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 1/8 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:

- 1/8–27 NPT
- 1/8–27 NPSC
- 1/4–14 NPTR
- 1/8–27 NPSM
- 1/8–27 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

1/8–27 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

Plane of wrench make-up

Reference plane zero

Plane of hand-tight engagement

Plane of complete thread length

Plane of effective thread length

Plane of vanish point

Wrench make-up

\[ L_3 \]

\[ L_1 \]

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

<table>
<thead>
<tr>
<th>Nominal Pipe Size</th>
<th>Pitch Diameter at Beginning of External Thread, (D_{1})</th>
<th>Effective Thread, External Thread</th>
<th>Length, (L_1) Plane to (L_2) Plane, (L_1 - L_2)</th>
<th>Wrench Make-Up Length, (L_3)</th>
<th>Nominal Complete External Threads</th>
<th>Change in Diameter per Turn of Thread, (0.0625/n)</th>
<th>Basic Minor Diameter at Small End of Pipe, (K_n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\frac{1}{16})</td>
<td>0.3125</td>
<td>0.27118</td>
<td>0.28118</td>
<td>0.2611</td>
<td>0.28750</td>
<td>0.27887</td>
<td>0.27798</td>
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<tr>
<td>(\frac{1}{4})</td>
<td>0.4050</td>
<td>0.36351</td>
<td>0.37360</td>
<td>0.28390</td>
<td>0.40000</td>
<td>0.39118</td>
<td>0.38687</td>
</tr>
<tr>
<td>(\frac{1}{8})</td>
<td>0.5400</td>
<td>0.47739</td>
<td>0.49163</td>
<td>0.4018</td>
<td>0.50520</td>
<td>0.49728</td>
<td>0.49190</td>
</tr>
<tr>
<td>(\frac{1}{16})</td>
<td>0.6750</td>
<td>0.61201</td>
<td>0.62701</td>
<td>0.4078</td>
<td>0.63750</td>
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<tr>
<td>(\frac{1}{8})</td>
<td>0.8400</td>
<td>0.73664</td>
<td>0.78443</td>
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<td>0.79127</td>
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<tr>
<td>(\frac{1}{4})</td>
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<td>0.77143</td>
<td>0.86768</td>
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<td>0.97738</td>
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<tr>
<td>(\frac{1}{8})</td>
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<td>0.86955</td>
<td>1.15713</td>
<td>0.4230</td>
<td>1.05838</td>
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<td>1.04653</td>
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<tr>
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<td>1.17609</td>
<td>0.4230</td>
<td>1.08234</td>
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<td>1.07063</td>
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<tr>
<td>(\frac{1}{8})</td>
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<td>0.4036</td>
<td>1.29627</td>
<td>1.29045</td>
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<tr>
<td>(\frac{1}{16})</td>
<td>2.0150</td>
<td>0.86955</td>
<td>1.27953</td>
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<td>1.50595</td>
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<td>1.49404</td>
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<tr>
<td>(\frac{1}{8})</td>
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<td>0.6280</td>
<td>1.54802</td>
<td>1.54200</td>
<td>1.53611</td>
</tr>
</tbody>
</table>

**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 for 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 \(L_2\) plug gage.
2. Also pitch diameter at gaging notch of \(L_2\) plug gage (hand-tight plane).
3. Also threaded length of \(L_1\) plug gage.
4. Reference dimension.
5. The length \(L_2\) 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 (\(L_1 = L_2 - 2P\)).
6. Given as information for use in selecting tap drills (see Nonmandatory Appendix B).