

MEDIEVAL CHAPEL - PARTICULAR TECHNICAL SPECIFICATIONS

1.3 Description of Interventions

1.3.1 Preliminary works – Protection

A. Security and safety of work site and arrangements:

Construction of a 2 metre high fence to the south side of the chapel (level +10.00 m). This will surround and define the work-site area, which will contain an area for depositing equipment and materials. In order to give unobstructed access to machinery, equipment and personnel to Chapel level (+5.00m) and Agiasma level (+2.50m) the area south to the main church must be cleared from everything and during work no visitors will be allowed to visit the site.

Public access to the Agiasma will not be allowed unless otherwise instructed by the Engineer.

Fencing must be also done along the north side of the main church (level +10.00m). This will secure visitors access to the east and north stoa of the main church throughout the whole execution of the works and will also define a north access to the worksite and a north area for depositing equipment and materials.

Signs will be placed at the entrance and other visible places of the work-site giving instructions for the safety of the workers and all of those visiting the site.

Debris and useless material will be gathered in bags or in a special container Skip and will be taken away during the procedure of the works.

B. Position of scaffoldings:

Scaffoldings will be placed throughout the façades as well as along both sides of the east wall of the Chapel. Tube-shaped frames will form the latter in compliance with the safety rules and the supervisors' instructions. It is necessary that safe working platforms with no gaps between the boards, continuous side railings and baseboards are provided. The scaffolds should be covered with burlaps. Steady ladders will ensure the communication between all levels. In the passage areas protective shelter will be constructed with plywood of at least 25mm thick panels. Special provision should be made for the installation of an electrical elevator for lifting and depositing materials, as well as for power and water supplies.

Scaffolding must also be installed in the chapel to support the vault during works on top.

C. Excavations:

Excavations works have been done in the chapel interior space and in the south and east yard of the chapel. The excavation shall be continued along the east and north facades of the chapel. The excavation work should be executed manually with caution so as not to disturb chapel's walls or foundations.

For this work, an archaeologist shall be employed to carry out the work. Archaeologist work must precede any other work. Priority must be given to the north side of chapel where excavation work must be completed and the results/finds must be given to the study team before any other consolidation work in the area.

1.3.2 Demolitions

A. Demolition of stone masonry:

The parts of the stone masonry at the positions of the blocked windows, as well as areas that will be reconstructed due to their dereliction. The work must be done manually and with caution with

excavation and the presence of supervision and without the use of machinery in order to avoid the disturbance of the retained surfaces of masonry.

B. Pointing removal:

Pointing removal will be done in 5cm depth in the areas shown at the drawings (MCP06, 07, 10, 11, 12, 13, 14, etc.) - which finally correspond to those that have been pointed during previous repairing interventions. The work will be executed with caution, so as the nearby areas with authentic mortars and blocks won't be disturbed. Mortar test samples will be taken from certain areas defined by the supervisors in order to carry out laboratory tests regarding their special characteristics. Special caution has to be given to the removal of cement pointing that might detach pieces from the blocks.

C. Rendering removal:

Internally, an experienced conservator must thoroughly examine the remaining renders on the walls and vaults. His/her work will include first aid stabilization of cracked or detached renders and cleaning so as to examine to what extent the inscriptions and other decorations exist and their state of preservation. Thorough documentation of the finds should follow (photos and tracings). At this stage the Engineer will evaluate the finds and decide whether to fix renders remnants in situ or remove them.

For calculation purposes both options must be considered: (A) detachment of selected renders, conservation and removal and (B) cleaning, stabilization and preservation in situ.

Externally, all cement based renders must be removed (church walls, east wall).

The work of render removal will be done manually, without any heavy machinery and with caution in order to avoid any disturbance to the preserved parts of the masonry mortars, of the pointing below and to avoid any damage to the stones. Special attention has to be given to the removal of cement-based render that might detach pieces from the blocks underneath. The work must be done by hand tools (chisels, hand hammers) and only if absolutely necessary heavier machinery can be used. If the above methods are proven insufficient, sandblasting can be applied (see Building Materials Conservation report as Appendix to the Specifications).

D. Demolition of reinforced concrete elements:

Structures of reinforced concrete (apse cover, roof and vaults cover, cornice, floors etc.) must be removed without causing any damage to the adjoining parts. For this reason, any kind of vibration and heavy power machinery (hammer drills etc.) must be avoided. The concrete should be cut into sections with an electric disk and be detached piece by piece. Attention has to be paid so as stone material underneath will not be affected and that loose mortars and plasters do not fall in the interior during demolitions.

E. Removal of filling of vaults:

After removing the cement (RC) of the roof/vaults cover, the filling of vaults and any loose material must also be removed until the stone structure is revealed. The work must be done with caution so as not to cause any damage to the vault structure below.

F. Rock removal:

The rocks that cover the North side of the Chapel can temporarily be removed so as to avoid damages during the execution of the root piles work. After this work is completed the rocks must be placed in their initial position so that the landscape of the area will be as it is today.

1.3.3 Reinforcements:

A. Concrete Piles on the East side:

To support the slide of part of the limestone rock where the monastery is situated, on the East side of the medieval chapel a series of concrete piles of 300mm diameter and a variable length of 10-12m will be constructed. On top of the piles a pile cap beam with 500x600mm dimensions will be constructed. The top of the pile cap must be 250mm below the surface. The location of the piles and pile cap are shown on the drawings.

The concrete of the piles and pile cap will be with sulphate resistant cement and all the reinforcement painted with the anticorrosive paint Draco Steel or equivalent.

The piles must be constructed by a specialist company and a method statement with all the necessary steps for the pile construction process must be submitted for approval to the Engineer. In the method statement the issues concerning the access and protection of the existing surfaces must be addressed.

B. Root Piles on the North side:

On the North side of the medieval chapel, a series of vertical and inclined root piles will be constructed. The aim of the root piles is to reinforce the rock below the chapel. The diameter of the root piles must be at least 120mm and a mortar with sulphate resistant cement will be used as per the specification. Inside each root pile a 20mm bar will be placed, painted with the anticorrosive paint Draco Steel.

The composition of the mortar is described in the specification and the mortar is inserted inside the tremie pipe using an injection pressure of less than 60Kg/m² at the top of the drill pipe. The root piles must be constructed by a specialist company and a method statement with all the necessary steps for their construction process must be submitted for approval to the Engineer. Special consideration must be given to the existing rocks that are on the North side of the chapel. The rocks can be temporarily removed so as to avoid causing them any damage during the execution of the root piles. After the task is completed the rocks must be placed in their initial position so that the landscape of the area will be as it is today.

C. Crack repairs:

The cracks on the masonry walls will be repaired with stone stitching; that is the replacement of the broken stones that bridge the cracks with new ones. These areas will be deeply re-pointed. If the width of the cracks is bigger than 10mm, the area ought to be grouted with a thick mortar, which will contain aggregates up to 4mm big. A second phase of grouting with fine particles shall take place with lime mortar of high viscosity.

D. Grouting:

Total grouting shall be used based on natural hydraulic lime. Materials like Kimia Limepor 100, Mapei Antique I, Albaria calce Alletamento, BASF or equivalent can be used. The characteristics of the materials that comprise the masonry have to be taken into account so that the gaps are filled successfully and the performance of the wall is improved after its consolidation. The grout is inserted -through thin transparent tubes (15mm diam.) placed on a 50 to 70 cm diagonal grid or along the length of the cracks- externally with a controllable coefficient and the least required pressure for its promotion in the cracked area. This is always below the tension limit of the crack and in any case it must fluctuate between 0.5 to 1 Atm at the insertion point of the masonry. The application should take place in areas that are indicated by the researcher or that will be agreed with the supervisors of the project before the beginning of the works. A detailed grout report will be kept for each tube.

For the preparation of the grout a high-speed mixer with a rate of at least 1,500-2,500 r/min is required. The mixer must allow the production of a stable and homogenous mix without the segregation of the materials with thin particles and of the cement. The time of mixing for the grout preparation will be defined on site by the supervisors and the researchers as it depends on the materials that will finally be used for its composition. An appropriate filter must be placed in front of the exit of the grout from the mixer in order to block the insertion of alien particles that may have mistakenly inserted in the mixer during the mixing process. Between the mixer and the pump a waiting container equipped with a slow-stirring system (150-300 r/min) is needed. The application of the grouting will be executed by a specialized work group, which shall use a pump of preferably continuous flow, with the capability of suction and grounding of material to a grain of 5mm. Both the pump and the nozzle will have compulsory integrated pressure gauges in operation, with the capacity of measuring pressure from 0.1 atm. Moreover, the pump that will be used ought to have a special valve integrated in its system, which will obstruct the rising of pressure over a specific limit.

This limit will be defined according to the position in which the pump is located every time in relation to the position of the wall, where the works are taking place, taking also into account the fact that the acceptable pressure of the nozzle is 0.5-1.00atm. The tubes must be blocked after the completion of the grouting in such a way so that the grout is retained under pressure inside the masonry.

The stability and the viscosity of the mixture must be often checked on the worksite, according to the instructions of the supervisors and every time the grouting procedure begins the results of the measurements must be registered in the diary.

The phenomenon of segregation (settlement – stratification) must be avoided and the perspiration should be less than 3%.

At the same time the conservators will supervise the preserved renders inside the building, which will have been temporarily consolidated where necessary.

E. Consolidation of the vault structure:

This refers to the four cross vaults of the main chapel and the vault of the Holy Bema.

Internally, The works to be done in the whole internal vaults surface are: careful and meticulous wedging of masonry, deep sealing of cracks and stitching where needed and deep pointing with hydraulic lime mortar (ALBARIA ALLETTAMENTO).

Externally, The works to be done in the whole external vaults surface are: removal of reinforced concrete elements (see above demolitions), removal of any other additional stone or plaster fillings, cleaning of loose deposits with air under pressure, repair of cracks with stitching and pinning with small stones and filling of gaps with watery lime mortar. Afterwards the whole surface will be rendered with hydraulic lime based mortar reinforced with fibres and carbon fibre grid for avoiding cracks, and will be 4-6cm thick. (ALBARIA ALLETTAMENTO or other equivalent). At this stage the external vaulting shall be formed so the thickness of the mortar will not be of equal thickness. The formation of vaults external surface shall be done by means of designed sawn boards or metal formwork or moulds. Also, at this stage the formation of the slopes shall be done so as to drain rain water to the east (as it is today). Afterwards a water-proofing system shall be applied (Kimicover GUAINA or equivalent) which will be followed by the final layer of hydraulic mortar reinforced by mesh (Kimia Tectoria TFT or equivalent).

Great attention shall be given to the formation of the finishing at the edges and ends of the insulation. Equal attention is required for the appropriate conservation of mortars until they mature, with constant wetting and compacting in the shade in order to avoid cracking from shrinking.

1.3.4 Structural works

A. Reconstruction of cornice:

The new cornice will be of ashlar local to match existing stones and will have a moulding that will follow the curves of the end of the masonry on the façade. These will be prepared on site by means of 1:1 profiles. The cornice stones will be laid with jointing lime mortar to replace existing reinforced concrete. The cornice is constituted by individual pieces 40-70cm long, which will be jointed on their upper surface with iron painted with marine paint ribbed U –channel- joints (80/240 - Φ 12). The placement of the joints will be done with mortar made of water and white cement.

B. Laying of lead sheets:

Strips of lead 30cm wide and 3mm thick and not longer than 1,20m shall be placed at the junctions of the vertical surfaces and the roofs. The lead sheets will fold below the render of the walls or inside the joints of the layers. They will be beaten into the desirable shape with timber or rubber hammers. The ditches of the gutters shall be also covered with lead.

C. Restoration of openings:

All blocked windows shall be opened in order to improve the lighting and the ventilation of the interior. The stone frames of the openings shall be restored as well as the masonry, which in all cases is disrupted or distorted due to the cracks and the deformation. The sidewalls of the openings shall afterwards be rendered with lime based plaster.

D. Renders: (see also above rendering removal):

Internally, all well-preserved authentic mortars and renderings will be retained, cleaned from dust, soot and moisture. Then they will be reinforced and consolidated with a process of repeated (30-40 times) sprays of very much diluted limewater. Also, crowning of the perimeter and grouting where needed must be carried out. All the above works must be carried out by a specialized conservator. This work must precede any other work in the chapel. Repairs and reconstructions of renders shall take place only where indicated by the study and according to the instructions of the Engineer.

If the existing renders will not be considered as important or worth preserving (after conservators work) a total or partial removal of them will be considered. This will be decided after the cleaning and evaluation of the existing renders, inscriptions etc.

Graffiti will be conserved by an appointed conservator. The contractor shall facilitate this work. A provisional sum of Euro 5,000 has been placed in the Bills.

E. Stone Cleaning:

Chapel Internally. Apart from renders repair or removal (see above) all stone surfaces must be cleaned from moisture, soot, paints or other stains and dirt. The work must be carried out by experienced personnel preferably conservator. Sample trial must precede large scale cleaning. The work will be done mechanically with small stone dressing or dental tools.

F. Water repellent treatment:

To be applied to all stone surfaces internally and externally of Chapel and the arcade. Wacker Stone Strengthener OH100 or equivalent will be used in order to increase stone cohesion and decrease the water absorption on all stone surfaces. The work must be carried out after the walls consolidation works, as described in the Building Materials Conservation report and according to the manufacturer's instructions.

G. Pointing:

The work of cleaning loose or deteriorated materials from the cracks and/or joints will be executed with caution, so as the nearby areas with authentic mortars and blocks won't be affected.

Special caution has to be given to the removal of cement pointing that might detach pieces from the adjacent stone blocks.

New mortars should be mixed according to manufacturer's specifications and should not be used after one hour, or when the mix is no longer workable without the addition of water. The joints should have the final appearance of the original ones, subject to the Engineer's decision.

The **Albaria Allettamento**, or other approved or equivalent will be used.

The work will be applied in all areas where the stone walls (either dressed stone or irregular) that will be un-plastered.

Procedure:

- cleaning of joints with stone dressing tools with care so that the surrounding stone is not scratched and joints are not widened. All cutting out of mortars should leave a square face in the back of the joint. Cleaning should be done in 5cm depth.
- removal of deteriorated material and loose deposits with soft bristle brushes.
- cleaning of the joints with air and water under pressure.

- mixing of mortar whereby aggregates are mixed dry and the binder is separately mixed with the pigments. All constituents are mixed together and the optimum amount of water is added.
- pointing of the joint by careful packing of the mortar in layers according to original form/profile.
- protection of mortar from rapid drying by covering with PVC membrane or damp cloth. Regular spraying with water in order to keep the mortar humid should take place for a minimum of 15 days.

H. New renders:

The work shall be applied to the external wall east of the chapel (both sides).

Hydraulic mortar **Albaria SP2**, or other approved or equivalent, will be used as prescribed by the manufacturer. The colour will be chosen from the manufacturer's palette in order to match the existing mortar (subject to Engineer's decision). The renders will contain polypropylene fiber reinforcement to improve the tensile strength of the masonry.

Procedure:

- dry mechanical cleaning with soft bristle brushes.
- wetting of the wall so it is humid but not wet in order to prevent mortar dehydration.
- mixing of mortar according to manufacturer's instructions.
- plastering of surfaces in layers according to manufacturer's instructions. The surface of each layer should remain rough in order to ensure better keying with the next layer. The final surface will be worked with a wood float, trowels and a floating rule.
- protection of mortar from rapid drying by covering with PVC membrane or damp cloth. Regular spraying with water in order to keep the mortar humid should take place for a minimum of 15 days.

I. Floor of the chapel:

A new floor will be reconstructed as shown on the drawings. It will be of Limassol stone and the final surface will be matte so that is more compatible and neutral. The substructure must include natural gravel (10mm – 20mm) to fill the gaps up to the desirable height. Laying shall be done with hydraulic lime mortar without joints. At the northeast corner a small part of the original floor was revealed at a lower level, after the excavation. This will be cleaned, preserved and covered with a glass panel as shown on the drawings.

J. Floor of the surrounding area (MCP03, MCP04):

The floor of the courtyard will be done of Limassol stone and pebbles as shown on the drawings. The pebbled floor will be plain, of grey pebbles (50mm to 70mm) placed on stiff cement mortar without decorations. At the Agiasma level a total reconstruction of slabs similar to the existing will be done. Along the east end of the area, towards the sea, blocks of cut Limassol stones shall be laid, which will also form the base of the railings. Slate slabs shall be also laid on the pathway, which surrounds the chapel towards the east and north sides.

K. Drainage system:

Along the south wall of the chapel a drainage system shall be constructed as shown on the relevant drawings (MCP02, MCP03, etc.). This will include an installation of perforated pipes to drain away moisture from foundations and floor.

L. Stairways:

The old solid stairs (south of chapel) will be restored with deep re-pointing, grouting in areas where the structure has voids and replacements of stones that show significant decay. In certain positions partial replacement of stone will be done. In areas where extended cement mortars were applied, if cement can be easily removed, the stones must be chiseled again to form the steps levels. If not (if removal of cement destroys stones), a total reconstruction of stairs must be done, that is defected stones must totally be removed and new similar ones to be placed. For calculation purposes both proposals must be taken to account.

The stairs leading from the south side to the Agiasma level must be totally reconstructed.

M. Reconstruction of the fountain of the Agiasma:

The reconstructed fountain will be in the same place with the old one, exploiting as much evidence as possible from the existing one. The old elongated marble basin which seats on the ground, the wall behind and the positions of the two piers are retained. The upper part of the structure with the lowered arch (in the place of the present reinforced concrete slab) and the mouldings copies decorations that are found on the adjacent buildings in a simplified manner. A new slab with an inscription will be placed so as to date and remind the restoration work of the chapel and the waterfront.

N. Construction of Altar:

A new Altar of simple design and made of wood (walnut) shall be constructed according to the drawings.

O. Construction of new icon screen:

In order to avoid the separation of the interior and the isolation of the Sanctuary from the main chapel, the icon screen is recommended to remain low in height as a barrier of the Holy Bema. It will be constructed in wood (walnut). These parts will be simply decorated adjusted to the order of the chapel. Certain morphological characteristics of the construction as well as an inscription with the date placed in an obvious position shall make the new icon screen distinct from the authentic parts of the monument.

P. Entrance door:

A new door made of hornbeam wood must be manufactured to copy the existing one. Must have all metal items as the existing one (metal hinges, rotation mechanism etc.) plus a traditional Cypriot type lock. Wood preservatives and water based varnish must be applied.

Q. External door:

A new door made of hornbeam wood must be manufactured at the opening on the east wall (from chapel level to Agiasma level). This must follow the previous door shape and structure. Wood preservatives and water based varnish must be applied.

R. New joinery:

The two main windows of the interior in the south wall of the Sanctuary and in the north aisle will be reconstructed of hornbeam wood and will be swinging single-leafed with simple railings for security and single glasses.

S. New metal windows:

They will be placed on the small skylights of the Sanctuary and will have a very thin L shaped frame (20/20mm). They will be swinging with single glass and placed on the internal face of the wall and will have a metal screen on their exterior.

All iron items must be painted with a high quality paints suitable for marine and coastal environment to give maximum corrosion protection. DULUX Aguagalv which contains zinc metal or other equivalent must be used. The paint must be applied according to manufacturer's instructions.

T. Railings and handrails:

They will be made of iron painted with marine type paint according to the drawings and will have timber (iroko) handrails. Their design is going to be plain and discreet so that they do not affect the current view of the interior. Railings must be placed in several locations as shown on the drawings. Along the waterfront stone piers, very similar in form with the concrete ones that were found at the site, will hold the steel railing that will mark the limits between the waterfront and the small plateau of the fountain.

All metal items must be painted with a high quality paints suitable for marine and coastal environment to give maximum corrosion protection. DULUX Aguagalv which contains zinc metal or other equivalent must be used. The paint must be applied according to manufacturer's instructions.

U. Electrical system:

The under floor installation of the electrical system is recommended using appropriate waterproof channels. Sockets shall be placed on the floor or on the walls at a low zone for the installation of floor lamps as well as for use during the cleaning of the interior. Externally typical safety lighting system shall be installed for night circulation with low energy lamps, which will mainly illuminate the floor and the stairs. See relevant electrical drawings.

V. Plumbing installations:

These are the reconstruction of the overflowing system of the tank (reopening of the existing overflow) and possibly the installation of a simple water filtering system for filtering any solid particles. Also, a typical crucible shall be inserted in the sill of the south window of the Sanctuary.

W. Cover of the well inside Chapel:

The cover plate of the well (access to the gallery under the floor) shall be restored after the pointing and the addition of the stones of the frames and the insertion of a permanent small door made of iron (painted with marine paint) frame and a timber final surface (hornbeam wood).

X. Cover of the well outside Chapel:

The cover of the well shall be done by a single piece Limassol stone. The stone must have iron (painted with marine paint) handle for lifting.