The Restoration on Sūq Harāj (Antoine Fischfisch and Michel Daoud)

1. Description of the Architecture

 $S\overline{u}q$ Har $\overline{a}j$ and its immediate vicinity are among the most densely populated parts of Tripoli (**Fig. 1**). Two streets run the length of the $s\overline{u}q$, one, Zuq $\overline{a}q$ al- $S\overline{u}siyya$, is 2.50 m wide on average, the other, $S\overline{u}q$ -Har $\overline{a}j$ Street, is 5 m. The $S\overline{u}q$ -Har $\overline{a}j$ Street crosses the courtyard of $S\overline{u}q$ Har $\overline{a}j$ and is a commercial street; the narrower Zuq $\overline{a}q$ al- $S\overline{u}siyya$, situated in the northeast directly behind $S\overline{u}q$ Har $\overline{a}j$, is a residential street (**Fig. 2**).

The ground-floor of Sūq Harāj has been designed for commercial purposes, it has a row of 7 shops on its west and originally 14 shops on the eastern side, which is surrounded by a *riwāq* (gallery). The arcades of the gallery rest on reused granite pillars and open on the rear to the actual shop-boxes which are covered by barrel vaults. The courtyard is covered by large cross vaults supported by two columns approximately 6 m high (**Fig. 3**). The upper storey houses small apartments accessible through a dark corridor which runs along a mezzanine. The small rooms get their light from windows of different sizes and from skylights that catch the daylight. The flat roof originally made of stamped clay, is covered by a layer of cement (**Fig. 4: a-b-c**).

Over the years, several additions to the upper parts have been made, such as offshoots and annexes to the original volume.

The whole forms a clear and well-defined volumetric entity with the following surfaces:

- Surface of the studied area (building and inner courtyard): 583m²
- Surface of the building: ground-floor: 583m²
- Surface of the building: first floor: 488m²
- Surface of the building: mezzanine: 58 m²
- Surface of the building: second floor: 143m²
- Surface of the roof: terrace: 544.5m²
- Total surface of the façades without openings: 371m^2
- Total surface of the façades with openings: 688.6m²

2. Description of the Structure

In contrast to the structure of the upper floor, the ground-floor is harmoniously composed. Only rarely does a relation of structural continuity exist between the two storeys. This is probably due to a functional subdivision of the ground-floor to small units for the accommodation of a greater number of shops, and another, more spacious arrangement on the first floor in order to make room inside for provisional or permanent lodgings. Notice that on the ground-floor all original inner walls (60 cm thick) are supporting walls; most of those on the first floor are thin (~30 cm thick) and not supporting (**Fig. 5**).

3. Methodology: Approaching the Restoration

The methodological proceeding was based on scientific criteria:

- The documentation (in writing and in drawing)
- The setting: measured survey of the architecture, listing the deformities; diagnosis
- Proposal for the restoration (drawings and technical specifications)
- Establishing the building site and execution of the work

3.1 The Documentation

The documentation aims at assembling all detailed information, be it in writing, as graphs or photographs, needed to understand and diagnose the irregularities. In its totality this documentation constitutes a factual basis to be consulted for future research or restoration of the monument. For that reason, a database containing this documentation has been handed over to the DGA (Directorate General of Antiquities) as well as to the German Orient–Institut for their respective archives.

The documentation comprises all steps of an intervention, namely the initial state before the restoration, the operation as such and the final result (**Fig.6**).



Fig. 1- The location of $S\overline{u}q\mbox{-Har}\overline{a}j$ in the old city of Tripoli (Fischfisch/Daoud).

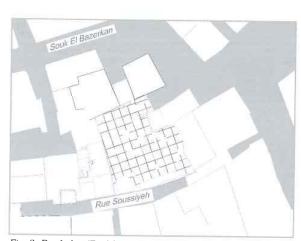


Fig. 2- Roof plan (Fischfisch/Daoud).

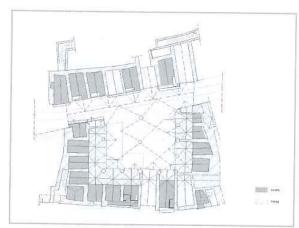


Fig. 3- Ground floor plan (Fischfisch/Daoud).

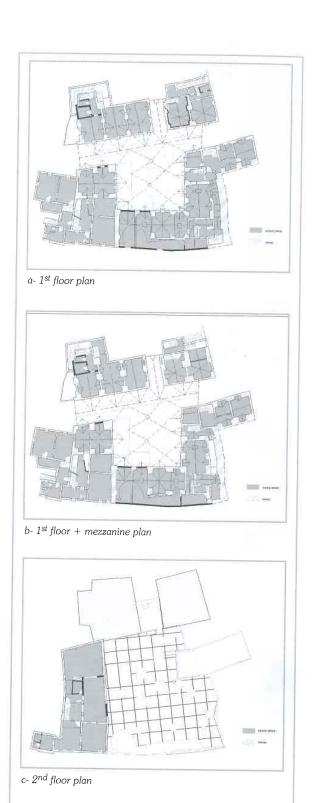


Fig. 4- Floor plans (Fischfisch/Daoud).

- Written documentation: Comprises written documents like the land register plans $(maq\overline{a}sim)$ or entries in the land register that help us to gain information about the history and the evolution of the monument.
- Graphic documentation: Graphic documents such as the drawings (plans, sections, façades, details) and sketches facilitating the understanding and "reading" of the building.
- Photographic documentation: The graphic analysis of the monument was accompanied by a photographic monitoring.

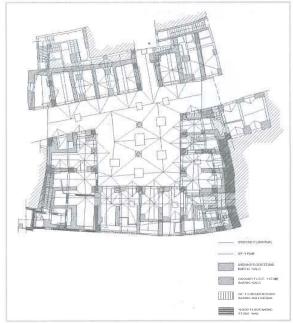


Fig. 5- Structural repartition plan (Fischfisch/Daoud).

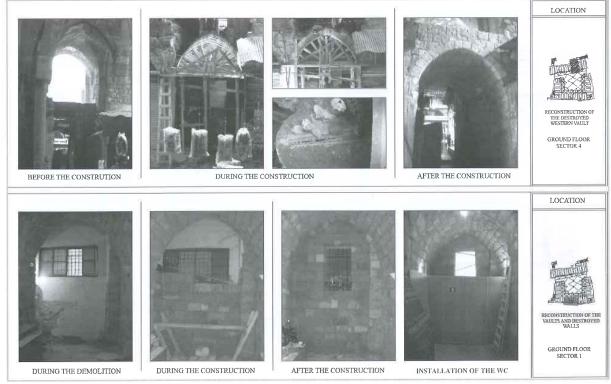


Fig. 6- Western passage and an eastern shop-box during reconstruction (Fischfisch/Daoud 2003-04),

3.2 The measuring Survey

The measuring survey consists of a graphic summary of the $s\bar{u}q$ in the shape of plans, sections and façades, covering every storey in order to facilitate the precise indication of the present state and the localisation of the various irregularities in the structure.

Four methods were used in the survey of the architecture:

- **1- Instrumental method:** For large plane surfaces a theodolite was used, operated by a specialized topographer. This planimetric method is indispensable in establishing the connection between the building and its environment.
- **2- Direct method:** The method of directly measuring the triangulations of the spaces inside the $s\bar{u}q$ is carried out using traditional measuring

instruments (rule, tape measure, plumb line, etc....) and referring to points (horizontal axes laid through the interior of the $s\bar{u}q$) chosen by the topographer.

- **3- Method used to document the details:** The details have been measured (point after point) with metrical rulers, plumb lines, tape measures etc. in order to document interesting architectural forms on a large scale (shop shutters, mouldings, arcades, vaults, capitals etc. ...).
- **4- Method of documentation by a technique close to photogrammetry:** The façades have been documented with a computer programme rendering results comparable in precision to that achieved by the direct instrumental methods. That allowed us to document all existing irregularities (**Fig. 7**).

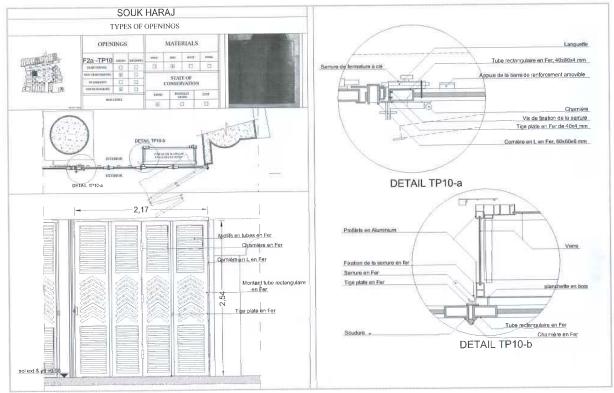


Fig. 7- Detail of a shop shutter south-eastern corner before restoration (Fischfisch/Daoud).

3.3 The Methodology of "Reading"

The $s\bar{u}q$ has been subdivided into 4 sectors every one of which has been analysed in detail starting from the present state of the surfaces, the façades, floors, ceilings, roofs and walls. The categories used for the description of the materials and the openings in the course of the sector analysis are the following:

- In very good condition = no need for restoration.
- In good condition = needs some retouching or painting.
- Recoverable = needs brushing up, painting or some partial changes: wood etc. The total of the renewed parts should not exceed 30% of the original ensemble.
- Not recoverable = may not be used, is in need of a complete change.

- Does not harmonize = should be changed completely.

Every part of the sector has been inventoried graphically, photographically and in writing. It has been identified by occupation, present function, the building materials used, their degree of degradation, the cause of the deformities, and the recommendations for restoration.

For example, sector 1-a, the southern rectangular block of the eastern side of the $s\bar{u}q$ with one façade to the inner courtyard and another façade towards the Zuqāq al-Sūsiyye: In the war years (1975 – 1990) this sector was hit by six grenades and most severely damaged. The outer façade (F1b) was destroyed in large parts, as were the vaulted galleries on the first floor, the roof, the ceiling and several shops on the ground-floor (**Fig. 8**).

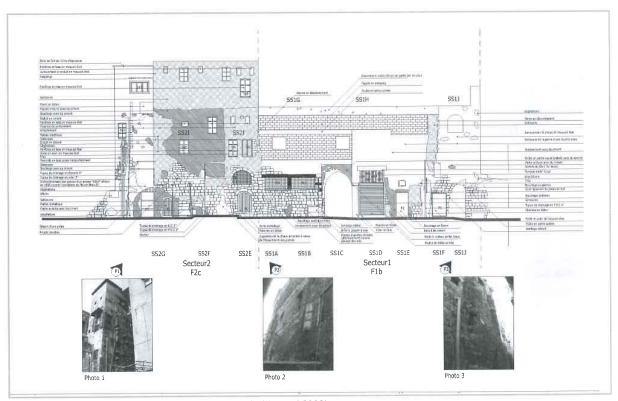


Fig. 8- Eastern street elevation before restoration (Fischfisch/Daoud 2003).

3.4 Condition of the Locality before our Intervention

3.4.1 Condition of the Structures

In general, the existent structures were stable, despite the relative height of the irregular cross vaulted roof ($\sim \! 10$ m) in the courtyard. The movement of the vaults has been more and more stabilized by the buttressing effect coming from the sides:

- North: by a courtyard house dating to the $18^{\rm th}$ and $19^{\rm th}$ centuries.
 - Southeast: by houses dating to the 19th century.
 - West: by the Suq al-Bazarkan.

But on the other hand, at two different places in the $s\bar{u}q$ the vaults have been destroyed.

The first place is the passage connecting the courtyard of the $s\bar{u}q$ with the $S\bar{u}q$ al- $B\bar{a}z$ ark $\bar{a}n$; the cause of the destruction is not known. The second place, facing the $Zuq\bar{u}q$ al- $S\bar{u}siyye$, was destroyed by grenades during the Lebanese civil war.

4. Analysis of the Locality's Condition and Strategy of the Intervention

In implementing the international methodology of conservation we stick to strategies, criteria and techniques that take into account the following factors:

- an evaluation of the historical importance of the $s\bar{u}q$ in general and of its architectonical elements in particular,
 - public security in a historical building,
 - reversibility of the intervention,
- the use of traditional techniques known from historical research, the "readings" of the monument and the analysis of the building materials.

All rehabilitation measures have been carried out with a view to the cultural value of the $s\bar{u}q$ and its traditional character. Given its historical complexity and its wealth of archaeological information this $s\bar{u}q$

is special as to its architecture and its value as national heritage - an importance demanding adequate studies and proposals for rehabilitation before any intervention to the building itself is started. We definitely needed to collect all information contributing to build the necessary foundation for facilitating the choice of remedial measures and for controlling the efficiency of the interventions. After several visits to the site and after a preliminary diagnosis of the structures we formulated a first estimate of the reasons of the disorder as well as the various aspects of the work for multi-disciplinary studies. The study of historical documents, of the architecture, a detailed inspection of the building, an examination of the construction and structures should provide us with all information needed for a proper analysis (Table 1).

5. Execution of the Work

Ever since its initial construction Suq Haraj has undergone much transformation, by adding to the volume of its architecture or by modifying the use of its spaces. Our conservation strategy consisted of keeping all modifications as testimony of the $s\overline{u}q$'s history and in adapting the new uses to that historical moment without obliterating the original structure. Our intervention aimed at keeping the ancient structure of the building alive and well, at the same time enhancing the key architectural elements that exemplify the various elements of construction (granite columns on the ground-floor, gallery in front of the shops facing the inner courtyard, etc.). Before starting with the work we had to take the needs of the owners of the shops or apartments and the way they made use of the spaces into consideration: we tried to meet their needs as well as to bear in mind the cultural and historical value of the $s\bar{u}q$, thus avoiding their direct participation that might not have taken into account the historical structure and its value. With that attitude we have always succeeded in inciting the people to find ways to meet their present interests or needs while, at the same time, preserving history, and we have made them see the technical and structural importance of traditional materials and their implementation.

Sector	Diagnose	Recommendations by priority
Sector 1	 Vaults destroyed by grenades. Infiltration of excess water through the roof. Floors and concrete covering badly executed. Openings in bad condition. Irregular and disharmonious restoration of the façade towards Sūsiyye Street. Dirt, micro-organisms and weeds appearing on the façade towards Sūsiyye Street. At the façades belonging to subsectors (SS1A) and (SS1B): cleaning and filling of the joints with cement. Serious fissures in the masonry and instability of the outer wall of subsector (SS1J). Electrical, sanitary and telephone installations badly put in place. 	In need of: Reconstruction of the destroyed vaults. Treatment of the openings, floors, façades. Stabilisation and reinforcement of sub-sector (SS1J). Treatment of the roofs where excess water comes in. Arrangement of the open-lying electrical, sanitary and telephone installations.
Sector 2	 Broken vault of the sībāt. Dirt, micro-organisms and weeds appearing on façade (F2a). Openings in bad condition. Infiltration of excess water through the roof. Electrical, sanitary and telephone installations badly put in place. Skylight blocked up with concrete. 	 Reinforcement of the broken vault of the sībāt. Treatment of the openings, floors, façades. Removal of weeds from the façade towards Sūsiyye Street. Making the roof and the terrace of the upper storey waterproof. Arrangement of the open-lying electrical, sanitary and telephone installations.
Sector 3	 Dirt, micro-organisms and weeds (F3b). Openings in bad condition. Some infiltration of water (SS3G), also at the façade (F3b). Skylight blocked up with concrete. Electrical, sanitary and telephone installations badly put in place. 	 Treatment of the openings, floors, façades. Arrangement of the open-lying electrical, sanitary and telephone installations. Making the roof waterproof. Reopening of the blocked-up skylights.
Sector 4	 Dirt, micro-organisms and weeds (F4a). Openings disharmonious and in bad condition. Vaults of sub-sector (SS4K) broken. Electrical, sanitary and telephone installations badly put in place. Appendages and structures belonging to sub-sectors (SS4K), (SS4H), (SS4L), (SS4M). 	 Treatment of the openings, floors, façades. Arrangement of the open-lying electrical, sanitary and telephone installations. Reconstruction of the vault of sub-sector (SS4L). Removal of all illegal and disharmonious concrete appendages from sub-sectors (SS4K), (SS4H) (SS4L), (SS4M).

Table 1- Diagnose, Recommendations, Results.

6. The Interventions and the Techniques Applied

As a general rule, the condition of the locality has been summarized before any intervention. The principal working-steps were as follows:

6.1 Cleaning

Cleaning the site from all kinds of debris; removal of weeds by tearing the creepers off the façades — manually, without applying any chemical product and, above all, without harming the historical stonework. Cleaning the structure from unsuitable materials means:

- Removing pieces of metal or fragments of wood fastened to the inner or outer walls – cautiously, not tearing them off so that the neighbouring stones will not be damaged.

- Removing the provisional doors and windows as well as all materials marked in the graphic documentation as blocking up the openings and skylights.
- Exposing the ceilings and other concrete structures, using manual tools in those places that are very near to ancient structures.

Before any exposure, scaffolds and props were erected for the safety of the workers (**Fig. 9**).

6.2 Replacement of the Stones

Once the scaffolds were erected we mapped the stones for the sake of identifying them and assembling all additional information as to historical subdivisions and the state of degradation. Replacement meant removal of the decayed stone and cleaning of the cavity, where then a new stone of the same kind and of a material quality identical with that of the old one

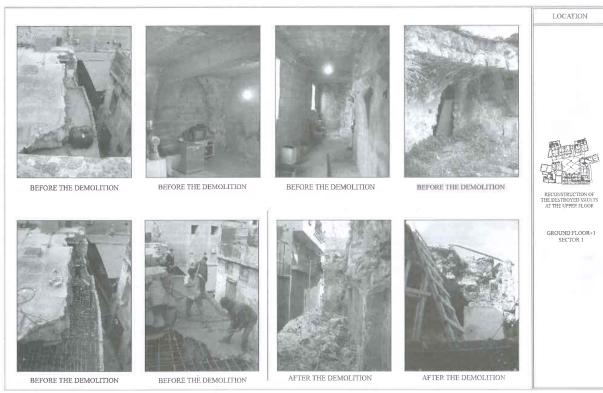


Fig. 9- Deconstruction of modern alternations eastside (Fischfisch/Daoud 2003-04).

was laid on a bed of traditional lime mortar. In order to make the colours of the old stones and the new ones more alike it was deemed necessary to apply a layer of patina – of natural composition, acid-free and reversible.

6.3 Erection of the Walls in Dressed Stones

This concerns mainly the east façade of the $s\bar{u}q$. The reconstruction included:

Preparing the foundation of sub-sectors (SS1A) and (SS1B) by laying open the original foundation and consolidating the destroyed parts with the help of a concrete anchorage. In that region a nylon cover

was spread to separate the archaeological level from our intervention. For the reconstruction in natural stones an adequate stone had to be chosen and put in place according to the traditional method. In order to differentiate the new building-measure from the original one we have provided leaden dating marks (size $5 \times 15 \times 80$ mm) all around the reconstructed surface and in every vertical joint between a reconstructed layer of stones and an old layer. Lengthwise the marks have been put perpendicularly to the frontal surface and pushed in deep between the stones so that their narrow side is at the same level with the mortar of the joints (**Fig. 10**).



Fig. 10- Reconstruction of eastern elevation and living units first floor (Fischfisch/Daoud 2003-04).

6.4 Treatment of the Roofs and Roof Terraces

The roofs has been protected by means of a waterproof cover of high quality and considerable longevity. A layer assuring adhesion of the two concrete beds has been spread; above it has been applied a multi-layered membrane (SBS, 4.5 kg/m²) of hot bitumen in connection with a heavy glass cloth and a polyester film protective against piercing and against weeds taking root. Finally the following layers have been put on top:

- A separating Geotextile layer (d=2) over the complete surface covered by the membrane.
- Thermal insulation of the terrace by means of $5\,$ cm of gravel.
- With the same end in view, concrete slabs have been put on concrete blocks in order to facilitate

access to and utilization of the terraces in front of the apartments and also to facilitate maintenance work. The top of the parapets has been protected by a galvanized metal sheet in the manner described in the plans (**Fig. 11**).

6.5 The Pavement

Inside the shops and in the $S\overline{u}$ siyye Street traces of the old pavement were visible. We supposed that the remainder of the pavement lay underneath the layer of concrete that had been applied at a later date. In order to find out, a team of archaeologists brought down archaeological soundings at those points where we expected to learn most about the former level of the pavement and how it related to the interior of the shops, and also about the relation of $S\overline{u}q$ Har $\overline{a}j$ and the adjacent $s\overline{u}qs$ (see article Meister / Karam).

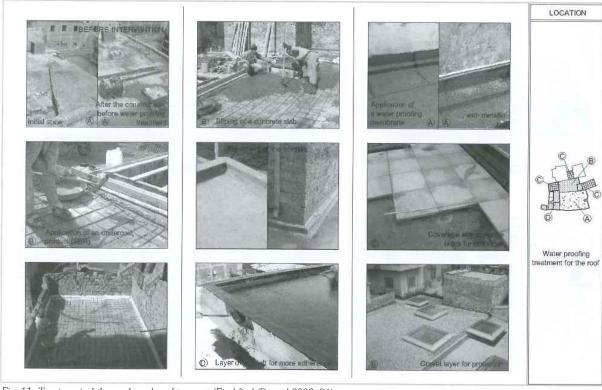


Fig. 11- Treatment of the roofs and roof terraces (Fischfisch/Daoud 2003-04).

The operation of removing the old pavement and laying the new one included:

- Removing the concrete layer without damaging the underlying pavement. The measure was supervised by an archaeologist from the DGA (Direction Générale des Antiquités) and the DAI (German Archaeological Institute).
- After a thorough cleaning of the complete pavement the slabs in situ were given numbers, they were photographed and manually deposited without breaking them.
- Above an insulating Geotextile a layer of coarse gravel (5 to $10\ \text{cm}$) was raised to a little dam in order to prevent the rising of water through capillaries in the humid soil.

- Another layer of 2 to 4 cm of fine gravel and more sand was spread to adjust the horizontal level.
- Putting back the old paving-stones by the numbers after they have been brushed with clean water and a plastic brush. A mixed cement mortar was used for the bed.
- Dating marks were put along the edge of the old pavement.
- The paving was completed with new stones 3 cm thick and in dimensions and texture identical with the old ones, as well as similar in colour.
- Lastly the joints were filled again with a mortar composed of natural hydraulic lime and river sand mixed with stone dust in order to come close to the colour of the old pavement (**Fig. 12**).



Fig. 12- Pavement hall (Fischfisch/Daoud 2005).

6.6 The Lime Plaster

It has only been applied to the outer façades of the shop walls and to the east façade as well as to the surfaces of the courtyard vaults. The operation included the removal of the old layer of decayed plaster without damaging the stones, cleaning the supports and the joints between the stones in order to strengthen the adhesion of the lime and the old stone support, the application of a first layer of plaster at 400 to 450 kg of lime for 1 m^3 of sand, the central layer of plaster had 350 kg/m^3 , the finishing layer had 250 kg/m^3 . On the vaults of the western part of the inner courtyard we found traces of the original plaster in situ and in good condition; we have cleaned the surface and carved a deep joint as a separating mark between the new and the old plaster (**Fig. 13**).

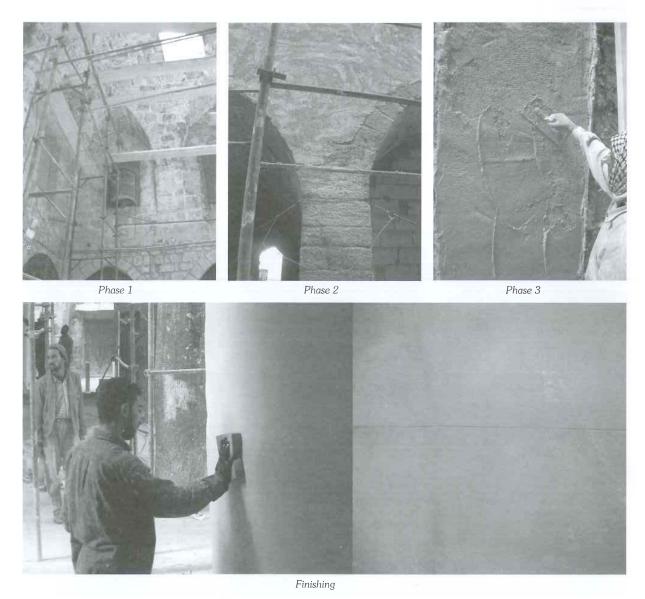


Fig. 13- Application of lime plaster (Fischfisch/Daoud 2005).

6.7 Consolidating the Stone Masonry

The damage caused by the grenades hitting mainly the eastern façade, and by the collapse of the sībāṭ buttressing the northern part of that façade has been remedied by a consolidation which meant filling the blanks and replacing the old mortar – broken by dynamic force or through the decay of its constitutive materials – by means of a new product, a binder injected like a thin mortar. That binder consists of a mixture of white cement and hydrated lime and is very fluid through the addition of a large quantity of water (Fig. 14).

6.8 Sanitary Installations

With regard to sanitary installations the measures included providing and setting the following elements and accessories:

- Water tanks holding 1000 litres for the apartments and the shops of the $s\overline{u}q$, welded water pipes made of galvanized steel, conforming to the DIN2440 norm, for the distribution of cold water to the households and of drinking water, as described and specified in the plans.
- The pipes laid in the ground were of Polypropylène (PPR) 20–25mm, conforming to the DIN 8077/78 norm.
- For waste water and for rain-water, pipes made of UPVC (ULPI) 4" with accessories of UPVC (READY) have been used. At two metres above ground these pipes have been replaced by cast-iron ones so that they will not be affected by any collision or dynamic force.
- The spy-holes in the ground (60x60 cm) were done in concrete with a cover in reinforced concrete, 6 cm thick.



Fig. 14- Reconstruction eastern upper floor and consolidating the stone masonry (Fischfisch/Daoud 2003–04),

- The connections to the terrace have been executed by means of pipes made of PVC or of galvanized steel, 2–3" thick. They dispose of rainwater from the higher terraces towards the lower ones or towards the drainage grid, also of PVC.
- The spy-holes / grids made of resistant PVC are 30x30 cm large. They are installed at the outlet of the pipes as indicated on the plans (**Fig. 15**).

6.9 The Canopies

The new canopies in front of the western row of shops are simplified in shape and material; they are executed as a slight structure of wood and zinc inspired by historical models and those of similar technical attaching without copying a certain historical period in every detail. Four canopies have been financed by the restoring architects, the CDR is going to finance the remaining four (**Fig. 16**).

6.10 Woodwork

Most of the wood used was qutrānī, put together and installed on the site as shown on the drawings and the illustrations of details. The wooden parts have been fixed to the walls in the traditional way, by means of wedges or by nuts made of galvanized steel. The wood has been treated beforehand against insect attacks; it has been painted in a green identical to that of the old windows of the $s\overline{u}q$. The metal parts in iron were treated against corrosion. They are identical in shape with the original parts. Relying on the documentation (written, drawn and, above all, photographed), those wooden parts that were lost, deteriorated, not recoverable by any restoring measure, or replaced in a manner incoherent with the historical ensemble have been replaced by parts identical in shape and dimensions with the original ones. The steel bars at the windows that were completely corroded have been replaced by identical bars.

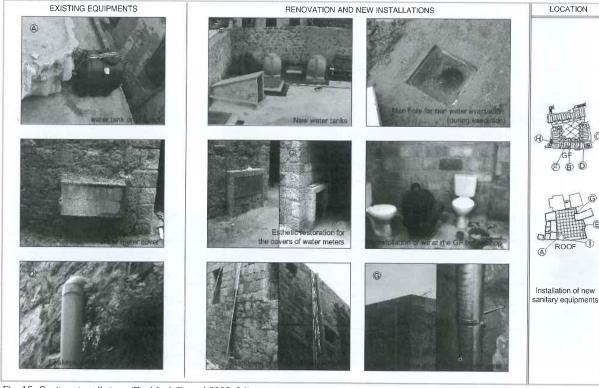


Fig. 15- Sanitary installations (Fischfisch/Daoud 2003-04),

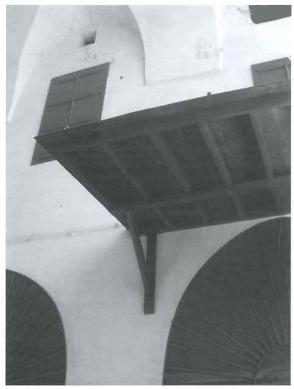


Fig. 16- Example of a canopy (Fischfisch/Daoud 2005).

For the sake of security the inhabitants of the $s\bar{u}q$ have replaced their old wooden doors/shop frontage shutters with new metallic ones; only few wooden shop shutters go back to the times of the French Mandate (around 1930). In meeting the needs of the $s\overline{u}q$'s inhabitants we have chosen a modern interpretation for the shop shutters, in harmony with the historical space but without obliterating the aspect and character of the building's architecture: we have installed shop shutters from metal covered on either side with panels of treated wood but with modern frames so that it is obvious that they are not the original shop shutters. In the north-eastern corner of the courtyard we have left in place two of the shutter lintels as a witness to the Mandate period (Fig. 17: a-b-c-d).

6.11 Metalwork

It includes mainly the window bars and tympana. The latter consisted of round smooth iron bars attached to crossbeams or frames made of flat iron. Most of the bars were in bad condition or had by and by been replaced by bars of modern shape and cut, that were not in harmony with the architectural and historical elements of the $s\bar{u}a$.

In those cases it was decided to replace the old iron bars while keeping as closely as possible to the traditional shape, material and manner of installation. In other words, we have followed a conception of reconstructing along an interpretation of the style of the early 20^{th} century, the time when the commercial space of the $s\bar{u}q$ was reorganized (extension of the shops towards the gallery, see contribution Weber). In case the iron was partially corroded or had undergone deformation or loss of joining elements we have restored it and applied several layers of anti-corrosive paint. The tympana above the shop-doors ($shamsiyy\bar{u}t$) have been reconstructed using a simplified model of those from the beginning of the 20^{th} century.

6.12 The Sky-lights

Concerning the blocked-up sky-lights of the first-floor corridor a modern technique has been used that will minimize the problem of maintenance (**Fig. 18**).

The same has been applied to the sky-lights of the $s\bar{u}q$'s large courtyard. All kinds of unsuitable covers (sheet metal, cement, wood, etc.) were removed from the openings and recovered with panels of laminated glass on an aluminium support in order to protect the interiors from rain-water and at the same time assure the necessary ventilation and lighting.

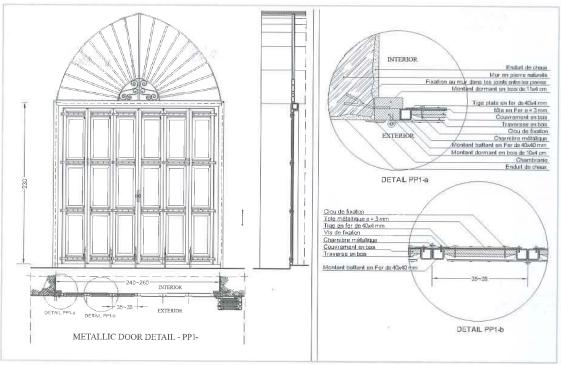


Fig. 17a- Technical drawing of the new shop shutters (Fischfisch/Daoud).

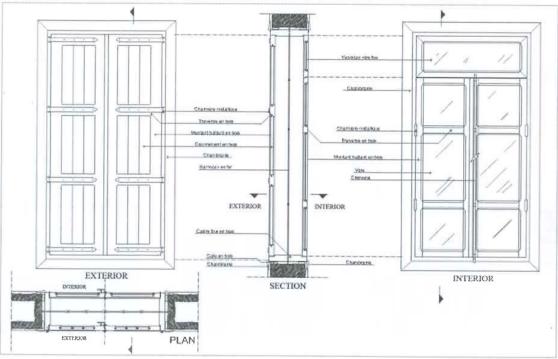


Fig. 17b- Technical drawing of windows and window shutters (Fischfisch/Daoud).



Fig. 17c- New shop shutters with old door lintels as a witness to the Mandate period (Fischfisch/Daoud 2005).



Fig 17d- New shop shutters with metal frames and panels of treated wood (Fischfisch/Daoud 2005).

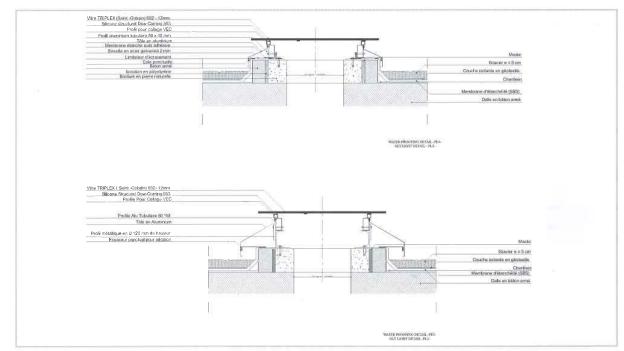


Fig 18- Technical drawing of the sky-lights (Fischfisch/Daoud).

7. Conclusion

The analyses accompanying this project demonstrate to which degree our urban and cultural heritage has, for decades, been neglected. Our intervention was a valuable scientific experience: on the field of techniques of conservation, as we followed the methodology and the international recommendations for the rehabilitation of ancient sites, and on the field of socio-economics, as we took into consideration the present needs of the inhabitants, encouraged cultural tourism and evaluated the living heritage of the $s\bar{u}q$.

As of now, with financial support from several organisations, local and international, such as the Farès foundation (part of $S\overline{u}q$ al- $B\overline{a}zark\overline{a}n$), the German government ($S\overline{u}q$ Har \overline{a}) and the World Bank (the remainder of the town), we have the hope that this town will one day emerge as an important centre of attraction for tourists – a development that would improve the living conditions of the inhabitants and create many of new jobs. But first of all we hope for a re-evaluation of the rich Lebanese urban heritage by the inhabitants themselves, filling them with proud and responsibility for their ancestor's cultural achievements – giving a city like Tripoli its unique place in human history.