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SHADI LAL BUILDING, LAHORE: A HISTORICAL AND ARCHITECTURAL ANALYSIS FOR CONSERVATION

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Article Info

Abstract
Shadi Lal, a monumental masterpiece of Mughal architecture, urgently demands comprehensive restoration and preservation efforts. This research seeks to address documentation and preservation issues related to the Shada Lal building. This project analyzed the processes that lead to the degradation of the building, including human vandalism and environmental effects, to formulate solutions to mitigate future damage and restore its historical importance. The study sought to identify historical damage and provide remedies to restore the bungalow to its original state, adhering to recognized conservation principles. A thorough analysis of the bungalow reveals that extensive structural repairs are imperative, transcending beyond mere cosmetic restoration. To ensure the bungalow's enduring legacy, formulating a comprehensive conservation strategy is critical, actively engaging the local community and fostering a sense of responsibility and stewardship. Further, detailed architectural documentation is vital to facilitate ongoing research and conservation initiatives, ensuring that every aspect of the property's historical and architectural significance is meticulously captured and preserved for future generations.

Keywords:
Shadi Lal Building; Mughal Architecture; Architectural Significance; Restoration; Documentation

Introduction

Culture is a key factor in the educational, artistic, and social transformation of societies. Architectural conservation is essential for preserving the heritage by upholding the material and design integrity of historical structures while enabling them to function in modern society [1].

The Shadi Lal Building in Lahore, Pakistan, exhibits a distinctive fusion of Mughal, Sikh, and Colonial architectural styles. Built in the early 20th century as the residence of Justice Sir Shadi Lal, is situated on Lytton Road, near Jain Mandir, Lahore, in 1941 Fateh Chand Trust purchased this property and launched the Fateh Chand College for Women. After partition (1947), the Evacuee Trust Property Board sold the property to the Education Department. Part of the building has been encroached; the main building has been in the (TEVTA) possession. The structure contains substantial historical and cultural significance, although it currently suffers substantial decay owing to environmental and human-induced factors [2].

Justice Shadi Lal was a distinguished Indian lawyer and the pioneer Indian Chief Justice of the Lahore High Court, serving tenure from 1920 to 1934. His services to the Indian court system were extensively acknowledged, and his house was erected as a symbol of status and legal authority [3]. The architectural elements of the buildings, including domes, arched verandas, elaborate frescoes, and courtyards, demonstrate a synthesis of Indo-Islamic and British colonial influences. Over the years, neglect, encroachments, and improper restoration methods have resulted in its steady deterioration [4].

Heritage protection is a global obligation, necessitating cooperation at both national and international levels to preserve significant historical sites [5]. Numerous historical structures in Pakistan are endangered due to inadequate study, inadequate preservation strategies, and limited funding [6]. The Shadi Lal Building, an architectural jewel in Lahore, serves as a connection to the past, linking present and future generations to the city's rich heritage. Its preservation is crucial for sustaining the historical and cultural identity of the region [7].

This study aims to identify the primary factors leading to the degradation of the Shadi Lal Building and suggests sustainable conservation methods. This study seeks to restore the building's original glory and ensure its longevity by blending traditional and contemporary conservation methods. Furthermore, it highlights the importance of architectural documentation, community engagement, and government intervention in preserving heritage structures [8].

Architectural conservation adheres to standards that prioritize minimal intervention, integrity, and the efficacy of restoration materials. The Venice Charter (1964) provided a framework for heritage conservation, promoting scientific ways to preserve the integrity of historical sites [1]. Elert et al. [9], assert that conservation initiatives must honor original materials while mitigating structural failures. Research has underscored the significance of digital documenting methods, such as photogrammetry and 3D scanning, in architectural preservation [10].

South Asian colonial-style architecture is distinguished by its integration of European classical components with indigenous artistic styles [11]. The Mughal style of architecture, characterized by domes, minarets, and elaborate frescoes, has significantly impacted buildings in Lahore, such as the Shadi Lal Building. Research indicates that the integration of Sikh and Colonial Architectural features, including arched verandas and ornamental motifs, illustrates the cultural integration during British governance [2]. The Indo-Saracenic style, which blends Gothic, Renaissance, and Indian features, significantly influenced the architecture of the colonial era [12]. Moreover, research on urban infrastructure underscores the deficiencies in preservation initiatives in swiftly growing metropolitan regions, accentuating the necessity for cohesive conservation policies [6].

The structural stability of historic structures is greatly impacted by environmental elements like humidity, air pollution, and temperature variations. Mughal and colonial buildings frequently employed lime mortar, which weakens masonry when it deteriorates from industrial pollution and

moisture intrusion [9]. The deterioration of brick facades and ornamental components has been compounded by Lahore's rising pollution levels [13]. Research shows that biological elements, such as vegetation encroachment and microbiological growth, worsen material deterioration [14]. Additionally, heritage sites like the Shalimar Gardens also shed light on how cultural identity and aesthetic legacy function in conservation initiatives [7].
Often, improper restoration techniques have caused damage to the structure instead of preservation. Research indicates that the use of modern cement-based mortars on historic structures has intensified structural vulnerabilities [15]. To maintain authenticity, effective conservation methods encourage using traditional materials like teakwood, sandstone, and lime plaster [16]. The research underscores the necessity of structural strengthening methods, including grouting and consolidation, to stabilize the fragile parts [17]. Planning conservation initiatives has also benefited from the use of digital heritage tools, such as BIM (Building Information Modeling) [18]. The significance of architectural documentation in directing successful conservation efforts is highlighted by research on Jani Khan's Tomb [8].

Efficient heritage conservation necessitates a multidisciplinary strategy that includes local communities, legislators, and conservation specialists. To ensure sustainable preservation, successful programs include a strong emphasis on community involvement, awareness campaigns, and legislative frameworks [3]. A long-term dedication to historical assets is promoted and a sense of care is fostered through public participation [19]. Stronger legal protections and budget allocations are also required because conservation initiatives in South Asia frequently encounter difficulties with funds, bureaucratic inefficiency, and urbanization pressures [5]. The preservation of the Shadi Lal Building necessitates a scientifically informed methodology that combines historical conservation guidelines, material science, and community engagement. By following established procedures and utilizing technical innovations, the preservation of this architectural wonder may be guaranteed for future generations.
The study includes detailed documentation of the architectural techniques employed in the building. An essential element is engaging the public to raise awareness and foster the ability to convey the building's significance to future generations. With a historical focus, the research seeks to enhance historical orientation and encourage participation in long-term conservation efforts. The ongoing research project will add to the body of knowledge concerning Mughal, Sikh, and colonial architecture and act as a guide when interpreting restored monuments.

RESEARCH SIGNIFICANCE

The deteriorated state of Shadi Lal emphasizes broader issues regarding the neglect of significant heritage structures. Although it possesses historical and architectural importance, no substantial restoration efforts have been launched to conserve this landmark due to insufficient preservation policies. Numerous sections of the building have been swiftly declining, with evident damage due to a lack of conservation. Furthermore, in the past, there have been no noteworthy restoration projects or efforts made to preserve this historical edifice. Consequently, the following research project has been undertaken to address the identified shortcomings.

METHODOLOGY

The literature review involved collecting primary data from public papers and databases, scrutinizing documents and cultural events in Lahore City, and examining the cultural and historical context, and references collected from the books and research papers. Case studies and interviews with residents and intellectuals were conducted to determine the heritage site's identity and significance. Architectural documentation included evaluating style, decoration, structure, materials, techniques, and original craftsmanship. Photographic documentation and conservation measures were also included.

DATA COLLECTION & ANALYSIS

The Shadi Lal Building, located on Lytton Road in Lahore, is of great importance due to its strategic positioning amidst a vibrant educational hub, cultural landmarks, healthcare facilities, and commercial areas. This structure was built in 1909 as the residence of Sir Shadi Lal, who was the first Indian Chief Justice of the Lahore High Court during that era. Currently, the site is used as a Government College of Technology for Women. This institute was initially established as the Government Polytechnic Institute for Women in Lahore in 1964, located on the premises of APWA College. It was relocated to its present location in 1970 upon acquiring this building**.**

Following its construction, the Shadi Lal house suffered significant damage due to harsh weather conditions and unskilled restoration efforts. It has undergone preservation and, as of 2025, is once again being conserved, albeit with some challenges, due to the application of modern materials and techniques on some sections of the building, aimed at extending its lifespan with newly applied materials. The building's evaluation involves an architectural review and a thorough analysis of material deterioration through historical and archaeological perspectives.

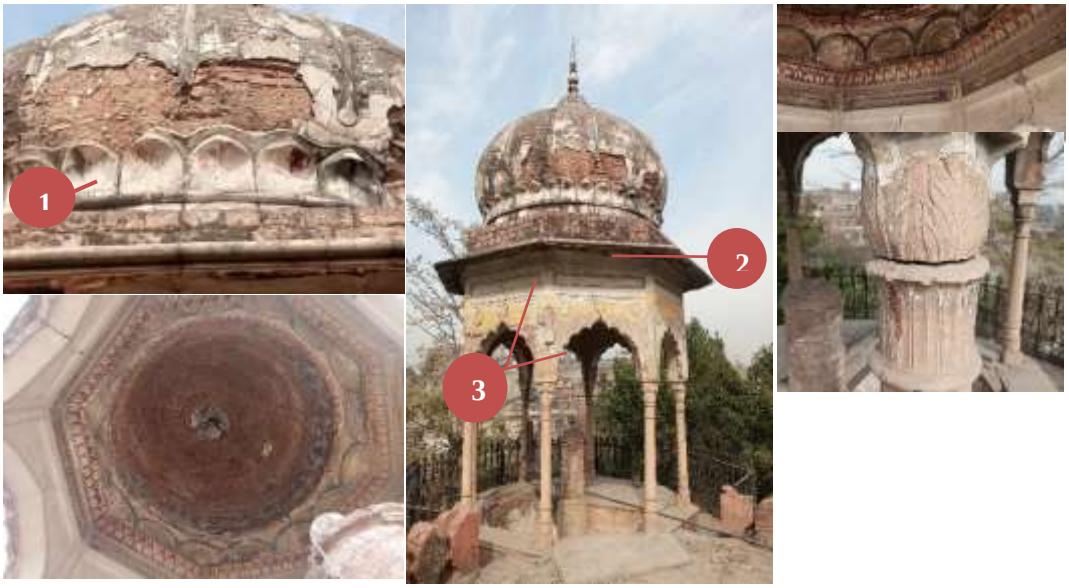
Figure 1. Location of Site Plan

The bungalow is a rectangular structure of 114 feet by 177 feet, without including porch entrances. The plan is rectangular and its layout follows a balanced and symmetrical design, which is common in colonial-era bungalows. There is a central courtyard with a water fountain, which serves as a focal point. The bottom side of the plan shows the main entrance, leading into a spacious veranda before accessing the main house. The veranda is supported by columns, which enhance the architectural elegance. Surrounding the courtyard, there are multiple rooms, most likely used as bedrooms, guest rooms, and lounges. Each room is connected via wide corridors, ensuring easy movement. On the top right, there is a service area with separate access, which could include the kitchen, storage, and servant quarters. The design includes wide passageways, ensuring proper ventilation and lighting throughout the building. The side wings of the bungalow have smaller rooms, which could be used for offices, study areas, or storage. Colonial-style arches and thick walls, ensure durability and aesthetic appeal. Courtyard-centric design, allowing natural light and ventilation in every part of the house. The first floor has a more open layout, keeping the courtyard as the central element. Fewer rooms compared to the ground floor, indicating that the

first floor was possibly used for private quarters or guest accommodations. The plan includes balconies and terraces overlooking the central courtyard. This allows for natural ventilation and shaded relaxation areas. There are **two staircases,** located on either side, providing easy access between floors. The central void keeps the house well-lit and ventilated. The large front veranda is mirrored on this floor, maintaining the building's symmetrical aesthetic. The bungalow has geometrical pattern ceilings, barrel vaulted, girders ceilings, and wooden strip ceilings.

Construction materials are local red brick, commonly used in colonial-era buildings in Lahore, known for its durability and aesthetic appeal, and lime mortar used as a binding material for bricks. It was a traditional construction material before the advent of cement, Sandstone, and Marble, used for decorative elements, pillars, and flooring. Sandstone was often sourced locally, while marble might have been brought from other regions. Whereas, wood is used in the construction of doors, windows, and roofing frameworks. Hardwood varieties like teak were often used for their strength and resistance to pests. Iron is used for structural reinforcements, railings, and decorative elements. Cast iron was commonly used during this period.

However, steel might have been used in later renovations or structural supports. Moreover, terracotta tiles are used for roofing and sometimes for flooring. These tiles were popular for their durability and insulation properties, for windows, allowing natural light while maintaining the aesthetic of the building. Stucco is used for ornamental details on facades and interiors. Carved Wood and Stone are used for intricate designs and architectural embellishments. Whereas, lime plaster is used for finishing walls and ceilings which provides a smooth surface for painting and



decoration. However, Different damages have been documented as mentioned below in detail;

Table 1. Left Minaret Decay Causes

Sr. #	Problems	Decay Causes	Remedial Measures
1	Lime plaster is chipped off and the core structure is exposed.	Weathering effects especially rain, temperature variations,	The damaged bricks should be re-plastered with lime mortar.

Figure 2. Left Minaret

2	Cracks	and no maintenance.	The deteriorated portion of the plaster should be removed and fresh plaster be applied by using the same old technique and material.
3	Missing elements	Maintenance/earthquake.	Replacement with the same elements.

Figure 3. Right Minaret

Table 1. Right Minaret Decay Causes

Sr. #	Problems	Causes of Decay	Remedial Measures
1	Lime plaster is chipped off and the core structure is exposed.	Weathering effects especially rain, temperature variations, and no maintenance.	The bricks that are damaged should be coated again with lime mortar.
2	Lime plaster is chipped off and core structure is exposed and the molding work is also damaged.		

Figure 4. Right Elevation

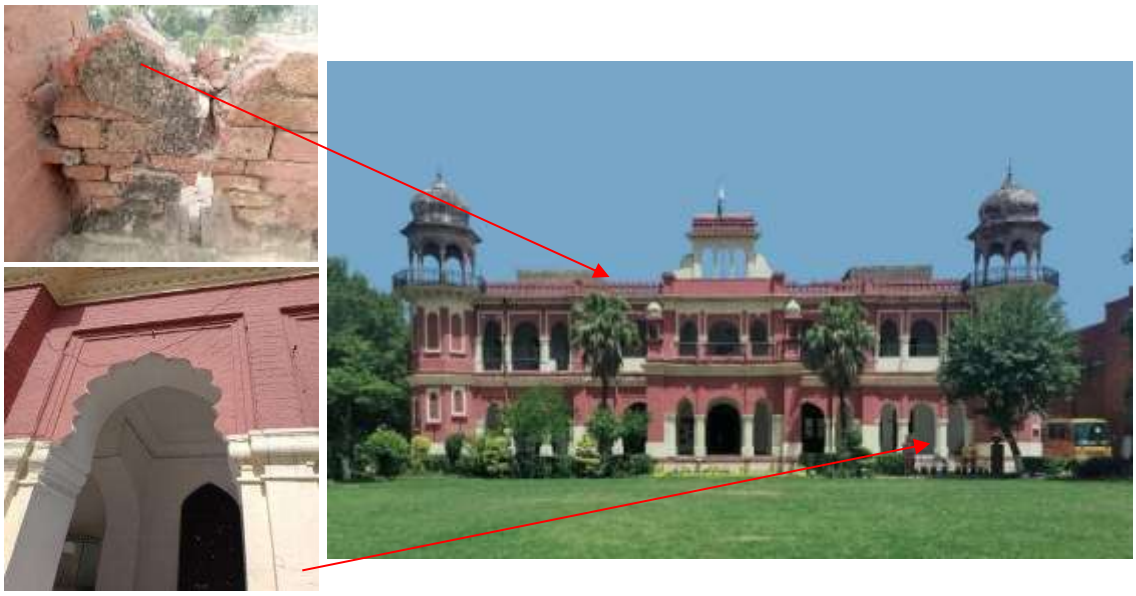
Figure 5. Left Elevation

Sr. #	Problems	Causes of Decay	Remedial Measures
1	Lime plaster is chipped off and the core structure is exposed.	Weathering effects especially rain, Temperature variations, and no maintenance.	The damaged bricks should be re-plastered with lime mortar.
2	Cracks	Weathering effects especially rain, Temperature variations, and no maintenance/ earthquake.	The Deteriorated portion of the plaster should be removed and fresh plaster be applied by using the same old technique and material.
3	Missing elements	No maintenance and earthquake destruction.	Replacement with the same Element
4	Damaged mortar and breakage/ missing structural portions.	Weathering effects, age and human vandalism by visitors and locals of the area. The seepage of the rain water causing moisture in masonry, corrosion and deterioration on the external surface of the monument thus producing cracks	The Deteriorated portion of the plaster should be

		and breakage.	detached and fresh plaster be applied by using the same old methods and material.
5	Damaged motif and breakage/ missing structural portions.	The seepage of the rain water causing moisture in masonry, corrosion and deterioration on the external surface of the monument thus producing cracks and breakage.	
6	Damaged mortar and breakage/ missing structural portions.	Weathering effects, age and human vandalism by visitors and locals of the area. The seepage of the rain water causing moisture in masonry, corrosion and deterioration on the external surface of the monument thus producing cracks and breakage.	

Table 3. Facade Elements Decaying Causes

Figures 4 and 5 of the building's exterior demonstrate an amalgamation of colonial and traditional architectural styles, characterized by arched entrances, intricate details, and a prominent dome. The upper-level balcony and windows exhibit extensive damage, evidenced by missing frames, collapsed sections, and clear signs of deterioration. The presence of scaffolding and debris indicates that conservation or restoration efforts are either underway or halted. The brickwork is severely deteriorated, with visibly crumbling bricks losing their original structural integrity. Plaster and decorative elements are either entirely eroded or partially visible beneath layers of dirt and overgrown vegetation. Wooden components, such as doors and window frames, appear to be either absent or profoundly decayed due to prolonged exposure to the elements. The foundation and lower walls demonstrate structural deficiencies, as evidenced by substantial cracks, missing



segments, and accumulated debris at the base.

Figure 6. Front Façade of Shadi Lal Building

In Figure 6 the building's facade consists of brick masonry, now visible due to the wear of plaster and paint layers. Intricate arches and ornamental cornices emphasize the colonial-era architectural style. The even alignment of windows and doors indicates a formal, balanced layout typical of historic administrative and institutional structures.

Figure 7, represents the first-floor windows, arched with detailed plaster moldings, these are now

heavily damaged, lacking glass panels, and having broken wooden frames. Some still have their wooden shutters, but most are either boarded or completely removed, leaving the interior exposed. The lack of protective features like grilles or iron bars indicates the building was not designed for high-security purposes.

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Figure 7. First-Floor Window

Figure 8. Entrance and Doorway

The centrally located main entrance features a decorative pediment, now partially ruined as shown in Figure 8. The entrances have carved wooden doors, though most are missing, broken, or decaying due to exposure. Some doorways have scaffolding, signaling ongoing restoration work. On the first floor, a projecting balcony with an ornate cast-iron railing is among the building's most prominent features. The balcony is structurally compromised, with sections of railing missing and cracked supporting brackets. The outer plaster on the balcony walls is peeling, exposing the brickwork beneath. The parapet wall and cornices are partly damaged or missing, indicating structural instability. A domed structure on the side, possibly a chhatri (small dome pavilion), implies Mughal or Indo-Saracenic architectural influences. The roofline seems to have suffered moisture damage, leading to vegetation growth and material weakening. The exposed bricks have become fragile and powdery due to long-term weather exposure. Significant portions of plasterwork have detached, especially around window frames and cornices. Plants growing through cracks point to moisture retention, which accelerates decay. Visible scaffolding and rubble piles indicate restoration work is underway.

The balcony, cornices, and parapet need urgent support and repairs to prevent collapse. Reinstallation of historically accurate wooden windows and doors can conserve authenticity. Carefully restoring decorative plaster elements can restore the building's original appeal. Moisture management through proper drainage systems is crucial to prevent further degradation.

Figure 9. Exterior Façade Windows

In Figure 9 the windows of the Shadi Lal Building embody a unique fusion of Mughal, Colonial, and Indo-Saracenic architectural styles, highlighting exquisite craftsmanship in wood, glass, metal, and stone. Although they hold historical importance, these features have undergone significant deterioration due to moisture, termite infestation, corrosion, and weather exposure. To preserve these windows, a scientific yet thoughtful conservation method is necessary, integrating traditional restoration practices with modern materials to ensure longevity while preserving authenticity. Through the use of thorough documentation, treatments specific to each material, and strategies for adaptive reuse, the architectural integrity of these windows can be protected, enabling them to continue representing the building's historical and cultural heritage.

Figure 10. Ventilation/Building Openings

In Figure 10 the brackets and cornices are adorned with elaborate floral and geometric carvings, serving both structural and decorative functions, although many are deteriorating due to material

degradation. The pilasters and capitals, adorned with intricate relief carvings, confer grandeur to the facade but exhibit signs of chipping and surface erosion over time. The chhatris (domed kiosks), supported by slender columns, remain as vestiges of royal architectural expression, symbolizing prestige and authority, albeit now visibly marred by broken edges. Furthermore, the dentil molding and corbelled eaves augment the building's silhouette, exemplifying precise craftsmanship that necessitates urgent conservation efforts. The deterioration of these elements highlights the pressing need for restoration and structural fortification to conserve the historical integrity of the Shadi Lal building.

Figure 11. Elements of Exterior Facade

In Figure 11 the architectural composition of the Shadi Lal Building exemplifies an amalgamation of Mughal, Colonial, and Indo-Saracenic styles, highlighting intricate craftsmanship and substantial historical significance. The parapet walls incorporate merlons battlement-like elements traditionally employed for defensive and aesthetic purposes, albeit presently exhibiting significant damage and erosion. The brackets and cornices, adorned with floral and geometric carvings, function as both structural supports and ornamental enhancements, yet prolonged neglect has resulted in apparent material degradation and deterioration. The pilasters and capitals, intricately carved with foliate and scroll motifs, underscore the skilled craftsmanship of the period, though chipping and erosion pose a threat to their preservation. The chhatris—domed kiosks—that epitomize royal magnificence and architectural distinction rest upon slender columns yet display cracks, loss of stucco, and material degradation.

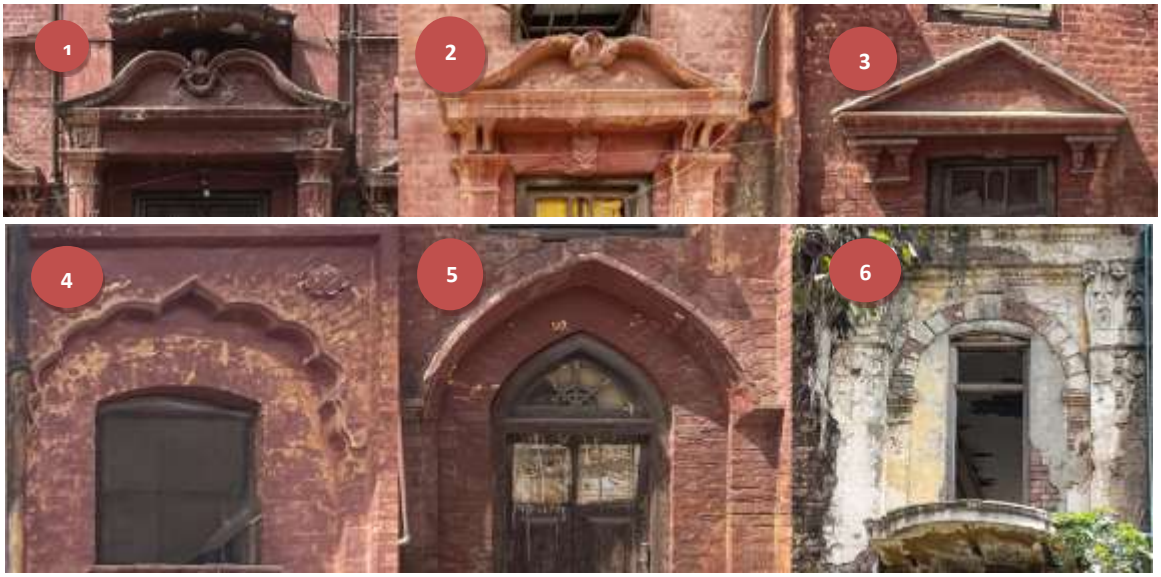

Figure 12. Pediments

In Figure 12 broken curved pediments (1 & 2) are shown, these architectural elements, influenced by Baroque and Rococo styles, are distinguished by their curved structures with central floral or scroll motifs. They are prevalent in European and colonial edifices, symbolizing magnificence and classical sophistication. The triangular pediment with brackets (part 3) represents the feature of Greek revival architecture, this triangular pediment is supported by decorative brackets, underscoring European influences within British-era colonial architecture. Scalloped Arch with Floral Details (part 4); this is a Mughal-style cusped arch, frequently observed in Islamic architecture, emphasizes elegance and ornamentation. The small floral motifs adorning the arch illustrate Mughal and Rajput artistic influences. Pointed Gothic Arch (part 5), representative of Gothic Revival architecture, this sharply pointed arch contributes to an impression of verticality and magnificence. The traceried window situated above the door consolidates the neo-Gothic features. Ornate balcony with Corinthian pilasters (part 6) shows the balcony, featuring sculpted corbels and Corinthian pilasters, indicating European influence, ostensibly inspired by Neoclassical and Victorian architecture. The elaborate relief work and arched window denote a synthesis of Indo-Saracenic aesthetics.

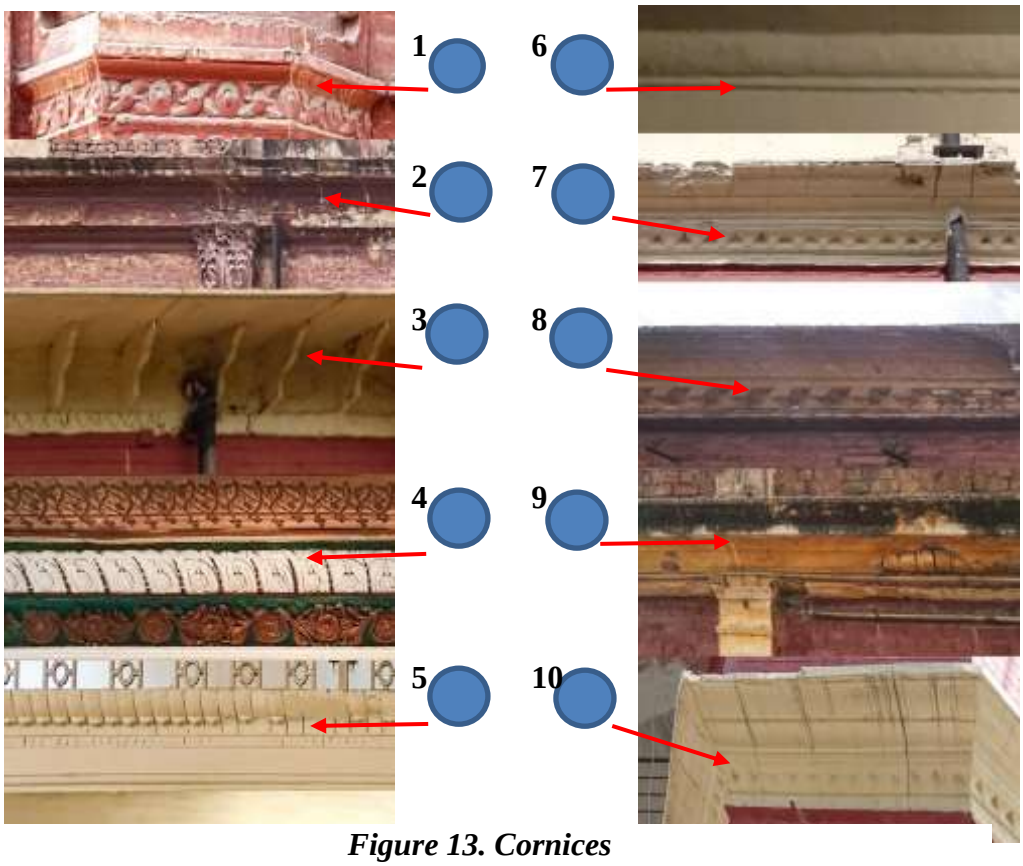

Figure 13. Cornices

In Figure 13, the bracketed cornice (parts 1 & 3) is characterized by the use of wooden or stone brackets to support an extended projection. It is a prevalent feature in Mughal and Colonial-era architecture, serving both structural and aesthetic purposes. Dentil cornice (parts 2 & 6) is distinguished by a series of repetitive block-like patterns known as dentils along the molding, this cornice is a defining aspect of Neoclassical and Victorian architectural styles, frequently observed in British colonial edifices. The floral and geometric frieze cornice (part 4), incorporates intricate floral and geometric relief carvings along the frieze, demonstrating Indo-Saracenic influences through a fusion of Mughal, Hindu, and European decorative elements. Egg-and-Dart Cornice (part 5) is characterized by decorative moldings featuring alternating oval (egg) and pointed (dart) motifs, this cornice has origins in classical Greek and Roman architecture, indicating European influences from the colonial period. Molded overhanging cornice with layered detailing (parts 7 & 10), its design comprises multiple stepped moldings that are frequently associated with Mughal and Rajput architectural styles. The protruding structure augments visual prominence and affords protection against weather. The cornice (part 8) is constructed with wood or brick with diagonal patterns, it seems to be layered or corbeled, typical of Mughal and Indo-Saracenic style architecture. The presence of zigzag or diagonal motifs reflects a decorative frieze, frequently utilized for visual embellishment in historic structures. It possibly once featured wooden or terracotta inserts, which have deteriorated with time. Yellow-tinted with tiered moldings (part 9), this cornice, projecting outward, draws inspiration from European colonial architecture, and it might be fashioned from plastered brick or stone. The horizontal layers and moldings demonstrate British colonial or neoclassical style, often applied for weather resistance and to visually separate building floors. The yellow tint indicates possible water exposure or age-related discoloration, a common occurrence in buildings over a century old.

Figure 14. Courtyard & Fountain

In Figure 14 the central octagonal fountain hints at Mughal or colonial styles, utilized for their visual appeal and cooling effects. The fountain is surrounded by an iron fence, suggesting its preservation or modification over time. The edifice features arched entries upheld by classical columns and may reflect Indo-Saracenic or British colonial influences. Its facade displays signs of aging, like peeling plaster and visible bricks. The upper floor boasts a decorative parapet with geometric cut-outs, similar to lattice or jali designs employed for ventilation and aesthetics. Round ornamental indents on the walls may have been used as decorative alcoves or for ventilation purposes. The rich greenery, including pruned bushes and trees, indicates attempts to preserve the area. The trees' proximity to the fountain implies the courtyard's design was intended to provide shade and cooling, a typical trait in historical homes and establishments.

RESULTS AND DISCUSSION

The Shadi Lal Building currently displays significant structural degradation, mostly resulting from prolonged exposure to weather elements and insufficient maintenance. Architectural documentation indicates the presence of cracks in the domes and minarets, damaged foundations, and degraded decorative features. The loss of original lime mortar and its substitution with incompatible cement-based materials has intensified structural instability [9].

Figures illustrating the building's façade reveal substantial deterioration of plaster and decorative elements, especially surrounding the minarets and facade. The dome, walls, and foundations show evidence of cracking, erosion, and instability, threatening collapse. Previous "restoration" efforts have frequently used improper materials and processes, such as modern cement plasters, which have exacerbated the damage to the original structure. The tomb has been mostly neglected, with no regular maintenance or conservation efforts. This has resulted in increased vegetation, debris accumulation, and hastened structural degradation. To address these concerns, the conservation strategy proposes the following major measures: The bungalow structure, including the dome, walls, and lintel, was thoroughly repaired and fortified using traditional materials and methods to restore structural integrity. Instead, modern materials and R.C.C. lentils, as well as brickwork, were used to maintain the bungalow by demolishing the old first-floor walls, with some parts restored using ancestral mortar made of lime, sand, and

clay aggregates. The removal of undesirable modern extensions and the restoration of the bungalow's original architectural elements, such as not restoring and dismantling the remaining balconies with modern brickwork and bonding materials. According to historical documents and on-site studies, the glazed black and white marble tile work may not need to be uprooted to keep its existing shape. The balcony, cornices, and parapet require immediate support and repairs to avoid collapse. Reinstalling historically appropriate wooden windows and doors might help to preserve their authenticity. Carefully repairing ornamental plaster pieces helps restore the building's original charm. Moisture control via suitable drainage systems is critical to prevent further damage. Implementing a regular maintenance regimen, which includes periodic inspections, cleaning, and small repairs, to avoid further degradation and ensure the Shadi Lal's long-term preservation. Extensive architectural documentation is required to support continuing study and conservation initiatives.

A review of the building plans reveals the existence of elegant acanthus embellishments, which are now significantly deteriorated due to air pollution and moisture penetration [4]. The preservation of these decorative components requires the use of conventional lime plaster methods, as supported by global conservation standards [1].

The exposure of construction materials to Lahore's elevated humidity and industrial contaminants has resulted in the degradation of red brick masonry and timber constructions. Photographic evidence reveals the discoloration of stone pieces, biological growth on outer walls, and corrosion of iron reinforcements within structural components [14]. Prior research highlights that microbial colonization hastens the deterioration of porous stone and brick, requiring biocidal interventions and regulated environmental conditions for sustained preservation [7].

To mitigate structural faults, conservation specialists advocate for the strengthening of walls and domes by the integration of traditional brick masonry with modern stabilizing techniques [16]. Architectural documentation indicates the restoration of missing frescoes and decorative elements through laser scanning and digital restoration [18]. Moreover, historical sources emphasize the significance of community participation in heritage conservation, as local engagement cultivates a sense of accountability and enduring governance [6, 19]. For this reason, after analyzing the conservation challenges, the architectural documentation was completed while preserving its original character. The restoration of the Shadi Lal Building necessitates a balance between maintaining historical authenticity and incorporating ecological preservation methods.

DOCUMENTATION

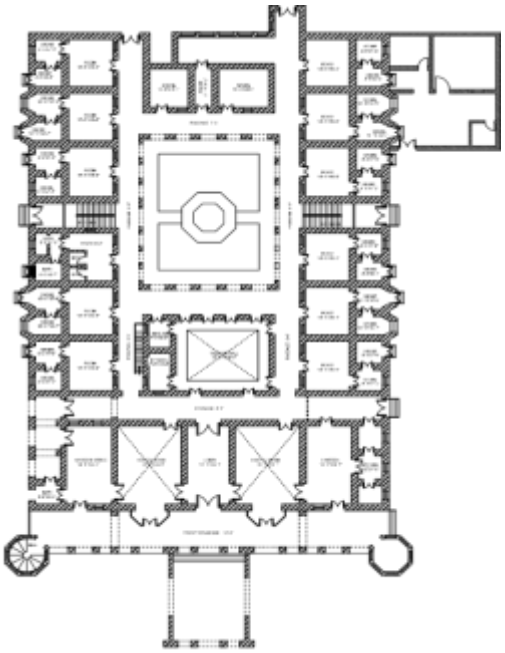

Figure 16. Ground Floor Plan

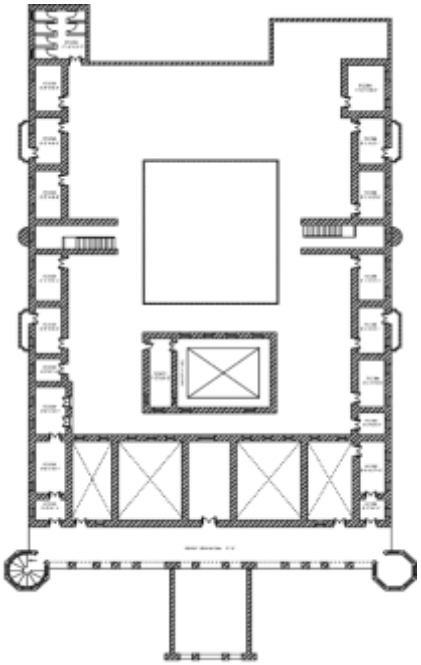

Figure 15. First Floor Plan

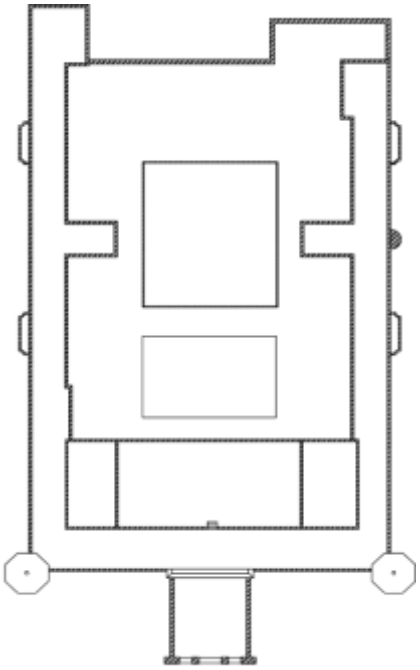

Figure 17. Roof Floor Plan

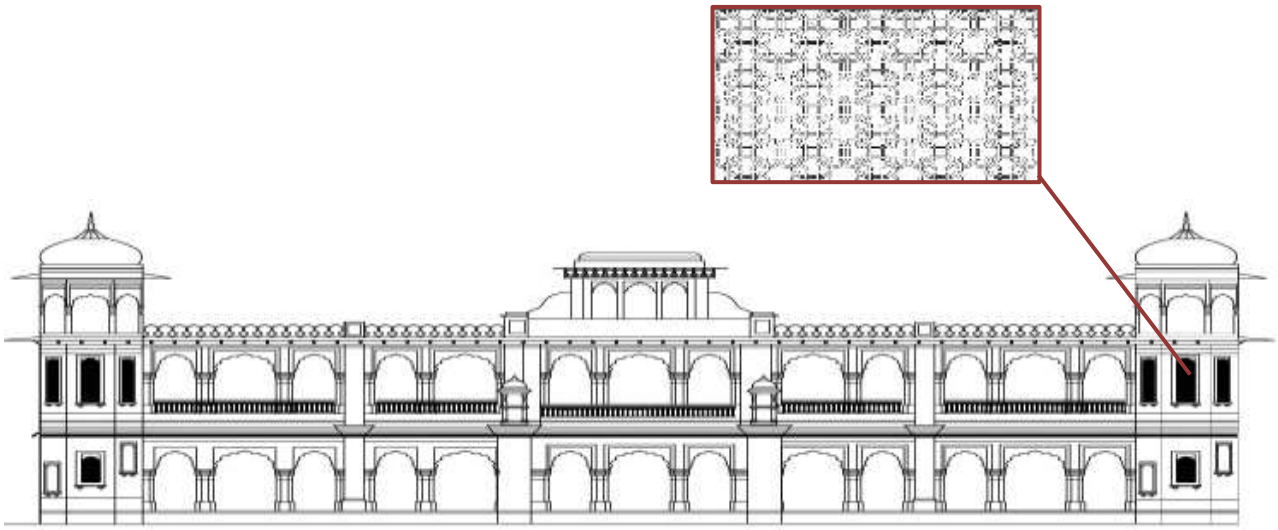

Figure 18. Front Facade

Figure 19. Side Facade of Shadi Lal Building

CONCLUSIONS

Architecture is a dynamic entity that is continually influenced by its environment and the relentless march of time. Like a living creature, architecture is highly sensitive to external influences and resolutely maintains its essential traits while carefully adjusting to changes. Shadi Lal has resolutely endured for nearly a century, but ill-considered renovations have severely undermined its architectural beauty and historical authenticity.

The huge Mughal architectural wonder Shadi Lal urgently needs extensive preservation and restoration work. In addition to the government, experts like architects, historians, and conservationists have to actively participate in preservation and restoration efforts to protect cultural assets. The bungalow's current condition eloquently illustrates the disastrous effects of ongoing façade modifications and inappropriate use, which have severely weakened its structural stability.

A thorough investigation revealed that the bungalow needs major structural repairs that go beyond simple cosmetic restoration. The transition from irregular repair cycles to a sustainable framework of regular maintenance is necessary to protect the structure from environmental deterioration, neglect, and possible vandalism. True conservation is always necessary, even for newly constructed structures. Preservation of Shadi Lal must be given top priority because further deterioration can only be stopped by careful, continuous maintenance, and the development of a comprehensive conservation plan. This research endorses the plan, highlighting the significance of community engagement to promote stewardship and accountability, thereby preserving the bungalow's lasting heritage.

FUTURE DIRECTIONS AND LIMITATIONS

The conservation of the Shadi Lal Building requires a multifaceted approach that integrates traditional restoration techniques with modern innovations while addressing various challenges. Material-specific conservation methods will involve the use of traditional materials like lime plaster, sandstone, and teakwood alongside modern conservation-grade materials such as breathable sealants and anti-corrosion coatings.

Structural reinforcement will focus on strengthening fragile components with minimal aesthetic alteration and repurposing the building for cultural or institutional use, such as a heritage museum or educational center, to ensure its long-term sustainability. Community engagement and policy development will be crucial in ensuring authenticity by involving local artisans, historians, and conservation experts, alongside advocacy for heritage conservation policies and funding support. However, several limitations pose challenges to these efforts. Material degradation may necessitate significant replacements, requiring a balance between restoration and historical authenticity. The decline in traditional craftsmanship further complicates restoration. Regulatory and legal challenges, including bureaucratic hurdles and conflicting interests between conservation and urban development, could further slowdown restoration efforts. By addressing these future directions while acknowledging the associated limitations, the architectural and historical legacy of the Shadi Lal Building can be preserved for future generations.

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