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Standard Guide for Fastener Sampling for Specified Mechanical Properties and Performance Inspection[1]

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INTRODUCTION

Throughout this guide the terms *detection* and *prevention* apply to quality control systems. A brief description of both is provided to assist the purchaser in the application of this guide.

The *detection system* relies on inspection as the primary means of controlling the quality of furnished material. Methods include in-process and final inspection. In-process inspection is typically performed by the individual performing the process and generally includes a first-piece inspection by someone other than the operator. Quality-control inspection may perform audit inspections on the process output during the course of the production run. In addition, a final inspection is performed by quality control inspectors according to a prescribed sample plan. The other sample plans utilize zero defects as their acceptance criteria.

The *prevention system* uses advanced quality planning in addition to many of the techniques used in the detection system. Quality planning incorporates a systems approach to quality control that focuses on defect prevention and continual improvement. In addition, Statistical Process Control (SPC) is usually applied to control the process, thereby reducing the variability of the output.

The ISO 9000, QS 9000, and the ASQ Q9000, quality system standards, or a combination thereof, are models that may be used in establishing a prevention-based quality system.

1. Scope

1.1 This guide provides sampling methods for determining how many fasteners to include in a random sample in order to determine the acceptability or disposition of a given lot of fasteners.

1.2 This guide is for mechanical properties, physical properties, coating requirements, and other quality requirements specified in the standards of ASTM Committee F16. Dimensional and thread criteria sampling plans are the responsibility of ASME Committee B18.

1.3 This guide provides for two sampling plans: one designated the "detection process," as described in Terminology F 1789, and one designated the "prevention process," as described in Terminology F 1789.

2. Referenced Documents

2.1 *ASTM Standards:*

F 1789 Terminology for F16 Mechanical Fasteners[2]

2.2 *ASME Standards:*

ASME B18.18.2M Inspection and Quality Assurance for High-Volume Machine Assembly Fasterners

ASME B18.18.3M Inspection and Quality Assurance for Special Purpose Fasteners[3]

ASME B18.18.5M Inspection and Quality Assurance Plan Requiring In-Process Inspection and Controls[3]

ASME B18.18.6M Quality Assurance Plan for Fasteners Produced in Third Party Accreditation System[3]

2.3 *ASQ Standards:*

ASQ Q9000 Quality Management and Quality Assurance Standards—Guidelines for Selection and Use[3]

ASQ Q9001 Quality Management Systems[3]

ASQ Q9002 Quality Systems—Model for Quality Assurance in Production and Installation[3]

ASQ Q9004 Quality Management and Quality System Elements—Guidelines for Quality Improvement[3]

2.4 *AIAG Standards:*

QS 9000 Quality System Requirements[4]

2.5 *ISO Standards:*

[1] This guide is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.93 on Quality Assurance Provisions for Fasteners.

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[2] *Annual Book of ASTM Standards*, Vol 01.08.

[3] Available from the American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

[4] Available from Automotive Industry Action Group (AIAG), 26200 Lahser Rd., Ste. 2000, Southfield, MI 48034–9738.

ISO 9000 Quality Management Systems[3]
ISO 9001 Quality Management Systems Requirements[3]
ISO 9002 Quality Systems—Model for Quality Assurance in Production and Installation[3]
ISO 9004 Quality Management Systems—Guidelines for Improvements[3]

3. Terminology

3.1 Terms shall be defined in accordance with Terminology F 1789.

3.2 *Definitions:*

3.2.1 *material review*, *n*—an evaluation by a team of fastener experts to determine the fastener's nonconformance with respect to fitness for general use, fitness for intended use, or fitness for specified use.

3.2.2 *random sampling*, *n*—when every fastener in the lot has an equal and independent chance of being chosen as the sample. The sample may be returned to the lot if it has not been altered or destroyed during the inspection/test upon completion of sampling.

3.2.3 *test*, *n*—an element of inspection that generally denotes the determination by technical means of the properties or elements of supplies, or components thereof and involves the application of established scientific principles and procedures.

3.2.4 *zero defects*, *n*—zero defects applies only to the random sample. It gives a 95% confidence level that the shipping lot is free from defects.

4. Significance and Use

4.1 Sampling shall be selected in a random manner, ensuring that any unit in the lot has an equal chance of being chosen. Sampling should not be localized by selections being taken from the top of a container or from only one container of multicontainer lots.

4.2 The purchaser should be aware of the supplier's quality assurance system. This can be accomplished by auditing the supplier's quality system, if qualified auditors are available, or by third-party assessment certification, such as provided by QS 9000, ASQ 9000, or ISO 9000.

5. Ordering Information

5.1 The purchaser shall specify at the time of order inquiry, the specification number, the issue date and the sampling plan (detection process or prevention process) required from the supplier.

5.2 Guidelines for sampling plan selection are provided in Section 6.

6. Selection of Sampling Plans

6.1 Except as specified in 6.2, the detection process sampling level in accordance with Table 1 shall be applied.

6.2 If the manufacturer's quality system conforms with ASME B18.18.5M, B18.18.6M, QS 9000, ASQ Q9001, Q9002 (up until the year 2003), ISO 9001, or ISO 9002 (up until the year 2003), the manufacturer shall be permitted to choose between the Prevention or Detection process for inspection and test purposes. Purchasers shall retain the right to specify the Prevention or Detection process at the time of inquiry or order (see Table 2).

7. Acceptance Criteria

7.1 The acceptance criteria for Table 3 is to accept the lot if zero nonconforming parts are detected in the random sample and reject the lot if at least one nonconforming part is detected in the random sample.

8. Disposition of Nonconforming Lots

8.1 *Manufacturer's Options*—The manufacturer shall choose one of the following options in the disposition of those fasteners that have been found to contain nonconformities prior to shipment. The fastener manufacturer shall maintain records of disposition.

8.1.1 They may be scrapped.

8.1.2 They may be 100 % sorted, and all nonconforming parts removed.

8.1.3 They may be reworked or reprocessed to correct the nonconforming characteristic(s).

8.1.4 The manufacturer may make concession by use of a documented internal review procedure and determine to ship product that is found to contain minor nonconformances that are not critical or key characteristics as determined by the end user. Nonconformance of critical or key characteristics shall need approval from the end user prior to shipment of product. (See 8.1.6.) (See QS 9000, 4.13.1.2, b.)

8.1.5 They may be regraded for alternative applications. (See QS 9000, 4.13.1.2, c.)

8.1.6 The end user may be informed of the nonconformity or nonconformities and his advice requested on their disposition. The user may consider the degree to which the characteristic(s) deviate(s) from specified requirements and the significance of the effect on the assembly or performance of the fasteners in their service application. The user may authorize a written release of the fasteners for completion of production or for shipment, as applicable.

8.2 *End User Options*—The end user shall choose one of the following options for the disposition of those fastener lots that have been rejected after delivery:

8.2.1 The end user considers the degree to which the characteristic(s) deviate(s) from specified requirements and the effect on their performance in the intended service application. The end user may authorize release of the parts or fastener lots for use.

8.2.2 They may be scrapped.

8.2.3 They may be 100 % sorted and nonconforming parts removed.

8.2.4 They may be reworked or reprocessed to correct the nonconforming characteristic(s).

8.2.5 They may be returned.