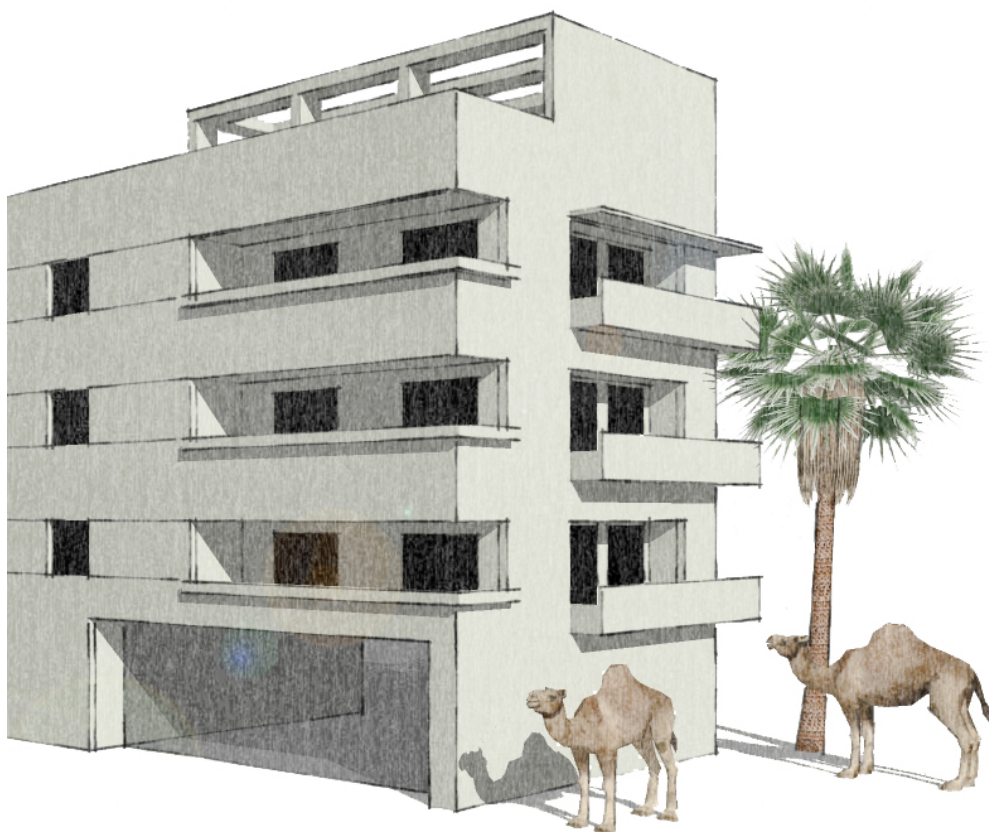


‘Adoption with Adaptation’

The pursuit to acclimatize international style architecture to Israel's environmental conditions



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April 2013

ABSTRACT

In order to understand the essence of contemporary Israeli Architecture, one has to go back in time to the 1930s, firstly understanding what were the climatic, cultural and ideological circumstances that brought a new born small city on the Mediterranean named Tel Aviv to become the world's largest concentrations of international style buildings, creatively adapted to fit Israel's local conditions and needs. By studying the sources of inspiration namely Le Corbusier and the Bauhaus, together with early experiments of regionalizing the international style in Israel, this paper will demonstrate how climatic considerations served as key generators in the formulation of a unique international style vocabulary which was used to define Israel's prevailing building tradition thereafter. The key elements of this adaptation will be further categorized and examined. Conclusively, in the light of the big gap between these past environmentally sensitive design strategies and contemporary fully glazed self-centered and mechanically controlled office towers, the question for further research rises: how can we once again adapt global building trends responsively?

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ACKNOWLEDGMENTS

I would like to express my gratitude to the entire staff of tutors and visiting lecturers at the AA SED program, mostly to Prof. S. Yannas for his personal guidance.

1. INTRODUCTION

International style Architecture and the Zionist Idea

In 2003, UNESCO proclaimed Tel Aviv's "white city" as a World Heritage Site, acknowledging the universal value of its unique and world's largest collection of International Style buildings; The "white city" celebrations which take place annually ever since this declaration, reveal the intriguing story of Tel Aviv - the first Modern Hebrew city, which was shaped up during the 30s by the affinity between the ideas of Modern Architecture and Zionism;

The Zionist ideology, driving the pursue of Jewish people towards new national identity, could not rely on local cultures and styles such as orientalism, nor on existing architectural traditions; thus, the ground was prepared for a new visual mold set by Modern Architecture (Nitzan-Shiftan 2004). Moreover, the needs of the new Jewish society to build fast, functional, effective and cheap in order to accommodate waves of immigrants, had matched the social and ideological background of Modern architecture and its machine esthetics and functionality.

The guidelines of modern architecture quickly emerged and implemented in Israel thanks to a group of young architects during the early 30s who were commonly known as the 'Chug' (circle); these architects imported modern ideas they had gained through education and professional practice in Europe, and actively promoted them upon their return through publications and built work. The adoption of these Modern architectural concepts by the 'Chug' architects had been involved with constant tension between the tough high ideology and local functional considerations; through adapting the international style to fit local conditions a unique architectural vocabulary was developed, also referred to as the 'Bauhaus vernacular', in which the Mediterranean sun angles, sea breeze for ventilation together with the life style of the worker were combined to forge a mold that continued to shape up the rest of the country after the establishment on the State of Israel in 1948 and further on during years to come throughout the country.



Figure 2.1 Tel Aviv 1930s
(Source: Tel Aviv municipality)

This paper will focus on the climatic considerations which formed the 'Bauhaus Vernacular' in Israel and portray how these considerations had created a unique vocabulary of adaptation to the Mediterranean weather. These climatic adaptations will be researched by firstly tracing back the sources of inspiration, and then examining them together with original published materials regarding climatic considerations published by the 'Chug' architects during the 30s; through that, the main principals of climatic adaptation will be highlighted focusing separately on urban positioning, built form, flat layout, Materiality and solar control detailing.

Conclusively, by briefly examining the evolution of Israeli Architecture from the 30s through important milestones in its history, the change of trend from climatic responsive design towards functional and low quality construction will be demonstrated; this trend which was associated with economic and technological restrictions is evident today, even in times of prosperity and could be best demonstrated through the irresponsive adoption of the High rise typology which along with many other factors calls for a new shift of thought – back to reconnecting Israeli architecture with the local climate.

2. SOURCES OF INSPIRATION

The Bauhaus

The important influence of the Bauhaus school on the early works of the Israeli Architects who attended it until 1933 was clearly noted; Figures 2.1-3 show two influential examples of Bauhaus architecture from the mid-20s (the Bauhaus building by Walter Gropius, 1926, and Mies Van Der Rohe's building in Werkbund exhibition in Stuttgart 1927, Figures 2.1 and 2.2 respectively) together with Arie Sharon's cooperative Worker Residences in Tel Aviv (1933-35). By examining these buildings together, one can clearly trace how the overall proportion, appearance and clean functional style of Mies in Werkbund had echoed through Sharon's work (Figure 2.3); However, despite the strong inspiration, some substantial modifications mark the beginning of a personal adaptation of these principles by Sharon to fit local social agenda and climatic conditions:

- (a) *Glazing area* - The windows sizes had been clearly minimized and were coupled with shutters to reduce unwanted sunlight penetration (Figure 2.3 C).
- (b) The glazed vertical staircase of the Werkbund building was converted into an open staircase with glass panel protection from wind and rain (Figure 2.3 B).
- (c) *Outdoor areas* - The climate allowed a strong connection with the outside; it was encouraged in the design by creating large communal enclosed gardens between the buildings (Figure 2.3 A), in addition to the introduction of small balconies facing these gardens which were inspired by the Bauhaus building in Dessau (Figures 2.1, 2.3B).
- (d) *Urban aspects* - In difference to the free standing posture of both Bauhaus buildings, the cooperative Worker Residences in Tel Aviv was a complex of four buildings built within the urban fabric, that generated thoughts regarding natural ventilation and solar access considerations which together had driven the design and positioning of the buildings (Figure 2.3 A).



Figure 2.1 Bauhaus building, Dessau
Walter Gropius 1926

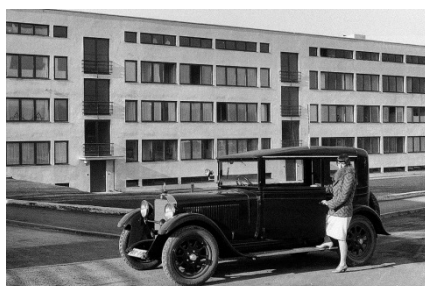
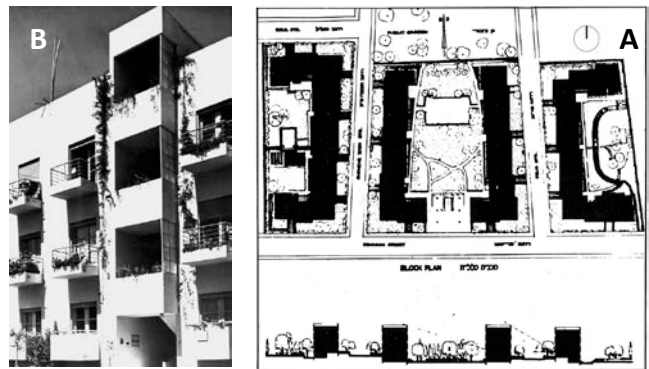


Figure 2.2 Werkbund exhibition building,
Stuttgart, Meis Van Der Rohe, 1927



Figure 2.3 cooperative Worker Residences,
Tel Aviv, Arie Sharon, 1933-5 (Source: Arie Sharon)

Le Corbusier

It is not by chance that the effect of Le Corbusier on the formation of Israeli Modern Architecture, both directly (by Israeli Architects who worked with him), and by his built work and published literature was immense; Inspired by his visits to the Mediterranean during the beginning of the 19th century, Le Corbusier's work offered local Israeli designers the architectural solutions they sought in order to adjust International Style to local conditions (Levin 1984); the use of reinforced concrete, whitewashed walls, the building on *pilotis*, sun control louvers and the ideas of the free plan and flat roof design, all served as major sources of inspiration in the formation of the local modern language not only the first, but also the second generations of Israeli Architects throughout the country.



Figure 2.4 Le Corbusier 5 points of Architecture
(Source: After Eli Inbar, Archidialog)



Figure 2.4 Engle House, Zeev Rechter, Tel-Aviv 1933
(Source: Levin 1984)

3. 'BAUHAUS VERNACULAR'

Climatic adaptations creating new vocabulary

A. Urban Layout

As the city of Tel Aviv grew rapidly - from a small village near Jaffa of 300 residents in 1910 to 150,000 by 1945 (Cohen 2003), an overall urban plan was urgently needed. During 1938 the British planner Patrick Geddes (who had been recruited for that mission as early as 1925), had introduced a new Master Plan; Geddes's plan created a local variation to the concept of the Garden City - with hierarchy between more intensive South-North roads and Westerly oriented secondary roads crossing them; These East-West roads which were cooled by the sea breeze, had lower density of residential units along them limited to 3-4 stories to allow air flow, and designed around small communal spaces and gardens.

The implications of building orientation was widely discuss in published articles of local architects (the 'Chug') during the 30s; It was argued that orienting the buildings towards west was very beneficial for natural cross ventilation during hot periods, and also should affect urban considerations of density and distances between buildings to allow air movement between them (Figure 3.1). The problematic excessive and hard-to-control heat gains towards the west were acknowledged by local architects and had been discussed in Dov Carmi's article 'The orientation of the flat in Tel Aviv'¹; according to Carmi, the prevailing recommended orientation should be North-West to achieve a balance between suitable ventilation and solar control considerations (see also chapter 3.C on Flat Layout).

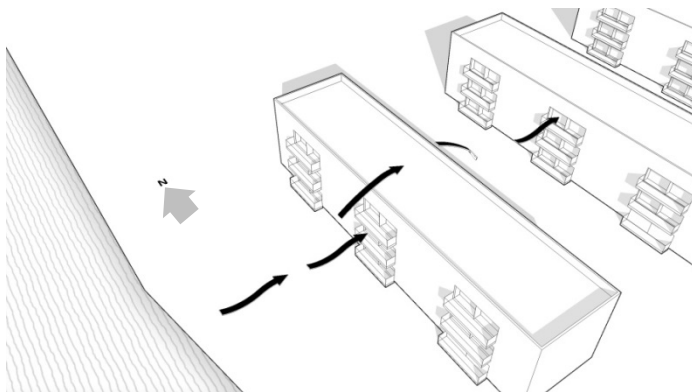


Figure 3.1 Illustration showing preferred orientation working with the sea breeze to achieve natural ventilation

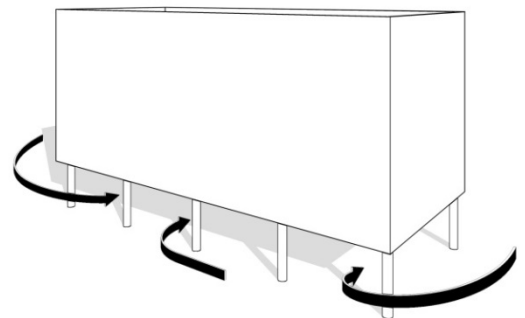


Figure 3.2 Illustration showing the concept of buildings elevated on columns (*pilotis*)

The idea of *pilotis* (Figure 3.2) had a strong role in shaping up the local character of Israeli Modern Architecture and was widely used in Tel Aviv and later throughout Israel; Apart from the urban advantages of continual communal ground floor and extension of the narrow public streets into a shaded city scape beneath the buildings, the Corbusian idea had introduced the local advantage of extending the sea breeze further inwards and helped relieve heat and humidity by cooling the building above, and the interior courtyard between the buildings. Architecturally, this idea had also served as the clearest manifestation of the free plan principal showing how the building is supported only by its concrete frame structure, allowing each plan and façade to be designed differently (Levin 1984).

¹ 'Habinyan Bamizrah Hakarov', November 1936

B. Building Volume

The envelope of the building had been transformed to fit local climatic conditions in different aspects –

Horizontal accentuation – The large continuous ribbon windows commonly used in the International Style design vocabulary (Figure 3.3) introduced problems of excessive heat; these were confronted creatively by minimizing the window sizes together with transforming some of these openings into sunken balconies that were aligned with the continuous horizontal lines (Figure 3.4 A).

Balconies served as an important extension of the small flats; it was where people ate, socialized and actually lived during different times of day. Very quickly balconies had taken a central part in the local design language serving also as overhangs; shadowing the openings and balconies below (Figure 3.4 B).

Roof tops were part of the local tradition since biblical times and worked very well with the flat roof terrace concept of the Modern Style; although the roof terrace served usually as a laundry area, in many examples the roof features a concrete pergola which in time had become one of the strong elements in Tel Aviv's International Design vocabulary (Figure 3.4 C).

Proportions – at the same time Le Corbusier was studying floor to ceiling heights with the modulator and planned section heights of around 2.26m (Unite le habitation), In Tel Aviv, generous floor height was designed around 3.2-3.4m, implementing previous knowledge of local Arab building tradition characterized by 4 meters floor height. However, detached Arab houses were designed with heat exhaustion for trapped hot air via small roof openings which were not feasible in residential blocks, and further on, when mechanical heating and cooling were introduced and became more commonly used, these big volumes resulted in higher heating and cooling loads.



Figure 3.3 Villa Savoye,
Le Corbusier 1929

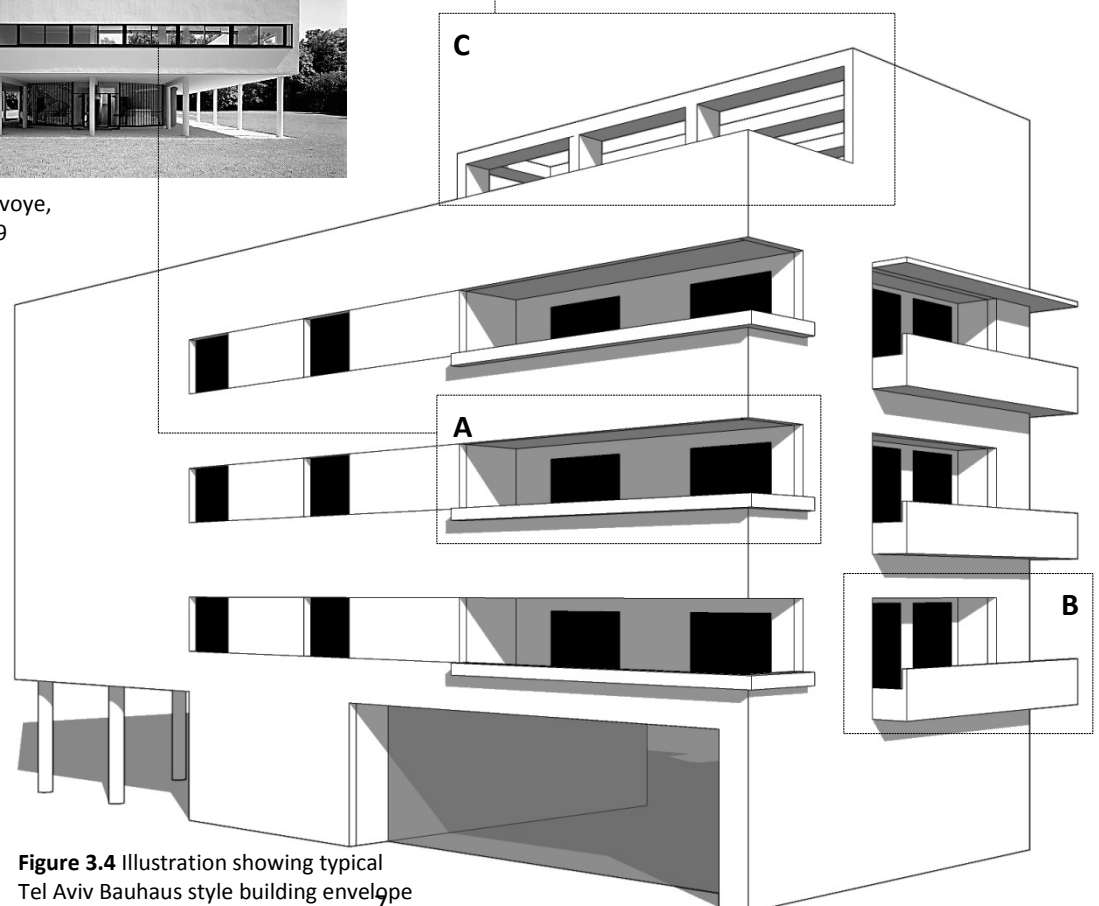


Figure 3.4 Illustration showing typical
Tel Aviv Bauhaus style building envelope

C. Flat Layout

Figures 3.5 and 3.6 show a typical flat layout according to Arie Sharon's illustrations; the simple functional square spaces reflect mostly the restricted economic possibilities and the need for functionalism and flexibility rather than the 'free flow of space' concept (Harari 2001). The importance of cross ventilation is clearly expressed through the layout (Figure 3.6) – to allow maximum ventilation on the East-West axis rooms are connected between them to dynamically allow the flow of air through (Figure 3.5). Sliding doors and movable partitions were used to allow occupants the flexibility to adapt to changes of climate in order to achieve comfort.

In his article 'The Orientation of the Flat in Tel Aviv' from 1936, Dov Carmi specifies how each room in the flat should be oriented in order to achieve comfort; for example Carmi makes the differentiation between the Master Bed room that should face North-East and the children's room which needs more daylight and should face South. Carmi recommends to orienting bed rooms towards the east as they will only heat up during summer mornings and will cool down by the Eastern night breeze during evenings (Carmi 1936). The illustrations of Sharon (Figure 3.6) demonstrate the same concepts; he draws a differentiation between Eastern rooms (Figure 3.6, blue color) and Western rooms (Figure 3.6, red color) and shows how the dynamic effect of wind direction and solar access should be accounted for in order to determine the flat layout in order to achieve comfort it different times of day.

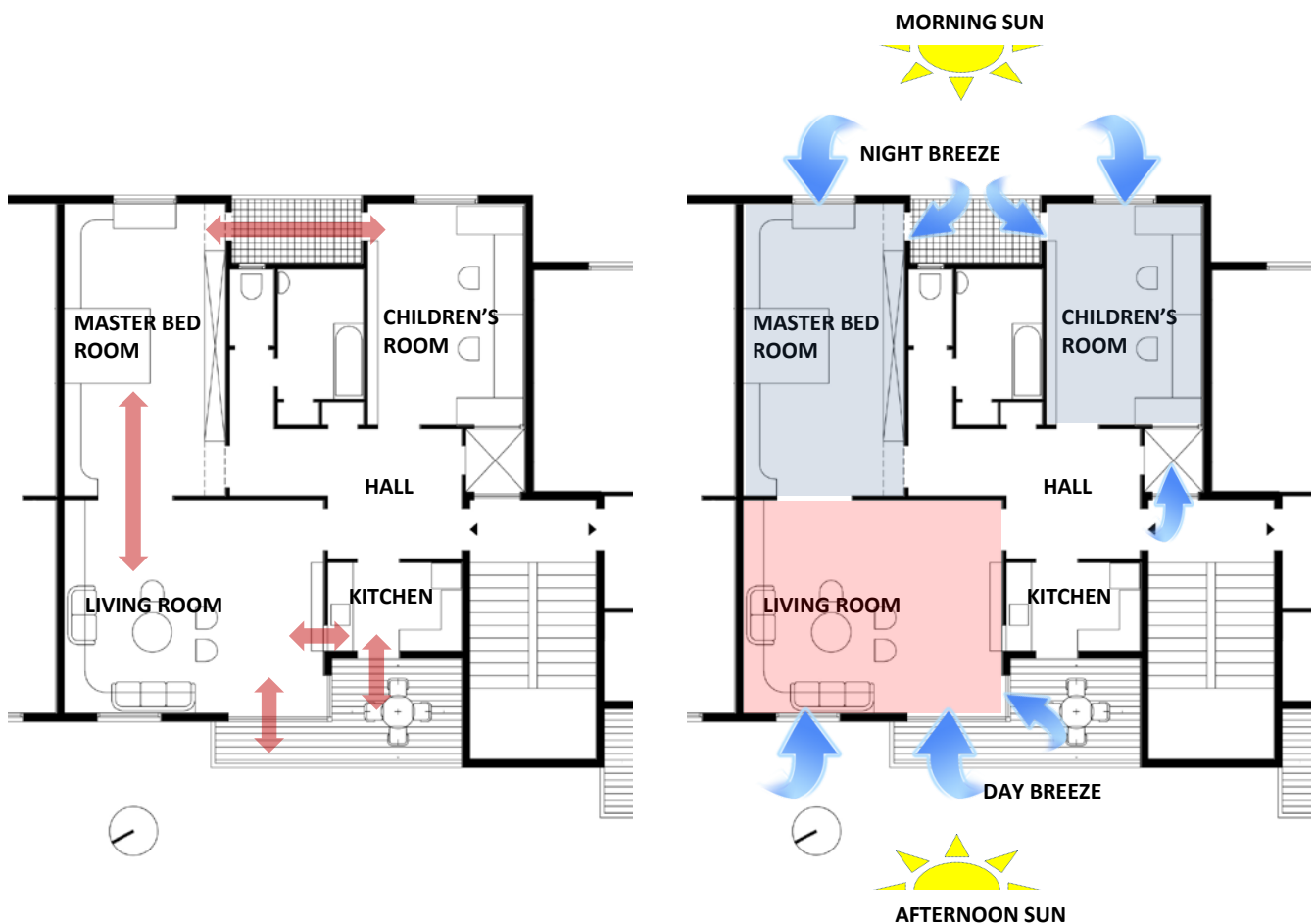


Figure 3.5 Typical Flat layout and functionality
(Source: After Arie Sharon 'Planning of Cooperative Houses, 1937).

Figure 3.6 Flat design environmental considerations
(Source: After Arie Sharon 'Planning of Cooperative Houses, 1937).

D. Materiality

For the consideration of the building's materiality, the international style modest & homogenous design aesthetics was in line with the local need to build economical, fast and simple; thus, apart from the Sanitary and mosaic tiles which were imported all other elements were completely local, done in-situ or prefabricated.

Reinforced concrete - The adoption of frame structure technology of reinforced concrete was derived both by architectural considerations inspired by the Domino House (Figure 3.7), as well as the economic restrictions and lack of local skills that restricted the ability to construct steel frame structures (such as Mies Van Der Rohe promoted). The use of concrete was also dictated from political reasons – to minimize the dependence on local Arab stone builders and by that also providing employment for many new unskilled immigrants.

Wall construction – Locally manufactured Silicate bricks and hollow concrete blocks were commonly used as infill materials, the later also serving for interior wall, being the cheapest building material available (consisting of a mixture of black cement and sea sand and shells). the finishing layers included smooth plaster and whitewash lime coating either white or gray (Figure 3.8).

Windows and Glazing – Glazing areas were restricted and small horizontal windows were installed with wooden frames set deep and aligned with the interior surface of the wall for solar control during summer. Iron frame windows were used in vertical staircase windows which were usually extended across the height of the building.

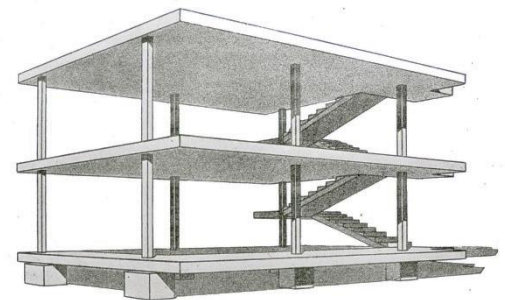


Figure 3.7 Domino House, Le Corbusier (1914)

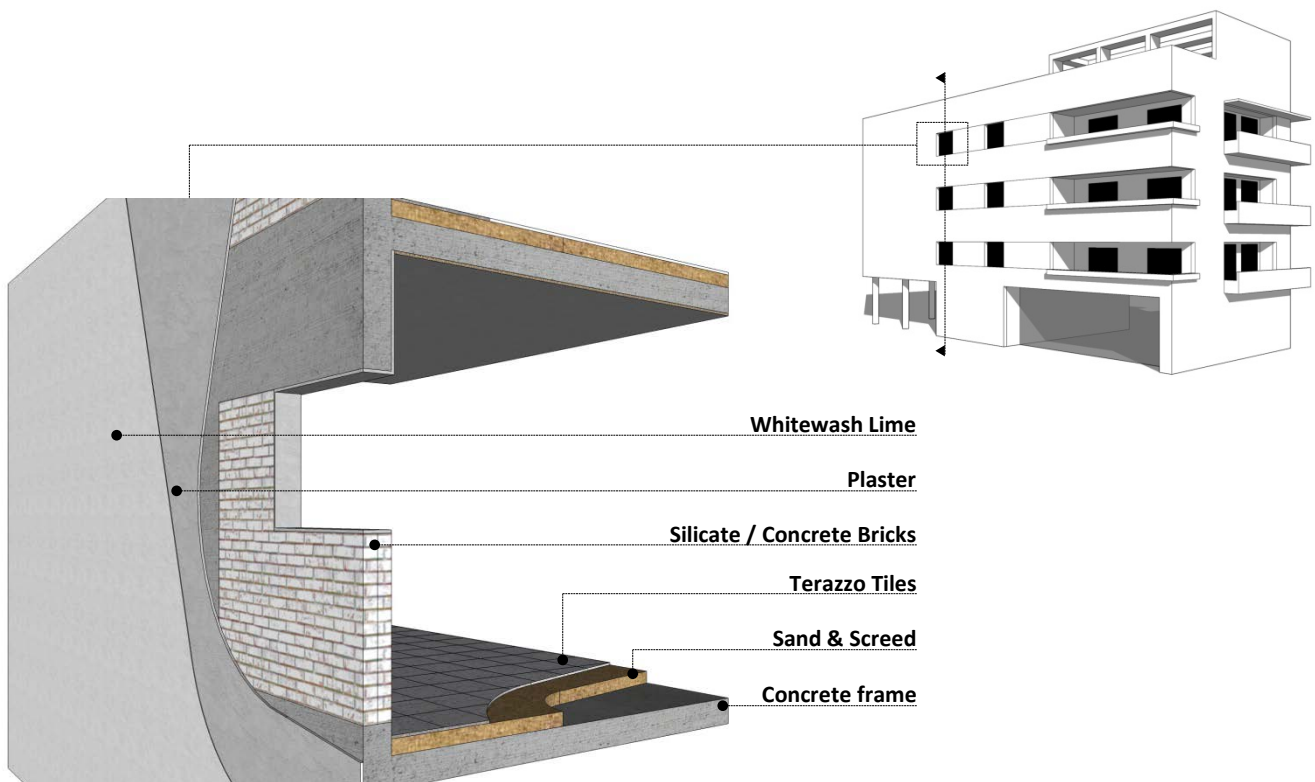


Figure 3.8 perspective section showing typical materiality

E. Solar Control Detailing

The hot and humid climatic condition of Tel Aviv demanded appropriate solar control and ventilation solutions to achieve comfort in the flats. The contradiction between using windows for daylight and ventilation and blocking undesirable direct sunlight gave birth to creative solutions that became hallmarks of the local modern style.

Fixed shading – included (a) Concrete overhangs, canopies and cornices both above balconies, building entrances and windows; (b) Rooftop concrete pergola; (c) Sunken balconies and windows. These static solutions were very effective in blocking the high summer sun mostly towards the South orientation (Figure 3.10). Local architects had shown creativity in adapting these “bumps” to the tough vocabulary of the international style and sensitivity for adjusting different elements toward different orientations using simple sun angle calculations.

Adaptive solutions – included different forms of movable roller and sliding blinds, which enabled the flow of air and view while blocking to strong undesirable sunshine. The most commonly used were the wooden roller blinds set on a rail which could be dynamically tilted achieving the effect of a canopy (Figure 3.11).

The unique image of contrast between the white-washed walls hit by the strong Mediterranean sun and the strong shadows created by these shading elements emphasized the local characteristic and challenges of the International style in Tel Aviv. Le Corbusier’s *brise-soleil*, which had been introduced in Israel later on (during 50s and 60s), were quickly adopted (and adapted) as the prevalent solar control methodology.



Figure 3.9 Fixed Solar control application in Tel Aviv
(Source: James Durham)



Figure 3.10 Illustration showing fixed solar control solutions. Simulated for 21 June 12:00

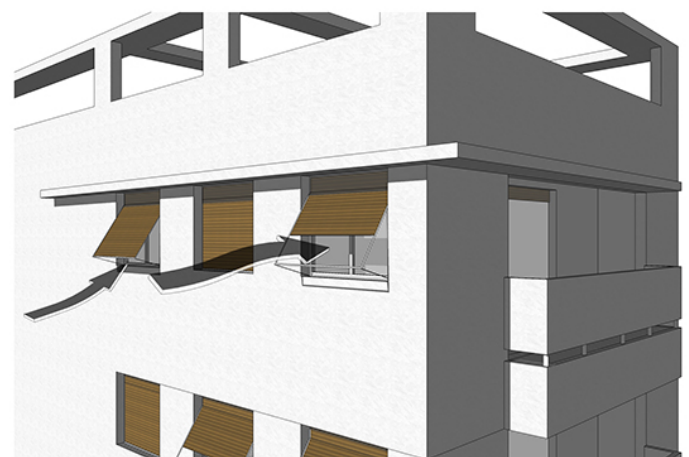


Figure 3.11 Illustration showing adaptive solar control solutions. Simulated for 21 June 16:00

4. CONCLUSIONS

Adaptive past vs. Neglected Present, What about the Future?

Towards the end of the 30s, the flock of immigrants to Tel Aviv, lack of urban planning and poor economic condition led to a dramatic decline in the use of the pure local language of the 'International Style'; trends of building additions to existing roof tops and enclosure of the *pilotis* levels began to emerge (Figure 4.1). These trends echoed further in years to come and were coupled with changing life styles and the need for bigger flats which together resulted in the enclosure of the balconies (Figure 4.2). Many buildings which were badly-built or poorly maintained stand in very poor physical condition even today after their unique architectural quality had been recognized (Figure 4.1-2).



Figure 4.1 Engel House, Zeev Rechter, Tel Aviv 1933
Then (top) and Now (top right)

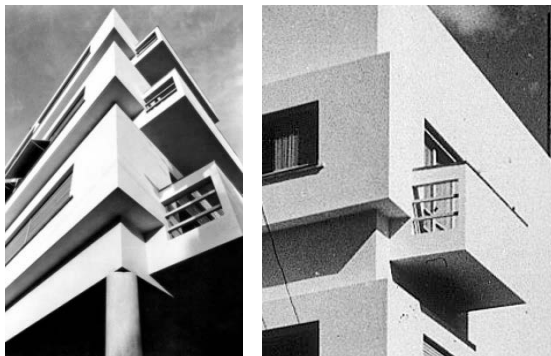


Figure 4.2 Details - Engel House, Zeev Rechter, Tel Aviv 1933. Then (top) and Now (top right)

During the 1936-39 Arab revolt and the Second World War following it, the construction in Israel had almost stopped. It was fully restarted only after 1948 with the independence of Israel when new versions to the International Style concepts emerged, driven by the political and socio economical urgent needs of the 50s and 60s to spread mass constructed buildings across Israel and occupy the new land as fast and as effective as possible (Figures 4.3, 4.4).



Figure 4.3 Yad Eliyahu - new residential mass building quarter in Tel Aviv, 1950 (Source: The Israeli Project)



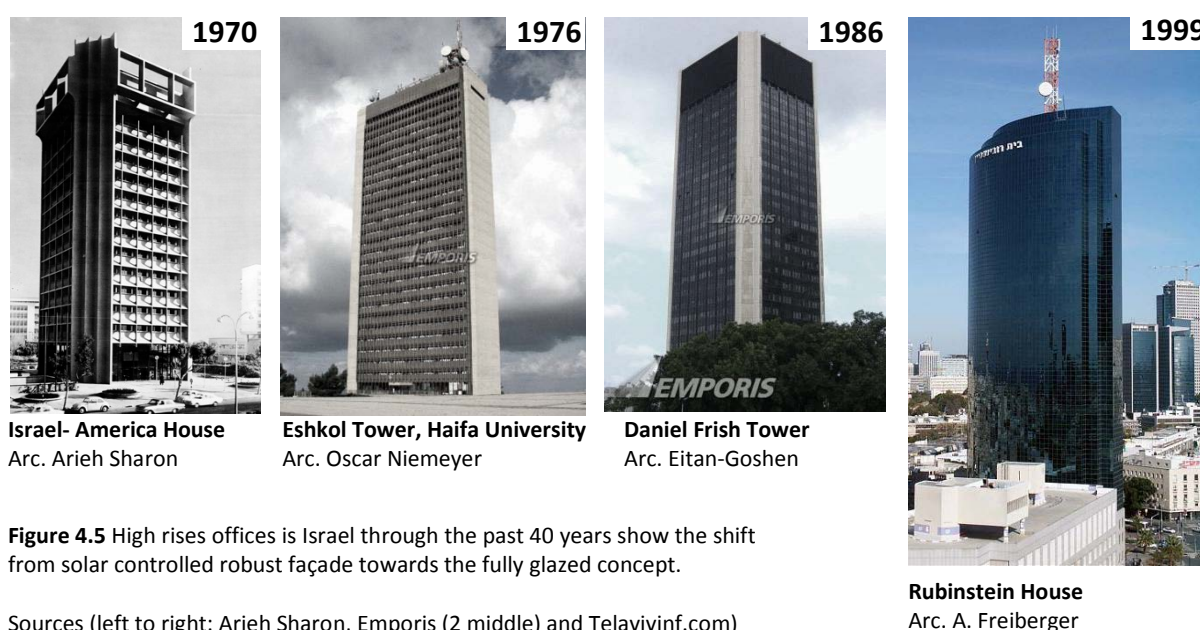
Figure 4.4 Typical cooperative apartment block, Lod 1971 (Source: The Marker)

Another important turning point had accrued following the war of 1967; Architecture expression of prosperity and pretentiousness replaced the aesthetic principals of modesty and functionality; The postmodern style was naturally adopted and along the development of the detached housing culture, few high rise office buildings had begun to emerge on Tel Aviv skyline, mostly under the influence of Le Corbusier's *brie-soleil* and High Rise concepts, designed using the language of brutalism (Figure 4.5 left).

During the late 80s and 90s the construction of office building high rises had been characterized by the extensive use of glass curtain wall systems which were coupled with the widespread installations of mechanical cooling and other active and energy consuming strategies to resolve overheating issues and supply comfort (Figure 4.5 middle). The prosperity of the late 90s (during the dot com boom) intensified this trend even more (the amount of skyscrapers above 25 floor was more than doubled during 1999-2000) and continues to echo also today across big cities throughout Israel, racing towards the tallest tower, with the local code merely used as an excuse to occasionally rendering them as 'green'.

The adoption of international building traditions is evident throughout the history of Israeli architecture, looking back on the achievements of past generations of architects, it is hard not to admire the high levels of sensitivity and ingenuity that were involved in the formation of a new architectural interpretation through working with the climate passively and expressively in all scales; adaptation which helped localize the international principals and personalize the architects' individual styles. The focus of this paper was on the formation of this unique climatic adaptation in the light of both the important role this vocabulary had played in the development of Israeli Architecture as we know it, and the contrast with contemporary deviations toward adopting fashionable architectural trends such as the skyscraper without adequately contextualizing it.

Nowadays, the evident urgent need for environmental responsive design had generated a new awareness aside an opportunity which will be researched further through my dissertation project to use the office high rise typology as an example of reconnecting Israeli architecture with the local climate; an adaptation which as this paper shows is deeply rooted into the syntax of Israeli Architecture.



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