RESTRUERE
STRUCTURE AND RESTORATION

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: concept, supervision of the design and implementation

Executive Summary on the mission carried out in Kutaisi (Georgia) at Gelati Monastery from May 25th until May 31st 2022.

Lead authors: Ugo Tonietti and Sara Stefanini,
belonging to Restruere Srl, Florence University spin-off.

June 9th, 2022

ReStruere s.r.l.
Via Montebello 12 50123 Firenze
Partita IVA: 07053950486
Email: info@restruere.com
PEC : info@pec.restruere.com

Content Index

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.

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

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 in constituted by Marco Pulieri and Vincenzo Centanni.

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

Acknowledgements

The mission has been possible and fruitful thanks to the continuous collaboration and support of the staff belonging to the Ministry of Culture, the National Agency for Cultural Heritage Preservation of Georgia, and various experts in the conservation field, together with skilled workers, that were present on-site during our stay in Gelati.

Special acknowledgements to:
Mrs Thea Tsulukiani, Minister of Culture, Sport and Youth
Mr Kaha (Karlo) Sikharulidze, First Deputy Minister of Culture, Sport and Youth
Mr Nikoloz (Nika) Aznaurashvili, General Director of the National Agency for the Cultural Heritage Preservation
Mr Tariel Kiparoidze, Chief Architect
Mr Lasha Shartava, Architect
Mr Alessandro Massari, Architect, Microclimatic expert
Mr Marco Pulieri, Restorator
Mr Roland Isakadze, Archaeologist
Mr Zurab Okroshidze, Director of Engineering Company Ltd “Capiteli”
Mr Zurab Zurabishvili, Director of Ltd. “CapitelEngineering”, and his team
Mr Merab Buchukvri, Wall paintings Conservator
Mr Nikoloz Zazunishvili, Restoration Architect
Mrs Lela Baramashvili, Head of Cultural Heritage Monitoring Service
Mrs Teona Bubuteishvili, Archaeologist
Mrs Shorena Tsitsagi, Head of International Relations Department
Mrs Salome Jamburia, Senior Specialist for International Relations Department
Mrs Tato (Tamar) Ketiladze, Head of the UNESCO and International Relations Unit
Mrs Nina Chikviladze - Translator

1. Background of the mission

Due to the conclusions of the report of the Microclimate Team (December 2021), the urgent need for sudden evaporation of the wet vaulted masonry system of the West Arm became evident in order to avoid dramatic consequences for the underlying paintings.

Because of this, as agreed during the meeting on 27 January 2022, urgent activities related to the opening of the West Arm have begun, in order to permit the evaporation of humidity endangering the underlying painting and frescoes. In particular, the procedure of removing part of the current covering of the pitches in the West Arm, including temporary metal cover and the glazed tiles roofing, must be accompanied by the creation of a light emergency temporary roofing in order to permit the evaporation while protecting the Arm from the ingress of rain.

During the months of February, March and April, there was a continuous exchange of ideas, designs, and indications between RS and GET for the definition of the emergency temporary structure for the West Arm covering.

Finally, thanks to the arrival of sunny days, it was possible to begin the work to remove the West Arm covering for the evaporation of humidity and the installation of the temporary emergency cover.

Once the covering and the filling on the South side of the West Arm had been removed, a longitudinal crack was revealed which affects the top of the wall.

2. Development of the mission

25th May, Wednesday

Departure from Italy.

26th May, Thursday

Arrival in Tbilisi and transfer to Kutaisi.

27th May, Friday

- Inspection of the crack on the South side of the West Arm;
- Inspection of the external South facade of the West Arm: findings of fractures in cornices and arches, evidence of the activation of old local mechanisms/kinematics;
- Survey of the position of the fractures in the cross-section;
- Opening of the North side of the West Arm covering: the presence of a crack similar to that of the South side, but lesser extent, was revealed. On the North wall, the same problems found on the South wall are observed, albeit less extensive;
- Given the presence of the cracks, the possibility of having to change the type of anchorage of the temporary cover becomes apparent: discussion for the possible modification of the anchorage;
- Inspection, using an endoscope, from inside the South wall of the West arm to check the thickness of the vault;
- Discussions about the cross-section of the wall near the cornice;
- Cleaning of the crack, south side.

28th May, Saturday

- Arrival of Marco Pulieri and Alessandro Massari;
- The discussion continues on the hypothesis of a temporary roof in case it is necessary to change the design due to the cracks: proposal of a light wooden roof covering anchored directly to the pitch;

· Removal of large quantities of lead from the pitches, especially near the frames;
· North side inspection, together with Alessandro Massari and Marco Pulieri;
· Finds of wet burnt wood on the North side;
· Collection of samples in the South: 1) ancient lime filling; 2) loose lead; 3) wet burnt wood.
· Excavation continues on the North side;
· Excavation continues of the South side (there is a strong damp smell, even though we were outdoors);
· The hole used for the inspection with the endoscope is extended up to the extrados of the vault: it is possible to measure that the section of the load-bearing masonry of the vault is about 40 cm.

29th May, Sunday

· Inspection of the cracks with Eng. Zurab Okroshidze;
· Discussion on the new situation due to the cracks, together with Eng. Zurab Okroshidze, Arch. Tariel Kiparoidze, Arch. Lasha Shartava, Arch. Nikoloz Zazunishvili, Zurab Zurabishvili, Nika Aznaurashvili, Kaha Sikharulidze, Lela Baramashvili and Nina Chikviladze.
· We arrived at the decision to provisionally consolidate the crack by using "staples" on it and then, after creating a horizontal plane, to proceed to the already designed anchoring where the "core" of the ancient filling is reliable.
· To check the consistency of the core of the wall, holes are drilled on the North side wall of the West Arm. The consistency seems solid enough to be able to continue with the solution of the staples and to confirm the anchoring solution of the emergency temporary covering using an anchored metal beam.
· Arrangements on the technological aspect of anchoring (methods and materials);
· Discussion with Kaha Sikharulidze, Salome Jamburia and Shorena Tsitsagi about the administrative aspects and the hangar structure issues.

30th May, Monday

· Discussion with Marco Pulieri and Alessandro Massari on the material needed for the levelling of the anchorage surface of the emergency temporary roofing: it is crucial not to use cement because it could worsen the situation of the salts in the wall and block the transpiration of the wall.
· Discussion with Tariel Kiparoidze, Lasha Shartava and Nika Aznaurashvili on the next steps: evaluating the volume and the load removed from the roof; technical discussion about the anchoring of the emergency temporary covering; importance of the historical study of the roofs coeval to the Monastery; future sampling for mechanical characterization.
· Lunch with Madam Minister and the Bishops;
· Press conference;
· Discussion with Roland Isakadze about the report he wrote regarding the historical, graphic and photographic documentation of Gelati Monastery;
· Discussion with Lasha Shartava on the materials to be used for the anchoring surface levelling (necessary to install the emergency temporary covering).
· Departure for Tbilisi

31th May, Tuesday

Return from Tbilisi to Italy

On telephone discussions about the type of mortar to be used for levelling the anchoring surface for the emergency temporary covering.

3. Considerations and decisions following the mission undertaken

Taken on-site and shared decisions

- **Reloading**. It is important to re-establish a balance in the statics of the vault system. For this reason, it is necessary to load again the parts of the under-roof, emptied of the filling materials, as soon as possible after the installation of the beam anchored to the core of the wall (support for the temporary light covering). The reloading can be done by applying sandbags on both South and North sides.

- **Anchorage levelling surface.** For the levelling of the anchorage surface, it is crucial not to use cement because it could worsen the situation of the salts in the wall and block the transpiration of the wall. It is possible to use a special pozzolana added mortar (MasterEmaco 285 Tix, imported from Turkey) for the levelling of anchorage surface and for all the other possible use, for local interventions, in the Monastery under-roof. When useful, the mortar can be additived by fine gravel (Dmax 20mm). In order to optimize the use of the mortar for levelling, it is possible to use bricks or stones to fill in the gaps present at the top of the wall.

- **Under-roof filling removal**. Remove from the under roof only the layer of the new filling (2008-2019 intervention) and the layer of old lime made conglomerate only when it is already collapsed and incoherent and under the supervision of the archaeologist. Maintain the covering of the extrados of the vault made by such an old conglomerate when solid.

- **Cross-section.** In order to better understand the relationship between the interior and the exterior of the vault, it is necessary to draw an accurate cross-section of the system constituted by external wall-under roof-corniches-old wall core-vault.

Further Recommendations and commitments

- It is necessary to respect as much as possible the consistency of the old walls, avoiding any removal/damage of their stones and of the internal core if not strictly necessary.

- It is necessary to adopt all the required soft approaches during the works on the roof.

- It is necessary to adopt all the required actions to prevent any other water infiltration during the operation of the implementation of the emergency temporary covering and under-roof filling removal.

- We agreed with the Minister that RS will prepare, in the next months, a draft version of a new Contract entirely dedicated to the studies and the consolidation proposals able to improve the structural behaviour of the main church. This new commitment is due to the severe cracks found in the main wall of the West Arm which refers to a past, and current, weakness of the Church to earthquakes.

Photographic Annex

27th May, Friday

	Southern wall of West Arm. Longitudinal crack on the top of the wall.
	Southern wall of West Arm. Molten lead block.

	Southern wall of West Arm. Discussion about the crack and the materials found in the filling of the under roof.
	Southern wall of West Arm. Longitudinal crack on the top of the wall.

	Southern wall of West Arm. Longitudinal crack on the top of the wall.
	Southern wall of West Arm. Longitudinal crack on the top of the wall.

	Southern wall of West Arm. Section of the roof layers regarding the last intervention.
	Southern wall of West Arm. The ancient collapsed mortar filling with a molten lead block.

	Southern wall of West Arm. Different layers of the under-roof filling.
	Southern wall of West Arm. Inspection of the external facade.

			Southern wall of West Arm. Cracks on cornices and arches.
			
			

	Southern wall of West Arm. Cracks on cornices and arches.
	Western wall of West Arm. Cracks on cornices.

	Western wall of West Arm. Cracks on cornices.
	Southern wall of West Arm, interior. Inspection, using an endoscope, in order to check the thickness of the vault.

	Northern wall of West Arm. Roof opening operations.
	Northern wall of West Arm. Roof opening operations.

	Northern wall of West Arm. Roof opening operations: findings of a longitudinal crack.

28th May, Saturday



Southern wall of West Arm. The opening.

Molden lead block.

	Ancient mortar filling with the imprint of timber.
	Wet burnt wood found during the opening.

	Lead with a nail hole.
	Molden lead block.

	Northern wall of West Arm. Roof opening operations.

	Southern wall of West Arm. Longitudinal crack on the top of the wall.

	Southern wall of West Arm. Longitudinal crack on the top of the wall.
	Northern wall of West Arm, interior. Internal-external through hole in the masonry of the vault.

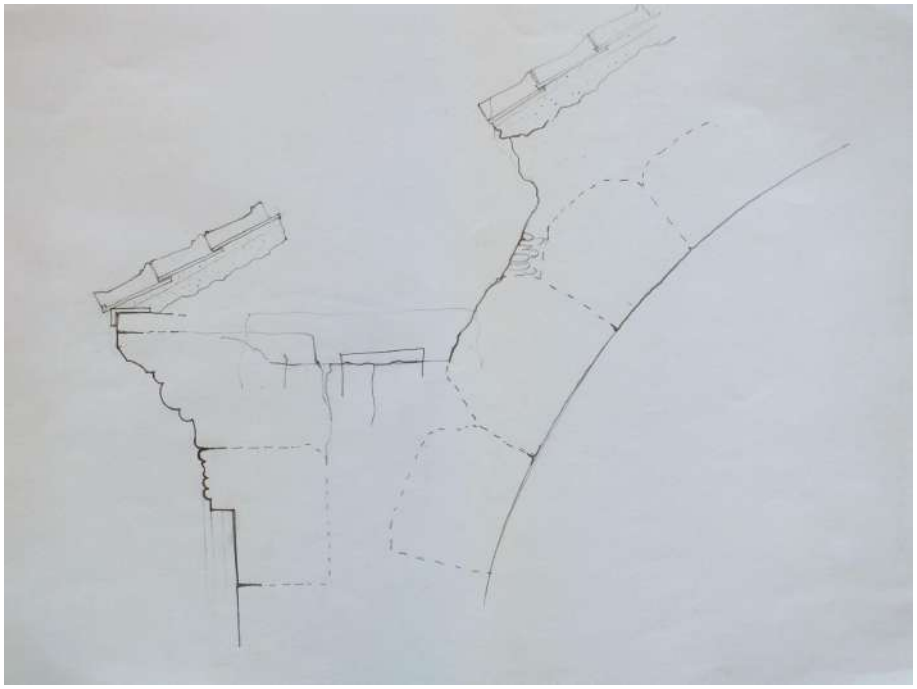
	Northern wall of West Arm, extrados. Internal-external through hole in the masonry of the vault.
	Southern wall of West Arm. Longitudinal crack on the top of the wall.

	Northern wall of West Arm. Longitudinal crack on the top of the wall.

29th May, Sunday

	Northern wall of West Arm. Inspection with Eng. Zurab Okroshidze.
	Northern wall of West Arm. Inspection and discussion with Eng. Zurab Okroshidze.

	Southern wall of West Arm. Inspection and discussion with Eng. Zurab Okroshidze.

	Northern wall of West Arm. Drilling a hole in the core of the wall.
	Southern wall of West Arm. Sketch of the cross-section (drawing by Lasha Shartava).