

# R400 CAST ACRYLIC ANNEALING SCHEDULE

## Side, Hatch and Main Viewports

11/9/2022

### Side & Hatch viewports

#### Normalization Schedule (Stachiw Table 15.2)\*\*

Acrylic thickness (inches) 1.5  
Ambient Temperature (F) 80

Normalization Schedule - Side and Hatch Viewports		
Time (hr)	DT (hr)	Temp (F)
0.0		80.0
1.9	1.9	266.0
7.9	6.0	266.0
9.7	1.8	176.0
11.7	2.0	176.0
13.7	2.1	95.0
14.7	1.0	95.0
16.2	1.5	80.0

16.2 hours

### Side & Hatch viewports

#### Annealing Schedule (Stachiw Table 15.3A)\*\*\*

Ambient Temperature (F) 85  
Annealing Temperature(F) 185  
Max Heating rate Deg F/hr (Stachiw 15.3A) 100  
Max Cooling rate Deg F/hr (Stachiw 15.3C) 13  
Time to cool to Amb Deg F (hrs) 7.7

Annealing Schedule - Side and Hatch Viewports		
Time (hr)	DT (hr)	Temp (F)
0.0		85.0
1.5	1.5	185.0
9.1	7.7	85.0

9.1 hours

### Main Viewport

#### Normalization Schedule (Stachiw Table 15.2)

Acrylic thickness (inches) 3  
Maximum Oven Heating rate Deg F/hr 50  
Time to heat 266 Deg F (hrs) 3.72  
Hold time at 266 Deg F (hrs) 7  
Maximum Cooling rate Deg F/hr 50  
Time to cool to 176 Deg F (hrs) 1.8  
Hold time at 176 Deg F (hrs) 3  
Maximum Oven Cooling rate Deg F/hr 14  
Time to cool to 95 Deg F (hrs) 5.8  
Hold time at 95 Deg F (hrs) 1  
Maximum Oven Cooling rate Deg F/hr 7  
Time to cool to Amb Deg F (hrs) 2.1  
Ambient Temperature (F) 80

Normalization Schedule - Main Viewport		
Time (hr)	DT (hr)	Temp (F)
0.0		80.0
3.7	3.7	266.0
10.7	7.0	266.0
12.5	1.8	176.0
15.5	3.0	176.0
21.3	5.8	95.0
22.3	1.0	95.0
24.4	2.1	80.0

24.4 hours

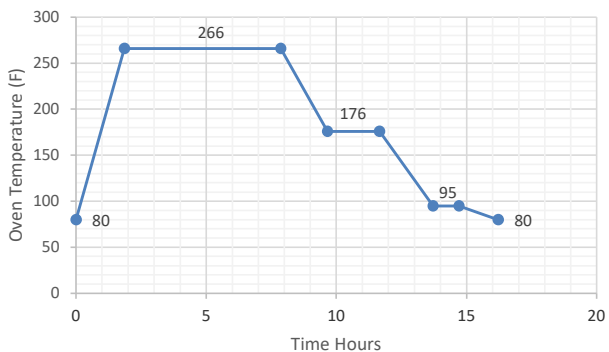
#### Annealing Schedule (Stachiw Table 15.3A)

Ambient Temperature (F) 85  
Annealing Temperature(F) 185  
Max Heating rate Deg F/hr (Stachiw 15.3A) 50  
Max Cooling rate Deg F/hr (Stachiw 15.3C) 7  
Time to cool to Amb Deg F (hrs) 14.3

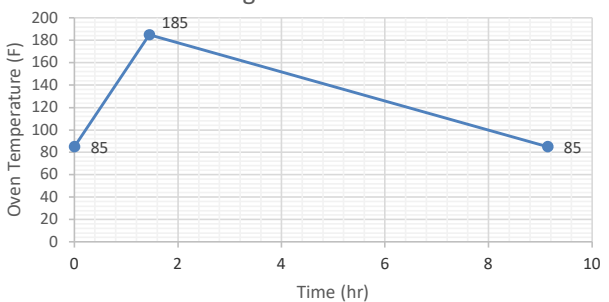
Annealing Schedule - Side and Hatch Viewports		
Time (hr)	DT (hr)	Temp (F)
0.0		85.0
2.9	2.9	185.0
17.2	14.3	85.0

17.2 hours

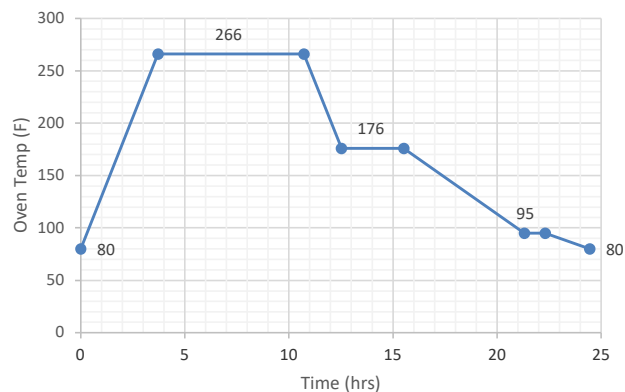
Normalization Schedule - Side and Hatch



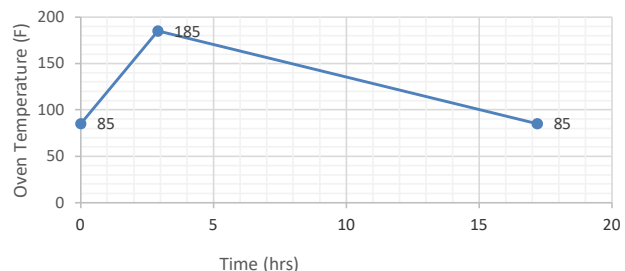
Annealing Schedule - Side and Hatch



Normalization Schedule - Main Viewport



Annealing Schedule - Main Viewport



\* Does not include the period of time required to raise the oven temperature from ambient room temperature to the set annealing temperature.

\*\* Normalization refers to a heat treatment process for removal of residual stress remaining in the casting from the casting procedure in which the casting is uniformly heated from room temperature at a controlled heating rate to a temperature above the glass transition point for a period of time long enough to achieve complete relaxation of existing locked-in strains and then is slowly cooled at a controlled rate that avoids introduction of residual stresses due to large temperature differentials across the cross-section of the casting. ... The end results of the normalizing thermal treatment is a casting that is fully stress-relieved. As a result of the complete relaxation, cell cast sheets and panels will shrink several percent laterally (1-2%) and swell several percent vertically (2-4%). Subsequent annealing treatments following fabrication procedures will not affect the size of a machined product even if the annealing is performed at 230 F. J. D. Stachiw, Handbook of Acrylics, page 835 section 15.2.1.

\*\*\* Annealing is a thermal treatment procedure intended primarily to relieve surface stresses on an acrylic component whose surfaces were machined, sanded, and/or machined polished. The component is heated at a controlled rate to a prescribed temperature below the 230 F transition point, held there for a prescribed period, and then cooled down to room temperature at a low rate which avoids introduction of residual stresses. J. D. Stachiw, Handbook of

Temperature affect on Acrylic - Acrylic sheet will soften gradually as the temperature is increased above 210°F (99°C). At temperatures from 340°F to 380°F (171°C to 193°C), it becomes soft and pliable and can be formed into almost any shape using inexpensive molds. The optimum forming temperature within this range depends on thickness and desired depth of draw. Acrylic sheet will typically shrink 1.5% when heated without a frame. As the sheet cools, it will harden and retain the formed shape. Interstate Plastics - Cast Acrylic sheet (GP)  
[https://www.interstateplastics.com/materialspecs/cast-acrylic-product-info-062718.pdf?srsId=AfmBOoMIYdmPlmEflJxayG\\_hpotG6sZO8F3QP9bOUJ57Ln](https://www.interstateplastics.com/materialspecs/cast-acrylic-product-info-062718.pdf?srsId=AfmBOoMIYdmPlmEflJxayG_hpotG6sZO8F3QP9bOUJ57Ln)

Bearing Gasket - These should be slightly oversized, of at least 80 - durometer hardness, and from 0.020 to 0.125 inches thick. ... Since the gaskets function as primary or secondary seals, they should preferably be made from non-permeable elastomeric material. J. D. Stachiw, Handbook of Acrylics, page 237 section 7.5.2.