

# KILN FIRING CHART

Firing converts ceramic work from weak greenware into a strong, durable form. As the temperature in a kiln rises, many changes take place in the clay; and understanding what happens during the firing can help you avoid problems. The following chart provides highlights of what happens when firing clay.

Temperature		Color	Cone (approx.)	Event
C°	F°			
1400	2552	Brilliant white	14 13 12	End of porcelain range
1300	2372	White	11	End of stoneware range
		Yellow-white	9 7	
1200	2192	Yellow	5½ 4	End of earthenware (red clay) range
1100	2012	Yellow-orange	2 1	Between 1100-1200°C, mullite and cristobalite (two types of silica) form when clay starts converting to glass. Clay and ceramic particles start to melt together and form crystals. These changes make the material shrink as it becomes more dense. Soaking (holding the end temperature) increases the amount of fused matter and the amount of chemical action between the fluxes and the more refractory materials.
		Orange	04 05	
1000	1832	Red-orange	06 07 08	
900	1652	Cherry red	010 012 013	Between 800-900°C sintering begins. This is the stage where clay particles begin to cement themselves together to create a hard material called bisque.
800	1472	Dull red	015 016 017	Between 300-800°C, the temperature must be raised steadily and ample air must be present to permit the complete burning of carbonaceous materials (impurities in the clay along with paper, wax, etc.). After 800°C, the clay surface will start to seal off, trapping unburned carbonaceous materials and sulfides, which could cause bloating and black coring.
700	1292	Dark red	018 019 020	
600	1112	Dull red glow	021 022	
500	932	Black		Quartz inversion occurs at 573°C. When clay is refired for a glaze firing, quartz crystals change from an alpha (α) crystal structure to a beta (β) crystal structure. The inversion is reversed on cooling. This conversion creates stresses in the clay so temperature increase and decrease must be slow to avoid cracking the work.
400	752			Between 480-700°C chemical water (referred to as "water smoke") is driven off.
300	572			Upon cooling, cristobalite, a crystalline form of silica found in all clay bodies, shrinks suddenly at 220°C. Fast cooling at this temperature will cause ware to crack.
200	392			
100	212			Water boils and converts to steam. Trapped water will cause clay to explode so all water should be evaporated below 100°C. Begin a firing by keeping the kiln below 100°C until all water has evaporated.