

Research Article

Study of the environmental Pollution as Sanitary Protection Zone Parameters and Sanitary Gaps of the Land and Property Complex of the Roshchino International Airport in Tyumen

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ABSTRACT

Airports are sources of environmental pollution, and therefore, reasonable parameters of their sanitary protection zones will ensure safety and favorable conditions for human activity and sustainable development of territories. In order to ensure the safety of the population and in accordance with the Federal Law "On the Sanitary and Epidemiological Welfare of the Population" dated March 30, 1999, No. 52-FZ, a special territory with a special mode of use is established around airports. The size of the sanitary protection zone of airports is established in each case on the basis of calculations of the dispersion of pollution in atmospheric air and physical impact on atmospheric air (noise, electromagnetic fields, vibration, infrasound, etc.), results of field studies and measurements at test points, and also based on an assessment of the risk to public health.

Keywords: Sanitary protection zone, Land and property complex of an airport, Factors and sources of pollution, Methods for establishing a sanitary protection zone.

INTRODUCTION

The object of the research is land and property complex (LPC) of the Roshchino International Airport, administratively located within the boundaries of the city of Tyumen. The airport is bordered by forest land, agricultural land,

garden plots, as well as urban residential high-rise buildings (Fig. 1).

Fig. 1 Location of the nearest residential area to the airport.



The aim of the study is to analyse the parameters of the sanitary protection zone and sanitary gaps of the international airport LPC, to establish the degree of negative impact on the part of the research object on the surrounding areas [1].

During the formation of the sanitary protection zone of the international airport LPC, the analysis included 885 sources of emissions of pollutants. The calculation of the pollutants dispersion was carried out for winter time, since, in the territory under consideration, there are sources of pollutants emission that operate at full capacity only in winter. The methodology for establishing the sanitary protection zone of the land and property complex of the Roshchino International Airport included the following calculations:

1. Calculation of pollutant emissions from:

- aircraft, which was conducted for four directions of takeoff and landing operations (SW-NE, NE-SW, NW-SE, SE-NW). The calculation was made for all four options, taking into account all the take-off and landing operations on the state of peak load (8 take-off and landing operations per hour). Measurements of the concentration of pollutants were carried out at an altitude of up to 300 m;
- industrial and municipal storage facilities;
- car parks located in the station square and in its vicinity (outside the airport);
- traffic flow on the access motorway.

Since the nearest residential area is located at a distance of 18-80 m east of the border of the airport, and the object for which it is necessary to determine the boundary of the sanitary protection zone is not included in the existing classification

[2], this boundary is established by calculation along lines of 1.0 MPC for substances (summation groups) that give the highest calculated values of surface concentrations

[3]. 14 control points located in the residential zone were selected as control points. From the data obtained it can be seen that in the residential area the maximum concentrations of pollutants for nitrogen dioxide were (0.85-0.96

MPC) and for suspended substances (1.01-1.06 MPC). At the same time, the background concentration on suspended substances is 1.0 MPC (the contribution from the object under consideration for this substance is less than 0.1 MPC). Carbon monoxide concentrations are within 0.80-0.92 MPC (with a background value of 0.8 MPC). Among the pollutants, the maximum concentrations of which in the residential area exceed 0.1 MPC, nitrous oxide should be indicated (0.82-0.83 MPC) with background concentration (0.80 MPC), gasoline (0.20-0.67 MPC), hydrocarbons C12-C19 (0.20-0.52 MPC) and azo dyes (0.22-0.44 MPC).

Objects, the placement of which is prohibited by clauses 5.1 and 5.2 of SanPiN 2.2.1/2.1.1.1200-03

[4], do not fall within the boundaries of the calculated sanitary protection zone due to the factor of air pollution.

2. In the acoustic calculation on runway 03/21, Boeing B737-800 is accepted as the noisiest among the frequently used aircraft. On the runway 12/30, a similar aircraft is adopted – Airbus A319, as the most common [5]. Sanitary and hygienic restrictions on noise within the territory under consideration are established based on the following factors [6, 7]:

- round-the-clock operation of the airport, in connection with which the acoustic calculations were carried out for day and night operation modes;
- rationing of aircraft noise generated by ground-based take-off and landing operations of aircraft, which will be conducted at the maximum sound level for the norms of night time of day ($L_{Amax} = 75$ dBA), as more strict [8];
- planning situation of the urban area.

Acoustic calculations showed that the adjacent residential development does not fall within the zone of noise discomfort.

3. Calculations of the electromagnetic field levels showed that the boundaries of the sanitary protection zone by the electromagnetic radiation

factor for transmitting radio-technical devices do not extend beyond the airport.

RESULTS

In the course of the study of the Roshchino International Airport land and property complex sanitary protection zone parameters, five zones were established:

1. The sanitary protection zone of the OJSC Roshchino Airport property complex located within the boundaries of Tyumen and the Tyumensky District of the Tyumen Region. From the boundaries of the land allocation, the Roshchino airport is located: from the north at a distance of 360 m, from the north-east – 360 m, from the east – 370 m, from the south-east – 150 m, from the south – along the border of the airport, from the south-west at a distance of 260 m, from the west – from 135 m to 270 m, from the north-west – at a distance of 270 m.
2. The zone of sanitary gaps along the standard flight routes in the aircraft take-off and landing zone of the OJSC Roshchino Airport for night time (from 575 m to 7650 m).
3. The zone of sanitary gaps along the standard flight routes in the aircraft take-off and landing zone of the OJSC Roshchino Airport for daytime (from 750 m to 2500 m).
4. Zone of development restriction and prohibition for the property complex of OJSC Roshchino Airport located within the boundaries of Tyumen and the Tyumensky district of the Tyumen region.
5. The security zone of the air approach ways to the airport Roshchino Tyumen, located within the boundaries of Tyumen, Tyumensky and Nizhnetavdinsky Districts of the Tyumen Region.

CONCLUSION

After the establishment of a sanitary protection zone and sanitary gaps of day and night time, it was revealed that more than 800 plots were in the zone of development restriction and prohibition, including private property.

Land plots that fall into the sanitary gap zone are not withdrawn, but a special mode of their use

can be introduced within the boundaries of these plots, restricting or prohibiting those activities that are not compatible with the goals of establishing zones [9].

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