Taking into Account Local Conditions in the Development of Climate Standards in Construction

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Abstract. Accuracy of climate assessment is one of the most difficult and at the same time the most urgent tasks of the world science. On the basis of interaction of a large number of various meteorological factors the normative indicators used at design, construction and operation of objects, the choice of constructive decisions of products and characteristics of materials are developed. Energy saving and safety are realized through provision of climatic parameters, qualitative technology of products and correct operation of construction objects.

The specificity of the orographic features of the construction site of JSC "Sayanskhimplast" has led to the development of climate regulations, taking into account the local conditions of the territory. In work were used materials of the Irkutsk Department of meteorological service, data of special surveys conducted by Zapsibnigni and materials thermoanemometer the site area. During the research the observational data of the average daily temperature of the atmospheric air of the construction site "Sayanskhimplast" were taken into account. Methods of calculation of meteorological parameters, developed in the Institute of building physics RAASN, it was also a comparison of the extremes of winter temperatures and representative cities, which has allowed the development of climate regulations for the city of Sayansk.

1. Introduction
The dependence of the weather on the atmospheric circulation is most evident in the temperate and high latitudes in which our country is located. Correct climate assessment is one of the most difficult and at the same time the most urgent tasks of the world science [1]. Energy saving and safety of construction projects is realized through the provision of climatic parameters, quality technology in the production of products and proper operation. Climate standards are developed to improve the safety of people in buildings and structures and the preservation of material values.

When zoning the territory for any climatic indicator, the influence of large-scale synoptic processes on the climate is considered, taking into account the conditions of the open place. The microclimate of certain areas, having a certain stability, may differ significantly from the climatic system of the area. In the development of standards of JSC "Sayanskhimplast" there was a need to clarify the climatic parameters for the construction site. On the figure 1 the location of the main points of the Irkutsk region is shown. The current regulations did not contain the data of G. Sayansk, which according to climatic features, as shown by further research, was closer to the thermal regime of the territory of the plant.
In the analysis of the climate of the area, the materials were used materials of the Irkutsk Department of meteorological service, Ifyyst special observation, aeroclimatic specific the state of the atmosphere in the area of Ziminsky chemical plant (research jnxtn, ZapSibNIGMI, resp. Lebedinsky A. B.), research jnxtn (resp. O. V. Klimov), as well as materials of thermal imaging of the industrial site. In addition, the materials of meteorological observations of the average daily temperature of the atmospheric air of the construction site “Sayanikhimplast” were taken into account. It was noted that the increase or weakening of circulation on a planetary scale is reflected only partially over this territory, manifesting itself in local features in accordance with the physical and geographical conditions of the area, as the pre-Baikal region, as a rule, is aside from the main trajectories of the cyclone. Meteorological observations were carried out on the territory of the construction site (Fig. 2).

The completeness and reliability of the information climate base is necessary in connection with the intense climate change, the consequences of which are manifested at the global and regional levels [2], causing the need for regular updating and adjustment of standards. All climate diversity, due to territorial differences of the Russian Federation can not be reduced to a list of items, v SNiP 23-01 «Climate standards in construction»

The low temperature of the external environment and the duration of its standing, affects the quality of the structures. Experts noted that the plastic properties of steels are markedly changed.
already at temperatures close to 0° [3], at a certain critical temperature, the metal becomes brittle. Fragility at low temperatures is also typical for reinforced concrete, not designed for severe frosts. A. N. Shkinev [4] provides data on accidents at low temperatures at construction objectes made of reinforced concrete. Durability of building envelope is one of the priority tasks of building physics [5, 6]. However, the focus on low temperature values leads to increased material costs, often unjustified [7].

In order to avoid this, when determining climatic standards, they proceed from the provision of design parameters, taking into account the execution of F. Z. No. 261 "on energy saving and energy efficiency improvement", F. Z. No. 184 "on technical regulation" and "Technical regulation on the safety of buildings and structures" No. 384.

Probabilistic analysis of the calculated external climatic parameters allows to estimate the number of times the climate parameters are exceeded over the calculated values, the total duration of the parameters exceedance and the duration of the greatest deviation. In the analysis of long-term periods of observations can be seen the stability of the climate system. In recent years, there has been a tendency to use shorter estimated observation periods due to climate change in recent decades. [8].

The plant is located in the foothills of the Irkutsk-Cheremkhovo plain, near the city of Sayansk. This area is part of the Central Siberian plateau with absolute marks of 400-500 m. from the South, South-West and West the area is protected by Eastern Sayans (with mountain heights up to 3000 m) from the wind in the direction of South-West transfer of air masses. In the North-West of the territory in the North-East direction stretches a strip of hills, called the Angara ridge, with individual heights of mountains up to 800 m or more. From the North-East, the plain is partially covered by the hills of the Lena-Angarsk plateau.

The southern part of the pre-Baikal region (the pre-Siberian zone, within which the study area is located) is located in the center of the Asian continent. It is surrounded by mountains on almost all sides and has complex orographic conditions. From the South and South-West district is covered by large mountain system of the Eastern Sayan mountains with altitudes up to 3000 m and from the North-West ridge of Angarsky mountain-ridge with elevations up to 600 m. To the northeast are hills of Lena-Angara plateau.

The Sayans are a serious orographic obstacle to the displacement of cyclones from the West to the East to the pre-Sayans zone. Due to the need for more accurate determination of meteorological parameters of the territory in the area of Sayansk chemical plant was installed own weather station. On the ric. 3 the dynamics of the average daily air temperature during January according to the observations of the Sayansk meteorological station for the period 1987-2010 is shown.
The complex of the conducted researches allowed to develop climatic standards of the territory of Sayansk, located near the construction site of the plant. Initially, the meteorological characteristics of the territory of the plant tied to the city of Winter, the climate of which was more severe, due to local orographic differences. In carrying out the studies, the coldest month of the year of the most severe winter was taken into consideration. A comparative analysis of the climatic differences of the territories is presented in table 1.

**Table 1.** Outdoor air temperature obtained directly from observations and regression equations

| Period             | The temperature of the coldest days | The temperature of the coldest five days |
|--------------------|-------------------------------------|----------------------------------------|
|                    | Average                | Calculated     | Average                | Calculated     |
| St. Zima 1923-1991| -44,8                  | -44,7          | -40,4                  | -40,1          |
| 1942-1991          | -44,8                  | -44,3          | -40,3                  | -39,8          |
| 1962-1991          | -43,6                  | -44,1          | -37,3                  | -39,6          |
| The industrial site of JSC "Sayanskhimplast" 1923-1991 | -43,8                  | -43,7          | -39,4                  | -39,1          |
| 1942-1991          | -43,8                  | -43,3          | -39,3                  | -38,8          |
| 1962-1991          | -42,6                  | -43,1          | -36,3                  | -38,6          |

The comparison of temperature conditions of representative cities of Irkutsk region in January 2001 is presented in table 2.

**Table 2.** Temperature regime of the Irkutsk region in January 2001 (the coldest day), the temperature in the "OS

| Irkutsk (c 1981 no 2010 r.) | Zima (1981 to 2010) | Sayansk (1987 to 2010) |
|-----------------------------|---------------------|------------------------|
| Date | Temperature | Date | Temperature | Date | Temperature |
| 3    | -40.0       | 4    | -42.4       | 4    | -41.5       |
| 5    | -42.6       | 5    | -42.1       | 6    | -42.4       |
| 6    | -42.0       | 7    | -42.4       | 7    | -43.1       |
| 8    | -42.8       | 8    | -44.5       | 8    | -42.1       |
| 9    | -41.3       | 9    | -46.9       | 9    | -43.8       |
| 10   | -39.2       | 10   | -45.4       | 10   | -43.3       |
| 11   | -39.4       | 11   | -44.8       | 11   | -41.8       |
| 12   | -41.9       | 12   | -41.1       | 13   | -40.2       |

$t_{sr.} = 40.7$  $t_{min.} = -42.8$  $t_{sr.} = -43.3$  $t_{min.} = -46.9$  $t_{sr.} = -42.4$  $t_{min.} = -43.8$
The methods of calculation of climatic parameters developed in the research Institute of building physics of RAASN, the analysis was carried of extreme values of winter temperatures of representative cities of the Irkutsk region are applied in the work. The research has shown that the weather conditions of the construction area of the industrial site of JSC "Sayanskhimplast" are the closest to the climate of the city of Sayansk. Climate regulations in the city of Sayansk was included in the latest revision of a Set of rules. SP 131.13330.2012. «Construction climatology». SNiP 23-01-99*.

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