ARCHITECTURAL CONSERVATION

RED MONASTERY SPRING 2016

Part II: The Tower

AMERICAN RESEARCH CENTER IN EGYPT

PRELIMINARY REPORT

Dr. Nicholas Warner, April 28, 2016

PART II: THE TOWER

5 ARCHITECTURAL DESCRIPTION (Figs. 5.1 - 5.7)

The Tower [Hisn / Qasr] of the Red Monastery is a two storey structure, approximately 12 metres square in plan, that was built immediately to the south of the South Portal leading into the church. The building is believed to date to the 13th century. It is almost entirely built of brick with barrel vaults and domes supported on masonry walls. These walls are up to 1.8 metres thick at the base of the tower, and taper externally. The entrance is through a pointed arched doorway on the north end of the west façade. External fenestration is minimal, with only small arched or square openings: one circular opening is located above the main entrance. A sunken square water tank, built of fired brick with an irregular stone border, exists in the southwest corner room. The date of this feature is unknown. Decorative limestone blocks and bosses carved with crosses can be seen in a number of locations built into the structure. At the centre of the tower, a circular well (1.1 metres in diameter) rises through the full height of the building and extends at least 6.5 metres underground. The well is located within the core of a vaulted staircase that rises to the first floor.

Archival images from the late-nineteenth and early-twentieth centuries show that the tower had a third storey of 'baladi style' construction in mud or fired brick. This storey seems to have been in various states of ruination at different times but was undoubtedly inhabited at various points in its history as can be determined from archaeological evidence retrieved during works in 2016.

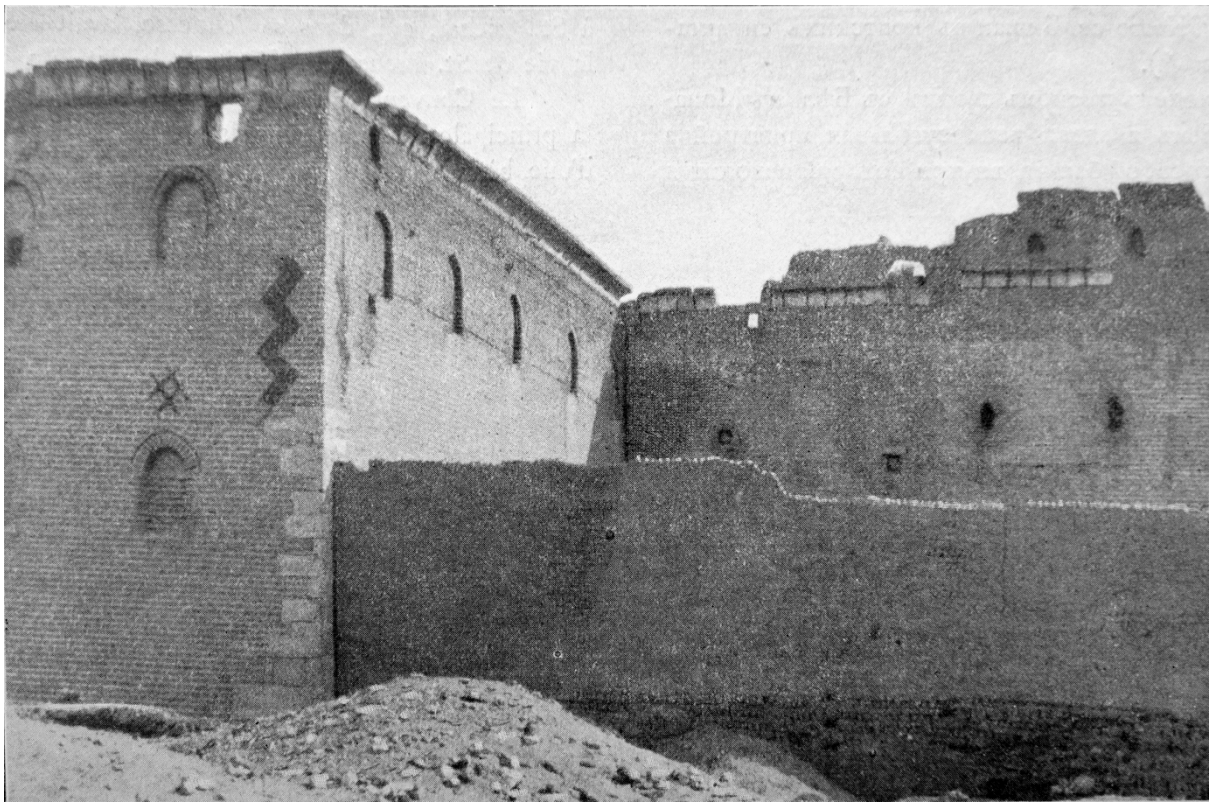


Fig. 5.1 Photograph of church and tower from west by Wladimir de Bock in 1897. Note the cavetto cornice blocks in situ on the west face of the tower and ruins of a third storey structure.

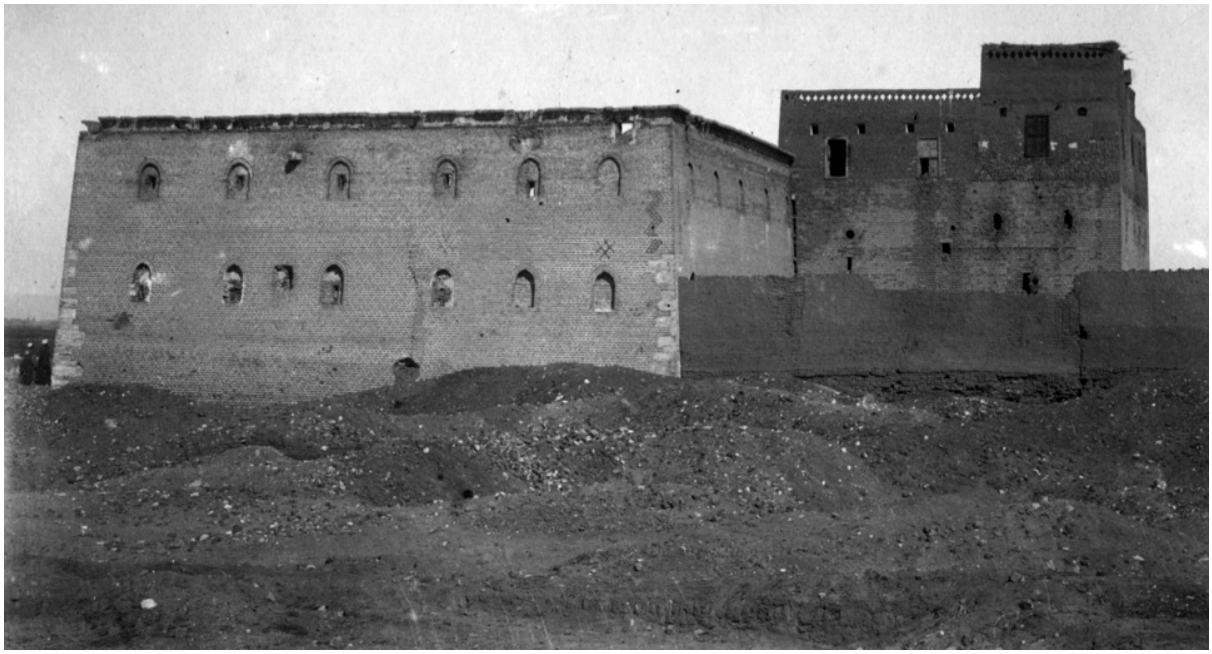


Fig. 5.2 Photograph of exterior of church and tower from west by unknown photographer in 1905-1909. Note removal of cavetto cornice blocks on the west face of the tower and construction of a new third storey.

Fig. 5.3 Photograph of tower from inside nave looking southeast by unknown photographer in 1905-1909. Note the new third storey construction.

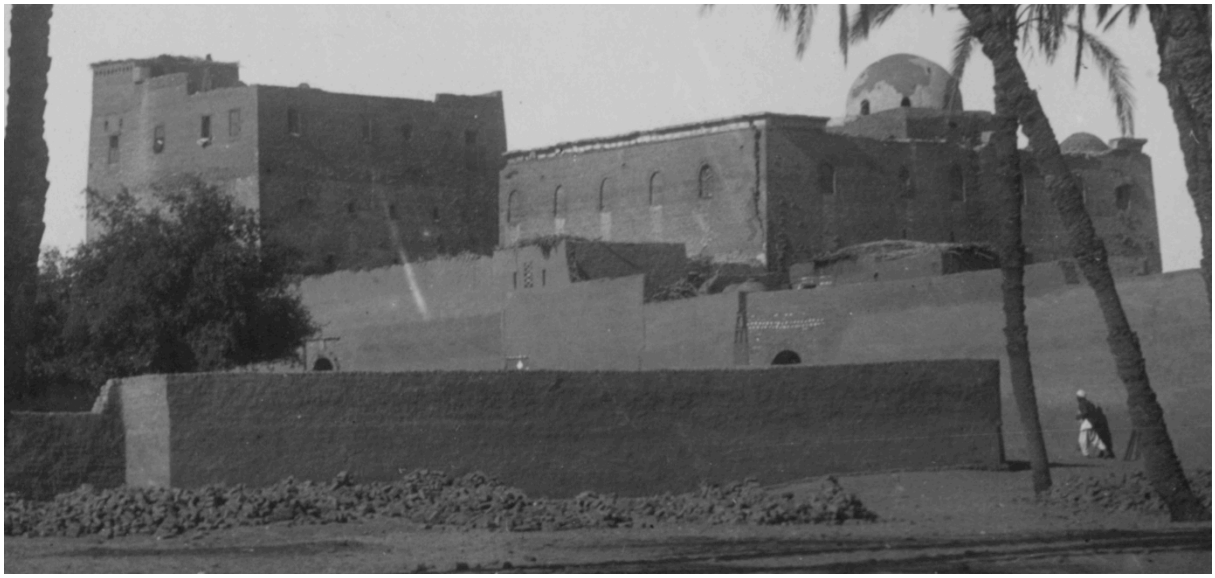


Fig. 5.4 Photograph of exterior of tower and church from southeast by unknown photographer in 1905-1909. Note the new third storey construction.

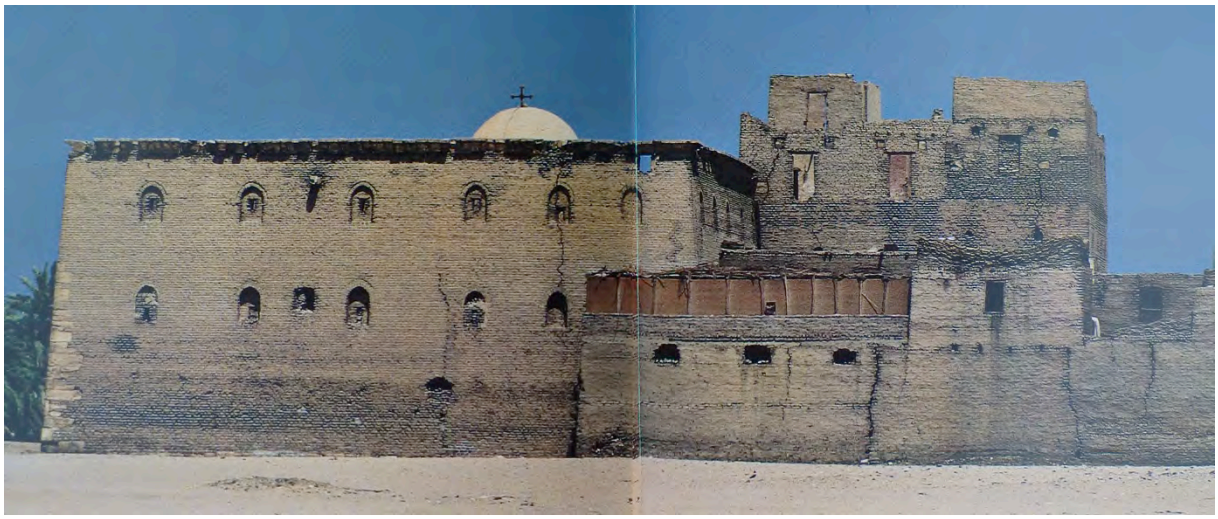


Fig. 5.5 View of the Red Monastery complex from the west, with tower on right, taken by M. Capuani c. 1990

Fig. 5.6 Remains of organic roofs of early twentieth century houses on the roof of the tower, c. 1995

The interior of the tower was undoubtedly plastered originally with a lime plaster. Some of this plaster was also decorated with plain color treatments but none of it appears to have survived the intervention of 1995-96, discussed below.

Fig. 5.7 Polychrome painted plaster bands on a first floor wall in the tower, circa 1995, now destroyed

6 PREVIOUS INTERVENTIONS (Figs. 6.1 – 6.11)

6.1 The Comité de Conservation des Monuments de l'Art Arabe, 1912

In 1912, the Comité removed a section of the north wall of the tower to expose the carved stonework of the South Portal of the church, and built a large arch on the line of this wall to support the masonry above. This arch followed the dimensions of the relieving arch in the south wall of the church above the South Portal. Construction of the arch was carried out with the same lightweight hollow bricks that were used for the construction of the dome over the sanctuary. This operation required the removal of half of the elliptical inclined vault that covered the entrance area of the tower. A support to the edge of the truncated vault was introduced at this time in the form of a steel channel. This beam was probably originally supported by blocking masonry inside a high level window at its east end, but subsequent modifications had removed the blocking and replaced it with a small piece of wood. The Comité also installed a wooden handrail to the edge of the truncated vault that had become a landing on the staircase by this point. The Comité was unable to remove the houses during its tenure, but it seems that the Supreme Council of Antiquities managed to do so at some point after 1976 up to which point the ruins of the houses are visible in archival images.

Fig. 6.1 Photograph of north face of south portal after removal of brick infill under relieving arches by unknown photographer 1912 (left) and face of south portal after removal of brickwork of north wall of tower by unknown photographer 1912 (right)

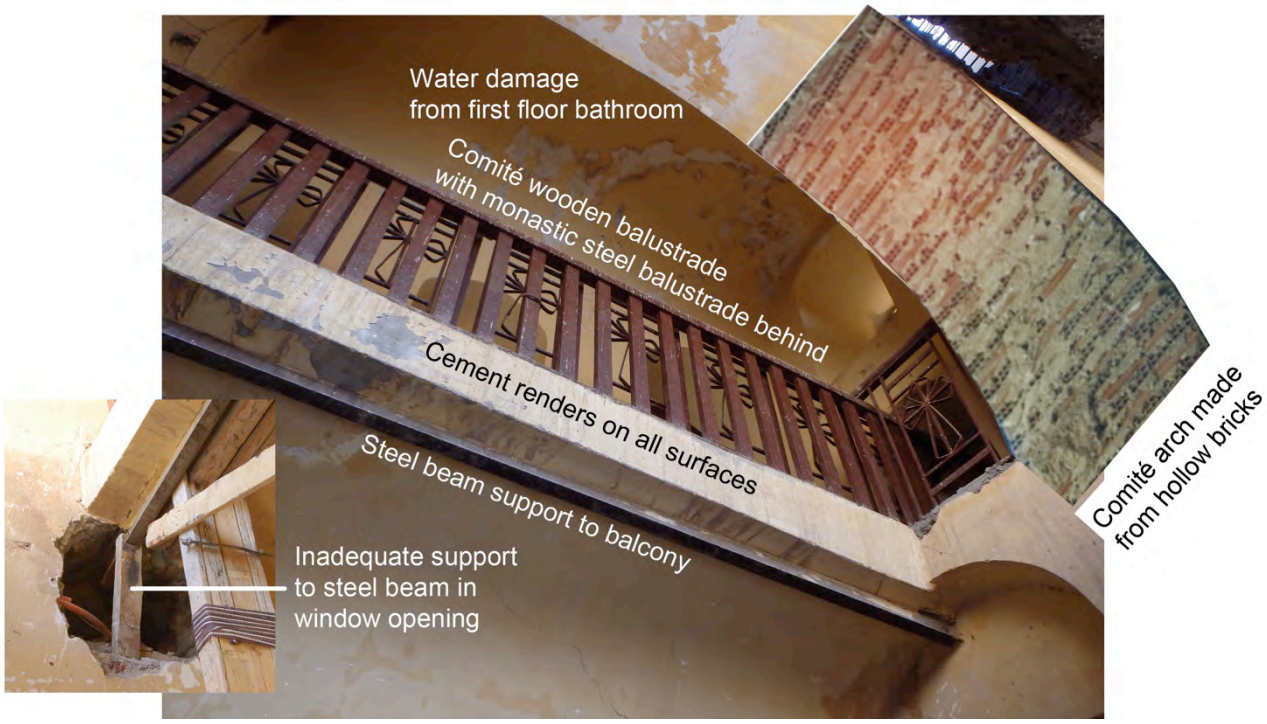


Fig. 6.2 Diagnostic view of upper area of entrance to tower showing Comité construction of arch using hollow bricks set in lime mortar, later plastered with cement during the intervention of 1995-96, and other interventions discussed below

6.2 SCA Intervention 1995-1996

In December 1995, a contractor [Megahid Mahmud al-Khalifa] employed by the Supreme Council of Antiquities carried out work on the tower as well as on the perimeter walls of the church. The exterior perimeter of the tower was reinforced at ground level by a 60 x 40 cm reinforced concrete beam set over 40 cm thick mass concrete footing. This beam was not only unnecessary from a structural point of view, but actually caused further damage to the low level masonry of the tower by trapping moisture deriving from the tower's inadequate waste water disposal system. By 2016, much of the reinforcement had rusted. Apart from the installation of the concrete beam, the entire exterior of the tower was repointed with a cement mortar including its stone quoins.

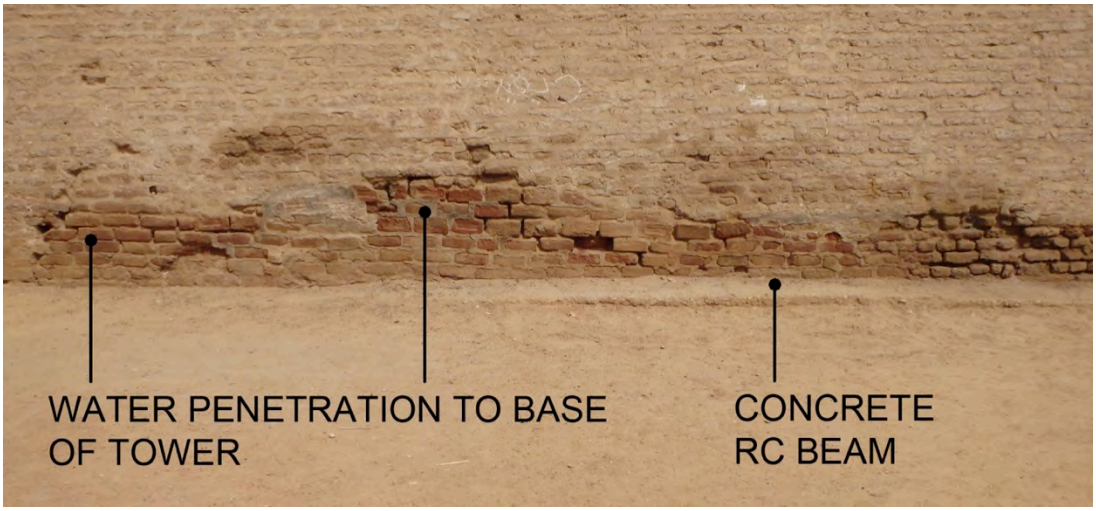


Fig. 6.3 Diagnostic of condition at tower base showing the top of the reinforced concrete beam and water damage.

Fig. 6.4 View of west wall of tower showing reinforced concrete beam at commencement of removal. Note the badly eroded limestone corner block

The extent to which the SCA project of 1995-96 intervened on the first and second floors of the tower is not completely clear. An open metal grille was certainly installed to cover the top of the gap between the tower's north wall and the south wall of the church above the south portal. This grille cut through a blank window arch of the south façade of the church. The sides of the gap between the two walls was not completely filled to full height and thus provided ideal roosting locations for birds. The crude repairs to the two domes of the first floor date to this period, as do various other masonry reconstructions, such as arches. The domes over the southeast and northeast rooms are made of fired brick. Both these domes were constructed using silt mortar, so the cement treatment was particularly inappropriate and difficult to rectify without causing considerable damage to the original structure. A number of timber stitches were also employed in the outer walls of the staircase. At the same time, numerous areas of the tower were re-plastered using a thick, dense, cement render, including the large arch in the north wall. It is likely that the renewal of the treads on the staircase can also be ascribed to this period of work.

Fig. 6.5 The gap between the north wall of the tower before (left) and after (right) the installation of the metal grille and handrail in 1995-96

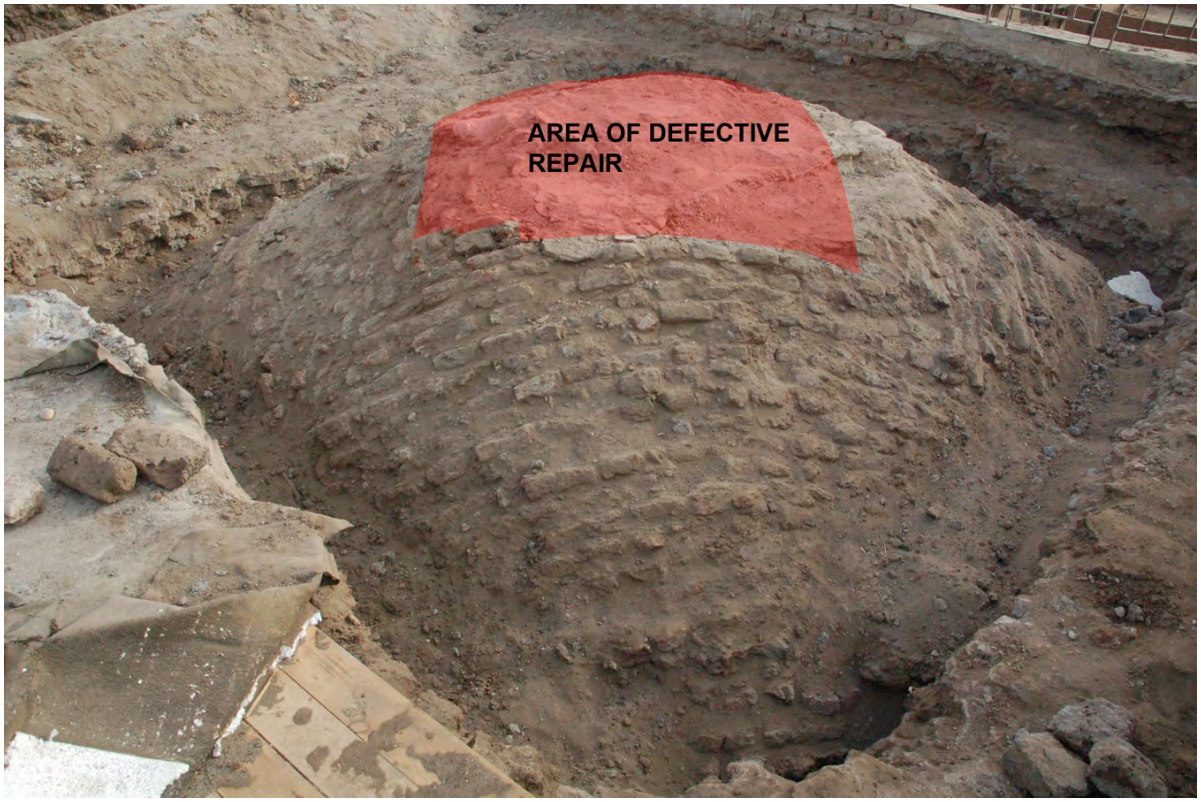


Fig. 6.6 The southeast dome after partial clearance showing area of defective repair, carried out without understanding of the structure of the dome

Fig. 6.7 Corner of the northeast dome after test clearance showing condition of northwest pendentive within later fill and blocking walls

Fig. 6.8 Defective repairs of arches (top left), southeast dome from below (top right) and masonry above staircase (bottom left) with cement mortar used above bricks laid in silt mortar. The original appearance of the stairs is seen at bottom left, replaced in 1995-96.

6.3 Monastic re-use of the Tower circa 1997 - present

From approximately 1997, with the arrival of Father Antonius at the site, to 2016 the tower has been used for domestic, administrative and storage purposes. During these years, numerous ad hoc interventions were made that contributed to the severe deterioration of the fabric of the building. These including the installation of flushing toilets at ground (x 2) and first (x 1) floors, and a bathroom and a kitchen on the first floor complete with an automatic washing machine. The result of this unsupervised and ill-advised activity was that by 2015, the tower was the worst affected part of the Red Monastery complex in terms of water damage to its masonry and foundations. This was because wastewater (including sewage) had accumulated in the well for at least 20 years prior to conservation. Defective water pipes also contributed to the problem causing water to seep into the surrounding ground. This water was absorbed by the masonry and caused damage to both its foundations and its external surfaces by capillary action through its structure. Water damage was also evident from the kitchen and bathroom installed at roof level. By 2016, subsidence-induced cracking was visible in the entrance area at ground level, as well as in the east wall of the ground floor toilet. This toilet had been hacked through the circular well, seriously destabilizing the core of the building.

Moisture meter readings were taken using a hand-held 'Tramex MEP' non-destructive moisture detector on the 6th April 2016. These readings, most of which were off the scale of the device, confirmed the visual evidence of damp penetration seen in spalled plaster surfaces to a height of 1.5 metres. Termite infestation was severe in all the door-frames at ground floor level, as well as under the walls themselves where foundations had been eroded and moisture had accumulated. The presence of much organic material at first floor level had also attracted termites to the upper reaches of the building.

Apart from water damage, the tower had also suffered in other ways during its conversion into a dwelling. Numerous concrete slabs, up to 35cm thick, had been poured in a number of rooms, with ceramic or terrazzo/mosaico floors laid over them. This substantially increased the dead loading on the structure, reduced floor to ceiling heights on the first floor, and trapped moisture at ground level. Cement renders had been applied in many areas, particularly at ground level, creating further problems for the masonry due to lack of permeability. Some of these renders were up to 10 cm thick. Two wooden beam roofs had been installed over the southwest corner room at first floor level in c. 2001 covered with polystyrene, bitumen, and a thin screed of cement. This construction provided an excellent environment for termites.

On the balcony overlooking the south portal, a second steel handrail was installed behind the wooden one installed by the Comité in 1912, which was partly rotted.

Fig. 6.9 The roof of the tower showing secondary structures prior to clearance.

Fig. 6.10 Termites and frass in decayed timber lintels on the ground floor of the tower

6.4 ARCE Documentation in 2015

In 2015 the tower was documented comprehensively architect Pietro Gasparri through laser scanning in a project sponsored by the Antiquities Endowment Fund of the ARCE. At this time, the only internal space in the tower that could not be scanned was the northeast domed room at first floor level that was in use by Father Antonius as his meditation space.

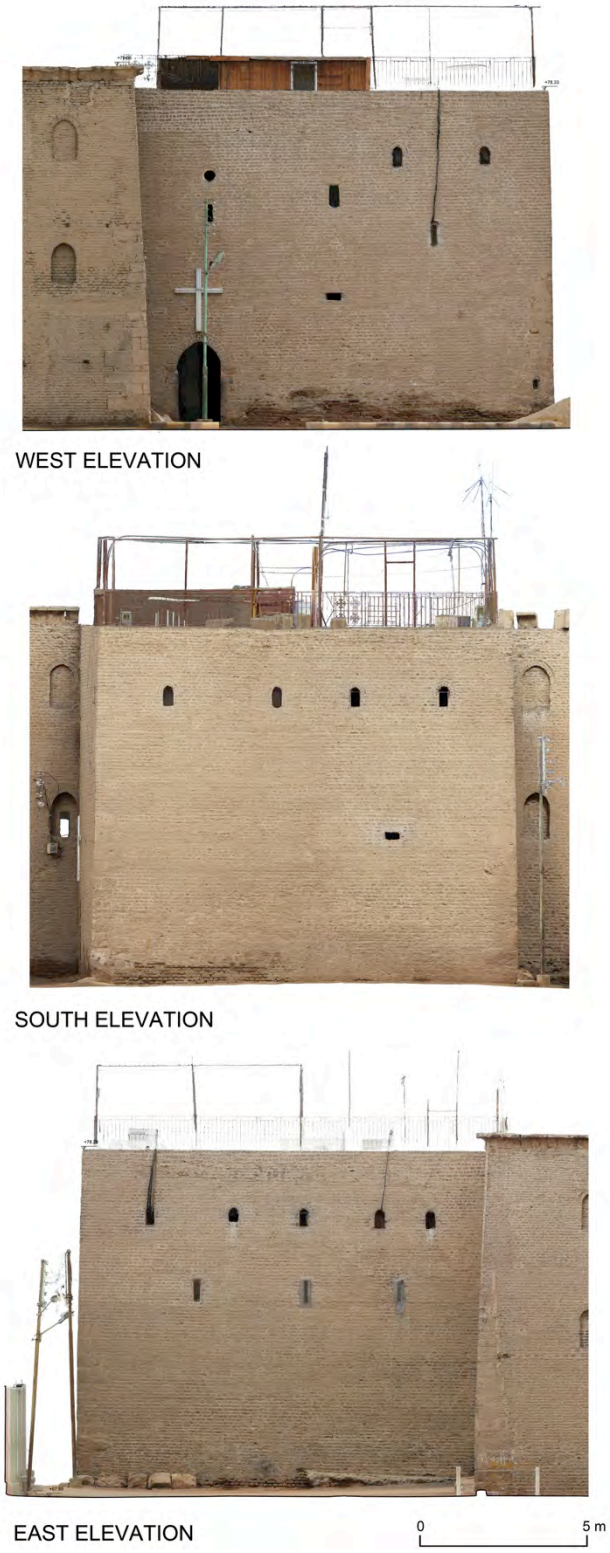


Fig. 6.11 Elevations of the tower as recorded by laser scan in 2015

7 INTERVENTION OF 2016: (Figs. 7.1 – 7.45)

In summary, prior to intervention in 2016, the condition of the tower was compromised by:

1 Damage from water infiltration at all levels causing structural degradation
2 Inappropriate materials used in previous interventions [concrete, ceramic tile, timber]
3 Inappropriate re-use contributing to physical and aesthetic degradation
4 Pigeon infestation to levels deemed hazardous to health.

7.1 REMOVAL OF ACCRETIONS

The first intervention in the tower was the stripping of the tower of all accretions, including reinforced concrete beams at ground level on the exterior, and concrete slabs, ceramic tiling, toilets, water pipes, electrical cables throughout the structure. Also removed was a significant amount of organic material at roof level that dated to the period of when the roof of the tower was re-inhabited after c.1905. The remains of the houses at second floor level, which seem to have been constructed with mud or fired brick laid in silt mortar, were demolished at some point after 1976. The levelling of the houses was covered by a layer of cement, possibly introduced in 1996 when the tower was re-occupied by Abuna Antonius.

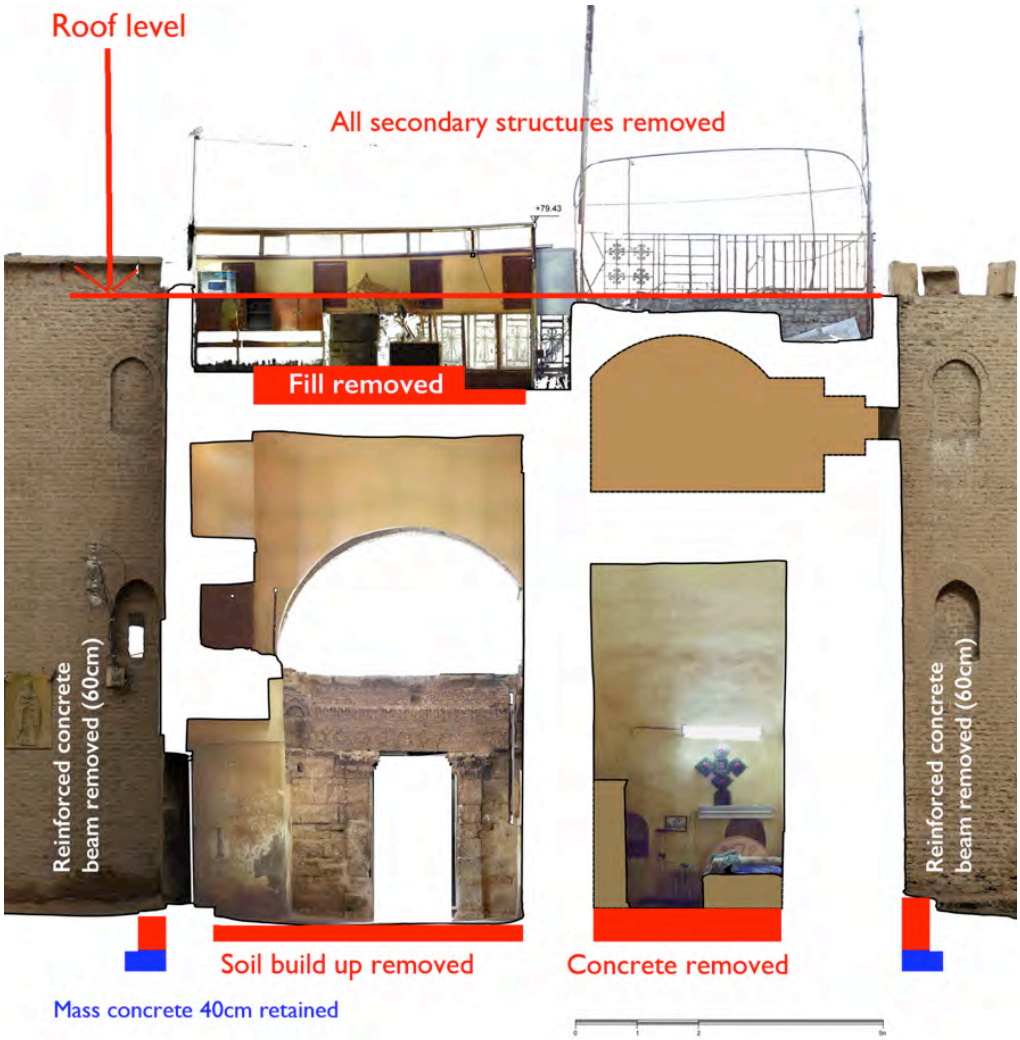


Fig. 7.1 East-west section through tower entrance area looking north showing elements removed

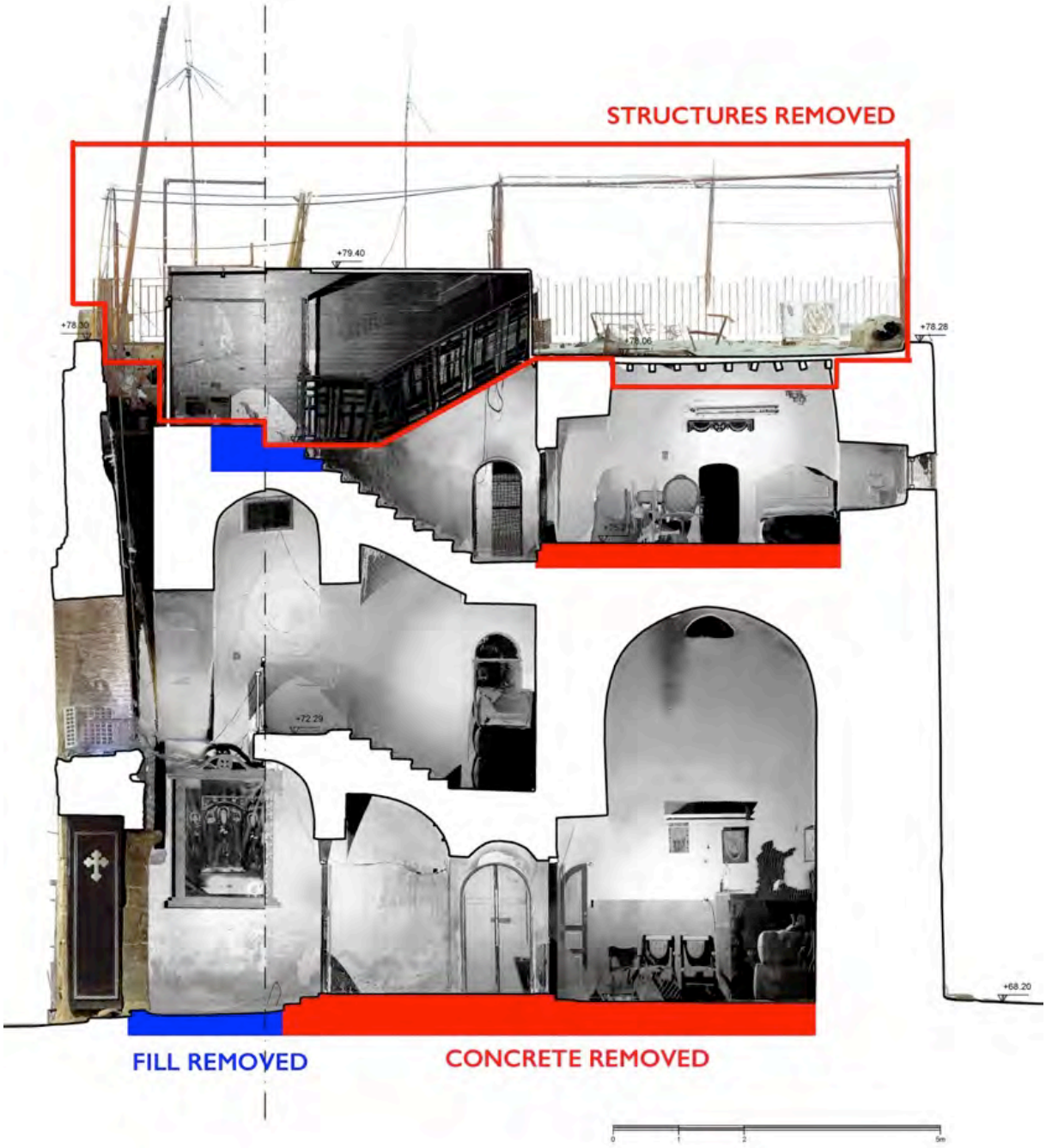


Fig. 7.2 North-south section through tower and south portal looking east showing elements removed

7.2 ARCHAEOLOGICAL FEATURES

A number of archaeological discoveries relevant to the construction and historic use of the tower were made during the process of clearance.

GROUND FLOOR

7.2.1 Pharaonic block on the south east corner of the tower with relief decoration.
This block was covered by the reinforced concrete beam installed in 1995. The block was recorded by tracing and photography and will be subject to further analysis.

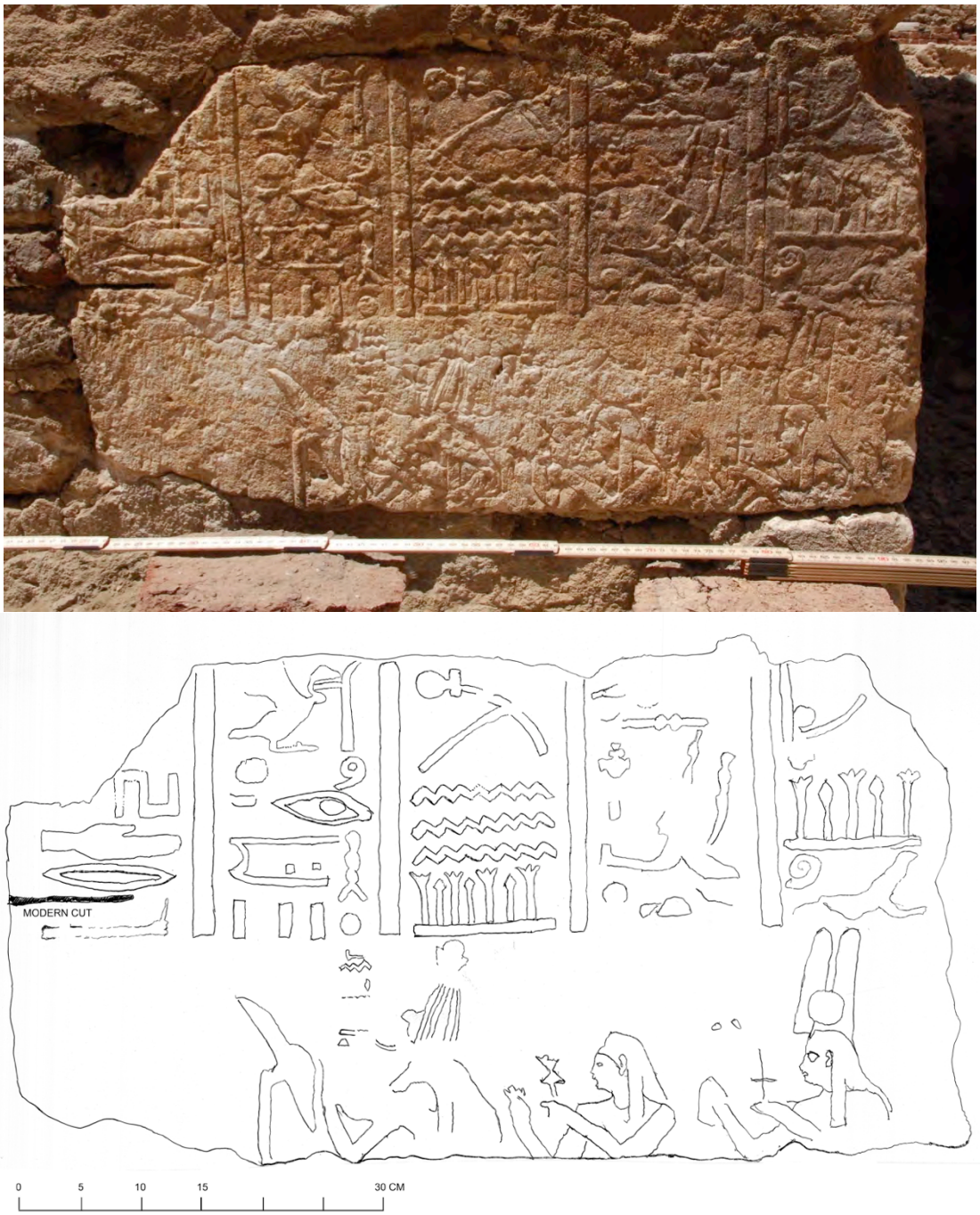


Fig. 7.3 Pharaonic block discovered on the southeast corner of the tower: photo (top) and drawing (bottom)

7.2.2 The well:

After the removal of a number of concrete slabs and the toilet at ground level, the brick well in the center of the tower was shown to be 1.1 m in diameter and approximately 6.5 m deep. It extended to the full height of the structure and had one surviving opening into it at mezzanine level. The emplacement for a least one beam to support a pulley was visible, together with a number of evenly distributed holes vertically that indicate footholds.

Fig. 7.4 The well seen from the mezzanine window opening looking down

7.2.3 Granite basin and limestone step in entrance area:

A circular Aswan granite basin with handling bosses (66 cm internal diameter with a rim of 10 cm and an internal depth of 35 cm) was set into the floor on axis with the south portal against the inner core of the tower. The basin was damaged by the installation of a modern water pipe, and was possibly used for the ritual washing of feet prior to entering the church. Immediately to the south of the basin, and slightly above it, is a limestone block with a circular depression at its center. The two elements may not be related to each other because the brickwork into which the limestone piece is set is modern with cement mortar. It is possible that it might have been a step up to the well that lies behind the wall, displaced slightly from its original context.

Fig. 7.5 View of newly discovered granite basin and limestone 'step'

3.2.4 North wall of the tower:

In 1912 the Comité removed a major part of the north wall of the tower in order to expose the carved stone frame of the south portal. A new arch was constructed at that time, made from hollow bricks, to support the remaining section of this wall at high level. The remains of the original fired brick foundation for the wall were discovered during clearance.

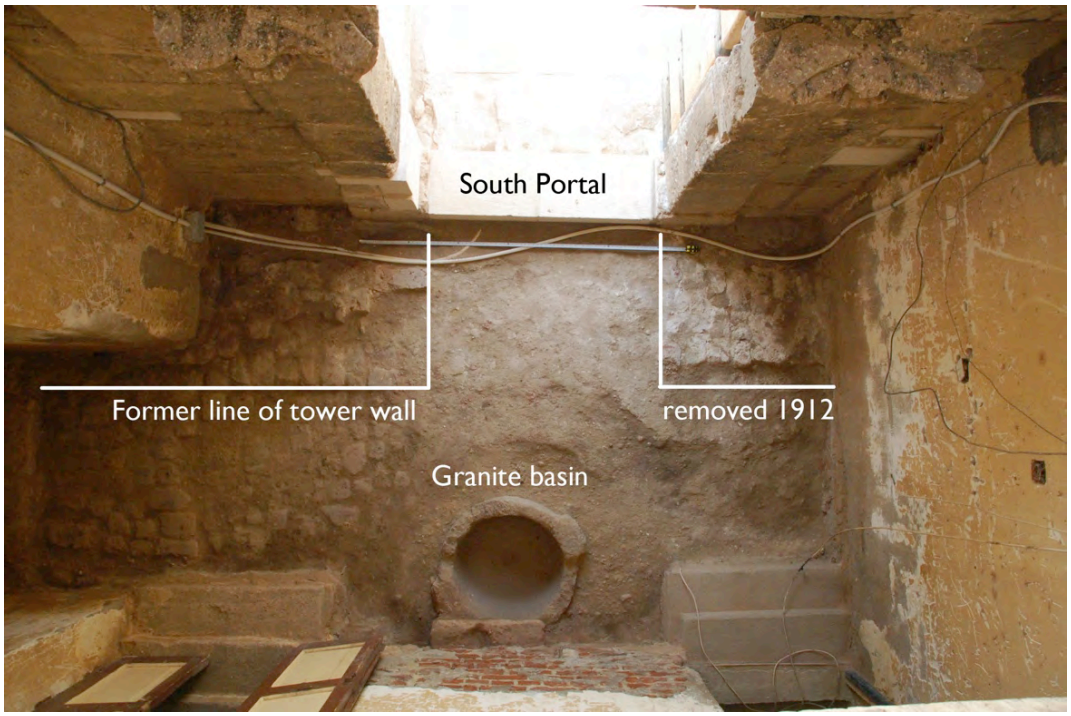


Fig. 7.6 View of tower entrance area from above showing location of wall removed in 1912 and granite basin

7.2.5 The southwest room:

A square tank (1.7 x 1.7 x 1.18 m deep) occupies most of the area of the room, and is roughly oriented to it. The tank is constructed from extremely small bricks (17 x 9 x 5 cm) set in lime mortar (including its base). Steps occupy the corners of the tank, giving it an octagonal plan at its base. Irregular limestone blocks are set over the edges of the tank. Although there are no signs of a water inlet into the tank from any direction, there seems to have been an overflow on the north side of the tank, as a 10 cm wide channel, 5 cm deep, runs parallel to the limestone blocks which are marginally lower on this side of the tank. The channel falls to the east, and it is not known whether a now-destroyed pipe may have recycled the overflow water to the well. It has been suggested that the tank was made for the purpose of adult baptism. Its date is open to question since the small brick size employed in its construction indicates that it was not built contemporaneously with the tower.

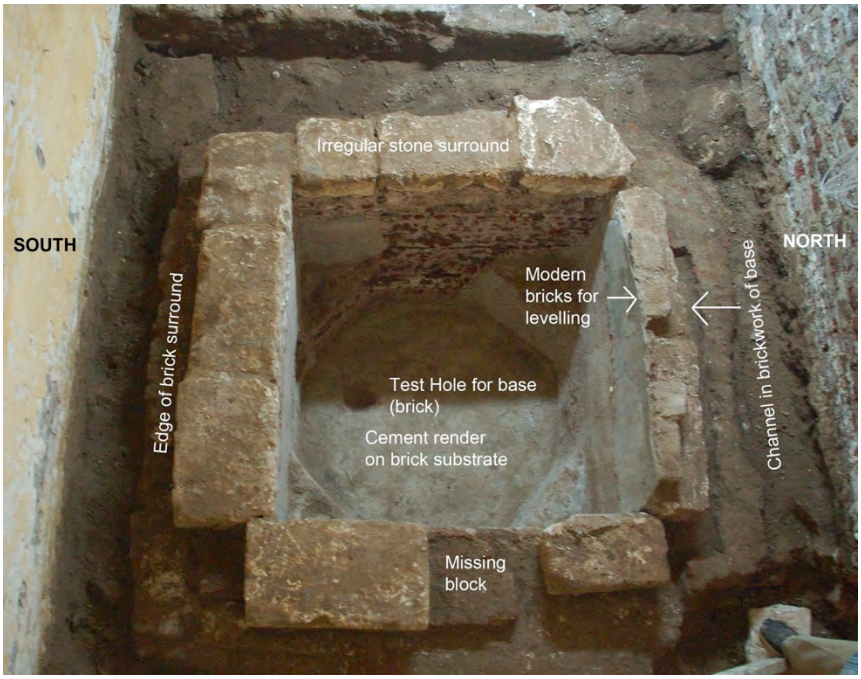


Fig. 7.7 Diagonal view of water tank from the northeast (top) and view from above after preliminary cleaning

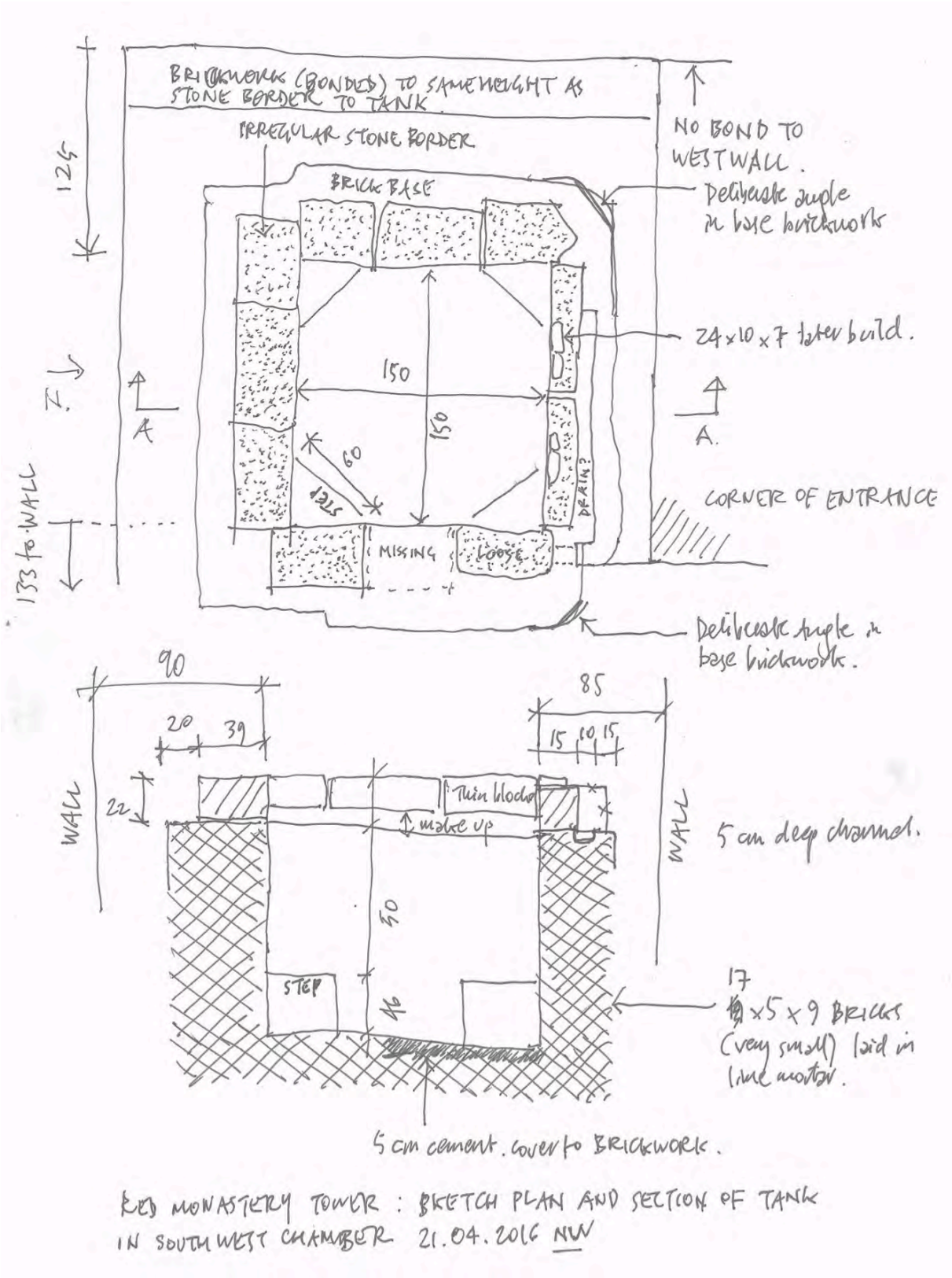


Fig. 7.8 Sketch plan and section of the water tank after removal of surrounding fill and rubble

7.2.6 Drainage channel on exterior of west wall of tower:
During the process of repairing the exterior of the brickwork of the west wall of the tower, a limestone drainage channel was discovered inside the wall, 1.7 metres to the south of the south door jamb of the entrance doorway. This channel, approximately 60cm above ground level, must have been related in some way to the well at the center of the tower. The channel appears to have been cut out of a 20cm diameter limestone column shaft.

Fig. 7.9 drainage channel in west face of south wall of tower

FIRST FLOOR

7.2.7 The blank window niche in the south façade of the church:
This feature, here documented for the first time, is of significance in that it provides clear proof that the tower was built after the reconstruction of the perimeter walls of the church in the thirteenth century.

Fog. 7.10 The blank window niche in the south façade of the church showing inappropriate level of steel grating and damage (top). The same area after removal of grating and prior to conservation (bottom)

7.2.8 The well and staircase:

Excavations showed that the well shaft was accessible from the first floor of the tower on its north side, via a niched opening that replicated the opening now located on the staircase landing at mezzanine level. This opening into the well was possibly related functionally to a

50 x 50 cm hole, 1.6 m deep, located directly above the apex of the brick arch over the north wall of the tower. There was no surviving evidence for the continuation of the staircase around the core masonry surrounding the well, but it can be assumed that the stair continued up to the roof, or a second floor, supported on vaults as below.

Fig. 7.11 First floor: view from east showing top of well and exposed vaulting of staircase

7.2.9 The southwest room:
The survival of the springing of a vault on the south side of this room showed that a single barrel vault originally covered this space, similar to that over the space below it on the ground floor. This discovery proves that the tower, when first built, was taller than the perimeter wall of the church. An additional semicircular-arched niche was also found in the center of the south wall of the room. This niche was concealed behind a later brick masonry arch running north-south across this room and dividing it in two. The niche replicates the pattern of three niches on each side of the southeast and southwest rooms, with a central blank niche flanked by window niches.

7.2.10 The southeast room:
The southeast room is roofed with a fired brick dome constructed as a 'sailor vault' or 'voûte en navette'. This type of dome is essentially made up of four interconnecting conical squinches. The bricks are laid in a silt mortar, and the dome had been damaged and badly repaired with cement at its apex in c.1995. This type of vaulting was also present over the 'khurus' of the main church in its post-mediaeval reconstruction, which also employed silt mortar. The Comité demolished this dome in 1909. Although the parallel is clear, there is no evidence that a contemporary date may be assigned to the dome over the southeast room of the tower. The evidence of Richard Pococke suggests that the date of the enclosure of the 'khurus' was prior to AD 1763.

Fig. 7.12 The 'sailor vault' over the khurus of the main church photographed before 1909 when it was removed by the Comité (foreground of photo)

Fig. 7.13 The 'sailor vault' over the southeast room of the first floor of the tower after clearance showing poor quality repair of apex with cement mortar and brick rubble

7.2.11 The northeast room:
It was not possible this season to clear the fill above the northeast room of the first floor, or enter this room. It is assumed, however, that this room is also covered by a dome similar in construction to that over the southeast room.

SMALL FINDS:

7.2.12 Pulley support
Part of a wooden pulley support, most probably deriving from an upper level of the tower and used in the well.

Fig. 7.14 Wooden beam with pulley emplacements

7.2.13 Carved limestone block
A carved limestone corner pilaster block from a doorway (position unknown) with cornucopia (46 x 23 x 14 cm). The pilaster has a groove cut through its center, indicating a secondary use that related to a screen or a door-frame. This block will be mounted in the lapidarium in future.

Fig. 7.15 Carved limestone pilaster block from inside the tower

7.2.14 Cornice blocks

Five additional cavetto cornice blocks were found in the fill of the first floor of the tower (to be reinstated in a future campaign). Another small, undecorated, cavetto corner block, perhaps from a door emplacement, was also discovered and set aside for future incorporation into new masonry in the tower.

7.2.15 Small finds from the roof of the tower

During the excavation of the debris that had accumulated on the roof of the tower, which mostly derived from the houses constructed on top of it in the early twentieth centuries, a number of small finds were made. These included glazed ceramics (Mamluk sgraffito ware and Chinese blue and white), a loom weight and 'threader', and a pipe bowl for an Ottoman period 'shibbuk'.

Fig. 7.16 Ottoman pipe bowl (top) and Chinese 'blue and white' sherd (bottom) from the fill on the tower roof

Fig. 7.17 Mamluk ceramics (top) and a loom weight and threader (bottom) from the fill of the tower roof

7.3 GROUND FLOOR EXTERNAL WORKS

7.3.1 Conservation of base of tower

Following the removal of the reinforced concrete beam from the base of the perimeter of the tower, which was carried out manually, the worst affected parts of the structure was seen to be on its west face. The patched brickwork along the entire length of the west face was removed and replaced with bricks matching the originals laid in lime mortar to a maximum height of 1.2 metres. One large badly eroded limestone corner block on the southwest corner was replaced with a new, dimensioned, block. Two old blocks, one made of vesicular basalt were placed to the east of the new block to provide support for the large limestone block immediately above. The lower areas of the south and east faces of the wall were re-pointed using lime mortar with some localised replacement brick masonry as required. The limestone drainage channel found on the west face at low level (see above) was temporarily blocked with brickwork and a new section of channel extending to the exterior of the façade will be installed next season. After the removal of the reinforced concrete beams at the base of the tower, the trench was backfilled with clean sand as a temporary measure.

Fig. 7.18 Manual removal of reinforced concrete beam on the west face of the tower

Fig. 7.19 Repointing a section of the east face of the tower

Fig. 7.20 Replacing brick masonry on the west face of the tower

Fig. 7.21 Replacing stone masonry on the south face of the tower

Fig. 7.22 The southwest corner of the tower after intervention showing new limestone corner block and two re-used old blocks to right

7.4 GROUND FLOOR INTERNAL WORKS

7.4.1 Consolidation of well surround

The insertion of the toilet into the well caused the near complete destruction of this key feature of the building and modern replacement brick masonry had failed on the east side of the well owing to the lack of any secure foundation. The defective masonry was propped, and the concrete slab over the well removed. The well was then filled with clean coarse sand to provide a safe working platform. The original diameter of the well was restored with new brickwork set in lime mortar and a new stone foundation to the southeast corner of the masonry surrounding the well was provided. A small opening was left in the south wall of the core to allow future access to the well.

Fig. 7.23 View of well showing damage to masonry caused by insertion of square toilet room, after removal of concrete slab and backfill with clean sand

Fig. 7.24 The well during reconstruction

Fig. 7.25 Condition of masonry of southeast corner of staircase core of tower prior to work

Fig. 7.26 Southeast corner of staircase during reconstruction

7.4.2 Consolidation of foundations

The foundations of the tower, as has been observed above, suffered greatly from water-induced erosion. In some areas, historic repairs had been effected by the insertion of large irregular blocks of gravel underneath the walls and protruding from their face. The strategy employed for the repair of the foundations was to remove as much of the rubble and silt as possible adjacent to the bases of the walls and reintroduce large limestone blocks in their place set in lime mortar with limestone flake packing where needed. In particularly badly damaged locations, such as the ground floor entrance passages, a series of limestone bracing blocks, running across the width of the passages, was introduced. Sometimes these blocks went underneath the walls themselves. The intention was to provide a rigid 'frame' at the base of the walls that would prevent any further movement in the walls.

Fig. 7.27 View of the entrance area inside the tower during consolidation work on foundations showing limestone block bracing between eroded sections of the walls. Note, at top, the concrete slab prior to removal with a large void below it.

7.4.2 Treatment of walls

To strengthen the walls in areas around the staircase where cracking was apparent, stone stiches measuring 15 x 15 x 60 cm were introduced into the masonry. The arch over the doorway at ground level over the staircase, above which serious cracking was evident, was rebuilt following the original profile and the poor quality timber lintels below it removed. Two other significant interventions were also made in the ground floor entrance area:

1 A redundant, non-structural, section of masonry below the east springing of the arch of the north wall was removed in order to allow for detailed conservation of the east side of the south portal to proceed in future campaigns.

2 A new supporting pier was constructed under the west corner of the truncated vault over the entrance area to provide additional support for this structural element.

Fig. 7.28 New limestone stitches in the walls of the staircase (left), and restored arch over stair entrance (right)

Fig. 7.29 East side of entrance area showing area of masonry removed (left), and new pier on west side (right)

7.4.3 Treatment of balcony:

In order to provide a structurally secure and more aesthetically appropriate solution to supporting the edge of the vault over the entrance area of the tower, which had been cut in half by the Comité, a new purpose made steel channel section was fabricated and installed at the edge of the vault after the removal of surplus cement render and the concrete screed over the balcony. This channel was supported at either end by steel plates set into the existing masonry. A new steel handrail will be installed at the edge of the balcony in the next conservation campaign.

Fig. 7.30 Steel channel section after installation at edge of mezzanine balcony seen from above

Fig. 7.31 Steel channel section after installation at edge of mezzanine balcony seen from below

7.5 FIRST FLOOR INTERNAL WORKS

7.5.1 Consolidation of arch above north wall of tower:

After removal of fill and defective brickwork, a crack was found in the large north arch of the tower at its west end. The masonry of the arch also contained a 50x 50 cm x 1.5 m deep brick lined hole immediately above its apex. To solve these structural deficiencies, four new steel channels 12 cm in depth were introduced in order to minimise any future loading on the arch from the planned superstructure of the tower around the staircase. The hole was packed with dry bricks and sand.

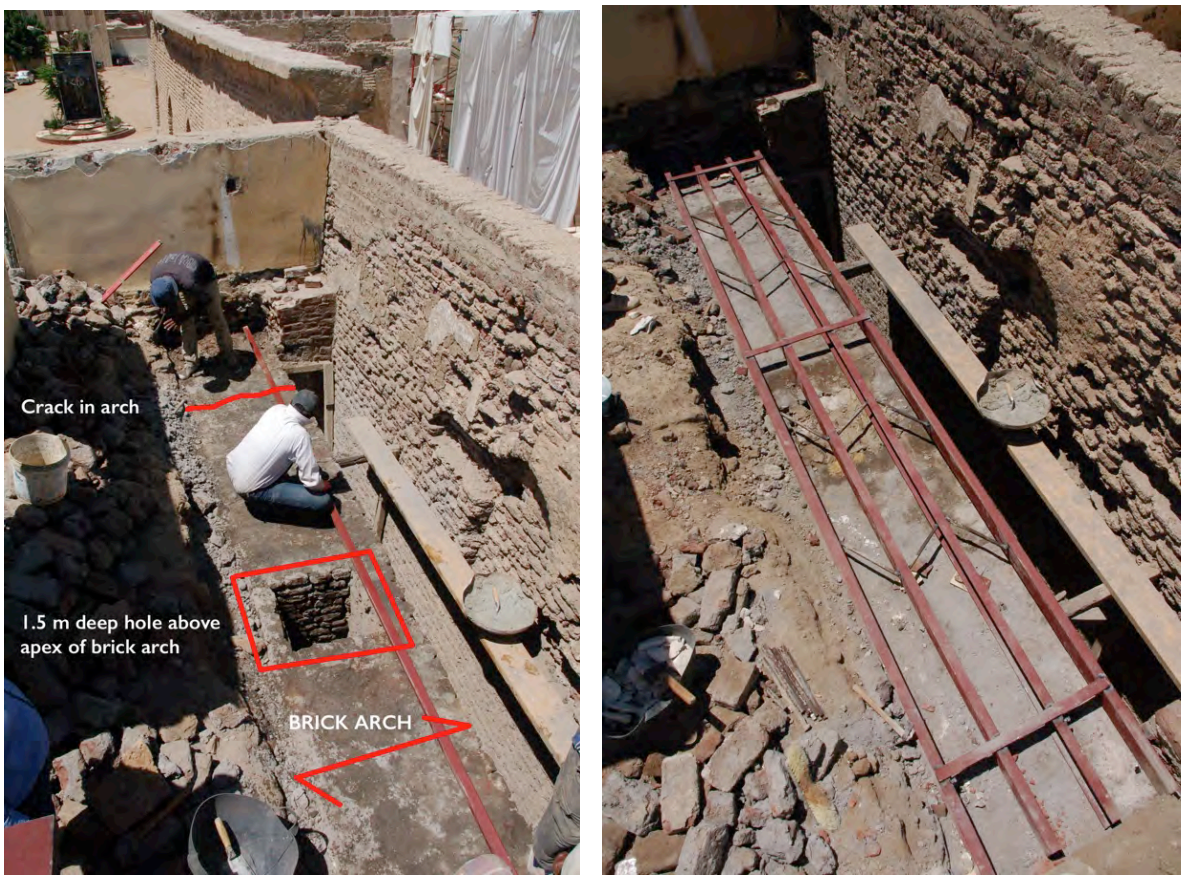


Fig. 7.32 View of the brick north arch of the tower before and after insertion of steel reinforcing beams

7.5.2 New blocking masonry between north wall of tower and south wall of church:

Brick blocking masonry was installed in the gap between north wall of tower and south wall of church where required to prevent the falling of rubble and dust into the entrance area from above. The area on the east side was particularly badly affected by this problem, exacerbated by the presence of a large limestone cornice block that had fallen into the gap and become wedged there. This block was removed with a block and tackle and the blocking was continued to full height.

7.5.3 Pigeon barriers:

The gap between the north wall of the tower and the south wall of the tower was an area so infested by pigeons that it created a health hazard. After completion of new blocking masonry to the full height of the gap, and the consolidation of the top of the arch in the north wall, two pigeon barriers were installed at low and high level. The low level barrier was a steel mesh on a steel angle frame, approximately 45 cm wide and 4.8 m long made in two sections. The

frames can be demounted for cleaning. The upper level barrier is temporary, and consists of a mesh laid over the modified grating that originally covered the gap. This is supported on steel angles running north-south, and will be replaced in a future phase of the project with a stainless steel grating that can be walked on. The level of this grating runs above the existing blank window niche at high level in the south wall of the church.

Fig. 7.33 Views of gap between the north wall of the tower and the south wall of the church (east side) showing condition before (left) and after (right) intervention. Note the cornice block wedged between the walls (left) and the new blocking masonry and anti-pigeon screens (right)

Fig. 7.34 Temporary pigeon barriers installed over well and gap between north wall of tower and south wall of church

7.5.4 Conservation of high-level masonry of south wall of church, south face:
This area of masonry had some losses in its original fabric that were made good with new matching brickwork. The arch over the blank window niche was also consolidated.

Fig. 7.35 Conservation of south wall of church during works showing masonry repairs

7.5.5 Consolidation of first floor masonry:
Following the removal of all surplus fill from around the staircase and above the first floor of the tower, an assessment of the extent and condition of the original masonry could be made. This resulted in the following interventions:

Construction of new staircase vaulting:
Three new vaults were constructed in order to protect the original staircase vaults and at the same time to raise the level of the planned new staircase to the roof, wrapping around the central well core.

Vault 1: protective vault over north vault of stair
This shallow vault was built above the north vault over the mezzanine balcony in order to avoid undue loading of this original piece of the structure of the tower whose future strength could not be guaranteed. The new vault was supported on horizontal steel channels 4.6 m long spanning between the east and west ends of the original vault. This vault will provide the base for the future intermediate landing of the staircase.

Fig. 7.36 View of new protective vault 1 from the east during construction

Vault 2: protective vault over west vault of stair

This semi-circular sloping vault, radius 65cm, was built above the west vault of the stair in order to avoid undue loading of this original piece of the structure of the tower whose future strength could not be guaranteed. A short wall was constructed at the base of the vault over the staircase arch below to provide lateral stability. This wall was supported on horizontal steel channels 1.55 m long spanning between the east and west ends of the original vault.

Fig. 7.37 View of new protective vault 2 from the northwest (in foreground) and vault 3 in background

Vault 3: protective vault over south vault of stair
This semi-circular vault, radius 65cm, was built above the south vault of the stair in order to avoid any loading of this original piece of the structure of the tower that was extremely weak. It will provide the base for the future upper landing of the staircase leading to the roof of the tower, and the space between the old and new vaults will be filled with a brick blocking wall.

Fig. 7.38 View of new protective vault 3 from the east

Arch in southwest room:
This arch was part of a secondary phase of construction and was extremely weak. To strengthen it, and at the same time to allow for the construction of new vaulting over the southwest room, replacing the wooden roof installed here in 2001, three steel beams were introduced above the arch as shown on the attached photographs. Two shallow vaults (50 cm from springing to internal apex) were then built over the two halves of the room running north to south, with a third small relieving vault above and between them.

Fig. 7.39 View of southwest room from the northeast after removal of timber roof construction

Fig. 7.40 Sequence of construction of new vaults over southwest room of tower at first floor level

Reconstruction of well surround

Associated with the construction of the new protective vaults of the staircase was the reconstruction of the well surround. This was carried out to the height of the future upper mezzanine landing of the staircase, with provision for a future window opening into the well on its north side.

Fig. 7.41 Reconstruction of the well surround in progress

Fig. 7.42 View of well surround after consolidation (to be continued next season)

Fig. 7.43 Views of the roof of the tower before (top) and after (bottom) interventions

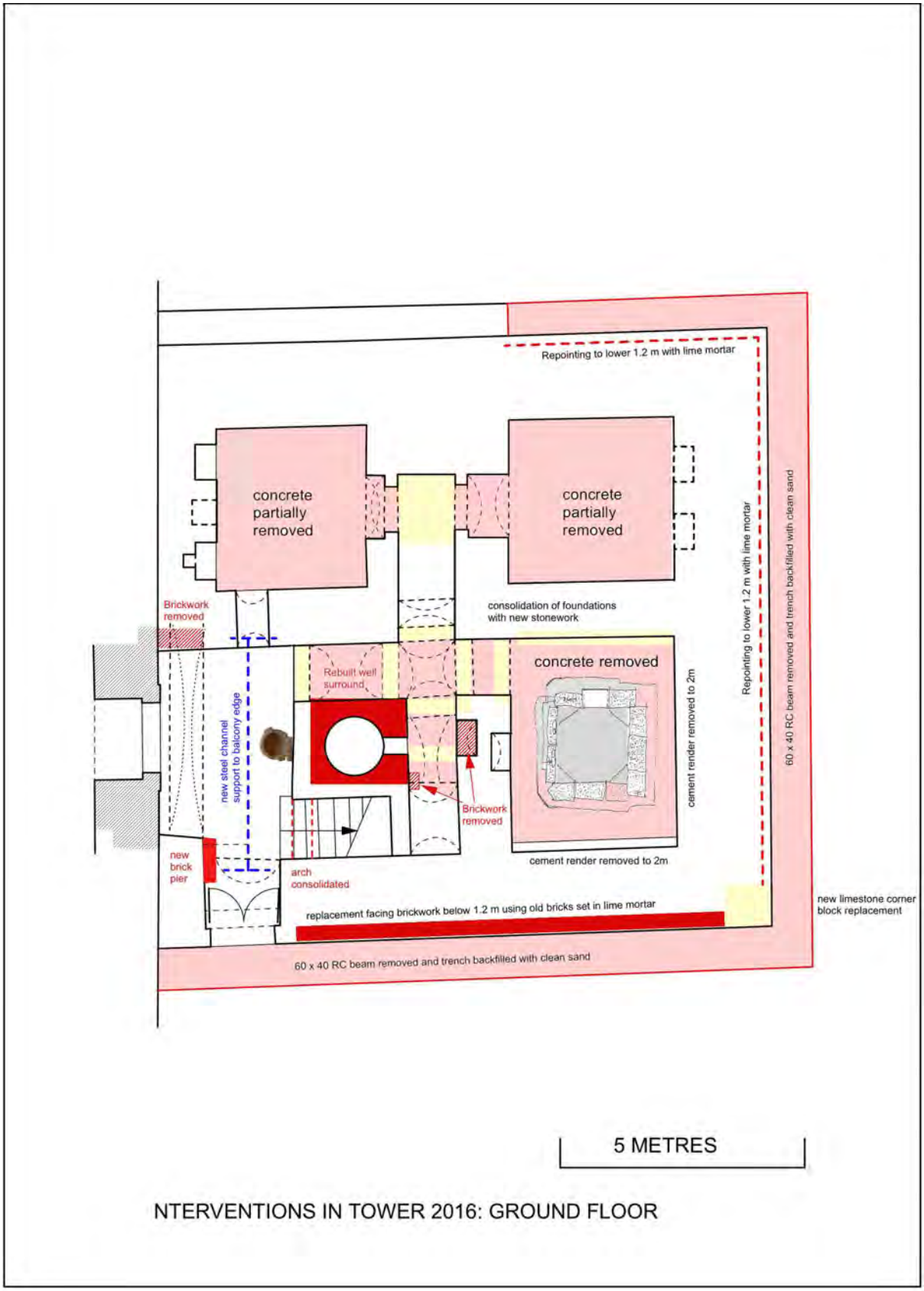


Fig. 7.44 Plan of ground floor of tower showing interventions

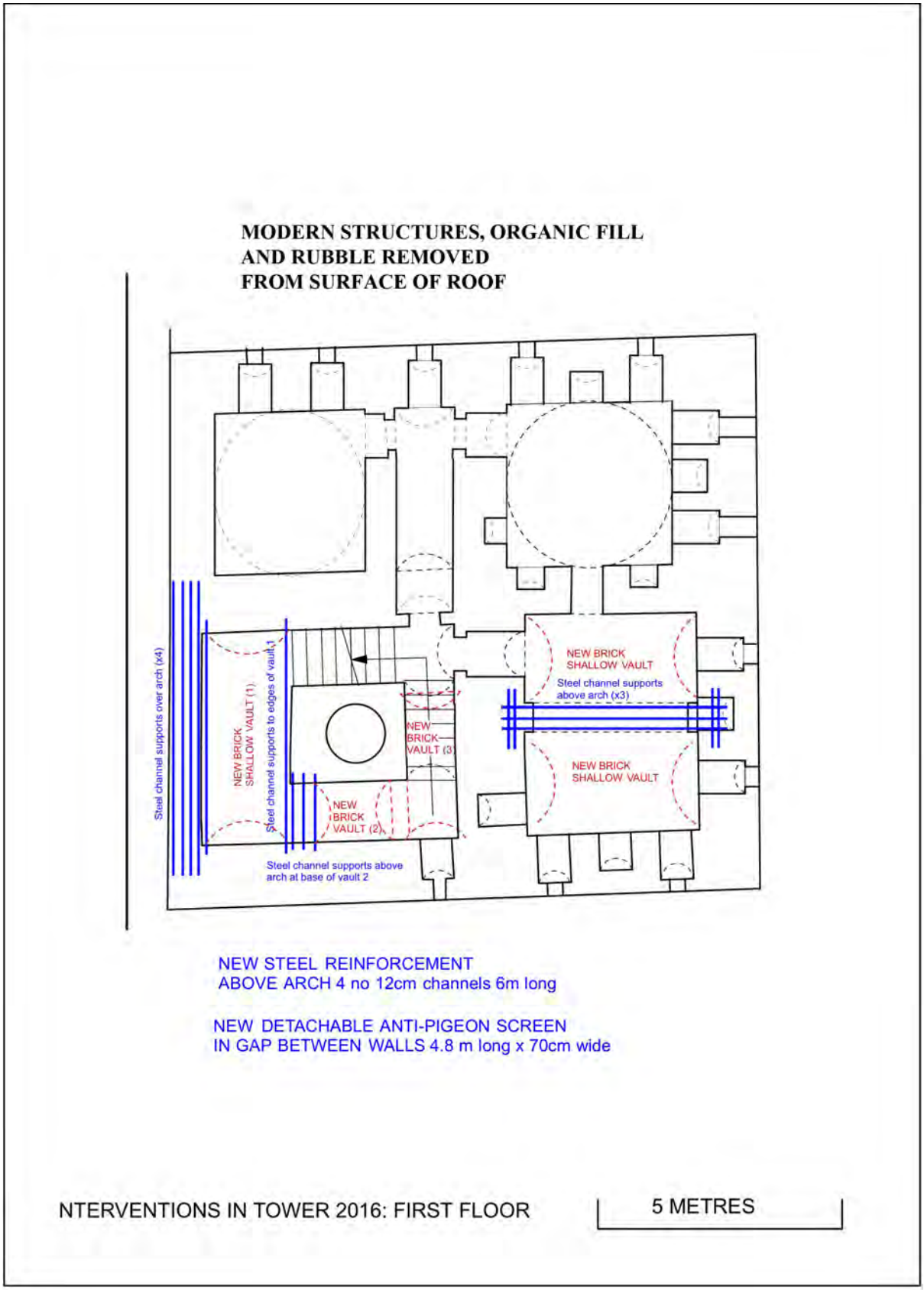


Fig. 7.45 Plan of first floor of tower showing interventions

PART III: RECOMMENDATIONS (Figs. 8.1 – 8.3)

It is recommended that during future campaigns of architectural conservation work at the Red Monastery Church, the following interventions should be made:

8.1 CORNICES

Reinstatement of five original cornice blocks on east façade and additional installation of four linear metres of new limestone cornice blocks (to match originals) in the last remaining location where cornice blocks are missing on the façade. This will complete this distinctive architectural feature of the church.

Fig. 8.1 View of the east façade of the church showing the last remaining location of missing cornice blocks

8.2 PROTECTION OF FOUNDATIONS

Following independent consultant assessments of the conditions around the foundations of the church relative to potential water infiltration and termite infestations, it is recommended that a capillary break trench be installed around the perimeter of the building [ARCE to supply copies of reports]. The trench will be approximately 60 cm wide x 1 metre deep, lined with an inorganic geotextile, and filled with gravel. Within the trench at intervals of approximately 1 metre, vertical perforated plastic pipes will be introduced through which a chemical termite deterrent can be poured into the ground. The area of the trench will be then paved over with limestone paviors.

8.3 DISPLAY OF ARCHAEOLOGICAL MATERIAL

Decisions must be taken as to the method of display of the archaeological elements of the tower discovered during the project works. These comprise the well, the granite basin in the entrance area, the position of the demolished north wall of the tower, the water tank in the southwest room at ground floor, and the presentation of small finds.

8.3.1 The well

After its reconstruction at ground floor level, the well provides a feature of interest in the building. It is recommended that there should be two points for seeing into the well: one on the balcony level of the staircase through an existing arched opening, and one at a higher level. The missing upper section of masonry surrounding the well would be rebuilt in association with the staircase leading to the roof, with an arched opening into it that mirrors the arched opening at the lower level. The timber beam and pulley block discovered during the work would be mounted inside the well facing this opening.

8.3.2 The granite basin and limestone 'step'

At present the basin is covered with a protective layer of sand. It can remain buried beneath the layer of new paving in the entrance area of the tower, or it can be removed and placed in the same location above the paving, perhaps mounted on a plinth. It would also be possible to mount the limestone 'step' above it embedded in the wall, if it was thought that there was a relationship between the two pieces. The Monastery has agreed to the suggestion of remounting the basin at a higher level.

8.3.3 The demolished north wall of the tower

It is recommended that the final treatment of the entrance area of the tower should contain some visual clues as to the former presence of the north wall of the tower that was substantially removed by the Comité in 1912. In plan the position of the wall can be marked in the paving by a different material, such as basalt, to differentiate it from the limestone paving proposed in the remainder of the entrance area. In section the position of the wall can be indicated by a difference in the color of the plaster, making a distinction between what was once solid masonry (eg. grey plaster), and what was interior space (eg. white plaster).

8.3.4 The water tank

The age of this feature is unknown, and its treatment would depend very much on the proposed future use of the space in which it is located. If the space is to serve a functional purpose it is recommended that the tank and its surround are reburied and a new floor laid above, perhaps with a surface indication of its size and location. The situation prior to intervention should not be replicated, as it offered little in the way of functional, aesthetic, or historic value. If it is felt that the tank is a feature of sufficient interest to be presented in a meaningful way, it is recommended that following complete cleaning, the gap between the brick masonry of the tank and the enclosing walls of the tower be filled with clean gravel and a stainless steel viewing deck with a handrail be constructed along the east side of the room passing above the exposed remains. This proposed treatment also has a significant functional benefit because the room containing the tank was one of the areas worst affected by damp and is home to a large colony of termites. Such a solution would allow the foundations to breathe and at the same time provide something of historic and visual interest within the tower.

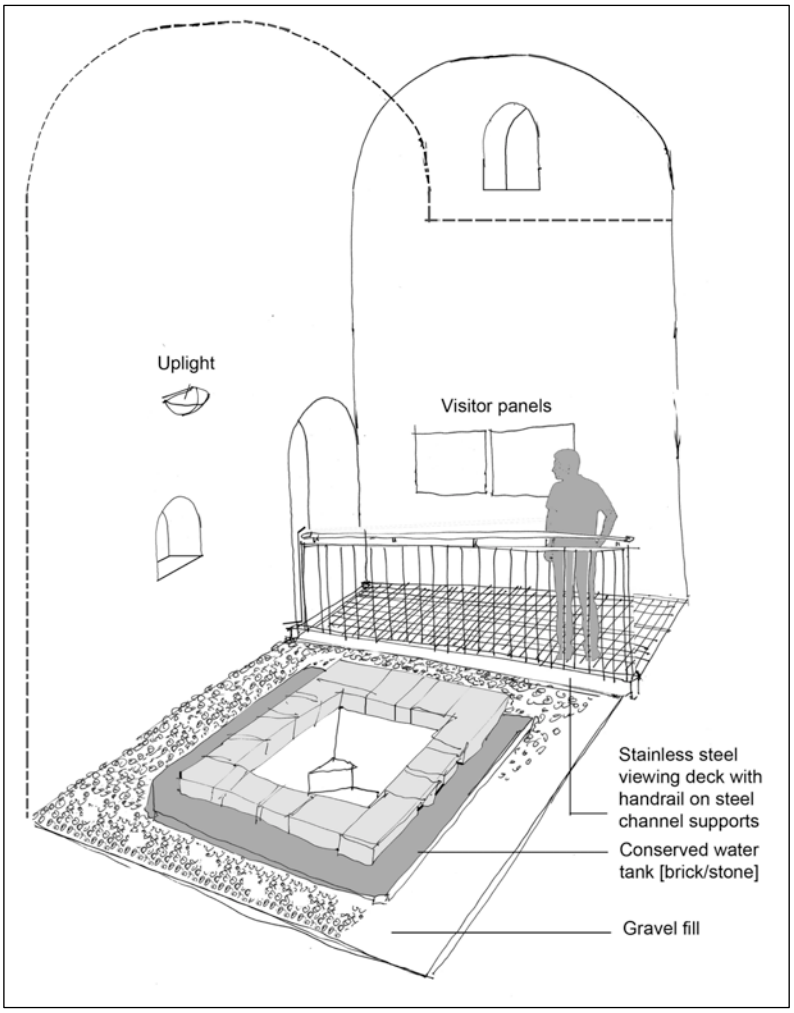


Fig. 8.2 Sketch of water tank showing suggested presentation

8.3.5 Small finds

The small finds deriving from the roof of the tower can be displayed in a small wall-mounted vitrine on the ground floor of the tower, perhaps in association with a visitor information panel in the tank room. The finds are minimal but still informative of the history and use of the building.

8.4 PIGEON DETERRENCE

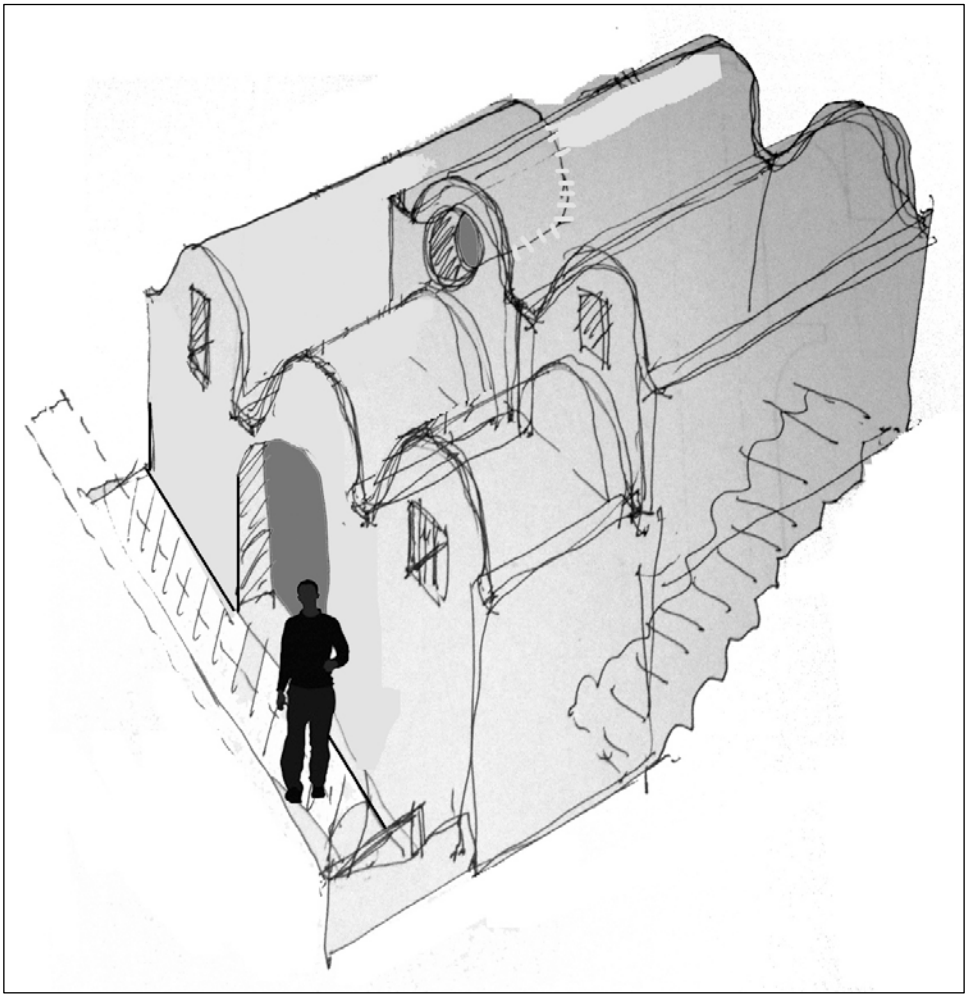
Monitoring of the ultrasonic pigeon deterrent installed in the entrance of the tower will provide evidence for whether this method of deterrence should be considered for other areas of the church.

8.5 CONSERVATION OF DOMES AT ROOF LEVEL

The two domes and one barrel vault on the eastern half of the roof of the tower are made of bricks set in silt mortar and are in a very poor condition. This has been exacerbated by inappropriate past repairs carried out with cement mortar and rubble. It is unlikely that these structures would survive the removal of these repairs, so it is proposed that they be covered by new protective vaults and that the whole eastern section of the roof be rendered with lime render laid to fall to external rainwater spouts.

8.6 SUPERSTRUCTURE OF THE STAIRCASE

It is proposed that the superstructure of the staircase of the tower should be built entirely from brick masonry using vaults, as shown in the attached sketch.



8.3 Sketch of proposed superstructure of staircase, seen from northwest

8.7 RE-USE OF THE TOWER

It is recommended that a suitable re-use is found for the spaces in the tower without the provision of any water that has caused so much physical damage to the structure of the building in the past. The Monastery has agreed that the ground floor of the tower should be used as a visitor center, with the display of visitor panels and screening of films regarding the history and conservation of the Church.