



IDENTIFYING ARCHITECTURAL ATTRIBUTES AND AESTHETICS FOR ASSESSMENT OF NEW INFILL DESIGN IN URBAN HISTORIC CONTEXT: THE CASE OF HISTORIC JEDDAH

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Abstract

Urban regeneration and architectural design in historical contexts have always presented serious challenges, thereby raising critical questions regarding the assurance of modern architecture designs that maintain compatibility with cherished heritage sites. Previous studies have analyzed theories and strategies in cases where new architecture has been interwoven into the existing historical urban fabric as infill projects aligned with the existing architectural heritage. These studies elaborated upon alternative philosophies regarding infill architecture projects, from mimesis or replication to contrasting approaches. The former seeks compatibility and visual harmony by linking new building designs to the historical aesthetics and character in order to preserve the contextual values of the site and its heritage. The alternative approach posits that any new intervention should represent its own period of time. Despite the inevitable contrast, new architecture should respect and compliment the historical context rather than overwhelm it. In some historic sites, the design of new buildings has been an important aspect reflected in the contextual design and integration of new infill structures; however, few focused on the historical area whose architectural and urban heritage values must be preserved. International organizations, such as UNESCO and ICOMOS, strive to preserve historical sites, including monuments, buildings, and exemplar neighborhoods worldwide. Doing so exposes them to several conflicting interests, not the least of which is the struggle between preservation and progress. Through these organizations, many guidelines have been declared in charters, formal recommendations, and binding resolutions that form the preservation, revitalization, and development principles for historical sites. To achieve these goals, most design principles and guidelines outline the desirable attributes and aesthetics of historic environments, especially their visual and spatial qualities. In historic sites, these characteristics are vital for the formation of appropriate design guidelines that can help maintain high-quality contextual bonds between the new and old. These common compatibility principles are used to assess urban and architectural features, including size, scale, proportion, character, materials and detail in order to protect the integrity of both the new structure and the context into which it is placed. In some sites, the identifiable physical attributes and aesthetics are not obvious, even for responsible local organizations and professional designers. One notable example is historic Jeddah in Saudi Arabia, a listed UNESCO World Heritage site. The historic center of old Jeddah has suffered continuous degradation resulting in the partial sacrifice of its traditional spirit, authentic urban and architectural Hijazi features, as well as hundreds of irreplaceable historic homes. Further, the urban expansion of Jeddah city is characterized by a fragmented structure and unregulated urban sprawl that lacks appealing integration between the old district and the new city. This has led to irregular building practices with an unpleasant blend of relatively few remaining historical buildings and an increasing percentage of contemporary buildings featuring non-conforming architectural characteristics. Current regulations and guidelines have not been sensitive to the district's historical nature or special status. The integration of new development into the old context has essentially failed, and the historic city's aesthetic and physical attributes remain undefined. Therefore, the aim of this study is to define the architectural attributes and aesthetics of Historic Jeddah in order to identify the basic principles of contextualism between the new and historical contexts. Methodologically, the study comprises two segments performed sequentially. The first introduces the current state of historic old Jeddah within its urban context and identifies the morphological transformations that shaped the current fabric as well as the main urban components and unique character areas that define the historical core of the city. The second identifies the attributes and aesthetic qualities of Hijazi-built communities in old Jeddah within the framework of existing theories of contextual architecture. The findings reveal how

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accurately defined attributes and aesthetics can be useful for major organizations and developers by providing clear information to enable the formulation of appropriate design guidelines for new architectural projects in historic urban environments, and also to ensure successful infill developments that preserve irreplaceable cultural values well into the future.

Key words: Historic Context; Infill Design; Architectural Attributes; Historic Jeddah

1. Introduction

Many heritage conservation and urban regeneration projects have occurred in historic districts, with continuous transformations reshaping the old city fabric, the main urban components, and areas with specific characteristics that define the historical core of the city. Heritage cores, such as the historic Jeddah district, reached its current form through a series of morphological and physical transformations to the existing environment, the urban fabric, as well as its unique character and urban functionality. The current state is seen as a partial loss of its traditional spirit, not to mention the damage to hundreds of historical homes with authentic *Hijaz*² architectural features. Today, this spirit is missing because of the deterioration of spatial quality and the center's "sense of place." New design developments in heritage sites have always presented serious challenges and continue to raise critical questions, especially regarding the compatibility of new architecture within an old historical context. Therefore, developments that propose modern designs for historical locations must be carefully scrutinized to evaluate their relationship and impact on the surrounding sites (Matero, 1993). In addition, during the design process, many parties with different interests and goals are inevitably involved, including developers, government organizations, landlords, residents (Imam, 2013; Sotoudeh & Abdullah, 2013), community representatives, as well as the designers. Therefore, guidelines and regulations must be based on acceptable standards that respect physical, social, and cultural needs. From an architectural design perspective related to cases of new infill design in historical contexts, it is important to understand the design guidelines that have been shaped from the physical attributes and aesthetics of the historic setting and the existing local architectural character (Zyscovich & Porter, 2008; Cramer & Breitling, 2012).

International organizations, such as UNESCO and ICOMOS, have published guidelines, charters, recommendations, and declarations in order to protect heritage sites worldwide, and additional specifications have been developed for unique districts and quarters by relevant local commissions and councils. These guidelines all outline the main criteria used to evaluate new infill development in historic contexts: proportion, character, scale, form, setting, materials, colors, and details. In essence, these design guidelines serve as a "quality control" mechanism to protect the historical context and control its architectural appearance simultaneously, thereby preventing new interventions to destroy the preexisting physical aesthetics. In historic areas like Jeddah, these characteristics are often not readily apparent for local organizations, communities, and architects. Over the last fifty years, the growth of the city was characterized by poorly regulated urban sprawl, fragmented city structures, and poor integration between the old district and the new city. This led to irregular building forms featuring an unpleasant mix of the remaining historical buildings with an increasing percentage of contemporary buildings with inconsistent architectural characteristics. Despite the site being listed among the most important UNESCO world heritage sites, current building regulations and guidelines have been insensitive to the area's historical nature and special status. The physical attributes and aesthetics of the

² Refer to Hejaz region in the west of Saudi Arabia.



old district remain undefined, and the design criteria that could govern the satisfactory integration of new buildings into the historical context of the district remains unspecified.

This paper aims to identify the urban characteristics and architectural aesthetics of the historic district of Jeddah in order to formulate a set of design guidelines based on assessment of desirable exterior visual appearances in this historical urban context. These guidelines would also serve to determine the consistency of architectural expressions in the preservation of authentic qualities after development according to the locally accepted principles of conservation. The goal is to identify the criteria that will form a base to guide architects when approaching new designs that will respect conservation of the historic area through the evaluation of infill examples in old Jeddah.

The paper is divided into three sections. The first section reviews the guidelines established by international organizations, relevant charters, and recommendations. It explores the importance of physical aesthetics to the symbolic values of historic urban settings. The second section introduces the current state of historic old Jeddah within its urban context and identifies the morphological transformations that shaped the current fabric as well as the main urban components and unique character areas that define the historical core of the city. The third identifies the attributes and aesthetics of Hijazi-built environments in the historic district of Jeddah according to the framework and principles of contextual architecture and conservation by providing a general discussion of the elements and features of traditional architecture and articulation details. This study creates a basis for design guidelines to help officials judge the suitability of proposed infill projects in old Jeddah during the design phase.

2. Infill Design Guidelines in Historic Context: An overview

Unregulated development within a historical context can inevitably affect the quality of the old district's appearance. According to previous research, design restrictions, guidelines, and reviews are essential to prevent the destruction of historical settings caused by the aesthetic failures of architects and to control building appearance (Nasar & May, 1994). Design regulations attempt to control neighborhoods for the benefit of the entire community, and they must be based on appropriate appearance guidelines based on professional research.

Several design guidelines have been adopted by international organizations, such as UNESCO and ICOMOS, and more specific frameworks have been developed for specific districts and quarters by authorized local commissions and councils. These design regulations deal extensively with spatial and visual aspects to help designers understand the unique characteristics of spaces and preserve the special qualities that give a place its character.

Design guidelines for historical contexts relate specifically to old historical districts. Examples include the Heritage Council of New South Wales (NSW) and the Royal Australian Institute of Architects. Both offer detailed design criteria for new infill development and outline six key criteria that are used to assess the process of achieving successful infill designs within old contexts: character, scale, form, setting, materials and colors, and detailing. They also provide information about how authorities assess infill buildings (NSW Heritage Office, 2005). Each criterion has a specific set of measurable indicators used to accurately assess the compatibility of new designs. Other organizations have created toolkits to heighten awareness of local conditions and architectural attributes to ensure successful infill development and new



interventions. In essence, these principles relate to history, existing patterns, scale, native materials, and building methods originally employed in the historic zone (EH & CABE, 2001; Preservation Alliance for Greater Philadelphia, 2007).

Another guideline mentioned by ICOMOS is the Venice charter of 1964. According to the charter, any new construction or transformation of a traditional site that modifies the relationships of mass and color is not permissible. The ICOMOS Burra charter stipulates that any new design must be distinguishable from the surroundings to protect the historic setting and must be compatible with the overall context to perpetuate harmony in the existing fabric. This charter provides guidelines that identify the cultural significance of sites identified as having “aesthetic, historic, and social values” and suggests policies that protect these cultural identities.

Worldwide organizations often develop generalized design guidelines for infill architecture and modify the wording and local specifics according to each district’s character and identity. They focus on compatibility with emphasis on unity, order, ratio, proportion, size or scale, rhythm, color, details, material, and special characteristics of historic quarters. From previous reviews of historic design criteria, they have included mainly formal variables related to the structure of form. Although they try to be context specific and flexible for different design schools and aesthetic interpretations, most of the guidelines address similar criteria and issues to preserve the character of historic districts; however, these sites tend to have unique physical attributes that no single generalized set of design guidelines or assessment tools would be suitable. Therefore, identifying the specific physical attributes and architectural character of each site is the key to forming accurate design guidelines in order to achieve compatible new infill designs in each historic context.

As mentioned, in the historic Jeddah district, generic regulations and design guidelines would not be accurate, and the unique characteristics would not be explicitly defined. Therefore, the current paper focuses on issues related to the identification of the unique characteristics that define Hegazi urban and architectural attributes in old Jeddah.

3. Historic Jeddah District: Urban and Architectural Character

The city of Jeddah is one of the most historic in Saudi Arabia and known worldwide as the gateway to the Holy City of Makkah. It has a rich cultural heritage and is an important hub for the Islamic world. Jeddah’s unique geography has enabled the city to develop as a successful port. Until 1947, the city’s growth was contained within the historic walls surrounding the old district. However, that wall was eventually demolished, thus allowing the city to expand. During the second half of the 20th century, the city developed northward, thus eroding the status of the historic area as residents and business headquarters moved to alternative locations. The current status of Historic Jeddah developed through a series of morphological transformations to its city fabric as well as its character and urban functionality (SCTA, 2013). Therefore, the historical center of old Jeddah likewise changed. The use of the word ‘character’ here refers to the combination of visual impressions, urban activity, cultural traits, and social interaction that shape a city’s identity and sense of place (Figure, 1).

The current character and structure of the historical area reflect the fragmentation that resulted from the drastic changes to the historical fabric. This spread both inside and outside the historic wall and affected the entire area to and from the water’s edge. Similarly, another zone of high-

rise and commercial buildings developed around the second most important street named *Al-Dahab* Street, thereby eliminating the continuity of the historical fabric that ran east to west. The modern buildings were designed in various renditions of diverse modern styles. It is worthwhile noting that new buildings constructed on the core and along the wide streets have hidden the remaining traditional buildings.

Figure 1. Map of City of Jeddah shows the Historic district in center of metropolitan area



Source: Satellite image, Google Earth, 2018.

The historical district exists today within a complex urban setting bordered on two sides by unplanned areas developed during the first wave of urban expansion between the 1950s and 1970s (Matthew & Johnson, 1980). Today, these areas present multiple challenges to the city in terms of architectural quality, and despite their inconsistency, they are highly interconnected with the old district. Nevertheless, they might also provide valuable opportunities for future regeneration and integration with the historical district to reactivate it as a vibrant section of the city.

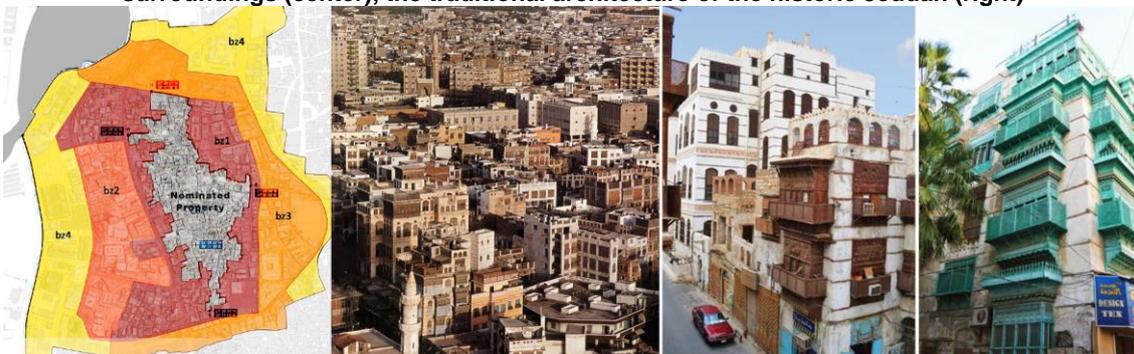
Historic Jeddah was first listed as a UNESCO World Heritage site in 2014 based on selection criteria (ii),(iv),and(vi). One implication of the nomination was that two main protection boundaries were identified, the “nominated property” and the “buffer zones” divided into four. The historic center of Jeddah, within which the nominated property is located, constitutes the most outstanding traditional urban center on the Red Sea. This area represents the best-preserved section of the old city and includes all of the traditional urban and architectural characteristics that typify Historic Jeddah. 50% of the structures from around fifty years ago have now been lost, including 650 buildings identified as historic structures (UNESCO, 2014). The current paper focuses on the formal aesthetics of the old historical context of the nominated property and its physical qualities.

In terms of urban elements, the traditional urban fabric of Historic Jeddah consists of a variety of space types, namely *barha*, *souq*, and *zuqaq*. Each type has specific spatial and functional characteristics as the terms indicate. For instance, *Barha* is a plaza that essentially forms the intersection of streets and alleys that feed into it. They differ in size from one location to another and serve as outlets for the residents of the narrow surrounding passages. *Souq* is a linear

marketplace, and the site is characterized by numerous *souqs* distributed among the streets that extend from the port to the boundaries located along the city's periphery. A *zuqaq* is a residential lane that is relatively narrow and has light traffic compared to the *souqs*. Some *zuqaqs* are dead ends and similar to a cul-de-sac. The alleys of the city divide the neighborhoods and have no clear direction; they narrow and widen according to the winding façades of the buildings. Historically, the width of the alleys was less than three meters and decreased in correlation to the size of surrounding buildings. These alleys represented the arteries of communication between the locations reserved for distinct activities. The resulting networks that developed around these spaces are one of the most differentiating features of Historic Jeddah.

In terms of architecture, the old district is characterized by aesthetically remarkable multi-story buildings as well as high-density low buildings. These structures were typically related to specific functions, such as trade or religion, and they defined the overall urban form and its divisions into clearly defined quarters. Their specific aesthetic and functional patterns, decorated woodwork façades, ground floor room used for offices and commerce, and rooms rented for pilgrims all reflect their adaptation to both the hot and humid climate of the Red Sea and to the cultural specificity of Jeddah. The houses of old Jeddah have always had an active relationship with the street in terms of entrance and fenestration, and they are comparatively extroverted in their layout configuration. Courtyards are rare, although some are used for functional purposes. This architectural typology born in Jeddah spread to nearby Hejaz cities; however, it has since completely disappeared under the pressure of modern development.

Figure 2. The Nominated property and buffer zones (left), the old urban fabric and the modern surroundings (center), the traditional architecture of the historic Jeddah (right)



Source: author.

The other key attribute of the traditional houses in Jeddah is their vertical organization. A distinguishing feature of the traditional architecture of Jeddah is the highly articulated building façades, differentiated by diverse geometrical arrangements of fenestration and ornate woodwork. Two main elements usually characterized the façades, the woodwork combining complex and dense segments, and the coral stones. The external decorative elements are found in five main forms: 1) typical wooden windows; 2) projected windows (*roshans*); 3) exquisitely carved ornamental doors, generally the main entrances; 4) creative lattice work and fretted decorations such as *shish*, which are mostly integrated into the *roshans*, and 5) decorative plastered work (*sgraffito*).

Currently, the existing fabric and architectural character of the historic district is a combination of both historical and modern layers. The basic problem is the method in which the contemporary developments were incorporated into the historic context. Understanding the essence of the

historic context and buildings based on the aforementioned formative elements can be considered the starting point for solving the problems of preservation and modern encroachment. As these issues must be considered while designing guidelines for any historical setting, this study focuses on the key attributes of historic context through an analysis of the district's architectural style. The identification of these attributes could form the basis for a tool to assess new interventions in historic settings. The intent is not to prevent change or progress, rather, to ensure that the district's architectural and material vocabulary is respected.

4. Identifying Urban and Architectural Attributes

According to the findings related to the urban and architectural elements of the historic district of Jeddah, this section defines the physical attributes based on contextual architecture principles and parameters as follows: 1) Order, 2) Unity, 3) Ratio, 4) Proportion, 5) Scale, 6) Rhythm, and 7) Details. Each parameter is clearly defined in order to determine its meaning in relation to the architecture in historical context and validated by specific urban cases for each criterion that were identified based on a range of measurable indicators that aimed to improve the accuracy of the assessment practice.

4.1 Order

The order criterion represents the creation of a harmonious bond between elements that appeared in historic Jeddah in two scales. Order can be measured using the following indicators: 1) building regulations (horizontal and vertical), with vertical calculated by the number of floors of a building and the total height of the building, and horizontal is calculated by the relationship between the positions of a new building and the regulation lines (Figure, 3), and 2) the layout of the building's openings (either horizontal, vertical, or composite layout). Horizontal refers to façades that are predominantly horizontal in their fenestration layout; that is, façades with segmented openings and roshans with horizontal connecting elements that make them appear as one.

Figure 3. Order analyzed by regulations, comparing new building with heritage context



Source: author.

In addition, there is another variation seen in some relatively recent historical buildings of Jeddah. With these, horizontality is expressed through the use of open balconies supported by slender wooden columns. The vertical type connects differently; the vertical elements have a

belt running horizontally called *hizam*, and verticality is determined as a single element that articulates the elevation vertically. The third category, composite, depicts façade layouts where no clearly dominant arrangement is identified. Instead, a combination of the aforementioned categories is observed in the same façade. This is commonly seen in bigger, more sophisticated buildings. This category has a very dense and heavy feel for which the size of the elevations also contributes.

4.2 Unity

In comparison with the order criterion, unity achieves harmony between several elements in the old district. However, order is indicated by the relationships between elements despite their differences, while unity is indicated by the characteristics of the building elements themselves that should be correlated in order to create an integrated frame. Therefore, unity in the historic context is assessed using the following indicators: 1) horizontal and vertical regulation continuity, 2) unity of store openings and building entrance designs at ground level, 3) building geometry in terms of shape of the base footprint and its orientation within the historic urban fabric, and 4) the unity of building colors and materials.

Figure 4. Continuity in terms of shape, form, coherence of building colors and material



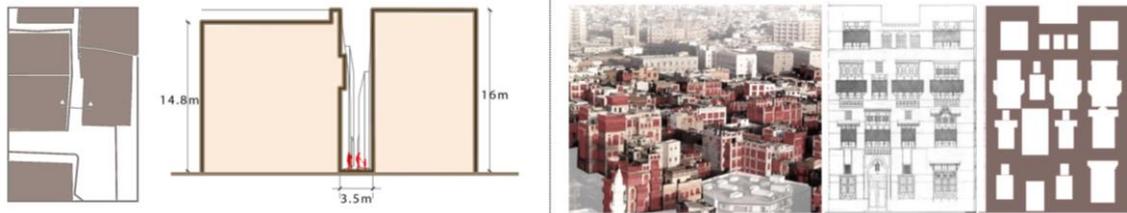
Source: author.

4.3 Ratio

In Historic Jeddah, the ratio criterion is defined by the physical parameters on three levels using the following indicators: 1) typology of street/path profiles by defining the relation between the width of the street and the height of the buildings. The traditional urban fabric of Historic Jeddah consists of a variety of space types, *barha*, *souq*, and *zuqaq*. The resulting network of these profile types is a unique and defining feature. In addition, new types of urban spaces started to form, primarily to serve vehicular traffic.

The street is basically a vehicular driveway with sidewalks and, in some cases, a dividing median. Streets are generally wide and consistent in form and width compared to the traditional spaces. 2) building dimensions are expressed by the ratio between the height and width of traditional and modern buildings, and 3) the void-to-solid ratio in building façades in general, and the wood-to-stone ratio in older houses.

Figure 5. Building height-to-street width and solid-to-void ratios



Source: author.

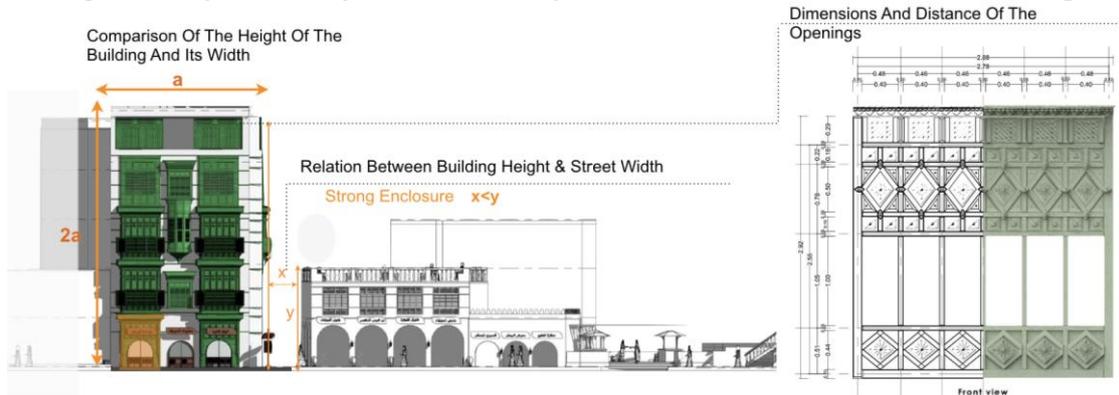
4.4 Proportion

Similar to the previous criterion, proportion can be defined by several elements in the old district using the following indicators: 1) Based on the aforementioned criteria, street sections are calculated by the relation between street width and building height. 2) Building dimensions are expressed by comparing the height and width of the building. Height is defined in traditional buildings as being between one and six stories high. The first category of low height appeared consistently in Historic Jeddah in buildings of communal nature, such as mosques, *ribats*, and schools. The second refers mainly to relatively tall houses between three and six stories high, or approximately 25 to 27 meters. Above that height, the buildings not only significantly alter the skyline and views of the area but also overpower their immediate surroundings. They radically distort the traditional human scale of the old city. 3) Distance and dimensions of the openings, arches, and woodwork elements that articulate the traditional buildings façades such as doors, windows, and roshans, as well as the proportion of their parts and details, are all measured. Arches were invented in order to allow openings that were wider than typical doors and windows on the exterior of the buildings. There are three types of arches: round, equilateral-pointed, and the trefoil arch. Whichever form was adopted, the arch often received special attention with decorative works requiring stones to be carefully laid, a feature that raised the building's status while offering local character and a unique appearance, as did the ground floor's openings and any emblematic building fenestration.

Roshans are the most recognizable element of the traditional architecture of old Jeddah. There are many variations and diversity in the number of assembled parts, size, and modularity. Despite these variations, all roshans are ultimately composed of similar sections, and the absence or presence of secondary parts defines the type. A single but complex roshan is generally divided into three typical and separately made parts, the "base" is the lower part, the "body" is the middle, and the "head" is the upper section (Alitany et al., 2014). Different motifs decorate each section, and each has a different pattern. Most are decorated with floral motifs, but geometrical motifs are also typical.

The woodwork covering roshans and window openings can be broken into modules following the vertical and horizontal axes. Combining both axes results in proportional rectangular frame modules. These modules offer substantial flexibility for the structure, opening arrangement, and ornamentation. The structure consists of a series of rectangular frames that allows for easy resizing. The rectangular module frames are either filled with solid elements or left empty to create openings. To understand these ratios and proportions, it is important to understand the relationship between the axes and the modules.

Figure 6. Proportion analyzed in relationship between certain elements in historic setting



Source: author.

Roshans adhere to a symmetrical, vertical arrangement around a central axis that determines its shape, sections, and structural framework. This axis influences the ornamentation down to the smallest, most intricate detail. Parallel to the vertical axis, the roshan can be divided into vertical modules that vary from fifty to seventy centimeters in size. The modules are proportional to the roshan's projection depth from the wall; therefore, the side vertical modules are usually the same as the vertical modules of the face. In dimensional terms, the smallest roshan face is formed from three adjacent vertical modules aligned side by side, but there can be as many as four to five in regular roshans. For the sides, roshans generally have one vertical module per side. Some double-depth roshans have two. There are also roshans with more than two vertical modules on the sides, and some unusual styles have none. Other complex roshans are unusual, rare, and exceedingly monumental; nevertheless, they generally consist of the same parts and are assembled in a similar manner. Some do not follow the typical rectangular layout plan nor adhere strictly to the same modules and proportions. The head and base are often proportional, and the horizontal modules have more influence on the structure and proportion of the body. It is important to understand the relationship between the horizontal module used for the head and those used for the ledge and the body. This body part is shaped from frames and combined with smaller squares and rectangular frames that form boundaries for *fretwork* and *shish* fillings. Each frame boundary can be set as a module. The width of the boundary is defined by the vertical module, but the height can vary widely following a horizontal module line. In general, most typical have a horizontal module that varies proportionately to the vertical module and measures approximately fifty to seventy centimeters, with the difference being that the height is either the same as the width or exceeds it. The horizontal modules divide the body into three assembled sections: ledge, openings, and forehead. The ledge and forehead usually have the same number of horizontal units, while the opening usually has more. Furthermore, the modules are important for the opening and its proportion in relation to the other parts as they facilitate the adjustable and sliding sections.

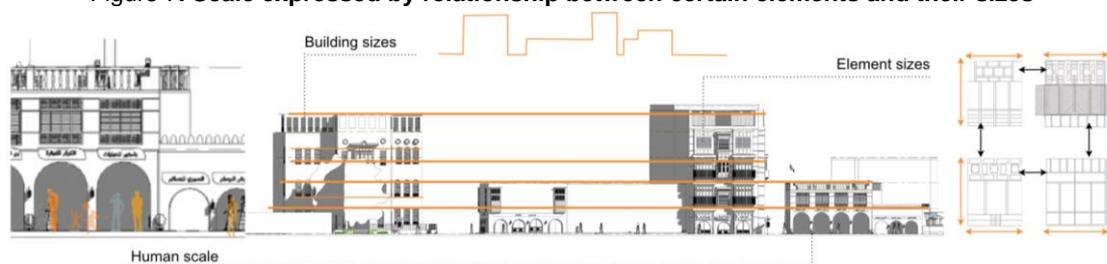
4.5 Scale

Scale is an important criterion for assessing architecture in a historical context. It includes the relationship between the size of buildings and surrounding elements. All designed elements should be appropriately sized in order to establish balanced relationships. Four scale measures and indicators cover the comparative analysis and evaluation processes: 1) building sizes

(height, width, and footprint), 2) size of building clusters, 3) size of elements in the building façades, 3) the scale of details, and 4) the human scale (Figure, 7).

In the historic district, several contemporary buildings have altered the scale and overall setting by exceeding the maximum allowable thresholds of historic buildings in terms of height and footprint. The identification of these buildings could form the basis for a scale impact analysis that might, along with other impact factors, lead to the development of a consistent set of guidelines for further interventions. This is important because the original loss of traditional scale was caused by the introduction of large-scale modern buildings that drastically and negatively altered the traditional skyline and streetscape experience of the old city.

Figure 7. Scale expressed by relationship between certain elements and their sizes



Source: author.

The map of the old city reveals the interface between urban and building levels, the clustering patterns, and the types of public and private areas. For the traditionally built structures, buildings were clustered in several configurations. The same categories can also be applied to the modern forms now found throughout the historical area. However, the scale and height of contemporary blocks are hardly comparable to the traditional clusters. While the analysis of traditional clusters can help us understand how these complex forms emerged and were woven within the traditional urban fabric, a study of the modern urban blocks may be more beneficial for discovering methods to utilize such buildings as part of a comprehensive intervention strategy for the entire site.

The impact of the modern building scale on the historical fabric can be studied in terms of its vertical impact on the skyline and horizontal impact on the streetscape. In order to observe these impacts in both dimensions, thresholds were established for building height and ground coverage based on estimated a set of maximum parameters of historic buildings, after which the buildings that exceeded those thresholds were identified as having considerable scale impact.

In terms of ground coverage scales in the old area, the main congregational mosques are the largest historical buildings in terms of footprint. It should be noted that even for the largest mosques, the streetscape impact of their long exterior walls was mitigated by converting the frontage facing the streets to retail shops, thus reducing the scale of the lengthy border walls and blending the large buildings with the surrounding markets.

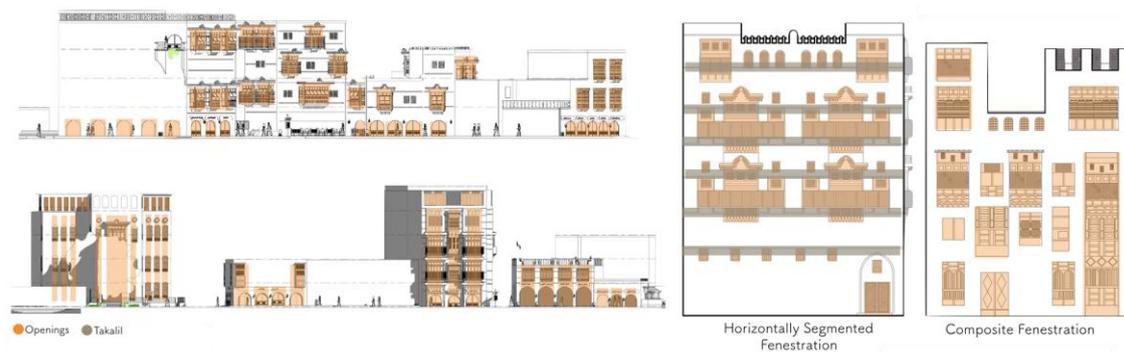
However, buildings with footprints exceeding the established thresholds were still considered to have high scale impact even when the street frontage was utilized for more intimate retail spaces because they still distorted the traditional urban scale hierarchy between buildings and clusters without the fractal scale gradation of historical buildings.

4.6 Rhythm

The definition of rhythm is simply the harmonious repetition of elements. In architecture, it is the repetition in equal intervals and distances, solids and voids, windows or doors, colors, and other factors. When related to contextualism in architecture, the rhythm of a building or blocks of buildings should be such that uniformity with the surroundings is not broken. Rhythm analysis can be performed numerous ways within various urban areas or contexts and by different actors. In the historic district, this criterion comprises two indicators: 1) rhythm of verticals that measure the distance between building openings, or the repetition or redundancy of typical elements, and 2) rhythm of horizontals, that is, the repetition or redundancy of horizontal wooden beams called *takalil* that were embedded between the stones in historic building façades.

Distinctive features of traditional Hejazi architecture of Historic Jeddah are the visual variety, the richness of materials, and the pulsing rhythms of its building façades. The principle element of traditional Hejazi façade design was the woodwork and fenestration layout. These were used as the key criteria for the analysis and categorization of building façade types in order to explore the different approaches of traditional façade design.

Figure 8. Rhythm of openings in scales of building and openings



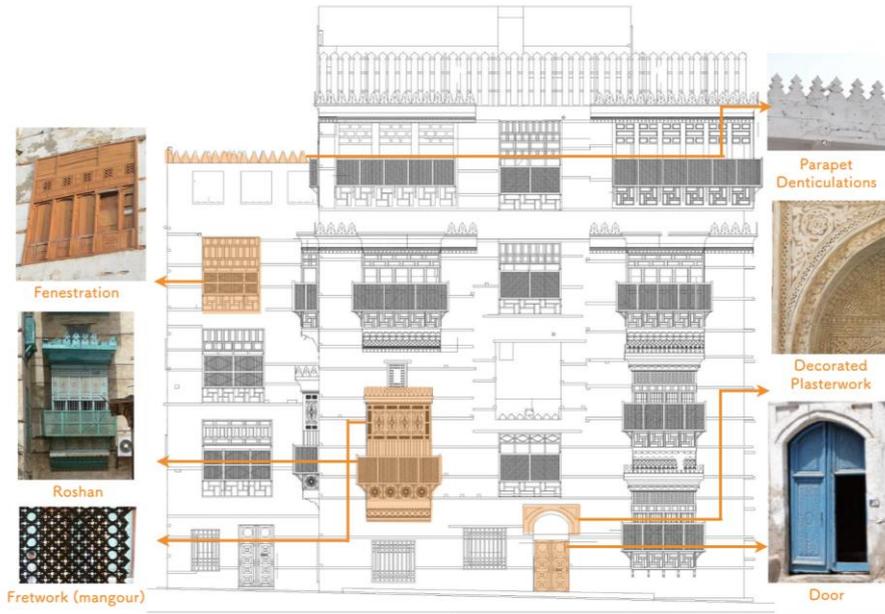
Source: author.

4.7 Details

Detailing in historic Jeddah can be interpreted in several ways. Generally speaking, details are important items that contribute to the overall positive perception of the site. Most notable on first glance are the roshans featuring a variety of motifs crafted in different sections and patterns. As mentioned, most are decorated with floral motifs, while geometrical motifs are also typical. Roofline parapets are also recognizable details that distinguish the traditional architecture of old Jeddah. In addition, doorways are often embellished with motifs above the entrance. Another detail element is a type of fretwork known as *manjor* that is based on geometric designs. In buildings, expressive details and decoration typically covered only specific areas and elements, for instance the upper sections of windows and roshans, because of the forgiving nature of their materials. Therefore, these received the majority of detailing and attention given that they were the only elements whose materials and construction allowed such creativity. There is a vast range of ornamental density, with some works intricately detailed while others were essentially panels with minimal elaboration.

One of the more remarkable elements of the historical buildings in old Jeddah is *sgraffito*, decorations that are found mainly on the lower floors of the exterior façades of old buildings or around the doors and main windows. *Sgraffito* is used primarily on ground floors at eye level to be appreciated by passers-by, never at the bottom of the wall, and only rarely on higher floors.

Figure 9. Typical detailed feathers in historical houses



Source: author.

Patterns usually form rectangular or square panels. It appears that the early decorations were simpler and more geometric, and plaster was carved with complex floral decorations cut deeply into the plaster without perforating its entire thickness. The analysis of details throughout the old district should cover the measures and evaluation relative to the following indicators: 1) geometrical and floral motifs and ornaments used for roshans, doors, and windows, 2) unique elements and embellishments of the building, 3) geometrical fretworks, 4) parapet denticulations, and 5) decorations in plaster walls (Figure, 9).

5. Conclusion

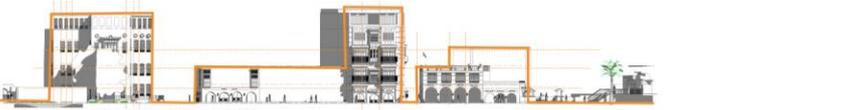
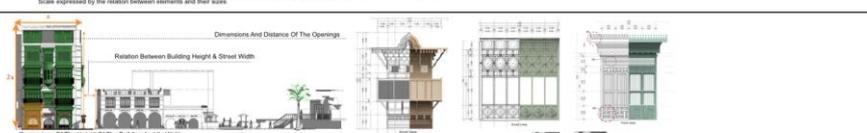
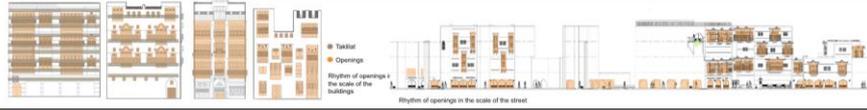
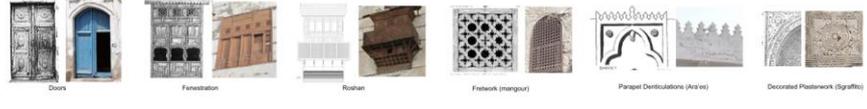
The historical context of the old Jeddah district reveals the uniqueness of its character, its formal attributes, and very impressive aesthetics. Infill design guidelines should respect this uniqueness as defined specifically for this important world heritage site. General guidelines drafted by international organizations serve as standardized reference starting points for preservation; however, when contextual guidelines are applied to unique settings, the specific characteristics of an area and its special values as an urban and architectural heritage site must also be considered before any future development is authorized.

This research identifies the urban and architectural attributes of the old Jeddah center and presents potential approaches for infill projects featuring contemporary architecture that first considers the sites' historical context to ensure the establishment of appropriate relationships between the old and new visual languages. According to accepted principles of conservation, in order to preserve historical character, it is important that proposed infill architecture be

compatible in size, scale, color, material, and character of the historical context. To achieve this, the architectural character and historic values of the context must first be clearly identified and acknowledged by all stakeholders.

As the historical composition of old Jeddah is continually threatened by inappropriate interventions, the regulations to determine the type and range of appropriate interventions have been modified frequently, especially in the last thirty years. Such changes have led to inconsistent approaches by the architects and planners tasked with the conservation of this priceless architectural heritage. Evaluation of the existing context reveals that the relationship between traditional and contemporary visions remains largely undefined. Therefore, this study may be helpful for decision makers and architects for two reasons, first by forming a basis for design guidelines and supporting only appropriate approaches for new infill projects during the design process, and second, by proposing a method to critique and professionally evaluate the existing infill structures found in the historic context of Jeddah. Also, even if a design for a new intervention appears to be distinct from the old site, it should at the very least preserve and respect the characteristics and significant values of the old historic context.

Table 1. Proposed urban and architectural attributes in the historic Jeddah context

<p>Order:</p> <ul style="list-style-type: none"> Vertical regulation Horizontal regulation Buildings' openings layout (horizontal, vertical and composite layouts) 	 <p>Continuity in terms of establishing harmony between horizontal and vertical regulation</p>
<p>Unity:</p> <ul style="list-style-type: none"> Horizontal and vertical regulation continuity. Unity of openings and buildings' entrances. Building geometry (shape of the base) Unity of buildings colours and materials. 	 <p>Continuity in terms of building shape and form, coherence of building colors, and compatibility of materials</p>
<p>Ratio:</p> <ul style="list-style-type: none"> Relation between the street width and building height. Ratio between the height and the width of the traditional and modern buildings Void-to-solid ratio, and wood-to-stone ratio in the old houses. 	
<p>Scale:</p> <ul style="list-style-type: none"> Building sizes (height, width and footprint) Size of building clusters Size of elements in the building's façades. The scale of the details Human scale. 	 <p>Scale expressed by the relation between elements and their sizes</p>
<p>Proportion:</p> <ul style="list-style-type: none"> The relation between street width and building height. Building dimensions (comparison of the height of the building and its width) Dimensions and distance of the openings. 	
<p>Rhythm:</p> <ul style="list-style-type: none"> Rhythm of verticals distance (openings, element repetition or redundancy) Rhythm of horizontals (Ex: horizontal wooden beams "Takallil") 	
<p>Detail:</p> <ul style="list-style-type: none"> Geometrical and floral motifs. Unique element of the building. Geometrical fretworks. Parapet denticulations. Plaster work decorations. 	

Source: author.

Conflict of Interest: The author declares no conflict of interests.



References

- Alitany, A., Rebondo, E., & Adas, A. (2013). The 3D documentation of projected wooden windows (The Roshans) in the old city of Jeddah (Saudi Arabia) using image-base techniques, *ISPRS Ann. Photogramm. Remote Sens. Spatial Inf. Sci.*, II-5/W1. XXIV International CIPA Symposium., II-5/W1, 7-12. DOI: [10.5194/isprsannals-II-5-W1-7-2013](https://doi.org/10.5194/isprsannals-II-5-W1-7-2013)
- Cramer, J., & Breittling, S. (2007). *Architecture in existing fabric: Planning, design, building*. Basel, Switzerland: Birkhäuser.
- EH. English Heritage & CABE. Commission for Architecture and the Built Environment. (2001). *Building in Context New Development in Historic Areas*. Retrieved from <https://www.designcouncil.org.uk/sites/default/files/asset/document/building-in-context-new-development-in-historic-areas.pdf>
- Imam, S. (2013). Assessment and review of infill designs' guidelines for residential urban conservation areas. *International Journal for Housing Science & Its Applications*, 37(3). Retrieved from <http://www.housingscience.org/html/publications/pdf/37-3-1.pdf>
- Matero, F. (1993). The Conservation of Immovable Cultural Property: Ethical and Practical Dilemmas. *Journal of the American Institute for Conservation*, 32(1), 15-21. DOI:[10.2307/3179648](https://doi.org/10.2307/3179648)
- Matthew, R., & Johnson-Marshall. (1980). *Jeddah: Historic Area Study, Design Demonstration Study*, Minister of Municipal and Rural Affairs, Municipality of Jeddah, Jeddah.
- Nasar, J. L. (1994). Urban Design Aesthetics: The Evaluative Qualities of Building Exteriors. *Environment and Behavior*, 26(3), 377–401. DOI: [10.1177/001391659402600305](https://doi.org/10.1177/001391659402600305)
- NSW Heritage Office. (2005). *Design in Context, guidelines for infill development in the historic environment*. Retrieved from <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Heritage/design-in-context-guidelines-for-infill-development-historic-environment.pdf>
- Preservation Alliance for Greater Philadelphia. (2007). *Sense of Place: Design Guidelines for New Construction in Historic District*. Retrieved from http://www.preservationalliance.com/wp-content/uploads/2014/09/SenseofPlace_final.pdf
- SCTA- Saudi Commission for Tourism and Antiquities, (2013). *Historic Jeddah, the Gate to Makkah: Nomination document for the inscription on the world heritage list*. Retrieved from UNESCO World Heritage Centre Website: https://whc.unesco.org/en/list/1361/documents/1361-1968-Executive_Summary-en.Pdf
- Sotoudeh, H., & Abdullah, W. M. (2013). Evaluation of fitness of design in urban historical context: From the perspectives of residents. *Frontiers of Architectural Research*, 2(1), 85-93. DOI:[10.1016/j.foar.2012.10.007](https://doi.org/10.1016/j.foar.2012.10.007)
- UNESCO, (2014). Historic Jeddah, the Gate to Makkah. Retrieved from <https://whc.unesco.org/en/list/1361/>
- Zyscovich, B., & Porter, D. R. (2008). *Getting real about urbanism: Contextual design for cities*. Washington: ULI-the Urban Land Institute.