

ARCHITECTURAL CONSERVATION RED MONASTERY SPRING 2018

AMERICAN RESEARCH CENTER IN EGYPT



Psammotermes hypostoma

PRELIMINARY TECHNICAL REPORT

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1 EXTERIOR WORKS (refer to figures 1, 2 & 3)

Termite protection work was carried outside the east wall of the church as the first part of a larger project that will be carried out in the fall of 2018 when the entire circuit of the building will be fully protected. This area is particularly susceptible to termite infestation owing to its proximity to a major source of water: the adjacent monastic resthouse. The method employed was sub-surface saturation of liquid chemical deterrent. At a distance of one metre from the wall, a line of vertical 5 cm diameter one-metre-long perforated PVC pipes was installed at intervals of one metre (total of 21 pipes), set within a 30 cm wide x 30 cm deep trench (Line 1). Each pipe was perforated along the lower 70 cm of its length, with a bottom cap to prevent the injected liquid from draining directly into the ground and to encourage its horizontal dispersal. Another line of 11 pipes of the same type was installed two metres away from the wall, at intervals of approximately two metres in order to avoid obstacles in the ground such as concrete (Line 2). The first line of pipes was designed to be capable of repeat applications of insecticide in the future, on a recommended cycle of five years, while the second was intended for one-time use only to spread the treatment over a wider area. The first line of pipes was divided into four separate sections, each of which was connected horizontally by a welded 5 cm diameter PVC feeder pipe with a single insertion point for the insecticide. This will also facilitate repeat applications as only one insertion point for the insecticide will be required every five metres.

The chemical compound used as the deterrent was “Pyrifos” (diethyl trichlor pyridyl phosphorothionate) – a broad-spectrum insecticide with no health side effects on mammals. This was used in place of the specified insecticide “Fibronil” because “Fibronil” has not been imported into Egypt for the last six months. The termite specialists from the Plant Protection Research Institute Dokki, Dr. Mohamed Kamal ‘Abd-el Latif Abbas and Dr. Tarek Raies Amin, the authors of an investigative report on the termite problems at the Monastery dated April 17, 2016, were consulted as to the best available alternative insecticide. The “Pyrifos” was used in a dilute solution with diesel in the proportion 20 cl to 5 litres. It was originally proposed to dilute the insecticide in water, according to the recommendations of Dr. Mohamed and Dr. Tarek, but Mr. Essam Rushdi (Director the MoA Sohag Conservation Department) requested that diesel be used as an alternate diluting agent. This seems not to have had any perceptible adverse effect on the rate of saturation achieved, at least during the initial application of the deterrent.

A total of 350 litres of deterrent was inserted into the pipes manually using a funnel. This volume was divided between Line 1 (150 litres) and Line 2 (100 litres). In addition, the excavated trench of Line 1 was treated with the same chemicals and filled with clean sand. A repeat application of chemicals using the pipes of Line 1 will

be carried out after one month to improve the saturation and diffusion of the deterrent. This secondary treatment, upon the advice of the Plant Institute Termite consultants, will utilize a different insecticide: “Deliron El_Nasr 727 EC” (O-4 bromo-2-chlorophenyl O-ethyl S-propyl phosphorothioate). In addition to the sub-surface application of deterrent, the same insecticide in dilute solution with water was also sprayed over the inner surface of the trench and across the surrounding ground. The trench was then backfilled with clean sand.

2 INTERIOR WORKS

Apart from the treatment of the ground outside the east wall of the church, insecticide was also applied inside the sanctuary area below the stone pavement and to wooden elements in the walls, in the manner described below.

2.1 Treatment of pavement (refer to figures 4 & 5)

The existing limestone floor installed inside the church in 2014 is of two thicknesses: 18 cm in the area of the triconch and projecting platform, and 7 cm in the side chambers. Mortar joints in the floor in all paved areas were selectively cleaned out, and a chemical deterrent introduced through the empty joints. Care was taken to make sure visually that the liquid chemicals, which were applied by hand using a funnel, spread along the path of the mortar joints under each block to ensure adequate dispersal of the deterrent. The insecticide used in the treatment was a mixture of “Pyrifos” (as used outside the church), “Citronelle” and “Navda Rumi” in the proportion 20 cl / 75 cl / 5 litres. It was originally proposed to dilute the “Pyrifos” in water, according to the recommendations of the termite specialists, but Mr. Essam Rushdi requested that “Navda Rumi” be used as an alternate diluting agent. This seems not to have had any perceptible adverse effect on the rate of saturation achieved, at least during the initial application of the deterrent.

The recommended rate of coverage was applied over the surface area of the paving, namely 4 litres per m². A total of 400 litres were used, with approximately 50 litres used in each of the side chambers and the remaining 300 litres used in the area of the triconch and projecting platform. The raised section of pavement under the external trilobe portal facing the nave was also treated at the same time.

Following chemical treatment, the open mortar joints in all areas apart from the sanctuary and projecting platform were re-pointed using a sifted sand and lime mortar (3:1 ratio). A visual assessment provided assurance that no further treatment was required as a satisfactory dispersal rate had been achieved. The areas with thicker floor slabs will be re-treated as necessary in the continuation of activities after Ramadan. This secondary treatment, upon the advice of the Plant Institute Termite

consultants, will utilize a different insecticide: “Deliron El_Nasr 727 EC” (O-4 bromo-2-chlorophenyl O-ethyl S-propyl phosphorothioate).

2.1 Treatment of cells

On the upper floor of the church, above the side chambers of the sanctuary and flanking the north and south semidomes, the vaulted cells also showed traces of termite infestation, particularly in the chambers on the north side. The north cells had been returned to use as storerooms and contained numerous carpets and wooden elements. These were removed (with a request that such materials should never be stored here as they constitute an attractive source of food for the termites), and the rooms were sprayed with the same chemical deterrent that was used in the sanctuary, with particular attention being paid to all internal corners.

2.3 Treatment of wooden elements (refer to figures 6 to 10)

The wooden elements of the sanctuary façade, triconch and roof structure provide the most dramatic evidence of termite activity in the church. These elements date from different periods of restoration. Major structural elements supporting the roof and the triconch date to the initial 1909-1912 project by the *Comité de conservation des monuments de l’Art Arabe*. Much of the wooden banding associated with the sanctuary façade also dates to this period. The roof cladding, some replacement beams, and elements inside the triconch date to the ARCE restoration of 2013-2014 carried out by the author of this report (for details, see internal report dated June 2014: *Red Monastery Church in Sohag. Architectural conservation and presentation 2013-2014*). The treated timber elements installed at this date thus far remain unaffected by termites. It is also probable that many wooden elements, particularly on the roof, were replaced piecemeal during unrecorded interventions in the intervening years between 1912 and 2014.

A full physical survey of condition was carried out using a ladder and a steel scaffold, and the results were recorded on drawings. Live termites were seen in many locations and, in some cases, wooden elements had been almost totally consumed from within. Fortunately, major structural components such as the massive wooden supports above the columns in front of the sanctuary and the beams directly above them have not been affected thus far. A common pattern of loss seen on the timber cornices within the sanctuary was for the section of wood immediately abutting the masonry of the walls to be attacked first. On the roof, three beams in the projecting section of the roof over the central area west of the sanctuary façade were also seriously infested.

A preliminary treatment of all timber was initiated during the May campaign, prior to full treatment in June. Where there was no risk posed to the structure, destroyed

elements were removed entirely and the voids carefully cleaned out. In the case of the south jamb of the north door between the projecting platform and the north lobe, brick masonry set in lime mortar was used to fill a very deep void. In other cases, such as in the cornices of the conches, one niche on the sanctuary façade, and on the roof, the damage was exposed for surface treatment pending replacement. All wooden elements were sprayed with the chemical insecticide “Woodserve”, trying to maximize internal coverage of the individual elements.

3 RECOMMENDATIONS FOR IMMEDIATE IMPLEMENTATION

The replacement of a significant number of wooden elements is unavoidable. A dimensioned list of replacement timbers to be prepared in advance of the return campaign scheduled for after Ramadan as follows:

Roof beams: 16cm x 7.5cm x 4m [4 pieces to include 1 spare]

Wooden bands: 10cm x 5cm [12 linear metres]

Wooden bands: 13cm x 7.5cm [2 linear metres]

Curved impost blocks for niche: 13cm x 15cm deep with internal diameter of 44cm

Cornices: 10cm x 20cm x 2m [12 pieces]

These timbers will be sourced from seasoned pitch pine (“Azizi”) beams and machined to size prior to being soaked in the chemical insecticide “Woodserv” in solution with “Navda Rumi”.

Of particular concern is the future protection of the timber lintels spanning between columns in the triconch. These provide structural support to each section of the triconch and the semidomes above them. It was the failure of these lintels in the mediaeval period (most probably for the same reasons – termite attack) that prompted the walling up of the lobes of the triconch to preserve the structure from collapse. It is proposed in each individual section of lintel at both levels to drill three 8 mm diameter holes from the upper leading edge of the lintel at a downward angle to a depth of approximately 30 cm – two thirds of the width of the lintel. This will be followed by a syringe injection of insecticide into the cores of the lintels, which it is hoped will provide sufficient chemical saturation to deter further attack.

The proposed conservation work in the sanctuary will require the construction of a full height wooden scaffolding as standard metal scaffolding sections do not provide sufficient proximity to the curving faces of the lobes to allow for work to proceed in safety.

An additional budget of \$1,290 will be required to carry out the proposed work broken down as follows:

Purchase of seasoned pitch pine timbers [1.7m ³]	LE 16,150
Machining timbers to size	LE 1,500
Additional Woodserve (20 l) and Navda Rumi (75 l)	LE 2,430
Transport of timber scaffolding to Sohag	LE 2,500
Total cost:	LE 22,580
Equivalent at LE17.5 to USD	USD 1,290

The cost of employing the additional two carpenters necessary to carry out the work, the rental of scaffolding, and any additional materials required to carry out plaster repairs adjacent to the locations where wooden elements are to be replaced will all be met from within the existing budget for the works.

3 SCHEDULE OF FUTURE WORK

The continuation of activities to combat termites at the Red Monastery Church is planned to commence immediately after Ramadan (provisionally 18 June) and to last for approximately one week to ten days. The work is expected to include the following activities:

- Re-application of insecticide outside the church using 'Line 1' dispersal points
- Possible subsurface installation of three 1" perforated PVC pipes (one per conch) to serve as permanent points for the introduction of chemical deterrents on a cyclical basis [to be studied further]
- Re-application of insecticide inside the sanctuary through open mortar joints
- Re-pointing of mortar joints with lime mortar

- Construction of full height timber scaffolding in each conch of the sanctuary to be able to carry out timber replacements and treatment successfully
- Removal of damaged and defective timber elements
- Thorough cleaning of voids and spray application of insecticide to local sites of infestation
- Fitting replacement wooden elements as required
- Possible drilling of timber cornices with 8mm diameter holes sloping inwards to 2/3rds of depth of lintels and syringe injection of insecticide [to be trialled]
- Surface treatment of wooden elements to match existing
- Localised lime mortar and plaster repairs to edges damaged by removal and installation of wooden elements
- Patination of surfaces of new fills to match surrounds