Pipe Threads, General Purpose (Inch)

1 INTRODUCTION

1.1 Scope

This Standard covers dimensions and gaging of pipe threads of the following series:

NPT
NPSC
NPTR
NPSM
NPSL

1.2 Related Standard

Hose coupling joints are ordinarily made with straight internal and external loose-fitting threads. There are several standards of hose threads having various diameters and pitches, one of which is based on the American National Standard Pipe Thread. By the use of this thread series, NPSH, it is possible to join small hose couplings in sizes ½ to 4, inclusive, to ends of standard pipe having American National Standard external pipe threads, using a gasket to seal the joint. For dimensions, tolerances, and gaging, see ASME B1.20.7.

1.3 Thread Designations

1.3.1 The types of pipe threads included in this Standard are designated by specifying in sequence the nominal pipe size, number of threads per inch, and the thread series symbol as follows:

⅛–27 NPT
⅛–27 NPSC
½–14 NPTR
⅛–27 NPSM
⅛–27 NPSL

Decimal equivalent notation may be substituted for fractional pipe sizes. For example

0.125–27 NPT

For left-hand threads, add "LH" to the designation. For example

⅛–27 NPT–LH

Designations without "LH" will signify right-hand threads.

1.3.2 Each of these letters in the symbols has significance as follows:

N = National (American) Standard
P = Pipe
T = Taper
S = Straight
C = Coupling
R = Railing Fittings
M = Mechanical
L = Locknut

1.4 Sealing (NPT and NPSC Only)

1.4.1 Mating Threads. Mating threads should always contact on the thread flanks. The design tolerances are such that mating crests and roots may clear, contact, or interfere (see Fig. 1). This joint may not necessarily seal, unless a sealant is used.

1.4.2 Sealant. Where pressure-tight, leak-free joints are required, it is intended that threads conforming to this Standard be made up wrench-tight with a sealant. To prevent galling during installation, the sealant may have lubricating properties.

1.4.3 Tightening Torque. Due to application-specific variables such as materials, wall thickness, operating pressures, etc., no guidance is given in this Standard regarding joint-tightening torque. However, joints should be tightened beyond the hand-tight engagement position. Advancing the joint past hand-tight creates interference between external and internal thread flanks, produces a seal (with the use of a sealant), and helps prevent loosening of the joint. Overtightening may be detrimental to the sealing function of the joint.

1.4.4 Other Considerations. Out-of-roundness of mating parts can negatively affect their ability to seal when made up wrench tight. The product's elasticity and ductility will also affect sealing.

1.4.5 Pressure-Tight Threads Without Sealant. Pipe threads designed for pressure-tight joints that may be used without sealing compounds (Dryseal Threads) are covered in ASME B1.20.3.

1.5 Appendices

Useful and supplementary information that is not a part of this Standard is presented in a nonmandatory appendix. Specifically, the nonmandatory appendices cover the turns of engagement method of gaging, suggested prethreading hole diameters, and an explanatory gaging matrix.

Fig. 3 American National Standard Taper Pipe Thread Notation

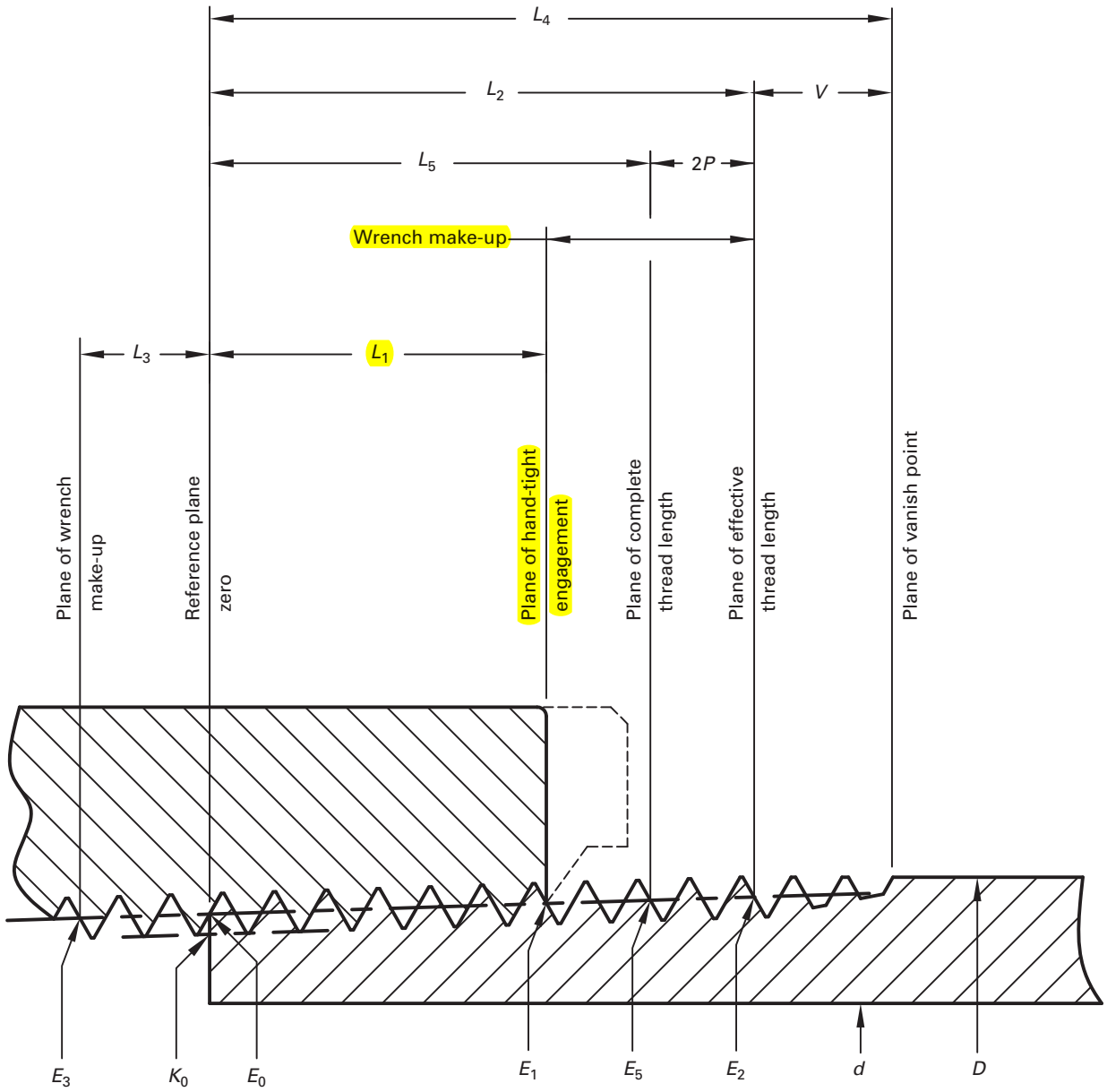

Table 2 Basic Dimensions of American National Standard Taper Pipe Thread, NPT (Cont'd)

Nominal Pipe Size	O.D. of Pipe, D	Threads/ Inch, n	Pitch of Thread, P	Pitch Diameter at Beginning of External Thread, E_0	Hand-tight Engagement			Effective Thread, External			Length, L_1 Plane to L_2 Plane, External Thread, $L_2 - L_1$		Wrench Make-Up Length, Internal Thread			Vanish Thread, V		Overall Length, External Thread,[4] L_4	Nominal Complete External Threads[5]		Height of Thread, h	Change in Diameter per Turn of Thread, $0.0625/n$	Basic Minor[6] Diameter at Small End of Pipe, K_0
					Length,[1] L_1		Pitch Diameter,[2] E_1	Length,[3] L_2		Pitch Diameter, E_3			Length, L_3		Pitch Diameter, E_3				Length, L_5	Pitch Diameter, E_5			
					in.	Threads		in.	Threads		in.	Threads	in.	Threads		in.	Threads		in.				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1/16	0.3125	27	0.03703704	0.27118	0.1600	4.32	0.28118	0.2611	7.05	0.28750	0.1011	2.73	0.1111	3	0.26424	0.1285	3.47	0.3896	0.1870	0.28287	0.02963	0.00231	0.2415
1/8	0.4050	27	0.03703704	0.36351	0.1615	4.36	0.37360	0.2639	7.13	0.38000	0.1024	2.76	0.1111	3	0.35656	0.1285	3.47	0.3924	0.1898	0.37537	0.02963	0.00231	0.3338
1/4	0.5400	18	0.05555556	0.47739	0.2278	4.10	0.49163	0.4018	7.23	0.50250	0.1740	3.13	0.1667	3	0.46697	0.1928	3.47	0.5946	0.2907	0.49556	0.04444	0.00347	0.4329
3/8	0.6750	18	0.05555556	0.61201	0.2400	4.32	0.62701	0.4078	7.34	0.63750	0.1678	3.02	0.1667	3	0.60160	0.1928	3.47	0.6006	0.2967	0.63056	0.04444	0.00347	0.5675
1/2	0.8400	14	0.07142857	0.75843	0.3200	4.48	0.77843	0.5337	7.47	0.79178	0.2137	2.99	0.2143	3	0.74504	0.2479	3.47	0.7815	0.3909	0.78286	0.05714	0.00446	0.7014
3/4	1.0500	14	0.07142857	0.96768	0.3390	4.75	0.98887	0.5457	7.64	1.00178	0.2067	2.89	0.2143	3	0.95429	0.2479	3.47	0.7935	0.4029	0.99286	0.05714	0.00446	0.9106
1	1.3150	11.5	0.08695652	1.21363	0.4000	4.60	1.23863	0.6828	7.85	1.25631	0.2828	3.25	0.2609	3	1.19733	0.3017	3.47	0.9845	0.5089	1.24544	0.06957	0.00543	1.1441
1 1/4	1.6600	11.5	0.08695652	1.55713	0.4200	4.83	1.58338	0.7068	8.13	1.60131	0.2868	3.30	0.2609	3	1.54083	0.3017	3.47	1.0085	0.5329	1.59044	0.06957	0.00543	1.4876
1 1/2	1.9000	11.5	0.08695652	1.79609	0.4200	4.83	1.82234	0.7235	8.32	1.84131	0.3035	3.49	0.2609	3	1.77978	0.3017	3.47	1.0252	0.5496	1.83044	0.06957	0.00543	1.7266
2	2.3750	11.5	0.08695652	2.26902	0.4360	5.01	2.29627	0.7565	8.70	2.31630	0.3205	3.69	0.2609	3	2.25272	0.3017	3.47	1.0582	0.5826	2.30543	0.06957	0.00543	2.1995
2 1/2	2.8750	8	0.12500000	2.71953	0.6820	5.46	2.76216	1.1375	9.10	2.79063	0.4555	3.64	0.2500	2	2.70391	0.4338	3.47	1.5712	0.8875	2.77500	0.10000	0.00781	2.6195
3	3.5000	8	0.12500000	3.34063	0.7660	6.13	3.38850	1.2000	9.60	3.41563	0.4340	3.47	0.2500	2	3.32500	0.4338	3.47	1.6337	0.9500	3.40000	0.10000	0.00781	3.2406
3 1/2	4.0000	8	0.12500000	3.83750	0.8210	6.57	3.88881	1.2500	10.00	3.91563	0.4290	3.43	0.2500	2	3.82188	0.4338	3.47	1.6837	1.0000	3.90000	0.10000	0.00781	3.7374
4	4.5000	8	0.12500000	4.33438	0.8440	6.75	4.38713	1.3000	10.40	4.41563	0.4560	3.65	0.2500	2	4.31875	0.4338	3.47	1.7337	1.0500	4.40000	0.10000	0.00781	4.2343
5	5.5630	8	0.12500000	5.39073	0.9370	7.50	5.44929	1.4063	11.25	5.47863	0.4693	3.75	0.2500	2	5.37511	0.4338	3.47	1.8400	1.1563	5.46300	0.10000	0.00781	5.2907
6	6.6250	8	0.12500000	6.44609	0.9580	7.66	6.50597	1.5125	12.10	6.54063	0.5545	4.44	0.2500	2	6.43047	0.4338	3.47	1.9462	1.2625	6.52500	0.10000	0.00781	6.3460
8	8.6250	8	0.12500000	8.43359	1.0630	8.50	8.50003	1.7125	13.70	8.54063	0.6495	5.20	0.2500	2	8.41797	0.4338	3.47	2.1462	1.4625	8.52500	0.10000	0.00781	8.3335
10	10.7500	8	0.12500000	10.54531	1.2100	9.68	10.62094	1.9250	15.40	10.66563	0.7150	5.72	0.2500	2	10.52969	0.4338	3.47	2.3587	1.6750	10.6500	0.10000	0.00781	10.4453
12	12.7500	8	0.12500000	12.53281	1.3600	10.88	12.61781	2.1250	17.00	12.66563	0.7650	6.12	0.2500	2	12.51719	0.4338	3.47	2.5587	1.8750	12.6500	0.10000	0.00781	12.4328
14	14.0000	8	0.12500000	13.77500	1.5620	12.50	13.87263	2.2500	18.00	13.91563	0.6880	5.50	0.2500	2	13.75938	0.4338	3.47	2.6837	2.0000	13.9000	0.10000	0.00781	13.6749
16	16.0000	8	0.12500000	15.76250	1.8120	14.50	15.87575	2.4500	19.60	15.91563	0.6380	5.10	0.2500	2	15.74688	0.4338	3.47	2.8837	2.2000	15.9000	0.10000	0.00781	15.6624
18	18.0000	8	0.12500000	17.75000	2.0000	16.00	17.87500	2.6500	21.20	17.91563	0.6500	5.20	0.2500	2	17.73438	0.4338	3.47	3.0837	2.4000	17.9000	0.10000	0.00781	17.6499
20	20.0000	8	0.12500000	19.73750	2.1250	17.00	19.87031	2.8500	22.80	19.91563	0.7250	5.80	0.2500	2	19.72188	0.4338	3.47	3.2837	2.6000	19.9000	0.10000	0.00781	19.6374
24	24.0000	8	0.12500000	23.71250	2.3750	19.00	23.86094	3.2500	26.00	23.91563	0.8750	7.00	0.2500	2	23.69688	0.4338	3.47	3.6837	3.0000	23.9000	0.10000	0.00781	23.6124

GENERAL NOTE: The basic dimensions of the American National Standard Taper Pipe Thread are given in inches to four or five decimal places. While this implies a greater degree of precision than is ordinarily attained, these dimensions are the basis of gage dimensions and are so expressed for the purpose of eliminating errors in computations.

NOTES:

(1) Also length of L_1 ring gage and length from gaging notch to small end of L_1 plug gage.

(2) Also pitch diameter at gaging notch of L_1 plug gage (hand-tight plane).

(3) Also threaded length of L_1 plug gage.

(4) Reference dimension.

(5) The length L_5 from the end of the pipe determines the plane beyond which the thread form is incomplete at the crest. The next two threads are complete at the root. At this plane, the cone formed by the crests of the thread intersects the cylinder forming the external surface of the pipe ($L_5 = L_2 - 2P$).

(6) Given as information for use in selecting tap drills (see Nonmandatory Appendix B).