Modified GEN-19.1 on 9/30/21 (Seraphin Test Measure Company)

Based upon written comments from Marc Buttler, Emerson Micro Motion, at the meeting of the Western Weights and Measures Association, Seraphin has changed the formulas contained in GEN-19.1 and Block 7 items to use the formula presented by Mr. Buttler. Basically, the formula:

Reduced MPE = (4/3 x MPE – U)

Is replaced in each instance by:

Increased MPE = (2/3 x MPE + U)

This revised formula is nearly identical with the current Handbook 44 language when it is specified to increase the tolerance by two standard deviations of the [Type 2] transfer standard when used to test commercial meters. The replacements are shown below.

GEN – GENERAL CODE

GEN-19.1 D G-T.5. Tolerances on Tests When Transfer Standards are Used., Appendix A, Section 3.2. Tolerances for Standards., and Appendix D – Definitions: standards, field., ~~transfer standard.~~ and standard, transfer,

Note: *These proposals are a modification of the 2021 S&T Agenda Block 1 Item GEN-19.1. Since the S&T Committee has changed these items from "assigned" to "developing," the submitter has revised and expanded the original proposal to address discussions within the NCWM Field Standards Task Group and other comments received on the proposal. These items are related, so they are submitted as group.*

Source:
Seraphin Test Measure Company

Purpose:

(a) Add text to Section 3.2. Tolerances for Standards of the Fundamental Considerations (Appendix A of Handbook 44) to recognize the wide range of transfer standards already recognized in Handbook 44, explain the critical differences between field standards and transfer standards, and to specify the use of the OIML R117 Reduced MPE formula when the uncertainty of the transfer standard exceeds the one-third requirement; and

(b) Add definitions for field standard and Type 1 and Type 2 transfer standards that identifies the critical characteristics for field and transfer standards regarding the Fundamental Considerations of Handbook 44.

Item Under Consideration:
Amend Handbook 44, General Code as follows:

G-T.5. Tolerances on Tests When Transfer Standards Are Used. – To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.

The codes 5.56.(a) Grain Moisture Meters, 5.56.(b) Grain Moisture Meters, and 5.57. Near-Infrared Grain Analyzers are exempt from this requirement, because NIST Handbook 159 has requirements for monitoring and retesting grain samples to ensure adequate stability and the tolerances for the devices under test already incorporate the uncertainty associated with the use of grain samples as transfer standards. The code 2.21. Belt-Conveyor Scale Systems is also exempt, because relative and absolute tolerances are included in the code.

Amend Handbook 44 Appendix A – Fundamental Considerations as follows:

3.2. Tolerances for Standards. – Except for work of relatively high precision, it is recommended that the accuracy of **field** standards used in testing commercial weighing and measuring equipment be established and maintained so that the use of corrections is not necessary. When the **field** standard is used without correction, its combined error and uncertainty must be less than one-third of the applicable device tolerance.
(Amended 202X)

And add the following at the end of Section 3.2. of the Fundamental Considerations.

Whenever possible and practical, field standards should be used to test commercial devices. However, where it is impractical or unduly cumbersome to use field standards, transfer standards may be used. There are two categories of transfer standards. The critical criteria that distinguish between these standards are (1) the accuracy and uncertainty of the standard, (2) the stability as a standard over an extended period, and (3) proven validity or performance of the standard over the range of environmental and operational conditions.

Both field standards and transfer standards must demonstrate metrological traceability to national or international standards. To demonstrate metrological traceability, (a) all measuring instruments used in the test system must be tested in a laboratory that is accredited or recognized at the time of calibration of these instruments, (b) the calibration service is included in the scope of measurements for the laboratory accreditation or recognition, and (c) adequate test data must exist and been collected using acceptable test methods to establish the uncertainty associated with the transfer standards.

A field standard is one that meets the one-third requirement mentioned earlier in this section. Additionally, the standard maintains its validity or stability as a standard over an

extended period, typically at least one year, and is known to maintain its value as a standard over the full range of environmental conditions and the range of operating conditions in which the standard may be used to test commercial weighing and measuring devices. Corrections may be used.

Transfer standards do not meet one or more of these critical criteria. One category of transfer standards, which is referred to here as a Type 1 transfer standard, is a transfer standard that meets the one-third accuracy requirement for a short time under a limited range of environmental conditions and/or a limited range of operating conditions. The accuracy of a Type 1 transfer standard may have to be tested each time it is used to verify that the desired accuracy and performance can be achieved when the Type 1 transfer standard is used under the limited environmental and operating conditions. When a Type 1 transfer standard is used, the basic tolerances specified for the commercial measuring devices are applied as specified in the applicable codes.

The second category of transfer standard, which is referred to here as a Type 2 transfer standard, is one that does not meet the one-third requirement. The Type 2 transfer standard must be stable and valid under the environmental or operating conditions in which it is used. The performance characteristics must be confirmed with sufficient data to properly characterize the uncertainty associated with the Type 2 transfer standard. When a Type 2 transfer standard is used, the tolerances applicable to the commercial weighing and measuring device must be increased to recognize the large uncertainty or corrections associated with the Type 2 transfer standard. When commercial meters are tested using a Type 2 transfer standard, the tolerance applied to the meter under test shall be determined as specified in OIML Recommendation 117-2: 2019, Section 4.2.2, which states:

~~Reduced MPE = (4/3 x MPE – U)~~

Increased MPE = (2/3 x MPE + U)

Where:

MPE = the applicable tolerance

U = uncertainty associated with the Type 2 transfer standard at the 95% confidence level.

(Added 202X)

And amend Handbook 44 Appendix D – Definitions as follows:

Standard, Field. – A physical artifact, static or dynamic measurement device or a reference material that (a) meets the requirements of the Fundamental Considerations, Section 3.2., (b) is stable (accurate and repeatable) over an extended period of time (typically one year), (c) is valid (corrections that may be used) over the range of environmental and operational parameters in which the commercial measuring devices are used, and (d) is

traceable to the reference or working standards through comparisons, using acceptable laboratory procedures.

(Added 202X)

~~**transfer standard. – A measurement system designed for use in proving and testing cryogenic liquid-measuring devices. [3.38]**~~

Standard, Transfer, Type 1 and Type 2. – A physical artifact, static or dynamic measurement device or a reference material that is proven to be stable (accurate and repeatable) for a short time under the limited environmental and operational conditions during which the transfer standard is used. A Type 1 transfer standard is a transfer standard that meets the one-third accuracy requirement for a short time over a limited range of environmental conditions and/or a limited range of operating conditions in which it is used. A Type 2 transfer standard is one that does not meet the one-third requirement and may not be stable or valid over an extended time period or over wide ranges of environmental or operating conditions.

(Added

B7: CLM-22.1 T.3. On Tests Using Transfer Standards.

Item Under Consideration:

Amend Handbook 44, Cryogenic Liquid-Measuring Devices Code as follows:

T.3. On Tests Using Transfer Standards. – ~~To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.~~ **When commercial meters are tested using a Type 2 transfer standard, the tolerance applied to the meter under test shall be determined as:**

~~**Reduced MPE = (4/3 x MPE – U)**~~

Increased MPE = (2/3 x MPE + U)

Where:

MPE = the applicable tolerance

U = uncertainty associated with the Type 2 transfer standard at the 95% confidence level.

(Amended 202X)

B7: CDL-22.1 T.3. On Tests Using Transfer Standards.

Item Under Consideration:

Amend Handbook 44, Carbon Dioxide Liquid-Measuring Devices Code as follows:

T.3. On Tests Using Transfer Standards. – ~~To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.~~ **When commercial meters are tested using a Type 2 transfer standard, the tolerance applied to the meter under test shall be determined as:**

~~Reduced MPE = (4/3 x MPE – U)~~

Increased MPE = (2/3 x MPE + U)

Where:

MPE = the applicable tolerance

U = uncertainty associated with the Type 2 transfer standard at the 95% confidence level.

(Amended 202X)

B7: HGM-22.1 T.4. Tolerance Application on Tests Using Transfer Standard Test Method.

Item Under Consideration:

Amend Handbook 44, Hydrogen Gas-Measuring Devices Code as follows:

T.4. Tolerance Application on Tests Using Transfer Standard Test Method. – ~~To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.~~ **When commercial meters are tested using a Type 2 transfer standard, the tolerance applied to the meter under test shall be determined as:**

~~Reduced MPE = (4/3 x MPE – U)~~

Increased MPE = (2/3 x MPE + U)

Where:

MPE = the applicable tolerance

U = uncertainty associated with the Type 2 transfer standard at the 95% confidence level.

(Amended 202X)