

**ASME B18.18.1-2007**

**[Revision of ANSI/ASME B18.18.1M-1987 (R2006)]**

# **Inspection and Quality Assurance for General Purpose Fasteners**

**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

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**Three Park Avenue • New York, NY 10016**

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# FOREWORD

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.

The overall climate in the Quality Assurance field has drifted towards defect-free manufacturing. The B18 Subcommittee 18 felt that an update should be made to this document to reflect this trend. The Standard was revised to allow for zero known defects as the criteria for lot acceptance. A proposal containing these changes, as well as editorial corrections, was prepared and submitted for letter ballot to the ASME B18 Standards Committee and B18 Subcommittee 18 members for approval. This Standard was approved as an American National Standard on January 11, 2007.



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

(The following is the roster of the Committee at the time of approval of this Standard.)

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# CORRESPONDENCE WITH THE B18 COMMITTEE

**General.** ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B18 Standards Committee  
The American Society of Mechanical Engineers  
Three Park Avenue  
New York, NY 10016-5990

**Proposing Revisions.** Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

**Interpretations.** Upon request, the B18 Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B18 Standards Committee.

The request for an interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings, which are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

**Attending Committee Meetings.** The B18 Standards Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B18 Standards Committee.

# 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; 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 Nonmandatory Appendix B). To assist in arriving at the most appropriate inspection level, the Decision Table included in Nonmandatory Appendix A 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. Sample sizes for lots up to 250,000 pieces are shown in Table 1; however, for lot sizes exceeding 250,000 pieces, Table 1, Note (2) shall apply.

### 1.4 Measuring and Testing Equipment

All inspection and testing equipment shall be calibrated and traceable to the National Institute of Standards and Technology (NIST) standard or an equivalent

national or international Standard. All calibration procedures shall comply with the requirements of ISO 17025, General Requirements for the Competence of Testing and Calibration Laboratories.

### 1.5 Basic Plan Outline

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

### 1.6 References

The following is a list of publications referenced in this Standard.

ASME B1.3M, Screw Thread Gaging Systems for Acceptability — Inch and Metric Screw Threads (UN, UNR, UNJ, M, and MJ)

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2300, Fairfield, NJ 07007-2300

ISO 17025, General Requirements for the Competence of Testing and Calibration Laboratories

Publisher: International Organization for Standardization (ISO), 1 rue de Varembe, Case Postale 56, CH-1211, Genève 20, Switzerland/Suisse

## 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.



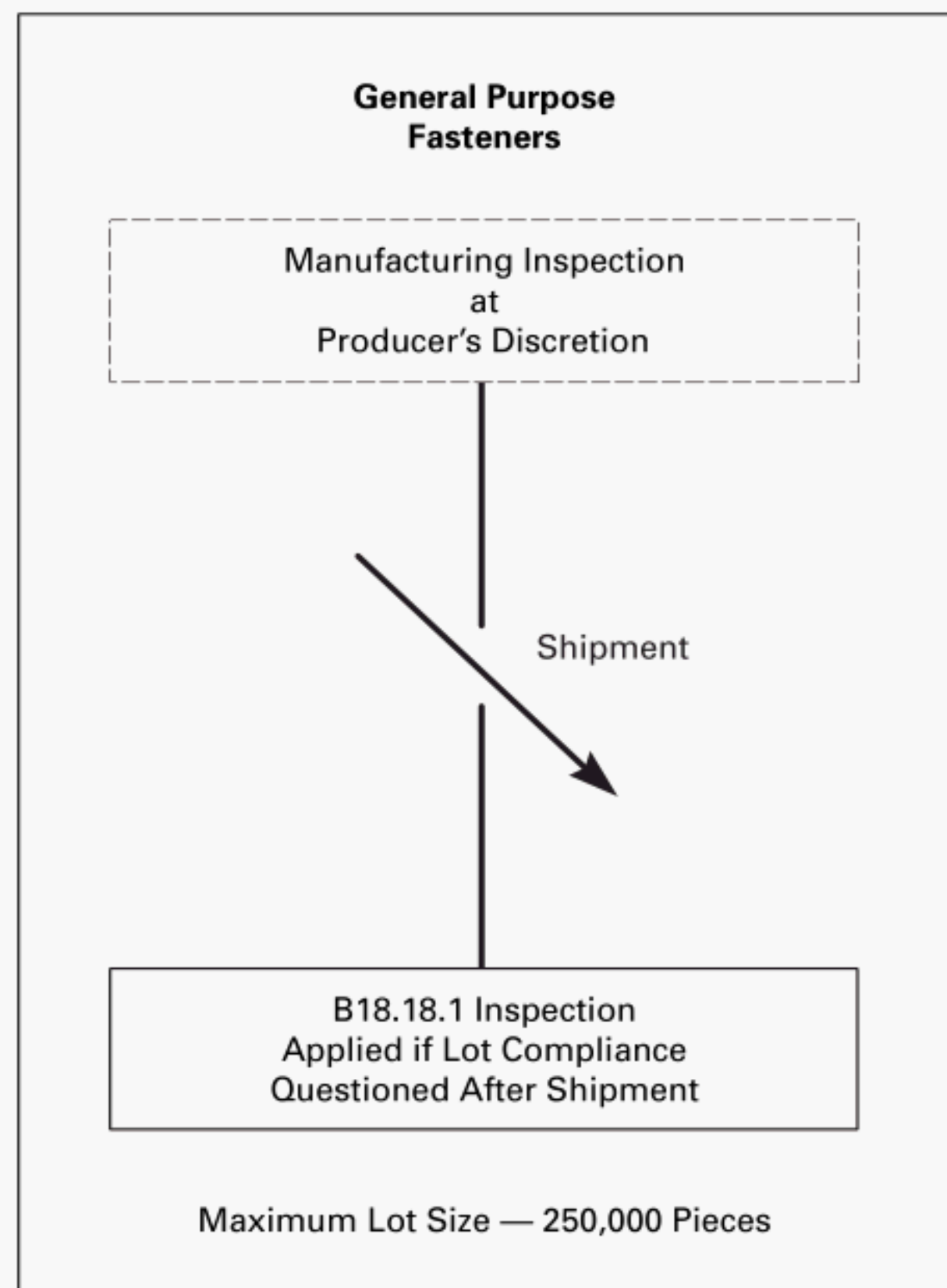
**Table 1 Sample Size**

Lot Size	Level of Inspection	Nondestructive Testing [Note (1)]		Destructive Testing	
		Sample Size	Acceptance Number	Sample Size	Acceptance Number
Up to 250,000 max.	A	46	0	8	0
	B	14	0	4	0
	C	8	0	1	0

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

NOTES:

- (1) Where sample size exceeds lot size, 100% inspection is to be applied.
- (2) For lot sizes over 250,000 pieces, increase the sample sizes shown in Table 1 by the same percentage that the lot size exceeds 250,000. Round up if sample size is not a whole number, (e.g., for lot size of 375,000 pieces increase the sample size by 50%).

**Fig. 1 Basic Plan Outline**

Any additional characteristics deemed applicable by the user that do not appear in the plan shall be designated by the user, preferably on engineering drawing and related specifications at the time of ordering. If the reference procedure of this plan is applied and an unspecified characteristic questioned, Fig. A-1 included in Nonmandatory Appendix A should be used to establish the inspection level of the characteristic in question.

### 2.3 Lot Definition

*lot*: quantity of finished product of one part number, assembled together for inspection by the user after shipment.

### 2.4 Purchased Accessories and Parts

Accessories, services, and partially fabricated parts (e.g., washers, nuts, plating, heat treating, blanks, etc.)

**Table 2 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	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 NOTES:**

(a) WA — when applicable

(b) NA — not applicable

**NOTES:**

(1) Unless otherwise specified in the product standard or by the customer, all threads will be inspected using ASME B1.3M, System 21.

(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 1 for sample size.

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 1 for each level of inspection and for each individual characteristic.

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

**Table 3 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	C	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 NOTES:

(a) WA — when applicable

(b) NA — not applicable

## NOTES:

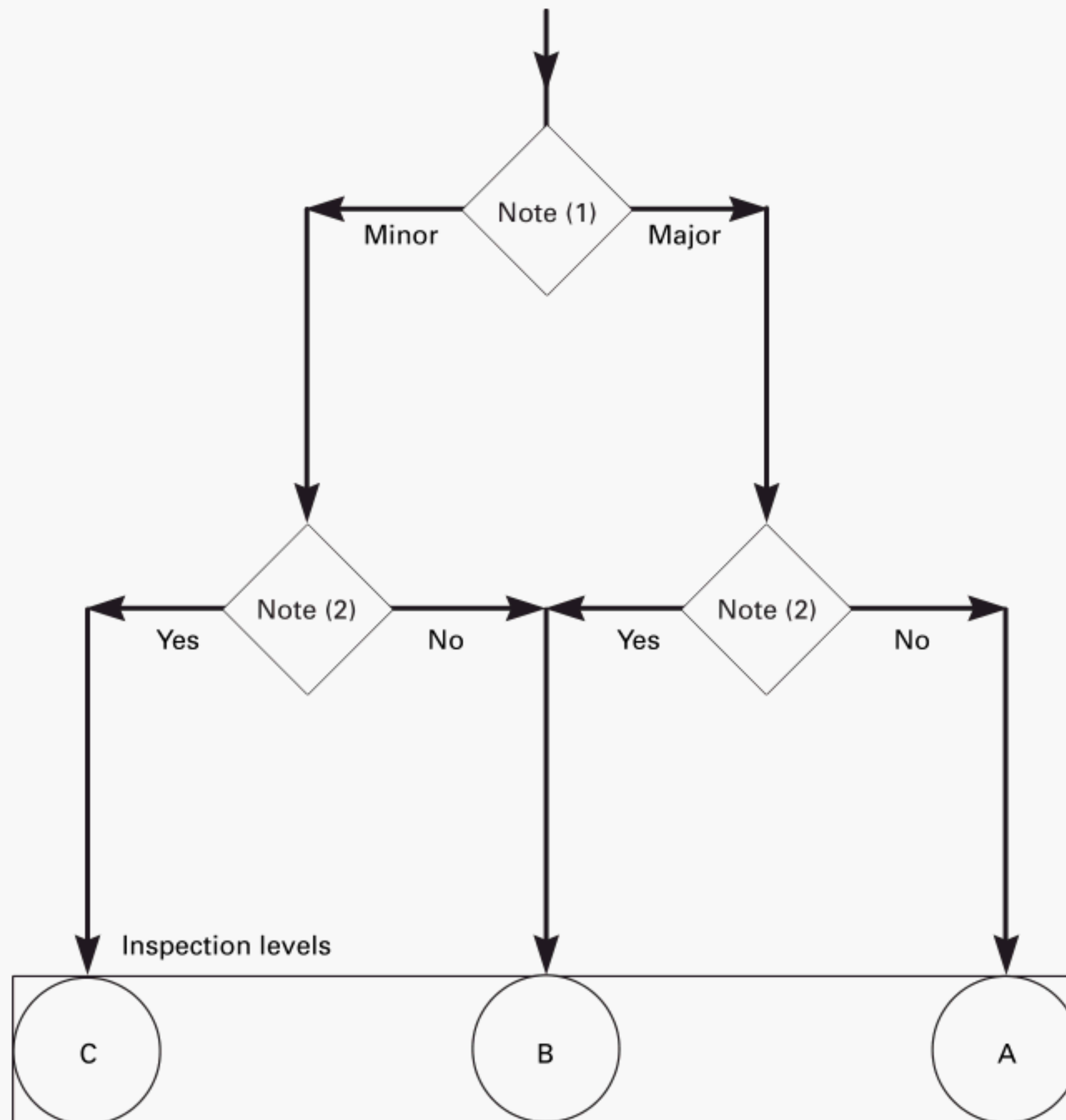
(1) Surface, core, or both as appropriate.

(2) Prevailing torque test includes thread start and all specified torque requirements. Refer to Table 1 for sample size.

# NONMANDATORY APPENDIX A

## INSPECTION LEVEL DECISION TABLE

Fig. A-1 Inspection Level Decision Table



## NOTES:

- (1) Is characteristic classified as major or minor? (A *major characteristic* materially affects the usability of the product for its intended purpose; a *minor characteristic* does not.)
- (2) Is characteristic set by tooling or material (not subject to rapid change during production)?



## NONMANDATORY APPENDIX B

### ORDERING INFORMATION

#### B-1 SPECIFICATIONS

The following should be included in the ordering information:

- (a) number and title of document
- (b) exceptions

#### EXAMPLES:

- (1) ASME B18.18.1M, Inspection and Quality Assurance for General Purpose Fasteners.
- (2) Thread acceptability shall be based on the thread acceptability paragraph in ASME B1.3M, Screw Thread Gaging Systems for Acceptability — Inch and Metric Screw Threads (UN, UNR, UNJ, M, and MJ) with an A inspection level.

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