# Realization of the "Roof Garden" in Ahmedabad by Le Corbusier
## - On the Creation of Villa Sarabhai -

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**Abstract**

The study aims to clarify the relationship between Le Corbusier's global concept regarding the environment ("Sun, Space, Green") and its realization in the transformation of the architectural form of the Villa Sarabhai (1952-1955) in Ahmedabad, India. According to an analysis of the *Le Corbusier Archives*, *Carnets* (*Sketchbooks*) and Le Corbusier's correspondence, Le Corbusier studied the architectural space of the Villa Sarabhai using the low-level vault to receive the wind and to merge into the landscape from the start of the project. However, in the process of this project, the rooftop form was transformed. That is, a roof garden where one could stroll freely on the vault was conceived. This horizontal layout with the "roof garden" differs from the utopian one that had been planned and achieved in the 1920's. The "roof garden" of Ahmedabad is a reflection of the relationship with the specific natural environment which Le Corbusier encountered.

**Keywords:** Le Corbusier; Ahmedabad; Villa Sarabhai; roof garden; sun

### 1. Introduction

This paper aims to clarify the relationship between the global concept of the environment and its realization at the local site, analyzing the transformation of the architectural form of Le Corbusier's Villa Sarabhai (1952-1955) in Ahmedabad, India.

Modern French architect Le Corbusier (1887-1965) formulated "Sun, Space, Green" ("Soleil, Espace, Verdure" in French) as necessary conditions of the modern urban environment from the perspective of urban sanitation according to the book of *Charte d'Athène* (Le Corbusier, 1943). An environmental diagram of this "Sun, Space, Green" should be realized at any place on Earth.

To realize such a global concept, Le Corbusier adapted his own prototypes. For example, the Villa Shodhan (1951-1956) in Ahmedabad is a cubic volume like the Maison Citrohan (1920) as a prototype. However, the Villa Sarabhai constructed at a contemporaneous period is a low-rise volume built as a continuous vault. The method of formation is contrastive.

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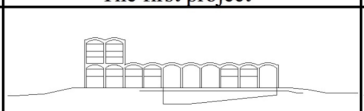
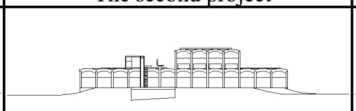
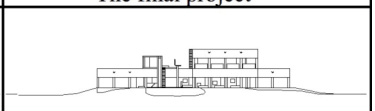
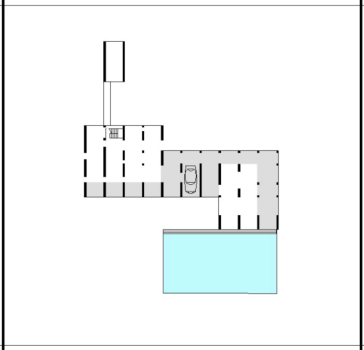
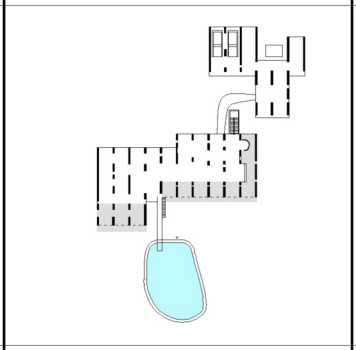
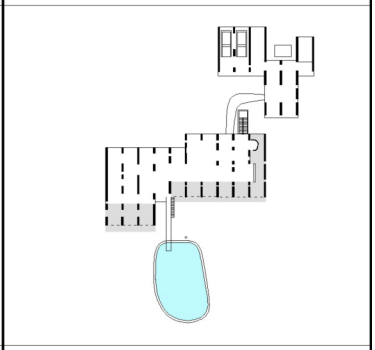
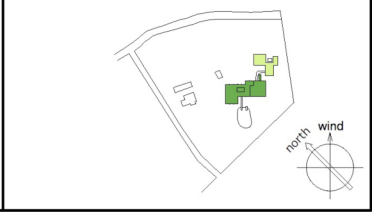
This paper analyzes the Villa Sarabhai formation to clarify the process of generating architectural form in contrast to the Villa Shodhan, considering the universality of the methodology upon which Le Corbusier's vision of the global environment is realized in a particular site.

Among previous researches, one paper analyzes the relation between roof form and environmental equipment function regarding Le Corbusier's initial house design (Benton, 1987). A different thesis refers to the symbolism inherent in the roof in Le Corbusier's architectural work (Curtis, 1986; Moos, 1971), and another discusses the regionalism in the vault (Kartik, 2002; Frampton, 1995). On the other hand, there are a range of papers researching the process of a specific architectural work with the vault (Chiambretto, 1987; Maniaque, 2005; Suárez, 2006[1]). However, no studies really clarify that the local environment influences the transformation process of architectural forms.

Compared with these studies, this paper refers to 156 architectural drawings (66 plans are dated) concerning the realization of Villa Sarabhai published in *Le Corbusier Archive XXVI* (*Archive*) (Le Corbusier, 1982) and Le Corbusier's notes in *Le Corbusier Carnets* (*Sketchbooks*), vols. 2-4 (Le Corbusier, 1981, 1982) and letter correspondence being kept by the Le Corbusier Foundation[2]. It divides the creative process according to three terms which correspond to the periods of execution of a series of plans for meetings with clients. Through this restoration of the process (Table 1.), this paper analyzes the relation between the transformation of the architectural form and Le

Table 1. Diagram of the Transformation of the Villa Sarabhai

| | The first project | The second project | The final project |
|---|---|---|---|
| South-West Elevation<br>0 10 20 30 m |  |  |  |
| Plan<br>half outdoor area<br>pool<br>0 10 20 30 m |  |  |  |
| Site Plan<br>Sarabhai's family<br>employee<br>0 40 80 120 m |  |  |  |

* This diagram is made by the author.

Corbusier's idea of the site environment where the Villa Sarabhai would be realized.

## 2. Creative Process of the Villa Sarabhai

### 2.1 The first project (from around 1951 to March 1952)

The Villa Sarabhai is a house built for Mrs. Manorama Sarabhai[3] and her two sons. The building project started in about 1951. In the same period, Le Corbusier had been commissioned for the projects of the Villa Hutheeing (which is antecedent to the Villa Shodhan), the Millowners' Association Building and the Sanskar Kendra Museum[4].

The Villa Sarabhai is located in the northeast suburbs of Ahmedabad, the Sabarmati River flows through its center. The houses of relatives of the Sarabhai family are scattered throughout the thick forest there under the scorching sun[5] (Fig.1.).

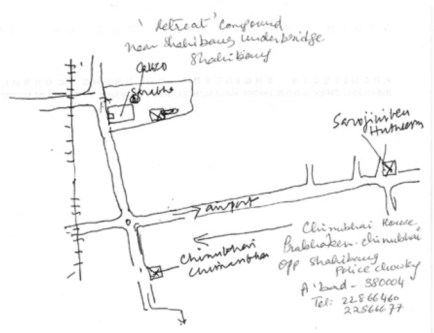



Fig.1. Site of Villa Chimanbhai (below), Villa Hutheeing (right) and Villa Sarabhai (above)[6]

Mrs. Sarabhai made a special request to have rooms with various functions, a swimming pool, and a veranda with a bed and an open terrace congenial to the Indian lifestyle[7]. On the other hand, Le Corbusier confirmed with Mrs. Sarabhai the climatic characteristics of the site in Ahmedabad with its intense temperature and strong wind[8].

No rough sketches by Le Corbusier exist. The first draft is composed of four drawings from March 7, 1952[9] (Fig.2.).

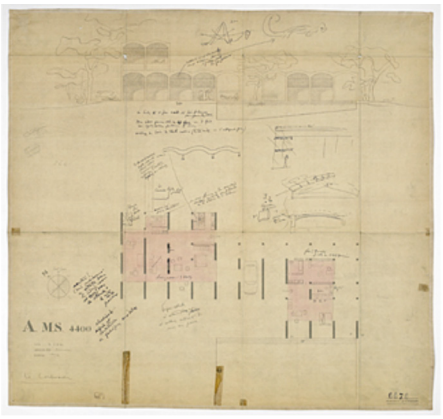



Fig.2. Main Floor Plan and Southwest Elevation (7 March 1952)[10]

In the site plan, the arrangement of the building has been decided by the seasonal wind that blows from the southwest, which also blows across the pool. For the first time, Le Corbusier was, right from the beginning, planning a system that employed cold air to

counterbalance the 50ºC climate of Ahmedabad in the summer[11].

The architectural form is composed of continuous vaults. The vault is seen in the plan of the early Villa Hutheesing and the early Villa Chimanbhai. It is the adaptation of Le Corbusier's own prototype developed from the Maisons Monol of 1919 (Sendai, 2005; Chiambretto, 2005) to shut out the light of the sun in India[12]. As a prototype this vault is supported not by columns but a long and slender wall.

In addition, the reticular device for sunshade and protection against moths is hung from the vault, the inside and outside of the vault are delicately separated. This sunshade device has its origin in the balcony called "loggia" from the Unité d'Habitation (1945) constructed in Marseille, and at the same time is a reference to the lattice screen of the stone wall called "Jali" belonging to a traditional technique of the Jaina temple in Gujarat[13]. Le Corbusier is paying attention to the form of this temple which is opened to the courtyard and shut to the outside.

However, the half outdoor space that Le Corbusier proposed does not have its origins in religious architecture alone. Le Corbusier was depicting the locals who relax on the balconies of the upper floors in the historical town district in Ahmedabad (Fig.3.). It is thought that the form of such a traditional residence influenced the draft of the Villa Sarabhai, in particular the concept of the "veranda".

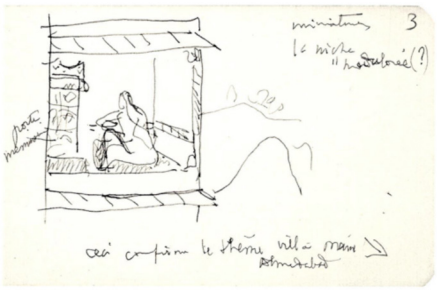


Fig.3. Sketches of Ahmedabad City by Le Corbusier (about October 1951)[14]

Moreover, the garage is placed at the center of the building, and the living room is located on both sides of the garage[15]. The internal stairs are planned on the northwest side to ascend from the outside. However, the rooftop would not be used, because the vault presented a curved surface.

Thus, Le Corbusier skillfully combined the vocabulary of traditional construction in Ahmedabad with existing prototypes of his own. He made the first project of the house which met the demand of Mrs. Sarabhai and merges on the site where the sun's heat is severe and the trees grow thickly.

**2.2 The second project (November 1952)**

The first project was summarized in two drawings in March 1952, and there are some notes written by Le Corbusier (Fig.2.). Perhaps these were made on the occasion of the direct meeting with Mrs. Sarabhai.

In a variety of examination items that have been described, important descriptions are the replacement of the employee's room from north to east near the front road, construction of the sunshade device with wooden panels and making the stairs outside.

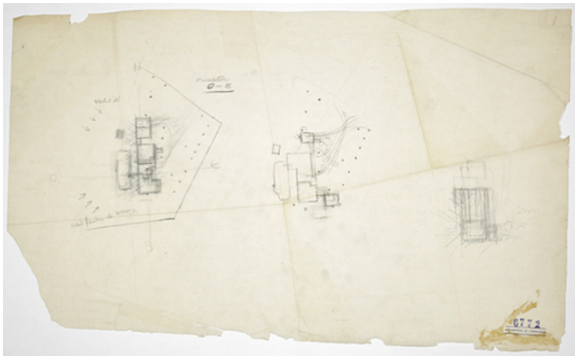


Fig.4. Reexamination of the Placement of Various Rooms[17]

The first reexamination since the first project was a replacement of the employees' room. The block of the employees' room and the house were examined to various degrees[16] (Fig.4.). Finally, the employees' room was located in the east with the garage and the stairs of the house were projected outside.

The bird's eye view was drawn again to determine the overall volume. The sunshade device was replaced by a wood panel. And at the same time, the rectangle of the pool was reduced, and it was transformed into an outline with a curve[18]. A small bower was drawn on the rooftop. However this was not used as a roof garden[19].

Next is an examination of more specific modifications started from May through June 1952. First, the approach from the employees' room to the house becomes a curve from the former straight line, and the carport is put in the block of the employees' room[20]. Moreover, an irrigation channel is depicted on the rooftop with the bower, and a pool slide ("toboggan") has been added[21]. On the other hand, concerning the interior space, furniture, desk, shelf, bed, etc. are planned to be made of wood[22].

Furthermore, the detail of the vault is examined, and the relationship between the waterway of the irrigation channel and gargoyle is also examined. At the same time, through the thickness of the top of the wall, the lintel and the vault are articulated[23].

In this way, two elevations and two floor plans were summarized in November 1952[24]. One span of the vault has been reduced from 3.66m to 2.96m in accordance with "Le Modulor" (Le Corbusier's module). The main floor and the interior stairs also have been dimensioned according to the stone division like "Le Modulor". The half outdoor space was designated as "veranda"; the bower in the upper floor was named "closed terrace (terrasse couverte)" and its outside "open terrace

(terrasse ouverte)".

In addition, independent columns were attached to the southwest facade and separated visually from the vault. Thus, the facade of the house emphasized verticality from the ground (Fig.5.).

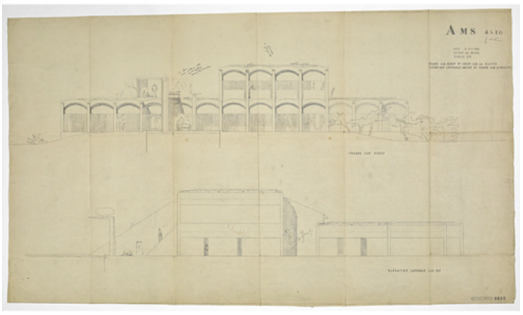


Fig.5. Southwest Elevation and Southeast Elevation (8 November 1952)[25]

**2.3 The final project (from the February 1953 to May 1955)**

In February 1953, three months after the establishment of the second project, the final project was made[26]. The most significant change other than a modification of various room arrangements is that the column disappears from the façade on the southwest side, and the horizontality of this façade is emphasized with a concrete lintel. The equal thickness of the lintel and inner wall makes a smooth continuity of the wall, the lintel and the vault[27]. The upper part of the vault is filled with soil to provide a promenade across the roof garden[28] (Fig.6.).

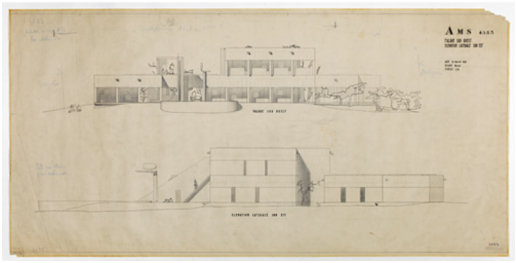


Fig.6. Southwest Elevation and Southeast Elevation (13 February 1953)[29]

After examining the series of drawings of the final project, Mrs. Sarabhai wanted to reduce the size of the pool[30]. Le Corbusier tried to respond to her request[31]. Also, Mrs. Sarabhai intermittently requested from Le Corbusier detailed revisions of the furniture arrangement of the living room[32], upstairs kitchen[33], bathroom[34], stairs for employees[35] and parapets[36], from July 1953 to June 1955. Le Corbusier coped with most of the requests of Mrs. Sarabhai regarding these vital functions[37].

Another request for the reduction of the pool size was made in February 1955, but Le Corbusier refused to do so because the excessive size reduction posed a risk to children[38]. Le Corbusier's refusal concerning repeated requests for reduction of the pool size was not only based on the functional reason that the pool had a fundamental role to act as a cooler in the first project. It is an aesthetics request for the effect of the surface of the water. In fact, Le Corbusier reads the effect of the reflection of the front surface of the water in front of the Haute Cour (1952) in Chandigarh as "miraculous" and "perfect"[39]. The horizon that the Haute Cour and the facade on the water create is a relation to and homology of the Villa Le Lac (1923) and Lac Leman. It is thought that Le Corbusier was depicting the vision of such a horizontal landscape in the Villa Sarabhai too. In fact, regarding the external facade, the exposed concrete material (lintel) emphasizes the horizontal effect.

Therefore, Le Corbusier's roof garden of the Villa Sarabhai is not another world separated from the earth like the Villa Savoye (1931)[40]. In Villa Sarabhai, it is conceived as an extension of the horizon of the earth. That is to say, this roof garden has a wild finish in response to the surrounding forest, and produces the atmosphere of a "bungalow"[41] (Fig.7.).

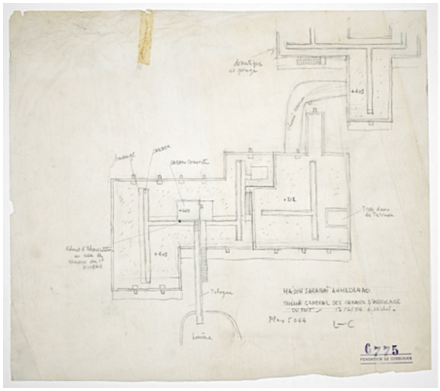


Fig.7. Examination of Roof Garden by Le Corbusier (17 June 1954)[42]

Meanwhile, since October 1953, reliefs made from a concrete mould were examined[43]. The brick wall, the concrete beam (lintel) and the plain tile roof of the vault will be separated visually (Fig.8.).

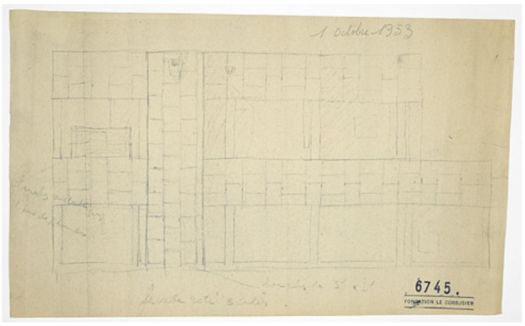


Fig.8. Examination of the Southwest Facade (1 October 1953)[44]

At the same time, Le Corbusier studied the color of the walls and furniture of the interior space of the vault roof[45], and considered the display of his own

photomontage[46]. As the project of the residence inside an agricultural estate near Cherchell, North Africa (1942) indicates[47], the internal space of the vault is like a "grotto"[48] achieved by the structure of the wall and the roof. In the case of the Villa Sarabhai, continuous space connected by the indoor, veranda and outside forest evokes such a primitive sense of grotto.

This effect does not concern decoration. In fact, Le Corbusier visited the completed Villa Sarabhai and wrote to Mrs. Sarabhai as follows. "I've visited the Villa. You have a beautiful residence. However, the gardener, your old furniture and suspicious ornamental art works may immediately destroy the atmosphere, the environment and the spirit of this residence. Please preserve this house!"[49]

At the same time, in the veranda of the southwest façade, a wooden revolving door was examined[50]. The revolving door is partially fitted with glass to obtain a visual continuity when it is closed.

Thus, the Villa Sarabhai realizes an integrated environment covered with vaults. At the same time, this is also the realization of the roof garden which had not been planned until this period. In fact, Le Corbusier writes of the roof of the Villa Sarabhai, as "one attainment" (Fig.9.)[51].

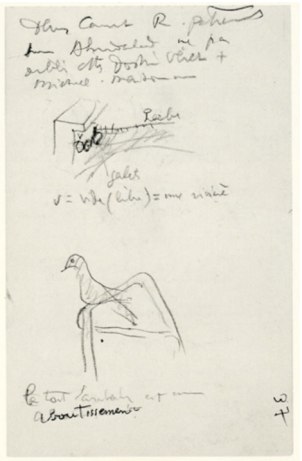


Fig.9. Vault Sketch of Villa Sarabhai by Le Corbusier (about May 1956)

## 3. Conclusion

Le Corbusier conceived an architectural space suitable to the site conditions (the sultry sun and the thick forest) since the beginning of the conception of the Villa Sarabhai. He depicted the roof as a low vaulted roof so as to receive cool breeze blowing over the pool but at the same time integrating it into the landscape rather than separating it. In this architectural composition, Le Corbusier adapted his own prototypes and referred to some motifs of historical buildings in India at the same time.

In this context, the first project had not been equipped with a roof garden on the vault. However, in the final project, Le Corbusier planned a wild roof garden where one was able to stroll. At the same time, the façade had been changed to emphasize the horizontal expression, and the veranda opens onto the nature.

In short, the creation of the Villa Sarabhai was the process of creating continuity with the external environment by using vaults and also this process of realization is promoted by the roof garden on the vault. This roof garden is not simply Le Corbusier's original "roof garden" separated from the earth in urban residences from the 1920s.

Le Corbusier describes the "roof garden" in Deux Maisons Construites Pour la Ville de Stuttgart Dans la Colonie de Weissenhof (1927) as having big advertising potential as an international style. "Instead of tile or slate, instead of the attic, the more glorious place in the house. Air, sun, space."[52]

However, at the site of the Villa Sarabhai, the strong sun and rich plants already existed. It did not need any rooftop separated from the earth. The "roof garden" of the Villa Sarabhai is different from "the Virgilian landscape"[53] that produces a naturalistic style. As a second earth, the "roof garden" of the Villa Sarabhai spreads horizontally while maintaining continuity with the earth. It differs from the parasol as the sunshade of the Villa Shodhan arranged to interrupt sunlight on the site where the trees are few. The natural trees around the Villa Sarabhai play the role of a natural parasol[54].

Thus, the creation of the Villa Sarabhai, like the Villa Shodhan, is the interaction with the natural environment in situ that Le Corbusier faced in India. However, it differs from the site in the Villa Shodhan where the trees are sparse. The site of the Villa Sarabhai is in a thick forest. In the Villa Sarabhai, it is possible to eat under the vault, cool down in the veranda and go up the stairs to the low roof garden surrounded by the forest again. Thus, Le Corbusier brought the vertical movement in the roof garden of the 1920s back to the earth again by creating horizontal continuity in the architectural promenade in the Villa Sarabhai.

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11) Le Corbusier, correspondence, Archive Fondation Le Corbusier (AFLC).
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16) Suárez, M. (2006) Commentaire de 1951 Villa de Mrs Manorama Sarabhai, Le Corbusier Plans, DVD vol.10, Echelle-1.

## Notes

[1] Suárez (2006) deals with the design process of Villa Sarabhai, but focuses on the relationship with the client.
[2] AFLC, L3-8, P3-5, P3-7, Fondation Le Corbusier.
[3] She is the widow and the younger sister of Chinubhai Chimanbhai who was the mayor of Ahmedabad.
[4] Perhaps, it seems that the Villa Sarabhai was requested during the first visit in India by Le Corbusier (1951/02/18-3/19). In fact, in May 1951, just after returning from India, correspondence with Le Corbusier and Mrs. Sarabhai had started.
[5] Le Corbusier did not visit the site before drawing the architectural concept. Le Corbusier had visited the site around February 1954. cf., Le Corbusier (1981), H31 (10).
[6] Sketch that Mr. Balkrishna V. Doshi drew when the author was interviewed, Ahmedabad, 2004.12.8.
[7] cf., AFC, notes de Le Corbusier, P3-5(166-167), 1951.11.26.
[8] cf., AFC, letter from Le Corbusier to Mme Sarabhai, P3-5 (161), 1951.10.1. In fact, fiercely hot and high humidity during the rainy season, and the difference with the winter season was about 70 degrees. cf., AFLC, P3-5(163), Letter from Mrs. Sarabhai to Le Corbusier, 1951.10.1.
[9] cf., FLC6675, Le Corbusier, Maisonnier, 1952.3.7; FLC6676, Le Corbusier, Maisonnier, 1952.3.7; FLC6677, Le Corbusier, Maisonnier, 1952.3.7; FLC6678, Le Corbusier, Maisonnier, 1952.3.7
[10] FLC6676, Le Corbusier, Maisonnier, 1952.3.7, Fondation Le Corbusier.
[11] Suárez (2006) interpretes that the pool in the first project is a reference to the step well in India. However, there is no record that Le Corbusier had visited the step well. Because, according to the author's interview with Balkrishna V. Doshi who worked with Corbusier and took part also in the achievement of Le Corbusier's architectural work of Ahmedabad, Le Corbusier visited the mausoleum of Sarkej (15th century - 16th century) and extolled its beauty. However, Le Corbusier was not interested in the shadow of the step well dug under the soil (Interview with Balkrishna V. Doshi by the author, Ahmedabad, 2004.12.8).
[12] In the same period of the project of the Villa Sarabhai, Le Corbusier had studied the vault roof as a prototype unit in Roq et Rob (1949).
[13] cf., Le Corbusier (1981), E18 (360), [1952.3]. In fact, Le Corbusier and Mrs. Sarabhai have visited the Jainism Sheth Hathisingh Temple in the old city of Ahmedabad. Le Corbusier inquired the detailed information on this religious architecture after this visit. cf., AFLC, P3-5(155), Letter from Le Corbusier to Mrs. Sarabhai, 1951.5.3.
[14] Le Corbusier (1981), E23 (611), [1951.10.27].
[15] Various room names are not described. However, it seems that these rooms are being allocated to the Mrs. Sarabhai and two sons.
[16] FLC31904, sd. Examination of the concrete external stairs afterwards, cf., FLC30261, s.d.; FLC31883, 1953.6.4.
[17] FLC6772, s.d., Fondation Le Corbusier
[18] cf., FLC6768, s.d.
[19] Suárez (2006) considers this bower as the room for the roof garden. However, the outdoors part where one can stroll is very small in this period.
[20] cf., FLC31882, 1952.5.21; FLC31884, 1952.6.4
[21] cf., FLC31886, 1952.6.20; FLC1952.6.25. It seems that the installation of the pool slide is not a demand of the client. It can be thought of as a reference to the Jantar Mantar astronomical observatory that Le Corbusier sketched in Delhi. cf., Le Corbusier, *Le Corbusier Carnet*, vol. 2, Éditions Herscher/Dessain et Tolra, Paris, 1981, E18(330), [1951.2.25.]. Suárez (2006) indicates the suggestions from Mrs. Sarabhai's son, but the source is not certain.
[22] ex., FLC31891. 1952.7.4; FLC31892, 1952.6.23
[23] cf., FLC6699, 1952.6.17; FLC30261, s.d.; FLC31894, s.d.
[24] Original plans, cf., FLC6679, Michel, 1952.11.8; FLC6683, Michel, 1952.11.10. Original elevation, cf., FLC6687, Michel, 1952.11.8; FLC6689, 1952.11.8.
[25] FLC6690, Michel, Le Corbusier, 1952.11.8, Fondation Le Corbusier
[26] 1/50 general drawings, FLC6693, Michel, 1953.2.12; FLC6694, Kim, 1953.2.13; FLC6686, Michel, 1953.2.13; FLC6695, Michel, 1953.2.13; FLC6696, Michel, 1953.2.14; FLC6697, Michel, 1953.2.13; FLC6698, Kim, 1953.2.13; FLC6701, Kim, 1953.2.13. In addition, drawings concerning the vault, the stairs, the gargoyle and the interior furniture are made.
[27] Examination process concerning the joint of wall and lintel, cf., FLC30260, s.d.; FLC30258, s.d.; FLC30259, s.d.; FLC31900.
[28] Examination of the covering of the roof vault, cf., FLC6713, s.d.; FLC6752, s.d.: FLC6775, Michel, Le Corbusier, 1954.6.17.
[29] FLC6695, Michel, 1953.2.13, Fondation Le Corbusier.
[30] cf., AFLC, P3-5(187), Letter from Véret to Le Corbusier, 1953.7.2.
[31] ex., FLC31902, s.d. and FLC31903, s.d. The pool has been diminished.
[32] ex., FLC6740, Michel, 1953.7.13.
[33] ex., FLC6773, 1953.7.8.
[34] ex., FLC6714, Doshi, 1955.2.2.
[35] ex., FLC6716, Tabito, 1955.2.13.
[36] ex., FLC6757, J. L. V., 1954.3.8.
[37] However, Le Corbusier has refused to set up an eave in the slide pool. cf., AFLC, P3-5(191), Letter from Véret to Le Corbusier, 1953.7.31.
[38] cf., AFLC, P3-5(219), Letter from Le Corbusier to Mrs. Sarabhai, 1955.2.7.
[39] cf., Le Corbusier (1981), J36(286), 1955.3.23; ibid., J36 (296), 1955.3.24.
[40] The fist case of the roof garden is the upper terrace of Maison Citrohan (1920). It is a form extremely similar to the house in Une cite Industrielle, etude pour la constructon villes (1917) by Tony Garnier, and the rooftop of the flat roof is one of the benefits of the reinforced concrete construction. Le Corbusier refers to "roof garden" as an architectural theme for the first time in the Maisons La Roche – Jeanneret (1923). Afterwards, this theme is intermittently pursued. In any case, Le Corbusier's "roof garden" is the planting for the protection roof and the control of the indoor thermal environment. In addition, "roof garden" is a place for natural life by contrast with the urban environment. cf., Le Corbusier (1910-1929), p.128; Le Corbusier (1938-1946), p.140.
[41] cf., AFLC, P3-5 (201), Letter from Le Corbusier to Mrs. Sarabhai, 1954.5.3; FLC6775, Michel, Le Corbusier, 1954.6.17.
[42] FLC6775, Michel, Le Corbusier, 1954.6.17, Fondation Le Corbusier.
[43] ex., FLC6744, Michel, 1953.10.27; FLC6746, Michel, 1953.10.25; FLC6743, s.d.: FLC6747, 1953.10.1; FLC6749, 1953.10.1; FLC6745, 1953.10.1.
[44] FLC6745, 1953.10.1, Fondation Le Corbusier.
[45] cf., Le Corbusier (1981), K42 (609), [1954.4.27].

[46] cf., Le Corbusier (1981), H31 (42), 1954.4.27; FLC6719, Le Corbusier, 1954.12.22; FLC6725, s.d.

[47] cf., Le Corbusier (1938-1946), p.112.

[48] cf., Samuel (2007), pp.28-33.

[49] cf., AFLC, P3-5(223), Letter that Le Corbusier addressed to Mrs. Sarabhai, 1955.5.1.

[50] ex., FLC6709, 1953.4.24; FLC6780, s.d.

[51] cf., Le Corbusier (1981), K42 (628), [1956.5.2].

[52] Le Corbusier (1910-1929), p.156.

[53] cf., Imbert (1993), p.182.

[54] The origin of Le Corbusier's "parasol" is a shade device of Le village coopératif (1934-38) as an application of the Maisons Monol (1919). On the other hand, from Pavillon Neslé (1928), Le Corbusier pursues steel "parasol" in the building type of pavilion. These researches are applied to the capitol building in Chandigarh and house designs in Ahmedabad. Concerning the parasol of the Villa Shodhan, see Sendai (2005).