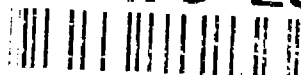


5 '63

AD-A279 290



2

U. S. DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS

**SCREW-THREAD STANDARDS  
FOR FEDERAL SERVICES  
1957**

Amends in part H28 (1944) (and in part its 1950 Supplement)

**HANDBOOK H28 (1957)—Part I**

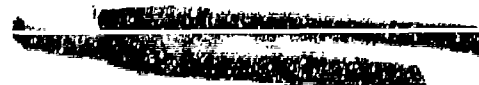
DTIC  
ELECTE  
MAY 09 1994

Reprinted November 1960 with corrections

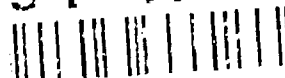
This document has been approved  
for public release and sale; its  
distribution is unlimited.

DTIC QUALITY INSPECTED 8

LIBRARY



94-13142



## U. S. DEPARTMENT OF COMMERCE

Sinclair Weeks, Secretary

## NATIONAL BUREAU OF STANDARDS

A. V. Astin, Director



## The National Bureau of Standards

### Functions and Activities

The functions of the National Bureau of Standards are set forth in the Act of Congress, March 3, 1901, as amended by Congress in Public Law 619, 1950. These include the development and maintenance of the national standards of measurement and the provision of means and methods for making measurements consistent with these standards; the determination of physical constants and properties of materials; the development of methods and instruments for testing materials, devices, and structures; advisory services to Government Agencies on scientific and technical problems; invention and development of devices to serve special needs of the Government; and the development of standard practices, codes, and specifications. The work includes basic and applied research, development, engineering, instrumentation, testing, evaluation, calibration services, and various consultation and information services. A major portion of the Bureau's work is performed for other Government Agencies, particularly the Department of Defense and the Atomic Energy Commission. The scope of activities is suggested by the listing of divisions and sections on the inside of the back cover.

### Publications

The results of the Bureau's work take the form of either actual equipment and devices or published papers; these papers appear either in the Bureau's own series of publications or in the journals of professional and scientific societies. The Bureau itself publishes three monthly periodicals, available from the Government Printing Office: The Journal of Research, which presents complete papers reporting technical investigations; the Technical News Bulletin, which presents summary and preliminary reports on work in progress; and Basic Radio Propagation Predictions, which provides data for determining the best frequencies to use for radio communications throughout the world. There are also five series of nonperiodical publications: The Applied Mathematics Series, Circulars, Handbooks, Building Materials and Structures Reports, and Miscellaneous Publications.

Information on the Bureau's publications can be found in NBS Circular 460, Publications of the National Bureau of Standards (\$1.25) and its Supplement (\$0.75), available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.



UNITED STATES DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS

W. W. WEEKS, *Secretary*

---

NATIONAL BUREAU OF STANDARDS HANDBOOK H28 (1957)

---

# SCREW-THREAD STANDARDS FOR FEDERAL SERVICES 1957

## PART I

UNIFIED, AMERICAN, AMERICAN NATIONAL, AND  
NATIONAL MINIATURE THREADS



Amends in part H28 (1944) (and in part its 1950 Supplement)

[Issued September 10, 1957]

Reprinted November 1960 with corrections  
See list on page II

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1957

DTIC QUALITY INSPECTED 3

## Reprinted with Corrections

November 1960

Pages 9, 12, 18, 20, 29, 30, 35, 51, 61, 69, 80 to 91, 99, 107, 109, 112, 117 to 119, 129, 163, 182 to 185, 187, 190, and 191 of this reprint contain corrections to the previous (March 1958) reprint. These corrections are shown by a double dagger. Single asterisks indicate corrections to the original printing as shown in the 1958 reprint. These corrections are shown on pages 39, 49, 105, 157, 183, 187, 190, and 193. On page 114, table VI.2, column 13; also the first paragraph of text, and the footnote 16 have been corrected.

The corrections on page 99 occur within the two blocks in which the daggers are placed. The corrections on pages 80 through 91 occur in the line when the daggers occur in the "number of pitches column," otherwise, the correction only pertains to the daggered value. The correction on page 107 is in the daggered line. The correction on page 109 is in the daggered paragraph. On page 112, the formula in the upper right-hand corner of figure VI.2 has been revised to read:

$$\frac{3}{8}H - (0.060 \sqrt{p^2} + 0.017p)/2''; \text{ the } \left. \frac{p}{8} \right| \leftarrow$$

has been deleted from the upper part of the right-hand view in figure VI.3.

## Foreword

The Interdepartmental Screw Thread Committee has been established by the Departments of Defense, Army, Navy, Air Force, and Commerce to promote uniformity in screw-thread standards in the Departments concerned.

The Committee is charged: (1) With the development of standards for screw threads; (2) the standardization of gages, dies, and taps; and (3) the standardization of dimensions of nuts, bolt heads, wrenches, and other items associated with the manufacture and use of interchangeable threaded parts. Standards developed by the Committee, when approved by the Departments concerned, are to be published together with a joint order making their use mandatory in the Departments of Defense and Commerce, except where a need for deviations therefrom is shown. Standards thus established are subject to such extension and revision as the Committee may find desirable.

The basis for this Handbook is the 1933 report, and preceding reports, of the National Screw Thread Commission, and Handbooks H25 dated 1939, and H28 dated 1942 and 1944, which superseded those reports and which this Handbook supersedes, together with pertinent standards approved and promulgated by the American Standards Association.

The current Handbook is to be issued in three volumes or parts, of which this volume constitutes Part I, superseding sections I, II, III, IV, V, XV, and XVI and appendixes 1, 2, 6, and 8 of Handbook H28 (1944). Sections XI, XII, XIII, XIV, and XVII and appendix 7 of H28 (1944) are superseded by Federal Specifications listed in appendix 6 herein. Part II will include standards for hose-coupling, pipe, and gas cylinder threads, and will be issued when the revised standards have been completely formulated. This will be followed by Part III, to include Acme, Stub-Acme, Buttress, and miscellaneous standard threads.

The standardization of bolts, nuts, screws, and related items, for purposes of procurement by the Federal Government, is covered by several pertinent Federal Specifications which are listed in the Index of Federal Specifications and Standards, available on a subscription basis from the Superintendent of Documents.

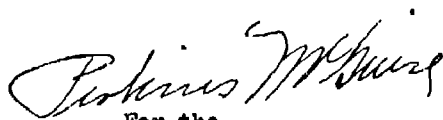
ARCHIBALD T. MCPHERSON, *Chairman.*

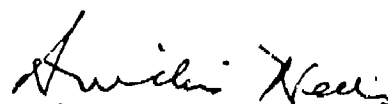
Accession For		
NTIS	CRA&I	<input checked="" type="checkbox"/>
DTIC	TAB	<input type="checkbox"/>
Unannounced		<input type="checkbox"/>
Justification .....		
By .....		
Distribution /		
Availability Codes		
Dist	Avail and/or Special	
A-1		

C-1636-A

APPROVAL BY THE SECRETARIES OF DEFENSE AND COMMERCE

The accompanying Handbook H28 (1957), Part I, on screw-thread standards for Federal Services, submitted by the Interdepartmental Screw Thread Committee, is hereby approved for use by the Departments of Defense and Commerce.

  
For the  
Secretary of Defense

  
Secretary of Commerce

## Contents

	Page	SECTION VI—Continued	Page
Foreword.....	iii	(c) Specifications for thread length.....	114
Approval by the Secretaries of Defense and Commerce.....	v	(d) Marking of gages.....	116
SECTION I. Introduction.....	1	4. Gage tolerances and wear allowances.....	117
1. Purpose of Federal standards for threaded products.....	1	5. Recommended gage practices.....	118
2. Personnel of the Committee.....	1	Appendix 1. American National form of thread and thread series for bolts, machine screws, nuts, tapped holes, and general applications.....	121
SECTION II. Nomenclature, definitions, and letter symbols.....	1	1. Introduction.....	121
1. Introductory.....	1	2. American National form of thread.....	121
2. Definitions of terms.....	2	(a) Specifications.....	121
(a) Terms relating to types of screw threads.....	2	(b) Illustration.....	121
(b) Terms relating to size and fit.....	2	(c) Basic thread data.....	121
(c) Terms relating to geometrical elements of screw threads.....	3	3. Thread series.....	122
(d) Terms relating to dimensions of screw threads.....	4	(a) American National coarse-thread series.....	122
(e) Terms relating only to taper screw threads.....	6	(b) American National fine-thread series.....	122
3. Letter symbols and abbreviations.....	7	(c) American National extra-fine thread series.....	123
(a) Dimensional symbols.....	7	(d) American National 8-thread series.....	123
(b) Identification designations.....	8	(e) American National 12-thread series.....	123
SECTION III. Unified thread form and thread series for bolts, machine screws, nuts, tapped holes, and general applications.....	10	(f) American National 16-thread series.....	124
1. Introduction.....	10	4. Classification and tolerances.....	124
2. The Unified form of thread.....	12	(a) General specifications.....	125
3. Thread series, symbols, and suggested applications.....	13	(b) Screw-thread classes.....	130
4. Classification and tolerances.....	18	5. Method of designating an American National thread.....	132
(a) General.....	18	6. Limits of size of gages.....	145
(b) Screw-thread classes.....	23	Appendix 2. American National screw threads of special diameters, pitches, and lengths of engagement.....	179
5. Method of designating a screw thread.....	26	1. Form of thread.....	179
6. Limits of size, standard thread series, table III.10.....	26	2. Standard pitches.....	179
7. Limits of size of gages.....	38	3. Classification and tolerances.....	179
8. Sizes of tap drills.....	68	(a) General specifications.....	179
SECTION IV. Unified threads of special diameters, pitches, and lengths of engagement.....	74	(b) Classification of threads.....	179
1. Introduction.....	74	4. Tables of dimensions.....	180
2. Unified form of thread.....	75	5. Gages.....	186
3. Preferred diameters and pitches.....	75	Appendix 3. Hole-size limits.....	186
4. Classification and tolerances.....	75	Appendix 4. Wire methods of measurement of pitch diameter of 60° threads.....	194
(a) General.....	75	1. Size of wires.....	195
(b) Screw-thread classes.....	79	2. Methods of measuring and using wires.....	195
5. Method of designating.....	98	3. Standard specification for wires and standard practice in measurement of wires.....	196
6. Directions for determining limits of size of special threads.....	100	4. General formula for measurement of pitch diameter.....	196
7. Gages.....	100	5. Measurement of pitch diameter of Unified, American, and American National straight thread.....	197
SECTION V. National Miniature screw threads.....	100	6. Measurement of pitch diameter of American Standard taper threads.....	197
1. Introduction.....	100	7. Measurement of pitch diameter of thread ring gages.....	200
2. Form of thread.....	101	Appendix 5. Design of special threads.....	200
3. National Miniature thread series.....	104	1. General.....	200
4. Classification and tolerances.....	104	2. Eccentricity of assembly and cross threading.....	201
5. Thread designations.....	105	3. Strength factors.....	201
6. Limits of size.....	105	4. Thread proportions in relation to tapping.....	204
7. Gages and gaging.....	107	5. Examples of thread design.....	204
SECTION VI. Gages and gaging for Unified, American, and American National threads.....	107	Appendix 6. References.....	205
1. Introduction.....	107	Index.....	207
2. Fundamentals.....	108		
3. Specifications for gage elements.....	109		
(a) General design.....	109		
(b) Specifications for thread form.....	110		

## Tables

	Page
Table II.1.—General symbols (see figs. II.2 and II.3)	9
Table II.2.—Pipe-thread symbols (see fig. II.4)	9
Table II.3.—Identification designations	10
Table III.1.—Thread data, Unified thread form (see fig. III.2)	12
Table III.2.—Unified and American, screw thread standard series	15
Table III.3.—Coarse thread series, basic dimensions, UNC and NC	16
Table III.4.—Fine thread series, basic dimensions, UNF and NF	16
Table III.5.—Extra-fine thread series, basic dimensions, UNEF and NEF	17
Table III.6.—8-thread series, basic dimensions, 8UN and 8N	17
Table III.7.—12-thread series, basic dimensions, 12UN and 12N	18
Table III.8.—16-thread series, basic dimensions, 16UN and 16N	19
Table III.9.—Increments in pitch-diameter tolerance formula	20
Table III.10.—Standard series limits of size—Unified and American screw threads	27–32
Table III.11.—Deviations in lead and half-angle equivalent to one-half of pitch diameter tolerances, Unified and American screw threads	32–38
Table III.12.—Gages for standard thread series, Unified and American screw threads	39–55
Table III.13.—Setting plug gages, Unified and American screw threads	56–68
Table III.14.—Tap drill sizes, Unified and American screw threads, classes 1B and 2B	69–71
Table III.15.—Tap drill sizes, Unified and American screw threads, class 3B	72–74
Table IV.1.—Thread data, Unified and American thread form	76
Table IV.2.—Allowances for external threads of special diameters and pitches, classes 1A and 2A	77
Table IV.2A.—Allowances, class 1AR	77
Table IV.3.—Major diameter tolerances for external threads of special diameters, pitches, and lengths of engagement, classes 1A, 1AR, 2A, and 3A	78
Table IV.4.—Pitch diameter tolerances for external threads of special diameters, pitches, and lengths of engagement, classes 1A and 1AR	80, 81
Table IV.5.—Pitch diameter tolerances for external threads of special diameters, pitches, and lengths of engagement, class 2A	82, 83
Table IV.6.—Pitch diameter tolerances for external threads of special diameters, pitches, and lengths of engagement, class 3A	84, 85
Table IV.7.—Pitch diameter tolerances for internal threads of special diameters, pitches, and lengths of engagement, class 1B	86, 87
Table IV.8.—Pitch diameter tolerances for internal threads of special diameters, pitches, and lengths of engagement, class 2B	88, 89
Table IV.9.—Pitch diameter tolerances for internal threads of special diameters, pitches, and lengths of engagement, class 3B	90, 91
Table IV.10.—Minor diameter tolerances for internal special screw threads, classes 1B and 2B	92, 93
Table IV.11.—Minor diameter tolerances for internal special screw threads, class 3B	94–97
Table IV.12.—Unified special diameter-pitch combinations	99
Table IV.13.—Consolidated method for the calculation of dimensions of special threads	99
Table V.1.—Thread form data, National Miniature screw threads	102
Table V.2.—Basic and design sizes, National Miniature thread series	104
Table V.3.—Limits of size and tolerances, National Miniature thread series	105
Table VI.1.—Specifications and format for tables of limits of size of threaded and plain gages for Unified, American, and American National external and internal threads	113
Table VI.2.—Specifications and format for tables of limits of size of threaded setting plug gages for Unified, American, and American National external threads	114
Table VI.3.—Constants for computing thread gage dimensions	115
Table VI.4.—Lengths of standard taperlock and trilock thread plug gage blanks	115
Table VI.5.—Lengths of standard thread ring gage blanks and total thread lengths of standard truncated setting plug gage blanks	115
Table VI.6.—Tolerances for W “go” and “not go” thread gages	117
Table VI.7.—Tolerances for X “go” and “not go” thread gages	118
Table VI.8.—Tolerances for Y “go” thread gages for classes 1, 1A, 1B, 2A, and 2B, NS and UNS threads only	119
Table VI.9.—Tolerances for plain gages	119
Table 1.1.—Basic thread data, American National form of thread	127
Table 1.2.—American National coarse-thread series, NC	128
Table 1.3.—American National fine-thread series, NF	129
Table 1.4.—American National extra-fine-thread series, NEF	129
Table 1.5.—American National 8-thread series, 8N	130
Table 1.6.—American National 12-thread series, 12N	131
Table 1.7.—American National 16-thread series, 16N	132
Table 1.8.—Limits of size and tolerances, classes 1, 2, 3, and 4, American National coarse-thread series, NC	133, 134
Table 1.9.—Limits of size and tolerances, classes 1, 2, 3, and 4, American National fine-thread series, NF	135, 136
Table 1.10.—Limits of size and tolerances, classes 2 and 3, American National extra-fine-thread series, NEF	137
Table 1.11.—Limits of size and tolerances, classes 2 and 3, American National 8-thread series, 8N	138, 139
Table 1.12.—Limits of size and tolerances, classes 2 and 3, American National 12-thread series, 12N	140–142

## Tables—Continued

	Page
Table 1.13.—Limits of size and tolerances, classes 2 and 3, American National 16-thread series, 16N.....	143, 144
Table 1.14.—Allowances and tolerances, classes 1 and 2.....	145
Table 1.15.—Allowances and tolerances, classes 3 and 4.....	145
Table 1.16.—Gages for standard thread series, American National screw threads.....	146-163
Table 1.17.—Setting plug gages, American National screw threads.....	164-178
Table 2.1.—Thread data for recommended pitches for threads of special diameters, pitches, and lengths of engagement.....	180
Table 2.2.—Schedule of tolerance increments for threads of special diameters, pitches, and lengths of engagement.....	180
Table 2.3.—Values for obtaining thread dimensions of screw threads of special diameters, pitches, and lengths of engagement, classes 1, 2, 3, and 4.....	181
Table 2.4.—Pitch diameter tolerances for screw threads of special diameters, pitches, and lengths of engagement, class 1.....	182
Table 2.5.—Pitch diameter tolerances for screw threads of special diameters, pitches, and lengths of engagement, class 2.....	183
Table 2.6.—Pitch diameter tolerances for screw threads of special diameters, pitches, and lengths of engagement, class 3.....	184
Table 2.7.—Pitch diameter tolerances for screw threads of special diameters, pitches, and lengths of engagement, class 4.....	185
Table 3.1.—Recommended hole size limits before threading for different lengths of engagement, UNC, UNF, UNEF, UN, UNS, NC, NF, NEF, and N series, classes 1B and 2B.....	187-189
Table 3.2.—Recommended hole size limits before threading for different lengths of engagement, UNC, UNF, UNEF, UN, UNS, NC, NF, NEF, and N series, class 3B.....	190-193
Table 3.3.—Recommended hole size limits before threading for different lengths of engagement, National Miniature thread series.....	193
Table 4.1.—Wire sizes and constants, Unified and American, American National, hose-coupling, and pipe threads (60°).....	195
Table 4.2.—Relation of best wire diameters and pitches—wires for Unified and American, American National, hose-coupling, and pipe threads (60°).....	196
Table 5.1.—Data for determining strength factors in special thread design.....	203

## Figures

Figure II.1.—Blunt start.....	4
Figure II.2.—General screw thread symbols.....	6
Figure II.3.—General screw thread symbols.....	7
Figure II.4.—Pipe thread symbols.....	8
Figure III.1.—Unified internal and external screw thread design forms (maximum material condition).....	11
Figure III.2.—Symbols for thread data in table III.1.....	13
Figure III.3.—Disposition of tolerances, allowances, and crest clearances for classes 1A, 2A, 1B, and 2B.....	24
Figure III.4.—Disposition of tolerances and crest clearances for classes 3A and 3B.....	25
Figure IV.1.—Thread dimensions to be determined for a special thread.....	99
Figure V.1.—Basic thread form, National Miniature threads.....	101
Figure V.2.—National Miniature internal and external screw thread design forms (maximum material condition).....	103
Figure V.3.—Disposition of tolerances and crest clearances, National Miniature threads.....	106
Figure V.4.—Suggested chart for projection inspection of external National Miniature threads.....	107
Figure VI.1.—Thread form of gages for external and internal threads.....	110
Figure VI.2.—Thread form of truncated thread setting plug gages.....	112
Figure VI.3.—Thread form of basic-crest thread setting plug gages.....	112
Figure 1.1.—American National form of thread.....	121
Figure 1.2.—Disposition of tolerances, allowance (neutral space), and crest clearances for class 1.....	122
Figure 1.3.—Disposition of tolerances and crest clearances for class 2.....	123
Figure 1.4.—Disposition of tolerances and crest clearances for class 3.....	124
Figure 1.5.—Disposition of tolerances, allowance (interference), and crest clearances for class 4.....	125
Figure 1.6.—Relation of maximum and minimum pitch diameters of classes 1, 2, 3, and 4 to basic pitch diameters.....	126
Figure 3.1.—Distribution of hole size limits before tapping, Unified and American threads.....	186
Figure 3.2.—Distribution of hole size limits before tapping, National Miniature threads.....	186
Figure 4.1.—Three-wire method of measuring pitch diameter of thread plug gages.....	194
Figure 4.2.—Measurement of pitch diameter of taper thread gages by the 2-wire method.....	198
Figure 4.3.—Measurement of pitch diameter of taper thread gages by the 3-wire method.....	199
Figure 4.4.—Measurement of pitch diameter of taper thread gages by the 4-wire method.....	200
Figure 5.1.—Critical sections in a thread assembly.....	201
Figure 5.2.—Chart for determining minimum length of thread engagement.....	202



# 1957 HANDBOOK OF SCREW-THREAD STANDARDS FOR FEDERAL SERVICES

As Approved 1957

## SECTION I. INTRODUCTION

### 1. PURPOSE OF FEDERAL STANDARDS FOR THREADED PRODUCTS

The purpose of this Handbook is to present complete dimensional data upon which specifications may be based for threaded products for Government requirements. So far as practicable, these data are intended to conform to generally accepted commercial practice, although certain special requirements of the Government necessitate the inclusion of some standards not generally applicable outside of the Government services. References are cited throughout the text to the standards promulgated by the American Standards Association, and to such other published standards as are in agreement with the specifications herein.

There are included in the body of the Handbook specifications for threaded products and gages, embodying sufficient information to permit the writing of definite and complete specifications for the purchase of screw-thread products. In the appendixes there is arranged supplementary information of both a general and a technical nature, including such specifications as are not intended to be mandatory.

### 2. PERSONNEL OF THE COMMITTEE

The personnel of the Interdepartmental Screw Thread Committee is as follows:

#### *Representing the Department of Defense:*

MR. SPENCER B. TERRY, Standardization Division, Supply and Logistics, Office of the Assistant Secretary of Defense, Washington 25, D. C.

#### *Representing the Department of the Army:*

MR. EUGENE VON LOESCH, Research and Development Division, Office of the Chief of Engineers, Department of the Army, Washington 25, D. C.  
MR. M. L. FRUCHTENICHT, Gage Laboratory, Frankford Arsenal, Ordnance Corps, Department of the Army, Philadelphia 37, Pennsylvania.

#### *Representing the Department of the Navy:*

MR. JAMES W. JENKINS, Metallurgical Branch, Material Development Division (Code 343), Department of the Navy, Washington 25, D. C.  
MR. J. E. WALTER, Engineering Department, U. S. Naval Gun Factory, Washington 25, D. C.

#### *Representing the Department of the Air Force:*

MR. ROY F. BOSRON, WCXP, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio.  
COL. IRVING H. HARE, RDTE3, Air Research and Development Command, (now retired).

#### *Representing the Department of Commerce:*

DR. ARCHIBALD T. McPHERSON, chairman, Associate Director, National Bureau of Standards, Washington 25, D. C.  
MR. IRVIN H. FULLMER, Secretary, Chief, Engineering Metrology Section, Optics and Metrology Division, National Bureau of Standards, Washington 25, D. C.

*Liaison Representatives of Sectional Committees Organized Under the Procedure of the American Standards Association and Sponsored by The American Society of Mechanical Engineers and the Society of Automotive Engineers or the American Gas Association:*

MR. WILLIAM L. BARTH, Executive Secretary, Engineering Standards, General Motors Corporation, 3044 West Grand Blvd., Detroit 2, Michigan. (Member of ASA Committees B1, B2, and B18.)  
MR. W. P. ENGLISH, Engine Technical Committee, Aircraft Industries Association, Inc.; mail to Fairchild Engine Division, Fairchild Engine and Airplane Corp., Deer Park, Long Island, New York. (Member of ASA Committee B1.)  
MR. H. C. ERDMAN, Technical Asst. to Pres., The National Screw & Manufacturing Co., 2440 E. 75th Street, Cleveland 4, Ohio. (Member of ASA Committees B1 and B18.)  
MR. H. W. ROBB, Manager, Company Standards, Engineering Services Division, General Electric Co., 1 River Road, Schenectady, New York. (Member of ASA Committees B1, B2, and B18.)  
MR. PAUL G. SCHULZ, Assistant Engineer of Standards, Engineering Division, Crane Co., 836 S. Michigan Avenue, Chicago 5, Ill. (Member of ASA Committees B1 and B2.)  
MR. WM. C. STEWART, Technical Adviser, Industrial Fasteners Institute, 1517 Terminal Tower, Cleveland 13, Ohio. (Member of ASA Committees B1 and B18.)  
MR. FRANK F. TISCH, Voi-Shan Manufacturing Co., division of Theoli Manufacturing Co., Culver City, Calif. (Member of ASA Committees B1 and B18.)  
MR. W. G. WALTERMIRE, Chief Products Engineer, The Lamson & Sessions Company, 1971 West 85th Street, Cleveland 2, Ohio. (Member of ASA Committees B1, B2, and B18.)  
MR. E. L. WILCOX, National Aircraft Standards Committee, Aircraft Industries Association of America, Inc.; mail to Republic Aviation Corp., Farmingdale, Long Island, New York.

#### *Subgroup Members Who Participated in the Preparation of the 1957 Revision:*

MR. P. S. CARTER, WCXP, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio.  
MR. W. L. COLEMAN, RDTE3, Air Research and Development Command, P. O. Box 1395, Baltimore 3, Md.  
MR. J. L. HERRING, Metallurgical Branch, Material Development Division (Code 343), Department of the Navy, Washington 25, D. C.  
MR. F. F. JACOBS, Bureau of Aeronautics, Department of the Navy, Washington 25, D. C.  
MR. JACK RATZKIN, Design Department, U. S. Naval Gun Factory, Washington 25, D. C.  
MR. J. E. WATSON, National Control Division, Gage Laboratory, Frankford Arsenal, Ordnance Corps, Department of the Army, Philadelphia 37, Pa.

## SECTION II. NOMENCLATURE, DEFINITIONS, AND LETTER SYMBOLS

### 1. INTRODUCTORY

The purposes of this section<sup>1</sup> are to establish uniform practices with regard to: (1) Screw-thread nomenclature, and (2) letter symbols for designating dimensions of screw threads for use on drawings, in tables of dimensions which set forth dimensional standards, and in other records, and for expressing mathematical relationships.

<sup>1</sup> This standard is in general agreement with American Standard ASA B1.7, "Nomenclature, Definitions, and Letter Symbols for Screw Threads," published by The American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. The latest revision should be consulted when referring to such standards.

The section consists of a glossary of terms, two tables of screw-thread dimensional symbols, three illustrations showing the application of dimensional symbols, and one table of identification designations.

**Typography.**—In accordance with the usual practice in published text, letter symbols and letter subscripts, whether upper or lower case, should be printed in italic type. An exception is Greek letters; Greek capital letters are always vertical, and lower case always resemble italics. In manuscripts this is indicated by underlining each symbol to be italicized. Coefficients, numeral subscripts, and exponents should be printed in vertical Arabic numerals. Standard mathematical notation should be followed.

## 2. DEFINITION OF TERMS

The terms commonly applied to screw threads may be classified in five general groups, namely: (1) Those relating to types of screw threads; (2) those relating to size and fit of mechanical parts in general; (3) those relating to geometrical elements of both straight and taper screw threads; (4) those relating to dimensions of screw threads; and (5) those relating only to taper screw threads.

The definitions presented herein apply to theoretically correct thread forms unless otherwise indicated.

(a) **TERMS RELATING TO TYPES OF SCREW THREADS.**—Screw threads and the terms generally applied to designate the types of screw threads are defined as follows:

1. **Screw thread.**—A screw thread (hereinafter referred to as a thread), is a ridge of uniform section in the form of a helix on the external or internal surface of a cylinder, or in the form of a conical spiral on the external or internal surface of a cone or frustum of a cone. A thread formed on a cylinder is known as a *straight* or *parallel* thread, to distinguish it from a *taper* thread which is formed on a cone or frustum of a cone.

2. **External thread.**—An external thread is a thread on the external surface of a cylinder or cone.

3. **Internal thread.**—An internal thread is a thread on the internal surface of a hollow cylinder or cone.

4. **Right-hand thread.**—A thread is a right-hand thread if, when viewed axially, it winds in a clockwise and receding direction.

5. **Left-hand thread.**—A thread is a left-hand thread if, when viewed axially, it winds in a counterclockwise and receding direction. All left-hand threads are designated *LH*.

6. **Single thread.**—A single (single-start) thread is one having lead equal to the pitch. (See (d) 1 and (d) 2, p. 4.)

7. **Multiple thread.**—A multiple (multiple-start) thread is one in which the lead is an integral multiple of the pitch. (See (d) 1 and (d) 2.)

8. **Classes of threads.**—Classes of threads are distinguished from each other by the amount of tolerance or tolerance and allowance specified.

(b) **TERMS RELATING TO SIZE AND FIT.**—Terms relating to the size and fit of parts, which are generally applicable to mechanical parts, including threads, are defined as follows:

1. **Nominal size.**—The nominal size is the designation which is used for the purpose of general identification.

2. **Dimension.**—A dimension is a geometrical characteristic such as diameter, length, angle, or center distance.

3. **Size.**—Size is a designation of magnitude. When a value is assigned to a dimension it is referred to hereinafter as the size of that dimension.

**NOTE.** It is recognized that the words "dimension" and "size" are both used at times to convey the meaning of magnitude.

4. **Allowance.**—An allowance is an intentional difference between the maximum material limits of mating parts. It is the minimum clearance (positive allowance) or maximum interference (negative allowance) between such parts. (See definition of "Fit.")

5. **Tolerance.**—A tolerance is the total permissible variation of a size. The tolerance is the difference between the limits of size.

6. **Basic size.**—The basic size is that size from which the limits of size are derived by the application of allowances and tolerances.

7. **Design size.**—The design size is that size from which the limits of size are derived by the application of tolerances. When there is no allowance the design size is the same as the basic size.

8. **Actual size.**—An actual size is a measured size.

9. **Limits of size.**—The limits of size are the applicable maximum and minimum sizes.

10. **Maximum material limit.**—A maximum material limit is the maximum limit of size of an external dimension or the minimum limit of size of an internal dimension.

11. **Minimum material limit.**—A minimum material limit is the minimum limit of size of an external dimension or the maximum limit of size of an internal dimension.

12. **Tolerance limit.**—A tolerance limit is the variation, positive or negative, by which a size is permitted to depart from the design size.

13. **Unilateral tolerance.**—A unilateral tolerance is a tolerance in which variation is permitted only in one direction from the design size.

14. **Bilateral tolerance.**—A bilateral tolerance is a tolerance in which variation is permitted in both directions from the design size.

15. **Unilateral tolerance system.**—A design plan which uses only unilateral tolerances is known as a Unilateral Tolerance System.

16. **Bilateral tolerance system.**—A design plan which uses only bilateral tolerances is known as a Bilateral Tolerance System.

17. **Fit.**—Fit is the general term used to signify the range of tightness which may result from the application of a specific combination of allowances and tolerances in the design of mating parts.

18. *Actual fit*.—The actual fit between two mating parts is the relation existing between them with respect to the amount of clearance or interference that is present when they are assembled.

*NOTE.* Fits are of three general types: clearance, transition, and interference.

19. *Clearance fit*.—A clearance fit is one having limits of size so prescribed that a clearance always results when mating parts are assembled.

20. *Interference fit*.—An interference fit is one having limits of size so prescribed that an interference always results when mating parts are assembled.

21. *Transition fit*.—A transition fit is one having limits of size so prescribed that either a clearance or an interference may result when mating parts are assembled.

22. *Basic hole system*.—A basic hole system is a system of fits in which the design size of the hole is the basic size and the allowance is applied to the shaft.

23. *Basic shaft system*.—A basic shaft system is a system of fits in which the design size of the shaft is the basic size and the allowance is applied to the hole.

(c) *TERMS RELATING TO GEOMETRICAL ELEMENTS OF SCREW THREADS*.—Terms relating to geometrical elements of both straight and taper threads are defined as follows:

1. *Axis*.—The axis of a thread is the axis of its pitch cylinder or cone.

2. *Pitch line*.—The pitch line is a generator of the cylinder or cone specified in the definition of pitch diameter.

3. *Form*.—The form of thread is its profile in an axial plane for a length of one pitch.

4. *Basic form of thread*.—The basic form of a thread is the theoretical profile of the thread for a length of one pitch in an axial plane, on which the design forms of the threads for both the external and internal threads are based.

5. *Design forms of thread*.—The design forms for a thread are the maximum material forms permitted for the external and internal threads.

6. *Fundamental triangle*.—The fundamental triangle is the triangle whose corners coincide with three consecutive intersections of the extended flanks of the basic form.

7. *Flank*.—The flank (or side) of a thread is either surface connecting the crest with the root, the intersection of which, with an axial plane, is theoretically a straight line.

8. *Leading flank*.—The leading flank of a thread is the one which, when the thread is about to be assembled with a mating thread, faces the mating thread.

9. *Following flank*.—The following flank of a thread is the one that is opposite to the leading flank.

10. *Pressure flank*.—The pressure flank is that which takes the thrust or load in an assembly. The term is used particularly in relation to buttress and other similar threads.

11. *Clearance (or trailing) flank*.—The clearance flank is that which does not take the thrust or load in an assembly.

12. *Crest*.—The crest is that surface of the thread that joins the flanks of the thread and is farthest from the cylinder or cone from which the thread projects.

13. *Root*.—The root is that surface of the thread that joins the flanks of adjacent thread forms and is identical with or immediately adjacent to the cylinder or cone from which the thread projects.

14. *Sharp crest (or crest apex)*.—The sharp crest is the apex formed by the intersection of the flanks of a thread when extended, if necessary, beyond the crest.

15. *Sharp root (or root apex)*.—The sharp root is the apex formed by the intersection of the flanks of adjacent thread forms when extended, if necessary, beyond the root.

16. *Base*.—The base of a thread is that section of the thread that coincides with the cylinder or cone from which the thread projects.

17. *Major cylinder or cone*.—See "major diameter" and "major cone."

18. *Minor cylinder or cone*.—See "minor diameter" and "minor cone."

19. *Pitch cylinder or cone*.—See "pitch diameter" and "pitch cone."

20. *Complete thread*.—The complete (or full) thread is that part of the thread having full form at both crest and root. When there is a chamfer at the start of the thread, not exceeding two pitches in length on an external thread or one pitch in length on an internal thread, it is included within the length of complete thread. When designing threaded products, it is necessary to take cognizance of: (1) Such permissible length of chamfer and (2) the first three threads which by virtue of "not go" gaging practice may exceed the product limits and which may be included within the length of complete thread. However, when the application is such as to require a minimum number of turns engagement, the specification shall so state and shall specify the minimum number of turns required.

21. *Incomplete thread*.—This is also known as the vanish or washout thread. On straight threads, the incomplete thread is that portion at the end having roots not fully formed by the lead or chamfer on threading tools.

On taper threads, the crest at the end may also be not fully formed due to the intersection of the major cone of an external thread, or the minor cone of an internal thread, with the cylindrical surface of the work.

22. *Effective thread*.—The effective (or useful) thread includes the complete thread and that portion of the incomplete thread having fully formed roots but having crests not fully formed.

23. *Total thread*. The total thread includes the complete or effective thread and the incomplete thread.

24. *Vanish cone*.—The vanish cone is a cone, the surface of which would pass through the roots of the incomplete thread formed by the lead or chamfer of the threading tool.

25. *Vanish point*.—The vanish point of an external thread is the intersection of a generator of the vanish cone with a generator of the cylinder of the largest major diameter of the thread.

26. *Blunt start*.—"Blunt start" designates the removal of the partial thread at the entering end of thread. This is a feature of threaded parts that are repeatedly assembled by hand, such as hose couplings and thread plug gages, to prevent cutting of hands and crossing of threads, and which was formerly known as a *Higbee cut*. (See fig. II.1.)

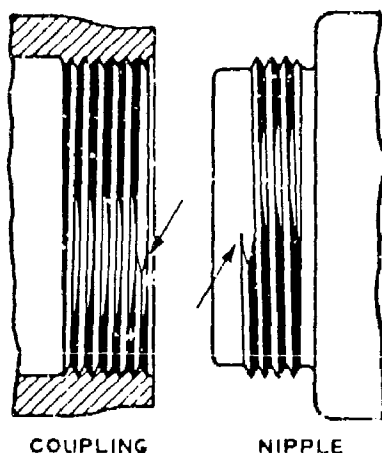


FIGURE II.1.—Blunt start.

(d) **TERMS RELATING TO DIMENSIONS OF SCREW THREADS.**—Terms relating to dimensions of both straight and taper threads are defined as follows:

1. *Pitch*.—The pitch of a thread is the distance, measured parallel to its axis, between corresponding points on adjacent thread forms in the same axial plane and on the same side of the axis.

2. *Lead*.—The lead is the distance a threaded part moves axially, with respect to a fixed mating part, in one complete rotation.

3. *Threads per inch*.—The number of threads per inch is the reciprocal of the pitch in inches.

4. *Turns per inch*.—The number of turns per inch is the reciprocal of the lead in inches.

5. *Included angle*.—The included angle of a thread (or angle of thread) is the angle between the flanks of the thread measured in an axial plane.

6. *Flank angle*.—The flank angles are the angles between the individual flanks and the perpendicular to the axis of the thread, measured in an axial plane. A flank angle of a symmetrical thread is commonly termed the *half-angle of thread*.

7. *Lead angle*.—On a straight thread the lead angle is the angle made by the helix of the thread at the pitch line with a plane perpendicular to the axis. On a taper thread, the lead angle at a given axial position is the angle made by the conical

spiral of the thread at the pitch line with the plane perpendicular to the axis at that position.

8. *Thickness of thread*.—The thickness of thread is the distance between the flanks of the thread measured at a specified position and parallel to the axis.

9. *Height of fundamental triangle*.—The height of the fundamental triangle of a thread, or the height of a sharp-V thread, is the distance, measured perpendicular to the axis, between the sharp major and minor cylinders or cones, respectively.

10. *Height of thread*.—The height (or depth) of thread is the distance, measured perpendicular to the axis, between the major and minor cylinders or cones, respectively.

11. *Addendum*.—The addendum of an external thread is the distance, measured perpendicular to the axis, between the major and pitch cylinders or cones, respectively. The addendum of an internal thread is the distance, measured perpendicular to the axis, between the minor and pitch cylinders or cones, respectively.

12. *Dedendum*.—The dedendum of an external thread is the distance, measured perpendicular to the axis, between the pitch and minor cylinders or cones, respectively. The dedendum of an internal thread is the distance, measured perpendicular to the axis, between the major and pitch cylinders or cones, respectively.

13. *Crest truncation*.—The crest truncation of a thread is the distance, measured perpendicular to the axis, between the sharp crest (or crest apex) and the cylinder or cone that would bound the crest.

14. *Root truncation*.—The root truncation of a thread is the distance, measured perpendicular to the axis, between the sharp root (or root apex) and the cylinder or cone that would bound the root.

15. *Major diameter*.—On a straight thread, the major diameter is the diameter of the coaxial cylinder that would bound the crest of an external thread or the root of an internal thread.

On a taper thread, the major diameter, at a given position on the thread axis, is the diameter of the major cone at that position.

16. *Minor diameter*.—On a straight thread, the minor diameter is the diameter of the coaxial cylinder that would bound the root of an external thread or the crest of an internal thread.

On a taper thread, the minor diameter, at a given position on the thread axis, is the diameter of the minor cone at that position.

17. *Pitch diameter (simple effective diameter)*.—On a straight thread, the pitch diameter is the diameter of the coaxial cylinder, the surface of which would pass through the thread profiles at such points as to make the width of the groove equal to one-half of the basic pitch. On a perfect thread this occurs at the points where the widths of the thread and groove are equal.

On a taper thread, the pitch diameter at a given position on the thread axis is the diameter of the pitch cone at that position.



18. *Virtual diameter (or effective size).*—The virtual diameter of an external or internal thread is the diameter derived by adding to the pitch diameter in the case of an external thread, or subtracting from the pitch diameter in the case of an internal thread, the cumulative effects of deviations from specified profile, including variations in lead, in uniformity of helix, in flank angle, taper, out-of-roundness, and surface defects.

19. *Depth of thread engagement.*—The depth (or height) of thread engagement between two mating threads is the distance, measured perpendicular to the axis, by which their thread forms overlap each other.

20. *Length of thread engagement.*—The length of thread engagement of two mating threads is the distance between the extreme points of contact on the pitch cylinders or cones, measured parallel to the axis.

21. *Crest clearance.*—The crest clearance in a thread assembly is the distance, measured perpendicular to the axis, between the crest of a thread and the root of its mating thread.

22. *Tensile stress area.*—The tensile stress area is the assumed area of an external threaded part that is used for the purpose of computing the tensile strength.

Tabulated stress areas in section III and appendix 1, applicable to steel parts, are computed from the following formula:

$$A_s = 3.1416 \left( \frac{E}{2} - \frac{3H}{16} \right)^2$$

or  $A_s = 0.7854 (D - 0.9743/n)^2$ ,

where  $E$  = basic pitch diameter  
 $D$  = basic major diameter  
 $n$  = threads per inch

For  $\frac{3H}{16}$ , see table III.1.

This formula correlates with test results for steels up to 100,000 psi ultimate strength.

For steels having ultimate strengths greater than 100,000 psi, it is recommended that the following formula be used to determine the stress area:

$$A_s = 3.1416 \left( \frac{E_{min}}{2} - \frac{3H}{16} \right)^2$$

where  $E_{min}$  equals minimum pitch diameter of the class of thread specified.

23. *Thread shear area.*—The thread shear area of the external thread is the effective area at a diameter equal to the maximum minor diameter of the internal thread. The thread shear area of the internal thread is the effective area at a diameter equal to the minimum major diameter of the external thread. The formula for shear area of the external thread at a diameter equal to the

maximum minor diameter of the internal thread ( $AS_i$ ) is as follows:

$$AS_i =$$

$$3.1416nL_eK_n \max \left[ \frac{1}{2n} + 0.57735(E_s \min - K_n \max) \right]$$

The formula for shear area of the internal thread at a diameter equal to the minimum major diameter of the external thread ( $AS_n$ ) is as follows:

$$AS_n =$$

$$3.1416nL_eD_s \min \left[ \frac{1}{2n} + 0.57735(D_s \min - E_n \max) \right]$$

where  $n$  = number of threads per inch

$L_e$  = length of engagement

$K_n \max$  = maximum minor diameter of internal thread

$E_s \min$  = minimum pitch diameter of external thread

$D_s \min$  = minimum major diameter of external thread

$E_n \max$  = maximum pitch diameter of internal thread.

As materials bearing the same name vary greatly in ultimate strength and in other essential characteristics, the formulas given below are included in order that a safe length of external thread mating with internal threads may be calculated. It is desirable that the length of internal thread and the dimensions of this thread, particularly its minor diameter, be such that, taking into account a possible difference in strength of material of the internal and external threads, the threaded portion of the external thread will break before either the external or internal threads strip. For this reason, the shearing strength of the assembled unit should be taken as  $\frac{1}{2}$  the tensile strength, which gives a small factor of safety.

The length of engagement of a threaded unit, that will develop maximum strength of an assembled threaded unit with external and internal threads manufactured of materials of equal tensile strength, is computed from the following formula:

$$L_e =$$

$$\frac{2 \angle \text{Stress area}}{3.1416nK_n \max \left[ \frac{1}{2n} + 0.57735(E_s \min - K_n \max) \right]}$$

This formula has the factor " $\frac{1}{2}$ " for relation of shearing strength to tensile strength incorporated therein. The formula, while given for steel external and internal threads, may be used for brass external and internal threads and provides an additional safety factor.

Where the external and internal threads are manufactured of materials of different tensile

strengths, the factor  $J$  for the relative strength in shear of external threads with respect to internal threads must be considered. The factor  $J$  is computed from the following formula:

$$J = \frac{AS_s \times \text{Tensile strength of external thread}}{AS_n \times \text{Tensile strength of internal thread}}$$

The length of engagement of a threaded unit adjusted to obtain proper relation of strength to cause breakage of the bolt before threads will shear is  $Q$  and is computed from the following formulas:

If  $J$  is less than 1,  $Q = L_c$

If  $J$  is greater than 1,  $Q = J \times L_c$

(c) TERMS RELATING ONLY TO TAPER SCREW THREADS.—Terms relating only to taper threads are defined as follows:

1. *Pitch cone*.—The pitch cone is a cone, the surface of which would pass through the thread profiles at such points as to make the width of the groove equal to one half of the basic pitch. On a perfect thread this occurs at the point where the widths of the thread and groove are equal.

2. *Major cone*.—The major cone is a cone having an apex angle equal to that of the pitch cone, the surface of which would bound the crest of an external thread or the root of an internal thread.

3. *Sharp major cone*.—The sharp major cone is a cone having an apex angle equal to that of the pitch cone, the surface of which would pass through the sharp crest of an external thread or the sharp root of an internal thread.

4. *Minor cone*.—The minor cone is a cone having an apex angle equal to that of the pitch cone, the surface of which would bound the root of an external thread or the crest of an internal thread.

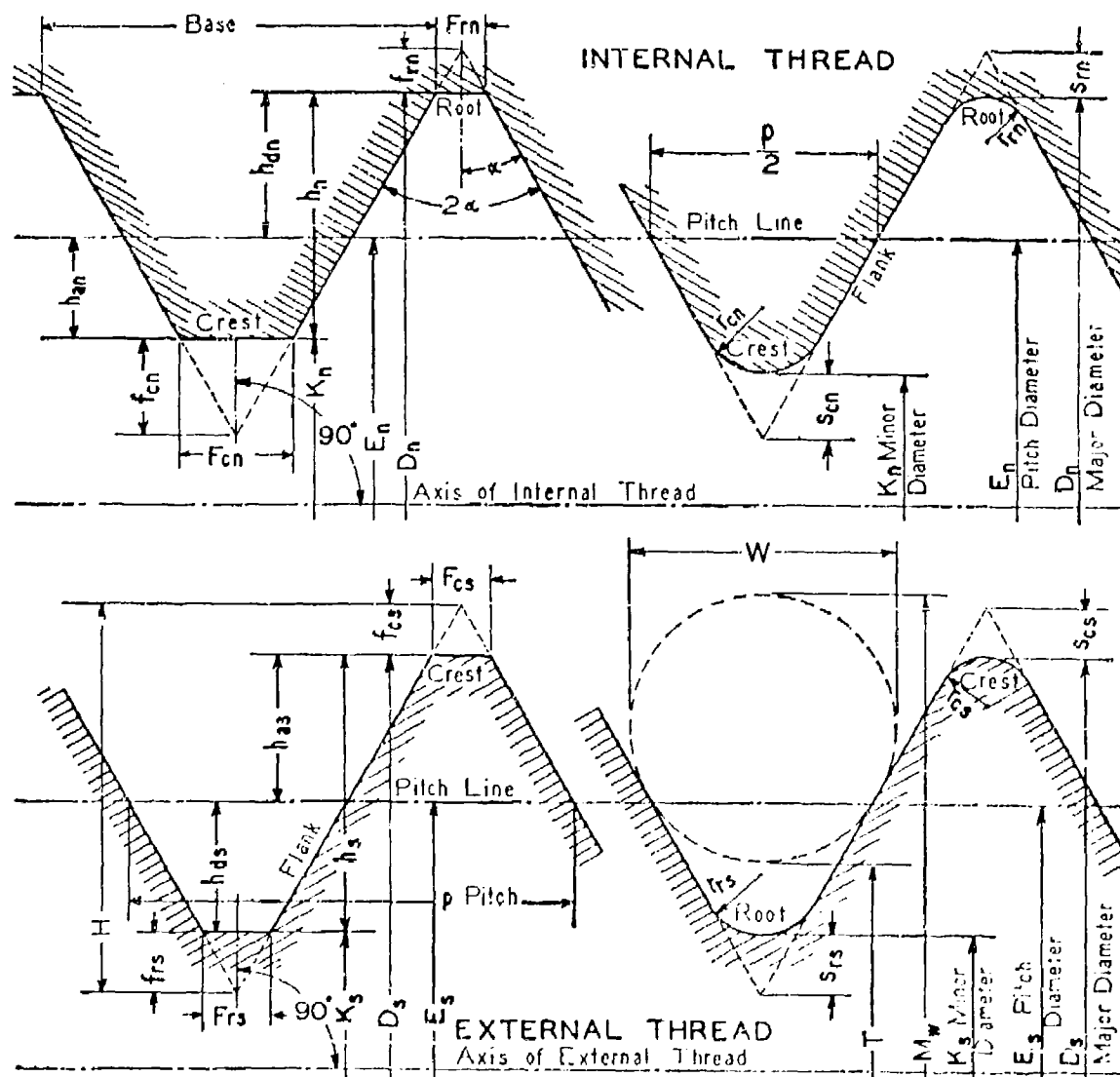


FIGURE H.2.—General screw thread symbols.

NOTE. These diagrams are not intended to show standard thread form; but illustrate only the application of symbols.





(b) **IDENTIFICATION DESIGNATIONS.** Identification designations are capital letter abbreviations of names used to designate various forms of thread and thread series, and commonly consist of combinations of such abbreviations. There are assembled in table II.3 the names and abbreviations which are now in use, together with references to standards in which they occur, of various standard threads. See also p. 26.

The method of designating a screw thread is by the use of the initial letters of the thread series, preceded by the diameter in inches (or the screw number) and number of threads per inch, all in Arabic characters, and followed by the classification of allowance and tolerance in Arabic numerals.

The designation applicable to each thread series is stated in the section where such series is presented, together with examples. If the thread is left hand, the symbol "*LH*" shall follow the class. No symbol is used to distinguish right hand threads. The number of threads per inch shall be indicated in all cases, irrespective of whether it is the standard number of threads for that particular size of threaded part, or special. Tools and gages for standard thread diameters and pitches shall bear standard identification designations, and special marking of such items shall be avoided.

Multiple threads shall be designated by showing both the pitch and the lead in accordance with examples given in the section on Acme threads.

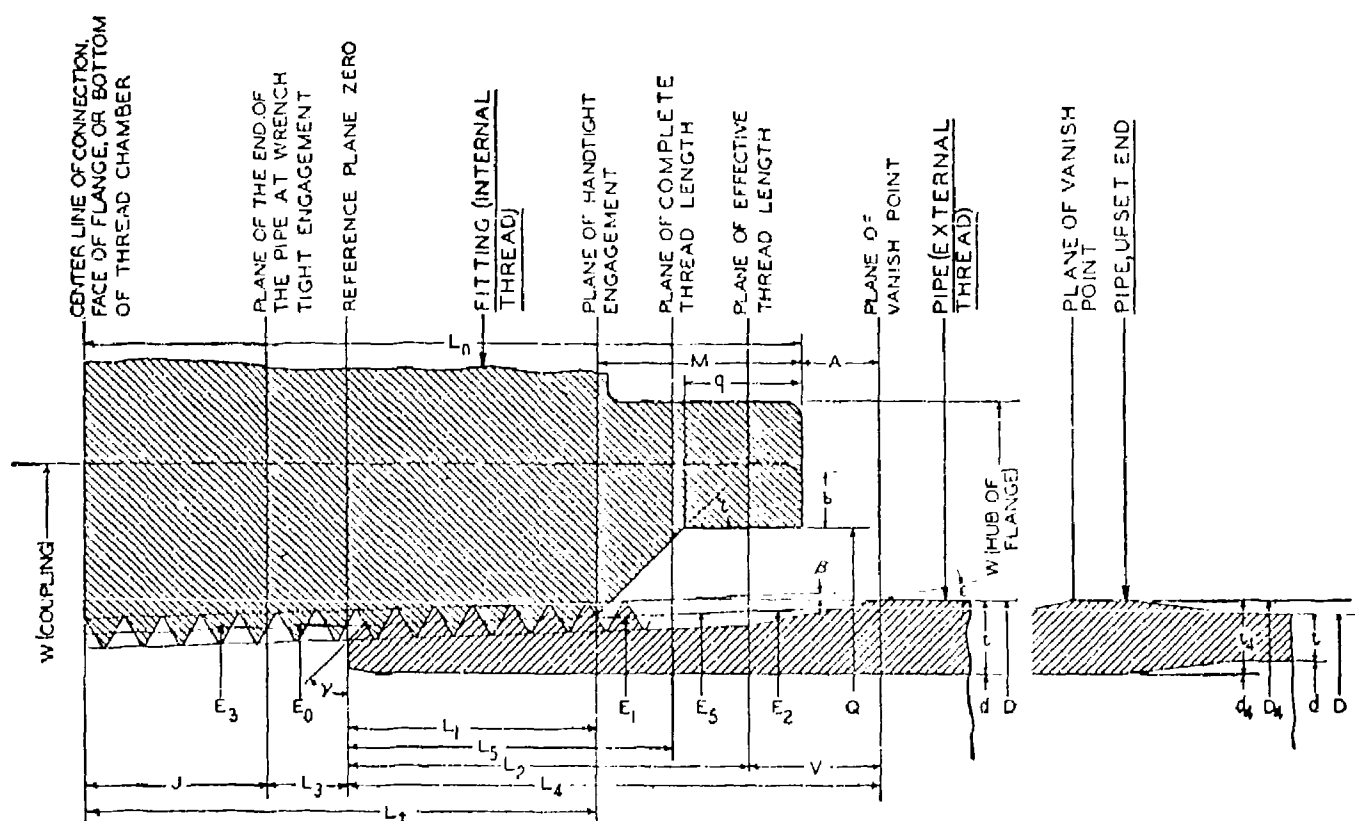


FIGURE II.4.—Pipe thread symbols.

TABLE II.1.—General symbols (see figs. II.2 and II.3)

Symbols	Dimensions	Remarks
$D$ .....	Major diameter.....	Exception: $R$ is used for basic major diameter when this differs from the nominal major diameter. Subscripts $s$ or $n$ , indicating external or internal thread, may be used if necessary.
$E$ .....	Pitch diameter.....	(Subscripts $s$ or $n$ , indicating external or internal thread, may be used if necessary. Equals $l/n$ . Equals $l/N$ . Equals $l/p$ .
$K$ .....	Minor diameter.....	
$p$ .....	Pitch.....	
$l$ .....	Lead.....	Equals $l/l$ .
$n$ .....	Number of threads per unit of length (per inch).....	
$N$ .....	Number of turns per unit of length (per inch).....	
$H$ .....	Height of fundamental triangle.....	
$h$ .....	Height of thread.....	Subscripts $s$ or $n$ , indicating external or internal thread, may be used if necessary.
$h_a$ .....	Addendum.....	
$h_d$ .....	Dedendum.....	
$h_e$ .....	Equals $2h_a$ of basic external thread.....	
$h_s$ .....	Depth of thread engagement.....	
$\alpha$ (alpha).....	Half-angle of symmetrical thread.....	
$\alpha_1$ .....	Angle between leading flank of thread and normal to axis of thread.....	
$\alpha_2$ .....	Angle between following flank of thread and normal to axis of thread.....	
$\lambda$ (lambda).....	Lead angle.....	$\tan \lambda = \frac{l}{\pi E}$
$r$ .....	Radius of rounding at crest, or radius of rounding at root.....	Subscripts $e$ or $r$ indicating crest or root, and $s$ or $n$ indicating external or internal thread may be used if necessary.
$a$ .....	Depth from apex of fundamental triangle to adjacent root or crest of thread:	
$a_f$ .....	(1) If rounded, (2) If flat.....	
$a_{fa}$ .....	Depth from apex of fundamental triangle to:	
$a_{fa}$ .....	(1) Flat at crest of external thread.....	
$a_{fa}$ .....	(2) Flat at root of external thread.....	
$a_{fa}$ .....	(3) Flat at crest of internal thread.....	
$a_{fa}$ .....	(4) Flat at root of internal thread.....	
$F$ .....	Width of:	
$F_a$ .....	(1) Flat (general).....	
$F_a$ .....	(2) Flat at crest of external thread.....	
$F_a$ .....	(3) Flat at root of external thread.....	
$F_a$ .....	(4) Flat at crest of internal thread.....	
$F_a$ .....	(5) Flat at root of internal thread.....	
$L$ .....	Length of bolt or screw.....	
$L_t$ .....	Length of full thread.....	Subscripts $s$ or $n$ may be used.
$L_e$ .....	Length of thread engagement.....	
$M_w$ .....	Diameter of measuring wires.....	
$T$ .....	Measurement over wires.....	
$C$ .....	Correction to measurement over wires to give pitch diameter.....	$E = M_w - C - c$ $C = w (1 + \cot \alpha \sec \alpha) - (\cot \alpha)/2n$ $E = T + P - c$ $P = 1/2p \cot \alpha - (\cot \alpha - 1)w$
$P$ .....	Correction to measurement under wires to give pitch diameter.....	
$\lambda'$ .....	Wire angle.....	See NPL "Gauging and Measuring Screw Threads," 1951, p. 23, or NBS Handbook H28 (1957), p. 197
$c$ .....	Wire angle correction.....	
Prefix symbol with $\delta$ (delta).....	Deviation in any dimension.....	Examples: Deviation in pitch, $\delta p$ ; deviation in half-angle, $\delta \alpha$ or $\delta \alpha_1$ .
$\delta E_a$ (delta $E_a$ ).....	Pitch-diameter equivalent of deviations in flank angles.....	
$\delta E_p$ (delta $E_p$ ).....	Pitch-diameter equivalent of deviation in pitch.....	
$O$ .....	Allowance at pitch diameter.....	

TABLE II.2.—Pipe-thread symbols (see fig. II.4)

Symbols	Dimensions	Remarks
$D$ .....	Outside diameter of pipe.....	(Subscript 4 is used for dimensions in plane of vanish point when these differ from $D$ , $d$ , or $t$ , respectively. Subscript $x$ denotes plane containing the diameter. For axial positions of planes see foot of this table. Subscripts $s$ or $n$ designating screw or nut may also be used if necessary. For axial position of plane containing basic diameter, see foot of this table.
$d$ .....	Inside diameter of pipe.....	
$t$ .....	Wall thickness of pipe.....	
$D_s$ .....	Major diameter.....	
$E_s$ .....	Pitch diameter.....	
$K_s$ .....	Minor diameter.....	
$L_s$ .....	Length of thread from plane of pipe end to plane containing basic diameter $D_s$ , $E_s$ , or $K_s$ .....	
$V$ .....	Length of washout (vanish cone) threads.....	
$\beta$ (beta).....	Half apex angle of pitch cone of taper thread.....	
$\gamma$ (gamma).....	Angle of chamfer at end of pipe measured from a plane normal to the axis.....	
$A$ .....	Handtight standoff of face of coupling from plane containing vanish point on pipe.....	
$M$ .....	Length from plane of handtight engagement to the face of coupling on internally threaded member.....	
$S$ .....	Distance of gaging step of plug gage from face of ring gage for handtight engagement.....	
$L_a$ .....	Length from center line of coupling, face of flange, or bottom of internal thread chamber to face of fitting.....	
$b$ .....	Width of bearing face on coupling.....	
$\tau$ (tau).....	Angle of chamfer at bottom of recess or counterbore measured from the axis.....	
$\epsilon$ (epsilon).....	Half apex angle of vanish cone.....	
$J$ .....	Length from center line of coupling, face of flange, or bottom of internal thread chamber to end of pipe, wrench engagement.....	
$L_u$ .....	(1) Length of straight full thread (see table II.1). (2) Length from plane of handtight engagement to small end of full internal taper thread.....	
$Q$ .....	Diameter of recess or counterbore in fitting.....	
$q$ .....	Depth of recess or counterbore in fitting.....	
$W$ .....	Outside diameter of coupling or hub of fitting.....	

DEFINITION OF PLANES DENOTED BY SUBSCRIPT  $x$ 

$x=0$ .....	Plane of pipe end.....
$x=1$ .....	Plane of handtight engagement or plane at mouth of coupling (excluding recess, if present). On British pipe threads this is designated the "gauge plane," and the major diameter in this plane is designated the "gauge diameter."
$x=2$ .....	Plane at which washout threads on pipe commence.
$x=3$ .....	Plane in coupling reached by end of pipe in wrench condition. ( $L_3$ is measured from plane containing pipe end in position of handtight engagement.)
$x=4$ .....	Plane containing vanish point of thread on pipe.
$x=5$ .....	Plane at which major diameter cone of thread intersects outside diameter of pipe.

NOTE.—Additional special subscripts are as follows: Plane  $x=6$  is the plane of the pipe end for mating joints. Plane  $x=7$  is the plane of the API gage point at a specified length from the plane of vanish point. Plane  $x=8$  is the plane of the large end of the "L" thread (see fig. 1) for the compressed-gas cylinder valve inlet connection thread. Plane  $x=9$  is the plane of the small end of the "L" thread plug gage for the compressed-gas cylinder inlet thread.

TABLE II.3.—Identification designations<sup>1 2</sup>

Designation	Thread series	References	
		ASA Standards	Handbook H28 (1957), section No.
Acme-C	Acme threads, centerizing	B1.5	XII.
Acme-G	Acme threads, general purpose	B1.5	XII.
Stub Acme	Stub Acme thread	B1.8	XIII.
AMO	American Standard microscope objective thread		
N, Butt	National Buttress thread	B1.9	XIV.
NC	American National coarse thread series	B1.1	Appendix 1.
NF	American National fine thread series	B1.1	Appendix 1.
NEF	American National extra-fine thread series	B1.1	Appendix 1.
8N	American National 8-thread series	B1.1	Appendix 1.
12N	American National 12-thread series	B1.1	Appendix 1.
16N	American National 16-thread series	B1.1	Appendix 1.
NH	American National hose coupling and fire hose coupling threads	B26, B33.1	X.
NGO	American National gas outlet thread	B57.1	IX.
NM	National Miniature thread series	B1.4	V.
NS	Special threads of American National form	B1.1	Appendix 2.
NC	American Standard coarse thread series	B1.1	III.
NF	American Standard fine thread series	B1.1	III.
NPT	American Standard taper pipe thread	B2.1	VII.
NPTF	American Standard taper pipe thread (dryseal)	B2.2	VIII.
NPTR	American Standard taper pipe thread for rolling fittings	B2.1	VII.
NPS	American Standard straight pipe thread	B2.1	VII.
NPSC	American Standard straight pipe thread in couplings	B2.1	VII.
NPSF	American Standard internal straight pipe thread (dryseal)	B2.2	VIII.
NPSI	American Standard intermediate internal straight pipe thread (dryseal)	B2.2	VIII.
NPSM	American Standard straight pipe thread for mechanical joints	B2.1	VII.
NPSL	American Standard straight pipe thread for locknuts and locknut pipe threads	B2.1	VII.
NPSH	American Standard straight pipe thread for hose couplings and nipples	B2.1, B33.1	X.
ANPT	Aeronautical taper pipe thread	(9)	(9).
RMS	American Standard surveying instrument mounting thread	Under development	
UNC	Unified coarse thread series	B1.1	III.
UNEF	Unified selected diameter-pitch combinations of the extra-fine thread series	B1.1	III.
UNF	Unified fine thread series	B1.1	III.
UNS	Unified selected diameter-pitch combinations of the 8-, 12-, and 16-thread series	B1.1	III.
	Unified threads of selected special diameters, pitches, and lengths of engagement	B1.1	IV.

<sup>1</sup> Methods of designating multiple threads are shown in ASA B1.5 Acme Screw Threads, and Part III of Handbook H28 (1957).

<sup>2</sup> All threads, except NGO, are right hand, unless otherwise designated. For NGO threads, designations "RH" or "LH" are required.

<sup>3</sup> Military Specification M11-P-7105, Pipe Threads, Taper, Aeronautical National Form.

## SECTION III. UNIFIED THREAD FORM AND THREAD SERIES FOR BOLTS, MACHINE SCREWS, NUTS, TAPPED HOLES, AND GENERAL APPLICATIONS

### 1. INTRODUCTION

The Unified thread standards,<sup>2</sup> which have been agreed upon by standards bodies of Canada, the United Kingdom, and the United States, constitute the basic American standards for fastening screw threads. They are a complete and integrated system of threads for fastening purposes in mechanisms and structures. Their outstanding characteristic is general interchangeability of threads achieved through the standardization of thread form, diameter-pitch combinations, and limits of size.

The standards have as their original basis the work done about a century ago by William Sellers in the United States and Sir Joseph Whitworth in Great Britain. Throughout the intervening years there have been many further developments and revisions, culminating in the system of Unified Threads approved and adopted for use by all inch-using countries.

<sup>2</sup> The Unified thread standards presented in this section are in general agreement with ASA B1.1 "Unified and American Screw Threads," published by the ASME, 20 West 30th Street, New York 18, N. Y.; also with CSA B1.1, "Standard for Unified and American Screw Threads," published by the Canadian Standards Association, Ottawa, Canada; and with British Standard 1580, "Unified Screw Threads," published by the British Standards Institution, 2 Park Street, London, W. 1. The latest revision should be consulted when referring to such standards.

Unification of screw thread standards received its impetus from the need for interchangeability among the billions of fasteners used in the complex equipment of modern warfare which was, and continues to be made in different countries. Equally important, however, are international trade in mechanisms of all kinds and the servicing of transportation equipment which moves from country to country. These have made unification not only highly advantageous but practically essential. In sizes  $\frac{1}{4}$  in. and larger, complete unification of certain thread series and six tolerance classes was signaled by the signing of an accord on November 18, 1948. Since that time a limited unification of seven sizes only for attachment purposes has been extended into smaller sizes. Although thread sizes less than  $\frac{1}{4}$  in. have not been unified, the tolerances and allowances based on Unified formulation are applied to these sizes in the United States and Canada, and they are known as American Standard threads.

In relation to previous American practice, as covered by appendixes 1 and 2 of this Handbook, Unified threads have substantially the same thread form and are mechanically interchangeable with American National threads of the same diameter and pitch.

The principal differences between the two systems relate to the application of allowances, the variation of tolerances with size, difference in amount of pitch diameter tolerance on external and internal threads, and differences in thread designations. Under the Unified system an allow-

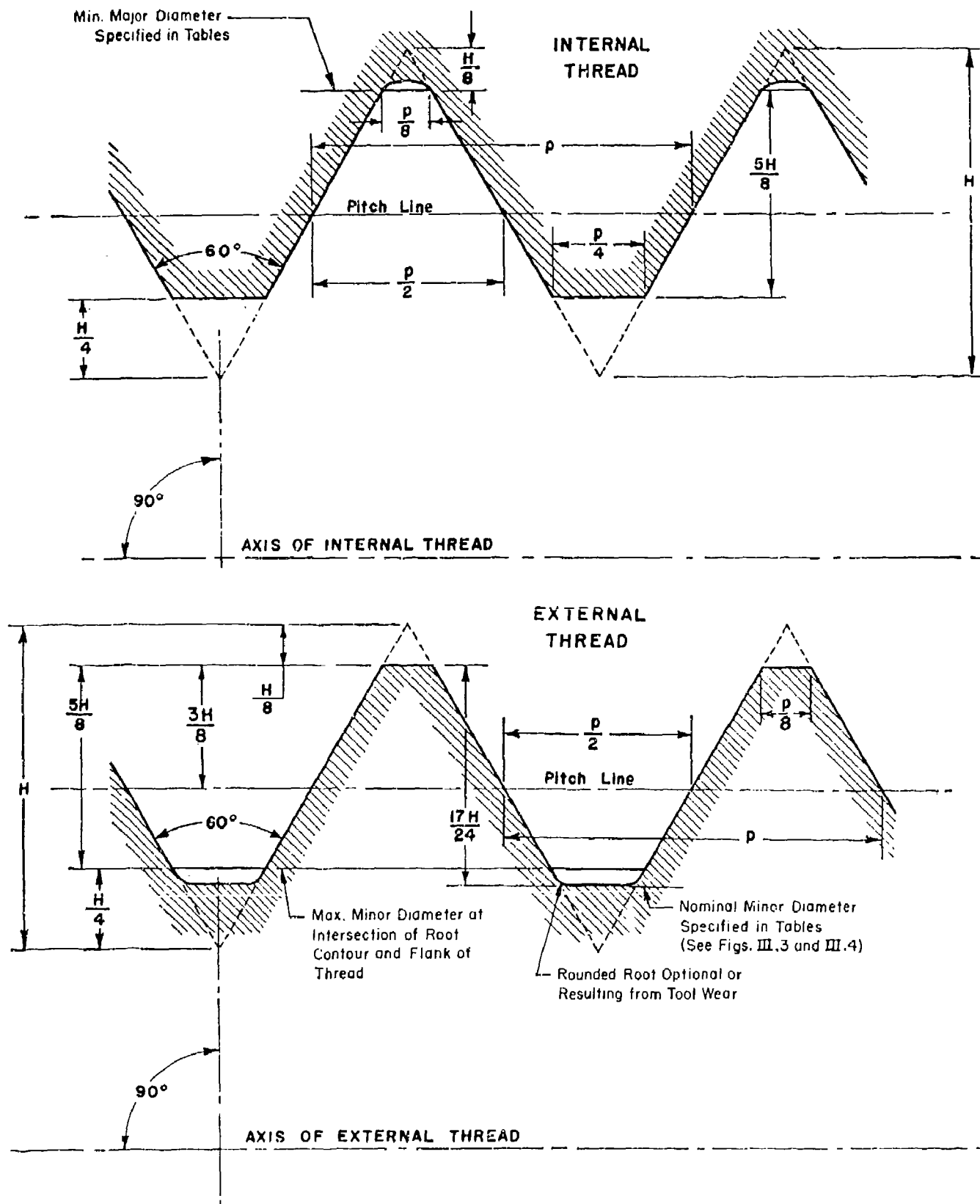


FIGURE III.1.—Unified internal and external screw thread design forms (maximum material condition).

NOTE.—See table III.1 for numerical values. In practice the crests of external threads may be rounded.

ance is provided on both the classes 1A and 2A external threads, whereas under the American National system only the class 1 external thread has an allowance. Under the Unified system, the pitch diameter tolerance of an internal thread is 30 percent greater than that of the external thread, but such tolerances are equal under the American National system. Unified tolerances and allowances for both standard and special diameter-pitch combinations are derived from the same formula, but American National tolerances for special threads have a different basis from that for some standard threads.

## 2. THE UNIFIED FORM OF THREAD

1. **ANGLE OF THREAD.**—The basic angle of thread between the flanks of the thread, measured in an axial plane, is  $60^\circ$ . The line bisecting this  $60^\circ$  angle is perpendicular to the axis of the screw thread.

2. **FORM OF CREST.**—The form of the crest of external threads is flat. The crest of the basic thread form of the external thread shall be truncated from the sharp crest an amount equal to

$H/8$ , where  $H$  is the depth of the fundamental triangle. The form of the crest of internal threads is flat and the crest shall be truncated from the sharp crest an amount equal to  $H/4$ .

3. **FORM OF ROOT.**—The crest clearances allowed are such as to permit rounded root forms in both the external and internal threads. Rounded roots are required in some applications and are made by tools that are purposely rounded. Otherwise, rounded roots may be the result of tool wear.

4. **CLEARANCE AT MINOR DIAMETER.**—A clearance is provided at the minor diameter of the internal thread by truncating from the sharp crest an amount equal to  $H/4$ .

5. **CLEARANCE AT MAJOR DIAMETER.**—A clearance is provided at the major diameter of the internal thread by making the thread form at the root such that its width is less than  $p/8$ .

6. **ILLUSTRATIONS.**—Figure III.1 shows the design forms (maximum material condition) of the external and internal threads of the Unified form of thread.

7. **BASIC THREAD DATA.**—The basic thread data for all standard pitches of the Unified form of thread are given in table III.1.

TABLE III.1.—Thread data, Unified thread form (see fig. III.2)

Threads per inch,	Pitch,	Flat at internal thread root, $F_{ra} = p/4 = 0.25p$	Flat at internal thread root and external thread crest, $F_{ra} = F_{ec} = p/8 = 0.125p$	Height of sharp thread, $H = 0.866025p$	Truncation of internal thread root and external thread crest, $f_{ra} = f_{ec} = H/6 = 0.10825p$	Truncation of external thread root, $t_{ra} = H/6 = 0.14434p$	Half addendum of external thread, $3/8 H = 0.16238p$	Truncation of internal thread crest, $f_{ra} = H/4 = 0.21651p$	Addendum of external thread, $h_{ra} = 3/8 H = 0.32470p$	Height of internal thread and depth of thread engagement, $h_n = h_e = 5/8 H = 0.54127p$	Height of external thread, $h_e = 7/8 H = 0.61343p$	Twice the external thread addendum, $2h_n = 2h_e = 3/4 H = 0.649519p$	Difference between max. major and pitch diameters of internal thread, $1/2 H = 0.79386p$	Double height of internal thread, $2h_n = 1/4 H = 1.08253p$	Double height of external thread, $1 1/2 H = 1.22687p$
$n$	$p$														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
80	$1/n$ 0.012500	$1/n$ 0.00312	$1/n$ 0.00156	$1/n$ 0.010825	$1/n$ 0.00135	$1/n$ 0.00180	$1/n$ 0.00203	$1/n$ 0.00271	$1/n$ 0.00406	$1/n$ 0.00677	$1/n$ 0.00767	$1/n$ 0.008119	$1/n$ 0.00992	$1/n$ 0.01353	$1/n$ 0.01534
72	0.013889	0.00347	0.00174	0.012028	0.00150	0.00200	0.00226	0.00301	0.00451	0.00752	0.00852	0.009021	0.01103	0.01504	0.01704
64	0.015625	0.00391	0.00195	0.013532	0.00169	0.00226	0.00254	0.00338	0.00507	0.00846	0.00958	0.010149	0.01240	0.01691	0.01917
56	0.017857	0.00446	0.00223	0.015465	0.00193	0.00258	0.00290	0.00387	0.00580	0.00967	0.01095	0.011599	0.01418	0.01933	0.02191
48	0.020833	0.00521	0.00260	0.018042	0.00226	0.00301	0.00338	0.00451	0.00677	0.01128	0.01278	0.013532	0.01654	0.02255	0.02556
44	0.022727	0.00568	0.00284	0.019682	0.00246	0.00328	0.00369	0.00492	0.00738	0.01236	0.01394	0.014762	0.01804	0.02460	0.02788
40	0.025000	0.00625	0.00312	0.021651	0.00271	0.00361	0.00406	0.00541	0.00812	0.01353	0.01534	0.016238	0.01985	0.02706	0.03067
36	0.027778	0.00694	0.00347	0.024056	0.00301	0.00401	0.00451	0.00601	0.00902	0.01504	0.01704	0.018042	0.02205	0.03037	0.03408
32	0.031250	0.00781	0.00391	0.027063	0.00338	0.00451	0.00507	0.00677	0.01015	0.01691	0.01917	0.020267	0.02481	0.03383	0.03854
28	0.035714	0.00893	0.00446	0.030929	0.00387	0.00516	0.00580	0.00773	0.01160	0.01933	0.02191	0.023197	0.02835	0.03866	0.04382
27	0.037037	0.00926	0.00463	0.032075	0.00401	0.00535	0.00601	0.00802	0.01203	0.02005	0.02272	0.024055	0.02940	0.04009	0.04544
24	0.041667	0.01042	0.00521	0.036084	0.00451	0.00601	0.00677	0.00902	0.01353	0.02255	0.02556	0.027063	0.03308	0.04511	0.05112
20	0.050000	0.01250	0.00625	0.043301	0.00541	0.00722	0.00812	0.01083	0.01624	0.02706	0.03067	0.032476	0.03969	0.05413	0.06134
18	0.055556	0.01389	0.00694	0.048113	0.00601	0.00802	0.00902	0.01203	0.01804	0.03007	0.03408	0.036084	0.04410	0.06014	0.06816
16	0.062500	0.01562	0.00781	0.054127	0.00677	0.00902	0.01015	0.01353	0.02030	0.03383	0.03834	0.040595	0.04962	0.06766	0.07668
14	0.071429	0.01786	0.00893	0.061869	0.00773	0.01031	0.01160	0.01546	0.02320	0.03866	0.04382	0.046394	0.05670	0.07732	0.08761
13	0.076923	0.01923	0.00962	0.066617	0.00833	0.01110	0.01249	0.01665	0.02458	0.04164	0.04719	0.049983	0.06107	0.08327	0.09447
12	0.083333	0.02083	0.01042	0.072160	0.00902	0.01203	0.01353	0.01804	0.02706	0.04511	0.05112	0.054127	0.06615	0.09021	0.10224
11 1/2	0.089091	0.02174	0.01087	0.075307	0.00941	0.01255	0.01412	0.01883	0.02824	0.04707	0.05334	0.056680	0.06903	0.09413	0.10698
11	0.090909	0.02273	0.01136	0.078730	0.00984	0.01312	0.01476	0.01968	0.02952	0.04921	0.05577	0.059047	0.07217	0.09841	0.11153
10	0.100000	0.02500	0.01250	0.086903	0.0103	0.01443	0.01624	0.02165	0.03218	0.05413	0.06134	0.064972	0.07939	0.10625	0.12289
9	0.111111	0.02778	0.01389	0.096225	0.01203	0.01694	0.01904	0.02406	0.03608	0.06014	0.06816	0.072169	0.08821	0.12028	0.13632
8	0.125000	0.03125	0.01562	0.108253	0.01353	0.01804	0.02030	0.02706	0.04059	0.06766	0.07668	0.081190	0.09923	0.13332	0.15336
7	0.142857	0.03571	0.01786	0.123718	0.01646	0.02062	0.02320	0.03003	0.04639	0.07732	0.08761	0.092788	0.11341	0.15465	0.17527
6	0.166667	0.04167	0.02083	0.144338	0.01804	0.02406	0.02706	0.03608	0.05413	0.09021	0.10224	0.108253	0.13231	0.18042	0.20448
5	0.200000	0.05000	0.02500	0.173205	0.02165	0.02887	0.03248	0.04330	0.06495	0.10825	0.12293	0.129904	0.15877	0.21651	0.24537
4 1/2	0.222222	0.05556	0.02778	0.192450	0.02406	0.03208	0.03608	0.04911	0.07217	0.12028	0.13632	0.144338	0.17641	0.24056	0.27264
4	0.250000	0.06250	0.03125	0.216606	0.02706	0.03608	0.04059	0.05413	0.08119	0.13532	0.15226	0.162790	0.19846	0.27033	0.30672

\* Equivalent to the "basic height"  $h$  of the original American National form.

NOTE:  $h_{ra} - f_{ra} = \frac{H}{4}$   
 $h_{ra} - h_{ra} = \frac{3}{8} H$



### 3. THREAD SERIES, SYMBOLS, AND SUGGESTED APPLICATIONS

1. **THREAD SERIES DEFINITION.**—Thread series are groups of diameter-pitch combinations distinguished from each other by the number of threads per inch applied to a specific diameter. The various diameter-pitch combinations of the six standard series are shown in table III.2, and the designations for the various thread series are shown in the dimensional tables.

2. **COARSE-THREAD SERIES.**—The basic dimensions of the coarse-thread series, including both

Unified thread sizes and additional American standard thread sizes, are given in table III.

3. The limits of size, allowances, and tolerances for the Unified classes, based on a length of engagement of one diameter, are given in table III.

10. Thread sizes of the coarse-thread series that are recognized as Unified are designated by the symbol "UNC". See footnote b, p. 16. All others are designated by "NC" with the Unified class designations to indicate their conformance to the Unified thread formulation.

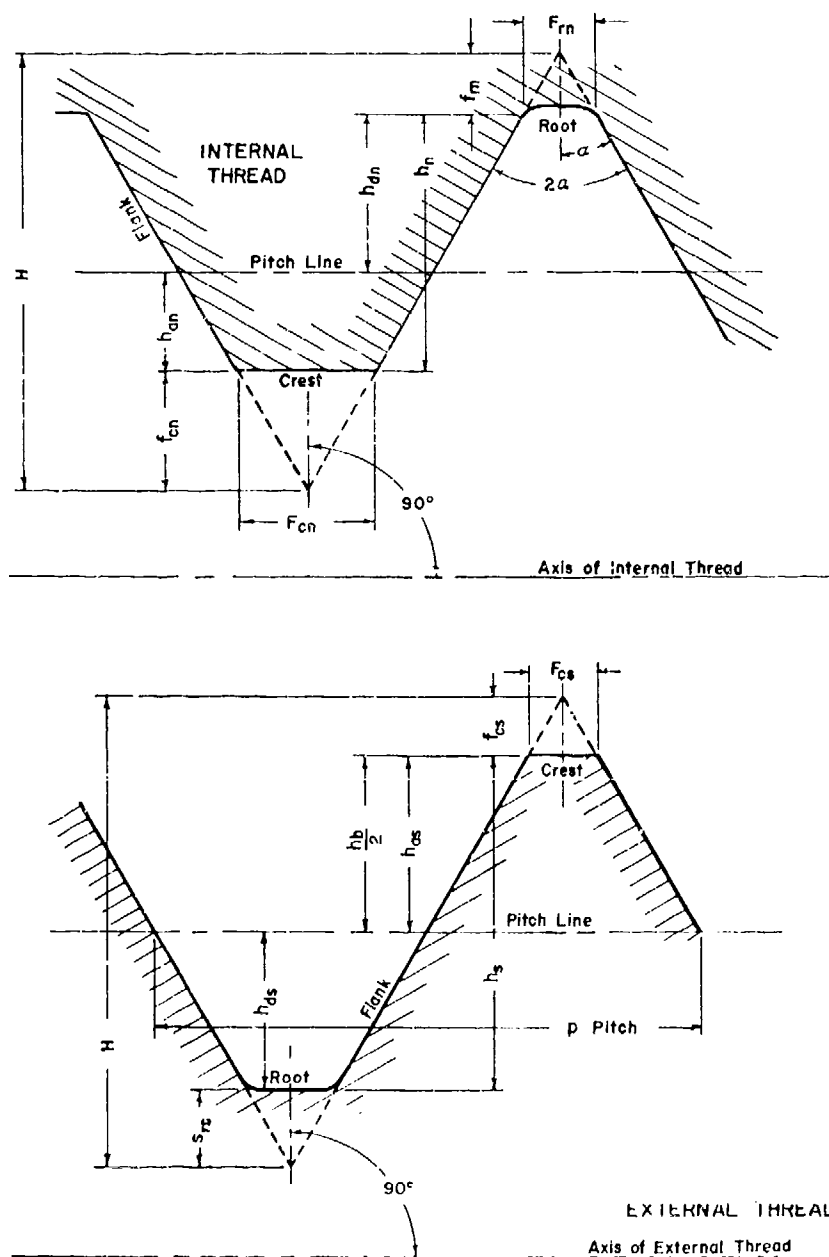


FIGURE III.2.—Symbols for thread data in table III.1.

The coarse-thread series is suitable for bolts, screws, nuts, and general use where the wall thickness will accommodate the thread dimensions. It is particularly advantageous for applications requiring rapid assembly or disassembly or for threading into lower-strength materials, such as castings, soft metals, and plastics.

**3. FINE-THREAD SERIES.**—The basic dimensions of the fine-thread series, including both Unified thread sizes and additional American standard thread sizes, are given in table III.4. The limits of size, allowances, and tolerances for the Unified classes, based on a length of engagement of one diameter, are given in table III.10. Thread sizes of the fine-thread series which are recognized as Unified are designated by the symbol "UNF". See footnote c, p. 16. All others are designated "NF" with the Unified class designations to indicate their conformance to the Unified thread formulation.

The fine thread series is suitable for bolts, screws, and nuts, and other applications where a closer ratio is desired between the static strengths of the bolt and thread, where length of engagement is limited, where a smaller lead angle is desired, or where the wall thickness requires a smaller thread. Caution should be observed when using this series in castings, soft metals, plastics, and similar lower-strength materials.

**4. EXTRA-FINE THREAD SERIES.**—The extra-fine-thread series is applicable where (1) thin-walled material is to be threaded, (2) thread height of nuts clearing ferrules, coupling flanges, etc., must be held to a minimum, and (3) a maximum practicable number of threads is required within a given thread length. The basic dimensions of the extra-fine-thread series are given in table III.5. The limits of size, allowances, and tolerances for the Unified classes, based on a length of engagement of 9 pitches, are given in table III.10. Thread sizes of the extra-fine-thread series which are recognized as Unified are designated by the symbol "UNEF". All others are designated by "NEF" with the Unified class designations to indicate their conformance to the Unified thread formulation.

**5. 8-THREAD SERIES.**—The 8-thread series is a uniform-pitch series for large diameters. Although originally intended for high-pressure-joint bolts and nuts, it is now widely used as a substitute for the coarse-thread series for diameters larger than 1 in. It is used particularly on bolts for high-pressure pipe flanges, cylinder-head studs, and similar fasteners against pressure. The basic dimensions of the 8-thread series are given in table III.6. In American practice, the limits of size of this series are customarily based on a length of engagement of one diameter, as given in table III.10. Such threads are designated "8N" with the Unified class designations to indicate their conformance to the Unified thread formulation. Sizes of the 8-thread series<sup>3</sup> larger than 1½

in. in even ½ in. are recognized as Unified sizes when limits of size are based on a length of engagement of 9 pitches, or 1½ in.

**6. 12-THREAD SERIES.**—The 12-thread series is a uniform-pitch series for large diameters requiring threads of medium-fine pitch. It is widely used in machine construction for thin nuts on shafts and sleeves. It also allows the specification of shoulder diameters in steps of ⅛ in., as from the standpoints of good design and simplification of practice it is desirable to limit shoulder diameters to ⅛-in. steps. Twelve threads per inch is the coarsest pitch in general use which will permit a threaded collar, which screws onto a threaded shoulder, to slip over a shaft, the difference in diameter between shoulder and shaft being ⅛ in. Sizes of the 12-thread series from ½ in. to and including 1½ in. are used in boiler practice, which requires that worn stud holes be retapped with a tap of the next larger size, the increment being ⅛ in. throughout most of the range. The 12-thread series also provides continuation of the fine-thread series for diameters larger than 1½ in.

The basic dimensions of the 12-thread series are given in table III.7. The limits of size, allowances, and tolerances for the Unified classes, based on a length of engagement of 9 pitches or ¾ in., are given in table III.10. Thread sizes of the 12-thread series which are recognized as Unified are designated by the symbol "12UN." All others are designated "12N" with the Unified class designations to indicate their conformance to the Unified thread formulation.<sup>3</sup>

**7. 16-THREAD SERIES.**—The 16-thread series is a uniform-pitch series for large diameters requiring fine-pitch threads. It is suitable for adjusting collars and retaining nuts, and also serves as a continuation of the extra-fine-thread series for diameters larger than 2 in. The basic dimensions of the 16-thread series are given in table III. 8. The limits of size, allowances, and tolerances for the Unified classes, based on a length of engagement of 9 pitches or ⅝ in., are given in table III. 10. Thread sizes of the 16-thread series which are recognized as Unified are designated by the symbol "16UN." All others are designated "16N" with the Unified class designations to indicate their conformance to the Unified thread formulation (see footnote 3).

**8. UNIFORM PITCH SERIES.**—The above 8-, 12-, and 16-thread series have application on parts that are repeatedly assembled and disassembled where it might be advantageous to rethread oversize to recondition the thread portions of the parts in service.

Whenever a thread in the 8-, 12-, and 16-thread series also appears in the UNC, NC, UNF, NF, UNEF or NEF series the designations, tolerances, and limits of size of these standard series are applicable.

<sup>3</sup> The British designation for Unified sizes in this series is "UN8".



TABLE III.2.—*Unified and American, screw thread standard series*

Size	Basic major diameter	Threads per inch						Size
		Coarse (UNC or NC)	Fine * (UNF or NF)	Extra fine † (UNEF or NEF)	8-Thread series (N)	12-Thread series (UN or N)	16-Thread series (UN or N)	
0	0.0600		80					0
1	.0730	64	72					1
2	.0860	66	64					2
3	.0990	48	56					3
4	.1120	40	48					4
5	.1250	40	44					5
6	.1380	32	40					6
8	.1640	32	36					8
10	.1900	24	32					10
12	.2160	24	28	32				12
1 1/4	.2500	20	28	32				1 1/4
1 1/8	.3125	18	24	32				1 1/8
1 1/2	.3750	16	24	32				1 1/2
1 3/8	.4375	14	20	28				1 3/8
1 1/2	.5000	13	20	28		12		1 1/2
1 5/8	.5625	12	18	24		12		1 5/8
1 3/4	.6250	11	18	24		12		1 3/4
1 7/8	.6875			24		12		1 7/8
2	.7500	10	16	20		12	16	2
2 1/8	.8125			20		12	16	2 1/8
2 1/4	.8750	9	14	20		12	16	2 1/4
2 3/8	.9375			20		12	16	2 3/8
1	1.0000		14					1
1 1/8	1.0625	8	12	20	8	12	16	1 1/8
1 1/4	1.1250			18	8	12	16	1 1/4
1 1/2	1.1875	7	12	18	8	12	16	1 1/2
1 3/4	1.2500			18	8	12	16	1 3/4
1 5/8	1.3125	7	12	18	8	12	16	1 5/8
1 7/8	1.3750			18	8	12	16	1 7/8
2	1.4375	6	12	18	8	12	16	2
2 1/8	1.5000			18	8	12	16	2 1/8
2 1/4	1.5625	6	12	18	8	12	16	2 1/4
2 3/8	1.6250			18	8	12	16	2 3/8
2 1/2	1.6875			18	8	12	16	2 1/2
2 5/8	1.7500	5		16	8	12	16	2 5/8
2 3/4	1.8125				8	12	16	2 3/4
2 7/8	1.8750				8	12	16	2 7/8
3	1.9375					12	16	3
2	2.0000	4 1/2		16	8	12	16	2
2 1/8	2.0625				8	12	16	2 1/8
2 1/4	2.1250				8	12	16	2 1/4
2 3/8	2.1875				8	12	16	2 3/8
2 1/2	2.2500	4 1/2			8	12	16	2 1/2
2 5/8	2.3125					12	16	2 5/8
2 3/4	2.3750					12	16	2 3/4
2 7/8	2.4375					12	16	2 7/8
3	2.5000	4			8	12	16	3
3 1/8	2.5625					12	16	3 1/8
3 1/4	2.6250					12	16	3 1/4
3 3/8	2.6875					12	16	3 3/8
3 1/2	2.7500	4			8	12	16	3 1/2
3 5/8	2.8125					12	16	3 5/8
3 3/4	2.8750					12	16	3 3/4
4	3.0000	4			8	12	16	4
4 1/8	3.1250				8	12	16	4 1/8
4 1/4	3.2500				8	12	16	4 1/4
4 3/8	3.3750				8	12	16	4 3/8
4 1/2	3.5000	4			8	12	16	4 1/2
4 5/8	3.6250					12	16	4 5/8
4 3/4	3.7500					12	16	4 3/4
5	3.8750					12	16	5
5 1/8	4.0000				8	12	16	5 1/8
5 1/4	4.2500				8	12	16	5 1/4
5 3/8	4.5000				8	12	16	5 3/8
5 1/2	4.7500				8	12	16	5 1/2
6	5.0000				8	12	16	6

\* For diameters over 1 1/2 in., use 12-thread series.

† For diameters over 2 in., use 16-thread series.

‡ For series symbols applying to a particular thread, see table III.10. Where the same thread is in two series, use symbols as explained in par. 8, p. 14.

§ Designated 8 UNS in the British Standard.

• NS. Formerly a standard size of the fine thread series.

TABLE III.3.—Coarse thread series, basic dimensions  
UNC and NC

Designation			Basic major diameter, <i>D</i>	Basic pitch diameter, <i>E</i>	Minor diameter, external threads, <i>K<sub>e</sub></i>	Minor diameter, internal threads, <i>K<sub>i</sub></i>	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2h$	Tensile stress area $A_s$ $\left(\frac{E-3H}{2-16}\right)^2$
Size	Threads per inch, <i>n</i>	Thread symbol							
1	2	3	4	5	6	7	8	9	10
No. in.			in.	in.	in.	in.	deg min	in. <sup>2</sup>	in. <sup>2</sup>
1 (.073)	64	NC	0.0730	0.0620	0.0538	0.0501	4 31	0.00218	0.00263
2 (.086)	56	NC	.0860	.0744	.0641	.0607	4 22	.00310	.00370
3 (.099)	48	NC	.0990	.0855	.0734	.0704	4 26	.00406	.00487
4 (.112)	40	NC	.1120	.0958	.0813	.0784	4 45	.00496	.00604
5 (.125)	40	NC	.1250	.1088	.0943	.0909	4 11	.00672	.00796
6 (.138)	32	NC	.1380	.1177	.0997	.1042	4 50	.00746	.00909
8 (.164)	32	NC	.1640	.1437	.1257	.1302	3 58	.01196	.0140
10 (.190)	24	NC	.1900	.1629	.1389	.1449	4 39	.01450	.0175
12 (.216)	24	NC	.2160	.1889	.1649	.1709	4 1	.0206	.0242
1/4	20	UNC	.2500	.2175	.1887	.1959	4 11	.0269	.0318
5/16	18	UNC	.3125	.2764	.2443	.2524	3 40	.0454	.0524
3/8	16	UNC	.3750	.3344	.2983	.3073	3 24	.0678	.0775
7/16	14	UNC	.4375	.3911	.3499	.3602	3 20	.0933	.1063
1/2	13	UNC	.5000	.4500	.4056	.4167	3 7	.1257	.1419
9/16	12	UNC	.5625	.5084	.4603	.4723	2 59	.162	.182
5/8	11	UNC	.6250	.5660	.5135	.5266	2 56	.202	.226
3/4	10	UNC	.7500	.6850	.6273	.6417	2 40	.302	.334
7/8	9	UNC	.8750	.8028	.7387	.7547	2 31	.419	.462
1	8	UNC	1.0000	.9188	.8466	.8647	2 29	.551	.606
1 1/8	7	UNC	1.1250	1.0322	.9497	.9704	2 31	.693	.763
1 1/4	7	UNC	1.2500	1.1572	1.0747	1.0954	2 15	.890	.969
1 1/2	6	UNC	1.3750	1.2667	1.1705	1.1946	2 24	1.054	1.155
1 3/4	6	UNC	1.5000	1.3917	1.2955	1.3196	2 11	1.294	1.405
1 7/8	5	UNC	1.7500	1.6201	1.5046	1.5335	2 15	1.74	1.90
2	4 1/2	UNC	2.0000	1.8557	1.7274	1.7594	2 11	2.30	2.50
2 1/4	4 1/2	UNC	2.2500	2.1057	1.9774	2.0094	1 55	3.02	3.25
2 1/2	4	UNC	2.5000	2.3376	2.1933	2.2294	1 57	3.72	4.00
2 3/4	4	UNC	2.7500	2.5876	2.4433	2.4794	1 46	4.62	4.93
3	4	UNC	3.0000	2.8376	2.6933	2.7294	1 36	5.62	5.97
3 1/4	4	UNC	3.2500	3.0876	2.9433	2.9794	1 29	6.72	7.10
3 1/2	4	UNC	3.5000	3.3376	3.1933	3.2294	1 22	7.92	8.33
3 3/4	4	UNC	3.7500	3.5876	3.4433	3.4794	1 16	9.21	9.66
4	4	UNC	4.0000	3.8376	3.6933	3.7294	1 11	10.61	11.08

\* See formula under definition of tensile stress area in Section II, p. 5.

† For attaching purposes only, numbered sizes 2-56, 4-40, 6-32, 8-32, and 10-24 are now included in the Unified thread series, designation NC.

Bold type indicates Unified threads, UNC. See footnote b and table III.10.

TABLE III.4.—Fine thread series, basic dimensions  
UNF and NF

Designation			Basic major diameter, <i>D</i>	Basic pitch diameter, <i>E</i>	Minor diameter, external threads, <i>K<sub>e</sub></i>	Minor diameter, internal threads, <i>K<sub>i</sub></i>	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2h$	Tensile stress area $A_s$ $\left(\frac{E-3H}{2-16}\right)^2$
Size	Threads per inch, <i>n</i>	Thread symbol							
1	2	3	4	5	6	7	8	9	10
No. in.			in.	in.	in.	in.	deg min	in. <sup>2</sup>	in. <sup>2</sup>
0 (.060)	80	NF	0.0600	0.0519	0.0447	0.0465	4 23	0.00151	0.00180
1 (.073)	72	NF	.0730	.0640	.0560	.0580	3 57	.00237	.00278
2 (.086)	64	NF	.0860	.0769	.0668	.0691	3 45	.00339	.00394
3 (.099)	56	NF	.0990	.0874	.0771	.0797	3 43	.00451	.00523
4 (.112)	48	NF	.1120	.0985	.0864	.0894	3 51	.00606	.00661
5 (.125)	44	NF	.1250	.1102	.0971	.1004	3 45	.00716	.00830
6 (.138)	40	NF	.1380	.1218	.1073	.1109	3 44	.00874	.01015
8 (.164)	36	NF	.1640	.1460	.1280	.1330	3 28	.01285	.01474
10 (.190)	32	NF	.1900	.1697	.1517	.1562	3 21	.0175	.0200
12 (.216)	28	NF	.2160	.1928	.1722	.1773	3 22	.0226	.0258
1/4	28	UNF	.2500	.2268	.2062	.2113	2 52	.0326	.0364
5/16	24	UNF	.3125	.2854	.2614	.2674	2 40	.0524	.0590
3/8	24	UNF	.3750	.3479	.3239	.3299	2 11	.0809	.0878
7/16	20	UNF	.4375	.4050	.3762	.3834	2 15	.1090	.1187
1/2	20	UNF	.5000	.4675	.4387	.4459	1 57	.1486	.1599
9/16	18	UNF	.5625	.5264	.4943	.5024	1 55	.189	.203
5/8	18	UNF	.6250	.5889	.5568	.5649	1 43	.240	.256
3/4	16	UNF	.7500	.7094	.6733	.6823	1 36	.361	.373
7/8	14	UNF	.8750	.8286	.7874	.7977	1 34	.480	.509
1	12	UNF	1.0000	.9459	.8978	.9098	1 36	.625	.663
1 1/8	12	UNF	1.1250	1.0709	1.0228	1.0348	1 25	.812	.856
1 1/4	12	UNF	1.2500	1.1959	1.1478	1.1598	1 16	1.024	1.073
1 1/2	12	UNF	1.3750	1.3209	1.2728	1.2848	1 12	1.294	1.345
1 3/4	12	UNF	1.5000	1.4459	1.3978	1.4098	1 3	1.521	1.581

\* For sizes larger than 1 1/4 in., use the 12-thread series. See table III.7.

† See formula under definition of tensile stress area in Section II, p. 5.

‡ For attaching purposes only, numbered sizes 0-80 and 10-32 are now included in the Unified thread series, designation NF.

Bold type indicates Unified threads, UNF. See footnote c and table III.10.

TABLE III.5.—Extra-fine thread series, basic dimensions  
UNEF and NEF

Designation			Basic major diameter, <i>D</i>	Basic pitch diameter, <i>E</i>	Minor diameter, external threads, <i>K<sub>i</sub></i>	Minor diameter, internal threads, <i>K<sub>s</sub></i>	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2h_s$	Tensile stress area $A_t$ $\pi \left( \frac{E-3H}{2} \right)^2$
Size <sup>a</sup>	Threads per inch, <i>n</i>	Thread symbol							
1	2	3	4	5	6	7	8	9	10
No. 12			in.	in.	in.	in.	deg min	in. <sup>2</sup>	in. <sup>2</sup>
$\frac{1}{16}$	32	NEF	0.2160	0.1957	0.1777	0.1822	2 55	0.0242	0.0270
$\frac{1}{8}$	32	NEF	.2500	.2207	.2117	.2162	2 29	.0344	.0379
$\frac{3}{16}$	32	NEF	.3125	.2922	.2742	.2787	1 57	.0581	.0625
$\frac{1}{4}$	32	NEF	.3750	.3547	.3367	.3412	1 36	.0878	.0932
$\frac{7}{16}$	28	UNEF	.4375	.4143	.3937	.3988	1 34	.1201	.1274
$\frac{1}{2}$	28	UNEF	.5000	.4768	.4562	.4613	1 22	.162	.170
$\frac{9}{16}$	24	NEF	.5625	.5354	.5114	.5174	1 25	.203	.214
$\frac{5}{8}$	24	NEF	.6250	.5979	.5730	.5790	1 16	.256	.268
$\frac{11}{16}$	24	NEF	.6875	.6604	.6364	.6424	1 9	.315	.329
$\frac{3}{4}$	20	UNEF	.7500	.7175	.6887	.6959	1 16	.369	.386
$\frac{13}{16}$	20	UNEF	.8125	.7800	.7512	.7584	1 10	.439	.458
$\frac{7}{8}$	20	UNEF	.8750	.8425	.8137	.8209	1 5	.515	.536
$\frac{15}{16}$	20	UNEF	.9375	.9050	.8762	.8834	1 0	.598	.620
1	20	UNEF	1.0000	.9675	.9387	.9459	6 57	.687	.711
$1\frac{1}{16}$	18	NEF	1.0625	1.0261	.9943	1.0024	0 59	.770	.799
$1\frac{1}{8}$	18	NEF	1.1250	1.0889	1.0568	1.0649	0 56	.871	.901
$1\frac{1}{4}$	18	NEF	1.1875	1.1514	1.1193	1.1274	0 53	.977	1.008
$1\frac{1}{2}$	18	NEF	1.2500	1.2130	1.1818	1.1899	0 50	1.090	1.123
$1\frac{3}{8}$	18	NEF	1.3125	1.2764	1.2443	1.2524	0 48	1.208	1.244
$1\frac{5}{8}$	18	NEF	1.3750	1.3389	1.3068	1.3149	0 45	1.333	1.370
$1\frac{7}{8}$	18	NEF	1.4375	1.4014	1.3693	1.3774	0 43	1.464	1.503
$1\frac{9}{8}$	18	NEF	1.5000	1.4639	1.4318	1.4399	0 42	1.60	1.64
$1\frac{11}{8}$	18	NEF	1.5625	1.5264	1.4943	1.5024	0 40	1.74	1.79
$1\frac{13}{8}$	18	NEF	1.6250	1.5889	1.5568	1.5649	0 38	1.89	1.94
$1\frac{15}{8}$	18	NEF	1.6875	1.6514	1.6193	1.6274	0 37	2.05	2.10
$1\frac{7}{4}$	16	UNEF	1.7500	1.7094	1.6733	1.6823	0 40	2.19	2.24
2	16	UNEF	2.0000	1.9594	1.9233	1.9323	0 35	2.89	2.95

<sup>a</sup> For sizes larger than 2 in., use 16-thread series. See table III. 8.<sup>b</sup> See formula under definition of tensile stress area in section II, p. 5.

Bold type indicates Unified threads, UNEF. See table III. 10.

TABLE III.6.—8-thread series, basic dimensions  
8UN and 8N <sup>b</sup>

Designation			Basic major diameter, <i>D</i>	Basic pitch diameter, <i>E</i>	Minor diameter, external threads, <i>K<sub>i</sub></i>	Minor diameter, internal threads, <i>K<sub>s</sub></i>	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2h_s$	Tensile stress area $A_t$ $\pi \left( \frac{E-3H}{2} \right)^2$
Size	Threads per inch, <i>n</i>	Thread symbol							
1	2	3	4	5	6	7	8	9	10
in.			in.	in.	in.	in.	deg min	in. <sup>2</sup>	in. <sup>2</sup>
$\frac{1}{16}$	8	UNC	1.0000	0.9188	0.8466	0.8647	2 29	0.551	0.606
$\frac{1}{8}$	8	N	1.1250	1.0438	.9716	.9897	2 11	.728	.790
$\frac{1}{4}$	8	N	1.2500	1.1688	1.0966	1.1147	1 57	.929	1.000
$\frac{1}{2}$	8	N, UNS	1.3750	1.2938	1.2216	1.2397	1 46	1.155	1.233
$\frac{1}{2}$	8	N, UNS	1.5000	1.4188	1.3466	1.3647	1 36	1.495	1.492
$\frac{1}{2}$	8	N, UNS	1.6250	1.5438	1.4716	1.4897	1 29	1.68	1.78
$\frac{1}{2}$	8	N, UNS	1.7500	1.6688	1.5966	1.6147	1 22	1.98	2.08
$\frac{1}{2}$	8	N, UNS	1.8750	1.7938	1.7216	1.7397	1 16	2.30	2.41
2	8	N, UNS	2.0000	1.9188	1.8466	1.8647	1 11	2.65	2.77
$2\frac{1}{8}$	8	N, UNS	2.1250	2.0438	1.9716	1.9897	1 7	3.03	3.15
$2\frac{1}{4}$	8	N, UNS	2.2500	2.1688	2.0966	2.1147	1 3	3.42	3.56
$2\frac{1}{2}$	8	N, UNS	2.3750	2.2938	2.2216	2.2397	0 57	4.29	4.44
$2\frac{3}{4}$	8	N, UNS	2.5000	2.4188	2.3466	2.3647	0 51	5.26	5.43
3	8	N, UNS	3.0000	2.9188	2.8466	2.8647	0 47	6.32	6.51
$3\frac{1}{4}$	8	N, UNS	3.2500	3.1688	3.0966	3.1147	0 43	7.49	7.69
$3\frac{1}{2}$	8	N, UNS	3.5000	3.4188	3.3466	3.3647	0 40	8.75	8.96
$3\frac{3}{4}$	8	N, UNS	3.7500	3.6688	3.5966	3.6147	0 37	10.11	10.34
4	8	N, UNS	4.0000	3.9188	3.8466	3.8647	0 35	11.57	11.81
$4\frac{1}{4}$	8	N, UNS	4.2500	4.1688	4.0966	4.1147	0 33	13.12	13.38
$4\frac{1}{2}$	8	N, UNS	4.5000	4.4188	4.3466	4.3647	0 31	14.78	15.06
$4\frac{3}{4}$	8	N, UNS	4.7500	4.6688	4.5966	4.6147	0 29	16.53	16.82
5	8	N, UNS	5.0000	4.9188	4.8466	4.8647	0 28	18.38	18.69
$5\frac{1}{4}$	8	N, UNS	5.2500	5.1688	5.0966	5.1147	0 26	20.33	20.66
$5\frac{1}{2}$	8	N, UNS	5.5000	5.4188	5.3466	5.3647	0 25	22.38	22.72
$5\frac{3}{4}$	8	N, UNS	5.7500	5.6688	5.5966	5.6147	0 24	24.52	24.88
6	8	N, UNS	6.0000	5.9188	5.8466	5.8647	0 23	26.76	27.14

<sup>a</sup> The 1"-8 size is in the coarse thread series, table III. 3, p. 16.<sup>b</sup> The 8N specified limits for all sizes are shown in table III. 6 in light type, based on a length of engagement equal to the basic major (nominal) diameter. For special applications, where tolerances based on a length of engagement of 9 threads are more suitable than those of the standard 8 thread series (8N), the 8UNS limits for all sizes larger than 1 1/4 in. may be derived from the tables in section IV. The 1 1/8 and 1 1/4 in. sizes are in table III. 10 and designated N, as the 1 diameter and 8 thread engagements are substantially equal.<sup>c</sup> See formula under definition of tensile stress area in section II, p. 5.

Bold type indicates Unified threads, UNS.

TABLE III.7.—12-thread series, basic dimensions  
12UN and 12N

Designation			Basic major diameter, $D$	Basic pitch diameter, $E$	Minor diameter, external threads, $K_e$	Minor diameter, internal threads, $K_i$	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2a_s$	Tensile stress area $A_s$ $\pi \left( \frac{E}{2} - \frac{3T}{16} \right)^2$
Size	Threads per inch, $n$	Thread symbol							
1	2	3	4	5	6	7	8	9	10
$\frac{1}{16}$	12	N	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$deg$ $min$	$in.^2$	$in.^2$
$\frac{1}{8}$	12	UNC	0.5000	0.4459	0.3978	0.4098	3 24	0.121	0.138
$\frac{3}{16}$	12	N	.5625	.5084	.4603	.4723	2 59	.162	.182
$\frac{1}{2}$	12	N	.6250	.5709	.5228	.5348	2 40	.210	.232
$\frac{5}{8}$	12	N	.6875	.6334	.5853	.5973	2 24	.264	.289
$\frac{3}{4}$	12	N	.7500	.6959	.6478	.6598	2 11	.323	.351
$1\frac{1}{16}$	12	N	.8125	.7584	.7103	.7223	2 0	.390	.420
$\frac{7}{8}$	12	N	.8750	.8209	.7728	.7848	1 51	.462	.495
$1\frac{1}{8}$	12	UN	.9375	.8834	.8353	.8473	1 43	.540	.570
$\frac{1}{2}$	12	UNF	1.0000	.9459	.8978	.9098	1 36	.625	.663
$1\frac{1}{16}$	12	UN	1.0625	1.0084	.9603	.9723	1 30	.715	.756
$\frac{3}{4}$	12	UNF	1.1250	1.0709	1.0228	1.0348	1 25	.812	.856
$1\frac{1}{8}$	12	UN	1.1875	1.1334	1.0853	1.0973	1 20	.915	.961
$\frac{1}{2}$	12	UNF	1.2500	1.1959	1.1478	1.1598	1 16	1.024	1.073
$1\frac{1}{16}$	12	UN	1.3125	1.2584	1.2103	1.2223	1 12	1.135	1.191
$\frac{3}{4}$	12	UNF	1.3750	1.3209	1.2728	1.2848	1 9	1.260	1.315
$1\frac{1}{8}$	12	UN	1.4375	1.3834	1.3353	1.3473	1 6	1.388	1.445
$\frac{1}{2}$	12	UNF	1.5000	1.4459	1.3978	1.4098	1 3	1.52	1.58
$1\frac{1}{8}$	12	UN	1.5625	1.5084	1.4603	1.4723	0 58	1.81	1.87
$\frac{3}{4}$	12	UN	1.6250	1.5709	1.5228	1.5348	0 54	2.12	2.19
$1\frac{1}{8}$	12	UN	1.6875	1.6334	1.5853	1.5973	0 50	2.45	2.53
2	12	UN	2.0000	1.9459	1.8978	1.9098	0 47	2.81	2.89
$2\frac{1}{16}$	12	UN	2.1250	2.0709	2.0228	2.0348	0 44	3.19	3.28
$2\frac{1}{8}$	12	UN	2.2500	2.1959	2.1478	2.1598	0 42	3.60	3.69
$2\frac{1}{4}$	12	UN	2.3750	2.3209	2.2728	2.2848	0 39	4.04	4.13
$2\frac{1}{2}$	12	UN	2.5000	2.4459	2.3978	2.4098	0 37	4.49	4.60
$2\frac{3}{8}$	12	UN	2.6250	2.5709	2.5228	2.5348	0 35	4.97	5.08
$2\frac{1}{2}$	12	UN	2.7500	2.6959	2.6478	2.6598	0 34	5.46	5.59
$2\frac{3}{4}$	12	UN	2.8750	2.8209	2.7728	2.7848	0 32	6.01	6.13
3	12	UN	3.0000	2.9459	2.8978	2.9098	0 31	6.57	6.69
$3\frac{1}{16}$	12	UN	3.1250	3.0709	3.0228	3.0348	0 30	7.15	7.28
$3\frac{1}{8}$	12	UN	3.2500	3.1959	3.1478	3.1598	0 29	7.75	7.89
$3\frac{1}{4}$	12	UN	3.3750	3.3209	3.2728	3.2848	0 27	8.38	8.52
$3\frac{1}{2}$	12	UN	3.5000	3.4459	3.3978	3.4098	0 26	9.03	9.18
$3\frac{3}{8}$	12	UN	3.6250	3.5709	3.5228	3.5348	0 26	9.71	9.86
$3\frac{1}{2}$	12	UN	3.7500	3.6959	3.6478	3.6598	0 25	10.42	10.57
$3\frac{3}{4}$	12	UN	3.8750	3.8209	3.7728	3.7848	0 24	11.14	11.30
4	12	UN	4.0000	3.9459	3.8978	3.9098	0 23	11.90	12.06
$4\frac{1}{16}$	12	UN	4.1250	4.0709	4.0228	4.0348	0 22	12.71	12.87
$4\frac{1}{8}$	12	UN	4.2500	4.1959	4.1478	4.1598	0 21	13.54	13.71
$4\frac{1}{4}$	12	UN	4.3750	4.3209	4.2728	4.2848	0 20	14.40	14.57
5	12	UN	5.0000	4.9459	4.8978	4.9098	0 18	18.8	19.0
$5\frac{1}{16}$	12	UN	5.1250	5.0709	5.0228	5.0348	0 18	20.8	21.0
$5\frac{1}{8}$	12	UN	5.2500	5.1959	5.1478	5.1598	0 17	22.8	23.1
$5\frac{1}{4}$	12	UN	5.3750	5.3209	5.2728	5.2848	0 16	25.0	25.2
6	12	UN	6.0000	5.9459	5.8978	5.9098	0 15	27.3	27.5

\* These are standard sizes of the UNC or UNF series.

\* See formula under definition of tensile stress area in section II, p. 5.

† Bold type indicates Unified threads, UN. See table III.10.

9. HIGH-TEMPERATURE, HIGH-STRENGTH APPLICATIONS.—For these applications the coarse-thread series is recommended in sizes from  $\frac{1}{4}$  to 1 in. and the 8-thread series in sizes over 1 in. Limits of size are given in table III.10. Some high-temperature applications involving special physical characteristics or conditions may require modification of dimensions, and it is recommended that when such are necessary, they be applied to the external thread. See par. (b) 2, p. 23.

#### 4. CLASSIFICATION AND TOLERANCES

##### (a) GENERAL

1. THREAD CLASSES.—Thread classes are distinguished from each other by the amounts of tolerance and allowance. There are established for general use six distinct classes of screw-thread tolerances and allowances. These classes, together with the accompanying specifications, are for the purpose of assuring the interchangeable

TABLE III.8.—16-thread series, basic dimensions  
16UN and 16N

Designation			Basic major diameter, $D$	Basic pitch diameter, $E$	Minor diameter, external threads, $K_e$	Minor diameter, internal threads, $K_i$	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2a_1$	Tensile stress area $A_t$ $\left(\frac{E}{2} - \frac{3H}{16}\right)^2$
Size	Threads per inch, $n$	Thread symbol							
1	2	3	4	5	6	7	8	9	10
<i>in.</i>			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>deg</i> <i>min</i>	<i>in.</i> <sup>2</sup>	<i>in.</i> <sup>2</sup>
<b><math>\frac{3}{16}</math></b>	16	UNF	0.7500	0.7094	0.6733	0.6823	1 36	0.351	0.373
<b><math>\frac{13}{16}</math></b>	16	UN	.8125	.7719	.7358	.7448	1 29	.420	.444
<b><math>\frac{7}{8}</math></b>	16	UN	.8750	.8344	.7983	.8073	1 22	.495	.521
<b><math>\frac{15}{16}</math></b>	16	UN	.9375	.8969	.8608	.8698	1 16	.576	.604
<b>1</b>	16	UN	1.0000	.9594	.9233	.9323	1 11	.663	.693
<b>1 1/16</b>	16	UN	1.0625	1.0219	.9858	.9948	1 7	.750	.780
<b>1 1/8</b>	16	UN	1.1250	1.0844	1.0483	1.0573	1 3	.836	.880
<b>1 3/16</b>	16	UN	1.1875	1.1469	1.1108	1.1198	1 0	.961	.997
<b>1 1/2</b>	16	UN	1.2500	1.2094	1.1733	1.1823	0 57	1.073	1.111
<b>1 5/16</b>	16	UN	1.3125	1.2719	1.2358	1.2448	0 54	1.191	1.230
<b>1 3/8</b>	16	UN	1.3750	1.3344	1.2983	1.3073	0 51	1.315	1.356
<b>1 7/16</b>	16	UN	1.4375	1.3969	1.3608	1.3698	0 49	1.445	1.488
<b>1 1/2</b>	16	UN	1.5000	1.4594	1.4233	1.4323	0 47	1.58	1.63
<b>1 9/16</b>	16	N	1.5625	1.5219	1.4858	1.4948	0 45	1.72	1.77
<b>1 5/8</b>	16	UN	1.6250	1.5844	1.5483	1.5573	0 43	1.87	1.92
<b>1 11/16</b>	16	N	1.6875	1.6469	1.6108	1.6198	0 42	2.03	2.08
<b>1 3/4</b>	16	UNEF	1.7500	1.7094	1.6733	1.6823	0 40	2.19	2.24
<b>1 13/16</b>	16	N	1.8125	1.7719	1.7358	1.7448	0 39	2.35	2.41
<b>1 7/8</b>	16	UN	1.8750	1.8344	1.7983	1.8073	0 37	2.51	2.58
<b>1 15/16</b>	16	N	1.9375	1.8969	1.8608	1.8698	0 36	2.71	2.77
<b>2</b>	16	UNEF	2.0000	1.9594	1.9233	1.9323	0 35	2.89	2.95
<b>2 1/16</b>	16	N	2.0625	2.0219	1.9858	1.9948	0 34	3.08	3.15
<b>2 1/8</b>	16	UN	2.1250	2.0844	2.0483	2.0573	0 33	3.24	3.35
<b>2 1/4</b>	16	N	2.1875	2.1469	2.1108	2.1198	0 32	3.48	3.55
<b>2 1/2</b>	16	UN	2.2500	2.2094	2.1733	2.1823	0 31	3.69	3.76
<b>2 3/16</b>	16	N	2.3125	2.2719	2.2358	2.2448	0 30	3.91	3.98
<b>2 1/8</b>	16	UN	2.3750	2.3344	2.2983	2.3073	0 29	4.12	4.21
<b>2 5/16</b>	16	N	2.4375	2.3969	2.3608	2.3698	0 29	4.36	4.44
<b>2 1/2</b>	16	UN	2.5000	2.4594	2.4233	2.4323	0 28	4.64	4.67
<b>2 3/8</b>	16	UN	2.6250	2.5844	2.5483	2.5573	0 26	5.00	5.16
<b>2 1/4</b>	16	UN	2.7500	2.7094	2.6733	2.6823	0 25	5.39	5.68
<b>2 3/4</b>	16	UN	2.8750	2.8344	2.7983	2.8073	0 24	6.13	6.22
<b>3</b>	16	UN	3.0000	2.9594	2.9233	2.9323	0 23	6.69	6.78
<b>3 1/16</b>	16	UN	3.1250	3.0844	3.0483	3.0573	0 22	7.28	7.37
<b>3 1/8</b>	16	UN	3.2500	3.2094	3.1733	3.1823	0 21	7.89	7.99
<b>3 1/4</b>	16	UN	3.3750	3.3344	3.2983	3.3073	0 21	8.52	8.63
<b>3 1/2</b>	16	UN	3.5000	3.4594	3.4233	3.4323	0 20	9.18	9.29
<b>3 3/8</b>	16	UN	3.6250	3.5844	3.5483	3.5573	0 19	9.86	9.98
<b>3 1/4</b>	16	UN	3.7500	3.7094	3.6733	3.6823	0 18	10.57	10.69
<b>3 3/4</b>	16	UN	3.8750	3.8344	3.7983	3.8073	0 18	11.30	11.43
<b>4</b>	16	UN	4.0000	3.9594	3.9233	3.9323	0 17	12.06	12.19
<b>4 1/16</b>	16	UN	4.1250	4.0844	4.0483	4.0573	0 16	13.65	13.78
<b>4 1/8</b>	16	UN	4.2500	4.2094	4.1733	4.1823	0 15	15.34	15.5
<b>4 1/4</b>	16	UN	4.3750	4.3344	4.2983	4.3073	0 15	17.1	17.3
<b>5</b>	16	UN	5.0000	4.9594	4.9233	4.9323	0 14	19.6	19.8
<b>5 1/4</b>	16	UN	5.2500	5.2094	5.1733	5.1823	0 13	21.0	21.1
<b>5 1/2</b>	16	UN	5.5000	5.4594	5.4233	5.4323	0 13	23.1	23.2
<b>5 3/4</b>	16	UN	5.7500	5.7094	5.6733	5.6823	0 12	25.2	25.4
<b>6</b>	16	UN	6.0000	5.9594	5.9233	5.9323	0 11	27.5	27.7

\*These are standard sizes of the UNF or UNEF series.

<sup>†</sup> See formula under definition of tensile stress area in section II, p. 6.

**Bold type indicates Unified threads, UN.** See table III.10.

manufacture of screw-thread parts. This standard includes classes 1A, 2A, and 3A, applied to external threads only, and classes 1B, 2B, and 3B applied to internal threads only. The requirements for a screw-thread fit for specific applications can be met by specifying the proper combination of classes for the components. For example, an external thread made to class 2A limits can be used with tapped holes made to classes 1B, 2B, or 3B limits for specific applications. It is not the purpose of this standard to limit applications of the various standard classes.

2. UNIFORM MINIMUM INTERNAL THREAD.  
The minimum major, pitch, and minor diameters

of the internal thread are respectively the same for classes 1B, 2B, and 3B.

### 3. DIRECTION AND SCOPE OF TOLERANCES.—

(a) The tolerance on the internal thread is plus, and is applied from the basic size to above basic size.

(b) The tolerance on the external thread is minus, and is applied from the maximum (or design) size to below the maximum size.

(c) The tolerances specified represent the extreme variations permitted on the product.

4. BASIC FORMULA FOR ALLOWANCES AND TOLERANCES.—Classes identified by a numeral fol-



TABLE III.9.—Increments in pitch-diameter tolerance formula<sup>1</sup>

$$(PD \text{ tolerance} = C(0.0015 \sqrt[3]{D} + 0.0015 \sqrt{L_e} + 0.015 \sqrt[3]{p})$$

Diameter, $D$				Length of engagement, $L_e$														
$D$	$0.0015 \sqrt[3]{D}$	$D$	$0.0015 \sqrt[3]{D}$	Based on			$L_e$	$0.0015 \times \sqrt{L_e}$	Based on			$L_e$	$0.0015 \times \sqrt{L_e}$	Based on			$L_e$	$0.0015 \times \sqrt{L_e}$
				1 $D$ for sizes	9 $p$ for tpi	20 $p$ for tpi			1 $D$ for sizes	9 $p$ for tpi	20 $p$ for tpi			1 $D$ for sizes	9 $p$ for tpi	20 $p$ for tpi		
in.	in.	in.	in.				in.	in.				in.	in.				in.	in.
0.1500	0.000861	1.9375	0.001870	#0			0.0600	0.000367	3/16			0.4375	0.000992				3.1250	0.002656
0.0625	0.000595	2.0000	0.001890				0.0625	0.000375		20		0.4500	0.001006			3 3/4	3.2500	0.002706
0.0750	0.000627	2.0625	0.001909	#1			0.0730	0.000405			44	0.4545	0.001011				3.3333	0.002732
0.0800	0.000632	2.1250	0.001928				0.0781	0.000419	3/8	18	40	0.5000	0.001061				3.3750	0.002754
0.0938	0.000682	2.1875	0.001947	#2			0.0800	0.000440			36	0.5556	0.001118			3 1/2	3.5000	0.002809
0.0990	0.000694	2.2500	0.001966				0.0938	0.000459	9/16	16		0.5625	0.001125				3.6250	0.002856
0.1120	0.000723	2.3125	0.001984	#3			0.0900	0.000472	5/8		32	0.6250	0.001186			3 3/4	3.7500	0.002905
0.1250	0.000750	2.3750	0.002001				1.1094	0.000495		14		0.6429	0.001203				3.8750	0.002953
0.1380	0.000775	2.4375	0.002019	#4			1.1200	0.00502			28	0.6875	0.001234			4	4.0000	0.003000
0.1640	0.000821	2.5000	0.002036			80	1.125	0.00505				0.7143	0.001268				4.1250	0.003047
0.1875	0.000859	2.6250	0.002060	#5		72	1.250	0.00530			27	0.7407	0.001291			4 1/4	4.2500	0.003092
0.1900	0.000862	2.7500	0.002102	#6			1.380	0.00557	3/4	12		0.7509	0.001299				4.3750	0.003137
0.2160	0.000900	2.8750	0.002133			64	1.406	0.00562			24	0.8125	0.001352			4 1/2	4.5000	0.003182
0.2500	0.000945	3.0000	0.002153				1.563	0.00593				0.8333	0.001369				4.6250	0.003226
0.3125	0.001018	3.1250	0.002193			56	1.607	0.00601	7/8			0.8750	0.001403			4 3/4	4.7500	0.003269
0.3750	0.001082	3.2500	0.002222	#8			1.640	0.00607		10		0.9000	0.001423				4.8750	0.003312
0.4375	0.001139	3.3750	0.002250				1.719	0.00622				0.9375	0.001452			5	5.0000	0.003354
0.5000	0.001191	3.5000	0.002277			48	1.875	0.00650	1	9	20	1.0000	0.001506				5.1250	0.003396
0.5625	0.001238	3.6250	0.002304	#10			1.900	0.00654				1.0625	0.001546			5 1/4	5.2500	0.003437
0.6250	0.001282	3.7500	0.002330				2.031	0.00676			18	1.1111	0.001581				5.3750	0.003478
0.6875	0.001324	3.8750	0.002356			44	2.045	0.00678	1 1/8	8		1.1250	0.001591			5 1/2	5.5000	0.003518
0.7500	0.001353	4.0000	0.002481	#12			2.150	0.00697				1.1875	0.001635				5.6250	0.003558
0.8125	0.001400	4.2500	0.002430				2.188	0.00702	1 1/4		16	1.2500	0.001677			5 3/4	5.7500	0.003597
0.8750	0.001435	4.5000	0.002476			40	2.250	0.00712				1.3125	0.001718				5.8750	0.003636
0.9375	0.001468	4.7500	0.002521				2.344	0.00726	1 3/8			1.3750	0.001759			6	6.0000	0.003674
1.0000	0.001500	5.0000	0.002565	3/4	36	80	2.500	0.00750			14	1.4286	0.001793				6.5000	0.003824
1.0625	0.001531	5.2500	0.002607				2.656	0.00773				1.4375	0.001798				7.0000	0.003969
1.1250	0.001560	5.5000	0.002648			72	2.776	0.00791	1 1/2	6		1.5000	0.001837				7.5000	0.004108
1.1875	0.001588	5.7500	0.002687			32	2.812	0.00795	1 5/8			1.6250	0.001912				8.0000	0.004243
1.2500	0.001616	6.0000	0.002726				2.960	0.00817			12	1.6667	0.001930				8.5000	0.004372
1.3125	0.001642	7.0000	0.002809	5/6		64	3.125	0.00839	1 3/4			1.7500	0.001984				9.0000	0.004500
1.3750	0.001678	8.0000	0.003000			28	3.214	0.00850	1 7/8			1.8750	0.002054				9.5000	0.004623
1.4375	0.001693	9.0000	0.003120				3.281	0.00859	2	4 1/2	10	2.0000	0.002121				10.0000	0.004743
1.5000	0.001717	10.0000	0.003232			27	3.343	0.00866	2 1/8			2.1250	0.002187				10.5000	0.004861
1.5625	0.001741	12.0000	0.003434				3.438	0.00880	2 1/4	4		2.2500	0.002250				11.0000	0.004975
1.6250	0.001764	14.0000	0.003615			56	3.571	0.00896				2.3750	0.002312				11.5000	0.005087
1.6875	0.001786	16.0000	0.003780				3.694	0.00909	2 3/8		8	2.5000	0.002372				12.0000	0.005196
1.7500	0.001808	18.0000	0.003931	3/8	24		3.750	0.00919				2.6250	0.002430					
1.8125	0.001829	20.0000	0.004072				3.906	0.00937	2 3/4			2.7500	0.002487					
1.8750	0.001850	24.0000	0.004327				4.063	0.00956				2.8750	0.002543					
						48	4.167	0.00968		3		3.0000	0.002598					
							4.219	0.00974										

Pitch,  $p$ 

Threads per inch	$0.015 \sqrt[3]{p}$	Threads per inch	$0.015 \sqrt[3]{p}$	Threads per inch	$0.015 \sqrt[3]{p}$	Threads per inch	$0.015 \sqrt[3]{p}$	Threads per inch	$0.015 \sqrt[3]{p}$	Threads per inch	$0.015 \sqrt[3]{p}$	Threads per inch	$0.015 \sqrt[3]{p}$	Threads per inch	$0.015 \sqrt[3]{p}$
80	0.002908	50	0.001105	36	0.001376	27	0.001667	18	0.002184	11 1/2	0.002844	7	0.004099		
72	0.002867	48	0.001136	34	0.001429	26	0.001709	16	0.002362	11	0.003033	6	0.004543		
64	0.002838	44	0.001204	32	0.001488	24	0.001803	14	0.002582	10	0.003232	5 1/2	0.004814		
60	0.002879	42	0.001241	30	0.001554	22	0.001910	13	0.002713	9	0.003467	5	0.004130		
56	0.002925	40	0.001292	28	0.001627	20	0.002036	12	0.002862	8	0.003750	4 1/2	0.005503		

<sup>1</sup> For class 2A,  $C=1$ . For other classes, values of  $C$  are given in the text, pp. 21 and 22.

lowed by the letters A and B are derived from Unified formulas in which the pitch diameter tolerances are based on increments of the basic major (nominal) diameter, the pitch, and the length of engagement. These formulas and the class designations apply to all of the threads specified in section III.

The basic formula, from which allowances on all diameters and tolerances on pitch diameter are derived, is:

$$\text{Tolerance (or allowance)} = C(0.0015 \sqrt[3]{D} + 0.0015 \sqrt{L_e} + 0.015 \sqrt[3]{p}),$$

where

$C$ —a factor which differs for the allowance or tolerance for each class

$D$ —basic major diameter

$L_e$ —length of engagement

$p$ —pitch.

This formula is based on the accuracy of present-day threading practice, and is applicable to all reasonable combinations of diameter, pitch, and length of engagement. Numerical values of the increments in the formula for standard diameters, pitches, and lengths of engagement are given in table III. 9.

5. ALLOWANCES.—Allowances are applied only to external threads. The values of the factor  $C$  (par. 4 above) for allowances are as follows:

Class	Factor $C$
1A	0.300
2A	.300
3A	.000

6. MAJOR DIAMETER TOLERANCES.—(a) *External threads*.—The tolerance on major diameter for class 1A is equal to  $0.090 \sqrt[3]{p^3}$  and for classes 2A and 3A is equal to  $0.060 \sqrt[3]{p^2}$ . Tolerances equal to  $0.090 \sqrt[3]{p^2}$  are provided for class 2A coarse and 8-thread series threads of unfinished, hot-rolled material.

(b) *Internal threads*.—The tolerance on major diameter of internal threads is equal to  $H/6$  plus the pitch diameter tolerance of the class of thread involved. The maximum major diameter of the internal thread may be determined by adding  $0.7939p (=11H/12, \text{ table III.1})$  to the maximum pitch diameter of the internal thread. In dimensioning internal threads the maximum major diameter is not specified, being established by the crest of an unworn tool. In practice, the major diameter of an internal thread is satisfactory when accepted by a gage or gaging method that represents the maximum material condition of an external thread which has no allowance.

7. MINOR DIAMETER TOLERANCES.—(a) *External threads*.—The tolerance on minor diameter of external threads is for reference only. At the nominal minor diameter, that is at the intersection of the rounded root with its center line (see fig. III.1) it equals the pitch diameter tolerance plus  $H/12$  and applies only where the rounded root is a requirement of the design. Otherwise the tolerance shall be  $H/4$  plus the pitch diameter tolerance. The minimum minor diameter of the external thread may be determined by subtracting  $0.6495p (=3H/4, \text{ table III.1})$  from the minimum pitch diameter of the external thread. In dimensioning external threads the minimum minor diameter is not specified, being established by the crest of an unworn tool. In practice, the minor diameter of an external thread is satisfactory when accepted by a gage or gaging method that represents the maximum material condition of the internal thread less the allowance, if any.

(b) *Internal threads*.—Internal thread minor diameter tolerances specified in the dimensional tables are based on the use of materials of equal tensile strength for screw or bolt and nut or tapped hole and a length of engagement equal to the nominal diameter. See p. 5. For general applications these tolerances are suitable for lengths of engagement up to  $1\frac{1}{2}$  diameters. They are based on formulas as follows:

Classes 1B and 2B:

All thread series in sizes less than  $\frac{1}{4}$  inch, tolerance  $= [0.05 \sqrt[3]{p^3} + 0.03p/D] - 0.002$  in., within the following limitations:

Tolerances shall not be greater than  $0.394p$ . (This corresponds to 53 percent of the basic thread height and applies in the range of the smallest number sizes of the NC and NF thread series.)

Tolerances shall not be less than  $0.25p - 0.4p^2$ . (This corresponds to a thread height of 65 percent for 80 to 24 threads per inch.)

The formulas are suitable for general applications having lengths of engagement up to  $1\frac{1}{2} D$ . However, some thread applications require lengths of engagement which are greater than  $1\frac{1}{2} D$  or less than  $D$ . For such applications it may be advantageous to increase or decrease tolerances, respectively, as explained in section IV or to use recommended hole size limits for different lengths of engagement, appendix 3, table 3.1, p. 187.

All thread series  $\frac{1}{4}$  in. and larger,<sup>4</sup> tolerance  $= 0.25p - 0.4p^2$ .

(This corresponds to a thread height of 64.5 percent for 32 threads per inch graduating to 71.8 percent for 4 threads per inch.)

Class 3B, all thread series:

Tolerance  $= 0.05 \sqrt[3]{p^3} + 0.03p/D - 0.002$  in., within the following limitations:

Tolerance shall not be greater than  $0.394p$ . (This corresponds to 53 percent of the basic thread height and applies in the range of the smallest numbered sizes of the UNC, UNF, NC, and NF thread series.)

Tolerance shall not be less than:

For 80 to 13 threads per inch, inclusive,  $0.23p - 1.5p^2$ . (This corresponds to a thread height of 67 percent for 80 threads per inch, graduating to 74 percent for 13 threads per inch.)

For 12 threads per inch and coarser,  $0.120p$ . (This corresponds to a thread height of 74 percent and is the tolerance for all sizes, 12 threads and coarser and 1 in. and larger.)

The formulas are suitable for general applications having lengths of engagement up to  $1\frac{1}{2} D$ . However, some thread applications require lengths of engagement which are greater than  $1\frac{1}{2} D$  or less than  $D$ . For such applications it may be advantageous to increase or decrease tolerances, respectively, as explained in section IV or to use recommended hole size limits for different lengths of engagement, appendix 3, table 3.2, p. 190.

8. PITCH DIAMETER<sup>5</sup> TOLERANCES.—(a) *Values of factor  $C$* .—The values of the factor  $C$  (par. 4

<sup>4</sup> The formula is not applicable to threads coarser than 4 tpi. For such threads use tolerance  $= 0.15p$ .

<sup>5</sup> The British designation for "pitch diameter" is "effective diameter."



above) for pitch diameter tolerances are as follows:

Class	Factor <i>C</i>
1A	1.500
1B	1.950
2A	1.000
2B	1.300
3A	0.750
3B	.975

It will be noted that the factor *C* is 30 percent greater for internal than for external threads of a given class number on account of the relative difficulties of manufacture.

(b) *Length of engagement*.—The tolerances on pitch diameter, and the allowances on all diameters, for the coarse-, fine-, and 8-thread series are based on a length of engagement equal to the basic major (nominal) diameter and are applicable to lengths of engagement up to  $1\frac{1}{2}$  diameters. For the extra-fine-, 12-, and 16-thread series they are based on a length of engagement of 9 pitches and are applicable to lengths of engagement from 5 to 15 pitches. Where the length of engagement exceeds that for which the tolerances are applicable, tolerances and allowances should be obtained from the tabulated tolerances or increments for special threads, if applicable, or computed from the formulas.

(c) *Limits of size*.<sup>5a</sup>—With respect to the pitch diameter limits of size, it is intended, except as hereinafter qualified, that no portion of the complete thread be permitted to project beyond the envelope defined by the maximum-metal limits on the one hand, or beyond that defined by the minimum-metal limits on the other, and thus be outside of the tolerance zone as illustrated in figures III.3 and III.4.<sup>5b</sup> Also, the diameter equivalent of the variation in any given element except pitch diameter shall not exceed one-half of the pitch diameter tolerance. Deviations from specified size and profile include variations in lead, uniformity of helix, flank angle, taper, out-of-roundness, and surface defects. Accordingly, values are given in table III.11, for the standard thread series and classes, of one-half of the pitch diameter tolerances and the deviations in lead and flank angle which are equivalent thereto. Flank angle equivalents are based on a depth of thread engagement of  $5H/8$ .

The diameter equivalents of variations in lead, uniformity of helix, and flank angle are always in the direction toward maximum material, that is, they increase the virtual diameter of the external thread and decrease that of the internal thread. Thus, the maximum-material pitch diameter limits

are a limitation of the virtual diameter (effective size) and are so specified herein for all thread classes.

Variations in taper and roundness of the pitch diameter, together with variations of the pitch diameter as a whole, may be in the direction of minimum material, and thus the minimum-material pitch diameter limit may be specified as a limitation of the pitch diameter as a single element. However, in view of the interrelation of the pitch diameter, variation in lead and flank angle, etc., together with practical considerations relating to established production processes, product application, and inspection procedures, it is customary to interpret the minimum pitch diameter of the external thread and the maximum pitch diameter of the internal thread as virtual diameters (effective sizes) in classes 1A, 2A, 1B, 2B, and 3B, for application to various mass-produced bolts, nuts, screws, and other similar threaded fasteners, and to some custom threaded parts where design requirements are fulfilled. See "Limit gages" and "Acceptability of threads," section VI, pp. 108 and 118.

(1) *Diameter equivalent of angle deviation*.—The general formula expressing the relation between deviation in the half angle of thread and its diameter equivalent—that is, the amount of the pitch diameter tolerance absorbed by such a deviation—is:

$$\cot \delta\alpha = \frac{h_e}{\delta E \sin \alpha \cos \alpha} \pm \cot \alpha,$$

in which

$\delta E$ —pitch diameter increment due to deviation in half angle

$h_e$ —depth of thread engagement

$\alpha$ —basic half angle of thread

$\delta\alpha$ —error in half angle of thread.

In solving for  $\delta E$  the average value of  $\delta\alpha$  for two sides of the thread, regardless of their sign, should be taken. The sign of  $\cot \alpha$  is plus when the half angle of thread is less than basic, minus when the half angle is greater than basic. By omitting  $\pm \cot \alpha$  from the formula an approximate mean value for  $\delta\alpha$  or  $\delta E$  is obtained which differs very little from either extreme value. The Committee has, therefore, adopted for general use the formula

$$\cot \delta\alpha = \frac{h_e}{\delta E \sin \alpha \cos \alpha}$$

For threads of Unified, American, or American National form, where  $h_e = 5H/8$ , this formula reduces to

$$\cot \delta\alpha = \frac{5p}{4\delta E}, \text{ or } \delta E = 1.25p \tan \delta\alpha.$$

<sup>5a</sup> For aeronautical applications, practice may deviate from those here specified. See Military Specification M11, S. 773.

<sup>5b</sup> The full tolerance cannot, therefore, be used on pitch diameter unless deviations in all other thread elements are zero.

(2) *Diameter equivalent of lead deviations.*—The formula expressing the relation between lead deviation between any two threads within the length of engagement, and its diameter equivalent is as follows:

$$\delta E = (\pm \delta p) \cot \alpha,$$

in which

$\delta E$  = pitch diameter increment due to lead deviation  
 $\delta p$  = the maximum pitch deviation between any two of the threads engaged

$\alpha$  = half angle of thread.

The quantity  $\delta E$  is always added to the measured pitch diameter in the case of an external thread, and it is always subtracted in the case of an internal thread, regardless of the sign introduced by the lead deviation  $\delta p$ .

For threads of Unified, American, or American National form, the above formula reduces to

$$\delta E = 1.7321 \delta p.$$

#### (b) SCREW-THREAD CLASSES

1 CLASSES 1A AND 1B. (a) *Definition.*—Classes 1A and 1B threads replace class 1 for new designs. These classes are intended for ordnance and other special uses. They are used on threaded components where quick and easy assembly is necessary and where a liberal allowance is required to permit ready assembly, even with slightly bruised or dirty threads.

Maximum diameters of class 1A (external) threads are less than basic by the amount of the same allowance as applied to class 2A. For the intended applications in American practice the allowance is not available for plating or coating. Where the thread is plated or coated, special provisions are necessary. The minimum diameters of class 1B (internal) threads, whether or not plated or coated, are basic, affording no allowance or clearance for assembly with maximum metal external thread components having maximum diameters which are basic.

(b) *Allowances and tolerances.*—Allowances and tolerances for the respective thread series are specified in tables and their application is shown in figure III.3.

2. CLASSES 2A AND 2B. (a) *Definition.*—Class 2A for external threads and 2B for internal threads are the most commonly used thread standards for general applications, including production of bolts, screws, nuts, and similar threaded fasteners.

The maximum diameters of class 2A (external) uncoated threads are less than basic by the amount of the allowance. The allowance minimizes galling and seizing in high-cycle wrench assembly, or it can be used to accommodate plated finishes or other coating. However, for threads with additive finish, the maximum diameters of class 2A may be exceeded by the amount of the allowance;

i.e., the 2A maximum diameters apply to an unplated part or to a part before plating whereas the basic diameters (the 2A maximum diameter plus allowance) apply to a part after plating. The minimum diameters of class 2B (internal) threads, whether or not plated or coated, are basic, affording no allowance or clearance in assembly at maximum metal limits. See par. 9, p. 18.

*Certain applications require an allowance to permit application of the proper lubricant when making up the assembly, particularly with pressure vessels and steel pipe flanges, fittings, and valves for high-temperature, high-pressure service. For such applications class 2A, which has an allowance, and class 2B are recommended, replacing class 7 which was previously established for such applications but which has been discontinued as an American Standard. See par. 9, p. 18. In this application, when the thread is coated, the 2A allowance may not be consumed by such coating.*

(b) *Allowances and tolerances.*—Allowances and tolerances for the respective thread series are specified in tables and their application is shown in figure III.3.

3. CLASSES 3A AND 3B.—(a) *Definition.*—Class 3A for external threads and class 3B for internal threads provide for applications where closeness of fit and accuracy of lead and angle of thread are important. They are obtainable consistently only by the use of high quality production equipment supported by a very efficient system of gaging and inspection. The maximum diameters of class 3A (external) threads and the minimum diameters of class 3B (internal) threads, whether or not plated or coated, are basic, affording no allowance or clearance for assembly of maximum-material components.

(b) *Allowances and tolerances.*—No allowance is provided, but since the tolerances on "go" gages are within the limits of size of the product, the gages will assure a slight clearance between product made to the maximum material limits. Tolerances for the respective thread series are specified in tables and their application is shown in figure III.4.

4. COATED THREADS. It is not within the scope of this standard to make recommendations for thicknesses of, or to specify limits for, coatings. However, it will aid mechanical interchangeability if certain principles are followed wherever conditions permit.

It is desirable that the finished threads be within the limits of size established herein. To that end, external threads should not exceed the basic size after plating and internal threads should not be below the basic size after plating. It is recognized that there are some commonly used processes, such as hot-dip galvanizing, which are firmly established, and threads coated by such processes do not fall within the scope of this recommendation.

Class 2A provides both a tolerance and an allowance. Many requirements for coatings are such as those deposited by electroplating processes. In

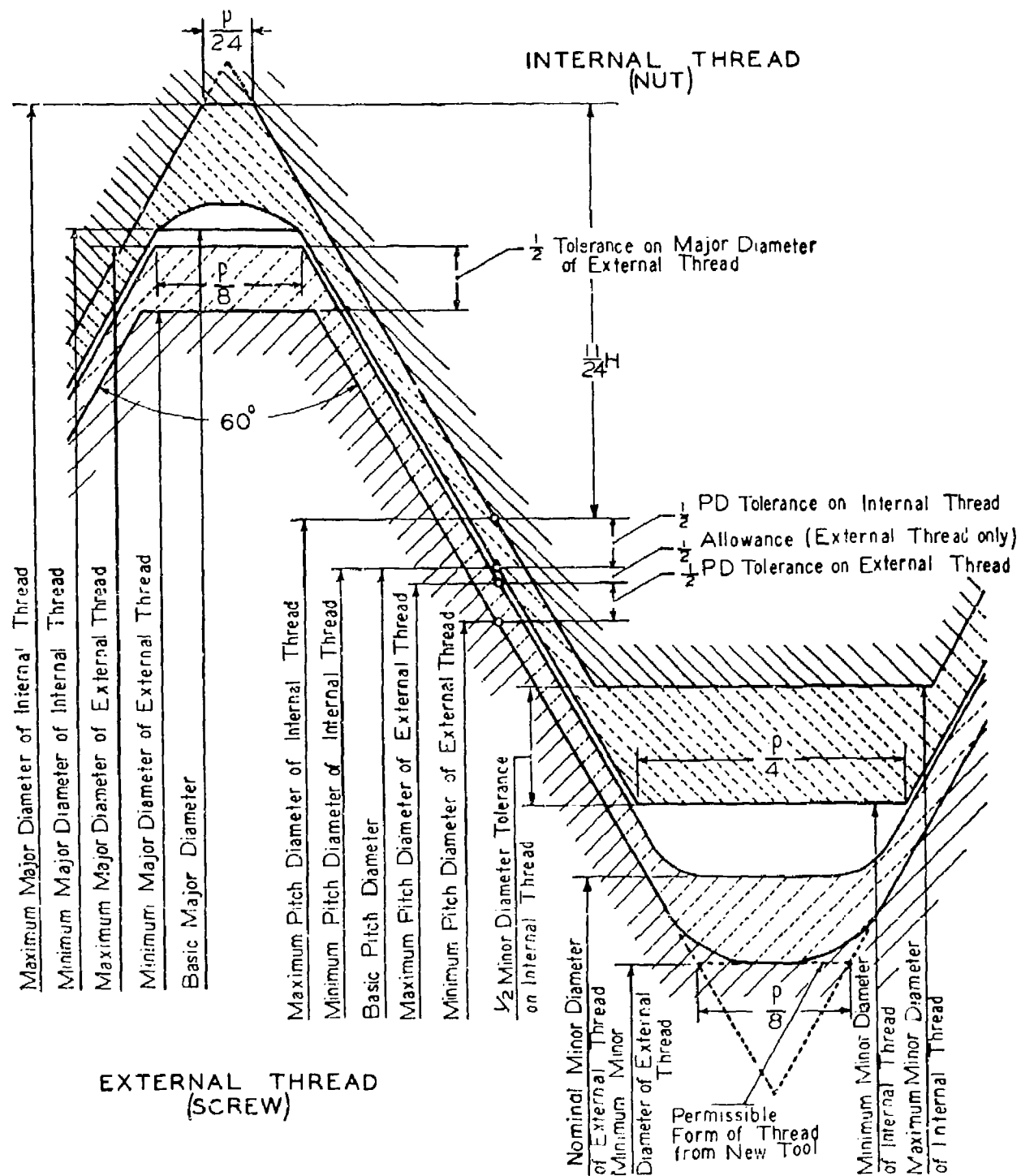


FIGURE III.3.—Disposition of tolerances, allowances, and crest clearances for classes 1A, 2A, 1B, and 2B.

NOTE: "Nominal minor diameter of screw" is that specified in tables.

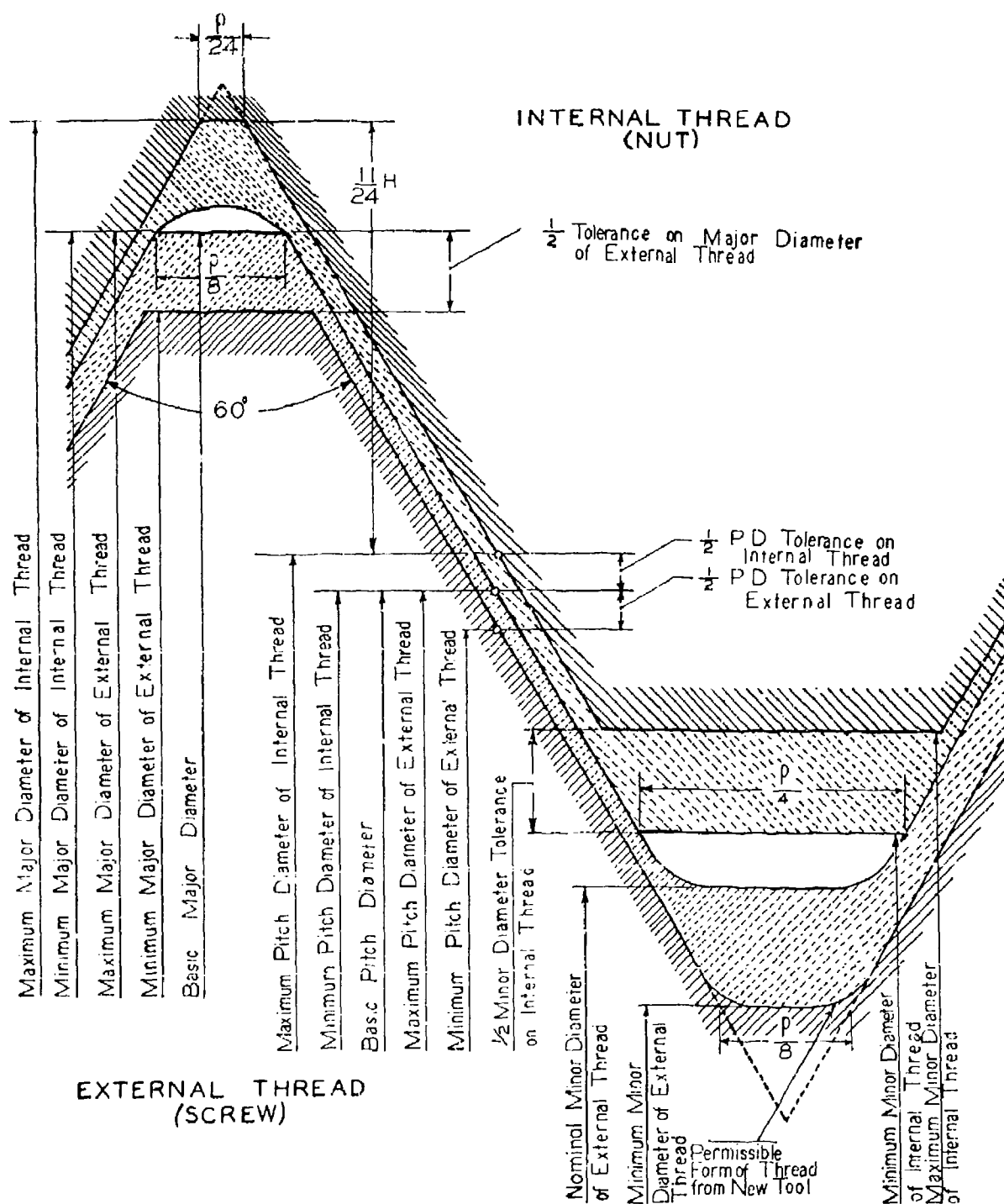


FIGURE III.4.—Disposition of tolerances and crest clearances for classes 3A and 3B.

NOTE: "Nominal minor diameter of screw" is that specified in tables.

general the 2A allowance provides adequate undercut for such coatings. See par. 2 above. There are variables in thickness of coating and symmetry of coating resulting from commercial processes. It should be stressed that threads after plating should be accepted by a basic size "go" thread ring gage or equivalent functional gage. Class 1A provides an allowance, but in this case the allowance is maintained for both coated and uncoated product.

Some tolerance classes do not include an allowance, i. e., class 3A. It is suggested that the limits of size before plating be reduced by the amount of the 2A allowance wherever that allowance is adequate.

No provision is made for overcutting internal threads, as coatings on such threads are not generally required. Further, it is very difficult to deposit a significant thickness of coating on the flanks of internal threads. Where a specific thickness of coating is required in an internal thread, it is suggested that the thread be overcut so that the thread as coated will be accepted by a "go" thread plug gage of basic size.

## 5. METHOD OF DESIGNATING A SCREW THREAD

1. STANDARD METHOD OF DESIGNATING.—The standard method of designating a screw thread is by specifying in sequence the nominal size, number of threads per inch, thread series symbol, and thread class symbol, supplemented optionally by pitch diameter and its tolerance or pitch-diameter limits of size.

An example of an external thread designation and its meaning is given below:

Example:  $\frac{1}{4}$ —20 UNC—3A

				Thread class design-
				ation
				Thread series designation
				(see dimensional tables)
				Number of threads per inch
				Nominal size (fractional diameter or
				screw number)

PD 0.2175-0.2147—(Specification of PD optional)

Where this, or a thread of a class other than 2A, is to be coated, the designation may, unless otherwise specified in procurement documents, be followed by the words "after coating," thus:

$\frac{1}{4}$ —20 UNC—3A

PD 0.2175-0.2147 AFTER COATING (Specification of PD optional)

$\frac{1}{4}$ —20 UNC—2A

PD 0.2164-0.2127 (Specification of PD optional when uncoated)

PD 0.2164-0.2127

BEFORE COATING	} (Required when coated except on stock items.)
PD 0.2175 MAX.	
AFTER COATING	

Unless otherwise specified, threads are right hand; a left-hand thread shall be designated "LH" as follows:

$\frac{1}{4}$ —20 UNC—3A—LH

2. APPLICATION OF STANDARD DESIGNATIONS.—The standard series designations listed in table III.10, col. 2, are applicable to the corresponding standard thread sizes when limits of size conform to those listed in table III.10 or when thread crests are modified in accordance with par. 3 below. The designation "NS" applies to all threads of the standard series for which limits of size are computed from step tables (section IV), increment tables, or Unified and American formulations for all elements.

3. MODIFIED THREADS.—It is occasionally necessary to modify the limits of size of the major diameter of an external thread or the minor diameter of an internal thread from the limits established for standard series threads in order to fit a specific purpose but without change in class of thread or pitch diameter limits. Such threads should be specified with the established thread designation followed by a statement of the modified diameter limits and the designation "MOD."

Examples:

External thread:

$\frac{3}{8}$  24 UNF—3A MOD.

Major diameter 0.3720–0.3648 MOD.

Internal thread:

$\frac{3}{8}$ —24 NF—2B MOD.

Minor diameter 0.330–0.336 MOD.

4. THREADS OTHERWISE ALTERED.—See section IV, p. 100.

5. UNIFIED THREAD SYMBOL DESIGNATIONS.—Where a thread series symbol in a designation of a screw thread starts with "U", it indicates that this series or diameter-pitch combination corresponds in all respects, including tolerances and allowances (if any), with the British and Canadian thread of the same designation. However, where the U does not appear in a thread designation of classes 1A, 2A, 3A, 1B, 2B, or 3B, all thread elements conform to the principle on which Unified threads are based.

## 6. LIMITS OF SIZE, STANDARD THREAD SERIES, TABLE III.10

The limits of size, allowances, and tolerances for the Unified classes are given in table III.10. See "3. Thread Series, Symbols, and Suggested Applications", p. 13.

The maximum-material pitch diameter limits (maximum external and minimum internal threads) are a limitation of the virtual diameter (effective size) for all thread classes. The minimum pitch diameter limits are to be interpreted in accordance with par. 8c, p. 22.



TABLE III.10.—Standard series limits of size—Unified and American screw threads

Nominal size and threads per inch	Series designation	External *									Internal *						
		Class	Allowance	Major diameter limits			Pitch diameter limits			Minor diameter <sup>2</sup>	Class	Minor diameter limits *		Pitch diameter limits			Major diameter
				Max <sup>b</sup>	Min	Min <sup>c</sup>	Max <sup>b</sup>	Min	Tolerance			Min	Max	Min	Max	Tolerance	
			in.	in.	in.	in.	in.	in.	in.	in.		in.	in.	in.	in.	in.	in.
0-80	NF	2A	0.0005	0.0595	0.0563		0.0514	0.0496	0.0018	0.0442	2B	0.0465	0.0514	0.0519	0.0542	0.0023	0.0600
		3A	0.0000	0.0000	0.0508		0.0519	0.0506	0.0013	0.0447	3B	0.0465	0.0514	0.0519	0.0536	0.0017	0.0600
1-64	NC	2A	0.0006	0.0724	0.0686		0.0623	0.0603	0.0020	0.0532	2B	0.0561	0.0623	0.0629	0.0655	0.0026	0.0730
		3A	0.0000	0.0730	0.0692		0.0629	0.0614	0.0015	0.0538	3B	0.0561	0.0623	0.0629	0.0648	0.0019	0.0730
1-72	NF	2A	0.0006	0.0724	0.0689		0.0634	0.0615	0.0019	0.0554	2B	0.0580	0.0635	0.0640	0.0665	0.0025	0.0730
		3A	0.0000	0.0730	0.0695		0.0640	0.0626	0.0014	0.0560	3B	0.0580	0.0635	0.0640	0.0659	0.0019	0.0730
2-56	NC	2A	0.0006	0.0854	0.0813		0.0738	0.0717	0.0021	0.0635	2B	0.0667	0.0737	0.0744	0.0772	0.0028	0.0860
		3A	0.0000	0.0860	0.0819		0.0744	0.0728	0.0016	0.0641	3B	0.0667	0.0737	0.0744	0.0765	0.0021	0.0860
2-64	NF	2A	0.0006	0.0854	0.0816		0.0753	0.0733	0.0020	0.0662	2B	0.0691	0.0753	0.0759	0.0786	0.0027	0.0860
		3A	0.0000	0.0860	0.0822		0.0759	0.0744	0.0015	0.0668	3B	0.0691	0.0753	0.0759	0.0779	0.0020	0.0860
3-48	NC	2A	0.0007	0.0983	0.0938		0.0858	0.0825	0.0023	0.0727	2B	0.0764	0.0845	0.0855	0.0885	0.0030	0.0990
		3A	0.0000	0.0990	0.0945		0.0855	0.0838	0.0017	0.0734	3B	0.0764	0.0845	0.0855	0.0877	0.0022	0.0990
3-56	NF	2A	0.0007	0.0983	0.0942		0.0867	0.0845	0.0022	0.0764	2B	0.0797	0.0865	0.0874	0.0902	0.0028	0.0990
		3A	0.0000	0.0990	0.0949		0.0874	0.0858	0.0016	0.0771	3B	0.0797	0.0865	0.0874	0.0895	0.0021	0.0990
4-40	NC	2A	0.0008	0.1112	0.1061		0.0950	0.0925	0.0025	0.0805	2B	0.0849	0.0939	0.0958	0.0991	0.0033	0.1120
		3A	0.0000	0.1120	0.1069		0.0958	0.0939	0.0019	0.0813	3B	0.0849	0.0939	0.0958	0.0982	0.0024	0.1120
4-48	NF	2A	0.0007	0.1113	0.1068		0.0978	0.0954	0.0024	0.0857	2B	0.0894	0.0968	0.0985	0.1016	0.0031	0.1120
		3A	0.0000	0.1120	0.1075		0.0985	0.0967	0.0018	0.0864	3B	0.0894	0.0968	0.0985	0.1008	0.0023	0.1120
5-40	NC	2A	0.0008	0.1242	0.1191		0.1080	0.1054	0.0026	0.0935	2B	0.0979	0.1062	0.1088	0.1121	0.0033	0.1250
		3A	0.0000	0.1250	0.1196		0.1088	0.1069	0.0019	0.0943	3B	0.0979	0.1062	0.1088	0.1113	0.0025	0.1250
5-44	NF	2A	0.0007	0.1243	0.1195		0.1095	0.1070	0.0025	0.0964	2B	0.1004	0.1079	0.1102	0.1134	0.0032	0.1250
		3A	0.0000	0.1250	0.1202		0.1102	0.1083	0.0019	0.0971	3B	0.1004	0.1079	0.1102	0.1126	0.0024	0.1250
6-32	NC	2A	0.0008	0.1372	0.1312		0.1169	0.1141	0.0028	0.0989	2B	0.104	0.114	0.1177	0.1214	0.0037	0.1380
		3A	0.0000	0.1380	0.1320		0.1170	0.1156	0.0021	0.0997	3B	0.1040	0.1140	0.1177	0.1204	0.0027	0.1380
6-40	NF	2A	0.0008	0.1372	0.1321		0.1210	0.1184	0.0025	0.1065	2B	0.111	0.119	0.1218	0.1252	0.0034	0.1380
		3A	0.0000	0.1380	0.1320		0.1218	0.1198	0.0020	0.1073	3B	0.1110	0.1186	0.1218	0.1243	0.0025	0.1380
8-32	NC	2A	0.0009	0.1631	0.1571		0.1428	0.1399	0.0029	0.1248	2B	0.150	0.159	0.1637	0.1675	0.0038	0.1640
		3A	0.0000	0.1640	0.1580		0.1437	0.1415	0.0022	0.1257	3B	0.1500	0.1589	0.1637	0.1665	0.0028	0.1640
8-36	NF	2A	0.0008	0.1632	0.1577		0.1452	0.1424	0.0028	0.1291	2B	0.154	0.162	0.1660	0.1696	0.0036	0.1640
		3A	0.0000	0.1640	0.1585		0.1460	0.1439	0.0021	0.1299	3B	0.1540	0.1616	0.1660	0.1687	0.0027	0.1640
10-24	NC	2A	0.0010	0.1890	0.1818		0.1619	0.1586	0.0033	0.1379	2B	0.145	0.156	0.1629	0.1672	0.0043	0.1900
		3A	0.0000	0.1900	0.1828		0.1629	0.1604	0.0025	0.1389	3B	0.1450	0.1555	0.1629	0.1661	0.0032	0.1900
10-32	NF	2A	0.0009	0.1891	0.1831		0.1688	0.1658	0.0030	0.1508	2B	0.156	0.164	0.1697	0.1735	0.0039	0.1900
		3A	0.0000	0.1900	0.1840		0.1697	0.1674	0.0023	0.1517	3B	0.1560	0.1641	0.1697	0.1726	0.0029	0.1900
12-24	NC	2A	0.0010	0.2160	0.2078		0.1879	0.1845	0.0034	0.1639	2B	0.171	0.181	0.1866	0.1903	0.0044	0.2160
		3A	0.0000	0.2160	0.2088		0.1889	0.1863	0.0026	0.1649	3B	0.1710	0.1807	0.1889	0.1922	0.0032	0.2160
12-28	NF	2A	0.0010	0.2150	0.2085		0.1918	0.1886	0.0032	0.1712	2B	0.177	0.186	0.1928	0.1970	0.0042	0.2160
		3A	0.0000	0.2160	0.2095		0.1928	0.1901	0.0024	0.1722	3B	0.1770	0.1857	0.1928	0.1959	0.0031	0.2160
12-32	NEF	2A	0.0009	0.2151	0.2091		0.1948	0.1917	0.0031	0.1768	2B	0.182	0.190	0.1967	0.1998	0.0041	0.2160
		3A	0.0000	0.2160	0.2100		0.1957	0.1933	0.0024	0.1777	3B	0.1820	0.1895	0.1957	0.1988	0.0031	0.2160
1/4-20	UNC	1A	0.0011	0.2489	0.2367	0.2367	0.2164	0.2108	0.0056	0.1876	1B	0.196	0.207	0.2175	0.2248	0.0073	0.2500
		2A	0.0011	0.2489	0.2408		0.2164	0.2127	0.0037	0.1876	2B	0.196	0.207	0.2175	0.2223	0.0048	0.2500
		3A	0.0000	0.2500	0.2419		0.2175	0.2147	0.0028	0.1887	3B	0.1960	0.2067	0.2175	0.2211	0.0036	0.2500
1/4-28	UNF	1A	0.0010	0.2490	0.2392		0.2258	0.2208	0.0050	0.2052	1B	0.211	0.220	0.2268	0.2333	0.0065	0.2500
		2A	0.0010	0.2490	0.2425		0.2258	0.2225	0.0033	0.2052	2B	0.211	0.220	0.2268	0.2311	0.0043	0.2500
		3A	0.0000	0.2500	0.2435		0.2268	0.2243	0.0025	0.2062	3B	0.2110	0.2190	0.2268	0.2300	0.0032	0.2500
3/4-32	NEF	2A	0.0010	0.2490	0.2430		0.2287	0.2255	0.0032	0.2107	2B	0.216	0.224	0.2307	0.2339	0.0042	0.2500
		3A	0.0000	0.2500	0.2440		0.2297	0.2273	0.0024	0.2117	3B	0.2160	0.2229	0.2297	0.2328	0.0031	0.2500
5/16-18	UNC	1A	0.0012	0.3113	0.2982		0.2752	0.2691	0.0061	0.2431	1B	0.252	0.265	0.2764	0.2843	0.0079	0.3125
		2A	0.0012	0.3113	0.3026	0.3082	0.2752	0.2712	0.0040	0.2431	2B	0.252	0.265	0.2764	0.2817	0.0053	0.3125
		3A	0.0000	0.3125	0.3038		0.2764	0.2734	0.0030	0.2443	3B	0.2520	0.2630	0.2764	0.2803	0.0039	0.3125
5/16-24	UNF	1A	0.0011	0.3114	0.3006		0.2843	0.2788	0.0055	0.2603	1B	0.267	0.277	0.2854	0.2925	0.0071	0.3125
		2A	0.0011	0.3114	0.3042		0.2843	0.2806	0.0037	0.2603	2B	0.267	0.277	0.2854	0.2902	0.0048	0.3125
		3A	0.0000	0.3125	0.3053		0.2854	0.2837	0.0027	0.2614	3B	0.2670	0.2754	0.2854	0.2890	0.0036	0.3125
5/16-32	NEF	2A	0.0010	0.3115	0.3055		0.2912	0.2880	0.0032	0.2732	2B	0.279	0.286	0.2922	0.2964	0.0042	0.3125
		3A	0.0000	0.3125	0.3065		0.2922	0.2898	0.0024	0.2742	3B	0.2790	0.2847	0.2922	0.2953	0.0031	0.3125
3/8-16	UNC	1A	0.0013	0.3737	0.3595		0.3331	0.3266	0.0065	0.2970	1B	0.307	0.321	0.3344	0.3429	0.0085	0.3750
		2A	0.0013	0.3737	0.3643	0.3605	0.3331	0.3287	0.0044	0.2970	2B	0.307	0.321	0.3344	0.3401	0.0057	0.3750
		3A	0.0000	0.3750	0.3656		0.3344	0.3311	0.0033	0.2983	3B	0.3070	0.3182	0.3344	0.3387	0.0043	0.3750
3/8-24	UNF	1A	0.0011	0.3739	0.3631		0.3468	0.3411	0.0057	0.3228	1B	0.330	0.340	0.3479	0.3553	0.0074	0.3750
		2A	0.0011	0.3739	0.3667		0.3468	0.3430	0.0038	0.3228	2B	0.330	0.340	0.3479	0.3528	0.0049	0.3750
		3A	0.0000	0.3750	0.3678		0.3479	0.3450	0.0029	0.3239	3B	0.3300	0.3372	0.3479	0.3516	0.0037	0.3750
3/8-32	NEF	2A	0.0010	0.3740	0.3680		0.3537	0.3503	0.0034	0.3357	2B	0.341	0.349	0.3547	0.3591	0.0044	0.3750
		3A	0.0000	0.3750	0.3690		0.3547	0.3522	0.0025	0.3367	3B	0.3410	0.3469	0.3547	0.3580	0.0033	0.3750
7/16-14	UNC	1A	0.0014	0.4361	0.4206		0.3897	0.3826	0.0071	0.3485	1B	0.360	0.376	0.3911	0.4093	0.0092	0.4375

TABLE III.10.—Standard series limits of size—Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	External *										Internal *						
		Class	Allowance	Major diameter limits			Pitch diameter limits			Minor diameter <sup>d</sup>	Class	Minor diameter limits *		Pitch diameter limits			Major diameter	
				Max <sup>b</sup>	Min	Min <sup>c</sup>	Max <sup>b</sup>	Min	Tolerance			Min	Max	Min	Max	Tolerance		
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	
1/2 20	UNF	1A	0.0013	0.4987	0.4965	.....	0.4662	0.4588	0.0064	0.4374	1B	0.446	0.457	0.4675	0.4759	0.0084	0.5000	
		2A	0.0013	.4987	.4966	.....	.4662	.4619	.0013	.4374	2B	.446	.457	.4675	.4731	.0056	.5000	
		3A	0.0030	.5000	.4919	.....	.4675	.4613	.0032	.4387	3B	.4460	.4537	.4675	.4717	.0012	.5000	
1/2 28	UNEF	2A	0.0011	.4989	.4924	.....	.4757	.4720	.0037	.4551	2B	.461	.470	.4768	.4816	.0048	.5000	
		3A	0.0030	.5000	.4935	.....	.4768	.4740	.0028	.4562	3B	.4610	.4676	.4768	.4801	.0036	.5000	
		1A	0.0016	.5009	.5437	.....	.5068	.4990	.0078	.4587	1B	.472	.490	.5084	.5186	.0102	.5625	
9/16-12	UNC	2A	0.0016	.5009	.5495	0.5437	.5068	.5016	.0052	.4587	2B	.472	.490	.5084	.5152	.0068	.5625	
		3A	0.0030	.5625	.5511	.....	.5084	.5015	.0039	.4603	3B	.4720	.4813	.5084	.5135	.0051	.5625	
		1A	0.0014	.5611	.5480	.....	.5250	.5182	.0068	.4929	1B	.502	.515	.5264	.5353	.0089	.5625	
9/16-18	UNF	2A	0.0014	.5611	.5524	.....	.5250	.5205	.0015	.4929	2B	.502	.515	.5264	.5323	.0059	.5625	
		3A	0.0030	.5625	.5558	.....	.5264	.5230	.0034	.4945	3B	.5020	.5106	.5264	.5308	.0044	.5625	
		2A	0.0012	.5613	.5541	.....	.5312	.5303	.0039	.5102	2B	.517	.527	.5354	.5405	.0051	.5625	
9/16-24	NEF	3A	0.0030	.5625	.5553	.....	.5354	.5325	.0029	.5114	3B	.5170	.5244	.5351	.5392	.0038	.5625	
5/8-11	UNC	1A	0.0016	.6234	.6052	.....	.5644	.5561	.0083	.5119	1B	.527	.546	.5669	.5767	.0107	.6250	
		2A	0.0016	.6234	.6113	.6052	.5644	.5589	.0055	.5119	2B	.527	.546	.5660	.5732	.0072	.6250	
		3A	0.0030	.6250	.6129	.....	.5660	.5619	.0041	.5135	3B	.5270	.5394	.5660	.5714	.0054	.6250	
5/8-12	N	2A	0.0016	.6234	.6120	.....	.5693	.5639	.0054	.5212	2B	.535	.553	.5709	.5780	.0071	.6250	
		3A	0.0030	.6250	.6136	.....	.5709	.5668	.0041	.5228	3B	.5350	.5463	.5709	.5762	.0053	.6250	
		1A	0.0014	.6236	.6105	.....	.5875	.5805	.0070	.5554	1B	.565	.578	.5889	.5980	.0091	.6250	
5/8-18	UNF	2A	0.0014	.6236	.6149	.....	.5875	.5828	.0047	.5554	2B	.565	.578	.5889	.5949	.0060	.6250	
		3A	0.0030	.6250	.6163	.....	.5889	.5854	.0035	.5568	3B	.5650	.5730	.5889	.5934	.0045	.6250	
		2A	0.0012	.6248	.6166	.....	.5967	.5927	.0040	.5727	2B	.580	.590	.5979	.6041	.0062	.6250	
3/4 24	NEF	3A	0.0030	.6250	.6178	.....	.5979	.5949	.0030	.5730	3B	.5800	.5869	.5979	.6018	.0039	.6250	
		2A	0.0016	.6250	.6145	.....	.6318	.6264	.0054	.5837	2B	.597	.615	.6334	.6405	.0071	.6875	
		3A	0.0030	.6875	.6761	.....	.6334	.6293	.0041	.5853	3B	.5970	.6082	.6334	.6387	.0053	.6875	
11/16-12	N	2A	0.0012	.6893	.6794	.....	.6592	.6552	.0040	.6352	2B	.642	.652	.6604	.6676	.0072	.6875	
		3A	0.0030	.6875	.6803	.....	.6701	.6674	.0028	.6364	3B	.6420	.6494	.6604	.6643	.0043	.6875	
3/4-10	UNC	1A	0.0018	.7482	.7288	.....	.6832	.6744	.0088	.6255	1B	.642	.663	.6850	.6965	.0115	.7500	
		2A	0.0018	.7482	.7353	.7288	.6832	.6773	.0059	.6255	2B	.642	.663	.6850	.6927	.0077	.7500	
		3A	0.0030	.7500	.7371	.....	.6850	.6806	.0044	.6273	3B	.6420	.6545	.6850	.6907	.0055	.7500	
3/4-12	N	2A	0.0017	.7483	.7369	.....	.6912	.6887	.0025	.6461	2B	.650	.678	.6979	.7031	.0052	.7500	
		3A	0.0030	.7500	.7386	.....	.6959	.6918	.0041	.6473	3B	.6500	.6705	.6959	.7013	.0054	.7500	
		1A	0.0015	.7485	.7343	.....	.7049	.7004	.0045	.6718	1B	.682	.696	.7094	.7192	.0098	.7500	
3/4-16	UNF	2A	0.0015	.7485	.7391	.....	.7079	.7029	.0050	.6718	2B	.682	.696	.7094	.7159	.0065	.7500	
		3A	0.0030	.7500	.7406	.....	.7194	.7056	.0038	.6733	3B	.6820	.6908	.7094	.7145	.0049	.7500	
		2A	0.0013	.7487	.7406	.....	.7162	.7118	.0044	.6874	2B	.696	.707	.7175	.7232	.0057	.7500	
3/4-20	UNEF	3A	0.0030	.7500	.7419	.....	.7175	.7142	.0033	.6887	3B	.6960	.7037	.7175	.7218	.0043	.7500	
1 1/4-12	N	2A	0.0017	.8108	.7994	.....	.7567	.7512	.0055	.7086	2B	.722	.740	.7584	.7656	.0072	.8125	
		3A	0.0030	.8125	.8011	.....	.7584	.7543	.0041	.7103	3B	.7220	.7429	.7584	.7638	.0054	.8125	
		2A	0.0015	.8110	.8016	.....	.7704	.7655	.0049	.7343	2B	.745	.759	.7719	.7782	.0063	.8125	
1 1/4-16	UNC	3A	0.0030	.8125	.8031	.....	.7719	.7683	.0036	.7358	3B	.7450	.7533	.7719	.7766	.0047	.8125	
		2A	0.0013	.8112	.8031	.....	.7787	.7743	.0044	.7498	2B	.758	.770	.7800	.7857	.0057	.8125	
		3A	0.0030	.8125	.8044	.....	.7800	.7767	.0033	.7512	3B	.7580	.7662	.7800	.7843	.0043	.8125	
1 1/4-20	UNEF	1A	0.0019	.8731	.8523	.....	.8009	.7914	.0095	.7368	1B	.755	.778	.8028	.8151	.0123	.8750	
		2A	0.0019	.8731	.8592	.8523	.8069	.7946	.0083	.7368	2B	.755	.778	.8028	.8110	.0082	.8750	
		3A	0.0030	.8750	.8611	.....	.8028	.7981	.0047	.7387	3B	.7550	.7681	.8028	.8089	.0061	.8750	
3/4-12	N	2A	0.0017	.8733	.8619	.....	.8192	.8137	.0055	.7711	2B	.785	.803	.8209	.8281	.0072	.8750	
		3A	0.0030	.8750	.8636	.....	.8209	.8168	.0041	.7728	3B	.7850	.7952	.8209	.8263	.0054	.8750	
3/4-14	UNF	1A	0.0016	.8734	.8579	.....	.8270	.8189	.0081	.7858	1B	.798	.814	.8286	.8392	.0106	.8750	
		2A	0.0016	.8734	.8631	.....	.8270	.8216	.0054	.7858	2B	.798	.814	.8286	.8355	.0070	.8750	
		3A	0.0030	.8750	.8647	.....	.8286	.8245	.0041	.7874	3B	.7980	.8068	.8286	.8339	.0053	.8750	
3/4 16	UN	2A	0.0015	.8735	.8641	.....	.8329	.8280	.0049	.7968	2B	.807	.821	.8344	.8407	.0063	.8750	
		3A	0.0030	.8750	.8656	.....	.8344	.8308	.0036	.7983	3B	.8070	.8158	.8344	.8391	.0047	.8750	
		2A	0.0013	.8737	.8656	.....	.8412	.8368	.0044	.8124	2B	.821	.832	.8425	.8482	.0057	.8750	
1 1/2-12	UNC	3A	0.0030	.8750	.8669	.....	.8425	.8392	.0033	.8137	3B	.8210	.8287	.8425	.8468	.0043	.8750	
		2A	0.0017	.9358	.9244	.....	.8817	.8760	.0057	.8336	2B	.847	.865	.8834	.8908	.0074	.9375	
		3A	0.0030	.9375	.9261	.....	.8834	.8793	.0041	.8353	3B	.8470	.8575	.8834	.8889	.0055	.9375	
1 1/2-16	UN	2A	0.0015	.9360	.9266	.....	.8954	.8904	.0050	.8593	2B	.870	.884	.8969	.9034	.0065	.9375	
		3A	0.0030	.9375	.9281	.....	.8969	.8932	.0047	.8608	3B	.8700	.8783	.8969	.9018	.0049	.9375	
1 1/2-20	UNEF	2A	0.0014	.9361	.9280	.....	.9036	.8991	.0045	.8748	2B	.883	.895	.9059	.9109	.0059	.9375	
		3A	0.0030	.9375	.9294	.....	.9050	.9016	.0034	.8762	3B	.8830	.8912	.9050	.9094	.0044	.9375	
		1A	0.0020	.9980	.9755	.....	.9168	.9067	.0101	.8446	1B	.865	.890	.9188	.9320	.0132	1.0000	
1 3/8	UNC	2A	0.0020	.9980	.9830	.9755	.9168	.9100	.0068	.8446	2B	.865	.890	.9188	.9276	.0088	1.0000	
		3A	0.0030	1.0000	.9850	.....	.9188	.9137	.0051	.8466	3B	.8650	.8797	.9188	.9254	.0066	1.0000	
		1A	0.0018	.9982	.9810	.....	.9441	.9353	.0088	.8960	1B	.910	.928	.9459	.9573	.0114	1.0000	
1-12	UNF	2A	0.0018	.9982	.9868	.....	.9441	.9382	.0059	.8960	2B	.910	.928	.9459	.9535	.0076	1.0000	
		3A	0.0030	1.0000	.9880	.....	.9459	.9415	.0044	.8978	3B	.9100	.9198	.9459	.9516	.0057	1.0000	
		1A	0.0015	.9985	.9894	.....	.9579	.9529	.0050	.9218	2B	.932	.946	.9594	.9659	.0065	1.0000	
1-16	UN	2A	0.															

TABLE III.10.—Standard series limits of size—Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	External •									Internal •						
		Class	Allowance	Major diameter limits			Pitch diameter limits			Minor diameter •	Class	Minor diameter limits •		Pitch diameter limits			Major diameter
				Max <sup>b</sup>	Min	Min <sup>c</sup>	Max <sup>b</sup>	Min	Tolerance			Min	Max	Min	Max	Tolerance	
				in.	in.	in.	in.	in.	in.	in.		in.	in.	in.	in.	in.	in.
1 1/4-16	UN	2A	0.0015	1.1235	1.1141	-----	1.0829	1.0779	0.0050	1.0468	2B	1.057	1.071	1.0844	1.0909	0.0065	1.1250
		3A	0.0000	1.1250	1.1156	-----	1.0844	1.0807	0.0037	1.0483	3B	1.0570	1.0658	1.0844	1.0893	0.0049	1.1250
1 1/4-18	NEF	2A	0.0014	1.1236	1.1149	-----	1.0875	1.0828	0.0047	1.0564	2B	1.065	1.078	1.0889	1.0951	0.0062	1.1250
		3A	0.0000	1.1250	1.1163	-----	1.0889	1.0853	0.0036	1.0568	3B	1.0650	1.0730	1.0889	1.0935	0.0046	1.1250
1 3/16-12	UN	2A	0.0017	1.1858	1.1744	-----	1.1317	1.1259	0.0058	1.0836	2B	1.097	1.115	1.1334	1.1409	0.0075	1.1875
		3A	0.0000	1.1875	1.1761	-----	1.1334	1.1291	0.0043	1.0853	3B	1.0970	1.1073	1.1334	1.1390	0.0056	1.1875
1 3/16-16	UN	2A	0.0015	1.1860	1.1766	-----	1.1454	1.1403	0.0051	1.1093	2B	1.120	1.134	1.1469	1.1535	0.0066	1.1875
		3A	0.0000	1.1875	1.1781	-----	1.1469	1.1431	0.0038	1.1108	3B	1.1200	1.1283	1.1469	1.1519	0.0050	1.1875
1 3/16-18	NEF	2A	0.0015	1.1860	1.1773	-----	1.1469	1.1450	0.0049	1.1178	2B	1.127	1.140	1.1514	1.1577	0.0063	1.1875
		3A	0.0000	1.1875	1.1788	-----	1.1514	1.1478	0.0036	1.1193	3B	1.1270	1.1355	1.1514	1.1561	0.0047	1.1875
1 1/4-7	UNC	1A	0.0022	1.2478	1.2232	-----	1.1550	1.1439	0.0111	1.0725	1B	1.095	1.123	1.1572	1.1716	0.0144	1.2500
		2A	0.0022	1.2478	1.2314	1.2232	1.1550	1.1476	0.0074	1.0725	2B	1.095	1.123	1.1572	1.1668	0.0086	1.2500
		3A	0.0000	1.2500	1.2336	-----	1.1572	1.1517	0.0055	1.0747	3B	1.0950	1.1125	1.1572	1.1644	0.0072	1.2500
1 1/4-8	N	2A	0.0021	1.2479	1.2329	1.2254	1.1567	1.1597	0.0070	1.0915	2B	1.115	1.140	1.1688	1.1780	0.0092	1.2500
		3A	0.0000	1.2500	1.2350	-----	1.1688	1.1635	0.0053	1.0966	3B	1.1150	1.1297	1.1688	1.1757	0.0069	1.2500
1 1/4-12	UNF	1A	0.0018	1.2482	1.2310	-----	1.1941	1.1849	0.0092	1.1460	1B	1.160	1.178	1.1959	1.2079	0.0120	1.2500
		2A	0.0018	1.2482	1.2368	-----	1.1941	1.1879	0.0062	1.1460	2B	1.160	1.178	1.1959	1.2039	0.0080	1.2500
		3A	0.0000	1.2500	1.2386	-----	1.1959	1.1913	0.0046	1.1478	3B	1.1600	1.1698	1.1959	1.2019	0.0060	1.2500
1 1/4-16	UN	2A	0.0015	1.2485	1.2391	-----	1.2079	1.2028	0.0051	1.1718	2B	1.182	1.196	1.2094	1.2160	0.0066	1.2500
		3A	0.0000	1.2500	1.2406	-----	1.2094	1.2056	0.0038	1.1733	3B	1.1820	1.1908	1.2094	1.2144	0.0050	1.2500
1 1/4-18	NEF	2A	0.0015	1.2485	1.2398	-----	1.2121	1.2075	0.0049	1.1803	2B	1.190	1.203	1.2139	1.2202	0.0063	1.2500
		3A	0.0000	1.2500	1.2413	-----	1.2139	1.2103	0.0036	1.1818	3B	1.1900	1.1980	1.2139	1.2186	0.0047	1.2500
1 5/16-12	UN	2A	0.0017	1.3108	1.2991	-----	1.2567	1.2509	0.0058	1.2086	2B	1.222	1.240	1.2584	1.2659	0.0075	1.3125
		3A	0.0000	1.3125	1.3011	-----	1.2584	1.2541	0.0043	1.2103	3B	1.2220	1.2323	1.2584	1.2640	0.0056	1.3125
1 5/16-16	UN	2A	0.0015	1.3110	1.3016	-----	1.2704	1.2653	0.0051	1.2343	2B	1.245	1.259	1.2719	1.2785	0.0066	1.3125
		3A	0.0000	1.3125	1.3031	-----	1.2719	1.2681	0.0038	1.2358	3B	1.2450	1.2543	1.2719	1.2769	0.0050	1.3125
1 5/16-18	NEF	2A	0.0015	1.3110	1.3023	-----	1.2749	1.2700	0.0049	1.2428	2B	1.252	1.265	1.2764	1.2827	0.0063	1.3125
		3A	0.0000	1.3125	1.3038	-----	1.2764	1.2728	0.0036	1.2443	3B	1.2520	1.2605	1.2764	1.2811	0.0047	1.3125
1 5/8-6	UNC	1A	0.0024	1.3726	1.3453	-----	1.2643	1.2523	0.0120	1.1681	1B	1.195	1.225	1.2667	1.2822	0.0155	1.3750
		2A	0.0024	1.3726	1.3544	1.3453	1.2643	1.2563	0.0080	1.1681	2B	1.195	1.225	1.2667	1.2771	0.0101	1.3750
		3A	0.0000	1.3750	1.3568	-----	1.2667	1.2607	0.0060	1.1705	3B	1.1950	1.2146	1.2667	1.2745	0.0078	1.3750
1 5/8-8	N	2A	0.0022	1.3728	1.3578	1.3503	1.2644	1.2614	0.0072	1.2194	2B	1.210	1.235	1.2638	1.2801	0.0083	1.3750
		3A	0.0000	1.3750	1.3600	-----	1.2667	1.2601	0.0051	1.2216	3B	1.2100	1.2347	1.2638	1.2808	0.0070	1.3750
1 3/2-12	UNF	1A	0.0019	1.3731	1.3559	-----	1.3190	1.3096	0.0094	1.2709	1B	1.285	1.303	1.3209	1.3332	0.0123	1.3750
		2A	0.0019	1.3731	1.3617	-----	1.3190	1.3127	0.0063	1.2709	2B	1.285	1.303	1.3209	1.3291	0.0082	1.3750
		3A	0.0000	1.3750	1.3636	-----	1.3209	1.3162	0.0047	1.2728	3B	1.2850	1.2948	1.3209	1.3270	0.0061	1.3750
1 3/2-16	UN	2A	0.0015	1.3735	1.3641	-----	1.3329	1.3278	0.0051	1.2968	2B	1.307	1.321	1.3344	1.3410	0.0066	1.3750
		3A	0.0000	1.3750	1.3656	-----	1.3344	1.3306	0.0038	1.2983	3B	1.3070	1.3158	1.3344	1.3394	0.0050	1.3750
1 3/2-18	NEF	2A	0.0015	1.3735	1.3648	-----	1.3373	1.3325	0.0049	1.3053	2B	1.315	1.328	1.3389	1.3452	0.0063	1.3750
		3A	0.0000	1.3750	1.3663	-----	1.3389	1.3353	0.0036	1.3068	3B	1.3150	1.3230	1.3389	1.3436	0.0047	1.3750
1 7/16-12	UN	2A	0.0018	1.4357	1.4243	-----	1.3816	1.3757	0.0059	1.3335	2B	1.347	1.365	1.3834	1.3910	0.0076	1.4375
		3A	0.0000	1.4375	1.4261	-----	1.3834	1.3790	0.0044	1.3353	3B	1.3470	1.3573	1.3834	1.3891	0.0057	1.4375
1 7/16-16	UN	2A	0.0016	1.4359	1.4265	-----	1.3953	1.3901	0.0052	1.3522	2B	1.370	1.384	1.3969	1.4037	0.0068	1.4375
		3A	0.0000	1.4375	1.4281	-----	1.3969	1.3930	0.0039	1.3508	3B	1.3700	1.3783	1.3969	1.4020	0.0051	1.4375
1 7/8-18	NEF	2A	0.0015	1.4360	1.4273	-----	1.3999	1.3940	0.0050	1.3678	2B	1.377	1.390	1.4014	1.4079	0.0065	1.4375
		3A	0.0000	1.4375	1.4288	-----	1.4014	1.3977	0.0037	1.3693	3B	1.3770	1.3855	1.4014	1.4062	0.0048	1.4375
1 7/8-6	UNC	1A	0.0024	1.4976	1.4703	-----	1.3893	1.3772	0.0121	1.2931	1B	1.326	1.356	1.3917	1.4075	0.0158	1.5000
		2A	0.0024	1.4976	1.4794	1.4703	1.3893	1.3812	0.0081	1.2931	2B	1.320	1.350	1.3917	1.4022	0.0105	1.5000
		3A	0.0000	1.5000	1.4818	-----	1.3917	1.3856	0.0061	1.2955	3B	1.3200	1.3396	1.3917	1.3996	0.0079	1.5000
1 7/8-8	N	2A	0.0022	1.4978	1.4828	1.4753	1.4166	1.4093	0.0073	1.3444	2B	1.365	1.390	1.4188	1.4283	0.0095	1.5000
		3A	0.0000	1.5000	1.4850	-----	1.4188	1.4133	0.0055	1.3466	3B	1.3650	1.3797	1.4188	1.4259	0.0071	1.5000
1 1/2-12	UNF	1A	0.0019	1.4981	1.4809	-----	1.4440	1.4344	0.0096	1.3953	1B	1.410	1.428	1.4459	1.4581	0.0125	1.5000
		2A	0.0019	1.4981	1.4867	-----	1.4440	1.4376	0.0064	1.3953	2B	1.410	1.428	1.4459	1.4542	0.0083	1.5000
		3A	0.0000	1.5000	1.4886	-----	1.4459	1.4411	0.0045	1.3978	3B	1.4100	1.4198	1.4459	1.4522	0.0063	1.5000
1 1/2-16	UN	2A	0.0016	1.4984	1.4890	-----	1.4578	1.4526	0.0052	1.4217	2B	1.432	1.446	1.4594	1.4662	0.0068	1.5000
		3A	0.0000	1.5000	1.4906	-----	1.4594	1.4555	0.0039	1.4233	3B	1.4320	1.4408	1.4594	1.4645	0.0051	1.5000
1 1/2-18	NEF	2A	0.0015	1.4985	1.4898	-----	1.4622	1.4574	0.0050	1.4303	2B	1.440	1.452	1.4639	1.4704	0.0065	1.5000
		3A	0.0000	1.5000	1.4913	-----	1.4639	1.4602	0.0037	1.4318	3B	1.4400	1.4480	1.4639	1.4687	0.0048	1.5000
1 1/2-6	N	2A	0.0016	1.5009	1.5515	-----	1.5203	1.5151	0.0052	1.4842	2B	1.495	1.509	1.5210	1.5277	0.0068	1.5625
		3A	0.0000	1.5025	1.5531	-----	1.5219	1.5180	0.0049	1.4858	3B	1.4950	1.5043	1.5219	1.5270	0.0051	1.5625
1 1/2-18	NEF	2A	0.0015	1.5010	1.5523	-----	1.5240	1.5190	0.0050	1.4928	2B	1.502	1.515	1.5264	1.5329	0.0065	1.5625
		3A	0.0000	1.5025	1.5538	-----	1.5264	1.5227	0.0037	1.4943	3B	1.5020	1.5105	1.5264	1.5312	0.0048	1.5625
1 3/8-8	N	2A	0.0022	1.6228	1.6078	1.6003	1.5416	1.5342	0.0074	1.4691	2B	1.490	1.515	1.5438	1.5535	0.0097	1.6250
		3A	0.0000	1.6250	1.6100	-----	1.5438	1.5382	0.0056	1.4716	3B	1.4900	1.5047	1.5438	1.5510		



TABLE III.10.—Standard series limits of size—Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	External •								Internal •							
		Class	Allowance	Major diameter limits			Pitch diameter limits			Minor diameter <sup>d</sup>	Class	Minor diameter limits •		Pitch diameter limits			Major diameter
				Max <sup>b</sup>	Min	Min <sup>c</sup>	Max <sup>b</sup>	Min	Tolerance			Min	Max	Min	Max	Tolerance	
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
1 1/4-16	UNEF	2A	0.0016	1.7481	1.7390	-----	1.7078	1.7025	0.0053	1.6717	2B	1.682	1.686	1.7094	1.7163	0.0069	1.7500
		3A	0.0000	1.7500	1.7406	-----	1.7094	1.7051	0.0010	1.6733	3B	1.6820	1.6908	1.7094	1.7146	0.0052	1.7500
1 1/2-16	N	2A	0.0016	1.8109	1.8015	-----	1.7703	1.7650	0.0053	1.7342	2B	1.745	1.759	1.7719	1.7788	0.0069	1.8125
		3A	0.0000	1.8125	1.8031	-----	1.7719	1.7679	0.0010	1.7358	3B	1.7450	1.7533	1.7719	1.7771	0.0052	1.8125
1 3/8-8	N	2A	0.0023	1.8727	1.8577	1.8502	1.7915	1.7838	0.0077	1.7193	2B	1.740	1.765	1.7938	1.8038	0.0100	1.8750
		3A	0.0000	1.8750	1.8600	-----	1.7938	1.7881	0.0057	1.7216	3B	1.7400	1.7547	1.7938	1.8013	0.0075	1.8750
1 7/8-12	UN	2A	0.0018	1.8732	1.8618	-----	1.8191	1.8131	0.0060	1.7710	2B	1.785	1.803	1.8209	1.8287	0.0078	1.8750
		3A	0.0000	1.8750	1.8636	-----	1.8209	1.8164	0.0015	1.7728	3B	1.7850	1.7948	1.8209	1.8267	0.0058	1.8750
1 7/8-16	UN	2A	0.0016	1.8734	1.8640	-----	1.8328	1.8275	0.0053	1.7967	2B	1.807	1.821	1.8314	1.8413	0.0069	1.8750
		3A	0.0000	1.8750	1.8656	-----	1.8344	1.8304	0.0010	1.7983	3B	1.8070	1.8158	1.8314	1.8396	0.0052	1.8750
1 5/8-16	N	2A	0.0016	1.9359	1.9265	-----	1.8953	1.8899	0.0054	1.8592	2B	1.870	1.884	1.8969	1.9039	0.0070	1.9375
		3A	0.0000	1.9375	1.9281	-----	1.8969	1.8929	0.0010	1.8608	3B	1.8700	1.8783	1.8969	1.9021	0.0052	1.9375
2-4 1/2	UNC	1A	0.0029	1.9971	1.9641	-----	1.8528	1.8385	0.0143	1.7245	1B	1.759	1.795	1.8557	1.8743	0.0186	2.0000
		2A	0.0029	1.9971	1.9751	1.9641	1.8528	1.8433	0.0095	1.7245	2B	1.759	1.795	1.8557	1.8681	0.0124	2.0000
		3A	0.0000	2.0000	1.9780	-----	1.8557	1.8486	0.0071	1.7274	3B	1.7590	1.7861	1.8557	1.8650	0.0093	2.0000
2-8	N	2A	0.0023	1.9977	1.9827	1.9752	1.9165	1.9087	0.0078	1.8413	2B	1.865	1.890	1.9188	1.9289	0.0101	2.0000
		3A	0.0000	2.0000	1.9850	-----	1.9188	1.9130	0.0058	1.8466	3B	1.8650	1.8797	1.9188	1.9263	0.0076	2.0000
2-12	UN	2A	0.0018	1.9982	1.9868	-----	1.9441	1.9380	0.0061	1.8960	2B	1.910	1.928	1.9459	1.9538	0.0079	2.0000
		3A	0.0000	2.0000	1.9886	-----	1.9459	1.9414	0.0015	1.8978	3B	1.9100	1.9198	1.9459	1.9518	0.0059	2.0000
2-16	UNEF	2A	0.0016	1.9984	1.9890	-----	1.9578	1.9524	0.0054	1.9217	2B	1.932	1.946	1.9594	1.9664	0.0070	2.0000
		3A	0.0000	2.0000	1.9906	-----	1.9594	1.9554	0.0010	1.9233	3B	1.9320	1.9408	1.9594	1.9646	0.0052	2.0000
2 1/8-16	N	2A	0.0016	2.0609	2.0515	-----	2.0203	2.0149	0.0054	1.9842	2B	1.995	2.009	2.0219	2.0289	0.0070	2.0625
		3A	0.0000	2.0625	2.0531	-----	2.0219	2.0179	0.0010	1.9858	3B	1.9950	2.0033	2.0219	2.0271	0.0052	2.0625
2 3/8-8	N	2A	0.0024	2.1246	2.1076	2.1001	2.0414	2.0335	0.0079	1.9692	2B	1.990	2.015	2.0438	2.0540	0.0102	2.1250
		3A	0.0000	2.1250	2.1100	-----	2.0438	2.0379	0.0059	1.9716	3B	1.9900	2.0017	2.0438	2.0515	0.0077	2.1250
2 1/2-12	UN	2A	0.0018	2.1232	2.1118	-----	2.0691	2.0630	0.0061	2.0210	2B	2.035	2.053	2.0709	2.0788	0.0079	2.1250
		3A	0.0000	2.1250	2.1136	-----	2.0709	2.0664	0.0015	2.0228	3B	2.0350	2.0448	2.0709	2.0768	0.0059	2.1250
2 1/2-16	UN	2A	0.0016	2.1234	2.1140	-----	2.0828	2.0774	0.0054	2.0467	2B	2.057	2.071	2.0843	2.0914	0.0070	2.1250
		3A	0.0000	2.1250	2.1156	-----	2.0844	2.0803	0.0011	2.0483	3B	2.0570	2.0658	2.0844	2.0896	0.0052	2.1250
2 3/8-16	N	2A	0.0016	2.1859	2.1765	-----	2.1453	2.1399	0.0054	2.1092	2B	2.120	2.134	2.1469	2.1539	0.0070	2.1875
		3A	0.0000	2.1875	2.1781	-----	2.1469	2.1428	0.0011	2.1108	3B	2.1200	2.1283	2.1469	2.1521	0.0052	2.1875
2 3/4-4 1/2	UNC	1A	0.0029	2.2171	2.2141	-----	2.1028	2.0882	0.0146	1.9745	1B	2.009	2.045	2.1057	2.1247	0.0190	2.2500
		2A	0.0029	2.2171	2.2251	2.2141	2.1028	2.0931	0.0097	1.9745	2B	2.009	2.045	2.1057	2.1185	0.0126	2.2500
		3A	0.0000	2.2500	2.2280	-----	2.1057	2.0984	0.0073	1.9774	3B	2.0090	2.0361	2.1057	2.1152	0.0095	2.2500
2 3/4-8	N	2A	0.0024	2.2176	2.2026	2.2251	2.1604	2.1584	0.0080	2.0942	2B	2.115	2.140	2.1688	2.1792	0.0104	2.2500
		3A	0.0000	2.2500	2.2350	-----	2.1688	2.1628	0.0060	2.0966	3B	2.1150	2.1297	2.1688	2.1766	0.0078	2.2500
2 1/2-12	UN	2A	0.0018	2.2482	2.2368	-----	2.1941	2.1880	0.0061	2.1460	2B	2.160	2.178	2.1959	2.2038	0.0079	2.2500
		3A	0.0000	2.2500	2.2386	-----	2.1959	2.1914	0.0015	2.1478	3B	2.1600	2.1698	2.1959	2.2018	0.0059	2.2500
2 1/2-16	UN	2A	0.0016	2.2484	2.2390	-----	2.2078	2.2024	0.0054	2.1717	2B	2.182	2.196	2.2094	2.2164	0.0070	2.2500
		3A	0.0000	2.2500	2.2406	-----	2.2094	2.2053	0.0011	2.1733	3B	2.1820	2.1908	2.2094	2.2146	0.0052	2.2500
2 3/8-16	N	2A	0.0017	2.3108	2.3014	-----	2.2702	2.2647	0.0055	2.2311	2B	2.245	2.259	2.2719	2.2790	0.0072	2.3125
		3A	0.0000	2.3125	2.3031	-----	2.2719	2.2678	0.0011	2.2358	3B	2.2450	2.2533	2.2719	2.2771	0.0054	2.3125
2 3/8-12	UN	2A	0.0019	2.3731	2.3617	-----	2.3190	2.3128	0.0062	2.2709	2B	2.285	2.303	2.3209	2.3290	0.0081	2.3750
		3A	0.0000	2.3750	2.3636	-----	2.3209	2.3163	0.0016	2.2728	3B	2.2850	2.2948	2.3209	2.3269	0.0060	2.3750
2 3/4-16	UN	2A	0.0017	2.3733	2.3639	-----	2.3327	2.3272	0.0055	2.2966	2B	2.307	2.321	2.3344	2.3416	0.0072	2.3750
		3A	0.0000	2.3750	2.3656	-----	2.3344	2.3303	0.0011	2.2983	3B	2.3070	2.3158	2.3344	2.3398	0.0054	2.3750
2 3/8-16	N	2A	0.0017	2.4358	2.4264	-----	2.3952	2.3897	0.0055	2.3501	2B	2.370	2.384	2.3969	2.4041	0.0072	2.4375
		3A	0.0000	2.4375	2.4281	-----	2.3969	2.3928	0.0011	2.3508	3B	2.3700	2.3783	2.3969	2.4023	0.0054	2.4375
2 1/2-4	UNC	1A	0.0031	2.4969	2.4612	-----	2.3315	2.3190	0.0155	2.1902	1B	2.229	2.267	2.3376	2.3578	0.0202	2.5000
		2A	0.0031	2.4969	2.4731	2.4612	2.3315	2.3211	0.0104	2.1902	2B	2.229	2.267	2.3376	2.3511	0.0135	2.5000
		3A	0.0000	2.5000	2.4762	-----	2.3376	2.3298	0.0078	2.1933	3B	2.2290	2.2594	2.3376	2.3477	0.0101	2.5000
2 1/2-8	N	2A	0.0024	2.4976	2.4826	2.4751	2.4164	2.4082	0.0082	2.3412	2B	2.365	2.390	2.4188	2.4291	0.0106	2.5000
		3A	0.0000	2.5000	2.4850	-----	2.4188	2.4127	0.0061	2.3466	3B	2.3650	2.3797	2.4188	2.4268	0.0080	2.5000
2 1/2-12	UN	2A	0.0019	2.4981	2.4867	-----	2.4400	2.4378	0.0062	2.3959	2B	2.410	2.428	2.4459	2.4540	0.0081	2.5000
		3A	0.0000	2.5000	2.4886	-----	2.4459	2.4413	0.0016	2.3978	3B	2.4100	2.4198	2.4459	2.4519	0.0060	2.5000
2 1/2-16	UN	2A	0.0017	2.4983	2.4889	-----	2.4577	2.4522	0.0055	2.4216	2B	2.432	2.446	2.4594	2.4666	0.0072	2.5000
		3A	0.0000	2.5000	2.4906	-----	2.4594	2.4553	0.0011	2.4233	3B	2.4320	2.4408	2.4594	2.4648	0.0054	2.5000
2 3/8-12	UN	2A	0.0019	2.6211	2.6117	-----	2.5630	2.5628	0.0062	2.5209	2B	2.535	2.553	2.5709	2.5790	0.0081	2.6250
		3A	0.0000	2.6250	2.6136	-----	2.5709	2.5663	0.0016	2.5228	3B	2.5350	2.5448	2.5709	2.5769	0.0060	2.6250
2 3/8-16	UN	2A	0.0017	2.6233	2.6139	-----	2.5827	2.5772	0.0055	2.5466	2B	2.557	2.571	2.5841	2.5916	0.0072	2.6250
		3A	0.0000	2.6250	2.6156	-----	2.5844	2.5803	0.0011	2.5483	3B	2.5570	2.5658	2.5841	2.5898	0.0054	2.6250
2 3/4-4	UNC	1A	0.0032	2.7468	2.7111	-----	2.5844	2.5686	0.0158	2.4401	1B	2.479	2.517	2.5876	2.6082	0.0206	2.7500
		2A	0.0032	2.7468	2.7230	2.7111	2.5844	2.5739	0.0105	2.4401	2B	2.479	2.517	2.5876	2.6013	0.0137	2.7500
		3A	0.0000	2.7500	2.7262	-----	2.5876	2.5797	0.0079	2.4433	3B						

TABLE III.10.—Standard series limits of size—Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	External •									Internal •									Major diameter	
		Class	Allowance	Major diameter limits			Pitch diameter limits			Minor diameter <sup>d</sup>	Class	Minor diameter limits •		Pitch diameter limits			Tolerance	Min			
				Max <sup>b</sup>	Min	Min <sup>c</sup>	Max <sup>b</sup>	Min	Tolerance			Min	Max	Min	Max	Tolerance					
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	
3/8-12	UN	2A	0.0019	3.1231	3.1117	-----	3.0690	3.0627	0.0063	3.0209	2B	3.035	3.053	3.0709	3.0791	0.0082	3.1250				
		3A	0.0000	3.1250	3.1136	-----	3.0709	3.0662	0.0047	3.0228	3B	3.0350	3.0448	3.0709	3.0771	0.0062	3.1250				
3/8-16	UN	2A	0.0017	3.1233	3.1139	-----	3.0827	3.0771	0.0056	3.0466	2B	3.057	3.071	3.0844	3.0917	0.0073	3.1250				
		3A	0.0000	3.1250	3.1156	-----	3.0844	3.0802	0.0042	3.0483	3B	3.0570	3.0658	3.0844	3.0899	0.0055	3.1250				
3/4-4	UNC	1A	0.0033	3.2467	3.2110	3.2110	3.0843	3.0680	0.0163	2.9400	1B	2.979	3.017	3.0876	3.1088	0.0212	3.2500				
		2A	0.0033	3.2467	3.2229	-----	3.0843	3.0734	0.0109	2.9400	2B	2.979	3.017	3.0876	3.1017	0.0141	3.2500				
		3A	0.0000	3.2500	3.2262	-----	3.0876	3.0794	0.0082	2.9433	3B	2.9790	3.0094	3.0876	3.0982	0.0106	3.2500				
3/4-8	N	2A	0.0026	3.2474	3.2324	3.2249	3.1662	3.1575	0.0087	3.0940	2B	3.115	3.130	3.1688	3.1801	0.0113	3.2500				
		3A	0.0000	3.2500	3.2350	-----	3.1688	3.1623	0.0065	3.0966	3B	3.1150	3.1297	3.1688	3.1772	0.0084	3.2500				
3/4-12	UN	2A	0.0019	3.2181	3.2367	-----	3.1940	3.1877	0.0063	3.1459	2B	3.160	3.178	3.1959	3.2041	0.0082	3.2500				
		3A	0.0000	3.2500	3.2386	-----	3.1959	3.1912	0.0047	3.1478	3B	3.1600	3.1698	3.1959	3.2021	0.0062	3.2500				
3/4-16	UN	2A	0.0017	3.2183	3.2389	-----	3.2077	3.2021	0.0056	3.1716	2B	3.182	3.196	3.2094	3.2167	0.0073	3.2500				
		3A	0.0000	3.2500	3.2406	-----	3.2094	3.2052	0.0042	3.1733	3B	3.1820	3.1908	3.2094	3.2149	0.0055	3.2500				
3/8-12	UN	2A	0.0019	3.3731	3.3617	-----	3.3196	3.3126	0.0064	3.2709	2B	3.285	3.303	3.3209	3.3293	0.0084	3.3750				
		3A	0.0000	3.3750	3.3636	-----	3.3209	3.3161	0.0048	3.2728	3B	3.2850	3.2948	3.3209	3.3272	0.0063	3.3750				
3/8-16	UN	2A	0.0017	3.3733	3.3639	-----	3.3227	3.3269	0.0058	3.2966	2B	3.307	3.321	3.3344	3.3419	0.0075	3.3750				
		3A	0.0000	3.3750	3.3656	-----	3.3244	3.3301	0.0042	3.2983	3B	3.3070	3.3158	3.3344	3.3400	0.0056	3.3750				
3/2-4	UNC	1A	0.0033	3.4967	3.4610	-----	3.3343	3.3177	0.0166	3.1900	1B	3.229	3.267	3.3376	3.3591	0.0215	3.5000				
		2A	0.0033	3.4967	3.4729	3.4610	3.3343	3.3233	0.0110	3.1900	2B	3.229	3.267	3.3376	3.3519	0.0143	3.5000				
		3A	0.0000	3.5000	3.4762	-----	3.3376	3.3293	0.0083	3.1933	3B	3.2290	3.2594	3.3376	3.3484	0.0108	3.5000				
3/2-8	N	2A	0.0026	3.4974	3.4824	3.4749	3.4162	3.4074	0.0088	3.3410	2B	3.365	3.390	3.4188	3.4303	0.0115	3.5000				
		3A	0.0000	3.5000	3.4850	-----	3.4188	3.4122	0.0065	3.3466	3B	3.3650	3.3797	3.4188	3.4274	0.0086	3.5000				
3/2-12	UN	2A	0.0019	3.4981	3.4867	-----	3.4440	3.4376	0.0064	3.3959	2B	3.419	3.428	3.4459	3.4543	0.0084	3.5000				
		3A	0.0000	3.5000	3.4886	-----	3.4459	3.4411	0.0048	3.3978	3B	3.4100	3.4198	3.4459	3.4522	0.0063	3.5000				
3/2-16	UN	2A	0.0017	3.4983	3.4889	-----	3.4577	3.4519	0.0058	3.4216	2B	3.432	3.446	3.4594	3.4669	0.0075	3.5000				
		3A	0.0000	3.5000	3.4906	-----	3.4594	3.4551	0.0043	3.4239	3B	3.4320	3.4408	3.4594	3.4650	0.0056	3.5000				
3/8-12	UN	2A	0.0019	3.6231	3.6117	-----	3.5690	3.5626	0.0064	3.5209	2B	3.535	3.553	3.5709	3.5793	0.0084	3.6250				
		3A	0.0000	3.6250	3.6136	-----	3.5709	3.5661	0.0048	3.5228	3B	3.5350	3.5448	3.5709	3.5772	0.0063	3.6250				
3/8-16	UN	2A	0.0017	3.6233	3.6139	-----	3.5827	3.5769	0.0058	3.5466	2B	3.557	3.571	3.5844	3.5919	0.0075	3.6250				
		3A	0.0000	3.6250	3.6156	-----	3.5844	3.5801	0.0043	3.5483	3B	3.5570	3.5658	3.5844	3.5900	0.0056	3.6250				
3/4-4	UNC	1A	0.0034	3.7466	3.7109	-----	3.5842	3.5674	0.0168	3.4399	1B	3.479	3.517	3.5876	3.6094	0.0218	3.7500				
		2A	0.0034	3.7466	3.7228	3.7109	3.5842	3.5730	0.0112	3.4399	2B	3.479	3.517	3.5876	3.6021	0.0145	3.7500				
		3A	0.0000	3.7500	3.7262	-----	3.5876	3.5792	0.0084	3.4423	3B	3.4799	3.5094	3.5876	3.5985	0.0109	3.7500				
3/4-8	N	2A	0.0027	3.7473	3.7323	3.7248	3.6661	3.6571	0.0090	3.5939	2B	3.615	3.640	3.6688	3.6805	0.0117	3.7500				
		3A	0.0000	3.7500	3.7350	-----	3.6688	3.6621	0.0067	3.5966	3B	3.6150	3.6297	3.6688	3.6776	0.0088	3.7500				
3/4-12	UN	2A	0.0019	3.7481	3.7367	-----	3.6940	3.6876	0.0064	3.6418	2B	3.660	3.678	3.6959	3.7043	0.0084	3.7500				
		3A	0.0000	3.7500	3.7386	-----	3.6959	3.6911	0.0048	3.6438	3B	3.6600	3.6698	3.6959	3.7022	0.0063	3.7500				
3/4-16	UN	2A	0.0017	3.7483	3.7389	-----	3.7077	3.7019	0.0058	3.6716	2B	3.682	3.696	3.7094	3.7169	0.0075	3.7500				
		3A	0.0000	3.7500	3.7406	-----	3.7094	3.7051	0.0043	3.6733	3B	3.6820	3.6908	3.7094	3.7150	0.0056	3.7500				
3/8-12	UN	2A	0.0020	3.8730	3.8616	-----	3.8189	3.8124	0.0065	3.7708	2B	3.785	3.803	3.8209	3.8291	0.0085	3.8750				
		3A	0.0000	3.8750	3.8636	-----	3.8209	3.8160	0.0049	3.7728	3B	3.7850	3.7948	3.8209	3.8273	0.0064	3.8750				
3/8-16	UN	2A	0.0018	3.8732	3.8638	-----	3.8326	3.8267	0.0059	3.7965	2B	3.807	3.821	3.8344	3.8420	0.0076	3.8750				
		3A	0.0000	3.8750	3.8656	-----	3.8344	3.8300	0.0044	3.7983	3B	3.8070	3.8158	3.8344	3.8401	0.0057	3.8750				
4-4	UNC	1A	0.0034	3.9666	3.9609	-----	3.8342	3.8172	0.0170	3.6899	1B	3.729	3.767	3.8376	3.8597	0.0221	4.0000				
		2A	0.0034	3.9666	3.9728	3.9609	3.8342	3.8229	0.0113	3.6899	2B	3.729	3.767	3.8376	3.8523	0.0147	4.0000				
		3A	0.0000	4.0000	3.9762	-----	3.8376	3.8291	0.0085	3.6933	3B	3.7290	3.7594	3.8376	3.8487	0.0111	4.0000				
4-8	N	2A	0.0027	3.9673	3.9623	3.9748	3.9161	3.9070	0.0091	3.8439	2B	3.865	3.899	3.9188	3.9307	0.0119	4.0000				
		3A	0.0000	4.0000	3.9850	-----	3.9188	3.9120	0.0068	3.8466	3B	3.8650	3.8797	3.9188	3.9277	0.0089	4.0000				
4-12	UN	2A	0.0020	3.9980	3.9866	-----	3.9439	3.9374	0.0065	3.8958	2B	3.910	3.928	3.9459	3.9544	0.0085	4.0000				
		3A	0.0000	4.0000	3.9886	-----	3.9459	3.9410	0.0049	3.8978	3B	3.9100	3.9198	3.9459	3.9523	0.0064	4.0000				
4-16	UN	2A	0.0018	3.9982	3.9888	-----	3.9576	3.9517	0.0059	3.9215	2B	3.932	3.946	3.9594	3.9670	0.0076	4.0000				
		3A	0.0000	4.0000	3.9906	-----	3.9594	3.9550	0.0044	3.9233	3B	3.9320	3.9408	3.9594	3.9651	0.0057	4.0000				
4 1/4-8	N	2A	0.0028	4.2472	4.2322	4.2247	4.1660	4.1567	0.0093	4.0938	2B	4.115	4.140	4.1688	4.1809	0.0121	4.2500				
		3A	0.0000	4.2500	4.2350	-----	4.1688	4.1618	0.0066	4.0966	3B	4.1150	4.1297	4.1688	4.1778	0.0090	4.2500				
4 1/4-12	UN	2A	0.0020	4.2480	4.2366	-----	4.1939	4.1874	0.0065	4.1458	2B	4.160	4.178	4.1959	4.2044	0.0085	4.2500				
		3A	0.0000	4.2500	4.2386	-----	4.1959	4.1910	0.0049	4.1478	3B	4.1600	4.1698	4.1959	4.2023	0.0064	4.2500				
4 1/4-16	UN	2A	0.0018	4.2482	4.2388	-----	4.2076	4.2017	0.0059	4.1715	2B	4.182	4.196	4.2094	4.2170	0.0076	4.2500				
		3A	0.0000	4.2500	4.2406	-----	4.2094	4.2050	0.0044	4.1733	3B	4.1820	4.1908	4.2094	4.2151	0.0057	4.2500				
4 1/2-8	N	2A	0.0028	4.4972	4.4822	4.4747	4.4160	4.4066	0.0094	4.3488	2B	4.265	4.300	4.3188	4.3310	0.0122	4.5000				
		3A	0.0000	4.5000																	



TABLE III.10.—Standard series limits of size—Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	External •									Internal •						
		Class	Allowance	Major diameter limits			Pitch diameter limits			Minor diameter <sup>d</sup>	Class	Minor diameter limits •		Pitch diameter limits			Major diameter
				Max •	Min	Min •	Max •	Min	Tolerance			Min	Max	Min	Max	Tolerance	
				in.	in.	in.	in.	in.	in.	in.		in.	in.	in.	in.	in.	in.
5/4-16	UN	2A	0.0018	5.2482	5.2383	—	5.2076	5.2045	0.0061	5.1715	2B	5.182	5.196	5.2094	5.2173	0.0079	5.2500
		3A	0.0000	5.2500	5.2406	—	5.2094	5.2049	0.0045	5.1733	3B	5.1820	5.1968	5.2094	5.2153	0.0059	5.2500
5/2-8	N	2A	0.0030	5.4970	5.4820	5.4745	5.4158	5.4059	0.0099	5.3436	2B	5.365	5.390	5.4188	5.4317	0.0129	5.5000
		3A	0.0000	5.5000	5.4850	—	5.4188	5.4114	0.0074	5.3496	3B	5.3650	5.3797	5.4188	5.4285	0.0097	5.5000
3/2-12	UN	2A	0.0020	5.4980	5.4866	—	5.4439	5.4372	0.0067	5.3958	2B	5.410	5.428	5.4459	5.4546	0.0087	5.5000
		3A	0.0000	5.5000	5.4886	—	5.4459	5.4409	0.0050	5.3978	3B	5.4100	5.4198	5.4459	5.4525	0.0066	5.5000
5/2-16	UN	2A	0.0014	5.4982	5.4888	—	5.4576	5.4515	0.0061	5.4215	2B	5.432	5.446	5.4594	5.4673	0.0079	5.5000
		3A	0.0000	5.5000	5.4906	—	5.4594	5.4549	0.0045	5.4233	3B	5.4320	5.4408	5.4594	5.4653	0.0059	5.5000
5/4-8	N	2A	0.0030	5.7170	5.7020	5.7245	5.6658	5.6558	0.0100	5.5936	2B	5.615	5.640	5.6688	5.6818	0.0130	5.7500
		3A	0.0000	5.7500	5.7350	—	5.6688	5.6613	0.0075	5.5966	3B	5.6150	5.6297	5.6688	5.6786	0.0095	5.7500
5/4-12	UN	2A	0.0021	5.7449	5.7365	—	5.6338	5.6269	0.0069	5.6457	2B	5.660	5.678	5.6959	5.7049	0.0090	5.7500
		3A	0.0000	5.7500	5.7386	—	5.6359	5.6307	0.0052	5.6478	3B	5.6600	5.6699	5.6959	5.7026	0.0067	5.7500
5/4-16	UN	2A	0.0019	5.7481	5.7387	—	5.7075	5.7013	0.0062	5.6711	2B	5.682	5.696	5.7094	5.7175	0.0081	5.7500
		3A	0.0000	5.7500	5.7406	—	5.7091	5.7047	0.0047	5.6733	3B	5.6820	5.6908	5.7094	5.7155	0.0061	5.7500
6-8	N	2A	0.0030	5.9570	5.9420	5.9745	5.9158	5.9056	0.0102	5.8436	2B	5.865	5.890	5.9188	5.9320	0.0132	6.0000
		3A	0.0000	6.0000	5.9850	—	5.9188	5.9112	0.0076	5.8496	3B	5.8650	5.8797	5.9188	5.9287	0.0099	6.0000
6-12	UN	2A	0.0021	5.9978	5.9865	—	5.9438	5.9369	0.0069	5.8957	2B	5.910	5.928	5.9459	5.9549	0.0090	6.0000
		3A	0.0000	6.0000	5.9886	—	5.9459	5.9407	0.0052	5.8978	3B	5.9100	5.9198	5.9459	5.9526	0.0067	6.0000
6-16	UN	2A	0.0019	5.9981	5.9887	—	5.9575	5.9513	0.0062	5.9214	2B	5.932	5.946	5.9594	5.9675	0.0081	6.0000
		3A	0.0000	6.0000	5.9906	—	5.9594	5.9547	0.0047	5.9233	3B	5.9320	5.9408	5.9594	5.9655	0.0061	6.0000

• Regarding combinations of thread classes, see par. 1, p. 18.

• For class 2A threads having an additive finish the maximum is increased to the basic size, the value being the same as for class 3A shown in this column, see par. 2, and 4, p. 23.

• For unfinished hot-rolled material.

• See figs. III.1, III.3, and III.4, pp. 11, 24, and 25.

• Revised minor diameter limits of classes 1B and 2B are in process of ratification as Unified Standard.

TABLE III.11.—Deviations in lead and half-angle equivalent to one-half of pitch diameter tolerances, Unified and American screw threads

Designation		External				Internal			
Size	Threads per inch	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle
1	2	3	4	5	6	7	8	9	10
No. in.			in.	in.	deg min		in.	in.	deg min
0.060	80	NF 2A	0.00090	0.00052	3 18	NF 2B	0.00115	0.00066	4 13
		NF 3A	0.00065	0.00038	2 23	NF 3B	0.00085	0.00049	3 7
1 .073	64	NC 2A	0.00100	0.00058	2 56	NC 2B	0.00130	0.00075	3 48
		NC 3A	0.00075	0.00043	2 12	NC 3B	0.00095	0.00055	2 47
1 .073	72	NF 2A	0.00095	0.00055	3 8	NF 2B	0.00125	0.00072	4 7
		NF 3A	0.00070	0.00040	2 19	NF 3B	0.00095	0.00055	3 8
2 .086	66	NC 2A	0.00105	0.00061	2 42	NC 2B	0.00140	0.00081	3 35
		NC 3A	0.00080	0.00045	2 3	NC 3B	0.00105	0.00061	2 42
2 .086	64	NF 2A	0.00100	0.00058	2 56	NF 2B	0.00135	0.00078	3 57
		NF 3A	0.00075	0.00043	2 12	NF 3B	0.00100	0.00058	2 56
3 .099	48	NC 2A	0.00115	0.00066	2 32	NC 2B	0.00150	0.00087	3 18
		NC 3A	0.00085	0.00049	1 52	NC 3B	0.00110	0.00064	2 25
3 .099	56	NF 2A	0.00110	0.00064	2 49	NF 2B	0.00140	0.00081	3 35
		NF 3A	0.00080	0.00045	2 3	NF 3B	0.00105	0.00061	2 42
4 .112	40	NC 2A	0.00125	0.00072	2 17	NC 2B	0.00165	0.00095	3 1
		NC 3A	0.00095	0.00055	1 44	NC 3B	0.00120	0.00069	2 12
4 .112	48	NF 2A	0.00120	0.00069	2 38	NF 2B	0.00155	0.00089	3 24
		NF 3A	0.00090	0.00052	1 59	NF 3B	0.00115	0.00066	2 32
5 .125	40	NC 2A	0.00130	0.00075	2 23	NC 2B	0.00175	0.00105	3 1
		NC 3A	0.00095	0.00055	1 44	NC 3B	0.00125	0.00072	2 17
5 .125	44	NF 2A	0.00125	0.00072	2 31	NF 2B	0.00160	0.00092	3 13
		NF 3A	0.00095	0.00055	1 55	NF 3B	0.00120	0.00069	2 25
6 .138	32	NC 2A	0.00140	0.00081	2 3	NC 2B	0.00185	0.00107	2 43
		NC 3A	0.00106	0.00061	1 32	NC 3B	0.00135	0.00078	1 59

TABLE III.11.—*Deviations in lead and half-angle equivalent to one-half of pitch diameter tolerances, Unified and American screw threads—Continued*

Designation		External				Internal			
Size	Threads per inch	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle
1	2	3	4	5	6	7	8	9	10
No. in.			in.	in.	deg min		in.	in.	deg min
6 0.138	40	NEF 2A	0.00130	0.00075	2 23	NEF 2B	0.00170	0.00098	3 7
		NEF 3A	0.00100	0.00058	1 50	NEF 3B	0.00125	0.00072	2 17
8 .164	32	NEF 2A	0.00145	0.00083	2 8	NEF 2B	0.00190	0.00110	2 47
		NEF 3A	0.00110	0.00064	1 37	NEF 3B	0.00140	0.00081	2 3
8 .164	36	NEF 2A	0.00140	0.00081	2 19	NEF 2B	0.00180	0.00104	2 58
		NEF 3A	0.00105	0.00061	1 44	NEF 3B	0.00135	0.00078	2 14
10 .190	24	NEF 2A	0.00165	0.00095	1 49	NEF 2B	0.00215	0.00124	2 22
		NEF 3A	0.00125	0.00072	1 22	NEF 3B	0.00160	0.00092	1 46
10 .190	32	NEF 2A	0.00150	0.00087	2 12	NEF 2B	0.00195	0.00113	2 52
		NEF 3A	0.00115	0.00066	1 41	NEF 3B	0.00145	0.00084	2 8
12 .216	24	NEF 2A	0.00170	0.00098	1 52	NEF 2B	0.00220	0.00127	2 25
		NEF 3A	0.00130	0.00075	1 26	NEF 3B	0.00165	0.00095	1 49
12 .216	28	NEF 2A	0.00160	0.00092	2 3	NEF 2B	0.00210	0.00121	2 42
		NEF 3A	0.00120	0.00069	1 32	NEF 3B	0.00155	0.00089	1 59
12 .216	32	NEF 2A	0.00155	0.00089	2 16	NEF 2B	0.00205	0.00118	3 0
		NEF 3A	0.00120	0.00069	1 46	NEF 3B	0.00155	0.00089	2 16
1/4	20	UNC 1A	0.00280	0.00162	2 34	UNC 1B	0.00365	0.00211	3 21
		UNC 2A	0.00185	0.00107	1 42	UNC 2B	0.00240	0.00139	2 12
		UNC 3A	0.00140	0.00081	1 17	UNC 3B	0.00189	0.00104	1 39
1/4	28	UNC 1A	0.00250	0.00144	3 12	UNC 1B	0.00325	0.00188	4 10
		UNC 2A	0.00165	0.00095	2 7	UNC 2B	0.00215	0.00124	2 45
		UNC 3A	0.00125	0.00072	1 36	UNC 3B	0.00160	0.00092	2 3
3/4	32	NEF 2A	0.00160	0.00092	2 21	NEF 2B	0.00210	0.00121	3 5
		NEF 3A	0.00120	0.00069	1 46	NEF 3B	0.00155	0.00089	2 16
5/16	18	UNC 1A	0.00305	0.00176	2 31	UNC 1B	0.00385	0.00228	3 15
		UNC 2A	0.00200	0.00115	1 39	UNC 2B	0.00265	0.00153	2 11
		UNC 3A	0.00150	0.00087	1 14	UNC 3B	0.00195	0.00113	1 37
5/16	24	UNC 1A	0.00275	0.00159	3 1	UNC 1B	0.00355	0.00205	3 54
		UNC 2A	0.00185	0.00107	2 2	UNC 2B	0.00240	0.00139	2 33
		UNC 3A	0.00135	0.00078	1 20	UNC 3B	0.00180	0.00104	1 59
5/16	32	NEF 2A	0.00165	0.00092	2 21	NEF 2B	0.00210	0.00121	3 5
		NEF 3A	0.00120	0.00069	1 46	NEF 3B	0.00155	0.00089	2 16
		UNC 1A	0.00325	0.00188	2 23	UNC 1B	0.00425	0.00245	3 7
3/8	16	UNC 2A	0.00220	0.00127	1 37	UNC 2B	0.00285	0.00165	2 5
		UNC 3A	0.00165	0.00095	1 13	UNC 3B	0.00215	0.00124	1 35
3/8	24	UNC 1A	0.00285	0.00165	3 8	UNC 1B	0.00370	0.00214	4 4
		UNC 2A	0.00190	0.00110	2 5	UNC 2B	0.00245	0.00141	2 42
		UNC 3A	0.00145	0.00084	1 36	UNC 3B	0.00185	0.00107	2 2
3/8	32	NEF 2A	0.00170	0.00098	2 30	NEF 2B	0.00220	0.00127	3 13
		NEF 3A	0.00125	0.00072	1 50	NEF 3B	0.00165	0.00095	2 26
7/16	14	UNC 1A	0.00355	0.00205	2 17	UNC 1B	0.00460	0.00266	2 57
		UNC 2A	0.00235	0.00136	1 30	UNC 2B	0.00305	0.00176	1 57
		UNC 3A	0.00175	0.00101	1 7	UNC 3B	0.00230	0.00133	1 29
7/16	20	UNC 1A	0.00310	0.00179	2 59	UNC 1B	0.00405	0.00234	3 42
		UNC 2A	0.00210	0.00121	1 55	UNC 2B	0.00270	0.00156	2 28
		UNC 3A	0.00155	0.00089	1 25	UNC 3B	0.00205	0.00118	1 53
7/16	28	NEF 2A	0.00180	0.00104	2 19	NEF 2B	0.00230	0.00133	2 57
		NEF 3A	0.00135	0.00078	1 44	NEF 3B	0.00175	0.00101	2 15
1/2	12	N 2A	0.00270	0.00156	1 29	N 2B	0.00350	0.00202	1 55
		N 3A	0.00200	0.00115	1 6	N 3B	0.00260	0.00150	1 26
1/2	13	UNC 1A	0.00370	0.00214	2 19	UNC 1B	0.00485	0.00285	2 53
		UNC 2A	0.00250	0.00144	1 29	UNC 2B	0.00325	0.00188	1 59
		UNC 3A	0.00185	0.00107	1 6	UNC 3B	0.00240	0.00139	1 26
1/2	20	UNC 1A	0.00320	0.00185	2 56	UNC 1B	0.00420	0.00242	3 51
		UNC 2A	0.00215	0.00124	1 58	UNC 2B	0.00290	0.00162	2 34
		UNC 3A	0.00160	0.00092	1 28	UNC 3B	0.00210	0.00121	1 55
1/2	28	NEF 2A	0.00185	0.00107	2 22	NEF 2B	0.00240	0.00139	2 5
		NEF 3A	0.00140	0.00081	1 48	NEF 3B	0.00180	0.00104	2 19
9/16	12	UNC 1A	0.00390	0.00225	2 9	UNC 1B	0.00510	0.00294	2 48
		UNC 2A	0.00290	0.00150	1 26	UNC 2B	0.00340	0.00196	1 52
		UNC 3A	0.00195	0.00113	1 4	UNC 3B	0.00255	0.00147	1 24
9/16	18	UNC 1A	0.00340	0.00196	2 48	UNC 1B	0.00445	0.00257	3 40
		UNC 2A	0.00225	0.00130	1 51	UNC 2B	0.00295	0.00170	2 26
		UNC 3A	0.00170	0.00098	1 24	UNC 3B	0.00220	0.00127	1 49
9/16	24	NEF 2A	0.00195	0.00113	2 9	NEF 2B	0.00255	0.00147	2 48
		NEF 3A	0.00145	0.00084	1 36	NEF 3B	0.00190	0.00110	2 5
		UNC 1A	0.00415	0.00240	2 5	UNC 1B	0.00535	0.00309	2 52
5/8	11	UNC 2A	0.00275	0.00159	1 23	UNC 2B	0.00390	0.00228	1 49
		UNC 3A	0.00205	0.00118	1 2	UNC 3B	0.00270	0.00156	1 22
5/8	12	N 2A	0.00270	0.00156	1 29	N 2B	0.00355	0.00205	1 57
		N 3A	0.00205	0.00118	1 8	N 3B	0.00265	0.00153	1 27
5/8	18	UNC 1A	0.00350	0.00202	2 53	UNC 1B	0.00455	0.00263	3 45
		UNC 2A	0.00235	0.00136	1 56	UNC 2B	0.00300	0.00173	2 28
		UNC 3A	0.00175	0.00101	1 27	UNC 3B	0.00225	0.00130	1 51
5/8	24	NEF 2A	0.00200	0.00115	2 12	NEF 2B	0.00260	0.00150	2 51
		NEF 3A	0.00150	0.00087	1 32	NEF 3B	0.00195	0.00113	2 9
1 1/16	12	N 2A	0.00270	0.00156	1 29	N 2B	0.00355	0.00205	1 57
		N 3A	0.00205	0.00118	1 8	N 3B	0.00265	0.00153	1 27
1 1/16	24	NEF 2A	0.00200	0.00115	2 12	NEF 2B	0.00260	0.00150	2 51
		NEF 3A	0.00150	0.00087	1 30	NEF 3B	0.00195	0.00113	2 9

TABLE III.11.—*Deviations in lead and half-angle equivalent to one-half of pitch diameter tolerances, Unified and American screw threads—Continued*

Designation		External				Internal			
Size	Threads per inch	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle
1	2	3	4	5	6	7	8	9	10
No. in.			in.	in.	deg min		in.	in.	deg min
3/4	10	UNC-1A UNC-2A UNC-3A	0.00440 .00295 .00220	0.00254 .00170 .00127	2 1 1 21 1 0	UNC-1B UNC-2B UNC-3B	0.00575 .00385 .00285	0.00332 .00222 .00165	2 38 1 40 1 19
3/4	12	N-2A N-3A UNF-1A UNF-2A UNF-3A	.00275 .00205 .00375 .00250 .00190	.00159 .00118 .00217 .00144 .00110	1 31 1 8 2 45 1 50 1 24	N-2B N-3B UNF-1B UNF-2B UNF-3B	.00360 .00270 .00450 .00325 .00245	.00208 .00156 .00283 .00188 .00141	1 59 1 29 3 35 2 23 1 48
3/4	20	UNEF-2A UNEF-3A N-2A N-3A	.00220 .00165 .00275 .00205	.00127 .00095 .00159 .00118	2 1 1 31 1 31 1 8	UNEF-2B UNEF-3B N-2B N-3B	.00215 .00165 .00360 .00270	.00124 .00085 .00156 .00115	1 68 1 59 1 29 2 19
1 1/4	12	UN-2A UN-3A UNEF-2A UNEF-3A	.00245 .00180 .00220 .00165	.00141 .00104 .00127 .00095	1 48 1 19 2 1 1 31	UN-2B UN-3B UNEF-2B UNEF-3B	.00315 .00235 .00285 .00215	.00182 .00136 .00165 .00124	2 19 1 43 2 37 1 58
1 1/4	20	UNC-1A UNC-2A UNC-3A N-2A N-3A	.00475 .00315 .00235 .00275 .00205	.00274 .00182 .00136 .00159 .00118	1 58 1 18 0 58 1 31 1 8	UNC-1B UNC-2B UNC-3B N-2B N-3B	.00615 .00410 .00305 .00360 .00270	.00355 .00237 .00176 .00208 .00156	2 22 1 41 1 15 1 59 1 29
1 1/4	12	UNF-1A UNF-2A UNF-3A	.00405 .00270 .00205	.00234 .00156 .00118	2 36 1 44 1 19	UNF-1B UNF-2B UNF-3B	.00530 .00350 .00285	.00306 .00202 .00153	3 24 2 15 1 42
1 1/4	14	UN-2A UN-3A UNEF-2A UNEF-3A	.00245 .00180 .00220 .00165	.00141 .00104 .00127 .00095	1 48 1 19 2 1 1 31	UN-2B UN-3B UNEF-2B UNEF-3B	.00315 .00235 .00285 .00215	.00182 .00136 .00165 .00124	2 19 1 43 2 37 1 58
1 1/4	16	UNC-1A UNC-2A UNC-3A N-2A N-3A	.00475 .00315 .00235 .00275 .00205	.00274 .00182 .00136 .00159 .00118	1 58 1 18 0 58 1 31 1 8	UNC-1B UNC-2B UNC-3B N-2B N-3B	.00615 .00410 .00305 .00360 .00270	.00355 .00237 .00176 .00208 .00156	2 22 1 41 1 15 1 59 1 29
1 1/4	20	UNF-1A UNF-2A UNF-3A	.00405 .00270 .00205	.00234 .00156 .00118	2 36 1 44 1 19	UNF-1B UNF-2B UNF-3B	.00530 .00350 .00285	.00306 .00202 .00153	3 24 2 15 1 42
1 1/2	12	UN-2A UN-3A UNEF-2A UNEF-3A	.00245 .00180 .00220 .00165	.00141 .00104 .00127 .00095	1 48 1 19 2 1 1 31	UN-2B UN-3B UNEF-2B UNEF-3B	.00315 .00235 .00285 .00215	.00182 .00136 .00165 .00124	2 19 1 43 2 37 1 58
1 1/2	16	UNC-1A UNC-2A UNC-3A N-2A N-3A	.00475 .00315 .00235 .00275 .00205	.00274 .00182 .00136 .00159 .00118	1 58 1 18 0 58 1 31 1 8	UNC-1B UNC-2B UNC-3B N-2B N-3B	.00615 .00410 .00305 .00360 .00270	.00355 .00237 .00176 .00208 .00156	2 22 1 41 1 15 1 59 1 29
1 1/2	20	UNF-1A UNF-2A UNF-3A	.00405 .00270 .00205	.00234 .00156 .00118	2 36 1 44 1 19	UNF-1B UNF-2B UNF-3B	.00530 .00350 .00285	.00306 .00202 .00153	3 24 2 15 1 42
1 3/4	12	UN-2A UN-3A UNEF-2A UNEF-3A	.00245 .00180 .00220 .00165	.00141 .00104 .00127 .00095	1 48 1 19 2 1 1 31	UN-2B UN-3B UNEF-2B UNEF-3B	.00315 .00235 .00285 .00215	.00182 .00136 .00165 .00124	2 19 1 43 2 37 1 58
1 3/4	16	UNC-1A UNC-2A UNC-3A N-2A N-3A	.00475 .00315 .00235 .00275 .00205	.00274 .00182 .00136 .00159 .00118	1 58 1 18 0 58 1 31 1 8	UNC-1B UNC-2B UNC-3B N-2B N-3B	.00615 .00410 .00305 .00360 .00270	.00355 .00237 .00176 .00208 .00156	2 22 1 41 1 15 1 59 1 29
1 3/4	20	UNF-1A UNF-2A UNF-3A	.00405 .00270 .00205	.00234 .00156 .00118	2 36 1 44 1 19	UNF-1B UNF-2B UNF-3B	.00530 .00350 .00285	.00306 .00202 .00153	3 24 2 15 1 42
2	8	UNC-1A UNC-2A UNC-3A UNF-1A UNF-2A UNF-3A	.00505 .00340 .00255 .00440 .00265 .00220	.00292 .00196 .00147 .00224 .00170 .00127	1 61 1 15 0 56 2 25 1 37 1 13	UNC-1B UNC-2B UNC-3B UNF-1B UNF-2B UNF-3B	.00660 .00440 .00330 .00570 .00390 .00285	.00381 .00254 .00191 .00329 .00219 .00165	2 25 1 37 1 13 3 8 2 5 1 34
2	12	UN-2A UN-3A UNEF-2A UNEF-3A	.00250 .00185 .00225 .00170	.00144 .00107 .00130 .00095	1 50 1 21 1 4 1 33	UN-2B UN-3B UNEF-2B UNEF-3B	.00325 .00245 .00285 .00215	.00188 .00141 .00170 .00127	2 23 1 48 2 42 2 1
2	16	UNC-1A UNC-2A UNC-3A N-2A N-3A	.00505 .00340 .00255 .00440 .00265	.00292 .00196 .00147 .00224 .00170	1 61 1 15 0 56 2 25 1 37	UNC-1B UNC-2B UNC-3B N-2B N-3B	.00660 .00440 .00330 .00570 .00390	.00381 .00254 .00191 .00329 .00219	2 25 1 37 1 13 3 8 2 5
2	20	UNF-1A UNF-2A UNF-3A	.00265 .00220 .00170	.00170 .00127 .00095	1 13 1 13 1 37	UNF-1B UNF-2B UNF-3B	.00285 .00215 .00165	.00165 .00119 .00085	1 34 1 31 1 23
2 1/4	12	UN-2A UN-3A UNEF-2A UNEF-3A	.00250 .00185 .00225 .00170	.00144 .00107 .00130 .00095	1 50 1 21 1 4 1 33	UN-2B UN-3B UNEF-2B UNEF-3B	.00325 .00245 .00285 .00215	.00188 .00141 .00170 .00127	2 23 1 48 2 42 2 1
2 1/4	16	UNC-1A UNC-2A UNC-3A N-2A N-3A	.00505 .00340 .00255 .00440 .00265	.00292 .00196 .00147 .00224 .00170	1 61 1 15 0 56 2 25 1 37	UNC-1B UNC-2B UNC-3B N-2B N-3B	.00660 .00440 .00330 .00570 .00390	.00381 .00254 .00191 .00329 .00219	2 25 1 37 1 13 3 8 2 5
2 1/4	20	UNF-1A UNF-2A UNF-3A	.00265 .00220 .00170	.00170 .00127 .00095	1 13 1 13 1 37	UNF-1B UNF-2B UNF-3B	.00285 .00215 .00165	.00165 .00119 .00085	1 34 1 31 1 23
2 1/2	12	UN-2A UN-3A UNEF-2A UNEF-3A	.00250 .00185 .00225 .00170	.00144 .00107 .00130 .00095	1 50 1 21 1 4 1 33	UN-2B UN-3B UNEF-2B UNEF-3B	.00325 .00245 .00285 .00215	.00188 .00141 .00170 .00127	2 23 1 48 2 42 2 1
2 1/2	16	UNC-1A UNC-2A UNC-3A N-2A N-3A	.00505 .00340 .00255 .00440 .00265	.00292 .00196 .00147 .00224 .00170	1 61 1 15 0 56 2 25 1 37	UNC-1B UNC-2B UNC-3B N-2B N-3B	.00660 .00440 .00330 .00570 .00390	.00381 .00254 .00191 .00329 .00219	2 25 1 37 1 13 3 8 2 5
2 1/2	20	UNF-1A UNF-2A UNF-3A	.00265 .00220 .00170	.00170 .00127 .00095	1 13 1 13 1 37	UNF-1B UNF-2B UNF-3B	.00285 .00215 .00165	.00165 .00119 .00085	1 34 1 31 1 23
2 3/4	12	UN-2A UN-3A UNEF-2A UNEF-3A	.00250 .00185 .00225 .00170	.00144 .00107 .00130 .00095	1 50 1 21 1 4 1 33	UN-2B UN-3B UNEF-2B UNEF-3B	.00325 .00245 .00285 .00215	.00188 .00141 .00170 .00127	2 23 1 48 2 42 2 1
2 3/4	16	UNC-1A UNC-2A UNC-3A N-2A N-3A	.00505 .00340 .00255 .00440 .00265	.00292 .00196 .00147 .00224 .00170	1 61 1 15 0 56 2 25 1 37	UNC-1B UNC-2B UNC-3B N-2B N-3B	.00660 .00440 .00330 .00570 .00390	.00381 .00254 .00191 .00329 .00219	2 25 1 37 1 13 3 8 2 5
2 3/4	20	UNF-1A UNF-2A UNF-3A	.00265 .00220 .00170	.00170 .00127 .00095	1 13 1 13 1 37	UNF-1B UNF-2B UNF-3B	.00285 .00215 .00165	.00165 .00119 .00085	1 34 1 31 1 23
3	8	UNC-1A UNC-2A UNC-3A UNF-1A UNF-2A UNF-3A	.00555 .00370 .00275 .00450 .00275 .00220	.00320 .00211 .00150 .00282 .00153 .00120	1 47 1 11 0 53 1 17 0 58 2 32	UNC-1B UNC-2B UNC-3B N-2B N-3B UNF-1B	.00720 .00490 .00360 .00490 .00315 .00690	.00416 .00277 .00208 .00266 .00199 .00346	2 19 1 32 1 9 1 41 1 16 3 18
3	12	UN-2A UN-3A UNEF-2A UNEF-3A	.00250 .00185 .00225 .00170	.00144 .00107 .00130 .00095	1 50 1 21 1 4 1 33	UN-2B UN-3B UNEF-2B UNEF-3B	.00325 .00245 .00285 .00215	.00188 .00141 .00170 .00127	2 23 1 48 2 42 2 1
3 1/4	12	UNC-1A UNC-2A UNC-3A N-2A N-3A	.00555 .00370 .00275 .00450 .00275	.00320 .00211 .00150 .00282 .00153	1 47 1 11 0 53 1 17 0 58	UNC-1B UNC-2B UNC-3B N-2B N-3B	.00720 .00490 .00360 .00490 .00315	.00416 .00277 .00208 .00266 .00199	2 19 1 32 1 9 1 41 1 16
3 1/4	16	UNF-1A UNF-2A UNF-3A	.00275 .00220 .00170	.00170 .00127 .00095	1 17 1 32 1 42	UNF-1B UNF-2B UNF-3B	.00266 .00199 .00346	.00199 .00127 .00173	1 16 1 12 1 39
3 1/4	20	UNF-1A UNF-2A UNF-3A	.00275 .00220 .00170	.00170 .00127 .00095	1 17 1 32 1 42	UNF-1B UNF-2B UNF-3B	.00266 .00199 .00346	.00199 .00127 .00173	1 16 1 12 1 39

TABLE III.11.—Deviations in lead and half-angle equivalent to one-half of pitch diameter tolerances, Unified and American screw threads—Continued

Designation		External				Internal			
Size	Threads per inch	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle
1	2	3	4	5	6	7	8	9	10
No. in.			in.	in.	deg min		in.	in.	deg min
134	16	UN-2A UN-3A NEF-2A NEF-3A	0.00255 .00190 .00245 .00180	0.00147 .00110 .00141 .00104	1 52 1 24 2 1 1 29	UN-2B UN-3B NEF-2B NEF-3B	0.00330 .00250 .00315 .00235	0.00191 .00144 .00182 .00136	2 25 1 50 2 36 1 56
134	18	UN-2A UN-3A NEF-2A NEF-3A	.00280 .00215 .00255 .00190	.00167 .00124 .00147 .00110	1 36 1 11 1 52 1 24	UN-2B UN-3B UN-2B UN-3B	.00375 .00280 .00330 .00250	.00217 .00162 .00191 .00144	2 4 1 32 2 25 1 50
134	18	NEF-2A NEF-3A	.00245 .00180	.00141 .00104	2 1 1 29	NEF-2B NEF-3B	.00315 .00235	.00182 .00136	2 36 1 56
134	6	UNC-1A UNC-2A UNC-3A N-2A N-3A	.00600 .00400 .00300 .00360 .00270	.00346 .00231 .00173 .00208 .00156	1 39 1 6 0 50 1 19 0 59	UNC-1B UNC-2B UNC-3B N-2B N-3B	.00780 .00520 .00390 .00465 .00350	.00450 .00300 .00225 .00268 .00202	2 9 1 26 1 4 1 42 1 17
134	8	UNF-1A UNF-2A UNF-3A UN-2A UN-3A	.00470 .00315 .00235 .00255 .00190	.00271 .00182 .00136 .00147 .00110	2 35 1 44 1 18 1 52 1 24	UNF-1B UNF-2B UNF-3B UN-2B UN-3B	.00615 .00410 .00305 .00330 .00250	.00355 .00237 .00176 .00191 .00144	3 23 2 15 1 41 2 25 1 50
134	16	NEF-2A NEF-3A	.00245 .00180	.00141 .00104	2 1 1 29	NEF-2B NEF-3B	.00315 .00235	.00182 .00136	2 36 1 56
134	18	UN-2A UN-3A NEF-2A NEF-3A	.00295 .00220 .00260 .00195	.00170 .00127 .00150 .00113	1 37 1 13 1 54 1 26	UN-2B UN-3B UN-2B UN-3B	.00380 .00285 .00340 .00255	.00219 .00165 .00196 .00147	2 5 1 34 2 39 1 52
134	18	NEF-2A NEF-3A UNC-1A UNC-2A UNC-3A	.00250 .00185 .00605 .00405 .00305	.00144 .00107 .00349 .00234 .00176	2 4 1 32 1 40 1 7 0 50	NEF-2B NEF-3B UNC-1B UNC-2B UNC-3B	.00325 .00240 .00796 .00525 .00395	.00188 .00139 .00456 .00302 .00228	2 41 1 59 2 10 1 27 1 5
134	6	N-2A N-3A	.00365 .00275	.00211 .00159	1 20 1 0	N-2B N-3B	.00475 .00355	.00274 .00205	1 44 1 18
134	8	UNF-1A UNF-2A UNF-3A UN-2A UN-3A	.00480 .00320 .00240 .00260 .00195	.00277 .00185 .00139 .00150 .00113	2 38 1 46 1 19 1 54 1 26	UNF-1B UNF-2B UNF-3B UN-2B UN-3B	.00625 .00415 .00315 .00340 .00255	.00361 .00240 .00182 .00196 .00147	3 26 2 17 1 44 2 30 1 52
134	16	NEF-2A NEF-3A N-2A N-3A	.00250 .00185 .00260 .00195	.00144 .00107 .00150 .00113	2 4 1 32 1 54 1 26	NEF-2B NEF-3B N-2B N-3B	.00325 .00240 .00340 .00255	.00188 .00139 .00196 .00147	2 41 1 59 2 30 1 52
134	18	NEF-2A NEF-3A	.00250 .00185	.00144 .00107	2 4 1 32	NEF-2B NEF-3B	.00325 .00240	.00188 .00139	2 41 1 59
134	8	N-2A N-3A	.00370 .00280	.00214 .00162	1 21 1 2	N-2B N-3B	.00485 .00360	.00280 .00208	1 47 1 19
134	12	UN-2A UN-3A	.00295 .00220	.00170 .00127	1 37 1 13	UN-2B UN-3B	.00380 .00285	.00219 .00165	2 5 1 34
134	16	UN-2A UN-3A	.00260 .00195	.00150 .00113	1 54 1 26	UN-2B UN-3B	.00340 .00255	.00196 .00147	2 30 1 52
134	18	NEF-2A NEF-3A N-2A N-3A	.00250 .00185 .00265 .00200	.00144 .00107 .00153 .00115	2 4 1 32 1 57 1 28	NEF-2B NEF-3B N-2B N-3B	.00325 .00240 .00345 .00260	.00188 .00139 .00199 .00150	2 41 1 59 2 32 1 54
134	18	NEF-2A NEF-3A UNC-1A UNC-2A UNC-3A	.00255 .00190 .00670 .00445 .00335	.00147 .00110 .00387 .00257 .00193	2 6 1 34 1 32 1 1 0 46	NEF-2B NEF-3B UNC-1B UNC-2B UNC-3B	.00330 .00245 .00870 .00580 .00435	.00191 .00141 .00502 .00335 .00251	2 43 2 1 2 0 1 20 1 0
134	5	N-2A N-3A	.00375 .00280	.00217 .00162	1 22 1 2	N-2B N-3B	.00490 .00370	.00283 .00214	1 48 1 21
134	8	UN-2A UN-3A	.00300 .00225	.00173 .00130	1 30 1 14	UN-2B UN-3B	.00390 .00280	.00225 .00167	2 9 1 36
134	12	UNEF-2A UNEF-3A	.00265 .00200	.00153 .00115	1 57 1 28	UNEF-2B UNEF-3B	.00345 .00260	.00199 .00150	2 32 1 54
134	16	N-2A N-3A	.00265 .00200	.00153 .00115	1 57 1 28	N-2B N-3B	.00345 .00260	.00199 .00150	2 32 1 54
134	8	N-2A N-3A	.00385 .00285	.00222 .00165	1 25 1 3	N-2B N-3B	.00500 .00375	.00289 .00217	1 50 1 22
134	12	UN-2A UN-3A	.00300 .00225	.00173 .00130	1 39 1 14	UN-2B UN-3B	.00390 .00280	.00225 .00167	2 9 1 36
134	16	UN-2A UN-3A	.00265 .00200	.00153 .00115	1 57 1 28	UN-2B UN-3B	.00345 .00260	.00199 .00150	2 32 1 54
134	18	N-2A N-3A	.00270 .00200	.00156 .00115	1 59 1 28	N-2B N-3B	.00350 .00260	.00202 .00150	2 34 1 54

TABLE III.11.—Deviations in lead and half-angle equivalent to one-half of pitch diameter tolerances, Unified and American screw threads—Continued

Designation		External				Internal			
Size	Threads per inch	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle
1	2	3	4	5	6	7	8	9	10
No. in.			in.	in.	deg min		in.	in.	deg min
2	4½	UNC-1A	0.00715	0.00413	1 28	UNC-1B	0.00930	0.00537	1 55
		UNC-2A	.00475	.00274	0 59	UNC-2B	.00620	.00358	1 17
		UNC-3A	.00355	.00205	0 44	UNC-3B	.00465	.00268	0 58
2	8	N-2A	.00390	.00225	1 26	N-2B	.00505	.00292	1 51
		N-3A	.00290	.00167	1 4	N-3B	.00380	.00219	1 24
2	12	UN-2A	.00305	.00176	1 41	UN-2B	.00395	.00228	2 10
		UN-3A	.00225	.00130	1 14	UN-3B	.00295	.00170	1 37
2	16	UNEF-2A	.00270	.00156	1 59	UNEF-2B	.00350	.00202	2 34
		UNEF-3A	.00200	.00115	1 28	UNEF-3B	.00280	.00150	1 54
2½	16	N-2A	.00270	.00156	1 59	N-2B	.00350	.00202	2 34
		N-3A	.00200	.00115	1 28	N-3B	.00280	.00150	1 54
2½	8	N-2A	.00395	.00228	1 27	N-2B	.00510	.00294	1 52
		N-3A	.00295	.00170	1 5	N-3B	.00385	.00222	1 25
2½	12	UN-2A	.00305	.00176	1 41	UN-2B	.00395	.00228	2 10
		UN-3A	.00225	.00130	1 14	UN-3B	.00235	.00170	1 37
2½	16	UN-2A	.00270	.00156	1 59	UN-2B	.00350	.00202	2 34
		UN-3A	.00200	.00115	1 28	UN-3B	.00280	.00150	1 54
2½	16	N-2A	.00270	.00156	1 59	N-2B	.00350	.00202	2 34
		N-3A	.00200	.00115	1 28	N-3B	.00280	.00150	1 54
2½	4½	UNC-1A	.00730	.00421	1 30	UNC-1B	.00950	.00548	1 58
		UNC-2A	.00485	.00280	1 0	UNC-2B	.00630	.00364	1 18
		UNC-3A	.00365	.00211	0 45	UNC-3B	.00475	.00274	0 59
2½	8	N-2A	.00400	.00231	1 28	N-2B	.00520	.00300	1 34
		N-3A	.00300	.00173	1 6	N-3B	.00390	.00225	1 26
2½	12	UN-2A	.00305	.00176	1 41	UN-2B	.00395	.00228	2 10
		UN-3A	.00225	.00130	1 14	UN-3B	.00235	.00170	1 37
2½	16	UN-2A	.00270	.00156	1 59	UN-2B	.00350	.00202	2 34
		UN-3A	.00200	.00115	1 28	UN-3B	.00280	.00150	1 54
2½	16	N-2A	.00275	.00159	2 1	N-2B	.00360	.00208	2 38
		N-3A	.00205	.00118	1 30	N-3B	.00270	.00156	1 59
2½	12	UN-2A	.00310	.00179	1 42	UN-2B	.00405	.00234	2 14
		UN-3A	.00230	.00133	1 16	UN-3B	.00300	.00173	1 39
2½	16	UN-2A	.00275	.00159	2 1	UN-2B	.00360	.00208	2 38
		UN-3A	.00205	.00118	1 30	UN-3B	.00270	.00156	1 59
2½	16	N-2A	.00275	.00159	2 1	N-2B	.00360	.00208	2 38
		N-3A	.00205	.00118	1 30	N-3B	.00270	.00156	1 59
2½	4	UNC-1A	.00775	.00447	1 25	UNC-1B	.01010	.00583	1 51
		UNC-2A	.00520	.00300	0 57	UNC-2B	.00875	.00390	1 14
		UNC-3A	.00390	.00225	0 43	UNC-3B	.00505	.00292	0 56
2½	8	N-2A	.00410	.00237	1 30	N-2B	.00530	.00306	1 57
		N-3A	.00305	.00176	1 7	N-3B	.00400	.00231	1 28
2½	12	UN-2A	.00310	.00179	1 42	UN-2B	.00405	.00234	2 14
		UN-3A	.00230	.00133	1 16	UN-3B	.00300	.00173	1 39
2½	16	UN-2A	.00275	.00159	2 1	UN-2B	.00360	.00208	2 38
		UN-3A	.00205	.00118	1 30	UN-3B	.00270	.00156	1 59
2½	12	UN-2A	.00310	.00179	1 42	UN-2B	.00405	.00234	2 14
		UN-3A	.00230	.00133	1 16	UN-3B	.00300	.00173	1 39
2½	16	UN-2A	.00275	.00159	2 1	UN-2B	.00360	.00208	2 38
		UN-3A	.00205	.00118	1 30	UN-3B	.00270	.00156	1 59
2½	4	UNC-1A	.00790	.00456	1 27	UNC-1B	.01030	.00595	1 53
		UNC-2A	.00525	.00303	0 58	UNC-2B	.00685	.00395	1 15
		UNC-3A	.00395	.00228	0 43	UNC-3B	.00515	.00297	0 57
2½	8	N-2A	.00415	.00240	1 31	N-2B	.00540	.00312	1 59
		N-3A	.00310	.00179	1 8	N-3B	.00405	.00234	1 28
2½	12	UN-2A	.00310	.00179	1 42	UN-2B	.00405	.00234	2 14
		UN-3A	.00230	.00133	1 16	UN-3B	.00300	.00173	1 39
2½	16	UN-2A	.00275	.00159	2 1	UN-2B	.00360	.00208	2 38
		UN-3A	.00205	.00118	1 30	UN-3B	.00270	.00156	1 59
2½	12	UN-2A	.00315	.00182	1 44	UN-2B	.00410	.00237	2 15
		UN-3A	.00235	.00136	1 18	UN-3B	.00316	.00179	1 42
2½	16	UN-2A	.00290	.00162	2 3	UN-2B	.00365	.00211	2 40
		UN-3A	.00210	.00121	1 32	UN-3B	.00275	.00159	2 1
3	4	UNC-1A	.00805	.00465	1 29	UNC-1B	.01045	.00603	1 55
		UNC-2A	.00535	.00309	0 59	UNC-2B	.00695	.00401	1 16
		UNC-3A	.00400	.00231	0 44	UNC-3B	.00520	.00300	0 57
3	8	N-2A	.00425	.00245	1 33	N-2B	.00555	.00320	2 2
		N-3A	.00320	.00185	1 10	N-3B	.00415	.00240	1 31
3	12	UN-2A	.00315	.00182	1 44	UN-2B	.00410	.00237	2 15
		UN-3A	.00235	.00136	1 18	UN-3B	.00310	.00179	1 42
3	16	UN-2A	.00290	.00162	2 3	UN-2B	.00365	.00211	2 40
		UN-3A	.00210	.00121	1 32	UN-3B	.00275	.00159	2 1
3½	12	UN-2A	.00315	.00182	1 44	UN-2B	.00410	.00237	2 15
		UN-3A	.00235	.00136	1 18	UN-3B	.00310	.00179	1 42



TABLE III.11.—Deviations in lead and half-angle equivalent to one-half of pitch diameter tolerances, Unified and American screw threads—Continued

Designation		External				Internal			
Size	Threads per inch	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle
1	2	3	4	5	6	7	8	9	10
No. in.			in.	in.	deg min		in.	in.	deg min
3/8	16	UN-2A	0.00280	0.00162	2 3	UN-2B	0.00365	0.00211	2 40
		UN-3A	.00210	.00121	1 32	UN-3B	.00275	.00159	2 1
		UNC-1A	.00815	.00471	1 30	UNC-1B	.01060	.00612	1 57
3/4	4	UN-2A	.00545	.00315	1 0	UN-2B	.00705	.00407	1 18
		UNC-3A	.00410	.00237	0 45	UNC-3B	.00530	.00306	0 58
3/4	8	N-2A	.00435	.00251	1 36	N-2B	.00565	.00326	2 4
		N-3A	.00325	.00198	1 11	N-3B	.00420	.00242	1 32
3/4	12	UN-2A	.00315	.00182	1 44	UN-2B	.00410	.00237	2 15
		UN-3A	.00335	.00195	1 18	UN-3B	.00310	.00179	1 42
3/4	16	UN-2A	.00290	.00162	2 3	UN-2B	.00365	.00211	2 40
		UN-3A	.00210	.00121	1 32	UN-3B	.00275	.00159	2 1
3/8	12	UN-2A	.00320	.00185	1 46	UN-2B	.00420	.00242	2 19
		UN-3A	.00240	.00139	1 19	UN-3B	.00315	.00182	1 44
3/8	16	UN-2A	.00290	.00167	2 8	UN-2B	.00375	.00217	2 45
		UN-3A	.00215	.00124	1 35	UN-3B	.00280	.00162	2 3
		UNC-1A	.00830	.00479	1 31	UNC-1B	.01075	.00621	1 58
3/8	4	UNC-2A	.00550	.00318	1 0	UNC-2B	.00715	.00413	1 19
		UNC-3A	.00415	.00240	0 46	UNC-3B	.00540	.00312	0 59
3/8	8	N-2A	.00440	.00254	1 37	N-2B	.00575	.00332	2 6
		N-3A	.00330	.00191	1 13	N-3B	.00430	.00248	1 35
3/8	12	UN-2A	.00320	.00185	1 46	UN-2B	.00420	.00242	2 19
		UN-3A	.00240	.00139	1 19	UN-3B	.00315	.00182	1 44
3/8	16	UN-2A	.00290	.00167	2 8	UN-2B	.00375	.00217	2 45
		UN-3A	.00215	.00124	1 35	UN-3B	.00280	.00162	2 3
3/8	12	UN-2A	.00320	.00185	1 46	UN-2B	.00420	.00242	2 19
		UN-3A	.00240	.00139	1 19	UN-3B	.00315	.00182	1 44
3/8	16	UN-2A	.00290	.00167	2 8	UN-2B	.00375	.00217	2 45
		UN-3A	.00215	.00124	1 35	UN-3B	.00280	.00162	2 3
		UNC-1A	.00840	.00485	1 32	UNC-1B	.01090	.00629	2 0
3/4	4	UNC-2A	.00560	.00323	1 2	UNC-2B	.00725	.00419	1 20
		UNC-3A	.00420	.00242	0 46	UNC-3B	.00545	.00315	1 0
3/4	8	N-2A	.00450	.00260	1 39	N-2B	.00585	.00329	2 9
		N-3A	.00335	.00193	1 14	N-3B	.00440	.00254	1 37
3/4	12	UN-2A	.00320	.00185	1 46	UN-2B	.00420	.00242	2 19
		UN-3A	.00240	.00139	1 19	UN-3B	.00315	.00182	1 44
3/4	16	UN-2A	.00290	.00167	2 8	UN-2B	.00375	.00217	2 45
		UN-3A	.00215	.00124	1 35	UN-3B	.00280	.00162	2 3
3/4	12	UN-2A	.00325	.00188	1 47	UN-2B	.00425	.00245	2 20
		UN-3A	.00245	.00141	1 21	UN-3B	.00320	.00185	1 46
3/4	16	UN-2A	.00295	.00170	2 10	UN-2B	.00380	.00219	2 47
		UN-3A	.00220	.00127	1 37	UN-3B	.00285	.00165	2 5
		UNC-1A	.00850	.00491	1 33	UNC-1B	.01105	.00638	2 2
4	4	UNC-2A	.00565	.00326	1 2	UNC-2B	.00735	.00424	1 21
		UNC-3A	.00425	.00245	0 47	UNC-3B	.00555	.00320	1 1
4	8	N-2A	.00455	.00263	1 40	N-2B	.00595	.00344	2 11
		N-3A	.00340	.00196	1 15	N-3B	.00445	.00257	1 38
4	12	UN-2A	.00325	.00188	1 47	UN-2B	.00425	.00245	2 20
		UN-3A	.00245	.00141	1 21	UN-3B	.00320	.00185	1 46
4	16	UN-2A	.00295	.00170	2 10	UN-2B	.00380	.00219	2 47
		UN-3A	.00220	.00127	1 37	UN-3B	.00285	.00165	2 5
4 1/4	8	N-2A	.00465	.00268	1 42	N-2B	.00605	.00349	2 13
		N-3A	.00350	.00202	1 17	N-3B	.00450	.00260	1 39
4 1/4	12	UN-2A	.00325	.00188	1 47	UN-2B	.00425	.00245	2 20
		UN-3A	.00245	.00141	1 21	UN-3B	.00320	.00185	1 46
4 1/4	16	UN-2A	.00295	.00170	2 10	UN-2B	.00380	.00219	2 47
		UN-3A	.00220	.00127	1 37	UN-3B	.00285	.00165	2 5
4 1/2	8	N-2A	.00470	.00271	1 43	N-2B	.00610	.00352	2 14
		N-3A	.00355	.00205	1 18	N-3B	.00460	.00266	1 41
4 1/2	12	UN-2A	.00325	.00188	1 47	UN-2B	.00425	.00245	2 20
		UN-3A	.00245	.00141	1 21	UN-3B	.00320	.00185	1 46
4 1/2	16	UN-2A	.00295	.00170	2 10	UN-2B	.00380	.00219	2 47
		UN-3A	.00220	.00127	1 37	UN-3B	.00285	.00165	2 5
4 3/4	8	N-2A	.00475	.00274	1 44	N-2B	.00620	.00358	2 16
		N-3A	.00360	.00208	1 19	N-3B	.00465	.00268	1 42
4 3/4	12	UN-2A	.00335	.00193	1 51	UN-2B	.00435	.00251	2 23
		UN-3A	.00250	.00144	1 22	UN-3B	.00330	.00191	1 49
4 3/4	16	UN-2A	.00305	.00176	2 14	UN-2B	.00395	.00228	2 54
		UN-3A	.00225	.00130	1 39	UN-3B	.00295	.00170	2 10
5	8	N-2A	.00485	.00280	1 47	N-2B	.00630	.00364	2 19
		N-3A	.00360	.00208	1 19	N-3B	.00470	.00271	1 43
5	12	UN-2A	.00335	.00193	1 51	UN-2B	.00435	.00251	2 23
		UN-3A	.00250	.00144	1 22	UN-3B	.00330	.00191	1 49
5	16	UN-2A	.00305	.00176	2 14	UN-2B	.00395	.00228	2 54
		UN-3A	.00225	.00130	1 39	UN-3B	.00295	.00170	2 10
5 1/4	8	N-2A	.00490	.00283	1 48	N-2B	.00635	.00367	2 20
		N-3A	.00365	.00211	1 20	N-3B	.00475	.00274	1 44

TABLE III.11.—Deviations in lead and half-angle equivalent to one-half of pitch diameter tolerances, Unified and American screw threads—Continued

Designation		External				Internal			
Size	Threads per inch	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle	Thread symbol	Half of pitch diameter tolerance	Equiv. deviation in lead	Equiv. deviation in half-angle
1	2	3	4	5	6	7	8	9	10
No. in.			in.	in.	deg min		in.	in.	deg min
5/16	12	UN-2A	0.00335	0.00193	1 51	UN-2B	0.00435	0.00251	2 23
		UN-3A	.00250	.00144	1 22	UN-3B	.00330	.00191	1 49
5/16	16	UN-2A	.00305	.00176	2 14	UN-2B	.00395	.00228	2 54
		UN-3A	.00225	.00130	1 39	UN-3B	.00295	.00170	2 10
3/8	8	N-2A	.00495	.00286	1 49	N-2B	.00645	.00372	2 22
		N-3A	.00370	.00214	1 21	N-3B	.00485	.00280	1 47
3/8	12	UN-2A	.00335	.00193	1 51	UN-2B	.00435	.00251	2 23
		UN-3A	.00250	.00144	1 22	UN-3B	.00330	.00191	1 49
3/8	16	UN-2A	.00305	.00176	2 14	UN-2B	.00395	.00228	2 54
		UN-3A	.00225	.00130	1 39	UN-3B	.00295	.00170	2 10
7/16	8	N-2A	.00500	.00289	1 50	N-2B	.00650	.00375	2 23
		N-3A	.00375	.00217	1 22	N-3B	.00490	.00283	1 48
7/16	12	UN-2A	.00345	.00199	1 54	UN-2B	.00450	.00260	2 28
		UN-3A	.00260	.00150	1 26	UN-3B	.00335	.00193	1 51
7/16	16	UN-2A	.00310	.00179	2 10	UN-2B	.00405	.00234	2 58
		UN-3A	.00235	.00136	1 43	UN-3B	.00305	.00176	2 14
1	8	N-2A	.00510	.00294	1 52	N-2B	.00660	.00381	2 25
		N-3A	.00380	.00219	1 24	N-3B	.00495	.00286	1 49
1	12	UN-2A	.00345	.00199	1 54	UN-2B	.00450	.00260	2 28
		UN-3A	.00260	.00150	1 26	UN-3B	.00335	.00193	1 51
1	16	UN-2A	.00310	.00179	2 10	UN-2B	.00405	.00234	2 58
		UN-3A	.00235	.00136	1 43	UN-3B	.00305	.00176	2 14

## 7. LIMITS OF SIZE OF GAGES

The limits of size of plain and thread gages applicable to the standard series of Unified and American screw threads are presented in table III.12. In this table *X* tolerances are applied to thread gages and *Z* tolerances to plain gages.

The limits of size of *W* truncated thread setting plug gages, and of both *W* and *X* basic-crest thread setting plug gages, are presented in table III.13 or as indicated in the footnotes to table III.13. These limits are developed in accordance with the requirements for gages and gaging stated in section VI, p. 107.

TABLE III.12.—Gages for standard thread series, Unified and American screw threads

Nominal size and threads per inch	Series designation	Gages for external threads										Gages for internal threads										Class	Series designation	Nominal size and threads per inch
		X thread gages					Z plain gages for major diameter					X thread gages					Z plain gages for minor diameter							
		Go		Not go			Go	Not go		Go	Not go		Go	Not go		Go	Not go		Go	Not go				
		Pitch diameter	Minor diameter	Plus tolerance gage	Minus tolerance gage	Fitch diameter		Minor diameter	Un-finished hot-rolled material		Pitch diameter	Major diameter		Pitch diameter	Major diameter		Minus tolerance gage	Plus tolerance gage						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21				
0-80	NF	2A	in.	0.0514	0.0480	0.0496	0.0489	0.0535	0.0543	in.	0.0600	0.0519	0.0596	0.0542	0.0542	in.	0.0514	2B	NF	0-80				
			0.0512	0.0488	0.0494	0.0472	0.0534	0.0544	0.0544	0.0544	0.0603	0.0521	0.0593	0.0540	0.0540	0.0603	0.0513							
1-64	NC	3A	in.	0.0512	0.0485	0.0494	0.0479	0.0535	0.0543	in.	0.0600	0.0519	0.0596	0.0542	0.0542	in.	0.0514	3B	NC	1-64				
			0.0517	0.0482	0.0494	0.0472	0.0534	0.0544	0.0544	0.0544	0.0603	0.0521	0.0593	0.0540	0.0540	0.0603	0.0513							
1-72	NF	2A	in.	0.0623	0.0555	0.0603	0.0569	0.0724	0.0686	in.	0.0730	0.0629	0.0723	0.0655	0.0655	in.	0.0623	2B	NF	1-72				
			0.0621	0.0551	0.0601	0.0573	0.0630	0.0724	0.0686	0.0686	0.0730	0.0629	0.0719	0.0653	0.0653	0.0686	0.0621							
2-56	NC	3A	in.	0.0623	0.0551	0.0601	0.0573	0.0724	0.0686	in.	0.0730	0.0629	0.0723	0.0655	0.0655	in.	0.0623	3B	NC	2-56				
			0.0621	0.0551	0.0601	0.0573	0.0630	0.0724	0.0686	0.0686	0.0730	0.0629	0.0719	0.0653	0.0653	0.0686	0.0621							
2-64	NF	2A	in.	0.0733	0.0655	0.0703	0.0678	0.0854	0.0813	in.	0.0860	0.0744	0.0849	0.0772	0.0772	in.	0.0733	2B	NF	2-64				
			0.0731	0.0653	0.0703	0.0678	0.0854	0.0813	0.0813	0.0813	0.0860	0.0744	0.0849	0.0772	0.0772	0.0860	0.0731							
3-48	NC	3A	in.	0.0733	0.0655	0.0703	0.0678	0.0854	0.0813	in.	0.0860	0.0744	0.0849	0.0772	0.0772	in.	0.0733	3B	NC	3-48				
			0.0731	0.0653	0.0703	0.0678	0.0854	0.0813	0.0813	0.0813	0.0860	0.0744	0.0849	0.0772	0.0772	0.0860	0.0731							
3-56	NF	2A	in.	0.0847	0.0759	0.0806	0.0781	0.0963	0.0923	in.	0.0970	0.0854	0.0979	0.0892	0.0892	in.	0.0847	2B	NF	3-56				
			0.0845	0.0757	0.0806	0.0781	0.0963	0.0923	0.0923	0.0923	0.0970	0.0854	0.0979	0.0892	0.0892	0.0970	0.0845							
4-40	NC	3A	in.	0.0847	0.0759	0.0806	0.0781	0.0963	0.0923	in.	0.0970	0.0854	0.0979	0.0892	0.0892	in.	0.0847	3B	NC	4-40				
			0.0845	0.0757	0.0806	0.0781	0.0963	0.0923	0.0923	0.0923	0.0970	0.0854	0.0979	0.0892	0.0892	0.0970	0.0845							
4-48	NF	2A	in.	0.0953	0.0854	0.0903	0.0878	0.1063	0.1023	in.	0.1070	0.0953	0.1063	0.0976	0.0976	in.	0.0953	2B	NF	4-48				
			0.0951	0.0852	0.0903	0.0878	0.1063	0.1023	0.1023	0.1023	0.1070	0.0953	0.1063	0.0976	0.0976	0.1070	0.0951							
5-40	NC	3A	in.	0.0953	0.0854	0.0903	0.0878	0.1063	0.1023	in.	0.1070	0.0953	0.1063	0.0976	0.0976	in.	0.0953	3B	NC	5-40				
			0.0951	0.0852	0.0903	0.0878	0.1063	0.1023	0.1023	0.1023	0.1070	0.0953	0.1063	0.0976	0.0976	0.1070	0.0951							
5-44	NF	2A	in.	0.1063	0.0953	0.1003	0.0978	0.1163	0.1123	in.	0.1170	0.1063	0.1163	0.1076	0.1076	in.	0.1063	2B	NF	5-44				
			0.1061	0.0951	0.1003	0.0978	0.1163	0.1123	0.1123	0.1123	0.1170	0.1063	0.1163	0.1076	0.1076	0.1170	0.1061							

TABLE III.12.—Gages for standard thread series, Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	Gages for external threads										Gages for internal threads										Class	Series designation	Nominal size and threads per inch	
		X thread gages					Z plain gages for major diameter					X thread gages					Z plain gages for minor diameter								
		Not go					Go					Not go					Go								
		Pitch diameter	Minor diameter	Plus tolerance gage	Minus tolerance gage	Pitch diameter	Minor diameter	Plus tolerance gage	Minus tolerance gage	Un-finished material	Semi-finished material	in.	in.	in.	in.	Pitch diameter	Minor diameter	Plus tolerance gage	Minus tolerance gage	Major diameter	Pitch diameter				in.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21					
6-32	NC	2A	0.1179	0.1034	0.1141	0.1073	0.1073	0.1372	0.1312	in.	in.	0.1177	0.1349	0.1214	0.1214	0.1040	0.1140	2B	NC						
		3A	0.1177	0.1032	0.1138	0.1070	0.1070	0.1370	0.1310	in.	in.	0.1175	0.1347	0.1212	0.1212	0.1038	0.1138	3B							
			0.1174	0.1027	0.1133	0.1065	0.1065	0.1367	0.1307	in.	in.	0.1172	0.1344	0.1209	0.1209	0.1035	0.1135								
6-40	NF	2A	0.1210	0.1062	0.1184	0.1114	0.1114	0.1372	0.1312	in.	in.	0.1208	0.1370	0.1252	0.1252	0.1100	0.1200	2B	NF						
		3A	0.1208	0.1060	0.1182	0.1112	0.1112	0.1370	0.1310	in.	in.	0.1206	0.1368	0.1250	0.1250	0.1098	0.1198	3B							
			0.1215	0.1067	0.1189	0.1119	0.1119	0.1377	0.1317	in.	in.	0.1213	0.1375	0.1257	0.1257	0.1105	0.1205								
8-32	NC	2A	0.1428	0.1268	0.1399	0.1329	0.1329	0.1632	0.1572	in.	in.	0.1426	0.1620	0.1475	0.1475	0.1300	0.1400	2B	NC						
		3A	0.1425	0.1265	0.1396	0.1326	0.1326	0.1630	0.1570	in.	in.	0.1423	0.1617	0.1472	0.1472	0.1298	0.1398	3B							
			0.1437	0.1277	0.1408	0.1338	0.1338	0.1637	0.1577	in.	in.	0.1435	0.1629	0.1484	0.1484	0.1305	0.1405								
8-36	NF	2A	0.1432	0.1272	0.1424	0.1354	0.1354	0.1632	0.1572	in.	in.	0.1430	0.1626	0.1484	0.1484	0.1302	0.1402	2B	NF						
		3A	0.1430	0.1270	0.1422	0.1352	0.1352	0.1630	0.1570	in.	in.	0.1428	0.1624	0.1482	0.1482	0.1300	0.1400	3B							
			0.1438	0.1278	0.1440	0.1370	0.1370	0.1637	0.1577	in.	in.	0.1436	0.1631	0.1490	0.1490	0.1307	0.1407								
10-24	NC	2A	0.1519	0.1349	0.1506	0.1436	0.1436	0.1800	0.1740	in.	in.	0.1517	0.1792	0.1672	0.1672	0.1430	0.1530	2B	NC						
		3A	0.1517	0.1347	0.1504	0.1434	0.1434	0.1798	0.1738	in.	in.	0.1515	0.1790	0.1670	0.1670	0.1428	0.1528	3B							
			0.1526	0.1356	0.1513	0.1443	0.1443	0.1807	0.1747	in.	in.	0.1524	0.1801	0.1682	0.1682	0.1437	0.1537								
10-32	NF	2A	0.1688	0.1518	0.1688	0.1618	0.1618	0.1900	0.1840	in.	in.	0.1686	0.1972	0.1736	0.1736	0.1540	0.1640	2B	NF						
		3A	0.1686	0.1516	0.1686	0.1616	0.1616	0.1898	0.1838	in.	in.	0.1684	0.1970	0.1734	0.1734	0.1538	0.1638	3B							
			0.1697	0.1527	0.1697	0.1627	0.1627	0.1907	0.1847	in.	in.	0.1695	0.1983	0.1745	0.1745	0.1547	0.1647								
12-24	NC	2A	0.1829	0.1649	0.1845	0.1775	0.1775	0.2150	0.2090	in.	in.	0.1827	0.2133	0.1933	0.1933	0.1710	0.1810	2B	NC						
		3A	0.1827	0.1647	0.1843	0.1773	0.1773	0.2148	0.2088	in.	in.	0.1825	0.2131	0.1931	0.1931	0.1708	0.1808	3B							
			0.1836	0.1656	0.1852	0.1782	0.1782	0.2157	0.2097	in.	in.	0.1834	0.2140	0.1944	0.1944	0.1716	0.1816								
12-28	NF	2A	0.1918	0.1718	0.1917	0.1847	0.1847	0.2250	0.2190	in.	in.	0.1916	0.2242	0.1970	0.1970	0.1760	0.1860	2B	NF						
		3A	0.1916	0.1716	0.1915	0.1845	0.1845	0.2248	0.2188	in.	in.	0.1914	0.2240	0.1968	0.1968	0.1758	0.1858	3B							
			0.1925	0.1725	0.1924	0.1854	0.1854	0.2257	0.2197	in.	in.	0.1923	0.2248	0.1982	0.1982	0.1767	0.1867								
12-32	NEF	2A	0.1948	0.1748	0.1947	0.1877	0.1877	0.2250	0.2190	in.	in.	0.1946	0.2242	0.1970	0.1970	0.1760	0.1860	2B	NEF						
		3A	0.1946	0.1746	0.1945	0.1875	0.1875	0.2248	0.2188	in.	in.	0.1944	0.2240	0.1968	0.1968	0.1758	0.1858	3B							
			0.1954	0.1754	0.1953	0.1883	0.1883	0.2257	0.2197	in.	in.	0.1952	0.2248	0.1982	0.1982	0.1767	0.1867								
14-20	UNC	1A	0.2144	0.1944	0.2143	0.2073	0.2073	0.2400	0.2340	in.	in.	0.2142	0.2396	0.2244	0.2244	0.1960	0.2060	13							
		2A	0.2142	0.1942	0.2141	0.2071	0.2071	0.2398	0.2338	in.	in.	0.2140	0.2394	0.2242	0.2242	0.1958	0.2058	2B	UNC						
		3A	0.2151	0.1951	0.2150	0.2080	0.2080	0.2407	0.2347	in.	in.	0.2149	0.2403	0.2251	0.2251	0.1967	0.2067	3B							

1A	2245	2108	2208	2208	2131	2191	2202	2200	2268	2488	2333	2333	2110	2200	UNF	1B
2A	2246	2109	2209	2209	2132	2192	2203	2203	2269	2489	2334	2334	2111	2139	2B	
3A	2247	2110	2210	2210	2133	2193	2204	2204	2270	2490	2335	2335	2112	2140	3B	
1A	2248	2111	2211	2211	2134	2194	2205	2205	2271	2491	2336	2336	2113	2141	NEF	2B
2A	2249	2112	2212	2212	2135	2195	2206	2206	2272	2492	2337	2337	2114	2142	3B	
3A	2250	2113	2213	2213	2136	2196	2207	2207	2273	2493	2338	2338	2115	2143	UNC	1B
1A	2251	2114	2214	2214	2137	2197	2208	2208	2274	2494	2339	2339	2116	2144	2B	
2A	2252	2115	2215	2215	2138	2198	2209	2209	2275	2495	2340	2340	2117	2145	3B	
3A	2253	2116	2216	2216	2139	2199	2210	2210	2276	2496	2341	2341	2118	2146	UNC	1B
1A	2254	2117	2217	2217	2140	2200	2211	2211	2277	2497	2342	2342	2119	2147	2B	
2A	2255	2118	2218	2218	2141	2201	2212	2212	2278	2498	2343	2343	2120	2148	3B	
3A	2256	2119	2219	2219	2142	2202	2213	2213	2279	2499	2344	2344	2121	2149	UNC	1B
1A	2257	2120	2220	2220	2143	2203	2214	2214	2280	2500	2345	2345	2122	2150	2B	
2A	2258	2121	2221	2221	2144	2204	2215	2215	2281	2501	2346	2346	2123	2151	3B	
3A	2259	2122	2222	2222	2145	2205	2216	2216	2282	2502	2347	2347	2124	2152	UNC	1B
1A	2260	2123	2223	2223	2146	2206	2217	2217	2283	2503	2348	2348	2125	2153	2B	
2A	2261	2124	2224	2224	2147	2207	2218	2218	2284	2504	2349	2349	2126	2154	3B	
3A	2262	2125	2225	2225	2148	2208	2219	2219	2285	2505	2350	2350	2127	2155	NEF	2B
1A	2263	2126	2226	2226	2149	2209	2220	2220	2286	2506	2351	2351	2128	2156	3B	
2A	2264	2127	2227	2227	2150	2210	2221	2221	2287	2507	2352	2352	2129	2157	UNC	1B
3A	2265	2128	2228	2228	2151	2211	2222	2222	2288	2508	2353	2353	2130	2158	2B	
1A	2266	2129	2229	2229	2152	2212	2223	2223	2289	2509	2354	2354	2131	2159	3B	
2A	2267	2130	2230	2230	2153	2213	2224	2224	2290	2510	2355	2355	2132	2160	UNC	1B
3A	2268	2131	2231	2231	2154	2214	2225	2225	2291	2511	2356	2356	2133	2161	2B	
1A	2269	2132	2232	2232	2155	2215	2226	2226	2292	2512	2357	2357	2134	2162	3B	
2A	2270	2133	2233	2233	2156	2216	2227	2227	2293	2513	2358	2358	2135	2163	NEF	2B
3A	2271	2134	2234	2234	2157	2217	2228	2228	2294	2514	2359	2359	2136	2164	3B	
1A	2272	2135	2235	2235	2158	2218	2229	2229	2295	2515	2360	2360	2137	2165	UNC	1B
2A	2273	2136	2236	2236	2159	2219	2230	2230	2296	2516	2361	2361	2138	2166	2B	
3A	2274	2137	2237	2237	2160	2220	2231	2231	2297	2517	2362	2362	2139	2167	3B	
1A	2275	2138	2238	2238	2161	2221	2232	2232	2298	2518	2363	2363	2140	2168	NEF	2B
2A	2276	2139	2239	2239	2162	2222	2233	2233	2299	2519	2364	2364	2141	2169	3B	
3A	2277	2140	2240	2240	2163	2223	2234	2234	2300	2520	2365	2365	2142	2170	UNC	1B
1A	2278	2141	2241	2241	2164	2224	2235	2235	2301	2521	2366	2366	2143	2171	2B	
2A	2279	2142	2242	2242	2165	2225	2236	2236	2302	2522	2367	2367	2144	2172	3B	
3A	2280	2143	2243	2243	2166	2226	2237	2237	2303	2523	2368	2368	2145	2173	NEF	2B
1A	2281	2144	2244	2244	2167	2227	2238	2238	2304	2524	2369	2369	2146	2174	3B	
2A	2282	2145	2245	2245	2168	2228	2239	2239	2305	2525	2370	2370	2147	2175	UNC	1B
3A	2283	2146	2246	2246	2169	2229	2240	2240	2306	2526	2371	2371	2148	2176	2B	
1A	2284	2147	2247	2247	2170	2230	2241	2241	2307	2527	2372	2372	2149	2177	3B	
2A	2285	2148	2248	2248	2171	2231	2242	2242	2308	2528	2373	2373	2150	2178	NEF	2B
3A	2286	2149	2249	2249	2172	2232	2243	2243	2309	2529	2374	2374	2151	2179	3B	
1A	2287	2150	2250	2250	2173	2233	2244	2244	2310	2530	2375	2375	2152	2180	UNC	1B
2A	2288	2151	2251	2251	2174	2234	2245	2245	2311	2531	2376	2376	2153	2181	2B	
3A	2289	2152	2252	2252	2175	2235	2246	2246	2312	2532	2377	2377	2154	2182	3B	
1A	2290	2153	2253	2253	2176	2236	2247	2247	2313	2533	2378	2378	2155	2183	NEF	2B
2A	2291	2154	2254	2254	2177	2237	2248	2248	2314	2534	2379	2379	2156	2184	3B	
3A	2292	2155	2255	2255	2178	2238	2249	2249	2315	2535	2380	2380	2157	2185	UNC	1B
1A	2293	2156	2256	2256	2179	2239	2250	2250	2316	2536	2381	2381	2158	2186	2B	
2A	2294	2157	2257	2257	2180	2240	2251	2251	2317	2537	2382	2382	2159	2187	3B	
3A	2295	2158	2258	2258	2181	2241	2252	2252	2318	2538	2383	2383	2160	2188	NEF	2B
1A	2296	2159	2259	2259	2182	2242	2253	2253	2319	2539	2384	2384	2161	2189	3B	
2A	2297	2160	2260	2260	2183	2243	2254	2254	2320	2540	2385	2385	2162	2190	UNC	1B
3A	2298	2161	2261	2261	2184	2244	2255	2255	2321	2541	2386	2386	2163	2191	2B	
1A	2299	2162	2262	2262	2185	2245	2256	2256	2322	2542	2387	2387	2164	2192	3B	
2A	2300	2163	2263	2263	2186	2246	2257	2257	2323	2543	2388	2388	2165	2193	NEF	2B
3A	2301	2164	2264	2264	2187	2247	2258	2258	2324	2544	2389	2389	2166	2194	3B	
1A	2302	2165	2265	2265	2188	2248	2259	2259	2325	2545	2390	2390	2167	2195	UNC	1B
2A	2303	2166	2266	2266	2189	2249	2260	2260	2326	2546	2391	2391	2168	2196	2B	
3A	2304	2167	2267	2267	2190	2250	2261	2261	2327	2547	2392	2392	2169	2197	3B	
1A	2305	2168	2268	2268	2191	2251	2262	2262	2328	2548	2393	2393	2170	2198	NEF	2B
2A	2306	2169	2269	2269	2192	2252	2263	2263	2329	2549	2394	2394	2171	2199	3B	
3A	2307	2170	2270	2270	2193	2253	2264	2264	2330	2550	2395	2395	2172	2200	UNC	1B
1A	2308	2171	2271	2271	2194	2254	2265	2265	2331	2551	2396	2396	2173	2201	2B	
2A	2309	2172	2272	2272	2195	2255	2266	2266	2332	2552	2397	2397	2174	2202	3B	
3A	2310	2173	2273	2273	2196	2256	2267	2267	2333	2553	2398	2398	2175	2203	NEF	2B
1A	2311	2174	2274	2274	2197	2257	2268	2268	2334	2554	2399	2399	2176	2204	3B	
2A	2312	2175	2275	2275	2198	2258	2269	2269	2335	2555	2400	2400	2177	2205	UNC	1B
3A	2313	2176	2276	2276	2199	2259	2270	2270	2336	2556	2401	2401	2178	2206	2B	
1A	2314	2177	2277	2277	2200	2260	2271	2271	2337	2557	2402	2402	2179	2207	3B	
2A	2315	2178	2278	2278	2201	2261	2272	2272	2338	2558	2403	2403	2180	2208	NEF	2B
3A	2316	2179	2279	2279	2202	2262	2273	2273	2339	2559	2404	2404	2181	2209	3B	
1A	2317	2180	2280	2280	2203	2263	2274	2274	2340	2560	2405	2405	2182	2210	UNC	1B
2A	2318	2181	2281	2281	2204	2264	2275	2275	2341	2561	2406	2406	2183	2211	2B	
3A	2319	2182	2282	2282	2205	2265	2276	2276	2342	2562	2407	2407	2184	2212	3B	
1A	2320	2183	2283	2283	2206	2266	2277	2277	2343	2563	2408	2408	2185	2213	NEF	2B
2A	2321	2184	2284	2284	2207	2267	2278	2278	2344	2564	2409	2409	2186	2214	3B	
3A	2322	2185	2285	2285	2208	2268	2279	2279	2345	2565	2410	2410	2187	2215	UNC	1B
1A	2323	2186	2286	2286	2209	2269	2280	2280	2346	2566	2411	2411	2188	2216	2B	
2A	2324	2187	2287	2287	2210	2270	2281	2281	2347	2567	2412	2412	2189	2217	3B	
3A	2325	2188	2288	2288	2211	2271	2282	2282	2348	2568	2413	2413	2190	2218	NEF	2B
1A	2326	2189	2289	2289	2212	2272	2283	2283	2349	2569	2414	2414	2191	2219	3B	
2A	2327	2190	2290	2290	2213	2273	2284	2284	2350	2570	2415	2415	2192	2220		



TABLE III.12.—Gages for standard thread series, Unified and American screw threads—Continued

Nominal size and threads per inch			Gages for external threads										Gages for internal threads										Series designation	Nominal size and threads per inch		
			X thread gages					Z plain gages for major diameter					X thread gages					Z plain gages for minor diameter								
			Not go					Go					Not go					Go								
			Pitch diameter	Minor diameter	Plus tolerance gage	Minus tolerance gage	Major diameter	Pitch diameter	Major diameter	Minor diameter	Unfinished rolled material	Semi-finished	Pitch diameter	Major diameter	Minor diameter	Unfinished rolled material	Semi-finished	Pitch diameter	Major diameter	Minor diameter	Unfinished rolled material	Semi-finished			Pitch diameter	Major diameter
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21						
1/2-20	UNF	1A	0.4682	0.4446	0.4508	0.4508	0.4490	0.4987	0.4875	in.	0.5000	0.4675	0.4976	0.4759	0.4759	0.4460	0.4570	1B								
		2A	0.4680	0.4441	0.4506	0.4506	0.4485	0.4986	0.4876	0.4876	0.5000	0.4678	0.4971	0.4756	0.4756	0.4461	0.4570	2B	UNF							
		3A	0.4689	0.4441	0.4511	0.4511	0.4486	0.4987	0.4876	0.4876	0.5000	0.4678	0.4971	0.4756	0.4756	0.4461	0.4570	3B								
1/2-28	UNEF	1A	0.4672	0.4435	0.4496	0.4496	0.4475	0.4972	0.4860	0.4860	0.4984	0.4665	0.4966	0.4750	0.4750	0.4451	0.4561	1B								
		2A	0.4670	0.4431	0.4496	0.4496	0.4475	0.4970	0.4859	0.4859	0.4984	0.4665	0.4966	0.4750	0.4750	0.4451	0.4561	2B	UNEF							
		3A	0.4678	0.4431	0.4501	0.4501	0.4480	0.4978	0.4868	0.4868	0.4992	0.4668	0.4969	0.4752	0.4752	0.4454	0.4564	3B								
3/8-12	UNC	1A	0.5068	0.4707	0.4900	0.4900	0.4810	0.5609	0.5437	0.5437	0.5625	0.5084	0.5547	0.5186	0.5186	0.4720	0.4890	1B								
		2A	0.5068	0.4707	0.4900	0.4900	0.4810	0.5609	0.5437	0.5437	0.5625	0.5084	0.5547	0.5186	0.5186	0.4720	0.4890	2B	UNC							
		3A	0.5068	0.4707	0.4900	0.4900	0.4810	0.5609	0.5437	0.5437	0.5625	0.5084	0.5547	0.5186	0.5186	0.4720	0.4890	3B								
3/8-18	UNF	1A	0.5230	0.5009	0.5182	0.5182	0.5062	0.5611	0.5480	0.5480	0.5625	0.5264	0.5597	0.5363	0.5363	0.5020	0.5190	1B								
		2A	0.5230	0.5009	0.5182	0.5182	0.5062	0.5611	0.5480	0.5480	0.5625	0.5264	0.5597	0.5363	0.5363	0.5020	0.5190	2B	UNF							
		3A	0.5230	0.5009	0.5182	0.5182	0.5062	0.5611	0.5480	0.5480	0.5625	0.5264	0.5597	0.5363	0.5363	0.5020	0.5190	3B								
3/8-24	NEF	1A	0.5342	0.5157	0.5306	0.5306	0.5218	0.5612	0.5542	0.5542	0.5625	0.5354	0.5672	0.5402	0.5402	0.5170	0.5299	1B	NEF							
		2A	0.5342	0.5157	0.5306	0.5306	0.5218	0.5612	0.5542	0.5542	0.5625	0.5354	0.5672	0.5402	0.5402	0.5170	0.5299	2B								
		3A	0.5342	0.5157	0.5306	0.5306	0.5218	0.5612	0.5542	0.5542	0.5625	0.5354	0.5672	0.5402	0.5402	0.5170	0.5299	3B								
5/8-11	UNC	1A	0.6444	0.6240	0.6361	0.6361	0.6254	0.6749	0.6632	0.6632	0.6750	0.6264	0.6681	0.6461	0.6461	0.6270	0.6490	1B								
		2A	0.6444	0.6240	0.6361	0.6361	0.6254	0.6749	0.6632	0.6632	0.6750	0.6264	0.6681	0.6461	0.6461	0.6270	0.6490	2B	UNC							
		3A	0.6444	0.6240	0.6361	0.6361	0.6254	0.6749	0.6632	0.6632	0.6750	0.6264	0.6681	0.6461	0.6461	0.6270	0.6490	3B								
5/8-12	N	1A	0.6693	0.6484	0.6604	0.6604	0.6497	0.6992	0.6875	0.6875	0.6992	0.6506	0.6921	0.6701	0.6701	0.6510	0.6730	1B	N							
		2A	0.6693	0.6484	0.6604	0.6604	0.6497	0.6992	0.6875	0.6875	0.6992	0.6506	0.6921	0.6701	0.6701	0.6510	0.6730	2B								
		3A	0.6693	0.6484	0.6604	0.6604	0.6497	0.6992	0.6875	0.6875	0.6992	0.6506	0.6921	0.6701	0.6701	0.6510	0.6730	3B								
5/8-18	UNF	1A	0.6872	0.6664	0.6784	0.6784	0.6677	0.7172	0.7055	0.7055	0.7172	0.6686	0.7101	0.6881	0.6881	0.6690	0.6910	1B	UNF							
		2A	0.6872	0.6664	0.6784	0.6784	0.6677	0.7172	0.7055	0.7055	0.7172	0.6686	0.7101	0.6881	0.6881	0.6690	0.6910	2B								
		3A	0.6872	0.6664	0.6784	0.6784	0.6677	0.7172	0.7055	0.7055	0.7172	0.6686	0.7101	0.6881	0.6881	0.6690	0.6910	3B								
3/4-24	NEF	1A	0.7967	0.7757	0.7877	0.7877	0.7770	0.8265	0.8148	0.8148	0.8265	0.7779	0.8194	0.7974	0.7974	0.7783	0.8003	1B	NEF							
		2A	0.7967	0.7757	0.7877	0.7877	0.7770	0.8265	0.8148	0.8148	0.8265	0.7779	0.8194	0.7974	0.7974	0.7783	0.8003	2B								
		3A	0.7967	0.7757	0.7877	0.7877	0.7770	0.8265	0.8148	0.8148	0.8265	0.7779	0.8194	0.7974	0.7974	0.7783	0.8003	3B								

[illegible]

[illegible]

[illegible]



TABLE III.12.—Gages for standard thread series, Unified and American screw threads—Continued

Nominal size and threads per inch			Series designation	Gages for external threads										Gages for internal threads										Series designation	Class	Z plain gages for minor diameter	Nominal size and threads per inch																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
				X thread gages					Z plain gages for major diameter					X thread gages					Z plain gages for minor diameter																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
				Go		Not go			Go		Not go			Go		Not go			Go		Not go																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
				Pitch diameter	Minor diameter	Plus tolerance gage	Minus tolerance gage	Pitch diameter	Minor diameter	Unfinished hot-rolled material	Semi-finished	Major diameter	Pitch diameter	Major diameter	Unfinished hot-rolled material	Semi-finished	Major diameter	Pitch diameter	Major diameter	Unfinished hot-rolled material	Semi-finished	Major diameter	Pitch diameter					Major diameter	Unfinished hot-rolled material	Semi-finished	Major diameter	Pitch diameter	Major diameter	Unfinished hot-rolled material	Semi-finished	Major diameter	Pitch diameter	Major diameter																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
1½-16 UN	UN	2A	in.	1.2704	1.2633	1.2563	1.2513	1.3100	1.3018	in.	1.3125	1.2719	1.3056	1.2735	1.2785	in.	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450	1.2450



194-16	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
--------	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Nominal size and threads per inch	Series designation	Gages for external threads										Gages for internal threads										Class	Series designation	Nominal size and threads per inch
		X thread gages					Z plain gages for major diameter					X thread gages					Z plain gages for minor diameter							
		Go		Not go			Go	Not go		Go	Not go		Go	Not go		Go	Not go							
		Pitch diameter	Minor diameter	Plus tolerance gage	Minus tolerance gage	Pitch diameter		Minor diameter	Unfinished hot rolled material		Semi-finished	Pitch diameter		Major diameter	Minus tolerance gage		Plus tolerance gage	Pitch diameter	Major diameter	Minus tolerance gage	Plus tolerance gage			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21				
1/4-16	N	2A	1.413	1.412	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398	2B	N	1/4-16				
		3A	1.414	1.413	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398		3B	1/4-16			
		2A	1.415	1.414	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399		1.398	2B	1/4-16		
1/4-18	NEF	3A	1.414	1.413	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398	3B	NEF	1/4-18			
		2A	1.415	1.414	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398		2B	1/4-18		
		3A	1.416	1.415	1.413	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399		1.398	3B	1/4-18	
1/4-20	N	1A	1.414	1.413	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398	1B	N	1/4-20			
		2A	1.415	1.414	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	2B		1/4-20			
		3A	1.416	1.415	1.413	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399		3B	1/4-20		
1/4-24	N	2A	1.414	1.413	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398	2B	N	1/4-24			
		3A	1.415	1.414	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	3B		1/4-24			
		2A	1.416	1.415	1.413	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399		2B	1/4-24		
1/4-28	UN	2A	1.414	1.413	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398	2B	UN	1/4-28			
		3A	1.415	1.414	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	3B		1/4-28			
		2A	1.416	1.415	1.413	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399		2B	1/4-28		
1/4-32	UNEF	2A	1.414	1.413	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398	2B	UNEF	1/4-32			
		3A	1.415	1.414	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	3B		1/4-32			
		2A	1.416	1.415	1.413	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399		2B	1/4-32		
1/4-40	N	2A	1.414	1.413	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398	2B	N	1/4-40			
		3A	1.415	1.414	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	3B		1/4-40			
		2A	1.416	1.415	1.413	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399		2B	1/4-40		
1/4-48	N	2A	1.414	1.413	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398	2B	N	1/4-48			
		3A	1.415	1.414	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	3B		1/4-48			
		2A	1.416	1.415	1.413	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399		2B	1/4-48		
1/4-56	UNC	2A	1.414	1.413	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398	2B	UNC	1/4-56			
		3A	1.415	1.414	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	3B		1/4-56			
		2A	1.416	1.415	1.413	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399		2B	1/4-56		
1/4-64	N	2A	1.414	1.413	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398	2B	N	1/4-64			
		3A	1.415	1.414	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	3B		1/4-64			
		2A	1.416	1.415	1.413	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399		2B	1/4-64		
1/4-80	UN	2A	1.414	1.413	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	1.398	2B	UN	1/4-80			
		3A	1.415	1.414	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399	3B		1/4-80			
		2A	1.416	1.415	1.413	1.412	1.411	1.410	1.409	1.408	1.407	1.406	1.405	1.404	1.403	1.402	1.401	1.400	1.399		2B	1/4-80		



50

50

[illegible]



TABLE III.12.—Gages for standard thread series, Unified and American screw threads—Continued

Nominal size and designation per inch			Gages for external threads										Gages for internal threads										Series designation	Class	Nominal size and threads per inch
			X thread gages					Z plain gages for major diameter					X thread gages					Z plain gages for minor diameter							
			Go	Not go			Go	Not go	Un-finished hot-rolled material	Semi-finished	Major diameter	Pitch diameter	Major diameter	Pitch diameter	Major diameter	Pitch diameter	Not go	Pitch diameter		Go	Not go				
				Pitch diameter	Minor diameter	Plus tolerance gage												Minus tolerance gage	Major diameter			Minus tolerance gage			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21					
3/4-12	UN	2A	3.3100	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126					
		3A	3.3100	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126					
		3A	3.3100	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126	3.3126					
3/4-16	UN	2A	3.3200	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226					
		3A	3.3200	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226					
		3A	3.3200	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226	3.3226					
3/4-20	UNC	1A	3.3300	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326					
		2A	3.3300	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326					
		3A	3.3300	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326	3.3326					
3/4-24	UNC	1A	3.3400	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426					
		2A	3.3400	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426					
		3A	3.3400	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426	3.3426					
3/4-28	N	2A	3.3500	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526					
		3A	3.3500	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526					
		3A	3.3500	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526	3.3526					
3/4-32	UNC	2A	3.3600	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626					
		3A	3.3600	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626					
		3A	3.3600	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626	3.3626					
3/4-36	UNC	2A	3.3700	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726					
		3A	3.3700	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726					
		3A	3.3700	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726	3.3726					
3/4-40	UNC	1A	3.3800	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826					
		2A	3.3800	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826					
		3A	3.3800	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826	3.3826					
3/4-44	N	2A	3.3900	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926					
		3A	3.3900	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926					
		3A	3.3900	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926	3.3926					

[illegible]

[illegible]

512-16	UN	2A	5.4576	5.4305	5.4515	5.4386	5.46820	5.5000	5.4594	5.4944	5.4873	5.43200	5.44000	UN	2B
			5.4570	5.4321	5.4520	5.4389	5.46705	5.5009	5.4600	5.4935	5.4877	5.43225	5.44175		
			5.4564	5.4314	5.4514	5.4384	5.46650	5.5000	5.4594	5.4924	5.4867	5.43200	5.44080		
514-8	N	3A	5.4588	5.4355	5.4543	5.4423	5.48975	5.5009	5.4600	5.4915	5.4851	5.43225	5.44055	N	2D
			5.4582	5.4358	5.4552	5.4287	5.47700	5.5000	5.4588	5.4915	5.4815	5.43200	5.44000		
			5.4576	5.4352	5.4546	5.4281	5.47625	5.5000	5.4582	5.4909	5.4811	5.43225	5.44055		
514-12	UN	3A	5.4594	5.4361	5.4550	5.4293	5.47800	5.5000	5.4594	5.4924	5.4867	5.43200	5.44080	UN	2B
			5.4588	5.4355	5.4543	5.4287	5.47700	5.5000	5.4588	5.4915	5.4815	5.43225	5.44055		
			5.4582	5.4358	5.4552	5.4281	5.47625	5.5000	5.4582	5.4909	5.4811	5.43200	5.44000		
514-16	UN	3A	5.4600	5.4367	5.4563	5.4300	5.47900	5.5000	5.4600	5.4935	5.4877	5.43225	5.44175	UN	2B
			5.4594	5.4361	5.4550	5.4293	5.47800	5.5000	5.4594	5.4924	5.4867	5.43200	5.44080		
			5.4588	5.4355	5.4543	5.4287	5.47700	5.5000	5.4588	5.4915	5.4815	5.43225	5.44055		
6-8	N	3A	5.4606	5.4373	5.4569	5.4316	5.48000	5.5000	5.4606	5.4941	5.4885	5.43225	5.44225	N	3B
			5.4600	5.4367	5.4563	5.4300	5.47900	5.5000	5.4600	5.4935	5.4877	5.43200	5.44175		
			5.4594	5.4361	5.4550	5.4293	5.47800	5.5000	5.4594	5.4924	5.4867	5.43200	5.44080		
6-12	UN	3A	5.4612	5.4379	5.4572	5.4329	5.48100	5.5000	5.4612	5.4947	5.4891	5.43225	5.44275	UN	2B
			5.4606	5.4373	5.4569	5.4316	5.48000	5.5000	5.4606	5.4941	5.4885	5.43225	5.44225		
			5.4600	5.4367	5.4563	5.4300	5.47900	5.5000	5.4600	5.4935	5.4877	5.43200	5.44175		
6-16	UN	3A	5.4618	5.4385	5.4578	5.4335	5.48200	5.5000	5.4618	5.4953	5.4897	5.43225	5.44325	UN	2B
			5.4612	5.4379	5.4572	5.4329	5.48100	5.5000	5.4612	5.4947	5.4891	5.43225	5.44275		
			5.4606	5.4373	5.4569	5.4316	5.48000	5.5000	5.4606	5.4941	5.4885	5.43225	5.44225		

TABLE III.13.—Setting plug gages, Unified and American screw threads

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs			
			Plug for "Go"			Plug for "Not go"					Major diameter			
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>		Not go <sup>1</sup>		
			Truncated	Full		Truncated	Full	Plus tolerance gage	Minus tolerance gage	W tolerance	X tolerance	W tolerance	X tolerance	
1	2	3	4	5	6	7	8	9	10	11A	11B	12A	12B	
0-80	NF	2A	<i>in.</i> 0.0561 .0558 .0566 .0563	<i>in.</i> 0.0595 .0598 .0600 .0603	<i>in.</i> 0.0514 .0513 .0519 .0518	<i>in.</i> 0.0550 .0547 .0560 .0557	<i>in.</i> 0.0584 .0587 .0594 .0597	<i>in.</i> 0.0496 .0497 .0506 .0507	<i>in.</i> 0.0496 .0495 .0506 .0505	<i>in.</i> 0.0595 .0598 .0600 .0603	<i>in.</i> 0.0595 .0598 .0600 .0603	<i>in.</i> 0.0584 .0587 .0594 .0597	<i>in.</i> 0.0584 .0587 .0594 .0597	
		2A	.0684 .0681 .0690 .0687	.0724 .0727 .0730 .0733	.0623 .0622 .0629 .0628	.0671 .0668 .0682 .0679	.0717 .0720 .0728 .0731	.0603 .0604 .0614 .0615	.0603 .0602 .0614 .0613	.0724 .0727 .0730 .0733	.0724 .0728 .0730 .0734	.0717 .0720 .0728 .0731	.0717 .0721 .0728 .0732	
		3A	.0687 .0684 .0693 .0690	.0724 .0727 .0730 .0733	.0634 .0633 .0640 .0639	.0675 .0672 .0686 .0683	.0715 .0718 .0726 .0729	.0615 .0616 .0626 .0627	.0615 .0614 .0626 .0625	.0724 .0727 .0730 .0733	.0724 .0727 .0730 .0733	.0715 .0718 .0726 .0729	.0715 .0718 .0726 .0729	
1-64	NC	2A	.0810 .0807 .0816 .0813	.0854 .0857 .0860 .0863	.0738 .0737 .0744 .0743	.0794 .0791 .0805 .0802	.0850 .0853 .0860 .0863	.0717 .0718 .0728 .0729	.0717 .0716 .0728 .0727	.0854 .0857 .0860 .0863	.0854 .0858 .0860 .0864	.0850 .0853 .0860 .0863	.0850 .0854 .0860 .0864	
		2A	.0814 .0811 .0829 .0817	.0854 .0857 .0860 .0863	.0753 .0752 .0759 .0758	.0801 .0798 .0812 .0809	.0847 .0850 .0858 .0861	.0733 .0734 .0744 .0745	.0733 .0732 .0744 .0743	.0854 .0857 .0860 .0863	.0854 .0858 .0860 .0864	.0847 .0850 .0858 .0861	.0847 .0851 .0858 .0862	
		3A	.0934 .0931 .0941 .0938	.0983 .0986 .0990 .0993	.0848 .0847 .0855 .0854	.0915 .0912 .0928 .0925	.0981 .0984 .0990 .0993	.0825 .0826 .0838 .0839	.0825 .0824 .0838 .0837	.0983 .0986 .0990 .0993	.0983 .0987 .0990 .0994	.0981 .0984 .0990 .0993	.0981 .0985 .0990 .0994	
2-56	NC	2A	.0939 .0936 .0946 .0943	.0983 .0986 .0990 .0993	.0867 .0866 .0874 .0873	.0922 .0919 .0935 .0932	.0978 .0981 .0990 .0993	.0845 .0846 .0858 .0859	.0845 .0844 .0858 .0857	.0983 .0986 .0990 .0993	.0983 .0987 .0990 .0994	.0978 .0981 .0990 .0993	.0978 .0982 .0990 .0994	
		2A	.1056 .1053 .1064 .1061	.1112 .1115 .1120 .1123	.0950 .0949 .0958 .0957	.1033 .1030 .1047 .1044	.1112 .1115 .1120 .1123	.0925 .0926 .0939 .0940	.0925 .0924 .0939 .0939	.1112 .1115 .1120 .1123	.1112 .1116 .1120 .1124	.1112 .1115 .1120 .1123	.1112 .1116 .1120 .1124	
		3A	.1064 .1061 .1071 .1068	.1113 .1116 .1120 .1123	.0978 .0977 .0985 .0984	.1044 .1041 .1057 .1054	.1110 .1113 .1120 .1123	.0954 .0955 .0967 .0968	.0954 .0953 .0967 .0966	.1113 .1116 .1120 .1123	.1113 .1117 .1120 .1124	.1110 .1113 .1120 .1123	.1110 .1114 .1120 .1124	
3-48	NF	2A	.1186 .1183 .1194 .1191	.1242 .1245 .1250 .1253	.1080 .1079 .1088 .1087	.1162 .1159 .1177 .1174	.1242 .1245 .1250 .1253	.1054 .1055 .1069 .1070	.1054 .1053 .1069 .1068	.1242 .1245 .1250 .1253	.1242 .1246 .1250 .1254	.1242 .1246 .1250 .1253	.1242 .1246 .1250 .1254	
		2A	.1191 .1188 .1198 .1195	.1243 .1246 .1250 .1253	.1095 .1094 .1102 .1101	.1168 .1165 .1181 .1178	.1240 .1243 .1250 .1253	.1070 .1071 .1083 .1084	.1070 .1069 .1083 .1082	.1243 .1246 .1250 .1253	.1243 .1247 .1250 .1254	.1240 .1243 .1250 .1253	.1240 .1244 .1250 .1254	
		3A	.1307 .1304 .1315 .1312	.1372 .1375 .1380 .1383	.1169 .1168 .1177 .1176	.1276 .1273 .1291 .1288	.1372 .1375 .1380 .1383	.1141 .1142 .1156 .1157	.1141 .1140 .1156 .1155	.1372 .1375 .1380 .1383	.1372 .1377 .1380 .1385	.1372 .1375 .1380 .1383	.1372 .1377 .1380 .1385	
4-40	NC	2A	.1316 .1313 .1324 .1321	.1372 .1375 .1380 .1383	.1210 .1209 .1218 .1217	.1292 .1289 .1306 .1303	.1372 .1375 .1380 .1383	.1184 .1185 .1198 .1199	.1184 .1183 .1198 .1197	.1372 .1375 .1380 .1383	.1372 .1376 .1380 .1384	.1372 .1375 .1380 .1383	.1372 .1376 .1380 .1384	
		2A	.1596 .1593 .1604 .1601	.1631 .1634 .1640 .1643	.1428 .1427 .1437 .1436	.1534 .1531 .1550 .1547	.1631 .1634 .1640 .1643	.1390 .1390 .1415 .1416	.1390 .1390 .1415 .1415	.1631 .1634 .1640 .1643	.1631 .1636 .1640 .1645	.1631 .1634 .1640 .1645	.1631 .1636 .1640 .1645	
		3A	.1672 .1669 .1680 .1677	.1632 .1635 .1640 .1643	.1452 .1451 .1460 .1459	.1544 .1541 .1559 .1556	.1632 .1635 .1640 .1643	.1424 .1425 .1439 .1440	.1424 .1423 .1439 .1438	.1632 .1637 .1640 .1643	.1632 .1636 .1640 .1644	.1632 .1635 .1640 .1643	.1632 .1636 .1640 .1644	
5-40	NF	2A	.1811 .1808 .1821 .1816	.1890 .1895 .1900 .1905	.1619 .1618 .1629 .1628	.1766 .1761 .1784 .1779	.1890 .1895 .1900 .1905	.1586 .1587 .1604 .1605	.1586 .1585 .1604 .1605	.1890 .1895 .1900 .1905	.1890 .1895 .1900 .1905	.1890 .1895 .1900 .1905	.1890 .1895 .1900 .1905	
		2A	.1826 .1823 .1835 .1832	.1891 .1894 .1900 .1903	.1688 .1687 .1697 .1696	.1793 .1790 .1809 .1806	.1891 .1894 .1900 .1903	.1658 .1659 .1674 .1675	.1658 .1657 .1674 .1673	.1891 .1894 .1900 .1903	.1891 .1896 .1900 .1905	.1891 .1894 .1900 .1905	.1891 .1896 .1900 .1905	
		3A	.1832 .1829 .1840 .1837	.1891 .1894 .1900 .1903	.1688 .1687 .1697 .1696	.1793 .1790 .1809 .1806	.1891 .1894 .1900 .1903	.1658 .1659 .1674 .1675	.1658 .1657 .1674 .1673	.1891 .1894 .1900 .1903	.1891 .1896 .1900 .1905	.1891 .1894 .1900 .1905	.1891 .1896 .1900 .1905	
6-32	NC	2A	.1996 .1993 .2004 .2001	.2053 .2056 .2060 .2063	.1840 .1839 .1848 .1847	.1928 .1925 .1940 .1937	.2053 .2056 .2060 .2063	.1890 .1891 .1900 .1901	.1890 .1889 .1900 .1901	.2053 .2056 .2060 .2063	.2053 .2057 .2060 .2064	.2053 .2057 .2060 .2064	.2053 .2057 .2060 .2064	
		2A	.2001 .2004 .2015 .2012	.2053 .2056 .2060 .2063	.1840 .1839 .1848 .1847	.1928 .1925 .1940 .1937	.2053 .2056 .2060 .2063	.1890 .1891 .1900 .1901	.1890 .1889 .1900 .1901	.2053 .2056 .2060 .2063	.2053 .2057 .2060 .2064	.2053 .2057 .2060 .2064	.2053 .2057 .2060 .2064	
		3A	.2001 .2004 .2015 .2012	.2053 .2056 .2060 .2063	.1840 .1839 .1848 .1847	.1928 .1925 .1940 .1937	.2053 .2056 .2060 .2063	.1890 .1891 .1900 .1901	.1890 .1889 .1900 .1901	.2053 .2056 .2060 .2063	.2053 .2057 .2060 .2064	.2053 .2057 .2060 .2064	.2053 .2057 .2060 .2064	
8-32	NF	2A	.2196 .2193 .2204 .2201	.2253 .2256 .2260 .2263	.2040 .2039 .2048 .2047	.2128 .2125 .2140 .2137	.2253 .2256 .2260 .2263	.2090 .2091 .2100 .2101	.2090 .2089 .2100 .2101	.2253 .2256 .2260 .2263	.2253 .2257 .2260 .2264	.2253 .2257 .2260 .2264	.2253 .2257 .2260 .2264	
		2A	.2201 .2204 .2215 .2212	.2253 .2256 .2260 .2263	.2040 .2039 .2048 .2047	.2128 .2125 .2140 .2137	.2253 .2256 .2260 .2263	.2090 .2091 .2100 .2101	.2090 .2089 .2100 .2101	.2253 .2256 .2260 .2263	.2253 .2257 .2260 .2264	.2253 .2257 .2260 .2264	.2253 .2257 .2260 .2264	
		3A	.2201 .2204 .2215 .2212	.2253 .2256 .2260 .2263	.2040 .2039 .2048 .2047	.2128 .2125 .2140 .2137	.2253 .2256 .2260 .2263	.2090 .2091 .2100 .2101	.2090 .2089 .2100 .2101	.2253 .2256 .2260 .2263	.2253 .2257 .2260 .2264	.2253 .2257 .2260 .2264	.2253 .2257 .2260 .2264	
10-24	NC	2A	.2396 .2393 .2404 .2401	.2453 .2456 .2460 .2463	.2240 .2239 .2248 .2247	.2328 .2325 .2340 .2337	.2453 .2456 .2460 .2463	.2290 .2291 .2300 .2301	.2290 .2289 .2300 .2301	.2453 .2456 .2460 .2463	.2453 .2457 .2460 .2464	.2453 .2457 .2460 .2464	.2453 .2457 .2460 .2464	
		2A	.2401 .2404 .2415 .2412	.2453 .2456 .2460 .2463	.2240 .2239 .2248 .2247	.2328 .2325 .2340 .2337	.2453 .2456 .2460 .2463	.2290 .2291 .2300 .2301	.2290 .2289 .2300 .2301	.2453 .2456 .2460 .2463	.2453 .2457 .2460 .2464	.2453 .2457 .2460 .2464	.2453 .2457 .2460 .2464	
		3A	.2401 .2404 .2415 .2412	.2453 .2456 .2460 .2463	.2240 .2239 .2248 .2247	.2328 .2325 .2340 .2337	.2453 .2456 .2460 .2463	.2290 .2291 .2300 .2301	.2290 .2289 .2300 .2301	.2453 .2456 .2460 .2463	.2453 .2457 .2460 .2464	.2453 .2457 .2460 .2464	.2453 .2457 .2460 .2464	
12-24	NF	2A	.2596 .2593 .2604 .2601	.2653 .2656 .2660 .2663	.2440 .2439 .2448 .2447	.2528 .2525 .2540 .2537	.2653 .2656 .2660 .2663	.2490 .2491 .2500 .2501	.2490 .2489 .2500 .2501	.2653 .2656 .2660 .2663	.2653 .2657 .2660 .2664	.2653 .2657 .2660 .2664	.2653 .2657 .2660 .2664	
		2A	.2601 .2604 .2615 .2612	.2653 .2656 .2660 .2663	.2440 .2439 .2448 .2447	.2528 .2525 .2540 .2537	.2653 .2656 .2660 .2663	.2490 .2491 .2500 .2501	.2490 .2489 .2500 .2501	.2653 .2656 .2660 .2663	.2653 .2657 .2660 .2664	.2653 .2657 .2660 .2664	.2653 .2657 .2660 .2664	
		3A	.2601 .2604 .2615 .2612	.2653 .2656 .2660 .2663	.2440 .2439 .2448 .2447	.2528 .2525 .2540 .2537	.2653 .2656 .2660 .2663	.2490 .2491 .2500 .2501	.2490 .2489 .2500 .2501	.2653 .2656 .2660 .2663	.2653 .2657 .2660 .2664	.2653 .2657 .2660 .2664	.2653 .2657 .2660 .2664	

See footnotes at end of table.



TABLE III.13.—Setting plug gages, Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs			
			Plug for "Go"			Plug for "Not go"					Major diameter			
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Pitch diameter	Go		Not go	
			Truncated	Full		Truncated	Full	Plus tolerance gage	Minus tolerance gage		W tolerance	X tolerance	W tolerance	X tolerance
1	2	3	4	5	6	7	8	9	10		11A	11B	12A	12B
12-24	NC	2A	<i>in.</i> 0.2071	<i>in.</i> 0.2150	<i>in.</i> 0.1879	<i>in.</i> 0.2025	<i>in.</i> 0.2150	<i>in.</i> 0.1845	<i>in.</i> 0.1845	<i>in.</i> 0.2150	<i>in.</i> 0.2150	<i>in.</i> 0.2150	<i>in.</i> 0.2150	<i>in.</i> 0.2150
		3A	.2066 .2081 .2076	.2155 .2160 .2165	.1878 .1889 .1888	.2020 .2043 .2038	.2155 .2160 .2165	.1844 .1863 .1864	.1844 .1863 .1862	.2155 .2160 .2165	.2155 .2160 .2165	.2155 .2160 .2165	.2155 .2160 .2165	.2155 .2160 .2165
		2A	.2079	.2150	.1918	.2041	.2150	.1886	.1886	.2150	.2150	.2150	.2150	.2150
12-28	NF	3A	.2074 .2089 .2084	.2155 .2160 .2165	.1917 .1928 .1927	.2036 .2059 .2054	.2155 .2160 .2165	.1887 .1904 .1905	.1885 .1904 .1903	.2155 .2160 .2165	.2155 .2160 .2165	.2155 .2160 .2165	.2155 .2160 .2165	.2155 .2160 .2165
		2A	.2086	.2151	.1948	.2052	.2151	.1917	.1917	.2151	.2151	.2151	.2151	.2151
		3A	.2083 .2096 .2092	.2154 .2160 .2163	.1947 .1957 .1956	.2049 .2068 .2065	.2151 .2160 .2163	.1918 .1933 .1934	.1916 .1933 .1932	.2151 .2156 .2160	.2151 .2156 .2160	.2151 .2156 .2160	.2151 .2156 .2160	.2151 .2156 .2160
12-32	NEF	2A	.2086	.2151	.1948	.2052	.2151	.1917	.1917	.2151	.2151	.2151	.2151	.2151
		3A	.2083 .2096 .2092	.2154 .2160 .2163	.1947 .1957 .1956	.2049 .2068 .2065	.2151 .2160 .2163	.1918 .1933 .1934	.1916 .1933 .1932	.2151 .2156 .2160	.2151 .2156 .2160	.2151 .2156 .2160	.2151 .2156 .2160	.2151 .2156 .2160
		2A	.2086	.2151	.1948	.2052	.2151	.1917	.1917	.2151	.2151	.2151	.2151	.2151
1/4-20	UNC	3A	.2399 .2404 .2404	.2489 .2494 .2494	.2154 .2163 .2163	.2324 .2319 .2344	.2483 .2488 .2489	.2108 .2109 .2127	.2108 .2107 .2127	.2489 .2494 .2489	.2489 .2494 .2489	.2489 .2494 .2489	.2489 .2494 .2489	.2489 .2494 .2489
		2A	.2399	.2489	.2154	.2324	.2483	.2108	.2108	.2489	.2489	.2489	.2489	.2489
		3A	.2399 .2404 .2404	.2489 .2494 .2494	.2154 .2163 .2163	.2324 .2319 .2344	.2483 .2488 .2489	.2108 .2109 .2127	.2108 .2107 .2127	.2489 .2494 .2489	.2489 .2494 .2489	.2489 .2494 .2489	.2489 .2494 .2489	.2489 .2494 .2489
1/4-28	UNF	2A	.2419	.2490	.2258	.2363	.2476	.2208	.2208	.2490	.2490	.2490	.2476	.2476
		3A	.2414 .2419 .2414	.2495 .2490 .2495	.2257 .2258 .2257	.2358 .2360 .2375	.2481 .2490 .2495	.2209 .2225 .2226	.2207 .2225 .2226	.2490 .2490 .2490	.2490 .2490 .2490	.2490 .2490 .2490	.2476 .2481 .2490	.2476 .2481 .2490
		2A	.2419	.2490	.2258	.2363	.2476	.2208	.2208	.2490	.2490	.2490	.2476	.2476
1/4-32	NEF	3A	.2425 .2422 .2432	.2490 .2493 .2503	.2267 .2266 .2266	.2390 .2357 .2405	.2489 .2482 .2503	.2255 .2256 .2273	.2255 .2256 .2273	.2490 .2493 .2500	.2490 .2495 .2500	.2490 .2495 .2500	.2489 .2492 .2500	.2489 .2494 .2500
		2A	.2425	.2490	.2267	.2390	.2489	.2255	.2255	.2490	.2490	.2490	.2489	.2489
		3A	.2422 .2432 .2432	.2493 .2503 .2503	.2266 .2266 .2266	.2357 .2405 .2503	.2482 .2503 .2503	.2256 .2273 .2274	.2256 .2273 .2272	.2493 .2500 .2503	.2495 .2500 .2505	.2495 .2500 .2505	.2492 .2500 .2505	.2494 .2500 .2505
1/2-18	UNC	1A	.3016	.3113	.2752	.2932	.3108	.2691	.2691	.3113	.3113	.3113	.3108	.3108
		2A	.3011 .3016 .3011	.3118 .3113 .3118	.2751 .2752 .2751	.2927 .2953 .2948	.3113 .3113 .3118	.2692 .2712 .2713	.2690 .2712 .2711	.3113 .3113 .3118	.3113 .3113 .3118	.3113 .3113 .3118	.3113 .3113 .3118	.3113 .3113 .3118
		3A	.3028 .3023	.3125 .3130	.2761 .2763	.2975 .2970	.3125 .3130	.2734 .2735	.2734 .2735	.3125 .3130	.3125 .3130	.3125 .3130	.3125 .3130	.3125 .3130
1/2-24	UNF	1A	.3035	.3114	.2843	.2968	.3100	.2787	.2788	.3114	.3114	.3114	.3100	.3100
		2A	.3030 .3035 .3030	.3119 .3114 .3119	.2842 .2843 .2842	.2963 .2966 .2981	.3155 .3114 .3119	.2789 .2805 .2807	.2789 .2805 .2807	.3119 .3114 .3119	.3119 .3114 .3119	.3119 .3114 .3119	.3105 .3114 .3119	.3105 .3114 .3119
		3A	.3046 .3041	.3125 .3130	.2854 .2863	.3007 .3002	.3125 .3130	.2827 .2828	.2827 .2826	.3125 .3130	.3125 .3130	.3125 .3130	.3125 .3130	.3125 .3130
1/2-32	NEF	2A	.3050	.3115	.2912	.3015	.3114	.2880	.2880	.3115	.3115	.3114	.3114	.3114
		3A	.3047 .3050 .3057	.3118 .3125 .3128	.2911 .2922 .2921	.3012 .3033 .3030	.3117 .3125 .3128	.2881 .2886 .2809	.2879 .2886 .2807	.3118 .3125 .3128	.3118 .3125 .3128	.3117 .3125 .3128	.3117 .3125 .3128	.3117 .3125 .3128
		1A	.3632	.3737	.3331	.3537	.3735	.3266	.3266	.3737	.3737	.3735	.3735	.3735
3/8-16	UNC	2A	.3626 .3632 .3626	.3743 .3737 .3743	.3330 .3331 .3330	.3531 .3558 .3552	.3741 .3737 .3743	.3267 .3267 .3288	.3265 .3267 .3286	.3743 .3743 .3743	.3743 .3743 .3743	.3743 .3743 .3743	.3741 .3741 .3743	.3741 .3741 .3743
		3A	.3645 .3649	.3750 .3756	.3344 .3348	.3582 .3576	.3750 .3756	.3311 .3312	.3311 .3310	.3750 .3756	.3750 .3756	.3750 .3756	.3750 .3756	.3750 .3756
		1A	.3660	.3739	.3468	.3591	.3724	.3411	.3411	.3739	.3739	.3739	.3724	.3724
3/8-24	UNF	2A	.3655 .3660 .3655	.3744 .3739 .3744	.3467 .3468 .3467	.3586 .3610 .3605	.3720 .3730 .3744	.3412 .3430 .3431	.3410 .3430 .3429	.3744 .3739 .3744	.3744 .3739 .3744	.3744 .3739 .3744	.3729 .3739 .3744	.3729 .3739 .3744
		3A	.3671 .3666	.3750 .3755	.3479 .3478	.3630 .3625	.3750 .3755	.3450 .3451	.3450 .3449	.3750 .3755	.3750 .3755	.3750 .3755	.3750 .3755	.3750 .3755
		2A	.3675	.3740	.3537	.3638	.3757	.3503	.3503	.3740	.3740	.3740	.3737	.3737
3/8-32	NEF	3A	.3672 .3685 .3682	.3743 .3750 .3753	.3536 .3547 .3546	.3635 .3657 .3654	.3740 .3750 .3753	.3501 .3522 .3523	.3502 .3522 .3521	.3743 .3750 .3753	.3745 .3750 .3753	.3745 .3750 .3753	.3740 .3750 .3753	.3742 .3750 .3753
		1A	.4246	.4361	.38079	.4135	.4361	.38260	.38260	.4361	.4361	.4361	.4350	.4350
		2A	.4246 .4246 .4246	.4361 .4361 .4361	.38079 .38079 .38079	.4135 .4135 .4135	.4361 .4361 .4361	.38260 .38260 .38260	.38260 .38260 .38260	.4361 .4361 .4361	.4361 .4361 .4361	.4361 .4361 .4361	.4350 .4350 .4350	.4350 .4350 .4350
1/2-20	UNF	3A	.4250 .4254	.4375 .4381	.38110 .38095	.4185 .4179	.4375 .4381	.38760 .38775	.38760 .38745	.4375 .4381	.4375 .4381	.4375 .4381	.4367 .4381	.4367 .4381
		1A	.4272	.4392	.4037	.4192	.4350	.3975	.3975	.4392	.4392	.4392	.4350	.4350
		2A	.4267 .4272 .4267	.4387 .4392 .4387	.4036 .4037 .4036	.4187 .4212 .4207	.4355 .4362 .4367	.3974 .3995 .3996	.3974 .3995 .3994	.4387 .4392 .4387	.4387 .4392 .4387	.4387 .4392 .4387	.4350 .4355 .4362	.4350 .4355 .4362

See footnotes at end of table.

TABLE III.13. —Setting plug gages, Unified and American screw threads— Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs							Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go 1	Not go 2
			Truncated	Full		Truncated	Full	Plus tolerance gage	Minus tolerance gage		
1	2	3	4	5	6	7	8	9	10	11	12
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
1/16-28	UNEF	2A	0.4203	0.4364	0.4132	0.4251	0.4364	0.4096	0.4096	0.4364	0.4364
			.4288	.4369	.4131	.4246	.4369	.4097	.4095	.4369	.4369
		3A	.4304	.4375	.4143	.4271	.4375	.4116	.4116	.4375	.4375
3/16-12	N	2A	.4855	.4981	.4439	.4750	.4981	.43890	.43890	.4981	.4981
			.4849	.4990	.44415	.4744	.4990	.43905	.43875	.4990	.4990
		3A	.4871	.5000	.44590	.4780	.5000	.44190	.44190	.5000	.5000
1/4-13	UNC	1A	.4853	.4985	.44850	.4744	.4985	.44110	.44110	.4985	.4985
			.4857	.4991	.44835	.4738	.4991	.44125	.44095	.4991	.4991
		2A	.4863	.4995	.44850	.4768	.4995	.44350	.44350	.4995	.4995
3/8-20	UNF	1A	.4857	.4991	.44835	.4762	.4991	.44365	.44365	.4991	.4991
			.4878	.5000	.45000	.4796	.5000	.44630	.44630	.5000	.5000
		3A	.4872	.5006	.44985	.4790	.5006	.44615	.44615	.5006	.5006
1/2-28	UNEF	1A	.4897	.4987	.4662	.4814	.4973	.4598	.4598	.4987	.4973
			.4892	.4992	.4661	.4809	.4978	.4599	.4597	.4992	.4978
		2A	.4897	.4987	.4662	.4836	.4987	.4613	.4613	.4987	.4987
5/16-18	UNC	1A	.4892	.4992	.4661	.4830	.4992	.4620	.4618	.4992	.4992
			.4910	.5000	.4675	.4890	.5000	.4643	.4643	.5000	.5000
		3A	.4905	.5005	.4674	.4855	.5005	.4644	.4642	.5005	.5005
3/4-16	UNF	2A	.4918	.4986	.4757	.4875	.4988	.4720	.4720	.4988	.4988
			.4913	.4994	.4756	.4870	.4993	.4721	.4719	.4994	.4994
		3A	.4929	.5000	.4768	.4895	.5000	.4740	.4740	.5000	.5000
7/16-14	UNC	1A	.4924	.5005	.4767	.4890	.5005	.4741	.4730	.5005	.5005
			.4940	.5009	.5068	.5351	.5009	.5090	.4990	.5009	.5009
		2A	.4974	.5015	.5066	.5315	.5015	.5092	.4988	.5015	.5015
1/2-12	UNC	1A	.5015	.5015	.5066	.5377	.5015	.5016	.5016	.5015	.5015
			.5040	.5015	.5066	.5371	.5015	.5011	.5011	.5015	.5015
		3A	.5046	.5025	.5081	.5406	.5025	.5045	.5045	.5025	.5025
5/8-18	UNF	1A	.5040	.5031	.5082	.5400	.5031	.5047	.5043	.5031	.5031
			.5014	.5011	.52500	.5423	.5599	.51820	.51820	.5011	.5599
		2A	.5509	.5616	.52485	.5418	.5604	.51835	.51835	.5616	.5616
3/4-16	UNC	1A	.5514	.5611	.52500	.5446	.5611	.52950	.52950	.5611	.5611
			.5509	.5616	.52485	.5441	.5616	.52905	.52905	.5616	.5616
		3A	.5528	.5625	.52610	.5471	.5625	.52300	.52300	.5625	.5625
1-24	NEF	1A	.5623	.5630	.52625	.5466	.5630	.52315	.52285	.5630	.5630
			.5534	.5613	.53120	.5483	.5613	.53040	.53030	.5613	.5613
		3A	.5529	.5618	.53105	.5478	.5618	.53045	.53045	.5618	.5618
1 1/8-12	N	1A	.5546	.5625	.53340	.5505	.5625	.53250	.53250	.5625	.5625
			.5511	.5630	.53325	.5500	.5630	.53265	.53265	.5630	.5630
		3A	.5511	.5630	.53325	.5500	.5630	.53265	.53265	.5630	.5630
1 1/4-11	UNC	1A	.6007	.6234	.5644	.5955	.6234	.5561	.5561	.6234	.6234
			.6031	.6240	.5642	.5949	.6240	.5563	.5559	.6240	.6240
		2A	.6097	.6234	.5644	.5983	.6234	.5589	.5589	.6234	.6234
1 1/2-12	N	1A	.6091	.6240	.5642	.5977	.6240	.5581	.5581	.6240	.6240
			.6113	.6250	.5660	.6013	.6250	.5619	.5619	.6250	.6250
		3A	.6107	.6256	.5668	.6007	.6256	.5621	.5617	.6256	.6256
1 3/8-16	UNF	1A	.6105	.6234	.5633	.5980	.6234	.5599	.5599	.6234	.6234
			.6090	.6240	.5631	.5994	.6240	.5601	.5601	.6240	.6240
		3A	.6121	.6250	.5670	.6029	.6250	.5638	.5638	.6250	.6250
1 3/4-10	UNC	1A	.6115	.6256	.5707	.6023	.6256	.5670	.5666	.6256	.6256
			.6139	.6236	.58750	.6046	.6222	.58050	.58050	.6236	.6222
		2A	.6134	.6241	.58735	.6041	.6227	.58065	.58065	.6241	.6227
2-8	NEF	1A	.6139	.6236	.58750	.6069	.6236	.58280	.58280	.6236	.6236
			.6134	.6241	.58735	.6064	.6241	.58295	.58295	.6241	.6241
		3A	.6153	.6250	.58890	.6095	.6250	.58540	.58540	.6250	.6250
2 1/2-6	UNC	1A	.6118	.6255	.58875	.6090	.6255	.58555	.58555	.6255	.6255
			.6159	.6238	.59670	.6107	.6248	.59270	.59270	.6238	.6238
		3A	.6154	.6243	.59655	.6102	.6243	.59255	.59255	.6243	.6243
3-4	N	1A	.6171	.6250	.59790	.6129	.6250	.59490	.59490	.6250	.6250
			.6166	.6255	.59775	.6124	.6255	.59475	.59475	.6255	.6255
		3A	.6166	.6255	.59775	.6124	.6255	.59475	.59475	.6255	.6255
3 1/2-6	UNC	1A	.6730	.6859	.6318	.6625	.6859	.6261	.6261	.6859	.6859
			.6724	.6865	.6316	.6619	.6865	.6266	.6262	.6865	.6865
		3A	.6746	.6875	.6334	.6654	.6875	.6293	.6293	.6875	.6875
4-4	NEF	1A	.6740	.6881	.6342	.6648	.6881	.6295	.6291	.6881	.6881
			.6784	.6893	.63920	.6732	.6963	.65520	.65520	.6893	.6893
		3A	.6779	.6898	.63905	.6727	.6968	.65535	.65535	.6898	.6898
4 1/2-4	UNC	1A	.6796	.6975	.66040	.6754	.6875	.65740	.65740	.6975	.6975
			.6791	.6980	.66025	.6740	.6880	.65755	.65725	.6980	.6980
		3A	.6791	.6980	.66025	.6740	.6880	.65755	.65725	.6980	.6980

See footnotes at end of table.

TABLE III.13.—Setting plug gages, Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs							Bast-crest setting plugs	
			Plug for "Go"			Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>
			Truncated	Full		Truncated	Full	Plus tolerance gage	Minus tolerance gage		
1	2	3	4	5	6	7	8	9	10	11	12
3/4-10	UNC	1A	<i>in.</i> 0.7336	<i>in.</i> 0.7482	<i>in.</i> 0.6832	<i>in.</i> 0.7177	<i>in.</i> 0.7482	<i>in.</i> 0.6744	<i>in.</i> 0.6744	<i>in.</i> 0.7482	<i>in.</i> 0.7482
		2A	.7330	.7488	.6830	.7171	.7488	.6746	.6742	.7488	.7488
		3A	.7336	.7482	.6832	.7206	.7482	.6773	.6773	.7482	.7482
3/4-12	N	1A	.7330	.7488	.6830	.7200	.7488	.6775	.6771	.7488	.7488
		2A	.7354	.7500	.6850	.7239	.7500	.6806	.6806	.7500	.7500
		3A	.7348	.7506	.6848	.7233	.7506	.6808	.6804	.7506	.7506
3/4-16	UNF	1A	.7354	.7483	.6912	.7218	.7483	.6887	.6887	.7483	.7483
		2A	.7348	.7489	.6910	.7212	.7489	.6889	.6885	.7489	.7489
		3A	.7371	.7500	.6939	.7239	.7500	.6918	.6918	.7500	.7500
3/4-20	UNEF	1A	.7365	.7506	.6957	.7273	.7506	.6920	.6919	.7506	.7506
		2A	.7380	.7485	.7079	.7275	.7473	.7004	.7004	.7485	.7473
		3A	.7374	.7491	.7077	.7269	.7479	.7006	.7002	.7491	.7479
1 1/16-12	N	1A	.7380	.7485	.7079	.7300	.7485	.7029	.7029	.7485	.7485
		2A	.7374	.7491	.7077	.7294	.7491	.7031	.7027	.7491	.7491
		3A	.7395	.7500	.7094	.7327	.7500	.7056	.7056	.7500	.7500
1 1/16-16	UN	1A	.7389	.7506	.7092	.7321	.7506	.7058	.7054	.7506	.7506
		2A	.7397	.7487	.71630	.7234	.7487	.71180	.71180	.7487	.7487
		3A	.7392	.7492	.71605	.7329	.7492	.71195	.71163	.7492	.7492
1 1/16-20	UNEF	1A	.7410	.7500	.71750	.7358	.7500	.71420	.71420	.7500	.7500
		2A	.7405	.7505	.71735	.7353	.7505	.71435	.71405	.7505	.7505
		3A	.7405	.7505	.71735	.7353	.7505	.71435	.71405	.7505	.7505
1 1/8-12	N	1A	.7970	.8108	.7567	.7873	.8108	.7512	.7512	.8108	.8108
		2A	.7973	.8114	.7565	.7867	.8114	.7511	.7510	.8114	.8114
		3A	.7995	.8125	.7584	.7901	.8125	.7543	.7543	.8125	.8125
1 1/8-16	UN	1A	.7990	.8131	.7582	.7898	.8131	.7545	.7541	.8131	.8131
		2A	.8005	.8110	.7701	.7926	.8110	.7655	.7655	.8110	.8110
		3A	.7999	.8116	.7702	.7920	.8116	.7657	.7653	.8116	.8116
1 1/8-20	UNEF	1A	.8020	.8125	.7719	.7954	.8125	.7683	.7683	.8125	.8125
		2A	.8014	.8131	.7717	.7948	.8131	.7685	.7681	.8131	.8131
		3A	.8022	.8112	.77870	.7960	.8112	.77430	.77430	.8112	.8112
3/8-9	UNC	1A	.8017	.8117	.77855	.7955	.8117	.77445	.77445	.8117	.8117
		2A	.8035	.8125	.79000	.7984	.8125	.77670	.77670	.8125	.8125
		3A	.8030	.8130	.77985	.7979	.8130	.77685	.77655	.8130	.8130
3/8-12	N	1A	.8573	.8731	.8069	.8395	.8731	.7914	.7914	.8731	.8731
		2A	.8566	.8738	.8067	.8388	.8738	.7916	.7916	.8738	.8738
		3A	.8573	.8731	.8069	.8395	.8731	.7914	.7914	.8731	.8731
3/8-14	UNF	1A	.8566	.8738	.8067	.8388	.8738	.7916	.7916	.8738	.8738
		2A	.8592	.8750	.8028	.8362	.8750	.7981	.7981	.8750	.8750
		3A	.8585	.8757	.8026	.8355	.8757	.7983	.7979	.8757	.8757
3/8-16	UN	1A	.8604	.8733	.8192	.8498	.8733	.8137	.8137	.8733	.8733
		2A	.8598	.8739	.8190	.8492	.8739	.8139	.8139	.8739	.8739
		3A	.8621	.8759	.8209	.8529	.8759	.8168	.8168	.8759	.8759
3/8-20	UNEF	1A	.8615	.8756	.8207	.8523	.8756	.8170	.8166	.8756	.8756
		2A	.8630	.8735	.8329	.8551	.8735	.8280	.8280	.8735	.8735
		3A	.8621	.8741	.8327	.8545	.8741	.8282	.8278	.8741	.8741
1 1/2-12	N	1A	.8615	.8759	.8314	.8579	.8759	.8308	.8308	.8759	.8759
		2A	.8639	.8756	.8342	.8573	.8756	.8310	.8306	.8756	.8756
		3A	.8647	.8737	.84120	.8584	.8737	.83080	.83080	.8737	.8737
1 1/2-16	UN	1A	.8642	.8742	.84105	.8579	.8742	.83095	.83095	.8742	.8742
		2A	.8660	.8750	.84250	.8608	.8750	.83200	.83200	.8750	.8750
		3A	.8655	.8755	.84235	.8603	.8755	.83205	.83205	.8755	.8755
1 1/2-20	UNEF	1A	.9229	.9358	.8817	.9121	.9358	.8799	.8799	.9358	.9358
		2A	.9223	.9360	.8815	.9115	.9361	.8792	.8792	.9361	.9361
		3A	.9246	.9375	.8834	.9154	.9375	.8793	.8793	.9375	.9375
1 3/4-12	N	1A	.9240	.9381	.8832	.9148	.9381	.8795	.8791	.9381	.9381
		2A	.9255	.9360	.8954	.9175	.9360	.8901	.8901	.9360	.9360
		3A	.9241	.9366	.8952	.9169	.9366	.8906	.8906	.9366	.9366
1 3/4-16	UN	1A	.9249	.9375	.8969	.9203	.9375	.8932	.8932	.9375	.9375
		2A	.9261	.9381	.8967	.9197	.9381	.8934	.8930	.9381	.9381
		3A	.9271	.9394	.9000	.9208	.9394	.8940	.8940	.9394	.9394
1 3/4-20	UNEF	1A	.9266	.9395	.90145	.9203	.9395	.89425	.89425	.9395	.9395
		2A	.9285	.9375	.90500	.9232	.9375	.89100	.89100	.9375	.9375
		3A	.9280	.9389	.90485	.9227	.9389	.89175	.89145	.9389	.9389

See footnotes at end of table.

TABLE III.13.—Setting plug gages, Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs		
			Plug for "Go"			Plug for "Not go"					Major diameter		
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Plus tolerance gage	Minus tolerance gage	W and X tolerances	Not go <sup>2</sup>
			Truncated	Full		Truncated	Full	Plus tolerance gage	Minus tolerance gage				
1	2	3	4	5	6	7	8	9	10	11	12		
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>		
1-8	UNC	1A	0.9809	0.9980	0.9168	0.9808	0.9980	0.9067	0.9067	0.9980	0.9980		
		2A	0.9802	0.9987	0.9169	0.9801	0.9987	0.9069	0.9065	0.9987	0.9987		
		3A	0.9809	0.9980	0.9168	0.9811	0.9980	0.9100	0.9069	0.9980	0.9980		
1-12	UNF	1A	0.9802	0.9987	0.9169	0.9801	0.9987	0.9069	0.9065	0.9987	0.9987		
		2A	0.9802	0.9987	0.9169	0.9801	0.9987	0.9069	0.9065	0.9987	0.9987		
		3A	0.9802	0.9987	0.9169	0.9801	0.9987	0.9069	0.9065	0.9987	0.9987		
1-16	UN	1A	0.9802	0.9987	0.9169	0.9801	0.9987	0.9069	0.9065	0.9987	0.9987		
		2A	0.9802	0.9987	0.9169	0.9801	0.9987	0.9069	0.9065	0.9987	0.9987		
		3A	0.9802	0.9987	0.9169	0.9801	0.9987	0.9069	0.9065	0.9987	0.9987		
1-20	UNEF	1A	0.9802	0.9987	0.9169	0.9801	0.9987	0.9069	0.9065	0.9987	0.9987		
		2A	0.9802	0.9987	0.9169	0.9801	0.9987	0.9069	0.9065	0.9987	0.9987		
		3A	0.9802	0.9987	0.9169	0.9801	0.9987	0.9069	0.9065	0.9987	0.9987		
1 1/16-12	UN	1A	1.0479	1.0608	1.0067	1.0371	1.0608	1.0010	1.0010	1.0608	1.0608		
		2A	1.0473	1.0614	1.0065	1.0365	1.0614	1.0012	1.0008	1.0614	1.0614		
		3A	1.0496	1.0625	1.0084	1.0403	1.0625	1.0012	1.0012	1.0625	1.0625		
1 1/8-16	UN	1A	1.0505	1.0610	1.0204	1.0425	1.0610	1.0154	1.0154	1.0610	1.0610		
		2A	1.0505	1.0610	1.0204	1.0425	1.0610	1.0154	1.0154	1.0610	1.0610		
		3A	1.0505	1.0610	1.0204	1.0425	1.0610	1.0154	1.0154	1.0610	1.0610		
1 1/8-18	UNF	1A	1.0514	1.0611	1.0200	1.0444	1.0611	1.0200	1.0200	1.0611	1.0611		
		2A	1.0509	1.0616	1.0204	1.0439	1.0616	1.0204	1.0204	1.0616	1.0616		
		3A	1.0528	1.0625	1.0210	1.0459	1.0625	1.0220	1.0220	1.0625	1.0625		
1 1/8-7	UNC	1A	1.1040	1.1228	1.0300	1.0810	1.1228	1.0191	1.0191	1.1228	1.1228		
		2A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
		3A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
1 1/8-8	N	1A	1.1040	1.1228	1.0300	1.0810	1.1228	1.0191	1.0191	1.1228	1.1228		
		2A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
		3A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
1 1/8-12	UNF	1A	1.1040	1.1228	1.0300	1.0810	1.1228	1.0191	1.0191	1.1228	1.1228		
		2A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
		3A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
1 1/8-13	UN	1A	1.1040	1.1228	1.0300	1.0810	1.1228	1.0191	1.0191	1.1228	1.1228		
		2A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
		3A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
1 1/8-14	NEF	1A	1.1040	1.1228	1.0300	1.0810	1.1228	1.0191	1.0191	1.1228	1.1228		
		2A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
		3A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
1 1/8-12	UN	1A	1.1040	1.1228	1.0300	1.0810	1.1228	1.0191	1.0191	1.1228	1.1228		
		2A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
		3A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
1 1/8-16	UN	1A	1.1040	1.1228	1.0300	1.0810	1.1228	1.0191	1.0191	1.1228	1.1228		
		2A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
		3A	1.1033	1.1235	1.0298	1.0803	1.1235	1.0193	1.0193	1.1235	1.1235		
1 3/16-10	NEF	1A	1.1763	1.1861	1.1490	1.1691	1.1861	1.1490	1.1490	1.1861	1.1861		
		2A	1.1753	1.1861	1.1490	1.1686	1.1861	1.1490	1.1490	1.1861	1.1861		
		3A	1.1778	1.1875	1.1510	1.1715	1.1875	1.1490	1.1490	1.1875	1.1875		

See footnotes at end of table

TABLE III.13.—Setting plug gages, Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"					Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>1</sup>	
			Truncated	Full		Truncated	Full	Plus tolerance gage	Minus tolerance gage			W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12	
1/4-7	UNC	1A	<i>in.</i> 1.2200	<i>in.</i> 1.2478	<i>in.</i> 1.1550	<i>in.</i> 1.2058	<i>in.</i> 1.2478	<i>in.</i> 1.1439	<i>in.</i> 1.1439	<i>in.</i> 1.2478	<i>in.</i> 1.2478	<i>in.</i> 1.2478
		2A	1.2283	1.2485	1.1548	1.2051	1.2455	1.1441	1.1437	1.2485	1.2485	1.2485
		3A	1.2312	1.2500	1.1572	1.2136	1.2500	1.1517	1.1517	1.2500	1.2500	1.2500
1/4-8	N	2A	1.2308	1.2479	1.1667	1.2138	1.2479	1.1597	1.1597	1.2479	1.2479	1.2479
		3A	1.2329	1.2500	1.1688	1.2176	1.2500	1.1635	1.1635	1.2500	1.2500	1.2500
		1.2322	1.2507	1.1686	1.2160	1.2507	1.1637	1.1633	1.2507	1.2507	1.2507	
1/4-12	UNF	1A	1.2353	1.2482	1.1941	1.2210	1.2474	1.1849	1.1849	1.2482	1.2482	1.2474
		2A	1.2347	1.2488	1.1939	1.2204	1.2480	1.1851	1.1847	1.2488	1.2488	1.2480
		3A	1.2371	1.2500	1.1959	1.2274	1.2500	1.1913	1.1913	1.2500	1.2500	1.2500
1/4-16	UN	2A	1.2380	1.2485	1.2079	1.2290	1.2485	1.2028	1.2028	1.2485	1.2485	1.2485
		3A	1.2395	1.2500	1.2094	1.2327	1.2500	1.2056	1.2056	1.2500	1.2500	1.2500
		1.2389	1.2506	1.2092	1.2321	1.2506	1.2058	1.2054	1.2506	1.2506	1.2506	
1/4-18	NEF	2A	1.2388	1.2485	1.21240	1.2316	1.2485	1.20750	1.20750	1.2485	1.2485	1.2485
		3A	1.2403	1.2500	1.21370	1.2344	1.2500	1.21080	1.21080	1.2500	1.2500	1.2500
		1.2398	1.2506	1.21376	1.2339	1.2506	1.21045	1.21045	1.2506	1.2506	1.2506	
1/2-6	UN	2A	1.2979	1.3108	1.2567	1.2870	1.3108	1.2569	1.2569	1.3108	1.3108	1.3108
		3A	1.2973	1.3114	1.2565	1.2864	1.3114	1.2511	1.2511	1.3114	1.3114	1.3114
		1.2966	1.3125	1.2564	1.2862	1.3125	1.2541	1.2541	1.3125	1.3125	1.3125	
1/2-16	UN	2A	1.3005	1.3110	1.2704	1.2924	1.3110	1.2653	1.2653	1.3110	1.3110	1.3110
		3A	1.3020	1.3125	1.2719	1.2952	1.3125	1.2681	1.2681	1.3125	1.3125	1.3125
		1.3014	1.3131	1.2717	1.2946	1.3131	1.2693	1.2679	1.3131	1.3131	1.3131	
1/2-18	NEF	2A	1.3013	1.3110	1.27490	1.2941	1.3110	1.27000	1.27000	1.3110	1.3110	1.3110
		3A	1.3028	1.3125	1.27640	1.2969	1.3125	1.27290	1.27290	1.3125	1.3125	1.3125
		1.3023	1.3130	1.27626	1.2964	1.3130	1.27265	1.27265	1.3130	1.3130	1.3130	
1/2-6	UNC	1A	1.3516	1.3726	1.2643	1.3245	1.3726	1.2522	1.2522	1.3726	1.3726	1.3726
		2A	1.3508	1.3734	1.2641	1.3237	1.3734	1.2524	1.2520	1.3734	1.3734	1.3734
		3A	1.3510	1.3750	1.2667	1.3259	1.3750	1.2547	1.2547	1.3750	1.3750	1.3750
1/2-8	N	2A	1.3557	1.3728	1.2916	1.3385	1.3728	1.2844	1.2844	1.3728	1.3728	1.3728
		3A	1.3550	1.3735	1.2914	1.3378	1.3735	1.2846	1.2846	1.3735	1.3735	1.3735
		1.3579	1.3759	1.2938	1.3425	1.3759	1.2884	1.2884	1.3759	1.3759	1.3759	
1/2-12	UNF	1A	1.3602	1.3731	1.3190	1.3457	1.3721	1.3096	1.3096	1.3731	1.3731	1.3721
		2A	1.3596	1.3737	1.3188	1.3451	1.3727	1.3098	1.3094	1.3737	1.3737	1.3727
		3A	1.3621	1.3750	1.3209	1.3523	1.3750	1.3162	1.3162	1.3750	1.3750	1.3750
1/2-16	UN	2A	1.3639	1.3766	1.3342	1.3571	1.3766	1.3308	1.3304	1.3766	1.3766	1.3766
		3A	1.3621	1.3741	1.3347	1.3543	1.3741	1.3280	1.3276	1.3741	1.3741	1.3741
		1.3645	1.3759	1.3344	1.3577	1.3759	1.3306	1.3306	1.3759	1.3759	1.3759	
1/2-18	NEF	2A	1.3638	1.3735	1.33740	1.3566	1.3735	1.33250	1.33250	1.3735	1.3735	1.3735
		3A	1.3653	1.3750	1.33900	1.3594	1.3750	1.33530	1.33530	1.3750	1.3750	1.3750
		1.3648	1.3765	1.33875	1.3589	1.3765	1.33545	1.33545	1.3765	1.3765	1.3765	
1/2-24	UN	2A	1.4228	1.4357	1.3816	1.4118	1.4357	1.3757	1.3757	1.4357	1.4357	1.4357
		3A	1.4222	1.4363	1.3814	1.4112	1.4363	1.3755	1.3755	1.4363	1.4363	1.4363
		1.4246	1.4377	1.3931	1.4165	1.4377	1.3790	1.3790	1.4377	1.4377	1.4377	
1/2-32	UNC	2A	1.4254	1.4359	1.3953	1.4172	1.4355	1.3901	1.3901	1.4359	1.4359	1.4359
		3A	1.4248	1.4365	1.3951	1.4166	1.4365	1.3903	1.3903	1.4365	1.4365	1.4365
		1.4270	1.4376	1.3960	1.4161	1.4376	1.3909	1.3909	1.4376	1.4376	1.4376	

See footnotes at end of table.



TABLE III.13.—Setting plug gages, Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs							Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go 1	Not go 1
			Truncated	Full		Truncated	Full	Plus tolerance gage	Minus tolerance gage		
1	2	3	4	5	6	7	8	9	10	11	12
1 1/16-18	NEF	2A	<i>in.</i> 1.4263	<i>in.</i> 1.4359	<i>in.</i> 1.39900	<i>in.</i> 1.4199	<i>in.</i> 1.4360	<i>in.</i> 1.39496	<i>in.</i> 1.39496	<i>in.</i> 1.4399	<i>in.</i> 1.4360
			1.4258	1.4365	1.39975	1.4185	1.4365	1.39595	1.39475	1.4365	1.4365
		3A	1.4278	1.4375	1.4010	1.4218	1.4375	1.39770	1.39770	1.4375	1.4375
			1.4273	1.4380	1.40125	1.4213	1.4380	1.39785	1.39755	1.4380	1.4380
1 1/8-8	UNC	1A	1.4766	1.4976	1.3893	1.4494	1.4976	1.3772	1.3772	1.4976	1.4976
			1.4758	1.4984	1.3891	1.4486	1.4984	1.3771	1.3770	1.4984	1.4984
		2A	1.4766	1.4976	1.3893	1.4494	1.4976	1.3812	1.3812	1.4976	1.4976
			1.4758	1.4984	1.3891	1.4486	1.4984	1.3811	1.3810	1.4984	1.4984
1 1/8-8	N	3A	1.4790	1.5000	1.3917	1.4518	1.5000	1.3856	1.3856	1.5000	1.5000
			1.4782	1.5008	1.3915	1.4510	1.5008	1.3858	1.3854	1.5008	1.5008
		1A	1.4807	1.4978	1.4166	1.4634	1.4978	1.4693	1.4693	1.4978	1.4978
			1.4800	1.4985	1.4164	1.4627	1.4985	1.4695	1.4691	1.4985	1.4985
1 1/2-12	UNF	3A	1.4820	1.5000	1.4188	1.4671	1.5000	1.4133	1.4133	1.5000	1.5000
			1.4822	1.5007	1.4186	1.4667	1.5007	1.4135	1.4131	1.5007	1.5007
		1A	1.4832	1.4981	1.4140	1.4705	1.4981	1.4314	1.4314	1.4981	1.4981
			1.4830	1.4987	1.4138	1.4699	1.4987	1.4316	1.4312	1.4987	1.4987
1 1/2-12	N	2A	1.4832	1.4981	1.4140	1.4705	1.4981	1.4316	1.4316	1.4981	1.4981
			1.4830	1.4987	1.4138	1.4703	1.4987	1.4318	1.4314	1.4987	1.4987
		3A	1.4871	1.5000	1.4159	1.4772	1.5000	1.4111	1.4111	1.5000	1.5000
			1.4865	1.5006	1.4157	1.4766	1.5006	1.4113	1.4109	1.5006	1.5006
1 3/8-16	UN	2A	1.4879	1.4981	1.4578	1.4797	1.4981	1.4526	1.4526	1.4981	1.4981
			1.4875	1.4990	1.4576	1.4791	1.4990	1.4528	1.4524	1.4990	1.4990
		3A	1.4895	1.5000	1.4594	1.4826	1.5000	1.4555	1.4555	1.5000	1.5000
			1.4890	1.5006	1.4592	1.4820	1.5006	1.4557	1.4553	1.5006	1.5006
1 3/8-16	NEF	2A	1.4888	1.4985	1.46210	1.4813	1.4985	1.45710	1.45710	1.4985	1.4985
			1.4883	1.4990	1.46225	1.4810	1.4990	1.45725	1.45725	1.4990	1.4990
		3A	1.4903	1.5000	1.46390	1.4833	1.5000	1.46020	1.46020	1.5000	1.5000
			1.4898	1.5005	1.46375	1.4838	1.5005	1.46035	1.46035	1.5005	1.5005
1 3/8-16	N	2A	1.5504	1.5609	1.52630	1.5422	1.5609	1.51510	1.51510	1.5609	1.5609
			1.5498	1.5615	1.52605	1.5416	1.5615	1.51535	1.51535	1.5615	1.5615
		3A	1.5520	1.5625	1.52790	1.5431	1.5625	1.51800	1.51800	1.5625	1.5625
			1.5514	1.5631	1.52765	1.5425	1.5631	1.51825	1.51775	1.5631	1.5631
1 3/8-18	NEF	2A	1.5513	1.5616	1.5219	1.5410	1.5616	1.5169	1.5169	1.5616	1.5616
			1.5508	1.5615	1.5217	1.5405	1.5615	1.5167	1.5167	1.5615	1.5615
		3A	1.5528	1.5625	1.5234	1.5428	1.5625	1.5227	1.5227	1.5625	1.5625
			1.5523	1.5620	1.5232	1.5423	1.5620	1.5229	1.5225	1.5620	1.5620
1 3/8-18	N	2A	1.6057	1.6228	1.54160	1.5883	1.6228	1.53420	1.53420	1.6228	1.6228
			1.6050	1.6235	1.54135	1.5876	1.6235	1.53445	1.53445	1.6235	1.6235
		3A	1.6070	1.6250	1.54380	1.5923	1.6250	1.53890	1.53890	1.6250	1.6250
			1.6072	1.6257	1.54355	1.5916	1.6257	1.53915	1.53795	1.6257	1.6257
1 3/8-18	UN	2A	1.6136	1.6232	1.59010	1.5993	1.6232	1.58320	1.58320	1.6232	1.6232
			1.6130	1.6238	1.59005	1.5987	1.6238	1.58315	1.58295	1.6238	1.6238
		3A	1.6121	1.6250	1.59000	1.6026	1.6250	1.58670	1.58670	1.6250	1.6250
			1.6115	1.6256	1.59005	1.6020	1.6256	1.58675	1.58625	1.6256	1.6256
1 3/8-16	UN	2A	1.6129	1.6234	1.58280	1.6047	1.6234	1.57760	1.57760	1.6234	1.6234
			1.6123	1.6240	1.58255	1.6041	1.6240	1.57785	1.57785	1.6240	1.6240
		3A	1.6145	1.6250	1.58410	1.6076	1.6250	1.58050	1.58050	1.6250	1.6250
			1.6139	1.6256	1.58415	1.6070	1.6256	1.58075	1.58025	1.6256	1.6256
1 3/8-18	NEF	2A	1.6138	1.6235	1.5871	1.6065	1.6235	1.5824	1.5824	1.6235	1.6235
			1.6133	1.6240	1.5872	1.6060	1.6240	1.5826	1.5822	1.6240	1.6240
		3A	1.6153	1.6250	1.5889	1.6083	1.6250	1.5852	1.5852	1.6250	1.6250
			1.6148	1.6255	1.5887	1.6088	1.6255	1.5854	1.5850	1.6255	1.6255
1 3/8-16	N	2A	1.6751	1.6859	1.61730	1.6671	1.6859	1.61000	1.61000	1.6859	1.6859
			1.6748	1.6865	1.61705	1.6665	1.6865	1.61025	1.60975	1.6865	1.6865
		3A	1.6770	1.6875	1.61960	1.6700	1.6875	1.61290	1.61290	1.6875	1.6875
			1.6764	1.6881	1.61965	1.6694	1.6881	1.61315	1.61265	1.6881	1.6881
1 3/8-18	NEF	2A	1.6763	1.6860	1.6199	1.6689	1.6860	1.6148	1.6148	1.6860	1.6860
			1.6758	1.6865	1.6197	1.6684	1.6865	1.6149	1.6146	1.6865	1.6865
		3A	1.6778	1.6875	1.6214	1.6717	1.6875	1.6176	1.6176	1.6875	1.6875
			1.6773	1.6880	1.6212	1.6712	1.6880	1.6178	1.6174	1.6880	1.6880
1 1/2-5	UNC	1A	1.7234	1.7473	1.61740	1.6906	1.7473	1.69400	1.69400	1.7473	1.7473
			1.7226	1.7481	1.61715	1.6898	1.7481	1.69425	1.69375	1.7481	1.7481
		2A	1.7244	1.7475	1.61775	1.6913	1.7475	1.69850	1.69850	1.7475	1.7475
			1.7226	1.7481	1.61715	1.6913	1.7481	1.69875	1.69825	1.7481	1.7481
1 1/2-5	N	3A	1.7261	1.7500	1.62010	1.7000	1.7500	1.61340	1.61340	1.7500	1.7500
			1.7253	1.7508	1.61985	1.6992	1.7508	1.61365	1.61315	1.7508	1.7508

See footnotes at end of table.

TABLE III.13.—Setting plug gages, Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"				Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter		Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>1</sup>
			Truncated	Full			Truncated	Full	Plus tolerance gage	Minus tolerance gage		
1	2	3	4	5	6	7	8	9	10	11	12	
			in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1/4-8	N	2A	1.7306	1.7477	1.6650	1.7131	1.7477	1.65900	1.65900	1.7477	1.7477	
			1.7299	1.7481	1.66525	1.7124	1.7481	1.65925	1.65875	1.7481	1.7481	
		3A	1.7320	1.7500	1.66900	1.7173	1.7500	1.66320	1.66320	1.7500	1.7500	
			1.7322	1.7507	1.66855	1.7166	1.7507	1.66345	1.66295	1.7507	1.7507	
1/4-12	UN	2A	1.7353	1.7482	1.69410	1.7242	1.7482	1.69810	1.69810	1.7482	1.7482	
			1.7347	1.7488	1.69385	1.7236	1.7488	1.69835	1.69785	1.7488	1.7488	
		3A	1.7371	1.7500	1.69590	1.7275	1.7500	1.69140	1.69140	1.7500	1.7500	
			1.7365	1.7506	1.69565	1.7269	1.7506	1.69165	1.69115	1.7506	1.7506	
1/4-16	UNEF	2A	1.7379	1.7494	1.70780	1.7296	1.7484	1.70250	1.70250	1.7484	1.7484	
			1.7373	1.7490	1.70755	1.7290	1.7490	1.70275	1.70225	1.7490	1.7490	
		3A	1.7395	1.7500	1.70940	1.7325	1.7500	1.70540	1.70540	1.7500	1.7500	
			1.7389	1.7506	1.70915	1.7319	1.7506	1.70565	1.70515	1.7506	1.7506	
1 1/4-16	N	2A	1.8004	1.8109	1.77030	1.7921	1.8109	1.76500	1.76500	1.8109	1.8109	
			1.7998	1.8115	1.77005	1.7915	1.8115	1.76525	1.76475	1.8115	1.8115	
		3A	1.8020	1.8125	1.77190	1.7950	1.8125	1.76790	1.76790	1.8125	1.8125	
			1.8014	1.8131	1.77165	1.7944	1.8131	1.76815	1.76765	1.8131	1.8131	
1 3/8-8	N	2A	1.8556	1.8727	1.79150	1.8379	1.8727	1.78380	1.78380	1.8727	1.8727	
			1.8549	1.8734	1.79125	1.8372	1.8734	1.78405	1.78355	1.8734	1.8734	
		3A	1.8579	1.8750	1.79380	1.8422	1.8750	1.78810	1.78810	1.8750	1.8750	
			1.8572	1.8757	1.79355	1.8415	1.8757	1.78835	1.78785	1.8757	1.8757	
1 3/8-12	UN	2A	1.8603	1.8732	1.81910	1.8492	1.8732	1.81310	1.81310	1.8732	1.8732	
			1.8597	1.8738	1.81885	1.8485	1.8738	1.81335	1.81285	1.8738	1.8738	
		3A	1.8621	1.8750	1.82090	1.8525	1.8750	1.81640	1.81640	1.8750	1.8750	
			1.8615	1.8756	1.82065	1.8519	1.8756	1.81665	1.81615	1.8756	1.8756	
1 3/4-16	UN	2A	1.8629	1.8734	1.83280	1.8546	1.8734	1.82750	1.82750	1.8734	1.8734	
			1.8623	1.8740	1.83255	1.8540	1.8740	1.82775	1.82725	1.8740	1.8740	
		3A	1.8645	1.8750	1.83440	1.8575	1.8750	1.83040	1.83040	1.8750	1.8750	
			1.8639	1.8756	1.83415	1.8569	1.8756	1.83065	1.83015	1.8756	1.8756	
1 3/4-16	N	2A	1.9254	1.9358	1.89630	1.9170	1.9359	1.89090	1.89090	1.9359	1.9359	
			1.9248	1.9365	1.89605	1.9164	1.9365	1.89115	1.89065	1.9365	1.9365	
		3A	1.9270	1.9375	1.89890	1.9200	1.9375	1.89290	1.89290	1.9375	1.9375	
			1.9264	1.9381	1.89865	1.9194	1.9381	1.89315	1.89265	1.9381	1.9381	
2-4 1/2	UNC	1A	1.9713	1.9971	1.85280	1.9347	1.9971	1.83890	1.83890	1.9971	1.9971	
			1.9705	1.9979	1.85255	1.9339	1.9979	1.83865	1.83825	1.9979	1.9979	
		2A	1.9713	1.9971	1.85280	1.9347	1.9971	1.83890	1.83890	1.9971	1.9971	
			1.9705	1.9979	1.85255	1.9339	1.9979	1.83865	1.83825	1.9979	1.9979	
2-8	N	2A	1.9896	1.9977	1.91650	1.9628	1.9977	1.90870	1.90870	1.9977	1.9977	
			1.9799	1.9984	1.91625	1.9621	1.9984	1.90845	1.90845	1.9984	1.9984	
		3A	1.9829	2.0000	1.91860	1.9671	2.0000	1.91300	1.91300	2.0000	2.0000	
			1.9822	2.0007	1.91835	1.9664	2.0007	1.91325	1.91275	2.0007	2.0007	
2-12	UN	2A	1.9853	1.9982	1.94410	1.9741	1.9982	1.93900	1.93900	1.9982	1.9982	
			1.9847	1.9988	1.94385	1.9735	1.9988	1.93925	1.93875	1.9988	1.9988	
		3A	1.9871	2.0000	1.94590	1.9775	2.0000	1.94140	1.94140	2.0000	2.0000	
			1.9865	2.0006	1.94565	1.9769	2.0006	1.94165	1.94115	2.0006	2.0006	
2-16	UNEF	2A	1.9879	1.9984	1.95790	1.9795	1.9984	1.95240	1.95240	1.9984	1.9984	
			1.9873	1.9990	1.95765	1.9789	1.9990	1.95265	1.95215	1.9990	1.9990	
		3A	1.9895	2.0000	1.95940	1.9825	2.0000	1.95540	1.95540	2.0000	2.0000	
			1.9889	2.0006	1.95915	1.9819	2.0006	1.95565	1.95515	2.0006	2.0006	
2 3/4-16	N	2A	2.0504	2.0609	2.02030	2.0420	2.0609	2.01490	2.01490	2.0609	2.0609	
			2.0498	2.0615	2.02005	2.0414	2.0615	2.01515	2.01515	2.0615	2.0615	
		3A	2.0520	2.0625	2.02190	2.0439	2.0625	2.01790	2.01790	2.0625	2.0625	
			2.0514	2.0631	2.02165	2.0434	2.0631	2.01815	2.01765	2.0631	2.0631	
2 3/4-8	N	2A	2.0555	2.0626	2.04140	2.0676	2.0626	2.03350	2.03350	2.0626	2.0626	
			2.0498	2.0635	2.04115	2.0669	2.0635	2.03375	2.03325	2.0635	2.0635	
		3A	2.0679	2.0650	2.04380	2.0690	2.0650	2.03590	2.03590	2.0650	2.0650	
			2.0672	2.0657	2.04355	2.0683	2.0657	2.03615	2.03565	2.0657	2.0657	
2 3/8-12	UN	2A	2.1103	2.1232	2.06910	2.0991	2.1232	2.06390	2.06390	2.1232	2.1232	
			2.1097	2.1238	2.06885	2.0985	2.1238	2.06415	2.06365	2.1238	2.1238	
		3A	2.1121	2.1250	2.07090	2.1009	2.1250	2.06540	2.06540	2.1250	2.1250	
			2.1115	2.1256	2.07065	2.1004	2.1256	2.06565	2.06515	2.1256	2.1256	
2 3/4-16	UN	2A	2.1429	2.1534	2.08280	2.1045	2.1534	2.07730	2.07730	2.1534	2.1534	
			2.1423	2.1540	2.08255	2.1039	2.1540	2.07755	2.07705	2.1540	2.1540	
		3A	2.1445	2.1550	2.08440	2.1065	2.1550	2.07930	2.07930	2.1550	2.1550	
			2.1439	2.1556	2.08415	2.1059	2.1556	2.07955	2.07905	2.1556	2.1556	
2 3/4-16	N	2A	2.1554	2.1659	2.14530	2.1670	2.1659	2.13990	2.13990	2.1659	2.1659	
			2.1548	2.1665	2.14505	2.1664	2.1665	2.14015	2.14015	2.1665	2.1665	
		3A	2.1579	2.1675	2.14690	2.1690	2.1675	2.14280	2.14280	2.1675	2.1675	
			2.1574	2.1681	2.14665	2.1684	2.1681	2.14305	2.14255	2.1681	2.1681	

See footnotes at end of table.

TABLE III.13.—Setting plug gages, Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"				Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>1</sup>	
			Truncated	Full		Truncated	Full	Plus tolerance gage	Minus tolerance gage			W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12	
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	
2 1/4-4 1/2	UNC	1A	2.2213	2.2471	2.10280	2.1844	2.2471	2.08520	2.08420	2.2471	2.2471	
		2A	2.2205	2.2479	2.10255	2.1836	2.2479	2.08446	2.08395	2.2479	2.2479	
		3A	2.2213	2.2471	2.10280	2.1893	2.2471	2.09310	2.09310	2.2471	2.2471	
2 1/4-8	N	1A	2.2205	2.2479	2.10255	2.1885	2.2479	2.09335	2.09285	2.2479	2.2479	
		2A	2.2242	2.2500	2.10570	2.1946	2.2500	2.09840	2.09840	2.2500	2.2500	
		3A	2.2234	2.2508	2.10545	2.1938	2.2508	2.09805	2.09815	2.2508	2.2508	
2 1/4-12	UN	1A	2.2305	2.2476	2.16640	2.2125	2.2476	2.15840	2.15840	2.2476	2.2476	
		2A	2.2298	2.2483	2.16615	2.2118	2.2483	2.15865	2.15815	2.2483	2.2483	
		3A	2.2329	2.2500	2.16890	2.2169	2.2500	2.16280	2.16280	2.2500	2.2500	
2 1/4-16	UN	1A	2.2322	2.2507	2.16855	2.2162	2.2507	2.16305	2.16255	2.2507	2.2507	
		2A	2.2353	2.2482	2.19410	2.2241	2.2482	2.18800	2.18800	2.2482	2.2482	
		3A	2.2347	2.2488	2.19365	2.2235	2.2488	2.18825	2.18775	2.2488	2.2488	
2 1/4-10	UN	1A	2.2371	2.2500	2.19590	2.2275	2.2500	2.19140	2.19140	2.2500	2.2500	
		2A	2.2365	2.2506	2.19565	2.2269	2.2506	2.19165	2.19115	2.2506	2.2506	
		3A	2.2379	2.2500	2.20940	2.2319	2.2500	2.20530	2.20530	2.2500	2.2500	
2 1/4-16	N	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-12	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-10	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-16	N	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-12	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-10	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-16	N	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-12	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-10	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-16	N	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-12	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-10	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-16	N	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-12	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-10	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-16	N	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-12	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-10	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-16	N	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-12	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-10	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-16	N	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-12	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-10	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-16	N	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		3A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
2 1/4-12	UN	1A	2.2379	2.2506	2.20915	2.2319	2.2506	2.20555	2.20555	2.2506	2.2506	
		2A	2.2379	2.2506	2.20915	2.2319						

TABLE III.13.—Setting plug gages, Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"					Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Pitch diameter	Go <sup>1</sup>	Not go <sup>1</sup>
			Truncated	Full		Truncated	Full	Plus tolerance gage	Minus tolerance gage		W and X tolerances	W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12	
2 3/4-8	N	2A	2.7304	2.7475	2.66630	2.7121	2.7475	2.65800	2.65800	2.7475	2.7475	2.7475
		3A	2.7297	2.7482	2.66605	2.7114	2.7482	2.65825	2.65775	2.7482	2.7482	2.7482
		3A	2.7329	2.7500	2.66580	2.7167	2.7500	2.66200	2.66200	2.7500	2.7500	2.7500
2 3/4-12	UN	2A	2.7322	2.7507	2.66555	2.7180	2.7507	2.66255	2.66235	2.7507	2.7507	2.7507
		2A	2.7352	2.7481	2.66400	2.7239	2.7481	2.66780	2.66780	2.7481	2.7481	2.7481
		3A	2.7346	2.7487	2.66375	2.7233	2.7487	2.66805	2.66755	2.7487	2.7487	2.7487
2 3/4-16	UN	3A	2.7371	2.7500	2.66300	2.7274	2.7500	2.69130	2.69130	2.7500	2.7500	2.7500
		3A	2.7365	2.7506	2.66265	2.7268	2.7506	2.69155	2.69105	2.7506	2.7506	2.7506
2 3/4-20	UN	2A	2.7378	2.7483	2.70770	2.7293	2.7483	2.70220	2.70220	2.7483	2.7483	2.7483
		3A	2.7372	2.7489	2.70745	2.7287	2.7489	2.70245	2.70195	2.7489	2.7489	2.7489
		3A	2.7395	2.7500	2.70940	2.7324	2.7500	2.70530	2.70530	2.7500	2.7500	2.7500
2 3/4-24	UN	3A	2.7389	2.7506	2.70915	2.7318	2.7506	2.70555	2.70505	2.7506	2.7506	2.7506
2 3/4-32	UN	2A	2.8602	2.8731	2.81900	2.8488	2.8731	2.81270	2.81270	2.8731	2.8731	2.8731
		3A	2.8596	2.8737	2.81875	2.8482	2.8737	2.81295	2.81245	2.8737	2.8737	2.8737
		3A	2.8621	2.8750	2.82000	2.8523	2.8750	2.81620	2.81620	2.8750	2.8750	2.8750
2 3/4-40	UN	3A	2.8615	2.8750	2.82065	2.8517	2.8750	2.81645	2.81595	2.8750	2.8750	2.8750
2 3/4-48	UN	2A	2.8628	2.8733	2.83270	2.8542	2.8733	2.82710	2.82710	2.8733	2.8733	2.8733
		3A	2.8622	2.8739	2.83245	2.8536	2.8739	2.82735	2.82685	2.8739	2.8739	2.8739
		3A	2.8645	2.8750	2.83410	2.8573	2.8750	2.83020	2.83020	2.8750	2.8750	2.8750
3-4	UNC	3A	2.8639	2.8756	2.83415	2.8567	2.8756	2.83045	2.82995	2.8756	2.8756	2.8756
		1A	2.9687	2.9698	2.83440	2.9295	2.9698	2.81830	2.81830	2.9698	2.9698	2.9698
		2A	2.9678	2.9677	2.83415	2.9257	2.9677	2.81855	2.81855	2.9677	2.9677	2.9677
3-8	N	2A	2.9697	2.9697	2.83440	2.9320	2.9697	2.82370	2.82370	2.9697	2.9697	2.9697
		3A	2.9678	2.9677	2.83415	2.9311	2.9677	2.82395	2.82395	2.9677	2.9677	2.9677
		3A	2.9719	3.0000	2.83760	2.9374	3.0000	2.82900	2.82900	3.0000	3.0000	3.0000
3-12	UN	3A	2.9710	3.0000	2.83735	2.9369	3.0000	2.82955	2.82955	3.0000	3.0000	3.0000
		2A	2.9803	2.9974	2.91620	2.9618	2.9974	2.90770	2.90770	2.9974	2.9974	2.9974
		3A	2.9796	2.9981	2.91595	2.9611	2.9981	2.90795	2.90745	2.9981	2.9981	2.9981
3-16	UN	3A	2.9829	3.0000	2.91880	2.9635	3.0000	2.91240	2.91240	3.0000	3.0000	3.0000
		3A	2.9822	3.0007	2.91855	2.9658	3.0007	2.91265	2.91215	3.0007	3.0007	3.0007
3-20	UN	2A	2.9852	2.9981	2.94400	2.9738	2.9981	2.93770	2.93770	2.9981	2.9981	2.9981
		3A	2.9846	2.9987	2.94375	2.9732	2.9987	2.93795	2.93745	2.9987	2.9987	2.9987
		3A	2.9871	3.0000	2.94580	2.9773	3.0000	2.94120	2.94120	3.0000	3.0000	3.0000
3-24	UN	3A	2.9865	3.0006	2.94565	2.9767	3.0006	2.94146	2.94096	3.0006	3.0006	3.0006
		2A	2.9878	2.9983	2.95770	2.9792	2.9983	2.95210	2.95210	2.9983	2.9983	2.9983
		3A	2.9872	2.9989	2.95745	2.9786	2.9989	2.95235	2.95185	2.9989	2.9989	2.9989
3 1/4-12	UN	3A	2.9895	3.0000	2.95940	2.9823	3.0000	2.95520	2.95520	3.0000	3.0000	3.0000
		3A	2.9889	3.0006	2.95915	2.9817	3.0006	2.95646	2.95646	3.0006	3.0006	3.0006
		2A	3.1102	3.1231	3.06900	3.0988	3.1231	3.06270	3.06270	3.1231	3.1231	3.1231
3 1/4-16	UN	3A	3.1096	3.1237	3.06875	3.0982	3.1237	3.06295	3.06245	3.1237	3.1237	3.1237
		3A	3.1121	3.1250	3.07090	3.1023	3.1250	3.06620	3.06620	3.1250	3.1250	3.1250
		3A	3.1115	3.1256	3.07065	3.1017	3.1256	3.06645	3.06595	3.1256	3.1256	3.1256
3 1/4-20	UN	2A	3.1128	3.1223	3.09270	3.1042	3.1223	3.07710	3.07710	3.1223	3.1223	3.1223
		3A	3.1122	3.1239	3.09245	3.1036	3.1239	3.07735	3.07685	3.1239	3.1239	3.1239
		3A	3.1145	3.1250	3.09440	3.1073	3.1250	3.08020	3.08020	3.1250	3.1250	3.1250
3 1/4-24	UNC	3A	3.1139	3.1256	3.09415	3.1067	3.1256	3.08045	3.07995	3.1256	3.1256	3.1256
		1A	3.2180	3.2467	3.08430	3.1762	3.2467	3.06800	3.06800	3.2467	3.2467	3.2467
		2A	3.2177	3.2476	3.08405	3.1763	3.2476	3.06825	3.06775	3.2476	3.2476	3.2476
3 1/4-32	UN	3A	3.2180	3.2467	3.08430	3.1816	3.2467	3.07340	3.07340	3.2467	3.2467	3.2467
		3A	3.2177	3.2476	3.08405	3.1807	3.2476	3.07365	3.07315	3.2476	3.2476	3.2476
		3A	3.2219	3.2500	3.08760	3.1876	3.2500	3.07940	3.07940	3.2500	3.2500	3.2500
3 1/4-40	UN	3A	3.2210	3.2500	3.08735	3.1867	3.2500	3.07965	3.07915	3.2500	3.2500	3.2500
		2A	3.2803	3.2474	3.19720	3.2116	3.2474	3.15750	3.15750	3.2474	3.2474	3.2474
		3A	3.2806	3.2481	3.19505	3.2109	3.2481	3.15775	3.15725	3.2481	3.2481	3.2481
3 1/4-48	UN	3A	3.2829	3.2500	3.19890	3.2164	3.2500	3.16230	3.16230	3.2500	3.2500	3.2500
		3A	3.2822	3.2507	3.19865	3.2157	3.2507	3.16255	3.16205	3.2507	3.2507	3.2507
3 1/4-60	UN	2A	3.2352	3.2481	3.19400	3.2238	3.2481	3.18770	3.18770	3.2481	3.2481	3.2481
		3A	3.2346	3.2487	3.19375	3.2232	3.2487	3.18795	3.18745	3.2487	3.2487	3.2487
		3A	3.2371	3.2500	3.19580	3.2273	3.2500	3.19120	3.19120	3.2500	3.2500	3.2500
3 1/4-72	UN	3A	3.2365	3.2506	3.19555	3.2267	3.2506	3.19145	3.19095	3.2506	3.2506	3.2506
		2A	3.2378	3.2483	3.20770	3.2292	3.2483	3.20210	3.20210	3.2483	3.2483	3.2483
		3A	3.2372	3.2489	3.20745	3.2286	3.2489	3.20235	3.20185	3.2489	3.2489	3.2489
3 1/2-12	UN	3A	3.2395	3.2500	3.20940	3.2324	3.2500	3.20520	3.20520	3.2500	3.2500	3.2500
		3A	3.2389	3.2506	3.20915	3.2317	3.2506	3.20546	3.20496	3.2506	3.2506	3.2506
		2A	3.3992	3.3750	3.31800	3.3481	3.3750	3.31290	3.31290	3.3750	3.3750	3.3750
3 1/2-16	UN	3A	3.3996	3.3737	3.31875	3.3481	3.3737	3.31265	3.31215	3.3737	3.3737	3.3737
		3A	3.4021	3.3750	3.32080	3.3522	3.3750	3.31610	3.31610	3.3750	3.3750	3.3750
		3A	3.4015	3.3756	3.32055	3.3516	3.3756	3.31636	3.31586	3.3756	3.3756	3.3756

See footnotes at end of table.

TABLE III.13.—Setting plug gages, Unified and American screw threads --Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"				Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter		Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>
			Truncated	Full			Truncated	Full	Plus tolerance gage	Minus tolerance gage		
1	2	3	4	5	6		7	8	9	10	11	12
3/8-16	UN	2A	in. 3.3628	in. 3.3733	in. 3.33270		in. 3.3540	in. 3.3733	in. 3.32690	in. 3.32690	in. 3.3733	in. 3.3733
		3A	3.3622	3.3739	3.33245		3.3534	3.3739	3.32715	3.32665	3.3739	3.3739
			3.3615	3.3750	3.33110		3.3572	3.3750	3.33010	3.33010	3.3750	3.3750
			3.3639	3.3756	3.33415		3.3566	3.3756	3.33035	3.32085	3.3756	3.3756
3/8-4	UNC	1A	3.4966	3.4967	3.43130		3.4260	3.4967	3.31770	3.31770	3.4967	3.4967
		2A	3.4977	3.4978	3.43105		3.4251	3.4978	3.31775	3.31775	3.4978	3.4978
		3A	3.4986	3.4987	3.43130		3.4316	3.4987	3.32330	3.32330	3.4987	3.4987
			3.4977	3.4978	3.43105		3.4307	3.4978	3.32355	3.32355	3.4978	3.4978
3/8-8	N	2A	3.4719	3.5000	3.43760		3.4376	3.5000	3.32580	3.32580	3.5000	3.5000
		3A	3.4710	3.5009	3.43735		3.4367	3.5009	3.32555	3.32555	3.5009	3.5009
3/8-12	UN	2A	3.4803	3.4974	3.41620		3.4615	3.4974	3.40740	3.40740	3.4974	3.4974
		3A	3.4706	3.4981	3.41595		3.4608	3.4981	3.40765	3.40765	3.4981	3.4981
			3.4829	3.5000	3.41880		3.4633	3.5000	3.41220	3.41220	3.5000	3.5000
			3.4822	3.5007	3.41855		3.4656	3.5007	3.41245	3.41195	3.5007	3.5007
3/8-16	UN	2A	3.4852	3.4981	3.41400		3.4737	3.4981	3.43760	3.43760	3.4981	3.4981
		3A	3.4846	3.4987	3.41375		3.4731	3.4987	3.43785	3.43735	3.4987	3.4987
			3.4871	3.5000	3.41590		3.4772	3.5000	3.44110	3.44110	3.5000	3.5000
			3.4865	3.5006	3.41565		3.4766	3.5006	3.44135	3.44085	3.5006	3.5006
3/8-12	UN	2A	3.4878	3.4983	3.45770		3.4790	3.4983	3.45190	3.45190	3.4983	3.4983
		3A	3.4872	3.4989	3.45745		3.4784	3.4989	3.45215	3.45165	3.4989	3.4989
			3.4905	3.5000	3.45910		3.4822	3.5000	3.45510	3.45510	3.5000	3.5000
			3.4909	3.5006	3.45915		3.4816	3.5006	3.45535	3.45485	3.5006	3.5006
3/8-12	UN	2A	3.6102	3.6231	3.59000		3.6087	3.6231	3.56260	3.56260	3.6231	3.6231
		3A	3.6096	3.6237	3.58975		3.6081	3.6237	3.56285	3.56235	3.6237	3.6237
			3.6121	3.6250	3.59090		3.6022	3.6250	3.56310	3.56310	3.6250	3.6250
			3.6115	3.6256	3.59065		3.6016	3.6256	3.56335	3.56285	3.6256	3.6256
3/8-16	UN	2A	3.6129	3.6233	3.58230		3.6040	3.6233	3.57690	3.57690	3.6233	3.6233
		3A	3.6122	3.6239	3.58205		3.6034	3.6239	3.57715	3.57665	3.6239	3.6239
			3.6145	3.6250	3.58410		3.6072	3.6250	3.58010	3.58010	3.6250	3.6250
			3.6139	3.6256	3.58415		3.6066	3.6256	3.58035	3.57985	3.6256	3.6256
3/8-4	UNC	1A	3.7185	3.7186	3.58120		3.6755	3.7186	3.59740	3.59740	3.7186	3.7186
		2A	3.7176	3.7177	3.58095		3.6747	3.7177	3.59765	3.59715	3.7177	3.7177
		3A	3.7185	3.7186	3.58120		3.6812	3.7186	3.57390	3.57390	3.7186	3.7186
			3.7176	3.7177	3.58095		3.6804	3.7177	3.57425	3.57375	3.7177	3.7177
3/8-8	N	2A	3.7219	3.7500	3.68760		3.6874	3.7500	3.57920	3.57920	3.7500	3.7500
		3A	3.7210	3.7509	3.68735		3.6865	3.7509	3.57945	3.57895	3.7509	3.7509
3/8-12	UN	2A	3.7392	3.7473	3.69610		3.7112	3.7473	3.65710	3.65710	3.7473	3.7473
		3A	3.7395	3.7480	3.69585		3.7105	3.7480	3.65735	3.65685	3.7480	3.7480
			3.7329	3.7500	3.69880		3.7162	3.7500	3.66210	3.66210	3.7500	3.7500
			3.7322	3.7507	3.69855		3.7155	3.7507	3.66235	3.66185	3.7507	3.7507
3/8-16	UN	2A	3.7352	3.7481	3.69400		3.7237	3.7481	3.68760	3.68760	3.7481	3.7481
		3A	3.7346	3.7487	3.69375		3.7231	3.7487	3.68785	3.68735	3.7487	3.7487
			3.7371	3.7500	3.69580		3.7272	3.7500	3.69110	3.69110	3.7500	3.7500
			3.7365	3.7506	3.69555		3.7266	3.7506	3.69135	3.69085	3.7506	3.7506
3/8-12	UN	2A	3.7378	3.7483	3.70770		3.7290	3.7483	3.70190	3.70190	3.7483	3.7483
		3A	3.7372	3.7489	3.70745		3.7284	3.7489	3.70215	3.70165	3.7489	3.7489
			3.7395	3.7500	3.70990		3.7322	3.7500	3.70510	3.70510	3.7500	3.7500
			3.7389	3.7506	3.70915		3.7316	3.7506	3.70535	3.70485	3.7506	3.7506
3/8-16	UN	2A	3.8601	3.8730	3.81900		3.8185	3.8730	3.81240	3.81240	3.8730	3.8730
		3A	3.8595	3.8736	3.81875		3.8179	3.8736	3.81265	3.81215	3.8736	3.8736
			3.8621	3.8750	3.82090		3.8521	3.8750	3.81690	3.81690	3.8750	3.8750
			3.8615	3.8756	3.82065		3.8515	3.8756	3.81725	3.81675	3.8756	3.8756
3/8-12	UN	2A	3.8627	3.8732	3.83290		3.8532	3.8732	3.82670	3.82670	3.8732	3.8732
		3A	3.8621	3.8738	3.83265		3.8526	3.8738	3.82695	3.82645	3.8738	3.8738
			3.8645	3.8750	3.83440		3.8571	3.8750	3.83090	3.83090	3.8750	3.8750
			3.8639	3.8756	3.83415		3.8565	3.8756	3.83125	3.83075	3.8756	3.8756
4-4	UNC	1A	3.9985	3.9986	3.83120		3.9254	3.9986	3.81720	3.81720	3.9986	3.9986
		2A	3.9976	3.9987	3.83095		3.9247	3.9987	3.81745	3.81695	3.9987	3.9987
		3A	3.9985	3.9986	3.83120		3.9312	3.9986	3.82290	3.82290	3.9986	3.9986
			3.9976	3.9987	3.83095		3.9303	3.9987	3.82315	3.82265	3.9987	3.9987
4-8	N	2A	3.9719	4.0000	3.83790		3.9371	4.0000	3.82940	3.82940	4.0000	4.0000
		3A	3.9710	4.0009	3.83765		3.9365	4.0009	3.82965	3.82915	4.0009	4.0009
4-12	UN	2A	3.9809	3.9973	3.91610		3.9611	3.9973	3.90700	3.90700	3.9973	3.9973
		3A	3.9805	3.9980	3.91585		3.9604	3.9980	3.90725	3.90675	3.9980	3.9980
			3.9829	4.0000	3.91880		3.9644	4.0000	3.91290	3.91290	4.0000	4.0000
			3.9822	4.0007	3.91855		3.9637	4.0007	3.91315	3.91265	4.0007	4.0007
4-16	UN	2A	3.9851	3.9980	3.91300		3.9735	3.9980	3.90740	3.90740	3.9980	3.9980
		3A	3.9845	3.9986	3.91275		3.9729	3.9986	3.90765	3.90715	3.9986	3.9986
			3.9871	4.0000	3.91590		3.9774	4.0000	3.91190	3.91190	4.0000	4.0000
			3.9865	4.0006	3.91565		3.9768	4.0006	3.91215	3.91165	4.0006	4.0006

See footnotes at end of table.



TABLE III.13.—Setting plug gages, Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs							Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>
			Truncated	Full		Truncated	Full	Plus tolerance gage	Minus tolerance gage	W and X tolerances	W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12
4-16	UN	2A	<i>in.</i> 3.9877 3.9871 3.9895 3.9889	<i>in.</i> 3.9982 3.9988 3.9980 4.0006	<i>in.</i> 3.95760 3.95735 3.95940 3.95915	<i>in.</i> 3.9788 3.9782 3.9821 3.9815	<i>in.</i> 3.9982 3.9988 4.0000 4.0006	<i>in.</i> 3.95170 3.95195 3.95500 3.95525	<i>in.</i> 3.95170 3.95115 3.95500 3.95475	<i>in.</i> 3.9982 3.9988 4.0000 4.0006	<i>in.</i> 3.9982 3.9988 4.0000 4.0006
4 1/4-8	N	2A	4.2301 4.2290 4.2329 4.2318	4.2472 4.2483 4.2500 4.2511	4.1690 4.1657 4.1688 4.1685	4.2168 4.2167 4.2159 4.2148	4.2472 4.2483 4.2500 4.2511	4.1567 4.1570 4.1618 4.1621	4.1567 4.1564 4.1618 4.1615	4.2472 4.2483 4.2500 4.2511	4.2472 4.2483 4.2500 4.2511
4 1/4-12	UN	2A	4.2351 4.2312 4.2371 4.2362	4.2480 4.2480 4.2500 4.2509	4.1939 4.1936 4.1959 4.1956	4.2235 4.2226 4.2271 4.2262	4.2480 4.2489 4.2500 4.2509	4.1874 4.1877 4.1910 4.1913	4.1874 4.1871 4.1910 4.1907	4.2480 4.2489 4.2500 4.2509	4.2480 4.2489 4.2500 4.2509
4 1/4-16	UN	2A	4.2377 4.2368 4.2395 4.2386	4.2482 4.2491 4.2500 4.2509	4.2076 4.2073 4.2091 4.2091	4.2288 4.2279 4.2321 4.2312	4.2482 4.2491 4.2500 4.2509	4.2017 4.2020 4.2050 4.2053	4.2017 4.2014 4.2050 4.2047	4.2482 4.2491 4.2500 4.2509	4.2482 4.2491 4.2500 4.2509
4 1/2-8	N	2A	4.4801 4.4790 4.4829 4.4818	4.4972 4.4983 4.5000 4.5011	4.4160 4.4157 4.4188 4.4185	4.4907 4.4906 4.4959 4.4947	4.4972 4.4983 4.5000 4.5011	4.4066 4.4069 4.4117 4.4114	4.4066 4.4063 4.4117 4.4114	4.4972 4.4983 4.5000 4.5011	4.4972 4.4983 4.5000 4.5011
4 1/2-12	UN	2A	4.4851 4.4842 4.4871 4.4862	4.4980 4.4989 4.5000 4.5009	4.4430 4.4436 4.4459 4.4456	4.4735 4.4726 4.4771 4.4762	4.4980 4.4989 4.5000 4.5009	4.4374 4.4377 4.4410 4.4413	4.4374 4.4371 4.4410 4.4407	4.4980 4.4989 4.5000 4.5009	4.4980 4.4989 4.5000 4.5009
4 1/2-16	UN	2A	4.4877 4.4868 4.4895 4.4886	4.4982 4.4991 4.5000 4.5009	4.4576 4.4573 4.4591 4.4591	4.4788 4.4779 4.4821 4.4812	4.4982 4.4991 4.5000 4.5009	4.4517 4.4520 4.4550 4.4553	4.4517 4.4514 4.4550 4.4547	4.4982 4.4991 4.5000 4.5009	4.4982 4.4991 4.5000 4.5009
4 3/4-8	N	2A	4.7300 4.7289 4.7329 4.7318	4.7471 4.7482 4.7500 4.7511	4.6659 4.6656 4.6688 4.6685	4.7165 4.7161 4.7157 4.7146	4.7471 4.7482 4.7500 4.7511	4.6561 4.6561 4.6616 4.6619	4.6561 4.6561 4.6616 4.6613	4.7471 4.7482 4.7500 4.7511	4.7471 4.7482 4.7500 4.7511
4 3/4-12	UN	2A	4.7351 4.7342 4.7371 4.7362	4.7480 4.7489 4.7500 4.7509	4.6639 4.6636 4.6659 4.6656	4.7233 4.7224 4.7270 4.7261	4.7480 4.7489 4.7500 4.7509	4.6872 4.6875 4.6909 4.6912	4.6872 4.6869 4.6909 4.6906	4.7480 4.7489 4.7500 4.7509	4.7480 4.7489 4.7500 4.7509
4 3/4-16	UN	2A	4.7377 4.7368 4.7395 4.7386	4.7482 4.7491 4.7500 4.7509	4.7076 4.7073 4.7091 4.7091	4.7286 4.7277 4.7320 4.7311	4.7482 4.7491 4.7500 4.7509	4.7015 4.7018 4.7049 4.7052	4.7015 4.7012 4.7049 4.7046	4.7482 4.7491 4.7500 4.7509	4.7482 4.7491 4.7500 4.7509
5-8	N	2A	4.9800 4.9789 4.9829 4.9818	4.9971 4.9982 5.0000 5.0011	4.9159 4.9156 4.9188 4.9185	4.9903 4.9892 4.9957 4.9946	4.9971 4.9982 5.0000 5.0011	4.9062 4.9065 4.9116 4.9119	4.9062 4.9059 4.9116 4.9113	4.9971 4.9982 5.0000 5.0011	4.9971 4.9982 5.0000 5.0011
5-12	UN	2A	4.9851 4.9842 4.9871 4.9862	4.9980 4.9989 5.0000 5.0009	4.9139 4.9136 4.9159 4.9156	4.9733 4.9724 4.9770 4.9761	4.9980 4.9989 5.0000 5.0009	4.9372 4.9375 4.9409 4.9412	4.9372 4.9369 4.9409 4.9406	4.9980 4.9989 5.0000 5.0009	4.9980 4.9989 5.0000 5.0009
5-16	UN	2A	4.9877 4.9868 4.9895 4.9886	4.9982 4.9991 5.0000 5.0009	4.9576 4.9573 4.9591 4.9591	4.9786 4.9777 4.9820 4.9811	4.9982 4.9991 5.0000 5.0009	4.9515 4.9518 4.9549 4.9552	4.9515 4.9512 4.9549 4.9546	4.9982 4.9991 5.0000 5.0009	4.9982 4.9991 5.0000 5.0009
5 1/4-8	N	2A	5.2390 5.2389 5.2329 5.2318	5.2471 5.2482 5.2500 5.2511	5.1659 5.1656 5.1688 5.1685	5.2102 5.2091 5.2156 5.2145	5.2471 5.2482 5.2500 5.2511	5.1561 5.1564 5.1615 5.1618	5.1561 5.1558 5.1615 5.1612	5.2471 5.2482 5.2500 5.2511	5.2471 5.2482 5.2500 5.2511
5 1/4-12	UN	2A	5.2351 5.2342 5.2371 5.2362	5.2480 5.2489 5.2500 5.2509	5.1939 5.1936 5.1959 5.1956	5.2233 5.2224 5.2270 5.2261	5.2480 5.2489 5.2500 5.2509	5.1872 5.1875 5.1909 5.1912	5.1872 5.1869 5.1909 5.1906	5.2480 5.2489 5.2500 5.2509	5.2480 5.2489 5.2500 5.2509
5 1/4-16	UN	2A	5.2377 5.2368 5.2395 5.2386	5.2482 5.2491 5.2500 5.2509	5.2076 5.2073 5.2091 5.2091	5.2286 5.2277 5.2320 5.2311	5.2482 5.2491 5.2500 5.2509	5.2015 5.2018 5.2049 5.2052	5.2015 5.2012 5.2049 5.2046	5.2482 5.2491 5.2500 5.2509	5.2482 5.2491 5.2500 5.2509
5 1/2-8	N	2A	5.4790 5.4788 5.4829 5.4818	5.4970 5.4981 5.5000 5.5011	5.4158 5.4155 5.4188 5.4185	5.4690 5.4689 5.4655 5.4644	5.4970 5.4981 5.5000 5.5011	5.4079 5.4082 5.4111 5.4117	5.4079 5.4076 5.4111 5.4111	5.4970 5.4981 5.5000 5.5011	5.4970 5.4981 5.5000 5.5011

See footnotes at end of table.

TABLE III.13.—Setting plug gages, Unified and American screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"				Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>1</sup>	
			Truncated	Full		Truncated	Full	Plus tolerance gage	Minus tolerance gage			W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12	
5/16-12	UN	2A	in. 5.4851	in. 5.4980	in. 5.4439	in. 5.4733	in. 5.4980	in. 5.4372	in. 5.4372	in. 5.4980	in. 5.4980	
			5.4842	5.4989	5.4436	5.4724	5.4989	5.4375	5.4369	5.4989	5.4989	
		3A	5.4871	5.5000	5.4450	5.4770	5.5000	5.4409	5.4409	5.5000	5.5000	
			5.4862	5.5009	5.4456	5.4761	5.5009	5.4412	5.4406	5.5009	5.5009	
5/16-16	UN	2A	5.4877	5.4982	5.4576	5.4786	5.4982	5.4515	5.4515	5.4982	5.4982	
			5.4868	5.4991	5.4573	5.4777	5.4991	5.4518	5.4512	5.4991	5.4991	
		3A	5.4895	5.5000	5.4584	5.4820	5.5000	5.4549	5.4549	5.5000	5.5000	
			5.4886	5.5009	5.4591	5.4811	5.5009	5.4552	5.4546	5.5009	5.5009	
5/16-8	N	2A	5.7299	5.7470	5.6958	5.7099	5.7470	5.6558	5.6558	5.7470	5.7470	
			5.7288	5.7471	5.6955	5.7098	5.7481	5.6581	5.6555	5.7481	5.7481	
		3A	5.7329	5.7500	5.6988	5.7154	5.7500	5.6613	5.6613	5.7500	5.7500	
			5.7318	5.7511	5.6985	5.7143	5.7511	5.6616	5.6610	5.7511	5.7511	
5/16-12	UN	2A	5.7350	5.7479	5.6938	5.7230	5.7479	5.6869	5.6869	5.7479	5.7479	
			5.7341	5.7488	5.6935	5.7221	5.7488	5.6872	5.6866	5.7488	5.7488	
		3A	5.7371	5.7500	5.6959	5.7268	5.7500	5.6907	5.6907	5.7500	5.7500	
			5.7362	5.7509	5.6956	5.7259	5.7509	5.6910	5.6904	5.7509	5.7509	
5/16-16	UN	2A	5.7376	5.7481	5.7075	5.7284	5.7481	5.7013	5.7013	5.7481	5.7481	
			5.7367	5.7480	5.7072	5.7275	5.7490	5.7016	5.7010	5.7490	5.7490	
		3A	5.7395	5.7500	5.7094	5.7318	5.7500	5.7047	5.7047	5.7500	5.7500	
			5.7386	5.7509	5.7091	5.7309	5.7509	5.7050	5.7044	5.7509	5.7509	
6-8	N	2A	5.9799	5.9970	5.9158	5.9597	5.9970	5.9056	5.9056	5.9970	5.9970	
			5.9788	5.9981	5.9155	5.9586	5.9981	5.9059	5.9053	5.9981	5.9981	
		3A	5.9829	6.0000	5.9188	5.9653	6.0000	5.9112	5.9112	6.0000	6.0000	
			5.9818	6.0011	5.9185	5.9642	6.0011	5.9115	5.9109	6.0011	6.0011	
6-12	UN	2A	5.9850	5.9970	5.9438	5.9730	5.9970	5.9369	5.9369	5.9970	5.9970	
			5.9841	5.9988	5.9435	5.9721	5.9988	5.9372	5.9366	5.9988	5.9988	
		3A	5.9871	6.0000	5.9459	5.9708	6.0000	5.9407	5.9407	6.0000	6.0000	
			5.9862	6.0009	5.9456	5.9759	6.0009	5.9410	5.9404	6.0009	6.0009	
6-16	UN	2A	5.9876	5.9981	5.9575	5.9784	5.9981	5.9513	5.9513	5.9981	5.9981	
			5.9867	5.9980	5.9572	5.9775	5.9980	5.9516	5.9510	5.9980	5.9980	
		3A	5.9895	6.0000	5.9594	5.9818	6.0000	5.9547	5.9547	6.0000	6.0000	
			5.9886	6.0009	5.9591	5.9809	6.0009	5.9550	5.9544	6.0009	6.0009	

<sup>1</sup> Pitch diameter limits of W basic-crest setting plug gages are given in column 6 of this table. Pitch diameter limits of X basic-crest setting plug gages are given in column 4 of table III.12.

<sup>2</sup> Pitch diameter limits of W basic-crest setting plug gages are given in columns 9 and 10 of this table. Pitch diameter limits of X basic-crest setting plug gages are given in columns 6 and 7 of table III.12.

## 8. SIZES OF TAP DRILLS

When it is important that the minor diameter of an internal thread conform to specified limits it may be necessary to use a reamer to finish the hole. However, a drill often can be made to cut sufficiently accurately for this requirement. A variety of factors enter into the production of a clean, round, straight hole of the correct diameter. For a discussion of these and other data on drilling and tapping reference should be made to "Drilled Holes for Tapping," published by the Drill and Reamer Division and the Tap and Die Division of the Metal Cutting Tool Institute.<sup>6</sup>

Table III.14 gives minor diameter limits and corresponding percentages of basic thread height,  $\frac{3}{4}H$ , for all standard series threads to and including  $3\frac{1}{2}$  in. diameter, classes 1B and 2B. Table III.15 is a similar table for class 3B. These tables also list sizes of drills that may be expected to drill holes within or near the specified minor

diameter limits. The diameter of the drill, the probable hole size, and the corresponding percentages of basic thread height are tabulated.

As a drill may normally be expected to cut oversize, probable hole sizes are tabulated that are derived from probable mean oversizes, also tabulated. The following is quoted from the above-mentioned report: "These oversizes were determined from a series of tests conducted by a number of drill manufacturers. Using six sizes of drills ranging from  $\frac{1}{16}$  to 1 in. a total of 2,808 holes were drilled in cast iron and steel. Commercial high speed drills were used and the drilling equipment was of the same type and condition that is normally encountered in metal working shops. The average depth of hole drilled was equal to  $1\frac{1}{2}$  times the drill diameter, and the measurement of the hole was made at the midpoint of the depth drilled. . . . With good drilling practices and with reasonable care in the resharpening of drills the average user may expect to drill oversize in the same manner."

<sup>6</sup> Address: 3114 Chrysler Bldg., 405 Lexington Ave., New York 17, N. Y.

TABLE III.14.—Tap drill sizes, Unified and American screw threads, classes 1B and 2B

Thread size	Threads per inch	Designation	Classes 1B and 2B minor diameter, internal threads				Tap drills and percent basic thread height					
			Minimum	Percent basic thread height	Maximum	Percent basic thread height	Nominal size	Diameter	Theoretical percent of thread	Probable oversize, mean	Probable hole size	Percent of thread
No. in.			in.		in.			in.		in.	in.	
0 0.060	80	NF	0.0465	83.1	0.0514	52.9	#56	0.0465	83	0.0015	0.0480	74
							3/64 in.	.0469	81	.0016	.0484	71
11 .073	64	NC	.0501	83.3	.0623	52.7	#54	.0550	89	.0015	.0565	81
							#53	.0595	67	.0016	.0610	59
11 .073	72	NF	.0580	83.1	.0635	52.7	#53	.0595	75	.0015	.0610	67
							1/16 in.	.0625	58	.0015	.0640	50
2 .086	56	NC	.0667	83.2	.0737	53.0	#51	.0670	82	.0017	.0687	75
							#50	.0700	69	.0017	.0717	62
2 .086	64	NF	.0691	83.3	.0753	52.7	#49	.0730	56	.0017	.0747	49
							#50	.0700	79	.0017	.0717	70
							#49	.0730	64	.0017	.0747	56
							#48	.0760	85	.0019	.0779	78
3 .099	48	NC	.0764	83.5	.0845	53.6	3/64 in.	.0781	77	.0019	.0800	70
							#47	.0785	76	.0019	.0804	69
							#46	.0810	67	.0019	.0829	60
							#45	.0820	63	.0019	.0839	56
							#46	.0810	78	.0019	.0829	69
3 .099	56	NF	.0797	83.2	.0865	53.9	#45	.0820	73	.0019	.0839	65
							#44	.0860	56	.0019	.0879	48
							#44	.0860	80	.0019	.0879	74
4 .112	40	NC	.0849	83.4	.0939	55.7	#43	.0890	71	.0020	.0910	66
							#42	.0935	57	.0020	.0955	51
							1/4 in.	.0938	56	.0020	.0958	50
							#43	.0890	85	.0020	.0910	78
							#42	.0935	68	.0020	.0955	61
4 .112	48	NF	.0894	83.5	.0998	56.2	1/4 in.	.0938	67	.0020	.0958	60
							#41	.0960	59	.0020	.0980	52
							#40	.0980	83	.0023	.1003	76
5 .125	40	NC	.0979	83.4	.1062	57.9	#39	.0995	79	.0023	.1018	71
							#38	.1015	72	.0023	.1038	65
							#37	.1040	65	.0023	.1063	58
5 .125	44	NF	.1004	83.3	.1079	57.9	#38	.1015	80	.0023	.1038	72
							#37	.1040	71	.0023	.1063	63
							#36	.1065	63	.0023	.1088	56
							#37	.1040	84	.0023	.1063	78
							#36	.1065	78	.0023	.1088	72
6 .138	32	NC	.104	83.8	.114	59.1	1/4 in.	.1064	70	.0026	.1120	64
							#35	.1100	69	.0026	.1126	63
							#34	.1110	67	.0026	.1136	60
							#33	.1130	62	.0026	.1156	55
							#34	.1110	83	.0026	.1136	75
6 .138	40	NF	.111	83.1	.119	58.5	#33	.1130	77	.0026	.1156	69
							#32	.1160	68	.0026	.1186	60
8 .164	32	NC	.130	83.8	.139	61.6	#29	.1360	69	.0029	.1389	62
							#28	.1405	78	.0029	.1434	70
8 .164	36	NF	.134	83.1	.142	61.0	1/4 in.	.1406	65	.0029	.1435	57
							#27	.1440	85	.0032	.1472	79
							#26	.1470	79	.0032	.1502	74
10 .190	24	NC	.145	83.1	.166	62.8	#25	.1495	75	.0032	.1527	69
							#24	.1520	70	.0032	.1562	64
							#23	.1540	66	.0032	.1572	61
							1/2 in.	.1562	83	.0032	.1594	75
10 .190	32	NF	.156	83.8	.164	64.1	#22	.1570	81	.0032	.1602	73
							#21	.1600	76	.0032	.1622	68
							#20	.1610	71	.0032	.1642	64
							1/2 in.	.1719	82	.0035	.1774	76
12 .216	24	NC	.171	83.1	.181	64.7	#17	.1730	79	.0035	.1765	73
							#16	.1770	72	.0035	.1805	66
							#15	.1800	67	.0035	.1835	60
							#16	.1770	84	.0035	.1805	77
12 .216	28	NF	.177	84.1	.186	64.7	#15	.1800	78	.0035	.1835	70
							#14	.1820	73	.0035	.1855	66
							#13	.1850	67	.0035	.1885	59
							#14	.1820	84	.0035	.1855	75
12 .216	32	NEF	.182	83.8	.190	64.0	#13	.1850	76	.0035	.1885	68
							1/2 in.	.1875	70	.0035	.1910	62
							#12	.1890	67	.0035	.1925	58
							#9	.1960	83	.0038	.1998	77
							#8	.1990	79	.0038	.2028	73
1/4	20	UNC	.196	83.1	.207	66.2	#7	.2010	75	.0038	.2048	70
							1/2 in.	.2031	72	.0038	.2069	66
							#6	.2040	71	.0038	.2078	65
							#5	.2055	69	.0038	.2093	63
1/4	28	UNF	.211	84.1	.220	64.7	#3	.2130	80	.0038	.2168	72
							1/2 in.	.2188	67	.0038	.2226	59
1/4	32	NEF	.216	83.8	.224	64.1	#2	.2210	71	.0038	.2248	67
1/4	36	UNS	.220	83.1	.226	66.5	#2	.2210	80	.0038	.2248	70
5/16	18	UNC	.252	83.8	.265	65.8	#1	.2570	77	.0038	.2608	72
							#1	.2610	71	.0041	.2651	66
5/16	24	UNF	.267	84.1	.277	65.6	J	.2660	86	.0041	.2701	78
							J	.2720	75	.0041	.2761	67
							J	.2770	66	.0041	.2811	58
5/16	32	NEF	.279	82.5	.286	65.3	K	.2810	78	.0042	.2852	67
5/16	36	UNF	.282	84.5	.289	65.1	1/2 in.	.2812	77	.0042	.2854	67
							7/16 in.	.2851	75	.0042	.2893	65
3/8	16	UNC	.307	83.8	.321	66.5	1/2 in.	.3125	77	.0044	.3169	72
							1/2 in.	.3160	73	.0044	.3204	67
3/8	24	UNF	.330	83.1	.340	64.7	Q	.3326	79	.0044	.3364	71
							1/2 in.	.3390	67	.0044	.3434	58
3/8	32	NEF	.341	83.8	.349	64.1	1/2 in.	.3438	77	.0045	.3483	66
							1/2 in.	.3480	67	.0045	.3525	55

TABLE III.14.—Tap drill sizes, Unified and American screw threads, classes 1B and 2B—Continued

Thread size	Threads per inch	Designation	Classes 1B and 2B minor diameter, internal threads				Tap drills and percent basic thread height					
			Minimum	Percent basic thread height	Maximum	Percent basic thread height	Nominal size	Diameter	Theoretical percent of thread	Probable oversize, mean	Probable hole size	Percent of thread
No.	in.		in.		in.			in.		in.	in.	
36	36	UNS	0.345	83.1	0.352	63.7	S	0.3480	75	0.0015	0.3525	62
36	14	UNC	.309	83.5	.376	66.3	T	.3580	86	.0016	.3626	81
36	20	UNF	.383	83.9	.395	65.4	W	.3960	79	.0016	.3966	79
36	28	UNEF	.399	83.0	.407	65.7	Y	.4010	72	.0016	.4086	72
36	12	N	.410	83.1	.428	66.5	Z	.4130	80	.0017	.4177	76
36	13	UNC	.417	83.1	.431	66.1	27.64 in.	.4219	72	.0017	.4296	68
36	20	UNC	.415	83.1	.457	66.2	27.64 in.	.4219	78	.0017	.4296	73
36	28	UNEF	.461	81.1	.470	61.7	27.64 in.	.4531	72	.0017	.4578	65
36	12	UNC	.472	83.6	.490	67.0	27.64 in.	.4688	67	.0018	.4736	57
36	18	UNF	.502	83.8	.515	65.8	27.64 in.	.4688	87	.0018	.4736	82
36	24	NEF	.517	81.1	.527	65.6	27.64 in.	.4841	72	.0018	.4892	68
36	28	UNS	.521	83.0	.532	65.7	27.64 in.	.5000	87	.0018	.5048	80
36	11	UNC	.527	83.0	.546	66.9	27.64 in.	.5000	78	.0018	.5110	71
36	12	N	.535	83.1	.553	66.5	27.64 in.	.5156	87	.0018	.5201	78
36	18	UNF	.565	83.1	.578	65.1	27.64 in.	.5203	78	.0018	.5251	69
36	21	NEF	.580	83.1	.590	64.7	27.64 in.	.5312	67	.0019	.5361	57
36	28	UNS	.586	81.1	.595	61.7	27.64 in.	.5312	78	.0019	.5361	67
36	12	N	.597	83.6	.615	67.0	27.64 in.	.5312	79	.0019	.5361	75
36	24	NEF	.612	81.1	.632	65.6	27.64 in.	.5409	72	.0019	.5458	68
36	10	UNC	.612	83.1	.663	67.0	27.64 in.	.5625	87	.0019	.5671	81
36	12	N	.660	83.1	.678	66.5	27.64 in.	.5625	87	.0019	.5671	71
36	16	UNF	.682	83.8	.696	66.5	27.64 in.	.5687	78	.0019	.5736	74
36	20	UNEF	.696	83.1	.707	66.2	27.64 in.	.5781	87	.0019	.5830	69
36	28	UNS	.711	81.1	.729	64.7	27.64 in.	.5828	78	.0019	.5877	55
36	12	N	.722	83.6	.749	67.0	27.64 in.	.5938	87	.0019	.5987	82
36	16	UNF	.735	83.1	.759	66.5	27.64 in.	.6061	72	.0019	.6113	68
36	20	UNEF	.758	83.9	.778	65.4	27.64 in.	.6061	87	.0019	.6113	77
36	9	UNC	.755	83.1	.778	67.2	27.64 in.	.6106	72	.0020	.6156	80
36	12	N	.785	83.1	.803	66.5	27.64 in.	.6106	79	.0020	.6156	61
36	14	UNF	.798	83.0	.814	65.7	27.64 in.	.6562	87	.0020	.6612	82
36	16	UN	.807	83.8	.821	66.5	27.64 in.	.6562	72	.0020	.6612	68
36	20	UNEF	.821	83.1	.832	66.2	27.64 in.	.6719	87	.0020	.6769	71
36	28	UNS	.836	81.1	.845	61.7	27.64 in.	.6875	72	.0021	.6926	64
36	12	UN	.847	83.6	.865	67.0	27.64 in.	.7031	67	.0021	.7082	56
36	16	UN	.879	82.1	.881	65.9	27.64 in.	.7188	72	.0021	.7239	67
36	20	UNEF	.883	83.9	.895	65.4	27.64 in.	.7344	87	.0022	.7395	71
36	8	UNC	.865	83.1	.890	67.7	27.64 in.	.7500	72	.0022	.7550	61
1	12	UNF	.910	83.1	.928	66.5	27.64 in.	.7656	72	.0022	.7708	72
1	14	NS	.923	83.0	.938	66.8	27.64 in.	.7812	87	.0022	.7861	82
1	16	UN	.932	83.8	.946	66.5	27.64 in.	.7969	72	.0022	.8021	67
1	20	UNEF	.946	83.1	.960	66.2	27.64 in.	.8125	87	.0022	.8176	76
1	28	UNS	.961	81.1	.970	61.7	27.64 in.	.8125	72	.0022	.8176	62
1 1/16	12	UN	.972	83.6	.990	67.0	27.64 in.	.8281	67	.0023	.8332	70
1 1/16	16	UN	.995	83.1	1.009	65.9	27.64 in.	.8438	87	.0023	.8489	61
1 1/16	20	UNEF	.995	83.1	1.009	65.4	27.64 in.	.8438	72	.0023	.8489	55
1 1/16	24	NEF	1.021	83.8	1.035	66.5	27.64 in.	.8594	87	.0023	.8645	81
1 1/16	16	UN	1.057	83.1	1.071	66.2	27.64 in.	.8750	72	.0023	.8801	67
1 1/16	18	NEF	1.065	83.1	1.078	65.1	27.64 in.	.8906	72	.0023	.8957	70
1 1/16	20	UNS	1.071	83.1	1.082	66.2	27.64 in.	.8906	87	.0023	.8957	67
1 1/16	24	UNS	1.086	81.1	1.095	61.7	27.64 in.	.9062	72	.0023	.9113	63
1 1/16	12	UN	1.097	83.6	1.115	67.0	27.64 in.	.9219	87	.0023	.9270	73
1 1/16	16	UN	1.120	83.1	1.131	66.5	27.64 in.	.9219	72	.0023	.9270	67
1 1/16	18	NEF	1.127	83.8	1.140	65.8	27.64 in.	.9375	87	.0023	.9426	78
1 1/16	7	UNC	1.095	83.5	1.123	68.1	27.64 in.	.9531	72	.0023	.9582	67
1 1/16	8	N	1.115	83.1	1.140	67.7	27.64 in.	.9688	87	.0023	.9739	72
1 1/16	12	UNF	1.169	83.1	1.178	66.5	27.64 in.	.9844	72	.0023	.9895	66
1 1/16	16	UN	1.182	83.8	1.196	66.5	27.64 in.	.9844	87	.0023	.9895	68
1 1/16	18	NEF	1.190	83.1	1.203	66.5	27.64 in.	.9900	72	.0023	.9951	77
1 1/16	20	UNS	1.196	83.1	1.207	66.2	27.64 in.	.9900	87	.0023	.9951	81
1 1/16	12	UN	1.222	83.6	1.240	67.0	27.64 in.	.9900	72	.0023	.9951	72
1 1/16	16	UN	1.245	83.1	1.259	65.9	27.64 in.	.9900	87	.0023	.9951	80
1 1/16	18	NEF	1.252	83.8	1.265	65.8	27.64 in.	.9900	72	.0023	.9951	65

TABLE III.14.—Tap drill sizes, Unified and American screw threads, classes 1B and 2B—Continued

Thread size	Threads per inch	Designation	Classes 1B and 2B minor diameter, internal threads				Tap drills and percent basic thread height					
			Minimum	Percent basic thread height	Maximum	Percent basic thread height	Nominal size	Diameter	Theoretical percent of thread	Probable oversize, mean	Probable hole size	Percent of thread
No. in.			in.		in.			in.		in.	in.	
13/16	6	UNC	1.195	83.1	1.225	69.3	13/16 in.	1.1875	87			
							13/16 in.	1.2031	79			
							13/16 in.	1.2188	72			
13/16	8	N	1.240	83.1	1.265	67.7	13/16 in.	1.2344	87			
							13/16 in.	1.2500	77			
13/16	12	UNF	1.285	83.1	1.303	66.5	13/16 in.	1.2812	87			
13/16	16	UN	1.307	83.8	1.321	66.5	13/16 in.	1.2909	72			
13/16	18	NEF	1.315	83.1	1.328	65.1	13/16 in.	1.3125	77			
							13/16 in.	1.3125	87			
17/16	12	UN	1.347	83.6	1.360	71.6	17/16 in.	1.3281	65			
							17/16 in.	1.3438	87			
17/16	16	UN	1.370	83.1	1.384	65.9	17/16 in.	1.3594	72			
17/16	18	NEF	1.377	83.8	1.390	65.8	17/16 in.	1.3750	77			
1 1/2	6	UNC	1.320	83.1	1.350	69.3	1 1/2 in.	1.3125	87			
							1 1/2 in.	1.3281	79			
1 1/2	8	N	1.365	83.1	1.390	67.7	1 1/2 in.	1.3594	87			
							1 1/2 in.	1.3750	77			
1 1/2	12	UNF	1.410	83.1	1.428	66.5	1 1/2 in.	1.4062	87			
1 1/2	16	UN	1.432	83.8	1.446	66.5	1 1/2 in.	1.4219	72			
1 1/2	18	NEF	1.440	83.1	1.452	66.5	1 1/2 in.	1.4375	77			
1 3/4	20	UNS	1.446	83.1	1.457	66.2	1 3/4 in.	1.4375	87			
1 3/4	16	N	1.495	83.1	1.509	65.9	1 3/4 in.	1.4531	72			
1 3/4	18	NEF	1.502	83.8	1.515	65.8	1 3/4 in.	1.4531	77			
							1 3/4 in.	1.5000	87			
1 3/4	8	N	1.490	83.1	1.515	67.7	1 3/4 in.	1.5000	87			
							1 3/4 in.	1.5156	65			
1 3/4	12	UN	1.535	83.1	1.553	66.5	1 3/4 in.	1.5156	87			
1 3/4	16	UN	1.557	83.8	1.571	66.5	1 3/4 in.	1.5312	72			
1 3/4	18	NEF	1.565	83.1	1.578	65.1	1 3/4 in.	1.5469	77			
1 3/4	16	N	1.620	83.1	1.634	65.9	1 3/4 in.	1.5625	77			
1 3/4	18	NEF	1.627	83.8	1.640	65.8	1 3/4 in.	1.5625	87			
							1 3/4 in.	1.5781	65			
1 3/4	5	UNC	1.534	53.1	1.558	70.1	1 3/4 in.	1.6250	77			
							1 3/4 in.	1.6406	87			
1 3/4	8	N	1.615	83.1	1.640	67.7	1 3/4 in.	1.6406	65			
							1 3/4 in.	1.5312	84			
1 3/4	12	UN	1.660	83.1	1.678	66.5	1 3/4 in.	1.5469	78			
							1 3/4 in.	1.6094	87			
1 3/4	16	UNEF	1.682	83.8	1.696	66.5	1 3/4 in.	1.6250	77			
1 3/4	20	UNS	1.695	83.1	1.707	66.2	1 3/4 in.	1.6406	77			
1 3/4	16	N	1.745	83.1	1.759	65.9	1 3/4 in.	1.6562	72			
1 3/4	8	N	1.740	83.1	1.765	67.7	1 3/4 in.	1.6719	77			
1 3/4	12	UN	1.785	83.1	1.803	66.5	1 3/4 in.	1.6875	77			
1 3/4	16	UN	1.807	83.8	1.821	66.5	1 3/4 in.	1.7031	72			
1 3/4	16	N	1.870	83.1	1.884	65.9	1 3/4 in.	1.7188	77			
2	4 1/2	UNC	1.759	83.5	1.795	71.0	2 in.	1.7344	77			
2	8	N	1.895	83.1	1.890	67.7	2 in.	1.7500	77			
2	12	UN	1.910	83.1	1.928	66.5	2 in.	1.7656	77			
2	16	UNEF	1.932	83.8	1.946	66.5	2 in.	1.7812	87			
2	20	UNS	1.946	83.1	1.957	66.2	2 in.	1.7969	72			
2 1/16	16	N	1.995	83.1	2.009	65.9	2 in.	1.8125	77			
2 1/16	8	N	1.990	83.1	2.015	67.7	2 in.	1.8281	77			
2 1/16	12	UN	2.035	83.1	2.052	66.5	2 in.	1.8438	77			
2 1/16	16	UN	2.057	83.8	2.071	66.5	2 in.	1.8594	77			
2 1/16	16	N	2.120	83.1	2.134	65.9	2 in.	1.8750	77			
2 1/4	4 1/2	UNC	2.009	83.5	2.045	71.0	2 1/4 in.	1.9906	87			
2 1/4	8	N	2.115	83.1	2.140	67.7	2 1/4 in.	1.9219	72			
2 1/4	12	UN	2.140	83.1	2.175	69.5	2 1/4 in.	1.9375	77			
2 1/4	16	UN	2.182	83.8	2.196	66.5	2 1/4 in.	1.9531	72			
2 1/4	20	UNS	2.196	83.1	2.207	66.2	2 1/4 in.	1.9688	77			
2 1/4	16	N	2.215	83.1	2.259	65.9	2 1/4 in.	2.0000	77			
2 1/4	12	UN	2.285	83.1	2.303	66.5	2 1/4 in.	2.0000	77			
2 1/4	16	UN	2.307	83.8	2.321	66.5	2 1/4 in.	2.0156	77			
2 1/4	16	N	2.370	83.1	2.384	65.9	2 1/4 in.	2.0312	77			
2 1/2	4	UNC	2.229	83.4	2.267	71.7	2 1/2 in.	2.0469	77			
2 1/2	8	N	2.365	83.1	2.390	67.7	2 1/2 in.	2.0625	77			
2 1/2	12	UN	2.410	85.1	2.428	66.5	2 1/2 in.	2.0781	77			
2 1/2	16	UN	2.432	83.8	2.446	66.5	2 1/2 in.	2.0938	77			
2 1/2	12	UN	2.535	83.1	2.553	66.5	2 1/2 in.	2.1094	77			
2 3/4	16	UN	2.557	83.8	2.571	66.5	2 3/4 in.	2.1250	77			
2 3/4	4	UNC	2.479	83.4	2.517	71.7	2 3/4 in.	2.1406	77			
2 3/4	8	N	2.615	83.1	2.640	67.7	2 3/4 in.	2.1562	77			
2 3/4	12	UN	2.660	83.1	2.678	66.5	2 3/4 in.	2.1719	77			
2 3/4	16	UN	2.682	83.8	2.696	66.5	2 3/4 in.	2.1875	77			
2 3/4	12	UN	2.785	83.1	2.803	66.5	2 3/4 in.	2.2031	77			
2 3/4	16	UN	2.807	83.8	2.821	66.5	2 3/4 in.	2.2188	77			
3	4	UNC	2.729	83.4	2.767	71.7	3 in.	2.2344	77			
3	8	N	2.865	83.1	2.890	67.7	3 in.	2.2500	77			
3	12	UN	2.910	83.1	2.924	66.5	3 in.	2.2656	77			
3	16	UN	2.932	83.8	2.946	66.5	3 in.	2.2812	77			
3 1/4	4	UNC	2.979	83.4	3.017	71.7	3 1/4 in.	2.2969	77			
3 1/2	4	UNC	3.229	83.4	3.267	71.7	3 1/2 in.	2.3125	77			
3 3/4	4	UNC	3.479	83.4	3.517	71.7	3 3/4 in.	2.3281	77			



TABLE III.15.—Tap drill sizes, Unified and American screw threads, class 3B

Thread size	Threads per inch	Designation	Class 3B minor diameter, internal threads				Tap drills and percent basic thread height					
			Minimum	Percent basic thread height	Maximum	Percent basic thread height	Nominal size	Diameter	Theoretical percent of thread	Probable oversize, mean	Probable hole size	Percent of thread
No. in.			in.		in.			in.		in.	in.	
0 0.060	80	NF	0.0465	83.1	0.0514	52.9	#50	0.0465	83	0.0015	0.0480	74
1 .073	64	NC	.0561	83.3	.0623	52.7	#44 in.	.0469	81	.0015	.0484	71
1 .073	72	NF	.0580	83.1	.0635	52.7	#54	.0550	89	.0015	.0565	81
2 .086	56	NC	.0667	83.2	.0737	53.0	#53	.0595	67	.0015	.0610	59
2 .086	64	NF	.0691	83.3	.0753	52.7	#53	.0595	75	.0015	.0610	67
3 .099	48	NC	.0704	83.5	.0845	53.6	#46 in.	.0625	58	.0015	.0640	50
3 .099	56	NF	.0797	83.2	.0865	53.9	#51	.0670	82	.0017	.0687	75
4 .112	40	NC	.0849	83.4	.0939	55.7	#50	.0700	69	.0017	.0717	62
4 .112	48	NF	.0894	83.5	.0968	56.2	#49	.0730	56	.0017	.0747	49
5 .125	40	NC	.0979	83.4	.1062	57.9	#50	.0700	79	.0017	.0717	70
5 .125	44	NF	.1004	83.3	.1079	57.0	#49	.0730	64	.0017	.0747	56
6 .138	32	NC	.1040	83.8	.1110	59.1	#48	.0760	85	.0019	.0779	78
6 .138	40	NF	.1110	83.1	.1186	59.7	#44 in.	.0781	77	.0019	.0800	70
8 .164	32	NC	.1300	83.8	.1389	61.8	#47	.0785	76	.0019	.0804	69
8 .164	36	NF	.1340	83.1	.1416	62.1	#46	.0810	67	.0019	.0829	60
10 .190	24	NC	.1450	83.1	.1555	63.7	#46	.0820	63	.0019	.0839	54
10 .190	32	NF	.1560	83.8	.1641	63.8	#46	.0810	78	.0019	.0829	69
12 .216	24	NC	.1710	83.1	.1807	65.2	#45	.0820	73	.0019	.0839	65
12 .216	28	NF	.1770	84.1	.1857	65.3	#44	.0860	56	.0019	.0879	48
12 .216	32	NEF	.1820	83.8	.1895	65.3	#44	.0860	80	.0019	.0879	74
14 .240	20	UNC	.1960	83.1	.2067	66.7	#43	.0880	71	.0020	.0910	65
14 .240	28	UNF	.2110	84.1	.2190	66.8	#42	.0935	57	.0020	.0955	51
14 .240	32	NEF	.2160	83.8	.2229	66.8	#42 in.	.0938	56	.0020	.0958	50
16 .270	18	UNC	.2520	83.8	.2630	68.6	#43	.0960	85	.0020	.0910	75
16 .270	24	UNF	.2670	84.1	.2754	68.5	#42	.0935	68	.0020	.0955	61
16 .270	32	NEF	.2700	82.5	.2847	68.5	#41	.0960	67	.0020	.0958	60
18 .300	16	UNC	.3075	83.5	.3192	70.0	#40	.0980	83	.0023	.1003	75
18 .300	24	UNF	.3300	83.1	.3372	69.8	#39	.0985	79	.0023	.1018	71
18 .300	32	NEF	.3410	83.8	.3490	69.2	#38	.1015	72	.0023	.1038	65
20 .360	14	UNC	.3600	83.5	.3717	70.9	#37	.1040	65	.0023	.1063	58
20 .360	20	UNF	.3830	83.9	.3916	70.7	#38	.1015	80	.0023	.1038	72
							#37	.1040	71	.0023	.1063	63
							#36	.1065	63	.0023	.1088	55
							#37	.1040	84	.0023	.1063	78
							#44 in.	.1065	78	.0023	.1088	72
							#35	.1094	70	.0026	.1120	64
							#35	.1100	69	.0026	.1126	63
							#34	.1110	67	.0026	.1136	60
							#32	.1120	62	.0026	.1156	55
							#34	.1110	83	.0026	.1136	75
							#33	.1130	77	.0026	.1156	69
							#32	.1100	68	.0026	.1186	60
							#29	.1300	69	.0029	.1380	62
							#29	.1300	78	.0029	.1380	70
							#28	.1405	65	.0029	.1431	57
							#44 in.	.1406	65	.0029	.1435	57
							#27	.1440	85	.0032	.1472	79
							#26	.1470	79	.0032	.1502	74
							#25	.1495	75	.0032	.1527	69
							#24	.1520	70	.0032	.1552	64
							#23	.1540	66	.0032	.1572	61
							#42 in.	.1562	83	.0032	.1594	75
							#22	.1570	81	.0032	.1602	73
							#21	.1600	76	.0032	.1622	68
							#20	.1640	71	.0032	.1642	64
							#44 in.	.1719	82	.0035	.1754	75
							#17	.1730	70	.0035	.1766	73
							#16	.1770	72	.0035	.1805	66
							#15	.1800	67	.0035	.1835	60
							#14	.1820	73	.0035	.1855	70
							#13	.1850	67	.0035	.1885	59
							#14	.1820	84	.0035	.1855	75
							#13	.1850	76	.0035	.1885	68
							#44 in.	.1875	70	.0035	.1910	62
							#12	.1890	67	.0035	.1925	58
							#9	.1960	83	.0038	.1998	77
							#8	.1990	79	.0038	.2028	73
							#7	.2010	75	.0038	.2048	70
							#44 in.	.2031	72	.0038	.2069	69
							#6	.2040	71	.0038	.2078	65
							#5	.2065	69	.0038	.2093	63
							#3	.2130	80	.0038	.2168	72
							#42 in.	.2188	67	.0038	.2226	59
							#44 in.	.2188	77	.0038	.2226	67
							#2	.2210	71	.0038	.2248	62
							F	.2670	77	.0038	.2698	72
							(C)	.2610	71	.0041	.2651	66
							H	.2600	86	.0041	.2701	78
							J	.2720	75	.0041	.2761	67
							K	.2816	78	.0042	.2852	67
							#42 in.	.2812	77	.0042	.2854	67
							#36 in.	.3126	77	.0044	.3169	72
							(C)	.3152	73	.0044	.3204	67
							Q	.3330	79	.0044	.3364	71
							#42 in.	.3438	77	.0045	.3493	66
							T	.3580	80	.0046	.3626	81
							#44 in.	.3591	84	.0046	.3639	79
							W	.3690	79	.0046	.3746	72
							#44 in.	.3806	72	.0046	.3862	65

TABLE III.15.—Tap drill sizes, Unified and American screw threads, class 3B—Continued

Thread size	Threads per inch	Designation	Class 3B minor diameter, internal threads				Tap drills and percent basic thread height					
			Minimum	Percent basic thread height	Maximum	Percent basic thread height	Nominal size	Diameter	Theoretical percent of thread	Probable oversize, mean	Probable hole size	Percent of thread
No.	in.		in.		in.			in.		in.	in.	
28	$\frac{1}{8}$	UNEF	0.3990	83.0	0.4051	69.8	Y	0.4040	72	0.0048	0.4086	62
12	$\frac{1}{4}$	N	.4100	83.1	.4223	71.8	7	.4130	80	.0047	.4177	76
13	$\frac{1}{4}$	UNC	.4170	83.1	.4284	71.7	$\frac{3}{16}$ in.	.4219	72	.0047	.4236	68
20	$\frac{1}{4}$	UNF	.4460	83.1	.4537	71.3	$\frac{3}{16}$ in.	.4219	78	.0047	.4296	73
28	$\frac{1}{4}$	UNEF	.4610	84.1	.4676	69.8	$\frac{3}{16}$ in.	.4631	72	.0047	.4678	66
12	$\frac{3}{8}$	UNC	.4720	83.6	.4843	72.2	$\frac{1}{2}$ in.	.4688	87	.0048	.4736	82
18	$\frac{3}{8}$	UNF	.5020	83.8	.5106	71.9	$\frac{1}{2}$ in.	.4844	72	.0048	.4892	68
24	$\frac{3}{8}$	NEF	.5170	84.1	.5244	70.4	$\frac{1}{2}$ in.	.5000	87	.0048	.5048	80
11	$\frac{1}{2}$	UNO	.5270	83.0	.5391	72.7	$\frac{1}{2}$ in.	.5062 in.	78	.0048	.5110	71
12	$\frac{1}{2}$	N	.5350	83.1	.5403	72.7	$\frac{1}{2}$ in.	.5156	87	.0048	.5204	78
18	$\frac{1}{2}$	UNF	.5650	83.1	.5730	72.1	$\frac{1}{2}$ in.	.5203 in.	78	.0048	.5251	69
24	$\frac{1}{2}$	NEF	.5800	83.1	.5869	70.4	$\frac{1}{2}$ in.	.5312 in.	79	.0049	.5362	75
12	$\frac{1}{2}$	N	.5970	83.6	.6085	73.0	$\frac{1}{2}$ in.	.5469 in.	72	.0049	.5518	68
16	$\frac{1}{2}$	UNF	.6280	83.8	.6360	72.9	$\frac{1}{2}$ in.	.5625 in.	87	.0049	.5673	80
20	$\frac{1}{2}$	UNEF	.6600	83.1	.6707	72.9	$\frac{1}{2}$ in.	.5687 in.	78	.0049	.5736	71
12	$\frac{1}{2}$	N	.6420	84.1	.6494	73.0	$\frac{1}{2}$ in.	.5781 in.	87	.0049	.5830	78
16	$\frac{1}{2}$	UNF	.6820	83.8	.6908	72.9	$\frac{1}{2}$ in.	.5828 in.	78	.0049	.5877	69
20	$\frac{1}{2}$	UNEF	.6960	83.1	.7037	71.3	$\frac{1}{2}$ in.	.5938 in.	87	.0049	.5987	82
12	$\frac{1}{2}$	N	.7220	83.6	.7329	73.5	$\frac{1}{2}$ in.	.6038 in.	87	.0050	.6086	77
16	$\frac{1}{2}$	UNF	.7450	83.1	.7533	72.9	$\frac{1}{2}$ in.	.6141 in.	87	.0050	.6190	80
20	$\frac{1}{2}$	UNEF	.7590	83.0	.7632	71.3	$\frac{1}{2}$ in.	.6244 in.	87	.0050	.6293	83
9	$\frac{3}{4}$	UNC	.7550	83.1	.7621	74.1	$\frac{1}{2}$ in.	.6347 in.	87	.0050	.6396	86
12	$\frac{3}{4}$	N	.7850	83.1	.7957	73.7	$\frac{1}{2}$ in.	.6450 in.	87	.0050	.6500	89
14	$\frac{3}{4}$	UNF	.7980	83.0	.8068	73.5	$\frac{1}{2}$ in.	.6553 in.	87	.0050	.6603	92
16	$\frac{3}{4}$	UN	.8070	83.8	.8158	72.9	$\frac{1}{2}$ in.	.6656 in.	87	.0050	.6706	95
20	$\frac{3}{4}$	UNEF	.8210	83.1	.8287	71.3	$\frac{1}{2}$ in.	.6759 in.	87	.0050	.6809	98
12	$\frac{3}{4}$	N	.8470	83.6	.8575	73.9	$\frac{1}{2}$ in.	.6862 in.	87	.0050	.6912	101
16	$\frac{3}{4}$	UN	.8700	83.1	.8783	72.9	$\frac{1}{2}$ in.	.6965 in.	87	.0050	.7015	104
20	$\frac{3}{4}$	UNEF	.8840	83.9	.8912	71.3	$\frac{1}{2}$ in.	.7068 in.	87	.0050	.7118	107
8	1	UNC	.8050	83.1	.8797	74.1	$\frac{1}{2}$ in.	.7171 in.	87	.0050	.7221	110
12	1	UNF	.9100	83.1	.9198	74.1	$\frac{1}{2}$ in.	.7274 in.	87	.0050	.7324	113
14	1	NS	.9230	83.0	.9315	73.8	$\frac{1}{2}$ in.	.7377 in.	87	.0050	.7427	116
16	1	UN	.9320	83.8	.9408	72.9	$\frac{1}{2}$ in.	.7480 in.	87	.0050	.7530	119
20	1	UNEF	.9460	83.1	.9537	71.3	$\frac{1}{2}$ in.	.7583 in.	87	.0050	.7633	122
12	$\frac{1}{2}$	UN	.9720	83.6	.9823	74.1	$\frac{1}{2}$ in.	.7686 in.	87	.0050	.7736	125
16	$\frac{1}{2}$	UN	.9860	83.1	1.0033	72.9	$\frac{1}{2}$ in.	.7789 in.	87	.0050	.7839	128
18	$\frac{1}{2}$	NEF	1.0020	83.8	1.0105	72.1	$\frac{1}{2}$ in.	.7892 in.	87	.0050	.7942	131
7	$\frac{1}{2}$	UNO	.9700	83.5	.9875	74.1	$\frac{1}{2}$ in.	.7995 in.	87	.0050	.8045	134
8	$\frac{1}{2}$	N	.9900	83.1	1.0047	74.1	$\frac{1}{2}$ in.	.8098 in.	87	.0050	.8148	137
12	$\frac{1}{2}$	UNF	1.0350	83.1	1.0448	74.1	$\frac{1}{2}$ in.	.8201 in.	87	.0050	.8251	140
16	$\frac{1}{2}$	UN	1.0570	83.8	1.0658	72.9	$\frac{1}{2}$ in.	.8304 in.	87	.0050	.8354	143
18	$\frac{1}{2}$	NEF	1.0650	83.1	1.0730	72.1	$\frac{1}{2}$ in.	.8407 in.	87	.0050	.8457	146
12	$\frac{1}{2}$	UN	1.0970	83.6	1.1073	74.1	$\frac{1}{2}$ in.	.8510 in.	87	.0050	.8560	149
16	$\frac{1}{2}$	UN	1.1200	83.1	1.1283	72.9	$\frac{1}{2}$ in.	.8613 in.	87	.0050	.8663	152
18	$\frac{1}{2}$	NEF	1.1270	83.8	1.1355	72.1	$\frac{1}{2}$ in.	.8716 in.	87	.0050	.8766	155
7	$\frac{1}{2}$	UNO	1.0950	83.6	1.1125	74.1	$\frac{1}{2}$ in.	.8819 in.	87	.0050	.8869	158
8	$\frac{1}{2}$	N	1.1150	83.1	1.1297	74.1	$\frac{1}{2}$ in.	.8922 in.	87	.0050	.8972	161
12	$\frac{1}{2}$	UNF	1.1600	83.1	1.1698	74.1	$\frac{1}{2}$ in.	.9025 in.	87	.0050	.9075	164
16	$\frac{1}{2}$	UN	1.1820	83.8	1.1908	72.9	$\frac{1}{2}$ in.	.9128 in.	87	.0050	.9178	167
18	$\frac{1}{2}$	NEF	1.1900	83.1	1.1980	72.1	$\frac{1}{2}$ in.	.9231 in.	87	.0050	.9281	170
12	$\frac{1}{2}$	UN	1.2220	83.6	1.2323	74.1	$\frac{1}{2}$ in.	.9334 in.	87	.0050	.9384	173
16	$\frac{1}{2}$	UN	1.2450	83.1	1.2533	72.9	$\frac{1}{2}$ in.	.9437 in.	87	.0050	.9487	176
18	$\frac{1}{2}$	NEF	1.2520	83.8	1.2605	72.1	$\frac{1}{2}$ in.	.9540 in.	87	.0050	.9590	179
6	$\frac{1}{2}$	UNO	1.1950	83.1	1.2146	74.1	$\frac{1}{2}$ in.	.9643 in.	87	.0050	.9693	182
8	$\frac{1}{2}$	N	1.2400	83.1	1.2547	74.1	$\frac{1}{2}$ in.	.9746 in.	87	.0050	.9796	185
12	$\frac{1}{2}$	UNF	1.2850	83.1	1.2948	74.1	$\frac{1}{2}$ in.	.9849 in.	87	.0050	.9899	188
16	$\frac{1}{2}$	UN	1.3070	83.8	1.3158	72.9	$\frac{1}{2}$ in.	.9952 in.	87	.0050	.1000	191
18	$\frac{1}{2}$	NEF	1.3150	83.1	1.3230	72.1	$\frac{1}{2}$ in.	1.0055 in.	87	.0050	1.0105	194
12	$\frac{1}{2}$	UN	1.3470	83.6	1.3573	74.1	$\frac{1}{2}$ in.	1.0158 in.	87	.0050	1.0208	197
16	$\frac{1}{2}$	UN	1.3700	83.1	1.3783	72.9	$\frac{1}{2}$ in.	1.0261 in.	87	.0050	1.0311	200
18	$\frac{1}{2}$	NEF	1.3770	83.8	1.3855	72.1	$\frac{1}{2}$ in.	1.0364 in.	87	.0050	1.0414	203
6	$\frac{1}{2}$	UNC	1.3200	83.1	1.3396	74.1	$\frac{1}{2}$ in.	1.0467 in.	87	.0050	1.0517	206
8	$\frac{1}{2}$	N	1.3650	83.1	1.3797	74.1	$\frac{1}{2}$ in.	1.0570 in.	87	.0050	1.0620	209
12	$\frac{1}{2}$	UNF	1.4100	83.1	1.4198	74.1	$\frac{1}{2}$ in.	1.0673 in.	87	.0050	1.0723	212
16	$\frac{1}{2}$	UN	1.4320	83.8	1.4408	72.9	$\frac{1}{2}$ in.	1.0776 in.	87	.0050	1.0826	215
18	$\frac{1}{2}$	NEF	1.4400	83.1	1.4480	72.1	$\frac{1}{2}$ in.	1.0879 in.	87	.0050	1.0929	218
16	$\frac{1}{2}$	N	1.4950	83.1	1.5033	72.9	$\frac{1}{2}$ in.	1.0982 in.	87	.0050	1.1032	221
18	$\frac{1}{2}$	NEF	1.5020	83.8	1.5105	72.1	$\frac{1}{2}$ in.	1.1085 in.	87	.0050	1.1135	224
8	$\frac{1}{2}$	N	1.4900	83.1	1.5047	74.1	$\frac{1}{2}$ in.	1.1188 in.	87	.0050	1.1238	227
12	$\frac{1}{2}$	UN	1.5390	83.1	1.5448	74.1	$\frac{1}{2}$ in.	1.1291 in.	87	.0050	1.1341	230
16	$\frac{1}{2}$	UN	1.5670	83.8	1.5658	72.9	$\frac{1}{2}$ in.	1.1394 in.	87	.0050	1.1444	233
18	$\frac{1}{2}$	NEF	1.5650	83.1	1.5730	72.1	$\frac{1}{2}$ in.	1.1497 in.	87	.0050	1.1547	236
16	$\frac{1}{2}$	N	1.6200	83.1	1.6283	72.9	$\frac{1}{2}$ in.	1.1600 in.	87	.0050	1.1650	239
18	$\frac{1}{2}$	NEF	1.6270	83.8	1.6355	72.1	$\frac{1}{2}$ in.	1.1703 in.	87	.0050	1.1753	242

TABLE III.14.—Tap drill sizes, Unified and American screw threads, classes 1B and 2B—Continued

Thread size	Threads per inch	Designation	Classes 1B and 2B minor diameter, internal threads				Tap drills and percent basic thread height					
			Minimum	Percent basic thread height	Maximum	Percent basic thread height	Nominal size	Diameter	Theoretical percent of thread	Probable oversize, mean	Probable hole size	Percent of thread
No. in.			in.		in.			in.		in.	in.	
1/16	6	UNC	1.193	83.1	1.225	69.3	1/16 in.	1.1875	87	-----	-----	-----
							1/16 in.	1.2031	79	-----	-----	-----
							1/16 in.	1.2188	72	-----	-----	-----
							1/16 in.	1.2344	87	-----	-----	-----
1/8	8	N	1.240	83.1	1.265	67.7	1/8 in.	1.2500	77	-----	-----	-----
							1/8 in.	1.2612	87	-----	-----	-----
1/8	12	UNF	1.285	83.1	1.303	66.5	1/8 in.	1.2669	72	-----	-----	-----
							1/8 in.	1.3125	77	-----	-----	-----
1/8	16	UN	1.307	83.8	1.321	66.5	1/8 in.	1.3125	87	-----	-----	-----
							1/8 in.	1.3281	65	-----	-----	-----
1/8	18	NEF	1.315	83.1	1.328	65.1	1/8 in.	1.3438	87	-----	-----	-----
							1/8 in.	1.3594	72	-----	-----	-----
1/4	12	UN	1.347	83.6	1.360	71.6	1/4 in.	1.3750	77	-----	-----	-----
							1/4 in.	1.3750	87	-----	-----	-----
1/4	16	UN	1.370	83.1	1.384	65.9	1/4 in.	1.3750	87	-----	-----	-----
							1/4 in.	1.3750	87	-----	-----	-----
1/4	18	NEF	1.377	83.8	1.390	65.8	1/4 in.	1.3125	87	-----	-----	-----
							1/4 in.	1.3281	79	-----	-----	-----
1/4	6	UNC	1.320	83.1	1.350	69.3	1/4 in.	1.3594	87	-----	-----	-----
							1/4 in.	1.3750	77	-----	-----	-----
1/4	8	N	1.365	83.1	1.390	67.7	1/4 in.	1.4062	87	-----	-----	-----
							1/4 in.	1.4219	72	-----	-----	-----
1/2	12	UNF	1.410	83.1	1.428	66.5	1/2 in.	1.4375	77	-----	-----	-----
							1/2 in.	1.4375	87	-----	-----	-----
1/2	16	UN	1.432	83.8	1.446	66.5	1/2 in.	1.4531	72	-----	-----	-----
							1/2 in.	1.5000	77	-----	-----	-----
1/2	18	NEF	1.440	83.1	1.452	66.2	1/2 in.	1.5000	87	-----	-----	-----
							1/2 in.	1.5156	65	-----	-----	-----
1/2	20	UNS	1.446	83.1	1.457	66.2	1/2 in.	1.4844	87	-----	-----	-----
							1/2 in.	1.5000	77	-----	-----	-----
1/2	24	N	1.495	83.1	1.509	65.9	1/2 in.	1.5312	87	-----	-----	-----
							1/2 in.	1.5469	72	-----	-----	-----
1/2	18	NEF	1.502	83.8	1.515	65.8	1/2 in.	1.5625	77	-----	-----	-----
							1/2 in.	1.5625	87	-----	-----	-----
1/2	8	N	1.490	83.1	1.515	67.7	1/2 in.	1.5781	65	-----	-----	-----
							1/2 in.	1.6250	77	-----	-----	-----
1/2	12	UN	1.535	83.1	1.553	66.5	1/2 in.	1.6250	87	-----	-----	-----
							1/2 in.	1.6406	65	-----	-----	-----
1/2	16	UN	1.557	83.8	1.571	66.5	1/2 in.	1.5312	84	-----	-----	-----
							1/2 in.	1.5469	78	-----	-----	-----
1/2	18	NEF	1.565	83.1	1.578	65.1	1/2 in.	1.6094	87	-----	-----	-----
							1/2 in.	1.6250	77	-----	-----	-----
1/2	20	UNS	1.620	83.1	1.634	65.9	1/2 in.	1.6406	67	-----	-----	-----
							1/2 in.	1.6562	87	-----	-----	-----
1/2	24	N	1.627	83.8	1.640	65.8	1/2 in.	1.6719	72	-----	-----	-----
							1/2 in.	1.6875	77	-----	-----	-----
1/2	5	UNC	1.634	83.1	1.568	70.1	1/2 in.	1.7031	72	-----	-----	-----
							1/2 in.	1.7500	77	-----	-----	-----
1/2	8	N	1.615	83.1	1.640	67.7	1/2 in.	1.7500	77	-----	-----	-----
							1/2 in.	1.7812	87	-----	-----	-----
1/2	12	UN	1.660	83.1	1.678	66.5	1/2 in.	1.7969	72	-----	-----	-----
							1/2 in.	1.8125	77	-----	-----	-----
1/2	16	UNEF	1.682	83.8	1.696	66.5	1/2 in.	1.8250	77	-----	-----	-----
							1/2 in.	1.8500	77	-----	-----	-----
1/2	20	UNS	1.696	83.1	1.707	66.2	1/2 in.	1.8750	76	-----	-----	-----
							1/2 in.	1.9062	87	-----	-----	-----
1/2	24	N	1.745	83.1	1.759	65.9	1/2 in.	1.9219	72	-----	-----	-----
							1/2 in.	1.9375	77	-----	-----	-----
1/2	8	N	1.740	83.1	1.765	67.7	1/2 in.	1.9531	72	-----	-----	-----
							1/2 in.	2.0000	77	-----	-----	-----
1/2	12	UN	1.785	83.1	1.803	66.5	1/2 in.	2.0000	77	-----	-----	-----
							1/2 in.	2.0312	87	-----	-----	-----
1/2	16	UN	1.807	83.8	1.821	66.5	1/2 in.	2.0625	77	-----	-----	-----
							1/2 in.	2.1250	77	-----	-----	-----
1/2	20	UNS	1.870	83.1	1.884	65.9	1/2 in.	2.0000	87	-----	-----	-----
							1/2 in.	2.0312	76	-----	-----	-----
1/2	24	N	1.870	83.1	1.884	65.9	1/2 in.	2.0625	77	-----	-----	-----
							1/2 in.	2.1250	77	-----	-----	-----
1/2	4	UNC	1.759	83.5	1.795	71.0	1/2 in.	2.1562	87	-----	-----	-----
							1/2 in.	2.1875	77	-----	-----	-----
1/2	8	N	1.865	83.1	1.890	67.7	1/2 in.	2.2500	77	-----	-----	-----
							1/2 in.	2.3125	77	-----	-----	-----
1/2	12	UN	1.910	83.1	1.928	66.5	1/2 in.	2.3750	77	-----	-----	-----
							1/2 in.	2.4375	77	-----	-----	-----
1/2	16	UNEF	1.932	83.8	1.946	66.5	1/2 in.	2.5000	77	-----	-----	-----
							1/2 in.	2.5625	77	-----	-----	-----
1/2	20	UNS	1.946	83.1	1.957	66.2	1/2 in.	2.6250	77	-----	-----	-----
							1/2 in.	2.6875	77	-----	-----	-----
1/2	24	N	1.995	83.1	2.009	65.9	1/2 in.	2.7500	77	-----	-----	-----
							1/2 in.	2.8125	77	-----	-----	-----
1/2	8	N	1.990	83.1	2.015	67.7	1/2 in.	2.8750	77	-----	-----	-----
							1/2 in.	2.9375	77	-----	-----	-----
1/2	12	UN	2.035	83.1	2.053	66.5	1/2 in.	3.0000	77	-----	-----	-----
							1/2 in.	3.0625	77	-----	-----	-----
1/2	16	UN	2.057	83.8	2.071	66.5	1/2 in.	3.1250	77	-----	-----	-----
							1/2 in.	3.1875	77	-----	-----	-----
1/2	20	UNS	2.120	83.1	2.134	65.9	1/2 in.	3.2500	77	-----	-----	-----
							1/2 in.	3.3125	77	-----	-----	-----
1/2	24	N	2.120	83.1	2.134	65.9	1/2 in.	3.3750	77	-----	-----	-----
							1/2 in.	3.4375	77	-----	-----	-----
1/2	4 1/2	UNC	2.009	83.5	2.045	71.0	1/2 in.	3.5000	77	-----	-----	-----
							1/2 in.	3.5625	77	-----	-----	-----
1/2	8	N	2.115	83.1	2.140	67.7	1/2 in.	3.6250	77	-----	-----	-----
							1/2 in.	3.6875	77	-----	-----	-----
1/2	12	UN	2.160	83.1	2.178	66.5	1/2 in.	3.7500	77	-----	-----	-----
							1/2 in.	3.8125	77	-----	-----	-----
1/2	16	UN	2.182	83.8	2.196	66.5	1/2 in.	3.8750	77	-----	-----	-----
							1/2 in.	3.9375	77	-----	-----	-----
1/2	20	UNS	2.196	83.1	2.207	66.2	1/2 in.	4.0000	77	-----	-----	-----
							1/2 in.	4.0625	77	-----	-----	-----
1/2	24	N	2.245	83.1	2.259	65.9	1/2 in.	4.1250	77	-----	-----	-----
							1/2 in.	4.1875	77	-----	-----	-----
1/2	16	UN	2.285	83.1	2.303	66.5	1/2 in.	4.2500	77	-----	-----	-----
							1/2 in.	4.3125	77	-----	-----	-----
1/2	20	UNS	2.307	83.8	2.321	66.5	1/2 in.	4.3750	77	-----	-----	-----
							1/2 in.	4.4375	77	-----	-----	-----
1/2	24	N	2.370	83.1	2.384	65.9	1/2 in.	4.5000	77	-----	-----	-----
							1/2 in.	4.5625	77	-----	-----	-----
1/2	4	UNC	2.229	83.4	2.267	71.7	1/2 in.	4.6250	77	-----	-----	-----
							1/2 in.	4.6875	77	-----	-----	-----
1/2	8	N	2.365	83.1	2.390	67.7	1/2 in.	4.7500	77	-----	-----	-----
							1/2 in.	4.8125	77	-----	-----	-----
1/2	12	UN	2.410	83.1	2.428	66.5	1/2 in.	4.8750	77	-----	-----	-----
							1/2 in.	4.9375	77	-----	-----	-----
1/2	16	UN	2.432	83.8	2.446	66.5	1/2 in.	5.0000	77	-----	-----	-----
							1/2 in.	5.0625	77	-----	-----	-----
1/2	20	UNS	2.535	83.1	2.553	66.5	1/2 in.	5.1250	77	-----	-----	-----
							1/2 in.	5.1875	77	-----	-----	-----
1/2	24	N	2.557	83.8	2.571	66.5	1/2 in.	5.2500	77	-----	-----	-----
							1/2 in.	5.3125	77	-----	-----	-----
1/2	4	UNC	2.479	83.4	2.517	71.7	1/2 in.	5.3750	77	-----	-----	-----
							1/2 in.	5.4375	77	-----	-----	-----
1/2	8	N	2.615	83.1	2.640	67.7	1/2 in.	5.5000	77	-----	-----	-----
							1/2 in.	5.5625	77	-----	-----	-----
1/2	12	UN	2.640	83.1	2.678	66.5	1/2 in.	5.6250	77	-----	-----	-----
							1/2 in.	5.6875	77	-----	-----	-----
1/2	16	UN	2.682	83.8	2.696	66.5	1/2 in.	5.7500	77	-----	-----	-----
							1/2 in.	5.8125	77	-----	-----	

ameters and pitches, allowances and tolerances, and detailed directions for specifying special threads on drawings. A discussion of factors affecting the design of special threads is presented in appendix 5, p. 200.

## 2. UNIFIED FORM OF THREAD

The Unified form of thread profile as specified in section III shall be used.

## 3. PREFERRED DIAMETERS AND PITCHES

The use, wherever possible, of the standard thread series in section III is recommended for all applications. Whenever sizes and pitches in the Unified or American Standard coarse, fine, or extra-fine, or the 8-, 12-, 16-thread series are not suitable, the designer can usually select a diameter or pitch from a preferred list. See table IV.12, p. 99.

1. PREFERRED DIAMETERS.—Whenever possible, the basic diameter should be selected from series of diameter increments as follows:

Range	Diameter increments	
	First choice	Second choice
in. 1/4 to 1/2	in. 1/16	in. 1/8
1/2 to 1 1/2	1/8	1/4
1 1/2 to 6	1/4	0.1
6 to 16	1/2	1/4
16 to 24	1	1/2

It is recommended that diameters less than 1/4 inch conform to the numbered sizes of screws as there is virtually no necessity for the selection of a diameter not included in the numbered sizes. Furthermore, the coarse and fine thread series provide ample choice as to diameter-pitch combinations.

2. PREFERRED PITCHES.—Whenever possible, the pitch should be selected from the series 40, 36, 32, 28, 24, 20, 16, 12, 10, 8, 6, and 4 threads per inch. Intermediate pitches should be used only when absolutely necessary. Pitches coarser than 4 threads per inch are not recommended.

There are practical limits to both the largest and smallest diameters suitable for any pitch. The curves of figure 5.2, p. 202, stop at such limits.

3. BASIC THREAD DATA.—Basic thread data for standard pitches are given in table IV.1. These are to be used in conjunction with the directions for specifying special threads on drawings, as given on p. 98.

## 4. CLASSIFICATION AND TOLERANCES

There are established for general use six distinct classes of screw thread tolerances and two classes of allowances, as specified in the following brief summary. These are, together with the recommendations for the purpose of manufacturing of screw

thread parts. This standard includes Unified classes 1A, 2A, and 3A, applied to external threads only, and classes 1B, 2B, and 3B applied to internal threads only. In addition, it includes American class 1AR, applied to external threads only, 16 threads per inch and coarser, produced by combining the American National class 1 allowances with class 1A tolerances. The requirements for a screw thread fit for specific applications can be met by specifying the proper combinations of classes for the components. For example, an external thread made to class 2A limits can be used with tapped holes made to classes 1B, 2B, or 3B limits for specific applications.

### (a) GENERAL

The following general specifications apply to all classes specified for applications of the Unified form of thread.

1. UNIFORM MINIMUM INTERNAL THREAD.—The minimum major, pitch, and minor diameters of the internal thread are, respectively, the same for classes 1B, 2B, and 3B.

2. DIRECTION AND SCOPE OF TOLERANCES.—

(a) The tolerance on the internal thread is plus, and is applied from the basic size to above basic size.

(b) The tolerance on the external thread is minus, and is applied from the maximum (or design) size to below the maximum size.

(c) The tolerances specified represent the extreme variations permitted on the product.

3. BASIC FORMULA FOR ALLOWANCES AND TOLERANCES.—The basic formula, from which allowances on all diameters and tolerances on pitch diameter are derived, is

$$\text{Tolerance (or allowance)} = C(0.0015 \sqrt[3]{D} + 0.0015 \sqrt{L_e} + 0.015 \sqrt[3]{p^2}),$$

where

$C$  = a factor which differs for the allowance or tolerance for each class

$D$  = basic major diameter

$L_e$  = length of engagement

$p$  = pitch

This formula is based on the accuracy of present day threading practice, and is applicable to all reasonable combinations of diameter, pitch, and length of engagement. Numerical values of the increments in the formula for standard diameters, pitches, and lengths of engagement are given in table III.9, p. 20.

4. ALLOWANCES.—Allowances are applied only to external threads. The values of the factor  $C$  (par. 3 above) for allowances are as follows:

Class	Factor $C$
1A	0.300
2A	.306
3A	.090



TABLE IV.1.—Thread data, Unified and American thread form

Threads per inch,	Pitch,	Flat at internal thread crest,	Flat at internal thread root and external thread crest,	Height of sharp v-thread,	Truncation of internal thread root and external thread crest,	Truncation of external thread root,	Half addendum of external thread,	Truncation of internal thread crest,	Addendum of external thread,	Height of internal thread and depth of thread engagement,	Height of external thread,	Twice the external thread addendum,*	Difference between max. major and pitch diameters of internal thread,	Double height of internal thread,	Double height of external thread,
$n$	$p$	$F_{in} = \frac{p}{4} = 0.25p$	$F_{ex} = \frac{p}{8} = 0.125p$	$H = 0.866025p$	$f_{in} = \frac{f_{ex}}{H} = 0.10825p$	$f_{ex} = \frac{H}{6} = 0.14434p$	$\frac{3}{8}H = 0.16238p$	$f_{in} = \frac{H}{4} = 0.21651p$	$h_{ex} = \frac{3}{8}H = 0.16238p$	$h_{in} = \frac{3}{8}H = 0.16238p$	$h_{ex} = \frac{1}{2}H = 0.43089p$	$2h_{ex} = \frac{3}{4}H = 0.64951p$	$\frac{1}{2}H = 0.43089p$	$2h_{in} = \frac{1}{2}H = 0.43089p$	$\frac{1}{2}H = 0.43089p$
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
80	in.	0.012500	0.006250	0.001562	0.010825	0.001367	0.001860	0.002033	0.002071	0.004106	0.006777	0.008119	0.006932	0.013553	0.015334
72	in.	0.013889	0.006944	0.001744	0.012028	0.001500	0.002000	0.002226	0.003011	0.004511	0.007522	0.008852	0.008021	0.016001	0.017704
64	in.	0.015625	0.007812	0.001953	0.013532	0.001659	0.002226	0.002554	0.003388	0.005077	0.008446	0.009858	0.010149	0.016191	0.018177
56	in.	0.017857	0.008929	0.002233	0.015465	0.001933	0.002554	0.002900	0.003877	0.005580	0.009667	0.010995	0.011599	0.018333	0.020361
48	in.	0.020833	0.010417	0.002600	0.018042	0.002226	0.003011	0.003388	0.004511	0.006777	0.011288	0.012788	0.013532	0.019554	0.022556
44	in.	0.022727	0.011364	0.002844	0.019682	0.002466	0.003288	0.003669	0.004942	0.007338	0.012330	0.013944	0.014762	0.018044	0.021078
40	in.	0.025000	0.012500	0.003125	0.021651	0.002711	0.003611	0.004006	0.005411	0.008122	0.013533	0.015334	0.016238	0.019555	0.022706
36	in.	0.027778	0.013889	0.003472	0.024056	0.003011	0.004006	0.004511	0.006001	0.009122	0.015044	0.017044	0.018044	0.022333	0.025669
32	in.	0.031250	0.015625	0.003959	0.027063	0.003388	0.004511	0.005077	0.006777	0.010155	0.016911	0.019177	0.020257	0.024811	0.028333
28	in.	0.035714	0.017857	0.004444	0.030929	0.003877	0.005155	0.005800	0.007773	0.011660	0.019333	0.021911	0.023197	0.028333	0.032861
27	in.	0.037037	0.018519	0.004633	0.032075	0.004001	0.005335	0.006001	0.008002	0.012033	0.020055	0.022722	0.024056	0.029400	0.034444
24	in.	0.041667	0.020833	0.005208	0.036084	0.004511	0.006001	0.006777	0.009002	0.013533	0.022556	0.025556	0.027063	0.033000	0.038667
20	in.	0.050000	0.025000	0.006250	0.043301	0.005411	0.007222	0.008122	0.010833	0.016234	0.027066	0.030967	0.032476	0.039669	0.046334
18	in.	0.055556	0.027778	0.006944	0.048113	0.006111	0.008002	0.009002	0.012033	0.018444	0.030007	0.034988	0.036988	0.044111	0.051333
16	in.	0.062500	0.031250	0.007812	0.054127	0.006944	0.009002	0.010155	0.013533	0.020330	0.033833	0.039334	0.040596	0.049667	0.058667
14	in.	0.071429	0.035714	0.008929	0.061859	0.007773	0.010333	0.011660	0.015446	0.023200	0.038966	0.043822	0.046394	0.056778	0.067222
12	in.	0.083333	0.041667	0.010417	0.072169	0.009002	0.012033	0.013533	0.018044	0.027066	0.045111	0.051122	0.054127	0.066111	0.079222
10	in.	0.100000	0.050000	0.012500	0.086603	0.010833	0.014434	0.016234	0.021655	0.032476	0.054133	0.061334	0.064951	0.079333	0.095556
8	in.	0.125000	0.062500	0.015625	0.108253	0.013533	0.018044	0.020330	0.027066	0.040596	0.067066	0.076933	0.081150	0.099222	0.120333
6	in.	0.166667	0.083333	0.020833	0.144338	0.018044	0.024000	0.027066	0.036089	0.054133	0.086022	0.102222	0.108253	0.132333	0.160444
4	in.	0.250000	0.125000	0.031250	0.216500	0.027066	0.036089	0.040596	0.054133	0.081150	0.135322	0.153336	0.162380	0.198444	0.236667

\* Equivalent to the "basic height"  $h$  of the original American National form.

NOTE.— $h_{in} = f_{in} = \frac{H}{4}$   
 $h_{ex} = h_{in} = \frac{3}{8}H$

The formula on p. 75 is not applicable to class 1AR as this class is produced by combining the American National class 1 allowances with class 1A tolerances. These allowances are larger than those for classes 1A and 2A and provide for ready assembly under adverse conditions. Numerical values of allowances for each pitch are given in tables IV.2 and IV.2A.

5. MAJOR DIAMETER TOLERANCES.—(a) *External threads*.—The tolerance on major diameter for special threads is not specified, as it must be determined in relation to the requirements of a given design in accordance with the procedure outlined on p. 201. Preferred tolerances equal to  $0.000\sqrt[3]{p^2}$  for classes 2A and 3A, and equal to  $0.000\sqrt[3]{p^2}$  for classes 1A and 1AR are given in table IV.3.

(b) *Internal threads*.—The tolerance on major diameter is for reference only. It is equal to  $H/6$  plus the pitch diameter tolerance of the class of thread involved. The maximum major diameter of the internal thread may be determined by adding  $0.7939p(11/12H)$ , table IV.1, to the maximum pitch diameter of the internal thread. In dimensioning internal threads the maximum major diameter is not specified, being established

by the crest of an unworn tool. In practice, the major diameter of an internal thread is satisfactory when accepted by a gage or gaging method that represents the maximum material condition of an external thread which has no allowance.

6. MINOR DIAMETER TOLERANCES.—(a) *External threads*.—The tolerance on minor diameter of external threads is for reference only. At the nominal minor diameter, that is at the intersection of the rounded root with its center line (see figure III.1, p. 11) it equals the pitch diameter tolerance plus  $H/12$  and applies only where the rounded root is a requirement of the design. Otherwise the tolerance shall be  $H/4$  plus the pitch diameter tolerance. The minimum minor diameter of the external thread may be determined by subtracting  $0.6495p(3/4H)$ , table IV.1, from the minimum pitch diameter of the external thread. In dimensioning external threads the minimum minor diameter is not specified, being established by the crest of an unworn tool. In practice, the minor diameter of an external thread is satisfactory when accepted by a gage or gaging method that represents the maximum material condition of the internal thread less the allowances, if any.



TABLE IV.2.—Allowances for external threads of special diameters and pitches, classes 1A and 2A  
(UNS and NS threads, see subsection 5, p. 98)

Threads per inch	Major, pitch, and minor diameter allowances *											
	$\frac{3}{16}$ 0.0600 to 0.0781	$\frac{1}{2}$ 0.0782 to 0.1095	$\frac{5}{8}$ 0.1095 to 0.1563	$\frac{3}{4}$ 0.1564 to 0.2188	$1\frac{1}{4}$ 0.2189 to 0.3125	$1\frac{1}{2}$ 0.3126 to 0.4375	$1\frac{3}{4}$ 0.4376 to 0.5625	$2$ 0.5626 to 0.6875	$2\frac{1}{2}$ 0.6876 to 0.8750	$3$ 0.8751 to 1.1250	$3\frac{1}{2}$ 1.1251 to 1.3750	$4$ 1.3751 to 1.6250
80	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
72	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0008	0.0009	0.0009	0.0010	0.0011	0.0012
64	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0008	0.0009	0.0009	0.0010	0.0011	0.0012
56	0.0006	0.0007	0.0007	0.0007	0.0007	0.0008	0.0008	0.0009	0.0009	0.0010	0.0011	0.0012
48	0.0007	0.0007	0.0007	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010	0.0011	0.0012
44	0.0007	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010	0.0010	0.0011	0.0012
40	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010	0.0010	0.0010	0.0011	0.0011	0.0012
36	0.0008	0.0009	0.0009	0.0009	0.0009	0.0010	0.0010	0.0010	0.0010	0.0011	0.0011	0.0012
32	0.0009	0.0009	0.0009	0.0010	0.0010	0.0010	0.0011	0.0011	0.0011	0.0011	0.0012	0.0012
28	0.0010	0.0010	0.0010	0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0012	0.0012	0.0013
27	0.0010	0.0010	0.0010	0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0012	0.0012	0.0013
24	0.0011	0.0011	0.0011	0.0011	0.0011	0.0012	0.0012	0.0012	0.0012	0.0013	0.0013	0.0013
20	0.0012	0.0012	0.0012	0.0012	0.0012	0.0013	0.0013	0.0013	0.0013	0.0014	0.0014	0.0014
18	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0014	0.0014	0.0014	0.0014	0.0015	0.0015
16	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0015	0.0015	0.0015	0.0015	0.0016
14	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0016	0.0016	0.0016	0.0017
12	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0017	0.0017	0.0017	0.0017	0.0018
10	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0019	0.0019	0.0019
8	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021
6	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
4	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030

Threads per inch	Major, pitch, and minor diameter allowances *											
	1¼ 1.6251 to 1.8750	2 1.8751 to 2.2500	2½ 2.2501 to 2.7500	3 2.7501 to 3.2500	3½ 3.2501 to 3.7500	4 3.7501 to 4.5000	5 4.5001 to 5.5000	6 5.5001 to 7.0000	8 7.0001 to 9.0000	10 9.0001 to 11.0000	12 11.0001 to 13.0000	
80	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
72												
64												
56												
48												
44												
40												
36												
32												
28	0.0012	0.0013	0.0013	0.0013	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	
27	0.0013	0.0013	0.0014	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	
24	0.0014	0.0014	0.0014	0.0015	0.0015	0.0015	0.0016	0.0016	0.0017	0.0017	0.0018	
20	0.0016	0.0015	0.0015	0.0016	0.0016	0.0016	0.0017	0.0017	0.0018	0.0018	0.0019	
18	0.0016	0.0015	0.0016	0.0016	0.0017	0.0017	0.0017	0.0018	0.0018	0.0019	0.0020	
16	0.0016	0.0016	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018	0.0019	0.0020	0.0021	
14	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018	0.0019	0.0019	0.0020	0.0021	0.0022	
12	0.0018	0.0018	0.0019	0.0019	0.0019	0.0020	0.0020	0.0021	0.0021	0.0022	0.0023	
10	0.0019	0.0020	0.0020	0.0020	0.0021	0.0021	0.0022	0.0022	0.0023	0.0023	0.0024	
8	0.0021	0.0022	0.0022	0.0023	0.0023	0.0023	0.0024	0.0024	0.0025	0.0025	0.0026	
6	0.0025	0.0025	0.0025	0.0026	0.0026	0.0026	0.0027	0.0027	0.0028	0.0028	0.0029	
4	0.0030	0.0030	0.0031	0.0031	0.0031	0.0032	0.0032	0.0033	0.0034	0.0034	0.0035	
Classes 1A and 2A allowances are determined by multiplying class 2A pitch diameter tolerances (computed to six decimal places) by 0.3 and are based on lengths of engagement of nine pitches.												

\* Allowances are based on diameters given in common fractions, which are the means of the diameter ranges expressed in decimals.

TABLE IV.2A.—Allowances, class 1AR

Threads per inch, $n$	Allowance, $G$ , classes 1 and 1AR <sup>1</sup>
40	in.
36	(0.0010)
32	(0.0011)
28	(0.0011)
24	(0.0012)
20	(0.0013)
18	(0.0015)
16	(0.0016)
14	0.0018
12	0.0021
10	0.0024
8	0.0028
6	0.0034
4	0.0044

<sup>1</sup> For values in parentheses there is no class 1AR as these are identical with those for class 1A.

(b) *Internal threads.*—Internal thread minor diameter tolerances specified in tables IV.10 and IV.11 are based on the use of materials of equal tensile strength for screw or bolt and nut or tapped hole and a length of engagement equal to the nominal diameter. See p. 5. For general applications these tolerances are suitable for lengths of engagement up to  $1\frac{1}{2}$  diameters. They are based on formulas as follows:

Classes 1B and 2B:

All special threads in sizes less than  $\frac{1}{4}$  in., tolerance  $\pm 0.05 \sqrt[3]{p^2} + 0.03p/D - 0.002$  in., within the following limitations:

Tolerances shall not be greater than  $0.394p$ . (This corresponds to 53 percent of the basic thread height and applies in the range of the smallest number sizes of the NC and NF thread series.)

**TABLE IV.3.—Major diameter tolerances for external threads of special diameters, pitches, and lengths of engagement, classes 1A, 1AR, 2A, and 3A**

(UNS and NS threads, see subsection 5, p. 98)

Threads per inch	Major diameter tolerance	
	Classes 1A and 1AR, $0.090\sqrt{p^3}$	Classes 2A and 3A, $0.060\sqrt{p^3}$
80	in.	in.
72	-----	0.0032
64	-----	.0035
56	-----	.0038
48	-----	.0041
44	-----	.0045
		.0048
40	0.0077	.0051
36	.0083	.0055
32	.0089	.0060
28	.0096	.0065
27	.0100	.0067
24	.0108	.0072
20	.0122	.0081
18	.0131	.0087
16	.0142	.0094
14	.0155	.0103
12	.0172	.0114
10	.0194	.0129
8	.0225	.0150
6	.0273	.0182
4	.0357	.0238

Tolerances shall not be less than  $0.25p - 0.4p^2$ . (This corresponds to a thread height of 65 percent for 80 to 24 threads per inch.)

The formulas are suitable for general applications having lengths of engagement up to  $1\frac{1}{2}$  diameters. For specific applications within this range or for longer lengths of engagement see table IV.10, p. 92, and table 3.1, p. 187.

All special threads  $\frac{1}{4}$  in. and larger, 80 to 4 threads per inch, inclusive,<sup>7</sup>

$$\text{tolerance} = 0.25p - 0.4p^2.$$

(This corresponds to a thread height of 64.5 percent for 80 threads per inch graduating to 71.8 percent for 4 threads per inch.)

Class 3B, all special threads:

Tolerance =  $0.05\sqrt{p^2} + 0.03p/D - 0.002$  in., within the following limitations:

Tolerance shall not be greater than  $0.394p$ . (This corresponds to 53 percent of the basic thread height and applies in the range of the smallest numbered sizes of the UNC, UNF, NC and NF thread series.)

Tolerance shall not be less than:

For 80 to 13 threads per inch, inclusive,  $0.23p - 1.5p^2$ . (This corresponds to a thread height of 67 percent for 80 threads per inch, graduating to 74 percent for 13 threads per inch.)

For 12 threads per inch and coarser, tolerance =  $0.120p$ . (This corresponds to a thread height of 74 per cent and is the tolerance for all sizes 12 threads and coarser and 1 in. and larger.)

The formulas are suitable for general applications having lengths of engagement up to  $1\frac{1}{2}$  diameters. For specific applications within this range or for longer lengths of engagement see table IV.11, p. 94 and table 3.2, p. 190.

<sup>7</sup> Formula is not applicable to threads coarser than 4 tpi. For such threads use tolerance =  $0.17p$ .

Some thread applications have lengths of engagement which are greater than  $1\frac{1}{2}$  diameters or less than 1 diameter. For applications having shorter or longer lengths of engagement it may be advantageous to decrease or increase the tolerance, respectively, as explained below.

The principal practical factors that govern these tolerances are tapping difficulties, particularly tap breakage in the small sizes, availability of standard drill sizes in the medium and large sizes, and depth of engagement. Depth of engagement correlates with the stripping strength of the thread assembly, and thus also with the length of engagement. It also correlates with the tendency toward disengagement of the threads on one side when assembly is eccentric. The amount of possible eccentricity is one half of the sum of the pitch diameter allowance and tolerance on both mating threads. For a given pitch or height of thread this sum increases with the diameter, and accordingly this factor would require a decrease in minor diameter tolerance with increase in diameter. However, such decrease in tolerance often is not feasible without requiring special drill sizes; therefore, to be able to use as many as possible of the available standard drill sizes listed in ASA B5.12, the minor diameter tolerance for classes 1B and 2B of a given pitch for  $\frac{1}{4}$  in. diameter and larger is constant, in accordance with a formula given above.

There may be applications where the lengths of engagement of the mating threads or the combination of materials used for mating threads are such that the maximum tolerance may not provide the desired strength of the fastening. Experience has shown that for lengths of engagement less than  $\frac{3}{8}D$  (the minimum thickness of standard nuts) the minor diameter tolerance may be reduced without causing tapping difficulties.

In other applications the length of engagement of mating threads may be long because of design considerations or the combination of materials used for mating threads. As the threads engaged increase in number, their depth of engagement may be shallower and still develop stripping strength greater than the external thread breaking strength. In these cases the maximum tolerance should be increased to reduce the possibility of tapping difficulties.

To reduce the number of minor diameter tolerances to a practical minimum, tolerances for all recommended diameters, lengths of engagement, and selected pitches are given in table IV.10 for classes 1B and 2B and in table IV.11 for class 3B.

In these tables, the tolerances for lengths of engagement less than  $\frac{3}{8}D$  are  $\frac{1}{2}$  the formula values. For lengths of engagement from  $\frac{3}{8}D$  to  $\frac{3}{4}D$ , the tolerances are three quarters of the formula values; for lengths of engagement from  $\frac{3}{4}D$  to  $1\frac{1}{2}D$ , the tolerances are equal to the formula values; and for lengths of engagement over  $1\frac{1}{2}D$ , the tolerances are  $1\frac{1}{4}$  times the formula values. Where the tolerance value so computed is more than  $0.394p$ ,

which corresponds to a resulting minimum thread height of 53 percent, the value is adjusted to equal 0.394p.

**7. PITCH DIAMETER TOLERANCES.**—(a) *Values of factor C.*—The values of factor *C* (par. 3 above) for pitch diameter tolerances are as follows:

Class	Factor <i>C</i>
1A and 1AR	1.500
1B	1.950
2A	1.000
2B	1.300
3A	0.750
3B	.975

It will be noted that the factor *C* is 30 percent greater for internal than for external threads of a given class number on account of the relative difficulties of manufacture.

(b) *Limits of size.*—With respect to the pitch diameter limits of size, it is intended, except as hereinafter qualified, that no portion of the complete thread be permitted to project beyond the envelope defined by the maximum material limits on the one hand, or beyond that defined by the minimum-material limits on the other, and thus be outside of the tolerance zone as illustrated in figures III.3 and III.4, pp. 24 and 25.<sup>7a</sup> Also, the diameter equivalent of the variation in any given element except pitch diameter shall not exceed one-half of the pitch diameter tolerance. Deviations from specified size and profile include variations in lead, uniformity of helix, flank angle, taper, out-of-roundness, and surface defects.<sup>8</sup>

The diameter equivalents of variations in lead, uniformity of helix, and flank angle are always in the direction toward maximum material, that is they increase the virtual diameter of the external thread and decrease that of the internal thread. Thus, the maximum-material pitch diameter limits are a limitation of the virtual diameter (effective size) and are so specified herein for all thread classes.

Variations in taper and roundness of the pitch diameter, together with variations of the pitch diameter as a whole, may be in the direction of minimum material, and thus the minimum-material pitch diameter limit may be specified as a limitation of the pitch diameter as a single element. However, in view of the interrelation of the pitch diameter, variation in lead and flank angle, etc., together with practical considerations relating to established production processes, product application, and inspection procedures, it is

<sup>7a</sup> The full tolerance cannot, therefore, be used on pitch diameter unless deviations in other thread elements are zero.

<sup>8</sup> In cases of size with the requirement, values are given in table III.11, p. 12, for the tolerance zone series and classes, of one-half of the pitch diameter. Deviations in lead and flank angle which are equivalent to the tolerance zone series and classes are based on a depth of thread engagement of 1.5p. For small sizes, see section III, p. 22. For aeronautical applications, see section III, p. 22. For military applications, see section III, p. 22. See Military Specifications for details from those here specified. See Military Specifications for details from those here specified.

customary to interpret the minimum pitch diameter of the external thread and the maximum pitch diameter of the internal thread as virtual diameters (effective sizes) in classes 1A, 2A, 1B, 2B, and 3B, for application to various mass-produced bolts, nuts, screws, and other similar threaded fasteners, and to some custom threaded parts where design requirements are fulfilled. See "Limit gages" and "Acceptability of threads," section VI, pp. 108 and 118.

(c) *Tables of pitch diameter tolerances.*—Numerical values of pitch diameter tolerances for classes 1A, 1AR, 1B, 2A, 2B, 3A, and 3B are given in tables IV.4 to IV.9, inclusive. Two sets of tolerances are given: Those for 5 to 15 pitches length of engagement, based on lengths of 9 pitches, and those for 16 to 30 pitches length of engagement, based on lengths of 20 pitches. If excessively small or large lengths of engagement are encountered, the thread tolerances may be calculated from the formulas, if considered advisable. Also, for threads per inch not included in the tables, tolerances should be calculated by applying the formulas.

#### (b) SCREW THREAD CLASSES

**1. CLASSES 1A, 1AR, and 1B.**—(a) *Definition.*—The combinations of classes 1A or 1AR and 1B are intended to cover the manufacture of threaded parts where quick and easy assembly is necessary, and where an allowance is required to permit ready assembly, even when the threads are slightly bruised or dirty.

Maximum diameters of class 1A (external) threads are less than basic by the amount of the same allowance as applied to class 2A. For the intended applications in American practice the allowance is not available for plating or coating. Where the thread is plated or coated, special provisions are necessary. The minimum diameters of class 1B (internal) threads, whether or not plated or coated, are basic, affording no allowance or clearance for assembly with maximum metal external thread components having maximum diameters which are basic.

(b) *Allowances and tolerances.*—Allowances for all diameters and pitch diameter tolerances are specified in table IV.2, IV.2A, IV.4, and IV.7, and their application is shown in figure III.3 p. 24.

**2. CLASSES 2A and 2B.**—(a) *Definition.*—Classes 2A for external threads and 2B for internal threads are designed for general use. A moderate allowance is provided for class 2A threads.

The maximum diameters of class 2A (external) uncoated threads are less than basic by the amount of the allowance. The allowance minimizes galling and seizing in high-cycle wrench assembly, or it can be used to accommodate plated finishes or other coating. However, for threads with additive finish, the maximum diameters of class 2A may be exceeded by the amount of the allowance; i.e., the 2A maximum diameters apply to an unplated part or

TABLE IV.4.—Pitch diameter tolerances for external threads of special  
(UNS and NS threads.)

Threads per inch	Lengths of engagement		Pitch diameter tolerances *									
	Number of pitches	Inches	$\frac{1}{16}$ 0.0600 to 0.0781	$\frac{3}{16}$ 0.0782 to 0.1094	$\frac{1}{4}$ 0.1095 to 0.1563	$\frac{3}{8}$ 0.1564 to 0.2188	$\frac{1}{2}$ 0.2189 to 0.3125	$\frac{3}{4}$ 0.3126 to 0.4375	$\frac{1}{2}$ 0.4376 to 0.6875	$\frac{3}{4}$ 0.6876 to 0.8750	$1$ 0.8751 to 1.1250	
				in.	in.	in.	in.	in.	in.	in.	in.	in.
80	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.06 \text{ to } 0.19 \\ 0.191 \text{ to } 0.38 \end{array} \right.$										
72	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.07 \text{ to } 0.21 \\ 0.211 \text{ to } 0.42 \end{array} \right.$										
64	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.08 \text{ to } 0.23 \\ 0.231 \text{ to } 0.46 \end{array} \right.$										
56	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.09 \text{ to } 0.27 \\ 0.271 \text{ to } 0.54 \end{array} \right.$										
48	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.10 \text{ to } 0.31 \\ 0.311 \text{ to } 0.62 \end{array} \right.$										
44	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.11 \text{ to } 0.34 \\ 0.341 \text{ to } 0.68 \end{array} \right.$		0.0038 .0043	0.0039 .0044	0.0041 .0046	0.0042 .0047	0.0044 .0049	0.0046 .0051	0.0047 .0052	0.0049 .0054	0.0051 .0056
40	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.12 \text{ to } 0.38 \\ 0.381 \text{ to } 0.76 \end{array} \right.$			.0041 .0046	.0043 .0048	.0044 .0049	.0046 .0051	.0048 .0053	.0049 .0054	.0050 .0055	.0052 .0058
36	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.14 \text{ to } 0.42 \\ 0.421 \text{ to } 0.84 \end{array} \right.$			.0043	.0045 0.050	.0046 0.052	.0048 0.054	.0050 0.056	.0051 0.057	.0052 0.058	.0054 0.060
32	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.16 \text{ to } 0.47 \\ 0.471 \text{ to } 0.94 \end{array} \right.$			.0045	.0047 .0053	.0048 0.054	.0050 0.056	.0052 0.058	.0053 0.059	.0055 0.061	.0057 0.063
28	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.18 \text{ to } 0.54 \\ 0.541 \text{ to } 1.08 \end{array} \right.$				.0050 0.056	.0051 0.058	.0053 0.060	.0055 0.061	.0056 0.063	.0058 0.064	.0060 0.066
27	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.19 \text{ to } 0.56 \\ 0.561 \text{ to } 1.12 \end{array} \right.$				.0051 0.057	.0052 0.059	.0054 0.061	.0056 0.062	.0057 0.064	.0058 0.065	.0060 0.067
24	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.21 \text{ to } 0.62 \\ 0.621 \text{ to } 1.24 \end{array} \right.$				.0054 0.062	.0055 0.064	.0057 0.065	.0059 0.066	.0060 0.067	.0061 0.068	.0063 0.070
20	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.25 \text{ to } 0.75 \\ 0.751 \text{ to } 1.50 \end{array} \right.$					.0060 0.067	.0062 0.069	.0063 0.071	.0065 0.072	.0066 0.073	.0068 0.074
18	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.28 \text{ to } 0.83 \\ 0.831 \text{ to } 1.66 \end{array} \right.$						.0066 0.073	.0067 0.074	.0068 0.076	.0069 0.077	.0071 0.078
16	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.31 \text{ to } 0.94 \\ 0.941 \text{ to } 1.88 \end{array} \right.$						.0069 0.077	.0070 0.078	.0072 0.080	.0073 0.081	.0075 0.082
14	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.35 \text{ to } 1.07 \\ 1.071 \text{ to } 2.14 \end{array} \right.$							.0075 0.083	.0076 0.085	.0077 0.086	.0079 0.088
12	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.42 \text{ to } 1.25 \\ 1.251 \text{ to } 2.50 \end{array} \right.$							.0080 0.090	.0082 0.091	.0083 0.092	.0085 0.094
10	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.50 \text{ to } 1.50 \\ 1.501 \text{ to } 3.00 \end{array} \right.$									.0090 0.101	.0092 0.103
8	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.62 \text{ to } 1.88 \\ 1.881 \text{ to } 3.75 \end{array} \right.$										.0103 0.114
6	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 0.83 \text{ to } 2.50 \\ 2.501 \text{ to } 5.00 \end{array} \right.$										
4	$\left\{ \begin{array}{l} 5 \text{ to } 15 \\ 16 \text{ to } 30 \end{array} \right.$	$\left\{ \begin{array}{l} 1.25 \text{ to } 3.75 \\ 3.751 \text{ to } 7.50 \end{array} \right.$										

\* Tolerances are based on diameters given in common fractions, which are the means of the diameter ranges expressed in decimals.



## diameters, pitches, and lengths of engagement, classes 1A and 1AR

See subsection 5, p. 98.)

Pitch diameter tolerances --Continued													Threads per inch
1¼ 1.1251 to 1.3750	1½ 1.3751 to 1.6250	1¾ 1.6251 to 1.8750	2 1.8751 to 2.2500	2¼ 2.2501 to 2.7500	3 2.7501 to 3.2500	3¼ 3.2501 to 3.7500	4 3.7501 to 4.5000	5 4.5001 to 5.5000	6 5.5001 to 7.0000	8 7.0001 to 9.0000	10 9.0001 to 11.0000	12 11.0001 to 13.0000	
in.	in.	in.	LEGENDS										
			1. These values do not agree with and shall not be used in place of any tabulated values for the UNC, UNF, and 8N thread series, in table III.10.										
			2. Formula: Class 1A tolerances for external threads are determined by multiplying class 2A tolerances (computed to six decimal places) by 1.500. See legend 2, table IV.5, for formula for class 2A tolerances.										
			3. Length of engagement increments included in the tabulated tolerances for lengths of engagement of from 5 to 16 pitches are based on lengths of 9 pitches; those for lengths of engagement greater than 15 to 30 pitches are based on lengths of 20 pitches. For lengths of engagement not tabulated, the formula in legend 2 should be applied.										
			4. Pitches listed are those used most commonly and are recommended. Where intermediate pitches are specified, the formula in legend 2 should be applied.										
			5. Tolerances are tabulated only for combinations of diameter, pitch, and length of engagement which are considered to be generally used. For other combinations encountered, see Design of Special Threads, appendix 5, p. 200.										
			in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
													80
													72
													64
													56
													48
													44
													40
0.0056 .0062	0.0058 .0063												36
.0066 .0064	.0060 .0066	0.0061 .0067	0.0063 .0068	0.0065 .0071	0.0067 .0073								32
.0061 .0068	.0063 .0069	.0064 .0071	.0066 .0072	.0068 .0074	.0070 .0076	0.0071 .0078	0.0073 .0079						28
.0061 .0069	.0064 .0070	.0065 .0071	.0066 .0073	.0069 .0075	.0070 .0077	.0072 .0079	.0074 .0080	0.0076 .0083	0.0079 .0085				27
.0065 .0072	.0067 .0073	.0068 .0076	.0069 .0076	.0071 .0078	.0073 .0080	.0075 .0082	.0077 .0083	.0079 .0086	.0082 .0088				24
.0070 .0077	.0071 .0079	.0073 .0080	.0074 .0081	.0076 .0084	.0078 .0085	.0080 .0087	.0081 .0089	.0084 .0092	.0087 .0094				20
.0073 .0081	.0074 .0082	.0076 .0084	.0077 .0086	.0079 .0087	.0081 .0089	.0083 .0091	.0084 .0092	.0087 .0095	.0090 .0097	0.0094 .0101			18
.0077 .0085	.0078 .0086	.0079 .0087	.0081 .0089	.0083 .0091	.0085 .0093	.0086 .0095	.0088 .0096	.0091 .0099	.0093 .0101	.0097 .0105	0.0101 .0109		16
.0081 .0090	.0083 .0091	.0084 .0093	.0085 .0094	.0087 .0096	.0089 .0098	.0091 .0100	.0092 .0101	.0095 .0104	.0098 .0107	.0102 .0111	.0105 .0114	0.0108 .0117	14
.0087 .0096	.0088 .0098	.0090 .0099	.0091 .0100	.0093 .0103	.0095 .0104	.0097 .0106	.0098 .0108	.0101 .0110	.0103 .0113	.0107 .0117	.0111 .0120	.0114 .0123	12
.0094 .0105	.0096 .0106	.0097 .0107	.0098 .0109	.0100 .0111	.0102 .0113	.0104 .0114	.0106 .0116	.0108 .0119	.0111 .0121	.0115 .0125	.0118 .0129	.0121 .0132	10
.0104 .0116	.0106 .0118	.0107 .0119	.0108 .0120	.0111 .0122	.0113 .0124	.0114 .0126	.0116 .0128	.0119 .0130	.0121 .0133	.0125 .0137	.0129 .0140	.0132 .0143	8
	.0121 .0136	.0123 .0136	.0124 .0138	.0126 .0140	.0128 .0142	.0130 .0143	.0131 .0145	.0134 .0148	.0137 .0150	.0141 .0154	.0144 .0158	.0147 .0161	6
			.0161 .0168	.0164 .0170	.0165 .0172	.0167 .0174	.0169 .0176	.0172 .0178	.0174 .0180	.0178 .0186	.0181 .0188	.0184 .0191	4



TABLE IV.5.—Pitch diameter tolerances for external threads of

(UNS and NS threads.

Threads per inch	Lengths of engagement		Pitch diameter tolerances *									
	Number of pitches	Inches	$\frac{1}{16}$ 0.0625 to 0.0781	$\frac{3}{32}$ 0.0781 to 0.1094	$\frac{1}{8}$ 0.1094 to 0.1563	$\frac{3}{16}$ 0.1563 to 0.2188	$\frac{1}{4}$ 0.2188 to 0.3125	$\frac{5}{16}$ 0.3125 to 0.4375	$\frac{3}{8}$ 0.4375 to 0.5625	$\frac{7}{16}$ 0.5625 to 0.6875	$\frac{1}{2}$ 0.6875 to 0.8750	1 0.8751 to 1.1250
80	5 to 15	0.06 to 0.19	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	16 to 30	0.191 to 0.38	0.0019 .0022	0.0020 .0022	0.0021 .0023	0.0022 .0024	0.0023 .0025	0.0024 .0026	0.0025 .0027	0.0026 .0029	0.0027 .0030	0.0028 .0031
72	5 to 15	0.07 to 0.21	.0020	.0021	.0021	.0023	.0023	.0025	.0026	.0027	.0028	.0029
	16 to 30	0.211 to 0.42	.0023	.0023	.0024	.0025	.0026	.0027	.0028	.0029	.0030	.0031
64	5 to 15	0.08 to 0.23	.0021	.0022	.0022	.0024	.0024	.0026	.0027	.0028	.0029	.0030
	16 to 30	0.231 to 0.46	.0025	.0025	.0026	.0027	.0028	.0029	.0030	.0031	.0032	.0033
56	5 to 15	0.09 to 0.27	.0023	.0023	.0024	.0025	.0026	.0027	.0028	.0029	.0030	.0031
	16 to 30	0.271 to 0.54	.0026	.0026	.0027	.0028	.0029	.0030	.0031	.0032	.0033	.0034
48	5 to 15	0.10 to 0.31	.0025	.0025	.0026	.0027	.0028	.0029	.0030	.0031	.0032	.0033
	16 to 30	0.311 to 0.62	.0029	.0029	.0030	.0031	.0032	.0033	.0034	.0035	.0036	.0037
44	5 to 15	0.11 to 0.34	.0026	.0026	.0027	.0028	.0029	.0030	.0031	.0032	.0033	.0034
	16 to 30	0.341 to 0.68	.0030	.0030	.0031	.0032	.0033	.0034	.0035	.0036	.0037	.0038
40	5 to 15	0.12 to 0.38	.0027	.0027	.0028	.0029	.0030	.0031	.0032	.0033	.0034	.0035
	16 to 30	0.381 to 0.76	.0031	.0031	.0032	.0033	.0034	.0035	.0036	.0037	.0038	.0039
36	5 to 15	0.14 to 0.42	.0029	.0029	.0030	.0031	.0032	.0033	.0034	.0035	.0036	.0037
	16 to 30	0.421 to 0.84	.0034	.0034	.0035	.0036	.0037	.0038	.0039	.0040	.0041	.0042
32	5 to 15	0.16 to 0.47	.0030	.0030	.0031	.0032	.0033	.0034	.0035	.0036	.0037	.0038
	16 to 30	0.471 to 0.94	.0035	.0035	.0036	.0037	.0038	.0039	.0040	.0041	.0042	.0043
28	5 to 15	0.18 to 0.54	.0033	.0033	.0034	.0035	.0036	.0037	.0038	.0039	.0040	.0041
	16 to 30	0.541 to 1.08	.0038	.0038	.0039	.0040	.0041	.0042	.0043	.0044	.0045	.0046
27	5 to 15	0.19 to 0.56	.0034	.0034	.0035	.0036	.0037	.0038	.0039	.0040	.0041	.0042
	16 to 30	0.561 to 1.12	.0038	.0038	.0039	.0040	.0041	.0042	.0043	.0044	.0045	.0046
24	5 to 15	0.21 to 0.62	.0036	.0036	.0037	.0038	.0039	.0040	.0041	.0042	.0043	.0044
	16 to 30	0.621 to 1.24	.0041	.0041	.0042	.0043	.0044	.0045	.0046	.0047	.0048	.0049
20	5 to 15	0.25 to 0.75	.0040	.0040	.0041	.0042	.0043	.0044	.0045	.0046	.0047	.0048
	16 to 30	0.751 to 1.50	.0045	.0045	.0046	.0047	.0048	.0049	.0050	.0051	.0052	.0053
18	5 to 15	0.28 to 0.83	.0043	.0043	.0044	.0045	.0046	.0047	.0048	.0049	.0050	.0051
	16 to 30	0.831 to 1.66	.0048	.0048	.0049	.0050	.0051	.0052	.0053	.0054	.0055	.0056
16	5 to 15	0.31 to 0.94	.0046	.0046	.0047	.0048	.0049	.0050	.0051	.0052	.0053	.0054
	16 to 30	0.941 to 1.88	.0051	.0051	.0052	.0053	.0054	.0055	.0056	.0057	.0058	.0059
14	5 to 15	0.36 to 1.07	.0049	.0049	.0050	.0051	.0052	.0053	.0054	.0055	.0056	.0057
	16 to 30	1.071 to 2.14	.0054	.0054	.0055	.0056	.0057	.0058	.0059	.0060	.0061	.0062
12	5 to 15	0.42 to 1.25	.0052	.0052	.0053	.0054	.0055	.0056	.0057	.0058	.0059	.0060
	16 to 30	1.251 to 2.50	.0057	.0057	.0058	.0059	.0060	.0061	.0062	.0063	.0064	.0065
10	5 to 15	0.50 to 1.50	.0055	.0055	.0056	.0057	.0058	.0059	.0060	.0061	.0062	.0063
	16 to 30	1.501 to 3.00	.0060	.0060	.0061	.0062	.0063	.0064	.0065	.0066	.0067	.0068
8	5 to 15	0.62 to 1.88	.0058	.0058	.0059	.0060	.0061	.0062	.0063	.0064	.0065	.0066
	16 to 30	1.881 to 3.76	.0063	.0063	.0064	.0065	.0066	.0067	.0068	.0069	.0070	.0071
6	5 to 15	0.83 to 2.50	.0066	.0066	.0067	.0068	.0069	.0070	.0071	.0072	.0073	.0074
	16 to 30	2.501 to 5.00	.0071	.0071	.0072	.0073	.0074	.0075	.0076	.0077	.0078	.0079
4	5 to 15	1.25 to 3.75	.0074	.0074	.0075	.0076	.0077	.0078	.0079	.0080	.0081	.0082
	16 to 30	3.751 to 7.50	.0079	.0079	.0080	.0081	.0082	.0083	.0084	.0085	.0086	.0087

\* Tolerances are based on diameters given in common fractions, which are the means of the diameter ranges expressed in decimals.

## special diameters, pitches, and lengths of engagement, class 2A

See subsection 5, p. 98.)

Pitch diameter tolerances — Continued													Threads per inch
1¼ 1.1251 to 1.3750	1½ 1.3751 to 1.6250	1¾ 1.6251 to 1.8750	2 1.8751 to 2.2500	2½ 2.2501 to 2.7500	3 2.7501 to 3.2500	3¾ 3.2501 to 3.7500	4 3.7501 to 4.5000	5 4.5001 to 5.5000	6 5.5001 to 7.0000	8 7.0001 to 9.0000	10 9.0001 to 11.0000	12 11.0001 to 13.0000	
in.	in.	in.	LEGENDS										
			1. These values do not agree with and shall not be used in place of any tabulated values for the UNC, UNF and 8N thread series, in table III.10.										80
			2. Formula: Class 2A tolerances = $0.0015\sqrt{D} + 0.0015\sqrt{L_e} + 0.015\sqrt{p^3}$ where $D$ = basic major diameter $L_e$ = length of engagement $p$ = pitch										72
			3. Length of engagement increments included in the tabulated tolerances for lengths of engagement of from 5 to 15 pitches are based on lengths of 9 pitches; those for lengths of engagement greater than 15 to 30 pitches are based on lengths of 20 pitches. For lengths of engagement not tabulated, the formula in legend 2 should be applied.										64
			4. Pitches listed are those used most commonly and are recommended. Where intermediate pitches are specified, the formula in legend 2 should be applied.										56
			5. Tolerances are tabulated only for combinations of diameter, pitch and length of engagement which are considered to be generally used. For other combinations encountered, see Design of Special Threads, appendix 5, p. 200.										48
			in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	44
													40
0.0037 .0041	0.0038 .0042												36
.0039 .0043	.0040 .0044	0.0041 .0045	0.0042 .0046	0.0043 .0047	0.0044 .0048								32
.0041 .0045	.0042 .0046	.0043 .0047	.0044 .0048	.0045 .0049	.0046 .0051	0.0048 .0052	0.0049 .0053						28
.0041 +.0046	.0042 .0047	.0043 .0048	.0044 .0048	.0046 .0050	.0047 .0051	.0048 .0052	.0049 .0053	0.0051 .0055	0.0053 .0057				27
.0043 .0048	.0044 .0049	.0045 .0050	.0046 .0051	.0048 .0052	.0049 .0053	.0050 .0054	.0051 .0055	.0053 .0057	.0054 .0059				24
.0047 .0052	.0048 .0053	.0049 .0053	.0049 .0054	.0051 .0055	.0052 .0057	.0053 .0058	.0054 .0059	.0056 .0061	.0058 .0063				20
.0049 .0054	.0050 .0055	.0051 .0056	.0051 .0057	.0053 .0058	.0054 .0059	.0055 .0060	.0056 .0061	.0058 .0063	.0060 .0065	0.0062 .0068			18
.0051 .0057	.0052 .0058	.0053 .0058	.0054 .0059	.0055 .0061	.0056 .0062	.0058 .0063	.0059 .0064	.0061 .0066	.0062 .0068	.0065 .0070	0.0067 .0073		16
.0054 .0060	.0055 .0061	.0056 .0062	.0057 .0063	.0058 .0064	.0059 .0065	.0061 .0067	.0062 .0068	.0064 .0069	.0065 .0071	.0068 .0074	.0070 .0076	0.0072 .0078	14
.0058 .0064	.0059 .0065	.0060 .0066	.0061 .0067	.0062 .0068	.0063 .0070	.0064 .0071	.0065 .0072	.0067 .0074	.0069 .0075	.0072 .0078	.0074 .0080	.0076 .0082	12
.0063 .0070	.0064 .0071	.0065 .0072	.0065 .0072	.0067 .0074	.0068 .0075	.0069 .0076	.0070 .0077	.0072 .0079	.0074 .0081	.0077 .0084	.0079 .0086	.0081 .0088	10
.0070 .0077	.0071 .0078	.0071 .0079	.0072 .0080	.0074 .0082	.0075 .0083	.0076 .0084	.0077 .0085	.0079 .0087	.0081 .0088	.0083 .0091	.0086 .0094	.0088 .0096	8
	.0081 .0090	.0082 .0091	.0083 .0092	.0084 .0093	.0085 .0094	.0087 .0096	.0088 .0097	.0090 .0098	.0091 .0100	.0094 .0103	.0096 .0105	.0098 .0107	6
			.0101 .0112	.0102 .0113	.0104 .0115	.0105 .0116	.0106 .0117	.0108 .0119	.0109 .0120	.0112 .0123	.0114 .0125	.0116 .0127	4

TABLE IV.6.—Pitch diameter tolerances for external threads of  
(UNS and NS threads.)

Threads per inch	Lengths of engagement		Pitch diameter tolerances *									
	Number of pitches	Inches	$\frac{1}{16}$ 0.0600 to 0.0781	$\frac{1}{8}$ 0.0782 to 0.1094	$\frac{1}{4}$ 0.1095 to 0.1663	$\frac{3}{8}$ 0.1564 to 0.2188	$\frac{1}{2}$ 0.2189 to 0.3125	$\frac{3}{4}$ 0.3126 to 0.4375	$\frac{1}{2}$ 0.4376 to 0.6625	$\frac{3}{4}$ 0.6626 to 0.6875	$\frac{1}{2}$ 0.6876 to 0.8750	1 0.8751 to 1.1250
			in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
80	{ 5 to 15 16 to 30	0.06 to 0.10 0.191 to 0.38	0.0014 .0016	0.0015 .0017	0.0015 .0017	0.0016 .0018	0.0017 .0019					
72	{ 5 to 15 16 to 30	0.07 to 0.21 0.211 to 0.42	.0015 .0018	.0016 .0018	.0016 .0018	.0017 .0019	.0018 .0020	0.0019 .0021				
64	{ 5 to 15 16 to 30	0.08 to 0.23 0.231 to 0.46	.0016 .0018	.0016 .0018	.0017 .0019	.0018 .0020	.0018 .0020	.0019 .0021	0.0020 .0022			
56	{ 5 to 15 16 to 30	0.09 to 0.27 0.271 to 0.54		.0017 .0020	.0018 .0020	.0019 .0021	.0019 .0021	.0020 .0023	.0021 .0023	0.0022 .0024	0.0022 .0025	
48	{ 5 to 15 16 to 30	0.10 to 0.31 0.311 to 0.62		.0019 .0021	.0019 .0021	.0020 .0022	.0020 .0023	.0022 .0024	.0022 .0025	.0023 .0026	.0024 .0026	
44	{ 5 to 15 16 to 30	0.11 to 0.34 0.341 to 0.68		.0010 .0022	.0020 .0022	.0021 .0023	.0021 .0024	.0022 .0025	.0023 .0026	.0024 .0026	.0024 .0027	0.0025 .0028
40	{ 5 to 15 16 to 30	0.12 to 0.38 0.381 to 0.76			.0021 .0023	.0021 .0024	.0022 .0025	.0023 .0026	.0024 .0027	.0025 .0027	.0025 .0028	.0026 .0029
36	{ 5 to 15 16 to 30	0.14 to 0.42 0.421 to 0.84			.0022 .0025	.0022 .0026	.0023 .0026	.0024 .0027	.0025 .0028	.0026 .0028	.0026 .0029	.0027 .0030
32	{ 5 to 15 16 to 30	0.16 to 0.47 0.471 to 0.94			.0023 .0026	.0024 .0026	.0024 .0027	.0025 .0028	.0026 .0029	.0027 .0030	.0027 .0030	.0028 .0031
28	{ 5 to 15 16 to 30	0.18 to 0.54 0.541 to 1.08				.0025 .0028	.0026 .0029	.0027 .0030	.0028 .0031	.0028 .0031	.0029 .0032	.0030 .0033
27	{ 5 to 15 16 to 30	0.19 to 0.56 0.561 to 1.12				.0025 .0029	.0026 .0029	.0027 .0030	.0028 .0031	.0029 .0032	.0029 .0032	.0030 .0033
24	{ 5 to 15 16 to 30	0.21 to 0.62 0.621 to 1.24				.0027 .0031	.0028 .0031	.0029 .0032	.0029 .0033	.0030 .0033	.0031 .0034	.0032 .0036
20	{ 5 to 15 16 to 30	0.25 to 0.75 0.751 to 1.50					.0030 .0034	.0031 .0036	.0032 .0036	.0032 .0036	.0033 .0037	.0034 .0038
18	{ 5 to 15 16 to 30	0.28 to 0.83 0.831 to 1.66						.0032 .0036	.0033 .0037	.0034 .0038	.0035 .0038	.0036 .0039
16	{ 5 to 15 16 to 30	0.31 to 0.94 0.941 to 1.88						.0034 .0038	.0035 .0039	.0036 .0040	.0036 .0041	.0037 .0042
14	{ 5 to 15 16 to 30	0.36 to 1.07 1.071 to 2.14							.0037 .0042	.0038 .0042	.0039 .0043	.0040 .0044
12	{ 5 to 15 16 to 30	0.42 to 1.25 1.251 to 2.50							.0040 .0045	.0041 .0046	.0041 .0046	.0042 .0047
10	{ 5 to 15 16 to 30	0.50 to 1.50 1.501 to 3.00									.0045 .0050	.0046 .0051
8	{ 5 to 15 16 to 30	0.62 to 1.88 1.881 to 3.75										.0051 .0067
6	{ 5 to 15 16 to 30	0.83 to 2.50 2.501 to 5.00										
4	{ 5 to 15 16 to 30	1.25 to 3.75 3.751 to 7.50										

\* Tolerances are based on diameters given in common fractions, which are the means of the diameter ranges expressed in decimals.

**special diameters, pitches, and lengths of engagement, class 3A**

See subsection 5, p. 98.)

Pitch diameter tolerances *--Continued													Threads per inch
1 1/4 1.1251 to 1.3750	1 1/2 1.3751 to 1.6250	1 3/4 1.6251 to 1.8750	2 1.8751 to 2.2500	2 1/2 2.2501 to 2.7500	3 2.7501 to 3.2500	3 1/2 3.2501 to 3.7500	4 3.7501 to 4.5000	5 4.5001 to 5.5000	6 5.5001 to 7.0000	8 7.0001 to 9.0000	10 9.0001 to 11.0000	12 11.0001 to 13.0000	
in.	in.	in.	LEGENDS										
			1. These values do not agree with and shall not be used in place of any tabulated values for the UNC, UNF, and 8N thread series, in table III.10.										80
			2. Formula: Class 3A tolerances for external threads are determined by multiplying class 2A tolerances (computed to six decimal places) by 0.750. See legend 2, table IV.5, for formula for class 2A tolerances.										72
			3. Length of engagement increments included in the tabulated tolerances for lengths of engagement from 5 to 15 pitches are based on lengths of 9 pitches; those for lengths of engagement greater than 15 to 30 pitches are based on lengths of 20 pitches. For lengths of engagement not tabulated, the formula in legend 2 should be applied.										64
			4. Pitches listed are those used most commonly and are recommended. Where intermediate pitches are specified, the formula in legend 2 should be applied.										56
			5. Tolerances are tabulated only for combinations of diameter, pitch, and length of engagement which are considered to be generally used. For other combinations encountered, see Design of Special Threads, appendix 5, p. 200.										48
			in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	44
													40
0.0028 .0031	0.0029 .0032												36
.0029 .0032	.0030 .0033	0.0031 .0034	0.0031 .0034	0.0032 .0035	0.0033 .0036								32
.0031 .0034	.0031 .0035	.0032 .0035	.0033 .0036	.0034 .0037	.0035 .0038	0.0036 .0039	0.0036 .0040						28
.0031 .0034	.0032 .0035	.0033 .0036	.0033 .0036	.0034 .0037	.0035 .0038	.0036 .0039	.0037 .0040	0.0038 .0041	0.0039 .0043				27
.0032 .0036	.0032 .0037	.0034 .0037	.0035 .0038	.0036 .0039	.0037 .0040	.0037 .0041	.0038 .0042	.0039 .0043	.0040 .0044				24
.0035 .0039	.0036 .0039	.0036 .0040	.0037 .0041	.0038 .0042	.0039 .0043	.0040 .0044	.0041 .0045	.0042 .0046	.0043 .0047				20
.0036 .0040	.0037 .0041	.0038 .0042	.0039 .0043	.0040 .0044	.0041 .0045	.0042 .0046	.0043 .0047	.0044 .0049	.0045 .0051				18
.0038 .0042	.0039 .0043	.0040 .0044	.0041 .0045	.0042 .0046	.0043 .0047	.0044 .0048	.0045 .0049	.0047 .0051	.0049 .0053	0.0050 .0055			16
.0041 .0045	.0041 .0046	.0042 .0046	.0043 .0047	.0044 .0048	.0045 .0049	.0046 .0050	.0047 .0051	.0048 .0052	.0049 .0053	.0051 .0055	.0053 .0057	0.0054 .0059	14
.0043 .0048	.0044 .0049	.0045 .0050	.0045 .0050	.0046 .0051	.0047 .0052	.0048 .0053	.0049 .0054	.0050 .0055	.0052 .0056	.0054 .0058	.0055 .0060	.0057 .0062	12
.0047 .0052	.0048 .0053	.0048 .0054	.0049 .0054	.0050 .0055	.0051 .0056	.0052 .0057	.0053 .0058	.0054 .0059	.0055 .0061	.0057 .0063	.0059 .0064	.0061 .0066	10
.0052 .0058	.0053 .0059	.0054 .0059	.0054 .0060	.0055 .0061	.0056 .0062	.0057 .0063	.0058 .0064	.0059 .0065	.0061 .0066	.0063 .0068	.0064 .0070	.0066 .0072	8
	.0061 .0067	.0061 .0068	.0062 .0069	.0063 .0070	.0064 .0071	.0065 .0072	.0066 .0073	.0067 .0074	.0068 .0075	.0070 .0077	.0072 .0079	.0074 .0080	6
			.0076 .0081	.0077 .0085	.0078 .0086	.0079 .0087	.0080 .0088	.0081 .0089	.0082 .0090	.0084 .0092	.0086 .0094	.0087 .0096	4

TABLE IV.7.—Pitch diameter tolerances for internal threads of

UNS and NS threads.

Threads per inch	Lengths of engagement		Pitch diameter tolerances *									
	Number of pitches	Inches	$\frac{1}{16}$ 0.0625 to 0.0781	$\frac{3}{32}$ 0.0782 to 0.1094	$\frac{1}{8}$ 0.1095 to 0.1563	$\frac{5}{32}$ 0.1564 to 0.2188	$\frac{3}{16}$ 0.2189 to 0.3125	$\frac{1}{2}$ 0.3126 to 0.4375	$\frac{5}{8}$ 0.4376 to 0.5625	$\frac{3}{4}$ 0.5626 to 0.6875	$\frac{7}{8}$ 0.6876 to 0.8750	1 0.8751 to 1.1250
				<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
80	{ 5 to 15 16 to 30	0.06 to 0.19 0.191 to 0.38										
72	{ 5 to 15 16 to 30	0.07 to 0.21 0.211 to 0.42										
64	{ 5 to 15 16 to 30	0.08 to 0.23 0.231 to 0.46										
56	{ 5 to 15 16 to 30	0.09 to 0.27 0.271 to 0.54										
48	{ 5 to 15 16 to 30	0.10 to 0.31 0.311 to 0.62										
44	{ 5 to 15 16 to 30	0.11 to 0.34 0.341 to 0.68		0.0050 .0056	0.0051 .0058	0.0053 .0060	0.0055 .0062	0.0058 .0064	0.0060 .0066	0.0062 .0068	0.0063 .0070	0.0065 .0072
40	{ 5 to 15 16 to 30	0.12 to 0.38 0.381 to 0.76			.0054 .0060	.0056 .0062	.0057 .0064	.0060 .0067	.0062 .0069	.0064 .0071	.0065 .0072	.0068 .0075
36	{ 5 to 15 16 to 30	0.14 to 0.42 0.421 to 0.84			.0056 .0065	.0058 .0066	.0060 .0067	.0063 .0070	.0065 .0072	.0066 .0074	.0068 .0075	.0071 .0078
32	{ 5 to 15 16 to 30	0.16 to 0.47 0.471 to 0.94			.0059 .0069	.0061 .0069	.0063 .0071	.0066 .0073	.0068 .0075	.0070 .0077	.0071 .0079	.0074 .0081
28	{ 5 to 15 16 to 30	0.18 to 0.54 0.541 to 1.08				.0065 .0073	.0067 .0075	.0069 .0078	.0072 .0080	.0073 .0081	.0075 .0083	.0078 .0086
27	{ 5 to 15 16 to 30	0.19 to 0.56 0.561 to 1.12				.0066 .0074	.0068 .0076	.0070 .0079	.0073 .0081	.0074 .0082	.0076 .0084	.0079 .0087
24	{ 5 to 15 16 to 30	0.21 to 0.62 0.621 to 1.24				.0070 .0080	.0072 .0080	.0074 .0083	.0076 .0085	.0078 .0087	.0080 .0088	.0082 .0091
20	{ 5 to 15 16 to 30	0.25 to 0.75 0.751 to 1.50					.0078 .0087	.0080 .0090	.0083 .0092	.0084 .0094	.0086 .0096	.0089 .0098
18	{ 5 to 15 16 to 30	0.28 to 0.83 0.831 to 1.66						.0084 .0095	.0087 .0097	.0088 .0098	.0090 .0100	.0093 .0103
16	{ 5 to 15 16 to 30	0.31 to 0.94 0.941 to 1.88						.0089 .0100	.0091 .0102	.0093 .0101	.0095 .0105	.0097 .0108
14	{ 5 to 15 16 to 30	0.36 to 1.07 1.071 to 2.14							.0097 .0109	.0099 .0110	.0100 .0112	.0103 .0115
12	{ 5 to 15 16 to 30	0.42 to 1.25 1.251 to 2.50							.0104 .0117	.0106 .0119	.0108 .0120	.0110 .0123
10	{ 5 to 15 16 to 30	0.50 to 1.50 1.501 to 3.00									.0117 .0131	.0120 .0134
8	{ 5 to 15 16 to 30	0.62 to 1.88 1.881 to 3.76										.0133 .0149
5	{ 5 to 15 16 to 30	0.83 to 2.50 2.501 to 5.00										
4	{ 5 to 15 16 to 30	1.25 to 3.75 3.751 to 7.50										

\* Tolerances are based on diameters given in common fractions, which are the means of the diameter ranges expressed in decimals.



## special diameters, pitches, and lengths of engagement, class 1B

See subsection 5, p. 08.)

Pitch diameter tolerances * -Continued													Threads per inch
1 1/4 1.1251 to 1.3750	1 1/2 1.3751 to 1.6250	1 3/4 1.6251 to 1.8750	2 1.8751 to 2.2500	2 1/4 2.2501 to 2.7500	3 2.7501 to 3.2500	3 1/2 3.2501 to 3.7500	4 3.7501 to 4.5000	5 4.5001 to 5.5000	6 5.5001 to 7.0000	8 7.0001 to 9.0000	10 9.0001 to 11.0000	12 11.0001 to 13.0000	
<i>in.</i>	<i>in.</i>	<i>in.</i>	LEGENDS										
			1. These values do not agree with and shall not be used in place of any tabulated values for the UNC, UNF, and 8N thread series, in table III.10.										80
			2. Formula: Class 1B tolerances for internal threads are 1.5 times class 2B tolerances and are determined by multiplying 2A tolerances (computed to six decimal places) by 1.950. See Legend 2, table IV.5, for formula for class 2A tolerances.										72
			3. Length of engagement increments include: a) in the tabulated tolerances for lengths of engagement from 5 to 15 pitches are based on lengths of 9 pitches; those for lengths of engagement greater than 15 to 30 pitches are based on lengths of 20 pitches. For lengths of engagement not tabulated, the formula in legend 2 should be applied.										64
			4. Pitches listed are those used most commonly and are recommended. Where intermediate pitches are specified, the formula in legend 2 should be applied.										56
			5. Tolerances are tabulated only for combinations of diameter, pitch, and length of engagement which are considered to be generally used. For other combinations encountered, see Design of Special Threads, appendix 5, p. 200.										48
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	44
													40
0.0073 .0080	0.0075 .0082												36
.0076 .0084	.0078 .0086	0.0080 .0087	0.0081 .0089	0.0084 .0092	0.0087 .0094								32
.0080 .0088	.0082 .0090	.0084 .0092	.0085 .0093	.0088 .0096	.0090 .0099	0.0093 .0101	0.0095 .0103						28
.0080 1.0089	.0083 .0091	.0085 .0093	.0085 .0095	.0089 .0097	.0092 .0100	.0094 .0102	.0096 .0104	0.0099 .0108	0.0103 .0111				27
.0085 .0093	.0087 .0095	.0088 .0097	.0090 .0099	.0093 .0102	.0095 .0104	.0097 .0106	.0100 .0108	.0103 .0112	.0106 .0115				24
.0091 .0100	.0093 .0102	.0095 .0104	.0096 .0106	.0099 .0109	.0101 .0111	.0104 .0113	.0106 .0115	.0109 .0119	.0112 .0122				20
.0095 .0105	.0097 .0107	.0099 .0109	.0100 .0110	.0103 .0113	.0105 .0116	.0108 .0118	.0110 .0120	.0113 .0123	.0116 .0127	0.0122 .0132			18
.0100 .0110	.0101 .0112	.0103 .0114	.0105 .0116	.0108 .0118	.0110 .0121	.0112 .0123	.0114 .0125	.0118 .0129	.0121 .0132	.0126 .0137	0.0131 .0142		16
.0105 .0117	.0107 .0119	.0109 .0121	.0111 .0122	.0114 .0125	.0116 .0127	.0118 .0130	.0120 .0132	.0124 .0135	.0127 .0138	.0132 .0144	.0137 .0148	0.0141 .0152	14
.0113 .0125	.0115 .0127	.0116 .0129	.0118 .0130	.0121 .0133	.0123 .0136	.0126 .0138	.0128 .0140	.0131 .0144	.0134 .0147	.0140 .0152	.0144 .0157	.0148 .0161	12
.0122 .0136	.0124 .0138	.0126 .0140	.0128 .0141	.0130 .0144	.0133 .0147	.0135 .0149	.0137 .0151	.0141 .0154	.0144 .0158	.0149 .0163	.0154 .0167	.0158 .0171	10
.0136 .0151	.0138 .0153	.0139 .0155	.0141 .0156	.0144 .0159	.0146 .0162	.0149 .0164	.0151 .0166	.0154 .0169	.0157 .0173	.0163 .0178	.0167 .0182	.0171 .0186	8
	.0158 .0175	.0160 .0177	.0161 .0179	.0164 .0182	.0167 .0184	.0169 .0186	.0171 .0188	.0174 .0192	.0178 .0195	.0182 .0200	.0187 .0205	.0191 .0209	6
			.0197 .0218	.0200 .0221	.0202 .0224	.0204 .0226	.0206 .0228	.0210 .0232	.0213 .0235	.0218 .0240	.0223 .0245	.0227 .0248	4

TABLE IV.8.—Pitch diameter tolerances for internal threads of  
(UNS and NS threads.)

Threads per inch	Lengths of engagement		Pitch diameter tolerances *									
	Number of pitches	Inches	$\frac{1}{16}$ 0.0600 to 0.0781	$\frac{3}{32}$ 0.0782 to 0.1094	$\frac{1}{8}$ 0.1095 to 0.1563	$\frac{3}{16}$ 0.1564 to 0.2188	$\frac{1}{4}$ 0.2189 to 0.3125	$\frac{5}{16}$ 0.3126 to 0.4375	$\frac{3}{8}$ 0.4376 to 0.5625	$\frac{7}{16}$ 0.5626 to 0.6875	$\frac{1}{2}$ 0.6876 to 0.8750	1 0.8751 to 1.1250
80	5 to 15	0.56 to 0.19	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
	16 to 30	0.191 to 0.38	0.0025 .0028	0.0026 .0029	0.0027 .0030	0.0028 .0031	0.0029 .0033					
72	5 to 15	0.07 to 0.21	.0026	.0027	.0028	.0029	.0030	0.0032				
	16 to 30	0.211 to 0.42		.0030	.0031	.0033	.0034	.0035				
64	5 to 15	0.08 to 0.23	.0027	.0028	.0029	.0031	.0032	.0034	0.0035			
	16 to 30	0.231 to 0.46		.0032	.0033	.0034	.0035	.0037	.0039			
56	5 to 15	0.09 to 0.27		.0030	.0031	.0032	.0033	.0035	.0037	0.0038	0.0039	
	16 to 30	0.271 to 0.54		.0034	.0035	.0036	.0037	.0039	.0040	.0042	.0043	
48	5 to 15	0.10 to 0.31		.0032	.0033	.0034	.0036	.0037	.0039	.0040	.0041	
	16 to 30	0.311 to 0.62			.0037	.0039	.0040	.0041	.0043	.0044	.0045	
44	5 to 15	0.11 to 0.34		.0033	.0034	.0036	.0037	.0039	.0040	.0041	.0042	0.0044
	16 to 30	0.341 to 0.68			.0039	.0040	.0041	.0043	.0044	.0045	.0047	.0048
40	5 to 15	0.12 to 0.38			.0036	.0037	.0038	.0040	.0041	.0043	.0044	.0045
	16 to 30	0.381 to 0.76			.0040	.0042	.0043	.0045	.0046	.0047	.0048	.0050
36	5 to 15	0.14 to 0.42			.0037	.0039	.0040	.0042	.0043	.0044	.0045	.0047
	16 to 30	0.421 to 0.84				.0044	.0045	.0046	.0048	.0049	.0050	.0052
32	5 to 15	0.16 to 0.47			.0039	.0041	.0042	.0044	.0045	.0046	.0047	.0049
	16 to 30	0.471 to 0.94				.0046	.0047	.0049	.0050	.0051	.0052	.0054
28	5 to 15	0.18 to 0.51				.0043	.0044	.0046	.0048	.0049	.0050	.0052
	16 to 30	0.511 to 1.08				.0049	.0050	.0052	.0053	.0054	.0055	.0057
27	5 to 15	0.19 to 0.56				.0044	.0045	.0047	.0048	.0050	.0051	.0052
	16 to 30	0.561 to 1.12				.0050	.0051	.0053	.0054	.0055	.0056	.0058
24	5 to 15	0.21 to 0.62				.0047	.0048	.0049	.0051	.0052	.0053	.0055
	16 to 30	0.621 to 1.24					.0051	.0053	.0054	.0055	.0056	.0058
20	5 to 15	0.25 to 0.75					.0052	.0054	.0055	.0056	.0057	.0059
	16 to 30	0.751 to 1.50					.0055	.0056	.0057	.0058	.0059	.0061
18	5 to 15	0.28 to 0.82						.0056	.0058	.0059	.0060	.0062
	16 to 30	0.821 to 1.65						.0059	.0061	.0062	.0063	.0065
16	5 to 15	0.31 to 0.94						.0059	.0061	.0062	.0063	.0065
	16 to 30	0.941 to 1.88						.0062	.0064	.0065	.0066	.0068
14	5 to 15	0.36 to 1.07							.0065	.0066	.0067	.0069
	16 to 30	1.071 to 2.14							.0067	.0068	.0069	.0071
12	5 to 15	0.42 to 1.25							.0070	.0071	.0072	.0074
	16 to 30	1.251 to 2.50							.0072	.0073	.0074	.0076
10	5 to 15	0.50 to 1.50								.0075	.0076	.0078
	16 to 30	1.501 to 3.00								.0077	.0078	.0080
8	5 to 15	0.62 to 1.88									.0081	.0083
	16 to 30	1.881 to 3.76									.0083	.0085
6	5 to 15	0.75 to 2.50										.0087
	16 to 30	2.501 to 5.00										.0089
4	5 to 15	1.25 to 3.75										.0093
	16 to 30	3.751 to 7.50										.0095

\* Tolerances are based on diameters given in common fractions, which are the means of the diameter ranges expressed in decimals.

## special diameters, pitches, and lengths of engagement, class 2B

See subsection 5, p. 98.)

Pitch diameter tolerances *—Continued													Threads per inch
11 <sub>4</sub> 1.1251 to 1.3750	11 <sub>2</sub> 1.3751 to 1.6250	11 <sub>4</sub> 1.6251 to 1.8750	2 1.8751 to 2.2500	21 <sub>2</sub> 2.2501 to 2.7500	3 2.7501 to 3.2500	31 <sub>2</sub> 3.2501 to 3.7500	4 3.7501 to 4.5000	5 4.5001 to 5.5000	6 5.5001 to 7.0000	8 7.0001 to 9.0000	10 9.0001 to 11.0000	12 11.0001 to 13.0000	
in.	in.	in.	LEGENDS										
			1. These values do not agree with and shall not be used in place of any tabulated values for the UNC, UNF and 8N thread series, in table III.10.										80
			2. Formula:										72
			Class 2B tolerances are determined by multiplying class 2A tolerances (computed to six decimal places) by 1.300. See legend 2, table IV.5, for formula for class 2A tolerances.										64
			3. Length of engagement increments included in the tabulated tolerances for lengths of engagement from 5 to 15 pitches are based on lengths of 9 pitches; those for lengths of engagement greater than 15 to 30 pitches are based on lengths of 20 pitches. For lengths of engagement not tabulated, the formula in legend 2 should be applied.										56
			4. Pitches listed are those used most commonly and are recommended. Where intermediate pitches are specified, the formula in legend 2 should be applied.										48
			5. Tolerances are tabulated only for combinations of diameter, pitch, and length of engagement which are considered to be generally used. For other combinations encountered, see Design of Special Threads, appendix 5, p. 200.										44
			in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	40
0.0049 .0053	0.0050 .0055												36
.0051 .0056	.0052 .0057	0.0053 .0058	0.0054 .0059	0.0055 .0061	0.0058 .0063								32
.0053 .0059	.0055 .0060	.0056 .0061	.0057 .0062	.0059 .0063	.0059 .0065	0.0062 .0067	0.0063 .0069						28
.0053 .0059	.0055 .0061	.0056 .0062	.0057 .0063	.0059 .0065	.0061 .0067	.0063 .0068	.0064 .0069	0.0066 .0072	0.0068 .0074				27
.0056 .0062	.0058 .0064	.0059 .0065	.0060 .0066	.0062 .0068	.0064 .0071	.0065 .0072	.0066 .0073	.0069 .0076	.0071 .0077				24
.0061 .0067	.0062 .0068	.0063 .0069	.0064 .0071	.0066 .0072	.0068 .0074	.0069 .0076	.0070 .0077	.0073 .0079	.0075 .0081				20
.0063 .0070	.0065 .0071	.0066 .0072	.0067 .0074	.0069 .0075	.0070 .0077	.0072 .0079	.0073 .0080	.0076 .0082	.0078 .0084	0.0081 .0088			18
.0066 .0074	.0068 .0075	.0069 .0076	.0070 .0077	.0072 .0079	.0073 .0081	.0075 .0082	.0076 .0083	.0079 .0086	.0081 .0088	.0084 .0092	0.0087 .0095		16
.0070 .0078	.0072 .0079	.0073 .0080	.0074 .0081	.0076 .0083	.0077 .0085	.0079 .0086	.0080 .0088	.0083 .0090	.0085 .0092	.0088 .0096	.0091 .0099	0.0094 .0102	14
.0075 .0083	.0076 .0085	.0078 .0086	.0079 .0087	.0081 .0089	.0082 .0090	.0084 .0092	.0085 .0093	.0087 .0096	.0089 .0098	.0093 .0101	.0096 .0104	.0099 .0107	12
.0082 .0091	.0083 .0092	.0084 .0093	.0085 .0094	.0087 .0096	.0089 .0098	.0090 .0099	.0091 .0101	.0094 .0103	.0096 .0105	.0100 .0109	.0103 .0112	.0105 .0114	10
.0090 .0101	.0092 .0102	.0093 .0103	.0094 .0104	.0096 .0106	.0098 .0108	.0099 .0109	.0100 .0111	.0103 .0113	.0105 .0115	.0108 .0119	.0111 .0122	.0114 .0124	8
	.0105 .0117	.0106 .0118	.0108 .0119	.0109 .0121	.0111 .0123	.0113 .0124	.0114 .0126	.0116 .0128	.0118 .0130	.0122 .0134	.0125 .0137	.0128 .0139	6
			.0131 .0146	.0133 .0147	.0135 .0149	.0136 .0151	.0138 .0152	.0140 .0154	.0142 .0156	.0146 .0160	.0149 .0163	.0151 .0166	4

TABLE IV.9.— Pitch diameter tolerances for internal threads of  
(UNS and NS threads)

Threads per inch	Lengths of engagement		Pitch diameter tolerances *									
	Number of pitches	Inches	$\frac{1}{4}$ in. 0.6600 to 0.0781	$\frac{3}{16}$ in. 0.0782 to 0.1094	$\frac{1}{2}$ in. 0.1095 to 0.1563	$\frac{5}{8}$ in. 0.1564 to 0.2188	1 in. 0.2189 to 0.3125	$\frac{3}{4}$ in. 0.3126 to 0.4375	1 1/8 in. 0.4376 to 0.5625	$\frac{3}{2}$ in. 0.5626 to 0.6875	2 in. 0.6876 to 0.8750	2 1/2 in. 0.8751 to 1.1250
80	5 to 15	0.06 to 0.19	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	16 to 30	0.191 to 0.38	0.0019 .0021	0.0019 .0022	0.0020 .0023	0.0021 .0024	0.0022 .0024					
72	5 to 15	0.07 to 0.21										
	16 to 30	0.211 to 0.42	.0019 .0021	.0020 .0023	.0021 .0023	.0022 .0025	.0023 .0025	0.0024 .0027				
64	5 to 15	0.08 to 0.23										
	16 to 30	0.231 to 0.46	.0020 .0024	.0021 .0024	.0022 .0025	.0023 .0026	.0024 .0027	.0025 .0028	0.0026 .0029			
56	5 to 15	0.09 to 0.27										
	16 to 30	0.271 to 0.54		.0023 .0025	.0023 .0026	.0024 .0027	.0025 .0028	.0026 .0029	.0027 .0030	0.0028 .0031	0.0029 .0032	
48	5 to 15	0.10 to 0.31										
	16 to 30	0.311 to 0.62		.0024 .0025	.0025 .0028	.0026 .0029	.0027 .0030	.0028 .0031	.0029 .0032	.0030 .0033	.0031 .0034	
44	5 to 15	0.11 to 0.34										
	16 to 30	0.341 to 0.68		.0025 .0026	.0026 .0029	.0027 .0030	.0028 .0031	.0029 .0032	.0030 .0033	.0031 .0034	.0032 .0035	0.0033 .0036
40	5 to 15	0.12 to 0.38										
	16 to 30	0.381 to 0.76		.0027 .0030	.0028 .0031	.0029 .0032	.0030 .0033	.0031 .0034	.0032 .0035	.0033 .0036	.0034 .0037	.0035 .0038
36	5 to 15	0.14 to 0.42										
	16 to 30	0.421 to 0.84			.0028 .0033	.0029 .0033	.0030 .0034	.0031 .0035	.0032 .0036	.0033 .0037	.0034 .0038	.0035 .0039
32	5 to 15	0.16 to 0.47										
	16 to 30	0.471 to 0.94			.0030 .0034	.0031 .0035	.0032 .0036	.0033 .0037	.0034 .0038	.0035 .0039	.0036 .0040	.0037 .0041
28	5 to 15	0.18 to 0.54										
	16 to 30	0.541 to 1.08				.0033 .0037	.0033 .0037	.0035 .0039	.0036 .0040	.0037 .0041	.0038 .0042	.0039 .0043
27	5 to 15	0.19 to 0.56										
	16 to 30	0.561 to 1.12				.0033 .0037	.0034 .0038	.0035 .0039	.0036 .0040	.0037 .0041	.0038 .0042	.0039 .0043
24	5 to 15	0.21 to 0.62										
	16 to 30	0.621 to 1.24				.0035 .0040	.0036 .0041	.0037 .0042	.0038 .0043	.0039 .0044	.0040 .0045	.0041 .0046
20	5 to 15	0.25 to 0.75										
	16 to 30	0.751 to 1.50					.0039 .0044	.0040 .0045	.0041 .0046	.0042 .0047	.0043 .0048	.0044 .0049
18	5 to 15	0.28 to 0.83										
	16 to 30	0.831 to 1.66					.0042 .0047	.0043 .0048	.0044 .0049	.0045 .0050	.0046 .0051	.0047 .0052
16	5 to 15	0.31 to 0.93										
	16 to 30	0.931 to 1.86					.0045 .0050	.0046 .0051	.0047 .0052	.0048 .0053	.0049 .0054	.0050 .0055
14	5 to 15	0.36 to 1.07										
	16 to 30	1.071 to 2.14						.0049 .0054	.0050 .0055	.0051 .0056	.0052 .0057	.0053 .0058
12	5 to 15	0.42 to 1.25										
	16 to 30	1.251 to 2.50						.0052 .0058	.0053 .0059	.0054 .0060	.0055 .0061	.0056 .0062
10	5 to 15	0.50 to 1.50										
	16 to 30	1.501 to 3.00								.0059 .0066	.0060 .0067	.0061 .0068
8	5 to 15	0.62 to 1.88										
	16 to 30	1.881 to 3.76										.0067 .0074
6	5 to 15	0.83 to 2.50										
	16 to 30	2.501 to 5.00										
4	5 to 15	1.25 to 3.75										
	16 to 30	3.751 to 7.50										

\* Tolerances are based on diameters given in common fraction, which are the means of the diameter ranges expressed in decimals.

special diameters, pitches, and lengths of engagement, class 3B

See subsection 5, p. 9\*.)

Pitch diameter tolerances • Continued													Threads per inch
1 $\frac{1}{4}$ 1.1251 to 1.3750	1 $\frac{1}{2}$ 1.3751 to 1.6250	1 $\frac{3}{4}$ 1.6251 to 1.8750	2 1.8751 to 2.2500	2 $\frac{1}{2}$ 2.2501 to 2.7500	3 2.7501 to 3.2500	3 $\frac{1}{2}$ 3.2501 to 3.7500	4 3.7501 to 4.5000	5 4.5001 to 5.5000	6 5.5001 to 7.0000	8 7.0001 to 9.0000	10 9.0001 to 11.0000	12 11.0001 to 13.0000	
<i>in.</i>	<i>in.</i>	<i>in.</i>	LEGENDS										
			1. These values do not agree with and shall not be used in place of any tabulated values for the UNC, UNF, and 8N thread series, in table III.10.										80
			2. Formula: Class 3B tolerances for internal threads are 0.75 times class 2B tolerances and are determined by multiplying class 2A tolerances (computed to six decimal places) by 0.975. See legend 2, table IV.5 for formula for class 2A tolerances.										72
			3. Length of engagement increments included in the tabulated tolerances for lengths of engagement from 5 to 15 pitches are based on lengths of 9 pitches; those for lengths of engagement greater than 15 to 30 pitches are based on lengths of 20 pitches. For lengths of engagement not tabulated, the formula in legend 2 should be applied.										64
			4. Pitches listed are those used most commonly and are recommended. Where intermediate pitches are specified the formula in legend 2 should be applied.										56
			5. Tolerances are tabulated only for combinations of diameter, pitch, and length of engagement which are considered to be generally used. For other combinations encountered, see Design of Special Threads, appendix 5, p. 200.										48
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	44
													40
0.0036 .0040	0.0037 .0041												36
.0038 .0042	.0039 .0043	0.0040 .0044	0.0041 .0044	0.0042 .0046	0.0043 .0047								32
.0040 .0044	.0041 .0045	.0042 .0046	.0043 .0047	.0044 .0048	.0045 .0049	0.0046 .0050	0.0047 .0051						28
.0040 .0045	.0041 .0046	.0042 .0046	.0043 .0047	.0045 .0049	.0046 .0050	.0047 .0051	.0048 .0052	0.0050 .0054	0.0051 .0055				27
.0042 .0047	.0043 .0048	.0044 .0049	.0045 .0049	.0046 .0051	.0048 .0052	.0049 .0053	.0050 .0054	.0052 .0056	.0053 .0058				24
.0045 .0050	.0046 .0051	.0047 .0052	.0048 .0053	.0050 .0054	.0051 .0055	.0052 .0056	.0053 .0058	.0055 .0059	.0056 .0061				20
.0047 .0052	.0048 .0053	.0049 .0054	.0050 .0055	.0051 .0057	.0053 .0058	.0054 .0059	.0055 .0060	.0057 .0062	.0058 .0063	0.0061 .0066			18
.0050 .0055	.0051 .0056	.0052 .0057	.0053 .0058	.0054 .0059	.0055 .0060	.0056 .0062	.0057 .0063	.0059 .0064	.0061 .0066	.0063 .0069	0.0066 .0071		16
.0053 .0058	.0054 .0059	.0055 .0060	.0056 .0061	.0057 .0063	.0058 .0064	.0059 .0065	.0060 .0066	.0062 .0068	.0063 .0069	.0066 .0072	.0068 .0074	0.0070 .0076	14
.0056 .0063	.0057 .0064	.0058 .0064	.0059 .0065	.0060 .0067	.0062 .0068	.0063 .0069	.0064 .0070	.0066 .0072	.0067 .0073	.0070 .0076	.0072 .0078	.0074 .0080	12
.0061 .0068	.0062 .0069	.0063 .0070	.0064 .0071	.0065 .0072	.0066 .0073	.0068 .0074	.0069 .0075	.0070 .0077	.0072 .0079	.0076 .0081	.0077 .0084	.0079 .0086	10
.0068 .0076	.0069 .0076	.0070 .0077	.0071 .0078	.0072 .0080	.0073 .0081	.0074 .0082	.0075 .0083	.0077 .0085	.0079 .0086	.0081 .0089	.0084 .0091	.0086 .0093	8
	.0070 .0088	.0080 .0089	.0081 .0089	.0082 .0091	.0083 .0092	.0084 .0093	.0085 .0094	.0087 .0096	.0089 .0098	.0091 .0100	.0094 .0103	.0096 .0104	6
			.0088 .0109	.0090 .0111	.0091 .0112	.0092 .0113	.0093 .0114	.0095 .0116	.0097 .0117	.0099 .0120	.0101 .0122	.0103 .0124	4



TABLE IV.10.—Minor diameter tolerances for internal special screw threads, classes 1B and 2B

(UNS and NS threads. See subsection 5, p. 98.)

Threads per inch	Tolerance ratios	Lengths of engagement in terms of diameter *		Minor diameter tolerances † for thread sizes having basic major diameters:											
		Tolerances based on—		0.060	0.073	0.086	0.109	0.125	0.15	0.18	0.216	0.25	0.315	0.398	0.500
		Above—		0.053	0.066	0.079	0.092	0.105	0.125	0.141	0.151	0.177	0.203	0.233	All larger diameters
		to— and including		0.066	0.079	0.092	0.105	0.118	0.131	0.151	0.177	0.203	0.233		
80	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	in. 0.0035	in. 0.0029	in. 0.0025	in. 0.0022	in. 0.0020	in. 0.0018	in. 0.0017	in. 0.0016	in. 0.0016	in. 0.0016	in. 0.0016	in. 0.0016
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0040	0.0041	0.0038	0.0034	0.0030	0.0028	0.0026	0.0023	0.0023	0.0023	0.0023	0.0023
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0040	0.0040	0.0039	0.0035	0.0030	0.0027	0.0024	0.0021	0.0021	0.0021	0.0021	0.0021
72	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0039	0.0033	0.0029	0.0026	0.0023	0.0021	0.0020	0.0017	0.0017	0.0017	0.0017	0.0017
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0055	0.0049	0.0043	0.0038	0.0035	0.0032	0.0029	0.0026	0.0026	0.0026	0.0026	0.0026
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0055	0.0055	0.0055	0.0051	0.0046	0.0042	0.0039	0.0034	0.0034	0.0034	0.0034	0.0034
64	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0015	0.0038	0.0033	0.0029	0.0027	0.0024	0.0023	0.0020	0.0019	0.0019	0.0019	0.0019
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0062	0.0057	0.0049	0.0044	0.0040	0.0037	0.0034	0.0030	0.0028	0.0028	0.0028	0.0028
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0062	0.0062	0.0062	0.0059	0.0053	0.0049	0.0045	0.0040	0.0038	0.0038	0.0038	0.0038
56	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0041	0.0038	0.0034	0.0031	0.0029	0.0024	0.0023	0.0020	0.0019	0.0019	0.0019	0.0019
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0066	0.0057	0.0051	0.0046	0.0043	0.0040	0.0036	0.0033	0.0032	0.0032	0.0032	0.0032
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0070	0.0070	0.0070	0.0067	0.0062	0.0057	0.0054	0.0047	0.0043	0.0043	0.0043	0.0043
48	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0045	0.0040	0.0037	0.0034	0.0031	0.0029	0.0026	0.0023	0.0022	0.0022	0.0022	0.0022
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0068	0.0061	0.0055	0.0051	0.0046	0.0043	0.0040	0.0036	0.0033	0.0032	0.0032	0.0032
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0082	0.0081	0.0074	0.0068	0.0063	0.0058	0.0053	0.0046	0.0043	0.0043	0.0043	0.0043
44	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0050	0.0044	0.0040	0.0038	0.0034	0.0033	0.0031	0.0028	0.0025	0.0025	0.0025	0.0025
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0074	0.0067	0.0061	0.0056	0.0051	0.0046	0.0043	0.0039	0.0036	0.0034	0.0034	0.0034
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0089	0.0089	0.0081	0.0075	0.0069	0.0063	0.0058	0.0051	0.0046	0.0046	0.0046	0.0046
40	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0049	0.0045	0.0041	0.0039	0.0034	0.0033	0.0031	0.0029	0.0025	0.0025	0.0025	0.0025
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0071	0.0067	0.0061	0.0057	0.0051	0.0046	0.0043	0.0039	0.0036	0.0034	0.0034	0.0034
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0088	0.0088	0.0081	0.0075	0.0069	0.0063	0.0058	0.0051	0.0046	0.0046	0.0046	0.0046
36	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0050	0.0046	0.0041	0.0039	0.0034	0.0033	0.0031	0.0029	0.0025	0.0025	0.0025	0.0025
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0075	0.0069	0.0061	0.0057	0.0051	0.0046	0.0043	0.0039	0.0036	0.0034	0.0034	0.0034
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0100	0.0093	0.0086	0.0081	0.0075	0.0069	0.0063	0.0056	0.0051	0.0051	0.0051	0.0051
32	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0049	0.0045	0.0041	0.0039	0.0034	0.0033	0.0031	0.0029	0.0025	0.0025	0.0025	0.0025
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0073	0.0067	0.0061	0.0057	0.0051	0.0046	0.0043	0.0039	0.0036	0.0034	0.0034	0.0034
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0098	0.0098	0.0091	0.0085	0.0079	0.0073	0.0068	0.0061	0.0056	0.0056	0.0056	0.0056
28	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0045	0.0042	0.0037	0.0035	0.0031	0.0030	0.0028	0.0025	0.0022	0.0022	0.0022	0.0022
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0068	0.0063	0.0057	0.0053	0.0048	0.0045	0.0041	0.0037	0.0034	0.0032	0.0032	0.0032
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0091	0.0091	0.0084	0.0078	0.0072	0.0066	0.0061	0.0054	0.0049	0.0049	0.0049	0.0049

\* Tolerances for lengths of engagement in terms of pitch should be selected from equivalent lengths of engagement in terms of diameter ranges.

† Revised minor diameter tolerances for classes 1B and 2B are in process of ratification as Unified Standard.

NOTE.—If the minor diameter tolerance as selected from this table is less than the pitch diameter tolerance, use the latter. See "Design of Special Threads," appendix 5.

TABLE IV.10.—Minor diameter tolerances for internal special screw threads, classes 1B and 2B—Continued

(UNS and NS threads. See subsection 5, p. 98.)

Threads per inch	Toler- ance ratios	Lengths of engage- ment in terms of diameter *		Minor diameter tolerances* for thread sizes having basic major diameters:											All larger diameters
		Tolerances based on—		0.060	0.073	0.086	0.099	0.112	0.125	0.138	0.164	0.190	0.216		
		↓ Above—													
			to— and in- cluding											0.053	
				0.066	0.079	0.092	0.105	0.118	0.131	0.151	0.177	0.203	0.233		
27	$\frac{1}{32}$ $\frac{1}{16}$ 1 $\frac{1}{8}$	$\frac{1}{32} D$	$\frac{1}{32} D$												<i>in.</i> 0.0044
		$\frac{1}{16} D$	$\frac{1}{16} D$												<i>in.</i> 0.0044
		$\frac{1}{8} D$	$\frac{1}{8} D$												<i>in.</i> 0.0044
		$\frac{1}{4} D$	$\frac{1}{4} D$												<i>in.</i> 0.0044
24	$\frac{1}{32}$ $\frac{1}{16}$ 1 $\frac{1}{8}$	$\frac{1}{32} D$	$\frac{1}{32} D$												<i>in.</i> 0.0044
		$\frac{1}{16} D$	$\frac{1}{16} D$												<i>in.</i> 0.0044
		$\frac{1}{8} D$	$\frac{1}{8} D$												<i>in.</i> 0.0044
		$\frac{1}{4} D$	$\frac{1}{4} D$												<i>in.</i> 0.0044
20	$\frac{1}{32}$ $\frac{1}{16}$ 1 $\frac{1}{8}$	$\frac{1}{32} D$	$\frac{1}{32} D$												<i>in.</i> 0.0044
		$\frac{1}{16} D$	$\frac{1}{16} D$												<i>in.</i> 0.0044
		$\frac{1}{8} D$	$\frac{1}{8} D$												<i>in.</i> 0.0044
		$\frac{1}{4} D$	$\frac{1}{4} D$												<i>in.</i> 0.0044
18	$\frac{1}{32}$ $\frac{1}{16}$ 1 $\frac{1}{8}$	$\frac{1}{32} D$	$\frac{1}{32} D$												<i>in.</i> 0.0044
		$\frac{1}{16} D$	$\frac{1}{16} D$												<i>in.</i> 0.0044
		$\frac{1}{8} D$	$\frac{1}{8} D$												<i>in.</i> 0.0044
		$\frac{1}{4} D$	$\frac{1}{4} D$												<i>in.</i> 0.0044
16	$\frac{1}{32}$ $\frac{1}{16}$ 1 $\frac{1}{8}$	$\frac{1}{32} D$	$\frac{1}{32} D$												<i>in.</i> 0.0044
		$\frac{1}{16} D$	$\frac{1}{16} D$												<i>in.</i> 0.0044
		$\frac{1}{8} D$	$\frac{1}{8} D$												<i>in.</i> 0.0044
		$\frac{1}{4} D$	$\frac{1}{4} D$												<i>in.</i> 0.0044
14	$\frac{1}{32}$ $\frac{1}{16}$ 1 $\frac{1}{8}$	$\frac{1}{32} D$	$\frac{1}{32} D$												<i>in.</i> 0.0044
		$\frac{1}{16} D$	$\frac{1}{16} D$												<i>in.</i> 0.0044
		$\frac{1}{8} D$	$\frac{1}{8} D$												<i>in.</i> 0.0044
		$\frac{1}{4} D$	$\frac{1}{4} D$												<i>in.</i> 0.0044
12	$\frac{1}{32}$ $\frac{1}{16}$ 1 $\frac{1}{8}$	$\frac{1}{32} D$	$\frac{1}{32} D$												<i>in.</i> 0.0044
		$\frac{1}{16} D$	$\frac{1}{16} D$												<i>in.</i> 0.0044
		$\frac{1}{8} D$	$\frac{1}{8} D$												<i>in.</i> 0.0044
		$\frac{1}{4} D$	$\frac{1}{4} D$												<i>in.</i> 0.0044
10	$\frac{1}{32}$ $\frac{1}{16}$ 1 $\frac{1}{8}$	$\frac{1}{32} D$	$\frac{1}{32} D$												<i>in.</i> 0.0044
		$\frac{1}{16} D$	$\frac{1}{16} D$												<i>in.</i> 0.0044
		$\frac{1}{8} D$	$\frac{1}{8} D$												<i>in.</i> 0.0044
		$\frac{1}{4} D$	$\frac{1}{4} D$												<i>in.</i> 0.0044
8	$\frac{1}{32}$ $\frac{1}{16}$ 1 $\frac{1}{8}$	$\frac{1}{32} D$	$\frac{1}{32} D$												<i>in.</i> 0.0044
		$\frac{1}{16} D$	$\frac{1}{16} D$												<i>in.</i> 0.0044
		$\frac{1}{8} D$	$\frac{1}{8} D$												<i>in.</i> 0.0044
		$\frac{1}{4} D$	$\frac{1}{4} D$												<i>in.</i> 0.0044
6	$\frac{1}{32}$ $\frac{1}{16}$ 1 $\frac{1}{8}$	$\frac{1}{32} D$	$\frac{1}{32} D$												<i>in.</i> 0.0044
		$\frac{1}{16} D$	$\frac{1}{16} D$												<i>in.</i> 0.0044
		$\frac{1}{8} D$	$\frac{1}{8} D$												<i>in.</i> 0.0044
		$\frac{1}{4} D$	$\frac{1}{4} D$												<i>in.</i> 0.0044
4	$\frac{1}{32}$ $\frac{1}{16}$ 1 $\frac{1}{8}$	$\frac{1}{32} D$	$\frac{1}{32} D$												<i>in.</i> 0.0044
		$\frac{1}{16} D$	$\frac{1}{16} D$												<i>in.</i> 0.0044
		$\frac{1}{8} D$	$\frac{1}{8} D$												<i>in.</i> 0.0044
		$\frac{1}{4} D$	$\frac{1}{4} D$												<i>in.</i> 0.0044

\* Tolerances for lengths of engagement in terms of pitch should be selected from equivalent lengths of engagement in terms of diameter ranges.

<sup>b</sup> Revised minor diameter tolerances for Classes 1B and 2B are in process of ratification as Unified Standard.

NOTE.—If the minor diameter tolerance as selected from this table is less than the pitch diameter tolerance, use the latter. See "Design of Special Threads," appendix 6.

TABLE IV.11. - Minor diameter tolerances

(UNS and NS threads.)

Threads per inch	Tolerance ratios	Lengths of engagement in terms of diameter *		Minor diameter tolerances for thread sizes having basic major diameters.									
		Tolerances based on →		0.060	0.073	0.086	0.099	0.112	0.125	0.138	0.154	0.180	
		↓ Above →		0.055	0.066	0.079	0.092	0.105	0.118	0.131	0.151	0.177	
			to → and in- cluding	0.060	0.070	0.082	0.105	0.118	0.131	0.151	0.177	0.203	
80	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	in.	in.	in.	in.	in.	in.	in.	in.	in.	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0035	0.0029	0.0025	0.0022	0.0020	0.0018	0.0017	0.0015	0.0013	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0040	0.0044	0.0038	0.0034	0.0030	0.0028	0.0026	0.0022	0.0020	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	
72	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0039	0.0033	0.0029	0.0026	0.0023	0.0021	0.0020	0.0017	0.0016	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0055	0.0049	0.0043	0.0038	0.0035	0.0032	0.0029	0.0026	0.0023	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	
64	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0045	0.0038	0.0033	0.0029	0.0027	0.0024	0.0023	0.0020	0.0018	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0062	0.0057	0.0049	0.0044	0.0040	0.0037	0.0034	0.0030	0.0027	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0062	0.0062	0.0062	0.0062	0.0062	0.0062	0.0062	0.0062	0.0062	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0062	0.0062	0.0062	0.0062	0.0062	0.0062	0.0062	0.0062	0.0062	
56	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0044	0.0038	0.0033	0.0029	0.0027	0.0024	0.0023	0.0020	0.0018	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	
48	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0045	0.0040	0.0037	0.0034	0.0032	0.0031	0.0029	0.0026	0.0023	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	
44	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0050	0.0044	0.0041	0.0037	0.0035	0.0033	0.0031	0.0028	0.0025	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0075	0.0075	0.0075	0.0075	0.0075	0.0075	0.0075	0.0075	0.0075	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	
40	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0040	0.0035	0.0033	0.0031	0.0029	0.0027	0.0025	0.0023	0.0021	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	
36	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0050	0.0046	0.0043	0.0038	0.0035	0.0033	0.0031	0.0028	0.0025	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0075	0.0075	0.0075	0.0075	0.0075	0.0075	0.0075	0.0075	0.0075	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	
32	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0049	0.0043	0.0040	0.0037	0.0035	0.0033	0.0031	0.0028	0.0025	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0122	0.0122	0.0122	0.0122	0.0122	0.0122	0.0122	0.0122	0.0122	
28	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0045	0.0040	0.0037	0.0034	0.0032	0.0031	0.0029	0.0026	0.0023	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	
27	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0047	0.0041	0.0038	0.0034	0.0032	0.0031	0.0029	0.0026	0.0023	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0071	0.0071	0.0071	0.0071	0.0071	0.0071	0.0071	0.0071	0.0071	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	
24	$\frac{1}{32}$	$\frac{1}{32} D$	$\frac{1}{32} D$	0.0053	0.0047	0.0044	0.0039	0.0036	0.0034	0.0032	0.0029	0.0026	
	$\frac{3}{64}$	$\frac{3}{64} D$	$\frac{3}{64} D$	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	
	1	$\frac{2}{32} D$	$\frac{2}{32} D$	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	
	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	

\* Tolerances for lengths of engagement in terms of pitch should be selected from equivalent lengths of engagement in terms of diameter ranges.

NOTE: - If the minor diameter tolerance as selected from this table is less than the pitch diameter tolerance, use the latter. See Design of Special Threads, appendix 5.

for internal special screw threads, class 3B

See subsection 5, p. 98.)

Minor diameter tolerances for thread sizes having basic major diameters:														Threads per inch
0.216	0.260	0.3125	0.375	0.4375	0.500	0.5625	0.625	0.6875	0.750	0.8125	0.875	0.9375	All larger diameters	
0.203	0.213	0.281	0.344	0.406	0.460	0.531	0.594	0.656	0.719	0.781	0.844	0.906		
0.233	0.281	0.344	0.406	0.460	0.531	0.594	0.656	0.719	0.781	0.844	0.906	0.969		
<i>in.</i> 0.0013 .0020 .0026 .0033	<i>in.</i> 0.0013 .0020 .0026 .0033	<i>in.</i> 0.0013 .0020 .0026 .0033	<i>in.</i> 0.0015 .0022 .0029 .0036	<i>in.</i> 0.0015 .0022 .0029 .0036	<i>in.</i> 0.0016 .0024 .0032 .0040	<i>in.</i> 0.0016 .0024 .0032 .0040	<i>in.</i> 0.0018 .0027 .0036 .0045	<i>in.</i> 0.0018 .0027 .0036 .0045	<i>in.</i> 0.0018 .0027 .0036 .0045	<i>in.</i> 0.0018 .0027 .0036 .0045	<i>in.</i> 0.0018 .0027 .0036 .0045	<i>in.</i> 0.0022 .0033 .0045 .0055	<i>in.</i> 0.0024 .0036 .0048 .0060	
.0015 .0022 .0029 .0036	.0015 .0022 .0029 .0036	.0015 .0022 .0029 .0036	.0015 .0022 .0029 .0036	.0015 .0022 .0029 .0036										
.0016 .0025 .0033 .0041	.0016 .0024 .0032 .0040	.0016 .0024 .0032 .0040	.0016 .0024 .0032 .0040	.0016 .0024 .0032 .0040										
.0018 .0029 .0039 .0040	.0018 .0027 .0036 .0045	.0018 .0027 .0036 .0045	.0018 .0027 .0036 .0045	.0018 .0027 .0036 .0045	.0018 .0027 .0036 .0045	.0018 .0027 .0036 .0045	.0018 .0027 .0036 .0045	.0018 .0027 .0036 .0045	.0018 .0027 .0036 .0045	.0018 .0027 .0036 .0045	.0018 .0027 .0036 .0045			
.0023 .0035 .0047 .0059	.0021 .0032 .0041 .0054	.0021 .0031 .0041 .0052	.0021 .0031 .0041 .0052	.0021 .0031 .0041 .0052	.0021 .0031 .0041 .0052	.0021 .0031 .0041 .0052	.0021 .0031 .0041 .0052	.0021 .0031 .0041 .0052	.0021 .0031 .0041 .0052	.0021 .0031 .0041 .0052	.0021 .0031 .0041 .0052			
.0026 .0039 .0052 .0055	.0024 .0036 .0045 .0059	.0024 .0036 .0045 .0056	.0024 .0036 .0045 .0056	.0024 .0036 .0045 .0056	.0022 .0033 .0045 .0056	.0022 .0033 .0045 .0056	.0022 .0033 .0045 .0056	.0022 .0033 .0045 .0056	.0022 .0033 .0045 .0056	.0022 .0033 .0045 .0056	.0022 .0033 .0045 .0056			
.0029 .0043 .0057 .0072	.0026 .0040 .0053 .0066	.0024 .0036 .0048 .0062	.0024 .0036 .0048 .0062	.0024 .0036 .0048 .0060	.0024 .0036 .0048 .0060	.0024 .0036 .0048 .0060	.0024 .0036 .0048 .0060	.0024 .0036 .0048 .0060	.0024 .0036 .0048 .0060	.0024 .0036 .0048 .0060	.0024 .0036 .0048 .0060			
.0032 .0048 .0064 .0081	.0030 .0044 .0059 .0074	.0026 .0039 .0053 .0066	.0026 .0039 .0052 .0065	.0026 .0039 .0052 .0065	.0026 .0039 .0052 .0065	.0026 .0039 .0052 .0065	.0026 .0039 .0052 .0065	.0026 .0039 .0052 .0065	.0026 .0039 .0052 .0065	.0026 .0039 .0052 .0065	.0026 .0039 .0052 .0065			
.0036 .0055 .0073 .0091	.0034 .0050 .0067 .0084	.0030 .0045 .0060 .0075	.0026 .0043 .0057 .0072	.0029 .0043 .0057 .0072	.0029 .0043 .0057 .0072	.0029 .0043 .0057 .0072	.0029 .0043 .0057 .0072	.0029 .0043 .0057 .0072	.0029 .0043 .0057 .0072	.0029 .0043 .0057 .0072	.0029 .0043 .0057 .0072			
.0042 .0063 .0084 .0105	.0039 .0058 .0077 .0096	.0034 .0051 .0069 .0086	.0032 .0047 .0063 .0079	.0032 .0047 .0063 .0079	.0032 .0047 .0063 .0079	.0032 .0047 .0063 .0079	.0032 .0047 .0063 .0079	.0032 .0047 .0063 .0079	.0032 .0047 .0063 .0079	.0032 .0047 .0063 .0079	.0032 .0047 .0063 .0079			
.0044 .0065 .0087 .0109	.0040 .0061 .0077 .0100	.0036 .0053 .0071 .0089	.0032 .0048 .0065 .0081	.0032 .0048 .0065 .0081	.0032 .0048 .0065 .0081	.0032 .0048 .0065 .0081	.0032 .0048 .0065 .0081	.0032 .0048 .0065 .0081	.0032 .0048 .0065 .0081	.0032 .0048 .0065 .0081	.0032 .0048 .0065 .0081			
.0049 .0073 .0098 .0122	.0045 .0068 .0090 .0113	.0040 .0066 .0090 .0100	.0037 .0055 .0073 .0087	.0035 .0052 .0070 .0087	.0035 .0052 .0070 .0087	.0035 .0052 .0070 .0087	.0035 .0052 .0070 .0087	.0035 .0052 .0070 .0087	.0035 .0052 .0070 .0087	.0035 .0052 .0070 .0087	.0035 .0052 .0070 .0087			

TABLE IV.11.—Minor diameter tolerances for

(UNS and NS threads.

Threads per inch	Tolerance ratios	Lengths of engagement in terms of diameter		Minor diameter tolerances for thread sizes having basic major diameters:									
		Tolerances based on →		0.060	0.073	0.086	0.099	0.112	0.125	0.138	0.164	0.190	
		↓ Above →		0.053	0.066	0.079	0.092	0.105	0.118	0.131	0.151	0.177	
			↓ to → and including	0.066	0.079	0.092	0.105	0.118	0.131	0.151	0.177	0.203	
20	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$										
	$\frac{1}{8}$	$\frac{1}{8} D$	$\frac{1}{8} D$										
	$\frac{1}{4}$	$\frac{1}{4} D$	$\frac{1}{4} D$										
18	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$										
	$\frac{1}{8}$	$\frac{1}{8} D$	$\frac{1}{8} D$										
	$\frac{1}{4}$	$\frac{1}{4} D$	$\frac{1}{4} D$										
16	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$										
	$\frac{1}{8}$	$\frac{1}{8} D$	$\frac{1}{8} D$										
	$\frac{1}{4}$	$\frac{1}{4} D$	$\frac{1}{4} D$										
14	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$										
	$\frac{1}{8}$	$\frac{1}{8} D$	$\frac{1}{8} D$										
	$\frac{1}{4}$	$\frac{1}{4} D$	$\frac{1}{4} D$										
12	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$										
	$\frac{1}{8}$	$\frac{1}{8} D$	$\frac{1}{8} D$										
	$\frac{1}{4}$	$\frac{1}{4} D$	$\frac{1}{4} D$										
10	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$										
	$\frac{1}{8}$	$\frac{1}{8} D$	$\frac{1}{8} D$										
	$\frac{1}{4}$	$\frac{1}{4} D$	$\frac{1}{4} D$										
8	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$										
	$\frac{1}{8}$	$\frac{1}{8} D$	$\frac{1}{8} D$										
	$\frac{1}{4}$	$\frac{1}{4} D$	$\frac{1}{4} D$										
7	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$										
	$\frac{1}{8}$	$\frac{1}{8} D$	$\frac{1}{8} D$										
	$\frac{1}{4}$	$\frac{1}{4} D$	$\frac{1}{4} D$										
6	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$										
	$\frac{1}{8}$	$\frac{1}{8} D$	$\frac{1}{8} D$										
	$\frac{1}{4}$	$\frac{1}{4} D$	$\frac{1}{4} D$										
4	$\frac{1}{16}$	$\frac{1}{16} D$	$\frac{1}{16} D$										
	$\frac{1}{8}$	$\frac{1}{8} D$	$\frac{1}{8} D$										
	$\frac{1}{4}$	$\frac{1}{4} D$	$\frac{1}{4} D$										

\* Tolerances for lengths of engagement in terms of pitch should be selected from equivalent lengths of engagement in terms of diameter ranges.

NOTE.—If the minor-diameter tolerance as selected from the table is less than pitch-diameter tolerance, use the latter. See "Design of Special Threads," appendix 5.



## Internal special screw threads, class SB - Continued

See subsection 5 p. 98.)

Minor diameter tolerances for thread sizes having basic major diameters:													Threads per inch
0.216	0.250	0.3125	0.375	0.4375	0.500	0.5625	0.625	0.6875	0.750	0.8125	0.875	0.9375	
0.263	0.283	0.281	0.344	0.406	0.469	0.531	0.594	0.656	0.719	0.781	0.844	0.906	
0.233	0.281	0.344	0.406	0.469	0.531	0.594	0.656	0.719	0.781	0.844	0.906	0.969	
<i>in.</i> 0.0054 .0081 .0108 .0135	<i>in.</i> 0.0048 .0072 .0096 .0120	<i>in.</i> 0.0044 .0066 .0088 .0110	<i>in.</i> 0.0041 .0062 .0082 .0103	<i>in.</i> 0.0039 .0058 .0078 .0097	<i>in.</i> 0.0039 .0058 .0078 .0097	<i>in.</i> 0.0039 .0058 .0078 .0097	<i>in.</i> 0.0039 .0058 .0078 .0097	<i>in.</i> 0.0039 .0058 .0078 .0097	<i>in.</i> 0.0039 .0058 .0078 .0097	<i>in.</i> 0.0039 .0058 .0078 .0097	<i>in.</i> 0.0039 .0058 .0078 .0097	<i>in.</i> 0.0039 .0058 .0078 .0097	All larger diameters
0.0054 .0081 .0108 .0135	0.0048 .0072 .0096 .0120	0.0044 .0066 .0088 .0110	0.0041 .0062 .0082 .0103	0.0039 .0058 .0078 .0097	0.0039 .0058 .0078 .0097	0.0039 .0058 .0078 .0097	0.0039 .0058 .0078 .0097	0.0039 .0058 .0078 .0097	0.0039 .0058 .0078 .0097	0.0039 .0058 .0078 .0097	0.0039 .0058 .0078 .0097	0.0039 .0058 .0078 .0097	
													20
													18
													16
													14
													12
													10
													8
													7
													6
													4

to a part before plating, whereas the basic diameters (the 2A maximum diameter plus allowance) apply to a part after plating. The minimum diameters of class 2B (internal) threads, whether or not plated or coated, are basic, affording no allowance or clearance in assembly at maximum material limits.

(b) *Allowances and tolerances.*—Allowances for all diameters and pitch diameter tolerances are specified in tables IV.2, IV.2A, IV.5, and IV.8, and their application is shown in figure III.3, p. 24.

3. CLASSES 3A AND 3B.—(a) *Definition.*—Classes 3A for external threads and 3B for internal threads provides for applications where closeness of fit and accuracy of lead and angle of thread are important. They are obtainable consistently only by the use of high quality production equipment supported by a very efficient system of gaging and inspection. The maximum diameters of class 3A (external) threads and the minimum diameters of class 3B (internal) threads, whether or not plated or coated, are basic, affording no allowance or clearance for assembly of maximum metal components.

(b) *Allowances and tolerances.*—No allowance is provided, but since the tolerances on “go” gages are within the limits of size of the product, the gages will assure a slight clearance between product made to the maximum-metal limits. Pitch diameter tolerances are specified in tables IV.6 and IV.9 and their application is shown in figure III. 4, p. 25.

4. SELECTION OF CLASS OF THREAD.—Consideration should first be given to the use of a class 2A external thread with a class 2B internal thread since these classes are designed for general use. The use of class 2A provides that there will always be a small clearance between maximum-material parts except when the external thread is plated. Plated parts are intended to be gaged with basic-size “go” gages. In either case, it is expected that parts will assemble readily without galling or seizing. Tolerances are sufficiently large so that ordinary production methods are generally applicable.

Past experience with similar designs may indicate that a more accurately made or closer fitting thread is required than that which is permitted by classes 2A and 2B tolerances. In such cases consideration should be given to the use of classes 3A and 3B. If these tolerances are not sufficiently close, it may be necessary to apply the American National class 3 tolerances. The necessary increase in cost should not be overlooked.

In some designs there may be advantages in providing for greater average looseness of fit than that obtained with classes 2A and 2B. Such greater average looseness is provided by classes 1A and 1B or the assembly of class 1A external threads with class 2B internal threads. The minimum looseness, however, is the same as for classes 2A and 2B except that a positive allowance is provided

for plated parts. When a greater minimum looseness is requisite to provide for adverse conditions of assembly, class 1AR is available, which is not a Unified class and is based on the American National class 1 allowance combined with class 1A tolerance. These classes also provide larger tolerances to the manufacturer, which may be of advantage if the thread is difficult to produce.

It should be noted that any class of external thread may be associated with any class of internal thread, there being no requirement to combine classes of like number.

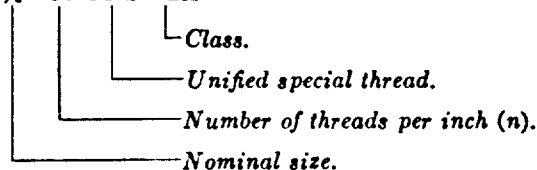
## 5. METHOD OF DESIGNATING

1. STANDARD METHOD OF DESIGNATING.—The method of designating a special thread is by the use of the letters UNS or NS, as indicated in tables IV. 2 to IV. 11, inclusive, preceded by the diameter in inches and the number of threads per inch, all in Arabic characters, and followed by the tolerance classification, with or without pitch diameter tolerances or limits of size. See “Method of designating a screw thread,” p. 26.

The symbol “UNS” is applicable to each of 69 Unified special diameter-pitch combinations listed in table IV.12 which are common to the lists of preferred combinations of the American, British, and Canadian standards.

An example of an external thread designation and its meaning is given as follows:

Example:  $\frac{1}{4}$ —36 UNS—2A



The designation “NS” applies only to threads not listed in table III.2 or IV.12 for which the limits of size are computed from the tables of this section, or increment tables (table III.2), or threads derived from the Unified formulations for all elements.

For all “NS” threads, specifications of the thread class and the pitch diameter limits are required. In addition the specification of the length of engagement is required.

Example:

$\frac{1}{4}$ —24NS—3A (Required)  
PD 0.2229—0.2198 (Required)  
Length of engagement 0.875 (Required)

2. MODIFIED THREADS.—It is occasionally necessary to modify the limits of size of the major diameter of an external thread or the minor diameter of an internal thread from the limits established for special threads in order to fit a specific purpose but without change in class of thread or pitch diameter limits. Such threads should be specified with the established thread designation followed by a statement of the modified diameter limits and the designation “MOD.”

TABLE IV.12.—Unified special diameter-pitch combinations

Preferred diameters	Preferred pitches, threads per inch					
	36	28	20	8	6	4
1/4	36					
5/16	36					
3/8	36					
7/16		28				
1/2		28				
3/4		28				
7/8		28				
1		28				
1 1/8		28	20			
1 1/4			20			
1 3/8				8		
1 1/2			20	8		
1 5/8			20	8	6	
1 3/4			20	8	6	
1 7/8			20	8	6	
2			20	8	6	
2 1/8				8		
2 1/4			20	8	6	
2 1/2			20	8	6	
2 3/4				8	6	
3				8	6	
3 1/4				8	6	
3 1/2				8	6	
3 3/4				8	6	
4				8	6	
4 1/4				8	6	4
4 1/2				8	6	4
4 3/4				8	6	4
5				8	6	4
5 1/4				8	6	4
5 1/2				8	6	4
5 3/4				8	6	4
6				8	6	4

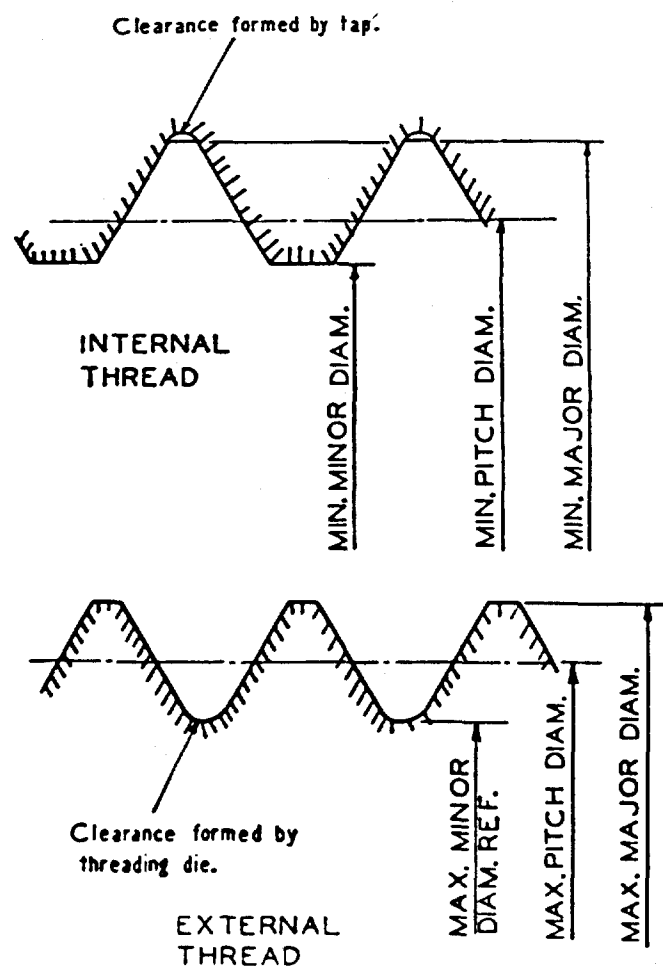


FIGURE IV.1.—Thread dimensions to be determined for a special thread.

TABLE IV.13.—Consolidated method for the calculation of dimensions of special threads

Thread element	External thread				Internal thread		
	Class 1A	Class 1A R	Class 2A	Class 3A	Class 1B	Class 2B	Class 3B
1	2	3	4	5	6	7	8
Major diameter	Nominal size minus allowance			Nominal size	Nominal size		
	Table IV. 2	Table IV. 2A	Table IV. 2				
Tolerance on major diameter	Use value in table IV. 3 or compute in accordance with directions for designing special threads p. 200. Apply minus				None specified as the maximum is established by the crest of an unworn tool		
Pitch diameter	Subtract $3/4H$ , table IV. 1, col. 13 from maximum major diameter				Subtract $3/4H$ , table IV. 1, col. 13 from basic major diameter		
Tolerance on pitch diameter	Table IV. 4 Apply minus	Table IV. 4 Apply minus	Table IV. 5 Apply minus	Table IV. 6 Apply minus	Table IV. 7 Apply plus	Table IV. 8 Apply plus	Table IV. 9 Apply plus
Minor diameter	Subtract $1\ 5/12H$ , table IV. 1, col. 16 from maximum major diameter. This is a reference dimension only				Subtract $1\ 1/4H$ , table IV. 1, col. 15 from the basic major diameter and round off to the nearest 0.001 inch for sizes 0.138 inch and larger. For class 3B a cipher is added to yield four decimal places.		
Tolerance on minor diameter	None specified as the minimum is established by the crest of an unworn tool				For general applications use value for $2/3D$ to $1/2D$ length of engagement from table IV. 10 or IV. 11; for specific applications use values for applicable length of engagement or compute in accordance with directions for designing special threads p. 200. Apply plus to four-place value of min minor diameter and round off for classes 1B and 2B values to the nearest 0.001 inch for sizes 0.138 inch and larger; class 3B values are to be rounded off to the nearest 0.0001 inch.		

**EXAMPLES:**

External thread:  
 2—14 NS—2A MOD.  
 Major diameter 1.995—1.985 MOD.  
 Internal thread:  
 1½—10 NS—3 MOD.  
 Minor diameter 1.398—1.408 MOD.

**3. THREADS OTHERWISE ALTERED**—If a standard series or special thread is altered in any respect other than major or minor diameter, as above stated, it is designated in accordance with the following examples:

Special external thread:  
 ¾—24 Am. Nat. form—SPECIAL  
 Major diameter 0.4340—0.4280 SPL.  
 Pitch diameter 0.4065—0.4025 SPL.  
 Length of engagement ¾ in. min.  
 Special form external thread:  
 ¾—18 SPECIAL FORM  
 Thread angle 60°  
 Major diameter 0.8750—0.8668  
 Pitch diameter 0.8384—0.8343  
 Max. minor diameter 0.8068 (as gaged)  
 Length of engagement 1½ in. min.

## 6. DIRECTIONS FOR DETERMINING LIMITS OF SIZE OF SPECIAL THREADS

The following directions are intended to simplify the task of the designer or specification writer in preparing the specification for a special thread:

The procedure to be followed in determining values for the essential thread elements, as shown in figure IV.1, and the associated tolerances, is outlined in table IV.13. The application of this and other tables is illustrated by the following example:

Internal thread, 1½—28UNS—2B  
 Length of engagement, 1 inch

Min major diameter.....=1.5000 inches  
 Min pitch diameter=basic major diameter—3/4H, table IV.1,=1.5000—0.0232.....=1.4768  
 Max pitch diameter=min pitch diameter+tolerance, table IV.8,=1.4768+0.0060.....=1.4828  
 Min minor diameter=basic major diameter—1¼H, table IV.1,=1.5000—0.0387.....=1.461  
 Max minor diameter=min minor diameter+tolerance, table IV.10,=1.4613+0.0063.....=1.468

The dimensions of the above internal thread may be stated on the drawing as follows:

Major diameter, 1.5000 min  
 Pitch diameter, 1.4768 +0.0060  
 —0.0000  
 Minor diameter, 1.461 +0.0063  
 —0.0000

External thread, 1½—28UNS—2A  
 To mate with the above thread

Max major diameter=basic major diameter—allowance, table IV.2,=1.5000—0.0013.....=1.4987  
 Min major diameter=max major diameter—tolerance, table IV.3,=1.4987—0.0065.....=1.4922  
 Max pitch diameter=max major diameter—3/4H, table IV.1,=1.4987—0.0232.....=1.4755  
 Min pitch diameter=max pitch diameter—tolerance, table IV.5,=1.4755—0.0046.....=1.4709  
 Min minor diameter=max major diameter—1¼H, table IV.1,=1.4987—0.0438.....=1.4549

The dimensions of the above external thread may be stated on the drawing as follows:

Major diameter, 1.4987 +0.0000  
 —0.0065  
 Pitch diameter, 1.4755 +0.0000  
 —0.0046  
 Minor diameter, 1.4549 nominal.

The design of a special thread usually requires that consideration be given to various factors in order that the thread assembly will function properly. These factors are discussed in appendix 5. It is to be noted particularly that deviations from the preferred tolerances for major diameter of the external thread and for minor diameter of the internal thread may be necessary in order to arrive at the optimum design.

## 7. GAGES

The specifications for gages as presented in section VI apply also to gages for special threads. With regard to the marking of gages, each gage shall be plainly marked, for identification, with the diameter, number of threads per inch, and class of thread. NOTE: No class is put on marking for "go" thread plug gages (all classes) and "go" thread ring gages, classes 2, 3, and 3A, because these are basic gages.

## SECTION V. NATIONAL MINIATURE SCREW THREADS

### 1. INTRODUCTION

This standard presents a new thread series to be known as National Miniature Screw Threads and is intended for general purpose fastening screws and similar uses in watches, instruments, and miniature mechanisms.<sup>\*</sup> The series covers a diameter range from 0.30 to 1.40 mm (0.0118 to 0.0551 in.) and thus supplements the Unified and American thread series that begin at 0.060 in. (No. 0 of the machine screw series).

The 14 sizes are systematically distributed, providing a uniformly proportioned selection over the entire range. They are alternately separated into two categories. The sizes shown in italics are selections made in the interest of simplification and are those to which it is recommended that usage be confined wherever the circumstances of design permit. For more restrictive conditions the intermediate sizes shown in light type are available.

The diameter-pitch combinations have been determined to provide both maximum strength against stripping and optimum conditions for manufacture on an interchangeable basis.

<sup>\*</sup> This standard is identical in all technical features with the current draft standard developed by subcommittee No. 4 of ASA Sectional Committee B1 on the Standardization and Unification of Screw Threads. The thread sizes are those endorsed by the American-British-Canadian Conference as the basis for a unified standard among the inch-using countries and coincide with the corresponding range of sizes in ISO (International Organization for Standardization) Recommendation No. 84. Additionally, it utilizes thread forms which are compatible in all significant respects with both the Unified and ISO basic thread profiles. Thus, this thread series is in both the American-British-Canadian and the ISO standardization programs.

The values of all dimensions are supplied in both metric and inch units. The standard being basically metric, only the metric values of the nominal diameters and pitches are rational. Consequently, metric units are stipulated for all formulas and the inch dimensions derived by conversion of the unrounded metric values, using the conversion factor 25.4 mm/in.<sup>10</sup>

Use of this series is recommended on all new products in place of the many improvised and unsystematized sizes now in existence that have never arrived at broad acceptance nor recognition by any standardization bodies.

## 2. FORM OF THREAD

1. **BASIC THREAD FORM.**—The theoretical profile on which the design forms of the threads covered by this standard are based is, except for one element, the Unified and American basic thread form as specified in section III and shown in figure V. 1. In exception is thread height, for which a basic value of  $0.52p$  is used instead of  $0.54127p$  ( $=5H/8$ ). Selection of this value is based on the extensive simplification that it

<sup>10</sup> American Standard ASA B48.1-1933.

affords throughout the calculations for this standard. Resulting coefficients in the formulas for many of the other thread dimensions derived from this property thereby become simple, finite multiples of the lowest common denominator (40) of the fractional equivalents of all but two of the metric pitches, thus yielding values for the majority of metric dimensions that are finite within the decimal place limits of the tables. Also, the calculation of inch equivalents from the terminal metric values is thereby simplified and discrepancies between the metric and inch tables kept to a minimum. This modification will not affect interchangeability with product made to any other standards retaining  $0.54127p$ , as the resulting difference is negligible and completely offset by practical considerations in tapping, full internal thread heights being invariably avoided in these small sizes to escape excessive tap breakage.

2. **DESIGN FORMS OF THREADS.**—The design forms (maximum material condition) of external and internal National Miniature threads are shown in figure V.2.

3. **BASIC THREAD DATA.**—(a) *Thread form.*—The formulas for the various features of the thread form are as follows:

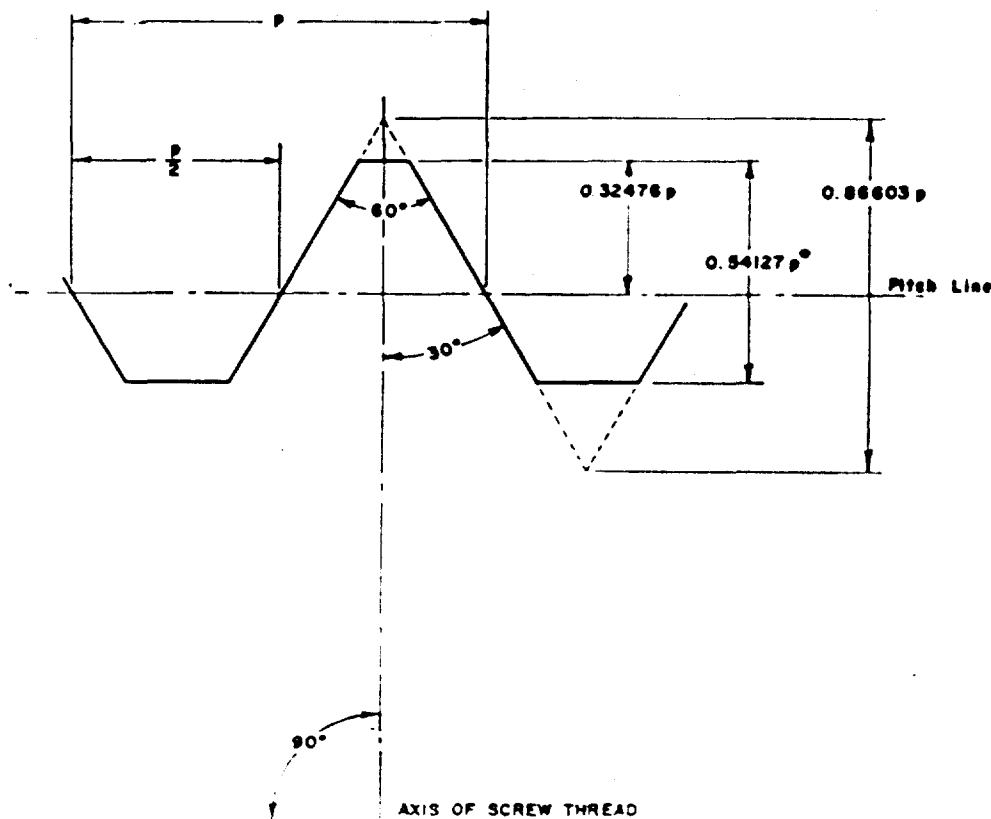


FIGURE V.1—Basic thread form, National Miniature threads.



Dimension	Symbol	Formula <sup>a</sup>
Basic thread form		
Angle of thread	$2\alpha$	60°.
Half angle of thread	$\alpha$	30°.
Pitch of thread	$p$	
No. of threads per inch	$n$	25.4/ $p$ .
Height of sharp-V thread	$H$	0.866025 $p$ .
Addendum of basic thread	$h_{ab}$	0.32476 $p$ .
Height of basic thread (Unified and ISO) <sup>b</sup>	$h_b$	0.54127 $p$ .
Height of basic thread (NM series).	$h_b$	0.52 $p$ .
Design thread form		
Addendum of external thread	$h_{ae}$	0.32476 $p$ .
Height of external thread	$h_a$	0.60 $p$ .
Flat at crest of external thread	$r_{ea}$	0.125 $p$ .
Radius at root of external thread	$r_{ra}$	0.158 $p$ (approx.).
Depth of thread engagement	$h_e, h_t$	0.52 $p$ .
Height of internal thread	$h_n$	0.556 $p$ .
Flat at crest of internal thread	$r_{en}$	0.27456 $p$ .
Radius at root of internal thread	$r_{rn}$	0.072 $p$ (approx.).

<sup>a</sup> The formulas are applied to the metric values of  $p$ . Tabulated inch dimensions are derived from the unrounded metric dimensions.  
<sup>b</sup> This item is listed for reference only. For the present standard all dependent details of thread form and dimensions are based on a height of 0.52 $p$ .

The corresponding thread data for the various standard pitches are shown in table V.1.

(b) *Thread sizes.* The formulas for basic and design thread sizes are as follows:

Dimension	Symbol	Formula
Major diameter, nominal and basic	$D$	
Major diameter of external thread	$D_a$	$D$ .
Major diameter of internal thread	$D_n$	$D - 2h_b + 2h_{an} = D - 0.072p$ .
Pitch diameter, basic	$E$	$D - 2h_{ab} = D - 0.64952p$ .
Pitch diameter of external thread	$E_a$	$E$ .
Pitch diameter of internal thread	$E_n$	$E$ .
Minor diameter, basic	$K$	$D - 2h_b = D - 1.04p$ .
Minor diameter of external thread	$K_a$	$D - 2h_a = D - 1.20p$ .
Minor diameter of internal thread	$K_n$	$K$ .

TABLE V.1. Thread form data, National Miniature screw threads

Basic		External thread								Internal thread		
Threads per inch <sup>a</sup>	Pitch, $p$	Height of sharp V thread, $H$ 0.866025 $p$	Height, $h_b$ 0.52 $p$	Addendum, $h_{ab}$ 0.32476 $p$	Height, $h_a$ 0.60 $p$	Flat at crest, $r_{ea}$ 0.125 $p$	Radius at root, $r_{ra}$ 0.158 $p$	Basic for minimum flat at root 0.61 $p$	Min. flat at root, $r_{en}$ 0.136 $p$	Height, $h_n$ 0.556 $p$	Flat at crest, $r_{en}$ 0.27456 $p$	Radius at root, $r_{rn}$ 0.072 $p$
1	2	3	4	5	6	7	8	9	10	11	12	13
	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>
0.050	0.0050	0.0050	0.0116	0.0250	0.018	0.0100	0.0126	0.0512	0.0109	0.0115	0.0230	0.0058
0.060	0.0060	0.0060	0.0138	0.0292	0.024	0.0112	0.0142	0.0576	0.0122	0.0130	0.0247	0.0065
0.080	0.0080	0.0080	0.0184	0.0392	0.032	0.0125	0.0158	0.0800	0.0136	0.0146	0.0275	0.0072
0.100	0.0100	0.0100	0.0230	0.0492	0.040	0.0138	0.0198	0.0960	0.0150	0.0162	0.0313	0.0080
0.125	0.0125	0.0125	0.0288	0.0618	0.050	0.0156	0.0237	0.0960	0.0170	0.0184	0.0343	0.0090
0.150	0.0150	0.0150	0.0346	0.0744	0.060	0.0168	0.0277	0.0960	0.0204	0.0220	0.0374	0.0108
0.175	0.0175	0.0175	0.0404	0.0870	0.070	0.0180	0.0277	0.1120	0.0218	0.0236	0.0404	0.0126
0.200	0.0200	0.0200	0.0462	0.0996	0.080	0.0192	0.0316	0.1280	0.0232	0.0252	0.0434	0.0144
0.225	0.0225	0.0225	0.0520	0.1122	0.090	0.0204	0.0356	0.1440	0.0246	0.0268	0.0464	0.0162
0.250	0.0250	0.0250	0.0578	0.1248	0.100	0.0216	0.0396	0.1600	0.0260	0.0284	0.0494	0.0180
0.300	0.0300	0.0300	0.0696	0.1512	0.120	0.0252	0.0474	0.1920	0.0308	0.0336	0.0584	0.0216
	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
317½	0.003150	0.003150	0.00101	0.00101	0.00186	0.00039	0.00050	0.00202	0.00013	0.00175	0.00086	0.00023
282½	0.003543	0.003543	0.00114	0.00115	0.00213	0.00044	0.00056	0.00227	0.00018	0.00196	0.00097	0.00026
254	0.003937	0.003937	0.00128	0.00128	0.00236	0.00049	0.00062	0.00252	0.00024	0.00219	0.00108	0.00028
203½	0.004921	0.004921	0.00156	0.00156	0.00295	0.00062	0.00078	0.00315	0.00037	0.00274	0.00135	0.00035
169½	0.005999	0.005999	0.00191	0.00192	0.00354	0.00074	0.00092	0.00378	0.00046	0.00328	0.00162	0.00043
145½	0.006990	0.006990	0.00228	0.00228	0.00413	0.00086	0.00109	0.00444	0.00054	0.00384	0.00190	0.00050
127	0.007874	0.007874	0.00264	0.00264	0.00472	0.00098	0.00124	0.00504	0.00062	0.00438	0.00216	0.00057
112½	0.008858	0.008858	0.00300	0.00300	0.00531	0.00111	0.00141	0.00567	0.00070	0.00493	0.00243	0.00064
101½	0.009843	0.009843	0.00336	0.00336	0.00590	0.00123	0.00156	0.00630	0.00078	0.00547	0.00270	0.00071
84½	0.011811	0.011811	0.00404	0.00404	0.00709	0.00148	0.00187	0.00756	0.00094	0.00657	0.00324	0.00085

<sup>a</sup> In all subsequent tables these values are rounded to the nearest whole number.

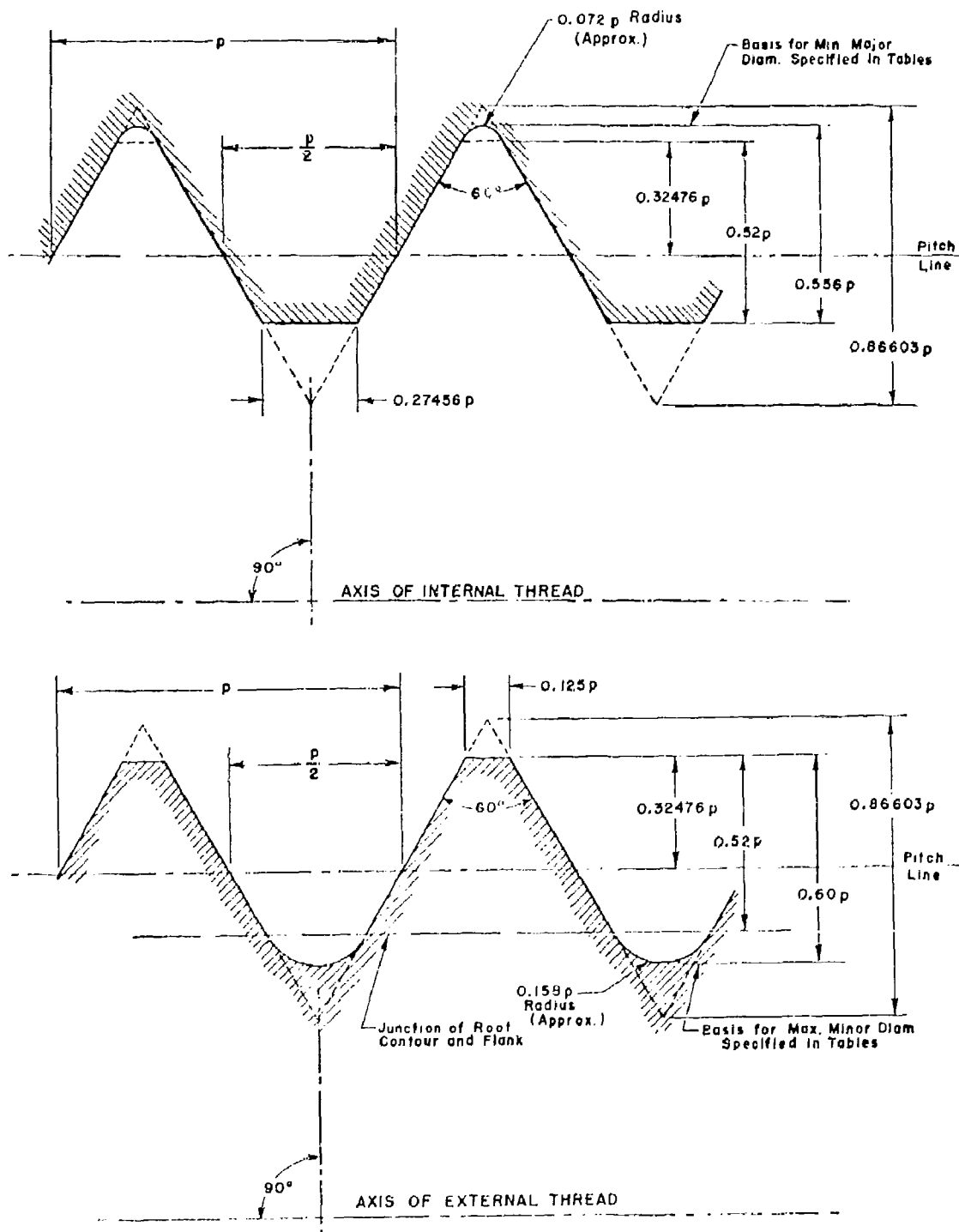


FIGURE V.2. — National Miniature internal and external screw thread design forms (maximum material condition).

### 3. NATIONAL MINIATURE THREAD SERIES

The diameter-pitch combinations which constitute the National Miniature thread series, and the design sizes, are those shown in table V.2, p. 104. All threads are of the single (single-start) type.

### 4. CLASSIFICATION AND TOLERANCES

1. CLASSIFICATION.—There is established herein only one class of thread, with zero allowance on all diameters.

2. TOLERANCES.—All tolerances governing limits of size are based on functions of the pitch only and apply to lengths of engagement from  $\frac{3}{4}$  to  $1\frac{1}{2}$  times the nominal diameter. (See note, table V.3, p. 107.) The limits of size resulting from the application of the specified tolerances are illustrated in figure V.3, p. 106. Length of engagement and nominal diameter have not been incorporated in any of the tolerance formulas in view of the following: (1) In the small thread sizes covered by this standard, lengths of engagement appreciably below or above the range covered by the formulas are seldom employed. (2) Functional fitness in these small sizes is dependent principally upon the properties of the thread rather than the size of the threaded member. (3) Total tolerances are too small to permit the imposition of minor order modifications.

(a) *Tolerances on external threads.*—Tolerances on external threads are applied to the design sizes in the minus direction. They are tabulated in table V.3, p. 105, and are based on the following formulas:

Tolerances on major diameter are equal to  $0.12p + 0.006$ .<sup>11</sup>

Tolerances on pitch diameter are equal to  $0.08p + 0.008$ .<sup>11</sup>

Tolerances on minor diameter are equal to  $0.16p + 0.008$ .<sup>11</sup>

The third formula is for reference only. In practice, the form of the threading tool is relied upon for controlling the minimum minor diameter, and this limit is not gaged, except in confirming new tools.

(b) *Tolerances on internal threads.*—Tolerances on internal threads are applied to the design sizes in the plus direction. They are tabulated in table V.3, p. 105.

Tolerances on major diameter are equal to  $0.168p + 0.008$ .<sup>11</sup> This formula is for reference only and is comprised of the pitch diameter tolerance and an extension of the thread form of  $0.08p$  beyond the basic major diameter. In practice, this limit is applied to the threading tool (tap) and is not gaged on the product.

Tolerances on pitch diameter are equal to  $0.08p + 0.008$ .<sup>11</sup>

Tolerances on minor diameter are equal to  $0.32p + 0.012$ .<sup>11</sup>

<sup>11</sup> Metric units (in millimeters) apply in these formulas. Inch tolerances are not derived by direct conversion of the metric values but are the differences between the rounded-off limits of size in inch units.

TABLE V.2. Basic and design sizes, National Miniature thread series

Size designation	Pitch, $p$	Basic major diameter, $D$	Basic pitch diameter, $F$ , $D - 0.64952p$	Minor diameter external threads, $K$ , $D - 1.20p$	Minor diameter internal threads, $K$ , $K = D - 1.04p$	Major diameter threads, $D$ , $D + 0.072p$	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D - 1.20p$
1	2	3	4	5	6	7	8	9
	mm	mm	mm	mm	mm	mm	deg mm	mm <sup>2</sup>
30NM	0.080	0.300	0.248	0.204	0.217	0.366	5 52	0.0597
35NM	.090	.350	.292	.242	.256	.406	5 37	.0723
40NM	.100	.400	.336	.290	.296	.467	5 26	.0851
45NM	.100	.450	.385	.336	.346	.517	4 44	.0814
60NM	.125	.500	.419	.350	.370	.609	5 26	.0668
65NM	.125	.550	.469	.400	.420	.659	4 51	.1195
60NM	.150	.600	.503	.420	.444	.611	5 26	.1297
70NM	.175	.700	.596	.490	.518	.713	5 26	.1780
80NM	.200	.800	.679	.560	.592	.811	5 26	.232
90NM	.225	.900	.754	.630	.666	.916	5 26	.291
100NM	.250	1.000	.838	.700	.740	1.018	5 26	.363
110NM	.270	1.100	.938	.800	.840	1.118	4 51	.458
120NM	.270	1.200	1.038	.900	.940	1.218	4 33	.668
140NM	.300	1.400	1.205	1.040	1.088	1.422	4 32	.811
	threads per inch	in.	in.	in.	in.	in.	deg mm	sq in. $\times 10^{-4}$
30NM	318	0.0118	0.0098	0.0080	0.0085	0.0120	5 52	0.455
35NM	292	.0138	.0115	.0095	.0101	.0140	5 37	.671
40NM	254	.0157	.0132	.0110	.0117	.0160	5 26	.961
45NM	254	.0177	.0152	.0130	.0136	.0180	4 44	1.262
60NM	203	.0197	.0165	.0138	.0146	.0200	5 26	1.407
65NM	203	.0217	.0185	.0157	.0165	.0220	4 51	1.872
60NM	169	.0246	.0198	.0165	.0175	.0240	5 26	2.03
70NM	145	.0276	.0231	.0193	.0204	.0281	5 26	3.76
80NM	127	.0315	.0264	.0220	.0233	.0321	5 26	5.06
90NM	113	.0354	.0297	.0248	.0262	.0361	5 26	6.56
100NM	102	.0394	.0330	.0275	.0290	.0404	5 26	8.22
110NM	102	.0433	.0369	.0315	.0331	.0440	4 51	9.41
120NM	102	.0472	.0404	.0354	.0370	.0480	4 33	14.43
140NM	86	.0551	.0474	.0409	.0428	.0540	4 32	12.57

3. **ROOT FLATS.**—The width of flat at the root of external threads,  $F_{ra}$ , at the minimum-material condition is  $0.136p$ , corresponding to a thread height of  $0.64p$ . Values for the various pitches are given in table V.1, page 102.

4. **COATED THREADS.**—It is not within the scope of this standard to make recommendations for thicknesses of, or to specify limits for, coatings. However, it is obvious that in these small sizes any coatings applied must be kept thin because of the smallness of the threads. Generally, the coatings employed in practice are confined to those of the electroplated or oxide types and are limited to a flash thickness. For applications where these coatings are inadequate the product is usually made of a corrosion-resistant material, thereby avoiding the problems attendant to providing for heavier coatings. However, where coatings of a measurable thickness are required, it is essential that they be included within the maximum-material limits since no allowance is provided between these limits of the external and internal thread. In other words, the maximum material limits given in this standard apply to both uncoated and coated threads.

## 5. THREAD DESIGNATIONS

Screw threads of this series shall be designated on engineering drawings, in specifications, and on tools and gages (when space permits) by the size designations shown in the first column of table V.2, in which the symbol "NM" designates the National Miniature series. To these designations may be affixed, in parentheses, the inch equivalent of the basic major diameter, but this addition is optional. Thus, for example, the thread size identified by the designation 80 NM may also be designated 80 NM (0.0315).

## 6. LIMITS OF SIZE

The limits of size of both external and internal threads, resulting from the application of the specified tolerances, are given in table V.3, p. 105, in both the metric and English systems and are illustrated in figure V.3. For hole size limits before tapping, see appendix 3, table 3.3 and figure 3.2, pp. 186, 193.

TABLE V.3.—Limits of size and tolerances, National Miniature thread series

Size designation <sup>a</sup>	Pitch	External threads									Internal threads							
		Major diameter limits			Pitch diameter limits			Minor diameter limits		Minor diameter limits	Pitch diameter limits			Major diameter limits		Minor diameter limits	Pitch diameter limits	Major diameter limits
		Max.	Min.	Tol.	Max.	Min.	Tol.	Max. <sup>b</sup>	Min. <sup>c</sup>		Max.	Tol.	Min.	Max.	Tol.	Min. <sup>d</sup>	Max. <sup>e</sup>	Min. <sup>f</sup>
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
30NM	0.080	0.300	0.284	0.016	0.218	0.234	0.014	0.204	0.183	0.217	0.234	0.037	0.218	0.202	0.016	0.206	0.227	0.307
35NM	0.090	0.350	0.333	0.017	0.292	0.277	0.015	0.242	0.220	0.256	0.297	0.041	0.292	0.267	0.025	0.286	0.311	0.380
40NM	0.100	0.400	0.382	0.018	0.335	0.319	0.016	0.280	0.256	0.296	0.340	0.044	0.335	0.311	0.024	0.325	0.350	0.432
45NM	0.100	0.450	0.432	0.018	0.385	0.369	0.016	0.330	0.306	0.346	0.390	0.044	0.385	0.361	0.024	0.375	0.400	0.482
50NM	0.125	0.500	0.479	0.021	0.419	0.401	0.018	0.350	0.322	0.370	0.422	0.052	0.419	0.397	0.022	0.409	0.431	0.538
55NM	0.125	0.550	0.529	0.021	0.469	0.451	0.018	0.400	0.372	0.420	0.472	0.052	0.469	0.447	0.022	0.459	0.481	0.588
60NM	0.150	0.600	0.576	0.024	0.503	0.483	0.020	0.420	0.388	0.444	0.504	0.056	0.503	0.479	0.024	0.493	0.519	0.644
70NM	0.175	0.700	0.673	0.027	0.586	0.564	0.022	0.490	0.454	0.518	0.586	0.068	0.586	0.560	0.026	0.576	0.600	0.759
80NM	0.200	0.800	0.770	0.030	0.679	0.646	0.024	0.560	0.520	0.592	0.668	0.076	0.670	0.634	0.034	0.660	0.694	0.856
90NM	0.225	0.900	0.867	0.033	0.754	0.728	0.026	0.630	0.589	0.666	0.750	0.084	0.754	0.720	0.034	0.744	0.778	0.962
100NM	0.250	1.000	0.964	0.036	0.808	0.780	0.028	0.700	0.659	0.740	0.822	0.092	0.828	0.792	0.036	0.818	0.852	1.063
110NM	0.250	1.100	1.063	0.036	0.898	0.869	0.028	0.800	0.759	0.840	0.922	0.092	0.928	0.892	0.036	0.918	0.952	1.193
120NM	0.250	1.200	1.164	0.036	1.038	1.010	0.028	0.900	0.859	0.940	1.032	0.092	1.038	1.002	0.036	1.028	1.062	1.293
140NM	0.300	1.400	1.358	0.042	1.205	1.173	0.032	1.040	0.984	1.068	1.196	0.108	1.205	1.167	0.038	1.195	1.233	1.480
<i>threads per in.</i>																		
30NM	318	0.0118	0.0112	0.0006	0.0098	0.0092	0.0006	0.0080	0.0072	0.0085	0.0100	0.0015	0.0098	0.0104	0.0006	0.0120	0.0129	0.0129
35NM	282	0.0138	0.0131	0.0007	0.0115	0.0109	0.0006	0.0095	0.0086	0.0101	0.0117	0.0016	0.0115	0.0121	0.0006	0.0140	0.0149	0.0149
40NM	254	0.0157	0.0150	0.0007	0.0132	0.0126	0.0006	0.0110	0.0101	0.0117	0.0134	0.0017	0.0132	0.0138	0.0006	0.0160	0.0170	0.0170
45NM	254	0.0177	0.0170	0.0007	0.0152	0.0145	0.0007	0.0130	0.0120	0.0136	0.0154	0.0018	0.0152	0.0158	0.0006	0.0180	0.0190	0.0190
50NM	203	0.0197	0.0189	0.0008	0.0165	0.0158	0.0007	0.0138	0.0127	0.0146	0.0166	0.0020	0.0165	0.0172	0.0007	0.0200	0.0212	0.0212
55NM	203	0.0217	0.0208	0.0009	0.0185	0.0177	0.0008	0.0157	0.0146	0.0165	0.0186	0.0021	0.0185	0.0192	0.0007	0.0220	0.0231	0.0231
60NM	169	0.0236	0.0227	0.0009	0.0198	0.0190	0.0009	0.0165	0.0153	0.0175	0.0198	0.0023	0.0198	0.0206	0.0009	0.0240	0.0251	0.0251
70NM	145	0.0276	0.0265	0.0011	0.0231	0.0222	0.0009	0.0192	0.0179	0.0204	0.0231	0.0027	0.0231	0.0240	0.0009	0.0280	0.0291	0.0291
80NM	127	0.0315	0.0303	0.0012	0.0264	0.0254	0.0010	0.0220	0.0206	0.0233	0.0263	0.0030	0.0263	0.0273	0.0009	0.0320	0.0337	0.0337
90NM	113	0.0354	0.0341	0.0013	0.0297	0.0287	0.0010	0.0248	0.0234	0.0262	0.0295	0.0033	0.0297	0.0307	0.0010	0.0360	0.0379	0.0379
100NM	102	0.0394	0.0380	0.0014	0.0330	0.0319	0.0011	0.0276	0.0262	0.0291	0.0327	0.0036	0.0330	0.0341	0.0011	0.0400	0.0420	0.0420
110NM	102	0.0433	0.0419	0.0014	0.0369	0.0358	0.0011	0.0315	0.0299	0.0331	0.0367	0.0036	0.0369	0.0380	0.0011	0.0440	0.0460	0.0460
120NM	102	0.0472	0.0458	0.0014	0.0409	0.0397	0.0012	0.0354	0.0337	0.0369	0.0406	0.0036	0.0409	0.0420	0.0011	0.0480	0.0500	0.0500
140NM	85	0.0551	0.0535	0.0016	0.0474	0.0462	0.0012	0.0409	0.0387	0.0428	0.0471	0.0043	0.0474	0.0485	0.0013	0.0560	0.0583	0.0583

<sup>a</sup> Sizes shown in Italics are preferred. It is recommended that selections be confined to these sizes insofar as possible.

<sup>b</sup> This limit, in conjunction with root form shown in figure V.2, is advocated for use when optical projection methods of racing are employed. For mechanical gauging the minimum minor diameter of the internal thread is applied.

<sup>c</sup> This limit is provided for reference only. In practice, the form of the threading tool is relied upon for this limit. Control by gaging is not imposed.

<sup>d</sup> This limit is provided for reference only, and is not forced. For gaging, the maximum major diameter of the external thread is applied.

NOTE.—Tol. limits in this table have been determined by direct conversion of corresponding metric dimensions prior to rounding off. Tol. tolerances are the differences between the inch limits and, consequently, differ in some instances by 0.0001 inch from the inch equivalent of the metric tolerance.

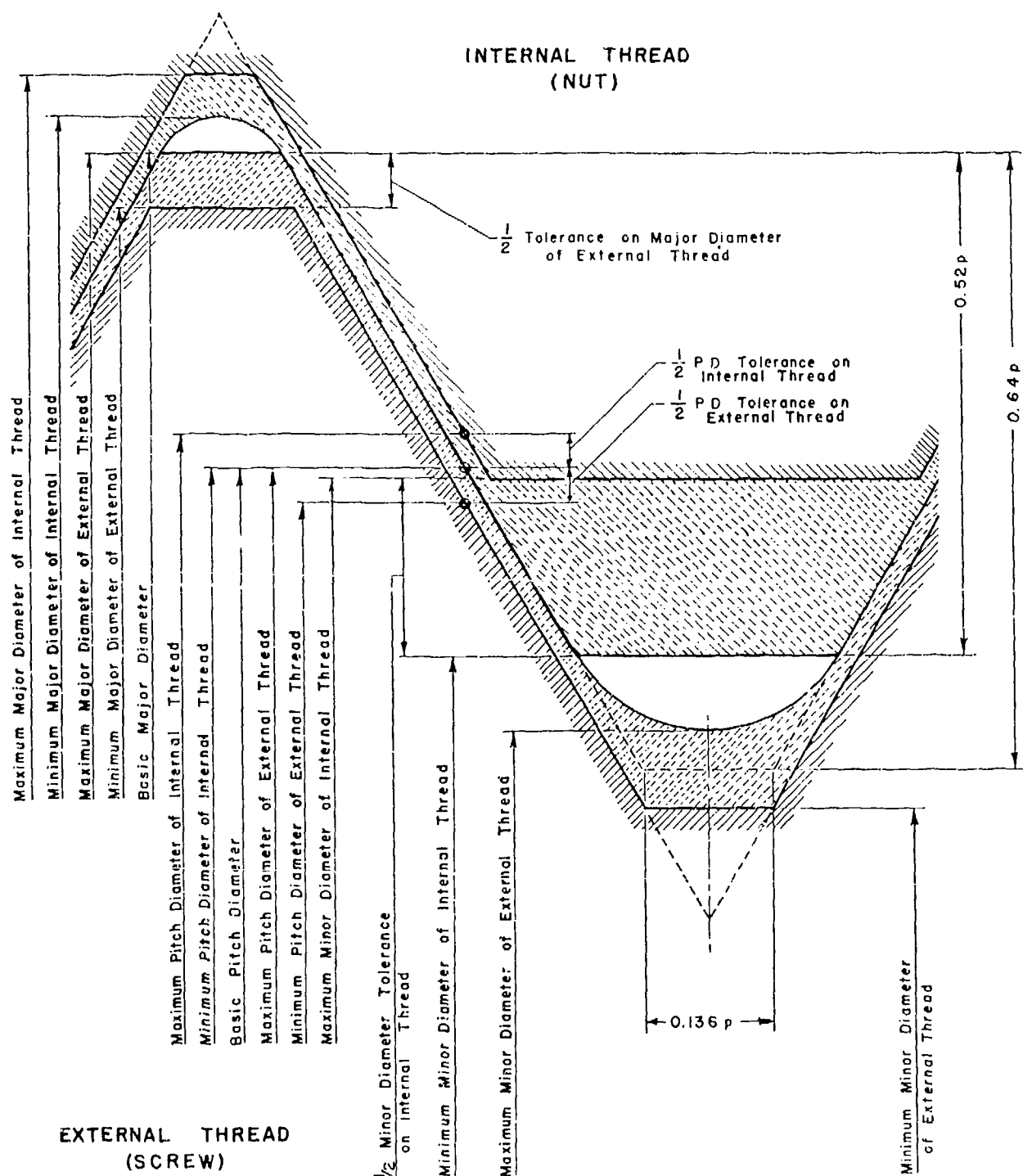


FIGURE V.3.—Disposition of tolerances and crest clearances, National Miniature threads.



## 7. GAGES AND GAGING

The development of a gaging standard for National Miniature threads is anticipated after the accumulation of more experience with this new standard. The following procedures are at present being successfully used by some producers:

1. **GAGING OF EXTERNAL THREADS.**—The major diameter of the external thread is inspected by either contact gaging or optical projection. All other dimensions, such as pitch diameter, lead, thread form, and minor diameter are inspected by optical projection methods. There is presented in figure V.4 an illustration of a chart which has been found very satisfactory for the optical projection method of inspection of external threads. Inspection at a magnification of 100 is recommended and at this scale the charts should be accurate to within  $\pm 0.01$  in. on all diameters and  $\frac{1}{4}$  on pitches cumulatively up to five.

2. **GAGING OF INTERNAL THREADS.**—The minor diameter of the internal thread is gaged with "go" and "not go" plain cylindrical plug gages. All other elements are checked only for assembleability limits by means of a "go" thread plug gage. For the minimum-material limit of the internal thread the accuracy and performance of the tap is relied upon. This implies that the major and pitch diameters of the tap do not exceed the maximum internal thread limits for these elements and disregards overcutting, which is rarely incurred because of the flexibility of these small taps and the manner in which they are generally fluted.

## SECTION VI. GAGES AND GAGING FOR UNIFIED, AMERICAN, AND AMERICAN NATIONAL THREADS

## 1. INTRODUCTION

Gaging of screw threads is the process of investigating or determining the extent to which they conform dimensionally to prescribed limits of size. Dimensional gages are the means applied for that purpose.

This standard for gages and gaging practice is supplementary to sections III and IV, and appendixes 1 and 2, and is intended to facilitate adherence to the limits of size specified therein without in any sense restricting the requirements more severely than those specified. Adherence to the gaging principles laid down, which have been tested by many years of practical use, will assure assembleability of threads interchangeably, the acceptance of satisfactory threads, and segregation or rejection of threads that are significantly outside of prescribed limitations.

There are two general methods of approach to the dimensional inspection of threads, namely inspection by attributes and inspection by variables. Inspection by attributes involves the application of limit gages to assure that the product is within the prescribed limits of size, whereas inspection by variables involves the application of indicating gages or measuring instruments to measure the extent of deviation of the elements of screw threads from prescribed

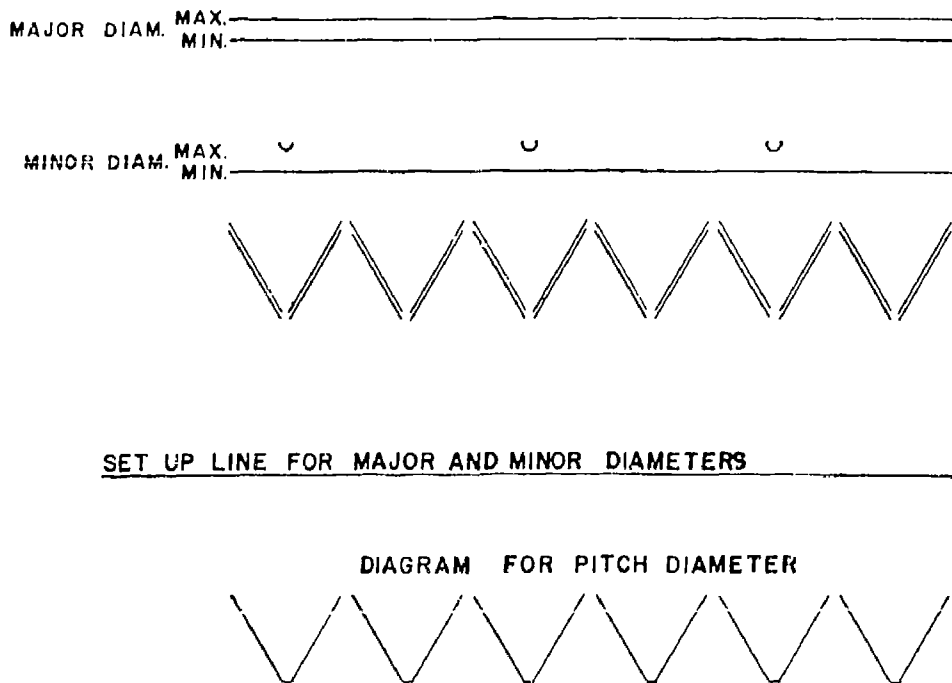


FIGURE V.4.—Suggested chart for projection inspection of external National Miniature threads.

limits of size. Inspection by variables is primarily useful in the control of production tools and processes. Such inspection may be applied, when necessary, to enforce the limits on deviations of individual thread elements, stated on pp. 22, 79, and 130, or to collect data for the analysis of screw thread defects. However, inspection by attributes generally forms the basis for the acceptance or rejection of threads with respect to conformity to specified limits of size.

## 2. FUNDAMENTALS

1. **GAGE CLASSIFICATION.**—The limits of size of the threads to be produced should be represented in: (1) Gages used in checking the threads as they are produced, known as “working gages”; (2) gages for use in the acceptance of the product, known as “inspection gages”; and (3) gages used to determine the accuracy of the two preceding classes of gages, known as “master” and “setting gages.”

2. **GAGES FOR REFERENCE.**—(a) *Master gage.*—The master gage is a thread plug gage which represents the physical dimensions of the basic size of the part. It clearly establishes the minimum size of the internal thread and the maximum size of the external thread at the point at which interference between mating parts begins when no allowance is provided. A master gage shall be accompanied by a record of its measurement.

(b) *Setting gage (check gage).*—(1) *Threaded setting gages.*—A setting gage is a thread plug gage to which adjustable thread ring gages, thread snap gages, and other thread comparators are set to size. Threaded setting plug gages are of two standard designs, which are designated as “basic-crest setting plugs” and “truncated setting plugs.”

The basic-crest setting plug is one having a width of flat at the crest equal to  $p/8$ . It is commonly used for setting thread snap gages and is also used for setting adjustable thread ring gages to size, when adequate facilities are available for checking the thread form and clearance at the major diameter. (See “procedure,” p. 118.)

The truncated setting plug of standard design<sup>12</sup> is the same as the basic-crest setting plug except that the crest of the thread is truncated for one-half of the length of the gage, giving a full-form portion and a truncated portion, as specified in par. 2 (a) p. 111. In setting thread gages to size, the truncated portion controls the pitch diameter, and the full-form portion assures that proper clearance is provided at the major diameter of the ring gage. Also, the use of the full-form portion in conjunction with the truncated portion checks to some degree the flank angle of the thread gage.

(2) *Plain cylindrical plug acceptance check gages.*—“Go” and “not go” plain cylindrical plug acceptance check gages are required to check the minor diameter limits of thread ring gages of the smaller

sizes, after the gage has been properly set to the thread setting plug gage. Standard measuring equipment is usually employed in lieu of plain cylindrical plug gages for sizes larger than  $\frac{3}{8}$  in. nominal diameter thread.

3. **LIMIT GAGES.**—Limit gages are of two categories, namely (1) maximum-metal-limit gages, designated “go” gages, and (2) minimum-metal-limit gages, designated “not go” gages.

(a) *Maximum-metal or “go” gages.*—The maximum-metal-limit or “go” gages check or control the extent of the tolerance, as applied to a specific screw thread, in the direction of the limit of maximum material and represent the maximum limit of external threads and the minimum limit of internal threads. The ideal maximum-metal-limit or “go” gage is a threaded counterpart of the thread, made exactly to its prescribed maximum-material limits and in length equal to the length of engagement of the thread with its mating thread. Such gages would most nearly duplicate the assembly conditions of threads. They control the virtual diameter (or effective size) at the maximum-material limit. See “Acceptability of Threads,” p. 118.

(b) *Minimum-metal or “not go” gages.*—The minimum-metal gages control the extent of the tolerance in the direction of the limit of minimum material and represent the minimum limit of external threads and the maximum limit of internal threads.

As stated on p. 22, the minimum-material pitch diameter limits are necessarily a limitation of the pitch diameter as a single thread element. Also, it is a principle of limit gaging that each element or dimension can be checked only singly by a minimum-metal-limit gage. Accordingly, separate gages are required to check pitch, major, and minor diameters at minimum-material limits. That is, for external threads two gages are necessary, one to check the major diameter and the other, pitch diameter; internal threads require a gage to check the pitch diameter and the other, minor diameter. A third factor in minimum-material-limit gaging is nontechnical but of practical importance, namely the economics of the gaging means and procedures, as thorough checking of a thread requires several individual gaging operations along and around the thread. It is not feasible, therefore, to establish an ideal gage design for gaging pitch diameter and approach that ideal closely in practice, as is done for maximum-metal-limit gages.

As a result, two distinct gaging practices are widely used, as follows:

(1) The use of “not go” thread plug and ring gages provides a satisfactory means of gaging when proper functioning of the thread assembly only requires control of the virtual diameter (or effective size) of the threads at the minimum material limits. The use of such gages is referred to as “virtual diameter (or effective size) gaging practice.” See “Acceptability of Threads,” p. 118.

<sup>12</sup> See Commercial Standard C28, for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. The latest revision should be consulted when referring to such standards.

(2) The use of "not go" thread snap or indicating gages conforming to the thread length requirements stated on p. 114, controls to a close degree the pitch diameter at the minimum-material limit as a single element. Thus, without further checking, their use provides an economical means of control over such other variables as lead, uniformity of helix, flank angle, taper, roundness, and surface condition. The use of such gages, however, is referred to as "single element gaging practice." See "Acceptability of Threads," p. 118.

4. **DIRECTION OF TOLERANCES ON GAGES.**—The dimensions of all gages used for the *production* of screw threads and "go" gages used for inspection shall be within the extreme limits of size of the product. The limits of size specified for screw threads represent the extreme limitation of an acceptable product. The tolerances are those necessary to include all errors or variations in the sizes of *production* tools, gages, and all other manufacturing variations. However, in order to avoid needless controversy on parts close to the minimum-material sizes or "not go" limits, because of possible small differences in sizes of the gages used, the pitch diameter tolerances on all "not go" gages used for *final inspection* and for inspection of purchased product may be outside the product limits if specifically authorized.

5. **TEMPERATURE AT WHICH GAGES SHALL BE STANDARD.**—*The nominal dimensions of gages and product shall be correct at a temperature of 68° F (20° C).* As gages and products are ordinarily checked at room temperature, whatever it may happen to be, it is desirable that the coefficient of thermal expansion of gages be the same as that of the product on which they are used. Inasmuch as the majority of threaded products consist of iron and steel, and as screw-thread gages are ordinarily made of hardened steel, this condition is ordinarily fulfilled without giving it special attention.

6. **MEASURING PRESSURE FOR WIRE MEASUREMENTS.**<sup>13</sup> In measuring the pitch diameter of hardened screw-thread gages by means of wires, and in measuring the wires themselves, the same contact load should be used. A contact load of 1 lb is recommended for pitches finer than 20 threads per inch and 2½ lb for 20 threads per inch and coarser. It is also recommended as standard practice that wires be measured between a flat contact and a cylindrical contact 0.750 in. in diameter. The contacts shall be of hardened steel, accurately ground and lapped.

### 3. SPECIFICATIONS FOR GAGE ELEMENTS

The design of gages is specified in this section only to the extent that it affects the results obtained in the gaging of threads. Other details of design and dimensions are left to the discretion

of individual departments and agencies of the Government. However, to serve their intended purposes satisfactorily, thread gages should be produced by employing only the latest and best manufacturing techniques. The type of steel or wear-resistant material selected, together with the heat-treating and stabilization processes, should provide for maximum wear life and reduce the dimensional instability to a minimum, thereby insuring that the gages will remain within the tolerances specified over a maximum period. Thread gages should be precision plug or ring lapped to insure adequate refinement of surface finish, removal of amorphous or smear metal after grinding, and uniformity of thread form over the entire length of the gaging member.

#### (a) GENERAL DESIGN

1. **DESIGN OF GAGE BLANKS.**—Designs of standard blanks for thread plug and ring gages, setting plug gages, plain cylindrical plug and ring gages, and plain snap gages have been developed by the American Gage Design Committee. The designs have proved satisfactory in many years of use and have been published in Commercial Standard C88, Gage Blanks (see footnote 12).

2. **REMOVAL OF SHARP END THREADS.**—To avoid feather edges on "go" and "not go" thread plug and ring gages and thread setting plug gages, the partial thread at both ends of the gage shall be removed to a blunt start (see definition 26, p. 4.) Not more than one complete turn of the thread shall be removed to the point where the full thread form is obtained. On thread ring gages of ½ in. nominal size or smaller or of 20 threads per inch and finer, and on all thread plug gages and setting plug gages of 28 threads per inch and finer, a 60° chamfer from the axis of the gage is permitted in lieu of removal of the partial thread. On truncated thread setting plugs of 28 threads per inch or coarser, where the truncated portion meets the full portion, the feather edge shall be completely removed.

3. **CHIP GROOVES IN "GO" THREAD PLUG GAGES.**—Each "go" thread plug gage, except in sizes 0.150 in. and smaller, shall be provided with a chip groove at the entering end. On reversible gages a chip groove is required at each end. Chip grooves are acceptable that are in accordance with general commercial practice such as a longitudinal groove cut parallel with the axis and extending the complete length of the gaging member, or a groove cut at an angle with the axis. The groove shall be located circumferentially at the start of the full thread and in all cases the depth shall extend below the root of the first full thread space. The widths recommended for chip grooves are as follows: Over 0.150 to 0.385 in. nominal diameter, ⅛ in.; above 0.385 to and including 2.010 in. nominal diameter, ⅜ in.; and above 2.010 in. nominal diameter, ¾ in. "Go" thread ring gages of the adjustable type (AGD standard) do not require chip grooves as the adjusting slots serve this purpose.

<sup>13</sup> Methods of measuring pitch diameter of thread plug gages are described, and specifications for wires are given in appendix 4, p. 194.

## (b) SPECIFICATIONS FOR THREAD FORM

1. **THREAD FORM OF "GO" AND "NOT GO" THREAD GAGES.**—The specifications for thread form of thread gages applicable to both external and internal threads, as exemplified by thread plug and ring gages, are stated in detail below, and are summarized in table VI.1 and figure VI.1. These specifications for thread form apply over the entire circumference and length of the gaging element.

(a) **"Go" thread gages.**—(1) **Thread crests.**—The major diameter of the "go" thread plug gage shall be the same as the minimum (basic) major diameter of the internal thread, with a plus gage tolerance. The minor diameter of the "go" thread ring gage shall be equal to the maximum pitch diameter of the external thread minus  $H/2$ , with a minus gage tolerance. The thread crests of plug and ring gages shall be flat in an axial section and parallel to the axis.

(2) **Thread roots.**—The minor diameter of the "go" thread plug gage shall be cleared beyond a  $p/8$  width of flat either by an extension of the sides of the thread toward a sharp V or by an undercut to any dimension no wider than the width resulting from  $p/8$  maximum width either side of the centerline of the thread space (see fig. VI.1). The major diameter of the "go" thread ring gage shall be cleared by a clearance cut of substantially  $p/8$  width and approximately central.

(3) **Concentricity of pitch and major or minor diameters.**—The pitch and major diameters of "go" thread plug gages, and the pitch and minor diameters of "go" thread ring gages shall be concentric. On thread plug gages an eccentric condition produces an oversize effective major diameter, having a width of flat less than  $p/8$ , which may encroach on the minimum permissible limit for the root profile of the internal thread. Similarly, on thread ring gages an eccentric condition produces an undersize effective minor diameter,

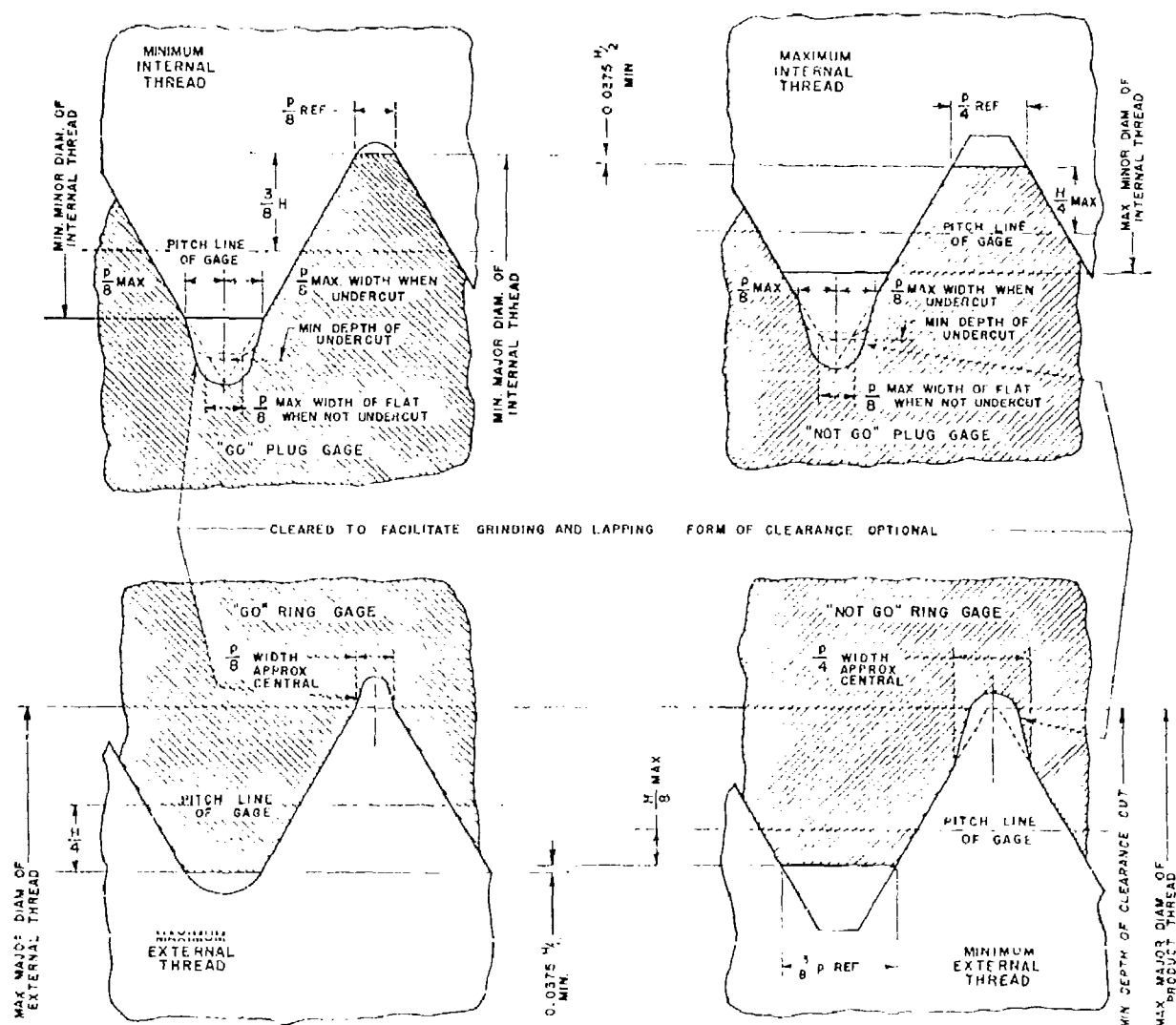


FIGURE VI.1. Thread form of gages for external and internal threads.



having a width of flat less than  $p/4$ , which may encroach on the maximum permissible limit for the root profile of the external thread. The following are the permissible maximum effective major and minimum effective minor diameters as determined by measurements of runout (total indicator reading) with respect to the pitch cylinder:

"Go" thread plug gage: maximum effective major diameter = maximum major diameter specified

"Go" thread ring gage: minimum effective minor diameter = measured minor diameter<sup>14</sup> - (pitch diameter gage tolerance + minor diameter gage tolerance)

(b) "Not go" thread gages.—(1) *Thread crests*.—The maximum major diameter of the "not go" thread plug or equivalent gage shall be equal to the maximum pitch diameter of the internal thread plus  $H/2$ . This corresponds to a width of flat at the crest of the gage equal to one-fourth of the pitch. However, the maximum major diameter of the "not go" thread plug gage shall not exceed<sup>15</sup> the minimum major diameter of the internal thread minus  $0.0375H$  ( $=0.05h_b$ ).

The minimum minor diameter of the "not go" thread ring or equivalent gage shall be equal to the minimum pitch diameter of the external thread minus  $H/4$ . This corresponds to a width of flat at the crest of the gage equal to three-eighths of the pitch. However, the minimum minor diameter of the "not go" thread ring gage shall not be less than the minimum minor diameter of the "go" thread ring gage plus  $0.0375H$  ( $=0.05h_b$ ). This requirement is necessary to insure that the minor diameter of the "not go" thread ring gage is not less than the minor diameter of the "go" ring gage, which may occur with a three-eighths pitch flat on the "not go" thread ring crest when there is a pitch diameter allowance on the external thread combined with a large pitch diameter tolerance.<sup>16</sup>

(2) *Thread roots*.—The minor diameter of the "not go" thread plug gage shall be cleared beyond a  $p/4$  width of flat by an undercut to any dimension no wider than the width resulting from  $p/8$  maximum width either side of the centerline of the thread space (see fig. V1.1). In small diameters and fine pitches this relief may be an extension of the sides of the thread from the position corresponding to this approximate width toward a sharp V. The major diameter of the "not go" thread ring gage shall be cleared by a clearance cut of substantially  $p/4$  width and approximately central. The "not go" thread ring gage shall clear the maximum major diameter of the external thread or the maximum major diameter of the full-form portion of the truncated thread setting plug for the "not go" thread ring gage, whichever is the greater.

<sup>14</sup> Required to be within the specified tolerance.

<sup>15</sup> This condition occurs in connection with small sizes of class 1 coarse and fine series threads and may occur for extreme combinations of large diameter and fine pitch of class 1 threads of special diameters, pitches, and lengths of engagement.

Thus contact of the thread gage can occur on the sides of the threads, but not on the crest or root. Also the effect of angle deviation on the fit of the gage with the thread is minimized.

(3) *Concentricity of pitch and major or minor diameters*. The pitch and major diameters of "not go" thread plug gages, and the pitch and minor diameters of "not go" thread ring gages shall be concentric. On thread plug gages an eccentric condition produces an oversize effective major diameter, having a width of flat less than  $p/4$ , which may encroach on the minimum permissible limit for the root profile of the internal thread. Similarly, on thread ring gages an eccentric condition produces an undersize effective minor diameter, having a width of flat less than  $3p/8$ , which may encroach on the maximum permissible limit for the root profile of the external thread. The following are the permissible maximum effective major and minimum effective minor diameters as determined by measurements of runout (total indicator reading) with respect to the pitch cylinder:

"Not go" thread plug gage: maximum effective major diameter = maximum major diameter specified.

"Not go" thread ring gage: minimum effective minor diameter = measured minor diameter<sup>14</sup> - 2 (pitch diameter gage tolerance + minor diameter gage tolerance).

## 2. THREAD FORM OF SETTING PLUG GAGES.

The specifications for thread form of setting plug gages are stated in detail below, and are summarized in table V1.2 and figures V1.2 and V1.3.

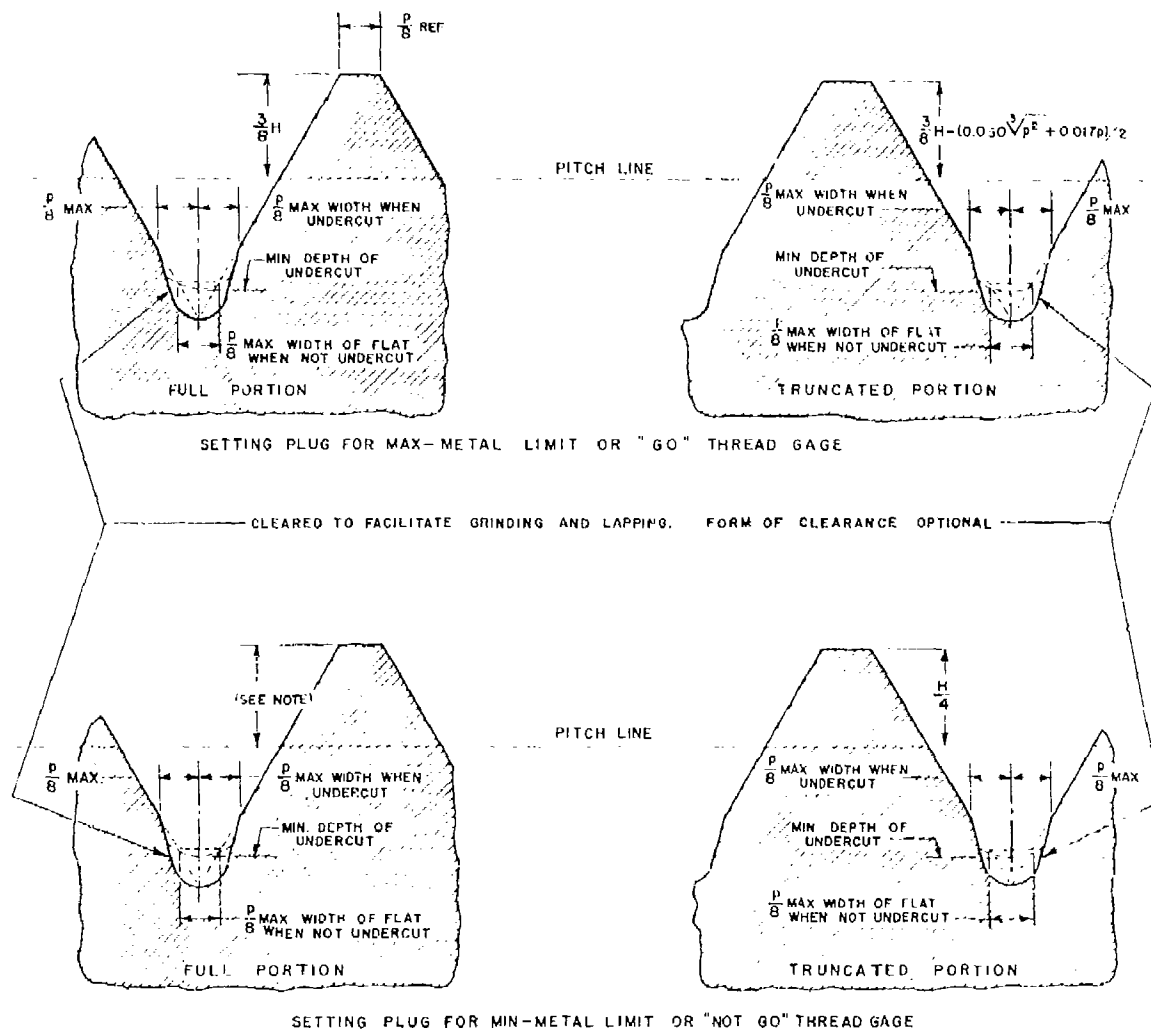
(a) *Truncated and basic-crest maximum-metal-limit ("go") thread setting plugs*.—(1) *Thread crests*.—The major diameter of the basic-crest setting plug, and of the full-form portion of the truncated maximum-metal-limit thread setting plug shall correspond to the maximum major diameter of the external thread (one-eighth pitch flat).

The major diameter of the truncated portion of the truncated maximum-metal-limit setting plug is equal to the maximum major diameter of the external thread (or the minimum major diameter of the full-form portion of the plug) minus  $(0.060\sqrt[3]{p^2} \pm 0.017p)$ .

(2) *Thread roots*.—The minor diameter of maximum-metal-limit ("go") thread setting plug shall be cleared beyond a  $p/8$  width of flat either by an extension of the sides of the thread toward a sharp V or by an undercut no wider than a width obtained from  $p/8$  maximum width either side of the centerline of the thread space (see figs. V1.2 and V1.3).

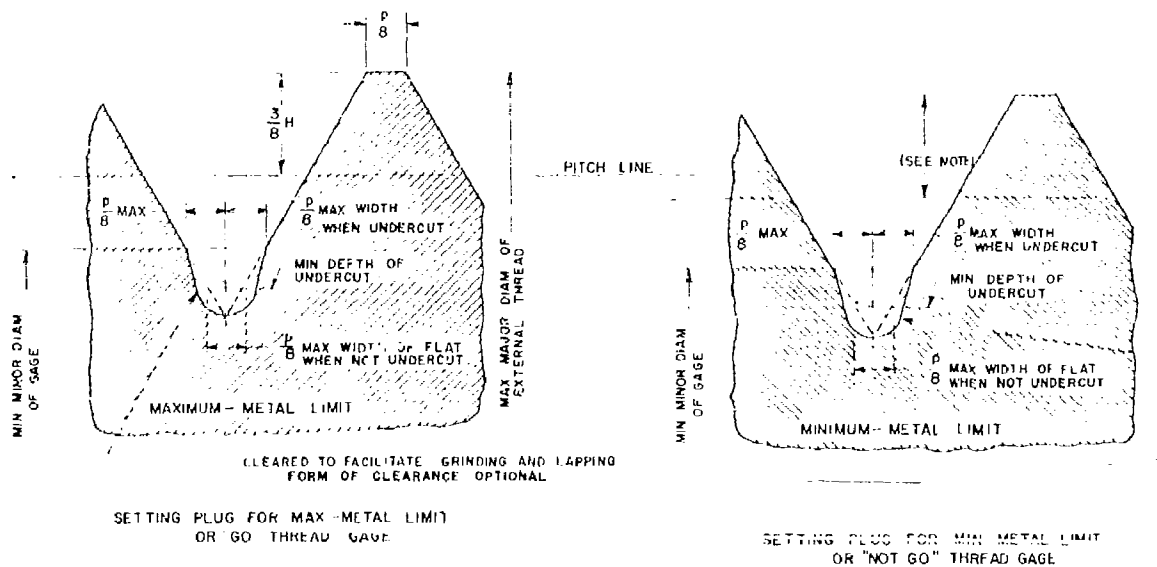
(b) *Truncated and basic-crest minimum-metal-limit ("not go") thread setting plugs*.—(1) *Thread crests*.—The major diameter of the truncated portion of the minimum-metal-limit ("not go") thread setting plug shall be equal to the minimum pitch diameter of the external thread plus  $H/2$ . The major diameter of the basic-crest setting





† FIGURE VI.2.—Thread form of truncated thread setting plug gages.

NOTE.—See table VI.2, column 13.



† FIGURE VI.3.—Thread form of basic-crest thread setting plug gages.

NOTE.—See table VI.2, column 13.

TABLE VI. 1.—Specifications and format for tables of limits of size of threaded and plain gages for Unified, American, and American National external and internal threads

Nominal size and threads per inch	Series designation	Class	Gages for external threads										Gages for internal threads										Class	Series designation	Nominal size and threads per inch			
			Thread gages					Plain gages for major diameter					Thread gages					Plain gages for minor diameter										
			Go		Not go			Go	Semi-finished	Unfinished hot-rolled material	Go		Major diameter	Pitch diameter		Major diameter	Not go		Pitch diameter	Major diameter	Not go					Pitch diameter	Major diameter	Plain gages for minor diameter
			Pitch diameter	Minor diameter	Pitch diameter	Minor diameter	Pitch diameter				Minor diameter	Plus tol. gage		Minus tol. gage	Major diameter		Pitch diameter	Minor diameter			Plus tol. gage	Minus tol. gage						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21								
			Max. pitch diameter of external thread. (Gage tolerance minus. When wear allowance is required, subtract the applicable wear allowance from the max. pitch diameter and then apply the gage tolerance minus.	Max. pitch diameter of external thread minus $H/2$ . (Gage tolerance minus.)	Min. pitch diameter of external thread. (Gage tolerance plus.)	Min. pitch diameter of external thread minus $H/4$ but not less than min. minor diameter of "Go" thread gage for external thread plus $0.0375/l$ ( $=0.054s$ ). (Gage tolerance minus.)	Max. major diameter of external thread. (Gage tolerance minus.)	Min. major diameter of external thread. (Gage tolerance plus.)	Min. major diameter of external thread of hot-rolled material in UNC-2A, NC-2A, NC-2, 8N-2A, and 8N-2. (Gage tolerance plus.)	Min. major diameter of internal thread. (Gage tolerance plus.)	Min. pitch diameter of internal thread. (Gage tolerance minus.)	Max. pitch diameter of internal thread plus $H/2$ , but not to exceed min. major diameter of "Go" thread gage for internal thread minus $0.0375/l$ ( $=0.054s$ ). (Gage tolerance minus.)	Max. pitch diameter of internal thread. (Gage tolerance minus.)	Max. pitch diameter of internal thread. (Gage tolerance minus.)	Max. pitch diameter of internal thread. (Gage tolerance plus, optional), see par. 4, p. 109.	Min. minor diameter of internal thread. (Gage tolerance plus.)	Max. minor diameter of internal thread. (Gage tolerance minus.)											

TABLE VI.2.—Specifications and format for tables of limits of size of threaded setting plug gages for Unified, American, and American National external threads

Nominal size and threads per inch	Series designation	Class	Truncated setting plugs								Basic-crest setting plugs			
			Plug for Go			Plug for Not go					Plug for Go		Plug for Not go	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter			Pitch diameter	Major diameter	Pitch diameter	
			Truncated	Full-form		Truncated	Full-form	Plus tol. gage	Minus tol. gage				Plus tol. gage	Minus tol. gage
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
			Max. major diameter of external thread (see note 1); max. diameter of full portion of "go" setting plug; see col. 5, minus 0.0003 in. (0.0075 in. gage tolerance minus).	Max. major diameter of external thread. Gage tolerance plus.	Max. pitch diameter of external thread. Gage tolerance minus. When wear allowance is required, subtract the allowable wear allowance from the max. pitch diameter and then apply the gage tolerance minus.	Min. pitch diameter of external thread plus $H/2$ . Gage tolerance minus.	Same as column 12.	Min. pitch diameter of external thread. Gage tolerance plus.	Min. pitch diameter of external thread. Gage tolerance minus (optional); see par. 4, p. 109.	Max. major diameter of external thread. Gage tolerance plus.	Same as column 6.	Max. major diameter of external thread provided that the min. major diameter corresponds to a truncation of not less than 0.007 $H$ and the max. major diameter of the gage corresponds to a truncation of not less than 0.0069 in. Gage tolerance plus. See footnote 16, p. 114.	Min. pitch diameter of external thread. Gage tolerance plus.	Min. pitch diameter of external thread. Gage tolerance minus (optional); see par. 4, p. 109.

plug and of the full form portion of the truncated minimum-metal-limit ("not go") thread setting plug equal to the maximum major diameter of the external thread (equals that of the maximum-metal-limit ("go") thread setting plug for the same external thread), provided that the minimum major diameter of the plug corresponds to a truncation of not less than 0.007  $H$  (width of flat equals 0.007  $p$ ). An additional requirement is that the maximum major diameter of the plug shall correspond to a truncation of not less than 0.0009 in. (width of flat equals 0.001 in.). When the latter requirement controls the maximum, the minimum of both  $X$  and  $W$  gages is less than this maximum by the amount of the  $X$  tolerance.<sup>16</sup>

(2) *Thread roots.* The minor diameter of the minimum metal limit ("not go") thread setting plug shall be cleared beyond a  $p/8$  width of flat either by an extension of the sides of the thread toward a sharp  $V$  or by an undercut no wider than a width obtained from  $p/8$  maximum width either side of the centerline of the thread space (see figs. VI.2 and VI.3).

(c) *Pitch diameter straightness.* To effect proper setting of a thread gage, the pitch cylinder<sup>17</sup> of the setting plug is required to be straight. The maximum permissible taper over the entire length

of the setting plug shall be within the following limits: For sizes to and including 4 in. nominal diameter maximum taper equals 0.0001 in., except that for threads coarser than 16 threads per inch the maximum taper equals 0.00015 in. For sizes larger than 4 in. nominal diameter, maximum taper equals 0.0002 in. The permissible taper should be back taper (largest diameter at entering end) and shall be confined within the pitch diameter limits.

3. SPECIFICATIONS FOR LIMITS OF SIZE.—The specifications and format for tables of limits of size of thread gages and setting plugs are summarized in tables VI.1 and VI.2 (see tables III.12, III.13, I.16, and I.17).

Constants for the various standard thread pitches which are required to determine gage dimensions are tabulated in table VI.3.

#### (c) SPECIFICATIONS FOR THREAD LENGTH

1. "Go" GAGES.—The ideal "go" thread gage, as stated in par. 3 (a), p. 108, should have a length equal to the length of engagement of the thread with its mating thread. The proper control of deviations from correct lead and zero taper requires (1) a length equal to the length of engagement and (2) that the gage should assemble its full length with the thread under inspection. In practice, the lengths of "go" gages made from standard blanks are usually about as long as the length of engagement, but exceptionally long engagements, or short engagements as for fine-pitch threads, may require modifications of the gage length. In specifying "go" thread gages, reference should be made to Commercial Standard CSS (see footnote

<sup>16</sup> The procedure for computing the maximum and minimum major diameters is as follows: Maximum major diameter of  $X$  or  $W$  setting plug = maximum pitch diameter of external thread plus  $3H/4$ . If this is greater than minimum pitch diameter of external thread plus  $3p/4$ , use the latter sum. Then add the  $X$  major diameter tolerance and compute the sum with the minimum pitch diameter of the external thread plus  $H/2$  minus 0.0003 in. In the latter case, the smaller of the two values is the maximum major diameter and is placed in the  $X$  major diameter tolerance to obtain a new minimum for both  $X$  and  $W$  setting plugs. Then apply  $W$  tolerance plus for the  $W$  setting plug and the  $X$  tolerance plus for the  $X$  setting plug.

<sup>17</sup> See definition 17, p. 4.

TABLE VI.3. Constants for computing thread gage dimensions

Threads per inch, $n$	$P \sin \phi$ $p$	$\frac{3}{4} p =$ $0.75p$	$p/4 =$ $0.25p$	$p/8 =$ $0.125p$	$0.067p$	$0.10018p$	$0.060\sqrt{p^2}$	$0.017p$	$0.000\sqrt{p^2}$ $+ 0.017p$	Height of sharp V- thread, $H =$ $0.866025p$	$\frac{1}{4} H =$ $0.21651p$	$H/2 =$ $0.43301p$	$H/4 =$ $0.21651p$	$0.73395 H$ $= 3.116p$ $= (2 \times$ $0.58p)$	$0.0375 H$ $= 0.0556p$ $= 0.03248p$
1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
80	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$	$\frac{1}{80}$
72	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$	$\frac{1}{72}$
64	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{1}{64}$
56	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$	$\frac{1}{56}$
48	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$	$\frac{1}{48}$
44	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{44}$
40	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$	$\frac{1}{40}$
36	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$
32	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$
28	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$	$\frac{1}{28}$
27	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$
24	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$
20	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$
18	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$
16	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
14	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$
13	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{13}$
12	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$
11½	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$	$\frac{1}{11.5}$
11	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$
10	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
9	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$
8	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
7	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$
6	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
5	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
4½	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$	$\frac{1}{4.5}$
4	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

TABLE VI.4.—Lengths of standard taperlock and trilock thread plug gage blanks

Thread sizes				Thread lengths			
Nominal range, inclusive		Decimal range		Thread plug gages		Fine-pitch instrument thread plug gages	
From	To	Above	To and including	Go (see notes)	Not go	Go	Not go
1	2	3	4	5	6	7	8
#0	#3	0.059	0.105	1½	1½	1½	1½
#1	#6	0.105	0.150	1½	1½	1½	1½
#8	#12	0.150	0.210	1½	1½	1½	1½
¼	5/16	0.210	0.305	1½	1½	1½	1½
3/8	½	0.305	0.510	1½	1½	1½	1½
7/16	¾	0.510	0.825	1½	1½	1½	1½
¾	1½	0.825	1.135	1½	1½	1½	1½
1½	2	1.135	1.510	1½	1½	1½	1½
2	2½	2.010	2.510	1½	1½	1½	1½
2½	3	2.510	3.010	1½	1½	1½	1½
3	12	3.010	12.010	1½	1½	1½	1½

1 For 12 threads per inch and finer.

2 For threads coarser than 12 per inch.

3 For 7 threads per inch and coarser.

4 For threads finer than 7 and coarser than 16 per inch.

5 For 16 threads per inch and finer.

TABLE VI.5.—Lengths of standard thread ring gage blanks and total thread lengths of standard truncated setting plug gage blanks

Thread sizes				Thread lengths			
Nominal range, inclusive		Decimal range		Length of thread ring gages		Thread lengths of truncated setting plug gages	
From	To	Above	To and including	Thin ring	Thick ring	For thin ring	For thick ring
1	2	3	4	5	6	7	8
#0	#3	0.059	0.090	1½	1½	1½	1½
#3	#6	0.090	0.105	1½	1½	1½	1½
#8	#12	0.105	0.150	1½	1½	1½	1½
¼	5/16	0.150	0.210	1½	1½	1½	1½
3/8	½	0.210	0.305	1½	1½	1½	1½
7/16	¾	0.305	0.510	1½	1½	1½	1½
¾	1½	0.510	0.825	1½	1½	1½	1½
1½	2	0.825	1.135	1½	1½	1½	1½
2	2½	1.135	1.510	1½	1½	1½	1½
2½	3	1.510	2.010	1½	1½	1½	1½
3	3½	2.010	2.510	1½	1½	1½	1½
3½	4	2.510	3.010	1½	1½	1½	1½
4	4½	3.010	4.010	1½	1½	1½	1½
4½	12½	4.010	12.010	1½	1½	1½	1½

1 Also applicable to fine-pitch instrument thread ring gages in the range from ¼ to 2½ in., inclusive.

2 These sizes of thread ring gages have counter-bored ends, so that the thread length of Nos. 0 to 2½ in. and of No. 3 to 6 in. is ¼ in.

12) which gives lengths of standard gage blanks. If such lengths are not satisfactory, the required lengths of gages should be specified. Tables VI.4 and VI.5 are the pertinent tables taken from the current edition of CS8.

Similarly, the lengths of plain "go" gages, used to check major and minor diameters, should be such that the thread may be checked for taper throughout its length.

Where indicating gages are used as either threaded or plain "go" gages, the contact elements should engage the thread both along and around the thread over an area approximately equivalent to that of the "go" plug or ring gages.

2. "NOT GO" GAGES.—(a) *Thread plug and ring gages.*—As "not go" gages are intended to check only the pitch diameter at the minimum-material limit, the length of the "not go" thread plug gage need be no more than the number of threads required to obtain an accurate three-wire measurement of pitch diameter—about three full threads. The lengths of standard blanks for "not go" gages, as in tables VI.4 and VI.5, are less than those for "go" gages.

As "not go" thread plug and ring gages normally check only the end threads of the threads under inspection, and as such end threads are not usually representative of the entire thread, a standard practice has been adopted with respect to permissible entry when plug and ring gages are used, as follows:

Threads are acceptable as within the minimum material limits if, when using plug and ring thread gages, the "not go" plug gage does not enter or the "not go" ring gage is not entered. Threads may be accepted if all complete threads can enter in, or be entered by the "not go" gage, provided that a definite drag results from metal to metal contact on or before the third turn of entry. Neither working nor final inspection "not go" gages should be forced after the drag is definite. The requirements of extreme applications such as exceptionally thin or ductile material, small number of threads, etc., may necessitate modification of this practice, and in such cases the "not go" gaging practice shall be as specified by the responsible department or agency of the Government.

(b) *Thread snap gages.*—Thread snap gages are generally adjustable and have contact anvils consisting of cone-points, wedge-shaped prisms with rounded edges, serrated or grooved plates, or grooved or threaded cylinders adjustably mounted and suitably spaced in a U-shaped frame. The positions of the anvils are set to a threaded setting plug gage, and the anvils are then clamped in position and sealed. The foregoing specifications for thread form are applicable to contact anvils, but the permissible eccentricity of the pitch and minor diameters of thread ring gages is not applicable to the anvils or rolls of thread snap gages.

"Not go" thread snap gages shall engage the thread over a length of two pitches. They permit

checking the thread at various positions along and around the thread. Thus, their use provides a more critical check than that of thread ring gages and definite information regarding other than the end threads.

(c) *Indicating thread gages.*—Indicating gages, having contact elements corresponding to the anvils specified for "not go" thread snap gages, provide an approximately equivalent check of the minimum-material pitch diameter limit. Indicating gages measure by electrical, optical, mechanical, or other indicating and amplifying means the dimensions or deviations in the dimensions of threads. Indicating gages are also extensively used as limit gages.

3. SETTING PLUG GAGES. —The lengths of truncated setting plugs shall be such as to provide engagement of the full length of thread of the ring or other gage being checked with the truncated threads and with the full threads. The lengths of basic-crest setting plugs shall similarly provide for full engagement. Lengths of standard blanks for truncated setting plugs are given in Commercial Standard CS8. (See footnote 12.) Table VI.5 is taken from the current edition of CS8.

#### (d) MARKING OF GAGES

Each gage shall be plainly and permanently marked with the minimum marking essential for positive identification. In the cases of thread plug and thread setting plug gages it may be desirable to identify both the gaging element and the handle. Recommended marking practices are as follows:

1. *THREAD PLUG GAGES.* —The "go" thread plug gage members are common to all classes of threads, both standard and special, and are identified by the nominal size, threads per inch, "GO," and pitch diameter. Example: " $\frac{1}{4}$ -20, GO, PD .2175." The "not go" thread plug gage members may be marked with: Nominal size, threads per inch, class, "NOT GO" and pitch diameter. Example: " $\frac{1}{4}$  20-2B, NOT GO, PD .2223."

2. *PLAIN PLUG GAGES FOR MINOR DIAMETER.* —The "go" plain plug gage members are common to all classes of threads and as such may be marked with: Nominal size, threads per inch, "GO," and minor diameter. Example: " $\frac{1}{4}$  20, GO, .1960."

The "not go" plain plug gage member may be marked with: Nominal size, threads per inch, "NOT GO," and minor diameter. Example: " $\frac{1}{4}$  20, NOT GO, .2067."

3. *THREAD RING GAGES AND SETTING PLUGS.* —The "go" thread ring gages, and setting plug gage members therefor, may be marked with: Nominal size, threads per inch, "GO," and pitch diameter. Example: " $\frac{1}{4}$  20, GO, PD .2175." Gages for classes 2, 3, and 3A are basic. Gages for classes 1A, 2A, and in some instances class 1, are common.

The "not go" thread ring or snap gages, and setting plug gage members therefor, may be marked with: Nominal size, threads per inch,



"NOT GO," and pitch diameter. Example: " $\frac{1}{4}$ -20, NOT GO, PD .2127."

4. PLAIN GAGES FOR MAJOR DIAMETER.—The "go" gages for major diameter of external threads may be marked with: Nominal size, threads per inch, "GO," and diameter. Example: " $\frac{1}{4}$ -20, GO, .2500."

The "not go" gages for major diameters may be marked with: Nominal size, threads per inch "NOT GO," and diameter. Example: " $\frac{1}{4}$ -20, NOT GO, .2408."

5. PLAIN PLUG ACCEPTANCE CHECK GAGES.—The "go" plain plug acceptance check gage members may be marked: "GO ACCEPT CHK FOR DIA. XXXX."

The "not go" plain plug acceptance check gage members may be marked: "NOT GO ACCEPT CHK FOR DIA. XXXX."

#### 4. GAGE TOLERANCES AND WEAR ALLOWANCES

1. STANDARD TOLERANCE CLASSES.—Standard tolerances for thread plug and ring gages and threaded setting plugs are of three classes: (1) *W* tolerances, shown in table VI.6, which represent the highest commercial grade of accuracy or workmanship and which are required especially for truncated setting plugs, (2) *X* tolerances, shown in table VI.7, which are larger than *W*

tolerances and are an economical compromise among such factors as gage cost, amount of product tolerance consumed by gage tolerances, and possible observational errors in the measurement of gages with generally available measuring equipment<sup>18</sup>; and (3) *Y* tolerances, shown in table VI.8, which include a wear allowance and are applicable only to UNS and NS threads in classes 1, 1A, 1B, 2A, and 2B.

2 TOLERANCE SPECIFICATIONS.—(a) *Direction of tolerances*<sup>19</sup>.—The directions of tolerances for the individual elements of the various types of gages are specified in tables VI.1 and VI.2.

(b) *Tolerances on lead*.—Tolerances on lead (pitch and helix) are specified as an allowable variation between any two threads not farther apart than the length of the standard gage, shown in CS8, Gage Blanks (see footnote 12), omitting one full turn at each end of the gage, except that in the case of setting plugs, the length shall be that of the thread in the mating ring gage. On truncated setting plugs, the sign of any lead error present shall be the same on the full-form portion

<sup>18</sup> While *X* tolerances on gages are generally acceptable, occasionally a combination of gage and tool errors may cut seriously into product limits, especially in the finer threads. When trouble is encountered in securing class 3 limits on 20 TPI threads per inch or finer, a careful inspection of tools and gages is suggested. A change to "*W*" gages may be economical as the closer tolerance gage may leave enough room of the working tolerance to ease the problem.

<sup>19</sup> See par. 4, p. 165.

TABLE VI.6—Tolerances for "*W*" "go" and "not go" thread gages

Threads per inch	Tolerance on lead <sup>1</sup>		Tolerance on half angle of thread	Tolerance on major or minor diameters			Tolerance on pitch diameter				
	To and including $\frac{1}{2}$ in. diam	Above $\frac{1}{2}$ in. diam		To and including $\frac{1}{2}$ in. diam	Above $\frac{1}{2}$ in. to 4 in. diam	Above 4 in. diam	To and including $\frac{1}{2}$ in. diam	Above $\frac{1}{2}$ in. to 1 $\frac{1}{2}$ in. diam	Above 1 $\frac{1}{2}$ in. to 4 in. diam	Above 4 in. to 8 in. diam	Above 8 in. to 12 in. diam <sup>2</sup>
1	2	3	4	5	6	7	8	9	10	11	12
	in.	in.	deg min ±	in.	in.	in.	in.	in.	in.	in.	in.
80	0.0001	0.00015	0 20	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
72	0.0001	0.00015	0 20	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
64	0.0001	0.00015	0 20	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
56	0.0001	0.00015	0 20	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
48	0.0001	0.00015	0 18	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
44	0.0001	0.00015	0 15	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
40	0.0001	0.00015	0 15	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
36	0.0001	0.00015	0 12	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
32	0.0001	0.00015	0 12	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
28	0.00015	0.00015	0 8	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
27	0.00015	0.00015	0 8	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
24	0.00015	0.00015	0 8	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
20	0.00015	0.00015	0 8	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
18	0.00015	0.00015	0 8	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
16	0.00015	0.00015	0 8	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
14	0.0002	0.0002	0 6	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
13	0.0002	0.0002	0 6	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
12	0.0002	0.0002	0 6	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
11 $\frac{1}{2}$	0.0002	0.0002	0 6	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
11	0.0002	0.0002	0 6	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
10	0.00025	0.00025	0 6	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
9	0.00025	0.00025	0 6	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
8	0.00025	0.00025	0 5	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
7	0.0003	0.0003	0 5	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
6	0.0003	0.0003	0 5	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
5	0.0003	0.0003	0 4	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
4 $\frac{1}{2}$	0.0003	0.0003	0 4	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004
4	0.0003	0.0003	0 4	0.0002	0.0003	0.0001	0.0001	0.00015	0.0002	0.0003	0.0004

<sup>1</sup> Allowable variation in lead between any 2 threads not farther apart than the length of the standard gage, shown in CS8, omitting 1 full thread at each end of the gage.

<sup>2</sup> Above 12 in. the tolerance is directly proportional to the tolerance in this column, in the ratio of the diameter to 12 in.

and the truncated portion, and such error shall be uniform within 0.0001 in. over any portion equivalent to the length of the thread ring gage.

(c) *Tolerances on flank angle.*—Tolerances are specified for the flank angles rather than the included angle to assure that the bisector of the included angle will be perpendicular to the axis of the thread within proper limits. The equivalent of the deviation from the true thread form caused by such irregularities as convex or concave flanks, rounded crests, or slight projections on the thread form, should not exceed the tolerances permitted on flank angle.

(d) *Tolerances not cumulative.*—Tolerances on lead, flank angle, and pitch diameter are not cumulative; that is, the tolerance on any one element may not be exceeded even though the errors in the other two elements are smaller than the respective tolerances.

(e) *Tolerances for plain gages.*—Standard tolerances for plain plug gages for minor diameter of internal threads and for gages for major diameter of external threads are *Z* tolerances, as shown in table VI.9.

TABLE VI.7.—Tolerances for *X* "go" and "not go" thread gages

Threads per inch	Tolerance on lead <sup>1</sup>	Tolerance on flank angle of thread	Tolerance on major or minor diameters		Tolerance on pitch diameter			
			To and including 4 in. diam.	Above 4 in. diam.	To and including 1½ in. diam.	Above 1½ to 4 in. diam.	Above 4 to 8 in. diam.	Above 8 to 12 in. diam.
1	2	3	4	5	6	7	8	9
	in.	deg. min.	in.	in.	in.	in.	in.	in.
80	0.0002	0 30	0.0003	—	0.0002	—	—	—
72	0.0002	0 30	0.0003	—	0.0002	—	—	—
64	0.0002	0 30	0.0004	—	0.0002	—	—	—
56	0.0002	0 30	0.0004	—	0.0002	0.0003	—	—
48	0.0002	0 30	0.0004	—	0.0002	0.0003	—	—
44	0.0002	0 20	0.0004	—	0.0002	0.0003	—	—
40	0.0002	0 20	0.0004	—	0.0002	0.0003	—	—
36	0.0002	0 20	0.0005	—	0.0002	0.0003	—	—
32	0.0003	0 15	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
28	0.0003	0 15	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
27	0.0003	0 15	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
24	0.0003	0 15	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
20	0.0003	0 15	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
18	0.0003	0 10	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
16	0.0003	0 10	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
14	0.0003	0 10	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
13	0.0003	0 10	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
12	0.0003	0 10	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
11½	0.0003	0 10	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
11	0.0003	0 10	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
10	0.0003	0 10	0.0005	0.0007	0.0003	0.0004	0.0005	0.0006
9	0.0003	0 10	0.0007	0.011	0.003	0.001	0.0005	0.0008
8	0.0004	0 6	0.0007	0.011	0.004	0.0005	0.0005	0.0008
7	0.0004	0 5	0.0007	0.011	0.004	0.0005	0.0005	0.0008
6	0.0004	0 5	0.0008	0.013	0.004	0.0005	0.0005	0.0008
5	0.0004	0 5	0.0008	0.013	—	0.0005	0.0005	0.0008
4½	0.0004	0 5	0.0008	0.013	—	0.0005	0.0005	0.0008
4	0.0004	0 5	0.0009	0.015	—	0.0005	0.0005	0.0008

<sup>1</sup> Allowable variation in lead between any two threads not further apart than the length of the standard gage, shown in CSM, omitting one full thread at each end of the gage.

<sup>2</sup> Above 12 in., the tolerance is directly proportional to the tolerance in this column, in the ratio of the diameter to 12 in.

NOTE.—When a wear allowance is wanted on "go" gages, it is recommended that the *X* pitch diameter tolerance be divided, one-half for wear and one-half for tolerance.

## 5. RECOMMENDED GAGE PRACTICES

1. *ACCEPTABILITY OF THREADS.*—(a) *At maximum-material limits.*—In case of question, the acceptability of threads at the maximum-material limits shall be based on gaging with "go" thread plug and ring gages conforming as closely as practicable to the limits of size of the thread and to the thread form and length specified for such gages (see par. 3(a), Maximum-metal or "go" gages, p. 108.)

(b) *At minimum-material limits.*—A choice of either of two gaging practices is available, as outlined under par. 3(b), p. 108. The practice to be chosen and applied will depend on whether virtual diameter (or effective size) gaging is specified for the particular application, or whether single element gaging practice is required.

Virtual diameter gaging practice, as previously noted, involving the use of thread plug and ring gages, is specified for all "go" limits of size. Virtual diameter gaging practice is customary for the "not go" limits of classes 1, 1A, 1B, 2, 2A, 2B, and 3B, and 3 internal threads. Single element gaging practice involving the use of thread snap gages, indicating type gages, or their equivalent, is recommended for the "not go" limits of size of all classes 3A and 3 external threads. However, for technical and economical reasons, all classes of external and internal threads larger than 6-in. nominal diameter shall be subject to measurement of the thread elements for acceptance. This is not to preclude the use of gages where economically feasible and acceptable to the producer and consumer.

2. *USES OF W AND X THREAD GAGES.*—(a) *"Go" and "not go" thread gages.*—It is recommended that *W* tolerances be applied to "go" and "not go" inspection and working thread gages for class 4. *X* tolerances are recommended as applicable to all inspection and working thread gages for classes 1, 1A, 1AR, 1B, 2, 2A, 2B, 3, 3A, and 3B, except as follows: *Y* tolerances, which include a wear allowance are applicable to UNS and NS threads in classes 1, 1A, 1B, 2A, and 2B.

(b) *Setting plugs for "go" and "not go" gages.*—It is recommended that *W* tolerances be applied on lead and angle to all setting plugs regardless of class. The pitch diameter tolerances shall be *W* or *X* as specified.

3. *BASIC-SIZE "GO" THREAD GAGES.*—Basic size "go" thread gages for internal threads are applicable to all internal thread classes. Basic size "go" thread ring gages and setting plugs are applicable to class 2A when coated. They are also applicable to external thread classes 2, 3A, and 3.

4. *PROCEDURE IN SETTING ADJUSTABLE THREAD RING GAGES.*—In setting an adjustable thread ring gage the sealing compound should be removed and the locking screw loosened. Turning the adjusting screw to the right enlarges the ring so

TABLE VI.8.—Tolerances for Y "go" thread gages for classes 1, 1A, 1B, 2A, and 2B, NS and UNS threads only

Threads per inch	Tolerance on lead <sup>1</sup>	Tolerance on half angle of thread	Tolerance on major or minor diameters		Limits on pitch diameter							
			To and including 4 in. diameter	Above 4 in. diameter	To and including 1½ in. diameter		Above 1½ in. to 4 in. diameter		Above 4 in. to 8 in. diameter		Above 8 in. to 12 in. diameter <sup>2</sup>	
					From—	To—	From—	To—	From—	To—	From—	To—
1	2	3	4	5	6	7	8	9	10	11	12	13
	<i>in.</i>	<i>deg min</i> ±	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
80	0.0002	0 45	0.0003	-----	0.0001	0.0003	-----	-----	-----	-----	-----	-----
72	.0002	0 45	.0003	-----	.0001	.0003	-----	-----	-----	-----	-----	-----
64	.0002	0 45	.0004	-----	.0001	.0004	-----	-----	-----	-----	-----	-----
56	.0002	0 45	.0004	-----	.0001	.0004	0.0001	0.0006	-----	-----	-----	-----
48	.0002	0 45	.0004	-----	.0001	.0004	.0001	.0006	-----	-----	-----	-----
44	.0002	0 30	.0004	-----	.0001	.0004	.0001	.0006	-----	-----	-----	-----
40	.0002	0 30	.0004	-----	.0001	.0004	.0001	.0006	-----	-----	-----	-----
36	.0002	0 30	.0004	-----	.0001	.0004	.0001	.0006	-----	-----	-----	-----
32	.0003	0 20	.0005	0.0007	.0001	.0004	.0001	.0006	0.0001	0.0008	0.0001	0.0010
28	.0003	0 20	.0005	.0007	.0002	.0005	.0002	.0007	.0002	.0009	.0002	.0011
27	.0003	0 20	.0005	.0007	.0002	.0005	.0002	.0007	.0002	.0009	.0002	.0011
24	.0003	0 20	.0005	.0007	.0002	.0005	.0002	.0007	.0002	.0009	.0002	.0011
20	.0003	0 20	.0005	.0007	.0002	.0005	.0002	.0007	.0002	.0009	.0002	.0011
18	.0003	0 15	.0005	.0007	.0002	.0005	.0002	.0007	.0002	.0009	.0002	.0011
16	.0003	0 15	.0006	.0009	.0002	.0006	.0002	.0008	.0002	.0010	.0002	.0011
14	.0003	0 15	.0006	.0009	.0002	.0006	.0002	.0008	.0002	.0010	.0002	.0012
13	.0003	0 15	.0006	.0009	.0002	.0006	.0002	.0008	.0002	.0010	.0002	.0012
12	.0003	0 10	.0006	.0009	.0002	.0006	.0002	.0008	.0002	.0010	.0002	.0012
11½	.0003	0 10	.0006	.0009	.0002	.0006	.0002	.0008	.0002	.0010	.0002	.0012
11	.0003	0 10	.0006	.0009	.0002	.0006	.0002	.0008	.0002	.0010	.0002	.0012
10	.0003	0 10	.0006	.0009	.0002	.0006	.0002	.0008	.0002	.0010	.0002	.0012
9	.0003	0 10	.0007	.0011	.0002	.0007	.0002	.0009	.0002	.0011	.0002	.0013
8	.0004	0 5	.0007	.0011	.0002	.0007	.0002	.0009	.0002	.0011	.0002	.0013
7	.0004	0 5	.0007	.0011	.0002	.0007	.0002	.0009	.0002	.0011	.0002	.0013
6	.0004	0 5	.0008	.0013	.0003	.0008	.0003	.0010	.0003	.0012	.0003	.0014
5	.0004	0 5	.0008	.0013	-----	-----	.0003	.0010	.0003	.0012	.0003	.0014
4½	.0004	0 5	.0008	.0013	-----	-----	.0003	.0010	.0003	.0012	.0003	.0014
4	.0004	0 5	.0009	.0015	-----	-----	.0003	.0011	.0003	.0013	.0003	.0015

<sup>1</sup> Allowable variation in lead between any two threads not farther apart than the length of the standard gage, shown in CSS, omitting one full thread at each end of the gage.

<sup>2</sup> Above 12 in. the tolerance is directly proportional to the tolerance in this column, in the ratio of the diameter to 12 in.

TABLE VI.9.—Tolerances for plain gages

Size range		Tolerances				
Above—	To and including	XX	X	Y	Z	ZZ
1	2	3	4	5	6	7
<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
0.020	0.825	0.00002	0.00004	0.00007	0.00010	0.00020
.825	1.510	.00003	.00005	.00009	.00012	.00024
1.510	2.510	.00004	.00008	.00012	.00016	.00032
2.510	4.510	.00005	.00010	.00015	.00020	.00040
4.510	6.510	.000065	.00013	.00019	.00025	.00050
6.510	9.010	.00008	.00016	.00024	.00032	.00064
9.010	12.010	.00010	.00020	.00030	.00040	.00080

that it turns freely onto the setting plug. Alternately adjusting the adjusting screw and tightening the locking screw, a firm fit on the smallest portion of the thread in the ring should result. While making the adjustment the knurled outside diameter and both sides of the ring should be lightly tapped with a soft-tip or plastic hammer to permit the threads of the ring to wrap themselves around the thread of the setting plug. After satisfactory adjustment has been obtained, the ring is to be removed from the plug and the same procedure of tapping is repeated with slightly

greater emphasis to the sides. If the thread ring gage possesses proper rigidity, the same feel should be still there when the setting gage again is turned into the ring. A tighter fit or inability to reenter the setting gage denotes a fault of the locking device, that should then be taken apart and checked for dimensional conformity to CSS. It is often advisable to do this before even attempting to adjust the thread ring gage. When proper adjustment has been obtained the gage should be sealed.

In setting to a truncated setting plug the ring

gage may be set to either the full or the truncated portion. It is common practice to set slightly freer than a snug fit to the truncated portion and then to check the root clearance and wear of flank angle by screwing the ring onto the full portion. Extreme caution is required when this practice is followed to prevent damage to the thread crest of the setting plug. The opposite practice is to adjust and set the ring to the full portion and then determine the fit of the gage on the truncated portion. If the thread form of the ring gage is satisfactory, there will be a slight or no change of fit. In the case of a worn thread ring gage, the presence of shake or play when on the truncated portion indicates that the sides of the thread are no longer straight near the root, and the gage should be relapped or discarded.

In order to provide maximum wear life of a setting plug, the plug should be threaded into a ring as few times as possible. This will prevent uneven wear and a taper on the truncated end of the plug. When setting plugs are thus used properly they do not wear unevenly. However, when setting plugs are applied repeatedly to check thread ring gages, the criteria for acceptability will vary with the type and application of the ring. A "not go" ring, for example, should be a snug fit at full engagement and provide some resistance to turning at one or two turns engagement. "Go" thread ring gages should also be a snug fit at full engagement. When the length of the product thread permits engagement with the full length of the "go" ring, the requirement as to partial engagement may be relaxed to permit a slightly freer fit. However, there should be no relaxation in the requirements when short product threads, that only partly engage the "go" ring, are being engaged.

If a basic-crest setting plug is used to set a thread ring gage, root clearance of the thread in the ring should be determined by the procedure outlined below.

The ring gage should be given further inspection to determine whether or not the minor diameter is within the specified limits. The minor diameter may be inspected by means of "go" and "not go" plain cylindrical plug acceptance check gages or by direct measurement.

**5. PROCEDURE FOR DETERMINING THE CLEARANCE IN THREAD RING GAGES.**—The roots of threads of ring gages, particularly "not go" ring gages, frequently do not clear the maximum major diameter of the external thread. To assist the gage maker and gage inspector, the recommended procedure for determining the clearance at root of thread of ring gages is given to supplement, or substitute for, the use of truncated setting plugs described in paragraph 4, above. For this purpose an optical examination of a sulfur-graphite, plaster of Paris, copper-amalgam, or other suitable cast of the thread is made by means of a projection comparator, toolmaker's microscope, or universal

measuring microscope. The actual magnification of the instrument as used must be known.

(a) *Methods of making sulfur-graphite casts.*—Sulfur-graphite casts are made from a thorough mixture of finely powdered graphite and crushed lump sulfur which is heated in a ladle until the sulfur is completely melted and becomes viscous. This mixture may be used repeatedly by crushing and remelting. The graphite should constitute about 7 percent of the mixture by weight, although in the practice of various users, the proportion varies from 4 to 20 percent. The graphite is added to eliminate reflections that would be produced by a plain sulfur cast, and to reduce the tendency to shrink upon cooling.

The casting mold may be formed by holding the ring gage between thin plates in the jaws of a vise, the top edge of the plate on one side being well below the thread axis. For small sizes of threads, a convenient arrangement is to use a taper mandrel that is provided with a lengthwise groove having smooth surfaces and an included angle of about 90°, into which the mixture is poured, and in which the cast is later mounted for examination. The bottom of the slot has a slight taper toward the axis at the small end. A square metal stop clamped in the groove serves as a wall in casting. The mandrel is also useful in making copper-amalgam casts, in which case the casting mixture is pressed in.

The sulfur-graphite casting mixture is poured into the mold when the temperature is from 260° to 266° F, and allowed to solidify with slow cooling. The cast may be marked with an identification number with a steel stylus. Sulfur-graphite casts warp considerably after a few hours.

(b) *Method of making plaster of Paris casts.*—A plaster of Paris cast is usually made to determine errors in thread angle, and this cast can usually be used to determine clearance. Such a cast is made by mixing 5 parts (28 g, or 1 oz) of a good grade of dental plaster of Paris with from 4 to 5 (26 ml) parts by weight of potassium-bichromate solution made by dissolving 40 g in 1 liter of water. The potassium bichromate inhibits rusting of the gage. This mixture is applied to the threads inside a mold which may be fashioned from cardboard or a strip of copper, with modeling clay pressed into the threads along the outside bottom edges of the mold. It should be allowed to harden completely before removal. Plaster of Paris casts have less shrinkage than sulfur-graphite, but do not retain dimensions over extended periods of time. They are difficult to remove from rough finish threads without damage.

(c) *Determining clearance of "go" thread ring gages.*—The flat at crest of the maximum external thread is one-eighth of the pitch, therefore, if the root of thread of the "go" ring is relieved to a width of one-eighth the pitch, the ring



threads clear the maximum major diameter of the thread. If the roots of the "go" ring gage threads are not relieved, they must be to a sharp enough V to clear a flat of one-eighth the pitch. The flanks of the thread should be straight to the point where the  $\frac{1}{8}$ -pitch flat will make contact with the flanks of the thread. The width of flat on the chart, or template, used should be one-eighth of the pitch times the magnification of the comparator.

(d) *Determining clearance of "not go" thread ring gages.*—The flat at the crest of a screw with maximum major diameter and minimum pitch diameter is determined by the formula:

$$\text{Flat} = \frac{p}{2} - h' \tan 30^\circ = \frac{p}{2} - 0.57735h'$$

for Unified or American National form of thread, where,  $h'$  = maximum major diameter minus minimum pitch diameter.

If the "not go" ring gage has a relief of  $\frac{1}{4}$  pitch, as recommended, it is necessary to determine whether or not the relief is deep enough. To do this, make a chart, or template, representing a  $60^\circ$  thread with a flat at crest equal to the flat, as determined by the above formula, times the magnification of the comparator. This chart, or template, should fit the image of the thread and contact the flanks of the thread image without contacting in the relief. If ring threads are not relieved, they must be sharp enough to permit the chart, or template, to contact on the flanks of the image rather than in the root.

## APPENDIX 1. AMERICAN NATIONAL FORM OF THREAD AND THREAD SERIES FOR BOLTS, MACHINE SCREWS, NUTS, TAPPED HOLES, AND GENERAL APPLICATIONS

### 1. INTRODUCTION

The American National standards for thread form and thread series as published in previous editions of this Handbook are republished here in condensed form. Except for class 5 threads they are largely superseded by the Unified and American threads as specified in section III. They are thus made available for continued use in existing design and for applications where Unified threads are considered to be less suitable, or where the application is not covered by Unified and American threads. If American National threads are specified, they shall conform to the requirements herein.

### 2. AMERICAN NATIONAL FORM OF THREAD

The form of thread profile specified herein, known previously as the "United States standard or Sellers' profile," is known as the "American National form of thread."

#### (a) SPECIFICATIONS

1. **ANGLE OF THREAD.**—The basic angle of thread ( $2\alpha$ ) between the sides of the thread measured in an axial

plane is  $60^\circ$ . The line bisecting this  $60^\circ$  angle is perpendicular to the axis of the screw thread.

2. **FLAT AT CREST AND ROOT.**—The flat at the root and crest of the basic thread form is  $\frac{1}{8} \times p$ , or  $0.125 \times p$ .

3. **DEPTH OF THREAD.**—The depth of the basic thread form is

$$h = 0.649519 \times p, \text{ or } h = \frac{0.649519}{n}$$

where

$p$  = pitch in inches

$n$  = number of threads per inch

$h$  = basic depth of thread

4. **CLEARANCE AT MINOR DIAMETER.**—A clearance shall be provided at the minor diameter of the internal thread by removing from the crest of the basic thread form an amount such as to provide a depth of thread not less than 53 to 75 percent (depending on the size), and not more than  $83\frac{1}{4}$  percent of the basic thread depth.

5. **CLEARANCE AT MAJOR DIAMETER.**—A clearance shall be provided at the major diameter of the internal thread by making the thread form such that the width of flat shall be less than  $\frac{1}{8} \times p$  but not less than  $\frac{1}{24} \times p$ .

#### (b) ILLUSTRATION

There are indicated in figure 1.1 the relations as specified herein for the American National form of thread for the minimum internal thread and maximum external thread, classes 2 and 3. These relations are further shown in figures 1.3 and 1.4.

#### (c) BASIC THREAD DATA

The basic thread data for this form of thread and for all standard pitches are given in table 1.1.

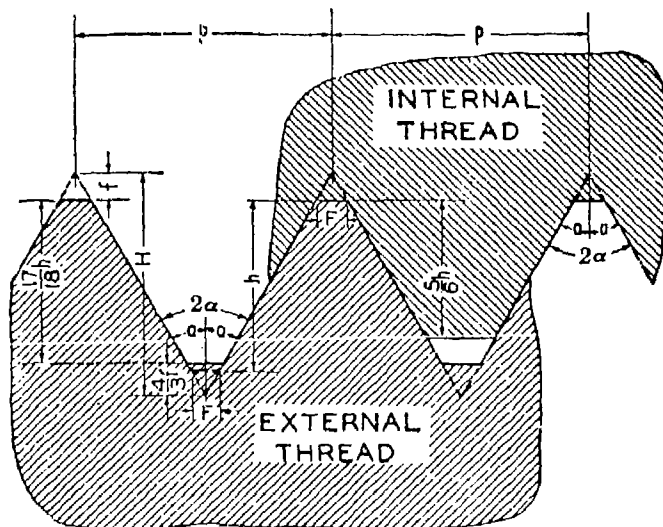


FIGURE 1.1.—American National form of thread.

NOTE.—No allowance is shown. This condition exists in classes 2 and 3 where both the minimum internal thread and the maximum external thread are basic.

#### NOTATION

- $2\alpha = 60^\circ$
- $\alpha = 30^\circ$
- $n$  = number of threads per inch
- $H = 0.866025 p$  = depth of  $60^\circ$  sharp V thread
- $h = 0.649519 p$  = depth of American National form of thread
- $2.6h = 0.541266 p$  = maximum depth of engagement
- $1.732h = 0.613435 p$
- $F = 0.125 p$  = width of flat at crest and root of American National form
- $f = 0.108253 p$
- $\frac{1}{24} p$  = depth of truncation
- $\frac{1}{8} p$



### 3. THREAD SERIES

It was the aim of the Committee, in establishing thread systems, to eliminate all unnecessary sizes and, in addition, to utilize, as far as possible existing predominating sizes. The coarse-thread and fine-thread series are maintained, the coarse-thread series being the "United States standard" threads, supplemented in the sizes below  $\frac{1}{4}$ -in. by sizes taken from the standard established by The American Society of Mechanical Engineers (ASME). The fine-thread series is composed of standards that have been found necessary, and consists of sizes taken from the standards of the Society of Automotive Engineers (SAE) and the fine-thread series of The American Society of Mechanical Engineers.

#### (a) AMERICAN NATIONAL COARSE-THREAD SERIES

In table 1.2 are specified the nominal sizes and basic dimensions of the "American National coarse-thread series."

The American National coarse-thread series is recommended for general use in engineering work, in machine construction where conditions are favorable to the use of bolts, screws, and other threaded components where quick and easy assembly of the parts is desired, and for all work where conditions do not require the use of fine-pitch threads.

#### (b) AMERICAN NATIONAL FINE-THREAD SERIES

In table 1.3 are specified the nominal sizes and basic dimensions of the "American National fine-thread series."

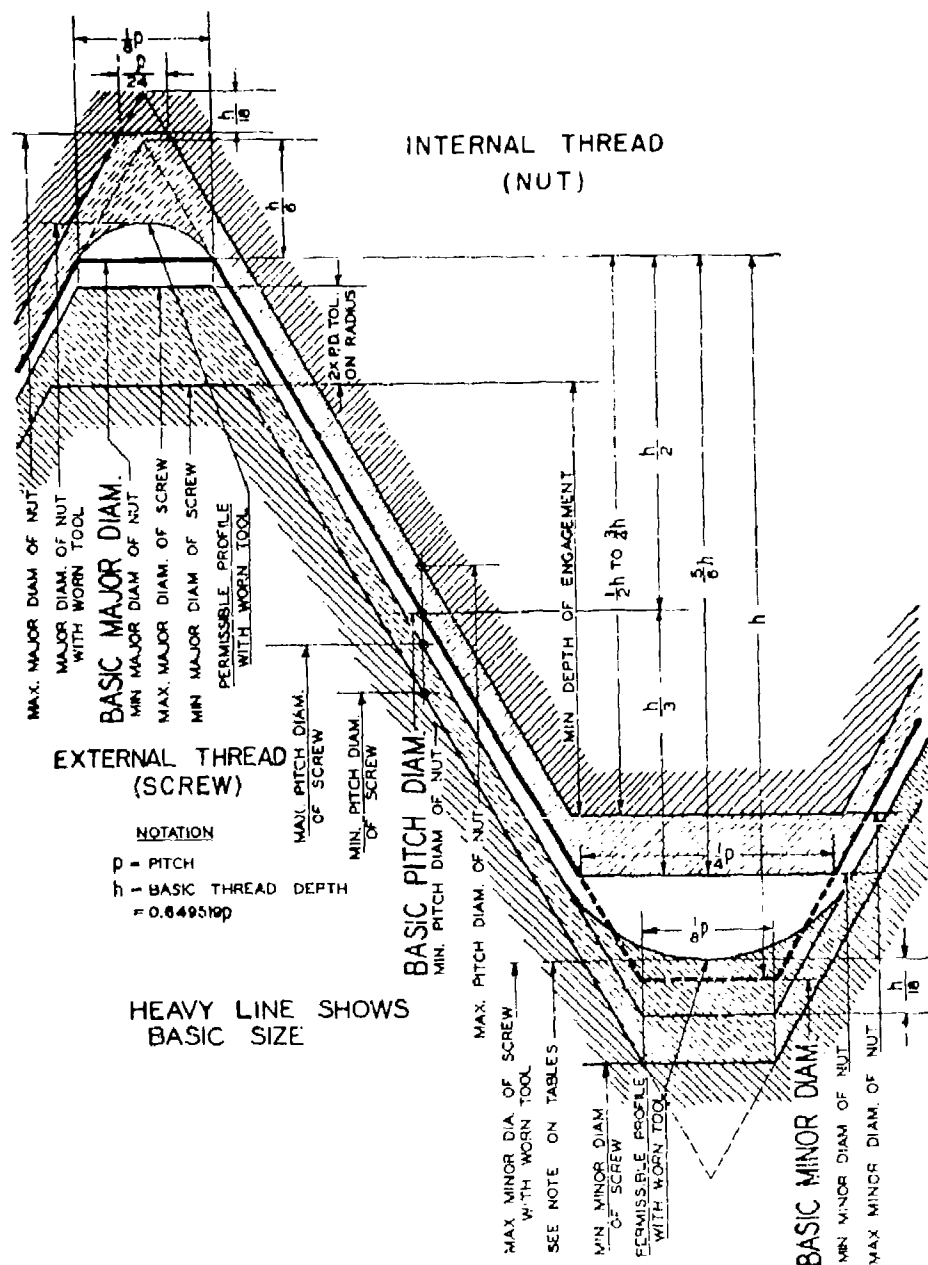


FIGURE 1.2.—Disposition of tolerances, allowance (neutral space), and crest clearances for class 1.

The American National fine-thread series is recommended for general use in automotive and aircraft work, and where special conditions require a fine thread.

(c) AMERICAN NATIONAL EXTRA-FINE-THREAD SERIES

In table 1.4 are specified the nominal sizes and basic dimensions of the "American National extra-fine-thread series."

The American National extra-fine-thread series is intended for special uses where (1) thin-walled material is to be threaded, (2) thread depth of nuts clearing ferrules, coupling flanges, etc., must be held to a minimum, and (3) a maximum practicable number of threads are required within a given thread length. This thread series is the same as the SA<sup>1</sup> extra-fine-thread series, but it includes additional sizes.

(d) AMERICAN NATIONAL 8-THREAD SERIES

In table 1.5 are specified the nominal sizes and basic dimensions of the "American National 8-thread series."

Bolts for high-pressure pipe flanges, cylinder-head studs, and similar fastenings against pressure require that an initial tension be set up in the fastening, by elastic deformation of the fastening and the components held together, such that the joint will not open up when the steam or other pressure is applied. To secure a proper initial tension it is not practicable that the pitch should increase with the diameter of the thread, as the torque required to assemble the fastening would be excessive. Accordingly, for such purposes the 8-thread series has come into general use.

(e) AMERICAN NATIONAL 12-THREAD SERIES

The nominal sizes and basic dimensions of the "American National 12-thread series" are specified in table 1.6.

Sizes of the 12-thread series from  $\frac{1}{2}$  in. to and including  $1\frac{1}{4}$  in. are used in boiler practice, which requires that worn stud holes be retapped with a tap of the next larger size, the increment being  $\frac{1}{16}$  in. throughout most of the range. Die-head chasers for sizes up to 3 in. are stocked by manufacturers.

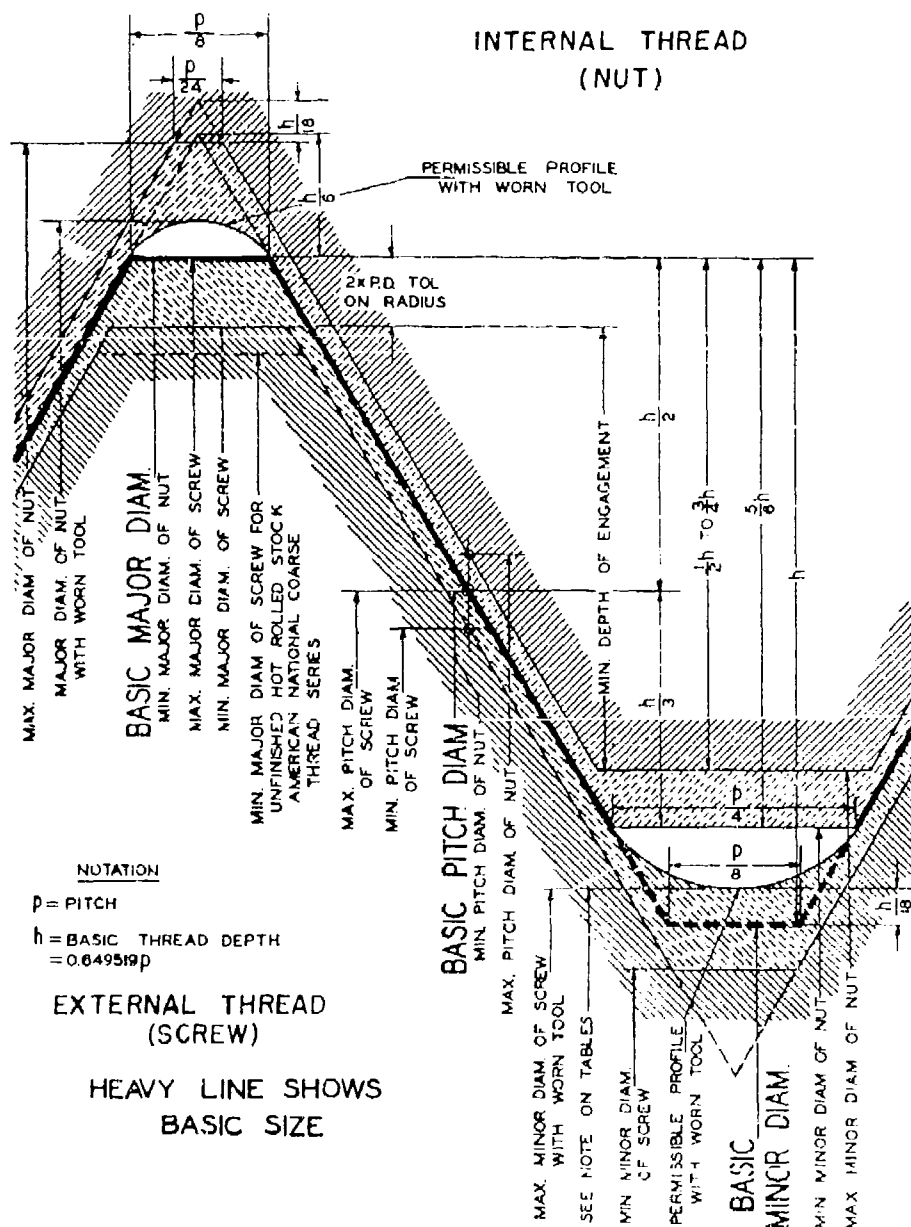


FIGURE 1.3.— Disposition of tolerances and crest clearances for class 2.

The 12-thread series is also widely used in machine construction as for thin nuts on shafts and sleeves. It also allows the specification of shoulder diameters in steps of  $\frac{1}{8}$  in., as from the standpoints of good design and simplification of practice, it is desirable to limit shoulder diameters to  $\frac{1}{8}$  in. steps. Twelve threads per inch is the coarsest pitch in general use, which will permit a threaded collar which screws onto a threaded shoulder to slip over a shaft, the difference in diameter between shoulder and shaft being  $\frac{1}{8}$  in.

#### (f) AMERICAN NATIONAL 16-THREAD SERIES

The nominal sizes and basic dimensions of the "American National 16-thread series" are specified in table 1.7.

The 16-thread series is a uniform pitch series for such applications as require a relatively fine thread. It is intended primarily for use on threaded adjusting collars and bearing retaining nuts.

#### 4. CLASSIFICATION AND TOLERANCES

Thread classes are distinguished from each other by the amounts of tolerance and allowance. There are established herein for general use four distinct classes of threads as specified in the following brief outline. These four classes, together with the accompanying specifications, are for the purpose of assuring the interchangeable manufacture of screw-thread parts throughout the country.

It is not the intention of the Committee arbitrarily to place a general class or grade of work in a specific class. Each manufacturer and user of screw threads is free to select the class best adapted to his particular needs. The limits of size and tolerances for four classes of threads are given in tables 1.8 to 1.13, inclusive.

- |              |   |
|--------------|---|
| Class 1----- | { Includes screw-thread work in which the threads must assemble readily.<br>Includes the major portion of interchangeable screw-thread work, finished and semifinished bolts and nuts, machine screws, etc. |
| Class 2----- |   |

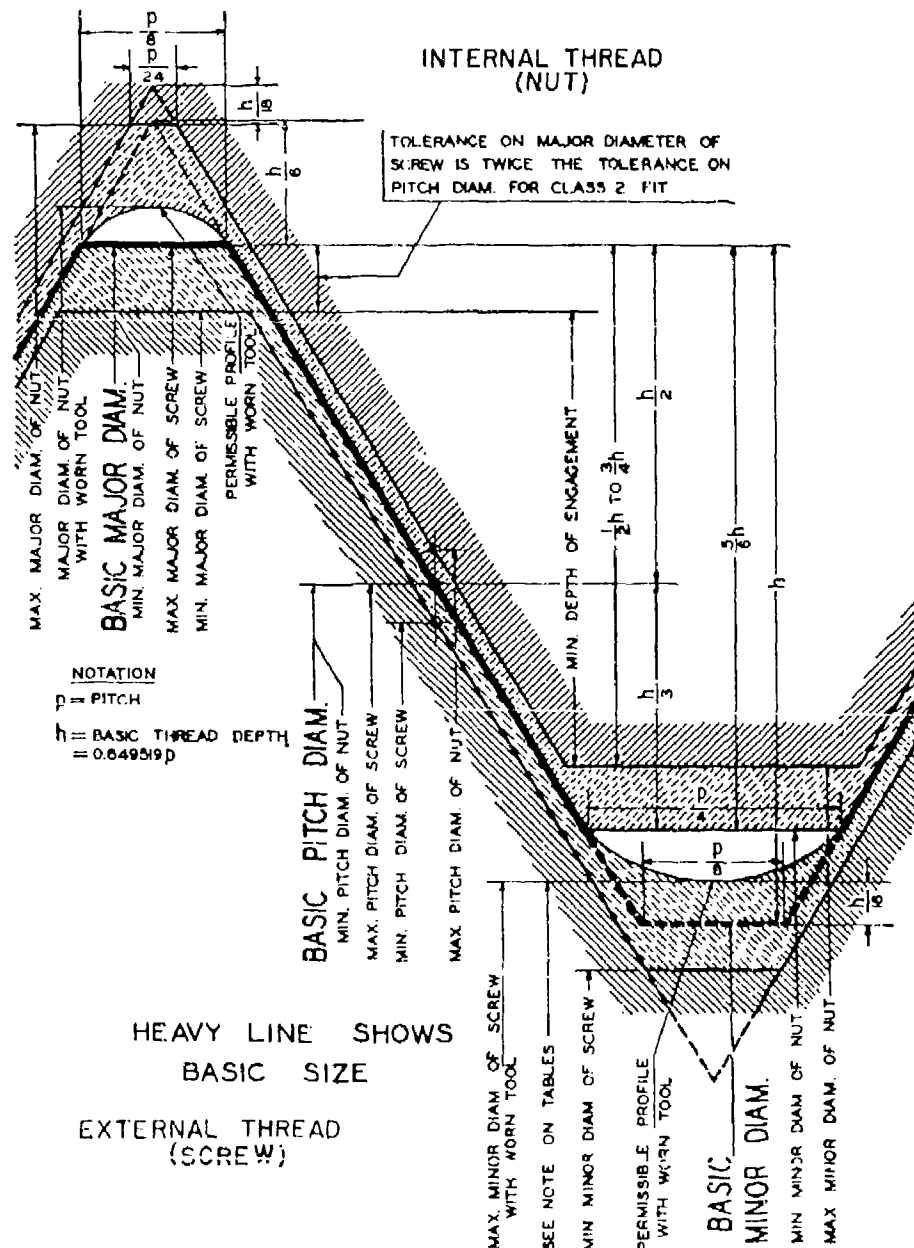


FIGURE 1.4.—Disposition of tolerances and crest clearances for class 3.

- Class 3-----} Includes the highest grade of interchangeable screw-thread work.
- Class 4-----} Includes screw-thread work requiring a fine snug fit, somewhat closer than class 3. In this class selective assembly of parts may be necessary.

It should be noted that, in the classification of screw threads, the class number designates the permissible limits of looseness or tightness. It has no connotations of quality in any other sense. Class 1 provides for the greatest permissible looseness between minimum external thread and maximum internal thread; class 4 provides for the smallest permissible looseness. Classes 2 and 3 are between classes 1 and 4 as regards looseness. Each class has its proper place and none should be regarded as superior or inferior provided that there is compliance with specification requirements under which it is manufactured and sold.

An examination of the dimensional specifications for the various classes shows that an external thread made to the tolerances and allowances of one class may be used with an internal thread of some other class. Thus, the requirements for a screw-thread fit for specific applications can be met by specifying the proper combination of classes for the components. For example, an external thread made to class 2 limits can be used with internal threads made to classes 1, 2, or 3 limits for specific applications. It is not the purpose of this standard to limit applications of the various standard classes.

#### (a) GENERAL SPECIFICATIONS

The following general specifications apply to the four classes of threads specified for applications of the American National form of thread.

1. **UNIFORM MINIMUM INTERNAL THREAD.**—The pitch diameter of the minimum internal thread corresponds to the basic size. The minimum major diameter of the

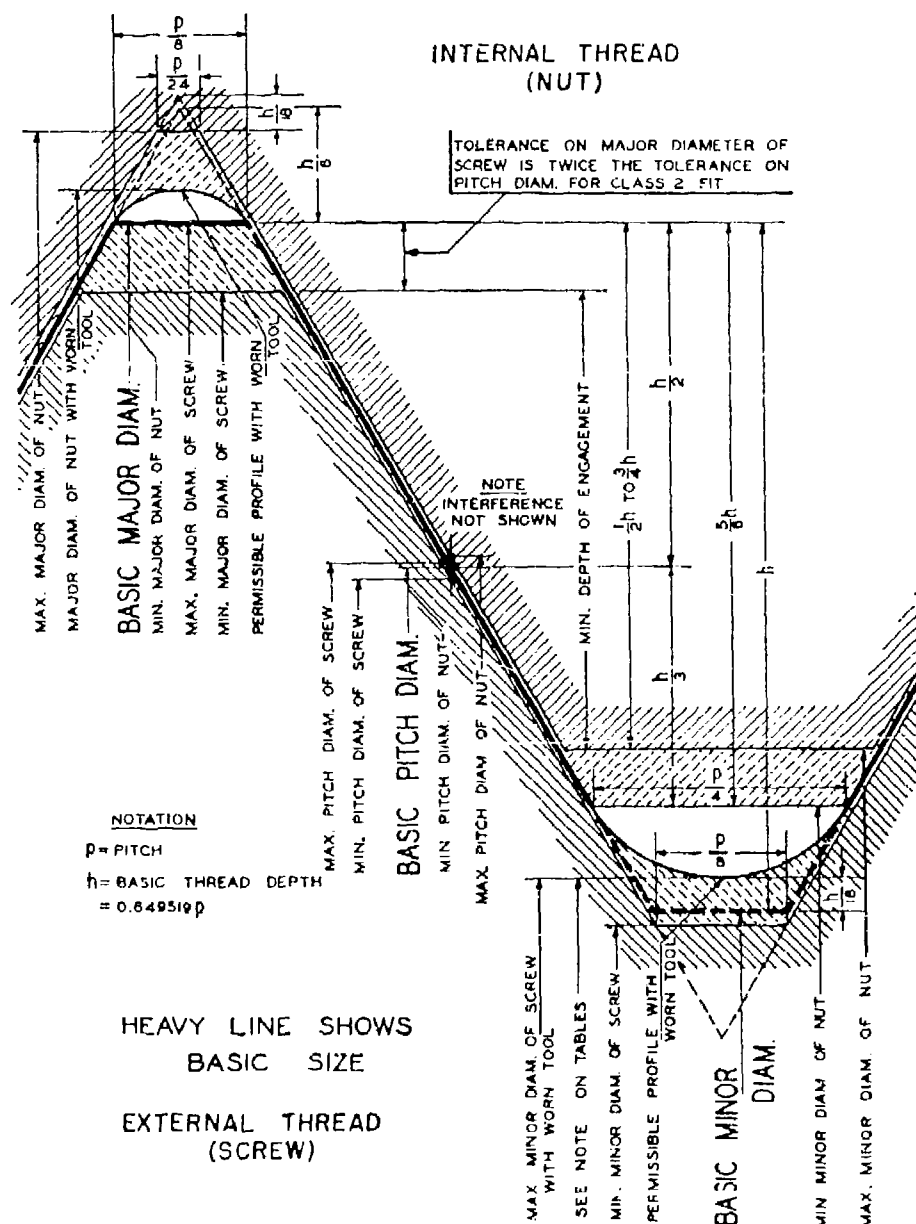


FIGURE 1.5.—Disposition of tolerances, allowance (interference), and crest clearances for class 4.

internal thread is the basic major diameter and is the same for all classes. In no case should the minimum major diameter of the internal thread, as results from a worn tap or cutting tool, be less than specified. The minimum minor diameter of the internal thread is the same for all classes.

2. **MAXIMUM EXTERNAL THREAD.**—The major and pitch diameters of the maximum external thread are equal to the respective basic diameters minus the allowance, if any. The maximum minor diameter of an external thread of a given pitch may be such as results from the use of a worn or rounded threading tool, when the pitch diameter is at its maximum value. In no case, however, should the maximum minor diameter of the thread, as results from tool wear, be greater than that corresponding to a  $p/4$  width of flat.

3. **DIRECTION AND SCOPE OF TOLERANCES.**—(a) The tolerance on the internal thread is plus, and is applied from the basic size to above basic size.

(b) The tolerance on the external thread is minus, and is applied from the maximum (or design) size to below the maximum size.

(c) The tolerances specified represent the extreme variations permitted on the product.

4. **MAJOR DIAMETER TOLERANCES.**—(a) *External threads.*—The tolerances on the major diameters of class 1 or class 2 external threads are twice the tolerance values allowed on the pitch diameters of the same respective classes and pitches with the following exception: On class 2, American National coarse-thread series, externally threaded parts of unfinished, hot-rolled material, the same tolerances on major diameter are applied as on class 1 external threads.

The tolerances on the major diameters of classes 3 and 4 external threads American National coarse-thread series, are the same as those on class 2 finished screws of the same thread series; and for the American National fine-thread series are the same as those on class 2 of that series.

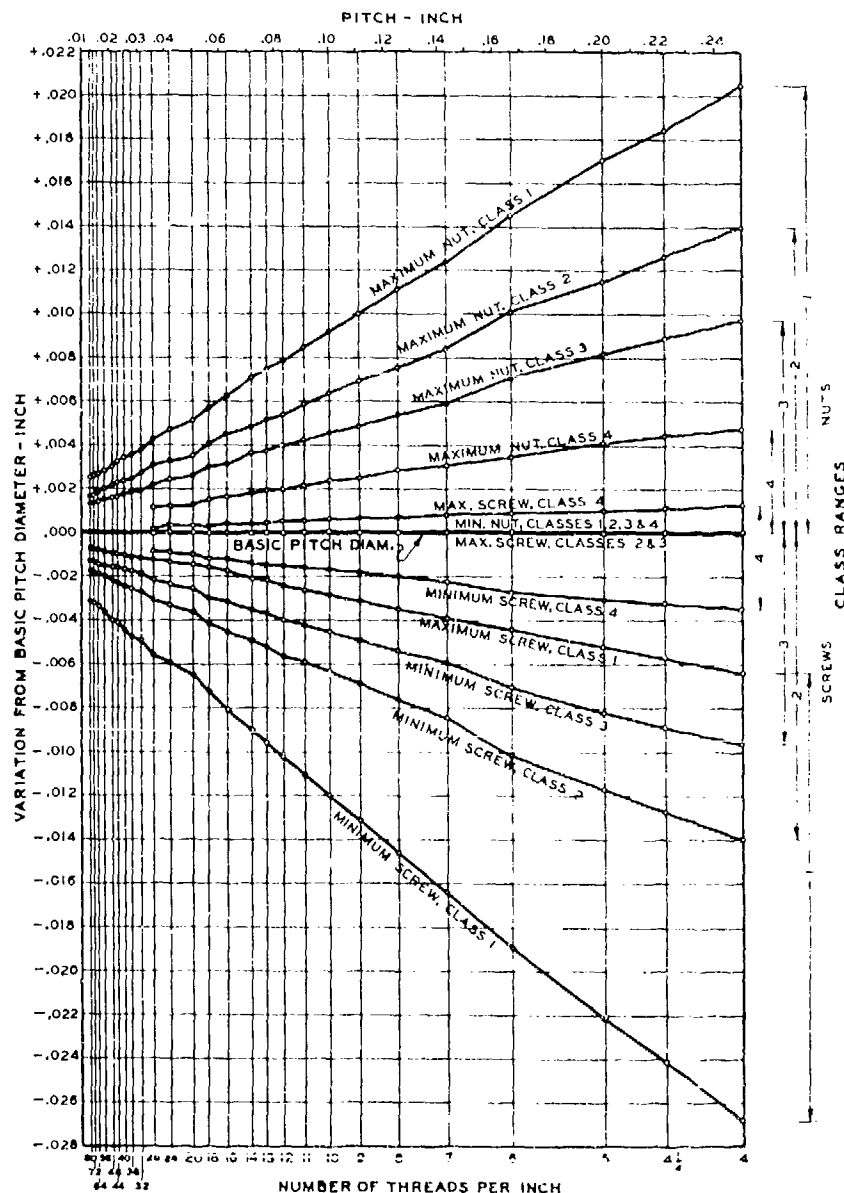


FIGURE 1.6.—Relation of maximum and minimum pitch diameters of classes 1, 2, 3, and 4 to basic pitch diameters.



TABLE 1.1.—Basic thread data, American National form of thread

Threads per in., $n$	Pitch, $p$	Basic width of flat, $p/8$	Minimum width of flat at major diameter of nut, $p/4$	Minimum width of flat at minor di- ameter of nut, $p/4$	Depth of thread, $h =$ $0.54126p$	$3h/4 =$ $0.40594p$	$2h/3 =$ $0.43303p$	$h/2 =$ $0.32476p$	$5h/12 =$ $0.27663p$	$h/3 =$ $0.21650p$	$h/6 =$ $0.10825p$	$h/9 =$ $0.07216p$	$h/15 =$ $0.03608p$	Depth of sharp-v thread, $h_f =$ $0.86602p$	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
80	0.012500	0.00156	0.0052	0.00312	0.00819	0.00577	0.00509	0.00441	0.00338	0.00271	0.00135+	0.00090	0.00045+	in.	0.010925
72	0.013889	0.00174	0.0058	0.00347	0.00921	0.00677	0.00607	0.00497	0.00390	0.00311	0.00150	0.00100	0.00050	in.	0.012098
64	0.015625	0.00195+	0.0065+	0.00391	0.01049	0.00761	0.00691	0.00577	0.00463	0.00384	0.00193	0.00129	0.00064	in.	0.013432
56	0.017857	0.00223	0.0074	0.0448	0.01199	0.00870	0.00807	0.00673	0.00543	0.00451	0.00226	0.00150	0.00077+	in.	0.014845
48	0.020833	0.00250	0.0087	0.0521	0.01332	0.01128	0.01015	0.00892	0.00764	0.00651	0.00246	0.00164	0.00082	in.	0.016462
44	0.022727	0.00284	0.0095+	0.0598	0.014762	0.01240	0.01107	0.00984	0.00851+	0.00737	0.00271	0.00180	0.00090	in.	0.018296
40	0.025000	0.00312	0.0104	0.0625	0.016258	0.01353	0.01219	0.01083	0.00957	0.00841	0.00287	0.00190	0.00100	in.	0.020356
36	0.027778	0.00347	0.0116	0.0694	0.018042	0.01504	0.01352	0.01203	0.00992	0.00901	0.00308	0.00200	0.00113	in.	0.022663
32	0.031250	0.00391	0.0130	0.0781	0.020297	0.01691	0.01522	0.01353	0.00946	0.00877	0.00338	0.00226	0.00129	in.	0.025303
28	0.035714	0.00446	0.0149	0.0893	0.023197	0.01933	0.01740	0.01545	0.00967	0.00902	0.00387	0.00258	0.00125	in.	0.028629
24	0.041667	0.00521	0.0174	0.1042	0.027056	0.02255+	0.02030	0.01804	0.01128	0.00992	0.00451	0.00301	0.00150	in.	0.032654
20	0.050000	0.00625	0.0208	0.1250	0.032476	0.02706	0.02436	0.02165+	0.01353	0.01083	0.00541	0.00361	0.00180	in.	0.038301
18	0.055556	0.00694	0.0231	0.1389	0.036084	0.3007	0.27106	0.24404	0.01504	0.01203	0.00601	0.00401	0.00200	in.	0.043113
16	0.062500	0.00751	0.0260	0.1562	0.040565	0.33853	0.30845	0.27706	0.01691	0.01353	0.00677	0.00451	0.00226	in.	0.048127
14	0.071429	0.00933	0.0298	0.1786	0.046394	0.38666	0.34440	0.30983	0.01933	0.01546	0.00773	0.00515+	0.00258	in.	0.054539
13	0.076923	0.00992	0.0321	0.1923	0.049983	0.41654	0.37447	0.33331	0.02082	0.01655+	0.00823	0.00555+	0.00279	in.	0.059617
12	0.083333	0.01042	0.0347	0.2083	0.054127	0.4511	0.40539	0.36004	0.02255+	0.01804	0.00902	0.00601	0.00301	in.	0.065267
11	0.090909	0.01087	0.0362	0.2174	0.058490	0.4707	0.42336	0.37765+	0.02353	0.01883	0.00941	0.00628	0.00314	in.	0.071307
10	0.100000	0.01250	0.0417	0.2500	0.064952	0.51413	0.4571	0.43300	0.02706	0.02165+	0.01083	0.00722	0.00351	in.	0.078730
9	0.111111	0.01389	0.0463	0.2778	0.072169	0.56314	0.54113	0.49411	0.03007	0.02406	0.01203	0.00802	0.00401	in.	0.086943
8	0.125000	0.01562	0.0521	0.3125	0.081190	0.67765	0.67059	0.61919	0.03383	0.02706	0.01353	0.00902	0.00451	in.	0.096227
7	0.142857	0.01786	0.0595+	0.3571	0.092788	0.77732	0.69569	0.61186	0.03665	0.03093	0.01546	0.01031	0.00515+	in.	0.106518
6	0.166667	0.02083	0.0694	0.4167	0.105553	0.90221	0.81119	0.72117	0.04511	0.03706	0.01804	0.01203	0.00601	in.	0.118338
5	0.200000	0.02600	0.0833	0.5000	0.129904	1.0825+	0.97543	0.86600	0.05413	0.04320	0.02165+	0.01443	0.00722	in.	0.132015
4 1/2	0.222222	0.02778	0.08926	0.5556	0.144338	1.2028	1.0825+	0.96223	0.06119	0.04811	0.02406	0.01604	0.00802	in.	0.147456
4	0.250000	0.03125	0.1042	0.6250	0.162380	1.3532	1.2178	1.0825+	0.08119	0.05413	0.02706	0.01804	0.00902	in.	0.165006

TABLE 1.2.—American National coarse-thread series, NC

Identification		Basic diameters			Thread data							
Size	Threads per inch, $n$	Major diameter, $D$	Pitch diameter, $E$	Minor diameter, $K$	Metric equivalent of major diameter	Pitch, $p$	Depth of thread, $h$	Basic width of flat, $p/8$	Minimum width of flat at major diameter of nut, $p/24$	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2A$ , $\frac{\pi K^2}{4}$	Tensile stress area, $\left(\frac{D+2E}{2}\right)^2 \frac{\pi}{4}$
1	2	3	4	5	6	7	8	9	10	11	12	13
No. in.		in.	in.	in.	mm	in.	in.	in.	in.	deg min	in. <sup>2</sup>	in. <sup>2</sup>
1 0.073	64	0.073	0.0629	0.0527	1.854	0.01562	0.01015	0.00195	0.00065	4 31	0.00218	0.00263
2 .086	56	.086	.0744	.0629	2.184	.01736	.01160	.00223	.00074	4 22	.00310	.00370
3 .090	48	.090	.0755	.0719	2.515	.02083	.01353	.00260	.00087	4 26	.00406	.00487
4 .112	40	.112	.0958	.0995	2.845	.02500	.01624	.00312	.00104	4 45	.00496	.00604
5 .125	40	.125	.1088	.1025	3.175	.02500	.01624	.00312	.00104	4 11	.00672	.00796
6 .138	32	.138	.1177	.10974	3.505	.03125	.02030	.00321	.00130	4 50	.00745	.00909
8 .164	32	.164	.1437	.1294	4.166	.03125	.02030	.00391	.00130	3 58	.01186	.0140
10 .190	24	.190	.1629	.1559	4.826	.04107	.02706	.00521	.00174	4 39	.01450	.0175
12 .211	24	.211	.1869	.1619	5.486	.04107	.02706	.00521	.00174	4 1	.0206	.0242
1/4	20	.2500	.2175	.1850	6.350	.05000	.03248	.00625	.00208	4 11	.0260	.0318
5/16	18	.3125	.2764	.2403	7.938	.05556	.03908	.00691	.00231	3 40	.0454	.0524
3/8	16	.3750	.3344	.2938	9.525	.06250	.04059	.00781	.00260	3 24	.0678	.0775
7/16	14	.4375	.3911	.3447	11.113	.07143	.04639	.00893	.00268	3 20	.0923	.1063
1/2	13	.5000	.4500	.4001	12.700	.07692	.04996	.00962	.00321	3 7	.1257	.1419
5/8	12	.5625	.5064	.4542	14.288	.08333	.05413	.01042	.00347	2 59	.162	.182
3/4	11	.6250	.5600	.5089	15.875	.09091	.05905	.01136	.00379	2 56	.202	.225
7/8	10	.7500	.6850	.6201	19.050	.10000	.06495	.01250	.00417	2 40	.302	.334
1 3/8	9	.8750	.8028	.7307	22.225	.11111	.07217	.01389	.00463	2 31	.419	.462
1 1/2	8	1.0000	.9188	.8376	25.400	.12500	.08119	.01562	.00521	2 29	.551	.606
1 3/4	7	1.1250	1.0322	.9394	28.575	.14286	.09279	.01786	.00595	2 31	.693	.763
2	7	1.2500	1.1572	1.0644	31.750	.16250	.09279	.01786	.00595	2 15	.890	.969
2 1/4	6	1.3750	1.2607	1.1585	34.925	.18750	.10825	.02083	.00694	2 24	1.054	1.155
2 1/2	6	1.5000	1.3917	1.2835	38.100	.20000	.12000	.02500	.00833	2 11	1.294	1.405
2 3/4	5	1.7500	1.6201	1.4902	44.450	.25000	.15000	.03125	.01042	2 15	1.744	1.90
3	4 1/2	2.0000	1.8557	1.7113	50.800	.22222	.14434	.02778	.00926	2 11	2.30	2.50
3 1/4	4 1/2	2.2500	2.1057	1.9613	57.150	.22222	.14434	.02778	.00926	1 55	3.02	3.25
3 1/2	4	2.5000	2.3376	2.1752	63.500	.25000	.16238	.03125	.01042	1 57	3.72	4.00
3 3/4	4	2.7500	2.5676	2.4252	69.850	.25000	.16238	.03125	.01042	1 45	4.62	4.93
4	4	3.0000	2.8376	2.6752	76.200	.25000	.16238	.03125	.01042	1 36	5.62	5.97
4 1/4	4	3.2500	3.0676	2.9252	82.550	.25000	.16238	.03125	.01042	1 29	6.72	7.10
4 1/2	4	3.5000	3.3376	3.1752	88.900	.25000	.16238	.03125	.01042	1 22	7.92	8.33
4 3/4	4	3.7500	3.5676	3.4252	95.250	.25000	.16238	.03125	.01042	1 16	9.21	9.66
5	4	4.0000	3.8376	3.6752	101.600	.25000	.16238	.03125	.01042	1 11	10.61	11.08

(b) *Internal threads*.—No tolerance is specified, as the maximum major diameter is established by the crest of an unwarped tool. See footnote, tables 1.8 to 1.13, inclusive.

5. BASIS FOR PITCH DIAMETER TOLERANCES.—(a) *NC and NF series, classes 1, 2, 3, and 4*.—The tolerances for screw threads specified for the coarse- and fine-thread series were arrived at by combining two factors, known as the net pitch diameter tolerance and the gage tolerance. The theoretical net tolerances for all threads of a given class bear a definite mathematical relationship to each other, and it was intended that these should in no way be reduced by permissible manufacturing tolerances for master gages; that is, gages within the original gage tolerances in the 1921 NISTC Progress Report, which were approximately equivalent to class A tolerances. Consequently the net tolerances were increased by the equivalent diametrical space required to provide for the gage tolerances on diameter, lead, and angle, to produce the extreme tolerances specified for the product. In practice, the actual net tolerances will depend upon the method of gaging and upon the accuracy of the gages used.

The net pitch diameter tolerances for the various classes are based on the following series for a pitch of  $\frac{1}{16}$  in.:

Class 1	0.0045
Class 2	.0030
Class 3	.0020
Class 4	.0010

Pitch diameter tolerances for pitches finer than  $\frac{1}{16}$  in. are to each other and to the tolerance for  $\frac{1}{16}$  in. as the 0.6th power of their respective pitches.

Pitch diameter tolerances for pitches coarser than  $\frac{1}{16}$  in. are to each other and to the tolerance for  $\frac{1}{16}$  in. as the 0.9th power of their respective pitches.

The exponent 0.6 was chosen for pitches finer than  $\frac{1}{16}$  in. because the resulting tolerances, except in two instances, do not vary more than 0.0001 in. from the pitch diameter tolerances specified in the original ASME Machine Screw Standard.

The tolerances on pitch diameter for the coarse- and fine-thread series are based on a length of engagement equal to the nominal diameter, but may be used for lengths of engagement up to  $1\frac{1}{2}$  diameters.

(b) *NEF, 8N, 12N, and 16N series, classes 2 and 3*.—The class 2 pitch diameter tolerances for the extra-fine-, 8-, 12-, and 16-thread series are equal to  $0.002\sqrt{D+0.0013L}$ , and 0.010 $\sqrt{p}$ , and the class 3 tolerances are 70 percent of the class 2 tolerances. The tolerances for the 8-thread series are based on a length of engagement equal to the nominal diameter and for the extra-fine-, 12-, and 16-thread series on a length of engagement of 9 pitches.

(c) *Limits of size*.—With respect to the pitch diameter limits of size, it is intended, except as hereinafter qualified, that no portion of the complete thread be permitted to project beyond the envelope defined by the maximum-material limits on the one hand, or beyond that defined

TABLE 1.3.—American National fine-thread series, NF

Identification		Basic diameters			Thread data							
Sizes	Threads per inch, $n$	Major diameter, $D$	Pitch diameter, $E$	Minor diameter, $K$	Metric equivalent of major diameter	Pitch, $p$	Depth of thread, $A$	Basic width of flat, $p/8$	Minimum width of flat at major diameter of nut, $p/24$	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2A$ , $\frac{\pi K^2}{4}$	Tensile stress area, $\pi \left( \frac{E+3H}{2} \right)^2$
1	2	3	4	5	6	7	8	9	10	11	12	13
No. $in.$		$in.$	$in.$	$in.$	$mm$	$in.$	$in.$	$in.$	$in.$	$deg \text{ min}$	$in.^2$	$in.^2$
0	80	0.060	0.0519	0.0438	1.524	0.01250	0.00812	0.00156	0.00052	4 23	0.00151	0.00180
1	72	0.073	0.0640	0.0550	1.854	0.01389	0.00902	0.00174	0.00058	3 57	0.00237	0.00278
2	64	0.086	0.0769	0.0657	2.194	0.01562	0.01015	0.00195	0.00065	3 45	0.00339	0.00394
3	56	0.099	0.0874	0.0758	2.515	0.01786	0.01160	0.00223	0.00074	3 33	0.00451	0.00523
4	48	0.112	0.0985	0.0849	2.845	0.02093	0.01353	0.00250	0.00087	3 51	0.00566	0.00661
5	44	0.125	0.1102	0.0955	3.175	0.02273	0.01476	0.00264	0.00095	3 45	0.00716	0.00830
6	40	0.138	0.1218	0.1055	3.505	0.02500	0.01624	0.00312	0.00104	3 44	0.00874	0.01015
8	36	0.164	0.1460	0.1279	4.166	0.02778	0.01804	0.00347	0.00116	3 28	0.01235	0.01474
10	32	0.190	0.1697	0.1494	4.826	0.03125	0.02030	0.00391	0.00130	3 21	0.0175	0.0200
12	28	0.216	0.1923	0.1696	5.486	0.03571	0.02320	0.00446	0.00149	3 22	0.0226	0.0258
$\frac{1}{16}$	24	0.2500	0.2268	0.2036	6.350	0.04167	0.02706	0.00521	0.00174	2 52	0.0326	0.0364
$\frac{3}{16}$	24	0.3125	0.2854	0.2584	7.938	0.04167	0.02706	0.00521	0.00174	2 40	0.0524	0.0580
$\frac{1}{4}$	20	0.3750	0.3479	0.3200	9.525	0.04167	0.02706	0.00521	0.00174	2 11	0.0909	0.0978
$\frac{5}{16}$	18	0.4375	0.4050	0.3725	11.113	0.04167	0.02706	0.00521	0.00174	2 15	0.1090	0.1187
$\frac{3}{8}$	16	0.5000	0.4675	0.4350	12.700	0.05000	0.03248	0.00625	0.00208	1 57	0.1496	0.1599
$\frac{7}{16}$	14	0.5625	0.5204	0.4903	14.288	0.05556	0.03608	0.00694	0.00231	1 55	0.189	0.203
$\frac{1}{2}$	12	0.6250	0.5829	0.5528	15.875	0.05556	0.03608	0.00694	0.00231	1 43	0.240	0.256
$\frac{5}{8}$	11	0.6875	0.6454	0.6153	17.463	0.06250	0.04039	0.00781	0.00260	1 36	0.351	0.373
$\frac{3}{4}$	10	0.7500	0.7079	0.6778	19.050	0.07143	0.04639	0.00893	0.00298	1 24	0.480	0.509
$\frac{7}{8}$	9	0.8750	0.8296	0.7822	22.225	0.07143	0.04639	0.00893	0.00298	1 22	0.646	0.680
1	8	1.0000	0.9536	0.9072	25.400	0.08333	0.05413	0.01042	0.00347	1 35	0.812	0.856
$1\frac{1}{8}$	7	1.1250	1.0709	1.0167	28.575	0.08333	0.05413	0.01042	0.00347	1 25	1.024	1.073
$1\frac{1}{4}$	6	1.2500	1.1959	1.1417	31.750	0.08333	0.05413	0.01042	0.00347	1 16	1.290	1.345
$1\frac{1}{2}$	5	1.3750	1.3209	1.2667	34.925	0.08333	0.05413	0.01042	0.00347	1 9	1.521	1.581
$1\frac{3}{4}$	4	1.5000	1.4459	1.3917	38.100	0.08333	0.05413	0.01042	0.00347	1 3	1.521	1.581

\* The designation of this size has been changed from "NF" to "NS."

TABLE 1.4.—American National extra-fine-thread series, NEF

Identification		Basic diameters			Thread data							
Sizes	Threads per inch, $n$	Major diameter, $D$	Pitch diameter, $E$	Minor diameter, $K$	Metric equivalent of major diameter	Pitch, $p$	Depth of thread, $A$	Basic width of flat, $p/8$	Minimum width of flat at major diameter of nut, $p/24$	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2A$ , $\frac{\pi K^2}{4}$	Tensile stress area, $\pi \left( \frac{E+3H}{2} \right)^2$
1	2	3	4	5	6	7	8	9	10	11	12	13
$in.$		$in.$	$in.$	$in.$	$mm$	$in.$	$in.$	$in.$	$in.$	$deg \text{ min}$	$in.^2$	$in.^2$
$\frac{1}{16}$	32	0.2500	0.2297	0.2094	6.350	0.03125	0.02030	0.00391	0.00130	2 29	0.0344	0.0379
$\frac{3}{16}$	32	0.3125	0.2922	0.2719	7.928	0.03125	0.02030	0.00391	0.00130	1 57	0.0581	0.0625
$\frac{1}{4}$	32	0.3750	0.3547	0.3344	9.525	0.03125	0.02030	0.00391	0.00130	1 36	0.0878	0.0932
$\frac{5}{16}$	24	0.4375	0.4143	0.3911	11.113	0.03571	0.02320	0.00446	0.00149	1 34	0.1201	0.1274
$\frac{3}{8}$	24	0.5000	0.4768	0.4536	12.700	0.03571	0.02320	0.00446	0.00149	1 22	0.162	0.170
$\frac{7}{16}$	24	0.5625	0.5354	0.5084	14.288	0.04167	0.02706	0.00521	0.00174	1 25	0.203	0.214
$\frac{1}{2}$	24	0.6250	0.5979	0.5709	15.875	0.04167	0.02706	0.00521	0.00174	1 16	0.250	0.268
$\frac{5}{8}$	24	0.6875	0.6604	0.6334	17.463	0.04167	0.02706	0.00521	0.00174	1 9	0.315	0.329
$\frac{3}{4}$	20	0.7500	0.7175	0.6850	19.050	0.05000	0.03248	0.00625	0.00208	1 16	0.369	0.393
$\frac{7}{8}$	20	0.8750	0.8425	0.8100	22.225	0.05000	0.03248	0.00625	0.00208	1 10	0.439	0.458
$1$	18	1.0000	0.9675	0.9350	25.400	0.05556	0.03608	0.00694	0.00231	1 4	0.515	0.536
$1\frac{1}{8}$	18	1.1250	1.0925	1.0600	28.575	0.05556	0.03608	0.00694	0.00231	1 0	0.598	0.620
$1\frac{1}{4}$	16	1.2500	1.2175	1.1850	31.750	0.06250	0.04039	0.00781	0.00260	0 57	0.687	0.711
$1\frac{1}{2}$	14	1.3750	1.3425	1.3100	34.925	0.06250	0.04039	0.00781	0.00260	0 59	0.770	0.799
$1\frac{3}{4}$	12	1.5000	1.4675	1.4350	38.100	0.06250	0.04039	0.00781	0.00260	0 56	0.871	0.901
$1\frac{7}{8}$	12	1.5625	1.5300	1.4975	39.675	0.06250	0.04039	0.00781	0.00260	0 53	0.977	1.009
$2$	12	1.6250	1.5925	1.5600	41.250	0.06250	0.04039	0.00781	0.00260	0 50	1.086	1.123
$2\frac{1}{8}$	12	1.6875	1.6550	1.6225	42.825	0.06250	0.04039	0.00781	0.00260	0 48	1.208	1.244
$2\frac{1}{4}$	12	1.7500	1.7175	1.6850	44.400	0.06250	0.04039	0.00781	0.00260	0 45	1.333	1.370
$2\frac{1}{2}$	12	1.8125	1.7800	1.7475	45.975	0.06250	0.04039	0.00781	0.00260	0 43	1.464	1.503
$2\frac{3}{4}$	12	1.8750	1.8425	1.8100	47.550	0.06250	0.04039	0.00781	0.00260	0 42	1.600	1.64
$3$	12	2.0000	1.9675	1.9350	50.800	0.06250	0.04039	0.00781	0.00260	0 40	1.74	1.79
$3\frac{1}{8}$	12	2.0625	2.0300	2.0000	52.375	0.06250	0.04039	0.00781	0.00260	0 38	1.89	1.94
$3\frac{1}{4}$	12	2.1250	2.0925	2.0600	53.950	0.06250	0.04039	0.00781	0.00260	0 37	2.05	2.10
$3\frac{1}{2}$	12	2.1875	2.1550	2.1225	55.525	0.06250	0.04039	0.00781	0.00260	0 35	2.19	2.24
$3\frac{3}{4}$	12	2.2500	2.2175	2.1850	57.100	0.06250	0.04039	0.00781	0.00260	0 35	2.34	2.39

TABLE 1.5.—American National 8-thread series, 8N

Identification		Basic diameters			Thread data			
Sizes	Threads per inch	Major diameter, $D$	Pitch diameter, $E$	Minor diameter, $R$	Metric equivalent of major diameter	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2h$ , $A_s = \frac{\pi R^2}{4}$	Tensile stress area, $A_t = \left(\frac{E+3H}{2}\right)^2$
1	2	3	4	5	6	7	8	9
<i>in.</i>		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>mm</i>	<i>deg min</i>	<i>in.<sup>2</sup></i>	<i>in.<sup>2</sup></i>
1	8	1.0000	0.9188	0.8376	25.400	2 29	0.551	0.606
1 1/8	8	1.1250	1.0438	0.9626	28.575	2 11	.728	.790
1 1/4	8	1.2500	1.1688	1.0876	31.750	1 57	.929	1.000
1 3/8	8	1.3750	1.2938	1.2126	34.925	1 46	1.155	1.233
1 1/2	8	1.5000	1.4188	1.3376	38.100	1 36	1.405	1.492
1 5/8	8	1.6250	1.5438	1.4626	41.275	1 29	1.68	1.78
1 3/4	8	1.7500	1.6688	1.5876	44.450	1 22	1.98	2.08
1 7/8	8	1.8750	1.7938	1.7126	47.625	1 16	2.30	2.41
2	8	2.0000	1.9188	1.8376	50.800	1 11	2.65	2.77
2 1/8	8	2.1250	2.0438	1.9626	53.975	1 7	3.03	3.16
2 1/4	8	2.2500	2.1688	2.0876	57.150	1 3	3.42	3.56
2 3/8	8	2.5000	2.4188	2.3376	63.500	0 57	4.29	4.44
2 1/2	8	2.7500	2.6688	2.5876	69.850	0 51	5.26	5.43
3	8	3.0000	2.9188	2.8376	76.200	0 47	6.32	6.51
3 1/4	8	3.2500	3.1688	3.0876	82.550	0 43	7.49	7.69
3 1/2	8	3.5000	3.4188	3.3376	88.900	0 40	8.75	8.96
3 3/4	8	3.7500	3.6688	3.5876	95.250	0 37	10.11	10.34
4	8	4.0000	3.9188	3.8376	101.600	0 35	11.57	11.81
4 1/4	8	4.2500	4.1688	4.0876	107.950	0 33	13.12	13.38
4 1/2	8	4.5000	4.4188	4.3376	114.300	0 31	14.78	15.06
4 3/4	8	4.7500	4.6688	4.5876	120.650	0 29	16.53	16.82
5	8	5.0000	4.9188	4.8376	127.000	0 28	18.38	18.69
5 1/4	8	5.2500	5.1688	5.0876	133.350	0 26	20.33	20.65
5 1/2	8	5.5000	5.4188	5.3376	139.700	0 25	22.38	22.72
5 3/4	8	5.7500	5.6688	5.5876	146.050	0 24	24.52	24.88
6	8	6.0000	5.9188	5.8376	152.400	0 23	26.76	27.14

\* Standard size of the American National coarse-thread series.

NOTE.—Pitch,  $p=0.12500$  in.; depth of thread,  $h=0.08119$  in.; basic width of flat,  $p/8=0.01562$  in.; minimum width of flat at major diameter of nut,  $p/24=0.00521$  in.

by the minimum-material limits on the other, and thus be outside of the tolerance zone as illustrated in figures 1.2 to 1.5 inclusive. Also, the diameter equivalent of the variation in any given element except pitch diameter shall not exceed one-half of the pitch diameter tolerance. (The full tolerance cannot, therefore, be used on pitch diameter unless deviations in other thread elements are zero.) Deviations from specified size and profile include variations in lead, uniformity of helix, flank angle, taper, out-of-roundness, and surface defects. Accordingly, values are given in tables 1.14 and 1.15, for the standard thread series and classes, of one-half of the pitch diameter tolerances and the deviations in lead and flank angle which are equivalent thereto. Flank angle equivalents are based on a depth of thread engagement of  $5H/8$ .

The diameter equivalents of variations in lead, uniformity of helix, and flank angle are always in the direction toward maximum material, that is they increase the virtual diameter of the external thread and decrease that of the internal thread. Thus, the maximum material pitch diameter limits are a limitation of the virtual diameter (effective size) and are so specified herein for all thread classes.

Variations in taper and roundness of the pitch diameter, together with variations of the pitch diameter as a whole, may be in the direction of minimum material, and thus the minimum-material pitch diameter limit may be specified as a limitation of the pitch diameter as a single element. However, in view of the interrelation of the pitch diameter, variation in lead and flank angle, etc., together with practical considerations relating to established production processes, product application, and inspection procedures, it is customary to interpret the minimum pitch diameter of the external thread and the maximum pitch diameter of the internal thread as virtual diameters (effective sizes) in classes 1 and 2, and classes

3 and 4 internal threads, for application to various mass-produced bolts, nuts, screws, and other similar threaded fasteners, and to some custom threaded parts where design requirements are fulfilled. See "Limit gages" and "Acceptability of threads," section VI, pp. 108 and 118.

6. MINOR DIAMETER TOLERANCES.—(a) *External threads*.—No tolerance is specified, as the minimum minor diameter is established by the crest of an unworn tool. See footnote, tables 1.8 to 1.13, inclusive.

(b) *Internal threads*.—The tolerance on minor diameter for a given size and pitch of thread is the same for all classes. For sizes 1 in. and larger the tolerance is equal to  $0.10825p$ . For most sizes less than 1 in., tolerances have been made arbitrarily larger than  $0.10825p$  to minimize tapping difficulties.

#### (b) SCREW THREAD CLASSES

1. CLASS 1.—(a) *Definition*.—Class 1 is intended to cover the manufacture of threaded parts where quick and easy assembly is necessary, and where an allowance is required.

(b) *Limits of size and tolerances*.—Limits of size and tolerances for the respective thread pitches are specified in tables 1.8 and 1.9, and their application is shown in figure 1.2.

2. CLASS 2.—(a) *Definition*.—Class 2 is intended to apply to the major portion of threaded work in interchangeable manufacture, where no allowance is required.

(b) *Limits of size and tolerances*.—No allowance is provided, but since the tolerances on "go" gages are within the limits of size of the thread, the gages will assure a slight clearance between external and internal threads made to the maximum-material limits. Limits of size and tolerances for the respective thread pitches

TABLE 1.6.—American National 12-thread series, 12N

Identification		Basic diameters			Thread data			
Sizes	Threads per inch	Major diameter, <i>D</i>	Pitch diameter, <i>E</i>	Minor diameter, <i>K</i>	Metric equivalent of major diameter	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2h$ $= \frac{\pi K^2}{4}$	Tensile stress area, $A_s = \left( \frac{E+3H}{2} \right)^2$
1	2	3	4	5	6	7	8	9
<i>in.</i>		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>mm</i>	<i>deg</i> <i>min</i>	<i>in.</i> <sup>2</sup>	<i>in.</i> <sup>2</sup>
$\frac{1}{2}$	12	0.5000	0.4450	0.3917	12.700	3 24	0.121	0.138
$\frac{5}{16}$	12	.5625	.5084	.4542	14.288	2 59	.162	.182
$\frac{3}{8}$	12	.6250	.5709	.5167	15.875	2 40	.210	.232
$\frac{1}{4}$	12	.6875	.6334	.5792	17.463	2 24	.264	.280
$\frac{3}{16}$	12	.7500	.6959	.6417	19.050	2 11	.323	.351
$\frac{1}{8}$	12	.8125	.7584	.7042	20.638	2 0	.390	.420
$\frac{7}{16}$	12	.8750	.8209	.7667	22.225	1 51	.462	.495
$\frac{1}{2}$	12	.9375	.8834	.8292	23.813	1 43	.540	.576
1	12	1.0000	.9459	.8917	25.400	1 36	.625	.663
$\frac{1}{4}$	12	1.0625	1.0084	.9542	26.988	1 30	.715	.766
$\frac{3}{8}$	12	1.1250	1.0709	1.0167	28.575	1 25	.812	.856
$\frac{1}{2}$	12	1.1875	1.1334	1.0792	30.163	1 20	.915	.961
$\frac{3}{4}$	12	1.2500	1.1959	1.1417	31.750	1 16	1.024	1.073
$\frac{1}{4}$	12	1.3125	1.2584	1.2042	33.338	1 12	1.139	1.191
$\frac{1}{2}$	12	1.3750	1.3209	1.2667	34.925	1 9	1.260	1.315
$\frac{1}{2}$	12	1.4375	1.3834	1.3292	36.513	1 6	1.388	1.445
$\frac{1}{2}$	12	1.5000	1.4459	1.3917	38.100	1 3	1.52	1.58
$\frac{1}{2}$	12	1.6250	1.5709	1.5167	41.275	0 58	1.81	1.87
$\frac{1}{2}$	12	1.7500	1.6959	1.6417	44.450	0 54	2.12	2.19
$\frac{1}{2}$	12	1.8750	1.8209	1.7667	47.625	0 50	2.45	2.53
2	12	2.0000	1.9459	1.8917	50.800	0 47	2.81	2.89
$\frac{3}{4}$	12	2.1250	2.0709	2.0167	53.975	0 44	3.19	3.28
$\frac{3}{4}$	12	2.2500	2.1959	2.1417	57.150	0 42	3.60	3.69
$\frac{3}{4}$	12	2.3750	2.3209	2.2667	60.325	0 39	4.04	4.13
$\frac{3}{4}$	12	2.5000	2.4459	2.3917	63.500	0 37	4.49	4.60
$\frac{3}{4}$	12	2.6250	2.5709	2.5167	66.675	0 35	4.97	5.08
$\frac{3}{4}$	12	2.7500	2.6959	2.6417	69.850	0 34	5.48	5.59
$\frac{3}{4}$	12	2.8750	2.8209	2.7667	73.025	0 32	6.01	6.13
3	12	3.0000	2.9459	2.8917	76.200	0 31	6.57	6.69
$\frac{3}{4}$	12	3.1250	3.0709	3.0167	79.375	0 30	7.15	7.28
$\frac{3}{4}$	12	3.2500	3.1959	3.1417	82.550	0 29	7.75	7.89
$\frac{3}{4}$	12	3.3750	3.3209	3.2667	85.725	0 27	8.38	8.52
$\frac{3}{4}$	12	3.5000	3.4459	3.3917	88.900	0 26	9.03	9.18
$\frac{3}{4}$	12	3.6250	3.5709	3.5167	92.075	0 26	9.71	9.86
$\frac{3}{4}$	12	3.7500	3.6959	3.6417	95.250	0 25	10.42	10.57
$\frac{3}{4}$	12	3.8750	3.8209	3.7667	98.425	0 24	11.14	11.30
4	12	4.0000	3.9459	3.8917	101.600	0 23	11.90	12.06
$\frac{1}{2}$	12	4.1250	4.0709	4.0167	104.775	0 22	12.70	12.86
$\frac{1}{2}$	12	4.2500	4.1959	4.1417	107.950	0 21	13.53	13.69
$\frac{1}{2}$	12	4.3750	4.3209	4.2667	111.125	0 21	14.38	14.54
$\frac{1}{2}$	12	4.5000	4.4459	4.3917	114.300	0 19	15.25	15.41
5	12	5.0000	4.9459	4.8917	127.000	0 18	18.8	19.0
$\frac{1}{2}$	12	5.1250	5.0709	5.0167	130.175	0 18	20.8	21.0
$\frac{1}{2}$	12	5.2500	5.1959	5.1417	133.350	0 17	22.8	23.1
$\frac{1}{2}$	12	5.3750	5.3209	5.2667	136.525	0 16	24.8	25.2
6	12	6.0000	5.9459	5.8917	152.400	0 15	27.3	27.6

\* Standard size of the American National coarse-thread series.

\* Standard size of the American National fine-thread series.

NOTE.—Pitch,  $p=0.08333$  in.; depth of thread,  $h=0.05413$  in.; basic width of flat,  $p/8=0.01042$  in.; minimum width of flat at major diameter of nut,  $p/24=0.00347$  in.

are specified in tables 1.8 to 1.13, inclusive, and their application is shown in figure 1.3.

3. CLASS 3.—(a) *Definition*.—Class 3 is intended for applications where closeness of fit and accuracy of lead and angle of thread are important. It is obtainable consistently only by the use of high quality production equipment supported by a very efficient system of gaging and inspection. It is the same in every particular as class 2, except that the tolerances are smaller.

(b) *Limits of size and tolerances*.—No allowance is provided, but since the tolerances on "go" gages are within the limits of size of the thread, the gages will assure a slight clearance between external and internal threads made to the maximum-material limits. Limits of size and tolerances for the respective thread pitches are

specified in tables 1.8 to 1.13, inclusive, and their application is shown in figure 1.4.

4. CLASS 4.—(a) *Definition*.—Class 4 is intended for threaded work requiring a fine snug fit, and where a screwdriver or wrench may be necessary for assembly. In the manufacture of screw-thread products belonging in this class it will be necessary to use precision tools, gages made to special tolerances for this class, and other refinements. This class should, therefore, be used only in cases where requirements of the mechanism being produced are exacting, or where special conditions require screws having a precision fit. In order to secure the fit desired it may be necessary in some cases to select the parts when the product is being assembled.

\* Including positive control of taps and dies by means of a lead screw.



TABLE 1.7.—American National 16-thread series, 16N

Identification		Basic diameters			Thread data			
Sizes	Threads per inch	Major diameter, <i>D</i>	Pitch diameter, <i>E</i>	Minor diameter, <i>K</i>	Metric equivalent of major diameter	Lead angle at basic pitch diameter, $\lambda$	Sectional area at minor diameter at $D-2A$ , $\frac{\pi K^2}{4}$	Tensile-stress area, $\pi \left( \frac{E+3F}{2} \right)^2$
1	2	3	4	5	6	7	8	9
$\frac{1}{16}$ in.	16	0.7500	0.7094	0.6688	19.050	1° 38'	0.351	0.373
$\frac{1}{8}$ in.	16	0.8125	0.7719	0.7313	20.632	1° 29'	0.420	0.444
$\frac{3}{16}$ in.	16	0.8750	0.8344	0.7938	22.225	1° 22'	0.495	0.521
$\frac{1}{2}$ in.	16	0.9375	0.8969	0.8563	23.813	1° 16'	0.578	0.604
1 in.	16	1.0000	0.9594	0.9188	25.400	1° 11'	0.663	0.693
$1\frac{1}{16}$ in.	16	1.0625	1.0219	0.9813	26.988	1° 7'	0.756	0.788
$1\frac{1}{8}$ in.	16	1.1250	1.0844	1.0438	28.575	1° 3'	0.850	0.889
$1\frac{1}{4}$ in.	16	1.1875	1.1469	1.1063	30.163	1° 0'	0.961	0.997
$1\frac{3}{8}$ in.	16	1.2500	1.2094	1.1688	31.750	0° 57'	1.073	1.111
$1\frac{1}{2}$ in.	16	1.3125	1.2719	1.2313	33.338	0° 54'	1.191	1.230
$1\frac{5}{8}$ in.	16	1.3750	1.3344	1.2938	34.925	0° 51'	1.315	1.356
$1\frac{3}{4}$ in.	16	1.4375	1.3969	1.3563	36.513	0° 49'	1.445	1.488
$1\frac{7}{8}$ in.	16	1.5000	1.4594	1.4188	38.100	0° 47'	1.58	1.63
2 in.	16	1.5625	1.5219	1.4813	39.688	0° 45'	1.72	1.77
$2\frac{1}{16}$ in.	16	1.6250	1.5844	1.5438	41.275	0° 43'	1.87	1.92
$2\frac{1}{8}$ in.	16	1.6875	1.6469	1.6063	42.863	0° 42'	2.03	2.08
$2\frac{1}{4}$ in.	16	1.7500	1.7094	1.6688	44.450	0° 40'	2.19	2.24
$2\frac{3}{8}$ in.	16	1.8125	1.7719	1.7313	46.038	0° 39'	2.35	2.41
$2\frac{1}{2}$ in.	16	1.8750	1.8344	1.7938	47.625	0° 37'	2.53	2.58
$2\frac{5}{8}$ in.	16	1.9375	1.8969	1.8563	49.213	0° 36'	2.71	2.77
3 in.	16	2.0000	1.9594	1.9188	50.800	0° 35'	2.89	2.95
$3\frac{1}{16}$ in.	16	2.0625	2.0219	1.9813	52.388	0° 34'	3.08	3.15
$3\frac{1}{8}$ in.	16	2.1250	2.0844	2.0438	53.975	0° 33'	3.28	3.35
$3\frac{1}{4}$ in.	16	2.1875	2.1469	2.1063	55.563	0° 32'	3.48	3.55
$3\frac{3}{8}$ in.	16	2.2500	2.2094	2.1688	57.150	0° 31'	3.69	3.76
$3\frac{1}{2}$ in.	16	2.3125	2.2719	2.2313	58.738	0° 30'	3.91	3.98
$3\frac{5}{8}$ in.	16	2.3750	2.3344	2.2938	60.325	0° 29'	4.13	4.21
$3\frac{3}{4}$ in.	16	2.4375	2.3969	2.3563	61.913	0° 29'	4.36	4.44
$3\frac{7}{8}$ in.	16	2.5000	2.4594	2.4188	63.500	0° 28'	4.60	4.67
$4\frac{1}{16}$ in.	16	2.5625	2.5219	2.4813	65.088	0° 26'	5.08	5.16
$4\frac{1}{8}$ in.	16	2.6250	2.5844	2.5438	66.675	0° 25'	5.50	5.58
$4\frac{1}{4}$ in.	16	2.6875	2.6469	2.6063	68.263	0° 24'	6.13	6.22
$4\frac{3}{8}$ in.	16	2.7500	2.7094	2.6688	69.850	0° 23'	6.69	6.78
$4\frac{1}{2}$ in.	16	2.8125	2.7719	2.7313	71.438	0° 22'	7.28	7.37
$4\frac{5}{8}$ in.	16	2.8750	2.8344	2.7938	73.025	0° 21'	7.89	7.98
$4\frac{3}{4}$ in.	16	2.9375	2.8969	2.8563	74.613	0° 21'	8.52	8.63
$4\frac{7}{8}$ in.	16	3.0000	2.9594	2.9188	76.200	0° 20'	9.18	9.29
$5\frac{1}{16}$ in.	16	3.0625	3.0219	2.9813	77.788	0° 19'	9.86	9.98
$5\frac{1}{8}$ in.	16	3.1250	3.0844	3.0438	79.375	0° 18'	10.57	10.69
$5\frac{1}{4}$ in.	16	3.1875	3.1469	3.1063	80.963	0° 18'	11.30	11.43
$5\frac{3}{8}$ in.	16	3.2500	3.2094	3.1688	82.550	0° 17'	12.06	12.19
$5\frac{1}{2}$ in.	16	3.3125	3.2719	3.2313	84.138	0° 17'		

\* Standard size of the American National fine-thread series.

NOTE.—Pitch,  $p=0.0625$  in.; depth of thread,  $h=0.0409$  in.; basic width of flat,  $p/8=0.00781$  in.; minimum width of flat at major diameter of nut,  $p/24=0.00260$  in.

(b) *Limits of size and tolerances.*—A small negative allowance is provided. Limits of size and tolerances for the respective thread pitches are specified in tables 1.8 and 1.9, and their application is shown in figure 1.5.

5. CLASS 5.—This is a wrench fit class intended for studs and tapped holes which are to be assembled permanently. As the earlier specifications have proved to be not entirely satisfactory this class is in process of revision. Reference should be made to previous editions of this handbook for the earlier specifications.

## 5. METHOD OF DESIGNATING AN AMERICAN NATIONAL THREAD

1. STANDARD AMERICAN NATIONAL THREADS.—The standard method of designating a screw thread is given in section III, p. 26. For all standard threads listed in tables 1.2 to 1.7, inclusive, only the thread designations need be placed on a drawing, it being understood that

the limits of size shall be in accordance with tables 1.8 to 1.13, inclusive, or the corresponding table in ASA B1.1.

Examples: 0.250-28NF-3  
2.000-8N-2

2. MODIFIED AMERICAN NATIONAL THREADS.—It is occasionally necessary to modify the limits of size of the major diameter of an external thread or the minor diameter of an internal thread from the limits established for standard series and special threads in order to fit a specific purpose but without change in class of thread or pitch diameter limits. Such threads should be specified with the established thread designation followed by a statement of the modified diameter limits and the designation "MOD."

External thread:

$\frac{3}{4}$  24NF-3 MOD.

Major diameter .3720-.3648 MOD.

Internal thread:

$\frac{3}{4}$  24NF-2 MOD.

Minor diameter .330-.336 MOD.

For further examples see section III, p. 26.

TABLE 1.8.—Limits of size and tolerances, classes 1, 2, 3, and 4, American National coarse-thread series, NC

Limits of size and tolerances	Machine screw number or nominal size															
	1	2	3	4	5	6	8	10	12	14	16	18	20	22	24	26
	Threads per inch															
	64	56	48	40	40	32	32	24	24	20	18	16	14	13	12	11
<b>EXTERNAL THREADS</b>																
Class 1, major diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0723	0.0852	0.0981	0.1110	0.1240	0.1369	0.1498	0.1627	0.1756	0.1885	0.2014	0.2143	0.2272	0.2401	0.2530
	Min.....	0.0671	0.0796	0.0919	0.1042	0.1172	0.1293	0.1423	0.1553	0.1683	0.1812	0.1942	0.2071	0.2201	0.2330	0.2460
Classes 2, 3, and 4, major diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0730	0.0860	0.0990	0.1120	0.1250	0.1380	0.1510	0.1640	0.1770	0.1900	0.2030	0.2160	0.2290	0.2420	0.2550
	Min.....	0.0692	0.0820	0.0946	0.1072	0.1202	0.1326	0.1456	0.1586	0.1716	0.1846	0.1976	0.2106	0.2236	0.2366	0.2496
Class 2, major diameter (threaded parts of unfinished, hot-rolled material)...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0730	0.0860	0.0990	0.1120	0.1250	0.1380	0.1510	0.1640	0.1770	0.1900	0.2030	0.2160	0.2290	0.2420	0.2550
	Min.....	0.0678	0.0804	0.0928	0.1052	0.1182	0.1304	0.1434	0.1564	0.1694	0.1824	0.1954	0.2084	0.2214	0.2344	0.2474
Class 1, minor diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0531	0.0633	0.0725	0.0803	0.0933	0.0986	0.1246	0.1376	0.1636	0.1872	0.2108	0.2344	0.2580	0.2816	0.3052
	Min.....	0.0538	0.0641	0.0734	0.0813	0.0943	0.0997	0.1257	0.1389	0.1649	0.1887	0.2125	0.2363	0.2601	0.2839	0.3077
Class 1, pitch diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0622	0.0736	0.0846	0.0948	0.1078	0.1166	0.1426	0.1516	0.1776	0.2012	0.2248	0.2484	0.2720	0.2956	0.3192
	Min.....	0.0596	0.0708	0.0815	0.0914	0.1044	0.1128	0.1388	0.1478	0.1738	0.1974	0.2210	0.2446	0.2682	0.2918	0.3154
Class 2, pitch diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0629	0.0744	0.0855	0.0958	0.1088	0.1177	0.1437	0.1529	0.1789	0.2025	0.2261	0.2497	0.2733	0.2969	0.3205
	Min.....	0.0610	0.0724	0.0833	0.0934	0.1064	0.1150	0.1410	0.1506	0.1766	0.2002	0.2238	0.2474	0.2710	0.2946	0.3182
Class 3, pitch diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0629	0.0744	0.0855	0.0958	0.1088	0.1177	0.1437	0.1529	0.1789	0.2025	0.2261	0.2497	0.2733	0.2969	0.3205
	Min.....	0.0615	0.0729	0.0839	0.0941	0.1071	0.1158	0.1418	0.1505	0.1765	0.2001	0.2237	0.2473	0.2709	0.2945	0.3181
Class 4, pitch diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0614	0.0716	0.0816	0.0917	0.1017	0.0919	0.0919	0.0919	0.0919	0.0919	0.0919	0.0919	0.0919	0.0919	0.0919
	Min.....	0.0614	0.0716	0.0816	0.0917	0.1017	0.0919	0.0919	0.0919	0.0919	0.0919	0.0919	0.0919	0.0919	0.0919	0.0919
<b>INTERNAL THREADS</b>																
Classes 1, 2, 3, and 4, major diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Min.....	0.0730	0.0860	0.0990	0.1120	0.1250	0.1380	0.1510	0.1640	0.1770	0.1900	0.2030	0.2160	0.2290	0.2420	0.2550
	Max.....	0.0561	0.0667	0.0764	0.0849	0.0979	0.1042	0.1302	0.1449	0.1709	0.1959	0.2209	0.2459	0.2709	0.2959	0.3209
Classes 1, 2, 3, and 4, minor diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Min.....	0.0623	0.0737	0.0841	0.0938	0.1062	0.1145	0.1384	0.1559	0.1801	0.2000	0.2230	0.2460	0.2690	0.2920	0.3150
	Tol.....	0.0062	0.0070	0.0077	0.0089	0.0083	0.0103	0.0082	0.0110	0.0092	0.0101	0.0106	0.0111	0.0110	0.0123	0.0127
Class 1, pitch diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0655	0.0772	0.0886	0.0992	0.1122	0.1215	0.1475	0.1575	0.1835	0.2071	0.2307	0.2543	0.2779	0.3015	0.3251
	Min.....	0.0626	0.0728	0.0831	0.0934	0.1064	0.1150	0.1410	0.1506	0.1766	0.2002	0.2238	0.2474	0.2710	0.2946	0.3182
Class 2, pitch diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0648	0.0764	0.0877	0.0982	0.1112	0.1204	0.1464	0.1562	0.1822	0.2058	0.2294	0.2530	0.2766	0.3002	0.3238
	Min.....	0.0619	0.0720	0.0822	0.0924	0.1054	0.1140	0.1400	0.1500	0.1760	0.2000	0.2240	0.2480	0.2720	0.2960	0.3200
Class 3, pitch diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0643	0.0759	0.0871	0.0975	0.1105	0.1196	0.1456	0.1553	0.1813	0.2049	0.2285	0.2521	0.2757	0.2993	0.3229
	Min.....	0.0614	0.0716	0.0816	0.0917	0.1017	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019
Class 4, pitch diameter...	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Max.....	0.0614	0.0716	0.0816	0.0917	0.1017	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019
	Min.....	0.0614	0.0716	0.0816	0.0917	0.1017	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019	0.1019

See footnotes on p. 134.

TABLE 1.8.—Limits of size and tolerances, classes 1, 2, 3, and 4, American National coarse-thread series, NC—Continued

Limits of size and tolerances		Size (inches)															
		3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	4
EXTERNAL THREADS		Threads per inch															
Max. Min. Tol.	in.	10	9	8	7	7	6	6	5	4 1/2	4	4	4	4	4	4	4
		in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Class 1, major diameter	Max.	0.7472	0.8719	0.9966	1.1211	1.2461	1.3706	1.4956	1.6201	1.7448	1.8693	1.9938	2.1183	2.2428	2.3673	2.4918	2.6163
	Min.	0.7388	0.8635	0.9882	1.1129	1.2376	1.3623	1.4870	1.6117	1.7364	1.8611	1.9858	2.1105	2.2352	2.3599	2.4846	2.6093
	Tol.	0.0084	0.0084	0.0084	0.0082	0.0085	0.0083	0.0081	0.0084	0.0084	0.0082	0.0080	0.0078	0.0076	0.0074	0.0072	0.0070
Classes 2, 3, and 4, major diameter	Max.	0.7500	0.8750	1.0000	1.1250	1.2500	1.3750	1.5000	1.6250	1.7500	1.8750	2.0000	2.1250	2.2500	2.3750	2.5000	2.6250
	Min.	0.7372	0.8620	0.9868	1.1116	1.2364	1.3612	1.4860	1.6108	1.7356	1.8604	1.9852	2.1100	2.2348	2.3596	2.4844	2.6092
	Tol.	0.0128	0.0130	0.0132	0.0134	0.0136	0.0138	0.0140	0.0142	0.0144	0.0146	0.0148	0.0150	0.0152	0.0154	0.0156	0.0158
Class 2, major diameter (threaded parts of unfinished, hot-dipped material)	Max.	0.7500	0.8750	1.0000	1.1250	1.2500	1.3750	1.5000	1.6250	1.7500	1.8750	2.0000	2.1250	2.2500	2.3750	2.5000	2.6250
	Min.	0.7315	0.8562	0.9809	1.1056	1.2303	1.3550	1.4797	1.6044	1.7291	1.8538	1.9785	2.1032	2.2279	2.3526	2.4773	2.6020
	Tol.	0.0185	0.0188	0.0191	0.0194	0.0197	0.0200	0.0203	0.0206	0.0209	0.0212	0.0215	0.0218	0.0221	0.0224	0.0227	0.0230
Class 1, minor diameter	Max.	0.6245	0.7356	0.8467	0.9578	1.0689	1.1800	1.2911	1.4022	1.5133	1.6244	1.7355	1.8466	1.9577	2.0688	2.1799	2.2910
	Min.	0.6273	0.7384	0.8495	0.9606	1.0717	1.1828	1.2939	1.4050	1.5161	1.6272	1.7383	1.8494	1.9605	2.0716	2.1827	2.2938
	Tol.	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035	0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0042	0.0043
Classes 2, 3, and 4, minor diameter	Max.	0.6273	0.7384	0.8495	0.9606	1.0717	1.1828	1.2939	1.4050	1.5161	1.6272	1.7383	1.8494	1.9605	2.0716	2.1827	2.2938
	Min.	0.6222	0.7333	0.8444	0.9555	1.0666	1.1777	1.2888	1.3999	1.5110	1.6221	1.7332	1.8443	1.9554	2.0665	2.1776	2.2887
	Tol.	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051
Class 1, pitch diameter	Max.	0.6822	0.7997	0.9172	1.0347	1.1522	1.2697	1.3872	1.5047	1.6222	1.7397	1.8572	1.9747	2.0922	2.2097	2.3272	2.4447
	Min.	0.6738	0.7913	0.9088	1.0263	1.1438	1.2613	1.3788	1.4963	1.6138	1.7313	1.8488	1.9663	2.0838	2.2013	2.3188	2.4363
	Tol.	0.0084	0.0084	0.0084	0.0082	0.0085	0.0083	0.0081	0.0084	0.0084	0.0082	0.0080	0.0078	0.0076	0.0074	0.0072	0.0070
Class 2, pitch diameter	Max.	0.6850	0.8025	0.9200	1.0375	1.1550	1.2725	1.3900	1.5075	1.6250	1.7425	1.8600	1.9775	2.0950	2.2125	2.3300	2.4475
	Min.	0.6766	0.7941	0.9116	1.0291	1.1466	1.2641	1.3816	1.4991	1.6166	1.7341	1.8516	1.9691	2.0866	2.2041	2.3216	2.4391
	Tol.	0.0084	0.0084	0.0084	0.0082	0.0085	0.0083	0.0081	0.0084	0.0084	0.0082	0.0080	0.0078	0.0076	0.0074	0.0072	0.0070
Class 3, pitch diameter	Max.	0.6850	0.8025	0.9200	1.0375	1.1550	1.2725	1.3900	1.5075	1.6250	1.7425	1.8600	1.9775	2.0950	2.2125	2.3300	2.4475
	Min.	0.6766	0.7941	0.9116	1.0291	1.1466	1.2641	1.3816	1.4991	1.6166	1.7341	1.8516	1.9691	2.0866	2.2041	2.3216	2.4391
	Tol.	0.0084	0.0084	0.0084	0.0082	0.0085	0.0083	0.0081	0.0084	0.0084	0.0082	0.0080	0.0078	0.0076	0.0074	0.0072	0.0070
Class 4, pitch diameter	Max.	0.6872	0.8047	0.9222	1.0397	1.1572	1.2747	1.3922	1.5097	1.6272	1.7447	1.8622	1.9797	2.0972	2.2147	2.3322	2.4497
	Min.	0.6788	0.7963	0.9138	1.0313	1.1488	1.2663	1.3838	1.5013	1.6188	1.7363	1.8538	1.9713	2.0888	2.2063	2.3238	2.4413
	Tol.	0.0084	0.0084	0.0084	0.0082	0.0085	0.0083	0.0081	0.0084	0.0084	0.0082	0.0080	0.0078	0.0076	0.0074	0.0072	0.0070
INTERNAL THREADS																	
Classes 1, 2, 3, and 4, major diameter	Max.	0.7500	0.8750	1.0000	1.1250	1.2500	1.3750	1.5000	1.6250	1.7500	1.8750	2.0000	2.1250	2.2500	2.3750	2.5000	2.6250
	Min.	0.7416	0.8663	0.9910	1.1157	1.2404	1.3651	1.4898	1.6145	1.7392	1.8639	1.9886	2.1133	2.2380	2.3627	2.4874	2.6121
	Tol.	0.0084	0.0084	0.0084	0.0082	0.0085	0.0083	0.0081	0.0084	0.0084	0.0082	0.0080	0.0078	0.0076	0.0074	0.0072	0.0070
Class 1, minor diameter	Max.	0.6817	0.7992	0.9167	1.0342	1.1517	1.2692	1.3867	1.5042	1.6217	1.7392	1.8567	1.9742	2.0917	2.2092	2.3267	2.4442
	Min.	0.6733	0.7908	0.9083	1.0258	1.1433	1.2608	1.3783	1.4958	1.6133	1.7308	1.8483	1.9658	2.0833	2.2008	2.3183	2.4358
	Tol.	0.0084	0.0084	0.0084	0.0082	0.0085	0.0083	0.0081	0.0084	0.0084	0.0082	0.0080	0.0078	0.0076	0.0074	0.0072	0.0070
Class 2, pitch diameter	Max.	0.6817	0.7992	0.9167	1.0342	1.1517	1.2692	1.3867	1.5042	1.6217	1.7392	1.8567	1.9742	2.0917	2.2092	2.3267	2.4442
	Min.	0.6733	0.7908	0.9083	1.0258	1.1433	1.2608	1.3783	1.4958	1.6133	1.7308	1.8483	1.9658	2.0833	2.2008	2.3183	2.4358
	Tol.	0.0084	0.0084	0.0084	0.0082	0.0085	0.0083	0.0081	0.0084	0.0084	0.0082	0.0080	0.0078	0.0076	0.0074	0.0072	0.0070
Class 3, pitch diameter	Max.	0.6817	0.7992	0.9167	1.0342	1.1517	1.2692	1.3867	1.5042	1.6217	1.7392	1.8567	1.9742	2.0917	2.2092	2.3267	2.4442
	Min.	0.6733	0.7908	0.9083	1.0258	1.1433	1.2608	1.3783	1.4958	1.6133	1.7308	1.8483	1.9658	2.0833	2.2008	2.3183	2.4358
	Tol.	0.0084	0.0084	0.0084	0.0082	0.0085	0.0083	0.0081	0.0084	0.0084	0.0082	0.0080	0.0078	0.0076	0.0074	0.0072	0.0070
Class 4, pitch diameter	Max.	0.6839	0.8014	0.9189	1.0364	1.1539	1.2714	1.3889	1.5064	1.6239	1.7414	1.8589	1.9764	2.0939	2.2114	2.3289	2.4464
	Min.	0.6755	0.7930	0.9105	1.0280	1.1455	1.2630	1.3805	1.4980	1.6155	1.7330	1.8505	1.9680	2.0855	2.2030	2.3205	2.4380
	Tol.	0.0084	0.0084	0.0084	0.0082	0.0085	0.0083	0.0081	0.0084	0.0084	0.0082	0.0080	0.0078	0.0076	0.0074	0.0072	0.0070

1. Dimensions given for the maximum minor diameter of the external thread are figured to the intersection of the thread arc with a center line through crest and root. The minimum minor diameter of the external thread shall be that corresponding to a flat at the minor diameter of the internal thread equal to  $1.5Xp$ , and may be determined by subtracting the basic thread depth,  $h$  (or  $0.683p$ ), from the maximum pitch diameter of the external thread.

2. Dimensions for the minimum major diameter of the internal thread correspond to the basic flat ( $1.5Xp$ ) and the profile at the major diameter produced by a worn tool must not fall below the basic outline. The maximum minor diameter of the internal thread shall be that corresponding to a flat at the major diameter of the maximum internal thread equal to  $1.5Xp$ , and may be determined by adding  $1.74Xh$  (or  $0.7029p$ ) to the maximum pitch diameter of the internal thread.

3. These dimensions are the maximum material or "go" size and are those which should be placed on the component drawing with the tolerances.

TABLE 1.9.—Limits of size and tolerances, classes 1, 2, 3, and 4, American National fine-thread series, NF

Limits of size and tolerances	Machine screw number or nominal size													
	0	1	2	3	4	5	6	8	10	12	14	16	18	20
	Threads per inch													
	80	72	64	56	48	44	40	36	32	28	28	24	24	20
<b>EXTERNAL THREADS</b>														
Class 1, major diameter	in. 0.0593 Min. 0.0545 Tol. 0.0048	in. 0.0723 Min. 0.0673 Tol. 0.0050	in. 0.0853 Min. 0.0801 Tol. 0.0052	in. 0.0982 Min. 0.0926 Tol. 0.0056	in. 0.1111 Min. 0.1049 Tol. 0.0062	in. 0.1241 Min. 0.1177 Tol. 0.0064	in. 0.1370 Min. 0.1302 Tol. 0.0068	in. 0.1629 Min. 0.1557 Tol. 0.0072	in. 0.1880 Min. 0.1813 Tol. 0.0067	in. 0.2148 Min. 0.2062 Tol. 0.0086	in. 0.2488 Min. 0.2402 Tol. 0.0086	in. 0.3112 Min. 0.3020 Tol. 0.0092	in. 0.3737 Min. 0.3645 Tol. 0.0092	in. 0.4360 Min. 0.4258 Tol. 0.0102
Classes 2, 3, and 4, major diameter	Max. 0.0600 Min. 0.0565 Tol. 0.0034	0.0730 0.0694 0.0036	0.0860 0.0822 0.0038	0.0990 0.0950 0.0040	0.1120 0.1076 0.0044	0.1250 0.1204 0.0046	0.1380 0.1332 0.0048	0.1640 0.1590 0.0050	0.1900 0.1846 0.0054	0.2160 0.2098 0.0062	0.2500 0.2438 0.0062	0.3125 0.3059 0.0066	0.3750 0.3684 0.0066	0.4375 0.4303 0.0072
Class 1, minor diameter	Max. 0.0440	0.0553	0.0661	0.0763	0.0855	0.0962	0.1063	0.1288	0.1506	0.1710	0.2050	0.2601	0.3226	0.3747
Classes 2, 3, and 4, minor diameter	Max. 0.0447	0.0560	0.0668	0.0771	0.0864	0.0971	0.1073	0.1299	0.1517	0.1722	0.2062	0.2614	0.3239	0.3762
Class 1, pitch diameter	Max. 0.0512 Min. 0.0488 Tol. 0.0024	0.0633 0.0608 0.0025	0.0752 0.0726 0.0026	0.0866 0.0838 0.0028	0.0976 0.0945 0.0031	0.1083 0.1051 0.0032	0.1208 0.1174 0.0034	0.1449 0.1413 0.0036	0.1686 0.1648 0.0038	0.1916 0.1873 0.0043	0.2256 0.2213 0.0043	0.2841 0.2795 0.0046	0.3466 0.3420 0.0046	0.4035 0.3984 0.0051
Class 2, pitch diameter	Max. 0.0519 Min. 0.0502 Tol. 0.0017	0.0640 0.0622 0.0018	0.0759 0.0740 0.0019	0.0874 0.0854 0.0020	0.0985 0.0963 0.0022	0.1102 0.1079 0.0023	0.1218 0.1194 0.0024	0.1460 0.1435 0.0025	0.1697 0.1670 0.0027	0.1928 0.1897 0.0031	0.2268 0.2237 0.0031	0.2854 0.2821 0.0033	0.3479 0.3446 0.0033	0.4050 0.4014 0.0036
Class 3, pitch diameter	Max. 0.0519 Min. 0.0506 Tol. 0.0013	0.0640 0.0627 0.0013	0.0759 0.0745 0.0014	0.0874 0.0859 0.0015	0.0985 0.0969 0.0016	0.1102 0.1086 0.0016	0.1218 0.1201 0.0017	0.1460 0.1442 0.0018	0.1697 0.1678 0.0019	0.1928 0.1906 0.0022	0.2268 0.2246 0.0022	0.2854 0.2830 0.0024	0.3479 0.3455 0.0024	0.4050 0.4024 0.0026
Class 4, pitch diameter	Max. 0.0519 Min. 0.0506 Tol. 0.0013	0.0640 0.0627 0.0013	0.0759 0.0745 0.0014	0.0874 0.0859 0.0015	0.0985 0.0969 0.0016	0.1102 0.1086 0.0016	0.1218 0.1201 0.0017	0.1460 0.1442 0.0018	0.1697 0.1678 0.0019	0.1928 0.1906 0.0022	0.2268 0.2246 0.0022	0.2854 0.2830 0.0024	0.3479 0.3455 0.0024	0.4050 0.4024 0.0026
<b>INTERNAL THREADS</b>														
Classes 1, 2, 3, and 4, major diameter	Min. 0.0600	0.0730	0.0860	0.0980	0.1120	0.1250	0.1380	0.1640	0.1900	0.2160	0.2500	0.3125	0.3750	0.4375
Classes 1, 2, 3, and 4, minor diameter	Max. 0.0465 Min. 0.0414 Tol. 0.0049	0.0580 0.0534 0.0054	0.0691 0.0646 0.0055	0.0797 0.0756 0.0059	0.0894 0.0860 0.0066	0.1004 0.0968 0.0064	0.1109 0.1079 0.0070	0.1339 0.1302 0.0063	0.1562 0.1524 0.0062	0.1773 0.1735 0.0062	0.2113 0.2074 0.0060	0.2674 0.2639 0.0065	0.3269 0.3239 0.0065	0.3834 0.3806 0.0072
Classes 1, 2, 3, and 4, pitch diameter	Min. 0.0519	0.0640	0.0759	0.0874	0.0985	0.1102	0.1218	0.1460	0.1697	0.1928	0.2268	0.2854	0.3479	0.4050
Class 1, pitch diameter	Max. 0.0543 Tol. 0.0024	0.0665 0.0025	0.0785 0.0026	0.0902 0.0028	0.1016 0.0031	0.1134 0.0032	0.1252 0.0034	0.1496 0.0036	0.1735 0.0038	0.1971 0.0043	0.2311 0.0043	0.2900 0.0046	0.3525 0.0046	0.4101 0.0051
Class 2, pitch diameter	Max. 0.0536 Tol. 0.0017	0.0658 0.0018	0.0778 0.0019	0.0891 0.0020	0.1007 0.0022	0.1125 0.0023	0.1242 0.0024	0.1485 0.0025	0.1724 0.0027	0.1959 0.0031	0.2299 0.0031	0.2887 0.0033	0.3512 0.0033	0.4086 0.0036
Class 3, pitch diameter	Max. 0.0532 Tol. 0.0013	0.0653 0.0013	0.0773 0.0014	0.0889 0.0015	0.1001 0.0016	0.1118 0.0016	0.1235 0.0017	0.1478 0.0018	0.1716 0.0019	0.1950 0.0022	0.2289 0.0022	0.2878 0.0024	0.3503 0.0024	0.4076 0.0026
Class 4, pitch diameter	Max. 0.0532 Tol. 0.0013	0.0653 0.0013	0.0773 0.0014	0.0889 0.0015	0.1001 0.0016	0.1118 0.0016	0.1235 0.0017	0.1478 0.0018	0.1716 0.0019	0.1950 0.0022	0.2289 0.0022	0.2878 0.0024	0.3503 0.0024	0.4076 0.0026

See footnotes on p. 136

TABLE 1.9.—Limits of size and tolerances, classes 1, 2, 3, and 4, American National fine-thread series, NF—Continued

Limits of size and tolerances		Size (Inches)									
		½	¾	¾	¾	¾	1	1⅛	1⅜	1⅝	1⅞
		Threads per inch									
		20	18	18	16	14	14NS	12	12	12	12
EXTERNAL THREADS		in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Class 1, major diameter.....	{Max.....	0.4965	0.5000	0.6234	0.7482	0.8720	0.9979	1.1226	1.2475	1.3726	1.4976
	{Min.....	.4883	.5495	.6120	.7356	.8589	.9839	1.1068	1.2318	1.3568	1.4818
	{Tol.....	.0102	.0114	.0114	.0126	.0140	.0140	.0158	.0158	.0158	.0158
Classes 2, 3, and 4, major diameter.....	{Max.....	.5000	.5625	.6250	.7500	.8750	1.0000	1.1250	1.2500	1.3750	1.5000
	{Min.....	.4928	.5543	.6168	.7410	.8652	.9902	1.1138	1.2388	1.3638	1.4888
	{Tol.....	.0072	.0082	.0082	.0090	.0098	.0098	.0112	.0112	.0112	.0112
Class 1, minor diameter.....	{Max.....	.4372	.4927	.5552	.6715	.7853	.9103	1.0204	1.1454	1.2704	1.3954
	{Min.....	.4387	.4943	.5568	.6733	.7874	.9124	1.0228	1.1478	1.2728	1.3978
	{Tol.....	.0015	.0016	.0016	.0018	.0021	.0021	.0024	.0024	.0024	.0024
Classes 2, 3, and 4, minor diameter.....	{Max.....	.4387	.4943	.5568	.6733	.7874	.9124	1.0228	1.1478	1.2728	1.3978
	{Min.....	.4372	.4927	.5552	.6715	.7853	.9103	1.0204	1.1454	1.2704	1.3954
	{Tol.....	.0015	.0016	.0016	.0018	.0021	.0021	.0024	.0024	.0024	.0024
Class 1, pitch diameter.....	{Max.....	.4660	.5248	.5873	.7076	.8265	.9515	1.0685	1.1935	1.3185	1.4435
	{Min.....	.4659	.5191	.5816	.7013	.8196	.9445	1.0606	1.1856	1.3106	1.4356
	{Tol.....	.0001	.0057	.0057	.0063	.0069	.0070	.0079	.0079	.0079	.0079
Class 2, pitch diameter.....	{Max.....	.4675	.5264	.5889	.7094	.8286	.9536	1.0709	1.1959	1.3209	1.4459
	{Min.....	.4639	.5223	.5848	.7049	.8237	.9487	1.0653	1.1903	1.3153	1.4403
	{Tol.....	.0036	.0041	.0041	.0045	.0049	.0049	.0056	.0056	.0056	.0056
Class 3, pitch diameter.....	{Max.....	.4675	.5264	.5889	.7094	.8286	.9536	1.0709	1.1959	1.3209	1.4459
	{Min.....	.4649	.5233	.5859	.7062	.8250	.9500	1.0669	1.1919	1.3169	1.4419
	{Tol.....	.0026	.0030	.0030	.0032	.0036	.0036	.0040	.0040	.0040	.0040
Class 4, pitch diameter.....	{Max.....	.4678	.5267	.5892	.7098	.8290	.9540	1.0714	1.1964	1.3214	1.4464
	{Min.....	.4665	.5252	.5877	.7082	.8272	.9522	1.0694	1.1944	1.3194	1.4444
	{Tol.....	.0013	.0015	.0015	.0016	.0018	.0018	.0020	.0020	.0020	.0020
INTERNAL THREADS		in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Classes 1, 2, 3, and 4, major diameter.....	{Min.....	.5000	.5625	.6250	.7500	.8750	1.0000	1.1250	1.2500	1.3750	1.5000
	{Max.....	.4459	.5024	.5649	.6823	.7977	.9227	1.0348	1.1598	1.2848	1.4098
	{Tol.....	.4331	.5190	.6725	.6933	.8082	.9312	1.0438	1.1688	1.2938	1.4188
Classes 1, 2, 3, and 4, minor diameter.....	{Min.....	.4372	.4927	.5552	.6715	.7853	.9103	1.0204	1.1454	1.2704	1.3954
	{Max.....	.4387	.4943	.5568	.6733	.7874	.9124	1.0228	1.1478	1.2728	1.3978
	{Tol.....	.0015	.0016	.0016	.0018	.0021	.0021	.0024	.0024	.0024	.0024
Classes 1, 2, 3, and 4, pitch diameter.....	{Min.....	.4675	.5264	.5889	.7094	.8286	.9536	1.0709	1.1959	1.3209	1.4459
	{Max.....	.4726	.5321	.5946	.7157	.8356	.9606	1.0788	1.2038	1.3288	1.4538
	{Tol.....	.0051	.0057	.0057	.0063	.0070	.0070	.0079	.0079	.0079	.0079
Class 1, pitch diameter.....	{Max.....	.4726	.5321	.5946	.7157	.8356	.9606	1.0788	1.2038	1.3288	1.4538
	{Min.....	.4675	.5264	.5889	.7094	.8286	.9536	1.0709	1.1959	1.3209	1.4459
	{Tol.....	.0051	.0057	.0057	.0063	.0070	.0070	.0079	.0079	.0079	.0079
Class 2, pitch diameter.....	{Max.....	.4711	.5305	.5930	.7139	.8335	.9585	1.0765	1.2015	1.3265	1.4515
	{Min.....	.4636	.5241	.5866	.7067	.8259	.9509	1.0689	1.1939	1.3189	1.4439
	{Tol.....	.0036	.0041	.0041	.0045	.0049	.0049	.0056	.0056	.0056	.0056
Class 3, pitch diameter.....	{Max.....	.4701	.5294	.5919	.7126	.8322	.9572	1.0749	1.1999	1.3249	1.4499
	{Min.....	.4626	.5230	.5855	.7056	.8248	.9498	1.0678	1.1928	1.3178	1.4428
	{Tol.....	.0026	.0030	.0030	.0032	.0036	.0036	.0040	.0040	.0040	.0040
Class 4, pitch diameter.....	{Max.....	.4698	.5279	.5904	.7110	.8304	.9554	1.0729	1.1979	1.3229	1.4479
	{Min.....	.4613	.5215	.5840	.7046	.8238	.9488	1.0668	1.1918	1.3168	1.4418
	{Tol.....	.0013	.0015	.0015	.0016	.0018	.0018	.0020	.0020	.0020	.0020

<sup>1</sup> Dimensions given for the maximum minor diameter of the external thread are figured to the intersection of the worn tool arc with a center line through crest and root. The minimum minor diameter of the external thread shall be that corresponding to a flat at the minor diameter of the minimum external thread equal to  $\frac{1}{8} \times p$ , and may be determined by subtracting the basic thread depth,  $h$  (or  $0.6495p$ ), from the minimum pitch diameter of the external thread.

<sup>2</sup> Dimensions for the minimum major diameter of the internal thread correspond to the basic fls ( $\frac{1}{8} \times p$ ) and the profile at the major diameter produced by a worn tool must not fall below the basic outline. The maximum major diameter of the internal thread shall be that corresponding to a flat at the major diameter of the maximum internal thread equal to  $\frac{1}{8} \times p$ , and may be determined by adding  $\frac{1}{8} \times p$  (or  $0.7930p$ ) to the maximum pitch diameter of the internal thread.

<sup>3</sup> These dimensions are the maximum material or "go" size, and are those which should be placed on the component drawing with the tolerances.



TABLE 1.10.—Limits of size and tolerances, classes 2 and 3, American National extra-fine-thread series, NEF

Limits of size and tolerances <sup>1</sup>	Size (inches)												
	3/4	5/16	3/8	7/16	1/2	9/16	5/8	1 1/16	3/4	1 1/8	7/8	1 1/2	1
	Threads per inch												
	32	32	32	28	28	24	24	24	20	20	20	20	20
<b>EXTERNAL THREADS</b>													
Classes 2 and 3, major diameter.....	in. 0.2500 Max..... Min..... Tol.....	in. 0.3125 0.2446 0.3071 0.0054	in. 0.3750 0.3696 0.3054 0.0062	in. 0.4375 0.4313 0.4062 0.0062	in. 0.5000 0.4938 0.4682 0.0062	in. 0.5625 0.5559 0.5304 0.0065	in. 0.6250 0.6184 0.5929 0.0066	in. 0.6875 0.6809 0.6554 0.0066	in. 0.7500 0.7428 0.7173 0.0072	in. 0.8125 0.8053 0.7798 0.0072	in. 0.8750 0.8678 0.8423 0.0072	in. 0.9375 0.9303 0.9048 0.0072	in. 1.0000 0.9928 0.9673 0.0072
Classes 2 and 3, minor diameter.....	Max.....	0.2117	0.2742	0.3367	0.3937	0.4562	0.5114	0.5739	0.6364	0.6887	0.7512	0.8137	0.8762
Class 2, pitch diameter.....	Max..... Min..... Tol.....	0.2297 0.2265 0.0032	0.2922 0.2890 0.0033	0.3547 0.3513 0.0034	0.4143 0.4107 0.0036	0.4768 0.4731 0.0037	0.5354 0.5314 0.0040	0.5979 0.5938 0.0041	0.6604 0.6563 0.0041	0.7175 0.7129 0.0046	0.7800 0.7754 0.0046	0.8425 0.8378 0.0047	0.9050 0.9003 0.0048
Class 3, pitch diameter.....	Max..... Min..... Tol.....	0.2297 0.2275 0.0022	0.2922 0.2890 0.0023	0.3547 0.3523 0.0024	0.4143 0.4118 0.0025	0.4768 0.4742 0.0026	0.5354 0.5326 0.0028	0.5979 0.5950 0.0029	0.6604 0.6575 0.0029	0.7175 0.7143 0.0032	0.7800 0.7768 0.0032	0.8425 0.8392 0.0033	0.9050 0.9017 0.0033
<b>INTERNAL THREADS</b>													
Classes 2 and 3, major diameter.....	Min.....	0.2500	0.3125	0.3750	0.4375	0.5000	0.5625	0.6250	0.6875	0.7500	0.8125	0.8750	0.9375
Classes 2 and 3, minor diameter.....	Min..... Max..... Tol.....	0.2162 0.2210 0.0048	0.2787 0.2835 0.0048	0.3412 0.3460 0.0048	0.3988 0.4044 0.0056	0.4613 0.4669 0.0056	0.5174 0.5239 0.0065	0.5790 0.5864 0.0065	0.6424 0.6489 0.0065	0.7050 0.7121 0.0072	0.7684 0.7756 0.0072	0.8319 0.8381 0.0072	0.8954 0.9016 0.0072
Class 2, pitch diameter.....	Min..... Max..... Tol.....	0.2207 0.2129 0.0032	0.2922 0.2855 0.0033	0.3547 0.3513 0.0034	0.4143 0.4107 0.0036	0.4768 0.4731 0.0037	0.5354 0.5314 0.0040	0.5979 0.5938 0.0041	0.6604 0.6563 0.0041	0.7175 0.7129 0.0046	0.7800 0.7754 0.0046	0.8425 0.8378 0.0047	0.9050 0.9003 0.0048
Class 3, pitch diameter.....	Min..... Max..... Tol.....	0.2297 0.2319 0.0022	0.2922 0.2945 0.0023	0.3547 0.3571 0.0024	0.4143 0.4168 0.0025	0.4768 0.4794 0.0026	0.5354 0.5382 0.0028	0.5979 0.6008 0.0029	0.6604 0.6633 0.0029	0.7175 0.7207 0.0032	0.7800 0.7832 0.0032	0.8425 0.8458 0.0033	0.9050 0.9079 0.0033

Limits of size and tolerances <sup>1</sup>	Size (inches)												
	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	1 7/8	1 7/8	1 7/8	1 7/8	1 7/8	2
	Threads per inch												
	18	18	18	16	18	18	18	18	18	18	18	16	16
<b>EXTERNAL THREADS</b>													
Classes 2 and 3, major diameter.....	in. 1.0625 Max..... Min..... Tol.....	in. 1.1250 1.0543 1.1168 0.0082	in. 1.1875 1.1793 1.1408 0.0082	in. 1.2500 1.2418 1.2028 0.0082	in. 1.3125 1.3043 1.2653 0.0082	in. 1.3750 1.3668 1.3278 0.0082	in. 1.4375 1.4293 1.3903 0.0082	in. 1.5000 1.4918 1.4528 0.0082	in. 1.5625 1.5543 1.5153 0.0082	in. 1.6250 1.6168 1.5778 0.0082	in. 1.6875 1.6793 1.6403 0.0082	in. 1.7500 1.7410 1.7020 0.0082	in. 1.8125 1.8030 1.7640 0.0082
Classes 2 and 3, minor diameter.....	Max.....	0.9943	1.0568	1.1193	1.1818	1.2443	1.3068	1.3693	1.4318	1.4943	1.5568	1.6193	1.6818
Class 2, pitch diameter.....	Max..... Min..... Tol.....	1.0264 1.0213 0.0051	1.0889 1.0837 0.0052	1.1514 1.1462 0.0052	1.2139 1.2086 0.0053	1.2764 1.2711 0.0053	1.3389 1.3335 0.0054	1.4014 1.3960 0.0054	1.4639 1.4584 0.0055	1.5264 1.5209 0.0055	1.5889 1.5833 0.0056	1.6514 1.6458 0.0056	1.7139 1.7083 0.0056
Class 3, pitch diameter.....	Max..... Min..... Tol.....	1.0264 1.0228 0.0036	1.0889 1.0853 0.0036	1.1514 1.1478 0.0036	1.2139 1.2102 0.0037	1.2764 1.2727 0.0037	1.3389 1.3351 0.0038	1.4014 1.3976 0.0038	1.4639 1.4601 0.0038	1.5264 1.5225 0.0039	1.5889 1.5850 0.0039	1.6514 1.6475 0.0039	1.7139 1.7100 0.0039
<b>INTERNAL THREADS</b>													
Classes 2 and 3, major diameter.....	Min.....	1.0625	1.1250	1.1875	1.2500	1.3125	1.3750	1.4375	1.5000	1.5625	1.6250	1.6875	1.7500
Classes 2 and 3, minor diameter.....	Min..... Max..... Tol.....	1.0024 1.0100 0.0076	1.0649 1.0725 0.0076	1.1274 1.1350 0.0076	1.1899 1.1975 0.0076	1.2524 1.2600 0.0076	1.3149 1.3225 0.0076	1.3774 1.3850 0.0076	1.4399 1.4475 0.0076	1.5024 1.5100 0.0076	1.5649 1.5725 0.0076	1.6274 1.6350 0.0076	1.6899 1.6975 0.0076
Class 2, pitch diameter.....	Min..... Max..... Tol.....	1.0264 1.0315 0.0051	1.0889 1.0941 0.0052	1.1514 1.1566 0.0052	1.2139 1.2192 0.0053	1.2764 1.2817 0.0053	1.3389 1.3443 0.0054	1.4014 1.4068 0.0054	1.4639 1.4694 0.0055	1.5264 1.5319 0.0055	1.5889 1.5945 0.0056	1.6514 1.6570 0.0056	1.7139 1.7195 0.0056
Class 3, pitch diameter.....	Min..... Max..... Tol.....	1.0264 1.0300 0.0036	1.0889 1.0925 0.0036	1.1514 1.1550 0.0036	1.2139 1.2176 0.0037	1.2764 1.2801 0.0037	1.3389 1.3427 0.0038	1.4014 1.4052 0.0038	1.4639 1.4677 0.0038	1.5264 1.5303 0.0039	1.5889 1.5928 0.0039	1.6514 1.6553 0.0039	1.7139 1.7175 0.0039

<sup>1</sup> Pitch diameter tolerances include deviations of lead and angle. The class 2 tolerances are based on the formulas in table 2.2 and a length of engagement of 9 threads. The class 3 tolerances are 70 percent of the class 2 tolerances.

<sup>2</sup> Dimensions given for the maximum minor diameter of the external thread are figured to the intersection of the worn tool arc with a center line through crest and root. The minimum minor diameter of the external thread shall be that corresponding to a flat at the minor diameter of the minimum external thread equal to  $1/4 \times p$ , and may be determined by subtracting the basic thread depth,  $h$  (or  $0.6495 p$ ), from the minimum pitch diameter of the external thread.

<sup>3</sup> Dimensions for the minimum major diameter of the internal thread correspond to the basic flat ( $1/4 \times p$ ), and the profile at the major diameter produced by a worn tool must not fall below the basic outline. The maximum major diameter of the internal thread shall be that corresponding to a flat at the major diameter of the maximum internal thread equal to  $3/4 \times p$ , and may be determined by adding  $1/4 \times h$  (or  $0.709 p$ ) to the maximum pitch diameter of the internal thread.

<sup>4</sup> These dimensions are the maximum material or "go" size, and are those which should be placed on the component drawing with the tolerances.

TABLE 1.11.—Limits of size and tolerances, classes 2 and 3, American National 8-thread series, 8N

Limits of size and tolerances <sup>1</sup>		Size (inches)							
		1 1/8	1 3/8	1 1/2	1 3/4	1 5/8	1 3/4	1 7/8	2
EXTERNAL THREADS		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
Classes 2 and 3, major diameter	{Max	1.0000	1.1250	1.2500	1.3750	1.5000	1.6250	1.7500	2.0000
	{Min	.9948	1.1098	1.2348	1.3598	1.4848	1.6098	1.7348	1.9848
	{Tol	.0152	.0152	.0152	.0152	.0152	.0152	.0152	.0152
Classes 2 and 3, minor diameter	Max <sup>2</sup>	.8466	.9716	1.0966	1.2216	1.3466	1.4716	1.5966	1.8466
Class 2, pitch diameter (for general use)	{Max <sup>3</sup>	.9188	1.0438	1.1688	1.2938	1.4188	1.5438	1.6688	1.9188
	{Min	.9112	1.0359	1.1605	1.2852	1.4098	1.5345	1.6591	1.9084
	{Tol	.0076	.0079	.0083	.0086	.0090	.0093	.0097	.0104
Class 3, pitch diameter	{Max <sup>3</sup>	.9188	1.0438	1.1688	1.2938	1.4188	1.5438	1.6688	1.9188
	{Min	.9134	1.0383	1.1639	1.2877	1.4125	1.5373	1.6620	1.9115
	{Tol	.0054	.0055	.0058	.0061	.0063	.0065	.0068	.0073
INTERNAL THREADS									
Classes 2 and 3, major diameter	Min <sup>4</sup>	1.0000	1.1250	1.2500	1.3750	1.5000	1.6250	1.7500	2.0000
Classes 2 and 3, minor diameter	{Min	.8647	.9897	1.1147	1.2397	1.3647	1.4897	1.6147	1.8647
	{Max	.8797	1.0045	1.1295	1.2545	1.3795	1.5045	1.6295	1.8795
	{Tol	.0148	.0148	.0148	.0148	.0148	.0148	.0148	.0148
Classes 2 and 3, pitch diameter	Min <sup>4</sup>	.9188	1.0438	1.1688	1.2938	1.4188	1.5438	1.6688	1.9188
Class 2, pitch diameter (for general use)	{Max	.9264	1.0517	1.1771	1.3024	1.4278	1.5531	1.6785	1.9282
	{Tol	.0076	.0079	.0083	.0086	.0090	.0093	.0097	.0104
Class 3, pitch diameter	{Max	.9242	1.0493	1.1746	1.2999	1.4251	1.5503	1.6756	1.9251
	{Tol	.0054	.0055	.0058	.0061	.0063	.0065	.0068	.0073

Limits of size and tolerances <sup>1</sup>		Size (inches)							
		2 3/8	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4
EXTERNAL THREADS		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
Classes 2 and 3, major diameter	{Max	2.1250	2.2500	2.5000	2.7500	3.0000	3.2500	3.5000	4.0000
	{Min	2.1098	2.2348	2.4848	2.7348	2.9848	3.2348	3.4848	3.9848
	{Tol	.0152	.0152	.0152	.0152	.0152	.0152	.0152	.0152
Classes 2 and 3, minor diameter	Max <sup>2</sup>	1.9716	2.0966	2.3466	2.5966	2.8466	3.0966	3.3466	3.8466
Class 2, pitch diameter (for general use)	{Max <sup>3</sup>	2.0438	2.1688	2.4188	2.6688	2.9188	3.1688	3.4188	3.9188
	{Min	2.0331	2.1578	2.4071	2.6564	2.9058	3.1556	3.4055	3.9053
	{Tol	.0107	.0110	.0117	.0124	.0130	.0132	.0133	.0135
Class 3, pitch diameter	{Max <sup>3</sup>	2.0438	2.1688	2.4188	2.6688	2.9188	3.1688	3.4188	3.9188
	{Min	2.0363	2.1611	2.4106	2.6601	2.9096	3.1595	3.4095	3.9093
	{Tol	.0075	.0077	.0082	.0087	.0092	.0093	.0095	.0095
INTERNAL THREADS									
Classes 2 and 3, major diameter	Min <sup>4</sup>	2.1250	2.2500	2.5000	2.7500	3.0000	3.2500	3.5000	4.0000
Classes 2 and 3, minor diameter	{Min	1.9897	2.1147	2.3647	2.6147	2.8647	3.1147	3.3647	3.8647
	{Max	2.0045	2.1295	2.3795	2.6295	2.8795	3.1295	3.3795	3.8795
	{Tol	.0148	.0148	.0148	.0148	.0148	.0148	.0148	.0148
Classes 2 and 3, pitch diameter	Min <sup>4</sup>	2.0438	2.1688	2.4188	2.6688	2.9188	3.1688	3.4188	3.9188
Class 2, pitch diameter (for general use)	{Max	2.0545	2.1798	2.4305	2.6812	2.9318	3.1820	3.4321	3.9323
	{Tol	.0107	.0110	.0117	.0124	.0130	.0132	.0133	.0135
Class 3, pitch diameter	{Max	2.0513	2.1765	2.4270	2.6775	2.9280	3.1781	3.4281	3.9283
	{Tol	.0075	.0077	.0082	.0087	.0092	.0093	.0095	.0095

See footnotes at end of table.

TABLE 1.11. *Limits of size and tolerances, classes 2 and 3, American National 8-thread series, 8N* Continued

Limits of size and tolerances <sup>1</sup>		Size (inches)							
		4 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>4</sub>	5	5 <sup>1</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>2</sub>	5 <sup>3</sup> / <sub>4</sub>	6
EXTERNAL THREADS		<i>m.</i>	<i>m.</i>	<i>m.</i>	<i>m.</i>	<i>m.</i>	<i>m.</i>	<i>m.</i>	<i>m.</i>
Classes 2 and 3, major diameter	Max	4.2500	4.5000	4.7500	5.0000	5.2500	5.5000	5.7500	6.0000
	Min	4.2348	4.4848	4.7348	4.9848	5.2348	5.4848	5.7348	5.9848
	Tol	.0152	.0152	.0152	.0152	.0152	.0152	.0152	.0152
Classes 2 and 3, minor diameter	Max. <sup>2</sup>	4.0966	4.3466	4.5966	4.8466	5.0966	5.3466	5.5966	5.8466
Class 2, pitch diameter (for general use)	Max. <sup>3</sup>	4.1688	4.4188	4.6688	4.9188	5.1688	5.4188	5.6688	5.9188
	Min	4.1551	4.4050	4.6549	4.9048	5.1547	5.4046	5.6545	5.9044
	Tol	.0137	.0138	.0139	.0140	.0141	.0142	.0143	.0144
Class 3, pitch diameter	Max. <sup>4</sup>	4.1688	4.4188	4.6688	4.9188	5.1688	5.4188	5.6688	5.9188
	Min	4.1592	4.4091	4.6590	4.9089	5.1589	5.4088	5.6587	5.9086
	Tol	.0096	.0097	.0098	.0099	.0099	.0100	.0101	.0102
INTERNAL THREADS									
Classes 2 and 3, major diameter	Min. <sup>5</sup>	4.2500	4.5000	4.7500	5.0000	5.2500	5.5000	5.7500	6.0000
Classes 2 and 3, minor diameter	Min	4.1147	4.3647	4.6147	4.8647	5.1147	5.3647	5.6147	5.8647
	Max	4.1295	4.3795	4.6295	4.8795	5.1295	5.3795	5.6295	5.8795
	Tol	.0148	.0148	.0148	.0148	.0148	.0148	.0148	.0148
Classes 2 and 3, pitch diameter	Min. <sup>6</sup>	4.1688	4.4188	4.6688	4.9188	5.1688	5.4188	5.6688	5.9188
Class 2, pitch diameter (for general use)	Max	4.1825	4.4325	4.6825	4.9325	5.1825	5.4325	5.6831	5.9332
	Tol	.0137	.0138	.0139	.0140	.0141	.0142	.0143	.0144
Class 3, pitch diameter	Max	4.1784	4.4285	4.6786	4.9287	5.1787	5.4288	5.6789	5.9289
	Tol	.0096	.0097	.0098	.0099	.0099	.0100	.0101	.0102

<sup>1</sup> Pitch diameter tolerances include deviations of lead and angle. The class 2 tolerances are based on the formulas in table 2.2 and a length of engagement equal to the basic major diameter for sizes from 1½ to 3 inches, inclusive, and a length of engagement of 3 inches for sizes over the 3-inch. The class 3 tolerances are 70 percent of the class 2 tolerances. The 1-inch size being in the American National coarse-thread series, the tolerances for this size correspond to that series.

<sup>2</sup> Standard size of the American National coarse-thread series.

<sup>3</sup> Dimensions given for the maximum minor diameter of the external thread are figured to the intersection of the worn tool arc with a center line through crest and root. The minimum minor diameter of the external thread shall be that corresponding to a flat at the minor diameter of the minimum external thread equal to 1/8 × *p*, and may be determined by subtracting 0.0812 inch from the minimum pitch diameter of the external thread.

<sup>4</sup> Dimensions for the minimum major diameter of the internal thread correspond to the basic flat (1/8 × *p*), and the profile at the major diameter produced by a worn tool must not fall below the basic outline. The maximum major diameter of the internal thread shall be that corresponding to a flat at the major diameter of the maximum internal thread equal to 1/4 × *p*, and may be determined by adding 0.0392 inch to the maximum pitch diameter of the internal thread.

<sup>5</sup> These dimensions are the maximum material or "go" size, and are those which should be placed on the component drawing with the tolerances.

TABLE 1.12. --Limits of size and tolerances, classes 2 and 3, American National 12-thread series, 12N

Limits of size and tolerances <sup>1</sup>		Size (inches)							
		$\frac{3}{8}$	$\frac{7}{16}$ <sup>2</sup>	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$1\frac{1}{8}$	$1\frac{1}{2}$
EXTERNAL THREADS		in.	in.	in.	in.	in.	in.	in.	in.
Classes 2 and 3, major diameter.....	{Max.....	0.5000	0.5025	0.6250	0.6875	0.7500	0.8125	0.8750	0.9375
	{Min.....	.4888	.5513	.6138	.6763	.7388	.8013	.8638	.9263
	{Tol.....	.0112	.0112	.0112	.0112	.0112	.0112	.0112	.0112
Classes 2 and 3, minor diameter.....	Max <sup>4</sup> .....	.3978	.4603	.5228	.5853	.6478	.7103	.7728	.8353
Class 2, pitch diameter (for general use).....	{Max <sup>5</sup> .....	.4459	.5084	.5709	.6334	.6959	.7584	.8209	.8834
	{Min.....	.4403	.5028	.5653	.6278	.6903	.7528	.8153	.8778
	{Tol.....	.0056	.0056	.0056	.0056	.0056	.0056	.0056	.0056
Class 3, pitch diameter.....	{Max <sup>5</sup> .....	.4459	.5084	.5709	.6334	.6959	.7584	.8209	.8834
	{Min.....	.4419	.5044	.5669	.6294	.6919	.7544	.8169	.8794
	{Tol.....	.0040	.0040	.0040	.0040	.0040	.0040	.0040	.0040
INTERNAL THREADS									
Classes 2 and 3, major diameter.....	Min <sup>3</sup> .....	.5000	.5025	.6250	.6875	.7500	.8125	.8750	.9375
Classes 2 and 3, minor diameter.....	{Min.....	.4098	.4723	.5348	.5973	.6598	.7223	.7848	.8473
	{Max.....	.4225	.4850	.5475	.6100	.6725	.7350	.7975	.8600
	{Tol.....	.0127	.0127	.0090	.0090	.0090	.0090	.0090	.0090
Classes 2 and 3, pitch diameter.....	Min <sup>6</sup> .....	.4459	.5084	.5709	.6334	.6959	.7584	.8209	.8834
Class 2, pitch diameter (for general use).....	{Max.....	.4515	.5140	.5765	.6390	.7015	.7640	.8265	.8890
	{Min.....	.4056	.4681	.5306	.5931	.6556	.7181	.7806	.8431
	{Tol.....	.0459	.0459	.0459	.0459	.0459	.0459	.0459	.0459
Class 3, pitch diameter.....	{Max.....	.4499	.5124	.5749	.6374	.6999	.7624	.8249	.8874
	{Min.....	.4040	.4665	.5290	.5915	.6540	.7165	.7790	.8415
	{Tol.....	.0459	.0459	.0459	.0459	.0459	.0459	.0459	.0459

Limits of size and tolerances <sup>1</sup>		Size (inches)							
		1	$1\frac{1}{8}$	$1\frac{1}{2}$ <sup>2</sup>	$1\frac{3}{4}$	$2$	$2\frac{1}{2}$	$3$	$3\frac{1}{2}$
EXTERNAL THREADS		in.	in.	in.	in.	in.	in.	in.	in.
Classes 2 and 3, major diameter.....	{Max.....	1.0000	1.0625	1.1250	1.1875	1.2500	1.3125	1.3750	1.4375
	{Min.....	.9888	1.0513	1.1138	1.1763	1.2388	1.3013	1.3638	1.4263
	{Tol.....	.0112	.0112	.0112	.0112	.0112	.0112	.0112	.0112
Classes 2 and 3, minor diameter.....	Max <sup>4</sup> .....	.8978	.9603	1.0228	1.0853	1.1478	1.2103	1.2728	1.3353
Class 2, pitch diameter (for general use).....	{Max <sup>5</sup> .....	.9459	1.0084	1.0709	1.1334	1.1959	1.2584	1.3209	1.3834
	{Min.....	.9403	1.0028	1.0653	1.1278	1.1903	1.2528	1.3153	1.3778
	{Tol.....	.0056	.0056	.0056	.0056	.0056	.0056	.0056	.0056
Class 3, pitch diameter.....	{Max <sup>5</sup> .....	.9459	1.0084	1.0709	1.1334	1.1959	1.2584	1.3209	1.3834
	{Min.....	.9419	1.0044	1.0669	1.1294	1.1919	1.2544	1.3169	1.3794
	{Tol.....	.0040	.0040	.0040	.0040	.0040	.0040	.0040	.0040
INTERNAL THREADS									
Classes 2 and 3, major diameter.....	Min <sup>3</sup> .....	1.0000	1.0625	1.1250	1.1875	1.2500	1.3125	1.3750	1.4375
Classes 2 and 3, minor diameter.....	{Min.....	.9098	.9723	1.0348	1.0973	1.1598	1.2223	1.2848	1.3473
	{Max.....	.9188	.9813	1.0438	1.1063	1.1688	1.2313	1.2938	1.3563
	{Tol.....	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090
Classes 2 and 3, pitch diameter.....	Min <sup>6</sup> .....	.9459	1.0084	1.0709	1.1334	1.1959	1.2584	1.3209	1.3834
Class 2, pitch diameter (for general use).....	{Max.....	.9515	1.0140	1.0765	1.1390	1.2015	1.2640	1.3265	1.3890
	{Min.....	.9056	.9681	1.0306	1.0931	1.1556	1.2181	1.2806	1.3431
	{Tol.....	.0459	.0459	.0459	.0459	.0459	.0459	.0459	.0459
Class 3, pitch diameter.....	{Max.....	.9499	1.0124	1.0749	1.1374	1.1999	1.2624	1.3249	1.3874
	{Min.....	.9040	.9665	1.0290	1.0915	1.1540	1.2165	1.2790	1.3415
	{Tol.....	.0459	.0459	.0459	.0459	.0459	.0459	.0459	.0459

See footnotes at end of table.

TABLE 1.12.—Limits of size and tolerances, classes 2 and 3, American National 12-thread series, 12N—Continued

Limits of size and tolerances <sup>1</sup>		Size (inches)							
		1 1/16	1 1/8	1 1/4	1 3/8	1 1/2	2	2 1/4	2 3/4
EXTERNAL THREADS		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
Classes 2 and 3, major diameter	Max	1.4375	1.5000	1.6250	1.7500	1.8750	2.0000	2.1250	2.2500
	Min	1.4263	1.4888	1.6138	1.7388	1.8638	1.9888	2.1138	2.2388
	Tol	.0112	.0112	.0112	.0112	.0112	.0112	.0112	.0112
Classes 2 and 3, minor diameter	Max <sup>4</sup>	1.3353	1.3978	1.5228	1.6478	1.7728	1.8978	2.0228	2.1478
Class 2, pitch diameter (for general use)	Max <sup>6</sup>	1.3834	1.4459	1.5709	1.6959	1.8209	1.9459	2.0709	2.1959
	Min	1.3778	1.4403	1.5645	1.6894	1.8143	1.9392	2.0641	2.1890
	Tol	.0056	.0056	.0064	.0065	.0066	.0067	.0068	.0069
Class 3, pitch diameter	Max <sup>6</sup>	1.3834	1.4459	1.5709	1.6959	1.8209	1.9459	2.0709	2.1959
	Min	1.3794	1.4419	1.5664	1.6913	1.8163	1.9412	2.0661	2.1911
	Tol	.0040	.0040	.0045	.0046	.0046	.0047	.0048	.0048
INTERNAL THREADS									
Classes 2 and 3, major diameter	Min <sup>5</sup>	1.4375	1.5000	1.6250	1.7500	1.8750	2.0000	2.1250	2.2500
Classes 2 and 3, minor diameter	Min	1.3473	1.4098	1.5348	1.6598	1.7848	1.9098	2.0348	2.1598
	Max	1.3563	1.4188	1.5438	1.6688	1.7938	1.9188	2.0438	2.1688
	Tol	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090
Classes 2 and 3, pitch diameter	Min <sup>6</sup>	1.3834	1.4459	1.5709	1.6959	1.8209	1.9459	2.0709	2.1959
Class 2, pitch diameter (for general use)	Max	1.3890	1.4515	1.5773	1.7024	1.8275	1.9526	2.0777	2.2028
	Tol	.0056	.0056	.0064	.0065	.0066	.0067	.0068	.0069
Class 3, pitch diameter	Max	1.3874	1.4499	1.5754	1.7005	1.8255	1.9506	2.0757	2.2007
	Tol	.0040	.0040	.0045	.0046	.0046	.0047	.0048	.0048

Limits of size and tolerances <sup>1</sup>		Size (inches)							
		2 3/8	2 1/2	2 5/8	2 3/4	2 7/8	3	3 1/4	
EXTERNAL THREADS		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	
Classes 2 and 3, major diameter	Max	2.3750	2.5000	2.6250	2.7500	2.8750	3.0000	3.1250	
	Min	2.3638	2.4888	2.6138	2.7388	2.8638	2.9888	3.1138	
	Tol	.0112	.0112	.0112	.0112	.0112	.0112	.0112	
Classes 2 and 3, minor diameter	Max <sup>4</sup>	2.2728	2.3978	2.5228	2.6478	2.7728	2.8978	3.0228	
Class 2, pitch diameter (for general use)	Max <sup>6</sup>	2.3209	2.4459	2.5709	2.6959	2.8209	2.9459	3.0709	
	Min	2.3139	2.4388	2.5638	2.6887	2.8136	2.9385	3.0635	
	Tol	.0070	.0071	.0071	.0072	.0073	.0074	.0074	
Class 3, pitch diameter	Max <sup>6</sup>	2.3209	2.4459	2.5709	2.6959	2.8209	2.9459	3.0709	
	Min	2.3160	2.4410	2.5659	2.6909	2.8158	2.9408	3.0657	
	Tol	.0049	.0049	.0050	.0050	.0051	.0051	.0052	
INTERNAL THREADS									
Classes 2 and 3, major diameter	Min <sup>5</sup>	2.3750	2.5000	2.6250	2.7500	2.8750	3.0000	3.1250	
Classes 2 and 3, minor diameter	Min	2.2848	2.4098	2.5348	2.6598	2.7848	2.9098	3.0348	
	Max	2.2938	2.4188	2.5438	2.6688	2.7938	2.9188	3.0438	
	Tol	.0090	.0090	.0090	.0090	.0090	.0090	.0090	
Classes 2 and 3, pitch diameter	Min <sup>6</sup>	2.3209	2.4459	2.5709	2.6959	2.8209	2.9459	3.0709	
Class 2, pitch diameter (for general use)	Max	2.3279	2.4530	2.5780	2.7031	2.8282	2.9533	3.0783	
	Tol	.0070	.0071	.0071	.0072	.0073	.0074	.0074	
Class 3, pitch diameter	Max	2.3258	2.4508	2.5759	2.7009	2.8260	2.9510	3.0761	
	Tol	.0049	.0049	.0050	.0050	.0051	.0051	.0052	

See footnotes at end of table.



TABLE 1.12. Limits of size and tolerances, classes 2 and 3, American National 12-thread series, 12N—Continued

Limits of size and tolerances <sup>1</sup>		Size (inches)							
		3/4	5/8	3/4	3/4	3/4	3/4	4	4 1/2
EXTERNAL THREADS		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
Classes 2 and 3, major diameter	Max	3.2500	3.3750	3.5000	3.6250	3.7500	3.8750	4.0000	4.2500
	Min	3.2388	3.3638	3.4888	3.6138	3.7388	3.8638	3.9888	4.2388
	Tol	.0112	.0112	.0112	.0112	.0112	.0112	.0112	.0112
Classes 2 and 3, minor diameter	Max	3.1478	3.2728	3.3978	3.5228	3.6478	3.7728	3.8978	4.1478
	Min	3.1366	3.2616	3.3866	3.5116	3.6366	3.7616	3.8866	4.1366
	Tol	.0112	.0112	.0112	.0112	.0112	.0112	.0112	.0112
Class 2, pitch diameter (for general use)	Max	3.1959	3.3209	3.4459	3.5709	3.6959	3.8209	3.9459	4.1959
	Min	3.1847	3.3097	3.4347	3.5597	3.6847	3.8097	3.9347	4.1847
	Tol	.0112	.0112	.0112	.0112	.0112	.0112	.0112	.0112
Class 3, pitch diameter	Max	3.1959	3.3209	3.4459	3.5709	3.6959	3.8209	3.9459	4.1959
	Min	3.1847	3.3097	3.4347	3.5597	3.6847	3.8097	3.9347	4.1847
	Tol	.0112	.0112	.0112	.0112	.0112	.0112	.0112	.0112
INTERNAL THREADS									
Classes 2 and 3, major diameter	Min	3.2500	3.3750	3.5000	3.6250	3.7500	3.8750	4.0000	4.2500
	Max	3.1388	3.2638	3.3888	3.5138	3.6388	3.7638	3.8888	4.1388
	Tol	.0112	.0112	.0112	.0112	.0112	.0112	.0112	.0112
Classes 2 and 3, minor diameter	Min	3.1959	3.3209	3.4459	3.5709	3.6959	3.8209	3.9459	4.1959
	Max	3.1847	3.3097	3.4347	3.5597	3.6847	3.8097	3.9347	4.1847
	Tol	.0112	.0112	.0112	.0112	.0112	.0112	.0112	.0112
Class 2, pitch diameter (for general use)	Max	3.2011	3.3261	3.4511	3.5761	3.7011	3.8261	3.9511	4.2011
	Min	3.1900	3.3150	3.4400	3.5650	3.6900	3.8150	3.9400	4.1900
	Tol	.0111	.0111	.0111	.0111	.0111	.0111	.0111	.0111
Class 3, pitch diameter	Max	3.2011	3.3261	3.4511	3.5761	3.7011	3.8261	3.9511	4.2011
	Min	3.1900	3.3150	3.4400	3.5650	3.6900	3.8150	3.9400	4.1900
	Tol	.0111	.0111	.0111	.0111	.0111	.0111	.0111	.0111

<sup>1</sup> Pitch diameter tolerances include deviations of lead and angle. The class 2 tolerances for sizes above 1 1/2 in. are based on the formulas in table 2.2 and a length of engagement of 0.75 in. The class 3 tolerances are 75 percent of the class 2 tolerances. For lengths of engagement of 1 in., 0.0019 in. may be added to these tolerances. For sizes up to 1 1/2 in. are included in the American National coarse or fine thread series, the tolerances to and including 1 1/2 in. correspond to these series.

<sup>2</sup> Standard size of the American National coarse thread series.

<sup>3</sup> Standard size of the American National fine thread series.

<sup>4</sup> Dimensions given for the maximum minor diameter of the external thread are figured to the intersection of the worn tool arc with a center line through crest and root. The minimum minor diameter of the external thread shall be that corresponding to a flat at the minor diameter of the minimum external thread equal to  $3/4 \times p$ , and may be determined by subtracting 0.0541 in. from the minimum pitch diameter of the external thread.

<sup>5</sup> Dimensions for the minimum major diameter of the internal thread correspond to the basic flat  $3/4 \times p$  and the profile at the major diameter produced by a worn tool must not fall below the basic outline. The maximum major diameter of the internal thread shall be that corresponding to a flat at the major diameter of the maximum external thread equal to  $3/4 \times p$ , and may be determined by adding 0.0541 in. to the maximum pitch diameter of the internal thread.

<sup>6</sup> These dimensions are the maximum material or "go" size, and are those which should be placed on the component drawing with the tolerances.

TABLE 1.13.—Limits of size and tolerances, classes 2 and 3, American National 16-thread series, 16N

Limits of size and tolerances <sup>1</sup>		Size (inches)									
		3/16	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2
<b>EXTERNAL THREADS</b>		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
Classes 2 and 3, major diameter	Max.	0.7500	0.8125	0.8750	0.9375	1.0000	1.0625	1.1250	1.1875	1.2500	1.3125
	Min.	.7410	.8035	.8660	.9285	.9910	1.0535	1.1160	1.1785	1.2410	1.3035
	Tol.	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090
Classes 2 and 3, minor diameter		Max.	.6733	.7358	.7983	.8608	.9233	.9858	1.0483	1.1108	1.1733
Class 2, pitch diameter (for general use)		Max.	.7094	.7719	.8344	.8969	.9594	1.0219	1.0844	1.1469	1.2094
Class 2, pitch diameter (for general use)	Min.	.7004	.7628	.8253	.8877	.9502	1.0126	1.0750	1.1375	1.2000	1.2625
	Tol.	.0090	.0091	.0091	.0092	.0092	.0093	.0094	.0094	.0095	.0095
Class 3, pitch diameter		Max.	.7094	.7719	.8344	.8969	.9594	1.0219	1.0844	1.1469	1.2094
Class 3, pitch diameter	Min.	.7004	.7628	.8253	.8877	.9502	1.0126	1.0750	1.1375	1.2000	1.2625
	Tol.	.0090	.0091	.0091	.0092	.0092	.0093	.0094	.0094	.0095	.0095
<b>INTERNAL THREADS</b>											
Classes 2 and 3, major diameter		Min.	.7500	.8125	.8750	.9375	1.0000	1.0625	1.1250	1.1875	1.2500
Classes 2 and 3, minor diameter		Min.	.6823	.7448	.8073	.8698	.9323	.9948	1.0573	1.1198	1.1823
Classes 2 and 3, minor diameter	Max.	.6913	.7538	.8163	.8788	.9413	1.0038	1.0663	1.1288	1.1913	1.2538
	Tol.	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090
Class 2, pitch diameter (for general use)		Min.	.7094	.7719	.8344	.8969	.9594	1.0219	1.0844	1.1469	1.2094
Class 2, pitch diameter (for general use)	Max.	.7189	.7814	.8439	.9064	.9689	1.0314	1.0939	1.1564	1.2189	1.2814
	Tol.	.0095	.0095	.0095	.0095	.0095	.0095	.0095	.0095	.0095	.0095
Class 3, pitch diameter		Min.	.7094	.7719	.8344	.8969	.9594	1.0219	1.0844	1.1469	1.2094
Class 3, pitch diameter	Max.	.7189	.7814	.8439	.9064	.9689	1.0314	1.0939	1.1564	1.2189	1.2814
	Tol.	.0095	.0095	.0095	.0095	.0095	.0095	.0095	.0095	.0095	.0095

Limits of size and tolerances <sup>1</sup>		Size (inches)									
		1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2
<b>EXTERNAL THREADS</b>		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
Classes 2 and 3, major diameter	Max.	1.3750	1.4375	1.5000	1.5625	1.6250	1.6875	1.7500	1.8125	1.8750	1.9375
	Min.	1.3660	1.4285	1.4910	1.5535	1.6160	1.6785	1.7410	1.8035	1.8660	1.9285
	Tol.	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090
Classes 2 and 3, minor diameter		Max.	1.2983	1.3608	1.4233	1.4858	1.5483	1.6108	1.6733	1.7358	1.7983
Class 2, pitch diameter (for general use)		Max.	1.3344	1.3969	1.4594	1.5219	1.5844	1.6469	1.7094	1.7719	1.8344
Class 2, pitch diameter (for general use)	Min.	1.3288	1.3913	1.4537	1.5161	1.5786	1.6411	1.7035	1.7660	1.8284	1.8909
	Tol.	.0056	.0056	.0057	.0058	.0058	.0058	.0059	.0059	.0060	.0060
Class 3, pitch diameter		Max.	1.3344	1.3969	1.4594	1.5219	1.5844	1.6469	1.7094	1.7719	1.8344
Class 3, pitch diameter	Min.	1.3305	1.3929	1.4554	1.5179	1.5803	1.6428	1.7053	1.7677	1.8302	1.8927
	Tol.	.0039	.0040	.0040	.0040	.0041	.0041	.0041	.0042	.0042	.0042
<b>INTERNAL THREADS</b>											
Classes 2 and 3, major diameter		Min.	1.3750	1.4375	1.5000	1.5625	1.6250	1.6875	1.7500	1.8125	1.8750
Classes 2 and 3, minor diameter		Min.	1.3075	1.3700	1.4325	1.4950	1.5575	1.6200	1.6825	1.7450	1.8075
Classes 2 and 3, minor diameter	Max.	1.3153	1.3778	1.4403	1.5028	1.5653	1.6278	1.6903	1.7528	1.8153	1.8778
	Tol.	.0080	.0080	.0080	.0080	.0080	.0080	.0080	.0080	.0080	.0080
Class 2, pitch diameter (for general use)		Min.	1.3344	1.3969	1.4594	1.5219	1.5844	1.6469	1.7094	1.7719	1.8344
Class 2, pitch diameter (for general use)	Max.	1.3400	1.4025	1.4651	1.5277	1.5902	1.6527	1.7153	1.7778	1.8404	1.9029
	Tol.	.0056	.0056	.0057	.0058	.0058	.0058	.0059	.0059	.0060	.0060
Class 3, pitch diameter		Min.	1.3344	1.3969	1.4594	1.5219	1.5844	1.6469	1.7094	1.7719	1.8344
Class 3, pitch diameter	Max.	1.3383	1.4009	1.4634	1.5259	1.5885	1.6510	1.7135	1.7761	1.8386	1.9011
	Tol.	.0039	.0040	.0040	.0040	.0041	.0041	.0041	.0042	.0042	.0042

See footnotes at end of table.

TABLE 1.13.—Limits of size and tolerances, classes 2 and 3, American National 16-thread series, 16N—Continued

Limits of size and tolerances <sup>1</sup>		Size (inches)									
		2	2 1/16	2 1/8	2 1/4	2 1/2	2 5/8	3	3 1/8	3 1/4	3 1/2
<b>EXTERNAL THREADS</b>		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
Classes 2 and 3, major diameter.....	Max.....	2.0000	2.0625	2.1250	2.1875	2.2500	2.3125	2.3750	2.4375	2.5000	2.6250
	Min.....	1.9910	2.0535	2.1160	2.1785	2.2410	2.3035	2.3660	2.4285	2.4910	2.6160
	Tol.....	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090
Classes 2 and 3, minor diameter.....	Max <sup>2</sup> ...	1.9233	1.9858	2.0483	2.1108	2.1733	2.2358	2.2983	2.3608	2.4233	2.5483
Class 2, pitch diameter (for general use).....	Max <sup>3</sup> ...	1.9594	2.0219	2.0844	2.1469	2.2094	2.2719	2.3344	2.3969	2.4594	2.5844
	Min.....	1.9504	2.0129	2.0754	2.1379	2.2004	2.2629	2.3254	2.3879	2.4504	2.5754
	Tol.....	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090
Class 3, pitch diameter.....	Max <sup>4</sup> ...	1.9594	2.0219	2.0844	2.1469	2.2094	2.2719	2.3344	2.3969	2.4594	2.5844
	Min.....	1.9551	2.0176	2.0801	2.1426	2.2051	2.2676	2.3301	2.3926	2.4551	2.5801
	Tol.....	.0043	.0043	.0043	.0043	.0043	.0043	.0043	.0043	.0043	.0043
<b>INTERNAL THREADS</b>											
Classes 2 and 3, major diameter.....	Min <sup>4</sup> ...	2.0000	2.0625	2.1250	2.1875	2.2500	2.3125	2.3750	2.4375	2.5000	2.6250
Classes 2 and 3, minor diameter.....	Min.....	1.9323	1.9948	2.0573	2.1198	2.1823	2.2448	2.3073	2.3698	2.4323	2.5573
	Max.....	1.9403	2.0028	2.0653	2.1278	2.1903	2.2528	2.3153	2.3778	2.4403	2.5653
	Tol.....	.0080	.0080	.0080	.0080	.0080	.0080	.0080	.0080	.0080	.0080
Class 2, pitch diameter (for general use).....	Min <sup>4</sup> ...	1.9594	2.0219	2.0844	2.1469	2.2094	2.2719	2.3344	2.3969	2.4594	2.5844
	Max.....	1.9555	2.0180	2.0805	2.1430	2.2055	2.2680	2.3305	2.3930	2.4555	2.5805
	Tol.....	.0061	.0061	.0061	.0061	.0061	.0061	.0061	.0061	.0061	.0061
Class 3, pitch diameter.....	Min <sup>4</sup> ...	1.9594	2.0219	2.0844	2.1469	2.2094	2.2719	2.3344	2.3969	2.4594	2.5844
	Max.....	1.9537	2.0162	2.0787	2.1412	2.2037	2.2662	2.3287	2.3912	2.4537	2.5787
	Tol.....	.0043	.0043	.0043	.0043	.0043	.0043	.0043	.0043	.0043	.0043

Limits of size and tolerances <sup>1</sup>		Size (inches)									
		2 3/4	2 7/8	3	3 1/8	3 1/4	3 3/8	3 1/2	3 5/8	3 3/4	4
<b>EXTERNAL THREADS</b>		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
Classes 2 and 3, major diameter.....	Max.....	2.7500	2.8750	3.0000	3.1250	3.2500	3.3750	3.5000	3.6250	3.7500	4.0000
	Min.....	2.7410	2.8660	2.9910	3.1160	3.2410	3.3660	3.4910	3.6160	3.7410	3.9910
	Tol.....	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090	.0090
Classes 2 and 3, minor diameter.....	Max <sup>2</sup> ...	2.6733	2.7983	2.9233	3.0483	3.1733	3.2983	3.4233	3.5483	3.6733	3.9233
Class 2, pitch diameter (for general use).....	Max <sup>3</sup> ...	2.7094	2.8344	2.9594	3.0844	3.2094	3.3344	3.4594	3.5844	3.7094	3.9594
	Min.....	2.7028	2.8278	2.9527	3.0777	3.2027	3.3277	3.4527	3.5777	3.7027	3.9527
	Tol.....	.0066	.0066	.0067	.0068	.0069	.0069	.0070	.0071	.0072	.0072
Class 3, pitch diameter.....	Max <sup>4</sup> ...	2.7094	2.8344	2.9594	3.0844	3.2094	3.3344	3.4594	3.5844	3.7094	3.9594
	Min.....	2.7048	2.8298	2.9547	3.0797	3.2046	3.3296	3.4545	3.5795	3.7044	3.9543
	Tol.....	.0046	.0046	.0047	.0047	.0048	.0048	.0049	.0049	.0050	.0051
<b>INTERNAL THREADS</b>											
Classes 2 and 3, major diameter.....	Min <sup>4</sup> ...	2.7500	2.8750	3.0000	3.1250	3.2500	3.3750	3.5000	3.6250	3.7500	4.0000
Classes 2 and 3, minor diameter.....	Min.....	2.6823	2.8073	2.9323	3.0573	3.1823	3.3073	3.4323	3.5573	3.6823	3.9323
	Max.....	2.6903	2.8153	2.9403	3.0653	3.1903	3.3153	3.4403	3.5653	3.6903	3.9403
	Tol.....	.0080	.0080	.0080	.0080	.0080	.0080	.0080	.0080	.0080	.0080
Class 2, pitch diameter (for general use).....	Min <sup>4</sup> ...	2.7094	2.8344	2.9594	3.0844	3.2094	3.3344	3.4594	3.5844	3.7094	3.9594
	Max.....	2.7160	2.8410	2.9661	3.0912	3.2163	3.3413	3.4664	3.5915	3.7165	3.9665
	Tol.....	.0066	.0066	.0067	.0068	.0069	.0069	.0070	.0071	.0072	.0072
Class 3, pitch diameter.....	Min <sup>4</sup> ...	2.7094	2.8344	2.9594	3.0844	3.2094	3.3344	3.4594	3.5844	3.7094	3.9594
	Max.....	2.7140	2.8390	2.9641	3.0891	3.2142	3.3392	3.4643	3.5893	3.7144	3.9645
	Tol.....	.0046	.0046	.0047	.0047	.0048	.0048	.0049	.0049	.0050	.0051

<sup>1</sup> Pitch-diameter tolerances include deviations of lead and angle. The class 2 tolerances are based on formulas in table 2.2, p. 180, and a length of engagement of 9 threads or 9/16 in. The class 3 tolerances are 70 percent of the class 2 tolerances. The 3/4-in. size being in the American National fine-thread series, the tolerance for this size corresponds to that series.

<sup>2</sup> Standard size thread of the American National fine-thread series.

<sup>3</sup> Dimensions given for the maximum minor diameter of the external thread are figured to the intersection of the worn-tool arc with a center line through crest and root. The minimum minor diameter of the external thread shall be that corresponding to a flat at the minor diameter of the minimum external thread equal to  $\frac{1}{16} \times p$ , and may be determined by subtracting 0.0406 in. from the minimum pitch diameter of the external thread.

<sup>4</sup> Dimensions for the minimum major diameter of the internal thread correspond to the basic flat  $\frac{1}{16} \times p$  and the profile at the major diameter produced by a worn tool must not fall below the basic outline. The maximum major diameter of the internal thread shall be that corresponding to a flat at the major diameter of the maximum internal thread equal to  $\frac{1}{16} \times p$ , and may be determined by adding 0.0406 in. to the maximum pitch diameter of the internal thread.

<sup>5</sup> These dimensions are the maximum material or "go" size, and are those which should be placed on the component drawing with the tolerances.

TABLE 1.14.—Allowances and tolerances, classes 1 and 2

Threads per inch	Class 1					Class 2				
	Allowances	Major diameter tolerances, external thread	Pitch- diameter tolerances	Lead deviations consuming one-half of pitch-diameter tolerances <sup>1</sup>	Deviations in half- angle consuming one-half of pitch-diameter tolerances	Major diameter tolerances, <sup>1</sup> external thread	Pitch- diameter tolerances	Lead deviations consuming one-half of pitch-diameter tolerances <sup>1</sup>	Deviations in half- angle consuming one-half of pitch- diameter toler- ances	
1	2	3	4	5	6	7	8	9	10	
	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>deg min</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>deg min</i>	
80	0.0007	0.0048	0.0024	0.0007	3 40	0.0034	0.0017	0.0005	2 35	
72	.0007	.0050	.0025	.0007	3 26	.0036	.0018	.0005	2 28	
64	.0007	.0052	.0026	.0008	3 50	.0038	.0019	.0005	2 19	
56	.0008	.0056	.0028	.0008	3 0	.0040	.0020	.0006	2 8	
48	.0009	.0062	.0031	.0009	2 50	.0044	.0022	.0006	2 1	
44	.0009	.0064	.0032	.0009	2 41	.0046	.0023	.0007	1 56	
40	.0010	.0068	.0034	.0010	2 36	.0048	.0024	.0007	1 50	
36	.0011	.0072	.0036	.0010	2 28	.0050	.0025	.0007	1 43	
32	.0011	.0076	.0038	.0011	2 19	.0054	.0027	.0008	1 39	
28	.0012	.0080	.0043	.0012	2 18	.0062	.0031	.0009	1 39	
24	.0013	.0082	.0046	.0013	2 6	.0066	.0033	.0010	1 31	
20	.0015	.0102	.0051	.0015	1 57	.0072	.0036	.0010	1 22	
18	.0016	.0114	.0057	.0016	1 58	.0082	.0041	.0012	1 25	
16	.0012	.0120	.0063	.0018	1 55	.0090	.0045	.0013	1 22	
14	.0021	.0140	.0070	.0020	1 52	.0098	.0049	.0014	1 19	
13	.0022	.0144	.0074	.0021	1 50	.0104	.0052	.0015	1 17	
12	.0024	.0158	.0077	.0023	1 49	.0112	.0056	.0016	1 17	
11	.0026	.0170	.0085	.0025	1 47	.0118	.0059	.0017	1 14	
10	.0028	.0184	.0092	.0027	1 45	.0128	.0064	.0018	1 13	
9	.0031	.0200	.0100	.0029	1 42	.0140	.0070	.0020	1 12	
8	.0034	.0222	.0111	.0032	1 42	.0152	.0076	.0022	1 10	
7	.0039	.0248	.0124	.0036	1 39	.0170	.0085	.0025	1 8	
6	.0044	.0290	.0145	.0042	1 40	.0202	.0101	.0029	1 9	
5	.0052	.0338	.0169	.0049	1 37	.0232	.0116	.0033	1 6	
4½	.0057	.0368	.0183	.0053	1 35	.0254	.0127	.0037	1 5	
4	.0064	.0408	.0204	.0059	1 33	.0280	.0149	.0040	1 4	

<sup>1</sup> Between any 2 threads not farther apart than the length of engagement.<sup>2</sup> The tolerances in column 3 apply to class 2 unfinished hot-rolled material, NC and 8N series.

TABLE 1.15.—Allowances and tolerances, classes 3 and 4

Threads per inch	Class 3				Class 4				
	Major diameter tolerances, external thread	Pitch- diameter tolerances	Lead devia- tions consum- ing one-half of pitch-diam- eter toler- ances <sup>1</sup>	Deviations in half- angle consuming one-half of pitch- diameter tol- erances	Major diam- eter tolerances, external thread	Interferences or negative allowances	Pitch-diam- eter toler- ances	Lead deviations consuming one-half of pitch-diameter tolerances <sup>1</sup>	Deviations in half- angle consuming one-half of pitch- diameter tol- erances
1	2	3	4	5	6	7	8	9	10
	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>deg min</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>deg min</i>
80	0.0034	0.0013	0.0004	1 59	-----	-----	-----	-----	-- --
72	.0036	.0013	.0004	1 47	-----	-----	-----	-----	-- --
64	.0038	.0014	.0004	1 43	-----	-----	-----	-----	-- --
56	.0040	.0015	.0004	1 36	-----	-----	-----	-----	-- --
48	.0044	.0016	.0005	1 28	-----	-----	-----	-----	-- --
44	.0046	.0016	.0005	1 21	-----	-----	-----	-----	-- --
40	.0048	.0017	.0005	1 18	-----	-----	-----	-----	-- --
36	.0050	.0018	.0005	1 14	-----	-----	-----	-----	-- --
32	.0054	.0019	.0005	1 10	-----	-----	-----	-----	-- --
28	.0062	.0022	.0006	1 11	0.0002	0.0002	0.0011	0.0003	0 35
24	.0066	.0024	.0007	1 6	.0006	.0003	.0012	.0003	0 23
20	.0072	.0026	.0008	1 0	.0072	.0003	.0013	.0004	0 30
18	.0082	.0030	.0009	1 2	.0082	.0003	.0015	.0004	0 31
16	.0090	.0032	.0009	0 59	.0090	.0004	.0016	.0005	0 29
14	.0096	.0036	.0010	0 58	.0098	.0004	.0018	.0005	0 29
13	.0104	.0037	.0011	0 55	.0104	.0004	.0019	.0005	0 29
12	.0112	.0040	.0012	0 55	.0112	.0005	.0020	.0005	0 28
11	.0118	.0042	.0012	0 53	.0118	.0005	.0021	.0006	0 26
10	.0126	.0045	.0013	0 52	.0128	.0006	.0023	.0007	0 25
9	.0146	.0049	.0014	0 51	.0146	.0006	.0024	.0007	0 25
8	.0152	.0054	.0016	0 50	.0152	.0007	.0027	.0008	0 25
7	.0179	.0059	.0017	0 47	.0170	.0009	.0030	.0009	0 24
6	.0207	.0071	.0020	0 49	.0202	.0009	.0036	.0010	0 25
5	.0232	.0082	.0024	0 47	.0232	.0010	.0041	.0012	0 23
4½	.0254	.0089	.0025	0 46	.0254	.0011	.0044	.0013	0 23
4	.0280	.0097	.0028	0 44	.0280	.0013	.0048	.0014	0 22

<sup>1</sup> Between any 2 threads not farther apart than the length of engagement.

## 6. LIMITS OF SIZE OF GAGES

The limits of size of plain and thread gages applicable to the standard series of American National screw threads are presented in table 1.16. In this table X tolerances are applied to thread gages for classes 1, 2, and 3, W tolerances to thread gages for class 4, and Z tolerances to

plain gages. The limits of size of W truncated thread setting plug gages, and of both W and X basic-crest thread setting plug gages, are presented in table 1.17 or as indicated in the footnotes to table 1.17. These limits are developed in accordance with the requirements for gages and gaging stated in section VI, p. 107.

TABLE 1.16.—Gears for standard thread series. American National screw threads

[illegible]



[illegible]

TABLE 1.16.—Gages for standard thread series, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Gages for external threads										Gages for internal threads										Series designation	Class	Nominal size and threads per inch
		Thread gages					Z plain gages for major diameter					Thread gages					Z plain gages for minor diameter							
		Go		Not go			Go		Not go			Go		Not go			Go		Not go					
		Pitch diameter	Minor diameter	Plus tol. gage	Minus tol. gage	Minor diameter	Major diameter	Minor diameter	Major diameter	Minor diameter	Major diameter	Major diameter	Minor diameter	Major diameter	Minor diameter	Major diameter	Major diameter	Minor diameter	Major diameter	Minor diameter	Major diameter			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21				
12-32	NEF	2	0.1957	0.1822	0.1926	0.1926	0.1838	0.2160	0.2106	0.2106	0.2160	0.1957	0.2123	0.1988	0.1988	0.1823	0.1875	0.1875	NEF	2				
		3	0.1954	0.1817	0.1929	0.1923	0.1863	0.2159	0.2106	0.2106	0.2160	0.1965	0.2118	0.1985	0.1985	0.1823	0.1875	0.1875	NEF	3				
			0.1957	0.1820	0.1935	0.1929	0.1867	0.2160	0.2106	0.2106	0.2160	0.1965	0.2118	0.1985	0.1985	0.1823	0.1875	0.1875	NEF					
			0.1954	0.1817	0.1938	0.1932	0.1872	0.2159	0.2106	0.2106	0.2160	0.1965	0.2118	0.1985	0.1985	0.1823	0.1875	0.1875	NEF					
14-20	NC	1	0.2160	0.1944	0.2109	0.2109	0.2001	0.2485	0.2433	0.2433	0.2485	0.2175	0.2443	0.2226	0.2226	0.2000	0.2000	0.2000	NC	1				
		2	0.2157	0.1939	0.2112	0.2106	0.2006	0.2484	0.2433	0.2433	0.2484	0.2178	0.2438	0.2223	0.2223	0.2000	0.2000	0.2000	NC	2				
		3	0.2172	0.1931	0.2139	0.2136	0.2006	0.2484	0.2433	0.2433	0.2484	0.2178	0.2438	0.2223	0.2223	0.2000	0.2000	0.2000	NC	3				
		4	0.2177	0.1931	0.2144	0.2149	0.2006	0.2484	0.2433	0.2433	0.2484	0.2178	0.2438	0.2223	0.2223	0.2000	0.2000	0.2000	NC	4				
14-28	NF	1	0.2250	0.2101	0.2213	0.2213	0.2136	0.2488	0.2433	0.2433	0.2488	0.2268	0.2466	0.2268	0.2268	0.2113	0.2113	0.2113	NF	1				
		2	0.2267	0.2097	0.2233	0.2237	0.2160	0.2487	0.2433	0.2433	0.2487	0.2271	0.2464	0.2268	0.2268	0.2113	0.2113	0.2113	NF	2				
		3	0.2288	0.2108	0.2246	0.2246	0.2160	0.2487	0.2433	0.2433	0.2487	0.2271	0.2464	0.2268	0.2268	0.2113	0.2113	0.2113	NF	3				
		4	0.2300	0.2118	0.2259	0.2259	0.2160	0.2487	0.2433	0.2433	0.2487	0.2271	0.2464	0.2268	0.2268	0.2113	0.2113	0.2113	NF	4				
14-32	NEF	2	0.2367	0.2162	0.2333	0.2333	0.2265	0.2500	0.2446	0.2446	0.2500	0.2287	0.2464	0.2287	0.2287	0.2162	0.2162	0.2162	NEF	2				
		3	0.2384	0.2162	0.2350	0.2350	0.2265	0.2500	0.2446	0.2446	0.2500	0.2287	0.2464	0.2287	0.2287	0.2162	0.2162	0.2162	NEF	3				
			0.2394	0.2162	0.2359	0.2359	0.2265	0.2500	0.2446	0.2446	0.2500	0.2287	0.2464	0.2287	0.2287	0.2162	0.2162	0.2162	NEF					
			0.2407	0.2162	0.2364	0.2364	0.2265	0.2500	0.2446	0.2446	0.2500	0.2287	0.2464	0.2287	0.2287	0.2162	0.2162	0.2162	NEF					
1/8-18	NC	1	0.2748	0.2507	0.2691	0.2691	0.2571	0.3109	0.3055	0.3055	0.3109	0.2764	0.3062	0.2821	0.2821	0.2524	0.2524	0.2524	NC	1				
		2	0.2745	0.2507	0.2723	0.2723	0.2571	0.3109	0.3055	0.3055	0.3109	0.2764	0.3062	0.2821	0.2821	0.2524	0.2524	0.2524	NC	2				
		3	0.2761	0.2515	0.2734	0.2734	0.2571	0.3109	0.3055	0.3055	0.3109	0.2764	0.3062	0.2821	0.2821	0.2524	0.2524	0.2524	NC	3				
		4	0.2761	0.2515	0.2734	0.2734	0.2571	0.3109	0.3055	0.3055	0.3109	0.2764	0.3062	0.2821	0.2821	0.2524	0.2524	0.2524	NC	4				
5/16-24	NF	1	0.2841	0.2621	0.2705	0.2705	0.2705	0.3124	0.3070	0.3070	0.3124	0.2854	0.3080	0.2854	0.2854	0.2674	0.2674	0.2674	NF	1				
		2	0.2858	0.2621	0.2732	0.2732	0.2705	0.3124	0.3070	0.3070	0.3124	0.2854	0.3080	0.2854	0.2854	0.2674	0.2674	0.2674	NF	2				
		3	0.2874	0.2621	0.2745	0.2745	0.2705	0.3124	0.3070	0.3070	0.3124	0.2854	0.3080	0.2854	0.2854	0.2674	0.2674	0.2674	NF	3				
		4	0.2874	0.2621	0.2745	0.2745	0.2705	0.3124	0.3070	0.3070	0.3124	0.2854	0.3080	0.2854	0.2854	0.2674	0.2674	0.2674	NF	4				
5/16-32	NEF	2	0.2922	0.2787	0.2869	0.2869	0.2821	0.3125	0.3071	0.3071	0.3125	0.2922	0.3090	0.2922	0.2922	0.2787	0.2787	0.2787	NEF	2				
		3	0.2939	0.2787	0.2892	0.2892	0.2821	0.3125	0.3071	0.3071	0.3125	0.2922	0.3090	0.2922	0.2922	0.2787	0.2787	0.2787	NEF	3				
			0.2949	0.2787	0.2902	0.2902	0.2821	0.3125	0.3071	0.3071	0.3125	0.2922	0.3090	0.2922	0.2922	0.2787	0.2787	0.2787	NEF					
			0.2959	0.2787	0.2919	0.2919	0.2821	0.3125	0.3071	0.3071	0.3125	0.2922	0.3090	0.2922	0.2922	0.2787	0.2787	0.2787	NEF					

[illegible]

TABLE 1.16.—Gages for standard series, American National screw threads—Continued

Gages for external threads										Gages for internal threads										Series designation	Class	Nominal size and threads per inch		
Thread gages					Z plain gages for major diameter					Thread gages					Z plain gages for minor diameter									
Go		Not go			Minor diameter	Go		Semi-finished	Unfin-ished hot-rolled material	Go		Pitch diameter		Not go		Major diameter	Pitch diameter		Major diameter				Not go	
Pitch diameter	Minor diameter	Plus tol. gage	Minus tol. gage	in.		in.	in.			in.	in.	in.	in.	in.	in.		in.	in.					in.	in.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21				
1/16-12 NC	1 2 3 4	NC	0.5060	0.4969	0.4981	0.4901	0.5001	0.5443	0.5495	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4850	1 2 3 4	NC	1/16-12				
			0.5057	0.4963	0.4984	0.4907	0.5000	0.5444	0.5496	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4849							
			0.5084	0.4717	0.5028	0.4848	0.5025	0.5513	0.5514	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4850							
			0.5081	0.4723	0.5044	0.4864	0.5025	0.5513	0.5514	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4849							
1/16-18 NF	1 2 3 4	NF	0.5081	0.4717	0.5044	0.4870	0.5024	0.5514	0.5514	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4849	1 2 3 4	NF	1/16-18				
			0.5089	0.4728	0.5069	0.4889	0.5025	0.5513	0.5514	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4850							
			0.5087	0.4722	0.5071	0.4895	0.5024	0.5514	0.5514	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4849							
			0.5248	0.5007	0.5191	0.5071	0.5609	0.5495	0.5495	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4849							
1/16-24 NEF	1 2 3 4	NEF	0.5245	0.5002	0.5191	0.5071	0.5609	0.5495	0.5495	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4849	1 2 3 4	NEF	1/16-24				
			0.5245	0.5002	0.5191	0.5071	0.5609	0.5495	0.5495	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4849							
			0.5245	0.5002	0.5191	0.5071	0.5609	0.5495	0.5495	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4849							
			0.5245	0.5002	0.5191	0.5071	0.5609	0.5495	0.5495	0.5468	0.5625	0.5084	0.5524	0.5163	0.5104	0.5166	0.4849							
1/8-11 NC	1 2 3 4	NC	0.5240	0.5240	0.5549	0.5549	0.5352	0.6224	0.6054	0.6054	0.6250	0.5660	0.6139	0.5745	0.5745	0.5266	0.5397	1 2 3 4	NC	1/8-11				
			0.5631	0.5234	0.5552	0.5546	0.5358	0.6223	0.6055	0.6055	0.6250	0.5663	0.6133	0.5742	0.5742	0.5266	0.5395							
			0.5600	0.5266	0.5601	0.5601	0.5404	0.6250	0.6132	0.6132	0.6250	0.5660	0.6107	0.5719	0.5719	0.5266	0.5397							
			0.5600	0.5266	0.5618	0.5618	0.5410	0.6250	0.6133	0.6133	0.6250	0.5660	0.6086	0.5702	0.5702	0.5266	0.5396							
1/4-12 N	1 2 3 4	N	0.5657	0.5260	0.5621	0.5615	0.5427	0.6249	0.6132	0.6132	0.6250	0.5660	0.6081	0.5689	0.5705	0.5267	0.5396	1 2 3 4	N	1/4-12				
			0.5644	0.5271	0.5644	0.5644	0.5447	0.6250	0.6132	0.6132	0.6250	0.5660	0.6075	0.5681	0.5681	0.5267	0.5396							
			0.5646	0.5265	0.5646	0.5642	0.5453	0.6249	0.6132	0.6132	0.6249	0.5662	0.6069	0.5679	0.5683	0.5267	0.5396							
			0.5709	0.5348	0.5653	0.5653	0.5473	0.6250	0.6138	0.6138	0.6250	0.5709	0.5709	0.5765	0.5765	0.5348	0.5433							
1/8-18 NF	1 2 3 4	NF	0.5706	0.5348	0.5656	0.5650	0.5479	0.6249	0.6138	0.6138	0.6250	0.5709	0.5709	0.5762	0.5762	0.5348	0.5437	1 2 3 4	NF	1/8-18				
			0.5700	0.5348	0.5669	0.5660	0.5489	0.6250	0.6138	0.6138	0.6250	0.5709	0.5709	0.5749	0.5749	0.5348	0.5438							
			0.5706	0.5342	0.5672	0.5666	0.5495	0.6249	0.6139	0.6139	0.6249	0.5712	0.5712	0.5746	0.5746	0.5349	0.5437							
			0.5773	0.5362	0.5816	0.5816	0.5606	0.6234	0.6120	0.6120	0.6234	0.5809	0.5809	0.5846	0.5846	0.5349	0.5437							
1/4-24 NEF	1 2 3 4	NEF	0.5870	0.5627	0.5819	0.5813	0.5701	0.6233	0.6121	0.6121	0.6233	0.5809	0.5809	0.5846	0.5846	0.5349	0.5437	1 2 3 4	NEF	1/4-24				
			0.5880	0.5648	0.5848	0.5848	0.5728	0.6250	0.6168	0.6168	0.6250	0.5809	0.5809	0.5846	0.5846	0.5349	0.5437							
			0.5886	0.5643	0.5851	0.5845	0.5733	0.6249	0.6169	0.6169	0.6249	0.5809	0.5809	0.5846	0.5846	0.5349	0.5437							
			0.5886	0.5643	0.5859	0.5859	0.5739	0.6250	0.6168	0.6168	0.6250	0.5809	0.5809	0.5846	0.5846	0.5349	0.5437							
1/16-12 N	1 2 3 4	N	0.5886	0.5643	0.5862	0.5856	0.5744	0.6249	0.6169	0.6169	0.6250	0.5809	0.5809	0.5846	0.5846	0.5349	0.5437	1 2 3 4	N	1/16-12				
			0.5890	0.5646	0.5870	0.5870	0.5757	0.6250	0.6168	0.6168	0.6250	0.5809	0.5809	0.5846	0.5846	0.5349	0.5437							
			0.5890	0.5646	0.5875	0.5875	0.5762	0.6249	0.6169	0.6169	0.6249	0.5809	0.5809	0.5846	0.5846	0.5349	0.5437							
			0.5979	0.5799	0.5938	0.5938	0.5849	0.6250	0.6184	0.6184	0.6250	0.5979	0.5979	0.6020	0.6020	0.5349	0.5437							



[illegible]



TABLE 1.16.—Gages for standard thread series, American National screw threads—Continued

Nominal size and threads per inch			Series designation	Gages for external threads										Gages for internal threads										Class	Series designation	Nominal size and threads per inch																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
				Thread gages					Z plain gages for major diameter					Thread gages					Z plain gages for minor diameter																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
				Go		Not go			Go		Not go			Go		Not go			Go		Not go						Go		Not go																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
				Pitch diameter	Minor diameter	Plus tol. gage	Minus tol. gage	Pitch diameter	Minor diameter	Plus tol. gage	Minus tol. gage	Pitch diameter	Major diameter	Pitch diameter	Major diameter	Plus tol. gage	Minus tol. gage	Pitch diameter	Major diameter	Pitch diameter	Major diameter	Plus tol. gage	Minus tol. gage				Pitch diameter	Major diameter	Plus tol. gage	Minus tol. gage																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								

Best Available Copy

[illegible]

TABLE 1.16.—Gages for standard thread series, American National screw threads—Continued

Series designation Nominal size and threads per inch			Gages for external threads										Gages for internal threads										Series designation	Nominal size and threads per inch				
			Thread gages					Z plain gages for major diameter					Thread gages					Z plain gages for minor diameter										
			Go		Not go			Minor diameter	Go		Semi-finished	Unfinished hot-rolled material	Go		Major diameter	Pitch diameter	Go		Major diameter	Pitch diameter	Go				Major diameter	Pitch diameter	Plus tol. gage	Minus tol. gage
					Pitch diameter	Plus tol. gage	Minus tol. gage																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21								
1 1/4-18 NEF	2	3	1.2139	1.1898	1.2086	1.2086	1.1966	1.25000	1.24180	in.	1.2500	1.2139	1.2433	1.2192	1.2192	1.1890	1.19750	2	NEF	1 1/4-18								
			1.2136	1.1893	1.2089	1.2083	1.1971	1.24988	1.24192	1.2505	1.2142	1.2428	1.2189	1.2189	1.1902	1.1973												
			1.2139	1.1898	1.2102	1.2102	1.1982	1.25000	1.24180	1.2500	1.2142	1.2428	1.2189	1.2189	1.1902	1.1973												
1 1/2-12 N	2	3	1.2584	1.2223	1.2528	1.2528	1.2348	1.31250	1.30130	in.	1.3125	1.2584	1.3001	1.2640	1.2640	1.22230	1.23130	2	N	1 1/2-12								
			1.2581	1.2217	1.2531	1.2525	1.2354	1.31238	1.30142	1.3131	1.2643	1.2643	1.22242	1.23118														
			1.2581	1.2217	1.2531	1.2525	1.2354	1.31238	1.30142	1.3131	1.2637	1.2637	1.22242	1.23118														
1 3/4-16 N	2	3	1.2719	1.2448	1.2664	1.2664	1.2529	1.31250	1.30350	in.	1.3125	1.2719	1.3045	1.2774	1.2774	1.24480	1.25280	2	N	1 3/4-16								
			1.2716	1.2445	1.2661	1.2661	1.2535	1.31238	1.30350	1.3131	1.2722	1.2722	1.3039	1.2777	1.2777	1.24492	1.25280											
			1.2716	1.2445	1.2661	1.2661	1.2535	1.31238	1.30350	1.3131	1.2722	1.2722	1.3039	1.2777	1.2777	1.24492	1.25280											
1 3/4-18 NEF	2	3	1.2764	1.2523	1.2711	1.2711	1.2591	1.31250	1.30430	in.	1.3125	1.2764	1.3058	1.2817	1.2817	1.25240	1.26000	2	NEF	1 3/4-18								
			1.2761	1.2518	1.2727	1.2727	1.2607	1.31238	1.30442	1.3131	1.2767	1.2767	1.3042	1.2801	1.2801	1.25252	1.26000											
			1.2761	1.2518	1.2727	1.2727	1.2607	1.31238	1.30442	1.3131	1.2767	1.2767	1.3042	1.2801	1.2801	1.25252	1.26000											
1 3/8-6 NC	1	2	3	4	1.2623	1.1901	1.2478	1.2478	1.2117	1.37060	1.34160	1.2667	1.3534	1.2812	1.2812	1.19460	1.21260	1	NC	1 3/8-6								
					1.2619	1.1893	1.2482	1.2474	1.2125	1.37048	1.34172	1.2671	1.3526	1.2816	1.2816	1.19472	1.21248											
					1.2617	1.1891	1.2480	1.2472	1.2123	1.37036	1.34160	1.2671	1.3526	1.2816	1.2816	1.19472	1.21248											
					1.2617	1.1891	1.2480	1.2472	1.2123	1.37036	1.34160	1.2671	1.3526	1.2816	1.2816	1.19472	1.21248											
1 3/8-8 N	2	3	1.2638	1.2397	1.2852	1.2852	1.2581	1.37500	1.35080	in.	1.3750	1.2693	1.3565	1.3024	1.3024	1.23770	1.25450	2	N	1 3/8-8								
			1.2634	1.2393	1.2848	1.2848	1.2576	1.37488	1.35002	1.3750	1.2693	1.3558	1.3020	1.3020	1.23782	1.25438												
			1.2634	1.2393	1.2848	1.2848	1.2576	1.37488	1.35002	1.3750	1.2693	1.3558	1.3020	1.3020	1.23782	1.25438												
1 3/8-12 NF	1	2	3	4	1.3185	1.2824	1.3106	1.3106	1.2926	1.37260	1.35680	1.3209	1.3649	1.3288	1.3288	1.28490	1.29380	1	NF	1 3/8-12								
					1.3182	1.2818	1.3100	1.3100	1.2932	1.37248	1.35662	1.3212	1.3643	1.3285	1.3285	1.28492	1.29382											
					1.3179	1.2815	1.3097	1.3097	1.2929	1.37236	1.35650	1.3212	1.3643	1.3285	1.3285	1.28492	1.29382											
					1.3176	1.2812	1.3094	1.3094	1.2926	1.37224	1.35638	1.3212	1.3643	1.3285	1.3285	1.28492	1.29382											
1 3/8-16 N	2	3	1.3344	1.3073	1.3291	1.3291	1.3153	1.37500	1.35900	in.	1.3750	1.3344	1.3671	1.3400	1.3400	1.30730	1.31530	2	N	1 3/8-16								
			1.3341	1.3070	1.3288	1.3288	1.3150	1.37488	1.35888	1.3750	1.3341	1.3668	1.3400	1.3400	1.30742	1.31518												
			1.3341	1.3070	1.3288	1.3288	1.3150	1.37488	1.35888	1.3750	1.3341	1.3668	1.3400	1.3400	1.30742	1.31518												
1 3/8-18 NEF	2	3	1.3389	1.3148	1.3335	1.3335	1.3215	1.37500	1.36080	in.	1.3750	1.3389	1.3684	1.3443	1.3443	1.31490	1.32250	2	NEF	1 3/8-18								
			1.3386	1.3145	1.3332	1.3332	1.3220	1.37488	1.36062	1.3750	1.3386	1.3684	1.3443	1.3443	1.31490	1.32250												
			1.3386	1.3145	1.3332	1.3332	1.3220	1.37488	1.36062	1.3750	1.3386	1.3684	1.3443	1.3443	1.31490	1.32250												

	1½-12	1½-16	1½-18	1½-6	1½-8	1½-12	1½-16	1½-18	1½-6	1½-8	1½-12	1½-16	1½-18
	N	N	NEF	NC	N	NF	N	NEF	N	NEF	N	N	NEF
2	1.34730	1.34780	1.34830	1.34880	1.34930	1.34980	1.35030	1.35080	1.35130	1.35180	1.35230	1.35280	1.35330
3	1.34742	1.34792	1.34842	1.34892	1.34942	1.34992	1.35042	1.35092	1.35142	1.35192	1.35242	1.35292	1.35342
4	1.34754	1.34804	1.34854	1.34904	1.34954	1.35004	1.35054	1.35104	1.35154	1.35204	1.35254	1.35304	1.35354
5	1.34766	1.34816	1.34866	1.34916	1.34966	1.35016	1.35066	1.35116	1.35166	1.35216	1.35266	1.35316	1.35366
6	1.34778	1.34828	1.34878	1.34928	1.34978	1.35028	1.35078	1.35128	1.35178	1.35228	1.35278	1.35328	1.35378
7	1.34790	1.34840	1.34890	1.34940	1.34990	1.35040	1.35090	1.35140	1.35190	1.35240	1.35290	1.35340	1.35390
8	1.34802	1.34852	1.34902	1.34952	1.34999	1.35049	1.35099	1.35149	1.35199	1.35249	1.35299	1.35349	1.35399
9	1.34814	1.34864	1.34914	1.34964	1.35014	1.35064	1.35114	1.35164	1.35214	1.35264	1.35314	1.35364	1.35414
10	1.34826	1.34876	1.34926	1.34976	1.35026	1.35076	1.35126	1.35176	1.35226	1.35276	1.35326	1.35376	1.35426
11	1.34838	1.34888	1.34938	1.34988	1.35038	1.35088	1.35138	1.35188	1.35238	1.35288	1.35338	1.35388	1.35438
12	1.34850	1.34900	1.34950	1.35000	1.35050	1.35100	1.35150	1.35200	1.35250	1.35300	1.35350	1.35400	1.35450
13	1.34862	1.34912	1.34962	1.35012	1.35062	1.35112	1.35162	1.35212	1.35262	1.35312	1.35362	1.35412	1.35462
14	1.34874	1.34924	1.34974	1.35024	1.35074	1.35124	1.35174	1.35224	1.35274	1.35324	1.35374	1.35424	1.35474
15	1.34886	1.34936	1.34986	1.35036	1.35086	1.35136	1.35186	1.35236	1.35286	1.35336	1.35386	1.35436	1.35486
16	1.34898	1.34948	1.34998	1.35048	1.35098	1.35148	1.35198	1.35248	1.35298	1.35348	1.35398	1.35448	1.35498
17	1.34910	1.34960	1.35010	1.35060	1.35110	1.35160	1.35210	1.35260	1.35310	1.35360	1.35410	1.35460	1.35510
18	1.34922	1.34972	1.35022	1.35072	1.35122	1.35172	1.35222	1.35272	1.35322	1.35372	1.35422	1.35472	1.35522
19	1.34934	1.34984	1.35034	1.35084	1.35134	1.35184	1.35234	1.35284	1.35334	1.35384	1.35434	1.35484	1.35534
20	1.34946	1.34996	1.35046	1.35096	1.35146	1.35196	1.35246	1.35296	1.35346	1.35396	1.35446	1.35496	1.35546
21	1.34958	1.35008	1.35058	1.35108	1.35158	1.35208	1.35258	1.35308	1.35358	1.35408	1.35458	1.35508	1.35558
22	1.34970	1.35020	1.35070	1.35120	1.35170	1.35220	1.35270	1.35320	1.35370	1.35420	1.35470	1.35520	1.35570
23	1.34982	1.35032	1.35082	1.35132	1.35182	1.35232	1.35282	1.35332	1.35382	1.35432	1.35482	1.35532	1.35582
24	1.34994	1.35044	1.35094	1.35144	1.35194	1.35244	1.35294	1.35344	1.35394	1.35444	1.35494	1.35544	1.35594



TABLE 1.16.—Gages for standard thread series, American National screw threads—Continued

Gages for external threads										Gages for internal threads										Series designation	Class	Nominal size and threads per inch		
Thread gages					Z plain gages for major diameter					Thread gages					Z plain gages for minor diameter									
Go		Not go			Minor diameter	Go		Not go		Unfin-ished hot-rolled material	Major diameter		Pitch diameter		Major diameter	Not go		Pitch diameter	Go				Not go	
Pitch diameter	Minor diameter	Plus tol. gage	Minus tol. gage	Plus tol. gage		Minus tol. gage	Major diameter	Minor diameter	Major diameter		Minor diameter	Major diameter	Minor diameter	Major diameter		Minor diameter	Major diameter		Minor diameter					Major diameter
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21				
1 1/4-16	N	2	1.6409	1.6198	1.6411	1.6411	1.6276	1.6375	1.6785	1.6785	1.6875	1.6469	1.6798	1.6527	1.6527	1.6198	1.62780	2	N	2	1.6198	1.62780		
		3	1.6465	1.6192	1.6407	1.6407	1.6282	1.6373	1.6786	1.6786	1.6881	1.6473	1.6792	1.6523	1.6523	1.6199	1.62764	3		3	1.6199	1.62764		
			1.6465	1.6192	1.6428	1.6428	1.6299	1.6373	1.6786	1.6786	1.6881	1.6473	1.6792	1.6510	1.6510	1.6199	1.62764					1.6199	1.62764	
1 1/4-18	NEF	2	1.6514	1.6273	1.6458	1.6458	1.6338	1.6875	1.6793	1.6793	1.6875	1.6514	1.6811	1.6570	1.6570	1.6274	1.63500	2	NEF	2	1.6274	1.63500		
		3	1.6510	1.6268	1.6462	1.6462	1.6343	1.6873	1.6794	1.6794	1.6880	1.6518	1.6806	1.6566	1.6566	1.6276	1.63484	3		3	1.6276	1.63484		
			1.6510	1.6268	1.6479	1.6479	1.6360	1.6873	1.6794	1.6794	1.6880	1.6518	1.6794	1.6553	1.6553	1.6276	1.63500					1.6276	1.63500	
1 1/4-5	NC	1	1.6149	1.5283	1.5980	1.5980	1.5547	1.7448	1.7110	1.7110	1.7508	1.6201	1.7236	1.6370	1.6370	1.5335	1.55510	1	NC	1	1.5335	1.55510		
		2	1.6144	1.5275	1.5975	1.5975	1.5535	1.7446	1.7111	1.7111	1.7508	1.6206	1.7236	1.6375	1.6375	1.5336	1.55494	2		2	1.5336	1.55494		
		3	1.6196	1.5327	1.6090	1.6090	1.5652	1.7500	1.7266	1.7266	1.7508	1.6201	1.7175	1.6312	1.6312	1.5336	1.55494	3		3	1.5336	1.55494		
		4	1.6196	1.5327	1.6119	1.6119	1.5686	1.7500	1.7266	1.7266	1.7508	1.6201	1.7149	1.6283	1.6283	1.5335	1.55494	4		4	1.5335	1.55494		
1 1/4-8	N	2	1.6688	1.6147	1.6591	1.6591	1.6320	1.7500	1.7348	1.7348	1.7508	1.6688	1.7326	1.6785	1.6785	1.6147	1.62950	2	N	2	1.6147	1.62950		
		3	1.6683	1.6140	1.6596	1.6596	1.6327	1.7498	1.7349	1.7349	1.7507	1.6683	1.7319	1.6756	1.6756	1.6147	1.62950	3		3	1.6147	1.62950		
			1.6683	1.6140	1.6625	1.6625	1.6356	1.7498	1.7349	1.7349	1.7507	1.6683	1.7297	1.6751	1.6751	1.6146	1.62934					1.6146	1.62934	
1 1/4-12	N	2	1.6959	1.6593	1.6994	1.6994	1.6714	1.7500	1.7389	1.7389	1.7508	1.6959	1.7385	1.7024	1.7024	1.6598	1.66880	2	N	2	1.6598	1.66880		
		3	1.6955	1.6592	1.6998	1.6998	1.6720	1.7498	1.7389	1.7389	1.7506	1.6953	1.7379	1.7020	1.7020	1.6596	1.66880	3		3	1.6596	1.66880		
			1.6953	1.6592	1.6913	1.6913	1.6739	1.7498	1.7389	1.7389	1.7506	1.6953	1.7366	1.7005	1.7005	1.6596	1.66880					1.6596	1.66880	
1 1/4-16	NEF	2	1.7094	1.6823	1.7035	1.7035	1.6900	1.7500	1.7410	1.7410	1.7508	1.7094	1.7424	1.7153	1.7153	1.6823	1.69030	2	NEF	2	1.6823	1.69030		
		3	1.7090	1.6817	1.7039	1.7039	1.6906	1.7498	1.7411	1.7411	1.7506	1.7098	1.7418	1.7157	1.7157	1.6824	1.69014	3		3	1.6824	1.69014		
			1.7090	1.6817	1.7057	1.7057	1.6924	1.7498	1.7411	1.7411	1.7506	1.7098	1.7406	1.7135	1.7135	1.6824	1.69014					1.6824	1.69014	
1 1/4-16	N	2	1.7719	1.7448	1.7660	1.7660	1.7525	1.8125	1.8035	1.8035	1.8125	1.7719	1.8049	1.7778	1.7778	1.7448	1.75280	2	N	2	1.7448	1.75280		
		3	1.7715	1.7442	1.7664	1.7664	1.7531	1.8123	1.8035	1.8035	1.8125	1.7723	1.8032	1.7774	1.7774	1.7446	1.75284	3		3	1.7446	1.75284		
			1.7715	1.7442	1.7677	1.7677	1.7542	1.8123	1.8035	1.8035	1.8125	1.7723	1.8026	1.7757	1.7757	1.7446	1.75284					1.7446	1.75284	
1 1/4-8	N	2	1.7938	1.7397	1.7833	1.7833	1.7567	1.8750	1.8596	1.8596	1.8750	1.7938	1.8579	1.8038	1.8038	1.7397	1.75450	2	N	2	1.7397	1.75450		
		3	1.7938	1.7397	1.7843	1.7843	1.7574	1.8748	1.8596	1.8596	1.8750	1.7943	1.8572	1.8038	1.8038	1.7397	1.75434	3		3	1.7397	1.75434		
			1.7933	1.7390	1.7868	1.7868	1.7597	1.8750	1.8596	1.8596	1.8750	1.7943	1.8549	1.8008	1.8008	1.7397	1.75434					1.7397	1.75434	
1 1/4-12	N	2	1.8209	1.7848	1.8143	1.8143	1.7963	1.8750	1.8596	1.8596	1.8750	1.8209	1.8636	1.8275	1.8275	1.7848	1.79380	2	N	2	1.7848	1.79380		
		3	1.8205	1.7842	1.8139	1.8139	1.7969	1.8750	1.8596	1.8596	1.8750	1.8213	1.8616	1.8271	1.8271	1.7846	1.79364	3		3	1.7846	1.79364		
			1.8205	1.7842	1.8163	1.8163	1.7989	1.8750	1.8596	1.8596	1.8750	1.8213	1.8610	1.8255	1.8255	1.7846	1.79364					1.7846	1.79364	
1 1/4-16	N	2	1.8344	1.8073	1.8284	1.8284	1.8149	1.8750	1.8601	1.8601	1.8750	1.8344	1.8675	1.8404	1.8404	1.8073	1.81530	2	N	2	1.8073	1.81530		
		3	1.8340	1.8067	1.8288	1.8288	1.8155	1.8748	1.8601	1.8601	1.8750	1.8344	1.8669	1.8408	1.8408	1.8073	1.81514	3		3	1.8073	1.81514		
			1.8340	1.8073	1.8302	1.8302	1.8167	1.8748	1.8601	1.8601	1.8750	1.8344	1.8657	1.8408	1.8408	1.8073	1.81530					1.8073	1.81530	



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100																																																																																																																																																																																																															
1	1.8980	1.8981	1.8982	1.8983	1.8984	1.8985	1.8986	1.8987	1.8988	1.8989	1.8990	1.8991	1.8992	1.8993	1.8994	1.8995	1.8996	1.8997	1.8998	1.8999	1.9000	1.9001	1.9002	1.9003	1.9004	1.9005	1.9006	1.9007	1.9008	1.9009	1.9010	1.9011	1.9012	1.9013	1.9014	1.9015	1.9016	1.9017	1.9018	1.9019	1.9020	1.9021	1.9022	1.9023	1.9024	1.9025	1.9026	1.9027	1.9028	1.9029	1.9030	1.9031	1.9032	1.9033	1.9034	1.9035	1.9036	1.9037	1.9038	1.9039	1.9040	1.9041	1.9042	1.9043	1.9044	1.9045	1.9046	1.9047	1.9048	1.9049	1.9050	1.9051	1.9052	1.9053	1.9054	1.9055	1.9056	1.9057	1.9058	1.9059	1.9060	1.9061	1.9062	1.9063	1.9064	1.9065	1.9066	1.9067	1.9068	1.9069	1.9070	1.9071	1.9072	1.9073	1.9074	1.9075	1.9076	1.9077	1.9078	1.9079	1.9080	1.9081	1.9082	1.9083	1.9084	1.9085	1.9086	1.9087	1.9088	1.9089	1.9090	1.9091	1.9092	1.9093	1.9094	1.9095	1.9096	1.9097	1.9098	1.9099	1.9100	1.9101	1.9102	1.9103	1.9104	1.9105	1.9106	1.9107	1.9108	1.9109	1.9110	1.9111	1.9112	1.9113	1.9114	1.9115	1.9116	1.9117	1.9118	1.9119	1.9120	1.9121	1.9122	1.9123	1.9124	1.9125	1.9126	1.9127	1.9128	1.9129	1.9130	1.9131	1.9132	1.9133	1.9134	1.9135	1.9136	1.9137	1.9138	1.9139	1.9140	1.9141	1.9142	1.9143	1.9144	1.9145	1.9146	1.9147	1.9148	1.9149	1.9150	1.9151	1.9152	1.9153	1.9154	1.9155	1.9156	1.9157	1.9158	1.9159	1.9160	1.9161	1.9162	1.9163	1.9164	1.9165	1.9166	1.9167	1.9168	1.9169	1.9170	1.9171	1.9172	1.9173	1.9174	1.9175	1.9176	1.9177	1.9178	1.9179	1.9180	1.9181	1.9182	1.9183	1.9184	1.9185	1.9186	1.9187	1.9188	1.9189	1.9190	1.9191	1.9192	1.9193	1.9194	1.9195	1.9196	1.9197	1.9198	1.9199	1.9200	1.9201	1.9202	1.9203	1.9204	1.9205	1.9206	1.9207	1.9208	1.9209	1.9210	1.9211	1.9212	1.9213	1.9214	1.9215	1.9216	1.9217	1.9218	1.9219	1.9220	1.9221	1.9222	1.9223	1.9224	1.9225	1.9226	1.9227	1.9228	1.9229	1.9230	1.9231	1.9232	1.9233	1.9234	1.9235	1.9236	1.9237	1.9238	1.9239	1.9240	1.9241	1.9242	1.9243	1.9244	1.9245	1.9246	1.9247	1.9248	1.9249	1.9250	1.9251	1.9252	1.9253	1.9254	1.9255	1.9256	1.9257	1.9258	1.9259	1.9260	1.9261	1.9262	1.9263	1.9264	1.9265	1.9266	1.9267	1.9268	1.9269	1.9270	1.9271	1.9272	1.9273	1.9274	1.9275	1.9276	1.9277	1.9278	1.9279	1.9280	1.9281	1.9282	1.9283	1.9284	1.9285	1

TABLE 1.16.—Gages for standard thread series, American National screw threads—Continued

Gages for external threads										Gages for internal threads										Series designation	Class	Nominal size and threads per inch
Thread gages					Z plain gages for major diameter					Thread gages					Z plain gages for minor diameter							
Not go					Go					Not go					Go							
Pitch diameter	Minor diameter	Plus tol. gage	Minus tol. gage	Unfinished hot-rolled material	Semi-finished	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
2 1/4-16	N	{	2 2719	2 2448	2 2656	2 2521	2 3125	2 3050	2 3050	in.	2 3125	2 2719	2 3053	2 2782	2 2448	2 2528	2 2528	2	N	2 1/4-16		
			2 2715	2 2442	2 2652	2 2517	2 3121	2 3046	2 3046	2 3046	2 3121	2 2715	2 3049	2 2778	2 2446	2 2524	2 2524					
			2 2713	2 2438	2 2648	2 2513	2 3117	2 3042	2 3042	2 3042	2 3117	2 2713	2 3028	2 2767	2 2446	2 2520	2 2520					
2 3/8-12	N	{	2 3209	2 2848	2 3139	2 2959	2 3750	2 3680	2 3680	in.	2 3750	2 3209	2 3640	2 3279	2 2848	2 2938	2 2938	2	N	2 3/8-12		
			2 3205	2 2842	2 3135	2 2955	2 3746	2 3676	2 3676	2 3676	2 3746	2 3205	2 3634	2 3275	2 2846	2 2934	2 2934					
			2 3201	2 2838	2 3131	2 2951	2 3742	2 3672	2 3672	2 3672	2 3742	2 3201	2 3632	2 3268	2 2846	2 2930	2 2930					
2 1/2-16	N	{	2 3344	2 3073	2 3281	2 3146	2 3750	2 3680	2 3680	in.	2 3750	2 3344	2 3678	2 3407	2 3073	2 3153	2 3153	2	N	2 1/2-16		
			2 3340	2 3067	2 3277	2 3142	2 3746	2 3676	2 3676	2 3676	2 3746	2 3340	2 3672	2 3403	2 3074	2 3151	2 3151					
			2 3336	2 3063	2 3273	2 3138	2 3742	2 3672	2 3672	2 3672	2 3742	2 3336	2 3653	2 3392	2 3076	2 3151	2 3151					
2 5/8-16	N	{	2 3669	2 3398	2 3605	2 3470	2 4375	2 4285	2 4285	in.	2 4375	2 3669	2 4304	2 4033	2 3696	2 3780	2 3780	2	N	2 5/8-16		
			2 3665	2 3392	2 3601	2 3466	2 4371	2 4281	2 4281	2 4281	2 4371	2 3665	2 4298	2 4029	2 3696	2 3776	2 3776					
			2 3661	2 3388	2 3597	2 3462	2 4367	2 4277	2 4277	2 4277	2 4367	2 3661	2 4285	2 4014	2 3696	2 3764	2 3764					
2 3/4-4	NC	{	2 3312	2 2951	2 3108	2 2567	2 4360	2 4270	2 4270	in.	2 5009	2 3376	2 4963	2 3580	2 2294	2 2564	2 2564	1	NC	2 3/4-4		
			2 3308	2 2947	2 3103	2 2563	2 4356	2 4266	2 4266	2 4266	2 5009	2 3376	2 4959	2 3516	2 2294	2 2564	2 2564					
			2 3304	2 2943	2 3099	2 2559	2 4352	2 4262	2 4262	2 4262	2 5009	2 3376	2 4956	2 3521	2 2294	2 2564	2 2564					
2 1/2-8	N	{	2 4188	2 3827	2 4071	2 3800	2 5000	2 4910	2 4910	in.	2 5009	2 4188	2 4846	2 4305	2 3647	2 3780	2 3780	2	N	2 1/2-8		
			2 4184	2 3823	2 4067	2 3796	2 4996	2 4906	2 4906	2 4906	2 5009	2 4184	2 4838	2 4305	2 3647	2 3780	2 3780					
			2 4180	2 3819	2 4101	2 3835	2 4992	2 4902	2 4902	2 4902	2 5009	2 4180	2 4834	2 4305	2 3647	2 3780	2 3780					
2 1/2-12	N	{	2 4459	2 4098	2 4388	2 4208	2 5000	2 4880	2 4880	in.	2 5009	2 4459	2 4891	2 4530	2 4098	2 4188	2 4188	2	N	2 1/2-12		
			2 4455	2 4094	2 4384	2 4214	2 4996	2 4886	2 4886	2 4886	2 5009	2 4455	2 4886	2 4530	2 4098	2 4188	2 4188					
			2 4451	2 4090	2 4380	2 4210	2 4992	2 4886	2 4886	2 4886	2 5009	2 4451	2 4883	2 4530	2 4098	2 4188	2 4188					
2 1/2-16	N	{	2 4504	2 4143	2 4387	2 4243	2 5000	2 4880	2 4880	in.	2 5009	2 4504	2 4891	2 4530	2 4143	2 4243	2 4243	2	N	2 1/2-16		
			2 4500	2 4139	2 4383	2 4239	2 4996	2 4880	2 4880	2 4880	2 5009	2 4500	2 4883	2 4530	2 4143	2 4243	2 4243					
			2 4496	2 4135	2 4379	2 4235	2 4992	2 4880	2 4880	2 4880	2 5009	2 4496	2 4883	2 4530	2 4143	2 4243	2 4243					
2 5/8-12	N	{	2 5709	2 5348	2 5592	2 5458	2 6248	2 6158	2 6158	in.	2 6250	2 5709	2 6141	2 5870	2 5519	2 5599	2 5599	2	N	2 5/8-12		
			2 5705	2 5344	2 5588	2 5454	2 6244	2 6154	2 6154	2 6154	2 6250	2 5705	2 6137	2 5866	2 5515	2 5595	2 5595					
			2 5701	2 5340	2 5584	2 5450	2 6240	2 6150	2 6150	2 6150	2 6250	2 5701	2 6133	2 5862	2 5511	2 5591	2 5591					
2 1/2-16	N	{	2 5844	2 5483	2 5727	2 5589	2 6248	2 6158	2 6158	in.	2 6250	2 5844	2 6180	2 5909	2 5573	2 5653	2 5653	2	N	2 1/2-16		
			2 5840	2 5479	2 5723	2 5585	2 6244	2 6154	2 6154	2 6154	2 6250	2 5840	2 6176	2 5905	2 5573	2 5651	2 5651					
			2 5836	2 5475	2 5719	2 5581	2 6240	2 6150	2 6150	2 6150	2 6250	2 5836	2 6172	2 5901	2 5573	2 5651	2 5651					

Best Available Copy



TABLE 1.16.—Gages for standard thread series, American National screw threads—Continued

Gages for external threads										Gages for internal threads										Series designation	Class	Nominal size and threads per inch					
Thread gages					Z plain gages for major diameter					Thread gages					Z plain gages for minor diameter												
Go		Not go			Go		Not go			Major diameter		Pitch diameter			Major diameter		Pitch diameter						Go		Not go		
Pitch diameter	Minor diameter	Plus tol. gage	Minus tol. gage	Minor diameter	Go	Semi-finished material	Unfin-ished hot-rolled material	Major diameter	Pitch diameter	Major diameter	Pitch diameter	Major diameter	Plus tol. gage	Minor tol. gage	Major diameter	Pitch diameter	Major diameter	Plus tol. gage	Minor tol. gage				Go	Not go			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22						
3/4-12	N	2	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		3	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		4	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
3/4-12	N	2	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		3	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		4	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
3/4-12	N	2	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		3	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		4	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
3/4-12	N	2	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		3	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		4	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
3/4-12	N	2	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		3	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		4	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
3/4-12	N	2	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		3	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		4	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
3/4-12	N	2	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		3	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						
		4	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147	3.1147						







Best Available Copy

Best Available Copy

TABLE 1.17.—Setting plug gages, American National screw threads

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs							Basic-crest setting plugs			
			Plug for "Go"			Plug for "Not go"				Major diameter			
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>		Not go <sup>2</sup>	
			Truncated	Full		Truncated	Full	Plus tol. page	Minus tol. page	W tolerance	X tolerance	W tolerance	X tolerance
1	2	3	4	5	6	7	8	9	10	11A	11B	12A	12B
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
0-80	NF	1	0.0550	0.0593	0.0512	0.0542	0.0576	0.0488	0.0488	0.0593	0.0593	0.0776	0.0576
		2	.0555	.0596	.0511	.0539	.0579	.0489	.0487	.0595	.0596	.0579	.0579
		3	.0563	.0600	.0519	.0556	.0590	.0502	.0502	.0600	.0600	.0590	.0590
1-64	NC	1	.0563	.0603	.0518	.0553	.0593	.0503	.0501	.0603	.0603	.0593	.0593
		2	.0566	.0606	.0519	.0560	.0594	.0506	.0506	.0606	.0606	.0594	.0594
		3	.0568	.0608	.0518	.0557	.0597	.0507	.0505	.0608	.0608	.0597	.0597
1-72	NF	1	.0683	.0723	.0622	.0654	.0710	.0596	.0596	.0723	.0723	.0710	.0710
		2	.0680	.0726	.0621	.0661	.0713	.0597	.0595	.0726	.0727	.0713	.0713
		3	.0690	.0730	.0629	.0678	.0724	.0600	.0600	.0730	.0730	.0724	.0724
2-56	NC	1	.0687	.0733	.0628	.0675	.0727	.0611	.0609	.0733	.0734	.0727	.0727
		2	.0690	.0730	.0629	.0683	.0729	.0615	.0615	.0730	.0730	.0729	.0729
		3	.0697	.0733	.0628	.0690	.0732	.0616	.0614	.0733	.0734	.0732	.0733
2-64	NF	1	.0686	.0723	.0633	.0668	.0708	.0608	.0608	.0723	.0723	.0708	.0708
		2	.0683	.0726	.0632	.0665	.0711	.0609	.0607	.0726	.0726	.0711	.0711
		3	.0693	.0730	.0640	.0682	.0722	.0622	.0622	.0730	.0730	.0722	.0722
3-48	NC	1	.0690	.0733	.0630	.0679	.0725	.0623	.0621	.0733	.0733	.0725	.0725
		2	.0693	.0730	.0640	.0687	.0727	.0627	.0627	.0730	.0730	.0727	.0727
		3	.0690	.0733	.0639	.0684	.0730	.0628	.0626	.0733	.0733	.0730	.0730
3-56	NF	1	.0808	.0852	.0736	.0785	.0841	.0708	.0708	.0852	.0852	.0841	.0841
		2	.0805	.0855	.0735	.0782	.0844	.0709	.0707	.0855	.0856	.0844	.0844
		3	.0816	.0860	.0744	.0801	.0857	.0724	.0724	.0860	.0860	.0857	.0857
4-40	NC	1	.0813	.0863	.0743	.0798	.0860	.0725	.0723	.0863	.0864	.0860	.0860
		2	.0816	.0864	.0744	.0803	.0860	.0729	.0729	.0864	.0864	.0860	.0860
		3	.0813	.0863	.0743	.0803	.0863	.0730	.0728	.0863	.0864	.0863	.0864
4-48	NF	1	.0813	.0853	.0752	.0794	.0840	.0726	.0726	.0853	.0853	.0840	.0840
		2	.0810	.0856	.0751	.0791	.0843	.0727	.0727	.0856	.0857	.0843	.0843
		3	.0820	.0860	.0759	.0808	.0854	.0740	.0740	.0860	.0860	.0854	.0854
5-40	NC	1	.0817	.0863	.0759	.0805	.0857	.0741	.0739	.0863	.0864	.0857	.0857
		2	.0820	.0860	.0759	.0813	.0859	.0745	.0745	.0860	.0860	.0859	.0859
		3	.0817	.0863	.0758	.0810	.0862	.0746	.0744	.0863	.0864	.0862	.0863
6-32	NF	1	.0932	.0981	.0846	.0905	.0971	.0815	.0815	.0981	.0981	.0971	.0971
		2	.0929	.0984	.0845	.0902	.0974	.0816	.0814	.0984	.0985	.0974	.0975
		3	.0941	.0990	.0855	.0923	.0989	.0833	.0833	.0990	.0990	.0989	.0989
6-48	NC	1	.0938	.0993	.0854	.0920	.0992	.0834	.0832	.0993	.0994	.0992	.0993
		2	.0941	.0990	.0855	.0929	.0990	.0839	.0839	.0990	.0990	.0990	.0990
		3	.0938	.0993	.0854	.0926	.0993	.0840	.0838	.0993	.0994	.0993	.0994
6-64	NF	1	.0938	.0982	.0846	.0915	.0971	.0838	.0838	.0982	.0982	.0971	.0971
		2	.0935	.0985	.0845	.0912	.0974	.0839	.0837	.0985	.0986	.0974	.0975
		3	.0946	.0990	.0874	.0931	.0987	.0854	.0854	.0990	.0990	.0987	.0987
7-32	NC	1	.0943	.0993	.0873	.0928	.0990	.0855	.0853	.0993	.0994	.0990	.0991
		2	.0946	.0990	.0874	.0936	.0990	.0859	.0859	.0990	.0990	.0990	.0990
		3	.0943	.0993	.0873	.0933	.0993	.0860	.0858	.0993	.0994	.0993	.0994
8-32	NF	1	.1054	.1110	.0948	.1022	.1102	.0941	.0941	.1110	.1110	.1102	.1102
		2	.1051	.1113	.0947	.1019	.1105	.0945	.0943	.1113	.1113	.1105	.1106
		3	.1061	.1123	.0958	.1032	.1120	.0954	.0954	.1123	.1123	.1120	.1120
8-48	NC	1	.1061	.1123	.0957	.1030	.1123	.0955	.0953	.1123	.1123	.1123	.1123
		2	.1061	.1123	.0958	.1039	.1129	.0941	.0941	.1129	.1129	.1129	.1129
		3	.1061	.1123	.0957	.1046	.1123	.0942	.0940	.1123	.1123	.1123	.1123
9-32	NF	1	.1062	.1111	.0976	.1035	.1104	.0945	.0945	.1111	.1111	.1104	.1104
		2	.1059	.1114	.0975	.1032	.1104	.0946	.0944	.1114	.1115	.1104	.1105
		3	.1071	.1120	.0985	.1053	.1119	.0963	.0963	.1120	.1120	.1119	.1119
10-24	NC	1	.1068	.1123	.0984	.1050	.1122	.0964	.0962	.1123	.1123	.1123	.1123
		2	.1071	.1120	.0985	.1059	.1129	.0969	.0969	.1129	.1129	.1129	.1129
		3	.1068	.1123	.0984	.1056	.1123	.0970	.0968	.1123	.1123	.1123	.1124
10-32	NF	1	.1183	.1249	.1078	.1159	.1232	.1044	.1044	.1249	.1249	.1232	.1232
		2	.1181	.1243	.1077	.1149	.1235	.1045	.1043	.1243	.1243	.1235	.1236
		3	.1194	.1250	.1088	.1172	.1240	.1051	.1051	.1250	.1250	.1240	.1240
12-24	NC	1	.1191	.1253	.1087	.1179	.1253	.1055	.1053	.1253	.1253	.1253	.1253
		2	.1194	.1250	.1088	.1179	.1250	.1051	.1051	.1250	.1250	.1250	.1250
		3	.1191	.1253	.1087	.1176	.1253	.1052	.1050	.1253	.1254	.1253	.1254
12-32	NF	1	.1189	.1241	.1093	.1159	.1232	.1061	.1061	.1241	.1241	.1232	.1232
		2	.1186	.1241	.1092	.1156	.1235	.1062	.1060	.1241	.1241	.1235	.1236
		3	.1198	.1250	.1102	.1177	.1250	.1079	.1079	.1250	.1250	.1250	.1250
14-12	NC	1	.1195	.1253	.1101	.1174	.1253	.1080	.1078	.1253	.1253	.1253	.1253
		2	.1198	.1250	.1102	.1181	.1250	.1086	.1086	.1250	.1250	.1250	.1250
		3	.1195	.1253	.1101	.1181	.1253	.1087	.1085	.1253	.1254	.1253	.1254
16-12	NF	1	.1394	.1369	.1166	.1293	.1362	.1178	.1178	.1369	.1369	.1362	.1362
		2	.1391	.1372	.1165	.1290	.1365	.1179	.1179	.1372	.1372	.1365	.1367
		3	.1405	.1380	.1177	.1295	.1380	.1190	.1190	.1380	.1380	.1380	.1380
18-12	NC	1	.1412	.1383	.1176	.1292	.1383	.1194	.1194	.1383	.1383	.1383	.1383
		2	.1415	.1380	.1177	.1293	.1380	.1198	.1198	.1380	.1380	.1380	.1380
		3	.1412	.1383	.1176	.1290	.1383	.1199	.1197	.1383	.1383	.1383	.1383

See footnotes at end of table.

TABLE 1.17. *Setting plug gages, American National screw threads - Continued*

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs							Basic-crest setting plugs			
			Plug for "Go"			Plug for "Not go"				Major diameter			
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go 1		Not go 2	
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage	W tolerance	X tolerance	W tolerance	X tolerance
1	2	3	4	5	6	7	8	9	10	11A	11B	12A	12B
6-40	NF	1	<i>in.</i> 0.1314	<i>in.</i> 0.1370	<i>in.</i> 0.1308	<i>in.</i> 0.1292	<i>in.</i> 0.1362	<i>in.</i> 0.1174	<i>in.</i> 0.1174	<i>in.</i> 0.1370	<i>in.</i> 0.1370	<i>in.</i> 0.1362	<i>in.</i> 0.1362
		2	.1311	.1372	.1297	.1279	.1365	.1175	.1173	.1373	.1371	.1365	.1366
		3	.1324	.1380	.1218	.1302	.1389	.1194	.1194	.1380	.1386	.1380	.1380
		3	.1321	.1383	.1217	.1299	.1383	.1195	.1193	.1383	.1381	.1383	.1381
		3	.1324	.1380	.1218	.1309	.1380	.1201	.1201	.1380	.1380	.1380	.1380
		3	.1321	.1383	.1217	.1309	.1383	.1202	.1200	.1383	.1381	.1383	.1381
8-32	NC	1	.1564	.1629	.1426	.1523	.1622	.1388	.1388	.1629	.1629	.1622	.1622
		2	.1561	.1632	.1425	.1526	.1625	.1389	.1387	.1632	.1631	.1625	.1627
		3	.1578	.1640	.1437	.1545	.1640	.1410	.1410	.1640	.1640	.1640	.1640
		3	.1572	.1643	.1436	.1542	.1643	.1411	.1409	.1643	.1645	.1643	.1645
		3	.1575	.1646	.1437	.1553	.1649	.1418	.1418	.1649	.1649	.1649	.1649
		3	.1572	.1643	.1436	.1550	.1643	.1419	.1417	.1643	.1645	.1643	.1645
8-36	NF	1	.1569	.1629	.1440	.1533	.1621	.1413	.1413	.1629	.1629	.1621	.1621
		2	.1566	.1632	.1448	.1530	.1624	.1414	.1412	.1632	.1633	.1624	.1625
		3	.1580	.1640	.1469	.1555	.1640	.1435	.1435	.1640	.1640	.1640	.1640
		3	.1577	.1643	.1469	.1552	.1643	.1436	.1434	.1643	.1644	.1643	.1644
		3	.1580	.1640	.1460	.1562	.1650	.1442	.1442	.1649	.1649	.1649	.1649
		3	.1577	.1643	.1459	.1559	.1643	.1443	.1441	.1643	.1644	.1643	.1644
10-24	NC	1	.1808	.1887	.1616	.1750	.1882	.1570	.1570	.1887	.1887	.1882	.1882
		2	.1803	.1892	.1615	.1745	.1887	.1571	.1569	.1892	.1892	.1887	.1887
		3	.1821	.1900	.1629	.1776	.1900	.1596	.1596	.1900	.1900	.1900	.1900
		3	.1816	.1905	.1628	.1771	.1905	.1597	.1595	.1905	.1905	.1905	.1905
		3	.1821	.1900	.1629	.1785	.1900	.1605	.1605	.1900	.1900	.1900	.1900
		3	.1816	.1905	.1628	.1780	.1905	.1606	.1604	.1905	.1905	.1905	.1905
10-32	NF	1	.1824	.1885	.1636	.1787	.1882	.1618	.1618	.1885	.1889	.1882	.1882
		2	.1831	.1892	.1635	.1780	.1885	.1619	.1617	.1892	.1891	.1885	.1887
		3	.1835	.1900	.1657	.1805	.1900	.1670	.1670	.1900	.1900	.1900	.1900
		3	.1832	.1903	.1656	.1802	.1903	.1671	.1669	.1903	.1905	.1903	.1905
		3	.1835	.1900	.1657	.1813	.1900	.1678	.1678	.1900	.1900	.1900	.1900
		3	.1832	.1903	.1656	.1819	.1903	.1679	.1677	.1903	.1905	.1903	.1905
12-24	NC	1	.2068	.2147	.1876	.2010	.2142	.1830	.1830	.2147	.2147	.2142	.2142
		2	.2063	.2152	.1875	.2005	.2147	.1831	.1829	.2152	.2152	.2147	.2147
		3	.2081	.2169	.1889	.2036	.2169	.1856	.1856	.2169	.2169	.2169	.2169
		3	.2076	.2165	.1888	.2031	.2165	.1857	.1855	.2165	.2165	.2165	.2165
		3	.2081	.2169	.1889	.2045	.2169	.1865	.1865	.2169	.2169	.2169	.2169
		3	.2076	.2165	.1888	.2040	.2165	.1866	.1864	.2165	.2165	.2165	.2165
12-28	NF	1	.2077	.2148	.1916	.2028	.2181	.1873	.1873	.2148	.2148	.2141	.2141
		2	.2072	.2153	.1915	.2023	.2186	.1874	.1872	.2153	.2153	.2146	.2146
		3	.2089	.2160	.1928	.2052	.2160	.1897	.1897	.2160	.2160	.2160	.2160
		3	.2084	.2165	.1927	.2047	.2165	.1898	.1896	.2165	.2165	.2165	.2165
		3	.2089	.2160	.1928	.2061	.2160	.1906	.1906	.2160	.2160	.2160	.2160
		3	.2084	.2165	.1927	.2056	.2165	.1907	.1905	.2165	.2165	.2165	.2165
12-32	NRF	2	.2095	.2160	.1957	.2061	.2160	.1926	.1926	.2160	.2160	.2160	.2160
		3	.2092	.2163	.1956	.2058	.2163	.1927	.1925	.2163	.2165	.2163	.2165
		3	.2095	.2160	.1957	.2070	.2160	.1935	.1935	.2160	.2160	.2160	.2160
		3	.2092	.2163	.1956	.2067	.2163	.1936	.1934	.2163	.2165	.2163	.2165
		3	.2095	.2160	.1957	.2096	.2160	.1949	.1949	.2160	.2160	.2160	.2160
		3	.2092	.2163	.1956	.2091	.2163	.1950	.1948	.2163	.2165	.2163	.2165
14-20	NC	1	.2395	.2485	.2160	.2329	.2484	.2169	.2169	.2485	.2485	.2481	.2481
		2	.2390	.2490	.2159	.2331	.2489	.2170	.2168	.2490	.2490	.2489	.2489
		3	.2410	.2500	.2175	.2356	.2500	.2199	.2199	.2500	.2500	.2500	.2500
		3	.2405	.2505	.2174	.2354	.2505	.2199	.2198	.2505	.2505	.2505	.2505
		4	.2410	.2500	.2175	.2366	.2500	.2199	.2199	.2500	.2500	.2500	.2500
		4	.2405	.2505	.2174	.2361	.2505	.2199	.2198	.2505	.2505	.2505	.2505
14-28	NF	1	.2413	.2503	.2178	.2382	.2503	.2165	.2165	.2500	.2500	.2500	.2500
		2	.2408	.2508	.2177	.2377	.2508	.2166	.2164	.2505	.2505	.2505	.2505
		3	.2417	.2488	.2256	.2368	.2481	.2213	.2213	.2488	.2488	.2481	.2481
		4	.2412	.2493	.2255	.2363	.2486	.2214	.2212	.2493	.2493	.2486	.2486
		3	.2424	.2505	.2267	.2387	.2505	.2238	.2236	.2505	.2505	.2505	.2505
		4	.2429	.2506	.2268	.2401	.2500	.2246	.2246	.2500	.2500	.2500	.2500
14-32	NRF	2	.2435	.2500	.2297	.2400	.2499	.2265	.2265	.2500	.2500	.2499	.2499
		3	.2432	.2503	.2296	.2397	.2502	.2266	.2264	.2503	.2505	.2502	.2504
		3	.2435	.2500	.2297	.2410	.2506	.2275	.2275	.2500	.2500	.2500	.2500
		3	.2432	.2503	.2296	.2407	.2503	.2276	.2274	.2503	.2505	.2503	.2505
		3	.2435	.2500	.2297	.2430	.2500	.2287	.2287	.2500	.2500	.2500	.2500
		3	.2432	.2503	.2296	.2425	.2503	.2288	.2286	.2503	.2505	.2503	.2505
16-18	NC	1	.3012	.3109	.2748	.2932	.3108	.2691	.2691	.3109	.3109	.3105	.3108
		2	.3007	.3111	.2747	.2927	.3113	.2692	.2690	.3111	.3111	.3113	.3113
		3	.3028	.3125	.2761	.2964	.3125	.2723	.2723	.3125	.3125	.3125	.3125
		3	.3023	.3130	.2763	.2959	.3130	.2724	.2722	.3130	.3130	.3130	.3130
		4	.3028	.3125	.2764	.2975	.3125	.2734	.2734	.3125	.3125	.3125	.3125
		4	.3023	.3130	.2763	.2970	.3130	.2735	.2733	.3130	.3130	.3130	.3130
16-18	NC	4	.3041	.3128	.2767	.2993	.3128	.2752	.2752	.3125	.3125	.3125	.3125
		4	.3026	.3133	.2766	.2988	.3133	.2753	.2751	.3130	.3130	.3130	.3130

See footnotes at end of table

TABLE 1.17.—Setting plug gages, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs							Basic-croset setting plugs			
			Plug for "Go"			Plug for "Not go"				Major diameter			
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>		Not go <sup>2</sup>	
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage	W tolerance	X tolerance	W tolerance	X tolerance
1	2	3	4	5	6	7	8	9	10	11A	11B	12A	12B
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
5/16-24	N F	1	0.3033	0.3112	0.2841	0.2975	0.3108	0.2795	0.2795	0.3112	0.3112	0.3108	0.3108
			.3028	.3117	.2840	.2970	.3113	.2796	.2794	.3117	.3117	.3113	.3113
		2	.3046	.3125	.2854	.3001	.3125	.2821	.2821	.3125	.3125	.3125	.3125
		3	.3041	.3130	.2853	.2996	.3130	.2822	.2820	.3130	.3130	.3130	.3130
5/16-32	N F	1	.3046	.3125	.2854	.3010	.3125	.2830	.2830	.3125	.3125	.3125	.3125
		2	.3041	.3130	.2853	.3005	.3130	.2831	.2829	.3130	.3130	.3130	.3130
		3	.3049	.3128	.2857	.3025	.3128	.2845	.2845	.3125	.3125	.3125	.3125
		4	.3044	.3133	.2856	.3020	.3133	.2846	.2844	.3130	.3130	.3130	.3130
3/8-16	N C	1	.3060	.3125	.2922	.3024	.3123	.2889	.2889	.3125	.3125	.3123	.3125
		2	.3057	.3128	.2921	.3021	.3126	.2890	.2888	.3128	.3130	.3126	.3130
		3	.3060	.3125	.2922	.3034	.3125	.2899	.2899	.3125	.3125	.3125	.3125
		4	.3057	.3128	.2921	.3021	.3128	.2900	.2898	.3128	.3130	.3128	.3130
3/8-24	N F	1	.3067	.3132	.3026	.3054	.3132	.3063	.3063	.3132	.3132	.3132	.3132
		2	.3061	.3138	.3025	.3058	.3138	.3061	.3062	.3138	.3138	.3138	.3138
		3	.3065	.3150	.3044	.3070	.3150	.3099	.3099	.3150	.3150	.3150	.3150
		4	.3069	.3156	.3043	.3077	.3156	.3103	.3101	.3156	.3156	.3156	.3156
3/8-32	N F	1	.3069	.3154	.3048	.3093	.3154	.3132	.3132	.3154	.3154	.3154	.3154
		2	.3066	.3155	.3047	.3090	.3155	.3133	.3131	.3155	.3155	.3155	.3155
		3	.3071	.3159	.3053	.3100	.3159	.3145	.3145	.3159	.3159	.3159	.3159
		4	.3066	.3155	.3047	.3090	.3155	.3134	.3134	.3155	.3155	.3155	.3155
3/8-24	N F	1	.3071	.3159	.3053	.3100	.3159	.3145	.3145	.3159	.3159	.3159	.3159
		2	.3066	.3155	.3047	.3090	.3155	.3134	.3134	.3155	.3155	.3155	.3155
		3	.3071	.3159	.3053	.3100	.3159	.3145	.3145	.3159	.3159	.3159	.3159
		4	.3066	.3155	.3047	.3090	.3155	.3134	.3134	.3155	.3155	.3155	.3155
3/8-32	N F	1	.3071	.3159	.3053	.3100	.3159	.3145	.3145	.3159	.3159	.3159	.3159
		2	.3066	.3155	.3047	.3090	.3155	.3134	.3134	.3155	.3155	.3155	.3155
		3	.3071	.3159	.3053	.3100	.3159	.3145	.3145	.3159	.3159	.3159	.3159
		4	.3066	.3155	.3047	.3090	.3155	.3134	.3134	.3155	.3155	.3155	.3155

See footnotes at end of table.



TABLE 1.17. *Setting plug gages, American National screw threads—Continued*

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs							Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage	W and X tolerances	W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>m</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
3/16-14	NC	1	0.4230	0.4354	0.38900	0.4129	0.4354	0.38200	0.38200	0.4354	0.4354
		2	0.4233	0.4360	0.38885	0.4123	0.4360	0.38215	0.38185	0.4360	0.4360
		3	0.4260	0.4375	0.39110	0.4171	0.4375	0.38620	0.38620	0.4375	0.4375
		4	0.4254	0.4381	0.39095	0.4165	0.4381	0.38635	0.38605	0.4381	0.4381
	NF	1	0.4260	0.4375	0.39110	0.4183	0.4375	0.38770	0.38770	0.4375	0.4375
		2	0.4254	0.4381	0.39095	0.4178	0.4381	0.38765	0.38735	0.4381	0.4381
		3	0.4264	0.4379	0.39150	0.4209	0.4379	0.38970	0.38970	0.4379	0.4379
		4	0.4258	0.4385	0.39135	0.4200	0.4385	0.38985	0.38955	0.4385	0.4381
	NEF	1	0.4270	0.4360	0.4035	0.4200	0.4379	0.3984	0.3984	0.4360	0.4359
		2	0.4265	0.4365	0.4034	0.4195	0.4364	0.3985	0.3983	0.4365	0.4364
		3	0.4285	0.4375	0.4050	0.4231	0.4375	0.4014	0.4014	0.4375	0.4375
		4	0.4280	0.4380	0.4049	0.4226	0.4380	0.4015	0.4013	0.4380	0.4380
3/16-20	NC	1	0.4285	0.4375	0.4040	0.4241	0.4375	0.4024	0.4024	0.4375	0.4375
		2	0.4280	0.4380	0.4039	0.4236	0.4380	0.4025	0.4023	0.4380	0.4380
		3	0.4288	0.4378	0.4043	0.4276	0.4378	0.4030	0.4030	0.4378	0.4378
		4	0.4283	0.4383	0.4052	0.4251	0.4383	0.4041	0.4039	0.4380	0.4375
	NEF	1	0.4304	0.4375	0.4143	0.4262	0.4375	0.4107	0.4107	0.4375	0.4375
		2	0.4299	0.4380	0.4142	0.4277	0.4380	0.4108	0.4106	0.4380	0.4380
		3	0.4304	0.4375	0.4143	0.4273	0.4375	0.4118	0.4118	0.4375	0.4375
		4	0.4299	0.4380	0.4142	0.4268	0.4380	0.4119	0.4117	0.4380	0.4380
3/16-28	NC	1	0.4871	0.5000	0.44590	0.4761	0.5000	0.44030	0.44030	0.5000	0.5000
		2	0.4865	0.5006	0.44575	0.4758	0.5006	0.44015	0.44015	0.5006	0.5006
		3	0.4871	0.5000	0.44590	0.4780	0.5000	0.44190	0.44190	0.5000	0.5000
		4	0.4865	0.5006	0.44575	0.4774	0.5006	0.44205	0.44175	0.5006	0.5006
	NF	1	0.4856	0.4978	0.44780	0.4737	0.4978	0.44040	0.44040	0.4978	0.4978
		2	0.4850	0.4984	0.44765	0.4731	0.4984	0.44055	0.44024	0.4984	0.4984
		3	0.4878	0.5000	0.45060	0.4781	0.5000	0.44480	0.44480	0.5000	0.5000
		4	0.4872	0.5006	0.44985	0.4775	0.5006	0.44495	0.44465	0.5006	0.5006
	NEF	1	0.4878	0.5000	0.45000	0.4796	0.5000	0.44630	0.44630	0.5000	0.5000
		2	0.4872	0.5006	0.44985	0.4790	0.5006	0.44645	0.44615	0.5006	0.5006
		3	0.4882	0.5004	0.45040	0.4818	0.5004	0.44850	0.44850	0.5004	0.5004
		4	0.4876	0.5010	0.45025	0.4812	0.5010	0.44865	0.44835	0.5006	0.5006
3/16-32	NC	1	0.4895	0.4985	0.4660	0.4826	0.4984	0.4600	0.4600	0.4985	0.4984
		2	0.4890	0.4990	0.4659	0.4821	0.4989	0.4610	0.4608	0.4990	0.4989
		3	0.4910	0.5000	0.4675	0.4876	0.5000	0.4630	0.4629	0.5000	0.5000
		4	0.4905	0.5005	0.4674	0.4871	0.5005	0.4640	0.4638	0.5005	0.5005
	NF	1	0.4910	0.5000	0.4675	0.4896	0.5000	0.4640	0.4640	0.5000	0.5000
		2	0.4905	0.5005	0.4674	0.4891	0.5005	0.4650	0.4648	0.5005	0.5005
		3	0.4913	0.5003	0.4678	0.4882	0.5003	0.4665	0.4665	0.5003	0.5003
		4	0.4908	0.5008	0.4677	0.4877	0.5008	0.4666	0.4664	0.5005	0.5005
	NEF	1	0.4929	0.5000	0.4768	0.4886	0.4999	0.4731	0.4731	0.5000	0.5000
		2	0.4924	0.5005	0.4767	0.4881	0.5004	0.4732	0.4730	0.5005	0.5004
		3	0.4929	0.5000	0.4768	0.4897	0.5000	0.4742	0.4742	0.5000	0.5000
		4	0.4924	0.5005	0.4767	0.4892	0.5005	0.4743	0.4741	0.5005	0.5005
3/16-40	NC	1	0.5472	0.5601	0.5090	0.5342	0.5601	0.4981	0.4981	0.5601	0.5601
		2	0.5466	0.5607	0.5088	0.5336	0.5607	0.4983	0.4979	0.5607	0.5607
		3	0.5496	0.5625	0.5084	0.5389	0.5625	0.5028	0.5028	0.5625	0.5625
		4	0.5490	0.5631	0.5082	0.5383	0.5631	0.5030	0.5026	0.5631	0.5631
	NF	1	0.5496	0.5625	0.5084	0.5405	0.5625	0.5044	0.5044	0.5625	0.5625
		2	0.5490	0.5631	0.5082	0.5399	0.5631	0.5046	0.5042	0.5631	0.5631
		3	0.5501	0.5630	0.5089	0.5430	0.5630	0.5069	0.5069	0.5625	0.5625
		4	0.5495	0.5636	0.5087	0.5424	0.5636	0.5071	0.5067	0.5631	0.5631
	NEF	1	0.5512	0.5609	0.52480	0.5439	0.5609	0.51910	0.51910	0.5609	0.5609
		2	0.5507	0.5614	0.52465	0.5427	0.5613	0.51925	0.51895	0.5614	0.5614
		3	0.5528	0.5625	0.52640	0.5494	0.5625	0.52230	0.52230	0.5625	0.5625
		4	0.5523	0.5630	0.52625	0.5479	0.5630	0.52245	0.52215	0.5630	0.5630
3/16-48	NC	1	0.5528	0.5625	0.52640	0.5475	0.5625	0.52340	0.52340	0.5625	0.5625
		2	0.5523	0.5630	0.52625	0.5470	0.5630	0.52355	0.52325	0.5630	0.5630
		3	0.5531	0.5628	0.52670	0.5493	0.5628	0.52526	0.52520	0.5625	0.5625
		4	0.5526	0.5633	0.52655	0.5488	0.5633	0.52535	0.52505	0.5630	0.5630
	NF	1	0.5546	0.5625	0.53540	0.5494	0.5625	0.53140	0.53140	0.5625	0.5625
		2	0.5541	0.5630	0.53525	0.5489	0.5630	0.53155	0.53125	0.5630	0.5630
		3	0.5546	0.5625	0.53540	0.5506	0.5625	0.53290	0.53290	0.5625	0.5625
		4	0.5541	0.5630	0.53525	0.5501	0.5630	0.53275	0.53245	0.5630	0.5630
	NEF	1	0.6087	0.6274	0.5634	0.5943	0.6274	0.5549	0.5549	0.6274	0.6274
		2	0.6081	0.6280	0.5632	0.5937	0.6280	0.5554	0.5547	0.6280	0.6280
		3	0.6113	0.6250	0.5660	0.5995	0.6250	0.5601	0.5601	0.6250	0.6250
		4	0.6107	0.6256	0.5659	0.5989	0.6256	0.5603	0.5599	0.6254	0.6254
3/16-56	NC	1	0.6113	0.6274	0.5660	0.6012	0.6274	0.5618	0.5618	0.6274	0.6274
		2	0.6107	0.6256	0.5658	0.6006	0.6256	0.5620	0.5616	0.6256	0.6256
		3	0.6118	0.6255	0.5665	0.6038	0.6255	0.5644	0.5644	0.6254	0.6254
		4	0.6112	0.6261	0.5663	0.6032	0.6261	0.5646	0.5642	0.6256	0.6256

See footnotes at end of table.

TABLE 1.17.—Setting plug gages, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"				Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter		Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>
			Truncated	Full			Truncated	Full	Plus tol. gage	Minus tol. gage		
1	2	3	4	5	6		7	8	9	10	11	12
			<i>in.</i>	<i>in.</i>	<i>in.</i>		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
5/8-12	N	2	0.6121	0.6250	0.5709		0.6014	0.6250	0.5653	0.5653	0.6250	0.6250
			.6115	.6250	.5707		.6008	.6250	.5655	.5651	.6250	.6250
		3	.6121	.6250	.5709		.6030	.6250	.5669	.5669	.6250	.6250
			.6115	.6250	.5707		.6024	.6250	.5671	.5667	.6250	.6250
5/8-18	NF	1	.6137	.6234	.58730		.6057	.6233	.58160	.58160	.6234	.6233
			.6132	.6230	.58715		.6052	.6230	.58145	.58145	.6230	.6230
		2	.6153	.6250	.58800		.6080	.6250	.58180	.58180	.6250	.6250
			.6148	.6255	.58875		.6081	.6255	.58195	.58165	.6255	.6255
		3	.6153	.6250	.58800		.6100	.6250	.58300	.58300	.6250	.6250
			.6148	.6255	.58875		.6095	.6255	.58305	.58275	.6255	.6255
		4	.6156	.6253	.58920		.6118	.6253	.58770	.58770	.6250	.6250
			.6151	.6258	.58905		.6113	.6258	.58785	.58755	.6255	.6255
5/8-24	NEF	2	.6171	.6250	.59790		.6118	.6250	.59390	.59390	.6250	.6250
			.6166	.6255	.59775		.6113	.6255	.59395	.59365	.6255	.6255
		3	.6171	.6250	.59790		.6130	.6250	.59500	.59500	.6250	.6250
			.6166	.6255	.59775		.6125	.6255	.59515	.59485	.6255	.6255
1 1/16-12	N	2	.6746	.6875	.6334		.6639	.6875	.6278	.6278	.6875	.6875
			.6740	.6881	.6332		.6633	.6881	.6276	.6276	.6881	.6881
		3	.6746	.6875	.6334		.6655	.6875	.6294	.6294	.6875	.6875
			.6740	.6881	.6332		.6649	.6881	.6296	.6292	.6881	.6881
1 1/16-24	NEF	2	.6796	.6875	.66040		.6743	.6875	.65630	.65630	.6875	.6875
			.6791	.6880	.66025		.6738	.6880	.65645	.65615	.6880	.6880
		3	.6796	.6875	.66040		.6755	.6875	.65750	.65750	.6875	.6875
			.6791	.6880	.66025		.6750	.6880	.65765	.65735	.6880	.6880
3/4-10	NC	1	.7326	.7442	.6822		.7163	.7442	.6730	.6730	.7442	.7442
			.7320	.7478	.6820		.7157	.7478	.6732	.6728	.7478	.7478
		2	.7354	.7500	.6850		.7219	.7500	.6786	.6786	.7500	.7500
			.7348	.7506	.6848		.7213	.7506	.6788	.6784	.7506	.7506
		3	.7354	.7500	.6850		.7238	.7500	.6805	.6805	.7500	.7500
			.7348	.7506	.6848		.7232	.7506	.6807	.6803	.7506	.7506
		4	.7360	.7506	.6856		.7266	.7506	.6833	.6833	.7500	.7500
			.7354	.7512	.6854		.7260	.7512	.6835	.6831	.7506	.7506
3/4-12	N	2	.7371	.7500	.6959		.7264	.7500	.6903	.6903	.7500	.7500
			.7365	.7506	.6957		.7258	.7506	.6905	.6901	.7506	.7506
		3	.7371	.7500	.6959		.7280	.7500	.6919	.6919	.7500	.7500
			.7365	.7506	.6957		.7274	.7506	.6921	.6917	.7506	.7506
3/4-16	NF	1	.7377	.7482	.7076		.7284	.7482	.7015	.7015	.7482	.7482
			.7371	.7488	.7074		.7278	.7488	.7015	.7011	.7488	.7488
		2	.7395	.7500	.7094		.7320	.7500	.7049	.7049	.7500	.7500
			.7389	.7506	.7092		.7314	.7506	.7051	.7047	.7506	.7506
		3	.7395	.7500	.7094		.7343	.7500	.7062	.7062	.7500	.7500
			.7389	.7506	.7092		.7337	.7506	.7064	.7060	.7506	.7506
		4	.7399	.7504	.7098		.7353	.7504	.7082	.7082	.7500	.7500
			.7393	.7510	.7096		.7347	.7510	.7084	.7080	.7506	.7506
3/4-20	NEF	2	.7410	.7500	.71750		.7345	.7500	.71290	.71290	.7500	.7500
			.7405	.7505	.71735		.7341	.7505	.71305	.71275	.7505	.7505
		3	.7410	.7500	.71750		.7360	.7500	.71430	.71430	.7500	.7500
			.7405	.7505	.71735		.7355	.7505	.71445	.71415	.7505	.7505
1 1/16-12	N	2	.7996	.8125	.7584		.7889	.8125	.7528	.7528	.8125	.8125
			.7990	.8131	.7582		.7883	.8131	.7530	.7526	.8131	.8131
		3	.7996	.8125	.7584		.7905	.8125	.7544	.7544	.8125	.8125
			.7990	.8131	.7582		.7899	.8131	.7546	.7542	.8131	.8131
1 1/16-16	N	2	.8020	.8125	.7719		.7939	.8125	.7668	.7668	.8125	.8125
			.8014	.8131	.7717		.7933	.8131	.7670	.7666	.8131	.8131
		3	.8020	.8125	.7719		.7955	.8125	.7684	.7684	.8125	.8125
			.8014	.8131	.7717		.7949	.8131	.7686	.7682	.8131	.8131
1 1/16-20	NEF	2	.8035	.8125	.78000		.7971	.8125	.77540	.77540	.8125	.8125
			.8030	.8130	.77985		.7965	.8130	.77555	.77525	.8130	.8130
		3	.8035	.8125	.78000		.7985	.8125	.77680	.77680	.8125	.8125
			.8030	.8130	.77985		.7980	.8130	.77695	.77665	.8130	.8130
3/8-9	NC	1	.8564	.8719	.7997		.8378	.8719	.7857	.7857	.8719	.8719
			.8554	.8726	.7995		.8371	.8726	.7859	.7856	.8726	.8726
		2	.8592	.8750	.8026		.8439	.8750	.7908	.7908	.8750	.8750
			.8585	.8757	.8026		.8432	.8757	.7909	.7906	.8757	.8757
		3	.8592	.8750	.8026		.8460	.8750	.7979	.7979	.8750	.8750
			.8585	.8757	.8026		.8453	.8757	.7981	.7977	.8757	.8757
		4	.8598	.8756	.8033		.8491	.8756	.8010	.8010	.8750	.8750
			.8591	.8763	.8032		.8484	.8763	.8012	.8008	.8757	.8757

See footnotes at end of table.

TABLE 1.17. --Setting plug gages, American National screw threads--(Continued)

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs							Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage		
1	2	3	4	5	6	7	8	9	10	11	12
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
3/8-12	N	2	0.8621	0.8750	0.8209	0.8514	0.8750	0.8153	0.8153	0.8750	0.8750
		3	.8615	.8750	.8207	.8508	.8750	.8155	.8151	.8750	.8750
			.8621	.8750	.8209	.8514	.8750	.8153	.8153	.8750	.8750
			.8615	.8750	.8207	.8508	.8750	.8155	.8151	.8750	.8750
3/8-14	NF	1	.8614	.8720	.8265	.8504	.8720	.8195	.8195	.8720	.8720
			.8608	.8735	.8263	.8498	.8735	.8197	.8193	.8735	.8735
		2	.8635	.8750	.8286	.8516	.8750	.8237	.8237	.8750	.8750
			.8629	.8756	.8284	.8510	.8756	.8239	.8235	.8756	.8756
		3	.8635	.8750	.8286	.8516	.8750	.8237	.8237	.8750	.8750
			.8629	.8756	.8284	.8510	.8756	.8239	.8235	.8756	.8756
		4	.8639	.8754	.8290	.8521	.8754	.8272	.8272	.8754	.8754
			.8633	.8760	.8288	.8515	.8760	.8274	.8270	.8760	.8760
3/8-16	N	2	.8615	.8750	.8344	.8564	.8750	.8294	.8292	.8750	.8750
		3	.8639	.8756	.8342	.8558	.8756	.8295	.8291	.8756	.8756
			.8615	.8750	.8344	.8564	.8750	.8294	.8292	.8750	.8750
			.8639	.8756	.8342	.8558	.8756	.8295	.8291	.8756	.8756
3/8-20	NEF	2	.8660	.8750	.84250	.8565	.8750	.83780	.83780	.8750	.8750
		3	.8655	.8755	.84235	.8560	.8755	.83795	.83765	.8755	.8755
			.8660	.8750	.84250	.8565	.8750	.83780	.83780	.8750	.8750
			.8655	.8755	.84235	.8560	.8755	.83795	.83765	.8755	.8755
1/2-12	N	2	.9246	.9375	.8834	.9139	.9375	.8778	.8778	.9375	.9375
		3	.9240	.9381	.8832	.9133	.9381	.8780	.8776	.9381	.9381
			.9246	.9375	.8834	.9139	.9375	.8778	.8778	.9375	.9375
			.9240	.9381	.8832	.9133	.9381	.8780	.8776	.9381	.9381
1/2-16	N	2	.9270	.9375	.8969	.9188	.9375	.8847	.8847	.9375	.9375
		3	.9264	.9381	.8967	.9182	.9381	.8849	.8845	.9381	.9381
			.9270	.9375	.8969	.9188	.9375	.8847	.8847	.9375	.9375
			.9264	.9381	.8967	.9182	.9381	.8849	.8845	.9381	.9381
1/2-20	NEF	2	.9285	.9375	.90700	.9220	.9375	.90030	.90030	.9375	.9375
		3	.9280	.9380	.90685	.9215	.9380	.90045	.90015	.9380	.9380
			.9285	.9375	.90700	.9220	.9375	.90030	.90030	.9375	.9375
			.9280	.9380	.90685	.9215	.9380	.90045	.90015	.9380	.9380
1-8	NC	1	.9795	.9966	.9154	.9584	.9966	.9943	.9943	.9966	.9966
		2	.9788	.9973	.9152	.9577	.9973	.9945	.9941	.9973	.9973
			.9820	1.0000	.9188	.9653	1.0000	.9912	.9912	1.0000	1.0000
		3	.9822	1.0007	.9186	.9646	1.0007	.9914	.9919	1.0007	1.0007
			.9829	1.0000	.9188	.9653	1.0000	.9914	.9914	1.0000	1.0000
		4	.9822	1.0007	.9186	.9646	1.0007	.9914	.9919	1.0007	1.0007
			.9836	1.0007	.9195	.9659	1.0007	.9918	.9918	1.0007	1.0007
			.9829	1.0014	.9193	.9652	1.0014	.9919	.9919	1.0007	1.0007
1-12	N	2	.9871	1.0090	.9459	.9764	1.0090	.9993	.9993	1.0090	1.0090
		3	.9865	1.0096	.9457	.9758	1.0096	.9995	.9991	1.0096	1.0096
			.9871	1.0090	.9459	.9764	1.0090	.9993	.9993	1.0090	1.0090
			.9865	1.0096	.9457	.9758	1.0096	.9995	.9991	1.0096	1.0096
1-14	NC	1	.9864	.9979	.9545	.9754	.9979	.9945	.9945	.9979	.9979
		2	.9858	.9985	.9543	.9748	.9985	.9947	.9943	.9985	.9985
			.9885	1.0000	.9546	.9766	1.0000	.9987	.9987	1.0000	1.0000
		3	.9879	1.0006	.9534	.9759	1.0006	.9989	.9987	1.0006	1.0006
			.9885	1.0000	.9546	.9766	1.0000	.9987	.9987	1.0000	1.0000
		4	.9879	1.0006	.9534	.9759	1.0006	.9989	.9987	1.0006	1.0006
			.9889	1.0004	.9540	.9764	1.0004	.9992	.9992	1.0004	1.0004
			.9883	1.0010	.9538	.9765	1.0010	.9994	.9990	1.0006	1.0006
1-16	N	2	.9895	1.0090	.9594	.9813	1.0090	.9992	.9992	1.0090	1.0090
		3	.9889	1.0096	.9592	.9807	1.0096	.9994	.9994	1.0096	1.0096
			.9895	1.0090	.9594	.9813	1.0090	.9992	.9992	1.0090	1.0090
			.9889	1.0096	.9592	.9807	1.0096	.9994	.9994	1.0096	1.0096
1-20	NEF	2	.9910	1.0090	.96750	.9844	1.0090	.99270	.99270	1.0090	1.0090
		3	.9905	1.0095	.96735	.9839	1.0095	.99285	.99255	1.0095	1.0095
			.9910	1.0090	.96750	.9844	1.0090	.99270	.99270	1.0090	1.0090
			.9905	1.0095	.96735	.9839	1.0095	.99285	.99255	1.0095	1.0095
1 1/16-12	N	2	1.0196	1.0625	1.0081	1.0389	1.0625	1.0628	1.0628	1.0625	1.0625
		3	1.0190	1.0631	1.0082	1.0383	1.0631	1.0631	1.0631	1.0631	1.0631
			1.0196	1.0625	1.0081	1.0389	1.0625	1.0628	1.0628	1.0625	1.0625
			1.0190	1.0631	1.0082	1.0383	1.0631	1.0631	1.0631	1.0631	1.0631
1 1/16-16	N	2	1.0529	1.0625	1.0219	1.0437	1.0625	1.0695	1.0695	1.0625	1.0625
		3	1.0514	1.0631	1.0217	1.0431	1.0631	1.0698	1.0694	1.0631	1.0631
			1.0529	1.0625	1.0219	1.0437	1.0625	1.0695	1.0695	1.0625	1.0625
			1.0514	1.0631	1.0217	1.0431	1.0631	1.0698	1.0694	1.0631	1.0631

See footnotes at end of table.

TABLE 1.17.—Setting plug gages, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"					Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter			Go <sup>1</sup>	Not go <sup>2</sup>
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage	W and X tolerances	W and X tolerances	
1	2	3	4	5	6	7	8	9	10	11	12	
1 1/4-18	NEF	2	in.	in.	in.	in.	in.	in.	in.	in.	in.	
			1.0528	1.0625	1.02640	1.0454	1.0625	1.02130	1.02130	1.0625	1.0625	
			1.0523	1.0630	1.02625	1.0449	1.0630	1.02145	1.02116	1.0630	1.0630	
			1.0528	1.0625	1.02640	1.0469	1.0625	1.02280	1.02280	1.0625	1.0625	
1 1/4-7	NC	1	1.0523	1.0630	1.02625	1.0464	1.0630	1.02265	1.02265	1.0630	1.0630	
			1.1023	1.1211	1.0283	1.0778	1.1211	1.0159	1.0159	1.1211	1.1211	
			1.1016	1.1218	1.0281	1.0771	1.1218	1.0161	1.0167	1.1218	1.1218	
			1.1062	1.1250	1.0322	1.0856	1.1250	1.0237	1.0237	1.1250	1.1250	
1 1/4-8	N	2	1.1055	1.1257	1.0320	1.0849	1.1257	1.0239	1.0235	1.1257	1.1257	
			1.1062	1.1250	1.0322	1.0882	1.1250	1.0263	1.0263	1.1250	1.1250	
			1.1055	1.1257	1.0320	1.0875	1.1257	1.0265	1.0261	1.1257	1.1257	
			1.1070	1.1258	1.0330	1.0919	1.1258	1.0300	1.0300	1.1250	1.1250	
1 1/4-12	NF	3	1.1063	1.1265	1.0328	1.0912	1.1265	1.0302	1.0298	1.1257	1.1257	
			1.1079	1.1250	1.0438	1.0900	1.1250	1.0350	1.0350	1.1250	1.1250	
			1.1072	1.1257	1.0436	1.0893	1.1257	1.0361	1.0357	1.1257	1.1257	
			1.1079	1.1250	1.0438	1.0924	1.1250	1.0383	1.0383	1.1250	1.1250	
1 1/4-16	N	1	1.1072	1.1257	1.0436	1.0917	1.1257	1.0385	1.0381	1.1257	1.1257	
			1.1097	1.1226	1.0685	1.0967	1.1226	1.0606	1.0606	1.1226	1.1226	
			1.1091	1.1232	1.0683	1.0961	1.1232	1.0608	1.0604	1.1232	1.1232	
			1.1121	1.1250	1.0709	1.1014	1.1250	1.0653	1.0653	1.1250	1.1250	
1 1/4-18	NEF	2	1.1115	1.1256	1.0707	1.1008	1.1256	1.0655	1.0651	1.1256	1.1256	
			1.1121	1.1250	1.0709	1.1030	1.1250	1.0669	1.0669	1.1250	1.1250	
			1.1115	1.1256	1.0707	1.1024	1.1256	1.0671	1.0667	1.1256	1.1256	
			1.1126	1.1255	1.0714	1.1055	1.1255	1.0694	1.0694	1.1250	1.1250	
1 1/4-7	NC	3	1.1120	1.1261	1.0712	1.1049	1.1261	1.0696	1.0692	1.1256	1.1256	
			1.1145	1.1250	1.0844	1.1061	1.1250	1.0790	1.0790	1.1250	1.1250	
			1.1139	1.1256	1.0842	1.1055	1.1256	1.0792	1.0788	1.1256	1.1256	
			1.1145	1.1250	1.0844	1.1077	1.1250	1.0806	1.0806	1.1250	1.1250	
1 1/4-8	N	1	1.1139	1.1256	1.0842	1.1071	1.1256	1.0808	1.0804	1.1256	1.1256	
			1.1153	1.1250	1.08890	1.1078	1.1250	1.08370	1.08370	1.1250	1.1250	
			1.1148	1.1255	1.08875	1.1073	1.1255	1.08385	1.08355	1.1255	1.1255	
			1.1153	1.1250	1.08890	1.1094	1.1250	1.08530	1.08530	1.1250	1.1250	
1 1/4-12	NF	2	1.1148	1.1255	1.08875	1.1089	1.1255	1.08545	1.08515	1.1255	1.1255	
			1.1746	1.1875	1.1334	1.1639	1.1875	1.1278	1.1278	1.1875	1.1875	
			1.1740	1.1881	1.1332	1.1633	1.1881	1.1276	1.1276	1.1881	1.1881	
			1.1746	1.1875	1.1334	1.1655	1.1875	1.1294	1.1294	1.1875	1.1875	
1 1/4-16	N	3	1.1740	1.1881	1.1332	1.1649	1.1881	1.1296	1.1292	1.1881	1.1881	
			1.1770	1.1875	1.1469	1.1686	1.1875	1.1415	1.1415	1.1875	1.1875	
			1.1764	1.1881	1.1467	1.1680	1.1881	1.1417	1.1413	1.1881	1.1881	
			1.1770	1.1875	1.1469	1.1702	1.1875	1.1431	1.1431	1.1875	1.1875	
1 1/4-18	NEF	1	1.1764	1.1881	1.1467	1.1696	1.1881	1.1433	1.1429	1.1881	1.1881	
			1.1778	1.1875	1.15140	1.1703	1.1875	1.14620	1.14620	1.1875	1.1875	
			1.1773	1.1880	1.15125	1.1698	1.1880	1.14635	1.14605	1.1880	1.1880	
			1.1778	1.1875	1.15140	1.1719	1.1875	1.14780	1.14780	1.1875	1.1875	
1 1/4-7	NC	2	1.1773	1.1880	1.15125	1.1714	1.1880	1.14795	1.14765	1.1880	1.1880	
			1.2273	1.2461	1.1533	1.2028	1.2461	1.1409	1.1409	1.2461	1.2461	
			1.2266	1.2468	1.1531	1.2021	1.2468	1.1411	1.1407	1.2468	1.2468	
			1.2312	1.2500	1.1572	1.2106	1.2500	1.1487	1.1487	1.2500	1.2500	
1 1/4-8	N	3	1.2305	1.2507	1.1570	1.2099	1.2507	1.1489	1.1485	1.2507	1.2507	
			1.2312	1.2500	1.1572	1.2132	1.2500	1.1513	1.1513	1.2500	1.2500	
			1.2305	1.2507	1.1570	1.2125	1.2507	1.1515	1.1511	1.2507	1.2507	
			1.2320	1.2508	1.1580	1.2169	1.2508	1.1550	1.1550	1.2500	1.2500	
1 1/4-12	NF	1	1.2313	1.2515	1.1578	1.2162	1.2515	1.1552	1.1548	1.2507	1.2507	
			1.2320	1.2500	1.1688	1.2146	1.2500	1.1605	1.1605	1.2500	1.2500	
			1.2322	1.2507	1.1686	1.2139	1.2507	1.1607	1.1603	1.2507	1.2507	
			1.2320	1.2500	1.1688	1.2171	1.2500	1.1630	1.1630	1.2500	1.2500	
1 1/4-16	N	2	1.2322	1.2507	1.1686	1.2164	1.2507	1.1632	1.1628	1.2507	1.2507	
			1.2347	1.2476	1.1635	1.2217	1.2476	1.1856	1.1856	1.2476	1.2476	
			1.2341	1.2482	1.1633	1.2211	1.2482	1.1858	1.1854	1.2482	1.2482	
			1.2371	1.2500	1.1659	1.2264	1.2500	1.1903	1.1903	1.2500	1.2500	
1 1/4-18	NEF	3	1.2365	1.2506	1.1657	1.2258	1.2506	1.1905	1.1901	1.2506	1.2506	
			1.2371	1.2500	1.1659	1.2280	1.2500	1.1919	1.1919	1.2500	1.2500	
			1.2365	1.2506	1.1657	1.2274	1.2506	1.1921	1.1917	1.2506	1.2506	
			1.2376	1.2505	1.1664	1.2305	1.2505	1.1944	1.1944	1.2500	1.2500	
1 1/4-7	NC	4	1.2370	1.2511	1.1662	1.2299	1.2511	1.1946	1.1942	1.2506	1.2506	
			1.2395	1.2500	1.2004	1.2310	1.2500	1.2030	1.2030	1.2500	1.2500	
			1.2389	1.2506	1.2002	1.2304	1.2506	1.2031	1.2037	1.2506	1.2506	
			1.2395	1.2500	1.2004	1.2327	1.2500	1.2050	1.2050	1.2500	1.2500	
1 1/4-8	N	3	1.2389	1.2506	1.2002	1.2321	1.2506	1.2058	1.2054	1.2506	1.2506	

Continued on next page of table.

Best Available Copy

TABLE 1.17.—Setting plug gages, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"					Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>	
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage			W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12	
1¼-18	NEF	2	in. 1.2403	in. 1.2500	in. 1.21390	in. 1.2327	in. 1.2500	in. 1.20860	in. 1.20860	in. 1.2500	in. 1.2500	
		3	1.2398	1.2505	1.21375	1.2322	1.2505	1.20875	1.20845	1.2505	1.2505	
			1.2403	1.2500	1.21390	1.2343	1.2500	1.21020	1.21020	1.2500	1.2500	
			1.2398	1.2505	1.21375	1.2338	1.2505	1.21035	1.21005	1.2505	1.2505	
1¼-12	N	2	1.2996	1.3125	1.2584	1.2889	1.3125	1.2528	1.2528	1.3125	1.3125	
		3	1.2990	1.3131	1.2582	1.2883	1.3131	1.2530	1.2526	1.3131	1.3131	
			1.2996	1.3125	1.2584	1.2905	1.3125	1.2544	1.2544	1.3125	1.3125	
			1.2990	1.3131	1.2582	1.2899	1.3121	1.2546	1.2542	1.3131	1.3131	
1¼-16	N	2	1.3020	1.3125	1.2719	1.2935	1.3125	1.2664	1.2664	1.3125	1.3125	
		3	1.3014	1.3131	1.2717	1.2929	1.3121	1.2666	1.2662	1.3131	1.3131	
			1.3020	1.3125	1.2719	1.2951	1.3125	1.2680	1.2680	1.3125	1.3125	
			1.3014	1.3131	1.2717	1.2945	1.3131	1.2682	1.2678	1.3131	1.3131	
1¼-18	NEF	2	1.3028	1.3125	1.27640	1.2952	1.3125	1.27110	1.27110	1.3125	1.3125	
		3	1.3023	1.3130	1.27625	1.2947	1.3130	1.27125	1.27095	1.3130	1.3130	
			1.3028	1.3125	1.27640	1.2968	1.3125	1.27270	1.27270	1.3125	1.3125	
			1.3023	1.3130	1.27625	1.2963	1.3130	1.27285	1.27255	1.3130	1.3130	
1¼-6	NC	1	1.3496	1.3706	1.2623	1.3200	1.3706	1.2478	1.2478	1.3706	1.3706	
		2	1.3488	1.3714	1.2621	1.3192	1.3714	1.2480	1.2476	1.3714	1.3714	
			1.3540	1.3750	1.2607	1.3288	1.3750	1.2566	1.2566	1.3750	1.3750	
			1.3532	1.3758	1.2605	1.3280	1.3758	1.2568	1.2564	1.3758	1.3758	
1¼-8	N	2	1.3579	1.3750	1.2938	1.3393	1.3750	1.2852	1.2852	1.3750	1.3750	
		3	1.3572	1.3757	1.2936	1.3386	1.3757	1.2854	1.2850	1.3757	1.3757	
			1.3579	1.3750	1.2938	1.3418	1.3750	1.2877	1.2877	1.3750	1.3750	
			1.3572	1.3757	1.2936	1.3411	1.3757	1.2879	1.2875	1.3757	1.3757	
1¼-12	NF	1	1.3597	1.3726	1.3185	1.3467	1.3726	1.3106	1.3106	1.3726	1.3726	
		2	1.3591	1.3732	1.3183	1.3461	1.3732	1.3108	1.3104	1.3732	1.3732	
			1.3621	1.3750	1.3209	1.3514	1.3750	1.3153	1.3153	1.3750	1.3750	
			1.3615	1.3756	1.3207	1.3508	1.3756	1.3155	1.3151	1.3756	1.3756	
1¼-16	N	2	1.3645	1.3750	1.3344	1.3559	1.3750	1.3288	1.3288	1.3750	1.3750	
		3	1.3639	1.3756	1.3342	1.3553	1.3756	1.3290	1.3286	1.3756	1.3756	
			1.3645	1.3750	1.3344	1.3576	1.3750	1.3305	1.3305	1.3750	1.3750	
			1.3639	1.3756	1.3342	1.3570	1.3756	1.3307	1.3303	1.3756	1.3756	
1¼-18	NEF	2	1.3653	1.3750	1.33890	1.3570	1.3750	1.33350	1.33350	1.3750	1.3750	
		3	1.3648	1.3755	1.33875	1.3571	1.3755	1.33365	1.33335	1.3755	1.3755	
			1.3653	1.3750	1.33890	1.3592	1.3750	1.33510	1.33510	1.3750	1.3750	
			1.3648	1.3755	1.33875	1.3587	1.3755	1.33525	1.33495	1.3755	1.3755	
1¼-12	N	2	1.4246	1.4375	1.3834	1.4139	1.4375	1.3778	1.3778	1.4375	1.4375	
		3	1.4240	1.4381	1.3832	1.4133	1.4381	1.3780	1.3776	1.4381	1.4381	
			1.4246	1.4375	1.3834	1.4155	1.4375	1.3794	1.3794	1.4375	1.4375	
			1.4240	1.4381	1.3832	1.4149	1.4381	1.3796	1.3792	1.4381	1.4381	
1¼-16	N	2	1.4270	1.4375	1.3960	1.4184	1.4375	1.3913	1.3913	1.4375	1.4375	
		3	1.4264	1.4381	1.3967	1.4178	1.4381	1.3915	1.3911	1.4381	1.4381	
			1.4270	1.4375	1.3960	1.4200	1.4375	1.3929	1.3929	1.4375	1.4375	
			1.4264	1.4381	1.3967	1.4194	1.4381	1.3931	1.3927	1.4381	1.4381	
1¼-18	NEF	2	1.4278	1.4375	1.40140	1.4201	1.4375	1.39600	1.39600	1.4375	1.4375	
		3	1.4273	1.4380	1.40125	1.4196	1.4380	1.39615	1.39585	1.4380	1.4380	
			1.4278	1.4375	1.40140	1.4217	1.4375	1.39760	1.39760	1.4375	1.4375	
			1.4273	1.4380	1.40125	1.4212	1.4380	1.39775	1.39745	1.4380	1.4380	
1¼-6	NC	1	1.4716	1.4956	1.3873	1.4450	1.4956	1.3728	1.3728	1.4956	1.4956	
		2	1.4704	1.4961	1.3871	1.4442	1.4961	1.3730	1.3726	1.4961	1.4961	
			1.4790	1.5000	1.3917	1.4538	1.5000	1.3810	1.3816	1.5000	1.5000	
			1.4782	1.5008	1.3915	1.4530	1.5008	1.3818	1.3814	1.5008	1.5008	
1¼-8	N	2	1.4790	1.5000	1.3917	1.4568	1.5000	1.3846	1.3846	1.5000	1.5000	
		3	1.4782	1.5009	1.3915	1.4560	1.5008	1.3848	1.3844	1.5008	1.5008	
			1.4799	1.5000	1.3920	1.4612	1.5000	1.3860	1.3860	1.5000	1.5000	
			1.4791	1.5017	1.3924	1.4604	1.5017	1.3862	1.3868	1.5008	1.5008	
1¼-12	N	2	1.4829	1.5000	1.4188	1.4630	1.5000	1.4008	1.4008	1.5000	1.5000	
		3	1.4822	1.5007	1.4186	1.4632	1.5007	1.4010	1.4006	1.5007	1.5007	
			1.4829	1.5000	1.4188	1.4656	1.5000	1.4125	1.4125	1.5000	1.5000	
			1.4822	1.5007	1.4186	1.4650	1.5007	1.4127	1.4123	1.5007	1.5007	



TABLE 1.17.—Setting plug gages, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"					Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>	
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage			W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12	
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	
1¼-12	NF	1	1.4847	1.4976	1.4435	1.4717	1.4976	1.4356	1.4356	1.4976	1.4976	
		2	1.4841	1.4982	1.4433	1.4711	1.4982	1.4358	1.4354	1.4982	1.4982	
		3	1.4871	1.5000	1.4459	1.4764	1.5000	1.4403	1.4403	1.5000	1.5000	
		4	1.4865	1.5006	1.4457	1.4758	1.5006	1.4405	1.4401	1.5006	1.5006	
1¼-16	N	2	1.4871	1.5000	1.4459	1.4780	1.5000	1.4419	1.4419	1.5000	1.5000	
		3	1.4865	1.5006	1.4457	1.4774	1.5006	1.4421	1.4417	1.5006	1.5006	
		4	1.4876	1.5005	1.4404	1.4805	1.5005	1.4444	1.4444	1.5000	1.5000	
		5	1.4870	1.5011	1.4402	1.4799	1.5011	1.4446	1.4442	1.5006	1.5006	
1¼-18	NEF	2	1.4895	1.5000	1.4594	1.4808	1.5000	1.4537	1.4537	1.5000	1.5000	
		3	1.4889	1.5006	1.4592	1.4802	1.5006	1.4539	1.4535	1.5006	1.5006	
		4	1.4895	1.5000	1.4594	1.4825	1.5000	1.4554	1.4554	1.5000	1.5000	
		5	1.4889	1.5006	1.4592	1.4819	1.5006	1.4556	1.4552	1.5006	1.5006	
1½-16	N	2	1.4903	1.5000	1.46390	1.4825	1.5000	1.45840	1.45840	1.5000	1.5000	
		3	1.4898	1.5005	1.46375	1.4820	1.5005	1.45855	1.45825	1.5005	1.5005	
		4	1.4903	1.5000	1.46390	1.4842	1.5000	1.46010	1.46010	1.5000	1.5000	
		5	1.4898	1.5005	1.46375	1.4837	1.5005	1.46025	1.45995	1.5005	1.5005	
1½-18	NEF	2	1.5520	1.5625	1.52190	1.5432	1.5625	1.51610	1.51610	1.5625	1.5625	
		3	1.5514	1.5631	1.52165	1.5426	1.5631	1.51635	1.51585	1.5631	1.5631	
		4	1.5520	1.5625	1.52190	1.5450	1.5625	1.51790	1.51790	1.5625	1.5625	
		5	1.5514	1.5631	1.52165	1.5444	1.5631	1.51815	1.51865	1.5631	1.5631	
1½-8	N	2	1.5528	1.5625	1.5264	1.5450	1.5625	1.5209	1.5209	1.5625	1.5625	
		3	1.5523	1.5630	1.5262	1.5445	1.5630	1.5211	1.5207	1.5630	1.5630	
		4	1.5528	1.5625	1.5264	1.5466	1.5625	1.5225	1.5225	1.5625	1.5625	
		5	1.5523	1.5630	1.5262	1.5461	1.5630	1.5227	1.5223	1.5630	1.5630	
1½-12	N	2	1.6079	1.6250	1.54380	1.5886	1.6250	1.53450	1.53450	1.6250	1.6250	
		3	1.6072	1.6257	1.54355	1.5879	1.6257	1.53475	1.53425	1.6257	1.6257	
		4	1.6079	1.6250	1.54380	1.5914	1.6250	1.53730	1.53730	1.6250	1.6250	
		5	1.6072	1.6257	1.54355	1.5907	1.6257	1.53755	1.53705	1.6257	1.6257	
1½-16	N	2	1.6121	1.6250	1.57090	1.6006	1.6250	1.56450	1.56450	1.6250	1.6250	
		3	1.6115	1.6256	1.57065	1.6000	1.6256	1.56475	1.56425	1.6256	1.6256	
		4	1.6121	1.6250	1.57090	1.6025	1.6250	1.56640	1.56640	1.6250	1.6250	
		5	1.6115	1.6256	1.57065	1.6019	1.6256	1.56665	1.56615	1.6256	1.6256	
1½-18	NEF	2	1.6145	1.6250	1.58440	1.6057	1.6250	1.57860	1.57860	1.6250	1.6250	
		3	1.6139	1.6256	1.58415	1.6051	1.6256	1.57885	1.57835	1.6256	1.6256	
		4	1.6145	1.6250	1.58440	1.6074	1.6250	1.58030	1.58030	1.6250	1.6250	
		5	1.6139	1.6256	1.58415	1.6068	1.6256	1.58055	1.58005	1.6256	1.6256	
1¾-16	N	2	1.6153	1.6250	1.5889	1.6074	1.6250	1.5833	1.5833	1.6250	1.6250	
		3	1.6148	1.6255	1.5887	1.6069	1.6255	1.5835	1.5831	1.6255	1.6255	
		4	1.6153	1.6250	1.5889	1.6091	1.6250	1.5850	1.5850	1.6250	1.6250	
		5	1.6148	1.6255	1.5887	1.6086	1.6255	1.5852	1.5848	1.6255	1.6255	
1¾-18	NEF	2	1.6770	1.6875	1.64690	1.6682	1.6875	1.64110	1.64110	1.6875	1.6875	
		3	1.6764	1.6881	1.64665	1.6676	1.6881	1.64135	1.64085	1.6881	1.6881	
		4	1.6770	1.6875	1.64690	1.6699	1.6875	1.64280	1.64280	1.6875	1.6875	
		5	1.6764	1.6881	1.64665	1.6693	1.6881	1.64305	1.64255	1.6881	1.6881	
1¾-12	NEF	2	1.6778	1.6875	1.6514	1.6699	1.6875	1.6458	1.6458	1.6875	1.6875	
		3	1.6773	1.6880	1.6512	1.6694	1.6880	1.6460	1.6456	1.6880	1.6880	
		4	1.6778	1.6875	1.6514	1.6716	1.6875	1.6475	1.6475	1.6875	1.6875	
		5	1.6773	1.6880	1.6512	1.6711	1.6880	1.6477	1.6473	1.6880	1.6880	
1¾-8	NC	1	1.7209	1.7448	1.61490	1.6846	1.7448	1.59800	1.59800	1.7448	1.7448	
		2	1.7201	1.7456	1.61465	1.6838	1.7456	1.59825	1.59775	1.7456	1.7456	
		3	1.7261	1.7500	1.62010	1.6951	1.7500	1.60850	1.60850	1.7500	1.7500	
		4	1.7253	1.7508	1.61985	1.6943	1.7508	1.60875	1.60825	1.7508	1.7508	
1¾-16	N	2	1.7261	1.7500	1.62010	1.6985	1.7500	1.61190	1.61190	1.7500	1.7500	
		3	1.7253	1.7508	1.61985	1.6977	1.7508	1.61215	1.61165	1.7508	1.7508	
		4	1.7271	1.7510	1.62110	1.7036	1.7510	1.61700	1.61700	1.7500	1.7500	
		5	1.7263	1.7518	1.62085	1.7028	1.7518	1.61725	1.61675	1.7508	1.7508	
1¾-20	N	2	1.7329	1.7500	1.62880	1.7132	1.7500	1.65010	1.65010	1.7500	1.7500	
		3	1.7322	1.7507	1.62855	1.7125	1.7507	1.65035	1.65085	1.7507	1.7507	
		4	1.7329	1.7500	1.62880	1.7161	1.7500	1.65200	1.65200	1.7500	1.7500	
		5	1.7322	1.7507	1.62855	1.7154	1.7507	1.65225	1.65175	1.7507	1.7507	
1¾-24	N	2	1.7371	1.7500	1.63590	1.7255	1.7500	1.68040	1.68040	1.7500	1.7500	
		3	1.7365	1.7506	1.63565	1.7249	1.7506	1.68065	1.68015	1.7506	1.7506	
		4	1.7371	1.7500	1.63590	1.7274	1.7500	1.68130	1.68130	1.7500	1.7500	
		5	1.7365	1.7506	1.63565	1.7268	1.7506	1.68155	1.68105	1.7506	1.7506	
1¾-28	N	2	1.7395	1.7500	1.70910	1.7306	1.7500	1.70350	1.70350	1.7500	1.7500	
		3	1.7389	1.7506	1.70915	1.7300	1.7506	1.70375	1.70325	1.7506	1.7506	
		4	1.7395	1.7500	1.70910	1.7324	1.7500	1.70530	1.70530	1.7500	1.7500	
		5	1.7389	1.7506	1.70915	1.7318	1.7506	1.70555	1.70505	1.7506	1.7506	

Best Available Copy

TABLE 1.17.—Setting plug gages, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"					Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>	
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage			W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12	
1 1/16-16	N	2	in.	in.	in.	in.	in.	in.	in.	in.	in.	
			1.8020	1.8125	1.77190	1.7931	1.8125	1.76000	1.76000	1.8125	1.8125	
			1.8014	1.8131	1.77165	1.7925	1.8131	1.76025	1.76575	1.8131	1.8131	
			1.8020	1.8125	1.77190	1.7948	1.8125	1.76070	1.76770	1.8125	1.8125	
1/4-8	N	2	1.8579	1.8750	1.79380	1.8379	1.8750	1.78380	1.78380	1.8750	1.8750	
			1.8572	1.8757	1.79355	1.8372	1.8757	1.78405	1.78355	1.8757	1.8757	
			1.8579	1.8750	1.79380	1.8409	1.8750	1.78680	1.78680	1.8750	1.8750	
			1.8572	1.8757	1.79355	1.8402	1.8757	1.78705	1.78655	1.8757	1.8757	
1/4-12	N	2	1.8621	1.8750	1.82090	1.8504	1.8750	1.81430	1.81430	1.8750	1.8750	
			1.8615	1.8756	1.82065	1.8498	1.8756	1.81455	1.81405	1.8756	1.8756	
			1.8621	1.8750	1.82090	1.8524	1.8750	1.81630	1.81630	1.8750	1.8750	
			1.8615	1.8756	1.82065	1.8518	1.8756	1.81655	1.81605	1.8756	1.8756	
1/4-16	N	2	1.8645	1.8750	1.83440	1.8555	1.8750	1.82840	1.82840	1.8750	1.8750	
			1.8639	1.8756	1.83415	1.8549	1.8756	1.82865	1.82815	1.8756	1.8756	
			1.8645	1.8750	1.83440	1.8573	1.8750	1.83020	1.83020	1.8750	1.8750	
			1.8639	1.8756	1.83415	1.8567	1.8756	1.83045	1.82995	1.8756	1.8756	
1 1/8-16	N	2	1.9270	1.9375	1.89690	1.9180	1.9375	1.89090	1.89090	1.9375	1.9375	
			1.9264	1.9381	1.89665	1.9174	1.9381	1.89115	1.89065	1.9381	1.9381	
			1.9270	1.9375	1.89690	1.9198	1.9375	1.89270	1.89270	1.9375	1.9375	
			1.9264	1.9381	1.89665	1.9192	1.9381	1.89295	1.89245	1.9381	1.9381	
2-4 1/2	NC	1	1.9685	1.9943	1.85000	1.9278	1.9943	1.83160	1.83160	1.9943	1.9943	
			1.9677	1.9951	1.84975	1.9270	1.9951	1.83185	1.83135	1.9951	1.9951	
			1.9742	2.0000	1.85570	1.9392	2.0000	1.84300	1.84300	2.0000	2.0000	
			1.9734	2.0008	1.85545	1.9384	2.0008	1.84325	1.84275	2.0008	2.0008	
2-8	N	2	1.9742	2.0000	1.85570	1.9430	2.0000	1.84680	1.84680	2.0000	2.0000	
			1.9734	2.0008	1.85545	1.9422	2.0008	1.84705	1.84655	2.0008	2.0008	
			1.9753	2.0011	1.85680	1.9480	2.0011	1.85240	1.85240	2.0011	2.0011	
			1.9745	2.0019	1.85655	1.9478	2.0019	1.85265	1.85215	2.0019	2.0019	
2-12	N	2	1.9829	2.0000	1.91880	1.9625	2.0000	1.90840	1.90840	2.0000	2.0000	
			1.9822	2.0007	1.91855	1.9618	2.0007	1.90865	1.90815	2.0007	2.0007	
			1.9829	2.0000	1.91880	1.9650	2.0000	1.91150	1.91150	2.0000	2.0000	
			1.9822	2.0007	1.91855	1.9649	2.0007	1.91175	1.91125	2.0007	2.0007	
2-16	NEF	2	1.9871	2.0000	1.94590	1.9753	2.0000	1.93920	1.93920	2.0000	2.0000	
			1.9865	2.0006	1.94565	1.9747	2.0006	1.93945	1.93895	2.0006	2.0006	
			1.9871	2.0000	1.94590	1.9773	2.0000	1.94120	1.94120	2.0000	2.0000	
			1.9865	2.0006	1.94565	1.9767	2.0006	1.94145	1.95095	2.0006	2.0006	
2 1/4-16	N	2	1.9895	2.0000	1.95940	1.9804	2.0000	1.95330	1.95330	2.0000	2.0000	
			1.9889	2.0006	1.95915	1.9798	2.0006	1.95355	1.95305	2.0006	2.0006	
			1.9895	2.0000	1.95940	1.9822	2.0000	1.95510	1.95510	2.0000	2.0000	
			1.9880	2.0006	1.95915	1.9816	2.0006	1.95535	1.95485	2.0006	2.0006	
2 3/4-16	N	2	2.0520	2.0625	2.02190	2.0420	2.0625	2.01580	2.01580	2.0625	2.0625	
			2.0514	2.0631	2.02165	2.0423	2.0631	2.01605	2.01555	2.0631	2.0631	
			2.0520	2.0625	2.02190	2.0417	2.0625	2.01760	2.01760	2.0625	2.0625	
			2.0514	2.0631	2.02165	2.0441	2.0631	2.01785	2.01735	2.0631	2.0631	
2 1/2-16	N	2	2.1079	2.1250	2.04380	2.0872	2.1250	2.03310	2.03310	2.1250	2.1250	
			2.1072	2.1257	2.04355	2.0865	2.1257	2.03335	2.03285	2.1257	2.1257	
			2.1079	2.1250	2.04380	2.0904	2.1250	2.03630	2.03630	2.1250	2.1250	
			2.1072	2.1257	2.04355	2.0897	2.1257	2.03655	2.03605	2.1257	2.1257	
2 3/4-12	N	2	2.1121	2.1250	2.07090	2.1002	2.1250	2.06410	2.06410	2.1250	2.1250	
			2.1115	2.1256	2.07065	2.0996	2.1256	2.06435	2.06385	2.1256	2.1256	
			2.1121	2.1250	2.07090	2.1022	2.1250	2.06610	2.06610	2.1250	2.1250	
			2.1115	2.1256	2.07065	2.1016	2.1256	2.06635	2.06585	2.1256	2.1256	
2 3/4-16	N	2	2.1145	2.1250	2.08440	2.1053	2.1250	2.07820	2.07820	2.1250	2.1250	
			2.1139	2.1256	2.08415	2.1047	2.1256	2.07845	2.07795	2.1256	2.1256	
			2.1145	2.1250	2.08440	2.1072	2.1250	2.08010	2.08010	2.1250	2.1250	
			2.1139	2.1256	2.08415	2.1066	2.1256	2.08035	2.07985	2.1256	2.1256	
2 3/4-20	N	2	2.1770	2.1875	2.14690	2.1678	2.1875	2.14070	2.14070	2.1875	2.1875	
			2.1764	2.1881	2.14665	2.1672	2.1881	2.14095	2.14045	2.1881	2.1881	
			2.1770	2.1875	2.14690	2.1697	2.1875	2.14260	2.14260	2.1875	2.1875	
			2.1764	2.1881	2.14665	2.1691	2.1881	2.14285	2.14235	2.1881	2.1881	
3-16	N	1	2.2187	2.2443	2.10090	2.1778	2.2443	2.08160	2.08160	2.2443	2.2443	
			2.2177	2.2451	1.99975	2.1770	2.2451	2.08185	2.08135	2.2451	2.2451	
			2.2187	2.2443	2.10090	2.1802	2.2443	2.08380	2.08330	2.2443	2.2443	
			2.2177	2.2451	1.99975	2.1802	2.2451	2.08405	2.08355	2.2451	2.2451	
3 1/4-16	N	2	2.2511	2.2508	2.10515	2.1884	2.2508	2.09325	2.09275	2.2508	2.2508	
			2.2511	2.2508	2.10515	2.1930	2.2508	2.09680	2.09630	2.2508	2.2508	
			2.2511	2.2508	2.10515	2.1972	2.2508	2.09705	2.09655	2.2508	2.2508	
			2.2511	2.2508	2.10515	2.1972	2.2508	2.09705	2.09655	2.2508	2.2508	
3 1/4-20	N	1	2.2511	2.2508	2.10680	2.1986	2.2511	2.10210	2.10210	2.2508	2.2508	
			2.2511	2.2508	2.10655	2.1978	2.2511	2.10235	2.10215	2.2508	2.2508	
			2.2511	2.2508	2.10680	2.1986	2.2511	2.10210	2.10210	2.2508	2.2508	
			2.2511	2.2508	2.10655	2.1978	2.2511	2.10235	2.10215	2.2508	2.2508	

TABLE 1.17.—Setting plug gages, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"					Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>	
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage	W and X tolerances	W and X tolerances	
1	2	3	4	5	6	7	8	9	10	11	12	
2¼-8	N	{	in.	in.	in.	in.	in.	in.	in.	in.	in.	
			2.2329	2.2500	2.16880	2.2119	2.2500	2.15780	2.15780	2.2500	2.2500	
			2.2322	2.2507	2.16855	2.2112	2.2507	2.15805	2.15755	2.2507	2.2507	
			2.2329	2.2500	2.16880	2.2152	2.2500	2.16110	2.16110	2.2500	2.2500	
2¼-12	N	{	2.2322	2.2507	2.16855	2.2145	2.2507	2.16135	2.16085	2.2507	2.2507	
			2.2371	2.2500	2.19590	2.2251	2.2500	2.18900	2.18900	2.2500	2.2500	
			2.2365	2.2506	2.19565	2.2245	2.2506	2.18925	2.18875	2.2506	2.2506	
			2.2371	2.2500	2.19590	2.2272	2.2500	2.19110	2.19110	2.2500	2.2500	
2¼-16	N	{	2.2365	2.2506	2.19565	2.2266	2.2506	2.19135	2.19085	2.2506	2.2506	
			2.2395	2.2500	2.20940	2.2303	2.2500	2.20320	2.20320	2.2500	2.2500	
			2.2389	2.2506	2.20915	2.2297	2.2506	2.20345	2.20295	2.2506	2.2506	
			2.2395	2.2500	2.20940	2.2321	2.2500	2.20500	2.20500	2.2500	2.2500	
2½-16	N	{	2.2389	2.2506	2.20915	2.2315	2.2506	2.20525	2.20475	2.2506	2.2506	
			2.3020	2.3125	2.27190	2.2927	2.3125	2.26560	2.26560	2.3125	2.3125	
			2.3014	2.3131	2.27165	2.2921	2.3131	2.26585	2.26535	2.3131	2.3131	
			2.3020	2.3125	2.27190	2.2946	2.3125	2.26750	2.26750	2.3125	2.3125	
2½-12	N	{	2.3014	2.3131	2.27165	2.2940	2.3131	2.26775	2.26725	2.3131	2.3131	
			2.3621	2.3750	2.32090	2.3500	2.3750	2.31390	2.31390	2.3750	2.3750	
			2.3615	2.3756	2.32065	2.3494	2.3756	2.31415	2.31365	2.3756	2.3756	
			2.3621	2.3750	2.32090	2.3521	2.3750	2.31600	2.31600	2.3750	2.3750	
2½-16	N	{	2.3615	2.3756	2.32065	2.3515	2.3756	2.31625	2.31575	2.3756	2.3756	
			2.3645	2.3750	2.33440	2.3552	2.3750	2.32810	2.32810	2.3750	2.3750	
			2.3639	2.3756	2.33415	2.3546	2.3756	2.32835	2.32785	2.3756	2.3756	
			2.3645	2.3750	2.33440	2.3571	2.3750	2.33000	2.33000	2.3750	2.3750	
2¾-16	N	{	2.3639	2.3756	2.33415	2.3565	2.3756	2.33025	2.32975	2.3756	2.3756	
			2.4270	2.4375	2.39690	2.4176	2.4374	2.39050	2.39050	2.4375	2.4374	
			2.4264	2.4381	2.39665	2.4170	2.4380	2.39075	2.39025	2.4381	2.4380	
			2.4270	2.4375	2.39690	2.4195	2.4375	2.39210	2.39210	2.4375	2.4375	
2¾-4	NC	{	2.4264	2.4381	2.39665	2.4189	2.4381	2.39265	2.39215	2.4381	2.4381	
			2.4655	2.4936	2.33120	2.4190	2.4936	2.31080	2.31080	2.4936	2.4936	
			2.4646	2.4945	2.33095	2.4181	2.4945	2.31105	2.31055	2.4945	2.4945	
			2.4719	2.5000	2.33760	2.4319	2.5000	2.32360	2.32360	2.5000	2.5000	
2¾-8	N	{	2.4710	2.5009	2.33735	2.4310	2.5009	2.32385	2.32335	2.5009	2.5009	
			2.4719	2.5000	2.33760	2.4362	2.5000	2.32790	2.32790	2.5000	2.5000	
			2.4710	2.5009	2.33735	2.4353	2.5009	2.32815	2.32765	2.5009	2.5009	
			2.4732	2.5013	2.33890	2.4424	2.5013	2.33410	2.33410	2.5000	2.5000	
2¾-12	N	{	2.4723	2.5022	2.33865	2.4415	2.5022	2.33435	2.33385	2.5009	2.5009	
			2.4829	2.5000	2.41880	2.4612	2.5000	2.40710	2.40710	2.5000	2.5000	
			2.4822	2.5007	2.41855	2.4605	2.5007	2.40735	2.40685	2.5007	2.5007	
			2.4829	2.5000	2.41880	2.4647	2.5000	2.41060	2.41060	2.5000	2.5000	
2¾-16	N	{	2.4822	2.5007	2.41855	2.4640	2.5007	2.41085	2.41035	2.5007	2.5007	
			2.4871	2.5000	2.44590	2.4749	2.5000	2.43880	2.43880	2.5000	2.5000	
			2.4865	2.5006	2.44565	2.4743	2.5006	2.43905	2.43855	2.5006	2.5006	
			2.4871	2.5000	2.44590	2.4771	2.5000	2.44100	2.44100	2.5000	2.5000	
2¾-20	N	{	2.4865	2.5006	2.44565	2.4765	2.5006	2.44125	2.44075	2.5006	2.5006	
			2.4895	2.5000	2.45940	2.4801	2.4999	2.45300	2.45300	2.5000	2.4990	
			2.4889	2.5006	2.45915	2.4795	2.5005	2.45325	2.45275	2.5006	2.5005	
			2.4895	2.5000	2.45940	2.4820	2.5000	2.45490	2.45490	2.5000	2.5000	
2¾-24	N	{	2.4889	2.5006	2.45915	2.4814	2.5006	2.45515	2.45465	2.5006	2.5006	
			2.6121	2.6250	2.57090	2.5999	2.6250	2.56380	2.56380	2.6250	2.6250	
			2.6115	2.6256	2.57065	2.5993	2.6256	2.56405	2.56355	2.6256	2.6256	
			2.6121	2.6250	2.57090	2.6020	2.6250	2.56590	2.56590	2.6250	2.6250	
2¾-28	N	{	2.6115	2.6256	2.57065	2.6014	2.6256	2.56615	2.56565	2.6256	2.6256	
			2.6145	2.6250	2.58440	2.6050	2.6248	2.57790	2.57790	2.6250	2.6248	
			2.6139	2.6256	2.58415	2.6044	2.6254	2.57815	2.57765	2.6256	2.6254	
			2.6145	2.6250	2.58440	2.6070	2.6250	2.57990	2.57990	2.6250	2.6250	
2¾-32	NC	{	2.6139	2.6256	2.58415	2.6064	2.6256	2.58015	2.57965	2.6256	2.6256	
			2.7155	2.7436	2.58120	2.6690	2.7436	2.56080	2.56080	2.7436	2.7436	
			2.7146	2.7445	2.58095	2.6681	2.7445	2.56105	2.56055	2.7445	2.7445	
			2.7219	2.7500	2.58760	2.6819	2.7500	2.57390	2.57390	2.7500	2.7500	
2¾-36	N	{	2.7210	2.7509	2.58735	2.6810	2.7509	2.57385	2.57335	2.7509	2.7509	
			2.7219	2.7500	2.58760	2.6802	2.7500	2.57790	2.57790	2.7500	2.7500	
			2.7210	2.7509	2.58735	2.6853	2.7509	2.57815	2.57765	2.7509	2.7500	
			2.7232	2.7513	2.58890	2.6924	2.7513	2.58410	2.58410	2.7500	2.7500	
2¾-40	N	{	2.7223	2.7522	2.58865	2.6915	2.7522	2.58435	2.58385	2.7509	2.7509	
			2.7329	2.7600	2.60880	2.7105	2.7600	2.65640	2.65640	2.7600	2.7600	
			2.7322	2.7607	2.60855	2.7098	2.7607	2.65665	2.65615	2.7607	2.7607	
			2.7329	2.7600	2.60880	2.7142	2.7600	2.66010	2.66010	2.7600	2.7600	
2¾-48	N	{	2.7322	2.7607	2.60855	2.7135	2.7607	2.66035	2.65985	2.7607	2.7607	

See footnotes at end of table.

TABLE 1.17.—Setting plug gages, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs							Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage	W and X tolerances	W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12
			<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
2 3/4-12	N	2	2.7371	2.7500	2.69590	2.7248	2.7500	2.68870	2.68870	2.7500	2.7500
			2.7365	2.7506	2.69565	2.7242	2.7506	2.68895	2.68845	2.7506	2.7506
		3	2.7371	2.7500	2.69590	2.7270	2.7500	2.69090	2.69090	2.7500	2.7500
			2.7365	2.7506	2.69565	2.7264	2.7506	2.69115	2.69065	2.7506	2.7506
2 3/4-16	N	2	2.7397	2.7500	2.70940	2.7299	2.7497	2.70280	2.70280	2.7500	2.7497
			2.7389	2.7506	2.70915	2.7293	2.7503	2.70305	2.70255	2.7506	2.7503
		3	2.7395	2.7500	2.70940	2.7319	2.7500	2.70480	2.70480	2.7500	2.7500
			2.7389	2.7506	2.70915	2.7313	2.7506	2.70505	2.70455	2.7506	2.7506
2 7/8-12	N	2	2.8621	2.8750	2.82090	2.8497	2.8750	2.81360	2.81360	2.8750	2.8750
			2.8615	2.8756	2.82065	2.8491	2.8756	2.81385	2.81335	2.8756	2.8756
		3	2.8621	2.8750	2.82090	2.8519	2.8750	2.81580	2.81580	2.8750	2.8750
			2.8615	2.8756	2.82065	2.8513	2.8756	2.81605	2.81555	2.8756	2.8756
2 7/8-16	N	2	2.8645	2.8750	2.83440	2.8549	2.8747	2.82780	2.82780	2.8750	2.8747
			2.8639	2.8756	2.83415	2.8543	2.8753	2.82805	2.82755	2.8756	2.8753
		3	2.8645	2.8750	2.83440	2.8569	2.8750	2.82980	2.82980	2.8750	2.8750
			2.8639	2.8756	2.83415	2.8563	2.8756	2.83005	2.82955	2.8756	2.8756
3-4	NC	1	2.9655	2.9936	2.83120	2.9190	2.9936	2.81080	2.81080	2.9936	2.9936
			2.9646	2.9945	2.83095	2.9181	2.9945	2.81105	2.81055	2.9945	2.9945
		2	2.9719	3.0000	2.83760	2.9319	3.0000	2.82360	2.82360	3.0000	3.0000
			2.9710	3.0009	2.83735	2.9310	3.0009	2.82385	2.82335	3.0009	3.0009
3-8	N	2	2.9719	3.0000	2.83760	2.9362	3.0000	2.82790	2.82790	3.0000	3.0000
			2.9710	3.0009	2.83735	2.9353	3.0009	2.82815	2.82765	3.0009	3.0009
		3	2.9732	3.0013	2.83890	2.9424	3.0013	2.83410	2.83410	3.0013	3.0013
			2.9723	3.0022	2.83865	2.9415	3.0022	2.83435	2.83385	3.0022	3.0022
3-12	N	2	2.9829	3.0000	2.91880	2.9599	2.9996	2.90580	2.90580	3.0000	2.9996
			2.9822	3.0007	2.91855	2.9592	2.9993	2.90605	2.90555	3.0007	3.0007
		3	2.9829	3.0000	2.91880	2.9637	3.0000	2.90960	2.90960	3.0000	3.0000
			2.9822	3.0007	2.91855	2.9630	3.0007	2.90985	2.90935	3.0007	3.0007
3-16	N	2	2.9871	3.0000	2.94590	2.9746	3.0000	2.93850	2.93850	3.0000	3.0000
			2.9865	3.0006	2.94565	2.9730	3.0006	2.93875	2.93825	3.0006	3.0006
		3	2.9871	3.0000	2.94590	2.9769	3.0000	2.94080	2.94080	3.0000	3.0000
			2.9865	3.0006	2.94565	2.9763	3.0006	2.94105	2.94055	3.0006	3.0006
3 1/4-12	N	2	2.9895	3.0000	2.95940	2.9798	2.9996	2.95270	2.95270	3.0000	2.9996
			2.9889	3.0006	2.95915	2.9792	2.9992	2.95295	2.95245	3.0006	3.0002
		3	2.9895	3.0000	2.95940	2.9818	3.0000	2.95470	2.95470	3.0000	3.0000
			2.9889	3.0006	2.95915	2.9812	3.0006	2.95495	2.95445	3.0006	3.0006
3 1/4-16	N	2	3.1121	3.1250	3.07090	3.0996	3.1250	3.06350	3.06350	3.1250	3.1250
			3.1115	3.1256	3.07065	3.0990	3.1256	3.06375	3.06325	3.1256	3.1256
		3	3.1121	3.1250	3.07090	3.1018	3.1250	3.06570	3.06570	3.1250	3.1250
			3.1115	3.1256	3.07065	3.1012	3.1256	3.06595	3.06545	3.1256	3.1256
3 1/2-12	N	2	3.1145	3.1250	3.08440	3.1047	3.1245	3.07760	3.07760	3.1250	3.1245
			3.1139	3.1256	3.08415	3.1041	3.1251	3.07785	3.07735	3.1256	3.1251
		3	3.1145	3.1250	3.08440	3.1068	3.1250	3.07970	3.07970	3.1250	3.1250
			3.1139	3.1256	3.08415	3.1062	3.1256	3.07995	3.07945	3.1256	3.1256
3 1/2-16	N	1	3.2155	3.2436	3.08120	3.1690	3.2436	3.06080	3.06080	3.2436	3.2436
			3.2146	3.2445	3.08095	3.1681	3.2445	3.06105	3.06055	3.2445	3.2445
		2	3.2219	3.2500	3.08760	3.1819	3.2500	3.07360	3.07360	3.2500	3.2500
			3.2210	3.2509	3.08735	3.1810	3.2509	3.07385	3.07335	3.2509	3.2509
3 1/2-20	N	2	3.2219	3.2500	3.08760	3.1862	3.2500	3.07790	3.07790	3.2500	3.2500
			3.2210	3.2509	3.08735	3.1853	3.2509	3.07815	3.07765	3.2509	3.2509
		3	3.2232	3.2513	3.08890	3.1924	3.2513	3.08410	3.08410	3.2513	3.2513
			3.2223	3.2522	3.08865	3.1915	3.2522	3.08435	3.08385	3.2522	3.2522
3 3/4-12	N	2	3.2329	3.2500	3.16880	3.2097	3.2494	3.15560	3.15560	3.2500	3.2494
			3.2322	3.2507	3.16855	3.2090	3.2501	3.15585	3.15535	3.2507	3.2501
		3	3.2329	3.2500	3.16880	3.2136	3.2500	3.15950	3.15950	3.2500	3.2500
			3.2322	3.2507	3.16855	3.2129	3.2507	3.15975	3.15925	3.2507	3.2507
3 3/4-16	N	2	3.2371	3.2500	3.19590	3.2245	3.2500	3.18840	3.18840	3.2500	3.2500
			3.2365	3.2506	3.19565	3.2239	3.2506	3.18865	3.18815	3.2506	3.2506
		3	3.2371	3.2500	3.19590	3.2268	3.2500	3.19070	3.19070	3.2500	3.2500
			3.2365	3.2506	3.19565	3.2262	3.2506	3.19095	3.19045	3.2506	3.2506
3 3/4-20	N	2	3.2395	3.2500	3.20940	3.2296	3.2494	3.20250	3.20250	3.2500	3.2494
			3.2389	3.2506	3.20915	3.2290	3.2500	3.20275	3.20225	3.2506	3.2500
		3	3.2395	3.2500	3.20940	3.2317	3.2500	3.20460	3.20460	3.2500	3.2500
			3.2389	3.2506	3.20915	3.2311	3.2506	3.20485	3.20435	3.2506	3.2506
3 3/4-24	N	2	3.3621	3.3750	3.32090	3.3494	3.3750	3.31330	3.31330	3.3750	3.3750
			3.3615	3.3756	3.32065	3.3488	3.3756	3.31355	3.31305	3.3756	3.3756
		3	3.3621	3.3750	3.32090	3.3517	3.3750	3.31560	3.31560	3.3750	3.3750
			3.3615	3.3756	3.32065	3.3511	3.3756	3.31585	3.31535	3.3756	3.3756

See footnotes at end of table.



TABLE 1.17.—Setting plug gages, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"					Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>	
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage	W and X tolerances	W and X tolerances	
1	2	3	4	5	6	7	8	9	10	11	12	
3/8-16	N	2	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
			3.3645	3.3750	3.33440	3.3546	3.3744	3.32750	3.32750	3.3750	3.3744	
		3	3.3639	3.3756	3.33415	3.3540	3.3750	3.32775	3.32725	3.3756	3.3750	
			3.3645	3.3750	3.33440	3.3567	3.3750	3.32960	3.32960	3.3750	3.3750	
3/4-4	NC	1	3.3639	3.3756	3.33415	3.3561	3.3756	3.32985	3.32935	3.3756	3.3756	
			3.4655	3.4936	3.33120	3.4190	3.4936	3.31080	3.31080	3.4936	3.4936	
		2	3.4646	3.4945	3.33095	3.4181	3.4945	3.31105	3.31055	3.4945	3.4945	
			3.4719	3.5000	3.33760	3.4319	3.5000	3.32360	3.32360	3.5000	3.5000	
		3	3.4710	3.5009	3.33735	3.4310	3.5009	3.32385	3.32335	3.5009	3.5009	
			3.4719	3.5000	3.33760	3.4362	3.5000	3.32790	3.32790	3.5000	3.5000	
		4	3.4710	3.5009	3.33735	3.4353	3.5009	3.32815	3.32765	3.5009	3.5009	
			3.4732	3.5013	3.33890	3.4424	3.5013	3.33410	3.33410	3.5000	3.5000	
3/4-8	N	2	3.4723	3.5022	3.33865	3.4415	3.5022	3.33435	3.33385	3.5009	2.5009	
			3.4829	3.5000	3.41890	3.4596	3.4992	3.40550	3.40550	3.5000	3.4992	
		3	3.4822	3.5007	3.41855	3.4589	3.4999	3.40575	3.40525	3.5007	3.4999	
			3.4829	3.5000	3.41890	3.4636	3.5000	3.40950	3.40950	3.5000	3.5000	
3/4-12	N	2	3.4822	3.5007	3.41855	3.4629	3.5007	3.40975	3.40925	3.5007	3.5007	
			3.4871	3.5000	3.44590	3.4744	3.5000	3.43830	3.43830	3.5000	3.5000	
		3	3.4865	3.5006	3.44565	3.4738	3.5006	3.43855	3.43805	3.5006	3.5006	
			3.4871	3.5000	3.44590	3.4767	3.5000	3.44060	3.44060	3.5000	3.5000	
3/4-16	N	2	3.4865	3.5006	3.44565	3.4761	3.5006	3.44085	3.44035	3.5006	3.5006	
			3.4895	3.5000	3.45940	3.4795	3.4993	3.45240	3.45240	3.5000	3.4993	
		3	3.4889	3.5006	3.45915	3.4789	3.4999	3.45265	3.45215	3.5006	3.4999	
			3.4895	3.5000	3.45940	3.4816	3.5000	3.45450	3.45450	3.5000	3.5000	
3/8-12	N	2	3.4889	3.5006	3.45915	3.4810	3.5006	3.45475	3.45425	3.5006	3.5006	
			3.6121	3.6250	3.57090	3.5993	3.6250	3.56320	3.56320	3.6250	3.6250	
		3	3.6115	3.6256	3.57065	3.5987	3.6256	3.56345	3.56295	3.6256	3.6256	
			3.6121	3.6250	3.57090	3.6016	3.6250	3.56550	3.56550	3.6250	3.6250	
3/8-16	N	2	3.6115	3.6256	3.57065	3.6010	3.6256	3.56575	3.56525	3.6256	3.6256	
			3.6145	3.6250	3.58440	3.6044	3.6242	3.57730	3.57730	3.6250	3.6242	
		3	3.6139	3.6256	3.58415	3.6038	3.6248	3.57755	3.57705	3.6256	3.6248	
			3.6145	3.6250	3.58440	3.6066	3.6250	3.57950	3.57950	3.6250	3.6250	
3/4-4	NC	1	3.6139	3.6256	3.58415	3.6060	3.6256	3.57975	3.57925	3.6256	3.6256	
			3.7155	3.7436	3.58120	3.6690	3.7436	3.56090	3.56090	3.7436	3.7436	
		2	3.7146	3.7445	3.58095	3.6681	3.7445	3.56105	3.56055	3.7445	3.7445	
			3.7219	3.7500	3.58760	3.6819	3.7500	3.57360	3.57360	3.7500	3.7500	
		3	3.7210	3.7509	3.58735	3.6810	3.7509	3.57385	3.57335	3.7509	3.7509	
			3.7219	3.7500	3.58760	3.6862	3.7500	3.57790	3.57790	3.7500	3.7500	
		4	3.7210	3.7509	3.58735	3.6853	3.7509	3.57815	3.57765	3.7509	3.7509	
			3.7232	3.7513	3.58890	3.6924	3.7513	3.58410	3.58410	3.7500	3.7500	
3/4-8	N	2	3.7223	3.7522	3.58865	3.6915	3.7522	3.58435	3.58385	3.7509	3.7509	
			3.7329	3.7500	3.66880	3.7095	3.7492	3.65540	3.65540	3.7500	3.7492	
		3	3.7322	3.7507	3.66855	3.7088	3.7499	3.65565	3.65515	3.7507	3.7499	
			3.7329	3.7500	3.66880	3.7135	3.7500	3.65940	3.65940	3.7500	3.7500	
3/4-12	N	2	3.7322	3.7507	3.66855	3.7128	3.7507	3.65965	3.65915	3.7507	3.7507	
			3.7371	3.7500	3.69590	3.7242	3.7500	3.68810	3.68810	3.7500	3.7500	
		3	3.7365	3.7506	3.69565	3.7236	3.7506	3.68835	3.68785	3.7506	3.7506	
			3.7371	3.7500	3.69590	3.7266	3.7500	3.69050	3.69050	3.7500	3.7500	
3/4-16	N	2	3.7365	3.7506	3.69565	3.7260	3.7506	3.69075	3.69025	3.7506	3.7506	
			3.7395	3.7500	3.70940	3.7294	3.7492	3.70230	3.70230	3.7500	3.7492	
		3	3.7389	3.7506	3.70915	3.7288	3.7498	3.70255	3.70205	3.7506	3.7498	
			3.7395	3.7500	3.70940	3.7315	3.7500	3.70440	3.70440	3.7500	3.7500	
3/8-12	N	2	3.7389	3.7506	3.70915	3.7309	3.7506	3.70465	3.70415	3.7506	3.7506	
			3.8621	3.8750	3.82090	3.8492	3.8750	3.81310	3.81310	3.8750	3.8750	
		3	3.8615	3.8756	3.82065	3.8486	3.8756	3.81335	3.81285	3.8756	3.8756	
			3.8621	3.8750	3.82090	3.8515	3.8750	3.81540	3.81540	3.8750	3.8750	
3/8-16	N	2	3.8615	3.8756	3.82065	3.8509	3.8756	3.81565	3.81515	3.8756	3.8756	
			3.8645	3.8750	3.83440	3.8543	3.8741	3.82720	3.82720	3.8750	3.8741	
		3	3.8639	3.8756	3.83415	3.8537	3.8747	3.82745	3.82695	3.8756	3.8747	
			3.8645	3.8750	3.83440	3.8565	3.8750	3.82940	3.82940	3.8750	3.8750	
4-4	NC	1	3.8639	3.8756	3.83415	3.8559	3.8756	3.82965	3.82915	3.8756	3.8756	
			3.9655	3.9936	3.83120	3.9190	3.9936	3.81080	3.81080	3.9936	3.9936	
		2	3.9646	3.9945	3.83095	3.9181	3.9945	3.81105	3.81055	3.9945	3.9945	
			3.9719	4.0000	3.83760	3.9319	4.0000	3.82360	3.82360	4.0000	4.0000	
		3	3.9710	4.0009	3.83735	3.9310	4.0009	3.82385	3.82335	4.0009	4.0009	
			3.9719	4.0000	3.83760	3.9362	4.0000	3.82790	3.82790	4.0000	4.0000	
		4	3.9710	4.0009	3.83735	3.9353	4.0009	3.82815	3.82765	4.0009	4.0009	
			3.9732	4.0013	3.83890	3.9424	4.0013	3.83410	3.83410	4.0000	4.0000	
4-4	NC	1	3.9723	4.0022	3.83865	3.9415	4.0022	3.83435	3.83385	4.0009	4.0009	
			3.9655	3.9936	3.83120	3.9190	3.9936	3.81080	3.81080	3.9936	3.9936	
		2	3.9646	3.9945	3.83095	3.9181	3.9945	3.81105	3.81055	3.9945	3.9945	
			3.9719	4.0000	3.83760	3.9319	4.0000	3.82360	3.82360	4.0000	4.0000	
4-4	NC	3	3.9710	4.0009	3.83735	3.9310	4.0009	3.82385	3.82335	4.0009	4.0009	
			3.9719	4.0000	3.83760	3.9362	4.0000	3.82790	3.82790	4.0000	4.0000	
		4	3.9710	4.0009	3.83735	3.9353	4.0009	3.82815	3.82765	4.0009	4.0009	
			3.9732	4.0013	3.83890	3.9424	4.0013	3.83410	3.83410	4.0000	4.0000	
4-4	NC	1	3.9723	4.0022	3.83865	3.9415	4.0022	3.83435	3.83385	4.0009	4.0009	
			3.9655	3.9936	3.83120	3.9190	3.9936	3.81080	3.81080	3.9936	3.9936	
		2	3.9646	3.9945	3.83095	3.9181	3.9945	3.81105	3.81055	3.9945	3.9945	
			3.9719	4.0000	3.83760	3.9319	4.0000	3.82360	3.82360	4.0000	4.0000	
4-4	NC	3	3.9710	4.0009	3.83735	3.9310	4.0009	3.82385	3.82335	4.0009	4.0009	
			3.9719	4.0000	3.83760	3.9362	4.0000	3.82790	3.82790	4.0000	4.0000	
		4	3.9710	4.0009	3.83735	3.9353	4.0009	3.82815	3.82765	4.0009	4.0009	
			3.9732	4.0013	3.83890	3.9424	4.0013	3.83410	3.83410	4.0000	4.0000	

Continued at end of table.



TABLE 1.17.—Setting plug gages, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs								Basic-crest setting plugs		
			Plug for "Go"				Plug for "Not go"				Major diameter		
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go 1	Not go 1		
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage			W and X tolerances	W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12		
4-8	N	2	<i>in.</i> 3.9820	<i>in.</i> 4.0000	<i>in.</i> 3.91880	<i>in.</i> 3.9594	<i>in.</i> 3.9990	<i>in.</i> 3.90530	<i>in.</i> 3.90530	<i>in.</i> 4.0000	<i>in.</i> 3.9990		
			3.9822	4.0007	3.91855	3.9587	3.9997	3.90555	3.90555	4.0007	3.9997		
		3	3.9829	4.0000	3.91880	3.9594	4.0000	3.90530	3.90530	4.0000	4.0000	4.0000	
			3.9822	4.0007	3.91855	3.9587	4.0007	3.90555	3.90555	4.0007	4.0007	4.0007	
4-12	N	2	3.9874	4.0000	3.91590	3.9741	4.0000	3.93800	3.93800	4.0000	4.0000	4.0000	
			3.9865	4.0006	3.91595	3.9735	4.0006	3.93825	3.93775	4.0006	4.0006		
		3	3.9871	4.0000	3.91590	3.9750	4.0000	3.94010	3.94010	4.0000	4.0000	4.0000	
			3.9865	4.0006	3.91565	3.9759	4.0006	3.94065	3.94015	4.0006	4.0006		
4-16	N	2	3.9895	4.0000	3.95910	3.9793	3.9991	3.95220	3.95220	4.0000	3.9991		
			3.9889	4.0006	3.95915	3.9787	3.9997	3.95245	3.95195	4.0006	3.9997		
		3	3.9895	4.0000	3.95910	3.9814	4.0000	3.95430	3.95430	4.0000	4.0000	4.0000	
			3.9889	4.0006	3.95915	3.9808	4.0006	3.95455	3.95405	4.0006	4.0006		
4½-8	N	2	4.2329	4.2500	4.1688	4.2092	4.2488	4.1551	4.1551	4.2500	4.2488		
			4.2318	4.2511	4.1685	4.2081	4.2499	4.1551	4.1548	4.2511	4.2499		
		3	4.2329	4.2500	4.1688	4.2134	4.2500	4.1592	4.1592	4.2500	4.2500	4.2500	
			4.2318	4.2511	4.1685	4.2122	4.2511	4.1595	4.1589	4.2511	4.2511		
4½-12	N	2	4.2371	4.2500	4.1959	4.2240	4.2500	4.1879	4.1879	4.2500	4.2500		
			4.2362	4.2509	4.1956	4.2231	4.2499	4.1882	4.1876	4.2509	4.2509		
		3	4.2371	4.2500	4.1959	4.2264	4.2500	4.1903	4.1903	4.2500	4.2500	4.2500	
			4.2362	4.2509	4.1956	4.2255	4.2509	4.1906	4.1900	4.2509	4.2509		
4½-16	N	2	4.2395	4.2500	4.2094	4.2291	4.2489	4.2020	4.2020	4.2500	4.2489		
			4.2386	4.2509	4.2091	4.2282	4.2498	4.2023	4.2017	4.2509	4.2498		
		3	4.2395	4.2500	4.2094	4.2313	4.2500	4.2042	4.2042	4.2500	4.2500	4.2500	
			4.2386	4.2509	4.2091	4.2291	4.2509	4.2045	4.2039	4.2509	4.2509		
4½-8	N	2	4.4829	4.5000	4.4188	4.4591	4.4988	4.4050	4.4050	4.5000	4.4988		
			4.4818	4.5011	4.4185	4.4580	4.4999	4.4053	4.4047	4.5011	4.4999		
		3	4.4829	4.5000	4.4188	4.4632	4.5000	4.4091	4.4091	4.5000	4.5000	4.5000	
			4.4818	4.5011	4.4185	4.4621	4.5011	4.4094	4.4088	4.5011	4.5011		
4½-12	N	2	4.4871	4.5000	4.4459	4.4739	4.5000	4.4378	4.4378	4.5000	4.5000		
			4.4862	4.5009	4.4456	4.4730	4.5009	4.4381	4.4375	4.5009	4.5009		
		3	4.4871	4.5000	4.4459	4.4753	4.5000	4.4402	4.4402	4.5000	4.5000	4.5000	
			4.4862	4.5009	4.4456	4.4751	4.5009	4.4405	4.4399	4.5009	4.5009		
4½-16	N	2	4.4895	4.5000	4.4594	4.4790	4.4988	4.4519	4.4519	4.5000	4.4988		
			4.4886	4.5009	4.4591	4.4781	4.4997	4.4522	4.4516	4.5009	4.4997		
		3	4.4895	4.5000	4.4594	4.4812	4.5000	4.4541	4.4541	4.5000	4.5000	4.5000	
			4.4886	4.5009	4.4591	4.4803	4.5009	4.4544	4.4538	4.5009	4.5009		
4¾-8	N	2	4.7329	4.7500	4.6688	4.7090	4.7486	4.6549	4.6549	4.7500	4.7486		
			4.7318	4.7511	4.6685	4.7079	4.7497	4.6552	4.6546	4.7511	4.7497		
		3	4.7329	4.7500	4.6688	4.7131	4.7500	4.6590	4.6590	4.7500	4.7500	4.7500	
			4.7318	4.7511	4.6685	4.7129	4.7511	4.6593	4.6587	4.7511	4.7511		
4¾-12	N	2	4.7371	4.7500	4.6959	4.7297	4.7500	4.6876	4.6876	4.7500	4.7500		
			4.7362	4.7509	4.6956	4.7288	4.7509	4.6879	4.6873	4.7509	4.7509		
		3	4.7371	4.7500	4.6959	4.7292	4.7500	4.6901	4.6901	4.7500	4.7500	4.7500	
			4.7362	4.7509	4.6956	4.7293	4.7509	4.6904	4.6898	4.7509	4.7509		
4¾-16	N	2	4.7395	4.7500	4.7091	4.7289	4.7487	4.7018	4.7018	4.7500	4.7487		
			4.7386	4.7509	4.7091	4.7280	4.7496	4.7021	4.7015	4.7509	4.7496		
		3	4.7395	4.7500	4.7091	4.7312	4.7500	4.7041	4.7041	4.7500	4.7500	4.7500	
			4.7386	4.7509	4.7091	4.7303	4.7509	4.7044	4.7038	4.7509	4.7509		
5-8	N	2	4.9829	5.0000	4.9188	4.9589	4.9986	4.9048	4.9048	5.0000	4.9986		
			4.9818	5.0011	4.9185	4.9578	4.9997	4.9051	4.9045	5.0011	4.9997		
		3	4.9829	5.0000	4.9188	4.9630	5.0000	4.9089	4.9089	5.0000	5.0000	5.0000	
			4.9818	5.0011	4.9185	4.9619	5.0011	4.9092	4.9086	5.0011	5.0011		
5-12	N	2	4.9871	5.0000	4.9459	4.9736	5.0000	4.9375	4.9375	5.0000	5.0000		
			4.9862	5.0009	4.9456	4.9727	5.0009	4.9378	4.9372	5.0009	5.0009		
		3	4.9871	5.0000	4.9459	4.9761	5.0000	4.9400	4.9400	5.0000	5.0000	5.0000	
			4.9862	5.0009	4.9456	4.9752	5.0009	4.9403	4.9397	5.0009	5.0009		
5-16	N	2	4.9895	5.0000	4.9594	4.9788	4.9986	4.9517	4.9517	5.0000	4.9986		
			4.9886	5.0009	4.9591	4.9779	4.9997	4.9520	4.9514	5.0009	4.9997		
		3	4.9895	5.0000	4.9594	4.9811	5.0000	4.9540	4.9540	5.0000	5.0000	5.0000	
			4.9886	5.0009	4.9591	4.9802	5.0009	4.9543	4.9537	5.0009	5.0009		
5¼-8	N	2	5.2329	5.2500	5.1688	5.2088	5.2484	5.1547	5.1547	5.2500	5.2484		
			5.2318	5.2511	5.1685	5.2077	5.2495	5.1550	5.1544	5.2511	5.2495		
		3	5.2329	5.2500	5.1688	5.2130	5.2500	5.1589	5.1589	5.2500	5.2500	5.2500	
			5.2318	5.2511	5.1685	5.2119	5.2511	5.1592	5.1586	5.2511	5.2511		

See footnotes at end of table.

TABLE 1.17. —Setting plug gages, American National screw threads—Continued

Nominal size and threads per inch	Series designation	Class	W truncated setting plugs							Basic-crest setting plugs	
			Plug for "Go"			Plug for "Not go"				Major diameter	
			Major diameter		Pitch diameter	Major diameter		Pitch diameter		Go <sup>1</sup>	Not go <sup>2</sup>
			Truncated	Full		Truncated	Full	Plus tol. gage	Minus tol. gage	W and X tolerances	W and X tolerances
1	2	3	4	5	6	7	8	9	10	11	12
5/16-12	N	2	<i>in.</i> 5.2371	<i>in.</i> 5.2500	<i>in.</i> 5.1959	<i>in.</i> 5.2235	<i>in.</i> 5.2499	<i>in.</i> 5.1874	<i>in.</i> 5.1874	<i>in.</i> 5.2569	<i>in.</i> 5.2499
		3	5.2369	5.2500	5.1956	5.2226	5.2505	5.1877	5.1871	5.2500	5.2508
			5.2371	5.2500	5.1959	5.2261	5.2500	5.1900	5.1900	5.2500	5.2500
5/16-16	N	2	5.2395	5.2500	5.2094	5.2287	5.2485	5.2043	5.2046	5.2590	5.2485
		3	5.2384	5.2500	5.2091	5.2278	5.2494	5.2019	5.2013	5.2599	5.2494
			5.2395	5.2500	5.2094	5.2310	5.2500	5.2039	5.2039	5.2500	5.2500
5/16-8	N	2	5.4829	5.5000	5.4188	5.4587	5.4984	5.4900	5.4916	5.5093	5.4984
		3	5.4818	5.5000	5.4185	5.4576	5.4995	5.4913	5.4913	5.5011	5.4975
			5.4829	5.5000	5.4188	5.4629	5.5000	5.4988	5.4988	5.5000	5.5000
5/16-12	N	2	5.4871	5.5000	5.4459	5.4734	5.4908	5.4373	5.4373	5.5099	5.4998
		3	5.4862	5.5000	5.4456	5.4725	5.4907	5.4373	5.4370	5.5009	5.5007
			5.4871	5.5000	5.4459	5.4750	5.4909	5.4399	5.4399	5.5000	5.5000
5/16-16	N	2	5.4895	5.5000	5.4501	5.4786	5.4984	5.4515	5.4515	5.5000	5.4984
		3	5.4886	5.5000	5.4501	5.4777	5.4993	5.4515	5.4512	5.5009	5.4993
			5.4895	5.5000	5.4501	5.4809	5.5000	5.4538	5.4538	5.5000	5.5000
5/16-8	N	2	5.7320	5.7500	5.6688	5.7096	5.7382	5.6515	5.6515	5.7500	5.7482
		3	5.7318	5.7500	5.6685	5.7075	5.7393	5.6518	5.6512	5.7511	5.7493
			5.7320	5.7500	5.6688	5.7128	5.7500	5.6587	5.6587	5.7500	5.7500
5/16-12	N	2	5.7371	5.7500	5.6959	5.7233	5.7497	5.6872	5.6872	5.7500	5.7497
		3	5.7362	5.7500	5.6956	5.7224	5.7506	5.6875	5.6869	5.7509	5.7506
			5.7371	5.7500	5.6959	5.7259	5.7500	5.6898	5.6898	5.7500	5.7500
5/16-16	N	2	5.7395	5.7500	5.7094	5.7285	5.7483	5.7014	5.7014	5.7500	5.7483
		3	5.7386	5.7500	5.7091	5.7276	5.7492	5.7017	5.7011	5.7509	5.7492
			5.7395	5.7500	5.7094	5.7309	5.7500	5.7038	5.7038	5.7500	5.7500
6-8	N	2	5.9829	6.0000	5.9188	5.9585	5.9982	5.9014	5.9014	6.0000	5.9982
		3	5.9818	6.0000	5.9185	5.9574	5.9993	5.9017	5.9011	6.0011	5.9993
			5.9829	6.0000	5.9188	5.9627	6.0000	5.9086	5.9086	6.0000	6.0000
6-12	N	2	5.9871	6.0000	5.9459	5.9732	5.9906	5.9371	5.9371	6.0000	5.9996
		3	5.9862	6.0000	5.9456	5.9723	5.9915	5.9374	5.9368	6.0009	6.0005
			5.9871	6.0000	5.9459	5.9758	6.0000	5.9397	5.9397	6.0000	6.0000
6-16	N	2	5.9895	6.0000	5.9594	5.9784	5.9982	5.9513	5.9513	6.0000	5.9982
		3	5.9886	6.0000	5.9591	5.9775	5.9991	5.9516	5.9510	6.0009	5.9991
			5.9895	6.0000	5.9594	5.9808	6.0000	5.9537	5.9537	6.0000	6.0000
			5.9895	6.0000	5.9594	5.9799	6.0000	5.9540	5.9540	6.0000	6.0000

<sup>1</sup> Pitch diameter limits of **W** basic-crest setting plug gages are given in column 6 of this table. Pitch diameter limits of **X** basic-crest setting plug gages are given in column 4 of table 1.16.

<sup>2</sup> Pitch diameter limits of **W** basic-crest setting plug gages are given in columns 9 and 10 of this table. Pitch diameter limits of **X** basic-crest setting plug gages are given in columns 6 and 7 of table 1.16.

## APPENDIX 2. AMERICAN NATIONAL SCREW THREADS OF SPECIAL DIAMETERS, PITCHES, AND LENGTHS OF ENGAGEMENT

The American National standards for screw threads of special diameters, pitches, and lengths of engagement are republished here as useful information. They are largely superseded by the Unified and American standards which are specified in section IV. If American National threads are specified, they shall conform to the requirements herein.

The tolerances specified in appendix 1 of this handbook apply in general to bolts, nuts, and tapped holes of standard pitches and diameters. They are based on the pitch of the thread and a length of engagement equal to the basic major diameter, but are used for lengths of engagement up to  $1\frac{1}{2}$  diameters.

In addition to the foregoing threaded components, there are large quantities of threaded parts produced, such as hub and radiator caps in the automotive industry, threaded collars on machine tools, etc., where the diameters are larger, the pitches finer, and the lengths of engagement shorter than for bolt and nut practice. The following specifications have been adopted for such threaded parts, and the tolerances are based on the diameter, pitch, and length of engagement of the components.

### 1. FORM OF THREAD

The American National form of thread profile as specified in appendix 1 shall be used.

### 2. STANDARD PITCHES

In appendix 1 there are given the limits of size for standard thread series. The use of these series, wherever possible, is recommended for all applications.

Whenever sizes and pitches in the American National coarse, fine, or extra-fine, or the 8-, 12-, or 16-thread series are not suitable, it is recommended that one of the following pitches be selected: 4, 6, 8, 10, 12, 14, 16, 18, 20, 24, 28, 32, 36, 40, 48, 56, or 64 threads per inch.

Basic thread data for these pitches are given in table 2.1, and also in table 1.1.

### 3. CLASSIFICATION AND TOLERANCES

There are established herein for general use four classes of screw-thread tolerances and allowances, which are named and numbered to correspond to the regular classification given in appendix 1. These four classes, together with the accompanying specifications, are intended to assure a uniform practice for screw threads not included in the American National coarse, fine, or extra-fine thread series, nor in the 8-, 12-, or 16-thread series.

It is not the intention of the Committee arbitrarily to place a general class or grade of work in a specific class of thread. Each manufacturer and user of screw threads is free to select the class best adapted to his particular needs.

#### (a) GENERAL SPECIFICATIONS

The following general specifications apply to all classes of thread specified for screw threads of special diameters, pitches, and lengths of engagement.

1. **UNIFORM MINIMUM INTERNAL THREAD.**—The pitch diameter of the minimum internal thread corresponds to the basic size.<sup>21</sup>

2. **TOLERANCES.**—(a) The tolerances specified represent the extreme variations allowed on the product.

(b) The tolerance on the internal thread is plus and is applied from the basic size to above basic size.

(c) The tolerance on the external thread is minus and

<sup>21</sup> Special cases will arise, however, when a class 1 thread is required on free-bell drawn tubing with thin walls, and in such cases, the allowance should be made in the internal thread.

is applied from the maximum size to below the maximum size.

(d) The pitch diameter tolerances for an external and an internal thread of a given class are the same.

(e) The pitch diameter tolerances are obtained by adding three values, or increments; one dependent upon the basic major diameter, another upon the length of engagement, and the third upon the pitch of the thread. These increments are based on formulas given in table 2.2. However, where tolerance values so obtained exceed those given in appendix 1 for corresponding pitches of the American National coarse or fine thread series, and for any diameters equal to or less than these standard sizes and lengths of engagement equal to or less than one diameter, the tolerances given in appendix 1 are used. (See rules for using tolerance tables on p. 180.)

(f) Pitch diameter limits of size are interpreted in accordance with appendix 1, par. 5 (c), p. 128.

(g) The tolerances on the major diameters of the external threads and minor diameters of the internal threads are based on the pitch of the thread, as these control the depth of engagement; they are, therefore, based on the pitch alone.

(h) The minimum minor diameter of an external thread of a given pitch is such as to result in a basic flat ( $\frac{1}{8} \times p$ ) at the root when the pitch diameter of the external thread is at its minimum value. When the maximum external thread is basic, the minimum minor diameter of the external thread will be below the basic minor diameter by the amount of the specified pitch diameter tolerance.

(i) The maximum minor diameter of an external thread of a given pitch may be such as results from the use of a worn or rounded threading tool, when the pitch diameter is at its maximum value. In no case, however, should the form of the external thread, as results from tool wear, be such as to cause the external thread to be rejected on the maximum minor diameter by a "go" thread ring gage, the minor diameter of which is equal to the minimum minor diameter of the internal thread.

(j) The maximum major diameter of the internal thread of a given pitch is such as to result in a flat equal to one-third of the basic flat ( $\frac{1}{24} \times p$ ) when the pitch diameter of the internal thread is at its maximum value. When the minimum internal thread is basic, its maximum major diameter will be above the basic major diameter by the amount of the specified pitch diameter tolerance plus two-ninths of the basic thread depth.

(k) The nominal minimum major diameter of an internal thread is the basic major diameter. In no case, however, should the minimum major diameter of the internal thread, as results from a worn tap or cutting tool, be such as to cause the internal thread to be rejected on the minimum major diameter by a "go" plug gage made to the maximum major diameter of the external thread.

(l) The tolerance on the minor diameter of an internal thread of a given pitch is one-sixth of the basic thread height regardless of the class of thread.<sup>22</sup>

#### (b) CLASSIFICATION OF THREADS

1. **CLASS 1.**—This class is intended to cover the manufacture of threaded parts where quick and easy assembly is necessary and where an allowance is required.

This class is made with an allowance on the external thread, so as to permit ready assembly, even when the threads are slightly bruised or dirty, in conformity with the practice in appendix 1.<sup>23</sup>

<sup>22</sup> Special threads having a length of engagement considerably less than one diameter will not develop the full strength of the external thread. The minimum minor diameter of the internal thread of the American National form of thread is such as to provide a minimum clearance on diameter at the minor diameter equal to two-ninths of the basic thread depth. If this clearance is reduced by providing a greater percentage of thread depth in the internal thread, the strength of such a fastening is increased. In such cases when the external thread is subject to considerable tension, it is permissible to make the minor diameter of the internal thread less than the minimum specified in order to give the necessary depth of engagement.

On the other hand, when the length of engagement is exceptionally long the minor diameter of the internal thread may be greater than the maximum specified without impairing the strength of the fastening.

<sup>23</sup> See footnote 21.

Tables 2.3 and 2.4 give the limits of size and tolerances for major, pitch, and minor diameters of threads of special diameters, pitches, and lengths of engagement.

2. CLASS 2.—This class is intended to apply to the major portion of threaded work in interchangeable manufacture, where no allowance is required. It is the same in every particular as class 1 except that it has no allowance and the tolerances are smaller.

Tables 2.3 and 2.5 give the limits of size and tolerances for major, pitch, and minor diameters of threads of special diameters, pitches, and lengths of engagement.

3. CLASS 3.—This class is intended to apply to the higher grade of interchangeable screw thread work. It is the same as class 2 in every particular except that the tolerances are smaller.

Tables 2.3 and 2.6 give the limits of size and tolerances for major, pitch, and minor diameters of threads of special diameters, pitches, and lengths of engagement.

4. CLASS 4.—This class is intended for threaded work requiring a fine, snug fit, and where a screwdriver or wrench may be necessary for assembly.

In the manufacture of screw-thread products belonging to this class it may be necessary to use precision tools, gages made to special tolerances for this class (see table VI.6, p. 117), and other refinements. This quality of work should, therefore, be used only in cases where requirements of the mechanism being produced are exacting. In order to secure the fit desired, it may be necessary in some cases to select the parts when the product is being assembled.

The maximum pitch diameters of the external threads are slightly larger than the minimum pitch diameters of the internal threads determined from table 2.3.

Tables 2.3 and 2.7 give the limits of size and tolerances for major, pitch, and minor diameters of threads of special diameters, pitches, and lengths of engagement.

#### 4. TABLES OF DIMENSIONS

In order to simplify the specification of dimensions of special fastening screw threads, tables 2.3, 2.4, 2.5, 2.6, and 2.7 are arranged herein, and are intended to cover all practical combinations of diameter, pitch, length of engagement, and class of thread. The use of these tables instead of the application of formulas to determine limits of size of a special thread facilitates placing dimensions on drawings. Also, in cases of special threads of the same diameter, pitch, and class of thread, but slightly different lengths of engagement, the threads may be gaged by a single set of gages, as identical pitch diameter tolerances will be applied.

1. ARRANGEMENT OF TABLES.—The arrangement of dimensions and tolerances given in these tables has the following features:

All thread dimensions of threads of special diameters, pitches, and lengths of engagement, except pitch diameter tolerances are derived from table 2.3.

Pitch diameter tolerances are taken from tables 2.4, 2.5, 2.6, or 2.7, depending upon the class required. These pitch diameter tolerances were obtained by adding increments, in accordance with table 2.2, corresponding to the major diameters at the top, the threads per inch at the side of the table, and mean lengths of engagement of  $\frac{1}{4}$ , 1, and  $2\frac{1}{4}$  inches for pitches from 64 to 12 threads per inch, inclusive, and  $\frac{1}{2}$ , 2, and  $4\frac{1}{2}$  inches for pitches from 10 to 4 threads per inch, inclusive. Thus, the increments of the pitch diameter tolerances based on length of engagement and on diameter vary by definite steps instead of continuously. However, in order that the tolerances given in these tables might be wholly consistent with those given in appendix 1, certain values as listed are greater or less than those yielded by the above method. This modification was made by inserting in the tables, in the positions corresponding to standard sizes, pitches, and lengths of engagement of the American National coarse- and fine-thread series, the pitch diameter tolerances listed in appendix 1. Then, wherever necessary, all values above and to the left of these inserted values were reduced so that none of them should exceed these standard values, and those below and to the right were increased so that none

should be less than the standard values. This has the important advantage that in a series of sizes, frequently occurring in practice, consisting partly of standard sizes and partly of special sizes, there will be no undue irregularity in the progression of the pitch diameter tolerance, with consequent difficulties in securing gages, etc.

The maximum pitch diameter tolerances listed are equal to the tolerances on the major diameter of the external threads of the same pitch, as given in table 2.3.

2. RULES FOR USE OF TABLES.—For consistent application of the pitch diameter tolerance tables to all cases, adherence to the following rules relative to the use of the tables is necessary:

1. Tolerances on pitch diameter corresponding to major diameters between those for which values are given in the tables shall be those of the next larger diameter.

2. Tolerances on pitch diameter for pitches between those for which values are given in the tables shall be those of the next coarser pitch, except that for screws having 80, 72, 44, 13, 11, 9, 7, 5, or  $4\frac{1}{2}$  threads per inch, lengths of engagement of one and one-half diameters or less, and diameters less than the standard diameters for the respective pitches as given in appendix 1, the tolerances given in appendix 1 shall be used.

3. Tolerances on pitch diameter for pitches coarser than 4 threads per inch shall be the same as those for 4 threads per inch.

4. Tolerances on pitch diameter when the length of engagement is exactly  $\frac{1}{2}$  or  $1\frac{1}{2}$  in. for 12 threads per inch and finer, or 1 or 3 in. for pitches coarser than 12 threads per inch, shall correspond to the interval of which these are the upper limits.

5. Tolerances on pitch diameter for lengths of engagement greater than those for which values are given shall be the maximum values listed for the pitch concerned.

TABLE 2.1.—Thread data for recommended pitches for threads of special diameters, pitches, and lengths of engagement

Threads per inch, $n$	Pitch, $p$	Depth of thread, $h$	Basic width of flat, $p/8$	Minimum width of flat at major diameter of nut, $p/24$
1	2	3	4	5
	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
64.....	0.01562	0.01015	0.00195	0.00065
56.....	.01786	.01160	.00223	.00074
48.....	.02033	.01353	.00250	.00087
40.....	.02500	.01624	.00312	.00104
36.....	.02778	.01804	.00347	.00116
32.....	.03125	.02030	.00391	.00130
28.....	.03571	.02320	.00446	.00149
24.....	.04167	.02706	.00521	.00174
20.....	.05000	.03248	.00625	.00208
18.....	.05556	.03608	.00694	.00231
16.....	.06250	.04059	.00781	.00260
14.....	.07143	.04639	.00893	.00298
12.....	.08333	.05413	.01042	.00347
10.....	.10000	.06495	.01250	.00417
8.....	.12500	.08119	.01562	.00521
6.....	.16667	.10825	.02083	.00694
4.....	.25000	.16238	.03125	.01042

TABLE 2.2.—Schedule of tolerance increments for threads of special diameters, pitches, and lengths of engagement

Class of thread	Diameter increment	Length of engagement increment	Pitch increment
1	2	3	4
Class 1.....	0.002 $\sqrt{D}$	0.0020	0.020 $\sqrt{p}$
Class 2.....	.002 $\sqrt{D}$	.0020	.010 $\sqrt{p}$
Class 3.....	.002 $\sqrt{D}$	.0020	.005 $\sqrt{p}$
Class 4.....	.001 $\sqrt{D}$	.0010	.0025 $\sqrt{p}$



6. For pitches finer than 64 threads per inch, apply the formulas in table 2.2. If the resulting tolerance is greater than that for 64 threads per inch as given in tables 2.4 to 2.7, for the same diameter and class, apply the tolerance for 64 threads.

3. **EXAMPLES.**—The following examples illustrate the use of these tables:

*Example:* 3¼-in., 16-thread, class 1, with allowance on external threads, ½ in. length of engagement:

From table 2.4:

Pitch diameter tolerance..... = 0.0095

Also from table 2.3, for the external thread:

Maximum major diameter = 3.2500 - 0.0018 = 3.2482

Minimum major diameter = 3.2482 - .0126 = 3.2356

Maximum minor diameter = 3.2500 - .0785 = 3.1715

Maximum pitch diameter = 3.2500 - .0424 = 3.2076

Minimum pitch diameter = 3.2076 - .0095 = 3.1981

And for the internal thread:

Minimum major diameter..... = 3.2500

Minimum minor diameter = 3.2500 - 0.0677 = 3.1823

Maximum minor diameter = 3.1823 + .0068 = 3.1891

Minimum pitch diameter = 3.2500 - .0406 = 3.2094

Maximum pitch diameter = 3.2094 + .0095 = 3.2189

*Example:* 3-in., 24-thread, class 2, ½ in. length of engagement:

From table 2.5:

Pitch diameter tolerance..... = 0.0066

In this instance the pitch diameter tolerance is printed in italics. In accordance with the footnote under table 2.5 it is desirable to avoid the use of tolerances set in italics as the combination of class of thread, length of engagement, pitch, and diameter is disproportionate. If it is decided to use a closer class, class 3 or class 4 may be chosen. As-

suming the choice of class 3, the following dimensions are obtained:

From table 2.6:

Pitch diameter tolerance..... = 0.0065

From table 2.3 for the external thread:

Maximum major diameter..... = 3.0000

Minimum major diameter = 3.0000 - 0.0066 = 2.9934

Maximum minor diameter = 3.0000 - .0511 = 2.9489

Maximum pitch diameter = 3.0000 - .0271 = 2.9729

Minimum pitch diameter = 2.9729 - .0065 = 2.9664

And for the internal thread:

Minimum major diameter..... = 3.0000

Minimum minor diameter = 3.0000 - 0.0451 = 2.9549

Maximum minor diameter = 2.9549 + .0045 = 2.9594

Minimum pitch diameter = 3.0000 - .0271 = 2.9729

Maximum pitch diameter = 2.9729 + .0065 = 2.9794

If, instead, it is decided to reduce the length of engagement to ½ in., the following dimensions are obtained:

From table 2.5:

Pitch diameter tolerance..... = 0.0060

From table 2.3 for the external thread:

Maximum major diameter..... = 3.0000

Minimum major diameter = 3.0000 - 0.0066 = 2.9934

Maximum minor diameter = 3.0000 - .0511 = 2.9489

Maximum pitch diameter = 3.0000 - .0271 = 2.9729

Minimum pitch diameter = 2.9729 - .0060 = 2.9669

And for the internal thread:

Minimum major diameter..... = 3.0000

Minimum minor diameter = 3.0000 - 0.0451 = 2.9549

Maximum minor diameter = 2.9549 + .0045 = 2.9594

Minimum pitch diameter = 3.0000 - .0271 = 2.9729

Maximum pitch diameter = 2.9729 + .0060 = 2.9789

TABLE 2.3.—Values for obtaining thread dimensions of screw threads of special diameters, pitches, and lengths of engagement, classes 1, 2, 3, and 4

Threads per inch	EXTERNAL THREAD SIZES									INTERNAL THREAD SIZES			
	To obtain maximum dimensions for major, pitch, and minor diameters, subtract the values in the "maximum" columns from the basic major diameter. Apply tolerances minus. See tables 2.4, 2.5, 2.6, and 2.7 for pitch diameter tolerances.									To obtain minimum dimensions for minor, pitch, and major diameters, subtract the values in the "minimum" columns from the basic major diameter. Apply tolerances plus. See tables 2.4, 2.5, 2.6, and 2.7 for pitch diameter tolerances.			
	Major diameter				Pitch diameter, maximum			Minor diameter, <sup>1</sup> maximum		Minor diameter		Pitch diameter, minimum	Major diameter, <sup>2</sup> minimum
	Maximum		Tolerance							Minimum	Tolerance		
	Class 1	Classes 2, 3, 4	Class 1	Classes 2, 3, 4	Class 1	Classes 2, 3	Class 4	Class 1	Classes 2, 3, 4	Classes 1, 2, 3, and 4			
1	2	3	4	5	6	7	8	9	10	11	12	13	14
64.....	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
56.....	0.0007	0.0000	0.0052	0.0038	0.0108	0.0101	0.0100	0.0199	0.0192	0.0169	0.0017	0.0101	0.0000
48.....	.0008	.0000	.0056	.0040	.0124	.0116	.0114	.0227	.0219	.0193	.0019	.0116	.0000
40.....	.0009	.0000	.0062	.0044	.0144	.0135	.0133	.0265	.0256	.0226	.0023	.0135	.0000
36.....	.0010	.0000	.0068	.0048	.0172	.0162	.0160	.0317	.0307	.0271	.0027	.0162	.0000
32.....	.0011	.0000	.0072	.0050	.0191	.0180	.0178	.0352	.0341	.0301	.0030	.0180	.0000
28.....	.0012	.0000	.0076	.0054	.0214	.0203	.0201	.0394	.0383	.0338	.0034	.0203	.0000
24.....	.0013	.0000	.0086	.0062	.0244	.0232	.0230	.0450	.0438	.0387	.0039	.0232	.0000
20.....	.0015	.0000	.0092	.0066	.0284	.0271	.0268	.0524	.0511	.0451	.0045	.0271	.0000
18.....	.0016	.0000	.0102	.0072	.0340	.0325	.0322	.0628	.0613	.0541	.0054	.0325	.0000
16.....	.0016	.0000	.0114	.0082	.0377	.0361	.0358	.0698	.0682	.0601	.0060	.0361	.0000
14.....	.0018	.0000	.0126	.0090	.0424	.0406	.0402	.0785	.0767	.0677	.0068	.0406	.0000
12.....	.0021	.0000	.0140	.0098	.0485	.0464	.0460	.0897	.0876	.0773	.0077	.0464	.0000
10.....	.0024	.0000	.0158	.0112	.0565	.0541	.0536	.1046	.1022	.0902	.0090	.0541	.0000
9.....	.0028	.0000	.0184	.0128	.0678	.0650	.0644	.1255	.1227	.1083	.0109	.0650	.0000
8.....	.0034	.0000	.0222	.0152	.0846	.0812	.0805	.1568	.1534	.1372	.0135	.0812	.0000
6.....	.0044	.0000	.0280	.0202	.1127	.1083	.1074	.2080	.2045	.1850	.0150	.1083	.0000
4.....	.0064	.0000	.0408	.0280	.1688	.1624	.1611	.3131	.3067	.2700	.0270	.1624	.0000

<sup>1</sup> Dimension given for the maximum minor diameter of the external thread are figured to the intersection of the worn tool arc with a center line through crest and root. The minimum minor diameter of the external thread shall be that corresponding to a flat at the minor diameter of the minimum external thread equal to  $\frac{1}{2} \times p$ , and may be determined by subtracting the basic thread depth,  $h$  (or 0.6495 $p$ ) from the minimum pitch diameter of the external thread.

<sup>2</sup> Dimension for the minimum major diameter of the internal thread correspond to the basic flat ( $\frac{1}{2} \times p$ ), and the profile at the major diameter produced by a worn tool that fall below the basic outline. The maximum major diameter of the internal thread shall be that corresponding to a flat at the major diameter of the internal thread equal to  $\frac{1}{2} \times p$ , and may be determined by adding  $1\frac{1}{2} \times h$  (or 0.7933 $p$ ) to the maximum pitch diameter of the internal thread.



TABLE 2.4.—Pitch diameter tolerances for screw threads of special diameters, pitches, and lengths of engagement, class 1

Lengths of engagement—		Pitch diameter tolerances for diameters up to and including—																					
From—	To and including—	1/16 inch	1/8 inch	3/16 inch	1/4 inch	1/2 inch	3/4 inch	1 inch	1 1/4 inches	2 inches	3 inches	4 inches	6 inches	8 inches	10 inches	12 inches	14 inches	16 inches	18 inches	20 inches	24 inches		
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.		
64	1/2	0.0026	0.0026	0.0034	0.0038	0.0042	0.0044	0.0047	0.0050	0.0052	0.0052	0.0052	0.0052	0.0052	0.0052	0.0052	0.0052	0.0052	0.0052	0.0052	0.0052		
36	1/2	0.0028	0.0034	0.0038	0.0042	0.0044	0.0046	0.0049	0.0052	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056		
48	1/2	0.0031	0.0034	0.0038	0.0042	0.0044	0.0046	0.0048	0.0051	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054		
40	1/2	0.0034	0.0034	0.0038	0.0042	0.0044	0.0046	0.0048	0.0051	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054		
36	1/2	0.0036	0.0036	0.0038	0.0042	0.0044	0.0046	0.0048	0.0051	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054		
32	1/2	0.0038	0.0038	0.0042	0.0044	0.0046	0.0048	0.0051	0.0054	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057		
28	1/2	0.0043	0.0043	0.0046	0.0048	0.0051	0.0054	0.0057	0.0060	0.0063	0.0063	0.0063	0.0063	0.0063	0.0063	0.0063	0.0063	0.0063	0.0063	0.0063	0.0063		
24	1/2	0.0046	0.0046	0.0048	0.0051	0.0054	0.0057	0.0060	0.0063	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066		
20	1/2	0.0051	0.0051	0.0054	0.0057	0.0060	0.0063	0.0066	0.0069	0.0072	0.0072	0.0072	0.0072	0.0072	0.0072	0.0072	0.0072	0.0072	0.0072	0.0072	0.0072		
18	1/2	0.0057	0.0057	0.0060	0.0063	0.0066	0.0069	0.0072	0.0075	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078		
16	1/2	0.0063	0.0063	0.0066	0.0069	0.0072	0.0075	0.0078	0.0081	0.0084	0.0084	0.0084	0.0084	0.0084	0.0084	0.0084	0.0084	0.0084	0.0084	0.0084	0.0084		
14	1/2	0.0070	0.0070	0.0072	0.0075	0.0078	0.0081	0.0084	0.0087	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090	0.0090		
12	1/2	0.0077	0.0077	0.0079	0.0081	0.0084	0.0087	0.0090	0.0093	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096		
10	1/2	0.0084	0.0084	0.0086	0.0088	0.0091	0.0094	0.0097	0.0100	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103		
8	1/2	0.0091	0.0091	0.0093	0.0095	0.0098	0.0101	0.0104	0.0107	0.0110	0.0110	0.0110	0.0110	0.0110	0.0110	0.0110	0.0110	0.0110	0.0110	0.0110	0.0110		
6	1/2	0.0098	0.0098	0.0100	0.0102	0.0105	0.0108	0.0111	0.0114	0.0117	0.0117	0.0117	0.0117	0.0117	0.0117	0.0117	0.0117	0.0117	0.0117	0.0117	0.0117		
4	1/2	0.0105	0.0105	0.0107	0.0109	0.0112	0.0115	0.0118	0.0121	0.0124	0.0124	0.0124	0.0124	0.0124	0.0124	0.0124	0.0124	0.0124	0.0124	0.0124	0.0124		

\* Standard size of the American National coarse-thread series.

NOTE.—It is preferable to avoid the use of tolerances set in italics by choosing a closer class, shorter length of engagement, coarser pitch, or smaller diameter. When the length of engagement exceeds one diameter and the pitch diameter tolerance exceeds 90 percent of the major diameter tolerance, table 2.3 column 4, the major diameter tolerance shall be 110 percent of the pitch diameter tolerance.

TABLE 2.5.—Pitch diameter tolerances for screw threads of special diameters, pitches, and lengths of engagement, class 2 (see note 2)

[illegible]

<sup>1</sup> Standard size of the American National coarse-thread series.      <sup>2</sup> Standard size of the American National fine-thread series.

NOTE 1.—It is preferable to avoid the use of tolerances set in italics by choosing a closer class, shorter length of engagement, coarser pitch, or smaller diameter. When the length of engagement exceeds one diameter and the pitch diameter tolerance exceeds 80 percent of the major diameter tolerance, table 2.3, column 5, the major diameter tolerance shall be 110 percent of the pitch diameter tolerance.

NOTE 2.—When it is expedient to apply class 2 to new design, the pitch and minor diameter tolerances published in tables 12 and 15 of ASA B1.1-1957, Unified and American Screw Threads, should be applied.



TABLE 2.7.—Pitch diameter tolerances for screw threads of special diameters, pitches, and lengths of engagement, class 4

[illegible]

Standard size of the American National fine-thread series.

\* Standard size of the American National coarse-thread series.

**Note.**—It is preferable to avoid the use of tolerances set in italics by choosing a shorter length of engagement, coarser pitch, or smaller diameter. When the length of engagement exceeds one diameter and the pitch diameter tolerance exceeds 90 percent of the major diameter tolerance, table 2.3, column 5, the major diameter tolerance shall be 110 percent of the pitch diameter tolerance.



## 5. GAGES

The classification of gages as presented in section VI applies also to gages for special threads.

In ordering gages for a special thread, the length of engagement of the component thread (as distinct from the length of the gage), and the diameter, pitch, and class of thread, should be stated, in order that the minimum material product limit, (pitch diameter of "not go" gage) may be determined correctly. With regard to the length of the "go" gage, and gage tolerances, for threads of exceptionally long lengths of engagement, the following practices are recommended: (1) For threads of classes 1 or 2, use the standard length of "go" gage as given in Commercial Standard CS8, and apply *X* tolerances; (2) for threads of classes 3 or 4, make the length of the "go" gage equal to the length of engagement and apply *W* tolerances.

With regard to the marking of gages, each gage shall be plainly marked, for identification, with the diameter, threads per inch, thread series—that is, "NS" to indicate a special thread of American National form—and class of thread.

## APPENDIX 3. HOLE SIZE LIMITS

Recommended hole size limits before threading and the corresponding tolerances are derived, to provide for optimum strength of fastenings and tapping conditions, from the minimum and maximum minor diameters of the internal thread, using the following rules, as illustrated in figure 3.1:

For the range to and including  $\frac{1}{8} D$  the minimum hole size is equal to the minimum minor diameter of the internal thread and the maximum hole size is larger by one-half the minor diameter tolerance.

For the range from  $\frac{1}{8} D$  to  $\frac{3}{8} D$  the minimum and maximum hole sizes are each one quarter of the minor diameter tolerance larger than the corresponding limits for the length of engagement to and including  $\frac{1}{8} D$ .

For the range from  $\frac{3}{8} D$  to  $1\frac{1}{2} D$  the minimum hole size is larger than the minimum minor diameter of the internal thread by one-half the minor diameter tolerance, and the maximum hole size is equal to the maximum minor diameter.

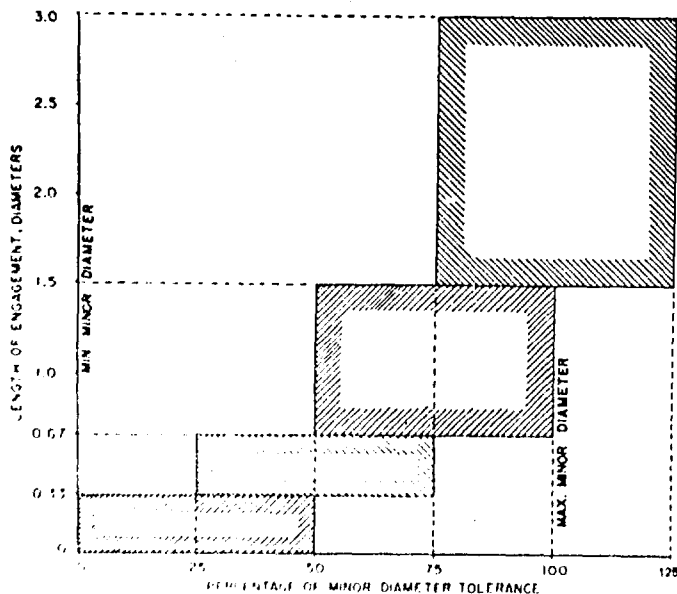


FIGURE 3.1. Distribution of hole size limits before tapping, Unified and American threads.

For the range from  $1\frac{1}{2} D$  to  $3 D$  the minimum and maximum hole sizes are each one quarter of the minor diameter tolerance of the internal thread larger than the corresponding limits for the  $\frac{3}{8} D$  to  $1\frac{1}{2} D$  length of engagement.

From the foregoing it will be seen that the difference between limits in each range is the same and equal to one-half of the minor diameter tolerance. This is a general rule. However, the minimum differences for sizes below  $\frac{1}{4}$  in. are equal to the minor diameter tolerances given in tables IV.10 and IV.11 for lengths of engagement to and including  $\frac{1}{8} D$ . For lengths of engagement greater than  $\frac{1}{8} D$  and for sizes  $\frac{1}{4}$  in. and larger the values are adjusted so that the difference between limits is never less than 0.0040 in.

For diameter-pitch combinations other than those given in tables 3.1 and 3.2, the tolerances given in table III.10, or the tolerance derived from the formula, should be similarly applied to determine the hole size limits.

Internal threads requiring modified minor diameters for lengths of engagement less than  $\frac{3}{8} D$  to develop the optimum strength of the fastening, or longer than  $1\frac{1}{2} D$  to reduce tapping difficulties, should be designated in accordance with par. 3, p. 26.

For National Miniature threads the distribution of hole size limits differs from the above, to accord with conditions peculiar to miniature threads, and is shown in figure 3.2. The maximum limits are based on providing a functionally adequate fastening for the most common applications, where the material of the externally threaded member is of a strength essentially equal to or greater than that of its mating part. In applications where, because of considerations other than the fastening, the screw is made of an appreciably weaker material, the use of smaller hole sizes is usually necessary to extend thread engagement to a greater depth on the external thread. However, hole sizes down to the minimum limit of the minor diameters must be avoided to allow for the spin-up developed as the result of the negative rake with which these small taps are ground.

Recommended hole size limits are tabulated in tables 3.1, 3.2, and 3.3.

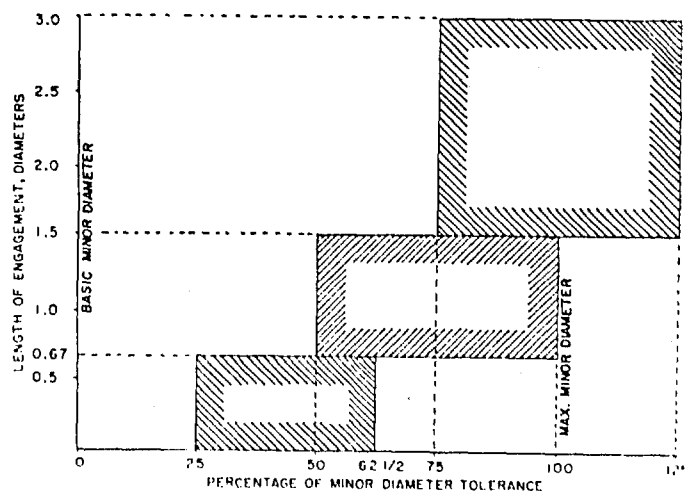


FIGURE 3.2.—Distribution of hole size limits before tapping, National Miniature threads.



TABLE 3.1.—Recommended hole size limits before threading for different lengths of engagement, UNC, UNF, UNEF, UN, UNS, NC, NF, NEF, and N series, classes 1B and 2B

(Based on table IV.10 \*)

Designation		Minor diameter, internal threads				Recommended hole size limits for different lengths of engagement							
Thread size	Threads per inch	Minimum	Percent of basic thread height <sup>a</sup>	Maximum <sup>c</sup>	Percent of basic thread height <sup>b</sup>	To and including $\frac{1}{4}$ D		Above $\frac{1}{4}$ D to $\frac{3}{4}$ D		Above $\frac{3}{4}$ D to $1\frac{1}{4}$ D		Above $1\frac{1}{2}$ D to 3 D	
						Min	Max	Min	Max	Min	Max	Min	Max
No. in.		in.		in.		in.	in.	in.	in.	in.	in.	in.	in.
0 .060	80	0.0465	83.1	0.0514	153.0	0.0465	0.0500	0.0479	0.0514	0.0479	0.0514	0.0514	0.0514
1 .073	64	0.0561	83.3	0.0623	52.7	0.0561	0.0599	0.0585	0.0623	0.0585	0.0623	0.0585	0.0623
1 .073	72	0.0580	83.1	0.0635	52.7	0.0580	0.0613	0.0596	0.0629	0.0602	0.0635	0.0602	0.0635
2 .086	56	0.0667	83.2	0.0737	53.0	0.0667	0.0705	0.0686	0.0724	0.0699	0.0737	0.0699	0.0737
2 .086	64	0.0691	83.3	0.0753	52.7	0.0691	0.0724	0.0707	0.0740	0.0720	0.0753	0.0720	0.0753
3 .092	48	0.0764	83.5	0.0845	53.6	0.0764	0.0804	0.0785	0.0825	0.0805	0.0845	0.0805	0.0845
3 .092	56	0.0797	83.2	0.0865	53.9	0.0797	0.0831	0.0814	0.0848	0.0821	0.0865	0.0821	0.0865
4 .112	40	0.0849	83.4	0.0939	55.7	0.0849	0.0894	0.0871	0.0916	0.0894	0.0939	0.0894	0.0939
4 .112	48	0.0894	83.5	0.0978	56.2	0.0894	0.0931	0.0912	0.0949	0.0931	0.0978	0.0931	0.0978
5 .125	40	0.0979	83.4	0.1062	57.9	0.0979	0.1020	0.1000	0.1041	0.1021	0.1062	0.1021	0.1062
5 .125	44	0.1004	83.3	0.1079	57.9	0.1004	0.1042	0.1023	0.1060	0.1042	0.1079	0.1042	0.1079
6 .138	32	0.104	83.8	0.114	59.1	0.104	0.109	0.106	0.112	0.109	0.114	0.109	0.114
6 .138	40	0.111	83.1	0.119	58.5	0.111	0.115	0.113	0.117	0.115	0.119	0.115	0.119
8 .164	32	0.130	83.8	0.139	61.6	0.130	0.134	0.132	0.137	0.134	0.139	0.134	0.139
8 .164	36	0.134	83.1	0.142	61.0	0.134	0.138	0.136	0.140	0.138	0.142	0.138	0.142
10 .190	24	0.145	83.1	0.156	62.8	0.145	0.150	0.148	0.154	0.150	0.156	0.150	0.156
10 .190	32	0.156	83.8	0.164	64.0	0.156	0.160	0.158	0.162	0.160	0.164	0.160	0.164
12 .216	24	0.171	83.1	0.181	64.7	0.171	0.176	0.174	0.179	0.176	0.181	0.176	0.181
12 .216	28	0.177	84.1	0.186	64.7	0.177	0.182	0.179	0.184	0.182	0.186	0.182	0.186
12 .216	32	0.182	83.8	0.190	64.0	0.182	0.186	0.184	0.188	0.186	0.190	0.186	0.190
14 .240	20	0.196	83.1	0.207	65.2	0.196	0.202	0.199	0.204	0.202	0.207	0.202	0.207
14 .240	28	0.211	84.1	0.220	64.7	0.211	0.216	0.213	0.218	0.216	0.220	0.216	0.220
14 .240	32	0.216	83.8	0.224	64.0	0.216	0.220	0.218	0.222	0.220	0.224	0.220	0.224
14 .240	36	0.220	83.1	0.226	66.5	0.220	0.224	0.221	0.225	0.224	0.226	0.224	0.226
16 .270	18	0.252	83.8	0.265	65.8	0.252	0.259	0.255	0.262	0.259	0.265	0.259	0.265
16 .270	24	0.267	84.1	0.277	65.6	0.267	0.272	0.270	0.275	0.272	0.277	0.272	0.277
16 .270	32	0.279	82.5	0.286	65.3	0.279	0.283	0.281	0.285	0.283	0.286	0.283	0.286
16 .270	36	0.282	84.5	0.289	65.1	0.282	0.286	0.284	0.288	0.285	0.289	0.285	0.289
18 .300	16	0.307	83.8	0.321	66.5	0.307	0.314	0.311	0.319	0.314	0.321	0.311	0.319
18 .300	24	0.330	84.1	0.340	64.7	0.330	0.335	0.333	0.338	0.335	0.340	0.335	0.340
18 .300	32	0.341	83.8	0.349	64.0	0.341	0.345	0.343	0.347	0.345	0.349	0.345	0.349
18 .300	36	0.345	83.1	0.352	63.7	0.345	0.349	0.346	0.350	0.347	0.352	0.347	0.350
20 .360	14	0.360	83.5	0.370	68.3	0.360	0.368	0.364	0.372	0.368	0.372	0.368	0.372
20 .360	20	0.383	83.9	0.395	65.4	0.383	0.389	0.386	0.391	0.388	0.395	0.388	0.391
20 .360	28	0.390	83.0	0.407	65.7	0.390	0.403	0.401	0.406	0.403	0.407	0.403	0.407
22 .420	12	0.417	83.1	0.434	66.0	0.417	0.426	0.421	0.430	0.426	0.431	0.426	0.430
22 .420	16	0.440	83.1	0.448	66.5	0.440	0.444	0.441	0.444	0.441	0.444	0.441	0.444
22 .420	20	0.440	83.1	0.457	66.2	0.440	0.452	0.449	0.454	0.452	0.457	0.452	0.457
22 .420	28	0.461	84.1	0.470	64.7	0.461	0.467	0.463	0.468	0.468	0.470	0.468	0.470
24 .480	12	0.472	83.6	0.490	67.0	0.472	0.476	0.476	0.486	0.480	0.486	0.480	0.486
24 .480	16	0.502	83.8	0.515	65.8	0.502	0.509	0.505	0.512	0.509	0.515	0.509	0.515
24 .480	24	0.517	84.1	0.527	65.6	0.517	0.522	0.520	0.525	0.522	0.527	0.522	0.527
24 .480	28	0.524	83.0	0.532	65.7	0.524	0.528	0.526	0.531	0.528	0.532	0.528	0.532
26 .540	11	0.527	83.0	0.546	66.9	0.527	0.536	0.532	0.541	0.536	0.546	0.541	0.546
26 .540	12	0.535	83.1	0.553	66.5	0.535	0.541	0.540	0.549	0.541	0.553	0.549	0.553
26 .540	16	0.565	83.1	0.578	65.1	0.565	0.572	0.568	0.575	0.572	0.578	0.572	0.578
26 .540	24	0.580	83.1	0.590	64.7	0.580	0.585	0.583	0.588	0.585	0.590	0.588	0.590
26 .540	28	0.586	84.1	0.595	64.7	0.586	0.591	0.588	0.593	0.591	0.595	0.593	0.595
28 .600	12	0.587	83.6	0.615	67.0	0.587	0.606	0.602	0.611	0.606	0.615	0.611	0.620
28 .600	16	0.612	84.1	0.622	65.6	0.612	0.617	0.615	0.620	0.617	0.622	0.617	0.622
30 .660	10	0.642	83.1	0.663	67.0	0.642	0.655	0.647	0.658	0.653	0.663	0.658	0.668
30 .660	12	0.669	83.1	0.678	66.5	0.669	0.679	0.665	0.674	0.669	0.678	0.674	0.682
30 .660	16	0.682	83.8	0.696	66.5	0.682	0.689	0.686	0.693	0.689	0.696	0.693	0.704
30 .660	24	0.696	83.1	0.707	66.2	0.696	0.702	0.699	0.704	0.702	0.707	0.704	0.710
30 .660	28	0.711	84.1	0.720	64.7	0.711	0.716	0.713	0.718	0.716	0.720	0.718	0.722
32 .720	12	0.722	83.6	0.740	67.0	0.722	0.731	0.727	0.736	0.731	0.740	0.736	0.745
32 .720	16	0.745	83.1	0.759	65.9	0.745	0.752	0.749	0.756	0.752	0.759	0.756	0.763
32 .720	20	0.759	83.9	0.770	65.4	0.759	0.764	0.761	0.766	0.764	0.770	0.766	0.772
34 .780	9	0.755	83.1	0.778	67.2	0.755	0.767	0.761	0.767	0.767	0.778	0.773	0.785
34 .780	12	0.785	83.1	0.803	66.5	0.785	0.794	0.790	0.799	0.794	0.803	0.799	0.808
34 .780	14	0.798	83.0	0.814	65.7	0.798	0.806	0.802	0.810	0.806	0.814	0.810	0.818
34 .780	16	0.807	83.8	0.821	66.5	0.807	0.814	0.811	0.818	0.814	0.821	0.818	0.825
34 .780	20	0.821	83.1	0.832	66.2	0.821	0.827	0.824	0.829	0.827	0.832	0.829	0.835
34 .780	28	0.836	84.1	0.845	64.7	0.836	0.840	0.838	0.843	0.840	0.845	0.843	0.847
36 .840	12	0.847	83.6	0.865	67.0	0.847	0.856	0.852	0.861	0.856	0.865	0.861	0.870
36 .840	16	0.870	83.1	0.884	65.9	0.870	0.877	0.874	0.881	0.877	0.884	0.881	0.888
36 .840	20	0.883	83.9	0.895	65.4	0.883	0.889	0.886	0.891	0.889	0.895	0.891	0.897
38 .900	8	0.865	83.1	0.890	67.7	0.865	0.878	0.871	0.884	0.880	0.891	0.884	0.896
38 .900	12	0.910	83.1	0.928	66.5	0.910	0.919	0.915	0.924	0.919	0.928	0.924	0.933
38 .900	14	0.923	83.0	0.938	65.8	0.923	0.931	0.927	0.934	0.931	0.938	0.934	0.942
38 .900	16	0.932	83.8	0.946	66.5	0.932	0.939	0.936	0.943	0.939	0.946	0.943	0.950
38 .900	20	0.946	83.1	0.957	66.2	0.946	0.952	0.949	0.954	0.952	0.957	0.954	0.959
38 .900	28	0.961	84.1	0.970	64.7	0.961	0.965	0.963	0.968	0.965	0.970	0.968	0.972
40 .1000	12	0.972	83.6	0.999	67.0	0.972	0.981	0.977	0.986	0.981	0.990	0.986	0.995
40 .1000	16	1.005	83.1	1.009	65.9	1.005	1.002	1.002	1.002	1.002	1.009	1.005	1.013
40 .1000	18	1.002	83.8	1.015	68.8	1.002	1.009	1.005	1.012	1.009	1.015	1.012	1.018

See footnotes at end of table.

TABLE 3.1.—Recommended hole size limits before threading for different lengths of engagement *L*, UNC, UNF, UNEF, UN, UNS, NC, NF, NEF, and N series, classes 1B and 2B—Continued

(Based on table IV.10 a)

Designation		Minor diameter, internal threads				Recommended hole limits, in its length of engagement							
Thread size	Threads per inch	Minimum	Percent of basic thread height <sup>b</sup>	Maximum <sup>c</sup>	Percent of basic thread height <sup>b</sup>	To and including $\frac{1}{2} D$		Above $\frac{1}{2} D$ to $\frac{3}{4} D$		$D$ to $1\frac{1}{2} D$		Above $1\frac{1}{2} D$ to $3 D$	
						Min	Max	Min	Max	Min	Max	Min	Max
No. in.		in.		in.		in.	in.	in.	in.	in.	in.	in.	in.
1¼	7	0.970	83.5	0.998	68.4	0.970	0.984	0.977	0.991	0.984	0.998	0.991	1.005
1¼	8	0.990	83.1	1.018	67.7	0.990	1.003	0.996	1.009	1.003	1.015	1.009	1.021
1¼	12	1.035	83.1	1.053	66.5	1.035	1.044	1.040	1.049	1.044	1.053	1.049	1.058
1¼	16	1.057	83.8	1.071	66.5	1.057	1.061	1.061	1.068	1.064	1.071	1.068	1.075
1¼	18	1.065	83.1	1.078	65.1	1.065	1.072	1.068	1.075	1.072	1.078	1.075	1.081
1¼	20	1.071	83.1	1.082	66.2	1.071	1.077	1.074	1.079	1.077	1.082	1.079	1.085
1¼	28	1.086	84.1	1.095	64.7	1.086	1.091	1.088	1.093	1.091	1.095	1.093	1.097
1½	12	1.097	83.6	1.115	67.0	1.097	1.106	1.102	1.111	1.106	1.115	1.111	1.120
1½	16	1.120	83.1	1.134	65.9	1.120	1.127	1.124	1.131	1.127	1.134	1.131	1.138
1½	18	1.127	83.8	1.140	65.8	1.127	1.134	1.130	1.137	1.134	1.140	1.137	1.143
1½	7	1.095	83.5	1.123	68.4	1.095	1.109	1.102	1.116	1.109	1.123	1.116	1.130
1½	8	1.115	83.1	1.149	67.7	1.115	1.128	1.121	1.131	1.128	1.140	1.134	1.146
1½	12	1.160	83.1	1.178	66.5	1.160	1.169	1.165	1.174	1.169	1.178	1.174	1.183
1½	16	1.182	83.8	1.196	66.5	1.182	1.189	1.186	1.193	1.189	1.196	1.193	1.200
1½	18	1.190	83.1	1.203	65.1	1.190	1.197	1.193	1.200	1.197	1.203	1.200	1.206
1½	20	1.196	83.1	1.207	66.2	1.196	1.202	1.199	1.204	1.202	1.207	1.204	1.210
1½	12	1.222	83.6	1.240	67.0	1.222	1.241	1.227	1.236	1.231	1.240	1.236	1.245
1½	16	1.245	83.1	1.259	65.9	1.245	1.252	1.249	1.256	1.252	1.259	1.256	1.263
1½	18	1.252	83.8	1.265	65.8	1.252	1.259	1.256	1.262	1.259	1.265	1.262	1.268
1¾	6	1.195	83.1	1.225	69.3	1.195	1.210	1.203	1.221	1.210	1.225	1.221	1.239
1¾	8	1.240	83.1	1.265	67.7	1.240	1.253	1.246	1.259	1.253	1.265	1.259	1.271
1¾	12	1.285	83.1	1.303	66.5	1.285	1.294	1.290	1.299	1.294	1.303	1.299	1.308
1¾	16	1.307	83.8	1.321	66.5	1.307	1.314	1.311	1.318	1.314	1.321	1.318	1.325
1¾	18	1.315	83.1	1.328	65.1	1.315	1.322	1.318	1.325	1.322	1.328	1.325	1.331
1¾	12	1.347	83.6	1.365	67.0	1.347	1.354	1.350	1.357	1.354	1.365	1.361	1.370
1¾	16	1.370	83.1	1.384	65.9	1.370	1.377	1.374	1.381	1.377	1.384	1.381	1.388
1¾	18	1.377	83.8	1.390	65.8	1.377	1.384	1.380	1.387	1.384	1.390	1.387	1.393
1¾	6	1.320	83.1	1.370	69.3	1.320	1.335	1.328	1.346	1.335	1.350	1.346	1.364
1¾	8	1.365	83.1	1.390	67.7	1.365	1.378	1.371	1.384	1.378	1.390	1.384	1.396
1¾	12	1.410	83.1	1.428	66.5	1.410	1.419	1.415	1.424	1.419	1.428	1.424	1.433
1¾	16	1.432	83.8	1.446	66.5	1.432	1.440	1.436	1.443	1.440	1.446	1.443	1.450
1¾	18	1.440	83.1	1.452	66.5	1.440	1.446	1.443	1.449	1.446	1.452	1.449	1.456
1¾	20	1.446	83.1	1.457	66.2	1.446	1.452	1.449	1.454	1.452	1.457	1.454	1.460
1¾	16	1.495	83.1	1.509	65.9	1.495	1.502	1.499	1.506	1.502	1.509	1.506	1.513
1¾	18	1.502	83.8	1.515	65.8	1.502	1.509	1.505	1.512	1.509	1.515	1.512	1.518
1¾	8	1.490	83.1	1.515	67.7	1.490	1.498	1.494	1.506	1.498	1.515	1.509	1.521
1¾	12	1.535	83.1	1.553	66.5	1.535	1.543	1.540	1.549	1.544	1.553	1.549	1.558
1¾	16	1.557	83.8	1.571	66.5	1.557	1.564	1.561	1.568	1.564	1.571	1.568	1.575
1¾	18	1.565	83.1	1.578	65.1	1.565	1.572	1.568	1.575	1.572	1.578	1.575	1.581
1¾	16	1.620	83.1	1.644	65.9	1.620	1.627	1.624	1.631	1.627	1.634	1.631	1.638
1¾	18	1.627	83.8	1.640	65.8	1.627	1.634	1.630	1.637	1.634	1.640	1.637	1.643
1¾	5	1.531	83.1	1.568	70.1	1.531	1.551	1.543	1.569	1.551	1.568	1.560	1.577
1¾	8	1.615	83.1	1.610	67.7	1.615	1.628	1.621	1.634	1.628	1.640	1.634	1.646
1¾	12	1.699	83.1	1.678	66.5	1.699	1.699	1.695	1.674	1.669	1.678	1.674	1.683
1¾	16	1.682	83.8	1.686	66.5	1.682	1.689	1.686	1.693	1.689	1.696	1.693	1.700
1¾	20	1.696	83.1	1.707	66.2	1.696	1.702	1.699	1.704	1.702	1.707	1.704	1.710
1¾	16	1.745	83.1	1.759	65.9	1.745	1.752	1.749	1.756	1.752	1.759	1.756	1.763
1¾	8	1.740	83.1	1.765	67.7	1.740	1.752	1.746	1.759	1.752	1.765	1.759	1.771
1¾	12	1.785	83.1	1.803	66.5	1.785	1.791	1.790	1.799	1.794	1.803	1.799	1.808
1¾	16	1.807	83.8	1.821	66.5	1.807	1.814	1.810	1.818	1.814	1.821	1.818	1.825
1¾	16	1.870	83.1	1.881	65.9	1.870	1.877	1.874	1.881	1.877	1.881	1.881	1.888
2	4½	1.759	83.5	1.795	71.0	1.759	1.777	1.768	1.786	1.777	1.795	1.786	1.804
2	8	1.865	83.1	1.890	67.7	1.865	1.878	1.871	1.884	1.878	1.890	1.884	1.896
2	12	1.910	83.1	1.928	66.5	1.910	1.919	1.915	1.924	1.919	1.928	1.924	1.933
2	16	1.932	83.8	1.946	66.5	1.932	1.939	1.936	1.943	1.939	1.946	1.943	1.950
2	20	1.946	83.1	1.957	66.2	1.946	1.952	1.949	1.954	1.952	1.957	1.954	1.960
2½	16	1.995	83.1	2.009	65.9	1.995	2.002	2.000	2.006	2.002	2.009	2.006	2.012
2½	8	1.990	83.1	2.015	67.7	1.990	2.003	1.996	2.009	2.003	2.015	2.009	2.021
2½	12	2.035	83.1	2.053	66.5	2.035	2.041	2.040	2.049	2.044	2.053	2.049	2.058
2½	16	2.057	83.8	2.071	66.5	2.057	2.064	2.061	2.068	2.064	2.071	2.068	2.075
2½	16	2.120	83.1	2.131	65.9	2.120	2.127	2.124	2.131	2.127	2.131	2.131	2.138
2½	4½	2.069	83.5	2.045	71.0	2.069	2.027	2.018	2.036	2.027	2.045	2.036	2.054
2½	8	2.115	83.1	2.140	67.7	2.115	2.128	2.121	2.134	2.128	2.140	2.134	2.146
2½	12	2.160	83.1	2.178	66.5	2.160	2.169	2.165	2.174	2.169	2.178	2.174	2.182
2½	16	2.182	83.8	2.196	66.5	2.182	2.189	2.186	2.193	2.189	2.196	2.193	2.200
2½	20	2.196	83.1	2.207	66.2	2.196	2.202	2.199	2.204	2.202	2.207	2.204	2.210
2½	16	2.245	83.1	2.259	65.9	2.245	2.252	2.249	2.256	2.252	2.259	2.256	2.263
2½	12	2.285	83.1	2.303	66.5	2.285	2.291	2.290	2.299	2.294	2.303	2.299	2.308
2½	16	2.307	83.8	2.321	66.5	2.307	2.314	2.311	2.318	2.314	2.321	2.318	2.325
2½	16	2.370	83.1	2.384	65.9	2.370	2.377	2.374	2.381	2.377	2.384	2.381	2.388

See footnotes at end of table.

TABLE 3.1.—Recommended hole size limits before threading for different lengths of engagement, UNC, UNF, UNEF, UN, UNS, NC, NF, NEF, and N series, classes 1B and 2B—Continued

(Based on table IV.10\*)

Designation		Minor diameter, internal threads				Recommended hole size limits for different lengths of engagement							
Thread size	Threads per inch	Minimum	Percent of basic thread height <sup>b</sup>	Maximum <sup>c</sup>	Percent of basic thread height <sup>c</sup>	To and including 1½ D		Above ¾ D to 3¼ D		Above 3¼ D to 1½ D		Above 1½ D to 3 D	
						Min	Max	Min	Max	Min	Max	Min	Max
No. in.		in.		in.		in.	in.	in.	in.	in.	in.	in.	in.
2½	4	2.229	83.4	2.267	71.7	2.229	2.248	2.238	2.238	2.248	2.267	2.278	2.277
2½	8	2.365	83.1	2.390	67.7	2.365	2.378	2.371	2.384	2.378	2.390	2.384	2.396
2½	12	2.410	83.1	2.428	66.5	2.410	2.419	2.415	2.421	2.419	2.428	2.424	2.433
2½	16	2.432	83.8	2.446	66.5	2.432	2.439	2.436	2.443	2.440	2.446	2.443	2.450
2½	20	2.446	83.1	2.457	66.2	2.446	2.452	2.449	2.454	2.452	2.457	2.454	2.460
2½	12	2.535	83.1	2.553	66.5	2.535	2.544	2.540	2.549	2.544	2.553	2.549	2.558
2½	16	2.557	83.8	2.571	66.5	2.557	2.564	2.561	2.568	2.564	2.571	2.568	2.575
2¾	4	2.479	83.4	2.517	71.7	2.479	2.498	2.489	2.508	2.498	2.517	2.508	2.527
2¾	8	2.615	83.1	2.640	67.7	2.615	2.628	2.621	2.634	2.628	2.640	2.634	2.644
2¾	12	2.660	83.1	2.678	66.5	2.660	2.669	2.665	2.671	2.669	2.678	2.674	2.683
2¾	16	2.682	83.8	2.696	66.5	2.682	2.689	2.686	2.693	2.689	2.696	2.693	2.700
2¾	12	2.785	83.1	2.803	66.5	2.785	2.794	2.790	2.809	2.794	2.803	2.809	2.808
2¾	16	2.807	83.8	2.821	66.5	2.807	2.814	2.811	2.818	2.814	2.821	2.818	2.825
3	4	2.729	83.4	2.767	71.7	2.729	2.748	2.739	2.758	2.748	2.767	2.758	2.777
3	8	2.865	83.1	2.890	67.7	2.865	2.878	2.871	2.884	2.878	2.890	2.884	2.896
3	12	2.910	83.1	2.928	66.5	2.910	2.919	2.915	2.921	2.919	2.928	2.924	2.933
3	16	2.932	83.8	2.946	66.5	2.932	2.939	2.936	2.943	2.939	2.946	2.943	2.950
3½	12	3.035	83.1	3.053	66.5	3.035	3.044	3.040	3.049	3.044	3.053	3.049	3.058
3½	16	3.057	83.8	3.071	66.5	3.057	3.064	3.061	3.068	3.064	3.071	3.068	3.075
3½	4	2.979	83.4	3.017	71.7	2.979	2.998	2.989	3.008	2.998	3.017	3.008	3.027
3½	8	3.115	83.1	3.140	67.7	3.115	3.128	3.121	3.134	3.128	3.140	3.134	3.146
3½	12	3.160	83.1	3.178	66.5	3.160	3.169	3.155	3.174	3.169	3.178	3.174	3.183
3½	16	3.182	83.8	3.196	66.5	3.182	3.189	3.186	3.193	3.189	3.196	3.193	3.200
3½	12	3.285	83.1	3.303	66.5	3.285	3.294	3.290	3.299	3.294	3.303	3.299	3.309
3½	16	3.307	83.8	3.321	66.5	3.307	3.314	3.311	3.318	3.314	3.321	3.317	3.325
3½	4	3.229	83.4	3.267	71.7	3.229	3.248	3.239	3.258	3.248	3.267	3.258	3.277
3½	8	3.365	83.1	3.390	67.7	3.365	3.378	3.371	3.384	3.378	3.390	3.384	3.396
3½	12	3.410	83.1	3.428	66.5	3.410	3.419	3.415	3.421	3.419	3.428	3.424	3.433
3½	16	3.432	83.8	3.446	66.5	3.432	3.439	3.436	3.443	3.439	3.446	3.443	3.450
3½	12	3.535	83.1	3.553	66.5	3.535	3.544	3.540	3.549	3.544	3.553	3.549	3.558
3½	16	3.557	83.8	3.571	66.5	3.557	3.564	3.561	3.568	3.564	3.571	3.568	3.575
3½	4	3.479	83.4	3.517	71.7	3.479	3.498	3.489	3.508	3.498	3.517	3.508	3.527
3½	8	3.615	83.1	3.640	67.7	3.615	3.628	3.615	3.634	3.628	3.640	3.634	3.646
3½	12	3.660	83.1	3.678	66.5	3.660	3.669	3.665	3.674	3.669	3.678	3.674	3.683
3½	16	3.682	83.8	3.696	66.5	3.682	3.689	3.686	3.693	3.689	3.696	3.693	3.700
3½	12	3.785	83.1	3.803	66.5	3.785	3.794	3.790	3.799	3.794	3.803	3.799	3.808
3½	16	3.807	83.8	3.821	66.5	3.807	3.814	3.811	3.818	3.814	3.821	3.818	3.825
4	4	3.729	83.4	3.767	71.7	3.729	3.748	3.739	3.758	3.748	3.767	3.758	3.777
4	8	3.865	83.1	3.890	67.7	3.865	3.878	3.871	3.884	3.878	3.890	3.884	3.896
4	12	3.910	83.1	3.928	66.5	3.910	3.919	3.915	3.921	3.919	3.928	3.924	3.933
4	16	3.932	83.8	3.946	66.5	3.932	3.939	3.936	3.943	3.939	3.946	3.943	3.950
4½	4	3.979	83.4	4.017	71.7	3.979	3.998	3.989	4.008	3.998	4.017	4.008	4.027
4½	8	4.115	83.1	4.140	67.7	4.115	4.128	4.121	4.134	4.128	4.140	4.134	4.146
4½	12	4.160	83.1	4.178	66.5	4.160	4.169	4.155	4.174	4.169	4.178	4.174	4.183
4½	16	4.182	83.8	4.196	66.5	4.182	4.189	4.186	4.193	4.189	4.196	4.193	4.200
4½	4	4.229	83.4	4.267	71.7	4.229	4.248	4.239	4.258	4.248	4.267	4.258	4.277
4½	8	4.365	83.1	4.390	67.7	4.365	4.378	4.371	4.384	4.378	4.390	4.384	4.396
4½	12	4.410	83.1	4.428	66.5	4.410	4.419	4.415	4.421	4.419	4.428	4.424	4.433
4½	16	4.432	83.8	4.446	66.5	4.432	4.439	4.436	4.443	4.439	4.446	4.443	4.450
4½	8	4.615	83.1	4.640	67.7	4.615	4.628	4.621	4.634	4.628	4.640	4.634	4.646
4½	12	4.660	83.1	4.678	66.5	4.660	4.669	4.665	4.674	4.669	4.678	4.674	4.683
4½	16	4.682	83.8	4.696	66.5	4.682	4.689	4.686	4.693	4.689	4.696	4.693	4.700
5	8	4.865	83.1	4.890	67.7	4.865	4.878	4.871	4.884	4.878	4.890	4.884	4.896
5	12	4.910	83.1	4.928	66.5	4.910	4.919	4.915	4.921	4.919	4.928	4.924	4.933
5	16	4.932	83.8	4.946	66.5	4.932	4.939	4.936	4.943	4.939	4.946	4.943	4.950
5½	8	5.115	83.1	5.140	67.7	5.115	5.128	5.121	5.134	5.128	5.140	5.134	5.146
5½	12	5.160	83.1	5.178	66.5	5.160	5.169	5.165	5.174	5.169	5.178	5.174	5.183
5½	16	5.182	83.8	5.196	66.5	5.182	5.189	5.186	5.193	5.189	5.196	5.193	5.200
5½	8	5.365	83.1	5.390	67.7	5.365	5.378	5.371	5.384	5.378	5.390	5.384	5.396
5½	12	5.410	83.1	5.428	66.5	5.410	5.419	5.415	5.421	5.419	5.428	5.424	5.433
5½	16	5.432	83.8	5.446	66.5	5.432	5.439	5.436	5.443	5.439	5.446	5.443	5.450
5½	8	5.615	83.1	5.640	67.7	5.615	5.628	5.621	5.634	5.628	5.640	5.634	5.646
5½	12	5.660	83.1	5.678	66.5	5.660	5.669	5.665	5.674	5.669	5.678	5.674	5.683
5½	16	5.682	83.8	5.696	66.5	5.682	5.689	5.686	5.693	5.689	5.696	5.693	5.700
6	8	5.865	83.1	5.890	67.7	5.865	5.878	5.871	5.884	5.878	5.890	5.884	5.896
6	12	5.910	83.1	5.928	66.5	5.910	5.919	5.915	5.921	5.919	5.928	5.924	5.933
6	16	5.932	83.8	5.946	66.5	5.932	5.939	5.936	5.943	5.939	5.946	5.943	5.950

\* The differences between limits are equal to the minor-diameter tolerances given in table IV.10 for lengths of engagement to and including 1½ D. However, the minimum values for lengths of engagement greater than 1½ D in sizes ¼ in. and larger are adjusted so that the difference between limits is never less than 0.0005 in. For diameter-pitch combinations other than those given in this table, the tolerances given in table IV.10 should be similarly applied to determine hole size limits.

<sup>b</sup> Based on values as rounded off in the preceding column.

<sup>c</sup> Based on a length of engagement equal to the nominal diameter.

TABLE 3.2.—Recommended hole size limits before threading for different lengths of engagement, UNC, UNF, UNEF, UN, UNS, NC, NF, NEF, and N series, class 3B

(Based on table IV.11\*)

Designation		Minor diameter, internal threads				Recommended hole size limits for different lengths of engagement							
Thread size	Threads per inch	Minimum	Percent of basic thread height <sup>a</sup>	Maximum <sup>a</sup>	Percent of basic thread height <sup>a</sup>	To and including $\frac{1}{2} D$		Above $\frac{1}{2} D$ to $\frac{3}{4} D$		Above $\frac{3}{4} D$ to $1\frac{1}{2} D$		Above $1\frac{1}{2} D$ to $3 D$	
						Min	Max	Min	Max	Min	Max	Min	Max
No. in.		in.		in.		in.	in.	in.	in.	in.	in.	in.	in.
0 0.060	80	0.0465	83.1	0.0514	153.0	0.0465	0.0500	0.0479	0.0514	0.0479	0.0514	0.0479	0.0514
1 .073	64	.0561	83.3	.0623	52.7	.0561	.0599	.0585	.0623	.0585	.0623	.0585	.0623
1 .073	72	.0580	83.1	.0635	52.7	.0580	.0613	.0596	.0629	.0602	.0635	.0602	.0635
2 .086	56	.0667	83.2	.0737	53.0	.0667	.0705	.0686	.0724	.0699	.0737	.0699	.0737
2 .086	64	.0691	83.3	.0753	52.7	.0691	.0724	.0707	.0740	.0720	.0753	.0720	.0753
3 .099	48	.0764	83.5	.0845	53.6	.0764	.0801	.0785	.0825	.0805	.0845	.0806	.0846
3 .099	56	.0797	83.2	.0865	53.9	.0797	.0831	.0814	.0848	.0831	.0865	.0833	.0867
4 .112	40	.0849	83.4	.0939	55.7	.0849	.0884	.0871	.0916	.0894	.0939	.0902	.0947
4 .112	48	.0894	83.5	.0968	55.2	.0894	.0931	.0912	.0949	.0931	.0968	.0938	.0976
5 .125	40	.0979	83.4	.1062	57.9	.0979	.1020	.1000	.1041	.1021	.1062	.1036	.1077
5 .125	41	.1004	83.3	.1079	57.9	.1004	.1042	.1023	.1060	.1042	.1079	.1050	.1097
6 .138	32	.1040	83.8	.1140	59.1	.1040	.1091	.1066	.1115	.1091	.1140	.1115	.1164
6 .138	40	.1110	83.1	.1186	59.7	.1110	.1148	.1128	.1167	.1147	.1186	.1166	.1205
8 .164	32	.1300	83.8	.1389	61.8	.1300	.1345	.1324	.1367	.1346	.1389	.1367	.1410
8 .164	36	.1340	83.1	.1416	62.1	.1340	.1377	.1359	.1397	.1378	.1416	.1397	.1435
10 .190	24	.1450	83.1	.1555	63.7	.1450	.1502	.1475	.1528	.1502	.1555	.1524	.1581
10 .190	32	.1560	83.8	.1641	63.8	.1560	.1601	.1581	.1621	.1601	.1641	.1621	.1661
12 .216	24	.1710	83.1	.1807	65.2	.1710	.1758	.1733	.1782	.1758	.1807	.1782	.1831
12 .216	28	.1770	81.1	.1857	65.3	.1770	.1815	.1791	.1836	.1815	.1857	.1836	.1878
12 .216	32	.1820	83.8	.1895	65.3	.1820	.1858	.1837	.1877	.1858	.1895	.1873	.1913
14 .24	20	.1980	83.1	.2067	66.7	.1980	.2013	.1996	.2040	.2013	.2067	.2040	.2094
14 .24	28	.2110	84.1	.2190	66.8	.2110	.2132	.2131	.2171	.2150	.2190	.2169	.2209
14 .24	32	.2160	83.8	.2229	66.8	.2160	.2196	.2172	.2212	.2189	.2229	.2209	.2246
14 .24	36	.2200	83.1	.2258	67.1	.2200	.2243	.2199	.2243	.2214	.2258	.2220	.2273
16 .27	18	.2520	83.8	.2630	68.6	.2520	.2577	.2551	.2604	.2577	.2630	.2604	.2657
16 .27	24	.2670	84.1	.2754	68.5	.2670	.2714	.2694	.2734	.2714	.2754	.2734	.2774
16 .27	32	.2790	82.5	.2847	68.5	.2790	.2817	.2792	.2832	.2807	.2847	.2822	.2862
16 .27	36	.2820	84.5	.2877	68.7	.2820	.2863	.2824	.2863	.2837	.2877	.2850	.2890
18 .30	16	.3070	83.8	.3182	70.0	.3070	.3127	.3101	.3155	.3128	.3182	.3155	.3209
18 .30	24	.3300	83.4	.3372	69.5	.3300	.3350	.3314	.3364	.3332	.3372	.3351	.3391
18 .30	32	.3410	83.8	.3499	69.2	.3410	.3441	.3415	.3455	.3429	.3499	.3469	.3514
18 .30	36	.3450	83.1	.3501	69.0	.3450	.3488	.3449	.3488	.3461	.3501	.3474	.3514
20 .33	14	.3690	83.5	.3717	70.9	.3690	.3690	.3688	.3688	.3659	.3717	.3688	.3746
20 .33	20	.3830	83.9	.3916	70.7	.3830	.3875	.3855	.3896	.3875	.3916	.3896	.3937
20 .33	28	.3900	83.0	.4051	69.8	.3900	.4020	.3995	.4035	.4011	.4051	.4017	.4067
22 .36	12	.4170	83.1	.4284	71.7	.4170	.4225	.4196	.4254	.4226	.4284	.4255	.4313
22 .36	18	.4400	83.1	.4423	71.8	.4400	.4401	.4429	.4492	.4490	.4423	.4492	.4555
22 .36	20	.4460	83.1	.4457	71.3	.4460	.4498	.4477	.4517	.4497	.4457	.4516	.4556
22 .36	28	.4610	84.1	.4676	69.8	.4610	.4615	.4620	.4636	.4636	.4676	.4652	.4692
24 .40	12	.4720	83.6	.4843	72.2	.4720	.4783	.4753	.4813	.4783	.4843	.4813	.4873
24 .40	18	.5000	83.8	.5106	71.9	.5000	.5065	.5045	.5086	.5065	.5106	.5086	.5127
24 .40	24	.5170	81.1	.5244	70.4	.5170	.5209	.5186	.5226	.5204	.5244	.5221	.5261
24 .40	28	.5240	83.0	.5301	69.8	.5240	.5270	.5245	.5285	.5261	.5301	.5277	.5317
26 .44	11	.5270	83.0	.5391	72.7	.5270	.5328	.5298	.5360	.5329	.5391	.5360	.5422
26 .44	12	.5350	82.1	.5452	72.7	.5350	.5406	.5377	.5435	.5405	.5452	.5434	.5492
26 .44	18	.5650	83.1	.5730	72.1	.5650	.5690	.5670	.5711	.5690	.5730	.5711	.5752
26 .44	24	.5800	83.1	.5869	70.4	.5800	.5831	.5811	.5851	.5829	.5869	.5846	.5886
26 .44	28	.5860	84.1	.5926	69.8	.5860	.5895	.5870	.5910	.5886	.5926	.5902	.5942
28 .48	12	.5970	83.6	.6095	73.0	.5970	.6029	.6001	.6057	.6029	.6095	.6057	.6113
28 .48	24	.6420	84.1	.6491	70.4	.6420	.6459	.6436	.6476	.6454	.6491	.6471	.6511
30 .54	10	.6420	83.1	.6545	73.5	.6420	.6481	.6449	.6513	.6481	.6545	.6513	.6577
30 .54	12	.6600	83.1	.6707	73.3	.6600	.6672	.6626	.6690	.6673	.6707	.6690	.6734
30 .54	16	.6820	83.8	.6903	72.9	.6820	.6866	.6844	.6887	.6865	.6903	.6886	.6929
30 .54	20	.6960	83.1	.7037	71.3	.6960	.6998	.6977	.7017	.6997	.7037	.7016	.7056
30 .54	28	.7110	84.1	.7176	69.8	.7110	.7145	.7129	.7169	.7146	.7176	.7152	.7192
32 .60	12	.7220	83.6	.7329	73.5	.7220	.7276	.7250	.7309	.7276	.7329	.7303	.7356
32 .60	16	.7450	83.1	.7533	72.9	.7450	.7491	.7469	.7512	.7490	.7533	.7511	.7554
32 .60	20	.7590	83.9	.7662	71.3	.7590	.7623	.7602	.7642	.7622	.7662	.7641	.7681
34 .68	9	.7550	83.1	.7681	74.1	.7550	.7614	.7580	.7647	.7614	.7681	.7647	.7714
34 .68	12	.7850	83.1	.7952	73.7	.7850	.7900	.7874	.7926	.7900	.7952	.7926	.7978
34 .68	14	.7980	83.0	.8068	73.5	.7980	.8022	.8000	.8045	.8023	.8068	.8045	.8090
34 .68	16	.8070	83.8	.8158	72.9	.8070	.8116	.8091	.8137	.8115	.8158	.8136	.8179
34 .68	20	.8210	83.1	.8287	71.3	.8210	.8248	.8227	.8267	.8247	.8287	.8266	.8306
34 .68	28	.8360	84.1	.8426	69.8	.8360	.8395	.8370	.8410	.8386	.8426	.8402	.8442
36 .72	12	.8470	83.6	.8575	73.9	.8470	.8524	.8499	.8550	.8524	.8575	.8550	.8601
36 .72	16	.8700	83.1	.8783	72.0	.8700	.8741	.8719	.8762	.8740	.8783	.8761	.8804
36 .72	20	.8830	86.9	.8912	71.5	.8830	.8872	.8852	.8892	.8872	.8912	.8891	.8931

See footnotes at end of table.

TABLE 3.2.—Recommended hole size limits before threading for different lengths of engagement, UNC, UNF, UNEF, UN, UNS, NC, NF, NEF, and N series, class 3B—Continued

(Based on table IV.11\*)

Designation		Minor diameter, internal threads				Recommended hole size limits for different lengths of engagement							
Thread size	Threads per inch	Minimum	Percent of basic thread height <sup>b</sup>	Maximum <sup>c</sup>	Percent of basic thread height <sup>a</sup>	To and including $\frac{1}{2} D$		Above $\frac{1}{2} D$ to $\frac{3}{4} D$		Above $\frac{3}{4} D$ to $1\frac{1}{2} D$		Above $1\frac{1}{2} D$ to $3 D$	
						Min	Max	Min	Max	Min	Max	Min	Max
No. in.		in.		in.		in.	in.	in.	in.	in.	in.	in.	in.
1	8	0.8650	83.1	0.8797	74.1	0.8650	0.8797	0.8684	0.8759	0.8722	0.8797	0.8769	0.8835
1	12	0.9100	83.1	0.9198	74.1	0.9100	0.9148	0.9123	0.9173	0.9148	0.9198	0.9173	0.9223
1	14	0.9340	83.0	0.9315	73.8	0.9330	0.9271	0.9219	0.9293	0.9271	0.9315	0.9293	0.9337
1	16	0.9320	83.8	0.9198	72.9	0.9320	0.9306	0.9344	0.9387	0.9365	0.9408	0.9386	0.9429
1	20	0.9169	83.1	0.9537	71.3	0.9160	0.9198	0.9177	0.9517	0.9197	0.9537	0.9516	0.9556
1	28	0.9610	84.1	0.9676	69.8	0.9610	0.9645	0.9620	0.9690	0.9636	0.9676	0.9652	0.9692
1½	12	0.9720	83.6	0.9823	74.1	0.9720	0.9773	0.9748	0.9798	0.9773	0.9823	0.9798	0.9848
1½	16	0.9650	83.1	1.0033	72.9	0.9650	0.9691	0.9660	1.0012	0.9690	1.0033	1.0011	1.0054
1½	18	1.0020	83.8	1.0105	72.1	1.0020	1.0065	1.0044	1.0085	1.0061	1.0105	1.0085	1.0126
1½	7	0.9700	84.0	0.9875	74.1	0.9700	0.9790	0.9747	0.9833	0.9789	0.9875	0.9832	0.9918
1½	8	0.9900	83.1	1.0017	74.1	0.9900	0.9972	0.9941	1.0009	0.9972	1.0017	1.0016	1.0085
1½	12	1.0350	83.1	1.0118	71.1	1.0350	1.0398	1.0373	1.0423	1.0398	1.0448	1.0423	1.0473
1½	16	1.0570	83.8	1.0658	72.9	1.0570	1.0616	1.0591	1.0637	1.0615	1.0658	1.0636	1.0679
1½	18	1.0530	83.1	1.0730	72.1	1.0530	1.0690	1.0639	1.0710	1.0689	1.0730	1.0710	1.0751
1½	20	1.0710	83.1	1.0787	71.3	1.0710	1.0748	1.0727	1.0767	1.0747	1.0787	1.0766	1.0806
1½	28	1.0860	84.1	1.0923	69.8	1.0860	1.0895	1.0870	1.0916	1.0886	1.0926	1.0902	1.0942
1½	12	1.0970	83.6	1.1073	74.1	1.0970	1.1023	1.0995	1.1048	1.1023	1.1073	1.1048	1.1098
1½	16	1.1200	83.1	1.1283	72.9	1.1200	1.1241	1.1216	1.1262	1.1240	1.1283	1.1261	1.1304
1½	18	1.1270	83.8	1.1355	72.1	1.1270	1.1315	1.1291	1.1335	1.1314	1.1355	1.1335	1.1376
1½	7	1.0950	83.5	1.1125	74.1	1.0950	1.1030	1.0987	1.1083	1.1039	1.1125	1.1082	1.1168
1½	8	1.1150	83.1	1.1297	74.1	1.1150	1.1222	1.1181	1.1259	1.1222	1.1297	1.1260	1.1335
1½	12	1.1600	83.1	1.1638	74.1	1.1600	1.1618	1.1623	1.1673	1.1618	1.1638	1.1673	1.1723
1½	16	1.1820	83.8	1.1923	72.9	1.1820	1.1866	1.1841	1.1887	1.1865	1.1908	1.1886	1.1929
1½	18	1.1900	83.1	1.1980	72.1	1.1900	1.1936	1.1919	1.1960	1.1939	1.1980	1.1969	1.2001
1½	20	1.1960	83.1	1.2037	71.3	1.1960	1.1998	1.1977	1.2017	1.1996	1.2037	1.2016	1.2056
1½	12	1.2220	83.6	1.2323	74.1	1.2220	1.2273	1.2248	1.2298	1.2273	1.2323	1.2298	1.2348
1½	16	1.2450	83.1	1.2533	72.9	1.2450	1.2491	1.2469	1.2512	1.2490	1.2533	1.2511	1.2554
1½	18	1.2520	83.8	1.2605	72.1	1.2520	1.2565	1.2544	1.2585	1.2564	1.2605	1.2585	1.2626
1½	6	1.1950	83.1	1.2146	74.1	1.1950	1.2016	1.1965	1.2066	1.2016	1.2146	1.2095	1.2196
1½	8	1.2400	83.1	1.2547	74.1	1.2400	1.2472	1.2434	1.2509	1.2472	1.2547	1.2510	1.2587
1½	12	1.2850	83.1	1.2918	74.1	1.2850	1.2898	1.2873	1.2923	1.2898	1.2918	1.2923	1.2973
1½	16	1.3070	83.8	1.3158	72.9	1.3070	1.3116	1.3091	1.3137	1.3115	1.3158	1.3136	1.3179
1½	18	1.3150	83.1	1.3230	72.1	1.3150	1.3190	1.3169	1.3210	1.3189	1.3230	1.3210	1.3251
1½	12	1.3170	83.6	1.3573	74.1	1.3170	1.3523	1.3198	1.3548	1.3523	1.3573	1.3548	1.3598
1½	16	1.3700	83.1	1.3783	72.9	1.3700	1.3741	1.3719	1.3762	1.3740	1.3783	1.3761	1.3804
1½	18	1.3770	83.8	1.3855	72.1	1.3770	1.3815	1.3794	1.3835	1.3814	1.3855	1.3835	1.3876
1½	6	1.3200	83.1	1.3396	74.1	1.3200	1.3296	1.3246	1.3346	1.3296	1.3396	1.3316	1.3416
1½	8	1.3650	83.1	1.3797	74.1	1.3650	1.3722	1.3681	1.3759	1.3722	1.3797	1.3759	1.3835
1½	12	1.4100	83.1	1.4198	74.1	1.4100	1.4148	1.4123	1.4173	1.4148	1.4198	1.4173	1.4223
1½	16	1.4320	83.8	1.4408	72.9	1.4320	1.4366	1.4341	1.4387	1.4365	1.4408	1.4386	1.4429
1½	18	1.4400	83.1	1.4480	72.1	1.4400	1.4416	1.4419	1.4439	1.4419	1.4480	1.4469	1.4491
1½	20	1.4460	83.1	1.4537	71.3	1.4460	1.4498	1.4477	1.4517	1.4497	1.4537	1.4516	1.4556
1½	16	1.4950	83.1	1.5033	72.9	1.4950	1.4991	1.4969	1.5012	1.4990	1.5033	1.5011	1.5054
1½	18	1.5020	83.8	1.5105	72.1	1.5020	1.5065	1.5044	1.5085	1.5061	1.5105	1.5085	1.5126
1½	8	1.4900	83.1	1.5047	74.1	1.4900	1.4972	1.4934	1.5009	1.4972	1.5047	1.5010	1.5087
1½	12	1.5350	83.1	1.5418	74.1	1.5350	1.5398	1.5373	1.5423	1.5398	1.5418	1.5423	1.5473
1½	16	1.5570	83.8	1.5658	72.9	1.5570	1.5616	1.5591	1.5637	1.5615	1.5658	1.5636	1.5679
1½	18	1.5650	83.1	1.5730	72.1	1.5650	1.5690	1.5669	1.5710	1.5689	1.5730	1.5710	1.5751
1½	16	1.6200	83.1	1.6283	72.9	1.6200	1.6241	1.6219	1.6262	1.6240	1.6283	1.6261	1.6304
1½	18	1.6270	83.8	1.6355	72.1	1.6270	1.6315	1.6294	1.6335	1.6314	1.6355	1.6335	1.6376
1½	5	1.5310	83.1	1.5575	74.1	1.5310	1.5455	1.5395	1.5545	1.5455	1.5575	1.5515	1.5635
1½	8	1.6150	83.1	1.6297	74.1	1.6150	1.6222	1.6181	1.6259	1.6222	1.6297	1.6260	1.6335
1½	12	1.6990	83.1	1.6948	74.1	1.6990	1.6918	1.6923	1.6973	1.6918	1.6948	1.6973	1.7023
1½	16	1.6520	83.8	1.6608	72.9	1.6520	1.6566	1.6541	1.6587	1.6565	1.6608	1.6586	1.6629
1½	20	1.6960	83.1	1.7037	71.3	1.6960	1.6998	1.6977	1.7017	1.6997	1.7037	1.7016	1.7056
1½	16	1.7450	83.1	1.7533	72.9	1.7450	1.7491	1.7469	1.7512	1.7490	1.7533	1.7511	1.7554
1½	8	1.7100	83.1	1.7517	74.1	1.7100	1.7472	1.7434	1.7509	1.7472	1.7517	1.7510	1.7585
1½	12	1.7850	83.1	1.7918	74.1	1.7850	1.7898	1.7873	1.7923	1.7898	1.7918	1.7923	1.7973
1½	16	1.8070	83.8	1.8158	72.9	1.8070	1.8116	1.8091	1.8137	1.8115	1.8158	1.8136	1.8179
1½	16	1.8700	83.1	1.8783	72.9	1.8700	1.8766	1.8741	1.8792	1.8740	1.8783	1.8761	1.8804
2	4½	1.7590	83.5	1.7861	74.1	1.7590	1.7727	1.7661	1.7794	1.7728	1.7861	1.7794	1.7927
2	8	1.8650	83.1	1.8797	74.1	1.8650	1.8722	1.8681	1.8759	1.8722	1.8797	1.8760	1.8835
2	12	1.9100	83.1	1.9198	74.1	1.9100	1.9148	1.9123	1.9173	1.9148	1.9198	1.9173	1.9223
2	16	1.9390	83.8	1.9368	72.9	1.9390	1.9366	1.9341	1.9387	1.9365	1.9408	1.9386	1.9429
2	20	1.9160	83.1	1.9537	71.3	1.9160	1.9498	1.9477	1.9517	1.9497	1.9537	1.9516	1.9556
2½	16	1.9950	83.1	2.0033	72.9	1.9950	1.9991	1.9969	2.0012	1.9990	2.0033	2.0011	2.0054
2½	8	1.9900	83.1	2.0017	74.1	1.9900	1.9972	1.9931	2.0009	1.9972	2.0017	2.0016	2.0085
2½	12	2.0350	83.1	2.0118	71.1	2.0350	2.0398	2.0373	2.0423	2.0398	2.0448	2.0423	2.0473
2½	16	2.0570	83.8	2.0658	72.9	2.0570	2.0616	2.0591	2.0637	2.0615	2.0658	2.0636	2.0679

See footnotes at end of table.



TABLE 3.2.—Recommended hole size limits before threading for different lengths of engagement, UNC, UNF, UNEF, UN, UNS, NC, NF, NEF, and N series, class 3B—Continued

(Based on table IV.11<sup>a</sup>)

Designation		Minor diameter, internal threads				Recommended hole size limits for different lengths of engagement							
Thread size	Threads per inch	Minimum	Percent of basic thread height <sup>a</sup>	Maximum	Percent of basic thread height <sup>b</sup>	To and including $\frac{1}{16} D$		Above $\frac{1}{16} D$ to $\frac{1}{2} D$		Above $\frac{1}{2} D$ to $1\frac{1}{2} D$		Above $1\frac{1}{2} D$ to $3 D$	
						Min	Max	Min	Max	Min	Max	Min	Max
No. 16	16	<i>in.</i>		<i>in.</i>		<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
2 1/16	16	2.1200	83.1	2.1283	72.9	2.1200	2.1241	2.1219	2.1262	2.1240	2.1283	2.1261	2.1301
2 1/8	8	2.0090	83.5	2.0361	74.1	2.0090	2.0227	2.0161	2.0291	2.0298	2.0361	2.0291	2.0427
2 1/4	8	2.1150	83.1	2.1247	74.1	2.1150	2.1222	2.1181	2.1259	2.1222	2.1267	2.1260	2.1335
2 1/2	12	2.1600	83.1	2.1698	74.1	2.1600	2.1648	2.1623	2.1673	2.1648	2.1688	2.1673	2.1723
2 3/8	16	2.1820	83.8	2.1908	72.9	2.1820	2.1866	2.1844	2.1887	2.1865	2.1908	2.1886	2.1929
2 3/4	20	2.1860	83.1	2.2037	71.3	2.1860	2.1998	2.1977	2.2017	2.1997	2.2037	2.2016	2.2056
2 7/8	16	2.2450	83.1	2.2532	72.9	2.2450	2.2491	2.2469	2.2512	2.2490	2.2533	2.2511	2.2554
2 3/2	12	2.2850	83.1	2.2948	74.1	2.2850	2.2898	2.2873	2.2924	2.2898	2.2948	2.2923	2.2973
2 5/8	16	2.3070	83.8	2.3158	72.9	2.3070	2.3116	2.3094	2.3137	2.3115	2.3158	2.3136	2.3179
2 5/16	16	2.3700	83.1	2.3783	72.9	2.3700	2.3741	2.3719	2.3762	2.3740	2.3783	2.3761	2.3801
2 1/2	4	2.2290	83.4	2.2591	74.1	2.2290	2.2411	2.2369	2.2519	2.2441	2.2591	2.2519	2.2691
2 3/4	8	2.3650	83.1	2.3797	74.1	2.3650	2.3722	2.3681	2.3759	2.3722	2.3797	2.3760	2.3835
2 7/8	12	2.4100	83.1	2.4198	74.1	2.4100	2.4148	2.4123	2.4173	2.4148	2.4198	2.4173	2.4223
2 15/16	16	2.4320	83.8	2.4408	72.9	2.4320	2.4366	2.4341	2.4387	2.4365	2.4408	2.4386	2.4429
2 1	20	2.4460	83.1	2.4537	71.3	2.4460	2.4498	2.4478	2.4517	2.4497	2.4537	2.4516	2.4556
2 1 1/8	12	2.5250	83.1	2.5448	74.1	2.5250	2.5398	2.5373	2.5423	2.5398	2.5448	2.5423	2.5473
2 1 1/4	16	2.5570	83.8	2.5658	72.9	2.5570	2.5616	2.5594	2.5637	2.5615	2.5658	2.5636	2.5679
2 1 1/2	4	2.4790	83.4	2.5091	74.1	2.4790	2.4911	2.4869	2.5019	2.4941	2.5091	2.5019	2.5169
2 1 3/8	8	2.6150	83.1	2.6297	74.1	2.6150	2.6222	2.6181	2.6259	2.6222	2.6297	2.6260	2.6335
2 1 1/4	12	2.6600	83.1	2.6698	74.1	2.6600	2.6648	2.6623	2.6673	2.6648	2.6688	2.6673	2.6723
2 1 3/4	16	2.6820	83.8	2.6908	72.9	2.6820	2.6866	2.6844	2.6887	2.6865	2.6908	2.6886	2.6929
2 1 7/8	12	2.7850	83.1	2.7948	74.1	2.7850	2.7898	2.7873	2.7923	2.7898	2.7948	2.7923	2.7973
2 1 5/8	16	2.8070	83.8	2.8158	72.9	2.8070	2.8116	2.8094	2.8137	2.8115	2.8158	2.8136	2.8179
3	4	2.7290	83.4	2.7591	74.1	2.7290	2.7411	2.7369	2.7519	2.7441	2.7591	2.7519	2.7691
3	8	2.8650	83.1	2.8797	74.1	2.8650	2.8722	2.8681	2.8759	2.8722	2.8797	2.8760	2.8835
3	12	2.9100	83.1	2.9198	74.1	2.9100	2.9148	2.9123	2.9173	2.9148	2.9198	2.9173	2.9223
3	16	2.9320	83.8	2.9408	72.9	2.9320	2.9366	2.9341	2.9387	2.9365	2.9408	2.9386	2.9429
3 1/8	12	3.0340	83.1	3.0448	74.1	3.0340	3.0398	3.0373	3.0423	3.0398	3.0448	3.0423	3.0473
3 1/8	16	3.0570	83.8	3.0658	72.9	3.0570	3.0616	3.0594	3.0637	3.0615	3.0658	3.0636	3.0679
3 1/4	4	2.9790	83.4	3.0091	74.1	2.9790	2.9911	2.9869	3.0019	2.9941	3.0091	2.9941	3.0169
3 1/4	8	3.1150	83.1	3.1247	74.1	3.1150	3.1222	3.1181	3.1259	3.1222	3.1267	3.1260	3.1335
3 1/4	12	3.1600	83.1	3.1698	74.1	3.1600	3.1648	3.1623	3.1673	3.1648	3.1688	3.1673	3.1723
3 1/4	16	3.1820	83.8	3.1908	72.9	3.1820	3.1866	3.1844	3.1887	3.1865	3.1908	3.1886	3.1929
3 3/8	12	3.2850	83.1	3.2948	74.1	3.2850	3.2898	3.2873	3.2923	3.2898	3.2948	3.2923	3.2973
3 3/8	16	3.3070	83.8	3.3158	72.9	3.3070	3.3116	3.3094	3.3137	3.3115	3.3158	3.3136	3.3179
3 1/2	4	3.2290	83.4	3.2591	74.1	3.2290	3.2411	3.2369	3.2519	3.2441	3.2591	3.2519	3.2691
3 1/2	8	3.3650	83.1	3.3797	74.1	3.3650	3.3722	3.3681	3.3759	3.3722	3.3797	3.3760	3.3835
3 1/2	12	3.4100	83.1	3.4198	74.1	3.4100	3.4148	3.4123	3.4173	3.4148	3.4198	3.4173	3.4223
3 1/2	16	3.4320	83.8	3.4408	72.9	3.4320	3.4366	3.4341	3.4387	3.4365	3.4408	3.4386	3.4429
3 3/4	12	3.5340	83.1	3.5448	74.1	3.5340	3.5398	3.5373	3.5423	3.5398	3.5448	3.5423	3.5473
3 3/4	16	3.5570	83.8	3.5658	72.9	3.5570	3.5616	3.5594	3.5637	3.5615	3.5658	3.5636	3.5679
3 3/8	4	3.4790	83.4	3.5091	74.1	3.4790	3.4911	3.4869	3.5019	3.4941	3.5091	3.5019	3.5169
3 3/8	8	3.6150	83.1	3.6297	74.1	3.6150	3.6222	3.6181	3.6259	3.6222	3.6297	3.6260	3.6335
3 3/8	12	3.6600	83.1	3.6698	74.1	3.6600	3.6648	3.6623	3.6673	3.6648	3.6688	3.6673	3.6723
3 3/8	16	3.6820	83.8	3.6908	72.9	3.6820	3.6866	3.6844	3.6887	3.6865	3.6908	3.6886	3.6929
3 3/4	12	3.7850	83.1	3.7948	74.1	3.7850	3.7898	3.7873	3.7923	3.7898	3.7948	3.7923	3.7973
3 3/4	16	3.8070	83.8	3.8158	72.9	3.8070	3.8116	3.8094	3.8137	3.8115	3.8158	3.8136	3.8179
4	4	3.7290	83.4	3.7591	74.1	3.7290	3.7411	3.7369	3.7519	3.7441	3.7591	3.7519	3.7691
4	8	3.8650	83.1	3.8797	74.1	3.8650	3.8722	3.8681	3.8759	3.8722	3.8797	3.8760	3.8835
4	12	3.9100	83.1	3.9198	74.1	3.9100	3.9148	3.9123	3.9173	3.9148	3.9198	3.9173	3.9223
4	16	3.9320	83.8	3.9408	72.9	3.9320	3.9366	3.9341	3.9387	3.9365	3.9408	3.9386	3.9429
4 1/4	4	3.9790	83.4	4.0091	74.1	3.9790	3.9911	3.9869	4.0019	3.9941	4.0091	3.9941	4.0169
4 1/4	8	4.1150	83.1	4.1247	74.1	4.1150	4.1222	4.1181	4.1259	4.1222	4.1267	4.1260	4.1335
4 1/4	12	4.1600	83.1	4.1698	74.1	4.1600	4.1648	4.1623	4.1673	4.1648	4.1688	4.1673	4.1723
4 1/4	16	4.1820	83.8	4.1908	72.9	4.1820	4.1866	4.1844	4.1887	4.1865	4.1908	4.1886	4.1929
4 1/2	4	4.2290	83.4	4.2591	74.1	4.2290	4.2411	4.2369	4.2519	4.2441	4.2591	4.2519	4.2691
4 1/2	8	4.3650	83.1	4.3797	74.1	4.3650	4.3722	4.3681	4.3759	4.3722	4.3797	4.3760	4.3835
4 1/2	12	4.4100	83.1	4.4198	74.1	4.4100	4.4148	4.4123	4.4173	4.4148	4.4198	4.4173	4.4223
4 1/2	16	4.4320	83.8	4.4408	72.9	4.4320	4.4366	4.4341	4.4387	4.4365	4.4408	4.4386	4.4429
4 3/4	8	4.6150	83.1	4.6297	74.1	4.6150	4.6222	4.6181	4.6259	4.6222	4.6297	4.6260	4.6335
4 3/4	12	4.6600	83.1	4.6698	74.1	4.6600	4.6648	4.6623	4.6673	4.6648	4.6688	4.6673	4.6723
4 3/4	16	4.6820	83.8	4.6908	72.9	4.6820	4.6866	4.6844	4.6887	4.6865	4.6908	4.6886	4.6929
5	8	4.8650	83.1	4.8797	74.1	4.8650	4.8722	4.8681	4.8759	4.8722	4.8797	4.8760	4.8835
5	12	4.9100	83.1	4.9198	74.1	4.9100	4.9148	4.9123	4.9173	4.9148	4.9198	4.9173	4.9223
5	16	4.9320	83.8	4.9408	72.9	4.9320	4.9366	4.9341	4.9387	4.9365	4.9408	4.9386	4.9429

See footnotes at end of table.

**TABLE 3.2.—Recommended hole size limits before threading for different lengths of engagement, UNC, UNF, UNEF, UN, UNS, NC, NF, NEF, and N series, class 5B—Continued**

(Based on table IV.11\*)

Designation		Minor diameter, internal threads				Recommended hole size limits for different lengths of engagement							
Thread size	Threads per inch	Minimum	Percent of basic thread height <sup>b</sup>	Maximum <sup>c</sup>	Percent of basic thread height <sup>b</sup>	To and including $\frac{1}{4} D$		Above $\frac{1}{4} D$ to $\frac{1}{2} D$		Above $\frac{1}{2} D$ to $1\frac{1}{2} D$		Above $1\frac{1}{2} D$ to $3 D$	
						Min	Max	Min	Max	Min	Max	Min	Max
No. in.		in.		in.		in.	in.	in.	in.	in.	in.	in.	in.
5/16	8	5.1150	83.1	5.1297	74.1	5.1150	5.1222	5.1184	5.1259	5.1222	5.1297	5.1260	5.1335
5/16	12	5.1600	83.1	5.1698	74.1	5.1600	5.1648	5.1623	5.1673	5.1648	5.1698	5.1673	5.1723
5/16	16	5.1820	83.8	5.1908	72.9	5.1820	5.1866	5.1844	5.1887	5.1865	5.1908	5.1886	5.1929
5/8	8	5.3650	83.1	5.3797	74.1	5.3650	5.3722	5.3684	5.3759	5.3722	5.3797	5.3760	5.3835
5/8	12	5.4100	83.1	5.4198	74.1	5.4100	5.4148	5.4123	5.4173	5.4148	5.4198	5.4173	5.4223
5/8	16	5.4320	83.8	5.4408	72.9	5.4320	5.4366	5.4344	5.4387	5.4365	5.4408	5.4386	5.4429
3/4	8	5.6150	83.1	5.6297	74.1	5.6150	5.6222	5.6184	5.6259	5.6222	5.6297	5.6260	5.6335
3/4	12	5.6600	83.1	5.6698	74.1	5.6600	5.6648	5.6623	5.6673	5.6648	5.6698	5.6673	5.6723
3/4	16	5.6820	83.8	5.6908	72.9	5.6820	5.6866	5.6844	5.6887	5.6865	5.6908	5.6886	5.6929
1	8	5.8650	83.1	5.8797	74.1	5.8650	5.8722	5.8684	5.8759	5.8722	5.8797	5.8760	5.8835
1	12	5.9100	83.1	5.9198	74.1	5.9100	5.9148	5.9123	5.9173	5.9148	5.9198	5.9173	5.9223
1	16	5.9320	83.8	5.9408	72.9	5.9320	5.9366	5.9344	5.9387	5.9365	5.9408	5.9386	5.9429

\* The differences between limits are equal to the minor-diameter tolerances given in table IV.11 for lengths of engagement to and including  $\frac{1}{4} D$ . However, the minimum values for lengths of engagements greater than  $\frac{1}{4} D$  in sizes  $\frac{1}{4}$  in. and larger are adjusted so that the difference between limits is never less than 0.0040 in. For diameter-pitch combinations other than those given in this table, the tolerances given in table IV.11 should be similarly applied to determine hole size limits.

<sup>b</sup> Based on values as rounded off in the preceding column.

<sup>c</sup> Based on a length of engagement equal to the nominal diameter.

**TABLE 3.3.—Recommended hole size limits before threading for different lengths of engagement, National Miniature thread series**

Designation		Minor diameter internal threads				Recommended hole size limits for different lengths of engagement <sup>b</sup>					
Thread designation <sup>a</sup>	Pitch	Minimum	Percent basic thread height	Maximum	Percent basic thread height	To and including $\frac{3}{4} D$		Above $\frac{3}{4} D$ to $1\frac{1}{2} D$		Above $1\frac{1}{2} D$ to $3 D$	
						Min.	Max.	Min.	Max.	Min.	Max.
	mm	mm		mm		mm	mm	mm	mm	mm	mm
30NM	0.080	0.217	100	0.254	54.8	0.226	0.240	0.236	0.254	0.245	0.264
35NM	.090	.256	100	.297	56.4	.267	.282	.277	.297	.287	.307
40NM	.100	.296	100	.340	57.7	.307	.324	.318	.340	.329	.351
45NM	.100	.346	100	.390	57.7	.357	.374	.368	.390	.379	.401
50NM	.125	.370	100	.422	60.0	.383	.402	.396	.422	.409	.435
55NM	.125	.420	100	.472	60.0	.433	.452	.446	.472	.459	.485
60NM	.150	.444	100	.504	61.5	.459	.482	.474	.504	.489	.519
70NM	.175	.518	100	.586	62.6	.535	.560	.552	.586	.569	.603
80NM	.200	.592	100	.668	63.5	.611	.640	.630	.668	.649	.687
90NM	.225	.666	100	.750	64.1	.687	.718	.708	.750	.729	.771
100NM	.250	.740	100	.832	64.6	.763	.798	.786	.832	.809	.855
110NM	.250	.840	100	.932	64.6	.863	.898	.886	.932	.909	.955
120NM	.250	.940	100	1.032	64.6	.963	.998	.986	1.032	1.009	1.055
140NM	.300	1.088	100	1.196	65.4	1.115	1.156	1.142	1.196	1.169	1.223
	Threads per inch	in.		in.		in.	in.	in.	in.	in.	in.
30NM	318	0.0085	100	0.0100	54.8	0.0080	0.0095	0.0093	0.0100	0.0096	0.0104
35NM	282	.0101	100	.0117	56.4	.0105	.0111	.0109	.0117	.0113	.0121
40NM	254	.0117	100	.0134	57.7	.0121	.0127	.0125	.0134	.0130	.0138
45NM	254	.0136	100	.0154	57.7	.0141	.0147	.0145	.0154	.0149	.0158
50NM	203	.0146	100	.0166	60.0	.0150	.0158	.0156	.0166	.0161	.0171
55NM	203	.0165	100	.0186	60.0	.0170	.0178	.0176	.0186	.0181	.0191
60NM	169	.0175	100	.0198	61.5	.0181	.0190	.0187	.0198	.0193	.0204
70NM	145	.0204	100	.0231	62.6	.0211	.0221	.0217	.0231	.0224	.0237
80NM	127	.0233	100	.0263	63.5	.0241	.0252	.0248	.0263	.0256	.0270
90NM	113	.0262	100	.0295	64.1	.0270	.0283	.0279	.0295	.0287	.0304
100NM	102	.0291	100	.0327	64.6	.0300	.0314	.0309	.0327	.0319	.0337
110NM	102	.0331	100	.0367	64.6	.0340	.0354	.0349	.0367	.0358	.0376
120NM	102	.0370	100	.0406	64.6	.0379	.0393	.0388	.0406	.0397	.0415
140NM	85	.0428	100	.0471	65.4	.0439	.0455	.0450	.0471	.0460	.0481

<sup>a</sup> Sizes shown in italics are preferred. It is recommended that selections be confined to these sizes insofar as possible.

<sup>b</sup> The limits recommended in this table are subject to further exploration. Limited experience with this new standard to date indicates these sizes to be satisfactory for use in machineable materials (brass, nickel-silver, etc.). For materials more difficult to machine, hole size limits in the next larger category are suggested. In the cases where hole size in excess of the maximum minor diameter are necessary, the excess is usually recovered in the thread form by the spin-up operation. The operator should take with which these small taps must be ground.

## APPENDIX 4. WIRE METHODS OF MEASUREMENT OF PITCH DIAMETER OF 60° THREADS

Pitch diameter is defined in section II, p. 4, as follows: "On a straight thread, the pitch diameter is the diameter of the coaxial cylinder, the surface of which would pass through the thread profiles at such points as to make the width of the groove equal to one-half of the basic pitch. On a perfect thread this occurs at the points where the widths of the thread and groove are equal."

"On a taper thread, the pitch diameter at a given position on the thread axis is the diameter of the pitch cone at that position."

The degree of accuracy to which the pitch diameter can be measured will depend on the accuracy of lead, helix, and form of thread. As thread plug gages and thread setting plug gages have highly accurate threads, their pitch diameters may be measured to a correspondingly high degree of accuracy by applying the methods described in this appendix. In turn, the virtual diameters (or effective sizes) of thread ring, snap, and indicating gages may be determined by fitting or comparison with such plug gages.

As most threads of mechanical fasteners and components are made to a lesser degree of accuracy than that of gage threads, their pitch diameters are not susceptible to accurate determination by direct measuring methods. On such threads the pitch diameter is to be regarded as the pitch cylinder or cone which would bound, on the maximum material side, the approximately cylindrical or conical surface which would pass through the thread profiles at all points such that the widths of the thread and groove are equal. Accordingly, the conformity of such threads with specified pitch diameter limits is determined by gaging means and methods specified in section VI.

The accurate measurement of pitch diameter of a thread, which may be perfect as to form and lead, presents certain difficulties which result in some uncertainty as to its true value. The adoption of a standard uniform practice in making such measurements is, therefore, desirable in order to reduce such uncertainty of measurement to a minimum. The so-called "three-wire method" of measuring pitch diameter, as here outlined, has been found to be the most generally satisfactory method when properly carried out, and is recommended for universal use in the direct measurement of thread plug and thread setting plug gages. (See fig. 4.1.)

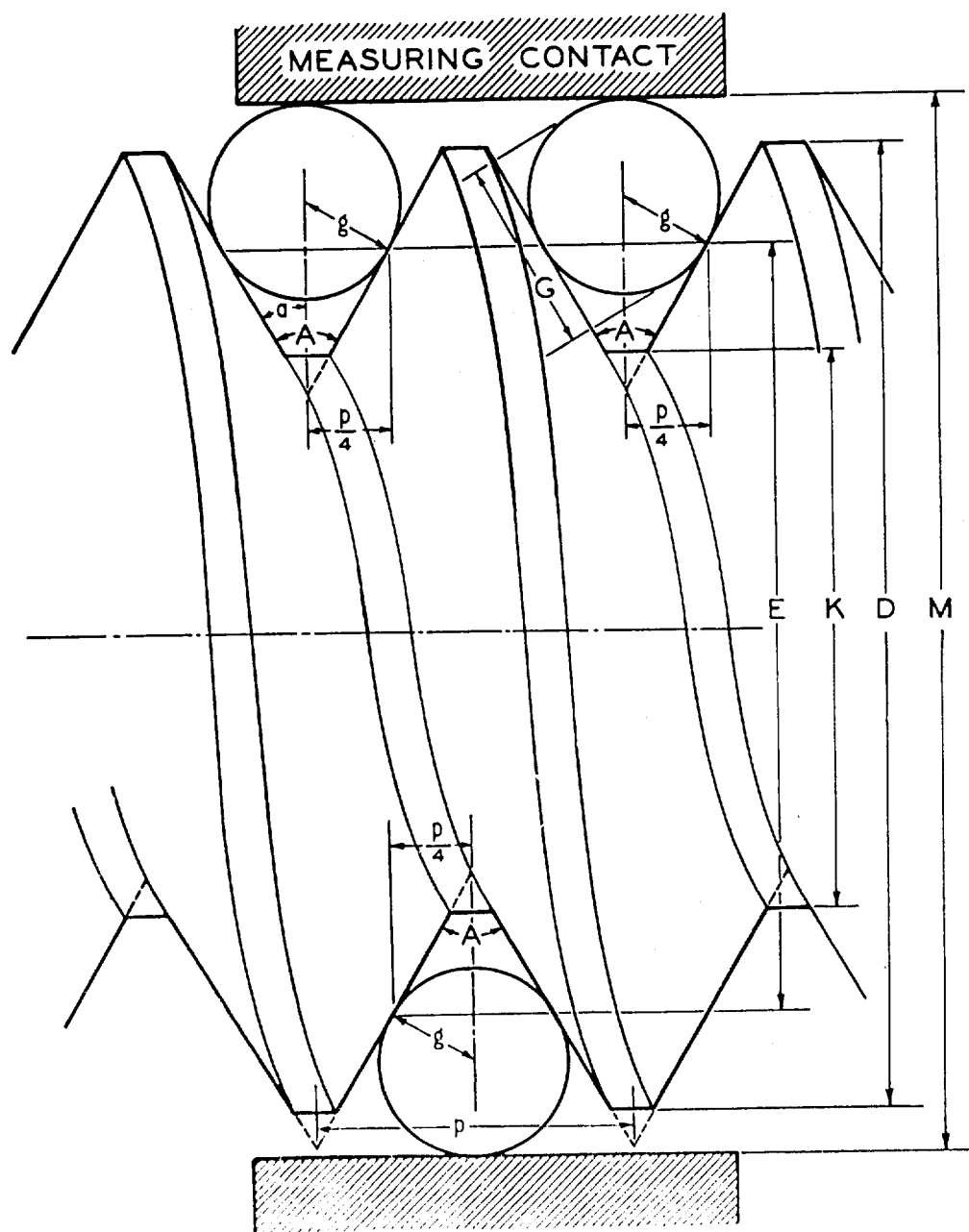


FIGURE 4.1 Three-wire method of measuring pitch diameter of thread plug gages.

## 1. SIZE OF WIRES

In the three-wire method of measuring pitch diameter small hardened steel cylinders or wires of correct size are placed in the thread space, two on one side of the screw and one on the opposite side, as shown in figure 4.1. The contact face of the comparator, measuring machine, or micrometer anvil or spindle over the two wires must be sufficiently large in diameter to touch both wires; that is, the diameter must be greater than the pitch of the thread. It is best to select wires of such a size that they touch the sides of the thread at the midslope, for the reason that the measurement of pitch diameter is least affected by any error in thread angle that may be present when such size is used. The size of wire that touches exactly at the midslope of a perfect thread of a given pitch is termed the "best-size" wire for that pitch. Any size, however, may be used that will permit the wires to rest on the sides of the thread and also project above the crest of the thread.

The depth at which a wire of given diameter will rest in a thread space depends primarily on the pitch and included angle of the thread; and secondarily, on the angle made by the helix, at the point of contact of the wire and the thread, with a plane perpendicular to the axis of the thread. Inasmuch as variation in the lead angle has a very small effect in determining the diameter of the wire that touches at the midslope of the thread, and as it is desirable to use one size of wire to measure all threads of a given pitch and included angle, the best size wire is taken as that size which will touch at the midslope of a groove cut around a cylinder perpendicular to the axis of the cylinder, and of the same angle and depth as the thread of the given pitch. This is equivalent to a thread of zero lead angle. The size of wire touching at the midslope, or "best-size" wire, is given by the formula:

$$G = \frac{p}{2} \sec \alpha$$

in which

$G$  = diameter of wire

$p$  = pitch

$\alpha$  =  $\frac{1}{2}$  included angle of thread.

This formula reduces to—

$$G = 0.57735 \times p, \text{ for } 60^\circ \text{ threads.}$$

It is frequently desirable, as, for example, when a best-size wire is not available, to measure pitch diameter by means of wires of other than the best size. The minimum size that may be used is limited to that permitting the wire to project above the crest of the thread, and the maximum to that permitting the wire to rest on the sides of the thread just below the crest, and not ride on the crest of the thread. The diameters of the best size, maximum, and minimum wires for Unified and American, American National, hose-coupling, and pipe threads are given in tables 4.1 and 4.2.

## 2. METHODS OF MEASURING AND USING WIRES

The computed value for the pitch diameter of a screw thread gage obtained from readings over wires will depend upon the accuracy of the measuring instrument used, the contact load, and the value of the diameter of the wires used in the computations. In order to measure the pitch diameter of a screw-thread gage to an accuracy within 0.0001 in. by means of wires, it is necessary to know the wire diameters to 0.00002 in. If the diameters of the wires are known only to an accuracy of 0.0001 in., an accuracy better than 0.0003 in. in the measurement of pitch diameter cannot be expected. Accordingly, it is necessary to use a measuring instrument that reads accurately to 0.00001 in.

Variations in diameter around the wire should be determined by rotating the wire between a measuring contact and an anvil having the form of a V-groove cut on a cylinder. The V-groove may be the thread space in a hardened and well-finished thread plug gage. Variations in

TABLE 4.1.—Wire sizes and constants, Unified and American, American National, hose-coupling, and pipe threads (60°)

Threads per inch, $n$	Pitch, $p = \frac{1}{n}$	Pitch $\frac{p}{2} = \frac{1}{2n}$	Depth of V thread, $\cot 30^\circ \frac{p}{2n}$	Wire sizes, <sup>1</sup>		
				Best, 0.57735p	Maximum, 1.01063p	Minimum, 0.50582p
1	2	3	4	5	6	7
	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>	<i>in.</i>
80	0.012500	0.00625	0.010825	0.00722	0.01263	0.00631
72	0.013889	0.00694	0.012028	0.00862	0.01403	0.00702
64	0.015625	0.00781	0.013532	0.00962	0.01579	0.00789
56	0.017857	0.00893	0.015465	0.01031	0.01801	0.00902
50	0.020000	0.01000	0.017321	0.01155	0.02021	0.01010
48	0.020833	0.01042	0.018042	0.01203	0.02105	0.01052
44	0.022727	0.01136	0.019682	0.01312	0.02296	0.01148
40	0.025000	0.01250	0.021651	0.01443	0.02526	0.01263
36	0.027778	0.01389	0.024656	0.01601	0.02807	0.01403
32	0.031250	0.01562	0.027968	0.01801	0.03157	0.01579
30	0.033333	0.01667	0.029888	0.01921	0.03388	0.01684
28	0.035714	0.01786	0.031929	0.02062	0.03608	0.01804
27	0.037037	0.01852	0.032675	0.02118	0.03742	0.01851
26	0.038462	0.01923	0.033409	0.02221	0.03886	0.01933
24	0.041667	0.02083	0.036084	0.02406	0.04210	0.02105
22	0.045455	0.02273	0.039365	0.02624	0.04592	0.02296
20	0.050000	0.02500	0.043301	0.02887	0.05052	0.02579
18	0.055556	0.02778	0.048133	0.03208	0.05614	0.02897
16	0.062500	0.03125	0.054129	0.03608	0.06315	0.03357
14	0.071429	0.03571	0.061859	0.04124	0.07217	0.03908
13	0.076923	0.03846	0.066467	0.04411	0.07772	0.03886
12	0.083333	0.04167	0.072169	0.04811	0.08420	0.04210
11 $\frac{1}{2}$	0.08957	0.04478	0.078307	0.05200	0.08786	0.04393
11	0.090909	0.04545	0.078730	0.05219	0.08785	0.04393
10	0.100000	0.05000	0.086623	0.05774	0.10104	0.05052
9	0.111111	0.05556	0.096225	0.06415	0.11226	0.05613
8	0.125000	0.06250	0.108368	0.07217	0.12630	0.06315
7 $\frac{1}{2}$	0.133333	0.06667	0.113170	0.07698	0.13417	0.06736
7	0.142857	0.07143	0.123718	0.08218	0.14444	0.07217
6	0.166667	0.08333	0.144338	0.09623	0.16839	0.08420
5 $\frac{1}{2}$	0.181818	0.09091	0.157459	0.10497	0.18370	0.09185
5	0.200000	0.10000	0.173205	0.11547	0.20297	0.10104
4 $\frac{1}{2}$	0.222222	0.11111	0.191540	0.12830	0.22459	0.11226
4	0.250000	0.12500	0.216506	0.14434	0.25239	0.12630

<sup>1</sup> These wire sizes are based on zero lead angle. Also maximum and minimum sizes are based on a width of flat at the crest equal to  $\frac{1}{8} \times p$ . The width of flat of American Standard pipe thread gages is slightly less than this, so that the minimum size listed is slightly too small for such gages. In any case the use of wires of either extreme size is to be avoided.

diameter along the wire should be determined by measuring between a flat contact and a cylindrical anvil.

A wire presses on the sides of a 60° thread with the load that is applied to the wire by the measuring instrument. This fact would indicate that the diameter of the wire should be determined by readings made on the wire over a hardened and lapped cylinder having a radius equal to the radius of curvature of the helical surface of the thread at the point of contact, using the load to be used in determining the pitch diameter of the gage. However, it is not practical to employ such a variety of cylinders as would be required, and it is recommended for standard practice that diameters of wires be measured between a flat contact and a 0.750-in. hardened and accurately ground and lapped steel cylinder with the load used in measuring the pitch diameter of the gage. The plane of the flat contact should be parallel to the contact element of the cylinder within 0.00001 in.

To avoid a deformation of the material of the wires and gages it is necessary to limit the contact load, and for consistent results a standard practice as to contact load in making wire measurements of hardened screw thread gages is necessary. Such a standard practice is included in the specifications below, and in section VI, p. 109. The use of different contact loads will cause a difference in the readings over the wires, and such errors can be compensated only by the use of a value for the diameter of the wires depending on the contact load used. The effect of variation in contact load in measuring threads of fine pitches is indicated by the difference in readings obtained with 2



TABLE 4.2.—Relation of best wire diameters and pitches<sup>1</sup>—wires for Unified and American, American National, hose-coupling, and pipe threads (60°)

Best wire sizes (inches)	Threads per inch																							
	80	72	64	56	50	48	44	40	36	32	30	28	27	26	24	22	20	18	16	14	13	12	11½	11
0.00722	⊗																							
0.00892	⊗	⊗																						
0.00902	⊗	⊗	⊗																					
0.00931	⊗	⊗	⊗	⊗																				
0.01155	⊗	⊗	⊗	⊗	⊗	⊗	⊗																	
0.01203	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗																
0.01312		⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗															
0.01443		⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗														
0.01604			⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗													
0.01804				⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗												
0.01924				⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗											
0.02092					⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗										
0.02138					⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗									
0.02221					⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗								
0.02406					⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗							
0.02624						⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗						
0.02887							⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗					
0.03208								⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗				
0.03608									⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗			
0.04124										⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗		
0.04441											⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	
0.04811												⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
0.05209													⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
0.05249														⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
0.05774															⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
0.06415																⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
0.07212																	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
0.07698																		⊗	⊗	⊗	⊗	⊗	⊗	⊗
0.08248																			⊗	⊗	⊗	⊗	⊗	⊗
0.09623																				⊗	⊗	⊗	⊗	⊗
0.10492																					⊗	⊗	⊗	⊗
0.11547																						⊗	⊗	⊗
0.12837																							⊗	⊗
0.14434																								⊗

<sup>1</sup> The crosses (X) indicate those wire diameters which can be used for each pitch. An encircled cross (⊗) indicates the "best wire" diameter for that pitch which heads the column.

and 5 lb loads on a 24-pitch thread plug gage. The reading over the wires with 5 lb load was 0.0001 in. less than with 2 lb load. The common shop practice of holding the wires in contact with the thread by means of elastic bands has a tendency to prevent the wires from adjusting themselves to the proper position in the thread spaces; thus a false measurement is obtained. In some cases it has also been the practice to support the gage being measured on two wires, which are in turn supported on a horizontal surface, and measuring from this surface to the top of a wire placed in a thread over the gage. If the gage is of large diameter, its weight causes a distortion of the wires and an inaccurate reading is obtained. For these reasons these practices should be avoided.

Measurements of a thread plug gage made in accordance with these instructions, with wires that conform to the following specifications, should be accurate to within 0.0001 in.

### 3. STANDARD SPECIFICATION FOR WIRES AND STANDARD PRACTICE IN MEASUREMENT OF WIRES

The following specifications represent present practice relative to thread measuring wires:

1. **COMPOSITION.** The wires shall be accurately finished hardened steel cylinders of the maximum possible hardness without being brittle. The hardness shall not be less than that corresponding to a Knoop indentation number of 630. A wire of this hardness can be cut with a file only with difficulty. The surface shall not be rougher than the equivalent of one measuring 3 microinches average deviation from a true cylindrical surface, as measured with a tracer instrument.

2. **CONSTRUCTION.** The working surface shall be at least 1 in. in length. The wire may be provided with a suitable means of suspension.

3. **CONTAINER AND MARKING.**—A suitable container shall be provided for each set of wires, and the pitch for which the wires are the best size and the diameter of the working part of the wires, as determined by measurements under standard conditions as specified below, shall be marked on the container.

4. **DIAMETER OF WIRES.**—One set of wires shall consist of three wires that shall have the same diameter within 0.00002 in., and this common diameter shall be within 0.0001 in. of that corresponding to the best size for the pitch for which the wire is to be used. Wires shall be measured between a flat contact and a 0.750-in. hardened and accurately ground and lapped steel cylinder with contact loads as follows: Wires for 60° threads and pitches finer than 20 threads per inch, 1 lb; wires for pitches of 20 threads per inch and coarser, 2½ lb. It is recommended that wires, which are to be used where the contact of the wire is a line contact, be measured between flat, parallel measuring contacts under a 1-lb load.

5. **VARIATIONS IN DIAMETER.**—Variations in diameter around the wire (roundness) shall not exceed 0.00002 in., as determined by measuring between a measuring contact and a hardened and well-finished 60° V-groove cut on a cylinder. Variations in diameter along the wire (taper), over the ½ in. interval at the center of its length, shall not exceed 0.00002 in., as determined by measuring between a flat contact and a cylindrical contact.

Tests for compliance of thread-measuring wires with the above specifications are made by the National Bureau of Standards for a stated fee.

### 4. GENERAL FORMULA FOR MEASUREMENT OF PITCH DIAMETER

The general formula for determining the pitch diameter of any thread whose sides are symmetrical with respect to a line drawn through the vertex and perpendicular to



the axis of the thread, in which the slight effect of lead angle is taken into account, is

$$E = M_w + \frac{\cot \alpha}{2n} - w[1 + (\operatorname{cosec}^2 \alpha + \cot^2 \alpha \tan^2 \lambda')^{\frac{1}{2}}], \quad (1)$$

in which

$E$  = pitch diameter  
 $M_w$  = measurement over wires  
 $\alpha$  = half angle of thread  
 $n$  = number of threads per inch =  $1/p$   
 $w$  = mean diameter of wires  
 $\lambda'$  = angle between axis of wire and plane perpendicular to axis of thread.

This formula is a very close approximation, being based on certain assumptions regarding the positions of the points of contact between the wire and the thread.

Formula 1 can be converted to the following simplified form, which is particularly useful when measuring threads of large lead angle:

$$E = M_w + \frac{\cot \alpha}{2n} - w(1 + \operatorname{cosec} \alpha'), \quad (2)$$

in which  $\alpha'$  = the angle whose tangent =  $\tan \alpha \cos \lambda'$ .

When formula 1 is used, the usual practice is to expand the square root term as a series, retaining only the first and second terms, which gives the following:

$$E = M_w + \frac{\cot \alpha}{2n} - w \left( 1 + \operatorname{cosec} \alpha + \frac{\tan^2 \lambda' \cos \alpha \cot \alpha}{2} \right). \quad (3)$$

For large lead angles it is necessary to measure the wire angle,  $\lambda'$ , but for lead angles of  $5^\circ$  or less, if the "best-size" wire is used, this angle may be assumed to be equal to the lead angle of the thread at the pitch line,  $\lambda$ . The value of  $\tan \lambda$ , the tangent of the lead angle, is given by the formula

$$\tan \lambda = \frac{l}{3.1416E} = \frac{1}{3.1416NE'}$$

in which

$l$  = lead  
 $N$  = number of turns per inch  
 $E$  = nominal pitch diameter, or an approximation of the measured pitch diameter.

## 5. MEASUREMENT OF PITCH DIAMETER OF UNIFIED, AMERICAN, AND AMERICAN NATIONAL STRAIGHT THREADS

For threads of the Unified, American, and American National coarse, fine, extra-fine, 8-, 12-, and 16-thread series, the term

$$\frac{w \tan^2 \lambda' \cos \alpha \cot \alpha}{2}$$

is neglected, as its value is small, being in all cases less than 0.00015 in. for standard fastening screws when the best-size wire is used, and the above formula 3 takes the simplified form

$$E = M_w + \frac{\cot \alpha}{2n} - w(1 + \operatorname{cosec} \alpha). \quad (4)$$

The practice is permissible provided that it is uniformly followed, and in order to maintain uniformity of practice, and thus avoid confusion, the National Bureau of Standards uses formula 4 for such threads. The Bureau also uses formula 4 for special  $60^\circ$  threads, except when the value of the term

$$\left( \frac{w \tan^2 \lambda' \cos \alpha \cot \alpha}{2} \right)$$

exceeds 0.00015 in., as in the case of multiple threads, or other threads having exceptionally large lead angles. For  $60^\circ$  threads this term exceeds 0.00015 when  $NE\sqrt{n}$  is less than 17.1.

For a  $60^\circ$  thread of correct angle and thread form the formula 4 simplifies to

$$E = M_w + \frac{0.86603}{n} - 3w. \quad (5)$$

For a given set of best-size wires

$$E = M_w - C$$

when

$$C = w(1 + \operatorname{cosec} \alpha) - \frac{\cot \alpha}{2n}.$$

The quantity  $C$  is a constant for a given thread angle, and, when the wires are used for measuring threads of the pitch and angle for which they are the best size, the pitch diameter is obtained by the simple operation of subtracting this constant from the measurement taken over the wires. In fact, when best-size wires are used, this constant is changed very little by a moderate deviation or error in the angle of the thread. Consequently, the constants for the various sets of wires in use may be tabulated, thus saving a considerable amount of time in the inspection of gages. However, when wires of other than the best size are used, this constant changes appreciably with a deviation in the angle of the thread.

It has been shown that, with the exception of coarse pitch screws, variation in angle from the basic size causes no appreciable change in the quantity  $C$  for the best-size wires. On the other hand, when a wire near the maximum or minimum allowable size is used, a considerable change occurs, and the values of the cotangent and cosecant of the actual measured half angle are to be used. It is apparent, therefore, that there is a great advantage in using wires very closely approximating the best size. For convenience in carrying out computations, the values of  $\cot \alpha/2n$  for standard pitches are given in table 4.1, p. 195.

## 6. MEASUREMENT OF PITCH DIAMETER OF AMERICAN STANDARD TAPER THREADS

The pitch diameter of a taper thread plug gage is measured in much the same manner as that of a straight thread gage, except that a definite position at which the measurement is to be made must be located. A point at a known distance  $L$  from the reference end of the gage is located by means of a combination of precision gage blocks and the cone point furnished as an accessory with these blocks, as shown in the inset in figure 4.2. The gage is set vertically on a surface plate, the cone point is placed with its axis horizontal at the desired height, and the plug is turned until the point fits accurately into the thread. The position of this point is marked carefully with a pencil or a bit of prussian blue.

**1. TWO-WIRE METHOD.**—Assuming that the measurement is to be made with a horizontal comparator, the gage is set in the comparator with its axis vertical, that is, the line of measurement and the thread axis are perpendicular to each other. The measurement is made with two wires, as shown in figure 4.2, one of which is placed in the thread to make contact at the same axial section of the thread as was touched by the cone point. This wire is designated the fixed wire. The second wire is placed in the thread space, on the opposite side of the gage, which is next above the fixed wire, and the measurement over the wires is made. The second wire is then placed in the thread space next below the fixed wire, and a second measurement is made. The average of these two measurements is  $M_w$ , the measurement over the wires at the position of the fixed wire.

The general formula for a taper thread, corresponding to formula 3 is

$$E = M_w + \frac{\cot \alpha - \tan^2 \beta \tan \alpha}{2n} - w \left( 1 + \operatorname{cosec} \alpha + \frac{\tan^2 \lambda' \cos \alpha \cot \alpha}{2} \right), \quad (6)$$

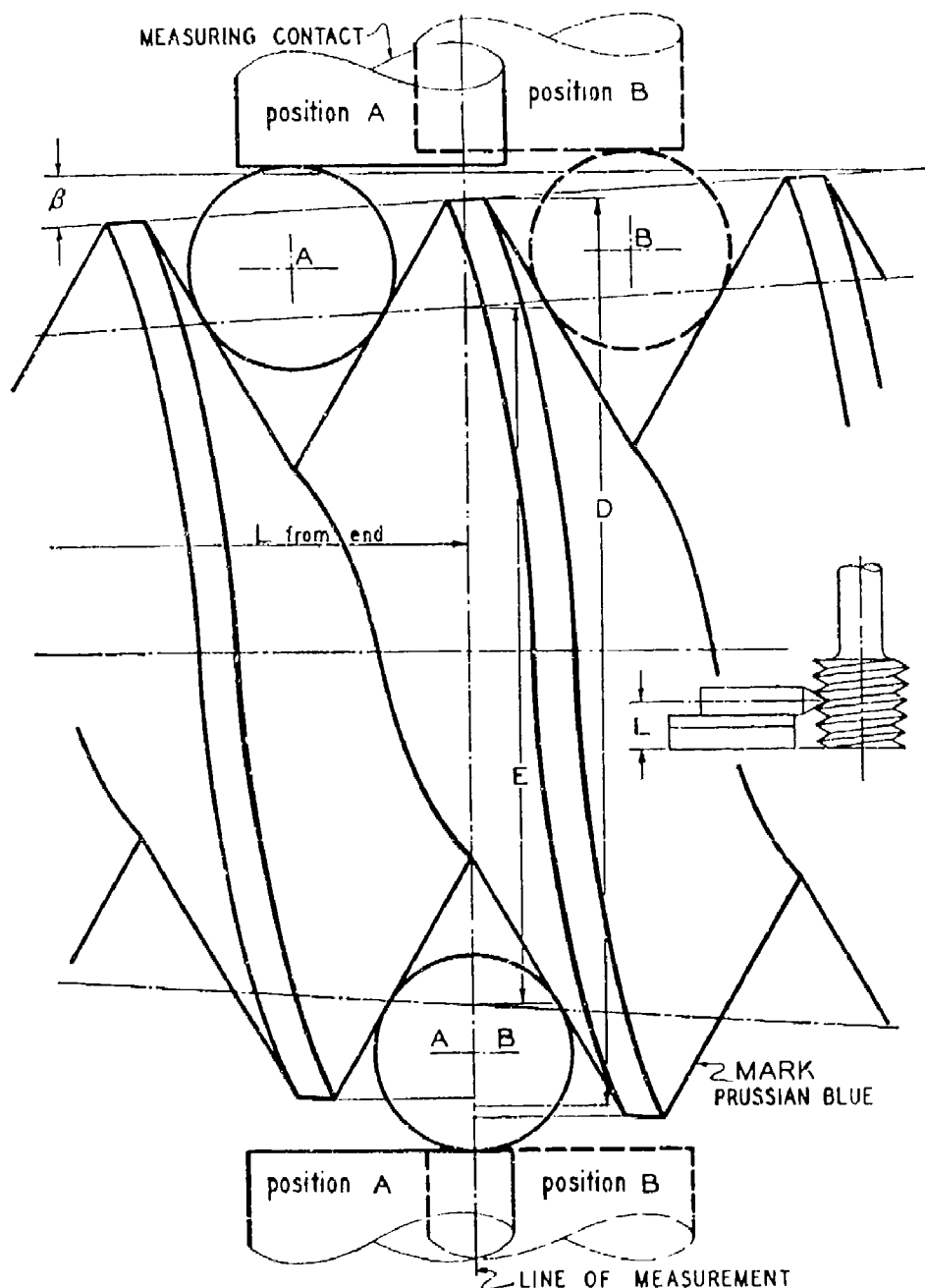


FIGURE 4.2.—Measurement of pitch diameter of taper thread gages by the 2-wire method.

in which

$E$  = pitch diameter  
 $M_w$  = measurement over wires  
 $\beta$  = half angle of taper of thread  
 $n$  = number of threads per inch =  $1/p$   
 $\alpha$  = half angle of thread  
 $w$  = mean diameter of wires  
 $\lambda'$  = wire angle.

The term

$$\frac{\cot \alpha - \tan^2 \beta \tan \alpha}{2n}$$

is the exact value of the depth of the fundamental triangle of a taper thread, which is less than that of the same-pitch thread cut on a cylinder. For steep-tapered thread gages, having an included taper larger than  $\frac{1}{4}$  in./ft this more

accurate term should be applied. For such a thread, which has a small lead angle, formula 6 takes the form

$$E = M_w + \frac{\cot \alpha - \tan^2 \beta \tan \alpha}{2n} - w(1 + \operatorname{cosec} \alpha) \quad (7)$$

Otherwise, as for American standard taper pipe threads having an included taper of  $\frac{1}{4}$  in./ft, the simplified formula 5

$$E = M_w + \frac{0.86603}{n} - 3w$$

for 60° threads may be used. This simplified formula gives a value of  $E$  that is 0.00005 in. larger than that given by the above general formula 6 for the  $2\frac{1}{2}$  in.-8 American Standard taper pipe thread, the worst case in this thread series.

The pitch diameter at any other point along the thread, as at the gaging notch, is obtained by multiplying the distance parallel to the axis of the thread, between this point and the point at which the measurement was taken, by the taper per inch, then adding the product to or subtracting it from the measured pitch diameter according to the direction in which the second point is located with respect to the first.

2. **THREE-WIRE METHOD.**—Depending on the measuring facilities available or other circumstances, it is sometimes more convenient to use three wires. In such cases measurement is made in the usual manner, but care must be taken that the measuring contacts touch all three wires, as the line of measurement is not perpendicular to the axis of the screw when there is proper contact (see fig. 4.3).

On account of this inclination, the measured distance between the axes of the wires must be multiplied by the secant of the half angle of the taper of the thread. The

formula for the pitch diameter of any taper thread plug gage, the threads of which are symmetrical with respect to a line perpendicular to the axis, then has the form corresponding to formula 4:

$$E = (M_w - w) \sec \beta + \frac{\cot \alpha}{2n} - w \operatorname{cosec} \alpha, \quad (8)$$

in which  $\beta$  = half-angle of taper of thread. Thus the pitch diameter of an American Standard pipe-thread gage having correct angle ( $60^\circ$ ) and taper ( $\frac{3}{4}$  in./ft.) is then given by the formula

$$E = 1.00049(M_w - w) + 0.86603 p - 2w. \quad (9)$$

An adaption of the three-wire method is frequently used to reduce the time required when the pitch diameter of a

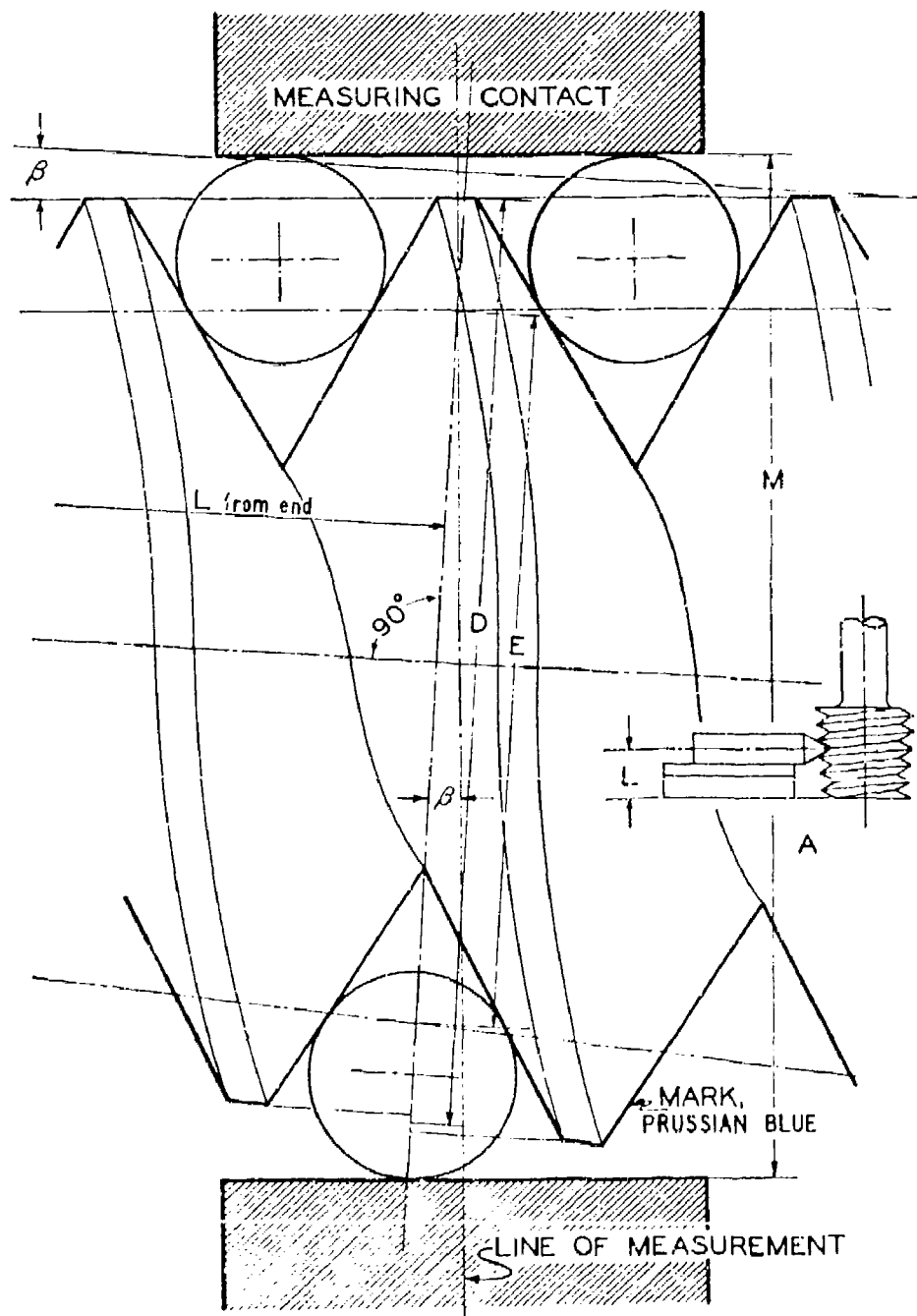


FIGURE 4.3.—Measurement of pitch diameter of taper thread gages by the 3-wire method

number of gages of the same size is to be measured. Only light gages, up to about 2 in., can be measured accurately by this method. The gage is supported on two wires placed several threads apart, which are in turn supported on a taper thread testing fixture. The third wire is placed in the threads at the top of the gage and measurement is made from the top of this wire to the bottom of the fixture with a vertical comparator having a flat anvil, using a gage block combination as the standard. The fixture consists of a block, the upper surface of which is at an angle to the base plane equal to the nominal angle of taper of the thread, 28°. Thus the element of the cone at the top of the thread gage is made parallel to the base of the instrument. The direction of measurement is not perpendicular to the axis of the gage but at an angle,  $\beta$ , from perpendicularity. A stop is provided at the thick end of the block with respect to which the gage is positioned on the fixture. As the plane of the end of the gage may not be perpendicular to the axis, a roll approximately equal to the diameter of the gage should be inserted between the stop and the gage to assure contact at the axis of the gage. For a given fixture and roll, a constant is computed which, when subtracted from the measured distance from the top of the upper wire to the base plane, gives  $M$  corresponding to the pitch diameter,  $E_0$ , at the small end of the gage.  $E_0$  is then determined by applying formula 8 or 9.

3. FOUR-WIRE METHOD.—A four-wire method of measurement that yields measurements of the pitch diameter,  $E_0$ , at the small end of the gage, and the half-angle of taper,  $\beta$ , is also sometimes used. This method is illustrated in figure 4.4 and requires four thread wires of equal diameter, a pair of gage blocks of equal thickness, and two pairs of rolls of different diameters, the rolls of each pair being equal in diameter. Two measurements,  $M_1$  and  $M_2$ , are made over the rolls and formulas are applied as follows:

$$\cot \frac{90^\circ - \beta}{2} = \frac{M_2 - M_1 + d_1 - d_2}{d_2 - d_1}, \quad (10)$$

$$M_w = M_2 - d_2 \left( 1 + \cot \frac{90^\circ - \beta}{2} \right) - 2y \sec \beta, \quad (11)$$

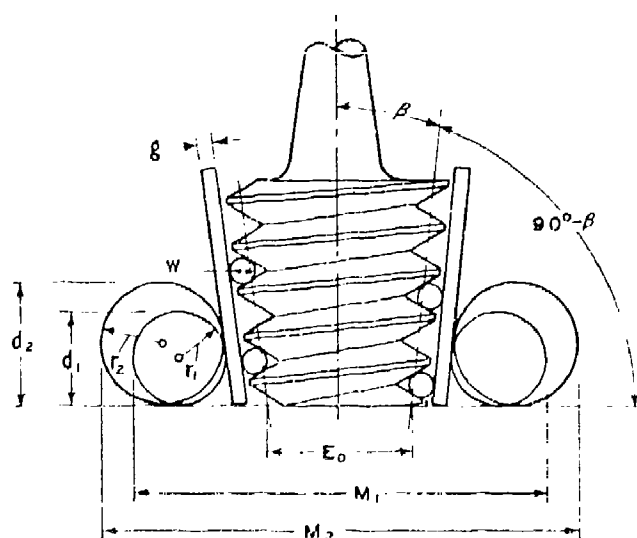


FIGURE 4.4.—Measurement of pitch diameter of taper thread gages by the 4-wire method.

in which

- $M_2$  = measurement over larger rolls
- $M_1$  = measurement over smaller rolls
- $d_2$  = diameter of larger rolls
- $d_1$  = diameter of smaller rolls
- $\beta$  = actual half-angle of taper of thread
- $g$  = thickness of each gage block.

To determine  $E_0$ , the pitch diameter at the small end of the gage,  $M_w$ , as determined from formula 11, is substituted in formula 6 or 7.

The errors of measurement by this method may be slightly but not significantly larger than by the other methods described, on account of elastic deformations of the rolls and gage blocks under the measuring load, and differing conditions of loading of the thread wires.

## 7. MEASUREMENT OF PITCH DIAMETER OF THREAD RING GAGES

The application of direct methods of measurement to determine the pitch diameter of thread ring gages presents serious difficulties, particularly in securing proper contact load when a high degree of precision is required. The usual practice is to fit the ring gage to a threaded setting plug. When the thread ring gage is of correct lead, angle, and thread form, within close limits, this method is satisfactory and represents standard American practice. It is the only method available for small sizes of threads. For the larger sizes, various more or less satisfactory methods have been devised, but none of these have found wide application.

## APPENDIX 5. DESIGN OF SPECIAL THREADS

### 1. GENERAL

In general, any given problem in thread design may be susceptible to several more or less satisfactory solutions based on the preliminary selection of certain elements of the design and the proper adjustment of the other elements. In other words, thread design is to a large extent empirical and is partially based on previous experience with similar designs and the judgment of the designer. Accordingly, it is not practicable to present a definite system of approach to the design of a threaded assembly but merely to present a discussion of various design factors.

The interrelation of length of engagement, minimum major diameter of the external thread, maximum minor diameter of the internal thread, and the strength of the assembled thread needs to be understood and carefully considered in order to produce the optimum design of a special thread. It is not economical to use either a length of thread engagement which is longer than required or shorter than that which will develop the full strength of the externally threaded member. Other factors, such as control of tap breakage, proper seating of a threaded part on a shoulder, the prevention of cross threading, conditions of loading when the assembled parts are not concentric, and possible collapse of a hollow externally threaded member, require careful analysis and adjustment of the design with respect to selection of the diameter-pitch combination, the class of thread, length of engagement, and major and minor diameter tolerances.

In redesigning threads from American National to Unified standards, it should be remembered that exact correspondence between the old and new class numbers does not exist. For most, but not all, diameter-pitch combinations, the combined tolerances and allowances of the Unified classes are somewhat larger than American National classes of corresponding number. Recommended procedure is to convert the thread to the corresponding class of Unified thread, compare the new major, pitch, and minor diameter tolerances with the old tolerances, and then give careful consideration to the desirability of the new limits of size.

Taking, for example, the conversion of a class 1 thread to classes 1A and 1B: Under ordinary conditions where the thread is being used only as a simple fastener and the length of engagement is normal, such substitution may be made. If, for any reason, the previously specified tolerances may not be exceeded, it may be necessary to specify class 2A or 2B or both. Also, if the thread must carry a high axial stress or if concentricity of the two mating parts is a factor, the conversion should be from class 1 to classes 2A and 2B.

A close fitting thread assembly under some conditions may fail, whereas the cause of failure may be eliminated by providing a looser fit. A cap screw that seats only on one side of the bearing surface under the head may break off when the screw is tightened. When a screw has a large bearing surface under the head or when the head must be square with a projecting pin, sufficient pitch diameter clearance must be provided to allow for any out-of-square-ness of the screw axis with the bearing surface under the head. Thus, as large a pitch diameter tolerance as possible, together with providing proper tolerances on squareness of face with the thread axis where seating is required, may avoid the necessity for specifying a heat treated bolt.

## 2. ECCENTRICITY OF ASSEMBLY AND CROSS THREADING

In assembly and use, the combined tolerances and allowances on both mating parts should not allow threads to disengage on one side when assembly is eccentric. The axis of the internal thread can be displaced radially from coincidence with the axis of the external thread by an amount equal to the sum of the pitch diameter tolerances and the allowance. This radial displacement may be sufficient so that the flank contact is entirely on one side and on the opposite side the crest of the external thread will be in line with the crest of the internal thread with the following results when the screw is constrained in such a position in a tapped hole: (1) There will be danger of crossing the threads in starting, and (2) the screw may pull out of the hole when tension is exerted in this constrained position. The minimum amount of overlap is arbitrary and controversial, but the following general rule can be used in lieu of more specific data:

As the first step to assure the minimum safe overlap on both sides when the assembly is concentric, the difference between the minimum major diameter of the ex-

ternal thread and the maximum minor diameter of the internal thread should not be less than twice the addendum of the external thread ( $\frac{3}{4} H$ , table III, 1, p. 12). (Otherwise stated, the sum of the major-diameter tolerance and allowance, if any, of the external thread and the minor-diameter tolerance of the internal thread should not be greater than  $\frac{4}{3}$  the addendum of the external thread,  $H/2$ , table III, 1. This provides for a minimum of 50 percent thread engagement. As the second step, to assure the minimum safe overlap on one side when the assembly is eccentric, the difference between the maximum pitch diameter of the internal thread and the minimum pitch diameter of the external thread should not be greater than twice the addendum of the external thread ( $\frac{3}{4} H$ , table III, 1). (Otherwise stated, the sum of the pitch-diameter tolerances of both threads and the allowance, if any, should not be greater than twice the addendum of the external thread,  $\frac{3}{4} H$ , table III, 1). This provides for an eccentric assembly condition equal to the addendum of external thread ( $\frac{3}{4} H$ , table III, 1) and zero minimum overlap on one side. If the results from the limits of size selected violate the above rules, the tolerances should be reduced by using a closer class of tolerance, assuming tolerances consistent with manufacturing possibility, or a coarser pitch should be used to increase the amount of overlap. The major-diameter tolerance of the external thread or minor-diameter tolerance of the internal thread should not be less than the pitch-diameter tolerance of the respective thread to maintain thread form.

It should be noted that, if the tolerance on the minor diameter of the internal thread must necessarily be large, the major diameter of the external thread must be held close to the maximum major diameter and vice versa.

## 3. STRENGTH FACTORS

1. CRITICAL AREAS.—The critical areas of mating threads, as related to the tensile strength of the thread assembly, are: The effective cross-sectional area, or stress area, of the external thread, (2) the shear area of the external thread that depends principally on the minor diameter of the tapped hole, and (3) the shear area of the internal thread that depends principally on the major diameter of the external thread. The formulas for tensile stress area and thread shear area are given in section II, p. 5, and these areas are indicated in figure 5.1.

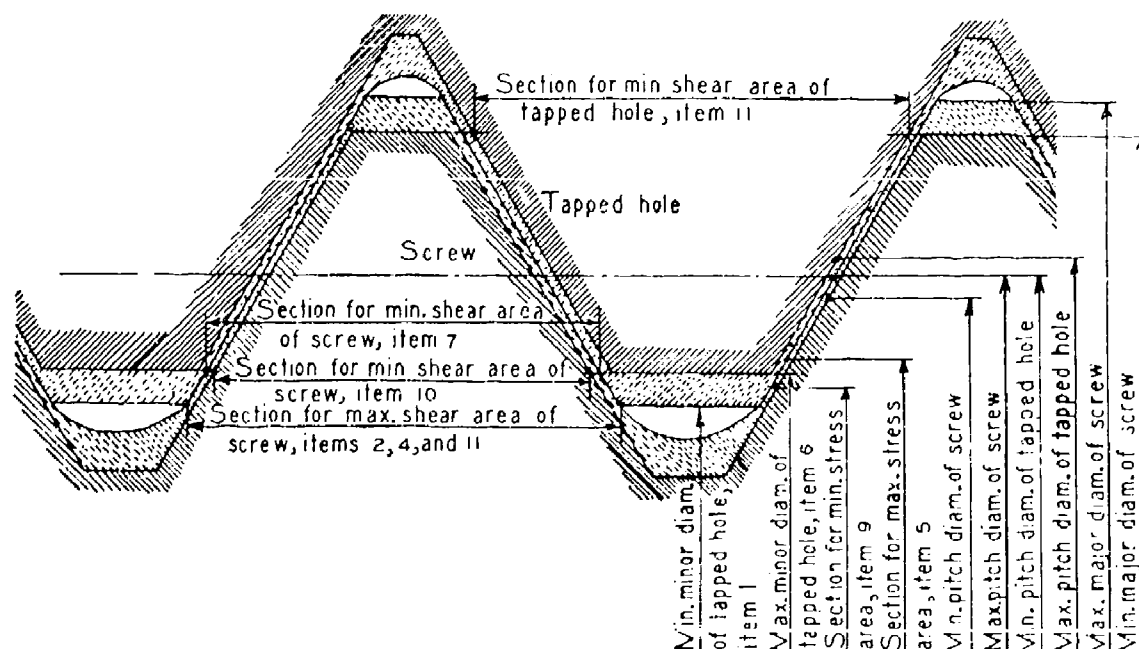


FIGURE 5.1.—Critical sections in a thread assembly.

See table 5.1 for formulas corresponding to item numbers.



If failure of a thread assembly should occur it is desirable that the external thread (screw) will break rather than that either the external or internal thread will strip. In other words, the length of thread engagement shall be sufficient to develop the full strength of the screw. Thus, the length of internal thread and the dimensions of this thread, particularly its minor diameter, should be such that, taking into account a possible difference in strength of material of the internal and external threads, the threaded portion of the external thread will break before either the external or internal threads strip.

2. LENGTH OF THREAD ENGAGEMENT.—The length of engagement of a threaded unit, which will develop maximum strength of assembled threads with external and internal threads manufactured of materials of equal tensile strength, is computed from the following formula:

$$L_e = \frac{2 \times \text{stress area}}{3,1416nK_n \max \left[ \frac{1}{2n} + 0.57735(E_t \min - K_n \max) \right]}$$

The factor 2 used in the numerator of this formula means that it is assumed that the area in shear must be twice the tensile stress area to develop the full strength of the screw. This assumption is based on experiments made by the National Bureau of Standards in 1929, in which it was found that for hot-rolled and cold-rolled steel, and brass screws and nuts, this factor varied from 1.7 to 2.0. Taking the factor as 2 provides in general a small factor of safety against stripping of the threads.

To facilitate the application of this formula various notations, constants, and formulas applicable to the determination of the relation of critical areas to thread dimensions are given in table 5.1 and are discussed below.

(a) Length of engagement determined by shear area of

external thread.—Formula 8, table 5.1, gives the length of engagement required to develop the full strength of the screw when the strength of the material in which the hole is tapped is the same as, or slightly less than, the strength of the material of the screw. The value of  $L_e$  thus obtained is sufficient for a permanently-fastened connection. If, however, the screw is an adjusting or lead screw, or if the connection will be frequently unscrewed,  $L_e$  should be increased to allow for the expected wear on the flanks of the threads during the useful life of the components.

For tapped holes in sheet metal, the maximum size of the screw to be specified should be such that the thickness of sheet equals the  $L_e$  required to develop full strength. In order to use the largest possible screw, it is necessary that the tolerance,  $T_{K_n}$ , on the minor diameter of the hole should be the practical minimum. If it should prove to be impracticable to reduce the minor diameter tolerance to such a value, it may be necessary to decrease the minimum minor diameter of the internal thread and to increase the minor diameter tolerance by the same amount. If this is done, the maximum minor diameter of the screw must be reduced by the same amount to prevent interference, and the minor diameter of the "go" thread ring gage must likewise be decreased, as this is the only control of the minor diameter of the screw. In all such cases, where dimensions are altered from those calculated according to the standard, the method of designation for modified threads, stated in section III, p. 26, should be followed.

(b) Length of engagement determined by shear area of internal thread.—The ratio of the area in shear in the screw and the area in shear in the tapped hole is given by formula 12, table 5.1. This ratio,  $R_1$ , will usually be less than 1 and the strength of the material of the tapped hole can be less than the strength of the material of the screw by this ratio with no indicated increase in

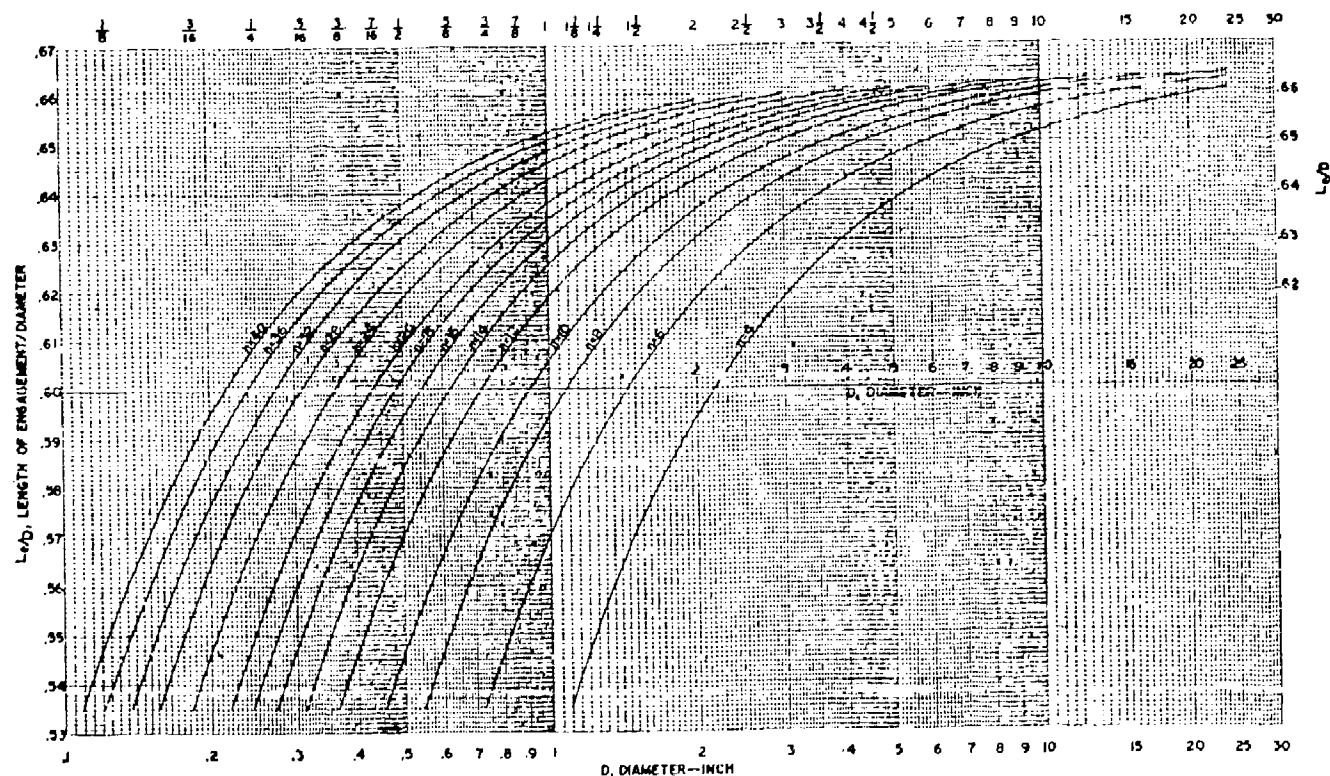


FIGURE 5.2.—Chart for determining minimum length of thread engagement.

$L_s$  by formula 8. If, however, the ratio

$$R_2 = \frac{\text{tensile strength of the material of the tapped hole}}{\text{tensile strength of the material of the screw}}$$

is less than  $R_1$ , then  $L_s$  should be multiplied by  $R_1/R_2$  to provide sufficient length of thread to prevent stripping of the threads in the tapped hole.

For retaining collars on shafts where the expected axial force resisted by the collar is appreciably less than the tensile force that the shaft itself is capable of resisting,  $L_s$  need only be long enough to withstand the expected axial force on the collar. If  $P_c$  is the axial force to be carried by the collar and  $uts$  is the tensile strength of the material of the shaft in pounds per square inch, then the length of thread engagement required on the shaft is equal to  $2P_c/(uts \times S_s \text{ min})$ , where  $S_s \text{ min}$  is given by formula 7, when the strength of material of the collar is the same or slightly less than the strength of material of the shaft. Ratios  $R_1$  and  $R_2$  should be computed as previously explained to determine whether or not a greater length is

required to prevent stripping of the threads in the collar.

(c) *Hollow externally threaded parts.*—For screws with through axial holes, the length of engagement required is of course less than if the screw is solid. For this condition, formula 8 becomes

$$L_s \text{ max} = \frac{2(A_s \text{ max} - A_s \text{ min})}{S_s \text{ min per inch}},$$

where  $A_s$  is the cross-sectional area of the hole.

However, as the wall thickness of either or both the internal and external members becomes thin, the tendency of the external member to enlarge and the internal member to neck down in the thread means that an  $L_s$  greater than given by the above formula must be used, also that the tolerances on minor diameter of the internal thread and major diameter of the external thread,  $T_{K_n}$  and  $T_{D_n}$ , must be small to obtain the maximum practicable depth of thread engagement. For components having threads on thin-wall tubing, tests under actual working conditions should be made to determine proper selection of wall thicknesses, length of engagement, and pitch of thread.

TABLE 5.1.—Data for determining strength factors in special thread design

#### NOTATION

$D$  = basic major diameter.  
 $D_s$  = major diameter of external thread.  
 $K_n$  = minor diameter of internal thread.  
 $T_{K_n}$  = tolerance on minor diameter of internal thread.  
 $T_{D_n}$  = tolerance on pitch diameter of external thread.

$G$  = allowance on all diameters of external thread.  
 $L_s$  = length of thread engagement.  
 $A_s$  = stress area of external thread.  
 $S_s$  = area in shear on external thread in line with  $K_n$ .  
 $S_n$  = area in shear in internal thread in line with  $D_s$ .

#### CONSTANTS

$$C_1 = \frac{3}{4} \pi = 2.356$$

$C_1 = \frac{3}{4} \pi = 2.356$	Threads per inch, $n$															
	40	36	32	28	27	24	20	18	16	14	12	10	8	6	4	
$C_2 = \frac{5 \cot 30^\circ}{8} \frac{1.08253}{n}$	0.0271	0.0301	0.0338	0.0387	0.0401	0.0451	0.0541	0.0601	0.0677	0.0773	0.0902	0.1083	0.1353	0.1804	0.2706	
$C_3 = \frac{9 \cot 30^\circ}{16} \frac{0.974279}{n}$	.0211	.0271	.0304	.0348	.0361	.0406	.0487	.0541	.0609	.0696	.0812	.0974	.1218	.1624	.2436	
$C_4 = n \tan 30^\circ = 0.57735n$	23.09	20.78	18.48	16.17	15.59	13.86	11.55	10.39	9.328	8.083	6.928	5.774	4.619	3.464	2.309	
$C_5 = \pi n \tan 30^\circ = 1.8138n$	72.55	65.30	58.04	50.79	48.97	43.53	36.25	32.65	29.02	25.39	21.76	18.14	14.51	10.88	7.255	

#### FORMULAS

##### MAXIMUM MATERIAL FOR BOTH EXTERNAL AND INTERNAL THREADS

Item

- $K_n \text{ min} = D - C_2$ .
- Max area in shear of external thread per inch =  $S_s \text{ max per inch} \times C_1 K_n \text{ min}$ .
- Min length of thread engagement,  $L_s \text{ min} = \frac{L_s}{D} \times D_s \text{ max}$ , with  $\frac{L_s}{D}$  taken from graph, figure 5.2.
- Area in shear of external thread in length  $L_s \text{ min} = S_s \text{ max per inch} \times L_s \text{ min}$  (— Item 2  $\times$  Item 3).
- Max stress area of external thread =  $A_s \text{ max} = \frac{S_s \text{ max per inch} \times L_s \text{ min}}{2} \left( \frac{1}{2} \text{ Item 4} \right) = \frac{C_1 K_n \text{ min} \times \frac{L_s}{D} \times D_s \text{ max}}{2}$ .

##### MAXIMUM MATERIAL EXTERNAL THREAD, $K_n$ MAXIMUM

- $K_n \text{ max} = K_n \text{ min} + T_{K_n}$ .
- Min area in shear of external thread per inch =  $S_s \text{ min per inch} \times K_n \text{ max}$  ( $C_1 - C_2 T_{K_n}$ ).
- $L_s$  required to develop full strength of external thread for  $T_{K_n}$  selected =  $\frac{2 A_s \text{ max}}{S_s \text{ min per inch}} = \left( \frac{2 \times \text{Item 5}}{\text{Item 7}} \right)$  or  $\left( \frac{\text{Item 4}}{\text{Item 7}} \right)$ .

##### MINIMUM MATERIAL FOR BOTH EXTERNAL AND INTERNAL THREADS

- Min stress area of external thread =  $A_s \text{ min} = 0.7854 [D - C_2 - (T_{D_n} + G)]^2$ .
- Min area in shear of external thread in length  $L_s = S_s \text{ min} \times K_n \text{ max} [C_1 - C_2 (T_{K_n} + T_{D_n} + G)] L_s$ , or  $= \pi K_n \text{ max} [0.75 - C_2 (T_{K_n} + T_{D_n} + G)] L_s$ .
- Min area in shear of internal thread in length  $L_s = S_n \text{ min} - \pi D_s \text{ min} [0.875 - C_1 (T_{D_n} + T_{K_n} + G)] L_s$ .

##### MINIMUM TAPPED HOLE, $D_t$ MINIMUM, WHEN TAPPED MATERIAL IS WEAKER THAN SCREW MATERIAL

- $R_1 = \frac{\text{area in shear of screw in length } L_s}{\text{area in shear of tapped hole in length } L_s} = \frac{\left( \frac{\text{Item 4}}{\text{Item 11}} \right) - 0.75 K_n \text{ min}}{D_t \text{ min} [0.875 - C_1 (T_{D_n} + T_{K_n} + G)]}$ .
- $R_2 = \frac{\text{ultimate tensile strength of tapped material}}{\text{ultimate tensile strength of screw material}}$ .
- If  $R_1 < R_2$ , then  $L_s \text{ required} = L_s \text{ for } T_{K_n} \text{ selected} \times \frac{R_1}{R_2} = \left( \frac{\text{Item 8} \times \text{Item 12}}{\text{Item 13}} \right)$ .

#### 4. THREAD PROPORTIONS IN RELATION TO TAPPING

In the production of threads it is considered impractical to tap a thread unless its diameter is greater than six times the basic thread height; therefore, when the ratio of  $D$  to  $H$  is less than 4.5, the use of a larger diameter, a finer pitch of thread, or both, should be considered.

The size of  $K_n$  is a factor in controlling tap breakage. Tap breakage is infrequent if the diameter of the tap is over  $\frac{1}{2}$  in. or if the length of thread to be tapped is less than  $\frac{1}{4}D$ . For sizes less than  $\frac{1}{2}$  in. and length of thread over  $\frac{1}{4}D$ , tap breakage can be minimized by use of a large  $K_n$ , that is  $T_{K_n}$  maximum. However, this means that  $L_e$  may have to be increased to develop the full strength of the screw.

#### 5. EXAMPLES OF THREAD DESIGN

The design of special threads for particular purposes is illustrated by the following examples:

**Example:** A gun barrel is subjected to an internal explosive pressure that produces a tensile stress in the threaded end. The length of engagement of the threads should be sufficient to produce a minimum area in shear on the threads of the screw in line with the minor diameter of the tapped hole threads equal to twice the maximum stress area of the threaded portion of the barrel.

Assume that the thread on the barrel is 1.5-8N-2A and the minimum internal diameter of the barrel at the threaded end is 0.792 in.

In table III.10 will be found the following maximum dimensions of the external thread:

$$D_s \text{ max} = 1.4978 \text{ in.}$$

$$E_s \text{ max} = 1.4166 \text{ in.}$$

$$K_n \text{ max} = 1.3441 \text{ in.}$$

From table III.10,  $K_n \text{ min} = 1.365 \text{ in.}$  If we select the tolerance for minor diameter of hole  $T_{K_n} = 0.0250 \text{ in.}$ ,  $K_n \text{ max}$  will equal  $1.365 + 0.025 = 1.390$ , which will permit the use of a  $1\frac{1}{8}$  (1.375)-in. tap drill.

The minimum area in shear per inch can be computed, using formula 7, table 5.1:

$$S_s \text{ min} = K_n \text{ max} (C_1 - C_2 T_{K_n})$$

$$= 1.390 (2.356 - 14.51 \times 0.025)$$

$$= 2.7703 \text{ in.}^2$$

The maximum stress area of the external thread, if solid, using formula 5, table 5.1, is

$$A_s \text{ max} = \frac{C_1 K_n \text{ min} \times \frac{L_e}{D} \times D_s \text{ max}}{2}$$

$$\frac{L_e}{D} \text{ from chart} = 0.622,$$

$$= \frac{2.356 \times 1.365 \times 0.622 \times 1.4978}{2} = 1.4977$$

Area of minimum center hole

$$= (\pi/4) \times 0.792^2 = 0.4926$$

Max stress area of external threaded member

$$= 1.0051$$

Length of thread engagement required

$$= L_e = \frac{2 \times \text{max } A_s}{S_s \text{ min}}$$

$$= \frac{2 \times 1.005}{2.7703}$$

$$= 0.726 \text{ in.}$$

If a length of engagement of 0.73 in. cannot be obtained, the tolerance on minor diameter,  $T_{K_n}$ , of the internal thread should be reduced. If a space for a longer length of engagement is available,  $T_{K_n}$  can be increased.

**Example:** The dimension is required of the large steel cap screw that can be used to hold a bracket on a cast iron body. The tensile strength of the steel is 60,000 lbs/in.<sup>2</sup>, the tensile strength of the cast iron 20,000 lb/in.<sup>2</sup>, and the thickness of the cast iron is such that the length of thread engagement cannot exceed 1.750 in. The screws on the top side of the bracket will be in tension. From the ratio of the tensile strengths of the two materials,  $R_2 = 20,000/60,000 = 0.333$ , it is evident that the length of the tapped hole thread must be considerably longer than the length of thread engagement required to develop the full strength of the screw.  $R_1$  will be of the order of 0.85 and the length of thread in the tapped hole will be approximately  $R_1/R_2 = 0.85/0.333 = 2.55$  times as long as the length required to develop the full strength of the screw.  $L_e$  required to develop the full strength of the screw must be of the order of  $1.750/2.55 = 0.686 \text{ in.}$

Inasmuch as the hole is tapped in cast iron, a relatively coarse thread would be required, that is UNC or coarser. For such threads  $L_e/D$ , as shown on the chart, figure 5.2, varies between 0.57 and 0.61. Taking  $L_e/D = 0.59$ , the approximate diameter required is  $0.686/0.59 = 1.163$ . Try  $D = 1\frac{1}{8} = 1.0625 \text{ in.}$  The selected pitch could be either 10 or 8 threads per inch with 8 threads per inch preferred. For a bracket screw, class 2A would be the preferred class. Thus, the screw is  $1\frac{1}{8}$ -8NS-2A and the hole  $1\frac{1}{8}$ -8NS-2B.

Next, compute the dimensions of the screw and hole to determine whether or not the above selection is correct.

Max major diameter of screw,  $D_s \text{ max}$ , table IV.2,

$$= \text{basic } D - G = 1.0625 - 0.0021 = 1.0604$$

Min major diameter of screw,  $D_s \text{ min}$ , table IV.3,

$$= D_s \text{ max} - T_{D_s} = 1.0604 - 0.0150 = 1.0454$$

Min minor diameter of tapped hole,  $K_n \text{ min}$ , table IV.1,

$$= D - 1\frac{1}{4}H = 1.0625 - 0.1353 = 0.9272$$

The number of  $1\frac{1}{8}$ -8 screws required will depend on the torque that may develop on the bracket that will produce tension in the screws. It should be possible to tighten these screws to the yield strength of the steel without stripping the cast iron threads.

The complete table of dimensions of the tapped hole and screw is

Internal thread,  $1\frac{1}{16}$ -8NS-2B

Min major diameter	$\overset{in.}{=} 1.0625$
Min pitch diameter, table IV.1,	$1.0625 - 0.0812 = 0.9813$
Max pitch diameter, table IV.8,	$0.9813 + 0.0089 = 0.9902$
Min minor diameter, table IV.1,	$1.0625 - 0.1353 = 0.9272$
Max minor diameter, table IV.10,	$0.9272 + 0.0312 = 0.9584$

External thread,  $1\frac{1}{16}$ -8NS-2A

Max major diameter, table IV.2,	$\overset{in.}{=} 1.0625 - 0.0021 = 1.0604$
Min major diameter, table IV.3,	$1.0604 - 0.0150 = 1.0454$
Max pitch diameter, table IV.1,	$1.0604 - 0.0812 = 0.9792$
Min pitch diameter, table IV.5,	$0.9792 - 0.0068 = 0.9724$
Max minor diameter, table IV.1,	$1.0604 - 0.1534 = 0.9070$

$L_e/D$  from chart, figure 5.2 = 0.5990

$$L_e \text{ min} = L_e/D \times D, \text{ max} = 0.5990 \times 1.0604 = 0.6352$$

$$T_{En} \text{ (table IV.8)} = 0.0089$$

$$R_1, \text{ table 5.1, formula 12} = \frac{0.75 K_n \text{ min}}{D_s \text{ min} [0.875 - C_1(T_{En} + T_{Ds} + G)]}$$

$$= \frac{0.75 \times 0.9272}{1.0454 [0.875 - 4.619(0.0089 + 0.0150 + 0.0021)]}$$

$$= 0.8812$$

$$L_e \text{ required in hole} = L_e \text{ min} \times \frac{R_1}{R_2} = 0.6352 \times 0.8812 / 0.3333 = 1.6794 \text{ in.,}$$

which is less than the  $L_e$  (1.750 in.) permitted.

## APPENDIX 6. REFERENCES

The following Federal Specifications may be obtained at the prices indicated upon application, accompanied by check, money order, cash, or Government Printing Office coupons to the Business Service Center, General Services Administration, Regional Office Building, Seventh and D Streets SW., Washington 25, D. C.

### Federal Specifications:

FF-B-561.	Bolts, Lag (10 cents).
FF-B-575.	Bolts, Hexagon and Square (15 cents).
FF-B-00584.	Bolts (Square Neck, Machine, Ribbed Neck, Finned Neck, Tee Head, Key Head) (Round Head).
FF-B-588.	Bolts, Toggle (5 cents).
FF-D-00200.	Devices, Anchoring, Masonry.
FF-N-836.	Nuts, Hexagon and Square (25 cents).
FF-N-845.	Nut, Plain, Wing.
FF-S-85.	Screws, Cap, Slotted and Hexagon Head (15 cents).
FF-S-86.	Screws, Cap, Socket Head (25 cents).
FF-S-88.	Screw Eyes (10 cents).
FF-S-92.	Screws, Machine; Slotted or Cross-Recessed (25 cents).
FF-S-103.	Screws, Set (10 cents).
FF-S-107.	Screws, Tapping, Slotted and Plain Head (Sheet Metal, Machine, and Drive) (20 cents).
FF-S-00109.	Screws, Wood; Cross-Recessed Head.
FF-S-111.	Screws, Wood, Slotted-Head (10 cents).
FF-T-305.	Thumb screws (10 cents).
FF-W-84.	Washers, Lock (Spring) (15 cents).
FF-W-92.	Washers, Metal, Flat (Plain) (15 cents).
FF-W-00100.	Washers, Tooth Lock.

The following standards and specifications may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Commercial Standards of the U. S. Department of Commerce, Office of Technical Services:

CS8. Gage Blanks (40 cents).

Simplified Practice Recommendations of the U. S. Department of Commerce, Business and Defense Services Administration:

- R23. Bolts, plow (5 cents).
- R51. Chasers for Self-opening and Adjustable Die Heads (10 cents).
- R60. Bolts, Carriage, Machine and Lag; Packaging of (5 cents).
- R169. Machine, Carriage, and Lag Bolts (Steel), (Stock Production Sizes (10 cents)).

The following standards have been approved and promulgated by the American Standards Association, and issued by The American Society of Mechanical Engineers, 29 West 39th Street, New York 18, N. Y.:

- B1.1. Unified and American Screw Threads for Screws, Bolts, Nuts, and Other Threaded Products (\$3.00).
- B1.2. Screw Thread Gages and Gaging (\$4.00).
- B1.5. Acme Screw Threads (\$2.25).
- B1.7. Nomenclature, Definitions, and Letter Symbols for Screw Threads (50 cents).
- B1.8. Stub Acme Screw Threads (\$1.25).
- B1.9. Buttress Screw Threads (\$1.50).
- B2.1. Pipe Threads (\$1.50).
- B5.4. Taps, Cut and Ground Threads (\$1.50).
- B5.12. Twist Drills, Straight Shank and Taper Shank (75 cents).
- B18.2. Square and Hexagon Bolts and Nuts (\$2.00).
- B18.3. Socket Head Cap Screws and Socket Set Screws (\$1.00).
- B18.5. Round Head Bolts (\$1.00).
- B18.6.1. Slotted and Recessed Head Wood Screws (\$1.00).
- B18.6.2. Tapping Screws.
- B18.6.3. Slotted and Recessed Head Machine Screws.
- B18.8. High-Strength, High-Temperature Internal Wrenching Bolts (50 cents).
- B18.9. Plow Bolts (55 cents).
- B18.10. Track Bolts and Nuts (\$1.00).



## INDEX

A		E	
	Page		Page
Abbreviations, screw thread	7, 10	Effective size, definition ( <i>see</i> Virtual diameter)	
Acceptability of threads	118	Effective thread, definition	3
Actual fit, definition	3	Eight-thread series	14, 17, 123, 130, 138
Actual size, definition	2	Engagement, depth of, definition	5
Addendum, definition	4	Engagement, length of	22, 128
Allowance, definition	2	Definition	5
Allowances ( <i>see</i> Tolerances and allowances)		External thread, definition	2
Altered threads	100	External thread tolerances	19, 75
American National screw threads	121	Major diameter	21, 76
Comparison with Unified screw threads	10	Minor diameter	21, 76
Form of thread	121	Pitch diameter	21, 79, 128
Limits of gage sizes	143	Extra-fine-thread series	14, 17, 123, 129, 137
Limits of thread sizes	128		
Method of designating	132		
Thread classes	130		
Thread form	121		
Thread series	122		
Coarse	122, 128, 133		
Extra-fine	123, 128, 137		
Fine	122, 128, 135		
8-thread	123, 130, 138		
16-thread	124, 132, 143		
12-thread	123, 131, 140		
Tolerances and allowances	124, 128, 131, 145		
American National special screw threads	179		
Form of thread	179		
Gages for	186		
Recommended pitches	179		
Thread classes	179		
Selection of	124		
Tolerances and allowances	126		
American Standard screw threads ( <i>see under</i> Unified and American)			
Angle deviations, diameter equivalent of	22, 32		
Angle, included, of thread, definition	4		
Axis of thread, definition	3		
B		F	
	Page		Page
Base of thread, definition	3	Fine-thread series	14, 16, 122, 129
Basic form of thread, definition	3	Fit, definition	2
Basic hole system, definition	3	Flank, definition	3
Basic size, definition	2	Flank angle, definition	4
Basic shaft system, definition	3	Following flank, definition	3
Bilateral tolerance, definition	2	Form of thread, definition	3
Bilateral tolerance system, definition	2	Fundamental triangle, definition	3
Blunt start, definition	4		
C		G	
	Page		Page
Classes of threads	130, 179	Gage classification	108
1	130, 179	Gage sizes, limits of	38, 145
1A	23, 79	Gage tolerances and wear allowances	117
1AR	75, 79	Gages	38, 100, 107
1B	23, 79	Constants for computing dimensions of	115
2	130, 180	Direction of tolerance on	109
2A	23, 79	For reference	108
2B	23, 79	Master	108
3	131, 180	Plain plug acceptance check	108
3A	23, 98	Setting (check)	108
3B	23, 98	General design	109
4	131, 180	Limit	109
5	132	Maximum-metal ("go")	108
Classes of threads, definition	18	Minimum-metal ("not go")	108
Clearance fit, definition	3	Limits of size	38, 113
Clearance (or trailing) fit, definition	3	Plain and thread	39, 113, 146
Coarse-thread series	13, 16, 122	Setting plug	38, 56, 114, 164
Coated threads	23	Marking of	116
Complete thread, definition	3	Standard temperature	109
Core diameter ( <i>see</i> Minor diameter)		Thread form	110
Crest, definition	3	"Go" and "Not go" thread gages	110
Crest clearance, definition	5	Setting plug gages	111
Crest truncation, definition	4	Thread length	114
Cross threading	201	Gages, ring	110
		Measurement of pitch diameter of	190
		Gaging practices, recommended	118
		Procedure in setting adjustable thread ring gages	118
		Procedure for determining clearance in thread ring gages	120
		Uses of W and X thread gages	118
		Gaging, screw thread	107
		Practices	118
		Virtual (or effective size)	118
		Single element	118
D		H	
	Page		Page
Daddendum, definition	4	Height of fundamental triangle, definition	4
Definitions	2	Height of thread, definition	4
Depth of thread engagement, definition	5	High-temperature, high-strength applications	23
Design forms of thread, definition	3	Hole size limits	186
Design forms of threads	3		
American National	122-125		
National miniature	103		
Unified	11		
Design information, screw threads of special diameters, pitches, and lengths of engagement	200		
American National	180		
Unified	98		
Design, size, definition	2		
Designating screw threads	8		
Method of	26		
Method of, special thread	98		
Designations, identification, screw thread	8, 26		
Diameter equivalent	22, 32		
Of angle deviations	22, 32		
Of lead deviations	23, 32		
Dimension, definition	2		
Dolls, tap, class of	68		
L		I	
	Page		Page
Lead, definition	4	Incomplete thread, definition	3
Lead angle, definition	4	Included angle, definition	4
Lead deviations, diameter equivalent of	23, 32	Interference fit, definition	3
Lead, variations in	32	Internal thread, definition	2
Leading flank, definition	3	Internal thread tolerances	19, 75
Left-hand thread, definition	2	Major diameter	21, 76
Length of engagement	22, 128	Minor diameter	21, 77
Length of thread engagement, definition	5	Pitch diameter	21, 79, 128
Limit gages, maximum-metal or "go"	108		
Minimum-metal or "not go"	108		
Limit, of size	26, 79, 128		
Definition	2		
Gages ( <i>see</i> Gage sizes)			
General	22, 79, 128		
Thread ( <i>see under</i> Screw threads)			



<b>M</b>	<b>Page</b>
Major cone, definition	6
Major diameter, definition	4
Major cylinder or cone, definition	3
Maximum material limit, definition	2
Measuring pressure	109
Measurement of pitch diameter	194
Wire method of	194
Method of designating threads	26, 98, 132
Miniature screw threads ( <i>see</i> National Miniature screw threads)	
Minimum material limit, definition	2
Minor cone, definition	6
Minor cylinder or cone, definition	3
Minor diameter, definition	4
Modified threads	26, 98
Multiple thread, definition	2

<b>N</b>	<b>Page</b>
National Miniature screw threads	100
Limits of thread size	105
Thread designations	105
Thread form	101
Tolerances	104
Net tolerances, basis of	128
Nomenclature ( <i>see</i> Definitions)	
Nominal size, definition	2

<b>P</b>	<b>Page</b>
Personnel of the Committee	1
Pipe thread	9
Symbols	9
Designations	10
Plating, screw thread ( <i>see</i> Coated threads)	
Pitch, definition	4
Pitch cone, definition	6
Pitch cylinder or cone, definition	3
Pitch diameter (simple effective diameter), definition	4
Pitch line, definition	3
Preferred diameters and pitches	75, 179
Pressure flank, definition	3

<b>R</b>	<b>Page</b>
Recommended gage practices	118
References	205
Right-hand thread, definition	2
Root, definition	3
Root truncation, definition	4
Rules for use of tables, special threads	180

<b>S</b>	<b>Page</b>
Screw thread	2
Classes	18, 75, 130, 179
Definition	2
Designating, method of	26, 98, 132
Elements, definitions	3
Forms	12, 101, 121
American National ( <i>see</i> American National screw threads)	
National Miniature ( <i>see</i> National Miniature screw threads)	
Unified ( <i>see</i> Unified and American screw threads)	
Limits of size	22, 79, 105, 128
Series	13, 104, 122
Definition	13
Shear area	5, 202
Definition	5
Formula	5
Symbols	7
Types, definitions	2
Sharp crest (or crest apex), definition	3
Sharp major cone, definition	6
Sharp minor cone, definition	7
Sharp root (or root apex), definition	3
Shear area, thread ( <i>see</i> Screw thread shear area)	
Single thread, definition	2
Sixteen-thread series	14, 18, 124, 143
Size, actual, basic, design, etc. definitions	2
Special screw threads ( <i>see</i> Unified and American special screw threads; American National special screw threads)	
Design	200
Standoff, definition	7
Strength factors in thread design	201
Stress area ( <i>see</i> Tensile stress area)	
Symbols	9, 13
Pipe thread	9
Screw thread	9

<b>T</b>	<b>Page</b>
Tap drill sizes	68
Taper screw thread elements, definitions	6
Taper threads, measurement of	107
Tapping, thread proportions in relation to	204
Temperature at which gages shall be standard	109
Tensile stress area	5, 10-19
Definition	5
Formula	5
Terminology ( <i>see</i> Definitions)	
Thickness of thread, definition	4
Thread ( <i>see</i> Screw threads)	
Thread design, examples of	204
Thread engagement	5, 22, 128
Depth of, definition	5
Eccentric	201
Length of, definition	5
Threads per inch, definition	4
Thread shear area, definition	5
Tolerance, definition	2
Tolerance limit, definition	2
Tolerance, unilateral, bilateral, definitions	2
Tolerances and allowances	20
Basic formula for	20
Definition of	2
Direction and scope of	19, 75, 104, 125, 179
Direction on gages	109
Gages	117
Major diameter	21
Minor diameter	21
Pitch diameter	21
Screw thread classes	18, 23
Total thread, definition	3
Transition fit, definition	3
Turns per inch, definition	4
Twelve-thread series	14, 18, 123, 140

<b>U</b>	<b>Page</b>
Unified and American screw threads	10
Applications	13
Limits of gage sizes	38
Limits of thread sizes	22, 79
Method of designating	26
Tap drill sizes	68
Thread classes	18, 75
Thread form	12
Thread series	13
Coarse	13, 16
Extra-fine	14, 17
Fine	14, 16
8-thread	15, 17
16-thread	14, 19
12-thread	14, 18
Tolerances and allowances	18
Variations in	22
Unified and American special screw threads	74
Diameter-pitch combinations	13, 15
Directions for determining limits of size of	100
Method for calculation of dimensions	99
Method of designating	98
Preferred diameters and pitches	75
Thread classes	75, 70
Selection of	98
Thread form	75
Tolerances and allowances	79
Unified form of thread	12

Unified thread series ( <i>see under</i> Unified and American)	
Uniform pitch series	14
Unilateral tolerance, definition	2
Unilateral tolerance system, definition	2

<b>V</b>	<b>Page</b>
Vanish cone, definition	4
Vanish point, definition	4
Variations in lead and angle	32
Virtual diameter (or effective size), definition	5

<b>W</b>	<b>Page</b>
Wire methods of measurement of pitch diameter	194
Measuring pressure for	109
Wires, thread measuring	195
Methods of measuring	195
Methods of using	195
Size of	195
Specifications for	196

## THE NATIONAL BUREAU OF STANDARDS

The scope of activities of the National Bureau of Standards at its headquarters in Washington, D. C., and its major field laboratories in Boulder, Colorado, is suggested in the following listing of the divisions and sections engaged in technical work. In general, each section carries out specialized research, development, and engineering in the field indicated by its title. A brief description of the activities, and of the resultant publications, appears on the inside front cover.

### WASHINGTON, D. C.

**Electricity and Electronics.** Resistance and Reactance. Electron Devices. Electrical Instruments. Magnetic Measurements. Dielectrics. Engineering Electronics. Electronic Instrumentation. Electrochemistry.

**Optics and Metrology.** Photometry and Colorimetry. Optical Instruments. Photographic Technology. Length. Engineering Metrology.

**Heat and Power.** Temperature Physics. Thermodynamics. Cryogenic Physics. Rheology. Engine Fuels. Free Radicals Research.

**Atomic and Radiation Physics.** Spectroscopy. Radiometry. Mass Spectrometry. Solid State Physics. Electron Physics. Atomic Physics. Neutron Physics. Nuclear Physics. Radioactivity. X-rays. Betatron. Nucleonic Instrumentation. Radiological Equipment. AEC Radiation Instruments.

**Chemistry.** Organic Coatings. Surface Chemistry. Organic Chemistry. Analytical Chemistry. Inorganic Chemistry. Electrodeposition. Gas Chemistry. Physical Chemistry. Thermochemistry. Spectrochemistry. Pure Substances.

**Mechanics.** Sound. Mechanical Instruments. Fluid Mechanics. Engineering Mechanics. Mass and Scale. Capacity, Density, and Fluid Meters. Combustion Controls.

**Organic and Fibrous Materials.** Rubber. Textiles. Paper. Leather. Testing and Specifications. Polymer Structure. Plastics. Dental Research.

**Metallurgy.** Thermal Metallurgy. Chemical Metallurgy. Mechanical Metallurgy. Corrosion. Metal Physics.

**Mineral Products.** Engineering Ceramics. Glass. Refractories. Enameled Metals. Concreting Materials. Constitution and Microstructure.

**Building Technology.** Structural Engineering. Fire Protection. Air Conditioning, Heating, and Refrigeration. Floor, Roof, and Wall Coverings. Codes and Specifications. Heat Transfer.

**Applied Mathematics.** Numerical Analysis. Computation. Statistical Engineering. Mathematical Physics.

**Data Processing Systems.** SEAC Engineering Group. Components and Techniques. Digital Circuitry. Digital Systems. Analog Systems. Application Engineering.

● Office of Basic Instrumentation

● Office of Weights and Measures

### BOULDER, COLORADO

**Cryogenic Engineering.** Cryogenic Equipment. Cryogenic Processes. Properties of Materials. Gas Liquefaction.

**Radio Propagation Physics.** Upper Atmosphere Research. Ionospheric Research. Regular Propagation Services. Sun-Earth Relationships.

**Radio Propagation Engineering.** Data Reduction Instrumentation. Modulation Systems. Navigation Systems. Radio Noise. Tropospheric Measurements. Tropospheric Analysis. Radio Systems Application Engineering.

**Radio Standards.** High Frequency Electrical Standards. Radio Broadcast Service. High Frequency Impedance Standards. Calibration Center. Microwave Physics. Microwave Circuit Standards.