

Artículo de investigación

Studies of cultural heritage sites of federal significance

ИССЛЕДОВАНИЯ ОБЪЕКТОВ КУЛЬТУРНОГО НАСЛЕДИЯ  
ФЕДЕРОЛЬНОГО ЗНАЧЕНИЯ

Estudios de sitios de patrimonio cultural de importancia federal.

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Abstract

This article is supposed to make a professional analysis and assess the reliability of the historical buildings in Ryazan - an object of cultural heritage of federal importance "House of Saltykov-Shchedrin (Morozov) - 18th century". On the basis of visual inspection and a large number of field studies using methods of ground-based laser scanning, photogrammetric method and other measuring instruments, areas of destruction and loss of the building were identified. According to the results of the analysis of archival documents and the processing of field work, a complex of architectural and archaeological measurement drawings was drawn up, on the basis of which further house restoration will be carried out without any damage to historical material. The article on a specific example provides brief archival information about the historical significance of the building, describes the methods and methods of the survey.

**Keywords:** Ryazan, historical buildings, architectural monuments, field studies, building facade, building walls and floors, laser scanner.

Аннотация

В данной статье предполагается сделать профессиональный анализ и оценить надежность здания исторической застройки г. Рязани – объект культурного наследия федерального значения «Дом Салтыкова-Щедрина (Морозова)-XVIII в.». На основе визуального обследования и большого количества натурных исследований методами наземного лазерного сканирования, фотограмметрическим методом и другими измерительными приборами было выявлены участки разрушений и утраты здания. По результатам анализа архивных документов и обработки полевых работ стал комплекс архитектурно-археологических обмерных чертежей, на основе которого будет дальнейшая реставрация дома без какого-либо ущерба историческому материалу. В статье на конкретном примере приводятся краткие архивные сведения об исторической значимости здания, описаны методы и способы обследования.

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**Ключевые слова:** Рязань, историческая застройка, памятники архитектуры, натурные исследования, фасад здания, стены и перекрытия здания, лазерный сканер.

## Resumen

Se supone que este artículo hace un análisis profesional y evalúa la confiabilidad de los edificios históricos en Ryazan, un objeto del patrimonio cultural de importancia federal "Casa de Saltykov-Shchedrin (Morozov) - Siglo XVIII". Sobre la base de la inspección visual y un gran número de estudios de campo que utilizan métodos de escaneo láser en tierra, el método fotogramétrico y otros instrumentos de medición, se identificaron áreas de destrucción y pérdida del edificio. De acuerdo con los resultados del análisis de documentos de archivo y el procesamiento del trabajo de campo, se diseñó un complejo de planos de mediciones arquitectónicas y arqueológicas, sobre la base de la cual se llevará a cabo una restauración adicional de la casa sin dañar el material histórico. El artículo sobre un ejemplo específico proporciona información breve de archivo sobre el significado histórico del edificio, describe los métodos y los métodos de la encuesta.

**Palabras clave:** Ryazan, edificios históricos, monumentos arquitectónicos, estudios de campo, fachada de edificios, paredes y pisos de edificios, escáner láser.

## Introduction

In today's world, when humanity is directed into space, to other planets, builders also want to rise above the clouds and build something brilliant that will be a triumph of engineering. However, skyscrapers conceived as flagships of the urban environment do not always cause joy and pride (Gražulevičiūtė-Vileniškė, Urbonas, 2011). Skyscrapers often stick up lonely over the whole surrounding landscape, disrupting the harmony of the city, and cultural and historical values fade into the background (Gražulevičiūtė-Vileniškė, Urbonas 2011; Meier, Wohlleben, 2000).

Many new different objects appear with the rapid growth of cities, their urbanization. The preservation of historical buildings (Zakharov, 2016; Romanova, Litvinova, 2010) and its unique environment, which is the spiritual and cultural heritage of large and small Russian cities, is becoming increasingly important. (Cramer, 2007). One of the most important tasks of local authorities, cultural and architectural authorities is the creation of a comfortable urban environment, a harmonious combination of the old and the new in the architecture of the modern city.

The tasks in relation to the urban heritage are really complex and painful. The problem of saving and maintaining the historical appearance

of ancient buildings and structures in our cities requires professional, competent decisions that must be realized by the citizens and the owners of these unique buildings (Gražulevičiūtė-Vileniškė, Urbonas, 2011). If the city authorities and the population do not have a precise understanding of the historical and cultural significance of architectural monuments, this will cause the disappearance of these monuments, the identity that is inherent in each ancient city (Meier, Wohlleben, 2000).

The object of the survey is in Ryazan (until 1778 - Pereyaslavl-Ryazan). The city was founded in 1095. Ryazan is the administrative center of the Ryazan region, one of the thirty largest cities in Russia. The population is more than 500 thousand (2018). Ryazan is divided into 4 districts, stands on the right bank of the Oka River and is 190 km away from Moscow.

The historical building of Ryazan, an object of cultural heritage of federal significance "House Saltykov-Shchedrin (Morozov)- 18th century", located at 42/24 Lenin Street was selected for analysis (Code of Architectural and Monumental Art of Russia).

The building was built in 1804 by the project of architect N. D. Shein (Fig. 1.a, b).

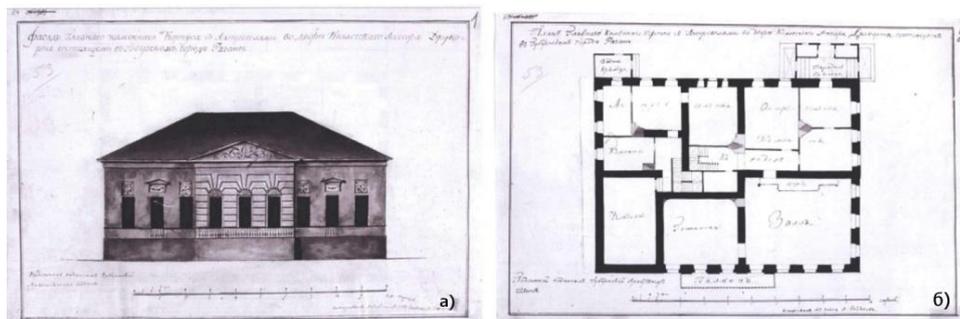


Fig. 1. A copy of the house of collegiate assessor Drucort,  
Architect N.D. Shein

a - the facade of the main stone building with entresols; b - plan of the main stone building with entresols (Archive of Federal State Budgetary Institution of Culture "Ryazan Historical and Archival Museum-Reserve". HB-1184).

The building was a city estate located in the central historical part of Ryazan at the intersection of the main street of the city - Lenin (formerly Astrakhanskaya) and Nikolodvoryanskaya Street (GARO). Initially, it was a brick one-story house on a white-stone foundation and entresols in nine window axes along the main facade and six window axes along the front one with a hipped metal roof. The main facade overlooking Astrakhanskaya street had a symmetrical composition and was designed in the style of classicism. The central three-window rusticated risalit was crowned with a triangular brick gable with a molded cartouche framed with a large floral ornament. In front of him the balcony-terrace on a stone base with a metal fence (fig. 2) (Avdonin, Akulshin, Geraskin et al., 2000; Makashin, 1957) was arranged on the entire width of the risalit.

The exit to the balcony was through a door located on the left window axis of the risalit. The

door and windows of the risalit are placed in high arched niches. The upper semicircular parts of the niches are filled with fan-shaped moldings with a relief five-leafed sheet in the center. The side parts of the main facade are symmetrical and smoothly plastered; they have a stretched window sill and decorative ornaments above the windows. The central windows are highlighted with triangular sandriks resting on the console.

Horizontal niche with stucco decor in the form of oak wreaths is located between the consoles. Square niches with stucco lancet arches inscribed in them, filled with ornamental and vegetable bas-relief, are located above the extreme windows of the lateral parts of the main facade. All facades were completed with a smooth frieze and a drawn plaster eaves with the removal of cornice limestone slabs. The basement of the building and the balcony is faced with limestone slabs. The windows of the mezzanine rooms looked out onto the courtyard and side facades.



Fig.2. House Saltykov - Shchedrin (Morozov), photo of windows. 19th century.

(Archive of Federal State Budgetary Institution of Culture “Ryazan Historical and Archival Museum-Reserve”).

Judging by the iconographic materials, the courtyard and side facades did not have stucco decoration. In the middle of the 19th century, two one-story brick extensions were built to the house from the side of the courtyard facade; one of them, located on the site of the original porch preserved. At the same time, and next to it, a new porch was built from the side of Nikolodvoryanskaya Street (Fig. 2) (Avdonin, Akulshin, Geraskin et al., 2000; Makashin, 1957).

The far right window of the southeast facade was converted into a doorway. A small staircase of limestone slabs led to it, which is not there now. A not preserved metal visor on the cast racks protected the porch. In 1866, Mrs. Starodubskaya became the owner of the house, the hereditary citizen Alexandra Alekseevna Anzimirova acquired the house in 1869, and later, the house passed to the family of Morozov merchants between 1877 and 1899 (Agromakov, Kashirin, 2000; Makashin, 1972). The house was in their possession until the beginning of the 20th century. In the second half of the 19th century, a

single-storey stone shop with its own entrance from Astrakhanskaya street was attached close to the north-west side facade of the mansion. In 1930-32, the layout of the house changed, at this time the balcony of the risalit was disassembled, and new partitions appeared in the house. In the 1940s, the Ryazan Regional Project Office carried out work on the reconstruction of the house where Saltykov-Shchedrin lived, and the shops adjacent to its north-western facade, to adapt the building under the Ryazan District Committee of the CPSU (b) (Agromakov, Kashirin, 2000, Romanova, Litvinova, 2010).

The project has not been fully implemented. The most significant alteration of the mansion refers to 1950-51. On the place of the attached one-storey bench along Lenin Street, using its wall, an extension was built, repeating the facade of 1804 (Agromakov, Kashirin, 2000; Makashin, 1972). This radically changed the nature of the building, enlarging the scale and bringing it closer to the image of the post-war residential development of the city. Currently, the building has a look that was formed in the 1950s with an extension from the courtyard added in the 2000s (Fig. 3.a) (Code of monuments of architecture and monumental art of Russia).

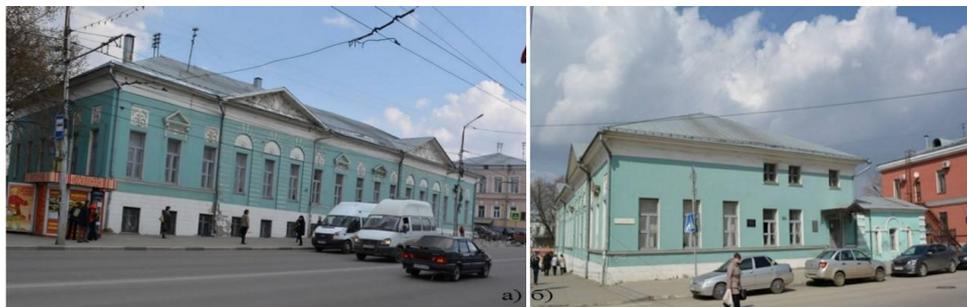


Fig. 3. House Saltykov - Shchedrin (Morozov): a - the main facade on Lenin Street (Astrakhanskaya); b - side facade on Nikolodvoryanskaya street, photo 2016

The Saltykov-Shchedrin House is a two-three-story brick building under a hip roof, rectangular in plan. The historical part of the building (1804) has three floors: basement, first and mezzanine. The extension of the second half of the 20th century has two floors: a basement and the first floor. The extension of the end of the 19th century along Nikolodvoryanskaya Street is one-story, with brick walls, under a gable roof (Fig. 3.b) (Code of monuments of architecture and monumental art of Russia). Expansion joints of the late extension are arranged in the form of a dense adjunction of a laying without bandaging of seams with inserts of a rolled waterproofing.

### Objectives and methodology

At the first stage of the preliminary inspection of the building, a visual inspection of parts of the building and its building structures was carried out, then the damage and defects were detected with the required measurements and a photo fixation was carried out.

The constructive scheme of the building is frameless. Bearing structures are brick exterior and interior walls and pylons, the joint work of which with disks of floors provides the spatial rigidity of the building.

Surfacing was carried out to examine the foundation of the building from the inside of the building. The foundations of the building are tape from a row brick masonry on lime-sand and cement-sand solutions; from rubble masonry from crushed stone of brick and limestone on lime-sand mortar; from quasi-row and row masonry blocks of limestone on the filler of the enclosing soil and brick rubble. The condition of the foundation structures is limited in operation. Sounding was performed to identify the material and the condition of the walls. The external walls are made of ceramic brick on lime-sand and cement-sand mortars; internal supports and supporting structures are brick walls and pylons; partitions are brick and wooden framed; lintels

above the openings are brick, supported by steel rails. The outer surface of the walls of the facades is plastered and painted; the walls are decorated with platbands, pilasters. The inner surface of the walls has a finish: plaster, painting, wallpapering.

- Cracks on the outer facade opening up to 0.3 mm.
- Cracks on the outer wall of the courtyard facade opening up to 5 mm at the junction of the later extension (Fig. 4.b).
- Traces of soaking on the yard facade and green algae on the concrete pavement (Fig. 4.a).



Fig.4. The courtyard facade: a - condition of the lower part of the wall of the extension of the end of the 19th century;  
b - through vertical crack in the northern part of the building

Internal supports, bearing structures of the building are brick walls and brick pylons. The state of the brick supporting structures of the walls and pylons is partially efficient. Interfloor overlappings are monolithic flat of concrete on the aggregate of brick battle, flat on wooden beams, vaulted brick, on steel rails with brick arches.

Attic overlaps are flat, on wooden beams. The state of the overlap on steel rails with brick arches, the state of brick arches and the state of monolithic floors is operational. The condition of the wooden floors is limited in operation.

The design of the main staircase is made of individual reinforced concrete prefab steps along channel bars made of channel bars, reinforced concrete platforms, marble trimming. The staircase to the second floor

is wooden. The condition of the stairs is workable.

The roof structure of the main volume is hipped. Rafter system - layered from a bar; crate of boards 140x50 with a pitch of 300 mm. Step of rafter legs of 2400 mm. Racks, struts and ridge bar of logs  $\phi = 200$  mm. Mauerlat from a bar of 200x200 mm.

Attachment roof construction - gable. Rafter legs from a bar; crate from board 150x20 mm.

The roof is metal of roofing tin, hip. The roof has leaks, the joints in the sheets are loose, and there are holes. Minor traces of decay due to leaks in the roof.

The condition of the supporting structures of the roof, truss legs is operational; the condition of the roofing and lathing is unsatisfactory (Fig. 5).

Recently, the house of Saltykov-Shchedrin was used to house a branch of the library, now it is transferred to the Ryazan Historical

and Architectural Museum-Reserve, which carries out repair and restoration work for subsequent museum use.



Fig. 5. Attic. The state of the truss system and roof  
**Analysis. Preliminary engineering opinion.**

The preliminary engineering report consists of a detailed description of the characteristics and state of the building's structures: foundations and soils, external and internal walls of the building, interfloor ceilings, floors and partitions, stairs and basements, the condition of the roof system and roof.

The foundations of the walls of the building are tape rubble, under the pillars located in the extension of the second half of the 20th century, presumably columnar rubble.

At the project marks of the bottom of the foundations there is a sandy, semi-solid, refractory loam (reference to the "Technical report on the results of engineering and geological surveys"). As part of this project, three holes were dug at the late extension walls: one at the wall of the courtyard facade and two at the wall of the side facade at the side of the escarpment. Cracks in the foundations were not found in all pits. The foundation of the foundations in two pits is loam, in the third pond - bulk soil.

Based on these studies, the project for this section of the walls proposed a rubble liner for supporting the foundations on the continental soil (loam), as well as the execution of a reinforced concrete cage with a thickness of 200 mm from the outside, waterproofing on the cage.

The description of the exterior walls assumes the condition of all parts of the building: the historical part of the building (1804), the extension of the end of the 19th century and the extension of the second half of the 20th century.

The walls of the historic part of the building and the extensions bearing, massive, brick, masonry is made of solid clay brick with lime mortar. There is a basement only at the walls of the main facade (on Lenin Street) and the side facade on Nikolodvoryanskaya Street. The wall of the main facade has a rizalit in the center, completed with a pediment. The risalit plane is rustovan. Most of the window openings on the facades are rectangular, except for one window opening in the mezzanine level on the courtyard facade - it has an arched lintel (Fig. 3.a).

From the side of the facade on Nikolodvoryanskaya Street, the main entrance to the building is located with white stone steps under the metal visor (Fig. 3.b), the entrance doorway is rectangular (Code of monuments of architecture and monumental art of Russia).

The corners of the wall on Nikolodvoryanskaya Street are framed with rusticated pilasters; this wall has three window openings with arched finishes (Fig. 3.b). End wall is deaf, without openings, completed with a pediment. The wall of the courtyard facade has three rectangular window openings. This extension has a brick crowning cornice.

The basement is only at the wall of the main facade (along Lenin Street). The base is a brickwork plastered cement - sand mortar with an imitation of the blocks. The wall of the main facade has a rizalit in the center, completed with a pediment. The risalit plane is rustovan. All window openings on the facades are rectangular. Six windows of the basement from the side of the main facade (except for the two leftmost ones)

have pitholes with brick walls. The entrance to the building under the metal canopy is located at the side facade wall, the entrance doorway is rectangular. There is a pit with reinforced concrete steps and side brick (not plastered) walls in front of the entrance. This extension has a crowning cornice; the lower part is a brick one, the upper protruding part is supposedly of reinforced concrete slabs (Fig. 3.a).

The walls are plastered with painting. Plaster walls have cracks opening from hair to 2 mm. On the surface of the walls in their lower part, there are traces of moisture damage: numerous cracks in the plaster, loss of the paint layer, in a couple of places - the loss of the plaster layer. The base also has many cracks in the plaster layer opening up to 5 mm. (Fig. 4a, b).

The wall of the north-western facade stands on a slope, below which is located Lybedsky

Boulevard. Previously, it was the floodplain of the Lybid River, which was drained in the 1950s in connection with the construction of a boulevard leading to a circus (Agromakov, Kashirin, 2000). The surface of the earth along the facade is approximately horizontal. The territory near this facade is also not landscaped: a narrow asphalt blind area is in an unsatisfactory condition. Several trees spontaneously grow on the slope near the building.

The floors are flat, presumably wooden. Finishing surfaces of floors - plaster and paint. Only the basement floor of the historic part of the building is covered with box-shaped vaults (Fig. 6.b) and Monier brickeds (Fig. 6.a).

The state of the floors is unsatisfactory - there is a partial loss of the paint layer and plaster layer in several places.



Fig. 6. Basement floor: a - basement floor (1804). Monier vaults; b - basement of the historic part of the building

Basically, the floors in the rooms are covered with linoleum, marble and ceramic tiles and the floors are covered with inlaid parquet in the historic part of the building.

Partitions are available on all three floors of the building. They are supposedly wooden. Partitions - plastered with painting. Almost all partitions have cracks: vertical when adjacent to the bearing walls and pillars, inclined and horizontal. Particularly significant cracks are in the partitions on the ground and on the mezzanine floors between the rooms.

The staircase to the mezzanine floor in the historic part of the building is a two-marsh wooden with bowstrings, with a wooden fence. The entrance to the attic from the staircase is via a small ladder. The elements of the stairs are painted. The state of unsatisfactory paint coverage has been lost in a number of places,

especially on treads. The main entrance to the building (porch) - with white-stone steps under the metal canopy is located at the side facade on Nikolodvoryanskaya Street (Fig. 3. b). The porch has three sides. The condition of the porch is unsatisfactory: the steps have cracks, chips and material loss.

The attic of the building is cold; the roof is hip with two triangular dormer windows on the courtyard facade. Skates of roofing over the historical part of the building and the extension of the second half of the 20th century are not on the same level. Duplex roof without dormer windows above the extension of the late 19th century.

Rafter system is mixed. The hanging part of it is a truss with two puffs, a "headstock" and struts connected to a "headstock" and a top tie. The trusses of the lost hip, located on the border with

the extension attic, have been preserved. In the zone of low attic flooring, the lower fastenings of trusses, through racks, rest on the beams of the attic floor. Separate truss legs reinforced boards. The crate is a new one from the boards, with the exception of the transition zone between the attic of the historical part and the extension.

The roof is made of galvanized steel, ordinary, and the bottom has been significantly rusty, which indicates the formation of condensate due to deficiencies in the temperature and humidity conditions of the attic room. There is an organized drainage system, which is in an unsatisfactory state: its individual elements are lost or deformed, the pipe marks abut against the ground, which is wrong.

### Results

1. According to the results of a visual survey, it can be concluded that a number of elements of the building are in an unacceptable condition, namely:
  - Sections of the outer and inner walls of the extension of the second half of the 20th century with through cracks.
  - Sections of the walls and floors of the building with traces of significant moisture damage.
  - Loors that have significant cracks in the plaster layer:
  - Transitional section of the roof between the historical part of the building and the annex.
2. Plaster of the mezzanine floor is in emergency condition.
3. The remaining elements of the building are in a restricted-working condition.
4. Cracks in the extension walls were formed 35-40 years ago, probably after draining the floodplain of the Lybed River in the 50s of the 20th century in connection with the construction of the boulevard. Presumably, the processes that occurred in the ground after that could have contributed to the formation of these cracks. In addition, it is possible that the construction in the courtyard in the 2000s of an extension with a basement floor also accelerated the process of opening these cracks.
5. Over-wetting of the walls of the semi-basement floor was most likely caused

by: the unsatisfactory condition of the blind area near the walls of the courtyard facade and the side facade from the side of the slope, the lack of adequate water drainage in the yard (especially the extension wall), the unsatisfactory condition of the pit at the windows of the main facade wall, unsatisfactory organized drainage.

6. The attic room has an unsatisfactory temperature and humidity regime, since the number of dormer windows - two in the courtyard facade - is not enough.

Field studies were carried out using a comprehensive method of documenting cultural heritage sites. During the work the following technologies were applied:

- Ground laser scanning and photogrammetric methods;
- Manual and instrumental domers in areas inaccessible to laser measurements.

Specialists who conducted field studies have the appropriate qualifications in the field of the protection of cultural heritage. Terrestrial laser scanning was carried out using tools, instruments and software:

- laser scanner Leica ScanStation P20
- PolyWorks 12
- Trimble Real Works Survey
- Leica Cyclone 7.4.1
- Leica Cloud Works + AutoCAD

The total number of stations is 30.

The use of this method made it possible to obtain comprehensive volume-spatial data about an object with high accuracy and accuracy of measurements. When conducting measurements using the laser scanning method, the final material of the field work is a cloud of points recorded on a digital medium.

Manual domes were carried out using instruments and tools:

- Laser level DEFORT DLL-10T-K 98299472
- Laser distance meter ADA ROBOT 60
- Level FIT 18210
- METRIC roulettes with a magnetic hook - 10 m
- SPARTA geodesic roulettes - 30 m
- teal roulettes - 3, 5, 7 m

The measurements were carried out in the conditional coordinate system specified at the beginning of the research. Measurements carried out along any single line were carried out “by accrual” from one point, and not separately, in order to avoid an increase in the error. Measurement was started with a zero line across the entire length of the facades of the object within the design boundaries. The mark of 0.000 was taken as the mark of the top of the main entrance to the building from the side of Nikolodvoryanskaya Street in the B / 1-H axes. Measuring (conditional) 0.000 corresponds to the absolute mark in the coordinate system of BSK +114.51. All vertical marks are tied to the conditional mark 0.000.

According to the results of field measurements, precise measurement drawings were made in electronic form and on paper. In the office processing of measurements, the results of manual measurements were tied to the data of laser scanning. All the main defects and losses were inflicted on the same measurement drawings of the facades, plans, cuts and scans on the walls of the premises. The axes on the dimensional drawings are shown conventionally. Dimensions are given on the surface of existing structures, finishing materials. Dimensions in the drawings are in millimeters, elevations - in meters.

In the course of the research, the areas of damage and loss were recorded, shown on the measurement drawings by the symbols:

- Location of cracks;
- Areas of hairline cracks on the plastering of facades;
- Places of destruction of the plaster layer, peeling paint layers;
- Places of wetting, biodegradation (mold, fungus, moss);
- Areas of late cure and inserts made with foreign materials;
- The loss of individual decorative elements, dumping.

The result of this section was a set of architectural and archaeological measurement drawings, which includes all the main projections of the monument, necessary for further design.

To extract the maximum amount of metric data on the facades and interiors of the object under

study, stereophotogrammetric measurements were made - the laser scanning method was chosen. This made it possible in the shortest possible time to obtain a highly accurate and comprehensive three-dimensional basis for the production of dimensional drawings for the object.

Laser Scanning is a technology for collecting accurate metric information about an object in large volumes and in a short time. The main advantages of the technology are:

- High detail of scanned objects;
- Non-contact measurement method provides the ability to shoot hard-to-reach surfaces without any damage to the historical material;
- minimization of the mistakes of performers due to the almost complete elimination of the “human factor” during field work;
- creation of drawings on a point model, and not on discrete measurements.

The product of Laser Scanning is a cloud of points (a set of scans from various survey points, stitched together in a single coordinate system). Point clouds are applicable to use for a wide range of objects, including small objects, architectural details, building facades and whole blocks. They are ideal for collecting information about surfaces, providing three-dimensional spatial orientation, serve as the basis for the production of architectural and archaeological drawings and high-precision 3D-models.

Specialists who carried out full-scale studies are directly related to the protection of cultural heritage and relevant qualifications.

The following devices, tools and software have been applied:

- Laser scanner Leica ScanStation P20 (production of laser measurements);
- PolyWorks 12 (merging scans into a single cloud of points);
- Trimble RealWorks Survey (additional quality control stitching);
- Leica Cyclone 7.4.1 (interpretation and post-processing of a cloud of points);
- Leica CloudWorks + AutoCAD (construction of measurement drawings on a point cloud);



Fig. 10. Laser scanner Leica ScanStation P20

Instruments and tools used for manual domes:

- laser level DEFORT DLL-10T-K 98299472,
- laser range finder ADA Cosmo 100 with A00412 inclinometer function,
- FIT level 18210,
- METRIC roulettes with a magnetic hook - 10m,
- SPARTA geodesic roulettes - 30m,
- steel roulettes - 3, 5, 7 m,

Manual measurements were made with reference to the data obtained on the basis of laser scanning.

### Conclusion

“Restoration” in Latin means “restoration”. In our rapidly changing world, the main task of restoration is to preserve the architectural monument in its original form (Zakharova, 2016; Romanova L.S., Litvinova, 2010).

The need for constant attention to the technical condition and operational reliability of buildings of architecture requires the joint activities of various qualified specialists: restorers, builders, archaeologists. In modern conditions, it is necessary to have a specific systematic approach to the restoration of buildings that deteriorate over time, while being able to assess and predict the deterioration, destruction and restoration of historical and cultural monuments, enabling future generations to comprehend the continuity of culture, thereby linking our past, present and future.

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