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The Piping & Tubing Design Guide is the ORIGINAL SolidWorks Routed Systems Manual

General Information About Pipe

Pipe is a cylindrical component that is used to carry material from one location to another. The material is moved through the pipe using gravity or pressure. Pipe may be fabricated from many different types of material such as carbon steel, stainless steel, alloy, plastic, rubber and even concrete.

While metal pipe may be fabricated in several different ways, such as hot extruded, UO and spiral rolled, the two most commonly used methods are seamless and welded.

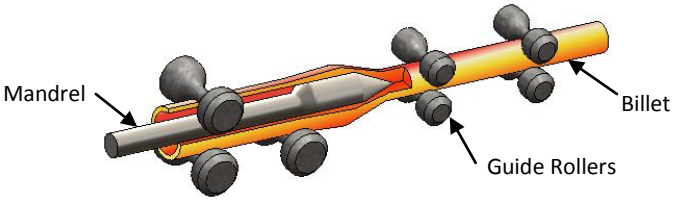

Figure 1a. Seamless Pipe

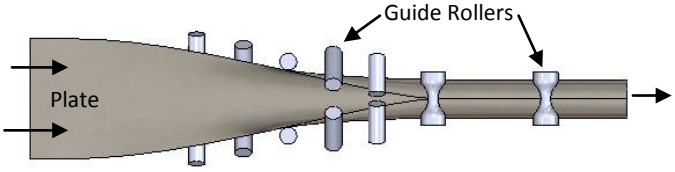

Figure 1b. Rolled &Welded Pipe

Seamless pipe is created by forcing a mandrel through an almost molten steel billet. Rollers and guides hold the outside of the pipe to maintain the outside size and shape. The pipe is then reheated and resized to produce a strong, solid section of pipe that contains no seams, and very little distortion. *(see Figure 1a.)*

Welded pipe takes a long, narrow flat piece of plate and forces it through guides, rolling the edges around until they meet end to end to form a cylinder. The edges are then welded together to form a uniform seam using either the buttwelded or erw method. *(see Figure 1b.)*

Pipe is generally fabricated in single and double random lengths at the mill. Larger pipe is usually made as 16 to 20 foot long single random lengths, and smaller pipe 2 inches and less may be fabricated between 35 to 40 foot double random lengths. When receiving a stick or spool of pipe, the length is considered random because you may get a short spool, and you may get a long spool. Never assume a stick of pipe will come to you in an exact length. Always plan on preparing the end of the spool for fit-up, welding or threading.

Over time, industry standards that govern the fabrication of pipe have been developed and accepted. In the United States, the American National Standards Institute created the guidelines for pipe fabrication known as ANSI B31. The British standard is BSi, German standard is DIN and Japan standard is JIS. For this document, we will continue based on the ANSI standards.

Pipe is fabricated in several different sizes based on outside diameter and wall thickness. When referring to pipe, a nominal callout and schedule is most commonly used. For example on a drawing you might call out a 4" Schedule 40 pipe. The actual dimensions of the pipe are 4.5" od, a wall thickness of 0.237", resulting in an id of 4.026". When identifying pipe, the schedule denotes the wall thickness and id. When ordering a flange that would butt-weld onto the end of piece of pipe, you might specify a 4" Class 150 with a schedule 40 bore. This tells the manufacturer to send you a flange that will fit onto a nominal 4" pipe, and have the bore, id, to match a schedule 40 pipe.

Pipe can be connected end to end using many different methods. When connecting one length of pipe to another length of pipe you would butt-weld them together or use a socket-welded or threaded coupling. Spools of pipe are connected together using bolted flanges, compression flanges or threaded fittings. Flanges come in many different designs such as socket welded, slip-on, butt-welded, Vanstone, Victaulic, Grayloc and several others. Factors such as temperature, pressure, material, service and maintenance requirements determine what types of connections you will use in the design.

Piping spools need to be supported properly or they will deform and fail in the field. There are unlimited methods for supporting different types of pipe. Due to system vibration, expansion and contraction during normal operating services, you may need to provide a mixture of fixed and sliding/rolling supports. To reduce the stress on piping systems and equipment from vibration and expansion/contraction, expansion joints are generally placed in the line.

To maximize your efficiency and dramatically improve the learning curve, the Piping & Tubing Design Guide from www.forefrontstudios.com has been the essential guide for your technical training library since 2004! Don't take my word for it, research it for yourself and see what others are saying!