



Identifying Standards and Codes for Facades Design for Buildings of Al Baha Region with Architectural Identity That is Quoted from its Heritage and Historical Structures

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Abstract. The conservation of AL Baha region's image via implementing coded architectural identity to its buildings' facades is a critical sustainable practice. It will assist Al Baha city council to enhance the region's image to the point of producing powerful feelings and clear in the mind as well as worth remembering to the city dwellers and visitors because of being aesthetically pleasing. This research aims to produce synthesised guidelines and stipulations for the approved, from Al Baha city council, design of a given building façade to be constructed within Al Baha region. Architectural façade elements have been quoted from four distinguished heritage and historical structures locating in Al Baha region, namely The Ain Ancient Village, Bin Rogosh Historical Palace, and Al dhafeer Historical Village in order to formulate a newly specified criterion-façade imagibility- and demonstrates its potential value as a guide for Al Baha region new and retrofitted buildings. The excerpt of these architectural elements have been adopted, redesigned according to modern methods that satisfy a building requirements from the aspects of: aesthetic appearance, façade construction systems, economy, climate interaction, mitigating energy consumption, day lighting and energy production. Each architectural element has undergone a comprehensive analysis that described its dimensions, ratios, window to wall ratio (WWR), daylight factor and illuminance level, air inlet and outlet, thermal comfort and possible integration to semi-transparent photovoltaics. The study presents a virtual theme of a potential façade of Al Baha city when the proposed guidelines are in effect as well as results of modelling of thermal and visual comfort. The PV electricity output was calculated from each transparency level under the two condition, summer and winter. The predicted flow patterns, temperature distribution and the daylight factors in the room have been used to determine the most appropriate opening locations, sizes and system specifications for maintaining a comfortable indoor.

Keywords: Preservation; Elements; Façade; Identity

1 Introduction

The conservation of theories and practices by reprocessing historic and traditional architectural elements have been accounted for utilising in the modern urban environment to apply sustainable practices (Chun, Hassan et al. 2005, Harun 2011, Shalunts, Haxhimusa et al. 2011, Murgul 2014, Khodeir, Aly et al. 2016, Alawad 2017). The reconsideration of heritage architectural components when designing modern buildings is, by definition, a sustainable approach to the built environment

based on quoting the elements standards and concepts and employ them in new structures to maintain and improve a city environmental and aesthetic status as well as its buildings facades bioclimatic characteristics.

Al Baha city is located in the southern region of the Kingdom of Saudi Arabia that includes each of Asir, Jazan, Najran and Al Baha regions where the domination of agricultural mountainous prevailing terrain and valleys. As such, the variety of the area topographies, had urged the dwellings to adhere their design criteria to different climatic conditions. Since Al Baha city is a part of the mountain side where the dominant cold weather during the winter and mild in the summer, buildings are built with stone for a height of 2-3 meters and then finalised by clay in the form of course layer running horizontally in the walls where the walls are constructed with clay that is mixed with cement and water at a height of 40 to 50 meters. Flat stones are then stacked side by side on each clay layer with a cantilever between 20 - 30 cm to protect mud walls from heavy rain (Al Ghabban Ali 2010), as shown in Figure 1.



Figure 1: The way buildings are constructed in Al Baha region. Surece: Author

Despite the diversity of Al Baha heritage upon the urban level with a variety of historic and traditional villages and structures which can demonstrate a pleasant theme that can be an added value to city future, the vernacular architecture of the modern city of Al Baha is still undefined from the aspect of architecture identity. However, the Saudi Commission for Tourism and National Heritage has worked on preserving the elements of the cultural heritage of the area by several actions: Identifying the sites of the urban heritage; stopping the random demolition works that were exposed to these sites; stipulating clear provisions for their protection; signing local and international memorandums of understanding for consultation projects; registering and classifying these sites in accredited organisations; exploring different international experiences in the preservation of heritage sites and implemented similar projects within the region (Heritage 2010).

This piece of research aims to conceptualise and develop a knowledge-based model for the representation of architectural heritage, in order to support both the investigation and synthesized architectural elements for façade design as part of the conservation process.

The aim of the investigation phase is to define specified codes for building facades of the city of Al Baha that suits the richness and specificity of information relating to façade design for its new urban areas. The assembly of historic façade components of Al Baha historic and traditional structures has the goal of creating a model that is able to provide the decision makers of the city council of Al Baha with regulations that can be used for conservation plan, and to act as a support for design decisionmaking. The proposed model has at its core a knowledge base developed through collected data from the existing historic and traditional buildings around the formalization of all specifications necessary for the full comprehension of the architectural facade objects to be employed in the modern structures.

This study assembled architectural façade components from ancient and traditional structures within Al Baha region such as: The Ain Ancient Village, Bin Rogosh Historical Palace, and Al dhafeer Historical Village, and identified each element criteria and concept. Then, proposed theme has been designed taking into account these criterion with modernisation of the design to specify standards for façade appearance for Al Baha city new and retrofitted buildings. **2 Heritage and historic structures of Al Baha region**

2.1 The Ain Ancient Village

It is the most famous historic villages of Al Baha region, on the valley side. The village is located on the top of a hill that is above sea level with 800 m looking over a spacious agricultural valley as shown in Figure 2. The dominant weather of its area is hot and humid during the summer with ranging degree between 35 and 45 °C while it is cold and humid during the winter season with an average degree of 20 to 25 °C. The village was built above a top of a hill for defence purposes that affect its openings criterion. It consists of a group of stone buildings, 59 houses and a mosque as shown in Figure 3, in the form of fortresses over gradient topographies (Consultancy 2010).

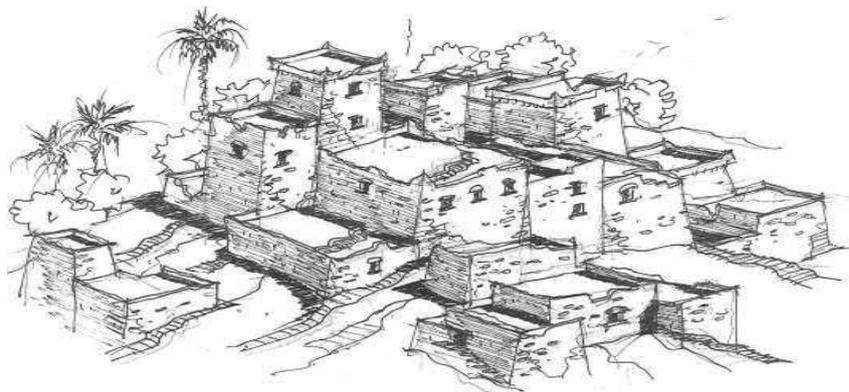


Figure 2: a sketch isometry of The Ain Ancient Village. Source: Author

The houses floor count ranging between 2 to 5 floor. The first floor usually allocated for livestock whilst the second floor is used as a store for crops where window openings are less needed. The highest floors are occupied by the dwellers and contain bedrooms, living areas and a kitchen with openings shown in Figure 4.

However, the roof accommodates the family gathering and visitors which sometimes a single room is constructed to be as a bedroom during the summer season. The Village houses are built from local stone while their ceiling are constructed from local trees called (Al Arar) (Consultancy 2010).



Figure 3: Openings and wall textures applied in the village houses. Source: (Consultancy 2010)

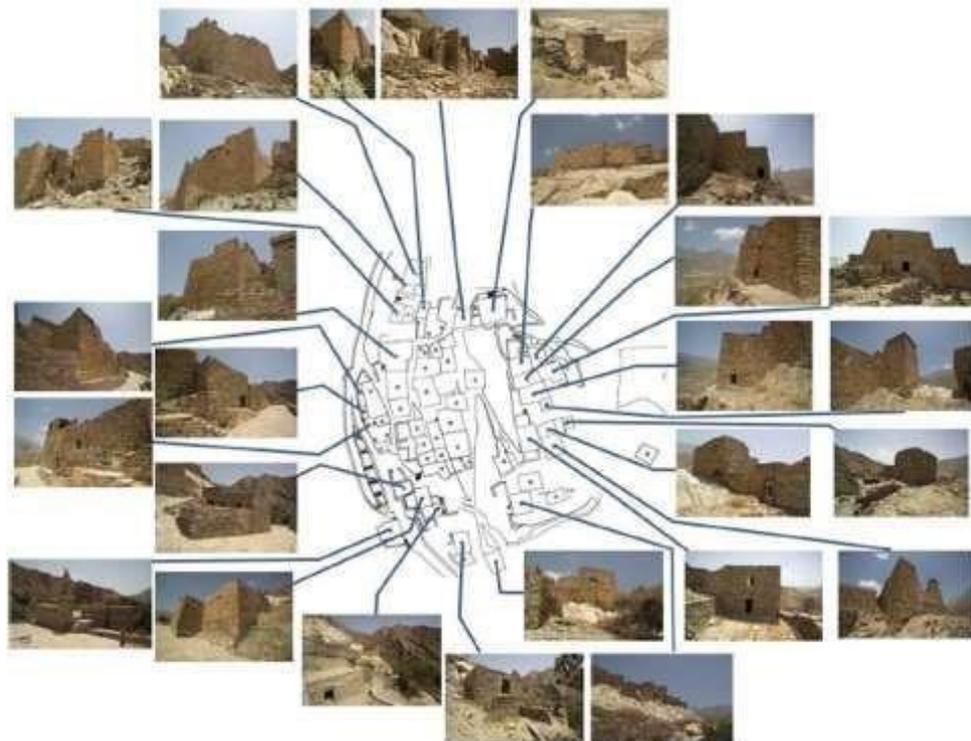


Figure 4: Houses of the Village According to their locations. Source: (Consultancy 2010)

2.2 Bin Rogosh Historical Palace

The palace was built in 1242AH by his owner (one of the village locals) and it is located in the mountain part within Al Baha region which is within Al Baha city. It is considered as one of the historic landmark in the area due to its vernacular design value as shown in Figure 5.

The dominant weather of the palace area is cold and dry during the heating season with an average temperature degree of 12°C, and it is warm and arid during the cooling season with an average temperature degree of 21°C (Heritage 2013). The Palace was built as a community centre for one of the region tribes and consists five guest houses as well as a periodical gathering room for the tribe dignities. As such, it represents the most bountiful architectural elements of the region, shown in Figure 6.

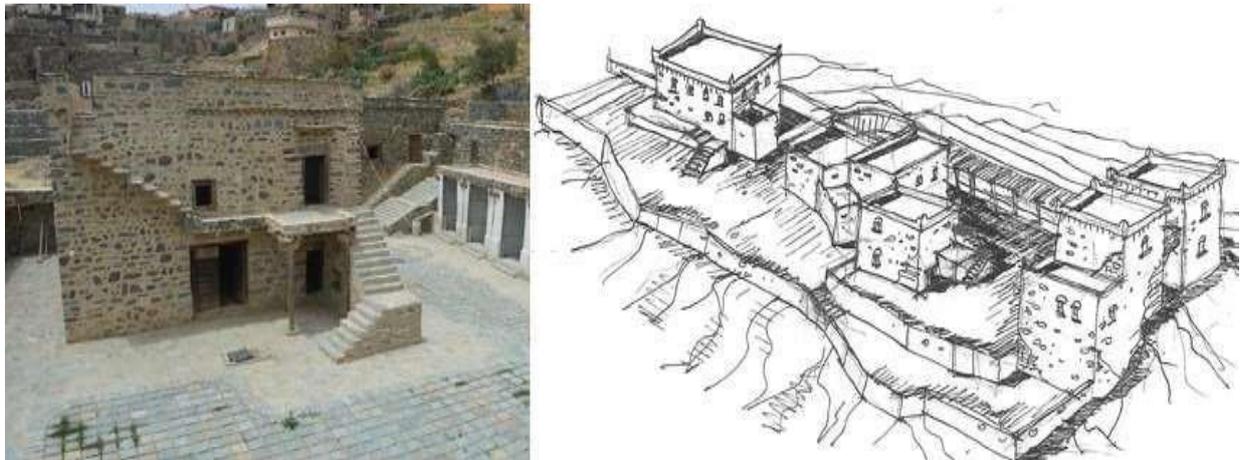


Figure 5: Bin Rogosh Palace. Source: Author



Figure 6: Architectural elements of Bin Rogosh Palace. Surce: (Heritage 2013)

2.3 Al Dhafeer Historical Village

Al Dhafeer historic village is located located in the southeast of Al Baha city within the mountain side which adhere to its climatic conditions during the summer and winter seasons. The design theme of the village is characterized by simplicity and uniformity of Al Baha vernacular architecture that reflects its culture and heritage, as shown in Figure 7 and 8. The village dwellings are 3 story buildings. They were stone constructed from party walls where ground floor was utilised for livestock and as a store for dwellers' crops where the absence of window openings are preferred. However, the first floor is allocated for a family to reside and have their daily life enjoying bedrooms, a kitchen, bathrooms and a living area. The highest floors were occupied as a recuperation place for the family.

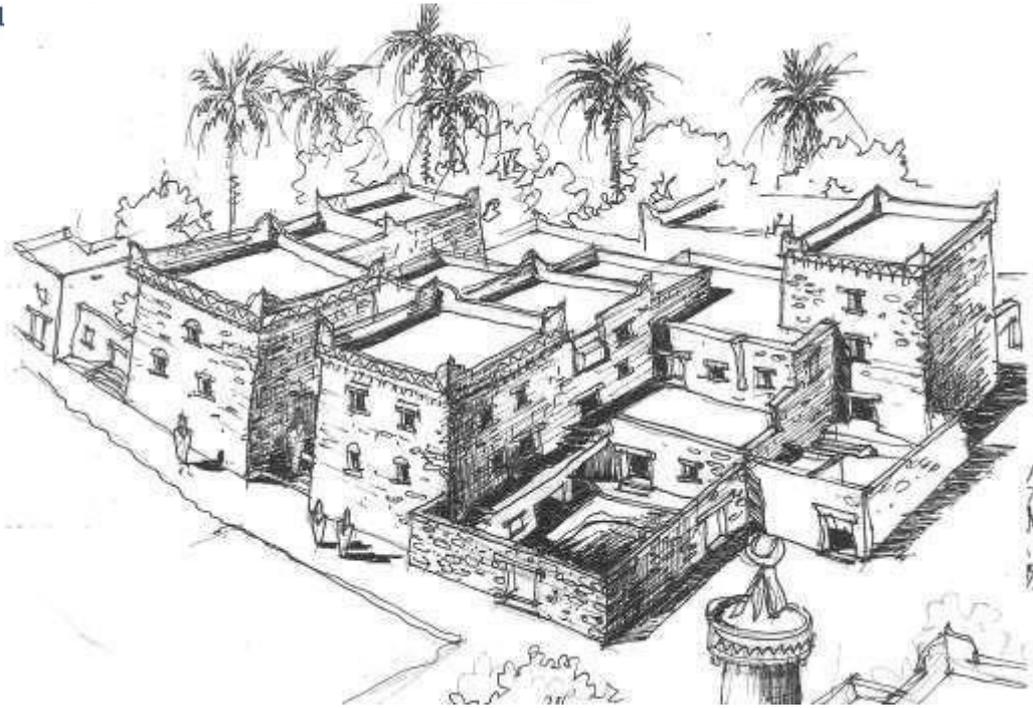


Figure 7: a sketch isometry of Al Dhafeer Historic Village. Source: Author

The stone walls formulate the façade textures and give an ornamentation appearance from its construction. Some of the building facades contain outside stairs that were built from elongated flat stones and can be as an element for the façade too. The stairs are often common for two adjacent houses. The village houses come into a form of fortresses for defense purposes. Building drip edges were constructed of trunks of trees as a skeleton which covered with stacks of leaves which then plastered by mud.

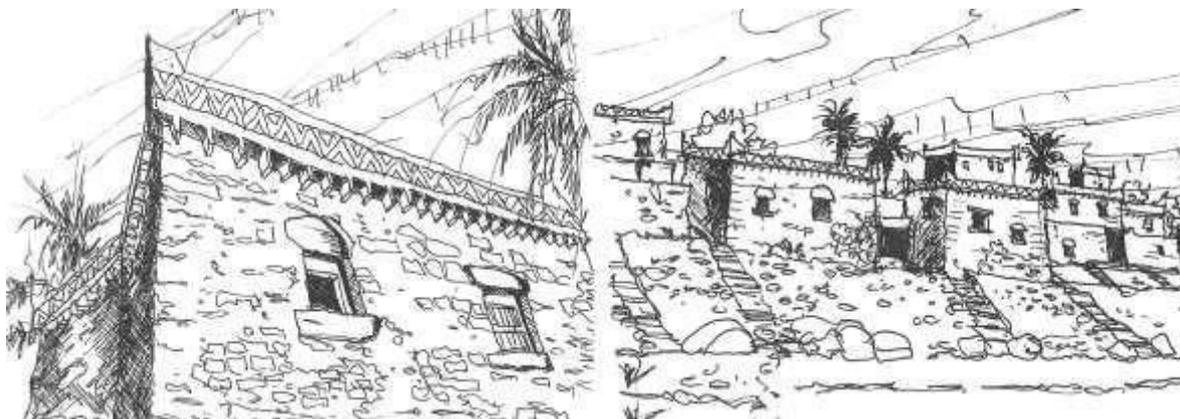


Figure 8: a sketch of façade texture and openings of Al Dhafeer Historic structures. Source: Author

3 Al Baha Region Façade Architectural Elements

Having completed a brief introduction about the most valuable buildings in Al Baha region that possess most of the façade architectural elements (windows as shown in Figure 9, doors, as shown in Figure 10, columns and stairs, as shown in Figure 11, and drip edges) of the region, this section will define each architectural components taking into account dimension, buildings heights, opening ratio,

and façade textures for the buildings of The Ain Ancient Village, Bin Rogosh Historic Palace, and Al Dhafeer Historic Village.



Figure 9: Window openings

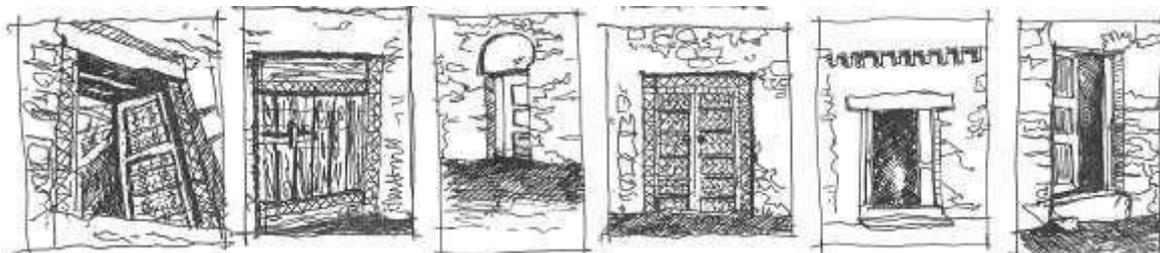


Figure 10: Doors openings

Figure 11 shows Al zafir column that is a supportive column were used to support heritage and historic construction systems for indoor inside the rooms and outdoor for outside stairs beneath the landing area. The column is wooden 3 meter high with a crown on top, and it is traditionally ornamented. It looks shiny and produces scented smell for indoor environment and has a capability to resist insects.

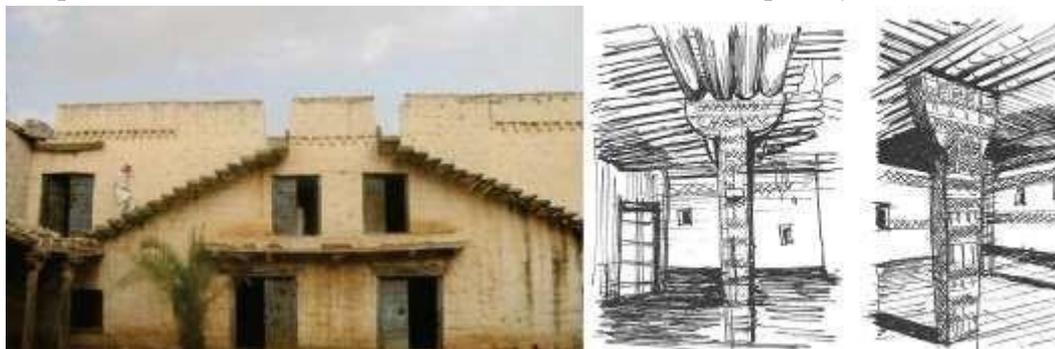


Figure 11: Stairs and Al Zafir column

3.1 Window Openings

A façade of each building was surveyed and its window openings were analysed and defined from the aspect of dimensions, solid and void as well as window to wall ratio (WWR), as shown in Figure 12 for The Ain building. It can be seen that solid theme is apparent in the first floor with an area of 62.1m² since the floor has been used as a warehouse whilst the second and the third floor are equipped with openings. The façade area of the second floor are 53.56 m² with total opening area of 0.72m² and WWR of 1.3%. However, the third floor openings are less in the amount and more spacious than the seconds' with slightly similar area of 52.24m² and total opening area of 2.08 m² and WWR of 3.8%.

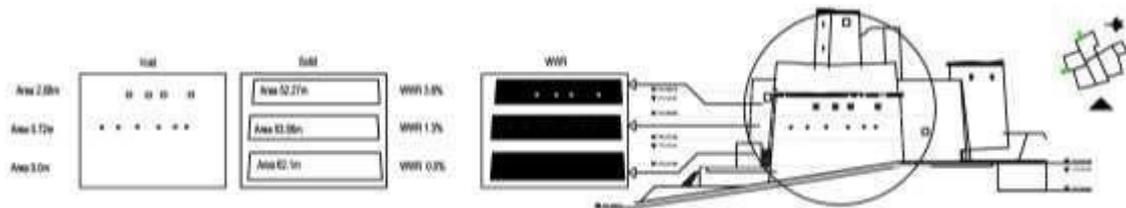


Figure 12: The Ain facade analysis

Similarly, the façade of Bin Rogosh Palace shown in Figure 13 represents solid theme in the first floor with an area of 42.54m², however, the second and the third floor are equipped with openings. The façade area of the second floor are 41.88m² with total opening area of 1.6m² and WWR of 3.8%. on the other hand, the third floor openings are less in the amount and similar in size with opening in the seconds' with slightly similar area of 39.93m² and total opening area of 0.8m² and WWR of 2.0%.

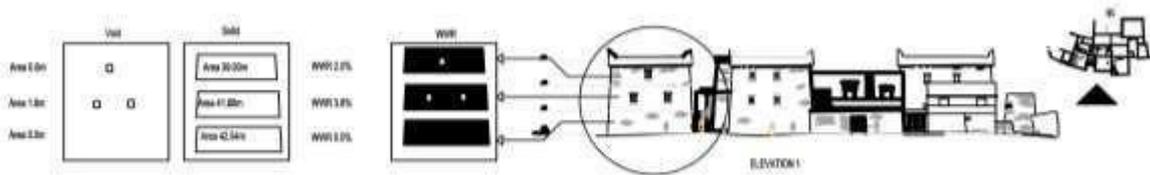


Figure 13: Bin Rogosh Facade Analysis

Furthermore, the façade of Al Dhafeer building as shown in Figure 14 represents solid theme in the first floor with an area of 43.54m² and void theme in the second and the third floor which are equipped with equal openings with regards to amount and size. The façade area of the second floor are 41.98m² with total opening area of 1.12m² and WWR of 2.7%. Similarly, the third floor openings are the equal in the amount and size with opening in the seconds' with slightly similar area of 39.76m² and total opening area of 1.6m² and WWR of 4.0%.

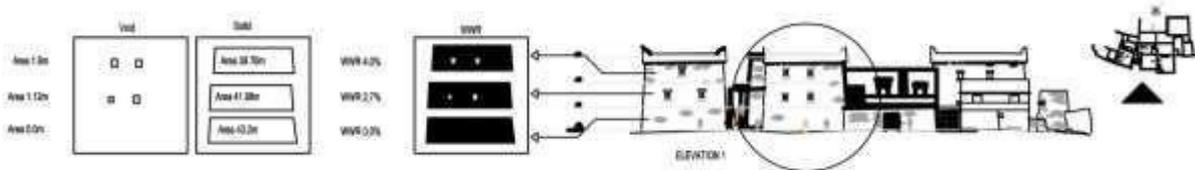


Figure 14: Al Dhafeer Building

3.1 Façade Textures

It can be noticed from the listed figures that building are built as massive construction for defence purposes and rain protection with 12 m high three-floor block with walls stone for ground floor, cast mud. Built like a bunker. Façades built of boulders and filed stones. The roofs, either pitched with palm or flat mud construction.

4 Proposed Façade Design and Conclusion



Figure 15: Schematic Façade for Al Baha city

Figure 15 illustrates a schematic façade design for Al Baha city that employed the briefed above architectural elements from the historic and ancient buildings. It can be concluded that an identified and coded façade design is an approach towards the restoration and the recall of traditional buildings techniques that are directly related to the preservation of bioclimatic design strategies. The investigation carried out within the framework of this study has confirmed the cultural aspect of facades in vernacular architecture and their specifications. The application of the traditional facade criterion of the city of Al Baha provide adequate street appearance for its urban theme where building heights are about 12m high giving three-story structures and a wall area for each floor with an average of 50m². However, openings are slight different between facades designed in the valley side from those in the mountain side. Openings in the valley side are more in the amount and less in the size with an average of 2m² whilst in the mountain size are less in the amount and large in size with an average of 1.5m² with.

5 Recommendations

Further study should be carried out and investigate the following:

- The use of local materials and their beneficial effects in terms of thermal performance of the building envelop and the level of occupants comfort.
- The daylight factor of the traditional façade with regards to window to wall ration of each floor.
- Energy consumption when applying traditional construction materials.
- Possible energy production when considering renewable energy applications integrated to traditional facades.

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