

# Cutting Stone Building Materials and Ceramic Tiles with Diamond Disc

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## Abstract

During the repair and restoration of buildings, ceramic tiles and blocks of  $\text{Al}_2\text{O}_3$  and  $\text{ZrO}_2$  are often cut. At present diamond abrasive discs are widely used for these purposes. The cutting process is accompanied by a considerable heat release and heating of the diamond disc. At a temperature of about  $600^\circ$ , the tensile strength of a disc is reduced by a factor of 2 and graphitization of diamond grains occurs. Thus, when cutting stone and building materials with a diamond disc, the disc heating temperature should not exceed  $600^\circ\text{C}$ . In the work, mathematical modeling of the diamond cutting disc heating on a metal base was performed while cutting ceramic materials to determine the time of continuous operation to a critical temperature of  $600^\circ\text{C}$ . The simulation results obtained showed the dependence of the heating temperature of the disc on the diameter of the latter, the speed of rotation, the minute feed, the grain size and the thickness of the disc. It is shown that by selecting appropriate process characteristics the time of continuous operation can be of the order of 10–12 min without the use of forced cooling.

## Keywords

Diamond cutting disc Disc temperature Ceramics  $\text{ZrO}_2$

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