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New Shift Test Loads and Test Patterns for Platform Scales with Less than Three Sections

By Steven Cook

At its 2007 Annual Meeting, the National Conference on Weights and Measures (NCWM) adopted changes to the Notes Section of the Scales Code in the 2007 Edition of NIST Handbook 44 (HB 44) regarding the amount of weight for the shift test and the position of the test loads. These changes apply to all types of platform scales with no more than four load supports (two sections) except for livestock, vehicle, and railway track scales, vehicle on-board weighing systems, and other scales listed as exceptions in 2007 Scales Code paragraph N.1.3.8. Changes to HB 44 include:

1. Deleting paragraph N.1.3.1. Bench and Counter Scales and renumbering subsequent paragraphs;
2. Changing the test load for the shift test from 50 % to a range of 30 % to 35 % of the scale capacity;
3. Changing the shift test pattern for bench and counter scales to be the same as the current test pattern for the other scales listed in paragraph N.1.3.7. (formerly N.1.3.8.); and
4. Providing guidance to the application of standards in a manor that is safe for the weights and measures inspector and will not over-concentrate the test load on the load-receiving element.

The major revision to the shift test procedures were made to shift test paragraph N.1.3.8. which has been renumbered to N.1.3.7. The revised paragraph reads as follows:

N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. A shift test shall be conducted using the following prescribed test loads and test patterns. A single field standard weight used as the prescribed test load shall be applied centrally in the prescribed test pattern. When multiple field standard weights are used as the prescribed test load, the load shall be applied in a consistent pattern in the shift test positions throughout the test and applied in a manner that does not concentrate the load in a test pattern that is less than when that same load is a single field standard weight on the load-receiving element.

(a) For scales with a nominal capacity of 500 kg (1000 lb) or less, a shift test shall be conducted using a one-third nominal capacity test load (defined as test weights in amounts of at least 30 % of scale capacity, but not to exceed 35 % of scale capacity) centered as nearly as possible at the center of each quadrant of the load-receiving element using the prescribed test pattern as shown in Figure 1. . ..

(b) For scales with a nominal capacity greater than 500 kg (1000 lb), a shift test may be conducted by either using a one-third nominal capacity test load (defined as test weights

in amounts of at least 30 % of scale capacity, but not to exceed 35 % of scale capacity) centered as nearly as possible at the center of each quadrant of the load-receiving element using the prescribed test pattern as shown in Figure 1, or by using a one-quarter nominal capacity test load centered as nearly as possible, successively, over each corner of the load-receiving element using the prescribed test pattern as shown in Figure 2. . ..

The new shift test procedures become effective in Handbook 44 on January 1, 2008. This article briefly discusses the changes listed above and the corresponding changes that will soon appear in NIST Handbook 112 "Examination Procedure Outlines for Commercial Weighing and Measuring Devices" and NIST training courses. This article also discusses some of the justification behind these changes.

1. Deleting Existing paragraph N.1.3.1. Bench and Counter Scales.

This paragraph and the corresponding definitions in HB 44 Appendix D for "bench scale" and "counter scale" are being removed since the changes to the shift test loads and test patterns eliminated the differences in shift test procedures between scales installed on a bench or counter and platform scales not installed on a bench or counter. One of the reasons the shift test procedures were amended was that scales of the same design, but with different capacities listed on an NTEP Certificate of Conformance, would have different shift test requirements depending on whether the scale was installed on a bench/counter or at ground level. The revision in the shift test procedures closely aligns HB 44 with international recommendations in OIML R 76 for "Non Automatic Weighing Instruments." These were the same reasons the requirements for the automatic zero-tracking mechanism in paragraph S.2.1.3. were amended for bench, counter, livestock, and "all other scales" (except vehicle, axle-load, and railway track scales) in 2005.

2. Changing the test load for the shift test from 50 % to a range of 30 % to 35 % of the scale capacity.

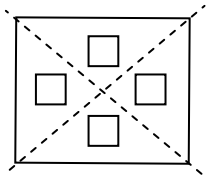
The change in the test load was made to bring the U.S. shift test requirements for scales with a load-receiving element having no more than four points of support into harmony with an international recommendation in OIML R 76. Although R 76 recommends a test load of one-third capacity of the scale, the NCWM adopted the range of test loads around one-third capacity to give the weights and measures official flexibility in the test load in the event they did not have a single test weight or a combination of weights that equaled exactly one-third scale capacity (e.g., a shift test load for a 100 lb scale at one-third capacity is 33.333…lb). Many weights and measures officials were concerned the lower test load would allow scales that would not pass at the former test load to now pass. During the review and development of these changes, the NCWM heard testimony and comments that:

- The smaller test load may also fall into a lower tolerance step.
- The 30 % to 35 % test load on scales with a single platform support (i.e., load cell) in the revised test pattern is roughly equivalent to the 50 % test load in the former test pattern since the test load is now farther from the center of the platform.

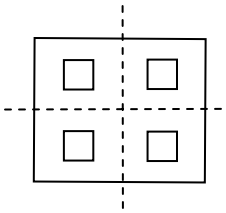
- Shift test performance data on 178 scales with a single load support was gathered from four jurisdictions and an NTEP laboratory. That data indicated there was a minimal increase in the shift test compliance rate (89 % to 91 %) with the revised shift test procedures.
- Shift test performance data where only the test load was reduced was gathered on 29 scales with four load supports from the same four jurisdictions and NTEP laboratory. That data indicated no change in the compliance rate (76 %). (NOTE: One scale failed with the 50 % capacity shift test load and passed with the 30 % to 35 % capacity shift test load, while another scale passed with the 50 % capacity shift test load and failed with the 30 % to 35 % capacity shift test load.)

3. Changing the shift test pattern for bench and counter scales to be the same as the current test pattern for the other scales listed in paragraph N.1.3.7. (formerly N.1.3.8.)

As you are probably aware, the previous test pattern for bench and counter scales was to place the test load centered successively at four points positioned equidistant between the center and the front, left, back, and right edges of the platform as follows:

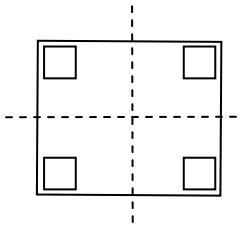


The revised test pattern shown below in paragraph N.1.3.7. Figure 1 for test loads of 30 % to 35 % of scale capacity is the same test pattern as in OIML R 76.



Paragraph N.1.3.7. Figure 1

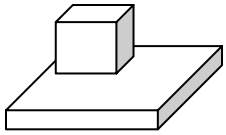
Note that the corner test pattern shown on page 10 in paragraph N.1.3.7. Figure 2 for test loads of 25 % of scale capacity remains unchanged.



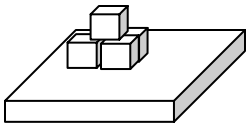
Paragraph N.1.3.7. Figure 2.

4. Guidelines for the application of test weights and test loads.

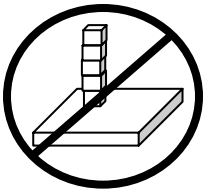
The revised requirements in paragraph N.1.3.7. (formerly N.1.3.8.) state that a single field standard weight used as the prescribed test load shall be applied centrally in the prescribed test pattern as shown below:



When multiple field standard weights are used, the load shall be applied in a consistent pattern in the shift test positions throughout the test as shown below:



Test weights and test loads should not be stacked or applied in a manner that concentrates the load in a test pattern that is less than when that same load is a single field standard weight on the load-receiving element.



In summary:

- The above revised shift test requirements are applicable to platform scales with no more than four load supports;
- Shift test positions for small capacity scales (formerly bench and counter scales) are now the same as other platform scales with no more than four load supports;
- Shift test loads have been reduced for platform scales with no more than four load supports;
- The alternate “one-quarter nominal capacity test load centered . . . over each corner of the load-receiving element” is no longer a suitable alternate shift test for scales with a capacity up to 1000 lb; and
- Shift test requirements for railway, vehicle, and livestock scales with four load supports, monorail scales, and other scales listed as exceptions in revised paragraph N.1.3.7. (formerly N.1.3.8.) remain unchanged.

For questions about the revised shift test procedures in Handbook 44, contact Steve Cook by telephone at 301-975-4003 or by e-mail at steven.cook@nist.gov.