was recommended that the Committee give consideration to amend the definition and clarify the meaning. Some spoke in opposition saying this item would cause consumer confusion in the marketplace if adopted. Several members questioned where the IRS obtained the numbers that are used the IRS tax form referenced in the conversion value justification. NIST provided an alternative proposal to the item and several members believed this proposal should be taken into consideration. Since the proposal from the NGSC was not released until June 10, 2014, members felt they did not have enough time to vet the modification or the NIST proposal. The Committee reviewed numerous letters in regards to the three items being considered here.

Mr. Ethan Bogren, NGSC Chair, provided the following write up from their NGSC’s meeting on January 14, 2015.

Natural Gas Steering Committee Update Report – January 14, 2015

The NGSC has been working diligently at achieving a compromise proposal regarding the sale of CNG/LNG as an alternative motor fuel. While the group has found success in establishing a consensus opinion in many aspects of the regulations, the group remains divided as to what unit of measure should be used for primary method of sale.

As you all know, there has been a proposal submitted urging NCWM to adopt gallon equivalent units (GGE/DGE) as the primary method of sale for natural gas products to be used as an alternative motor fuel. There has been a feeling by many members of NCWM that this would be considered a diversion from the customary units in which commodities are sold in the United States causing concern.

Since a consensus regarding the units used for the primary method of sale for natural gas products was unable to be achieved, the NGSC is prepared to submit two proposals to the L&R and S&T Committees for comment and review. It was agreed by NGSC members that this was the only fair way to represent the group as a whole.

While both proposals have many similarities, I would like to summarize the major differences regarding the method of sale as it pertains to each document.

Volume Equivalent Compromise Version: CNG/LNG shall be measured in mass and indicated in gallon equivalent units unless the weights and measures official having jurisdiction mandates otherwise through local regulation. This would make GGE/DGE units the only unit of quantity required to be displayed on the dispenser during a retail transaction.

Mass Compromise Version: CNG/LNG shall be measured in mass and indicated in mass. The display of supplemental information would also be permitted on the dispenser. This would allow GGE/DGE units to be indicated on the dispenser display face as long as it is stated the GGE/DGE units are for value comparison purposes only.

There is a willingness to accept equivalent units for advertising purposes such as street signs.

The NGSC is confident that a compromise will be found with the guidance of the S&T and L&R Committees. Along with input coming from the floor during Open Hearings during the NCWM Interim Meeting a sense of which proposal best represents the body of the National Conference of Weights & Measures may be determined.

NCWM 2015 Interim Meeting: A joint session was held with the L&R and S&T Committees to hear this Item along with Item 237-1 of the L&R report and S&T Item 337-1. (Documentation for the S&T Item 337-1 can be found within the S&T report). Two proposals were addressed. Proposal One, titled “The Volume Equivalent Compromise” requires natural gas to be measured in mass and indicated in equivalent gallon units or mass. Proposal Two, titled “The Mass Compromise Version” would require natural gas to be measured and indicated in mass with supplemental equivalent information to be displayed on the dispenser for value comparison.

Proposal One, Volume Equivalent Compromise Version was supported by industry representatives and several weights and measures officials. Some reasons for supporting Proposal One is it will cause less consumer confusion. Having one method of sale that consumers are currently familiar with allows them to make value comparisons at the pump and quickly compare street signage with various stations. It would be costly to manufacture dispensers that can indicate in both mass and equivalent gallons.

Proposal Two, Mass Compromise Version was supported by numerous weights and measures officials who favor a “traceable unit.” Equivalent values are not NIST traceable units of measurement. The equipment currently is able to indicate in mass units. There are several products that allow for supplemental information to be posted (e.g., paint and fertilizer). Natural gas composition fluctuates and the equivalent values have not been validated. With new fuels being developed, the correct decision needs to be made on this matter, because it may affect future proposals brought before the Conference. The NIST S&T Technical Advisor requested that FALS review the references and data that was used determine the values on the equivalent units. The FALS has agreed to put together a WG and provide additional feedback on this area.

The L&R Committee agreed to move Proposal One, “Volume Equivalent Compromise” version with revisions as addressed during the NGSC work session and Open Hearings. The Committee modified the language in Section 2.27.2.1. and 2.27.2.3. to add the language “or mass” to the last sentence in each section and moved this forward as a Voting item.

2.27.2.1. Method of Retail Sale. – All compressed natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be measured in terms of mass, and indicated in the gasoline liter equivalent (GLE), ~~or~~ gasoline gallon equivalent (GGE), diesel liter equivalent (DLE), ~~or~~ diesel gallon equivalent (DGE) units, or mass.

2.27.2.3. Method of Retail Sale. – All liquefied natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be measured in mass, and indicated in diesel liter equivalent (DLE), ~~or~~ diesel gallon equivalent (DGE) units, or mass.

2015 NCWM Annual Meeting: A joint session was held with the L&R and S&T Committees to hear this item along with Item 237-1 of the L&R report and S&T Item 337-1. (Documentation for the S&T Item 337-1 can be found within the S&T Committee report.) Mr. Matthew Curran (FALS Chair) provided the following modifications to the language as it appeared in NCWM Publication 16 (2015):

Under 2.27.1. Definitions (note renumbering of sections will be done editorially by NIST):

- Delete in its entirety Section 2.27.1.2. Gasoline Liter Equivalent (GLE).
- Under 2.27.1.3. remove metric equivalent 2.567 kg.
- Delete in its entirety Section 2.27.1.4. Diesel Liter Equivalent (DLE).

Under 2.27.2. Method of Retail Sale and Dispenser Labeling:

- Under this section strike the term “is equal to” and replace with “means.”
- Under 2.27.2.1. strike the terms equivalent (GLE) or gasoline. Strike diesel liter equivalent (DLE).
- Under 2.27.2.2. strike the term “kilogram.” Strike “1 Gasoline Liter Equivalent (GLE) is equal to means 0.678 kg of Natural Gas.”
- Under 2.27.2.3. strike the term “liter equivalent (DLE), diesel.”
- Under 2.27.2.4. strike the term “kilogram (kg) or”. Strike **“1 Diesel Liter Equivalent (DLE) is equal to means 0.726 kg of Liquefied Natural Gas” or.** In the last sentence strike **“consistent with the method of sale used.”** Change the term and to ‘or’ **Compressed Natural Gas” and or “1 Diesel Gallon Equivalent (DGE).**

The Committee acknowledged receiving letters in support of this proposal and that the majority of comments made during the Open Hearings were also in support of the proposal. It was noted the Committee should consider measurement principles, value comparisons, and traceability (**Note:** equivalents are not traceable) during its analysis. A TG under the FALS is currently looking at the equivalent numbers. It was also questioned whether both proposals were reviewed and considered in detail. A corrected document was received for Appendix A, Background and Justification for Handbook 130, Definition of “Diesel Gallon Equivalent (DGE)” of Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) as a Vehicular Fuel.

A majority of the Committee believe that the changes submitted during Open Hearings are fully developed and will align with language proposed in S&T 337-1. The language changes support clarifying that two types of natural gas exist as a motor vehicle fuel [compressed and liquefied]. Additionally, the proposal makes it clear that the method of sale for compressed natural gas may be either GGE, DGE, or mass, and for liquefied natural gas the method of sale

may be DGE or mass; however, all natural gas sold as a vehicle fuel shall be measured in mass. This Item along with 237-1 and S&T Item 337-1 received a split vote, therefore it was returned to the Committee.

Regional Association Comments:

CWMA 2014 Annual Meeting: This received numerous comments from both industry representatives and regulators. No new issues surfaced, and based on the number of comments heard, most of the comments pointed toward the need to keep the method of sale in mass, and that continued utilization of equivalencies is not in keeping with appropriate metrological practices. However, a supplemental marketing statement similar to the proposal developed by NIST would be useful to consumers. Mr. Ronald Hayes, who serves on the NGSC, indicated that the group met via teleconference in the week previous to the CWMA meeting and continues to work through this issue. Mr. Constantine Cotsoradis, Flint Hills Resources, presented an amendment to the Method of Sale section, which was forwarded to the Steering Committee for their consideration. Due to the contentious nature of this issue, further work is merited by the metrological community and industry. The Committee believes there is no evidence that suggests equivalency measures are appropriate for a method of sale. The Committee believes there is merit for consideration in the newly proposed verbiage because retail sales occur in other locations other than a retail dispenser. The Committee also recognizes the importance of consumer understanding and acceptance, and believes this issue needs to continue development through the NGSC.

CWMA 2015 Annual Meeting: Discussions were robust and reflected the same positions and information as prior meetings and dialogue. The Committee believes the item is fully developed. A Vote of acclamation was too close to determine, so the Chair opted for a show of hands, followed by a standing Vote. The item passed with a Vote of 18 for and 17 opposed.

WWMA 2014 Annual Meeting: Mr. Mahesh Albuquerque, Chairman of the NGSC, provided an update from the NGSC September 4, 2014, meeting. The NGSC is reviewing: natural gas dispenser labeling requirements; refining the current proposal based upon feedback including data from the CRC regarding sampling to determine the average natural gas BTU content and data from the American Transportation Research Institute regarding the average BTU content of diesel fuel; and drafting an alternative proposal for the 2015 Interim Meeting.

WWMA recommended that NCWM consider all alternatives, including the NIST alternate proposal. However, if the NCWM determines that DGE/DLE is an appropriate method of sale for natural gas, the WWMA recommended that the sale of CNG at high-flow retail motor fuel dispensers be in units of DGE/DLE only, and at low-flow CNG retail motor fuel dispensers, allow GGE/GLE only. The WWMA believes it would be confusing for drivers of light duty CNG vehicles to see prices expressed in both GGE and DGE. Also, the WWMA suggested the NCWM consider a customer activated selectable display for indication at the dispenser (GGE/DGE/lb or GLE/DLE/kg). The WWMA recommended striking the word “approximately” from Sections 2.27.2.2. and 2.27.2.4. because an approximate amount cannot be conclusively verified. Several regulators offered comments, both in support and in opposition, similar to those received at previous meetings. Five regulators supported the NIST alternative. One regulator commented that other fuel marketers may seek a gallon-equivalent for their fuels (e.g., electricity).

During the WWMA voting session, one regulator noted that the WWMA had previously recommended withdrawing all agenda items relating to DGE/DLE, and requested the L&R Committee poll the voting members to see how many are in support of the continued use of equivalent units. The voting results were 23 in opposition to the use of equivalent units, and 12 in support of using equivalent units “going forward”. WWMA recommended this remain an Informational item.

NEWMA 2014 Interim Meeting: NEWMA recommended that the NGSC consider that the Method of Sale be changed to mass and that the NIST proposal to modify Section 3.37, Mass Flow Meters in NIST Handbook 44 (2014 edition) be considered. (The draft NIST proposal is on the NEWMA Web Site as a supporting document.) NEWMA recommended that Item 237-1 and also Item 337-1 from the S&T agenda be Informational items pending final language from the NGSC at the NCWM 2015 Interim Meeting.

NEWMA 2015 Annual Meeting: There was concern this change further confuses consumers. The Committee believes that consumers are adaptable to the marketplace. The Committee is anxious to learn more about the work being done on verifiable equivalency conversion factors being worked on by the Natural Gas Conversion WG. A motion was

made to continue this as a Voting item along with agenda Item 237-1 and S&T agenda Item 337-1. At the time of the vote there was no second received on the motion. Therefore, the item was returned to the Committees.

SWMA 2014 Meeting: The Committee heard from Dr. Matthew Curran with the Natural Gas Steering Committee who indicated they were still working on the item. The SWMA recommended this be an Informational item.

Additional letters, presentations, and data may have been part of the Committee’s consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

237 NIST HANDBOOK 130 – UNIFORM ENGINE FUELS AND AUTOMOTIVE LUBRICANTS REGULATION

237-1 V Section 1. 1.36. Liquefied Natural Gas (LNG) and Section 3.11. Compressed Natural Gas (CNG)

(This item was returned to Committee.)

Source:

Clean Vehicle Education Foundation (2013)

Purpose:

Enable consumers to make cost and fuel economy comparisons between diesel fuel and natural gas.

Item Under Consideration: Amend NIST Handbook 130, Uniform Engine Fuels and Automotive Lubricants Regulation as follows:

Section 1. Definitions

1.36. Liquefied Natural Gas (LNG). – Natural gas that has been liquefied at – 162 °C (– ~~259~~260 °F) and stored in insulated cryogenic tanks for use as an engine fuel.

Section 3. Classification and Method of Sale of Petroleum Products

3.11. Compressed Natural Gas (CNG).

3.11.1. How Compressed Natural Gas is to be Identified. – For the purposes of this regulation, compressed natural gas shall be identified by the term “Compressed Natural Gas” or “CNG.”

3.11.2. Retail Sales of Compressed Natural Gas Sold as a Vehicle Fuel.

~~3.11.2.1. Method of Retail Sale. All CNG kept, offered, or exposed for sale or sold at retail as a vehicle fuel shall be in terms of the gasoline liter equivalent (GLE) gasoline gallon equivalent (GGE).~~

3.11.2.2₁. Retail Dispenser Labeling.

3.11.2.2_{1.1}. Identification of Product. – Each retail dispenser of CNG shall be labeled as “Compressed Natural Gas.”

~~3.11.2.2.2. Conversion Factor. All retail CNG dispensers shall be labeled with the conversion factor in terms of kilograms or pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have either the statements “1~~

~~Gasoline Liter Equivalent (GLE) is equal to 0.678 kg of Natural Gas “1 Gasoline Gallon Equivalent (GGE) is equal to 5.660 lb of Natural Gas consistent with the method of sale used.~~

3.11.2.21.32. Pressure. – CNG is dispensed into vehicle fuel containers with working pressures of ~~16 574 kPa~~, 20 684 kPa (**3000 psi**), or 24 821 kPa (**3600 psi**). The dispenser shall be labeled ~~16 574 kPa~~, 20 684 kPa (**3000 psi**), or 24 821 kPa (**3600 psi**) corresponding to the pressure of the CNG dispensed by each fueling hose.

3.11.2.21.43. NFPA Labeling. – NFPA Labeling requirements also apply. (Refer to NFPA 52.)

3.11.3. Nozzle Requirements for CNG. – CNG fueling nozzles shall comply with ANSI/AGA/CGA NGV 1.

Background/Discussion:

The gasoline gallon equivalent (GGE) unit was defined by NCWM in 1994 to allow users of natural gas vehicles to readily compare costs and fuel economy of light-duty compressed natural gas vehicles with equivalent gasoline powered vehicles. For the medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit (already in widespread use) allowing a comparison of cost and fuel economy with diesel powered vehicles. The submitter stated that the official definition of a DLE and a DGE will likely provide justification for California, Wisconsin and many other states to permit retail sales of CNG for heavy-duty vehicles in these convenient units. The mathematics justifying the specific quantity (mass) of compressed natural gas in a DLE and DGE (please refer to the Report of the 99th National Conference on Weights and Measures (SP1193, 2014).

NCWM 2014 Interim Meeting: Mr. Albuquerque (Chair, National Gas Steering Committee) notified the Committee that this item was actively being developed by the National Gas Steering Committee.

The L&R Committee responded to the NGSC’s June 10, 2014, request to change the NGSC’s March 2014 recommendation for DGE units. The L&R Committee agreed that the CNG and LNG conversion factors proposed for use in converting these gases to DGE units should be revised in the 2014 Interim Report so that their numerical values are expressed to three decimal places rather than two decimal places. These changes are reflected in the following proposed modifications to Section 1. Definitions 1.XX, and to the proposed new definition for “diesel gallon equivalent” to read: 1 Diesel Gallon Equivalent (DGE) is ~~6.380~~ 6.384 lb of Compressed Natural Gas and 1 Diesel Gallon Equivalent of Liquefied Natural Gas is ~~6.060~~ 6.059 lb.

NCWM 2014 Annual Meeting: A joint session was held with L&R and S&T Committees to hear comments on this Item. It was noted that if the L&R did not move forward the Item 232-3 there would be no reason to proceed with Item 237-2 and S&T Item 337-2 as it appeared in the “Report of the 98th National Conference on Weights and Measures.” There was discussion regarding the term “approximately equal” in Sections 2.27.2.2. and 2.27.2.4. It was noted this term was not a measurement equivalency but equal to in energy content. It was recommended that the Committee give consideration to amend the definition and clarify the meaning. Some spoke in opposition that this Item would cause consumer confusion in the marketplace, if adopted. Several members questioned where IRS obtained the numbers that are used the IRS tax form. NIST provided an alternative proposal and several members believed this proposal should be taken into consideration. Since the proposal from the NGSC was not released until June 10, 2014, members felt they did not have enough time to vet the modification or the NIST proposal. The Committee reviewed numerous letters in support of all the Items that reflect this issue.

March 2014 Natural Gas Steering Committee Report to the L&R and S&T Committees:

The Natural Gas Steering Committee (NGSC) was formed in July 2013 to help understand and educate the NCWM membership regarding the technical issues surrounding the proposed changes to NIST Handbook 44 and NIST Handbook 130 submitted by the Clean Vehicle Education Foundation (CVEF), the anticipated impact of the proposed changes, and issues related to implementation requirements when compressed natural gas (CNG) and liquefied natural gas (LNG) are dispensed and sold as a retail engine fuel in gallon equivalent units.

NCWM Interim Meeting in January 2014: Mr. Mahesh Albuquerque, Chair of the NGSC, provided the S&T and L&R Committees with an update from the NGSC, including proposed revisions to the proposals submitted by the

CVEF. The NGSC heard comments from the floor related to the proposed revisions and requested additional time to further develop its recommendations. The S&T and L&R Committees agreed to allow the NGSC additional time to meet and develop alternative proposals to those on the S&T and L&R Committees January 2014 agendas, with the expectation that the NGSC recommendations would be ready for inclusion in NCWM Publication 16, and moved forward as a Voting Item at the July 2014 NCWM Annual Meeting.

Summary of NGSC Meeting Discussions:

The NGSC met weekly following the January 2014 Interim Meeting and focused on modifying the Clean Vehicle Education Foundation (CVEF) 2013 proposals for the recognition of diesel gallon equivalent (DGE) units for CNG/LNG dispenser indications and the method of sale for these two natural gas alternative engine fuels. The NGSC reviewed multiple modifications to those proposals including:

- limiting sales to a single unit of mass measurement enforceable by 2016;
- requiring indications in mass and gasoline and diesel gallon equivalents, while phasing in mass only units;
- require sale by mass as the primary means, but allow for the simultaneous display of volume equivalent units, so long as the purchaser always had access to the mass (traceable) measurement; and
- a proposal from NIST, OWM which would allow the posting of supplemental information to assist consumers in making value comparisons and for use by taxation/other agencies, but requiring the phase in of indications in mass.

The NGSC received:

- input from Department of Energy (DOE) on the latest edition of the DOE “Transportation Energy Data Book”: edition 32, July 2013 available on the Oak Ridge National Laboratory website at: <http://cta.ornl.gov/data/index.shtml>;
- updates from CNG (3) and LNG (1) dispenser manufacturers indicating their dispensing systems comply with the requirements in the handbooks, and have the capability to indicate a sale in a single unit of measurement, and any further input on adding displays to the cabinet for additional units would require further cost analysis; while one original equipment manufacturer indicated use of their LNG RMFD in a fleet operation where indications are only in the DGE; and
- feedback from committee members related to the pros and cons of requiring the indication of sale in mass or gallon equivalent units, including traceability, equipment capabilities, marketplace considerations, and units used by state and federal agencies.

Also noted in the NGSC discussions were:

- how a gallon equivalent unit is derived using energy content and how the gallon equivalent is defined and measured in terms of mass, not volume;
- for the last 20 years, NIST Handbook 44 and NIST Handbook 130 have required all dispensing equipment to indicate deliveries of natural gas in GGE units to consumers and in mass units for inspection and testing purposes. CNG RMFD equipment in the most states comply with the requirements in the handbooks;
- international practices for indicating CNG and LNG engine fuel deliveries are predominantly mass; Canada requires LNG indications in the kilogram and the corresponding OIML R 139 “Compressed gaseous fuel measuring systems for vehicles” standard requires indication of the measured gas in mass;
- the variations in engine efficiency relative to a single conversion factor based on an averaged energy content for LNG and the primary focus of the driving public and fleets on mileage rather than petroleum products no longer used to fuel their vehicles;

- the work ahead over the next year by ASTM Committees to develop current CNG and LNG fuel quality standards which will need to be referenced in NIST Handbook 130;
- differences in the measurement of the gallon and kilogram – since the gallon is a volume measurement and not an energy measurement, and the NIST Handbook 44, Mass Flow Meters Code includes a requirement for volume-measuring devices with ATC used in natural gas applications to be equipped with an automatic means to make corrections, if the device is affected by changes in the properties of the product; it was also noted that U.S. gasoline and diesel dispensers are not required to have ATC; whereas ATC does occur in sales at the wholesale level;
- how traceability applies to the measurement results at each level of the custody chain (to include the determination of the uncertainty of all calibrations and use of an appropriate unit of measurement); and
- the capabilities of equipment in the marketplace.

A DOE representative supported the use of gallon equivalents, and pointed out that they are used in the DOE Transportation Energy Data Book. The DOE representative also pointed out that other federal agencies including the IRS were requiring use of gallon equivalent units for reporting.

Industry representatives on the NGSC indicated that they are actively campaigning to their state and federal offices, encouraging each government branch to recognize sales of CNG and LNG in gasoline and diesel volume equivalent units. Industry sectors represented on the NGSC indicated that their customers are satisfied with the averaged fuel energy values that correspond to the conversion factors for CNG and LNG, with only one exception. The exception was a truck stop chain indicating their customers would be amenable to a single conversion factor for both fuels. The CVEF also provided a comparison of GTI's 1992 study results and preliminary data from a 2013 study. The CVEF reported the constituents in natural gas as basically unchanged over 21 years since the NCWM first recognized the GGE. Industry unanimously opposed a recommendation for phasing in mass as the only unit of measurement, noting also that U.S. drivers would be confused by SI units while acknowledging that the United States is in the minority of countries whereby delivery and sales are by equivalent units. At the conclusion of the NGSC deliberations, NGVAmerica provided the following statement:

“One of the major advantages of the proposal as currently drafted with inclusion of the DGE and GGE units for natural gas is that this is a proposal that the natural gas industry can support. It further recognizes what is already the preferred practice for how natural gas is measured and dispensed. The latest proposal with DGE and GGE units provides a pathway forward toward a national consensus approach. If the proposal were to instead require use of kilograms or even pounds as the primary method of sale, industry would not support that proposal and likely would strongly oppose it this summer if NCWM were to consider it as a voting issue. Also, if NCWM finalizes on a standard that does not include DGE or GGE, industry is committed to pursuing adoption of an alternative standard on a state by state basis, which could lead to different treatment across the country. Several states have already introduced legislation to recognize the DGE standard (CA, IL, MO, and VA) and I expect more will do so later this year. And you know Colorado and Arkansas already have put in place standards that recognize the DGE units.”

NGSC Recommendations:

After consideration of all of the above, the NGSC recommends alternate proposals to the L&R and S&T Committee Agenda Items which further modify and consolidate the Clean Vehicle Education Foundation 2013 proposals to include:

- 1) requirements for measurement in mass and indication in gallon equivalent units (NIST Handbook 44 paragraphs S.1.3.1.1. and S.1.3.1.2.; and NIST Handbook 130 paragraphs 3.11.2.1. and 3.12.2.1.);
- 2) posting of a label that has both the GGE and DGE or the GLE and DLE for CNG applications (NIST Handbook 44 paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2; and NIST Handbook 130 paragraphs 3.11.2.2.2. and 3.12.2.2.2.);

- 3) expression of all equivalent conversion factors expressed in mass units to three significant places beyond the decimal point for consistency (NIST Handbook 44 paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2 and Appendix D and NIST Handbook 130 Section 1, paragraphs 3.11.2.2.2. and 3.12.2.2.2.);
- 4) correction of the temperatures in the LNG definition (NIST Handbook 130 Section 1);
- 5) addition of 16 CFR Part 309 for CNG automotive fuel rating (NIST Handbook 130 paragraph 3.11.2.2.5.); and
- 6) reference to NFPA 52 (NIST Handbook 130 paragraph 3.12.2.2.4.)

With regards to NIST Handbook 44 the NGSC recommends withdrawing S&T Agenda Items 337-1 and 337-4 and the consolidation of Agenda Items 337-2, 337-3, and 337-5 into a newly revised single Voting Item designated as Item 337-2 as it appeared in the “Report of the 98th National Conference on Weights and Measures.” The NGSC also recommends further modifications to corresponding NIST Handbook 130 proposals to align the definitions of related terms and method of sale with definitions, indicated delivery and dispenser labeling requirements being proposed for NIST Handbook 44.

With regards to NIST Handbook 44, the NGSC also recommends consideration of a new Developing item addressing proposed changes to Paragraph S.3.6 Automatic Density Correction designated as Item 360-4. This new proposal is consistent with the NGSC decision to encourage further work beyond the current scope of their work on the CVEF’s proposals to fully address all LNG applications.

Representatives of the NGSC and the S&T and L&R Committees met in March 2014, all agreed on the course of action outlined above.

Additional Contacts: Clean Energy, Seal Beach, CA, NGVAmerica, Washington, DC, Clean Vehicle Education Foundation, Acworth, GA. Regional Association Comments: (Fall 2013 Input on the Committee’s 2014 Interim Agenda Items 337-1 through 337-5)

With regards to NIST Handbook 130 the NGSC recommends Withdrawing L&R Agenda Items 237-1 and the consolidation of Agenda Items 237-2, 237-3, and 237-5 into newly revised single Voting item designated as 237-1 in the “Report of the 98th National Conference on Weights and Measures.”

NCWM 2015 Interim Meeting: A joint session was held with the L&R and S&T Committees to discuss Item 232-4 of the L&R report. Documentation for the S&T Item 337-1 can be found within the S&T report. Two proposals were addressed. Proposal One, titled “the Volume Equivalent Compromise” requires natural gas to be measured in mass and indicated in equivalent gallon units or mass. The Second Proposal titled, “The Mass Compromise Version” would require natural gas to be measured and indicated in mass with supplemental equivalent information to be displayed on the dispenser for value comparison.

Proposal One was supported by industry representatives and several weights and measures officials. Some reasons for supporting Proposal One is it will cause less consumer confusion. Having one method of sale that consumers are currently familiar with allows them to make value comparisons at the pump and quickly compare street signage with various stations. It would be costly to manufacturer dispensers that can indicate in both mass and equivalent gallons.

The Second Proposal was supported by numerous weights and measures officials who favor a traceable unit. Equivalent values are not NIST traceable units of measurement. The equipment currently is able to indicate in mass units. Currently there are several products that allow for supplemental information to be posted (e.g., paint and fertilizer.) Natural gas composition fluctuates and the equivalent values have not been validated. With new fuels being developed, the correct decision needs to be made on this matter because it may affect future proposals brought before the Conference. The NIST Technical Advisor requested that the FALS review the references and data that is used for the conversion values on the equivalent units. The FALS has agreed to put together a WG and provide additional feedback on this area. After solicitation for volunteers, a mixed WG comprised of FALS and NGSC members was formed and is currently functioning under the NGSC. However, should the NGSC dissolve prior to completion of this review, the WG would move under FALS.

Mr. Ethan Bogren, NGSC Chair, provided the following write up from their NGSC’s meeting on January 14, 2015.

Natural Gas Steering Committee Update Report – January 14, 2015:

The NGSC has been working diligently at achieving a compromise proposal regarding the sale of CNG/LNG as an alternative motor fuel. While the group has found success in establishing a consensus opinion in many aspects of the regulations, the group remains divided as to what unit of measure should be used for primary method of sale.

As you all know, there has been a proposal submitted urging NCWM to adopt gallon equivalent units (GGE/DGE) as the primary method of sale for natural gas products to be used as an alternative motor fuel. There has been a feeling by many members of NCWM that this would be considered a diversion from the customary units in which commodities are sold in the United States causing concern.

Since a consensus regarding the units used for the primary method of sale for natural gas products was unable to be achieved, the NGSC is prepared to submit two proposals to the L&R and S&T Committees for comment and review. It was agreed by NGSC members that this was the only fair way to represent the group as a whole.

While both proposals have many similarities, I would like to summarize the major differences regarding the method of sale as it pertains to each document.

Volume Equivalent Compromise Version: CNG/LNG shall be measured in mass and indicated in gallon equivalent units unless the weights and measures official having jurisdiction mandates otherwise through local regulation. This would make GGE/DGE units the only unit of quantity required to be displayed on the dispenser during a retail transaction.

Mass Compromise Version: CNG/LNG shall be measured in mass and indicated in mass. The display of supplemental information would also be permitted on the dispenser. This would allow GGE/DGE units to be indicated on the dispenser display face as long as it is stated the GGE/DGE units are for value comparison purposes only.

There is a willingness to accept equivalent units for advertising purposes such as street signs.

The NGSC is confident a compromise will be found with the guidance of the S&T and L&R Committees. Along with input coming from the floor during Open Hearings during the NCWM Interim Meeting a sense of which proposal best represents the body of the National Conference of Weights and Measures may be determined.

NCWM 2015 Interim Meeting: A joint session was held with the L&R and S&T Committees to hear comments on this item along with Item 232-4 of the L&R report. Documentation for the S&T Item 337-1 can be found within the S&T Committee report. Proposal One, titled “The Volume Equivalent Compromise” requires natural gas to be measured in mass and indicated in equivalent gallon units or mass. Proposal One was supported by industry representatives and several weights and measures officials. Reasons for supporting Proposal One is it will cause less consumer confusion. Having one method of sale that consumers are currently familiar with allows them to make value comparisons at the pump and quickly compare street signage with various stations. It would be costly to manufacturer dispensers that can indicate in both mass and equivalent gallons.

Proposal Two titled, “The Mass Compromise Version,” would require natural gas to be measured and indicated in mass with supplemental equivalent information to be displayed on the dispenser for value comparison. Proposal Two was supported by numerous weights and measures officials who favor a traceable unit. Equivalent values are not NIST traceable units of measurement. The equipment currently is able to indicate in mass units. There are several products that allow for supplemental information to be posted (e.g., paint and fertilizer). Natural gas composition fluctuates and the equivalent values have not been validated. With new fuels being developed, the correct decision needs to be made on this matter because it may affect future proposals brought before the Conference. A NIST S&T Technical Advisor requested FALS review the references and data that is used for the values on the equivalent units. The FALS has agreed to put together a WG and provide additional feedback on this area.

Proposal Two, “The Mass Compromise” recommended the following:

1.XX. Diesel Gallon Equivalent (DGE). – Diesel Gallon Equivalent (DGE) means 6.384 lb of compressed natural gas or 6.059 lb of liquefied natural gas.

1.25. Gasoline Gallon Equivalent (GGE). – ~~Gasoline Gallon~~ Equivalent (**GGE**) ~~means to 2.567 kg~~ (5.660 lb) of **compressed** natural gas.

~~**1.26. Gasoline Liter Equivalent (GLE).** – Equivalent to 0.678 kg (1.495 lb) of natural gas.~~

1.35. Liquefied Natural Gas (LNG). – Natural gas that has been liquefied at ~~–126.1~~ **162** °C (– ~~259~~ **260** °F) and stored in insulated cryogenic tanks for use as an engine fuel.

3.11. Compressed Natural Gas (CNG).

3.11.1. How Compressed Natural Gas is to be Identified. – For the purposes of this regulation, compressed natural gas shall be identified by the term “Compressed Natural Gas” or “CNG.”

3.11.2. Retail Sales of Compressed Natural Gas Sold as a Vehicle Fuel.

3.11.2.1. Method of Retail Sale. – All CNG kept, offered, or exposed for sale or sold at retail as a vehicle fuel shall be **either** in terms of the gasoline ~~liter equivalent (GLE) or gasoline~~ gallon equivalent (GGE), **the diesel gallon equivalent (DGE), or in mass if required by the weights and measures authority having jurisdiction.**

3.11.2.2. Retail Dispenser Labeling.

3.11.2.2.1. Identification of Product. – Each retail dispenser of CNG shall be labeled as “Compressed Natural Gas.”

3.11.2.2.2. Conversion Factor. – All retail CNG dispensers shall be labeled with the conversion factor in terms of ~~kilograms or~~ pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have either the statement **“1 Gasoline Liter Equivalent (GLE) is equal to 0.678 kg of Natural Gas” or “1 Gasoline Gallon Equivalent (GGE) is equal to means 5.660 lb of Compressed Natural Gas,” or “1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas”,** consistent with the method of sale used.

3.11.2.2.3. Pressure. – CNG is dispensed into vehicle fuel containers with working pressures of ~~16 574 kPa,~~ 20 684 kPa (**3,000 psig**), or 24 821 kPa (**3,600 psig**). The dispenser shall be labeled ~~16 574 kPa,~~ 20 684 kPa (**3,000 psig**), or 24 821 kPa (**3,600 psig**) corresponding to the pressure of the CNG dispensed by each fueling hose.

3.11.2.2.4. NFPA Labeling. – NFPA Labeling requirements also apply. (Refer to NFPA 52.)

3.11.3. Nozzle Requirements for CNG. – CNG fueling nozzles shall comply with ANSI/AGA/CGA NGV 1.

3.12. Liquefied Natural Gas (LNG).

3.12.1. How Liquefied Natural Gas is to be Identified. – For the purposes of this regulation, liquefied natural gas shall be identified by the term “Liquefied Natural Gas” or “LNG.”

3.12.2. Retail Sales of Liquefied Natural Gas Sold as a Vehicle Fuel.

3.12.2.1. Method of Retail Sale. – All LNG kept, offered, or exposed for sale or sold at retail **as a vehicle fuel shall be in terms of the diesel gallon equivalent (DGE), or in mass if required by the weights and measures authority having jurisdiction.**

3.12.23. Labeling of Retail Dispensers of Liquefied Natural Gas Sold as a Vehicle Fuel Labeling.

3.12.23.1. Identification of Product. – Each retail dispenser of LNG shall be labeled as “Liquefied Natural Gas.”

3.12.3.2. Conversion Factor. – **All retail LNG dispensers shall be labeled with the conversion factor in terms of pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have the statement “1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas”.**

3.12.23.23. Automotive Fuel Rating. – LNG automotive fuel shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 306.

3.12.23.34. NFPA Labeling. – NFPA Labeling requirements also apply. (Refer to NFPA ~~5752~~.)

Based upon information from the NGSC and information in Proposal One “Volume Equivalent Compromise Version” the Committee removed the following language that appeared in NCWM Publication 15 (2015) from the Item for Consideration:

Section 1. Definitions

1.XX. Diesel Gallon Equivalent (DGE). – **means 6.384 lb of compressed natural gas or 6.059 lb of liquefied natural gas.**

1.XX. Diesel Liter Equivalent (DLE). – **means 0.765 kg of compressed natural gas or 0.726 kg of liquefied natural gas.**

1.26. Gasoline Gallon Equivalent (GGE). – **means** 2.567 kg (5.660 lb) of **compressed** natural gas.

1.27. Gasoline Liter Equivalent (GLE). – **means** 0.678 kg (1.495 lb) of **compressed** natural gas.

Based upon information from the NGSC the Committee deleted Section 3.11.2.1. Method of Retail Sale and Section 3.11.2.2.2. Conversion Factor, and the entire Section for 3.12. Liquefied Natural Gas (LNG) from the Item Under Consideration in the 2015 NCWM Interim Report. The Committee is recommending it move forward as a Voting Item.

Section 3. Classification and Method of Sale of Petroleum Products

3.11.2.1. Method of Retail Sale. – All CNG kept, offered, or exposed for sale or sold at retail as a vehicle fuel shall be **measured** in terms of **mass, and indicated in** the gasoline liter equivalent (GLE), gasoline gallon equivalent (GGE), **diesel liter equivalent (DLE), or diesel gallon equivalent (DGE) units.**

3.11.2.2.2. Conversion Factor. – All retail CNG dispensers shall be labeled with the **equivalent** conversion factor in terms of kilograms or pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have either the statements “1 Gasoline Liter Equivalent (GLE) is **Approximately Equal** to 0.678 kg of Natural Gas” **and “1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.765 kg of Compressed Natural Gas”** or **the statements** “1 Gasoline Gallon Equivalent (GGE) is **Approximately Equal** to 5.660 lb of **Compressed Natural Gas**” **and “1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.384 lb of Compressed Natural Gas”** consistent with the method of sale used.

3.11.2.2.5. Automotive Fuel Rating. – CNG automotive fuel shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 309.

NCWM 2015 Annual Meeting: A joint session was held with the L&R and S&T Committees to hear this item along with Item 232-4 and S&T Item 337-1. (Documentation for the S&T Item 337-1 can be found within the S&T report.) The Committee acknowledged receiving letters in support of these items and that the majority of comments made during the Open Hearings were also in support of this proposal. It was noted that measurement principles, value comparisons, traceability (note: equivalents are not traceable) need to be analyzed. It is difficult to work with equivalent values that fluctuate in value. There is a task group under the FALS that is currently looking at the equivalent numbers. A corrected document was received for Appendix A., Background and Justification for NIST Handbook 130, Definition of “Diesel Gallon Equivalent (DGE)” of Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) as a Vehicular Fuel.

A majority of the Committee believe that the changes submitted during Open Hearings are fully developed and will align with language proposed in S&T Item 337-1. The language changes support clarifying that two types of natural gas exist as a motor vehicle fuel [compressed and liquefied]. Additionally, the proposal makes it clear that the method of sale for compressed natural gas may be either GGE, DGE, or mass, and for liquefied natural gas the method of sale may be DGE or mass; however, all natural gas sold as a vehicle fuel shall be measured in mass. This Item along with Items 232-4 and S&T Item 337-1 received a split vote, therefore, it was returned to the Committee.

Regional Association Comments:

CWMA received numerous comments from both industry representatives and regulators. No new issues surfaced, and based on the number of comments heard, most of the comments pointed toward the need to keep the method of sale in mass, and that continued utilization of equivalencies is not in keeping with appropriate metrological practices. However, a supplemental marketing statement similar to the proposal developed by NIST would be useful to consumers. Mr. Ronald Hayes, who serves on the Natural Gas Steering Committee, indicated that the group met via teleconference in the week previous to the CWMA meeting and continues to work through this issue. Mr. Constantine Cotsoradis, Flint Hills Resources, presented an amendment to the Method of Sale section, which was forwarded to the Steering Committee for their consideration. Due to the contentious nature of this issue, further work is merited by the metrological community and industry. The Committee believes there is no evidence that suggests equivalency measures are appropriate for a method of sale. The Committee believes there is merit for consideration in the newly proposed verbiage because retail sales occur in other locations other than a retail dispenser. The Committee also recognizes the importance of consumer understanding and acceptance, and believes this issue needs to continue development through the Natural Gas Steering Committee.

CWMA 2015 Annual Meeting: Discussions were robust and reflected the same positions and information as prior meetings and dialogue. The Committee believes the item is fully developed. At the CWMA voting session, a vote of acclamation was too close to determine. The Chair opted for a show of hands, followed by a standing vote. The item passed with a vote of 18 For, 17 Opposed. The item has been fully developed and is ready for Voting status.

WWMA 2014 Annual Meeting: It was heard that the Natural Gas Steering Committee (NGSC) is reviewing: natural gas dispenser labeling requirements; refining the current proposal based upon feedback including data from the CRC regarding sampling to determine the average natural gas BTU content and data from the American Transportation Research Institute regarding the average BTU content of diesel fuel; and drafting an alternative proposal for the 2015 NCWM Interim Meeting.

WWMA recommended that NCWM consider all alternatives, including the NIST alternate proposal. However, if the NCWM determines that DGE/DLE is an appropriate method of sale for natural gas, the WWMA recommended that the sale of CNG at high-flow retail motor fuel dispensers be in units of DGE/DLE only, and at low-flow CNG retail motor fuel dispensers, allow GGE/GLE only. WWMA felt it would be confusing for drivers of light duty CNG vehicles to see prices expressed in both GGE and DGE. Also, WWMA suggested the NCWM consider a customer activated selectable display for indication at the dispenser (GGE/DGE/lb or GLE/DLE/kg). WWMA recommended striking the word “approximately” from Sections 3.11.2.2.2. and 3.12.2.2.2. because an approximate amount cannot be conclusively verified.

Several regulators offered comments, both in support and in opposition, similar to those received at previous meetings. Five regulators supported the NIST alternative. One regulator commented that other fuel marketers may seek a gallon-equivalent for their fuels (e.g., electricity).

WWMA 2014 Voting Session: One regulator noted the WWMA had previously recommended withdrawing all agenda items relating to DGE/DLE, and requested the L&R Committee poll the voting members to see how many are in support of the continued use of equivalent units. The voting results were 23 in opposition to the use of equivalent units, and 12 in support of using equivalent units “going forward.” WWMA recommended this remain an Informational item.

NEWMA 2014 Interim Meeting: NEWMA recommended that the NGSC consider that the method of sale be changed to mass and the NIST proposal to modify Section 3.3.7. Mass Flow Meters in NIST Handbook 44 (2014 Edition) be considered. (The draft NIST proposal is on the NEWMA Web Site as a supporting document <http://www.newma.us/meetings/interim/meeting-documents>.) NEWMA recommended that this Item 237-1 and Item 337-1 from the S&T Committee agenda be Informational items pending final language from the NGSC at the NCWM 2015 Interim Meeting.

NEWMA 2015 Annual Meeting: There were concerns that this change further confuses consumers. Consumers are adaptable to the marketplace. The Committee is anxious to learn more about work being done on verifiable equivalency conversion factors, which is being worked on by the Natural Gas Conversion WG. A motion was made to continue this as a Voting item along with Item 237-1 and S&T Committee Item 337-1. At the voting session, no second was received on the motion and all items were returned to the Committee.

SWMA 2014 Meeting: The Committee heard from Dr. Matthew Curran (Florida) that the NGSC was working on the item and FALS had deferred the work to the NGSC. The SWMA recommended that the item be an Informational item.

Additional letters, presentations, and data may have been part of the Committee’s consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

237-2 I Sections 2.1.3. Minimum Antiknock Index (AKI), Section 2.1.4. Minimum Motor Octane Number, and Section 3.2.5. Prohibition of Terms – Table 1.

Source:
General Motors (2013)

Purpose:
Remove obsolete Altitude De-rating of Octane practice, establish a National Octane Baseline, and harmonize Octane Labeling from state to state.

Item Under Consideration:
Amend the NIST Handbook 130, Engine Fuels and Automotive Lubricants Regulation as follows:

Section 2. Standard Fuel Specification

2.1.3. Minimum Antiknock Index (AKI). – The AKI of gasoline and gasoline-oxygenate blends shall not be less than 87. The AKI shall not be less than the AKI posted on the product dispenser or as certified on the invoice, bill of lading, shipping paper, or other documentation;
(Amended 20XX)

2.1.4. Minimum Motor Octane Number. – The minimum motor octane number shall not be less than 82. ~~for gasoline with an AKI of 87 or greater;~~
(Amended 20XX)

Section 3. Classification and Method of Sale of Petroleum Products

3.2. Automotive Gasoline and Automotive Gasoline-Oxygenate Blends

3.2.5. Prohibition of Terms. – It is prohibited to use specific terms to describe a grade of gasoline or gasoline-oxygenate blend unless it meets the minimum antiknock index requirement shown in Table 1. Minimum Antiknock Index Requirements.

| Table 1. Minimum Antiknock Index Requirements | | |
|--|---|---------------------------------------|
| Term | Minimum Antiknock Index | |
| | ASTM D4814 Altitude Reduction Areas IV and V | All Other ASTM D4814 Areas |
| Premium, Super, Supreme, High Test | 90 | 91 |
| Midgrade, Plus | 87 | 89 |
| Regular Leaded | 86 | 88 |
| Regular, Unleaded (alone) | 85 | 87 |
| Economy | -- | 86 |

(Table 1. Amended 1997 and 20XX)

Background/Discussion:

These recommended changes to NIST Handbook 130, Engine Fuels and Automotive Lubricants Regulations to the octane will harmonize with an effort underway in the ASTM International (ASTM) Gasoline and Oxygenates Subcommittee to include a minimum motor octane number (MON) performance limit in gasoline. The naming of the various octanes is a function for weights and measures.

Nominally, vehicles manufactured after 1984 include engine computer controls maintaining optimal performance while using gasoline octane of 87-AKI or higher. The practice of altitude de-rating of octane, resulting in octanes below 87-AKI, reduces a vehicle's efficiency and fuel economy. Increasingly, more vehicles are boosted (turbocharged/supercharged) eliminating altitude intake air effects. Additionally, consumers using gasoline with an octane AKI below 87 will void their vehicle owner's warranty. The Coordinating Research Council (CRC) Report No. 660, "*Fuel Anti-knock Quality – Engine Response to RON (Research Octane Number) versus MON*," May 2011 demonstrates the continued need for gasoline MON octane for the large bored, naturally aspirated U.S. engines. Setting an 82-MON minimum maintains the current MON level for today's 87-AKI Regular Unleaded gasoline. A common U.S. octane specification between ASTM, NCWM, and Vehicle Owners Manuals will give states clear direction on how best to enforce proper fuel pump octane labeling and quality levels on behalf of vehicle consumers.

Leaded gasoline is not available at retail and, therefore, labeling guidance is not needed.

NCWM 2013 Interim Meeting: The FALS could not reach agreement on this item during their Sunday work session. The Committee received and reviewed several letters in support of this proposal. During Open Hearings, Mr. Studzinski (General Motors) provided a presentation. The Committee also received comments in opposition to the proposal citing the lack of consumer complaints with sub octane, and it was requested that the Committee wait until the CRC study provides data that can be used by ASTM and NCWM to determine whether or not a change is necessary. The Committee recommends this be an Informational item.

NCWM 2013 Annual Meeting: Mr. Hayes, FALS Chair, provided a presentation and stated that the CRC study has been expanded and finalized data is expected by year end. It was also noted the ASTM ballot failed. The Committee

concur to await a recommendation from FALS once they have considered all the data. At the 2014 NCWM Interim Meeting, Mr. Studzinski provided an update that the CRC study is almost finalized and then a ballot will be prepared for ASTM. Mr. Studzinski will have additional information for the 2015 NCWM Interim Meeting.

NCWM 2014 Annual Meeting: Dr. Matthew Curran, FALS Chair, remarked that the FALS is recommending this remain an Informational item until the CRC study results are complete. Mr. Studzinski provided a briefing that a report should be issued in the fall of 2014.

NCWM 2015 Interim Meetings: The FALS Chair notified the Committee that the CRC study is still being finalized. The L&R Committee is designating this as an Informational item.

NCWM 2015 Annual Meeting: The FALS Chair provided an update stating this item was on the ASTM ballot and did not pass at the June 2015 ASTM Meeting. ASTM is evaluating the negative ballots. FALS would like to await further action within ASTM before changes are considered by the Conference.

Regional Association Comments:

CWMA 2014 Annual Meeting: It was reported that that Mr. Studzinski (General Motors) provided an update at the 2014 NCWM Annual Meeting and the information is posted on the NCWM website. Mr. Studzinski indicated that this item is waiting on the CRC study final report which is anticipated before the 2015 NCWM Interim Meeting. The CRC study results will provide additional information to determine the future path of this item.

CWMA 2015 Annual Meeting: An industry representative from Marathon indicated there is an ASTM ballot that closes June 12 that requires a minimum 87.0 octane and 82.0 Minimum Octane Number (MON). This issue will be further discussed at the June ASTM meeting. An industry representative from BP commented that negative ballots would be adjudicated in June, and the decision will be made whether or not to move forward to the main D02 Committee at the December meeting. The Committee is recommending this remain Informational until additional information is received.

WWMA 2014 Annual Meeting: Opposition was heard from two regulators. There was support from one regulator, who said that in his state, competing stations in the same city sell regular gas at two different octane levels. Two state directors recommended removing the word “leaded” from Table 1. WWMA recommended the NCWM consider the data in the CRC study before determining the appropriate status for this item.

NEWMA 2014 Interim Meeting: The L&R Chairman commented that the CRC study related to this item has not yet been released, but should be by the 2015 NCWM Interim meeting. An industry representative who is a member of the FALS commented that the study will be published before the Interim Meeting, and FALS will be in a position by January to give L&R a recommendation as to how this item should move forward. NEWMA recommended the item remain an Informational item. At the 2015 NEWMA Annual Meeting, they were informed the CRC study has yet to be released and agree this should remain Informational.

SWMA 2014 Annual Meeting: The Committee heard that CRC had finished the study and was evaluating the results. A report should be issued by the end of the year. The Committee was also made aware that FALS was working on the issue. SWMA recommended that the item be an Informational item.

Additional letters, presentations, and data may have been part of the Committee’s consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

237-3 V Section 4.3. Dispenser Filters

(This item returned to Committee.)

Source:

Missouri Department of Agriculture (2012)

Purpose:

Recognize the need for 10-micron or smaller nominal pore-sized filters for today's diesel engines.

Item Under Consideration:

Amend the NIST Handbook 130, Engine Fuels and Automotive Lubricants Regulation as follows:

4.3. Dispenser Filters.**4.3.1. Engine Fuel Dispensers.**

- (a) All gasoline, gasoline-alcohol blends, gasoline-ether blends, ethanol flex fuel, and M85 methanol dispensers shall have a 10 micron or smaller nominal pore-sized filter.
- (b) All biodiesel, biodiesel blends, diesel, and kerosene dispensers shall have a ~~30~~ **10** micron or smaller nominal pore-sized filter **except for dispensers with flow rates greater than 15 gallons per minute which shall have a 30 micron or smaller nominal pore size filter.**

(Added 2008) (Amended 2014 **and 20XX**)

Background/Discussion:

Abnormal dispenser filter plugging at retail will alert the retailer of potential storage tank problems. Requiring 10 micron filters for all products will reduce the inventory of types of filters and the potential of installing the wrong filter for all products at the same site.

NCWM 2012 Interim Meeting: Mr. Ronald Hayes, FALS Chair, informed the Committee that FALS recommended that this item be Informational because of industry concerns that 10 micron filters would be too restrictive of flow in high-flow systems. One industry representative expressed opposition for the use of 10 micron filters and recommends this item to be Withdrawn. A representative of an automobile manufacturer claimed diesel passenger vehicles do not have the sophisticated filtration systems commonly found on commercial heavy duty vehicles and 10 micron filters on dispensers are needed for protection from particulate contamination. As proposed, this item could cause clogging of diesel dispenser filters in colder climates. The Committee believes this item has merit but lacks a consensus and also believes that FALS needs to address these concerns. The 2012 L&R Committee designated this item as an Informational item and assigned it to FALS for further development.

NCWM 2012 Interim Meeting: It was apparent to the Committee that there are many unresolved issues related to passenger vehicles. The Committee encourages the FALS to continue developing this item.

NCWM 2012 Annual Meeting: Several stakeholders spoke in opposition on f this item. Mr. Ronald Hayes, FALS Chair remarked that the FALS worked on this item in 2007 and believes FALS needs to continue to work on this item. The NCWM L&R Committee agreed that this item is not ready and supports the continued development by FALS.

NCWM 2013 Interim Meeting: Mr. Hayes, FALS Chairperson, remarked that a similar item was brought before the Committee in 2007. FALS did not have enough time in their work session to work on this item. There are several stakeholders and states that are having issues with the terminology and would like it removed from the agenda. Mr. Hayes (Missouri) remarked that they supported this item because contamination is an issue with cars that do not have filtering systems. The Committee reviewed comments from the Regional Associations; however, FALS did not have sufficient time to review and make recommendations to the Committee. The Committee would like for FALS to continue to work on this item and is proposing this be an Informational item.

NCWM 2013 Annual Meeting: Mr. Hayes, FALS Chair, requested that the Committee allow them to continue to work on a recommendation for this item. There was opposition on moving this item forward. In less than two years since this proposal came forward there has been no data developed. The Committee reviewed Regional Association reports, Open Hearing comments, and letters received, and then changed the status of this item to Developing.

NCWM 2014 Interim Meeting: Mr. Hayes (Missouri) who submitted the proposal offered modified language and supporting data to support the flow rate on 10-micron diesel filters. There was considerable discussion in regards to the fill time reduction, burdensome cost for station owners, and equipment and filter maintenance. It was noted that there is work being done within ASTM but at this time that information cannot be shared. The Committee reviewed the Item Under Consideration within NCWM Interim Publication 15 (2014). The Committee moved forward the modified language provided by Mr. Hayes for consideration as a Voting item.

NCWM 2014 Annual Meeting: The Committee reviewed several letters and additional data submitted by the Petroleum Marketers Association of American (PMAA). The FALS recommended this Item move forward for a Vote. During the open hearing there were mixed concerns in regards to this this Item. Numerous concerns were expressed regarding the data from PMAA. Several comments were heard that ASTM should be allowed to develop a standard.

NCWM 2015 Interim Meeting: The FALS Chair notified the Committee that this proposal was discussed in their work session and the FALS group is divided on a recommendation. Mr. Russ Lewis (Marathon Petroleum Co.) submitted the CRC Report "Diesel Fuel Storage and Handling guide. In addition, Prentiss Searles (API) provided the Committee with a listing of the various studies and the findings that support moving this Item forward. The Committee reviewed additional letters and Regional Association recommendations. During open hearing testimony, there was discussion as to whether this is a weights and measures issue or a housekeeping issue for the stations. There was lengthy discussion as to the type of particulates and contaminates a 10-micron filter could remove. Cost effectiveness was a concern as to who would bear the burden of the cost. With the extensive discussion on this subject matter and new information received, the Committee is designating this item as a Voting item.

NCWM 2015 Annual Meeting, Mr. Lewis (on behalf of API) provided a presentation on dispenser filters. Mr. Curran (FALS Chair) informed the Committee that FALS is divided on this issue but would like it to proceed with a Vote. There were no new comments other than those that have already been provided in this report. The outcome of the voting session was a split vote; therefore, it was returned to the Committee.

Regional Association Comments:

CWMA's L&R Committee heard no opposing comments and believes the proposal protects consumer vehicles and alerts retailers of potential product quality problems. Comments from previous meetings included a remark from an official indicating a smaller porosity filter may be acceptable, but for now this is a reasonable start. General Motors (GM) supported this item for passenger vehicles, as these vehicles now have 4-micron filters. Several industry representatives did not support this item during a past meeting because they believe this is a dispenser protection issue rather than a consumer protection issue. A state regulator remarked it is a fuel quality issue, which impacts consumers' vehicles and fuel systems. Officials clarified that the proposal should only apply to passenger type vehicles, and it would specifically exempt high-flow rate meters such as truck stop meters. CWMA supported the following proposal and recommended it as a Voting item.

1.3. Dispenser Filters.

4.3.1. Engine Fuel Dispensers.

- (a) All gasoline, gasoline-alcohol blends, gasoline-ether blends, E85 fuel ethanol and M85 methanol dispensers shall have a 10 micron or smaller nominal pore-sized filter.
- (b) All biodiesel, biodiesel blends, diesel, and kerosene dispensers shall have a ~~30~~ **10** micron or smaller nominal pore-sized filter **except for dispensers with flow rates greater than 15 gallons per minute which shall have a 30 micron or smaller nominal pore size filter.**

CWMA 2014 Annual Meeting: A regulator commented this item has been vetted through the regions several times. There is additional data on the NCWM website that was shared with FALS. It was stressed that this item is for retail motor fuel dispensers for passenger vehicles not high-flow meters. The regulator also mentioned the work done by his staff during cold weather to test whether or not flow rates through 10-micron filters were more diminished than fuel flowing through 30-micron filters during sub-zero weather. The regulator stated FALS supports this item. A second regulator commented that he was seeking clarification on whether determination of the flow rate would be made with a marked flow rate or flow rate at the dispenser. Other regulators stated the intent was to have 10 micron filters on passenger vehicle dispensers and light trucks only. This proposal best accomplishes that end. An industry representative asked about the cost between the 10-micron filters and 30-micron filters. A regulator responded costs were the same. The CWMA L&R Committee believes the item has been fully developed and is ready for Voting.

CWMA 2015 Annual Meeting: Mr. Lewis (Marathon Oi) gave a presentation related to this project. He spoke in favor of the proposal. A representative from BP commented that when they owned retail stations, they required 10-micron filters on diesel dispensers. Currently, when they work with jobbers, they still recommend it. He spoke in favor of the proposal. A regulator from Minnesota commented that if a filter is the last line of defense, it is a positive step for consumers, and spoke in favor of the proposal. A regulator from Missouri commented that any state with a fuel quality program should have a dispenser filter requirement of 10 microns. It is even more critical in diesel engines today for the fuel to be as clean as possible due to the high pressure technology in the engines. The Committee moved this forward as a Voting item.

WWMA 2013 Annual Meeting: It was heard from one regulatory official recommending Withdrawal of the item because it is unnecessary. There is concern with the potential negative impact on the speed of fuel delivery. The submitting regulatory official supports the item with the language for Section 4.3.1.(b) as presented above in the CWMA Interim Report. WWMA recommends this item as a Voting item.

WWMA 2014 Annual Meeting: Opposition was heard on this item from two regulators. Mr. Ronald Hayes (Missouri), spoke in favor of the item, saying that it would help protect high-pressure fuel rails in today's diesel engines and that the auto manufacturers and Engine Manufacturers Association (EMA) want this amendment. Mr. Hayes stated additional data (subsequent to the Petroleum Marketers Association of America study) will be posted on the NCWM website under NCWM Publication 15 documents prior to the 2015 Interim Meeting. WWMA recommended this remain an Informational Item and that NCWM wait until they receive new additional data and can determine the appropriate status.

NEWMA 2014 Interim Meeting: A regulator commented that the item should be Withdrawn from the agenda because weights and measures should not legislate a filter size. Another regulator stated it was the responsibility of ASTM to provide a standard that yields fuel fit for purpose. An industry representative from petroleum marketers opposes this item. NEWMA recommended that this item be Withdrawn.

NEWMA 2015 Annual Meeting: A presentation was provided by Mr. Russ Lewis (Marathon Petroleum) on behalf of the American Petroleum Institute (API). Among other topics, Mr. Lewis indicated the EPA is looking more closely at filter issues in general, and their report is due to be released during summer 2015. After the presentation, a retired official asked what was coming from the terminal that could cause filter plugging. Mr. Lewis indicated that the most effective way to address particulate matter in fuel is to have a robust maintenance system throughout the entire fuel distribution system. A state official asked about Europe's experience with diesel fuel. Part of the more stringent diesel specification in Europe requires a fuel filter with a 5-micron pore size. A regulator asked if there was more frequent filter changing. Mr. Lewis indicated if the only thing you do when a filter is clogged is replace the filter, it will be more frequent. However, if a frequently clogged filter leads to better tank maintenance, once the tanks are cleaned, filter replacements will be less frequent. A PMD Corporation official indicated that they are seeing a lot of problems with filters being damaged, and they would support better fuel housekeeping, and supports 10-micron filters. A state regulator commented that the information in Mr. Lewis's presentation changed his mind to support moving a 10-micron filter. NEWMA feels that this item is fully developed and recommended that it be a Voting item.

SWMA 2011 Annual Meeting: It was reported that an industry representative stated that standard retailer dispensers use a 10-micron filter, and high capacity dispensers use 30-micron filters (i.e., diesel dispensed at truck stops). The company's engineers have determined that reducing a 30-micron filter to a 10-micron filter will drastically reduce flow rate to trucks. Another industry representative agreed and re-iterated that truck stops would see a tremendous

reduction in flow. The Committee believed this proposal was not practical and would have a negative impact and undue burden on the trucking industry. SWMA did not forward the item to NCWM.

SWMA 2012 Annual Meeting: An industry representative commented that the current technology to put a 10-micron filter on diesel at a truck stop will prohibit fuel from being dispensed in a timely manner and, therefore, opposes this. The Committee recommends the use of 10-micron filters be limited to passenger vehicle meters and specifically exempt high-flow rate meters. SWMA recommended the item be a Voting item but with the changes as described by the Committee.

SWMA 2013 Annual Meeting: The SWMA supported moving this item forward as a Voting item on the NCWM agenda modifying the requirements to read; 10-micron filters on devices delivering 15 gpm or less and 30-micron filters for greater than 15 gpm.

SWMA 2014 Meeting Committee was given a copy of the CRC Report No. 667, Diesel Fuel and Handling Guide. The Committee heard that a study had been completed on low temperature flow rates and that information was on the FALS section of the NCWM website. The CRC report is available at www.crcao.org. The SWMA recommended that the item be Informational.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

260 HANDBOOK 133

260-1 V Section 2.7. Chitterling Test Procedure.

(This item was Adopted.)

Source:

NIST Office of Weights and Measures (2015)

Purpose:

Provide inspectors and packers with uniform test methods and include a specific purge requirement in NIST Handbook 133.

Item Under Consideration:

Amend NIST Handbook 133 as follows:

2.7. Determining the Net Weight and Percent of Purge in Packages of Fresh and Frozen Chitterlings.

2.7.1. Test Equipment.

- **Scale or balance and mass standards (the standards are used to verify the accuracy and repeatability of the weighing device).**
- **Partial immersion thermometer or equivalent with 1 °C (2 °F) graduations and a range of - 35 °C to + 50 °C (- 30 °F to + 120 °F) accurate to ± 1 °C (± 2 °F).**
- **Sink (e.g., water bath, ice chest) or other receptacle of suitable size to hold the packages for thawing and water source and hose with fresh water that can be maintained at a temperature between 23 °C to 29 °C (75 °F to 85 °F) (for thawing plastic bags or buckets of chitterlings).**

An alternative thawing procedure for packages requires access to a refrigerator that must be available for storing sample packages for several days to thaw.

- Stainless Steel Sieve(s) and Drain Pan(s) – No. 8 mesh, 203 mm (8 in) or 304 mm (12 in). Use is based on the labeled net weight of the package under inspection.
- Chitterlings Worksheet for Category A and Category B (See Appendix C)
- Stopwatch (to measure drain periods).
- Knife or box cutter (to open packages).
- Waterproof marking pen (for numbering the packages).
- Disposable (non-latex) gloves.
- Paper towels (drying sieve drain pan, packages and work area).
- Large plastic bags (to hold product emptied from packages).
- Plastic rod (to insert into buckets of chitterlings to determine if the product is thawed and to ensure there are no chunks of ice remaining).

2.7.2. Test Procedure for Net Weight and Purge Determination for Fresh and Frozen,

This procedure is used to determine (1) the net weight and (2) the purge in packages of fresh and frozen chitterlings. The purge determination procedure requires the destructive testing of all of the sample packages.

- 1. Follow Sections 2.3.1. “Define the Inspection Lot,” 2.3.2. “Select Sampling Plans.” Use Appendix A, Table 2-1. “Sampling Plans For Category A,” if the testing is outside of a USDA inspected packing facility or use Table 2-2. “Sampling Plans for Category B,” if the testing is inside a USDA inspected packing facility, 2.3.3. “Record Inspection Data”, and 2.3.4. “Random Sample Selection”.**
- 2. Select the random sample of packages.**
- 3. Dry the sample packages and number each (e.g., 1-12) using a waterproof marker.**
- 4. Record the Product Brand, Inspector Name, Labeled Net Weight (top of Column A), Packer Identity, Lot Code, Number Unreasonable E, MAV from Table 2-9, and the Unit of Measure of the scale used for weight determinations on the Chitterling Worksheet. The appropriate information can be transferred to an official inspection report at the conclusion of the inspection. The worksheet should be added to the official record of the inspection.**

2.7.2.1. Net Weight and Purge Determinations

Follow these procedures to determine the net weight and amount of purge from chitterlings.

2.7.2.1.1. Test Procedure for Determining the Net Weight and Purge from Fresh and Frozen Chitterlings

- 1. Determine the Gross Weight of each sample package (record in Column B),**
- 2. Determine the tare weight of the sieve drain pan (record in Drain Pan Tare above Column F).**

Frozen Chitterlings

3. **Fully immerse the unopened package of frozen chitterlings in a water bath maintained at a temperature between 23 °C to 29 °C (75 °F to 85 °F).**

Note: An alternative approach to thawing large frozen packages (e.g., 5 kg [10 lb] plastic pails) is to randomly select [mark them to be held for inspection] the sample packages and place them in a refrigerator for partial thawing over several days and then carrying out the final thawing using the water bath technique.

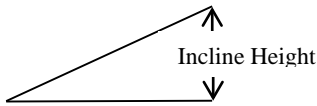
Note: If the products are to be placed in refrigerated storage for several days for partial thawing, segregate them from other product inventory and mark each container with an identifier to allow the inspector to ensure that they were the samples selected for testing (mark both lid and container on buckets) when the inspection is resumed after the thawing process. Also, mark the packages with a conspicuous notice that they are being held for inspection.

4. **Maintain a continuous flow of water into the bath to keep the temperature within the specified range until the chitterlings are thawed. The chitterlings are thawed when it is determined by touch that they are not rigid and no ice crystals are observed or felt within or on their outside surface.**

Note: for buckets insert a plastic rod into the chitterlings to determine if the product is thawed and to ensure there are no chunks of ice remaining.

Fresh and Frozen Chitterlings

5. **Draining the Chitterlings: Depending on the availability of a sink and work space and the inspector’s preference, use the procedures in either Method A. or Method B. to drain the chitterlings. Refer to Table 1 for the appropriate size sieve to use based on the labeled net weight on the package.**

| <u>Table 1.</u> | | | |
|--|----------------------------------|--|-------------------------------------|
| <u>Labeled Net Weight</u> | <u>Sieve Diameter</u> | <u>30 Degree Tilt from Horizontal</u> | <u>Incline Height</u> |
| <u>If more than 453 g (1 lb) use:</u> | <u>300 mm (12 in)</u> |  | <u>175 mm (6.9 in)</u> |
| <u>If less than 453 g (1 lb) use:</u> | <u>203 mm (8 in)</u> | | <u>116.8 mm (4.6 in)</u> |
| <ul style="list-style-type: none"> • <u>This procedure requires that the sieve and drain pan be cleaned and dried after each use. It is a good measurement practice to obtain the dry weights of both the sieve and pan and recheck those weights periodically during the test to make sure the cleaning and drying procedures are efficient.</u> • <u>If the amount of chitterlings in the package exceeds the capacity of the sieve, divide the solids evenly among two or more sieves of the same dimensions or make multiple determinations using a single sieve. Exercise care when transferring the chitterlings into the sieves to avoid spilling liquid which can void the test.</u> | | | |

Method A. Place a sieve over a sink or waste collection container. Pour the chitterlings into the sieve and distribute them over the surface of the sieve with a minimum of handling. Hold the sieve firmly and incline it 30 degrees (see Figure 1 for an example of a tilt block for use with a sink drain set at 30 degrees) to facilitate drainage, then start the stop watch and drain for

exactly two-minutes. At the end of the drain time immediately transfer the chitterlings to a Drain Pan for weighing. Determine the Purged Net Weight of the chitterlings using the following formula and Record in Column F of the worksheet

Drained Chitterlings and Drain Pan – Drain Pan Tare = Purged Net Weight

Method B. Place a sieve on its Drain Pan. Pour the chitterlings into the sieve and distribute them over the surface of the sieve with a minimum of handling. Hold the sieve firmly and incline it 30 degrees to facilitate drainage, then start the stop watch and drain for exactly two-minutes. At the end of the drain time immediately transfer the Drain Pan with the Purged Liquid to the scale for weighing. Dry the empty package to determine its tare weight and enter it in Column C. Determine the Purged Net Weight of the chitterlings using the following formula and record in Column F of the worksheet.

(Gross Weight of Package – Package Tare Weight) – (Weight of Purged Liquid & Drain Pan – Drain Pan Tare) = Purged Net Weight

(Column B – Column C) – (Weight of Purged Liquid & Drain Pan – Drain Pan Tare) = Purged Net Weight

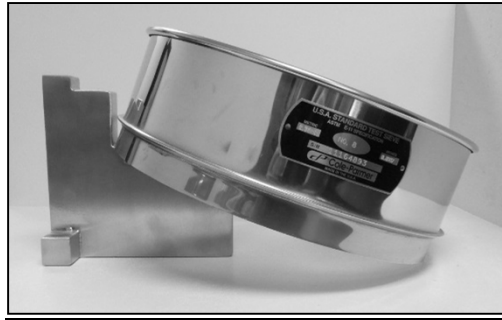


Figure 1. Tilt Block set at 30 degrees.

6. Calculate Purge using the formula shown below (use the labeled net weight in Column A and NOT the gross weight of the package in Column B) and record the result in Column G of the worksheet.

$$\text{Purge in \%} = (\text{Labeled Weight} - \text{Purged Net Weight}) \div \text{Labeled Weight} \times 100$$

$$\text{Purge in \%} = \text{Column A} - \text{Column F} \div \text{Column A} \times 100$$

Example: The labeled net weight is 5 lb and the Purged Net Weight is 4.19 lb

$$\text{5 lb} - \text{4.19 lb} = \text{0.81 lb} \div \text{5 lb} = \text{0.162} \times 100 \% = \text{16.2 \% purge}$$

7. Dry the empty package and determine its tare weight (Record in Column C of the worksheet.)
8. Subtract the individual Package Tare Weight from the individual Package Gross Weight to obtain the Actual Package Net Weight (Record in Column D of the worksheet). Do not use an Average Tare Weight. Use the formula:

$$\text{Actual Package Net Weight} = \text{Gross Weight} - \text{Tare Weight}$$

$$\text{Actual Package Net Weight} = \text{Column B} - \text{Column C}$$

9. Subtract the Actual Package Net Weight from the Labeled Net Weight (record in Column E of worksheet). Use the formula:

$$\text{Package Error} = \text{Labeled Net Weight} - \text{Actual Package Net Weight}$$

$$\text{Package Error} = \text{Column A} - \text{Column D}$$

10. Repeat for all packages in the sample.

Note: The determination of compliance with the net weight and purge requirements are carried out concurrently. The calculation of the average net weight and average purge is completed after all of the packages are opened and all purge amounts are obtained. The sample must pass both the net weight and purge tests to comply with this section.

2.7.3. Evaluations of Results – Compliance Determinations

1. Net Weight

- a. Individual Package Requirement: If there are negative package errors, determine if any of the values exceed the Maximum Allowable Variation (MAV) for the packaged quantity in Appendix A, Table 2-9. “U.S. Department of Agriculture, Meat and Poultry Groups and Lower Limits for Individual Packages” (i.e., if the labeled net weight is more than 3 lb up to 10 lb then the MAV = 42.5 g (0.094 lb) 1.5 oz).

- If a package error exceeds the MAV, mark it as “Failed” in the MAV Fail column.
- Count the number of packages that exceed the MAV. If the number of packages that exceed the MAV is greater than the number allowed as specified in Appendix A, Tables 2-1. “Category A” or Table 2-2. “Category B”, the sample fails. Mark the sample as “Failed” in the box “Net Weight Compliance.”
- If the sample passes the Individual Package Requirement, apply the Average Error Requirement.

- b. Average Error Requirement: Sum the package errors in Column E and enter the value in Box E1-Total Error. Divide the value in Box E1 by the Sample Size (n) to obtain an Average Error and enter the value in Box E2. If the Average Error (E2) is a positive number, the sample passes. Go to the Net Weight Compliance Section and mark the sample as “Passed.”

- If the Average Error (E2) is a negative number, calculate the sample standard deviation of the package errors (Column E) and enter it in the block “Net Weight Compliance section.
- Use the Sample Correction Factor (SCF) to calculate the Sample Error Limit (SEL).

$$\text{Sample Error Limit (SEL)} = \text{Sample Standard Deviation} \times \text{Sample Correction Factor}$$

- Disregarding the signs,
 - if Average Error (E2) is larger than the SEL, the sample fails. Mark it “Failed” in the Net Weight Compliance Section of the worksheet.

or

- if the Average Error is less than the SEL, the sample passes. Go to the Net Weight Compliance Section and mark the sample as “Passed.”

2. Purge

Follow these procedures to determine the amount of purge from the chitterlings. Apply the Average Requirement in accordance to Section 2.3.7.2. to the purge to determine if the sample passes or fails the requirement. The Average Adjusted Purge (AAP) for the sample shall not exceed 20 % of the labeled weight. The Maximum Allowable Variations (MAV) (Lower Limits for Individual Packages) in Appendix A, Table 2-are not applied in the purge test.

- **Sum the purge values in Column G and enter the value in G1-Total Purge. Divide the value in G1 by the Sample Size (n) to obtain an Average Purge and enter the value in G2. If the Average Purge (G2) is less than or equal to 20 %, the sample passes. Go to the Purge Compliance Section and mark the sample as “Passed.”**
- **If Average Purge is greater than 20 %, calculate the Sample Standard Deviation of the values in Column G and enter it in the block provided in the Purge Compliance Section.**
- **Use the Sample Correction Factor (SCF) to calculate the Purge Sample Error Limit (PSEL) in percent.**
- **Subtract the PSEL from the Average Purge (G2) to obtain an Adjusted Average Purge (AAP) and enter that value in G3.**
- **Pass or Fail**
 - **If AAP (G3) is greater than 20 %, the sample fails. Enter the Purge Value (G3) in the Purge Value Compliance section and mark the sample as “Failed.”**
 - or**
 - **If AAP (G3) is 20 % or less, the sample passes. Enter the Purge Value (G3) in the Purge Compliance section and mark the “Passed.”**

Background/Discussion:

There are no test procedures or purge requirements for chitterlings and beef tripe in NIST Handbook 133. Currently the states must adapt the drained weight test procedures and then rely on purge allowances published on USDA websites to test these products. Adoption of the test procedures and inspection forms will ensure that inspectors and packers have recognized test procedures to use that are uniform and will allow for the collection of test data that can then be used in affirming or modifying the current 20 % limit on purge that the USDA websites cite. These commodities are typically tested on a complaint only basis. Over the past several years, several states and packers have requested guidance on the test procedure and have questioned the reasonableness of the current allowances. NIST, OWM has worked with several packers and states to develop and test the attached procedures with the goal of having the proposal submitted for consideration by the NCWM for possible adoption.

It will provide states with ready access to a test procedure for these unique products should they receive a consumer complaint. Currently when officials receive complaints on these products the inspector must carry out extensive research to find the necessary information for conducting tests of these products, and they may not find out about the USDA information until after they complete the inspection. In 2013 this difficulty may have led one state to test these products without making any allowance for the purge as required by the USDA.

Interim 2015 Meeting: A comment was made by a county in California as to whether this item is ready to be adopted as a test procedure due to the issue on the potential of excessive purge. The background information has different purge limits. If adopted, it should be done on an interim approach so that data can be used to validate the information.

The Committee believes this item is fully developed with all the information received. If the manufacturers are concerned, the L&R Committee would like to receive feedback. The 2015 L&R Committee is moving this forward as a Voting item.

NCWM 2015 Annual Meeting: A letter was received from the North American Meat Institute (NAMI) requesting an opportunity to conduct additional research and testing to determine if 20 % purge is reasonable for beef tripe. Until this is done NAMI requested that the term “beef tripe” be stricken from the proposal. The Committee removed the term “beef tripe” and footnote 1 and 9 from the test procedure.

Refer to Appendix B for the Executive Summary, additional background, and initial proposal for Section 2.7. Chitterling Test Procedure and sample test reports.

Regional Association Comments:

CWMA received comment from a Missouri regulator who asked if this issue was similar to seafood. An Illinois regulator indicated that the “purge” from the items would be different due to the cell structure of the differing proteins. The Committee concurs with NIST, OWM that a WG should continue to review and further evaluate the test procedure and existing purge limit. CWMA forwarded the item to NCWM, recommending it as a Developing Item.

CWMA 2015 Annual Meeting: An industry representative from Smithfield Foods commented that the test procedure is a positive measure, but there is concern with the proposed limits. A NIST Technical Advisor concurred that further study and validation needs to be done; however, USDA’s guidance is 20 % purge. NIST suggests that we consider moving forward with the testing procedure, collect data, and reevaluate the tolerance level once there is additional data collected. The industry representative commented that the proposal states that 20 % is a pass-fail parameter, and that poses concern to the industry. The NIST representative commented again that the only recommendation they have is that of USDA, and the proposal should either go forward and be amended later if data suggests it, or the Conference could wait until more data is collected, which could take years.

WWMA heard from one regulator who stated that this item is not ready for inclusion into NIST Handbook 133 because of the USDA FSIS response to the question about when to measure purge. The FSIS stated that “historically, FSIS has not objected to chitterlings having a 20 % purge due to the washing and preparation with water. Net weight should be verified after packaging and prior to freezing.”

WWMA suggested that NIST establish a voluntary WG to validate the draft testing procedures and verify the 20 % purge allowance. WWMA suggested that data be collected on water absorption prior to freezing *and* water purge after thawing frozen product. The Committee encouraged regulators with processing facilities in their jurisdictions to contact NIST to volunteer for this study; study results should not be based on data from frozen product only. WWMA recommended this item be a Developing Item.

NEWMA 2014 Interim Meeting: The L&R Chair commented that the testing of this type of product is problematic as there is no established test procedure to incorporate the unique content of this product after it has thawed. A state regulator suggested it be considered a Developing item. Another regulator suggested that NEWMA follow the lead of the Southern Region and recommend the item move forward with Voting status since there were NIST representatives at the Southern meeting to more fully explain the proposal. NEWMA forwarded the item to NCWM and recommended it as a Developing item to allow NIST to fully refine the testing procedures. At the 2015 NEWMA Annual Meeting, the Committee feels this item is fully developed and recommended that it be a Voting item.

SWMA 2014 Meeting: The Committee heard comments from NIST that the changes were needed as a result of testing issues in some states. The Committee was also provided with a copy of an executive summary report by NIST. SWMA forwarded the item to NCWM and recommended it as a Voting item.

Additional letters, presentations, and data may have been part of the Committee’s consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

260-2 V Section 3.9. Dimensional Test Procedure for Verifying the Compressed Quantity Declaration on Packages of Peat Moss.

(This item was Adopted.)

Source:

NIST, Office of Weights and Measures (2015)

Purpose:

Provide improved dimensional test procedures for the verification of the compressed volume of peat moss and animal bedding.

Item Under Consideration:

Amend NIST Handbook 133 by replacing section 3.9. Peat Moss in its entirety with the following:

3.9. Peat Moss

3.9.1. Dimensional Test Procedure for Verifying the Compressed Quantity

3.9.1.1. ~~Test Equipment~~

- ~~Tape measure~~

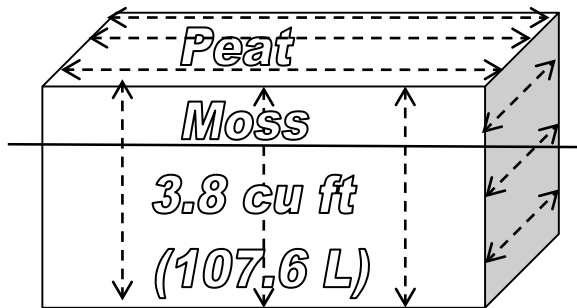


Figure 3-1. Peat Moss

3.9.1.2. ~~Test Procedure~~

- ~~1. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample.~~
- ~~2. For each dimension (length, width, and height) take three equidistant measurements.~~
- ~~3. —~~
- ~~4. Calculate the average of each dimension.~~
- ~~5. Multiply the averages to obtain the compressed cubic volume as follows:~~

$$\text{average height} \times \text{average width} \times \text{average length} = \text{cubic measurement}$$

- ~~6. Subtract the labeled volume from the measured volume to determine package error. (Amended 2010)~~

3.9.1.1. Test Equipment

- **Calculator or Spreadsheet Software (programmed to make volume calculations)**
- **Volumetric Package Worksheet (Appendix C at end of this report)**
- **Non-permanent marking pen.**
- **Knife or Razor Cutter (for use in opening packages and unwrapping shrink-wrapped pallets in warehouses)**
- **Cellophane or Duct Tape (for use in securing packaging tails)**
- **Dimensional Measuring frame (drawings are located at www.nist.gov/owm)**



Figure 3-1. Picture of a Dimensional Measuring Frame.

- **Rigid Rulers – Starrett¹ or equal with 1.0 mm graduations. The edges of a ruler used with a measuring frame must be straight and the edges must be the zero point (see Exhibit 2).**
- **300 mm (12 in)**
- **500 mm (19.5 in)**
- **1 m (39 inch)**
- **Carpenter Squares**
- **300 mm (12 in)**
- **600 mm (24 in)**

¹ Notice: The mention of trade or brand names does not imply endorsement or recommendation by the U.S. Department of Commerce over similar products available from other manufacturers.

3.9.1.2. Test Procedure

Test Notes:

Rounding: When a package measurement falls between graduations on a ruler, round the value up. This practice eliminates the issue of rounding from the volume determination and provides the packager the benefit of the doubt. If a ruler with a graduation of 1.0 mm is used, the rounding error will be limited to 0.5 mm or less. It is good practice to circle a measurement that has been rounded up or make a statement to such effect so that it becomes a part of the record.

Dimension Identification: The following package nomenclature is used to identify the dimensions measured in this test procedure.

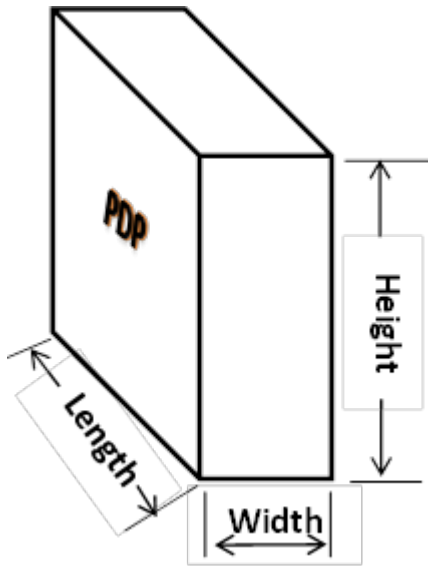


Figure 3-2. Dimension Identification.

Note: Packages of compressed peat moss do not have declaration of expanded volume.

Safety



This procedure does not address all of the safety issues that users need to be aware of in order to carry out the following tasks. Users are sometimes required to conduct tests in warehouse spaces or retail stores where fork-trucks are in motion – care must be taken to warn others to avoid or exercise care around the test site. The procedure requires users to lift heavy objects including large bulky packages and test measures and includes the use of sharp instruments to obtain packages from shrink-wrapped pallets. Users may be required to climb ladders or work platforms to obtain sample packages. When opening and emptying packages, dust, or other particles may be present or escape from the packages, which may cause eye injuries and respiratory or other health problems. Users must utilize appropriate safety equipment and exercise good safety practices. If safe working conditions cannot be ensured, suspend testing until the situation is corrected.

- 1. Follow the Section 2.3.1. “Define the Inspection Lot.” Use a “Category A” Sampling Plan for the inspection. Collect the sample packages from the Inspection Lot using random sampling.**

If the packages are not randomly selected, the sample will not be representative of the lot and the test results will not be valid for use in enforcement action. Place the sample packages in a location where there is adequate lighting and ample space for the packages and test equipment.

- 2. Examine the package for excess packaging material (i.e., packaging tails). Fold the packaging material consistent with design of the packaging and tape the material securely to the package so that its effect on the dimensional measurement is minimized. If the thickness of packaging tail appears excessive, it is appropriate to determine its average thickness by making at least three measurements along its length using a dead weight dial micrometer specified in Section 4.5. “Polyethylene Sheeting” and subtract the thickness from the measurement of length, width or height. Any deduction from a measurement should be noted on the inspection report.**
- 3. If a Dimensional Measuring Frame is used, place it on a solid support. If a table is used, select one of sufficient load capacity to hold the weight of the frame and the heaviest package to be tested.**
- 4. Position the frame so that the zero end of the ruler can be placed squarely and firmly against a surface of the frame and so that the ruler graduations can be read. Position yourself so that you can read both the ruler and the edge of the carpenter square in Exhibit 2.**
- 5. Place the package against two sides of the frame without compressing the package. Place a carpenter square against the package at the point of measurement and align the ruler perpendicular to the edge of the carpenter square as shown in Exhibit 3 where the package length and Exhibit 4 where the package height are being determined.**

Using a Measuring Frame for Dimensional Testing
Ruler and Carpenter Square define Zero Reference and Measurement Point



Figure 3-2(b). The rigid frame allows the observer to hold the zero reference point firmly in place.



Figure 1-4. Length Measurement.



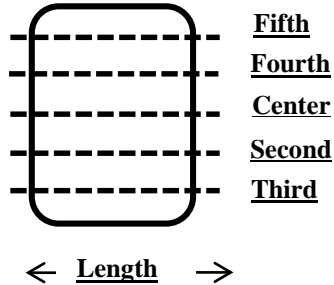
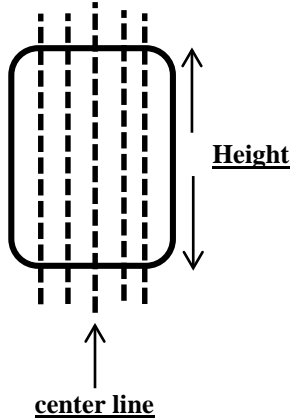
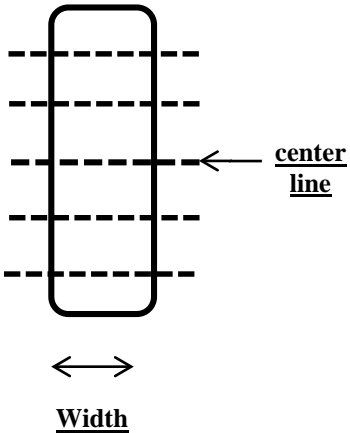
Figure 3-5. Height Measurement – A packaging tail on the end of the package can affect this measurement so it has been folded over and taped against the end of the package.



Figure 3-6. Width Measurement – the frame is rotated on its end to vertical so that the carpenter square does not compress the product.

6. Measurements – take at least five measurements* of each of the dimensions as follows:

***On small packages (height or length dimensions of 152 mm [6 in] or less) at least three measurements are taken using the following the instructions).**

| Inspect the package for shape and place the flattest surfaces against the measuring frame. | |
|---|---|
| <p>i.</p> | <p><u>Length (see Exhibit 3):</u></p> <ol style="list-style-type: none"> <u>a. take the first measurement across the center line of the Length axis of package.</u> <u>b. take the second measurement at half the distance between the center Line and either of the package edges.</u> <u>c. take the third measurement half the distance between the second measurement and the package edge.</u> <u>d. take the fourth measurement on the opposite end of the package at half of the distance between the center line and the package edge.</u> <u>e. take the fifth measurement at half of the distance between the fourth measurement and the package edge.</u> |
| |  |
| <p>ii.</p> | <p><u>Height: (see Exhibit 4):</u></p> <ol style="list-style-type: none"> <u>a. take the first measurement across the center line of the Height axis of the package.</u> <u>b. take the second measurement at half the distance between the center line and the package edge.</u> <u>c. take the third measurement half the distance between the second measurement and the package edge.</u> <u>d. take the fourth measurement on the opposite end of the package at half of the distance between the center line and the package edge.</u> <u>e. take the fifth measurement at half of the distance between the fourth measurement and the package edge.</u> |
| |  |
| <p>iii.</p> | <p><u>Width: (see Exhibit 5): If using one, turn the measuring frame on end and place the package on its bottom and against the frame as shown in the picture and on the right where the package width is being measured.</u></p> <ol style="list-style-type: none"> <u>a. take the first measurement across the center line of Width axis of the package.</u> <u>b. take the second measurement at half the distance between the center line and the package edge.</u> <u>c. take the third measurement half the distance between the second measurement and the package edge.</u> <u>d. take the fourth measurement on the opposite end of the package at half of the distance between the center line and the package edge.</u> <u>e. take the fifth measurement at half of the distance between the fourth measurement and the package edge.</u> |
| |  |

7. Record the dimensions of each package in millimeters in a software program or inspection form that includes the information shown in the sample worksheet “Calculate the Compressed Volume of the Package in Liters” (below). Enter the measurements in the appropriate spaces and calculate the volume in liters. Calculate the package error by following the steps listed in the table and then calculate the average error for the sample.

Note: The following table is an example of the information from an actual test that is included in a worksheet for verifying the compressed volume on packages of peat moss. The Inspection Worksheet for Dimensional Testing (see Appendix C) has space for a sample of 12 packages and includes the steps for calculating the Average Package Error. Here, the package error in the dimensional volume was + 6.8 L (+ 0.24 ft³). To determine the value of the MAV look up the labeled quantity in Appendix A, Table 2-6. Maximum Allowable Variations for Packages Labeled by Liquid and Dry Volume.

| SAMPLE WORKSHEET | | | | |
|---|---------------------------------------|-------------------|-----------------------|-------------------------|
| Calculate the Compressed Volume of the Package in Liters | | | | |
| <u>Unit of Measure = 1.0 mm</u> | | <u>Length (L)</u> | <u>Width (W)</u> | <u>Height (H)</u> |
| <u>1.</u> | | <u>482</u> | <u>282</u> | <u>690</u> |
| <u>2.</u> | | <u>490</u> | <u>278</u> | <u>690</u> |
| <u>3. (Center Line)</u> | | <u>493</u> | <u>276</u> | <u>681</u> |
| <u>4.</u> | | <u>499</u> | <u>272</u> | <u>677</u> |
| <u>5.</u> | | <u>493</u> | <u>269</u> | <u>657</u> |
| <u>a.</u> | <u>Average:</u> | <u>491</u> | <u>275.4</u> | <u>679</u> |
| <u>b.</u> | <u>L × W × H = Volume/1 000 000</u> | <u>91.8 L</u> | | |
| <u>c.</u> | <u>Labeled Compressed Quantities:</u> | <u>85 L</u> | <u>NA cu in</u> | <u>3.0 cu ft</u> |
| <u>d.</u> | <u>Conversion Factors</u> | <u>NA</u> | <u>(b) × 61.02374</u> | <u>(b) × 0.03531467</u> |
| <u>e.</u> | <u>Converted Volume</u> | <u>85 L</u> | <u>NA cu in</u> | <u>3.24 cu ft</u> |
| <u>f.</u> | <u>Package Error = (b – c)</u> | <u>6.8 L</u> | <u>NA cu in</u> | <u>0.24 cu ft</u> |

3.9.2. Uncompressed Volume Packages

Use the following method to test peat moss sold using an uncompressed volume as the declaration of content. The procedure as defined by the latest version of ASTM D2978-03, “Standard Test Method for Volume of Processed Peat Materials.”

3.9.2.1. Test Equipment

- 12.7 mm (or ½ in) sieve
- Use ~~a one of the following~~ **test** measure appropriate for the package size. (Refer to Table 3-4. “Specifications for Test Measures for Mulch and Soils” for additional information on test measure **size and** construction.)
 - ~~28.3 L (1 ft³) measure with inside dimensions of 30.4 cm (12 in) by 30.4 cm (12 in) by 30.4 cm (12 in). Mark the inside of the measure with horizontal lines every 1.2 cm (½ in) so that package errors can be directly determined~~

- ~~100 L (3.5 ft³) measure with inside dimensions of 50 cm (19.68 in) by 50 cm (19.68 in) by 40 cm (15.74 in). The inside of the measure should be marked with horizontal lines every 1.2 cm (½ in) so that package errors can be directly determine~~

- Straight edge, 50.8 cm (20 in) in length
- Sheet for catching overflow of material
- Level (at least 15.24 cm (6 in) in length)

3.9.2.2. Test Procedure

1. Follow Section 2.3.1. “Define the Inspection Lot.” Use a “Category A” sampling plan in the inspection; select a random sample.
2. Open each package in turn, remove the contents, and pass them through the sieve directly into the measuring container (overfilling it). Use this method for particulate solids (such as soils or other garden materials) labeled in cubic dimensions or dry volume. Some materials may not pass through the sieve for peat moss; in these instances, separate the materials by hand (to compensate for packing and settling of the product after packaging) before filling the measure.

Note: Separated material (product not passing through the sieve) must be included in the product volume.

3. Shake the measuring container with a rotary motion at one rotation per second for five seconds. Do not lift the measuring container when rotating it. If the package contents are greater than the measuring container capacity, level the measuring container contents with a straightedge using a zigzag motion across the top of the container.
4. Empty the container. Repeat the filling operations as many times as necessary, noting the partial fill of the container for the last quantity delivered using the interior horizontal markings as a guide.
5. Record the total volume.
6. To compute each package error, subtract the labeled quantity from the total volume and record it.

3.9.3. Evaluation of Results

Follow the procedures in Section 2.3.7. “Evaluate for Compliance” to determine lot conformance for either procedure.

Note: To determine the value of the MAV look up the labeled quantity in Appendix A, Table 2-6. Maximum Allowable Variations for Packages Labeled by Liquid and Dry Volume.

Background/Discussion:

This proposal will provide a standardized test method that will improve measurement accuracy at the point of pack and in testing at other locations. The test procedure recommends the use of a gravimetric audit procedure that may reduce destructive testing and reduce inspection time.

Although some existing test measures may still be used, this proposal encourages users to purchase the prescribed volumetric test measures, chutes, and measuring instruments.

The NIST, OWM will develop and provide technical training on this subject matter and develop detailed equipment designs and drawings, which will be made available on the NIST, OWM website. The OWM will assist the peat moss industry in implementing the proposed method of sale as well as developing and incorporating good manufacturing practices to ensure that the requirements of NIST Handbook 133 are met.

NCWM 2015 Interim Meeting: The Committee agreed that Sections 3.9.1 and 3.9.1.a. need to be removed from the language. The Committee agreed any term related to “animal bedding” should also be removed to align with Item 232-3. The NIST Technical Advisor remarked that the background information is being reviewed for formatting by the office Publication Coordinator and advised that no technical changes were being made and would be resubmitted with NCWM Publication 16 (2015). The 2015 L&R Committee agreed to move this forward as a Voting item.

NCWM 2015 Annual Meeting: The Committee deleted figure 3.1 since NIST has provided detailed pictures within the test procedure. In Section 2.9.1.2., Step 7. Note: the line “Apply a tentative MAV of 5 % to a dimensional measured volume was stricken. It was replaced with “To determine the value of the MAV look up the labeled quantity in Appendix A., Table 2-6. Maximum Allowable Variations for Packages labeled by Liquid and Dry Volume.”

Refer to Appendix C., “Testing Packages of Animal Bedding and Peat Moss with Compressed and Expanded Volume Declarations” for the Executive Summary, additional background, forms, and supporting information.

Regional Association Comments:

NEWMA 2014 Interim Meeting: The L&R Chairman stated that NIST, OWM had submitted considerable information to the regions for review. This is one of a number of proposals that represents a large amount of work done at NIST to provide more consistent standards. An industry representative commented that he participated in the development of this proposal, and said industry has had a long-term struggle with various standards for both compressed and non-compressed packaging. He said these new procedures would allow for more accurate and easier testing in the field. He indicated that removal of the “compressed” description is important, because a consumer needs to know the usable amount of volume inside the package. These new procedures will minimize destructive testing, and will cover testing of new products in the market place. He strongly supports the proposal. A regulator asked if this procedure would include pelletized product. The industry representative indicated it would cover those products. Another regulator asked if compressed product would be broken up or crushed in the compressing process, and would, therefore, settle out to net a different volume. The industry representative explained there is a certain amount of destruction, so the usable volume will generally be slightly less than the volume statement. A regulator expressed support for this item to allow for clear and easy understanding by the consumer. Another regulator asked a question about the chute design during the test procedure. The industry representative explained that one of the challenges in testing volume is the amount of variability depending on the raw material you are starting with. He further explained the chute allowed for more consistency among and between products and repeated testing. NEWMA forwarded the item to NCWM and recommended that this be a Voting item.

NEWMA 2014 Annual Meeting: This item was considered in conjunction with Items 232-3 and 260-3. The Committee would like the work “tentative” stricken from the MAV values and considers this item fully developed.

SWMA 2014 Meeting: The Committee heard an overview of the changes being suggested from NIST. The Committee also heard that the requirement to put a compressed statement on a package was unnecessary and not very useful to the end user. The recoverable volume is what the customer uses. This would remove animal bedding from the test method in its entirety. The Committee heard that the test procedures are ready. It was also noted that the illustrations be changed to depict peat moss. SWMA forwarded the item to NCWM, recommending it as a Voting item.

Additional letters, presentations, and data may have been part of the Committee’s consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

260-3 V Section 3.15. Test Procedure for Verifying the Usable Volume Declaration on Packages of Animal Bedding

(This item was moved to Informational status.)

Source:

NIST Office of Weights and Measures (2015)

Purpose:

Add a test procedure in NIST Handbook 133, Section 3.15. Test Procedure for Verifying the Usable Volume Declaration on Packages on Animal Bedding. This test procedure will be used for verifying the compressed volume and usable (uncompressed) volume on packages of animal bedding.

Item Under Consideration:

Amend NIST Handbook 133 as follows:

Section 3.15. Test Procedure for Verifying the Usable Volume Declaration on Packages of Animal Bedding

3.15.1. Test Equipment

- **Calculator or Spreadsheet Software**
- **Modified Standard Package Report Form – Appendix D (at end of report).**
- **Package Inspection Worksheet Appropriate for Test Measure:**
 - **Appendix A – 26 Point Measurement Grid and Package Error Worksheet for Cylindrical Test Measures (at the end of the report)**
 - **Appendix B – 25 Point Measurement Grid and Package Error Worksheet for Square or Rectangular Test Measures (at the end of the report)**
- **Permanent Ink - Marking Pen.**
- **Knife or Razor Cutter (for use in opening packages and unwrapping shrink-wrapped pallets in warehouses)**
- **Cellophane Tape, Duct Tape (for repairing chutes and sealing packages)**
- **Polyethylene Bags (49 L to 113.5 L [13 gal to 30 gal]) (to hold product once it is uncompressed)**
- **Rigid Rulers – Starrett² or equal with 1.0 mm graduations. The edges of a ruler used with a measuring frame must be straight and the edges must be the zero point (see Exhibit 2).**
 - **300 mm (12 in)**
 - **500 mm (19.5 in)**

² Notice: The mention of trade or brand names does not imply endorsement or recommendation by the U.S. Department of Commerce over similar products available from other manufacturers.

- **1 m (39 in)**
- **Tarp - Canvas 3 m × 3 m (10 ft × 10 ft)**
- **Broom and Dust Pan**
- **Levels – for verifying the level of the test measure and taking headspace readings.**
 - **152 mm (6 in) Bubble Level**
 - **1 m (40 in) Carpenter Level**
- **Scale 15 kg (30 lb) (only used if the audit procedure is utilized.)**
- **Chutes for Uncompressing and Pouring the Bedding into a Test Measure**

**Table 1.
Recommended Chute Dimensions**

| <u>Nominal Capacity</u> | <u>Height</u> | <u>Width</u> | <u>Length</u> |
|-----------------------------------|-----------------------|-----------------------|------------------------|
| <u>70 L (2.5 ft³)</u> | <u>254 mm (10 in)</u> | <u>228 mm (9 in)</u> | <u>1219 mm (48 in)</u> |
| <u>100 L (3.5 ft³)</u> | <u>254 mm (10 in)</u> | <u>279 mm (11 in)</u> | <u>1397 mm (55 in)</u> |
| <u>170 L (6 ft³)</u> | <u>279 mm (11 in)</u> | <u>355 mm (14 in)</u> | <u>1727 mm (68 in)</u> |
| <u>240 L (8.5 ft³)</u> | <u>304 mm (12 in)</u> | <u>406 mm (16 in)</u> | <u>2006 mm (79 in)</u> |
| <u>283 L (10 ft³)</u> | <u>304 mm (12 in)</u> | <u>406 mm (16 in)</u> | <u>2286 mm (90 in)</u> |

NOTE: Chutes (see examples below) may be constructed using hinges and pins so that they lie flat for transporting. They can be constructed of sheet metal or with other slick surface material which enable the bedding to flow easily. The construction of the chutes used in this study allows the sides to move in or out slightly so that the bedding does not become clogged at the outlet. The heights and lengths may be adjusted slightly to fit into vehicles for transport but the widths should not be reduced because narrowing the opening can restrict material flow and result in “bridging” where the bedding collects and creates a block. Also, the width should be kept smaller than the opening of the test measure so that spillage does not occur during pouring.

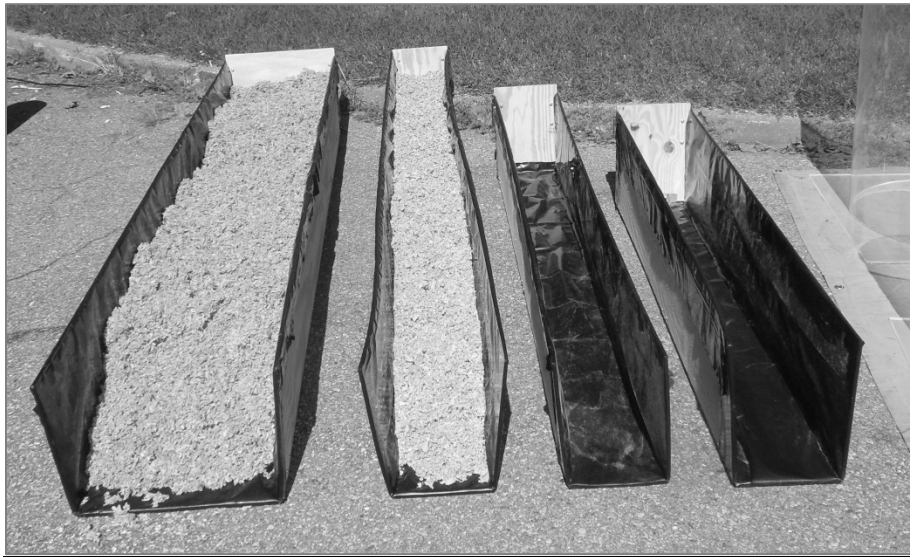


Figure 2. Testing Chutes.

- **Test Measures (see Table 2. “Test Measures for Animal Bedding”)**

Table 2. Test Measures for Animal Bedding NOTES: a, b, c, and d
Only Interior Dimensions Are Used for Volume Calculations
Must Be Calibrated with Traceable Measurement Standards Prior to Use

| Rectangular & Square Test Measures | | | | | | |
|---|------------------------------------|-----------------------------------|-----------------------------------|--|--------------------------------------|---|
| <u>Actual Volume of the Measure</u> ^{b & d} | <u>Interior Wall Dimensions</u> | | | <u>Surface Area</u> | <u>Marked Increments on Ruler</u> | <u>Increment Volume</u> |
| | <u>Length</u> | <u>Width</u> | <u>Height</u> ^d | | | |
| <u>31.9 L</u> <u>1.13 ft³</u> | <u>213.4 mm</u> <u>(8.4 in)</u> | <u>203.2 mm</u> <u>(8 in)</u> | <u>736.6 mm</u> <u>(29 in)</u> | <u>43 362 mm²</u> <u>(67.2 in²)</u> | <u>12.7 mm</u> <u>(0.5 in)</u> | <u>550.6 mL*</u> <u>0.55 L</u> <u>(33.6 in³)</u> |
| <u>28.3 L</u> <u>1 ft³</u> | <u>304.8 mm</u> <u>(12 in)</u> | <u>304.8 mm</u> <u>(12 in)</u> | <u>304.8 mm</u> <u>(12 in)</u> | <u>92 903 mm²</u> <u>(144 in²)</u> | | <u>1.18 L**</u> <u>(72 in³)</u> |
| <u>63.7 L</u> <u>2.25 ft³</u> | <u>304.8 mm</u> <u>(12 in)</u> | <u>304.8 mm</u> <u>(12 in)</u> | <u>685.8 mm</u> <u>(27 in)</u> | | | |
| | <u>406.4 mm</u> <u>(16 in)</u> | <u>228.6 mm</u> <u>(9 in)</u> | <u>685.8 mm</u> <u>(27 in)</u> | | | |
| <u>92 L</u> <u>3.25 ft³</u> | <u>304.8 mm</u> <u>(12 in)</u> | <u>304.8 mm</u> <u>(12 in)</u> | <u>990.6 mm</u> <u>(39 in)</u> | | | |
| | <u>406.4 mm</u> <u>(16 in)</u> | <u>228.6 mm</u> <u>(9 in)</u> | <u>990.6 mm</u> <u>(39 in)</u> | | | |
| <u>*1.0 mm = 43 mL (2.6 cu in)** 1.0 mm = 92 mL or 0.09 L (5.6 cu in)</u> | | | | | | |
| Square Test Measures | | | | | | |
| <u>Actual Volume of the Measure</u> ^{b & d} | <u>Interior Wall Dimensions</u> | | | <u>Surface Area</u> | <u>Marked Increments On Ruler</u> | <u>Increment Volume</u> |
| | <u>Length</u> | <u>Width</u> | <u>Height</u> ^d | | | |
| <u>77.4 L</u> <u>(2.73 ft³)</u> | <u>381 mm</u> <u>(15 in)</u> | <u>381 mm</u> <u>(15 in)</u> | <u>533.4 mm</u> <u>(21 in)</u> | <u>145 161 mm²</u> <u>(225 in²)</u> | <u>1.0 mm</u> <u>(0.03937 in)</u> | <u>0.14 L</u> <u>(8.5 in³)</u> |
| <u>144 L</u> <u>(5.09 ft³)</u> | <u>508 mm</u> <u>(20 in)</u> | <u>508 mm</u> <u>(20 in)</u> | <u>558.8 mm</u> <u>(22 in)</u> | <u>258 064 mm²</u> <u>(400 in²)</u> | | <u>0.25 L</u> <u>(15.2 in³)</u> |
| <u>283 L</u> <u>(10 ft³)</u> | <u>609.6 mm</u> <u>(24 in)</u> | <u>609.6 mm</u> <u>(24 in)</u> | <u>762 mm</u> <u>(30 in)</u> | <u>371 612 mm²</u> <u>(576 in²)</u> | | <u>0.37 L</u> <u>(22.5 in³)</u> |

Table 2. Test Measures for Animal Bedding NOTES: a, b, c, and d
Only Interior Dimensions Are Used for Volume Calculations
Must Be Calibrated with Traceable Measurement Standards Prior to Use

| <u>Cylindrical Test Measures</u> | | | | | |
|---|--|-------------------------------------|---|--|---|
| <u>These dimensions are based on the tube having a ¼ inch wall thickness. Other tube thicknesses may be used.</u> | | | | | |
| <u>Actual Volume</u> <i>Volume = $\pi r^2 h$</i> | <u>Interior Diameter</u> <u>(Outside Diameter)</u> | <u>Height</u> | <u>Surface Area</u> <i>Area = πr^2</i> | <u>Increment</u> | <u>Increment Volume</u> |
| <u>52 L</u> <u>(1.8 ft³)</u> | <u>292.1 mm (304.8 mm)</u> <u>11.5 in (12 in)</u> | <u>780 mm</u> <u>(30.70 in)</u> | <u>67 012 mm²</u> <u>(103.8 in²)</u> | <u>1.0 mm</u> <u>(0.03937</u> <u>in)</u> | <u>0.06 L</u> <u>(4 in³)</u> |
| <u>124 L</u> <u>(4.3 ft³)</u> | <u>444.5 mm (457.2 mm)</u> <u>17.5 in (18 in)</u> | <u>800 mm</u> <u>(31.49 in)</u> | <u>155 179 mm²</u> <u>(240.52 in²)</u> | | <u>0.15 L</u> <u>(9.4 in³)</u> |
| <u>279 L</u> <u>(9.8 ft³)</u> | <u>596.9 mm (609.6</u> <u>mm)</u> <u>23.5 in (24 in)</u> | <u>1000 mm</u> <u>(39.37 in)</u> | <u>279 829 mm²</u> <u>(433.76 in²)</u> | | <u>0.27 L</u> <u>(16.4 in³)</u> |

Notes for Table 2:

- a. Rectangular and Square Based Dry Measures are typically constructed of 12.7 mm to 19.05 mm (0.5 in to 0.75 in) Marine Plywood. A 4.76 mm (³/₁₆ in) transparent sidewall is useful for determining the level of fill, but must be reinforced or be made of thicker material if it distorts when the measure is filled. If the measure has a clear front, place the level gage at the back (inside) of the measure so that the markings are read over the top of the animal bedding. Any of these measures may be made without an attached bottom for ease of emptying if they are placed on a solid level base during filling and measurement.**
- b. Other size measures may be used if calibrated and the volume equivalence of the increment of 1.0 mm is no greater than 1/6 the MAV. Widening the base of a measure reduces the column height of the product and will reduce compression but the trade-off is that the larger surface area increases the volume so the potential for measurement errors increase. One of the benefits of the cylindrical design is that, in addition to eliminating the 90 degree angles of the corners where gaps in fill frequently occur, the surface area of a cylinder is less than an equal volume square measure and that results in better resolution in the volume measurements (i.e., compare the readability of a 24 in sq box which has a surface area of 576 in², to the 24 in cylinder which has a surface area of 433 in²). The height of the test measure may be reduced, but this will limit the volume of the package that can be tested.**
- c. If lines are marked in any test measures, they should extend around all sides of the measure if possible to improve readability. It is recommended that a line indicating the MAV level also be marked to reduce the possibility of reading errors when the level of the product is at or near the MAV.**
- d. If the measures are built to the dimensions shown above, the actual volume of most of the measures will be larger than the nominal volume so that plus errors (overfill) can be measured accurately.**

3.15.2. Test Procedure

Test Notes:

Rounding: When a volume measurement falls between graduations on a ruler, round the value in the direction that favors the packer. This practice eliminates the issue of rounding from the volume determination and provides packagers the benefit of the doubt. The ruler graduation is 1.0 mm so the rounding error will be limited to 0.5 mm or less. It is good practice to circle a measurement that has been rounded up or make a statement to such effect so that it becomes a part of the inspection record.

Safety:



This procedure does not address all of the safety issues that users need to be aware of in order to carry out the following tasks. Users are sometimes required to conduct test in warehouse spaces or retail stores where fork-trucks are in motion – care must be taken to warn others to avoid or exercise care around the test site. The procedure requires users to lift heavy objects including large bulky packages and test measures and includes the use of sharp instruments to obtain packages from shrink-wrapped pallets. Users may be required to climb ladders or work platforms to obtain packages. When opening and emptying packages, dust, and other particles may be present or escape from the packages which may cause eye injuries and respiratory or other health problems. Users must utilize appropriate safety equipment and exercise good safety practice. If safe working conditions cannot be ensured, suspend testing until the situation is corrected.

- 1. Follow the Section 2.3.1. “Define the Inspection Lot” select “Category A, Sampling Plan” in this inspection. Determine the Sample Size based on the size of the Inspection Lot using Category A. Collect the sample packages from the Inspection Lot using Section 2.3.4. “Random Sampling Selection.”**

Test Note: Place the test equipment and sample packages in a location where there is adequate lighting and ample space around the packages and equipment so the packages can be opened and the chutes and test measures used safely.

Optional – Audit Screening by Weight

The full test procedure requires that all of the packages be opened for testing. Regardless of the type of bedding, the product cannot be returned to the original package. An alternative gravimetric auditing procedure may be used to reduce the amount of destructive testing and conserve inspection resources.

Audit Procedure: After randomly selecting the sample packages from the Inspection Lot, obtain the gross weight for each package. Select the lightest and heaviest packages and conduct a usable volumetric test these two packages. If the lightest and heaviest packages pass (i.e., each contains at least the useable volume declared on the label), it is highly likely that the remaining packages in the sample will also pass. Accept these two package samples as an AUDIT TEST and move on to inspect other types of bedding or Inspection Lots of other types or brands of bedding. If either of the two packages is found to have a minus error that exceeds the Maximum Allowable Variation, the sample fails. No further testing is required (i.e., assuming no MAV is allowed for the sample size (see Appendix A, Table 2-1. “Sampling Plans for Category A.”) If either of the packages is found to have a minus error that does not exceed

the MAV, continue to test all of the packages and take action based on the final results from the complete sample.

Test Note: If the gravimetric audit procedure is used, ensure that the scale is placed on a solid level support and that its accuracy has been verified to a test load that is at least 10 % more than the gross weight of the packages (e.g., to estimate that load, place one of the packages on the scale and then test the scale with a load above the package's gross weight). See Section 2.2. "Measurement Standards and Test Equipment" for additional information.

2. **Select the appropriate test measure for the package size.**
 - **Spread a tarp large enough to hold a chute and test measure.**
 - **Place the chute and test measure on the tarp. Verify that the test measure is level.**
3. **Select a chute of appropriate capacity (see Table 1) for the package size and position it on the tarp.**
4. **Open the Packaging, Uncompressing and Pouring the Bedding into the Test Measure Twice.**
 - **Open Package: Place the package in the chute and use a knife or box cutter to open and remove the wrapper. Spread the bedding uniformly along the length of the chute. The bedding is uncompressed in two steps. The first step is to loosen the clumps of bedding by gently pulling them apart (do not tear the fibers of cellulose bedding or "grind" any bedding between your hands because these practices break the material down). Spread your fingers and pick the material up using your hands from beneath to loosen it up. There should be no clumps of bedding in the chute. If any bedding has fallen out of the chute onto the tarp, collect it and return it to the chute. The following pictures illustrate this step of the procedure. The second step of the expanded volume recovery process is to pour the bedding into a test measure as described in Step 2.**

Exhibit 1.



Exhibit 2.



Exhibit 3. First pour into the test measures.



- **First Pour: The first pour into the test measure is only used to further un-compress the bedding so no measurements are taken. Hold the chute above the test measure and tilt it so that you pour the bedding into the center of the test measure. The bedding should be poured slowly into the test measure in one continuous stream and not “dumped” (if it is “dumped” or poured too quickly some of the bedding will blow out of the measure or the bedding will be packed down and its volume reduced). The flow rate should be controlled by the tilt angle of the chute. The chute itself can be shaken but DO NOT HIT OR SHAKE THE TEST MEASURE. (Do not adjust the flow by closing the opening of the chute as that may cause the bedding to heap up and then fall into the measure in clumps which may result in impact compression). Empty the bedding back into the chute and spread it out evenly along its length.**



Exhibit 4. Showing how to hold a chute for the pour.



Exhibit 2. Showing how to cradle the chute on one arm and holding it with one hand while tilting it with the other hand.

- **Second Pour: The second pour into the test measure is used to make the volume determination. Hold the chute above the test measure and tilt it so that you pour the bedding into the center of the test measure. The bedding should be poured slowly into the test measure in one continuous stream and not “dumped.” The flow rate**

should be controlled by the tilt angle of the chute. The chute can be shaken but DO NOT HIT OR SHAKE THE TEST MEASURE.

Test Note: Stop filling the measure if it appears that the test measure will overflow. The overflow product should be measured separately (use a smaller test measure of adequate size and capacity if one is available) and the multiple measurement volumes are added. If pouring into a square test measure, pour at an angle to two corners for the widest opening (see Exhibit 12).



Exhibit 6. Filling a 44 L Test Measure.



Exhibit 7. Filling a Square Test Measure at an Angle to use the Larger Opening.

5. Volume Determination.

DO NOT HAND LEVEL THE SURFACE OF THE BEDDING AS MANUAL LEVELING “PACKS” THE BEDDING AND REDUCES ITS VOLUME. DO NOT JAR OR SHAKE THE TEST MEASURE

Test Note: Before using a test measure for volume determinations, place a level of adequate length on top of the test measure at five approximately equal measuring points across the top. A permanent marking pen can be used to evenly space the marks across the top edge of the test measure so that it can be positioned to take the measurements (see Exhibit 13).



Exhibit 3. Marking the evenly spaced measuring points across the top of the test measure.

- **Place a rigid level or straight edge of adequate size on top the test measure and select a ruler of adequate length to reach to the lowest level of the top surface of the bedding. Start at the measuring points to your left or right, place the ruler against the side of the level, and hold it with either hand. The zero graduation is pointed down so the ruler can be lowered into the test measure for measurement. Lower the ruler into the test measure slowly until its end is at the surface level of the bedding (see Exhibits 14 and 15).**



Exhibit 4. Placing ruler into the test measure with zero end down.



Exhibit 10. Ruler shown with zero end at surface of the bedding.

- **Determine the depth of each measurement point from the surface of the bedding to the bottom edge of the straight edge and record the value in the appropriate space on the worksheet. Take a minimum of 25 measurements (at least 26 for cylindrical measures) across the top of the test measure in a grid pattern. Read the graduations on the ruler from a position that minimizes errors caused by parallax.**

Table 2. Illustrations of Depth Determinations with Cylindrical Test Measures



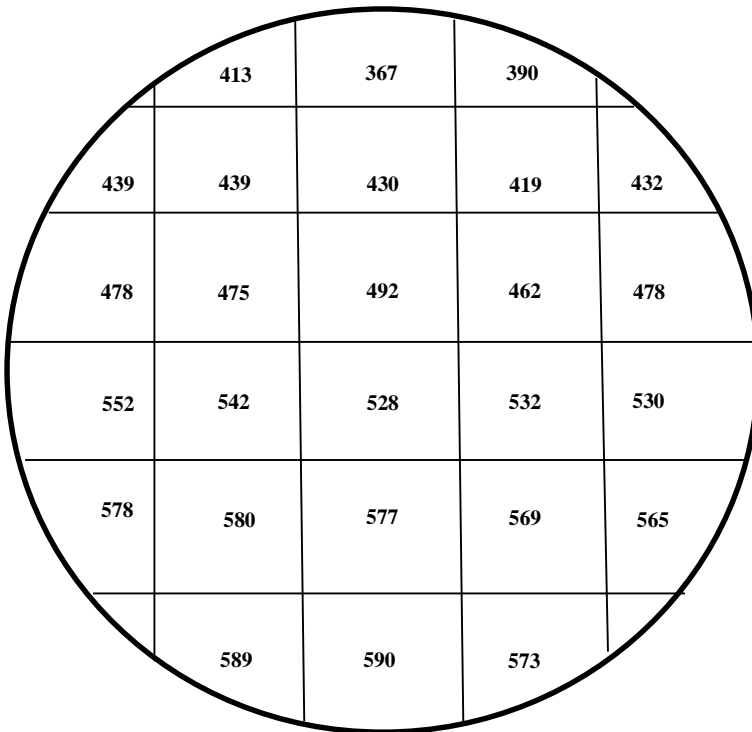
Figure 1. Shows how to read the depth of container.

The picture on the left (Figure1) shows how to read the depth from the bottom of the straightedge (top edge of measure) down to the bedding in a 44 L test measure from a position that reduces parallax. The graphic below (Figure 2) illustrates the actual worksheet with the headspace procedure on the 44 L cylinder test measure (its internal radius is 151 mm and its height is 610 mm). The bedding was poured into the test measure but not leveled. Then 26 measurements were made at the locations shown on the grid to determine the depth of the product from the top edge of the measure. The average of the 26 values was 500.7 mm which was subtracted from the height of the test measure to obtain 109.26 mm for the average height of the column of bedding in the measure.

The volume was calculated using: $Volume\ in\ liters = \pi r^2 h$
 $Pi) 3.14159265 \times 23035.69 \times 109.26\ mm = 7.90\ L^*$

*After the calculation was completed the result was divided by 1 000 000 to obtain the volume in liters.

Figure 2 Illustration of Worksheet.



**Table 2. Illustrations of Depth Determinations
with Cylindrical Test Measures**



Figure 3. Using the headspace measurement on a 279 L test measure. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.



Figure 4. Illustrating how the ruler is placed on the bedding with the headspace method. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.

Table 3. Illustrations of Depth Determinations with Square Test Measures

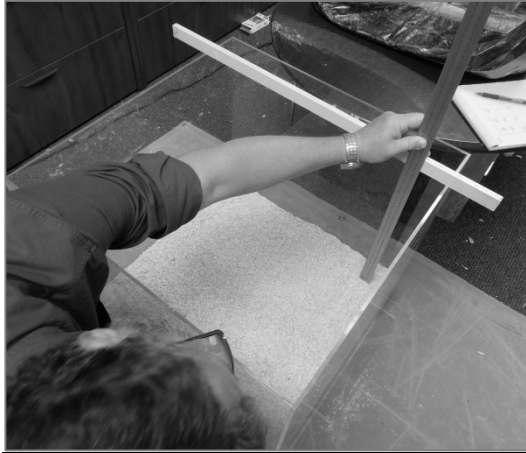


Figure 1.

| | | | | |
|------------|------------|------------|------------|------------|
| <u>246</u> | <u>162</u> | <u>81</u> | <u>132</u> | <u>177</u> |
| <u>195</u> | <u>115</u> | <u>43</u> | <u>46</u> | <u>112</u> |
| <u>111</u> | <u>77</u> | <u>51</u> | <u>95</u> | <u>146</u> |
| <u>220</u> | <u>138</u> | <u>46</u> | <u>98</u> | <u>131</u> |
| <u>264</u> | <u>193</u> | <u>118</u> | <u>148</u> | <u>180</u> |

Figure 2.

The picture on the left (Figure 1) shows how to read the depth from the bottom of the straightedge (top edge of measure) down to the bedding in a 283 L square test measure from a position that reduces parallax. The graphic on the right (Figure 2) illustrates the actual worksheet with the headspace procedure on the square test measure (its internal dimensions are 609.6 mm × 609.6 mm × 762 mm (24 in × 24 in × 30 in). The bedding was poured into the test measure but not leveled. Then 25 measurements were made at the locations shown on the grid to determine the depth of the product from the top edge of the measure. The average of the 25 values was 133 mm that was subtracted from the height of the test measure to obtain 629 mm for the average height of the column of bedding in the measure.

The volume was calculated using: Volume in liters = lwh 609.6 mm × 609.6 mm × 629 mm = 233.74 L*

***After the calculation was completed, the result was divided by 1 000 000 to obtain the volume in liters.**



Figure 3. Using the headspace measurement on 56.6 L (2 cu ft) test measure. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.

Table 3. Illustrations of Depth Determinations with Square Test Measures

Figure 4. Showing how the ruler is placed on the bedding with the headspace method. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.

6. Using a Worksheet for Volume Calculation

- Enter the sample number of the package on the worksheet along with its labeled usable volume.
- Test Measure Information
 - For a cylindrical test measure, enter its interior height and radius in the spaces labeled A and B.
 - For a square or rectangular test measure enter its interior height and the area of its base (i.e., length × width) in spaces labeled A and B.
- Sum the measurements in the grid, divide the value by the number of measurements (i.e., 25 or 26), and enter this value in the space labeled C, Average Depth.
- Calculate the Average Height of the Bedding (subtract C [Average Depth] from A [Interior Height of Test Measure]) and enter this value in the space labeled D.
- Calculate the Volume of Bedding in the Package:
 - For a cylindrical test measure, the formula ($Volume\ in\ Liters = \pi r^2 h$) is shown in E on the worksheet. It is $Volume\ (Liters) = 3.14159265 \times r^2 (B^2) \times Average\ Height\ (D) \div 1\ 000\ 000$. Enter the package volume in the space provided for this value in E.
 - For a square or rectangular test measure the formula ($Volume\ in\ Liters = LWH$) is shown in E on the worksheet. It is $Volume\ (Liters) = B\ (Area\ of\ Test\ Measure\ Base) \times D\ (Average\ Height) \div 1\ 000\ 000$. Enter the package volume in the space provided for this value in E.
- Calculate the Package Error using the following formula:
 - Package Error = Labeled Usable Volume (Liters) – E Package Volume (Liters)

$$\text{Package Error (Liters)} = \text{Labeled Expanded Volume} - \text{Package Volume}$$

- Transfer the individual package errors (verify whether they are positive or negative) to the “Modified Standard Package Report for Animal Bedding” in Appendix D. Fill in the required header information. For Box 7, “Number of Unreasonable Package Errors Allowed for Sample Size, use Appendix A, to Table 2-1. “Sampling Plans for Category A, Column 4.”, Based on the sample size, determine how many packages may have minus package errors that exceed the MAV (i.e., unreasonable package error).

Then:

- Calculate the Total Error (Enter in Box 8. “Total Error”).

7. Evaluation of the Test Results and Determination of Pass or Fail

- Determine if any of the minus package errors exceeds the MAV. Apply a tentative MAV value of 5 % ($0.05 \times$ labeled expanded volume) to single measurement volume determinations and a tentative MAV value of 10 % ($0.10 \times$ labeled expanded volume) on multiple-measurement volume determinations (enter in Box 4 “MAV”). If none of the minus package errors exceeds the MAV, go to Step 3. If any of the minus package errors exceed the MAV, enter the number of packages in Box 9 “Number of Unreasonable Minus Errors”. Go to Box 10 “Is Box 9 Greater than Box 7?” and determine if the value exceeds the number in Box 7 “Number of Unreasonable Package Errors Allowed for Sample Size”. If the number of packages with unreasonable errors exceeds the number permitted in Box 7 “Number of Unreasonable Package Errors Allowed for Sample Size,” the sample fails. Go to Box 17 “Disposition of the Inspection Lot” and reject the Inspection Lot.
- Calculate the Average Error for the sample by dividing Box 8 “Total Error,” by Box 6 “Sample Size” and enter the value in Box 11 “Calculate Average Error,” then go Box 12 “Does Box 11 equal Zero or Plus?” If the Average Error is zero or a positive number the sample passes, go to Box 17 “Disposition of the Inspection Lot” and approve the inspection lot. If the Average Error is a negative value go to Step 4. If the Average Error is a negative value go to Step 4 on the Inspection Worksheet.
- Calculate the Sample Standard Deviation and enter in Box 13. 13 “Compute Sample Standard Deviation.” To obtain the Sample Correction Factor for the sample size use Appendix A, Table 2-1. “Sampling Plans for Category A,” Column 3 “Sample Correction Factor’ and enter that in Box 14 “Sample Correction Factor.” Then calculate the Sample Error Limit by multiplying Box 13 “Compute Sample Standard Deviation” and Box 14 “Sample Correction Factor.” Enter the value in Box 15 “Compute Sample Error Limit.”
 - Disregarding the signs, determine if the minus in Box 11 “Calculate Average Error” is larger than the value in Box 15 “Compute Sample Error Limit.”
 - If yes, the sample fails, go to Box 17 “Disposition of Inspection” and reject the Inspection Lot.
 - If no, the sample passes, go to Box 17 “Disposition of Inspection” and approve the Inspection Lot
- Prepare a comprehensive report of the test results and enforcement action taken and present the information to the party responsible for the product.

Background/Discussion:

This proposal will provide a standardized test method that will improve measurement accuracy at the point of pack and in testing at other locations. The test procedures recommend the use of a gravimetric audit procedure that may reduce destructive testing and reduce inspection time.

Even though some existing test measures may still be used the proposed procedure encourages users to purchase the prescribed volumetric test measures, chutes and measuring instruments.

The NIST, OWM will develop and provide technical training on this subject matter and develop detailed equipment designs and drawings which will be made available on its website. The OWM will assist the animal bedding industry in implementing the proposed method of sale as well as developing and incorporating good manufacturing practices to ensure that the requirements of NIST Handbook 133 are met.

NCWM 2015 Interim Meeting: Mr. Whiting (American Wood Fiber) spoke in support of this test procedure. Mr. Whiting worked closely with NIST, OWM on reviewing this test procedure and agrees this procedure has less variability, sensitivity, not time consuming, and is easier to perform in the field. A California county representative (regulator) suggested that the definition for animal bedding should account for wood shavings and chips. He also inquired about the results when the procedure is used to test ground corn and cat litter. It was also remarked that building a chute as specified and lifting it on shoulders and pouring needs to be examined. Could this be done with smaller chutes and multiple pours? Mr. Whiting, who has performed this procedure, remarked this may need two inspectors. He also stated animal bedding with dense particle size has better repeatability. The NIST Technical Advisor remarked that the background information provided by OWM is being reviewed for formatting by the office Publication Coordinator, advised that no technical changes were being made, and noted that it would be resubmitted with NCWM Publication 16 (2015). The 2015 L&R Committee agreed to move this forward as a Voting item.

NCWM 2015 Annual Meeting: It was noted by the NIST Technical Advisor that the term “expanded volume should read “usable volume” and the term “compressed” was deleted from the section title. There was discussion concerning clay products when using chutes. Concern was expressed regarding the cost of purchasing testing equipment. The reason for the various vessel sizes is due to the variety of package sizes in the marketplace. The term “expanded” was changed to “usable” throughout the proposal along with minor editorial changes. This item was moved from Voting to Informational status.

Refer to Appendix C. “Testing Packages of Animal Bedding and Peat Moss with Compressed and Expanded Volume Declarations” for the Executive Summary, additional background, and supporting information.

Regional Association Comments:

NEWMA 2014 Interim Meeting: The L&R Chairman stated that NIST, OWM had submitted considerable information for the regions to review. This is one of a number of proposals that represents a large amount of work done at NIST to provide more consistent standards. An industry representative commented that he participated in the development of this proposal, and said industry has had a long-term struggle with various standards for both compressed and non-compressed packaging. He said these new procedures would allow for more accurate and easier testing in the field. He indicated the removal of the term “compressed” from the descriptor is important, because a consumer needs to know the usable amount of volume inside the package. These new procedures will minimize destructive testing and will cover testing of new products in the market place. He strongly supports the proposal. A regulator asked if this procedure would include pelletized product. The industry representative indicated it would cover those products. Another regulator asked if compressed product would be broken up or crushed in the compressing process and would, therefore, settle out to net a different volume. The industry representative explained there is a certain amount of destruction, so the usable volume will generally be slightly less than the original volume. A regulator expressed support for this item to allow for clear and easy understanding by the consumer. Another regulator asked a question about the chute design during the test procedure. The industry representative explained that one of the challenges in testing volume is the amount of variability, depending on the raw material being used. He further explained the chute allowed for more consistency among and between products and repeated testing. NEWMA forwarded the item to NCWM and recommended that this be a Voting item.

NEWMA 2014 Annual Meeting: This item was considered in conjunction with Items 232-3 and 260-2. The Committee would like the word “tentative” stricken from the MAV values and considers this item fully developed.

SWMA 2014 Meeting: The Committee heard an overview of the changes being suggested from NIST. The Committee also heard that the requirement to put a compressed statement on a package was unnecessary and not useful to the end user. The recoverable volume is what the customer uses. The Committee heard that the test procedures are ready. SWMA forwarded the item to NCWM, recommending it as a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

270 OTHER ITEMS

270-1 D Fuels and Lubricants Subcommittee

Source:

The Fuels and Lubricants Subcommittee (2007)

Purpose:

Update the Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation in NIST Handbook 130 including major revisions to fuel ethanol specifications. Another task will be to update the Basic Engine and Fuels, Petroleum Products, and Lubricants Laboratory Publication.

Item Under Consideration:

This item is under development. All comments should be directed to Dr. Matthew Curran, FALS Chair at (850) 921-1570, Matthew.Curran@freshfromflorida.com, or Ms. Lisa Warfield, NIST Technical Advisor at (301) 975-3308, lisa.warfield@nist.gov.

Background/Discussion:

The Subcommittee met on January 24, 2007, at NCWM Interim Meeting to undertake a review of a number of significant issues related to fuel standards. Their first project was to undertake a major review and update of the Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation in NIST Handbook 130. The Subcommittee also met at the 2007 NCWM Annual Meeting and continued its work on a number of items in addition to preparing a major revision of the Fuel Ethanol Specifications. Since then, the Subcommittee has met regularly at the NCWM meetings, forming working groups to complete specific projects. An update on these projects is given below:

Handbook 130 WG: Mr. Jennings submitted to the FALS edits to Handbook 130 currently being proposed by his WG and asked the Subcommittee to begin considering the proposed changes now. The Handbook 130 WG plans to share the proposed changes with the regions over the course of the next year with the goal that NCWM consider voting on the changes at its 2016 NCWM Annual Meeting. Mr. Jennings then invited FALS members to consider joining the group and requested that a collaboration site on the NCWM website be established to allow interested parties to comment on the proposed changes. Dr. Curran agreed to send a request for a collaboration site to NCWM Executive Director.

Renewable Diesel Labeling and Definitions WG: Ms. Rebecca Richardson provided an update on the group's efforts to FALS. Ms. Richardson believes the group would benefit from additional involvement from engine manufacturers and refiners. Mr. Derek Regal from Tesoro volunteered to serve on the WG.

CNG/LNG Equivalent Values WG: Mr. Jeff Clarke updated FALS on the efforts and purpose of this WG to determine whether or not the diesel gallon equivalency conversion factor is accurate and added that the group has not reached consensus on the conversion factor. Mr. Clarke then reviewed the current values and historical energy values and ratios from various models.

Organometallic WG: Mr. Jeff Jetter (R&D Americas) provided a power point presentation on the work being done under the umbrella of the ASTM International Committee D02. The CRC has been commissioned to summarize the

volumes of data that have been posted on the NCWM Organometallic WG repository site. The CRC report is under review and should be released in the coming weeks. Mr. Randy Jennings (Tennessee) presented proposed changes relative to organometallics as a part of the Uniform Engine Fuel and Automotive Lubricants Regulation WG presentation. Currently, the proposed changes to the uniform regulation are labeling requirements based upon the Nevada and Tennessee rules. The route for NCWM will depend upon the outcome of the ASTM TG efforts. Mr. Jetter, Mr. Jennings, and Ms. Alyson Fick (ASTM International) provided a more detailed presentation on the collaboration between ASTM and NCWM at the NCWM Annual Meeting technical session.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

270-2 D Packaging and Labeling Subcommittee

Source:

Packaging and Labeling Subcommittee (2011)

Purpose:

Provide an update of the activities of this Subcommittee, which reports to the L&R Committee. The mission of PALS is to assist the L&R Committee in the development of agenda items related to packaging and labeling. The Subcommittee will also be called upon to provide important and much needed guidance to the regulatory and consumer packaging communities on difficult questions. PALS will report to NCWM L&R Committee. The Subcommittee is comprised of a Chairperson and eight voting members.

Item Under Consideration:

This item is under Development. All comments should be directed to Mr. Chris Guay, Packaging and Labeling Subcommittee Chair at (513) 983-0530, guay.cb@pg.com or Mr. David Sefcik, NIST Technical Advisor at (301) 975-4868, david.sefcik@nist.gov.

Background/Discussion:

The Subcommittee is comprised of four regulatory officials (one from each region) and four from industry (retailers and manufacturers). Mr. Guay, PALS Chair, reported that work is currently being held through webinar meetings and at the NCWM meetings. PALS members are responsible for providing updates at their regional meetings. Mr. Guay added that PALS will be developing proposals and providing guidance and recommendations on existing proposals as assigned by the NCWM L&R Committee. He also stressed the need and importance of having key federal agencies (FDA, FTC, and USDA) participating.

Mr. Guay reported the Subcommittee is considering further development of the following items:

- **Additional Net Content Declarations on the Principal Display Panel** – Package net contents are most commonly determined by the product form, for example – solid products are labeled by weight and liquid products are labeled by volume. Semi-solid products such as pastes, creams, and viscous liquids are required to be labeled by weight in the United States and by volume in Canada.
- **Icons in Lieu of Words in Packages Labeled by Count** – Can a clear and non-misleading icon take the place of the word “count” or “item name” in a net content statement? While existing Federal regulation requires regulatory label information to be in “English,” the increasing presence of multilingual labels and the growing diversity of the U.S. population suggest more consumers are served with a clear and non-misleading icon.
- **Multilingual Labels**
- **Multipacks and Bundle Packages** – The net content statements for multipacks and bundled packages of individually labeled products can be different based on the approach used to calculate them. The difference is the result of the degree of rounding for dual U.S. customary unit and metric declarations. Using two

apparently valid but different methods can yield one net content statement result that provides better accuracy between the metric and inch-pound declarations, and a different net content result which is consumer friendly.

NCWM 2013 Interim Meeting: Mr. James Kohm (Director of Enforcement at the Federal Trade Commission [FTC]), briefed NCWM on the goals and objectives of FTC. Mr. Kohm gave a general overview of the Fair Packaging and Labeling Act (FPLA) and announced it is under review in 2013. Mr. Chris Guay provided an update on the action of PALS. PALS will be focusing on best practice principles for the various quantity and quality statements seen in the marketplace

NCWM 2014 Interim Meeting: Mr. Guay stated they are awaiting an announcement from FTC in regards to updating the FPLA regulations.

NCWM 2014 Annual Meeting: Mr. Guay reported that PALS had drafted and submitted comments in response to a Federal Register Notice requesting possible updates to FTC's Fair Packaging and Labeling Act regulations. PALS drafted 15 specific comments for FTC consideration, and these were submitted in May 2014. PALS reviewed the comments in detail during their Subcommittee session held on Sunday afternoon. FTC is now in the process of considering these and other comments and will issue a formal proposal to make changes within the next one to two years.

NCWM 2015 Interim Meeting: Mr. Guay reported that PALS was making progress on a Recommended Practice Document for quantity-related statements appearing on the package net content statement outside of the required statement of net quantity. He noted that no guidance or regulation exists for these types of statements and as a result, every manufacturer creates their own approach. A Recommended Practice Document is expected to help bring uniformity and consistency by providing a reference for these types of label statements. This document will either be a stand-alone document on the NCWM website or included as part of another NCWM publication.

NCWM 2015 Annual Meeting: Mr. Guay reported that FTC has recommended adoption of five of the amendments recommended by PALS into their final FPLA regulations. FTC also responded to each recommendation made by PALS. FTC did not propose adoption of amendments from any other source.

Mr. Guay and Ms. Angela Godwin (Ventura County, California) gave a presentation providing details of the developing Recommended Practice Document to build awareness and to get broader input on this item. The Subcommittee's goal is to have the document mostly done by early 2016 so that it can be refined and edited prior to the 2016 Annual Meeting. It is expected to be submitted for regional review in autumn 2016.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

270-3 D Moisture Allowance Task Group (MATG)

Source:

Moisture Allowance Task Group (2012)

Purpose:

This Task Group will provide additional guidance for making moisture allowances for products not listed in NIST Handbook 133.

Item Under Consideration:

This item is under Development. All comments should be directed to Mr. Kurt Floren, Moisture Allowance Task Group Chair at (626) 575-5451, kfloren@acwm.lacounty.gov or Ms. Lisa Warfield, NIST Technical Advisor at (301) 975-3308, lisa.warfield@nist.gov

Background/Discussion:

NCWM 2012 Interim Meeting: Ms. Judy Cardin, Committee Chair, will be requesting that the NCWM Board of Directors form a new Task Group to review moisture allowance. The 2012 L&R Committee designated this item as a Developing item.

NCWM 2012 Annual Meeting: Mr. Floren (Los Angeles County, California) announced that he will Chair the Moisture Allowance Task Group.

NCWM 2013 Interim Meeting: Mr. Floren announced that he is seeking a representative from each region for the MATG. Currently, the following regions have provided a representative; NEWMA, Mr. Frank Greene, (Connecticut) and the WWMA, Mr. Brett Gurney (Utah). The following individuals have expressed interest; Ms. Maile Hermida (Hogan Lovells US, LLP), Ms. Ann Boeckman (Kraft Foods Group), and Mr. Chris Guay (Procter and Gamble Co.). Mr. Floren remarked that meetings will be held via web-meetings and at the NCWM Conferences.

NCWM 2014 Interim Meeting: The MATG discussed how to move forward on this item and reviewed past history of prior work done. At the 2014 and 2015 NCWM Annual Meeting, Mr. Floren informed the Committee that there has been scheduling conflicts with other priorities this past year, and he has not had the opportunity to get a meeting scheduled. Mr. Floren would like the opportunity to continue chairing this TG and will pursue this item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the *Report of the 99th National Conference on Weights and Measures* (SP1193, 2014).

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- Mr. Tim Lloyd, Montana | Committee Chair (absent at the 2015 NCWM Interim)
 - Mr. Richard Lewis, Georgia | Member (Acting Committee Chair – 2015 NCWM Interim)
 - Mr. Louis Sakin, Towns of Hopkinton/Northbridge, Massachusetts | Member
 - Mr. John Albert, Missouri | Member
 - Ms. Kristin Macey, California | Member
 - Mr. Steven Grabski, Walmart Stores | Associate Membership Representative (absent at the 2015 Annual)
 - Mr. Lance Robertson, Measurement Canada | Canadian Technical Advisor
 - Ms. Lisa Warfield, NIST, OWM | NIST Technical Advisor (absent at the 2015 Annual)

Laws and Regulations Committee

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Appendix A

Items 232-4 and 237-1: Handbook 130

Background and Justification for Handbook 130 Definitions of “Diesel Gallon Equivalent (DGE)” of Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) as a Vehicular Fuel

Clean Vehicle Education Foundation

Development of the “Gasoline Gallon Equivalent” by NCWM*

In 1993, under the auspices of the National Conference on Weights and Measures (NCWM), a Compressed Natural Gas (CNG) Working Group came together to determine the way in which CNG would be sold to the public at retail as a motor fuel.

The working group focused on three issues:

1. How to provide the Natural Gas Vehicle (NGV) industry a method of sale that would be familiar and acceptable to consumers
2. How to provide weights and measures officials a verifiable and quantifiable means to determine the accuracy of natural gas dispensers; and
3. How to meet these requirements with a uniform, national standard.

NCWM considered three proposals for the method of sale of CNG:

1. Joules, the unit of energy measurement in SI units
2. Mass
3. The Gasoline Gallon Equivalent (GGE)

The Natural Gas Vehicle Coalition (now NGV America) recommended that the Gasoline Gallon Equivalent be adopted as the method of sale for CNG, and that it be based on the energy equivalent of a gallon of gasoline. The use of the GGE was recommended primarily for the convenience of the retail customer comparing the cost and fuel economy of a natural gas vehicle to a comparable gasoline vehicle. During the discussion, a proposal was made to eliminate the reference to energy content of CNG and replace it with a fixed conversion factor based on mass, with the fixed mass of CNG being equal to a gallon of gasoline. Measurement of mass in the retail dispenser and

* *Report of the 78th National Conference on Weights and Measures, 1993*, NIST Special Publication 854, pp 322-326.
Report of the 79th National Conference on Weights and Measures, 1994, NIST Special Publication 870, pp 213-217.
Program and Committee Reports for the National Conference on Weights and Measures, 79th Annual Meeting, July 17-21, 1994, NCWM Publication 16, pp 89-92.

verification by W&M officials is easier and less costly than measurement of energy content.

Since the energy content of a unit measure of CNG (standard cubic foot - scf) and gasoline (gallon) vary widely depending on the sample of fuel measured, the reference gallon of gasoline was determined to be Indolene, the gasoline used by EPA to certify emissions and fuel economy, with an energy content (lower heating value) of 114,118 BTU/gal. Work conducted by the Institute of Gas Technology and the Gas Research Institute (now combined into the Gas Technology Institute) surveyed 6,811 samples of natural gas nationwide and concluded that the “average” natural gas in the US had an energy content (lower heating value) of 923.7 BTU/scf, and a density of 0.0458172 lbs/cubic foot. This translates 20,160.551 BTU/lb. Dividing gasoline’s 114,118 BTU/gal by natural gas’s 20,160.551 BTU/lb gives 5.660 lbs of natural gas = 1 GGE. Similar calculations determined that a gasoline liter equivalent of natural gas equals 0.678 kg of natural gas.

At its 79th annual meeting in July of 1994, NCWM adopted resolutions that:

All natural gas kept, offered or exposed for sale or sold at retail as a vehicle fuel shall be in terms of the gasoline liter equivalent (GLE) or gasoline gallon equivalent (GGE), and

All retail natural gas dispensers shall be labeled with the conversion factor in terms of kilograms or pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have either the statement “1 Gasoline Liter Equivalent (GLE) is equal to 0.678 kg of Natural Gas” or “1 Gasoline Gallon Equivalent (GGE) is equal to 5.660 lb of Natural Gas” according to the method of sale used.”

These statements can be found in NIST Handbook 130*, along with the definition of “natural gas” which seems to apply only to Compressed Natural Gas, not to Liquefied Natural Gas. Handbook 130, §§3.11 and 3.12 (Engine Fuels, Petroleum Products, and Automotive Lubricants Regulations) confirm that these requirements are for CNG, rather than LNG. Similar requirements and definitions are found in Handbook 44.

During the discussions it was recognized that, although diesel and gasoline are both sold in gallon units, a gallon of diesel fuel has substantially more energy content than a gallon of gasoline. While it is convenient to use the Gasoline Gallon Equivalent unit when comparing the cost and fuel economy of gasoline-powered light-duty vehicles to equivalent natural gas vehicles, a Diesel Gallon Equivalent unit would be more useful for operators of medium and heavy-duty (usually diesel powered) vehicles. However, in 1994, the NCWM working group “agreed to defer development of a “Diesel Gallon Equivalent” until the issues related to the ‘Gasoline Gallon Equivalent’ were decided by the NCWM and agreed to meet again if additional work is necessary.”** The issue of the

* “Method of Sale Regulation,” §2.27

** *Report of the 79th National Conference on Weights and Measures, 1994*, NIST Special Publication 870, p 214

formal definition a Diesel Gallon Equivalent (DGE) unit has not come before NCWM from that time until today, although the DGE is often used in the industry, defined as 6.31 lb of compressed natural gas.

Need for a Definition of a “Diesel Gallon Equivalent” Unit

Today there are an increasing number of commercial vehicles using natural gas as a fuel, to lower emissions and Greenhouse Gases, decrease America’s use of petroleum, and lower fuel costs (U.S. DOE Clean Cities Alternative Fuel Price Report for April 2012 shows in Table 2 ‘Overall Average Fuel Price on Energy-Equivalent Basis’ that diesel is priced at \$4.12/gal and CNG at \$2.32/gal http://www.afdc.energy.gov/afdc/pdfs/afpr_apr_12.pdf).

Since the NCWM’s working group deferred development of a DGE unit in 1994, there has been little call by the natural gas vehicle industry for the formalization of that unit in the sale of Compressed Natural Gas. However, the use of **Liquefied** Natural Gas (LNG) as a motor fuel has been growing (more than 350 LNG stations are being built on the nations interstate Highways) and there is significant interest in using the DGE as a unit for the sale of that fuel.

NG as a motor fuel is used almost exclusively by commercial vehicles, most of which view diesel as the conventional alternative. Using the same logic as was used for the development of the GGE unit, the convenience of the retail customer comparing the cost and fuel economy of a natural gas vehicle to a comparable conventional vehicle, it makes sense for NCWM to now “officially” define the DGE.

Other than §3.12. Liquefied Natural Gas, in the Engine Fuels and Automotive Lubricants Regulation section of Handbook 130, we find no specific provisions in either Handbook 44 or Handbook 130 for the retail sale of LNG as a motor fuel. However, LNG is sold in California and other states on a mass basis (by the pound), which allows for easy confirmation by weights and measures authorities. An “official” definition of the DGE as a specific mass of LNG and CNG would allow states to easily move from retail sale by pound to retail sale by DGE, simplifying the sale process for the retail customer used to dealing with “gallons of diesel” as a fuel measure.

Therefore, at this time we are asking for a definition of the Diesel Gallon Equivalent (and Diesel Liter Equivalent) units by NCWM.

Justification of the Definition of a DGE as 6.38 Pounds of Compressed Natural Gas

Handbook 130 contains the following definitions of natural Gas as a vehicle fuel*:

Gasoline liter equivalent (GLE). – Gasoline liter equivalent (GLE) means

* NIST handbook 130, 2006, Method of State Regulation, §§2.27.1.2 and 2.227.1.3; also Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation, §§1.25 and 1.26.

0.678 kg of natural gas.

Gasoline gallon equivalent (GGE). – Gasoline gallon equivalent (GGE) means

2.567 kg (5.660 lb) of natural gas.

As the NCWM working group recognized during its deliberations in 1993 on the Gasoline Gallon Equivalent unit, both gasoline and natural gas can vary in their BTU content from sample to sample. The working group determined the gasoline gallon (energy) equivalent based on a gallon of Indolene (114,118 BTU/gal – lower heating value) and a survey of 6,811 natural gas samples nationwide with an average of 923.7 BTU/scf (lower heating value) and a density of 0.0458172 lb/cubic foot. This equates to 20,160.551 BTU/lb. Dividing gasoline's 114,118 BTU/gal by natural gas's 20,160.551 BTU/lb gives 5.660 lb of natural gas = 1 GGE. Similar calculations determined that a gasoline liter equivalent of natural gas equals 0.678 kg of natural gas.

Starting with 5.660 lb of natural gas = 1 GGE and 0.678 kg of natural gas = 1 GLE, we can calculate the mass of natural gas necessary to make a DGE and a DLE by comparing the amount of energy in a gallon of diesel fuel to the amount of energy in a gallon of gasoline fuel and apply that ratio to scale up the masses of natural gas calculated for the GGE and GLE units.

Unfortunately, it is no easier today than it was in 1993 to set one energy value as representative of a unit for all gasoline, (or diesel) fuel. EPA's certification fuel has likely changed in energy content since 1993, as both gasoline and diesel fuels have been modified for improved emissions.

We recommend using the most recent Department of Energy *Transportation Energy Data Book*^{*}, as an authoritative reference for both gasoline and diesel fuel energy values. Taking further surveys or basing our calculations on today's EPA certification fuel only delays our action, substantially increases costs, and, in the end, provides a limited potential increase in accuracy based on one point in time. Table B.4 of the *Transportation Energy Data Book*, on the heat content of fuels lists the net energy of diesel as 128,700 BTU/Gal. The 31st Edition may be downloaded at the following site. <http://cta.ornl.gov/data/download31.shtml>

Therefore, a Diesel Gallon Equivalent of compressed natural gas is:

$$(128,700 \text{ BTU/Gal} / 20,160.551 \text{ BTU/lb}) = 6.38 \text{ lb/DGE} (2.894 \text{ kg/DGE})$$

and a Diesel Liter Equivalent of compressed natural gas is:

$$2.894 \text{ kg/DGE} \times 0.2642 \text{ Gal/Liter} = 0.765 \text{ kg/DLE}$$

^{*} Stacy C. Davis and Susan W. Diegel, Oak Ridge National Laboratory, *Transportation Energy Data Book*, Edition 31, 2012, ORNL-6987, or <http://cta.ornl.gov/data/index.shtml>

Justification of the Definition of a DGE as 6.06 Pounds of Liquefied Natural Gas

Cooling pipeline natural gas to -259 °F makes liquefied Natural Gas (LNG). The pipeline natural gas has the same national average composition as was determined for CNG with a LHV of 20,160.551 BTU/lb. In order to reduce the natural gas temperature for liquefaction carbon dioxide must be removed since it would solidify in the system and nitrogen, which remains a gas at LNG temperatures, is reduced to less than 0.5 % by volume in the final product. These changes to the composition of the pipeline gas increase the LHV of LNG to 21,240 BTU/lb.

| National Average Natural Gas Composition Used for GGE Standard - Applied to LNG DGE - GGE Calculation | | | | | | | | |
|---|--------------|--------|-----------------|-----------------|-------------|-------------|--------------------------|---------|
| CNG | | | | LNG | | | | |
| Components | LHV - BTU/LB | LBS/CF | %V ¹ | %V ² | LBS/CF | %MASS | LHV | |
| C1 | 21537 | 0.0425 | 92.87 | 95.12 | 0.040425567 | 90.29305699 | 19446.41568 | |
| C2 | 20394 | 0.0803 | 3.34 | 3.42 | 0.002746969 | 6.13552872 | 1251.279727 | |
| C3 | 19807 | 0.1196 | 0.63 | 0.65 | 0.000771727 | 1.723700114 | 341.4132816 | |
| i-C4 | 19529 | 0.1582 | 0.07 | 0.07 | 0.000113422 | 0.253334595 | 49.47371306 | |
| n-C4 | 19815 | 0.1582 | 0.12 | 0.12 | 0.000194437 | 0.434287877 | 86.05414286 | |
| i-C5 | 19478 | 0.1907 | 0.04 | 0.04 | 7.81272E-05 | 0.174502103 | 33.98951966 | |
| n-C5 | 20485 | 0.1907 | 0.03 | 0.03 | 5.85954E-05 | 0.130876577 | 26.81006688 | |
| C6 | 19403 | 0.0228 | 0.05 | 0.05 | 1.16761E-05 | 0.026079234 | 5.06015379 | |
| N2 | 0 | 0.0744 | 2.07 | 0.50 | 0.000370992 | 0.828633789 | 0 | |
| CO2 | 0 | 0.117 | 0.78 | 0.00 | 0 | 0 | 0 | |
| | | | 100.00 | 100.00 | 0.044771512 | 100 | 21240 | |
| | | | | | | | Diesel ³ LHV= | 128,700 |
| | | | | | | | LNG - DGE= | 6.06 |

¹CNG national average composition of natural gas from the NCWM Laws and Regulations - CNG Working Group letter 10/18/1993 Appendix A. Conversion Factor Background

²LNG composition based on CNG composition with CO2 removed and nitrogen reduced to 0.5%

³ DOE Transportation Energy Data Book Table B.4

Note: each 0.1% reduction/addition of nitrogen in LNG lowers/raises DGE by 0.01 lb

Therefore, a Diesel Gallon Equivalent of LNG is:

$$128,700 \text{ BTU/lb} / 21,240 \text{ BTU/lb} = 6.06 \text{ lb/DGE} (2.749 \text{ kg/DGE})$$

and a Diesel Liter Equivalent of LNG is:

$$2.749 \text{ kg/DGE} \times 0.2642 \text{ Gal/Liter} = 0.7263 \text{ kg/DLE}$$

The attached presentation file provides an overview of the CNG and LNG processes from pipeline to dispensing along with the calculation of the LNG LHV based on the change in LNG chemical composition through the liquefaction process.

Prepared by:
 Clean Vehicle Education Foundation
<http://www.cleanvehicle.org>

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Appendix B

Item 260-1: Handbook 133

Section 2.7. Chitterling Test Procedure

How to Determine the Net Weight and Purge of Packaged Chitterlings¹ Using NIST Handbook 133, “Checking the Net Contents of Packaged Goods”

Executive Summary

When a Weights and Measures Inspector tests frozen chitterlings, the purpose of the inspection is to determine if the package contains the labeled net weight and if the purge is 20 % or less after thawing (purge is based on the labeled net weight). Inspectors typically use Section 2.3. “Basic Test Procedure” and other portions of National Institute of Standards and Technology (NIST) Handbook 133, “Checking the Net Contents of Packaged Goods” (the 2005 edition was adopted by USDA in 73 Federal Register 52192 on Sept. 9, 2008) to conduct these tests. To determine the amount of purge, inspectors modify the procedures in Section 2.6. “Determining the Net Weight of Encased-In-Ice and Ice Glazed Products.” The modifications include thawing the product while it is still in the package, then draining it and applying the 20 % purge limit established by the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA). Inspectors defer to the USDA purge value because a specific limiting value for the purge for chitterlings has not been adopted by the National Conference on Weights and Measures (NCWM), and, therefore, a value is not in NIST Handbook 133. The USDA recommends that purge determinations be conducted at the packing plant. However, state and local inspections of chitterlings are needed outside packing plants because inspections are usually only carried out in response to consumer complaints about short weight or excessive purge in the packages they purchase at retail or over the Internet. In the past few years, most of the inspection results shared with the Office of Weights and Measures (OWM) at NIST indicated that inspectors have found the purge from chitterlings was often much greater than 20 %. In 2011, several states contacted the OWM seeking technical assistance because of ongoing disputes they were having with packers over the test procedures used and the amount of purge allowed. Some states reported that they found purge amounts as high as 50 % in packages put-up by both domestic and foreign packers. In addition to the test data from inspectors and multiple packers, a study conducted at Iowa State University on the purge from frozen chitterlings revealed purge ranging from 30 % to 50 %. OWM reviewed the test methods used by the states, Iowa State University, and several chitterling packers to identify opportunities for improving the accuracy and repeatability of the test procedure. A few differences between the test procedures used by packers and state inspectors were found, but, overall, the approaches to testing were consistent. As noted above, the NIST Handbook 133 does not include a test procedure or purge allowance for chitterlings. Because state weights and measures officials are required to investigate the complaints they receive,

and there is a general need for a nationally uniform test procedure for use in law enforcement, there appears to be sufficient justification for the NCWM to add a specific test procedure and purge limits for this unique product¹ to NIST Handbook 133. The OWM has developed a draft test procedure for review and evaluation by packers and officials that may, depending on the level of support it finds among officials and packers, be submitted to the NCWM for possible addition to NIST Handbook 133 later in 2014. Adoption and use of a uniform test procedure should improve test uniformity, increase confidence in the test results and protect consumers and packagers from unfair trade practices.

Other Issues That Can Be Studied if a Uniform Test Method Is Adopted

Further study and guidance is needed regarding the methods used to thaw frozen chitterlings. Several weights and measures inspectors reported that thawing large packages of chitterlings takes an extensive amount of time and is labor and resource intensive (e.g., large quantities of warm water are used or several days are required for the product to thaw so it can be tested). If quicker thawing techniques could be identified, it could improve productivity and reduce inspection costs for packers and officials. Another effort that should benefit packers would be to identify and share good packing and filling practices to reduce variations in the packing process. The purge values on different lots tested by the states and in the university study varied significantly and large variations between packers were found. Reducing variability will benefit packers and consumers alike and may be achieved with only minor changes in the filling process. Perhaps the most significant issue that needs further study is if the 20 % limit is appropriate for frozen chitterlings. Several packers reported that they can only meet the 20 % purge limit and avoid consumer complaints on frozen chitterlings if they target their purge results to fall within 5 % to 10 %. Yet, chitterlings from these packers still do not meet the 20 % limit when their frozen chitterlings are thawed and tested using NIST Handbook 133 procedures.

The NIST Office of Weights and Measures invites interested weights and measures officials and packers to join a WG that will coordinate a review of the draft chitterling test procedure and other issues related to the testing of chitterlings (and beef tripe). If you are interested in participating in this work or if you have comments or questions, please contact Ken Butcher at (301) 975-4859 or kbutcher@nist.gov

¹ Because they are similar and have the same issues with freezing and thawing this procedure may be used for testing beef tripe (which is made from the stomach of cows).

What are Chitterlings?

The USDA's definition of chitterlings is in 9 CFR Ch. III §317.8 (30). The term "Chitterlings" shall apply to the large intestines of swine, or young bovine animals when preceded with the word "Calf" or "Veal." Meat food products that contain chitterlings or calf or veal chitterlings, in accordance with § 318.6(b)(8) of this subchapter shall be identified with product names that refer to such ingredients, as for instance, "Chitterling Loaf," "Chitterling Pie," or "Calf Chitterlings and Gravy." Their texture is similar to calamari (squid). According to the USDA,² chitterlings are a popular food served in many parts of the United States, the Caribbean, Latin America, western Asia, and Europe. Also called "chitlins," as defined above, they are the large intestines of swine (hogs) or calves. According to one industry source, chitterlings are eaten year round but about 90 % are sold during the Thanksgiving, Christmas, and New Year Holidays. Chitterlings are also used as casings for some sausages.

Chitterling Cleaning, Processing and Packaging

The large intestine of a hog is a soft tubular organ typically 5 meters to 6 meters (16 ft to 20 ft) long. When the intestine is removed from a freshly killed hog, it usually contains undigested food, fecal matter, and fat with glands and connective tissue still attached. To avoid foodborne illnesses, intestines require a thorough cleaning prior to consumption. Chitterlings can become contaminated with the bacteria *Yersinia enterocolitica*, which can cause a diarrheal illness called "yersiniosis." *Yersinia* survives in cold temperatures and can grow inside the refrigerator. Other foodborne pathogens (e.g., salmonella and *E. coli*) may also be present. For these reasons, the FSIS regulations require the product be thoroughly cleaned by the packer to prevent disease.

At most packing plants, the cleaning is performed using machines that flush fecal matter from pig intestines using tap water. The chitterlings are uncoiled and manually placed over a feed tube which sprays water through the tube forcing the fecal material out. During the process, the intestines are cut and cleaned again in centrifugal or agitating washing bowls prior to undergoing final inspection and cleaning before being packaged. Although the cleaning equipment is designed to minimize structural damage to the cells of the intestines, the pressurized water may wash away some of the mucosa (intestinal lining) along with the digested material and fecal matter. The damage to the mucosa may increase the amount of purge released from the chitterlings. Packers tell consumers that even chitterlings sold as "pre-cleaned" should be rinsed and cleaned again before cooking.

² http://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/foodborne-illness-and-disease/yersiniosis-and-chitterlings/ct_index Accessed July 11, 2014.

Water Content³ and Purge

Meat and poultry products have naturally occurring high water content. For example, a whole chicken fryer is 66 % water and a whole beef brisket is made up of about 71 % water. USDA studies show that raw chitterlings typically have water content of 67 % to 69 %.

CURRENT USDA GUIDANCE:

Net Weight on Chitterlings⁴

Published 10/28/2009 09:29 AM | Updated 10/28/2009 09:29 AM

QUESTION TO FSIS: *“According to the Food Standards and Labeling Policy Book, frozen chitterlings are permitted to contain 20 % of the frozen net weight as purge. At what point in the process should the determination of the 20 % purge be measured; post packaging and prior to freezing, or post packaging after freezing?”*

FSIS RESPONSE: *“Historically, FSIS has not objected to chitterlings having up to a 20% purge due to the washing and preparation with water. Net weight should be verified after packaging and prior to freezing. When verifying net weights, inspection personnel will not take regulatory action for product containing up to 20% purge. This maximum of 20% purge is representative of actual purge from the washing process; it is not acceptable to add additional liquid to the package.”*

The basis of the FSIS allowance for purge may represent the purge found with fresh-raw chitterlings and may NOT be based on data from actual purge testing on frozen chitterlings. The 20 % purge value appears to have been taken from the 1981 Edition of USDA Agriculture Handbook No. 8-10 prepared by the USDA Human Nutrition Information Service⁵ based on unfrozen chitterlings. As explained earlier several packers reported that they can only meet the 20 % purge limit and avoid consumer complaints on frozen chitterlings if they target their purge results to fall between 5 % to 10 %.

³ “Yield and Comparison of Nutritive and Energy Values; Fatty Acids and Cholesterol Content of Raw and Cooked Chitterlings.” By M.W. Vaughn, D.P. Wallace and B.W. Forster in Journal of Food Science – Volume 43 (1978).

⁴ http://askfsis.custhelp.com/app/answers/detail/a_id/1309 - Accessed on July 10, 2014.

⁵ See Page 126 -- Pork, Fresh Chitterlings, Raw - Composition of Foods: pork products: raw, processed, prepared / Part 2 of 2 of Agriculture Handbook 1983. Volume 008-10 Pages p. 101-206. Author: Anderson, Barbara A Doc ID ah008_10pt2 U.S. Dept. of Agriculture, Human Nutrition Information Service Subject: Pork--Composition--Tables; Canned pork--Composition--Tables; Food Composition Tables (<http://naldc.nal.usda.gov/catalog/CAT84802715>).

See also <http://naldc.nal.usda.gov/naldc/download.xhtml?id=CAT84802715&content=PDF> which was accessed on July 10, 2014.

Does USDA consider Purge to be retained water?

No, FSIS Directive 6700.1 (11/27/2002) addresses this question:

17. How is the retained water statement handled with chitterlings since the product is allowed to be packaged with up to a 20 percent purge?

Answer: Many years ago, before 1992, FSIS allowed, under normal conditions and good manufacturing practices, purge in containers of chitterlings not to exceed 20 percent of the marked weight of the product. The policy is long-held and is practiced industry wide. Consumers who purchase this product are aware of the policy and practice and have come to expect moisture content in chitterlings. As a result of this long-standing policy, no retained water statement is required when chitterlings are packaged with a purge. If chitterlings retain water during post evisceration processing and are not packaged with a purge, the product's labeling is required to bear a retained water statement.

The Impact of Freezing on Cells – Industry Approaches to Compliance

When meat or poultry products are frozen, the water that is a natural component of all meats turns to solid ice crystals. The water expands when it freezes and the sharp-edged crystals push into the surrounding tissue, rupturing the cells. The water that is outside the cell wall freezes first. As it does, it leeches water from the cell walls. After thawing, the product will have lost some of its natural springiness because the water released from the cells during freezing flows out of the thawing meats. Studies have shown that under some conditions, cell destruction can also occur during the thawing process.⁶ After chitterlings are washed, they are weighed in advance of packaging. The weight includes the chitterlings (and the fluid held within the cell walls), and water accumulated in the folds and on the surface of the chitterlings, which are then packaged for freezing. Chitterlings are made up of gelatinous cells that easily rupture and the amount of damage depends primarily on the speed of the freezing process. When the chitterlings are thawed, the purge flowing out includes water that was originally held within many of the cells, the surface water, and water trapped in the crevices and folds of the product.

There are studies showing freezing damages the cells and releases water that cannot be reabsorbed. If chitterlings are tested before freezing and a purge of 20 % is found, any test conducted after freezing and thawing will find a much higher level of purge. Purge occurs with all meats, but with chitterlings, the amount of purge is measured and is required to meet a limit. The USDA limits the amount of water at point of pack to 20 % so consumers receive a certain amount of meat solids in a product that is packaged in water. A limit on purge is similar to a standard-of-fill that the Food and Drug Administration defines for other food products with similar water versus solid content issues (e.g., tuna fish). For these reasons, and to ensure they meet the USDA requirements, several chitterling packers keep their pre-packaged chitterling purge levels to 7 % to 10 %. Yet, as mentioned above, packages from those packers are often found to have purge levels of 24 % to 34 % when thawed, and the NIST Handbook 133 procedures are used to test purge levels.

⁶ Mazur, Peter, "Freezing of Living Cells: mechanisms and implications." American Journal of Physiology, 247. 1984.

Background

In 2011 the OWM was contacted by several state weights and measures officials for assistance in resolving disagreements with packers over the use of NIST Handbook 133, “Checking the Net Contents of Packaged Goods.” Several state inspectors reported they routinely receive consumer complaints about the amount of purge in chitterlings, and they had used Section 2.6. “Determining the Net Weight of Encased-in-Ice and Ice Glazed Products” to verify the net weight. They also reported that the amount of purge had been determined after thawing the frozen chitterlings. Data from the inspectors revealed that the purge from all of the chitterlings tested exceeded a 20 % limit specified by USDA. OWM also learned that at least one state had taken legal action against a packer whose chitterlings failed the 20 % purge limit. The state had collected its evidence using a test procedure similar to Section 2.6. but had added some practical modifications so it was usable in testing chitterlings.⁷

Another concern raised by the inspectors was that neither a purge limit nor test procedures for the determination of purge are included in NIST Handbook 133. As noted above, the test procedures in Section 2.6. were originally developed for drained weight testing of shrimp and other frozen foods to verify only net weight declarations. OWM agreed to review the test methods used by the state inspectors to see if the current test procedure could be revised to make it appropriate for use in testing chitterlings.

Note: The 2005 edition of NIST Handbook 133 was adopted by the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture for use in testing meat and poultry products in 2008 (see 9 CFR 442.2 “Quantity of Contents Labeling and Procedures and Requirements for Accurate Weights” and 73 FR 52192).

Based on the information presented above, state weights and measures inspectors need to have a test procedure tailored to the testing of chitterlings in NIST Handbook 133 so inspectors can test in retail stores in response to consumer complaints. States do not have access to packing plants located in other states or countries; therefore, they rely on tests at retail or wholesale locations for their investigations. Testing at the retail level (the end point in distribution) allows inspectors to look at a variety of packers to ensure fair competition, and state inspectors are able to discover changes to the product that may occur during distribution from environmental factors, mishandling or tampering of product. Packers and consumers both benefit from having retail marketplace surveillance to maintain equity and fair competition.

⁷ In November 2010, San Diego County District Attorney’s Office filed a complaint and stipulated judgment against Clougherty Packing, LLC for \$451,564. Clougherty settled without admitting fault or liability. The case resulted from a consumer complaint to the California Department of Measurement Standards (CDMS) regarding large amounts of purge from chitterlings. More than 60 000 packages of chitterlings were ordered off-sale after samples were tested and shortages ranging from 31 % to 45 % were found.

Net Weight versus Purge

A review of test results from several states and a university indicates that a majority of the packaged chitterlings tested comply with the average and individual package requirements for net weight as required under NIST Handbook 133. Currently, the handbook does not include limits on the amount of purge from chitterlings. State weights and measures officials follow a 20 % limit published by the USDA. Determining the amount of purge goes beyond net weight testing. Several inspectors reported the test procedure to conduct the purge tests in Section 2.6. had to be modified. Inspectors asked for technical assistance in evaluating whether their modifications to the current procedure were acceptable and requested revisions to accommodate purge testing be made to NIST Handbook 133 so the test procedure would be uniform and accepted nationally.

USDA established the limits on purge to ensure that packages of chitterlings contain a certain percentage of meat. Currently, the USDA policy sets the upper limit of purge at 20 % of the labeled quantity. Recent inspections conducted by several states and a comprehensive study by a university found that packages of frozen chitterlings from several packers (including one supplier from Europe) contain purge in the range of ± 30 % to + 50 %. The following results were obtained using the current test procedures based on Section 2.6. Inspections by state weights and measures inspectors in California, Florida, Mississippi and Louisiana, which were carried out in response to consumer complaints about high amounts of purge in packages of chitterlings, revealed the following: (1) In October 2010, weights and measures inspectors from Louisiana tested samples from 10 lots (totaling more than 7740 containers) and found an average purge of 49 %; (2) In October 2010, Florida weights and measures inspectors tested samples from a lot of 324 packages and found an average purge 33 %; and (3) In November 2010, the San Diego District Attorney announced a settlement in an investigation of a consumer complaint. In this case weights and measures inspectors had tested lots totaling 60,588 packages from one packer and had found shortages of 31 % to 45 %.

Several chitterling packers have expressed concerns about the appropriateness of the test procedures used by inspectors and about the high purge levels inspections had uncovered. One packer/retailer commented that it was difficult for his company to compete against many other packers because chitterlings are not routinely tested for compliance with purge limits. Several packers shared in-plant test data from their plants showing they target for a purge of 7 % to 10 % on in-plant tests. These packers reported that if they do not target for low purge levels in their testing, they see a dramatic jump in consumer complaints about excessive purge.

The data from one university study of five packers indicates that the purge from sample lots (total $5 \times 30 = 150$ packages) ranged from 26.9 % to 57.3 % or from about 7 % to 37 % higher than the 20 % limit set by the USDA. The data was obtained in laboratory conditions and showed significant differences in purge amounts. The differences are likely caused by packers having different pre and post freezing purge targets and variations in test equipment and drain procedures. There are also likely to be different fill target weights, weighing devices (e.g., different scale divisions), and other unique packaging procedures or freezing processes.

Variations in the standard deviations found on packages produced by the different packers ranged from 1.7 % to 5.2 %. The results include samples with purge rates as low as 18 % and as high as 66 %. The range of net contents is so wide that it would likely frustrate the ability of consumers

to estimate how many packages to purchase to obtain a specific amount of chitterlings for use in a recipe, to determine serving size, and to make value comparisons. Even packages from the same packer had a wide range of purge values.

| Packer | a | b | c | d | e |
|---|--------------|--------------|--------------|--------------|--------------|
| Average Purge* | 34.2 % | 57.3 % | 26.9 % | 33.6 % | 27.9 % |
| Standard Deviation (σ) | 1.9 | 3.2 | 1.7 | 5.2 | 2.4 |
| Range of Results ($\pm 3 \sigma$) | 28 % to 40 % | 47 % to 66 % | 21 % to 31 % | 18 % to 49 % | 20 % to 35 % |
| *Data is percentage purge based on labeled quantity from a 2008 study conducted by Dr. Ken Prusa, Professor, Iowa State University of Science and Technology on samples from five packers of 30 packages of frozen chitterlings using the procedures in Section 2.6. of NIST Handbook 133. Published with permission. | | | | | |

Thawing Procedures

Several inspectors requested guidance on how to efficiently thaw chitterlings to improve the proficiency of their tests and accuracy of the results. Inspectors stated the thawing process for large frozen packages (e.g., 2.2 kg, 5.0 kg [5 lb and 10 lb] packages of frozen product) is time consuming regardless of the product. Access to large quantities of hot water and sink space are significant problems in many locations (the National Marine Fisheries, an agency of the U.S. Department of Commerce has indicated that their inspectors face similar challenges when they conduct inspections of imported seafood). A few state inspectors reported that they have to let sample packages of chitterlings sit in room temperature water for long hours or in a refrigerator for several days to allow them to thaw. Another packer reported that its tests had not revealed any correlation between thaw time and increased purge. Still, reviewing the current thawing procedures to identify ways to increase uniformity, repeatability, and accuracy may be beneficial.

The thawing procedure in NIST Handbook 133 specifies that the water temperature be maintained between 23 °C to 29 °C (75 °F to 85 °F). Some inspectors asked if the temperatures of the water increases purge or if the temperature of the chitterlings at the time they are drained impacts purge levels. One packer has conducted some preliminary testing to explore that question. The results of those tests indicated that the water temperature used to thaw the chitterlings probably does not increase purge results, however, the water must not be too hot because it may cause the proteins in the chitterlings to denature. The packer's tests indicated the temperature of the chitterlings at the time they are drained may increase purge values. The data showed that warm chitterlings (e.g., room temperature or about 70 °F) lost about 10 % more purge than chitterlings cooled to 40 °F before draining. Because the packer's data is limited more study is needed to better understand this aspect of purge testing.

Draft Proposed Section 2.7. for a Chitterling (and Beef Tripe) Test Procedure

Introduction

This test procedure was originally developed for the Food and Drug Administration (FDA) in the 1960s for its use in testing frozen blocks of seafood and other products. Over the years it has been modified for use in testing a variety of products including frozen seafood and glazed chicken breasts. Based on a review of the USDA procedures and information received from several weights and measures inspectors and chitterling packers, several changes are proposed for Section 2.6. “Determining the Net Weight of Encased-in-Ice and Ice Glazed Products” to make it appropriate for use in testing frozen chitterlings when determining their net weight and the amount of purge in the package.

The draft test procedure can be used in USDA inspected packing plants and in wholesale and retail locations by weights and measures officials to determine if it is practical and to identify additional areas for improvement. For the test procedure to be added to NIST Handbook 133, it must be adopted by the NCWM.⁸ Before submitting any proposal to the NCWM, support from both packers and weights and measures officials must be garnered. One goal of this paper is to raise the question of whether or not the 20 % purge limit set by USDA is appropriate for previously frozen chitterlings. Based on the information presented below, the current purge value of 20 % may not be appropriate for use in testing frozen chitterlings. However, increasing it to 30 % would not dramatically increase compliance levels. Before an appropriate purge value for frozen chitterlings can be recommended, data from tests of packages from many packers must be collected using a uniform test procedure.

The OWM recommends the formation of a WG to review of the draft chitterling test procedure. The group should consider investigating some of the other issues mentioned above, including developing and sharing good packing practices and alternative thawing procedures. Once a uniform test method and good packing practices are in place, data could then be collected to determine if a different purge limit for frozen chitterlings should be considered. OWM will use the draft test procedure to provide training to interested state officials and will recommend that states use it in investigations of consumer complaints. OWM will also encourage states to share their experience with the draft procedure so it can be improved, and invite them to share test data with the group so the data can be used to evaluate the test procedure and existing purge limit.

⁸ The NCWM is a not-for-profit corporation dedicated to developing the U.S. standards for weights and measures. The NCWM is open to all interested parties and among its membership are representatives of the American Meat Institute and Food Marketing Institute and many of their member companies.

Modifications of Section 2.6. Net Weight of Encased-In-Ice and Ice Glazed Products for Use with Chitterlings

1. As with other foods where drained weight testing is used, the weight-per-volume of solids is approximately the same as the fluid poured from the package so all of the samples must be opened. For this reason, the use of an average tare weight or an average purge value cannot be used to compute package errors.

Change: Add the following note to the test procedure in NIST Handbook 133:

Note: All of the packages in the sample must be opened. This is because the purge from each package may vary significantly. Another reason is that the weight-per-volume of solids is often nearly equal to the weight of the liquid poured from the package. For these reasons an average tare weight or average purge value calculated using just a few packages would not be representative of the sample.

2. A Weights and Measures Inspector reported that a 300 mm (12 in) sieve could hold 2.2 kg (5 lb) of chitterlings when tilted at 30 degrees but several measurements were required when larger containers were tested. It was suggested that a note be added to the test procedure to clarify that multiple measurements were permitted and to alert inspectors that some sieves may not hold the entire contents of larger packages.

Change: Add the following:

Note: If the amount of chitterlings in the package exceeds the capacity of the sieve, divide the solids evenly among several sieves of the same dimensions or make multiple determinations using a single sieve.

Addressing Differences from Current Field Use

3. **Packed or Unpacked** – Section 2.6. requires products to be unwrapped so they can be thawed in a water bath. The temperature is typically maintained using a constant flow of warm water. In discussions with state weights and measures inspectors who have tested chitterlings, we learned that they thaw the chitterlings while they are still packaged so they can obtain an accurate measurement of the purge from each package. State inspectors also report that allowing selected frozen sample packages to thaw for several days at 4 °C (40 °F) and then using a warm water bath to complete the process is a practical alternative that should be recognized when limited time and other resources exist (e.g., a sample size of 48 packages is needed to test a large inspection lot and there are limited sinks and water supplies at the point of inspection.)

Change: Revise the procedure so frozen chitterlings can be thawed in the package and add a statement indicating that alternative thawing procedures may be used. Also, delete reference to the wire mesh basket used to hold unwrapped products under water while preventing the loss of product solids.

Associated with this provision is a note which reads that “Direct immersion does not result in the product absorbing moisture because the freezing process causes tissue to lose its ability to hold water.” If the procedure is modified to allow frozen chitterlings to be thawed in the package the note is no longer relevant and it should be removed.

Change: Delete the NOTE.

4. **Thawing Procedure** – Inspectors have reported difficulties using the thawing techniques prescribed in Section 2.6. due to the size of the containers, sample sizes, availability of an adequate size water bath, and supply of hot water. The draft procedure calls for the packages to be immersed in a water bath. But, when the sample is made up of 4.0 kg (10 lb) buckets, many sinks cannot hold more than a few containers. To determine if the center of a bucket has thawed an inspector recommended that a dowel rod be inserted gently into the container to determine if there is any remaining frozen product or chunks of ice.

Change: Amend the section to allow for the use a sink, ice chest or other large vessel. Add a note for the inspector to use a dowel rod to determine if the product has completely thawed and that there are no chunks of ice in the container.

5. A packer suggested guidance to help inspectors decide when chitterlings are “thawed out.” The recommendation was to add a statement that a “thawed condition” is one in which no ice crystals are observed or felt in or on the chitterlings.

Change: Insert a note that the chitterlings are thawed when it is determined by touch that they are not rigid and no ice crystals are observed or felt within or on their outside surface.

6. **Drain Angle** – The techniques that inspectors use to tilt the sieve to drain chitterlings (and other frozen products) vary widely which may affect test results. The current procedure specifies that the sieve be tilted at a 30 degree angle for two minutes. To address this issue, a tilt-angle block was fabricated so that it raises a 304 mm (12 in) sieve to the correct height of 152 mm (6 in) to achieve a 30 degree angle. (See figure 1 on page 17 for an example). The angle block was designed for use with both the 203 mm (8 in) and 304 mm (12 in) sieves and at other drain angles. A drawing of one type of angle block is available upon request from OWM to allow for local construction.

Change: Add Figure 1 (page 17) to the test procedure and provide access to drawings of one type of tilt-angle block so it can be fabricated locally. Include the following note:

Note: Other methods may be used for draining as long as the correct drain angle is used.

7. **USDA Policy on Chitterling Purge** – Several inspectors pointed out that NIST Handbook 133 does not include a purge limit. It was suggested that the current USDA limit on purge be added to NIST Handbook 133.

Change: Add a requirement to NIST Handbook 133 to include the USDA 20 % limit on purge.

8. **USDA Policy on Chitterling Purge** – The USDA procedure for purge tests conducted inside a packing plant is to calculate it using the individual labeled quantity and actual net weight of

the package, not the gross weights of the individual packages (standardized). USDA policy also only applies an average requirement to purge tests. No Maximum Allowable Variation is applied to the individual purge results. This USDA policy must be added to the NIST Handbook 133 procedure to ensure consistent testing and application of the purge requirements between the packing plant and the field.

Change: Add a step in the procedure to calculate purge values for each package using the quantity labeled on the package.

10. **Other Changes** – Amend the procedure to explain how to determine purge values and net weight requirements. These additions are incorporated in the following draft of 2.X.

A draft procedure for determining the net weight and percent of purge of chitterlings is presented below. If the procedure is added to NIST Handbook 133, it will be added as a new Section 2.7. in Chapter 2. “Test Procedures – For Packages Labeled by Weight – Gravimetric Testing.” Worksheets for use in testing chitterlings with both the Category A and Category B Sampling Plans are included.

Draft NIST Handbook 133 – Chitterling Test Procedure 2.7.

Because of the unique properties of chitterlings, they require special test methods to ensure the integrity and consistency of the test.

2.7. Determining the Net Weight and Percent of Purge in Packages of Fresh and Frozen Chitterlings

2.7.1. Test Equipment

- Scale or balance and mass standards (the standards are used to verify the accuracy and repeatability of the weighing device).
- Partial immersion thermometer or equivalent with 1 °C (2 °F) graduations and a – 35 °C to + 50 °C (– 30 °F to + 120 °F) accurate to ± 1 °C (± 2 °F).
- Sink (e.g., water bath, ice chest) or other receptacle of suitable size to hold the packages for thawing and water source and hose with fresh water that can be maintained at a temperature between 23 °C to 29 °C (75 °F to 85 °F) (for thawing plastic bags or buckets of chitterlings).

An alternative thawing procedure for packages requires access to a refrigerator that must be available for storing sample packages for several days to thaw.

- Stainless Steel Sieve(s) and Drain Pan(s) - Number 8 mesh, 203 mm (8 in) or 304 mm (12 in). Use is based on the labeled net weight of the package under inspection.
- Stopwatch (to measure drain periods).

- Knife or box cutter (to open packages).
- Waterproof marking pen (for numbering the packages).
- Disposable (non-latex) gloves.
- Paper towels (drying sieve drain pan, packages and work area).
- Large plastic bags (to hold product emptied from packages).
- Plastic rod (to insert into buckets of chitterlings to determine if the product is thawed and to ensure there are no chunks of ice remaining).

2.7.2. Test Procedure for Net Weight and Purge Determination for Fresh and Frozen Chitterlings.

This procedure is used to determine (1) the net weight and (2) the purge in packages of fresh and frozen chitterlings. The purge determination procedure requires the destructive testing of all of the sample packages.

1. Follow Sections 2.3.1. Define the Inspection Lot, 2.3.2. Select Sampling Plans (use the “Category A” Sampling Plans in Table 2-1 if the testing is outside of a USDA inspected packing facility or, the “Category B” Sampling Plan in Table 2-2 if the testing is inside a USDA inspected packing facility), 2.3.3. Record Inspection Data, and 2.3.4. Random Sample Selection.
 - Select the random sample of packages.
 - Dry the sample packages and number each (e.g., 1-12) using a waterproof marker.
 - Record the Product Brand, Inspector Name, Labeled Net Weight (top of Column A), Packer Identity, Lot Code, Number of Unreasonable Errors, MAV from Table 2-9, and the Unit of Measure of the scale used for weight determinations on the worksheet. The appropriate information can be transferred to an official inspection report at the conclusion of the inspection. The worksheet should be added to the official record of the inspection.

2.7.2.1. Net Weight and Purge Determinations

Follow these procedures to determine the net weight and amount of purge from chitterlings.

2.7.2.1.1. Test Procedure for Determining the Net Weight and Purge from Fresh and Frozen Chitterlings.

1. Determine the Gross Weight of each sample package (record in Column B).
2. Determine the tare weight of the sieve drain pan (record in Drain Pan Tare above Column F).

Frozen Chitterlings

3. Fully immerse the unopened package of frozen chitterlings in a water bath maintained at a temperature between 23 °C to 29 °C (75 °F to 85 °F).

Note: An alternative approach to thawing large frozen packages (e.g., 5 kg [10 lb] plastic pails) is to randomly select [mark them to be held for inspection] the sample packages and place them in a refrigerator for partial thawing over several days and then carrying out the final thawing using the water bath technique.

Note: If the products are to be placed in refrigerated storage for several days for partial thawing, segregate them from other product inventory and mark each container with an identifier to allow the inspector to ensure that they were the samples selected for testing (mark both lid and container on buckets) when the inspection is resumed after the thawing process. Also, mark the packages with a conspicuous notice that they are being held for inspection.

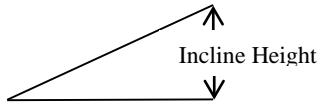
4. Maintain a continuous flow of water into the bath to keep the temperature within the specified range until the chitterlings are thawed. The chitterlings are thawed when it is determined by touch that they are not rigid and no ice crystals are observed or felt within or on their outside surface.

Note: for buckets insert a plastic rod into the chitterlings to determine if the product is thawed and to ensure there are no chunks of ice remaining.

Fresh and Frozen Chitterlings

5. Draining the Chitterlings: depending on the availability of a sink and work space and the inspector's preference, use the procedures in either Method a. or Method b. to drain the chitterlings.⁹ Refer to the Table for the appropriate size sieve to use based on the labeled net weight on the package.

⁹ If carried out with proficiency, which comes with practical experience, the procedures in Method a. and Method b. will provide identical results. The procedure in Method b requires additional steps to calculate the Purged Net Weight but some inspectors have indicated that they prefer Method b. because the drain time and product is easier to control (because the chitterlings in the sieve may continue to drain). Regardless of the method used the inspector must handle the product carefully but quickly to avoid errors that may void the test. Also, some inspectors often use a waste container to collect the package liquids so that all of the product can be returned the package for subsequent return to the packer. Other inspectors

| Table 1. | | | |
|--|-------------------|--|----------------------|
| Labeled Net Weight | Sieve Diameter | 30 Degree Tilt from Horizontal | Incline Height |
| If more than 453 g (1 lb) use a: | 300 mm (12 in) |  | 175 mm (6.9 in) |
| If less than 453 g (1 lb) use a: | 203 mm (8 in) | | 116.8 mm (4.6 in) |
| <ul style="list-style-type: none"> • This procedure requires that the sieve and drain pan be cleaned and dried after each use. It is a good measurement practice to obtain the dry weights of both the sieve and pan and recheck those weights periodically during the test to make sure the cleaning and drying procedures are efficient. • If the amount of chitterlings in the package exceeds the capacity of the sieve, divide the solids evenly among two or more sieves of the same dimensions or make multiple determinations using a single sieve. Exercise care when transferring the chitterlings into the sieves to avoid spilling liquid which can void the test. | | | |

Method A. Place a sieve over a sink or waste collection container.¹⁰ Pour the chitterlings into the sieve and distribute them over the surface of the sieve with a minimum of handling. Hold the sieve firmly and incline it 30 degrees (see Figure 1 for an example of a tilt block for use with a sink drain set at 30 degrees) to facilitate drainage, then start the stop watch and drain for exactly two-minutes. At the end of the drain time immediately transfer the chitterlings to a Drain Pan for weighing. Determine the Purged Net Weight of the chitterlings using the following formula and Record in Column F of the worksheet.

$$\text{Drained Chitterlings and Drain Pan} - \text{Drain Pan Tare} = \text{Purged Net Weight}$$

Method B. Place a sieve on its Drain Pan. Pour the chitterlings into the sieve and distribute them over the surface of the sieve with a minimum of handling. Hold the sieve firmly and incline it 30 degrees to facilitate drainage, then start the stop watch and drain for exactly two-minutes. At the end of the drain time immediately transfer the Drain Pan with the Purged Liquid to the scale for weighing. Dry the empty package to determine its tare weight and enter it in Column C. Determine the Purged Net Weight of the chitterlings using the following formula and Record in Column F of the worksheet.

$$(\text{Gross Weight of Package} - \text{Package Tare Weight}) - (\text{Weight of Purged Liquid \& Drain Pan} - \text{Drain Pan Tare}) = \text{Purged Net Weight}$$

$$(\text{Column B} - \text{Column C}) - (\text{Weight of Purged Liquid \& Drain Pan} - \text{Drain Pan Tare}) = \text{Purged Net Weight}$$

report that some retailers do not want the product repackaged so the liquids are drained into a sink, the solids discarded, and the disposition reported on the inspection report.

¹⁰ Ibid., p. L&R – B14.

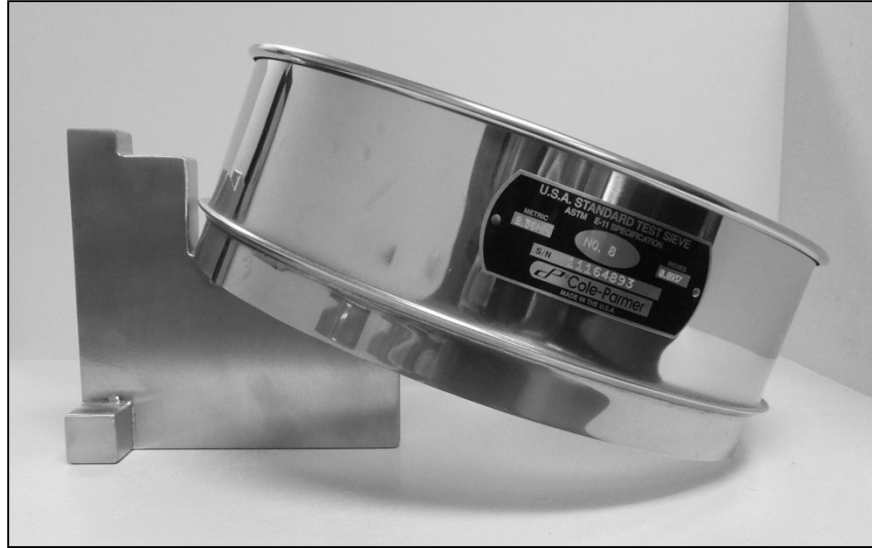


Figure 1. Tilt Block set at 30 degrees

6. Calculate Purge using the formula shown below (use the labeled net weight in Column A and NOT the gross weight of the package in Column B) and record the result in Column G of the Worksheet.

$$\text{Purge in \%} = (\text{Labeled Weight} - \text{Purged Net Weight}) \div \text{Labeled Weight} \times 100$$

$$\text{Purge in \%} = \text{Column A} - \text{Column F} \div \text{Column A} \times 100$$

Example: The labeled net weight is 5 lb and the Purged Net Weight is 4.19 lb

$$5 \text{ lb} - 4.19 \text{ lb} = 0.81 \text{ lb} \div 5 \text{ lb} = 0.162 \times 100 \% = 16.2 \% \text{ purge}$$

7. Dry the empty package and determine its tare weight (record in Column C of the worksheet.)
8. Subtract the individual Package Tare Weight from the individual Package Gross Weight to obtain the Actual Package Net Weight (record in Column D of worksheet). Do not use an Average Tare Weight. Use the formula:

$$\text{Actual Package Net Weight} = \text{Gross Weight} - \text{Tare Weight}$$

$$\text{Actual Package Net Weight} = \text{Column B} - \text{Column C}$$

9. Subtract the Actual Package Net Weight from the Labeled Net Weight (record in Column E of worksheet). Use the formula:

Package Error = Labeled Net Weight – Actual Package Net Weight

$$Package\ Error = Column\ A - Column\ D$$

Repeat for all packages in the sample.

Note: The determination of compliance with the net weight and purge requirements are carried out concurrently. The calculation of the average net weight and average purge is completed after all of the packages are opened and all purge amounts are obtained. The sample must pass both the net weight and purge tests to comply with this section.

2.7.3. Evaluations of Results – Compliance Determinations

1. Net Weight

- a. **Individual Package Requirement:** If there are negative package errors, determine if any of the values exceed the Maximum Allowable Variation (MAV) for the packaged quantity in NIST Handbook 133, Appendix A, Table 2-9. “U.S. Department of Agriculture, Meat and Poultry Groups and Lower Limits for Individual Packages” (i.e., if the labeled net weight is more than 3 lb up to 10 lb then the MAV = 42.5 g (0.094 lb) 1.5 oz).
 - If a package error exceeds the MAV, mark it as “Failed” in the MAV Fail column.
 - Count the number of packages that exceed the MAV. If the number of packages that exceed the MAV is greater than the number allowed in NIST Handbook 133, Appendix A, Tables 2-1. Sampling Plans for Category A or Table 2-2. Sampling Plans for Category B, the sample fails. Mark the sample as “Failed” in the Net Weight Compliance section of the worksheet.
 - If the sample passes the Individual Package Requirement, apply the Average Error Requirement.
- b. **Average Error Requirement:** Sum the package errors in Column E and enter the value in E1 – Total Error. Divide the value in E1 by the Sample Size (n) to obtain an Average Error and enter the value in E2. If the Average Error (E2) is a positive number, the sample passes. Go to the Net Weight Compliance Section and mark the sample as “Passed.”
 - If the Average Error (E2) is a negative number, calculate the sample standard deviation of the package errors (Column E) and enter it in the block provided in the Net Weight Compliance section.

- Use the Sample Correction Factor (SCF) to calculate the Sample Error Limit (SEL).

$$\text{Sample Error Limit (SEL)} = \text{Sample Standard Deviation} \times \text{Sample Correction Factor}$$

- Disregarding the signs,
 - if the Average Error (E2) is larger than the SEL, the sample fails. Mark it “Failed” in the Net Weight Compliance Section of the worksheet,
 - or
 - if the Average Error is less than the SEL, the sample passes. Go to the Net Weight Compliance Section and mark the sample as “Passed.”

2. Purge

Follow these procedures to determine the amount of purge from the chitterlings. Apply the Average Requirement in Section 2.3.7.2. to the purge to determine if the sample passes or fails the requirement. The Average Adjusted Purge (AAP) for the sample shall not exceed 20 % of the labeled weight. The Maximum Allowable Variations (Lower Limits for Individual Packages) in NIST Handbook 133, Appendix A, Table 2-9. are not applied in the purge test.

- Sum the purge values in Column G and enter the value in G1 – Total Purge. Divide the value in G1 by the Sample Size (n) to obtain an Average Purge and enter the value in G2. If the Average Purge (G2) is less than or equal to 20 %, the sample passes. Go to the Purge Compliance Section and mark the sample as “Passed.”
- If the Average Purge is greater than 20 %, calculate the Sample Standard Deviation of the values in Column G and enter it in the block provided in the Purge Compliance section.
- Use the Sample Correction Factor (SCF) to calculate the Purge Sample Error Limit (PSEL) in percent.
- Subtract the PSEL from the Average Purge (G2) to obtain an Adjusted Average Purge (AAP) and enter that value in G3.
- Pass or Fail

- If the AAP (G3) is greater than 20 %, the sample fails. Enter the Purge Value (G3) in the Purge Compliance section and mark the sample as “Failed.”

or

- if the AAP (G3) is 20 % or less, the sample passes. Enter the Purge Value (G3) in the Purge Compliance section and mark the sample as “Passed.”

| INSPECTOR: <i>S. INSPECTOR</i> | | CHITTERLING WORKSHEET NET WEIGHT & PURGE DETERMINATIONS WORKSHEET FOR SAMPLE OF 12 PACKAGES – HB 133 CATEGORY A | | | | | | | |
|--|--------------------|---|---------------------|--------------------------------------|--------------------------|---|--|---|-------------------------------|
| DATE: <i>July 12, 2014</i> | | PACKER: <i>PACKER INC. 1000 ROADWAY PACKINGTOWN, USA</i> | | | | LOT CODE: <i>A342012</i> | | DRAIN PAN TARE: <i>0.997 lb</i> | UNIT OF MEASURE: <i>lb</i> |
| PACKAGE NUMBER | A | B | C | D | E | IF ERROR EXCEEDS MAV = FAIL | F | G | |
| | LABELED NET WEIGHT | PACKAGE GROSS WEIGHT | PACKAGE TARE WEIGHT | ACTUAL PACKAGE NET WEIGHT B – C = | PACKAGE ERROR D – A = | | PURGED NET WT WEIGHT OF DRAINED CHITTERLINGS (OR PURGED LIQUID) AND DRAIN PAN – DRAIN PAN TARE = | PURGE % $\frac{(A - F) \times 100}{A}$ | |
| 1 | <i>5 lb</i> | <i>5.130</i> | <i>0.032</i> | <i>5.098</i> | <i>0.098</i> | | <i>4.19</i> | <i>16.2</i> | % |
| 2 | | <i>5.160</i> | <i>0.033</i> | <i>5.127</i> | <i>0.127</i> | | <i>4.21</i> | <i>15.8</i> | % |
| 3 | | <i>5.012</i> | <i>0.032</i> | <i>4.980</i> | <i>- 0.020</i> | | <i>4.17</i> | <i>16.6</i> | % |
| 4 | | <i>5.170</i> | <i>0.034</i> | <i>5.136</i> | <i>0.136</i> | | <i>4.20</i> | <i>16.0</i> | % |
| 5 | | <i>5.020</i> | <i>0.033</i> | <i>4.987</i> | <i>- 0.013</i> | | <i>4.18</i> | <i>16.4</i> | % |
| 6 | | <i>5.102</i> | <i>0.032</i> | <i>5.070</i> | <i>0.070</i> | | <i>4.22</i> | <i>15.6</i> | % |
| 7 | | <i>5.051</i> | <i>0.033</i> | <i>5.018</i> | <i>0.018</i> | | <i>4.24</i> | <i>15.2</i> | % |
| 8 | | <i>5.116</i> | <i>0.032</i> | <i>5.084</i> | <i>0.084</i> | | <i>4.20</i> | <i>16.0</i> | % |
| 9 | | <i>5.120</i> | <i>0.034</i> | <i>5.086</i> | <i>0.086</i> | | <i>4.19</i> | <i>16.2</i> | % |
| 10 | | <i>5.023</i> | <i>0.032</i> | <i>4.991</i> | <i>- 0.009</i> | | <i>4.20</i> | <i>16.0</i> | % |
| 11 | | <i>5.122</i> | <i>0.032</i> | <i>5.090</i> | <i>0.090</i> | | <i>4.26</i> | <i>14.8</i> | % |
| 12 | | <i>5.020</i> | <i>0.033</i> | <i>4.987</i> | <i>- 0.013</i> | | <i>4.18</i> | <i>16.4</i> | % |
| NUMBER OF UNREASONABLE ERRORS ALLOWED: NONE Table 2-9. MAV: <i>0.0.094 lb</i> | | E1 – TOTAL ERROR <i>0.054 lb</i> | | | | G1 – TOTAL PURGE <i>191.2</i> | | % | |
| | | E2 – AVERAGE ERROR <i>0.0045</i> (E1 ÷ n =) | | | | G2 – AVERAGE PURGE <i>15.9</i> (G1 ÷ n =) | | % | |
| | | G3 – ADJUSTED AVERAGE PURGE (G2 – PSEL =) | | | | | | | % |
| NET WEIGHT COMPLIANCE: (1) If any of the minus package errors (see Column E) exceed the MAV, the sample fails. (2) If none exceeds the MAV and the Average Error (E2) is a positive number, the sample passes. (3) If the Average Error (E2) is a minus number, calculate the sample standard deviation and enter it below. (4) Use the Sample Correction Factor (SCF) to calculate the Sample Error Limit (SEL). (5) Disregarding the signs, (a) if the Average Error (E2) is larger than the SEL, the sample fails or (b) if the Average Error is less than the SEL the sample passes. | | | | | | | | | |
| STANDARD DEVIATION: <i>0.0601</i> × 0.635 (SCF) = <i>0.0382</i> (SEL) PASSED ✓ FAILED | | | | | | | | | |
| PURGE COMPLIANCE: MAVS ARE NOT APPLIED IN THE PURGE TEST (1) If the Average Purge Error (G2) is less than or equal to 20 %, the sample passes. (2) If the Average Purge Error is greater than 20 %, calculate the sample standard deviation and enter it below. (3) Use the Sample Correction Factor (SCF) to calculate the Purge Sample Error Limit (PSEL) in percent. (4) Subtract the PSEL from the Average Purge (G2) to obtain an Adjusted Average Purge (AAP) and enter that value in G3. (5)(a) If the AAP (G3) is greater than 20 %, the sample fails or (b) if the AAP (G3) is 20 % or less, the sample passes. | | | | | | | | | |
| STANDARD DEVIATION: <i>2.420</i> × 0.635 (SCF) = <i>1.536</i> (PSEL) PURGE (G3) <i>18.83</i> % PASSED ✓ FAILED | | | | | | | | | |
| SAMPLE DISPOSITION: <i>Lot passes on both criteria.</i> | | | | | | | | | |

| INSPECTOR: <i>S. INSPECTOR</i> | | CHITTERLING WORKSHEET FOR USE INSIDE A USDA INSPECTED PACKING PLANT | | | | | | | | |
|--|--------------------|---|----------------------------------|--|------------------------------|--------------------------------|--|---|------------|---|
| DATE: <i>July 14, 2014</i> | | NET WEIGHT & PURGE DETERMINATIONS | | | | | | | | |
| WORKSHEET FOR SAMPLE OF 10 PACKAGES – HB 133 CATEGORY B | | | | | | | | | | |
| PACKER: <i>PACKER INC. 1000 ROADWAY PACKINGTOWN, USA</i> | | | | LOT CODE: <i>A34526</i> | | DRAIN PAN TARE: | | UNIT OF MEASURE: | | |
| | | | | BRAND: <i>ALLBRAND</i> | | <i>0.997 lb</i> | | <i>lb</i> | | |
| PACKAGE NUMBER | A | B | C | D | E | IF ERROR EXCEEDS MAV = FAIL | F | G | | |
| | LABELED NET WEIGHT | PACKAGE GROSS WEIGHT | PACKAGE TARE WEIGHT | ACTUAL PACKAGE NET WEIGHT B – C = | PACKAGE ERROR D – A = | | PURGED NET WT DRAINED CHITTERLINGS (OR PURGED LIQUID) AND PAN – DRAIN PAN TARE = | PURGE % $\frac{(A - F) \times 100}{A}$ | | |
| 1 | 5 | 5.130 | 0.032 | 5.098 | 0.098 | | 4.19 | 16.2 | % | |
| 2 | | 5.160 | 0.033 | 5.127 | 0.127 | | 4.21 | 15.8 | % | |
| 3 | | 5.012 | 0.032 | 4.980 | - 0.020 | | 4.17 | 16.6 | % | |
| 4 | | 5.170 | 0.034 | 5.136 | 0.136 | | 4.20 | 16.0 | % | |
| 5 | | 5.020 | 0.033 | 4.987 | - 0.013 | | 4.18 | 16.4 | % | |
| 6 | | 5.102 | 0.032 | 5.070 | 0.070 | | 4.22 | 15.6 | % | |
| 7 | | 5.051 | 0.033 | 5.018 | 0.018 | | 4.24 | 15.2 | % | |
| 8 | | 5.116 | 0.032 | 5.084 | 0.084 | | 4.20 | 16.0 | % | |
| 9 | | 5.120 | 0.034 | 5.086 | 0.086 | | 4.19 | 16.2 | % | |
| 10 | | 5.023 | 0.032 | 4.991 | - 0.009 | | 4.20 | 16.0 | % | |
| NUMBER OF UNREASONABLE ERRORS ALLOWED: NONE | | | E1 – TOTAL ERROR | | | <i>0.057 lb</i> | G1 – TOTAL PURGE | | <i>160</i> | % |
| Table 2-9. MAV: 0.094 lb | | | E2 – AVERAGE ERROR (E1 ÷ n =) | | | <i>0.057 lb</i> | G2 – AVERAGE PURGE: (G1 ÷ n =) | | <i>16</i> | % |
| NET WEIGHT COMPLIANCE: (1) If any of the minus package errors (see Column E) exceed the MAV the sample fails. (2) If none of the package errors exceeds the MAV and the Average Error (E2) is a positive number the sample passes. (3) If the Average Error (E2) is a minus number the sample fails. | | | | | | | | | | |
| PASSED: <input checked="" type="checkbox"/> FAILED: | | | | | | | | | | |
| PURGE COMPLIANCE: MAVS ARE NOT APPLIED IN THE PURGE TEST (1) If the Average Purge Error (G2) is less than or equal to 20 %, the sample passes. (2) If the Average Purge Error (G2) is greater than 20 %, the sample fails. | | | | | | | | | | |
| PURGE: <i>16 %</i> PASSED: <input checked="" type="checkbox"/> FAILED: | | | | | | | | | | |
| SAMPLE DISPOSITION: <i>Approved for sale.</i> | | | | | | | | | | |

**BLANK FORMS FOR CATEGORY A AND CATEGORY B SAMPLING
PLANS ARE PROVIDED ON THE FOLLOWING PAGES**

| INSPECTOR: | | CHITTERLING WORKSHEET | | | | | | | |
|--|--------------------|--|--|--|------------------------------|--|---|---|---|
| DATE: | | NET WEIGHT & PURGE DETERMINATIONS | | | | | | | |
| PACKER: | | LOT CODE: | | | | DRAIN PAN TARE: | UNIT OF MEASURE: | | |
| | | BRAND: | | | | | | | |
| PACKAGE NUMBER | A | B | C | D | E | IF ERROR EXCEEDS MAV = FAIL | F | G | |
| | LABELED NET WEIGHT | PACKAGE GROSS WEIGHT | PACKAGE TARE WEIGHT | ACTUAL PACKAGE NET WEIGHT B - C = | PACKAGE ERROR D - A = | | PURGED NET WT WEIGHT OF DRAINED CHITTERLINGS (OR PURGED LIQUID) AND DRAIN PAN - DRAIN PAN TARE = | PURGE % $\frac{(A - F) \times 100}{A}$ | |
| 1 | | | | | | | | | % |
| 2 | | | | | | | | | % |
| 3 | | | | | | | | | % |
| 4 | | | | | | | | | % |
| 5 | | | | | | | | | % |
| 6 | | | | | | | | | % |
| 7 | | | | | | | | | % |
| 8 | | | | | | | | | % |
| 9 | | | | | | | | | % |
| 10 | | | | | | | | | % |
| 11 | | | | | | | | | % |
| 12 | | | | | | | | | % |
| NUMBER OF UNREASONABLE ERRORS ALLOWED: | | | E1 - TOTAL ERROR | | | G1 - TOTAL PURGE | | | % |
| Table 2-9. MAV: | | | E2 - AVERAGE ERROR (E1 ÷ n =) | | | G2 - AVERAGE PURGE (G1 ÷ n =) | | | % |
| | | | G3 - ADJUSTED AVERAGE PURGE (G2 - PSEL =) | | | | | | % |
| <p>NET WEIGHT COMPLIANCE: (1) If any of the minus package errors (see Column E) exceed the MAV, the sample fails. (2) If none exceeds the MAV and the Average Error (E2) is a positive number, the sample passes. (3) If the Average Error (E2) is a minus number, calculate the sample standard deviation and enter it below. (4) Use the Sample Correction Factor (SCF) to calculate the Sample Error Limit (SEL). (5) Disregarding the signs, (a) if the Average Error (E2) is larger than the SEL, the sample fails or (b) if the Average Error is less than the SEL the sample passes.</p> | | | | | | | | | |
| <p>STANDARD DEVIATION: × 0.635 (SCF) = (SEL) PASSED FAILED</p> | | | | | | | | | |
| <p>PURGE COMPLIANCE: MAVS ARE NOT APPLIED IN THE PURGE TEST (1) If the Average Purge Error (G2) is less than or equal to 20 %, the sample passes. (2) If the Average Purge Error is greater than 20 %, calculate the sample standard deviation and enter it below. (3) Use the Sample Correction Factor (SCF) to calculate the Purge Sample Error Limit (PSEL) in percent. (4) Subtract the PSEL from the Average Purge (G2) to obtain an Adjusted Average Purge (AAP) and enter that value in G3. (5)(a) If the AAP (G3) is greater than 20 %, the sample fails or (b) if the AAP (G3) is 20 % or less, the sample passes.</p> | | | | | | | | | |
| <p>STANDARD DEVIATION: × 0.635 (SCF) = (PSEL) PURGE (G3) PASSED FAILED</p> | | | | | | | | | |
| SAMPLE DISPOSITION: | | | | | | | | | |

| INSPECTOR: | | CHITTERLING WORKSHEET FOR USE INSIDE A USDA INSPECTED PACKING PLANT NET WEIGHT & PURGE DETERMINATIONS WORKSHEET FOR SAMPLE OF 10 PACKAGES – HB 133 CATEGORY B | | | | | | | | |
|---|--------------------|--|-----------------------------------|--|------------------------------|--------------------------------|--|---|---|---|
| DATE: | | | | | | | | | | |
| PACKER: | | | | | | | | | | |
| | | | | LOT CODE: | | DRAIN PAN TARE: | UNIT OF MEASURE: | | | |
| | | | | BRAND: | | | | | | |
| PACKAGE NUMBER | A | B | C | D | E | IF ERROR EXCEEDS MAV = FAIL | F | G | | |
| | LABELED NET WEIGHT | PACKAGE GROSS WEIGHT | PACKAGE TARE WEIGHT | ACTUAL PACKAGE NET WEIGHT B – C = | PACKAGE ERROR D – A = | | PURGED NET WT DRAINED CHITTERLINGS (OR PURGED LIQUID) AND PAN – DRAIN PAN TARE = | PURGE % $\frac{(A - F) \times 100}{A}$ | | |
| 1 | | | | | | | | | % | |
| 2 | | | | | | | | | % | |
| 3 | | | | | | | | | % | |
| 4 | | | | | | | | | % | |
| 5 | | | | | | | | | % | |
| 6 | | | | | | | | | % | |
| 7 | | | | | | | | | % | |
| 8 | | | | | | | | | % | |
| 9 | | | | | | | | | % | |
| 10 | | | | | | | | | % | |
| NUMBER OF UNREASONABLE ERRORS ALLOWED: NONE Table 2-9. MAV: | | | E1 – TOTAL ERROR | | | | G1 – TOTAL PURGE | | | % |
| | | | E2 – AVERAGE ERROR (E1 ÷ n =) | | | | G2 – AVERAGE PURGE: (G1 ÷ n =) | | | % |
| NET WEIGHT COMPLIANCE: (1) If any of the minus package errors (see Column E) exceed the MAV the sample fails. (2) If none of the package errors exceeds the MAV and the Average Error (E2) is a positive number the sample passes. (3) If the Average Error (E2) is a minus number the sample fails. PASSED: FAILED: | | | | | | | | | | |
| PURGE COMPLIANCE: MAVS ARE NOT APPLIED IN THE PURGE TEST (1) If the Average Purge Error (G2) is less than or equal to 20 %, the sample passes. (2) If the Average Purge Error (G2) is greater than 20 %, the sample fails. PURGE: PASSED: FAILED: | | | | | | | | | | |
| SAMPLE DISPOSITION: | | | | | | | | | | |

Appendix C

Items: 232-3, 260-2, and 260-3: Handbook 133

Executive Summary and Supporting Documentation Animal Bedding (Feb. 9, 2015)

Testing Packages of Animal Bedding and Peat Moss

with

Compressed/Expanded Volume Declarations

Executive Summary

Animal Bedding (Bedding), also called pet or stall bedding, litter or simply bedding, is generally sold by dry volume in compressed or uncompressed packages. Based on numerous failed inspections of packaged animal bedding, the Office of Weights and Measures (OWM) conducted a study in which compressed and uncompressed packages of animal bedding were measured using a variety of procedures and test equipment. The results from those tests indicate that the current procedures in the 2014 edition of NIST Handbook 133, “Checking the Net Contents of Packaged Goods,” the dimensional inspection procedure for testing compressed packages (e.g., peat moss); and the volumetric inspection procedure (e.g., mulch); are inadequate for use in testing animal bedding. Uncompressed volume measurements of animal bedding are dependent on a number of factors, including the size and shape of the measuring container, the method of filling the measuring container, and the means used to break up the bedding prior to measuring. Based on the findings of this study, a draft procedure was developed for testing the uncompressed volume of animal bedding. OWM also designed and constructed new test measures to be used with the procedure, and then brought these measures to several animal bedding packaging plants for on-site verification of the test methods. Preliminary findings indicate that the draft procedure provides more consistent measurement results. Further, the study shows that there is no correlation between compressed and uncompressed volumes of animal bedding, leading to the conclusion that the requirement for compressed volume statements on the package label is unnecessary. The following proposal includes recommended changes to the method of sale for Animal Bedding in NIST Handbook 130, “Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality,” a revised test procedure for NIST Handbook 133 relating to the verification of the compressed volume of peat moss (which has been used with animal bedding), new test procedures for measuring the compressed and uncompressed volumes of animal bedding, suggested test equipment and a gravimetric auditing procedure that allows inspectors to avoid destroying all of the packages.

The following amendments to the Method of Sale of Commodities Regulation in NIST Handbook 130 are proposed:

1. For the reasons described in background Section 2(a) (page 27), the OWM recommends that the method of sale for animal bedding be amended to eliminate the requirement that packages bear a declaration of compressed volume. If this recommendation is adopted, the method of sale will require that packages of bedding only have a declaration of the expanded (uncompressed) volume that can be recovered by the consumer.

2. For the reasons described in background Section 2(b) (page 28) the OWM recommends that a new definition for animal bedding and a revised method of sale be adopted to replace the current wording in Section 2.23. Animal Bedding, in the Uniform Method of Sale of Commodities Regulation in NIST Handbook 130. The proposed definition for animal bedding and recommended revisions to the method of sale are presented in the following:

2.23. Animal Bedding. – ~~Packaged animal bedding of all kinds, except for baled straw, shall be sold by volume, that is, by the cubic meter, liter, or milliliter and by the cubic yard, cubic foot, or cubic inch. If the commodity is packaged in a compressed state, the quantity declaration shall include both the quantity in the compressed state and the usable quantity that can be recovered. Compressed animal bedding packages shall not include pre-compression volume statements.~~

Example:

~~250 mL expands to 500 mL (500 in³ expands to 1000 in³).~~

2.23.1. Definitions.

- (a) **Animal Bedding – any material, except for baled straw, kept, offered or exposed for sale or sold for primary use as a medium for any companion or livestock animal to nest or eliminate waste.**
- (b) **Expanded Volume – the volume of the product that can be recovered from the package by the consumer after it is unwrapped and uncompressed.**

2.23.2. Method of Sale.

- (a) **Packaged animal bedding shall be advertised, labeled, offered and exposed for sale and sold on the basis of the Expanded Volume. If unit pricing is offered to retail consumers, it shall be in terms of the price per liter.**
- (b) **The quantity declaration shall include the terms “Expanded Volume” or wording of similar import that expresses the facts, and shall be in terms of the largest whole unit of the milliliter, liter, or cubic meter. A declaration may also include the quantity in terms of largest whole unit of cubic inches, cubic foot, or cubic yard only.**
- (c) **The display of pre-compression volume, compressed volume or supplementary dry measure units (e.g., dry quart, bushel) anywhere on the package is prohibited.**

Examples: Expanded Volume 41 Liters (1.4 Cubic Feet)

Expanded Volume 1.4 Cubic Feet (41 Liters)

Expanded Volume 27.9 Liters (1700 Cubic Inches)

Expanded Volume 113 L (4 Cubic Feet)

Expanded Volume 8 Cubic Feet (226 L)

2.23.1.3. Exemption - Non-Consumer Packages of Animal Bedding Sold to Laboratory Animal Research Industry. – Packaged animal bedding consisting of granular corncobs and other

dry (8 % or less moisture), pelleted, and/or non-compressible bedding materials that are sold to commercial (non-retail) end users in the laboratory animal research industry (government, medical, university, preclinical, pharmaceutical, research, biotech, and research institutions) may be sold on the basis of weight.

(Added 1990) (Amended 2012 **and 20XX**)

The following test procedures and other amendments are proposed for Chapter 3. “Test Procedures for Packages Labeled by Volume” in NIST Handbook 133:

1. For the reasons described in the background of Section 4 (page 46), the OWM recommends adoption of amendments to Section 3.9. “Peat Moss.” The proposed amendments revise the dimensional test procedure used in verifying compressed volume declarations on packages of peat moss and, if the requirement that packages bear a declaration of the compressed volume in the package is not eliminated as recommended above, animal bedding (see page 4).
2. For the reasons described in the background of Section 3 (page 30), the OWM recommends adoption of a new Section 3.15. that includes a volumetric test procedure for animal bedding (see page 13).
3. For the reasons described in the background of Section 3(b) (page 31), the OWM recommends that no enforcement action be taken on the 1 % percent Maximum Allowable Variation (MAV) in Table 2-6 (which covers most sizes of the expanded volume declarations on bedding packages) because that value is unreasonable. Instead, the OWM recommends a tentative MAV of 5 % be applied to single measurement determinations of bedding volume and a tentative MAV of 10 % be applied when multiple measurements are used to make volume determinations. OWM recommends these MAV values be used pending further studies of test data collected using large test measures, single measurement determinations and utilizing the new test procedure.
4. For the reasons described in the background of Section 3(e) (page 34), the OWM recommends that test measures not be filled by hand. Instead, the OWM recommends that compressed bedding be uncompressed in suitable sized chutes and then poured into a test measure (see page 39). As described on page 36, Section 3(f), pouring the bedding helps the product volume recover from the compression applied during packaging.
5. For the reasons described in the background of Section 3(h) (page 40), the OWM recommends that for official inspections the volume of the bedding in the test measure be determined without leveling the product and using a modified headspace method (based on NIST Handbook 133, Section 3.7. “Volumetric Test Procedure for Paint...”).
6. For the reasons described in the background of Section 3(i) (page 44), the OWM recommends that officials use a gravimetric auditing procedure to identify potentially short measure samples to reduce destructive testing and conserve inspection resources.
7. For the reasons described in the background of Section 3(j) (page 46), the OWM recommends that, unless the sample packages of animal bedding fail the dimensional test (of the compressed volume, that the final decision to accept or reject an Inspection Lot be based on the results of a test that verifies the expanded (uncompressed) volume declared on the package.

The current test procedure in NIST Handbook 133, Section 3.9. “Peat Moss” will be modified as shown:

3.9. Peat Moss

3.9.1. Dimensional Test Procedure for Verifying the Compressed Packages

3.9.1.1. Test Equipment

- Tape measure

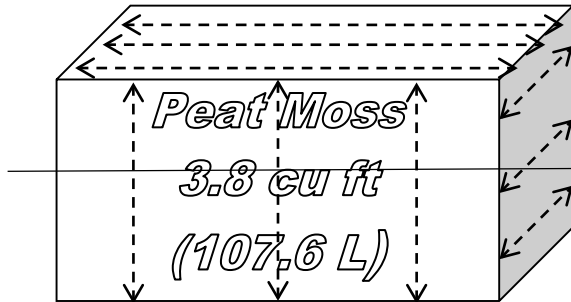


Figure 3-1. Peat Moss

3.9.1.2. Test Procedure

- ~~7. Follow Section 2.3.1. “Define the Inspection Lot.” Use a “Category A” sampling plan in the inspection; select a random sample.~~
- ~~8. For each dimension (length, width, and height) take three equidistant measurements.~~
- ~~9. Calculate the average of each dimension.~~
- ~~10. Multiply the averages to obtain the compressed cubic volume as follows:~~

$$\text{average height} \times \text{average width} \times \text{average length} = \text{cubic measurement}$$

- ~~11. Subtract the labeled volume from the measured volume to determine package error.~~

(Amended 2010)

3.9.2. Uncompressed Volume Packages

~~Use the following method to test peat moss sold using an uncompressed volume as the declaration of content. The procedure as defined by the latest version of ASTM D2978-03, “Standard Test Method for Volume of Processed Peat Materials.”~~

3.9.2.1. Test Equipment

- ~~12.7 mm (or 1/2 in) sieve~~
- ~~Use one of the following measures as appropriate for the package size. (Refer to Table 3-4. “Specifications for Test Measures for Mulch and Soils” for additional information on test measure construction.)~~

- ~~28.3 L (1 ft³) measure with inside dimensions of 30.4 cm (12 in) by 30.4 cm (12 in) by 30.4 cm (12 in). Mark the inside of the measure with horizontal lines every 1.2 cm (½ in) so that package errors can be directly determined~~
- ~~100 L (3.5 ft³) measure with inside dimensions of 50 cm (19.68 in) by 50 cm (19.68 in) by 40 cm (15.74 in). The inside of the measure should be marked with horizontal lines every 1.2 cm (½ in) so that package errors can be directly determined~~

- ~~Straight edge, 50.8 cm (20 in) in length~~
- ~~Sheet for catching overflow of material~~
- ~~Level (at least 15.24 cm (6 in) in length)~~

~~3.9.2.2. Test Procedure~~

- ~~7. Follow Section 2.3.1. “Define the Inspection Lot.” Use a “Category A” sampling plan in the inspection; select a random sample.~~
- ~~8. Open each package in turn, remove the contents, and pass them through the sieve directly into the measuring container (overfilling it). Use this method for particulate solids (such as soils or other garden materials) labeled in cubic dimensions or dry volume. Some materials may not pass through the sieve for peat moss; in these instances, separate the materials by hand (to compensate for packing and settling of the product after packaging) before filling the measure.~~

~~Note: Separated material (product not passing through the sieve) must be included in the product volume.~~

- ~~9. Shake the measuring container with a rotary motion at one rotation per second for 5 seconds. Do not lift the measuring container when rotating it. If the package contents are greater than the measuring container capacity, level the measuring container contents with a straightedge using a zigzag motion across the top of the container.~~
- ~~10. Empty the container. Repeat the filling operations as many times as necessary, noting the partial fill of the container for the last quantity delivered using the interior horizontal markings as a guide.~~
- ~~11. Record the total volume.~~
- ~~12. To compute each package error, subtract the labeled quantity from the total volume and record it.~~

~~3.9.3. Evaluation of Results~~

~~Follow the procedures in Section 2.3.7. “Evaluate for Compliance” to determine lot conformance for either procedure.~~

3.9.1.1. Test Equipment

- Calculator or Spreadsheet Software (programmed to make volume calculations)

- **Volumetric Package Worksheet (Appendix C at end of this report)**
- **Non-permanent marking pen.**
- **Knife or Razor Cutter (for use in opening packages and unwrapping shrink-wrapped pallets in warehouses)**
- **Cellophane or Duct Tape (for use in securing packaging tails)**
- **Dimensional Measuring Frame (see Exhibit 1 and drawings at <https://www.nist.gov/owm> [to be posted])**



Exhibit 5. Picture of a Dimensional Measuring Frame.

- **Rigid Rulers – Starrett¹³ or equal with 1.0 mm graduations. The edges of a ruler used with a measuring frame must be straight and the edges must be the zero point (see Exhibit 2).**
 - **300 mm (12 in)**
 - **500 mm (19.5 in)**
 - **1 m (39 inch)**
- **Carpenter Squares**
 - **300 mm (12 in)**

¹³ Notice: The mention of trade or brand names does not imply endorsement or recommendation by the U.S. Department of Commerce over similar products available from other manufacturers.

- 600 mm (24 in)

3.9.1.2. Test Procedure

Note: Test Notes

Rounding: When a package measurement falls between graduations on a ruler, round the value up. This practice eliminates the issue of rounding from the volume determination and provides the packager the benefit of the doubt. If a ruler with a graduation of 1.0 mm is used, the rounding error will be limited to 0.5 mm or less. It is good practice to circle a measurement that has been rounded up or make a statement to such effect so that it becomes a part of the record.

Dimension Identification: The following package nomenclature is used to identify the dimensions measured in this test procedure.

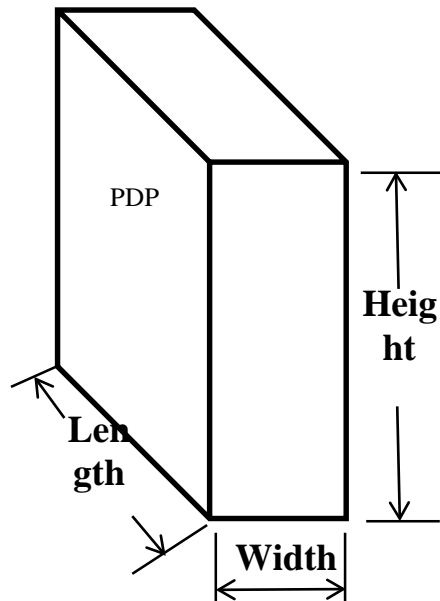


Figure 3-2. Dimension Identification.

Note: Packages of compressed peat moss do not have declaration of expanded volume.

Safety



This procedure does not address all of the safety issues that users need to be aware of in order to carry out the following tasks. Users are sometimes required to conduct tests in warehouse spaces or retail stores where fork-trucks are in motion – care must be taken to warn others to avoid or exercise care around the test site. The procedure requires users to lift heavy objects including large bulky packages and test measures and includes the use of sharp instruments to obtain packages from shrink-wrapped pallets. Users may be required to climb ladders or work platforms to obtain sample packages. When opening and emptying packages, dust, or other particles may be present or escape from the packages, which may

cause eye injuries and respiratory or other health problems. Users must utilize appropriate safety equipment and exercise good safety practices. If safe working conditions cannot be ensured, suspend testing until the situation is corrected.

- 6. Follow the Section 2.3.1. “Define the Inspection Lot.” Use a “Category A” Sampling Plan for the inspection. Collect the sample packages from the Inspection Lot using random sampling. If the packages are not randomly selected, the sample will not be representative of the lot and the test results will not be valid for use in enforcement action. Place the sample packages in a location where there is adequate lighting and ample space for the packages and test equipment.**
- 2. Examine the package for excess packaging material (i.e., packaging tails). Fold the packaging material consistent with design of the packaging and tape the material securely to the package so that its effect on the dimensional measurement is minimized. If the thickness of packaging tail appears excessive, it is appropriate to determine its average thickness by making at least three measurements along its length using a dead weight dial micrometer specified in Section 4.5. “Polyethylene Sheeting” and subtract the thickness from the measurement of length, width or height. Any deduction from a measurement should be noted on the inspection report.**
- 3. If a Dimensional Measuring Frame is used, place it on a solid support. If a table is used, select one of sufficient load capacity to hold the weight of the frame and the heaviest package to be tested.**
- 4. Position the frame so that the zero end of the ruler can be placed squarely and firmly against a surface of the frame and so that the ruler graduations can be read. Position yourself so that you can read both the ruler and the edge of the carpenter square in Exhibit 2.**
- 5. Place the package against two sides of the frame without compressing the package. Place a carpenter square against the package at the point of measurement and align the ruler perpendicular to the edge of the carpenter square as shown in Exhibit 3 where the package length and Exhibit 4 where the package height are being determined.**

**Using a Measuring Frame for Dimensional Testing
Ruler and Carpenter Square define Zero Reference and Measurement Point**



Exhibit 6. The rigid frame allows the observer to hold the zero reference point firmly in place.



Exhibit 7. Length Measurement.



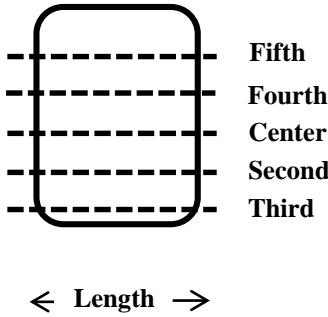
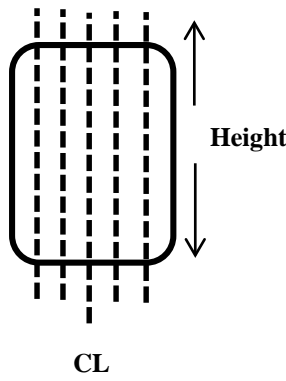
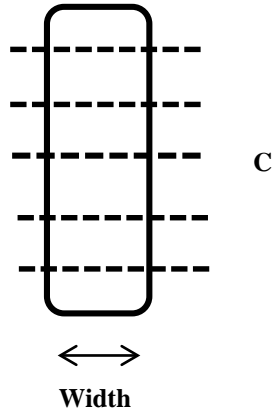
Exhibit 8. Height Measurement – A packaging tail on the end of the package can affect this measurement so it has been folded over and taped against the end of the package.



Exhibit 9. Width Measurement – the frame is rotated on its end to vertical so that the carpenter square does not compress the product.

6. Measurements – take at least five measurements* of each of the dimensions as follows:

***On small packages (height or length dimensions of 152 mm [6 in] or less) at least three measurements are taken using the following the instructions).**

| <u>Inspect the package for shape and place the flattest surfaces against the measuring frame.</u> | |
|--|---|
| <p>i.</p> <p><u>Length (see Exhibit 3):</u></p> <ol style="list-style-type: none"> <u>a. take the first measurement across the center line of the Length axis of package.</u> <u>b. take the second measurement at half the distance between the center Line and either of the package edges.</u> <u>c. take the third measurement half the distance between the second measurement and the package edge.</u> <u>d. take the fourth measurement on the opposite end of the package at half of the distance between the center line and the package edge.</u> <u>e. take the fifth measurement at half of the distance between the fourth measurement and the package edge.</u> |  |
| <p>ii.</p> <p><u>Height: (see Exhibit 4):</u></p> <ol style="list-style-type: none"> <u>a. take the first measurement across the center line of the Height axis of the package.</u> <u>b. take the second measurement at half the distance between the center line and the package edge.</u> <u>c. take the third measurement half the distance between the second measurement and the package edge.</u> <u>d. take the fourth measurement on the opposite end of the package at half of the distance between the center line and the package edge.</u> <u>e. take the fifth measurement at half of the distance between the fourth measurement and the package edge.</u> |  |
| <p>iii.</p> <p><u>Width: (see Exhibit 5): If using one, turn the measuring frame on end and place the package on its bottom and against the frame as shown in the picture and on the right where the package width is being measured.</u></p> <ol style="list-style-type: none"> <u>a. take the first measurement across the center line of Width axis of the package.</u> <u>b. take the second measurement at half the distance between the center line and the package edge.</u> <u>c. take the third measurement half the distance between the second measurement and the package edge.</u> <u>d. take the fourth measurement on the opposite end of the package at half of the distance between the center line and the package edge.</u> <u>e. take the fifth measurement at half of the distance between the fourth measurement and the package edge.</u> |  |

7. Record the dimensions of each package in millimeters in a software program or inspection form that includes the information shown in the sample worksheet “Calculate the Compressed Volume of the Package in Liters” (below). Enter the measurements in the appropriate spaces and calculate the volume in liters. Calculate the package error by following the steps listed in the table and then calculate the average error for the sample.

Note: The following table is an example of the information from an actual test that is included in a worksheet for verifying the compressed volume on packages of peat moss. The Inspection Worksheet for Dimensional Testing (see Appendix C) has space for a sample of 12 packages and includes the steps for calculating the Average Package Error. Here, the package error in the dimensional volume was + 6.8 L (+ 0.24 ft³). Apply a tentative MAV of 5 % to a dimensional measured volume.

| SAMPLE WORKSHEET | | | |
|---|--|--------------------------|------------------------------|
| Calculate the Compressed Volume of the Package in Liters | | | |
| | <u>Unit of Measure = 1.0 mm</u> | <u>Length (L)</u> | <u>Width (W)</u> |
| | | <u>Height (H)</u> | |
| <u>1.</u> | | <u>482</u> | <u>282</u> |
| <u>2.</u> | | <u>490</u> | <u>278</u> |
| <u>3. (Center Line)</u> | | <u>493</u> | <u>276</u> |
| <u>4.</u> | | <u>499</u> | <u>272</u> |
| <u>5.</u> | | <u>493</u> | <u>269</u> |
| <u>a. Average:</u> | | <u>491</u> | <u>275.4</u> |
| <u>b. L × W × H = Volume/1 000 000</u> | | <u>91.8 L</u> | |
| <u>c. Labeled Compressed Quantities:</u> | | <u>85 L</u> | <u>NA cu in</u> |
| <u>d. Conversion Factors</u> | | <u>NA</u> | <u>(b) × 61.02374</u> |
| <u>e. Converted Volume</u> | | <u>85 L</u> | <u>NA cu in</u> |
| <u>f. Package Error = (b – c)</u> | | <u>6.8 L</u> | <u>NA cu in</u> |

3.9.2. Uncompressed Volume Packages

Use the following method to test peat moss sold using an uncompressed volume as the declaration of content. The procedure as defined by the latest version of ASTM D2978-03, “Standard Test Method for Volume of Processed Peat Materials.

3.9.2.1. Test Equipment

- 12.7 mm (or ½ in) sieve
- Use ~~a one of the following test~~ measure appropriate for the package size. (Refer to Table 3-4. “Specifications for Test Measures for Mulch and Soils” for additional information on test measure **size and** construction.)
 - ~~28.3 L (1 ft³) measure with inside dimensions of 30.4 cm (12 in) by 30.4 cm (12 in) by 30.4 cm (12 in). Mark the inside of the measure with horizontal lines every 1.2 cm (½ in) so that package errors can be directly determined~~
 - ~~100 L (3.5 ft³) measure with inside dimensions of 50 cm (19.68 in) by 50 cm (19.68 in) by 40 cm (15.74 in). The inside of the measure should be marked with~~

~~horizontal lines every 1.2 cm (1/2 in) so that package errors can be directly determined~~

- Straight edge, 50.8 cm (20 in) in length
- Sheet for catching overflow of material
- Level (at least 15.24 cm (6 in) in length)

3.9.2.2. Test Procedure

1. Follow Section 2.3.1. “Define the Inspection Lot.” Use a “Category A” sampling plan in the inspection; select a random sample.
2. Open each package in turn, remove the contents, and pass them through the sieve directly into the measuring container (overfilling it). Use this method for particulate solids (such as soils or other garden materials) labeled in cubic dimensions or dry volume. Some materials may not pass through the sieve for peat moss; in these instances, separate the materials by hand (to compensate for packing and settling of the product after packaging) before filling the measure.

Note: Separated material (product not passing through the sieve) must be included in the product volume.

3. Shake the measuring container with a rotary motion at one rotation per second for five seconds. Do not lift the measuring container when rotating it. If the package contents are greater than the measuring container capacity, level the measuring container contents with a straightedge using a zigzag motion across the top of the container.
4. Empty the container. Repeat the filling operations as many times as necessary, noting the partial fill of the container for the last quantity delivered using the interior horizontal markings as a guide.
5. Record the total volume.
6. To compute each package error, subtract the labeled quantity from the total volume and record it.

3.9.3. Evaluation of Results

Follow the procedures in Chapter 2, Section 2.3.7. “Evaluate for Compliance” to determine lot conformance.

Note: To determine the value of the MAV look up the labeled quantity in Appendix A, Table 2-6. Maximum Allowable Variations for Packages Labeled by Liquid and Dry Volume.

Section 3.15. Test Procedure for Verifying the Expanded Volume Declaration on Packages of Animal Bedding

3.15.1. Test Equipment

- Calculator or Spreadsheet Software
- Modified Standard Package Report Form – Appendix D (at end of report).
- Package Inspection Worksheet Appropriate for Test Measure:
 - Appendix A – 26 Point Measurement Grid and Package Error Worksheet for Cylindrical Test Measures (at the end of the report)
 - Appendix B – 25 Point Measurement Grid and Package Error Worksheet for Square or Rectangular Test Measures (at the end of the report)
- Permanent Ink - Marking Pen.
- Knife or Razor Cutter (for use in opening packages and unwrapping shrink-wrapped pallets in warehouses)
- Cellophane Tape, Duct Tape (for repairing chutes and sealing packages)
- Polyethylene Bags (49 L to 113.5 L [13 gal to 30 gal]) (to hold product once it is uncompressed)
- Rigid Rulers – Starrett¹⁴ or equal with 1.0 mm graduations. The edges of a ruler used with a measuring frame must be straight and the edges must be the zero point (see Exhibit 2).
 - 300 mm (12 in)
 - 500 mm (19.5 in)
 - 1 m (39 in)
- Tarp - Canvas 3 m × 3 m (10 ft × 10 ft)
- Broom and Dust Pan
- Levels – for verifying the level of the test measure and taking headspace readings.
 - 152 mm (6 in) Bubble Level
 - 1 m (40 in) Carpenter Level
- Scale 15 kg (30 lb) (only used if the audit procedure is utilized.)

¹⁴ Notice: The mention of trade or brand names does not imply endorsement or recommendation by the U.S. Department of Commerce over similar products available from other manufacturers.

- Chutes for Uncompressing and Pouring the Bedding into a Test Measure

| Table 1. Recommended Chute Dimensions | | | |
|--|----------------|----------------|-----------------|
| Nominal Capacity | Height | Width | Length |
| 70 L (2.5 ft ³) | 254 mm (10 in) | 228 mm (9 in) | 1219 mm (48 in) |
| 100 L (3.5 ft ³) | 254 mm (10 in) | 279 mm (11 in) | 1397 mm (55 in) |
| 170 L (6 ft ³) | 279 mm (11 in) | 355 mm (14 in) | 1727 mm (68 in) |
| 240 L (8.5 ft ³) | 304 mm (12 in) | 406 mm (16 in) | 2006 mm (79 in) |
| 283 L (10 ft ³) | 304 mm (12 in) | 406 mm (16 in) | 2286 mm (90 in) |

NOTE: Chutes (see examples below) may be constructed using hinges and pins so that they lie flat for transporting. They can be constructed of sheet metal or with other slick surface material which enable the bedding to flow easily. The construction of the chutes used in this study allows the sides to move in or out slightly so that the bedding does not become clogged at the outlet. The heights and lengths may be adjusted slightly to fit into vehicles for transport but the widths should not be reduced because narrowing the opening can restrict material flow and result in “bridging” where the bedding collects and creates a block. Also, the width should be kept smaller than the opening of the test measure so that spillage does not occur during pouring.




Figure 3. Testing Chutes.

- Test Measures (see Table 2. “Test Measures for Animal Bedding”)

Table 2. Test Measures for Animal Bedding NOTES: a, b, c, and d

Only Interior Dimensions Are Used for Volume Calculations
 Must Be Calibrated with Traceable Measurement Standards Prior to Use

| Rectangular & Square Test Measures | | | | | | |
|---|--------------------------|---------------------|---------------------|---|----------------------------|--|
| Actual Volume of the Measure ^{b & d} | Interior Wall Dimensions | | | Surface Area | Marked Increments on Ruler | Increment Volume |
| | Length | Width | Height ^d | | | |
| 31.9 L 1.13 ft ³ | 213.4 mm (8.4 in) | 203.2 mm (8 in) | 736.6 mm (29 in) | 43 362 mm ² (67.2 in ²) | 12.7 mm (0.5 in) | 550.6 mL* 0.55 L (33.6 in ³) |
| 28.3 L 1 ft ³ | 304.8 mm (12 in) | 304.8 mm (12 in) | 304.8 mm (12 in) | 92 903 mm ² (144 in ²) | | 1.18 L** (72 in ³) |
| 63.7 L 2.25 ft ³ | 304.8 mm (12 in) | 304.8 mm (12 in) | 685.8 mm (27 in) | | | |
| | 406.4 mm (16 in) | 228.6 mm (9 in) | 685.8 mm (27 in) | | | |
| 92 L 3.25 ft ³ | 304.8 mm (12 in) | 304.8 mm (12 in) | 990.6 mm (39 in) | | | |
| | 406.4 mm (16 in) | 228.6 mm (9 in) | 990.6 mm (39 in) | | | |
| *1.0 mm = 43 mL (2.6 cu in) ** 1.0 mm = 92 mL or 0.09 L (5.6 cu in) | | | | | | |
| Square Test Measures | | | | | | |
| Actual Volume of the Measure ^{b & d} | Interior Wall Dimensions | | | Surface Area | Marked Increments On Ruler | Increment Volume |
| | Length | Width | Height ^d | | | |
| 77.4 L (2.73 ft ³) | 381 mm (15 in) | 381 mm (15 in) | 533.4 mm (21 in) | 145 161 mm ² (225 in ²) | 1.0 mm (0.03937 in) | 0.14 L (8.5 in ³) |
| 144 L (5.09 ft ³) | 508 mm (20 in) | 508 mm (20 in) | 558.8 mm (22 in) | 258 064 mm ² (400 in ²) | | 0.25 L (15.2 in ³) |
| 283 L (10 ft ³) | 609.6 mm (24 in) | 609.6 mm (24 in) | 762 mm (30 in) | 371 612 mm ² (576 in ²) | | 0.37 L (22.5 in ³) |

Table 2. Test Measures for Animal Bedding NOTES: a, b, c, and d

Only Interior Dimensions Are Used for Volume Calculations
Must Be Calibrated with Traceable Measurement Standards Prior to Use

Cylindrical Test Measures

These dimensions are based on the tube having a ¼ inch wall thickness. Other tube thicknesses may be used.

| Actual Volume <i>Volume = $\pi r^2 h$</i> | Interior Diameter (Outside Diameter) | Height | Surface Area <i>Area = πr^2</i> | Increment | Increment Volume |
|--|---|-----------------------|---|------------------------|-----------------------------------|
| 52 L (1.8 ft ³) | 292.1 mm (304.8 mm) 11.5 in (12 in) | 780 mm (30.70 in) | 67 012 mm ² (103.8 in ²) | 1.0 mm (0.03937 in) | 0.06 L (4 in ³) |
| 124 L (4.3 ft ³) | 444.5 mm (457.2 mm) 17.5 in (18 in) | 800 mm (31.49 in) | 155 179 mm ² (240.52 in ²) | | 0.15 L (9.4 in ³) |
| 279 L (9.8 ft ³) | 596.9 mm (609.6 mm) 23.5 in (24 in) | 1000 mm (39.37 in) | 279 829 mm ² (433.76 in ²) | | 0.27 L (16.4 in ³) |

Notes for Table 2:

- a. Rectangular and Square Based Dry Measures are typically constructed of 12.7 mm to 19.05 mm (0.5 in to 0.75 in) Marine Plywood. A 4.76 mm (³/₁₆ in) transparent sidewall is useful for determining the level of fill, but must be reinforced or be made of thicker material if it distorts when the measure is filled. If the measure has a clear front, place the level gage at the back (inside) of the measure so that the markings are read over the top of the animal bedding. Any of these measures may be made without an attached bottom for ease of emptying if they are placed on a solid level base during filling and measurement.
- b. Other size measures may be used if calibrated and the volume equivalence of the increment of 1.0 mm is no greater than 1/6 the MAV. Widening the base of a measure reduces the column height of the product and will reduce compression but the trade-off is that the larger surface area increases the volume so the potential for measurement errors increase. One of the benefits of the cylindrical design is that, in addition to eliminating the 90 degree angles of the corners where gaps in fill frequently occur, the surface area of a cylinder is less than an equal volume square measure and that results in better resolution in the volume measurements (i.e., compare the readability of a 24 in sq box which has a surface area of 576 in², to the 24 in cylinder which has a surface area of 433 in²). The height of the test measure may be reduced, but this will limit the volume of the package that can be tested.
- c. If lines are marked in any test measures, they should extend around all sides of the measure if possible to improve readability. It is recommended that a line indicating the MAV level also be marked to reduce the possibility of reading errors when the level of the product is at or near the MAV.
- d. If the measures are built to the dimensions shown above, the actual volume of most of the measures will be larger than the nominal volume so that plus errors (overfill) can be measured accurately.

3.15.2. Test Procedure

Test Notes:

Rounding: When a volume measurement falls between graduations on a ruler, round the value in the direction that favors the packer. This practice eliminates the issue of rounding from the volume determination and provides packagers the benefit of the doubt. The ruler graduation is

1.0 mm so the rounding error will be limited to 0.5 mm or less. It is good practice to circle a measurement that has been rounded up or make a statement to such effect so that it becomes a part of the inspection record.

Safety:



This procedure does not address all of the safety issues that users need to be aware of in order to carry out the following tasks. Users are sometimes required to conduct test in warehouse spaces or retail stores where fork-trucks are in motion – care must be taken to warn others to avoid or exercise care around the test site. The procedure requires users to lift heavy objects including large bulky packages and test measures and includes the use of sharp instruments to obtain packages from shrink-wrapped pallets. Users may be required to climb ladders or work platforms to obtain packages. When opening and emptying packages, dust, and other particles may be present or escape from the packages which may cause eye injuries and respiratory or other health problems. Users must utilize appropriate safety equipment and exercise good safety practice. If safe working conditions cannot be ensured, suspend testing until the situation is corrected.

8. Follow the Section 2.3.1. “Define the Inspection Lot,” select “Category A – Sampling Plan” in this Inspection. Determine the Sample Size based on the size of the Inspection Lot using Category A. Collect the sample packages from the Inspection Lot using Section 2.3.4. “Random Sampling Selection.”

Test Note: Place the test equipment and sample packages in a location where there is adequate lighting and ample space around the packages and equipment so the packages can be opened and the chutes and test measures used safely.

Optional – Audit Screening by Weight

The full test procedure requires that all of the packages be opened for testing. Regardless of the type of bedding, the product cannot be returned to the original package. An alternative gravimetric auditing procedure may be used to reduce the amount of destructive testing and conserve inspection resources.

Audit Procedure: After randomly selecting the sample packages from the Inspection Lot, obtain the gross weight for each package. Select the lightest and heaviest packages and conduct an expanded volumetric test on these two packages. If the lightest and heaviest packages pass (i.e., each contains at least the expanded volume declared on the label), it is highly likely that the remaining packages in the sample will also pass. Accept these two package samples as an AUDIT TEST and move on to inspect other types of bedding or Inspection Lots of other types or brands of bedding. If either of the two packages is found to have a minus error that exceeds the Maximum Allowable Variation, the sample fails. No further testing is required (i.e., assuming no MAV is allowed for the sample size (see Appendix A, Table 2-1. “Sampling Plans for Category A”). If either of the packages is found to have a minus error that does not exceed the MAV, continue to test all of the packages and take action based on the final results from the complete sample.

Test Note: If the gravimetric audit procedure is used, ensure that the scale is placed on a solid level support and that its accuracy has been verified to a test load that is at least 10 percent more than the gross weight of the packages (e.g., to estimate that load, place one of the packages on the scale and then test the scale with a load above the package’s gross weight). See Section 2.2. “Measurement Standards and Test Equipment” for additional information.

9. Select the appropriate test measure for the package size.
 - Spread a tarp large enough to hold a chute and test measure.
 - Place the chute and test measure on the tarp. Verify that the test measure is level.
10. Select a chute of appropriate capacity (see Table 1) for the package size and position it on the tarp.
11. Open the Packaging, Uncompressing and Pouring the Bedding into the Test Measure Twice.
 - **Open Package:** Place the package in the chute and use a knife or box cutter to open and remove the wrapper. Spread the bedding uniformly along the length of the chute. The bedding is uncompressed in two steps. The first step is to loosen the clumps of bedding by gently pulling them apart (do not tear the fibers of cellulose bedding or “grind” any bedding between your hands because these practices break the material down). Spread your fingers and pick the material up using your hands from beneath to loosen it up. There should be no clumps of bedding in the chute. If any bedding has fallen out of the chute onto the tarp, collect it and return it to the chute. The following pictures illustrate this step of the procedure. The second step of the expanded volume recovery process is to pour the bedding into a test measure as described in Step 2.

Exhibit 10.



Exhibit 11.



Exhibit 12. First pour into the test measures.



- **First Pour:** The first pour into the test measure is only used to further un-compress the bedding so no measurements are taken. Hold the chute above the test measure and tilt it so that you pour the bedding into the center of the test measure. The bedding should be poured slowly into the test measure in one continuous stream and not “dumped” (if it is “dumped” or poured too quickly some of the bedding will blow out of the measure or the bedding will be packed down and its volume reduced). The flow rate should be controlled by the tilt angle of the chute. The chute itself can be shaken but **DO NOT HIT OR SHAKE THE TEST MEASURE.** (Do not adjust the flow by closing the opening of the chute as that may cause the bedding to heap up and then fall into the measure in clumps which may result in impact compression). Empty the bedding back into the chute and spread it out evenly along its length.



Exhibit 13. Showing how to hold a chute for the pour.



Exhibit 14. Showing how to cradle the chute on one arm and holding it with one hand while tilting it with the other hand.

- **Second Pour:** The second pour into the test measure is used to make the volume determination. Hold the chute above the test measure and tilt it so that you pour the bedding into the center of the test measure. The bedding should be poured slowly into the test measure in one continuous stream and not “dumped.” The flow rate should be controlled

by the tilt angle of the chute. The chute can be shaken but **DO NOT HIT OR SHAKE THE TEST MEASURE.**

Test Note: Stop filling the measure if it appears that the test measure will overflow. The overflow product should be measured separately (use a smaller test measure of adequate size and capacity if one is available) and the multiple measurement volumes are added. If pouring into a square test measure, pour at an angle to two corners for the widest opening (see Exhibit 12).



Exhibit 15. Filling a 44 L Test Measure.



Exhibit 16. Filling a Square Test Measure at an Angle to use the Larger Opening.

12. Volume Determination.

DO NOT HAND LEVEL THE SURFACE OF THE BEDDING AS MANUAL LEVELING “PACKS” THE BEDDING AND REDUCES ITS VOLUME. DO NOT JAR OR SHAKE THE TEST MEASURE

Test Note: Before using a test measure for volume determinations, place a level of adequate length on top of the test measure at five approximately equal measuring points across the top. A permanent marking pen can be used to evenly space the marks across the top edge of the test measure so that it can be positioned to take the measurements (see Exhibit 13).



Exhibit 17. Marking the evenly spaced measuring points across the top of the test measure.

- Place a rigid level or straight edge of adequate size on top the test measure and select a ruler of adequate length to reach to the lowest level of the top surface of the bedding. Start at the measuring points to your left or right, place the ruler against the side of the level, and hold it with either hand. The zero graduation is pointed down so the ruler can be lowered into the test measure for measurement. Lower the ruler into the test measure slowly until its end is at the surface level of the bedding (see Exhibits 14 and 15).



Exhibit 18. Placing ruler into the test measure with zero end down.



Exhibit 19. Ruler shown with zero end at surface of the bedding.

- Determine the depth of each measurement point from the surface of the bedding to the bottom edge of the straight edge and record the value in the appropriate space on the worksheet. Take a minimum of 25 measurements (at least 26 for cylindrical measures) across the top of the test measure in a grid pattern. Read the graduations on the ruler from a position that minimizes errors caused by parallax.

Table 2. Illustrations of Depth Determinations with Cylindrical Test Measures



Figure 1. Shows how to read the depth of container.

The picture on the left (Figure1) shows how to read the depth from the bottom of the straightedge (top edge of measure) down to the bedding in a 44 L test measure from a position that reduces parallax. The graphic below (Figure 2) illustrates the actual worksheet with the headspace procedure on the 44 L cylinder test measure (its internal radius is 151.5 mm and its height is 610 mm). The bedding was poured into the test measure but not leveled. Then 26 measurements were made at the locations shown on the grid to determine the depth of the product from the top edge of the measure. The average of the 26 values was 500.7 mm which was subtracted from the height of the test measure to obtain 109.3 mm for the average height of the column of bedding in the measure.

The volume was calculated using:

$$Volume\ in\ liters = \pi r^2 h \quad 3.14159265 \times 22952 \times 109.3\ mm = 7.88\ L^*$$

*After the calculation was completed the result was divided by 1 000 000 to obtain the volume in liters.

Figure 4. Illustration of Worksheet.

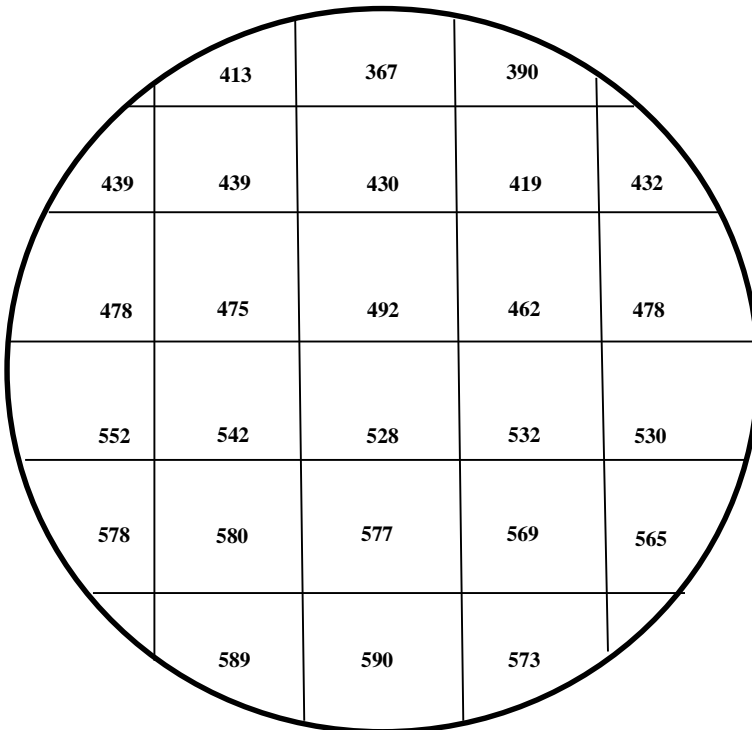


Table 2. Illustrations of Depth Determinations with Cylindrical Test Measures



Figure 5. Using the headspace measurement on a 279 L test measure. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.



Figure 4. Illustrating how the ruler is placed on the bedding with the headspace method. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.

Table 3. Illustrations of Depth Determinations with Square Test Measures



Figure 1.

| | | | | |
|-----|-----|-----|-----|-----|
| 246 | 162 | 81 | 132 | 177 |
| 195 | 115 | 43 | 46 | 112 |
| 111 | 77 | 51 | 95 | 146 |
| 220 | 138 | 46 | 98 | 131 |
| 264 | 193 | 118 | 148 | 180 |

Figure 2.

The picture on the left (Figure 1) shows how to read the depth from the bottom of the straightedge (top edge of measure) down to the bedding in a 283 L square test measure from a position that reduces parallax. The graphic on the right (Figure 2) illustrates the actual worksheet with the headspace procedure on the square test measure (its internal dimensions are 609.6 mm × 609.6 mm × 762 mm (24 in × 24 in × 30 in). The bedding was poured into the test measure but not leveled. Then 25 measurements were made at the locations shown on the grid to determine the depth of the product from the top edge of the measure. The average of the 25 values was 133 mm that was subtracted from the height of the test measure to obtain 629 mm for the average height of the column of bedding in the measure.

The volume was calculated using: Volume in liters = lwh 609.6 mm × 609.6 mm × 629 mm = 233.74 L*

*After the calculation was completed, the result was divided by 1 000 000 to obtain the volume in liters.



Figure 3. Using the headspace measurement on 56.6 L (2 cu ft) test measure. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.

Table 3. Illustrations of Depth Determinations with Square Test Measures



Figure 4. Showing how the ruler is placed on the bedding with the headspace method. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.

13. Using a Worksheet for Volume Calculation

- Enter the sample number of the package on the worksheet along with its labeled expanded volume.
- Test Measure Information
 - For a cylindrical test measure, enter its interior height and radius in the spaces labeled A and B.
 - For a square or rectangular test measure enter its interior height and the area of its base (i.e., length × width) in spaces labeled A and B.
- Sum the measurements in the grid, divide the value by the number of measurements (i.e., 25 or 26), and enter this value in the space labeled C, Average Depth.
- Calculate the Average Height of the Bedding (subtract C [Average Depth] from A [Interior Height of Test Measure]) and enter this value in the space labeled D.
- Calculate the Volume of Bedding in the Package:
 - For a cylindrical test measure, the formula ($Volume\ in\ Liters = \pi r^2 h$) is shown in E on the worksheet. It is $Volume\ (Liters) = 3.14159265 \times r^2 (B^2) \times Average\ Height\ (D) \div 1\ 000\ 000$. Enter the package volume in the space provided for this value in E.
 - For a square or rectangular test measure the formula ($Volume\ in\ Liters = LWH$) is shown in E on the worksheet. It is $Volume\ (Liters) = B\ (Area\ of\ Test\ Measure\ Base) \times D\ (Average\ Height) \div 1\ 000\ 000$. Enter the package volume in the space provided for this value in E.
- Calculate the Package Error using the following formula:

- Package Error = Labeled Expanded Volume (Liters) ____ – E Package Volume (Liters) ____

$$\text{Package Error (Liters)} = \text{Labeled Expanded Volume} - \text{Package Volume}$$
- Transfer the individual package errors (verify whether they are positive or negative) to the “Modified Standard Package Report for Animal Bedding” in Appendix D. Fill in the required header information. For Box 7, “Number of Unreasonable Package Errors Allowed for Sample Size,” use Appendix A, Table 2-1. “Sampling Plans for Category A, Column 4.” Based on the sample size, determine how many packages may have minus package errors that exceed the MAV (i.e., unreasonable package error). Then:
- Calculate the Total Error (Enter in Box 8 “Total Error”).

14. Evaluation of the Test Results and Determination of Pass or Fail

- Determine if any of the minus package errors exceeds the MAV. Apply a tentative MAV value of 5 % ($0.05 \times$ labeled expanded volume) to single measurement volume determinations and a tentative MAV value of 10 % ($0.10 \times$ labeled expanded volume) on multiple-measurement volume determinations (enter in Box 4 “MAV”). If none of the minus package errors exceeds the MAV, go to Step 3. If any of the minus package errors exceed the MAV, enter the number of packages in Box 9 “Number of Unreasonable Minus Errors.” Go to Box 10 “Is Box 9 Greater than Box 7?” and determine if the value exceeds the number in Box 7 “Number of Unreasonable Package Errors Allowed for Sample Size.” If the number of packages with unreasonable errors exceeds the number permitted in Box 7 “Number of Unreasonable Package Errors Allowed for Sample Size,” the sample fails. Go to Box 17 “Disposition of the Inspection Lot” and reject the Inspection Lot.
- Calculate the Average Error for the sample by dividing Box 8 “Total Error” by Box 6 “Sample Size” and enter the value in Box 11 “Calculate Average Error,” then go Box 12 “Does Box 11 equal Zero or Plus?” If the Average Error is zero or a positive number, the sample passes, go to Box 17 “Disposition of the Inspection Lot” and approve the Inspection Lot. If the Average Error is a negative value go to Step 4.
- Calculate the Sample Standard Deviation and enter in Box 13 “Compute Sample Standard Deviation.” To obtain the Sample Correction Factor for the sample size use Appendix A, Table 2-1. “Sampling Plans for Category A,” Column 3 “Sample Correction Factor” and enter that in Box 14 “Sample Correction Factor.” Then calculate the Sample Error Limit by multiplying Box 13 “Compute Sample Standard Deviation” and Box 14 “Sample Correction Factor.” Enter the value in Box 15 “Compute Sample Error Limit.”
- Disregarding the signs, determine if the minus in Box 11 “Calculate Average Error” is larger than the value in Box 15 “Compute Sample Error Limit.”
 - If yes, the sample fails, go to Box 17 “Disposition of Inspection” and reject the Inspection Lot.
 - If no, the sample passes, go to Box 17 “Disposition of Inspection” and approve the Inspection Lot

- Prepare a comprehensive report of the test results and enforcement action taken and present the information to the party responsible for the product.

Background

1. Animal Bedding

Animal Bedding (Bedding), also called pet or stall bedding, litter or simply bedding, is generally sold by dry volume in compressed or uncompressed packages. A survey of several Internet retailers and retail stores conducted near the NIST revealed that a few packers sell bedding (e.g., pelletized) by net weight, which is prohibited by the current method of sale. Quantity declarations are often presented in a mixture of customary volume measurements including dry quart, cubic inch, and the cubic foot. Quantity declarations in metric units are predominantly by the liter and milliliter. For compressed packages, a declaration of both the compressed volume and uncompressed volume is required according to the NIST Handbook 130, Section B. Uniform Method of Sale of Commodities, 2.23. “Animal Bedding.” Package sizes vary widely. For example, compressed volumes can range from about 4 L (230 cu in) to 85 L (3 cu ft). The uncompressed (expanded) volumes can range from about 6 L (600 cu in) up to 340 L (12 cu ft). It is consumer preference that determines how much bedding is used to “surface” a cage or stall. Unlike compressed peat moss, which is also labeled in volume, there are no user instructions on packages of bedding recommending a specific depth for a consumer to fill a cage or litter box or to “surface” a stall (see Section 2. “Method of Sale and Terminology” for more on this subject). Also, unlike packages of peat moss, the shape of packages of bedding is subject to wide variations due to the packaging stretching and plumping because of the pressure exerted by the compressed material they hold. Several manufacturers describe the “ideal” bedding as having minimal dust and “fines” (small particles of the bedding material), a moisture of 8 % to 15 %, and good “loft” so that the product provides good absorption of liquids.

2. Method of Sale and Terminology

a. Compressed Volume Declaration

The presence of a declaration of compressed volume is of little or no value to consumers. Several packers were asked what value was the compressed volume information to consumers. The unanimous response was that a compressed volume declaration does not help consumers to make value comparisons and it is ineffective in preventing unfair competitive practices. The packers agreed that it is the expanded volume declared on packages of bedding that is the most useful information for consumers. The primary reason is that it helps the purchaser estimate the size of package to buy or how many packages are needed to “bed” a cage or “surface” a stall. The area coverage obtained from a compressed package depends in large part on the characteristics of the material and the packaging process (e.g., force of compression). An expanded volume declaration is the only quantity declaration that is reliable and that aids consumers. Even a net weight declaration on bedding packages would not be useful. This is because the bedding in a heavier package may not expand as much as the bedding in a lighter package. For example, in this study packages of one product were found to vary in weight by only one or two grams but differed in volume yields by almost two liters. For bedding the weight/volume relationship is counter-intuitive because of variations in the raw material, moisture content; the size of the material, “fines” or small particles, and the amount of “dust” that varies from package to package. Packers and consumers alike would benefit if the National Conference on Weights and Measures (NCWM) would remove the requirement for a compressed volume declaration from the method of sale regulation and require bedding to be advertised, sold and unit priced on the basis of the expanded (uncompressed) volume declaration.

NOTE: At the beginning of this study the OWM reviewed the existing dimensional test procedures in Section 3.9. “Peat Moss” and found the procedures lacked some generally accepted good practices inherent in dimensional metrology to reduce measurement uncertainty. As a result, OWM developed a new dimensional test procedure for use in verifying the compressed volume of packages of bedding

that is a significant improvement over the current method in Section 3.9. “Peat Moss.” It was only during the second phase of the study that it became clear that it was the expanded volume test that was critical in ensuring that consumers receive full measure. If the recommendation to remove the compressed volume declaration requirement for packages of bedding is not accepted, the proposed dimensional test methods and equipment recommendations will improve the measurement process and increase the accuracy of volumetric results for packages of bedding and peat moss alike. If the requirement for bedding packages to include a compressed volume declaration is eliminated, the OWM recommends Section 3.9. “Peat Moss” be amended to adopt the proposed dimensional test procedure.

b. Proposed Terminology and Prohibited Terms

Typically bedding is a material offered for sale for use with pets, animals, reptiles, birds or other creatures but it may be offered for sale for other purposes such as providing a ‘surface’ for stalls, paddocks or arenas. Bedding or surfacing materials may be used with horses, dogs, cats, birds, ferrets, rabbits, guinea pigs, exotic animals, chinchillas, hamsters, rats, gerbils, mice, turtles, snakes and many other creatures from the wild or domesticated pets and farm animals. The following suggested definition is written to include any material intended for use with any creature that is labeled by volume but is not intended to apply to straw or hay sold by the bale.

Definition of Animal Bedding

In 2013 the NCWM considered the following definition for Animal Bedding but did not accept it. The NCWM’s reticence was only due to concerns that the proposal might not cover all types of animal bedding.

Animal bedding is defined as “any product or material, except for baled straw or peat moss, that is advertised, offered for sale, or sold for primary use as a medium for animals to bed, nest or eliminate waste, such as compressed wood pulp or cellulose fibers (confetti, granules, or pellets), softwood shavings, shredded paper, compressed coconut fiber, ground corn cob, pelleted paper or wheat straw, cotton fibers, and bamboo products or any other material.”

While an all-encompassing list of raw materials helps improve clarity, manufacturers are always identifying new raw materials for use as bedding. The NCWM usually chooses open-ended definitions for products to be covered by a method of sale. This places more emphasis on the way that the product is used to be determinative of whether or not a product falls under a method of sale so there are no “loopholes” and packers understand what is expected. Adopting a definition that is all inclusive of the raw materials that are currently used to make bedding as well as still being able to encompass new materials that may enter the stream of production is the most flexible and efficient approach.

The OWM recommends the following:

Animal Bedding – any material, except baled straw, that is kept, offered, or exposed for sale or sold for primary use as a medium for any companion or livestock animal to nest or eliminate waste.

Units of Measure

The Federal Trade Commission considers “pet care” products to be exempt from its regulatory control under the Fair Packaging and Labeling Act. Because the labeling of bedding falls solely under the jurisdiction of states who have adopted the Uniform Packaging and Labeling Regulation (UPLR) in NIST

Handbook 130, “Uniform Laws in the Areas of Legal Metrology...,”¹⁵ the display of customary units is optional. Since 1999 the UPLR has required metric units to be declared on all packages which fall under its regulations but it also allows packagers the option of displaying customary units such as the cubic foot or cubic inches. As a result, quantity declarations may be shown on packages of bedding in terms of the milliliter (mL), liter (L), or cubic meter (m³). As currently written, the method of sale for bedding in Section 2.23. of the Method of Sale of Commodities Regulation in NIST Handbook 130 requires units in both systems of measurement to be displayed. That provision is inconsistent with the requirements in the UPLR that were adopted to encourage the use of voluntary metric only labeling. Also the current regulation does not prohibit the use of other customary dry measurements such as the dry quart or bushel which, if used instead of liters, cubic inches, or cubic feet, may frustrate value comparisons since most consumers may not know the volume of a dry quart and bushel are equivalent to 0.388 cubic foot and 1.244 cubic feet respectively.

Proposed Method of Sale

A proposal to revise the current method of sale in Section 2.23. “Animal Bedding” is presented below. The proposal includes a new definition for “animal bedding,” limits the units of measure that can be used, and includes other restrictions to ensure that label terms are used consistently. The requirement for a “compressed volume” declaration of quantity is eliminated. The proposal replaces the term “usable” with the term “expanded volume.” The term “expanded volume” is preferred because it informs consumers that the quantity declaration represents the volume of product to be recovered once it is unwrapped and uncompressed. The proposal requires the use of the term “expanded volume” only in conjunction with the quantity statement on the lower 30 % of the Principal Display Panel and does not prohibit the use of the terms “compressed,” “expands to,” or “usable” elsewhere on the label. However, the proposed language prohibits the display of “pre-compression” and “compressed” volume declarations anywhere on the package. Finally, it clarifies that metric units are required to appear on the Principal Display Panel and that specific customary units such as cubic inches and cubic feet (e.g., dry quart and bushel are not permitted to appear on the package) may be included at the option of the packer. Because these products will all bear expanded volume in metric units and because consumers have a good comprehension of the volume contained in a liter, OWM is recommending that the method of sale include a provision that, while it does not require unit prices be posted, requires all unit pricing when it is voluntarily provided by the retailer be unit priced on the basis of price per liter.

2.23. Animal Bedding.

2.23.1. Definitions.

(a) Animal Bedding – any material, except for baled straw, kept, offered or exposed for sale or sold for primary use as a medium for any companion or livestock animal to nest or eliminate waste.

(b) Expanded Volume – the volume of the product that can be recovered from the package by the consumer after it is unwrapped and uncompressed.

2.23.2 Method of Sale.

¹⁵ <http://www.nist.gov/pml/wmd/pubs/hb130-14.cfm>

- (a) Packaged animal bedding shall be advertised, labeled, offered and exposed for sale and sold on the basis of the Expanded Volume. If unit pricing is offered to retail consumers it shall be in terms of the price per liter.**
- (b) The quantity declaration shall include the terms “Expanded Volume” or wording of similar import that expresses the facts, and shall be in terms of the largest whole unit of the milliliter, liter, or cubic meter. A declaration may also include the quantity in terms of largest whole unit of cubic inches, cubic foot, or cubic yard only.**
- (c) The display of pre-compression volume, compressed volume, or supplementary dry measure units (e.g., dry quart, bushel) anywhere on the package is prohibited.**

Examples: Expanded Volume 41 Liters (1.4 Cubic Feet)

Expanded Volume 1.4 Cubic Feet (41 Liters)

Expanded Volume 27.9 Liters (1700 Cubic Inches)

Expanded Volume 113 L (4 Cubic Feet)

Expanded Volume 8 Cubic Feet (226 L)

2.23.1.3. Exemption - Non-Consumer Packages of Animal Bedding Sold to Laboratory Animal Research Industry. – Packaged Animal Bedding consisting of granular corncobs and other dry (8 % or less moisture), pelleted, and/or non-compressible Bedding materials that are sold to commercial (non-retail) end users in the laboratory animal research industry (government, medical, university, preclinical, pharmaceutical, research, biotech, and research institutions) may be sold on the basis of weight.

3. Technical Issues and Recommendations

- a. A Test Procedure and New Designs of Test Measure for Use with Bedding are needed to Ensure Accurate and Repeatable Results.**

There is no test procedure for animal bedding in NIST Handbook 133 “Checking the Net Contents of Packaged Goods”¹⁶ (NIST Handbook 133). When there is no test procedure for such a unique product, weights and measures officials must either develop new methods or modify existing ones for use.¹⁷ Most weights and measures officials use the peat moss dimensional procedure (see Section 3.9. “Peat Moss”) to verify a declaration of compressed volume on bedding. They use the mulch test procedure and the volumetric measures designed for use in testing bags of mulch (see Section 3.10. “Mulch and

¹⁶ <http://www.nist.gov/pml/wmd/pubs/hb133-15.cfm>

¹⁷ The fact that test procedures for a specific product are absent from NIST Handbook 133 does not preclude the inspection of any package by weights and measures officials. That is because they have the authority to verify the quantity of any package sold by weight, measure or count as well as the duty to prevent fraud and unfair competition in the marketplace. Since there are literally thousands of products for which no specific test procedure will be found in NIST Handbook 133 officials are encouraged to contact NIST Office of Weights and Measures and other weights and measures colleagues for assistance when they encounter new or unique products.

Soils by Volume”) to verify uncompressed volume declarations. The mulch test procedure, like other volumetric methods, (such as those used in determining the weight-per-bushel for grain), require that the product be poured into a test measure from a consistent height, and there are strict limits on the handling of the product. Handling must be kept to a minimum because it reduces product volume. The way that bedding should be handled is significantly different from how pine bark and other mulches are handled when testing mulch because bedding has to be uncompressed or broken up before it can be tested. This has led to the practice of breaking the product up on a tarp and then placing the product into a test measure by hand. Packers have concerns with this practice because they know from their testing experience at the point-of-pack that hand-filling reduces the volume delivered to the test measure, increasing the variability of tests. Another factor that contributes to the measurement uncertainty in testing bedding is the size of the packages, which can range from a few hundred cubic inches to more than 10 cu ft. Most states and packers only have test measures with capacities up to 3 cu ft so they have to take multiple measurements to test a 10 cu ft package. Because uncertainties associated with multiple readings of a single test measure are additive, the resulting measurement has a large uncertainty and may be only an approximation of the true volume contained in the package instead of one that is accurate and repeatable within reasonable limits.

b. Reasonable Maximum Allowable Variations for both the compressed and expanded volume declarations must be developed in the near future or packages of Bedding should be exempted from the Individual Package Requirement in NIST Handbook 133¹⁸

Ideally, the same test procedures and equipment specifications should be used by both packagers and weights and measures officials. This will allow for the collection of data that can be used to develop a reasonable MAV for bedding. Currently, the MAV Tables in NIST Handbook 133, Appendix A. (See Table 2-6. “Maximum Allowable Variations for Packages Labeled by Liquid and Dry Volume”) define an unreasonable package error as a package found to have a minus error greater than one percent (1 %) of the labeled quantity. In 2013 the NIST Office of Weights and Measures (OWM) reviewed limited data from inspections conducted in 2012 and 2013 by several states. This data revealed that most of the packages failed to meet the expanded volume declarations. In addition, the standard deviations found in the results were such that OWM recommended against enforcement of the 1 % percent MAV in Table 2-6, because the value appears to be unreasonable. Since these packages are required to bear two volume declarations, compressed and expanded, values for the MAV for both the compressed and expanded volumes will need to be quantified. (See discussion of the usefulness of the compressed quantity declaration elsewhere in this paper.) It is recommended, given the nature of the product, the uncertainty inherent in reading the test measures and other issues discussed in the following, more data from a wider range of bedding materials and package sizes will be needed before a final recommendation for a reasonable MAV can be proposed. However, based on current test results and anecdotal information and comments from several state officials who have tested a great deal of bedding, it is anticipated that an MAV of between 5 % to 10 % for tests where the volume of bedding is determined in a single measurement will ultimately be found to be reasonable. The tentative 5 % MAV recommendation would only be reasonable for a single measurement test. For example, if a 2 cu ft test measure is used to test a bag with an 8 cu ft expanded volume; four measurements are needed, so the MAV value must be at least doubled. For multiple measurements of volume for a single package, it is recommended that the tentative MAV be increased to 10 %. Note that previous data obtained using hand-filling cannot be combined with data obtained using the recommended test

¹⁸ Currently the average error of a lot, shipment or delivery of bedding, where the sample size is 12 or fewer packages, must be at least equal to the labeled quantity and no individual package may have an unreasonable minus error (i.e., exceed the permitted Maximum Allowable Variation).

procedures to develop recommendations for the MAV values. If reasonable values for the MAVs cannot be developed in the near future, it is recommended that bedding be exempted from the Individual Package Requirement just as the NCWM has done with prepackaged firewood.

c. Uniform Specifications for Test Measures of Appropriate Sizes for Packages of Bedding

It is known that industry and weights and measures officials use a variety of test measures, dimensional determinations, and volumetric procedures to verify the quantity declarations on packages of bedding. Because there are no specifications for test measures, officials typically use the measures specified in NIST Handbook 133 for testing packages of bark mulch. The dimensions of the mulch test measures were selected to replicate the package cross-section of bags of mulch that are sold in uncompressed quantities of 57 L (2 cu ft) or more. It is obvious that the cross-sections of bedding packages differ substantially from those of packages of mulch, and most bedding is compressed while bark mulch is not.

The maximum capacity of the mulch test measures is 2 cu ft or 3 cu ft.¹⁹ When officials test large packages of bedding, they currently use multiple fills of the test measures to verify the quantity of an 8 cu ft, 10 cu ft, or 12 cu ft bag. Each of those individual measurements includes errors resulting from reading and rounding the results. When 4, 5, or 6 readings are combined, the measurement errors are added up, and the resulting action may be taken on faulty data. The Office of Weights and Measures recommends that multiple measurements of bedding be avoided whenever possible and a test measure of adequate size be used so that a single measurement can be made to determine the volume of bedding in a package.

To avoid the multiple-measurement issue, we constructed several large capacity test measures of square and cylindrical designs so that the volume of a package could be determined in a single measurement. The larger test measure designs also enlarge the area of the bottom of the column of product in the test measure. The larger area allows the height of the column to be reduced which reduces compression (see Exhibit 18). The OWM has developed specifications and some notes on test measure design and construction, which are presented in the following. Unlike mulch, where there are typically a few package sizes such as 56 L (2 cu ft) or 85 L (3 cu ft), bedding is sold (as mentioned above) in a variety of package sizes so test measures with a fixed volume marked on a scale with a few graduations above and below a set volume are impractical for use in testing bedding. For this reason, the OWM recommended designs for the test measures that are specific to bedding, and can be used to test most package sizes in a single measurement.

One reason for using the cylindrical design typically used for dry measures is that its shape reduces the occurrence of the voids frequently seen in the corners of square test measures. Voids in bedding cannot be completely avoided but with the cylindrical design their number is reduced so that they have less impact on the measurement result. The voids that appeared in the cylindrical measures in this study appeared less frequently than in square test measures. (See Exhibit 17 showing void in corner of square test measure.) As noted, the cylindrical design is preferred for dry measures as stated in NIST Handbook 44, “Specifications, Tolerances and Other Technical Requirements for Commercial Weighing and Measuring Devices,” Section 4.45. Dry Measures. A cylinder is one of the most structurally sound and strongest of the geometrical shapes. That strength derives from the geometrical shape which disperses stress throughout walls of the vessel. (See Exhibit 16 of the cylindrical and square test measures used in this study.) In addition, the surface area of a cylinder is smaller than the

¹⁹ We understand that some packers (and at least one weights and measures jurisdiction) use a 1 cu ft test “struck” measure for volume measurements which further demonstrates the need for test measure specifications.

surface area of a square test measure of similar capacity so the volume can be determined with greater accuracy.

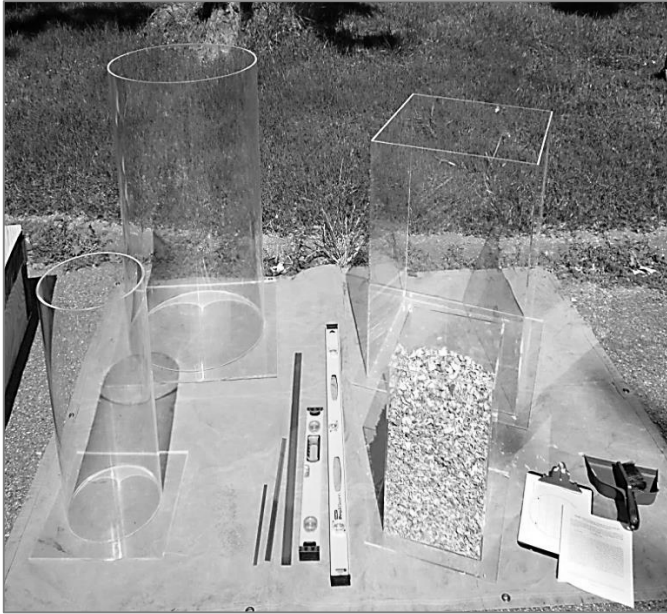


Exhibit 20. Test Measures Used in Study. The large test measures hold up to 279 L (10 cu ft) while the small measures hold up to 52 L (1.5 cu ft).



Exhibit 21. Gap in Corner of Test Measure.



Exhibit 22. Two Different Test Measures. The test measure on the left contains 226 L (8 cu ft) of bedding while the test measure on the right contains 56 L (2 cu ft).

d. Traceability of Measuring Instruments and Test Measures

Another issue of concern is whether not the measurement standards (i.e., test measures and measuring instruments such as tape measures) used by officials and industry have been calibrated and that certificates have been issued indicating that they are traceable to national measurements standards. If untraceable measuring equipment is used in volumetric determinations, the data is questionable. When questionable measurements are involved there will be disagreements over test results and there is the

likelihood that packages will be misbranded.²⁰ To achieve uniformity and to ensure confidence in test data, all test measures, and measuring devices used by weights and measures officials and that are used in industry quantity control must be calibrated to be traceable to the SI. Calibrations can be provided by NIST recognized state metrology laboratories or other accredited facilities. (See pictures in Exhibit 19 of a calibrated internal diameter micrometer being used to verify the actual dimensions of the test measures used in this study.)

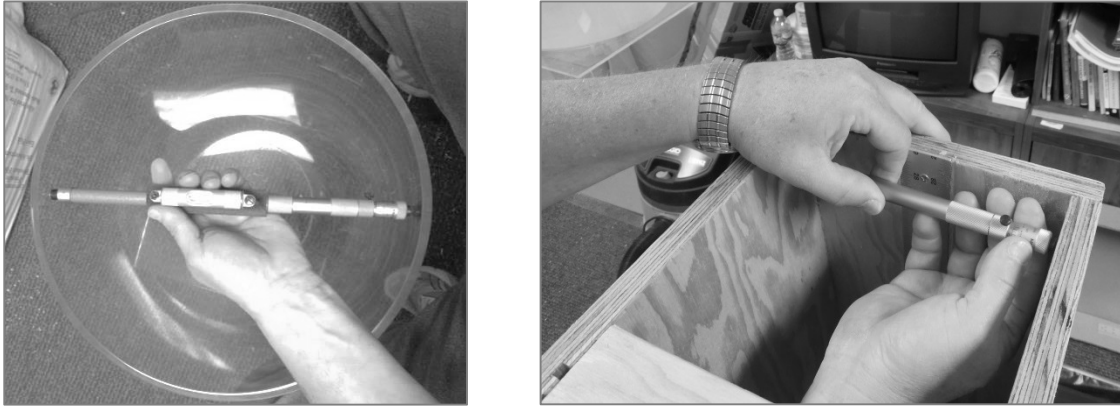


Exhibit 23. Calibrated Internal Diameter Micrometer.

e. Hand Filling Reduces the Product Volume

The standard test method for determining the weight per bushel of grain is determined using a cylindrical dry measure, which is filled using a pour method. This test method has been adapted in NIST Handbook 133 for determining the volume of Borax to verify the net weight of packages of that product. The accuracy and reliability of the pour method and the use of cylindrical dry measures is established, and it dates back to reports to the NCWM issued in 1913 and before.²¹ A pour filling method is also used in testing mulch and some states use that method (after breaking up the compressed product) to test bedding, while other states use hand filling. Hand filling is used because the compressed product has to be broken up before placing it in a test measure. It is important to note that most of the packaging machines, which fill packages of bedding, have measurement chambers that are filled to a predetermined level with loose bedding using a “pouring” system, and then compressed into the package form and then wrapped. Thus, using a pour method to fill a test measure somewhat replicates the process followed in making the original volume measurement.

In this study we compared the volume obtained by pouring the bedding into a test measure to the volume obtained by hand filling the test measure. We found that hand-filling test measures consistently reduced

²⁰ Misbranding means overstating the net quantity of contents, misleads consumers, frustrates value comparisons, and is an unfair trade practice.

²¹ See “Testing of Capacity Measures” by R.Y. Ferner, National Bureau of Standards on pages 181 - 200 in the Report of the 8th National Conference on Weights and Measures (1913). Cylindrical Test Measures: in addition to its strength which reduces the chance of deflection in the cylinder walls, another benefit of the cylindrical design is that it eliminates the 90 degree angles of the corners (where gaps in product fill frequently occur). Still another advantage of the design is that the surface area of a cylinder is less than that of an equal size square. It is the smaller surface area that improves the resolution in the volume measurements (i.e., using a 1.0 mm increment to compare the 0.37 L readability of a 24 in² square box with a surface area of 576 in², to 0.27 L readability of a 24 in cylinder which has a surface area of 433 in²).

the volume obtained regardless of the type or size of the bedding (i.e., large and small flake). We also found that hand filling has a larger standard deviation than the pour method, which results in a larger uncertainty in test results. We verified the effect of hand-filling by first determining a specific volume of each product using a pour method and adjusting the volume. We then transferred the bedding to the test measure by hand. As shown in the following tables, we consistently found the resulting volume was substantially reduced. We then transferred the product into the test measure using a plastic lined chute and the pour filling method. We performed ten tests for each fill method and found the product volumes from the pouring tests were consistently higher than those found in the hand-filling method. We also found the standard deviations in the pour filling method were consistently lower than those found using the hand-filling method (see Tables 1, 2, and 3). It is important to note that at the end of the ten tests with hand filling we retested the bedding using the pour method and found that the volume of the product recovered close to the original amount.

| Table 1. 42 L – Large Flake Wood Product | | |
|---|-----------------------|---------------------------|
| Fill Method | Average Volume | Standard Deviation |
| Hand | 41.64 L | 1.32 |
| Pour | 42.14 L | 0.17 |

| Table 2. 35 L – Small Flake Wood Product | | |
|---|-----------------------|---------------------------|
| Fill Method | Average Volume | Standard Deviation |
| Hand | 33.69 L | 0.22 |
| Pour | 35.05 L | 0.19 |

| Table 3. 38 L – Shredded Paper | | |
|---------------------------------------|-----------------------|---------------------------|
| Fill Method | Average Volume | Standard Deviation |
| Hand | 38.35 L | 0.97 |
| Pour | 38.78 L | 0.36 |

Exhibit 24. Photo to the right shows the use of a chute to pour small flake bedding into a 283 L (10 cu ft) test measure.



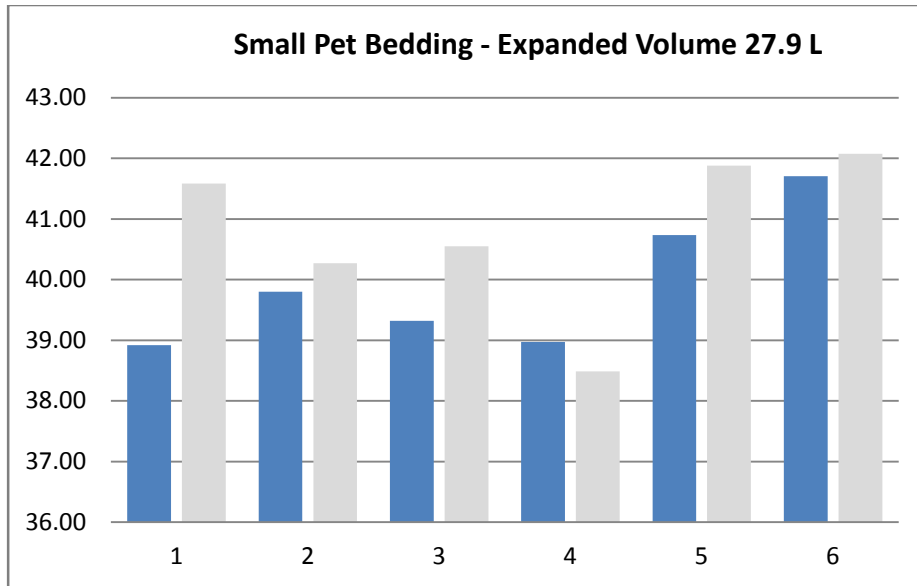
Exhibit 25. Photo to the left shows the use of a chute to pour shredded paper bedding into a 44 L (1.5 cu ft) test measure.



Even though we found the repeatability of pour filled tests to be significantly better than hand filling, more testing will be needed to confirm that the results are reproducible with all types of bedding.

f. The Pour Filling Method aids in the Recovery of Product Volume

More than 100 measurements were made using the pour filling method pictured above and it was found that the volume quantities obtained on second pour were generally greater than those obtained during the first pour. The increase in volume found on the second pour was common with most products and makes sense after examining the packaging process. The compression bagging machines are designed to compress product in different ratios but in one example the product is compressed in a ratio of 5 to 1 using up to 1000 or more pounds per square inch of pressure (i.e., 10 cu ft of loose bedding is compressed to 2 cu ft). Even though the test procedure calls for compressed product to be “uncompressed” by hand, that process in itself does not appear to be sufficient to completely loosen the product on its own. The pouring aids in uncompressing the product and allows it to recover more of its original pre-compression volume. The findings indicate that the volumetric test procedure should require at least two pours for each package with the expanded volume being determined on the second pour. The graph below illustrates the findings on a sample of six packages of small pet bedding of shredded paper. The results illustrate (the first pour volume is illustrated by the dark column and the second pour volume is illustrated by the lightly shaded column) how the product volume typically, but not always (see package 4, which also happened to be the lightest weight package in the sample), increases on the second pour. Some of the differences between the first and second pour were 2 L (122 cu in or 7 %) or more. We found similar increases of volume with all other products, further supporting the suggested requirement for at least two pours before the volume is determined.



g. Chutes – Used for Uncompressing Bedding and Pouring into the Test Measure

Because the compressed bedding must be uncompressed by hand before it can be poured into a test measure, it was decided that a tray or chute of adequate size could be used for both purposes. When experimenting with plain cardboard chutes, it was found that the bedding would not flow into the test measures evenly and without a lot of shaking. Cardboard chutes were then lined with polyethylene sheeting creating a smooth slippery surface that allowed the bedding to flow freely and evenly into the test measure. The latest generation of the chutes was constructed of wood in various dimensions to hold the expanded volume of various size packages of bedding. Constructed of ¼ inch plywood, they are lined with thick poly sheeting to ensure the product flows out smoothly. In Exhibit 22 upper left picture, a 280 L (10 cu ft) chute is being used to uncompress the bedding. In the picture on the right the bedding has been uncompressed and is ready to be poured into the test measure. The pictures on the next page show how the bedding is uncompressed in a chute by hand. The last picture shows the four sizes of chutes used in this study.

Exhibit 26. These pictures show a package of bedding being opened and the product being uncompressed and prepared for measuring.





Exhibit 27. The following pictures show how a larger chute (over 280 L) and smaller chutes are used to fill the test measures.



The specifications for the chutes corresponding to typical size packages of bedding are shown below and will be included in the equipment list for the expanded volume test procedure.

| Chute Specifications | | | |
|-------------------------------|----------------|----------------|-----------------|
| Chute Nominal Capacity | Height | Width | Length |
| 70 L (2.5 ft ³) | 254 mm (10 in) | 228 mm (9 in) | 1219 mm (48 in) |
| 100 L (3.5 ft ³) | 254 mm (10 in) | 279 mm (11 in) | 1397 mm (55 in) |
| 170 L (6 ft ³) | 279 mm (11 in) | 355 mm (14 in) | 1727 mm (68 in) |
| 240 L (8.5 ft ³) | 304 mm (12 in) | 406 mm (16 in) | 2006 mm (79 in) |
| 283 L (10 ft ³) | 304 mm (12 in) | 406 mm (16 in) | 2286 mm (90 in) |

NOTES: The chutes are constructed using hinges and pins so that they can lay flat for transportation. They can be constructed of sheet metal or other slick surface material which enable the bedding to flow easily. The construction of the chutes used in this study allows the sides to move in or out slightly so that the bedding does not become clogged at the outlet. The heights and lengths may be adjusted slightly to fit into vehicles for transport but the widths should not be reduced because narrowing the opening can restrict material flow. Also, the width should be kept smaller than the opening of the test measure so that spillage does not occur during pouring.

h. Calculating the Volume of Bedding in a Test Measure Using a Headspace Method

i. Hand Leveling of the Bedding causes “Packing” and Reduces Volume

Whenever dry measures are used, NIST Handbook 133 cautions inspectors that measures should be filled “without agitating” (Section 2.4. “Borax”), or that the inspector should “not rock, shake, drop, rotate, or tamp the test measure” (Section 3.10. “Mulch”). This study was conducted following the handbook’s guidance and the test measures were filled using the pour method. Following the instructions in Section 3.10. “Mulch,” care was exercised “in leveling the surface” of the bedding so that visual readings could be taken across the top surface of the bedding to determine the volume. In Exhibit 25 below, a level is being used to check for level. For this study multiple measurements were taken (e.g., 4 to 12 readings which were averaged) of the height of the bedding inside the test measures. One of the advantages of using the transparent test measures was that the amount of “packing” that was taking place inside the test measure could be seen and measured as the surface of the product was leveled. The term “packing” is used here to clearly distinguish the unintentional, but unavoidable, reduction of volume that results from the act of hand-leveling the bedding. This seems to be a reasonable distinction to make since some level of compression of all of the bedding types tested occurred, and cannot be eliminated. However, larger surface areas of the recommended test measure designs reduce the height of the column in the measure substantially, which in turn will reduce the amount of compression that occurs during testing.



Exhibit 28. Leveling the Surface. Showing the use of a 150 mm mesh to level the surface of large flake bedding.



Exhibit 29. Checking Level. Checking the surface of large flake bedding for an approximation of a level condition.

The impact of “packing” was first observed when leveling out a test measure filled with small flake bedding. It was determined that using hands to level the product would not result in consistent results between inspectors. A 150 mm piece of rigid stainless steel mesh was then used to level the product. However, even when all three testers used the same mesh to level the small flake bedding, there were wide variations over the surface of the product as well as a reduction in volume. Samples of large flake and cellulose bedding were tested and it was found that “packing” occurred with those products.

It should be noted that measurements were made in millimeters because that size increment is easily readable in field situations and it simplifies the calculations. “Packing” is a concern because a 1.0 mm change in height of the bedding has a significant impact on the resulting volume in any test measure (the errors vary depending on the surface area of the test measure). For the 63.7 L (2 cu ft) wooden test measure used for measuring mulch, a 1.0 mm error in a height measurement will result in an error of 92 mL (5.6 cu in) while a 1.0 mm error in a 283 L (10 cu ft) square wooden test measure recommended for use in testing bedding will result in a volume error of 0.37 L (22.6 cu in). On the other hand, due to its smaller surface area, a 1.0 mm error in measurement in the 279 L (9.8 cu ft) cylindrical measure is equivalent to 0.27 L (16.4 cu in).

To find a way to address the issue of the “packing” caused by hand leveling, the bedding was repoured into the test measure and, without leveling the product, the headspace measurement procedure was used as described in the following Item ii. “Headspace Measurement Procedure Adapted for Bedding.” Twenty-six measurements were taken across the surface area of the bedding to determine its volume. Those values were averaged and subtracted from the height of the test measure to ascertain the volume as illustrated in Figure 1. The bedding was then leveled with the 150 mm wire mesh and another 26 measurements were taken across the surface to determine the volume. The differences were significant and verified that leveling the product by hand reduced the volume. The volume, after leveling on the smaller test measures, ranged from 0.2 L to 0.5 L less than the unleveled volume and up to 5 L less than the unleveled volume on the larger test

measures. Because these significant differences were discovered early in this study no further leveling of the bedding was done, and the headspace method was used for all subsequent volume determinations. It was found, after a little practice, the measurements were easily made and the improvements in accuracy were well worth the added effort.

ii. Headspace Measurement Procedure Adapted for Bedding

Testing any product (from grain to Borax) using a dry measure can be fraught with opportunities for measurement errors from “packing” when the product is leveled.²² Measurements were taken inside the test measure rather than around the outside of the test measure. This allowed more accurate measurements to be made directly on the product so that the variations in the surface (which cannot be eliminated) could be “smoothed” out by averaging multiple measurements. This headspace method is used in NIST Handbook 133 for determining the volume of paint in a can and is described in Section 3.7. “Volumetric Test Procedure for Paint, Varnish, and Lacquers.” In that procedure the volume is determined by measuring from the bottom of a spanner bar down to the surface of the liquid and this value is subtracted from the interior height of the can to obtain a height measurement, which can then be used to calculate the volume of the paint. The surface of a liquid is level so only three measurements are taken and averaged. Because the surface of bedding is very irregular, a greater number of measurements must be taken in a uniform pattern across the surface of the bedding to obtain a representative depth from the top of the test measure. By taking at least 25 measurements spaced across the surface area of the square or cylindrical measures, good results were obtained with a good representation of the average depth. The follow graphics illustrate how the headspace method works:

²² See page 191 in “Testing of Capacity Measures” by R.Y. Ferner, National Bureau of Standards on pages 181 - 200 in the Report of the 8th National Conference on Weights and Measures for 1913 for an earlier discussion of the “packing” effect.”



Picture 1. This picture shows how to read the depth of container.

The picture on the left (Picture 1) shows how to read the depth from the bottom of the straightedge (top edge of measure) down to the bedding in a 44 L test measure from a position that reduces parallax. Picture 2 below illustrates the actual worksheet with the headspace procedure on the 44 L cylinder test measure (its internal radius is 151 mm and its height is 610 mm). The bedding was poured into the test measure but not leveled. Then 26 measurements were made at the locations shown on the grid to determine the depth of the product from the top edge of the measure. The average of the 26 values was 500.7 mm which was subtracted from the height of the test measure to obtain 109.26 mm for the average height of the column of bedding in the measure.

The volume was calculated using: $Volume\ in\ liters = \pi r^2 h$
 $3.14159265 \times 23035.69 \times 109.26\ mm = 7.90\ L^*$

*After the calculation was completed, the result was divided by 1 000 000 to obtain the volume in liters.

Figure 6. Illustration of Worksheet.

| | | | | |
|-----|-----|-----|-----|-----|
| | 413 | 367 | 390 | |
| 439 | 439 | 430 | 419 | 432 |
| 478 | 475 | 492 | 462 | 478 |
| 552 | 542 | 528 | 532 | 530 |
| 578 | 580 | 577 | 569 | 565 |
| | 589 | 590 | 573 | |



Figure 3. Using the headspace measurement on a 279 L test measure. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.



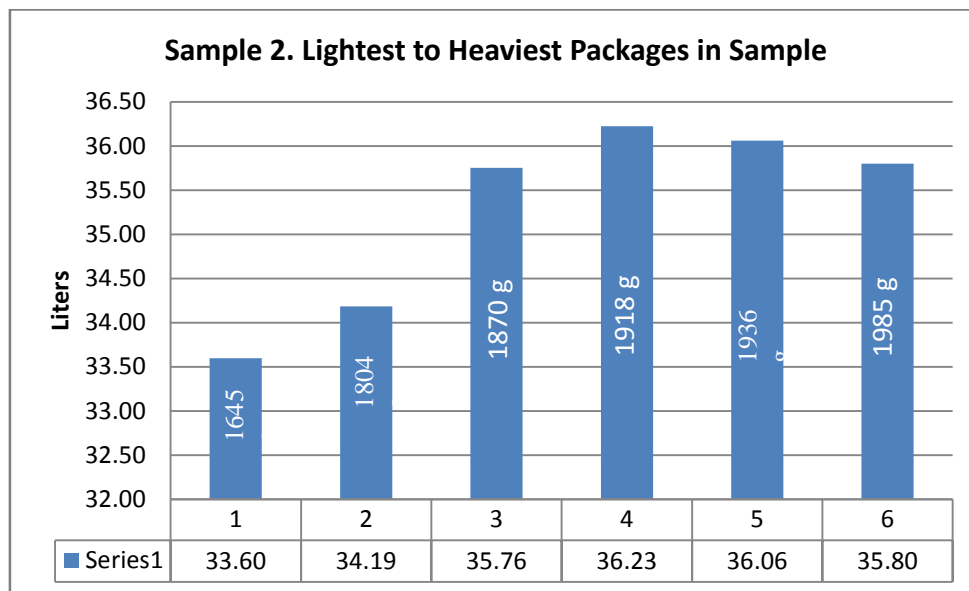
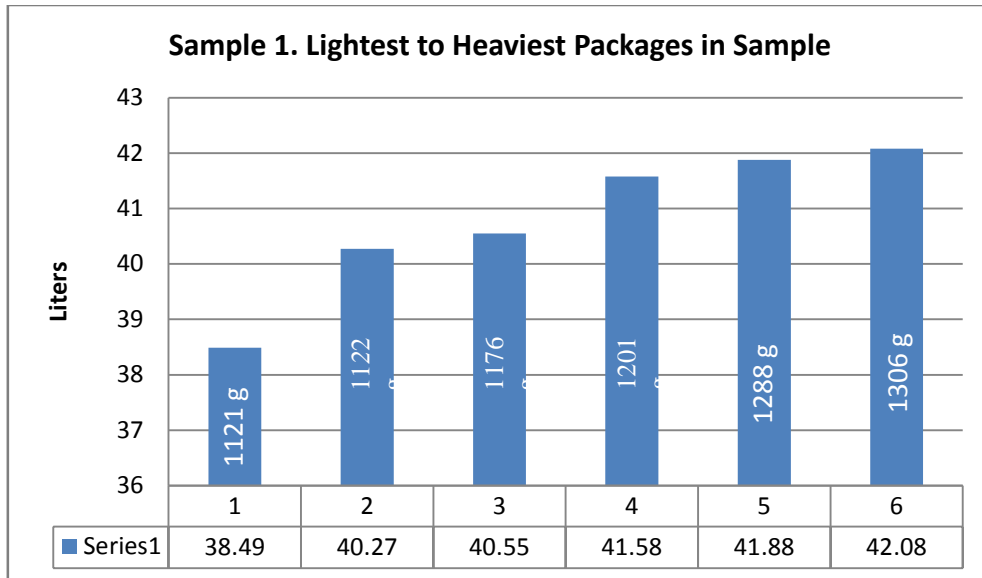
Figure 4. Showing how the ruler is placed on the bedding with the headspace method. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.

Some packers may choose to level the product in a test measure or take fewer readings across the surface to determine if the package passes or fails a quantity control test in a production environment. But, in official inspections by weights and measures officials, it is recommended that the product be poured into the test measure and measured without leveling so that the “packing” (volume reduction) that is known to occur whenever the product is handled can be avoided. Also, for official tests, it is critical that variations be measured so the data can be utilized in the calculations of sample standard deviations and sample error limits to decide if a sample passes or fails.

i. Optional Audit Screening by Weight

The verification of the expanded volume of animal bedding outside of a production plant requires the inspector to destroy the package and un-compress the product. After the product is tested, it cannot be returned to the original packaging so it will need to be discarded or placed in a large trash bag to be held for disposition by the retail store. In carrying out this study, the packages were weighed prior to opening them for the volumetric test to see if there was a consistent relationship between weight and volume. In reviewing the test data, it was found that the net weight of the packages did not correlate with the expanded volume found in testing. However, it was determined that the package gross weights could be used in an audit procedure. For example, if the expanded volumes of the lightest and heaviest packages in a sample passed, it could be expected that all of the remaining packages in the sample would also contain at least the expanded volume. The Industry experts we spoke with agreed that this type of weight screening was workable could be used to save both time and labor expenses and also reduce destructive testing and product waste.

To see if a weight screening approach would work in the real world, two sets of samples comprised of six packages from two different lots of a bedding product made of cellulose were collected. The expanded volume declared for both samples was 27.9 L (1700 cu in). All of the packages in each sample were weighed to obtain their gross weights and then each was tested to verify the expanded volume. The results from both samples revealed that the expanded volumes of the four intermediate weight packages fell well within the range in volume between the lightest and heaviest packages in the sample (the gross weights of each bag are shown on the bars of the graphs).



Regardless of the type of product under test, the volumetric test destroys the packaging and the product cannot be repackaged. This is a suggested alternative approach to reduce destructive testing and to save inspection resources. The test procedure will contain the recommendation that after randomly selecting the sample packages from the inspection lot, a gross weight be taken on all, select the lightest and heaviest packages first, and conduct a volumetric test on them to verify the expanded volume. If the lightest and heaviest packages pass the volumetric test, it is likely that the remaining packages in the sample will also pass. Jurisdictions may want to accept the sample as an AUDIT TEST and inspect another lot. If either of the two packages are found to have a minus error that exceeds the MAV the sample fails and no further testing should be done (assuming 0 MAVs are allowed for the sample size (see NIST Handbook 133, Appendix A, Table 2-1. “Sampling Plans for Category A”). However, if either of the first two packages has a minus error that does not exceed the MAV the inspector should test all of the packages in the sample as they normally would in a NIST Handbook 133 test procedure.

If the gravimetric audit procedure is used, the inspector will be advised to ensure that the scale is sitting on a solid level support and that its accuracy has been verified to a test load that is at least 10 % more than the gross weight of one of the packages (e.g., to estimate that value place one of the packages on the scale and then test the scale with a load above the package’s gross weight).

j. There is Little Benefit for Consumers in Verifying the Compressed Quantity Declaration

Based on a review of test data provided by states from the 2012 - 2013 testing, it is noted that in most instances the fact that a package passed the compressed dimensional test did not ensure that the package would pass the uncompressed volume test. Test findings for the compressed and uncompressed quantities in this study were consistent with the state results. Furthermore, in the opinion of industry experts, even if the compressed quantity is correct that does not mean that the expanded (uncompressed) volume declaration will be accurate.

It is unlikely that most packages of animal bedding would fail the dimensional test. If the sample packages do not measure up, the Inspection Lot should be rejected without further testing. However, if should a sample passes the dimensional test, the volumetric test must be carried out before a final decision on whether or not the lot passes both tests is made.

4. Packages of Compressed Bedding

a. How Manufacturers determine a Compressed Volume Declaration.

A compressed volume declaration on a package of bedding is determined from the target dimensions of the finished goods package as designed. Manufacturers design these packages as cuboids with all right angles and flat surfaces. Typically, the natural variability of the fibers they package will almost always create some “plumping” along the surfaces and rounding on the edges resulting in irregular package dimensions. For most manufacturers the target compressed volume design intentionally errs on the side of a smaller compressed volume declaration than could be reasonably claimed, but that approach ensures compliance with the stated compressed volume (assuming the package is adequately filled). Because packers tend to understate the compressed volume declaration, these products routinely pass the compressed package (peat moss) test procedure in NIST Handbook 133.

b. A Dimensional Test is used to Verify Compressed Volume.

This method of determining the volume has a large uncertainty. This is due to the difficulty in obtaining exact measurements of irregularly shaped packages in flexible packaging. Typically bedding packages (like peat moss) are formed in a rectangular cuboid, but the edges of most bags are rounded and there is expansion (or “plumping”) of the panels of a bag (including the ends and sides). Some packages of compressed bedding are irregular in shape and so loosely packed such that they do not hold a cuboid form firmly enough for reproducible measurements to be made. Exhibit 26 on the left shows a package of peat moss, which is the product that the original test procedure was developed to verify. Exhibit 27 on the right is a package of “compressed” bedding that is too loosely packed to utilize the peat moss dimension procedure.



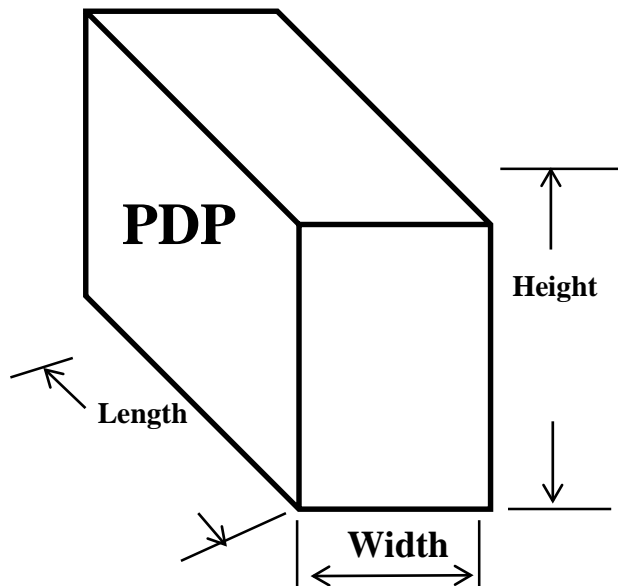
Exhibit 30. Peat Moss.



Exhibit 31. Compressed Bedding.

Note: For the purpose of providing uniform identity of the dimensions recorded for this study, a cuboid is shown in Exhibit 28 with the dimensions identified and oriented with the Principal Display Panel (PDP) as it is defined in the NIST Handbook 130, “Uniform Packaging and Labeling Regulation.”

Exhibit 32. Determining the Volume of a Cuboid.



The formula for determining the volume of a cuboid²³ is $Volume = Length \times Width \times Height$ (Note: an alternative formula $Volume = Height \times Area\ of\ the\ Base$ (where $L \times W$ give the area of the base). In the case of packages of bedding, this formula may not provide an accurate determination of volume. This is because the geometric formula for a cuboid is based on the 6 panels of the cuboid being flat and the 12 edges meeting at 90 degree right angles. On most compressed bedding, the package edges are rounded and there can be “plumping” or depressions in the package panels (excess packaging tails²⁴

²³ A cuboid has six rectangle faces, twelve edges and eight vertices. It is also called a right cuboid because the edges meet at right angles of exactly 90 degrees.

²⁴ A packaging “tail” is that part of the flexible packaging remaining after the package is heat sealed and cut.

can also cause errors) making it difficult to visually define a measurement point. The following picture shows the rounded edge of a 16 L package of red cedar bedding. The “plumping” of the package and rounded edges (angles) make it difficult to define a measurement point for the length, width, and height of the package.



Exhibit 33. Plumped bedding package illustrating rounded edges (angles), which hinders getting accurate measurement points.

A packaging “tail” is the part of the packaging remaining after the package is heat sealed and cut. Typically, tails are found only on the top or bottom of the package and can be avoided in taking the length and width measurements along one side of the package. As shown in the photographs in Exhibit 32 the size of a “tail” can vary greatly from product to product. If, for some reason, they cannot be avoided for the dimensional test, they must be folded consistent with the packaging design and taped against the body of the package to provide a clear field of view and placement of measuring equipment during the dimensional test.

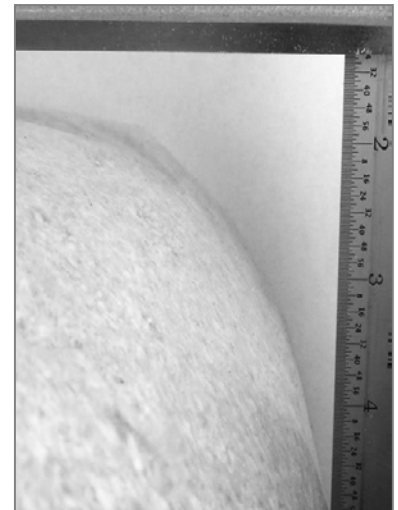
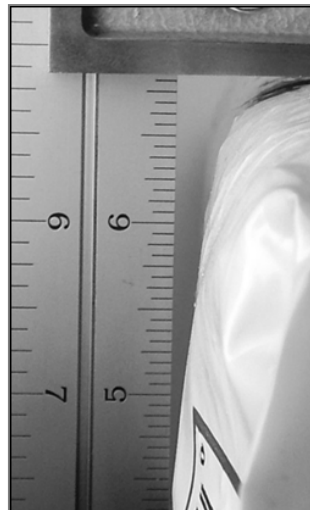


Package Tails: The “tail” on the package shown at right was folded and taped so that dimensional measurements of height could be made. The thickness of single layer of this wrapper was 0.0035 in. At several measurement points on one end of this package there were seven layers (0.024 in) of packaging. In addition, the “tail” on the other end of the package totaled three layers (0.010 in). The total thickness for both ends was 0.034 in. In NIST Handbook 44, “Specifications, Tolerances and other Technical Requirements for Commercial Weighing and Measuring Devices,” Section 5.52. “Linear Measures” the Acceptance Tolerance for a 36 in ruler is ± 0.046 in. In this example, the error caused by not deducting for the thickness of the packaging equaled at least 70 % of the tolerance allowed for a 36 in ruler.



Unlike the ASTM International test method for peat,²⁵ NIST Handbook 133 does not require adjustment of the net volume to reduce measurements to account for the thickness of the packaging (e.g., on a 3 mil thick package [0.003 in], each measurement would be reduced by twice the bag thickness or (0.006 in) which benefits packers). (See the discussion in the table above for an example of how the packaging thickness with multiple thicknesses relates to the tolerance for the measuring device.) By not deducting for the thickness of the packaging, the calculated volume is increased to the benefit of the packer.

NIST Handbook 133 requires the measurements to represent the dimensions of the cuboid of the bedding so the inspector must ensure that tails are folded and measurement points taken such that multiple folds of packaging material do not affect the accuracy of the measurements. The following pictures (Exhibit 32) show the edges from 16 L (1000 cu in), 85 L (3 cu ft) and 113 L (4 cu ft) packages of mini and large flake bedding showing how rounded “angles” make it difficult to define a measurement point for the length, width, and height of the package.



²⁵ See Section 6.2 of ASTM International D2978-03 (Reapproved 2010) “Standard Test Method for Volume of Processed Peat Materials.”

Exhibit 35. Measurement Technique.

The radius of the edges of the packages tested with quantities of 16 L to 156 L ranged from about $\frac{3}{16}$ in to more than 2.5 in. The following graphics illustrate how the radius impacts the accuracy of the area determination. The area of the colored rectangle with 90 degree angles shown below is 96 sq in.

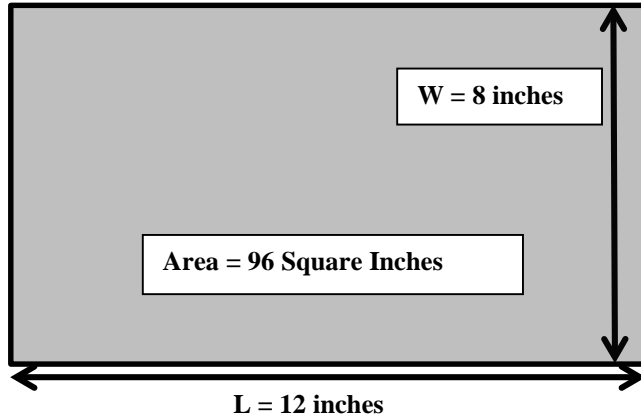


Exhibit 36. Graphics illustrating impacts the accuracy of the area.

If this rectangle is redrawn with rounded corners the area will decrease as the radius increases.

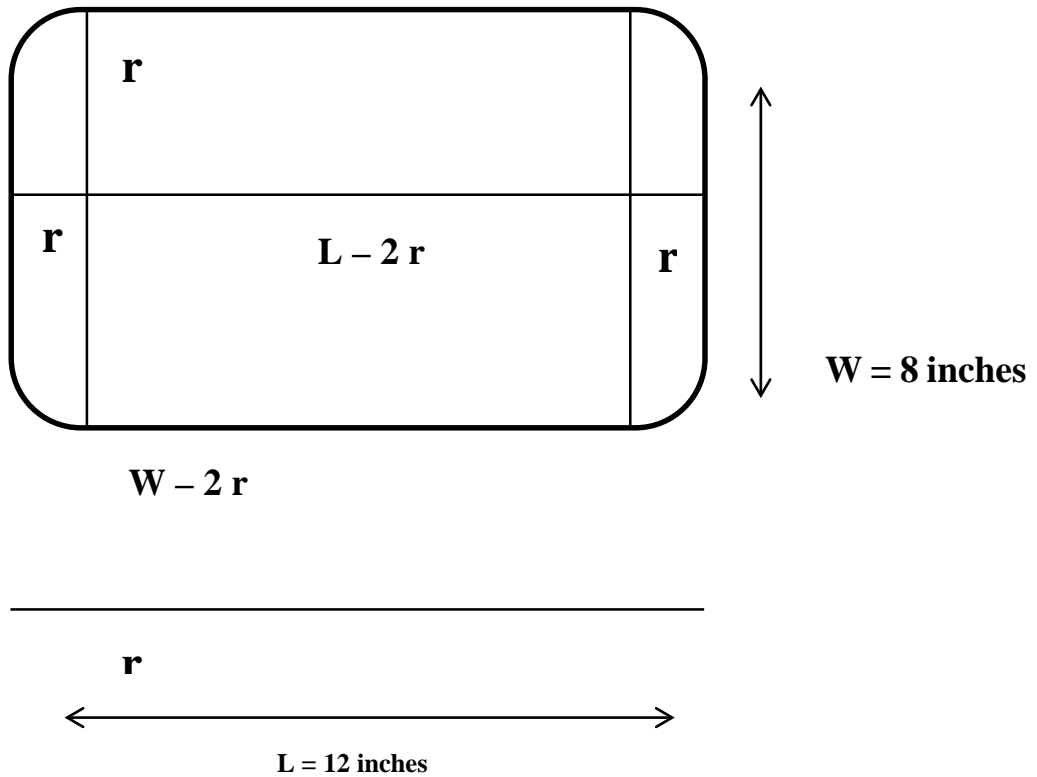


Exhibit 37. The impact of rounded corners on determining the accuracy of

This table illustrates how rounded corners impact the accuracy of a volume determination. The comparison of radius measurements show how the cuboid volume differs from the actual volume of the package from 1 cu in to 86 cu in as the radius of the corners increases.

| Radius (r) of Corners in Inches | Length | Width | Height | Volume with Rounded Corners $H \times (L \times W - (4 - 3.14159265) r^2)$ Volume in Cubic Inches | Cuboid Volume $L \times W \times H$ | Difference from Cuboid in Cubic Inches |
|--|-----------|-------|--------|---|---|---|
| | in Inches | | | | | |
| $\frac{3}{16}$ | 12 | 8 | 16 | 1535.5 | 1536 cu in | - 0.5 |
| 0.25 | | | | 1535 | | - 1.0 |
| 0.5 | | | | 1532 | | - 4.0 |
| 1.0 | | | | 1522 | | - 14.0 |
| 2.5 | | | | 1450 | | - 86.0 |

c. Product Variations Are Common in Other Dimensional Tests in NIST Handbook 133

It is important to remember that dimensional testing is used for other packaged goods in NIST Handbook 133 such as bundled and boxed firewood as well as polyethylene sheeting and even paint. Similar measurement challenges are encountered in defining the measurement point and in accounting for irregular shapes. However, bedding can be distinguished from packages of firewood because packages of bedding are required to bear declarations of the quantity in terms of the usable (expanded) volume which can be verified in a test measure.

Average of Multiple Measurements

One approach that NIST Handbook 133 uses to deal with variations in product sizes is to take multiple measurements along each panel and then average the results. The assumption for this approach is that the greater the number of measurements taken, the better the average value reflects the actual dimensions of the product under test. Because the shapes of bedding packages vary significantly, additional measurements improve the accuracy of the measurements. For the test procedure recommended NIST is advises that at least five measurements be taken for each dimension being verified (i.e., length, width, and height) and that these values be averaged.

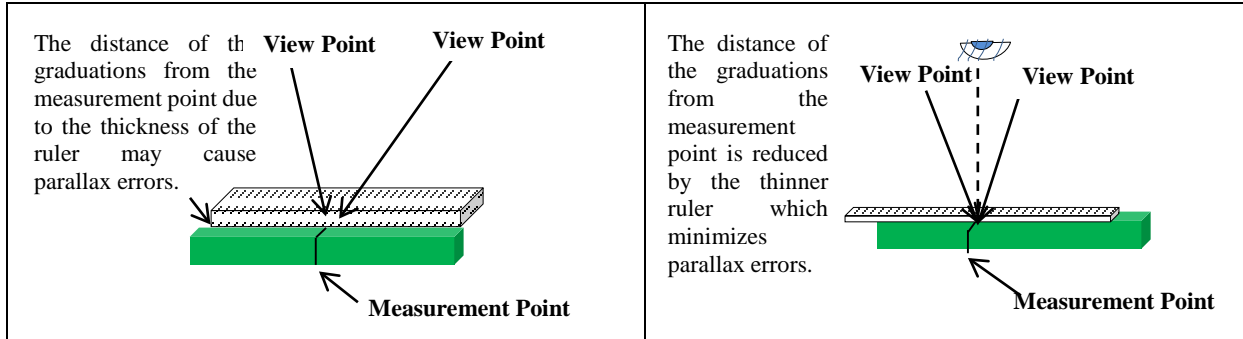
5. Errors

a. Observational Error

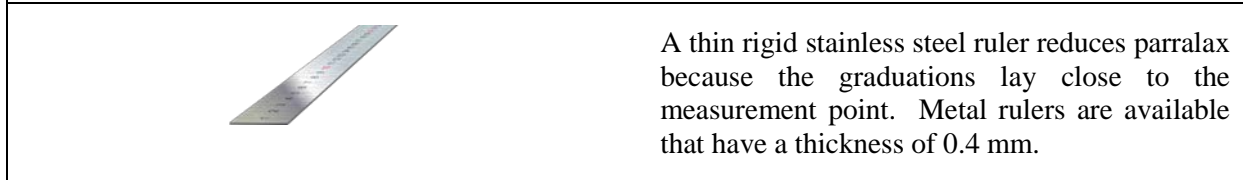
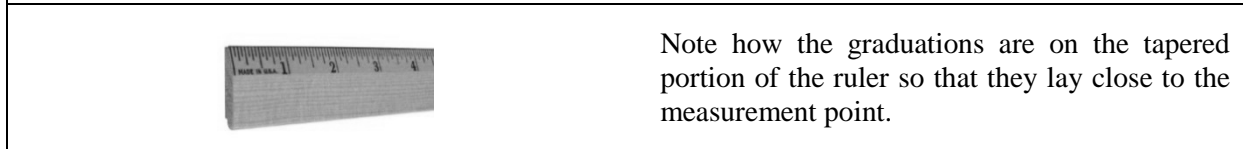
For this test procedure a linear measurement is understood to be the distance between two points in a straight plane, that is a reference (or zero) point and a measurement point. There are many possibilities for error in testing packages dimensionally. One of the most difficult issues with bedding packages is identifying measurement points due to the irregular surfaces of the planes (e.g., plumping of the package). Several recommendations are provided below that may help reduce measurement errors and uncertainty. Some basic measurement issues which are problematic in most measuring processes will be reviewed so that every reader has an understanding of the factors that were considered in developing these test procedures.

i. Parallax

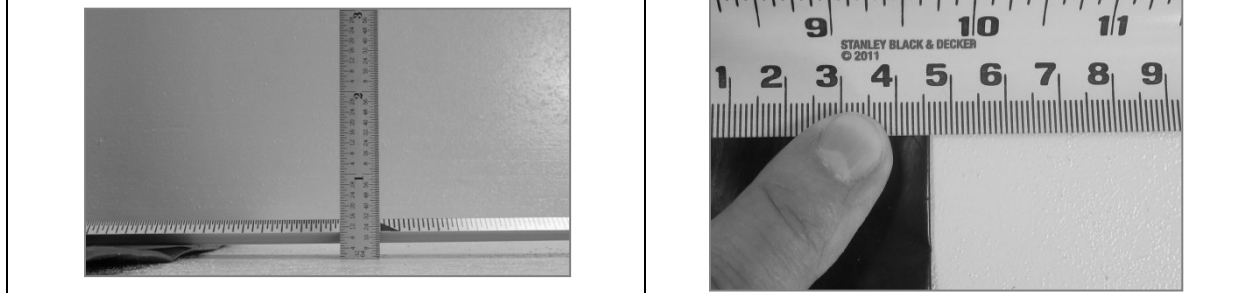
When the graduations are too far from the measurement point, such as when a thick ruler is used, there is a possibility that measurement errors will occur as a result of parallax. Parallax is the apparent displacement of a graduation due to a slight change in the position of the observer. This is illustrated in the exaggerated graphic on the left.



One way to reduce parallax error is to use a thin ruler and place it so that its graduations are as close to the measurement point as possible. By understanding parallax you can usually reduce it to a minimum by using suitable test equipment and aligning your eyes so that they are perpendicular to the graduation (see dashed line) and the measurement point. See graphic above right.



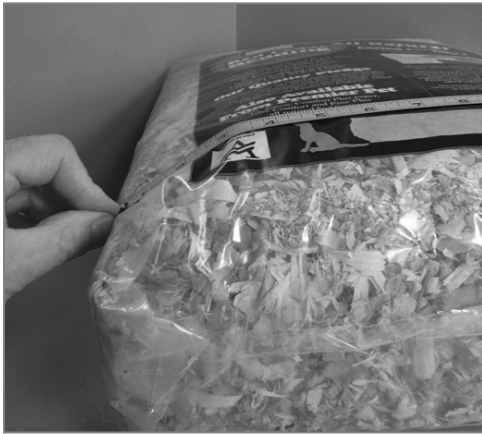
A rigid tape measure can also cause parallax errors. This is because the curve in the blade (which strengthens the tape) will hold the markings up off the package being measured by as much as $\frac{9}{32}$ in or more on a 1 in wide tape. To eliminate this problem the inspector must push the tape flat against the package. See picture at right.



b. Manipulative Errors

i. Bending a Tape or Using Improper Angles on a Ruler or Tape will Result in Measurement Errors

For this test procedure a linear measurement is considered the distance between two points in a straight plane. When a linear measuring device is used, it is important that the measuring instrument not bend or “deflect” because any measurement taken that is not parallel to the edge of the package (i.e., the straight plane mentioned before) will introduce trigonometric errors (these are typically cumulative). This is one reason that flexible tapes are not recommended for use in this NIST Handbook 133 test procedure. As mentioned above, most tape measures have a curve in the blade to stiffen it. Because tapes are flexible, it is essential that the inspector reduce the deflection to a minimum before taking a reading of any measurement. Another source of error is the angle of the measurement. Always keep a 90-degree angle to the edges of the package to avoid introducing errors (see photos exaggerated examples.)



Do not bend the tape.



Wrong! Keep the angle of the tape or ruler perpendicular to the edges of the package or trigonometric errors will occur.

Exhibit 38. Proper Measurements are required to avoid errors.

ii. Rounding

Another source of error occurs when the measurement point falls halfway between two graduations on a ruler. Here the error can be as much as half the graduation. For example, if you use a ruler with $1/16$ in (1.58 mm) graduations, the potential rounding error is $1/32$ in (0.75 mm) or more. To avoid disputes over the possibility of subjective judgments, the draft procedure requires rounding of measurements that fall between two graduations up in favor of the packer as a matter of practice. The use of millimeters will help to further reduce the errors in volumetric determinations and will simplify the calculations as well.

iii. Slippage

It is difficult to keep the zero “reference point” stabilized when you are measuring any object free handed. Packages of bedding are much more difficult to measure because of their irregular shapes. When measuring most items, you place the zero of the ruler at one edge of the object and then move your head to read the ruler at the measurement point. Experts in dimensional measurement have found that when the observer moves their head from the reference point to view the measurement

point they frequently move their hands apart and lose the zero reference.²⁶ See Exhibit 35. This draft procedure recommends that at least 5 measurements be taken to determine the length, width, and height of a package so there will be a potential for 15 instances of slippage, which can have significant impact on the accuracy of the volume determination. Several inspectors who recognize the problem of slippage and who routinely test bedding reported that they use a clipboard or place the package against a wall to provide a solid base for the zero reference. Using that concept, an inexpensive but rigidly constructed three-sided “Measurement Frame” was built to aid in keeping the reference point stable against a solid surface to improve the accuracy of the measurements. See Exhibit 36.



Exhibit 39. Taking Measurement Points.

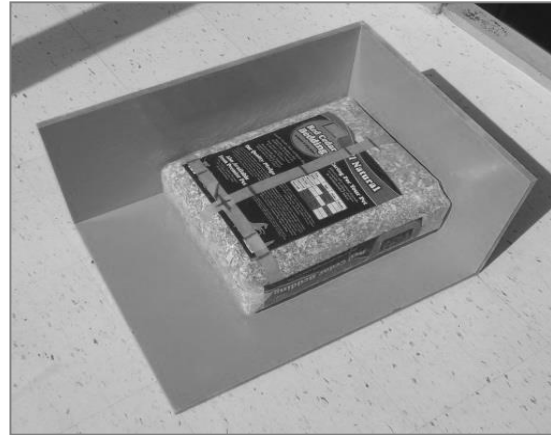
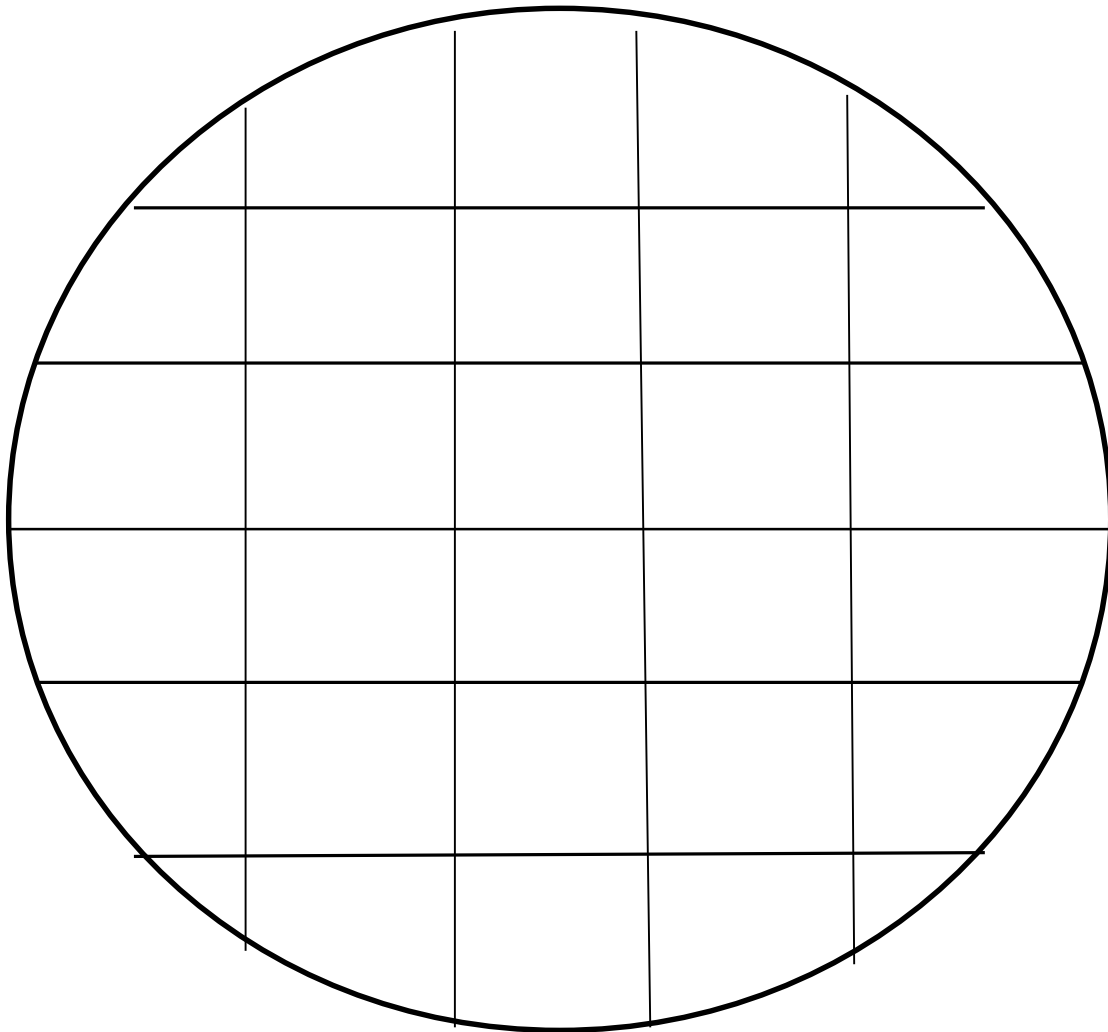


Exhibit 40. Measurement Frame built as an aid to keep reference point stable.

Another step to improve the process is the use of a carpenter square or straight edge to help define the measurement point. The square or straight edge is moved to five points along the package to allow the inspector to make measurements of variations in the dimension. By combining the use of the measurement frame, a rigid rule with 1.0 mm graduations and the carpenter square or straight edge, the accuracy and reproducibility of the measurements (and so the compressed volume measurement) are improved substantially.

²⁶ See Chapter 5, “Measurement with Graduated Scales and Scaled Instruments in “Fundamentals of Dimensional Metrology” for additional information on good measurement practices.

Appendix A. 26 Point Measurement Grid and Package Error Worksheet for Cylindrical Test Measures



Sample Package _____ Labeled Expanded Volume (L): _____

A. Interior Height of Test Measure: _____ B. Radius of Test Measure (r): _____

C. Average Depth (Sum of Measurements ÷ 26): _____

D. Average Height of Bedding (= A - C): _____

E. Volume (L): _____ = $3.14159265 \times r^2 (B^2)$: _____ \times D: _____ \div 1 000 000

F. Package Error (L): _____ = Labeled Volume (L): _____ - E (L): _____

Volume is calculated using: *Volume in liters = $\pi r^2 h$* For example: if r^2 is 23035 and height of bedding is 109.26 then
 $((\text{Pi}) 3.14159265 \times r^2 (23035) \times 109.26) \div 1\,000\,000 = 7.90 \text{ L}$

Appendix B. 25 Point Measurement Grid and Package Error Worksheet for Square or Rectangular Test Measures

| | | | | |
|--|--|--|--|--|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Sample Package _____ Labeled Expanded Volume (L): _____

A. Interior Height of Test Measure: _____ B. Area of Test Measure Base (L× W): _____

C. Average Depth (Sum of Measurements ÷ 25): _____

D. Average Height of Bedding (= A – C): _____

E. Volume (L): _____ = B. Area of Test Measure Base: _____ × D: _____ ÷ 1 000 000

F. Package Error (L): _____ = Labeled Volume (L): _____ – E (L): _____

Volume is calculated using: *Volume in liters = (lw)h* For example: *If length and width are 609.6 the area of the measure's base is 371612. If the Average Height of the Bedding is 109.26 then:*

B. Area of Test Measure Base (371612) × Average Height of Bedding (109.26) ÷ 1 000 000 = 40.6 L

| | | | | | | | | | | | | | | | | | | | | |
|--|---|--|--|--|--|-------------------------|--------------|--|--|--------------------------------------|-----------------------|------------|---------------|--|----------------------|--|--|------------|--------------|---|
| Date: | NIST Handbook 133 - Category A Lot Size _____ Sample Size _____ Worksheet for Packages of Animal Bedding and Peat Moss Labeled by Volume – Dimensional Procedure | | | | | | | | | | | | | | | | | | | |
| Labeled Quantity | Converted to Fluid Ounce or Metric | | | | | Largest Quantity | | | | | Manufacturer : | | | | | | | | | |
| | | | | | | | | | | | Product: | | | | | | | | | |
| | | | | | | | | | | | Lot Code: | | | | Plant Number: | | | | | |
| 1 cubic foot = 1728 cu in *Total Volume (cu ft) (measure in in) = L × W × H ÷ 1728 or *Total Volume (L) (measure in mm) = L × W × H ÷ 1 000 000 | | | | | | | | | | | | | | | | | | | | |
| Dimensional Measurements | | | | | | | | | | | | | | | | | | | | |
| Dimensions Measured in: <input type="checkbox"/> mm <input type="checkbox"/> in | | | | | | | | | | Package Error in: mL cu in | | | | | | | | | | |
| | Length | | | | | Avg | Width | | | | | Avg | Height | | | | | Avg | Total | |
| 1. | | | | | | | | | | | | | | | | | | | | + |
| | | | | | | | | | | | | | | | | | | | | - |
| 2. | | | | | | | | | | | | | | | | | | | | + |
| | | | | | | | | | | | | | | | | | | | | - |
| 3. | | | | | | | | | | | | | | | | | | | | + |
| | | | | | | | | | | | | | | | | | | | | - |
| 4. | | | | | | | | | | | | | | | | | | | | + |
| | | | | | | | | | | | | | | | | | | | | - |
| 5. | | | | | | | | | | | | | | | | | | | | + |
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| 6. | | | | | | | | | | | | | | | | | | | | + |
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| 7. | | | | | | | | | | | | | | | | | | | | + |
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| 8. | | | | | | | | | | | | | | | | | | | | + |
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| 9. | | | | | | | | | | | | | | | | | | | | + |
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| 10. | | | | | | | | | | | | | | | | | | | | + |
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| 11. | | | | | | | | | | | | | | | | | | | | + |
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| 12. | | | | | | | | | | | | | | | | | | | | + |
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Appendix C. Inspection Worksheet for Dimensional Testing

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|---|--|--|--|--|--|--|--|--|--|--|--|
| <p>Step 1. What is the MAV for this labeled quantity in Table 2-6?</p> <p><input type="checkbox"/> _____ mL <input type="checkbox"/> _____ cu in</p> | <p>Total Package Error</p> | | | | | | | | | | |
| <p>Step 2. How many minus errors exceed the MAV _____? If the number of unreasonable errors exceeds the number permitted for the sample size in Table 2-1., the sample fails; go to Step 7. If there are no Unreasonable Errors, sum the package errors, and calculate the Average Error entering it in Step 3. Go to Step 4.</p> | <p>Step 3: Average Package Error</p> | | | | | | | | | | |
| <p>Step 4. If the Average Error is zero or a positive number, the sample passes; go to Step 7. If the Average Error is a negative number, go to Step 5.</p> <p>Step 5. Calculate the Sample Standard Deviation (<i>s</i>) and multiply (<i>s</i>) by the Sample Correction Factor (<i>SCF</i>) for the sample size to obtain the Sample Error Limit (<i>SEL</i>); go to Step 6.</p> <p style="text-align: center;">(<i>s</i>) _____ × (<i>SCF</i>) _____ = <i>SEL</i> _____</p> | <p>Box 6. Disregarding the signs, is the <i>SEL</i> in Step 5 larger than the Average Package Error in Step 3? If yes, the sample passes, go to Step 7 and approve the lot. If no, the sample fails, go to Step 7 and reject the lot.</p> | | | | | | | | | | |
| <p>Step 7. Action Taken: <input type="checkbox"/> Lot Rejected <input type="checkbox"/> Lot Approved</p> | | | | | | | | | | | |
| <p>Random Numbers: Enter the numbers as you select them in the top row and reorder them in the bottom row.</p> | | | | | | | | | | | |
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Appendix D. Modified Standard Package Report for Animal Bedding

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|---|--|--|---|---|--|
| Date: | Modified Standard Package Report for Animal Bedding | | Sampling Plan A – Table 2-1., Appendix A in NIST Handbook 133 | Report Number: | |
| Location (name, address) | | Product/Brand Identity | Manufacturer | Container Description: | |
| | | Lot Codes | | | |
| 1. Labeled Quantity (Expanded Volume): | 2. Unit of Measure: Liter | 3. MAV: - Single Volume Determination 5 % - Multiple Volume Determinations 10 % | 4. MAV (0.05 × Box 1. Expanded Volume) or (0.10 x Box 1. Expanded Volume) | 5. Inspection Lot Size: | 6. Sample Size (n): |
| | | | | | 7. Number of Unreasonable Package Errors Allowed for Sample Size: |
| Gross Weight for Audit Testing | | Package Error | | Test Notes | |
| | | – | + | | |
| <i>1.</i> | | | | | |
| <i>2.</i> | | | | | |
| <i>3.</i> | | | | | |
| <i>4.</i> | | | | | |
| <i>5.</i> | | | | | |
| <i>6.</i> | | | | | |
| <i>7.</i> | | | | | |
| <i>8.</i> | | | | | |
| <i>9.</i> | | | | | |
| <i>10.</i> | | | | | |
| <i>11.</i> | | | | | |
| <i>12.</i> | | | | | |
| | | Total: | Total: | | |
| 8. Total Error: | 9. Number of unreasonable minus (–) errors (compare each package error with Box 4): | | 10. Is Box 9 greater than Box 7? <input type="checkbox"/> Yes, lot <u>fails</u> go Box 17 <input type="checkbox"/> No, go to Box 11. | 11. Calculate Average Error: (Box 8 ÷ Box 6 =) | |
| 12. Does Box 11 = Zero (0) or Plus (+)? <input type="checkbox"/> Yes, lot <u>passes</u> , go to Box 17 <input type="checkbox"/> No, go to Box 13, 14, 15 & 16 | 13. Compute Sample Standard Deviation: | | 14. Sample Correction Factor: | 15. Compute Sample Error Limit (Box 13 × Box 14 =) | |
| 16. Disregarding the signs, is Box 11 larger than Box 15? <input type="checkbox"/> Yes, lot <u>fails</u> , go to Box 17 <input type="checkbox"/> No, lot <u>passes</u> , go to Box 17 | | | 17. Disposition of Inspection Lot <input type="checkbox"/> Approve <input type="checkbox"/> Reject | | |
| Comments: | | | Official's Signature | | |
| | | | Acknowledgement of Report | | |

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APPENDIX E. EXPERTS IN THE ANIMAL BEDDING INDUSTRY CONTACTED FOR TECHNICAL ASSISTANCE.

NIST EXTENDS ITS SINCERE APPRECIATION TO THESE EXPERTS FOR THEIR ADVICE AND ASSISTANCE.

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