

Department of Energy

Pt. 431, Subpt. K, App. B

equipment, has the equipment on loan, or the equipment is provided by another party. Equipment shall be used in a manner which assures that measurement uncertainty is known and is consistent with the required measurement capability.

6.2 Calibration and Certification.

The party performing the tests must:

(a) Identify the measurements to be made, the accuracy required (section 2.0) and select the appropriate measurement and test equipment;

(b) At prescribed intervals, or prior to use, identify, check and calibrate, if needed, all measuring and test equipment systems or devices that affect test accuracy, against certified equipment having a known valid relationship to nationally recognized standards; where no such standards exist, the basis used for calibration must be documented;

(c) Establish, document and maintain calibration procedures, including details of equipment type, identification number, location, frequency of checks, check method, acceptance criteria and action to be taken when results are unsatisfactory;

(d) Ensure that the measuring and test equipment is capable of the accuracy and precision necessary, taking into account the voltage, current and power factor of the transformer under test;

(e) Identify measuring and test equipment with a suitable indicator or approved identification record to show the calibration status;

(f) Maintain calibration records for measuring and test equipment;

(g) Assess and document the validity of previous test results when measuring and test equipment is found to be out of calibration;

(h) Ensure that the environmental conditions are suitable for the calibrations, measurements and tests being carried out;

(i) Ensure that the handling, preservation and storage of measuring and test equipment is such that the accuracy and fitness for use is maintained; and

(j) Safeguard measuring and test facilities, including both test hardware and test software, from adjustments which would invalidate the calibration setting.

[71 FR 24999, Apr. 27, 2006, as amended at 71 FR 60662, Oct. 16, 2006]

EFFECTIVE DATE NOTE: At 71 FR 24999, Apr. 27, 2006, appendix A to subpart K of part 431 was added, effective May 30, 2006, except for section 6.2(f) and section 6.2 (b) and (c) which contain information collection requirements and will not become effective until approval has been given by the Office of Management and Budget.

APPENDIX B TO SUBPART K OF PART 431—SAMPLING PLAN FOR ENFORCEMENT TESTING

Step 1. The number of units in the sample (m_1) shall be in accordance with §§431.198(a)(4), 431.198(a)(5), 431.198(a)(6) and 431.198(a)(7) and shall not be greater than twenty. The number of tests in the first sample (n_1) shall be in accordance with §431.198(a)(8) and shall be not fewer than four.

Step 2. Compute the mean (\bar{X}_1) of the measured energy performance of the n_1 tests in the first sample by using equation 1 as follows:

$$\bar{X}_1 = \frac{1}{n_1} \sum_{i=1}^{n_1} X_i \quad (1)$$

where X_i is the measured efficiency of test i .

Step 3. Compute the sample standard deviation (S_1) of the measured efficiency of the n_1 tests in the first sample by using equation 2 as follows:

$$S_1 = \sqrt{\frac{\sum_{i=1}^{n_1} (X_i - \bar{X}_1)^2}{n_1 - 1}} \quad (2)$$

Step 4. Compute the standard error ($SE(\bar{X}_1)$) of the mean efficiency of the first sample by using equation 3 as follows:

$$SE(\bar{X}_1) = \frac{S_1}{\sqrt{n_1}} \quad (3)$$

Step 5. Compute the sample size discount ($SSD(m_1)$) by using equation 4 as follows:

$$SSD(m_1) = \frac{100}{1 + \left(1 + \frac{.08}{\sqrt{m_1}}\right) \left(\frac{100}{RE} - 1\right)} \quad (4)$$

where m_1 is the number of units in the sample, and RE is the applicable EPCA efficiency when the test is to determine compliance with the applicable statutory standard, or is the labeled efficiency when the test is to determine compliance with the labeled efficiency value.

Step 6. Compute the lower control limit (LCL_1) for the mean of the first sample by using equation 5 as follows:

$$LCL_1 = SSD(m_1) - tSE(\bar{X}_1) \quad (5)$$

where t is the 2.5th percentile of a t-distribution for a sample size of n_1 , which yields a

Pt. 431, Subpt. K, App. B

10 CFR Ch. II (1-1-10 Edition)

97.5 percent confidence level for a one-tailed t-test.

Step 7. Compare the mean of the first sample (\bar{X}_1) with the lower control limit (LCL₁) to determine one of the following:

(i) If the mean of the first sample is below the lower control limit, then the basic model is in non-compliance and testing is at an end.

(ii) If the mean is equal to or greater than the lower control limit, no final determination of compliance or non-compliance can be made; proceed to Step 8.

Step 8. Determine the recommended sample size (n) by using equation 6 as follows:

$$n = \left[\frac{tS_1(108 - 0.08RE)}{RE(8 - 0.08RE)} \right]^2 \quad (6)$$

where S₁ and t have the values used in Steps 3 and 6, respectively. The factor

$$\frac{108 - 0.08RE}{RE(8 - 0.08RE)}$$

is based on an 8-percent tolerance in the total power loss.

Given the value of n, determine one of the following:

(i) If the value of n is less than or equal to n₁ and if the mean energy efficiency of the first sample (\bar{X}_1) is equal to or greater than the lower control limit (LCL₁), the basic model is in compliance and testing is at an end.

(ii) If the value of n is greater than n₁, and no additional units are available for testing, testing is at an end and the basic model is in non-compliance. If the value of n is greater than n₁, and additional units are available for testing, select a second sample n₂. The size of the n₂ sample is determined to be the smallest integer equal to or greater than the difference n - n₁. If the value of n₂ so calculated is greater than 20 - n₁, set n₂ equal to 20 - n₁.

Step 9. After testing the n₂ sample, compute the combined mean (\bar{X}_2) of the measured energy performance of the n₁ and n₂ tests of the combined first and second samples by using equation 7 as follows:

$$\bar{X}_2 = \frac{1}{n_1 + n_2} \sum_{i=1}^{n_1+n_2} X_i \quad (7)$$

Step 10. Compute the standard error (SE(\bar{X}_2)) of the mean efficiency of the n₁ and n₂ tests in the combined first and second samples by using equation 8 as follows:

$$SE(\bar{X}_2) = \frac{S_1}{\sqrt{n_1 + n_2}} \quad (8)$$

(Note that S₁ is the value obtained above in Step 3.)

Step 11. Set the lower control limit (LCL₂) to,

$$LCL_2 = SSD(m_1) - tSE(\bar{X}_2) \quad (9)$$

where t has the value obtained in Step 5 and SSD(m₁) is sample size discount from Step 5. Compare the combined sample mean (\bar{X}_2) to the lower control limit (LCL₂) to find one of the following:

(i) If the mean of the combined sample (\bar{X}_2) is less than the lower control limit (LCL₂), the basic model is in non-compliance and testing is at an end.

(ii) If the mean of the combined sample (\bar{X}_2) is equal to or greater than the lower control limit (LCL₂), the basic model is in compliance and testing is at an end.

MANUFACTURER-OPTION TESTING

If a determination of non-compliance is made in Steps 6, 7 or 11, above, the manufacturer may request that additional testing be conducted, in accordance with the following procedures.

Step A. The manufacturer requests that an additional number, n₃, of units be tested, with n₃ chosen such that n₁+n₂+n₃ does not exceed 20.

Step B. Compute the mean efficiency, standard error, and lower control limit of the new combined sample in accordance with the procedures prescribed in Steps 8, 9, and 10, above.

Step C. Compare the mean performance of the new combined sample to the lower control limit (LCL₂) to determine one of the following:

(a) If the new combined sample mean is equal to or greater than the lower control limit, the basic model is in compliance and testing is at an end.

(b) If the new combined sample mean is less than the lower control limit and the value of n₁+n₂+n₃ is less than 20, the manufacturer may request that additional units be tested. The total of all units tested may not exceed 20. Steps A, B, and C are then repeated.

(c) Otherwise, the basic model is determined to be in non-compliance.

[71 FR 24999, Apr. 27, 2006]

Subpart L—Illuminated Exit Signs

SOURCE: 70 FR 60417, Oct. 18, 2005, unless otherwise noted.