

Preservation, Restoration and Upgrade of the Indian Institute of Management in Ahmedabad, India

BY BRINDA SOMAYA

Indian Institute of Management in Ahmedabad (IIMA), is under an ongoing conservation project to preserve, restore and upgrade the built fabric of the iconic and modern heritage structures designed by Louis I. Kahn, in India. These include eighteen dormitory buildings and the main complex (the school) housing four faculty blocks, the classroom complex and the Vikram Sarabhai library building. The project entails carrying out a detailed study of the cultural significance of the buildings, conducting surveys for preparation of as-built drawings, building condition mapping and assessment, preparation and execution of a detailed conservation plan and strategies for restoration, retrofitting and upgrading the built fabric along with its spatial expression, with due consideration to both its status as a significant work of 20th century monumental architecture and as a premier management institute of the country.

Somaya & Kalappa Consultants (SKK) were appointed as the conservation architects for the project of preservation, restoration and upgrade of the Indian Institute of Management in Ahmedabad (IIMA), in 2014. The first step was to understand the story of evolution of IIMA campus and the cultural significance of its buildings; not only with respect to Louis I. Kahn's design but also its contribution as modern built heritage from India's post-independence period.

The IIMA and Louis Kahn

Modern India

The introduction of Modern Movement ideas within Indian architecture was brought by European schools of thought, in particular the practices introduced by the British during its colonial rule. In Indian society, the idea of being "modern" was considered as an overall approach towards life, an inventive and progressive way of living with better standards and adopting modern technology, including the ideas of futuristic minds like Jawahar Lal Nehru (1889–1964). This was particularly evident in 1911, when the capital of British India shifted from Calcutta to New Delhi and a new form of modern architecture was introduced: a blend of European style with Indian elements, by Edwin Lutyens (1869–1944) and Herbert Baker (1862–1946), defining the new and progressive India.

However, after the Independence (1947), Chandigarh, the "dream city" of India's first Prime Minister Jawahar Lal Nehru (1947–1964), planned by Le Corbusier (1887–1965), became the modern symbol of newly independent India. In the 1950s, Le Corbusier was

invited to design the Mill Owners' Association Building and Villa Sarabhai, in Ahmedabad. The architect Balkrishna Doshi (1927–) — who had worked for Le Corbusier in Paris (1951–1954) — invited Kahn to execute a master plan for the nascent IIMA. Thus, Kahn became the next significant architect for India. His buildings, combining a pure expression of material and monumentality with regional elements, went beyond the mere concepts of functionality, giving rise to a new dimension to Indian modern architectural design.

A IIM in Ahmedabad

Ahmedabad was chosen as the capital of Gujarat state after the bifurcation of the Bombay state on 1 May 1960. With classical and colonial European styled buildings lining the city's streetscapes, Ahmedabad became a metropolis, and a center of higher education, science and technology, through the establishment of many educational and research institutions. In 1961, at a time when professional management was a little-known concept, Vikram Sarabhai (1919–1971) and Shri Kasturbhai Lalbhai (1894–1980), with the support of the then-Chief Minister of Gujarat, Jivraj Mehta (1887–1978), and a group of enlightened individuals, founded and established the IIMA.

In a true spirit of public private partnership, the IIMA was set up through a coalition of central and state governments, local industrialists, the Ford Foundation and the Harvard Business School. The founders wanted the IIMA to generate knowledge that would be applied for development, and every move made towards its establishment strove for excellence.

Despite the founders having initially offered the commission for IIMA to architect Balkrishna Doshi, Doshi recommended Louis Kahn for the project, arranging the commission so that the architecture students at the National Institute of Design would have the opportunity to work with him. Kahn translated this educational philosophy into infrastructure by designing spaces that supported and promoted easy personal interaction and provided inspiration. He achieved what every architect strives to achieve: the embodiment of a philosophy in a timeless structure.

Introducing Kahn's architecture

Architecture has to have the element of time. How can you judge a work today, let's say a work by anyone among these well-known architects that is exciting and wonderful? And then what will happen to it 20, 50 years later? That's the measure. That is why the Salk Institute will always be as perfect as it was conceived. The teak wood may fade away... probably did or has... but the spirituality of that project will remain. Now that building will withstand the test of time, no question about it.

Monumentality, timelessness and spirituality are elements that formed a part of the legacy of Kahn. IIMA demonstrates the poetry of light and the creation of monumental architecture beyond the human scale. Encouraged by the appreciation of the traditional city fabric and inspired by its ruins, Kahn absorbed relevant experiences of Indian architecture — the medieval Mughal monuments, the 20th century buildings of Lutyens in New Delhi and Le Corbusier in Chandigarh — to concept the building.

Kahn conceived the IIMA with four functions: the school, dormitories, faculty housing and staff housing:

The school and the dormitories are a unit, like a monastery. Corridors are avoided by having deep porches, off all the dormitory rooms, where tea is served and things are discussed. The school is around a court which has in it an amphitheater. Everything here is planned around the idea of meeting.

He referred to institutes as "houses for inspiration", places that were defined by the need to shelter learning within a supportive community through a combination of collective and individual activity. This, combined with his interest in exhibiting the idea of



01 Louis Kahn, Indian Institute of Management in Ahmedabad, India, 1962-1974. Construction of dormitories. © UPENN Archives, SNK, 1960s.

urban planning and appreciation for monastic solitude, influenced his design for IIMA, where spiritual qualities were transformed into strong and monumental structures. From the initial conceptualization of IIMA (1963) to 1974, numerous master plans were put forth, evaluated and modified due to the client's requirements and cost-related issues.

I made all these buildings answerable to each other even though the scale of the house and the school is so different. The material of brick bearing walls and piers with concrete floors is retained throughout the larger spans giving rise to arches and buttresses, the more modest spaces simple slabs on walls. Consistent with the order of brick construction and the introduction of concrete, the concrete combines with the characteristics of brick in the making of the flat arches. In the houses, where there is not sufficient dimensional expanse to use a full arch, concrete restraining tension beams are introduced to counter the thrust of the flat arches³.

Blending modern architecture and Indian tradition, the IIMA planning, with walkways and arcades interconnecting the blocks, reflects the streets of the old city of Ahmedabad, while the use of local materials pay homage to the Indian vernacular culture. Kahn was fascinated with brick as a building material; while before he had used brick as a veneer, in IIMA he used it as a structural material. Several mock-ups and test constructions were done to demonstrate the construction of brick arches and the bricks used were hand-molded and cut to shape at the site.

Kahn's architecture under restoration

The school building and the dormitories form one unit that is interconnected with passages, courts and the Village Street. These buildings were executed from 1964 to 1975 and cover an approximate built-up area of 396,690 sq ft (36,854 m²) and site area of 8.3 acres (3.36 ha).

The school building comprises the library, classroom complex and faculty blocks with the Kahn Plaza at the center. The main entrance to the school building is located on the east with a ceremonial entry from the mango tree leading towards the Harvard Steps.

The Vikram Sarabhai library building is divided into two wings by a central staircase. One wing is the stack area and on the other side there's the main entrance lobby on the first floor and a reading hall on the second floor. The library counter is located at the entrance on the first floor.

The library is an important element of the court. It was given greater authority and presence, becoming almost freestanding at the head of the court when its site was adjusted to accommodate the mango tree at the entrance.

The elevations correspond to the needs of the building. The north-east elevation was constructed using piers that were required to take the loads of the book stacks, with the solid load bearing walls protecting the triple height of the reading room. The oculus is supported by a brick ring beam without any concrete ties. Facing problems with the glazing of the circular oculus, Kahn experimented small scale aluminum sections. However, the existing heavy timber members are designed by Anant Raje (1929-2009).

In classroom complex, each classroom is designed as an amphitheater, a semi-circle of seating set within a square, as Kahn believed this would increase active participation between the students and the teacher. The entry foyer, which is shared with the neighboring classroom, forms a gathering space very illuminated and well ventilated. Generous meeting spaces between the rooms, and a long open corridor connecting them, represents his belief that learning should continue outside the classroom as well. The long corridor terminates in two-story porches on either end, each lit by a giant oculus. The ground floor of the complex serves as administration offices. On the rear elevation, the

walls are buttressed with outward stepping.

The faculty blocks are located on the south-west side of the court connected by a long cloister similar to that of the classroom complex on the east wing. The corridors also connected to the individual courts that separate the faculty wings. The faculty wing is divided into rooms on either side of a central passage.

In the Kahn plaza, the court was never intended to be open on the north-west end but was meant to be enclosed by the construction of a dining hall. The hall was to be serviced by a circular kitchen, designed to ensure the smell of cooking would not permeate the court. However, in 1974 after Kahn's death, the dining hall was redesigned by Anant Raje and situated at its current location, leaving the court open.

Currently the court is used for convocation ceremonies and other important activities. It is one of the main features of the old campus.

Concerning dormitories: while D1 to D15 were constructed initially (1964-1969), D16 to D18 were constructed at a later date (1971). D1 to D15 are triangular in plan with two sides comprising rooms with a central court used as a communal space and the main staircase extending as a semicircular block through this space. The pantry and bathing facilities are housed in an attached service block.

The ground floor of the perimeter blocks was intended to have double height arcades used for common and general purposes. However, in the present day they have been converted to rooms to increase the existing capacity of the dormitories.

D16 to D18 responded to a different program, and so the service blocks are located at both ends of the row of student rooms.

Building condition assessment

From 2014 to 2015, detailed condition mapping of the school building and 18 dormitories were carried out by SNK to understand the



02 Louis Kahn, Indian Institute of Management in Ahmedabad, India, 1962-1974. © Louis I. Kahn Collection, University of Pennsylvania and the Pennsylvania Historical and Museum Commission.

extent of deterioration in the external and internal built fabric. Non-destructive tests were carried out to analyze the state of the building materials such as brick, concrete, cement mortar, reinforcement bars, condition of structural members, and the soil.

The main causes of deterioration of these buildings were the techniques used for construction and localized repair carried out thereafter. It was found that cover blocks used during the reinforced cement concrete construction were either absent or inadequately sized leading to the carbonation of the slab to its full depth. Concrete encasing was not used to protect the embedded reinforcement bars in the brickwork to prevent the bars from rusting and today the rusting of these bars has led to the cracking of the brickwork. Bricks used at IIMA were found to be the second-class bricks as per IS 3102-1971 with average compressive strength of 4.89 N/sqmm and with inbuilt efflorescence. These were found to be made from the local soil available, hand molded and kiln fired. Due to use of such type of bricks and the brick edges being blunt, face filled pointing was used to hide the blunt edges. When such type of pointing gets damaged, it allows the collection of water causing further damage and ingress of the water into the masonry. Cement mortar repairs have been carried out on the exposed brick façade blocking the breathability of the existing exposed brick surface. New layers of terrace waterproofing have been added without removing the old and damaged waterproofing which has led to the damage of the terrace slab.

The dormitories

The dormitory buildings were the first set of buildings taken up for construction, with dorms D1 to D15 built between 1964 and 1969 and dorms D16 to D18 added in 1971. It was noticed that D1, D2 and D15 show higher levels of structural distress due to the type of construction techniques used (such as missing or inadequately sized cover blocks). D4, D7 and D10, which are built on built-up ground, show some amount of floor settlement in the passage and staircase area. D16, D17 and D18 mostly show deterioration on the third-floor level where the waterproofing of the terrace has failed, leading to the spalling of RCC slab cover. A change from English to Flemish bond was also noticed in dorms such as D1 and D15. It was found that, when the dorm buildings were built in the beginning of 1964, English bond was preferred instead of Flemish, because it was stronger and, being easy to construct, it probably reduced the quantum of construction supervision required. Due to the inferior appearance of English bond for exposed brickwork, during the construction of the experimental arch (1964), it may have

been decided to switch over to Flemish bond. The closing of the full height vertical opening in the duct wall and reduction of the staircase drum roof (after its collapse during the 2001 earthquake) was also noted. The alterations are not in sync with the original character of the buildings and threaten its cultural significance. These alterations will be reversed and the buildings will be restored as originally planned as far as possible and to the best of its feasibility to respond to the future needs.

The school building

Even though the school building was constructed later (1968–1975), the construction issues seen in the dormitories were noticed there too. Unlike certain dorms, the construction of this building is executed in Flemish bond. Excessive damage was found at the terrace slab with numerous cracks and water leakage in the library building, faculty blocks and the classroom complex. The library was found to be the most affected, with the ceiling revealing signs of spalling and exposed reinforcement bars, and mortar repairs done on the slab in patches. External walls have numerous vertical separation cracks running the full height of the building, and the bottom of the parapet horizontal separation cracks. In the faculty blocks, cracks were found in arches spanning between the two blocks, due to corrosion of the embedded reinforcement bars. During the 2001 earthquake part of the parapet of the classroom complex was severely damaged and had to be demolished. As a part of the building restoration process, this parapet will be rebuilt.

Trial solutions for architectural and structural restoration

On reviewing the condition of these buildings, a list of trial solutions for architectural and structural restoration was formulated by SNK to test the workability and feasibility of these solutions at the site. Final results were approved by SNK and IIMA before the final execution was to be undertaken. The suggested solutions were carried out at the site by contractor M/s Savani Construction Pvt. Ltd. in the presence of the architect's team. These trial solutions were pertaining to various modern and traditional methods of brick façade cleaning (water misting, chemical, poulticing, brush abrasive and abrasive blasting), brick pointing and replacement and the removal of biological growth. A mock-up for structural stitching and repair of RCC slab was also carried out.

It was concluded that using traditional solutions for hard efflorescence cleaning (such as tamarind or vinegar wash) did not

work at the site since the salt deposit on the brick surface is very stiff and strong. This required a specialized chemical cleaning process by using cleaner which water-based having low VOC, over 70% biodegradable and is a fast-acting eco-friendly product, approved in a demonstration by the selected vendor, when trial solutions were being carried out in the presence of SNK and IIMA.

Cement forms a hard substance once it sets. When it bonds with a softer material like brick, it becomes difficult to remove the brick from cement without damaging the brick. Hence, removing the existing incorrect pointing and correcting it would be difficult as this would require the removal of all face bricks — which might end up damaging the structure. It was concluded that repointing will be done for areas only where the existing pointing is either damaged or missing. A trial for reversing the face bricks of the façade and placing the same in position was also attempted to avoid the use of new bricks. However, due to the strong bond of the cement with brick, it took almost 40 minutes to manually remove single brick without damaging the same. Therefore, it was concluded that in this case, where the brick face was damaged, part of it would be removed and replaced with new bricks that matches the finish and the color of the existing bricks while ensuring that the structural stability of the wall is not compromised. This was possible as these bricks were found to be damaged at intermittent locations.

Project planning and execution

After the finalization of the solutions, the logistics and phasing of this project were worked out in detail by SNK. During the building condition study, the library building and dorm D15 were found to require the most immediate attention, being proposed to be included in the first phase of the restoration project. Gujarat is an earthquake prone area, so a seismic analysis of the buildings was carried out by a team of experts from Indian Institute of Technology Madras (IITM), Chennai, in collaboration with the SNK team.

The project execution program and timelines were prepared by SNK in collaboration with IIMA and conservation execution tenders were floated for both buildings in the months of May-June 2016. After detailed analysis and scrutiny of the tenders submitted by various contractors, individual contractors were appointed. During the same period, Jones Lang LaSalle, IP, Inc was also appointed as the Project Management Consultant for this project.

Before the restoration works started at the site for both buildings, a detailed execution plan for their restoration work and phasing

03 Louis Kahn, Indian Institute of Management in Ahmedabad, India, 1962-1974. Louis Kahn Plaza. © SNK, 2014.



04 Louis Kahn, Indian Institute of Management in Ahmedabad, India, 1962-1974. Experimental arch built to demonstrate the construction under Kahn's supervision in 1970. © SNK, 2015.



was worked out by the entire team of SNK, PMC, the contractors and IIMA. The internal, enabling and scaffolding works were started in the monsoon month, July 2016, followed by the external works, to be executed after the monsoons.

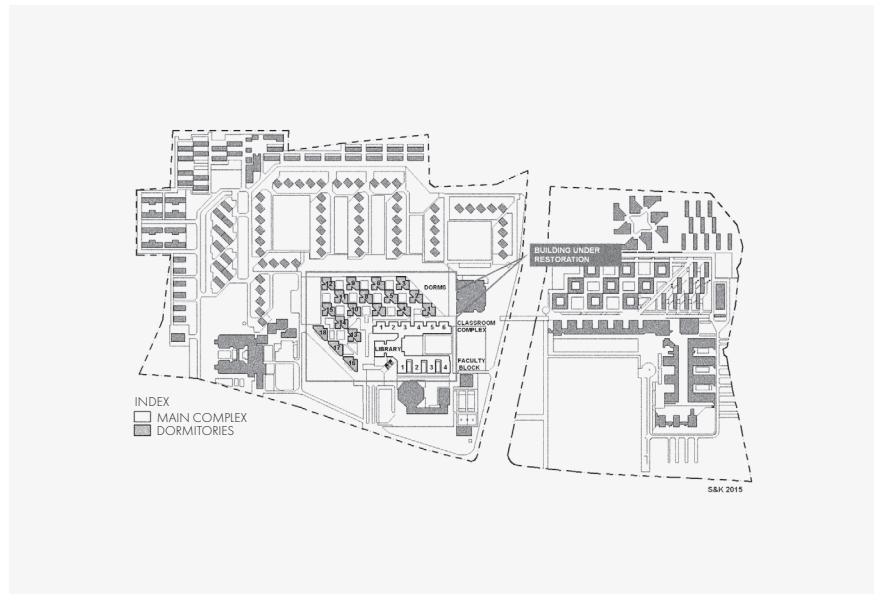
Dormitory D15

D15 was among the first set of dormitories that was constructed at IIMA. Being one of the oldest dorms, it showed a high level of architectural and structural distress compared to others. Hence, it was considered as a pilot project and the overall conservation plan and methodologies carried out at this dormitory can be applied as a base for the rest of the 17 dormitories in the coming phases.

D15 is a boys' dorm that consists of ground and two floors with a mezzanine between the ground and first floors in the toilet block. It covers a built-up area of approximately 1090 m². The dormitory consists of four areas of use – two common rooms (proposed as per Kahn's original design), 10 students' rooms (each on first and second floor), a triangular circulation lobby at every floor (with semi-circular staircase) and a service block (consisting of pantry, electrical room, bathrooms and toilets).

The conservation plan for D15 entails architecture and structure renovation, retrofitting (including seismic requirements) and Mechanical Electrical and Plumbing upgrade. It also includes restoration of architectural features and spaces designed by Louis Kahn that were earlier altered, such as the staircase drum roof and the common rooms on the ground floor.

The exterior conservation work comprises the repair of loading-bearing exposed brick walls, structural retrofitting, brick masonry crack stitching, specialized chemical cleaning for removing efflorescence and biological growth from the brick masonry, damaged brick replacement and repointing, treating



05 Louis Kahn, Indian Institute of Management in Ahmedabad, India, 1962-1974. Buildings under restoration. © SNK, 2015.

rising damp, restoring staircase roof, terrace waterproofing repair, restoration of doors and windows.

The interior conservation works includes restoration of internal exposed brick masonry, RCC slabs, masonry grouting, flooring restoration, toilet revamp, re-introduction of common rooms on the ground floor as per Louis Kahn's design, redesigning furniture, upgrade of mechanical, electrical and plumbing services through installation of new HVAC system, new electrical, low-voltage and plumbing lines as per current norms, and new lighting design.

The library building

The library building situated at the apex of the Kahn Plaza was constructed between 1968 and 1975. The library consists of ground more four floors and is divided into two

wings by a central circulation area with two staircases on either side. The reading hall on the second floor is the main feature of the building with a triple height space and large circular openings. The library covers a built-up area of approximately 4580 m².

To work out a conservation strategy for this building, intense brain-storming sessions were carried out between SNK and IIMA. This conservation plan not only entailed restoration and renovation of the existing structure, but also a complete internal re-planning and refurbishment of the library including MEP services that could cater to its current and future needs. During meticulous internal planning process, appropriate measures were implemented to make the library building barrier-free. The silent, quiet and collaborative study zone were also introduced for the students (the collaborative study zone aims

06 Louis Kahn, Indian Institute of Management in Ahmedabad, India, 1962-1974. The main reading hall, Vikram Sarabhai library. © SNK, 2014.



07 Louis Kahn, Indian Institute of Management in Ahmedabad, India, 1962-1974. Faculty blocks. © SNK, 2014.



08 Louis Kahn, Indian Institute of Management in Ahmedabad, India, 1962-1974. Lecture room, classroom complex. © SNK, 2014.



09 Louis Kahn, Indian Institute of Management in Ahmedabad, India, 1962-1974. Faculty blocks. © SNK, 2014.

to create spaces for meetings and discussions that are flexible and transparent for enhanced intellectual engagement).

The conservation works undertaken were the same referred in D15, in addition to the reconstruction of 85 damaged arches and of the southeast building, and RCC terrace slab repairs. In the interior it is also important to note that the new lighting design has taken into consideration the requirements of a library.

The restoration work is expected to be completed by May 2018.

Conclusion

Kahn's buildings are not easy to look after. There's a complexity both in the detailing and the structure. Besides, there's also a huge change in today's needs. At the time these buildings were built, systems such as plumbing and electrical services were quite

different and there was no internet; services that have now become such an important part of construction did not have the same importance at that time. Therefore, interventions started to happening over the years, with later consequences. There is a need for "a bigger picture" approach, and I think that is what is great about what is happening now. The board and the director of the IIMA are looking at the entire campus holistically. It's the first time that 20th century buildings are being addressed in this way, in India, and I hope it will set a precedent for other buildings, like Corbusier's buildings in Chandigarh

Notes

- 1 Architect I. M. Pei on the works of Louis Kahn, from *My Architect, a Son's Journey, My Architect, a Son's Journey*. Directed by Nathaniel Kahn, 2003; United States: New Yorker Video, 2003. Film.
- 2 Louis Kahn, *Louis I. Kahn: Complete Work 1935-1974*, Birkhauser Verlag AG, Basel Switzerland, 1977, 291.
- 3 *Id.*

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