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Monitoring of the temperature – moisture regime of critical parts in the tower of the St. Martin Cathedral in Bratislava.

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Historic monuments are subject to degradation due to exposition to surrounding meteorological conditions and groundwater. Degradation is most often manifested by deterioration of plaster, walls structure and building elements like stones. A significant attention measures are undertaken to prevent degradation of the cultural heritage throughout the world. Our contribution is to monitor the objects for recognition of the critical state when it is necessary to make adjustments to avoid destruction. Buildings consisting from the listed elements belong to porous materials. Moisture diffusion, condensation, etc. attack structure stability of the buildings. Then the moisture diffusion and effects like drying, freezing / thawing belong to the control mechanisms of the degradation. In addition to laboratory experiments concerning the mentioned effects, we simultaneously studied processes by monitoring of the cultural monuments. During monitoring we have identified diffusion of moisture associated with cycle day / night and cycle moisture /drying caused by meteorological precipitation. Long term monitoring is performed in the tower of St. Martin Cathedral in Bratislava under the window sill of the belfry in exterior at three orientations, the north, south and the west. Monitoring is carried out in plaster and in masonry about 10 cm from the wall surface. The thermal conductivity sensors are used for monitoring that operate on the principle of the hot ball method. Then thermal conductivity of porous material is a function of pore content. The sensor has shape of a ball in diameter up to 2 mm in which a heat source as well as a thermometer is integrated into one component. A small heat output is delivered into the surrounding material. The temperature response of the sensor gives information on the thermal conductivity. For use in the preservation of cultural heritage a number of measuring devices have been developed for automatic registration of temperature and moisture in masonry and plaster of monuments.