



K-TUBE TECHNOLOGIES

# Top Five Design Mistakes to Avoid When Specifying Stainless Steel Tubing

*A Tube is not a Tube*



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# 1. Specifying the dimensions without identifying the clearance that is needed for a proper fit

Sometimes when people order tubing, they specify the dimensions without considering the tubing's fit with other components. Components must have clearance between them in order for them to fit together.

If your tube has to accommodate a wire guide that is exactly .025 inches in diameter, and you order tubing that has an ID of exactly .025 inches in diameter, then the wire guide won't fit. The measurement you requested was dimensional, not functional.

**The tube's functional fit is influenced by:**

- Length
- Straightness
- Roundness
- Inner surface finish

**Tip:** Specify dimensions that are based on the tube's function and required fit.

## 2. Requesting a surface finish without specifying ID or OD

Sometimes when people order tubing, they specify a surface finish without distinguishing between the inner and outer surfaces. The inner and outer surfaces have different functions, though, so you need to specify the surface finish for both surfaces.

Most drawings have a generic title-block callout for surface finish or surface roughness. The specification in the title block is often ambiguous, because it doesn't say whether the finish applies to the inner or outer surface.

**Tip:** Specify the surface finish for both the inner and outer surfaces. And use correct units: Rq (RMS) or Ra.

|   |                              |        |
|---|------------------------------|--------|
| ITEM  | DRAWING NUMBER W/O REV LEVEL |        |
| MATERIAL  | DRAWN BY                     | DATE   |
| UNLESS OTHERWISE SPECIFIED:<br>ALL DIMENSIONS ARE IN INCHES   | DESIGN BY                    | DATE   |
|   | CHECKED BY                   | DATE   |
| DECIMALS  | TOLERANCES:                  |        |
| .X ± .1   | ANGULAR                      | ± .25° |
| .XX ± .01   |                              |        |
| .XXX ± .005   |                              |        |
| SURFACE ROUGHNESS   | 125/√                        |        |
| REMOVE ALL BURRS AND<br>BREAK SHARP EDGES .03 MAX.<br>SURFACE TEXTURE TO BE IN<br>ACCORDANCE WITH LATEST ANSI B46.1 | RESPONSIBLE ENGINEER         | DATE   |
| DIMENSIONING & TOLERANCING IN<br>ACCORDANCE WITH LATEST ANSI Y14.5  | GROUP LEADER                 | DATE   |
| ELECTRONIC FILE NAME  |                              | DATE   |

Example Title Block

### 3. Specifying temper instead of tensile strength

Sometimes when people order tubing, they request a particular temper but not a particular tensile strength. Temper is not quantifiable, because there is not a tubing standard for temper. Tensile strength, however, is measurable.

In these industry examples, you can see that different manufacturers associate tempers with different ranges of tensile strengths. If you don't specify a tensile strength, then your tubing could fall anywhere within these ranges.

**Tip:** Specify the tensile strength that you need.

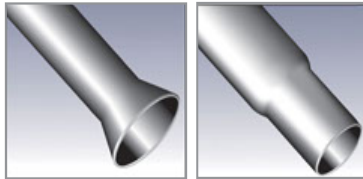
Industry Examples:

| Temper    | Tensile Min (kpsi) | Tensile Max (kpsi) |
|-----------|--------------------|--------------------|
| Anneal    | N/A                | 110                |
| 1/8 Hard  | 90                 | 120                |
| 1/4 Hard  | 100                | 130                |
| 1/2 Hard  | 110                | 140                |
| 3/4 Hard  | 120                | 150                |
| Full Hard | 140                | N/A                |

| Temper (Tensile Strength)         |  |                                  |
|-----------------------------------|--|----------------------------------|
| <b>Full Hard</b><br>> 140,000 PSI | <b>1/2 Hard</b><br>120,000-140,000 PSI | <b>Annealed</b><br>< 120,000 PSI |

| Alloy | Temper    | Tensile Strength (ksi) |
|-------|-----------|------------------------|
| 304   | Annealed  | 100 max.               |
| 304L  | Half Hard | 110 — 140              |
|       | Full Hard | 140 min.               |

## 4. Not giving the manufacturer enough details about secondary fabrication or end application



Sometimes when people order tubing, they don't tell the manufacturer what type of fabrication will be done later in the process. This information could help the manufacturer ensure that you receive the right kind of tubing.

### **End Forming: Flaring, Swaging, Crimping, etc.**

If you'll be end forming your tubing, then you may need a different design to resist splitting. The elongation of the tubing limits how much you can flare, swage, or crimp the tubing.

### **Laser Cutting**

If you'll be laser cutting your tubing, then the choice of alloy and strength is important. Smaller laser-cut features might require higher-strength materials or homogenous tubing.

### **Bending and Coiling**

If you'll be bending or coiling your tubing, then you'll want to choose a tensile strength and wall thickness that controls springback.

**Tip:** Provide details to the manufacturer about fabrication or end application.

## 5. Not specifying the processing and cleaning requirements for the project

Sometimes when people order tubing, they don't specify that their tubing needs to be processed and cleaned in a particular way.

If you can't have PTFE in your tubing, but you don't tell the manufacturer, then you might receive tubing that you can't use, because PTFE is commonly used in processing. If the manufacturer doesn't know your requirements, it can't process and clean the tubing appropriately.

**Tip:** Tell the manufacturer if you have particular processing and cleaning requirements.

Here are some of the cleaning and processing options that you might need to specify:

### **Drawing Lubricant**

- Oil
- PTFE

### **Cleaning Solutions**

- IPA wipes
- Ultrasonic cleaning w/degreaser
- Acid cleaning
- Citric and nitric passivation



LET'S WORK TOGETHER

# How to Collaborate or Buy



## For instant access to stock tubing

- No request for quote is necessary
- Over 100 options available
- Easy payment options
- Shipped the same day



## For custom tubing with unique requirements

- Made exactly to your specifications
- Total traceability
- Quality assurance program for consistency



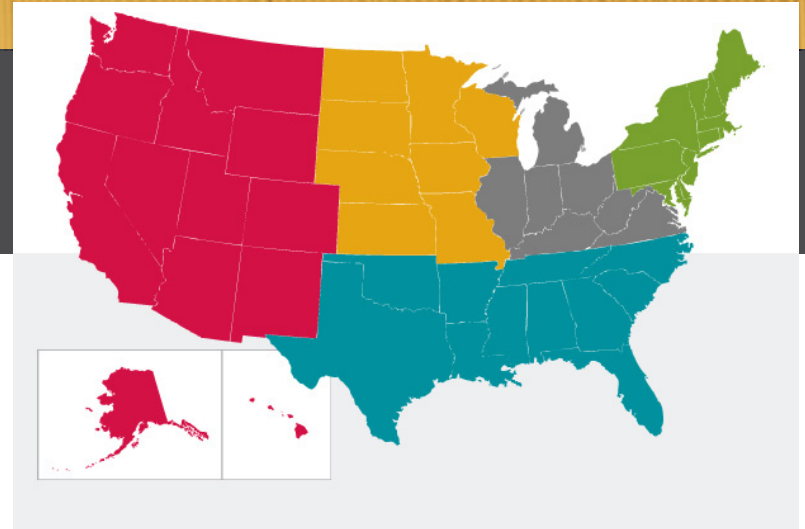
## For design refinements of early-stage projects

- Collaborate with the makers of your tubing
- Explore alloy options to enhance your decision
- Benefit from quick-turnaround manufacturing for early-stage prototypes

## CONTACT US

# Whatever your question or need, K-Tube is here to assist you.

Our professional staff is available to assist you with custom projects and provide you with the direction you need to complete your project to specification and on time. We look forward to working with you. Thank you for considering K-Tube.



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K-TUBE TECHNOLOGIES

**Manufacturing stainless steel  
tubing for more than 40 years.**



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