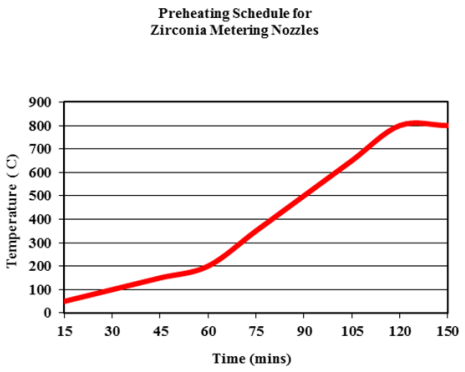
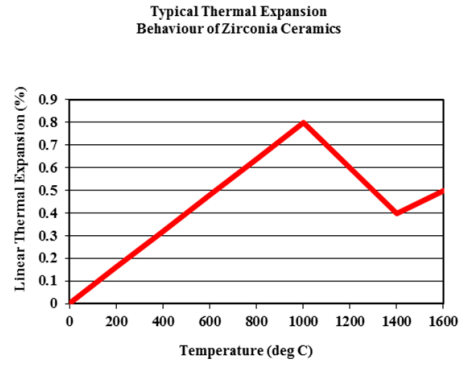
Zirconia Metering Nozzles

Preheating Guidelines





The following information is based on our experiences of optimum conditions for the preheating of zirconia metering nozzles. The information is intended as a guideline and it is acknowledged that slight variation to temperature and dwell times could be incurred.

To minimise on thermal shock and potential cracking it is recommended that metering nozzles are heated prior to casting operation.

During the initial stages of preheating, a gentle or "lazy" flame should be applied to the bottom of the nozzle. The burner flame should circulate around the lower surface of the zirconia insert and the surrounding tundish nozzle outer. This practice will allow the nozzle outer and insert to heat up at a similar rate and minimise any thermal gradient between the two materials.

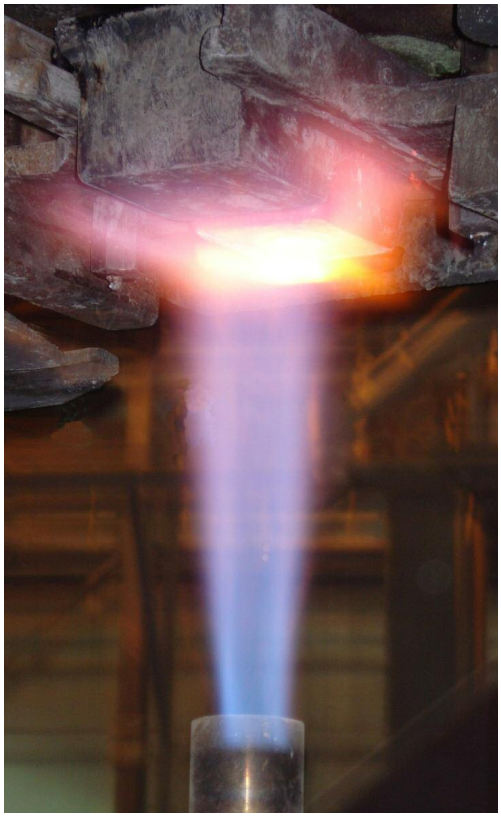
It is recommended that the nozzle be heated to a temperature of 200°C during the initial 60 minutes of preheating. This schedule will allow for the gradual release of any residual moisture within the nozzle and surrounding mortar/castable.

The temperature can be increased during the second hour to a maximum temperature of 800°C.

Due to the complex nature of phase transformations that are associated with zirconia ceramics it is highly recommended that the preheating temperature does not exceed 950 – 1000°C. This is due to the thermal expansion characteristics of zirconia and associated transformation from monoclinic to tetragonal form (1100 – 1300°C). This change results in a volume reduction. Consequently, the cooling of a nozzle from a temperature of 1300°C to below the phase transformation point leads to an expansion of the material and tensile stresses that can result in cracking.

It is very important that the burner flame is aligned centrally to the bottom of the nozzle. This action will result in an equal temperature distribution around the walls of the zirconia insert and nozzle outer. Failure to meet these criteria may result in cracking of the nozzle during preheating or chilling of the steel stream during the initial stages of casting.

The time taken between the end of preheating and the start of casting should be kept to a minimum to increase the chances of a free start and minimise any thermal shock of the nozzle during the initial stages of casting.



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