MANIPAL UNIVERSITY JAIPUR

REPORT ON TAPI BAORI

Architectural Documentation on Tapi Baori of Jodhpur

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TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

The desert city of Jodhpur was founded in 1459 AD since then the water structures of various types have been employed to harvest rainwater to make the region hospitable throughout the year.

Jodhpur, like many cities in India, is a city of lakes. It is one of the well-known, tourist attraction destinations in India. The interconnected water architecture system of the region was designed to conserve the minimal water available through rainfalls, and conserved it as reliable water resources through baoris, kunds and lakes.

Figure 1: The Gulabsagar seen against the cityscape of Jodhpur

Figure 2: Worship at the Ranisar during Gangaur festival

Source: (Thilak)

Heritage Water System of Jodhpur

Jodhpur has hills surrounding Mehrangarh Fort and is a catchment area for monsoon waters that flow down into small and large depressions, which in medieval period converted them into lakes from where water was drawn to over hundreds of step-wells and jhalaras.

The city heritage was not just great in art and architecture but also skillfully managed the water resources of the region. This made it possible to supply water through a gravity-led system. A vast network of lakes and canals were built in the hills around the city, while wells, bawaris, jhalaras and tanks became a common feature in the plains. Rainwater stored in the lakes uphill percolates through aqueducts or underground channels to recharge wells and stepwells."

The city's water management system was so calculated that the city was able to quench the thirst of its inhabitants till 1950s through a complex network of lakes, step-wells, wells and jhalaras. (singh)

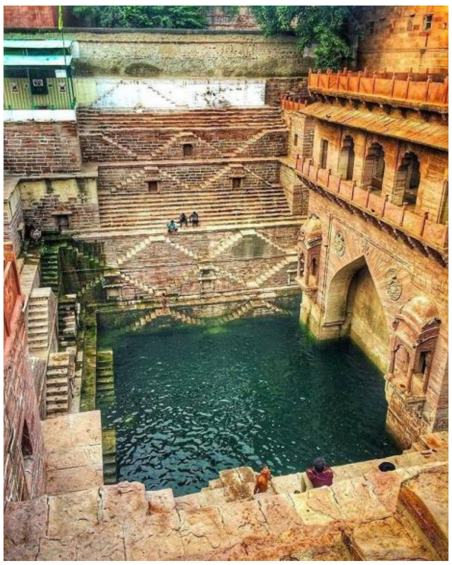


Figure 3: Tunwarji ka Jhalra
Source: (singh)

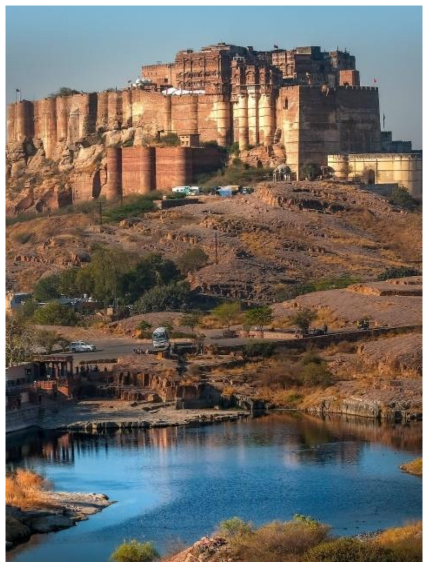


Figure 4: A magnificent stepwell in Jodhpur.
Source: (Fort)

Water Crisis

In the recent past, Jodhpur, like other cities of Rajasthan, has let its water architecture collapse and fall victim to rapid urbanization and public apathy. However, these stepwells also went into disuse, when supply from the Indira Gandhi canal brought perennial water from the rivers in Punjab into this desert city. (N. Sridharan)

Today, many of these architectural marvels that also double up as one of India's oldest rainwater harvesting systems lie dilapidated.

Historic waterbodies now lie covered in the garbage or have been destroyed by encroachments. Channels that transported water from lakes outside the city to tanks within for public use even as recently as the mid-twentieth century have also been destroyed, leading to the degradation of the reservoirs.

Figure 5: the stepwells of Jodhpur

Source: (Somvanshi)

Stepwell / Baodi

A 1989 survey by the School of Desert Sciences found 48 stepwell / baoris in the city of Jodhpur.

The common English term ‘stepwell’ encompasses two main types of structures and their hybrids: the baodi, is typically sheltered stepped well where a deep well spilling into a rectangular tank is reached by descending levels of steps from one side, while jhalra are square open structures closer in shape to a stepped pond, with staggered stairs reaching down to the water from three or four sides. Baodi can hold water for a long time because of almost negligible water evaporation. The SDS surveyed 45 baodi - 16 inside the city and 29 outside.

Baodi was once at the center of the social life of the communities that used them. They provided fresh water to locals, it also provided refuge at night to travelers, traders, and pilgrims.

Figure 6: Chand Baori
Source: (Goverement, n.d.)

Figure 7: Raghunath Baori

Figure 8: Raghunath Baori

Source: (Water Heritage of Jodhpur – Then and Now)

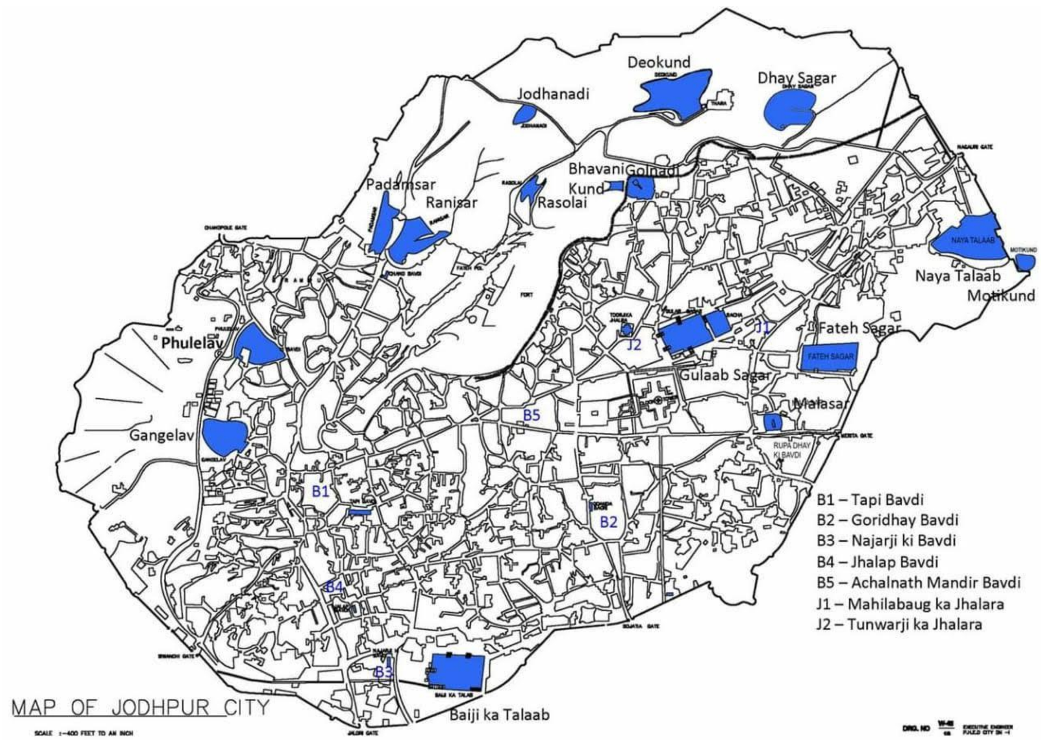


Figure 9: Map of Jodhpur city

Source: (Mallya)

Tapi Baodi

Despite being right in the heart of the old city, the crumbling multi-level rose-red sandstone the Tapi baori is completely hidden from the casual eye and is poignantly lovely.

Tapi Bawdi was built by Natho Ji Vyas, deewan of Maharaja Jaswant Singh l (founder of Jodhpur). Until tap water was introduced, Tapi Baodi provided Jodhpur's residents free clean drinking water for some 350 years. The baodi measures at 360 feet deep, 40 feet wide, and 250 feet long. (Heritage travel)

<u>Tapi Baodi</u>

Figure 10: Tapi Bawari first Pavalion

Figure 12: Tapi Bawari

Figure 13: Tapi Bawari Pavilion View 1

Figure 14: Tapi Bawari during raining season

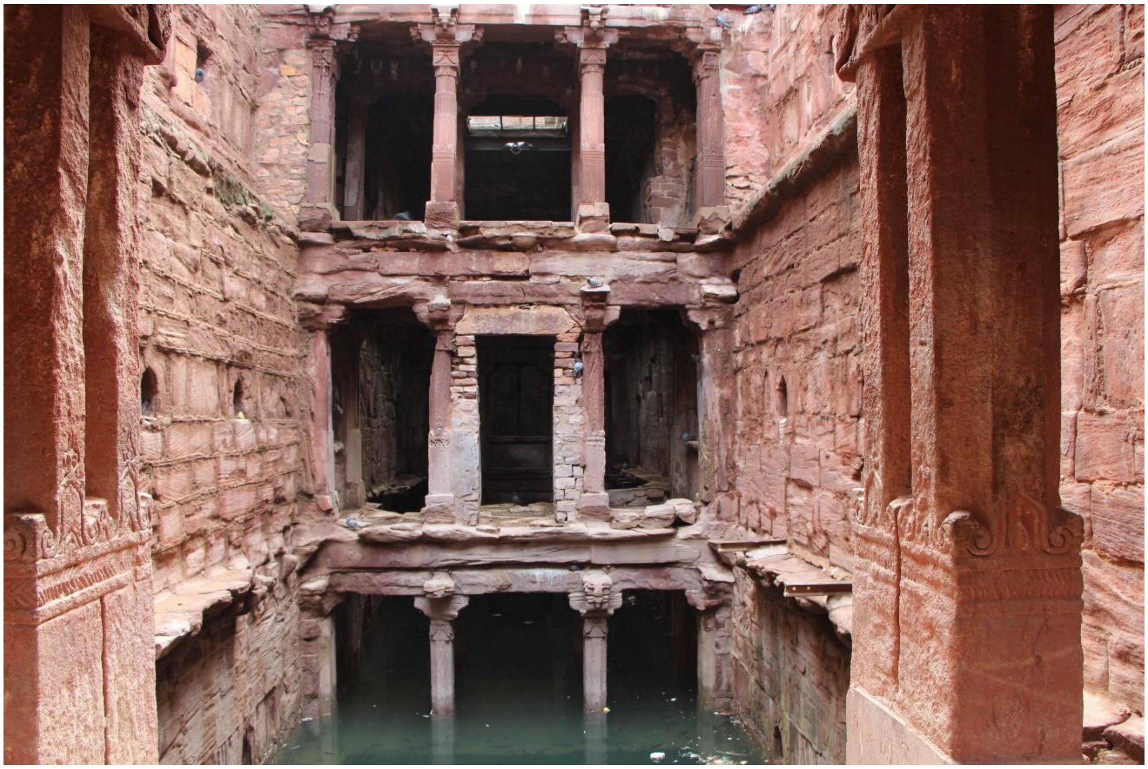


Figure 15: Tapi Bawari Pavilion View 2

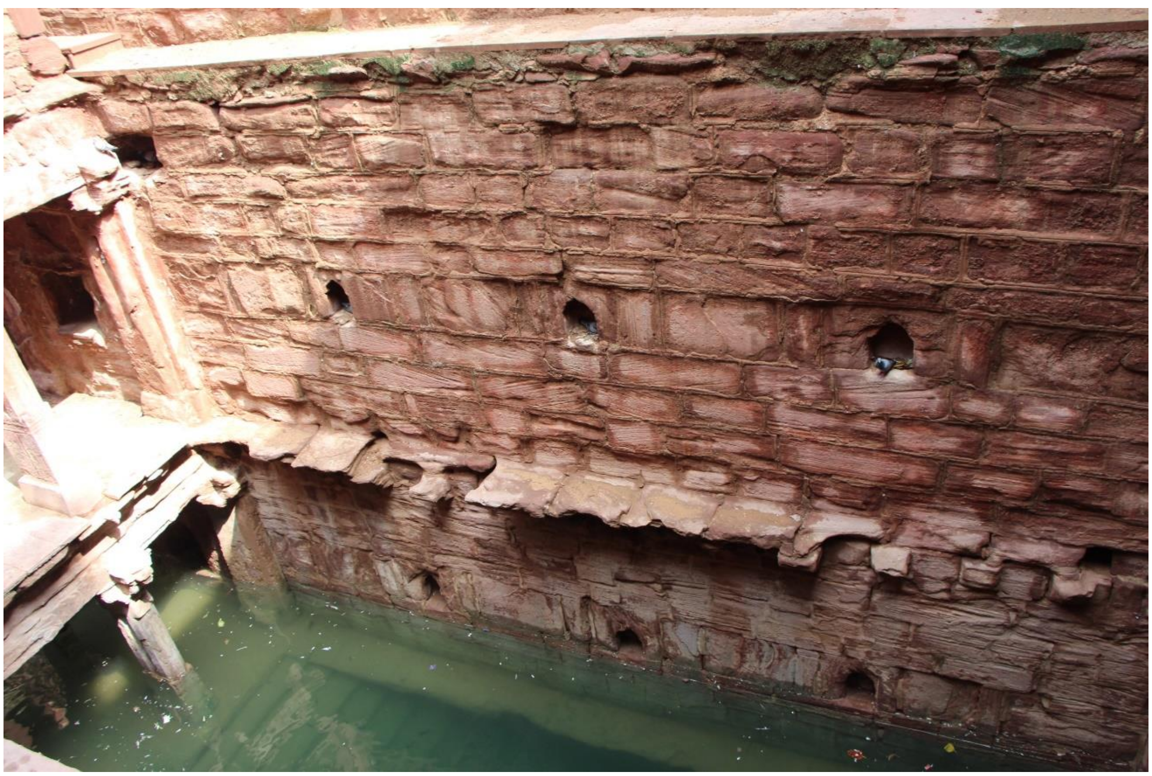


Figure 16: Tapi Bawari

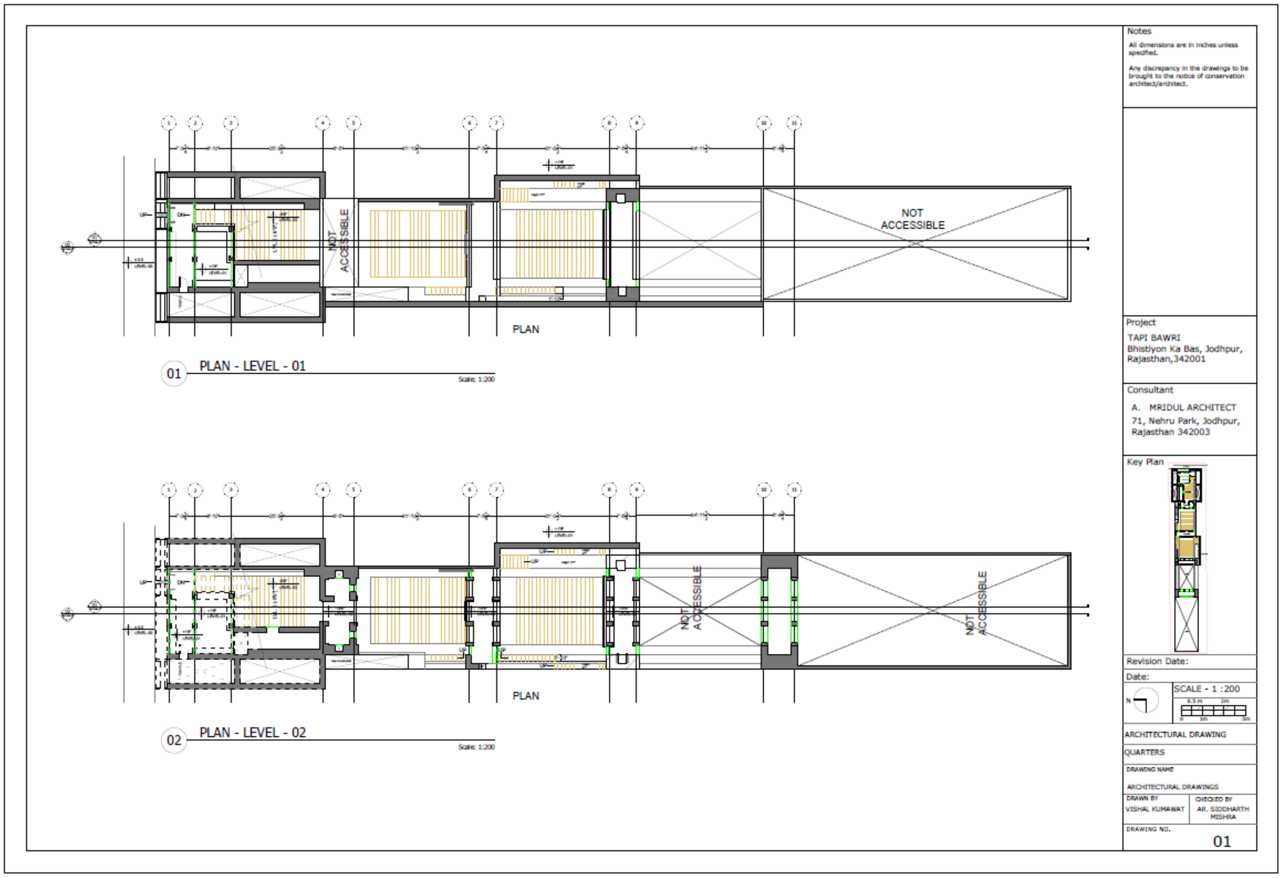
CHAPTER 2: ARCHITECTURAL DOCUMENTATION

The documentation of heritage buildings is a topic that has been discussed for a very long time to help safeguard valuable built heritage. It is usually the most fundamental and crucial process that can affect and facilitate any required procedures to preserve heritage buildings for the next generations. (Ahmed Khalil)

The documentation of heritage buildings also supports the development of a better understanding of the building's history; its historic socio-economic context, the building technologies employed, construction materials and, on a larger scale, our knowledge concerning its historic period and ancient societies. (Ahmed Khalil)

The Architectural drawings generated were used to assess the deterioration and structural damage. It also helped in identifying the character defining features of the Baodi to be protected and the documented. The measure drawings were also used to propose the restoration plan and help to implement the work through the same drawings.

Plan of Tapi Bawari



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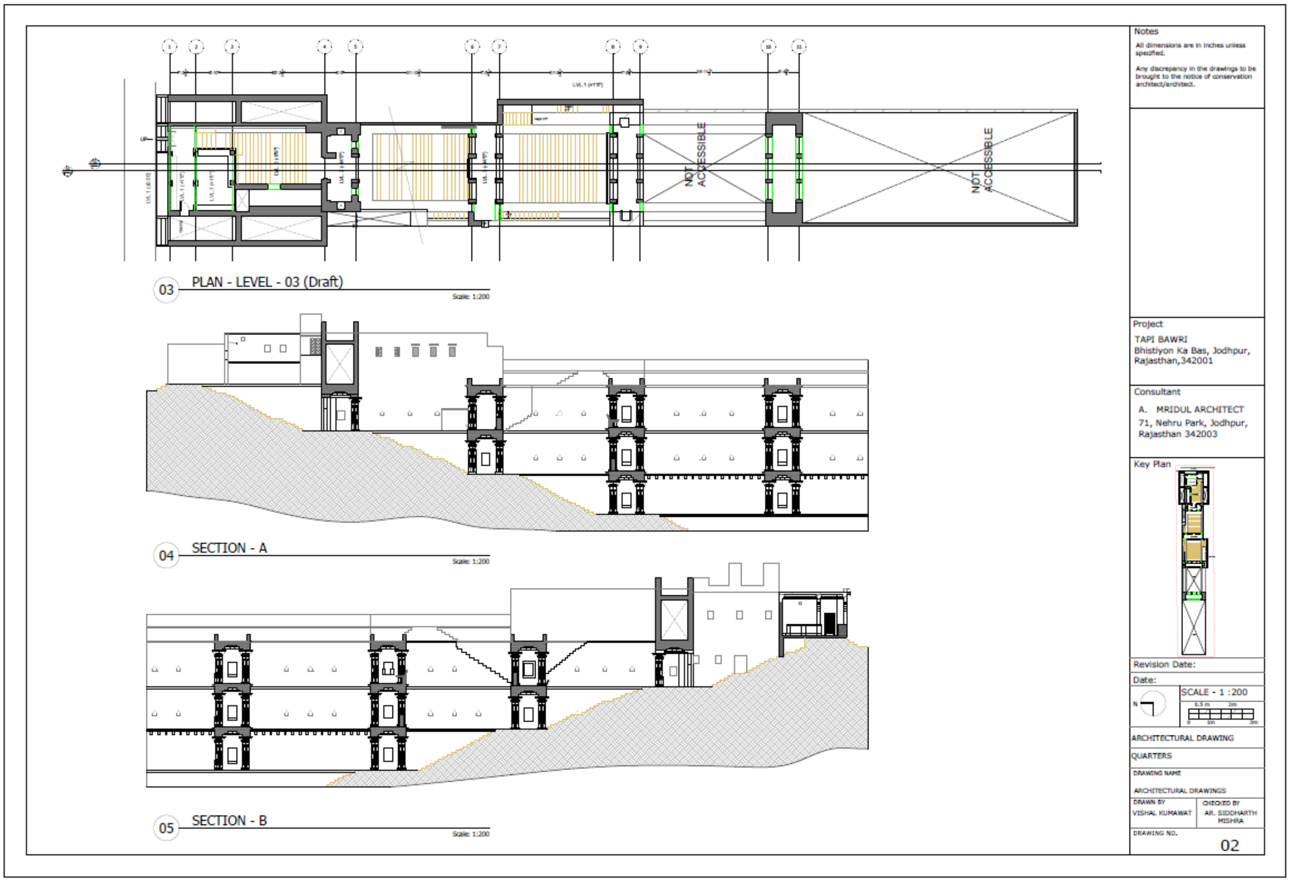
Elevation and Site Section of Tapi Bawari



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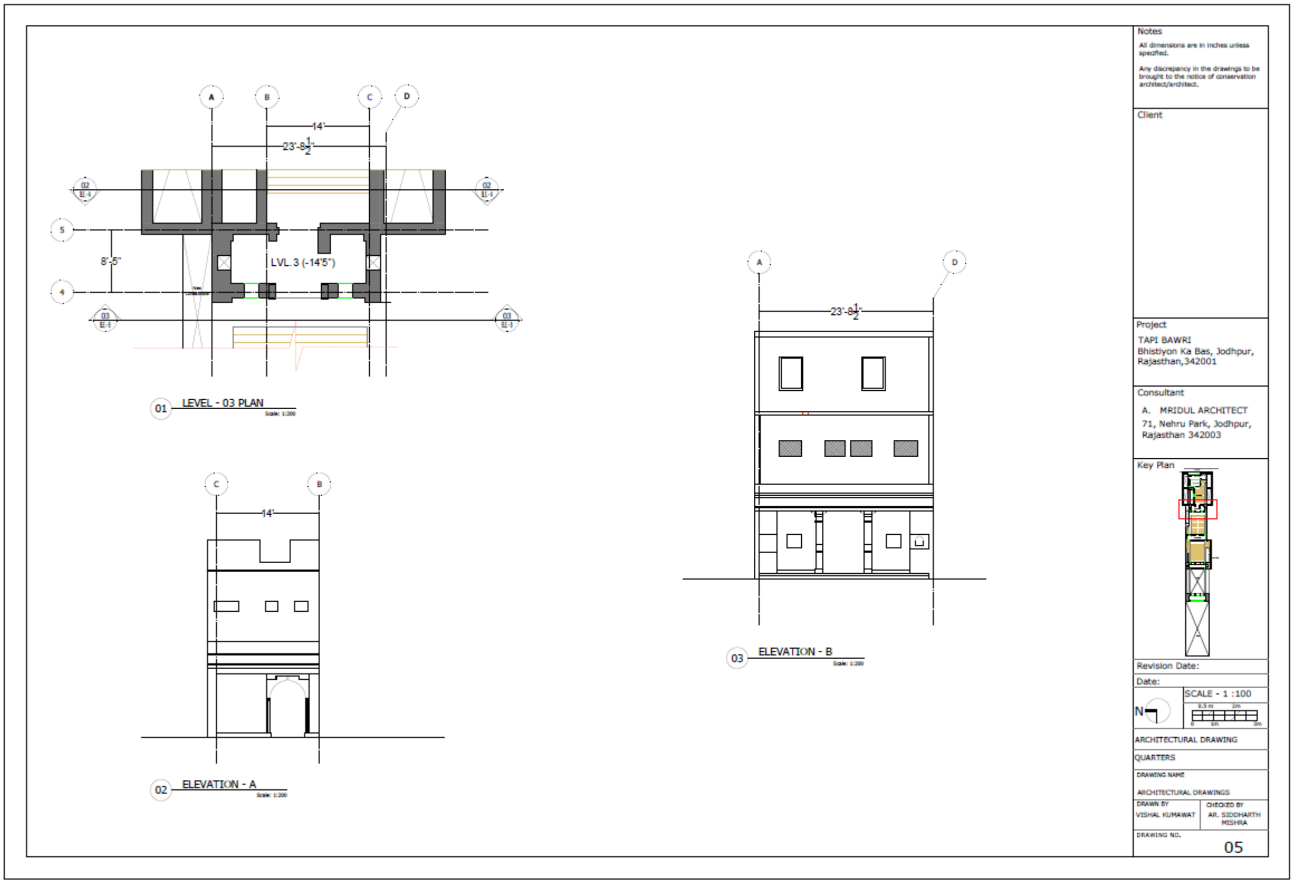
Bawari Entrance intervention of Tapi Bawari



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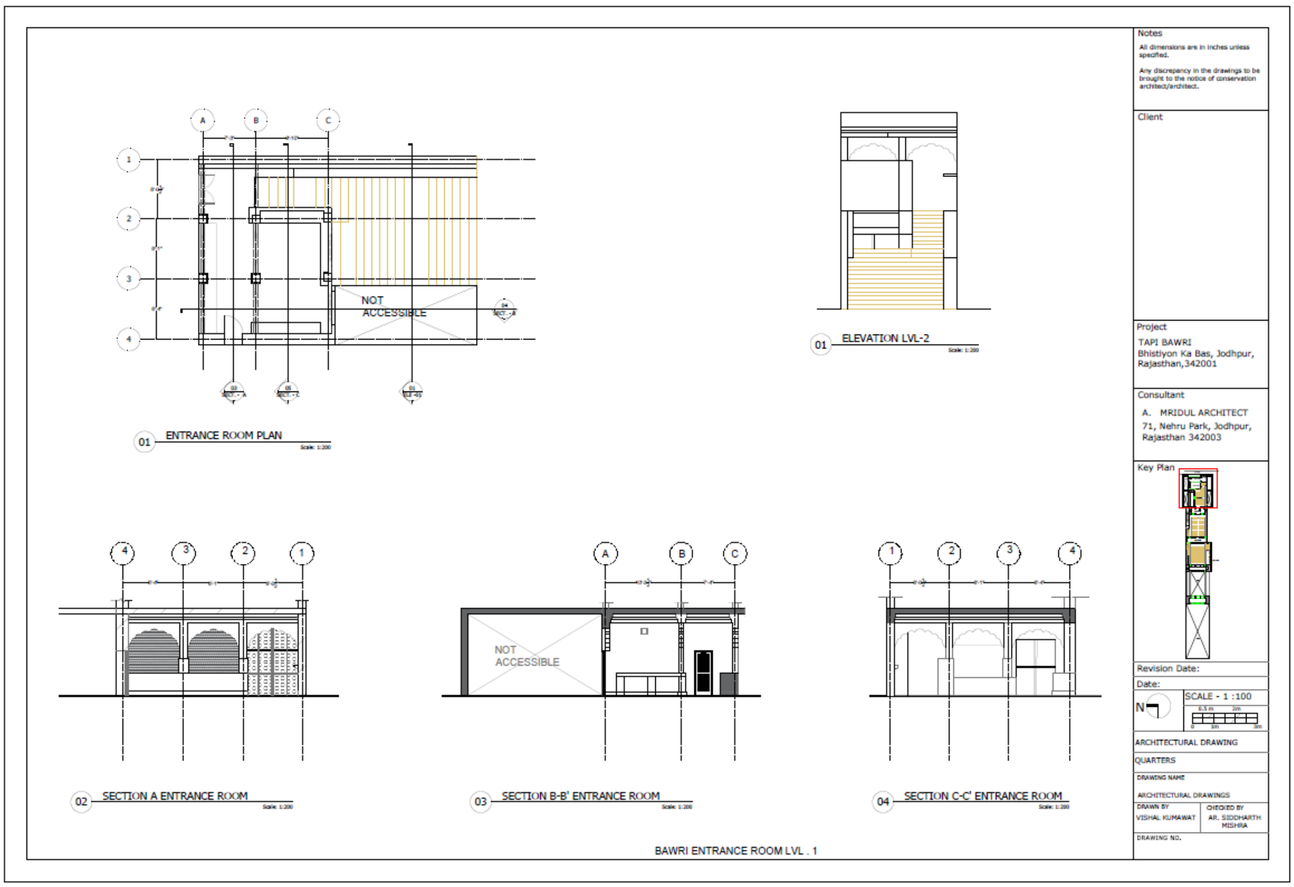
Plan of later intervention of Tapi Bawari



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CHAPTER 3: CONDITION ANALYSIS

The condition Mapping was the next level of documentation. All surfaces were examined with non – invasive methods to record the condition. Along with Visual inspections. Condition Mapping was conducted at different level from exterior elevations to interior surfaces of Baodi.

The base measured drawings were used to map and inventory the list of defects and deteriorations identified on inspection. These in turn helped assess the condition and inform the decision on the proposed remedies and repair of the defects.

DETERIORATION AND IT'S TYPE

The action or process of becoming impaired or inferior in quality, functioning, or condition: the state of having deteriorated. (merriam-webster, n.d.)

During the survey different type of Deterioration was encountered in the Tapi Baodi Heritage Structure.

(a) **Alterations: -** Modification of the material does not necessarily a worsening of its characteristics from the point of view of conservation. For instance, a reversible coating applied on a stone may be considered an alteration.

Causes:

- Factors unforeseeable at the early stage
- Total or partial change of use
- Change of ownership necessitating enlargement, extension, or other changes.
- Failure of building components
- Changing technological possibilities.
- Restoration of old monuments
- Wear and tear

Figure 9: Restoration of old monuments

(b) **<u>Alveolisation</u>: -** Formation, on the stone surface, of cavities (alveoles) which may be interconnected and may have variable shapes and sizes (generally centimetric, sometimes metric). Alveolization is a kind of is a differential weathering possibly due to inhomogeneities in physical or chemical properties of the stone.

Cases:

- Change in physical and chemical properties of stone
- Loosing of masonry
- Human intervention
- Biological habitation

Figure 10: Change in physical and chemical properties of stone

(c) **<u>Biological Deposits: -</u>** Colonization of the stone by plants and organisms such as birds, fishes', bacteria, cyanobacteria, algae, fungi and lichen (symbioses of the latter three). Biological colonization also includes influences by other organisms such as animals nesting on and in stone.

Cases:

- Vacant Spaces
- Sheltered Areas for Organisms
- Comfortable Environment
- Niches And Grooves Acting as safe Zones
- Small Cracks Act as Good Hiding

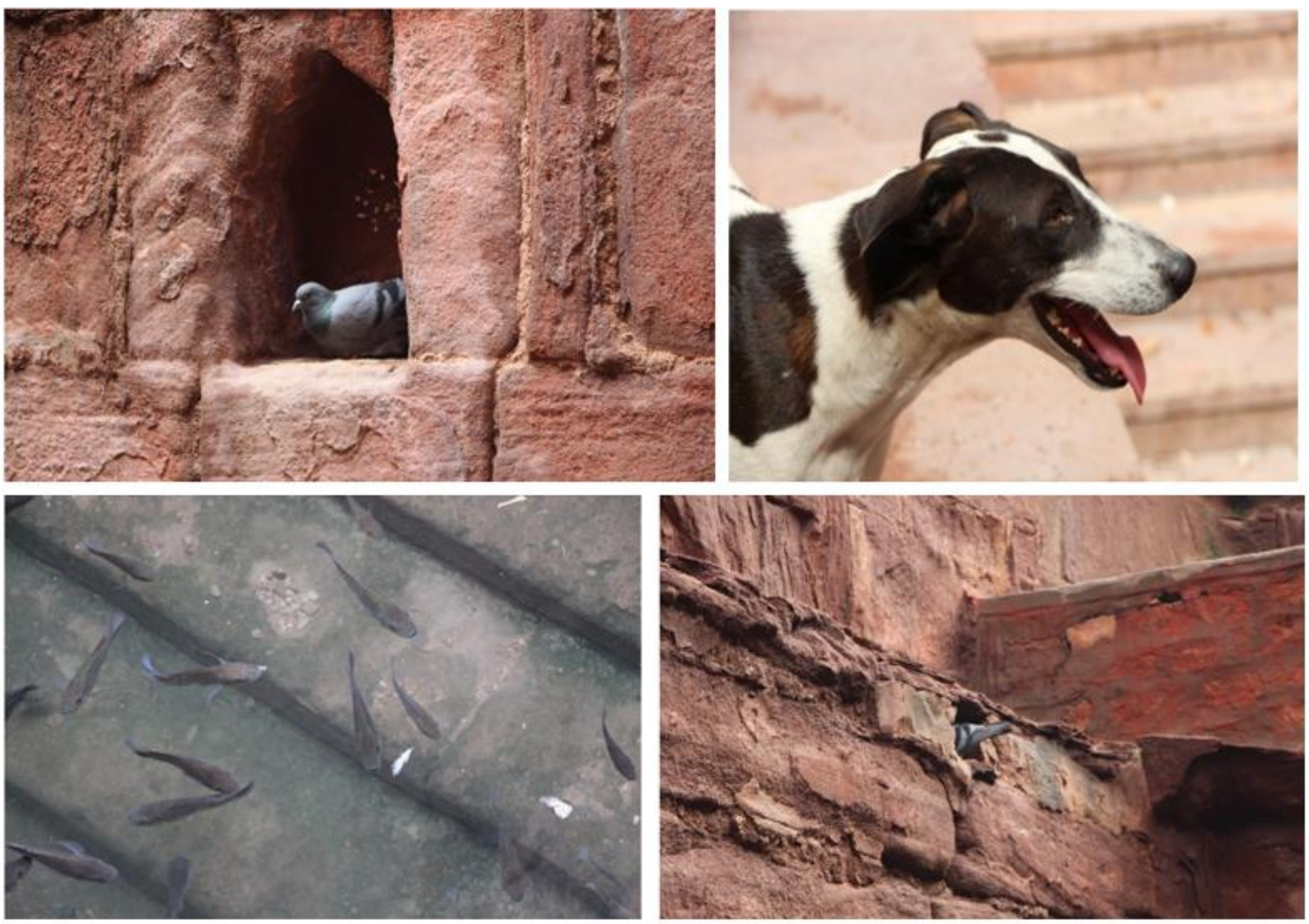


Figure 10: Sheltered Areas for Organisms

(d) **Blistering: -** Separated, air-filled, raised hemispherical elevations on the face of stone resulting from the detachment of an outer stone layer. This detachment is not related to the stone structure.

Cases:

- Moisture change
- Elastic deformation
- Change in temperature
- Corrosion of reinforcement
- Vegetation growth

Figure 11: Elastic deformation

(e) **Cracks: -** Individual fissures, clearly visible by the naked eye, result from the separation of one part from another. - Fracture: Crack that crosses completely the stone piece - Star cack: Crack having the form of a star. Rusting iron or mechanical impact are possible causes of this type of damage. - Hair crack : Minor crack with width dimension < 0.1 mm

Cases:

- Exposure of surface
- Natural wear and tear

Figure 12: Natural wear and tear

(f) <u>Debris: -</u> Scattered pieces of rubbish or remains. It also includes loose natural material consisting especially of broken pieces of rock.

Cases:

- Demolition
- Chipping
- Lack of maintenance
- Accumulation of chipped material

Figure 17: Debris

(g) <u>Delamination: -</u> Detachment process affecting laminated stones (most of the sedimentary rocks, some metamorphic rocks). It corresponds to a physical separation into one or several layers following the stone laminae. The thickness and shape of the layers is variable. The layers may be oriented in any direction regarding the stone surface.

Cases:

- Weathering
- Incorrect orientation of stones
- Natural phenomena
- Exposure of material for long periods

Figure 18: Different layers of stone is visible due to exposure to weathering

(h) **Deformation: -** Change in shape without losing integrity, leading to bending, buckling, or twisting of a stone block.

Cases: • Stress

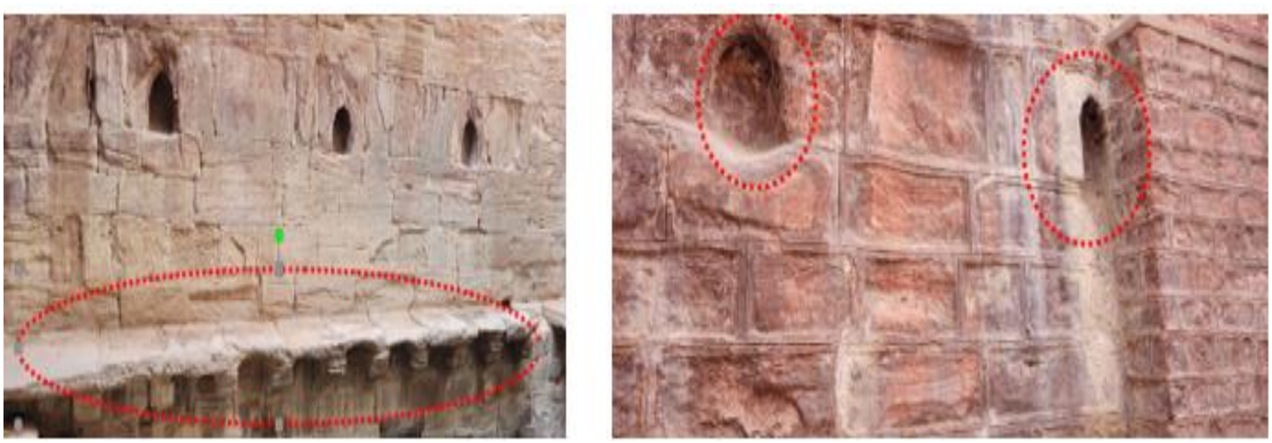


Figure 19: Stress Deformation

(i) <u>Discoloration: -</u> Change the stone colour in one to three of the colour parameters: hue, value and chroma. - hue corresponds to the most prominent characteristic of colour (blue, red, yellow, orange etc..). - value corresponds to the darkness (low hues) or lightness (high hues) of a colour. - chroma corresponds to the purity of a colour. High chroma colours look rich and full. Low chroma colours look dull and greyish. Sometimes chroma is called saturation

Cases:

- Water run off
- Cracks
- Fractures
- Holes

Figure 110:Discoloration

(j) <u>Erosion and Weathering: -</u> Loss of original surface, leading to smoothed shapes. Any chemical or mechanical process by which stones exposed to the weather undergo changes in character and deteriorate.

Cases:

- Excessive vibrations
- Improper floating tool
- Damp
- Mineral released iron oxidation
- High water table

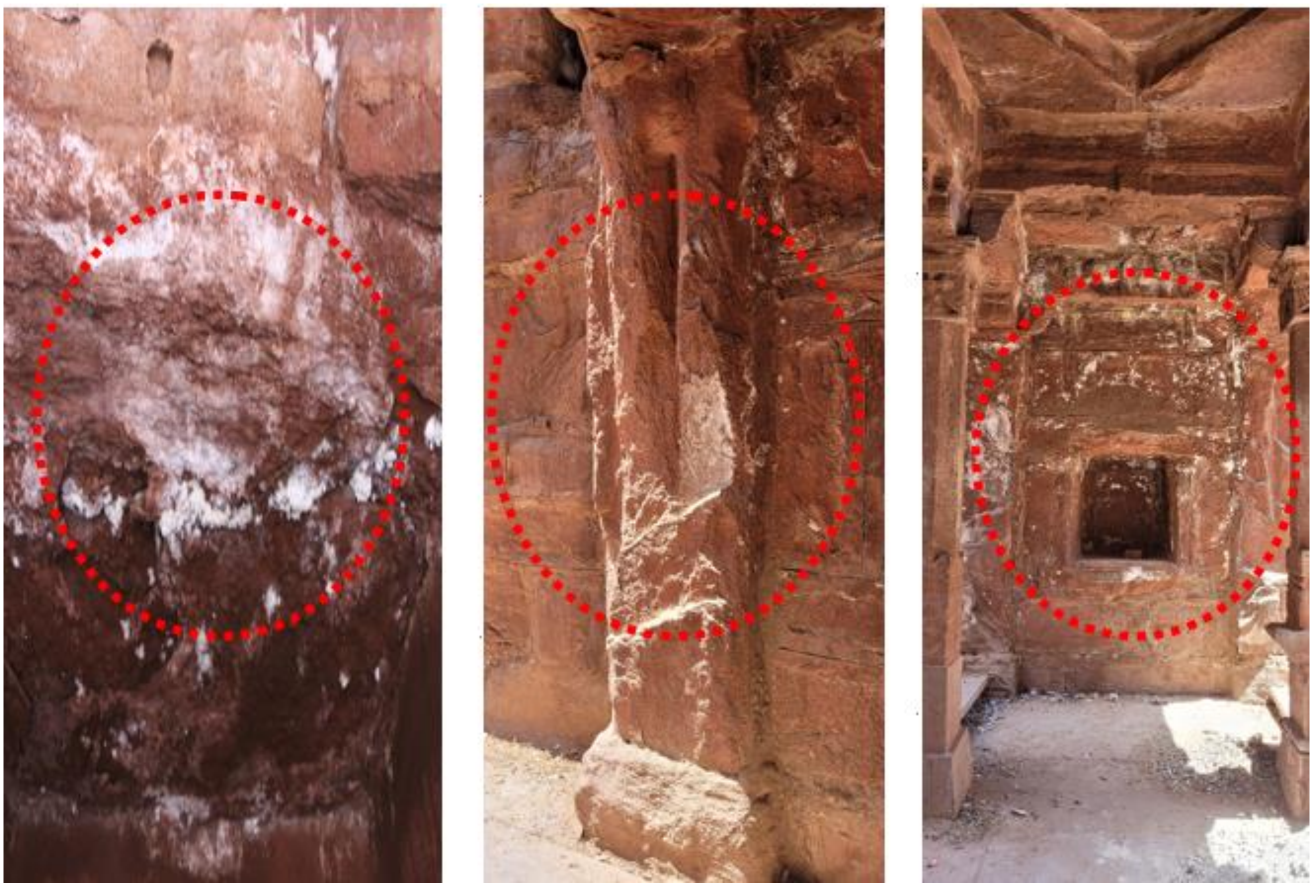


Figure 111: Erosion and Weathering

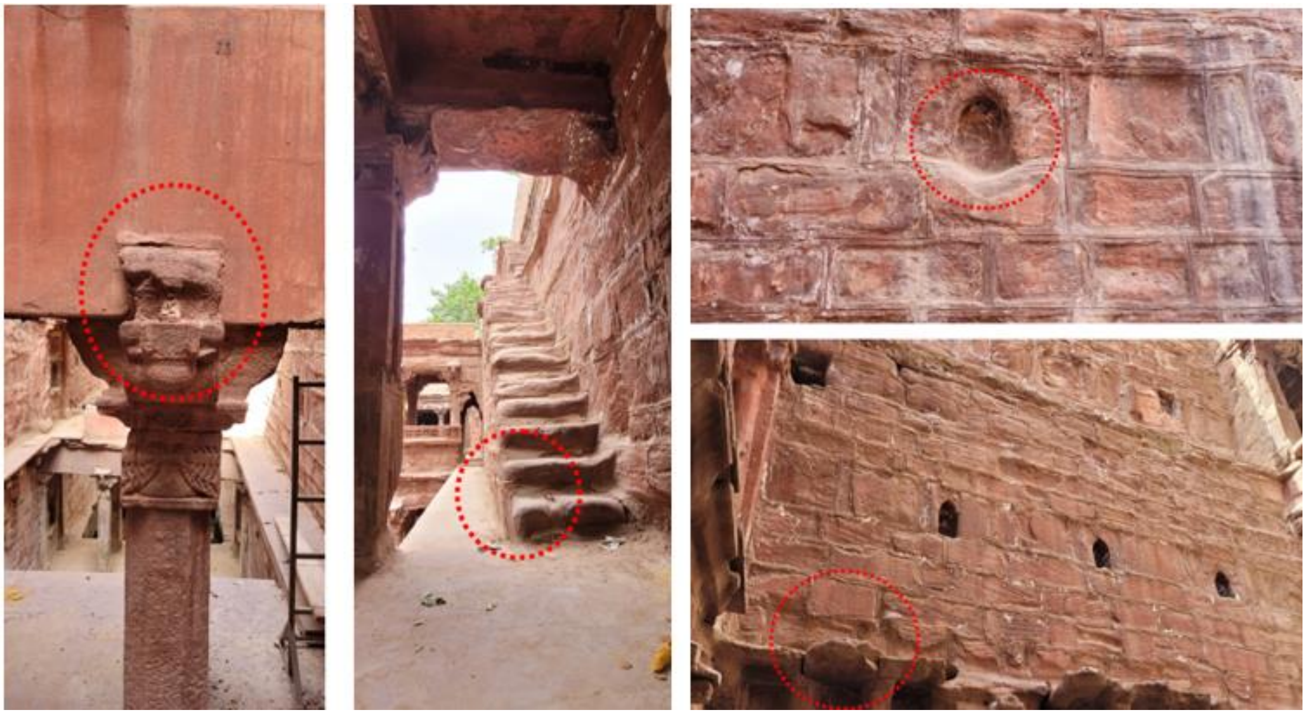


Figure 112: Erosion and Weathering

(k) <u>Graffiti: -</u> Engraving, scratching, cutting or application of paint, ink, or similar matter on the stone surface.

Cases:

- Human Intervention

Figure 113: Inking

(l) Later, Interventions: - Area in and around the Baodi was subjected to further construction. A temple was constructed in the periphery of the Baodi.

(1) Internal Intervention

Figure 14: Intervention

(2) External Intervention

Figure 15:Intervention

(m) Encrustation and Mikrokrast: - Network of small, interconnected depressions of millimetric to centimetric scale, sometimes looking like a hydrographic network. Microkarst patterns are due to a partial and/or selective dissolution of calcareous stone surfaces exposed to water run-off. Deposition of salt compounds on the walls.

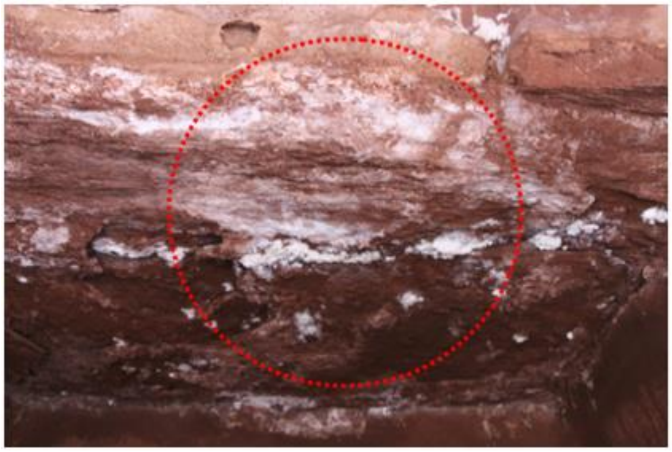
 

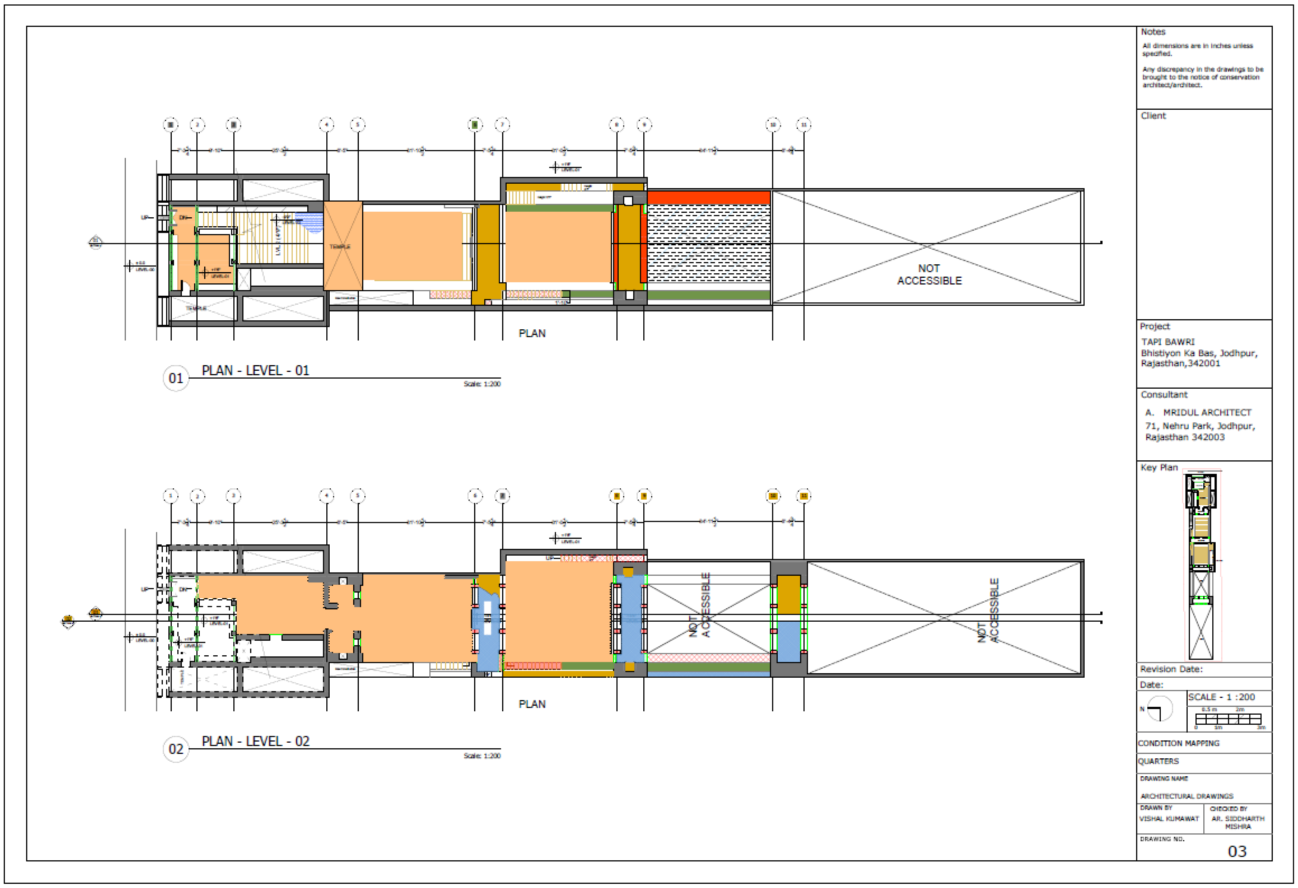
Figure 16: Microkarst patterns

(n) **Mechanical Damage: -** Loss of stone material clearly due to a mechanical action.

Cases:

- Impact damage
- Key
- Cut
- Scratch
- Abrasion

Condition Mapping Plan of Tapi Baodi



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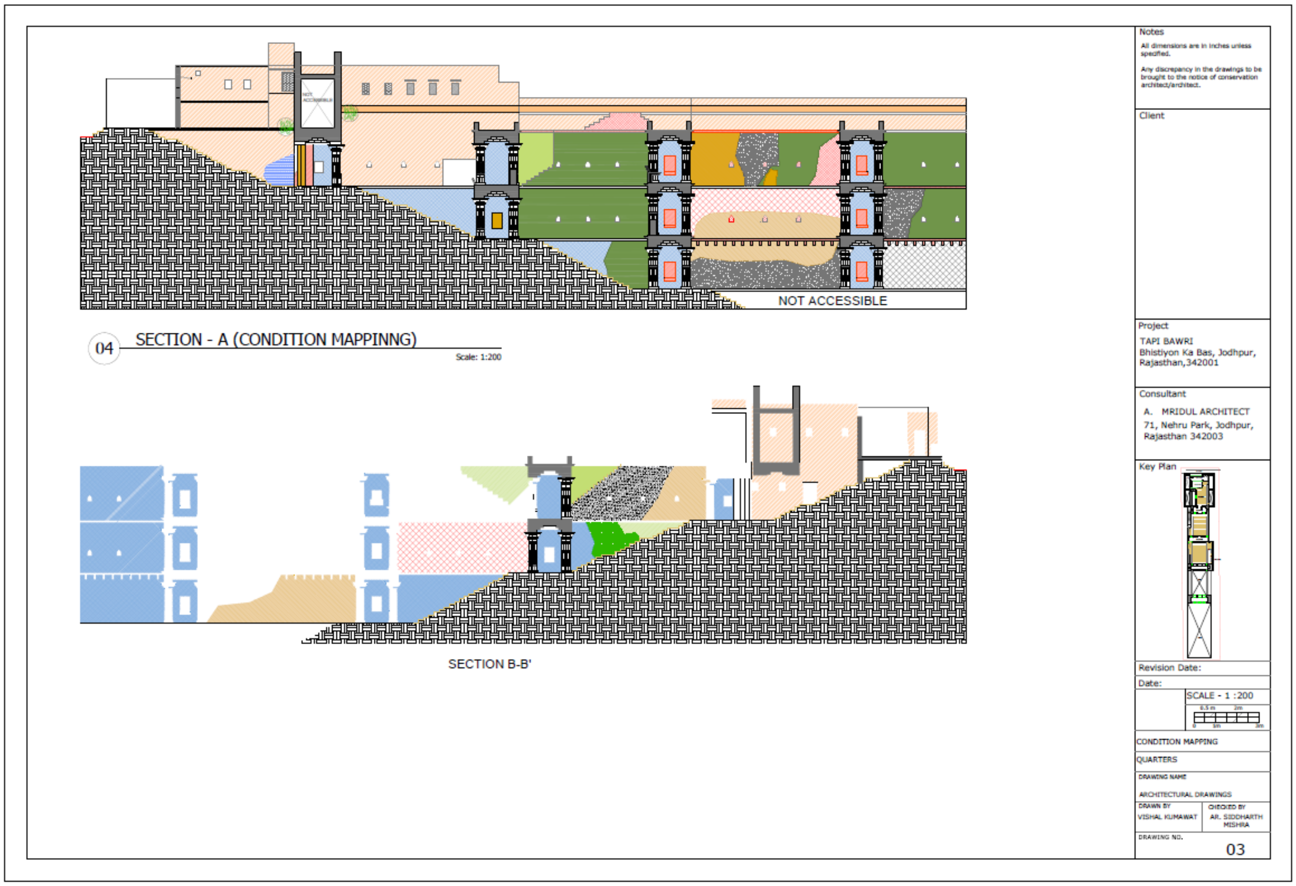
Condition Mapping Site Sections of Tapi Baodi



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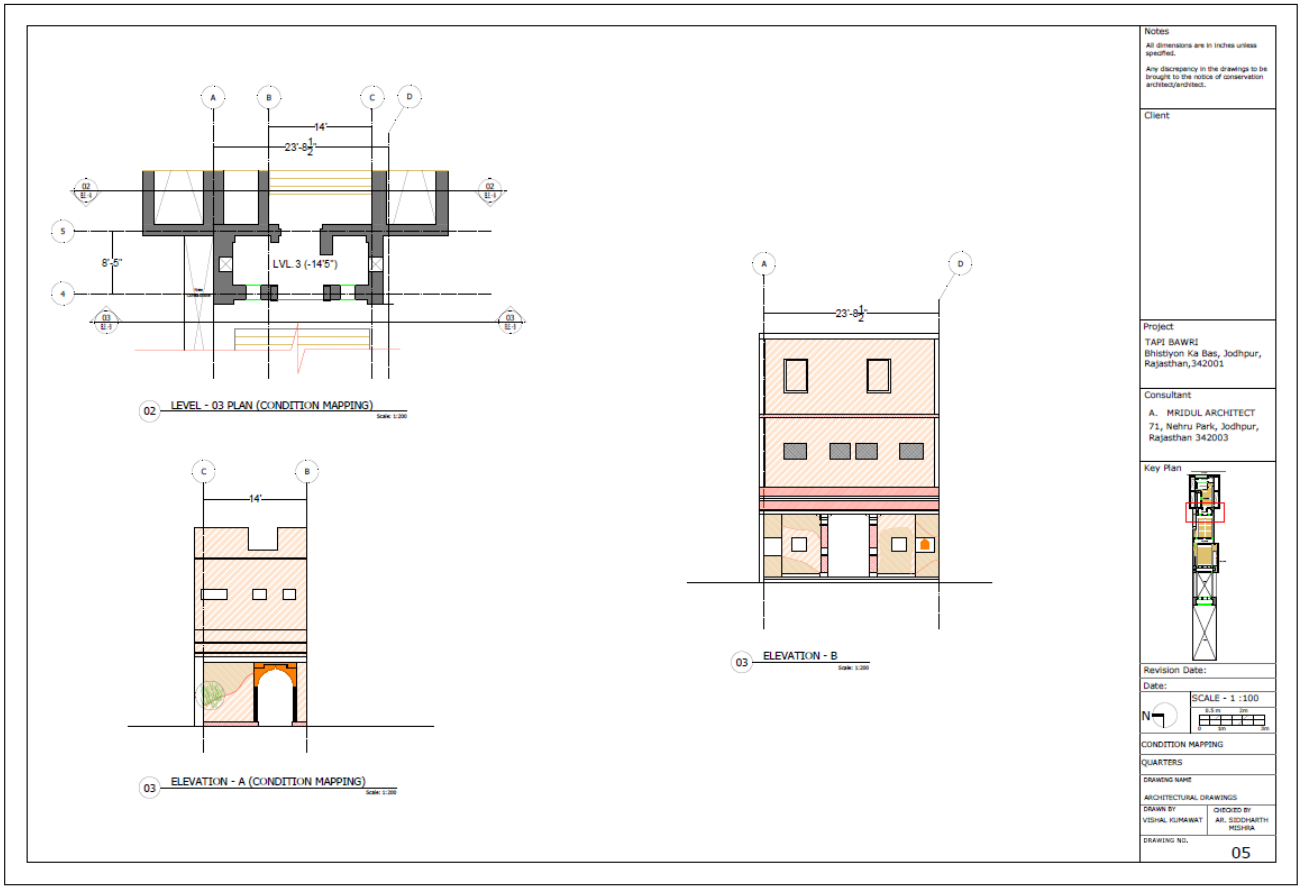
Condition Mapping Entrance of Tapi Baodi



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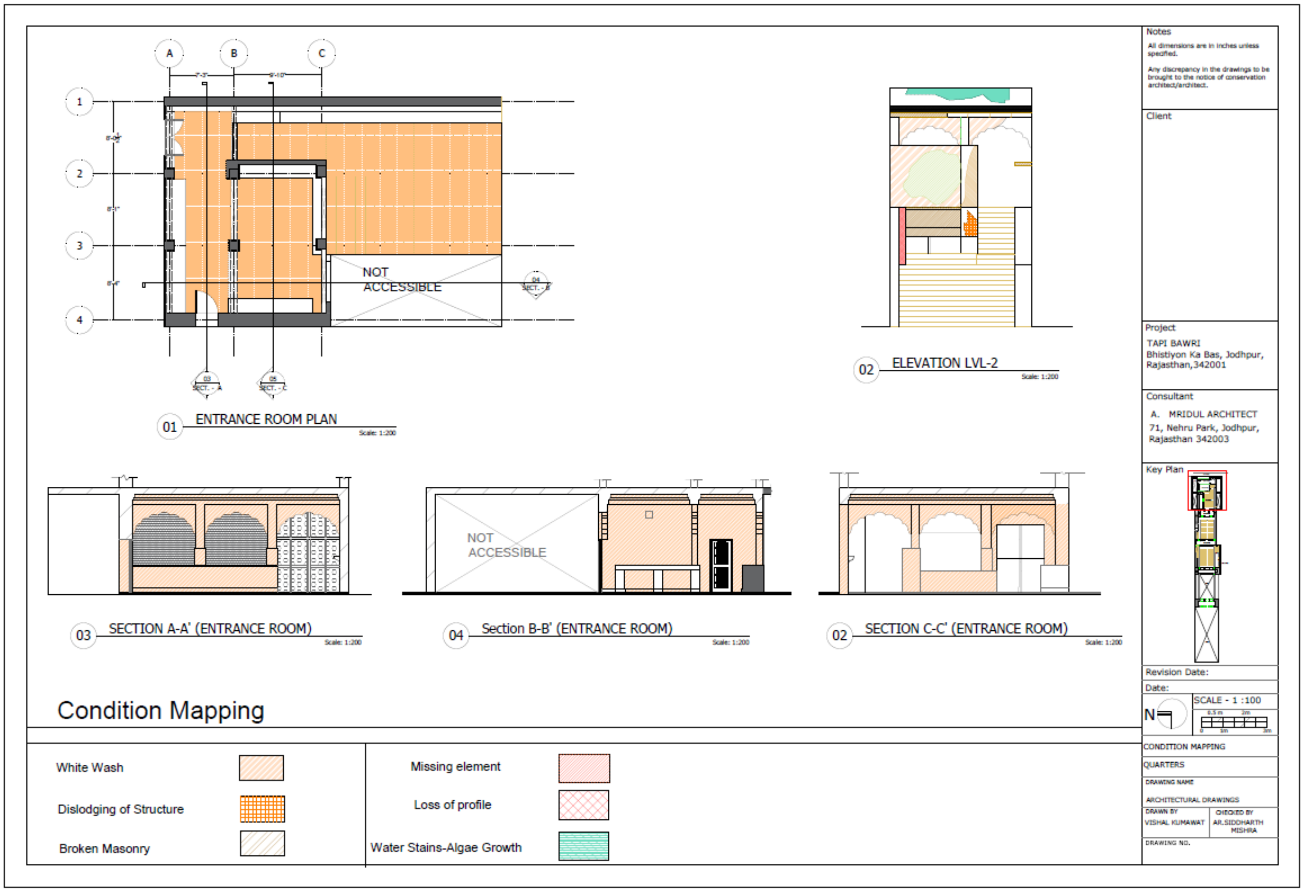
Condition Mapping later Intervention Temple of Tapi Baodi



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