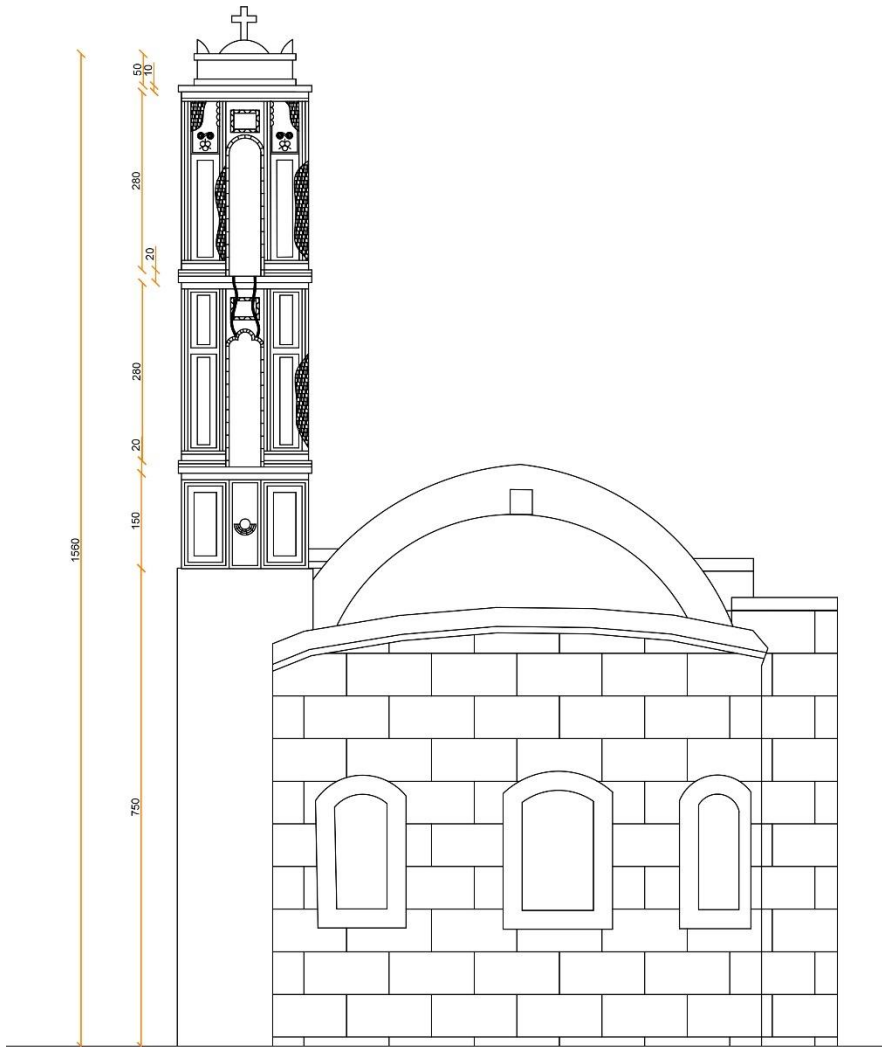


## **Annex 1.1 TERMS OF REFERENCE**

### Conservation works at Agia Anastasia church

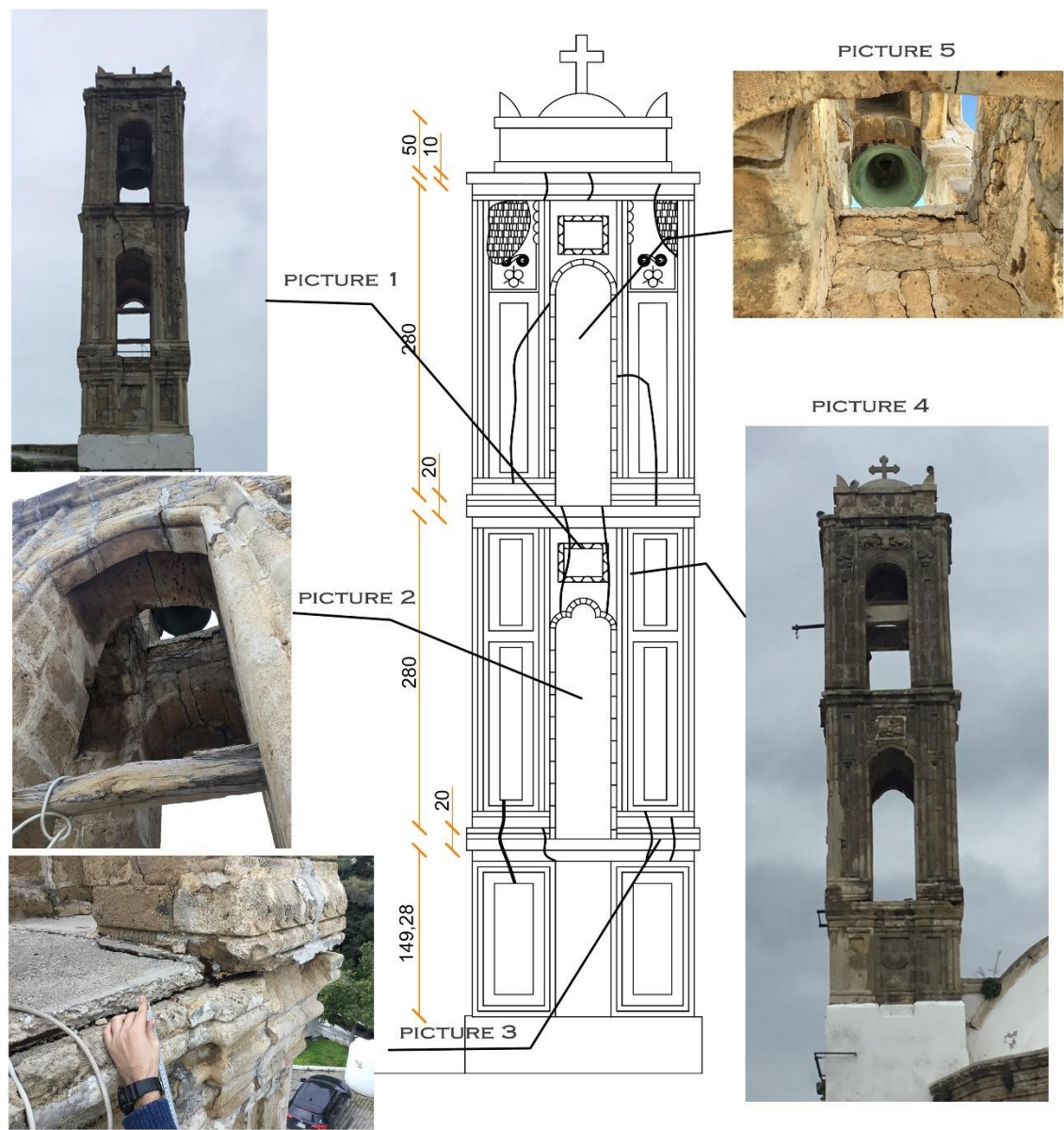
Ag. Anastasia Church is located in Lapithos/Lapta, Cyprus. The height of its bell tower is 15.6 meters from the base and 8.1 meters from the roof of the church, where the bell tower becomes a cantilever member. The bell tower has approximately 2 x 2 meters square plan. Above the roof the bell tower is composed of three parts, solid base, first level and second level with the cross and the bell.



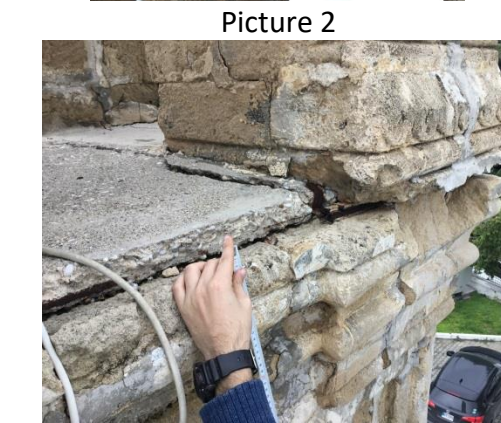


### Figure 1 East Elevation

The construction materials are local cut limestone, ornamented limestone, wooden beams, iron reinforcement in between the levels, and one bronze bell

**The Assessment:**



	<p>Extensive cracking and dislocation between the stones are seen especially in the second and third part of the bell.</p>
	<p>The wooden elements connecting the pillars are not treated. These elements provide diaphragm support to the bell towers.</p>
	<p>Extensive Corrosion and material loss is seen at the connecting iron plates.</p>



Picture 4

Wrong past repairs with cement plasters are seen on the bell tower partially covering the existing cracks.

Out of plane movement (leaning towards south) is observed in the bell tower.



Picture 5

Material loss, dislocation between the stones, wrong past repairs and the bell is seen at the internal parts of the bell tower.

## **Intervention:**

### **I. Scaffold and Detail Drawings:**

Support and scaffold setup will be done as required by regulations. Method statement has to be submitted for the approval of the UNDP Engineer relating this item.

### **II. Disassemble and rebuilding of the belfry**

#### ***a. Methodology***

1. The stones of the bell tower will be numbered and documented by the Site architect. The numbering of stones should be carried out using a water-soluble paint that can be washed off later without damage to the surface of the stone.
2. The site architect will document the bell tower (the belfry overall and of the numbered stones individually) before and after the works by means of Drawings/sketches and photographic documentation.
3. The stones should be taken down one by one starting from the uppermost part.
4. A conservator has to be present during the dismantling of the belltower.
5. Bell will be removed and stored safely on site.
6. All the dismantled stones will be safely stored on site
7. Ornamented carved stones will be protected before removal according to the instructions of the conservator.
8. If any conservation actions are needed for the ornamented carved stones these will be undertaken by the conservator on site before reassembling the bell tower. At the end of his assignment the conservator will need to submit a report of the works conducted in English.
9. Wooden members will be removed treated and replaced as specified.
10. All past cement plasters will be removed carefully without causing any damage to existing stones. Cement plaster will be replaced with specified hydraulic lime-based mortar (MasterEmaco® S 285 TIX or equivalent), during rebuilding the pointing of the stones will be done with the same mortar
11. Rebuilding including new structural reinforcement and replacement of heavily weathered stones- explained in item (b& c)
12. Bell will be repositioned at its original place.

\* A detailed method statement with risk assessment and mitigations must be submitted for the approval of the Engineer relating this item

#### ***b. Visual Estimate of Stone Replacement & Protecting the ornamented stones***

In total 50 stones (estimated) that are broken and heavily weathered will be replaced with new local stones which should have the same characteristics as the stone to be replaced (texture, toughness, color, carving, size). The stones will be re-positioned using Hydraulic Lime based (MasterEmaco® S 285 TIX) (Formerly known as Albaria Struttura) or

equivalent. Total number of stones to be replaced is subject to the approval of the Engineer.

\* Method statement has to be submitted for the approval of the Engineer relating this item

*c. Structural Reinforcement between levels*

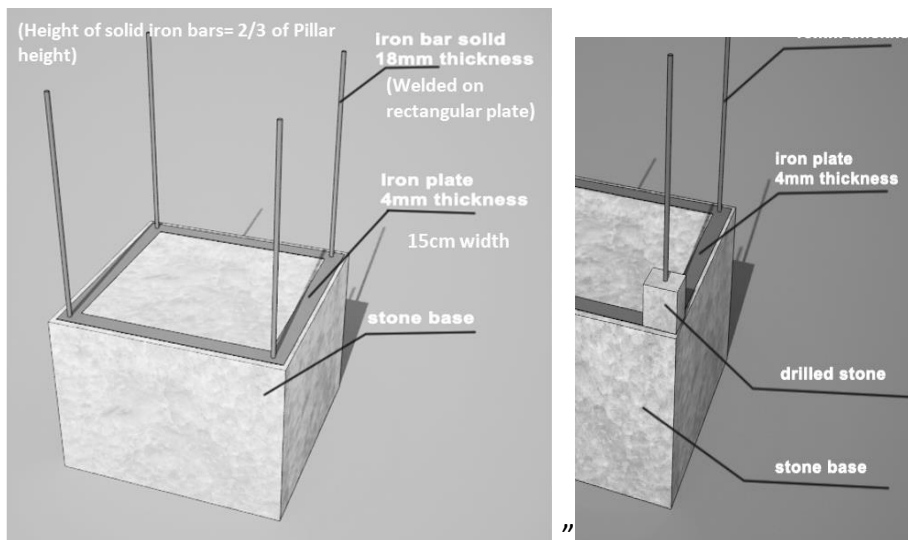
Iron structural reinforcement will be placed internally at the shown levels to replace the existing heavily corroded iron members. (Figure 8).

The 4mm thick and 15cm wide rectangular iron plate will have 4 solid, welded 18mm diameter bars on its corners that reaches up to  $\frac{2}{3}$  of the height of each pillar. There will be two such structural reinforcements.

Stones at shown level will be carved (16cm wide 2 cm deep) to receive the rectangular base of the reinforcement and covered with Albaria Struttura or equivalent mortar.

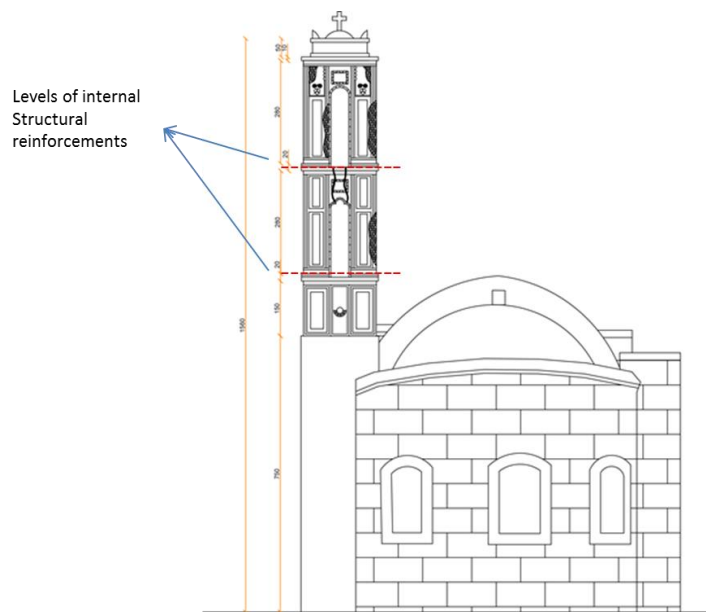
Stones of the pillars will have a drilled hole at the center (d 3cm) and the stones will be placed as shown in figure 7. The gap between the iron and the stone will be filled with Albaria Innezione or equivalent injection mortar.

The iron used will be protected with water resistant, anti – corrosive primer such as (sika Armatec 100 master seal 300) or equivalent.



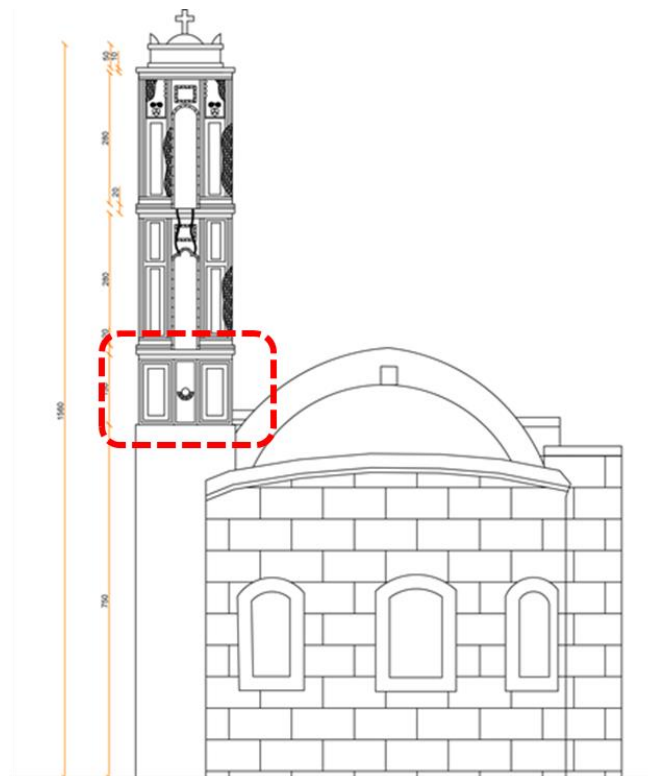
**Figure 2 Representative 3D Drawing of the structural reinforcement**





### Figure 3 Levels of Iron Structural reinforcement

*d. Pointing of the solid base part*



**Figure 4 First part of the bell tower-solid base**

### Procedure

- Clean the 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.
- Remove deteriorated material and loose deposits with soft bristle brushes.
- Clean the joints with air and water under pressure.  
Mortar mix where 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.
- Point joint by careful packing of the mortar in layers according to original form/profile.
- Protect 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.

New mortars should be mixed according to manufacturer's specifications. The joints should have the final appearance of the original ones, subject to the engineer's decision both in the solid base part and the rebuilt first and second levels. For pointing purposes MasterEmaco® N 275 TIX (Formerly known as Albaria® Intonaco) or equivalent will be used

### **3 - Description of Works:**

No:	Works Item	Description
1	Site mobilization and demobilization	Mobilization consists of basic site facility for sanitary and resting needs of personnel and other incidentals at the project site. Removal of items and demobilization from the site.
2	Health & safety implementation	Creation and implementation of a health and safety plan for the works described to this ToR. Includes all required health & safety elements and items. Note: Barriers of 2m high with fiber netting will be installed to create an enclosed area and to keep people away. Contractors' materials and the dismantled stones should be safely stored within this area. After completion of works all will be removed.
3	Support and Scaffold setup	Support and scaffold setup will be done as required by regulations. Method statement has to be submitted for the approval of the UNDP Engineer relating the design and the construction of this item. Scaffolds to be erected under the supervision of the HS Officer and certifies by the HS Officer; no access on scaffolds until the HS Officer approves the scaffolds.
4	Disassembling and rebuilding of the bell-tower	The stones of the bell tower will be numbered and documented. The numbering of stones should be carried out using a water-soluble paint that can be washed off later without damage to the surface of the stone.



		<p>The documentation of the belfry (before and after the works) will be done by drawings/sketches (both the belfry overall and of the numbered stones individually) and photographic documentation, by the site architect.</p> <p>The stones should be taken down one by one starting from the uppermost part. A conservator has to be present during the dismantling of the bell tower.</p> <p>Bell will be removed and stored safely on site.</p> <p>All the dismantled stones will be safely stored on site.</p> <p>Ornamented carved stones will be protected before removal according to the instructions of the conservator.</p> <p>If any conservation actions are needed for the ornamented carved stones these will be undertaken by the conservator on site before reassembling the bell tower. At the end of his assignment the conservator will need to submit a report of the conservation works he/she conducted in English.</p> <p>Wooden members will be removed treated and replaced as specified.</p> <p>All past cement plasters will be removed carefully without causing any damage to existing stones. Cement plaster will be replaced with specified hydraulic lime-based mortar (MasterEmaco® S 285 TIX or equivalent), during rebuilding the pointing of the stones will be done with the same mortar</p> <p>Rebuilding including new structural reinforcement and replacement of heavily weathered stones- explained in item (b&amp; c)</p> <p>Bell will be repositioned at its original place.</p>
5	Stone replacement at the bell-tower	<p>Replace 50 stones (estimated) are that are broken and heavily weathered with new local stones with the same characteristics as the stone to be replaced in (texture, toughness, color, carving, size).</p> <p>Stones will be replaced using Hydraulic Lime based (MasterEmaco® S 285 TIX) or equivalent.</p>
6	Structural Reinforcement of the bell-tower	<p>Iron structural reinforcement will be placed internally at the shown levels to replace the existing heavily corroded iron members. (Figure 8).</p> <p>The 4mm thick and 15cm wide rectangular iron plate will have 4 solid, welded, 18mm diameter bars on its corners that reaches up to 2/3 of the height of each pillar. There will be two such structural reinforcements.</p> <p>Stones at shown level will be carved (16cm wide 2 cm deep) to engulf the rectangular base of the reinforcement and covered with Albaria Struttura or equivalent mortar.</p> <p>Stones of the pillars will have a drilled hole at the center (d 3cm) and the stones will be placed as shown in figure 7. The gap between the iron and the stone will be filled with Albaria Innezione or equivalent injection mortar.</p> <p>The iron used will be protected with water resistant, anti – corrosive primer such as (sika Armatec 100 master seal 300) or equivalent.</p>
7	Pointing- solid base of the bell-tower	<p>Clean the 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.</p> <p>Remove deteriorated material and loose deposits with soft bristle brushes.</p> <p>Clean the joints with air and water under pressure.</p> <p>Mix 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.</p> <p>Point joints by careful packing of the mortar in layers according to original form/profile.</p>

		<p>Protect 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.</p> <p>New mortars should be mixed according to manufacturer's specifications. The joints should have the final appearance of the original ones, subject to the engineer's decision both in the solid base part and the rebuilt first and second levels. For pointing purposes MasterEmaco® N 275 TIX(Formerly known as Albaria® Intonaco) or equivalent will be used</p>
8	Original Wooden member treatment	Remove Original wooden members, treat with Silvanol 726 or equivalent and replace at their original position
9	Removal and replacement of the bell	Remove, store and replace the bell without harming the stones. Treat the wooden and iron mechanisms of the of the bell with sika Armatex 100, Silvanol 726 or equivalents

