

Recognition of Lubrication Workshop in Native Architecture (Case Study: Lubrication Workshop of Najafabad, Isfahan)

Faezeh Khorshidi^a, Ahmad Danaeinia^{b*}

^a*Department of Conservation and Restoration, Yazd Branch, Islamic Azad University, Yazd, Iran*

^b*Assistant Professor at Department of Architecture and Art, Kashan, University of Kashan, Iran*

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Abstract

One of the characteristics of a building in Iran is the diversity in the type of land use and its architecture which has a direct relationship with thinking, creativity and people's need. Lubrication workshop structure is part of the native heritage that meets the needs of people in the environmental condition of that time. However, a few studies have been conducted on the mode of operation and spatial structure recognition. The aim of the present research is to identify the characteristics, principles of the formation of spatial species and extraction of efficient elements which have been selected as a case study of Najafabad mines (i.e. lubrication workshop). Therefore, the spatial structure of the lubrication workshop was analyzed and compared, based on library studies and field observations via a descriptive-analytical method. The physical factors were analyzed by the existing maps, and the spatial structure of the case sample was extracted. It was found that the lubrication workshop has distinct and recognizable patterns, and according to space and organization of the functional space it follows a single pattern. Further research can provide a background for architectural design that like the past is responsive to the needs of people and can be implemented as a model for resuscitation of native architectural identity.

Keywords: Lubrication workshop; Physical; Najafabad; Native Architecture; Spatial Structure

1. Introduction

The artistic creativity begins with human needs, capabilities and time technology. To create suitable form, the most important mechanism for creating artistic work is the attention to the spirit

* Corresponding author. Tel: +98-9122574096.

E-mail address: danaeinia@kashanu.ac.ir.

of the place, weather condition and available materials (Wagner, 1991: 88, quoted from article 2005: 54). Nowadays, lack of attention to lifestyle and loss of attractiveness, has led to the destruction of native pattern in architecture; that this category has been affective in the crisis of identity and quality of architecture.

One of the characteristic of the structure in Iran has been the diversity of the type of land use and its architecture which has direct relation with thought, creativity and needs of people. Lubrication workshop are heritage of the past because of the people needs for lighting and attempt to eliminate the darkness over the years there have been many ways and means for the need. One of the ways has been the use of oil extracted from seed oil for which lubrication workshop was established. The workshops are advanced with complex and interesting structure that has been considered as industrial building. Lubrication workshop in addition to oil and edible oil has played an important role in providing livestock feeds and agricultural fertilizers. In fact, the professional exercise is one of the most important professions and giving importance to light and brightness the lubrication workshop have been sacred and of special importance (Moradi, 2008: 18). But, due to the replacement of the engine over the animals and the industrialization, the lubrication workshop has lost its usage and very limited number is still operating and the remaining buildings are abandoned and are being ruined and destroyed. In the past, Najafabad was the epicenter for lubrication workshops having 12 workshops and among which just one is operating.

This profession and place is of architectural type that has been less known among the people, this is the reason which has caused the practice and lubrication workshop exposed to destruction. Analyzing these structures, identifying the factors shaping and influencing the form and spatial organization is based on the needs of people; and their culture has a significant role in the quality of today's architecture. Analyses of the form and understanding the relationship between the existing spaces in the physical structure is a science has been introduced as space syntax in architecture. Different spaces reflect the different manner of life of their users. Using space syntax method, can understand the cultural and social characteristics of its inhabitants that influences the formation of different spatial patterns (Hiller, 2007: 44). The present research, based on this theory has made an attempt to extract the differences and similarities existing in the spatial patterns used in the selected lubrication workshop. With this analysis one can see the fundamental values that exist in the principles of architecture and its performance.

Studies in the field of lubrication workshop have not been considered by the researchers as an independent structural species. The detail execution, the placement of spaces and other things has not reached the recognition stage. While, the lubrication workshop been a native heritage can give us deep and broad understanding of the history of architecture. As Rappaport says, history and architectural theory as traditional and common has focused on the study of well-known monuments. While such works are only small sections of the built architectural work at any time (Rapaport, 1996: 1). Generally, lubrication workshops are not valuable monuments, but are among those which are less visible but are of importance and have been studied.

The complete document about the lubrication workshop is the documentary produced by Hossieni. This documentary illustrates the way of extracting oil and part of the document has depicted the Najafabad lubrication workshop. Another book entitled, 'Anonymous ancient heritage: Lubrication workshop of Isfahan' by Beheshtian, describes the method of oil extraction by tools and devices of the workshop. It has also introduced the existing lubrication workshop and mentions the name of Najafabad lubrication workshop. In the travelogue entitled 'A journey to the court of king of Sahebgaran', by Henry Brogshen has introduced lubrication workshop as the main profession of the town people.

However, there is no mention about the spatial structure of the lubrication workshop, only through articles it has been discussed. The two articles written as ‘the sustainable heritage lubrication workshop’ by Jaffari and other which describes the space organization of lubrication workshop, their performance and characteristic of the sustainable architecture of the lubrication workshop. In another article entitled, ‘Recognition and analysis of architectural structure of traditional lubrication workshop’ by Abdollahi and co-authors has described about the structure related to lubrication workshop which has used case study of Shahi lubrication workshop. This study, analyses the lubrication workshop such as the spatial relation, component morphology, hierarchy, etc. The aim of the study is the analytical study of the spaces of Najafabad lubrication workshop that leads to new physical understanding of the workshop.

2. Methodology

To conduct this research from the remaining five lubrication workshops in Najafabad only three has been selected and the other two is not selected because of access restriction and insufficient information. Therefore, after introducing the entire lubrication workshop; the data collection is through field observation and library documents which is through descriptive-analytical method. To study the physical factors according to the existing document of the three selected workshop and the sketch drawing of different spaces comparing with the existing maps, the spatial structure of the case samples was extracted.

3. Concept of Native Architecture

Native architecture is an architecture that grows within the society and over time adapts itself with the social, climatic and technological conditions; and consistent with values, economic and cultural lifestyle that is productive. In summary, native architecture is an architecture by the people and not for the people. The architecture is native when it shows all the criteria related to the environment and the native context. This means, only within a particular society, using certain technology and special materials, the systems and laws of the social-cultural of that society is acceptable and recognizable (Damyar and Nari Qomi, 2012: 66).

4. History of Lubrication Workshop

4.1. Lubrication Workshop in Persian Dictionary

The name of lubrication workshop and its synonyms such as oil workshop, and oil mill have been repeated many times in vocabularies. In Dehkhoda dictionary, the lubrication workshop is referred as a place where extraction takes place or where grape extract or vegetable oil is obtained. The kiosk and lubrication workshop are referred to oil house for example to one who extracts oil from castor and sesame oil, etc., is called as oil extractor (Dehkhoda, 1998: 15-14-19).

4.2. History and Origin of Lubrication Workshop

Oil production from vegetable seed and their use was since the ancient times, so that the olive seed oil has been very holy in the Jews religion. In holy Quran vegetable oil seed has been mentioned as olive oil. The Assyrians, Egyptian and Greek are also familiar with oil extraction skills (Jaffari Farsani et al., 2013: 3). Considering the historical and archaeological evidence of oil extraction was there in Iran since ancient times. The discovery of oil extraction during the

Achaemenid dynasty is seen in Sistan (ancient city of Dahanehgholaman which is 44 km from Zabul) (Damyar and Nari Qomi, 2012). During this historical period, sesame oil was exported to Egypt. The earliest means and device for oil extraction was a tool called “Choghangiri” (engraving) and it is through that this word was the same as oil extraction which was converted to engraving. This small device consists of two stones, one stone is larger with depth in the middle and at the bottom of which there is a hole, and the other stone is smaller that is place within the larger stone and it is moved by camel or cow; and this device only extracts castor oil and barley.

Over time, due to the growing need of people, oil workshop got more advanced which lead to the emergence of lubrication workshop (or refineries). Although the formation of lubrication workshop is related before the Safavid period, but during the Safavid period there was evolution of similar industries. The present quality of lubrication workshop in terms of the beam, stone, mills and kink has been related to before Safavid period, like the lubrication workshop street of Ghandilsazha in Dardast area and Sheikh Bahaei lubrication workshop in Jamaleh alley. During the Safavid period many lubrication workshops were built and therefore the construction of these industrial workshops was related to that period. But, based on these documents during the Safavid period, the existing samples were used as patterns for construction of the lubrication workshop such as Shahi and Shahzadegan lubrication workshop in Isfahan (Beheshtian, 1972: 8).

5. How Lubrication Workshop Operate

Initially, some oil seeds such as poppy burned in furnace with wood and charcoal and were crushed (milling) operation with stone mill. The stone was rolled out by camels and cows and the seeds were crushed and softened and with certain amount of water dough was made, after an hour of rotation of the stone the resulting dough was prepared for lubrication. The dough was poured on a tray called copy with a thickness of 60 cm and these copies were placed in a trench called ‘Tilveh’ about 32 to 37 copies were place above one another. In front of the ‘Tilveh’ there is a narrow duct that the end is connected to the kink (or borehole). Here the oiling operation begins. At the top of the ‘Tilveh’ there are wooden levers with 12 meter length and 60-70 cm thickness, the ends with rope and pulley which moves in up and down direction. At first, with a small beam named as ‘Karmael’ presses the copies to prepare the work for the large beam then several pieces of wood named as ‘Shagerdeh’ were placed above one another till under the large beam and then the large beam gradually lowered to press and extract oil. The person use to hang on the head of the wood to bring down the lever and push up the beam with the stone weight to the ceiling and thus pressing the seeds. It took a day for the oil to come out of the grains and then into the trench (Beheshtian, 1972: 13-18).

The remainder dough in the copies was used for animal feeding, soap manufacturing and preparing edible sweet named as ‘Takhtakh’ (Pirnia, 2008: 534).

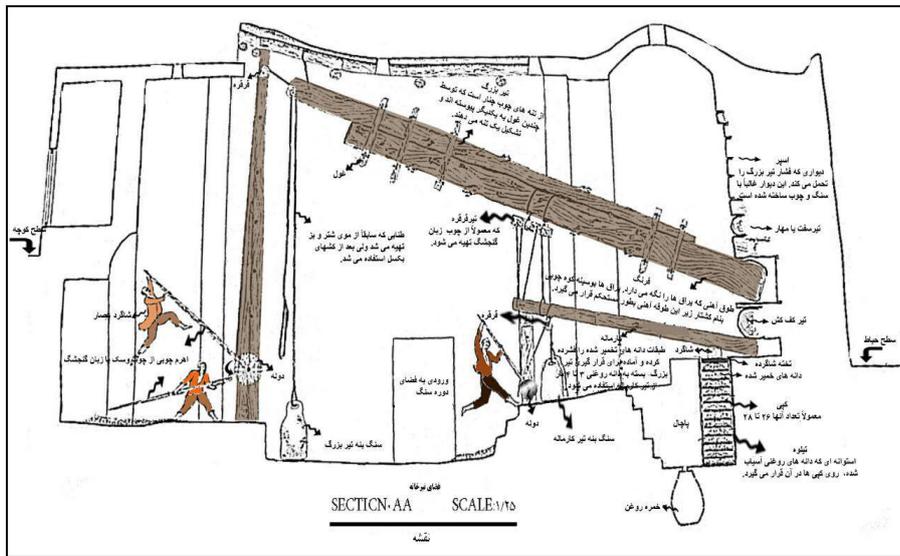


Fig 1 Manner of oil lubrication (source: Beheshtian, 1972)

5.1. Main Spaces of Lubrication Workshop

Lubrication workshop are vast and elevated building which are common in terms of structure and components, but has minor difference in the dimension and shape of the building. The lubrication workshop building is usually a two-story building built within the ground (Fig 2). The upper floor is the entrance and the lower floor is the most important part of lubrication. The lower floor consists of several small rooms, large rooms with dome roof. Generally, the building material was lime mortar and stone; and walls and ceiling were of straw and bricks. The dome roof had built-in windows. For the main part of the lubrication workshop a large hall was considered wider than other rooms. In the middle of this room a radius lesser than the room environment, a solid foundation of 1 m circular height was built. The other rooms of this building are the warehouse room for raw materials, the storage room for extracted oil, the resting room for the workers, stable for animals (Azimi, 2000: 105).



Fig 2 Elevation of Moheballi lubrication workshop

The main components of the lubrication workshop are;

Mill: At the center of this space there is a grinding stone that is moved with the help of camel or mule, so that the oil seed are powdered and the roof is dome shape to keep the seeds cool. Usually, in each lubrication workshop with respect to its location there are 2-4 millstone, one of the stone is used for sowing the seeds and then transferred to another to be dough.

Beam house (Hinges): The main and most important stage of oil extraction is conducted in beam house or hinges. It is a rectangular space and due to the presence of long beams, its height is

very tall till the ceiling and reaches to about 11 meters. To withstand the pressure of the beam, a sparrow wall was clamped with sturdy wooden coil and large stone with 3 meter width. This is called as the solid wall (because of this, the lubrication workshop was built underground to withstand the beams). The ceiling engaged with wooden beams has arched roof and its lighting was provided with the roof sunlight.

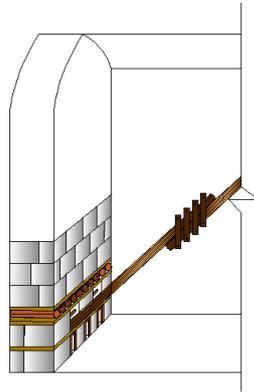


Fig 3 Elevation of sparrow wall of beam house

6. Study Area

The city of Najafabad was built around 1022 AH along the Shah Abbas Safavid dynasty in a large plain of 29 km west of Isfahan (Yazdani Najafabadi, 2004: 44). The design and initial division of Najafabad which is based on the unique architecture and principles of urban design was carried out by Sheikh Bahaei during Shah Abbas I. The buildings and remains such as mosque, caravanserais, old castle, lubrication workshops, husseiniyeh are the resemblance of the ancient city (Yousefi, 2011: 1). Considering the agricultural situation, presence of gardens, shortage of fertilizers, need to provide night lighting was the first step to lay the foundation stone of the lubrication workshop by a clergy of the city of Najafabad which later reached to 12 lubrication workshops (Izadi, 2013: 28). Extraction and desalination were one of the most important occupations in the past of Najafabad.

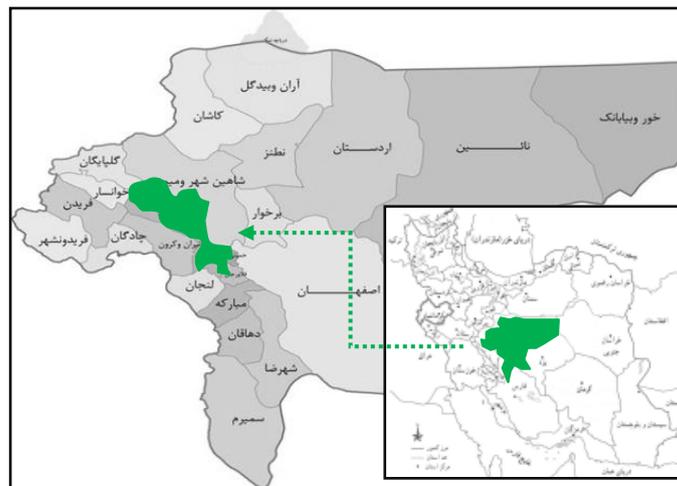


Fig 4 Map of Najafabad location in the province

6.1. Lubrication Workshop Sample Studied

In the past there were 12 lubrication workshops in the city, but today it has reached to only five. According to the survey conducted and the available documents achieved by the architects and cultural heritage experts, three lubrication workshops are selected. In Fig 5, the building location and in Table 1, the general specification and plan are provided.



Fig 5 Sample location on the map (source: googleearth.com)

Table 1 Specification of the studied lubrication workshop

Name of Lubrication Workshop	Construction Date	Architectural Specification	Floor Plan
Bozorg	Safavid	Biggest and the oldest lubrication workshop of the city has four mills and only beam house remains. The construction materials are straw and brick. The lighting is through the roof skylight	
Zamaniyan	Qajar	Two floors, the ground floor is a place for the workers to live. The part of the stable for camel and dock were ruined over time and construction has been done.	
Mohebali	Early Qajar	Has two floors, the workshop is on the basement and stable for camel and dock on the ground floor. The basement is the main part and goes to the heart of ground and covered with sand lined	

6.2. Study the Physical Sample

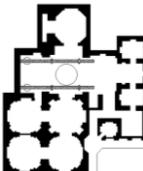
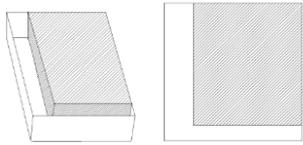
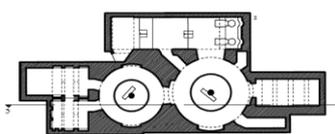
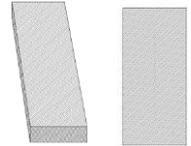
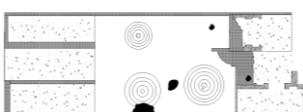
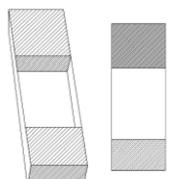
One of the ways for physical recognition is the analysis of the spatial structure and for this it is required to study and analyze every spatial part and its relationship and hierarchy of spaces. In this section, a comparative comparison of the classified properties related to shape and physical structure of each space will be carried out. In lubrication workshop, each space has a specific function; depending on the function it has a particular geometric form. Therefore, in all workshops, the shape of space is almost the same depending on the importance of the lubrication workshop the size of space is small or large. In Table 2, each component forms the space of the selected samples.

Table 2 Morphological spatial component of lubrication workshop

Lubrication workshop name	Entrance	Beam house	Sowing	Camel stable
Bozorg				
Zamaniyan				Not recognized and construction been done
Mohebali				
Name	Grain discharge	Storage	Resting room	Incubator
Bozorg				
Zamaniyan	Construction has been done			
Mohebali				

In Table 3, lubrication workshop has been studied according to shape and the positive and negative space ratio has been specified in each plan. Large percentage has been recognized as closed space and smaller part is open space. This open space is associated to camel stable. Therefore, because of closed plan and lacking visual communication with the surrounding environment reflects the emphases on the principle of introvert structure and space constraint.

Table 3 Open and close space ratio

Lubrication workshop name	Structure floor plan	Ration of open and close space
Bozorg		
Zamaniyan		
Mohebali		

At each location, spaces based on type of performance and activities in a hierarchy are grouped together and are divided into three categories as general, private and semi-private. Because of the general function of the lubrication workshop, it is not possible to determine the private and semi-private spaces, but based on the location of beam house it can be classified in terms of its importance and spatial emphasis. In chart 1, it has been shown that the beam house (main part of the workshop) which is the last and most important stage of the lubrication workshop is located at the end of hierarchy. The more one gets towards the beam house it adds to the importance and emphasis the space. (In all lubrication workshops this hierarchy is similar, because of this reason it has been shown in chart 1).

In Table 4, various component of the plan are represented as symbolically in form of circle and way of communication between spaces as a line, so that the communication properties between spaces are displayed in a simplified way.

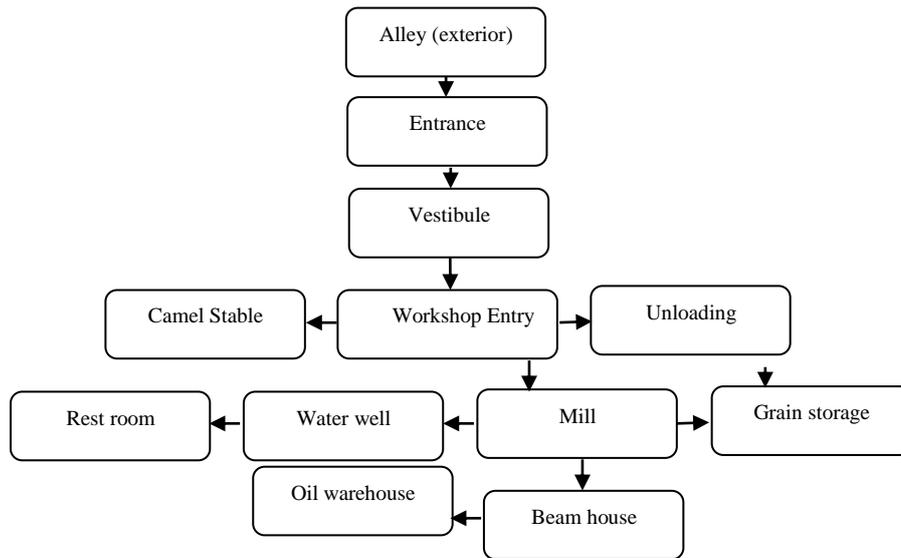


Chart 1 Hierarchy and sequence of space

Table 4 Space relationship chart

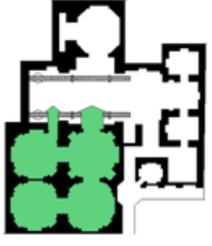
Bozorg lubrication workshop	Zamaniyan lubrication workshop	Mohebali lubrication workshop
<p>○ Camel stable ● Beam house ● Mill ⊗ Entrance</p>		

By observing the plan studied in Table 5 and 6, it is concluded that the spaces around the mill and beam house without intermediate connection with the mill and beam house has direct relationship.

Table 5 Study the relationship of beam house with the surrounding area

Boroz lubrication workshop	Zamaniyan lubrication workshop	Mohebali lubrication workshop

Table 6 Studying the relationship of mill with surrounding area

Bozorg lubrication workshop	Zamaniyan lubrication workshop	Mohebali lubrication workshop
		

7. Conclusion

The study aim was to analyze and compare the structure of the Najafabad lubrication workshops. The lubrication workshop despite of many similarities there are minor differences that affects the spatial relationship between the lubrication workshops. In order to achieve this goal, the space syntax technique and analysis has been used. According to research findings it is concluded that the lubrication workshop has distinct pattern and recognizable; and according to space and organization of function follows a single pattern and the only difference is the spatial relationship. Today, the principle of architecture and function of lubrication workshop can be used which does not mean the physical repetition and its function, because it meets the need of its time and it is useless to repeat it. But, it is only a mean to understand the principles and values. The principles mean that the Iranian architects have tried to preserve value and respect human being in space hierarchy. Today, due to employment at maximum level and weakening of spatial origin it is of less importance than the past. Hence, it can be used as a model for revival of native architecture identity.

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