Realization of the "Museum of Unlimited Growth" Without Façade in Ahmedabad by Le Corbusier

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Abstract
This paper aims to clarify the design method with a prototype by Le Corbusier, analyzing the transformation of the "Museum of Unlimited Growth" as prototype in Ahmedabad, India (1957). According to the analysis of the Le Corbusier Plans, the Carnets (Sketchbooks) and the documents of Le Corbusier's correspondence, the author categorizes the process of the transformation of the prototype into four parts, referring to the site plan composition. As a result, the paper finds two opposed ideas: on one hand, Le Corbusier expresses the universality of the museum "without façade" through the small, symbolic beam-like projections on the façade. On the other hand, he camouflages the façade with plants for the mitigation of the local climate. In conclusion, the paper clarifies that the creative process of Le Corbusier's prototype of Museum in Ahmedabad is the interaction between idealization and localization.

Keywords: Le Corbusier; museum; prototype; Ahmedabad; without façades

1. Introduction (Fig.1.)

Fig. 1. The Museum in Ahmedabad Under Construction (View from the Sabarmati River Side)

The "Museum of Unlimited Growth" (1939) as a prototype by the architect Le Corbusier (1887-1965) started from the "World Museum" of the Mundaneum (1929) and is formally established in the museum project in Philippeville, North Africa. The Museum of Ahmedabad in India (1951-1955) has importance as the first realization of this prototype.

As Ahmedabad developed with the textile industry, mill owners invited Le Corbusier for consultation regarding its modernization. Le Corbusier, who visited Chandigarh to make the capital city plans, stayed in Ahmedabad for three days from 20th March 1951. He was offered some projects: a few public buildings and private houses. The museum project, requested by Ahmedabad's mayor Chinubhai Chimanbhai, is one of them. The requirement from the client was the creation of a cultural center, not only the so-called art museum. Such a general museum consists of a number of sections; Art, Archeology, Natural history and Industrial history. For the first step of this project, the client needed an art museum as the core facility; preparing for the future construction of other annexes.

This condition was ideal for Le Corbusier who considered the museum fundamentally as the "world museum" to present human knowledge, which is not only possible through the art museum for collections and exhibitions.

Given such a program, Le Corbusier immediately noted and listed some construction themes, such as adoption of reinforced concrete, selection of local brick or stone material, correspondence with the climate (in particular, strong rain and local wind), etc. Nevertheless, he did not at all describe the whole idea for the museum. This was because he had already established the final image of this museum. He probably intended to adapt the prototype "Museum of Unlimited Growth" in Ahmedabad.
In Le Corbusier's museum prototype, visitors can enter the central hall of the cubic volume raised up by the pilotis. We can ascend the slope of the central hall to the exhibition floor and follow the spiral route, making a turn at the corner. In this continuous exhibition floor, the natural top light device emphasizes the spiral route, which offers the possibility of "unlimited" extension. According to the spiral-shape, the façade of the museum can always be renewed; as a consequence, the "Museum" is "without façade".

However, such a monotonous unlimited circulation may be a labyrinth for visitors; it is difficult for them to know where they are. The solution for this monotony is the fylfot circulation "Swastika", inserted in the cubic volume, which allows them to go to the central hall or the outside garden.

Needless to say, the construction of the museum in Ahmedabad is not a perfect reproduction of such a prototype. It is inevitable that a museum as prototype is influenced by external factors: geometry of the construction site, regional climate, the genre of the collections works, limited budget, etc. In particular, the problem of climate in contrast with the occidental climate is considerable for French-Swiss Le Corbusier.

![Diagram of the Transformation of the "Museum of Unlimited Growth" in Ahmedabad](image)

Fig.2. Diagram of the Transformation of the "Museum of Unlimited Growth" in Ahmedabad
In such a context, this study aims to clarify the design method with a prototype by Le Corbusier, analyzing the transformation of the "Museum of Unlimited Growth" as prototype in Ahmedabad.

Previous researches on Le Corbusier's museum discuss the historical value of his museum works (McClellan, 2008; Jodidio et al., 2010), or Le Corbusier's measure of concrete as material in Ahmedabad (Gargiani and Rosellini, 2011) or the top light system of this museum (Taguchi, et al., 2009; Watanabe et al., 2010). To the best of the author's knowledge, no research has yet been carried out to discuss the transformation of the spatial composition of the museum and its causes from the viewpoint of prototype.

According to an analysis of the Œuvres complètes, and the Le Corbusier Plans (176 plans), the Carnets (Sketchbook) and Le Corbusier's correspondence conserved at the Le Corbusier Foundation, the author categorizes the process of the transformation of the site plan in four parts (Fig.2).

2. Creative Process of the Museum in Ahmedabad

2.1 The First Project (from 19th September 1951 to 16th November 1951)

Le Corbusier visited the construction site in the occasion of the first visit at Ahmedabad. On the site he grasped the importance of the south road connecting the bridge of the Sabarmati River in its urban context, thus drawing the view toward the Sabarmati River (Fig.3.).

The construction site for the museum is located along the Sabarmati River on the opposite side of the traditional old town. It was on the 19th of September 1951 that Le Corbusier drew the first sketches for this site (Fig.4.). It was six months after the request for the museum by the client. In principle, the general plan by Le Corbusier is composed of the museum (exhibition space for art works) and the theater (dance space). The latter occupies the central space of the whole site and it is separated from the museum by a wall. For Le Corbusier, the museum itself was no more than one element of the cultural site in this period. From the 26th of September 1951, after one week from the first sketches, the plans by Le Corbusier show a clearer separation between the exhibition space and the dance space.

The volume of the exhibition space of 50 meters square is connected to three annexes for archeology, natural history and anthropology. The passageway is in the fylfot-shape. This is a simple adaptation of the principle of the "Museum of Unlimited Growth" at Philippeville, covering the functional condition in Ahmedabad.

However, not only functional conditions, but also climatic conditions such as the strong sunlight in Ahmedabad were imposed on Le Corbusier's idea. Le Corbusier, who had already visited the site, had to understand it with feeling. In fact, the central part of the prototype of the museum is opened as a courtyard with plants. The central hall and slope are also open-air, and visitors can go up to the upper floor of the indoor exhibition space raised up by pilotis.

It is certain that the courtyard is one of the transformations of the "Museum of Unlimited Growth" as prototype in Ahmedabad. This is a simple adaptation of the principle of the "Museum of Unlimited Growth" at Philippeville, covering the functional condition in Ahmedabad.

On the other hand, Le Corbusier studied different devices for natural lighting of the exhibition floor. In the "Museum of Unlimited Growth", the top light device corresponds with the spiral circulation on the
exhibition floor. In the Museum in Ahmedabad, the top light device, serving also as drainage, is arranged in rows to cope with the regional climate.

In the dance space are arranged the two main buildings: "Miracle Box" as the avant-garde stage setting and the "Spontaneous Theater" for folklore. Each is Le Corbusier's prototype, but both have a deep relation with Indian culture at the same time.

Based on these studies, the site plan was established on 9th October 1951 (Fig.4.). The center core of the site is apparently the dance space. The main access is from the west side of the site, and access to the exhibition space, separated from the dance space by a wall, is from the opposite east side.

2.2 The Second Project (from 11th March 1952 to 8th June 1952)

Le Corbusier consulted this plan with the client on the occasion of his second visit to Ahmedabad (from the 24th to 26th of November 1951). And also, he visited the construction site for the first time. On the site he understood the importance of the south road connecting the bridge of the Sabarmati River in its urban context, thus drawing the view toward the Sabarmati River (Fig.5.).

In March 1952, after a five-month interval from the second visit to Ahmedabad, Le Corbusier started to study again the relationship between the dance space and the exhibition space (Fig.6.), and established the site plan in detail. Reflecting on the study on site by Le Corbusier, the main access to this cultural site is changed from the west side to the south side and connected with the main south road. The "Spontaneous Theater" as prototype is abandoned, and the "Miracle Box" and the outdoor seats in the semi-circular shape are unified. Yet, the central core of the site is still the dance space.

On the other hand, the principle profile of the museum as the exhibition space is not changed. The main study for the museum is the interior of the exhibition floor: the mobile or fixed display cases according to Le Corbusier's measurement system, the Modulor.

Furthermore, in the exhibition floor of the museum, Le Corbusier studied the artificial lighting system in addition to the natural top lighting (Fig.7.). The "Museum of Unlimited Growth" as prototype has no artificial lighting. In the adaptation of the prototype in Ahmedabad, protection from the strong sunlight or the constant lighting for the art works forced Le Corbusier to use mechanical equipment.

2.3 The Third Project (from 30th May 1952 to 23rd November 1952)

The second project plans dated 11th March 1952 are focused on the serious question posed by the client when Le Corbusier visited Ahmedabad for the third time in March 1952.

After consulting with Le Corbusier, the client rearranged the problems and proposed to Le Corbusier the insertion of the small size "Miracle Box" into the museum and cancellation of several facilities like the auditorium, etc. The client was not negative about the outdoor theater for traditional folklore, but doubted the avant-garde function like the "Miracle Box". The client demanded from Le Corbusier a museum in principle, not a theater. Through the proposition of the functional reorganization, the client indirectly denied the central dance space conceived by Le Corbusier.

Le Corbusier accepted the proposition by the client, and studied the central exhibition space with the museum. That is, the museum was disposed in the
former place of the "Miracle Box" or the auditorium. Still more, Le Corbusier made the museum turn over like a mirror image (Fig.8.).

In addition, he studied possibilities for a library, offices and meeting rooms on the roof of the museum, which were the additional requests by the client. However, the acceptance of these requests indicates the abandonment of the natural top lighting. In fact, he stopped studying the top light device from the 2nd of July 1952. However, he did not consider any rooms on the roof. He considered the climate and studied a basin of 15 cm deep on the roof to protect from the temperature and humidity (the highest temperature of 48°C, the highest humidity of 86%).

Le Corbusier vindicated the abandonment of the natural top lighting as follows:

"The space for electrical installation extends under the entire surface of the ceiling which is placed in shadow, as described above, against the effects of the sun. Henceforth it will be possible to employ the illumination in solo, in duo, in trio, in symphony – uniformly subdued or sharply accented – analogous to the system of a musical score. The illumination has become an integral part of the museum's impression on the visitor. It is raised to the level of emotive power. It has become a determining element of the architecture."

This is self-denial of the natural top lighting of the prototype. At least, the basin on the roof cuts off perfectly the communication with the sunlight from the ceiling. It is certain that this solution is the victory of the exceptional climate in Ahmedabad that is different from Europe. However, in return for this defeat of the pure prototype, Le Corbusier rather tries to discover the value of the illumination of the artificial lighting to solve the limitation of the prototype.

On the other hand, the façade of the museum with the small beam-like projections manifests the possibility of extension of the "Museum of Unlimited Growth" as prototype. At the same time, the opening system such as grating or lattice for ventilation, named "clastra" is adopted on the façades of all sides. The "clastra" is also one of the prototypes by Le Corbusier, but the simplified "clastra" of this museum is different from the "clastra" of the wall of the entrance hall in the Unité d'habitation at Marseille (1952) or the South wall of the Chapel at Ronchamp (1953).

Nevertheless, we can say that the "clastra" of the museum in Ahmedabad is also a reference to the lattice screen of the stone wall called "Jali" belonging to a vernacular technique of the Jaina temple in Gujarat. In the process of the localization of Le Corbusier's prototype, its universality is reflected in the historical buildings.

Then, the site plan is reviewed again for the meeting with the client on the occasion of Le Corbusier's fourth visit to Ahmedabad (Fig.10.). In general, reflecting the demand by the client, the auditorium is abandoned and the museum occupies the central core of the site and is
connected to the long esplanade toward the Sabarmati River.

The esplanade from the museum on the west side to the Sabarmati River on the east side is a new concept, which reflects the theme of the view studied during Le Corbusier’s first visit to the construction site one year before (Fig.5.).

However, independent of the demand by the client, the "Miracle Box" removed along the esplanade becomes rather more important than before.

2.4 The Final Project (from 16th January 1953 to 20th May 1955)

During Le Corbusier’s fourth visit to Ahmedabad (from the 13th to 17th of November 1952), Le Corbusier and his client probably discussed the modification of the plan due to further reduction of the budget. In fact, Le Corbusier fundamentally reviewed the site plan and the functional composition of the museum (Fig.11.), and established the final plan in a short period.

Moreover, the open-air theater was disposed from the axis of the museum to the Sabarmati River. This is the final abandonment of the "Miracle Box" by Le Corbusier. Although the demand of the client caused this decision, its disposition blocked the view toward the Sabarmati River, which Le Corbusier had taken great care about.

Concerning the museum, the plants of the courtyard are changed to a small pond, and the stairs from the ground to the roof garden are set up (Fig.12.). It is certain that this circulation is separated from the exhibition route in order to see the art works in the museum, but visitors can see the two sorts of waterscape, in the ground and the rooftop.

Le Corbusier explained this rooftop as follows:
"It is assumed that visits to the museum will be made particularly in the evening and night-time; they will wind up on the roof which will offer a wonderfully flowered surface formed by more than 45 basins, of 50 m² each, all filled with water to a depth of 40 cm. This water is protected from the torrid sun by the shade of thick vegetation; each basin is strewn with leaves or blossoms floating on the surface of the water, the ensemble forming a checkerboard of blue, red, green, white, yellow, etc..."

It is certain that this is a new landscape. However, the rooftop, which should be called a garden, has no relation with the exhibition floor. It was a last measure taken under pressure of the necessity of protection from the climate in Ahmedabad and the abandonment of the significant top lighting system. Thus, the museum as prototype is realized, replacing the top roof lighting with the roof garden.

Moreover, the outer wall of the museum is studded with cheaper local brick tiles. Le Corbusier, who presumed the use of regional materials from the beginning, would have had no problem about the choice of material adopted on the prototype.

In the process of Le Corbusier’s review of the façade of the museum, the "claustra", the upper part of the façade, was canceled and replaced with a strip window which shows the brick material and emphasizes the horizontality of the façade.
In addition, the façade is covered with plants (Fig.13.). The vegetation of the outer wall is certainly one of the measures to protect against the severe climate, but it is possibly a method to show the "without façade" by "camouflage" with vegetation of the outer wall.

After these studies, the construction of the museum started from April 1954. However, the annexes, connected by the fylfot circulation "Swastika" or the open-air theater, has not yet been realized till today and maintenance of the roof garden and vegetation of the wall are not functioning so far.

3. Conclusion

The transformation process of the museum in Ahmedabad is no more than the localization of the "Museum of Unlimited Growth" as prototype with due consideration to the climate of the tropical region. The central part of the ideal prototype has become a void, a courtyard, and the natural lighting form has vanished from the ceiling.

It is a fact that Le Corbusier wrote, "we know that the museum does not grow unlimitedly" concerning this museum project, and he discovered the vernacular beauty in the façade of its museum. However, in spite of such awareness, Le Corbusier also declared the possibility of the extension of the completed building in Ahmedabad as the "Museum of Unlimited Growth." Moreover, he appealed to the Prime Minister Nehru about several constructions of this building type in other regions. This explains that the transformation process of the museum in Ahmedabad is not only the collapse of the prototype, but also the interaction of transformation and purification.

Remarkably, the façade of the museum suggests the duality of the building, assimilating the local climate and the ideal situation for the prototype separating nature. While the outer wall with the small beam-like projections indicates the museum "without façade" with unlimited extensions, the museum camouflaged by vegetation denies these small projections, a sign of "Unlimited Growth" and accepts independently the vegetable "growth".

Notes
1. AFLC (Archive Fondation Le Corbusier), L3-8-55.
2. AFLC, F1-11-18, "Propositions pour le Musée Municipal par Shri Gautam Sarabhai, 1951-3-23".
3. cf., ibid.
4. cf., Le Corbusier (1929-1934), p.73; AFLC, F1-9-1, Manuscrit de Le Corbusier sur le Musée à croissance illimitée 1939, non daté.
5. Made by the author. The overlap or the blank of each period depends on the plans conserved by the Le Corbusier Foundation.
7. About the studies on prototype, cf., Sendai (2005); Sendai (2012).
11. AFLC, C3-8, F1-11, P3-4, L3-8.

14. Le Corbusier was proposed three construction sites by the client (ex., FLC7069, 1951.5.25; FLC7070). He selected without hesitation this riverside site providing a wide landscape toward the old town.
15. In fact, Le Corbusier became more attracted by Hindi dance than Indian art (cf., AFLC, P2-3-83, lettre de Le Corbusier à O.D. Sondhi, 1953.1.15).
17. The annex of anthropology probably contains the display of the regional industrial history which the client demanded at the beginning.
18. About the characteristics of the climate in Ahmedabad, Le Corbusier had already received information in fragments. cf., AFLC, F1-11-18, Propositions pour le Musée Municipal par Shri Gautam Sarabhai, 1951-3-23. Le Corbusier feared not only strong sunlight, but also heavy rain and high humidity more than necessary. His anxiety introduced the emphasis of the roof system with gargoyles.
19. Mrs. Sarabhai informed Le Corbusier of the great quantity of rain in the monsoon season (cf., AFLC, F1-11-28, Passage de la lettre de Melle Gira SARABHAI du 1/10/51). It can be also said that he ought to set the pilots in preparation flooding.
20. The two prototypes for the dance are independent of each other. However, these are unified in Ahmedabad. cf., AFLC, W1-8-126, Le Corbusier, Album Nivola.
21. The prototypes for the dance probably came from the open theater in the Unité d'habitation, Marseilles (1952) or the Hindi dance (cf., Le Corbusier (1981), vol. 2, p.307, [1951.7.8]; ibid., p.308 [1952.6.14]). However, we could not indicate that Le Corbusier understood very well the importance of the Indian dance to unify the divers races in the modern Indian nation.
25. The outdoor seats in a semi-circular-shape have an important role for the outer ritual in the first project of the Ronchamp Chapel.
27. FLC7000. And for more sources, ex., FLC7024; FLC7039; Xenakis, FLC7023, 1952.6.8; [Xenakis], FLC7040.
28. cf., Le Corbusier (1938-1946), p.17. In Le Corbusier's pavilions for pictures, sculptures and photographs, etc., he has no idea concerning the artificial lighting.
29. cf., AFLC, P3-4-217, lettre de B. P. Patel (Municipal Commissioner) to Le Corbusier, 1952.7.7.
30. At the same time, staff of the Atelier Le Corbusier study the details of the top light device (ex., Xenakis, FLC7023, 1952.6.8.). Such a complicated study process demonstrates Le Corbusier's mental vibration between the ideal concept on prototype and the client's real demand.
31. cf., Maisonnier, FLC7009, 1952.7.22.
32. Maisonnier, FLC30208, 1952.5.30.
34. Olek, FLC6952, 1952.11.9. About the other plans being studied the façade, ex., [Le Corbusier], FLC29074; Olek, FLC6951, 1952.11.9.
In the project of the museum of Tokyo (1959) or the "Museum of Knowledge" in Chandigarh (1960), Le Corbusier will also conceive the idea of roof garden. Le Corbusier's roof garden on which man and nature are unified is the fundamental meta-prototype irrespective of the building type.

Le Corbusier left many details of the frame of the glass wall, the ventilation, the profile of the pond, etc. to Doshi who was an old staff member of Le Corbusier (cf., AFLC, P3-4-149, lettre de Le Corbusier à Doshi, 1955.5.21).

In addition, the position of the slope in the courtyard of the museum is moved to the west side which can not give visitors a view to the Sabarmati River from the slope (cf., [Le Corbusier], FLC7030). Visitors see only the sky framed by the courtyard. The courtyard in the final project obtains openness and closeness at the same time.

Le Corbusier requested photographs of the museum under construction in Le Corbusier (1952-1957), p.159. However, the reason for the rapid establishment of the final plan in February 1953 is not so clear, because Le Corbusier had enough time to review problems before the next fifth visit in Ahmedabad from the 20th to 23rd June 1943.

About the studies by Le Corbusier just before the abandonment of the "Miracle Box", cf., [Le Corbusier], AFLC, F1-11-33.

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Le Corbusier Carnets