

Refurbishment of Alkhua Mosque: Using environmental Design principles

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Abstract

In Saudi Arabia, there are many heritage mosques which are unique in terms of their built environment and architecture. This research reviews the previous study for the heritage mosques in western region in Saudi Arabia generally and Taif specifically. In addition to that the research studies Alkhua mosque attributes which is the main mass, rear courtyard, surrounding areas and cistern using various methods such as cad drawing, survey, photo snaps and Photoshop for documentation, on the one hand. On the other hand, the measures, which have been done to refurbish the mosque, were prepared for the visitors as well as for heritage conservation. In addition to that, assessing visitor view after the refurbishment was through using post occupancy evaluation method. The main contribution of this research is the documentation of the mosque, environmental Attributes analysis and the restoration of the mosque.

Keywords: Architectural heritage, Documentation, environmental analysis, refurbishment and post occupancy evaluation.

I. INTRODUCTION

Taif city is accounted as one of the most important cities in Saudi Arabia. This is for two reasons which are its climate, location and heritage buildings such as palaces, mosques and bridges. Taif has many mosques with historical and cultural depth and is rich in this type of building. There are several researchers who documented this type of buildings from historical perspective as follow:

BaAntar mosque is located at the top of the plateau village of Taif and attributed to Sheikh Ahmed bin Abdullah bin Hassan bin Mohammed bin Abdullah Baantar who deceased on 1091 AH, Nazeel Alssaeg renewed its architecture style and construction after 1045 AH. In addition to that, it has been renewed during Saudi era. Halima Alsaadiyah Mosque was based in the Halima village of Bani Saad which is located south of Taif, 60 km., it is said that it was built in the Halimah Sa'diyah village who Fads nursing Prophet Mohammad. However, this novel is transmitted by public and not founded. This is because Prophet Mohammad did not come to this region as some historical dated said [1, 2]. It is clear from these two mosques the historical depth and their value as well as the refurbishment of the Mosque of Baauntar where it was pointed to the beauty of its architecture, but was it the restoration according to the standards approved for the restoration of this type of buildings.

Kubzaa mosque is located in Valley Wej, its tall is 12 m and its shape are square. This mosque is surrounded by bowl which exposed from the eastern and southern sides, and the place shape, where the funeral prayer, is square, too, its span is 9m². The Mihrab is located in the west side. The minaret is located in the eastern corner of the mosque, and is made up of three sections, the bottom square, the centre octagon, the upper rounder and ends with semi-dome structure, model similar to minarets that were built in Egypt and Yemen in the seventh Hijri century.



Fig. 1. The minaret of Kubzaa mosque [1]

It is unlikely to have been re-building of this mosque in the Ayyubid or early Mamluk era. The entrance of the mosque is located in the southern side and head held lobular, and was above the threshold writing is not readable, it has been renovated this mosque at the present time Sidra mosque: is named also, Alsidra mosque, attributed to the Prophet Mohammad. It is located at the Black Horn of toast vally Wakdan at east of Taif. This place stopped the Prophet Mohammad when he entered the Taif from Leayah side. Recently, renovated, which is rectangular in shape, small in size, non-roofed, adjoining place of ablution and the minaret [1, 2]. It is clear that one of the main attributes of the kubzaa mosque is the minaret which is one of the land mark for the mosque. However, the researcher is mentioned that the minaret can be used for several functions. One of them is as a wind catcher [3]. This means to make mosque elements more sustainable and with multiple functions.

Mosque of Senoussi is simple architecture and is not roomy. There is an open courtyard and a garage in front of the door and depends on the ceiling on its pillars have arches between the courtyard and the mosque is located behind the remaining wall of Taif. Mosque of Shams was, built after the tenth century, and

its shape a rectangular dimension 20 * 15 consists of the prayer house and open courtyard. Mosque of Abdullah bin Abbas has a courtyard which has rectangular windows. In addition to that, the mosque is divided into two parts with three holes and the mihrab is located in the western part opposite the door, which is hollow and crowned by a lobed Arch. Mosque of Adas is located in the western part of the orchards and at the foot of the mountain is a small mosque. Mosque of Aqeel is Located east of the Saudi Post established by Aqeel bin Omar al - Saqqaf 1291 H. [1, 2]. The material of Moaz mosque is a stone building and a plastered stone [1, 2].

Mosque of Madhoun: it is known as the Qantara and Umbilical shape. It has a hollow mihrab with a prominent roof on the wall. This tendency helped to drain the rain water, where the mazeab is located above the mihrab and its minaret is cylindrical, with a spiral door and staircase [1, 2]. This mosque has been documented and analysis by the researcher in terms of survey and environmental analysis as well as architecture elements [4].

To sum up the main mosque sustainable value (MSV) of the review of these historical mosques, it can be classified to three parts shape, environmental characteristics (E-CH) and history value (H-V). As selected and classified in both Fig. 2 and Table 1.

There are several environmental attributes in the previous review. There is courtyard as well as arches that give ease of air permeability. in addition, there is a harmony with the topography. In addition, the material which was used is a stone building and a plastered stone.



Fig. 2. Mosque sustainable value

II. ALKAUA MOSQUE AS ENVIROMENTAL BUILDING

Also called the Almoukef Mosque, this mosque is located, where Prophet Mohammed Stand on the Mountain of Abu Zubaydah to the left of the outgoing from Almtnah to Taif at Mount said Khareen. Its long is 20 m, and its height is 3 m, and at the bottom a courtyard Exposed its long 7 m, and its width 4 m, and this mosque consists of two sections, the total length each is 7 m and its width is 4 m. The two sections is separated by a wall mediates door-knotted, is beset with two windows teaspoon with arches, and to the right inside of the door there is a small niche next to a small square window shape, and surrounded the mosque a small fence consists of four building blocks, and a height of 1 m. Also, the entrance of this mosque is from the east wall [1, 2].

This mosque has several values as introduced on the introduction section, shape, environmental. The characteristics (E-CH) and history value (H-V), should be considered to document this mosque to keep sustainable. In addition to that, this mosque is exposed to be burned twice. This mosque is located inside groves Almtnah. This area is archaeological area.

In this area are found many historical mosques when Prophet Muhammad arriving to Taif city. It is said that this mosque location is the place spot where the Prophet Muhammad, peace be upon him, when he came to Taif [5].

Table 1. Mosque sustainable value

Mosque	Shape	E-Ch	H-V
BaAntar	-	-	1091H
Halima Alsaadiyah	-	-	Prophet's mission
Kubzaa	- Its tall is 9m - Square shape - Mihrab - Minaret	- Bowl	-
Sidra	- Rectangular shape	-	Prophet's mission
Senoussi	- Simple architecture - Not roomy - Arches	- Courtyard	-
Shams	- Rectangular 10*20	- Courtyard	10th century
Abdullah bin Abbas	- Rectangular	- Courtyard - Windows	-
Adas	- Small	- Green area - Respect surrounded area	-
Aqeel	-	-	1291 H
Madhoun	- Umbilical shape - Minaret - Arch	-	-
Moaz bin Jabal	- Rectangular	- Courtyard - Stone - Plastered	12th century
Alkhua	- 8*7m	-	Prophet's mission

For this reason, kind of protection for the heritage building is to document its details in case its expose for any disaster with consideration of sustainable environment and use. In addition to that, the mosque will be reactivated through many different measures which are historical analytical, environmental analysis, architecture documentation, Mosque refurbishment, preparation for mosque usage and assessing the visitors view through using post occupancy evaluation.

III. HISTORICAL ANALYSIS

This mosque has a unique property where the Prophet Muhammad stayed when he went to Taif as introduced in the previous section, on the one hand. On the other hand, this mosque has a high status and value among the residents of Taif

and it is considered as one of the landmarks in Taif. In addition, many visitors to Makkah for Umrah or Hajj visit this mosque during their stay. These features reinforce and reflect the historical and cultural dimension and importance of this city in particular and the Kingdom of Saudi Arabia in general. This is because of the high symbolism of this mosque.

IV. ENVIRONMENTAL ANALYSIS

In terms of site location, this mosque respects the site topography through many measurements as appeared in the following photo. One of its respective was built on different levels as well as respects the gradients of the nearby mountain. Site selection and dealing with the topography was one of the main pillars that considered by the ancestors of Zhaoxing Village with harmony on the both side of the flat river valley. It was structured to be inhabited [6]. This show to what extends the essential of consideration the surrounding area during the building construction as well a take the advantage of the available natural factors.

This mosque is closed also to natural farms which are kind of unique environment that include both Farms and Mountain and located on valley Waj as shown on the following photos of site as shown in Fig. 3.

Using natural material is one of the environmental building attributes. This is appeared on the mosque walls where used stone and mud one the one hand. On the other hand, it was used wood for roof with cover of the mud. These gives a good thermal comfort during the winter time where the environment degree achieved 14 degree during winter time as referred on [7].

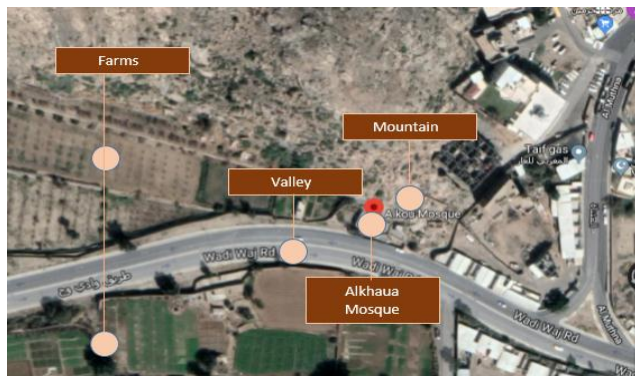


Fig. 3. Site environmental analysis

V. ARCHITECTURE DOCUMENTATION

This mosque was burned more than once by some who espoused the ideology of radical doctrines. Therefore, the result of the documentation of the mosque became high important to keep it as a base in case of any damage. The documentation has several stages surveys, architecture drawing, architecture details, and photos.

VI. ALKHUA MOSQUE SURVEY

There are several reasons to do a survey for this mosque which are documentation and refurbishment. For the documentation is to create a data base for the heritage mosques. In terms of refurbishment is to be as a base for helping the builder to build

and relocate the material in the right place. The result of the survey was 6 points as introduced in following table (Table 2) and the surveyors used the total station for this task.

Table 2. Surveys Points

PT no.	False Northing	False Easting
1	2351229.5255	643902.2958
2	2351228.4283	643901.8147
3	2351226.5202	643905.1244
4	2351219.4239	643902.1744
5	2351222.5851	643892.9962
6	2351231.3620	643896.8777

VII. ALKHUA MOSQUE AUTOCAD DRAWINGS

One of the main documentation attributes was drawing the elevations and the plan of the mosques illustrated in Fig. 4, 5, 6 and 7. In addition to that, it has been documented some of the mosque details such as Fig. 8. It is also recorded its sizes and dimensions. This was through using AutoCAD Software. The shape of the mosque is an irregular plan.

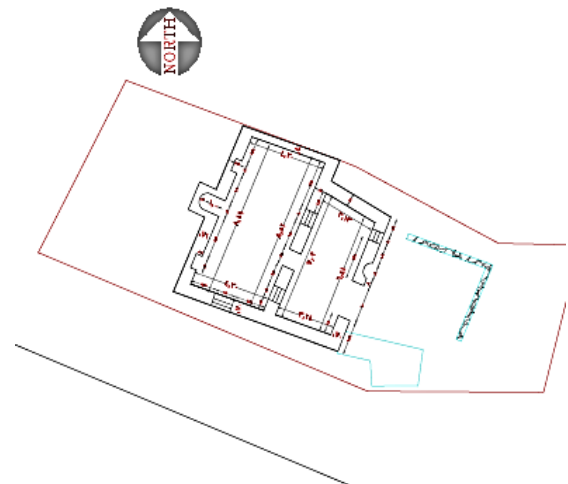


Fig. 4. Ground floor plan

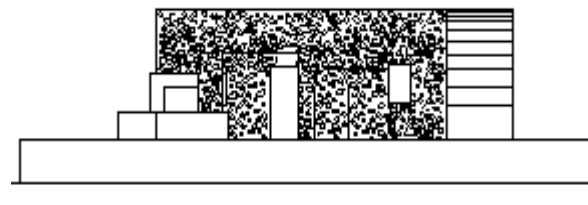


Fig. 5. East Elevation

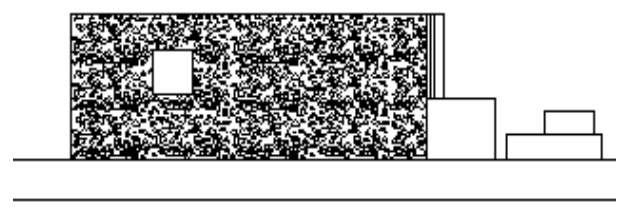


Fig. 6. South Elevation

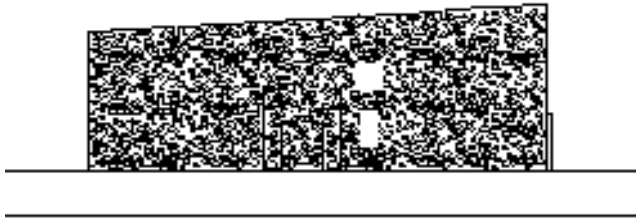


Fig. 7. West Elevation

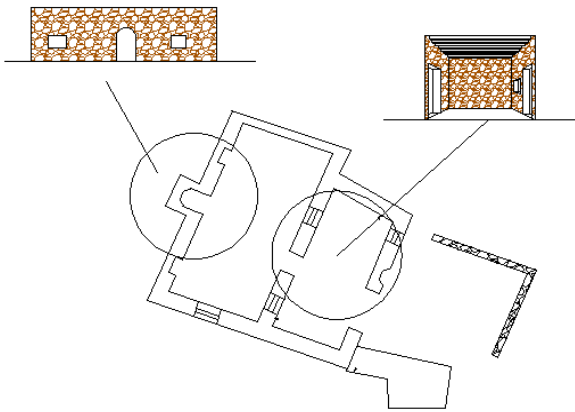


Fig. 8. AutoCAD Details

VII ALKHUA MOSQUE PRESENTATION

It has been using Photoshop software to simulate the real elevations. This will help the researcher or the refurbishment team to have sense about the mosque as well as to take any actions during the planning phase for restoration.

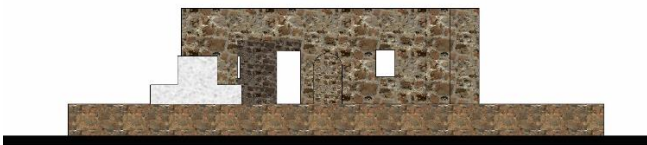


Fig. 9. East Elevation



Fig. 10. South Elevation

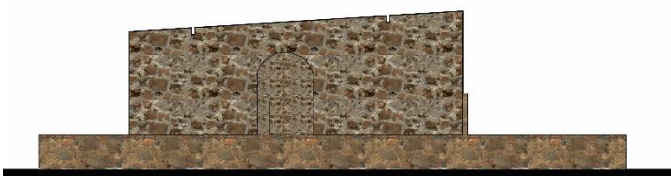


Fig. 11. West Elevation

VIII. ALKHUA MOSQUE PHOTO SNAPS

For the site documentation and building was snapped different photos which shows Fig. 12, 13 and 14, which shows its perspectives, elevations and the previous restoration attempts. The white paint was developed after being subjected to an attempted burn and must be taken into account when developing the restoration plan.



Fig. 12. Outside perspective



Fig. 13. East elevation and perspectives



Fig. 14. The niche of the mosque

IX. ALKHUA MOSQUE REFURBISHMENT

The refurbishment of this project has been done through several stages as the following table:

Table 3. Alkhua mosque refurbishment

No	Stages	Description
1	Documentation	This mosque has been documented through several stages started from reviewing the historical of the mosque before snapping, surveying, drawing and presenting the mosque.
2	Decision Making	Due to the many demands to address the situation of visitors to the mosque, which requires the reduction of false religious practices. In addition, directing visitors to the right path by activating the mosque and operating it by performing prayers and obligatory prayers instead of being abandoned. For this reason, this decision was made by the Tourism Development Council in cooperation with the General Authority for Tourism and National Heritage and the management of mosques in Taif.
3	Permission Refurbishment	A refurbishment license has been issued by the municipality.
4	Funding	Funding has gone through two phases. The first stage committed the donor to the restoration of the mosque and then withdrew. The second stage was to search for a donor and was able to convince one of the donors, but was secured half of the amount of repair.
5	Funding Assessment	Due to the low amount, an analysis was carried out on how to deal with it during the restoration process and what items are necessary and which items may be deferred. This will make the mosque ready for operation as a first stage of restoration.
6	Refurbishment plan	The schedule of items has been prepared and the contractor has been searched to perform the work to show the best possible and achieve the desired job. The contract was signed between the contractor and the donor. In addition to that, it was prepared tables of quantities, specifications and standards.
7	Refurbishment	The engineering office was identified, which performs engineering supervision during the restoration process. It is started through several stages as well introduced in the next section.

X. THE REFURBISHMENT PROCESS:

X.I. Mosque Documentation

It has mentioned above this mosque was burned by extremists. This was the main reason for the documentation that has been done as introduced on the main section of this paper.

X.II. Restoration the Mosque Skeleton:

Restoration of the outer and inner cover of the mosque by abrades the previous layers refurbishment such as the old roof, outside paint and some interior renovation. This was for two reasons as follow: One of the reasons is that the previous restoration was performed in a non-professional manner. As a result of the previous restoration the features of the mosque were changed. In addition to that, the refurbishment is considered the environmental issues in terms of respecting the location topography, and using the local material.



Fig. 15. Abrade wall during the refurbishment

X.III. Roofs

The roof was replaced because it is one of the building elements that was previously affected by the fire. It was using three layers concrete, wood board and Armstrong ceiling aluminium. These materials were selected in terms of the local material and simulate the previous style.



Fig. 16. Roof before and After Refurbishment

X.IV. Landscape and new construction

The surrounding area of the mosque has been developed to achieve the security and the basic needs. In terms of the security, this was through building the surrounding wall. In terms of the basic needs, there was not a bathroom in the site. Even though, one of the main conditions to pray is to perform

ablution. For this reason, the availability of the bathrooms is an imperative. It is considered through using the local environmental material.



Fig. 17. The new construction surrounding wall, bathrooms and flagstones



Fig. 18. The outside perspective

X.V. Door and Window:

There were no doors or windows but openings to the surrounding area. For this reason, after the rehabilitation of the building from both sides inside and outside, the door and window were installed of local wood which lead to meet the environmental conditions during the refurbishment.



Fig. 19. The new door and window

The refurbishment of the mosque was done. There is an essential need to assess the end user satisfaction. For this reason, visitors to the mosque were asked through a questionnaire which designed based on the post occupancy evaluation [POE].

According to [8], POE “as the examination of the effectiveness of the design environment for human users.” the researcher defined the POE as an assessment tool of the suitability for the indoor building environment for both users and visitors. This definition concentrates on the visitors and suitability. One of the reasons, heritage building has many visitors. They cannot be classified as the main user. In addition to that, the view of mosque suitability before and after restoration is not similar. The question is to what extent are you satisfied about mosque indoor environment and its refurbishment met your needs? It is determined visitor’s satisfaction through assessing building generally (security, accessibility and cleanliness) and location specific (Air quality, Temperature, Noise and Light). This survey was oriented to the visitors of Alkhua mosque.

XI. QUESTIONNAIRE ANALYSIS AND FINDING

The questionnaire has been adopted based on [9]. It is used fixed questions with specific scale. 50 surveys distributed to the mosque visitors. The survey was designed to have 3 sections as follow [A: Introduction, B: Respondents information and C: The main questionnaire of the research which is the attributes and sub-attributes].

Table (5) illustrates that popular of the respondents are satisfied and very satisfied which is to some extent in satisfied level. This appears in the majority factors of security. The highest percentage of security was allied to safe (66%), mosque access control (6%), security mosque zoning (60%) and spatial configuration (46%). However, in terms of unsatisfied and medium level were for mosque visibility (50%) and mosque lighting (56%). The most factors of accessibility and cleanliness were satisfied such as accessible to the mosque from the street (56%), accessible to the zoning and facilities (50%) and the level of cleaning 44%. the percentage of the accessible to the roof were 40% which is in the medium level. This is because there is no need to access the roof except if there is any maintenance work. The majority of the respondents indicated that they are satisfied about air quality of the mosque can enhance the indoor comfort (48%) and control over ventilation (42%), as well as, the highest percentage of the air quality was related to air fresh (66%). The majority of the visitors (76%) stated that the temperature during the winter is very cold and during the summer in the medium level as (66%) of visitors referred. based on the survey finding the level of the noise from street was quite as 70 % respondents said. In addition to that, there is distraction from external square noise as 44% visors indicated. The majority of respondents 64% referred the natural light which is in the medium level. This is because here are two opining sources for the natural lighting door and window. In addition to that, in terms of artificial lighting, which was installed during the refurbishment process, 54% respondents indicated.

XII. CONCLUSION

In this research, the previous study illustrated that there is an essential need to refurbish this mosque. This is for several reasons such as its historical and the incidents of attempting to burn the mosque were repeated. The comparative analysis of this mosque with other mosques was form three perspectives

which are shape, environmental characteristics (E-CH) and history value (H-V). In addition to that it has been analysed this mosque from different angles which are historical analytical, environmental analysis, architecture documentation, Mosque refurbishment, preparation for mosque usage and assessing the visitors view through using post occupancy evaluation. One of the main challenges was the limitation of the budget to refurbish Alkhawa mosque. The process of refurbishment from documentation to the refurbishment was one of the main challenges. Finally, the result of assessing the visitor view through using post occupancy evaluation. In general, the POE can help to assess the indoor environment and the suitability of the building for the main user who is the mosque visitor. In addition to that, it can help the stakeholder to have a vision to improve the current measurement of the refurbishment. The previous measurement can lead to protect this historical mosque and revive it again.

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Attributes		To What extent are you satisfied about mosque indoor environment and outdoor aspects after refurbishment? In terms of the following factors	Likert-Scale				
			(1) Very Unsatisfactory	(2) Unsatisfactory	(3) Medium	(4) Satisfactory	(5) Very Satisfactory
Building Generally	Security	Safe	0%	6%	14%	66%	14%
		Mosque Visibility	4%	20%	50%	16%	10%
		Mosque Access control	0%	0%	14%	66%	20%
		Security mosque zoning	0%	0%	14%	60%	26%
		Mosque Lighting	14%	56%	30%	0	0
		Spatial configuration	0%	20%	30%	46%	4%
	Accessibility	Accessible to the mosque from street	0%	0%	20%	56%	24%
		Accessible to the roof	0%	20%	40%	25%	15%
		Accessible to the zoning and facilities	0%	0%	10%	40%	50%
	Cleanliness	The level of cleaning	0%	0%	20%	36%	44%
Location specific	Air quality	the quality of the air during visiting the mosque	0%	2%	4%	48%	46%
		Air Fresh or Stale	0%	0%	4%	30%	66%
		Air movement	0%	6%	20%	36%	38%
		control over ventilation	0%	10%	34%	42%	14%
	Temperature	The temperature level during the summer season	Very cold (0%)	Cold (4%)	Medium (66%)	Hot (26%)	Very Hot (4%)
		The temperature level during the winter season	Very cold (76%)	Cold (24%)	Medium (0%)	Hot (0%)	Very Hot (0%)
	Noise	Are you satisfied from the noise outside the mosque? Is it quite or noisy?	Very Noisy (0%)	Noisy (2%)	Medium (2%)	Quite (70%)	Very Quiet (26%)
		Is there distraction from external square noise?	Very Noisy (30%)	Noisy (44%)	Medium (26%)	Quite (0%)	Very Quiet (0%)
	Light	The level of natural light	Very Little (10%)	Little (26%)	Medium (64%)	Much (0%)	Too Much (0%)
		The level of artificial light	Very Low (0%)	Low (18%)	Medium (54%)	High (28%)	Very High (0%)