Pyrometric cones have been used to monitor ceramic firings for more than 100 years. They are useful in determining when a firing is complete, if the kiln provided enough heat, if there was a temperature difference in the kiln or if a problem occurred during the firing.

Cones are made from carefully controlled compositions. They bend in a repeatable manner (over a relatively small temperature range - usually less than 40°F). The final bending position is an indication of how much heat was absorbed.

The Orton charts were determined using precisely controlled kilns in an air atmosphere. Cones do not measure temperature alone. They measure heatwork, the combined effect of time and temperature. The role that heating rates have on the endpoint temperature is observed to be that the temperature required to cause a cone to bend will be higher for faster heating rates and lower for slower rates. Heating rates that simulate fast, medium, or slow firings were tabulated.

Temperatures shown for small cones were determined using a heating rate of 30°F/hr (or 12.5°C/hr) in a gas-fired kiln. A cone will close to duplicating the results of self-supporting cones if mounted upright, properly simulating the position of a self-supporting cone. Typically, small cones will deform 7-10 degrees C earlier than a self-supporting cone, so the temperature values for a self-supporting cone can be used to determine an equivalent small cone temperature by subtracting 7-10 degrees C (or 12.5-18 degrees F). Placing a small cone or bar cone into a kiln should be done with care so that the desired temperature state is established in the kiln and the cone is placed upright, properly simulating the position of a self-supporting cone. It will always be desirable to use the desired temperature stated on the cone chart. To produce a properly fired result, the next cone higher in sequence is placed into the shutoff device and the result is confirmed by a cone placed inside the kiln on a kiln shelf.

Reducing atmospheres can affect the burning behavior of cones, especially the red colored cones manufactured between numbers 010-3. If these cones are used in the absence of oxygen, the red iron oxide in the formulation can reduce and change the cone appearance so the cone will appear matte, green, or bloated. Cones made with red iron oxide can reduce and change the cone appearance so the cone will appear matte, green, or bloated.

For more information on pyrometric cones, contact Orton or visit us at www.ortonceramic.com.