



RIGID TUBE CAPABILITIES GUIDELINE

BENDING (Cold Forming):

<u>Range of Tube Diameter</u>	1/16" to 3"
<u>Preferred Minimum Centerline Bend Radii</u>	
Titanium	3 x Tube O.D. ([±] 3% Flattening Allowance)
Ferrous & Nickel Alloys	2 x Tube O.D. ([±] 5% Flattening Allowance)
Non-Ferrous Alloys	1½ x Tube O.D. ([±] 5% Flattening Allowance)
<u>Preferred Minimum Distance Between Bends</u>	1½ x Tube O.D. ([±] 10% Flattening Allowance)
	2 x Tube O.D. (Special Tooling Required for Shorter Lengths)

Note: Material properties for elongation must be compatible with bend requirements.

JOINING:

<u>DC Orbital Welding</u>	12 Units 1/8" to 3" O.D.
<u>Manual Welding</u>	(20) Manual Weld Stations (2) VAC Atmosphere Weld Chambers Load/Unload Chamber 24" x 36"; 15" x 72" Work Area 36" x 80"
<u>Induction Brazing</u>	10 KVA to 50 KVA
<u>Furnace Brazing & Heat Treating</u>	VFS MODEL HL 66 Work Zone 50" x 34" x 72" Max. Temperature 2400°F Vacuum 1.0 x 10 ⁻⁴ Torr. CNC Control ABAR/IPSEN MODEL H3636 TURBO TREATER Work Zone 24" x 24" x 36" Max. Temperature 2400°F Vacuum 1.0 x 10 ⁻⁴ Torr. To 2 Bar CNC Control
<u>Torch Brazing</u>	
<u>Mechanical Attached Fittings</u>	Deutsch DMA, Deutsch Permaswage, Sierracin-Harrison Elastomercy Swage, Wiggins/Hydraflow, Rynglok

END FORMING:

<u>Annealed Ferrous, Nickel or Non-Ferrous</u>	Flaring: 3/16" to 3" O.D. x .065 Wall Max. Beading: 1/4" to 3" O.D. x .065 Wall Max. Swaging: 2" O.D. Max. x .065 Wall Max.
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OUTSIDE SUBCONTRACT EXPERIENCE:

Plasma Coating
Grinding
Plating
Shot Peening
Dip Brazing
Sheet Metal Forming
Resistance Welding
Painting

NON-DESTRUCTIVE TESTING:

Medium and Maximum Pressures

Air	10,000 PSI
Water	10,000 PSI
Inert Gas	6,000 PSI

Radiographic Inspection

Maximum Material Thickness	1" Equivalent SST
Automatic Film Processing	

Fluorescent Penetrant Inspection

Water Washable and Post Emulsifiable System
Normal to High Sensitivity

Ultrasonic

Shear Wave Impulse Echo by Contact Method

INSPECTION:

3 Eaton Leonard Laser Visions: (2) Optima (1) Standard

Non-Contact Tube Measuring Machine	Tube Envelope ± .005
Tolerance	End Points ± .002

Networked to All Power Benders for Set-Up
Elongation/Springback Feedback

Mitutoyo B706 Coordinate Measuring Machine

Measuring Range	X Axis 28", Y Axis 24", Z Axis 18"
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ENGINEERING:

CATIA V4, V5

Unigraphics NX2 CAD/System (4 Station), Windows Platform

IGES, STEP, UG Translators

3D Wire Frame & Solid Modeling
Tool, Jig & Fixture Design
Reverse Engineering of Assemblies

TESTING:

Class 1000 Clean Room Capabilities

NVR Analysis
Particle Size & Weight Analysis
Packaging