

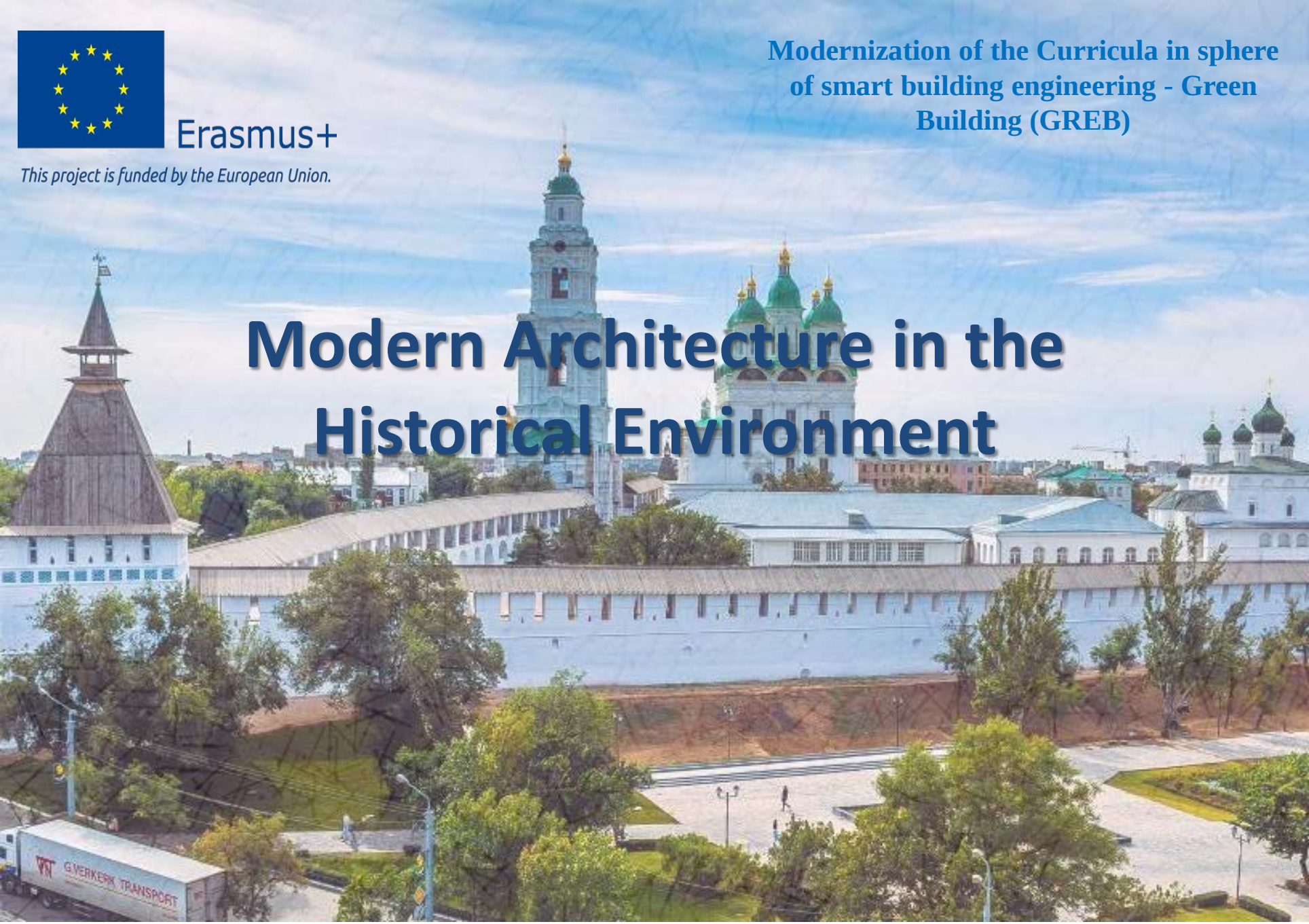


Erasmus+

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**Modernization of the Curricula in sphere
of smart building engineering - Green
Building (GREB)**

Modern Architecture in the Historical Environment



COURSE OUTCOMES:

As a result of studying the discipline, the student must know:

- the system of normative documentation for solving the problems of placing modern architecture in a historical environment;
- the feature of urban space for performance modern architecture in a historical environment;
- the basic principles of the organization of protection zones of cultural heritage sites;
- the methods of reconstruction of historic buildings and restoration of architectural monuments with used BIM technologies;
- the environmental requirements for the protection of architectural monuments.

To have experience in: Apply the technique of composite visual perception, to use computer-aided design as a means of visual demonstration when solving a harmonious perception of the environment.



The historical part of the city of Astrakhan has largely retained a valuable historical and cultural environment. At the present time, the historical center of the city is being rebuilt due to the growth of the administrative center. New buildings appear on vacant sites, or sites with dilapidated wooden structures. As a result, new approaches should be taken into account in the design within the boundaries of historical settlements. Comfortable perception of the historical and cultural environment must be preserved. Modern requirements for the level of functioning of the building to introduce in the design.

Issues of preservation and development of the historical and architectural environment of the city are considered in the textbook. New opportunities in the reconstruction and restoration of monuments of architecture are offered taking into account BIM technologies.



Students get an insight into working with cultural heritage sites in the city of Astrakhan. Therefore, the first chapter describes the history of the formation of urban planning in the Volga region and focuses on the study of the historical formation of the city of Astrakhan. Students should have an idea about the historical and architectural environment of the object under study.



Historical prints

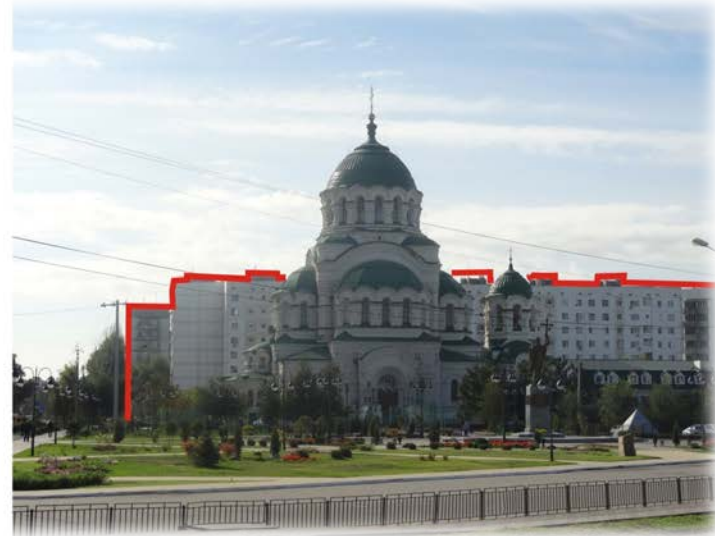
Historical watercolor

Further attention is drawn to the assessment of the architectural environment, the pros and cons are revealed. For example, we can cite the following violations:

- loss of fragments of the historical planning urban planning structure;
- construction of buildings that are not large-scale objects of cultural heritage that violate the silhouette in the perception of the compositional integrity of the environment;
- inattention to the existing historic buildings, inaction regarding the possible destruction of buildings.



Disonance structures in the perception of panarama embankment of the river.



Background Disonance Buildings



Рис. Фотография по ул. Карла 14 граница территории исследования



Рис. Фотография по ул. Зою Космодемьянской (граница территории исследования)



Рис. Фотография по ул. Елизаров (граница территории исследования)

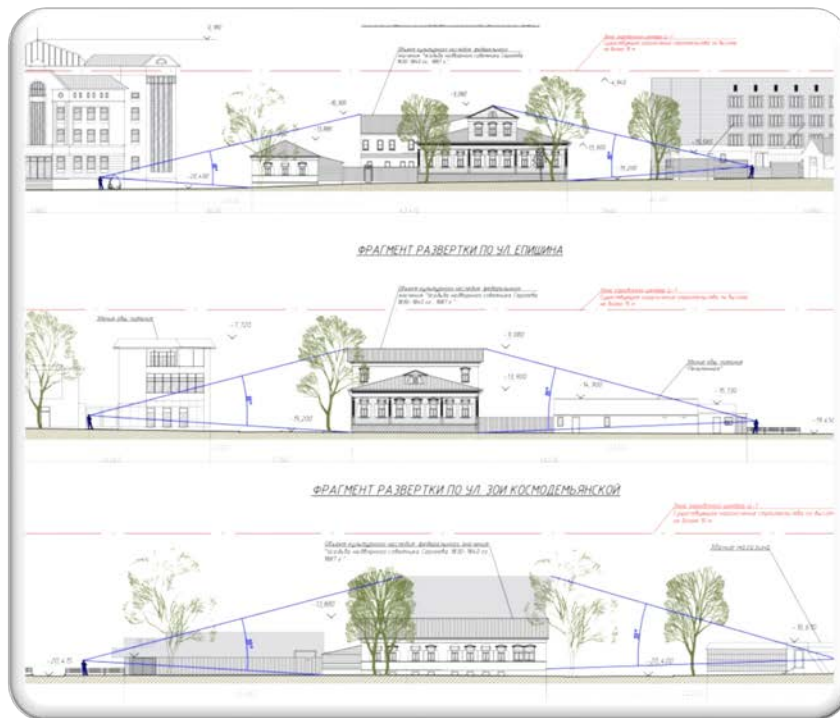


Рис. Фотография по южной стороне территории участка (граница территории исследования)

Front view, photo



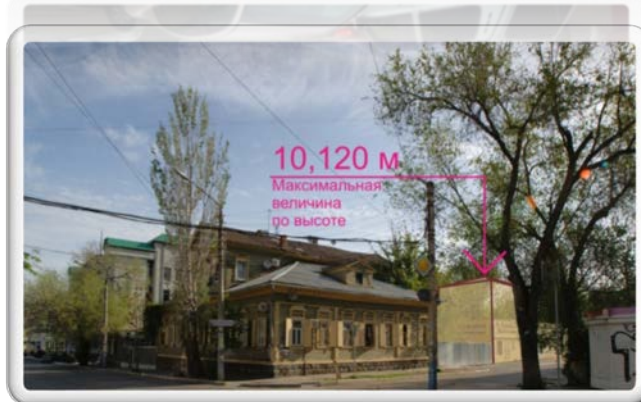
Objecting photo



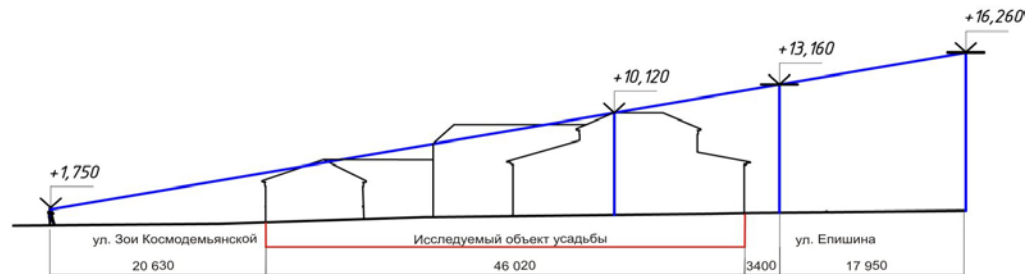
Landscape-visual analysis

Design possibilities are considered in the conditions of historical and cultural environment. The presentation is about conducting a landscape-visual analysis of the environment.

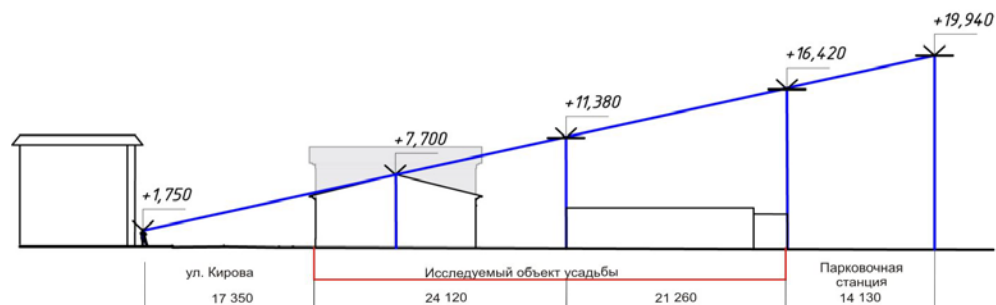
Assessment of the architectural environment forms proposals for the style solution of the facades.



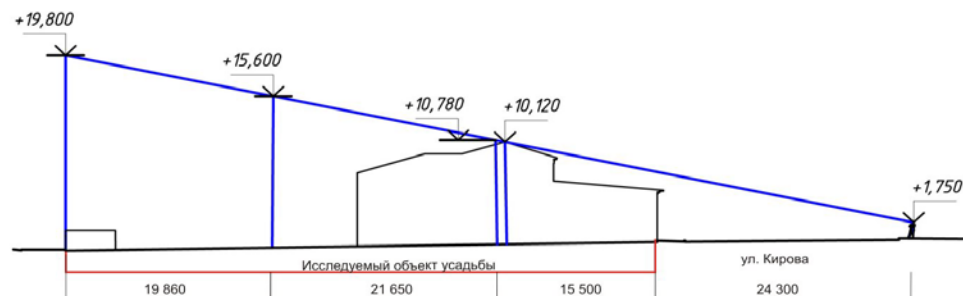
Сечение 1



Сечение 2



Сечение 3



The analysis allows you to set the altitude parameters for modern construction.



London

The second chapter is aimed at the study of architectural monuments, the definition of methods of restoration and ways to determine the reconstruction of buildings and the environment in order to adapt to modern life.

Theoretical methodologies are analyzed, which are aimed at preserving objects in the conditions of the construction of new design objects.



Russia



Front view, design of church



Chemical exposure to the atmosphere



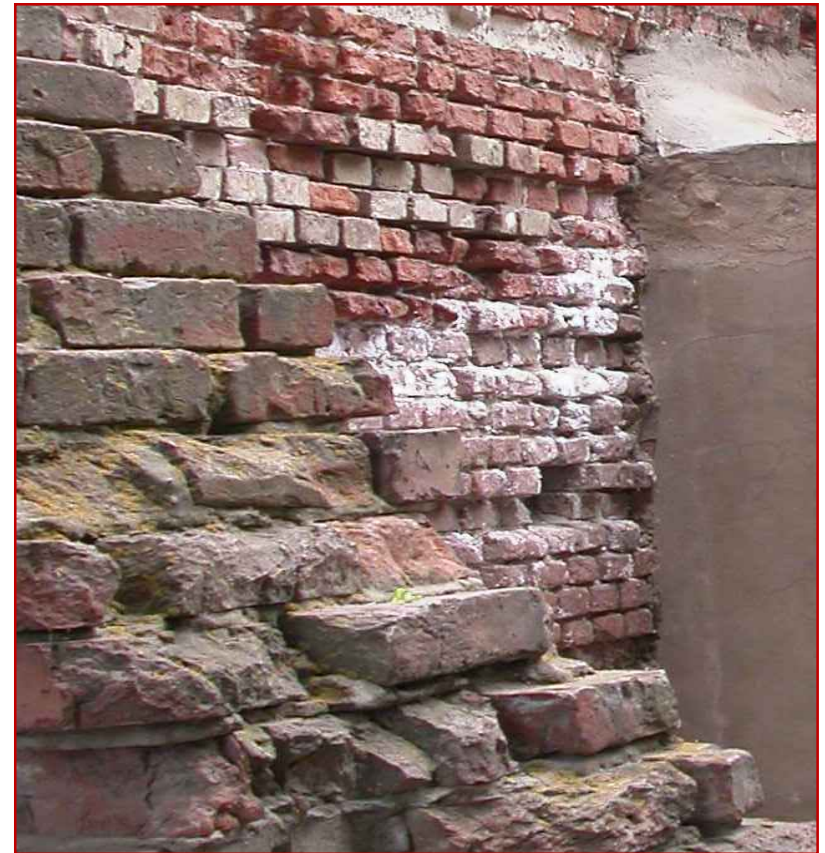
In the third chapter the engineering issues of restoration of architectural monuments and the diagnosis of deformations arising during the operation of buildings, architectural monuments are considered.



The fungal manifestations



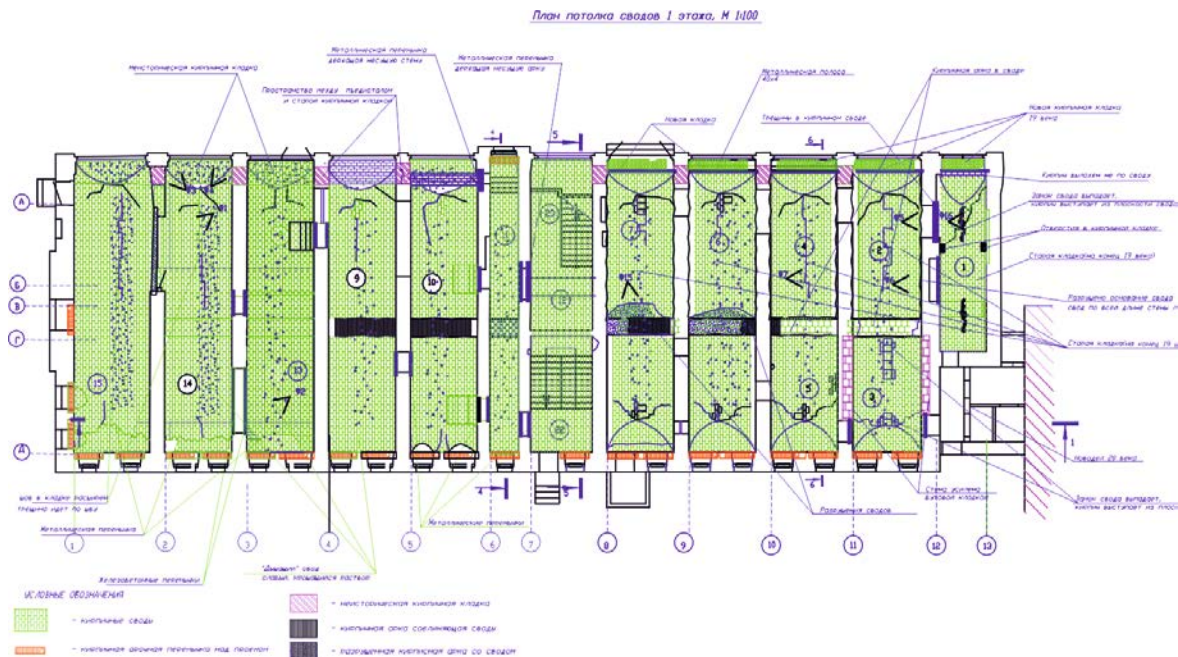
Biodestructive



Vegetable layering



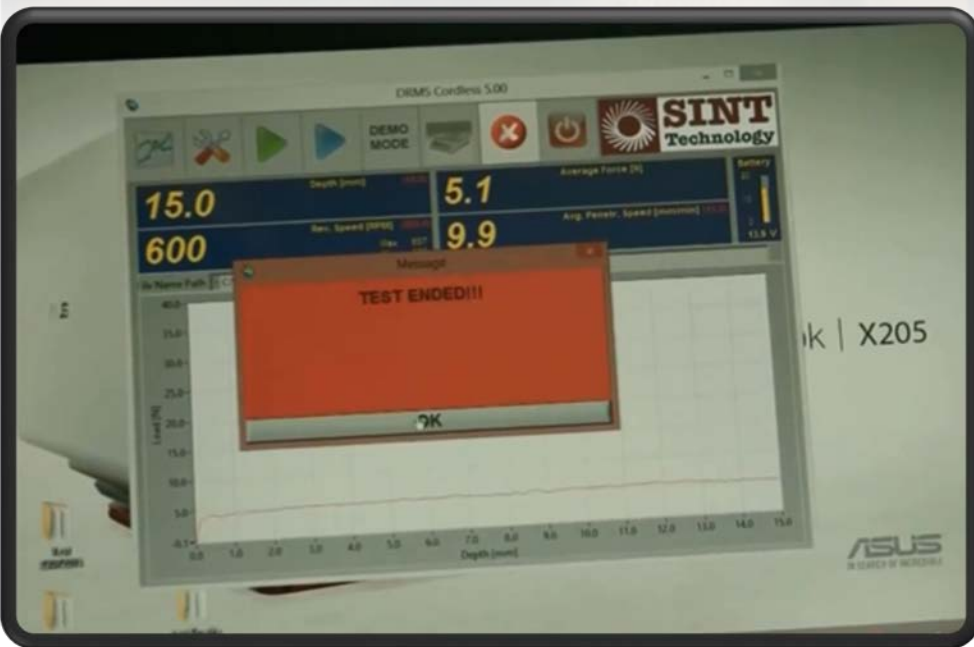
Cracks in the arch



Destruction plan



Measurements



Measurements

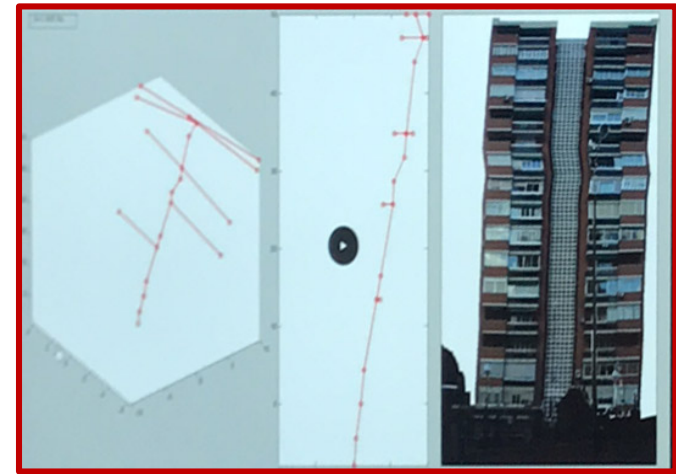
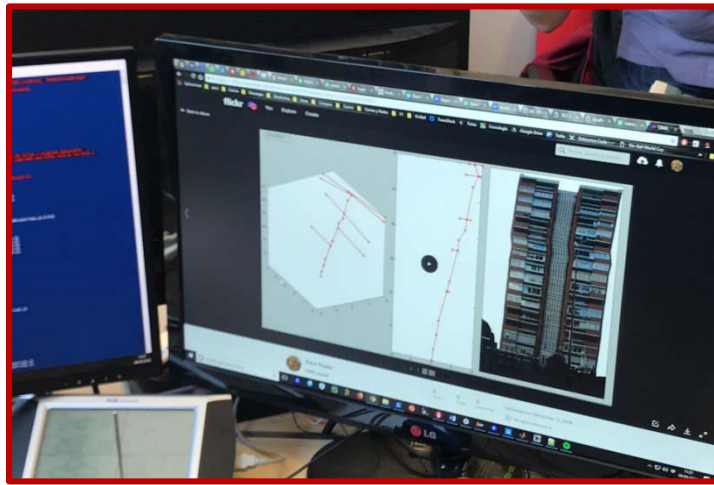
Specialized technological equipment for the collection of information on cultural heritage sites has been reviewed. Thus, the input data for determining the physicommechanical properties of masonry can be obtained using drilling equipment with a sensitive tip that transmits data to a personal computer. The program processes and gives an idea of the density of the rock at the sites of the studied construction sites. Such equipment was used in the examination of the Cologne Cathedral.



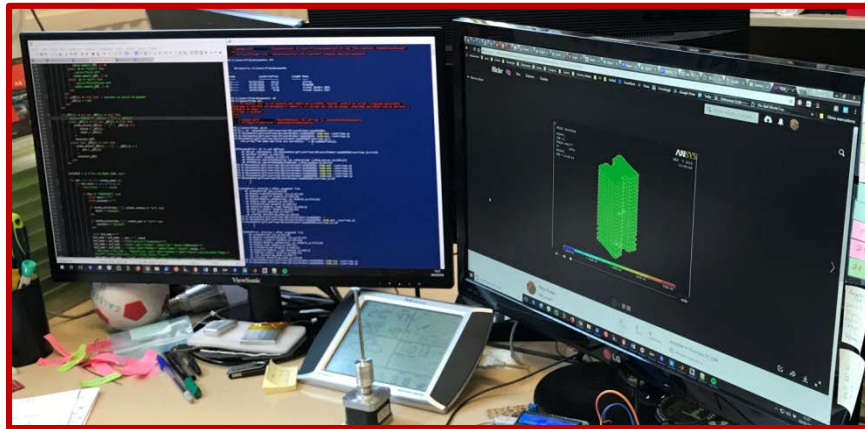
Indications



POLITÉCNICA



Measurements



Indications



Device

At the Polytechnic University of Madrid, much attention is paid to the application of technical innovations in experimental design. Instruments and motion sensors are used to monitor buildings in seismic areas. Its allow you to measure changes in the position of structural elements and in the early stages to detect deformations.

Further, modern methods of modeling during restoration and reconstruction are considered. Restoration activity is significantly different from the usual project process.

Therefore, for the introduction of BIM technologies in the process of restoration measures, it is necessary to adhere to the consistent implementation of comprehensive surveys.

Input research data will be the basis for the restoration work. A similar database of input data can be obtained through the use of modern technical support: a laser scanner, gps equipment, unmanned means, motion sensors, etc. Full systematization of information about the object under study will facilitate further work in creating a three-dimensional information model of the building being restored.



The cloud of points



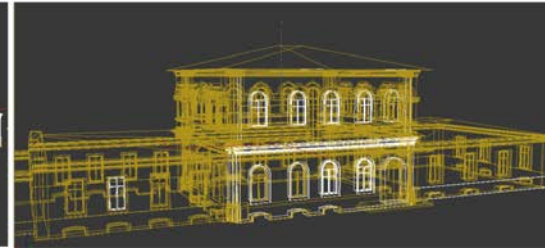
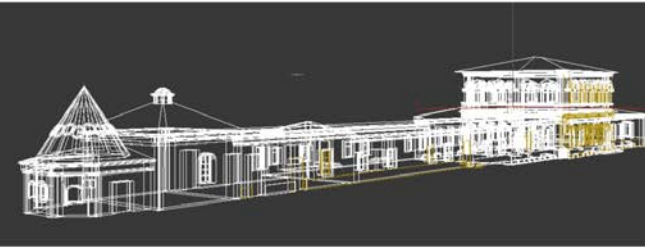
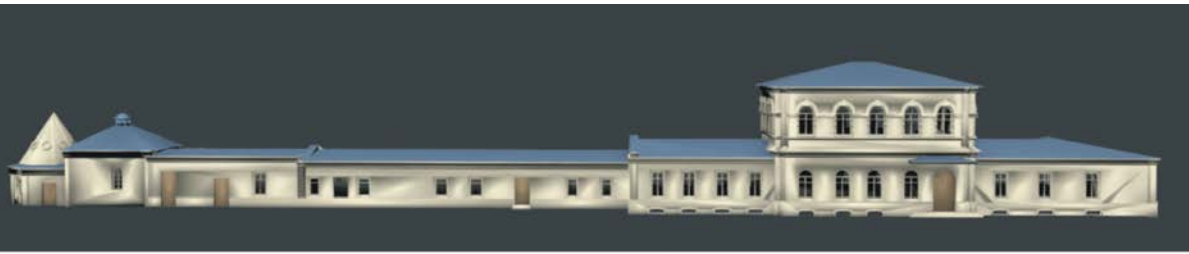
The cut



Scanning principle



3d scanner



3d model



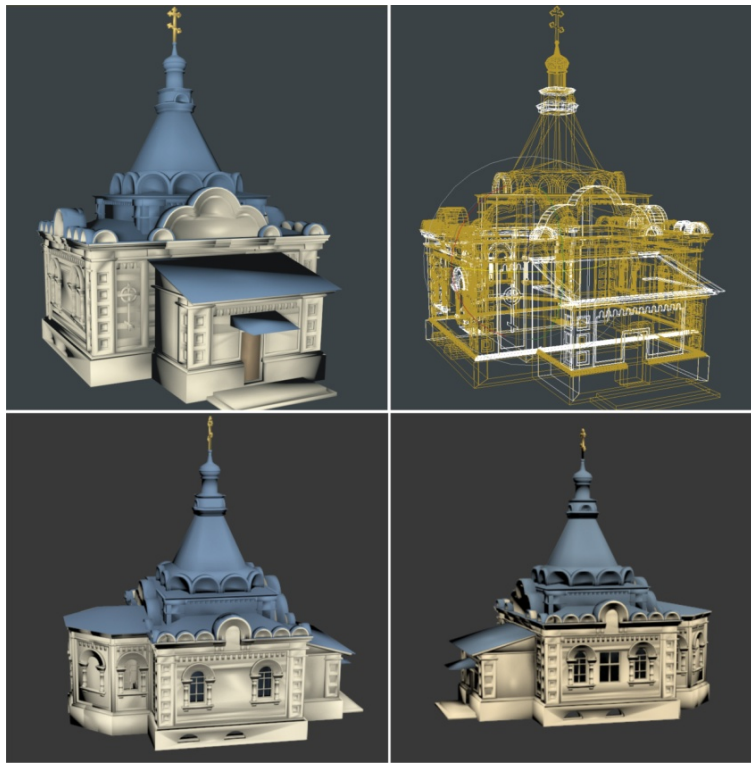
Varvara's chapel



The monastery building

Objects such as the monastery building and Varvara chapel were scanned and transferred to a three-dimensional model. Later from the three-dimensional model orthogonal projections are selected.

Monuments of architecture using BIM technologies are monitored for maximum accuracy in detecting defects and determining the state of the monument. Such accuracy can be ensured by using a 3D scanner for drawing drawings and cartograms of defects. After processing, the slice is obtained with a detailed three-dimensional image. This principle of obtaining a three-dimensional model was applied at the Pokrovo-Boldinsky Monastery in Astrakhan when developing the project for the restoration of final qualifying work.



3d model

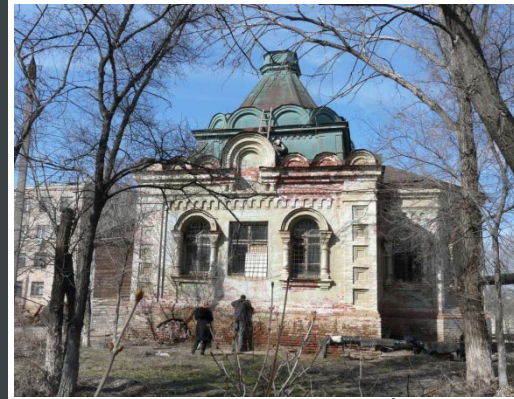
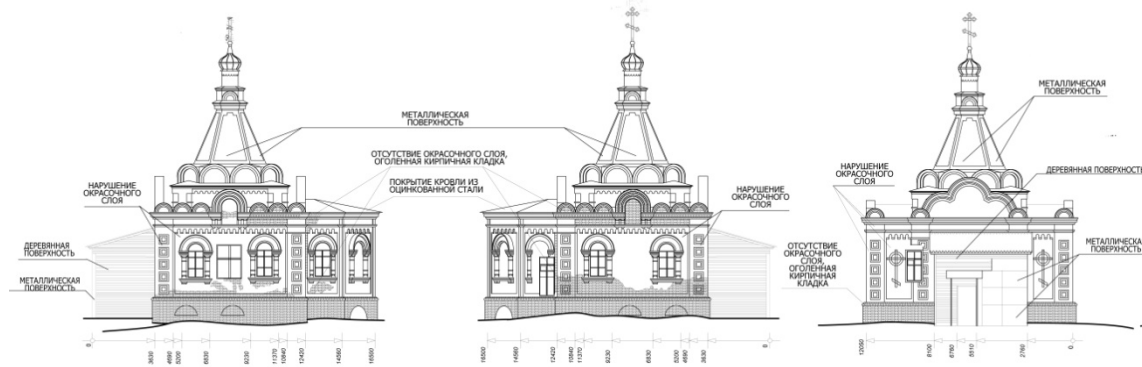


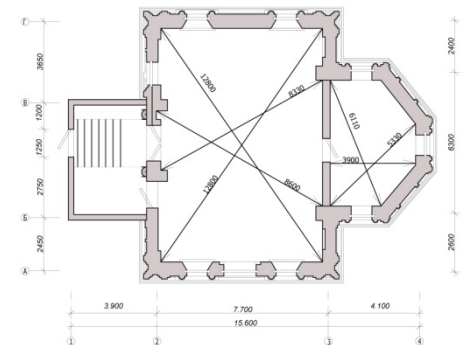
Photo 1



Photo 2



The facades of Ekaterina's church



The plan of Ekaterina's church

BIM technologies allow the restoration of not only existing monuments, but also to recreate the lost objects using various techniques. The 3D model allows you to see the recreated object with the details in real view and regenerate the environment in the virtual reconstruction in full for a certain historical period. The bell tower of the Pokrovo-Boldino Monastery in the city of Astrakhan became one of the examples for such studies.



Historical photo of
bell tower

3d model

