

## Understanding Threaded Parts

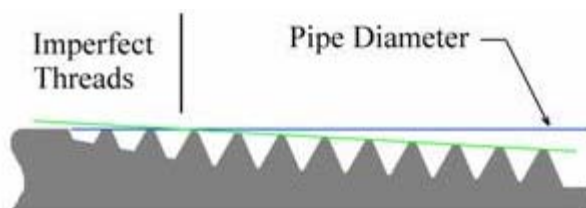
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**C**an I get a Schedule 40 threaded nipple? This is a common question that is asked about the use of threaded fittings. Although the following information is specific to PVC plastic fittings, the concept holds true for other materials. The standards for National Pipe Threads (NPT) and those published by the American Society of Testing Materials (ASTM) define the size, tolerance and wall thickness of threaded components. This is clearly done to permit universal interchange and interface between various materials, manufacturers and components.

Since Iron Pipe Size (IPS) pipe has a controlled outside diameter, the wall thickness will vary with the different pressure ratings. For example, a 1" Schedule 40, Schedule 80 or SDR/class pipe have the identical outside diameter, but the wall thickness will vary depending upon the specific schedule or pressure rating. The fittings are separated into two basic groups Schedule 40 for lower pressure applications and Schedule 80 for the higher pressures.

Let's start with the simple act of making a male pipe thread. The NPT threads have a taper of  $\frac{3}{4}$ " for 12" of length or approximately  $3\frac{1}{2}^\circ$ . This makes a sealing or leak-free joint. It is because of this taper or conical shape, that Schedule 40 and thin wall pipe cannot be threaded or used for nipples. Threads are cut deeper at the end of the pipe causing a wall thickness reduction. The wall thickness of Schedule 40 PVC pipe can be .133 inches thick; the taper of the threads alone would reduce the pipe by 45%.

The last 30% of the threads are not the full profile and depth, but the effective threads account for 70% if the thread length has a full profile. This means that a 1" Schedule 40 pipe wall would become very thin under the first few lead threads of the pipe. This same relationship would follow through to all sizes of Schedule 40 pipe.



The ASTM standards for NPT in PVC/plastic fittings additionally control the wall thicknesses within the threaded portion of a fitting or nipple. There are two standards that govern the threaded portion of PVC/plastic fittings, ASTM D2466 for Schedule 40 fittings and ASTM D2464 for Schedule 80 fittings. The requirements within the standard for Schedule 40 states, "For any threaded fitting the minimum wall thickness of the threaded portion shall be at least equal to the thickness of material under the thread root (valley) of threaded Schedule 80 pipe of the same size."



This requires that the threaded portion of a schedule 40 fitting must have extra material under the threaded portion for the wall thickness until it equals that of a Schedule 80 pipe.

Therefore, adding wall thickness to a Schedule 40 nipple until there is sufficient material under the threads would result in a Schedule 80 nipple, not Schedule 40. For female threads, the minimum wall thickness requirements hold true. However, if implemented differently, a Schedule 40 coupling or socket fitting can maintain the identical outside diameter as a threaded fitting. Since a socket fits over the outside of a pipe, and a female thread adds material to the socket wall thickness, providing the necessary thickness under the threads.

However, the ASTM standard for Schedule 80 fittings establishes a minimum outside diameter for female threaded parts. This is called the "M" diameter, which is larger than the required outside diameter of a Schedule 80 socket by approximately  $\frac{1}{8}$  inch. As a result, a Schedule 80 female threaded part may have a larger outside dimension than a solvent cement version of the same part.