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REPUBLIKA E SHQIPËRIE
MINISTRIA E KULTURËS



TECHNICAL SPECIFICATIONS HAMMAM OF DURRES



ATELIER 4
ARCHITECTURE • ENGINEERING • CONSULTING



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22644-001_ALB_EU4C_RFP_01 - "Provision of Consultancy for Design services for EU4CULTURE Project - Support for revitalization of cultural heritage sites and monuments affected by Earthquake in Albania."

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1. MECHANICAL PROPERTIES

1.1 MORTAR

Mechanical properties of lime mortar should be in conformity to the Albanian standard STASH 510-81. The mortar test methodology is given in STASH 543-83. The mortar resistance will be determined testing cubes with dimensions 7.07x7.07x7.07cm, in wet conditions. The mortar must withstand at least 15 freeze-thaw cycles.

Table 1. Mechanical properties of lime mortar

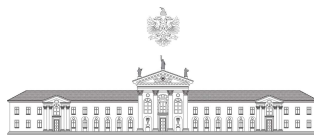
Mortar type	Proportion of volumes (Lime:Sand)	Mortar class (strength) (daN/cm ²)	Lime wash (l)	Cement (kg)	Sand (m ³)	Gypsum (kg)	Water (l)
Lime mortar, lime having consistence of 12 cm	1:3	4	350	-	0.99	-	120

Important notes:

1. The above recipe has an orienting character, as in advance the mortar that must be placed in the site, has to be verified with laboratory tests to meet the requirements of mechanical resistance and durability as described above. In case the test results do not meet the technical requirements, then notify the structural engineer, for the review of the recipe.
2. Mortar components should be obtained from the nearest quarries, in order to identify as far as possible the constituent materials of the original mortar.
2. Do not use, for any reason, lime mortar combined with stainless steel elements.



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1.2 STEEL

Mechanical properties of steel used in the project is given in the table below.

Table 2. Mechanical properties of steel

Material	Density (kg/m ³)	Brinell Hardness Number	Modulus of Elasticity (x10 ³ MPa)	Yielding stress (MPa)	Tensile strength (MPa)	Ultimate strain (%)	Coefficient of thermal expansion (x10 ⁻⁶ °C)
Iron / Steel for RC elements							
Iron and mild steel	7870	115	196	195	390	35	12
Ductile stainless steel (Hot rolled)	7970	150	196	295	590	10	17
Steel for high strength cables							
High- strength stainless steel (Cold rolled)	7970	300	206	785	980	5	17
Iron / Steel for tie rods, profiles and accessories: Class S275							
Iron and mild steel	7870	115	200	265	410	23	12



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2. INSTALLATION STEPS

2.1 TECHNICAL NOTES FOR THE CONSOLIDATION OF THE DOME:

1. The mortar of the joints of the stone/brick masonry must be ejected up to a depth of 5 cm, through out the entire size of the joints.
2. In case the joint size (width/height) is less than 8 mm, the stones and the bricks next to that joint must be cut as specified in the previous note and the size of the joint should be no less than 8 mm.
3. The joints must be polished with pressurized air and must be cured with water.
4. Set the first layer of mortar in the prepared joint.
5. Set the helicoidal stainless steel rebar of diameter $d=8\text{mm}$ and length $l=100\text{ cm}$.
6. Set the second layer of the mortar.
7. Set the closing layer of the joint with original mortar.

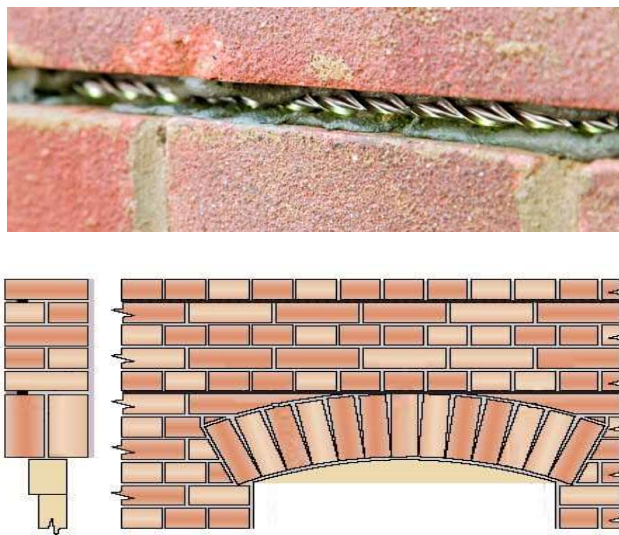


Figure 1 Set the helicoidal stainless steel rebar.



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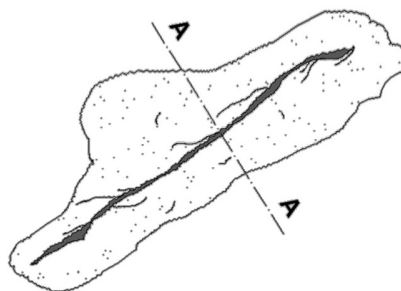
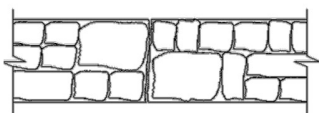
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2.1 RESTAURATION OF BRICK MASONRY BY STITCHING METHOD

PRERJA A-A PARA RESTAURIMIT



PRERJA A-A PAS RESTAURIMIT

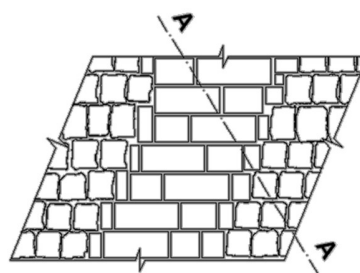


Fig. 4. Repairing masonry through "stitching" method.



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The steps for the strengthening are:

- Demolition of existing plaster and drawing out masonry.
- Removing the elements of masonry affected by splitting and some other elements, to form a sufficient space for the introduction of new elements to the masonry, taking care to form a perimeter suitable for the connection old masonry with the new one and to create indentations and fugues which do not fall over each other.
- The introduction of new elements of masonry (stone or bricks), after cleaning and washing the cavities created with water, taking care in the formation of so-called notches. Must be used light expansive bond materials, composed of aggregates similar to what constitutes existing bonding material.

2.2 LOCAL LIME MORTAR INJECTION

Mortar injection will be realized according to the following steps:

1. In case when that the pipe of injection cannot penetrate directly to the crack, is necessary to use a drilling rotary machine (of 14 mm diameter) at the route of the crack. If the cracking lies on both sides, the holes will be made on both sides of masonry. The holes will have the depth depending to the thickness of masonry, while their minimum depth is 20 cm. The maximum distance between the injection holes shall be taken 40 cm.
2. Insert the pipe in each of the holes, to a depth of about 5 cm.
3. The filling of cracks or degraded joints from outside, will be with the same injection mortar, or when this is not possible must be used a rapid drying mortar.
4. Prepare the mixture to be injected with the drill rotary machine and brush. Injection of mixture must start from the bottom holes of the masonry continuing in the upper ones.
5. If the walls inside are filled with non-cohesive material and gaps, then for the purpose of saving materials and avoidance of over-strengthening local of masonry, mortar must be not-very fluid.



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Tabela 3. Injection According to Crack Width

Crack Width	Racommended procedure
< 0.1mm	Injection with epoxy
0.3m to 3mm	Injection with lime mortar that contains shrinkage reducing admixture
>10mm	Reconstruction of damaged area with new units. Cracks may sealed with mortar if the wall thickness is relatively small

2.3 REPAIR OF JOINTS WITH LIME MORTAR

To realize the repair of masonry surface, the following steps should be followed:

1. Initially, the part of the masonry that needs intervention will be carefully identified, ie the parts where the mortar in the masonry joints are degraded and the part where the mortar in the joint is missing.
2. Once the problem has been identified, the joints should be carefully cleaned mechanically from debris and unconsolidated mortar.
3. Once the joints have been mechanically cleaned, they will be washed with running water.
4. Once they have been washed with running water, the mortar filling will start (when the problem is superficial). In case the damaged existing mortar goes deep in the masonry, then the new mortar will be injected to that depth. The mortar recipe should be designed according to the original masonry mortar, ie according to the in-situ materials.
5. If the masonry is non-plastered (which depends on the typology of the building) after the joints have been filled with mortar, the mortar will be cleaned from the surface of the stones so that it is not visibly invasive for the surface of the masonry units.