Unraveling the mysteries of pipe thread size

By Paul Nelson

Am I the only person who has ever been confused by the mysterious system of determining threaded pipe size? I expect not. A few years ago, when restoring my first tractor, I would go to a hardware store thinking I knew what size fitting to get and, upon returning home, discovered I had bought the wrong size. My error was in assuming that the physical diameter of the fitting or opening was equal to pipe thread size. Wrong!

In restoring Ferguson and other tractors one encounters pipe thread size issues with oil line fittings, oil passage plugs, water temperature gauge connections, radiator and engine block drain cocks, and even auxiliary hydraulics.

I ran across some helpful information some time back that made a lot of sense and I have decided to pass it along to others who may have experienced some of the same confusion and occasional frustration that I have.

Common pipe thread sizes

Two common pipe thread sizes exist:

- **NPT** - the tapered National Pipe Thread
- **NPSM** - the straight National Standard Free-Fitting Straight Mechanical Pipe Thread

Tapered threads are for joining and sealing; straight threads are only for joining.

Other pipe thread sizes include

- **NPTF** - this Dry-seal thread allows for joining without sealants.
- **GHT** - the Garden Hose Thread
- **NST** - Fire Hose Coupling
- **BSPT** - British Standard Taper Pipe Thread

The NPT and NPTF threads are interchangeable with sealants such as PTFE tape. None of the other thread standards are interchangeable. Female NPT threads can be designated as "FPT" and male NPT threads can be designated as "MPT."

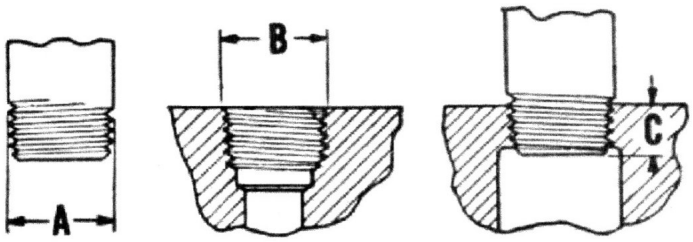
Pipe size vs. physical dimensions

Once you accept the fact that pipe sizes ***do not*** refer to any physical dimensions of the pipe, part of the mystery disappears. The outside diameter of each pipe or fitting must be measured and compared to table in the next column for size identification. For example, a 3/4 inch NPT pipe thread has an outside diameter of 1.05 inches.

Each thread size has a defined number of threads per inch (TPI). The 3/4 inch NPT pipe thread has 14 threads per inch. Both the TIP and OD of the thread are required for positive identification of thread size because several sizes have the same TPI.

Normal engagement

The information found in column 4 of the table to the right enables you to determine the correct depth for the pipe to be turned into the fitting so that the fitting is tight. This can be done by wrapping masking tape around the pipe to mark the correct engagement depth before inserting the pipe into the fitting and tightening it.



Male Pipe Threads: Measure the outside diameter of the large portion of the thread at "A" and then find the figure nearest this dimension in column 1 or 2 of the chart below. The dimension in column 3 will be your nominal pipe thread size.

Female Pipe Threads: Measure the top diameter at "B." Find the number nearest this dimension in column 1 or 2 of the chart below. The dimension in Column 3 will be your nominal pipe thread size.

Column 1	Column 2	Column 3	Column 4	Column 5
OD Fraction (in inches) (A or B)	Decimal (in inches) (A or B)	Pipe Thread Size	Normal Engagement for tight joint (C)	Threads Per Inch
5/16	0.3125	**1/16**	0.2611	**27**
13/32	0.405	**1/8**	0.2369	**27**
35/64	0.540	**1/4**	0.4018	**18**
43/64	0.675	**3/8**	0.4078	**18**
27/32	0.840	**1/2**	0.5337	**14**
1-3/64	1.050	**3/4**	0.5457	**14**
1-5/16	1.315	**1**	0.6828	**11-1/2**
1-21/32	1.660	**1-1/4**	0.7068	**11-1/2**
1-29/32	1.900	**1-1/2**	0.7235	**11-1/2**
2-3/8	2.375	**2**	0.7565	**11-1/2**
2-7/8	2.875	**2-1/2**	1.1375	**8**
3-1/2	3.5	**3**	1.2000	**8**
4	4.0	**3-1/2**	1.2500	**8**
4-1/2	4.5	**4**	1.3000	**8**

(*Technical information for this article was adapted from the following web site: www.plumbingsupply.com/.*)