PIPE TAPS

Pipe thread tapping is more difficult than machine thread tapping. The demands for accuracy of the product thread are greater because a pipe thread is not a fastening thread, but a sealing assembly.

Pipe taps and other threading tools must cut 100% of the thread height to maintain the standard thread profile. Pipe thread engagement generally requires total thread contact of the two parts. Both thread flanks and the crest and root of the thread.

Because of the very heavy chip load on a pipe tap, the design and use of these taps must be given special consideration.

- Tap design must provide relief features and flute form to hold tapping effort to a minimum.
- Sharpness must be retained to minimize stop line ridges in the product thread.
- Lead screw control is best in pipe tapping.
- The tap and the workpiece must be held rigid.
- A good cutting oil should be used.
- A flow of coolant should be used whenever possible. If a coolant flow is not possible, oil should be brushed on the tap and in the hole. The use of a squirt can is not as efficient as brushing on.
- Tapping depth must be controlled to prevent driving the taper pipe tap beyond the gage line. This should be controlled by a stop on the tapper.
- The practice of twisting a wire around the tap thread to serve as a stop gage is highly detrimental to tap performance. It blocks coolant and interferes with chip motion in the flutes.
- There must be ample power to drive the tap, without stopping or hesitation, to the required depth.

Call your Vermont Tap & Die distributor or representative for assistance with pipe threading problems.

Technical Information

All 1/8" pipe taps are available with either the small (.3125 diameter) shank or with the standard large (.4375 diameter) shank. If not specified, the large shank will be furnished.

Special projection taps (short or long) are available.

Pottstown type and other special shank taps are available as special.

British pipe taps BSPT and BSPP are available as special. These taps are made to American standard pipe tap general dimensions (standard blank) with British Standard Pipe thread — Whitworth form.

When tapping pipe threads, the hole size should be adjusted so that the tap will develop the full thread profile in the workpiece. Generally, the drill selected is the nearest standard drill size less than the tap minor diameter. (See Table 18)

The Use of Taper Pipe Reamers

Most taper pipe thread tapping can be done in a straight drilled hole - not taper reamed.

There are some pipe thread assembly conditions that require reaming to have a greater number of fully profiled or "perfect" threads in the hole, such as the ANPT and some gas coupling threads.

Taper reaming should be avoided whenever possible. It imposes an unnaturally high strain on the tap threads because the tap has to start its cut at the crests of the full threads, with the cutting forces in the direction of the tap cross section, instead of progressing along the chamfered thread and in a lengthwise direction. The tap chamfer is really ineffective.

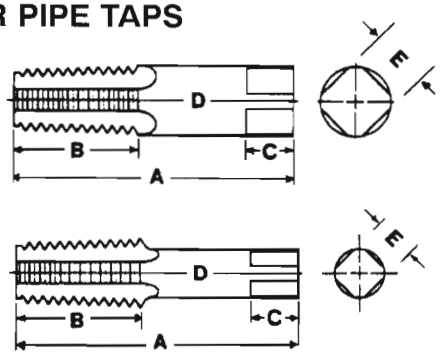
Taper reaming depth must be carefully controlled. If it is too deep, the tap will not produce a full height pipe thread when stopped at the required gaging position. If it is not reamed deeply enough, an even greater load is imposed on the tap, resulting in reduced tap life.

Taper pipe reaming has been found to be an unnecessary operation and the cause of what was believed to be "tapping problems."

TABLE #13 USCTI TABLE 310
PIPE TAP THREAD DESIGNATION SYMBOLS

DESIGNATION	THREAD SERIES DESCRIPTION	AMERICAN NATIONAL STANDARD REFERENCE NO.
NH	American Standard hose coupling threads of full form	B2.4 (B1.20.7)
NPS	American Standard straight pipe threads	–
NPSC	American Standard straight pipe threads in pipe couplings	B1.20.1
NPSF	Dryseal American Standard fuel internal straight pipe threads	B1.20.3
NPSH	American Standard straight hose coupling threads for joining to American Std taper pipe threads	B24
NPSI	Dryseal American Std intermediate internal straight pipe threads	B1.20.3
NPSL	American Standard straight pipe threads for loose fitting mechanical joints with locknuts	B1.20.1
NPSM	American Standard straight pipe threads for free-fitting mechanical joints for fixtures	B1.20.1
ANPT	Aeronautical National Form taper pipe threads	As published in MIL-P-7105
NPT	American Standard taper pipe threads for general use	B1.20.1
NPTF	Dryseal American Standard taper pipe threads	B1.20.3
NPTR	American Standard taper pipe threads for railing joints	B1.20.1
NGO	National gas outlet threads	ANSI/CGA V-1 (B57.1)
NGS	National gas straight threads	ANSI/CGA V-1 (B57.1)
NGT	National gas taper threads (see also SGT)	ANSI/CGA V-1 (B57.1)

TABLE #14 USCTI TABLE 311
GENERAL DIMENSIONS AND TOLERANCES FOR STRAIGHT AND TAPER PIPE TAPS



Nominal Size (Inches)	Dimensions - Inches				
	Length Overall A	Length of Thread B	Length of Square C	Diameter of Shank D	Size of Square E
1/16	2-1/8	11/16	3/8	.3125	.234
1/8	2-1/8	3/4	3/8	.3125	.234
1/8	2-1/8	3/4	3/8	.4375	.328
1/4	2-7/16	1-1/16	7/16	.5625	.421
3/8	2-9/16	1-1/16	1/2	.7000	.531
1/2	3-1/8	1-3/8	5/8	.6875	.515
3/4	3-1/4	1-3/8	11/16	.9063	.679
1	3-3/4	1-3/4	13/16	1.1250	.843
1-1/4	4	1-3/4	15/16	1.3125	.984
1-1/2	4-1/4	1-3/4	1	1.5000	1.125
2	4-1/2	1-3/4	1-1/8	1.8750	1.406
2-1/2	5-1/2	2-9/16	1-1/4	2.2500	1.687
3	6	2-5/8	1-3/8	2.6250	1.968
3-1/2	6-1/2	2-11/16	1-1/2	2.8125	2.108
4	6-3/4	2-3/4	1-5/8	3.0000	2.250

Element	Range	Direction	Tolerance
Length Overall A	1/16" to 3/4" incl.	Plus or Minus	1/32"
	1" to 4" incl.	Plus or Minus	1/16"
Length of Thread B	1/16" to 3/4" incl.	Plus or Minus	1/16"
	1" to 1-1/4" incl.	Plus or Minus	3/32"
	1-1/2" to 4" incl.	Plus or Minus	1/8"
Length of Square C	1/16" to 3/4" incl.	Plus or Minus	1/32"
	1" to 4" incl.	Plus or Minus	1/16"
Diameter of Shank D	1/16" to 1/8" incl.	Minus	.0015"
	1/4" to 1/2" incl.	Minus	.0020"
	3/4" to 1" incl.	Minus	.0020"
	1-1/4" to 4" incl.	Minus	.0030
Size of Square E	1/16" to 1/8" incl.	Minus	.0040"
	1/8" to 3/4" incl.	Minus	.0060"
	1" to 4" incl.	Minus	.0080"

TABLE #15 USCTI TABLE 334
THREAD LIMITS FOR STRAIGHT PIPE TAPS - CUT THREAD
American Standard Pipe Form (NPS) (NPSC)

NOMINAL SIZE (in.)	THREADS PER INCH NPS	SIZE AT GAGING NOTCH	PITCH DIAMETER	
			MIN.	MAX.
1/8	27	0.3736	0.3721	0.3751
1/4	18	0.4916	0.4908	0.4938
3/8	18	0.6270	0.6257	0.6292
1/2	14	0.7784	0.7776	0.7811
3/4	14	0.9889	0.9876	0.9916
1	11-1/2	1.2386	1.2372	1.2412
1-1/4	11-1/2	1.5834	1.5817	1.5862
1-1/2	11-1/2	1.8223	1.8207	1.8252
2	11-1/2	2.2963	2.2944	2.2994
2-1/2	8	2.7622	2.7605	2.7660
3	8	3.3885	3.3869	3.3924
3-1/2	8	3.8888	3.8873	3.8928
4	8	4.3871	4.3856	4.3911

TABLE #16 USCTI TABLE 335
THREAD LIMITS FOR STRAIGHT PIPE TAPS - GROUND THREAD
American Standard Pipe Form (NPS) (NPSC) (NPSM)

NOM. SIZE (in.)	THREADS PER INCH NPS	MAJOR DIAMETER			PITCH DIAMETER		
		PLUG AT GAGING NOTCH	MIN. G	MAX. H	PLUG AT GAGING NOTCH	MIN. K	MAX. L
1/8	27	0.3983	0.4022	0.4032	0.3736	0.3746	0.3751
1/4	18	0.5286	0.5347	0.5357	0.4916	0.4933	0.4938
3/8	18	0.6640	0.6701	0.6711	0.6270	0.6287	0.6292
1/2	14	0.8260	0.8347	0.8357	0.7784	0.7806	0.7811
3/4	14	1.0364	1.0447	1.0457	0.9889	0.9906	0.9916
1	11-1/2	1.2966	1.3062	1.3077	1.2386	1.2402	1.2412
1-1/4	11-1/2	1.6413	1.6507	1.6522	1.5834	1.5847	1.5862
1-1/2	11-1/2	1.8803	1.8897	1.8912	1.8223	1.8237	1.8252
2	11-1/2	2.3542	2.3639	2.3654	2.2963	2.2979	2.2994
2-1/2	8	2.8454	2.8604	2.8619	2.7622	2.7640	2.7660
3	8	3.4718	3.4868	3.4883	3.3885	3.3904	3.3924
3-1/2	8	3.9721	3.9872	3.9887	3.8888	3.8908	3.8928
4	8	4.4704	4.4855	4.4870	4.3871	4.3891	4.3911

TABLE #17 USCTI TABLE 335A
THREAD LIMITS FOR STRAIGHT PIPE TAPS - GROUND THREAD
American Dryseal Pipe Form (NPSF)

		MAJOR DIAMETER		PITCH DIAMETER			
NOM. SIZE (in.)	THDS PER INCH NPSF	MIN. G	MAX. H	PLUG AT GAGING NOTCH E	MIN. K	MAX. L	MINOR DIA. FLAT MAX.
1/16	27	0.3008	0.3018	0.2812	0.2772	0.2777	0.004
1/8	27	0.3932	0.3942	0.3736	0.3696	0.3701	0.004
1/4	18	0.5239	0.5249	0.4916	0.4859	0.4864	0.005
3/8	18	0.6593	0.6603	0.6270	0.6213	0.6218	0.005
1/2	14	0.8230	0.8240	0.7784	0.7712	0.7717	0.005
3/4	14	1.0335	1.0345	0.9889	0.9817	0.9822	0.005
1	11-1/2	1.2933	1.2943	1.2386	1.2295	1.2305	0.006

TABLE #18 TAP DRILL SIZES FOR TAPER AND STRAIGHT PIPE TAPS

		TAPER PIPE THREADS		
SIZE OF TAP	THREADS PER INCH	WITH TAPER PIPE REAMER	WITHOUT TAPER PIPE REAMER	STRAIGHT* PIPE THREADS
1/16	27	15/64	D	1/4
1/8	27	21/64	Q	11/32
1/4	18	27/64	7/16	29/64
3/8	18	9/16	37/64	37/64
1/2	14	11/16	23/32	23/32
3/4	14	57/64	59/64	15/16
1	11-1/2	1-1/8	1-5/32	1-11/64
1-1/4	11-1/2	1-15/32	1-1/2	1-33/64
1-1/2	11-1/2	1-23/32	1-47/64	1-3/4
2	11-1/2	2-3/16	2-7/32	2-7/32

** NPS only*

TABLE #19 USCTI TABLE 338
THREAD LIMITS FOR CUT AND GROUND THREAD TAPER PIPE TAPS
American Standard Pipe Form (NPT) and American Standard Dryseal Pipe Form (NPTF)

NOMINAL SIZE	THREADS PER INCH	GAGE MEASUREMENT - INCHES		TAPER PER FOOT - INCHES			
				CUT THREAD		GROUND THREAD	
(inches)	NPT	PROJECTION	TOLERANCE + or -	MIN.	MAX.	MIN.	MAX.
1/16	27	0.312	1/16	23/32	27/32	23/32	25/32
1/8	27	0.312	1/16	23/32	27/32	23/32	25/32
1/4	18	0.459	1/16	23/32	27/32	23/32	25/32
3/8	18	0.454	1/16	23/32	27/32	23/32	25/32
1/2	14	0.579	1/16	23/32	13/16	23/32	25/32
3/4	14	0.565	1/16	23/32	13/16	23/32	25/32
1	11-1/2	0.678	3/32	23/32	13/16	23/32	25/32
1-1/4	11-1/2	0.686	3/32	23/32	13/16	23/32	25/32
1-1/2	11-1/2	0.699	3/32	23/32	13/16	23/32	25/32
2	11-1/2	0.667	3/32	23/32	13/16	23/32	25/32
2-1/2	8	0.925	3/32	47/64	51/64	47/64	25/32
3	8	0.925	3/32	47/64	51/64	47/64	25/32
3-1/2	8	0.938	1/8	47/64	51/64	47/64	25/32
4	8	0.950	1/8	47/64	51/64	47/64	25/32

TABLE #20 USCTI TABLE 338
FORMULAE VALUES

THREADS PER INCH	A	B	C	D	E
27	0.0267	0.0296	0.0257	0.0234	0.0251
18	0.0408	0.0444	0.0401	0.0377	0.0395
14	0.0535	0.0571	0.0525	0.0515	0.0533
11-1/2	0.0658	0.0696	0.0647	0.0614	0.0649
8	0.0966	0.1000	0.0946	–	–

FORMULAE

Cut and Ground Thread - American Standard Pipe Form
Minimum major diameter = measured pitch diameter plug A
Maximum major diameter = measured pitch diameter plus B
Minimum minor diameter = measured pitch diameter minus B
Maximum minor diameter = measured pitch diameter minus C

Ground Thread - American Standard Dryseal Pipe Form
Minimum major diameter = measured pitch diameter plus D
Maximum major diameter = measured pitch diameter plus E
Minimum minor diameter = maximum or smaller
Maximum minor diameter = measured pitch diameter minus E