

**RESTORATION WORKS AT SUMHURAM
(ARCHAEOLOGICAL PARK OF KHOR RORI)
(Sultanate of Oman)
CAMPAIGN February-March 2016**

IMTO

Italian Mission To Oman



**Technical Report
06th February – 24th March 2016**

Emiliano Mura

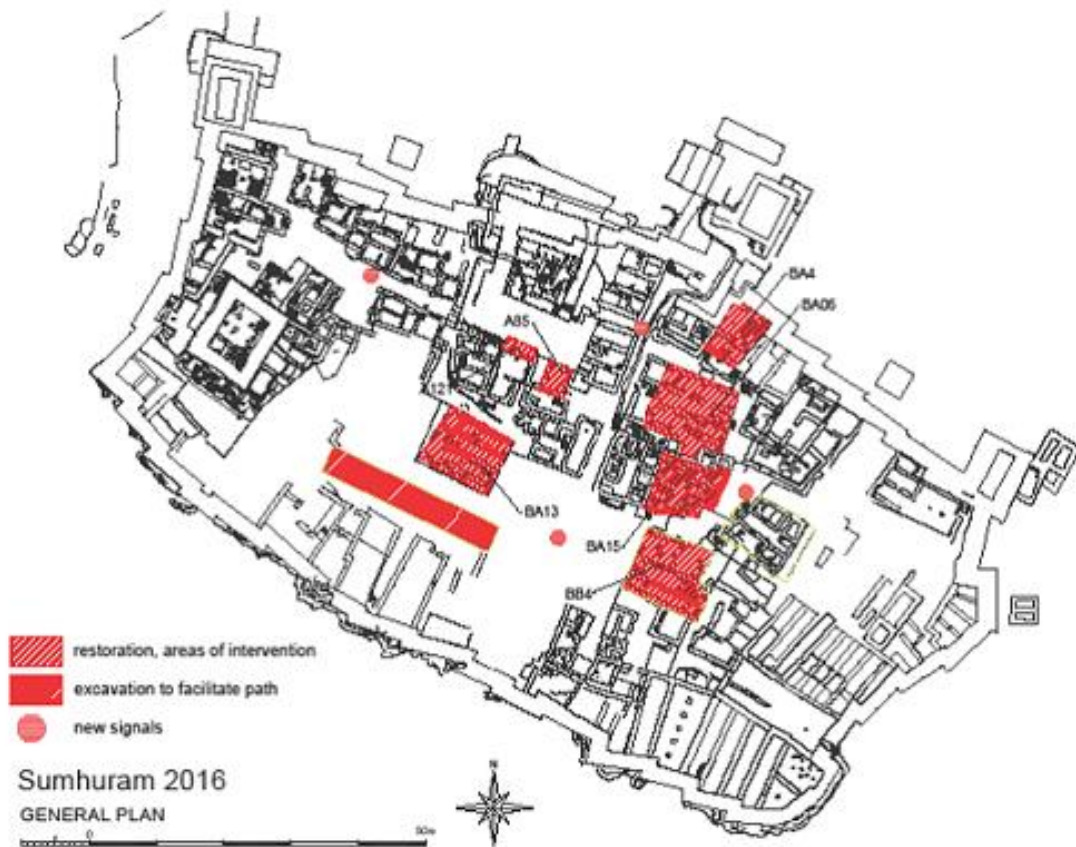
Miriam Rossetti

Introduction

During excavations in February- March 2016 the restoration works were carried out within the city:

- Building BA13. The restoration of the walls M485, M494, M569, M562, M567.
- Building BA15. The restoration of the walls M635-M484.
- Room A85. The restoration of the wall M193.
- Building BB4. The restoration of the wall M582.
- Building BA4. The restoration of the walls M70, M77, M62, M63, M69.
- Building BB2. The restoration of the wall M529.

The following map shows all the locations:



Worker Teams

Two teams of workers have engaged to work out all the eighteen operations to complete the reconstruction of the above-mentioned areas. One team of five people was engaged to prepare the mortar and the second one of thirteen people has engaged for the restoration of the walls.

Working progress status

In order to check the advancement of the works, we daily took a significant number of pictures of the areas. The number of the pictures and the point of viewing from which they are taken from, are those considered necessary for a good comprehension about the working progress status.

Mortar preparation

The mortar we used for the connection between the stones is the same used during the previous campaigns:

- **80** grams of brown colour with **200** grams of yellow colour.

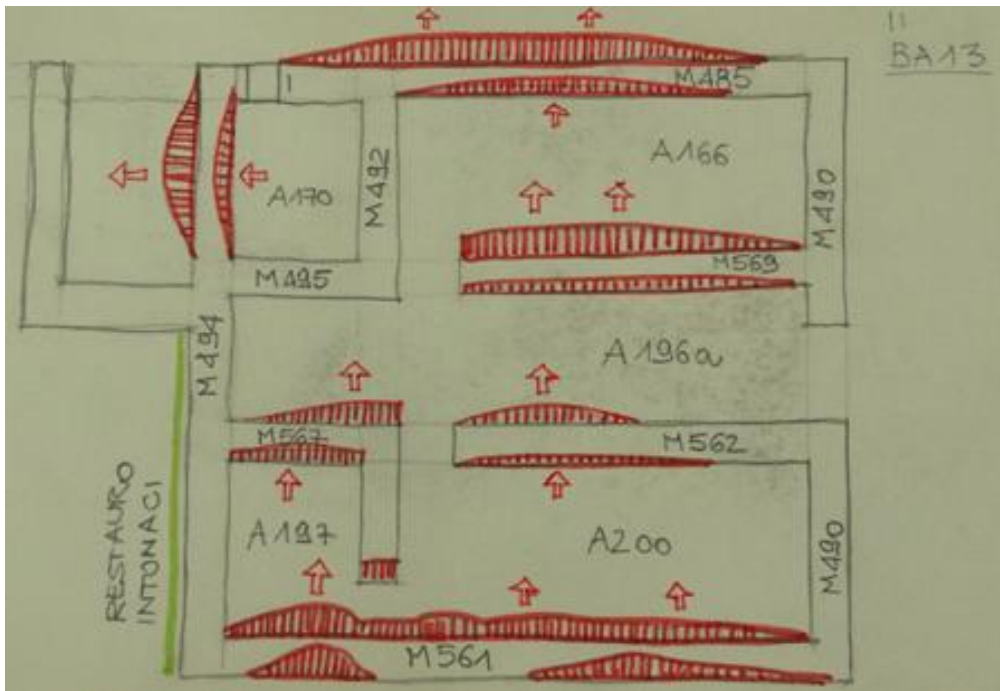
The oxide colours, mentioned above, plus 4 buckets of sand composes the mix of the mortar with eight scoops (**600grams**) of lime powder.

The percentage of lime on sand is 1:6, and then we have two different kinds of mortar:

- **Stone mortar**, used for the external leaves of stones, obtained by the mix of sieved sand, hydrated lime, brown and yellow oxides for the chromatic tone.
- **Filling mortar**, used for the back filling of the structure, made with the same components, except the use of raw sand instead of sieved sand without any brown and yellow oxides.

Building BA13

The building had a large part of the walls collapsed. The restoration was done by giving the priority to the walls on the tourist route and then those inside. The work is proceeded with the disassembly of some parts of the masonry, the cleaning and the replacement with the same stones as not to alter the original shape.



Sketch area BA13. Plan with collapsing walls

Restoration of the wall M485



M485, south front wall, before the restoration.



M485, south front wall, during removing stones.



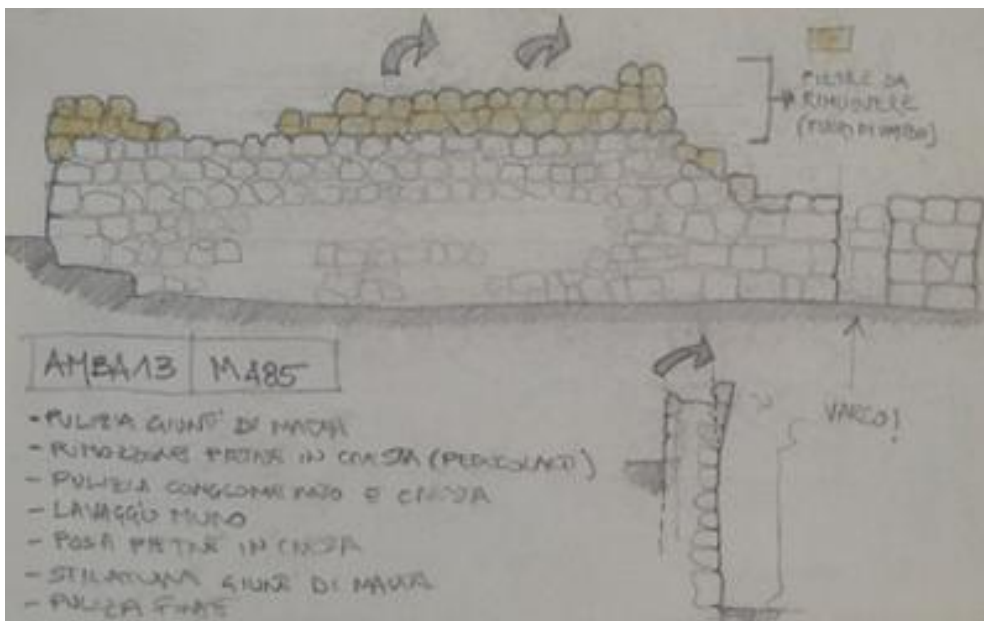
M485, south front wall, after the restoration.



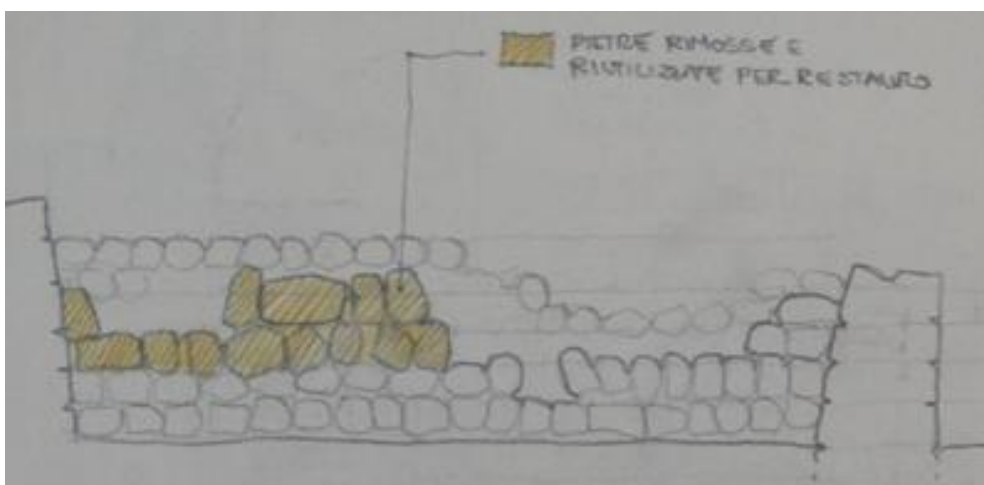
M485, north front wall, before the restoration.



M485, north front wall, after the restoration.



M485, south front wall. Stones to remove highlighted with hatch



M485, north front wall. Stones to remove highlighted with hatch

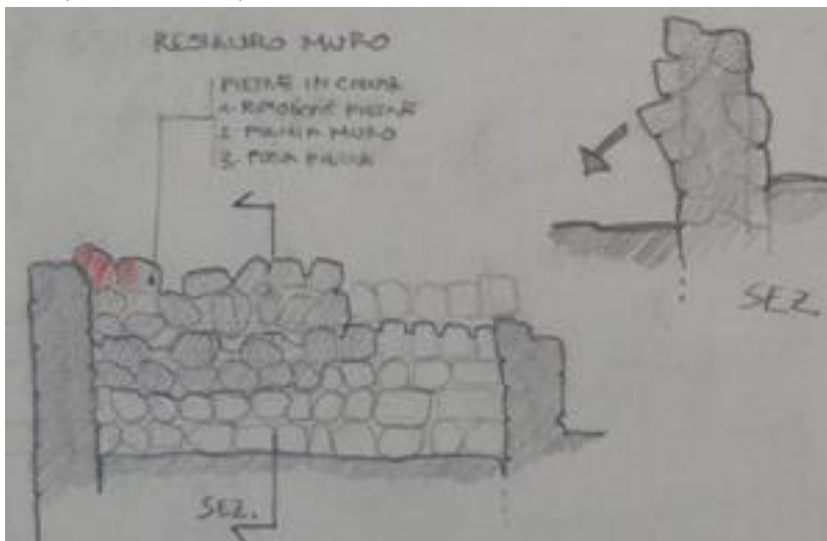
Restoration of the wall M494



M494, west front wall, before the restoration.



M494, west front wall, after the restoration.



M494, west front wall. Stones to remove highlighted with hatch

Restoration of the wall M569



M569, north front wall, before the restoration.



M569, north front wall, after the restoration.

Restoration of the wall M562



M562, north front wall, before the restoration.



M562, north front wall, after the restoration.

Restoration of the wall M567



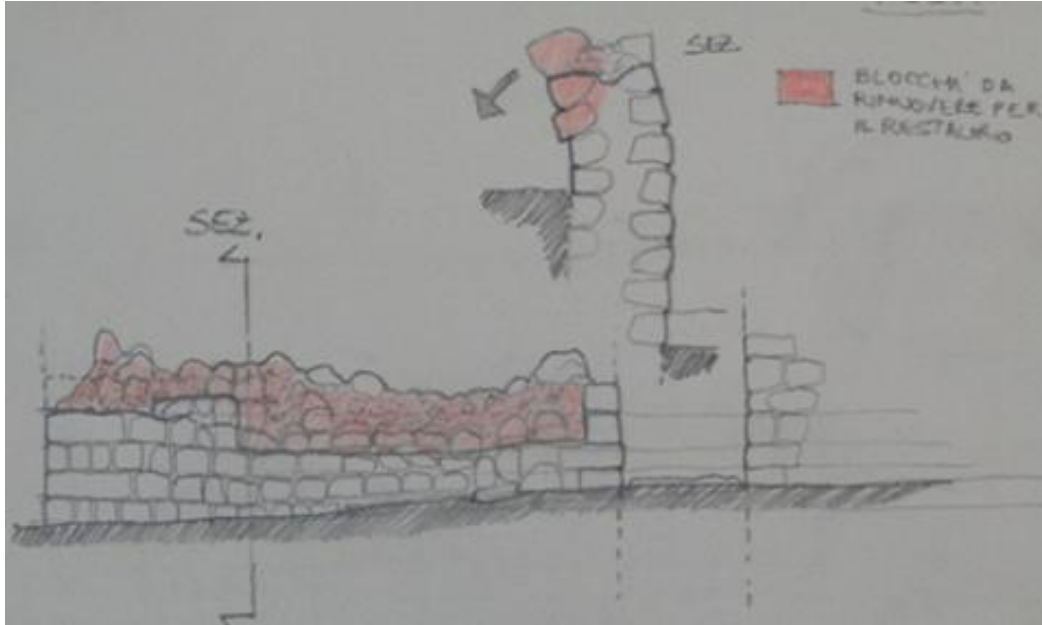
M567, south front wall, before the restoration.



M567, south front wall, after the restoration.

Building BA15

The restoration was done by giving the priority to the walls on the tourist route. The work is proceeded with the disassembly of some parts of the masonry, the cleaning and the replacement with the same stones as not to alter the original shape.



M635, south facing wall. Stones to remove highlighted with hatch

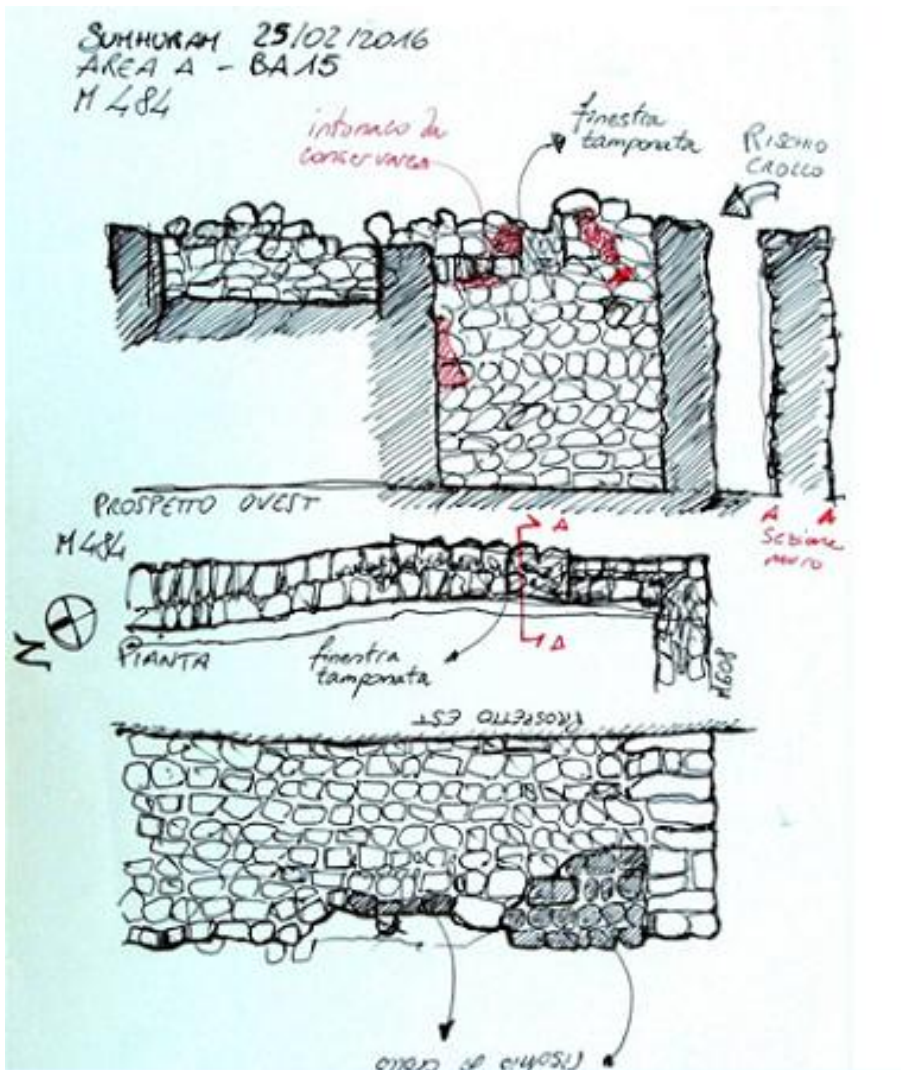
Restoration of the wall M635



M635, south front wall, before the restoration.



M635, south front wall, after the restoration



Restoration of the wall M484



M484, east front wall, before the restoration.

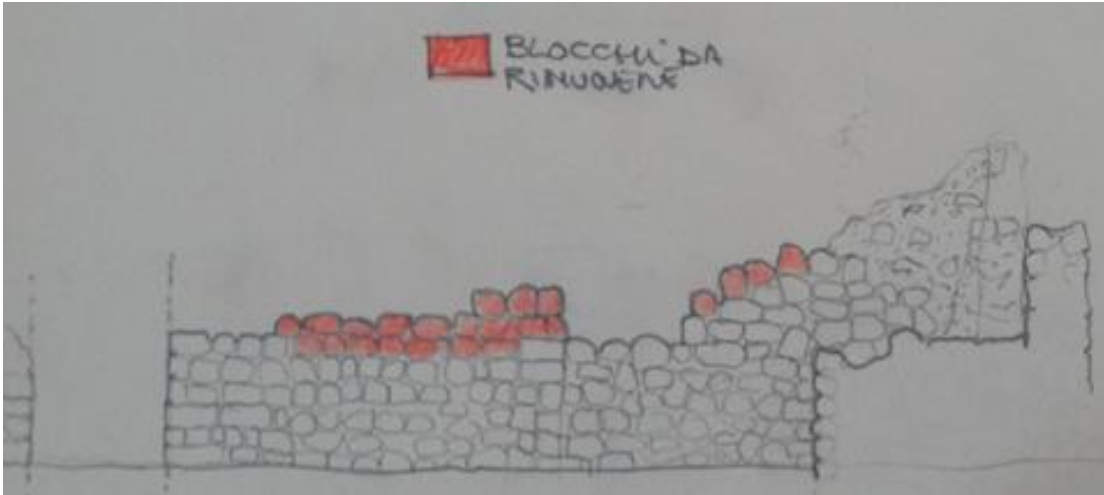


M484, east front wall, after the restoration.

Building BB4

The restoration was done by giving the priority to the walls on the tourist route. The work is proceeded with the disassembly of some parts of the masonry, the cleaning and the replacement with the same stones as not to alter the original shape.

Restoration of the wall M581



M581, south front wall. Stones to remove highlighted with hatch



M581, south front wall, before the restoration.

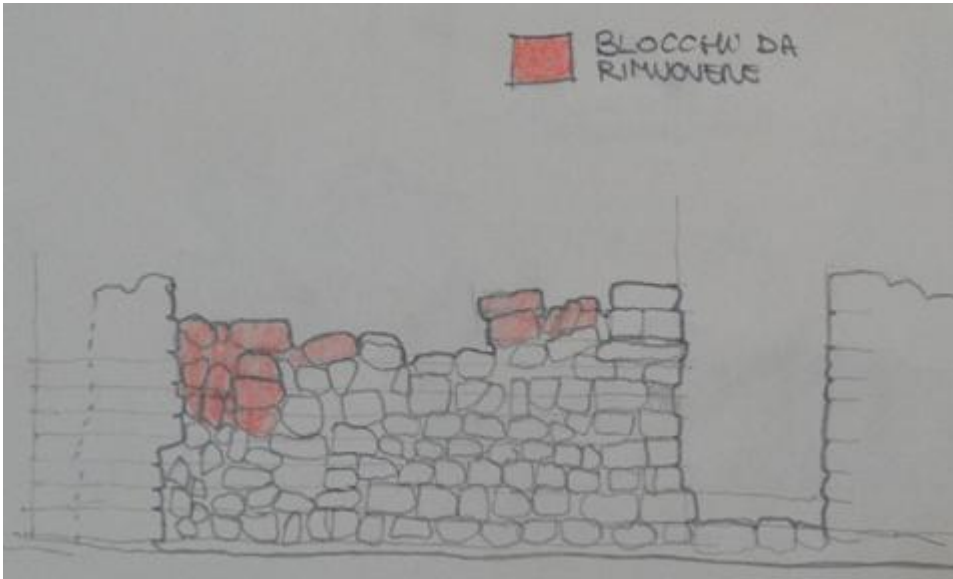


M581, south front wall, after the restoration.

Building BA4

The restoration was done by giving the priority to the walls on the tourist route. The work is proceeded with the disassembly of some parts of the masonry, the cleaning and the replacement with the same stones as not to alter the original shape.

Restoration of the wall M70



M70, south front wall. Stones to remove highlighted with hatch



M70, south front wall, before the restoration.



M70, south front wall, after the restoration.



M70, south front wall, before the restoration.



70, south front wall, after the restoration

Restoration of the wall M77



M77, north front wall, before the restoration.



M77, north front wall, after the restoration.

Restoration of the wall M69



M69, south front wall, before the restoration.



M69, south front wall, after the restoration.



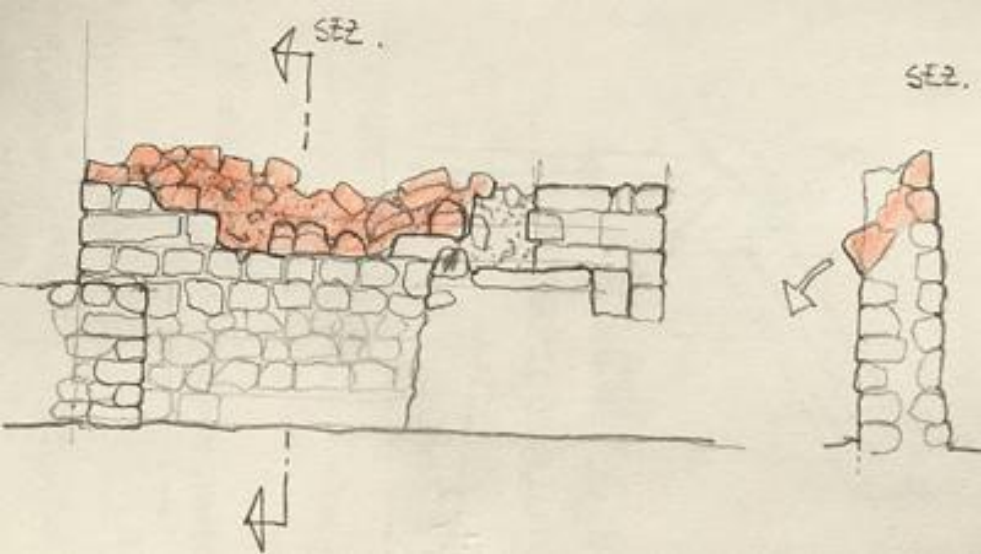
M63, south front wall, before the restoration.



M63, south front wall, after the restoration

Building BB2

Restoration of the wall M521



M521, east front wall. Stones to remove highlighted with hatch

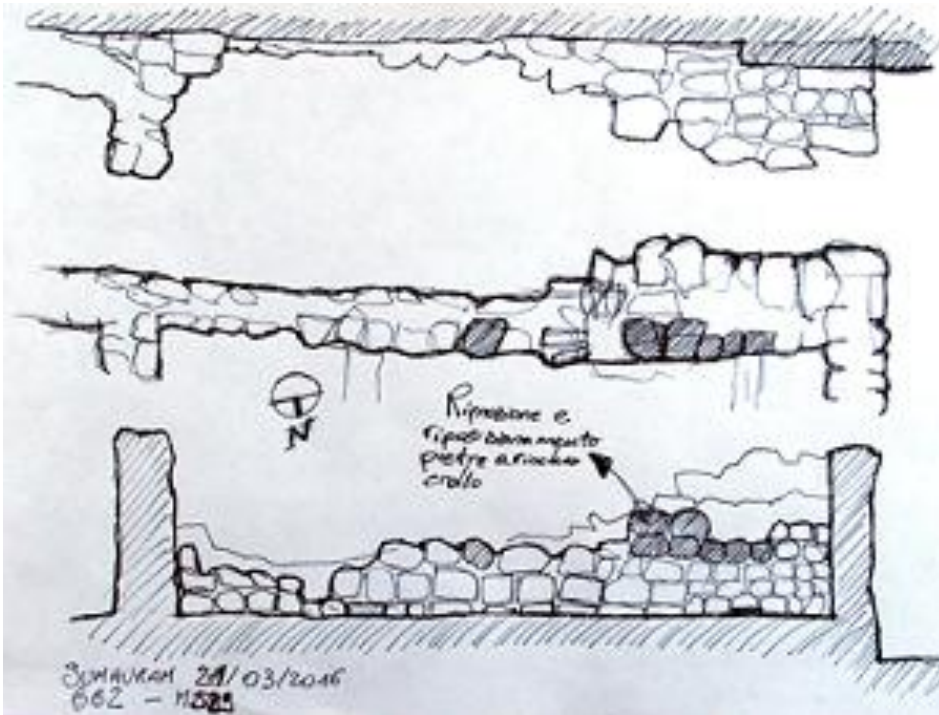


M521, west front wall, before the restoration



M521, west front wall, after the restoration

Restoration of the wall M529



M529, north front wall. Stones to remove highlighted with hatch



M529, north front wall, before the restoration

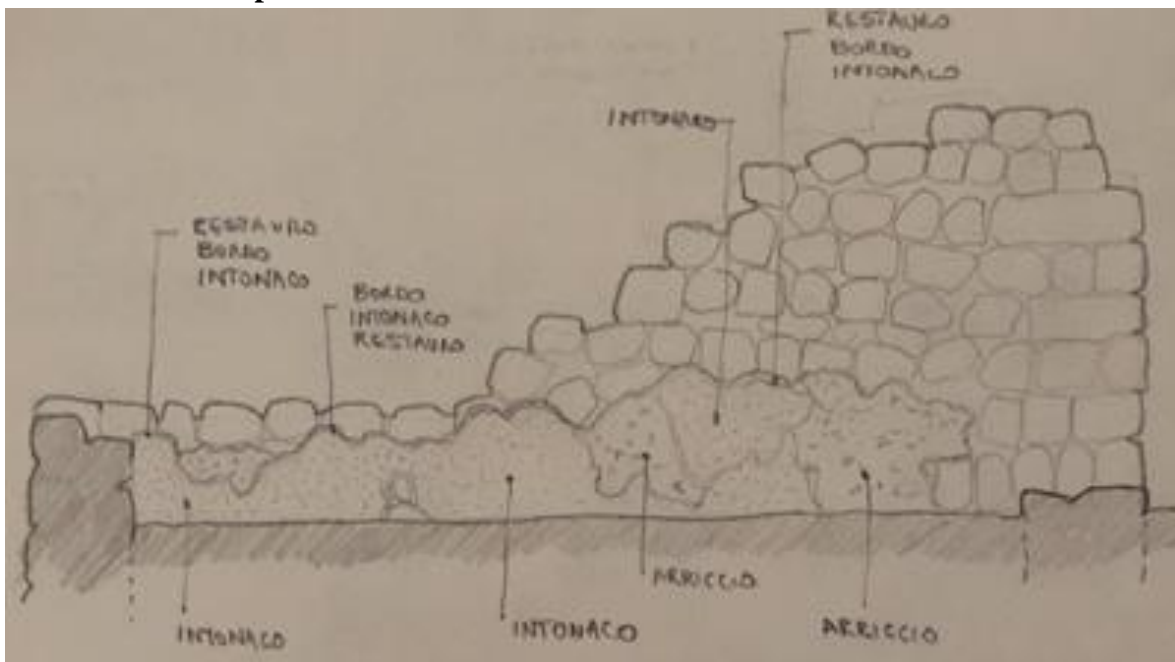


M529, north front wall after the restoration

Restoration of plaster

During the restoration of the walls we have personally run the consolidation of the plaster wall of the M494 (BA13) and the wall M17 (A121). Execution phases: cleaning with brushes and water, laying of a new mortar in the edges.

Restoration of the plaster wall M494



M494 (BA13). Plaster, intervention of restoration



M494 (BA13), west wall, façade. before the restoration



M494 (BA13), west wall, façade. before the restoration



Dust removal



Cleaning



Laying of new plaster



Setting of new plaster

Restoration of the plaster wall M17



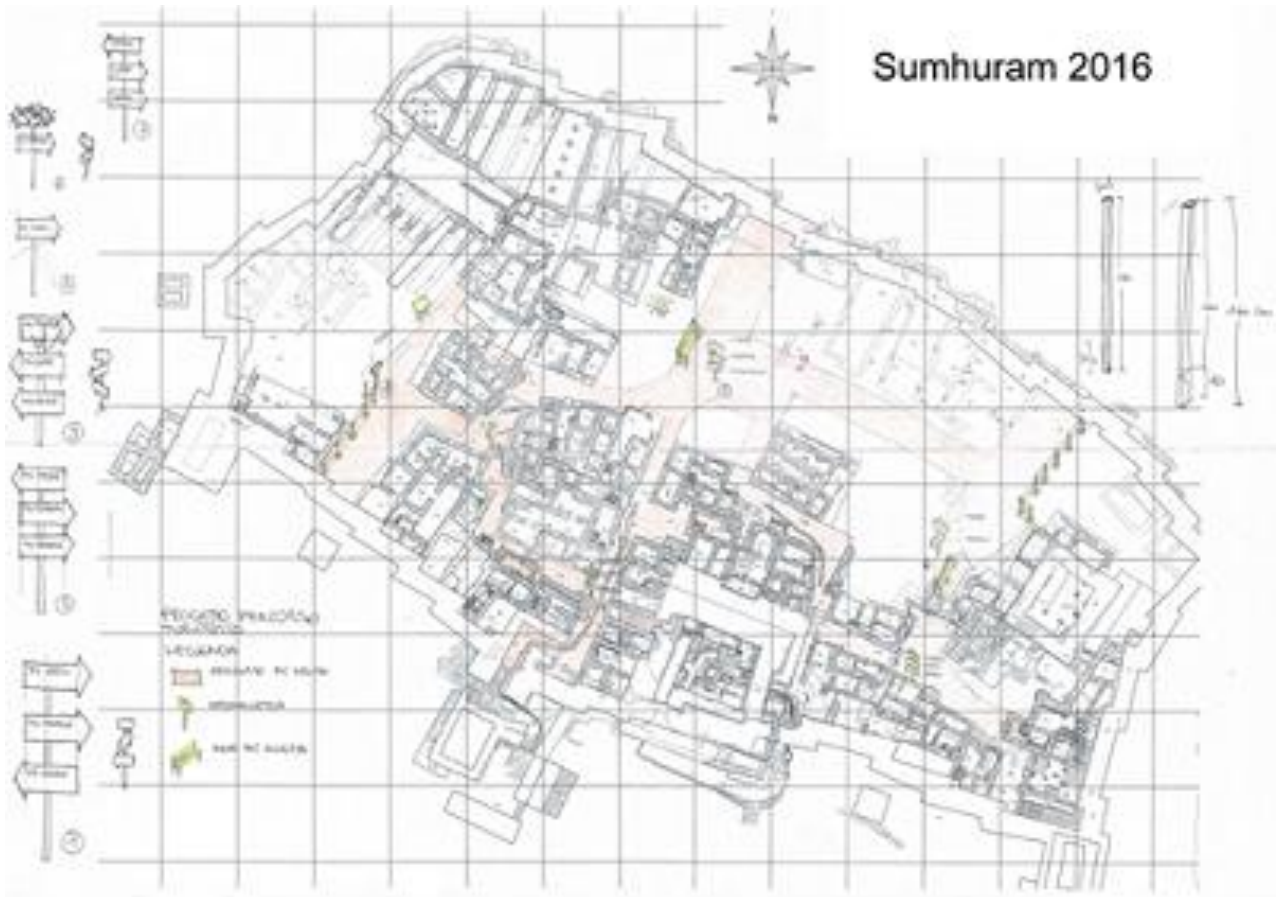
M17 (A121), south wall, façade. before the restoration



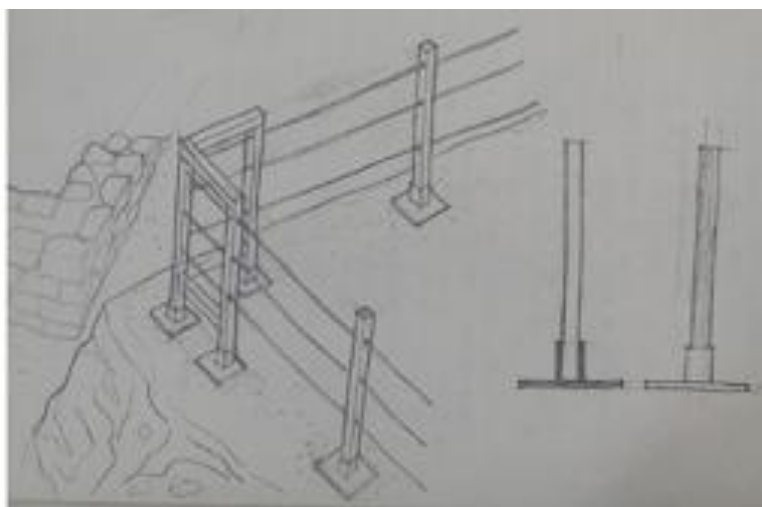
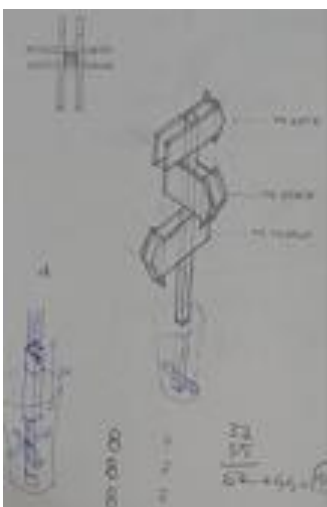
M17 (A121), south wall, façade. after the restoration

Tourist route project

Along the tour route I have designed and built the signs useful to direct visitors during the visit. The panels were made of brown painted wood, in total are n.4 and positioned along the crossings in order to signal the presence of the main monuments.



Plan of tourist path with signage and deterrents



Project indication signs and deterrents



Arrows signs in site

Change of the old explanatory panels

It has been decided to change three panels and their support in the archaeological park, out of the city wall, and exactly in the site of necropolis, the houses near the gallery, and for the wall of Inqitat.

The new support have the same design of the new panels put inside the city of Sumhuran during the campaign of October-November 2012 (SUM12C).

The support is composed as follow:

- A base (monolite) made by concrete;
- A steel frame three millimeter in thk;
- An Aluminium plate on which is attached the info panel.

For this mission we decided to make only the monolite base, made by the means of white concrete adding yellow and brown oxide colours in order to get the sand colour. To make the monolite stronger we used steel for reinforcement. This operation will be finished during the next mission.

Here you can see the phases sequences of the installation



Removing the existing panel



New foundation



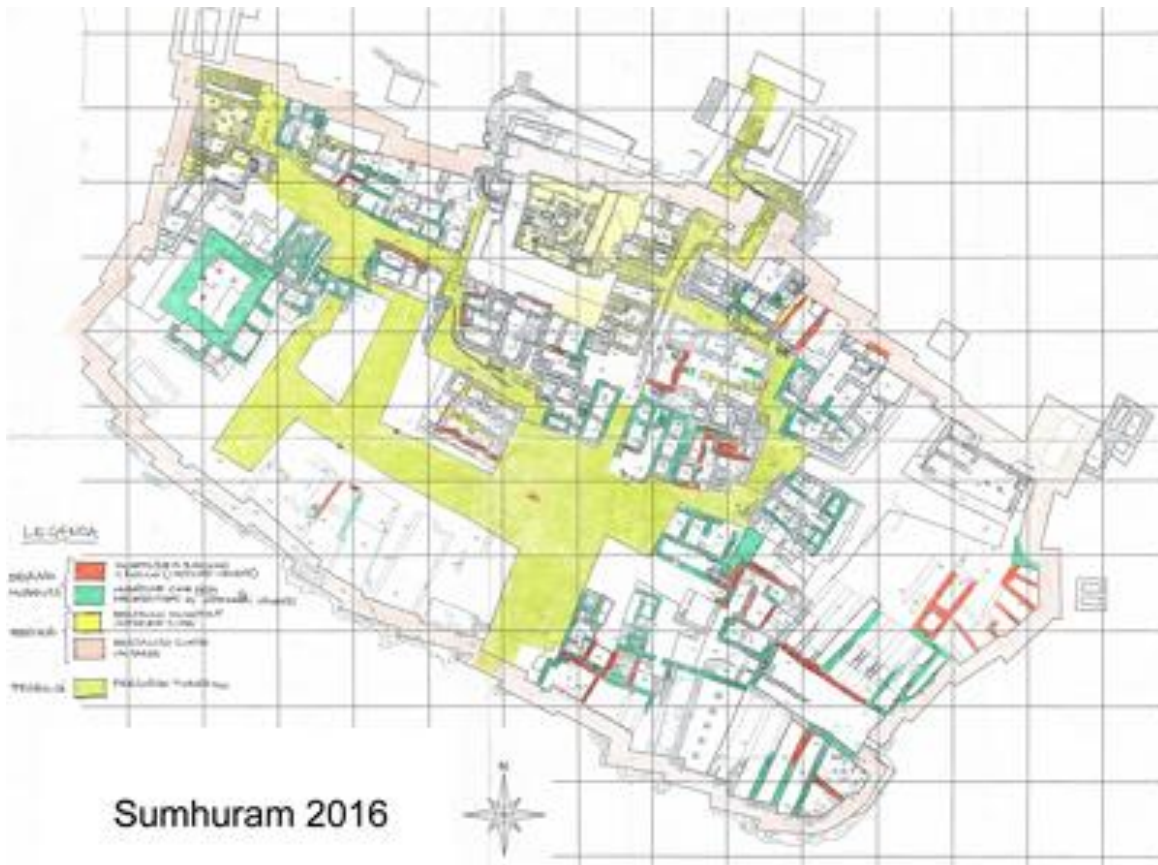
Formwork



Monolite made by couloured concrete

Archaeological risk's map

The risk map is useful to the identification of risk masonry collapse (red) and then to the most urgent restoration. Green degraded walls that do not require urgent action, in yellow walls restored, light green the visit route. The risk map allows the defining of guidelines aimed to further restoration planning.



Plan with a risk collapse highlighted walls

RESTORATION WORKS AT HAMR AL-SHARQIYA

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Andrea Moretti

Antonio Salvi



Promontory of site Al Hamr Sharqyia (Inqitat) north side



View from the top of the site Hamr al-Sharqyia (Inqitat)



Introduction

In the archaeological site Hamr al-Sharqyia (Inqitat) there is a bronze settlement, indicated by round, stone and megalithic-style structures at the top of the promontory. The wall of a large Islamic settlement emerge on the easternmost point of the promontory. The wall has a length of 700 m with towers every 25 m and one door between two principal towers located in the middle of the wall. The preliminary phase analyzed the conservation of the site and the understanding of the structural problems. The intervention of reconstruction has been designed by focusing on these different points:

- New access path
- The two towers at sides of the main gate
- Reconstruction of the first 20mt of the wall (close to the gate)

The methodological approach

Checking of the existing structures, cleaning removing the sand, estimating the amount of damage and verifying which parts could be preserved. Then start whit the consolidation and restoration.

Index

Step One: Site visit, understanding of the site, assessment of the conservation status, assessment of problems.

Step Two: Detection area of intervention, photographic survey, metric survey, sketches of existing wall.

Step Three: Reconstruction project

Step Four: Work development

Step Five: Final situation

Step One: Site visit, understanding the site, assessment of the conservation status, assessment of problems.

The archaeological site of Hamr al-Sharqiya is situated on the promontory. The long wall (700m) delimits archaeological area. The entrance is surrounded by two towers.

Along the west wall alternating zones of collapse and evident and well preserved areas. Near the tower there was a big collapse and the opening of a passage of recent construction.

Along the east wall alternating zones of collapse and evident and well preserved areas. Near the tower there was a big crash and the wall is almost completely collapsed.

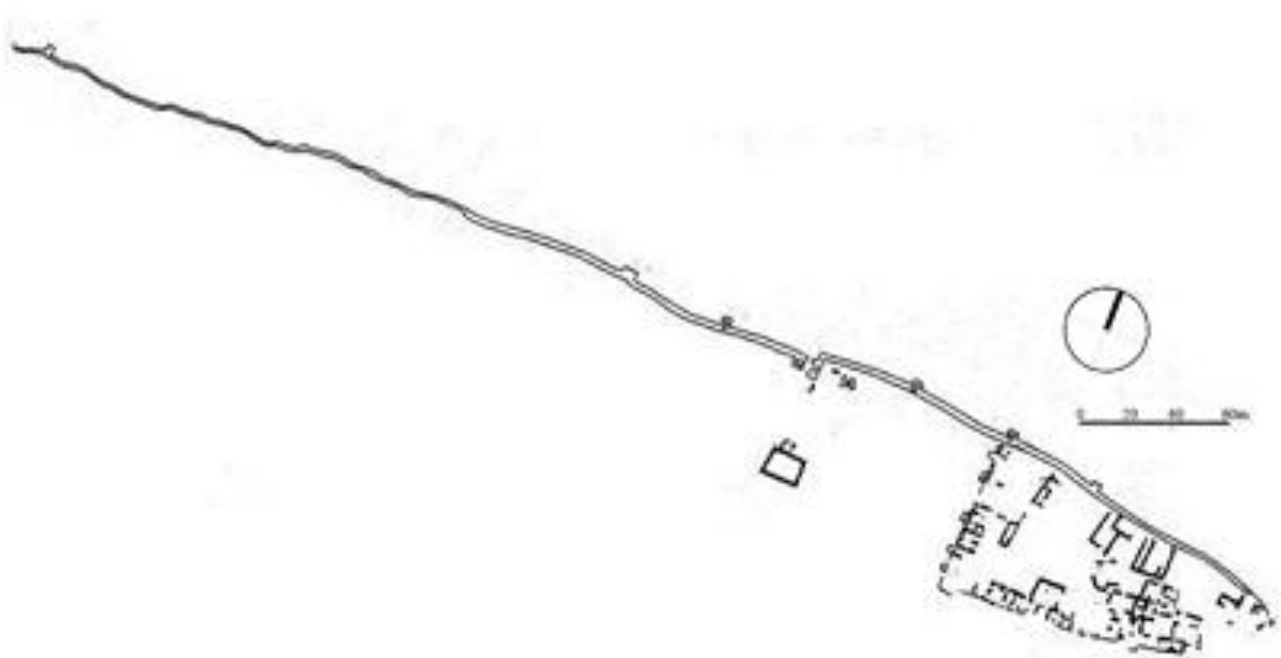
Along the west wall and the east wall, there are many zone that had many wind sand accumulation.

The west tower is in poor condition, there are many collapses and many unsafe and unstable stones.

Inside the tower there are many debris and a lot of wind sand.

The east tower is in the best storage conditions, despite being required many interventions of consolidation, the wall portions have the most stable and best preserved. Inside the tower there are many debris and a lot of wind sand.

Step Two: Photographic survey, metric survey, design of existing wall, detection area of intervention.



Plan of the site Hamr al-Sharqiya (Inqitat)



View of north side, tower east, tower west, the principal door and the walls



East wall in bad condition



East wall in good condition



West wall in bad condition



West wall in good condition



Principal door north side



Principal door south side



West tower, east side



West tower, south-west side



East tower, west side



East tower, south side



East tower, west tower and principal door south side



West wall, view from above

Metric Survey East Tower (Supervisor: Arch. Andrea Moretti)



East tower north-east side



East tower east side



East tower east-south side



East tower west side

Metric Survey West Tower (Supervisor: Arch. Andrea Moretti)



West tower north side



West tower west side



West tower west-south side



West tower south side

Metric Survey West Wall (Supervisor: Arch. Antonio Salvi)



West wall south side



West wall north side

1400
van den ghe...



Sketch of existing wall

STEP THREE_Project intervention area.

The restoration focuses on the two towers and the main gate and on the reconstruction of the first 20mt of the wall (close to the gate)

.Addition to the restoration of the towers we will proceed with the creation of a way of access to facilitate access to the site for visitors.

The West tower is in bad condition.

It is necessary a step of removing the stones of collapse, a consolidation of unstable stones, a thorough cleaning and finally restore four front walls with the restoration of the original part.

The East tower is in a better state of preservation.

It is necessary a consolidation of unstable stones, a thorough cleaning, the partial re-building the four face walls and restoration of corner and original stonework.

The construction technique chosen for the restoration is to drywall.

Inside the two facing walls will proceed with the filling thorough the use of mixed particle size varies stones, sand and ground.

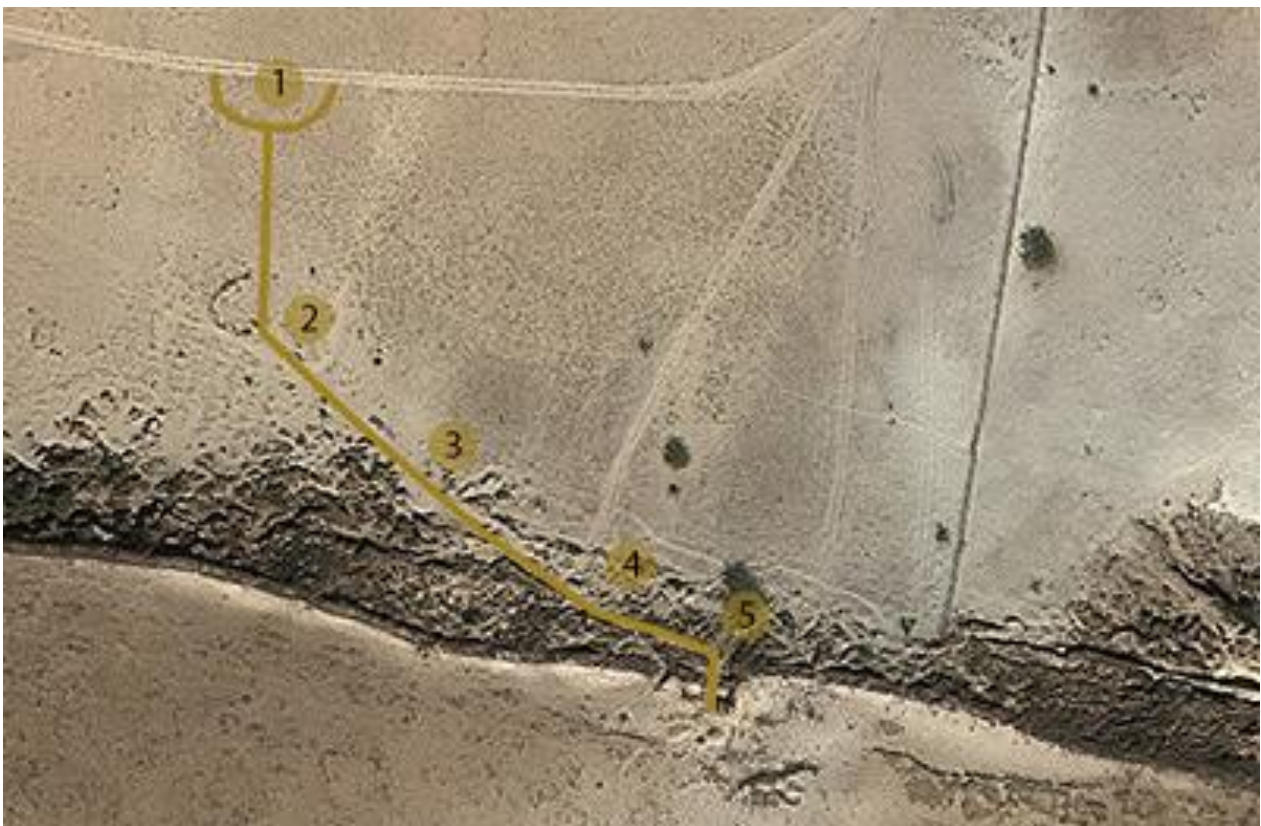
Other operations that are deemed necessary during the restoration work are:

- Removal of accumulation of soil to release part of the submerged wall.
- Construction of podiums jagged inside the wall to highlight the ridge and stabilize the building.
- Cleaning of stretches of the wall that showed encrustation.
- Consolidation at the base of the wall through new elements graft.

Time Schedule at the beginning



STREET PROJECT (Supervision: Arch. Andrea Moretti and Arch. Antonio Salvi)



Street project



Street before



Street after zone 1



Street after zone 2



Street after zone 3

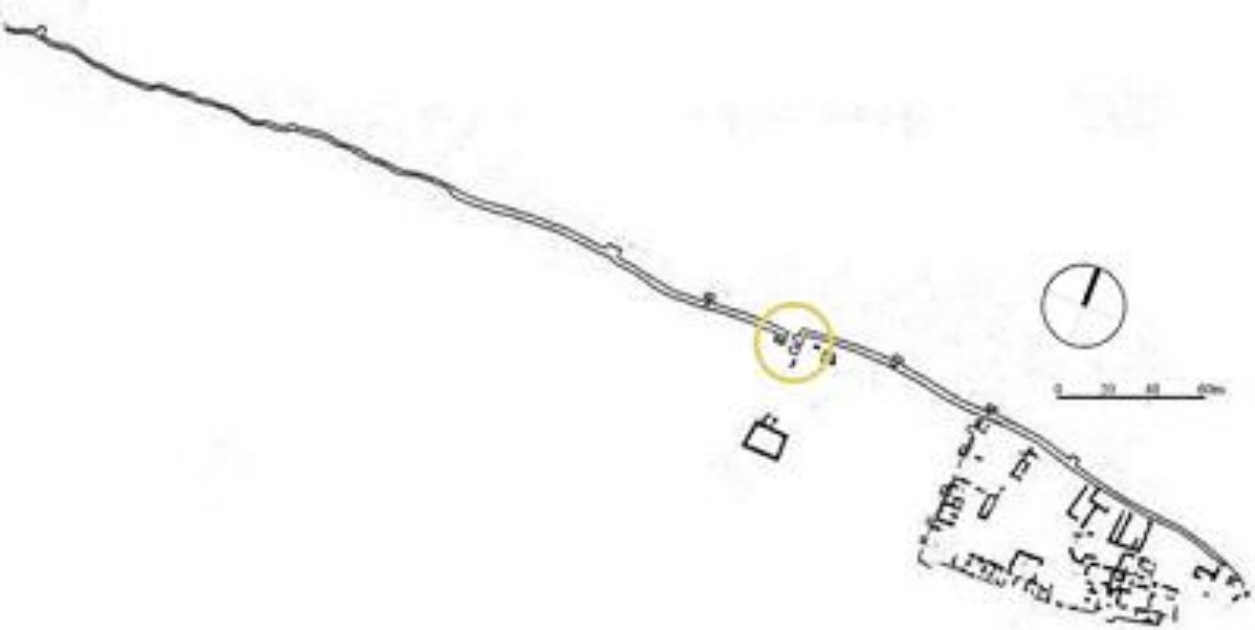


Street after zone 4



Street after zone 5

PRINCIPAL DOOR PROJECT (Supervision: Arch. Andrea Moretti)



Plan of detection area of intervention



Principal door north side before restoration



Principal door north side after restoration



Principal door south side before restoration



Principal door south side after restoration

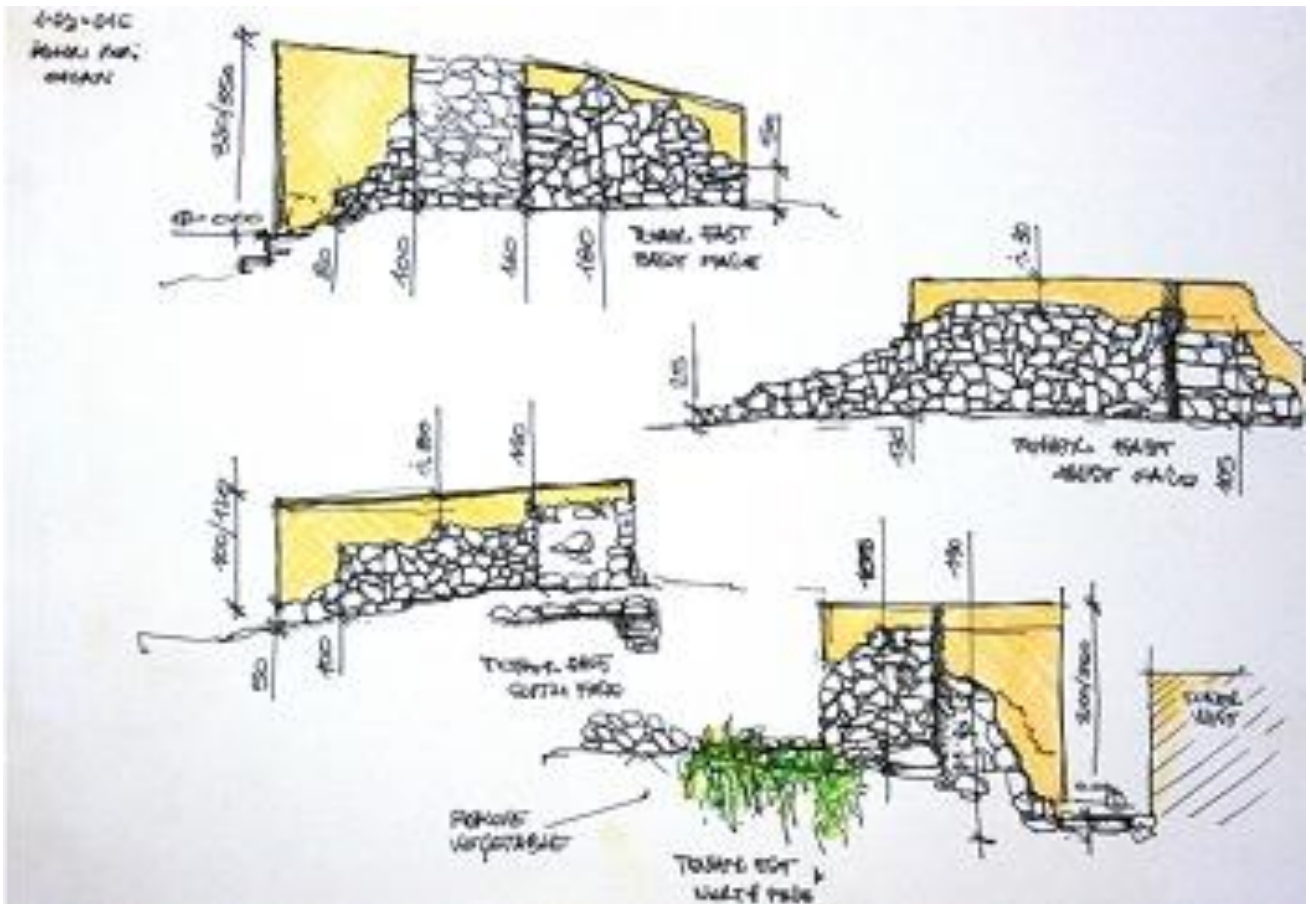
East Tower Project and Restoration (Supervision: Arch. Andrea Moretti)

The restoration of the tower was carried out using the technique of dry wall , with a filling of different grain of stones and ground.

The height reached during the restoration of the walls is demonstrated by the survey of archaeological remains clean and secured .

The interior of the tower has been emptied from the debris and clean .

The ground and sand present on the sides of the tower removed to allow cleaning and consolidation of the original stone.



Project for east tower



View on the down street before restoration



View on the down street after restoration



View on the up street before restoration



View on the up street after restoration



View north-west side before restoration



View north side after restoration



View east side before restoration



View east side after restoration



View east-south side before restoration



View east-south side after restoration



View south side before restoration



View south side after restoration



View south-west side before restoration



View south-west side after restoration



View west side before restoration



View west side after restoration

East Wall Project and Consolidation (Supervision: Arch. Andrea Moretti)

In the last job I worked to consolidate the beginning of the east wall.
This consolidation will serve for the continuation the restoration of walls in future missions .



View north side before restoration



View north side after restoration

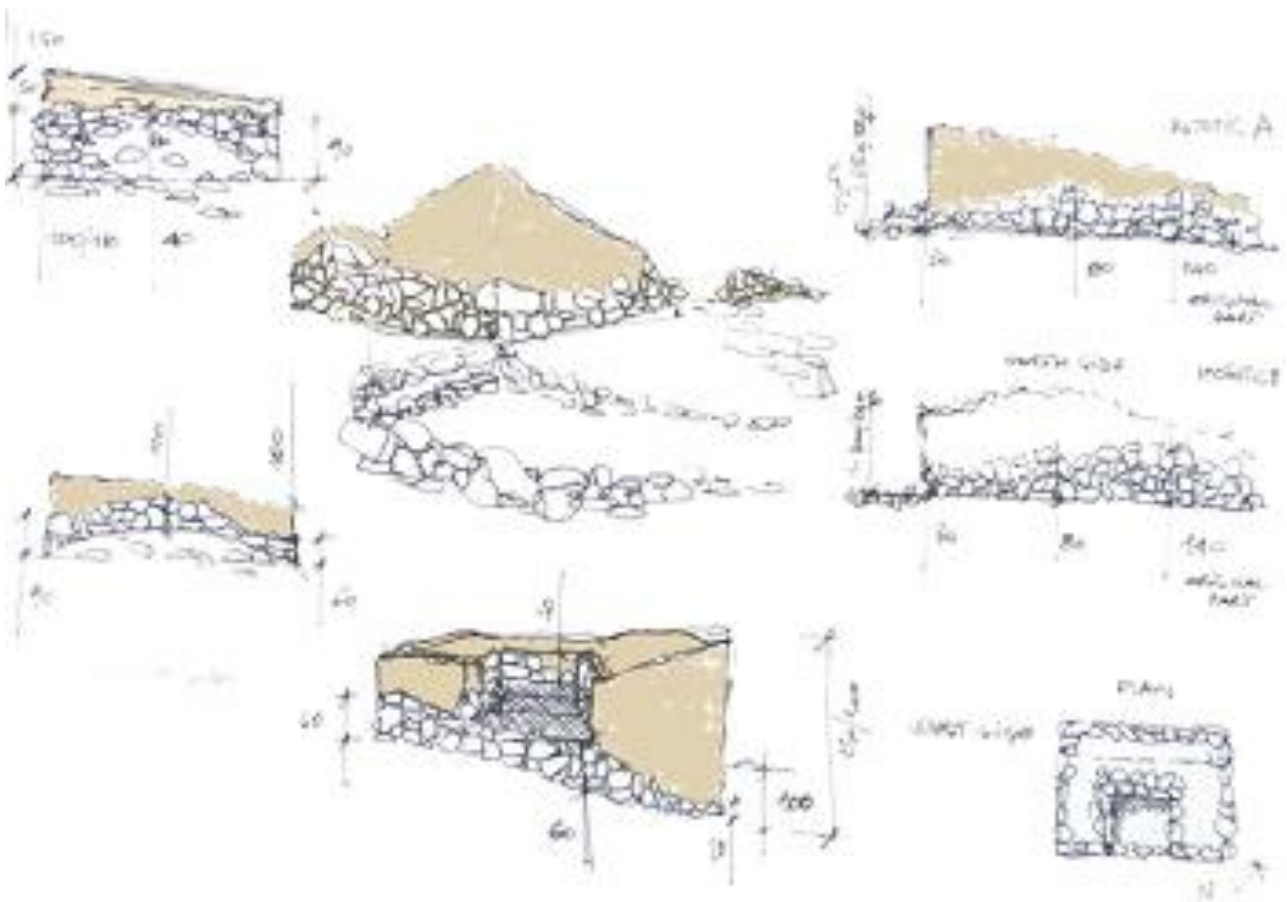
West Tower Project and Restoration (Supervision: Arch. Andrea Moretti)

The restoration of the tower was carried out using the technique of dry wall , with a filling of different grain of stones and ground.

The height reached during the restoration of the walls is demonstrated by the survey of archaeological remains clean and secured .

The interior of the tower has been emptied from the debris and clean .

The ground and sand present on the sides of the tower removed to allow cleaning and consolidation of the original stone.



Project for west tower



View on the down street before restoration



View on the down street after restoration



View on the up street before restoration



View on the up street after restoration



North side before restoration



North side after restoration



West side before restoration



West side after restoration



South side before restoration



South side after restoration



South - East side before restoration



South - East side after restoration

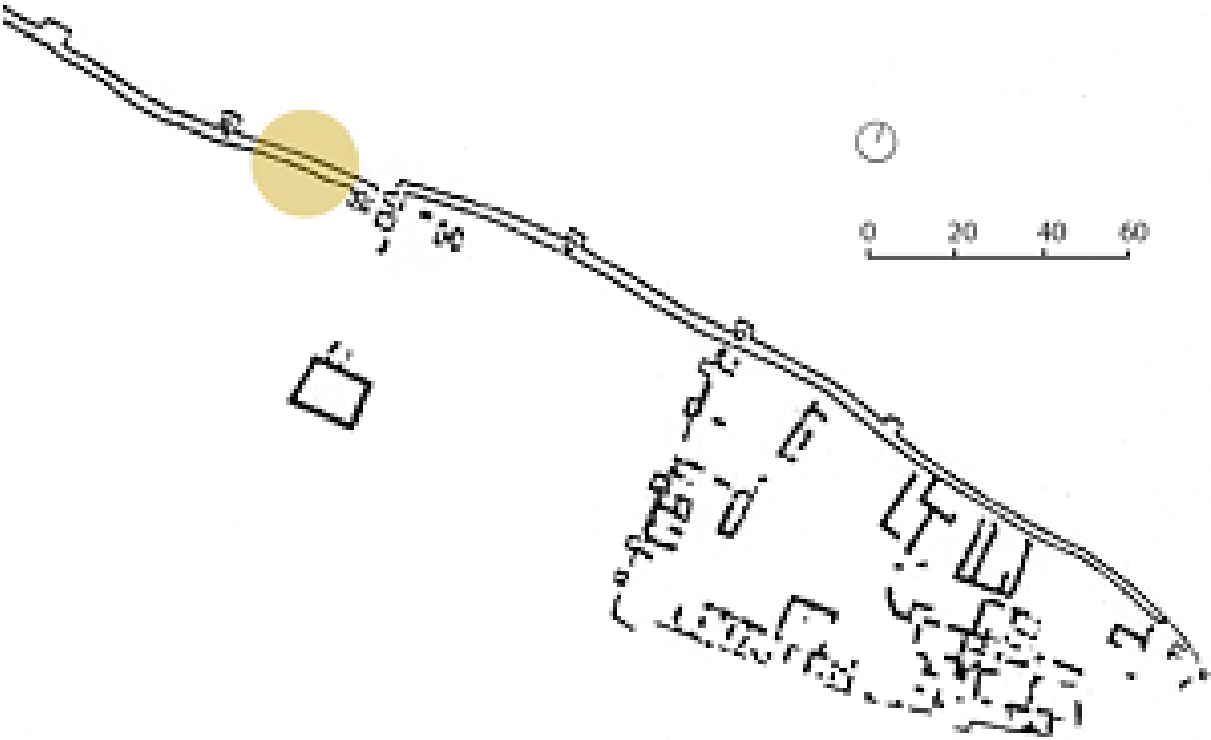


East side before restoration



East side after restoration

Reconstruction of the first 20 m of the West Wall, close to the gate (Supervision: Arch. Antonio Salvi)



Plan of the site Hamr al-Sharqia (Inqitat) with the intervention area



Consolidation of basement



North face, connection with west tower



Construction of regular rows



Geo-textile pose



Filling



Northern face during restoration



Terraced steps, in accordance with the existing southern front



East view, first half complete



Northern face



Cleaning of the southern face



Finish the filling with the soil



Terraced steps towards the walls better preserved

Step Five: Final situation



North side before cleaning



Project area after cleaning north side



Project area after cleaning north side



South side, the wall and the towers



West wall and towers from South-West



Connection with tower



Terraced steps



South Side



View on the principal street, north side east wall, east tower, west tower and west wall