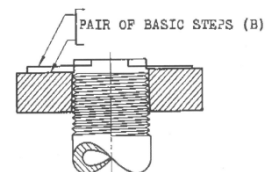
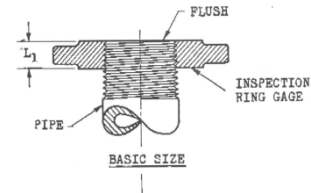
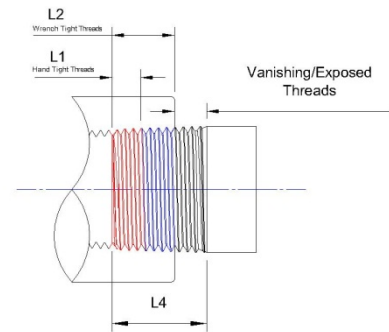


ANPT Inspection Gaging & Recommended Thread Make-Up Procedures

The following guidelines are intended to provide the fabricator and installer a basic interpretation of ANSI B1.20.1 National Pipe Tapered Thread (NPT), SAE AS71051B Aeronautical National Pipe Tapered Thread (ANPT) and their respective gaging specifications so to quickly determine whether the pipe nipple is cut and/or the joint made-up properly. Both NPT and ANPT taper pipe threads have the same general form and dimensions except ANPT tolerances are held a bit closer. There are many variables that effect thread quality and form from dull or improperly ground chasers to incorrect machine set-up and performance, these guidelines are to be used in conjunction with the referenced specifications, periodic quality control inspection measures and experience. Furthermore these recommendations assume the threads are properly formed i.e. free from chatter & tares and are not out-of-round.

ANPT Male Thread Inspection

- 1) **L4 Overall Thread Length** – Determine the nominal pipe size and measure the overall thread length and compare it to the corresponding L4 dimension below. Ultimately it should be within plus or minus one thread or the thread pitch dimension, but it is standard nipple manufacturing practice to vary up to twice the thread pitch dimension due to cutting tool lead-in differences, ref ASTM A733-4.2. If the measured L4 dimension is typically greater than or less than the thread pitch dimension and the L1 and L2 dimension measures correctly, then this difference should be added/subtracted from the exposed ($L4 - (L1 + L3)$) thread dimension in the chart below.
- 2) **L1 Hand Tight** – Insure threads are free of chips, burrs, abrasives, nicks, or other foreign materials. Engage a calibrated NPT L1 ring gage to hand tight. A light tap or rap of the gage or nipple is common practice to assure proper seating of the gage. The nipple is correct only if the small end does not project through the ring gage more than one thread for the minimum size (MN), or fails to come flush (B) with the face of the gage but not more than one turn for maximum size (MX). Remember the condition. Disengage L1 gage.
- 3) **L2 Wrench Tight** – Insure threads are free of chips, burrs, abrasives, nicks, or other foreign materials. Engage a calibrated ANPT L2 ring gage to hand tight. A light tap or rap of the gage or nipple is common practice to assure proper seating of the gage. The nipple is correct only if the L2 ring has the same position or flush condition as the L1 ring within $\frac{1}{2}$ turn. By this relationship, taper, lead, thread angle, and size has been established within tolerance. Disengage L2 gage.
- 4) **Six-Step Taper Truncation Gage** – Engage an ANPT Six-Step Taper Gage without pressure. This gage has three pairs of steps marked MN (Min), B (Basic), MX (Max). The terms refer to the product thread size or the major thread pitch diameter. Select the pair of steps which corresponds nearest to the position or flush condition of the L1 gage from above, if the small end of the product is flush or between the pair of steps selected it has correct truncation.

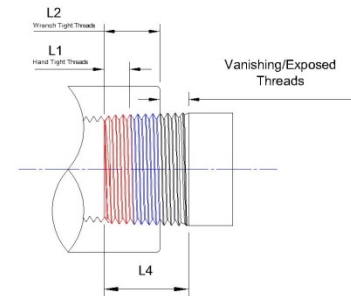


Fitting & Sprinkler Make-On Procedures

Under normal installation procedures, using either pipe dope or tape containing Teflon, NPT threads are cut with sufficient length to permit sealing when made-up to wrench tight engagement.

A nipple being threaded into the fitting should make up hand tight to the L1 dimension shown in the chart below. With respect to 1/2" or 3/4" sprinklers, some manufacturers employ a short shank on the sprinkler. Instead of providing the number of threads required by the specifications, i.e. the total number of effective male threads equal to L2, the manufacturer reduces the number L2 threads so that hand tight (L1) make-up does not equal the number of threads shown in the following chart. It is a relatively simple matter to determine whether a short shank is provided on the sprinkler by counting the number of perfect threads. If less than the number shown in L2, then the sprinkler employs a short shank.

When made-up to wrench tight engagement, the total make-up should equal L1 + L3 shown in the following chart, plus or minus one thread (the tolerance of NPT threads). Note, when a sprinkler is installed in either a 1/2" or 3/4" fitting, the total make-up can be reduced by approximately two (2) threads if a short shank sprinkler is used. The job foreman can quickly double check the installers work by visually checking the number of exposed threads showing on the nipple. This typically is 3 1/2 - 4 threads plus or minus one thread up to 2" nominal pipe size. Note the number of vanishing threads showing on the make-up can vary by up to 2 threads due to cutting tool lead-in differences.



Nominal Pipe Size	L4 Overall		L1		L3 Female		L1 + L3	L2 Male		L4 - (L1+L3)
	Thrd Length Inch	Thrd Pitch Inch	Hand Tight Inch / Thrds	Wrench Tight Inch / Thrds	Total Make-Up Inch / Thrds	Wrench Tight Inch / Thrds	Exposed Threads Inch / Thrds			
1/4"	0.595	0.056	0.228 / 4.1	0.168 / 3.0	0.396 / 7.1	0.402 / 7.2	0.199 / 3.6			
3/8"	0.601	0.056	0.240 / 4.3	0.168 / 3.0	0.408 / 7.3	0.408 / 7.3	0.193 / 3.4			
1/2"	0.782	0.071	0.320 / 4.5	0.214 / 3.0	0.534 / 7.5	0.534 / 7.5	0.248 / 3.5			
3/4"	0.794	0.071	0.339 / 4.8	0.214 / 3.0	0.553 / 7.8	0.546 / 7.6	0.241 / 3.4			
1"	0.985	0.087	0.400 / 4.6	0.270 / 3.0	0.670 / 7.6	0.683 / 7.8	0.315 / 3.6			
1 1/4"	1.009	0.087	0.420 / 4.8	0.270 / 3.0	0.690 / 7.8	0.707 / 8.1	0.319 / 3.7			
1 1/2"	1.025	0.087	0.420 / 4.8	0.270 / 3.0	0.690 / 7.8	0.724 / 8.3	0.335 / 3.9			
2"	1.058	0.087	0.436 / 5.0	0.270 / 3.0	0.709 / 8.0	0.757 / 8.7	0.349 / 4.0			
2 1/2"	1.571	0.125	0.682 / 5.5	0.250 / 2.0	0.932 / 7.5	1.138 / 9.1	0.639 / 5.1			
3"	1.634	0.125	0.766 / 6.1	0.250 / 2.0	1.016 / 8.1	1.200 / 9.6	0.618 / 4.9			
4"	1.734	0.125	0.844 / 6.8	0.250 / 2.0	1.094 / 8.7	1.300 / 10.4	0.640 / 5.1			

If a sprinkler or a pipe nipple fails to provide the total engagement listed (L1+L3), the installer should (1) back the sprinkler or nipple out, (2) check the threads for chips, burrs, abrasives, nicks, or other foreign materials and conformity to ANSI B1.20.1, (3) clean if necessary, (4) reapply pipe sealant and make up again. Under no circumstances should the installer over-torque the sprinkler or nipple, since this may only aggravate the problem and perhaps even damage the threads.

Aegis strongly recommends that installers have both a L1 internal NPT thread plug gage for female threads, and a L1 external ring gage for male threads on the job site for typical nominal pipe sizes installed, ie 1/2" thru 2". These inexpensive gages are extremely useful for locating and repairing thread problems in the field.

Come back labor can be virtually eliminated, if during fabrication and installation of the piping, the above procedures are followed. Move over, the need to drain the system upon finding a leaking sprinkler or pipe nipple is also eliminated when the fabricator and/or installer knows that adequate seal tight engagement of the threads was made from the outset.