Tri-City Extrusion

Industry Explanation vs Porthole and Seamless

Port Hole Seam – Region in an extruded product where metal has been welded together in the extrusion die because of high pressure and elevated temperature. The extrusion seam is not visible on the extruded product unless an appropriate surface treatment, e.g. etching and anodizing, has been made. A longitudinal extrusion seam is one in a hollow profile or a tube, parallel to the extrusion direction, which has been formed after creating two or more streams of metal and rejoining them around the mandrel of a porthole die. Extrusion seams are naturally occurring in porthole dies. This concept is sometimes termed “charge weld

Take extruded aluminum tube for example. This comes in two forms: structural and seamless. Structural extruded tube is made by the porthole process, and for that reason is sometimes referred to as “porthole.” Seamless is made by the seamless extrusion process.

Generally speaking, seamless extruded tubes are a little more expensive, which might push you to specify structural. However, this is one of those situations where saving a few bucks could end up costing a lot more. Let's take a look at when it's okay to use porthole extruded tubes and when you should pay the extra for seamless.

Process Overview

Structural and seamless tube are both extruded. That means a billet of material is forced through a hole in a die shaped to form the two dimensional cross-section you need. (We've called it the “toothpaste process” in the past and compared it to decorating a cake.)

Sometimes you want that extruded material to have a hole down the center. The simplest example is circular tube or pipe. (Read “Your Guide to Hollow Cylinders” for an explanation of the difference.) Porthole and seamless are different ways of forming that hollow internal section.

In porthole, metal is forced around a shape that matches the hollow section you want to extrude. Physics being what it is, the tooling needs ribs to hold that shape in place, and the metal has to flow around them. That separates the metal as it extrudes, so a second die forces those sections back together. At the micro-structure level, the surfaces weld to each other, which means there's a seam.

As the name suggests, seamless extruded tubes avoid this. The difference is that a forming mandrel is inserted into the billet of material from the rear, and pushed thorough until it's very close to the opening in the die. The material flows through the gap, emerging with both internal and external dimensions fixed and without any seams.

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Pros and Cons

Inevitably, a seam is a region of weakness. It's also where corrosion is most likely to start, (although most grades of aluminum don't corrode to any significant extent.) Because of this you don't use porthole extruded tubes in situations where there's high internal pressure or the extrusion will be subjected to severe loads.

The seams aren't generally visible to the naked eye, unless the extrusion is anodized. That tends to highlight them, which may be an issue in some applications.

In favor of porthole extruded tubes, the concentricity of inner and outer diameters is usually better than that achieved in the seamless process. That's because seamless allows the mandrel to wander with regard to the die opening. Also, when extruding small cross-sections by the porthole process it's sometimes possible to fit multiple opening in a single die. That increases efficiency and lowers the cost per foot of extrusion.

Aluminum Extrusion Applications

Select seamless extruded tubes when the application involves internal pressure or high external loads. Hydraulic tubing and baseball bats are two examples. You may also choose seamless when appearance is important, especially if the extrusion will be anodized.

Structural tubing is appropriate for all those applications that don't apply high forces. For example, railings, window frames and other architectural uses. And as it's less expensive it tends to be the default choice. Before specifying structural tubing though, remember to consider the application. It will work most of the time, but in some situations could be an expensive mistake.

Extruded tube is brought to final dimensions by the hot extrusion process and can be seamless or non-seamless. Although you cannot visually tell the difference between seamless and structural pipe and tube, they are different, and choosing the right one will depend on your application.

Seamless Tube: Hydro seamless tubes are produced using two methods. One method pushes a hollow aluminum billet through a Die and Mandrel Press with tremendous force at high temperatures. The other method pushes a solid billet through a Piercer Press and then a mandrel pierces and extrudes the billet in a second forward stroke. Regardless of the method used, the tube will have no weld or seam, making it ideal for anodizing and other finishing procedures.

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Advantages of seamless tube and pipe:

•No weld seams, preferred for pressure vessels
•More uniform anodizing appearance, especially on heavier wall sections
•No weld seams that could split in forming operation
•Increased structural integrity

Structural Tube: Hydro structural tube is produced with either the porthole or bridge die method. Solid aluminum billet is pushed through the die with tremendous force at high temperatures. The tube separates during the process and is formed back together by an inherent welding process while passing through the extrusion die. There is a slightly visible seam that may be noticeable to the naked eye if the tube is anodized or "finished."

Advantages of structural tube and pipe:

•Improved control of wall thickness eccentricity
•More ability to use multi-hole dies for smaller diameter sizes to improve productivity, decreases costs

Seamless Tubing Applications

Seamless pipe and tube is typically used for pressure vessels, hydraulic cylinders, compressed gas cylinders, drive shafts, lighting applications and bus conductors. They are recommended for applications requiring:

•Critical pressure ratings
•Demanding forming applications
•Critical strength requirement
•Uniform anodizing appearance

Aluminum Tubing Options

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