

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	End of porcelain range
			13	
			12	
1300	2372	White	11	End of stoneware range
			9	
		Yellow-white	7	End of earthenware (red clay) range
1200	2192	Yellow	5½	
			4	
		Yellow-orange	2	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.
1100	2012	Orange	1	
			04	
		Red-orange	05	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.
1000	1832		06	
			07	
900	1652	Cherry red	08	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.
			010	
			012	
800	1472	Dull red	013	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.
			015	
			016	
700	1292	Dark red	017	Between 480-700°C chemical water (referred to as “water smoke”) is driven off.
			018	
			019	
600	1112	Dull red glow	020	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.
			021	
			022	
500	932	Black		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.
400	752			
300	572			
200	392			
100	212			