Create a stress-strain plot for the three specimens.

Assume the specimens are round .

As you can see from the Highlighted cell (D10), the material with the overall greatest reduction in strength is the Post Heat Treating @ 850. Based on

Cross Sectional Area=A
Force=P
Stress=σ
Strain=e
Initial Length=lo
Current Lenth=l
CrossSectionArea=Ao
ε=l-lo/lo
σ=P/A
UTS=Ultimate Tensile Strength

specimen diameter = 0.25 in
initial length = 6 in
initial force = 0 lbs

49.1E-3 CSA (in^2)

101.7E+3 Minimum UTS
152.8E+3 UTS Pre Heat
135.0E+3 UTS Heat 650
101.7E+3 UTS Heat 850

Pre Heat Treating

Length (in)		Force (lbf)		ε	σ
6		0		0	000.0E+0
6	1/4	6.0E+3		0.041667	122.2E+3
6	3/8	6.9E+3		0.0625	140.6E+3
6	1/2	7.5E+3		0.083333	152.8E+3
6	5/8	6.9E+3		0.104167	140.6E+3
6	3/4	6.0E+3	<= fracture	0.125	122.2E+3

Post Heat Treating @ 650

Length (in)		Force (lbf)		ε	σ
6		000.0E+0		0	000.0E+0
6	1/4	5.3E+3		0.041667	108.0E+3
6	3/8	6.1E+3		0.0625	124.2E+3
6	1/2	6.6E+3		0.083333	135.0E+3
6	5/8	6.1E+3		0.104167	124.2E+3
6	3/4	5.3E+3	<= fracture	0.125	108.0E+3

Post Heat Treating @ 850

Length (in)		Force (lbf)		ε	σ
6		000.0E+0		0	000.0E+0
6	1/4	4.0E+3		0.041667	81.4E+3
6	3/8	4.6E+3		0.0625	93.6E+3
6	1/2	5.0E+3		0.083333	101.7E+3
6	5/8	4.6E+3		0.104167	93.6E+3
6	3/4	4.0E+3	<= fracture	0.125	81.4E+3