

Working committee notes for updating ANSI C12.1-2001 Section  
5.1.4.3.3 Statistical Sampling Plan  
31 March 2006

Existing verbiage in ANSI C12.1-2001  
Section 5.1.4.3.3 Statistical Sampling Plan

**The statistical sampling plan used shall conform to accepted principles of statistical sampling based on either variables or attributes methods. Meters shall be divided into homogeneous groups, such as manufacturer and manufacturer's type. The groups may be further divided into subdivision within the manufacturer's type by major design modifications.**

**NOTE—Examples of statistical sampling plans can be found in ANSI/ASQC Z1.9, the ANSI version of MIL-STD-414 and ANSI/ASQC Z1.4, the ANSI version of MIL-STD-105.**

Background and reason for updating. Statistical sampling plans have been in vogue for over 40 years in the electrical utility industry. Plans developed in the 1960's were regulated by the individual utility commissions and typically affected only the investor owned utilities. ANSI weighed in on the matter in the 5<sup>th</sup> edition of ANSI C12.1-1965 in Section 8.1.8.6 Statistical Sampling, in a fairly lengthy and detailed write-up on statistical testing. This write-up included a definition of acceptable performance of the plan and potential corrective actions based on failure of a group. Programs put in use at the time were all sampling by attributes plans as this was feasible to administer given the resources available to the meter shops and the metering engineers of the day. A copy of the 1965 edition is attached for your reference.

Over the ensuing years there was an industry wide loss of focus on the reason for the sampling plan and corrective actions became punitive as opposed to beneficial for utility and consumer. Subsequent editions of the ANSI standard eliminated all of the verbiage on acceptable performance and corrective actions while state run regulatory commissions either referred to ANSI for guidance, neglected the topic completely, or put in place pass/fail criteria that had little or nothing to do with valid statistical sampling plans.

In the proposed update of the standard we are hoping to once again provide guidance to utilities and regulatory commissions as they revisit the issue of statistical sampling and incorporate updated sampling by variable statistical plans. This guidance is intended to allow regulatory commissions and utilities to run cost effective sampling plans that will give a better and clearer indication of how a utility's meter population is performing and what would be the best course of action (for both consumers and the utility) for groups that are performing less than optimally.

Proposed wording;

**The statistical sampling plan used shall conform to accepted principles of statistical sampling based on either variables or attributes methods as found in either ANSI/ASQC Z1.9 or ANSI/ASQC Z1.4**

*Comment on change in first paragraph; Reference to the old Military Standards is no longer appropriate as they have been unsupported for over 10 years in favor of the ANSI standards. This writer also did not see any reason for even discussing any other methods as these are the two methods presently used as the basis for every statistical sampling plan presently in use in the United States. This statement is based on having canvassed every known state regulation and utility plan that I have become aware of over the past ten years.*

**Meters shall be divided into homogeneous groups, such as manufacturer and manufacturer's type, and may be further subdivided in accordance with location or other factors which may be disclosed by analyzing test records to have an effect on performance. Subsequently, groupings may be modified or combined if justified by performance records.**

*Comment on change in the second paragraph; Data analysis tools have become greatly enhanced with the introduction of spreadsheets, PC's, and automated data collection systems into the meter shops. Factors which might influence a meter's performance could be manufacturer, or design type, or manufacturing location, or environment, or usage. Analyzing the test data to help split a group or combine a group into more like-performing meters will allow utilities to better and more quickly isolate groups of poorly performing meters This is nearly the same wording of the 1965 standard.*

**The sample taken each year from each homogeneous group shall be of sufficient size to demonstrate with reasonable assurance the condition of the group from which the sample is drawn. The sampling plan shall include an adequate policy to ensure that the meters selected have been randomly selected and have not been physically damaged or tampered with. An acceptable sampling program is one in which a sample will 95 times out of 100, determine whether as many as 97.5 percent of a homogeneous group are within the limits defined in 5.1.2. Plans based on the variables methods shall use a minimum sample size of 30 meters and plans based on the attributes method shall use a minimum sample size of 300 meters in each homogenous group. If a group does not meet the performance criteria then corrective action shall be taken.**

*Comment on addition of third paragraph and associated wording; This is once again a return to the past. This wording is a synopsis of the 1965 ANSI version. The only departure is using a minimum sample size of only 30 meters for variable plans instead of 100 as this has been the number proposed by qualified statistical mathematicians in formulating plans for electric and gas utilities over the past ten years. In light of this*

*more recent information I felt that 30 was a more appropriate number. This allows a more cost effective alternative for statistically sampling smaller groups.*

**The corrective action may consist of an accelerated test program, splitting the group into two or more groups; an accelerated retirement program; or a slower, sample driven retirement plan.**

**An accelerated test program will test a larger sample of the group to confirm or disprove the failure of a group in the same year or the following year. This new test will have a larger group and will not include any of the meters from the initial test.**

**Split the group into two or more groups of similarly performing meters (based on analysis of the meter test data). After splitting the groups a larger test sample will be taken of each group that same year or the following year.**

**Implementing a plan to retire a group should be over a period acceptable to the local utility commission and the utility involved. Length of time specified should recognize the amount of revenue being unrecognized each year and the cost required to retire the group in question.**

**If the cost of a forced retirement plan would be more expensive than ten times the estimated annual loss of revenue than in the interest of both the consumer and the utility this group should continue to be monitored through an accelerated test plan and all meters removed through this test plan should be retired. No additional effort will be necessary to more quickly retire this group until the estimated loss in revenue is greater than 10% of the cost to replace the entire meter group.**

*Comments on the addition of this section; In general this is what was included in the 1965 version. The last paragraph of this section is new and reflects today's greater awareness of being a better steward of our customer's funds. In order to better protect any individual from being overcharged or any group from being unfairly subsidized we need to retire failed groups providing that the cost of the solution does not far outweigh the cost of the problem.. In this is the case a forced or accelerated retirement does a disservice to the ratepayer and the utility and is simply a waste of funds and resources. The use of 10% is arbitrary and could be either greater or lesser. A ten year payback still seems draconian, and perhaps a 7 year payback should be the maximum payback. We can discuss when we get together in Houston.*

I will have copies of this along with copies of the 1965 standard (albeit not very good copies – if any one has access to a better original that would be great). I will be in Houston from Sunday early afternoon until Wednesday late afternoon. TESCO will be set up in the Regal suite (24<sup>th</sup> floor - same floor as the EEI Sunday night reception)

Tom Lawton – TESCO, an Advent company.

Members of the committee;  
Jim DeMars, Florida Power & Light Co.,  
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