# Annealing of Castings

| Thickness (Inches) | Anneal Soak Time @ 960° F @ 516° C | Initial Cooling Rate (° F/Hr) | Initial Cooling Range (°F) | 2nd Cooling Rate (°F/Hr) | 2nd Cooling Range (°F) | Final Cooling Rate °F/hr | Final Cooling Range (°F/Hr) | Total Minimum Time Hours |
|---|---|---|---|---|---|---|---|---|
| (mm) | | (° C/Hr) | (°C) | (°C/Hr) | (°C) | °C/hr | (°C/Hr) | |
| .5 in | 2 hr. | 100 | 960 - 800 | 180 | 800 - 700 | 600 | 700 - 70 | 6 |
| 12 mm | | 55 | 516 - 427 | 99 | 427- 371 | 330 | 371 - 21 | |
| .75 in | 3 hr | 45 | 960 - 800 | 81 | 800 - 700 | 270 | 700 - 70 | 10 |
| 19 mm | | 25 | 516 - 427 | 45 | 427 - 371 | 150 | 371 - 21 | |
| 1.0 in | 4 hr | 27 | 960 -800 | 49 | 800 - 700 | 162 | 700 - 70 | 16 |
| 25 mm | | 15 | 516 - 427 | 27 | 427 -371 | 90 | 371 - 21 | |
| 1.5 in | 6 hr | 12 | 960 -800 | 22 | 800 - 700 | 72 | 700 - 70 | 33 |
| 38 mm | | 6.7 | 516 -427 | 12 | 427 - 371 | 40 | 371 - 21 | |
| 2.0 in | 8 hr | 6.8 | 960 - 800 | 12 | 800 - 700 | 41 | 700 - 70 | 56 |
| 50 mm | | 3.8 | 516 - 427 | 6.8 | 427 - 371 | 22 | 371 - 21 | |
| 2.5 in | 10 hr | 4.3 | 960 - 800 | 8 | 800 - 700 | 26 | 700 - 70 | 84 |
| 60 mm | | 2.4 | 516 - 427 | 4.3 | 427 - 371 | 14.4 | 371 - 21 | |
| 3.0 in | 12 hr | 3 | 960 - 800 | 5.4 | 800 - 700 | 18 | 700 - 70 | 119 |
| 75 mm | | 1.7 | 516 -427 | 3.1 | 427 - 371 | 10 | 371 - 21 | |
| 4.0 in | 16 hr | 1.7 | 960 - 780 | 3.1 | 780 - 680 | 10 | 680 - 70 | 216 |
| 100 mm | | 0.94 | 516 - 416 | 1.7 | 416 - 360 | 5.6 | 360 - 21 | |
| 6.0 in | 24 hr | 0.75 | 960 - 760 | 1.3 | 760 - 660 | 4.5 | 660 - 70 | 499 |
| 150 mm | | 0.42 | 516 - 404 | 0.76 | 404 - 349 | 2.5 | 349 - 21 | |
| 8.0 in | 32 hr | 0.42 | 960 - 740 | 0.76 | 740 - 640 | 2.5 | 640 - 70 | 916 |
| 200 mm | | 0.23 | 516 - 393 | 0.42 | 393 - 338 | 1.4 | 338 - 21 | |

If your controller cannot be programmed for degrees per hour it will be necessary to do the following conversion to convert from degrees per hour to hours per degree. Find the row you will be using (Thickness) and subtract the degrees in the Initial Cooling Range. Example: Your casting is solid and it is 3 inches thick: Subtract 800° from 960° (960° -800° = 160°) Divide the answer (160°) by the degrees per hour (3°) 160 ÷ 3 = 53.3 hrs. (round it up to 54 hrs). This answer is the number of hours required to lower the temperature to 800 degrees at the given rate of 3 degrees per hr. Repeat for the Second Rate and for the Final Cooling Rate.

This annealing chart is derived from Corning's method as shown in McLellan and Shand. It is based on a flat slab of uniform thickness that is set up in such a fashion that it can cool equally from top and bottom.

If the glass is not set up in such a fashion that it can cool equally from top and bottom or is anything besides a flat slab of uniform thickness, select an annealing cycle for a piece that is twice the thickness of the thickest area of the piece.

Even a very conservative annealing cycle may not work if the annealing oven is not capable of cooling evenly. If your glass checks, check your oven before you blame the chart.

This chart re-printed through the courtesy of Dan Schwoerer, The Bullseye Glass Co.