

BIKANER: A CULMINATION OF ARCHITECTURAL ELEGANCE WITH VISUAL HARMONY

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Abstract

The city of Bikaner is a unique blend of culture, art and architecture. Famous for its dulmehra stone clad mansions it is often referred as the “City of thousand Havelis”. The havelis are 100-400 years old redefines its glorious past. Its distinctive architectural style is marked by features like carved stone jaalis, projected jharokhas, stone brackets, wooden doors/windows, fresco works and more . The compact city planning with narrow streets and climate responsive layout creates harmony in architecture by blending art, science and architecture. The traditional art form such as Usta art or Sunehri munawwati nakkashi, Aala-gila and fresco work were employed in interiors reflecting the skill of artisans and traditional excellence.

The architecture in Bikaner evolved over the year influenced by varied cultures. The invasion of Mughals, British in India affected politically, economically, culturally. The fusion of Persian, Mughals, British in Rajputana styles was evident in art and architecture. The havelis integrated these elements while preserving its traditional character and identity. The artisans from varied cultures exchanged their skills developed a distinct style and aesthetic value. The forts, havelis (merchant’s townhouse), religious buildings, its decorative elements all exhibits the unique architectural character and a captivating visual language integrating the climate responsive design. Thus Bikaner city plan is an exceptional example integrating the conscious design and aesthetics considering appropriate material selection and creating harmonic cooperation between form and function.

Index Terms: Bikaner, Traditional art and architecture, Diversity

1. INTRODUCTION

A nation's identity is built on its heritage. It combines art, architecture, and culture. Bikaner is a heritage city that thrives on its art, architecture and cuisine. Its fort, havelies has historical significance, a diverse cultural heritage, and creative and architectural contributions. Despite living in a hot and dry climate, the impact may be observed in planning and design. Living in desert and semi-arid environments is difficult. Dust and sand storms are common. The climate effect has resulted in responsible and environmentally sustainable architectural style. Furthermore, there were over a thousand Havelies throughout the city. Bikaner a historic city of Rajasthan was established in 1488 AD by Rao Bika the son of Rao Jodha of Jodhpur. The area was earlier known as “Jangladesh”. After conquering the land the barren area became a thriving princely state¹. Bikaner unlike other fort cities of Rajasthan has sandy terrain and flat land. It has extreme temperature in summer and winter, frequent sand storms, resulting in sparse vegetation and difficult living condition². This has shaped the architectural style of the city.

This study suggests that Bikaner's architectural identity is more than simply the beauty of its individual monuments; it is also about a profound feeling of harmony and balance—a sandstone symphony. This symphony is the result of deliberately mixing opposites. It is seen in the combination of strong Rajput military features and the refined beauty of Mughal design, in the contrast between the grand size of royal forts and the fine, human-scale details of merchant havelis, and in the clever architectural methods that address the harsh desert climate to create livable, even luxurious, spaces.

The city planning demonstrates a balance by adapting form and function with respect to climate. The diverse culture has curated a unique vernacular style that blends spirituality and everyday exists together in a smoothly integrated urban setting.

The aim of this research is to deconstruct the symphony by identifying and analyzing the fundamental characters and the notions that govern them. The approach in urban planning and architectural units such as Junagarh fort, havelies, temples and Lalgah palace will be examined. In an era increasingly concerned with sustainable and culturally sensitive architecture, the lessons embedded in Bikaner's stones are more relevant than ever. This study draws from architectural documentation, historical texts, and visual analysis to argue that Bikaner's true genius lies in its holistic and balanced approach to the built environment.

2. RESEARCH METHODOLOGY

The research aim to study the architectural language of the city through primary and secondary data. The multi-faceted approach has been adapted in a planned manner. The objective is to collect accurate detailed data. A quality driven methodology was employed. The qualitative data are the core of research and quantitative elements such as physical or geographical dimensions, climate support the collected data. This method is appropriate for the thorough analysis. The monuments such as Junagarh fort, Lalgah Palace, havelies and temples were selected for the case study.

The research was conducted in both theoretical and empirical phases:

2.1. Theoretical phase: will include collection of primary and secondary data source. The extensive document analysis and archival study was conducted in historical context.

Literature review of secondary sources such as relevant book, journals and articles on Rajasthan, Mughals, Rajputana, Bikaner was analyzed. The historical data from primary sources such as museum, Bikaner archive, library in Junagarh fort and city magazine was evaluated and analyzed. Old maps and photographs from digital archive were collected as well.

2.2. Empirical phase: In this phase the data was collected firsthand through on-site visit, observation, documentation. The method includes following components to complete research:

Identifying sites: The sites were allocated and studied on the basis of importance in architectural identity of Bikaner.

Fieldwork: The selected site was studied through visit. The monuments location, layout, form, architectural features such as courtyards, jaalis, jharokha, detailed facades, art and materials all were documented. Its relation with surrounding, climate provides an opportunity to gain an insight into the knowledge of its creators. The spatial experience enhances the research such as discovering the passive cooling features, lighting through jaalis, behavior of material and arrangement of spaces according to function and privacy. The details were captured through photography of structure, facades, ornamentation, decorative elements, arts and others.

2.3. Analysis and documentation:

The secondary data helps in identifying the components, structure and methods. While the on-site collection of primary data through photography, sketches and interview of locals provides a firsthand experience in analyzing the style and patterns. The influence of Mughal, Rajput and British in architecture of Bikaner was investigated with the reason for design and technical choices. The social, cultural, climatic relation were analyzed in relation to historic and present context.

3. HISTORICAL AND GEOGRAPHICAL CONTEXT

The architectural harmony of Bikaner is closely tied to its history and geographic location. The area of

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Bikaner city is 270 sq.km. and the district covers 30247.90 sq.km.. It is situated at latitude north 27°15'–28°22' and longitude east 72°06'–73°46', at a height of 238 m (MSL) (District Statistical Outline, Bikaner 2004). The region slopes toward the west and southwest. The geographical setting of the Thar Desert created challenges of scarcity and adaptation³. The extreme climatic condition, abundance of sunlight, sparse vegetation creates a need to develop climate responsive architecture to make it practical and livable. The Dulmera sandstone (red) an excellent thermal insulator became the prime choice in discovering the solution⁴. This grounded the city's architecture in its landscape and ensured visual harmony with the surroundings. This historical account begins by Rao Bika Ji who established a small fort known as Rati Ghati. However, the sixth king, Raja Rai Singh (1571-1611), who lived alongside Mughal Emperor Akbar, was the catalyst for the true development of architecture. The elegant Mughal architectural style, which was prevalent in Agra and Fatehpur Sikri, was also introduced by Rai Singh, a well-known general in Akbar's court. In addition to making him extremely wealthy, his sub continental campaigns brought him talented craftsmen from places like Gujarat and Bengal⁵. This exposure did a fantastic job of combining the opulent and garden-focused Mughal design with the robust Rajput style. A unique Bikaneri style was produced by combining the grace of the Mughals with the strength of the Rajputs. The rulers who after him carried on this custom, and each one contributed their own tale to the city's architectural chronicles⁶. The political and economic stability of the state, particularly under Maharaja Ganga Singh in the late 19th and early 20th centuries, sparked another wave of building. The European influences of this era combined Rajput, Mughal, and colonial styles to create a harmonious Indo-Saracenic lexicon, as seen at Lalgarh Palace⁷. Furthermore, Bikaner became prosperous because of its location on the old caravan trade routes, which gave rise to the affluent merchant caste known as the Marwaris. Their patronage resulted in the construction of elaborately carved havelis and temples, further enriching the civic harmony of the royal core.

Table 1: Historical Periods and Architectural Evolution in Bikaner

Period	Rulers	Key Architectural developments	Primary Influences
1488-1571	Rao Bika Ji & early rulers	Foundation of city; early fortifications	Indigenous Rajput style
1571-1750	Raja Rai Singh & successors	Construction and expansion of Junagarh Fort; major temples	Rajput-Mughal Synthesis
1750-1887	Monarchs & Merchant Class	Proliferation of ornate havelis; temple construction	Rajput, Gujarati, Mughal
1887-1943	Maharaja Ganga Singh	Construction of Lalgarh Palace; modern infrastructure	Indo-Saracenic, European

3.1. Junagarh Fort: The Unassailable Symphony in Stone

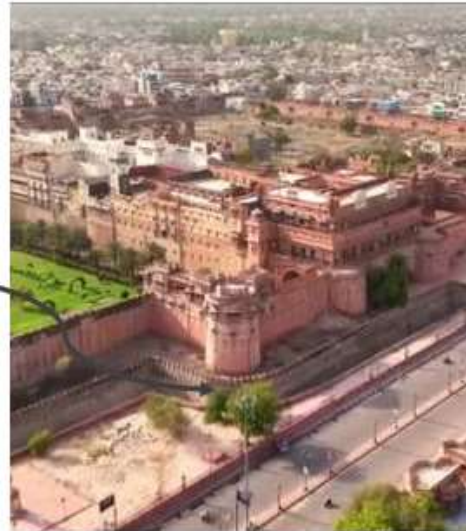
Junagarh Fort, Bikaner's architectural heart, is an excellent example of city design philosophy. Originally known as 'Chintamani Durg'. Junagarh, is a fort that stands on flat ground, as opposed to the hill forts of Chittorgarh and Jodhpur; this suggests that its power was achieved by inventive building construction⁵. Its beauty stems from the confluence of two seemingly contradictory goals: robust defense and high-end aestheticism. The fort was constructed during the reign of Raja Rai Singh (1571-1611 AD) under the supervision of his prime minister Karan Chand. It was built 1.5 kilometers from the city center. The related wall and moat construction commenced in 1589 and completed in 1594. The palaces, rooms, temples were added in the complex subsequently by others ruler. Though the work continued till 20th century, but extensive renovation work was conducted specifically by Maharaja Dungar Singh (reigned from 1872-1887). From its completion 20 kings resided in fort till 1902 then royal family shifted to Lalgarh palace.



The Junagarh fort built along a rectangular layout covering an area of 5.28 hectare. The defensive wall have a perimeter of 986 mts. in length.

The aerial view of fort.

Source: Google Earth



The privacy of fort increases from east to west. As from the main entrance in east the space is planned considering the increasing degree of intimacy towards the opposite direction. Like the audience hall, Ganga niwas vaulted and without internal columns is located on extreme east and after passing through a series of courtyards one reaches to more intimate spaces, the Anup mahal, Phool mahal and other private apartments.



Source: wikipedia



Source: Author (Courtyard surrounded with arched partial open, closed spaces) deeply carved with intricate jaalis

3.1.1 Fort architecture: the balance of defense and beauty

Bikaner has some strong forts and walled structure that developed over the year. The outside walls of the fort are a stunning work of fortification. They rise to 12 meters high and have 37 strategically located bastions, each with an overlapping shooting field. The approach for the main gate is a clever combination of military strategy and psychology. There is a row of zigzag gates known as Karan Pol, Suraj Pol, and Daulat Pol that are designed to slow down an approaching army, allowing it to fire on them from a variety of angles. Artistic elements have always accompanied military accuracy. The Suraj Pol, or Sun Gate on the east, faces the first ray of sunlight at morning, and its front is colored with a

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magnificent brightness and strengthened by a sequence of four gates⁸. The final gate is the Daulat Pol, which has handprints and sati marks from royal widows who turned to Jauhar, creating a sorrowful yet beautiful vision of sacrifice that combines history and art. The high walls are stunning, but alive with stone texture and a rhythmic pattern of bastions that contrasts with the arid sky⁶. To strengthen the defense of fort moat is positioned along the wall approximately nine meters wide and six to eight meters deep.

3.1.2. Unity/Coherence of Architectural Styles

Within the fort, there are palaces, courtyards, and pavilions that showcase Bikaner's unique stylistic mash-up. Karan Mahal is the public audience hall built with architectural influences of Mughal. Anoop Mahal is a palace of administration with a variety of styles like inlay work in gold with gems. The multi-story edifice is created in a strong Rajput style, yet the interior is adorned with Mughal art. The walls are ornamented with rich crimson and gold lacquer work, and the heavy jali (lattice) screens soften the harsh desert light into attractive patterns, creating a pleasant, inviting atmosphere. Badal Mahal also called as the "Palace of Clouds" contributes to the poetic harmony. The walls frescoed with clouds and rain is an attractive response to the dry and arid conditions of outside. This depicts an ideal equilibrium between the reality of limited water and the perception of abundance, as well as how design responds to psychological requirements. Phool Mahal or the "Palace of Flowers" is the oldest space of complex, lavishly decorated with floral designs in stucco works, inlays, and mirror mosaics. Not mere ornamentation these mirror serves a purpose; oil lights are reflected in it and used to illuminate the inside; later, electric power arrived, uniting the mirrors' beauty and utility⁴. As a result, the fort complex is more than just a collection of structures; it is a carefully orchestrated event that strikes a balance between the overwhelming and the beautiful styles of Rajput and Mughal.



Anoop Mahal courtyard with carved lattice jallis and overhanging enclosed balconies or iharokha. Stucco work with flower motifs and glass inlay work in Phool Mahal. Source: Author



The Badal mahal an extension of Anup mahal is a combination of various styles with stones and blue-white cloud painted room to provide a soothing affect in arid climate.

Radha Krishna fresco painting inside niche. Source: Author & Flickr.com



4. RELIGIOUS ARCHITECTURE: A TAPESTRY OF SPIRITUAL

EQUILIBRIUM

Bikaner's religious architecture adds a crucial aspect to the city's story, demonstrating harmony in diversity. Hindu temples can accept any other faith, although they are all created in a similar traditional North Indian Nagara style, with each religion portrayed through distinct scales, materials, and decorations that represent devotion.

4.1. Bhandasar Jain Temple: The Harmony of Exquisite Detail

Constructed by a prosperous Jain trader 'Bhandasa Oswal' in the 15th century, Bhandasar Temple is a three-story marvel of elaborate craftsmanship in Maru-Gurjara (Solanki style) architecture. It is also renowned in its magnificent frescoes and gilded leaves on ceilings and pillars depicting the Jain legends and heavenly beings. It is the harmony of proportions and opulent pictures. There is decoration in every inch, but it is not turbulent but exquisitely engulfed. They say that 40,000 kg of ghee was placed in the mortar rather than water, as the patron was devoted to this and it symbolized material novelty both to strength and to symbolism⁹. The spire of the temple is high in contrast with the flat terrain of the city and it balances the city skyline.



The temple ceiling and walls frescoes showing religious stories of Jain tirthankars and cosmology scenes in Rajasthani style.

The ceiling and pillars have mirrors inlaid which reflects lamplight and creates a sparkling effect.

Source: Author & Wikipedia



4.2. Karni Mata Temple, Deshnok:

Karni Mata Temple is located 30 km south of Bikaner and is an intriguing example of a difficult harmony. The temple is devoted to the mystic Karni Mata, an incarnation of Durga, and it houses almost 20,000 black rats (kabbas), her fallen descendants¹. The very temple is a beautiful white marble building, with solid silver gates which were a gift of Maharaja Ganga Singh. Nonetheless, its construction suits its special inhabitants. The fine wire mesh is used to enclose the whole complex to keep the rats away of birds and low runners are used to allow the rats to move easily. It brings about an interesting contrast of the holy (the marble, the silver, the god) and the apparently profane (the rats). The rats and the devotees occupy the same space and this promotes this special bond. The architecture promotes and reflects a particular belief system as the view of pilgrims who take care about moving through the rats, offering them milk and sweets, demonstrates a certain degree of functional and spiritual harmony¹⁰.

5. CIVIC AND ROYAL ARCHITECTURE: HAVELIS AND LALGARH PALACE

5.1. Merchant Havelis: The Harmony of Civic Prosperity

Beautiful havelis, or ancient townhouses, flank the busy streets of Bikaner's old city. Bikaner's havelis are 100 to 400 years old. But their glory and dignity is still intact. The magnificent cornice on the outer Dulmera stone facade of the havelis adds to their beauty⁴. Bikaner was also called as "City of 1000 havelies" built by wealthy merchants during 16th to 19th centuries. Though the count has reduced in recent years due to modern requirement and high cost of maintenance. The havelies are a balance between internal extravagance and public modesty. Although enormous, the exterior is more or less

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understated, with elegantly sculpted, solid fronts for seclusion. The Havelies made of red Dulmera stones in Bikaner follows an intricate architectural style and displays excellent craftsmanship. The Jharokhas(projected windows), the carved doors, the Jaali(lattices), the specially made ghumariyas (cellars), the diwans sitting on one side of the palaces from yesterday's creation, the golden art that is Flowers, leaves etc. everything together creates such a beautiful environment due to which Bikaner has a different identity in the world¹¹.



Rampuriya Haveli: The projections, deep cornices, vibrant color of windows with Dulmera stone add as decorative and climate responsive elements in Havelis.

Source: Author



The interior around the main courtyard (aangan), which serves as the focal point of the house, displays the architectural splendor. This is the masterpiece of ornamentation: rich brackets, fine filigrees, flower-wreaths, gods, trains, European elements in frescos and Victorian friezes inspired by the contemporary colonial style.



Intricate ceiling with Usta (gold leaf) and fresco work of a haveli
Image credit: Suman Bajpai

Interior of a room of Rampuria haveli
Source: Bhanwar Niwas official website



This mixture suggests the exposure of the merchants to worldly influences but it is strongly embedded in a setting that is Indian. The havelis balances between tradition and modernity, locality and the worldwide tendencies, personal life and business activities and forms a harmonious urban environment which depicts a civilized society¹².



Source: Author (The facades represents aesthetics and a wise selection of material as per climate)

5.2. Lalgarh Palace: The Final Movement of Synthesis

Designed by one of the British engineers named Sir Samuel Swinton Jacob and commissioned by

Maharaja Ganga Singh, Lalarh Palace (1902-1926) is one of the last architectural movements in Bikaner. It is an exquisite amalgam of the so-called "Indo-Saracenic style, which incorporated the elements of indian and Islamic to the European planning. The music in the palace is obtained through the effective way in which the various elements have been incorporated. It is constructed using the identical red sandstone used to build Junagarh Fort thus aesthetically linked to the past. Its outside has typical Rajput features such as jharokhas (balconies jutting out), chhatris (crowned with domes) and elaborate jali designs. Nonetheless, it has lavish interiors, ball rooms, sweeping stairways, and billiard rooms in a typically European design. The adoption of a British style of life is symbolized by the fireplaces which are only required in short periods of time given the climate of the area. The brilliance of Lalarh Palace is that this mixture does not seem to be artificial and unnatural⁸. The components are in coordination to form a harmonious comprehensive unity. It is indicative of confidence and progressive harmony in which there is a combination of rich heritage and a modern identity in a kingdom. A portion of the palace is currently operating as a heritage hotel where a new equilibrium of preservation, as well as practical implementation, is realized, as its narrative is being told to a new generation.



Source: Author



Source: flickr.com

6. URBAN PLANNING AND ENVIRONMENTAL HARMONY: THE CITY AS A BALANCED ORGANISM

The harmony in Bikaner goes beyond separate structures to the layout and infrastructure of the city itself. Its urban planning illustrates a thoughtful blend of human needs and environmental constraints. The ancient wall of the city was initially enclosed with a fortified wall that went around the part in length of 7 kilometers and the part was cross-figured with five gates that clearly divided the urban and the desert areas. The interior design of those walls is organic; narrow, winding streets. Such a design was not an accident but a calculated plan of dealing with the climate. The small streets provide deep shadows and create an impression of canyons, which cools the temperature considerably and protect

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the residents against the dust full of desert winds.



Another very impressive system of management in Bikaner is its water system. Water is life in a desert, and the city architecture is the reflection of this fact¹³. Bikaner was at the forefront in construction of bavadis (stepwells) and tankas (underground water tanks). Such constructions as the elaborately decorated Devikund Sagar stepwell were social centers and cool areas, along with balancing functionality, social mission and aestheticism. Another example is at the outskirts shown by the Gajner Palace and Lake. It started as a hunting lodge and was designed to focus on the artificial lake that drew various animals and created a micro climate¹⁴. This was a project that combined royal recreations, environmental intervention and architectural beauty and transformed a section of the desert into an oasis. This comprehensive vision of planning, in terms of which defense, climate control, water conservation, social structure, and beauty are regarded as inseparable components of a single system, is the highest embodiment of architectural harmony of Bikaner¹⁵. A city itself is a harmonious mechanism, which is adapted to the surrounding environment perfectly.

7. CONCLUSION: THE ENDURING LEGACY OF A DESERT SYMPHONY

Bikaner is a mighty example of how people can manage to establish harmony and beauty in an extreme environment. It is built like a symphony, with every little element, all the big fort gate and the little jali screen, all the large palace and the little stepwell, all the huge mass of architecture, playing and denying its part in the great symphony. This discovery demonstrates that this harmony is obtained by means of frequent and capable harmonizing of opposites. Architecturally the Mughal, Gujarati and European influences further refined but did not overpower the indigenous Rajput styles, which formed the strong identity of Bikaneri. The defensive buildings are well-designed works of art; climate-sensitive elements, beautiful gardens, handy fountains are used as places of culture and aesthetics.

Scale and Detail: Scale of monuments balances against workmanship, and small scale of havelis against workmanship, gets its glory by ornamentation.

Environment and Habitability: The city does not struggle with the desert, but learns in the desert and employs local materials and adapts it to bearable climatic conditions to design a sustainable habitat.

The symphony of Bikaner is not a relic but a living tradition. The havelis are a beautiful example of art in themselves. Be it the red stone windows on the outer face or the inner walls, unique examples of art can be seen in all of them. The art of havelis is a living art, an art connected to everyday life. Ongoing efforts to maintain havelis, adapt palaces for new purposes, and honor temples ensure that this legacy endures. For today's architects, planners, and conservationists, Bikaner offers valuable lessons in

thoughtful design, cultural respect, and sustainable practices. It shows that true architectural greatness lies not in imposing structures on a landscape but in finding harmony among land, culture, climate, and human desires—creating a timeless symphony in stone that resonates through history.

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