

AVISTA UTILITIES

GAS METER MEASUREMENT PERFORMANCE PROGRAM (PMC PROGRAM)

GAS METER SHOP – STANDARD OPERATING PROCEDURE		
Title: Gas Meter Measurement Performance Program		Date: 12-14-20
Jurisdiction: Washington, Idaho, Oregon	Manager: Jeff Webb	Page 1 of 13

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 - e. WAC 480-90 “Gas companies - operations”, Section 333, 338, 343, & 348

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SCOPE

This procedure covers the methodology, testing requirements, and annual reporting guidelines for Avista’s gas meter measurement performance testing program (PMC Program) for new and in-service meters.

Deviations or changes to this SOP (Standard Operating Procedure) shall be approved by the Gas Measurement Manager. Material changes require concurrence with the governing commission. Non-material changes shall be submitted to the commissions in conjunction with annual meter performance statistics.

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GENERAL

COMPLIANCE

Idaho: Avista ID Gas Tariff Rule No. 27, Section 25, effective November 1, 2018, has been approved and prescribes the minimum inspection and testing requirements.

Oregon: Gas meter testing requirements for Avista are promulgated by Oregon Administrative Rules, Chapter 860, Division 023 “Service Standards”, Section 0015 (Testing Gas and Electric Meters). Avista Gas Tariff Rule No. 18, Section 20, effective September 1, 2012, has been approved and is in compliance with the requirements of the applicable OAR and prescribes the minimum inspection and testing requirements. It is the intent that this program is in accordance with the aforementioned Oregon Administrative Rules.

Washington: Gas meter testing requirements for Avista are promulgated by Washington Administrative Code, Chapter 480-90 “Gas companies - operations”, Section 333 (Initial accuracy of meters), Section 338 (Metering tolerance), Section 343 (Statement of meter test procedures), and Section 348 (Frequency of periodic meter tests). Avista Gas Tariff Rule No. 170, Section 20, effective November 30, 2011, has been approved and is in compliance with the requirements of WAC 480-90 and prescribes the minimum inspection and testing requirements. It is the intent that this program is in accordance with WAC 480-90.

HISTORY

Avista’s current random meter measurement performance program is in accordance with ANSI Z1.9 (Inspection by Variables). Random sampling and testing is completed for all meters 1000 CFH and smaller. The program was revised and upgraded in 2009. The prior program was in accordance with inspection standard ANSI Z1.4 (Inspection by Attributes). The change in inspection standard and programmatic changes were completed in order to enhance the quality and accuracy of the measurement performance program.

In 2011 the gas meter testing program was enhanced as follows:

- Random sampling program - Redefined a meter population. Previously a meter population was defined as meters of the same model, installed in the same State jurisdiction, and purchased in the same year. The revised definition for a meter population now includes meters of the same model, size, and manufactured in the same year. The new definition removes the criteria to test meters by state. A statistical analysis of meter testing results for all three (3) states revealed that the mean accuracy and standard deviation of accuracy about the mean are similar for all three states and that any difference is not statistically significant, indicating that state test results can be combined. Random sampling gas meter testing requirements for 2012 were developed using the revised meter population definition.
- Installed turbine Meters: Changes were made to expand turbine testing requirements to include both single rotor and dual rotor auto adjust meters.
- Installed rotary meters: Changes were made to provide clarification regarding necessary test requirements for rotary meters.

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In 2019 a new subpart titled “Meter Data Management Calibration” was added to section VI Installed Meter Testing Program, part c. This subpart defines an alternative means to address meter families that are experiencing a consistent drift in mean accuracy identified by the sample meter testing program. Because these families are experiencing a consistent drift in accuracy, the meter reading can be corrected by changing the Installation Constant value in Avista’s Meter Data Management system rather than replacing the meter. Meter families experiencing this drift in accuracy will continue to be tested under tightened inspection and their Installation Constant reevaluated every year.

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GAS METER MEASUREMENT PROGRAM REQUIREMENTS

I. Tests of Customer Meters

- a. Avista shall maintain a quality control program to verify performance accuracy of new meters and installed meters.
- b. Testing of Small Capacity Meters. All meters with capacities up to and including one thousand (1,000) cubic feet per hour (cfh) at ½” differential pressure that have been in service ten (10) or more years as established by either the last install date or manufacture date shall be tested through annual random sampling using sample size methods in accordance with ANSI/ASQ-Z1.9 or other generally accepted statistical method that conforms to the requirements of the applicable sections of ANSI B.109.1 and B109.2 measuring in-service performance of diaphragm type gas meters.
- c. Testing of Larger Capacity Meters. All meters with capacities greater than one thousand (1,000) cfh that have been in service ten (10) years as established by either last install or manufacture date shall be replaced or field tested based on a periodic schedule. Diaphragm type meters shall be tested in accordance with applicable sections of ANSI B109.1 and B109.2. Rotary type meters shall be tested in accordance with applicable sections of ANSI B109.3.

II. Customer Meter Accuracy

- a. Accuracy of Meters
 - i. Diaphragm Meters:
 - 1. A new gas meter installed for the use of any customer shall not be more than one (1) percent slow or fast.
 - 2. Every meter removed from service and opened for repair shall have the meter tolerance adjusted to 100% plus or minus 0.5%, with no greater spread than 0.7% between the check and open prior to being reinstalled.
 - 3. Meters not opened for repairs may be reinstalled without adjustment if found to be not more than two (2) percent in error slow or fast, per Section III (Customer Meter Test Loads).
 - ii. Rotary Meters
 - 1. A new gas meter installed for the use of any customer shall not be more than one (1) percent slow or fast.
 - 2. Meters inspected by differential pressure testing shall confirm that the meter is performing within 150% of the manufacturer’s specification for differential pressure at the operating pressure.
 - 3. Every meter tested by proving shall be adjusted to be not more than two (2) percent slow or fast before being reinstalled.
 - iii. Turbine Meters

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1. A new gas meter installed for the use of any customer shall not be more than one (1) percent slow or fast.
 2. Meters inspected by spin testing shall confirm that the meter is performing within the manufacture's limits.
 3. Every meter tested by proving shall be adjusted to be not more than two (2) percent slow or fast before being reinstalled.
- b. Removal of Defective Meters from Service. No meter that is mechanically defective shall be placed in service or allowed to remain in service after the defect has been discovered. When any gas meter is not connected and in service, the inlet and outlet will be capped to prevent the drying out of diaphragms and contamination of the meter with dirt and debris. The exception shall be when stored indoors during the testing and/or repair process.

III. Customer Meter Test Loads

- a. Testing of Meters, Test Equipment. All tests to determine the accuracy of registrations of gas service meters shall be made with a suitable meter prover or testing equipment as detailed in this standard.
- b. Gas Flows During Testing. The flow rate to be used in testing meters, except orifice type meters and high volume meters with capacity in excess of test equipment capability, will be at twenty (20) percent (Check) and one hundred (100) percent (Open) of their capacity. For the purpose of determining the accuracy of these meters, the average of the two results shall be used.
- c. High Volume Meters. Turbine and rotary meters that have rated capacities in excess of the mechanical limits of the proving equipment shall be tested at a minimum of two (2) points of flow with each at or above a minimum of 15% of the rated capacity of the meter. For purposes of the test the two results shall be averaged and shall conform to the standards set forth in Section II (Customer Meter Accuracy).

IV. Meter Test Procedures and Test Records

- a. Reporting
 - i. After December 31 of each year, meter test results will be summarized, analyzed and forwarded to all the three State Utility Commissions. Retention and filing of records will be in accordance with the appropriate Commission requirements.
- b. Test Records
 - i. After December 31 of each year, meter test results will be summarized and analyzed. Annual results of all meter accuracy tests will be tabulated and retained in accordance with the appropriate Commission as follows:
 1. Idaho: Avista ID Gas Tariff Rule No. 27, Section 25
 2. Oregon: OAR 860-023-0015(4)
 3. Washington: WAC 480-90-353
 - ii. Avista shall keep records of tests of the accuracy of each of its meters, which may be superseded by a later test, but shall be maintained for not less than two years. These records shall give:

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1. sufficient information to identify the meter,
 2. the reason for the test,
 3. the date of the test and reading of the meter,
 4. an identification of the person making the test, and
 5. accuracy, as found and as left, together with enough of the data taken at the time of the test to permit the convenient checking of the methods employed and the calculations.
- c. Technical Standard. Technical performance requirements for diaphragm natural gas meters shall be per the current versions of ANSI B109.1 and ANSI B109.2. Technical performance requirements for rotary type natural gas meters shall be per the current versions of ANSI B109.3.
- d. Uniquely Defective Test. An individual meter test result within a random sample of more than 10% error shall be declared a uniquely defective test and disregarded. A substitute test will be made with meter selected from within the same test family. Subject meter shall be adjusted or replaced.

V. New Meters

- a. New meters shall be factory tested and certified to meet accuracy criteria specified by Section II (Customer Meter Accuracy).
 - i. Manufacturers shall provide results of new meter testing that conforms to generally accepted practice for meter accuracy and performance. Diaphragm meters shall meet the standards set forth in ANSI B109.1 and ANSI B.109.2. Rotary meters shall meet the standards set forth in ANSI B109.3.
- b. Inspection and acceptance testing by Avista prior to installation of new meters.
 - i. Each meter shipment will be inspected for physical damage. Meters found to be damaged or in damaged packaging will be tested, repaired and/or calibrated or returned to the manufacturer as described herein. All costs for tests, return shipping and/or calibration to meters described in this section shall be borne by the manufacturer.
 - ii. Normal acceptance testing described herein, not associated with physical damage found on arrival of the shipment, will be performed for all meters not factory tested prior to shipment. Expanded testing beyond normal test quantities for shipments found to be non-conforming through acceptance testing will be paid for by the manufacturer or the shipment returned to the manufacturer per negotiations between Avista and the manufacturer.
- c. New diaphragm type meters, less than or equal to 1000 CFH:
 - i. The methodology for the random sampling of new meters is derived from ANSI/ASQ Z1.9 or other generally accepted statistical method that conforms to the requirements of the applicable sections of ANSI B.109.1 and B109.2.
 1. The lot size to determine random sample quantity shall be the size of the shipment.
 2. Acceptable Quality Limit (AQL) for analysis of new meters will equal 1.5.

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- ii. Sample size: is based on Normal inspection levels
 - 1. Normal inspection is the default inspection level.
 - 2. Sample size for meter types with five (5) test histories are eligible for application of switching rules in general accordance with the guidelines contained within the Standard as modified below.
 - 3. Switching Rules:
 - a. Normal to tightened: Switching rules for transition from normal to tightened inspection shall be applied if two (2) out of five (5) consecutive lots have been rejected on original inspection. Testing beyond the sample size for normal inspection level will be paid for by the manufacturer.
 - b. Tightened to Normal: Switching rules for transition from tightened to normal inspection may be applied when testing has been at the tightened level and five (5) consecutive batches have been acceptable on original inspection.
 - c. Normal to Reduced: Switching rules for transition from normal to reduced inspection (inspection level II to inspection level III) may be applied if:
 - i. Preceding five (5) lots have been on normal inspection and none have been rejected, AND
 - ii. Meter model has been in steady production without major design modifications (as determined by the Company).
 - d. Reduced to Normal: Switching rules for transition from reduced to normal (inspection level III to inspection level II) shall be applied if:
 - i. A batch is rejected under reduced inspection, OR
 - ii. Meter model has not been in steady production or a major design modification has occurred (as determined by the Company).
 - 4. Random sampling per the Standard shall be discontinued if five (5) consecutive lots are not accepted. Acceptance procedures as detailed herein shall not be resumed until corrective action has been taken.
- d. New diaphragm meters, greater than 1000 CFH.
 - i. New large capacity diaphragm meters shall be tested against metering tolerance of Section II.
 - ii. Meters found to be outside of tolerance shall be adjusted per section II. If the meter cannot be adjusted within these standards, it shall be returned to the manufacturer.
- e. New rotary meters.
 - i. Rotary meters shall meet the accuracy requirements as specified in Section II and appropriate requirements of ANSI B109.3.
- f. New turbine meters.

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- i. New turbine meters shall meet the accuracy requirements as specified in Section II and shall be spin tested at installation to verify they will operate within the accuracy limits as specified by the manufacture.

VI. Installed meter testing program

- a. General: Meters shall be inspected and tested against metering tolerance prescribed in Section II. Meters found to be outside the tolerances shall be immediately adjusted or replaced.
- b. Age: Testing requirements are applicable to meters that are 10 years old or older. The first year of required testing is calculated as Manufacturing year + 9.
- c. Meters, diaphragm type 1000 CFH and smaller, randomly sampled: A random sample of meters shall be selected, tested against tolerances prescribed by Section II, and analysis conducted using the Standard. The annual random sampling program shall begin during the tenth (10th) year after meter manufacture date. The methodology for sample sizes and analysis for the meter testing program is derived from ANSI/ASQ Z1.9 (hereafter may be referred to as the Standard) or other generally accepted statistical method that conforms to the requirements of the applicable sections of ANSI B.109.1 and B109.2 measuring in-service performance of gas meters.
 - i. The lot size to determine random sample quantity shall be the size of the meter population. A meter population should include randomly sampled meters in approximate proportion to the number of meters installed in each operating area.
 - ii. A meter population is defined as meters of the same model, size, and manufactured year.
 - 1. Meter population is synonymous with the term lot as used in the Standard.
 - 2. Major design changes to a meter model within a single year shall be a new population for sampling
 - iii. All of the meters within a population will be identified by a “flag” in Avista’s Service Suite mobile application at the beginning of a calendar year. Meters shall be chosen at random and in sufficient quantities to meet the guidelines for sampling as detailed in the standard. Once the required number of meters in each family is removed for testing the “flag” will be removed in Service Suite indicating that no more meters in that family are required for testing. Meter populations of 50 or fewer units are subject to modified sample size. Sample quantity shall be set to avoid repeat testing of a meter more than once every ten years.
 - iv. Inspection Levels, Sample Size and Test result analysis:
 - 1. General: Analysis of population sample results shall conform to the guidelines contained in the Standard. Acceptable Quality Limit (AQL) for analysis will equal 10.0.
 - 2. Normal inspection is the default level of inspection.
 - 3. Inspection levels for meter types with five (5) year test histories are eligible for application of switching rules.
 - 4. Switching rules:

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- a. Normal to tightened: Switching rules for transition from normal to tightened inspection shall be applied if two (2) lots out of five (5) consecutive lots have been rejected.
 - b. Tightened to Normal: Switching rules for transition from tightened to normal inspection may be applied when testing has been at the tightened level and five (5) consecutive batches have been acceptable.
 - c. Normal to Reduced: Switching rules for transition from normal to reduced inspection may be applied if:
 - i. Preceding ten (10) lots have been on normal inspection and none have been rejected.
 - d. Reduced to Normal: Switching rules for transition from reduced to normal shall be applied if:
 - i. A batch is rejected.
5. Failure of meter population. A meter population shall be declared defective (failed) when:
- a. Three (3) consecutive yearly inspections for a population under tightened inspection are not accepted based on AQL of 10.0 for overall performance (double specification limit) AND/OR
 - b. Two (2) consecutive yearly inspections for a population under tightened inspection are not accepted based on AQL of 10.0 for overall performance (single specification limit) which measures meters running fast, also referred to as Failed Fast.
- These failed meter families shall either be removed from service as described by subpart 6 or have their Installation Constant updated in the Meter Data Management system as described in subpart 7.
6. Removal of failed meter population: Removal of a meter population of less than 2500 units may take place within one (1) year. Removal of meter population of more than 2500 units may take place over two (2) years. Removal of meter population of more than 5000 units may take place over three (3) years. Removal of meter population of more than 7500 units may take place over four (4) years.
7. Meter Data Management calibration: If a statistical analysis shows that a meter family is experiencing a consistent drift in mean accuracy, the meter reading may be corrected by adjusting the entire family's Installation Constant value in the Meter Data Management system rather than removing the meters from service. Meter families experiencing this drift in accuracy will continue to be tested under tightened inspection and their Installation Constant reevaluated every year.
- d. Installed diaphragm meters, greater than 1000 CFH, periodic test.
- i. 1001 CFH through 3000 CFH: Inspected and proved every ten (10) years or sooner.
 - ii. Larger than 3000 CFH: Inspected and proved every five (5) years or sooner.
 - iii. All meters shall be tested against metering tolerance of Section II.

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- iv. Meters found to be outside of tolerance shall be adjusted to within the tolerances as specified in Section II.
- e. Installed rotary meters, periodic test.
 - i. Testing of installed rotary meters will be done using either a portable transfer prover or differential testing device. A differential test shall confirm a minimum of two (2) points. Results of a differential test or prover test shall show that the meter is performing within the accuracy as detail in Section II.
 - ii. Meters shall be inspected and tested every five (5) years or sooner.
 - iii. Meters found to be outside of tolerance shall be adjusted to within the tolerances as specified in Section II or removed from service.
- f. Installed turbine meters, periodic test.
 - i. Installed single rotor turbine meters shall be inspected and spin tested annually and determined to be within the manufactures acceptability limits. Turbine meters failing the spin test shall be removed from the field and repaired prior to any subsequent installation.
 - ii. Installed auto adjust meters shall be inspected annually and determined to be operating within the manufactures acceptability limits. Meter Delta A (ΔA), the difference between the main and sensing rotor pulses, that exceed the manufactures recommended operating parameters shall be repaired or replaced.
 - iii. All turbine meters will be tested with a transfer proven or at an approved offsite facility at a maximum interval of every ten (10) years. Tested meters shall meet or exceed the meter accuracy requirements of Section II.

VII. Meter Test Equipment and Application

- a. Meter test equipment
 - i. Transfer Prover. The accuracy of the testing equipment is ascertained through:
 - 1. Monthly, in-house self-testing procedures.
 - 2. Sending of Standard Meter Module to the manufacturer for periodic calibration. The period between factory calibrations shall not exceed five (5) years.
 - ii. Sonic Nozzle Prover and Bell Prover.
 - 1. The accuracy of the testing equipment is ascertained through an automatic test diagnostic. The diagnostic is completed each time the prover is powered on.
 - 2. The test equipment shall be factory calibrated every two (2) years.
- b. Meters shall be tested on either: Sonic Nozzle, Bell Prover, Transfer Prover, or at an approved offsite facility.

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APPENDIX – COMPLIANCE STANDARDS

- Avista ID Gas Tariff Rule No. 27, Section 25
- Avista OR Gas Tariff Rule No. 18
- OAR 860-023 (Public Utility Commission)
- Avista WA Gas Tariff Rule No. 170, Section 20
- WAC 480-90 “Gas companies - operations”, Section 333, 338, 343, & 348

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