AMERICAN NATIONAL STANDARD

Buttress Inch Screw Threads

7°/45° Form With 0.6 Pitch Basic Height of Thread Engagement

ANSI B1.9 - 1973
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Incorporates 2/79 Errata

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FOREWORD

Although the buttress thread was described as early as the March, 1888, Journal of the Franklin Institute, it was so little used that its national standardization was not undertaken until after the Combined Conservation Committee in early 1942 reviewed the standardization status of items needed in the war effort. Formerly each application of the buttress thread was treated individually and the form it took depended on the experience of the designer and the manufacturing equipment available.

At the American-British-Canadian conference in New York, in 1943, they agreed that a basic profile should be established for this thread. As the Military Departments needed buttress and other special types of threads, the War Production Board in February, 1944, arranged with the ASA to establish a General War Committee on Screw Threads.

The Interdepartmental Screw Thread Committee (ISTC) agreed to develop a buttress thread form having a pressure flank angle of 7 deg, which closely approaches the static angle of friction for well lubricated steel surfaces in contact, and a clearance flank angle of 45 deg.

The British agreed to prepare and circulate a draft specification for an asymmetrical buttress thread having a 7 deg load flank angle, a 45 deg clearance flank angle, and a basic height of thread engagement of 0.4 pitch.

The 1944 edition of Handbook H28 published the ISTC's recommendation of a basic buttress thread form which had a crest flat in the nut twice that of the screw, and a thread engagement height of approximately $0.56p$. In November 1944, the ASA War Subcommittee on Buttress Threads was established and after reviewing the British draft of April 1945, this committee felt that because of the distortion tendency of thin wall tubing, a greater basic height of thread engagement than $0.4p$ was desirable, especially since the minimum height of thread engagement is necessarily less than $0.4p$ by one-half the sum of the allowance and the tolerances on minor diameter of internal thread and major diameter of external thread. Therefore, the July 1945 draft of the War Standard was based on a basic height of thread engagement of $0.5p$.

Another American-British-Canadian conference sponsored by the Combined Production and Resources Board was held in Ottawa, Canada, September-October 1945. Here the British proposal of April 1945, with an alternate design of 0 deg pressure flank angle and a trailing flank angle of 52 deg, was reviewed and compared with the American proposal of July 1945. Learning that the British had had considerable favorable experience on thin wall tubing with buttress threads having $0.4p$ basic height of thread engagement, it was decided that the American standard might adopt this basis. Accord was also reached on preferred diameters and pitches, thread dimension tolerances and allowances, and on having each standard include in its appendix an alternate thread of 0 degree pressure flank angle. Further, each country agreed to publish the standard in conformance with their respective formats.

In April 1946, buttress threads were assigned to Subcommittee No. 3 of the Sectional Committee on the Standardization and Unification of Screw Threads, B1, and the committee membership was enlarged. This committee prepared and circulated in 1948 to members of the B1 committee a draft of a proposed standard based on the British proposal with a basic thread height of $0.4p$. The comments included so many objections to the shallow height of thread that in 1949 the committee decided to base the next draft on a thread having $0.6p$ engagement height. The committee also voted not to include in the appendix of the American standard data for a buttress thread having 0 deg pressure flank angle as it was evident that this was only one of several modifications that might be needed for special applications.

The next American-British-Canadian conference was called at the request of the Director of Defense Mobilization and held in New York, June 1952. The British Standard 1657: 1950 for Buttress Threads which is based on a thread engagement height of $0.4p$ and the American draft of September 1951, based on thread engagement height of $0.6p$, were reviewed. It was concluded that the applications for buttress threads are so varied that threads with either engagement height ($0.4p$ or $0.6p$) might be preferred for particular design requirements. It was recommended that the next printing of the British standard and the forthcoming American standard include the essential details of the other country's standards in appendixes. ASA B1.9-1953, Buttress Screw Threads, was issued in conformance with this recommendation.

This 1973 Revision of B1.9 is being issued to bring the standard into conformance with present practices. The three classes of threads have been reduced to two—Class 2 (standard grade) and Class 3 (precision grade).

Following approval by the Sectional Committee of B1, and the Secretariats, the revised standard was submitted to the American National Standards Institute for approval. This approval was granted on October 22, 1973.

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

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SCOPE: Nomenclature of screw threads; form of threads; diameter and pitches of screws for various uses; classification of thread fits, tolerances and allowances for threaded parts; and the gaging of threads. Screw threads for fire hose couplings are not included within the scope.

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CONTENTS

Section		Page
1.	Scope	1
2.	Definitions	1
3.	Form of Thread	1
4.	Symbols and Formulas	3
5.	Preferred Diameter-Pitch Combinations	4
6.	Tolerances	4
	6.1 Pitch Diameter Tolerances	4
	6.2 Tolerances on Major Diameter of External Thread and Minor Diameter of Internal Thread	7
	6.3 Tolerances on Minor Diameter of External Thread and Major Diameter of Internal Thread	7
	6.4 Lead and Flank Angle Deviations for Class 2	7
	6.5 Diameter Equivalents for Variations in Lead and Flank Angles for Class 3	7
	6.6 Tolerance on Taper and Roundness	7
7.	Allowance for Easy Assembly	8
8.	Example Showing Dimensions for a Typical Buttress Thread (2 Inch Diameter, 4 TPI, 7°/45° Flank Angles, Class 2)	8
9.	Thread Designations	8
	9.1 Thread Designation Abbreviations	8
	9.2 Designations for Standard Threads	8
	9.3 Superseded Designations	10
10.	Measurement of Buttress Thread Gages and Product	10
	10.1 Pitch Diameter Determination of Threaded Plug Gages	11
	10.2 Pitch Diameter Determination of Threaded Ring Gages	11
	10.3 Pitch Diameter Determination of External Product Threads	11
	10.4 Pitch Diameter Determination of Internal Product Threads	11
	10.5 Lead and Flank Angle Measurement	11
11.	Recommended Gaging Practice	11
	11.1 Recommended Gages and Gaging Practice for External Thread	11
	11.2 Recommended Gages and Gaging Practice for Internal Thread	12
	11.3 Root Relief Width for Gages	15
	11.4 Gage Tolerances	15
12.	Dimensional Acceptability of Buttress Product Screw Threads	15
	12.1 Dimensional Acceptability of Class 2 Buttress Product Threads	15
	12.2 Dimensional Acceptability of Class 3 Buttress Product Threads	15
Appendix A – Pitch Diameter Equivalents for Lead and Flank Angle Deviations		19
	A.1 Lead Deviations	19
	A.2 Flank Angle Deviations	19
	A.3 Computed Functional Size	19

Section Page

Appendix B – Pitch Diameter Measurement 20
B.1 Measurement of Pitch Diameter of External Buttress Threads 20
B.2 Measurement of Pitch Diameter and Groove Diameter of Internal Buttress Threads 20
B.3 Lead-Angle Correction 22
B.4 Wire Sizes 23
Appendix C – Notes on Corresponding British Standards 25
Appendix D – Buttress Screw Thread Designations Used in Old ASA B1.9-1953 Standard 27

TABLES

Table 1 Diameter-Pitch Combinations for 7°/45° Buttress Threads 4
Table 2 Basic Dimensions for 7°/45° Buttress Threads of Preferred Pitches 5
Table 3 Tolerances, Class 2 (Standard Grade) 6
Table 4 Tolerances, Class 3 (Precision Grade) 7
Table 5 Allowances, Classes 2 and 3 10
Table 6 *X* Gagemaker's Tolerances for GO and NOT GO Buttress Threaded Plug, Ring, Snap and Indicating Gages 13
Table 7 *W* Gagemaker's Tolerances for GO and NOT GO Buttress Threaded Setting Plug Gages 14
Table 8 Gagemaker's Tolerances for Plain Plug, Ring and Snap Gages 15
Table 9 Pitch Diameter Equivalents for Lead Deviations 16
Table 10 Pitch Diameter Equivalents for Flank Angle Deviations 17, 18
Table 11 Thread-Measuring Wires for 7°/45° Buttress Threads 21
Table 12 Numerical Data for British Standard Form Buttress Screw Threads 26

FIGURES

Fig. 1a Form of Standard 7°/45° Buttress Thread with 0.6*p* Basic Height of Thread Engagement and Round Root 2
Fig. 1b Form of 7°/45° Buttress Thread with 0.6*p* Basic Height of Thread Engagement and Flat Root 2
Fig. 2 Disposition of Buttress Thread Tolerances, Allowances, and Root Truncations 6
Fig. 3 Measuring Steps for Internal Pitch Diameter 22
Fig. 4 Diameters of "Best" and "Maximum" Thread Wires for Buttress Screw Threads 23
Fig. 5 British Standard Form of Buttress Thread Assuming no Allowance 25

AMERICAN NATIONAL STANDARD

BUTTRESS INCH SCREW THREADS

GENERAL

The buttress form of thread has certain advantages in applications involving exceptionally high stresses along the thread axis in one direction only. As the thrust side (load flank) of the standard buttress thread is made very nearly perpendicular to the thread axis, the radial component of the thrust is reduced to a minimum. On account of the small radial thrust, the buttress form of thread is particularly applicable when tubular members are screwed together. Examples of actual applications are the breech assemblies of large guns, airplane propeller hubs, and columns for hydraulic presses.

In selecting the form of thread recommended as standard, manufacture by milling, grinding, rolling, or other suitable means, has been taken into consideration. All dimensions are in inches.

SPECIFICATIONS

1 SCOPE

This standard relates to screw threads of buttress form and provides:

(a) A form of 7°/45° buttress thread with 0.6*p* basic height of thread engagement (see Fig. 1a).

(b) A table of preferred diameter-pitch combinations (see Table 1).

(c) A formula for calculating pitch diameter tolerances (see Par. 6.1).

(d) Tolerances for major and minor diameters (see Par. 6.2 and 6.3).

(e) A system of allowances between external and internal threads (see Par. 7).

(f) Recommended methods of measuring and gaging (see Par. 10 and 11).

(g) Dimensional acceptability of buttress product (see Section 12).

[a] In instances where absence of root radius is not detrimental to the requirements for strength, and where it is more economical to provide tools which do not produce a radius at root, flat root buttress threads may be specified.

APPENDIXES

The following appendixes are included in this standard:

(1) Pitch Diameter Equivalents for Lead and Flank Angle Deviations

(2) Pitch Diameter Measurement for External and Internal Buttress Threads

(3) 7°/45° British Standard Buttress Thread with 0.4*p* Basic Height of Thread Engagement.

1.1 The intent of this standard is not to preclude the use of other measuring or gaging systems provided they are properly correlated.

2 DEFINITIONS

See ANSI B1.7.

3 FORM OF THREAD

The form of the buttress thread is shown in Figs. 1a and 1b and has the following characteristics:

(a) A load flank angle, measured in an axial plane, of 7 degrees from the normal to the axis

(b) A clearance flank angle, measured in an axial plane, of 45 degrees from the normal to the axis

(c) Equal truncations at the crests of the external and internal threads such that the basic height of thread engagement (assuming no allowance) is equal to 0.6 of the pitch

(d) *Roots of threads*

(1) Equal radii, at the roots of the external and internal basic thread forms tangential to the load flank and the clearance flank (see Section 4, note a). There is, in practice, almost no chance that the thread forms will be achieved strictly as basically specified, that is, as true radii.

(2) Equal flat root of the external and internal thread (see footnote a).