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Belt-Conveyor Scale Systems Questions on Testing

By Steven Cook

WMD has received several questions regarding the new language, terminology, and the applicability of the test notes that were amended and added to the NIST Handbook 44 Belt Conveyor Scale Systems Code in 2004. This article summarizes the questions and provides weights and measures officials, belt-conveyor scale users, and service agents some background information on the changes and the WMD response to the inquiries.

At the 2004 Annual Meeting the National Conference on Weights and Measures (NCWM) adopted a proposal to add language to the 2005 edition of the NIST Handbook 44 Belt-Conveyor Scale Systems Code that would:

- ◆ require testing a belt-conveyor scale at several flow rates to verify the scale maintains accuracy over a range of flow rates for a specific installation, and
- ◆ amend and clarify guidelines for an appropriate minimum test load.

Prior to these changes, Handbook 44 did not clearly call for tests at flow rates other than the normal operating flow rate. Belt-conveyor scales often operate at other-than-the-normal flow rate for varying time periods and, thus, need to provide accurate weighing at all flow rates.

Question 1: Do all tests in NIST Handbook 44 Section 2.21. Belt-Conveyor Scale Systems Code Notes (N) paragraphs need to be performed?

Tests in NIST Handbook 44 Notes (N) paragraphs must be performed as part of the official test performed by the official with statutory authority.

Throughout Handbook 44, technical requirements of a similar nature, or those directed to a single characteristic, may be grouped together in an orderly fashion to facilitate the location of individual requirements. The paragraphs of each code are divided into sections with each section designated by a letter and a name. Each subsection is given a letter number designation and a side title. The "Introduction" at the beginning of Handbook 44 discusses the system used to designate these groupings of paragraphs. The letter that appears first in a paragraph has a specific meaning. In this case, the letter "N" stands for "notes" and denotes that these paragraphs apply to the official testing of devices by weights and measures officials. Handbook 44 Appendix D Definitions further defines "notes" as follows:

notes. A section included in each of a number of codes, containing instructions, pertinent directives, and other specific information pertaining to the testing of devices. Notes are primarily directed to weights and measures officials.

Additionally, test notes apply to any test of a device under official test conditions by service agents and belt conveyor scale systems users if so directed by the official with statutory authority. The test notes requirements are also of interest to device manufacturers and users, whose equipment will be tested according to these guidelines.

Question 2: NIST Handbook 44 Section 2.21. Belt-Conveyor Scale Systems Code paragraph N.2.1. Initial Verification was added to the handbook in 2005. The paragraph requires that tests be conducted at the normal use flow rate; at a flow rate down to 35 % of the maximum flow rate; and at an intermediate flow rate between these two points. Is the requirement in paragraph N.2.1. retroactive or nonretroactive, and do commercial belt-conveyor scale systems installed prior to this date need to meet this new testing requirement during the system's next official test?

Nonretroactive requirements are typically limited to the specifications or design requirements ("S" paragraphs) in Handbook 44. They are printed in italics to indicate they are classified as nonretroactive while retroactive requirements are printed in upright roman type in Handbook 44. New or amended design requirements may necessitate a change in the construction or marking of a weighing or measuring device. Many devices currently in service will not be able to meet the new requirement at the time the change becomes effective. The cost of making modifications to nonconforming equipment already in service would impose a significant burden on owners and operators. Additionally, the modification of devices already manufactured but not yet sold would have imposed costs upon manufacturers and distributors.

It should be noted that test notes, tolerances ("T" paragraphs), and user requirements ("UR" paragraphs) are rarely given a nonretroactive status. However, there are instances where nonretroactive notes, tolerances, and user requirements are necessary such as when new or amended device specifications are added or changed that impacts official test, use, and installation of the device. For example, Scales Code paragraphs N.1.5. Discrimination Test and T.N.7. Discrimination were added to the handbook in 1985. Paragraph N.1.5., which was added as a nonretroactive test requirement for all automatic indicating scales marked with an accuracy class after January 1, 1986, describes the procedures for the discrimination test. Paragraph T.N.7. was added as a retroactive tolerance for scales marked with an accuracy class. Paragraph N.1.5. was not intended for scales that may have been marked with an accuracy class manufactured before the effective date of the newly adopted 1986 marking requirements and tolerances.

A different example where a "user requirement" was given a nonretroactive status is also in the Scales Code in Paragraph UR. 2.6. Approaches. This "user requirement" was made nonretroactive since the requirements to install approaches on existing installations would be too costly to the scale owner, and the location of many existing scales made it impossible to install straight and level approaches since they may have been permanently installed too close to a barrier, property line, etc.

While paragraph N.1.2. Initial Verification was adopted as a retroactive requirement and applies to all belt-conveyor scale systems, one must note that the test requirement applies only to "initial verifications." Weights and measures officials, service agents, and device owners will discover that the term "initial verification" is not defined in Handbook 44; however, it is commonly interpreted by weights and measures as the verification of a weighing or measuring device which has not been previously verified by the official with statutory authority for use in commercial service.

Generally, existing belt conveyor scale systems are not required to be tested at the flow rates listed in paragraph N.2.1. However, existing systems may be required to be tested under the requirements of paragraph N.2.1. as determined by the official with statutory authority if the device is placed into commercial service:

- ◆ after a major reconditioning or overhaul, or
- ◆ when a non-commercial device is placed into commercial service for the first time.

Even though an existing system may not be subject to an "initial verification," paragraphs N.2.2. Subsequent Verifications and N.3.2. Material Tests require that belt-conveyor scale systems be tested at the normal use flow rate and at other flow rates used at the installation in addition to being tested at all belt-loading conditions.

Question 3: Since paragraph N.2.1. Initial Verification requires material tests at three different flow rates and N.3.2. Material Test requires three individual material tests, are three material tests required at each different flow rate for a total of nine material tests?

A single material test conducted at each of the three flow rates during initial verification (as required in paragraph N.2.1.) satisfies the requirements of paragraph N.3.2., which states that a minimum of three individual tests are required during initial verification.

Remember that the number of material tests required during an official test of a belt-conveyor scale is considered the minimum number of tests to be performed in order to comply with the testing requirements in Handbook 44. Additional tests may be required if there are questions about marginal test results or to assure the official that the system will:

- ◆ provide results as required in paragraph T.1. Tolerance Values ($\pm 0.25\%$), or
- ◆ repeat within 0.25% as required in paragraph T.2. Tolerance Values, Repeatability.

The NCWM Specifications and Tolerances (S&T) Committee received comments during the 2004 Interim Meeting open hearings and from the regional weights and measures associations concerning the definition of the terms used in conjunction with paragraphs N.2.1. Initial Verification, N.2.2. Subsequent Verification, and N.2.3. Minimum Load Test. The S&T Committee considered the comments and concluded that defining these terms was not necessary since those terms are commonly used in reference to tests on many other types of weighing devices and are thought to be well understood by the

weights and measures community. However, as a result of the above questions, there appears to be some confusion with the terms. Thus, additional amendments to clarify or reorganize the test notes and associated definitions in the Belt Conveyor Scale Systems Code may be needed.

Please contact Steve Cook by phone at 301-975-4003 or by email at steven.cook@nist.gov if you have any questions on the information provided in this article or suggestions for improving the Belt-Conveyor Scale Systems Code.