

Solder Alloys

◆ Lead-Free Solder

- SnAgCu = Sn3.9Ag0.6Cu
- SnAgCuBi = Sn3.4Ag1.0Cu3.3Bi
- SnCu = Sn0.7Cu

◆ Baseline

- Sn63 = Sn37Pb

Mfg JTP Test Vehicle Matrix

Type	Laminate	Surface Finish	Reflow Solder	Wave Solder	Comment
Lead-Free	High tg	Immersion Silver	?	SnCu	No SMT parts?
			SnAgCu	SnAgCu	Wave solder not economical
			SnAgCuBi	SnAgCuBi	Wave solder not economical
Baseline (control)	High tg	HASL	Sn63	Sn63	

Mfg JTP Test Vehicle Matrix

Type	Laminate	Surface Finish	Reflow Solder	Wave Solder	Comment
Lead-Free	High tg	Immersion Silver			NO SMT parts?
					Wave solder not economical
					Wave solder not economical
Baseline (control)	High tg				

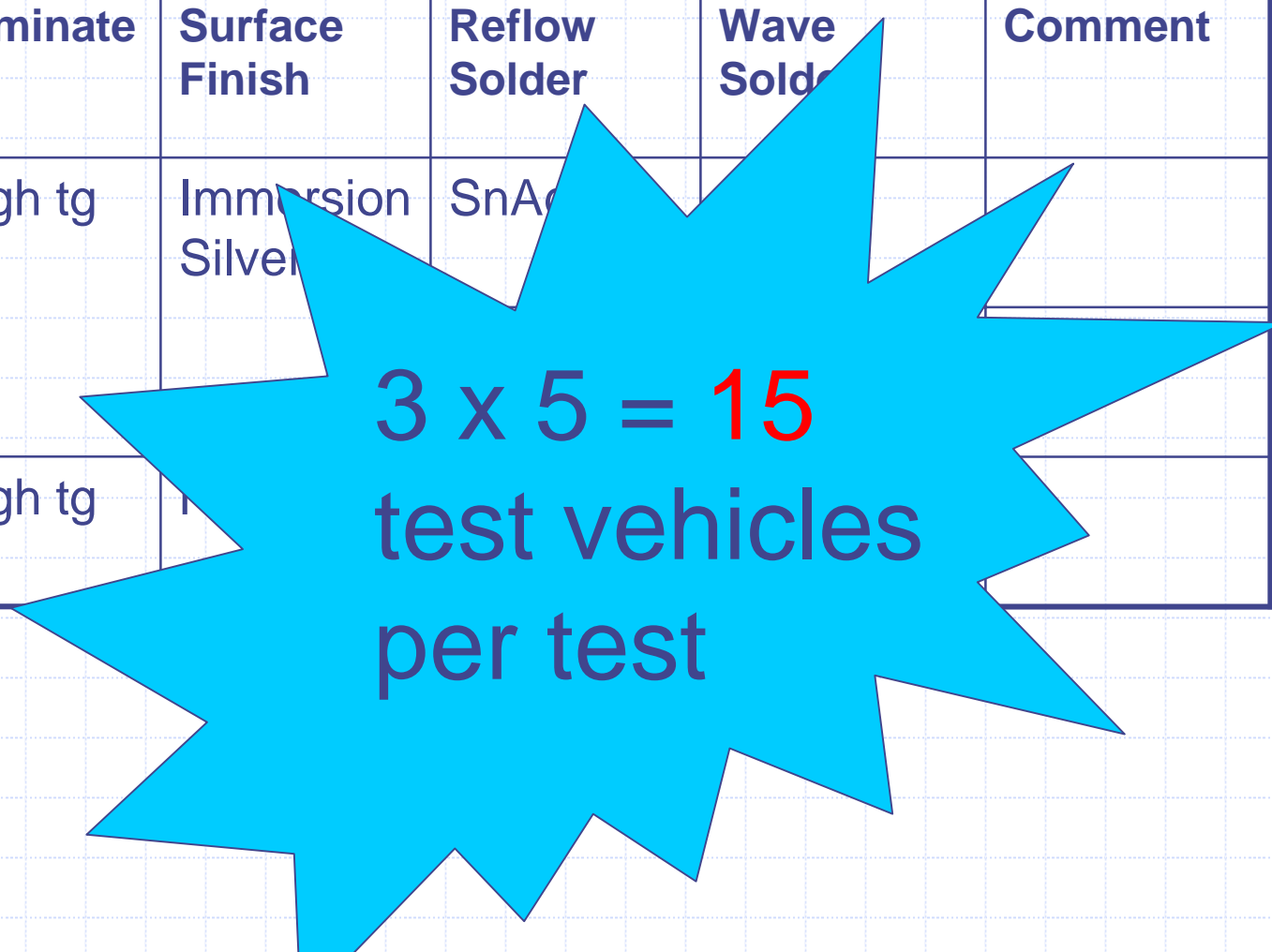
4 x 5 = 20
TEST VEHICLES
 per test

Alternative Mfg JTP Test Vehicle Matrix

Type	Laminate	Surface Finish	Reflow Solder	Wave Solder	Comment
Lead-Free	High tg	Immersion Silver	SnAgCu	SnAgCu or SnCu?	
			SnAgCuBi	SnCu	
Baseline (control)	High tg	HASL	Sn63	Sn63	

Alternative Mfg JTP Test Matrix

Type	Laminate	Surface Finish	Reflow Solder	Wave Solder	Comment
Lead-Free	High tg	Immersion Silver	SnAg		
Baseline (control)	High tg				



$3 \times 5 = 15$
test vehicles
per test

Repair JTP Test Vehicle Matrix

Type	Laminate	Surface Finish	Reflow & Wave Solder	Repair Solder
Repair SnPb	FR4	HASL	Sn63	SnCu
				SnAgCu
				SnAgCuBi
Repair SnPb Control	FR4	HASL	Sn63	Sn63
Repair Lead-Free	High Tg	Immersion Silver	SnCu	Sn63
			SnAgCu	Sn63
			SnAgCuBi	Sn63
Repair Lead-Free Control	High Tg	Immersion Silver	SnCu	SnCu
			SnAgCu	SnAgCu
			SnAgCuBi	SnAgCuBi

Repair JTP Test Matrix

Type	Laminate	Surface Finish	Reflow & Wave Solder	Repair Solder
Repair SnPb	FR4	HASL	Sn63	SnCu
				SnAgCu
				SnAgCuBi
Repair SnPb Control	FR4			
Repair Lead-Free	High Tg			Sn63
				Sn63
				Sn63
Repair Lead-Free Control	High Tg			SnCu
				SnAgCu
				SnAgCuBi

10 x 5 = 50
TEST VEHICLES
 per test

Recommended Repair JTP Test Vehicle Matrix

Type	Laminate	Surface Finish	Reflow & Wave Solder Alloy	Repair Solder Alloy
Repair	FR4	HASL	Sn63	SnCu
				SnAgCu
				SnAgCuBi
Repair Control	FR4	HASL	Sn63	Sn63

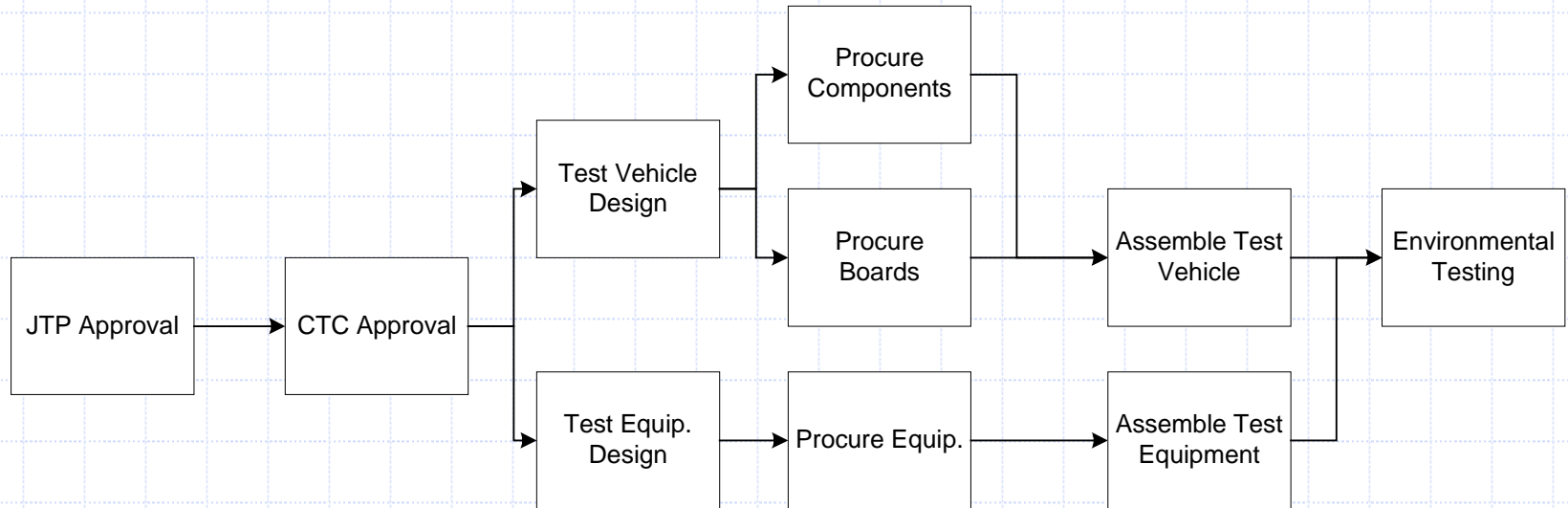
Recommended Repair JTP Test Matrix

Type	Laminate	Surface Finish	Reflow & Wave Solder	Repair Solder Alloy
Repair	FR4			SnCu
				AgCu
				SnAgCuBi
Repair Control	FR4		63	Sn63

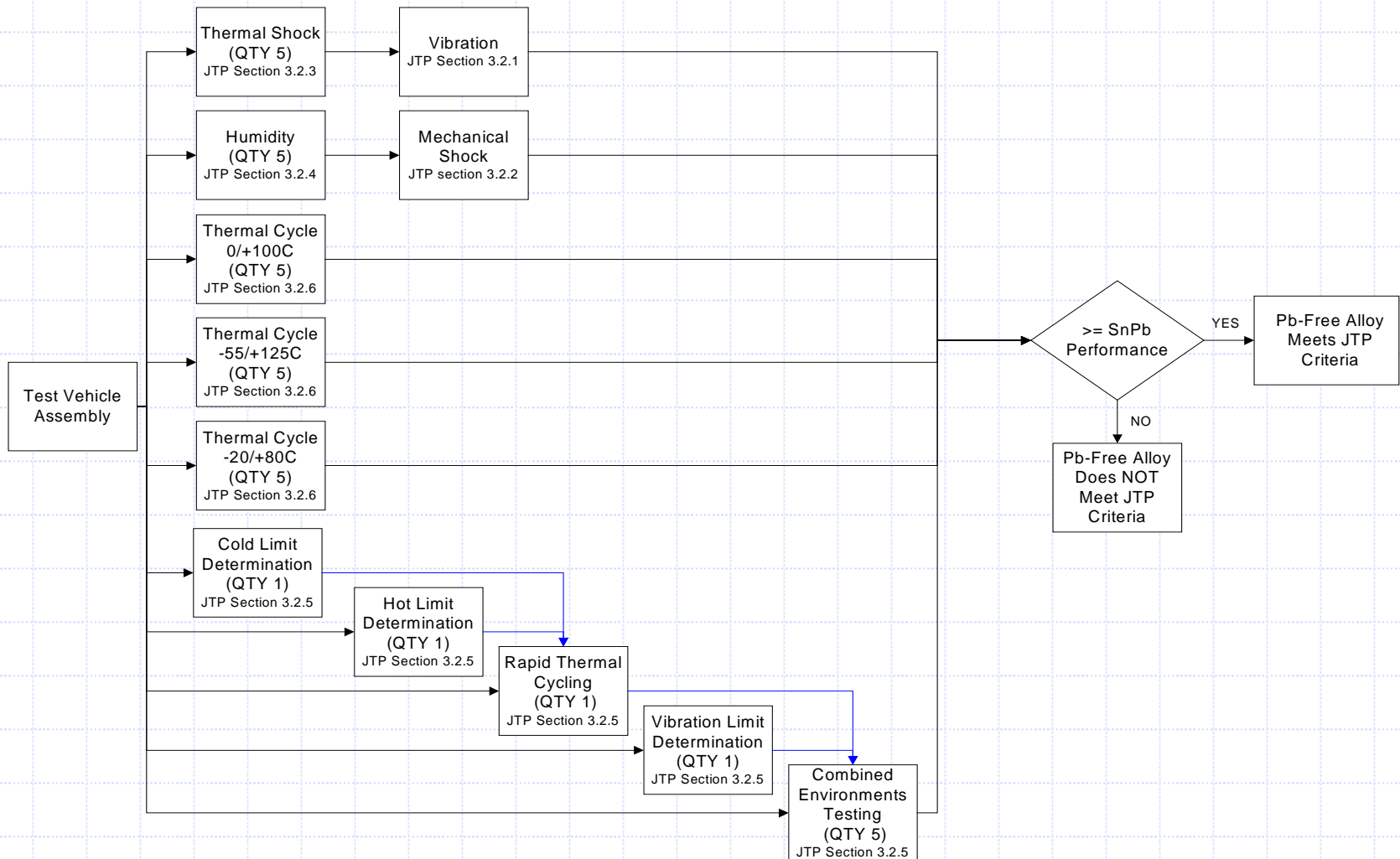
4 x 5 = 20

TEST
VEHICLES
per test

Project Flow Chart



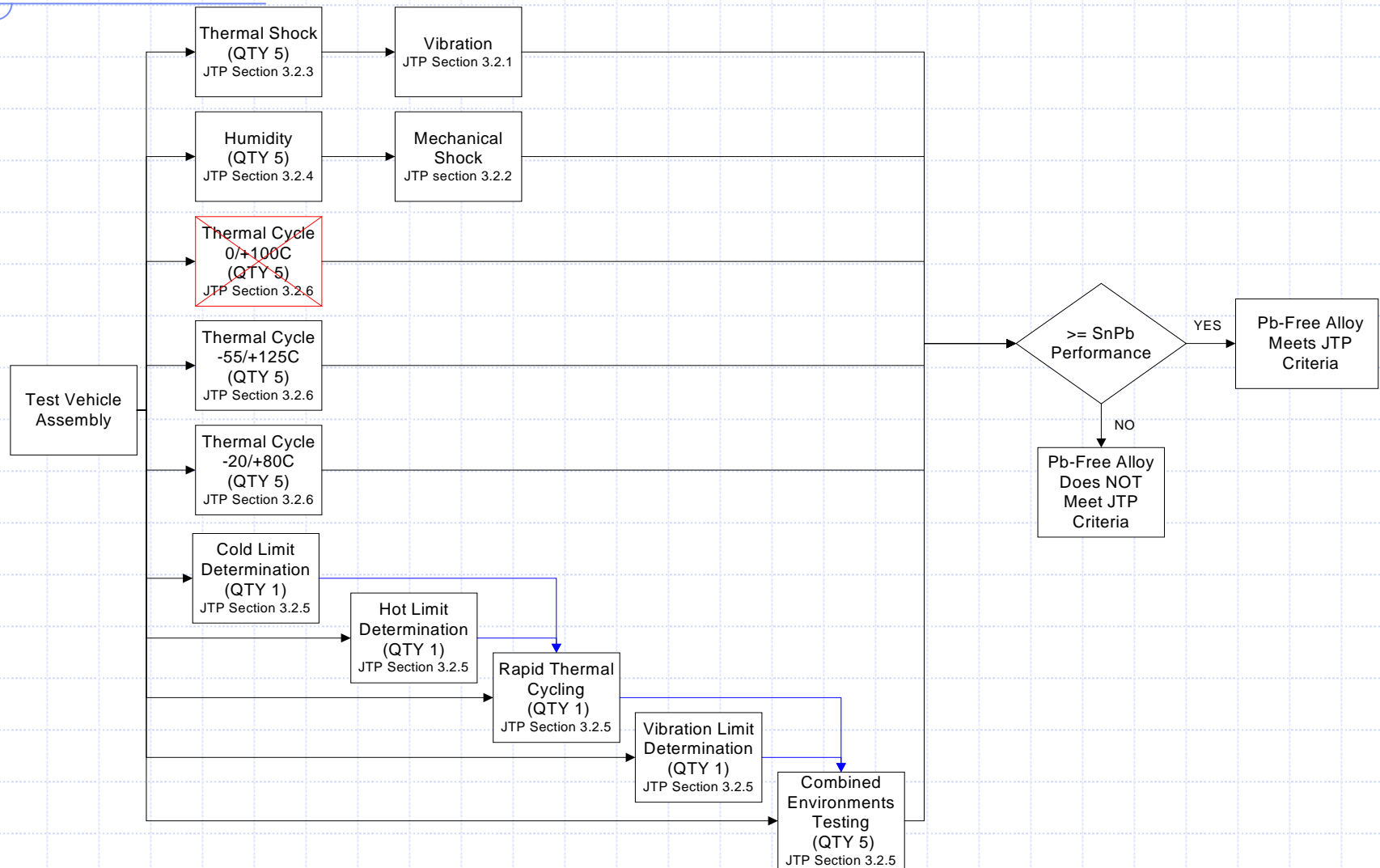
Critical Test Flow Chart



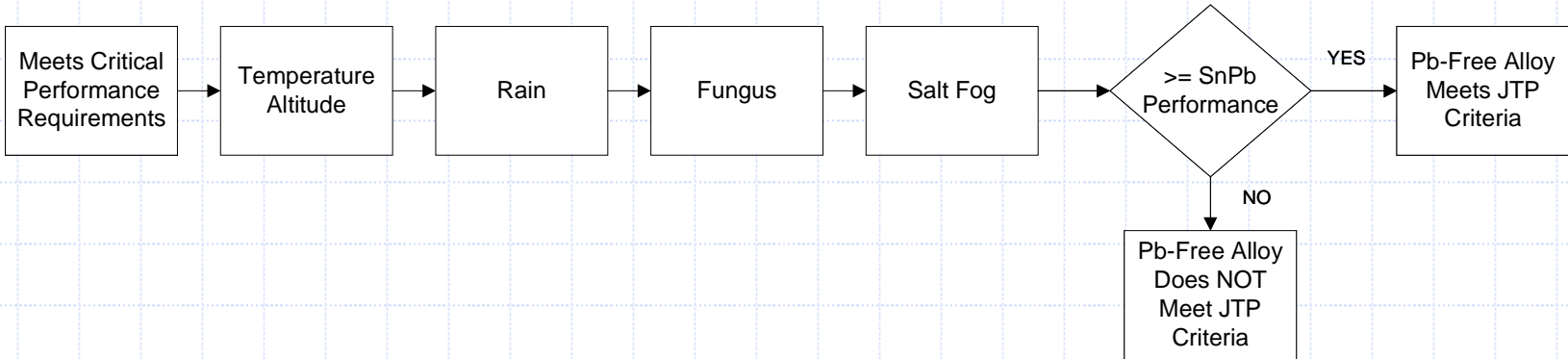
Critical Test Flow Chart



Two Thermal Cycle Critical Test Flow Chart



Extended Test Flow Chart



Mfg. Test Options vs. Resources

OPTION	# of ALLOYS	TV per Alloy	TOTAL
Original Test Matrix + Extended/Three Thermal Cycle Ranges	4	39	156
Original Test Matrix/Three Thermal Cycle Ranges	4	34	136
SnCu Wave Only/Three Thermal Cycle Ranges	3	34	102
SnCu Wave Only/Two Thermal Cycle Ranges	3	29	87
SnCu Wave Only/One Thermal Cycle Range	3	24	72

Repair Test Options vs. Resources

OPTION	# of Alloys	TV per Alloy	TOTAL
Original Repair Test Matrix/Three Thermal Cycle Ranges	10	34	340
SnCu Wave Only/Three Thermal Cycle Ranges	8	34	272
SnCu Wave Only/One Thermal Cycle Ranges	8	24	192
Recommended Repair Matrix/Two Thermal Cycle Ranges	4	29	116
Recommended Repair Matrix/ One Thermal Cycle Range	4	24	96

Thermal Cycle Test Duration

Temp. Range, C	Est. # of Cycles	Ramp Rate, C/min	Dwell Time, min.	Duration, Days*
0/+100	8,000	30	15	204
0/+100	8,000	20	15	223
0/+100	8,000	10	15	278
0/+100	8,000	4	15	445
-55/+125	3,000	20	15	100
-55/+125	3,000	10	15	138
-55/+125	3,000	4	15	250

*Assumes 24 hrs. a day of chamber operation & 0 days of maintenance downtime, holidays, etc.