THE HISTORIC
CENTRE
OF

SHEKI

WITH KHAN'S PALACE

RESTORATION MANUAL

The document was developed by IPOGEA Traditional Knowledge Research Centre, former and Tourism Ministry of Culture of the Republic of Azerbaijan in 2011-2015.

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After the inscription of the Historic Centre of Sheki into UNESCO World Heritage List on July 07, 2019, the Restoration Manual was revised, with the consent of the authors, by the State Tourism Agency and the Reserves Management Centre under the State Tourism Agency in 2020.

State Tourism Agency of
the Republic of Azerbaijan

RESERVES
MANAGEMENT
CENTER

United Nations
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Cultural Organization

Historic Centre of Sheki with the Khan's Palace inscribed on the World Heritage List in 2019

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Foreword

The Historic Centre of Sheki with the Khan's Palace was inscribed to UNESCO World Heritage List on the 43rd session of UNESCO World Heritage Committee. According to UNESCO's final decision regarding the Historic Centre of Sheki with the Khan's Palace, the Restoration Manual, which was developed in 2011-2015, was required to be translated and updated. As the Historic Centre of Sheki with the Khan's Palace is located within the boundaries of Yukhari Bash State Historic-Architectural Reserve under the State Tourism Agency of the Republic of Azerbaijan, the Restoration Manual was translated into Azerbaijani and revised by the State Tourism Agency (STA) and Reserves Management Centre (RMC).

The Manual contains rules and instructions prepared for all competent persons and institutions involved in the restoration and preservation of the Historic Centre of Sheki. The main purpose of the Manual is to draw attention to the culturally significant buildings and their construction systems. The Manual provides specific proposals for the restoration and maintenance of the urban fabric of Sheki based on the research on historical and architectural traditions, and information obtained from local architects, engineers, and builders.

The Restoration Manual reconstructs the typological and constructive system of the city together with the traditional housing landscape of Sheki through images and original drawings. For each item, the historical forms and structures, the degradation factors, the conservation and restoration requirements, and the indicators of correct re-use and evolution are analysed.

According to the experts of the Reserves Management Centre of the State Tourism Agency, the focus of the Restoration Manual is mainly framed by typologies, traditional construction methods and their modern application. The detailed information about the monumental buildings, natural morphology of the reserve, and various buildings in the previous version of the Manual is already incorporated in the Conservation Plan of the reserve, so the relevant adjustments were made accordingly and recurring sections were taken out from the Manual.

The Manual was developed and made possible by the former Ministry of Culture and Tourism of the Republic of Azerbaijan (the Ministry of Culture since 2018), "Azerberpa" Scientific Research and Project Institute, the Executive Committee of Sheki City, Yukhari Bash National Historic-Architectural Reserve, architects Sehran Mammadov and Mammad Usubov, members of the Council of Elders, and the representatives of the local population. The Manual was fully revised and amended accordingly by the architects and cultural heritage specialists of the Reserves Management Centre under the State Tourism Agency in 2020.

Urban Ecosystem in Sheki

The modern Sheki is in the valley created by Kish and Gurjana rivers and a network of channels and surrounded by the Greater Caucasus Mountain Range. The Historic Centre of Sheki with the Khan's Palace (later reffered as the historic city) which is within the boundaries of Yukhari Bash National Historic-Architectural Reserve, stretches from the Dayirmanarkh channel along the bed of the Gurjana River to the Sheki Fortress and Mustafabey forest. The reserve area is surrounded on three sides by mountain slopes covered with bushes and forests. When viewed from above, the roofs covered with ceramic tiles make it difficult to distinguish between residential and public buildings. Only mosques are distinguished by their minarets and caravanserais by their large scale.

The Site was completely rebuilt on a new ground after the devastating flood of 1772 and still has a mostly homogeneous and easily recognizable urban texture. The urban landscape of the Historic Centre of Sheki has preserved and developed local construction traditions and building techniques while responding to continuously evolving socio-economic conditions. The Restoration Manual covers information on technological norms, methods, construction materials and their use in the construction process in accordance with these centuries-old traditions.

The Site preserves the visual integrity of the Historic Urban Landscape surrounded by mountain slopes. The buildings constructed after the 1772 flood were built in accordance with the features of traditional construction techniques. The monumental buildings of the city further expanded their scope and decorative aspects, reflecting the main elements of traditional architecture.

Every stage of the development in urban planning and architecture results in the evolution of buildings of different functions and their acquisition of more complex forms. Evolving socio-economic conditions create more complex structures to meet emerging needs. Traditional residential houses in Sheki also functioned as silk production workshops – multifunctional interiors with verandas, storage rooms and roofs were adapted to these needs. Structure and development of houses considered not only the needs of daily life and agricultural production, but also religious rituals (qibla). Thus, the combination of fascinating nature and ancient construction culture resulted in a unique urban landscape in Sheki.

Surrounding landscape and climate with abundant rainfall are important factors for the general perception of Sheki. The morphology of the urban fabric and its growth patterns were a direct result of the topography of the site, political and religious reasons, economic development, and related activities. Architectural styles were influenced by trade relations along the Silk Road, particularly with Iran and Ottoman empire during the Safavid and Qajar eras, and the later by the Russian rule. Every house has its own garden which is reflected in the general characteristics of the urban planning. These gardens create a distinctive and coherent visual integrity of Historic Urban Landscape.

The Site is divided into neighbourhoods (mahalla) with their own public squares, mosques, and bathhouses (hammam). Every neighbourhood has their share of workshops, shops and stores, industrial facilities, and schools together with residential houses. The main public and commercial artery of the city. (Akhundzade Avenue) is stretching along the Gurjana river starting from the area where Gurjana river flows into the Dayirmanarkh channel. Toward the end of the high street and at the highest point of the city, there stands a fortress built to observe the surrounding territory. Initially, Sheki emerged as a feudal fortress-city with stone walls and moats, several gates, mosques, houses, and shops, as well as silk and craft workshops. The city walls have not survived, but the city itself and its keep have preserved their integrity.

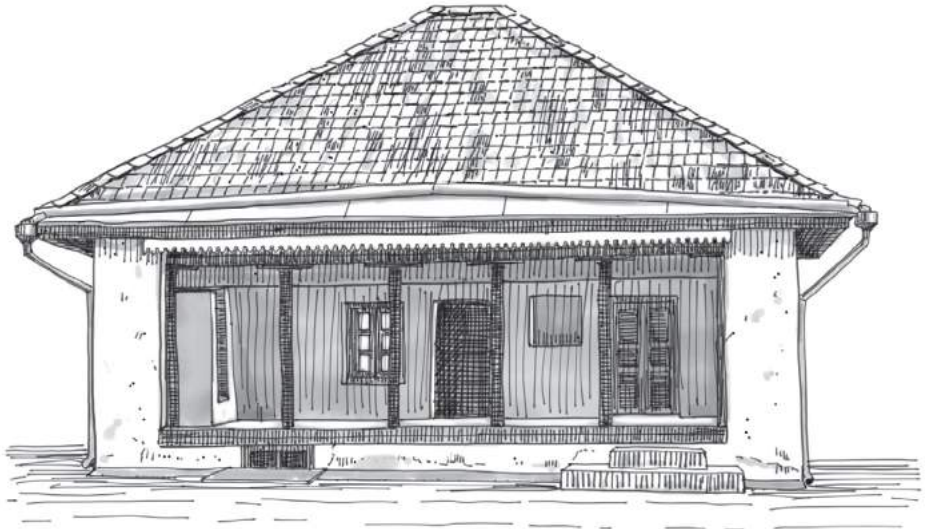
The Site, which is now part of the wider reserve, receives its water supply from Deyirmanarkh channel taking its water from the Kish River, and an earthenware pipeline network (Tajlig) taking its water from mountain springs that feed the Gurjana River. Tajliq water supply network covers all private houses and land plots throughout the Historic Centre bringing water from its sources through ditches and underground tunnels and ends in the Gurjana River and the Dayirmanarkh channel. The old water mills on the Deyirmanarkh used to supply the neighbourhoods with flour.

All residential houses were adapted to agricultural production, especially sericulture and silk production. A typical house faces the street on one side and the adjacent land plot on the other side, thus creating an unusual perspective for a garden city. Load-bearing timber frame system was widely used in the construction of early buildings in Sheki as it is in a seismic mountainous area. This constructive technique gives elasticity to the thick walls and neutralises vibrations during earthquakes.

I. Architectural typologies

FIGURE 1: Architectural typologies of the residential house.

1.1.Residential houses



New buildings in Sheki after the flood of 1772 were built on a new ground but in accordance with centuries-old constructive traditions. The streets are narrow and bent with a lot of blind alleys characteristic of mediaeval urban planning.

One of the main reasons for the picturesque landscape of Sheki is its urban texture being closely connected with surrounding nature. Despite the organic formation of the urban texture, it has an architectural integrity. The reason for this was the simultaneity of its construction on a new ground, and a single development of the buildings in the dense greenery of the gardens. Residential houses with their adjacent gardens are one of the main components of the historic urban landscape (Figure 3).

Local natural and climatic peculiarities and construction materials had an influence on formation of traditional residential houses in Sheki. Most often the house is located on the side of a cone alluvial, at the bottom of a mountain. For this reason, the slope is one of the factors that affects the building typology. Houses in Sheki have the long side that follows level curves, and in this way, the slope is mitigated, and the ground is made flatter (Figure 2). The ground floor of a typical house is always raised from the ground due to the heavy floods affecting the area. The 1772 flood that swept away the previous settlement, where the buildings had fragile mud and wooden walls, still effects the memory.

FIGURE 2: Typical house in Sheki with the longer side parallel to the level curves and the first floor partially underground

Closed layout of the residential house and its garden, which is traditional for Sheki, isolates it from the outside world in a manner characteristic for the mediaeval urban planning. The house has an adjacent land plot with a garden, which is reflected in the general character of the urban planning. Mulberry trees are dominant elements in the garden and their leaves served as food for silkworms. Under the Soviet administration, and at present, the spatial organization of the city did not undergo major changes, but new regulations were introduced for building permits. The adjacent land plot can be 600 square metres at most . In accordance with the detailed regulations on zoning, type and scale of construction set out by the Urban Planning and Construction Code of the Republic of Azerbaijan, only a section of the adjacent land plot can be allocated for building and the remaining area should be kept free from any construction. These regulations allow the preservation of private gardens and the general urban structure in the Historic Centre.

Mountainous area and its high seismicity determined the nature of a constructive solution for the housing. Anti-seismic properties of buildings are reinforced with timber framing in mudbrick walls, and brick belts and post in walls built from quarry stones.

Residential houses were built using mudbricks and covered with ceramic tiles. Initially, all houses, including those owned by the rich and the ruling class were built using mudbricks but the socio-economic development in the following decades resulted in the utilisation of more durable materials, such as quarry stones and fired bricks. All these construction materials (quarry stones, fired bricks and mudbricks) can be observed being used in Sheki today – sometimes in the same building.

The basic housing type is an elongated building with two rooms and a deep veranda, called seyvan, facing south or south-east, and covered by ceramic tiled steeply pitched roof. Houses can be enlarged by adding new rooms or floors, but the layout and key features of the house remain unchanged. Single-storey or two-storey houses often have the same layout. The outer walls are built of mudbricks, fired bricks, or stones, and plastered using lime plaster mixed with ochre-coloured solution. This type of construction is also found in nearby districts with similar nature and climatic conditions.

FIGURE 3: A view of Sheki from the mountains

[1]The land plots for suburban houses can be 1,200 square metres.
[2]According to these rules, the construction coefficient of the area under individual houses in the land plots can constitute no more than 0.2 of the total land plots. See the Decision of the Cabinet of Ministers of the Republic of Azerbaijan on approval of the Detailed Rules on Zoning of territories, type and scale of construction", Article 4.13.

The gate (darvaza) is also an important architectural element of the residential house. The gate is made of wood in a form of arche and decorated by ornaments carved on wood itself or metal ornaments such as takkulbab (door knocker), handles, etc. The columns of veranda have a special place in the decoration of the house. These columns are often decorated with carved elements. All houses have attics where silkworms were once bred, or fruits are dried. Decorative wooden cornices in high attic roofs can be found even in ordinary houses and they reach the highest level of decoration and artistic value in the Khan's Palace and the Khan's House. The windows in more wealthy houses are decorated with fretwork called shabaka (Chapter 2.3.1). The interiors of residential houses are characterised by the abundance of wall niches of different forms, sizes, and functionalities and all the household utensils are kept there. Also, the mantelpieces (bukhari) display a high level of decorations (Chapter 2.2.5).

1.1.1. Single-storey house with garden (basic type)

The basic type of traditional house has a rectangular layout. In these houses, one side of the building opens into the garden along the entire length of the wall. According to the local way of life and worldview, the entrance of the house and the facade facing the garden should face south or southwest to make the best use of the climatic conditions. Due to the religious factor, one wall of the house faces Mecca (qibla). One of the outer walls of the house may overlap with the boundary walls of the garden (in this case, the outer wall of the house serves also as a boundary wall) or it may be slightly inward from the boundary wall parallel to it inside the garden. The wall of the building facing the street is usually without windows. Even if there are windows facing the street, they are usually built high so that the inside is not visible. The yard where the house is located is enclosed with a stone wall 200-300 cm high along the perimeter (Chapter 2.2.9). An elegant entrance gate opens to the main street (Chapter 2.2.3).

Because the houses are built on a slope, there is empty space under them - a basement. The basement is also used as a warehouse for storing agricultural products. Having a thick-walled basement or being elevated also increases the resistance of the house against floods. Historically, the basement or ground floor were paved with clay over rammed earth.

The foundation is usually of quarry stones (Chapter 2.1.1) and walls are of quarry stones, river stones or bricks. The walls of the house are usually 80-100 cm thick. The wooden attics of the houses have an inclined slope (Chapter 2.1.3). The attic is used for storing agricultural or livestock products.

Figure 4: A single-story house with a garden near Sheki

The rooms have low ceilings and narrow door and window openings that may be designed to reduce heat loss during the winter months. In the past, people slept on reed rugs (hasir) laid on the floor or couches. In the mornings, the function of the rooms used to change as so blankets and rugs were piled up inside the niches and arches, creating more space in the rooms (Chapters 2.2.7 and 2.2.8). Numerous arches and niches not only lightened the walls but also increased the anti-seismic resistance of the building structure. In the past, houses did not have private bathrooms, so people frequented public bathhouses. Currently private bathrooms are built in the yards.

From the point of view of production, the house is also a productive asset (Chapter 4.1) where a garden and a sunny veranda (2.2.1) play an important role in production[3].

1.1.2.Two-storey house

Two-storey houses belonged to the wealthiest part of the population, who built their homes in the upper, more prestigious part of the town.

The house is built on a foundation of quarry stone which gives it an elevation and the main walls start at a height of 80 cm above the ground level. This allows the house to have a basement, which increases the resistance against floods. If the ground floor is not built above the basement, then its floor is paved with fired bricks.

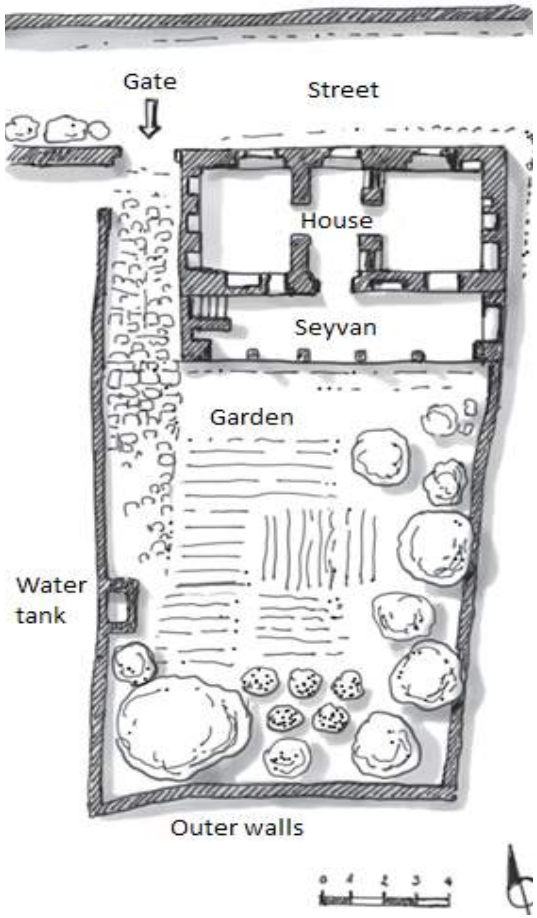


FIGURE 5: Single-story house with a garden

The structure of the floors is assembled from simple or complex wooden constructions depending on the weight of the load. The wooden beams of the floor, which sometimes are visible from outside, intersperse with the wall structure from the outside, levelling it and giving it an anti-seismic function thanks to the elasticity of the wood. The lower part of the ceiling constructions is made of thicker and thinner planks, and the upper part is made of plywood. The ceilings are sometimes covered with a layer of rammed earth.

The walls of the ground floor (80 cm in width) is built of stones or fired bricks, while the first floor is often built using mudbricks for being lighter and having qualities of thermal insulation. Thus, a characteristic feature of two-storey houses is the lighter construction of the upper floor.

Compared to the first floor, the windows on the second floor are larger and can absorb more light. The window openings are in a rectangular form. In this house type, windows are also found on the walls facing the street. In addition to the veranda (seyvan), which comes from the basic type, there are also balconies (eyvan) of different forms and types.

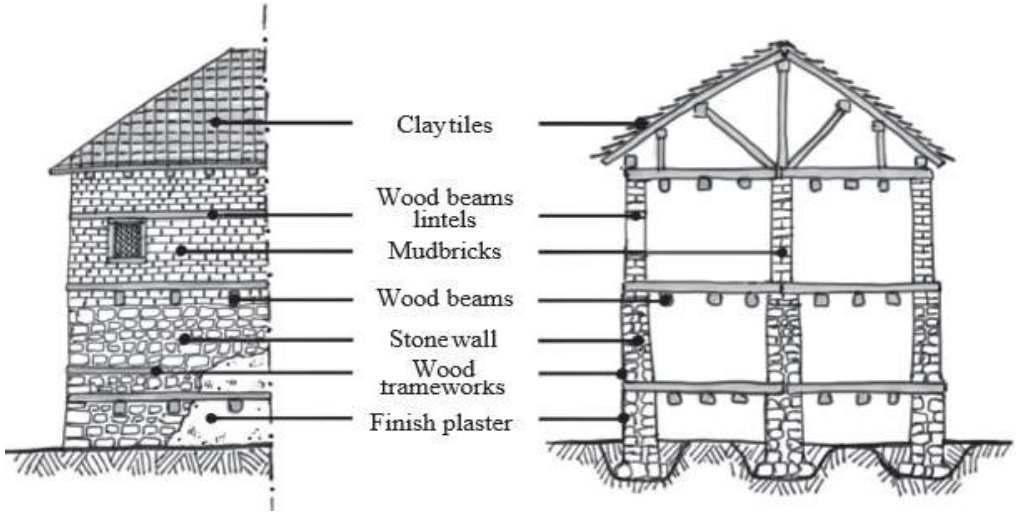


FIGURE 6: Traditional typology of the two-storey houses.

FIGURE 7: Traditional house with a veranda and basement

[3] The plan of a single-storey house with a garden (Figure 5) is taken from this publication: Бретаницкий Л., Датиев С., Мамиконов Л., Мотис Д., Нуха. Сокровища зодчества народов СССР. Moskva, 1948, с. 35.

1.1.3.Three-storey house

Three-storey houses have been constructed since the 19th century. Mudbrick and timber beam typology in these houses, especially in the public buildings is replaced by fired bricks and quarry stones. The façades have plenty of decorations made of combinations of stones and fired brick. There are several examples of this type and most of them are located on the main shopping street (Akhundzade Avenue).

The entrance has become more functional (external gates disappear). The ground floor of a three-story house was usually designed as a shop or living quarters for workers engaged in silk and tobacco production.

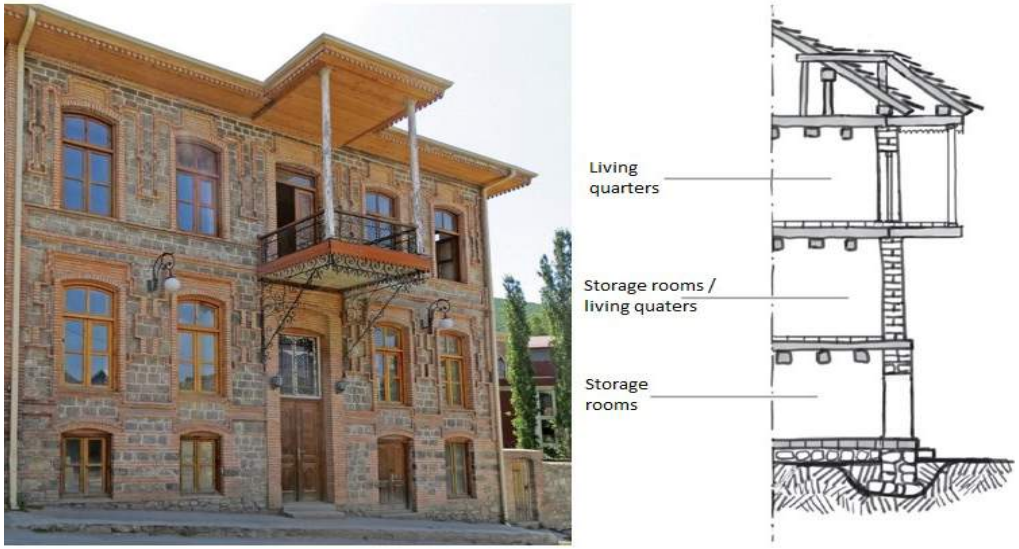


FIGURE 8: Traditional typology of three-storey house

The number and size of the rooms in these buildings are increasing and the buildings have their summer and winter sections. This type of houses tends to have balconies, which enrich the contour and scheme of the façades, rather than traditional verandas. Balconies are facing the street. Thus, there emerges a new type of house, which is facing the street, in contrast to a traditional house whose façade is facing the garden. However, walls made of traditional materials, balconies, high roofs, attics, and large courtyards are also preserved in such houses.

Rising economic prosperity has resulted in more rich decorations on facades, windows, and other elements of the house. These houses were mostly built during Imperial Russian period and were products of Russian influence on local architectural traditions.

1.1.4.Durability and transformation of basic types

The research in the area showed that only 4,2% of public and residential buildings are remnants of the Khanate period (1748-1819). 60,3% of the buildings were constructed during the Imperial Russian period (1819-1918) and the period of Azerbaijan Democratic Republic (1918-1920). 33,4% of the buildings were built during the Soviet period (1920-1990) while 2,1% were constructed during the independence period of Azerbaijan (starting from 1991)[4] .

[4] J. Jokilehto, Management Plan. Baku, 2015, p. 23

The development of these typologies is based on the transformation of the most ancient house (basic type), characterized by its simplicity, because one floor consisted of two communicating rooms. Each room had maximum dimensions of 4.5 x 6.5 metres, depending on the warping of the floors and the dimensions of the timber beams. Both rooms opened into the veranda, which had a maximum depth of 4,5 m. Only entrance into the house was through the veranda. In the interior there were many wall niches used to store the usual objects of the household.

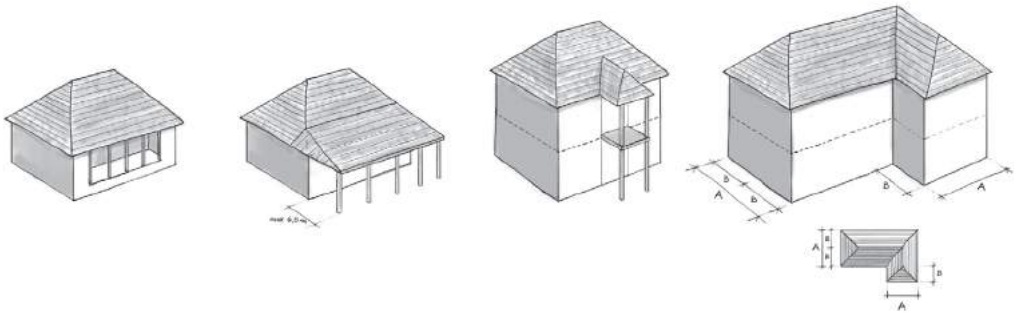


FIGURE 9: Development of house types in Sheki: a) simple house with veranda; b) evolved house with veranda; c) two-storey house with a balcony; d) two-storey house of L-shape.

When additional space was needed, new rooms of the same size and features were added to the same floor of the main building. At the same time, the verandas were built up (thus turned into another room) to gain additional space or they were moved to the wall on the narrow side of the house. As a result of these transformations there was a lack of natural lighting in the rooms. New windows had to be opened or their numbers increased on all four façade walls to solve the problem.

Another transformation of the basic type is the addition of a new floor with external wood stairs and building a balcony over the veranda. Thus, the size of living quarters is doubled. The number of niches and windows are added to lighten the walls on the upper floor.

As a continuation of the transformation, as with one floor houses, the veranda begins to be closed to obtain, in this way, another closed space, and it is moved on the short side of the house. Consequently, the new stairs are added inside the house. Only in few cases, houses with already two floors are changed or totally rebuilt to add the second floor. In this three-storey house typology, verandas are replaced by balconies.

EVOLUTION OF THE BASIC TYPE

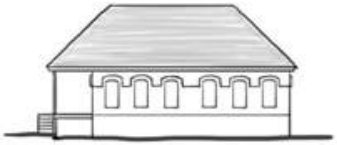
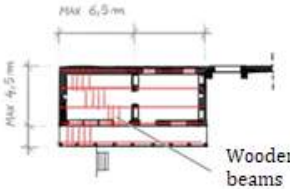
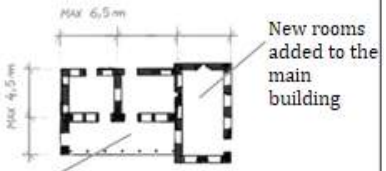
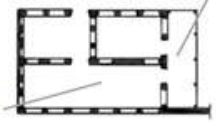
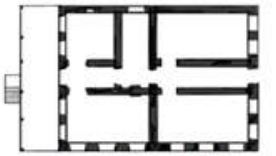
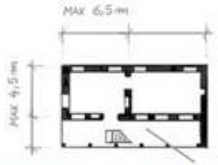
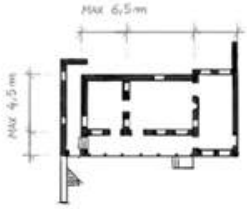
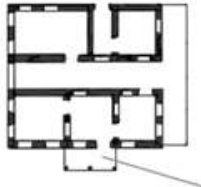
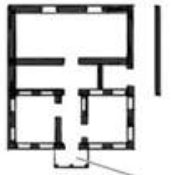
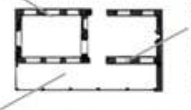
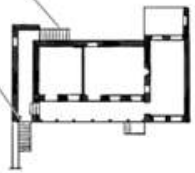
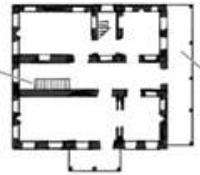
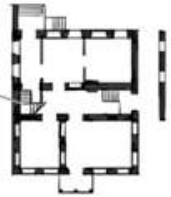
		BASIC TYPE	BASIC TYPE WITH ADDED NEW SPACE	COMBINED WITH BALCONY	NEW FLOOR
ONE-STOREY BUILDINGS	FACADE	 Windows on the wide side open into seyvan			
	PLAN	 Wooden beams	 New rooms added to the main building. Seyvan	 Seyvan joins the building with windowed walls. Veranda on the short side has a door and a window	 Soviet era buildings used to have windows on all four sides
TWO- OR THREE-STOREY BUILDINGS	FACADE	New floor does not increase the dimentions of the ground floor. Stairs leading to seyvan.  Windows do not repeat the pattern of the ground floor	Windows repeat the pattern of the ground floor 		
	GROUND FLOOR	 Windows are on the long side of seyvan		 Balcony	 Balcony
	FIRST FLOOR	More niches to make the wall of the upper floor lighter.  New windows added to increase natural light inside the rooms. Seyvan is added to the upper floor	Stairs are outside 	Stairs are inside.  Entrance and windows together with the balcony are on the shorter side	Stairs are inside 

FIGURE 10: Archive photo of M.F. Akhundov's house. A residential house from the 18th century, now the House-Museum of M.F. Akhundov.

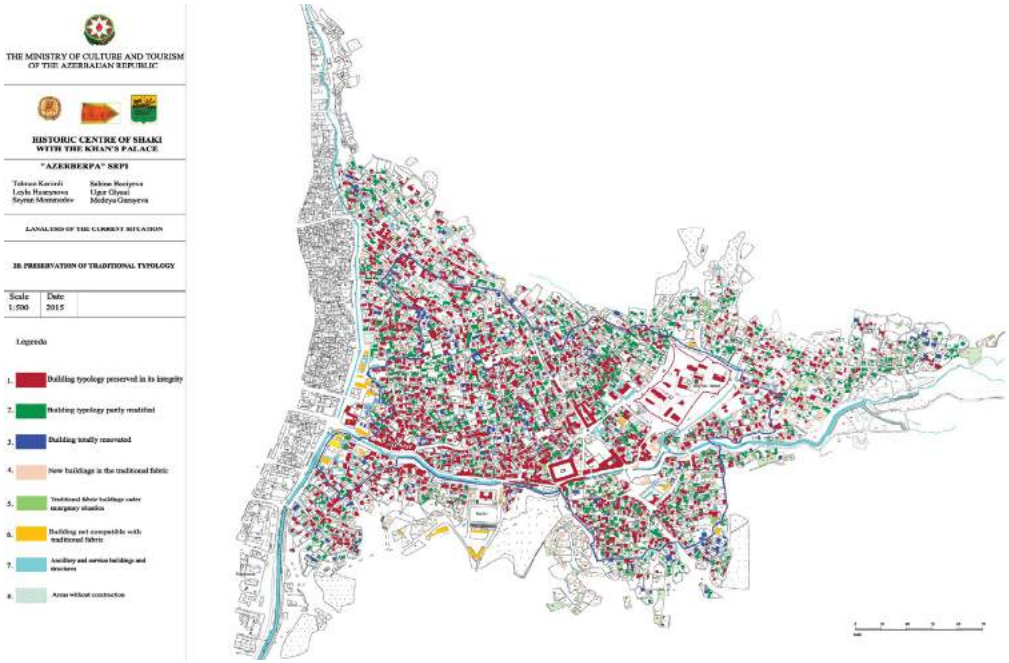
There are 2775 residential houses on the historical territory of Sheki (Core and Buffer zones) and 1255 (45%) of these houses retained their historical integrity. Despite the fact that most of these houses have such modifications as glazing of balconies, partial loss of architectural details such as the railings of the balconies and staircases, wooden decoration of the overhangs, and outbuildings in the courtyard, the basic structure and layout as well as facades of the buildings have been preserved.

A total of 738 houses (26,6%) have minor changes, which are reflected in additional extensions to the main retained historical house. These are such changes as increase of the area of balconies, extensions where kitchen, hallway or other necessary auxiliary rooms are located.

A total of 315 (to 11.35%) historic houses are fully modified with extensions. These are additional rooms, verandas, modified roofs, etc.

A total of 361 houses (13%) on the site are newly built houses. They are built without taking into consideration of historical traditions and with the use of new modern materials. A total of 84 houses (3%) are in a critical condition and requires immediate intervention. These are traditional houses, which were not subject to modifications and mostly abandoned by the owners.

A total of 22 (0,8%) houses have been completely lost and their land plots are vacant. These plots of land are privately owned and their owners plan to build new houses (Map 1)[5] . The design and construction of these new houses should be carried out in accordance with local architectural traditions. Please see the Conservation plan for detail.



MAP 1: Preservation of traditional typology.

[5] J. Jokilehto, Historic Centre of Sheki with the Khan's Palace. Baku, 2015, pp. 114 – 115.

II. Construction typologies

The buildings in Sheki are composed of various elements and these elements can be classified according to their functions:

- Structural elements are the main load-bearing structures of buildings,
- Architectural elements carry distinctive features of traditional Sheki architecture.
- Decorative elements are highly expressive forms of applied art created by local artisans and craftspeople.

2.1.Structural elements

Buildings in Sheki were built in accordance with ancient building techniques and practices born of a long-term evolutionary process. The constructive systems of foundations, masonry structures, piles, beams and pillars, slabs, floors, and ceilings have been developed since Bronze Age with the same technologies. All these elements come from local materials, easily available and low cost.

2.1.1.Foundations

From the structural point of view the methods and techniques of masonry are the same as for laying foundation. The foundation is laid in a manner of ribbon under all walls to be raised. The foundations are made of quarry stones, it is laid below the ground level in a trench and narrows upwards.

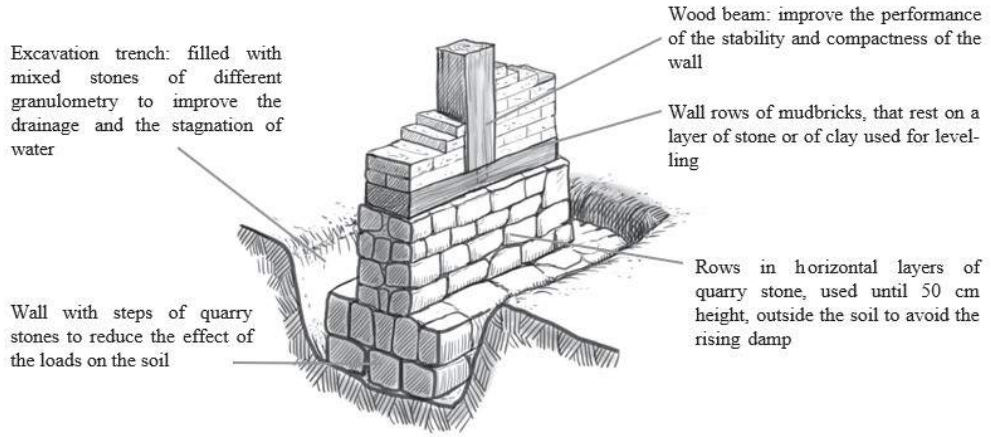


FIGURE 11: Traditional typology of stone foundation

When digging trenches for the foundation, the edges of the trenches should be reinforced to prevent landslides during the work process. Trenches are dug until they reach the base layer of the soil, and if the density and durability of the base layer are not in doubt, the bottom of the trenches are reinforced. The depth of trenches is usually 60-80 cm below the ground level. The reinforcement process continues until there is no significant trace left on the soil after the blows. After that, the process of laying the foundation may begin.



FIGURE 12: Stone foundations are laid from a depth of 60-80 cm to a height of 50 cm above ground level

The base layer of the foundation is made of thick quarry stones, and the part above the ground level is made of thin quarry stones. The thickness of the base layer of the foundation depends on the pressure acting on the foundation, the characteristics of the soil and the load of the walls on it. The thickness also depends on the type and density of the base soil on which it sits. The foundation is laid by adding the stones one layer horizontally along the entire perimeter of the future building. The sequence of construction phases depends on the curing time (adhesion) of the adhesive solution and occurs gradually. The foundation should rise to a height of at least 50 cm above the ground to protect the walls (made of mudbricks, fired bricks, etc.) from moisture.

FGURE 13: a) Influence of atmospheric factors on the lower part of the building; b) fractures caused by instability of foundations; c) reinforcement of foundations with concrete

a) Decay

The instabilities of the foundation have several causes: insufficient calculation of dimensions in the design phase; increase in loads transferred to the foundation by additional structures subsequently erected on the walls (such as new additions to old buildings); seismic activities, changes in the properties of the subsoil as a result of the continuous impact of ground waters.

b) Prescription

It is essential to restore the stability of the foundations to definitively repair the lesions produced in the masonry works from subsidence. Geological and civil engineers analyse the problems at the foundation and suggest solutions. Geological engineers help to determine the most suitable solution and appropriate technologies according to the characteristics of the soil, while civil engineers prepare a reinforcement project. The oldest and most basic rehabilitation technique consists in creating, under existing foundations, a sub-system that deepens the bottom floor, but above all that widens the base of the wall. The construction of the lower foundation should be carried out first at one and then at the other side of the existing foundation wall with small pieces of 1-2 meters. First, the lower foundation is built at one side of the existing foundation and only after the concrete is fully cured, work is carried out in the same manner at the opposite side of the existing foundation (Figures 14 and 15).

FIGURE 14: Rehabilitation of the foundation by reinforcing work with concrete beams

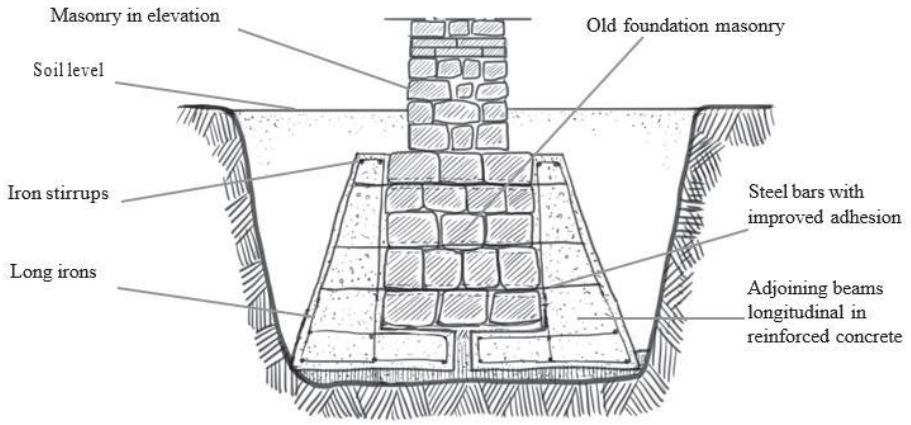


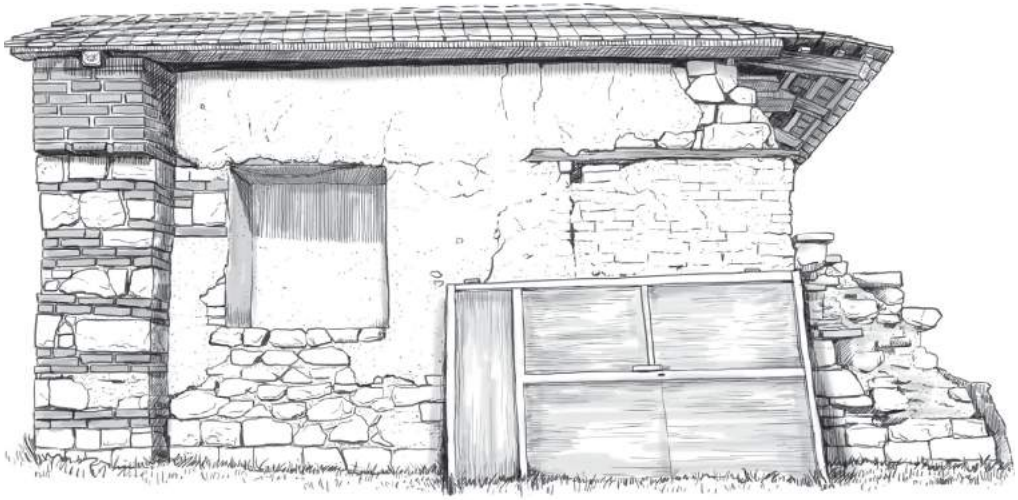
FIGURE 15: Rehabilitation of the foundation by reinforcing work with concrete beams

It is advisable to keep ready the pieces of beams or iron pipes, with plates welded at the ends, to be placed under the wall, in the centre of each trench, as soon as the excavation has been carried out. It is not advisable to use wooden props, because they will remain drowned in the concrete casting (thin or reinforced) that will constitute the sub-foundation. The use of concrete facilitates all operations, but two circumstances must be kept in mind:

• First of all it is necessary to wait a few days before considering each section of sub- foundation realized as efficient, to allow time for the concrete to mature and acquire a good consistency; therefore it is advisable to proceed to samples and not in line.
• Due to casting difficulties and shrinkage phenomena it is not easy to make a good connection between the base of the masonry and the top of the sub-foundation; it is convenient then to intervene after casting, injecting pressure cement paste at the separation surface; or, more simply, a small space is left in the concrete underfloor in which a masonry of solid bricks and cement mortar can be filled with.

The proposed method may be useful for the stone houses of the 19th and 20th centuries. In residential buildings and palaces built in the 18th century like the Khan's Palace and the Khan's House, the foundation was a continuation of the wall. The foundation was not broadened, and the depth was only 40 cm. In the process of restoration, there should be an individual approach, a static examination and specialist's decision regarding strengthening the foundations of more ancient houses.

2.1.2. Masonry structures



The walls of the houses have a variable thickness ranging from 100 to 80 cm. As in the most archaic procedures to give structural durability straw is used for production of mudbricks and earthen plaster (wool from various animals was also used in the past). Straw is cut into smaller pieces and mixed with mud mixture. Resulting mudbricks are then left to dry for a day or sometimes half a day outdoors depending on the amount of sunlight.

The earthen plaster is called singir or suvax in local dialect (3.1.4). Even the most important buildings in Sheki were made of mudbricks dried under the sun. They were placed inside timber frames and then plastered over with earthen plaster. Mudbrick is sensitive to moisture, so the base of superstructure had to remain dry. Therefore, the foundations of the walls were made of stone and elevated above the ground to prevent mudbrick from contacting the ground. Sometimes the stone is used up to the internal height of the ground floor. When building a wall out of quarry stones, the inner and outer layers of the wall are built first. The thick walls have a gap filled by hand with less regular and small stones, but also filled with earth, preferably clay. A layer of levelled mud is applied between the stone wall and the rows of mudbricks to create a good base for the superstructure. As the height of mudbrick wall increases, the thickness of upper part decreases (usually from the outside). This technique contributes to a better stability and durability of the masonry.

FIGURE 16: Mudbrick walls built in traditional style in the upper row; more modern masonry techniques of later periods using rock and fired bricks in the lower row.

The oldest buildings had mudbrick structures and wooden frames (Figure 19). The walls of the monumental buildings (such as the Khan's Palace) were reinforced with large wooden structures and were filled with mudbricks. The buildings of later periods were built with quarry stone instead of mudbricks where rows of fired bricks replaced wooden frames in providing anti-earthquake functions. Even the courtyard walls were often built with the two-colour combination of grey quarry stone and red fired bricks. This technique frees the masonry from the monotony of grey-blue colour.

Over time, and as the welfare of the population increased, the use of quarry stones and fired bricks in the construction of houses also increased. The surface of the walls of residential and public buildings is covered with a brick pattern by laying bricks in a different direction. The decoration of the facades consisted of various architectural details, among which arches played an important role.

a) Decay

Various levels of degradation can be found in some parts of the masonry in Sheki. Degradation occurs mainly due to the age of the adhesive solution or atmospheric influences. It is also possible to identify local damage caused by landslides or seismic effects. These lesions can be identified by similar signs in some parts of the masonry. Main causes for the degradation include the onset of the demolition process as a result of overloading, condensation of atmospheric moisture, accumulation of moisture in building materials, as well as abrasion and degradation of the material due to water leakage from the pores.

a) b) c)

d) e) f)

FIGURE 17: Degradation in traditional walls such as (a) wrecking at the base of the wall and therefore (b) cracks; (c), (d) rupture and cracks in lime mortar and plaster as a result of the atmospheric impact on the surface and (e, f) subsequent washing away of mudbricks.

a)

b)

FIGURE 18: Modifications inconsistent with traditional materials and techniques such as (a) addition of limestones and (b) reinforced concrete structures with the help of cement-based plaster.

As previously mentioned, atmospheric conditions often influence the health of masonry. Wind, rain, and sunshine are main factors that affect or determine the degradation of the building. In some cases, these factors contribute to the degradation processes already in place. Another source of deterioration of the masonry is the biological aggression of micro and macro organisms. These organisms cause physical-mechanical (disruption, development of micro-fractures, destruction of the substrate) and chemical (decomposition and alteration of the substrate) degradation in the materials.

Another example of deterioration is the replacement of traditional elements of the masonry with modern materials using modern techniques and plasters. Today the walls of houses are increasingly realized with prefabricated blocks and reinforced concrete resulting in the proliferation of elements that contradict the traditional historical context of Sheki.

FIGURE 19: Wooden frame visible from the inside of the worn-out wall

b) Prescription

Conservation:

The load-bearing walls in the building must be maintained and preserved in their original character and finishing. To this end it is required that these elements be object of:

• Periodic maintenance, with the adoption of all the necessary measures to prevent or slow down its degradation.
• Restoration, whenever said degradation is shown to a degree that can no longer be controlled by simple maintenance; for these operations, the general intervention criteria indicated below apply:
• The cleaning of the alien elements in stone and bricks generally aimed at the removal of encrustations and other deposits of various nature and consistency, which inevitably form on the external parts of buildings.
• Superficial consolidation of the material that makes up the masonry package whenever there are obvious phenomena of superficial degradation such as scaling, exfoliation, small detachments, flattening and the like.
• In the case of elements with protruding arrangement (windowsills, cornices, and the like) the regularization of the upper faces which have discontinuities, depressions and surface irregularities that may favour the stagnation of water and its absorption by the materials. From these parts, water can leak and collect inside the masonry, which in turn can trigger a large-scale degradation process.
• Protective work to be done when the outer surface of the materials is excessively moist and detrimental to the proper protection of the building. These measures are to be aimed at preventing the penetration of water into the porous materials of the building, which has typological or historical-architectural value, to reduce the changes caused by moisture in the masonry and to eliminate the factors that cause significant changes in appearance.

Consolidation:

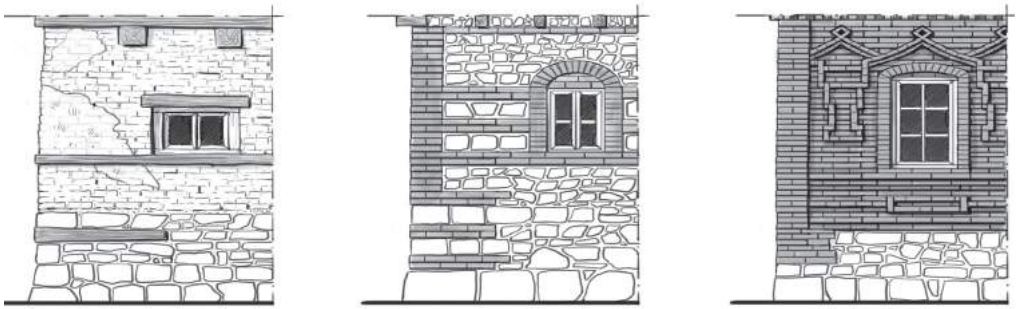
Consolidation work should be carried out in cases of significant damage to natural stone or fired brick elements of typological and historical-architectural value (as well as in cases of vibrations and instability). Consolidation should be carried out to stabilise and preserve the damaged building material without altering the appearance of the building. The consolidation and reintegration of damaged or missing parts will have to be carried out by means of scrap-stitching with recycled materials or in any case homogeneous with the original one in terms of quality and size.

Consolidation of stone masonry, as well as repair of wall cracks can also be done by making perforations (opening holes in the wall) and injecting adhesive solutions. During the process, it is necessary to prevent the leakage of the solution and to ensure that the appearance of the facade does not change. In addition, reinforcement of masonry walls and repair of cracks can be done with the use of metal cables and metal clamps (anchor bolts), if they do not damage other structural elements of the building.

It should be noted that it is not allowed to add metal, reinforced concrete and other structural elements that damage the original appearance of the masonry. Regardless of the condition of the surface of masonry, only the above-mentioned techniques should be used to fix cracked or damaged walls.

In case the masonry to be consolidated must be dismantled first for reconstruction, then the surface of the masonry shall be constructed using the old material or similar materials and in accordance with the same texture as possible.

Following the general provisions of the previous paragraphs, the large-scale consolidation or reconstruction works should not alter the overall appearance of the façade.



a) b) c)

FIGURE 20: Evolution of masonry (a) where a simple house with stone foundation, mudbrick walls and wooden beams influences the masonry of later periods; (b, c) walls of stone and fired brick, and fired brick with anti-earthquake functions.

In addition, any overhangs, as well as plaster, masonry parts or other inappropriate materials and layers that are inconsistent with the initial appearance of the houses should be removed or demolished. Traces and fragments of pre-existing masonry structures must not be removed or altered. If any stone elements with sculptural characteristics or with particularly complex processing is lost or destroyed, they may be made of the same materials and installed in accordance with their original forms. In some special cases it can be made in the original forms but from other materials.

Grouting

If the condition of the wall surface allows water to penetrate the masonry and does not protect it from moisture, then it is necessary to re-plaster the wall or fill any cavities. New grout should be of the same type, colour, and size as the previous one, and no colour differences should be allowed. In addition to traditional mortar with a mixture of lime and sand, other materials of the same or similar colour can be used in the works carried out on the visible surface of the walls.

Using modern materials. The surface of masonry made from modern materials (bricks, autoclaved aerated concrete, limestone, etc.) should have a traditional look. Local plaster that reflects traditional colours and texture (Figure 133) should be used instead of fake facades or metro tiles that mimic traditional materials. Although modern construction techniques allow for more innovative architectural solutions, forms and proportions of traditional houses must also be preserved.

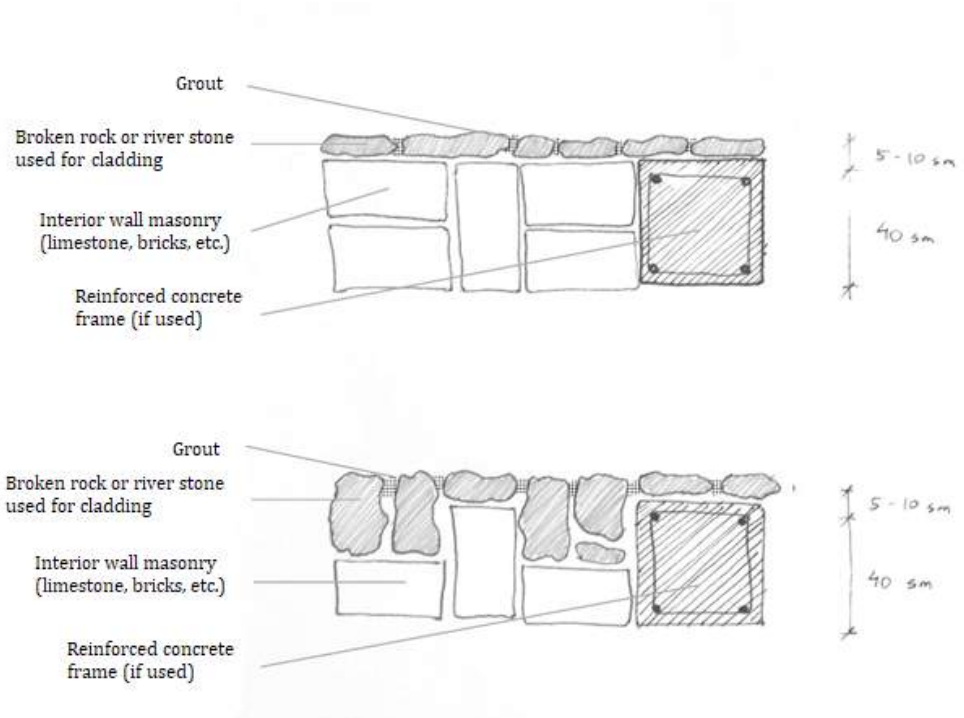


FIGURE 21: When cladding the masonry with river stones or quarry stones, in accordance with the logic of masonry, the stones should be laid parallel to the ground on the longer side, and the gaps between the stones should be filled with traditional grout because the colour of cement-based adhesive does not match the colour of stones.

FIRED BRICK. The upper layers of the walls should be cladded with traditional bricks or other materials like traditional bricks. When cladding the masonry with fired bricks, it is possible to divide them into 2-3 parts along the length or the width for purposes of economy. Use of metro tiles for cladding the surface of masonry is forbidden. Gaps between bricks should be filled with grout.

RIVER STONE, QUARRY STONES. When cladding the masonry with river stones or quarry stones, in accordance with the logic of masonry, the stones should be laid parallel to the ground on the longer side, and the gaps between the stones should be filled with traditional grout because the colour of cement-based adhesive does not match the colour of stones. If the colour of the adhesive solution used to apply the stones does not match the colour of the grout, then the gaps between the stones are cleaned with metal brushes and filled with grout. After the gaps are filled with grout, there should remain 1-2 cm difference between the surface of stones and the surface of grout, thus placing the grout surface lower than stone surface (Figure 120).

PLASTER. In the past, most buildings in Sheki were built of mudbricks and plastered with local plaster called singir. it is only allowed to paint the masonry if the colour of the masonry cladding is adjusted to the colour of traditional plaster, and if the corners of the wall are resolved in a small radius (Figure 133).

When using fired bricks, quarry stones, and river stones in the masonry surface, after a while white salt stains appear on the surface. This is due to the salinity of the sand in the adhesive solution. To prevent this, it is recommended to use a ceramic adhesive instead of cement-based adhesive solution.

2.1.3.Attics

Wooden pillars and poles used for attic construction can be cut out in a round (old typology) or rectangular manner (Figure 22).

FIGURE 22: Attic structure in Sheki buildings are entirely or partially made of wooden joists, rafters, and tie beams.

Wooden materials were supplied from the forests around Sheki in the past. However, it is mostly wood from coniferous trees such as pine and fir trees that are used today because they are easily available but also durable against xylophagous insects which feed on wood and eventually destroy it.

The size of poles is calculated according to the load capacity of the rooms they will cover. In residential buildings, the size of the room was determined by the length of the existing poles. That is why the maximum dimensions of the rooms (6.5 x 4.5 m) do not change, and these dimensions are repeated even when the size of the house increases.

Roof structure in Sheki buildings are supported by wooden trusses formed by rafters and tie beams which in turn form a trellis structure. Scissors trusses are the most common among several available forms because they are easy to realise (Figure 23). Simple truss is placed directly on the wall. One or more supporting pole elements may be added at the edges of the truss to strengthen the shear resistance.

The constructive connections of the attic can be realised in several different forms. The traditional connection is carried out by joining the inclined poles at a sharp angle to the tie beam or by joining both into one another. The connection of inclined poles is also carried out by means of joining wooden board at the end of the attic (Figure 31).

To increase the light of the triangular truss, a vertical, central element, called a king post, can be added to the diagram described, connected to the ridge and to the tie beam so as to reduce the inflection of the latter; in this way it is possible to cover lights from 6 to 7 m.

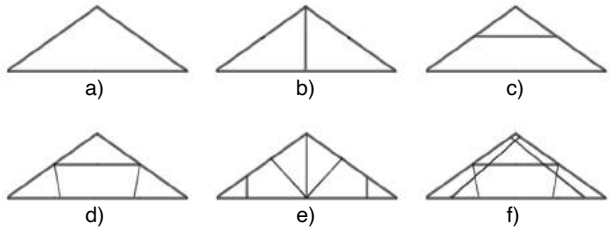


FIGURE 23: Schematic types of wooden trusses: a) simple triangular; b) with a king post; c) reinforced triangular; d) composed or Palladian truss; e) with struts; f) scissors truss

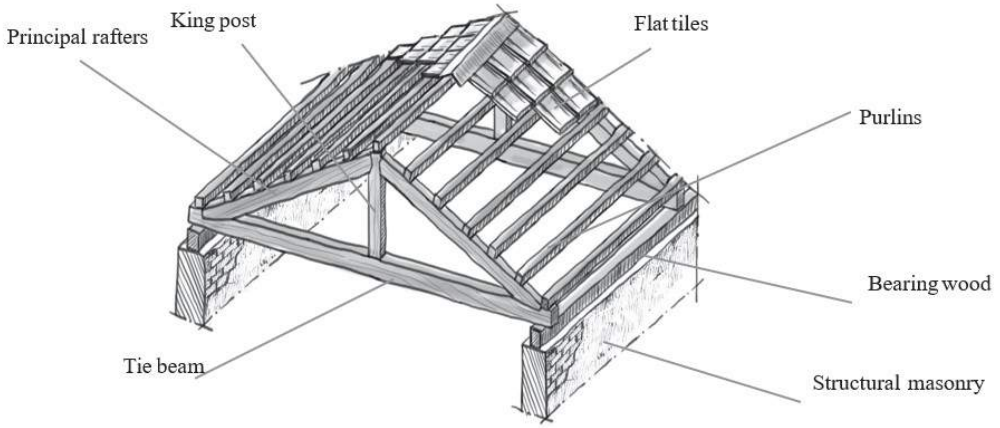


FIGURE 24: Roof structure made of wooden truss with a king post

The simple Palladian truss is formed from the triangular truss with a king post by adding two diagonal elements between the tie beam and the rafters, called struts, which perform the task of reducing the free light of the rafters; the light to be covered with these structures can reach 12 m. The reinforced triangular truss derives from the simple Palladian truss, eliminating the king post and the struts and creating a straining beam and two queen posts. Compared to the Palladian truss, it is easier to construct. Adding to the triangular reinforced to the straining beam and two queen posts is formed the truss composed of the light to be covered with these structures that can reach 16 m. The double tie beam Palladian truss has been used to cover challenging lights, which is formed by adding to the simple Palladian truss a straining beam contrasted by the rafters from which the stalks branch off (Figure. 24).

FIGURE 25: Scissors truss

The trusses are topped by purlins orthogonally with a spacing of 25 cm from each other, to permit, in this way, the hooking and the installation of ceramic roof tiles.

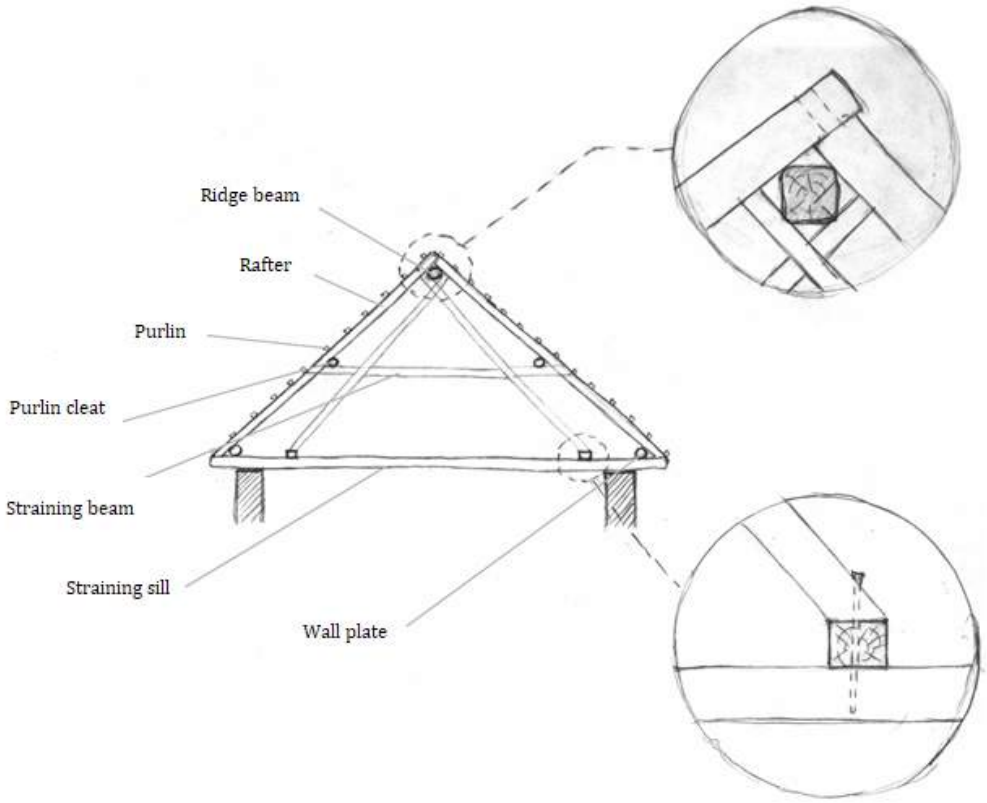


FIGURE 26: Scissors truss

The roof is made of durable materials that can withstand humidity and the smoke from fireplaces. The structure of the roof, which sits on the load bearing walls, projects from these walls, and creates gaps, which in turn allows the attic to have more light and air circulation (Figure 27).

Unlike similar roofs in other parts of the world, the smoke from the chimneys on the roofs of Sheki diffuses directly into the attic. This allows the attic space to assume some seasonal functions:

• Chimney smoke in the attic performs several functions by fumigating the area in winter: it not only melts the accumulated snow on the roof, but also destroys parasites on the wood.

• In summer, the attic is used to store and dry fruit, vegetables, tobacco, and even for silkworm breeding.

FIGURE 27: Traditional attic preserves its multi-functionality and plays an important role in agricultural production

The lack of chimneys gives the general appearance of Sheki roofs an unusual visual and aesthetic feature, but in addition to their aesthetic features, unique attics of Sheki also have some common use advantages:

• Protection from harsh weather conditions: Ceramic tiles on inclined roofs ensure rapid and easy flow of rainwater and prevents snow from accumulating on the roofs.
• Hydrothermal functions: The air circulation in the roof creates an air layer in the attic, which acts as insulation between the living quarters and the outer environment and prevents heat loss.
• Lack of chimneys: There are no external chimneys on the roofs, which ensures that the roofs are completely cladded with ceramic tiles. The chimneys of fireplaces open directly into the attic.
• Destroying parasites: The chimney diffuses the smoke directly into the attic and spreads it all over the wooden structure of the roof. Due to their antiseptic properties, the smoke and heat prolong the life of wooden elements by destroying xylophagous insects.
• Spreading heat: The smoke insulates and ensures the spread of heat in the attic and further spreads it to the lower, living quarters.
• No snow accumulation:The smoke in the attic facilitates the melting of snow and prevents its accumulation on the roof.
• Smoking environment: The smoke in the attic makes it an ideal place for drying and smoking food products such as meat or fruit, as well as tobacco.
• Silkworm breeding: An attic with good air circulation is also an ideal place for breeding silkworms that need a large, protected, and dark space.

FIGURE 28: Moisture is one of the main causes of wood degradation. Causes of moisture include capillarity – the movement of water through the pores, hygroscopic effect – the absorption of moisture in the air, condensation of atmospheric humidity and infiltration factors.

a) Decay and prescription

Since the attic structure belongs to the interior of the house, the following section is recommendations only.

The causes for deterioration of attic structures are the same as the causes for degradation of wooden materials (see the section on wood in the chapter on materials).

The restoration of decaying wooden poles and beams consists of replacing them with new ones that are more resistant to horizontal and vertical loads and can distribute loads. Thus, while preserving the original structure, the individual elements can be replaced with new ones.

It is recommended to inject with the epoxy resin the removable elements during restoration. Epoxy is injected into the wood mass at very low pressure through specially prepared holes with a diameter of not less than 6 mm. It is evident how in such cases the resistance of the single beam increases thanks to the binding action carried out on the internal fibres by the resin.

It is also possible to provide for replacement of a damaged part with a new part always made of wood. The surfaces of both parts in contact must be shaped like a sawtooth to improve the clamping. The joining takes place through the action of an adhesive, usually epoxy resin, which is spread on the contact surfaces.

FIGURE 29: Replacement of damaged parts of the truss

The use of resin replaces the previous use of metal elements screwed to the two parts to be connected. When the wooden element does not need to be removed, it can be reinforced in place.

When using new wooden material, it is important for it to have the same type or composition as the old wooden material being replaced. This is important to avoid the difference in load effects that may result from the shrinkage of the wood over time. For this same reason it is necessary to let the new wood mature in the environment in which it will have the same thermo-hygrometric balance of the replaced material.

Particular attention should be paid to horizontal beams (connecting beams) that bear the load of the vertical poles of the truss. This issue is important because these elements are structural elements that carry a special heavy load and are exposed to the environment. These constructive elements require in-depth analysis and technological care.

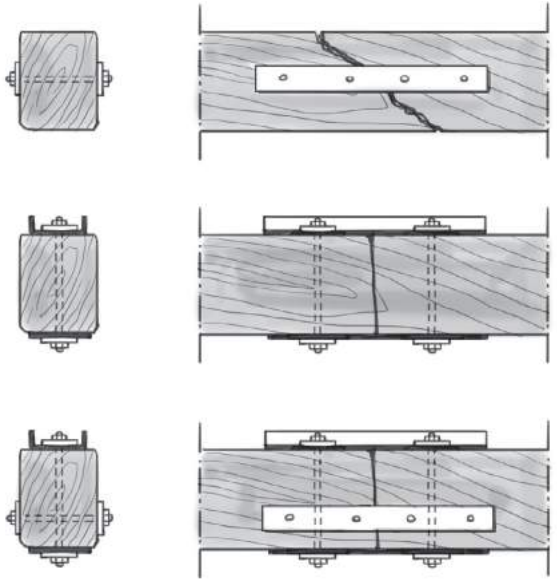


FIGURE 30: Restoring a damaged beam – combining a healthy part with new parts

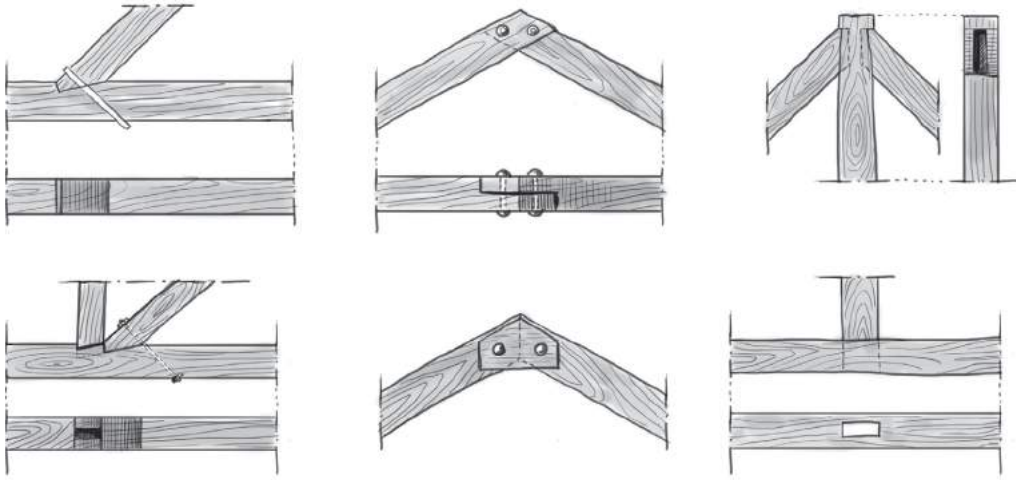


FIGURE 31: Knots of wooden truss

Rehabilitation, reinforcement, reconstruction, and replacement of the attic structure can be permitted to adapt the attic to new functions (especially the attics that are not convenient for household use). It is permitted to turn the attic into a living quarter to prevent new additions or new floors to the house. It is recommended to use the attic as a bedroom. Simple modifications and alterations (such as opening windows in roofs and attics) that do not significantly affect the shape and geometric size of the roofs are allowed only if they do not harm the traditional character of the building in terms of size, space and historical urban landscape.

2.1.4.Floors and ceilings

The main load-bearing structure of a simple floor is assembled from wooden beams (15-20 cm). The beams are arranged at 70-90 cm along the short span of the space covered (3-5 metres) and their edges sit directly on the masonry.

A complex structure is used when a wider area needs to be covered. In such cases, main beams (25-30 cm) are arranged at 2-5 metres in parallel to the short side of the room and secondary beams (10-15 cm) are placed on the main beams in perpendicular. The beams of the floor and attic construction sit on the beams arranged on the load-bearing walls. This technique guarantees levelling and elasticity of the overall structure. Long floorboards are laid on the load-bearing beams and fastened with nails to them. Floorboards are then painted with water-proof paints to increase water resistance of the floor.

For floors made of compressed earth, short floorboards (their length is slightly more than the distance between the two beams) are laid on the load-bearing beams and wooden boughs are arranged all over the boards. 5-cm thick crushed soil mixed with reed straw rugs (hasir) or carpets.
When there is no basement or the grou
nd floor is not elevated, then fired bricks are laid on the compressed earth.

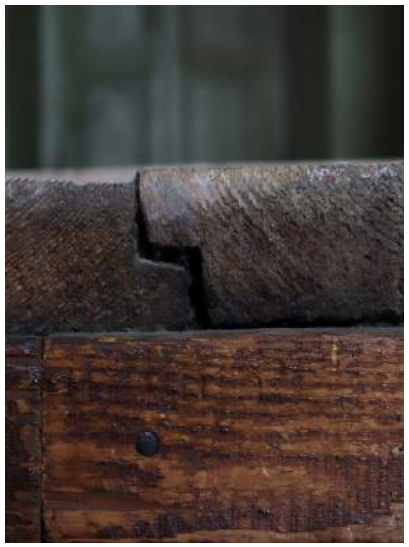


Figure 32: Technique for joining floorboards

FIGURE 33: Examples of ceilings and floors preserved and restored correctly. The ceilings can be plastered or left bare while the floors can be covered with wooden boards or compressed earth.

a) Decay and prescription

The causes for deterioration of floors and ceilings are the same as the causes for degradation of wooden materials (see the section on wood in the chapter on materials).

Since the floors and ceilings belong to the interior of the house, their restoration and reconstruction using the above-mentioned traditional techniques is of a recommendatory nature.

It is recommended to build new floors in a traditional manner using wood or bricks. The traditional compressed earth floor texture can be obtained by adding a small amount of soil and straw to the epoxy. Ceilings can be kept as they are (bare wood) or covered with fair-coloured plaster.

FIGURE 34: Moisture is one of the main causes of wood degradation. Causes of moisture include capillarity – the movement of water through the pores, hygroscopic effect – the absorption of moisture in the air, condensation of atmospheric humidity and infiltration factors.

a) b) c)

d) e)

FIGURE 35: (a) Replacement of degraded wooden beams with new elements made of the same material and the same shape; (b) traditional ceiling; (c) preparing the floor base with wooden boards before laying the floor; (d, e) wooden ceilings made in the traditional way.

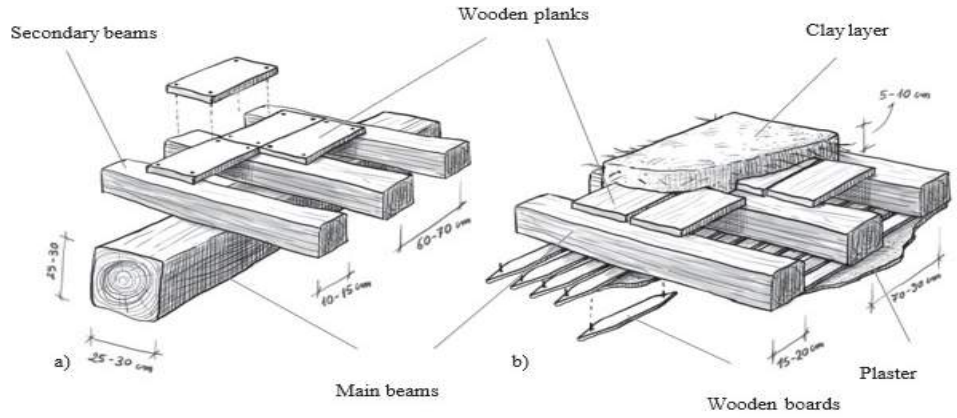


FIGURE 36: Typical floor cross sections: a) wooden floor; b) compressed earth floor.

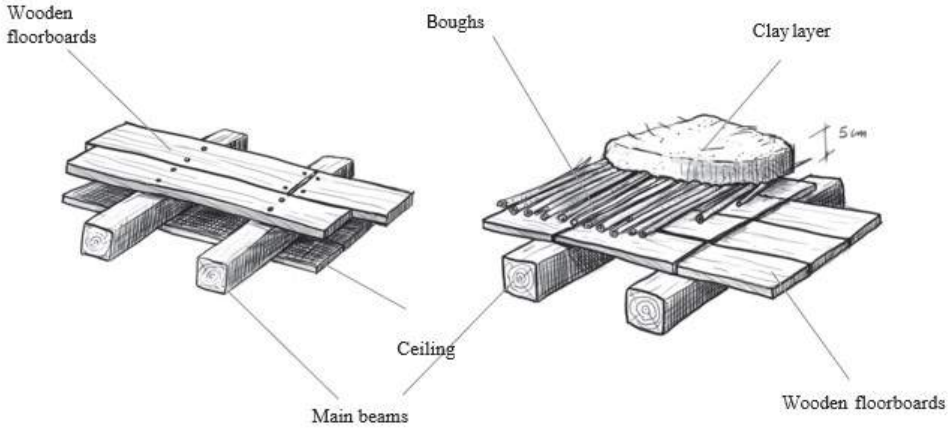


FIGURE 37: Traditional floor cross sections: c) simple type with ceiling; d) ancient type with compressed earth

2.2. Architectural elements

Verandas, balconies, roofs with ceramic tiles, doors, windows, and mantelpieces in residential buildings are the proof of arts and crafts in Sheki since past centuries. These distinctive elements break the mould of a rigid architecture and they are a typical added value that make them different from other architecture in Azerbaijan and in the world.

A characteristic feature of these architectural treasures is the presence of extremely valuable decorative elements on them developed by local artisans and craftspeople. A special mention must be done to the roofs which with their multi-functionality show almost unique characteristics.

2.2.1. Verandas, balconies, bay windows

Verandas (seyvan) and balconies (eyvan) play a leading role in spatial composition of buildings of Sheki. They have decorative elements like balusters and trellis works, wooden columns, and column caps. Verandas are covered with fretwork in more wealthy houses.

FIGURE 38: Wool processing in a veranda

Traditional houses have deep verandas facing the south or south-east. The wooden frame structure of a veranda gives the building an additional anti-seismic feature. The veranda was mainly used as a kitchen and dining area during the summer months.

FIGURE 39: Balconies (the upper row) and bay windows (the lower row)

The veranda is also a working space for processing agricultural products (i.e., drying fruit or tobacco), breeding silkworms, household works, or arts and crafts. For example, the veranda is used for storing and processing wool (Figure 38) while in winter months the attic under the roof is utilized for the same purposes.

The columns of verandas and balconies play a special place in decoration of the houses. These columns are often decorated with carved wood elements. Balconies and verandas also play a fundamental role in the spatial composition of buildings.

Typical balconies have an external projection up to 1.7 metres. For the balconies supported by pillars, this projection can be up to 2.4 metres. The most common type is a balcony with a rectangular plan.

FIGURE 40: The design of balconies varies depending on financial resources of homeowners.

The history of traditional balconies goes back to ancient times and they have similarities with mashrabiya[6]. Over the centuries, protruding balconies have undergone various development paths, and mostly influenced by Russian architecture.

The projecting balconies are turned into bay windows (closed balconies) when they are enclosed with planks, windows, and fretwork. Bay windows are common in the facades of the most of wealthy residences of Sheki built during the imperial Russian period.

The advantages of closed balconies are the extension of living space, letting in more light and air, but also maintaining the principles of Islamic intimacy. Closed balconies also have climatic function regulating heat and cold.

FIGURE 41: Decay factors for balconies and closed balconies are the same as the causes for degradation of wooden materials.

FIGURE 42: Another cause of decay of verandas, balconies and bay windows is complete replacement of existing elements or non-traditional architectural patterns in new buildings.

a) Decay

The causes for deterioration of verandas, balconies and bay windows are the same as the causes for degradation of wooden materials (see the section on wood in the chapter on materials).
Verandas and balconies have been enclosed in many houses in recent years to reduce heat losses during winter and create additional living space.

Another form of degradation is making of unnecessary and inappropriate additions to newly built or restored balconies, especially the construction of balconies using very different shapes and materials from the traditional typology (Figure 42).

[6] Mashrabiya is an architectural element characteristic of Arabic residences and a type of projecting oriel window enclosed with carved wood and commonly used on the street side of the building.

FIGURE 43: Traditional typology of verandas and balconies and their position in relation to the main façade

b) Prescription

The construction of balconies and verandas on the façades is subject to compliance with the requirements and criteria indicated below and must propose similar types to the many examples of traditional balcony and veranda present in various parts of the territory and in particular in the intervention area.

The new balconies and verandas must have the rectangular plan and be positioned on the façade of the building respecting the symmetries of the same, generally assuming a central position with respect to the same, as typical of the numerous examples of traditional typologies present in the territory.

FIGURE 44: Traditional types of balconies. The open balconies are the oldest type.

In the construction of new verandas, rectangular forms, and traditional dimensions (maximum 4.5 metres of depth) shall be respected.

Following guidelines shall always be respected in construction of new balconies facing the street or public spaces to preserve the public interest:
• Balconies and enclosed balconies must not project more than 1.7 metres from the façade, and if supported by columns, then no more than 2.4 metres. When the area in front of the building is used as a road or public square, the height of the balconies must not be less than 3.5 metres above the ground.
• In the case of public sidewalk below, the height limit can be reduced up to 3 metres, but the balcony itself must not project more than the width of the sidewalk.
• Brackets or columns supporting the balcony must not interfere with pedestrian traffic.
Balcony glazing is inevitable from practical point of view but the requirements to preserve the configuration of original columns, column capitals and glazing proportions must be observed.
• Following requirements must be observed while balcony glazing:
• Original columns of verandas or balconies must be preserved and not dismantled or replaced.
• Frames must have wooden texture and must be placed behind the original columns and not seen from the outside.
• Proportion of glazing frames must be in line with traditional glazing proportions. The framework must be small. The lower part of the glazing must be executed with wooden panels or panels with wooden texture as in traditional glazing.

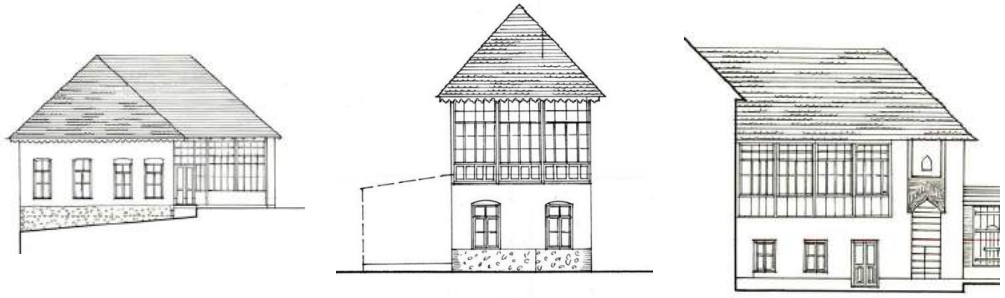


FIGURE 45: Traditional types of balcony glazing may be used for reference during glazing works.

Decorative and structural elements of traditionally designed stone or metal brackets that extend beyond the façade surface and support existing balconies must be preserved with the necessary consolidation, restoration and reintegration works. In addition, metal and wooden sections of verandas, balconies, and bay windows, including their floors, railings, balustrades, columns, cornices, and other elements must be restored and protected with special care. Only those interventions necessary to improve safety are allowed given that they not change the traditional architectural features. New additions or replacements that do not conform to the traditional typology need to be replaced in accordance with the traditional typology.

2.2.2. Roofs

The dominant visual element of the landscape of Sheki are its roofs, namely shape and material of roofs, which characterise the urban landscape within the surrounding natural landscape. Historical materials are mainly traditional ceramic tiles which still constitute most of the roofs of traditional houses. However, traditional ceramic tile roofs require time-consuming and frequent repairs

FIGURE 46: The dominant visual element of the landscape of Sheki are its roofs, their shape and materials, and the most commonly used material is ceramic tiles.

The roofs have a slope of never less than 28% and usually between 28-45%. The steep slope of the roofs prevents snow, which is usual from December to March, from accumulating on the roofs and allows the maximum use of the attic space. The old roofs of Sheki have large overhangs of 0.6-1.2 metres projecting from the façade and are supported with decorative end and rafter spars and sometimes with additional cantilevered bars. These overhangs are called shilasar in Sheki.

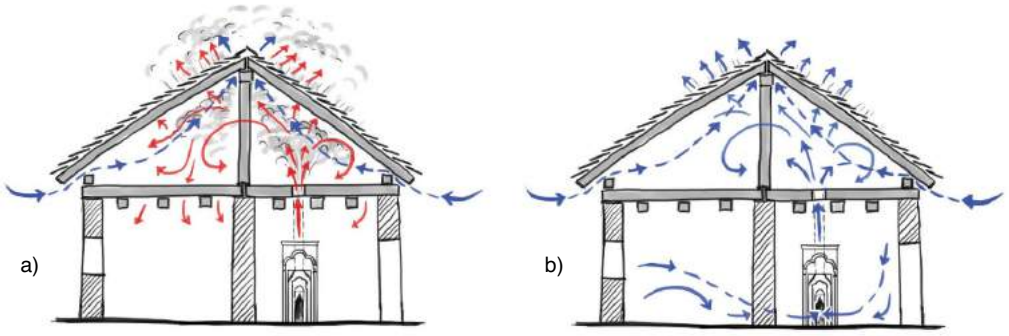


FIGURE 47: A typical “roof chimney” in Sheki – a multifunctional system with different uses for summer (a) and winter (b).

In the past, the roof overhangs in the mansions and houses of the wealthy class were decorated with ornate wooden planks. Old buildings in Sheki had no roof drainage systems due to their steep slopes and large overhangs.

Due to weather conditions in Sheki, auxiliary buildings, external entrances, and boundary walls also have the same but simplified typologies in addition to private and public buildings. These secondary structures topped with ceramic tiles have a special role in forming the traditional appearance of the city and its streets.

The construction package of the roof is very simple and light, and well ventilated (2.2.5). It consists of warping of main and secondary beams, with purlins laid at 25 cm from each other as they must be laid directly below ceramic tiles. There is no insulation or other protective layer between the inside and the outside of the roof. The result is a highly ventilated roof designed to adapt better to different weather conditions.

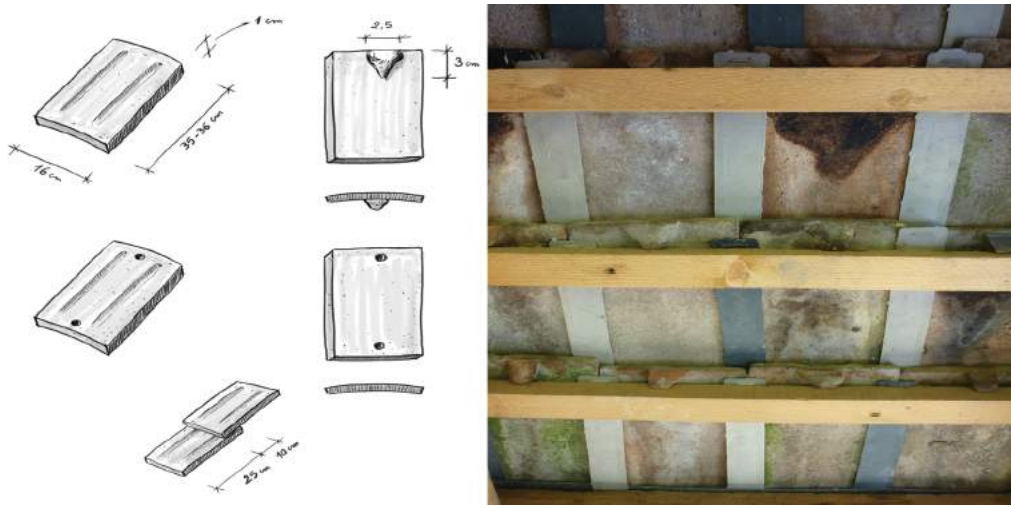


FIGURE 48: The ceramic tiles are regular, and their extreme flatness guarantees their stability and water resistance of the entire roofing. There are two types of tiles used for roofing: the one for the flaps and the one for the ridge segments and the corners.

Despite the absence of dormer windows, traditional roofs still let in some faint natural light. Sunlight could penetrate inside the attic filtering through the interstices between the ceramic tiles. However, in recent years, wooden, plastic or metal boards have been installed under the tiles for insulation purposes and they prevent sunlight from entering the attic. Therefore, some tiles on the roofs are removed and replaced with glass or small windows.

Dormer windows and chimneys can be found on the roofs of some 19th century buildings. During the same period, there emerged the tradition of covering the roofs with double layer of ceramic tiles to strengthen the roof and reduce the effects of wind.

The roofs of buildings are covered with flat ceramic tiles in a parallel fashion. This type of roofing requires continuous maintenance.

FIGURE 49: The roofs are covered with flat ceramic tiles in a parallel fashion. This type of roofing requires continuous maintenance.

The ceramic tiles are rectangular in shape. Their extreme flatness guarantees the stability and the water resistance of the entire roof. Two shallow steaks on their external surface facilitates the flow of rainwater.

Laying ceramic tiles is an easy process and it does not require any adhesives. The tiles are fixed to interlocking on the rafters of the secondary structure of the roof, thanks to the presence of a tooth, which allows its locking to the support (Figure 48).

A small difference is found in the tiles of the ridge segments and of the corners. These do not have the tooth on the surface but have two through holes useful for fixing with nails (Figure 48).

a) Decay

INCONSISTENT MATERIALS AND FORMS: Most buildings (77,7%) still retain their historic ceramic-tiled roofs despite the complexity of their maintenance. Part of the traditional roofs is contaminated by modern roofing materials (14,8%), such as light grey aluminium sheets or bright red modern industrial tiles that are not compliant with the historical architectural context of the area. A total of 5.7% of newly built houses have a tin covering.

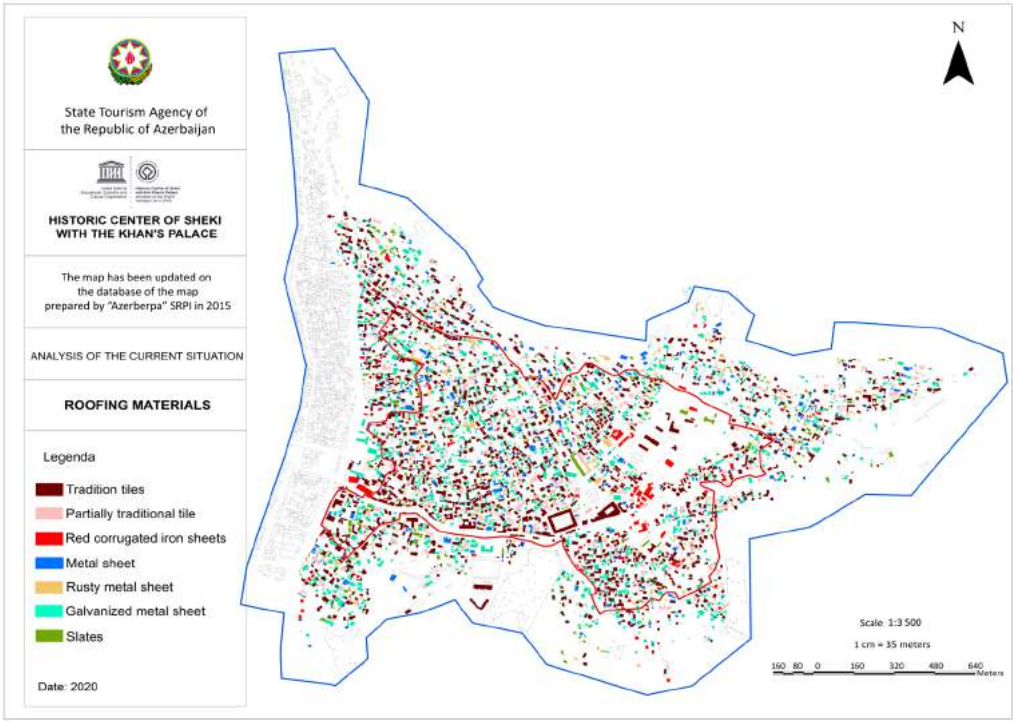
Tile lining of 1.8% of houses is replaced with asbestos-cement slates (Map 2). Of this last element, it is recommended the removal by specialized firms for a proper disposal, because of the health hazard.

Because of the high cost of traditional ceramic tiles and difficulty obtaining them, ceramic tiles are replaced in the process of construction of new buildings or repairing of the roofs with modern roofing materials such as light grey aluminium sheets, asbestos-cement roofing or bright red modern industrial plates which come into conflict with traditional typology.

Some examples of bad use of roof materials are:

- asbestos roofing sheet
- aluminium sheets
- red metal sheets with tiled patterns
- rusty iron sheets

Moreover, there is a widespread tendency in the variations from the traditional type that affects the slope, number, shape, geometric dimensions of the roofs and the addition of openings such as dormer windows, pocket terraces and skylights (Figure 57).



MAP 2: Roof materials

DETERIORATION OF TRADITIONAL ROOFS: Some construction errors, such as the inconsistency of the tiles with the slope of the roof surface, defects in the dimensions of the tiles, inaccuracies in the joints, and other factors, can reduce the quality of traditional roofing.

Tiles should be regularly maintained due to exposure to atmospheric substances. Atmospheric exposure can cause fractures, and when there are defects in the production process, they can cause water leakage. Water leakage problems may result from following causes:

• Loosening of shims: wooden shims are placed between purlins and tiles along the joining lines of the tiles. Shims are to prevent any water leakage between two tiles. One of the most common cause of water leakage is loosening of shims.
• Physical problems: Birds building nests in the attic or under the tiles sometimes accidentally displace or move individual tiles from their positions. Also defects in the firing process of tiles can result in cavities remaining in the finished products. Moisture and humidity accumulated in these cavities turn into ice when the temperature drops, and as a result, the tile "explodes".
• Aerodynamic problems: Winds of certain intensity moves the tiles from their positions, and water leaks through the emerged gap on the roof.
• Infiltration caused by gravity force: Some tiles installed incorrectly or moved by wind or animals, and thus with raised edges can cause water leakage by gravity with lateral winds.
• Infiltration by capillarity: Water can leak through small pores between the tiles.

FIGURE 50: The main causes for deterioration of wooden structure of the roof are the same as the causes for degradation of wooden materials. Other causes include water leakage through gaps left by missing tiles, and contamination with modern roofing materials such as light grey aluminium sheets, asbestos-cement roofing or bright red modern industrial plates which come into conflict with traditional typology. Additions that are not typical of traditional roof shapes (protrusions, indentations, pocket terraces, etc.) should also be noted.

Other degradation factors include the presence or absence of voids in the roof, the accumulation of various foreign bodies such as dust, mould, bird droppings, and changes in the surface of materials (rust, decay) caused by atmospheric phenomena and biological factors.

FIGURE 51: Wooden shims are placed between purlins and tiles along the joining lines of the tiles. Shims prevent any water leakage between two tiles. One of the most common cause of water leakage is loosening of shims.

b) Prescription

Roofs that are built or restored in the reserve territory must be covered with local materials – flat ceramic tiles. Original and traditional roofing must be maintained and preserved.

For the purposes of this regulation, the existing roofing of buildings of ancient pattern that have not undergone changes with respect to their structure is considered traditional. Their traditional forms (geometric shapes, number of slopes and their inclination) and ceramic tile covers must be preserved during maintenance. If it is necessary to rebuild a roof, it must be rebuilt in the same shape and geometry, maintaining its traditional character.

Proper installation of the roof cover depends on the quality of the materials used when fastening and joining the ceramic tiles on the purlins. Tiles are laid in horizontal rows parallel to the edges of the roof, the top tile is raised a few centimetres above the bottom tile, thus preventing water leakage or infiltration. As the tiles are stacked in a staggered pattern, the connection line between the tiles above falls to the centre of the tiles below, which prevents water from seeping in.

During the reconstruction or rebuilding of the roof, traditional tiles should be retained and re-used together with new materials. It is recommended to store the tiles outdoors before their assembly to speed up the aging process and increase their compatibility with the historical context.

FIGURE 52: Drawing: A tile hypothesis for the ridge segments and the corners; photos above: actual roof pitches solutions; photo below: The traditional and better solution.

FIGURE 53: Simple skylights to allow sunlight into the attic making it habitable. The size of the skylight corresponds to one or two tiles.

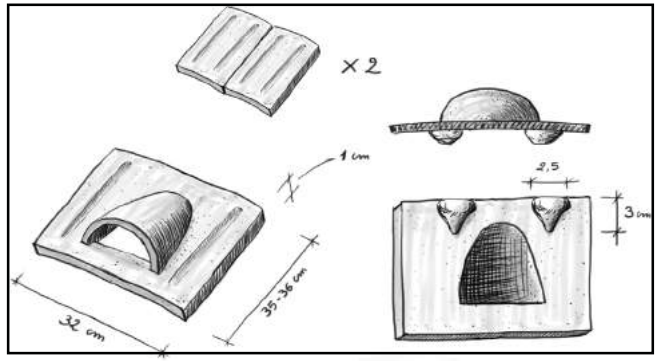


FIGURE 54: The tile called “wolf’s mouth”

Further waterproof layers are permitted, even with modern materials, if they are completely covered and made invisible by a layer of traditional tiles.

Using special tiles (e.g. the tile called “wolf ’s mouth” which allows venting of fumes in order to avoid building of a chimney) and materials (e.g., glass tile, for letting in the light into the attic) is allowed if these special elements do not alter the structure and aesthetics of the roof.

It is necessary to preserve the traditional elements of the roofs without making new additions to them:

• Chimneys: if necessity, little chimney pots should be added on the slope of the roof not facing the street. Moreover, chimney pots should be painted in the colour of ceramic tiles to soften the visual impact on the roof.
• Ventilation pipes: It is not recommended to place ventilation pipes on the roof. Instead, the use of properly shaped traditional tiles should be preferred (Figure 54). When this is not possible, the ventilation pipes should have the colour of ceramic tiles and be small and be placed on the slope of the roof facing the garden side and not the street (Figure 62).
• Dormer windows: if necessary, dormer windows are permitted only on the sloop of the roof facing the garden and not the street. Maximum two dormer windows are permitted, and they should be placed on the roof symmetrically. (Figure 57).
• Skylights: if necessary, tiny skylights corresponding to the size of one or two tiles can be installed but not more than two per each slope of the roof.
• Modern materials: if necessary and to avoid the illegal disassembly, resale, and reuse of already installed ceramic tiles, low-cost alternatives made available by government incentives may be used.
• Technical installations: TV antennas, satellite dishes, solar panels and other installations should be placed on the side of the house facing the garden and remain unnoticeable.

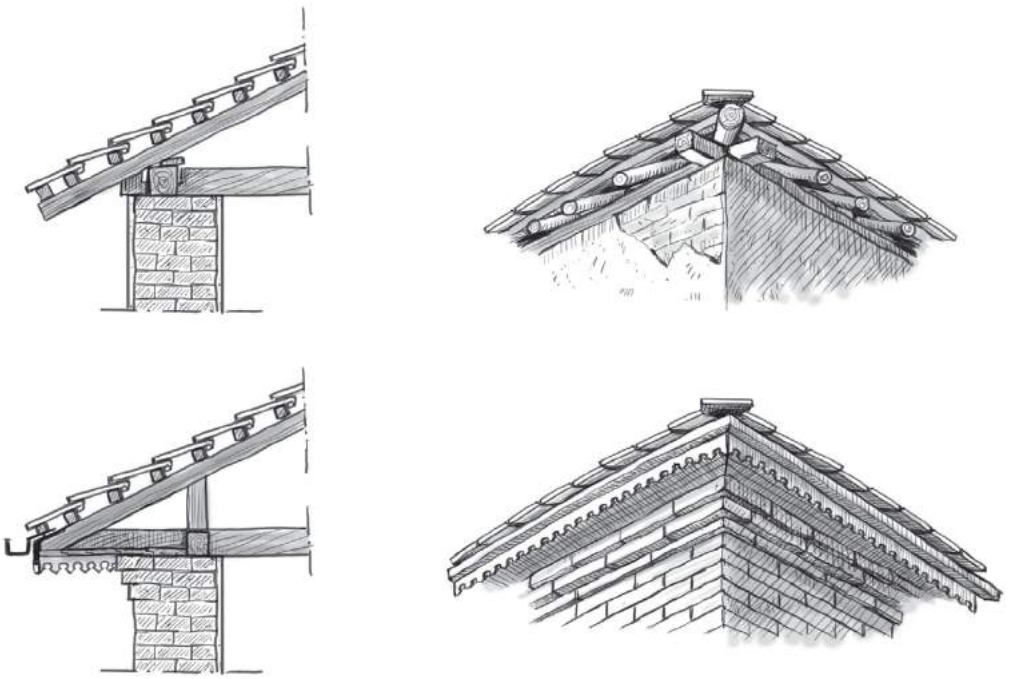


FIGURE 55: Traditional and more modern roof overhangs

Improvements and upgrades (energy saving, safety, insulation, waterproofing, etc.) are allowed if these works do not damage the traditional appearance of the roof.

Waterproofing and other insulation layers should not be visible from the outside after the improvement or upgrade processes, and special attention should be given to the cornices and overhangs (Figure 60). Another existing waterproofing typology that can be implemented is the one with inserted elements of juncture between the tiles in transparent or translucent material (plastic, resin, acrylic sheet, etc.). Because they are transparent or translucent, they will also permit the sunlight into the attic (Figure 61).

FIGURE 56: Various stages of the reconstruction of a traditional roof. The old roof, which could not be restored, is dismantled, new wooden structure is reassembled and then covered with ceramic tiles.

Those interventions with a purpose of adapting inadequate or contaminated roofs to traditional typologies are always permitted. It is also allowed to replace roofing made of non-traditional elements (metallic or plastic sheets). In this case, only traditional tiles must be used.

It is recommended to reuse as much of the dismantled usable materials as possible during the restoration and reconstruction of the roofs.

If the part of the roof is deteriorated and unusable, its reconstruction should take place as follows:

- It is recommended to employ a random sequence of new and old reusable tiles of the same type, size, and colour.
- Partially reconstructed roofing with non-traditional roofing materials (asbestos-cement, lightweight aluminium, red metallic, etc.) can be rebuilt by following the procedures listed above using traditional ceramic tiles.
- From modern materials, only soft materials that look like traditional tiles can be utilised (Figure 58).

IGURE 57: Dormer windows must be in compact and small forms that follow the historical style dictated by the Khan's Palace. Maximum two windows can be installed respecting the symmetry and not facing the main road.

FIGURE 59: The chimney pot visible in the attic, lit by soft light filtering between the tiles and the skylight.

FIGURE 58: From modern materials, only soft materials that look like traditional tiles are allowed

Roof overhangs

The original architectural, constructive, and dimensional features of roof overhangs must be properly maintained and preserved (Figure 55). If these elements are damaged or cannot be restored due to interference (if the details are completely lost), they must be rebuilt in a form consistent with their original character and using similar materials.

If the roof overhangs are partially damaged, only the damaged parts should receive the intervention; but the respective reconstruction should be carried out in line with the characteristics and forms of the intact parts.

Roof overhangs, cornices, decorated corbels, and other elements must be preserved in accordance with the special preservation guidelines listed below and consistent with their materials.

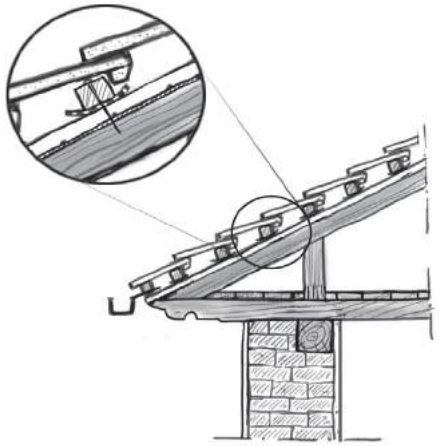


FIGURE 60: Modern roof solution with traditional overhang and metal sheet

When the original appearance of the roof cornices is restored, their individual parts must be dismantled and reassembled one by one in accordance with the traditional forms and materials and rebuilt by reconstructing damaged or missing parts.

Restored or replaced wooden elements should be pre-painted and treated with a transparent protective solution to obtain the respective colours and shades.

Roof drainage systems

There were no gutter channels in most of the ancient buildings in Sheki such as mansions, palaces, caravanserais, etc. The rainwater was naturally drained from the roof discharging to a 60-120 cm distance from the facade surface. Therefore, roof drainage systems must comply with the architectural and design features of the facades.

It is recommended to place the gutters close to the edges of the facade, and if this is not possible or the length of the gutter is not enough for discharging rainwater, then the gutters can be placed in the middle of the facade. In general, it is recommended to place gutters and downspouts in accordance with the architectural features of the facade and without obstructing the decorative elements.

In the presence of numerous projecting elements typical of the facades of fired brick and stone buildings, the gutters should be adapted to the relief of the facade of the building and its curves should repeat the relief of the facade. When it is necessary to replace gutters and downspouts, their accessories and other decorative elements of local tradition should be preserved and restored.

A hollow chute is placed on the joining line of two slopes of the roof (Figure 63). It is placed under one or two ceramic tiles from both directions and prevents water leakage during precipitation.

When it is necessary to replace the metal straps that fasten gutters and downspouts to the facade, they must be replaced using new materials that have the same design, form, and colour. Hanging straps should be made of copper or other metals painted in the respective colour.

The gutters and downspouts must generally be made of copper. The use of other metals or plastics may be permitted only if they possess the same colours as copper or weathering steel. The use of other materials such as plastic, stainless steel or unpainted galvanized steel is categorically excluded.

Given the long-lasting showers in Sheki, it is recommended that the diameters of the gutters be at least 100 mm.

FIGURE 61: Correct roof drainage system

FIGURE 62: Good integration between drainage system and wooden elements (detail from Baku)

The above limitations do not apply in the case of roofs that have already been the subject of interventions that have in fact modified the original features, with transformations incompatible with the character of the building or the context in which it is located. In such cases the modifications that are necessary to restore the original conformation or in order to achieve a new conformation of the roof more suited to the architectural features of the building are allowed, adapting it to the traditional typologies present in the contex

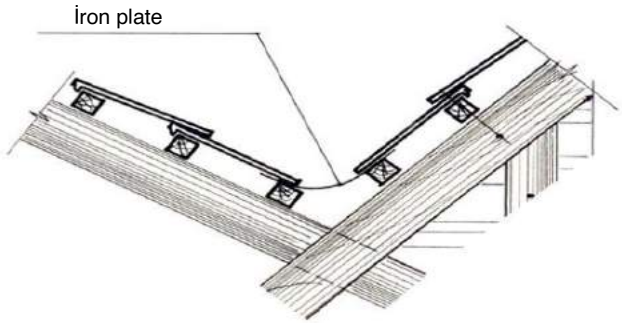
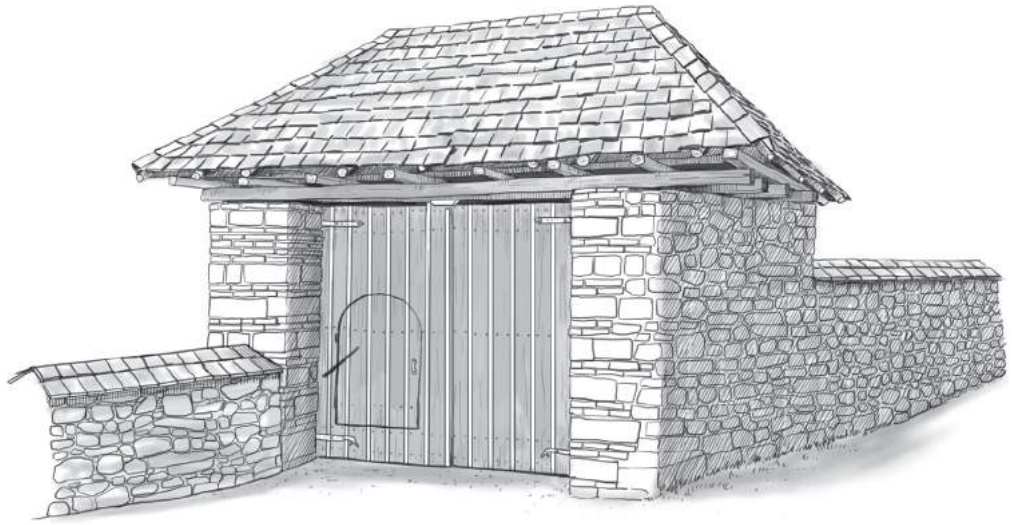


FIGURE 63: Hollow chute

2.2.3. Gates



The gates on the street have great importance in the architectural look of the residential house. Being in various forms of arches, they were decorated by wooden carved ornaments and metal forging products such as takkulbab (Figure. 65), handles, loops, battening plates, etc.

The external doors are usually built in continuity with the structure of the walls, for this reason they are constructed in stone and bricks. This typology is always covered by a small roof of 2 or 4 slopes. This roof covering reproduces in small detail the roof system of the house, using the same typology of wooden structure and the disposal of the flat tiles. Different kinds of openings, in wood and in double leaf, are developed under this covering and often framed in round, lowered, pointed, and Islamic arches or topped by a simple lintel. Arches and lintels permit an opening variable from 1.5 metres (Russian type) to 3 metres. This wide dimension allowed, especially in caravanserais and in residential houses, the entrance of carts and wagons. One of the double leaves was realized as a door of reduced dimensions for the access of people so that the entire double leaf door is not necessarily opened every time.

Buildings opening directly into the street appeared during the 19th century and have a typology of door with different characteristics from the previous ones, due to the Russian influence. The doors are of double leaves under a system of arches and lintels that permits a width from 1.2 to 1.5 metres. The height of the door is between 1.9 and 2.3 metres. They can be surmounted by a skylight.

FIGURE 64: Traditional types of gates that open out of the boundary walls.

FIGURE 65: Ancient door knockers (takkulbab) for men (left) and women (right)

a) Decay

The causes for deterioration of the gates are the same as the causes for degradation of wooden materials (see the section on wood in the chapter on materials). Roofs built over traditional gates play an important role in the preservation of gates. They protect the gates from precipitation and, as a result, its wood from rotting. Another factor of decay is the loss of decorations and the colour alteration. This last aspect is manifested through the variation of one or more parameters that define the colours (tint, clarity, saturation) on wide areas or more localised ones.

Traditional wooden gates to the inner courtyards or gardens have been replaced with metallic gates due to their low cost and durability. Such practice has a negative impact on the historical perception of the streets. Besides the alteration of the materials, there is a widespread tendency to vary the traditional shapes of doors in advantage of the most modern ones, out of the traditional context of Sheki.

FIGURE 66: Modern gates and doors that contradict the traditional gate typology of Sheki in terms of shape and material use

Prescription

Any intervention on the façades will also have to tend to the conservation of the doors and gates that present the typical characteristics of the tradition and the locality. Any new or replacement gates and doors opening into the street must be designed in accordance with the traditional typology.

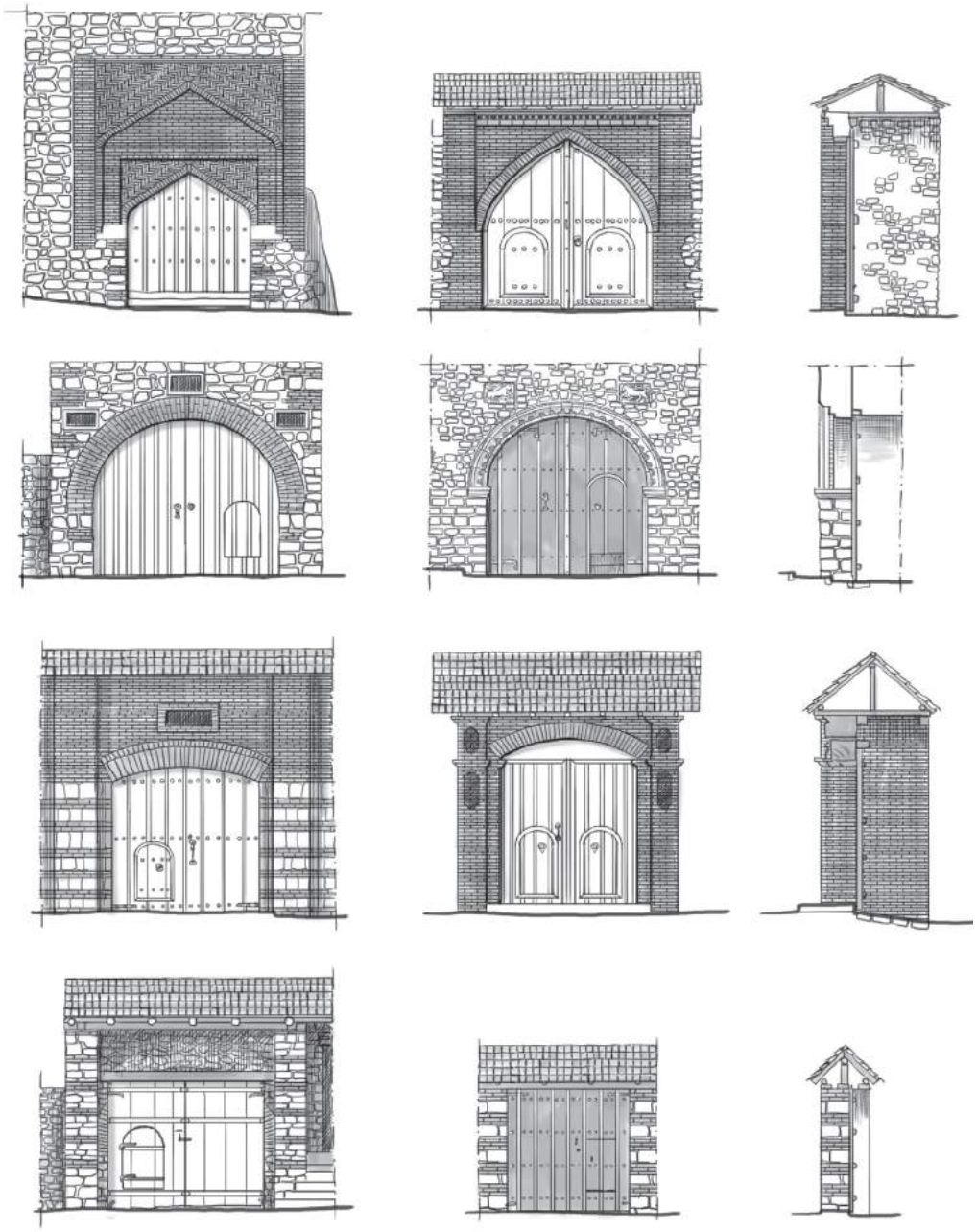


FIGURE 67: Types of traditional gates

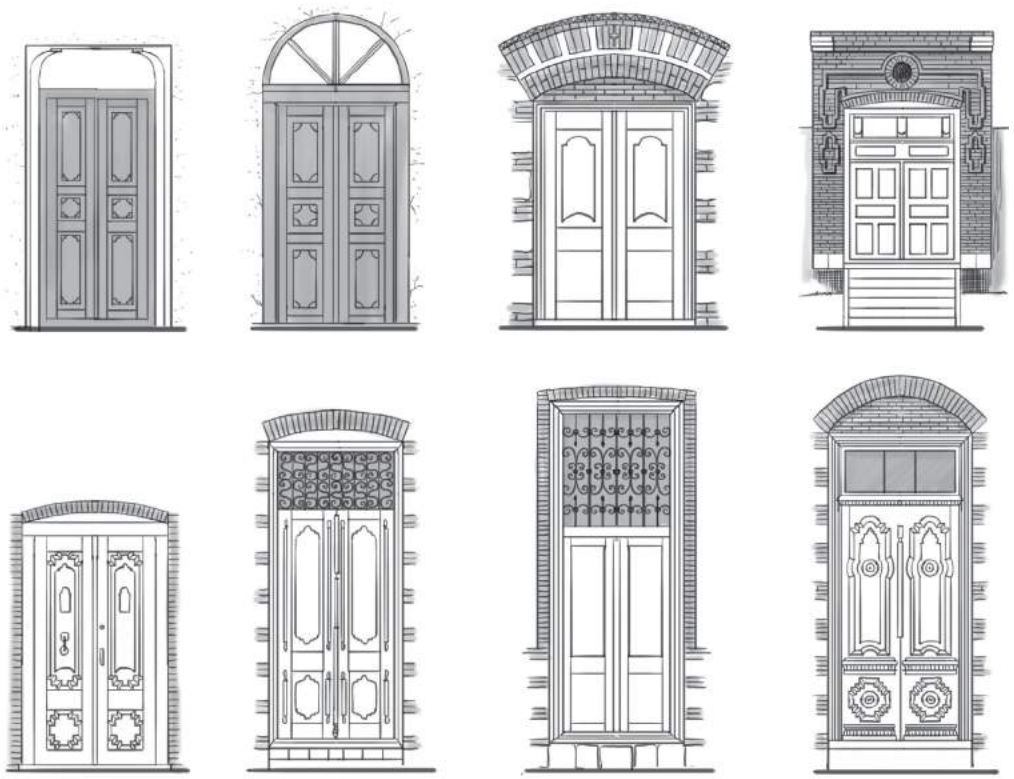


FIGURE 68: Types of traditional doors

The doors and gates of ancient workmanship and traditional typology and their fixtures and elements must be preserved and restored. In the case in which these particular fixtures present themselves in a state of deterioration that does not allow a restoration, they can be replaced with new fixtures that re-propose the formal characteristics (for shape, material, colour, surface finish, etc.) in such a way as to do not introduce alterations in the architectural composition of the façades.

Materials, colours, and forms to be used in maintenance interventions or replacement of existing doors and gates or their elements, or in cases of new installation, when not otherwise documented, must first be deduced from the original traces. In the absence of these, only the traditional materials, colours and forms present in the intervention area can be used, favouring the one that best harmonises with the colours of the façade painting and respecting the uniformity criteria of the solution.

Any new gates or doors must be made of wood, which is a quality element in accordance with this regulation, but the use of iron, aluminium or PVC painted with the above criteria is also allowed. They will have to be a continuous surface or with mouldings or with vertical staves and will have to resume the drawings and patterns of the traditional types of the old doors present in the intervention area. Skylights over the gates can be permitted but must be made according to the traditional types and painted with traditional colours and with criteria of uniformity with the colours of the door and the façade.

The new doors for the garages opening into the street must have the material and morphological characteristics of the typical gate type made with an external wooden cladding, different from the matchboard, and painted with traditional colours.

When adapting the incongruous metallic gates to the traditional typology, the existing metallic gate should be covered with wooden material after cleaning its outer surface from additional decorations. The structure and proportions of the wooden cladding should be adapted to traditional patterns. The use of matchboard cladding is not allowed. When the metal gate is covered with wood, a small tiled roof should be built over the gate to protect the wood from precipitation.

Even the new French doors for the commercial facilities will have to be made of wood as a quality objective, but they can alternatively be made of PVC, aluminium or iron, painted with opaque colours, excluding any type of glossy finish.

For the shop windows, the single glass solution is allowed, which allows a wide visibility of the displayed merchandise, possibly as a quality objective, taking up the solutions of traditional types that are often still present in the territory concerned.

All doors and generally the windows that give access to the public area or public use must generally open towards the inside of the building; when this is not possible and in cases in which, to ensure compliance with specific regulations, doors must open outwards, they must be properly retracted with respect to the façade so that the opening does not create obstacles to the free movement of vehicles and pedestrians.

2.2.4. Windows

FIGURE 69: Traditional windows of Sheki are made of wood and have two or three casements. Windows on the ground floor have wrought iron railings outside.

The oldest types of windows were of rectangular shape and with a small opening. Placed on the mudbrick walls, they had wooden casings that regularised their profile and stability. They were very small to avoid the loss of heat (Figure 69). In the 19th century, the windows gained a greater size were surmounted by arches. Despite their smaller size, the traditional windows were thick in width which extended the range of sunlight inside the rooms.

The windowsills were made of wood in the houses of the rich and in stone in those of the lower class. The traditional wooden windows had a single frame or were divided into two frames of same dimensions, and those which had one or more additional wooden grilles were called “three-pane windows”.

The windows are surmounted by arches or lintels of different types (semi-circular, segmental, equilateral, and four-centred) which permit the sizes varying from 0.3 to 1.3 metres in width and from 0.3 to 2.3 metres in height.

a) Decay

Currently old wooden casings are replaced with metallic or PVC casings that are less expensive and more durable but also not consistent with the traditional forms and proportions. The transparent glasses are also replaced by bigger glasses sometimes mirrored and coloured and not in line with the traditional typology.
Further deterioration factors are the larger casements, the loss of decorations such as small furnishing elements, and the chromatic alteration that manifests itself through the variation of one or more parameters that define the colour (tint, clarity, saturation) that can refer to large or localized areas of the fixtures.

b) Prescription

Any intervention on the façades must also be aimed at the conservation of the windows that possess the typical characteristics of tradition.

FIGURE 70: Some of the traditional windows in Sheki are in a state of decay. Wooden casings affected by xylophagous insects and atmospheric precipitation have deteriorated. Another factor of decay is the replacement of traditional wooden casings with modern casings that differ in both materials and forms.

The most common type of traditional windows is made of wood with a single casing or divided into two casements of the same size and divided into three panes by one or two thin wooden grilles. This type is called a “three-pane window”. Traditional windows have one or two layers of the same size, and each layer in turn is divided into two or more panes.

Although today the constructive potential of glass and other materials permit many forms, it is important to adhere to “three-pane” pattern when installing new windows.

The proportion between the width and the height of the window must not exceed 1:2.

When the preservation or restoration of the windows is not possible or appropriate (for justified reasons adequately illustrated in the project) the new solutions will be acceptable if they are compatible and compliant with the traditional typology. However, any innovations that involve the installation of mirrored glass or English style windows are forbidden.

The windows must be made of wood in accordance with the traditional typology but the use of iron, aluminium or PVC, painted with opaque colour from the traditional palette (Figure 133), is also permitted except for any type of glossy finish.

The original colours of windows must be preserved during maintenance or restoration works.

All the windows of the same building unit must have the same colours and shades. For unified or divided buildings, the above-mentioned provisions for plaster and painting are also valid here.

It is generally forbidden to replace the original fixtures of the windows with others that represent a different style from the originals and are incongruous with the architectural features of the façade.

It is forbidden to install false windows. Windows with adequate glass or double glass can be used for reducing noise pollution inside the living quarters or preventing heat loss.

In any intervention that affects the façade in its entirety, it will be necessary to proceed with the removal of the casings and the elements connected to them which are incompatible with the traditional typologies indicated in this manual.

FIGURE 71: Traditional windows with wrought iron railings

FIGURE 72: Correctly installed plastic window with wooden texture and wrought iron railings

It is absolutely forbidden to leave the galvanised iron elements exposed (unpainted).

Window railings can be installed at the windows of the basement and the ground floor in accordance with the traditional types. Window railings of wrought or hand-forged iron are to be conserved and restored as elements of traditional arts and crafts.

The installation of window railings in the outbuildings is also permitted if they are made according to the traditional types. Except for special cases duly documented, the iron elements must have the traditional colours with opaque protection paint or graphite colour.

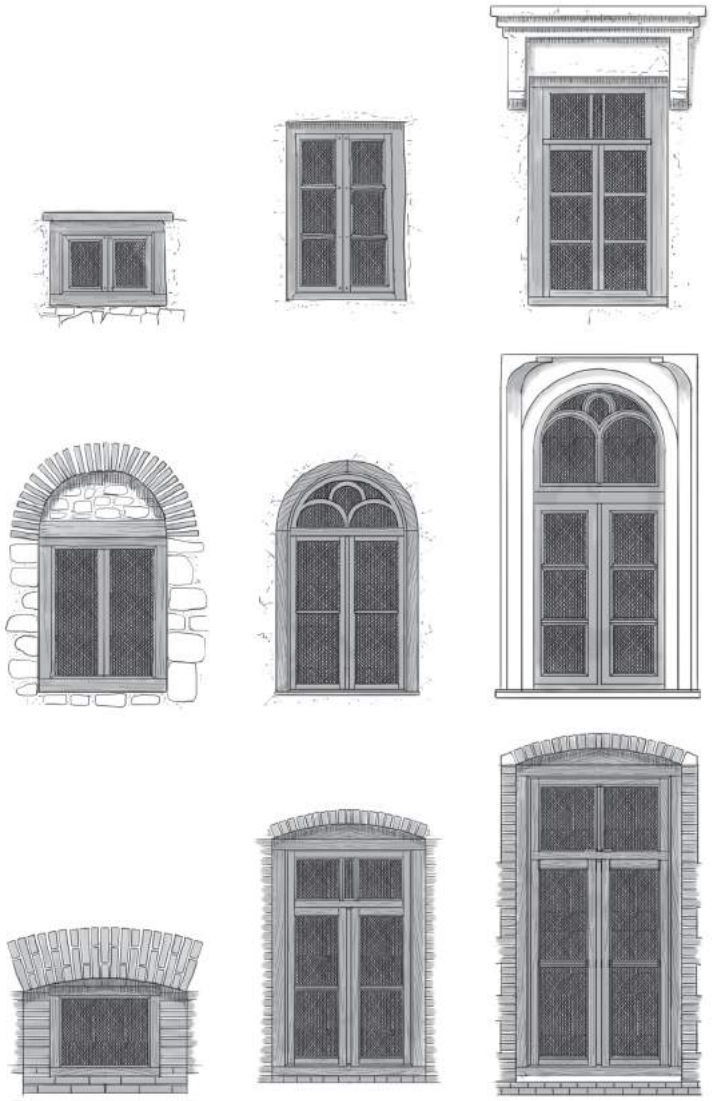


FIGURE 73: Types of traditional windows

In general, the preservation of existing ironwork elements that are typical of certain historical periods is also prescribed. These elements (window and skylight railings, cornices, shutters, door knockers, handles, loops, battening plates, etc.) cannot be removed and only the interventions necessary for their maintenance and conservation must be carried out. Their replacement is allowed only with new elements that faithfully reproduce the formal characters (form, material, colour, surface finish, etc.) so as not to introduce alterations in the architectural composition of the façade. When replacing windows in shops, workshops and public catering facilities, wood or other material with wooden texture must be used for window casings. In these facilities, the window casings should be designed with denser linear frames (Figure 75).

FIGURE 74: Preserved window on the ground floor of a public building

FIGURE 75: Two examples of PVC casings. The casing on the left is more reminiscent of old wooden frames but the casing on the right is rather simple and incongruous.

2.2.5. Mantelpieces

All traditional houses in Sheki have fireplaces that have lost their practical functions since the advent of gas and alternative heating, but their mantelpieces continue to play a role as decorative elements in the interior. The design and decoration of the mantelpieces depended on their position inside the room and their functions, as well as the wealth of the household. Mantelpieces in the houses of the rich are the valued works of decorative arts.The building stock in the reserve area (UNESCO World Heritage Site and its buffer zone) consists of 2,775 houses and 1,015 of them (36,5%) have preserved their mantelpieces. Out of these, 86 mantelpieces have carved decorations of artistic value.

The mantelpieces are of special interest from the point of view of their decorations. The fireplaces in places such as kitchens and used for household needs had simple mantelpieces. However, the mantelpieces in the living rooms of especially the rich were decorated by paintings or carvings

Fireplaces were used for heating the living quarters during winter months, but they also played a role in air circulation with their chimneys having the function of ventilation shaft that permitted more air in the environment and cooling the premises during summer (Figure 47).

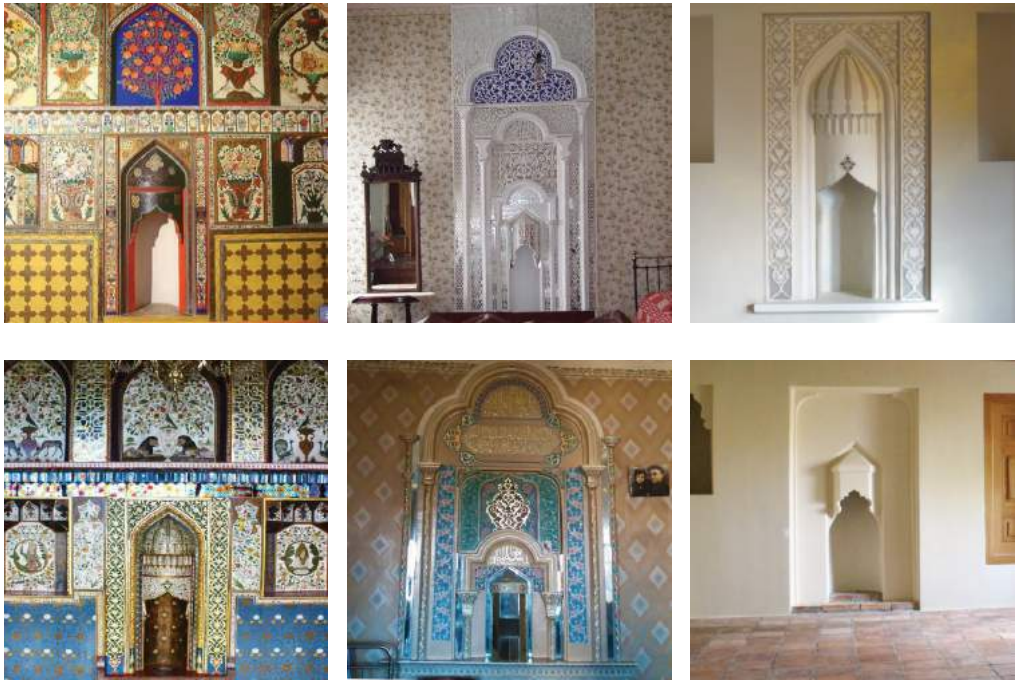


FIGURE 76: The design and decoration of the mantelpieces depended on their position inside the room and their functions, as well as the wealth of the household.

a) Decay

Most of the ancient fireplaces are currently in a dilapidated state due to being disused or they have been replaced with modern installation. Some elements or decorations of those remaining mantelpieces are lost. There are also problems with the accumulation of dirt between the chimney and the hearth, the formation of moisture and water leakage. The stagnation of the smell of smoke on the hearth floor; the fall of soot every time the damper is used to adjust the flue; the presence of soot on the hearth floor; the presence of smoke inside the rooms are all signs that cleansing the chimneys is long overdue.

FIGURE 77: Most of the ancient fireplaces are currently in a dilapidated state due to being disused. They are subject to several factors of decay such as accumulation of alien elements, cracks, and loss of decorative elements.

b) Prescription

There are a lot of traditional fireplaces and mantelpieces in Sheki and their preservation in the original form is one of the main objectives of the building norms. It is necessary to restore them by repairing all its components or replacing them, when alternatives are not possible, with forms and materials that are faithful to tradition. Many chimneys need maintenance, the technique of cleaning the chimney provides the sliding of the brush inside the pipes to remove all the residues and debris present inside. In this way, all the elements that obstruct the passage of the fumes come down, until they touch the hearth, and then be easily eliminated. When proceeding with the brushing of the chimney walls, care must be taken not to scratch the structure with the brush. The chimney can be cleaned from either above or below.

When restoring the structural and decorative elements, metallic nets should be installed to arm the plaster, especially in the edges, to allow a greater resistance and adhesion to the overlying plaster.

All decorations must be restored in accordance with the original plans following the historical documentation or in the event of lack of data – in accordance with the traditional typologies.

2.2.6. Stairs

Indoor stairs in Sheki are of simple aesthetics and structure and only serve their primary function of providing vertical connection. Stairs differ by their material: stairs made of stone (in monumental buildings, but also for accessing the basements in the typical housing) and wood (easily available in the surrounding forests).

The stairs are usually in a straight run with one flight only. Their stringers are made of oak wood and threads

from other types of wood. The stringers are joined with metal rods fastened under the treads (Figure 78 a). Closed stringers are fastened to the wall and the load bear of open stringers are calculated carefully. Stairways are bordered with the balustrade.

Access doors are installed at the end of the stairs leading from the ground floor to the first floor and at the end of the stairs leading to the attic (Figure 78 b). At night, the access doors are closed and locked to separate and secure the floor.

Treads are joined with stringers at a depth of 20-25 mm and depending on the form of joining, the stairs became recessed or mortised (Figure 82).

FIGURE 78: (a) The stringers are joined with metal rods fastened under the treads; (b) Access doors are installed at the end of the stairs leading from the ground floor to the first floor

FIGURE 79: Typical stairs in Sheki only serve their primary function. They are usually in a straight run and made from masonry or wood.

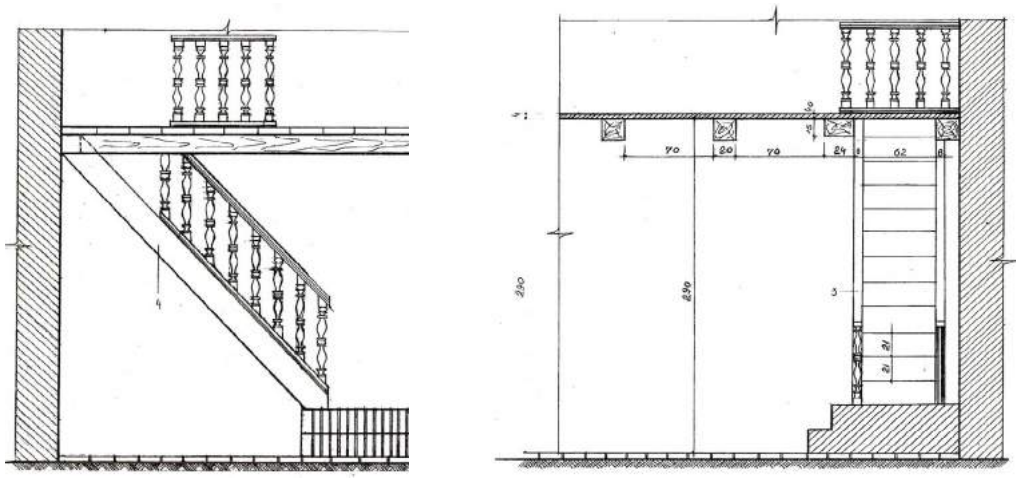


FIGURE 80: Stairs made of wood

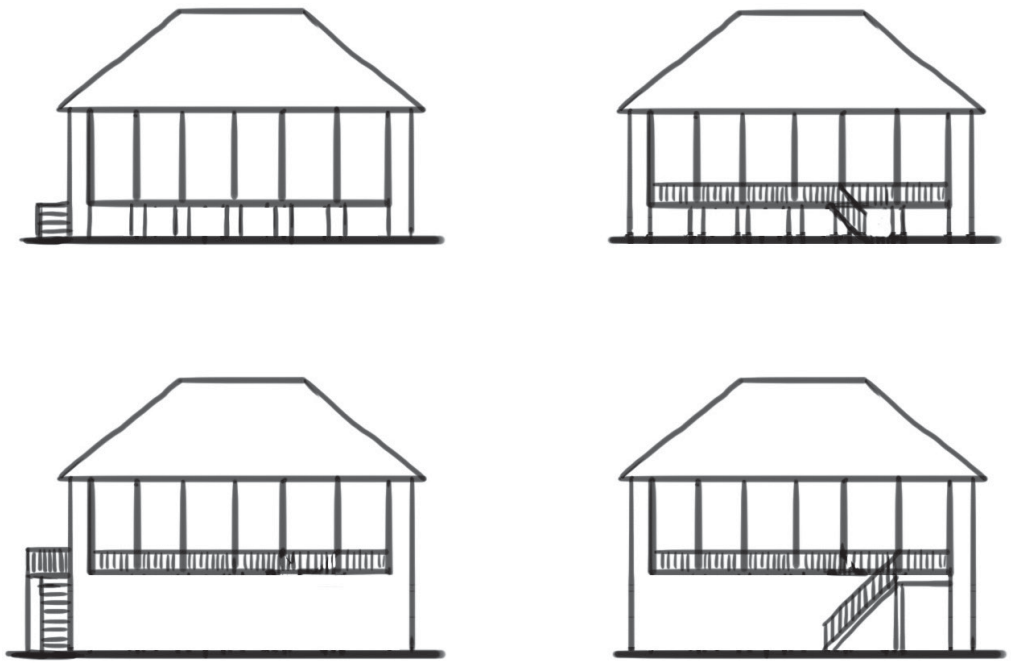


FIGURE 81: Traditional outdoor stairs in a straight run

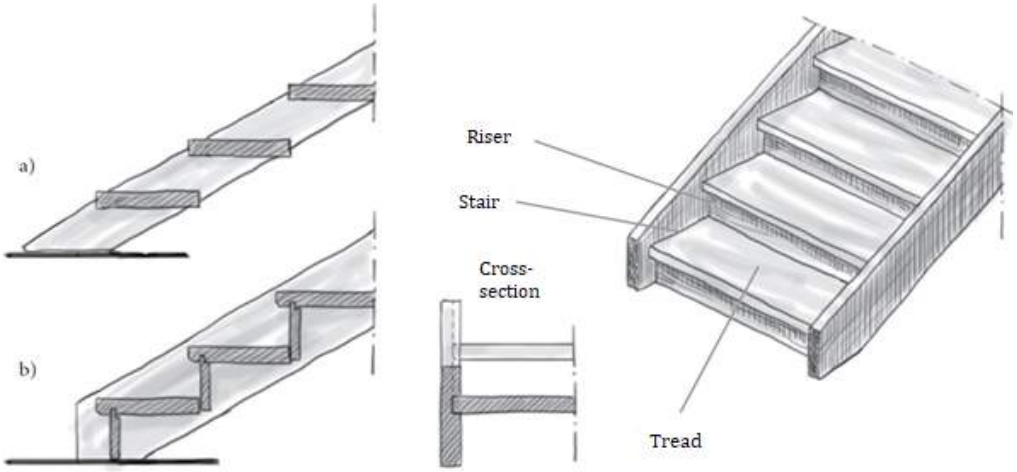


FIGURE 82: Wooden stairs most common in Sheki: a) recessed stairs; b) mortised stairs

a) Decay

The causes for deterioration of stairs are the same as the causes for degradation of wooden materials (see the section on wood in the chapter on materials).

b) Prescription

External stairs of existing and new buildings in the reserve territory must meet the following requirements and criteria. If the flight of the outdoor stairs is more than eight treads, they should be made of wood or cladded with wood. Stairs with less than eight treads should be made of fired bricks, quarry or river stones or cladded with those materials. It is forbidden to keep the concrete structure of the stairs exposed or use other materials not mentioned above in the cladding.

Building new stairs or improving the accessibility of existing stairs should be carried out in accordance with the traditional typology or the diagrams present in this Manual (Figure 81). Any stairs in traditional houses that have been altered in a manner contrary to the traditional typology must be rebuilt in accordance with the instructions in this Manual.

FIGURE 83: The causes for deterioration of stairs are the same as the causes for degradation of wood. Exposure to atmospheric elements, destructive activity of biological microorganisms, decay, etc. and the use of incongruous materials and forms that do not conform to traditional typologies.

2.2.7. Arches

Arches are structural elements forming continuation of walls, gates, doors, and windows and allowing the distribution of load by dividing structures diagonally. The arches in Sheki can be classified into four different types according to their structural forms. The semi-circular arch has its keystone as the centre of the semi-circle that forms the curve of the arch. The centre of the semi-circle forming the curve of the segmental arch is located below the keystone on the central axis. The both sections of the equilateral arch are made up of the parts of the circles whose centres are symmetrically slid through the middle of the keystone. The four-centred arch (also called Islamic or Tudor arch) is a bow-shaped arch with a pointed apex. All these arches were built from fired bricks, carved stones, or both (Figure 86).

FIGURE 84: Arches are structural elements forming continuation of the walls, gates, doors, and windows and allowing the distribution of the load by dividing the structure diagonally.

a) Decay

Arches degrade as they lose their original function. The main causes of deterioration are the wear of the adhesive solution (plaster) and the effects of atmospheric precipitation. It is also possible to observe signs of cracks in the arches caused by foundation damages in the foundation caused by seismic activity, as well as fractures at the points where the loads are concentrated (Figure 89).

In general, atmospheric factors (rain, wind, sun) affect the deterioration of the building. All the factors that lead to the decay of stone materials discussed in previous chapters (high humidity, condensation, water leakage, activities of micro and macro organisms, physical and mechanical and chemical effects, discoloration and loss of decorative elements, etc.) adversely affects the condition of arches as well.

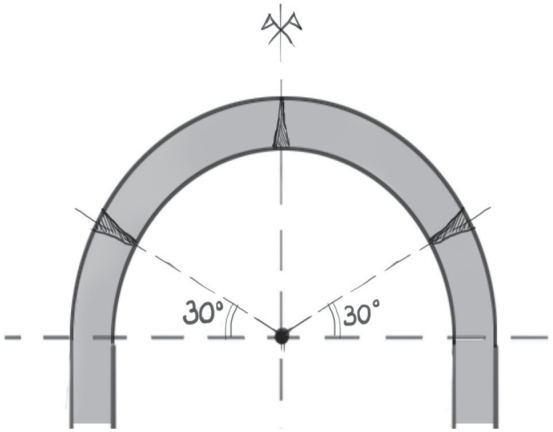


FIGURE 85: Points of load concentration in arches

b) Prescription

When the arches in the protected territory are restored, their original appearance must be preserved. The arches of redesigned buildings in the area should be constructed in accordance with the following scheme (Figure 86). It is not permitted to build arches that are inconsistent with the architectural traditions of Sheki.

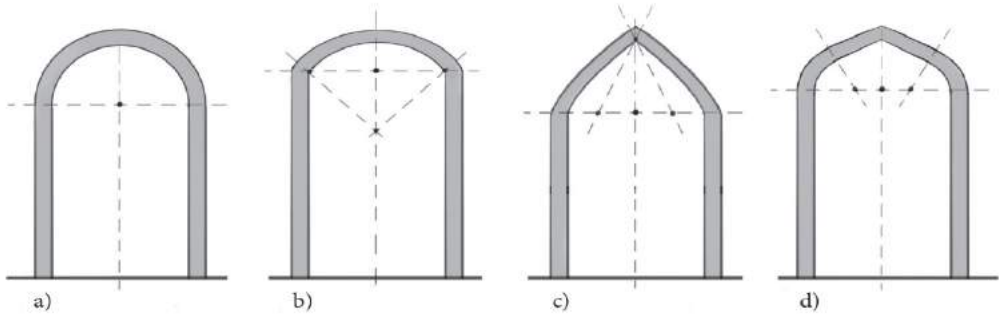


FIGURE 86: Types of arches in Sheki: a) semi-circular; b) segmental; c) equilateral; and d) four-centred

The new arches must be built in the same form and using the same materials as the existing typologies in the construction tradition of Sheki. When building arches made of cut stone or fired bricks, the total number of building units (i.e., bricks or stones) must be an odd number. One unit must be used as a keystone, and the remaining units must form the voussoirs arranged symmetrically. For better load distribution, the processing or alignment of stones or bricks should be done in such a manner as to ensure that the surfaces of the elements fit together well. Thus, the lines joining the elements must converge at the centre of the circle forming the arc curve eliminating the risk of slipping downward.

In the construction of brick arches, the mortar takes on much importance as opposed to the similar elements in cut stone where the mortar is placed in minimum and constant thicknesses. When building arches made of both stones and bricks at the same time, it is recommended to place the stone blocks near the points of load concentration to increase the mechanical resistance of the arch. The arch structure easily tends to deteriorate in some sections rather than in others and this usually happens at keystones and in the sections called “breaking points” located on the rise at 30° from the impost plane (Figure 85). The specific geometric formation of the arch makes it difficult to use fired bricks as keystones.

2.2.8. Wall niches

FIGURE 87: The traditional houses have many wall niches serving storage functionals but also used to lighten the walls and create sub-rigid structures with anti-seismic function. They are mostly found on the upper floors

The traditional houses in Sheki have many wall niches. In addition to having a storage functionality for keeping household objects, the wall niches are also used to lighten the walls and create sub-rigid structures with anti-seismic function. Therefore, they are found in greater numbers on the upper floors

Depending on their size and location, the wall niches were designed to store boxes and other household items. Besides their storage designation, they also play a role in enriching the interior of the house. The decorative patterns on the upper parts of the niches, mainly in the upper corners, add a special feature to the surfaces of the interior walls. Some large niches are divided into several horizontal compartments with wooden shelves.

FIGURE 88: Some large niches are divided into several horizontal compartments with wooden shelves.

Decay and prescription

Since the wall niches belong to the interior of the house, the following section is recommendations only, except for the niches of outstanding value.

During restoration and repair works, metal mesh sheets should be used to ensure the adhesion and durability of the plaster in the corners of the niche. If the wall niches have decorative elements, it is necessary to preserve and maintain them according to the historical documentation and, in case this is not available, they must be restored following the traditional models closest to the typology.

FIGURE 89: Arches and niches are subject to fractures. Other degradation factors include the accumulation of foreign bodies in decorative parts, and the formation of cavities, as well as incongruous additions.

FIGURE 90: Correctly restored wall niches

2.2.9. Boundary walls

Restoration concerns not only buildings, but also boundary walls, which play an important role in the historical appearance and perception of the streets. Traditionally, the walls were built of river stones using limestone mortar. Gradually river stones were replaced by quarry stones and limestone mortar with a mixture of cement and sand. Sometimes the boundary walls are plastered (see 3.1.4). There is usually a roof-like cap made of ceramic tiles and bricks at the top of the wall with a double function of protecting the masonry from precipitation and giving it an aesthetic appearance (Figure 94).

The precursor to today's stone walls were simple fences of antiquity made of wood to protect the cultivated land plots from grazing animals. Subsequently, wooden fences evolved into stone or mudbrick walls in the Islamic period especially when the intimacy of the family needed more adequate protection. In the 18th century, building these boundary walls from stone became a norm in Sheki. Today some of these old stone walls are preserved and they sometimes reach up to 3 meters in height.

Barriers structures in Azerbaijan were of simple construction till the middle of the 20th century. The bottom half of the barrier was made of stones at a height of 15-25 cm and the rest from the boughs of thorny bushes. Starting from the mid-20th century, the ability to transport stones was greatly increased by commissioning of new trucks and living conditions improved and as a result, people started to build more stone barriers across the country.

FIGURE 91: Traditional walls made of river stones using limestone mortar

a) Decay

Many walls are currently in poor condition due to the absence of adequate maintenance. The major factor of deterioration is water, which through infiltration and rising damp causes erosion of the mortar, detachment of the stones and loss of cohesion of the masonry and consequent collapse.

There also some incongruous additions of multiple nature. They differ in forms, materials, and assembly techniques. The heights of different boundary walls are not coherent with one another. The original materials have been replaced over time with cheaper modern alternatives such as prefabricated blocks or concrete. Sometimes fake cladding is used to disguise later incongruous additions, but they are implemented in a manner not compatible with the nature of the traditional walls (Figure 92). Where traditional material is used, it is often done badly with poor results of aesthetic compatibility.

FIGURE 92: Later additions or replacements not consistent with the traditional typologies

b) Prescription

Traditional boundary walls must also be maintained and restored through consolidation avoiding their demolition or reconstruction where possible. This requires the following:

• Periodic maintenance with the adoption of all necessary measures to prevent or slow down its degradation.
• Restoration if the degradation is shown to a degree that can no longer be controlled by simple maintenance (for the general intervention criteria see the section on the masonry structures).

Maintenance and restoration works must be carried out using the same type of material and techniques with respect to the existing structure to achieve aesthetic homogeneity during the intervention. Particular attention should be given to the mortar and its application. The new mortar must be of the same type, colour, and grain size as the original one and must not introduce any chromatic alteration. If the new mortar does not give the colour of the traditional mortar, the gaps between the stones on the outer surface of the wall should be covered with the grout of the appropriate colour. Any partial destruction of the walls for making a new opening is not permitted except for adaptation for incongruous old openings to the traditional gate typology and creating a new opening to the car park otherwise inaccessible. The latter opening must also be in the traditional gate typology.

FIGURE 93: Newly restored boundary walls in Sheki Fortress

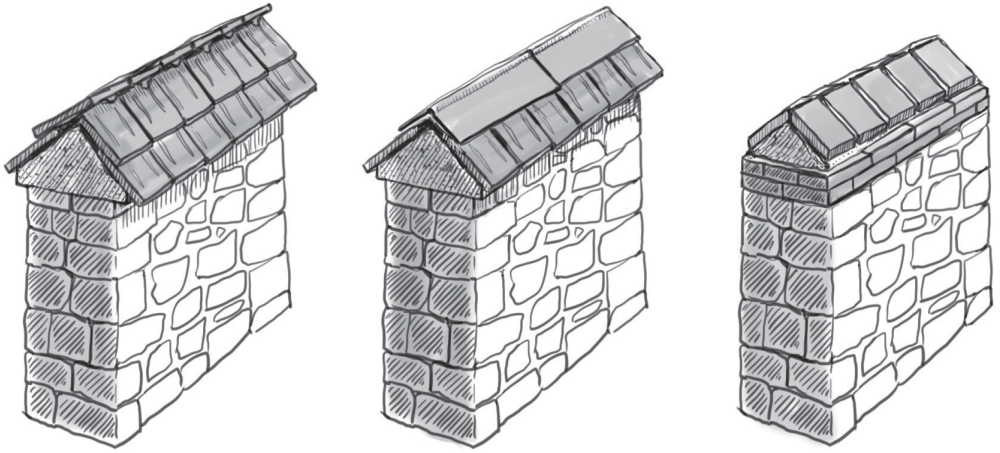


FIGURE 94: Types of walls according to their caps: (from left to right) ancient period, modern period, and Russian period.

The new boundary walls must have a minimum height of 1 metre up to a maximum of 2 metres. It is recommended to install caps made of ceramic tiles or bricks on the top of the walls following three possible solutions: ancient, modern, and Russian (Figure 94). Alternatively, a lower stone wall (1 metre) may be built and its height then increased by 30-50 cm using interwoven green branches (Figure 93).

It is not permitted to finish the surface of the walls with materials other than those imitating river stones, quarry stones, fired bricks or adobe. The use of prefabricated blocks and cement mortar in the construction of new walls is allowed if the surface of the walls is finished in accordance with the traditional typology. The wall can be built of metallic panels if its surface is finished completely with one of materials mentioned above or completely hidden behind bushes or flowering shrubs. Construction of walls with stone or brick columns or metal railings is not permitted.

2.3. Decorative elements

The traditional houses in Sheki are rich in decorative elements for the development of arts and crafts in the city has positive impact on the artistic elements of the façades, interiors, and gates.

Columns of verandas and balconies have a special place in the decoration of the traditional houses. These columns were often decorated with carved elements. The roofs of even the ordinary houses have decorated cornices and overhangs and these decorative elements reach the highest level of artistry and applied art in such monumental buildings as the Shekikhanov's House. The windows in more wealthy households are decorated with fretwork (shabaka). The interiors of the residential houses display the abundance of wall niches of different forms, sizes, and functionalities. The mantelpieces present in every house have special artistic value from the point of view of decorative arts. The design and decorations of the mantelpiece depended on its position in the interior of the house, its designated function, and the wealth of the household. The gates are also of great importance in the architectural appearance of the residential house. They were made in a form of various arches and decorated with the carved ornaments of wood and various elements of metal forging such as door knockers (takkulbab), handles, loops, battening plates, etc.

The houses of the rich were decorated with the painted in bright colours and mirrors, verandas and ceilings were painted with large murals.

2.3.1. Fretwork

The windows in some monumental buildings and houses in Sheki are made of richly decorated wooden fretwork filled with multi-coloured glass. These fretwork windows called shabaka were once made from Venetian glass which is a testimony to the existence of trade relations between Sheki and Europe through the Silk Road. Hand-made Venetian glass from Murano had a thickness of 2 mm but Russian-made glass used for restoration today can have a thickness of up to 4 mm making it slightly opaque.

FIGURE 95: Windows in monumental buildings and houses are made of shabaka – richly decorated wooden fretwork filled with multi-coloured glass.

The finest parts of fretwork are made from the wood of plane, linden and beech trees and showcase the intricate skills of local artisans and craftspeople. Numerous tiny wooden details of the fretwork are joined only by a system of rebates and housing. Fragments are joined so tightly that the fretwork seems to be a single unit, not a composite thing. One square metre of fretwork may be composed of 5,000 individual fragments, and its most remarkable feature is being assembled without using any nails or glue. The master usually frames his fretwork with relatively thick casing to highlight its fine design. Casings are usually made from walnut or black oak timber and decorated with carvings designed as a continuation of the ornamental lines of fretwork. The patterns on the casing form a geometrical design resulting in an integral and complete pattern composition with the fretwork[7].

a) Decay

The causes for deterioration of the fretwork are the same as the causes for degradation of wood (see the section on wood). Further non-structural degradation factors are the loss of decorations including glasses, the chromatic alteration that manifests itself through the variation of one or more parameters that define the colours (tint, clarity, saturation), and the surface contaminations due to the accumulation of foreign materials such as dust or dirt.

[7] Z.Mammadli. Sheki Khan Palace. Baku, 2006, pag. 137–139.

FIGURE 96: Restoration and conservation of decorative windows are carried out by local workshops engaged in the production of glass and wooden elements in accordance with the traditional typology.

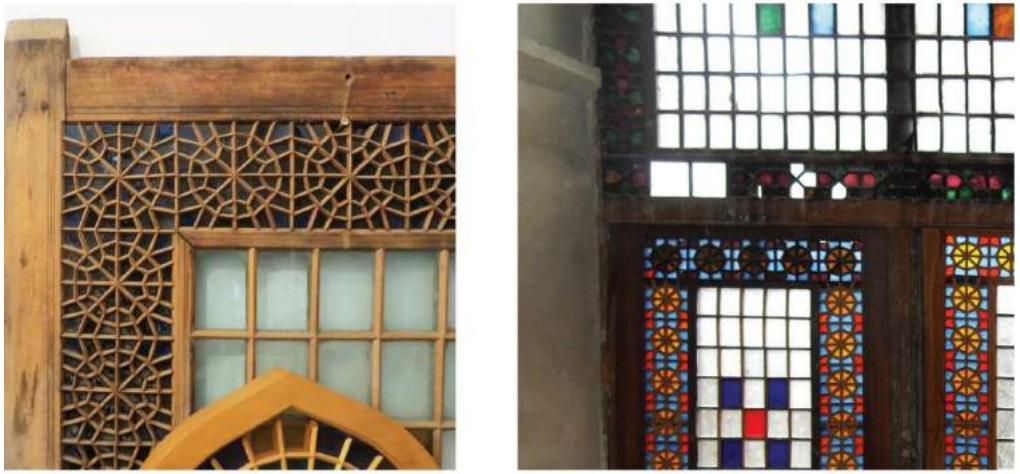


FIGURE 97: Deterioration of fretwork happen by their constant exposure to atmospheric and biological agents. Wood casings are attacked by xylophagous insects or rots, glass elements become loose and come off or their surface gets contaminated.

b) Prescription

All fretwork including those in the perimeter walls and in verandas and balconies must be preserved. These elements can only be subjected to cleaning, consolidation, and eventual reinstatement of the missing or deteriorated parts and must in any case be treated accordingly.

In the event of unfortunate deterioration or detachment (from vandalism or other traumatic events that can damage the elements otherwise intact and well preserved) consolidation techniques must be adopted first and subsequently, damaged, or missing parts must be restored. Said operations must, in general, be performed with the possible adoption of deep consolidation or joining techniques. When the deterioration state of the decorative element is so advanced that it does not allow any reasonable form of consolidation or restoration, it is prescribed the remake integration, resumption of gaps and other similar partial interventions. The dismantling must be particularly precise in order not to cause any damage to the adjoining elements and the reconstructed elements must reproduce exactly the forms, texture, surface finish and colours of the previous elements so as not to cause any alteration of the architectural appearance of the façade.

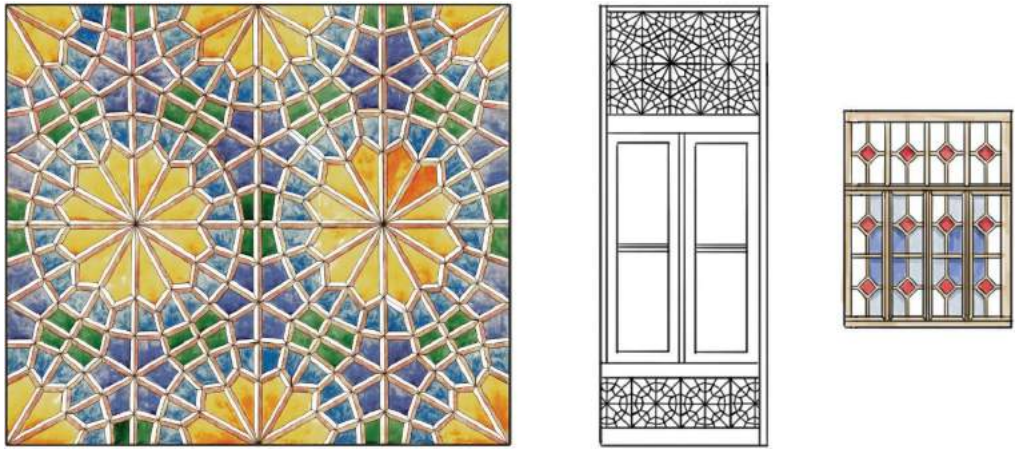


FIGURE 98: Fretwork may also be present in residential buildings.

It is not permitted to install the fretwork on the external façade if there is no empty space behind it. Installing any fretwork made of materials other than wood is not permitted. The fretwork used in the façade must be made of only wood and glass. Installing the fretwork on the wooden balustrade is permitted. It is recommended to darken the wooden parts of the fretwork before installing them.

2.3.2. Ornaments

Most houses in Sheki, especially the houses of the rich have many decorative elements or embellishments such as ornaments of various forms and materials. Frames made of bricks that emphasize the openings or mouldings and bands on the main façades are typical examples of traditional ornaments (Figure 99). Other examples of ornaments made of stucco or wood include casings around the fretwork and false ceilings found inside the building.

The ornaments are characterized by complex symmetrical weaves and depict stylised plants, animals, and stalactites. All these decorative elements enrich the simple structure of the house and serve to reaffirm the prestige of the property owner.

FIGURE 99: Ornaments on a mosque façade (left) and mantelpiece (right) in Sheki

a) Decay

Because of their age and exposure to atmospheric agents, the ornaments are subject to various degradation factors such as the loss of adhesion between the mortar and the wall support causing their detachment. That is why there are cracks or losses in many ornaments.

The forms of ornaments are characterised by indentations and thus they are subject to other factors such as the condensation of atmospheric humidity, infiltrations and above all to the surface deposits due to accumulation of foreign materials of various kinds, such as, for example, dust, dirt or guano of variable thickness. The above-mentioned physical-mechanical and chemical processes often influence the health of the masonry and in some cases, contribute to the degradation process already in place.

Another decay factor is the contamination of traditional models with modern additions out of historical and architectural context of Sheki. Polished or glazed porcelain tiles or other incongruous wall and façade applications have increasing presence in Sheki. In addition to their nonconformity, these materials do not respect the traditional form and colour variations with compositional results far from the traditional decorative elements.

FIGURE 100: Ornaments are subject to various degradation factors such as chromatic alterations, cracks and fractures, and surface contamination. Moreover, they are frequently contaminated with elements, forms, and materials outside the historical context.

b) Prescription

If the ornaments have lost the adhesion with the substrate, they must be consolidated by restoring the adhesion between the mortar and the substrate. The intervention must be carried out with the possible adoption of deep consolidation or bonding techniques, such as, for example, injecting binding mixtures beneath the plaster. When the state of decay of the ornament is so advanced that it does not allow any reasonable form of consolidation or restoration, it must be reconstructed. During reconstruction, the dismantling process must be carried out with precision not to cause any damage to the adjoining elements and the reconstructed elements must reproduce the forms, texture, surface finish, and colours of the previous elements so as not to result in any incongruous alteration of the architectural appearance of the façade.

FIGURE 101: Metal mesh should be placed between the mortar and the substrate to make the reconstructed decorative elements durable.

The reconstruction must be carried out in accordance with the profile that is completely identical to that of the previous element. The mortar must be enriched with resin anchors if necessary and have a composition, granulometries and chromatism like that of the removed parts. For achieving more durability of the ornaments made of stucco, it is also necessary to strengthen the stucco.

In the event of unfortunate deterioration or detachment of the ornament (from vandalism or other traumatic events that can damage the elements otherwise intact and well preserved), the consolidation or binding techniques already prescribed for the stone or brick elements may also be adopted.

All ornaments on the perimeter walls with both plastered and exposed surfaces must be preserved. These elements can only be subjected to cleaning, consolidation, and eventual replacement of the missing or deteriorated parts and must in all cases be treated appropriately whenever intervening on the surfaces where they are present.

The consolidation must be carried out in depth on the elements of historical, architectural, or typological value that are in an advanced state of degradation to guarantee their stability and conservation.

FIGURE 102: Cleaning the ornaments with the absorbent wrapping technique which involves the use of substances with high absorbency capacity such as cellulose pulp, carboxymethyl cellulose, talc, colloidal silica and some particular types of clays (bentonite, meerschaum, and attapulgite).

Protective treatments must be carried out on the external surface of the material whenever the latter absorbs excessive water which is detrimental to good conservation.

The ornaments made of plastered masonry and moulded as frames, pilasters, plinths, and other elements must also be preserved and restored by cleaning, consolidation, and reinstatement or restoration of the missing parts. If their removal is unavoidable, they must be faithfully reconstructed based on detailed graphic and photographic surveys previously performed in the forms necessary for documenting every detail, or through moulding of casts.

The ornaments made of plastered and painted masonry must be restored with the same colour and surface treatment that repeats the plastic and chromatic qualities of the imitated or simulated material. It is also necessary to proceed with the restoration of the elements of special value and complexity such as frescoes, tempera, stucco, graffiti, etc.

2.3.3. Carved wood

Wood carving is one of the oldest techniques and is performed by carving the wooden surface with special tools (chisel and gouge) by following a preestablished pattern. The wood carving is performed directly on the solid wood, on the structural part of the wood in question (for example on the joists, panels or doors) or it is worked as a separate piece and then applied to the structure as in the case of the ornaments of veranda. Almost all types of wood can be used for wood carving, but softwood is the best for the finest work.

FIGURE 103: Wooden ornaments on the columns of verandas and balconies.

FIGURE 104: Wooden balustrades are divided into four groups according to manufacturing techniques: a) with balusters carved of wood; b) with flat balusters cut from wood; c) with fretwork instead of balusters; and d) with wooden panels.

Carved wooden elements include cornices and other decorations of the overhangs running along the roofs of the buildings, the columns of verandas and balconies and their ornaments, carved balustrades, and other elements. They are made of mostly linden wood due to the softness of the material.

Verandas and balconies are decorated with rich ornaments of geometric, floral, or animal motifs, from elegant and intricate to simple and primitive carvings.

Balustrades on verandas and balconies have a special place in the decorative richness of the facade. The balustrades are made of either forged metal or wood and wooden balustrades are further divided into four groups according to the technique of their manufacture: a) with balusters carved of wood; b) with flat balusters cut from wood; c) with fretwork instead of balusters; and d) with wooden panels (Figure 104). Fretwork or flat balusters have been traditionally used in local architecture from ancient times, but vase-shaped balusters emerged under the influence of Russian architecture.

FIGURE 105: Balustrade made of forged metal

FIGURE 106: Typical wooden cornices hand-carved according to traditional patterns

a) Decay

The main causes for deterioration of the elements of carved wood are the same as the causes for degradation of wood (see the section on wood).Further non-structural degradation factors are loss of ornaments, the chromatic alteration that manifests itself through the variation of one or more parameters that define the colour (tint, clarity, saturation), and the surface deposits due to accumulation of foreign materials of various kinds, such as, for example, dust, dirt or guano of variable thickness.

FIGURE 107: Wooden cornices are subject to rapid degradation with the detachment of sections. Wood loses its protective layer which should be renewed every five years.

b) Prescription

The elements of the buildings made of carved wood must be preserved. These elements can only be subjected to cleaning, consolidation, and eventual replacement of the missing or deteriorated parts and must in all cases be treated appropriately whenever intervening on the surfaces where they are present.

In the event of unfortunate deterioration or detachment of the carved wood element (from vandalism or other traumatic events that can damage the elements otherwise intact and well preserved), consolidation techniques must be adopted first and subsequently, damaged, or missing parts must be restored. When the state of decay of the ornament is so advanced that it does not allow any reasonable form of consolidation or restoration, it must be reconstructed. The reconstruction must be carried out in accordance with the profile that is completely identical to that of the previous element.

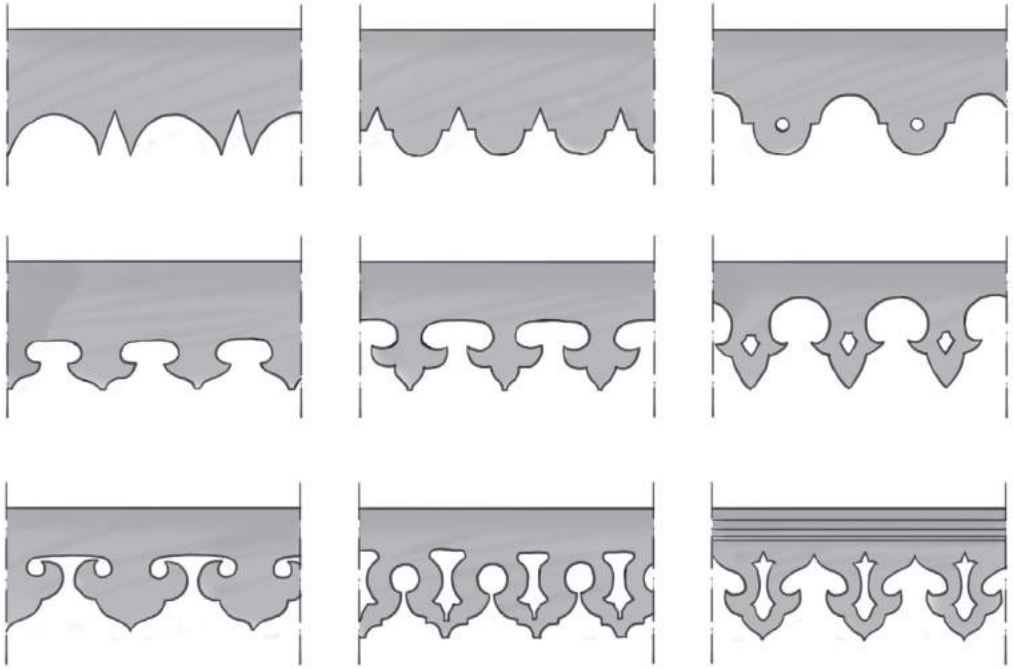


FIGURE 108: Carved decorative elements of verandas and balconies can be made from metal, but they must have right characteristics to resemble solid wood as much as possible

When replacing degraded cornices in traditional houses or installing new cornices in new buildings, more durable metal cornices can be used instead of wooden ones. However, they must possess the right characteristics to resemble solid wood as much as possible. Their thickness must not be less than 2 cm. Mixed compositions of materials such as a metal sheet or profiled metal are also permitted to limit the costs.

2.3.4. Tiles

This type of decorative element is rare and can be found in the monumental buildings and wealthier households. The most particular element is the tile made with a reflecting surface. Their composition in symmetrical and repeated patterns embellishes and illuminates the rooms in which they are placed. There are also examples of this fine decoration on the mantelpieces which are considered one of the valuable pieces of furniture. They are also widely used in bathhouses and bathrooms due to their waterproof properties (Figure 110).

FIGURE 109: Traditional tiles with reflecting surfaces in the monumental buildings

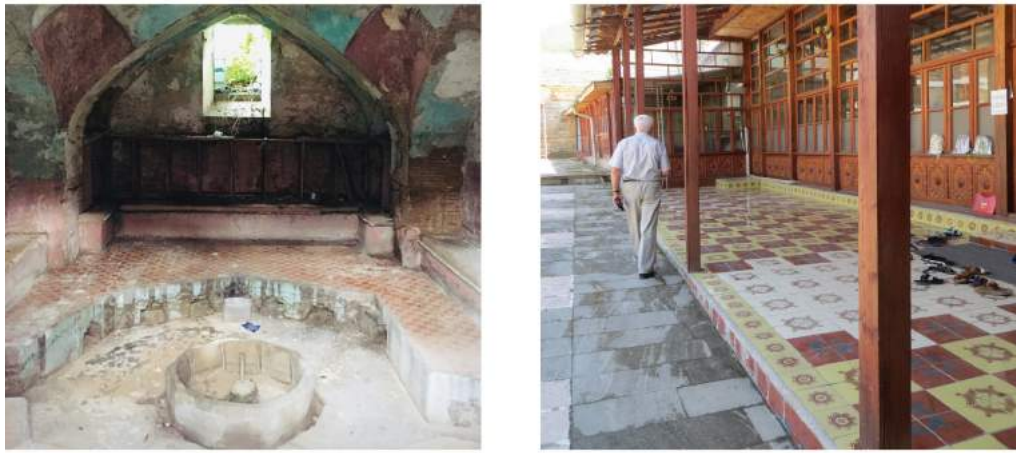


FIGURE 110: Bathhouses (hamams) and mosques are the places where the tiles find a more functional use. Glazed tiles are more resistant to water and easily cleaned.

The laying of tiles takes place through a thin layer of mortar which is sufficient to anchor them to the rough and porous substrate. The shapes of the tiles used in the past were almost always hexagonal, square or rectangular, but more complex shapes are used in more recent times that allow a complete combination when the pieces are put in contact with each other. The gaps between the tiles are filled with very fine grout or the settling is carried out on opposite sides so that the decorative motifs are connected seamlessly as in ornamental coverings.

There are brick sidewalks outside the old houses, on the opposite side of the house from the veranda (Figure 111). The sidewalk usually has a width of one metre. The lower part of the sidewalk is made of river stones or quarry stones and the surface is paved with 20x20 cm bricks. The edge of the sidewalk is cladded with bricks to prevent any erosion

a) Decay

Because of aging, exposure to atmospheric agents and pollutants, the tiles are subject to degradation factors such as loss of adhesion between the mortar and the substrate and resulting detachment, chromatic alterations through the variation of one or more parameters that define the colour (tint, clarity, saturation), and surface deposits such as dust and pollutants such as smoke.

b) Prescription

Any traditional tiles in the buildings must be preserved. These elements can only be subjected to cleaning, consolidation, and eventual replacement of the missing or deteriorated parts and must in all cases be treated appropriately whenever intervening on the surfaces where they are present. When the degradation state of a decorative element is so advanced that it does not allow any reasonable form of consolidation or restoration, it is recommended to reconstruct and replace missing parts, close gaps, and make other similar interventions. The dismantling process must be carried out with precision not to cause any damage to the adjoining elements and the reconstructed elements must reproduce the forms, texture, surface finish, and colours of the previous elements so as not to result in any incongruous alteration of the architectural appearance of the façade. When gaps appear in the composition of these elements, the missing parts should be reassembled as a rule using the same techniques, shapes, and colours.

FIGURE 111: There are brick sidewalks outside the old houses, on the opposite side of the house from the veranda.

FIGURE 112: Decay factors affecting the tiles with reflecting surfaces

FIGURE 113: Using traditional bricks or tiles with brick texture will preserve the traditional appearance of the residential houses in Sheki

In the past, baked bricks were laid on the sidewalks and other damp areas of the courtyards. Today the houses and courtyards are contaminated with numerous kinds of polished porcelain tiles that are incongruous within the context of the traditional residential housing. It is recommended to start re-applying traditional bricks or brick-sized 20x20 cm ceramic tiles with brick texture to prevent the advance of porcelain tiles. This measure will contribute to the preservation of the traditional typology of Sheki houses if they are widely used in the courtyards, halls, kitchens, bathrooms, and other areas of the house (Figure 113).

2.3.5. Frescoes

Fresco is one of the most common and ancient techniques of mural painting made with coloured earth pigments or metal oxides of a stable colour on freshly painted lime plaster.

The colours are simply dissolved in water, smoothing them against a marble slab by a spatula to eliminate all the aggregate and coarse parts. In the same way the final layer of the plaster to be painted with fresco must be smooth, without graininess and with a structure not excessively compacted. The plaster is always made with quality lime and with thin aggregates of siliceous nature.

As the painting process lasts for days, the main lines of the composition are sketched on the underlayer in a manner not to be visible afterwards. The quality of the lime putty and the pigments, together with the ratio, must remain the same for the whole work and it often becomes necessary to prepare all of the mixture in a single solution and store under a layer of water. This is the only way to achieve homogeneous image on the surface.

FIGURE 114: Exquisite frescoes inside the Khan's Palace

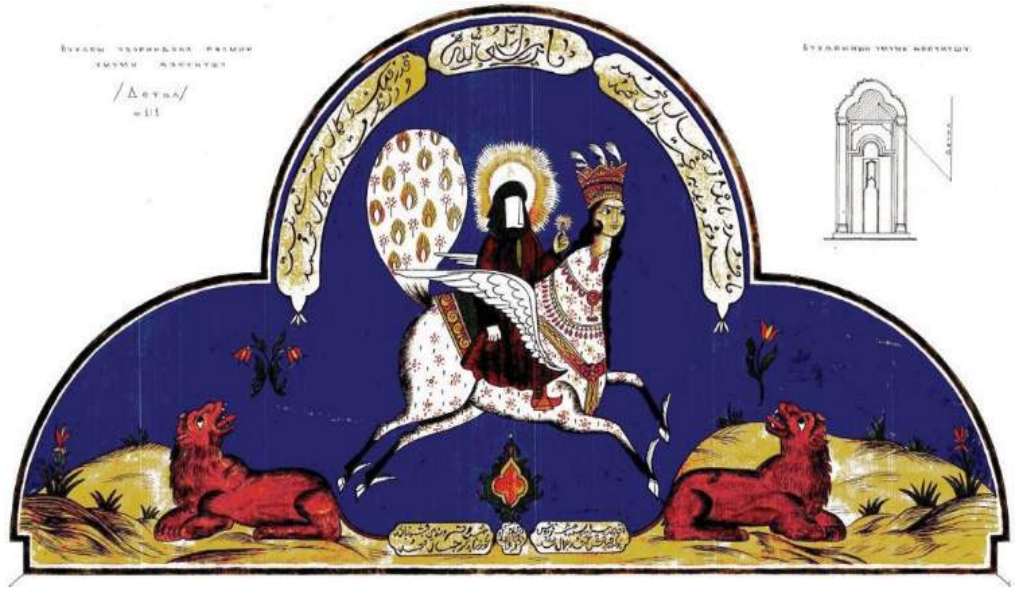


FIGURE 115: Complex fresco from the decorations of mantelpiece

a) Decay

Because of aging, exposure to atmospheric agents and pollutants the frescoes are subject to decay factors such as the loss of adhesion between the plaster and the substrate causing their structural degradation, blistering and flaking off, the chromatic alterations through the variation of one or more parameters that define the colour (tint, clarity, saturation), surface deposits such as dust and pollutants such as smoke.

b) Prescription

Any intervention must ensure the preservation and restoration of original or historical pictorial decorations (also on the façades, overhangs, window frames, pilasters, etc.). Removing or covering any visible pictorial decorations on the walls and door or window frames is forbidden. Any present gaps in the frescoes must be restored using the same techniques, shapes, and colours. When the gaps are particularly extensive and involve a large part of the decorative apparatus, the remaking of the lost parts will be allowed if it is possible to reconstruct with certainty the original constituent module of the same apparatus.

FIGURE 116: Deterioration of frescoes and loss of original colours

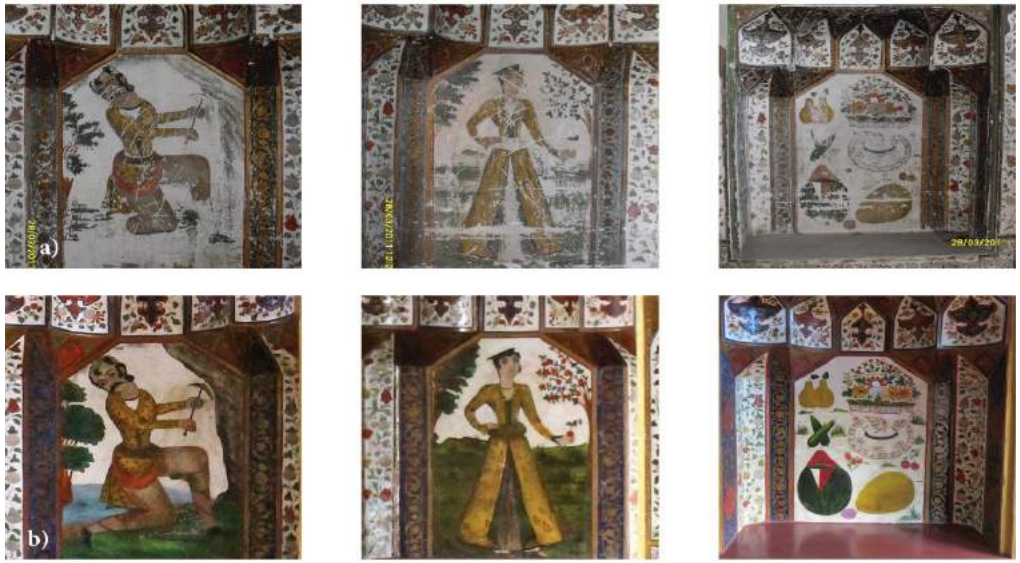


FIGURE 117: Frescoes before and after restoration

III. Materials

3.1. Traditional materials

Construction materials should be compatible with the traditional materials of historic buildings in surroundings. Traditional materials used in the historical buildings of the town are preferred ones. These are quarry stones, river stones and bricks of varying sizes for building walls; wood and ceramic tiles in the elements of buildings; and limestone mortar for plastering walls and filling joints. The builders of the town were improving architectural aspects of the building by decorating them by various decorative fittings. Brick trimmings of the windows and doors, the composition of the patterned bricking on façades, gypsum plaster (carbonic calcium) of the interiors are distinctive features in construction of the buildings in Sheki which should be observed.

3.1.1. Wood

Wood is a widespread application in the field of construction thanks to its easy availability in the nearby forests on the surrounding mountains, its lightness, elastic qualities, and easy processing. Timber is used in the construction of buildings both for the construction of main loadbearing structures as well as for finishing and decoration works. Depending on the intended use, the application of wood material may vary based on its mechanical strength, hardness, elasticity, or durability, as well as its colour and texture of the surface obtained after its processing.

Technical characteristics of wood are unlikely to be constant and many depend on the age of the tree and its growing conditions, as well as on the maturing systems of the sawn material. Several stages of processing are required to produce construction timber so that pieces of various shapes and sizes suitable for design and manufacturing needs can be obtained from the tree. The final quality of the material depends not only on the qualities of the trees used, but also on the care with which its processing is undertaken.

The wooden elements of the buildings often require pieces of special shapes and sizes that are not always directly obtainable from raw materials. It is therefore necessary to join several elements using connecting pieces such as nails, struts, wedges, iron holds and clamps so that wooden material is stable, durable, and resistant to heavy load and blows. The construction is facilitated by square or rectangular shapes of timber beams and planks. The joints are obtained with the cutting tools that give a convenient shaping to the timber, creating reliefs and grooves on the parts in the connection points; the simple coupling systems are usually recommended as they ensure sufficient strength without having to resort to complicated slots which could weaken the longitudinal fibre structure of wood.

FIGURE 118: Pinewood is a type of coniferous wood suitable for the use of roof structures, for its resistance to xylophage agents.

Historically, different types of wood have been used in construction for different purposes. For example, poplar wood was used mostly in attic construction because its trunk is flat and light. Wood from plane trees was used for supporting beams of the attic. Wooden frames of houses built of mudbricks were made of maple and oak trees due to their strength. Beams used in the construction were usually made of oak and rarely jasmine. Historically oak wood was also used for the floor and plane wood for the ceiling. Poplar wood was used to furbish window and door openings and niches in the walls. More recently wood from coniferous trees have been used for making beams and other wooden construction materials.

a) Decay

Wood is sensitive to numerous living organisms that can find shelter in it and use it directly or indirectly as nourishment for their life cycle. Wood is among completely biodegradable materials, but this feature, which is excellent from an ecological point of view, is unfavourable in terms of structural use. Degradation of wooden structures occurs under the influence of various factors. One of the main causes of wood degradation is water that causes the material to rot. The presence of water in the wood as in the form of moisture is caused by various factors such its capillarity, hygroscopic features and condensation of atmospheric humidity and infiltration.

b) Prescription

Conservation of wooden elements is a necessary condition for the maintenance of the performance requisites envisaged by the construction project. Each single wooden element has its own functionality and is used in the structural scheme of a building based on calculations, codified procedures, technical standards, and decades of application experience. The durability of wood is an achievable end ensuring the correct preservation. Preserving wood means excluding environmental, climatic and biohazard conditions that could be compromising to its integrity.

The first stage of the restoration process is to remove dust and dirt that have accumulated on the surface of wooden materials. To achieve this, a vacuum cleaner that can penetrate the deepest pores, and brushes of different sizes with stiffer bristles are used.

FIGURE 119: Re-use of some well-preserved old wooden planks

The greatest danger for wood is represented by humidity, so to preserve the material for a longer time, it is advisable to cover the surface of wooden materials with a coating that protects it from moisture, as well as fungi and parasites.
Antiseptics are used to control parasites such as xylophagous insects, termites, and fungi that cause the degradation of wooden structures. These substances are dissolved in water or organic solutions and then applied to the surface of wood or injected into it. In case of presence of fungi, it is necessary to immediately create a moisture-free environment, thereby returning the optimal humidity and temperature regime, which is the enemy of fungal microorganisms, and then take measures to destroy the fungi with chemicals.

When using new wooden material, it is important for it to have the same type or composition as the old wooden material being replaced. This is important to avoid the difference in load effects that may result from the shrinkage of the wood over time. For this same reason it is necessary to let the new wood mature in the environment in which it will have the same thermo-hygrometric balance of the replaced material.

While preserving the original structure, its individual elements can be replaced with new ones. All carved elements in the wooden structure of the buildings must be preserved. These elements can only go through the process of restoration and joining. When their degradation condition does not allow for a thorough restoration process, it is recommended to re-integrate them and fill in the gaps. In this case, dismantling works must be carried out with special care to avoid damage to the elements; restored parts must not differ from the previous ones in terms of their shape, texture, surface and colour, and no changes must be made to the original architectural appearance of the building.

It is recommended to impregnate removable elements with epoxy resins during restoration. Epoxy is injected into the wood mass at very low pressure through specially prepared holes with a diameter of not less than 6 mm. It is evident how in such cases the resistance of wood increases thanks to the binding action carried out on the internal fibres by the resin. The use of epoxy resin replaces the previous use of metal elements screwed to the two parts to be connected. When the wooden element does not need to be removed, it can be reinforced in place.
It is also possible to provide for replacement of a damaged part with a new part made of wood. The surfaces of both parts in contact must be shaped like a sawtooth to improve the clamping. The joining takes place through the action of epoxy resin, which is spread on the contact surfaces.

3.1.2. Stone

In the acquisition of the stones, the builders counted on those in site or in the nearest zone to avoid difficult transportation operations. Therefore, according to their origins, the stones can be distinguished as quarry stones and river stones.

It often happened that the rock formations, due to the atmospheric agents, tended to separate into regularly shaped blocks, not requiring further processing. Regular stones contributed to the construction of straight masonry.

The river stones, easy to find in the area, due to the proximity of many rivers and waterways (Kish, Dayirman and Gurjana), were very convenient for paving roads and internal courtyards.

FIGURE 120: Quarry stones and fired bricks on the left, river stones and fired bricks on the right

Quarry stones

This material, mainly used in masonry, consists of roughly carved rectangular stones. These roughly carved stones are obtained either because of direct atmospheric erosion or in the process of stone processing in the rocky areas in the piedmonts.

Quarry stones are stones extracted from the rocky slopes of the surrounding mountains, and they are carved and polished in a straight shape, mainly in the form of a parallelepiped. This process is a costly procedure, so only the load-bearing walls and other important parts of buildings are built with quarry stones.

The larger fragments are put on the outside, their flat side on the façade and the cavities that form in the wall core are filled with smaller

FIGURE 121: Quarry stones are carved and polished in a straight shape, mainly in the form of a parallelepiped

fragments. Their irregular polyhedral shape with sharp edges allows to obtain a stable joint between the components especially with the use of the mortar.

The use of unpolished stones allows to make the external appearance of the wall regular; the fragments take the form of flat and elongated splinters of variable thickness and can be connected to discontinuous courses, generally horizontal. What distinguishes a quarry stone from a river stone is that the former is yellowish in colour.

River stones

This material with very rounded edges and a smooth surface covered with soil mould is obtained from riverbeds or alluvial sediments. Despite very dense rock composition, river stones do not hold the mortar used in masonry well enough and do not provide sufficient stability for walls, and are therefore mainly used for paving streets and in the construction of non-structural parts of buildings and boundary walls. The river stones used in Sheki are mainly collected from the Kish riverbed. In the past, stones were also collected from the Gurjana riverbed. What distinguishes a river stone from a quarry stone is that the former is greyer and more bluish in colour.

Sorted river stones

Polished small fragments broken from large river stones were widely used in ornamental masonry. These fragments were carved in a rectangular shape and mostly used in combination with fired bricks. One of the important features of river stones is that they break in a straight line when struck and this feature facilitates the widespread use of broken river stones. However, the use of these kind of stones has decreased in recent years.

a) Decay

The causes of degradation of natural stone can derive from physical, chemical, and biological actions in many cases present simultaneously.Among the causes of deterioration of a physical nature, particularly damaging is thermal, frost, water, wind, and mechanical actions. The thermal actions, connected to the seasonal and daily cycles, namely the variation of the temperature, results in expansion and decohesion of the matter. These deformations, also due to the simultaneous presence of different minerals in the stones, determine internal tension states with consequent decohesion and local disintegration of the material. The action of frost, connected to the porosity of the material that can cause the absorption of water to saturation, causes on the one hand the contraction of the stone and, on the other, the increase in the volume of the water absorbed. The two pressures deriving from this

FIGURE 122: Due to their rounded surface, river stones are mostly used for paving the streets.

FIGURE 123: Sorted river stones were carved in a rectangular shape and mostly used in combination with fired bricks.

phenomenon add up and cause a tension state that tends to break up the stone. Thus, both erosion of the surface layer and reduction of the load-bearing capacity of the stone can be verified.The biological actions of degradation can derive both from microorganisms and from macro organisms. Among the micro-organisms it is necessary to remember the bacteria, the mosses, the lichens, and the algae which, from what has been ascertained, are always the cause of processes of disintegration of the stone materials. Among the macro-organisms it is necessary to remember the vegetables, which with their roots are wedged in the stones, and the animals depositing excrements containing acids that have chemical effects on stones.

b) Prescription

It is necessary to make an accurate selection of stone materials to better meet the static and functional needs. All rocks are adapted to provide suitable pieces, but those in thin or highly schistose layers, as well as those fractured or friable, are generally to be discarded. Using local stones is always the preferred way. The maintenance interventions consist of a series of operations such as:

- Cleaning
- Consolidation
- Preservation

These operations are not always all necessary and must not produce harmful effects, therefore, the choice of the material and the method to be used must be made based on appropriate checks.

The cleaning intervention has the sole purpose of eliminating the pathologies that can generate further degradation. It must not aim at improving and/or modifying the aesthetic and chromatic aspect of the object. The cleaning presents technical problems to be tackled with extreme caution, as it consists of a series of operations that tend to remove from the surface of the product those foreign substances, that are pathogenic and generating degradation, through mechanical and/or chemical actions that entail a certain margin of risk for the surface itself. For these reasons, any technique adopted should be used with different graduality and intensity depending on the type of substance to be removed and the nature of the stone element and, above all, the state of conservation of the object to be cleaned. The only thing certain is to start the operation gradually having the foresight to stop just before that it is too late.

Consolidating is the application of products able to penetrate deeply, improving the cohesion of the degraded material and the adhesion between it and the healthy substrate.

The consolidating solutions, both organic and inorganic, must penetrate the porous substrate and tie the altered parts to healthy ones and responding to some fundamental needs such as:

- Chemical compatibility with the substrate so as not to cause the formation of harmful by-products.
- Physical compatibility as inorganic material.
- Uniform absorption by the material subjected to treatment.
- Do not excessively reduce the permeability, to allow the eventuality water present in the material to evaporate.
- Chemical and thermal stability to avoid chromatic alteration of the treated surface.

The choice of consolidation must be considered viable only where the state of degradation is so advanced as to affect the duration and stability of the work, because today there is no completely reversible consolidation. These materials used have the sole purpose of slowing down the deterioration processes. The application of chemical protections on the altered surface is necessary every time they are identified as factors that generate degradation, external agents to the surface itself (atmospheric pollutants, condensation of moisture, etc.).

The protective devices must have the following characteristics:

- Chemical inertia in relation to stone material.
- Absence of harmful by-products.
- Ultraviolet chemical stability.
- Water repellence.
- Good water vapour permeability.
- Minimal influence on the chromatic aspect of the support.

3.1.3. Brick

The bricks in the ordinary masonry are arranged in horizontal layers called courses (curbs, rows) and fixed together with a fine and well-screened mortar composed of an air or hydraulic binder; in placing the bricks in layers, to obtain a perfect chaining of the structure, the vertical joints must be staggered. After the construction, the brick surfaces can be worked with a certain precision when it is necessary to make gables, cornices, pilasters, and decorative reliefs. Two types of bricks are used in Sheki: mudbricks and fired bricks.

Mudbricks

The most widely used material for buildings, since ancient times, is the rammed earth. One of its best uses is brick dried in the sun (also called adobe), thanks to the easy availability of the material, easy realisation and low cost since the kilns for fired bricks have never had regular use in Sheki.

The dry, pebble soil did not offer good quality dough, so that straw, grass, and leather strips were usually added to the mud to improve cohesion. What is needed is to moisten the soil, create the appropriate mixture and mould it into wooden formwork to obtain the bricks of the size that was needed. The mud is then pressed into moulds by hand or with mortars, then separated and left to dry in the sun with a varying seasoning time, turning the brick before on the two main faces and, once hardened, cutting on the sides.

Mudbricks tend to crumble under the pressure and action of atmospheric agents. Therefore, in the rainy climates such as Sheki a stone foundation was used to avoid placing them directly on the ground. One function of roof overhangs is also to protect mudbrick masonry from rains.

The production of mudbricks was carried out directly on the construction site and using the available moulds. Therefore, the size of mudbricks varies depending on the moulds used. The most common mudbricks are 9 x 18 x 28 cm.

In general, the adobe is produced with a mixture of earth, water, and straw, mixed in proportions that depend substantially on the chemical-physical characteristics of the land used. The earth must first be a land derived from excavations at depths normally greater than 50-80 cm, that is, below the layer of earth containing organic elements. The presence of such elements could in fact lead to dangerous phenomena of rotting and rot-forming of portions of the adobe, causing serious pathologies in the walls made with them. The addition of straw to the ground serves to create a multidirectional fibrous structure, which helps to reduce shrinkage and cracking induced by it. The fibres also allow accelerating the drying process because they allow a better drainage of moisture outwards through their channels, lighten the material and enhance its thermal insulating properties. Instead of straw, synthetic fibres or animal (horse) hair can also be used. The granulometric composition must be such that it is possible to obtain sufficiently compact and resistant adobe, while the consistency must give the dough an adequate workability. The earth must be taken care of to avoid mixing it with organic soil and vegetation.

FIGURE 124: The most widely used material for buildings, since ancient times, is the rammed earth. One of its best uses is brick dried in the sun (adobe).

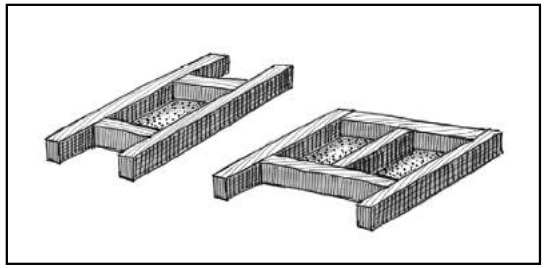


FIGURE 125: Wooden formwork to produce mudbricks. The area in contact with the ground must be covered with a thin layer of sand, to prevent the still wet adobe from sticking to the ground.

The straw, cut into long stems no more than the smaller size of the sides of the produced adobe (10 cm in general), is added in a variable percentage up to 3% by weight. The first phase of the production of the mixture is the humidification of the earth to obtain the right plasticity: the amount of water to be added varies according to the degree of workability that is desired and the type of land available (quantity and type) of clay. After re-humidification, the straw is added and mixed to obtain a uniform dough. Once the desired degree of homogeneity has been reached, the blocks are produced: the area concerned must be flattened (alternatively a simple wooden base can be used) and covered with a thin layer of sand, to prevent the adobe still wet adhere to the ground (Figure 125). The mould can be single or multiple, in wood or steel, without or with bottom. Its dimensions are variable according to the local tradition, even if this is accompanied by the need to create adobe of different sizes or shapes (for example for corner solutions and for the vaults of the ovens). To prevent the adobe from adhering to the walls of the mould, they are immersed in water before any demoulding. The shape of the blocks is made by filling the mould and compressing the mixture against its walls to form the edges and eliminate the cavities that can form between one layer and another; level the surface to remove excess material, remove the mould and allow the adobe to dry. After a few days, when it is possible to handle it without deforming, it will be turned over and laid down to complete drying evenly on all sides.

As soon as the adobe has hardened and there is no danger of injury in transport, even if it has not completed the drying process, it moves to another area, where it is stacked with the other adobe cut and spaced for each other to allow ventilation. When the drying is finished the adobe are stacked waiting to be transferred to the construction site.

Fired bricks

The production of fired bricks requires the use of clays, without calcium carbonate, which knead to become of plastic consistency, are first subjected to processes of formation by formwork, by hand or with machines, and then to drying and firing processes. The slightly fired bricks, called “albasi”, are yellow in colour and have high porosity; those fired well, called strong, have intense colouration and low porosity; those fired too much have brown colour and are partially vitrified. The red bricks, in some cases of more comfortable building, have a double colouring obtained by the different cooking of the material or by the amount of presence of iron in the mixture.

The introduction of fired bricks In Sheki was after mudbricks and stones used in construction since ancient times.

FIGURE 126: Fired bricks come in two colors, depending on the technology of firing and the amount of iron in them.

The laying of fired bricks is quite simple, even if it must follow some rules without which neither adequate stability nor the characteristics of resistance and distribution of the efforts required to the walls are obtained. Before use, the fired bricks must be carefully wet until almost saturated and when they are laid, they must be impregnated but dry on the surface so as not to dilute the fixing mortars. Even the laying bed must be wet with plenty, especially if it is an old wall. On the surface, a regular layer of mortar of about 15 mm is laid with a trowel, on this bed the brick is placed that must be compressed slightly and moved making it crawl up to its final position; the excess mortar drains and fills the vertical joint and with this operation the brick remains well adherent to the mixture due to the lack of air bubbles in the interface and can only be detached with a shock. In this phase only small settlements are possibly made by beating the brick with the handle of the trowel.

a) Decay

Depending on the origin, the degradation of bricks can be cause by two different factors:

• Congenital factors: They are due to the characteristics of the chemical composition, the porosity and the internal structure of the material, which in turn depend on the nature and composition of the source material and the peculiarities of the processing and also of cooking (saline content, calcium carbonate, processing, firing mode, temperature and duration of firing, conditions of installation of the element).

• External factors: They are due to the action of external agents such as water, wind, pollution, biological attack. It is above all the presence of water that causes the greatest alterations of the material provoking both physical (freezing and washout) and chemical (sulfurization, carbonation, etc.) effects.

b) Prescription

Adobe and fired bricks used in the restoration of ancient buildings and the construction of modern buildings must be made using the traditional techniques and dimensions mentioned above.

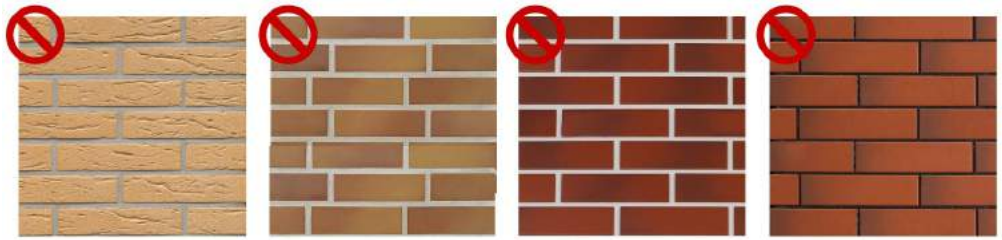


FIGURE 127: The use of materials that improperly imitate bricks is prohibited

The surface of the walls must be covered with traditional bricks or materials like traditional bricks. It is forbidden to use metro tiles on the surface (Figure 127). When covering the finished masonry with fired bricks, it is possible to break up the fired brick into 2 or 3 parts per its length and more per its width to save money (Figure 128). The gaps between the brick covers must be filled with patchwork.

FIGURE 128: Brick cladding when only the façade of the building is covered with fired bricks.

3.1.4. Plaster

The plaster is the surface finish of the walls, applied with the aim of levelling and smoothing the surfaces. The plaster has both a protective and a decorative function, precisely because it is the last layer covering the structures of a building. In Sheki, there are different types of plasters, which can have very different thickness, costs and laying times, made from raw earth and lime. The plaster is generally a mortar obtained by mixing water, a mineral binder and an inert. In general, each plaster is laid in several overlapping layers.

Clay plaster

Usually in the buildings with mud wall, the outer surface is smoothed first with mud and then plastered with clay. This technique improves the resistance of masonry to the erosion.

For its application by hand, an ancient technique is still in use, where mud spheres suitable for being held in one hand are formed and then forcefully thrown against the wall and then flattened by hand.

The clay plaster once laid on the brickwork needs at least 5 days to dry, only after this time it reaches the functional characteristics, i.e. those to protect the masonry from rainwater. Despite the due attention in the production of the material and in its application, this technique requires constant maintenance. Every 25 years a new plastering must be provided for the masonry structures. The areas that undergo a rapid breakup are those near the earth, due to rising water phenomena.

FIGURE 129: Buildings with mud wall, the outer surface is smoothed first with mud and then plastered with clay. This technique improves the resistance of masonry to the erosion.

Lime plaster

The composition made of lime, hydraulic lime, and gypsum is typical of the traditional construction in Sheki:

• The lime plaster has excellent performance in the face of frost and thaw because it easily returns moisture to the outside, has good resistance to water, but poor resistance to mechanical stress.

• The hydraulic lime plaster has excellent resistance to thermal changes and ease of installation, but low elasticity.

• The gypsum plaster, consisting of crystalline or anhydrous gypsum, is used in the interior walls, and can also be the last finish on other types of plasters.

The traditional lime plaster is made in 3 layers, applied at intervals of time, to gradually cover the shrinkage cracks. The first layer, adhering to the masonry, constitutes the layer of greater resistance and less absorption and serves to ensure adherence of the supporting plaster. It is realized with thin mortar, in a thickness not higher than 5 mm, with lime and sand in a ratio 1:1, very diluted, thrown with force against the previously wet wall. Then a draft layer is laid which forms the body of the plaster.

It is applied by strips and is composed of mortar with a pasty consistency, with dosages of water and minor binders with respect to the first layer to ensure both a good compactness and a low tendency to crack, it extends with the aid of a wooden ruler pressed against the wall. Before applying the last layer, it is advisable to allow 3 to 8 days to pass, depending on climatic conditions, to avoid emergence of unseen cracks. This treatment is applied by means of a wide brush and using a mixture made of lime, water and mineral pigments of a more or less high density according to the covering effect to be obtained; its application can be preceded by a treatment of milk of lime which improves the adhesion of the pigmented layer and limits its absorption by the underlying material. A covering effect is obtained with a pigmented varnish which at the same time ensures the masonry surfaces remain impermeable. Cooked linseed oil is applied on the dry surface with a brush and a mixture of suitable pigments (red, yellow, and black) with white lead is applied on top of this layer to obtain the desired colour.

FIGURE 130: Traditional lime plaster is made in three layers, applied at intervals of time, to gradually cover the shrinkage cracks.

a) Decay

Currently, in many cases the traditional lime-based plasters are not preserved in their original character or as a finish on the façades. They are often substituted with cement mortar or mixtures with prevalent cement content that are more resistant and easier to make but have nothing to do with the traditional context of Sheki. These are two most common substitutes:

• Cement plaster has high consistency and considerable simplicity of application. Although it has low elasticity, is subject to shrinkage and does not allow the evaporation of water, it is used a lot.
• Rough mortar plaster is the most widespread today because it is compatible with most of the building materials. It is made with the aggregation of several binders in various solutions (hydraulic lime and aerial lime, cement and aerial lime, cement and hydraulic lime, aerial lime and plaster, cement and hydraulic lime and aerial lime).
Foreign additions incompatible with traditional architecture include plastic-based sprays and rustic plasters made with sprayed mortar or cement techniques. The colours used to paint the façades are also different today from those with a historical presence: quartz paints and washable paints together with materials of plastic consistency are being used increasingly. When properties are united, or a single property is divided up, even if they preserve the original type, colours and plasters tend to change with new ownership.

FIGURE 131: A plaster made of cement and sand on the wall made of mudbricks. Poor adhesion between two different kinds of materials, weak elasticity and airtightness of the cement resulted in the collapse of entire parts of the plaster

b) Prescription

Plasters made of lime and clay is considered traditional, therefore the masonry must be exclusively covered with these plasters.

In general, any intervention on the façades must preserve their original character and finish of traditional lime-based or clay-based plasters. Any additions necessary due to various states of deterioration must be performed with materials and techniques like those of the original plaster to be preserved.

Plaster must be spread on the surface with a trowel using the traditional technique and following materials:

• Lime mortar and sand.
• Lime mortar and sand with milk of lime.
• Lime clay and rammed earth.

The use of bastard-type mortar in place of lime mortar and the use of the premixed products specific for the realisation of the plasters is tolerated, provided that the finishing is the same as the traditional one.

In any cases of partial or total remaking of plasters, the use of cement mortar or mixtures with a predominantly cement content is strictly forbidden. It is also forbidden to use plastic of any kind and rustic plasters made from mortar or cement spraying techniques. The use of glued stone plinths is also forbidden.

FIGURE 132: New types of plaster incompatible with traditional architecture include plastic-based sprays and rustic plasters made with sprayed mortar or cement techniques.

To understand the importance of the different properties that plaster may have, it should be pointed out how different it is to spread the plaster outside the building, rather than inside of it. The former will have to withstand atmospheric agents, while the latter will have to prevent moisture and water condensation from accumulating in enclosed spaces.

Very often it is necessary to intervene on existing walls in which the damage due to humidity is very evident. To ensure the restoration of these structures, it is important to choose additions to the plaster that give it water-resistant properties. Water-resistant plaster guarantees the evaporation of the water present in the wall and blocks the accumulation of moisture. Before applying the water-resistant plaster, it is important to remove the existing plaster, clean the walls and let them dry.

A fibre-reinforced type of plaster should be used to increase the mechanical resistance. This special plaster is mainly recommended for those situations in which the wall is subject to stress leading to cracks and breaking down. This plaster contains additives and substances that allow a better load distribution. An alternative is the reinforced plaster with an armature. This network allows to contain any detachment or breaking down of the plaster and is particularly recommended in the works of reconstruction.

During the restoration, some buildings originally plastered were improperly transformed by being stripped of their plaster which left their stones and bricks exposed to external forces. This general requirement can be waived for some buildings which, following the modification, have assumed a new character that is now historicised and worthy of being maintained as it is.

The maintenance and restoration of the façade plaster must be extended to all parts visible from the public, and in general, all visible parts that have been designed to be plastered.

These operations must always be completed with the painting in accordance with the provisions of colour and pattern rules (Figure 133).

The colour is an identity factor of Sheki to be safeguarded in the action of restoration for preserving the traditional urban views. a sample of colours attributable to the monumental and traditional historical buildings in the Historical Centre of Sheki have been obtained to distinguish them from modern colours. These colours give a highly effective overall chromatic image, making Sheki even more as an urban complex that preserves a homogeneous visual and historical integrity.

FIGURE 133: Colour palette allowed for use on the facades

All the external parts of the buildings that are plastered (façades, internal masonry, visible parts of roof, chimneys, etc.) must be painted using colours that conform to the local traditional colours and tonalities. Different colours can also be used if relevant tests carried out on the façades demonstrate their historical presence. In the absence of reliable references in relation to the original or historic colour of a façade, the colours and tones of the painting must in any case comply with the aforementioned sampling and the choice of colours must be harmonised and relevant with the context and the façade in which it is applied. Silicate paints can be applied on old traditional plasters only after preparing and reintegrating the base and fixing of the old paint.

Plinths on the ground floors of buildings are allowed, even with a different colour from the masonry. Their average height must not exceed one metre.

The quartz painting, the washable paints in general, and the plastic consistency materials (plastic, scratched and similar plasters) are categorically excluded. For the buildings that do not currently have any frescoes or other murals, similar decorations in traditional style may be referred to if typology, period of construction and the context may allow it.

In general, all painting interventions on façades (excluding façades) must provide for the chromatic diversification of the architectural-decorative elements (pilasters, cornices, window sills, string courses, window frames, gratings, plaster-like floor coverings, etc.) and technological-functional (guttering channels, downpipes, etc.). Any inconsistent paintwork must be removed and replaced with traditional paintwork even during maintenance or renovation.

In cases of unified or divided buildings, the following criteria must be followed:

• If unified building consists of building cores that still highlight their original formal autonomy (different horizontal alignments of the windows, different arrangement of the ground floors, different height of the buildings, etc.), there must be an intervention normally with different colours, even if all the nuclei turn out to be of a single property.

• If the building is divided into several properties, but unequivocally preserves the original type of single building unit, the colour must be one, except for the terraced or court buildings that can vary the colour with the change of ownership.

During any restoration work on the plasters, care must be taken to preserve and highlight old street numbers, street signs, commemorative and indicative memorials, wrought iron and any other similar elements designed to be visible above the plaster because they constitute documents of the historical evolution of the building.

During interventions, it is also necessary to proceed with the removal of the flounces and plinths (in stone, marble or other material) which had recently been added to the building and which were not relevant with the original façade system.

3.2. Modern additions

Today Sheki continues to evolve as steadily as in the past. It is possible to see these transformations in the introduction of modern materials. This evolution cannot and must not be stopped, but it may be regulated to allow the acceptable coexistence between the ancient and the modern.

3.2.1. Modern materials

Cement is one of the main building materials belonging to the category of hydraulic binders. Cement has been widely used in the construction in Sheki since 1960s, gradually replacing the use of constructions made of stone or brick load-bearing walls thanks to its economy and the ease of its installation. In modern buildings, cement is used as the main admixture of concrete in load-bearing structures and as the main adhesive material in masonry and plaster.

Metals have always been widely used in building constructions, the most widely used products are those from iron and steel used for their strength and resistance as connecting elements of wood and masonry structures. Non-ferrous metals such as copper, tin, and zinc are most used in hydraulic works and finishing decorations. Although plastics are not always visible in buildings, they are used in a wide and growing range of applications, including insulation, pipes, fixtures, and interior design. This growth is mainly due to the unique characteristics of plastics which include economy, durability and insulating properties, malleability, lightness, and manageability.

Prescription

All these modern materials are permitted if their use does not involve alterations in the traditional composition of the historic centre of Sheki. When used, they will have to follow the typical shapes and sizes, and mitigation measures must be applied to reduce their impact as much as possible, i.e. avoid their direct exposure by imitating the colours and shapes of traditional elements. Cement, in addition to following the above instructions, must never be left exposed, but covered with plaster. The use of plastic materials must be reduced and be environmental friendly as much as possible; also made less identifiable through the use of traditional colours and texture, i.e. the gutters will have to be in colours similar to copper or weathering steel. All objects made of metals must be protected with isolation treatments, not only against humidity but also from the action of aggressive substances such as gypsum, at whose contact the iron corrodes due to a chemical exchange reaction. Wrought iron is the most resistant to corrosion both for the purity of the starting mineral and for the high content of siliceous slag. These are not completely expelled during hammering, but they are very widespread to form real siliceous layers incorporated together with the hot-formed oxides present both inside the mass and outside the piece, where they form a coating very thin glassy consistency adherent to the surface and able to protect it in environmental conditions not too unfavourable. Metal anticorrosive treatments are carried out in different ways: the use of linoleum- based paints mixed with carbon black or black dyes of natural origin, represents sufficient protection against rust and does not require particular treatment, like the coating of paint.

Using materials that do not conform to the traditional architecture of Sheki (ceramic granite, aluminium tiles, etc.) is prohibited in public places or on structures visible from public places (facades, boundary walls, pavements, etc.).

3.2.2. Technical installations

a) Decay

Sheki has evolved through the transformation, even its technical installations have undergone drastic changes due to socioeconomic evolution. This evolution must not or cannot be stopped but only regulated through simple rules, thus allowing coexistence between the past and the present. Currently no installations of technological systems respect the architectural pattern of the façades of the buildings of Sheki altering the entire traditional urban landscape with electric cables, telephone lines, television antennas, water, and gas pipelines. Almost all of them are on view and not concealed and not making the urban architectural system fully legible.

b) Prescription

All installations of technological systems, of whatever entity and nature they are, must respect the architectural warp of the façade and introduce in it the slightest possible alteration. To this end, for the individual technological systems, such as for example: electricity cables, telephone lines, television antennas, water, and gas pipelines, etc. the provisions of the following paragraphs shall apply.

In general, the systems to be installed on the façades must be placed under track and therefore completely invisible to the outside. When this is not possible, due to the characteristics of the façade or the excessive burden of the intervention, the systems must be positioned on the façade of the buildings in an orderly and organic manner, in order to make the architectural structure of the façade fully legible and conceal the implants from view as much as possible. In any case, cables must guarantee the most rigorous respect for any wall paintings, decorations, and historical-artistic testimonies in general. The cables and pipelines of the installations must be generally:

• arranged according to a vertical line in correspondence with the limits of the façade or in the immediate proximity of the downspouts and therefore hidden by them.
• arranged along horizontal lines above string courses or other decorative elements in relief, to remain hidden by them or in any case such locations as to cause the slightest possible alteration of the façade.
• placed below the roof covering immediately above the line of the gutter.

When, due to the characteristics of the building, it is not possible to obtain one of the accommodations referred to in the previous points, it is permissible to arrange the installations according to a horizontal line immediately below the starting altitude of the building overhang.

All parts of the installed systems that are visible from the outside must be painted in the same colour as the façade or the decorative element that hides them.

During any intervention that affects the façade in its entirety, even during simple maintenance, the reorganization of the existing systems is prescribed, as far as possible and without excessive costs.

Systems can be arranged differently from the above, only if they are installed on internal or lateral façades, but in all cases not visible from the street.
It is not allowed to install visible technological systems (such as heat pumps, condensing units and similar) on the slopes of inclined roofs and on the façades of buildings visible from public areas.

Such installations may be permitted only if the present covering, due to its original form, has conveniently disassembled parts and is particularly suitable for housing the system without its presence altering the prospects visible from the most significant neighbouring vantage points.

FIGURE 134: Possible installation of chimneys must consider the context and be non-invasive, fitting with the colours of the roof for a less visual impact.

The placement of such systems is generally admissible when:

• they are positioned on flat surfaces and hidden by special items (masonry or metal) of the dimensions strictly necessary to contain the technological system and to ensure its functionality. These artefacts must be placed against any masonry emerging and painted in the same colour as the same; if this is not possible, they must however be made and finished in such a way as to minimize their visibility and guarantee the best possible integration into the surrounding environment.

• placed on the roof of minor buildings and these are at a much lower altitude than the roof of the main building and facing the inner courtyard or in any case on completely internal spaces of the building.

• placed in appropriate compartments in the space below the inclined slope of the roof and shielded by suitable grilles that resume the lines of the roof covering.

• placed in line with walls emerging from the roof and backwards with respect to the eaves line to a sufficient extent not to make them visible from below, provided they are shielded by special artefacts (masonry or metal) painted in the same colour of the wall they are leaning against and the dimensions strictly necessary to contain the technological system and to ensure its functionality.

FIGURE 135: The side vent should only be installed in the inner courtyard and never on the main street and respect the colour of the wall on which it is placed (e.g. shades of grey are admissible on stone).

FIGURE 136: It is important to prevent randomisation and indiscriminate placement of receptive devices, avoiding the strong visual impacts that a wrong location on the building can create.

Solar and photovoltaic panels

The installation of solar panels and photovoltaic panels is generally allowed on condition that the positioning of the system guarantees to minimize its visibility and ensure the best insertion into the surrounding environment, bearing in mind that:

• In the first place, a position on the ground or on smaller buildings must be sought, located at a lower level than the main body.
• Any storage tanks must be installed inside the existing closed spaces.

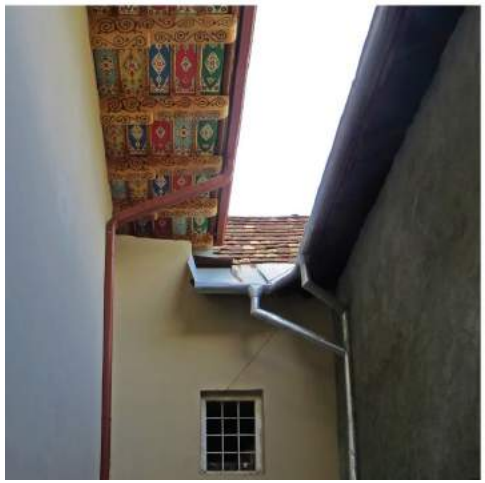


FIGURE 137: Simple or decorated in the traditional style, the gutters and the downspouts are necessary to reduce the rapid deterioration of the overhanging structures and of the underlying walls due to uncontrolled waters. The colour must be copper or weathering steel, or a pre-rusted material should be used. This colour is integrated with the roof tiles. The pipes are often decorated. This is a recent tradition that should be perpetuated and incentivized.

Antennas and television equipment

The following provisions are intended to regulate the installation of television antennas, satellite dishes, as well as all other technological equipment for reception of mobile signals, radio and television programs or other satellite services, to prevent randomisation and indiscriminate placement of receptive devices, avoiding the strong visual impacts that a wrong location on the building can create, and also to facilitate installers and users in the choice of possible locations. All new buildings consisting of several units will generally have to use centralized systems for both traditional and satellite television reception. In general, all antennas must normally be placed in gardens or courtyards, on lowered building structures, in niches, loggias, etc. with less impact than that on the roof, on condition that the antenna or dish is completely invisible from the public street.

Installations on façades that face the public street or streets of public use are prohibited. They must be painted with an opaque tone colour that is suitable for camouflaging with the structure on which they are installed or the surrounding environment, i.e. green if in the garden.

The satellite dishes must have minimum dimensions of the most widespread standards, i.e. 60-85 cm. These standards may be subject to variation in consideration of technologies that go in the sense of diameter reduction. They must also be free of logotypes, friezes, writings, or other elements susceptible of highlighting their presence. The connecting cables must be as much as possible hidden or camouflaged, following eaves, cornices, or other elements, and coloured like the part of building on which they are installed. It is forbidden to install them on balconies or terraces facing streets and public spaces and in gardens and courtyards of value and in those that are visible from the public street. Exceptions are permitted only if the necessity due to technical reasons is identified and no other location is possible.

Counters

In general, the counters must be placed outside the individual housing units, so as to make them easily accessible to the companies that manage the distribution networks, but inside the building or in any case in positions other than the façades facing the public street. When this proves impossible, it is possible to place the counter in a special niche opened in the outer wall, of the dimensions strictly necessary for the purpose and suitably concealed by a door. The door must be of material, colour, and form such as to reproduce the colours, characteristics, and lines of the façade section in which it is positioned and causing the least possible alteration. In case of several counters to be placed on the façade, the niches and the doors must be neatly aligned. The colouring and surface finish of the doors must be such as to guarantee adequate durability over time.

Heat pumps, condensing units, air conditioners

It is not permitted to install visible technological systems such as heat pumps, condensing units, air conditioners, etc. on the façades facing the public. These are technical systems for one or more residential units that vary in size, from the small removable box to the refrigeration towers.

The installations are allowed, in compliance with the other requirements of this manual and the following conditions:

• they are mainly placed along the internal façades, choirs, or courtyards completely inside the building or in any case on walls not visible from public spaces.
• they are installed, where possible, in special niches opened in the attic above the eaves line.

If it is unavoidable to install the machinery on the main façades, installation can only be allowed when the machinery (because it is completely inside the building or because it is specially designed) does not cause any disturbance to the architectural balance of the façade or decorative apparatus of the same. This can be achieved by using openings that already characterize the design of the façade and which are not indispensable to guarantee the minimum hygiene for the rooms behind and the compliance with the safety regulations.

In the case specified above, the installation is admissible even if installed on appropriate re-enters, the pilasters of the façade, designed to hide the view as much as possible and are painted in the same colours as the façades in which they are installed and if necessary, must be adequately shielded from special envelopes tinted with the most suitable colour to reduce visibility. All systems must comply with the specific noise conditions set by the current regulations as well as the methods of execution.

Wall Boilers

The wall boilers for autonomous heating must be provided, in new buildings, inside the dwellings, in special rooms and in compliance with the safety regulations set out in current legislation. If the installation outside the building is unavoidable, the boilers must not be laid on the main façades but must be placed on appropriate re-enters with suitable shielding to hide the view as much as possible.

FIGURE 138: Bad example of an intercom on an old door.

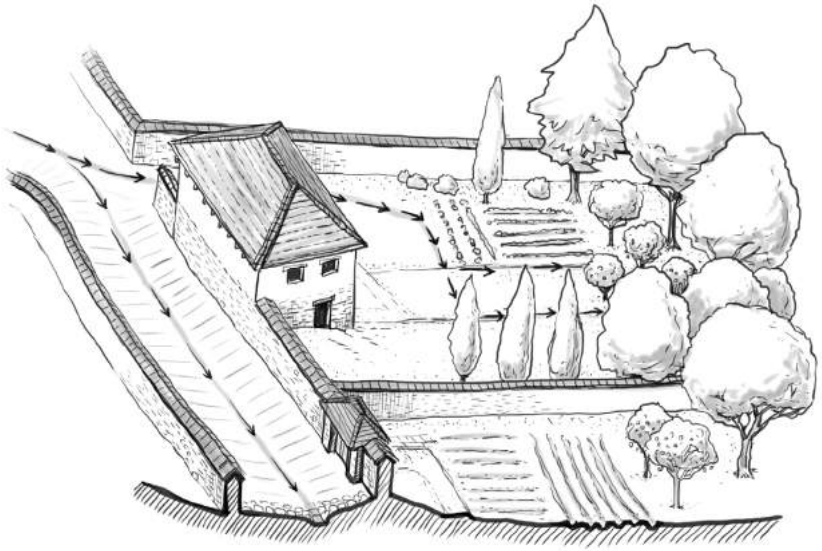
Bells, push-button panels, and intercoms
The criteria to be followed for the installing electrical bells, push-button panels, intercoms, and video intercoms on the façades of buildings or walls visible from public areas are listed below. The application of electrical bells, push-button panels, intercoms and video intercoms must generally take place on the side of the entrance door at an appropriate height from the street level, also to allow use by disabled people and in any case in a position that does not lead to alterations incompatible with the architectural and chromatic features of the façade. Are permitted exceptions only in cases where it is impossible to comply with the above criteria.

It is not allowed to place electric bells, intercoms and video intercoms on doors, gates or other types of mobile frames that constitute a significant testimony from the historical, artistic, and environmental point of view. They will not be able to overlap with architectural and decorative elements of the building such as cornices, rusticated stone elements, urban furnishing elements, etc. Generally, on façades that border public areas, they will have to tend to adapt to the level of the masonry on which they are installed and must be made with materials suited to the architectural and chromatic characteristics of the façade.

It is advisable to order the various electric bells and intercoms of several units of the same building within a single element, of simple design, according to traditional models and materials.

In the case in which there are electric bells and pushbuttons with historical testimonial value in good state of conservation, these must be maintained even if no longer used.

IV. Gardens



Gardens are one of the most important components of urban fabric. Two-thirds of the city is still occupied by houses with gardens. Today, only some of them have retained their former economic function. Currently, the conservation of gardens has become a problem because agriculture is a low-income sector.

In the second half of the 18th century, the economy of Sheki was mainly based on agriculture. There were 202 mulberry orchards in 13 villages of the khanate and most of them were in the city itself. The specialisation in sericulture resulted in many mulberry orchards.

All city gardens are enclosed with stone walls which prevent them from being seen from the outside. The garden is located opposite the main (south-western) facade of the house, usually facing the veranda. Vegetables are grown in the immediate section of the garden close to the water source. Fruit trees, primarily mulberry trees essential for sericulture, are planted in another section. The edges of the garden are usually planted with taller trees that provide shade. Another section of the garden is used for keeping poultry and silkworms. And there is usually an open space near the house for household activities.

Parts of the garden was intended for agriculture, which was the primary source of food supply, and covered with seasonal growths of vegetables. This area was divided into subplots with each reserved for only one type of vegetables. The garden was planted with mainly small fruit trees such as apple, pomegranate, maple with some distance, so that vegetables planted next to them could also receive sufficient sunlight.

Different types of plants such as tomatoes, peppers, potatoes, cabbage, and beans are grown in the garden in accordance with the local climate and based on traditional methods using supporting sticks. Plants are cultivated using a system so that the water reaches them in different parts of the garden by its own flow. Water enters the area through various ditches along the roads. Water is transferred to the garden by a stone or earth dam in the ditches. Other parts of the garden include walnut, chestnut, and other large fruit trees, including mulberry, whose leaves serve as food for silkworms and livestock.

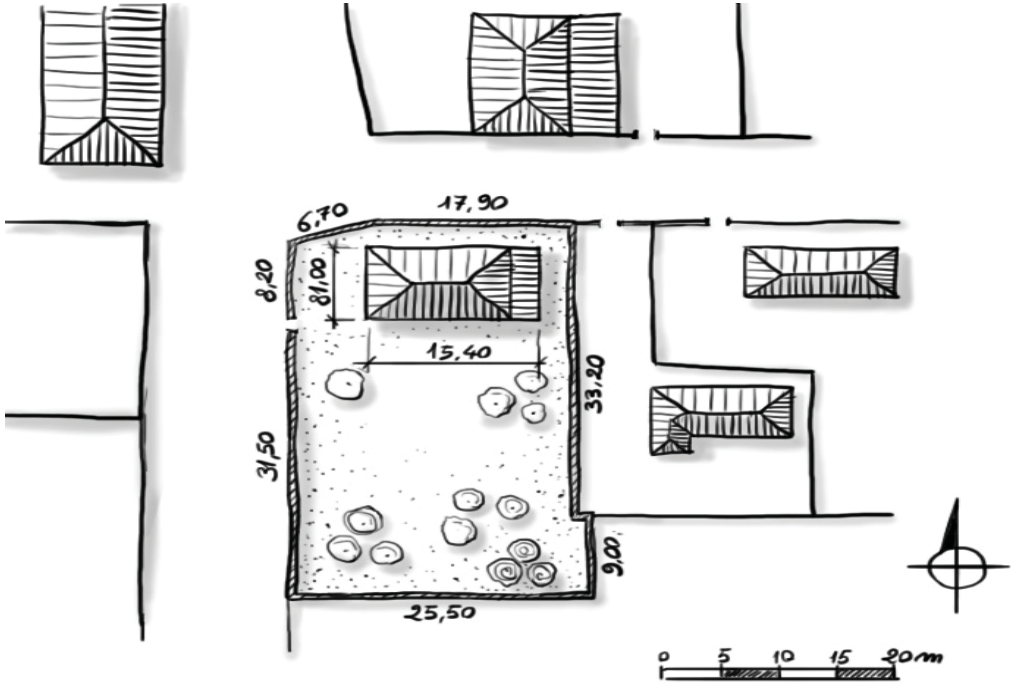


FIGURE 139: Schematic plan of a one-storey house with a garden

FIGURE 140: Traditional layout of a garden

a) Decay

Gardens are in neglected condition because agriculture is considered a low-income sector. Due to the loss of their original function, the gardens have also lost or changed their original appearance. Gardens have been turned into storage areas, private parking lots, paved courtyards, and in some cases, even built-up.

b) Prescription

Some exemplary gardens (e.g., those promoting local agricultural products) may be used for educational or eco-tourism purposes.

4.1. Outbuildings and auxiliary structures

Traditional Sheki gardens had several outbuildings and other auxiliary structures such as open pavilions ("altiachiq"), pergolas, barns, pens, chicken coops, pools, and water tanks. "Altichiq" is a rectangular wooden pavilion open from two or three sides and adjoining the boundary walls from remaining sides. This structure with a ceramic tiled roof usually hosted tandoor, home bakery or logs. Its open structure was designed to facilitate air circulation while baking bread in tandoor. "Altichiq" was usually 2-3 metres in width and 4-6 metres in length.

FIGURE 141: cc and tandoor

The pergolas are usually assembled from forest wood 1-2 meters above the ground. Being high above the ground, the pergolas were thus protected from moisture and household animals and provided shade and cool air. It was also used for storing fruit and vegetable during cold seasons. Barns are separate outbuildings built of river stones, quarry stones or mudbricks, and used for storing household items and tools. Pens were built close to the entrance or the house. Since fewer people are engaged in animal husbandry in Sheki these days, pens are demolished and replaced with new additions (rooms) to the houses.

a) Decay

The reasons for decay in these buildings are structural, i.e. the failure of the supporting structures and a change in function. Structural faults vary depending on the materials of the building, and their restoration and repair methods are described in detail in other sections. The reasons for the change in purpose are due to changes in lifestyles and household economies over time.
At present, due to socio-economic changes, sericulture is no longer practiced in the private gardens. Therefore, buildings related to silk production (for example, warehouses, barns) are either abandoned or turned into new additions to houses or outbuildings of other purposes.

FIGURE 141: "Altiachiq" and tandoor

b) Prescription

These buildings can be reused, but their size and dimensions cannot be increased. In addition, these buildings must follow the traditional architectural style of Sheki (see previous paragraphs). In case of a change in purpose of an outbuilding, only a single-storey residential or other building shall be permitted to be built on its foundations. Facade elements and roof of the building is to be designed in accordance with traditional architectural style of Sheki.

Reserves Management Center
under the
State Tourism Agency
of the
Republic of Azerbaijan

2020