

Tube Bending Guidelines: 'Manual' Rotary Draw (Ercolina)

Sept 2026

VR3 has developed expertise in bend forming round tubes to suit a variety of applications. This knowledge, combined with the pre-profiling of the straight tubes, produces accurate one-off tube components ready for weld assembly.

VR3 has established a process to extract bend data from a 3D solid model to produce tube components with multiple bends in 3D space while maintaining the end profile orientations. VR3 only offers bending for round tubing.

The constraints and preferences below are for formed tube components with notched end profiles using our **standard rotary draw tube bending process**. CNC rotary draw mandrel bending is available for some larger volume projects, but is not economical for low volume quantities.

1. Tubes formed with the rotary draw process use fixed bend die CLR, specific to the tube OD.
2. Minimum standard bend CLR are 3 to 4 times the tube OD.
3. If your design allows it, always select the largest available CLR, and use the same CLR for all bends of a tube
4. The minimum wall thickness for each bend radius is subject to the material properties.
5. Thicker wall tubes are easier to bend, and maintain roundness, while thinner wall tubes require larger bend radii.
6. To maintain roundness in the formed area, with a bend angle greater than 90 degrees require increase the wall thickness.
7. Sometimes shallow bend angles less than 20 degrees can sometimes be achieved with thinner wall tubes than listed and not overly distort the tube.
8. Minimum distances between consecutive bends are required for tubes with multiple bends; typically, 3.0" to 5.0"
9. Minimum end straight lengths of approx. 3.0" to 5.0" (to deepest point of notch) are required for proper support during bending.

Bend features in tube structures are the most challenging aspect to design and manufacture. If the bend features are kept simple and our constraints are met, the added complexity of bend features can be worth it for a design or manufacturing benefit.

See the next page for the list of current standard VR3 Bend Dies.

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Tube OD (in.)	Centerline Bend Radii	Min. wall thickness	Straight Length
(in.)	(mm / in.)	thickness (in.)	minimum (in.)
0.250"	36mm / 1.42"	>or = .035"	3.00"
0.375"	36mm / 1.42"	>or = .035"	3.00"
0.500"	36mm / 1.42"	>or = .049"	3.00"
	50.8mm / 2.00"	>or = .049"	2.00"
0.625"	46mm / 1.81"	>or = .049"	3.25"
	50.8mm / 2.00"	>or = .049"	2.00"
	63.5mm / 2.50"	>or = .049"	2.00"
0.750"	46mm / 1.81"	>or = .058"	3.25"
	67mm / 2.64"	>or = .049"	4.00"
	98.4mm / 3.88"	>or = .049"	"
	153.4mm / 6.04"	>or = .035"	"
0.875"	46mm / 1.81"	>or = .083"	3.25"
	67mm / 2.64"	>or = .049"	4.00"
	96.8mm / 3.81"	>or = .049"	"
	150.6mm / 5.93"	>or = .035"	"
1.000"	56mm / 2.21"	>or = .120"	3.50"
	67mm / 2.64"	>or = .095"	4.00"
	82mm / 3.25"	>or = .058"	4.50"
	149.2mm / 5.88"	>or = .035"	4.50"
1.125"	67mm / 2.64"	>or = .083"	4.00"
	82mm / 3.25"	>or = .058"	4.50"
1.250"	82mm / 3.25"	>or = .120"	4.50"
	112mm / 4.41"	>or = .065"	4.50"
	151.4 / 5.96"	>or = .049" (.035 ??)	4.50"
1.375"	82mm / 3.25"	>or = .083"	4.50"
	112mm / 4.41"	>or = .065"	4.50"
1.500"	100mm / 3.94"	>or = .083"	4.50"
	150mm / 5.91"	>or = .065"	5.25"
1.625"	130mm / 5.12"	>or = .083"	5.00"
1.750"	150mm / 5.91"	>or = .083"	5.25"
	170mm / 6.70"	>or = .083"	5.75"
2.000"	150mm / 5.91"	>or = .120"	5.25"
	190mm / 7.50"	>or = .083"	6.00"
½" pipe (.840" od)	56mm / 2.21"		3.50"
¾" pipe (1.050" od)	67mm / 2.64"		4.00"
1" pipe (1.315" od)	67mm / 2.64"		4.00"
	82mm / 3.23"		4.50"
	112mm / 4.41"		4.50"
1 ¼" pipe (1.660" od)	130mm / 5.12"		5.00"