The Building of the Non-Classical Secondary School in Yakutsk City – the Architectural Monument of the Early 20th Century

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Abstract. This article considers the problem of preservation of an architectural monument and a method of its restoration. The short characteristic of the stone constructions during the pre-revolutionary period in Yakutsk is provided. The description of the building of the non-classical secondary school was made on the basis of references, archival documents and on-site investigations. So features of its construction and the reasons of gradual destruction have been revealed. In 1917 the commission of YORGS (Yakut Office of the Russian Geographical Society) have been given results of inspection of building on permafrost, where the main reasons for deformations of the strip foundations on permafrost have been revealed. Results of inspection for 2007 with recommendations about restoration of the learning building of the non-classical secondary school have been stated. There also stated the offer on creation of the new sightseeing attraction in the city with the need of preservation of more than two collapsing of historical monuments.

1. Introduction

The two-story brick learning building of Yakut non-classical secondary school applies to monuments of architecture of the beginning of the early 20th century. The public of the city is faced by a serious problem of preservation of this historical building. The last twenty years the monument has not operated and is being deserted. Still the issue of a method of its restoration hasn't resolved yet, therefore studying of features of construction of this building and its technical condition are relevant.

2. Construction of the first stone buildings in Yakutsk

Yakutsk founded in 1632 remained almost wooden city till the middle of the 20th century. The city started building stone houses in XVIII century. The first stone house of voivode office was built in Yakutsk in the wooden ostrog (fort) in 1707 under the decree of the tsar Peter I, but, unfortunately, this building hasn't remained [1,2]. Further, throughout the XVIII-XIX-th centuries in Yakutsk there were construction of mainly stone church[3]. In 1836 on the main city street there was constructed the big civil building – Gostiny Dvor, and from the middle of the XIX-th century stone shops of city merchants appeared. Since the beginning the XX-th century till 1917 a number of constructions from a brick of civil buildings were built: library, district court, treasury, non-classical secondary school, trading houses of rich merchants and also the state wine warehouse which was located in three stone two-storied buildings [4]. Pre-revolutionary Yakutsk had no large industrial enterprises.
"Manufacture" of a brick at the so-called "brick-plants" located in the neighborhood of the city where clay bricks for needs of the city were made. These brick-plants represented by simple sheds where workers tempered clay and burned a brick, using sometimes as the subsidiary strength of horses and bulls [5]. Bricks for construction were made "on a simple clay well fermented and properly burned" [6]. In construction one type of bar bricks with dimensions close to the standard of that time 27 × 13 × 6,6 cm was used. The production of bricks by different teams and the imperfect system of molding and burning gave small fluctuations in sizes of bricks within 2 cm [7].

Figure 1. Yakutsk non-classical secondary school (1911 y.) on Politseiskiy street (now Yaroslavskiy street)

All first stone buildings were constructed on the strip foundations laid on depth of 1,5 - 2 meters. The foundations had width of 1,25 - 1,5 meters at a thickness of walls of 1 meter, and in temples – were even thicker. Beams of a floor kept within on the wooden rollers and columns buried up to 1 meter in soil. Buildings were heated by the Dutch furnaces from the burned brick [8,9]. According to a census of 1917, in Yakutsk there were 1140 buildings, from them stone were 48 [4], but during the Soviet period their most part were simply destroyed. In the 90th years of the XX-th century Yakutsk started restoration works to preservation of not numerous monuments of architecture, history and culture [10]. In 1992 the architect N.P. Kradin made "The Annotated Heritage of Yakutsk "catalog in which he highlighted that the building of the Yakut non-classical secondary school was of historical and architectural value and "it was recommended to statement on local state protection" [11].

3. History of the non-classical secondary school construction

The non-classical secondary school was one of the first average educational institutions of the Yakut area. It was founded in 1890 on the basis of the Yakut six-grades men pro-gymnasium which settled down in the two-storied wooden building. In 1907 money for construction of the stone building was allocated, and the foundation was already laid on May 1, 1908 not far from wooden building. The building was constructed by construction committee under the leadership of the governor I.I. Kraft. Bricklayers for construction of walls were invited from the Irkutsk province. To the fall of the next year the building was constructed and covered with an iron roof [12]. The ceremonial opening and consecration of the stone two-storied building of the Yakut non-classical secondary school was held on January 7, 1911 (picture 1). The prayer was served by the bishop Yakut and Vilyuysk Innokentiy in the presence of the governor I.I. Kraft, teachers, pupils and honorable citizens [13]. Serious significance was at that time attached to spiritual education of pupils, therefore on the second floor of non-classical secondary school Innokentyevsky church were consecrated [14]. The construction committee under the leadership of the Yakut governor I.I. Kraft transferred the new building to the jurisdiction of economic committee of the school in August 4, 1911 [17]. The learning building of the Yakut non-classical secondary school was one of the biggest buildings built in the first decade of the XX-th century. The design and estimate documentation were made by the engineer D. Magidey who was guided at the same time by the approximate construction program for educational institutions [15]. Large by the sizes (49,0 x 47.9 m), the P-shaped two-storied building in the plan dominated among surrounding buildings. Bricks were plastered and painted in two tones. The composition of the main facade was solved with three-part partitioning due to the wide architectural projection, portioned by pilasters in window piers. Windows were rectangular, narrow and high, both on the main, and on side facades. Building volume on all perimeter was emphasized with forming drop appron.[11].
Brick walls of the building were put up on the strip footings from a rabble stone. Depth of the base of external walls "was accepted in 2,13 m, and internal in 4 arshins (2,8 m) at a thickness of walls of the first floor in 3 ½ brick (1,0 m), the second floor in 3 bricks (0,85 m) and internal in 2 bricks (0,56 m)" [16]. Overlapping from boards 50 mm thick were laid on wooden beams with a diameter of 250 - 280 mm. There was a roof with a sloping surfaces on wooden rafters. In the building of non-classical secondary school instead of traditional furnaces the project was provided by the system of the central steam heating that was then for Yakutsk one of miracles of technical progress.

4. Technical condition of the building in pre-revolutionary period

For the first time the adverse effect of steam pipes on permafrost of soil was established in April 9, 1912. The special commission examined the building of school and decided the need to repair "with isolation of steam pipes under floors of the first floor against soil thawing" and "with isolation of an underground soils against thawing of frozen soil" that "would stop cracks in all internal walls" [16]. This resolution was executed but thawing of soil continued also in the next years [8]. In 1914 the strip foundation of the educational building of the non-classical secondary school had partial deformation. Walls had wide cracks [8].

The condition of the educational building caused worry among the leaders of the area, various commissions recognizing critical condition of the building were created. In October 1916 the civil engineer A.N. Aristov examined the building. He noted that cracks had appeared in walls at once after moving of pupils to the new building. Observations showed that "the bases of external walls were located in frozen soil, and the bases of internal walls were in the thawed soil saturated with water reasoning the movement of walls" [18]. As it was established by technical inspection of the building of the Yakut non-classical secondary school in October 1916, "damages to walls came only from the wrong establishment of steam heating in that building. As the air holes on the bottom of the exterior walls of the building had always been closed in winter so steam pipes under the first floor didn't freeze through, therefore, destruction of walls of the building with steam heating happened constantly from year to year" [16]. The engineer Aristov suggested to solve a problem in two ways: first, to deepen the foundation of internal walls to a sandy layer with a laying of a rabble stone on hydraulic solution for foundation base expansion; secondly, to freeze soil of internal walls and to remake all system of heating to prevent new thawing [19]. In 1917, the soil which thawed near the furnace sank that led to deformation of the base, appearance of cracks on walls and to a partial collapse of a ceiling in classes [20]. The condition of the building of school testified the need to develop new technical methods of construction on permafrost.

As it was established by technical inspection of the building of the Yakut non-classical secondary school in October 1916, "damages to walls came only from the wrong establishment of steam heating in that building. In September, 1917 the commission as a part of members of YaORG N. Koryakin, I. Pavlov, the city technician Starodub made a soil research near the former voivode office (1707), ancient churches of the 18th century, the building of the Yakut non-classical secondary school. Researches showed that "foundations of these buildings were located on eternally frozen clean sand which was situated under the office building – at a depth of 0,9 m, and at the building of the Yakut non-classical secondary school (according to Middendorf) – at a depth of 4,2 m to 5,3 m" [16]. Apparently from the act of September 5, 1917 depth of thawing of the soil was determined by trial holes of soil on which buildings in Yakutsk were built by a research from 1,06 m up to 1,42 m [16]. The commission recommended to observe a number of technical requirements at construction of stone buildings on frozen soil "for their protection from destruction" [16]. The following items were among technical requirements: 1) "to build stone buildings without basements as they served as good conductors of heat to a foundation base, and in them water from thawing of frozen soil accumulated easily"; 2) "to do floors of the first floor double and warm with elevated air holes under a floor"; 3) "it is necessary to give a slope from the stone building that the water falling from roofs and formed from thawing didn't accumulate near its foundations" [16].

5. Technical condition of the building after 1917
Long time the building of non-classical secondary school were absolutely neglected. In 1934 upon termination of capital repairs in it the state teacher training college was placed, and since 1956 – faculties of the Yakut state university were placed [20]. Since 1998 the building was already empty and didn’t operate.

In 1930 the building was put in operation after restoration of temperature condition of soil of the basis again, and in ten years, in 1940, the soils of the building started to thaw again and, in this regard under the building the cold aired underground was established [21]. In 1980, the foundation grounds again began to precipitate due to the thawing of permafrost and dangerous cracks appeared in the building. The only dug-out well showed that the strip foundation of the building were ribbed from rubble stones and laid down to a depth of about 2.4 m. The thickness of the foundation corresponded to thickness of walls of the first floor. According to the data of geodetic observations for 1992 - 1998 the process of sediment development had the progressive character which depended on the weather: in winter, there was a rise in the building, in the summer period - its subsidence. Unorganized water drainage which led to a humidification and decrease in durability of the lower ranks of a bricklaying [21] negatively affected a building condition.

The examination conducted in the summer of 2007 showed that soil up to the depth of 2,8 m were presented by loams with impurity of fragments of bricks, boards and gravel. Below, up to the depth of 5,1 m, there were salted soil which leaned on hard frozen sands. Survey of the building revealed existence of traces of repair: strengthening of the strip foundation by a ferro concrete shirt 100 mm thick, replacement of the destroyed laying in the lower part of walls on 800 mm. A large number of cracks, both on external, and on internal walls of the building and the partial collapse of some sites of walls were recorded. The lack of overlapping of the first floor led to littering of internal space of the building flooded with a surface water. By results of inspection the following recommendations were made: to scavenge and carry out drainage trays; to restore temporary tightening; to strengthen the foundations; to replace and restore a laying of arches and walls; to restore overlappings; to replace a roof; to remove cement and sand plaster and to restore limy plaster [21].

Conclusion
Comparing results of the conducted examinations of the building of the non-classical secondary school it is possible to draw certain conclusions. First, till 1917 "thawing" of permafrost of the foundations because of misuse of the building was the main reason for deformation of the foundations (placement of system of steam heating under the first floor, lack of the aired underground). Secondly, conditions for restoration of level of permafrost have not been created till today.

Restoration of buildings of the XVIII-XX centuries in the conditions of distribution of permafrost starts with strengthening of the foundations. Today the freezing is the most widespread way of increase in the bearing ability of the thawed soil. But this method can affect the condition of the bearing walls due to the rise of freezing water-saturated grounds. Chemical fixing of soil (cementation, silication, etc.) for the strip foundation 2.4 - 2.8 m high immersed in thawed soil will be the most acceptable. It will allow to strengthen at the same time the foundation, to increase the bearing ability of soil, without having caused at the same time additional vertical deformations of walls. After strengthening of soil it is possible to start strengthening of brick walls, restoration of other structures of the building.

In Yakutsk there is already an experience of restoration of buildings on the strip foundations with preservation of a frozen ground condition. So, for example, at restoration of National library, Preobrazhenskiy church and Bogoroditsky Church the aired underground "by means of outlets and subfloors for the purpose of a soil freezing" has been organized [10]. To strengthening of the strip foundations the following events have been developed and implemented: cementation to remove defects in the foundation material; devices under the foundations of the bored piles transferring the load of deep-laying incompressible medium and fine sands; device of a monolithic reinforced concrete belt.

In June 1, 2016 in the historical building of the Yakut non-classical secondary school there was a fire that began from the second floor and quickly spread over the wooden overlapping to the roof. The
further delay in restoration of the building can lead to the collapse of walls and final loss of the last monument built from a brick at the beginning of the XX-th century. Around the building of the non-classical secondary school, it is necessary to create a security zone and to organize temporary preservation of an object of cultural heritage. Besides, it is necessary to include two more collapsing historical monument in this security zone: wooden two-storied building of a pro-gymnasium and mine well of F. Shergin whose depth is 116,5 meters [12]. Already there is a design offer on creation of such museum complex which on condition of restoration of all three objects of cultural heritage can apply for the status of the sightseeing attraction of the city of Yakutsk.

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