Guidelines for Tube Expansion

Unproperly rolled joints create considerable additional expense: under-rolled joints must be re-rolled, and over-rolled tubes must be removed and replaced.The optimum joint is one that develops a leak-tight joint with adequate strength for the intended service, but with the minimum amount of cold working (or tube wall reduction).

Application	Tube Wall Reduction*
Nonferrous tubes in surface condensers	3% to 4%
Steel tubes in heat exchangers	5% to 10%
Soft copper and aluminum tubes in heat exchangers	8% to 12%
Boiler tubes	12% to 14%

**After metal-to-metal contact of the tube Outer Diameter with the tubesheet hole.*

Here is an example of the application of this method for a 2-inch Outer Diameter 10 Gauge tube in a boiler.

Tubesheet Hole:	2.010
Tube Outer Diameter :	-2.000
Clearance:	.010
Tube Inner Diameter :	1.732
Clearance:	+.010
Tube Inner Diameter @ Metal-to-Metal:	1.742
13% of .134 x 2:	.035
Tube Inner Diameter @ Metal-to-Metal:	+1.742
Expanded Tube Inner Diameter:	1.777

Tube Rolling Worksheet

1. Tubesheet Hole _____
   Tube Outer Diameter = - _____
   Clearance _____

2. Tube Inner Diameter _____
   Clearance = + _____
   Inner Diameter @ Metal to Metal _____

3. ___% of ____(Wall) x 2 _____
   Tube Inner Diameter
   @ Metal to Metal = + _____
   Expanded Tube Inner Diameter _____

TUBE WALL THICKNESS OF WALL IN BIRMINGHAM WIRE GAUGE

GA	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Inch	.028	.032	.035	.042	.049	.058	.065	.072	.083	.095	.109	.120	.134	.148	.165	.180	.203	.220	.238	.259	.284	.300	.340
mm	.7	.8	.9	1.1	1.2	1.5	1.7	1.8	2.1	2.4	2.8	3.0	3.4	3.8	4.2	4.6	5.2	5.6	6.0	6.6	7.2	7.6	8.6