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1.9 Preservation and restoration of building structures of churches in Ukraine, which are religious, historical, cultural and architectural heritage

On the territory of Ukraine there are a large number of buildings of temples that have great religious, cultural and architectural values. Considering that most of them were built hundreds of years ago, an urgent issue is to examine the state of the existing structures of these structures. If, on the basis of the survey, damage to building structures that affect the bearing capacity of the structure is revealed, it is necessary to develop high-quality solutions to preserve the architectural monument and extend its service life.

In the article, on the example of two existing buildings of the Ukrainian Greek Catholic Church, a survey of building structures is considered and a solution is given to preserve and strengthen the building structures of these buildings.

Survey and fortification of the bell tower in the village. Hlibovychi, Lviv region, Ukraine.

The purpose of the work: to carry out a visual inspection of the bell tower and develop a project for the replacement of foundations.

Today the building is in use.

To achieve this goal, the following tasks were performed:

1) a site visit has been made;

2) a project was developed for the installation of foundations under the supporting structures of the bell tower.

The existing building was built approximately in the 18th century (figure 1).

The bell tower is paved with cobblestones (figure 2)

Structural scheme - wooden frame (figure 3).

The rigidity of the structure in both directions is provided by a wooden frame made of columns, joints and braces (figure 3).

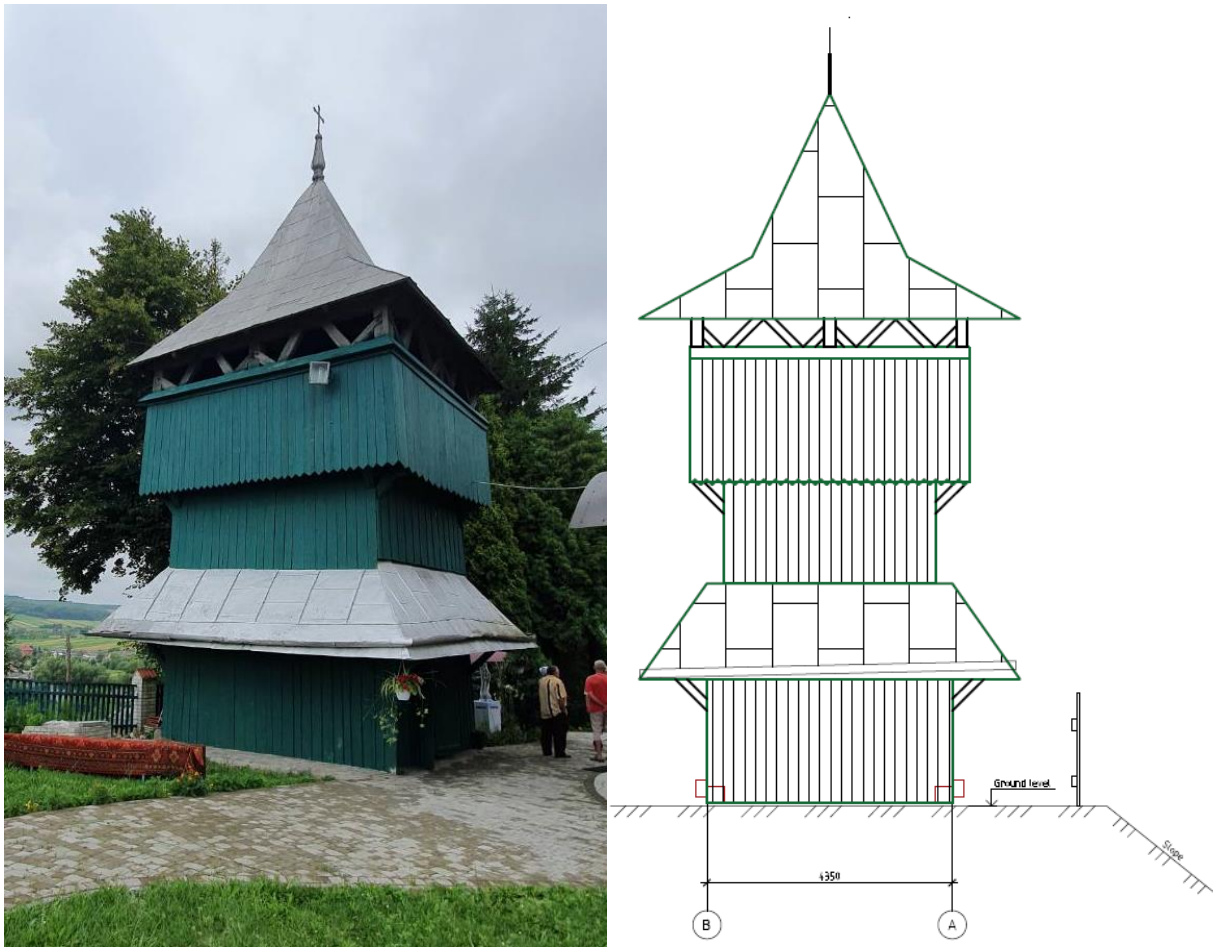

Figure 1. General view of the inspected building.

Figure 2. View of support beds and beams

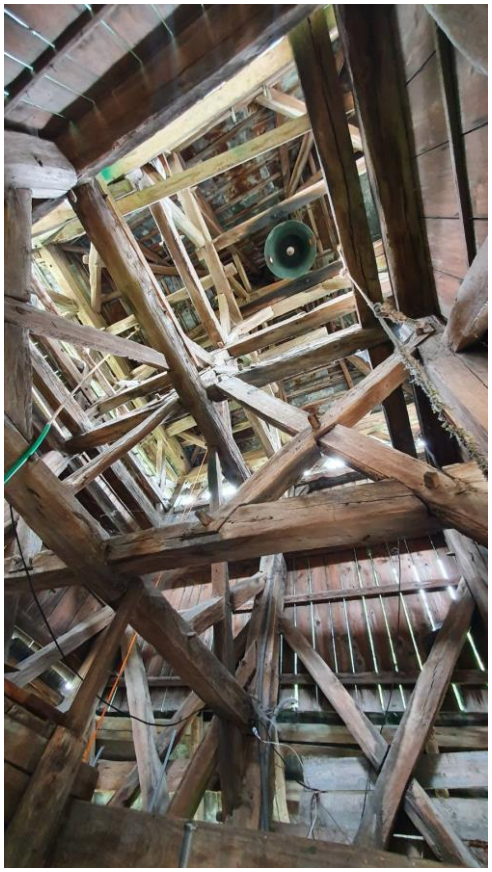

Figure 3. General view of structures from the inside

Subsidence of the foundations under the supporting wooden beds along axis A was detected, as a result of which the wall tilted along axis 1 (photo 4).

Figure 4. View of the inclined side wall

Design solutions have been developed to replace the foundations of the bell tower to preserve the structure (Figure 5, 6).

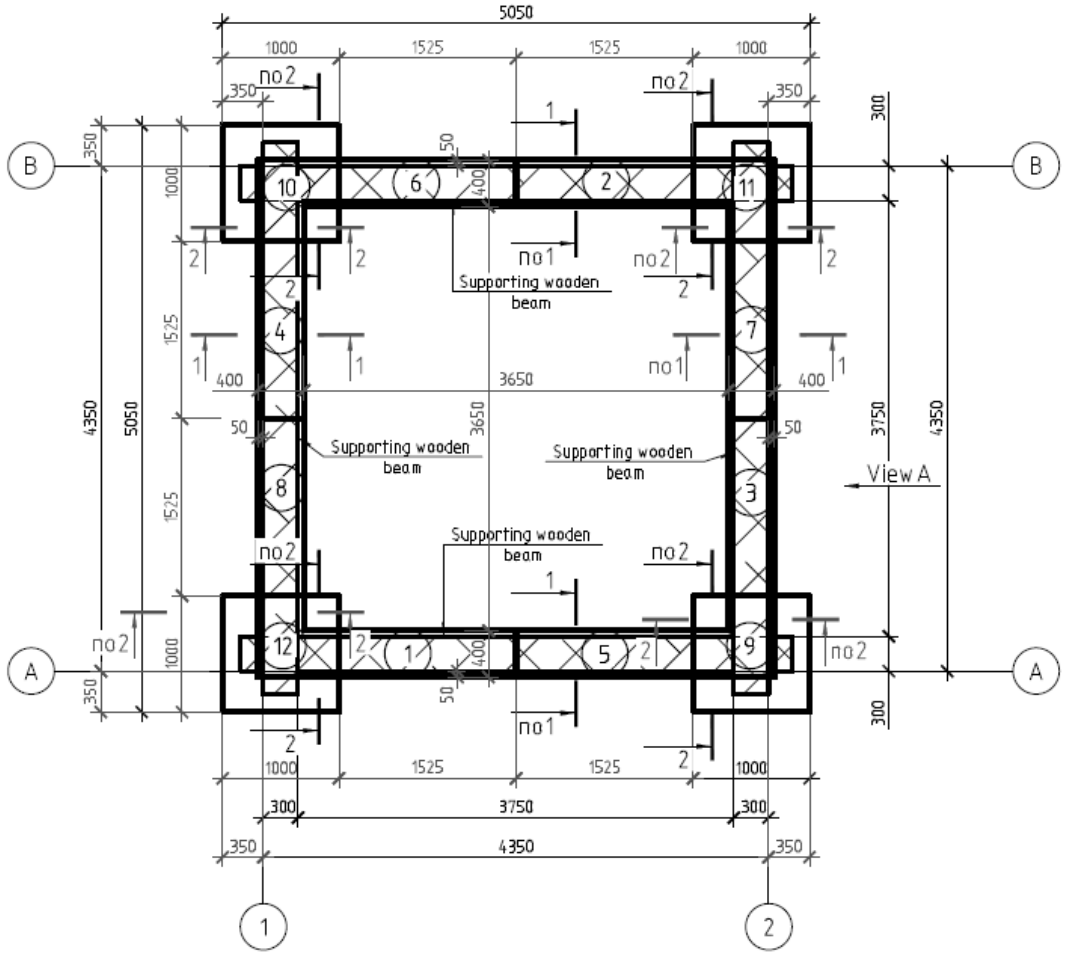

Figure 5. Scheme of strengthening the supporting wooden beams of the bell tower structure

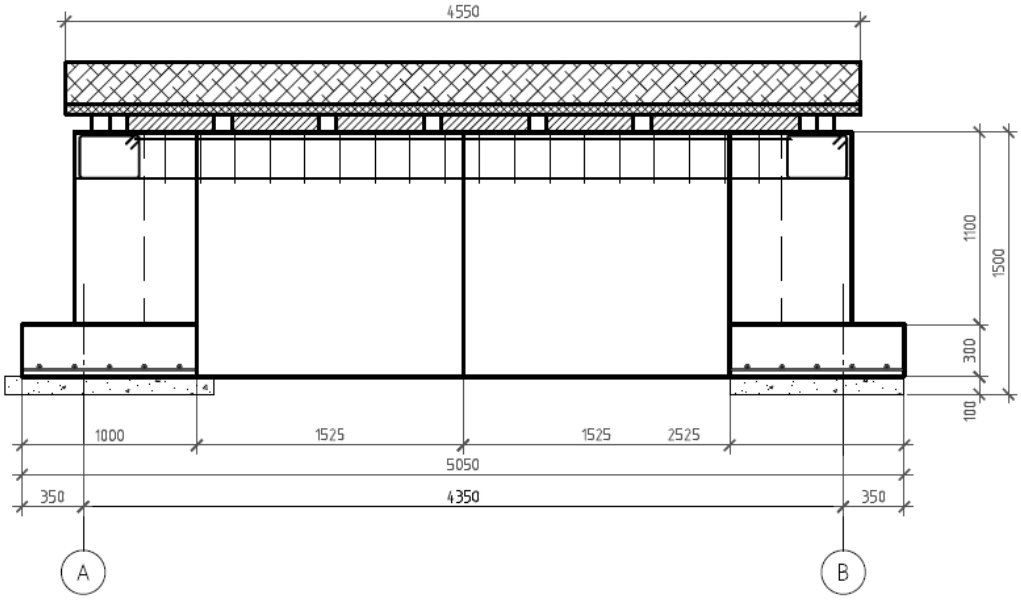

Figure 6. View A

The following sequence of work is proposed:

- under a monolithic foundation, perform concrete preparation from concrete of class C8 / 10;

- the foundation device should be carried out in sections according to the scheme. The device of adjacent sections must be carried out no earlier than 7 days after completion of work on the adjacent section;

- when arranging foundation grips, lay 2 layers of roofing material under horizontal beds and beams with an overlap on adjacent sections of at least 200 mm;

- 7 days after the installation of all the foundations, it is necessary to install the tower in a vertical position by wedging the supporting wooden planks along the length of the foundations with oak or steel wedges. If necessary, use jacks to raise the supporting wooden beams;

- after wedging and bringing the tower to a vertical position, it is necessary to grout under the wooden beams and beams with a cement mortar of at least M200 along the entire perimeter at their contact with the foundations.

Inspection of the Church of the Intercession of the Holy Virgin in the village of Svirzh, Lviv region, Ukraine.

The purpose of the work: to conduct a visual examination and recommendations for keeping the foundations and walls of the temple from moisture.

To achieve this goal, the following tasks were performed:

1) the building as a whole was examined;

2) defects and damage to the building are recorded;

3) the actual condition of the building is determined;

Surveyed public building, built in 1546-1561 (Figure 7).

The structural scheme is a frameless structure with load-bearing longitudinal and transverse walls.

The rigidity of the building in both directions is provided by external and internal load-bearing brick walls.

Today the building is in operation.

Figure 7. Head facade.

During the inspection of the object, photographic fixation of defects in structural elements was carried out, as well as means of checking the geometric dimensions and condition of the elements of the house.

As a result of the inspection of the building, the following was found:

- foundations for brick walls - solid strip of rubble masonry;
- external walls - brick;
- internal walls - brick;
- floor - wooden;
- roofing - roofing sheet steel on wooden supporting structures;
- drainage - external organized;
- blind area - concrete.

In general, the following was recorded for the building in the internal and external volume:

- excessive humidity in the premises of the 1st floor;
- lack of waterproofing of the floor of the 1st floor on the ground;

- lack of foundation waterproofing;
- lack of a drainage system;
- damage to the external drainage system;
- damage to the facade equipment, falling plaster;
- damage to cornices on the facade of the building;
- damage to roof elements;
- damage to the paving around the perimeter of the building.

Figure 8. Damage to the facade and blind area.

Figure 9. Damage to the cornices on the facade of the building, finishing of the facade and roof elements.

Based on the results of the survey, the following conclusions can be drawn:

1. The surveyed structure is in a generally satisfactory (2) condition.

2. For the possibility of further safe operation of the building, it is necessary:

- along the perimeter of the church building, make a system of drainage channels for organized drainage of surface and melt water from the building towards the lower horizon (see Appendix B), install drainage channels at a minimum distance of 2 m from the church building;

- perform an organized drainage of rainwater from rain pipes-gutter from the building to the drainage canals (see Appendix B);

- perform drainage along the perimeter of the building at a depth of at least 1.2 m (see Appendix D);

- perform vertical waterproofing of foundations along the perimeter of the building (see Appendix D);

- make the floor in the premises of the 1st floor, taking into account modern requirements with a waterproofing device (see Appendix D);

- perform local repairs of the roof with a possible change in the slopes of the horizontal roof gutters from the places of perpendicular joints of the outer walls;

- to repair the existing system of external drainage of rainwater (downpipes-chute);

- carry out repair work on the restoration of the exterior finish of the facade using modern facade plasters and paints;

- repair the blind area with organized drainage of water from it through the tray into the drainage channels to prevent rainwater from entering under the base of the foundations and on the walls of the basement;

- clean up landslides and debris in basements

Conclusion. Restoration and strengthening of building structures is of great importance for the preservation of existing buildings for religious and cultural purposes. Each such building is unique. Accordingly, refurbishment and enhancement solutions must be tailored to maintain their value to society and extend their lifespan.