

MODELING OF HEAT AND MOISTURE STATE OF TUNNELS KP "KIEV METROPOLITEN" DURATION OF THE CALENDAR YEAR

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The goal of the work. To develop a CFD model of the heat and moisture condition of tunnels of service connecting branches (SCB) of the Kyiv Metro and on its basis to perform the forecasting of the humid state of tunnels during a full calendar year during the implementation of summer airflow from the environment in the tunnel SCB, and the removal of tunnel air was carried out by fans of stations.

Results. On the basis of the received architectural and construction documentation from KP "Kyiv Metro" a geometric model of tunnels of the SCB between the Klovska-Maidan Nezalezhnosti-Khreshchatyk stations was constructed. The length of the tunnels is 2.5km, the depth of the metro station "Klovs'ka" is 50m, the difference in the height of the plane of the track between the highest and lowest points of the tunnels of the SCB is 60m. The settlement network contains about 1.5 million cells.

The developed physical model is a set of physical processes that take place in the tunnels of the SCB: the process of mixing the outer and wet tunnel air, the heat exchange between the tunnel air and the wall mount of the tunnel, the mass transfer of the liquid to the air - the processes of evaporation and condensation. The indicated physical processes can be described by differential equations of heat conductivity, energy, motion, heat transfer, which calculate the temperature fields, velocities for three components along the directions of coordinates x , y , z , pressure and humidity.

The adequacy of the developed CFD model was ensured by the use of available experimental data: temperature and humidity of tunnel air, temperature of the walls of the tunnels, costs and direction of air flow. The refined model showed the proximity of the calculated and experimental values of the temperature and humidity in the tunnels.

Conclusions. On the basis of the CFD model, the forecasting of the microclimate parameters change during the full calendar year was made subject to the implementation of the recommendations of IET NAS on the organization of the operation of the tunnel ventilation system of the SCB. Based on the analysis of the results of computer simulation, it has been established that for winter and autumn periods, the average relative humidity of tunnel air SCB may reach a normalized value of 75% or 80%, during the summer period relative humidity will be lower than 75%. The testing of recommended operating modes of ventilation installations from August 15 to November 13, 2018 has led to a decrease in the humidity of tunnel air in the range from 50 to 75%.