AN AMERICAN NATIONAL STANDARD

Inspection and Quality Assurance for General Purpose Fasteners

ASME/ANSI B18.18.1M-1987

REAFFIRMED 1999

FOR CURRENT COMMITTEE PERSONNEL
PLEASE SEE ASME MANUAL AS-11

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THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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FOREWORD

(This Foreword is not part of ASME/ANSI B18.18.1M-1987.)

American National Standards Committee B18 for the standardization of bolts, screws, nuts, rivets, and similar fasteners was organized in March 1922 as Sectional Committee B18 under the aegis of the American Engineering Standards Committee (later the American Standards Association, then the United States of America Standards Institute and, as of October 6, 1969, the American National Standards Institute, Inc.) with the Society of Automotive Engineers and the American Society of Mechanical Engineers as joint sponsors.

Subcommittee 18 of Committee B18 was established in September 1978 to develop a document to cover the quality assurance provisions for internally and externally threaded metric fasteners and accessories or associated parts.

At the March 1979 meeting of Subcommittee 18, it was agreed that the quality assurance document should be circulated for subcommittee consideration as a proposed standard. Subcommittee acceptance of the content ensued and the document was approved by letter ballot to the American National Standards Committee B18 on March 21, 1980.

The standard was subsequently approved by the Secretariat and submitted to the American National Standards Institute for designation as an American National Standard; it was designated ANSI B18.18.1M-1982 and approved on September 14, 1982.

A periodic review of the standard, undertaken by the Subcommittee in 1985, resulted in agreement that the document be revised to allow it to be used for inch as well as metric products. This was done by deleting the word "metric" from the title as well as from each place in the standard where it would inhibit the use of the document for inch as well as metric products. By retaining the "M" in the designator, the standard can be used for both inch and metric products without having to change any references made. A proposal containing these changes, as well as editorial corrections, was prepared and balloted by letter ballot to ASME Committee B18. Following approval by ASME, the proposal was submitted to the American National Standards Institute and designated an American National Standard on January 16, 1987.

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Standardization of Bolts, Nuts, Rivets, Screws, Washers, and Similar Fasteners

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INSPECTION AND QUALITY ASSURANCE FOR GENERAL PURPOSE FASTENERS

1 GENERAL INFORMATION

1.1 Basic Plan Structure

This Standard outlines a Quality Assurance Plan for internally and externally threaded fasteners and accessories or associated parts. Provisions are included for sampling plans, inspection frequencies, control procedures, and record keeping.

Included in this plan are fasteners for general purpose applications, such as those where hand assembly is employed and cost is probably of prime consideration. This plan relies on judicious manufacturing controls and inspections by the producer and, should a dispute arise, provides an inspection plan for lot compliance after shipment.

This Standard will be used in conjunction with other accepted standards for product, testing, gaging, and material and, therefore, those provisions as well as packaging are not included herein.

1.2 Inspection Levels

The substantial difference in importance to the user of various characteristics and the dissimilar degrees of control in manufacture make impractical the subjecting of all characteristics to the same degree of inspection. Therefore, three inspection levels have been provided.

Any additional characteristics deemed applicable by the user that do not appear in the plan shall be explicitly designated by the user, preferably on engineering drawings and related specifications by the appropriate code letter at the time of ordering (see Appendix II). To assist in arriving at the most appropriate inspection level, the Decision Table included in Appendix I is recommended for guidance.

1.3 Lot Sizes

When the acceptance number for sampling by attributes is fixed, variation in sample size results in variation of acceptable quality. Therefore, to avoid this inconsistency, fixed sample sizes are applied for the greatest range of lot size. Lot sizes are restricted to a maximum of 250,000 pieces.

1.4 Measuring and Testing Equipment

All measuring instruments, gages, and testing equipment used to inspect incoming materials and parts in process and in final inspection shall be calibrated at planned intervals to National Bureau of Standards (NBS) or other equivalent National Standards where applicable. The dates of calibration and fixture checks shall be recorded. Inspection records shall be kept for a minimum of 1 year.

1.5 Basic Plan Outline

The basic plan outline as shown in Fig. 1 is included to enhance understanding and use.

2 GENERAL PURPOSE FASTENERS

2.1 Scope

This Standard outlines the inspection plan to be employed when lot compliance after shipment of general purpose fasteners is questioned by the user. The producer is responsible for supplying a product of satisfactory quality through judicious manufacturing controls and inspection.

2.2 Applicable Characteristics

The general plan outlines the significant applicable characteristics that are described by related specifications and engineering drawings. Three levels of inspection — A, B, and C — are employed. Each characteristic is assigned an appropriate level. These characteristics and corresponding inspection levels are listed in Tables 1 through 3 for various types of products.

Any additional characteristics deemed applicable by the user that do not appear in the plan shall be designated by the user, preferably on engineering

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drawings and related specifications at the time of ordering. If the reference procedure of this plan is applied and an unspecified characteristic questioned, the Decision Table included in Appendix I should be used to establish the inspection level of the characteristic in question.

2.3 Lot Definition

A *lot* is a quantity of finished product of one part number, assembled together for inspection by the user after shipment. Maximum lot size for user inspection shall not exceed 250,000 pieces.

2.4 Purchased Accessories and Parts

Accessories, services, and partially fabricated parts (e.g., washers, nuts, plating, heat treating, blanks, etc.) may be purchased by the prime contractor from other suppliers for use in production of fasteners; however, the prime contractor shall be solely responsible for the quality of the final product.

2.5 Inspection for Lot Compliance After Shipment

When parts have been found that the user considers nonconforming, the following inspection procedure will apply.

(*a*) A random sample shall be obtained from the lot and jointly inspected by the user and manufacturer, or as mutually agreed to, for the characteristic(s) in question.

(*b*) The sample size and acceptance/rejection criteria shall be in accordance with Table 3 for each level of inspection and for each individual characteristic.

In the event of rejection, suitable disposition of the lot shall be negotiated by user and manufacturer.

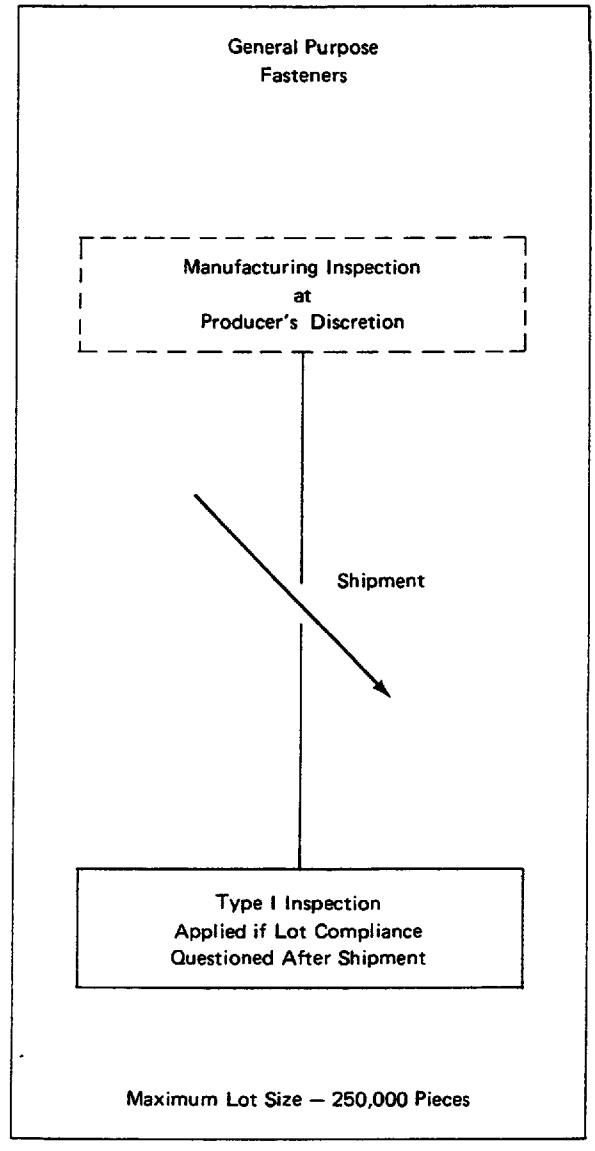

FIG. 1 BASIC PLAN OUTLINE

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TABLE 1 NONDESTRUCTIVE

	Characteristic	Inspection Level	Internally Threaded Parts	Externally Threaded Parts
1	Body diameter	C	NA	WA
2	Length	B	NA	WA
3	Width across flats	B	WA	WA
4	Width across corners	C	WA	WA
5	Head or nut thickness	C	WA	WA
6	Wrenching height	B	WA	WA
7	Angularity of bearing surface	C	WA	WA
8	Bearing surface diameter	C	WA	WA
9	Head diameter	C	NA	WA
10	Flange diameter	C	WA	WA
11	Flange thickness	C	WA	WA
12	Recess penetration	A	NA	WA
13	Point diameter	C	NA	WA
14	Countersink diameter and depth	C	WA	NA
15	Thread acceptability [Note (1)]	B/C	WA	WA
16	Total thread length	B	NA	WA
17	Grip length	B	NA	WA
18	Slot width	A	WA	WA
19	Slot depth	A	WA	WA
20	Slot alignments and location	C	WA	WA
21	Visual inspection [Note (2)]	A	WA	WA

GENERAL NOTE:
Legend: WA — when applicable
NA — not applicable

NOTES:
(1) ANSI/ASME B1.3M or other applicable standards and at the appropriate inspection level (B or C).
(2) Visual inspection for grade and source identification, presence of finish, duds, head and/or flange eccentricity, flange flatness, radius under head, type of washer, presence of locking feature, closeness of thread to head, and general workmanship. Refer to Table 3 for sample size.

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TABLE 2 DESTRUCTIVE

	Characteristic	Inspection Level	Internally Threaded Parts	Externally Threaded Parts
1	Proof load — externally threaded	C	NA	WA
2	Proof load — internally threaded	B	WA	NA
3	Tensile strength (wedge or axial)	B	NA	WA
4	Hardness [Note (1)]	A	WA	WA
5	Case depth	B	NA	WA
6	Decarburization	C	WA	WA
7	Torsional strength	B	NA	WA
8	Drive test	B	NA	WA
9	Prevailing torque [Note (2)]	B	WA	WA
10	Washer hardness	B	NA	WA
11	Ductility	A	NA	WA
12	Plating thickness	B	WA	WA
13	Salt spray	B	WA	WA
14	Hydrogen embrittlement	A	WA	WA

GENERAL NOTE:
Legend: WA — when applicable
NA — not applicable

NOTES:
(1) Surface, core, or both as appropriate.
(2) Prevailing torque test includes thread start and all specified torque requirements. Refer to Table 3 for sample size.

TABLE 3 SAMPLE SIZE

		Nondestructive Testing [Note (1)]		Destructive Testing	
Lot Size	Level of Inspection	Sample Size	Acceptance Number	Sample Size	Acceptance Number
Up to 250,000 maximum	A	100	2	8	0
	B	32	1	4	0
	C	8	0	1	0

GENERAL NOTE:
Quench cracking observed in a single piece renders the lot subject to rejection.

NOTE:
(1) Where sample size exceeds lot size, 100% inspection is to be applied.

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APPENDIX I
INSPECTION LEVEL DECISION TABLE

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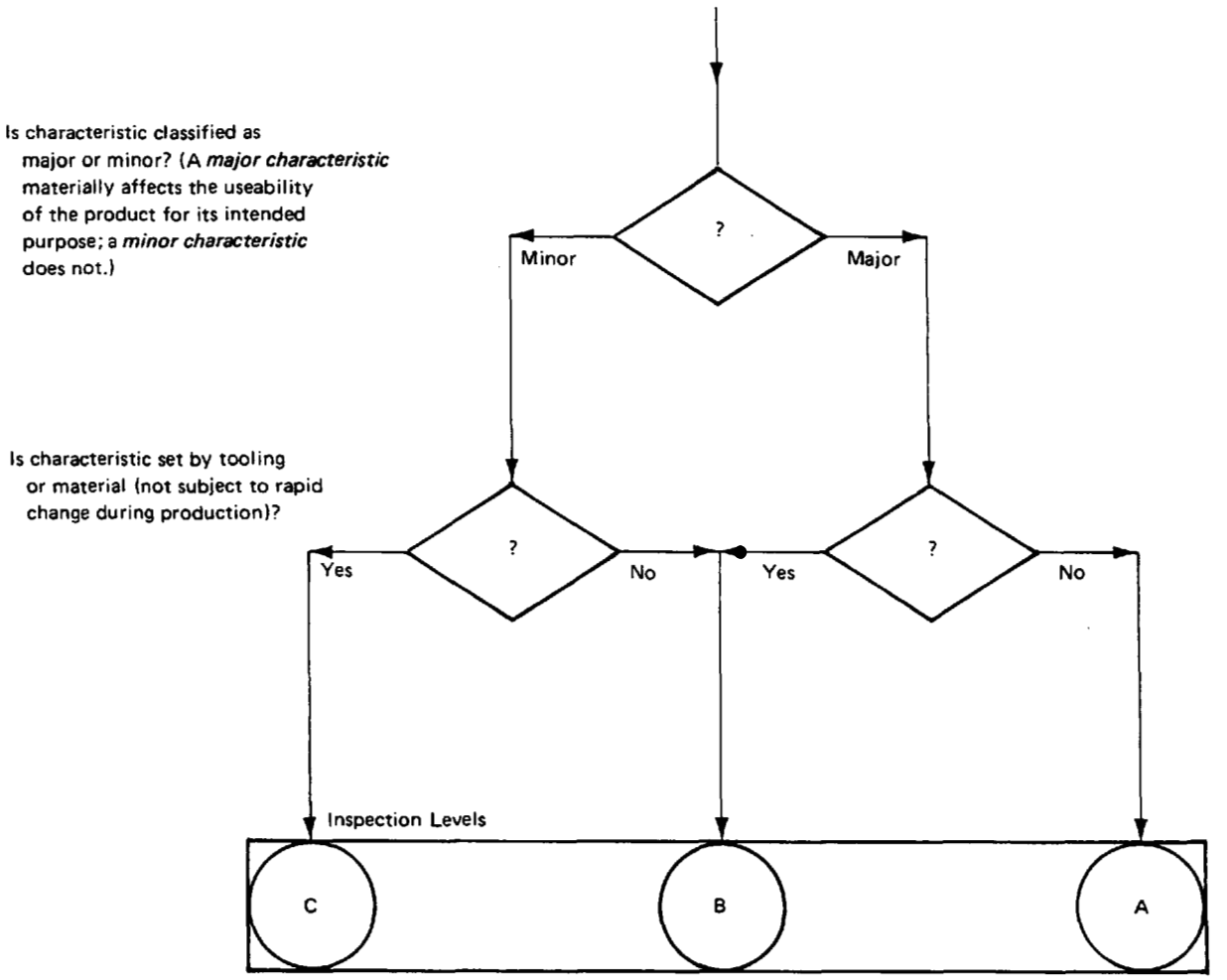

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APPENDIX II
ORDERING INFORMATION

(This Appendix is not part of ASME/ANSI B18.18.1M-1987, and is included here for information purposes only.)

Specifications

(*a*) Number and title of document
(*b*) Exceptions

Example

(*a*) ASME/ANSI B18.18.1M, Inspection and Quality Assurance for General Purpose Fasteners
(*b*) Thread acceptability shall be based on the thread acceptability paragraph in ANSI/ASME B1.3M with an A inspection level.

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AMERICAN NATIONAL STANDARDS FOR BOLTS, NUTS, RIVETS, SCREWS, WASHERS, AND SIMILAR FASTENERS

Small Solid Rivets B18.1.1-1972 (R1983)
Large Rivets B18.1.2-1972 (R1983)
Metric Small Solid Rivets B18.1.3M-1983
Square and Hex Bolts and Screws — Inch Series B18.2.1-1981
Square and Hex Nuts B18.2.2-1972 (R1983)
Metric Hex Cap Screws B18.2.3.1M-1979
Metric Formed Hex Screws B18.2.3.2M-1979
Metric Heavy Hex Screws B18.2.3.3M-1979
Metric Hex Flange Screws B18.2.3.4M-1984
Metric Hex Bolts B18.2.3.5M-1979
Metric Heavy Hex Bolts B18.2.3.6M-1979
Metric Heavy Hex Structural Bolts B18.2.3.7M-1979
Metric Hex Lag Screws B18.2.3.8M-1981
Metric Heavy Hex Flange Screws B18.2.3.9M-1984
Metric Hex Nuts, Style 1 . . . . . B18.2.4.1M-1979
Metric Hex Nuts, Style 2 . . . . . B18.2.4.2M-1979
Metric Slotted Hex Nuts B18.2.4.3M-1979
Metric Hex Flange Nuts B18.2.4.4M-1982
Metric Hex Jam Nuts B18.2.4.5M-1979
Metric Heavy Hex Nuts B18.2.4.6M-1979
Socket Cap, Shoulder and Set Screws (Inch Series) B18.3-1986
Socket Head Cap Screws (Metric Series) B18.3.1M-1986
Metric Series Hexagon Keys and Bits B18.3.2M-1979 (R1986)
Hexagon Socket Head Shoulder Screws (Metric Series) B18.3.3M-1986
Hexagon Socket Button Head Cap Screws (Metric Series) B18.3.4M-1986
Hexagon Socket Flat Countersunk Head Cap Screws (Metric Series) B18.3.5M-1986
Metric Series Socket Set Screws B18.3.6M-1986
Round Head Bolts (Inch Series) B18.5-1978
Metric Round Head Short Square Neck Bolts B18.5.2.1M-1981
Metric Round Head Square Neck Bolts B18.5.2.2M-1982
Wood Screws B18.6.1-1981
Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws B18.6.2-1972 (R1983)
Machine Screws and Machine Screw Nuts B18.6.3-1972 (R1983)
Metric Thread Forming and Thread Cutting Tapping Screws B18.6.5M-1986
Metric Machine Screws B18.6.7M-1985
Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws (Inch Series) B18.6.4-1981
General Purpose Semi-Tubular Rivets, Full Tubular Rivets, Split Rivets and Rivet Caps B18.7-1972 (R1980)
Metric General Purpose Semi-Tubular Rivets B18.7.1M-1984
Clevis Pins and Cotter Pins B18.8.1-1972 (R1983)
Taper Pins, Dowel Pins, Straight Pins, Grooved Pins, and Spring Pins (Inch Series) B18.8.2-1978
Plow Bolts B18.9-1958 (R1977)
Track Bolts and Nuts B18.10-1982
Miniature Screws B18.11-1961 (R1983)
Glossary of Terms for Mechanical Fasteners B18.12-1962 (R1981)
Screw and Washer Assemblies — Sems B18.13-1965 (R1983)
Forged Eyebolts B18.15-1985
Mechanical and Performance Requirements for Prevailing-Torque Type Steel Metric Hex Nuts and Hex Flange Nuts B18.16.1M-1979 (R1986)
Torque-Tension Test Requirements for Prevailing-Torque Type Steel Metric Hex Nuts and Hex Flange Nuts B18.16.2M-1979 (R1986)
Dimensional Requirements for Prevailing-Torque Type Steel Metric Hex Nuts and Hex Flange Nuts B18.16.3M-1982
Wing Nuts, Thumb Screws, and Wing Screws B18.17-1968 (R1983)
Inspection and Quality Assurance for General Purpose Fasteners B18.18.1M-1987
Inspection and Quality Assurance for High-Volume Machine Assembly Fasteners B18.18.2M-1987
Inspection and Quality Assurance for Special Purpose Fasteners B18.18.3M-1987
Inspection and Quality Assurance for Fasteners for Highly Specialized Engineered Applications B18.18.4M-1987
Lock Washers B18.21.1-1972 (R1983)
Metric Plain Washers B18.22M-1981
Plain Washers B18.22.1-1965 (R1981)
Beveled Washers B18.23.1-1967 (R1975)



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