VR3 Engineering
precision tube fabrication

Tube Bending Guidelines: Semi-Automatic Bending June 2017

VR3 has developed expertise in bending and rolling tubes to suit a variety of applications. This knowledge combined with the pre-profiling of the straight tubes produces accurate, formed tube components ready for weld assembly.

VR3 has developed 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.

This tube bending guideline / data applies to our 'rotary draw' process and current bend dies.

VR3 also offers automatic CNC mandrel bending service for thin wall tubing and production bending. Please see our CNC Bend Tooling list for available tooling.

The following are constraints and preferences of our tube bending process when combined with end profiles:

1. Bends are formed with fixed radius bend dies that are not adjustable.
2. Centerline bend radius 'CLR' is generally in the range of 3 to 4 times the tube OD.
3. Thicker wall tubes can be bent to tighter radii.
4. Thinner wall tubes require larger bend radii and have limited bend angles.
5. Bend angles greater than 90 degrees require thicker wall thicknesses.
6. Shallow bend angles less than 20 degrees can sometimes be achieved with thinner wall tubes.
7. Minimum distances between consecutive bends are also required for tubes with multiple bends; typically from 3.50" to 6.00".
8. Minimum straight tube lengths of approx. 3.50" to 6.00" are also required from the end of a tube (deepest notch) to the start of a bend. This is required to properly support the tube during bending.
9. Minimum bend radii are also subject to the material properties.
10. Refer to the chart for bending dies currently available.
11. If possible by design, always select the larger bend radius.
12. Test bends are always required to validate the bend tooling setup.

See sheet 2 for current List of 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”	40mm / 1.60”	>or = .035”	3.00”
0.375”	40mm / 1.60”	>or = .035”	3.00”
0.500”	40mm / 1.60"	>or = .049”	3.00”
0.625”	46mm / 1.81”	>or = .049”	3.25”
	50.8mm / 2.00”	>or = .049”	3.25”
	63.5mm / 2.50”	>or = .049”	3.25”
0.750”	46mm / 1.81”	>or = .058”	3.25”
	67mm / 2.64”	>or = .049”	4.00”
	98.4mm / 3.88”	>or = .049”	“
	152.4 / 6.00”	>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)	R56mm (2.21”)		3.50”
¾” pipe (1.050” od)	R67mm (2.64”)		4.00”
1” pipe (1.315” od)	R67mm (2.64”)		4.00”
	R82mm (3.23")		4.50”
	R112mm (4.41”)		4.50”
1 ¼”pipe (1.660”od)	use 1.625” OD tube die (R130mm / 5.118”)		

For Further Information, contact VR3 Engineering / 519 273 6660 / info@vr3.ca