博士学位論文

カイロにおける新たなマシュラビッヤの提案に関する研究
―イスラムと日本の文化から見る伝統的な格子の融合―

審査員会主査：　陣内秀信教授

審査委員：　大江新教授、渡邊真理教授、永瀬克己助教授、高村雅彦助教授

法政大学審査学位論文
法政大学工学研究科建設工学専攻博士課程

04R9502

ネルミン・アブデル・ハリム

A NEW *MASHRABIYYA* FOR CONTEMPORARY CAIRO

Integrating Traditional Latticework from Islamic and Japanese Cultures

By

Nermine Abdel Gelil Mohamed Abdel Halim

A Thesis Submitted to the
Graduate School of Engineering at Hosei University in Partial Fulfillment of the
Requirements for the Degree of

DOCTOR OF PHILOSOPHY
in
ARCHITECTURE

Approved by the Examining Committee
Prof. Dr. Hidenobu JINNAI, Main Supervisor
Prof. Dr. Shin ŌE
Prof. Dr. Mari WATANABE
Asso. Prof. Dr. Katsumi NAGASE
Asso. Prof. Dr. Masahiko TAKAMURA

TOKYO, JAPAN

December 2006

ABSTRACT

With between 14 and 15 million inhabitants, Cairo is the most populous city in Africa and the Middle East. Most Cairo residents live in five- or six-story apartment buildings with open balconies, glass panels, and wood shutters called *sheesh*. In response to Cairo's density, hot and arid climate, and social and environmental needs, residents tend to manipulate or modify their balconies and windows with curtains, latticework, reflecting glass, or shades. Depending on their interpretations of societal veiling requirements, women keep their *sheesh* closed or don veils whenever they perform household duties on their balconies or near their windows.

As a balance between social and environmental needs, a number of Egyptian architects and scholars are now calling for the revival of the *mashrabiyya*—a traditional latticework applied to the windows of residences in Cairo between the 16th and 19th centuries to shelter women from the gaze of men and to ameliorate the region's hot climate. However, reintroducing the *mashrabiyya* raises several issues tied to a) its role as a veil since late 20th century interpretation of that concept; b) the high cost of building a *mashrabiyya*; c) urban pollution, which has negative impacts such as corroding the *mashrabiyya*'s intricate latticework; and d) legislative, urban, and architectural changes affecting the traditional functions of the *mashrabiyya*.

Japanese are familiar with a latticework named *kōshi*, including a townhouse variation known as *machiya no kōshi*. They are found in dense urban contexts and have social and environmental functions similar to those of the *mashrabiyya* yet are much simpler and more flexible. This thesis therefore offers suggestions for using *machiya no*

kōshi design elements as practical solutions for problems associated with reviving the use of *mashrabiyya* in contemporary Cairo.

Topics addressed in this thesis are the uses, problems, and modifications of current residential thresholds in Cairo; the traditional form of the *mashrabiyya* and its social and environmental role in traditional homes; social, economic, environmental, legislative, and architectural barriers to using the traditional *mashrabiyya* form in contemporary Cairo residences; and how the *machiya no kōshi's* simple approach to controlling privacy, lighting, and airflow can be adapted to *mashrabiyya* design. I then offer a proposal for a new *mashrabiyya* derived from a mix of its traditional design and ideas from the *machiya no kōshi* as an alternative to *sheesh*, glass panels, and other inadequate threshold modifications.

論文要旨

本研究は、＜マシュラビッヤ＞と呼ばれる伝統的な格子を対象に、現在のカイロに見られる多層のアパートに適合させるための改良案を提示することを最終的な目的とする。そのプロセスにおいては、カイロにおける住宅の開口部に見られる改造、伝統的なマシュラビッヤの形態とその社会的・環境的な役割、それを現在のカイロで応用する際の社会的・経済的・環境的・法的・建築的な意味を考察し、また日本の町屋の格子が持つプライバシー・照明・気流のコントロールなどについて比較検討をおこなったうえで両者の利点を融合し、新たなマシュラビッヤを提案しようとするものである。

アフリカと中東において最も人口密度の高いカイロは、1400～1500 万の住民が住む典型的なメガ・シティである。カイロの大部分の世帯は 5～6 層のアパートに居住し、各戸の開口部はオープン・バルコニー、ガラス戸、＜シーシュ＞と呼ばれるヴェネチア木材の雨戸から構成されるのが一般的である。そうしたなかで、カイロの人口高密の高さや暑く乾燥した気候、そして相反する社会的・環境的機能に応じて、住民はこれらの装置を変化させながら使用する傾向が強い。たとえば、シーシュを常に閉じたままにする、目隠しのための＜ベール＞（イスラムの服装）をする、反射ガラスを取り付ける、シェードを引く、またはカーテンや格子でバルコニーを囲むなどがある。これらの変化に注目する研究者の多くは、こうした問題を解決するために、＜マシュラビッヤ＞の復活を望み、それによって社会的・環境的ニーズの均衡が効果的に保たれると考えた。

マシュラビッヤは、アラブの伝統的な住居の窓に施される彫刻の施された木製の格子を指し、男性の目から女性を守るとともに、この地域の暑く乾燥した気候を緩和する役割を担った。その語源とデザインは、16 世紀から 19 世紀前半におけるカイロの住居建築に関連付けることができる。

カイロにマシュラビッヤを再び導入するためには、次のような問題について取り扱わなくてはならない。１）20 世紀以来のエジプトの社会変化にともなうベールなどの役割の再評価。２）マシュラビッヤのコストが高いことによる経済的な問題。３）伝統的なマシュラビッヤを腐食させるカイロの公害（環境問題）。４）法律・都市計画・建築デザインにおける変化。とりわけ、道幅と天井高の変化と現代における空間的柔軟性へのニーズがマシュラビッヤの機能に与える影響。

一方、日本では、町屋において様々なスタイルからなる格子が使われている。町屋の格子もまた、高密な都市のコンテクストにおいて使用され、同時にマシュラビッヤに似た社会的・環境的機能を持っていることから、そのデザイン要素を調査研究し組み込むことにより、カイロにおけるマシュラビッヤの復活の問題と、現代のニーズに合った実践的な解決法を見出すことができるのではないかと考える。

こうした目的と問題意識を持ち、本論文は 5 章から構成される。各章の論述は以下の通りである。

第 1 章では、現在のカイロにおける住居の開口部について、その使用、問題、変化について見ていく。第一に、カイロが 19 世紀初頭から現在までに経験した社会的変化における開口部の取り扱いについて歴史的に解読する。その際、ベールの使用とプライバシーの必要性を中心に考察する。第二に、オープン・バルコニー、ガラス窓、さらにシ

ーシュについて具体的に見ていく。第三に、開口部の作用の仕方、必要に応じた窓とバルコニーの改造の方法について分析する。最後に、エジプトの住居の空調について明らかにするが、これはマシュラビッヤの冷却機能の再導入について議論する際に、どの程度、空調が普及しているかを知ることが必要となるからである。

第２章では、カイロにおけるマシュラビッヤの伝統的な形態と、その社会的・環境的役割について考察する。第一に、マシュラビッヤという用語の語源と意味について、第二にカイロでマシュラビッヤが出現した歴史的理由について検討し、第三にその典型的な形態について分析していく。最後に、伝統的住居というコンテクストのなかで、その形態がいかに家族の社会的なニーズとカイロの気候に適合していたかについて明らかにする。

第３章では、伝統的なマシュラビッヤの形態を現代カイロに再導入する際の社会的・経済的・環境的・法的・都市的・建築的な意味について分析する。第一に、現代女性をベールで覆うことが適切であるかについて社会的に考察する。現在、女性の役割は、マシュラビッヤを通して消極的に傍観する立場から、積極的な社会のパートナーへと変化しており、さらに家庭においては、外の世界にあっても多くの役割を担っている。第二に、マシュラビッヤの組立に要する膨大な時間、熟練作業によるコストの高さ、木材の希少性と輸入による出費、さらには職人不足など、主にその経済的意味について明らかにする。第三に、カイロは世界第二位の大気汚染都市であるため、マシュラビッヤの複雑な彫刻の格子が腐食し、清掃や維持が困難となり、そのうえ冷却機能にも影響が生じる環境のなかで、その装飾的なデザインを覆い隠すようになる過程について考察する。最後に、法的、都市的、建築的な要素が、いかにマシュラビッヤの機能に影響しているかについて検討する。これらの要素は、伝統的なイスラム法（シャリーア）とは異なり、プライバシーの必要性について考慮しない現代の建築法や拡幅された道幅、低くなったアパートの天井高、さらには現代における空間的柔軟性へのニーズとも深く結びついている。

第４章では、日本における町屋の格子に見る順応性について分析し、カイロのマシュラビッヤの改良に対する可能性について考察する。第一に、格子という用語についての定義をおこなう。第二に、町屋において格子が生まれた歴史的な理由について検討する。第三に、格子の様々なタイプの包括的な分類を試み、さらに特徴的なタイプのいくつかに注目し、その形態と機能を解き明かす。最後に、第３章で明らかにしたマシュラビッヤの問題を解決するために、町屋の格子の特徴を利用する方法について具体的に検討する。例えば、町屋の格子の中で、間口を全開できる格子がある。それはエジプトの都市部で多く行わる社会的な集まりの時に家を換気するために適している（その時はベールをするので女性を隠す装置が必要ない）。また、マシュラビッヤと現在のシーシュは格子の隙間が固定されているのに対して、町屋ではプライバシーや採光や風量の状況に合わせて隙間を自由に調節できる格子がある。そして、マシュラビッヤを現在カイロの多層のアパートに使った場合、採光と換気に適しているがプライバシーが守られない問題がある。町屋の格子の中ではプライバシーを守りつつ採光と換気を十分得られる格子がある。また、格子の特徴がたて組みであることと断面が直線であるため、汚染物質が溜まりにくくて、マシュラビッヤに比べて清掃や維持が容易であり、腐食しにくい。こうした町屋の格子の特性をカイロのマシュラビッヤの改良に利用する方法について具体

的に検討する。

第５章では、伝統的な形態から分岐し、日本における伝統的な町屋の格子の要素を組み込み応用した、新たなマシュラビッヤを提案する。ここでは、まず提案するマシュラビッヤの形態と機能について具体的に説明し、第二に高価な輸入木材に代わる材料について提示する。第三に、この提案のメリットについて分析をおこなう。

以上のように、本研究は、現在のカイロに適合しうるマシュラビッヤの在り方について様々な観点から考察し、それをもとに新たな改良案を提示するものである。特に、伝統的なマシュラビッヤのデザインと、現在使用されているバルコニー・ガラス戸・シーシュ・その他の不適切に改造された開口部に代わるものとして、日本の町屋の格子の利点を融合させた点に本論文の特徴がある。

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER ONE

CHAPTER TWO

CHAPTER THREE

CHAPTER FOUR

CHAPTER FIVE

INTRODUCTION

Background

Located in the hot and arid subtropical region of North Africa (30°2' North, 31°13' East) (**Fig.1**), Cairo has a desert climate that contrasts daytime dry heat with cool nights. Its hot season lasts for nearly eight months, from March to October.[1] A mega-city with between 14 and 15 million inhabitants (almost one-half of Egypt's urban population),[2] Cairo was listed in 2004 as the tenth most populous metropolitan area in the world and the first in Africa and the Middle East.[3] The physical size of Cairo was less than 13 square kilometers (km²) in the early nineteenth century, 100 km² by 1950,[4] and according to the latest estimate is now 330 km² (**Fig.2**).[5] The metropolitan area currently consists of the Cairo Governorate, the Qaliyubia Governorate (north of the Cairo Governorate) and urban parts of the Giza Governorate (west of the Nile).[6] Approximately 70% of its developed 220 square kilometers[7] is residential,[8] making Cairo one of the densest cities in the world.[9] In 1994 it had an overall density of 32,000 inhabitants/km², ranging from 109,000/km² in the most crowded districts to 15,000/km²

---

1 *Cairo* (2006), in Encyclopaedia Britannica, retrieved March 6, 2006, from Encyclopaedia Britannica Premium Service: http://www.britannica.com/eb/article-59326

2 D. Sims (2003), *Urban Slums Reports: The case of Cairo, Egypt*, UNDERSTANDING SLUMS: Case Studies for the Global Report on Human Settlements 2003, London: Development Planning Unit (DPU), University College, p. 3.

3 Wikipedia (2006), *List of Metropolitan Areas by Population*, compiled from the United Nations 2005 World Urbanization Prospects Report, retrieved September 11, 2006, from www.wikipedia.org

4 M. Yousry and T. A. Aboul Atta (1997), "The Challenge of Urban Growth in Cairo," in C. Rakodi (Ed.), *The Urban Challenge in Africa: Growth and Management of its Large Cities*, Tokyo, New York, Paris: United Nations University Press, p. 18.

5 H. Saker (1996), *New Urban Communities: Have They Improved the Situation of Central Areas?*, as cited in M. El-Batran and C. Arandel (1998), "A shelter of their Own: Informal Settlement Expansion in Greater Cairo and Government Responses," *Environment and Urbanization*, vol. 10, n. 1, p. 218.

6 The governorates are the main divisions of local administration in Egypt; Sims, op cit., p. 3.

7 Saker, op cit.

8 Yousry and Aboul Atta, op cit., p. 23; M. F. Gorgy (1985), "The Greater Cairo Region: Land Use Today and Tomorrow," in A. Evin (Ed.), *The Expanding Metropolis: Coping with the Urban Growth of Cairo*, Singapore: Concept Media/The Aga Khan Award for Architecture, p. 177.

9 El-Batran and Arandel, op cit.

Fig.1. Egypt administrative divisions, 1990. (Perry-Castañeda Library, Map Collection, University of Texas Libraries)

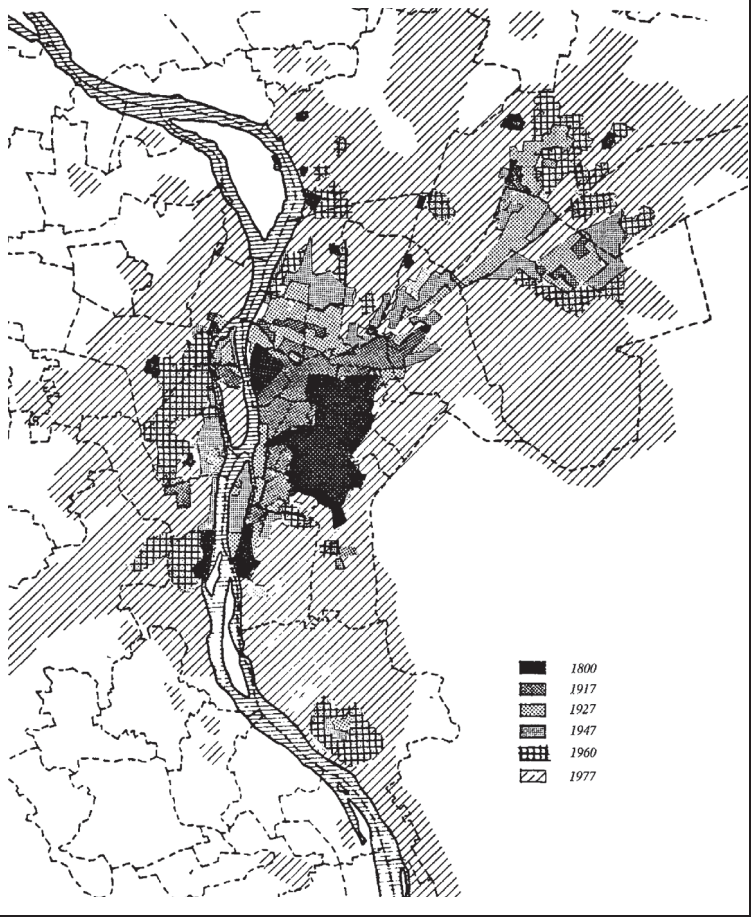


Fig.2. The development of Cairo from 1800 to 1977. (The Aga Khan Program for Islamic Architecture 1985, p. 96)

in the least (**Fig.3**).[10]

Most urban households in Egypt live in apartment buildings—93.3% in urban governorates and 85% in other urbanized areas.[11] Most of Cairo's apartment buildings are either five or six stories, with a few exceeding six stories and a small number one or two stories.[12] Their facades typically consist of regular compositions of open balconies and openings with glass panels and Venetian timber shutters called *sheesh* (see **Fig.4**). In response to Cairo's climate, density, and conflicting social and environmental functions, people tend to either behave according to how these devices are arranged or adapt them to their individual needs.

To address problems associated with temperature control and social customs, a number of architects and scholars in the Arab world are calling for a revival of the traditional Islamic latticework called *mashrabiyya*. In terms of both etymology and design, they are associated with traditional Egyptian urban architecture from the 16th to the first half of the 19th century.[13] Its primary functions were to protect Muslim women from the gaze of men and to ameliorate the region's hot and arid climate. Currently it is rare to see *mashrabiyyas* used as residential screens for windows or balconies.[14] They are most commonly found in historically preserved houses from the Mamluk and

---

10 Yousry and Aboul Atta, op cit., p. 21.

11 F. El-Zanaty and A. Way (2006), *Egypt Demographic and Health Survey 2005*, Cairo: Ministry of Health and Population, National Population Council, El-Zanaty and Associates, and ORC Macro, pp. 22-23. Hereafter *EDHS*.

12 There are no accurate figures on the heights of the apartment buildings in Cairo. However, a survey has been conducted for the Building Energy Code Project on 120 typical apartment buildings in Cairo, 22% were of more than six stories, 70% were from five to six stories, and only 8% were low-rise buildings of two stories. See S. Aziz et al. (2001), *Residential Building Survey in Cairo and Alexandria*, Cairo: Housing and Building Research Center, as cited in J. Huang et al. (2003), *The Development of Residential and Commercial Building Energy Standards for Egypt*, paper presented at the Energy Conservation in Buildings Workshop, Kuwait, December 15-17, p. 4.

13 D. Behrens-Abouseif (1991), "Mashrabiyya," in C.E. Bosworth, et al. (Eds.), *The Encyclopaedia of Islam New Edition* (Vol. 6), Leiden: E.J. Brill, p. 718.

14 B. Kenzari and E. Yasser (2003), "The Ambiguous Veil: on Trancparency, the Mashrabiy'ya, and Architecture," *Journal of Architectural Education*, vol. 56, n. 4, p. 22.

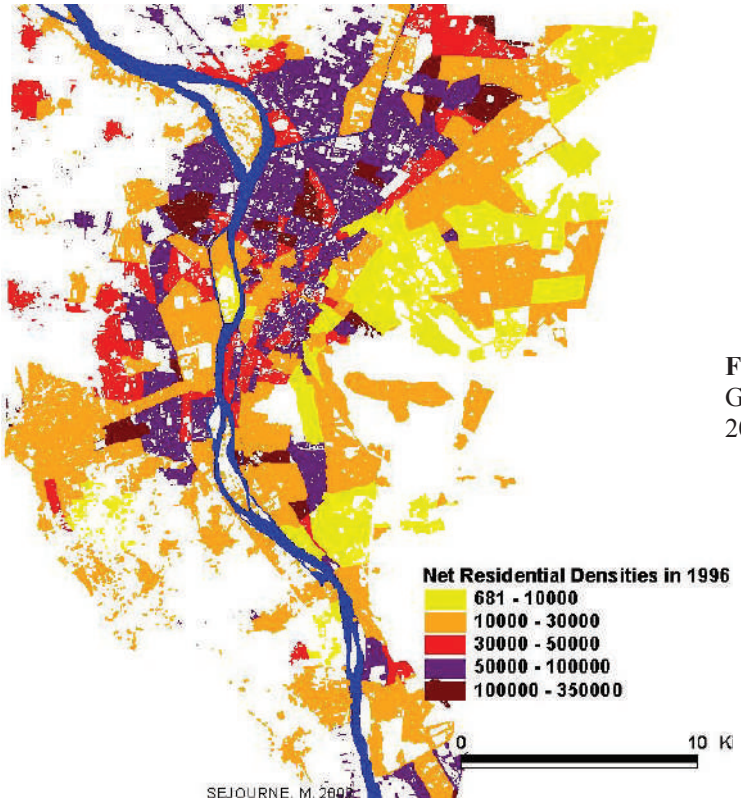


Fig.3. Net residential densities in Greater Cairo, 1996 (inh/sq.km). (Sims 2003, p. 21)

Fig.4. A typical apartment building in Cairo, el-Sahafiyyin district.

Ottoman periods or as decorative screens that add an oriental touch to the façades or interiors of upper class residences (villas), commercial centers, government buildings, hotels, and the like.

In 1995, the Research Center for Islamic History, Art and Culture in Istanbul (with the Turkish acronym IRCICA) and the Egyptian Ministry of Culture sponsored "Crafts in Traditional Islamic Architecture"—an academic conference held in Cairo that focused on the *mashrabiyya*. Researchers, specialists, and university professors of architecture presented twenty-eight papers on all aspects of *mashrabiyya* in the Arab world. Topics included preserving *mashrabiyya* as a traditional craft and cultural heritage, training craftsmen, increasing community awareness of the craft, and providing financial assistance to traditional craftsmen.[15] The consensus of the attendees was that the *mashrabiyya* should be improved and adapted to contemporary lifestyles, but they offered no suggestions on how to realize this goal.

Objectives

I will use this dissertation to propose an improved *mashrabiyya* design that can be applied to contemporary Cairo's ubiquitous multi-story apartment buildings. I will address four central issues:

1) The role of *mashrabiyya* as a protective veil in light of the changing meaning of veils since late 20th century Egypt.
2) Economic problems related to the high cost of building and buying a *mashrabiyya*.

[15] T. Nazih (Ed.) (2000), *al-Mashrabiyyat wal-Zujaj al-Mu'asha'fi al-'alam al-Islami, Proceedings of the International Seminar: Crafts in Traditional Islamic Architecture with Special Focus on Mashrabiyya and Stucco Colored Glass, 3-9 December, Cairo, 1995*, Istanbul: IRCICA.

3) Environmental problems tied to pollution, such as corroding the intricate work of traditional *mashrabiyya*.
4) Legislative, urban, and architectural changes affecting the traditional functions of the *mashrabiyya*.

Methodology

The opportunity to perform research in Japan has allowed me to study the Japanese latticework called *kōshi* and its townhouse version known as *machiya no kōshi*. *Machiya no kōshi*, which are commonly found in dense urban contexts, have social and environmental functions similar to the *mashrabiyya* yet are much simpler and more flexible. I will therefore offer suggestions for using *machiya no kōshi* design elements as practical solutions for problems associated with reviving the use of *mashrabiyya* in contemporary Cairo. Toward this end, I will

1) examine potential modifications of current residential thresholds in Cairo;
2) examine the traditional form of the *mashrabiyya* and its social and environmental role in traditional homes;
3) analyze social, economic, environmental, legislative, and architectural barriers to using the traditional *mashrabiyya* form in contemporary Cairo residences;
4) describe how the Japanese *machiya no kōshi*'s simple approach to control privacy, lighting, and airflow, as well as other practical features, can be adapted to *mashrabiyya* design; and
5) offer a proposal for a new *mashrabiyya* design for use in contemporary Cairo.

Dissertation Organization

This dissertation consists of five chapters:

In Chapter 1, "Residential Thresholds in Cairo," I will trace the idea of "threshold" in the context of social changes that Cairene society has gone through since the early 19th century, with a special focus on veiling and privacy. After explaining the uses of and problems associated with open balconies and windows with glass panels and *sheesh*, I will describe how typical Egyptian households modify them according to individual needs. Finally, I will address the topic of residential air conditioning in Egypt, since any discussion of the cooling functions of *mashrabiyya* would be incomplete without looking at the presence of modern air conditioning.

In Chapter 2, "*Mashrabiyya* for Veiling and Climate Control," I will explain the traditional role of the *mashrabiyya* in Cairene homes, beginning with a discussion of the derivation and meaning of the term "mashrabiyya." After examining historical reasons leading to its appearance in Cairo, I will describe its typical form and analyze how the form was adapted to social needs and climatic conditions.

In Chapter 3, "Traditional *Mashrabiyya* for Contemporary Cairo?" I will look at potential barriers to reviving the use of the traditional *mashrabiyya* design in present-day Cairo. First, I will discuss the veiling of women in contemporary Egypt in light of their changing roles from passive onlookers through a *mashrabiyya* to active partners engaged in many activities outside and inside the home. Next, I will list the reasons behind the considerable expense of building a *mashrabiyya*, describe maintenance and other problems associated with air pollution in Cairo, and examine how legislative, urban, and architectural factors affect *mashrabiyya* functions.

In Chapter 4, "Screens Outside the Arab World: The Japanese *Machiya no Kōshi*," I will review the forms and uses of the Japanese latticework known as *kōshi* as a

design feature of traditional townhouses called *machiya*, beginning first with a discussion of the meaning of the term "kōshi" and of the historical reasons leading to its appearance in the *machiya*. Then will analyze its various forms and functions and will suggest how incorporating design elements from *machiya no kōshi* may serve as a practical solution for the issues addressed in the preceding chapter.

In the final chapter, "A Proposal for a New *Mashrabiyya* in Cairo," I will offer a proposal for an improved *mashrabiyya* in contemporary Cairo that responds to changes in apartment thresholds and incorporates ideas from the Japanese *machiya no kōshi* while honoring the function and design of traditional *mashrabiyya*. I will provide an illustrative explanation of the new *mashrabiyya*'s form and functions, make suggestions for a different manufacturing material, and discuss how this alternative *mashrabiyya* can be modified to the needs of Cairo residents.

CHAPTER 1

RESIDENTIAL THRESHOLDS IN CAIRO

This chapter will trace first the idea of "threshold" in the context of social changes that Cairene society has gone through since the early 19th century, with a special focus on veiling and privacy. Then will explain the uses of and problems associated with open balconies and windows with glass panels and *sheesh*, and will describe how typical Egyptian households modify them according to individual needs. Finally, will address the topic of residential air conditioning in Egypt, since any discussion of the cooling functions of *mashrabiyya* would be incomplete without looking at the presence of modern air conditioning.

1-1 History of the Residential Threshold in Context of Cairo Society

1-1-1 *Mashrabiyya* for Traditional Society

Between 1517 and 1805, Cairo lost its position as a national capital and instead became a provincial seat in the Ottoman Empire. Unlike the sultans of the Mamluk period (1250-1517), who expressed their status through urban expansion and architecture, the Ottomans contained Cairo within the existing Mamluk boundaries as much as possible (**Figs.5, 6**).[1] Cairo became a very dense city during this period, making courtyards and larger openings indispensable for ventilation and light.

The Ottomans were very conservative in their interpretations of Qur'an verses on women's veils, and thus required Egyptian women to cover their entire bodies, including hands and faces. The Ottomans enforced gender segregation, home seclusion, and completely blocking harems (female quarters) from the outside world. To aid

[1] See **2-3 Historic Background**; also the studies of D. Behrens-Abouseif (1989), *Islamic Architecture in Cairo: An Introduction*, Leiden, New York: E.J. Brill, p. 40; D. Behrens-Abouseif (1990), "Note sur la Fonction de la Cour dans la Maison Moyenne du Caire Ottoman," in *l'Habitat Traditionnel dans les Pays Musulmans autour de la Mediterranee* (Vol. 2), Cairo: Institut Francais d' Archeologie Orientale, pp. 411-419; P. Speiser (1991), "La Restauration du Palais Bashtak," in *l'Habitat Traditionnel dans les Pays Musulmans autour de la Mediterranee* (Vol. 3), Cairo: Institut Francais d' Archeologie Orientale, pp. 810-817; A. Sedky (2001), "The Factors Influencing the Change in Cairene Domestic Architecture after the Ottoman Conquest," *EJOS-Electronic Journal Of Oriental Studies*, vol. 4, n. 38, pp. 3-8, 23.

Fig.5. Historic map of Cairo made by Matteo Pagano (1515-1588) in 1549. (From http://commons.wikimedia.org/wiki/Cairo)

Fig.6. Cairo in 1800 after being filled up during the Ottoman period. (*Description de l'Egypte* 1822, plate 1)

ventilation and lighting while protecting women's privacy, frames of wood latticework known as *mashrabiyya* were installed in residential quarters. *Mashrabiyya* allowed women to watch and listen to outside events while remaining secluded.

During the early part of the Ottoman occupation, veiling was restricted to upper-class women and therefore viewed as a mark of power, wealth, respectability,[2] and family honor and prestige.[3] Middle class women gradually began adopting veils, and eventually poor women copied veiled clothing styles using cheap materials.[4] As the veil became common to all social classes in Cairo, so did the *mashrabiyya* in Egyptian homes. Cairo's facades at the end of the Ottoman Empire were characterized by countless numbers of *mashrabiyya* windows (**Fig.7**).[5]

1-1-2 New Windows for Traditional Society

In the early nineteenth century, Cairo was a cohesive community of less than 13 square kilometers with two ports—Bulaq to the north and Misr al-Qadimah to the south. The Citadel, in the south-west corner of the city, was the center of government. The total population during this period has been estimated at 267,000, including 10,000 members of the Ottoman and Mamluk ruling elite.[6]

During the rule of Muhammad Ali from 1805 to 1848,[7] Cairenes resisted many

---

2 F. El Guindi (1999), *Veil: Modesty, Privacy, and Resistance*, Oxford: Berg, p. 103.

3 M. Badran (1988), "The Feminist Vision in the Writings of Three Turn-of-the-Century Egyptian Women," *Bulletin (British Society of Middle Eastern Studies)*, vol. 15, n. 1/2, pp. 11-12.

4 E.W. Lane (1954), *Manners and Customs of the Modern Egyptians*, London: Dent, pp. 48-49. This book is a reprint of the 1860 third edition.

5 D. Behrens-Abouseif (1991), "Mashrabiyya," in C.E. Bosworth, et al. (Eds.), *The Encyclopaedia of Islam New Edition* (Vol. 6), Leiden: E.J. Brill, p. 718. See also **Figs. 40, 41**.

6 The Aga Khan Program for Islamic Architecture Harvard University and the Massachusetts Institute of Technology (1985), "Cairo: 1800-2000 Planning for the Capital City in the Context of Egypt's History and Development," in A. Evin (Ed.), *The Expanding Metropolis: Coping with the Urban Growth of Cairo*, Singapore: Concept Media/The Aga Khan Award for Architecture, p. 95.

7 Muhammad Ali' dynasty is not part of the Ottoman period. Muhammad Ali was a young Albanian officer who had been second in command of an Albanian contingent sent by the Ottoman government to fight the French

attempts at modernization.[8] He focused on institutional, administrative, and military development, tried to introduce Western industrial and agricultural technology,[9] and attempted to improve the city's level of education[10] by sending hundreds of students to Europe for training.[11] Although veiling customs and gender segregation were still dominant during this period, Muhammad Ali banned the adornment of newly built houses with *mashrabiyya* during the last decade of his administration because of their alleged potential as a fire hazard.[12] This action is frequently interpreted by historians as a rejection of traditional values.[13] Regardless of the motivation, Cairenes were required to adopt new windows, which Edward William Lane (1801-1876) who spent most of the years between 1825 and 1849 in Egypt described as follows:

> Windows with European sashes of glass, each with a sash of close trelliswork outside the lower half . . . They are mostly built in the Turkish style, more or less approaching to European fashions; not well adapted to a hot climate.[14]

It is important to add that this new style of window was also not well suited to Egyptian cultural traditions (**Fig.8**).

1-1-3 The Emergence of the Open Balcony and the *Sheesh*

During his reign of Egypt from 1863 to 1879, Khedive Ismail expressed an

---

occupation (1798-1801). He was recognized by Istanbul and appointed Ottoman viceroy (*wali*) of Egypt in 1805, and since his reign, Egypt became independent of direct Ottoman control. See J. Abu-Lughod (1971), *Cairo: 1001 Years of the City Victorious*, Princeton: Princeton University Press, pp. 83-85; S. Zuhur (1992), *Revealing Reveiling: Islamic Gender Ideology in Contemporary Egypt*, New York: State University of New York Press, p. 39;; M. Badran (1988), "The Feminist Vision in the Writings of Three Turn-of-the-Century Egyptian Women," *Bulletin (British Society of Middle Eastern Studies),* vol. 15, n. 1/2, p. 11.

8 J. Abu-Lughod (1971), *Cairo: 1001 Years of the City Victorious*, Princeton: Princeton University Press, p. 83.

9 Ibid.

10 J. Abu-Lughod (2004), "Cairo, an Islamic Metropolis," in S. Bianca and P. Jodidio (Eds.), *Cairo: Revitalising a Historic Metropolis*, Turin: Umberto Allemandi & C. for Aga Khan Trust for Culture, p. 27.

11 S.E. Ibrahim (1985), "Cairo: A Sociological Profile," in A. Evin (Ed.), op cit., p. 27.

12 Abu-Lughod *Cairo: 1001 Years of the City Victorious*, p. 94.

13 Ibid.

14 Lane, op cit., p. 8.

Fig.7. A street in Cairo, photo taken between 1860 and 1890. (Prints and Photographs Online Catalogue, Library of Congress)

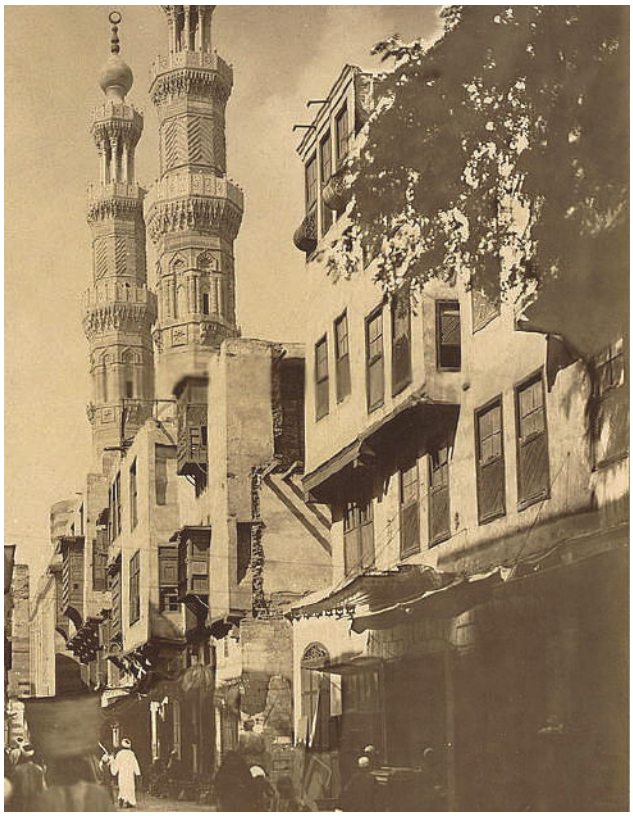


Fig.8. A street in Cairo showing the new residential windows as described by Lane (1954). The photo shows also the minarets of Moayed Mosque. (Photo by Bonfils, between 1867 and 1899, Prints and Photographs Online Catalogue, Library of Congress)

enthusiastic love of urban embellishments.[15] He planned to mark the completion of the Suez Canal in 1869 with a celebration attended by many European aristocrats.[16] Two years prior to that celebration he was invited by Napoleon III to participate in the *Exposition Universelle* held in Paris, and he was received personally by Baron Haussmann. As much as he was astonished by Haussmann's city planning and architectural accomplishments, he worried about inviting European kings and princes to a city that "reflected so poorly on its ruler."[17] He knew that Cairo could not compete with the achievements he saw in Paris, and therefore drew up and executed a master plan for the city's Ismailiyya quarter that was heavily influenced by what he had seen in Paris (**Fig.9**).[18] He pushed hard to have the construction completed prior to the planned opening of the canal in November of 1869.[19]

As Cairo's first modern neighborhood, most villas in Ismailiyya were built using a Palladian design with rooms arranged symmetrically around a central hall with no intermediate zone[20]—a design that could never be accepted by a society that demanded female veiling and gender segregation. Although he offered royal lands without charge to princes and wealthy merchants to encourage them to build these European style villas, the district was never fully urbanized except for some public improvements. Thus, until the end of Ismail's reign in 1879, the French-style western sector of Cairo retained the appearance of a premature subdivision of 200 houses and palaces juxtaposed with the old city rather than a substantial community of its own.[21]

---

15 J. Abu-Lughod (1965), "Tale of Two Cities: The Origins of Modern Cairo," *Comparative Studies in Society and History*, vol. 7, n. 4, p. 436.
16 Abu-Lughod (1965), op cit., p. 440.
17 Ibid.
18 Ibid., p. 441.
19 Ibid., p. 442.
20 K. Asfour (1993), "The Domestication of Knowledge: Cairo at the Turn of the Century," *Muqarnas X: An Annual on Islamic Art and Architecture*, vol. 10, p. 131.
21 Abu-Lughod (1965), op cit., p. 443.

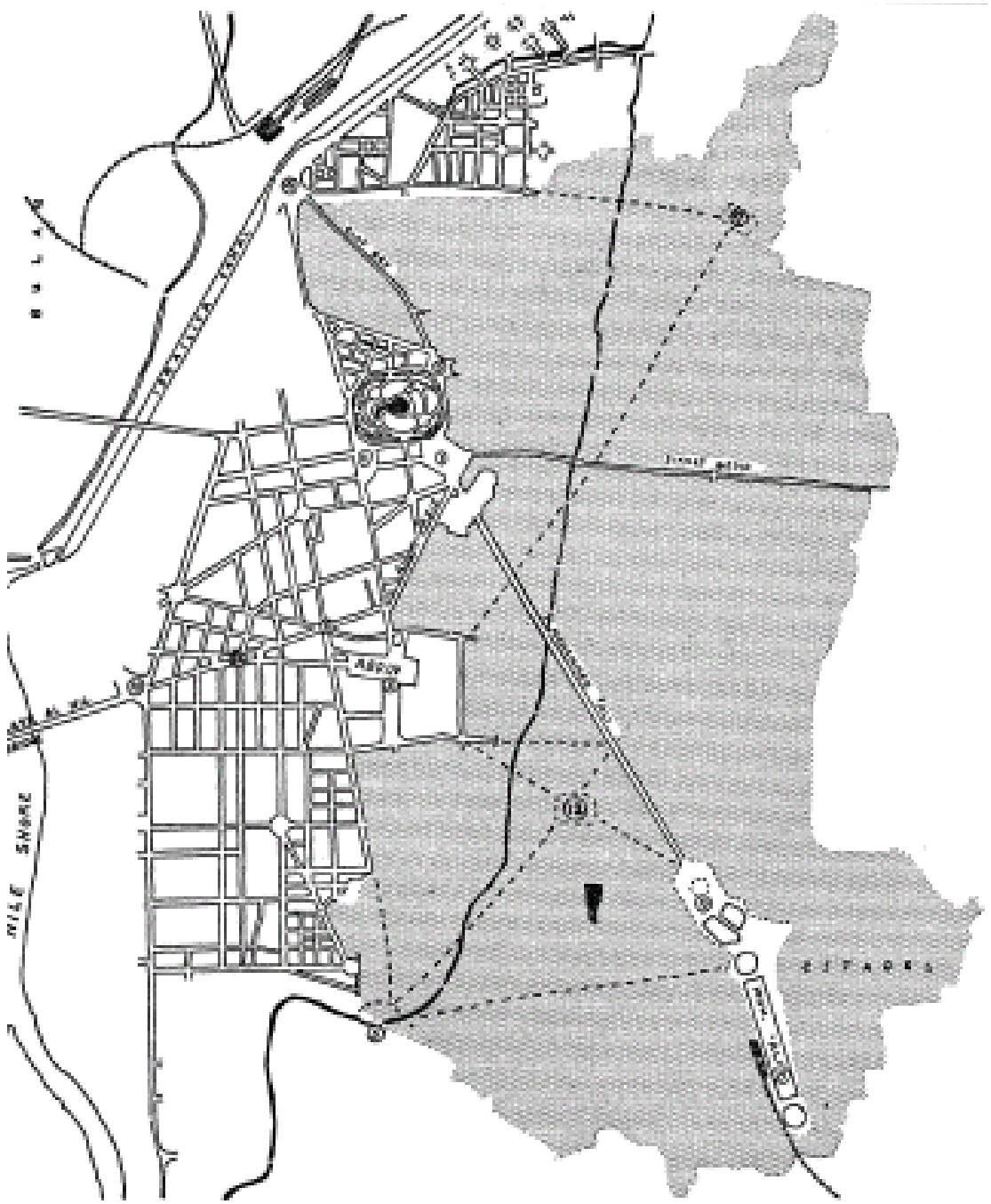


Fig.9. City of Cairo showing existing settlement until 1860s and new additions and changes planned by Ismail in 1867. (Abu-Lughod 1965, p. 447)

European style windows with glass panels, open balconies, and the wood-slotted Venetian shutters called *sheesh* were found as early as the 1870s (**Figs. 10, 11**). Their obvious Italian influences[22] are ascribed to the number of Italians architects and technicians employed by the Egyptian Ministry of Public Works and the owners of private palaces and residences.[23] Thus, balconies and Venetian shutters became established parts of buildings in both westernized and traditional Cairo. Egyptians may have been attracted to the ability of *sheesh*—consisting of small horizontal fixed slats tightly set in a wooden frame—to protect their homes from intense sunlight. However, unlike the *sheesh* found today, the old design featured an upper part that could be opened separately to ensure lighting and ventilation. Another design allowed users to open the lower part upward.

Combined, the civil projects that were started during Ismail's reign—including railroads, telegraphs, a western-style city, and luxurious palaces—resulted in a cash-starved country. England purchased all of Egypt's shares in the Suez Canal, which led to that country's involvement in the financial management of Egypt and its military occupation from 1882 until the Protectorate officially ended in 1936.[24] The western European areas and streets built during the Ismail period provided a foundation on which the British built their own colonial sector.[25]

---

22 J. Berque and M. Shaka (1974), *La Gamâliya depuis un Siècle*, Paris: Librairie orientaliste, as cited in J.C. Depaule and S. Noweir (1986), "Balcons au Caire: Les relations de l'intérieur et de l'extérieur dans l'habitat populaire," *Architecture and Behaviour*, vol. 2, n. 3-4, p. 305.

23 C. Myntti (2000), *Paris along the Nile: Architecture in Cairo from the Belle Epoque*, Cairo: American University in Cairo Press.

24 Abu-Lughod (1965), op cit., p. 451; L. Sherif (2002), *Architecture as a System of Appropriation: Colonization in Egypt*, paper presented at the First International Conference of the UIA-WPAHR-V on Architecture & Heritage as a Paradigm for Knowledge and Development: Lessons of the Past, New Inventions and Future Challenges, Bibliotheca Alexandrina, Egypt, 2-4 March, p. 7.

25 Abu-Lughod (1965), op cit., p. 449.

Fig.10. The new balconies and Venetian shutters in a street in Cairo. (In an album dated 1871-2, Egyptian Mirage Collection, the Archive of the Griffith Institute collection, Oxford)

Fig.11. Commercial street in Cairo showing the new upper floors' solid projections with the Venetian shutter divided into two parts. (Photo by Bonfils, between 1867 and 1899, Prints and Photographs Online Catalogue, Library of Congress)

1-1-4 Veiling and Resisting the Open Balcony

From 1882 to the end of the century, Cairo's population increased from more than 400,000 to almost 600,000. The growth was fueled by rural and foreign migration.[26] Greeks arrived in the city in search of commercial opportunities, Italians to operate machine shops and minor industries, French, Swiss, Swedish, Belgian and English entrepreneurs were attracted by expanding opportunities, and British military and civilian personnel were assigned to help with government administration.[27] Commercial, financial, and consular buildings replaced the villas and gardens of previous decades,[28] and new government buildings and ministry offices were built toward the linear strip east of and parallel to the Qasr al-'Aini Street.[29] The increase of civil servants led to a strong demand for housing. Large white Victorian mansions with high glass windows, designed by European architects chiefly for the foreign community, were constructed along the western edge of the government zone, while new districts such as al-Hilmiyya (1894-1903) for high-ranking Egyptian officials[30] were developed adjacent to the European city of Ismail.[31]

Although European architects tried to localize villa facades by adopting an Arab style derived from mosque architecture, al-Hilmiya residents rejected both the typical European arrangement of their villas and their open balconies[32]—marks of a society that wished to maintain its traditions "while aspiring to new forms for dwellings."[33] To replace central halls behind entrance porches and flanked by rooms with no

[26] Ibid., p. 454.
[27] Ibid., pp. 454-455.
[28] Ibid., p. 455
[29] Ibid.
[30] Abu-Lughod (1965), op cit., pp. 455-456.
[31] Sherif (2002), op cit., p. 7.
[32] Asfour, op cit., p. 133.
[33] Ibid., p. 134.

intermediary spaces, architects re-introduced the *salamlik*, the traditional male reception room (**Fig.12**).[34] To solve the problem of open balconies, builders and families placed parapets of freestanding *mashrabiyyas* or Venetian shutters over terrace balustrades to allow women to enjoy their balconies without being seen (**Fig.13**).[35]

1-1-5 The Veiling Debate and Western Apartments

Between 1882 and 1907 the number of foreigners in Cairo increased from 21,650 to 150,000 (16% of the city's population). This rapid increase triggered a building boom of new residential areas that continued throughout the first half of the twentieth century.[36] Expansion into Garden City and Zamalik took place in the late nineteenth and early twentieth centuries, and Heliopolis and Maadi were both planned and built during the same period.[37] The European real estate and construction entrepreneurs who dominated the Egyptian building sector until the 1930s[38] built apartment buildings for the foreign community that made use of neo-classical, neo-renaissance, neo-baroque, gothic revival, and neo-Islamic styles (**Fig.14**).[39]

Aside from stylistic ornaments, the facades of these buildings consisted of multiple designs of open balconies with balustrades (**Figs.15, 16**) and large windows with glass panels treated with the same wooden *sheesh* that were widely used following the Ismail period. Another development that seems to have emerged in the 1870s was a shutter on a frame that could be opened upward to block the sun while allowing some light to enter and ensuring ventilation (**Fig.17**). A brief period of experimentation with

34 Ibid.
35 Ibid.
36 The Aga Khan Program for Islamic Architecture, op cit., p. 96.
37 Ibrahim, op cit., p. 27.
38 T.A. Abdel Gawwad (1989), *Misr, al 'emara fel karn al 'eshreen*, Cairo: The Anglo-Egyptian, pp. 138-144.
39 Y. Eid (2005), *Sustainability of 19th and 20th Century Buildings in Egypt*, paper presented at the International Seminar on the Management of the Shared Mediterranean Heritage, Alexandria, Egypt, March 29-31 p. 5.

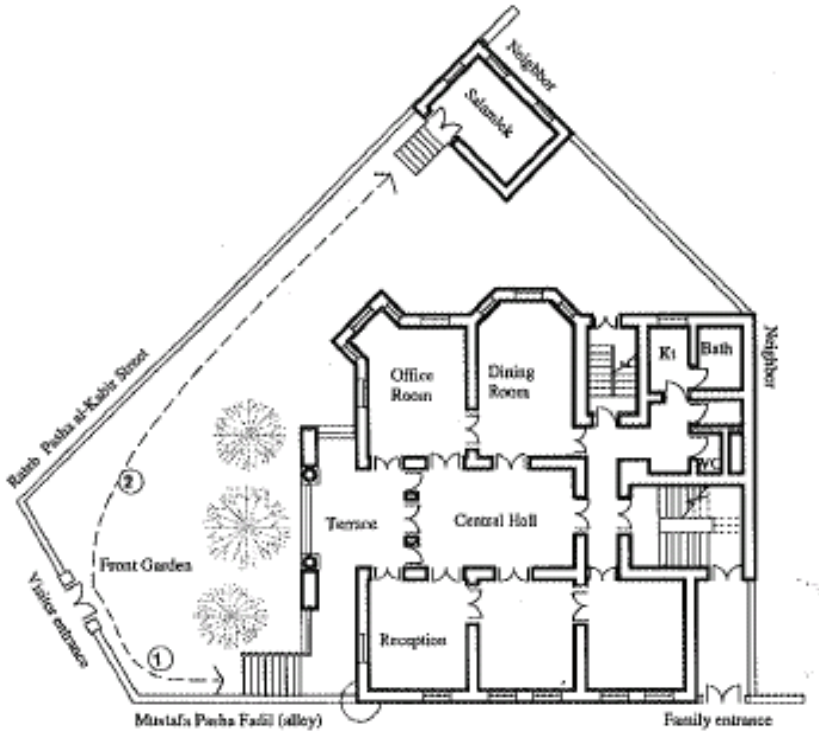


Fig.12. Plan of the villa of Muhammad Sadeq in Hilmiyya. To solve the problem of privacy in this western villa, a separate *salamlik* for male gustes and a special entrance for the family have been applied. (Asfour 1993, p. 132)

a) Facade of villa of Delbrun Shukri in Hilmiyya with Venetian shutters over the balustrade. (Asfour 1993, p. 135)

b) Detail of a villa showing the *mashrabiyya* typically applied over the balustrade. (Asfour 1993, p. 136)

Fig.13. Adapting the balconies of the western villas to the veiling and privacy needs of the Egyptian society during early-twentieth century.

Fig.14. Colonial architecture during the first half of the 20th century, Solaiman Pasha square, downtown Cairo. (Photo by Azlan Nache)

Fig.15. Balconies along Emad Al-Din Street, downtown Cairo.

Fig.16. An art nouveau style balcony with a Venetian shutter in Garden City. (Photo by Donat Agosti)

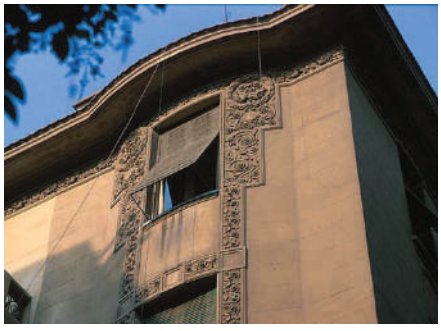


Fig.17. The shutters used during the first half of the 20th century, Garden City. Right, the rolling shutter opening upward, left, the Venetian shutter divided into two parts. (Photo by Donat Agosti)

rationalist architecture occurred in the 1920s, but modernism gradually became the prevalent style of apartment building architecture since the 1930s (**Fig.18**). In addition to eliminating all classical ornamentation in facades, modernist architects treated the thresholds between apartment interiors and exteriors with even wider glass panel windows and Venetian shutters on open balconies. Since the European and modern style apartments that marked the western part of Cairo were originally built for the foreign community, such features were acceptable. However, due to societal changes that occurred during the city's liberal age, Cairenes started moving to these apartments.[40]

Encounters with western culture and lifestyle led to a rethinking of Egyptian women's position and fueled the emergence of a feminist movement starting in the late nineteenth century.[41] However, few real changes occurred until the third decade of the twentieth century. The first Egyptian to openly and directly address the issue of women's veiling was Qasim Amin (1863-1908). In his book *Tahrir al-Mar'a* (*The Liberation of the Woman*) published in 1899, he called for education for women, an end to veiling and polygamy, and divorce law reform.[42] He attacked the customs of home seclusion and gender segregation and argued that no Islamic legal texts required veiling.[43] In 1923, two women—Huda Sha'rawi and Saiza Nabarawi—who had recently attended an international feminist meeting in Rome, removed their face covers as a symbolic action. This launched a movement among upper-class women to move

---

40 The period from the 1920s to the 1950s was considered Cairo's liberal age; see Ibrahim (1985), op. cit., pp. 25-26.

41 G. Baer (1969), *Studies in the Social History of Modern Egypt*, as cited by J.E. Tucker (1983), "Problems in the Historiography of Women in the Middle East: the Case of Nineteenth-Century Egypt," *International Journal of Middle East Studies,* vol. 15, n. 3, p. 324.

42 S. Zuhur (1992), *Revealing Reveiling: Islamic Gender Ideology in Contemporary Egypt*, New York: State University of New York Press, p. 40.

43 V.J. Hoffman-Ladd (1987), "Polemics in Modesty and Segregation in Contemporary Cairo," *International Journal of Middle East Studies,* vol. 19, n. 1, pp. 26-27.

about Cairo without their protective covers.[44] From the 1920s until the early 1950s, Cairene women fought against veiling and polygamy, entered public social life, and tried to gain access to education beyond primary and secondary school.[45]

During this same period, moving from older parts of the city to apartments in western Cairo was considered an important step of social and financial mobility.[46] Large numbers of the Egyptian elite and middle class moved to the western districts of Garden City, Zamalik, Heliopolis, and Maadi,[47] and later to the northeast and northwest sections that were settled by less wealthy foreigners.[48] The act of integrating foreign communities led to further adoption of many aspects of western lifestyles.[49] Living in apartments with outward looking designs reflected a shift toward European values and female freedoms.[50] Buildings in the old city were left to poor Egyptians who were migrating from rural communities in growing numbers. No investments were made in the infrastructure of the old city.[51] Buildings that had once been the homes of the rich and powerful were subdivided into small apartments crowded with dozens of families, with more living in shacks built in courtyards and on roofs.[52] When the old city reached its saturation level, the poor began living in large slums on the urban outskirts.[53]

1-1-6 Westernized Women and International Style

The 1952 revolution led by Gamal Abdel Nasser was a turning point in Egyptian

---

44 A.E. Macleod (1991), *Accommodating Protest: Working Women, the New Veiling, and Change in Cairo*, Cairo: The American University in Cairo Press, p. 102.
45 Zuhur, op cit., p. 44.
46 The Aga Khan Program for Islamic Architecture, op cit., p. 97.
47 Ibrahim (1985), op. cit., p. 30.
48 The Aga Khan Program for Islamic Architecture, op cit.
49 Ibrahim (1985), op. cit., p. 27.
50 Eid, op cit., p. 5.
51 Ibrahim (1985), op. cit.
52 The Aga Khan Program for Islamic Architecture, op cit.
53 D.J. Stewart (1999), "Changing Cairo: The Political Economy of Urban Form," *International Journal of Urban and Regional Research*, vol. 23, n. 1, p. 139.

society and housing architecture. As part of his nationalist agenda, Nasser took political and economic power away from foreigners and the Egyptian elite.[54] Thus, since 1961 the number of foreigners living in Cairo has been negligible, while the overall population of the city has grown from 2.35 million in 1950 to 3.7 million in 1960 to 5.7 million in 1970.[55] The boom was the result of natural growth and rural-urban migration that began during the colonial phase and continued after the revolution under the encouragement of the government, which wanted workers for new industrial centers.[56] Nasser promised free education and employment for all secondary school graduates, resulting in growth in public sector (mostly lower middle-class) employment from 325,000 in 1952 to 1,035,000 in 1966-67.[57] To support lower-middle class workers and families, Nasser instituted rent controls that discouraged private development for the rental market.[58] The combination of a continuous increase in Cairo's population, the growing number of public sector employees, the proliferation of new rural migrant settlements, the deteriorating conditions of existing ones, plus a diminished rental market produced a critical housing shortage.

In response, the government constructed subsidized public housing projects (known as "popular housing projects" in Egypt) for low- and middle-income Egyptians. Residents could buy their units by making nominal payments or pay rent according to their financial capacities.[59] The Helmiet-Zeitoun, Helwan, and Embaba housing projects were built during this period—all of them filled with two-story duplexes with

54 Ibrahim (1985), op. cit.
55 Ibid., p. 29.
56 Stewart, op cit., p. 140.
57 Ibid., p. 138.
58 The Aga Khan Program for Islamic Architecture, op cit.
59 Ministry of Municipal and Rural Affairs and Development Popular Housing Co. (1954), *Development Popular Housing Co. Projects to be Executed in 1954-1956*, Cairo: Ministry of Municipal and Rural Affairs, Development Popular Housing Co., p. 2.

little, if any, variation. In other area, slums were cleared and replaced by apartment blocks of five- and six-story buildings; examples include Zeinhom and Ain al Sira. Cooperative ownership housing projects for middle-income groups were built in Ma'rouf, Manial, and Shubra.[60] These consisted of detached and attached houses and apartment buildings.[61]

The Nasser government also developed industrial and government centers outside of Cairo to absorb the city's increasing population, followed by the construction of housing for their workers. These residential towns were generally comprised of two- to four-story apartment units. Examples include towns built for employees of the Iron and Steel Mill Company in Helwan in the south (**Fig.19**) and for railway workers in Abu Zaabal. Nasr City (on the eastern edge of Cairo) was designated as a government center with housing for middle-class civil servants in eleven-story apartment buildings.[62] A small number of new districts in Cairo were planned and developed by private real estate interests. Among these were Engineers' City, Professors' City, and Journalists' City.[63] Initially designed to consist of single-unit dwelling areas, these districts were designated for high-rise development during Anwar Sadat's "open door" policy in the 1970s.[64]

The Nasserite housing projects are all examples of modern architectural design that followed the modernist trends that began in the 1930s. This shift was initiated by European architects and adopted by Egyptian architects who began designing buildings

60 Abu-Lughod (1971), op cit., pp. 231-232.
61 A. Rageh (1985), "The Changing Pattern of Housing in Cairo," in A. Evin (Ed.), op cit., p. 136.
62 The Aga Khan Program for Islamic Architecture, op cit., p. 98.
63 Ibrahim (1985), op. cit., p. 30.
64 Ibid.

in the 1930s and later.[65] The principles of international modern architecture—including functional and repeatable plans, plain facades with no ornaments, and cubic forms—were economically appealing and quickly applicable in response to Cairo's housing shortage. Sociologist Mona Abaza gives the following description of the resulting style that characterized Egyptian public housing projects during the 1960s:

> Bauhaus architecture, a German invention born out of a situation of scarcity, was adopted by the ruling regime in order to seek for functional solutions. The aim was to solve the housing problem for the needy. Such a style was functional and operative in a "developing" nation like Egypt. Popular housing could have been a replica—but much worse maintained—than the German social housing.[66]

During this period, neither architects nor inhabitants questioned the use of balconies, glass panels, or *sheesh*. Unlike previous decades, *sheesh* were built as two panels opening sideways, with the upper movable part eliminated. Despite its function of blocking the intense Egyptian sun, many housing projects lacked *sheesh* when they were built, and so occupants had to add them individually. While balconies extended out from buildings during the colonial phase, they were embedded into building façades during the modern period. This embedded typology facilitated the phenomenon of enclosed balconies that emerged in later years.[67]

Privacy concerns were weaker during this period, since Nasser was encouraging Egyptians to adopt modern lifestyles. He specifically encouraged women to work outside the home and supported the principle of gender equality,[68] therefore the 1950s

---

65 T.A. Abdel Gawwad (1989), *Misr, al 'emara fel karn al 'eshreen*, Cairo: The Anglo-Egyptian, pp. 138-144.
66 M. Abaza (2004), Advertising History, *Al-Ahram Weekly Online*, n. 697.
67 See **1-3 Threshold Modification**
68 Tucker, op cit., p. 326.

and 1960s were marked by a prevalence of unveiled westernized Egyptian women living in Cairo. His nationalist agenda included the adoption of an Egyptian lifestyle that was not oriented to the West, yet upper class women showed a preference for western fashions and middle class women wore more modest versions of western clothes on the street and at home.[69] Veiling in Cairo almost completely disappeared during this time, since western dress became an important symbol of entering the middle class.[70] A conservative group known as the *Foundation of Muslim Brotherhood* was founded in 1928, but its members failed to convince Egyptian society about the evils of copying European ways, despite their attempts at *tajdid* (reform) during the 1950s.[71] Many women feared this movement and viewed it as an attempt to return to the *harem* age.[72] Based on his growing fear that Islamic groups would interfere with socialist progress, Nasser banned the group in 1964 and jailed or exiled many of its members.[73]

The second half of the 1960s and first half of the 1970s (after Anwar Sadat rose to power in 1970) witnessed a sharp drop in public housing construction and a serious housing shortage. The Egyptian military was given the bulk of the country's resources for the conflict with Israel,[74] but rural migration into Cairo continued and Nasser's promise of inexpensive housing, rent controls, and restrictions on the private sector diminished housing production.[75] Informal settlements built on agricultural lands on the

69 E. Fernea and R. Fernea (1987), *The Arab World: Personal Encounters*, New York: Anchor Press, as cited by Zuhur, op cit., p. 49.
70 Macleod, op cit., p. 103.
71 See **3-1-1 History of the Contemporary Veil in Egypt**.
72 R.P. Mitchell (1969), *The Society of the Muslim Brothers*, London: Oxford University Press, as cited by Zuhur, op cit., p. 45.
73 Zuhur, op cit., p. 51.
74 El-Batran and Arandel, op cit., p. 219.
75 Ibrahim (1985), op. cit., p. 27.

edge of Cairo were used to house rural migrants pouring into the city.[76]

The typology of informal settlements—which currently houses over half the population of greater Cairo and almost half the city's total residential area—has its roots in the 1960s,[77] when farmers on the fringes of "formal" Cairo subdivided their land holdings and sold them to individual owner-builders.[78] The buildings that were constructed followed the public housing project model,[79] but minus plaster on their exteriors. The result: glum red brick cubes with windows and balconies arranged symmetrically.[80] This phenomenon accelerated dramatically with the beginning of Anwar Sadat's open door policy in 1974.[81]

1-1-7 Renewed Veiling and Open Threshold Continuity

From 1970 until his assassination in 1981, Anwar Sadat reversed Nasser's nationalist policies and adopted an "open-door" policy (*Infintah*) that encouraged private investment through free trade, joint ventures, open ports, and foreign participation in the economy.[82] Restrictions on private enterprise were lifted in all areas of industry and production, and import rules were relaxed.[83] To meet the growing need for housing and in the face of sharp increases in land prices, it became easier for investors to build vertical extensions on existing buildings than to construct new apartments on new sites.[84] The housing crisis was exacerbated by the emergence of a new wealthy class consisting of workers returning from jobs in oil-rich Arab countries

---

76 F. Ghannam (2002), *Remaking the Modern: Space, Relocation and the Politics of Identity in a Global Cairo*, Berkeley: University of California Press, p. 27.
77 Sims , pp. 5, 11; El-Batran and Arandel, op cit., p. 222.
78 Sims, op cit., p. 5.
79 A. Ibrahim (1988), "Al Iskan al-'ahwa'i," *Alam al-Bina*, n. 97.
80 Rageh, op cit., p. 139.
81 Sims, op cit., p. 5.
82 Zuhur, op cit., p. 51.
83 Rageh, op cit., p. 138.
84 Ibid.

who wanted higher quality apartments and real estate investment opportunities.[85]

From the mid-1970s to today, the housing skyline in Cairo has undergone a fundamental transformation.[86] Private villas in Zamalik, Garden City, Maadi, and along the Nile have been torn down and replaced with high-rise luxury apartment buildings. Apartment buildings in the middle class areas of Mohandissin City, Professors' City, and Journalists' City have expanded vertically (**Fig.20**), single occupancy villas have been replaced by multi-story apartment buildings, and high-rise towers have been erected on empty lots (**Fig.21**).[87] Most of these apartment buildings were designed with embedded balconies and glass windows with or without *sheesh*.

During the Nasser era, four new satellite cities were proposed in the desert surrounding Cairo to redirect population growth and to provide alternative sites for urban development.[88] Sadat expanded the plan to include the construction of at least fourteen new cities.[89] Construction of the first city, named 10th of Ramadan, began in 1977. The government was responsible for providing roads, infrastructure, necessary public buildings, and subsidized low-income housing blocks; cooperatives, the private sector, and individuals were responsible for constructing middle-income and upper-income housing. Architectural forms and plans continued to rely on Nasser-era prototypes (**Fig.22**).[90]

In terms of social issues, the Sadat era is now considered the time when a “new

---

85 The Aga Khan Program for Islamic Architecture, op cit., pp. 98-99, Ibrahim (1985), op cit., p. 28.
86 Ibrahim (1985), op cit., p. 28.
87 Ibid.
88 Arab Republic of Egypt (1977), *Urban Land Use in Egypt*, Cairo: Ministry of Housing and Recreation, Ministry of Planning, as cited in Stewart, op cit., p. 140.
89 Stewart, op cit., p. 140; The Aga Khan Program for Islamic Architecture, op cit., p. 106.
90 M.S. Hegab (1985), “New Towns Policy,” in A. Evin (Ed.), op cit. pp. 171-174; El-Batran and Arandel, op cit., p. 219; The Aga Khan Program for Islamic Architecture, op cit., pp. 107-111; Rageh, op cit., p. 139.

Fig.18. Lababidi apartment building, 1940s, by arch. Albert Zananiri. Modernism identically treated the threshold between the interior and the exterior with open balconies and large windows with glass panels and shutters. (Raafat 1998)

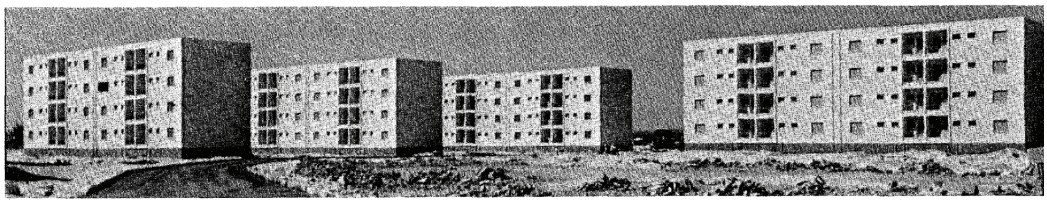


Fig.19. Early public apartment blocks built for the Iron Mill Company's employees in HeIwan. (Rageh 1985, p. 136)

Fig.20. New floors with different style added to a residential building in Zamalik. (Rageh 1985, p. 133)

Fig.21. Modern apartment towers in Cairo. Above, Maadi towers. (The Arab Contractors homepage www.arabcont.com). Below, apartments for Ein Shams University stuff. (Mahmoudia homepage www.a2zdecor.com/company/elmahmoudia)

Fig.22. Early public housing for lower income groups in sixth of October City. (Photo by Michel Le Page)

veiled woman" emerged in Cairo.[91] Two armed conflicts with Israel, the perception that Sadat betrayed the nation by signing the Camp David Peace Treaty in 1978, and discontent over wider gaps in income distribution created by the open door policy triggered a new period of nationalist soul-searching.[92] Women's veils reappeared in the wake of criticism of modernization as a negative phenomenon that encouraged people to reject Islam and other indigenous traditions.[93] They were also viewed as reaffirmations of a national identity that rejected western values and styles.[94] Beginning in the mid-1970s, lower-middle class working women started wearing veils, but unlike their ancestors during the Ottoman period, they continued to attend universities, participate in social affairs,[95] and work outside the home. By the late 1970s Egyptian women were a strong presence in all areas of public- and private-sector employment.[96]

During the Mubarak era (1981-present), wearing veils has developed into a movement with wide appeal among lower-middle class working women.[97] During the late-1980s, elite and middle class women moved away from emulating their western counterparts, with a small number adopting the veil.[98] Since the 1990s, veiling has gained widespread acceptance among educated university students and professionals in technical fields.[99]

However, this shift toward more conservative Islamic values has not been

---

91 For further information on this new veil, see **3-1-1 History of the Contemporary Veil in Egypt**, and **3-1-2 Meaning of the Contemporary Veil**.
92 See Zuhur, op cit., p. 53, and Macleod, op cit.
93 L. Reese (1998), "The Burqa, Chador, Veil and Hijab!," in *Women in the Muslim World*, Berkeley: Women in World History Curriculum, retrieved January 11, 2005, from www.womeninworldhistory.com/sample-13.html
94 Ibid.; Macleod, op cit., p. 103.
95 Macleod, op cit., p. 104.
96 Zuhur, op cit., p. 54.
97 Macleod, op cit., p. 106.
98 Zuhur, op cit., p. 120.
99 Hoffman-Ladd, op cit., p. 19.

accompanied by changes in home thresholds. Instead, there was a noticeable shift toward post-modern (often Islamic and Pharaonic) styles on the part of architects and designers and the emergence of individual households modifying their balconies and windows. In the 1980s, Mubarak followed a housing policy similar to Sadat's: providing public housing, encouraging private investment, and developing new cities. The majority of 1980s construction (both private and public) followed modernist architectural styles, with a small minority reflecting post-modern trends. That has changed since the 1990s; according to Ashraf Salama, a well-known Egyptian professor of architecture, new architectural styles represent "a transformation from following international modernism to following international post-modernism."[100] While they resisted the constraints of modernism, Egyptian architects failed to acknowledge the needs of Egyptians who had become increasingly concerned with veiling and privacy. Instead, they based their new designs on historic styles such as the Pharaonic and Islamic. Examples can be found in the apartment buildings designed by the Egyptian architect Ashraf Salah Abo Seif, who makes extensive use of arches and wooden pergolas, and who harmonizes building shells to add an Islamic touch (**Fig.23**).[101] Still, even though post-modern architectural products in Cairo are characterized by a diversity of styles and facades, they remain similar in terms of thresholds, with open balconies, glass panels, and occasional *sheesh*.

The post-modern movement in Egypt influenced public housing in the 1990s. In 1996, Mubarak launched a national campaign called "shelter for all," whose goal was to

[100] A. Salama (1999), *Contemporary Architecture of Egypt: Reflections on Architecture and Urbanism of the Nineties*, paper presented at the Regional Seminar, Architecture Reintroduced: New Projects in Societies in Change, Beirut, Lebanon, 24-27 November, p. 13.
[101] Ibid., p. 15.

offer attractive lower-income housing and to finance it through a combination of direct government subsidies, cooperative loans, and the participation (including direct donations) of wealthy businessmen, contractors, real estate investors, corporations, and financial institutions. The first two projects of the program were named the "Mubarak Youth Housing Project" (1996) and "Future Housing Project" (1998).[102] To change negative perceptions and to improve the architectural standards of public housing prototypes adopted from the Nasser era, plans and designs for Mubarak projects were chosen via national architectural competitions.

The winning design of the Future Housing Project was based on a mixed Islamic architectural vocabulary—for instance, pointed arches, *ablaq* (term used to describe alternating light and dark courses of masonry), woodwork, and balcony interplay (**Fig.24**). Although windows were covered with lace-like latticework, the designs generally failed to address the issue of balcony openness. Instead, they used open balconies in a manner that made facades look like those found on traditional buildings without reintroducing the social and environmental roles of traditional *mashrabiyya*. On traditional Cairo buildings, *mashrabiyya* positioning was first of all a reflection of the internal arrangement of a house, second an indispensable solution to problems associated with narrow streets,[103] and third a requirement of *Shari'a* (Islamic law) for respecting the *fina'* of others.[104] However, these circumstances have changed in modern Cairo. The

[102] The Ministry of Housing Utilities and Urban Communities (2001), *Shelter Programmes and City Development Strategies in Egypt*, paper presented at the Istanbul + 5: The United Nations Special Session of the General Assembly for an Overall Review and Appraisal of the Implementation of the Habitat Agenda, New York, 6-8 June, p. 2.

[103] A secondary street (*tariq salik or zuqaq nafid*) was about five meters, and a cul-de-sac (*zuqaq ghayr nafid*) was about two meters, see L. Fernandes (1990), "Habitat et Prescription Legales," in *l'Habitat Traditionnel dans les Pays Musulmans autour de la Mediterranee* (Vol. 2), Cairo: Institut Francais d' Archeologie Orientale

[104] The *fina'* is the space covering the whole area abutting the house's external wall and usually extending to the whole width of the neighborhood's street, and within which one was allowed to build his *mashrabiyyas*. See **3-4 Legislative/Urban/Architectural Issues**. For more information on the *Shari'a*'s building regulations, see Fernandes, op cit.; B.S. Hakim (1988), *Arabic-Islamic Cities: Building and Planning Principles*, London and

Fig.23. A postmodern apartment building by Ashraf Salah Abo Seif. (Photo by Ahmed Abdel Wahab)

Fig.24. Future Housing Project in El Obour City, 1998. (Eldemery 2003, p. 8)

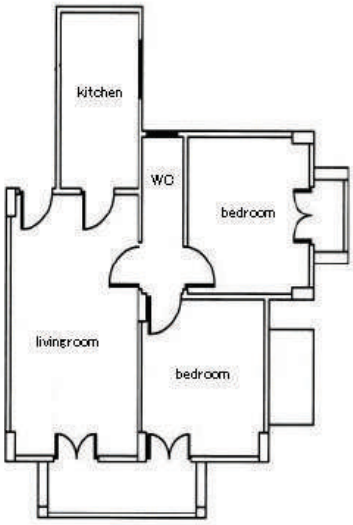


Fig.25. A more recent design of the Youth and Future Housing Projects, 10th of Ramadan City. Above, general view showing the *sheesh* and open balconies (The Arab Contractors' homepage www.arabcont.com); below left, plan of a unit (El-Hefnawi 2000); below right, balconies' various types with some easy to enclose and others (without ceilings or side panels) more difficult (Photo by Michel Le Page).

more recent housing project design shown in **Figure 25** still features open balconies, glass panels, and *sheesh*. In this particular design there is a variety of balcony types, with some easy to enclose and others more difficult.

1-2 Current Thresholds: Uses and Issues

The threshold problem in the apartment building of Cairo arises from a conflict between social and environmental needs. On the one hand are privacy (veiling) needs and how they affect daily and social activities that take place near a window or on a balcony. On the other are needs for natural light, ventilation, views, and shade. These environmental concerns also conflict with each other because current combinations of balconies, windows, and *sheesh* fail to address them simultaneously.

As Askar et al. observe that windows with glass panels exist "to permit daylight to enter the building's interior, to allow ventilation, and to provide views of the local ambient environment. Psychologically they are also desirable for contributing to the mental health of the occupants."[105] However, achieving these goals means that windows fail to maintain privacy; furthermore, it is difficult to strike a balance between light and ventilation in a hot and arid climate.[106] Many Cairenes therefore put thick curtains on their windows, which boosts a sense of privacy and shade but blocks daylight, air, and views. Tinted or surface-coated glass helps maintain privacy and reduce solar heat and glare,[107] but at the expense of ventilation and sometimes with unusual levels of ambient light. However, there are also pros and cons when using

New York: Kegan Paul International; S. Al-Hathloul (2002), "Legislation and the Built Environment in the Arab-Muslim City," *Diwan al-Mimar*, vol. 2001 - 2002 series, April 22, retrieved April 19, 2006, from csbe.org/e_publications/arab-muslim_city.

105 H. Askar et al. (2001), "Windows for Buildings in Hot Arid Countries," *Applied Energy*, vol. 70, n. 1, p. 84.

106 Ibid.

107 Ibid.

sheesh. Hassan Fathy, a noted Egyptian architect who pioneered appropriate technology for building, notes that when closed for privacy and shading purposes, Venetian wood shutters completely obstruct one's view to the outside and darkens the interior space considerably (**Figs.26, 27**). Moreover, air that does enter tends to flow upward over the heads of the occupants. However, if the slats were arranged to direct wind downward, the *sheesh* would loose its effectiveness in blocking the intense rays of sunlight that are a fixture of life in Cairo.[108]

Issues surrounding the design of balconies in Cairo are considered important due to their perceived indispensability for social and environmental reasons. According to the results of a public housing survey conducted by Rawia Hammouda, 58.8% of the respondents described their balconies as indispensable, 37.3% said they were both indispensable and enjoyable, and only 3.9% viewed them as unnecessary.[109] Many Cairenes drink their morning coffee and afternoon tea while reading a newspaper on their balconies. Students may use them for studying, males and females alike may use them for chatting with neighbors, and many consider them as refuges. Egyptian women negotiate prices with peddlers and lower baskets with ropes to exchange money for vegetables, fruits, and bread (**Fig.28**).[110] Balconies are where women hang the family wash, air out bedding, and clean dust from carpets. They are where onions and garlic cloves are hung to dry and "where all sorts of odds and ends are packed in cartons and stacked in the corner."[111] Balconies are where people stand to call down welcomes to their guests, where women take care of infants and check on the arrival of their

[108] H. Fathy (1986), *Vernacular Architecture: Principles and Examples with Reference to Hot Arid Climates*, Chicago: The University of Chicago Press, p.45.
[109] R. Hammouda (1992), *Urban Aesthetics in Developing Coutries*, unpublished doctoral dissertation, Cairo University.
[110] On the uses of the balcony in Cairo see A. Elbendary (2003), Out on the Balcony, *Al-Ahram Weekly Online*, n. 646; Depaule and Noweir, op cit., pp. 312-314.
[111] Elbendary, op cit.

husbands and children from work and school. Many families gather on balconies to eat, talk, and enjoy the cool evenings of Cairo (as many other Mediterranean cities in the Arab World) (**Fig.29**).[112] In working class areas, balconies are viewed as places to raise poultry, listen to the radio, and watch television.

In short, balconies play a central role in the lives of many Cairenes, but while they serve many functions, they require various strategies to turn them into private spaces that also block living quarters from the intense Egyptian sun.

1-3 Threshold Modifications

Numerous studies and surveys have been conducted on how members of various social classes in Cairo behave when using their balconies and windows and how they adapt those spaces to their needs.[113] For the most part, the collected data show that the three main reasons for modifying balconies and windows are privacy needs, protection from the sun, and the need for extra space. Behaviors that were repeatedly reported or observed included:

- continuous closing of *sheesh*.
- continuous closing of curtains, either on the windows or on the balcony.
- wearing a veil whenever the window or balcony is used (**Fig.30**).

---

[112] B. Al-Abed (1990), *Modernity or Continuity, Notes on the Dialectic of Contemporary Arab Architecture*, paper presented at the The Delft International Working Seminar on Critical Regionalism, Context and Modernity, Delft, Holland, 13-15 June, p. 8.

[113] M. Sibley-Behloul (2002), "Informal Transformations of Formal Housing Estates in Algiers and Cairo," *GBER*, vol. 2, n. 3; A.G. Tipple (1999), "Transforming Government-Built Housing: Lessons from Developing Countries," *Journal of Urban Technology*, vol. 6, n. 3; Depaule and S. Noweir, op cit.; J. Taktak (2002), *Architectural and Urban Design Enhancing the Sense of Belonging within a Cultural Developing Society*, unpublished doctoral dissertation, Cairo University; M. El Kadi (1996), *Users Additions to Facades: Recording and Analysis*, unpublished masters thesis, Cairo University; H. Abdel Fattah (1994), *Social and Cultural Values and Architecture*, unpublished masters thesis, Cairo University; S. Hegazi (1991), *Ta'aleem al-Islam wa Tasmeem al-Maskan*, unpublished masters thesis, Cairo University; Survey by the author in 2005 at Zeinhom public housing for lower income, Montasser cooperative housing for middle and upper-middle income, various lower, middle, and upper income apartment buildings in Al-Ahram, Faisal, al-Mohandeseen, and Giza districts.

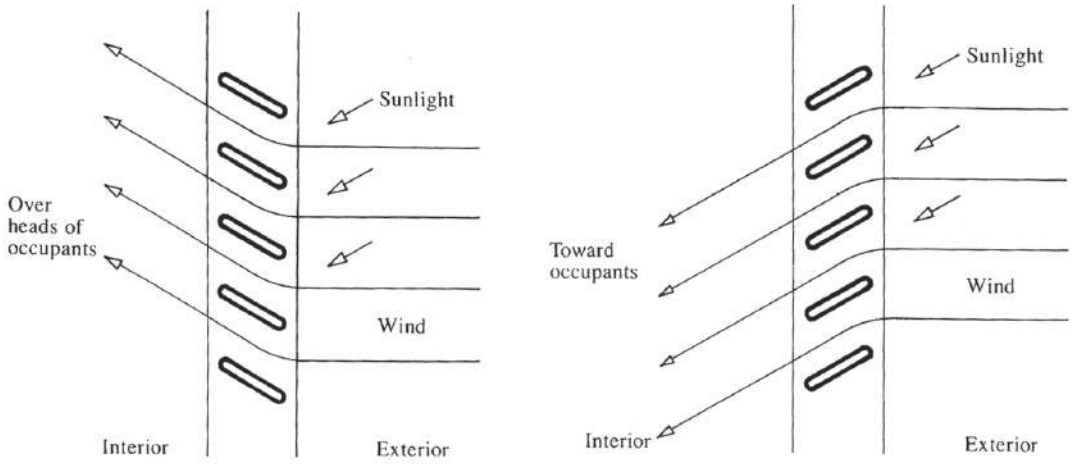


Fig.26. The *Sheesh* used in Egypt. Left, the optimal position for blocking sunlight is undesirable with regard to the wind direction. Right, the position for the optimal direction of the air movement in undesirable with regard of sunshine. (Fathy 1986, fig.17)

Fig.27. The dimming effect of the *sheesh*. People often open a small part in the *sheesh* in order to maintain privacy or to break direct sunlight while allowing for some natural light, which is still limited and insufficient. (From www.e-dar.com)

Fig.28. The basket used for buying from the peddlers. (The author)

Fig.29. A family sitting in their balcony, downtown Cairo. It is common to have chairs in the balcony. (Photo by Peppers)

- sitting on the balcony at night and turning off the light.
- hiding behind a curtain while hanging wet clothes (**Fig.31**).

Some of the many modifications of openings and balconies that have been reported or observed include:

- Closing off the balcony railing with a cloth or bricks (**Fig.32**). This prevents being seen while sitting and allows women to sit on chairs on their balconies while wearing scarves but without having to change out of their house clothes.
- Replacing glass panels with opaque or reflecting panels. Among poor families, a plastic sheet or newspaper may suffice.
- Closing off one side of the balcony with a wood or aluminum partition to block a side neighbor's view (**Fig.33**). This modification in often made on balconies that jut out from a façade and are opened on two or three sides.
- Surrounding the balcony with a curtain to ensure privacy and shade.
- Permanently closing the balcony with a fixed object (e.g., wood lattice, glass panels, bricks, or *sheesh*) while retaining a window or movable panel on it (**Figs.34, 35**). Jean-Charles Depaule and Sawsan Noweir, on their study on the balconies of Cairo, describe these as interpretations of the traditional *mashrabiyya*.[114] One wooden device observed on balconies in the Zeinhom housing project bears a striking resemblance to a *mashrabiyya* (**Fig.36**). It has an upper part that compensates for reduced lighting and ventilation when the lower part is closed for privacy or for shading purposes.
- Permanently closing part of the balcony while leaving the rest open.

[114] Depaule and Noweir, op cit., pp. 301-302.

Fig.30. A woman wearing a scarf while hanging the washing. Note the overhang over the lines. (The author)

Fig.31. Modifications on a residential building in Imbaba district in Cairo. All these large windows were balconies before people closed it with *sheesh*. The curtains are fixed to the last washing line to preserve privacy while hanging. Over the washing lines of the ground floor, an overhang is installed, and in the second floor, a shade is installed. (The author)

Fig.32. Modifications of the railing. The railing is closed with a cloth or with bricks to preserve privacy while sitting in the balcony. Above, apartment in 15th May City (www.e-dar.com); below, apartment in Imbaba (the author).

Fig.33. Closing the side of the balcony to protect oneself from the neighbor's eye. Above, an apartment building in Giza; below, an apartment building in Mohandissin, Cairo. (The author)

Fig.34. Modifications on the balconies and windows of three apartment buildings in middle and upper class districts in Cairo. Right, el-Sahafiyyin (Journalists) district, middle, el-Mohandissin (Engineers) district, and left, el-Haram district. (The author)

Fig.35. Modifications on the balconies of two apartment buildings. Right, in el-Haram district, left, near Giza Square. (The author)

Fig.36. Zeinhom Public Housing, Cairo: General view and various modifications on the balconies. People closed the balcony with a wooden device similar to the *mashrabiyya*. (The author)

- After closing off a balcony, eliminating the wall between it and the apartment to increase internal space while preserving the balcony's accustomed uses.
- Adding a completely new room to an apartment (**Fig.37**).
- Increasing window size.
- Changing window location and closing off the original (usually with bricks). Often the motivation is that the original window location is not suitable for the desired arrangement of furniture.
- Installing a new window in a solid wall.
- Changing the opening direction of a *sheesh* from sideways to upward (**Fig.38**). This is especially convenient for hiding women from view while they hang their wash.
- Applying large shades on a balcony or window (**Fig.39**). Motivations are both environmental and social, as shades can be lowered to a level that blocks the vision of a neighbor across the way. However, this modification has a considerable dimming effect, blocks one's view, and prevents a great deal of air from entering.
- Installing an overhang over a window or balcony (**Figs.30, 31, 39**). The motivation is not necessarily related to blocking the sun. Some occupants install overhangs to protect their drying clothes from getting dirty or wet from their upstairs neighbors' dusting or washing activities.

1-4 Air Conditioning in Cairo

According to Egypt Demographic and Health Survey (EDHS), 82.8% of all households in major Egyptian cities had an electric fan as a cooling device in 2000; this rate increased to 91.8% in 2003. No EDHS data on the percentage of households

Fig.37. A room added to a unit in Zeinhom Housing. (The author)

Fig.38. Changing the opening direction of the *sheesh* from sideward to upward to preserve privacy while hanging the washing. Note that the other *sheesh* (without washing lines) has not been changed. (The author)

Fig.39. Overhang and shades installed on balconies in Montasser housing, el-Haram. (The author)

owning air conditioning units are available for 2000,[115] but 11.2% of all households were reported as having at least one air conditioning unit in 2003.[116] Surprisingly, this rate decreased to 8.8% in the 2005 survey, while the rate of fan ownership slightly increased.[117] An obvious explanation is the desire to save on electricity bills, of which air conditioning represents 32% due to the long duration of the hot season.[118] Thus, compared to other parts of the world, the popularity of air-conditioning in Egypt is very low. According to Fathy, the *mashrabiyya* is the best natural solution for thermal regulation in hot and arid regions because its design hinders the flow of heat into a home while enhancing the cooling effects of wind and humidity through the process of evapo-transpiration.[119]

1-5 Conlusions

1) In an attempt to modernize Cairo, Muhammad Ali banned *mashrabiyya* from being installed in newly built houses. Therefore, European-style glass windows were used in the city beginning in the 1840s, even though they did not match the climatic, veiling, or gender segregation needs of Cairenes.

2) Open balconies and Venetian wood shutters are Italian-influenced objects that emerged in Cairo in the 1870s—prior to the emergence of apartment building typologies.

---

115 See El-Zanaty and Way (2001), *EDHS 2000*, pp. 22-23.
116 El-Zanaty and Way (2004), *EIDHS 2003*, pp. 9-10.
117 El-Zanaty and Way (2006), op cit., p. 25.
118 A. El-Safty and A.J. Al-Daini (2002), "Economical Comparison between a Solar-powered Vapour Absorption Air-conditioning System and a Vapour Compression System in the Middle East," *Renewable Energy*, vol. 25, n. 4, as cited in N. Rona (2004), *Solar Air-Conditioning Systems*, Göteborg: Chalmers University of Technology, p. 1.
119 Fathy, op. cit., pp. 47-49. For the *mashrabiyya*'s environmental functions, see **2-5 Environmental Function**.

3) Shutters of that period were similar to the ones used today, but more adaptive to Cairo's climate. They had upper sections that could be opened separately to ensure lighting and ventilation without opening the lower section. Another design had a lower section that could be opened upward to provide protection from the sun while ensuring sufficient lighting and ventilation.

4) At the beginning of the twentieth century, Egyptian elites began residing in western-style villas. Because they were still concerned with veiling, they rejected open balconies and installed either a *mashrabiyya* or Venetian shutters over their balustrades.

5) Apartment buildings spread throughout Cairo during the first half of the twentieth century. Many residential facades contained framed Venetian shutters that could be opened upward to block the sun while ensuring sufficient lighting and ventilation.

6) From the 1920s until the early 1950s, Egyptian women fought against veiling and polygamy, entered public social life, and attempted to achieve higher levels of education. The same period witnessed the movement of residents from the old city to apartments in western Cairo as a symbol of upward mobility.

7) Upper Cairene society adopted a westernized lifestyle prior to the 1952 revolution, then Nasser encouraged all classes to modernize during his 1956-1970 regime. With his support, women entered the workforce in large numbers and veils gradually disappeared from view. During the 1950s and 1960s, unveiled westernized Egyptian women dominated Cairo.

8) During the Nasser era, public housing emerged and modern architecture was applied to all housing projects. The typology of a balcony embedded in a façade was adopted during this period, which facilitated the phenomenon of enclosed balconies that emerged later. The common *sheesh* design during this period consisted of two panels that opened sideways. The upper part that allowed for lighting and ventilation without opening the lower part was eliminated. The ability to open a *sheesh* upward to block the sun was also eliminated.

9) The origin of a "new veiled woman" in Cairo can be traced to the Sadat era (1970-1981). Beginning in the mid-70s, lower-middle class working women gradually started wearing veils. However, unlike the Ottoman period, they continued to attend universities, take part in outside life, and attend social events. By the late 1970s, women were found in large numbers in all areas of employment in both the public and private sectors.

10) During the Mubarak era (1981-present), wearing a veil developed into a movement that spread from lower middle class working women to all other social classes in the 1990s.

11) The shift to Islamic values and wearing veils during the 1980s and 1990s was not accompanied by significant changes in the treatment of apartment thresholds. However, there was a noticeable shift toward post-modern (often Islamic and Pharaonic) styles on the part of architects and designers and the emergence of individual households modifying their balconies and windows.

12) The devices applied to apartment thresholds in Cairo, whether offered to or added by households, have conflicting functions. The *sheesh* blocks direct sunlight and ensures privacy, but restricts air, lighting, and views. Glass panels fail to maintain privacy, cause excessive heat build-up, and produce glare. Tinted or surface-coated glass maintains privacy and reduces heat transmission and glare but ignores ventilation needs and restricts light. Balconies, while considered indispensable by most urban households, fail to shield women from public view or block the intense sun of Cairo. Curtains, while ensuring privacy and shade, block daylight, air, and views. Shades, when lowered to a level that blocks sunrays and the views of neighbors across the way, have a considerable dimming effect, block most views, and reduces ventilation. Various ways of closing balconies also create conflicts among privacy, blocking the sun, lighting, ventilation, and views.

13) Because households want to reduce their electricity bills, air conditioning is not very popular in Egypt.

CHAPTER 2

MASHRABIYYA FOR VEILING AND CLIMATE CONTROL

In this chapter I will explain the traditional roles that the *mashrabiyya* played in Cairene homes. After discussing the derivation and meaning of the term *mashrabiyya* I will examine the historical reasons for its appearance and use in Cairo, describe its typical form and design, and examine how this form was adapted to traditional social needs and the climate of Cairo.

2-1 Derivation and Meaning

The word *mashrabiyya* is derived from the Arabic verb *shariba*, "to drink," and originally described a place for drinking.[1] Lane defined a *mashrabiyya* as a piece of latticework from which small sections projected; these sections were used to put and cool earthen water drinking bottles by exposing them to airflow (through evaporation).[2] *Mashrabiyyas* were later applied to whole windows, and the term took on the additional meaning of the wood-turning technique that produced the latticed panels.[3] Today the word refers to either the window itself or the craft of producing wooden lattices from small pieces of turned wood that are initially shaped with a lathe then assembled in intricate and often decorative patterns.[4]

2-2 Historic Background

It is commonly believed that the *mashrabiyya* gained popularity during the Mamluk period of Egyptian history (1250-1517), but there is considerable evidence showing that as a large latticed window or balcony, the *mashrabiyya* came into widespread use in Cairo following the Ottoman conquest and ensuing occupation

1 H. Fathy (1986), *Vernacular Architecture: Principles and Examples with Reference to Hot Arid Climates*, Chicago: The University of Chicago Press, p. 47.
2 E.W. Lane (1954), *Manners and Customs of the Modern Egyptians*, London: Dent, p. 8.
3 D. Behrens-Abouseif (1991), "Mashrabiyya," in C.E. Bosworth, et al. (Eds.), *The Encyclopaedia of Islam New Edition* (Vol. 6), Leiden: E.J. Brill, p. 717.
4 Fathy, op. cit., p. 47.

(1517-1805).[5] According to Mamluk wakf deeds[6] that include detailed descriptions of buildings, homes during the Mamluk period featured the same fenestration used in mosque architecture. Lower windows were rectangular with iron or bronze grills and upper windows were arched with glass-filled stucco grills. Windows facing a lane in more common houses or less visible windows toward the back of homes of the wealthy were made of unturned pieces of wood. The deeds refer to turned wood (an old Egyptian craft), but instead of being associated with windows,[7] the wood was used for balustrades, wooden lanterns, or mosque screens. Regular references to *mashrabiyya* windows are dated following the Ottoman conquest.[8] Toward the end of the occupation, the *mashrabiyya* was common to all urban homes, and Cairene facades were characterized by their large numbers of projecting *mashrabiyya* windows (**Figs.40, 41**).[9]

There are at least two possible explanations for why the *mashrabiyya* emerged and spread during the Ottoman occupation: the Ottomans' urban policy and their interpretations of Qur'anic verses on veiling. During the Mamluk period, sultans expressed their status via urban expansion and attention-getting architectural manifestations. As a result, the capital city of Cairo developed in all directions beyond Fustat boundaries (first Islamic capital of Egypt). Doris Behrens-Abouseif, a specialist in Mamluk and Ottoman art and architecture of Egypt and Syria and in social history, suggests that common homes of that period had no courtyards because land was

---

5 Behrens-Abouseif (1991), op. cit., p. 719; D. Behrens-Abouseif (1990), "Note sur la Fonction de la Cour dans la Maison Moyenne du Caire Ottoman," in *l'Habitat Traditionnel dans les Pays Musulmans autour de la Mediterranee* (Vol. 2), Cairo: Institut Francais d' Archeologie Orientale, p. 411, hereafter *HT*; J. Revault (1988), "l'Architecture Domestique au Caire a l'Epoque Ottomane," in *HT* (vol.1), op. cit., , pp. 52-58.

6 A Mamluk wakf deed is and endowment deed or entailed bequest.

7 Behrens-Abouseif (1991), op cit., p. 718.

8 Ibid., p. 719; Revault, op cit., pp. 44, 46.

9 Behrens-Abouseif (1991), op. cit., p. 718.

Fig.40. A multitude of *mashrabiyyas* in a street in Cairo, 19th C. (Photo by Sebah, J.P., archive of the Griffith Institute, Oxford)

Fig.41. *Azbakiyya* Quarter in Cairo seen from the Nile, early 19th C. (*Description de l'Egypte: Planches, Etat Moderne I* 1822, plates 41-42)

plentiful; accordingly, building facades were linear with openings that overlooked the street.[10]

During the Ottoman occupation, Cairo lost its status as a national capital and instead became a provincial capital. The Ottoman rulers promoted a policy aimed at containing the expansion of Cairo that resulted in rooms being added to existing Mamluk-period buildings (**Fig.42a**).[11] As a result, Cairo became a very dense city and courtyards and larger openings were indispensable for access, ventilation, and light (**Figs.5, 6, 42a,b**). However, larger openings conflicted with the Ottomans' more conservative interpretation of Islamic veiling requirements, which demanded more privacy and separate female quarters (*harem*). They therefore devised the *mashrabiyya* for ventilation, light, and strictly protecting women's privacy in a dense urban environment.

While environmental and social needs gave birth to the *mashrabiyya*, three factors are thought to have influenced its design: the traditional balconies of Istanbul (the Ottoman capital), access to wood, and the already developed Egyptian craft of turned wood. According to Jacques Revault, a leading French scholar who documented a great part of North Africa's traditional domestic architecture, the projecting wooden balconies of traditional homes in Istanbul[12] influenced the style and construction of

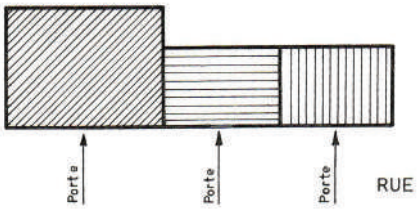
---

10 Behrens-Abouseif (1990), op. cit., pp. 411-419.

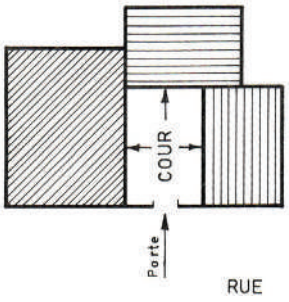
11 See the studies of D. Behrens-Abouseif (1989), *Islamic Architecture in Cairo: An Introduction*, Leiden, New York: E.J. Brill, p. 40; idem (1990), op. cit., pp. 411-419; P. Speiser (1991), "La Restauration du Palais Bashtak," in *HT* (vol. 3), op cit., pp. 810-817; A. Sedky (2001), "The Factors Influencing the Change in Cairene Domestic Architecture after the Ottoman Conquest," *EJOS-Electronic Journal Of Oriental Studies*, vol. 4, n. 38, pp. 3-8, 23.

12 Called *khafas* or cage, as explained by N. Safwat (2000), "Al Hadatha wal-Takalid wal-Indimaj: Fikrat al-Khususiyya fil-'Imara al-'othmaniyya," in T. Nazih (Ed.), *al-Mashrabiyyat wal-Zujaj al-Mu'asha'fi al-'alam al-Islami, Proceedings of the International Seminar: Crafts in Traditional Islamic Architecture with Special Focus on Mashrabiyya and Stucco Colored Glass, 3-9 December, Cairo, 1995*, Istanbul: IRCICA, p. 95.

(a)



The Street in the Mamluk Period



The Street in the Ottoman Period

(b)

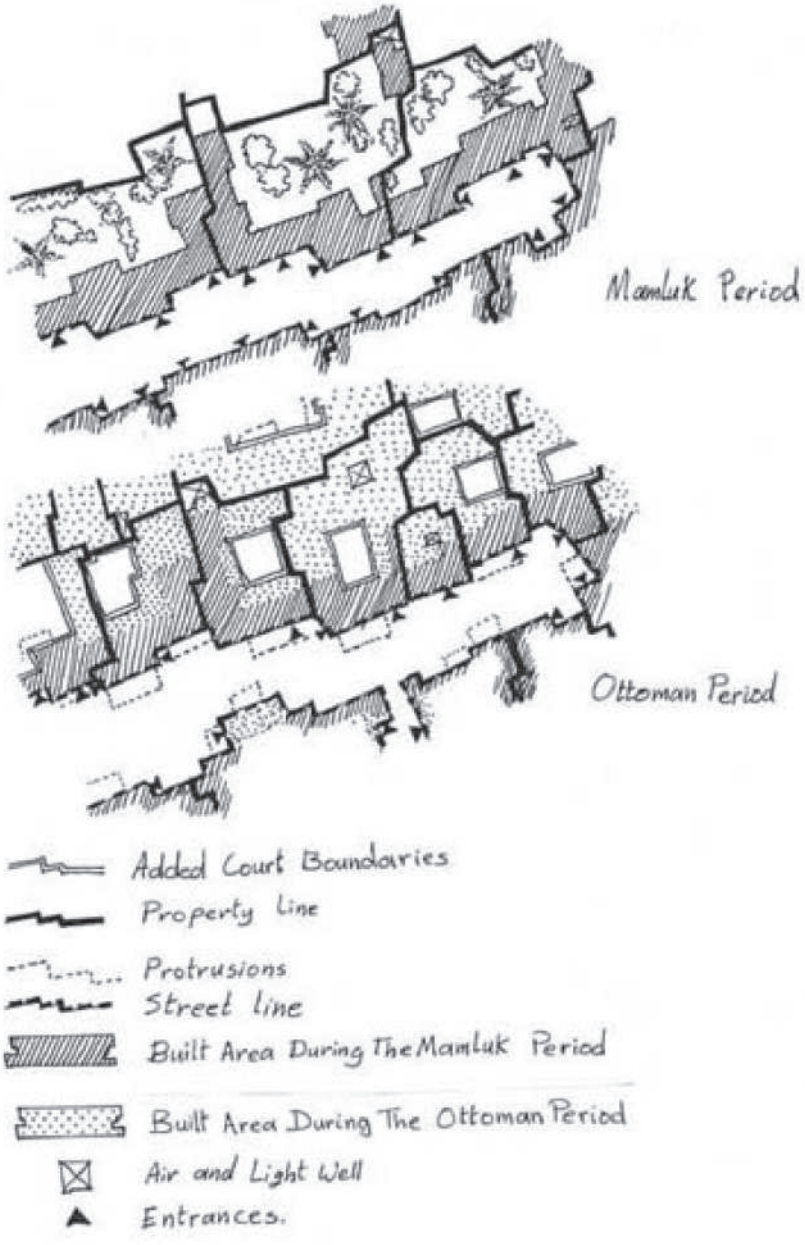


Fig.42. Urban changes during the Ottoman period.

(a) Diagram showing the development of the Cairene court during the Ottoman period, after Behrens-Abouseif (1990).

(b) Reconstruction of the probable development of a typical Cairene fabric as suggested by Sedky (1999).

Cairene *mashrabiyya* as something that extended outward from a facade.[13] Greater accessibility to wood (imported from other parts of the empire) encouraged its use as a building material.[14] Prior to the Ottoman period, the use of scarce Egyptian wood was limited to decorating Mamluk religious monuments and palaces. Beech, oak, walnut, and logwood were imported from Lebanon and Syria, and teak, sandal, and ebony from India.[15] These woods soon became widely used for *mashrabiyyas*, placards, ceilings, furniture, ornamentation, and other aspects of domestic architecture.[16] Finally, the local craft of assembling pieces of wood turned with a lathe that had its roots in Pharaonic, Coptic,[17] and Islamic periods could be used to make *mashrabiyya* latticework.[18]

The disappearance of *mashrabiyyas* from Cairene facades began with the arrival of Muhammad Ali (who reigned from 1805 to 1848).[19] In accordance with his efforts at modernization and westernization, he banned *mashrabiyyas* from newly constructed buildings.[20] By the second half of the nineteenth century they had been replaced by open balconies and openings with a combination of glass panels and *sheesh* (Venetian shutters).[21] Solely these devices continued to be offered to urban households in Egypt so far. The *mashrabiyya*, on the other hand, is now used for purely decorative purposes—for instance, adding traditional touches to furniture or the façades and interiors of upper-class houses (villas), commercial centers, government buildings, and hotels.

---

13 Revault, op. cit., p.44.
14 Ibid.
15 S. Lamei et al. (1996), *Light Screens: The Arabian Turned Wood Work (Mashrabiya) and Stucco Coloured Glass Windows in Egypt*, Cairo: Arab Egyptian Center, p. 19.
16 Revault, op cit., p. 44.
17 A.R. Yousef (2000), "Al-Mashrabiyya wa Zakharifoha fi Misr," in Nazih (Ed.), op. cit., p. 165.
18 J. Spencer (1992), "Mashrabeya: an Architectural Language," *Journal of Arts and the Islamic World*, vol. 21, pp. 49-50.
19 As mentioned in chapter 1, during Muhammad Ali' reign Egypt became independent of direct Ottoman control; see chapter 1, note 18.
20 J. Abu-Lughod (1971), *Cairo: 1001 Years of the City Victorious*, Princeton: Princeton University Press, p. 94.
21 See **1-1-3 The Emergence of the Open Balcony and the *Sheesh***.

2-3 The Traditional *Mashrabiyya* Form

A typical *mashrabiyya* (**Figs.43, 44**) is made of unvarnished pieces of wood fixed together without glue or nails[22] and installed either flush with or extending out from a building façade.[23] Its parts include:

1) the main *mashrabiyya* opening, consisting of a lower section below eye level with fine turned pieces woven in a tight lattice pattern and an upper section above eye level with a more open lattice pattern. The lower section ensured privacy and blocked Cairo's intense sunlight, and the upper section allowed for light and airflow.[24]
2) an overhang immediately above the *mashrabiyya* to block sunrays from entering through the more open lattice pattern of the upper section.[25]
3) a flat window above the overhang (called a *qamariyyah*) consisting of an open latticework pattern, wood grating, or stucco filled with colored glass.[26] This window was often added above a *mashrabiyya* that did not provide sufficient airflow.[27]

A *mashrabiyya* could also be equipped with one or all the following: a) small pieces that extended out from the main lattice to cool the earthen drinking bottles;[28] b) hinges or grooved slots that allowed for the opening and closing of the main fixed

22 Behrens-Abouseif (1991), op. cit., p. 718.
23 F. Abdel 'Alim (2000), "Al-Tatawwor al-Tarikhi wal-Athari lel-Mashrabiyya," in Nazih (Ed.), op. cit., p. 226.
24 Fathy, op. cit., pp. 47-48; Revault, op. cit., p. 56.
25 Fathy, op. cit., pp. 47-48.
26 Lane, op. cit., p. 8.
27 Fathy, op. cit., p. 48.
28 Ibid.; Lane, op. cit., p. 8.

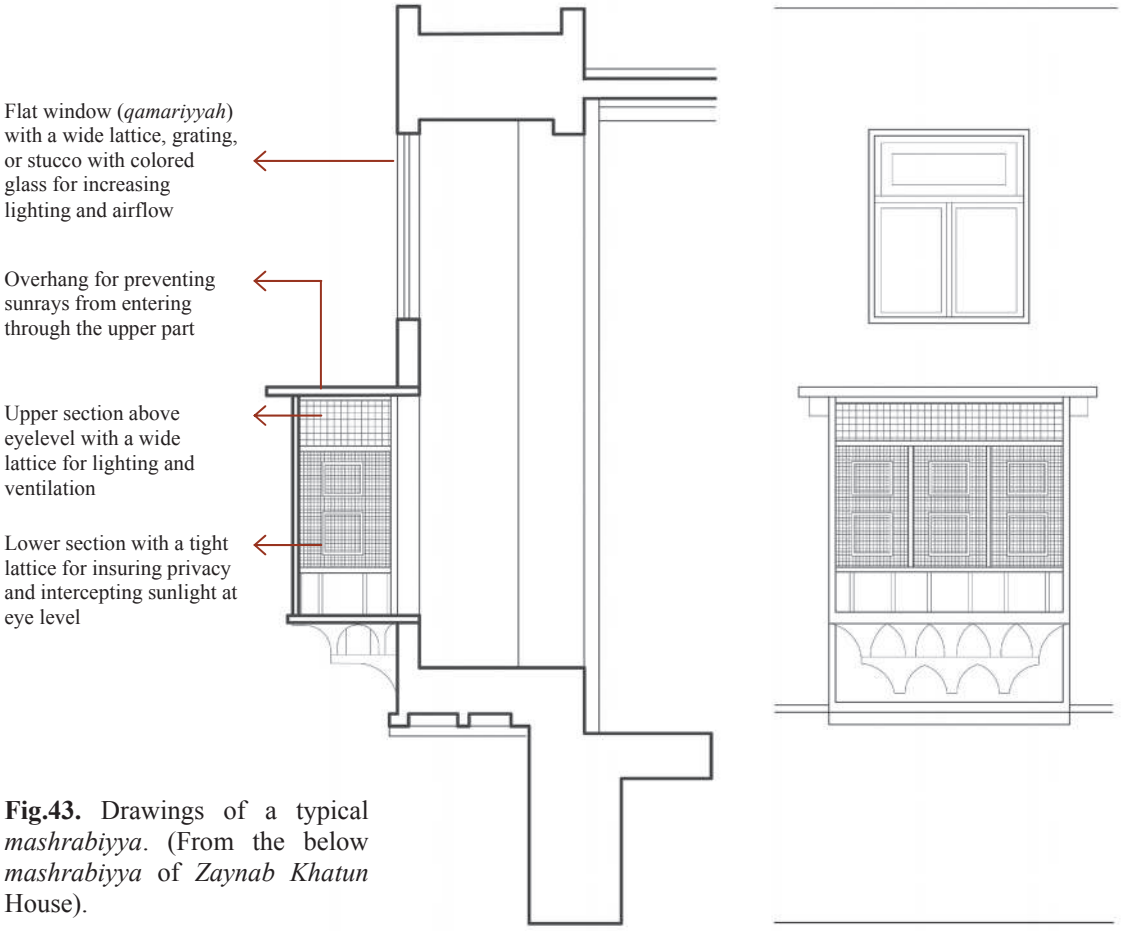


Fig.43. Drawings of a typical *mashrabiyya*. (From the below *mashrabiyya* of *Zaynab Khatun* House).

Fig.44. A typical *mashrabiyya* in the Northern *qa'a* of *Zaynab Khatun* House, seen from inside and from the court. (The author)

panels to increase lighting and ventilation;[29] c) internal glass for protection from cool temperatures or dust;[30] d) external wood shutters for more protection.

While preserving its basic functions, a *mashrabiyya* could be altered in response to the façade's orientation, the function of the inner space, the social class of the household, or other needs. *Mashrabiyya* in poorer neighborhoods or that covered less important spaces in private houses usually lacked the upper window, and upward-opening shutters usually replaced the fine latticework of the lower part. As I will explain in a later section, the orientation of the façade directly influenced the size of a *mashrabiyya*'s opening, sections, interstices, and overhang.

2-4 *Mashrabiyya* and the Traditional Veil

2-4-1 The Traditional Veil

The Islamic veil and the *mashrabiyya* serve identical purposes: alternately protecting from and providing access to the outside.[31] As defined in the *Encyclopedia of Islam*, the Arabic term *hijab* (which corresponds to the Western term "veil") is derived from the verb *hajaba* ("to conceal"). Its specific definition is "any veil placed in front of a person or an object to conceal it from view or to isolate it."[32] In Islam, the veiling norm is based on two principles: *'awra* (pudenda) and *fitna* (chaos).[33] A woman's body is an *'awra* that must be covered to avoid embarrassment and shame. Her appearance causes *fitna*, and therefore she must be veiled as protection for herself,

29 Lamei et al. , op cit., p. 18.
30 Lane, op. cit., p. 8.
31 F. El Guindi (1999), *Veil: Modesty, Privacy, and Resistance*, Oxford: Berg, p. 99.
32 J. Chelhod (1990), "Hidjab," in C.E. Bosworth, et al. (Eds.), *The Encyclopaedia of Islam New Edition* (Vol. 3), Leiden: E.J. Brill vol. 3, p. 359.
33 V.J. Hoffman-Ladd (1987), "Polemics in Modesty and Segregation in Contemporary Cairo," *International Journal of Middle East Studies*, vol. 19, n. 1, p. 28.

men, and societal morality.[34] Perhaps the most oft-cited Qur'an verse on female veiling states:

> And tell the believing women to lower their gaze and be modest, and to display of their adornment only that which is apparent, and to draw their veils over their bosoms, and not to reveal their adornment save to their own husbands or fathers or husbands' fathers, or their sons or their husbands' sons, or their brothers or their brothers' sons or sisters' sons, or their women, or their slaves, or male attendants who lack vigour, or children who know naught of women's nakedness. And let them not stamp their feet so as to reveal what they hide of their adornment. And turn unto Allah together, O believers, in order that ye may succeed.[35]

The phrases "to draw their veils over their bosoms" and "only which is apparent" have been interpreted as injunctions to veil women's hair, necks, ears and bodies, but not faces or hands.[36] Accordingly, a woman should wear a veil in front of male non-relatives either at home or in public. However, the Qur'an allows her to unveil in front of and to have free conversation with close male relatives and males disqualified as sexual objects by age or legal status.[37] It neither states that she must be secluded at home nor forbids her from working outside the house as long as the work does not interfere with her home duties or lowers her dignity.[38]

---

34 P. Mule and D. Barthel (1992), "The Return to the Veil: Individual Autonomy vs. Social Esteem," *Sociological Forum*, vol. 7, n. 2, p. 328; Hoffman-Ladd, op. cit., pp. 31, 43.

35 M. Pickthall (1930), *The Meaning of the Glorious Koran*, New York: A. A. Knopf, retrieved June 29, 2006, from University of Southern California homepage, www.usc.edu/dept/MSA/quran, *surah* 24, verse 31.

36 The "veil of the Prophet's household," which included the covering of their whole body, protected them when they went out from being annoyed or even known, especially at the beginning of the diffusion of Islam; Chelhod, op. cit., p. 359; L. Reese (1998), "The Burqa, Chador, Veil and Hijab!," in *Women in the Muslim World*, Berkeley: Women in World History Curriculum, retrieved January 11, 2005, from www.womeninworldhistory.com/sample-13.html; Hoffman-Ladd, op. cit., pp. 26-27.

37 See the previous Qur'an verse; R.T. Antoun (1968), "On the Modesty of Women in Arab Muslim Villages," *American Anthropologist, New Series*, vol. 70, n. 4, pp. 672-673.

38 M. Abdul-Rauf (1977), *The Islamic view of women and the family*, New York: Robert Speller and Sons, as cited by S. López-Rocha (2001), "Women in Islamic Egypt: Perceptions and Observed Behavior among a Group of Egyptians," *LLC Review*, vol. 1, Fall, p. 26.

In Cairo, the "traditional veil" that many people view as a symbol of oppression and seclusion appeared following the Ottoman conquest.[39] There is no archival evidence of women being secluded at home or completely covered in public during the preceding Mamluk period; on the contrary, it appears that they were prominent and visible in many domains of public life.[40] However, based on their more conservative interpretation of Qur'anic verses on veiling, the Ottomans required not only the basic veil described above, but also covering the entire body (including face and hands), gender segregation, and home seclusion. At the beginning of this period, veiling was restricted to upper class women. Using descriptions of the Prophet Mohamed's wives as models, women had to cover their entire bodies in public as an expression of a woman's (and her family's) status and respectability (**Fig.45**).[41] They had to be segregated from men to preserve their sexual purity, which also contributed to family honor and prestige.[42] Due to the perceived need to develop and maintain large households (another status marker), women were secluded at home.

According to Judith Tucker, author of many publications on the history of women and gender in the Arab world, elegant harems in Cairo represented reproduction and the urban poor represented production. Among upper class families, the practices of polygamy and concubinage underscored the roles of women as bearers and caretakers in order to develop large households.[43] In contrast, the urban poor could not afford to view women as symbols of reproduction that must be secluded because they had to work.[44]

---

39 Accurate information on the veil in Cairo appears after the Mamluk arrival (1250).
40 El Guindi, op. cit., p. 103.
41 Ibid.
42 M. Badran (1988), "The Feminist Vision in the Writings of Three Turn-of-the-Century Egyptian Women," *Bulletin (British Society of Middle Eastern Studies)*, vol. 15, n. 1/2, pp. 11-12.
43 J.E. Tucker (1983), "Problems in the Historiography of Women in the Middle East: the Case of Nineteenth-Century Egypt," *International Journal of Middle East Studies*, vol. 15, n. 3, p. 330.
44 Tucker, op. cit., pp. 330-331; Badran, op. cit., pp. 11-12.

However, since veiling was viewed as a marker of power and wealth, middle class women began copying the practice. Even working class women who could not afford to buy veiling outfits copied them using cheap materials[45] (**Fig.45**). Toward the end of the Ottoman period, women in all urban classes adopted the traditional veil. As veils became common to all social classes, so did the *mashrabiyya*.

2-4-2 The *Mashrabiyya* as an Architectural Veil

In Ottoman Cairo, households living in palaces, mansions, owned or rented middle class houses and collective units followed the practices of veiling, gender segregation, and home seclusion to varying degrees. Cairenes utilized the *mashrabiyya* according to the following rules and constraints (**Figs.46, 47**):

1) The *salamlik*[46] (male reception room) of a house, courtyard, and surrounding streets were considered public spaces.
2) To preserve the norms of veiling, gender segregation, and home seclusion, women were assigned a separate *haramlik*[47] (from the word *harem*).
3) Women were allowed to gaze outward at public spaces.
4) As long as there were no guests in the *salamlik*, women were free to move and use the entire house.

Barriers between *haramlik* and public spaces were controlled by a combination of their arrangement and *mashrabiyya* placement. Installed between the *haramlik* and *salamlik*, courtyards, and streets, *mashrabiyya* ensured one-way outward views for women.

---

45 Lane, op. cit., pp. 48-49.
46 A Turkish word that refers to spaces for receiving male guests, commonly used since the Ottoman period.
47 A Turkish word that refers to female quarters, from harem; see Archnet (1998), "Haremlik," in *Dictionary of Islamic Architecture*, Cambridge: Massachusetts Institute of Technology, Harvard University, and the Aga Khan Trust for Culture

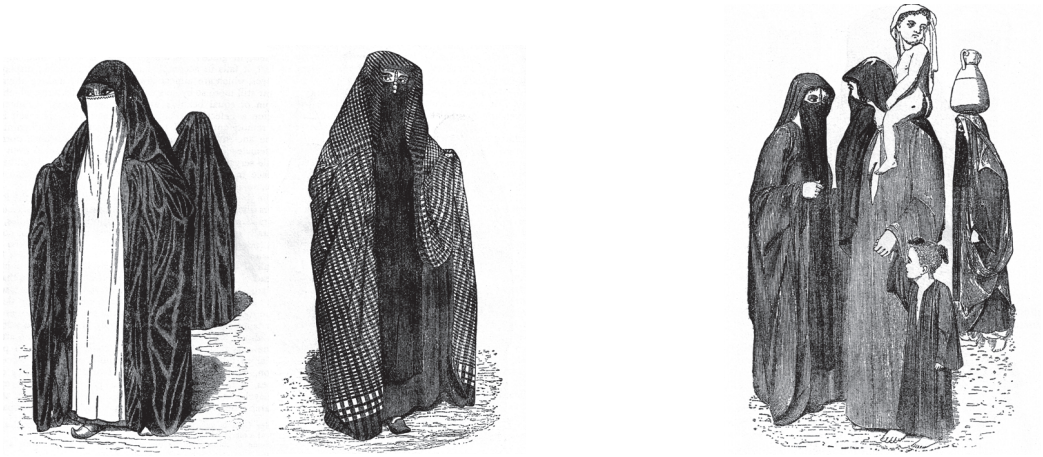


Fig.45. Women' veiling during the Ottoman period, throughout the 19th C., and up to the early 20th C. Left, upper and middle class; right, lower class. (Lane 1954, pp.47-50)

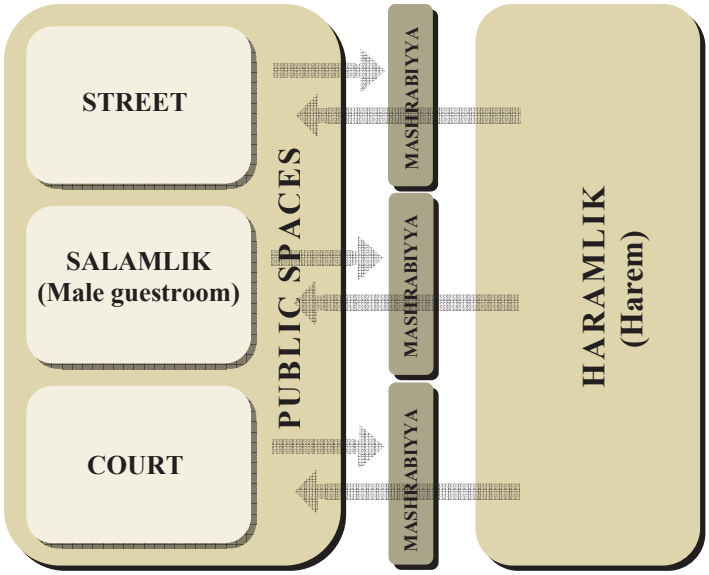


Fig.46. Diagram showing how the *mashrabiyya* controlled the vision between the *haramlik* or female spaces and public spaces (street, *salamlik* or male spaces, and court).

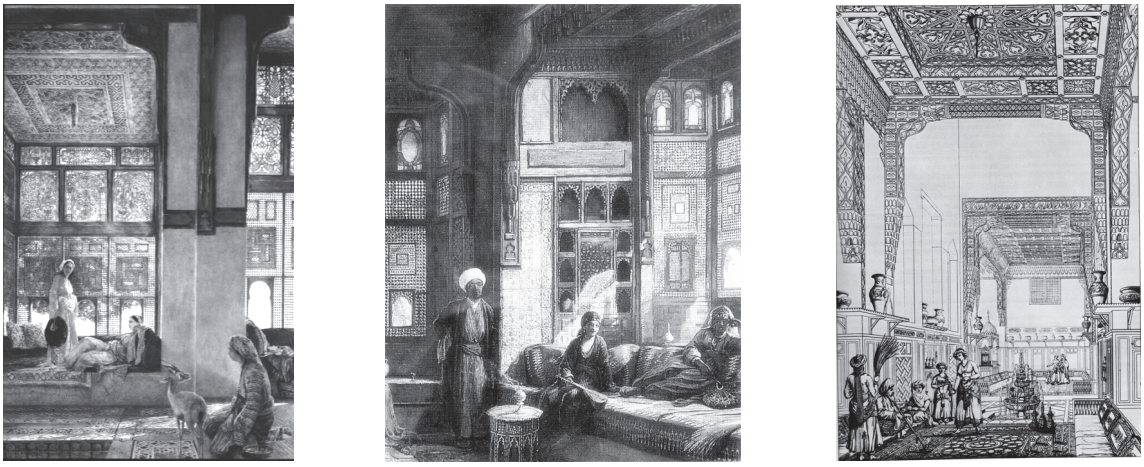


Fig.47. Women in the *haramlik* and the *salamlik*. Left and middle, women behind a harem's *mashrabiyya*. (Lewis, 1873) Right, the grand summer *qa'a* of *Hushqadam* house; when not receiving guests, the *qa'a* was usually used by the master and his household. (Coste, 1837, in Maury et al. 1983, p.103)

While the idea of a private house was consistent, differences in scale were determined by household status. Entrances generally opened onto secondary streets or cul-de-sacs, with indirect corridors giving access to interior courtyards that were concealed from outside view. Unlike courtyards in other Arabic-Islamic countries, Cairene courtyards were not considered social spaces for housework or other purposes, but a means of ventilation, lighting, and communication between various quarters of the home.[48] They therefore contained most of the entrances, including a special entrance to the *haramlik*. Arranged on two or three stories, house quarters consisted of two zones. The *salamlik* (used for receiving male guests and accessible directly from the courtyard) consisted of one or several *qa'a* (reception halls), a *maq'ad* (loggia overlooking the courtyard), and a *takhtabush* (courtyard arcade). Situated on the upper floors, *haramlik* consisted of one or more wings, each with its own living and sleeping rooms.[49] To hide the *haramlik* from view while allowing women to watch the events occurring outside, *mashrabiyyas* were installed between the *haramlik* and *salamlik*, *haramlik* and courtyard, and *haramlik* and street. The *bayt Shabshiri* ("Shabshiri house") shown in **Figures 48**, **49**, and **50** is an example of a traditional house that illustrates these relationships.[50]

Located next to the entrance, the *salamlik* of *bayt Shabshiri* begins with a *takhtabush*, then a *maq'ad* and two anterooms. The *haramlik* area consists of two *qa'a* on the second and third floors and two large rooms placed above each other along the west side of the first and second floors (**Fig.50**). A special staircase provides access

48 Revault, op. cit., p. 46. For understanding the courtyard in Cairo, see **2-2 Historic Background**.

49 Besides the *salamlik* and *haramlik*, the house includes also the *manafi'*, or services, consisting of latrines, kitchen (if present), storage, and the servants' rooms. See Maury et al., op. cit, pp. 106-107, 142-282; Revault, op. cit., pp. 43-59.

50 *Bayt Shabshiri* is a Cairene house built in the seventeenth century at Bab Zuwayla quarter, a dense commercial area, near Al Mu'izz Street. On *Bayt Shabshiri*, see Revault, op. cit., pp. 43-59; Maury et al., op. cit., pp.155-158.

Fig.48. Plans of *Bayt Shabshiri*. (Maury et al. 1983, pp.155-158)

1.Entrance 2.Anteroom with bench 3.Indirect corridor 4.Court 5.*Takhtabush* 6.Anteroom 7-8.Storerooms 9.Stairs to the *maq'ad* 10.Storeroom (or domestic room) 11.Porche 12.Kitchen 13.Latrines 14.*Haramlik* (harem) staircase 15.Storeroom 16.Room 17.Lobby 18.Latrines 19.Anteroom 20-21.Rooms 22.Anteroom of the *maq'ad* 23.*Maq'ad* 24. Stairs to the *maq'ad* 25.Corridor 26.Latrines 27.Anteroom 28.Room 29.Corridor 30-31 Anteroom and room 32.Chimeny 33.Latrines 34.Corridor (and its void in the 3rd floor plan) 35.Small room 36.Anteroom 37.Water jars reserve 38.Grand *qa'a* (and its void in the 3rd floor plan) 39.Anteroom 40.Staircase for the 3rd floor's *qa'a* 41.Small room 42.Room (and its void in the 3rd floor plan) 43.Anteroom 44.Stairs 45.Lobby 46.Room for watching the 2nd floor's *qa'a* 47. Lobby 48. Upper *qa'a* of the *haramlik*. 49. Room for watching the 2nd floor's *qa'a*.

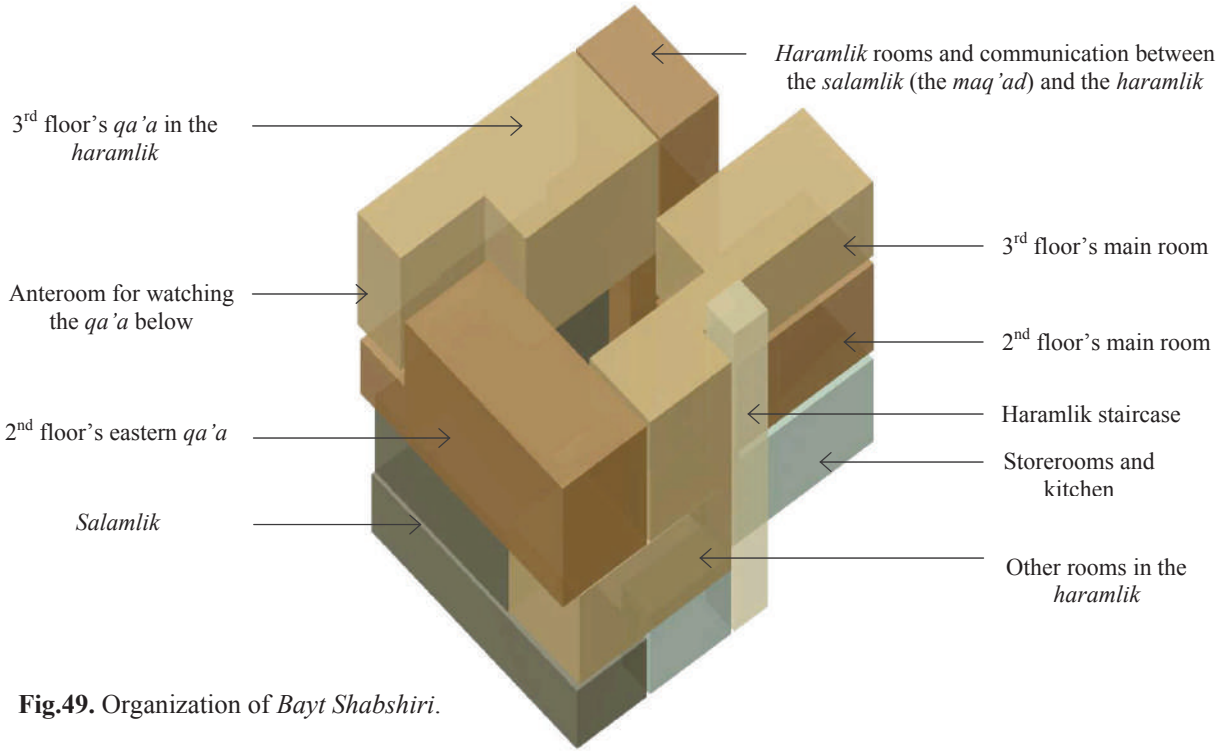


Fig.49. Organization of *Bayt Shabshiri*.

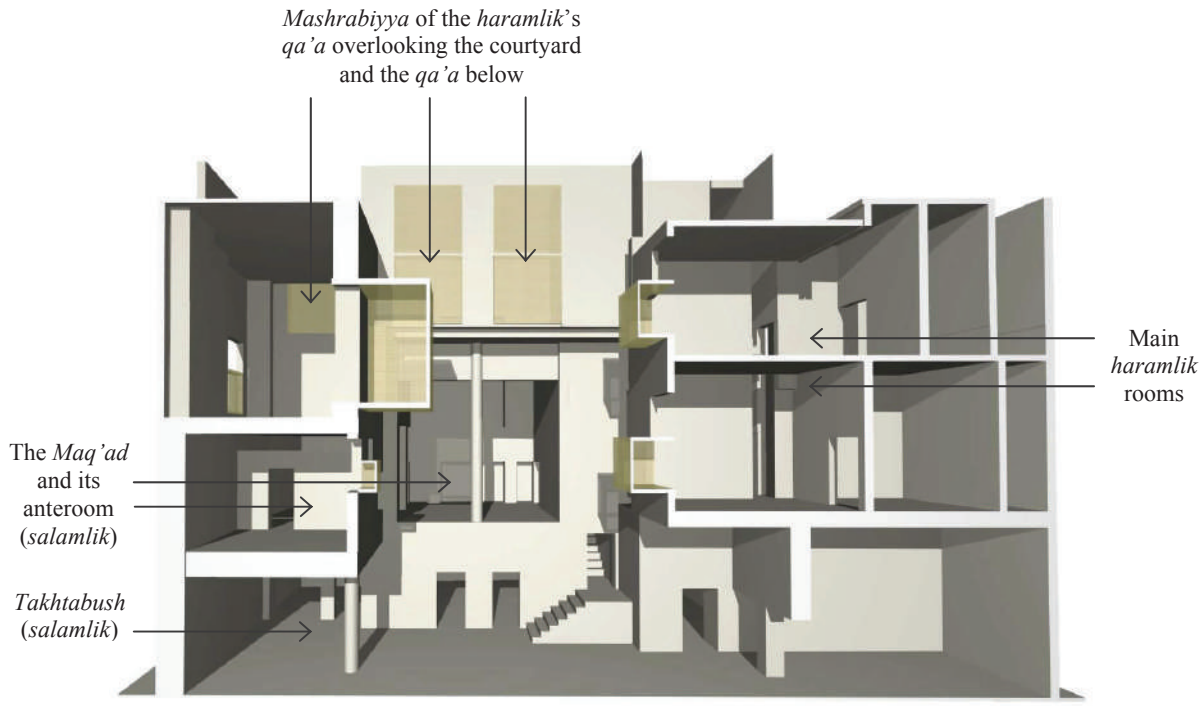


Fig.50. Perspective section (simplified) in *Bayt Shabshiri*.

from the first floor. Since the *salamlik* of this house has no *qa'a*, the second floor *qa'a* served as a *haramlik* on most days but a *salamlik* for important events and ceremonies; women watched these through a *haramlik-salamlik mashrabiyya* placed on the third floor *qa'a* (**Fig.51**). Women were also able to watch and listen to events taking place in the courtyard from all sections of their *haramlik* due to the placement of six *haramlik*-courtyard *mashrabiyya* windows and balconies installed in the two *qa'as* as well as the large rooms on the first and second floors (**Figs.52**, **53**, **54**). Women could also watch what was happening on the street from their eastern rooms and *qa'a* while hidden from passersby and neighbors across the way. During the Ottoman period, women spent countless hours watching and listening to street life.

The *manzil* ("house") *Amna bint Salim* (built in 1540) and *manzil al-Kiridliya* (1631) shown in **Figure 55** are also worth noting due to the special attention given to their *haramlik* and visual experience from the *haramlik* outward. The two houses were built next to the *Ibn Tulun* mosque in the southernmost part of Islamic Cairo. The passageway containing their entrances is all that remains from the narrow street that once ran through the formerly dense residential quarter.[51] On the ground floor of each house, the *salamlik* begins with a room near an entrance, followed by a *maq'ad* accessible via a staircase and directly linked to a *qa'a*. Similar to *bayt Shabshiri*, the *qa'a* of *al-Kiridliya* served a dual purpose as an everyday *haramlik* and a *salamlik* during special events. When those events occurred, the women of the household moved either to upper rooms (since removed) or to a *qa'a* on the east side of the house. With its three-sided opening, this *qa'a* gave them a panoramic view of the *maq'ad*, the courtyard, and the surrounding streets (**Figs.56, 57**). The *haramlik* of *manzil Amna bint Salim* is

[51] Servants and less important guests entered *manzil al-Kiridliya* from a modest entrance on Ibn Tulun Street; on *Manzil Amna bint Salim* and *al-Kiridliya* see Maury et al., op. cit., pp. 170-180.

Fig.51. Second floor's *qa'a* overlooked by the upper *qa'a*'s *mashrabiyya*, *Bayt Shabshiri* (Islamic Art Network)

Fig.52. Two *mashrabiyyas* in the third floor's *qa'a* overlooking the *Bayt Shabshiri* courtyard. (Islamic Art Network)

Fig.53. Two *Mashrabiyyas* in the second floor's *qa'a* overlooking the *Bayt Shabshiri* courtyard. (Islamic Art Network)

Fig.54. *Mashrabiyyas* of the *haramlik*'s main rooms in second and third floor overlooking the *Bayt Shabshiri* courtyard. (Islamic Art Network)

Fig.55. *Manzil Amna bint Salim* (in the back), and *manzil al-Kiridliya* (on Ibn Tulun street). (The author)

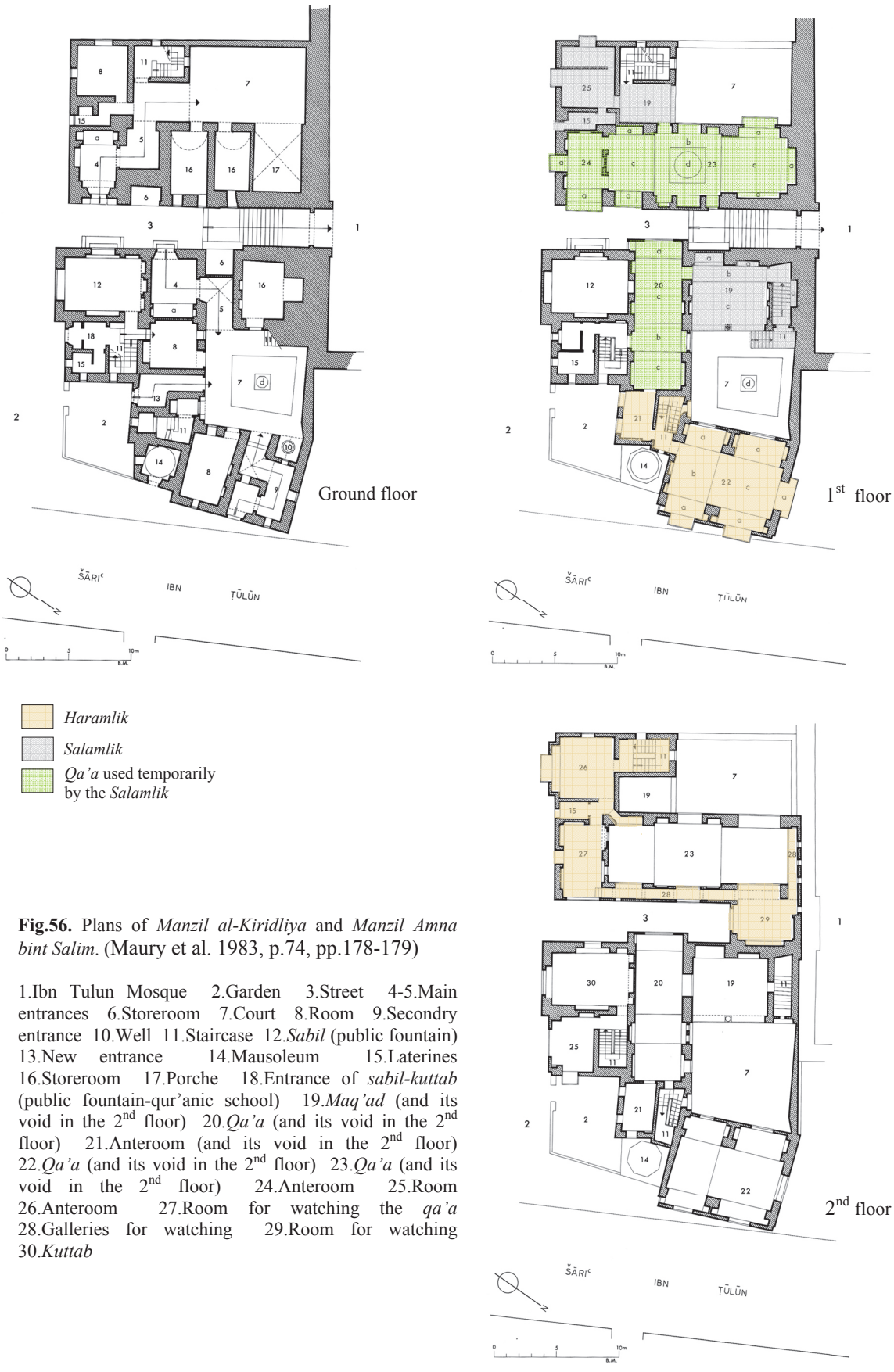


Fig.56. Plans of *Manzil al-Kiridliya* and *Manzil Amna bint Salim*. (Maury et al. 1983, p.74, pp.178-179)

1.Ibn Tulun Mosque 2.Garden 3.Street 4-5.Main entrances 6.Storeroom 7.Court 8.Room 9.Secondry entrance 10.Well 11.Staircase 12.*Sabil* (public fountain) 13.New entrance 14.Mausoleum 15.Laterines 16.Storeroom 17.Porche 18.Entrance of *sabil-kuttab* (public fountain-qur'anic school) 19.*Maq'ad* (and its void in the 2nd floor) 20.*Qa'a* (and its void in the 2nd floor) 21.Anteroom (and its void in the 2nd floor) 22.*Qa'a* (and its void in the 2nd floor) 23.*Qa'a* (and its void in the 2nd floor) 24.Anteroom 25.Room 26.Anteroom 27.Room for watching the *qa'a* 28.Galleries for watching 29.Room for watching 30.*Kuttab*

also notable for occupying almost the entire upper part of the first floor *qa'a*. The *haramlik*'s rooms and galleries overlook this *qa'a* with large *mashrabiyyas* and many windows that open upward (**Figs.58**). During parties, these *mashrabiyyas* veiled the harem's members and female singers, thus allowing guests to listen to their performances without seeing them.

Most middle and working class households (headed by small merchants, artisans, shopkeepers, and the like) lived in collective housing known as *rab'*.[52] Though smaller and more basic, the spatial organization and openings of *rab'* were designed or altered to protect the norms of veiling.[53] *Rab'* consists of groups of apartment units (plural *masakin*) that were sometimes constructed separately but more often built above commercial units referred to as *wakala* or *khan*.[54] *Rab'* units surrounds a shared courtyard and are accessed by a separate entrance (**Fig.59**). Each unit (singular *maskan*) overlooks the courtyard, street, or both and is organized on two or three levels connected by an internal stairway.[55] Similar to private homes, guestrooms were on the lower level and household rooms on upper levels, with an internal staircase connecting them (**Fig.60**).[56] In the absence of guests the entire unit was dedicated to household purposes. The storeroom placed next to the guestroom helped screening them from the

---

[52] L.A. Ibrahim (1978), "Middle-Class Living Units in Mamluk Cairo," *AARP Art and Archaeology Research Papers*, vol. 14, p. 24; B. Maury et al. (1983), *Palais et Maisons du Caire II Epoque Ottomane*, Paris: Centre National de la Recherche Scientifique, p. 77.

[53] It is not clear how households during the Mamluk period used the unit. The Ottomans seem to have modified the openings of the Mamluk *rab'* such as by adding *mashrabiyyas*. See J.C. Garcin et al. (1982), *Palais et Maisons du Caire I Epoque Mamelouke*, Paris: Centre National de la Recherche Scientifique, p. 133, note 5.

[54] The term indicating the function of the building, e.g. *khan*, *funduq*, or *wakala* was applied only on the ground floor; while upper floors were referred to separately, usually as *rab'*, Ibrahim (1978), op. cit., p. 28. And unlike the *khan*, *funduq*, or *wakala*, which served as a temporary lodging for travelers, foreign traders, military people, and such, *rab'* is a fixed lodging rented by common Egyptians who had their shops and workshops nearby or beneath, A. Raymond (1980), "The Rab': A Type of Collective Housing in Cairo During the Ottoman Period," in J.G. Katz (Ed.), *Architecture as Symbol and Self-Identity*, Philadelphia: Aga Khan Award for Architecture, p. 57.

[55] The structure of the *rab'* has undergone little change from the Mamluk through the Ottoman period and reached equilibrium by the end of the fifteenth century, Ibrahim (1978), op. cit., pp. 24-31.

[56] Usually, an anteroom, a kitchen, and a latrine were in the second level (mezzanine), and in the third floor were the household room.

Fig.57. *Mashrabiyya* in the first floor's *qa'a* of the *haramlik*, overlooking the street, *Manzil al-Kiridliya*. (The author)

Fig.58. The *qa'a* of *Manzil Amna bint Salim* overlooked by its *haramlik*. Left, watching galleries overlooking the first floor's *qa'a*. (The author) Right, the *qa'a* seen from the upper northern gallery, showing the opposite southern gallery and a large *mashrabiyya* overlooking the courtyard. (Photo by Fishkid)

main household entrance.[57] Furthermore, unit openings were carefully managed to meet individual household veiling needs.

For instance, the guestroom of the *rab'-wakala* of Sultan *El-Ghuri*[58] (shown in **Figs.60, 61**) has six windows with wood grills with wide patterns that do not provide privacy. However, the three windows below eye level are equipped with double shutters that open upward. These shutters obstructed a view inwards but not outwards. The flexible shutters also blocked the sun and could be adjusted according to the weather. The third floor (restricted to women) has a large *mashrabiyya* through which the occupants gazed and perhaps participated in the activities of the courtyard, street, or both (**Fig.61**).[59]

Though different in appearance, the *rab'-wakala* of *Qayt-Bay* is consistent with the veiling norm (**Fig.62**). Organized on two levels with no special upper floor or individual household *mashrabiyya* (**Fig.63**), each apartment has a set of openings that combined have the same effect as a *mashrabiyya*. Far above eye level, three windows with wide grill patterns ensured adequate lighting and airflow. Below eye level, projecting latticework with a tight pattern of finely turned pieces ensured privacy and blocked the sun. Similar to the *rab'-wakala* of Sultan *El-Ghuri*, middle shutters that could be opened or shut were added to allow for adjustments according to internal use or weather (**Fig.64**).

---

57 L. Ibrahim (1984), "Residential Architecture in Mamluk Cairo," *Muqarnas*, vol. 2, p. 57.

58 A typical *rab'-wakala* built during the Mamluk period between 1504 and 1505, and which its facades were most probably modified during the Ottoman period by adding *mashrabiyyas*. See Garcin et al. (1982), op cit., p. 133, note 5.

59 For detailed information on *rab'-wakala* of Sultan *El-Ghuri*, see Garcin et al., op. cit., pp. 133; Ibrahim (1978), op. cit., pp. 24-31; Raymond (1980), op. cit., p. 57-60.

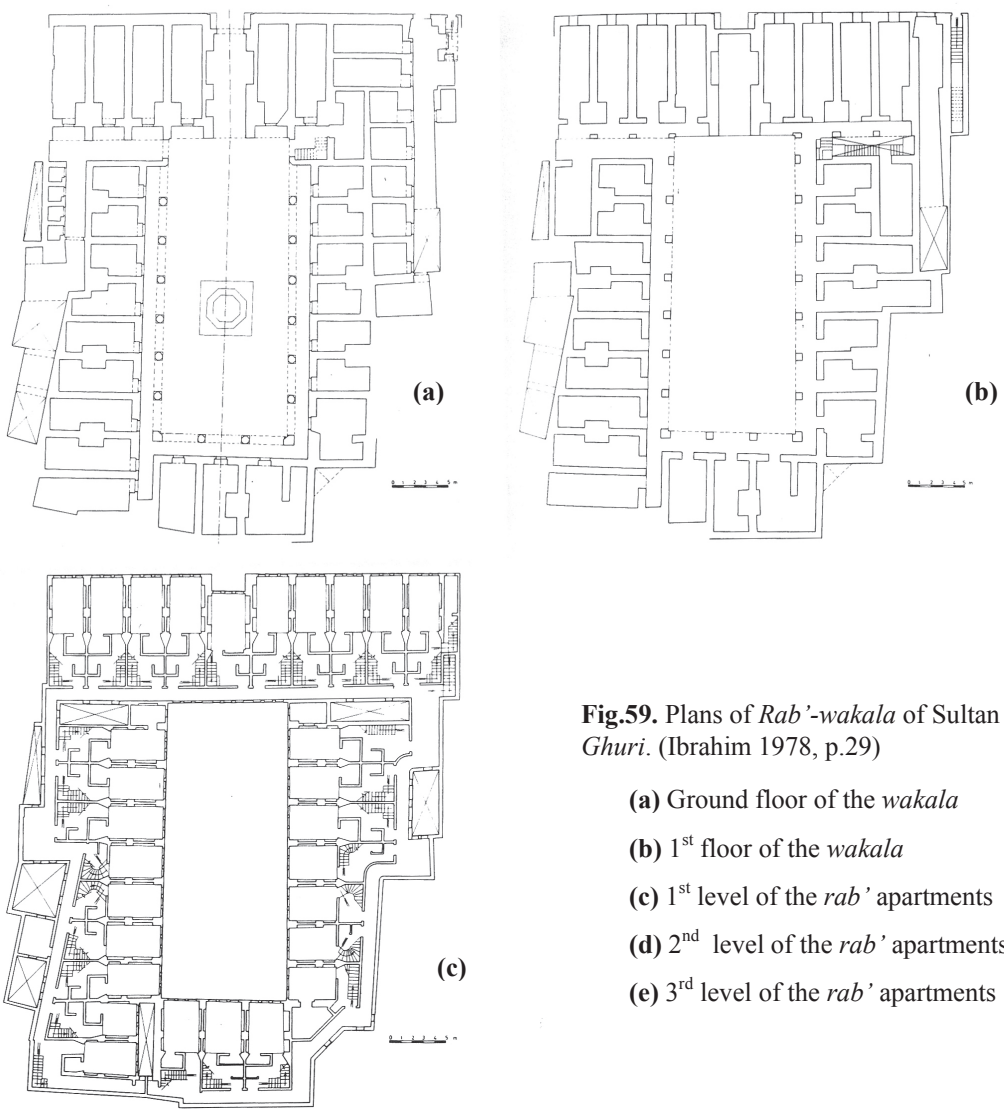


Fig.59. Plans of *Rab'-wakala* of Sultan *El-Ghuri*. (Ibrahim 1978, p.29)

(a) Ground floor of the *wakala*

(b) 1st floor of the *wakala*

(c) 1st level of the *rab'* apartments

(d) 2nd level of the *rab'* apartments

(e) 3rd level of the *rab'* apartments

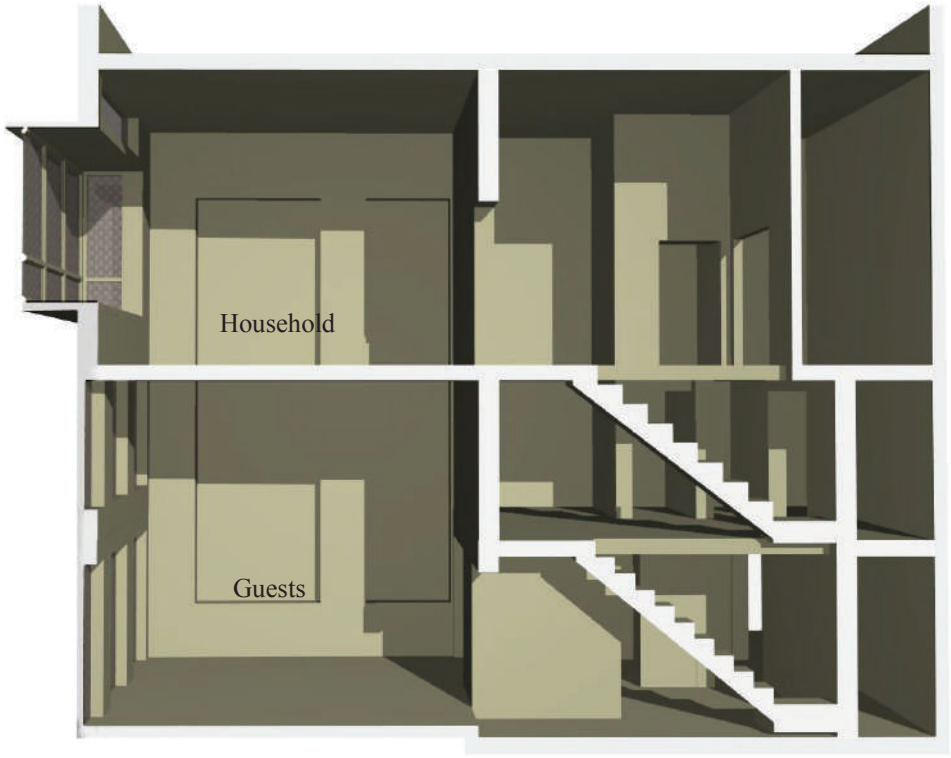


Fig.60. Perspective section (simplified) in a unit of *Rab* of *El-Ghuri*.

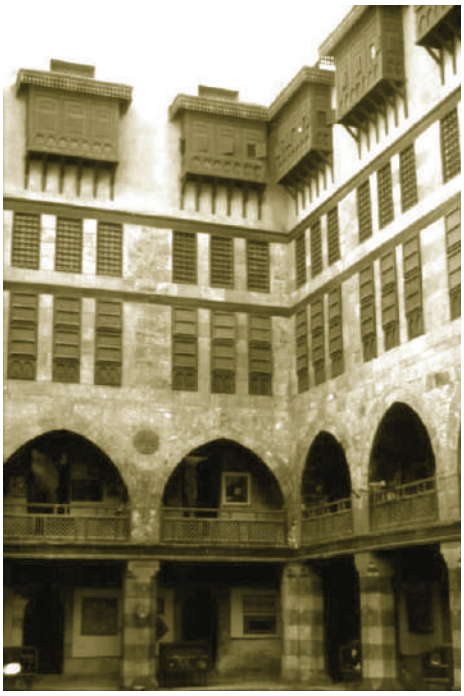
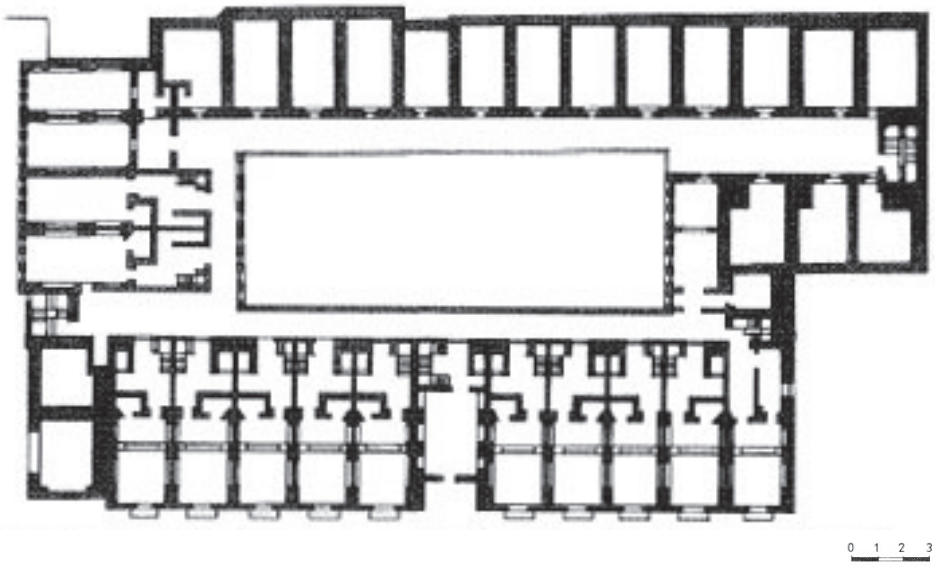


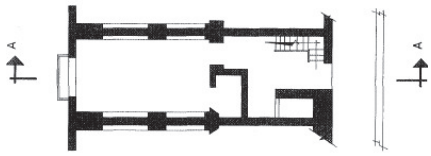
Fig.61. *Rab'-wakala* of Sultan *El-Ghuri* seen from the court. The photo shows the form and arrangement of its openings. (Islamic Art Network)

Fig.62. Façade of *Rab'-wakala* of *Qayt-Bay*. (ArtServe, the Australian National University)

(a)



(b)



(c)

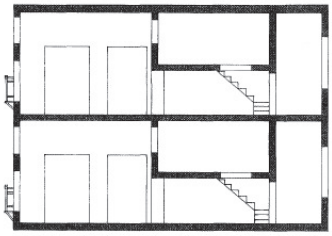


Fig.63. *Rab'-wakala* of *Qayt-Bay*. (Ibrahim 1984, pp. 50-51)

(a) 1st level of the *rab'* apartments

(b) Plan of a unit's 1st level (entrance, staircase, guestroom, water jars reserve, and latrine.

(c) Section in two units

Fig.64. Arrangement and form of the openings of *Rab' Qayt-Bay*. (ArtServe, the Australian National University)

The tight patterns of *mashrabiyya* sections below eye level ensure protection from outside gazes because when looked at from the outside, they appear to be completely opaque. Their design (an open pattern of the part above eye level plus a flat window above the overhang) specifically protects women from the gazes of neighbors across the way. This form of protection to preserve privacy is specifically mentioned in *shari'a* (Islamic law), which stipulates the size and height of openings and their relative locations with respect to houses directly across a street or pathway.[60] At the same time that *mashrabiyya* allowed women to listen to and gaze at public spaces, the hinged sections that opened upward, though tiny, allowed them to lean out to watch and call out to members of the household, servants, or merchants without being seen. When extended from a wall, *mashrabiyya* also allowed for wider views.[61]

2-5 Environmental Function

Cairo has only two seasons: almost eight months of summer (March to October) and four months of winter (November to February).[62] Overwhelming dry heat, intense sunlight, a dazzling sky, and a light breeze characterize summer days, with a cooler and more humid period from midnight to early morning. Average maximum and minimum temperatures are 37.5ºC and 16ºC and the daily average 25ºC; on the hottest days it often reaches 43ºC. Winter is still warm, with average maximum and minimum temperatures of 25ºC and 8ºC and a daily average of 16ºC. The air always feels dry, with an average relative humidity of 56% in summer and 65% in winter. Rain is

[60] It was even necessary to take permission from the opposite neighbor to install a *mashrabiyya* overlooking his house, since it allowed for seeing him without his knowledge. See **3-4 Legislative/Urban/Architectural Issues**; L. Fernandes (1990), "Habitat et Prescription Legales," in *HT* (vol. 2), op. cit., p. 422.

[61] Lane, op. cit., p. 506.

[62] *Cairo* (2006), in Encyclopaedia Britannica, retrieved March 6, 2006, from Encyclopaedia Britannica Premium Service: www.britannica.com/eb/article-59326

extremely rare—zero inches in summer and a 0.2 inch average in winter.[63] A northern breeze remains constant at an average speed of 3.35m/s almost the entire year—hot in the daytime and cool at night.[64] In March or May the city experiences south and southwest winds called *khamaseen* that carry fine particles of sand from the nearby desert for 1-3 days, resulting in hot and dusty weather.[65]

As mentioned in chapter 1, Fathy believes that the *mashrabiyya* is the best solution for thermal comfort in hot and arid regions because its design mitigates intense light and hinders the flow of heat into homes while enhancing the cooling effects of wind and humidity.[66] The tight latticework at eye level intercepts direct sunlight and reduces glare, while the open upper lattice pattern compensates for the dimming effect by allowing reflected light to illuminate the upper part of a room (**Fig.65**). In addition, the wood pieces used to form the latticework are made of many small rounded dowels that soften the penetrating light and reduce the contrast between the dark pieces and bright interstices (**Fig.66**). The overhang described in an earlier section prevents direct sunlight from entering through the wide upper lattice.

Since privacy and sunlight considerations require small interstices until eye level, the open upper lattice pattern sometimes does not provide enough airflow. Therefore, above the overhang, a window with wide grill is added to allow for better ventilation

---

63 *Temperatures and Precipitation - Selected International Cities Table 1331*. (2002), Statistical Abstract of the U.S.: 2001, Washington, DC: U.S. Dept. of Commerce, Bureau of the Census, p. 837, retrieved December 13, 2005, from http://www.census.gov/prod/2002pubs/01statab/intlstat.pdf

64 *International Weather for Energy Calculations (IWEC Weather Files) User Manual and CD-ROM* (2001), Atlanta: ASHRAE.

65 S.A. Al-Wakeel and M.A. Serag (1989), *Al-Manakh wa 'imarat al-Manatek al-Hara*, Cairo: Alam al-Ketab, p. 133.

66 The following information on the *mashrabiyya*'s environmental functions is based on Hassan Fathy's studies; see Fathy, op. cit., pp. 46-49.

(see the typical *mashrabiyya* in **Figs.43**, **44**).[67] If this solution is still not enough, the area covered by the *mashrabiyya* can be increased—even to the point of covering the entire facade of a room, as in the *manzil al-Suhaimy* shown in **Figures 67** and **68**. A larger *mashrabiyya* can also help compensate for the dimming effect of the tighter pattern below eye level. Another strategy is to extend a *mashrabiyya* away from a façade to allow extra light and air to enter through three sides.[68] Decisions on extending or increasing the size of a *mashrabiyya*, its pieces, interstices, projection, and overhang depend on such factors as the interior room function, size, ceiling height, and the amount of light and ventilation desired.

Façade orientation is a particularly important factor, with a northern orientation the most desirable because it faces the prevailing wind direction and has the least sun exposure. Since direct northern exposure to the sun only occurs in the early and late hours of summer, the size of a *mashrabiyya* and its interstices for a northern *haramlik* can be enlarged (depending on privacy concerns) to allow for more ventilation and reflected light. To block the greater amount of sunlight that enters from east and west facades, the interstices of the lower latticework are narrowed and the overhang is enlarged. With regard to wind, a southern orientation is least desirable because it receives no wind; therefore less important rooms in a house are oriented to the south. A traditional design feature of Egyptian residences is the *malqaf*—an airshaft that rises above a building and faces in the direction of the prevailing wind to capture and direct it downward toward rooms with southern orientation.[69] The one advantage of a southern

---

67 The problem of direct sunlight penetrating through this window is not considered an issue because it enters the room far above eye or head level.

68 G.R. Al-Heggawi (2000), "Al-Mashrabiyyat wal-Zujaj a-Mu'ashak fil- Kuwait," in Nazih (Ed.), op. cit., p. 301.

69 The *malqaf* dates from the ancient Egyptian civilization and has long been a feature of vernacular architecture. See Fathy, op. cit., p. 56.

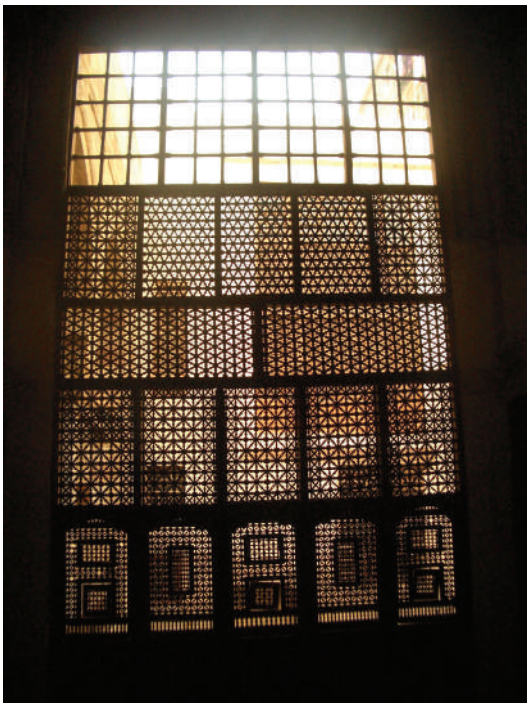


Fig.65. A *mashrabiyya* overlooking the court in *manzil Sitt Wasila*. The photo shows the amount of light penetrating through its two sections above and below eye level. (The author)

Fig.67. *Mashrabiyya* covering the entire façade of two *qa'as* overlooking the northern garden in *manzil al-Suhaymi*. (The author)

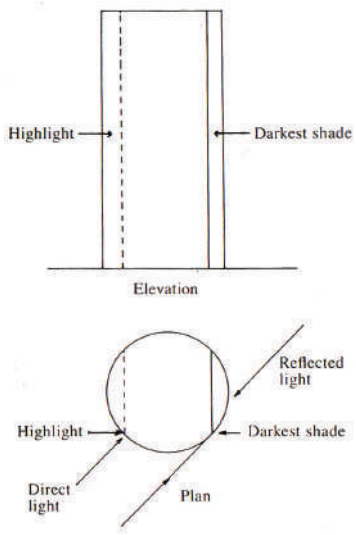


Fig.66. Effect of the turned pieces on the penetrating light. The *mashrabiyya* soften the intensity of the penetrating light by graduating it on the round surfaces of its pieces. (Fathy 1986, fig. 20)

Fig.68. Same *mashrabiyya* in *manzil al-Suhaymi* seen from inside (ground floor). The lower tight lattice, upper wide lattice, and the colored glass window in a typical *mashrabiyya* has been unified to form one large *mashrabiyya*. (The author)

exposure is that the high angle of the sun means that it can be blocked with a small overhang; in winter, the low sun can penetrate through the upper part of a *mashrabiyya* and window above, thus warming rooms when doing so is most desirable.

Besides controlling sunlight and airflow, the *mashrabiyya* is also a cooling device. All organic fibers (including wood) constantly absorb, preserve, and release water. Through the process of evapo-transpiration, water flows through the fibers of a plant to its surface and evaporates, thus cooling the surface. As long as they are not varnished, wood fibers maintain this characteristic even after being removed from a live tree and used in construction. During cool evenings, the wood sections of a *mashrabiyya* absorb moisture carried on the wind and passing through the interstices. When heated by sunlight, these pieces release the moisture into the air that passes through, thereby increasing humidity within a home and reducing its temperature. The larger the area of a *mashrabiyya* or size of its wooden pieces, the greater its humidifying and cooling effect. Larger wooden pieces not only have more surface area for evaporation but also greater volume, and therefore release moisture for longer time periods.[70]

Typically, *mashrabiyya* is made of unvarnished pieces of wood fixed together without glue or nails through an intricate method of joinery. This gives the panels greater flexibility to withstand wide swings in temperature by allowing them to expand and shrink without breaking or cracking.[71]

2-6 Conclusions

[70] Fathy, op. cit., p. 48-49
[71] Behrens-Abouseif (1991), op. cit., p. 718. See also **3-2 Cost**.

1) The use of *mashrabiyyas* as large latticed windows or balcony covers began during the Ottoman occupation (1517-1805). They were typical fixtures in Cairene homes during that period.

2) As a result of the increasing density in Cairo (and its hot and arid climate), Ottoman-period designers and builders created courts and larger openings for access, ventilation, and light in domestic quarters. However, since the Ottomans were more conservative in interpreting Islamic rules for veiling than the former Mamluk rulers (1250-1517),[72] they also enforced higher levels of privacy and separate female quarters (*harems*) that could not be seen from the outside. They therefore devised the *mashrabiyya* to ventilate and illuminate domestic quarters while at the same time protecting women from outside gazes in the increasingly dense city.

3) Considering its scarcity in Egypt, wood would not have been used for making *mashrabiyyas* if the Ottomans had not supplied it from other areas within their empire.

4) The design of traditional balconies in Istanbul, the availability of wood from other areas within the Ottoman Empire, and the preexisting Egyptian craft of turned wood merged to influence the features of Cairene *mashrabiyyas*.

5) *Mashrabiyya* sections below eye level served to ensure privacy, block or mitigate intense sunlight, and reduce glare. Sections above eye enhanced lighting and ventilation.

[72] See **2-4-1 The Traditional Veil**.

6) An overhang above a *mashrabiyya* was necessary to prevent sunrays from directly entering through the wide pattern of the upper section.

7) Since rooms in traditional homes have high ceilings, installing a window above a *mashrabiyya* overhang was considered indispensable for providing adequate ventilation and illumination. Direct sunlight entering through these windows was not considered a problem because it entered far above a user's head.

8) During conservative Islamic periods, *shari'a* (Islamic law) stipulated the heights of houses and sizes and locations of openings in relation to surrounding buildings. This insured that women could not be seen by neighbors across the way through the wide patterns of the upper section of a *mashrabiyya* nor through the window just below the overhang.

9) Windows that opened upward were best for hiding women from view when they leaned out to watch or call for someone.

10) When extended outward from a façade, a *mashrabiyya* provides increased views, light, airflow, and space.

11) A *mashrabiyya* made from unvarnished organic material such as wood increases indoor humidity through evapo-transpiration and therefore reduces the temperature of a room.

12) The round shape of the pieces used to construct a *mashrabiyya* mitigates the intensity of incoming light and reduces glare.

13) Assembling *mashrabiyya* pieces without glue or nails gives the panels flexibility by allowing them to expand and shrink without breaking, despite large swings in temperature.

CHAPTER 3

TRADITIONAL *MASHRABIYYA* FOR CONTEMPORARY CAIRO?

This chapter discusses issues associated with reintroducing the traditional *mashrabiyya* to contemporary Cairo. After describing its appropriateness in terms of today's veiling practices (which have changed considerably), I will discuss expenses involved with constructing and installing *mashrabiyyas*, how air pollution in Cairo would most likely affect them, and how legislative, urban, and architectural issues might influence *mashrabiyya* design and function.

3-1 Traditional *Mashrabiyya* and the Contemporary Veil

In addition to face covers, veiling practices also entail gender segregation and home seclusion. Thus, understanding the contemporary meaning of veiling in Cairo requires understanding historical changes that occurred after the Ottoman occupation as well as during the second half of the nineteenth century and all of the twentieth century. In the first part of this section I will give a brief history of Egyptian veiling practices beginning from the first half of the nineteenth century, in the second part I will explain the meaning and role of veiling in contemporary Egyptian society, then in the final part discuss the appropriateness of the traditional *mashrabiyya* to contemporary veiling beliefs.

3-1-1 History of the Contemporary Veil in Egypt

Napoleon's invasion of Egypt (1798-1801) is considered the first modern physical intrusion of a Western power into Egypt. However, neither his invasion nor the modernization policies of Muhammad Ali between 1805 and 1848 that paved the way for a modern nation[1] affected the true core of Egyptian society.[2] True, the Muhammad Ali period is considered the starting point for important socio-economic transformations

[1] S. Zuhur (1992), *Revealing Reveiling: Islamic Gender Ideology in Contemporary Egypt*, New York: State University of New York Press, p. 39.
[2] J. Abu-Lughod (1971), *Cairo: 1001 Years of the City Victorious*, Princeton: Princeton University Press, p. 83.

as Egypt became independent of direct Ottoman control, and his policies led to significant agricultural and industrial development in and around Cairo,[3] yet deep social change required much more time to develop—from the second half of the nineteenth century to the early 1950s. Important movements during that period can be summarized as follows:

- The first school for girls was founded in 1873 in Cairo by the reformist Khedive Ismail who reigned from 1863 to 1879.[4] Called the *Saniyya* School, it was first attended by middle-class Egyptian females, some of whom went on to become pioneers in the new professions of journalism and secular education.[5]
- Education and mobility for upper class women, who hired European tutors for home teaching. These women also took advantage of the greater mobility provided to them by the introduction of new carriageways and railroads.
- The Islamic reform movement. A significant rethinking of women's position started in the second half of the nineteenth century according to the ideas of such reformers as Muhammad 'Abdu (1849-1905) and Qasim Amin (1863-1908). Many reforms were based on integrating western-inspired attitudes toward women into an Islamic framework.[6] Sheikh Muhammad Abdu encouraged Muslims to adopt the doctrine of Islamic modernism as a means of coping with socio-economic change and a new direction for Egyptians, and criticized the patriarchal domination of women within the family and society.[7] Qasim Amin

---

3 Zuhur, op cit.; Abu-Lughod, op cit., p. 83-85; M. Badran (1988), "The Feminist Vision in the Writings of Three Turn-of-the-Century Egyptian Women," *Bulletin (British Society of Middle Eastern Studies),* vol. 15, n. 1/2, p. 11.

4 J. Chelhod (1990), "Hidjab," in C.E. Bosworth, et al. (Eds.), *The Encyclopaedia of Islam New Edition* (Vol. 3), Leiden: E.J. Brill, p. 360.

5 Badran, op cit., p. 11.

6 G. Baer (1969), *Studies in the Social History of Modern Egypt*, as cited by J.E. Tucker (1983), "Problems in the Historiography of Women in the Middle East: the Case of Nineteenth-Century Egypt," *International Journal of Middle East Studies,* vol. 15, n. 3, p. 324.

7 Badran, op cit., p. 12.

called for education for women, an end to veiling and polygamy, and divorce law reforms.[8] The start of Egyptian feminism can be traced to his book *Tahrir al-Mar'a* ("The Liberation of the Woman") published in 1899.[9]

However, the veil he criticized was not the same as the veil as it is understood today. Today's veil is focused on covering a woman's body so that only parts her face and hands are shown, as required by Islamic law (*Shari'a*).[10] The veil that Qasim Amin attacked included the customs of veiling women's faces, home seclusion, and gender segregation. He argued that if Islamic Law contained any specific text requiring these practices, he would never consider writing anything in disagreement with divine commands that must be obeyed.[11]

- The participation of feminists in the struggle against British occupation. Upper class women entered political life by participating in the struggles of Egyptian nationalist and other groups focused of expelling the British, who occupied Egypt officially from 1882 to 1936.[12]
- Feminism and removing face covers. Upon their return from an international feminist meeting held in Rome in 1923, Huda Sha'rawi and Saiza Nabarawi removed their face covers. Their symbolic action launched a movement among upper-class women to go into public spaces in Cairo without their protective covers (**Fig.69**).[13] Since the face cover was the most powerful symbol of oppression, taking it off constituted a startling rejection of patriarchal values and a

[8] Zuhur, op cit., p. 40.
[9] Badran, op cit.
[10] See **2-4-1 The Traditional Veil**.
[11] V.J. Hoffman-Ladd (1987), "Polemics in Modesty and Segregation in Contemporary Cairo," *International Journal of Middle East Studies,* vol. 19, n. 1, pp. 26-27.
[12] A.E. Macleod (1991), *Accommodating Protest: Working Women, the New Veiling, and Change in Cairo*, Cairo: The American University in Cairo Press, p. 102.
[13] Macleod, op cit., p. 102.

powerful declaration of a desire to engage in social life.[14] From the 1920s until the early 1950s, women energetically resisted veiling and polygamy, entered public social life, and fought to obtain higher education. Their successes expanded choices for women and created Egyptian social services that legitimized female employment.[15]

- The establishment of the Muslim Brotherhood (*al-Ikhwan al-Muslimin*) in 1933, the Muslim Sisterhood (its female branch) in 1933, and the Association of Muslim Women in 1937. Political struggles among the King, his cabinet, the *Wafd* (a national political organization), and the British were motivators for the founding of these Islamic organizations.[16] According to Zuhur, "decreased public political participation, multilevel alienation, governmental rigidity, growing economic inequality, and the presence of foreign troops in Egypt during the Second World War" resulted in a search for cultural identity that paved the way for *al-Ikhwan*'s growth.[17] However, its female branch never reached the same level of popularity. In fact, it became the target of attacks by Egyptian women who considered the movement an attempt to return the country to the *harem* age.[18]

The 1952 Revolution against the British and King Faruk marked a major turning point for female labor participation, political equality, and freedom of dress. As part of his socialist policies from 1956 to 1970, Nasser encouraged female employment and supported the principle of gender equality.[19] In addition to establishing free education,

[14] P. Mule and D. Barthel (1992), "The Return to the Veil: Individual Autonomy vs. Social Esteem," *Sociological Forum,* vol. 7, n. 2, p. 323.
[15] Zuhur, op cit., p. 44.
[16] Ibid.
[17] Ibid., pp. 44-45.
[18] R.P. Mitchell (1969), *The Society of the Muslim Brothers*, London: Oxford University Press, as cited by Zuhur, op cit., p. 45.
[19] Tucker, op cit., p. 326.

he guaranteed jobs for all secondary school graduates, equal pay and benefits for women, maternity leaves, and special laws that excluded women from some requirements (e.g., working at night). During this era, women entered the workforce in factories and government bureaucracies,[20] and women in wealthy families began wearing western fashions.[21] Middle class women began wearing more modest versions of western clothes at home and on the street. It became less shocking to see Egyptian women wearing pants, short dresses, swimsuits, and sleeveless blouses. Western fashions became important symbols of entering the middle class (**Fig.70**).[22]

The Muslim Brotherhood and more moderate groups responded with a call for *tajdid* ("reform") that entailed "an avoidance of both the narrow-mindedness of the East and the moral laxness and individualism of the west."[23] They proclaimed that women and men are equal under Islam, that the mingling of sexes for logical reasons is acceptable, and that women's education is necessary but should be viewed primarily as preparation for family life. On the topic of women's fashion, however, they vehemently argued that copying European ways was responsible for increased mixing of the sexes and the resulting immorality and debauchery. The white *khimar* and head cover that members of the Muslim Sisterhood adopted during the 1950s was the forerunner of today's dress and veiling practices.[24] However, during that decade western fashion was dominant.[25]

---

20 Macleod, op cit., pp. 3-4.

21 Elizabeth and Robert Fernea, a scholarly couple who traveled and lived in the Middle East for over thirty years since 1956, describe members of Cairo's new elite in the late 1950s buying flowers and giving dinner parties E. Fernea and R. Fernea (1987), *The Arab World: Personal Encounters*, New York: Anchor Press, as cited by Zuhur, op cit., p. 49.

22 Macleod, op cit., p. 103.

23 Zuhur, op cit., p. 46.

24 The *khimar* is a fabric that covers the throat in a way a wimple does, Zuhur, op cit., p. 47.

25 Macleod, op cit., p. 102.

The origin of the "new veiling" in Cairo can be traced to the Sadat era (1970-1981). In addition to reversing Nasser's economic policies by encouraging private (including foreign) investment in trade, joint ventures, ports, and other economic sectors, he released many Muslim Brotherhood members that had been imprisoned by Nasser in order to appease critics on the left.[26] However, Sadat's *infitah* (or "economic opening") resulted in wider gaps in income distribution and economic discontent.[27] Israel's 1967 military victory shook the confidence and inner faith of Egyptians. That war, the 1973 victory on Israel,[28] the belief that Sadat betrayed the nation by signing the 1978 Camp David Peace Treaty,[29] and widespread economic discontent were the main motivators behind a new period of nationalist soul-seeking based on Islamic values.[30] Muslim groups proposed an alternative Islam that opposed the policies of the state and the then-current religious establishment.[31] The veil reappeared as modernization was increasingly attacked as a rejection of not just Islamic but all indigenous traditions.[32]

The ideology and image of the new Islamic woman presented a major challenge to the western image[33] that dominated Cairene society until the mid-1970s.[34] However, women continued to attend universities, work, and take part in activities outside the home, attend social affairs, and enjoy freedom of mobility and public life.[35] At the beginning of this shift, veiled women wore long skirts or floor-length gowns with wide

---

26 Zuhur, op cit., p. 51.
27 Ibid., p.52.
28 Macleod, op cit., p. 103.
29 Zuhur, op cit., p. 53.
30 See Macleod, op cit.; Zuhur, op cit.
31 Macleod, op cit., p. 104.
32 L. Reese (1998), "The Burqa, Chador, Veil and Hijab!," in *Women in the Muslim World*, Berkeley: Women in World History Curriculum, retrieved January 11, 2005, from www.womeninworldhistory.com/sample-13.html
33 Zuhur, op cit., p.109.
34 Macleod, op cit., p. 103.
35 Ibid., p. 104.

sleeves and covered their heads with nun-like coifs.[36] But by this time, large numbers of lower-middle and middle class women were employed in public and private sector positions. Female white collar workers, bank clerks, tour guides and agents, and other service-sector employees were especially visible.[37] Elite and upper middle-class women had yet to take the new veiling practices (or the women who followed them) seriously, and families with strong liberal leanings were shocked when their daughters adopted the new veil. In many cases, veiling was viewed as a source of embarrassment.[38]

Since becoming president in 1981, Hosni Mubarak has followed two policies regarding Islamists: for more radical factions they include warnings, surveillance, harassment, legal measures, and mass arrests; for moderate Islamists they include limited invitations to participate in government (including membership in the Egyptian parliament).[39] Egyptian television and radio stations now broadcast many hours of religious programming. To a certain degree Mubarak has tolerated criticism and dissent, and a growing number of women have taken advantage of opportunities to express anti-secular views and to participate in Islamist social and political activities.[40] During the 1980s, veiling developed into a movement with wide appeal among lower middle-class working women[41] to the degree that it was promoted as a "women's movement."[42] Until the mid-1980s, the middle class and the petite bourgeoisie had promoted the unveiled woman as a powerful and appealing image with desirable attributes and possessions. Adherence to this image declined as the veil was increasingly

36 Ibid.
37 Zuhur, op cit., p. 54.
38 Ibid., p. 53.
39 Ibid., p.55.
40 Ibid., p. 57.
41 Macleod, op cit., p. 106.
42 Mule and Barthel, op cit., p. 323.

adopted in the late 1980s.[43] Throughout the 1990s the popularity of veiling grew fastest among educated university students and professionals in technical fields.[44]

3-1-2 Meaning of the Contemporary Veil

Ahmed,[45] El Guindi,[46] MacLeod, Mule and Barthel, Hoffman-Ladd, Nasser,[47] Perkins,[48] and Zuhur are among scholars who consider the contemporary Egyptian veil as a "new veiling" instead of a re-veiling—a complex symbol with multiple meanings as a sincerely believed religious command, a personal choice with no sense of imposition, a practical device for accessing public life and interacting with men, and a form of universal dress.

In contrast with the Ottoman period, there is no public law in Egypt that requires veiling and no institution that enforces adherence to veiling practices. There is some evidence showing that most Egyptian women believe that they should adopt veiling because it is a proper standard of modesty as stated by Allah.[49] Based on her survey on women in Cairo, Sherifa Zuhur, a professor of Islamic and regional studies, reports that the *hijab* is viewed as a sign of religious identity and sincere belief by all veiled women and approximately 40% of unveiled women. She also found that the prevailing opinion among respondents under 30 years of age is that they are considered religious because they are veiled, whereas many unveiled women stated that "because I don't wear the

---

43 Zuhur, op cit., p. 120.
44 Hoffman-Ladd, op cit., p. 19.
45 Ahmed, L. (1992). Women and Gender in Islam: Historical Roots of a Modern Debate. New Haven: Yale University Press.
46 El Guindi, F. (1999). *Veil: Modesty, Privacy, and Resistance*. Oxford: Berg.
47 Nasser, M. (1999). The New Veiling Phenomenon _ is it an Anorexic Equivalent? A Polemic. *Journal of Community & Applied Social Psychology, 9*, 407-412.
48 Perkins, A. (2002). Review Article: Veil of Tradition, Veil of Resistance, Islamic Dress in Contemporary Egypt. *Text, Practice, Performance, 4*, 65-84.
49 Reese, op cit.

hijab yet, I am not considered religious enough."[50]

Zuhur also reports that for the majority of women in Cairo, adopting the veil is a voluntary practice that is rarely overruled by husbands or families.[51] Most of the women she interviewed said that they had made a completely personal choice—that is, no one had to convince them to wear a *hijab*.[52] Accordingly, in Cairo today it is still possible to see women from all social and economic classes wearing veils, western fashions, and variations in-between.[53] According to their personal understanding and interpretations of the degree of modesty required by Islam, veiled women wear outfits ranging from fashionable but modest western style clothes that cover everything but their hands and faces to loose clothes with headscarves that cover the head and neck to dark and heavy clothes with *khimars* or *nikabs* (complete face covers)[54] as shown in **Figure 71**.

The presence of veiled and unveiled sisters in the same family is not uncommon. In her study of a group of women living in Cairo, MacLeod gives the following description:

> Karima used to wear western clothes but switched a few months after the birth of her son to a kind of modified Islamic dress. She generally wears western-style clothes, but cut loose and quite long with wrist-length sleeves and high necks. On her head she wraps a gauzy scarf carefully to cover her hair, neck, and shoulders. Her sister, who is engaged, wears western dress with carefully matched shoes, bags, and jewelry, all in bright shades of reds and yellows.[55]

---

50 Zuhur, op cit., p. 74.
51 See Perkins, op cit., p. 74; Zuhur, op cit., p. 121.
52 But a few admitted that teachers or fellow students had encouraged them to begin veiling, Zuhur, op cit., p. 76.
53 Macleod, op cit., p. 17.
54 Ibid., p. 106.
55 Ibid., p. 27.

Fig.69. Huda Sha'rawi, right, with Saiza Nabarawi at a women's conference in Rome after they had removed their face veils. (Badran 1999)

Fig.70. Egyptian middle class-women during the early-seventies. (Source: the author)

Fig.71. Contemporary Styles in Cairo streets: unveiled, western style veil, *khimar*, and *nikab* dresses. (Photo by Gabriel 2003)

The new veiling is no longer associated with home seclusion and gender segregation, but viewed as a practical device that allows for interactions with men in public life. The veil symbolizes gender boundaries that originate from Islamic concepts of women and female sexuality.[56] It is important to remember that although Islam forbids men from gazing at women, men rarely follow that rule, therefore many women use the veil as a device that allows them to move about in public without having to worry about men's gazes. The veil sends a message about the wearer and about the relationship between a wearer and viewer, and provides women with their own private spaces, desexualizes their contacts with men, and proclaims their religious faith.[57] In other words, the veil is an adaptive tactic for walking in the streets, taking public transportation, attending university, going to the workplace, and so on.[58]

The veil also has meaning and utility during events that take place in the home, which Egyptians use for many events tied to social obligations, social customs, and religion. During the fasting month of Ramadan, relatives, friends, and colleagues often invite each other to gather at their homes for the main daily meal known as *iftar* ("breakfast at sunset") and to socialize afterwards.[59] Feasts are also major occasions for social gatherings: the *Eid al-Fitr* ("Feast of Breakfast") that immediately follows Ramadan and lasts for three days, and the *Eid al-Adha* ("Feast of Sacrifice") that coincides with the *Hajj* and lasts for four days. These feasts usually start with a small snack followed by *Salat al-Eid* ("Feast Prayers") in a mosque. Afterwards, neighbors,

---

56 Mule and Barthel, op cit., p. 328.
57 Hoffman-Ladd, op cit., p. 43.
58 M. Nasser (1999), "The New Veiling Phenomenon _ is it an Anorexic Equivalent? A Polemic," *Journal of Community & Applied Social Psychology*, vol. 9, p. 409.
59 S. Arab (2000), "Ramadan in Egypt: a Lifetime Experience," *Tour Egypt Monthly,* vol. 1, n. 6, retrieved June 21, 2006, from http://egyptmonth.com/mag11012000/index.htm

friends, and relatives visit each other to exchange greetings and give money to children.[60]

Another important ceremony is the *sebua*, which is held on the seventh day following a child's birth. The *sebua* is celebrated with a reunion of relatives and friends in the parents' home to share their happiness and to offer gifts to the newborn.[61] Many events associated with marriage take place in the home—for instance, the custom of the future groom joining the bride's family for dinner on a regular basis before their wedding and visits between members of the respective families. After a certain period passes, the bride's family usually plays host to the *katb al-kitab* ("marriage contract party"), which is attended by close family members and friends.[62] Upon returning from their honeymoon, the new couple receives congratulatory guests for many days. Also, when a child passes a major final exam, relatives are invited to visit to congratulate the parents and to offer gifts. When a death occurs, although the deceased is buried quickly (often before sunset on the day of death according to Islamic tradition, or at the longest within three days), relatives and friends visit to offer condolences for several days afterwards. The official mourning period for the deceased lasts for forty days, during which special prayers are offered, rituals followed, and respects paid by friends and family.[63]

Contemporary Egyptian women no longer have to hide behind a harem's

---

60 M. Osama (2001), "Eid: Celebration for the Young and Old," *Tour Egypt monthly,* vol. 2, n. 1, retrieved June 21, 2006, from http://egyptmonth.com/mag01012001/index.htm

61 E.W. Fernea (1995), "Childhood in the Muslim Middle East," in E.W. Fernea (Ed.), *Children in the Muslim Middle East*, Austin, TX: University of Texas Press, p. 5

62 B. Sherif (1999), "The Prayer of a Married Man Is Equal to Seven Prayers of a Single Man," *Journal of Family Issues,* vol. 20, n. 5, pp. 625, 628.

63 C. Rose and L. Boxberger (2000), *Life in Modern Cairo*, retrieved June 10, 2006, from the Center for Middle Eastern Studies Public Service MENIC, the University of Texas at Austin: inic.utexas.edu/menic/cairo/modern/life/life.html

mashrabiyya during these religious and social occasions. Instead, they are now perceived as active partners in receiving and welcoming guests, and the veils they wear in front of non-relative male guests (as stated by the *Qu'ran*) allows them to fulfill their role with comfort and confidence.

Last, veils can also serve as strategic means for disguising poverty and/or class status. It is a practical solution for lower middle class women who cannot afford to buy the fashionable clothes associated with an urban lifestyle. However, among lower middle class Egyptian women this reason is cited much less than religious obligation. The same is true with a growing number of middle and upper-class women who are adopting the veil.[64]

3-1-3 *Mashrabiyya* Appropriateness to the New Veiling

Aspects of contemporary veiling practices that lead many scholars to describe them as the "new veiling" present problems for using *mashrabiyyas* in Cairene homes. Perhaps foremost is the desire of women to have fewer hindrances when engaging in such simple activities as hanging the wash and airing out bedding, monitoring the activities of children playing outside, calling out to vendors and negotiating prices, checking on the arrivals of husbands and children from work and school, saluting guests upon their arrival or departure, or simply gathering with their families on balconies to enjoy the evening coolness while talking or eating (**Fig.72**).[65] Therefore, for *mashrabiyyas* to gain acceptance in Cairo, they must provide easier access to the "outside world" of balconies while still serving their veiling function.

---

64 Mule and Barthel, op cit., p. 329.

65 This later use of the balcony is popular in all Mediterranean countries of the Arab World, see B. Al-Abed (1990), *Modernity or Continuity, Notes on the Dialectic of Contemporary Arab Architecture*, paper presented at the The Delft International Working Seminar on Critical Regionalism, Context and Modernity, Delft, Holland, 13-15 June, p. 8. For the uses of the balcony, see also **1-2 Current Thresholds: Uses and Issues** and **Figures 28, 29**.

Second is the wide variation in adherence to veiling practices among Cairene women today—that is, varying degrees of modesty and concerns about privacy across and even within households. Concern about men's gazes differs according to a woman's age, time of day, and climatic conditions, among other factors. According to Farha Ghannam, an anthropologist, households in Cairo modify the interiors and façades of their apartment units to control what, when, and how the self is seen by others according to the requirements of the moment.[66] The traditional *mashrabiyya* is insufficiently flexible for fast adaptation to varying needs for openness—once the interval of interstices between wooden pieces is fixed, so is the degree of privacy.

Third, for wedding banquets, Ramadan dinners, and other social occasions, women still feel a need to wear veils in front of males they are not related to, thus making *mashrabiyya* veiling redundant. Privacy needs are less important than they once were during such events, with Cairenes now accustomed to opening their windows and balconies for ventilation purposes and using balconies as gathering spaces for talking, smoking, sitting, or spending a few moments separated from a crowded interior. Problems associated with heat and direct sunlight are reduced because many of the events described above are commonly held during evening hours. In order to be accepted, *mashrabiyyas* must therefore be designed to allow for fast removal or modification.

3-2 Cost

The *mashrabiyya* suffers from the negative image that it is difficult or too expensive to purchase. Since women belonging to all social classes in Cairo are

[66] F. Ghannam (2002), *Remaking the Modern: Space, Relocation and the Politics of Identity in a Global Cairo*, Berkeley: University of California Press, p. 96.

adopting the veil, the need of a veiling device is widespread. However, *mashrabiyyas* are not perceived as easy to obtain. Instead, they are viewed as decorative luxuries that only the rich can afford. This image must be changed in order for *mashrabiyyas* to be accepted as objects that are as common as *sheesh*.

The prohibitive cost of a *mashrabiyya* is due to the time-intensive skilled labor required to construct its pieces and to assemble them, the high cost of wood in Egypt, and the scarcity of craftsmen. For the most intricate *mashrabiyyas*, a single square yard of latticework may consist of as many as 2,000 pieces (1,655 pieces per square meter)[67] (**Fig.73**). Each individual piece is initially turned on a lathe and shaped using a chisel or gouge (**Figs. 73, 75**).[68] A craftsman must be very careful, since applying a tool for a split second too long can make a piece lop-sided or too thin; such skill is gained only through long periods of practice. The finished pieces are joined end-to-end, with one end containing a pin and the other a receiving hole. One piece can be joined to as many as eight other pieces. The final decorative lattice pattern is placed inside framed panels that form the *mashrabiyya*'s lower and upper sections. A single *mashrabiyya* takes a great deal of skill, effort, and time to create.

As stated in an earlier chapter, Egypt's lack of forest resources meant that the Ottomans had to supply wood from other parts of their empire to build *mashrabiyyas*. The country currently imports all of its wood, resulting in prices that are prohibitively high for most Egyptians. Examples include imported Russian whitewood (spruce) for $200 per cubic meter ($m^3$), Scandinavian whitewood for $214/$m^3$, Scandinavian redwood for $190-$200/m^3, low quality grades of Russian redwood for $180/$m^3$,

[67] J. Spencer (1992), "Mashrabeya: an Architectural Language," *Journal of Arts and the Islamic World*, vol. 21, p. 51.

[68] Turning is defined as artfully removing areas of wood by means of a lathe to create forms or designs; see ibid.

Romanian beech for $180-$300/m³, European (Romanian, Croatian, Bosnian) oak for $410-$430/m³ and American oak for $570-$860/m³. Add to these prices an 8% import tariff, 5% sales tax, and 3% customs service fee.[69]

The long-accepted story that the *mashrabiyya* was developed as a way to use scraps of wood has been discounted by most practitioners of the craft, since scraps are inadequate for making good *mashrabiyya* pieces. Well-made, long-lasting *mashrabiyyas* require high-quality wood that has the grain, size, and strength needed for turning.[70] Those craftsmen who are actively making *mashrabiyyas* today usually use beech or oak, both of which are very expensive for working class Egyptians.

The scarcity of craftsmen also drives up the cost of making *mashrabiyyas*. The afore-mentioned ban of *mashrabiyyas* in the 1840s reduced demand for the wood carvers, turners, inlayers, and joiners who built them. Those who make them today have been successful at adapting to a shrinking market by creating items for tourist consumption, villas, commercial centers, government buildings, hotels and so on.[71] Nowadays, making a simple *sheesh* requires the skills of a carpenter (*najjar*), whereas making a *mashrabiyya* requires the skills of a craftsman.

3-3 *Mashrabiyyas* and Air Pollution

Cairo has been identified as the world's second most polluted city (**Fig.76**)—an important consideration when designing a new *mashrabiyya*.[72] The five main

[69] S. Ibrahim (2005), *Egypt Solid Wood Products Annual 2005*, Gain Report, Cairo: USDA Foreign Agricultural Service, p. 4.
[70] Spencer, op cit., p. 51.
[71] Ibid., p. 52.
[72] According to the United Nations Environment Programme (UNEP) and World Health Organization (WHO), air pollution in downtown Cairo is 10 to 100 times higher than the level considered safe for inhabitants, see UNEP and WHO (1994), "Air Pollution in the World's Megacities," *Environment,* vol. 36, n. 2.

Fig.72. Some uses of the balcony. Left, bedclothes hanged out; right, a woman commonly wearing a scarf when hanging out the washing. (The author)

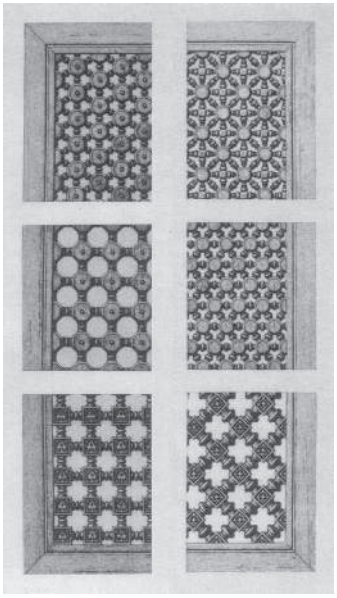


Fig.73. Different patterns of latticework. Four pieces inserted into a central one, six pieces inserted into a central one, and eight pieces inserted into a central one. (Prisse d'Avennes 1983)

Fig.74. A traditional craftsman turning manually a piece of wood. (*Description de l'Egypte:Planches, Etat Moderne II* 1823, plate *XV*)

Fig.75. The mechanized woodturning.

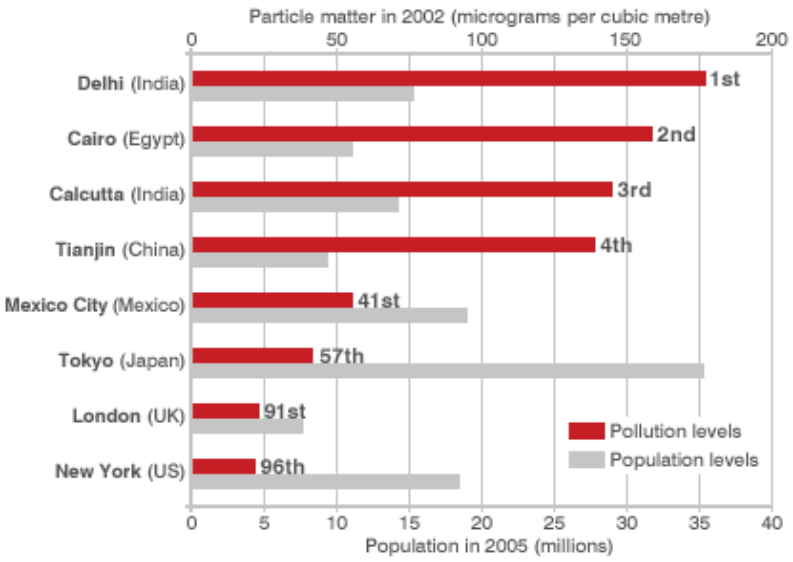


Fig.76. World's most polluted cities. (The World Bank)

contributors to pollution in Cairo are a) dust consisting of sand particles and dirt carried by the wind from the surrounding deserts;[73] b) lead from internal combustion engine exhaust;[74] c) cement dust and heavy metal compounds in emissions from cement and chemical factories and iron and steel smelters;[75] d) the burning of agricultural waste (especially rice and hay stalks), which has been identified as the major contributor to Cairo's infamous "black cloud;"[76] and e) a slow pollutant dispersion rate due to temperature, lack of rain, and lack of strong winds for most of the year.[77]

According to a restoration specialist named Mohamed Abdel Hadi, when the carbon dioxide, sulfur dioxide, and nitric oxide commonly found in air pollutants mix with the water content of wood, they respectively transform into carbonic, sulfuric, and nitric acids that gradually corrode a *mashrabiyya's* latticework. In addition, the accumulation of dust and soot in the intricate latticework creates a thick black layer that not only makes it difficult to clean, but also hides its original ornamental patterns[78] and reduces its evapo-transpiration capacity. The huge numbers of corners and horizontal surfaces of *mashrabiyya* pieces, their turned shapes, and their complex patterns provide many places for pollutants to gather. Philipp Speiser, member of the German Archaeological Institute, reports that during the restoration of the Palace of Emir Bashtak in Cairo, detailed wooden decorations were covered in thick layers of dust, and

---

73 Ibid., p. 40.
74 Ibid., p. 41.
75 Ibid.; A. El-Noshokaty (2002), Clearing the air: What's that acrid smell?, *Al-Ahram Weekly Online*, n. 575, retrieved, April 3, 2005, from http://weekly.ahram.org.eg/2002/575/sc4.htm
76 A heavy layer of smog that has been covering Cairo since 1998 during spring and summer. See M. Bakr (2004), Working for the Environment, *Al-Ahram Weekly Online*, n. 694, retrieved April 3, 2005, from http://weekly.ahram.org.eg/2004/694/sc5.htm; M.A. EL-Shahawy and A.F. Hanna (2003), "Meteorological Conditions Leading to Air-pollution Episodes in Greater Cairo City (Egypt)," *European Geophysical Society,* vol. 5, n. 00103.
77 UNEP and WHO, op cit., pp. 40-41.
78 M. Abdel Hadi. (2000), "Wad' Al-Mashrabiyya wa Tarmimoha," in Nazih (Ed.), op cit., p. 160.

workers had to spend long hours cleaning those intricate parts that could be preserved and replacing the ones that had already been destroyed.[79]

3-4 Legislative/Urban/Architectural Issues

During periods of strict Islamic control, building and urban design guidelines followed Islamic law (*Shari'a*). Among religious principles are the concepts of *harm*—that is, individuals are allowed to exercise their full rights providing their decisions or actions do not cause harm to others—and the *privacy* of clothing, home, and communication. Islam dictates that one must respect the private domains of others and not invade them.[80] The idea of invasion includes being able to see into a household from a building across the way; such visual intrusion is considered harmful, especially when women can be viewed by male strangers. *Shari'a* thus has very specific rules for the size, height, and location of building openings relative to the street and opposite houses[81] (**Figs. 77**, **78**, **79**).

In the past, potential male viewers stood or sat at openings or *mashrabiyyas* in an opposite building, or on the street (**Fig. 80**). To look across or down into a *haramlik* was made impossible by *Shari'a* rules for the above-eye level sill of a window (**Fig. 78**). Looking up from lower levels toward a *harem* was simply not done, especially in front of passersby, since traditional Muslim rules designated *harems* as forbidden sacred areas;[82] looking at *harem* occupants was also considered a major insult.[83]

---

79 P. Speiser (1991), "La Restauration du Palais Bashtak," in *l'Habitat Traditionnel dans les Pays Musulmans autour de la Mediterranee* (Vol. 3), Cairo: Institut Francais d' Archeologie Orientale, p. 818, hereafter, *HI*.

80 B.S. Hakim (1988), *Arabic-Islamic Cities: Building and Planning Principles*, London and New York: Kegan Paul International, pp.15, 19-20.

81 See Hakim, op. cit.; L. Fernandes (1990), "Habitat et Prescription Legales," in *HT* (vol. 2), op. cit., p. 422.

82 G. Petherbridge (1995), "The House and Society," in G. Michell (Ed.), *Architecture of the Islamic World*, London: Thames and Hudson, p. 196

83 D.F. Beck (1957), "The Changing Moslem Family of the Middle East," *Marriage and Family Living*, vol. 19, n. 4, p. 341. The word *harem* is the plural of *hurma* (woman) and shares the same linguistic root as the word *haram*,

Fig.77. Concept of the *fina'* according to the *Shari'a*. In *al-tariq al 'amm*, the *fina'* extends from the entry door to a distance not exceeding half the width of the street. In a *tariq salik or zuqaq nafid* and a *zuqaq ghayr nafid*, the *fina'* covers vertically the whole area abutting the house's external wall and usually extending to the whole width of the street. (Al-Hathloul 1981)

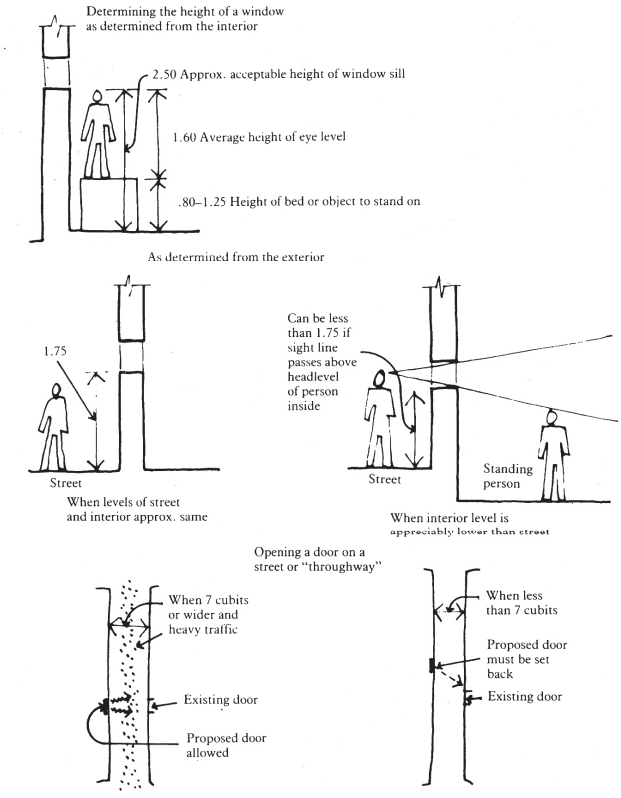


Fig.78. Regulations on doors and windows as decided by the *Shari'a*. (Hakim 1988, pp. 34, 35)

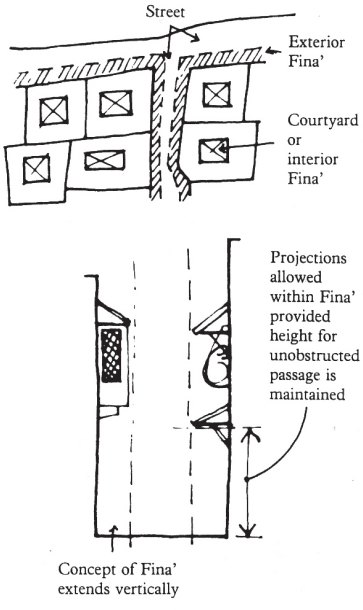


Fig.79. Regulations on the projections. They were allowed within once *fina'*. (Hakim 1988, p. 29)

Regardless of position (above, below, or across), if a male tried to look into a *harem* from behind his own *mashrabiyya*, the position of the *harem*'s *mashrabiyya,* the small size of the moveable windows, and their relative position to each completely blocked his view. A separate *Shari'a* rule made it necessary to get permission from neighbors across the way before building or installing a *mashrabiyya*, since it might allow for looking into another household without its knowledge.[84] In short, *Shari'a* strictly forbade all gazing into others' homes; any potential viewpoint had to be corrected or removed.[85]

In contrast, current Egyptian building codes[86] do not include rules based on *harm* or *privacy* principles, meaning that currently there are no laws or regulations on the positions of openings relative to one another. Instead, laws controlling the construction and position of openings, projections, and parapets only consider safety, lighting, and ventilation. Examples of current regulations are as follows:

> The area of the ventilation and natural light opening shall not, in any case whatsoever, be smaller than specified below:
> Eight percent of the surface area of each room or office, with a minimum of one square meter. Ten percent of the surface area of each utility space (bathroom, with the area of each opening determined by measuring the distances between the facets of the building. If there are several openings, the area of each ventilation and natural light opening shall be determined by calculating the total areas of the openings, on condition that the area of each opening is utilized in the building.[87]

---

which means "holy, sacred, and forbidden," see Petherbridge, op cit.; B. Kenzari and E. Yasser (2003), "The Ambiguous Veil: on Trancparency, the Mashrabiy'ya, and Architecture," *Journal of Architectural Education*, vol. 56, n. 4, p. 19.

84 Fernandes, op. cit.

85 Hakim, op cit., p. 33.

86 Originated in 1976 and adjusted in 1996 (with some additions in 1997 and 1998).

87 F. Ahmad and A. Sha'ban (2000), *Law 106 of 1976 on Directing and Regulating Building Works as Amended by Law 101 of 1996*, Cairo: Al Hai'a al-'Ama li-Sho'oun al-Matabi' al-'amiriyya, p. 63.

> The maximum projection of a hanging balcony or tower may not exceed 10% and 5%, respectively, of the width of the road, and, in either case, it may not exceed 1.25 m.[88]
> Balconies on the first eight floors above street level shall have a parapet of no less than 0.90m high. The height of the parapet shall be increased by 10 cm for each of the floors above the eighth, to a maximum of 1.4 m.[89]

In light of these laws, the traditional *mashrabiyya* design would not work properly in modern multistory apartments whose occupants are concerned about privacy or veiling issues. As shown in **Figure 81**, the flat windows and wide latticework of the upper sections of traditional *mashrabiyyas* would allow neighbors to easily look into an apartment's interior space, and tightening the latticework would interfere with lighting and airflow. Second, in order to allow women to perform their daily outdoor activities, the windows that open upward to hide them would have to be enlarged, which would expose them to the gazes of neighbors living directly across from or below them as well as passersby who—unlike those in the past—are more likely to look up.

Street width is another factor that will influence the utility of *mashrabiyyas* in modern-day Cairo. The Ottoman occupiers applied *Shari'a* when constructing streets: main streets (*al-tariq al 'amm*) were more than five meters wide, secondary streets (*tariq salik or zuqaq nafid*) less than five meters, and cul-de-sacs (*zuqaq ghayr nafid*) approximately two meters. According to these standards, a *mashrabiyya*'s overhang blocked views through its upper (wide) lattices, especially along cul-de-sacs. If applied to today's Cairene streets,[90] these overhangs would have to be extended to unrealistic

[88] Ibid., p. 70.
[89] Ibid., p. 48.
[90] The streets' widths followed when planning a residential neighborhood in a new city around Cairo are also of three levels; they are however much larger; for example, the average of main streets in the new cities around Cairo are 21-25 meters wide, distributive streets are 15-18 meters wide, and local streets are 6-10 meters wide. For abundant information on the urban planning and design of several new cities around Cairo, see N. Abdelkader and S. Ettouny (1997), *Ishkaliyyat al-Naseeg wal Tabi'*, Cairo: Al 'Arabi lel Nashr wal Tawzee'.

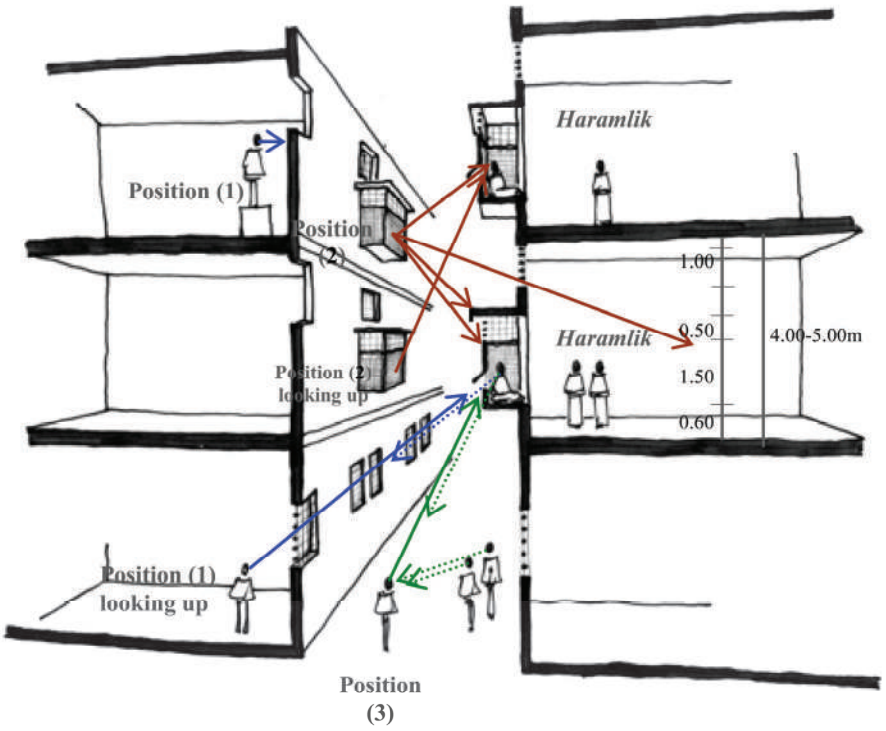


Fig.80. An illustration suggesting three possible positions of a person looking on a *haramlik* facing his house in a 5m width Cairene traditional street (a *zuqaq*). From position (1), he is unable to look because the opening's sill is around 2.5m as stated by the *Shari'a*. From position (1) or (3), looking up was unacceptable in traditional Muslim societies and the windows were too small to provide a clear view. From position (2), the locations of the *mashrabiyyas* relative to one another, the street's width, the overhang, the ceiling height, and the tiny sizes of the *mashrabiyya*'s windows prevented or provided an unclear view inside the *haramlik*.

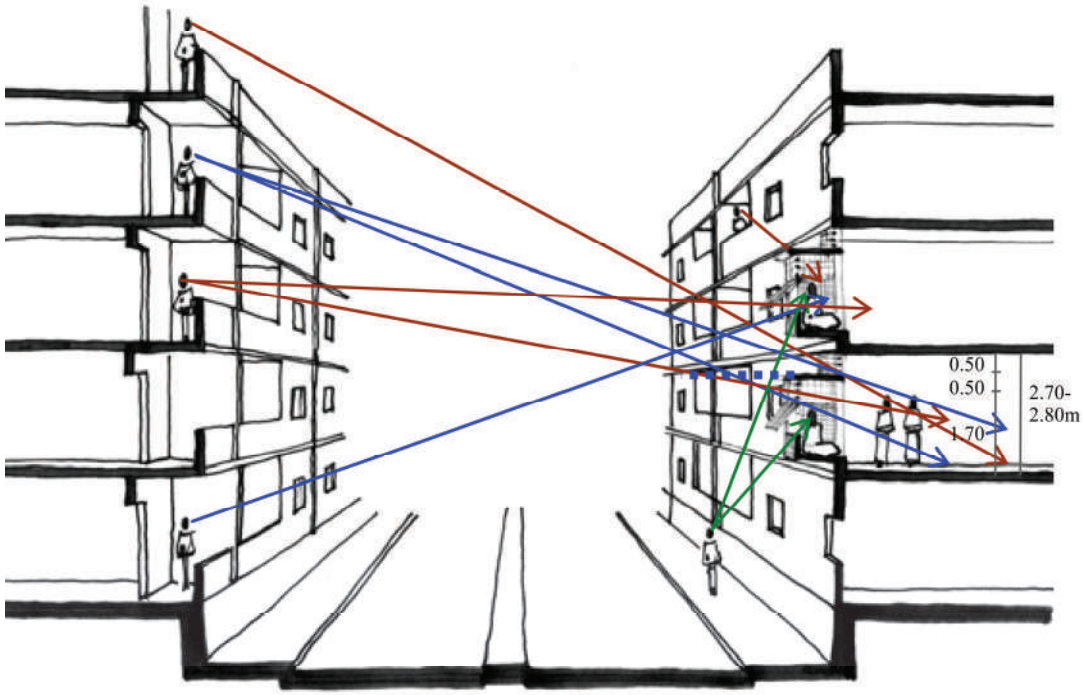


Fig.81. An illustration showing how a room in a modern apartment would be easily intruded even if applying the traditional *mashrabiyya*. The parapets' heights, the street's width, the ceiling height, the location of the opposite openings relative to the *mashrabiyya*, the fact that in modern society looking up at a woman happens frequently, all this contributes to the problem. In addition, the ceiling height will considerably reduce the *mashrabiyya*'s parts; its section below eyelevel will be 1.70-1.80m high, its upper section and the window above will be 0.50m high each.

proportions to block the gazes of neighbors on higher floors across the way (**Fig.81**).

Ceiling heights—much lower than those in the past—also present several problems. The high ceilings of traditional homes insured that when looking through the flat window above the overhang, a neighbor would only see the space above a woman's head (**Fig.80**). With internal heights of modern rooms ranging between 2.70 and 2.80 meters,[91] much more would be viewable through that window if a traditional *mashrabiyya* were installed (**Fig.81**). Furthermore, the individual parts of a traditional *mashrabiyya* would have to be reduced considerably to match the smaller dimensions of today's apartments—perhaps requiring the elimination of the window above the overhang, whose purpose is to ensure adequate airflow and light.

Finally, a new *mashrabiyya* design needs to take into consideration changing uses of internal space in Cairene homes. *Mashrabiyyas* were previously used for long hours of watching and relaxing, and their floors were often raised and filled with cushions. This would be impractical for modern urban households that are smaller and whose interior spaces may serve multiple purposes, including enjoying the various social uses of balconies.

3-5 Conclusions

1) In Cairene homes, the role of the modern veiled woman has changed from passive onlooker to active partner, making the traditional *mashrabiyya's* fixed panels and small windows unsuitable because they are hindrances to necessary balcony activities. Enlarging windows that open upward (providing access while hiding women from view) is a potential solution, but it may not ensure protection from

[91] Ahmad and Sha'ban (2000), op cit., p. 49.

the gazes of neighbors who live across the way (at the same level or lower) and passersby.

2) Since women with various degrees of concern for modesty and veiling often live in the same neighborhood, building, or household, any contemporary *mashrabiyya* design must be flexible to meet their separate needs for privacy. This characteristic is not found in the traditional *mashrabiyyas*: since intervals between wooden pieces are fixed, so is the degree of privacy. An important question is how to make these intervals adjustable.

3) Women are no longer forbidden to mingle with men during frequent religious and social events held in Cairene homes. *Mashrabiyya* veiling is therefore considered redundant and unnecessary because women either wear veils in front of non-relative males or simply do not follow the religious-based practice. Thus, Egyptians generally open their modern balconies and windows for ventilation and socialization, meaning that a modern *mashrabiyya* design must allow for quick and easy modification to allow for balcony access and openness.

4) Veils have been adopted by women in all urban classes, therefore a new version of the *mashrabiyya* must be made available to all households (as *sheesh* currently are) and not restricted to wealthy households.

5) The high cost of a new *mashrabiyya* is the result of the time-intensive skilled labor required to build and assemble one, the high cost of imported wood in Egypt, and the scarcity of craftsmen. It is therefore necessary to simplify the *mashrabiyya* design to make it easy for common *najjareen* (carpenters) as well as

highly skilled craftsmen to construct, as is the case with *sheesh*. In addition, an alternative building material is required to keep costs low. But in order to preserve the *mashrabiyya*'s cooling capabilities, an organic material that has the same evapo-transpiration capacity as wood is required.

6) Cairo's dusty and polluted air is capable of corroding the intricate wood latticework of *mashrabiyyas*, thereby reducing their evapo-transpiration capacities, making them difficult to clean, and covering their ornamental characteristics. *Mashrabiyya* latticework must therefore be simplified in a way that reduces the number of corners and horizontal surfaces on which pollutants can gather.

7) In light of Egypt's and Cairo's modern building laws, widths of modern streets, and apartment ceiling heights, the upper sections of traditional *mashrabiyyas* (with their wide latticework and flat windows above their overhangs) cannot insure privacy. On the other hand, reintroducing the *Shari'a* principles of *harm* and *privacy* as guides for regulating openings on secular building laws is both far-fetched and incomplete, since the Egyptian urban context has changed considerably since past Islamic periods. Buildings are now taller, streets wider, and apartment ceilings lower. The upper sections and flat windows of traditional *mashrabiyyas* compensated for decreased light and airflow caused by the tight latticework of the lower sections. Any new design must address this conflict between social and environmental needs.

8) The larger size of traditional *mashrabiyya* sections makes them incompatible with the low ceiling heights of modern apartments. Since the window above the traditional overhang helped ventilate and light taller and larger interior spaces, and

since similar functions can be served by the upper section of a *mashrabiyya*, it is logical to sacrifice the upper window in any new *mashrabiyya* design.

9) The raised floors that accompanied the traditional *mashrabiyya* are inappropriate to modern needs for spatial flexibility and access to balconies for performing household chores and holding social events.

CHAPTER 4

SCREENS OUTSIDE THE ARAB WORLD: THE JAPANESE *MACHIYA NO KŌSHI*

The Japanese latticework called *kōshi* was commonly applied on three types of buildings: samurai residences, shrines and temples, and townhouses called *machiya*.[1] At one time *machiya* served as residences for merchants and artisans in urban area,[2] since they combined residential functions with retail or workshop space.[3] *Machiya* latticework—*machiya no kōshi*—is found in dense urban contexts and has social and environmental functions similar to those of a *mashrabiyya*, but the Japanese version is much simpler and more flexible. In this chapter I will propose incorporating *kōshi* design elements into the *mashrabiyya* as a practical solution to the problems described in the preceding chapter. After defining and describing *kōshi* in the following section, I will examine the historical factors behind its emergence in Japanese cities, analyze its various forms and functions, and examine how its design elements might be used to address *mashrabiyya*-related issues in Cairo.

4-1 Meaning of *Kōshi*

According to the Tokyo-published Encyclopedia of Architecture and Building (EAB), the term *kōshi* generally means "wood, bamboo, or iron pieces arranged so they cross one another"—that is, "latticework." *Kōshi* and *shitomi* are both used as names for a Japanese version of hinged latticed shutters.[4] The term *kōshi* is often confused with *renji*, the name of an older latticework style that first appeared in temples in the late sixth century and which were later used on *machiya*.[5] According to Susumi Hiyuga,

---

1 N. Nagai. (1996), "Machiya no kōshi," in Wafūkenchikusha (Ed.), *Kōshi no omotegamae*, Kyoto: Gakugei shuppansha, p. 5.

2 T. Nakagawa (2005), *The Japanese House: in Space, Memory, and Language*, Tokyo: International House of Japan, p. 251.

3 M.N. Parent. (2003), "Machiya," in *JAANUS*, retrieved July 22, 2005, from Japanese Architecture and Art Net Users System homepage: www.aisf.or.jp/%7Ejaanus/deta/m/machiya.htm

4 S. Aoki et al. (Ed.) (1993), *Encyclopedia of Architecture and Building (Kenchiku daijiten)*, Tokyo: Shōkokusha, p. 523, hereafter *EAB*.

5 A. Nakamura (1997), "Chronological Table," in K. Matsuki, et al. (Eds.), *The Form of Japanese Windows*, Tokyo: Itagarasu kyōkai, p. 186.

professor of history of architecture in Kyoto Institute of Technology, *kōshi* latticework consists of horizontal and vertical mullions regularly arranged in squares and *renji* refers to latticework in which the vertical mullions outnumber the horizontal, resulting in a pattern where the intervals between horizontal mullions are larger than those between the vertical.[6]

Norio Nagai, a specialist in the carpentry of traditional homes, explains that the Chinese characters for *kōshi* (格子, originally 隔子) can be literally translated as "separating thin mullions," implying the function of the latticework. The Chinese characters for the word *renji* (連子, originally *reishi* 櫺子) mean "square wooden mullions"—representing the form of the latticework. Therefore they should not be considered different types. He also suggests that the word *kōshi* should be applied to all types of latticework including the *renji*, which represents one of many *kōshi* forms.[7] Today the word *renji* is more commonly used when referring to latticework with vertical bars arranged in wide intervals.[8]

4-2 *Machiya no Kōshi*: From Protection to Privacy

Machiya first appeared in Kyoto during the Heian period (794-1192).[9] Heian (the ancient name of present-day Kyoto) was the Japanese capital and therefore a major political, economic, cultural, and religious center. Its inhabitants included the imperial court, members of the aristocracy, bureaucrats, merchants, and craftsmen. The aristocracy adopted a style called *shinden zukuri* ("palatial style") for their residences[10]

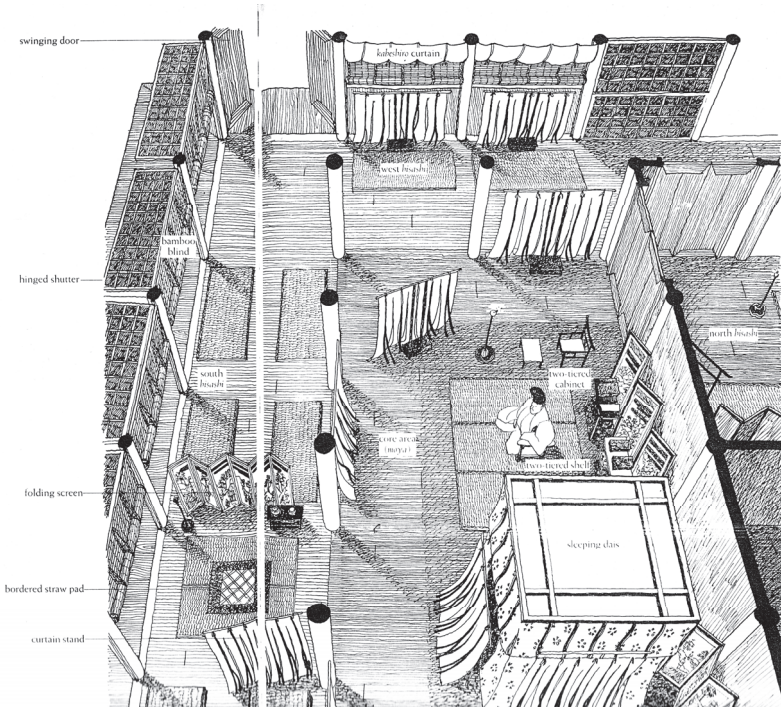
6 S. Hiyuga (1988), *Monogatari mono no kenchikushi: Mado no hanashi*, Tokyo: Kashima shuppankai, pp. 9-11.
7 Nagai, op. cit, p. 3.
8 Nakagawa, op cit., p. 58.
9 U. Nishiyama (1975), *Nihon no sumai*, Tokyo: Keisō shobō, p. 19.
10 The process whereby this style developed is not clear; see K. Inaba and S. Nakayama (2000), *Japanese Homes and Lifestyles: An Illustrated Journey through History*, Tokyo, New York, London: Kodansha International, p. 38.

that entailed *shitomi*—wooden hinged and latticed shutters with squared patterns installed to fill the entire space between the building's pillars.

The weight and awkwardness of the *shitomi* influenced the development of the *hajitomi*, a two-part latticed shutter[11] whose upper section could be lifted while the lower part stayed in place. When closed, these shutters offered protection from rain and wind. When opened upward, the upper section blocked the sun while allowing members of the household to enjoy their gardens (**Fig.82**).[12] The popularity of *hajitomi* grew during the ninth century[13]. Toward the end of the Heian period, merchants and craftsmen who did work for and supplied goods to tax-free estates owned by aristocrats, shrines, and temples formed guilds. In return for paying taxes to estate owners (their patrons) living in or near Kyoto, Nara, and Kamakura, they were given local monopoly privileges and exemptions from custom duties.[14] These merchants and craftsmen started adding *hajitomi* shutters and *hajitomi* variations to their *machiya*.

Merchants and craftsmen reached their highest levels of prosperity during the thirteenth and fourteenth centuries of Japan's medieval period (1192-1603), during which political power was transferred from the imperial court to the military. The Kamakura period (1192-1333) is so named because the national capital was moved from Kyoto to Kamakura (in Kanagawa prefecture). However, Kyoto maintained its position as the most important economic and cultural center, and its resident merchants and craftsmen continued to build their *machiya*.[15] Kamakura period *machiya* consisted of two to three bays with a dirt-floor working section or passageway, a retail shop or

[11] Parent, "Shitomido," in *JAANUS*, retrieved July 21, 2005, from www.aisf.or.jp/~jaanus/deta/s/shitomido.htm
[12] Aoki et al., op cit., pp. 718-719; Inaba and Nakayama, op. cit, pp. 38-39.
[13] Nakamura, op cit, p. 188.
[14] Inaba and Nakayama, op. cit, p. 48.
[15] Inaba and Nakayama, op. cit, pp. 43-44.



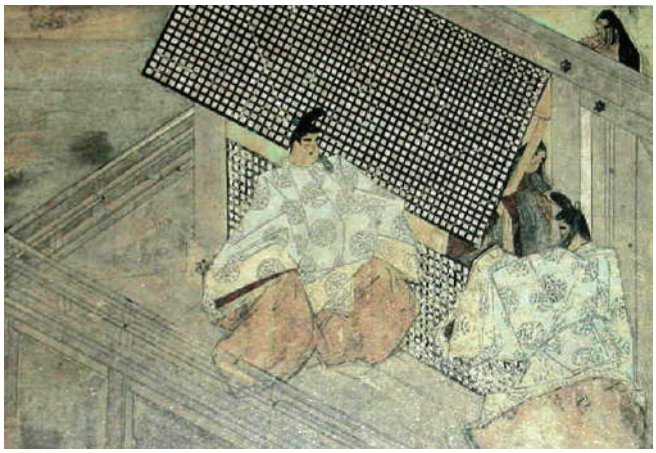


Fig.82. *Shitomi* and *hajitomi* of the *shinden zukuri*, the "palacial style" residences of the aristocrats during the Heian period (794-1192). Above, reconstruction by Inaba and Nakayama 2000, p.38. Below, from the picture scroll of *murasakishikibu nikki emaki*.

workshop, and a living area in back.[16] Up to the fourteenth century, *hajitomi* were used almost exclusively on the front sides of houses (*minka*) (**Fig.83**).[17] However, military activity during the second half of the medieval period led to the emergence of a new latticework style.

In the first year of the Muromachi period (1333-1573), two vassals rebelled against and overthrew the Kamakura *bakufu* ("shogunate"). Two periods of instability followed: the Northern and Southern Courts period (1336-1392) and the Warring States period (1467-1573).[18] The chronic warfare that plagued Kyoto (as well as the rest of the country) motivated townspeople to secure their *machiya* from the constant movement of armed strangers into their communities.[19] They started applying a sturdy protective lattice named *dai-gōshi* ("stationary lattice") consisting of thick bars behind which a bamboo curtain (*sudare*) was hung in the front of their *machiya*[20] (**Figs.84, 85**). The *dai-gōshi* served as a barrier while the *sudare* allowed the occupants to remain unseen while they observed strangers entering the city.[21] The combination of *dai-gōshi* and *sudare* is thought to be the forerunner of the fine Kyoto latticework called *Kyō-gōshi* that emerged in later centuries.[22] During the sixteenth century, merchants started the practice of displaying their goods on benches called *misetana* that they put in front of their *dai-gōshi*. The *misetana* also served as a sitting bench for customers.[23] During the

[16] Ibid., p. 50.
[17] According to the picture scroll of *Shigisan engi emaki*, explained by Hiyuga, op cit., p. 94.
[18] During the first period (*nanbokuchō jidai*), two rival imperial lines fought for legitimacy; during the later period (*sengoku jidai*), provincial worriers fought against one another and against the *Muromachi bakufu* for political domination; see Inaba and Nakayama, op. cit, p. 43.
[19] M.E. Berry (1994), *The Culture of Civil War in Kyoto*, Berkeley: University of California Press, pp. 1-6, 214-218.
[20] According to the drawings in the folding screen *Rakuchū rakugai zubiyōfu*, explained by Hiyuga, op cit., p. 13; see also Nishiyama, op cit., p. 26.
[21] Hiyuga, op cit., p. 102.
[22] Ibid.
[23] Nishiyama, op cit., p. 21.

subsequent Edo period the shelf/bench was called *agemise*.[24]

Japan was finally unified during the Edo period (1603-1867, also known as the Early Modern period). The Tokugawa *bakufu* established a system whereby it ruled the country with support from feudal lords known as *daimyo*. It was during this time that Edo—today's Tokyo—became the center of power. The Tokugawa *bakufu* divided the society into four classes: *samurai* (military class), farmers, craftsmen, and merchants. Under a system called *sankin-kōtai*, *daimyo* and their samurai maintained dual living quarters in Edo and their own territories, and were required to spend alternate years living in each location.[25] Merchants who served the samurai class set up their own quarters in Edo, and merchants who were permanent Edo residents competed with the outsiders.[26]

Up to the mid-seventeenth century, merchants and craftsmen installed *dai-gōshi* or *shitomi* on their *machiya*.[27] The former were identical to those used during the medieval periods and the latter were adaptations of the *hajitomi*. As shown in **Figure 86**, the upper (*shitomi*) section of a *hajitomi* could be lifted outward and the lower section (*agemise*) served as an extension of the shop space for displaying goods, extra working space, or a space for greeting special customers. At night, a *machiya* was closed up by lowering the *shitomi* and lifting the *agemise*.[28]

Starting in the middle of the Edo period, the merchant class gained economic

---

[24] Called *battarishōgi* since the Meiji period, see Nishiyama, op cit., p. 26.
[25] Inaba and Nakayama, op. cit., pp. 59-60.
[26] Ibid., p. 60.
[27] Twenty-five *machiya* of the first half of the 17th century were illustrated in the *Shichijūichiban shokunin uta awase shokunin zukushi e*. In 1665, about eighty *machiya* were shown in the kyoto's guide book (*Kyōto annaisho*). They had the previous *shitomi* / *agemise* and the *dai-gōshi*. Fine latticework could not yet be found; see Hiyuga, op cit., p. 99.
[28] Hiyuga, op cit., p. 95.

Fig.83. Latticed shutters opening upward in the houses of the twelve century. (Chino 1991, p. 43)

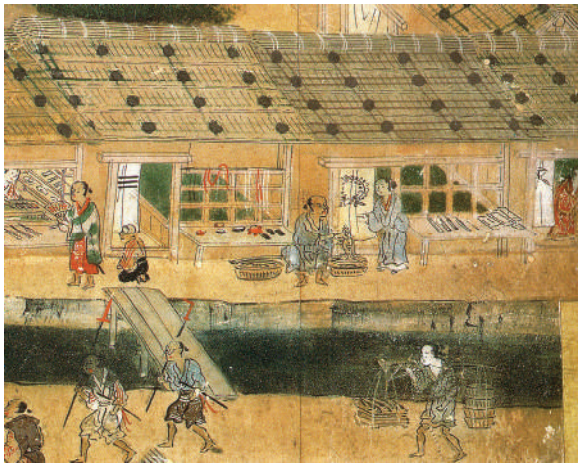


Fig.84. *Machiya* with sturdy lattice during the Warring States period (1467-1573), first half of the sixteenth century. Okudaira 1991, p. 11)

Fig.85. Kometani House, 18th c. Imai district, Nara pref. Imai was originally a fortified area built to withstand wars and riots of late-medieval periods. The sturdy design of this house is typical of the district. (Ando 1997, p. 98)

Fig.86. Frontage of a cypress wood craftsman's *machiya* (1624-1643). (Higuchi and Ishiyama 1977, p. 166)

dominance over the samurai class as the *sankin-kōtai* system saddled the latter with huge expenses. The populations of Japanese cities increased rapidly during the second half of the Edo period. Large *machiya* were built along main streets, and side streets were full of smaller *machiya* for coopers, mat makers, day laborers, and shopkeepers who sold sundries, sweets, and other inexpensive items.[29] Expanding commerce, especially in Kyōto, led to a sharp increase in the number of *machiya*, which in turn led to the emergence of the style known as *Kyō-gōshi* ("Kyoto latticework") toward the end of the seventeenth century. Initially the word referred to the wooden bars installed in front of windows,[30] but was later used to describe the fine style of latticework that spread throughout Japan.[31]

Three other factors contributed in the evolution of the finer *Kyō-gōshi* from its thicker *dai-gōshi* predecessor. The first was advancements in architectural technologies and carpentry tools.[32] The second was the introduction of roof tiling toward the end of the seventeenth century, which reduced load distribution and made roof structures lighter. Accordingly, it was no longer necessary to install supporting structural lattices below.[33] Third, the severe circumstances of the medieval period created a strong need for security and fear of strangers that translated into a need for privacy during the Edo period.[34] When installed at the boundary between a *machiya* interior and the street, *kōshi* ensured ventilation and light while allowing occupants to look over their customers and to watch and hear street activity without being seen.[35]

[29] Inaba and Nakayama, op. cit, p. 75.
[30] Hiyuga, op cit., p. 98.
[31] Ibid., p. 99.
[32] Ibid., p. 100.
[33] Ibid.
[34] K. Ando (1997), "Fūdo to Kurashi no Katachi," in Matsuki, op cit., p. 100.
[35] Nakagawa, op cit., p. 53.

4-3 *Kōshi* Forms and Functions

Kyō-gōshi latticework evolved into many different forms during the second half of the Edo period, and *machiya no kōshi* became a familiar feature of Japanese *machi-nami* ("urban streetscapes")[36] (**Figs.87, 88**). To the untrained eye, all *kōshi* appear to be identical, but Japanese recognize differences in *kōshi* piece arrangements, forms, and names associated with specific cities and districts as well as with specific *machiya* business types and structures.

4-3-1 *Machiya* Structure

The word *machiya* can be used to describe either businesses with entrances on main streets or backstreet work and living spaces for small merchants and craftsmen. In the past a typical *machiya* had a dirt-floor passageway (*tōriniwa*) on one side and two rows of rooms on the other. The rooms included a shop facing the street called *mise* and an inner shop called *okumise* (**Figs.89, 90**).[37] The main entrance opened onto a dirt-floor yard next to the shop. Toward the back were entrances to the house (*genkan*), kitchen (*daidoko*), living room (*nakanoma*), a reception room (*zashiki*), and a privy (*benjo*). A large *machiya* might have a storehouse, garden, and tearoom adjacent to the *zashiki*. The *tōriniwa*, which gave direct access from the street to the rear, was used for household purposes and storage spaces linked to the shop or shops in front. It also allowed for direct access to the privy in the back.[38]

A typical Kyoto *machiya* contained latticework along the outside of the shop, a latticed door at the entrance, and an *agemise*.[39] While all *machiya* initially consisted of

[36] Nagai, op cit., p. 1.
[37] Nishiyama, op cit., pp. 19-54
[38] Ibid., p. 29.
[39] Ibid., pp. 26-27.

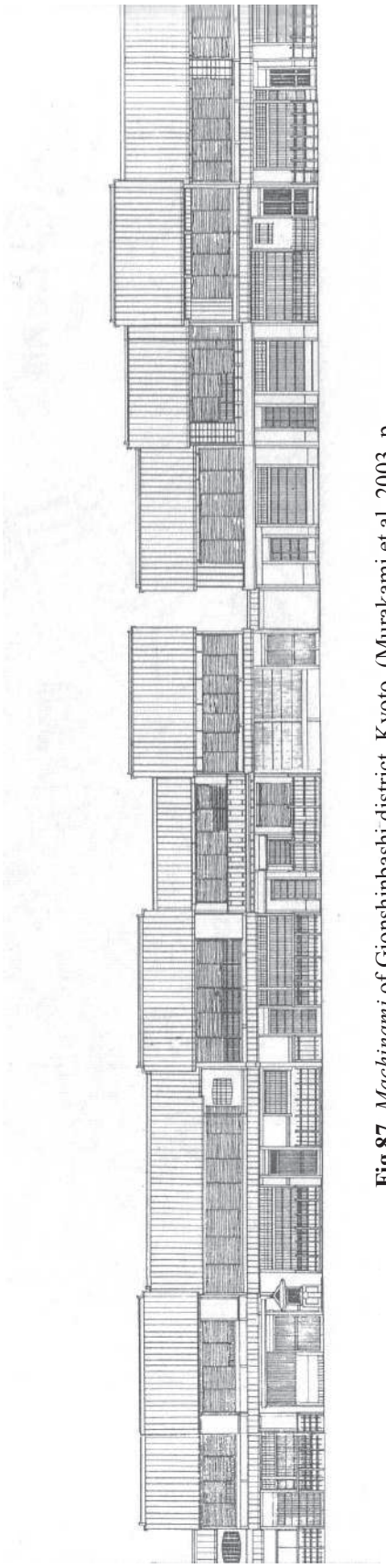


Fig.87. *Machinami* of Gionshinbashi district, Kyoto. (Murakami et al. 2003, p. 536-537)

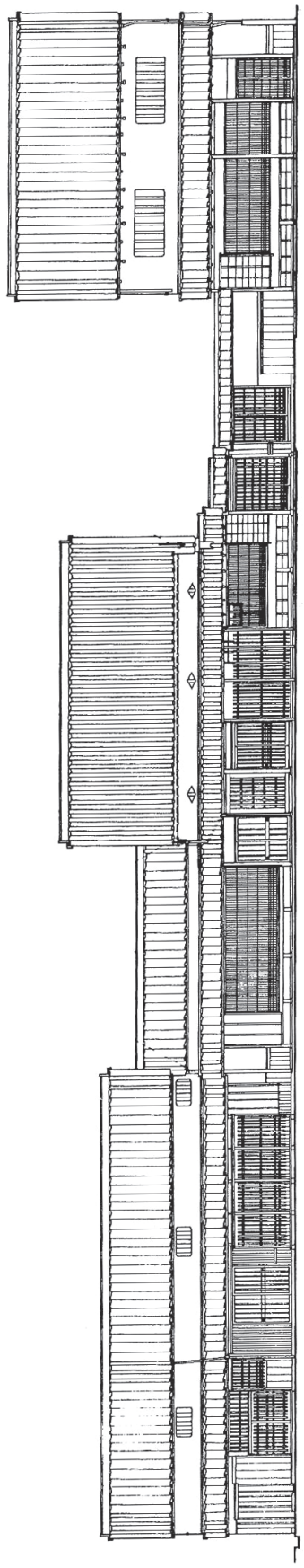
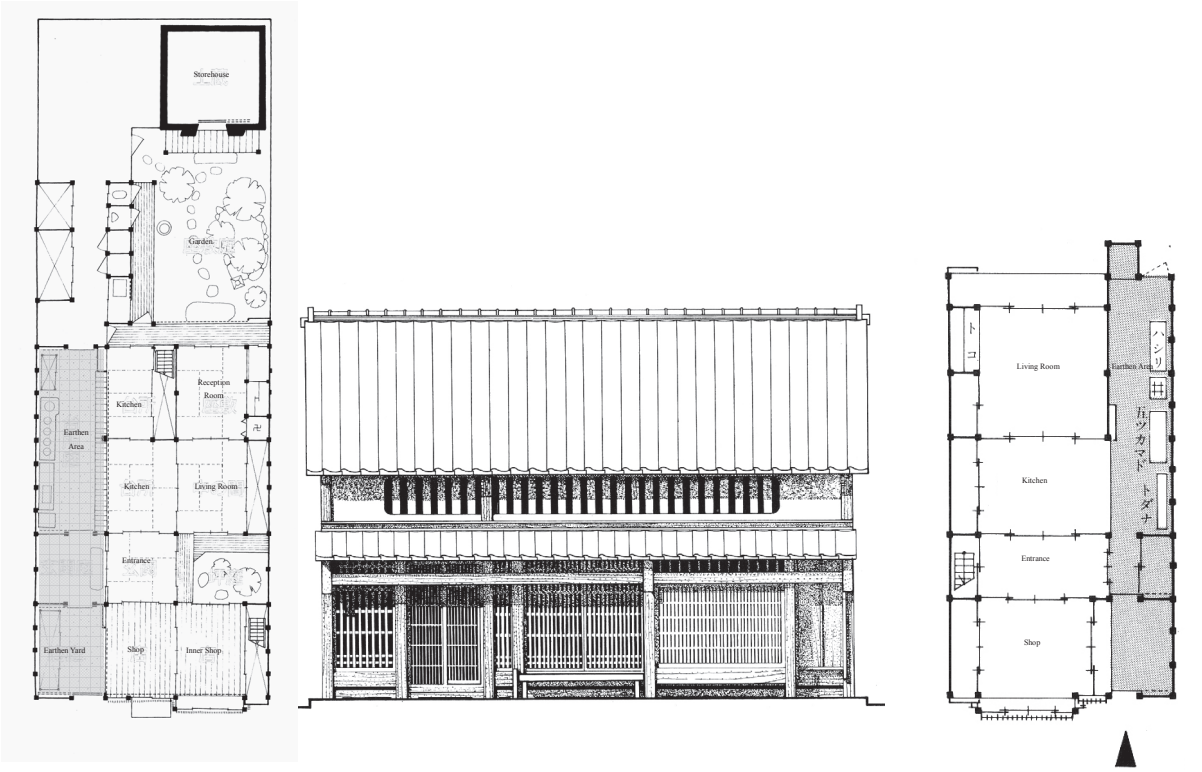


Fig.88. *Machinami* of Imai district, Nara pref. (Murakami et al. 2004, p. 150)



Kawakita House. Left, plan. (Kanazaki and Shintani, 1998, p. 4)
Right, façade. (Suzuki 1980, p. 141)

Plan of Kuriyamariichirō House. (Suzuki 1980, p. 141)

Fig.89. Typical *machiya* in Kyoto.

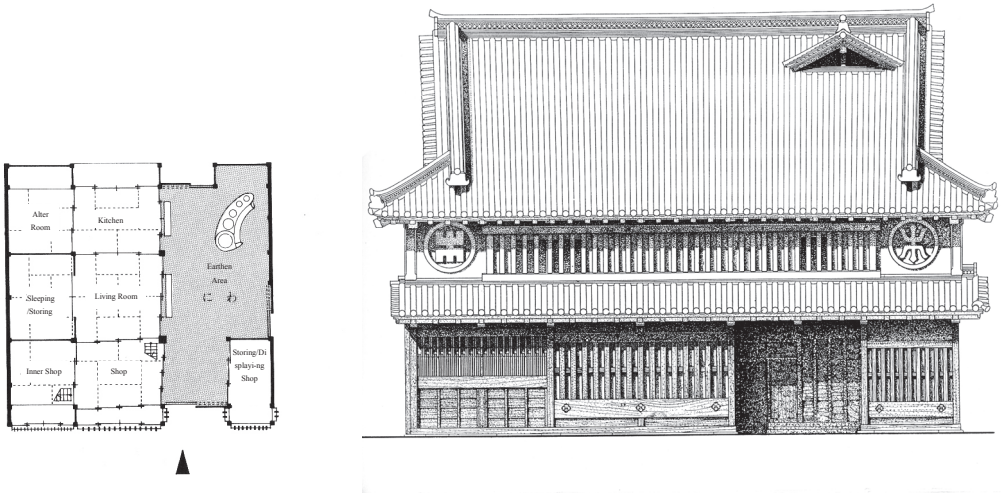


Fig.90. A Typical *machiya* in Imai (Nara Pref.). Toyoda House, Plan and façade (Suzuki 1980, p. 140)

one floor only, second stories were added as their numbers grew and space became scarce. At first, the two-story versions consisted of work and living spaces in the ground floor and a low first floor (*zushi-nikai*) that was primarily used for storage.[40] Ventilation and light for the first floor were provided via a *kōshi* called *mushiko* (*mushiko mado*) (**Figs.88, 89, 90**).[41] Over time, the *zushi-nikai* developed into a regular first floor (**fig. 87**).[42]

4-3-2 *Kōshi* Categories

According to the literature on *kōshi*,[43] the various forms can be divided into four categories:

1) The merchant's business. For example, the latticework on the *machiya* inhabited by sake, rice, charcoal, bran, and thread dealers are respectively called, *sakaya-gōshi*, *komeya-gōshi*, *sumiya-gōshi*, *fuya-gōshi* and *itoya-gōshi*. The latticework on teahouses, haberdasheries, and "non-business" *machiya* are called *chaya-gōshi*, *komamonoya-gōshi* and *shimotaya-gōshi*. In each case the design was adapted to the use of the store.
2) The city or district the *machiya* is located. Thus, the typical latticework in Kyoto is called *kyō-gōshi*. Other examples are *Nara-gōshi*, *Takayama-gōshi*, *Takehara-gōshi*, *Yoshiwara-gōshi*, *Sakaido-gōshi* and *Kurashiki-gōshi*.
3) The architectural design of the *koshi*. In this category the names are descriptive and given according to the arrangement, number, size, or height of its mullions;

---

[40] Inaba and Nakayama, op. cit, p. 78.
[41] Nishiyama, op cit., p. 27.
[42] Ibid.
[43] Hiyuga, op cit.; Nagai, op cit., pp. 3-7; Yasui (1996), "Kyōto no omotegamae to kōshi," in Shingakugei Wafū Kenchiku Sōsho, op cit., pp. 8-48; Nakagawa (2005), op cit., pp. 51-62; T. Ikeda. (1997), "Mado: sono shurui," in S. Hiyuga (Ed.), *Nihon no mado*, Kyoto: Tankōsha, p. 13; O. Ooba (1997), "Kōshi mado," in Hiyuga (Ed.), op cit., pp. 99-108; Wafūkenchikusha (Ed.) (1999), *Gaiheki no ishō*, Tokyo: Kenchikushiryō kenkyūsha, pp. 13-87; T. Masuda (1997), *Kabe Mado Kōshi*, Tokyo: Gurafikkusha; R. Yamamoto (1999), *Kyōto ─kenchiku to machinami no 「idenshi」*, Tokyo: Kenchikushiryō kenkyūsha, pp. 148-157.

the *kōshi's* structure (stationary or removable); or its position relative to the wall (flush with or extending out from). This category will be discussed in detail in a later section.

4) The *kōshi* function. The lattice on the small window projecting from the living quarters whose purpose is for watching outside activities is called *monomi-gōshi* ("watching lattice"). A similar window in which oil lamps were once placed to illuminate the street for passersby is called *andon-gōshi* ("lantern lattice") or *hijiri mado*. The curved lattice used to protect the lower parts of a *machiya* from fouling or damage by animals or people is called an *inuyarai* ("dog fence"). And the lattice used as a fence in front of a *machiya* to keep out horses and dogs is called a *komayose* ("horse approach").

Three points concerning these classifications are worth mentioning. First, I found *kōshi* types that were not mentioned in any of these four categories—for example, *Osaka-degōshi*, *Kitsuji-gōshi*, and *musō-renji*. I included these under their corresponding categories. Second, I found *kōshi* that did not fit into any of the four categories—for example, *yokozan-zuke-gōshi*, *ranma-zuke-gōshi*, and *ta-gōshi*. I created new categories for these. Third, interrelationships among the four categories are unclear, especially between the third category and the other three. *Kōshi* in this category occasionally overlap with *kōshi* in the other categories. For example, the *Kyō-gōshi* in the second category is sometimes referred to as *senbon-gōshi* ("thousand mullions lattice"),[44] which would place it in the third category. Another example is the *itoya-gōshi* ("thread store lattice") that is architecturally referred to as *kiriko-gōshi* when

[44] Hiyuga, op cit., p. 102.

placed in the third category.[45] In an attempt to develop a more comprehensive classification system I reorganized the four main categories, added *kōshi* to each, and created additional categories for *kōshi* that did not fit into any of the original four. *Kōshi* categories and interrelationships are illustrated in **Figure 91**.

Japanese *kōshi* can be organized according to their two basic forms: *dai-gōshi*, consisting of stationary latticework embedded in the pillars of a façade, and *hamekomi-gōshi*, consisting of latticework that can be removed from an opening. The mullions of the latter are installed inside a frame that is easily attached to pillars or stiles using removable pins (**Figs.92, 93**). During festivals such as Kyoto's *Gion* festival, all removable lattices are detached, thus making their *machiya* completely open[46] (**Figs.94, 95**) and transforming private space into public or semi-public space. In contrast, stationary latticework was used for protection from or the control of animals (e.g., *Nara-gōshi*), to display prostitutes in red-light districts (e.g., *Yoshiwara-gōshi* and *Kitsuji-gōshi*), or for storing barrels and other heavy objects. Examples of the storage latticework include the charcoal, sake, and rice dealers' *kōshi*.[47] The sturdy design of the charcoal dealer's latticework (*sumiya-gōshi*) allowed for charcoal or firewood storage while simultaneously protecting the surrounding space from charcoal dust.[48] The extra strength comes from its close arrangement of vertical panels connected to and held together by crosspieces to create a type of barn door[49] (**Fig.96**). This design has an architecturally determined name—*meita-gōshi* ("wooden panel latticework"). The *meita-gōshi* design was also popular among businesses that required wide doors called

[45] A lattice with vertical mullions between which are short secondary mullions cut from the top, see Hiyuga, op cit., p. 88.
[46] Hiyuga, op cit., p. 102.
[47] Yasui, op cit, pp. 9, 13; Nakagawa, op cit., p. 57.
[48] Yasui, op cit.; K. Inoguchi and M. Sugimoto (2000), *Yomigaeru kyō no machiya: iyashi no kūkan*, Kyoto: Maria shobō, p. 92.
[49] Yasui, op cit, p. 9.

格子の形状による分類

竪組

連子

浪連子

眠連子（盲格子）

無双連子

竪組＋貫

組子の寸法

親子格子（子持ち格子）

一本子持ち

二本子持ち

三本子持ち

目板格子

細目格子ー江市屋格子

組子の高さ

切子格子

一本切子

二本切子

三本切子

四本切子

格子の音楽性

連子格子

吹き寄せ格子

木返し格子

千本格子

竪横組

正方枠格子（桝組格子）

長方枠格子

構造式による分類

台格子（固定）

嵌込格子（着脱）

取付位置による分類

平格子（側柱筋）

出格子（張り出し）

柱立て出格子

釣出格子

竪の太さによる分類

太格子

細格子

物見窓付格子

欄間付格子

彫刻板付格子

横桟付格子

下見腰付格子

格子の付属装置による分類

用途による分類

行灯格子

物見格子

遊郭格子

大矢来

駒寄

地域名による分類

倉敷格子

大阪出格子

吉原格子

奈良格子（法蓮格子 鹿格子 丸太格子）

木辻格子

京格子（千本格子）

堺戸格子

竹原格子

高山格子（入格子）

職業による分類

仕舞屋格子

小間物屋格子

茶屋格子

糸屋格子

糸屋

紐屋

呉服屋

織屋

酒屋格子

米屋格子

炭屋格子

甕屋格子

Fig.91. *Machiya no Kōshi* categories, names, and designs.

Fig.92. A detail of the removable frame, pillar, and stile. (The author, a survey in Kanazawa city)

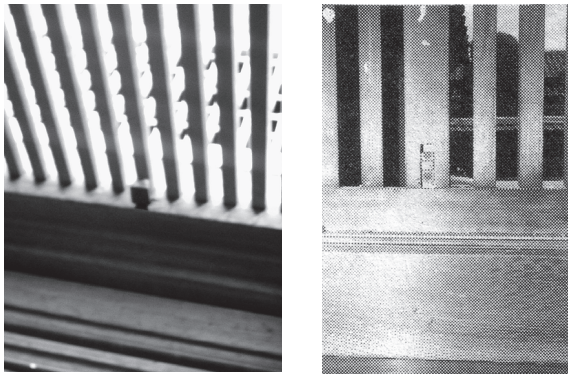


Fig.93. The removable pins of the *hamekomigōshi*. (Left: the auther,; right: Hiyuga 1988, p. 102)

Fig.94. Yoshida House in Rokkaku, Kyoto. Above, before taking out the lattice; below, the entirely opened façade has transformed the interior into a semi-public space. (Yasui 1996, p. 44)

Fig.95. A façade in Takoyakushi street, Kyoto. Above, before taking out the lattice; below, during the Gion festival. (Wafūkenchikusha 1999, p. 22)

ōdo for moving large goods in or out of the *machiya*.[50]

Fuya-gōshi is another type that has been adapted for purposes of strength. While named for use with bran stores, it is also popular among makers of *tofu* (bean curd) and *konnyaku* (a jelly made from the starch of the devil's tongue plant).[51] Always projecting from a wall (*de-gōshi*), *fuya-gōshi* consist of two main sections: an upper part made of latticework arranged vertically, usually in a pattern called *kogaeshi* in which the intervals are the same size as the mullion widths;[52] and a lower part called *shitami-ita* ("horizontal siding boards") behind which earthen charcoal braziers, water containers, and frying equipment are installed (**Fig.97**).[53]

The stationary *kōshi* category includes *komeya-gōshi* (rice) and *sakaya-gōshi* (sake)[54] (**Fig.98**). In addition to being non-removable (*dai-gōshi*) they are also non-projecting (*hira-gōshi*). Both are constructed from logs arranged vertically in a *kogaeshi* pattern and reinforced with three or four crosspieces called *nuki*.[55] At night they are closed using the *musō* method (*musō-shimari*).[56]

This method was originally used in a very flexible window called *musō-mado* (*mado* means "window") that was later incorporated into many types of latticework and doors.[57] The *musō-mado* can be easily adjusted to varying degrees of openness to

---

[50] Nakagawa, op cit., p. 58.
[51] Yasui, op cit., p. 13.
[52] Called also *komagaeshi*, see Hiyuag, op cit., p. 91; Nakagawa, op cit., p. 58, Aoki et al., op cit., p. 585.
[53] Yasui, op cit., p. 13.
[54] The only difference between the two lattices is that the rice store lattice is unpainted because it is subject to dirtiness due to the rice or brain dust. On the other hand, the sake store lattice is painted with red-ocher to protect it from any sake that may reach the wood, see Yasui, op cit., p. 13; Hiyuga, op cit., p. 90.
[55] Aoki et al., op cit., p. 589.
[56] This method is explained in the following paragraph. The word *musō* is translated as "hit and miss" in A. Ueda (1990), *The Inner Harmony of the Japanese House*, Tokyo New York London: Kodansha International, p. 50; "unequal" in H. Engel (1964), *The Japanese House: a Tradition for Contemporary Architecture*, Tokyo: Charles E. Tuttle Co., p. 155; and "unparalleled" in Ando, op cit., p. 117.
[57] Wafūkenchikusha, op cit., pp. 49-54.

provide lighting and airflow (**Fig.99**). Its design coincides with an internal lattice that slides along a grooved track. The internal lattice can be moved and the intervals of the external lattice adjusted to various degrees of openness.[58] A *kōshi* called *Eichiya-gōshi*, similar to the *musō-mado*, allows for greater adjustment. As described by Masaru Kumagai and in Wafūkenchikusha, the internal sliding lattice of the *Eichiya-gōshi* is divided into three separate horizontal sections. Each section slides to the left and right, allowing the occupant to separately adjust the three levels of the external lattice intervals[59] (**Fig.100**).

Hiyuga takes a different approach to describing the *Eichiya-gōshi*, claiming that it received its name in Kyoto and that it is identical to the *sasame-gōshi* that got its name in Edo (Tokyo).[60] The latticework is very fine, with narrow intervals and a special design in the cross-section consisting of beveled mullions installed with the narrow portion facing inward (**Fig.101**). Seen from the outside, the mullion intervals are very close, thus providing a great deal of privacy. From the inside they are wide enough to allow a surprising amount of light and air to pass through.[61] This design also provides sound insulation.[62]

The EAB gives the same description as above to *sasame-gōshi* and *Eichiya-gōshi*, but with a small addition to the latter[63]—a lattice with the same function as the internal lattice of a *musō-mado* is installed behind the lattice containing the

[58] Engel (1964), op cit., p. 155; Hiyuga, op cit., pp. 22-23.
[59] M. Kumagai (1996), "Takayama no Kōshi," in Shingakugei wafūkenchiku sōsho, op cit., p. 121; Wafūkenchikusha, op cit., p. 54.
[60] Hiyuga, op cit, p. 90-91.
[61] The *sasame-gōshi* is described in Hiyuga, op cit., p. 90-91; Yasui, op cit., p. 12; Aoki et al., op cit, p. 631.
[62] Yasui, op cit., p. 12.
[63] Aoki et al., op cit, p. 147.

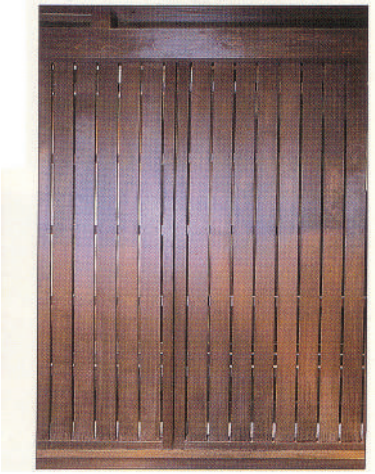


Fig.96. Lattice of the charcoal dealer, *sumiya-gōshi*. (Wafūkenchikusha 1999, p. 78)

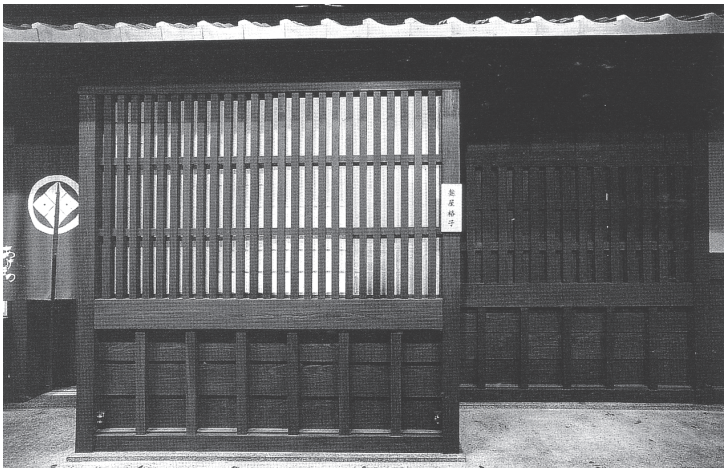


Fig.97. Bran store latticework, *fuya-gōshi*. (Inoguchi 2000, p. 92)

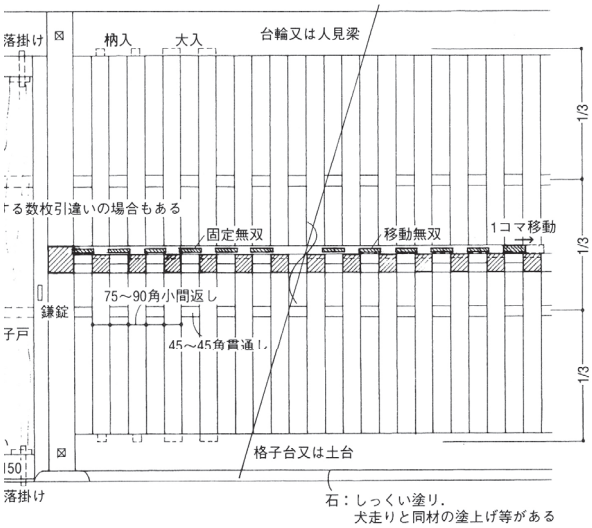


Fig.98. Lattice of the rice dealer, *komeya-gōshi*. (Yamamoto 1999, p. 152)

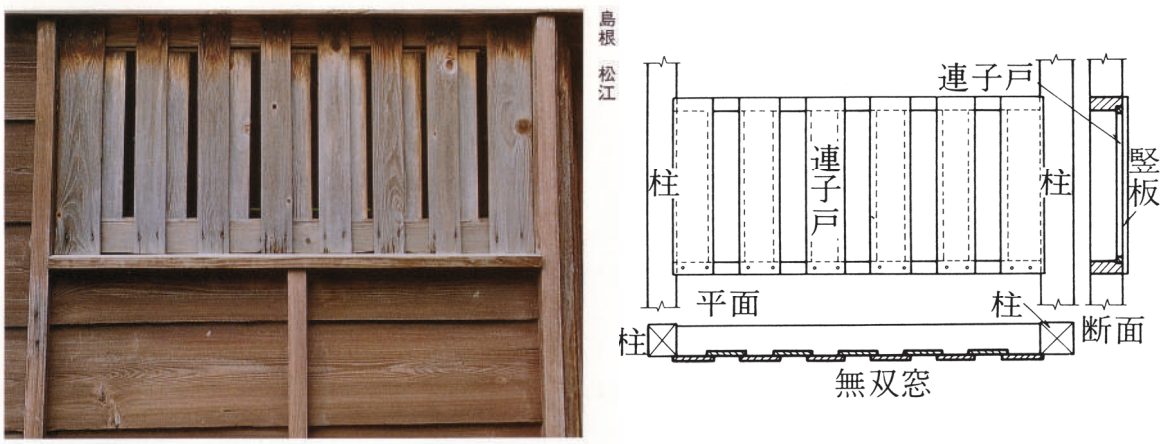


Fig.99. *Musō-mado*. Left, on a house in Matsue city, Shimane pref. (Ikeda, 1997, p. 46) Right, plan and elevation. (Aoki et al. 1993, p. 1622)

beveled mullions[64] (**Fig.102**). This combination of *musō-mado* and *sasame-gōshi* design features provides two advantages: greater flexibility in adjustments to achieve desired degrees of openness, light, and airflow, and greater privacy without a dimming effect or an uncomfortable decrease in airflow.

Due to its design, the *sasame-gōshi* was particularly favored for the facades of traditional tea houses (*chaya*) and other establishments built in red-light districts during the Edo period.[65] Regardless of type, latticework in these districts was generally called *kaku-gōshi* ("red-light district latticework").[66] During the Edo period, districts such as Yoshiwara in Tokyo, Shimabara and Gion in Kyoto, Shinmachi in Osaka, and Chayamachi in Kanazawa contained special houses called (*o*)*chaya*, in which prostitutes entertained samurai and wealthy merchants.[67] Two kinds of *kōshi* ([*o*]*chaya-gōshi*) were favored for these houses: one for displaying prostitutes and one for ensuring privacy.[68] The former had wide intervals[69] or a feature that resembled a balustrade. An example is the *Yoshiwara-gōshi* that was initially used on the upper floors of Yoshiwara *chaya*; a similar *kōshi* was used on the ground floor of Shinmachi *chaya*.[70] To ensure privacy, brothel owners installed very fine latticework with close intervals such as the *sasame-gōshi* of Kanazawa (**Fig.103**) and *Kyō-gōshi* of Kyoto.[71] The latter is architecturally referred to as *senbon-gōshi* ("thousand mullions lattice") (**Fig.104**).[72] The use of very fine latticework on the façades of brothels reflected a strong concern for

[64] According to the EAB, Eichiya Sōsuke is a cart man who became wealthy after working for the government as a wood and bamboo supplier around the middle of the Edo Period (between 1744 and 1747). His house was located in Yonozawa-chō district in Tokyo and he was the first to use this lattice in the second floor, hence the name Eichiya-gōshi. Since then, it became fashionable in the townhouses; see Aoki et al., op cit., p. 147.
[65] It was also seen in the facades of haberdasheries, see Hiyuga, op cit., p. 90; Yasui, op cit., p. 8.
[66] Yasui, op cit., p. 8.
[67] Aoki et al., op cit., p. 1677.
[68] Ibid., p. 1055.
[69] Hiyuga, op cit., p. 38.
[70] Hiyuga, op cit., p. 41.
[71] T. Ikeda. (1997), "Mado no dezain," in Hiyuga (Ed.), op cit., p. 18.
[72] Hyuga, op cit., pp. 98-100, 102.

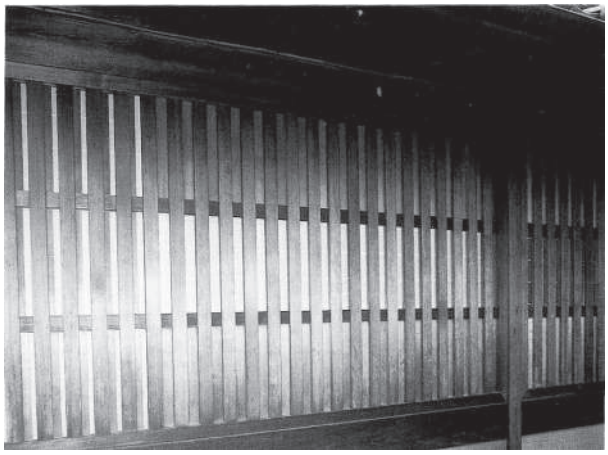
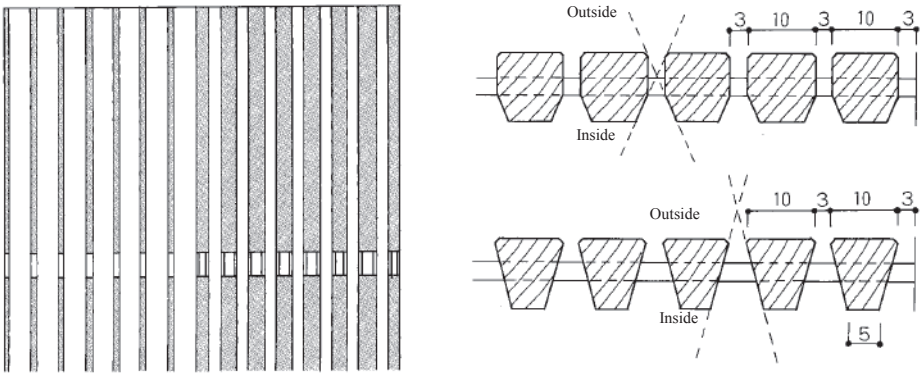


Fig.100. An *Eichiya-gōshi* in Nakatsugawa city, Gifu pref. This lattice is divided horizontally into three parts, each of which can be adjusted separately by the *musō* method. (Kumagai 1996, p. 121)



As seen from outside and inside

Fig.101. *Sasame-gōshi*. Right, various plans; left, elevation. (Nagai 1996, p. 7)

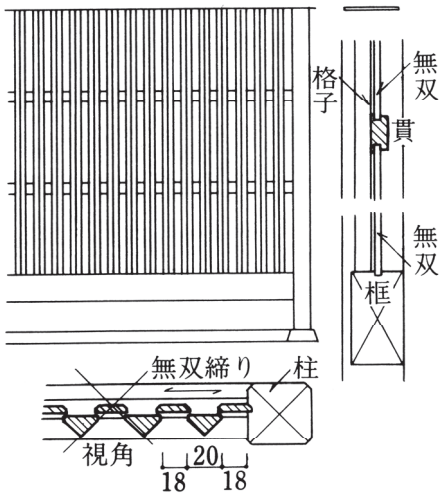


Fig.102. *Eichiya-gōshi* according to the EAB. (Aoki et al. 1993, p. 147)

Fig.103. A *chaya* in Higashi Chayamachi, a former entertainment district in Kanazawa city. Above, façade; below, *sasame-gōshi* seen from outside and detail of the mullions' cross-section. (The author)

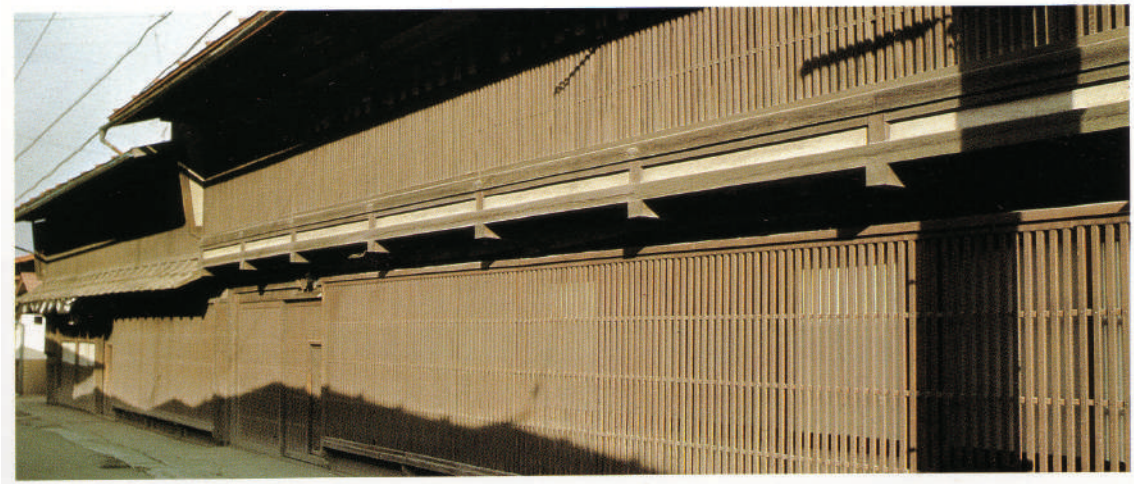


Fig.104. A *Senbon-gōshi* in Shiojiri city, Nagano pref. (Masuda 1997, p. 83)

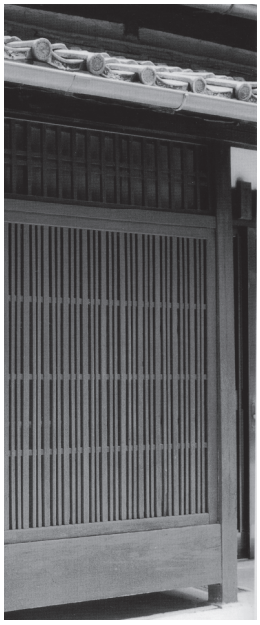
privacy over light and ventilation. The owners of other types of *machiya* used other types of latticework to allow light and air to enter while still maintaining acceptable levels of privacy. These concerns are particularly clear in the designs of *shimotaya-gōshi* and *itoya-gōshi*.

Similarities between *shimotaya-gōshi* (non-business latticework) and *mashrabiyyas* are striking (**Fig.105**). Originally applied to the fronts of *shimotaya* (a non-business *machiya*),[73] this type of latticework was later used on many other types of *machiya*.[74] In the same manner as *mashrabiyyas*, *shimotaya-gōshi* consist of two main sections on a base and are installed either flush with the building façade (*hira-gōshi*) or extending out from the façade (*de-gōshi*).[75] The upper section (a transom window) is made of *renji*, a lattice of thin vertical mullions regularly arranged with wide intervals to allow for adequate lighting and airflow.[76] Reaching up to the *renji* is a lower section whose main purpose is to ensure privacy.[77] It consists of various styles of fine lattices such as *kogaeshi-gōshi* (in which the mullion widths and intervals are equal) and *oyako-gōshi* (made of vertical mullions with thinner secondary mullions arranged in between) (**Fig.106**). The significant advantage of the *shimotaya-gōshi* over the *mashrabiyya* is the ability to remove its lower section (*hamekomi-gōshi*) to allow for complete openness as needed.[78]

In a like manner, the *itoya-gōshi* design allows light and air to flow through an upper part while ensuring privacy with the lower part; the *itoya-gōshi* design is

[73] Such as the second houses, houses of retired tradesmen, or houses of rentiers (who live on investment interest), see Aoki et al., op cit., p. 732.
[74] Yasui, op cit., p. 10.
[75] See Hiyuga, op cit., p. 91; Yasui, op cit., p. 10.
[76] Aoki et al., op cit., p. 732.
[77] Ibid.
[78] Aoki et al., op cit., p. 732.

Fig.105. *Shimotaya-gōshi* of Horii house, Kyoto. Kanazaki and Shintani 1998, p. 31)



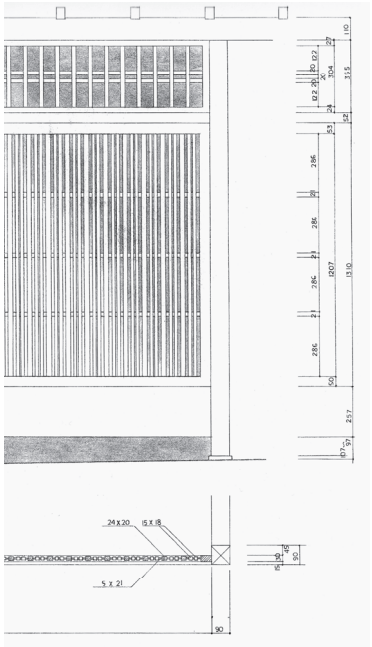


Fig.106. *Shimotaya-gōshi* with *oyako-gōshi*, Nakao house, Shimoshimizu district, Nara pref. (Wafūkenchikusha 1996, pp. 74, 75)

architecturally referred to as *kiriko-gōshi* (**Fig.91**). Upon closer observation, different types of *itoya-gōshi* have different features, depending on whether they are installed in front stores selling thread, string, silk goods, or other types of fabrics.[79] In these stores, lighting plays a significant role in highlighting the colors and designs of the goods being sold, therefore the latticework consists of vertical mullions that run from the bottom to the top of the opening interspersed with shorter mullions (*kiriko*) cut at the top to whatever length is necessary for the desired amount of light. For a *gofukuya* (store which sold fine textiles typically for making kimono) the number of short mullions set between the two main mullions is typically two (*nihon-kiriko-gōshi*); for an *itoya* and/or a *himoya* (thread and/or string store) the number is three (*sanbon-kiriko-gōshi*); and for an *orimonoya* (fabric store) the number is four (*yonhon-kiriko-gōshi*)[80] (**Fig.91**).

In addition to its remarkable simplicity, efficiency, and functionality, the *kōshi* also has an aesthetic quality. Viewed from an interior space, it takes on the appearance of a transparent screen with a beautiful silhouette (**Fig.107**)—an effect produced by changing the thickness, height, and arrangement of the mullions.[81] The latticework in *oyako-gōshi*, *itoya-gōshi* and *fukiyose-gōshi* (consisting of sets of two or more mullions arranged vertically in equal intervals) exerts a particularly elegant effect on penetrating light[82] (**Fig.108**). Combinations of the design features of two or more of these lattices were used to enhance a latticework's appearance and effect on light[83] (**Fig.109**).

---

79 Yasui, op cit., p. 12.

80 Ibid.

81 Though rarely seen in the *machiya no gōshi*, latticework with carved wood was typical of Takehara, and was called *Takehara-gōshi*. A carved board was horizontally installed in the middle or lower part of the lattice; this is architecturally called *chōkoku-itazuke-gōshi* (latticework with carved board). This carved board can be also substituted with horizontal slats; in this case, the lattice is called *yokozanzuke-gōshi*, and is also a *Takehara-gōshi*. See **Figure 91**, and M. Suzuki. (1996), "Takehara no kōshi," in Wafūkenchikusha (Ed.), op cit., pp. 89-112.

82 Aoki et al., op cit., p. 1440.

83 T. Ikeda (1997), "Mado no dezain," in Hiyuga (Ed.), op cit., p. 18.

Fig.107. *Sasame-gōshi* seen from outside and inside. A house in Higashi Chayamachi, Kanazawa. (The author)

Fig.108. *Fukiyose kiriko-gōshi* seen from outside and inside. Yoshijima house in Takayama city. (Ando 1997, p. 100)

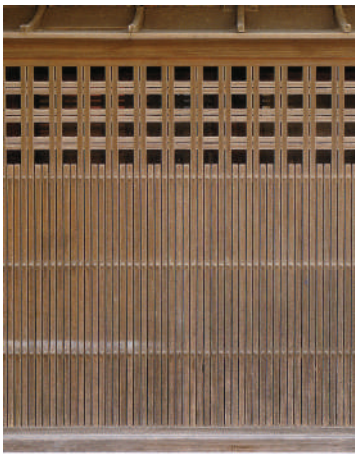


Fig.109. Other design of the *fukiyose kiriko-gōshi*, Wakayama pref. The elegant appearance of this latticework is produced by the rhythm of the mullions (*fukiyose*), their heights (*kiriko*), and the *fukiyose* design of the transom. (Wafūkenchikusha 1996, p. 127)

4-4 Comparing *Machiya no Kōshi* and the *Mashrabiyya*

4-4-1 Social Issues

In contrast to the *mashrabiyya*, the Japanese *kōshi* allows for easy and full access to an outside space for daily activities. A similarity that the two lattices share is that the *mashrabiyya*'s windows and the *shitomi* both opened upward. However, the *shitomi*'s positioning between the pillars of *machiya* gave the occupants the ability to move freely between interior and exterior spaces, whereas the traditional *mashrabiyya* only allowed Egyptian women to lean out slightly for purposes of communicating with outsiders. The *hamekomi-gōshi* in particular provides considerable access to exterior spaces while still ensuring privacy when desired. During festivals and important events, *machiya* occupants could easily remove these light lattices, decorate their building façades, and transform their *machiya* into semi-public spaces; this feature also allowed merchants to display their goods to passersby.[84] The same design feature could satisfy the needs of urban-dwelling Egyptians to quickly transform their exterior (balcony) spaces for social events and to provide complete openness for ventilation and socialization.[85] I therefore suggest incorporating the *hamekomi-gōshi* design to allow for quick removal of *mashrabiyya* panels.

Furthermore, while the wooden pieces and interstices of the *mashrabiyya* are fixed, the *musō-mado* is easily adjusted to match changing needs for privacy, lighting, and airflow. The *musō-mado* is also referred to as "the window without fittings" because no additional fittings are needed for making these adjustments.[86] I therefore suggest incorporating design features of the *musō-mado* into the *mashrabiyya* to meet the

[84] Hiyuga, op cit., p. 102.
[85] See **3-1-3 *Mashrabiyya* Appropriateness to the New Veiling**.
[86] Hiyuga, op cit., p. 22.

changing requirements of Cairenes for openness/privacy, ventilation, and light.

4-4-2 *Machiya no kōshi* and *Mashrabiyya* Costs

The initial simple and sturdy design of *kōshi* focused on protection, and it maintained its simplicity even following the appearance of fine latticework in the late seventeenth century. Accordingly, it can be manufactured for a much lower cost than a *mashrabiyya*. The long and regularly shaped slats of wood used to construct *machiya no kōshi* are quickly and easily processed compared to the individual *mashrabiyya* pieces that require labor-intensive turning and assembly. After cutting, *kōshi* mullions are assembled by either piercing them by long crosspieces (*nuki*) or by interlocking (Figs.**110, 111, 112**), whereas thousands of small pieces must be fitted and assembled to produce a single *mashrabiyya*.[87] The interlocking technique has also been used in Egypt, but it is more commonly associated with the traditional *rawshan* found in Saudi Arabia.[88] *Rawshan* pieces are much more difficult to process because they have to be cut into very specific shapes to produce ornamental patterns (**Fig.113**).

Once *kōshi* mullions are assembled into a lattice, the ends of individual mullions are inserted into peripheral pillars and stiles (in the case of the stationary *dai-gōshi* lattice) or into the frame (in the case of the removable *hamekomi-gōshi* lattice).[89] Thus, the number of joints required to construct a *kōshi* is considerably smaller than that for a *mashrabiyya*. Furthermore, pins are fixed into the removable frames of *hamekomi-gōshi*

---

[87] For information on the *kōshi*'s architectural details, see Shōkokusha (Ed.) (1973), *Mokuzō no shōsai: 4 tategu・zōsakuhen*, Tokyo: Shōkokusha. Nailing was sometimes used to add a decorative effect to the lattice such as the *kitsuji-gōshi* though not generally preferred by quality carpenters, see K. Nishihara (1968), *Japanese Houses: Patterns for Living*, Tokyo: Japan Publications, Inc., p. 119.

[88] On this technique, see S.M. Ankawi. (2000), "Al-Rawshan wa Tajrobat Tatweerihi," in Nazih (Ed.), op cit., pp. 50-52.

[89] Shōkokusha (Ed.), op cit., pp. 25-27.

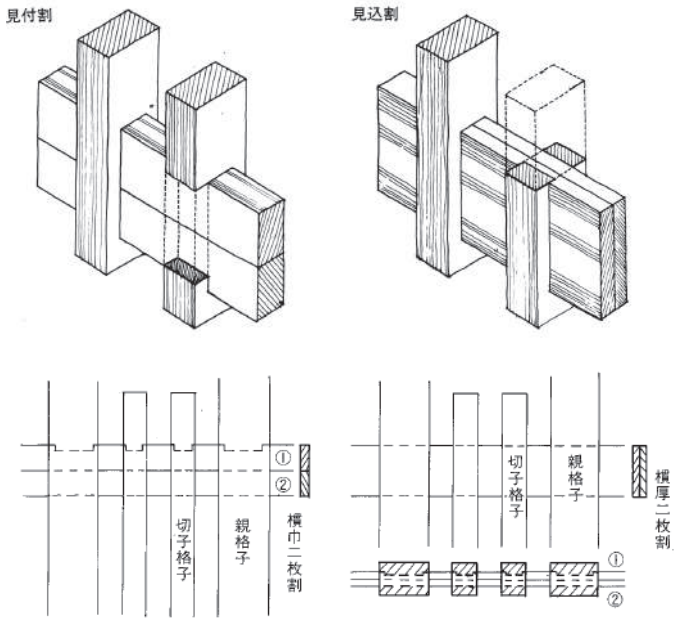


Fig.110. Types of inserted crosspieces (*nuki*). *Mitsuke-wari* (left) and *mikomi-wari* (right). (Shōkokusha 1973, p. 39)

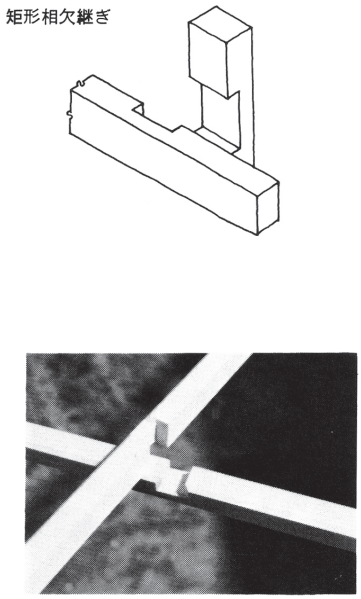


Fig.111. Interlocking method of the *kōshi*'s mullions. (Shōkokusha 1973, p. 28)

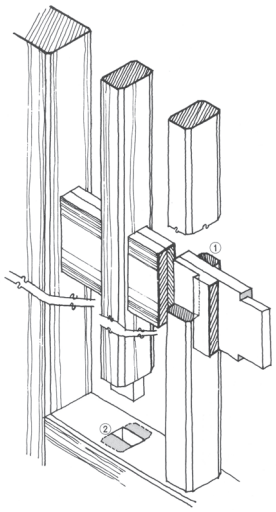


Fig.112. Detail showing the frame, mullions, and crosspiece of a *kōshi*. (Shōkokusha 1973, p. 83)

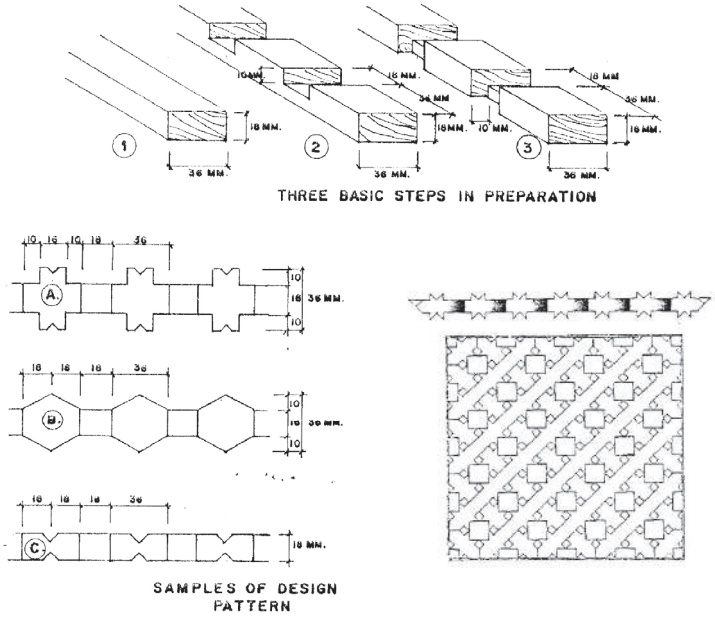


Fig.113. *Mangūr* lattice of the Saudi Arabia's *Rawshan*. Basic processing steps, pieces' various designs, and final pattern. (Ankawi 2000, pp. 50, 51)

to allow for quick attachment/detachment from a wall.[90] This is made possible by the light weight of its latticework resulting from the use of thin vertical mullions, whereas a single square yard in a *mashrabiyya* can contain as many as 2,000 wood pieces.[91]

4-4-3 *Machiya no Kōshi* and *Mashrabiyya* Environmental Issues

A *machiya no kōshi* is less exposed to damage by pollutants than a *mashrabiyya* and is easier to maintain and clean. The verticality and straight lines of a *kōshi* reduces the percentage of horizontal surface area and the number of corners on which pollutants and dust can accumulate. Its verticality is the result of the deep eaves that adorn most Japanese houses, which eliminate the need for horizontal louvers for shade;[92] its straight lines are the result of the uniform shape of its mullions—rectangular, square, triangular, circular, or half-circular.

Whereas the basic *mashrabiyya* design allows for the expansion and shrinkage of wood due to wide swings in temperature, the resilient *kōshi* design responds to the prevalence of earthquakes and typhoons in Japan. Like *mashrabiyya* pieces, *kōshi* mullions are constructed and fixed without glue or nails;[93] unlike small *mashrabiyya* pieces, *kōshi* mullions are interlocked or pierced into one another without any cutting, thus giving the latticework both flexibility and firmness against external forces. Compared to the *kōshi*, the *mashrabiyya* lacks strength.

4-4-4 *Machiya no Kōshi* and Legislative/Urban/Architectural Issues

Among the problems of reintroducing the *mashrabiyya* to contemporary Cairo

---

[90] Hiyuga, op cit., p. 102.
[91] J. Spencer (1992), "Mashrabeya: an Architectural Language," *Journal of Arts and the Islamic World,* vol. 21, p. 51.
[92] Nishihara, op cit., p. 83.
[93] Nishihara, op cit., p. 119.

architecture is the conflict between environmental and social/privacy needs. If applied to the city's multi-story apartments, wide lattices can expose interior spaces to outside view as has been discussed in the preceding chapter.[94] Since it is critical to compensate for lighting and airflow decreased by the tight latticework of lower *mashrabiyya* sections, I suggest that design features of the Japanese *sasame-gōshi* be incorporated into *mashrabiyya* to take advantage of the *sasame-gōshi*'s ability to ensure privacy while allowing for adequate lighting and airflow.

4-5 Conclusions

1) Like the *mashrabiyya*, *machiya no kōshi* found on traditional townhouses in dense Japanese urban contexts address social and environmental issues. Unlike the *mashrabiyya*, *machiya no kōshi* is much simpler and more flexible, and therefore offers practical solutions to the *mashrabiyya* problems discussed in the preceding chapter.

2) While the *mashrabiyya* design is a reflection of its initial central role of protecting women in their *harems* from outside view, the *kōshi* design is a reflection of a need for privacy plus the interests of local commerce, trade, and small-scale manufacturing. In other words, the *kōshi* has greater role diversity compared to the *mashrabiyya*.

3) Incorporating the removable characteristic of *hamekomi-gōshi* panels into *mashrabiyya* design will allow for quick and easy transformation for opening balconies, thus making them environmentally and socially suitable for events held in urban Egyptian homes.

[94] See **3-4 Legislative/Urban/Architectural Issues**.

4) In contrast to the fixed degrees of privacy and openness of the *mashrabiyya*, the *musō-mado* can easily be adjusted to various degrees of openness, lighting, and airflow. The *Eichiya-gōshi* design that features three overlapping *musō-mado* allows for even greater adjustment. Adding this feature to a new version of the *mashrabiyya* will allow Cairene women to easily adjust *mashrabiyya* interstices to desired degrees of privacy, as well as in response to changing weather conditions.

5) In contrast to the wide lattice patterns associated with the upper section of the traditional *mashrabiyya*, the beveled mullions of the *sasame-gōshi* ensure privacy while allowing for adequate lighting and ventilation. In addition, they insulate against excessive outside noise.

6) According to the EAB, the *Eichiya-gōshi* combines the advantages of the *sasame-gōshi* and *musō-mado*.[95] This lattice can be adjusted to various degrees of openness. Even when its intervals are reduced for privacy, the *Eichiya-gōshi* still provides sufficient lighting and airflow.

7) The artistic effect of the *mashrabiyya* is produced by turning individual pieces and assembling them in an intricate ornamental composition. The artistic effect of the *kōshi* is produced by changing the thickness, height, and arrangement of its mullions, thus making latticework aesthetically pleasing without having to use complex designs.

8) Compared with the turning and assembling processes involved in *mashrabiyya*

[95] The design described in Aoki et al. (Ed.), op cit., p. 147.

construction, *kōshi* mullions can be made and assembled much faster and at a much lower cost due to their long, regular shape and interlocked or pierced construction. This process also gives *kōshi* flexibility and strength against typhoons, earthquakes, and other external forces.

9) *Kōshi* verticality and straight lines reduce the percentage of horizontal surface area and the number of corners on which pollutants and dust can accumulate. *Kōshi* is therefore less prone to damage from pollution and easier to maintain and clean. Since Cairo is the second most polluted city in the world and has regular periods of dusty weather, *mashrabiyya* pieces should be made as vertical and regularly shaped as possible.

CHAPTER 5

A PROPOSAL FOR A NEW *MASHRABIYYA* IN CAIRO

Reviving the traditional *mashrabiyya* is one suitable response to issues involving Cairo's climate, density, conflicting social and environmental functions, and use of balconies, since its design harmonizes social and environmental needs. In this chapter I will offer a proposal for an improved *mashrabiyya* in contemporary Cairo that responds to changes in apartment thresholds and incorporates ideas from the Japanese *machiya no kōshi* while honoring the function and design of traditional *mashrabiyya*. I will provide an illustrative explanation of the new *mashrabiyya*'s form and functions, make suggestions for a different manufacturing material, and discuss how this alternative *mashrabiyya* can be modified to the needs of Cairo residents.

5-1 New *Mashrabiyya* Form and Function

My proposed new *mashrabiyya* consists of three sections (see **Fig.114**): first, a hinged middle section that opens upward, thus allowing women to perform household chores hidden from the gazes of neighbors and passersby. Attached to the middle section is another piece that can be lowered to give additional privacy from neighbors at the same or lower level across the way and people walking along the street below (**Fig.115**). Second, an upper section that compensates for reductions in lighting and airflow when needs for privacy or mitigating light intensity require closing sections below eye level (**Fig.116**). However, this section will continue to ensure privacy because its beveled mullions will be installed with the narrow portion facing outward (**Fig.117**). Third, a lower section that works as a railing and serves other functions in combination with the other sections (see **Figs114, 115**).

The middle and lower sections each consist of one fixed external lattice and one internal lattice that slides to the left or right along a grooved track. This allows for

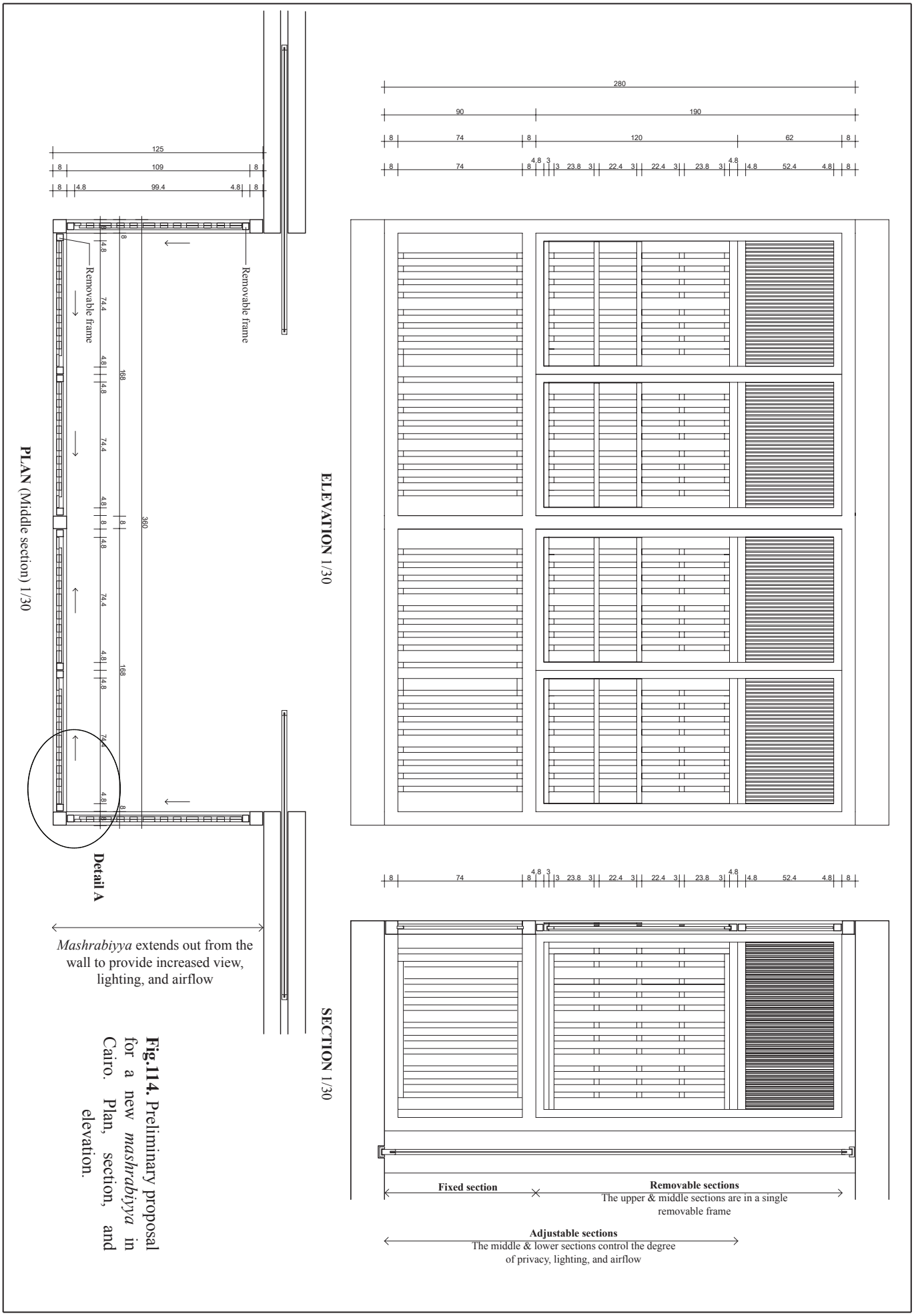
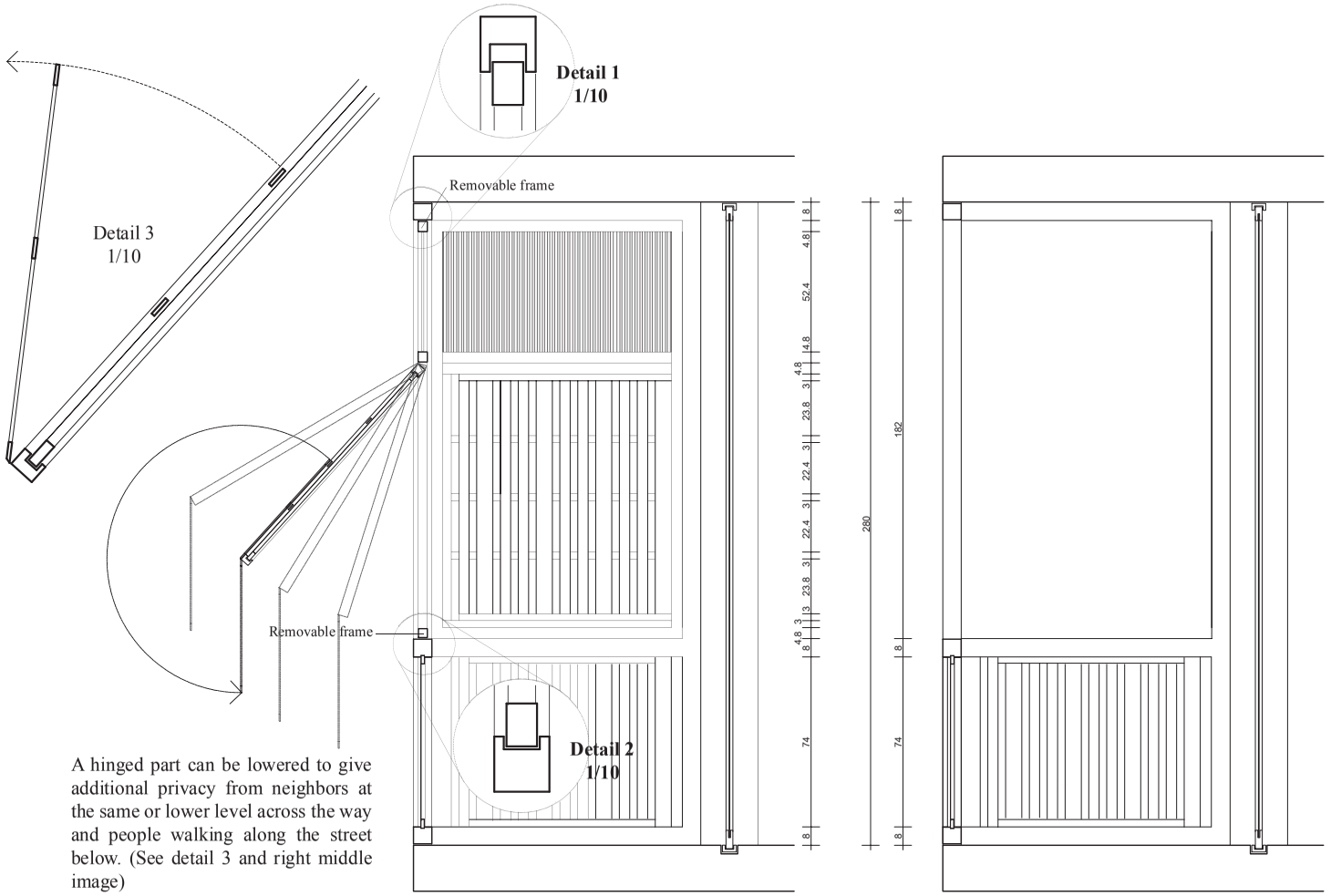
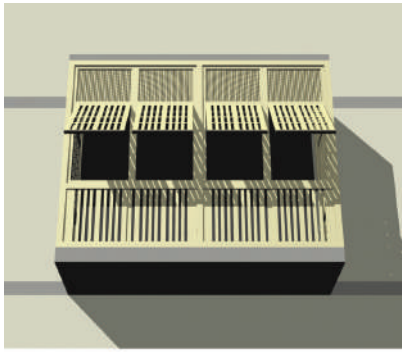


Fig.114. Preliminary proposal for a new *mashrabiyya* in Cairo. Plan, section, and elevation.

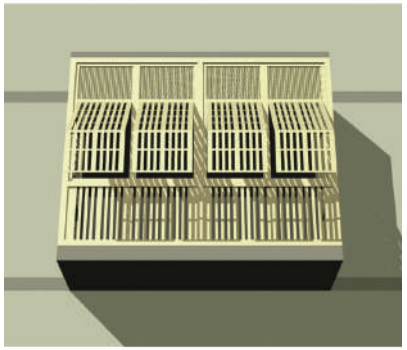


Cross-section showing the functions of the middle part 1/30

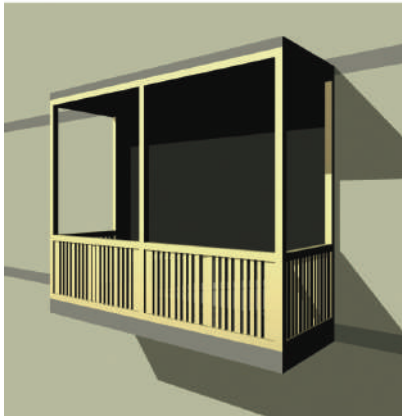
Cross-section in the *mashrabiyya* after removing the frame 1/30



Mashrabiyya seen from a lower level

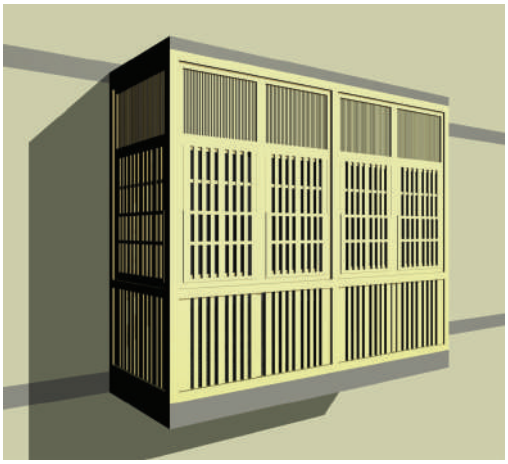


Mashrabiyya after lowering the hinged part

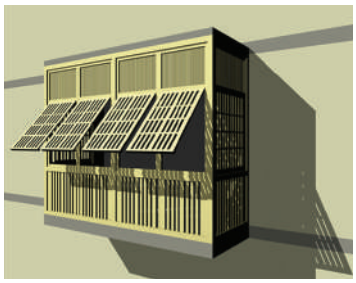


When social events are held at home, the new *mashrabiyya* can be opened by removing frames containg the middle and upper sections

Fig.115. Illustrations showing the functions of the middle section and the new *mashrabiyya* transformed into an open balcony



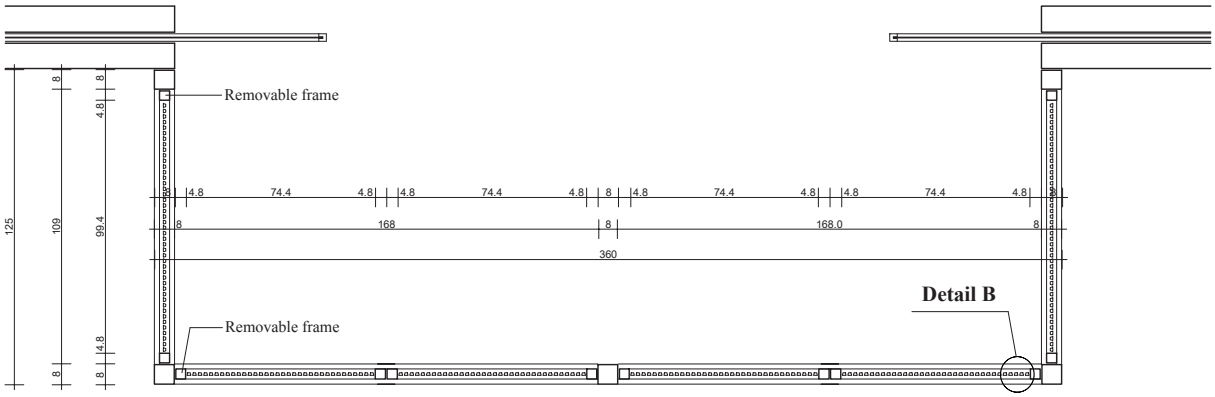
The new *mashrabiyya* seen from outside and inside



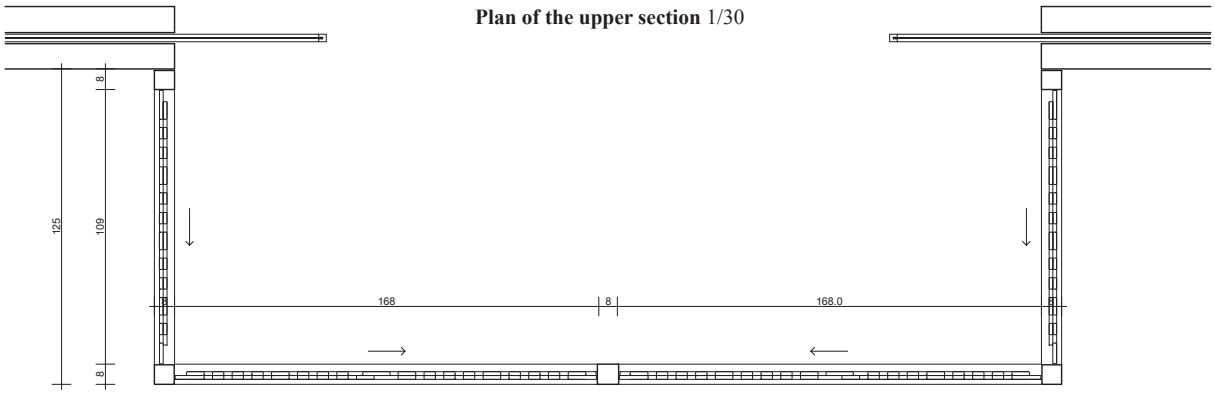
The middle section enables outdoor activities while veiling women. (See figure 5-2 for more functions)

When privacy and light intensity require closing the intervals below eye level, the upper section will compensate for the reduction in lighting and airflow without decreasing privacy from the surrounding buildings (see Detail B).

Effect of the new *mashrabiyya* on the penetrating light

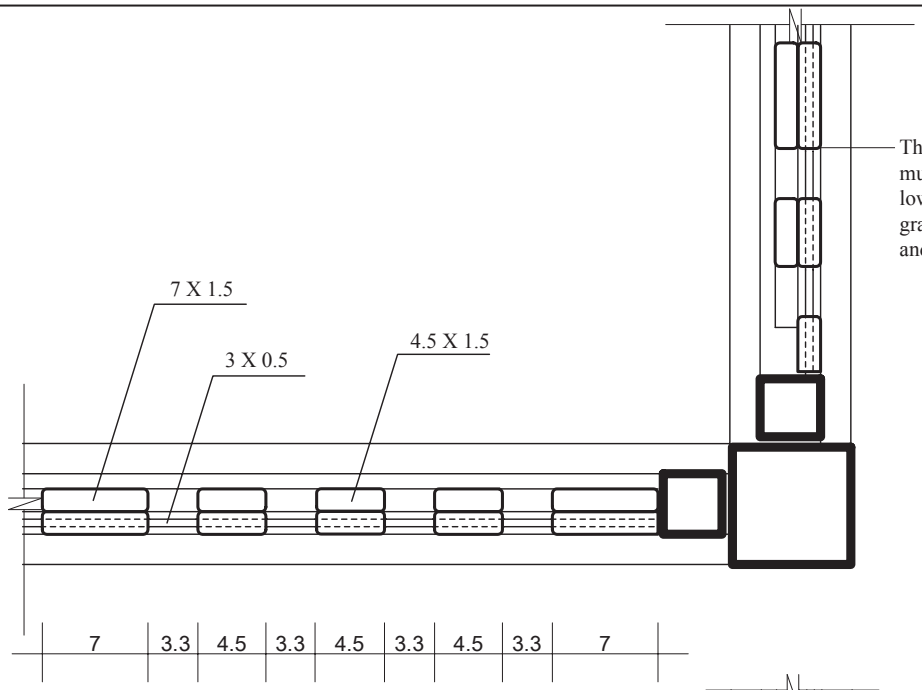


Plan of the upper section 1/30



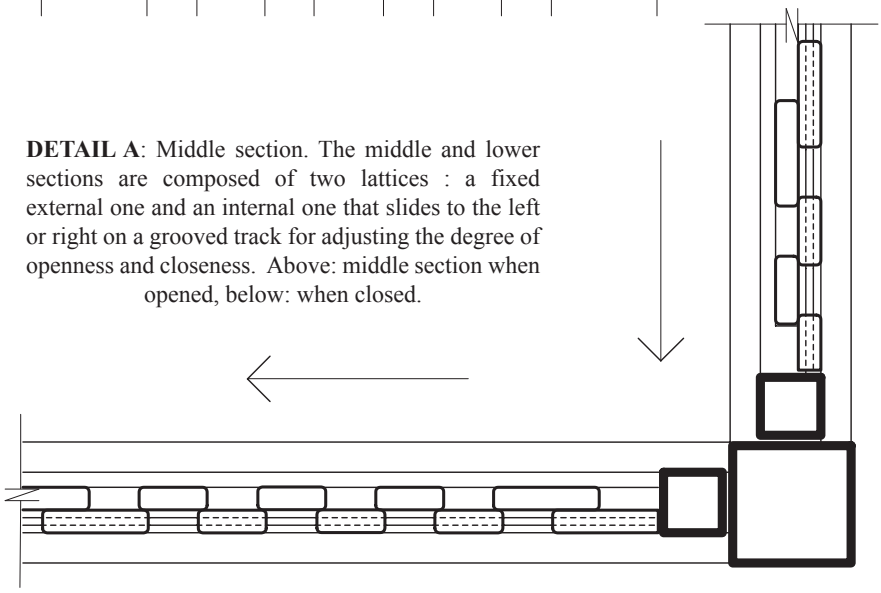
Plan of the lower section 1/30

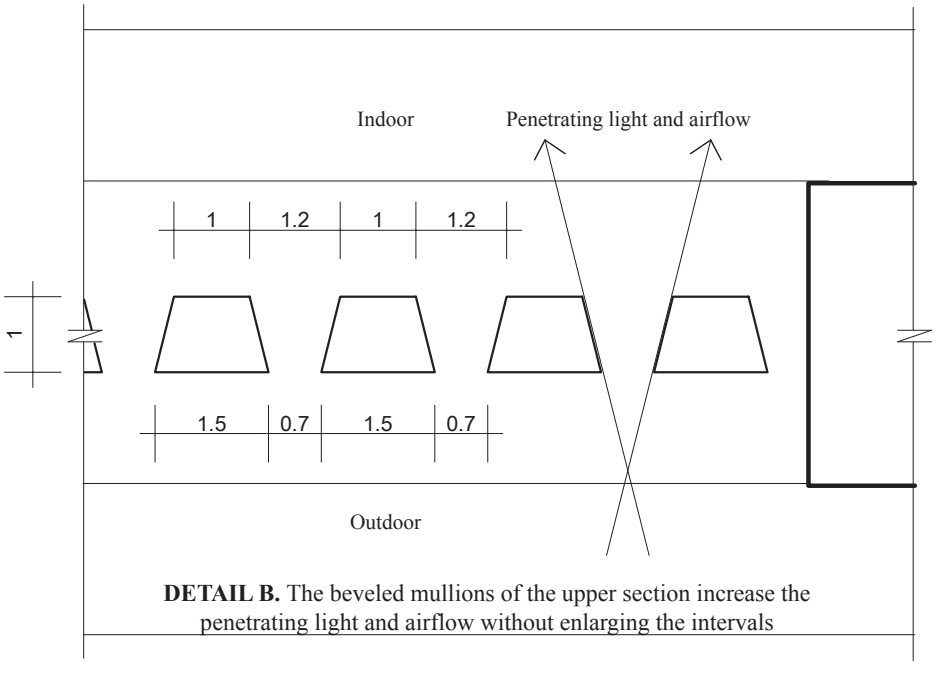
Fig.116. Plans of the upper and lower sections and various views from inside and outside



The corners of each mullion in the middle and lower sections are round to graduate the intense light and reduce glare below eye level.

DETAIL A: Middle section. The middle and lower sections are composed of two lattices : a fixed external one and an internal one that slides to the left or right on a grooved track for adjusting the degree of openness and closeness. Above: middle section when opened, below: when closed.





DETAIL B. The beveled mullions of the upper section increase the penetrating light and airflow without enlarging the intervals

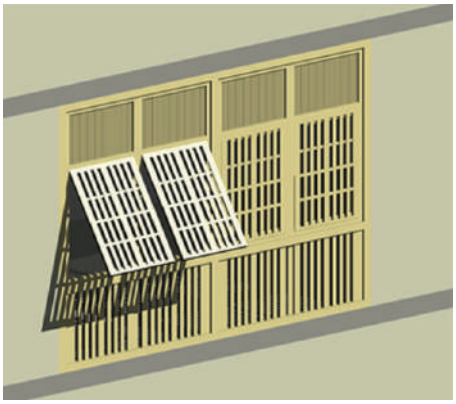
Fig.117. Details of the upper and middle sections

adjustments in the degree of openness (**Figs.114**, **116**, **117**). Therefore, the new *mashrabiyya* will be adaptable not only to varying privacy needs, but also to climatic conditions and orientation. Furthermore, by closing its intervals and then lifting it up, the middle section provides shade and protects drying clothes from getting dirty or wet due to the actions of upstairs neighbors.[1] The upper and middle sections are attached via a single frame that can be removed to create an open balcony or window during social events or when there is a need for more ventilation (see **Fig.115**).

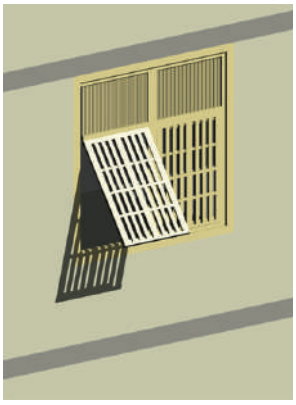
Other features of the new *mashrabiyya* include the lack of a raised floor, which allows for greater flexibility. Most of its mullions will be vertical to reduce the number of corners and the amount of horizontal surfaces on which pollutants and dust can gather, thus making it less subject to damage and easier to clean, and enabling the evapo-transpiration process that is the basis for its cooling function. The corners of each mullion in the middle and lower sections are rounded for the purpose of mitigating the intense Egyptian light and to reduce glare below eye level. To enhance the aesthetic effect of penetrating light, mullions with two different thicknesses will be used, and three horizontal pieces will be pierced into the mullions. This will also add strength.

If extended outward from a wall, the new *mashrabiyya* will provide increased views, light, and airflow. Still, its flexibility will allow its users to install it in other ways, such as that shown in **Figure 118**. It will be possible to install the new *mashrabiyya* as a large window or balcony flush with the wall (type A), as a smaller *mashrabiyya* flush with or extending out from the wall (types B and C), or as a window (type D).

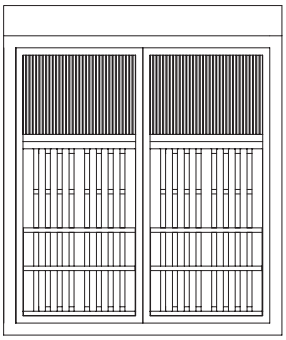
[1] See **1-3 Threshold Modifications**.



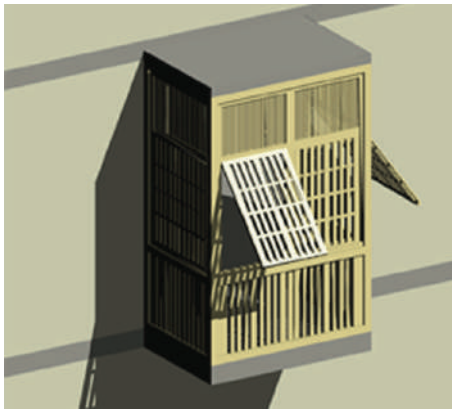
Type A



Type D

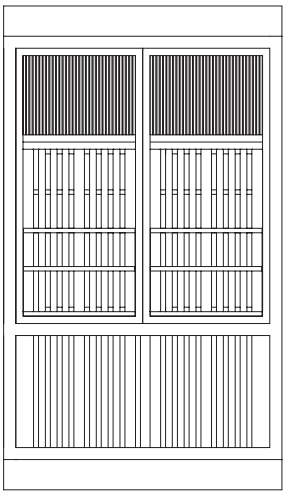


Type D: Elevation 1/50

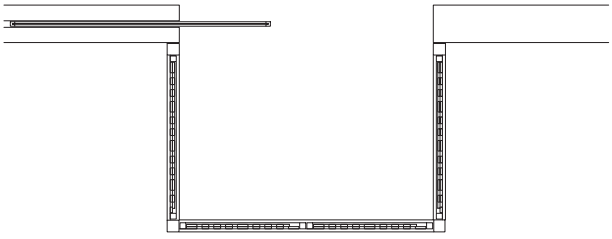


Type B

Type C



Types B and C: Elevation 1/50



Type B: Plan of the middle part 1/50

Fig.118. Different applications of the new *mashrabiyya*. It will be possible to install the new *mashrabiyya* as a large window or balcony flush with the wall (type A), as a smaller *mashrabiyya* flush with or extending out from the wall (types B and C), or as a window (type D).

Types C and D: Plan of the middle part 1/50

Type A: Plan of the middle part 1/50

5-2 Manufacturing Material

Egyptian Venetian shutters called *sheesh* are currently built using low-grade Russian and Scandinavian spruce—a kind of softwood also called whitewood. While low in cost relative to other types of imported wood, it is also considered low-quality, therefore about 70% is consumed by the construction industry for scaffolds, forms, and joinery. The remainder is used to build window frames, *sheesh*, low-cost doors, low-quality furniture, and other inexpensive items.[2]

Wood in general (and spruce in particular) is inappropriate for the new *mashrabiyya* for at least three reasons. First, despite its low grade, spruce is still expensive in light of the salaries of most Cairenes. To manufacture one new *mashrabiyya* of the type shown in **Figure 114**, the cost of materials is estimated to be $112 (650LE) if Russian spruce or low-grade beech is used.[3] This would put it out of reach for most residents in the city. Second, due to the low density of spruce compared to hardwoods, it is either very difficult or impossible to use for making fine latticework or processing thin slats. Craftsmen who still make *mashrabiyya* today use good quality beech or oak, which is twice as expensive as spruce. Third, wood is generally subject to physicochemical deterioration (from moisture, sun, and pollution) and biological deterioration (from microscopic organisms, insects, etc.).[4] Still, wood is a good thermal insulator, and if left unvarnished, increases indoor humidity through the process of evapo-transpiration,[5] thus reducing the temperature of an interior space.

---

2 S. Ibrahim (2005), *Egypt Solid Wood Products Annual 2005*, Gain Report, Cairo: USDA Foreign Agricultural Service, p. 4.

3 The volume of the proposed *mashrabiyya* is 0.56 m³, and Russian whitewood (spruce) costs $200 per cubic meter; see Ibid.

4 M. Abdel Hadi. (2000), "Wad' Al-Mashrabiyya wa Tarmimoha," in T. Nazih (Ed.), *al-Mashrabiyyat wal-Zujaj al-Mu'asha'fi al-'alam al-Islami, Proceedings of the International Seminar: Crafts in Traditional Islamic Architecture with Special Focus on Mashrabiyya and Stucco Colored Glass, 3-9 December, Cairo, 1995*, Istanbul: IRCICA, pp. 157-161.

5 Explained in **2-5 Environmental Function**.

For these reasons, the new *mashrabiyya* must be manufactured using a material that is locally available, affordable, durable, and with the same cooling capacities as wood. Since 1989, researchers at Ain Shams University in Cairo have studied potential substitutes for imported commercial timber in Egypt. They have given particular attention to *date palm leaves' midribs* (DPLM). Available in huge quantities as a cheap secondary product from the annual pruning of date palm trees, DPLM has been used for many centuries for many purposes in rural daily life. The trees are well-adapted to Egypt's hot and arid climate.

The date palm (*phoenix dactylifera*) is common throughout Egypt, the Middle East, and North Africa—home to 95% of the world's total.[6] Leading producers of dates are (in descending order) Iraq, Iran, Saudi Arabia, Algeria, and Egypt. Egypt has seven million date palms, representing 7% of the world total.[7] Just under 80% of Egypt's productive date palms (5.5 million trees) are found in the Nile Delta and Nile Valley—that is, in the cultivated area from the Mediterranean Sea to Aswan, including the Fayoum depression (**Fig.119**).[8] This means that DPLM (**Fig.120**), if found to be a suitable substitute for wood, will be easy to harvest and transport to Cairo and other new cities in north Egypt. Although fifth in the number of date palms, Egypt is at the top of the list of date-producing countries, producing 20.6% of the world total.[9] This statistic is reflected in the large amount of palm midribs produced by yearly pruning, a necessary stage in date production. The size of the DPLM crop is currently estimated at

6 A. Botes and A. Zaid. (2002), "The Economic Importance of Date Production and International Trade," in A. Zaid (Ed.), *Date Palm Cultivation: FAO Plant Production and Protection Papers -156*, Rome: Food and Agriculture Organization of the United Nations, Table 9.
7 M. Riyad (1996), "The Date Palm Sector in Egypt," *CIHEAM-IAMZ*, n. 28, p. 45; Botes and Zaid, op cit.
8 Riad, op cit., pp. 45-46.
9 Botes and Zaid, op cit., Table 14.

136,000 tons per year—the equivalent of approximately 12% of Egypt's wood imports.[10]

Pruned palm leaves already have a history of use as a wood substitute in rural areas. They have been or are still being used in fencing and roofing, as house partitions, screens, and doors, and to make such items as baskets, sacks, mats, small fans, hats, and hand brooms.[11] Their midribs are traditionally used to make crates and furniture.[12] To obtain a midrib, the leaf (3-6 meters in length)[13] is cut and separated from the palm tree at a length determined by prevailing cultural practices. The triangular-shaped midrib, which becomes thinner toward the end of the leaf, is cut into slats in standard lengths but at different thicknesses. The slats are combined and used to make furniture and crates for carrying and selling foodstuffs such as vegetables, fruits, chickens, and rabbits (**Fig.121**).[14]

Date palms need much less water and maintenance than other trees and are less subject to disease and parasites.[15] Throughout their life spans, their leaves tolerate millions of cycles of loading without breaking, even when subjected to strong hot desert storms.[16] Unlike wood, date palm midribs do not have radial rays—that is, no cross-links between the fibro vascular bundles that serve as the midrib's structural unit

---

[10] H.I. El-Mously et al. (1995), *Mechanical Properties of Date Palm Leaves' Midrib (DPLM) in Relation to its Utilization as a Substitute for solid Wood (poster)*, paper presented at IUFRO XX World Congress, Tampere, Finland,

[11] W.H. Barreveld (1993), *Date Palm Products. FAO Agricultural Services Bulletin No. 101*, Rome: Food and Agriculture Organization of the United Nations, op cit., Chapter 5.

[12] Ibid.

[13] A. Zaid and P.F. de Wet. (2002), "Botanical and Systematic Description of the Date Palm," in A. Zaid (Ed.), *Date Palm Cultivation: FAO Plant Production and Protection Papers -156*, Rome: Food and Agriculture Organization of the United Nations.

[14] Barreveld, op cit.

[15] H.I. El-Mously (1998), "The Date Palm: the Princess of a Sustainable Future," *INES Newsletter*, n. 23, p. 2.

[16] H.I. El-Mously (2000), *An Introduction to the Workshop: Inventing and Refining Sustainable Technologies and Services*, paper presented at International Conference: Challenges for Science and Engineering in the 21st Century, Stockholm, Sweden, p. 13.

(**Fig.122**). These bundles are linked by flexible parenchyma tissue. This structure gives the midrib its distinctive properties of flexibility, toughness, and protection against damage from heat.[17]

To evaluate midrib properties, to compare them with the corresponding properties of wood, and to test the potential for using DPLM to manufacture products that are normally made with wood, researchers at the Center for Development of Small-Scale Industries[18] at Ain Shams University prepared DPLM specimens from three locations in Egypt and examined their physical and mechanical properties. According to their results, the average modulus of rupture (MOR) in static bending was 13 KN/cm2, modulus of elasticity (MOE) in bending 1400 KN/cm2, tensile strength 9 KN/cm2, and compressive strength 6 KN/cm2.[19] Average DPLM density was measured at 0.66 gm/cm3.[20] These values are comparable to those for several types of commercial wood, including beech and spruce.[21]

The Center designed special machines and built prototypes to process DPLM into slats to manufacture products such as blockboard, particleboard, lumber-like blocks, and parts that could be used to construct *mashrabiyyas* (**Fig.123**).[22] Successful outcomes were listed in the United Nations Environment Programme's *International*

---

17 Ibid.

18 From 1993-1995, this project was sponsored by IDRC (The International Development Research Center located in Canada); it is also called "Date Palm Midrib Utilization Project."

19 MOR is the force necessary to break a material of specified width and thickness expressed in kilo Newton-force per square centimeter. MOE is the measure of the elastic force of any material, expressed by the ratio of a stress on a given unit of the material to the accompanying distortion, or strain. Tensile strength measures the force required to pull a material to the point where it breaks. Compressive strength is the capacity of a material to withstand axially directed pushing force. When the limit of compressive strength is reached, materials are crushed.

20 El-Mously et al. (1995), op cit.

21 H.I. El-Mously (1995), *Final Report of Date Palm Midrib Utilization Project*, Cairo: Center for Development of Small-Scale Industries and Local Technologies, retrieved August 6, 2006, from IDRC Development Research Information System http://idris.idrc.ca

22 El-Mously et al. (1995), op cit.

Fig.119. Date Palms (*phoenix dactylifera*) in Fayoum Oasis west of Cairo. (Photo by Michi Bertsch)

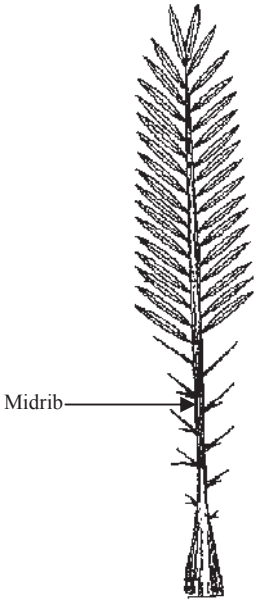


Fig.120. Date palm frond. (Zaid and de Wet 2002)

Fig.121. Carrying crates made with date palm midribs. (Photo by Murphy and Richmond 2003)

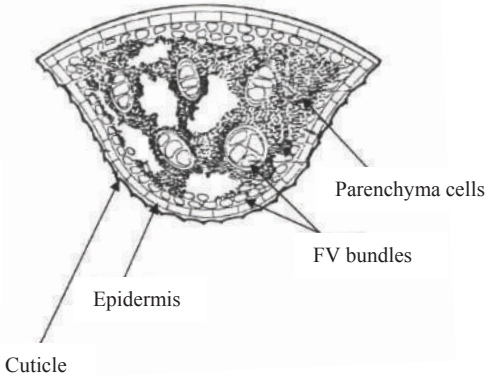


Fig.122. Anatomical structure (cross-section) of the palm midrib. (El-Mously 2000, p. 15.)

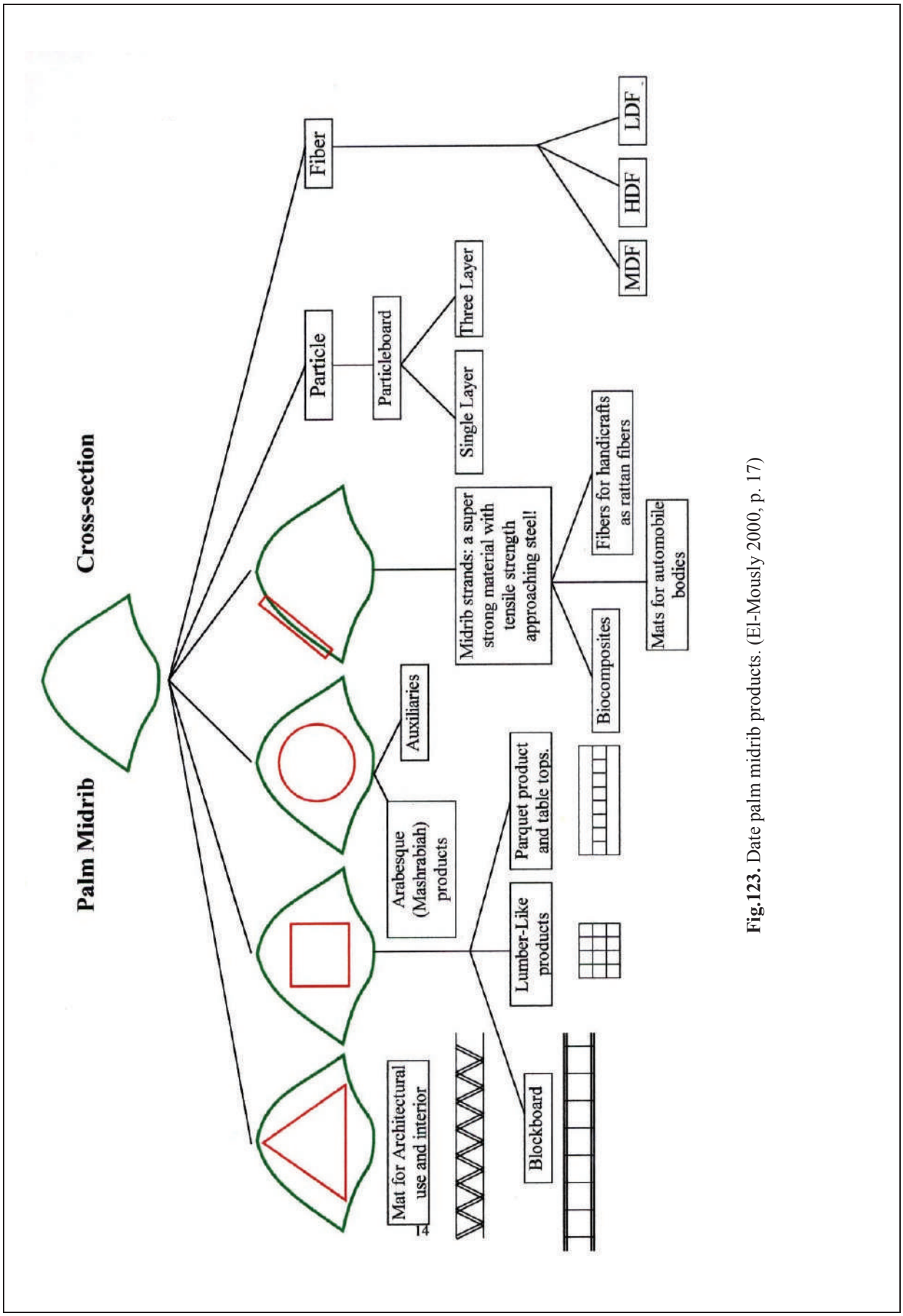


Fig.123. Date palm midrib products. (El-Mously 2000, p. 17)

Examples of Sustainable Product Development"—confirmation that "the date palm in Egypt can be a local alternative for wood."[23]

Six blockboard samples (100 cm x 50 cm x 1.3 cm) made from DPLM slats instead of spruce wood were tested by members of the Institute for Wood Research at the University of Munich in 1996 (**Fig.124**).[24] The Institute was commissioned to assess product quality according to German standards.[25] Block cores consisted of slats cut from palm leaf midribs, with cross sections measuring 1 cm x 1 cm. Surface veneers from poplar wood (1.5 mm thick) were glued onto both sides of block cores using urea formaldehyde resin.

According to the test results,[26] the mechanical properties of the DPLM blockboard samples were comparable to those of spruce-core blockboard,[27] leading the authors of the final Institute report to state, "this panel is suitable for a great number of applications such as furniture, interior fittings, containers and equipment, as well as wall and ceiling paneling."[28] DPLM blockboard has been successfully marketed and used by UNICEF in the construction of furniture for 100 community schools built in Upper Egypt (**Fig.124**).[29]

Other products have been created, formed, and tested. The Center for Development of Small-Scale Industries showed that it is possible to produce

[23] H. Hegeman (1997), *International Examples of Sustainable Product Development: Directory of 35 Examples*, Amsterdam: United Nations Environment Programme.
[24] It is possible to make thicker blockboard using more than one layer of slats.
[25] F. Troger (1996), *Quality Assessment of Palm Leaves' Midrib BIockboard According to German Standards*, Munich: Institute for Wood Research, Munich University, retrieved February 6, 2006, from http://www.egy-com.org/products_1.htm
[26] Tests involved examining moisture content, thickness swelling, density, internal bond strength, bending strength, and specifications on surface veneer and core layer.
[27] El-Mously et al. (1995), op cit.
[28] Troger, op cit.
[29] El-Mously (1998), op cit., p. 5.

mashrabiyya parts by turning individual DPLM slats with lathes and assembling the results in the same manner as that used with traditional *mashrabiyyas*.[30] In one project, an entire partition was successfully manufactured using turned pieces of DPLM installed into DPLM frames (**Fig.125**). Midrib shavings have been used to make particleboard whose physical and mechanical properties match and sometimes exceed[31] Egyptian particleboard standard 906/1991.[32] In addition, the Center made a lumber-like product from air-dried DPLM converted into 1 x 1 cm cross-section strips and glued with urea formaldehyde (UF).[33] The final blocks had 7 x 7 cm cross-sections and 42 cm lengths. Results from tests of MOR, MOE, compressive and shear strength parallel to grain, nail-pull and hardness indicate that the mechanical and strength properties of the DPLM blocks were comparable to those of beech wood. Other tests show that it is possible to manufacture lumber-like products of any desired dimension from DPLM.[34]

Ain Shams University researchers have found that date palm midrib properties can be enhanced via several techniques, including *retting*, which is commonly used for preserving bamboo against attack by insects; soaking in fresh water, which reduces the starch content and thus reduces its food value to insects, and impregnation to improve mechanical and fire retardance properties.[35]

---

[30] El-Mously (1998), op cit., p.4
[31] El-Mously et al. (1995), op cit.
[32] El-Mously (1998), op cit., p. 5.
[33] In research on manufacturing environmentally friendly lumber-like products from date palm midribs, some DPLM blocks were made using animal glue (AG) instead of urea formaldehyde (UF). Test results show that the AG glue bond strength was close to that of UF, thus supporting its use as a substitute. El-Mously (1995), op cit.; H.I. El-Mously et al. (1999), *An Environment-Friendly Lumber-like Product from Date Palm Leaves' Midribs*, paper presented at the Eco-Design, First International Symposium on Environmentally Conscious Design and Inverse Manufacturing, Tokyo, p. 927.
[34] This research has been awarded the EUROMAT 97 conference prize for the best poster, April 1997, Maastricht. See T.A. Mohammad et al. (1997), *A New Lumber-like Product from Date Palm Leaves' Midribs. A Poster*, paper presented at The 5th European Conference on Advanced Materials and Processes and Applications, EUROMAT 97, Maastricht.
[35] El-Mously (2000), op cit., p. 16.

Fig.124. Blockboard made with date palm leaves' midribs (DPLM). Left, the midribs are used as a core while surface veneers are glued on both sides. The total thickness is one cm. Right, Furniture made with DPLM blockboard in a community school established by the UNICEF. (From EGYCOM homepage: www.egy-com.org)

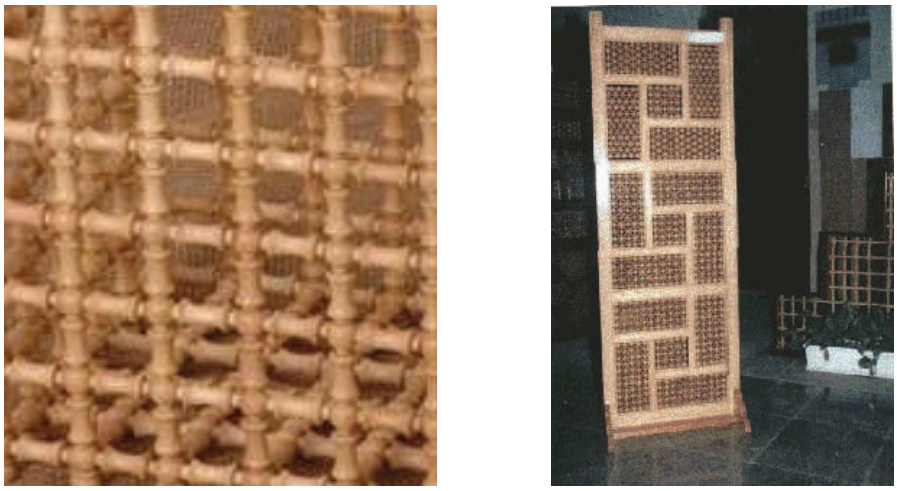


Fig.125. Latticework made by turning and assembling DPLM. The frames in the right partition are also made with midribs. (From EGYCOM homepage: www.egy-com.org)

In summary, there are at least nine factors supporting the use of DPLM for manufacturing the new *mashrabiyya*:

- DPLM is available in huge quantities in Egypt as a product of the annual pruning of date palms.
- Date palms need much less water and maintenance and are less subject to disease and parasites compared to other trees.
- DPLM can easily be transported to Cairo and major new cities, since approximately 80% of the country's productive date palms are located in the Nile Delta and Nile Valley, including the Fayoum depression west of Cairo.
- Unlike wood, DPLM has already adapted to Egypt's hot and arid climate, therefore it is less subject to damage caused by sunlight and heat. DPLM also has the characteristic of high thermal insulation.
- The physical and mechanical properties of DPLM (i.e., modulus of rupture, modulus of elasticity, tensile strength, compressive strength, and average density) are all comparable to those of beech, spruce, and other types of commercial wood.
- One cubic meter of DPLM currently costs 86$ (500LE), compared to $200 (1169LE) for one cubic meter of spruce or low-quality beech—less than half the price. DPLM for one 0.56 m³ *mashrabiyya*—the volume of the proposed new design—will cost $48 compared to $112 if Russian spruce or low-grade beech is used.[36]
- DPLM blockboard, particleboard, blocks, logs, and *mashrabiyya* parts have been successfully manufactured without size restraints. In all cases these products

[36] For the various applications shown in **Fig.118**, type A (0.36 m³) will cost $31 using DPLM and $72 using wood, type B (0.65 m³) $56 using DPLM and $130 using wood, type C (0.21 m³) $18 and $42, and type D (0.12 m³) $10.3 and $24.

have physical and mechanical properties comparable to those of commercial timber products.

- There is potential to manufacture environmentally friendly lumber-like products from DPLM using animal glue instead of urea formaldehyde.
- It is possible to use such common techniques as retting, soaking in fresh water, and impregnation to enhance DPLM durability and other properties.

5-3 Merits of the New *Mashrabiyya*

1) The design of the new *mashrabiyya* provides air, lighting, and views, and allows for various uses of balconies while blocking sunrays and veiling women. When closed, a *sheesh* blocks direct sunrays and insures privacy but blocks air, light, and views. Glass panels fail to maintain privacy, are subject to creating excessive heat for interior spaces, and produce glare. While serving many uses, balconies shelter neither from the neighbors' gazes nor from the intense sun of Cairo. Curtains ensure privacy and shade but also block daylight, air, and views. Tinted or surface-coated glass maintains privacy and reduces insolation and glare, but totally ignores ventilation needs and has sometimes unusual levels of ambient light. When lowered to a level that blocks sunrays and the view of neighbors across the way, shades exert a considerable dimming effect, block views, and prevent ventilation.

2) The upward-opening middle section of the new *mashrabiyya* protects women from the gazes of neighbors living above them, across and above/below them, and from passersby. This makes it much easier for women to remain hidden while hanging their washing, calling to and negotiating with peddlers, performing other

household tasks, or simply sitting next to a *mashrabiyya*.

3) In contrast to the fixed panels and small interstices of the traditional version, the new *mashrabiyya* can be adjusted to various degrees of privacy as well as to desired levels of lighting and airflow. It can also be transformed from an interior space to an open balcony for social events. In addition, its flexibility allows for various orientations.

4) The new *mashrabiyya* can assist women who wish to follow *shari'a* rules for veiling but in the context of modern-day Cairo, which has different dimensions of ceiling heights and street widths compared to the last period in which *mashrabiyya* were employed. The new design allows for ample lighting and airflow while maintaining privacy in multi-story apartment buildings constructed according to current building codes. In other words, the proposed new *mashrabiyya* harmonizes environmental and social needs.

5) Since its horizontal surface space and the number of corners where pollutants and dust can gather will be considerably reduced, the new *mashrabiyya* will be less subject to corrosion and easier to clean and maintain.

6) The simple design of the new *mashrabiyya* means that it can be constructed by common *najjareen* (carpenters) instead of requiring highly skilled craftsmen. A cheap local material—date palm leaf midrib (DPLM)—has been shown to be a viable substitute for imported wood. When used, DPLM can cut the cost of the material necessary for producing a single *mashrabiyya* by almost 57%.

7) Similar to wood, DPLM provides high thermal insulation and can increase humidity/reduce temperature in interior spaces via evapo-transpiration. Its advantages over wood, besides the cost, are that it is less subject to disease, parasites, and damage due to intense sunlight and heat.

8) Considering the unpopularity of air conditioning in Egypt, the cooling functions of the new *mashrabiyya* would meet the cooling needs of many Cairene households.[37]

9) Because its floor is not raised, the new *mashrabiyya* meets contemporary requirements for spatial flexibility.

5-4 Conclusion

I this chapter I offered a proposal for a new *mashrabiyya* design that utilizes latticework from traditional Japanese *machiya no kōshi* for use with apartment buildings in contemporary Cairo. Since it meets contemporary social and economic needs and ameliorates the intense Egyptian heat, I suggest that this new *mashrabiyya* is a better alternative to the *mashrabiyya*'s traditional design, to open balconies, to openings blocked with glass panels and *sheesh*, and to the modifications and additions commonly made by Cairene households.

[37] See **1-4 Air-conditioning in Cairo**.

CONCLUSION

In this dissertation I offered a preliminary proposal for a new framed latticework design derived from the traditional Islamic *mashrabiyya* and the Japanese *machiya no kōshi* for application to apartment buildings in contemporary Cairo.

After analyzing problems associated with residential thresholds in Cairo, I explained how open balconies and the combination of glass panels and *sheesh* have conflicting social and environmental functions, and examined modifications and additions commonly made by households to adapt their thresholds to their needs. Next, I described the role that *mashrabiyyas* played in traditional Cairene homes and how its design was adapted to meet the needs of women's veiling as well as ventilating and cooling interior spaces, and analyzed problems with applying the same design to present-day Cairo.

The conclusion from this background is that improvements are required so that a new type of *mashrabiyya* will allow women to perform their household chores on their balconies without having to don their veils and also allow them to make fast and easy adjustments to match varying degrees of privacy, including creating completely open balconies for social events. To reduce its prohibitively high cost, the new *mashrabiyya* needs to be much simpler so that carpenters can build them using indigenous materials that eliminate the need to use expensive imported wood. Considering the dusty weather of Cairo and its status as the second most polluted city in the world, the new *mashrabiyya*'s pieces must be vertical as much as possible to reduce the amount of horizontal surfaces and the number of corners that will need cleaning. This will also preserve the latticework's capacity to cool interior spaces by the process of

evapo-transpiration. I analyzed how the new *mashrabiyya* (especially its upper section) requires redesign in light of modern building laws in Egypt, wider modern streets, and lower ceiling heights in apartments. All of these factors affect the veiling function of a *mashrabiyya*, which still must provide acceptable levels of lighting and ventilation. Accordingly, the size of the new *mashrabiyya* must be reduced to match current ceiling heights and the floors surrounding them must not be raised, as was the case with traditional *mashrabiyyas*. Eliminating the raised floor will allow for greater internal flexibility.

In the fourth chapter I gave a historical background and detailed description of the Japanese latticework known as *kōshi* that is commonly seen on traditional townhouses called *machiya*. According to my observations, incorporating design elements from the *machiya no kōshi* offers practical solutions to problems associated with the traditional *mashrabiyya* design. For example, a window called *musō-mado* can be adjusted to varying degree of openness, lighting, and airflow, and the design of a specific *machiya no kōshi* called *sasame-gōshi* allows for a high level of privacy while allowing a surprising amount of air and light to pass through. Another version called *hamekomi-gōshi* allows for complete openness by detaching it from a building's façade—another feature that can be incorporated into a new *mashrabiyya* design. Furthermore, the simplicity, verticality, fast construction methods, and aesthetic effects of *machiya no kōshi* all make it an attractive alternative to the traditional *mashrabiyya*.

Since it will address contemporary social and economic needs, mitigate heat and intense light, and be easy to maintain, the proposed *mashrabiyya* will be a better alternative to traditional *mashrabiyyas*, open balconies, glass panels and *sheesh*, and

other modifications and additions commonly made to thresholds by Cairene residents. I also described an alternative manufacturing material that is locally available in large quantities—date palm leaves' midribs (DPLM). Using DPLM to build a single new *mashrabiyya* will cut the cost of wood for the same purpose by almost 57% (using imported Russian spruce or low-grade beech). In addition, DPLM is an excellent thermal insulator, an organic material (meaning that it will have the same cooling capacity via evapo-transpiration as wood *mashrabiyyas*), and less subject to disease and parasites or damage caused by intense sunlight and heat.

My plans for future research involve conducting detailed environmental studies of the new *mashrabiyya's* performance. Studies are also required to determine if the new design will actually work in an urban environment in terms of guaranteeing privacy from various vantage points above, below, and across from apartments where the new *mashrabiyya* is installed. In addition, a full-scale model of the new *mashrabiyya* constructed with DPLM is required in order to understand the difficulties that might arise from the design or material and to experiment with ways of improving the proposed design. Finally, research must be conducted to determine whether Cairene residents are willing to accept the new DPLM *mashrabiyya* as a replacement for their current methods for veiling, lighting, and ventilating their apartments, and if so, if they have suggestions for improving its form and functions.

BIBLIOGRAPHY

Abaza, M. (2004, 697). Advertising History. *Al-Ahram Weekly Online*.

Abdel 'Alim, F. (2000). Al-Tatawwor al-Tarikhi wal-Athari lel-Mashrabiyya. In T. Nazih (Ed.), *al-Mashrabiyyat wal-Zujaj al-Mu'asha'fi al-'alam al-Islami, Proceedings of the International Seminar: Crafts in Traditional Islamic Architecture with Special Focus on Mashrabiyya and Stucco Colored Glass, 3-9 December, Cairo, 1995* (pp. 225-230). Istanbul: IRCICA.

Abdel Fattah, H. (1994). *Social and Cultural Values and Architecture*. Unpublished masters thesis, Cairo University.

Abdel Gawwad, T. A. (1989). *Misr, al 'emara fel karn al 'eshreen*. Cairo: The Anglo-Egyptian.

Abdel Gelil, N. (2006). A New Mashrabiyya for Contemporary Cairo: Integrating Traditional Latticework from Islamic and Japanese Cultures. *JAABE, 5*(1), 37-44.

Abdel Hadi, M. (2000). Wad' Al-Mashrabiyya wa Tarmimoha. In T. Nazih (Ed.), *al-Mashrabiyyat wal-Zujaj al-Mu'asha'fi al-'alam al-Islami, Proceedings of the International Seminar: Crafts in Traditional Islamic Architecture with Special Focus on Mashrabiyya and Stucco Colored Glass, 3-9 December, Cairo, 1995* (pp. 157-164). Istanbul: IRCICA.

Abdelkader, N. & Ettouny, S. (1997). *Ishkaliyyat al-Naseeg wal Tabi'*. Cairo: Al 'Arabi lel Nashr wal Tawzee'.

Abdul-Rauf, M. (1977). *The Islamic view of women and the family*. New York: Robert Speller and Sons.

Abu-Lughod, J. (1965). Tale of Two Cities: The Origins of Modern Cairo. *Comparative Studies in Society and History, 7*(4), 429-457.

Abu-Lughod, J. (1971). *Cairo: 1001 Years of the City Victorious*. Princeton: Princeton University Press.

Abu-Lughod, J. (2004). Cairo, an Islamic Metropolis. In S. Bianca & P. Jodidio (Eds.), *Cairo: Revitalising a Historic Metropolis* (pp. 19-30). Turin: Umberto Allemandi & C. for Aga Khan Trust for Culture.

Ahmad, F. & Sha'ban, A. (2000). *Law 106 of 1976 on Directing and Regulating*

Building Works as Amended by Law 101 of 1996 (7th ed.). Cairo: Al Hai'a al-'Ama li-Sho'oun al-Matabi' al-'amiriyya.

Ahmed, L. (1992). *Women and Gender in Islam: Historical Roots of a Modern Debate*. New Haven: Yale University Press.

Al-Abed, B. (1990, 13-15 June). *Modernity or Continuity, Notes on the Dialectic of Contemporary Arab Architecture.* Paper presented at the The Delft International Working Seminar on Critical Regionalism, Context and Modernity, Delft, Holland.

Al-Hathloul, S. (2002). Legislation and the Built Environment in the Arab-Muslim City. *Diwan al-Mimar, 2001 - 2002 series* (April 22). Retrieved April 19, 2006, from csbe.org/e_publications/arab-muslim_city

Al-Heggawi, G. R. (2000). Al-Mashrabiyyat wal-Zujaj a-Mu'ashak fil- Kuwait. In T. Nazih (Ed.), *al-Mashrabiyyat wal-Zujaj al-Mu'asha'fi al-'alam al-Islami, Proceedings of the International Seminar: Crafts in Traditional Islamic Architecture with Special Focus on Mashrabiyya and Stucco Colored Glass, 3-9 December, Cairo, 1995* (pp. 299-314). Istanbul: IRCICA.

Al-Wakeel, S. A. & Serag, M. A. (1989). *Al-Manakh wa 'imarat al-Manatek al-Hara* (3rd ed.). Cairo: Alam al-Ketab.

Ando, K. (1997). Fūdo to kurashi no katachi. In K. Matsuki, et al. (Eds.), *The Form of Japanese Windows* (pp. 71-128). Tokyo: Itagarasu kyōkai.

Ankawi, S. M. (2000). Al-Rawshan wa Tajrobat Tatweerihi. In T. Nazih (Ed.), *al-Mashrabiyyat wal-Zujaj al-Mu'asha'fi al-'alam al-Islami, Proceedings of the International Seminar: Crafts in Traditional Islamic Architecture with Special Focus on Mashrabiyya and Stucco Colored Glass, 3-9 December, Cairo, 1995* (pp. 27-52). Istanbul: IRCICA.

Antoun, R. T. (1968). On the Modesty of Women in Arab Muslim Villages. *American Anthropologist, New Series, 70*(4), 671-697.

Aoki, S., et al. (Eds.). (1993). *Encyclopedia of Architecture and Building (Kenchiku daijiten)* (2nd ed.). Tokyo: Shōkokusha.

Arab, S. (2000). Ramadan in Egypt: a Lifetime Experience. *Tour Egypt Monthly, 1*(6). Retrieved June 21, 2006, from egyptmonth.com/mag11012000/index.htm

Archnet. (1998). Haremlik. In *Dictionary of Islamic Architecture*. Cambridge:

Massachusetts Institute of Technology, Harvard University, and the Aga Khan Trust for Culture.

Asfour, K. (1993). The Domestication of Knowledge: Cairo at the Turn of the Century. *Muqarnas X: An Annual on Islamic Art and Architecture, 10*, 125-137.

Askar, H., et al. (2001). Windows for Buildings in Hot Arid Countries. *Applied Energy, 70*(1), 77-101.

Aziz, S., et al. (2001). *Residential Building Survey in Cairo and Alexandria*. Cairo: Housing and Building Research Center.

Badran, M. (1988). The Feminist Vision in the Writings of Three Turn-of-the-Century Egyptian Women. *Bulletin (British Society of Middle Eastern Studies), 15*(1/2), 11-20.

Badran, M. (1999, 462). Feminism in a Nationalist Century. *Al-Ahram Weekly, 20th Century Special Issue*.

Baer, G. (1969). *Studies in the Social History of Modern Egypt*. Chicago: The University of Chicago Press.

Bakr, M. (2004, 694). Working for the Environment. *Al-Ahram Weekly Online*.

Barreveld, W. H. (1993). *Date Palm Products. FAO Agricultural Services Bulletin No. 101*. Rome: Food and Agriculture Organization of the United Nations.

Beck, D. F. (1957). The Changing Moslem Family of the Middle East. *Marriage and Family Living, 19*(4), 340-347.

Behrens-Abouseif, D. (1989). *Islamic Architecture in Cairo: An Introduction*. Leiden, New York: E.J. Brill.

Behrens-Abouseif, D. (1990). Note sur la Fonction de la Cour dans la Maison Moyenne du Caire Ottoman. In *l'Habitat Traditionnel dans les Pays Musulmans autour de la Mediterranee* (Vol. 2, pp. 411-418). Cairo: Institut Francais d'Archeologie Orientale.

Behrens-Abouseif, D. (1991). Mashrabiyya. In C. E. Bosworth, et al. (Eds.), *The Encyclopaedia of Islam New Edition* (Vol. 6, pp. 717-720). Leiden: E.J. Brill.

Berque, J. & Shaka, M. (1974). *La Gamâliya depuis un Siècle*. Paris: Librairie orientaliste.

Berry, M. E. (1994). *The Culture of Civil War in Kyoto*. Berkeley: University of

California Press.

Botes, A. & Zaid, A. (2002). The Economic Importance of Date Production and International Trade. In A. Zaid (Ed.), *Date Palm Cultivation: FAO Plant Production and Protection Papers -156*. Rome: Food and Agriculture Organization of the United Nations.

Cairo. (2006). In *Encyclopaedia Britannica*. Retrieved March 6, 2006, from Encyclopaedia Britannica Premium Service www.britannica.com/eb/article-59326

Chelhod, J. (1990). Hidjab. In C. E. Bosworth, et al. (Eds.), *The Encyclopaedia of Islam New Edition* (Vol. 3, pp. 359-361). Leiden: E.J. Brill.

Chino, K. (1991). *Shigisan engi emaki*. Tokyo: Shōgakukan.

Curl, J. S. (1993). *Encyclopaedia of Architectural Terms* (2nd ed.). London: Donhead.

Depaule, J. C. & Noweir, S. (1986). Balcons au Caire: Les relations de l'intérieur et de l'extérieur dans l'habitat populaire. *Architecture and Behaviour, 2*(3-4), 301-321.

Description de l'Egypte: Planches, Etat Moderne I. (1822). Paris: Panckoucke.

Description de l'Egypte: Planches, Etat Moderne II. (1823). Paris: Panckoucke.

Egypt, A. R. o. (1977). *Urban Land Use in Egypt*. Cairo: Ministry of Housing and Recreation, Ministry of Planning.

Eid, Y. (2005, March 29-31). *Sustainability of 19th and 20th Century Buildings in Egypt.* Paper presented at the International Seminar on the Management of the Shared Mediterranean Heritage, Alexandria, Egypt.

El Guindi, F. (1999). *Veil: Modesty, Privacy, and Resistance*. Oxford: Berg.

El Kadi, M. (1996). *Users Additions to Facades: Recording and Analysis*. Unpublished masters thesis, Cairo University.

El-Batran, M. & Arandel, C. (1998). A shelter of their Own: Informal Settlement Expansion in Greater Cairo and Government Responses. *Environment and Urbanization, 10*(1), 217-232.

Elbendary, A. (2003, 646). Out on the Balcony. *Al-Ahram Weekly Online*.

Eldemery, I. M. (2003). *Islamic Architecture: Cultural Heritage and Future Challenges*. Housing &Building Research Center.

El-Hefnawi, A. (2000). *Climatic Design for Low-cost Housing in Egypt*. Sweden: Lund

University AEE Advanced International Training Programme.

El-Mously, H. I. (1995). *Final Report of Date Palm Midrib Utilization Project*. Cairo: Center for Development of Small-Scale Industries and Local Technologies. Retrieved August 6, 2006, from IDRC Development Research Information System idris.idrc.ca

El-Mously, H. I. (1998). The Date Palm: the Princess of a Sustainable Future. *INES Newsletter*(23).

El-Mously, H. I. (2000). *An Introduction to the Workshop: Inventing and Refining Sustainable Technologies and Services.* Paper presented at the International Conference: Challenges for Science and Engineering in the 21st Century, Stockholm, Sweden.

El-Mously, H. I. (2000). *Use of Agricultural Residues in Industry: A Case Study from Egypt.* Paper presented at the International Confference: Challenges for Science and Engineering in the 21st Century, Stockholm, Sweden.

El-Mously, H. I., et al. (1999). *An Environment-Friendly Lumber-like Product from Date Palm Leaves' Midribs.* Paper presented at the Eco-Design, First International Symposium on Environmentally Conscious Design and Inverse Manufacturing, Tokyo.

El-Mously, H. I., et al. (1995). *Mechanical Properties of Date Palm Leaves' Midrib (DPLM) in Relation to its Utilization as a Substitute for solid Wood (poster).* Paper presented at the IUFRO XX World Congress, Tampere, Finland.

El-Noshokaty, A. (2002, 575). Clearing the air: What's that acrid smell? *Al-Ahram Weekly Online*.

El-Safty, A. & Al-Daini, A. J. (2002). Economical Comparison between a Solar-powered Vapour Absorption Air-conditioning System and a Vapour Compression System in the Middle East. *Renewable Energy, 25*(4), 569-583.

El-Shahawy, M. A. & Hanna, A. F. (2003). Meteorological Conditions Leading to Air-pollution Episodes in Greater Cairo City (Egypt). *European Geophysical Society, 5*(00103).

El-Zanaty, F. & Way, A. (2001). *Egypt Demographic and Health Survey 2000*.

Calverton, Maryland: Ministry of Health and Population (Egypt), National Population Council and ORC Macro.

El-Zanaty, F. & Way, A. (2004). *Egypt Interim Demographic and Health Survey 2003*. Cairo: Ministry of Health and Population, National Population Council, El-Zanaty and Associates, and ORC Macro.

El-Zanaty, F. & Way, A. (2006). *Egypt Demographic and Health Survey 2005*. Cairo: Ministry of Health and Population, National Population Council, El-Zanaty and Associates, and ORC Macro.

Engel, H. (1964). *The Japanese House: a Tradition for Contemporary Architecture*. Tokyo: Charles E. Tuttle Co.

Fathy, H. (1986). *Vernacular Architecture: Principles and Examples with Reference to Hot Arid Climates*. Chicago: The University of Chicago Press.

Fernandes, L. (1990). Habitat et Prescription Legales. In *l'Habitat Traditionnel dans les Pays Musulmans autour de la Mediterranee* (Vol. 2, pp. 419-426). Cairo: Institut Francais d' Archeologie Orientale.

Fernea, E. & Fernea, R. (1987). *The Arab World: Personal Encounters*. New York: Anchor Press.

Fernea, E. W. (1995). Childhood in the Muslim Middle East. In E. W. Fernea (Ed.), *Children in the Muslim Middle East* (pp. 3-16). Austin, TX: University of Texas Press.

Garcin, J. C., et al. (1982). *Palais et Maisons du Caire I Epoque Mamelouke*. Paris: Centre National de la Recherche Scientifique.

Ghannam, F. (2002). *Remaking the Modern: Space, Relocation and the Politics of Identity in a Global Cairo*. Berkeley: University of California Press.

Gorgy, M. F. (1985). The Greater Cairo Region: Land Use Today and Tomorrow. In A. Evin (Ed.), *The Expanding Metropolis: Coping with the Urban Growth of Cairo* (pp. 176-182). Singapore: Concept Media/The Aga Khan Award for Architecture.

Hakim, B. S. (1988). *Arabic-Islamic Cities: Building and Planning Principles* (2nd ed.). London and New York: Kegan Paul International.

Hammouda, R. (1992). *Urban Aesthetics in Developing Coutries*. Unpublished doctoral thesis, Cairo University.

Hegab, M. S. (1985). New Towns Policy. In A. Evin (Ed.), *The Expanding Metropolis: Coping with the Urban Growth of Cairo* (pp. 171-174). Singapore: Concept Media/The Aga Khan Award for Architecture.

Hegazi, S. (1991). *Ta'aleem al-Islam wa Tasmeem al-Maskan*. Unpublished masters thesis, Cairo University.

Hegeman, H. (1997). *International Examples of Sustainable Product Development: Directory of 35 Examples*. Amsterdam: United Nations Environment Programme.

Higuchi, H. & Ishiyama, H. (1977). *Shichijūichiban shokunin uta awase shokunin zukushi e*. Tokyo: Kōwa shuppan.

Hiyuga, S. (1988). *Monogatari mono no kenchikushi: Mado no hanashi*. Tokyo: Kashima shuppankai.

Hoffman-Ladd, V. J. (1987). Polemics in Modesty and Segregation in Contemporary Cairo. *International Journal of Middle East Studies, 19*(1), 23-50.

Huang, J., et al. (2003, December 15-17). *The Development of Residential and Commercial Building Energy Standards for Egypt.* Paper presented at the Energy Conservation in Buildings Workshop, Kuwait.

Ibrahim, A. (1988). Al Iskan al-'ahwa'i. *Alam al-Bina, 97*.

Ibrahim, L. (1984). Residential Architecture in Mamluk Cairo. *Muqarnas, 2*, 47-59.

Ibrahim, L. A. (1978). Middle-Class Living Units in Mamluk Cairo. *AARP Art and Archaeology Research Papers, 14*, 24-30.

Ibrahim, S. (2005). *Egypt Solid Wood Products Annual 2005*. Gain Report. Cairo: USDA Foreign Agricultural Service.

Ibrahim, S. E. (1985). Cairo: A Sociological Profile. In A. Evin (Ed.), *The Expanding Metropolis: Coping with the Urban Growth of Cairo* (pp. 25-33). Singapore: Concept Media/The Aga Khan Award for Architecture.

Ikeda, T. (1997). Mado no dezain. In S. Hiyuga (Ed.), *Nihon no mado* (pp. 17-48). Kyoto: Tankōsha.

Ikeda, T. (1997). Mado: sono shurui. In S. Hiyuga (Ed.), *Nihon no mado* (pp. 5-16). Kyoto: Tankōsha.

Inaba, K. & Nakayama, S. (2000). *Japanese Homes and Lifestyles: An Illustrated Journey through History* (J. Bester, Trans.). Tokyo, New York, London:

Kodansha International.

Inoguchi, K. & Sugimoto, M. (2000). *Yomigaeru kyō no machiya: iyashi no kūkan*. Kyoto: Maria shobō.

International Weather for Energy Calculations (IWEC Weather Files) User Manual and CD-ROM. (2001). Atlanta: ASHRAE.

Jomard, E. F. (1822). Ville du Caire. In *Description de I'Egypte* (Vol. 2, pp. 662-696). Paris: L'Imprimerie Imperiale.

Kamel, A. (2000). Kaifa Yomken lel Asala al-Taklidiyya an Takoun Masdar Elham Litahreek 'onsor al-Hadatha. In T. Nazih (Ed.), *al-Mashrabiyyat wal-Zujaj al-Mu'asha'fi al-'alam al-Islami, Proceedings of the International Seminar: Crafts in Traditional Islamic Architecture with Special Focus on Mashrabiyya and Stucco Colored Glass, 3-9 December, Cairo, 1995* (pp. 81-91). Istanbul: IRCICA.

Kanazaki, J. & Shintani, A. (1998). *Kyō-machiya*. Kyoto: Mitsumura Suiko Shoin.

Kenzari, B. & Yasser, E. (2003). The Ambiguous Veil: on Trancparency, the Mashrabiy'ya, and Architecture. *Journal of Architectural Education, 56*(4), 17-25.

Kumagai, M. (1996). Takayama no kōshi. In Shingakugei wafūkenchiku sōsho (Ed.), *Kōshi no omotegamae* (pp. 113-121). Kyoto: Gakugei shuppansha.

Lamei, S., et al. (1996). *Light Screens: The Arabian Turned Wood Work (Mashrabiya) and Stucco Coloured Glass Windows in Egypt*. Cairo: Arab Egyptian Center.

Lane, E. W. (1954). *Manners and Customs of the Modern Egyptians* (Reprint of the 1860, 3rd ed.). London: Dent.

López-Rocha, S. (2001). Women in Islamic Egypt: Perceptions and Observed Behavior among a Group of Egyptians. *LLC Review, 1*(Fall), 26-44.

Macleod, A. E. (1991). *Accommodating Protest: Working Women, the New Veiling, and Change in Cairo*. Cairo: The American University in Cairo Press.

Masuda, T. (1997). *Kabe Mado Kōshi*. Tokyo: Gurafikkusha.

Maury, B., et al. (1983). *Palais et Maisons du Caire II Epoque Ottomane*. Paris: Centre National de la Recherche Scientifique.

Ministry of Municipal and Rural Affairs & Development Popular Housing Co. (1954). *Development Popular Housing Co. Projects to be Executed in 1954-1956*. Cairo: Ministry of Municipal and Rural Affairs, Development Popular Housing Co.

Mitchell, R. P. (1969). *The Society of the Muslim Brothers*. London: Oxford University Press.

Mohammad, T. A., et al. (1997). *A new lumber-like product from date palm leaves'midribs. A poster.* Paper presented at the The 5th European Conference on Advanced Materials and Processes and Applications, EUROMAT 97, Maastricht.

Mule, P. & Barthel, D. (1992). The Return to the Veil: Individual Autonomy vs. Social Esteem. *Sociological Forum, 7*(2), 323-332.

Murakami, J., et al. (Eds.). (2004). *Kinki chihō no machinami* (Vol. 3). Tokyo: Tōyō shorin.

Myntti, C. (2000). *Paris along the Nile: Architecture in Cairo from the Belle Epoque*. Cairo: American University in Cairo Press.

Nagai, N. (1996). Machiya no kōshi. In Wafūkenchikusha (Ed.), *Kōshi no omotegamae* (pp. 3-7). Kyoto: Gakugei shuppansha.

Nakagawa, T. (2005). *The Japanese House: in Space, Memory, and Language* (G. Harcourt, Trans.). Tokyo: International House of Japan.

Nakamura, A. (1997). Chronological Table (A. M. Oshima & H. Watanabe, Trans.). In K. Matsuki, et al. (Eds.), *The Form of Japanese Windows* (pp. 185-195). Tokyo: Itagarasu kyōkai.

Nasser, M. (1999). The New Veiling Phenomenon ⎯ is it an Anorexic Equivalent? A Polemic. *Journal of Community & Applied Social Psychology, 9*, 407-412.

Nazih, T. (Ed.). (2000). *al-Mashrabiyyat wal-Zujaj al-Mu'asha'fi al-'alam al-Islami, Proceedings of the International Seminar: Crafts in Traditional Islamic Architecture with Special Focus on Mashrabiyya and Stucco Colored Glass, 3-9 December, Cairo, 1995*. Istanbul: IRCICA.

Nishihara, K. (1968). *Japanese Houses: Patterns for Living*. Tokyo: Japan Publications, Inc.

Nishiyama, U. (1975). *Nihon no sumai* (Vol. I). Tokyo: Keisō shobō.

Okudaira, S. (1991). *Rakuchū rakugai zubyōfu to nanbanbyōbu*. Tokyo: Shōgakukan.

Ooba, O. (1997). Kōshi mado. In S. Hiyuga (Ed.), *Nihon no mado* (pp. 99-108). Kyoto: Tankōsha.

Osama, M. (2001). Eid: Celebration for the Young and Old. *Tour Egypt monthly, 2*(1). Retrieved June 21, 2006, from egyptmonth.com/mag01012001/index.htm

Parent, M. N. (2003). Machiya. In *JAANUS*. Retrieved July 22, 2005, from Japanese Architecture and Art Net Users System www.aisf.or.jp/%7Ejaanus/deta/m/machiya.htm

Parent, M. N. (2003). Shitomido. In *JAANUS*. Retrieved July 21, 2005, from Japanese Architecture and Art Net Users System www.aisf.or.jp/~jaanus/deta/s/shitomido.htm

Perkins, A. (2002). Review Article: Veil of Tradition, Veil of Resistance, Islamic Dress in Contemporary Egypt. *Text, Practice, Performance, 4*, 65-84.

Petherbridge, G. (1995). The House and Society. In G. Michell (Ed.), *Architecture of the Islamic World*. London: Thames and Hudson.

Pickthall, M. (1930). *The Meaning of the Glorious Koran* (Electronic ed.). New York: A. A. Knopf. Retrieved June 29, 2006, from University of Southern California homepage www.usc.edu/dept/MSA/quran

Raafat, S. (1998). Cairo's Belle Epoque Architects 1900 - 1950. *Cairo's Recollections Online egy.com*.

Rageh, A. (1985). The Changing Pattern of Housing in Cairo. In A. Evin (Ed.), *The Expanding Metropolis: Coping with the Urban Growth of Cairo* (pp. 133-140). Singapore: Concept Media/The Aga Khan Award for Architecture.

Raymond, A. (1980). The Rab': A Type of Collective Housing in Cairo During the Ottoman Period. In J. G. Katz (Ed.), *Architecture as Symbol and Self-Identity* (pp. 55-62). Philadelphia: Aga Khan Award for Architecture.

Reese, L. (1998). The Burqa, Chador, Veil and Hijab! In *Women in the Muslim World*. Berkeley: Women in World History Curriculum. Retrieved January 11, 2005, from www.womeninworldhistory.com/sample-13.html

Revault, J. (1988). L'Architecture Domestique au Caire a l'Epoque Ottomane. In *l'Habitat Traditionnel dans les Pays Musulmans autour de la Mediterranee* (Vol. 1, pp. 43-60). Cairo: Institut Francais d' Archeologie

Orientale.

Riad, M. (1996). The Date Palm Sector in Egypt. *CIHEAM-IAMZ*(28), 45-53.

Rona, N. (2004). *Solar Air-Conditioning Systems* (e-Book ed.). Göteborg: Chalmers University of Technology.

Rose, C. & Boxberger, L. (2000). *Life in Modern Cairo*. Retrieved June 10, 2006, from the Center for Middle Eastern Studies Public Service MENIC inic.utexas.edu/menic/cairo/modern/life/life.html

Safwat, N. (2000). Al Hadatha wal-Takalid wal-Indimaj: Fikrat al-Khususiyya fil-'Imara al-'othmaniyya. In T. Nazih (Ed.), *al-Mashrabiyyat wal-Zujaj al-Mu'asha'fi al-'alam al-Islami, Proceedings of the International Seminar: Crafts in Traditional Islamic Architecture with Special Focus on Mashrabiyya and Stucco Colored Glass, 3-9 December, Cairo, 1995* (pp. 93-98). Istanbul: IRCICA.

Saker, H. (1996). *New Urban Communities: Have They Improved the Situation of Central Areas? Greater Cairo Region Case Studies.* Paper presented at the 20th INTA Annual World Conference: New Urban Communities: Past Experience and the Future of Cities, Cairo.

Sakr, T. M. (1993). *Early Twentieth-Century Islamic Architecture in Cairo*. Cairo: The American University in Cairo Press.

Salama, A. (1999, 24-27 November). *Contemporary Architecture of Egypt: Reflections on Architecture and Urbanism of the Nineties.* Paper presented at the Regional Seminar, Architecture Reintroduced: New Projects in Societies in Change, Beirut, Lebanon.

Sedky, A. (2001). The Factors Influencing the Change in Cairene Domestic Architecture after the Ottoman Conquest. *EJOS-Electronic Journal of Oriental Studies, 4*(38), 1-23.

Sherif, B. (1999). The Prayer of a Married Man Is Equal to Seven Prayers of a Single Man. *Journal of Family Issues, 20*(5), 617-632.

Sherif, L. (2002, 2-4 March). *Architecture as a System of Appropriation: Colonization in Egypt.* Paper presented at the First International Conference of the UIA-WPAHR-V on Architecture & Heritage as a Paradigm for Knowledge and Development: Lessons of the Past, New Inventions and Future Challenges,

Bibliotheca Alexandrina, Egypt.

Shōkokusha (Ed.). (1973). *Mokuzō no shōsai: 4 tategu・zōsakuhen*. Tokyo: Shōkokusha.

Sibley-Behloul, M. (2002). Informal Transformations of Formal Housing Estates in Algiers and Cairo. *GBER, 2*(3), 32-41.

Sims, D. (2003). *Urban Slums Reports: The case of Cairo, Egypt*. UNDERSTANDING SLUMS: Case Studies for the Global Report on Human Settlements 2003. London: Development Planning Unit (DPU), University College.

Speiser, P. (1991). La Restauration du Palais Bashtak. In *l'Habitat Traditionnel dans les Pays Musulmans autour de la Mediterranee* (Vol. 3, pp. 809-825). Cairo: Institut Francais d' Archeologie Orientale.

Spencer, J. (1992). Mashrabeya: an Architectural Language. *Journal of Arts and the Islamic World, 21*, 49-52.

Stewart, D. J. (1999). Changing Cairo: The Political Economy of Urban Form. *International Journal of Urban and Regional Research, 23*(1), 128-146.

Suzuki, K. (Ed.). (1980). *Nihon no minka 6: Machiya II, Kinki* (Vol. 6). Tokyo: Gkushūkenkyūka.

Suzuki, M. (1996). Takehara no kōshi. In Wafūkenchikusha (Ed.), *Kōshi no omotegamae*. Kyoto: Gakugei shuppansha.

Taktak, J. (2002). *Architectural and Urban Design Enhancing the Sense of Belonging within a Cultural Developing Society*. Unpublished doctoral thesis, Cairo University.

Temperatures and Precipitation - Selected International Cities Table 1331. (2002). Statistical Abstract of the U.S.: 2001. Washington, DC: U.S. Dept. of Commerce, Bureau of the Census. Retrieved December 13, 2005, from www.census.gov/prod/2002pubs/01statab/intlstat.pdf

The Aga Khan Program for Islamic Architecture Harvard University and the Massachusetts Institute of Technology. (1985). Cairo: 1800-2000 Planning for the Capital City in the Context of Egypt's History and Development. In A. Evin (Ed.), *The Expanding Metropolis: Coping with the Urban Growth of Cairo* (pp. 91-120). Singapore: Concept Media/The Aga Khan Award for Architecture.

The Ministry of Housing Utilities and Urban Communities. (2001, 6-8 June). *Shelter Programmes and City Development Strategies in Egypt.* Paper presented at the Istanbul + 5: The United Nations Special Session of the General Assembly for an Overall Review and Appraisal of the Implementation of the Habitat Agenda, New York.

Tipple, A. G. (1999). Transforming Government-Built Housing: Lessons from Developing Countries. *Journal of Urban Technology, 6*(3), 17-35.

Troger, F. (1996). *Quality Assessment of Palm Leaves' Midrib BIockboard According to German Standards*. Munich: Institute for Wood Research, Munich University. Retrieved February 6, 2006, from The Egyptian Society for Endogenous Development of Local Communities homepage www.egy-com.org/products_1.htm

Tucker, J. E. (1983). Problems in the Historiography of Women in the Middle East: the Case of Nineteenth-Century Egypt. *International Journal of Middle East Studies, 15*(3), 321-336.

Ueda, A. (1990). *The Inner Harmony of the Japanese House* (S. Suloway, Trans.). Tokyo New York London: Kodansha International.

UNEP & WHO. (1994). Air Pollution in the World's Megacities. *Environment, 36*(2), 40-42.

Wafūkenchikusha (Ed.). (1996). *Kōshi no omotegamae*. Kyoto: Gakugei shuppansha.

Wafūkenchikusha (Ed.). (1999). *Gaiheki no ishō*. Tokyo: Kenchikushiryō kenkyūsha.

Wikipedia. (2006). *List of Metropolitan Areas by Population*. Compiled from the United Nations 2005 World Urbanization Prospects Report. Retrieved September 11, 2006, from www.wikipedia.org

Yamamoto, R. (1999). *Kyōto―kenchiku to machinami no「idenshi」*. Tokyo: Kenchikushiryō kenkyūsha.

Yasui, K. (1996). Kyōto no omotegamae to kōshi. In Shingakugei wafūkenchiku sōsho (Ed.), *Kōshi no omotegamae* (pp. 8-48). Kyoto: Gakugei shuppansha.

Yousef, A. R. (2000). Al-Mashrabiyya wa Zakharifoha fi Misr. In T. Nazih (Ed.), *al-Mashrabiyyat wal-Zujaj al-Mu'asha'fi al-'alam al-Islami, Proceedings of the International Seminar: Crafts in Traditional Islamic Architecture with Special Focus on Mashrabiyya and Stucco Colored Glass, 3-9 December,*

Cairo, 1995 (pp. 165-170). Istanbul: IRCICA.

Yousry, M. & Aboul Atta, T. A. (1997). The Challenge of Urban Growth in Cairo. In C. Rakodi (Ed.), *The Urban Challenge in Africa: Growth and Management of its Large Cities*. Tokyo, New York, Paris: United Nations University Press.

Zaid, A. & de Wet, P. F. (2002). Botanical and Systematic Description of the Date Palm. In A. Zaid (Ed.), *Date Palm Cultivation: FAO Plant Production and Protection Papers -156*. Rome: Food and Agriculture Organization of the United Nations.

Zuhur, S. (1992). *Revealing Reveiling: Islamic Gender Ideology in Contemporary Egypt*. New York: State University of New York Press.