

The Inverse Problem in the Process of Heat and Moisture Transfer in Multilayer Walling

Authors : Bolatbek Rysbaiuly, Nazerke Rysbayeva, Aigerim Rysbayeva

Abstract : Relevance: Energy saving elevated to public policy in almost all developed countries. One of the areas for energy efficiency is improving and tightening design standards. In the tie with the state standards, make high demands for thermal protection of buildings. Constructive arrangement of layers should ensure normal operation in which the humidity of materials of construction should not exceed a certain level. Elevated levels of moisture in the walls can be attributed to a defective condition, as moisture significantly reduces the physical, mechanical and thermal properties of materials. Absence at the design stage of modeling the processes occurring in the construction and predict the behavior of structures during their work in the real world leads to an increase in heat loss and premature aging structures. Method: To solve this problem, widely used method of mathematical modeling of heat and mass transfer in materials. The mathematical modeling of heat and mass transfer are taken into the equation interconnected layer [1]. In winter, the thermal and hydraulic conductivity characteristics of the materials are nonlinear and depends on the temperature and moisture in the material. In this case, the experimental method of determining the coefficient of the freezing or thawing of the material becomes much more difficult. Therefore, in this paper we propose an approximate method for calculating the thermal conductivity and moisture permeability characteristics of freezing or thawing material. Questions. Following the development of methods for solving the inverse problem of mathematical modeling allows us to answer questions that are closely related to the rational design of fences: Where the zone of condensation in the body of the multi-layer fencing; How and where to apply insulation rationally his place; Any constructive activities necessary to provide for the removal of moisture from the structure; What should be the temperature and humidity conditions for the normal operation of the premises enclosing structure; What is the longevity of the structure in terms of its components frost materials. Tasks: The proposed mathematical model to solve the following problems: To assess the condition of the thermo-physical designed structures at different operating conditions and select appropriate material layers; Calculate the temperature field in a structurally complex multilayer structures; When measuring temperature and moisture in the characteristic points to determine the thermal characteristics of the materials constituting the surveyed construction; Laboratory testing to significantly reduce test time, and eliminates the climatic chamber and expensive instrumentation experiments and research; Allows you to simulate real-life situations that arise in multilayer enclosing structures associated with freezing, thawing, drying and cooling of any layer of the building material.

Keywords : energy saving, inverse problem, heat transfer, multilayer walling

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