

FED-STD-H28/7A  
25 October 1984  
SUPERSEDING  
~~FED-STD-H28/7~~  
31 August 1978  
(See Note)

**FEDERAL STANDARD**  
**SCREW-THREAD STANDARDS FOR FEDERAL SERVICES**  
**SECTION 7**  
**PIPE THREADS, GENERAL PURPOSE**

This standard was approved by the Assistant Administrator,  
Office of Federal Supply and Services, General Services  
Administration, for the use of all Federal Agencies.

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NO DELIVERABLE DATA REQUIRED BY THIS DOCUMENT

THIS

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## INFORMATION SHEET ON FEDERAL STANDARDS

This Federal Standard is issued in loose-leaf form to permit the insertion or removal of new or revised pages and sections.

All users of Federal Standards should keep them up to date by inserting revised or new pages as issued and removing superseded and cancelled pages.

New and revised pages will be issued under Change Notices which will be numbered consecutively and will bear the date of issuance. Change Notices should be retained and filed in front of the standard until such times as they are superseded by a reissue of the entire standard.

## FOREWORD

The American National Standard for Pipe Threads, originally known as the Briggs Standard, was formulated by Mr. Robert Briggs. For several years around 1862 Mr. Briggs was superintendent of the Pascal Iron Works of Morris, Tasker & Company, Philadelphia, PA., and later engineering editor of the Journal of the Franklin Institute. After his death on July 24, 1882, a paper by Mr. Briggs containing detailed information regarding American pipe and pipe thread practice, as developed by him when superintendent of the Pascal Iron Works, was read before the Institution of Civil Engineers of Great Britain. This is recorded in the Excerpt Minutes, Volume LXXI, Session 1882-1883, Part 1, of that Society.

It is of interest to note that the nominal sizes (diameters) of pipe ten (10) inches and under, and the pitches of the thread were for the most part established between 1820 and 1840.

By publishing his data, based on years of practice, Mr. Briggs was the means of establishing definite detail dimensions. The Briggs formula did not provide for the internal threads or gaging requirements for making taper threaded joints. It established only the external thread on pipe, with no tolerance.

In 1886 the large majority of American manufacturers threaded pipe to practically the Briggs Standard, and acting jointly with The American Society of Mechanical Engineers (ASME) they adopted it as a standard practice that year, and master plug and ring gages were made.

Later at various conferences representatives of the manufacturers and the ASME established additional sizes, certain details of gaging, tolerances, special applications of the standard, and in addition tabulated the formulas and dimensions more completely than was done by Mr. Briggs.

Until the manufacturers adopted the Briggs thread in 1886, it seems that each manufacturer of necessity threaded his pipe and fittings according to his best judgment. After 1886 there was some attempt to work toward better interchangeability. However, the need for a better gaging practice resulted in the adoption of the thin ring gage and the truncation of the plug and ring gages to gage the flanks of the thread. This practice of threading fittings and couplings which provides threads to make up joints with a wrench was standardized about 1913.

In 1913 a Committee on the Standardization of Pipe Threads was organized for the purpose of re-editing and expanding the Briggs Standard. The American Gas Association (AGA) and the American Society of Mechanical Engineers served as joint sponsors. After six years of work, this committee completed the revised standard for pipe threads which was published in the ASME Transactions of 1919, and was approved as an American Standard by the American Engineering Standards Committee, now named the American National Standards Institute. This standard was adopted by and appeared in the first 3 reports of the National Screw Thread Commission (NSTC).

Working with gage and tap makers, the NSTC extensively revised pipe thread gage tolerances and published these in the final NSTC Report in 1933. Further revision was made by the Sectional Committee on the Standardization of Pipe Threads, B2, which was organized in 1927 under the joint sponsorship of AGA and ASME. Their first standard was the American Standard for Pipe Threads, ASA B2.1-1942. The information from this standard was included in the first issue of the National Bureau of Standards (NBS) Handbook H28 (1942).

Dryseal pipe threads were added to the NBS Handbook H28(1944) and the 1945 Pipe Thread Standard ASA B2.1-1945. The Dryseal threads were separated from the ASA B2.1-1960 and put into a separate standard ASA B2.2-1960. These documents as well as the NBS Handbook H28 (1957) also revised the  $L_2$  hand tight engagements and corresponding  $E_1$  pitch diameters for the  $1/8$  and  $1/4$  nominal sizes to better agree with the number of turns specified for other sizes of taper pipe threads.

Under the sponsorship of ASME, the final issue of B2.1 was published as USAS B2.1-1968. Responsibility for this American National Standard for Pipe Threads was transferred from the ANSI Committee B2 to the ASME Committee B1 in 1973 which prepared the standard ANSI/ASME B1.20.1-1983.

FED-STD-H28/7, 31 August 1978, superseded Section VII of the NBS Handbook H28 (1957). It was titled "American Standard Pipe Threads (Except Dryseal and Hose Coupling Types)". The present issue is a complete revision of this standard.

FED-STD-H28/7A was prepared by the Defense Industrial Supply Center (DLA-IS) and incorporates the American National Standard for Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1-1983. Significant changes from the previous issue include the following:

- (1) Deleted full engagement  $L_2$  working ring gage.
- (2) Deleted reference gages.
- (3) Deleted master plug gage with small (0.033P) truncation.
- (4) Increased crest truncations for 27 and 18 thread per inch working gages to be equal to those of Dryseal pipe thread gages.
- (5) Reduced permissible wear on working gages from  $1/2$  to  $1/4$  turn.
- (6) Added turns-engagement method of gaging.

## SECTION 7 - PIPE THREADS, GENERAL PURPOSE

1. Scope. This section provides the standards for general purpose pipe threads used by the Federal Services.

1.1 Limitations. The following pipe threads are not covered in this section:

- a. Dryseal pipe threads (NPTF, PTF SAE Short, NPSF, NPSI) - see FED-STD-H28/8.
- b. Hose coupling and fire-hose coupling threads (NH, NPSH) - see FED-STD-H28/10.
- c. Aeronautical National Form taper pipe threads (ANPT) - see MIL-P-7105.

2. Referenced documents.

2.1 Government publication. The issue of the following document in effect on the date of invitation for bids or request for proposal forms a part of this standard to the extent specified herein.

Federal standard.

FED-STD-H28/1 Nomenclature, Definitions and Letter Symbols for Screw Threads

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative bi-monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S Government Printing Office, Washington, DC 20402.

(Single copies of this standard and other Federal specifications, standards and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.

(Federal Government activities may obtain copies of Federal standardization documents, and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

2.2 Other publications. The following document forms a part of this standard to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American National Standard.

ANSI/ASME B1.20.1-1983 Pipe Threads, General Purpose (Inch)

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(Application for copies should be addressed to the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017 or the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

3. Definitions. The terms applicable to this standard are defined in FED-STD-H28/1

4. General requirements. Thread designs, designations and inspection requirements shall be in accordance with ANSI/ASME B1.20.1-1983. Gages and gaging shall be in accordance with ANSI/ASME B1.20.1 - 1983 and alternatives in subsection 5 below.

5. Detailed requirements.

5.1 Alternate taper pipe thread gages - Limit type. There are occasions when it is desirable to check the maximum and minimum limits of taper threaded product directly with a limit working gage rather than with a standard basic working gage, which necessitates counting the turns by which the gage overtravels or fails to come up to the basic surface on the product. To meet this requirement, the design of limit gage shown in figure 7.1 has been developed as an alternative to the recognized standard type plug and ring gages. These gages retain the basic notch on the plug together with the basic surface of the ring, and in addition include two notches, or steps, on both plug and ring, one the maximum and one the minimum. The retention of the basic step or notch is not essential but facilitates checking against the master and reference gages and also provides a convenient means of checking the maximum and minimum steps. The limit gage thread form, tolerances, etc., are the same as specified for the corresponding standard type gages.

5.2 Alternate taper pipe thread gages - Triroll types. Zero lead threaded triroll gages are used to provide a functional check on external thread pitch diameter, taper, lead and flank angles. Examination is by visual or by dial indicator reading. Pitch diameters at each end of the effective thread ( $E_0$  and  $E_2$ ) may be checked using indicator gages with special short engagement thread rolls. External thread major diameters and taper may be checked using a plain triroll gage. This gage permits measurement of taper deviation which may be examined visually, or for all practical purposes be measured by inserting two thickness gages between the gage rolls and major diameter of the product, one on each side, at the point of extreme gap. This gage has a flush-pin arrangement with basic, maximum, and minimum steps on the body which represent the thread size, and maximum and minimum steps on the flush pin corresponding to the limits on crest truncation.

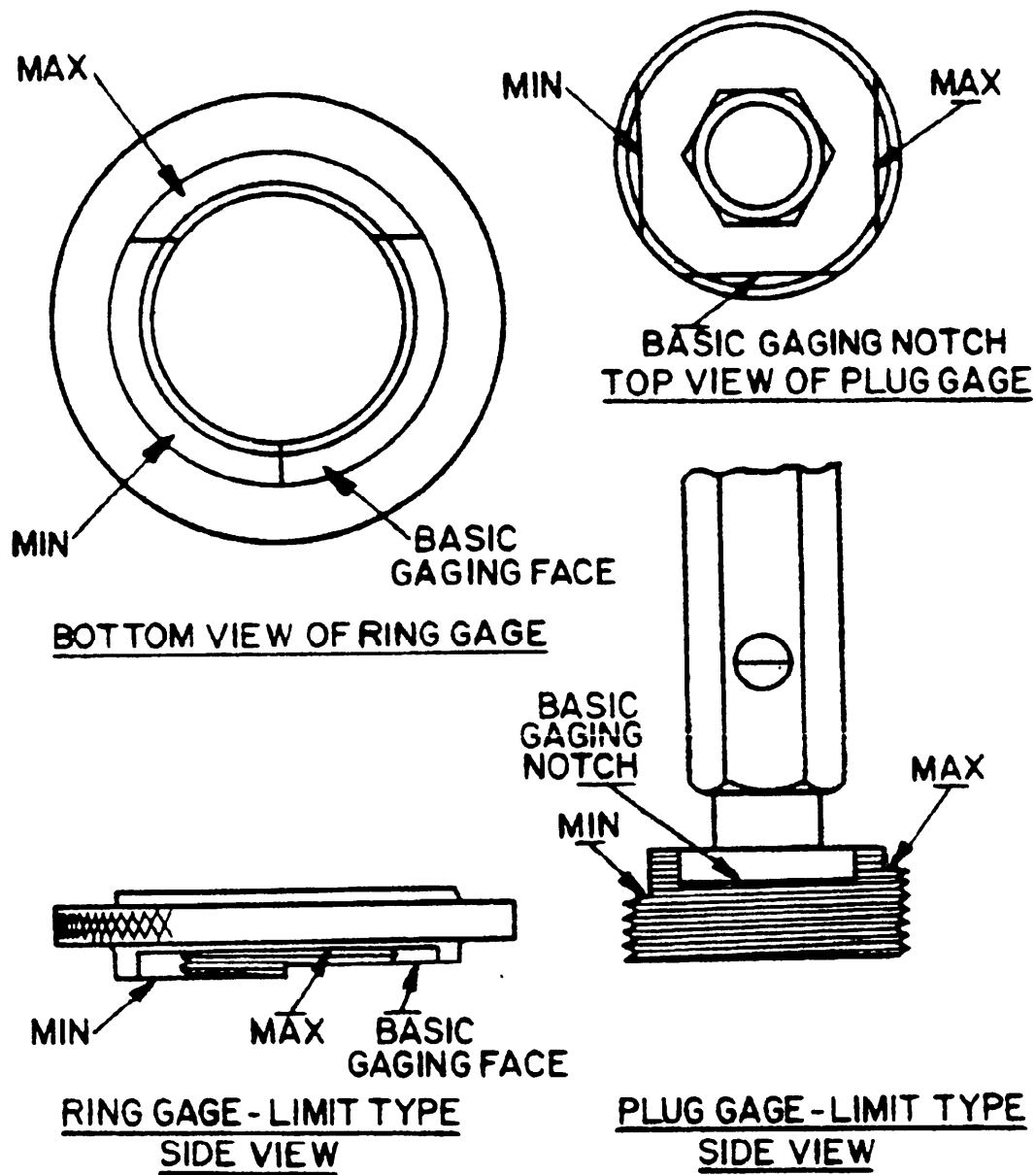


FIGURE 7.1- Alternative form of taper pipe thread limit plug and thread ring gages.

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**6. Notes.**

6.1 Supersession note. In addition to superseding FED-STD-H28/7 dated 31 August 1978, together with FED-STD-H28/8A this document also supersedes appendix A4 Subsections 6 and 7 and Appendix A7 of FED-STD-H28, dated 31 March 1978.

**MILITARY INTERESTS:**

Custodians:

Army - AR  
Navy - AS  
Air Force - 11

Review Activities:

Army - AT, GL, ME, MI  
Navy - YD

**CIVIL AGENCY COORDINATING ACTIVITIES:**

Commerce - NBS  
DOT - ACO, APM, FAA, FRA, NHTT  
GSA - FSS, PCD  
HUD - HCC  
Justice - FPI  
NASA - JFK, LRC, MSF  
USDA - AFS

**PREPARING ACTIVITY:**

DLA - IS

(DoD Project THDS-0051)

APPENDIX A

PITCH DIAMETER MEASUREMENT OF TAPER THREAD PLUG AND RING GAGES

10. Scope. This appendix provides reference information on measuring pitch diameters of taper thread gages using calibrated wires. The information contained herein is intended for guidance only.

20. Pitch diameter measurements.

20.1 Procedures. Procedures for measuring pitch diameters of taper thread plug and ring gages appear in ANSI B1.20.5-1978 Appendix B. This American National Standard is incorporated into FED-STD-H28/8A, Dryseal Pipe Threads. See latest editions applicable.

20.2 Measuring Wires. Requirements for calibrated measuring wires used in pitch diameter measurements appear in ANSI/ASME B1.2-1983 Appendix B. This American National Standard is incorporated into FED-STD-H28/6A, Gages and Gaging for Unified Screw Threads - UN and UNR Thread Forms (Not issued as of 1 October 1984). See latest editions applicable.



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## APPENDIX B

## SPECIAL PIPE THREAD APPLICATIONS

30. Scope. This appendix provides reference information on special pipe threads which had been included in FED-STD-H28 Appendix 7. The information contained herein is for guidance only.

40. Threading of pipe for American National Standard threaded steel flanges. Requirements for extra long external taper pipe threads on pipes engaged with threaded steel flanges of classes 600 or higher rating, appear in Annex A of ANSI B16.5-1981, American National Standard for Pipe Flanges and Flanged Fittings. See latest edition applicable.

50. Internal straight pipe threads in finished drums and external threads on plugs.

50.1 Standard drum closures. The flanges of the bung and vent are tapped respectively with 2 in. and 3/4 in. straight pipe threads having dimensions in accordance with table VII.B.1. Large tolerances in addition to the allowance have been provided to ensure easy seating of the plug in the flange when making up the joint with a proper gasket.

TABLE VII.B.1 Drum plug and flange thread limits of size and tolerances.

Item	Size	Threads per inch	Major diameter			
			Maximum	Tolerance	Minimum	
Flange.....	in. 3/4	14	in. .....	in. .....	in. 1.0324	
Plug.....	3/4	14	1.0274	0.0200	1.0074	
Flange.....	2	11 1/2	.....	.....	2.3495	
Plug.....	2	11 1/2	2.3395	.0200	2.3195	
Item	Pitch diameter			Minor diameter		
	Maximum	Tolerance	Minimum	Maximum	Tolerance	Minimum
Flange.....	in. 1.0045	in. .0185	in. .9860	in. 0.9648	in. 0.0200	in. 0.9448
Plug.....	.9810	.0180	.9630	.9398	.....	.....
Flange.....	2.3150	.0220	2.2030	2.2628	.0200	2.2428
Plug.....	2.2830	.0220	2.2610	2.2328	.....	.....

50.2 Special drum closures. Some types of explosives and other dangerous materials are transported in containers having a special form of flange and plug. The dimensions of the straight screw threads of these parts are established by the Interstate Commerce Commission. The thread form is that originally developed by the Manufacturing Chemist's Association (now Chemical Manufacturers Association). Its principal dimensions are:

Form of thread: Angle,  $60^{\circ}$ ; depth of thread, 0.0933 in; and radii of crest and root, 0.0075 in.

Internal screw thread in flange: threads per inch, 8; pitch diameter, 2.2067 in.; maximum major diameter, 2.305; minimum major diameter, 2.295 in.; maximum minor diameter, 2.1184 in.; minimum minor diameter, 2.1084 in.; length of thread, 11/16 in.

External screw thread on plug: pitch diameter, 2.1887 in.; maximum major diameter, 2.287 in.; minimum major diameter, 2.277 in.; maximum minor diameter, 2.1004 in.; minimum minor diameter, 2.0904 in.; length of thread, 11/16 plus 1/8 in. recess.

60. Taper and straight threads for rigid steel electrical conduit and fittings. Requirements for conduit and fitting threads appear in the National Electrical Manufacturers Association (NEMA) Publication No. FB1-1977. (See latest edition applicable). These threads are based upon standard taper and straight pipe threads. The non-standard size 4 1/2 - 8 pipe thread has been added. A summary of conduit thread characteristics is provided in table VII.B.2 for information.

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TABLE VII.B.2 Conduit Thread Characteristics.

Conduit Thread Designation	Type	Description	Gaging
NTC	External taper	Same as NPT	NPT $L_1$ limit gage
NTC - SHORT	External taper	Same as NPT except minimum thread length is equal to tabulated minimum thread projection of connector in UL514B. Thread tapers down from $E_1$ pitch diameter	Modified NPT $L_1$ limit gage
NTC	Internal taper	Same as NPT except 4 pitches extra engagement.	Special NPT " $L_1$ plus 4 pitch" gage
NTCM	Internal taper	Same as NPT except 1 pitch extra engagement. Thread depth is the same as for NTC	NPT $L_1$ gage or special NPT " $L_1$ plus 1 pitch" gage
NSC	External straight	Pitch diameters less than NPT diameter $E_1$ with maximum for 18tpi, -0.002; tolerance 0.005 for 14tpi, -0.002; tolerance 0.006 for 11.5tpi, -0.0025; tolerance 0.008 for 8tpi, -0.003; tolerance 0.011 Minimum thread length is equal to tabulated minimum thread projection of connector in UL 514B.	NPSM GO thread gage
NSC	Internal straight	Pitch diameters greater than NPT diameter $E_1$ with minimum for 18tpi, +0.002; tolerance 0.006 for 14tpi, +0.003; tolerance 0.007 for 11.5tpi, +0.005; tolerance 0.008 for 8tpi, +0.007; tolerance 0.012 Minimum thread depth is the same as NPT $L_2$ .	NPSM GO thread gage
NSC - SHORT	Internal straight	Same as NSC except minimum thread depth is 3.5 pitches for 18 and 14tpi and 4 pitches for 11.5 and 8tpi.	NPSM GO thread gage