

**Safeguarding and conservation of Gelati Monastery  
World Heritage Property, Georgia**

***Agreement between LEPL "National Agency for Cultural Heritage Preservation of Georgia"  
and "ReStruere ltd, Florence University spin-off"***



**EMERGENCY PHASE E.1**

**West Arm Emergency Uncovering: supervision of the implementation**

**Deliverable E.1.A**

**Executive summary of activities and report of the phase E.1.1**

***(West Arm covering removal.***

***Supervision of the implementation of the emergency temporary covering)***

**December 29th, 2022**

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## Definition of the Terms

GET: “Georgian Expert Team”. It is the team in charge of carrying out the activities in Georgia related to the safeguard project of Gelati Monastery, World Heritage Property. The Team is composed of Tariel Kiparoidze and Lasha Shartava.

MCSY: “Ministry of Culture, Sport and Youth of Georgia”.

MCT: “Microclimate Consultancy Team”. It is the team in charge of carrying out the activities relating to microclimatic issues. The Team is constituted by Studio Massari.

NACHP: “National Agency for Cultural Heritage Preservation of Georgia”.

RET: “Restoration Expert Team”. It is the Italian Restorers Team. The Team in charge of carrying out the restoration of frescoes and paintings, joined with Georgian Restorers. The Team is constituted by Marco Pulieri and Vincenzo Centanni.

RS: “ReStruere Team”. The Team is composed of Ugo Tonietti, Sara Stefanini and Arash Boostani.

## Acknowledgements

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This document is based on the Internal Expected Outcomes E.1.1 (“Report and complete documentation on the WA opening works” by GET), titled “*Gelati Monastery Complex - Church of Nativity of the Virgin - The Implementation of Temporary Roofing of the West Arm*”. Please refer to that report for a detailed chronological description, accompanied by photographs, and architectural and structural design drawings of the temporary roof.

## **1 - Background of Phase E.1.1**

The conclusions of the report of MCT, dated December 2021, highlighted the urgent need for evaporation of the wet vaulted system of the West Arm (WA), operating from outside by uncovering the pitch, to avoid dramatic consequences for the paintings.

Activities regarding the opening of the WA roofing system began. It was immediately clear that the removal of the roofing layers should be accompanied by the creation of a light emergency temporary cover that would permit evaporation while protecting the WA structure from weathering once the layers of the roof have been removed.

## **2 - Activities related to the West Arm Emergency Uncovering**

The undertaken activities can be summarised as follows:

### **A. Designing phase, from February to April 2022.**

During these months, fruitful coordination was put in place between RS and GET, with a continuous exchange of information, ideas, design and indications. The contribution provided by MCT in the design phase of the temporary roof was also essential as regards the definition of the ventilation levels necessary to achieve the purpose of drying the masonry. This influenced the design of the air inlet and outlet channels under the temporary roof.

### **B. Removal of the existing (new) roofing layers (in the areas of fastening of the temporary structure), from May 17th to June 2nd 2022, and RS mission and supervision of the removal process, from May 25th until May 31st 2022.**

During the activities of removing the roofing layers, two longitudinal cracks were observed on the top of the Southern and Northern walls of WA. The cracks are likely due to an earthquake that occurred in ancient times. This discovery obliged the involved teams to delay the work schedule to face the unforeseen situation modifying the planned activities for the temporary covering. Moreover, the cracks highlighted the necessity to open a new research and investigation path regarding the structural consolidation of the Arms.

For a detailed report of the mission, with a photographic annex, please refer to “*Executive Summary on the mission carried out in Kutaisi (Georgia) at Gelati Monastery from May 25th until May 31st 2022*” by RS (June 9th, 2022).



Figure 1. Northern wall of West Arm, clean view of the opening. The longitudinal crack is visible.

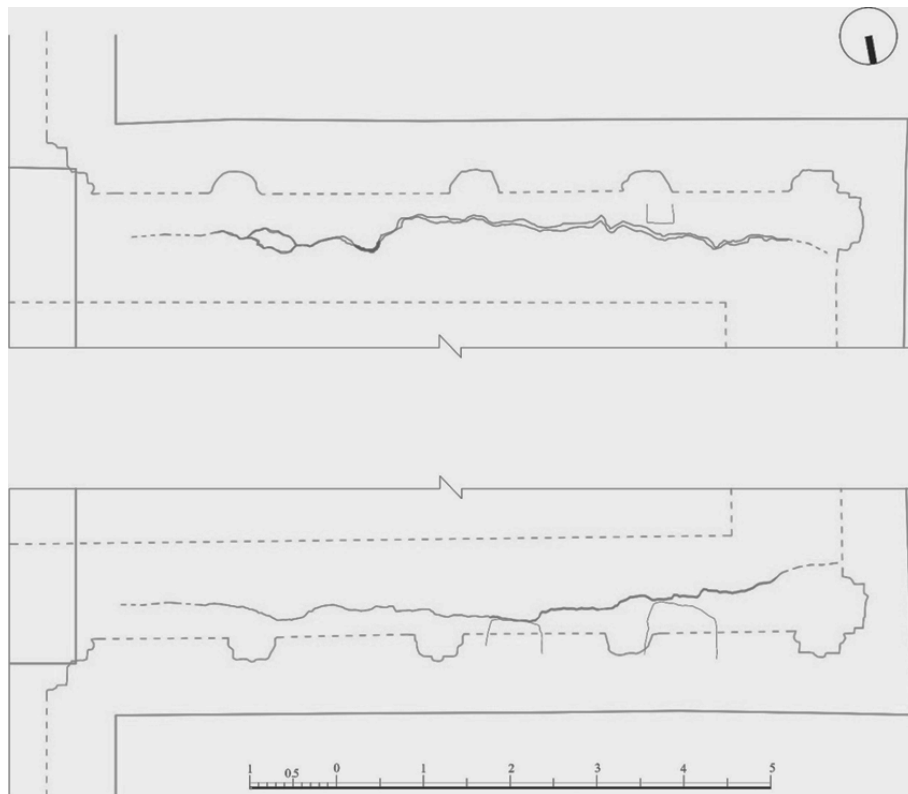


Figure 2. Plan of the course of the longitudinal cracks of the South (top) and North (bottom) wall, (drawing by Architect Lasha Shartava)

C. **Crack stitching**, from June 3rd to June 7th, 2022.

During the RS mission, it was decided to stitch the cracks before continuing the operation of removal of the roofing layer in order to consolidate the top of the walls. The walls were drilled using a non-vibrating, electric drill (150-200mm deep) and anchors were placed perpendicular to the cracks, every 500-600mm, at a distance of 250-300mm from the cracks. An anchoring solution was used to

fasten the stainless steel rods. After that, the metal rods were connected with stainless steel wires (diameter 3mm).



Figure 3. The stitching of the longitudinal cracks on the Northern (left) and Southern (right) walls (photos by Architect Lasha Shartava).

**D. Removal of existing (new) roofing layers, from June 7th to June 30th 2022.**

After securing the top of the walls with the stitching, the removal of a great part of the covering continued. 65% of the total West Arm's roof area has been removed.



Figure 4. The WA pitch after the removal of the external layers of the roof, and before covering it back with the tin temporary cover (photo by Architect Lasha Shartava).

## E. Arrangement of the temporary roofing

- **Preparation of areas for support of metal construction**, from July 5th to August 10th 2022
- **Arrangement of the metal construction**, from August 11th to August 16th 2022
- **Arrangement of roofing**, from August 17th to August 25th 2022

The anchoring of the temporary roof was particularly accurate as the roof would be anchored to the top part of the walls of an ancient building. Particular attention was paid to the compatibility of materials and the reversibility of the intervention. A structural lime mortar (MasterEmaco S 285 TIX) was used to level the surface of the anchoring. The lime layer was poured over a geotextile layer.

At the end of a long and careful study process, in order to distribute the loads evenly, a longitudinal metal square pipe (horizontal beam) was used on which the bases of the supporting columns of the temporary roof were fixed, five per pitch.

To support the covering layer, five metal trusses were installed by means of a crane. A prefabricated metal structure was installed on the ridge to create a chimney effect needed for ventilation. Metal framed doors were also installed on the sides of the metal structure for inspection.

Finally, the tin sheets roofing layer was arranged. Under the tin sheets, a layer to avoid condensation was installed. On the sides of the temporary covering, profiled tin sheets with 10mm holes were installed to permit better ventilation of the WA roof.

Rainwater pipes and bird-proof metal nets were arranged.



Figure 5. The lime levelling layer for the anchoring and operations to install the anchors of the temporary cover (photo by Architect Lasha Shartava).



Figure 6. The anchoring of the temporary cover for both pitches (photos by Architect Lasha Shartava).



Figure 7. The metal trusses with the pre-fabricated structure on the ridge of the pitches, useful for the chimney effect (photo by Architect Lasha Shartava).



Figure 8. Installation of the tin sheets of the covering and tin sheets with holes to permit ventilation. The perforated sheets are darker to avoid visual impact and glare caused by the reflection of the sun's rays (photo by Architect Lasha Shartava).



Figure 9. The WA temporary covering, view from the outside (photo by Architect Lasha Shartava).



Figure 10. The WA temporary covering, view from the inside (photo by Architect Lasha Shartava).



Figure 11. Details of the WA temporary covering: gutter line (photo by Architect Lasha Shartava).





Figure 12. Details of the WA temporary covering: gutter line and opening for internal inspection (photo by Architect Lasha Shartava).



Figure 13. The WA temporary covering, global view (photo by Architect Lasha Shartava).

## F. Microclimate monitoring

The whole phase of WA uncovering was accompanied by the careful monitoring work carried out by MCT. This took place over several stages and the results are shown in the reports listed below. The assessments of the MCT fully confirm the effectiveness of the uncovering action adopted on the WA.

- **MCT mission and monitoring of the hygrometric state of the structures**, from May 28th to June 1st 2022.  
For the hygrometric survey, hygroscopic salt tests, laboratory tests, microclimatic aspects, other miscellaneous observations and conclusion of the monitoring, please refer to *“West arm of the Main Church of the World Heritage site – Gelati Monastery. Examination of hygrometric state of the structures. Mission Arch. Alessandro Massari of 28/05 – 01/06 2022”* by MCT (June 2022), and annexed sheets.  
For the hygrometric survey of St George Church, please refer to *“Church of St George - Preliminary investigations on the structural hygrometric. Missions Arch. Alessandro Massari of 06 – 12/11/2021 and 28/06 – 01/07/2022”* by MCT (June 2022), and technical sheet.
- **MCT mission and monitoring of the hygrometric state of the structures**, from October 4th to October 8th 2022.  
For the hygrometric survey, salt tests, laboratory tests and the conclusion of the monitoring, please refer to *“West arm of the Main Church of the World Heritage site – Gelati Monastery. Examination of hygrometric state of the structures. Mission Arch. Alessandro Massari, Arch. Simona Balsamo of: 04-08/10/2022”* by MCT (November 2022), and technical sheets.
- For general and deeper considerations about the microclimate monitoring, please refer to *“Deliverable E.1.B - Executive summary of activities and reports of the phases E.1.2 (Monitoring of the evaporation) and E.1.3 (Technical support for submitting the summary of the implemented works to WHC)”* by RS (December 2022).

## 3 - Final Considerations

In conclusion, RS is satisfied with the implementation works of the removal of a great part of the WA roof and the creation of a temporary emergency covering of the WA and happy with the result obtained regarding the acceleration of the process of evaporation of humidity from the outside. The design process was conducted in close coordination between the teams. Even the unpredictable situation discovered after the removal of the existing (new) roofing layers, that is the discovery of the longitudinal cracks on top of the walls, has been faced focusing on the goal of safeguarding the Church, using material and techniques maximally compatible with the ancient structure.

The delay caused by modifying the planned work process, due to cracks, can be considered a physiological delay associated with work on an ancient historical building.

The works were carried out in rainless weather, paying attention to details and under the supervision of an architect, constructor and archaeologist, following safety rules. Activities were approached without any harmful percussion or vibration, to avoid, as much as possible, any possible damage to the painting on the inside.

For a more detailed and in-depth account of the work carried out, including a detailed chronological description, accompanied by photographs, and architectural and structural design drawings of the temporary roof, please refer to the aforementioned report by GET *“Gelati Monastery Complex - Church of Nativity of the Virgin - The Implementation of Temporary Roofing of the West Arm”*.