

220 CMR 36.00: SAMPLE TEST PROCEDURES FOR NEW RESIDENTIAL AND SMALL COMMERCIAL GAS METERS

Section

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36.01: General

220 CMR 36.00 provides a test procedure, according to an attributes sampling plan, for new residential and small commercial gas meters with rated capacity not greater than 425 cubic feet per hour (cfh), that ensures compliance with M.G.L. c. 164, § 103.

36.02: Sampling Procedure

- (1) Selection of samples and sample testing of new meters shall be conducted in accordance with 220 CMR 36.08 using General Inspection Level II and Single Sampling Plan for Normal Inspection with an Acceptable Quality Level (AQL) of 2.5.
- (2) New meter lots shall be established consisting of meters of a single type and size, manufactured under the same conditions, and essentially at the same time. The lot size will determine the sample size and the accept/reject level as shown in 220 CMR 36.08(7).
- (3) The sample shall be made up of a proportionate number of meters selected at random from each subplot, such that each meter in the lot has an equal chance of being selected for the sample.
- (4) Meters shall be tested using the best technology available at the time a company's existing meter testing technology is replaced.

36.03: Accuracy Requirements

- (1) When purchasing new meters, accuracy specifications to the manufacturer shall be 100%  $\pm$  .5% proof. All new meters must be tested by the manufacturer and the test records must be provided to the company's manager in charge of meter testing and repair.
- (2) The accuracy requirements of new meters tested by Department of Public Utilities (Department) personnel shall be 100%  $\pm$  1% proof.

36.04: Rejected or Defective Meters in Accepted Test Lot

Any rejected or defective meter that is part of an accepted test lot of meters shall be adjusted by the company's personnel and retested by the Department in accordance with 220 CMR 36.03(2).

36.05: Meters in Unaccepted Test Lot

When a test lot is not accepted, every meter in the lot shall be returned to the manufacturer or tested by the Department. If the meters are tested by the Department, all meters in the lot that are found to be rejected or defective shall be returned to the manufacturer or adjusted by the company's personnel and retested by the Department in accordance with 220 CMR 36.03(2).

36.06: Sealing of Accepted Meters

- (1) Each accepted new meter shall be sealed by affixing to the meter a prenumbered Department decal, colored other than yellow.
- (2) Each accepted meter that is not new and was previously used to measure gas shall be sealed by affixing to the meter a yellow, prenumbered Department decal.
- (3) Any accepted meter shall not be required to be sealed by any means other than the aforementioned decals.

36.07: Records

- (1) The following information shall be recorded on the Department Gas Meter Inspector's "Original Record of the Inspection of Gas Meters". For all accepted new meters, the decal number shall be entered in the Inspector's number column and the manufacturer's or company's serial number of the meter to which the decal is affixed shall be entered in the maker's number column. The proof of each meter tested in the sample shall be recorded in the proof column.
- (2) Each company shall maintain a record of manufacturer and Department test or proof results for all new meters in each sample lot as required by the Department. Beginning January 1, 2021, new meter test records shall be recorded and stored in electronic format and retained for the service life of the meter, and all existing meter test records then in electronic format shall continue to be stored in that format for the service life of the meter.

36.08: Selection of Samples and Sample Testing

- (1) Scope.
  - (a) Purpose. 220 CMR 36.00 establishes sampling plans and procedures for inspection by attributes. When specified by the responsible authority, 220 CMR 36.00 shall be referenced in the specification, contract, inspection instructions, or other documents and the provisions set forth in 220 CMR 36.00 shall govern. The "responsible authority" shall be designated in one of the above documents.
  - (b) Application. Sampling plans designated in 220 CMR 36.00 are applicable, but not limited, to inspection of the following:
    1. End items;
    2. Components and raw materials;
    3. Operations;
    4. Materials in process;
    5. Supplies in storage;
    6. Maintenance operations;
    7. Data or records; or
    8. Administrative procedures.

These plans are intended primarily to be used for a continuing series of lots or batches. The plans may also be used for the inspection of isolated lots or batches, but in this latter case, the user is cautioned to consult the operating characteristic curves (*see* MIL STD-1916, "[Department of Defense] Preferred Methods for Acceptance of Product"; ANSI/ASQ Z1.4, "Sampling Procedures and Tables for Inspection by Attributes") to find a plan that will yield the desired protection.
  - (c) Inspection. Inspection is the process of measuring, examining, testing, or otherwise comparing the unit of product (*see* 220 CMR 36.08(1)(e)) with the requirements.
  - (d) Inspection by Attributes. Inspection by attributes is inspection whereby either the unit of product is classified simply as defective or non-defective, or the number of defects in the unit of product is counted, with respect to a given requirement or set of requirements.
  - (e) Unit of Product. The unit of product is the item inspected in order to determine its classification as defective or non-defective or to count the number of defects. It may be a single article, a pair, a set, a length, an area, an operation, a volume, a component of an end product, or the end product itself. The unit of product may or may not be the same as the unit of purchase, supply, production, or shipment.

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(2) Classification of Defects and Defectives.

(a) Method of Classifying Defects. A classification of defects is the enumeration of possible defects of the unit of product classified according to their seriousness. A defect is any nonconformance of the unit of product with specified requirements. Defects will normally be grouped into one or more of the following classes, but defects may be grouped into other classes, or into subclasses within these classes.

1. Critical Defect. A critical defect is a defect that judgment and experience indicate is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the product; or a defect that judgment and experience indicate is likely to prevent performance of the tactical function of a major end item such as a ship, aircraft, tank, missile or space vehicle. *NOTE:* For a special provision relating to critical defects, *see* 220 CMR 36.08(6)(c).

2. Major Defect. A major defect is a defect, other than critical, that is likely to result in failure, or to reduce materially the usability of the unit of product for its intended purpose.

3. Minor Defect. A minor defect is a defect that is not likely to reduce materially the usability of the unit of product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit.

(b) Method of Classifying Defectives. A defective is a unit of product which contains one or more defects. Defectives will usually be classified as follows:

1. Critical Defective. A critical defective contains one or more critical defects and may also contain major and/or minor defects. *NOTE:* For a special provision relating to critical defectives, *see* 220 CMR 36.08(6)(c).

2. Major Defective. A major defective contains one or more major defects, and may also contain minor defects, but contains no critical defect.

3. Minor Defective. A minor defective contains one or more minor defects, but contains no critical or major defect.

(3) Percent Defective and Defects per 100 Units.

(a) Expression of Nonconformance. The extent of nonconformance of product shall be expressed either in terms of percent defective or in terms of defects per 100 units.

(b) Percent Defective. The percent defective of any given quantity of units of product is 100 times the number of defective units or product contained therein divided by the total number of units of product, *i.e.:*

$$\text{Percent defective} = \frac{\text{Number of defectives}}{\text{Number of units inspected}} \times 100$$

(c) Defects per 100 Units. The number of defects per 100 units of any given quantity of units of product is 100 times the number of defects contained therein (one or more defects being possible in any unit of product) divided by the total number of units of product, *i.e.:*

$$\text{Defects per 100 units} = \frac{\text{Number of defectives}}{\text{Number of units inspected}} \times 100$$

(4) Acceptable Quality Level (AQL).

(a) Use. The AQL together with the Sample Size Code Letter, is used for indexing the sampling plans provided in 220 CMR 36.00.

(b) Definition. The AQL is the maximum percent defective (or the maximum number of defects per 100 units) that, for purposes of sampling inspection, can be considered satisfactory as a process average. A process average is the average percent defective or average number of defects per 100 units (whichever is applicable) of product submitted by the supplier for original inspection. Original inspection is the first inspection of a particular quantity of product as distinguished from the inspection of product which has been resubmitted after rejection.

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(c) Note on the Meaning of AQL. When a consumer designates some specific value of AQL for a certain defect or group of defects, it indicates to the supplier that the consumer's acceptance sampling plan will accept the great majority of the lots or batches that the supplier submits, provided the process average level of percent defective (or defects per 100 units) in these lots or batches is no greater than the designated value of AQL. Thus, the AQL is a designated value of percent defective (or defects per 100 units) that the consumer indicates will be accepted most of the time by the acceptance sampling procedure to be used. The sampling plans provided in 220 CMR 36.00 are so arranged that the probability of acceptance at the designated AQL value depends upon the sample size, being generally higher for large samples than for small ones, for a given AQL. The AQL alone does not describe the protection to the consumer for individual lots or batches, but more directly relates to what might be expected from a series of lots or batches, provided the steps indicated in 220 CMR 36.00 are taken. It is necessary to refer to the operating characteristic curve of the plan to determine what protection the consumer will have.

(d) Limitation. The designation of an AQL shall not imply that the supplier has the right to supply knowingly any defective unit of product.

(e) Specifying AQLs. The AQL to be used will be designated in the contract or by the responsible authority. Different AQLs may be designated for groups of defects considered collectively, or for individual defects. An AQL for a group of defects may be designated in addition to AQLs for individual defects, or subgroups, within that group. AQL values of 10.0 or less may be expressed either in percent defective or in defects per 100 units; those over 10.0 shall be expressed in defects per 100 units only.

(f) Preferred AQLs. The values of AQLs given in these tables are known as preferred AQLs. If, for any product, an AQL be designated other than a preferred AQL, these tables are not applicable.

(5) Submission of Product.

(a) Lot or Batch. The term lot or batch shall mean "inspection lot" or "inspection batch" (*i.e.*, a collection of units of product from which a sample is to be drawn and inspected to determine conformance with the acceptability criteria), and may differ from a collection of units designated as a lot or batch for other purposes (*e.g.*, production, shipment, *etc.*).

(b) Formation of Lots or Batches. The product shall be assembled into identifiable lots, sublots, batches, or in such other manner as may be prescribed (*see* 220 CMR 36.08(5)(d)). Each lot or batch shall, as far as is practicable, consist of units of product of a single type, grade, class, size, and composition, manufactured under essentially the same conditions, and at essentially the same time.

(c) Lot or Batch Size. The lot or batch size is the number of units of product in a lot or batch.

(d) Presentation of Lots or Batches. The formation of the lots or batches, lot or batch size, and the manner in which each lot or batch is to be presented and identified by the supplier shall be designated or approved by the responsible authority. As necessary, the supplier shall provide adequate and suitable storage space for each lot or batch, equipment needed for proper identification and presentation, and personnel for all handling of product required for drawing of samples.

(6) Acceptance and Rejection.

(a) Acceptability of Lots or Batches. Acceptability of a lot or batch will be determined by the use of a sampling plan or plans associated with the designated AQL or AQLs.

(b) Defective Units. The right is reserved to reject any unit or product found defective during inspection whether that unit of product forms part of a sample or not, and whether the lot or batch as a whole is accepted or rejected. Rejected units may be repaired or corrected and resubmitted for inspection with the approval of, and in the manner specified by, the responsible authority.

(c) Special Reservation for Critical Defects. The supplier may be required at the discretion of the responsible authority to inspect every unit of the lot or batch for critical defects. The right is reserved to inspect every unit submitted by the supplier for critical defects, and to reject the lot or batch immediately, when a critical defect is found. The right is reserved also to sample, for critical defects, every lot or batch submitted by the supplier and to reject any lot or batch if a sample drawn therefrom is found to contain one or more critical defects.

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(d) Resubmitted Lots or Batches. Lots or batches found unacceptable shall be resubmitted for reinspection only after all units are reexamined or retested and all defective units are removed or defects corrected. The responsible authority shall determine whether normal or tightened inspection shall be used, and whether reinspection shall include all types or classes of defects or of the particular types or classes of defects which caused initial rejection.

(7) Drawing of Samples.

(a) Sample. A sample consists of one or more units of product drawn from a lot or batch, the units of the sample being selected at random without regard to their quality. The number of units of product in the sample is the sample size.

(b) Representative Sampling. When appropriate, the number of units in the sample shall be selected in proportion to the size of sublots or subbatches, or parts of the lot or batch, identified by some rational criterion. When representative sampling is used, the units from each part of the lot or batch shall be selected at random.

(c) Time of Sampling. Samples may be drawn after all the units comprising the lot or batch have been assembled, or samples may be drawn during assembly of the lot or batch.

SAMPLE SIZE AND ACCEPT/REJECT LEVEL FOR SINGLE SAMPLING  
PLAN GENERAL INSPECTION LEVEL II AQL = 2.5

<u>LOT SIZE</u>	<u>SAMPLE SIZE</u>	<u>ACCEPT/REJECT</u>
2 to 8	2	0/1
9 to 15	3	0/1
16 to 25	5	0/1
26 to 50	8	0/1
51 to 90	13	1/2
91 to 150	20	1/2
151 to 280	30	2/3
281 to 500	50	3/4
501 to 1,200	80	5/6
1,201 to 3,200	125	6/8
3,201 to 10,000	200	10/11

Note that the first number on each line in the “Accept/Reject” column is the maximum number of defective meters allowable in a sample size for the lot to be accepted. The second number on each line in this column is the minimum number of defective meters in a sample size which requires that the lot be rejected.

REGULATORY AUTHORITY

220 CMR 36.00: M.G.L. c. 164, § 103.