Module 4.3.6

Medium Capacity Weighing Systems

Overview and Scope

This module sets standards for basic inspection and testing of static weighing systems with capacities over 150 kg (300 lb) and up to 1,500 kg (3,000 lb), both unmarked and marked. This includes static weighing applications using platform, hopper, tank, and other designs. The segment is geared toward specific concepts related to device technology, operations, and the specific inspection requirements and test procedures for these devices.

Prerequisites

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

Learning Objectives

1 Technologies Used in Medium Capacity Scales

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

1.1 Identify the weighing technology (strain gage load cell, lever, etc) used in the scale and identify the locations of the main load sensors.

1.2 Identify the indicator technology (analog electronic, digital electronic, beam, dial, etc) used in the scale.

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

1.4 Explain that these scales may be interfaced with printers and may also be interfaced to computer systems that record and/or control the weighing operations.

1.5 Recognize that scale performance will vary with the size of the load (linearity), position of load, influences such as temperature, supply voltage, etc, and distrubances 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 medium capacity scale system and demonstrate ability to operate a scale. To demonstrate this, the inspector can:

2.1 Recognize and interpret required identification markings on a scale or element (i.e. Table 6.3.a.). Also find the marking requirements in Handbook 44 and apply them.

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

2.3 Operate the following functions/operations on a scale.

2.3.1 Power on/off.

2.3.2 Zero.

2.3.3 Tare - if scale has a tare function.

2.3.4 Print

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

2.4.1 Gross, Net, and Tare weight indications.

2.4.2 Center of Zero, Motion, and others.

2.4.3 Underload/Overload error conditions.

3 Technical Requirements

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

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

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

3.1.2 Scale capacities, scale divisions and limit of indications.

3.1.3 Motion detection requirements – zero, tare, printing, etc

3.1.4 Design requirements for weighing elements.

3.2 Apply the rules for matching weighing elements to indicating elements (modules) and identify where to find the requirements in HB44.

3.3 Apply the rules for matching load cells to the specific scale application using capacity and division size, and identify where to find the requirements in HB44.

4 User Requirements

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

4.1 Assess suitability of a medium capacity scale for a given application, considering design, class (if marked), application and typical load, and be able to cite the appropriate sections of Handbook 44 to support the assessment.

4.2 Apply requirements for scale installation in UR.2. and all applicable subsections.

4.3 Apply general use requirements in UR.3. and all applicable subsections.

4.4 Apply maintenance requirements in UR.4. and all applicable subsections.

5 Basic Test Procedures

A weights and measures inspector should be able to apply the appropriate performance tests to a small capacity 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 and minimum amounts of the test loads that must be applied in official tests.

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

5.4.1 Correctly use substitution test procedures, where appropriate, given the available test weights and test loads.

5.4.2 Correctly use strain-load test procedures, where appropriate, given the available test weights and test loads.

5.5 Select appropriate test weights and 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 weights or 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 weights 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 weights or 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 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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