Module: 8.7
Small Capacity Weighing Systems (Registered Service Agents)

Overview and Scope

This module outlines the learning objectives registered servicepersons must understand and apply to successfully perform their duties in placing in service, testing, repairing, and calibrating weighing systems with capacities up to 150 kg (300 lb). The module focuses on specific concepts related to device technology, operations, and specific inspection requirements and test procedures found in NIST Handbook 44, and NIST EPO 1(Retail Computing Scales).

Prerequisites

Module 8.1 - NIST Handbook 44 and NIST Handbook 130 – Basic (Registered Service Agents)

Learning Objectives

1 Technologies and Terminology

A registered serviceperson should understand the method of operation, primary technologies and basic terms used in typical small capacity scales. To demonstrate this, the serviceperson can:

1.1 Identify whether the device is single load cell or multiple load cell design.

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

1.3 Identify the components of a weighing system: load receiving element, weighing element, indicator, and peripherals like printers and computers.

1.4 Recognize the components of a point-of-sale system (weighing element, customer display, operator display, operator controls, point of sale software and printer).

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

1.6 Locate and apply the terms and definitions applicable to small capacity weighing systems found in NIST Handbook 44, Appendix D.

2 Scale Markings and Operations

A registered serviceperson should understand the various marking requirements applicable to a scale system. To demonstrate this, the serviceperson can:

2.1 Recognize and interpret required identification markings on a scale or element (Section 2.20 cales, Table S.6.3.a.).

2.2 Recognize and interpret required markings on the controls, indications, and features of a small capacity scale.

2.3 Recognize the following functions/operations on a scale.

2.3.1 Power on/off.

2.3.2 Zero.

2.3.3 Tare (both platter and keyboard tare) and Tare Clear - if scale has a tare function.

2.3.4 Unit price entry and clear of unit price.

2.3.5 Pre-pack function (for either or both tare and unit price) and clear pre-pack.

2.3.6 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, pricing displays, and others.

2.4.3 Underload/Overload error conditions.

2.5 Apply appropriate security measures to a scale, i.e. seals or audit trails.

3 Applications, Tolerances and Performance Requirements for Scales with a Class Mark

A registered serviceperson should understand the classification system for static scales and be able to apply the performance standards under each class. To demonstrate this, the serviceperson can:

3.1 Recognize how the basic tolerances, repeatability tolerances, agreement requirements, and General Code abnormal performance requirements work together to define limits to deviations in scale performance.

3.2 Describe the organization of accuracy classes for marked scales specified in Section 2.20 Scales, Table 3.

3.3 Recognize how scale class is related to typical application in Section 2.20 Scales, Table 7a.

3.4 Determine if a scale conforms to the class declared by the manufacturer.

3.5 Determine if a given scale is suitable for weighing certain commodities by using Section 2.20 Scales, Table 7a.

3.6 Compute tolerances for any class marked scale as shown in Section 2.20 Scales, Table 6.

3.7 Understand how to find either the acceptance or maintenance tolerance for any load on a scale given the scale class, capacy, nd division size.

4 Applications, Tolerances and Performance Requirements for Unmarked Scales Not Marked With an Accuracy Class.

A registered serviceperson should understand the differences in code applications for unmarked scales and be able to apply the performance standards for unmarked scales. To demonstrate this, the serviceperson can:

4.1 Understand how unmarked scales are defined from their application rather than class design as described in Section 2.20 Scales, Table 7.b. and Table T.1.1.

4.2 Determine if an unmarked scale is suitable for use in an application as specified in Section 2.20 Scales, Table 7.b.

4.3 Compute the tolerances for unmarked scales for a given test load and test procedures per Section 2.20 Scales, Table T.1.1.

5 Technical Requirements

A registered serviceperson should understand the various technical requirements applicable to a small capacity scale. To demonstrate this, the serviceperson can:

5.1 Apply the rules regarding the following scale features/indications and know where to find them in Handbook 44.

5.1.1 Zero load indications, zero setting operations, and automatic zero setting (zero tracking)as stated in Section 2.20 Scales, S.2.1.1. through S.2.1.6.

5.1.2 Digital scale divisions and limit of indication.

5.1.3 Determine if a scale's division is properly expressed as 1, 2, or 5 or a decimal multiple or submultiple of 1, 2, or 5 as stated in Section 2.20 Scales, S.1.2.1.

5.1.4 Determine if the digital representation of zero conforms to Section 2.20 Scales, G-S.5.2.2.

5.1.5 Clearing of unit price only after a transaction has been indicated.

5.1.6 Level indication for portable scales as stated in Section 2.20 Scales, S.2.4.

5.1.7 Motion detection requirements (stable condition) - zero, tare, printing, etc.

5.1.8 Design requirements for weighing elements. Section 2.20 Scales, S.4.

5.1.9 Mathematic agreement of computed price information.

5.2 Apply the rules for matching weighing elements to indicating elements (modules) in accordance with Section 2.20 Scales, S.6.3.4.

6 User Requirements

A registered serviceperson should understand the various user requirements applicable to a small capacity scale. To demonstrate this, the serviceperson can:

6.1 Assess suitability of a small capacity scale marked with an accuracy class for a given application, considering design, class, application and typical load in Section 2.20 Scales ,Tables 7a. and 8.

6.2 Apply requirements for scale installation in Section 2.20 Scales, UR.2.1., UR.2.2., UR.2.3., and UR.2.10.

6.3 Apply general use requirements in Section 2.20 Scales, UR.3.1., 3.2., 3.5., 3.6, and 3.9.

6.4 Apply maintenance requirements in Section 2.20 Scales, UR.4.1., UR.4.2., and UR4.3.

7 Basic Test Procedures

A registered serviceperson should be able to apply the appropriate performance tests to a small capacity scale and evaluate compliance with the applicable tolerances and performance standards. To demonstrate this, the registered serviceperson can:

7.1 Determine whether the test weights to be used in the test are appropriate for use in official tests.

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

7.3 Determine minimum amounts of test weights required for testing a given scale.

7.4 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.

7.5 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.

7.6 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.

7.7 Recognize when a Repeatability Test is necessary, perform the test, and evaluate the test results for compliance with applicable tolerances and agreement requirements as shown in Section 2.20 Scales, T.N.5.7.

7.8 Recognize the NIST EPOs provide an outline to follow for examining scales and balances.

7.9 Recognize potential safety hazards associated with servicing and inspecting scales.

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