

RESTORATION WORK IN THE SOLAR CULT COMPLEX OF THE TEMPLE OF HATSHEPSUT IN DEIR EL-BAHARI

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The present restoration project of the Solar Cult Complex located in the northern part of the Temple of Hatshepsut commenced in 2002. The complex, which comprises a

vestibule hall and an open court, was excavated and documented in the past (Karkowski 2003: 29–33), and the remains preserved and restored on a current basis.

EXISTING STATE (2002)

VESTIBULE

The north wall furnished with a niche *in situ*, preserved to just above the lintel of the niche, that is about 3 m high,¹ was restored to its full height of 5.85 m under the previous head of the mission, Franciszek Pawlicki, in 1994/5 [Fig. 1]. Red brick (with a plaster coating) was used for the purpose, introducing sequences of fragmentary stone blocks in their original position. Architrave sockets were marked in their theoretical emplacements. The same procedure was adopted for the south and east walls which had been preserved, the south wall (including the entrance portal leading into the complex) to a height of 4.20 m and the east wall to about 2.00 m. The reconstruction of these two walls to 5.75 m was necessitated, according to extant conservation documentation, by

ongoing work in the Coronation Portico in 1985 (completed by Z. Wysocki's team, cf. Wysocki 1991: 7–20). Of the west wall separating the vestibule from the open court only one course of stone blocks has survived (approx. 0.43 m high).

SOLAR COURT

The north wall with the entrance to the Upper Shrine of Anubis stood to a height of approx. 2.00 m. Zygmunt Wysocki's team cleaned the back of the wall in the 1988/89 season, then reinforced its structure, conserving and completing some of the blocks from the ceiling of the shrine around the entrance. Wooden roofing was also introduced over the shrine at the time to keep out rain. No more than a third of the shrine is now still inside the shale rock

1 Photo documentation received from the Metropolitan Museum of Art in New York does not show the niche preserved to its full height, which means that it was restored sometime before the Polish team commenced work on the Temple of Hatshepsut.

formation in which it was cut originally due to weathering and erosion that this rock is highly susceptible to. The south wall of the court was preserved to about mid-height and was reconstructed to full height during preservation work conducted in the 1980s. It was made of red brick in the layer technique with a void inside. The face was lined with concrete slabs set in lime–cement mortar made using large-grain aggregate. The niche

in this wall was reconstructed with missing blocks replaced by newly-cut ones. The west wall is one of the few temple walls preserved almost intact. The mission directed by F. Pawlicki dismantled the wall, examined it and rebuilt it with appropriate structural reinforcement. The sun altar was the only part of the complex studied comprehensively in the past (Karkowski 2003: 39–41 and 126) and subjected to extensive conservation work.

PREPARING FOR THE RESTORATION

The adoption of specific methods conditions any proper restoration of historic monuments. The first step in the process is a comprehensive study of the

feature and this has been ongoing over the years, ever since Polish teams started work on the temple. Archaeological, architectural and egyptological documentation has been



Fig. 1. The Upper Terrace of the Temple of Hatshepsut in the end of the 19th century (Photo courtesy of the Metropolitan Museum of Art in New York)

prepared, providing specialists from the current team with data input for monument evaluation prerequisite to forming a conservation proposal and postulates. The analyses took into account all elements of the

monument in its present state, as well as bringing out values that have been obliterated, lost or had remained concealed until now. Conservation work by previous teams has also been considered.

CONSERVATION PROPOSAL AND POSTULATES

General conservation ideas for the complex were developed with an eye to clarifying the functional and spatial plan of the complex for future visitors.

Specific guidelines for particular elements of the complex were formulated, including the reconstruction of all walls to their full height in order to close/complete the complex. The sole exception was the wall between the vestibule and solar court, envisioned as a permanent-ruin display. The design, prepared by Teresa Kaczor based on Andrzej Kwaśnica's idea, called for original blocks to be placed in their original position in the entrance portal to the court. The guidelines for the north wall of the court with the Shrine of Anubis anticipated development of a project for the preservation of the shrine (developed by Mięczyśław Michiewicz in 1999), a design of the door to the shrine (Teresa Kaczor, 2001), conservation of the wall painting inside the shrine (conservation program developed and implemented by painting restorer M. Podkowińska-

Lulkiewicz), reconstruction of the north wall in natural stone,² and preparing the space behind the wall for a water-draining installation covering the northern part of the Temple of Hatshepsut to be executed at a later date. A joint point of the proposal for the north and west wall was to prepare a project (effected by Teresa Kaczor) for the display of preserved elements of the cornice and balustrade on their top.

The south wall, having already been once restored, had to be dealt with differently. The program called for taking down the revetment of concrete slabs, correcting the false inclination angle of the wall and revetting it again in natural stone. In view of the fact that the wall is layered with a void inside, it was recommended in the proposal to seal the wall on top and protect it against rainfall (project developed by the present authors).

The conservation program for the Sun Altar itself was prepared by painting restorer Izabela Uchman-Laskowska.

PRESERVATION OF THE COMPLEX

SHRINE OF ANUBIS

Until 2002 the vault of the Anubis Shrine was protected by a temporary wooden shelter in the form of a gable roof with a slope

of ~45° (100%). Rafters of coniferous wood, 8/8 cm in section, spaced 0.90 m apart, were supported on wooden collar beams (12/18 cm) [*Fig. 2*]. The latter were

2 In keeping with the recommendations of the ICOMOS Charter on the Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage (2003) concerning non-replacement and respect for historical materials (pt. 3.12).

supported on one side on the top of the north wall of the Solar Court and on the other on the heavily eroded rock slope. The roofing consisted of 4/4 cm wooden laths. The outer roofing comprised palm-leaf matting.

The technical condition of this shelter structure left much to be desired with the outer roofing damaged, frayed at the roof

edges and with sections missing. It no longer served its purpose.

Design guidelines for protecting the shrine and installing a roof above it were prepared by Mieczysław Michiewicz already in 1999.

The technical design for the roof satisfied the following physico-technical functions:

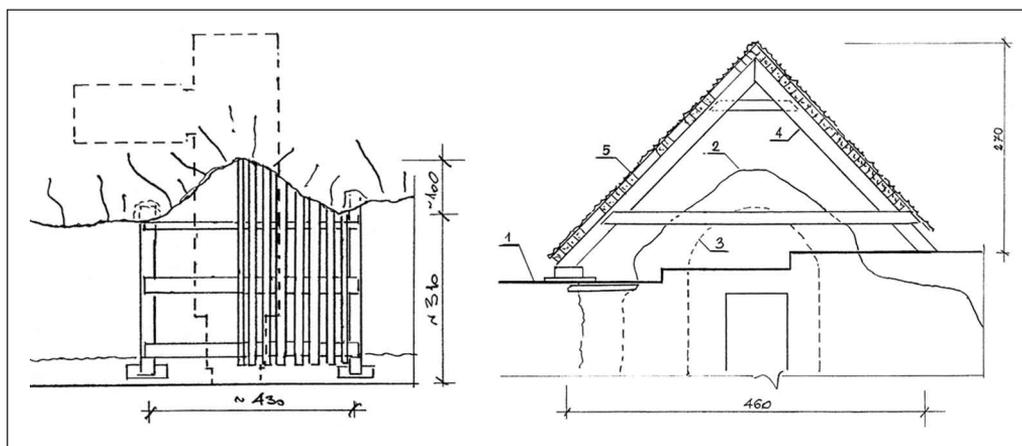


Fig. 2. Provisional roofing of the Shrine of Anubis: top plan (left) and view: 1 – wall top, 2 – top of shrine vault, 3 – underside of shrine vault, 4 – wooden roofing shelter, 5 – outer roofing (Drawing M. Michiewicz)

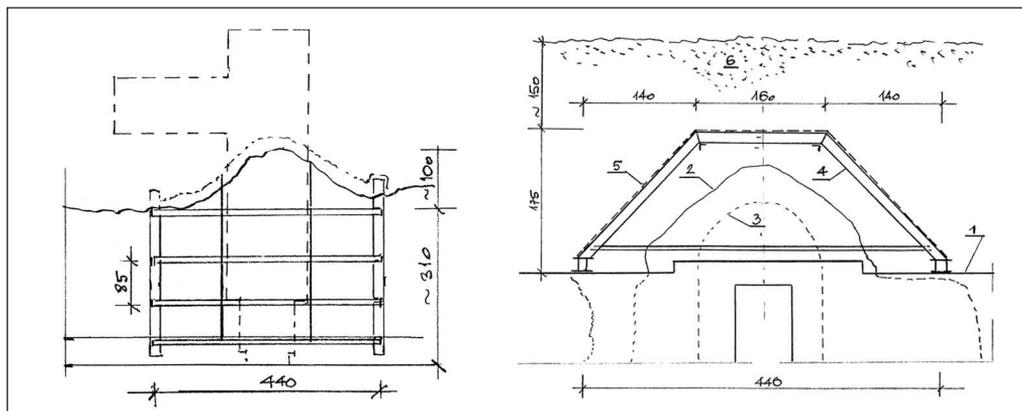


Fig. 3. Design of the roof shelter over the Shrine of Anubis: plan (left) and view: 1 – intermediary wall level, 2 – top of shrine vault, 3 – underside of shrine vault, 4 – steel-and-reinforced concrete structure (roof shelter), 5 – bitumen insulation of roof shelter, 6 – covering of rock detritus (Drawing M. Michiewicz)

1. protection from rainfall and waterflow from neighboring rock slope;
2. protection from dynamic rockfall from considerable heights and uncontrolled burying under rock detritus from the neighboring rock slope;
3. safe transfer of load from planned burying under rock detritus of the shelter roof up to 1.50 m high;
4. ensuring ventilation of space between top of shrine vault and the shelter roof;
5. protection from temperature variation, water condensation and ultraviolet radiation.

It was designed as a spatial, steel-and-reinforced concrete structure rising above the top of the shrine's vault [Fig. 3]. The carrying framework is formed of welded steel trapeze frames made of double-T hot-rolled profiles 140 mm high, spaced axially every 85 cm. These frames were supported on steel beams concreted in rock-cut sockets on one side and supported on the uncovered part of the north wall of the Solar Court on the other. The supports distribute the vertical and horizontal loads from the frame strutting. The edge frame set on the wall surface was reinforced with steel tighteners, limiting the considerable spread of the support beams.



Fig. 4. View of the protected vault following the present work (Photo M. Jawornicki)

The steel frames were filled with monolithic ribbed plates 14 cm thick, reinforced with smooth steel of A0 class, 8 mm in diameter and with a span of 15 cm [Figs 4, 5]. The edge panel of the reinforced-concrete slab on the side of the rock slope is supported on a steel frame and continuous groove cut in the rock. The steel structure was given a rustproof coating. B20 monolithic concrete was used (C16/20). Slabs were poured in traditional formwork of galvanized steel sheets, the latter also protecting the top surfaces of the shrine's vault from the wet concrete mass. The top surface of the roof shelter was covered with two layers of a bitumen mass, additionally protecting against water and damp. Once the concrete achieved full strength, the roof shelter was covered with rock detritus, which was designed to act additionally as a shock-absorbing layer for dynamic rockfalls from considerable heights.

The carrying capacity of the roof shelter over the Shrine of Anubis was calculated according to Polish Building Norms by the carrying capacity border states using distributed safety coefficients. The resulting carrying capacity corresponds to the outer static load $g_{Sd} = 120 \text{ kN/m}^2$. Taking into account the possibility of exceptional



Fig. 5. Shrine of Anubis and the north wall of the court during the project (Photo T. Kaczor)

dynamic action, the potential for which exists in the region, the static load was calculated, in spite of the shock-absorbing layer, according to a reduced dynamic norm coefficient $\gamma_f = 1.2$. The resulting supplementary outer limit is $g_{\max} = 100\text{kN/m}^2$, that is, 10 t/m^2 . This corresponds to a covering of rock detritus 4.50 m thick. The controlled (shock-absorbing) cover is 1.50 m thick, giving a safety margin for the roof of $\sim 200\%$.

NORTH WALL OF THE COURT

Work on the north wall of the court proceeded concurrently with structural work on the Shrine [Fig. 5]. In line with the program guidelines, stone blocks of specific dimensions according to the historic courses were prepared. They were laid in a lime-cement mortar. Above the ancient vault of the shrine, one of the blocks was mounted in a movable position in order to assure continuous monitoring of the original vault, this in line with the ICOMOS Charter of 2003 (pt. 3.21) which says that “checks and monitoring during and after the intervention should be carried out to ascertain the efficacy of the results”.

In order to isolate the roof shelter of the shrine and eliminate any additional load, a reinforced concrete beam (20/24 cm) was mounted in the wall above the shelter.

VESTIBULE WALL

The original blocks from the wall between the vestibule and court were protected in the 2002 season. The portal in this wall and fragments on either side were recreated in the form of a permanent ruin [Fig. 6]. The joining of this non-existent wall with the north wall of the complex was arranged in a way to present ancient wall-building techniques. The joining with the south wall was shown as traces modeled in mortar.

SOUTH WALL OF THE COURT

Work on the south wall of the court started in January 2004 with the removal of the artificial stone revetment slabs. The technical condition of the wall was checked. Red bricks from the upper courses were struck off sufficiently to correct the false inclination of the restored wall surface. A lime-cement mortar render was used to coat this wall after cleaning off the brick dust. The design for the new stone revetment called for each slab to be anchored separately with stainless steel anchors. The first course of slabs had a thickness of 18 cm, the ones above respectively 16 and 14 cm. Once each course of slabs was anchored in place, the gap behind the slabs was filled with a lime-cement mortar (with white cement added). The new stone revetment was adapted in height to the original courses and ranged from 46 to 50 cm. In the 2005 season, the new stone facing was smoothed with stone-polishing tools.

CORNICE DISPLAY

In 2005, the team also concentrated on installing the display of cornices on top of the north and west walls, which had



Fig. 6. Vestibule wall with portal opening onto the court (Photo M. Jawornicki)

already undergone conservation treatment (the blocks were preserved and protected by Andrzej Sośnierz). The first stage comprised four cornice blocks being set on the north wall, starting from the corner with the west wall. Further blocks were mounted on the west wall. For lack of blocks to fill the entire

length of the walls, the gaps were completed with low walls plastered in the color of the limestone. Apart from the aesthetic value of this composition, it had the functional purpose of screening the structure of the ceiling over the Northern Chamber of Amun-Re [Fig. 7].



Fig. 7. Solar Cult Complex. General view toward the west and north. State during conservation work in 2005 (Photo M. Jawornicki)

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