Module: 4.3.4
Precision Weighing Systems Class I and II

Overview and Scope

This module sets standards for basic inspection and testing of precision weighing systems primarily in Classes I or II, but also some precision Class III scales such as jewelers scales, prescription scales, grain-test scales, and scales used in the cannabis trade. The module is geared toward specific concepts related to device technology, operations, and specific inspection requirements and test procedures.

Prerequisites

4.2 NIST Handbook 44 - Introduction to Device Control; 4.3.1 Static Electronic Weighing Systems, General

Learning Objectives

1 Technologies Used in Precision Scales.

A weights and measures inspector should understand the method of operation and the primary technologies used in typical precision scales. To demonstrate this, the inspector can:

1.1 Identify whether the device uses lever, load cell, or force restoration technology.

1.2 Restate that these scales may be made up of weighing elements/modules and indicator elements/modules.

1.3 Recognize that scale performance will vary with the size of the load (linearity), position of load, influences such as temperature, supply voltage, etc, and disturbances such as drafts, vibration, EMI/RFI, etc.

2 Scale Markings and Operations

A weights and measures inspector should understand the various marking requirements applicable to a scale system and demonstrate ability to operate a scale. To demonstrate this, the inspector can:

2.1 Recognize and interpret required identification and functional markings on a scale or element (i.e. Table 6.3.a.).

2.2 Recognize and interpret markings regarding a counting feature, where applicable.

2.3 Recognize and interpret required markings on the controls, indications and features of a scale in this category.

2.4 Operate the following functions/operations on a scale: Power, zero, tare (if equipped), printing, and counting (for legal-for-trade applications on prescription scales).

2.5 Recognize and interpret the information displayed on a scale, including:

2.5.1 Gross, Net, and Tare weight indications, including displays where d and e are not the same.

2.5.2 Center of Zero, Motion, and others.

2.5.3 Underload/Overload error conditions.

3 Technical Requirements

A weights and measures inspector should understand the various technical requirements applicable to a precision scale. To demonstrate this, the inspector can:

3.1 Apply the rules regarding the following scale features/indications and where to find them in HB44.

3.1.1 Zero load indications, zero setting operations, and automatic zero setting (zero tracking).

3.1.2 Digital scale divisions (including displays with d and e) and limit of indication.

3.1.3 Level indication for portable scales.

3.1.4 Motion detection requirements - zero, tare, printing, etc.

3.1.5 Design requirements for weighing elements.

3.1.6 Counting feature - piece weight, piece weight sample, total count, etc.

3.2 Apply the rules for matching weighing elements to indicating elements (modules).

4 User Requirements

A weights and measures inspector should understand and be to apply the user requirements applicable to a precision scale. To demonstrate this, the inspector can:

4.1 Assess suitability of a class marked scale for a given application, considering design, class, application and typical load in Tables 7a. And 8.

4.2 Apply requirements for scale installation in UR.2.

4.3 Apply general use requirements in UR.3. (Subsections 3.1., 3.2., and 3.5.).

4.4 Apply maintenance requirements in UR.4.

5 Basic Test Procedures

A weights and measures inspector should be able to apply the appropriate performance tests to a precision scale and evaluate compliance the applicable tolerances and performance standards. To demonstrate this, the inspector can:

5.1 Appraise whether the verification standards to be used in the test are appropriate for use in official tests.

5.2 Use test weights appropriately and care for them when not in use.

5.3 Determine minimum amounts of standards required for testing a given scale.

5.4 Select appropriate test loads for an Increasing Load Test for a given scale, perform the test, and evaluate the test results for compliance with applicable tolerances.

5.5 Select appropriate test loads for a Decreasing Load Test for a given scale, perform the test, and evaluate the test results for compliance with applicable tolerances.

5.6 Select appropriate test loads for a Shift Test (eccentric loading) for a given scale, perform the test, and evaluate the test results for compliance with applicable tolerances and agreement requirements.

5.7 Discuss appropriate times to perform a Discrimination Test or a Repeatability Test.

5.8 Select appropriate test loads for a Discrimination Test for a given scale, perform the test, and evaluate the test results for compliance with the applicable standards.

5.9 Select appropriate test loads for a Repeatability Test for a given scale, perform the test, and evaluate the test results for compliance with applicable tolerances and agreement requirements.

5.10 Select appropriate tests and test loads to evaluate the counting feature on a legal-for-trade prescription scale, perform the test, and evaluate the test results for compliance with applicable requirements.

5.11 Decide when error weights should be used to precisely determine scale errors to less than one scale division, and demonstrate ability to determine the precise error of a scale in an appropriate test.

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