Thermal properties of cement mortar with different mix proportions

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ABSTRACT

The energy required for the heating and cooling of buildings is strongly dependant on the thermal properties of the construction material. Cement mortar is a common construction material that is widely used in buildings. The main aim of this study is to assess the thermal properties of cement mortar in...
terms of its thermal conductivity, heat capacity and thermal diffusivity in a wide range of grades (cement: sand ratio between 1:2 and 1:8). As there is insufficient information to predict the thermal conductivity and diffusivity of a cement mortar from its physical and mechanical properties, the relationships between thermal conductivity and diffusivity and density, compressive strength, water absorption and porosity are also discussed. Our results indicate that, for a cement mortar with a 28-day compressive strength in the range of 6–60 MPa, thermal conductivity, specific heat and thermal diffusivity are in the range of 1.5–2.7 W/(m·K), 0.87–1.04 kJ/kg·K and 0.89–1.26 (x10⁻⁶ m²/s), respectively. The scanning electron microscope (SEM) images showed that pore size varied from 18 μm to 946 μm for samples with different cement-to-sand ratios. The porosity of cement mortar has a significant effect on its thermal and physical properties. For this reason, thermal conductivity and thermal diffusivity was greater in cement mortar samples with a higher density and compressive strength.

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