Qualification indicators of architectural forms and their circulation zones

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Abstract. This paper contains the climatic construction conditions analysis in the Volgograd region and considers the standard architectural forms of buildings and structures.

Introduction

The development of modern construction using new architectural forms, efficient building materials and structures with constantly growing floors, as well as the construction zone expansion (deserts, northern territories, high mountains) require the most complete study of the construction site conditions, including the flows aerodynamics of the development space. Retter E.I., Shilov A.A., Kuznetsov Yu. A. and others dealt with the problem of architectural and building aerodynamics. Criteria describing the structures geometry under study and the aerodynamic characteristics were established by testing various models of architectural forms, buildings models, and building areas in a wind tunnel. The revealed dependencies are used in the modern architecture that in turn is today unthinkable without taking into account the climatic features of the proposed constructional region. These provisions will be defined for the Volgograd region.

Materials and methods

Volgograd region belongs to the climatic subdistrict with a sharply continental climate of steppes and semi-deserts of the Lower Volga region, and Kazakhstan [1]. The region is located on the border of dry steppes and semi-deserts of the Caspian lowland, far from extensive water spaces and oceans.

| Wind mode. frequency of wind directions | 1 | 2 | 3 |
|----------------------------------------|---|---|---|
| Wind mode. frequency of wind directions | [%] | January | 6 | S | July | 14 |
| points of the compass                  |   |    |   |   |

Table 1. Wind speed
The highest wind speed which excess in the year is 5% [m/sec] 10

results

This interaction analysis is a difficult task for one, two buildings and a very complex one for a microdistrict with dozens of differently located buildings. The task is complicated with latest architectural forms use, and in view of the construction equipment and technology development and with a multiple size increase of building objects and their configuration, the wind flow aerodynamics will also change [6]. There are the following main architectural forms of residential buildings (refer with Figure 1)
Figure 1. Building configurations

a - tower; b - L-shaped plan; c - U-shaped plan; d - T-shaped plan;

To build a more complete picture of a given surface aerodynamics (microdistrict development), the areas of aerodynamic shadows, wind pressure and relative speeds isolines of various architectural forms buildings are first determined. Then, a general picture of the individual buildings aerodynamics impact on the general microclimate in the developed area (microdistrict) is formed. It is also necessary to analyze the lower atmosphere properties and composition in the developed area [7].

Discussion and conclusion

The application of patterns characterizing the general atmosphere circulation is complicated by the local features of a given geographical area, for example, forests, hills, valleys, industrial or residential complexes that especially affect the air flow character. Near the earth’s surface the air flow is turbulized, there is wind speed pulsation in magnitude and direction [8].

Summary

Proceeding from this, when designing a building, it is necessary to take into account the whole variety of architectural, structural, environmental and town-planning requirements and standards that have tendencies to toughening. More detailed aerodynamic parameters will be discussed in the future works.

References

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