The Building Arts

Introduction

The study of building typologies in Syria involves discussing details concerning construction techniques, materials used in construction and their availability in the local environment, as well as the methods used to prepare these materials in traditional architecture.

In general, the traditional building typologies required great precision in the use of traditional tools by craftsmen and technicians to achieve exceptional results. Slightly improved forms of these tools are still used nowadays: they have changed to adapt to new techniques in architecture, and in some cases give faster results though they are usually less accurate.

Completion time and factors that help the building process and the remaining techniques and methods used to complete the building process must also be studied.

Lifestyles change from one place to another, and the building materials that change according to availability in the particular area, produced different building typologies in different areas and cities. The building materials available in each area define the building typology as well as the shape of the buildings and their overall appearance. This can be clearly observed in rural architecture, as some villages use mud as a main building material, while others use rough stone constructions or wooden frameworks filled with earth. Furthermore, the building techniques used in mud architecture also vary in roofing methods: in the north, mud cupolas are used while flat roofs are dominant in the south. In cities, stone is the main material used in building; though a few other rare typologies can be found.

In this chapter, we will discuss the architectural features of traditional buildings in detail; this will be done according to a classification technique of building elements, followed by the different variations of these elements, and the consequences on a structure when changing building materials. This classification includes vertical elements (walls) and horizontal elements (roofs), renderings, openings, arches, etc.

Walls

- Stone Walls

Stone was the main building material used in most Syrian cities. It was also used to build houses in some villages where it is a widely available raw material, such as in Ezra'a.

Some masons specialized in building stone walls. In general, a number of masons were needed to build a stone wall, some of whom specialized in preparing the stone while the others built the wall. There were many types of stones, and they differed from area to area and city to city: limestone was used in Aleppo while limestone and basalt were used in Damascus. We will explain later why the stone used for the internal façade was different from the stone used for the external façade, and why some villages in the southern areas used different size rough stones for building.

- Ashlar and dressed quarry stone walls

Stone walls have been used in all types of buildings since the beginning of urban construction. They can still be found in the old cities of Syria (The Old City of Aleppo, The Old City of Damascus, The Old City of Homs...).

A variety of stones, such as ashlar and dressed quarry stone were used in building and constructing walls. The type of stone used differed according to the wall type and its function in the building, it could either be an internal wall or an external wall. In general, the stones come in large random shapes, which are then squared in the workshop and made into a standard rectangular shape.

The stones are laid in a mortar of mud and straw. The wall is built on a stone foundation, usually a trench in the ground around 1m deep. Then the wall is constructed with two stone facings, with a rubble and soil filling between them. The thickness of each stone facing is about 30 cm, and the width of the core is about 10cm: the complete wall is about 70 - 80 cm thick.

One exceptional type of hewn or dressed stone wall presents an alternation of colors in the stone courses. These walls were used in the old houses of Damascus because of their durability and beauty, and were especially used in the walls opening onto courtyards, giving these walls an aesthetic role. They can still be observed today in the main rooms and in the inner courtyards of old prestigious Damascus houses. These walls use three types of stone: Black basalt, which is strong and durable; White, yellowish, or reddish limestone that is less durable; Mazzi Stone (found in the area of Mezzeh), which is pinkish and quite hard.

The thickness of these walls ranges between 50- 90 cm and they can reach 30 m high in some houses. They are constructed on a rough stone foundation. After they are cut and grouped by size, the stone courses are laid in alternating colors (black, yellow, and white) in a pattern (coursed ashlar running bond). Lime mortar (exceptionally lead) is used to bind the stones, and these walls are not rendered.
- **Rough stone walls**

  These walls are often used in village houses, for example around Lattakia, where stone is used in building many different shapes and sizes of walls.

  The foundation that supports these walls is dug to a depth of 50 cm, and its width reaches 100 cm. The foundation consists of large uncut rocks with rubble packed in between them. The wall (a double facing grouted cavity wall) is then built on this base. It consists of two stone faces about 25 cm wide each. The core is usually filled with rubble and earth, mixed with straw. The complete wall is about 60-70 cm thick and plays an important insulation role. Mud mortar is used to join the stones together and is also used in pointing the external walls, to fill in the gaps.

- **Dry Stone**

  These walls are found in the south of Syria, where volcanic basalt rock is widely available. The ruins of basalt houses still stand today in the provinces of Daraa and Sueda, withstanding harsh climates and time.

  Ashlar is used for building walls. These stones change in color according to their mineral composition and are designed to withstand vertical and horizontal loads. The dimensions of the stones are about 37x 37x 70cm, and the thickness of the wall reaches about 70cm; they are laid in a running pattern. A trench is dug in the ground and is filled with hard rubble; then scaffolds are made to raise the heavy stones which are then laid in a running pattern.

- **Mud Walls**

  - **Mudbrick walls**

    Mud walls were used in building in both the city and the country and they can still be found in some buildings in the Old City of Damascus and a few villages in the outskirts of Aleppo and Damascus.

    Mud is the main building material in this type of construction: it is used in the body of the wall, in rendering and mortar. First the mud is prepared and mixed with straw, which gives it strength, and then it is put into formworks to form mud units that often reach the following dimensions: 10x40x20 cm. Mud mortar is used in bonding the mud units: both have the same contents but the mud used in the mortar is sieved and refined making it smoother and easier to apply.

    Mud walls are built on the very ground if it is rock. If the ground is loose, the wall is built on a stone foundation of about 50-75 cm deep and which rises about 50 cm or more above ground level.

    The wall is built on these foundations at a thickness ranging between 60-70 cm and the mud bricks or elements are assembled alternately: every two long units for one wide unit and so on. Finally, the walls are covered with a mud or lime rendering on the outside to make them smooth.

- **Rammed earth walls**

  These walls consist in courses of mud blocks: they are found in the Damascus region, and are known for their low cost and fast construction. Pebbled soil is put in formworks that slide along the walls: the formworks are 150 cm long and range from 80-90 cm high, the width ranges from 50-60 cm.

  The foundation for this type of wall is made from limestone and mortar 120 cm deep and 60-80 cm wide. The surface of the foundation is leveled, then the formwork is put in the corner of the building and filled with wet pebbled soil that is pressed and rammed with a stick, then the formwork is slid further to make another unit.

  In this building type, small stones are used to join the courses together. Finally, the walls are covered with a mud or lime rendering to make them smooth.

- **Woodframe Walls**

  These walls were used in cities and are still found nowadays in some villages. They are based on a wooden frame that bears and transfers the loads. In general, these walls are constructed on a continuous masonry base. In Syria, this technique is used for upper floors whilst the ground floor is constructed with stone walls.

  In general, the formwork consists of vertical columns that are systematically spaced about 25 cm apart, joined by
horizontal beams, and diagonal bonding beams that are crossed in an X shape to protect from collapse.

The spaces in the wooden frame are filled with mud units (dimensions of unit 17x17x10 cm) which are dried and hardened in the sun. These units are regularly laid at a 45 degree angle and are covered with a mud or lime rendering.

Openings, Arches and Associated Elements

In general, openings are divided into two groups: the first consists of doors and windows, the second consists of arches.

The shapes of these openings change according to style and age. Many different civilizations flourished in Syria leaving testimonies of their architecture on buildings and architectural elements, including the shape of openings and arches. In some exceptional circumstances, multiple architectural styles can be found in a same single building.

- Openings

The sizes of openings vary in stone buildings: the borders of these openings are either straight, curved or pointed. It is important to arrange the top part of the opening carefully so that it can withstand loads and transfer them to the jambs. The top part is called the “najafeh” (lintel) and the sides of the opening are called the “fakhdan” (jambs). Many different types of lintels can be found in old buildings, such as the one piece straight lintel, made of stone for the outside and wood for the inside. Flat lintels are also used when an odd number of stones are arranged carefully and locked into place, with a central stone called the key stone; the resistance of this type of opening depends on the shapes of the stones, their contact and fitting. The stones that rest on the jambs bear the greatest loads from the upper layers. A slightly curved lintel a semi circle arch, a pointed arch or a horse shoe are sometimes used as well, all structurally performing.

In general, the stone lintel is used on the external façade for all types of arches. On the inside, a wooden lintel is generally put 5cm higher: it consists of wooden logs arranged over the width of the opening, covered underneath with a thin wooden panel called “al twan” (sofit).

The openings in mud architecture are limited to doors and small windows, the largest of which is 1.2 x 0.9 m. Very small openings range from 20 to 40 cm wide and are 40cm high; these are only used for ventilation.

The lintel used in mud architecture is usually straight, though some arched lintels can be found in the villages around Damascus: these are made with a one piece wooden lintel crossing the width of the opening.

In general, the openings in traditional architecture are small on the external facade and larger on the inner facade, looking onto the courtyard; this architectural style is environmentally healthy and takes privacy into consideration; an essential factor in eastern architecture.

- Arches

There are many ways to construct arches: these change according to the different building typologies used in the Syrian areas, but in general they are mainly used to shorten the span.

Arches are frequently used in urban architecture and are widely used in the architecture of important buildings and religious structures. They are found in the entrances and passages of these buildings, and are used in houses on a smaller scale, mostly in the iwan. The shape of the arch changed with the change of architectural style and age.

Arches were used in rural stone architecture, especially in the architecture of southern area and the Damascus area, to shorten spans. These regions used rough stone to form the inner arches and ashlar for the arches on the external facades. Most of these arches were semicircle shapes transferring the loads to the base of the arch.

The arches that were used in Syrian architecture depend on the architectural style. Semicircle arches or transcending arches are used in the Umayyad era, with plant ornamentation and elements such as grape vines, palm branches, roses and tulips on their edges.
Pointed arches consisting of two sections, an upper flat section and a lower curving section, are originally Persian and were used in the Abbasid age. These were then further developed in the Ottoman age and were modernized, making the flat part of the arch more complex.

In the Mameluke era, pointed arches made of two joining arches were used, which had wide openings known as the “maghmous” type (a double centered 5-segmental span). A new type of arch was also popular in that period; it consisted of components making the arch look like a group of books tightly placed together; this style can be considered an advanced version of the ribbed arch.

- Kishks
  Kishks (wooden kiosks) are protruding windows that look like closed wooden balconies. They were used in traditional architecture to ensure the privacy of a house but let inhabitants see passersby and watch the street without being seen; they also provide natural ventilation. Kishks are considered an Ottoman architectural feature that spread in Syria in the Ottoman period.

  The wooden construction of the kishk rests on stone consoles; in modern constructions steel beams replace the stone consoles. Kishks were decorated simply; special attention was given to corners, cornices and the "oriel" (underneath the projecting sides of the roof).

  The walls of the kishk are composed of round wooden studs covered on both sides with wooden panels; the exterior panels are usually decorated with fine woodwork. The windows are usually integrated into the external wood construction; window types followed the historic period of construction.

  The ceiling is composed of wooden planks supported by wooden beams and covered with decorated wooden panels. Kishks also have a sloping wooden roof that is protected with metal sheets.

  We can differentiate several types of small kishks, such as secondary kishks mashrabias.

  The condition of the kishks nowadays is usually very bad due to exposure to weather and lack of maintenance. These factors have caused damage to the outer facades of kishks and in some cases have even damaged the kishk itself. A rapid treatment of the problems or pathologies lessens the amount of effort and the costs in the long run.

- Vaults and Cupolas

  - Vaults
    Roofing using vaults is an old way of covering large halls, crossing areas and passages; no matter how long they are, as can be observed in traditional souks.

  There are two types of vaults in traditional architecture:
  1- Barrel Vaults: also known as half cylindrical vaults.
  2- Cross Vaults: consist of two consecutive crossing and orthographic vaults.

  Stone is the main material used in building vaults; both types of vaults have the same building principle. They are structured on a wooden formwork that takes the shape of the vault; this frame is built up to the height of the wall and is supported by horizontal and vertical supports that hold
the arch-shaped frame. Mud or lime mortar is used to join the stones and give the whole structure stability.

The thickness of the roof ranges between 35-40 cm, plus the layer of earth filling used to fill the gaps that finalize the shape of the roof: this surface structure increases the thickness of the roof, thereby further improving its insulation properties.

- Mud Cupolas

Mud cupolas are used in covering spaces of mud construction. They are found in the countryside of the northern areas of Syria. Mud is the main building material used in this type of architecture and it is also used in rendering and binding.

Coarse earth is mixed with water and straw to make the main building unit that is shaped by putting the mixture in frameworks, 10x40x20 cm. These units are used after they have dried and hardened in the sun.

The thickness of a mud cupola ranges between 30-40 cm and its summit can reach 7 m high. The builder starts building the first course from the four corners of the space, the courses are arranged on top of each other towards the center, while mud mortar is used to bind the structure. The earth rendering is made from fine earth mixed with water and straw and is used to make the cupola smooth and help finish the shape.

- Stone Cupolas

Architects used cupolas as a substitute for the flat roof. Stone cupolas were considered one of the most important architectural features used in roofing: it covers the main spaces in mosques, churches, baths and some great houses. They were used in all Syrian cities and in some villages that used stone for building.

These cupolas take on different shapes: semi spherical, onion shaped or ribbed; they can also be an egg shape, depending on the dimensions of the space and the ratio of its length to its width.

Stone is the main building material: each stone is cut and smoothened to reach the standard dimensions of 30x30x25 cm. The formwork that is used to set the shape and degree of the stone’s curve must be prepared to give the structure a smooth surface from the interior and exterior. The stones are lined up on the formwork, in their final position, up to the final stone, which is called the key stone. The latter can be cut into a star shape, a round shape or a squared shape.

Lime mortar is the binding material used during construction; lime rendering is applied in the final stage on the inside facings.

- Wooden Floors

Wood has been used in roofing ground and upper floors in houses and important spaces; this type of roofing is widespread throughout Syrian cities and villages and is

Flat Roofing

- Stone Roofing

This construction type appeared a long time ago in the southern areas of Syria, thanks to the availability of basalt, which is used in roofing. This construction type is unique in the area and this technique has reached a sophisticated level, clearly observable in the major monuments in Bosra, Shabaa and other areas. The basalt rocks are cut to the right dimensions nearby hills and valleys where they are quarried, and it is no surprise the area is famous for its carving stone craft. In general, the construction system is based on rectangle basalt rocks called the mizan (the scale): their dimensions are 35x37x70 cm. They are used as side beams that rest on the walls, increasing the span on which the rabad (long stones that are set over the width of the space) rests.

The construction system of these roofings is set in such a way that vertical forces and the horizontal forces (earthquakes) are systematically dispatched, but to a certain limit. The experience inherited through history has played an important role in the continuity of this type of building. Locals have learnt to use the basalt rocks and have reached the ideal dimensions that can be endured by the hard basalt rocks, and the optimal span that can be tolerated by the stone without breaking. This explains why the dimensions of the built units over the centuries are almost identical.

- Al-Frouqios

Damascus
The Building Arts

considered an important architectural, constructional and aesthetic feature.

Poplar logs have been used in roofing since it was grown in the nearby fields and was available in large quantities in nature. Cypress wood, known for its durability, solidity and quality, was also used. The diameter of the logs used is about 15 cm: they extend to cover the width of the room and are supported on either end by the walls of the room.

In some cases, in important halls and prestigious houses, the wooden logs are covered with wooden boards called "al Tabak" of 20x120 cm and 2 cm thick, which are ornamented with colored or gold decorations.

- Thatched roofing covered with mud
This type of roofing is found in the Damascus region, in different shapes and styles according to the availability of raw materials, it can also be found in some parts of the Lattakia region and surrounding areas.

In general, it consists of main and secondary beams and covering layers of natural materials e.g. tree branches, reeds, cane, straw, wooden slats, etc. Poplar, lazab, and oak woods are the main building material.

The construction of the roof depends on a main beam, made of poplar wood with a 25-30 cm diameter. Extending above it, parallel to each other about 25-30 cm apart, secondary poplar branches (beams) with a 12-15 cm diameter are set. The covering layers of straw, reeds, leaves are then applied above. The span can reach 6 m and a layer of rough wet earth is applied over the top with a thickness ranging from 15-30 cm.

- Earth Rendering
Earth render is often used as rendering material for the external facades of buildings in which mud is the main material. Earth rendering is found in the region of Damascus and the outskirts of Aleppo.

There are two types of traditional earth rendering: coarse rendering and soft render. Both types consist of mud mixed with water, with the exception of straw addition (wheat straw, or barley), in the case of coarse rendering, to give it more cohesiveness. Coarse rendering is then covered with a layer of smooth rendering.

Mud rendering is characterized by its inability to withstand climate conditions and great need of regular renewal and fixing.

- Washes
Whitewash is used on stone and mud walls; it is usually liquid. It is made from limestone that is soaked in water for a couple of days until it is ready for use. It is applied in one layer and produces a bright white color and a pleasant smell. In village houses, it is used instead of paint on the inside walls.
In general, whitewash is used to conserve the main material of the wall and helps ensure the durability of the building, protecting it from moisture.

**Evolution and Transformation**

Some formal transformations that modify textures can affect the aspect of a construction. The general shape of a building changes according to the typology, the area, the materials used, and the coating technique. In some typologies, earth and lime rendering have been substituted with cement plaster, which gives the building a different appearance, and also keeps the stone from breathing properly. If the rendering is not periodically renewed, it will fall off and ruin the appearance of the building; the reasons for this neglect can be poverty or inexperience.

**- Materials and Know How**

One of the most important reasons for changing the typology and/or the construction technique of a traditional building is the change in the materials used, the lack of expertise and the shortage in skilled craftsmen who master the different typologies, and are able to produce the same quality as in old buildings.

For example, a mud cupola can be replaced with a flat wooden roof, covered with tree branches and canes, in turn covered with reinforced concrete, which is appreciated for its fast hardening, high resistance and durability. Another reason for the use of concrete is a lack of expertise to build, repair or maintain mud cupolas.

This also applies to other architectural features found in the old city, such as stone cupolas and dome vaults, which are also replaced with cement structures for the same reasons.

---

Other elements were also replaced: for example lime rendering is often replaced with cement plaster, because lime rendering takes time to prepare, hydrated lime must be made, plaster is slow to prepare and needs time to set between two applications. Cement plaster is quick to prepare, apply and dry but in the end, lime rendering is still the best quality material for a use on traditional buildings, allowing for the structure to breathe and for the humidity to migrate out from it.

**- Conclusion**

Looking at the current state of traditional architecture in Syria, we notice that it suffers from many damages inflicted upon it by the wear and tear of time, worsened by weather damages and neglect; this is especially true in rural areas, whereas some cities have lately started rehabilitation and maintenance programs to preserve their traditional architecture. In Aleppo, a program for the rehabilitation of the Old City of Aleppo has been initiated while a similar program has also been established to preserve and maintain the Old City of Damascus.

But these programs were only initiated after the housing stock had already suffered from damage and neglect. The traditional housing stock is now in need of considerable care and professional effort to reach a good level of restoration. Although a lot of effort is being put into rehabilitation programs, they still lack the experience and the know-how in rehabilitation techniques. However, the development process is steadily underway, and progress is being made to reach a good level of rehabilitation and expertise.

Cases are different for traditional architecture in rural areas and in Syrian cities: the wear of time has taken its toll of buildings which suffer from neglect and damages. Another important factor is a shortage of craftsmen and technicians specialized in traditional architecture, due to a development of new building techniques that neither use these traditional crafts nor support them. Furthermore, there is a tendency towards replacing the traditional building materials with newer, more durable materials that are faster to implement, but they lack quality, and do not fulfill all the requirements that the traditional materials and building techniques used to, such as thermal and acoustic insulation.

It was also noticed that, in some cases, the residents themselves didn’t want to use the traditional architectural forms. This was either because they wanted to follow modern lifestyles, or because of high renovation costs, or was a result of their ignorance in rehabilitation and rebuilding techniques. In addition, most of the experienced builders and craftsmen in the traditional forms have left Syria for different reasons; this has been a major setback for the continuity of traditional crafts.

Therefore, more light must be shed on this problem and more attention should be focused on traditional architecture in the city and the countryside, and experienced work teams should be assigned and trained to maintain and rehabilitate traditional buildings according to suitable rehabilitation techniques.