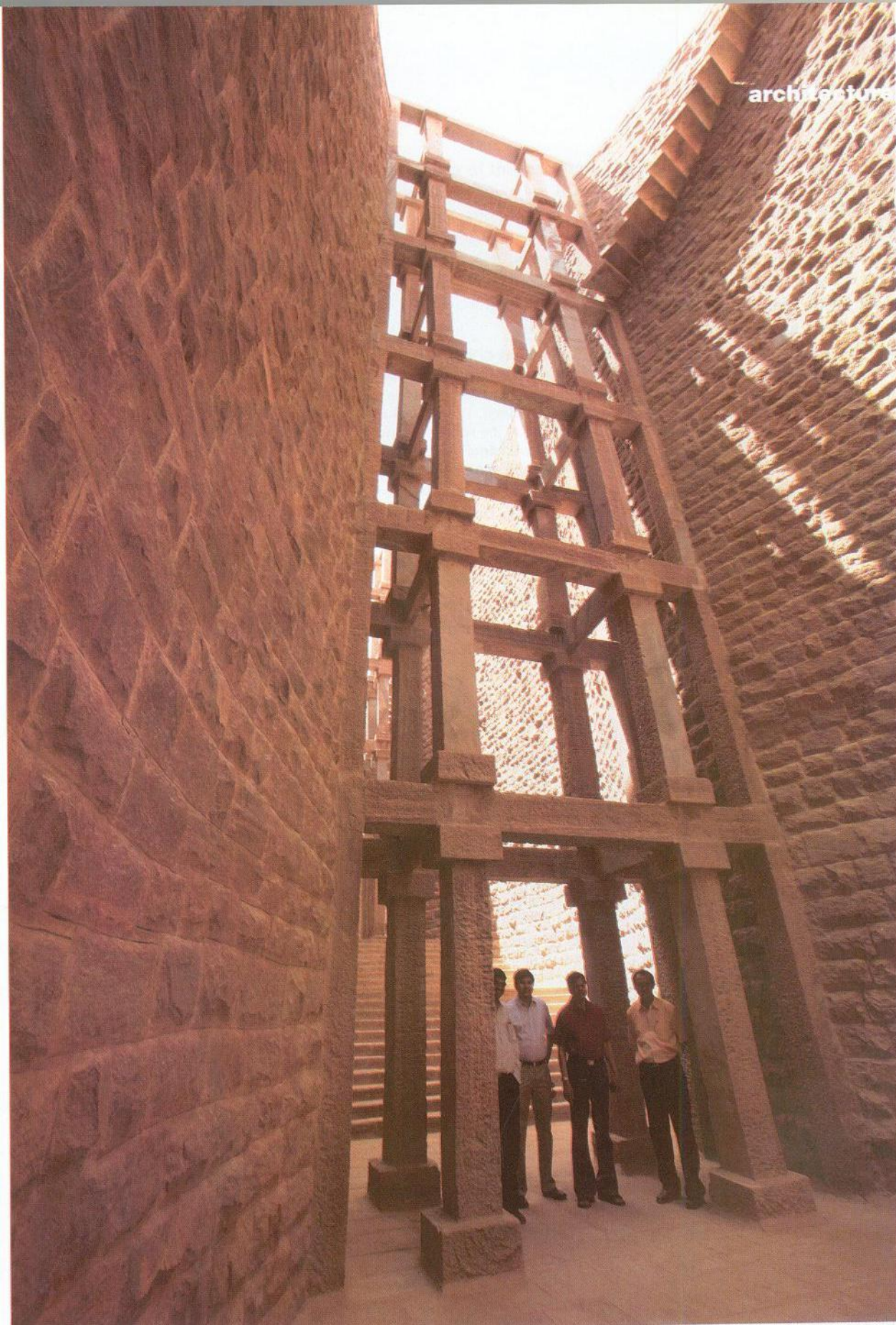
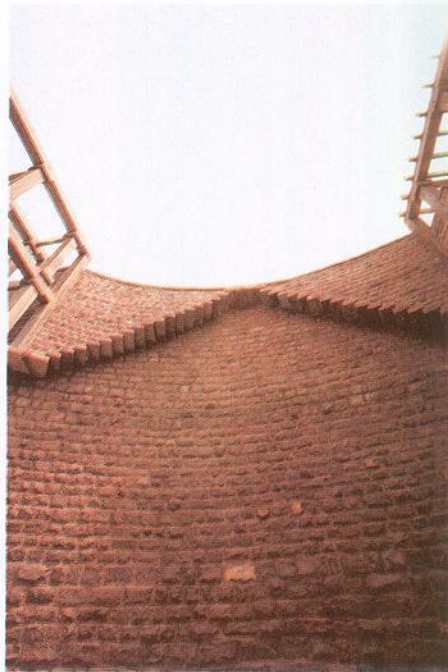


Birkha Bawari a modern stepwell

Birkha Bawari is the man-made rainwater harvesting stepwell at Umaid Heritage, the visionary new gated housing development below the famed Umaid Bhawan Palace in Jodhpur. As a unique combination of a *kund* and a *bawri*, it is a modern interpretation of an ancient water management system. Designed by Anu Mridul, it rekindles ancient Indian building traditions while it collects rainwater from surrounding areas in the housing colony, finds out Devyani Jayakar.



The majority of stone employed in the masonry walls has been quarried from the site of the township itself. The superfluous material on the site was converted into the principal material of construction of the *bawari*.



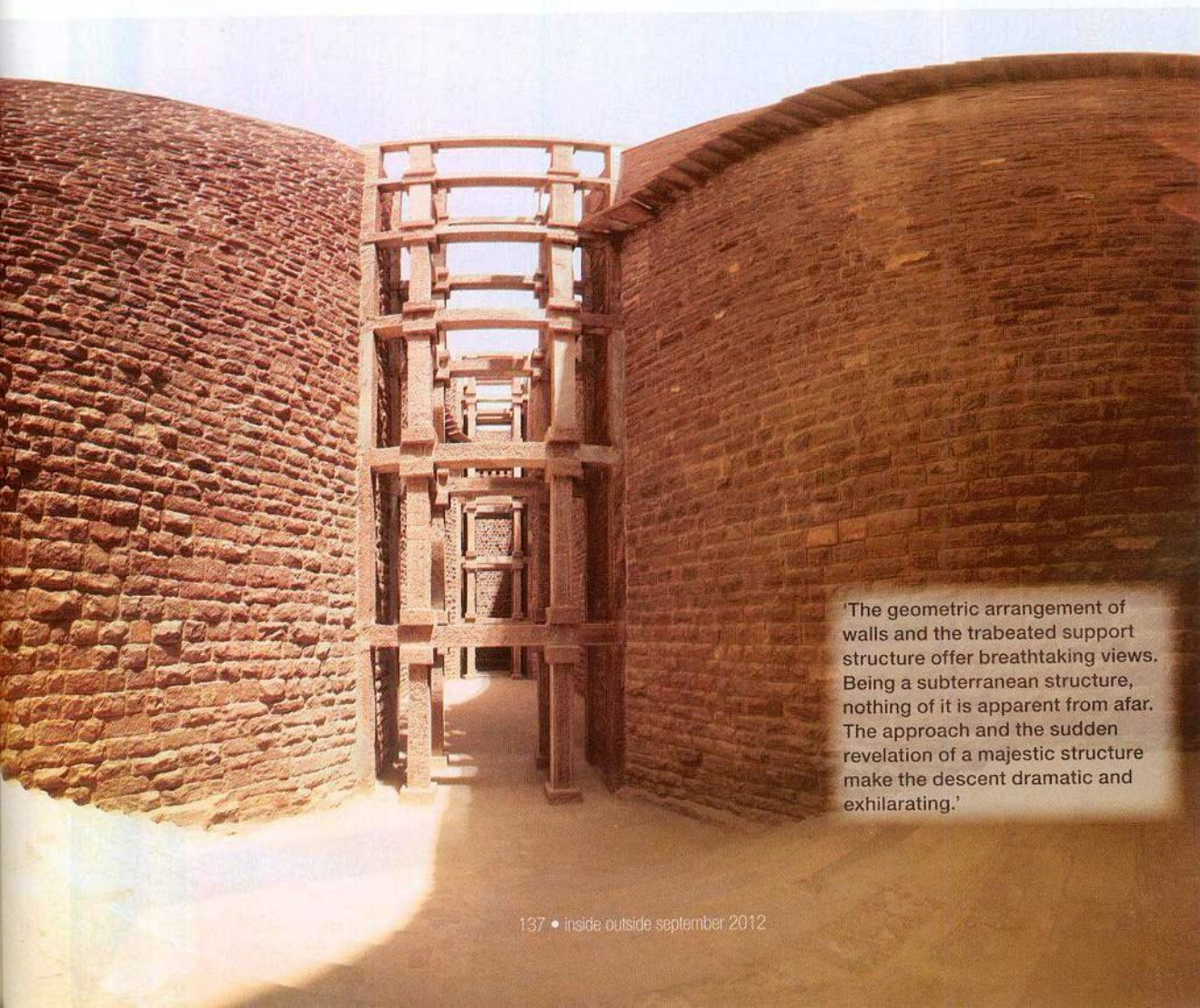
Quickly! Which architectural structure is unique to the Indian subcontinent? Yes, it is the stepwell, which is not found in any other part of the world, although arid conditions do abound outside of India as well. Known locally as *bawdi* or *baoli*, stepwells date back to the 6th century and were conceived to overcome the extreme weather conditions in Rajasthan and Gujarat, where it rains for only three months of the year, followed by nine months of drought. Construction involved the digging of huge trenches, lined with stone blocks and steps, allowing access to the falling water table throughout the dry months.

In the beginning of the last century, technological changes ushered in an era of abundant availability of water. River water from far flung states and rainwater collected in dams was supplied in never-before volumes. Piped water supply altered the concept of consumption and conservation of water. When water became easily available, the traditional water bodies were neglected, treated with contempt and used as open sewers. Even the best architectural structures of these regions were abandoned and left to fall into ruins.

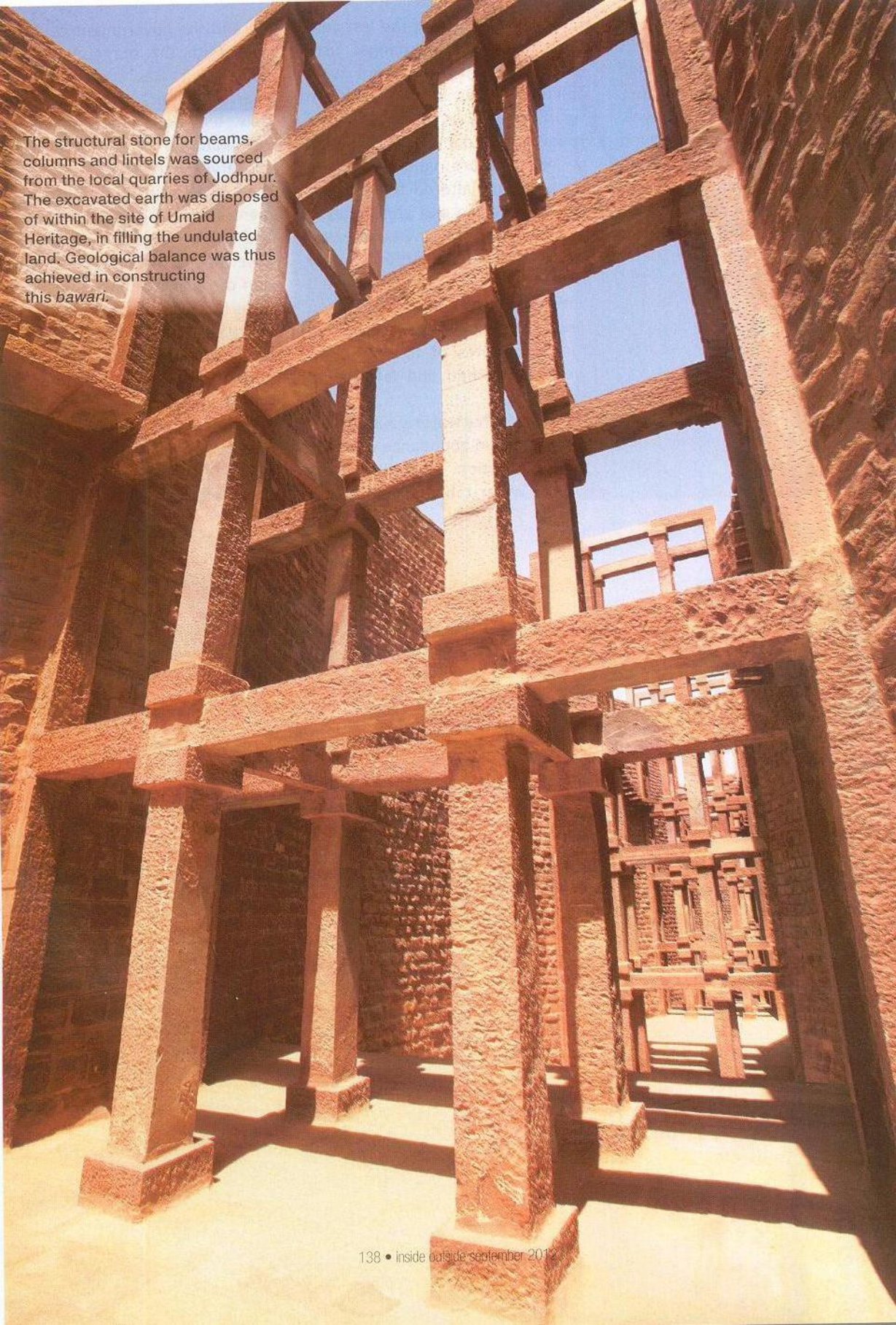
However, that water would always be available in abundance was only a misconception. Soon, the underground water table started reced-

ing and the government could not cope with the burgeoning water demand. 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.

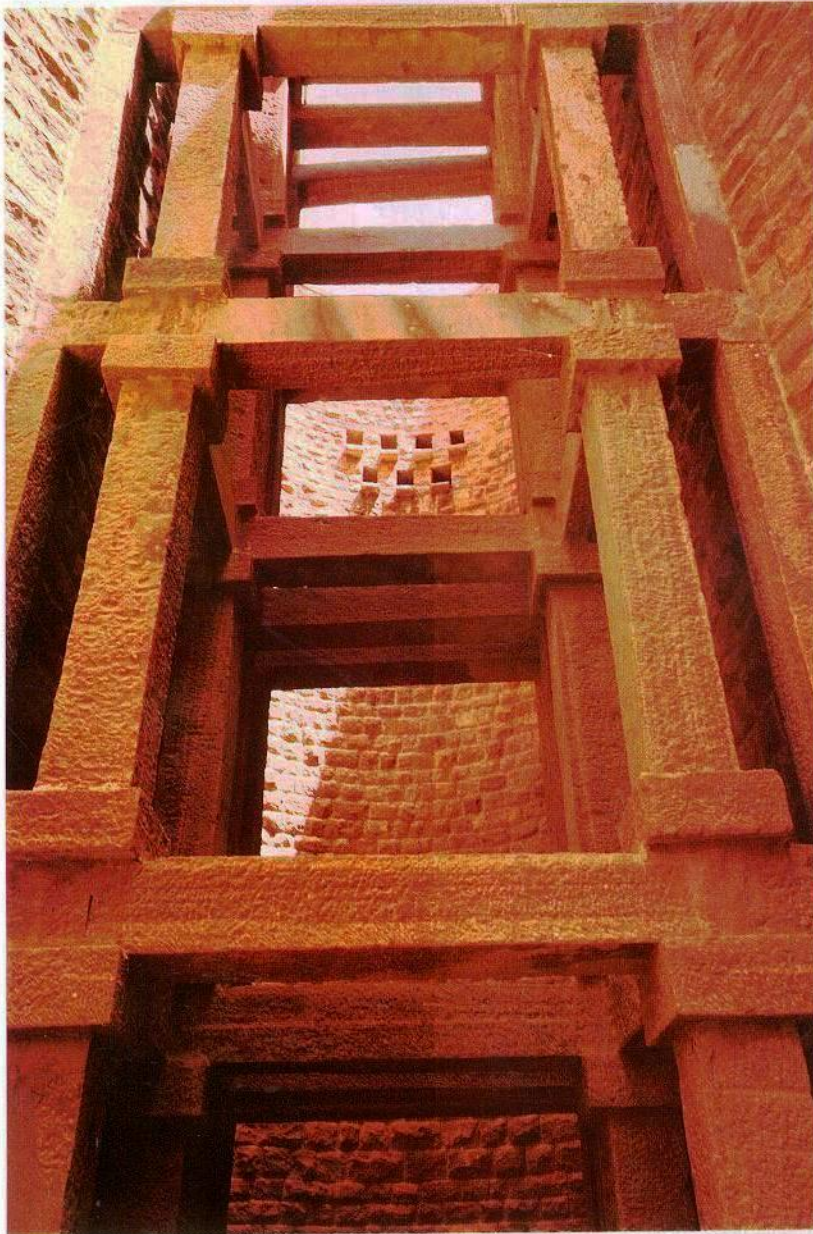
Situated at the foothills of the Umaid Bhawan Palace, this 110 acre housing township built by Suresh Gandhi in association with His Highness Gaj Singhji of Jodhpur, has as one of its most distinctive features Birkha Bawari, a non-profit venture of rainwater harvesting.



'The geometric arrangement of walls and the trabeated support structure offer breathtaking views. Being a subterranean structure, nothing of it is apparent from afar. The approach and the sudden revelation of a majestic structure make the descent dramatic and exhilarating.'



The structural stone for beams, columns and lintels was sourced from the local quarries of Jodhpur. The excavated earth was disposed of within the site of Umaid Heritage, in filling the undulated land. Geological balance was thus achieved in constructing this *bawari*.



In conceiving the final architectural form and structural system of the *bawari*, Anu Mridul was inspired by the age-old techniques of natural caves and tunnels and man-made vaults. Vaults are roof structures designed to transfer large amounts of load to the ground, through pillars and walls. The thickness of Birkha Bawari's 'vaulted walls' is merely 0.7 mts, very thin compared to the average thickness of conventional dam-like retaining walls.

As a modern-day stepwell, it is unlike its more extravagant predecessors, such as the Rani ki Vav at Patan. There are no carvings of Gods and Goddesses, but its visual impact and drama is supported by the structure itself and by the play of light and shadow within its pillars and walls.

The lay of the township site is valley-like and the location of the *bawari* is in one of the deeper troughs of the land. The site is linear, shaped like a leisurely lying dinosaur. The central core of the site is landscaped with lush greenery and water parks. Says architect Anu Mridul: 'Unlike a cylindrical well, where water is drawn through a Persian wheel or its equivalent, *bawaris* are linear-shaped stepwells, where steps lead down to the water.'

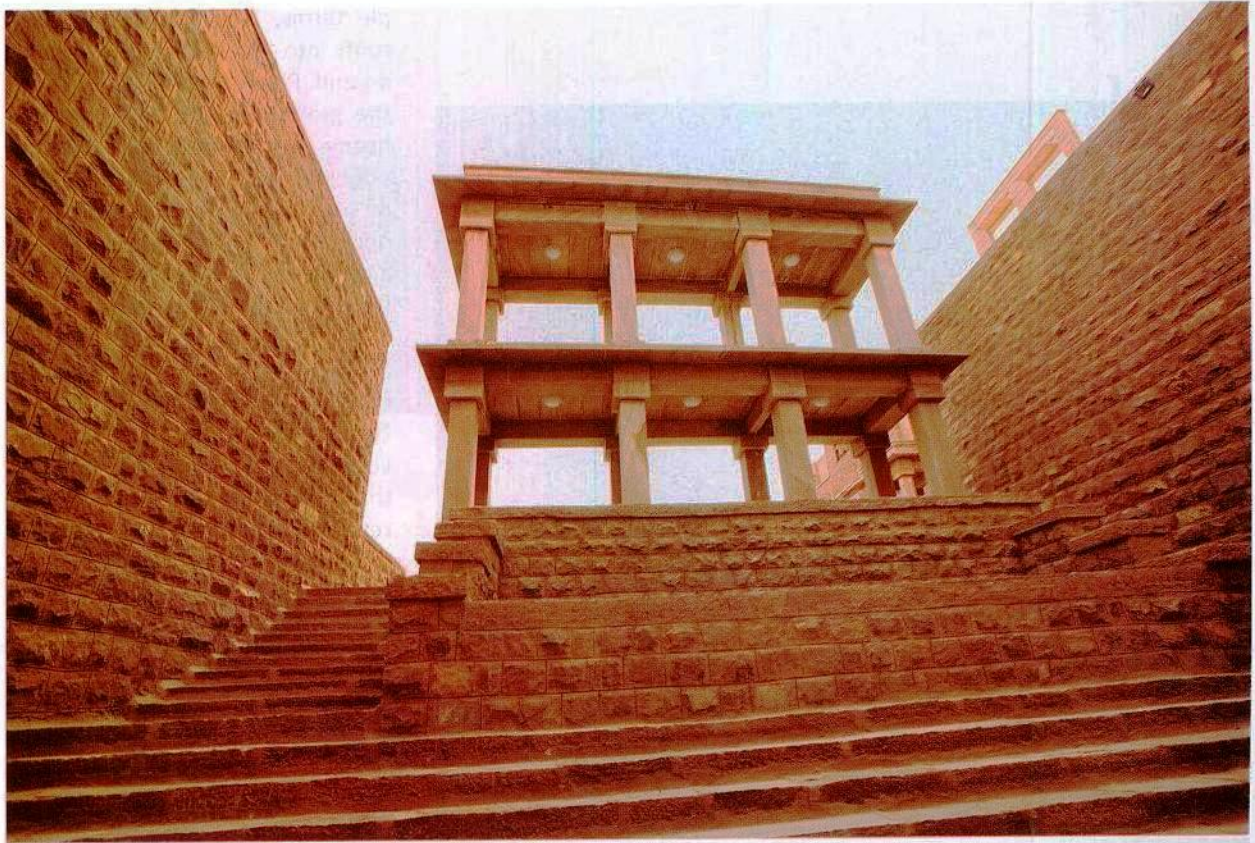
The design of Birkha Bawari was inspired from that of traditional *kunds* (stepped ponds) as well as *bawaris* or *vavs* (stepwells), making it a unique combination of both. The part similar to a *kund* is only symbolic, to be used as a forecourt and grand entrance into the earth and the *bawari*. It also facilitates the initial descent, in a limited area of 21 mts x 21 mts.

The *bawari* is about 224 mts long, 10.5 mts wide, with an average depth of 11 mts from ground level and an average water depth of 7 mts. The deepest part is 18 mts from the surrounding ground and is 6 storeys deep at the farthest end. At an estimated cost of ₹ 75 million, it will be able to hold up to 17.5 million litres of water at full capacity.

Excavations for the *bawari* were started in 2008. After the top layers were excavated, the task became arduous as the soil was rock-like. No kind of mechanical means could help in digging further with ease. The *bawari* was designed, as per



The design of Birkha Bawari was inspired from that of traditional *kunds* as well as *bawaris* or *vavs*, making it a unique combination of both.



The *bawari* has been developed to double as a community space. The forecourt, in the form of a stepped *kund*, offers a majestic space for gatherings and even casual walks.

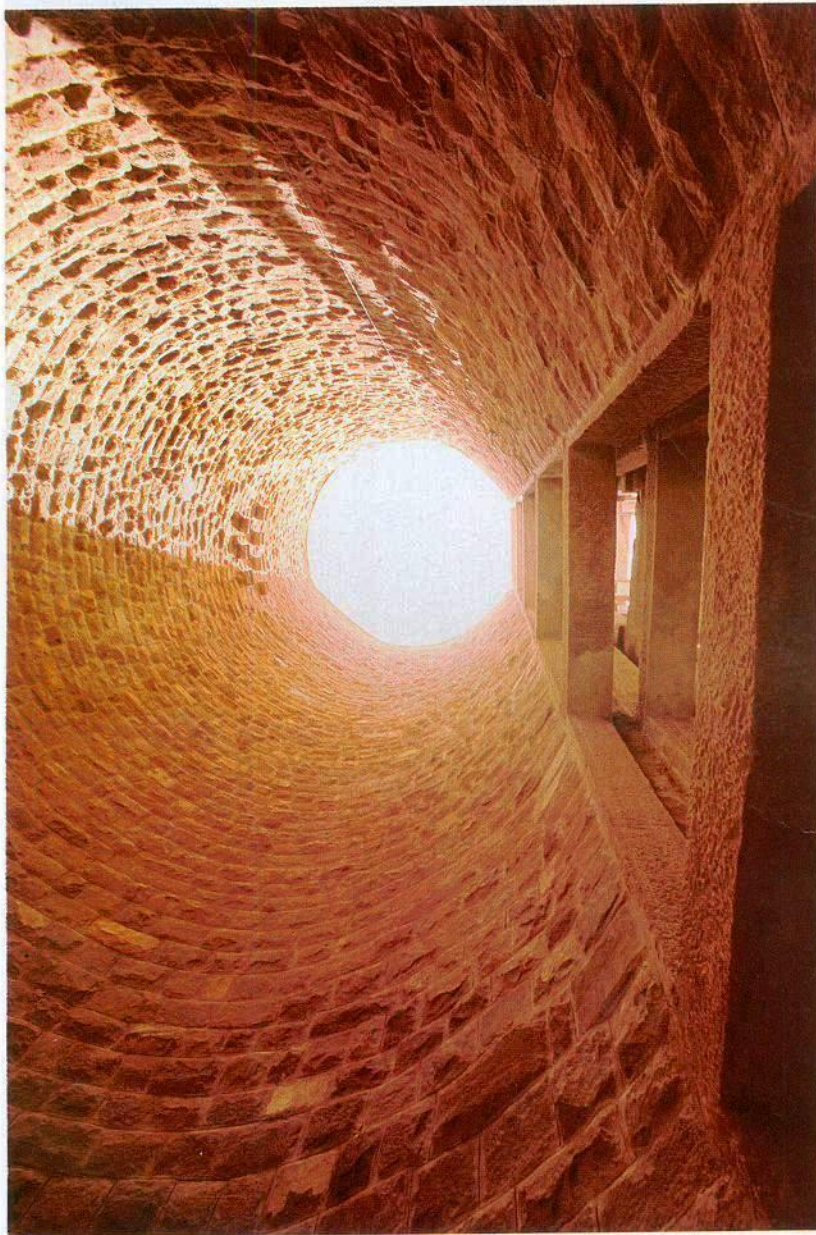
tradition, to gradually descend into the earth. Geological investigation had revealed the first subterranean stream at 20 mts from ground level. Since this was to be a rainwater harvesting structure, the depth was restricted to 18 mts to stay clear of any underground stream of water.

In terms of construction material, the building of Birkha Bawari is truly indigenous. The majority of stone employed in the masonry walls has been quarried from the site of the township itself and the superfluous material on the site was converted into the principal material of construction of the *bawari*. The structural stone for beams, columns and lintels was sourced from the local quarries of Jodhpur. The excavated earth was disposed of within the

site of Umaid Heritage, in filling the undulated land. Geological balance was thus achieved in constructing this *bawari*.

One of the greatest challenges was to obtain maximum volumetric space for the water, by displacing minimum excavated space through the construction of the retaining structure. Many structural systems were explored. While RCC and steel were ruled out for reasons of ecology and economy, a conventional dam-like stone retaining wall would have left much less space for water. It would also have required a huge supply of stone and hence finance.

In conceiving the final architectural form and structural system of the *bawari*, Anu was inspired by the age-old techniques of natural caves



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and tunnels and man-made vaults. Says Anu: 'In Birkha Bawari, in simple terms, I have turned vaulted roofs into "vaulted walls" standing on end. Pillars that transfer load to the ground, in this case, become beams transferring thrust to the opposite side. A series of segments of such "vaulted walls" are placed opposite one another and are held against each other by a trabeated (column and beam) structure. The vaults on opposite sides thus nullify each other's thrust and balance each other. The thickness of these "vaulted walls" is merely 0.7 mts, very thin relative to the average thickness of conventional dam-like retaining walls.'

Says Suresh Gandhi: 'As per tradition, the *bawari* has been developed to serve as a community space. The forecourt, in the form of a stepped *kund*, offers a majestic space for gatherings and even casual walks. All along the walls of the *bawari*, there is a meandering promenade lined with landscaped parks.' The trabeated system, holding the opposite walls together, also serves as bridges connecting either side of the *bawari*. Designed as verandahs directly overlooking the water below, it is a prized spot for visitors. These verandahs have been provided at two levels, one at the ground level and another one storey below, touching the water level when the *bawari* is at its fullest.

Says Anu: 'The geometric arrangement of walls and the trabeated support structure offer breathtaking views. Being a subterranean structure, nothing of it is apparent from afar. The approach and the sudden revelation of a majestic structure make the descent dramatic and exhilarating.' Add to that the preservation of a scarce resource, and we have a truly green structure! 