Methods for Evaluating the Effectiveness of Natural Air Exchange of Residential Premises

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ABSTRACT: Comfortable conditions in the premises of residential buildings are determined by a complex of interrelated processes. In accordance with sanitary and epidemiological regulations, residential premises must be provided with: thermal comfort (microclimate), light comfort (natural lighting), insolation comfort (set duration of solar irradiation), noise comfort (not exceeding the standard noise level) , etc.

KEYWORDS: flat comfort, area, sick building, air comfort, dry skin, apartments,design ofbuildings.

I. INTRODUCTION

A special place in this list takes air comfort (breathability), that is, the provision of premises of fresh air, which is determined by the ratio of the change of "dirty" indoor air is more pure atmospheric preserving sanitary velocities of air flows in rooms. The world health organization found that residential air is 4-5 times more polluted than atmospheric air. A person spends up to 70% of the time in residential areas and there is a "Sick building syndrome" (Sick building syndrome), the signs of which are runny nose, eye irritation, dry skin, headache, cough, fatigue. Currently, air exchange in residential areas is provided by the design of natural ventilation, as the most economical. The design standards for natural ventilation allow us to estimate only one parameter of air exchange - the volume of air being removed. [1]

II. RELATED WORK

The study of this question showed that the rules of natural ventilation have a number of disadvantages and uncertainties, namely: to assess the speed of air flow in the space and the flow from dirty areas to clean; do not take into account the change in the thermal head in connection with the annual course of air temperature and do not account for the wind pressure that affects the amount of disposable pressure; the applicable standard is no concept of "quality of ventilation of premises". In connection with the above, the study of air exchange patterns in residential areas of buildings of mass development, depending on the volume planning solutions of apartments with different climate parameters is a very urgent task. [1]

For the first time a set of indicators that determine the quality of ventilation of premises: the volume of the air track and speed of air flow in the rooms of the apartment, the residence time of air in stagnant areas of the premises, the flow of air flow from "dirty" areas in the living room and it is shown that the inclusion of a specific set of indicators in the standards for the design of natural ventilation will improve the quality of design of natural ventilation; - developed a method for quantitative evaluation of ventilation of premises on the basis of CFD modeling using ANSYS software products: FLUNT and GAMBIT, which will allow to assess the impact of planning solutions for the apartments on the quality of the air; for the first time the regularities of changes of quantitative indicators of the qualitative characteristics of air exchange in residential areas depending on the magnitude of the ventilation rate, from obyemnoplanirovachnykh solutions of apartments and their orientation, the use of air handling devices; - developed methods for determining the calculated parameters of temperature and wind speed, which will determine the actual values of the annual course of the available head. [2]

III.TEXTINPAINING

The main objectives are the method of determining volumes of fresh air which is taken into account: climate parameters, aerodynamics building area, orientation of the building and number of storeys; - developed recommendations for improving the effectiveness of ventilation of premises on the design phase of apartments; - the

results of studies included in a course of lectures on discipline "Physics of the environment and enclosing structures", section "Natural ventilation in buildings" for students of specialty "Design of buildings».

Artificial ventilation:

1) Supply - when air is supplied from the street by ventilation systems.

2) Supply and exhaust - artificial inflow and exhaust. Air is supplied through the supply chamber, where it is heated, filtered, and removed through ventilation. It can be dominated by either inflow or exhaust, depending on the purpose of ventilation.

3) Exhaust-the ventilation system removes air from the room to the outside, reducing the air pressure in the room is compensated by natural ventilation.

The General principle of ventilation is that the exhaust fan should prevail in dirty rooms(in order to exclude the spontaneous flow of dirty air into neighboring rooms – for example, in infectious departments, the exhaust fan prevails by 20%). In clean rooms, the inflow should prevail(so that they do not receive air from dirty rooms, for example, in operating rooms, the inflow prevails by 20%).

IV. EXPERIMENTAL RESULTS

In apartments with two ducts that are posted in different areas of the apartment, is aligned with the change of air in homes and not depend on floor area, however, the flow of air from "dirty" areas more intensively distributed in living room. By increasing the length of the apartment on the facade of the building is established that: - the residence time of air in stagnant areas of premises does not depend on their removal from the ducts, but only on the ventilation rate; - with the removal of the living room from the ventanal reduced numb them in air flow from dirty areas. The results of the research presented in the third Chapter of the work allowed us to establish patterns of changes in the quality characteristics of air exchange depending on the volume-planning solution of the apartment, the location of the "inflow-exhaust" and other factors. [3]

V. CONCLUSION

In conclusion, based on the analysis of several dozen design solutions of supply devices, the system of supply-exhaust ventilation with heat recovery (SPVVR) was selected for research. The SPVVR system can work both on the inflow and on the exhaust; it can work in reverse mode with heating of the supply air. The product is produced commercially in two versions: a circular cross-section for the conditions of reconstruction of buildings and square - for new construction.

First established that the efficiency of natural ventilation of premises is determined by the following set of indicators quality: the ventilation rate, the trajectories and velocities of air flow on poedem of the apartment, length of stay of air in the stagnant areas of the premises, the flow of air flow from "dirty" areas (kitchens, bathrooms) to the living room.

Methods for determining the calculated values of air temperature and wind speed for estimating the annual course of the available head are developed. It is shown that the annual course of the heat head should be calculated from the average monthly values of air temperatures, and the wind head-from one value of the wind speed, which is determined by the highest probability of the total wind head based on the product of the probabilities of wind speeds in the year and the value of the wind head at these speeds.

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