Remnants of Culture

Birkha Bawari, designed by Jodhpur-based architect A. Mridul at Umaid Heritage, a township at the foothills of Umaid Bhawan Palace, is a contemporary reliquary of addressing cultural and ecological issues as a propitious incarnation alluding to the built heritage of 'Kunds' and 'Bawaris'.

Text: *Maanasi Hattangadi*
Writings & Data: *A. Mridul*
Images: *Paramjit Singh, DARIRC, New Delhi ; courtesy A. Mridul*

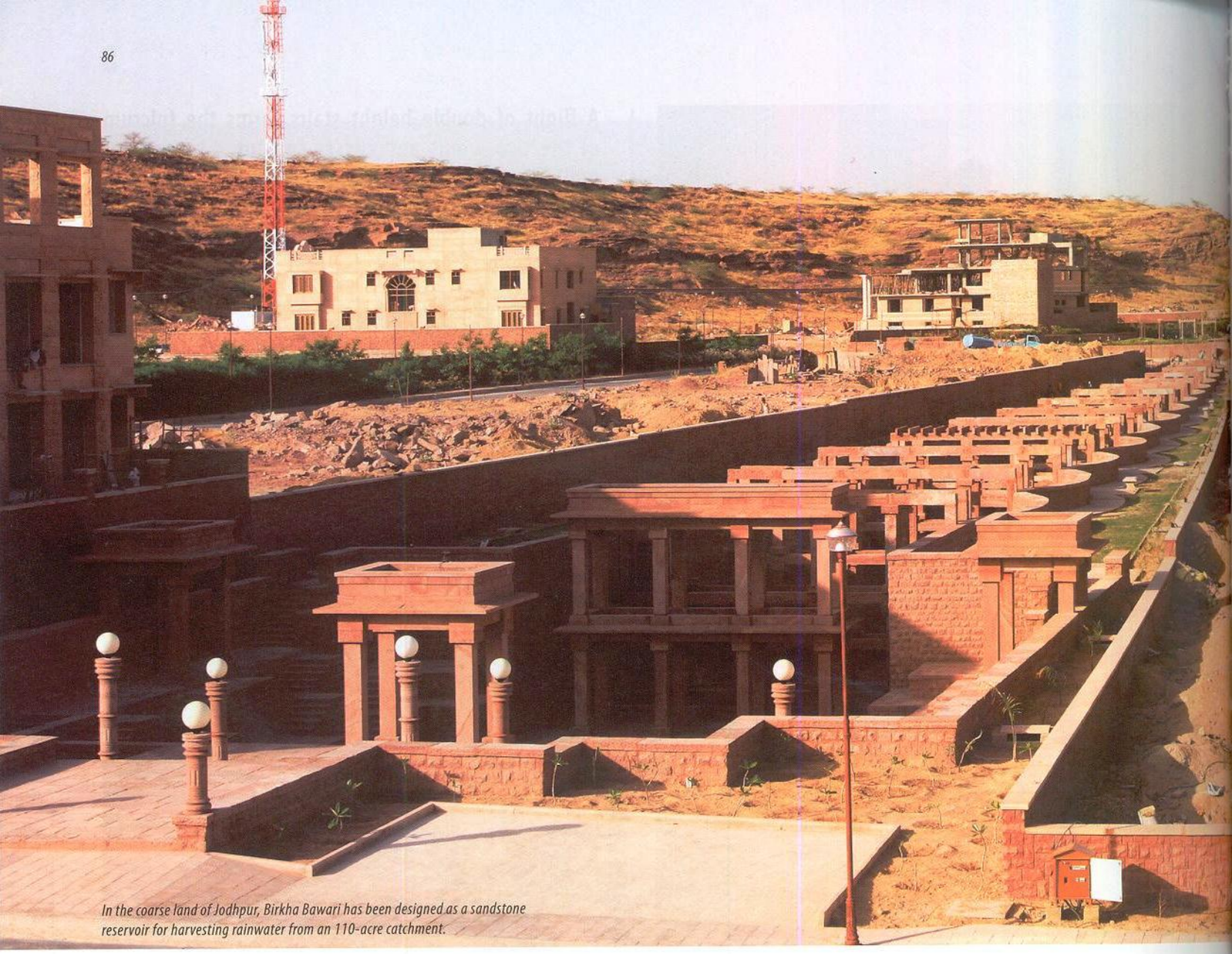
The reciprocal and sometimes antagonistic relationships between architecture, landscape and water form the resonant legacies of the different languages of how we inhabit our cities. Design has always taken its cues from such histories and ecologies. These nuances also situate cities of India within this collective - water is developed as an individual manner such as water is itself, as well as within its environmental context and within the frames of a polarity of a typical city like Jodhpur.

On one parched edge of the Thar Desert, Jodhpur revels in the immediacy and grandeur of monuments, blue laneways and a curious zest for life. The daily trials of life are dealt amid the sun-ravaged summers, where the temperature rises upto 48°C and is fraught with frequent sandstorms and unpredictable, low rainfall around an average of 300mm. Beyond dry and dusty everyday mundanities, its architecture has been privy to prescient disciplinary notions set by nature that question the limits of each construct and instil new flows of communication across them in order to address contemporary societal concerns. Today, at a unique crossroad when everyone is aiming to implement a vision for finding a balance between a culture of consumption and the need for protection of our natural ecosystems, the ironical discovery is that it has been always the way of life here.

A shell for emotional and physical existence of the ubiquitous preoccupation with preservation of water and the impact of its value – the thoughtfully designed 'Birkha Bawari' is a unique water-harvesting stone structure by A. Mridul, an architect based in Jodhpur.

In a picturesque setting, the Umaid Heritage Township expansive over 2km, sits lightly at the foothills of the Umaid Bhavan Palace. Complementing the historic fabric, the set of buildings shapes the urban living amidst Jodhpur sandstone finishes and endemic landscapes extending over half the stretch. Much like a diaphanous edge, Birkha Bawari as a sandstone reservoir for harvesting rainwater from an 110-acre catchment embraces its site physically and in consequence, is in one of the deeper troughs of the central core – enveloped in a sense of familiarity and undisturbed within the rhythms of the place.

As Antoni Gaudi once said, "Originality is returning to the origin". A place of seclusion and serenity, the visual narrative resembling the formal presence of traditional harvesting systems like 'Paar', 'Talab/Bandhis', 'Saza Kuva', 'Johad, 'Naada/Bandha', 'Rapat', 'Kuis/Beris', 'Jhalaras' in our collective imagination evolves into a modern ethic. Delving into the respository of the latent spirits of the vernacular as a point of both, arrival and departure, the architect says, "Bawari, in the vernacular, means a stepped well. Unlike



In the coarse land of Jodhpur, Birkha Bawari has been designed as a sandstone reservoir for harvesting rainwater from an 110-acre catchment.

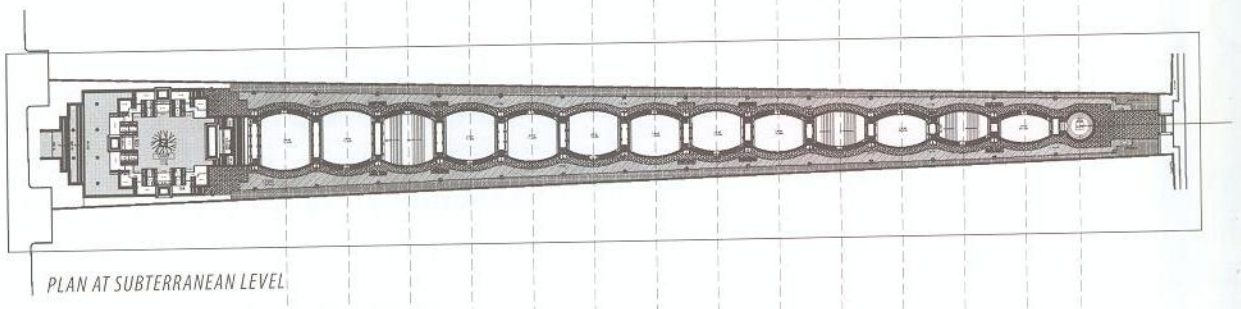
"In the semi-arid regions of Rajasthan and Gujarat, water was a scarce resource. Water from both, high-up in the sky and deep-down in the earth, was difficult to obtain. So, it was highly valued, respected, revered and almost worshipped. Intricately crafted well structures, step-ponds, step-wells and ponds were built to draw water from the earth or to collect water from the sky. Man brought to water the gift of his best skills in building structures to hold it. These exquisitely built structures to store and conserve water in these regions bear testimony to the worship-like value people attached to water. This survived through centuries, through changing times, changing regimes, till these regions remained water-scarce and arid.

In beginning of the last century, technological changes bore an illusive impression in the psyche of people of this region with regard to abundant availability of water. Canal-drawn river waters from neighbouring states and rainwater collected in dams were supplied in never-before volumes. Plentitude of piped water supply altered the concept of consumption and conservation of water.

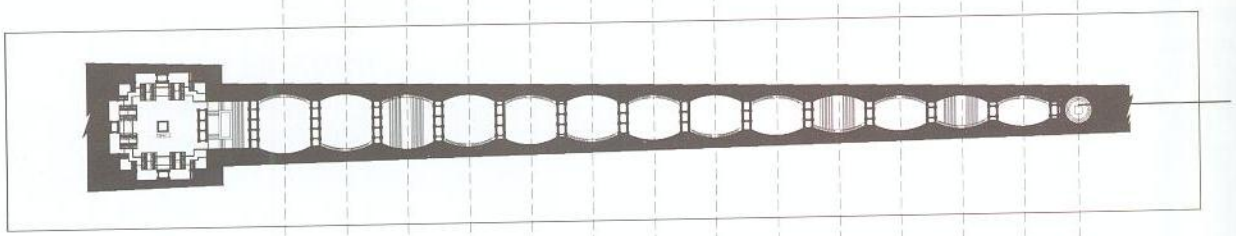
The new generations could never venerate water as it became easily available. The traditional water bodies were neglected, treated with contempt and banished to open sewers. The best of architectural structures of these regions were abandoned and were left to dilapidate. Temples of water turned into tombs of water.

That water would always be available in abundance soon proved to be a misconception. The government could not cope with the ever-escalating water demand of a proliferating population and its new developing needs. Both, government and public, started heavily drawing and draining groundwater. In the wake of ruthless groundwater exploitation leading to its depletion and ever-shrinking volumes of state-supplied water, realisation finally dawned that conserving rainwater by ancient wisdom is most relevant.

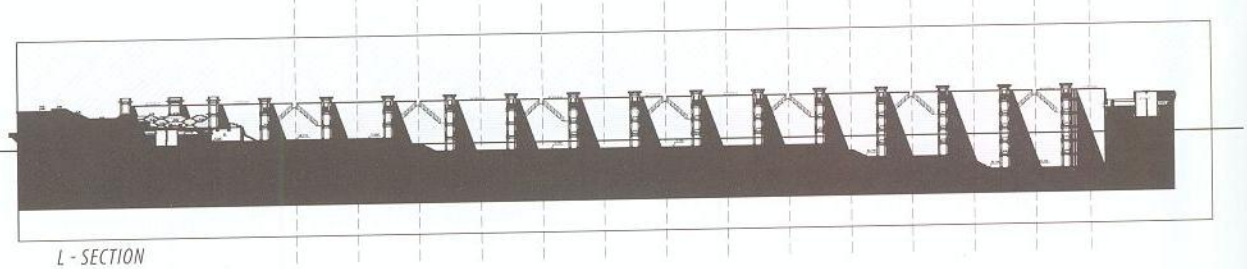
It was only in the last quarter of the 20th century that a slow, but determined, movement was initiated to preserve water-conserving structures and restore their value and glory. The movement gradually gained momentum and at the end of the century, the government mandated construction of rainwater harvesting structures through bye-laws. Notwithstanding the mandating through law and its weak enforcement, there are visionaries and committed people who have realised the importance of water conservation. One of the finest examples of this can be found in the creation of a unique water-harvesting stone structure, 'Birkha Bawari', in Jodhpur, a semi-arid region of Rajasthan. It kind of marks the return of the golden era of water harvesting structures." - A Mridul



PLAN AT SUBTERRANEAN LEVEL

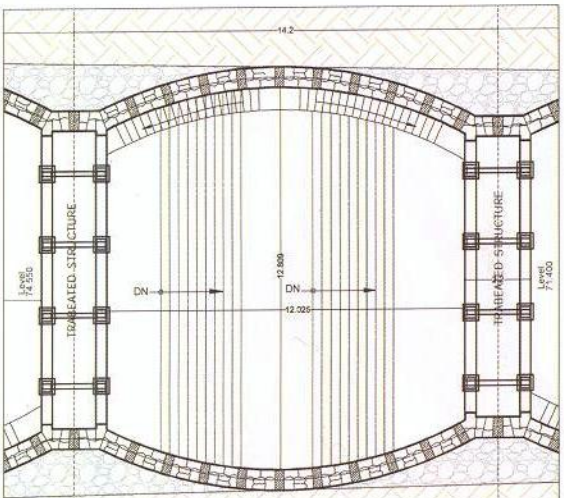


PLAN AT GROUND LEVEL

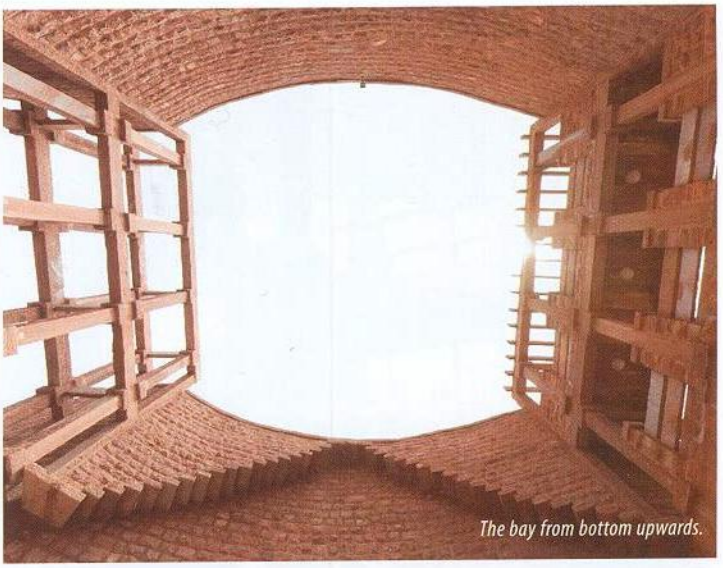


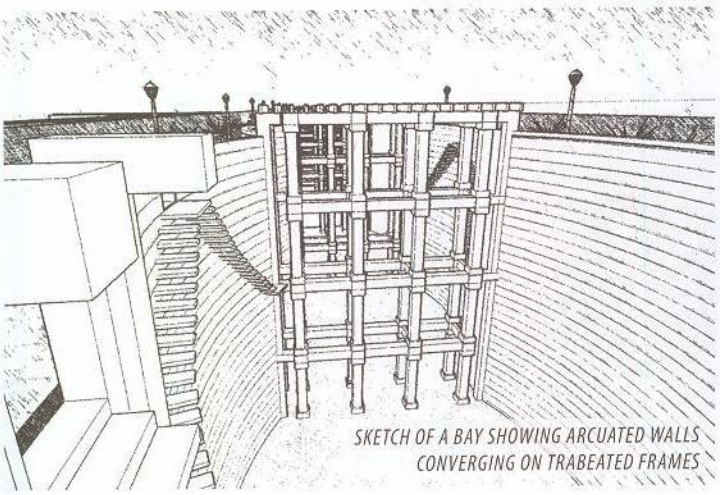
L - SECTION

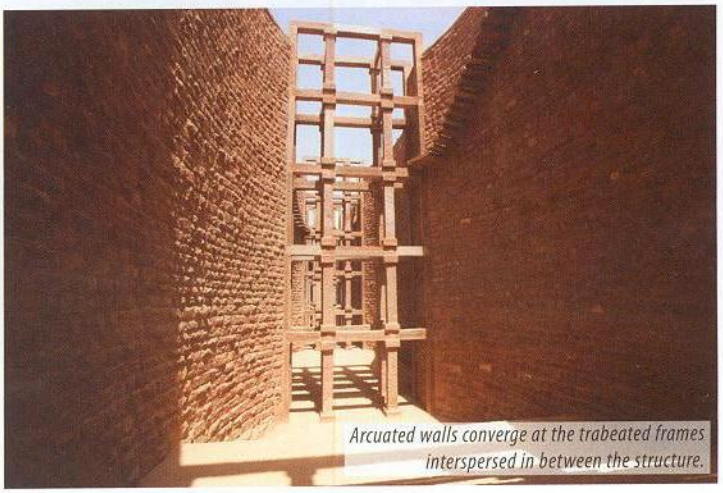
Set in Umaid heritage township, the construct explores one of the deeper troughs in the central core.



STRUCTURAL SYSTEM DESIGN OF A SINGLE MODULE OF BAYS


The bay from bottom upwards.


SKETCH OF A BAY SHOWING ARCUATED WALLS CONVERGING ON TRABEATED FRAMES

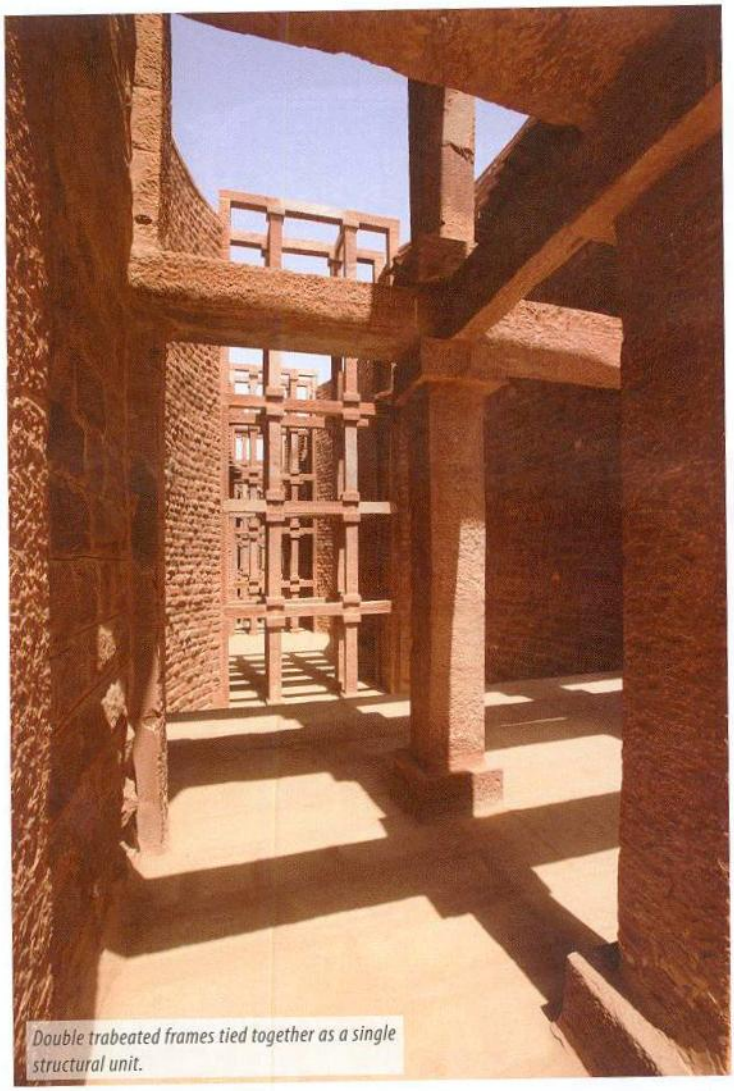

Arcuated walls converge at the trabeated frames interspersed in between the structure.

a cylindrical well, where water is drawn through Persian wheel or its equivalent, Bawari is a linear step-well, where steps lead down into the well water. 'Birkha', in local dialect means rain. Aptly enough, this unique step well-shaped rainwater harvesting structure has been named 'Birkha Bawari'.

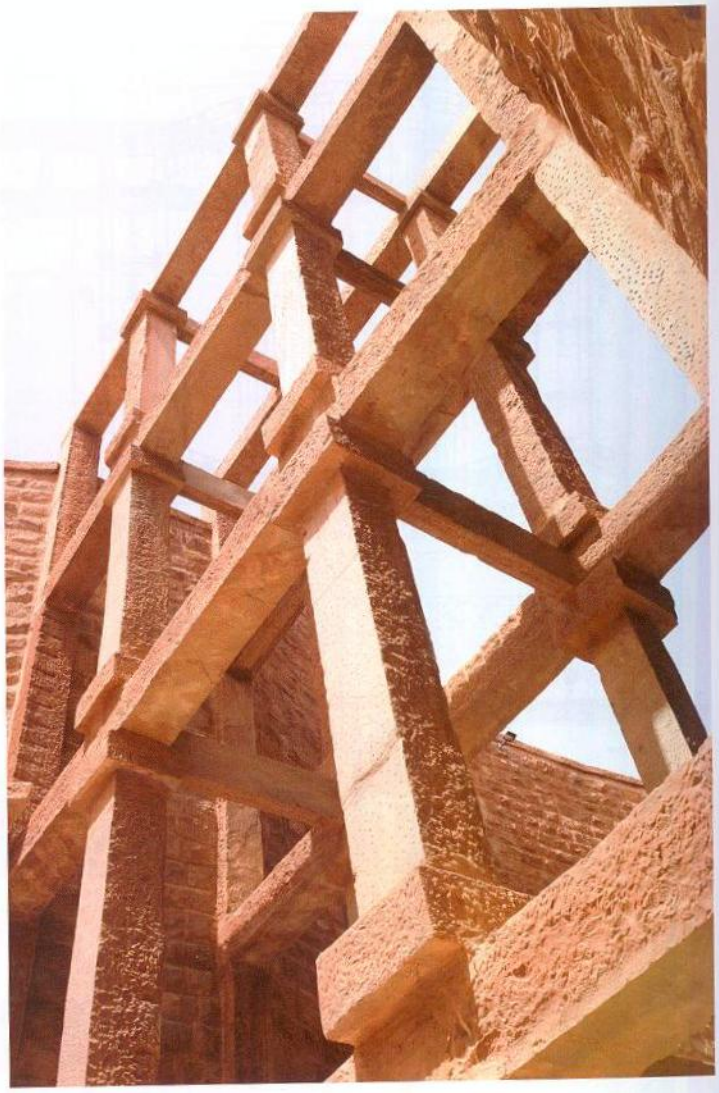
The centuries-old exquisite Bawaris of Rajasthan and Gujarat are brilliant examples of art, architecture and engineering, interlaced together. The design idea of 'Birkha Bawari' was inspired from that of myriad traditional 'Kund' (stepped ponds) and 'Bawari' or 'Vav" (stepped wells). Though there may not be examples of both forms in simultaneity, 'Birkha Bawari', essentially a water-harvesting structure, has been designed as a unique combination of 'Kund' and 'Bawari'. The former is only symbolic, to be used as a forecourt and grand entrance into the earth and the latter." The interpretation of the design has been striking in many ways and it is rewriting of history as designers. It is looking at the same possibilities, but has a complete different reading of them.

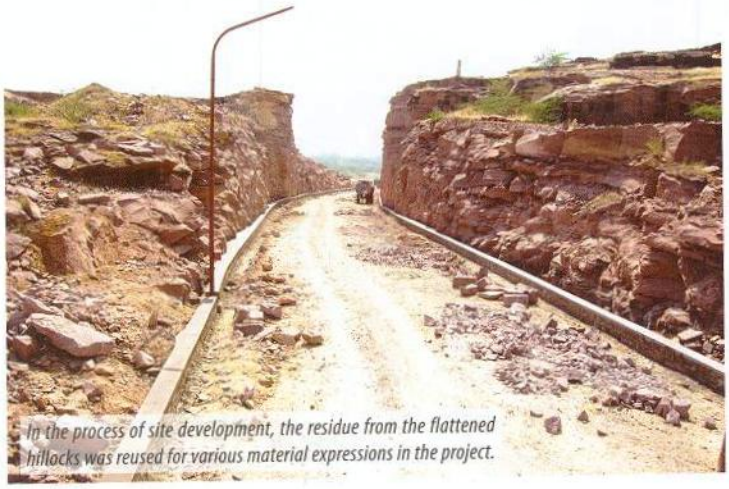
The initial encounter is arcane, shyly grand. The architecture is a spontaneous process and receptive to the surroundings – explorating gently as six storeys of depth at the farthest end perforate its surface and around 18m below the surrounding ground. The formal construct is over 224m in length, average 10.5m in width with an average depth of 11m from ground level and an average water depth of 7m. The mass was open to modification from two conceptual

> "A novel composite structure for the subterranean reservoir has been created by a series of segments of such 'vaulted walls' placed opposite one another and held against each other by a trabeated (post and beam) structure. The vaults on opposite sides nullify each other's thrust and counter-balance each other. The thickness of these arcuated 'vault like' walls is merely 0.7 metres, very slender relative to the average thickness of a conventional dam-like retaining wall. Consequently, minimum excavated space was displaced by the structure of the step-well, allowing for a larger volume of water storage." - A. Mridul

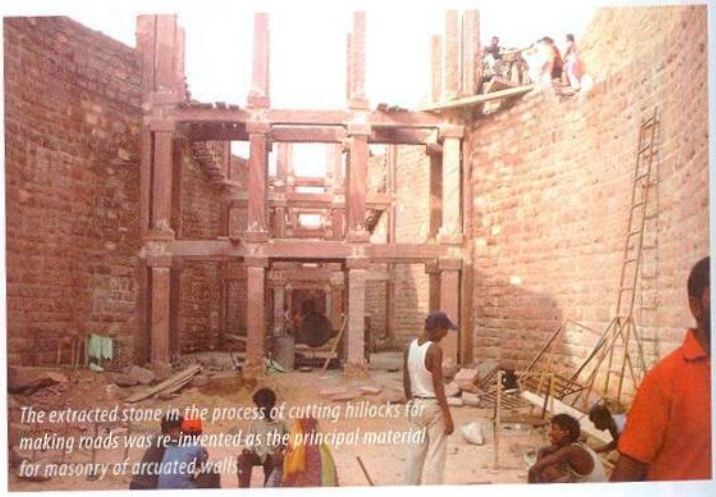


Double trabeated frames tied together as a single structural unit.





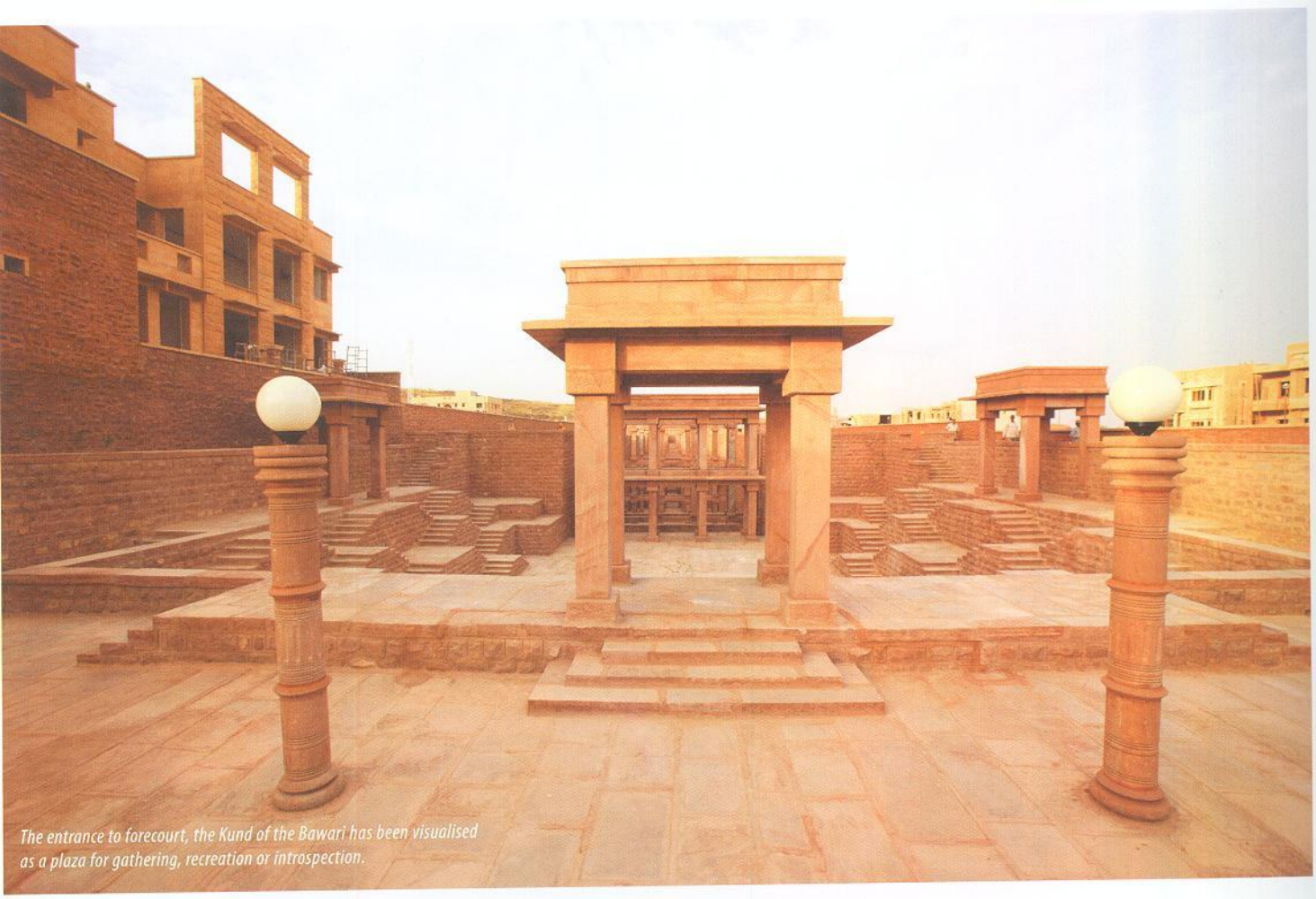
In the process of site development, the residue from the flattened hillocks was reused for various material expressions in the project.



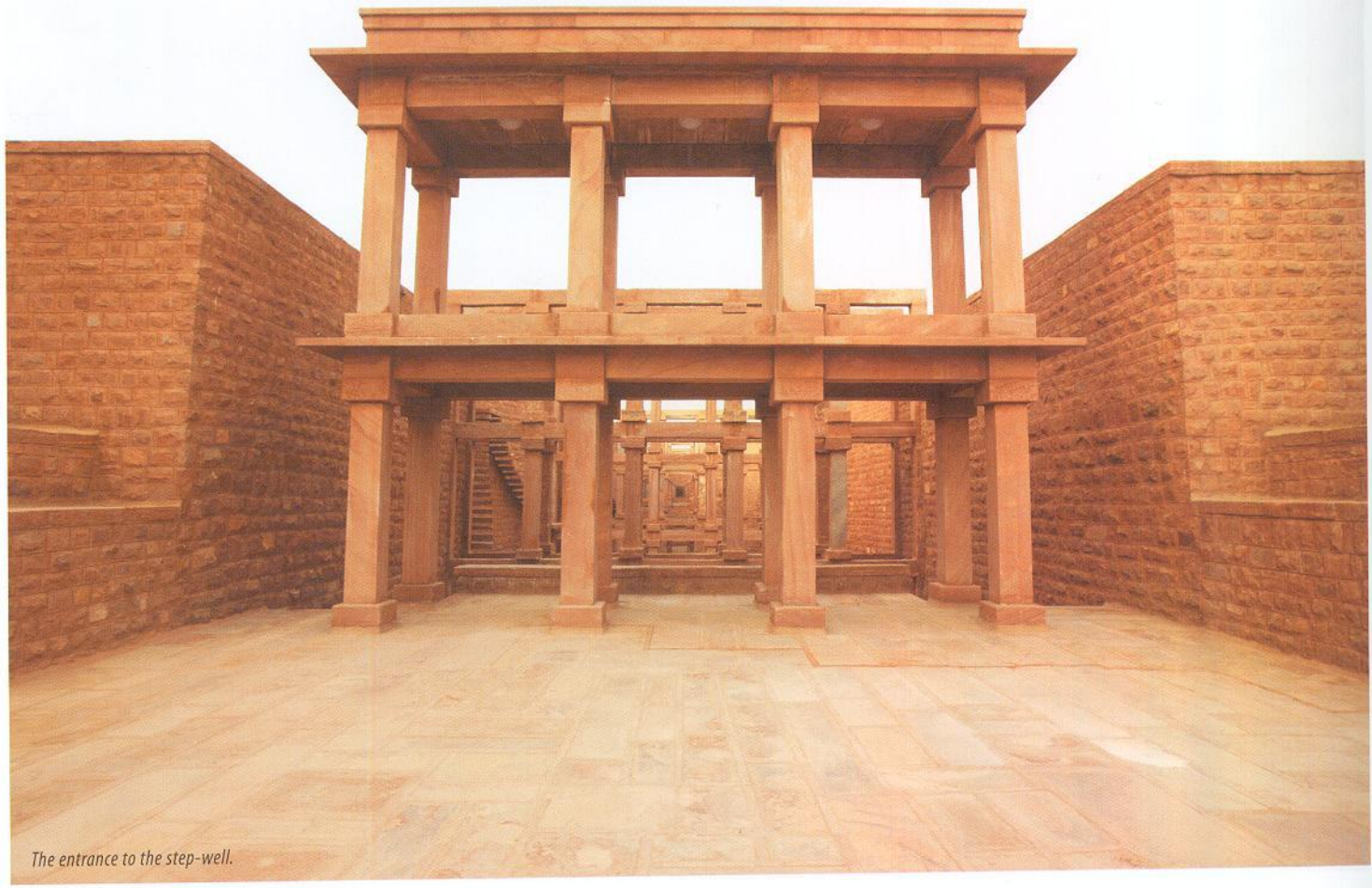
The extracted stone in the process of cutting hillocks for making roads was re-invented as the principal material for masonry of arcuated walls.

"Its creation is especially significant as it is constructed of locally available natural building material (majority of sandstone quarried from the site), built by local craftsmen, to collect nature-generated water; rainwater from the township's catchment, by help of natural energy, gravity, without resorting to mechanical and electrical means. This clean, energy-saving method, using natural energy to collect natural resource for sustaining nature, should go a long way in alleviating the acute water shortage faced by the region and contribute to the efforts in mitigating the threat of global warming." – A. Mridul

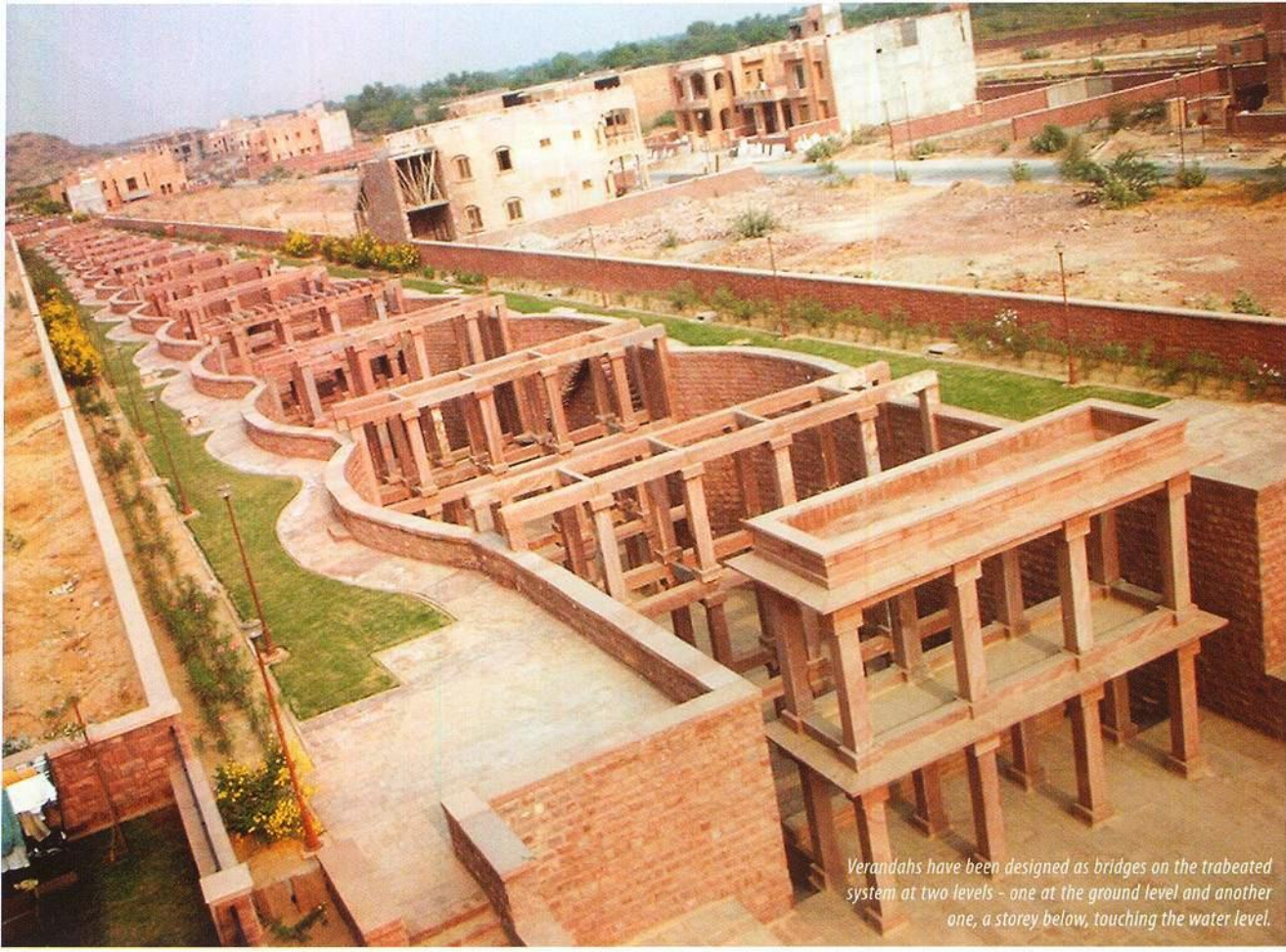
The trabeated frames are aligned sculpturally in a linear fashion.



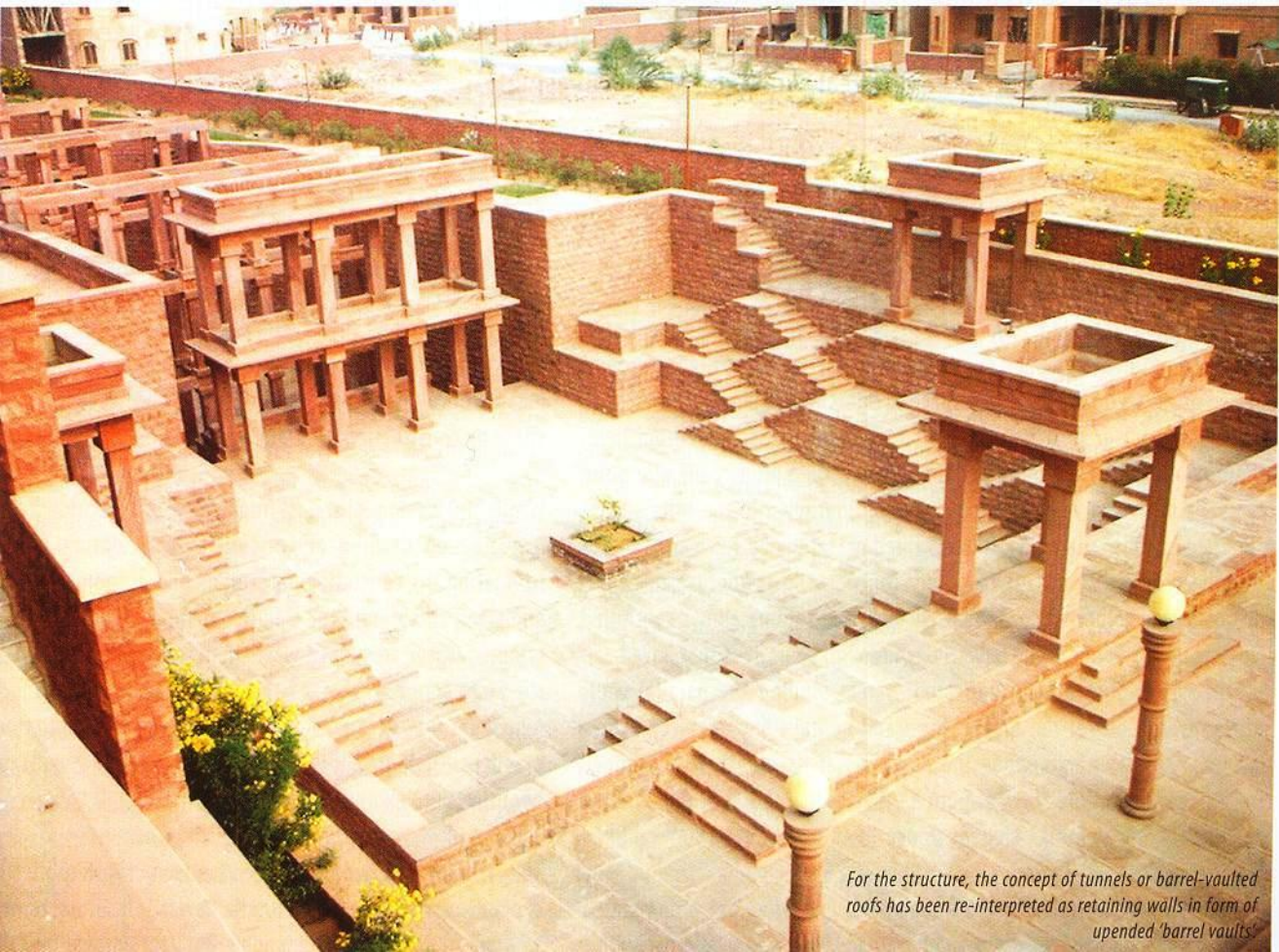
The entrance to forecourt, the Kund of the Bawari has been visualised as a plaza for gathering, recreation or introspection.



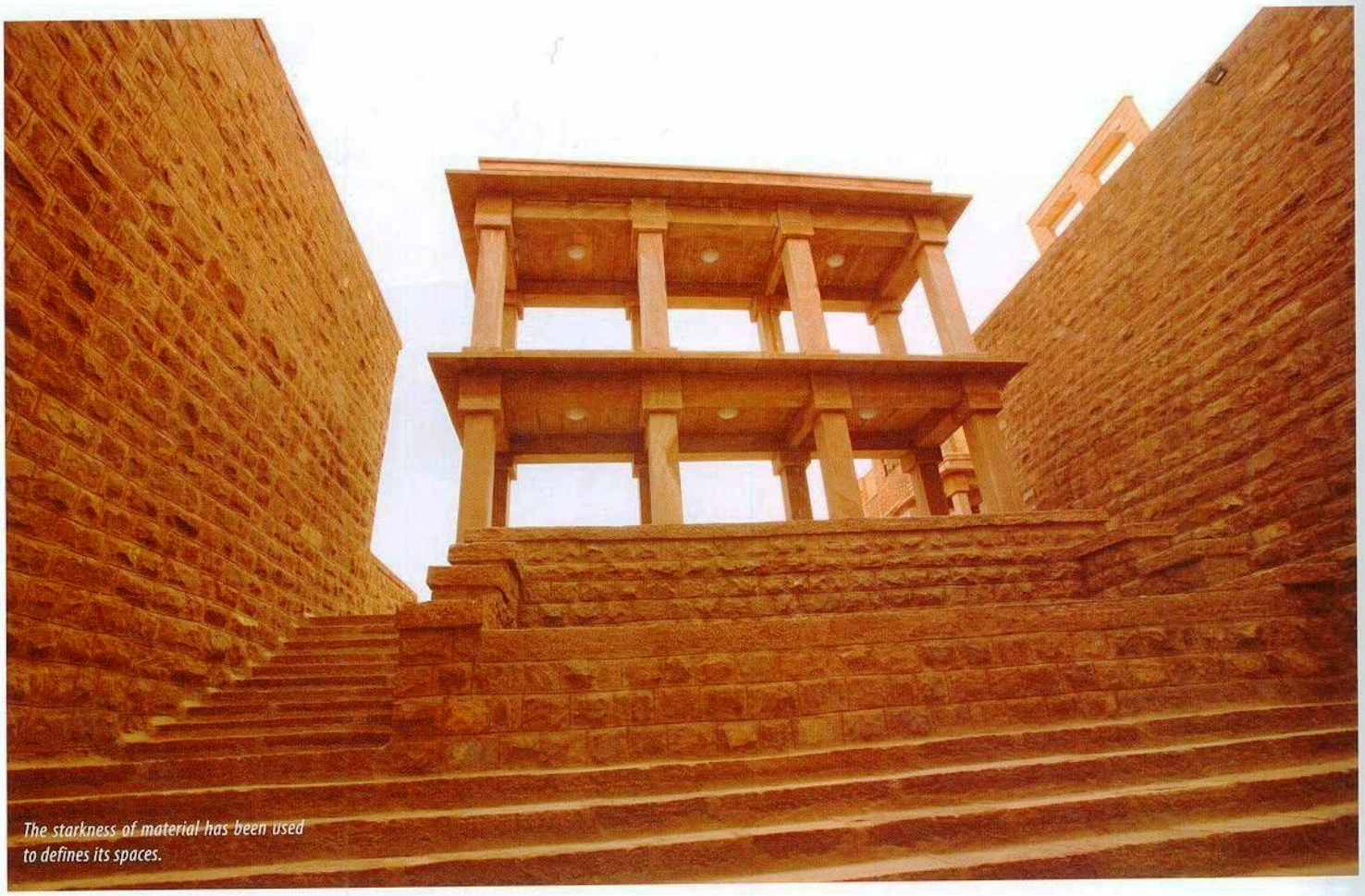
The entrance to the step-well.



Verandahs have been designed as bridges on the trabeated system at two levels - one at the ground level and another one, a storey below, touching the water level.



For the structure, the concept of tunnels or barrel-vaulted roofs has been re-interpreted as retaining walls in form of upended 'barrel vaults'.



The starkness of material has been used to defines its spaces.

> "Pillars of the conventional vaults that transfer load on-ground, here become beams transferring thrust on the opposite sides and the pillars of this system only hold-up and provide bearing plate for connecting these short stone beams, there being structural and physical constraints with long single-piece beams." - A. Mridul

forces – the inner idea of the volume and the external characteristics like the foreseen geological impact, wherein investigations revealed the first subterranean stream at 20m from ground level. In view of this, the depth was resolved at 18m to serve its purpose as a rainwater harvesting structure.

The horizontally striated organisation seems simple and pragmatic. A forecourt, in form of a stepped Kund, conspicuously occupies the foreground devised as an inviting communal space towards which people gravitate to meet, introspect or recreate. The architecture retreats silently from here, offering only tantalising glimpses of the landscaped promenade along the two walls of the Bawari. As one begins the journey into the lofty spaces contained by the arcuated walls interrupted gracefully by vertical frames of the trabeated system, the effusing light concocts the aesthetic experience. The abstracted columnar space that encloses the volume allows controlled connects into, and out of the Bawari beyond with verandahs that have been designed as bridges on the trabeated system binding the parallel walls at two levels - one at the ground level and another one, a storey below, touching the water level when the Bawari is at its fullest. The inscribed circular opening enfolds rays of light as they pierce through, illuminating the stillness of water in an elegant stance.

The mediation between the ground and water was progressively choreographed. Taking a complex, holistic idea and explicating it within the extant site condition, rife with wild vegetation over solid rock-bound contours was difficult. "Excavations for the 'Bawari' were incepted in December 2005," the architect explains. "After excavating the top layers, it became an arduous task as the soil was rock-like, hard, and offered tremendous resistance to digging. No kind of mechanical means could help in digging further with facility. Controlled explosion through dynamite sticks had to be employed. One of the greatest challenges was to obtain maximum volumetric space for the water by displacing minimum excavated space by construction of retaining structure."

While the design abstains from overt interventions, it is equivocal in investigation of form and material. Its sculptural form is carved out, navigating the constraints of ecology and economy in justification for RCC and steel, and around the traditional stone-retaining wall that would have retained lesser amount of water than required. These constraints grounded the architecture in the search of a new structure that was principled by reinvigoration of age-old barrel-vaulted roofs and local construction practices. Owing to this, the extruded retaining walls, anchored unto a depth of 18m, exhibit uniform slenderness.

The essential functionality of the vaulted roof is simplified by A.Mridul, who expands on its concept, "In 'Birkha Bawari', in simple terms, a conventional vaulted roof has been upended as 'vaulted wall' (standing on ends).

The geological equilibrium has been conserved by sourcing structural stones for posts and beams, flooring and steps from the local quarries within a radius of 15km of the site.

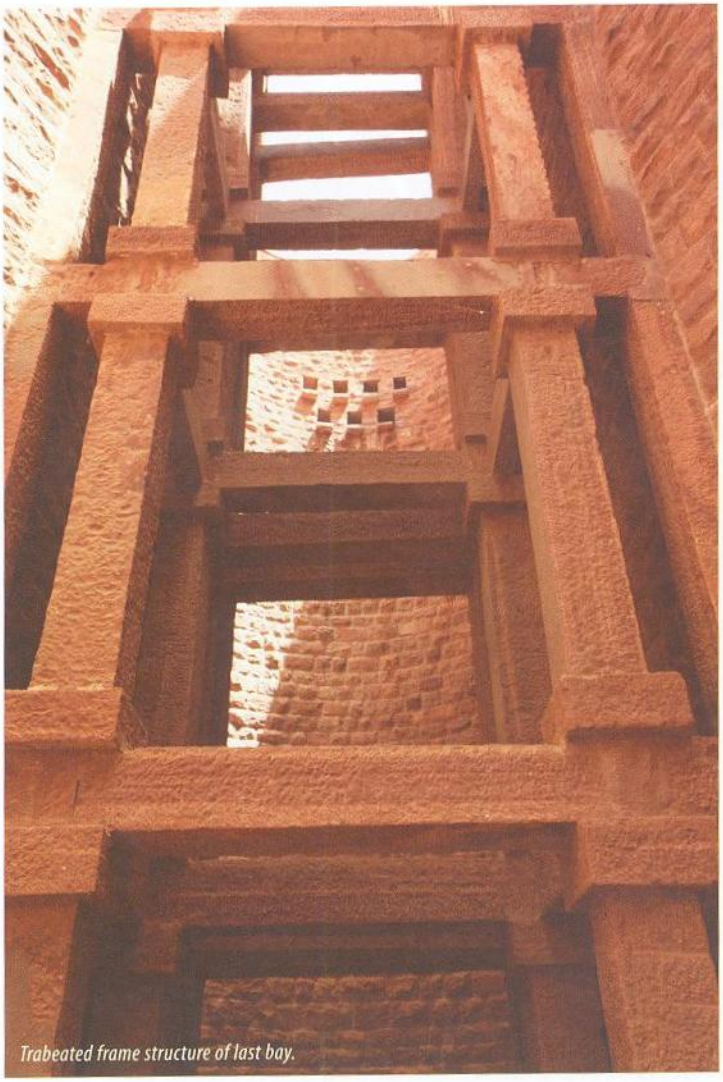
Instead of conventional retaining walls for countering the earth pressure, the concept of tunnels or barrel-vaulted roofs has been re-interpreted as retaining walls in form of upended 'barrel vaults'. Pillars of the conventional vaults that transfer load on-ground, here become beams transferring thrust on the opposite sides and the pillars of this system only hold-up and provide bearing plate for connecting these short stone beams, there being structural and physical constraints with long single-piece beams.

A novel composite structure for the subterranean reservoir has been created by a series of segments of such 'vaulted walls' placed opposite one another and held against each other by a trabeated (post and beam) structure. The vaults on opposite sides nullify each other's thrust and counter-balance each other. The thickness of these arcuated 'vault like' walls is merely 0.7 metres, very slender relative to the average thickness of a conventional dam-like retaining wall. Consequently, minimum excavated space was displaced by the structure of the step-well, allowing for a larger volume of water storage."

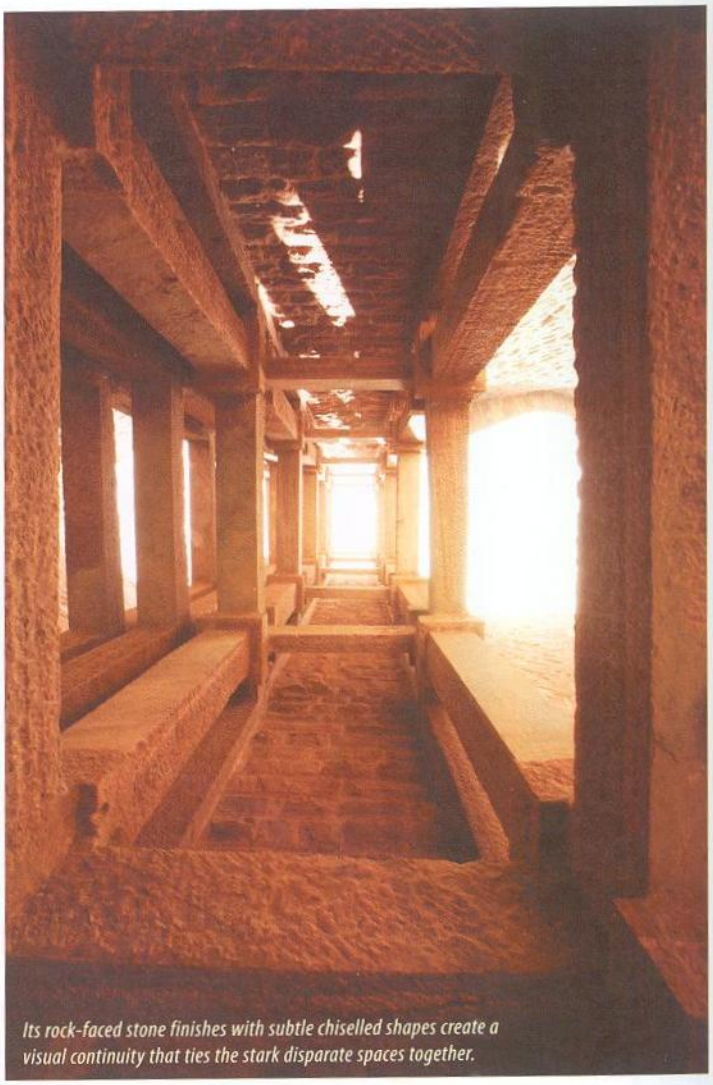
The urban insert appears to contain a fragmented rationale – providing a range of scales and moments. The inherent philosophy is to evoke an experience through honest expression of materiality. Extracted from the residuary obtained from levelling the contoured site to integrate roads and plots, the site-quarried red sandstone defines the coursed masonry walls of the step-well and the additional scrap was used for in-fills and base and foundation concrete. The material appropriation is a more utilitarian approach to retain a geological equilibrium by sourcing structural stones for posts and beams, flooring and steps from the local quarries within a radius of 15km of the site and layering the undulated silhouette of the land with excavated earth. From water to earth, the elements of architecture have retained the naturalness. Its rock-faced stone finishes with subtle chiselled shapes create a visual continuity that ties the stark, disparate spaces together. Contrasting with the rawness is the precise geometry and singularity of its planning, emerging as an authentic stratum of its prevalent culture.

It paraphrases the architect's ethos, jointly authored by the skilful instinct to preserve, "Its creation is especially significant as it is constructed of locally available natural building material (majority of sandstone quarried from the site), built by local craftsmen, to collect nature-generated water; rainwater from the township's catchment, by help of natural energy, gravity, without resorting to mechanical and electrical means. This clean, energy-saving method, using natural energy to collect natural resource for sustaining nature, should go a long way in alleviating the acute water shortage faced by the region and contribute to the efforts in mitigating the threat of global warming. Designed to hold about 150 million litres of harvested rainwater when at its fullest, it shall serve as a rich source of water for irrigation and for sustenance of the huge tracts of green, in an otherwise water-scarce region."

At the heart of its vision is a timeless truth. As contemporary as it is traditional, the spontaneity between these interactions jointly author a pure geometrical object secure in its harmony and aesthetic unity. A paradigm for the present, it depicts a reconnect in a fresh light, as part of a more extensive and continuous tradition with water itself. It is celebratory in its capacity for perceptual self-renewal of water in the congenial context and kind of cultural objective of embracing a space and creating a forum



Trabeated frame structure of last bay.



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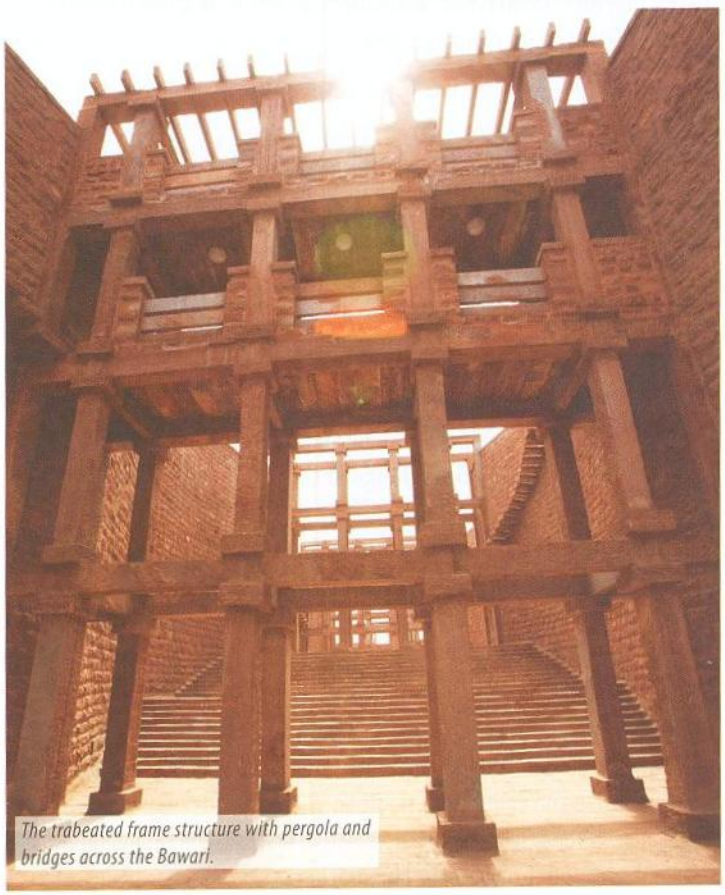
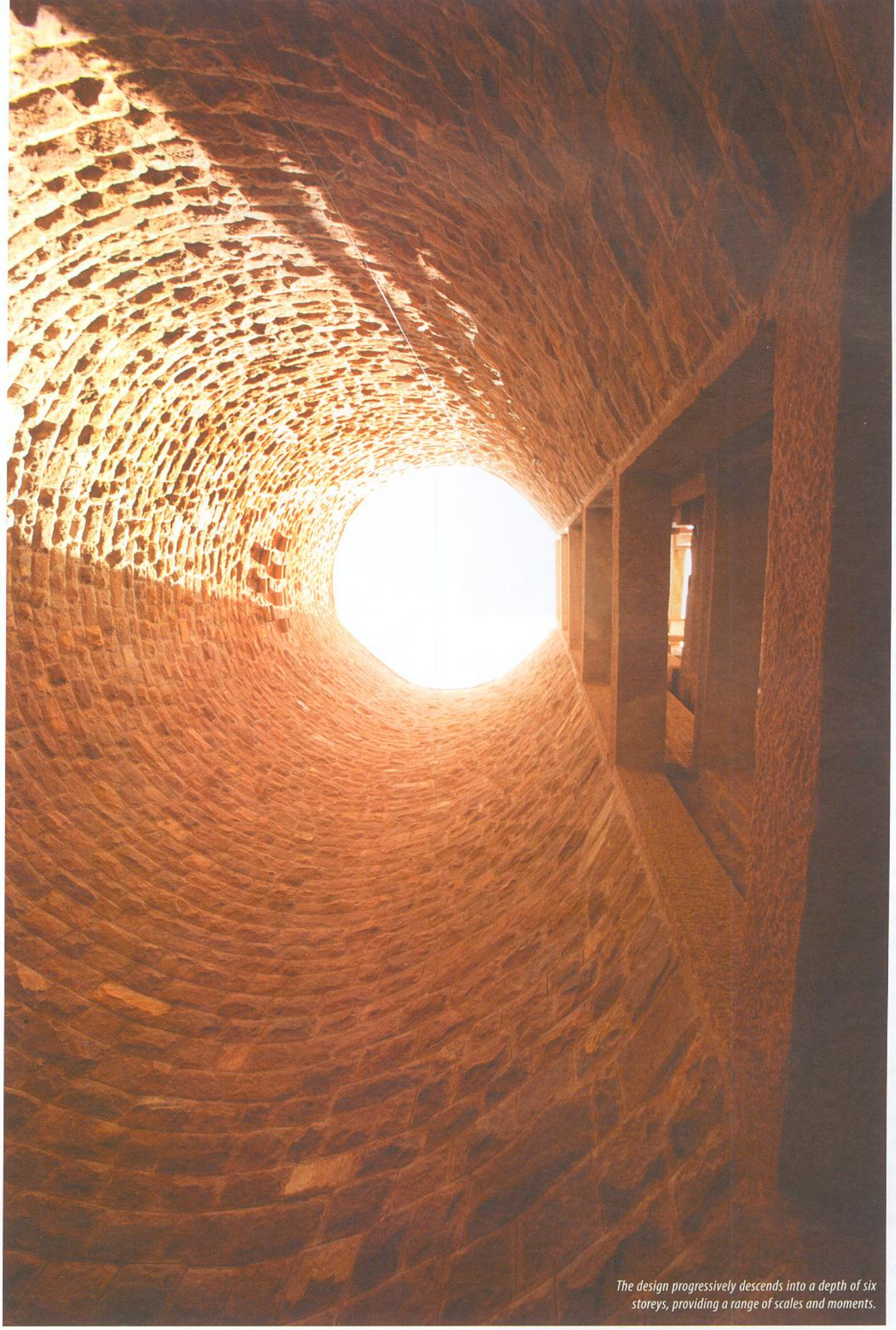


The trabeated frame structure with pergola and bridges across the Bawari.

in the traditional sense in conjunction with interrelated technologies for exploration. The emphasis is on the local assets as it organically seeks to create a living urban corridor, cohesively bridging a lacuna in the city. The art of finding impulses from within itself has the volition to develop solutions and ultimately meet the challenges of our time. What distinguishes its architects is the deliberateness of its intent and design; slow in pace, but dynamic; in a state of transformation, yet in a state of equilibrium as water itself; analogous to its characteristic spirituality, both as a force of transformation and that of cultural renewal. ■

FACT FILE:

Project	:	Birkha Bawari, (Sandstone Step-Well for Rainwater Harvesting)
Location	:	Umaid Heritage Housing Township, Jodhpur, Rajasthan
Architect	:	A. Mridul, Jodhpur
Design Team	:	A. Mridul - Principal Architect, Rajendra Roop Rai & Hitesh Rathore
Landscape	:	Kishore Pradhan, Mumbai
Structural System	:	A. Mridul
Structural Design	:	Saurabh Varshney, Jodhpur
Client	:	Ess Gee Real Estate Developers Pvt. Ltd., Mumbai
Contractors	:	Civil - M/S Sana Constructions, Jodhpur Excavation - Rb Stones, Jodhpur
Project Estimate	:	₹8 crore
Initiation of Project	:	2006
Completion of Project	:	2009
Project Area	:	5750 sqm



The design progressively descends into a depth of six storeys, providing a range of scales and moments.