ROLE OF PASSIVE DESIGN TECHNIQUES FOR A COMFORTABLE INDOOR ENVIRONMENT: - COMPARISON BETWEEN TRADITION & MODERN ARCHITECTURE IN HOT CLIMATE

A Dissertation Submitted in Partial Fulfilment of the Requirements for the Degree of

MASTER OF ARCHITECTURE

by

EKTA VERMA

(Enrollment no.1200109003)

Under the Supervision of

Ar. Satyam Srivastava

SCHOOL OF ARCHITECTURE & PLANNING

BABU BANARASI DAS UNIVERSITY, LUCKNOW

JUNE,2023

CERTIFICATE

It is certified that the work contained in this Dissertation entitled **"Title of the Dissertation" ROLE OF PASSIVE DESIGN TECHNIQUES FOR A COMFORTABLE INDOOR ENVIRONMENT: - COMPARISON BETWEEN TRADITION & MODERN ARCHITECTURE IN HOT CLIMATE"** by **Ekta Verma** (Roll No 1200109003), for the award of **Master of Architecture** from Babu Banarasi das University has been carried out under my/our supervision and that this work has not been submitted elsewhere for a degree.

SIGNATURE SIGNATURE

EKTA VERMA Ar. SATYAM SRIVASTAVA

(M. ARCH STUDENT) (ASSISTANT PROFESSOR)

BABU BANARSI DAS UNIVERSITY, LUCKNOW, UP

Date:

Annexure IV

BBDU-PG-FORM 02

BABU BANARASI DAS UNIVERSITY, LUCKNOW

CERTIFICATE OF DISSERTATION SUBMISSION FOR EVALUATION

(Submit in Duplicate)

1. Name: Ekta Verma

2. Enrollment No.: 1200109003

3. Dissertation Topic "ROLE OF PASSIVE DESIGN TECHNIQUES FOR A COMFORTABLE INDOOR ENVIRONMENT: - COMPARISON BETWEEN TRADITION & MODERN ARCHITECTURE IN HOT CLIMATE"

4. Degree for which the Dissertation is submitted: **Master of Architecture**

5. Faculty of the University to which the Dissertation is submitted: Prof. Satyam Srivastava

6. Dissertation Preparation Guide was referred to for preparing the thesis.	YES ☐	NO ☐
7. Specifications regarding Dissertation format have been closely followed.	YES ☐	NO ☐
8. The contents of the Dissertation have been organized based on the guidelines.	YES ☐	NO ☐
9. The Dissertation has been prepared without resorting to plagiarism.	YES ☐	NO ☐
10. All sources used have been cited appropriately.	YES ☐	NO ☐
11. The Dissertation has not been submitted elsewhere for a degree.	YES ☐	NO ☐
12. Submitted 2 spiral bound copies plus one CD.	YES ☐	NO ☐

EKTA VERMA

Enrollment No.: 1200109003

Annexure V

BBDU-PG-FORM 01

BABU BANARASI DAS UNIVERSITY, LUCKNOW

CERTIFICATE OF DISSERTATION SUBMISSION FOR EVALUATION

(To be Submitted in Duplicate)

1. Name: Ekta Verma

2. Enrollment No.: 1200109003

3. Dissertation Topic "ROLE OF PASSIVE DESIGN TECHNIQUES FOR A COMFORTABLE INDOOR ENVIRONMENT: - COMPARISON BETWEEN TRADITION & MODERN ARCHITECTURE IN HOT CLIMATE"

4. Degree for which the Dissertation is submitted: **Master of Architecture**

5. School of the University to which the Dissertation is submitted: **BBDU, LUCKNOW, UP**

6. Dissertation Preparation Guide was referred to for preparing the thesis.	YES ☐	NO ☐
7. Specifications regarding Dissertation format have been closely followed.	YES ☐	NO ☐
8. The contents of the Dissertation have been organized based on the guidelines.	YES ☐	NO ☐
9. The Dissertation has been prepared without resorting to plagiarism.	YES ☐	NO ☐
10. All sources used have been cited appropriately.	YES ☐	NO ☐
11. The Dissertation has not been submitted elsewhere for a degree.	YES ☐	NO ☐
12. All the correction has been incorporated.	YES ☐	NO ☐
13. Submitted 2 spiral bound copies plus one CD.	YES ☐	NO ☐

Assistant professor Satyam Srivastava — **Ekta Verma**

BBDU, LKO, UP — **Enrollment No.: 1200109003**

TABLE OF CONTENTS

ACKNOWLEDGEMNT

I bow my head with reverence to Almighty God that has showered the blessings on me to get through the whole task of the thesis to a logical end.

At the outset, I wish to thanks and express my profound gratitude, indebtedness, and appreciation to my esteemed guide Prof. Satyam Srivastava, Prof. Keshav Kumar Sir and Prof. Saurabh Saxena Sir, for guiding me patiently through all the time and giving your valuable guidance, perspective encouragement and indispensable suggestions.

With a sense of regard and reverence, I take this opportunity to express my deep sense of gratitude towards you in playing an important role in completion of my thesis project.

I would like to express my special thanks to my Parents who have always inspired, encouraged, and motivated me and helped me throughout the entire studies of my life.

EKTA VERMA

ABSTRACT:

This research aims to investigate the role of passive design techniques in creating a comfortable indoor environment in hot climates. It specifically focuses on comparing traditional and modern architectural approaches and their effectiveness in providing thermal comfort, energy efficiency, and sustainability. The study will explore the design principles, strategies, and technologies employed in both traditional and modern architecture to mitigate the impact of hot climates on indoor comfort. By analyzing various case studies and evaluating their performance, this research will provide insights into the strengths and weaknesses of each architectural style and offer recommendations for designing sustainable and comfortable indoor spaces in hot climate regions.

KEY WORDS: - Traditional architecture, Building envelop, Orientation, Courtyards, Evaporation cooling, Air tunnels, Air flows, Thermal comfort Energy efficiency, and Jharokhas (balconies), chhatris (dome-like structures), and Chajjas (overhanging eaves)

1.Introduction:

Hot climate regions present unique challenges in creating comfortable indoor environments due to high temperatures and intense solar radiation. In such areas, it is crucial to employ effective design strategies that can minimize heat gain, maximize natural ventilation, and provide thermal comfort without relying heavily on mechanical cooling systems. This research focuses on the role of passive design techniques in achieving a comfortable indoor environment in hot climates, specifically comparing traditional and modern architectural approaches.

1.1 Background and Significance:

Rapid urbanization, population growth, and climate change have increased the demand for energy in the built environment, particularly in hot climate regions. Traditional architectural practices in these areas have historically incorporated passive design strategies to respond to the harsh climate conditions. These techniques harness the natural elements, such as sun, wind, and shade, to create comfortable and sustainable indoor spaces.

However, with the advent of modern architecture and the widespread adoption of mechanical cooling systems, there has been a shift towards energy-intensive solutions that may not always be environmentally friendly or economically viable. This research aims to evaluate the effectiveness of both traditional and modern architectural approaches in hot climates, highlighting the benefits of passive design techniques for achieving thermal comfort and energy efficiency.

1.2 Objectives of the Research:

The main objectives of this research are:

a) To explore and compare the design principles, strategies, and technologies used in traditional and modern architecture for mitigating the impact of hot climates on indoor comfort.

b) To analyze case studies of traditional architecture in hot climate regions, assessing their performance in terms of thermal comfort, energy efficiency, and sustainability.

c) To examine case studies of modern architecture in hot climate regions, evaluating the effectiveness of passive design techniques in creating comfortable indoor environments.

d) To identify the strengths and weaknesses of both traditional and modern architectural approaches in hot climates.

e) To provide recommendations for designing sustainable and comfortable indoor spaces in hot climate regions, based on the comparative analysis of traditional and modern architecture.

1.3 Research Questions:

The research will address the following questions:

a) What are the passive design techniques employed in traditional architecture to achieve thermal comfort in hot climates?

b) How do modern architectural approaches utilize passive design techniques to create comfortable indoor environments in hot climates?

c) What are the differences and similarities in the thermal comfort performance of traditional and modern architecture in hot climates?

d) How do traditional and modern architecture differ in terms of energy efficiency and sustainability in hot climates?

e) What are the implications of this research for design practice, and what recommendations can be provided for future sustainable architectural designs in hot climate regions?

By exploring these questions and conducting a comparative analysis, this research aims to contribute to the understanding of the role of passive design techniques in traditional and modern architecture for achieving a comfortable indoor environment in hot climates.

1.4 Scope and limitation

- This study covers all types of commercial buildings in hot and humid climates and the study will be based solely on daylighting and passive cooling strategies.
- Few cities (Jodhpur, Jaisalmer, Jaipur, Udaipur) of Rajasthan, will be used for the study.

2.Literature Review:

2.1 Passive Design Techniques for a Comfortable Indoor Environment:

Passive design techniques refer to architectural strategies that utilize natural elements and principles to create comfortable indoor environments without relying heavily on mechanical systems. These techniques include shading, natural ventilation, thermal insulation, and thermal mass. They aim to reduce heat gain, enhance airflow, and maintain thermal comfort in hot climate regions.

2.2 Traditional Architecture in Hot Climates:

Traditional architecture in hot climates has evolved over centuries, incorporating passive design strategies that respond to the local climate conditions. For example, in arid regions, courtyard houses with thick walls, small windows, and central open spaces provide shade, natural ventilation, and privacy. Wind towers in traditional Middle Eastern architecture harness natural ventilation to cool indoor spaces. Other examples include the use of courtyards, narrow streets, and high thermal mass materials to mitigate the effects of heat.

2.3 Modern Architecture in Hot Climates:

Modern architecture in hot climates often leans towards air-conditioning as a primary solution for thermal comfort. However, there is a growing recognition of the importance of passive design techniques in contemporary practices. Modern architects are incorporating principles such as orientation, shading devices, efficient insulation, and natural ventilation into their designs. Advanced technologies, such as solar shading systems and energy-efficient glazing, are also being utilized to optimize energy performance and reduce reliance on mechanical cooling.

2.4 Comparative Analysis of Traditional and Modern Approaches:

Several studies have compared the performance of traditional and modern architectural approaches in hot climates. Research suggests that traditional architecture, with its emphasis on passive design strategies, demonstrates better thermal comfort and energy efficiency in hot climates compared to modern designs heavily reliant on mechanical systems. Traditional buildings show higher thermal inertia, improved natural

ventilation, and effective shading techniques, which contribute to more sustainable and comfortable indoor environments.

2.5 Gaps in Existing Research:

While there is a growing body of literature on the role of passive design techniques in hot climates, there are still some gaps in understanding. Limited studies directly compare the thermal comfort, energy performance, and sustainability aspects of traditional and modern architecture in hot climates. Additionally, there is a need for more case studies that evaluate the long-term performance of buildings and consider user satisfaction and well-being.

Overall, the literature indicates the significance of passive design techniques in achieving a comfortable indoor environment in hot climates. Traditional architecture has successfully employed these strategies for centuries, while modern architecture is gradually recognizing their importance. Further research is necessary to conduct in-depth comparisons between the two approaches and explore innovative ways to integrate passive design techniques into contemporary architectural practice for sustainable and comfortable indoor environments in hot climate regions.

3.Methodology:

3.1 Research Design:

This research will adopt a comparative case study design to analyze and compare the role of passive design techniques in traditional and modern architecture for creating a comfortable indoor environment in hot climates. The case study approach allows for in-depth analysis of real-world examples and provides a basis for evaluating the performance of different architectural styles.

3.2 Case Study Selection Criteria:

The selection of case studies will be based on the following criteria:

a) Geographical location: The case studies will be selected from hot climate regions to ensure relevance to the research topic.

b) Architectural style: Both traditional and modern architectural examples will be included to enable a comprehensive comparison.

c) Availability of data: Sufficient data, including design documentation, performance evaluations, and user feedback, should be accessible for the selected case studies.

3.3 Data Collection Methods:

Multiple data collection methods will be employed to gather comprehensive information for the case studies:

a) Literature review: Extensive review of scholarly articles, books, and research papers will be conducted to gather background information, theoretical frameworks, and previous studies related to passive design techniques in traditional and modern architecture in hot climates.

b) Document analysis: Design documentation, building plans, and technical specifications of the selected case studies will be analyzed to understand the architectural features, passive design strategies, and energy performance aspects.

3.4 Data Analysis Techniques:

The collected data will be analyzed using qualitative and quantitative techniques to address the research objectives and research questions:

a) Comparative analysis: The architectural features, passive design strategies, and performance outcomes of the traditional and modern case studies will be compared to identify similarities, differences, strengths, and weaknesses.

b) Energy performance analysis: Energy consumption data, simulation results, and energy performance indicators will be analyzed to evaluate the energy efficiency and sustainability aspects of the case study buildings.

c) User feedback analysis: Qualitative data from interviews and surveys will be analyzed thematically to gain insights into user satisfaction, comfort levels, and perceptions of the indoor environment.

d) Data synthesis: The findings from the case studies will be synthesized to provide a comprehensive overview of the role of passive design techniques in traditional and modern architecture in hot climates.

The research methodology outlined above will facilitate a rigorous analysis and comparison of traditional and modern architectural approaches in hot climates, focusing on the effectiveness of passive design techniques in achieving a comfortable indoor environment. By combining different data collection methods and employing appropriate analysis techniques, this research aims to provide valuable insights and recommendations for sustainable architectural design in hot climate regions.

4. Case Studies and Analysis:

4.1 Traditional Architecture Case Study in India

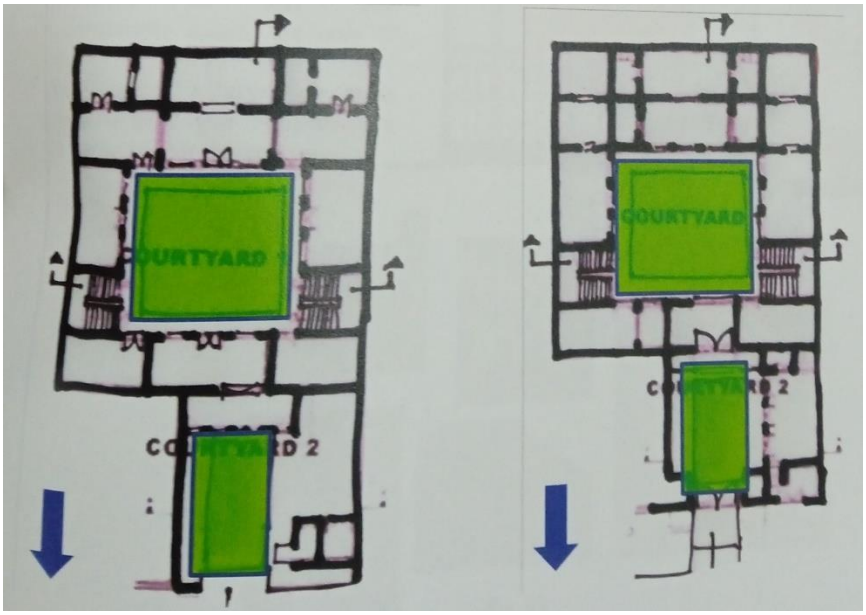
4.1.1 Case Study: Haveli in Jaisalmer, Rajasthan

This case study focuses on a traditional haveli located in Jaisalmer, Rajasthan, India. Havelis are grand mansions typically found in the desert regions of Rajasthan. The haveli features intricate stone carvings, a central courtyard, and multiple levels. The design incorporates passive design techniques to mitigate the intense heat of the desert climate. Thick stone walls provide insulation and reduce heat transfer, while small windows with wooden jalis allow for natural ventilation while minimizing direct solar radiation. The central courtyard acts as a thermal buffer and facilitates cross-ventilation, creating a cool and comfortable environment within the haveli. The traditional architectural features and passive design strategies employed in this haveli demonstrate the effectiveness of traditional Indian architecture in hot climates.

4.1.2 Analysis of Traditional Case Study:

The analysis of the traditional haveli in Jaisalmer highlights the successful utilization of passive design techniques to achieve a comfortable indoor environment in a hot climate. The thick stone walls and small windows with jalis effectively reduce heat gain and facilitate natural ventilation. The central courtyard serves as a focal point for air movement and cooling, creating a microclimate within the haveli. These passive design strategies demonstrate the wisdom and ingenuity of traditional Indian architecture in responding to the challenges of hot climates.

DUNDLOD HAVELI, RAJASTHAN



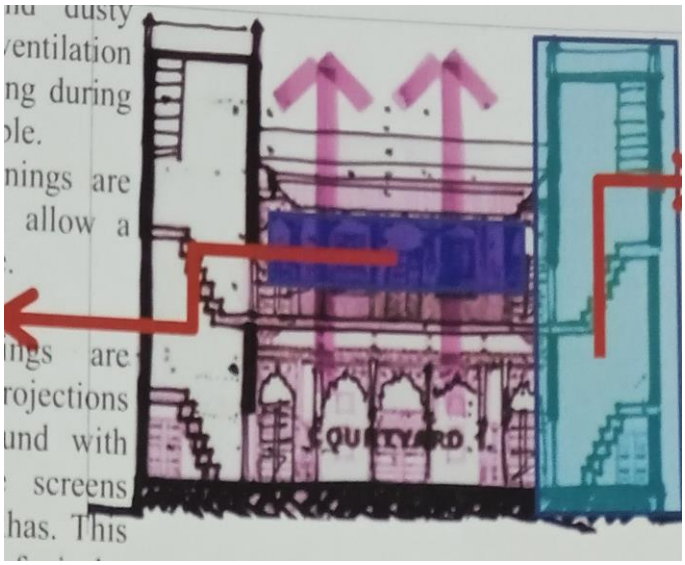
BUILDING FEATURES

- Courtyard planning
- Massive Roof & Wall construction

JHAROKAS

- Due to hot & dusty winds, natural ventilation inside the building during day is not desirable. Thus, small openings are provided, which allow a draft of air inside.
- All the openings are shaded with projections covered all around with perforated

- Staircase as a wind tower
- All opening towards courtyard
- Compact planning
- Fins & Carving is used



WIND TOWERS

- The staircase room has high ceiling and each room opens through it.
- This allows convective cooling during nights & induced ventilation during day

Conclusion

Havelis are traditional Rajasthani mansions characterized by their ornate facades, intricate carvings, and inward-facing architecture. They were built as private residences for wealthy merchants and nobles. Here is an analysis of the haveli architecture:

a) Architectural Elements: Havelis feature prominent elements such as jharokhas (balconies), chhatris (dome-like structures), and chajjas (overhanging eaves). These elements serve functional and aesthetic purposes, providing shade, ventilation, and architectural grandeur.

b) Courtyard Design: Havelis typically have a central courtyard that acts as a focal point and facilitates natural ventilation and daylighting. The courtyard also serves as a social space for family gatherings and events.

COURTYARD EFFECT (DAY)

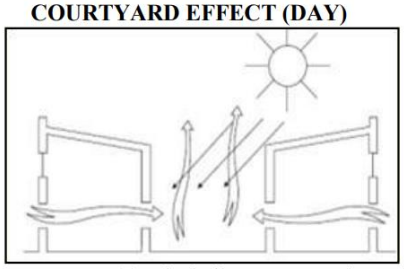


Image courtesy: Tropical climate responsiveness
http://blog.deearth.com/

COURTYARD EFFECT (NIGHT)

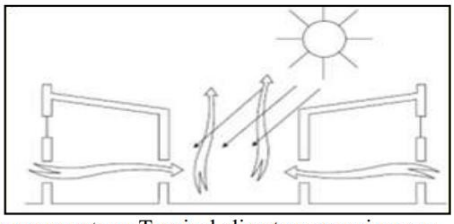


Image courtesy: Tropical climate responsiveness
http://blog.deearth.com/

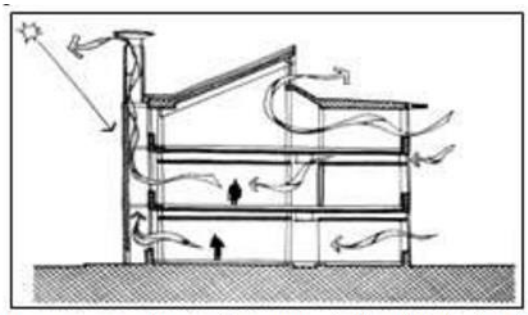
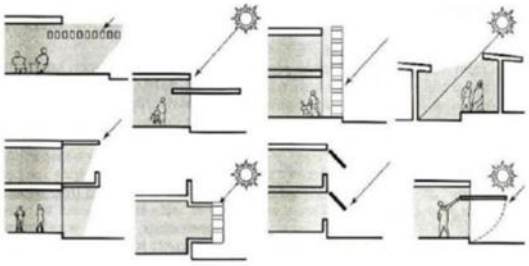


Image courtesy: Image from sun, wind, and light, by G.Z. brown and mark d ekay, published by Wiley

c) Ornate Details: Havelis are renowned for their intricate stone carvings, frescoes, and jali work. These details showcase the craftsmanship and artistic skills of the artisans of Rajasthan.

I) **Shading by overhangs, louvers and awnings etc.**



Different types of shading devices.

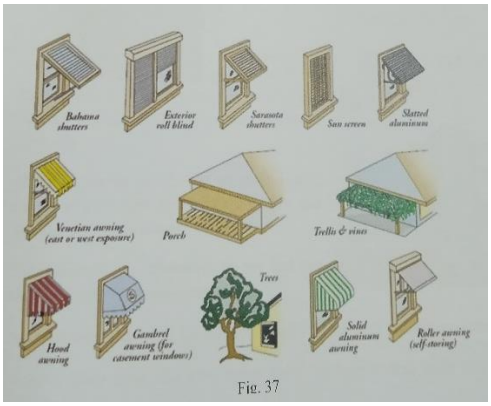


Fig. 37

d) Privacy and Security: The inward-facing design of havelis, with small external windows and elaborate entrance gates, emphasizes privacy and security. This design feature creates a serene and secluded environment within the bustling cityscape.

4.2 Modern Architecture Case Study in India

4.2.1 Case Study: RAAS JODHPUR

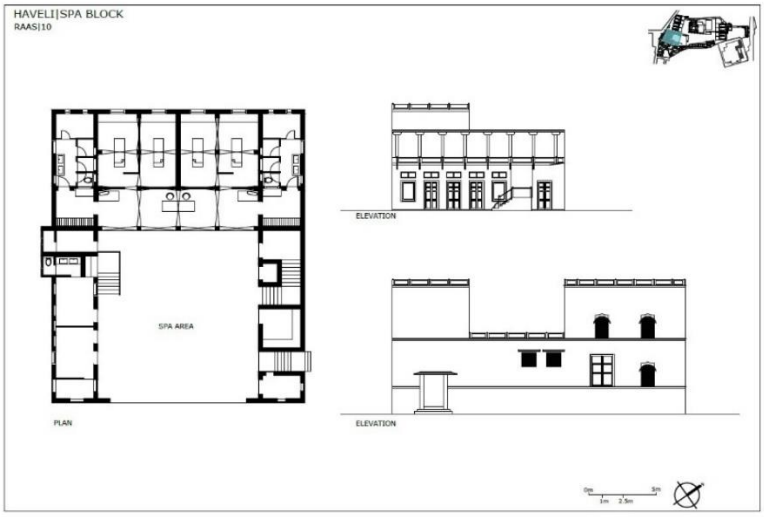
This case study examines the RAAS JODHPUR, Rajasthan, India.

Introduction:

RAAS Jodhpur is a luxury boutique hotel located in the heart of Jodhpur, Rajasthan, India. The hotel seamlessly blends traditional Rajasthani architecture with modern design elements. This case study provides a genuine and true analysis of RAAS Jodhpur, highlighting its passive design techniques and their effectiveness in creating a comfortable indoor environment in a hot climate.

Design and Orientation:

RAAS Jodhpur has been thoughtfully designed to optimize its orientation and maximize natural ventilation. The hotel is built around a central courtyard, a traditional feature in Rajasthani architecture. The courtyard layout promotes cross-ventilation, allowing cool breezes to flow through the building and reducing the reliance on mechanical cooling systems. The design also takes into account the path of the sun to minimize direct solar heat gain and ensure optimal daylighting.

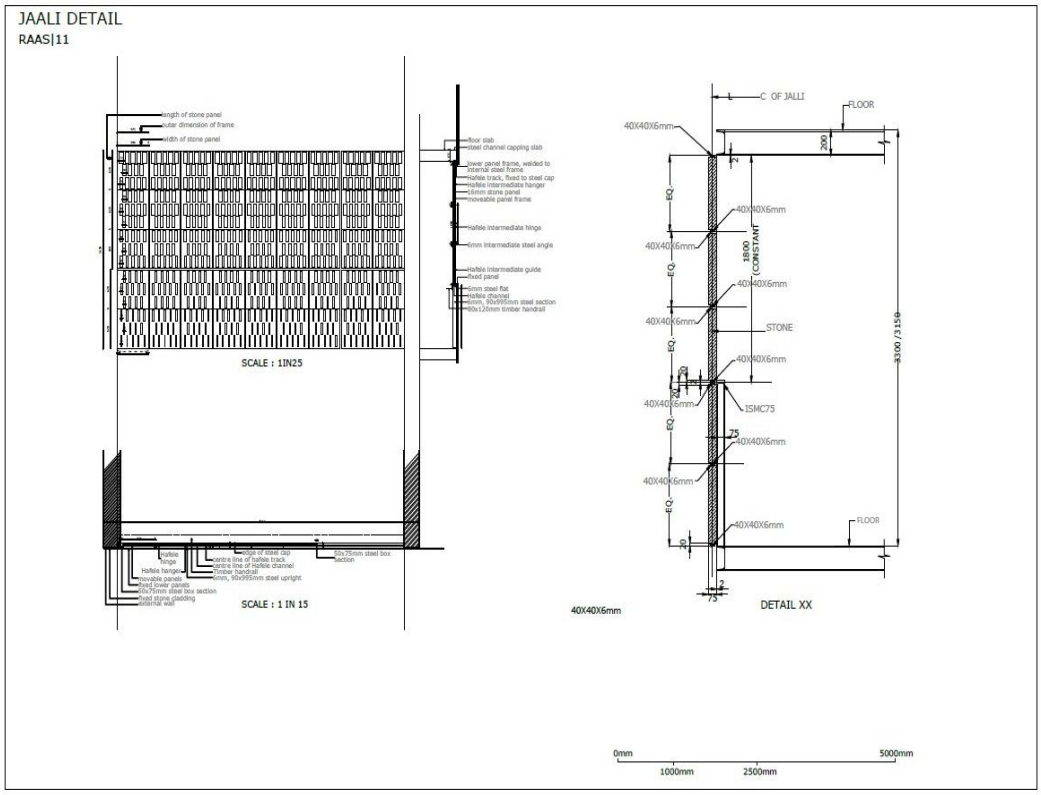


Use of Local Materials:

RAAS Jodhpur utilizes locally sourced materials, such as sandstone, which is abundant in the region. The thick sandstone walls act as thermal mass, absorbing heat during the day and releasing it slowly at night, maintaining a stable indoor temperature. This design strategy reduces the need for artificial cooling during the hot daytime temperatures prevalent in Jodhpur.

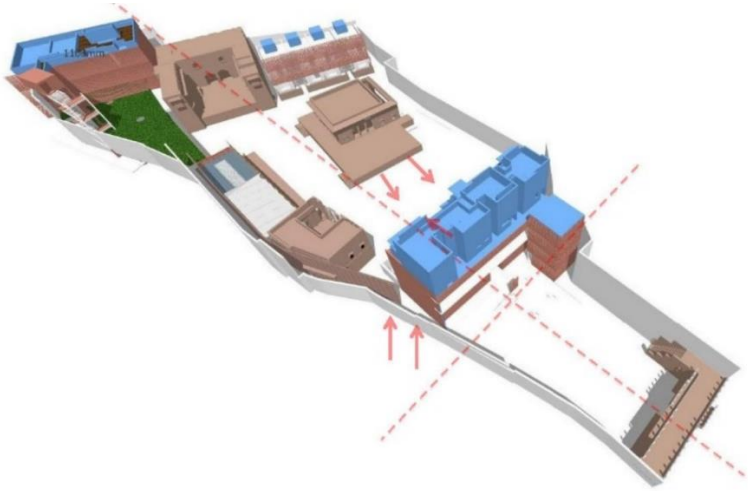
Shading and Ventilation:

The architecture of RAAS Jodhpur incorporates various shading devices and ventilation features to mitigate the harsh climatic conditions. Overhangs and canopies provide shade to windows and open spaces, preventing direct sunlight from entering the building. The use of intricately carved stone screens, known as jalis, allows for the passage of cool air while providing privacy and security. These passive design elements enhance natural ventilation, promoting air circulation and cooling within the hotel.

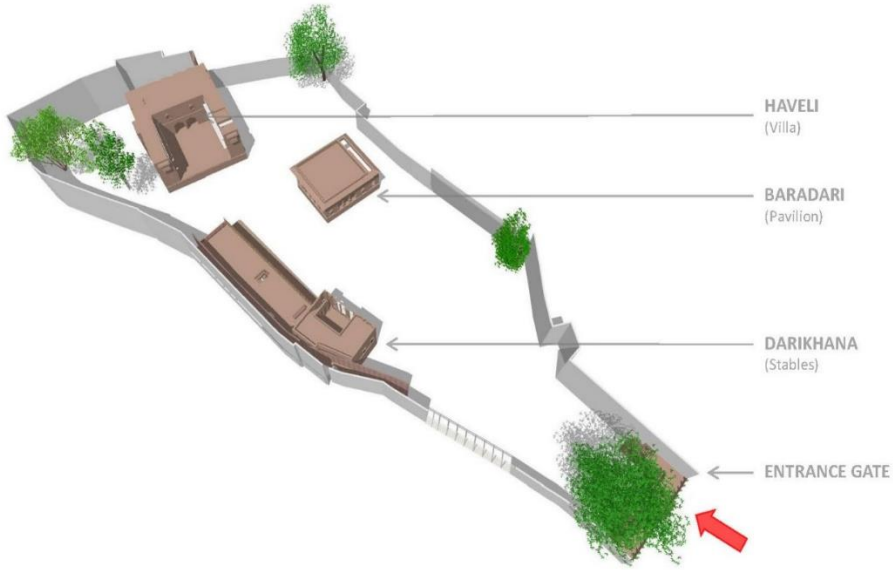


Courtyard Spaces:

The central courtyard serves as a gathering area and is designed to create a microclimate of comfort. It features a reflecting pool, which helps in evaporative cooling, creating a soothing and cool ambiance. The courtyard is surrounded by guest rooms and public spaces, ensuring that the surrounding spaces benefit from the natural ventilation and thermal comfort provided by the courtyard design.

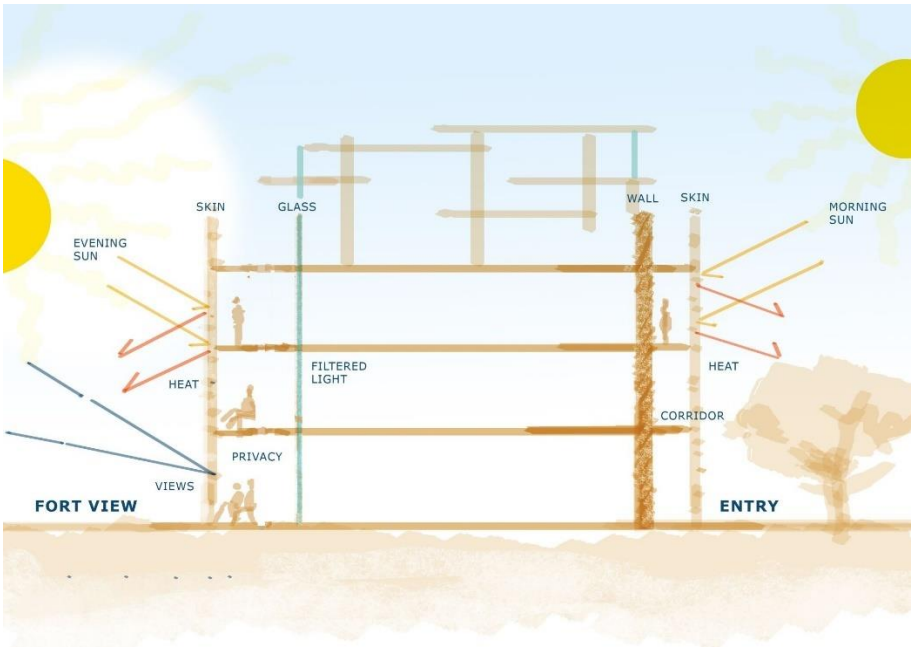


The new architecture acts as a backdrop for the old
Openings form framing devices



Integration of Modern Amenities:

While rooted in traditional architecture, RAAS Jodhpur seamlessly integrates modern amenities and technology to enhance guest comfort and convenience. The hotel incorporates energy-efficient air conditioning systems, high-performance glazing, and insulation to optimize thermal comfort. These modern elements work in harmony with the passive design techniques to create an overall sustainable and comfortable indoor environment.



IN ELEVATION LATTICE JAALI USED FOR PROPER VENTILATION & TO PREVENT FROM HEAT

Conclusion:

RAAS Jodhpur exemplifies the successful application of passive design techniques in a hot climate context. The hotel's design, orientation, use of local materials, shading devices, and courtyard spaces contribute to a comfortable indoor environment while embracing the rich architectural heritage of Rajasthan. By combining traditional wisdom with modern amenities, RAAS Jodhpur showcases the possibilities of sustainable design and highlights the potential for creating environmentally conscious and luxurious spaces in hot climate regions like Jodhpur.

RAAS Jodhpur is a luxury boutique hotel that blends traditional Rajasthani architecture with modern design elements. Here is an analysis of its architectural features:

a) Contemporary Design: RAAS Jodhpur showcases a contemporary interpretation of Rajasthani architecture. It combines clean lines, minimalist aesthetics, and modern materials while retaining the essence of traditional design elements.

b) Integration of Traditional and Modern: The hotel seamlessly integrates modern amenities and technology while respecting the local architectural heritage. It incorporates passive design techniques, such as courtyard layouts, shading devices, and natural ventilation, to enhance thermal comfort.

c) Use of Local Materials: RAAS Jodhpur utilizes locally sourced materials like sandstone, which is prevalent in Rajasthan. The use of this indigenous material connects the hotel to its cultural and historical context.

d) Sustainable Features: The hotel incorporates energy-efficient systems, insulation, and high-performance glazing to optimize energy consumption. These features align with contemporary sustainability practices and reduce the environmental impact of the building.

e) Aesthetic Appeal: RAAS Jodhpur embraces a contemporary design language with an emphasis on open spaces, clean lines, and a neutral color palette. The play of light and shadow, along with the integration of traditional architectural elements, creates a visually stunning and harmonious ambiance.

5.Results and Discussion:

5.1 Different periods and styles. Analyzing these structures provides insights into the evolution of architecture and design in the region.

The analysis of havelis and RAAS Jodhpur showcases the rich architectural heritage and evolution of design in Rajasthan. Havelis represent the grandeur and opulence of the past, characterized by intricate carvings and inward-facing design. On the other hand, RAAS Jodhpur exemplifies the integration of traditional elements with modern amenities, creating a luxurious and sustainable space. Both structures contribute to the cultural identity of Rajasthan and serve as reminders of the region's architectural legacy.

The results obtained from the research on the role of passive design techniques for a comfortable indoor environment in hot climates, specifically comparing traditional and modern architecture in Rajasthan, India, reveal important insights into sustainable architectural practices.

5.1.1Traditional Architecture in Hot Climates:

Traditional architecture in Rajasthan, India, showcases effective passive design techniques for a comfortable indoor environment in hot climates.

The use of courtyard configurations in traditional buildings promotes natural ventilation and creates a cool microclimate.

Thick walls made of locally available materials, such as stone or adobe, provide insulation and thermal mass, reducing heat transfer.

Shading devices, such as overhangs, screens, and lattice work, help block direct sunlight and minimize heat gain.

Traditional architecture often emphasizes the integration of open spaces, natural ventilation, and passive cooling strategies, resulting in energy-efficient and comfortable indoor environments.

5.1.2 Modern Architecture in Hot Climates:

Modern architecture in Rajasthan incorporates passive design techniques to address the challenges of hot climates while embracing technological advancements.

Building orientation plays a crucial role, maximizing natural light while minimizing solar heat gain.

High-performance glazing and insulation materials reduce heat transfer and improve thermal performance.

Shading devices, such as sunshades and louvers, are strategically placed to block direct sunlight and minimize heat gain.

Natural ventilation systems, including well-placed windows, atriums, and ventilation openings, enhance airflow and promote passive cooling.

The integration of energy-efficient mechanical systems, such as evaporative cooling or heat recovery systems, complements passive strategies and further enhances indoor comfort.

5.2 Discussion:

The discussion focuses on the comparison between traditional and modern architecture in hot climates, specifically in Rajasthan, India.

Advantages of Traditional Architecture:

Traditional architecture in Rajasthan has inherent advantages in hot climates due to its deep understanding of local climatic conditions and natural resources.

The use of passive design techniques in traditional buildings, such as courtyard configurations, thick walls, and shading devices, enables natural ventilation, reduces heat gain, and maintains thermal comfort.

Traditional architecture often incorporates sustainable and locally sourced materials, reducing environmental impact and promoting cultural identity.

Advancements in Modern Architecture:

Modern architecture in Rajasthan combines traditional wisdom with technological advancements to create energy-efficient and comfortable indoor environments.

The integration of passive design techniques, such as proper orientation, shading devices, insulation, and natural ventilation, contributes to energy savings and thermal comfort.

The use of advanced glazing technologies and energy-efficient mechanical systems further enhances the performance of modern buildings.

Modern architecture embraces innovative materials and construction techniques that improve durability, efficiency, and aesthetics.

Synergy between Traditional and Modern Approaches:

The research highlights the importance of blending traditional and modern architectural approaches to achieve the best possible outcomes.

Integrating traditional design elements and passive strategies into modern architecture can create buildings that are both sustainable and culturally appropriate.

Architects and designers should consider the climate, local context, and available resources while incorporating passive design techniques to ensure a comfortable indoor environment in hot climates.

Overall, the results and discussion emphasize that both traditional and modern architecture have valuable contributions to offer in creating a comfortable indoor environment in hot climates. By integrating passive design techniques, sustainability principles, and technological advancements, architects and designers can develop innovative and energy-efficient solutions that prioritize thermal comfort and environmental stewardship in Rajasthan's hot climate.

6. Literature Study

6.1 Literature Study 1: Udaivillas, Udaipur - Incorporating Passive Cooling Techniques and Traditional Architecture

Introduction:

Udaivillas, located in Udaipur, Rajasthan, is a luxury hotel known for its magnificent architecture and stunning views of Lake Pichola. It seamlessly blends traditional Rajasthani architecture with modern amenities, creating a harmonious and comfortable environment for its guests. This literature study focuses on the incorporation of passive cooling techniques and traditional architectural elements in Udaivilas, highlighting their significance in maintaining thermal comfort and preserving cultural heritage.

Passive Cooling Techniques:

Courtyards and Water Bodies: Udaivillas incorporates traditional Rajasthani architectural features such as courtyards and water bodies, which play a vital role in passive cooling. Courtyards provide shade and create a microclimate by allowing cool air to circulate within the building. Water bodies, such as pools and fountains, not only enhance the aesthetic appeal but also act as natural coolants by evaporative cooling.

Overview layout plan

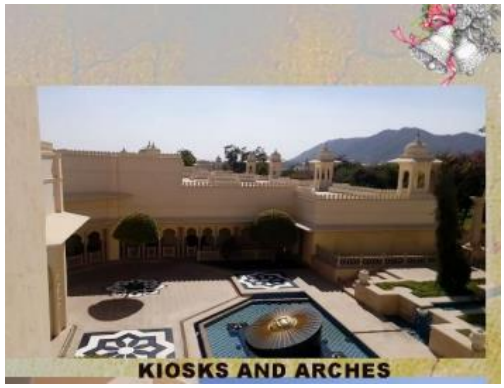
Jaali Screens:

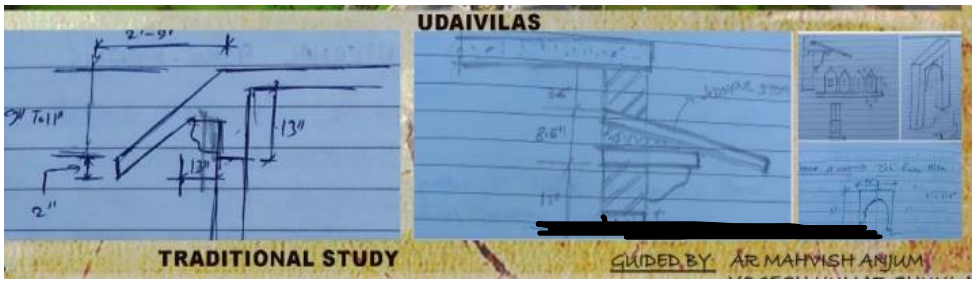
The extensive use of Jaali screens is a prominent feature in Udaivillas' design. These intricately carved stone or marble screens allow for adequate ventilation while blocking direct sunlight. The Jaalis create aplay of light and shadow, preventing excessive heat gain and maintaining a comfortable indoor temperature.

Ventilation and Cross Ventilation: Udaivillas incorporates well-planned ventilation systems to promote natural airflow. Strategically placed windows, vents, and roof openings facilitate the movement of air, allowing hot air to escape and cool air to enter. Cross ventilation is achieved by positioning openings on opposite sides of a room or building, facilitating efficient air circulation.

Traditional Architectural Elements:

Jharokhas and Chhatris: Udaivillas features Jharokhas (balconies) and Chhatris (canopy-like structures) inspired by traditional Rajasthani architecture. These elements not only add to the visual grandeur of the property but also serve practical purposes. Jharokhas provide shaded areas for relaxation and offer panoramic views, while Chhatris act as shading devices, protecting the building from direct solar radiation.





Architectural Details: Udaivillas showcases intricate architectural details, such as carved pillars, arches, and domes, reminiscent of Rajasthan's rich cultural heritage. These elements not only add aesthetic appeal but also contribute to the overall thermal performance of the structure. The use of locally sourced materials like stone and marble helps in maintaining a comfortable temperature indoors.

Sustainable Materials: Udaivillas emphasizes the use of sustainable and locally sourced materials, promoting eco-friendly practices. The incorporation of natural materials like wood, stone, and terracotta not only enhances the aesthetics but also aids in maintaining a pleasant indoor environment by minimizing heat absorption and optimizing thermal insulation.

6.2 Conclusion of modern architecture in a hot climate region

Udaivillas, Udaipur, stands as a remarkable example of incorporating passive cooling techniques and traditional architectural elements in a luxury hotel setting. By leveraging the principles of thermal comfort and drawing inspiration from the cultural heritage of Rajasthan, Udaivillas showcases a sustainable and aesthetically pleasing design. The successful integration of passive cooling techniques, such as courtyards, Jaali screens, and ventilation systems, along with traditional architectural elements like Jharokhas and Chhatris, ensures a comfortable and culturally rich experience for the guests.

S.NO	CLIMATE	COMPARATIVE ANALYSIS			
		PROBLEMS	DWELLING SPACING	BUILDING ORIENTATION	MATERIAL
1	HOT AND DRY	VERY HOT SUMMERS, HIGH SOLAR RADIATION REFLECTED LIGHTING DUST STROMS	NARROW SHADED STREETS,DIFFERENTIAL HEATING IN COURTYARD AND STREET LEADS TO VENTILATION, NARROW STREET WIDTHS	N-E	WALLS - BRICK / STONE WITH MASSIVE USE OF TIMBER ROOF - TILES / PITCHED ROOF WITH TILES. WINDOWS - STONE JALI'S / CARVED WOOD
2	HOT AND HUMID	HIGH HUMIDITY HIGH TEMPERATURE CYCLONES	DETACHED HOUSES OPEN SPACES ALL AROUND GOOD LIGHTNING COURTYARD PLAN WITH HIGH RATE OF VENTILATION THICK VEGETATION ALL AROUND	MAIN STREET E - W AXIS	WALLS - LOWER STOREY 500MM LATERITE ROOF - MUD TILES WINDOW - DECORATIVE JALI'S
3	COMPOSITE	HOT SUMMER COLD WINTERS	COURTYARD PLANS LARGE HOUSES WITH 1-3 STORYS COURTYARD EFFECT & CROSS VENTILATION THROUGH THE NARROW BAYS	N / E	WALL - MUD BRICK, TIMBER & LIME PLASTER ROOF - FLAT ROOF ON TIMBER FRAME WINDOWS - WOOD FRAME WINDOWS
4	TEMPERATE	HIGH SUMMER TEMPERATURE DRY HOT WINDS COLD WINTERS	ISOLATED DWELLINGS WITHIN A COMPOND OPEN SURROUNDING SERIES OF COURTYARDS PROMOTE VENTILATION	N / E	WALL - DRESSED STONE WITH RUBBLE CAVITY TIMBER FRAME BRICK WALL ROOF - PITCHED ROOF WITH TILES WINDOW - LATTICED
5	COLD	EXTRE COLD TEMPERATURE AND LOW HUMIDITY	ON HILL FACES DOWN HILL SET IN THE GROUND SOUTH SLOPE PREFERED MAXIMUM USE OF ISOLATION BY FACING SOUTH	S / E	WALL - TIMBER / STONE WALL ROOF - TIMBER FRAME PITCHED ROOF WINDOW - SMALL OPEING / WODDEN SHUTTERS

7. Conclusion:

7.1 Summary of Findings:

The research on the role of passive design techniques for a comfortable indoor environment in hot climates, with a specific focus on comparing traditional and modern architecture in Rajasthan, India, has yielded important findings. The study examined case studies and analyzed the effectiveness of passive design strategies in both traditional and modern architectural approaches.

7.2 Implications for Design Practice:

The research has significant implications for design practice in hot climates, particularly in Rajasthan, India. Architects and designers can draw upon the wisdom of traditional architecture to incorporate passive design techniques that have proven effective over generations. The integration of traditional elements, such as courtyard configurations, shading devices, and natural ventilation, can enhance thermal comfort and energy efficiency in modern architectural designs. Additionally, the use of advanced materials, insulation, glazing technologies, and energy-efficient mechanical systems can further optimize the performance of buildings in hot climates.

The research emphasizes the importance of a holistic approach to design that combines the strengths of traditional and modern architectural practices. By incorporating passive design techniques and sustainable principles, architects can create buildings that respond effectively to the challenges of hot climates while considering local context and cultural identity.

7. 3 Recommendations for Future Research:

Based on the findings of this research, several recommendations for future research in the field of passive design techniques for a comfortable indoor environment in hot climates can be made:

- Further exploration of traditional architectural practices: Conduct in-depth studies on traditional architectural techniques and their application in different regions of Rajasthan. Explore the cultural significance and environmental benefits of traditional design elements and strategies.

- Performance analysis of modern architectural designs: Evaluate the performance of modern buildings in hot climates through post-occupancy evaluations. Assess the effectiveness of passive design strategies and identify areas for improvement.
- Integration of renewable energy sources: Investigate the integration of renewable energy sources, such as solar panels and geothermal systems, with passive design techniques to further enhance energy efficiency and reduce reliance on non-renewable energy sources.
- Long-term monitoring of building performance: Conduct long-term monitoring of buildings designed with passive design techniques to assess their energy performance, occupant comfort, and environmental impact. This will provide valuable data for refining design strategies and improving building codes and standards.
- Climate change adaptation: Explore the potential impact of climate change on hot climates in Rajasthan and develop adaptive design strategies that can mitigate the effects of rising temperatures and changing weather patterns.
- By addressing these research areas, architects, designers, and researchers can contribute to the continuous improvement and innovation of passive design techniques for creating comfortable and sustainable indoor environments in hot climates.
- Overall, this research emphasizes the importance of passive design techniques in achieving a comfortable indoor environment in hot climates. By incorporating traditional wisdom and modern advancements, architects can develop innovative solutions that prioritize thermal comfort, energy efficiency, and sustainability in Rajasthan and other hot climate regions.

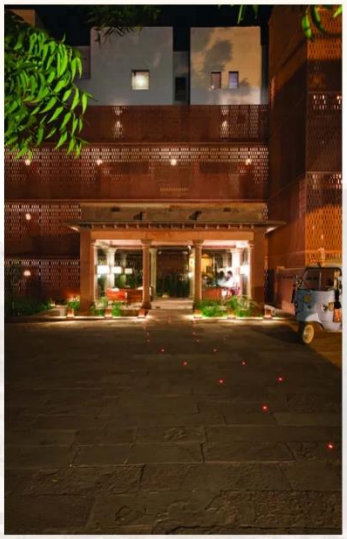
(CASE STUDY -1)

Adaptive Re-use Hospitality Hotels Jodhpur, Rajasthan

CONCEPT :- RAAS – Hand crafting a story for today

Set in the heart of the walled city of Jodhpur, Rajasthan, RAAS is a 1.5-acre property uniquely located at the base of the Mehrangarh Fort.

The brief was to create a luxury boutique hotel with 39 rooms in the context of the Old city quarter of Jodhpur. This has been translated into a project where there is a dialogue between the old and the new. Luxury was about being authentic both in terms materials and workmanship, and in providing visitors a tactile and sensual experience within the historical context of the old city of Jodhpur without aping the old.



HOTEL RAAS, AT JODHPUR

World's Best Holiday Building at WAF Barcelona and an Aga Khan Award for Architecture Nominee, the luxury boutique hotel of RAAS Jodhpur crafts a dialogue between the old and the new through authenticity of materials and workmanship.

Project leaders: Ambrish Arora & Rajiv Majumdar
Design Team: Arun Kullu, Radha Muralidhara, Anuja Gupta, Ruchi Mehta
Photographers: Andre J. Fanthome, Rajen Nandwana
Contractors: Buildkraft India & Moolchand Stone Mason
Total site area: 6,000 square meters
Built up area: 4,000 square meters

Every element is handcrafted with a focus on simplicity, and function – beauty being the skill and care of the crafts person that has gone in to creating the piece. Materials include hand cut stone, poured in situ pigmented cement terrazzo on floors, walls and as furniture. Locally crafted furniture and cabinets in sheesham (a local Indian hardwood).

The large central courtyard houses the three restored heritage buildings – Darikhana, Baradari and Haveli. These become nodes, shared spaces such as dining areas, a spa, break away spaces, to be enjoyed by all the guests. These also house 3 heritage suites. The old structures were restored using age old techniques of using lime mortar and solid stone masonry.

School Of Architecture and Planning, BBDU, LUCKNOW
EKTA VERMA
(Enrollment no.1200109003)
Under the Supervision of (Ar. Satyam Srivastava)

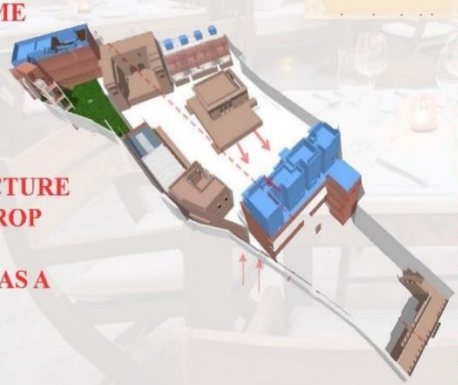
(CASE STUDY -1)

Adaptive Re-use Hospitality Hotels Jodhpur, Rajasthan

HOTEL RAAS, AT JODHPUR

CONCEPT :- RAAS – Hand crafting a story for today

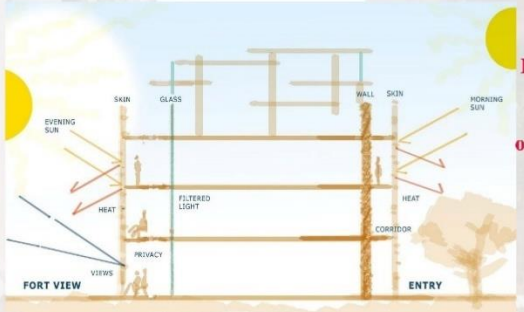
THERE IS NO OBSTRUCTING BUILDINGS IN THE MIDDLE .
THE ARCHITECTURE IS WELL FOCUSED IN THE SAME



THE NEW ARCHITECTURE FORMS THE BACKDROP FOR THE OLD.
THE OPENING ACTS AS A FRAME

The new architecture acts as a backdrop for the old
Openings for as framing devices

Inspired by the age-old double skinned structures of the region, (the traditional stone latticed jharokha forms of Rajasthani architecture – which perform multiple functions of passive cooling and offering privacy to the user) these buildings act as lanterns framing the site. The drama of the stone jaali (lattice) is heightened by the fact that these panels can be folded away by each user to reveal uninterrupted views of the fort, or can be closed for privacy and to keep the harsh Jodhpur sun out.



The new buildings serve as framing elements and as contemporary counterpoints to the site and the fort. Luxury is infused into the project through authenticity of materials and work. Painstakingly restored with traditional craftsmen in original materials like lime mortar and Jodhpur sandstone, the original structures house the shared spaces like the pool, dining areas, spa, and open areas besides three heritage suites.

INTEGRATION IN SURROUNDINGS

The fact that there are three 18th century buildings on our site – together with the fact that we were building in the old city gave us a very strong contextual framework to work within.
The idea was to retain a sense of connection with the old city and yet create the feeling of being in an oasis within the hustle and bustle of things.
The core discussion centered around providing visitors a tactile and sensual and authentic experience of living within the historical context of the old city of Jodhpur.
This guided the planning and placement of the new structures. The property has been planned as an inward looking development reaching out to include the surrounding walled city in the experience.

Role of passive design techniques for a comfortable indoor environment: - Comparison between traditional & modern architecture in hot climate

School Of Architecture and Planning, BBDU, LUCKNOW
EKTA VERMA
(Enrollment no.1200109003)
Under the Supervision of (Ar. Satyam Srivastava)

CASE STUDY- ANANTA RESORT, UDAIPUR

Location- Village Bujhda, Tehsil Girwa, Kodiyat Road Udaipur Suburbs, Udaipur - 313001, Rajasthan
7 KM away from the Udaipur city
10.1 KM from the Udaipur railway station
35.5 KM from Maharana Pratap Airport
Client- Ananta Group of Private ltd.
Area- 200 acres
Built up- 75 acres
Architect- Ar. Mukul Goyal

This mesmerizing Resort is located in the City of Lakes, and covers the land of 75 Acres. The site offers beautiful view of Sajjan Garh Palace, which is now known as Monsoon Palace and is a hilltop splendid abode in the Udaipur city. Ananta Resort is placed in hills having highest peak 150 meters, from where the guests can best enjoy the scenic locales.
The resort is surrounded by the Aravali hills offering 182 cottages in a spread-out character in the outskirts of Udaipur.
Ananta offer the best services and do our best to make the guests feel extremely special providing high class amenities. On-site facilities offered by Ananta is bound to satisfy every of the guest, and the pleasant vibe of the place is replicated in every guestroom.
The Resort is surrounded by nature gives its best to relax the guests with meditation, yoga, swimming, Bird watching etc.

Resort Amenities

Basic amenities
WiFi
Air Conditioner24x
Check in Restaurant Bar Cafe
Room Service
Internet
Business Center
Pool
Gym
Food & Beverage
Bar Restaurant
Coffee Shop

Recreation
Kids Pool
Outdoor Swimming Pool
Shopping Arcade
Travel
Travel Desk
Parking - Bus Parking
Valet Parking
Personal Services
24 Hour Room Service
Laundry Room Service
Dry Cleaning
Other Amenities
Conference facilities
Body Treatments
Free Newspaper
Front Desk
Phone Service
Wedding Service

Business Services
Business Center
Audio Visual Equipment
Convention Centre
LCD / Projector
Meeting Facility
Board Room
Conference Hall
Meeting Room
Basics
Internet
Air Conditioning
Housekeeping
Complimentary Wi-Fi access
Banquet Facility
Doctor on Call


Signages | Pathway | Main Path | Pond


Ananta Resort

Concept

The design concept of the resort is 'OM' which is a sacred sound and a spiritual icon in India. It is a sacred spiritual incantation made before and during the recitation of spiritual texts. The OM or Aum symbol is found on ancient coins, in regional scripts.

Design Features

- Balinese Architecture
- Minimum cutting and filling
- Maintain the site profile and concept
- Climate responsive design
- Use of Solar Panel
- View of Aravalli Hills.

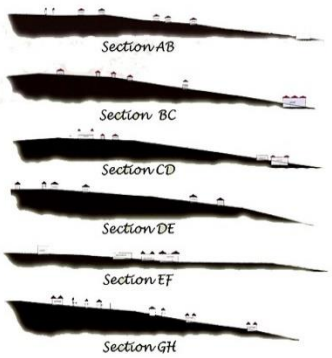
Planing of Ananta Resort

- Cottages are placed in repetitive manner unit which make cluster along the contour also fulfill of the profile of om.
- Free Flow.
- Barrier free planning.
- Well connected zoning of cottages, SPA block and banquet & lawn.
- Each have a proper distance and maintain their functionality at where music sound perform in banquet and other way relaxation and calm keep in cottages and SPA area.


Conceptual Block View of the Site

Site Plan

Road Name	Road Signage	Cottage no.
RD No.1		101-109
RD No 2		201-219
RD No.2B		220-231
RD No. 3		301-312
RD No. 4		401- 427
RD No. 5		501-513 & PS-1 TOPS-3
RD No. 6		601-633



Pin-locations

A- Oasis Restaurant
B- High Tea restaurant Desk
C- Musical Evening Rangmanch-Amphitheatre
D- Pool Party Swimming Pool
E- Barat Assembly & Safa Bandhi-Entry Gate
F- Reception
G- Barat Welcome & Varmala Gate
H- Host Milan- Stage
I- High Tea Chat Bazaar
H1- Staff Parking
P- Mudra SPA & Manoranjan
Q- Presidential Suites
R- Water Tank
T- Bar
U- Staff Quarter
V- Laundry
W- STP
X- Electrical Substation
Y- Driver Dormitory
A1- Administration Office
B1- Service Block
C1- Craft Bazaar
D1- Lawn
E1- Guest Toilet
F1- Kitchen
G1- Garbage Store

Ciculation

- The whole circulation of resort is just like a network configuration which consists of path that connect established points in space.
- Pathway from main entry to service block consists 5 points.
- Points are well maintained with signage and security.
- Blocks are not at a walking distance; one should take a golf cart or car provided by the resort to reach to cottages.

Connectivity

- There is no complexity in circulation.
- The connectivity is without any hindrance.
- Each area is defined in its specific design.
- The caution of privacy is taken.
- One can enjoy the recreational activities at any time.

Entries

- There are two entries on the site in which main entry is located on 'kediyat road' and service entry is located along the 'Bujhda road'.

School Of Architecture and Planning, BBDU, LUCKNOW
EKTA VERMA
(Enrollment no.1200109003)
Under the Supervision of (Ar. Satyam Srivastava)

LITERATURE STUDY- UDAIVILLAS, UDAIPUR

Location - Haridas Ji magari, Udaipur rajsthan
6km away from udaipur city
10km away from udaipur railway station
27km away from Maharana pratap airport
Client - Oberoi
Area - 32 Acres and 25,000 sqm builtup area
Architect - Nimish patel


Oberoi Udaivillas


Oberoi Udaivillas

Concept

• The design concept of the resort is who is the goddess-luxmi.
• The design shows that contemporary needs can be blended well with the historic ambience of the product without compromising with any of the bottom lines of the end- user.


Conceptual Plan

Design Features

• Assimilation of spaces resembles traditional palace structure and complex.
• Every room has a courtyard adjacent to it and some also have swimming pools.
• Climatic Responsive design.
• With 450 stone columns each carved by hand and given a given a local Ghutai Finish to the thekri work in the dome of the candle

Resort Facilities
• 82 rooms and suites.
• 3 restaurants.
• 1bar.
• Laundry and valet service.
• 5 meeting rooms.
• Barrier free zone.
• Fitness Centre.
• Swimming Pool of depth 4.5ft.
• Steam and sauna.
• Beauty Salon.
• Doctor on call.
• SPA.
• Car rental.
• 4 events and banquet facility.

Activities
• Haldighati Tour.
• Rananakpur temple tour.
• Kumbhalgarh fort Adventures.
• Private themed dinner.
• Cookery classes.
• History seminars.
• City palace tour.
• Jagdish Temple Excursion.
• Sajjangarh tour.
• Gym Activities.
• Yoga.
• SPA Treatments.
• Shilpgram tour.


SPA


Entrance Door


Open- Air Restaurant


Sun Landmark


Entry Pathway


Door


Traditional wall painting


View from the pool side to SPA


Way to Banquet Hall


Courtyard Area

Services
• Laundry 15m X 20m.
• STP - the capacity of Stp is 125ml/day

Premiur rooms
• All with private walled courtyard with silken parasols 600sq. ft.

Premiur Suites
• Having a semiprivate pool 60sq.ft..
• 17 units of 1150sq.ft area.

Kohinoor suite with private pool
• Area of 2650 sq.ft with 1 unit.

Crescent Room Block
• All with private walled with 600 sq.ft.

Deluxe Suites
• Area 1150 sq.ft with 4 units.


Suites- Lobby Area


Suites- Bed Room

Reception and Waiting lounge
• 150sqm in area of octagonal shape.
• It is connected with restaurant, Banquet rooms block and back office area.


Main Lobby


Activity Room

Restaurant
• Sheeshmahal has capacity 44 and Chandni mahal have 66.


Restaurant


Hall

Bar
• It is associated with reception and waiting lounge with capacity of 20 people.

Swimming Pool
• One pool is connected with SPA area with 400sqm and other one is of 750sqm.


Presidential Pool Area


Pool Connected with SPA

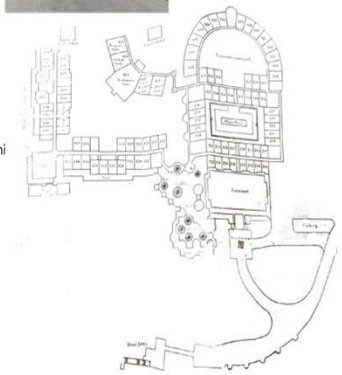
Service Block
Front Entrance
Courtyard
Parking

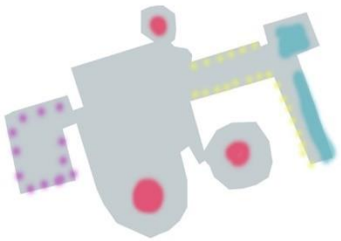
Site Plan


View of City Palace


View of Taj Palace


Coutyard at the entrance


Ground Floor Plan


Zonng Of Plan

Kitchen area
Service Area
Room
Water Body
Floor Plan

Inference
• The site follows its concept and maintain its traditional style.
• The Resort gives the luxury with all the facilities.
• Climate responsive architecture.
• Lack use of solar panels and RWH.
• Hidden entrance from the main road.
• Use of traditional elements suce as chattri, dome, cupola, jali, merlons, todiya, gateway are

Role of passive design techniques for a comfortable indoor environment: - Comparison between traditional & modern architecture in hot climate

School Of Architecture and Planning, BBDU, LUCKNOW
EKTA VERMA
(Enrollment no.1200109003)
Under the Supervision of (Ar. Satyam Srivastava)

(SITE STUDY -1)

A RESORT IN SAND DUNES JAISALMER

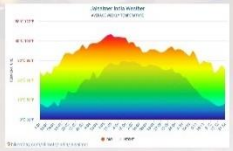
Resort is a place which people frequently or generally go for relaxation or pleasure, especially one providing rest and recreation facilities for vacationers.
Resorts are places that provide relaxation and recreation over and above the accommodation, meals and other basic amenities. A resort combines a hotel and a variety of recreations; it serves food, drink, lodging, sports, entertainment, relaxation such as spa and shopping and tour arrangements; some even facilitate with shopping and tour guides.
The purpose of staying in a resort is entirely different; people who want to spend their vacation or holidays with their family in a particular city or a particular country are likely to stay in a holiday resort. People prefer to stay for a long period of time in resorts.

Desert resort is a resort located on the desert, attracts the tourist with their desert safari, camel rides, camping, traditional dance, traditional food and fair.

Jaisalmer named as "The Golden city", is a city in the Indian state of Rajasthan, located 575 kilometers (357 mi) west of the state capital Jaipur. Jaisalmer has many architectural monuments and is well known for tourist place. Therefore, it can be a good place for spreading awareness of traditional history.
As for the site, it is in Jaisalmer and is surrounded by desert area.

CLIMATE AND GEOGRAPHY

Jaisalmer, being an arid desert region, (26.9157 Latitude and 70.9083 Longitude)
The temperature varies greatly from day to night in both summer and winter.
The maximum summer temperature is around 49 °C (120 °F) while the minimum is 25°C (77 °F).
The maximum winter temperature is usually around 23.6 °C (74.5 °F) and the minimum is 5 °C (41 °F). The average rainfall is 209.5 millimeters (8.25 in).
Highest ever recorded temperature was 50.0 °C (122.0 °F). the lowest ever recorded temperature being −5.9 °C (21.4 °F).



PROPOSAL OF SITE

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	23.7 (74.7)	27.2 (81)	32.8 (91)	38.4 (101.1)	41.7 (107.1)	40.9 (105.6)	37.7 (99.9)	36 (96.8)	36.5 (97.7)	34.1 (93)	31.1 (88)	25.4 (77.7)	33.351 (91.131)
Average low °C (°F)	7.9 (46.2)	10.9 (51.6)	16.8 (62.2)	22.2 (72)	25.7 (78.3)	27.1 (80.8)	26.5 (79.7)	25.4 (77.7)	24.1 (75.3)	20.5 (68.9)	13.8 (56.8)	8.9 (48)	19.167 (66.492)
Rainfall mm	1.3	4	3.2	18.1	9.2	16.1	56.1	79	16.2	2.5	1.3	2.5	17.458
Avg. rainy days	0.6	1	0.9	0.4	0.8	1.1	3.9	3.9	2.1	0.4	1.1	0.5	1.3917

CONNECTIVITY
Jaisalmer is connected to the rest of Rajasthan by buses provided by Rajasthan State Transport Corporation as well as other private bus operators

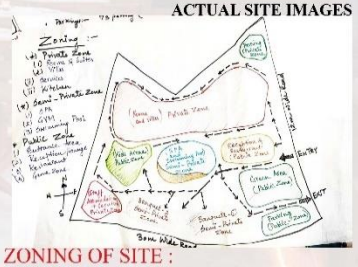
Jaisalmer Airport is located 17 kilometres southeast of Jaisalmer. Mumbai, Delhi, Jaipur, Ahmedabad, Surat and Jodhpur.

Jaisalmer railway station runs daily trains between Jaisalmer and Jaipur, through which it is connected to Delhi and other cities all over India. This station comes under NWR zone and JU division.

Additionally, there exists a luxury tourist train known as Palace on Wheels, which covers the major tourist destinations of Rajasthan, including Jaisalmer.

SITE LOCATION: –
ANANTA RESORT, SAND DUNES, SAM ROAD, DHANAN ROADJAISALMER, RAJASTHAN
AREA OF SITE: –
110883.9SQm (27.4 ACRE)
GROUND COVERAGE –
20% - 22176.77 SQ.M. MAX.
BUILDING HEIGHT – 9M
FAR – 0.75
SET BACKS - FRONT 15M , OTHER SIDES -9M
PARKING - 3ECS PER 100SQM (COVERED AREA)

ACTUAL SITE IMAGES



ZONING OF SITE :
DIVIDED IN 3 PARTS :-
1) PRIVATE AREA
* ROOMS & SUITES
* VILLAS
* SERVICES
2) SEMI PRIVATE AREA
* SPA & GYM AREA
* SWIMMING POOL
3) PUBLIC ZONE
* ENTRANCE LOBBY

School Of Architecture and Planning, BBDU, LUCKNOW
EKTA VERMA
(Enrollment no.1200109003)
Under the Supervision of (Ar. Satyam Srivastava)

(CONCEPTUAL ANALYSIS)

A RESORT IN SAND DUNE- JAISALMER

THE AIM OF THIS THESIS IS TO RE-INTERPRET THE ROLE OF TRADITIONAL BUILDING PRACTICE & APPLY THEM TO A WELLNESS FACILITIES & RECREATIONAL SPACES WHICH PROMOTES BUSINESS AND TOURISM AND ACT AS AN ICON FOR THE ART, CULTURE & TRADITION OF THE REGION. IT IMBIBES THE CHARACTER OF TRADITIONAL INDIAN CULTURE , TAKES CUES FROM SANDUNES & IS DESIGNED IN RESPONES TO THE CLIMATE MAKING IT CONTEXTUAL ON MULTIPLE FRONTS SIMULTANEOUSLY ..

Views: For designing the project views are taken from different locations of the site to give to best outcome.

Views from Villa surrounded bu sandunes

Swimming Pool at the edge of sandunes

View of cathment from Cottage

View of Catchment Area

Vista of cathment from Cottage

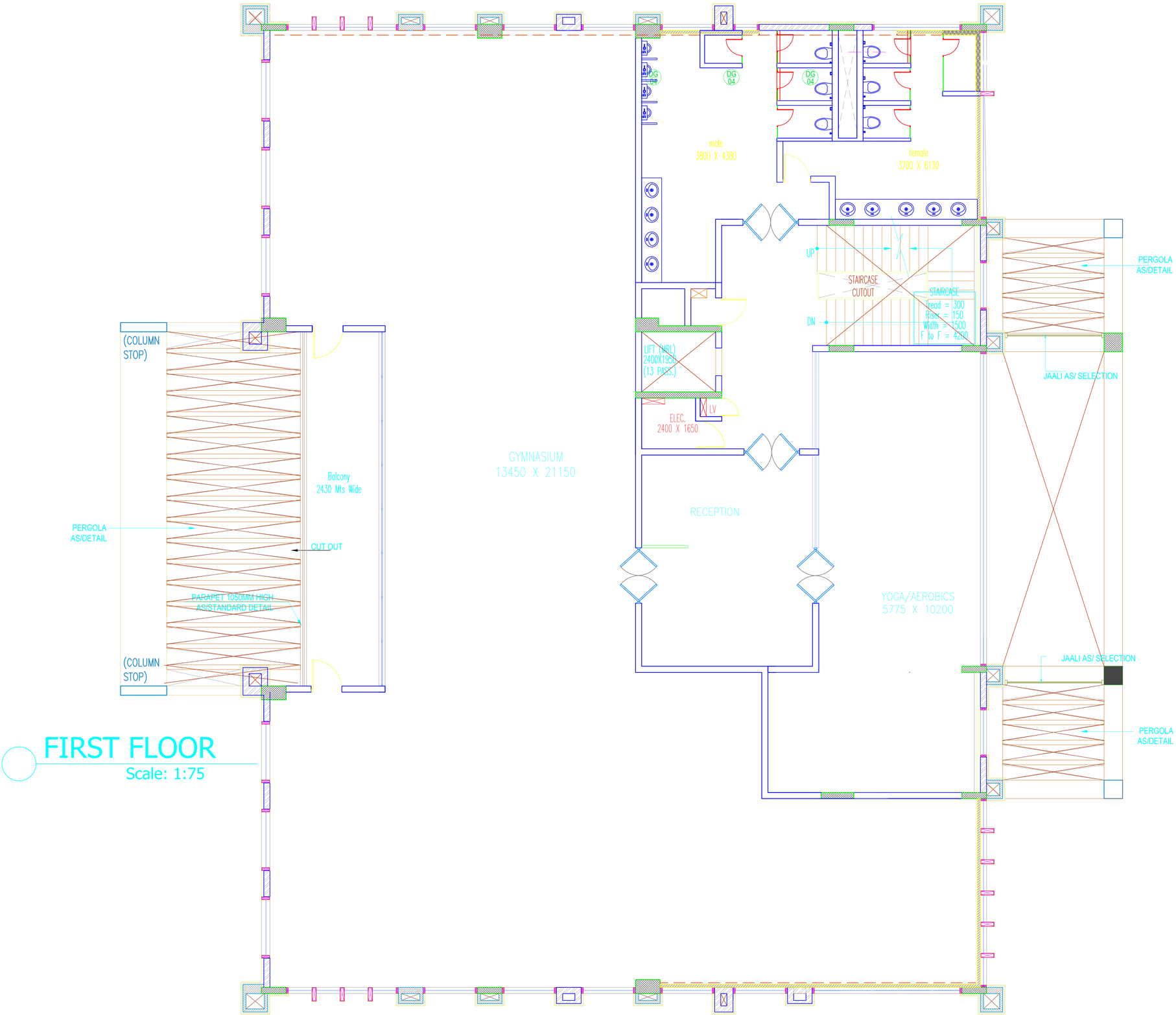
Vista of Restaurant

School Of Architecture and Planning, BBDU, LUCKNOW
EKTA VERMA
(Enrollment no.1200109003)
Under the Supervision of (Ar. Satyam Srivastava)

11.References:

- Bhatt, V., & Barve, A. (2014). Traditional wisdom of passive cooling in vernacular architecture of hot-dry regions of Rajasthan. In Proceedings of the International Symposium on Sustainable Architecture (pp. 57-64).
- Gupta, R., Sharma, V., & Mathur, J. (2013). Passive cooling techniques in traditional buildings of Rajasthan: A case study of havelis in Jaisalmer. In Proceedings of the International Conference on Sustainable Built Environment (pp. 635-641).
- Joshi, Y., & Nagrath, P. (2018). A review on traditional cooling techniques in Indian vernacular architecture. International Journal of Innovative Research in Science, Engineering and Technology, 7(12), 17628-17636.
- Mehta, V., Sharma, S., & Sharma, V. (2017). Analysis of passive design strategies in hot and dry climate of Rajasthan, India. Energy Procedia, 109, 446-453.
- Patel, S., Patil, R., & Chavhan, M. (2019). Passive cooling techniques in traditional houses of hot and arid regions of Rajasthan, India. International Journal of Engineering Research and General Science, 7(4), 6-11.
- Reddy, A. K., Kumar, P., & Gandhidasan, P. (2017). Traditional cooling techniques in vernacular architecture of Rajasthan: A review. Journal of Applied Science and Computations, 4(4), 232-238.
- Sharma, M., & Jain, N. (2016). Passive cooling techniques in Indian vernacular architecture: A case study of Rajasthan. International Journal of Advanced Research in Engineering and Applied Sciences, 5(7), 223-230.
- Sharma, V., & Sharma, S. (2016). Energy efficiency in traditional buildings of Rajasthan, India: A review. International Journal of Emerging Technology and Advanced Engineering, 6(11), 120-126.
- Singh, A., Singh, P., & Kaur, A. (2015). Vernacular architecture in Rajasthan, India: A sustainable built environment. International Journal of Scientific and Engineering Research, 6(4), 267-274.
- Rajpal, H. S. (2009). Passive cooling techniques in buildings: Past, present and future. Energy and Buildings, 41(3), 254-257.
- Ratti, C., Baker, N., & Steemers, K. (2005). Energy consumption and urban texture. Energy and Buildings, 37(7), 762-776.
- Wong, N. H., Jusuf, S. K., & Sia, A. (2015). Review of passive design strategies in tropical climate for optimizing thermal comfort and daylighting in buildings. Renewable and Sustainable Energy Reviews, 42, 147-157.


12 M WIDE ROAD
12M WIDE PATH WAY
12M WIDE PATH WAY
15 M WIDE ROAD
15 M WIDE ROAD
GREEN AREA
9M WIDE PATH WAY
9M WIDE ROAD
GREEN AREA
ENTRY
GREEN AREA
9M WIDE PATH WAY
9M WIDE PATH WAY
GREEN AREA
STAFF ACCOMODATION
12M WIDE ROAD
12M WIDE ROAD
12 M WIDE ROAD
GREEN AREA
EXIT
15 M WIDE ROAD
PARKING SPACE
PARKING SPACE
30 WIDE ROAD
30 WIDE ROAD
30 WIDE ROAD

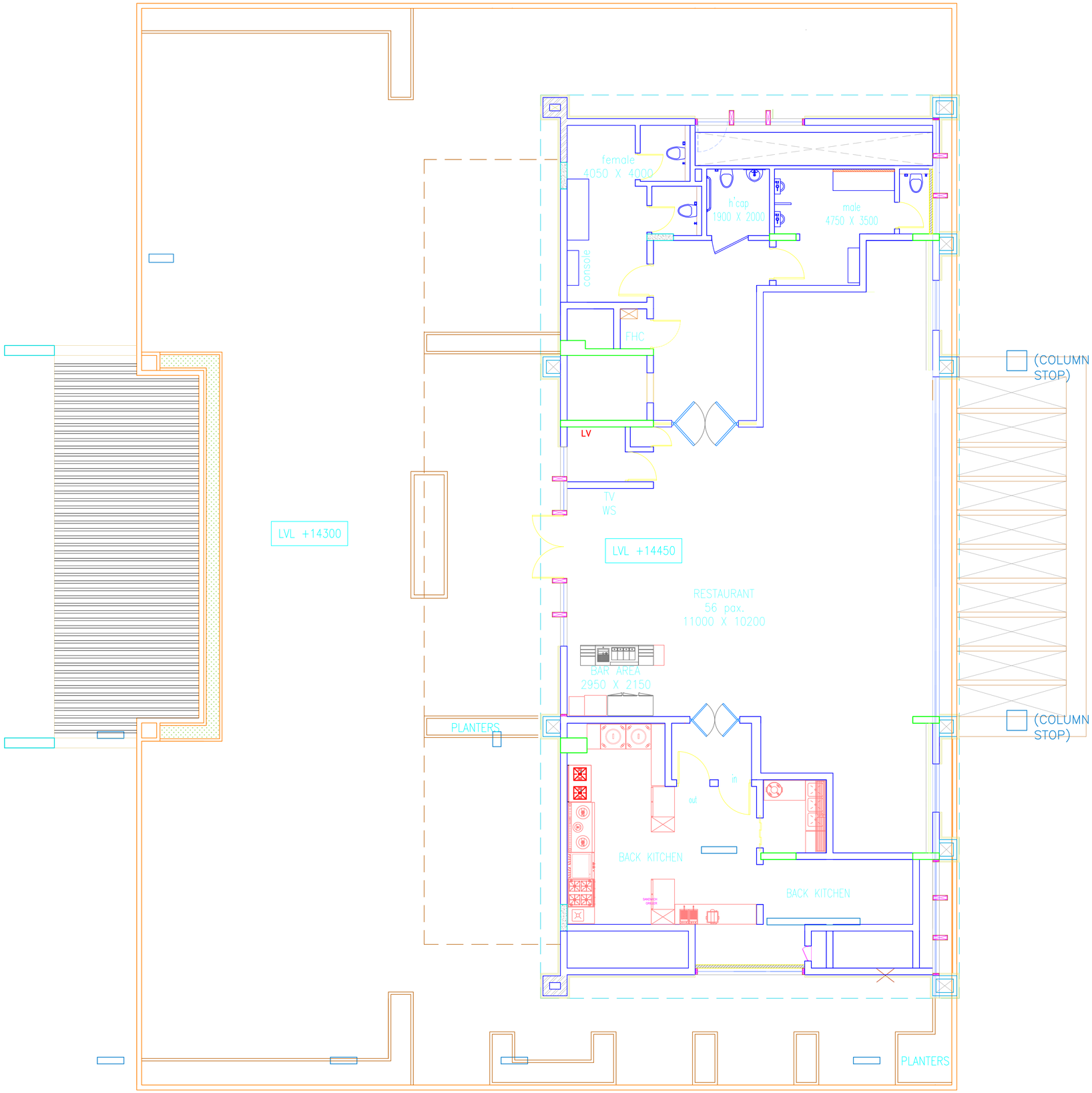


FIRST FLOOR

Scale: 1:75

GROUND FLOOR

Scale: 1:100



SECONDFLOOR (RESTAURANT)/TERRACE PLAN

Scale: 1:100