

THE COURT HOUSE--A RESIDENTIAL ALTERNATIVE

By

ESTON W. MCGEE, II.

Bachelor of Science in Architectural Studies

Oklahoma State University

Stillwater, Oklahoma

1973

Submitted to the Faculty of the School of Architecture
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
MASTER OF ARCHITECTURE
May, 1975

PREFACE

I wish to express my deepest thanks to my professional project advisor, Mr. F. Cuthbert Salmon, Professor of Architecture, for his valuable suggestions, criticisms, and guidance in keeping me on the objectives of my project and off the paths of confusion.

I especially want to thank my other committee members, Mr. J. Steve Ownby, Associate Professor of Landscape Design, and Mr. Ed Hoag, Instructor of Landscape Design; both in the Department of Horticulture for their interest and help they provided me on this project.

It is with great pleasure that I dedicate this project to my parents as a gesture of thanks at the end of my college career and also to thank them for letting me choose, a long time ago, to study architecture.

Finally, I would like to thank my wife, Linda, for her constant encouragement, generous patience, understanding, and infinite love. I would have been lost without her valuable typing skills and secretarial expertise.

TABLE OF CONTENTS

PREFACE

INTRODUCTION 1

1. THE COURT HOUSE IN THE BEGINNING 5
 Selected Examples

2. THE COURT HOUSE IN CONTEMPORARY DESIGN 27
 Selected Examples

3. THE PHYSICAL AND CONCEPTUAL ASPECTS OF THE COURT HOUSE 46
 The Building Site
 The Court House Proper
 Orientation
 Daylighting
 Fenestration
 Adaptation to Topographical Features
 Cross-Ventilation
 The Court Garden
 Activities
 Reflected Light
 Noise
 Climatological Factors
 The Psychological and Sociological Benefits

4. THE COURT HOUSE AND SOLAR EFFECTS 66
 Solar Loads on Glass
 Solar Shading Devices--In General
 Solar Devices Suitable for the Court House
 General Orientation Requirements

5. THE COURT GARDEN AND LANDSCAPE DESIGN. 74
 Importance of Landscape Design
 Microclimate of the City
 Plant Selection
 Categorized Plant List for the Court Garden
 Functions of Selected Plant Materials in the Court Garden
 The Overhead Plane--Overhead Treatment
 The Base Plane--Paving
 Court Garden Enrichment
 Night Lighting
 Maintenance

6.	APPLICATION OF DESIGN CRITERIA	87
	Site Description	
	Design Process .	
	Program	
	Objectives	
	Final Design	
	Floor Plan	
	Street Elevations	
	Court Garden Elevations	
	Wall Sections	
	Parking Modifications	
	Plan Modification	
	Density Arrangements	
7.	CASE STUDIES	106
	A. Denver, Colorado	
	Orientation	
	Solar Shading Plots and Treatment in the Court Garden	
	Climatological Data	
	Landscape Design	
	B. Houston, Texas	
	Orientation	
	Solar Shading Plots and Treatment in the Court Garden	
	Climatological Data	
	Landscape Design	
	C. Phoenix, Arizona	
	Orientation	
	Solar Shading Plots and Treatment in the Court Garden	
	Climatological Data	
	Landscape Design	
	SUMMARY	141
	BIBLIOGRAPHY.	144

INTRODUCTION

As building materials, land values, labor costs, fuel costs, and transportation costs increase, it seems that a pleasant, economical, urban dwelling is called for now more than ever before. Due to these rising costs and the current energy crisis, current thinking is taking a special look at the further development of the single-family residence in the suburbs. The trend seems to be a revitalization and boom of the dying urban centers. The row house provides the most space at the lowest cost, provides greater privacy than single or two-family houses on small lots, and makes more efficient use of the land that would otherwise be lost in narrow sideyards. Each unit generally occupies about 25 to 35 feet of frontage and may be one, but usually two or more stories high. However, the court house goes one step further in fulfilling the strong human need to be in contact with the earth and its growth. The court house meets the criteria set forth for the row house as well as provides private court gardens which fulfill this need to be in contact with nature.

This project has seven main divisions. Chapter 1 traces the court house through some of its historical periods and examines its development in certain geographical areas.

Chapter 2 describes the evolution of the court house concept in contemporary design. Some of the more important court house developments are illustrated.

Chapter 3 analyzes the physical and conceptual aspects of the court house. The site requirements are examined first; and followed by the study of the house proper, the court garden itself, and finally the human aspects of the court garden house are discussed.

Chapter 4 is concerned with the solar effects on the court house. Solar loads on glass are discussed first; followed by a general discussion of shading devices. A chart of appropriate solar shading devices for the court house is given. The chapter is concluded with a discussion on solar orientations and where the shading devices are applicable.

Chapter 5 studies the relationship between landscape design and the court garden. The chapter begins with a discussion on the importance of landscape design and the microclimate of the city. Specific plant requirements, selection, and functions are studied along with the treatment of the overhead and base planes. The chapter is concluded with a discussion of court garden enrichment elements, night lighting, and maintenance.

Chapter 6 begins with the specific site dimensions and requirements. The design process and space program used in the final development of the court house are listed. A list of objectives precedes the final court house design, which is followed by a discussion of the design. Additional drawings, including wall sections and details, elevations, parking and plan modifications, and density arrangements on the city block support the final design.

Chapter 7 is made up of three case studies in three United States cities which illustrate the adaptability of the court house in the United States. These are: Denver, Colorado; Houston, Texas; and Phoenix, Arizona. These cities were chosen because they present three totally different climates, plant materials lists, and solar requirements. Each case study begins with an explanation of the orientation which is followed by solar shading plots of the court gardens and a solar shading examination of the glass in the summer months. A climatological data chart is included along

with a brief description of the climate. Finally, there is a comprehensive plant materials list of selected court garden plants followed by the landscape development of each of the three court gardens.

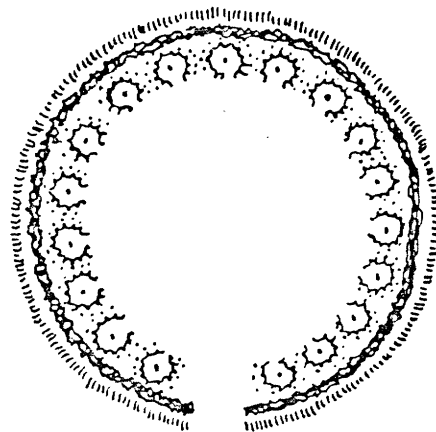
1. THE COURT HOUSE IN THE BEGINNING

The precise form and appearance of prehistoric court houses remain undetermined. Their prototypes may have been the encampments of nomadic tribes or the fenced-in compound dwellings of the first tillers. These two dwelling-types differ greatly from one another. The former has a temporary character whereas the latter is more permanent. They have, however, a common denominator: their defensive nature. Invariably their plans provide an enclosure to protect the inhabitants from man and beast, and often from harsh weather.

It is very likely that prehistoric man lived in a way that was similar to that of primitive man in our day. Tent encampments still give shelter to many nomadic tribes in Moslem countries, and compound dwellings are numerous in West African and South African villages, as well as in other parts of the world where indigenous building traditions are deep-rooted. (3:9)* Chapter 1 is comprised of illustrations and extractions from The Court-Garden House, by Schoenauer and Seeman, in order to establish a historical basis of the court house.

* * * * *

NORTH AFRICAN *DOUAR*



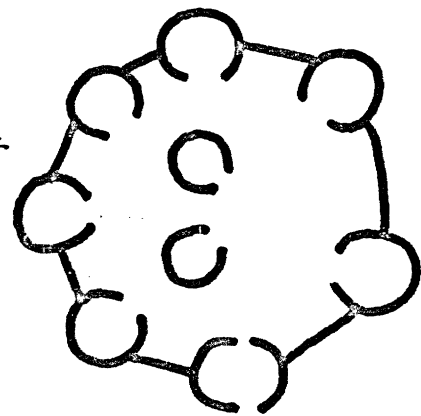
*(3:9)--means item 3, page 9 of the Bibliography

The encampments of the nomadic tribes of North Africa are called *douars*. Tents are pitched on the periphery of a circular plot surrounded by a ditch and a mound, the latter surmounted by hedges or thorn-bush. All tents open toward the large central court, and within this enclosure live the members of the tribe together with their animals. These various defensive measures provide the isolation and protection essential to their existence. (3:9)

* * * * *



WEST AFRICAN COMPOUND



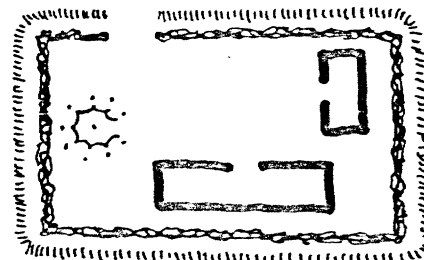
In their simplest form, the compounds of West African villages consist of a number of round huts, joined by a wall and enclosing a courtyard. Depending on its size, the courtyard itself may contain a few detached huts. This dwelling-type shelters a large and complex family with their belongings, and bears much resemblance to the more primitive *douars*. (3:9)

* * * * *

The basic dwelling-units in the above examples are circular in shape, a characteristic of the most primitive building traditions. This is the simplest form of human habitation, whether found in the Arctic or in the tropics. The igloo of the Eskimo, the wigwam of the North American Indian, the *yurt* of the Mongolian tribes, and the numerous types of the African round hut all bear witness to this fact. Man discarded this simple form of building, however, because of inherent disadvantages that became apparent when he attempted to join single units together, or when he desired larger floor areas. With rectilinear construction, joining of series of units was rendered much less difficult, and roof structures over the increased floor area did not pose such great problems: the lateral dimensions, at least, were not thereby restricted. (3:11)

* * * * *

NORTH AFRICAN *NOUALA*

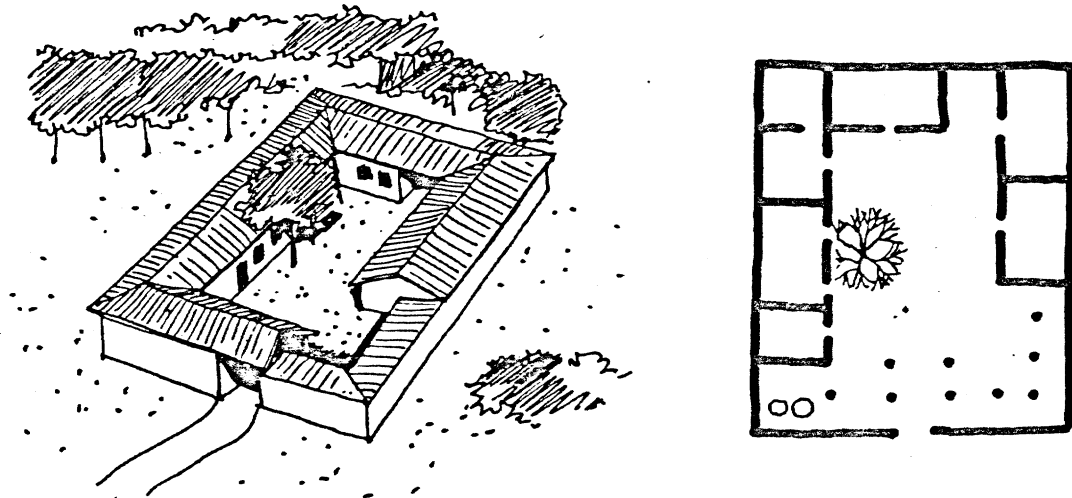


Rectangular compound dwellings abound in many geographical areas. An example of one of the simplest is the Moroccan *nouala*, which marks the transition between the *douar* and the more conventional court house. The *nouala* is found on the agricultural plains of Morocco and consists of a rectangular plot surrounded by a protective mound, with huts built on stone foundations and having thatched roofs, situated along two or three sides of the rectangle. All openings are into the interior

courtyard. (3:11)

* * * * *

WEST AFRICAN DWELLING



Noualas have their counterparts in West Africa, where they may vary in form and complexity but never in concept. We find here many variations on the same theme, ranging from only a few buildings contained within the enclosure to those in which the buildings form a continuous ring around the central courtyard. (3:13)

* * * * *

Historically, the urban court house developed along with the emergence of the first cities. The adoption of the familiar rural prototypes in urban areas must have been made for reasons other than that of defense; this factor would have lost its validity once the court house became only a small unit within a city protected by other defensive measures.

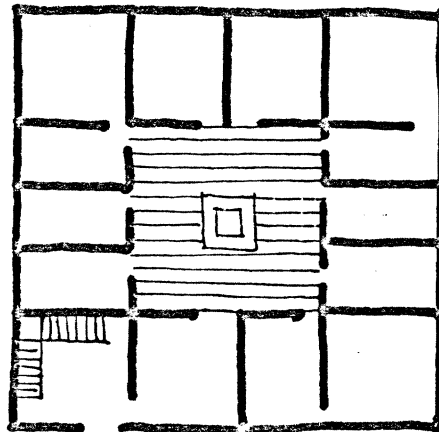
Three basic factors contributed to the popularity of court houses.

15

First, there was a great religious impetus: the open interior court was congruous with man's mental image of heaven--a paradise in the wilderness. Secondly, there was an economic factor: since the size of cities was necessarily restricted, a dwelling-type which did not require large plots of land had to be developed. The limited technological knowledge of the times restricted building height; the court house dwelling therefore permitted the greatest densities. The third and final consideration was that of climate: the court house came to be known and used as an efficient means by which to escape from extremes of weather. (3:15)

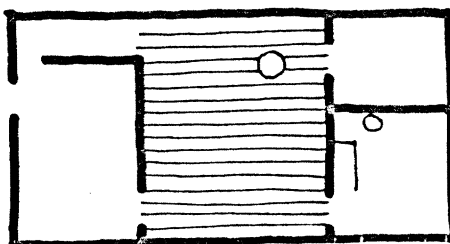
* * * * *

EGYPTIAN COURT HOUSE

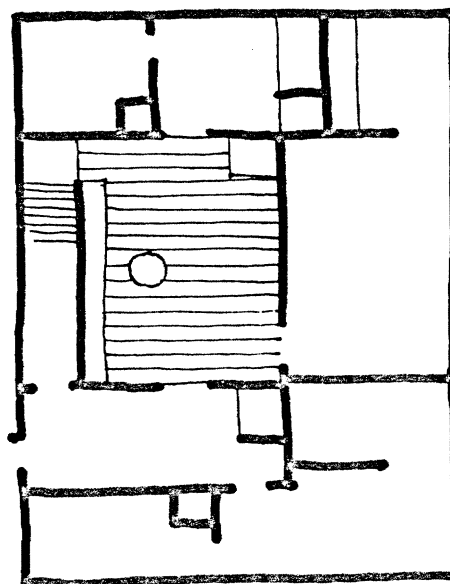


Thus we find early cities like Kahun, in Northern Egypt, in which the predominant family dwelling-type was the court house. Kahun court houses varied in size, from humble one-room dwellings built of unburnt brick, to larger multistoreyed units of more permanent materials. Their common characteristic, however, was constant: they all had a central open court giving access and light to the surrounding rooms. (3:15)

* * * * *



TEL-EL-AMARNA

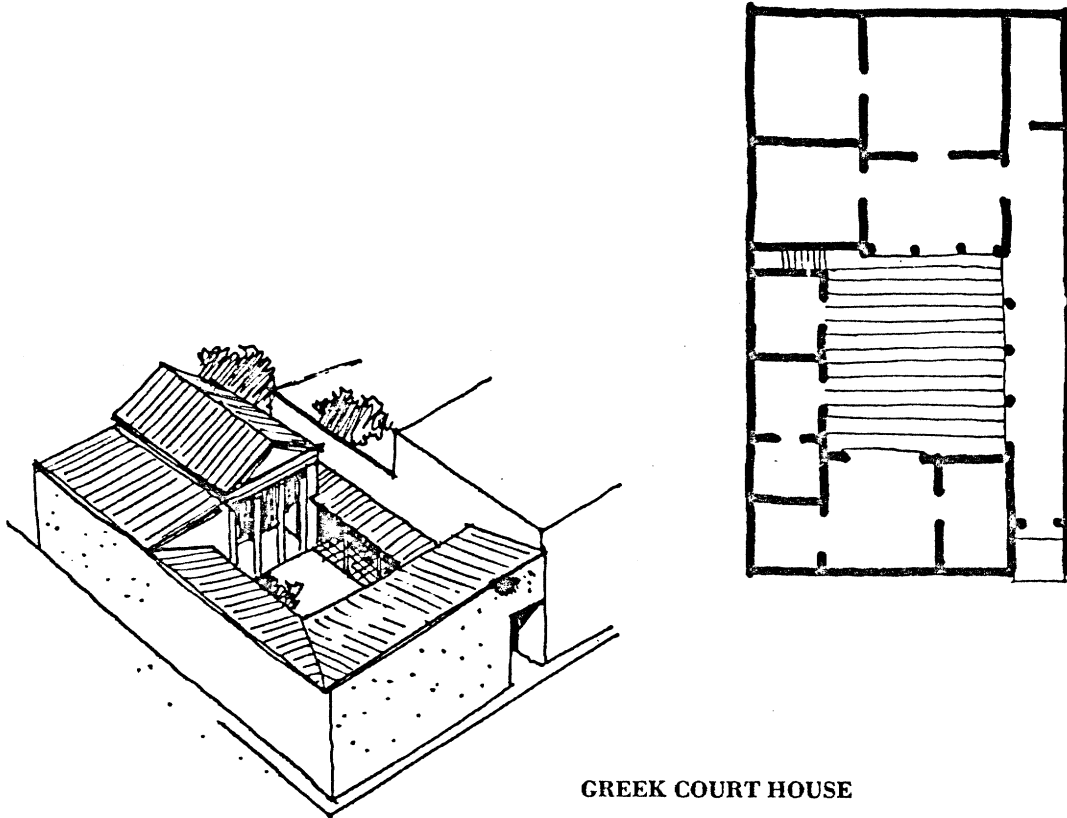


A clearer picture of the Egyptian court house can be gained from the report on the excavation of Tel-el-Amarna, a workers' village near the northern group of rock tombs. Identical houses built back-to-back line the streets, each house embracing an open court which serves as both kitchen and workshop. Although the plans are identical, featuring one large living-room and two little bedrooms at the back, one can observe variations from house to house introduced, doubtless, by the tenants to suit their individual needs. The internal arrangements are hardly ever

the same and the objects found in the houses show considerable variety.

(3:17)

* * * * *



GREEK COURT HOUSE
PRIENE

Many centuries later, during the classical epoch of Greece, the court house was still the predominant dwelling-type in the urban community. It underwent a sophistication surpassed only by the later Roman atrium house.

An open court was found in every Hellenic home whenever it had more than one or two rooms. The court was an indispensable feature; it served as a reliable source of light for the surrounding rooms and enabled the inhabitants, throughout the greater part of the year, to carry on many

activities in the open, while remaining in comparative privacy and seclusion from the outside world. Whenever the court was contiguous to the street, it was enclosed by a masonry wall called the *herkos*.

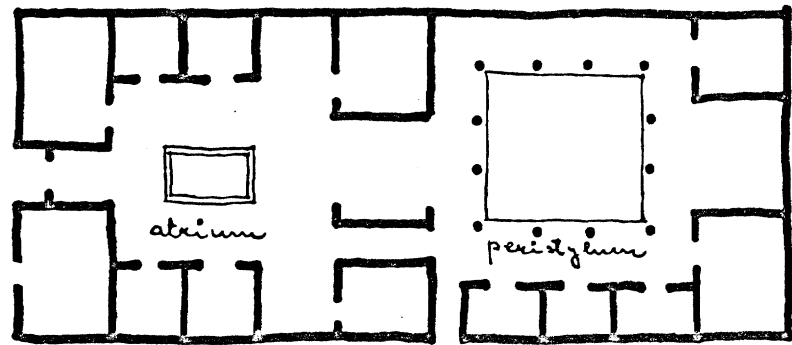
The court was usually located in the southern part of the house in order that the principal living rooms might face south upon it, and a common feature was an altar dedicated to Zeus Herkeios, the god of the courtyard. Otherwise, courts varied from place to place in many respects. Their size, relation and proportion to the total area of the house varied within rather wide limits, and the paving of the courts ranged from hard-packed earth to the more elaborate mosaic floors of the better-class houses of Delos.

The Greek court house was normally a single-storeyed structure surrounding the court on three or--more rarely--four sides, with porticoes facing one or more sides of the court. A peristyle, or range of columns surrounding the court, though appearing frequently, was not always present; nor was symmetry an unfailing characteristic of the typical Greek house. In fact, little effort was made to achieve symmetry of plan, contrary to the usual Hellenic practice in monumental architecture.

Access to the Greek house was through a single or double wooden door, which was often recessed from the narrow street into the wall so as to give shelter to anyone waiting for the door to be opened. Through this porch, called *prothyron*, one entered directly, or by way of a short corridor, into the courtyard. (3:17)

* * * * *

ROMAN ATRIUM HOUSE



The Roman atrium house evolved partly from the Greek peristyle house and partly from the Etruscan atrium house, the latter having only a small roofopening above the atrium. As a consequence, the Roman atrium house emerged with two interior courts, the peristyle and the atrium. The street entrance led to a passage (*prothyrum*), which in turn opened into the atrium. The latter served as a centre for the more public functions of the home and was surrounded by small rooms and recesses. Here were found the guest rooms, the reception room, and the conversation rooms, in addition to the servants' room. A protective roof, supported on brackets projecting from the wall, gave shelter around the periphery of the atrium, and shed the rain water towards the centre and into the impluvium, or water cistern sunk in the pavement.

The peristyle formed the nucleus of family activities and was linked to the atrium by a narrow passageway (*fauces*) and an open salon (*tablinum*), which could be curtained off. The peristyle was larger than the atrium. It also had a central impluvium for rain water, the roof being supported, however, by columns and not by brackets. This court often served as a garden. The rooms surrounding the peristyle were the bedrooms (*cubiculae*), the dining room (*triclinia*), recesses for conversation (*alae*), one

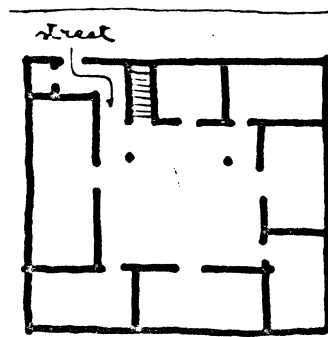
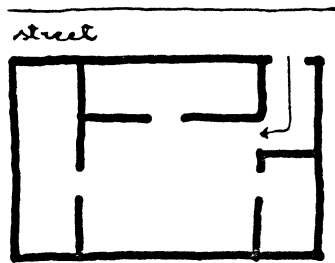
reception room (*oecus*), and the kitchen with its ancillary rooms.

The remains of Pompeian houses suggest that the Roman *domus* was usually one-storey high, and that all rooms were lit by relatively small openings facing the interior courts. Thus the atrium house had a plain, windowless facade toward the narrow street, interrupted only by recessed areas let for shops. In contrast to this starkness, the interior was sumptuous; the floors were patterned mosaic or marble, the walls were painted in fresco, and the ceiling timbers were often gilded. In addition to the family altar in the atrium, the two courts were lavishly adorned by fountains, statues, vases, and other embellishments.

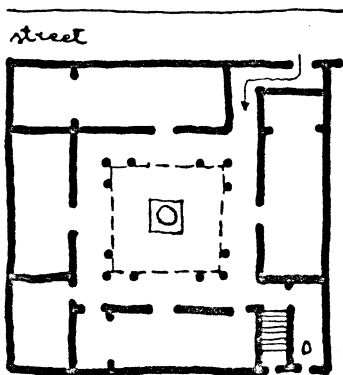
With the fall of Rome, the frequency of the atrium house as a dwelling-type diminished. Other types, such as tenements and the Roman villa, became dominant on the European continent. During the Middle Ages and the Renaissance, the character of dwellings changed to such an extent that even in Italy the *cortile* with its open arcade became a rarity, a lingering trace of the ancient house.

Court houses survived, however, as a more humble dwelling-type in other regions bordering on the Mediterranean, namely in the domain of the North African Mussulman. Court houses are, to this day, the vernacular form of Moslem building tradition. (3:21)

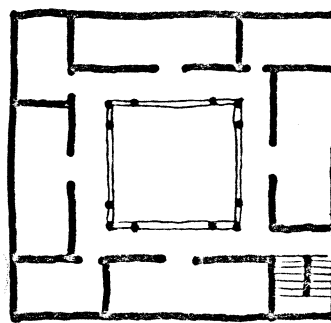
* * * * *



MOROCCAN COURT HOUSES or *DARS*



First floor



Second floor

The *dar*, in its simplest form, consists of an exterior wall enclosing a rectangular plot. Parallel to this runs an interior wall circumscribing an open court called *oust-ad-dar*. The distance between the two walls never exceeds ten feet. Facing the four sides of the open court are four main rooms, each having a central wall-opening which gives access and light to the room. These four rooms are long and narrow, the narrow dimension being dictated by the length of the available timber. This disproportion is often offset by the employment of a wide niche (*behou*) in the wall facing the entrance door. The *behou* is frequently flanked left and right by a built-in cabinet; with this recess the room plan takes on a T-shape.

The corners of the property contain the secondary rooms such as the kitchen, utilities, toilets, and the entrance hall. The entrance is invariably shaped in such a way as to impede the view from the street, even though the door may be left open.

It is common to have either partial or complete coverage of the floor area in a second storey, reached by a stairway in the immediate vicinity of the entrance. The more elaborate dwellings have two complete storeys, the upstairs rooms being lit from the interior through windows or doors opening onto a gallery. In some cases they may have windows on the exterior, provided that they do not look out over a neighbouring court or terrace.

The *dar* may vary in detail, but its basic characteristics are always the same. Thus, for example, one will never encounter a triangular or polygonal courtyard. Two *dars* may be united to form a single dwelling. In fact, the Moroccan often expands his house by acquiring the neighbouring property and connecting the two with a passage. The palaces follow the same principle, using a whole series of court houses linked to each other by corridors. Each court, with its adjacent rooms, may be used for one particular function only: the women's quarters, for example, visitors' reception rooms, and so on.

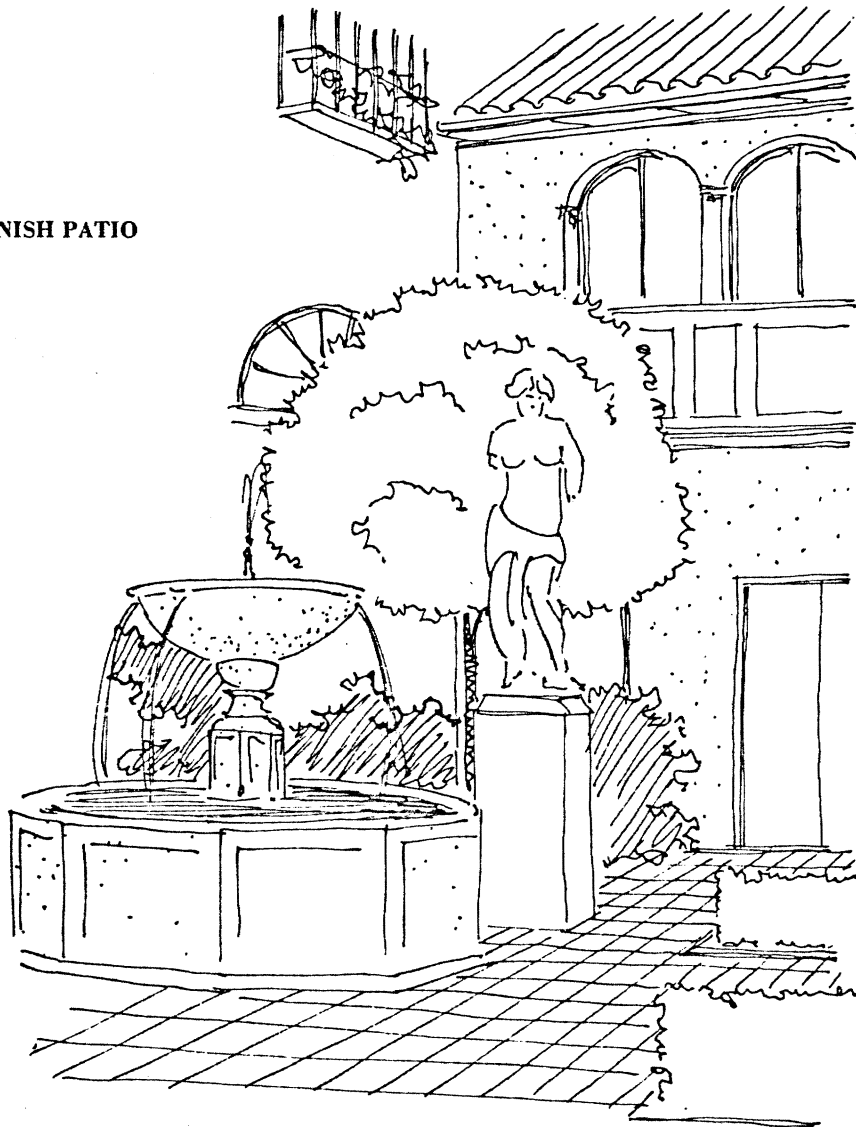
Further, the *dar* is an inherent part of the Moslem way of life. It provides shelter with complete privacy, guarding the family from the prying eyes of strangers in the best Moslem tradition; it isolates them from the outside world, which is filled with intrigue, corruption and jealousy. Finally, it gives protection from the extreme climatic conditions, the pitiless sun and the grinding sandstorms. A marked contrast

is ever present between the blinding whiteness and nakedness of the outside, and the enchanting narrowness and deep shadiness of the inside.

(3:25)

* * * * *

SPANISH PATIO



Moorish conquerors reintroduced the court house concept with their invasion of the Iberian Peninsula. Whether or not the Roman atrium house also played a part in the evolution of the Spanish patio house has

not been clarified, since there is a notable lack of study of Spanish domestic architecture. In general, it seems that there are two basic dwelling-types in Spain: the northern, a solid-block dwelling of stone or wood predominating from the Bay of Biscay and the Pyrenees to the Ebro and Duero Rivers, and the southern, a courtyard dwelling or characteristic patio house, extending from southern Catalonia to Andalusia.

In describing the patio, Edmondo de Amicis aptly wrote: "It is not a courtyard, it is not a garden, it is not a room: but it is something between all three." It is a relatively small space ingeniously organized, functioning as the epicentre of all family activities, with room left for only a few plants. In its landscaping no attempt is made at any imitation of nature.

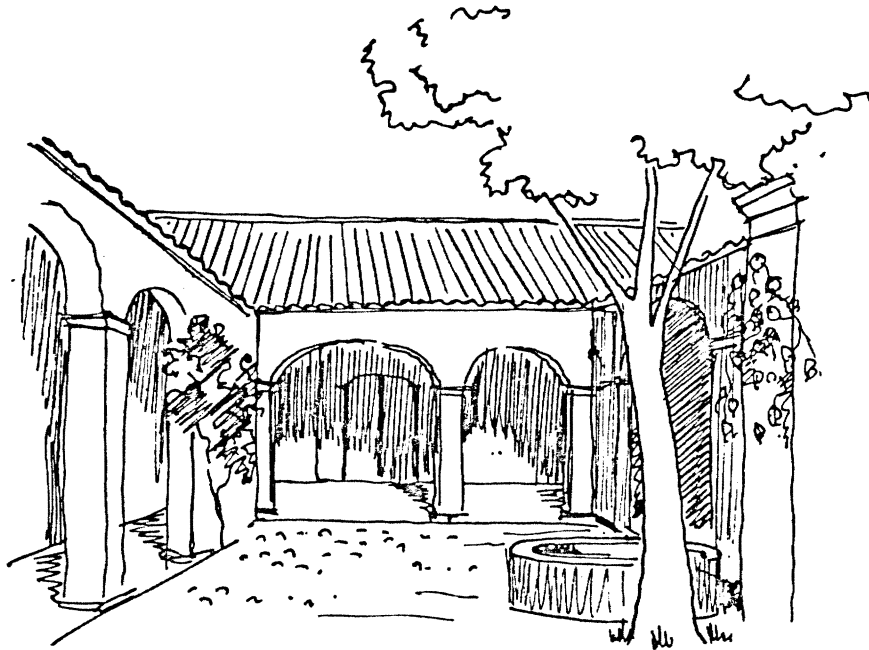
Consisting of a paved area with the usual single citrus tree, a fountain or well, and numerous colourful potted plants filling out every available space, it presents itself to the eye as an unforgettable picture. In contrast to the dust and glare of the street, the patio is moist, green, and cool, being watered all day long.

The patio is separated from the street by a paved vestibule, and is surrounded by living quarters on the ground floor and sleeping quarters on the second floor. The walls are plain stucco and are frequently painted, making them chalky and silky to the touch. If the houses, adjoining one another, are painted alike, it is often difficult to detect the end of one and the beginning of the next.

The court house was brought to Latin America by Spanish colonists, and survives to this day as the predominating local type of dwelling. In spite of similar general patterns, patio houses vary somewhat in character

from country to country. It may be adequate, however, to use the Mexican court house as a typical representative. (3:33)

* * * * *



MEXICAN PATIO

Mexican city houses present themselves to the street in continuous rows of one- or two-storey structures with plain facades, where ornament is concentrated around the main entrance and perhaps around the windows. The first-storey windows are usually protected by wrought-iron grilles in varied designs and motifs which may be repeated in the railings of the balconies, the latter being another favourite feature of the elevation. Where wood is plentiful, grilles and railings may be of turned wood. The modelled plaster surfaces of the exterior are often painted in delicate flat hues, giving enchanting colour effects to the streetscape.

The typical court house in Mexico is entered through a monumental doorway, leading into a passageway known as the *zaguan*. At some distance behind the massive doors in this passageway there is a secondary *porton*, a grilled, single or double gate, usually of ornamental wrought-iron. Since the main portal is left open during the day, these grilled gates serve as a measure of protection from intruders, yet they give the passers-by a fleeting glimpse of the flower-filled patio beyond. In the entryway, one also frequently finds a solid masonry bench for the benefit of visitors.

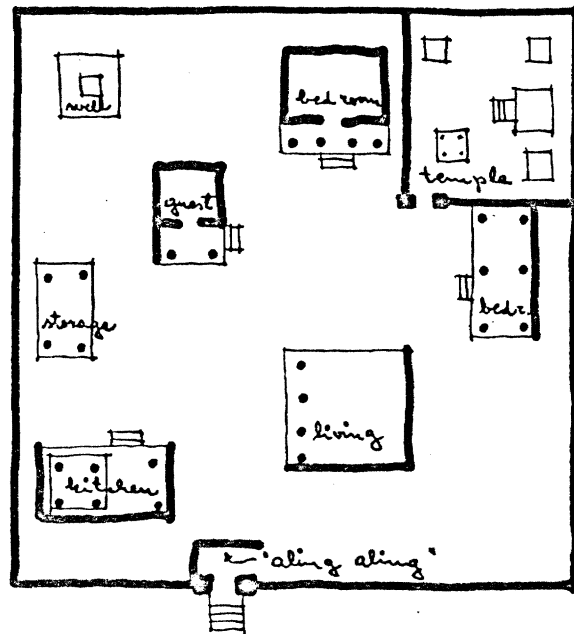
From the *zaguan* one enters the patio. This is the centre of Mexican family life, around which the home is built. All principal rooms open directly onto the patio, which may have arcades or colonnaded corridors on one or more sides. In general, the patio is paved with brick or stone and is often luxuriantly planted; palms, citrus, and fig trees, climbers and numerous gay pots with flowering plants spread splashes of colour over the patio. The trees stand in circular or octagonal *varreatas*, low masonry enclosures faced with glazed tiles. There may be a fountain in the centre or near the wall. In larger homes one finds a secondary patio, surrounded by the kitchen and other service and utility rooms, the link between the two patios frequently being the dining room.

Various forms of masonry are used in the construction of patio houses; in the smaller houses adobe is used, but more commonly brick and stone are employed, the latter often only as trim around the doors and windows, and for structural members such as columns and arches. Modelled plaster is used extensively in the interior, and is painted with flat colour. In the lower altitudes, Spanish curved tiles are used for the

pitched roof, but in the higher and drier parts of Mexico the flat roof is the rule, and consists of layers of brick and dirt fill. (3:35)

* * * * *

BALINESE PEKARANGA



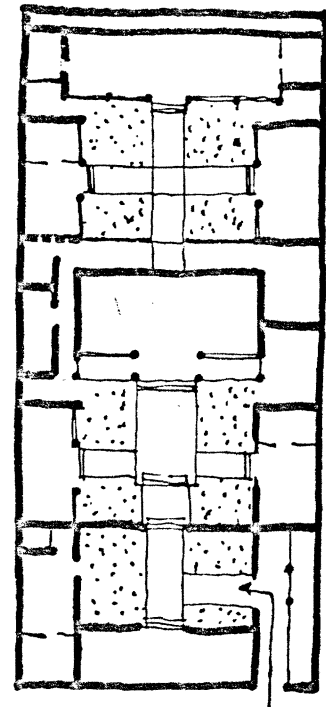
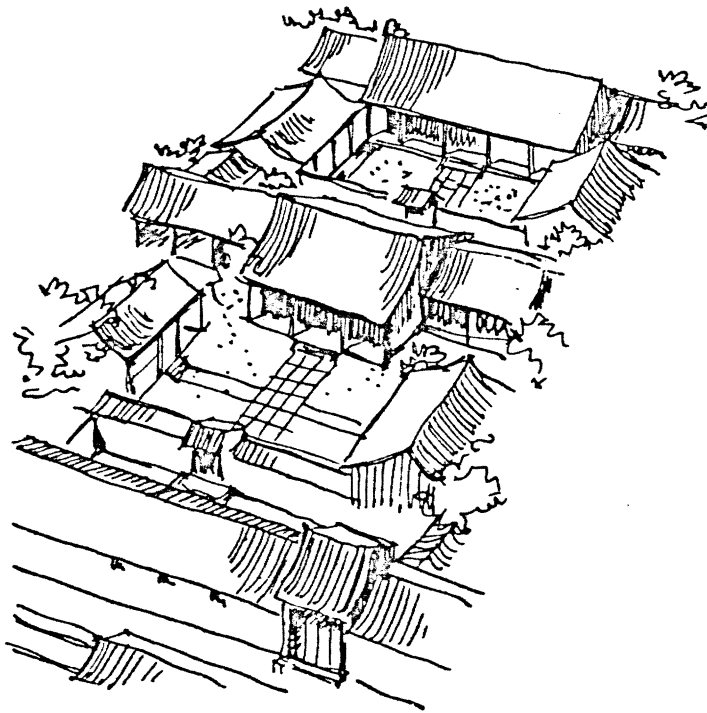
Court houses are found not only in the Mediterranean area or in Latin America. They are also numerous in Asia, reaching their highest development in the Far East, in China and Japan. The origin of the Sino-Japanese court house must have been similar to that of its Mediterranean counterparts.

Accordingly the typical family dwelling in Bali, for example, has a remarkable resemblance to the earliest human habitations: a wall enclosing several buildings with different functions. In Bali the courtyard (*pekaranga*) is fenced in on all four sides and has an area of

approximately ten thousand square feet. Within this court are built small detached structures such as the temple (*sauggah*), living-room (*balegede*), guest house (*lodji*), bedroom (*umameten*), kitchen (*dapur*), and storage room (*lumbung*). One element found in Chinese houses as well is the screen wall at the main entrance, called *aling aling*, whose function is to prevent the entry of evil spirits, which are reportedly unable to travel around corners.

When it is considered that the Balinese are not always familiar with doors and their use, the *aling aling* assumes a greater importance. This screen wall does not simply ward off evil spirits; it also prevents intrusions or the peering of unfriendly eyes, thus providing the all-important privacy. (3:39)

* * * * *



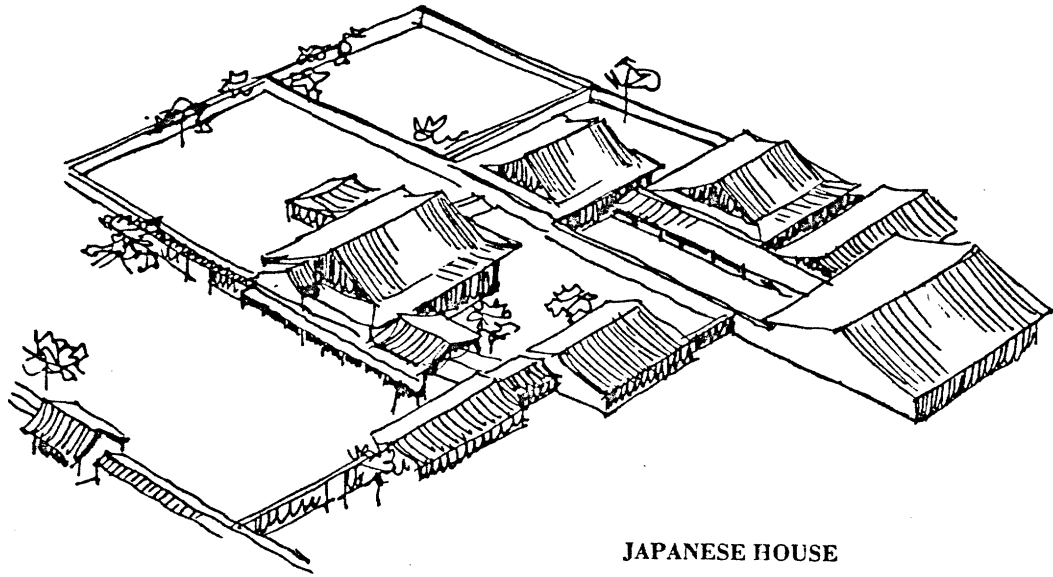
CHINESE COURT HOUSE

The typical Chinese court house is a compound dwelling which consists of several buildings surrounding a court. One reaches the house through the main port and immediately faces a screen wall not unlike the Balinese *aling aling*. Here, again, the screen, according to popular belief, stops the entry of the rectilinear-travelling evil spirits. The belief is that, once inside, even a tiny devil or evil spirit can expand and dislodge the occupants.

Throughout China one-storey houses are the rule. It is considered presumptuous to live in a house which is higher than the walls surrounding the town. There appears to be a geographical factor in the relationship between courtyards and houses; in the North the courtyards are larger than the houses, whereas the opposite is true of the South. In addition, the projecting roofs of the southern houses partially cover the courtyards.

The street elevation of the Chinese house is very simple, and it seldom has more than a door and a window pitched high up under the eaves. The residential streets are very narrow but picturesque, owing to the homogeneous appearance of the buildings, with the occasional tree waving over the rooftops. The main entrance is not in the central axis of the building complex, though the plan is often symmetrical. This would be interpreted as an offense against the gods, for things human cannot be perfect. (3:43)

* * * * *



JAPANESE HOUSE

Asymmetry is carried even further in the Japanese house, because it is preferred by Zen Buddhists as being dynamic and alive; symmetry, on the other hand, is unreal and abstract, and suggests completion and perfection, which are foreign to the Japanese mind. Shintoist and Zen Buddhist thought is reflected in every aspect of the Japanese house, and most of all in its garden. Nature is highly venerated; man must maintain close contact with it since deep contemplation can be achieved only in its midst. Hence the great importance attached to the landscape architecture of the Japanese court-garden. (3:45)

* * * * *

Now that the court houses of the various parts of the world have been described, it is interesting to note the similarities between the different stages in the evolution of this housing-type as manifested in the two main regions of its origin: the Mediterranean and the Far East. There is a definite relationship apparent between the *mualas* of Morocco and the Balinese *pekaranga* houses. Perhaps less surprising is the similarity

between the Moslem *dar* and the Hindu court house. Finally, the resemblance of the Chinese courtyard house to the Roman atrium house is indisputable.

This fascinating similarity cannot be accidental; its explanation may lie in human ecology. Need for privacy, climatic conditions, and the requirements for adjustment to available land area limitations, find their solution in a general and widespread housing form: the court house." (3:45)

2. THE COURT HOUSE IN CONTEMPORARY DESIGN

The court house concept in contemporary architecture is only now coming into general acceptance. In those countries where the court house was an indigenous form of housing, its acceptance was much more rapid. In contrast, countries with no court house traditions are slowly but increasingly adopting this concept.

One of the first introductions of the court house principle in a country with no court heritage was made in Germany by Mies van der Rohe, in the early nineteen-thirties, with a design for a row-house development consisting of a series of L-shaped court houses. Somewhat later, L. Hilberseimer, a colleague of Mies van der Rohe, applied a similar principle for an urban residential design. Neither of these was carried out, yet their significance and importance in the evolution of the court house concept was far-reaching and exerted a marked influence on later court house developments.

In 1940, almost a decade after Mies van der Rohe's first court house project, a study was published by the Italian architects Pagano, Diotallevi, and Marescotti, outlining the advantages of the court house concept. This study was well received by some architects and resulted, twelve years later, in the first comprehensive court house development on the European continent: Libera's Tuscolano project outside Rome.

With the arrival of the nineteen-fifties, the court house concept suddenly found a wide acceptance in a number of countries in Europe and the Americas. Its use was not limited to those regions which had warm climates and were free from snow and freezing temperatures; it was successfully introduced to northern countries like Denmark and Sweden, and most recently to England and Canada.

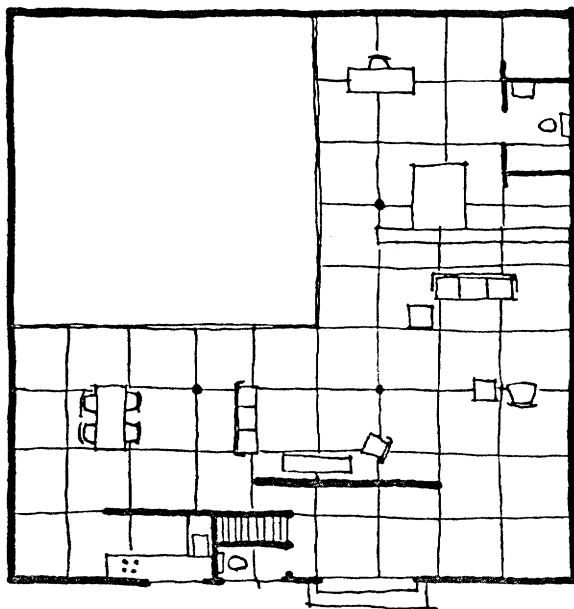
The northern European examples of court house development are of great importance with respect to the adaptability of this concept to Canadian housing. The climate of these countries resembles Canada's, and their slightly milder weather may be offset by their shorter daylight periods in the winter season. It is evident that the court houses here are not merely replicas of the Mediterranean patio houses, but are adaptations to their new environment and retain only the basic principle: the desire for privacy and efficiency of land use, allowing greater densities without resort to multiple-storey dwelling-types and without any sacrifice of public open space.

This new house-type is only at the threshold of its evolution. Indications of this are its increasing popularity as a design problem in the leading architectural schools of many countries, and its inclusion in numerous housing-competition designs. The role of the court house in the residential scene is expanding rapidly; but to assure its success at the start it is imperative to study the existing examples with reference to their workability and adaptability to their respective environments.

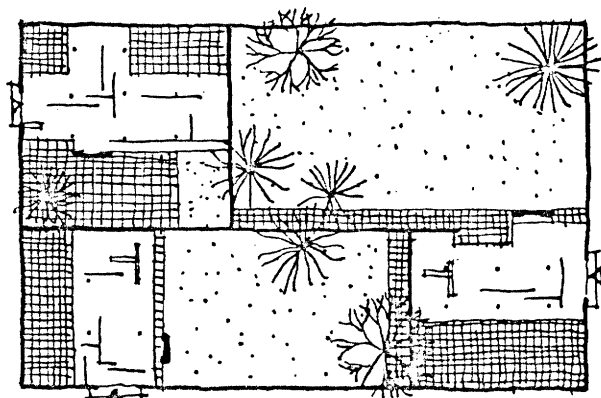
The following pages contain descriptions of some of the more important court house designs of the past several decades. They appear approximately in chronological order so as to reveal the simultaneous evolution of this concept. Many detached court houses which have been built but which do not comply with the definition of the court house as given in the Introduction, i.e. having two exterior blank walls which lend themselves for terrace and cluster development, have been excluded. (3:51) Again, Chapter 2 is comprised of illustrations and extractions from The Court-Garden House, by Schoenauer and Seeman, in order to serve as a tool to

bring the court house up to modern times.

* * * * *



1931
PROJECT: COURT HOUSES



1938
PROJECT: GROUP OF COURT HOUSES

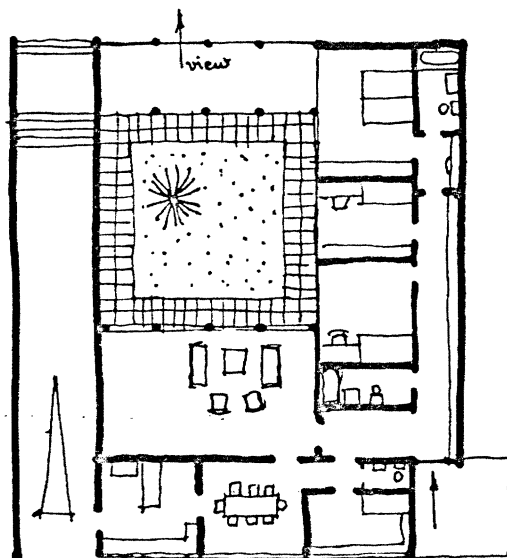
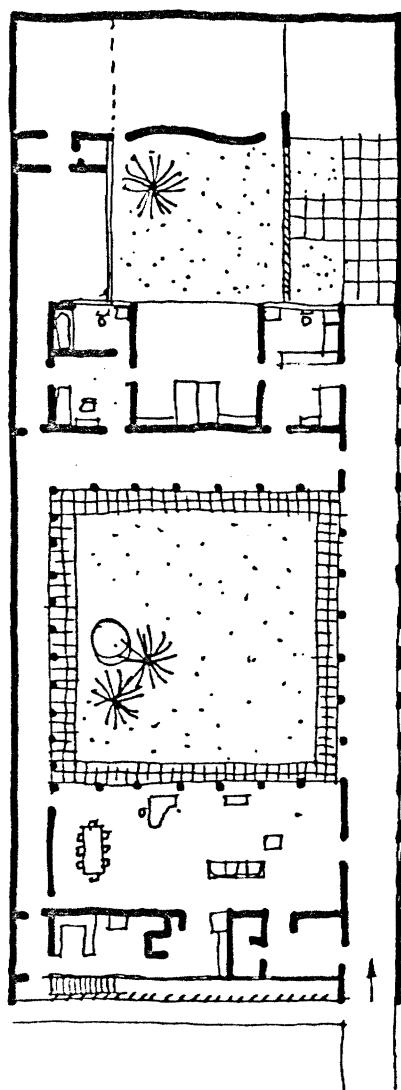
LUDWIG MIES van der ROHE
Germany, 1931-38

Between the years 1931 and 1938, Mies van der Rohe designed a series of projects for court houses. The seed of this work seems to have appeared earlier, in his walled-in court of the highly-successful Barcelona Pavilion of 1929. His first design, far-advanced for its time, was a continuous row of L-shaped houses with enclosed court space. The exterior walls of the house facing the court were conceived entirely in glass in contrast with those facing the street, which were shown with

a minimum of fenestration.

In 1938, soon after emigrating to America, Mies van der Rohe carried this concept forward into a rectangular walled-in grouping of three dwellings of various sizes and shapes, each having a terraced court and a larger garden-court. Here, at last, was a contemporary home intended for an urban environment, yet retaining the privacy of the rural or suburban home. (3:55)

* * * * *



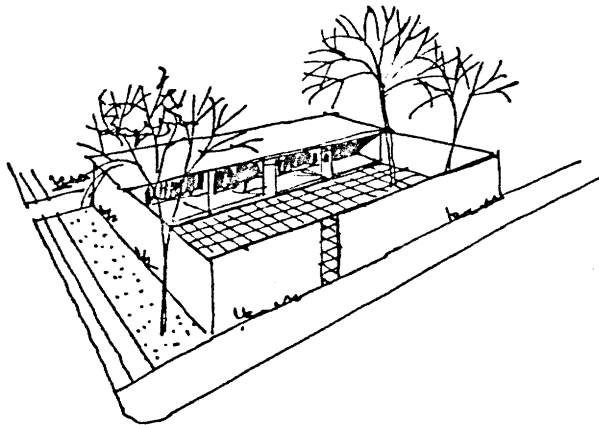
1940-47
COURT HOUSES IN SÃO PAULO

DANIELE CALABI
Brazil, 1940-47

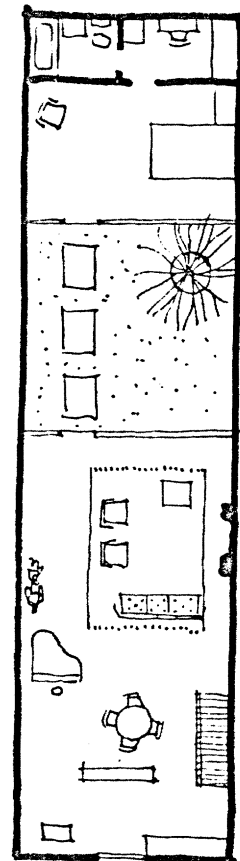
During the forties, Daniele Calabi designed three houses with atria in São Paulo, Brazil. They all represent strong statements of the validity of the inward-directed floor plan in more luxurious homes.

In the first example, highly formal in execution, there is a large central atrium, enclosed on two sides by colonnaded walks in marble surfacing. Utility rooms and servants' quarters act as a buffer zone between the dust and noise of the street and the inner parts of the house. There is also a smaller patio off the master bedroom. (3:59)

* * * * *



1942
RESIDENCE, CAMBRIDGE, MASSACHUSETTS



1952
ROCKEFELLER GUEST HOUSE

PHILIP C. JOHNSON
New England, 1942-52

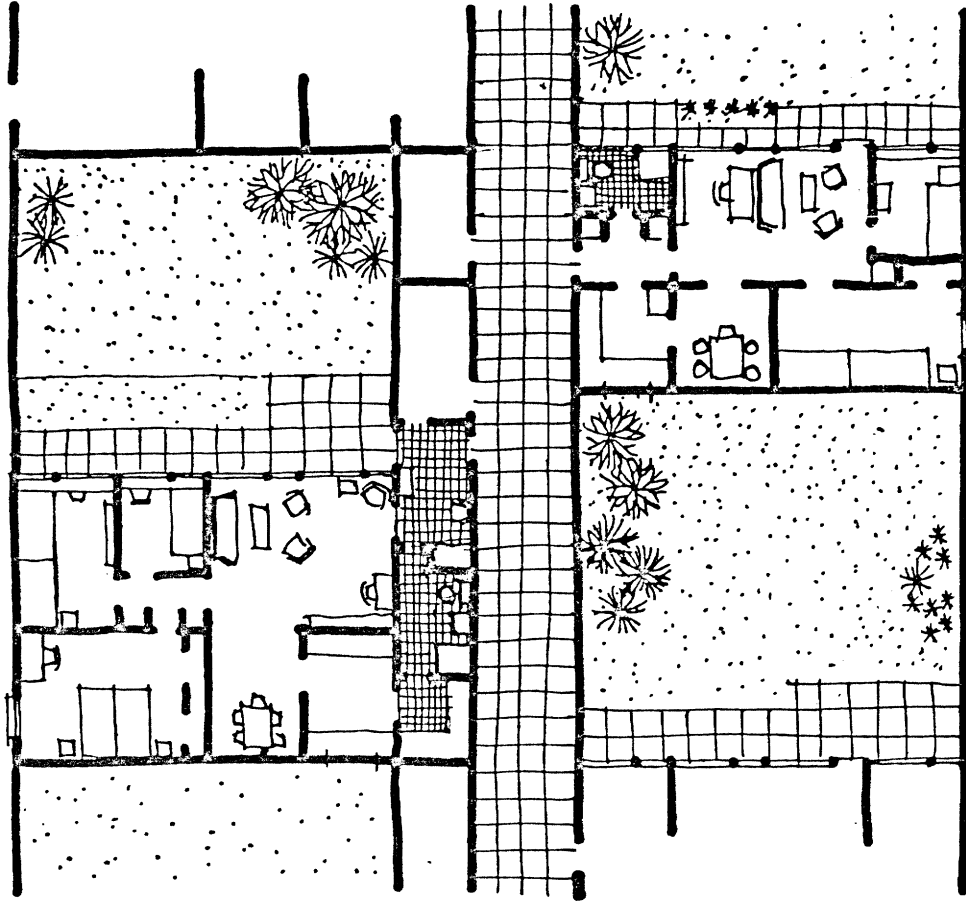
Philip Johnson was one of the first American architects to include the court garden in residential design in the United States. His first court house, designed in 1942, was an elongated rectangular plan with all its openings in one entirely-glazed wall facing the court. A high wall, fronting on the public sidewalk, included the court to form an enclosed garden.

In 1949, Johnson designed the Rockefeller Guest House in downtown New York. A pleasant inner court contains a tree, a terrace, a fountain, and a pool with three stepping-stones. Of this spacial arrangement, Prof. I. McHarg writes:

The impact of these few elements in this small space is overwhelming in contrast to the heat, fumes, noise, overpowering scale and tension of downtown Manhattan. This court, as a demonstration of the quality which can be achieved in a small urban space, is one of the most powerful exhibits as evidence of the validity of the court house concept. (3:61)

* * * * *

1952
COURT HOUSE DEVELOPMENT
DENMARK



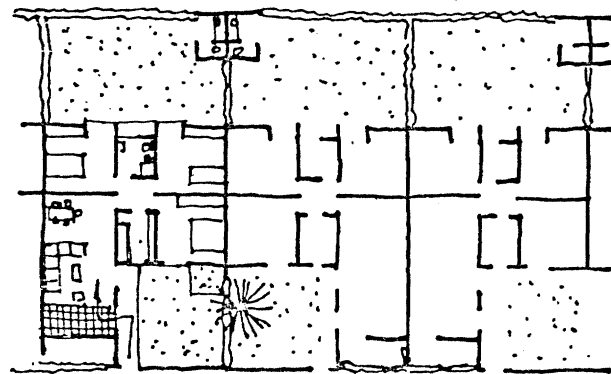
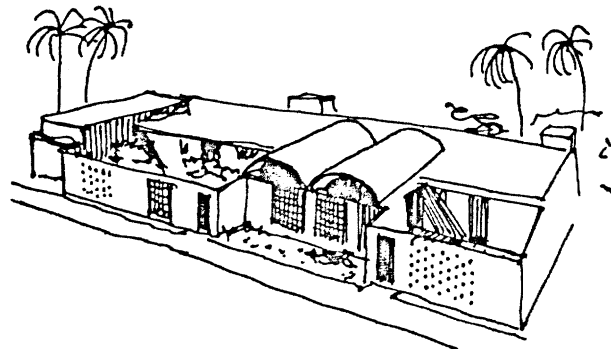
ESKE KIRSTENSEN
Denmark, 1952

In this design, Professor Kirstensen has arranged his rectangular dwelling-units of varying widths on both sides of a straight paved walk, and has alternated them with open spaces in chequerboard fashion. With the aid of storage rooms, free-standing walls, and a windowless wall of a neighbouring house, he has succeeded in creating private courts for each house. These courts run the entire depth of the house and lead out to common green spaces arranged at the rear of the houses. His design permits a very flexible arrangement in order to include houses of varying

sizes for particular family needs. The kitchens, bathrooms, and other areas requiring mechanical and service connections are aligned beside the common walk for maximum economy in service lines. (3:69)

* * * * *

1954
HOUSING DEVELOPMENT
CUBA



PAUL LESTER WIENER
JOSÉ LUIS SERT
and E. E. SEELYE
Cuba, 1954

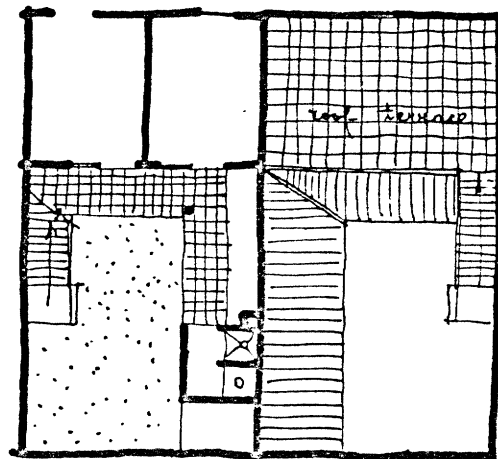
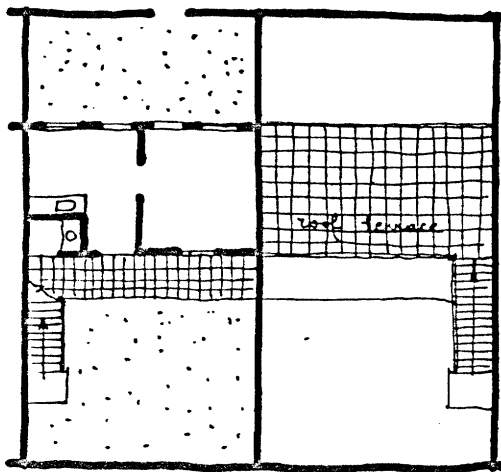
Continuing with their studies and experimentation on housing in the countries of Brazil, Peru, Colombia, and Venezuela, Wiener, Sert, and Seelye evolved a compact urban court house for Cuba. The scheme took into careful consideration the cost of the utilities and the construction, as well as the climatic conditions.

The patios, one at the front and another at the rear of each unit, have a special importance in the design. The architects have commented

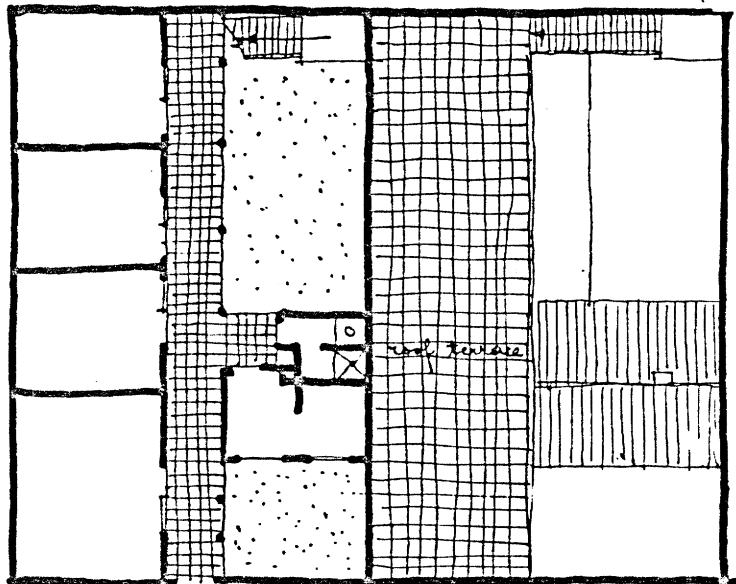
that rooms opening onto these patios will appear more spacious and, because of its privacy, each patio becomes an integral part of the house.

The architects also point out that it is preferable to combine the house units into groups since their small scale, when detached, becomes too noticeable, and does not help towards the achievement of an integrated streetscape. (3:79)

* * * * *



• ground floor • second floor • • ground floor • second floor •



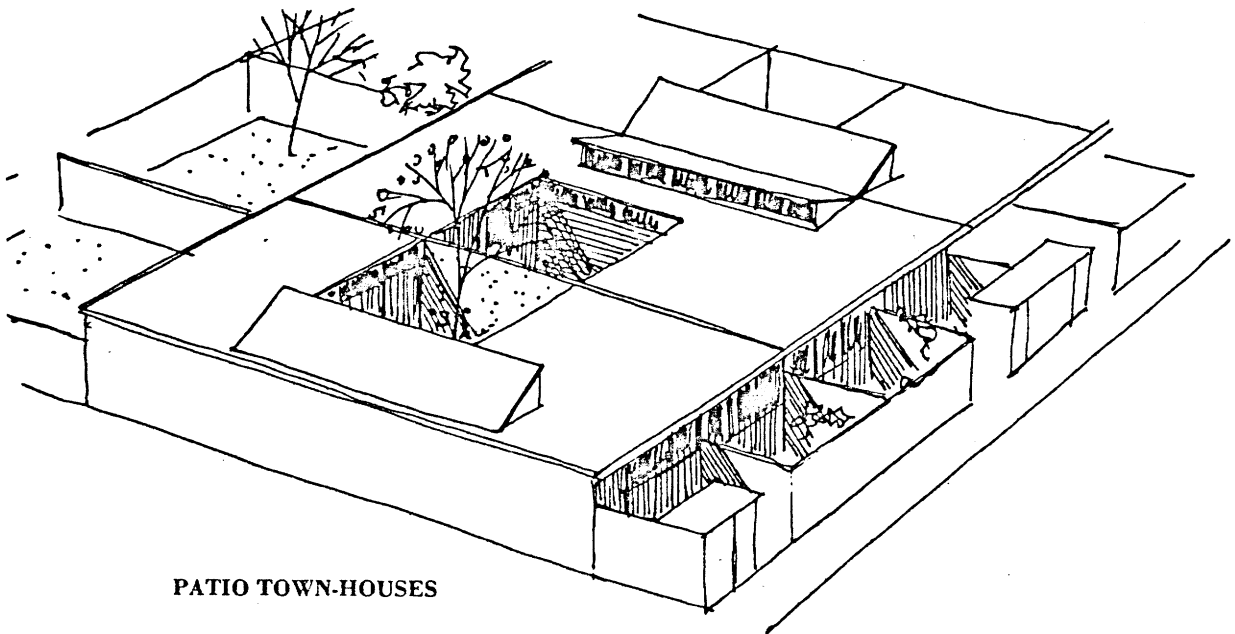
• ground floor • second floor •

1955
COURT HOUSE DEVELOPMENT
IRAQ

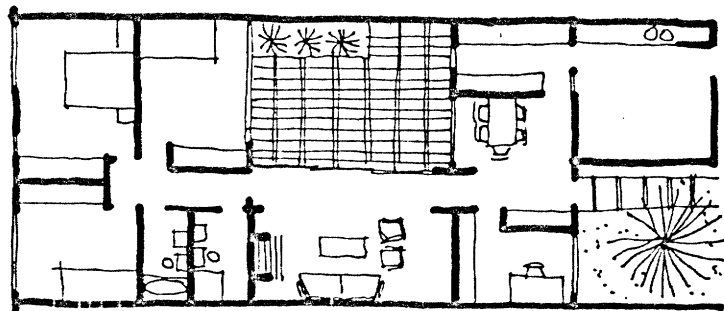
DR. C. A. DOXIADIS and ASSOCIATES
Iraq, 1956

Dr. Doxiadis, in collaboration with other Greek architects, has designed successful low-cost housing developments for workers in Iraq. The housing, as in Wiener and Sert's study, is minimal, and makes the fullest possible use of the open court for living and of the adjacent covered terrace for dining. This roofcover helps also to shade the openings to the sleeping rooms. The roof over the bedrooms is terraced and is a welcome place for sleeping on warm nights. The sides of the roof terraces are pierced to catch the breezes. (3:87)

* * * * *



PATIO TOWN-HOUSES

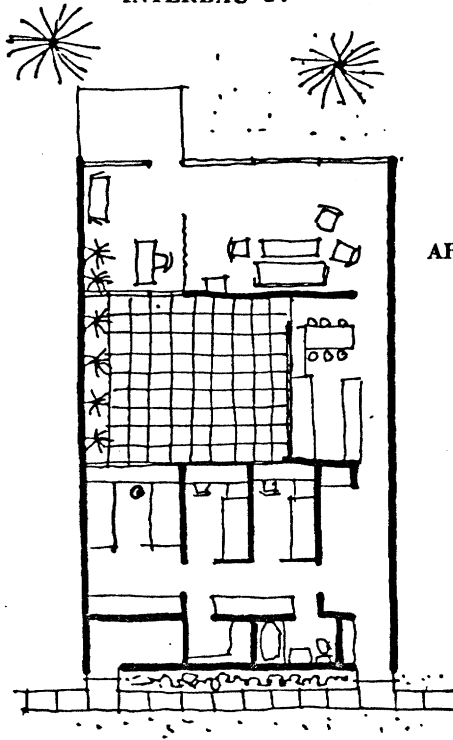


SERGE CHERMAYEFF
Boston, 1956

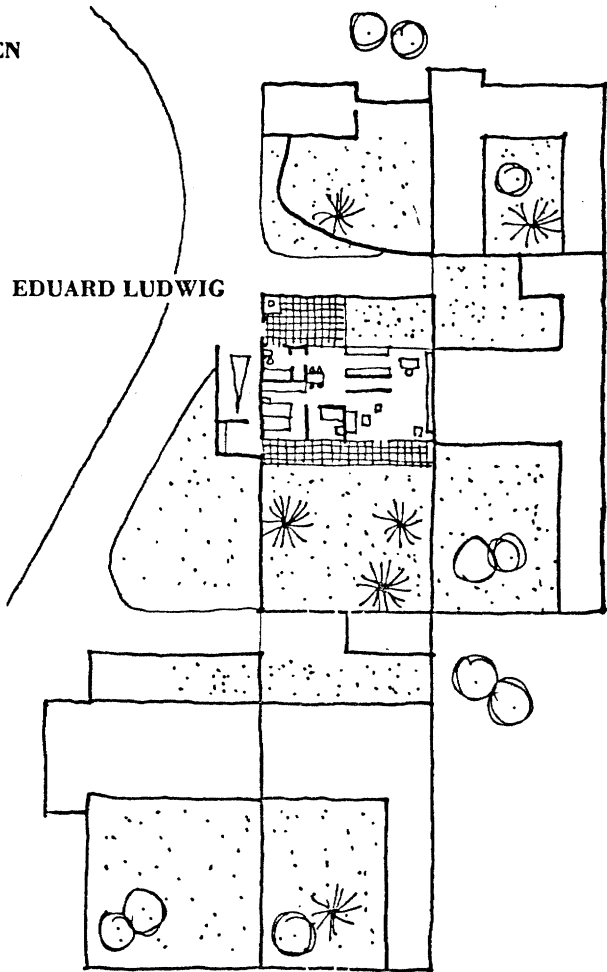
Serge Chermayeff and his students at the Harvard Graduate School of Design developed a study of patio town-houses, with 'lot-line-to-lot-line living' making maximum use of expensive city land. They made a variety of plans of one-storey dwellings, each having at least one central court and secondary wall-enclosed courts at the front and rear. The central court often acted as a buffer between the living areas and the sleeping quarters. Sometimes the kitchen is placed adjacent to the interior court, permitting outdoor dining in summer. (3:89)

* * * * *

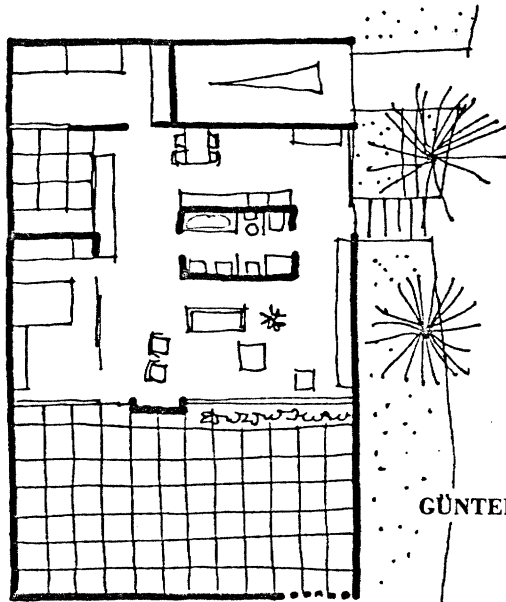
INTERBAU '57



ARNE JACOBSEN



EDUARD LUDWIG



GÜNTER HÜNOW

INTERBAU '57
Berlin

For the Berlin Exhibition on Housing in 1957, three different architects designed houses with open court gardens

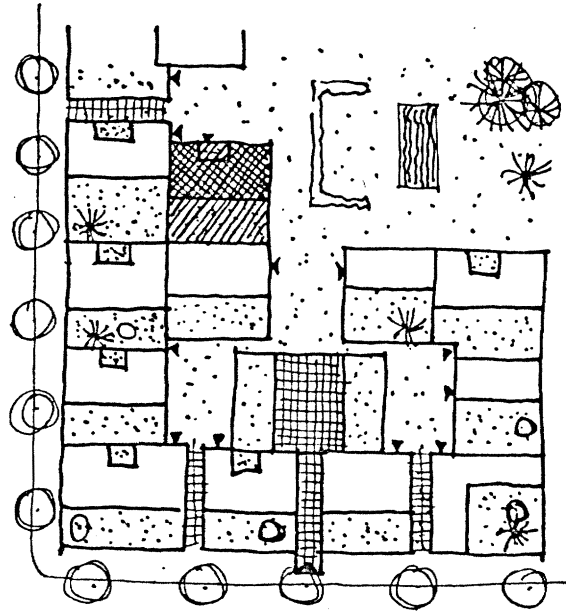
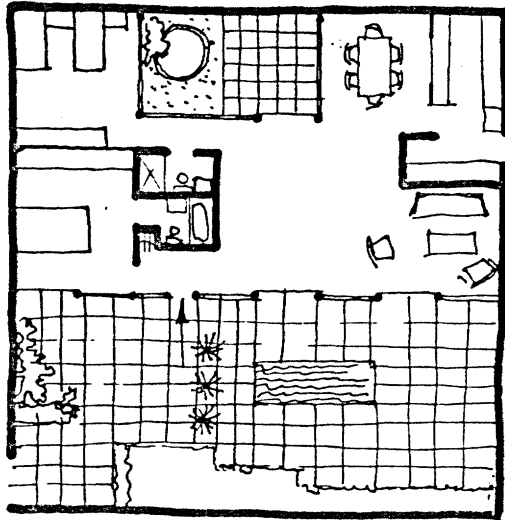
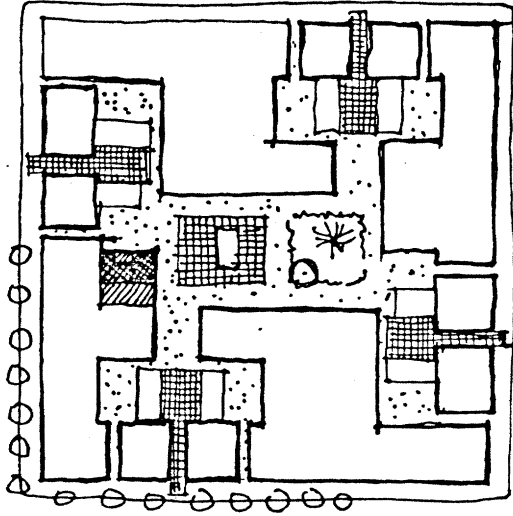
A. Jacobsen of Denmark designed a row of four atrium houses. He

succeeded by means of the inner court and the connecting kitchen-dining wing in separating the living and sleeping quarters. In addition, by placing his secondary rooms along the street side, he created a buffer zone against street noise.

Professor E. Ludwig of Berlin designed a series of five houses of varying size and floor plan, each having an interior and entrance court. A garage adjacent and attached to the house proper is provided with each unit.

Finally, Gunter Hunow, also of Berlin, had a single house built containing a large front court with an additional child's play court. The house is so designed as to permit a continuous row development. (3:91)

* * * * *



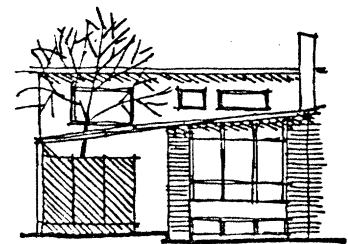
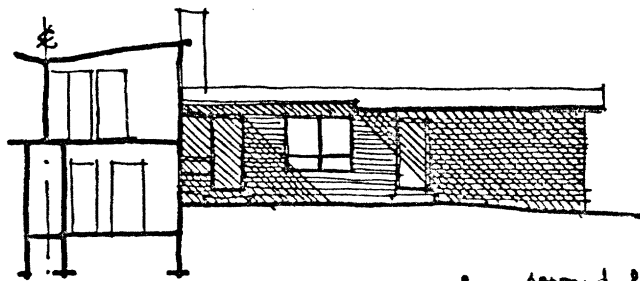
1957
COURT HOUSE STUDY

ARCHITECTURAL STUDENTS
supervised by
PROFESSOR IAN MCHARG
University of Pennsylvania, 1957

In 1957 Professor McHarg, a long-time proponent of the court house concept in America, directed his students in the School of Architecture at the University of Pennsylvania in studies and plans for court-housing in cities. "In this study," he writes, "the intention was not only to exploit the court house but to create a community which would be as

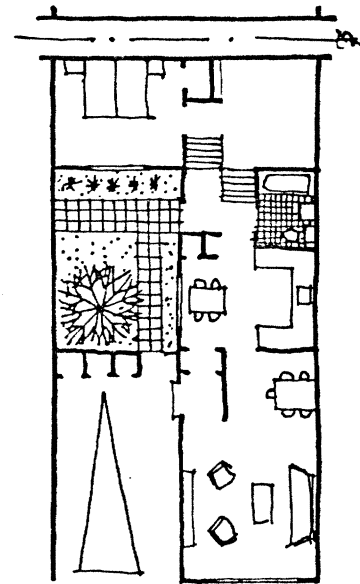
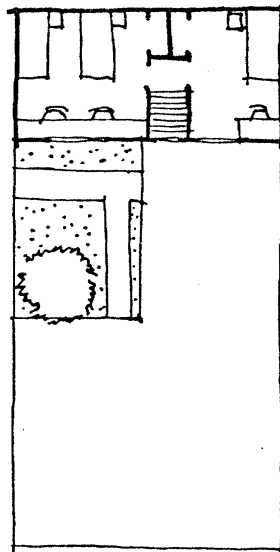
salubrious at the community level as would be the court house at the dwelling level. To create the court house community it was required that groups of six to ten court houses depend upon one common court acting as forecourt, and that beyond that a central open space with small playground and swimming pool be provided as the venue for social intercourse in the block." (3:93)

* * * * *



• second floor •

• ground floor •



1959
COURT HOUSE DEVELOPMENT
CANADA

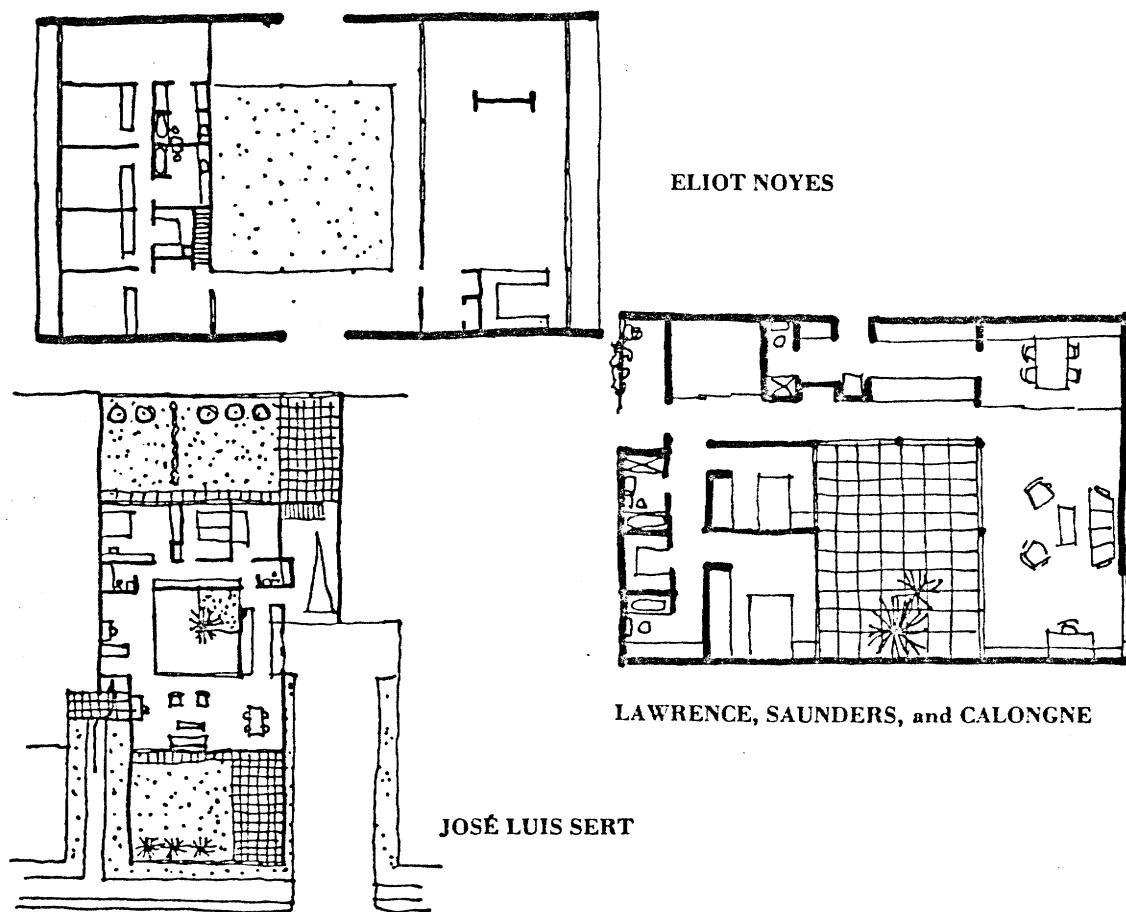
ERIC E. EMBACHER
Toronto, 1959

This dwelling unit, which has received much publicity in Canada, has been designed so that it may be grouped back-to-back as well as in terrace

arrangements. This has permitted the construction of clusters of eight to ten house units, each unit on a lot no larger than fifteen thousand square feet. The development has been approved by the Central Mortgage and Housing Corporation for mortgage financing, and the units can be either individually leased or sold under co-operative ownership.

The house has a split-level design, so that the sleeping quarters at the rear of the house are separated from the living quarters by half a level. Two bedrooms and the kitchen face an enclosed patio of approximately 260 square feet, while the living and dining areas look out towards the street. (3:99)

* * * * *



SINGLE-FAMILY COURT HOUSES
Recent examples
United States

Remarkable progress in the design of court houses has been made recently in the United States. The following are a few examples of the more outstanding court house designs.

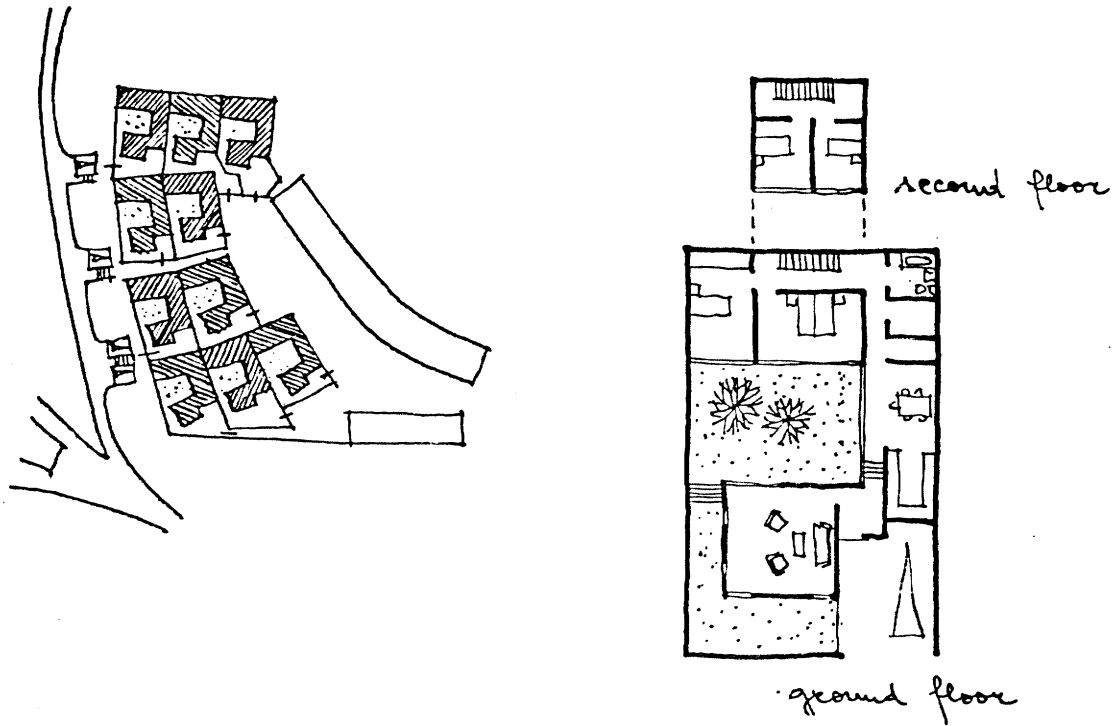
The home of the architect Eliot Noyes, in New Canaan, Conn., is flanked on two sides by heavy fieldstone walls which enclose a large central open space. This plan could with only slight modification, be applied to attached urban housing.

In New Orleans, La., architects Lawrence, Saunders, and Calongne have designed a house which encircles a large slab-paved court. The only natural light other than that received from the court is obtained through many skylights.

The home of the architect José Luis Sert in Cambridge, Mass., testifies to the livability of the court house in more northerly latitudes. His house has a front and rear court as well as a central patio court. Sert states that "the walls enclosing the courts act as buffers against view and noises, and such courts, if properly proportioned, can be agreeable and livable, even in cold climates." (3:103)

* * * * *

1960
COURT HOUSE DEVELOPMENT
ENGLAND



TOM HANCOCK of
MORTON AND LUBTON
England, 1960

This development is located on a central urban site of only 6.7 acres at Henley-on-Thames, England. A mixture of flats, terrace houses and court houses were grouped together in an exciting urban design, with a density of ninety persons per acre.

The court houses are arranged in a tight cluster on the south side of the site. All the habitable rooms face onto a well-oriented private court. An added feeling of enclosure and privacy is obtained by winding a high wall around an almost free-standing living-room, leaving the car-port entry as the only break in the wall surrounding the entire property. Two bedrooms are located on a second-floor level without depriving the neighbours of their privacy. (3:107)

3. THE PHYSICAL AND CONCEPTUAL ASPECTS OF THE COURT HOUSE

The physical and conceptual advantages of the court house are numerous. Some of them are intrinsic in the physical form of the house while others are less obvious. In order to analyze all of them it is necessary to examine the four main areas of importance: the building site, the court house proper, the court garden, and the psychological and sociological implications of family and community life in this dwelling type. (3:115)

THE BUILDING SITE

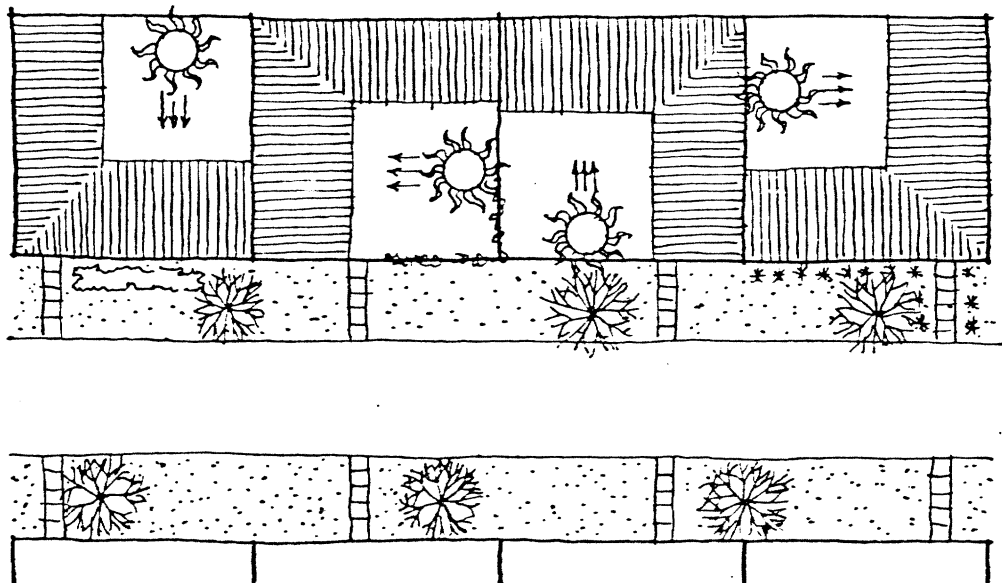
There is little doubt in the fact that the minimal claim of the court house on the available urban city blocks is highly advantageous. This factor becomes of greater importance as land becomes scarcer and more expensive, and when residential areas become too remote from the urban center. The court house allows for side yards to be omitted and front and rear yards to be incorporated into internal court yards of the house itself. Single-family units can be packed side by side and back to back if their open space is within their walls rather than outside them. This derives from an old Mediterranean prototype. It allows the privacy, control, and directness of access of single-family houses to be provided at much higher densities. (6:301) Therefore, utilization of valuable urban land in court house developments becomes a compact and economical process. The court house is more efficient in land usage and will often claim only one-half the site area required by a conventional split-level or bungalow dwelling. (3:115)

THE COURT HOUSE PROPER

The second main area of importance in the court house is that of the

building proper. Its inward directed design enables the architect to orientate (discussed in Chapter 4) in relation to sunlight. Since these rooms receive their view without reference to the streetscape, it becomes excessive to require the present setbacks of buildings from the property line. At the same time, by bringing the front walls of opposing houses closer together and joining them into long terraces, a clearer harmony between building and street is created, eliminating the air of bleakness and spottiness which is so characteristic of conventional suburban developments. (3:117)

ORIENTATION in RELATION to SUNLIGHT



Since the urban court house is attached to its neighboring dwelling unit, fenestration is eliminated along the sidewalls and directed inwardly to the court or to the front or back of the court house. This restriction imposed on the architect requires him to seriously consider daylighting as

an integral part of the architectural design in providing good lighting. In order to use daylight to advantage, various design factors must be taken into account. These include the following: (8:921)

1. Variations in the amount and direction of incident daylight.
2. Luminance (photometric brightness) and luminance distribution of clear, partly cloudy, and overcast skies.
3. Variations in sunlight intensity and direction.
4. Effect of local terrain, landscaping, and nearby buildings on available light.

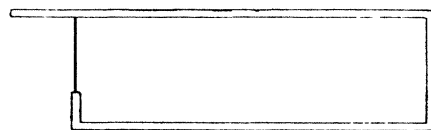
Daylighting consists basically of two types: sidelighting and toplighting. (8:923) Sidelighting is the placement of windows in the sidewall of the daylighted space and has both advantages and disadvantages. In addition to admitting the daylight, the window area can provide for natural ventilation and can afford the room occupants a view of the outdoors, which is highly desirable. However, the distance from the window to the farthest work area is a design limitation, and the window, which is the light source for the room, is prominent in the field of view. The brightness of the window may be troublesome unless controlled.

Toplighting is the second type of daylighting and has the advantage of being used without limitation on the width of the lighted space. The daylight openings afford only a view of the sky and are usually used in conjunction with some side-wall fenestration to provide a view of the outdoors. Toplighting can be effectively controlled, so that illumination can be distributed evenly throughout the space with controlled brightness.

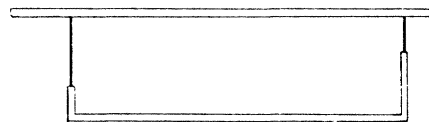
In the northern latitudes of the United States, consideration should be given to orientation of the windows in a southerly direction. Assuming suitable sun controls, this orientation affords the maximum daylight, particularly in winter months, and permits the effective utilization of

solar energy as an aid to heating. In southern latitudes of the United States, northerly exposures should be considered to limit the solar heating. As a general rule, east-west orientations present the most difficult problems of daylight control and complicate heating and air-conditioning design. (8:924)

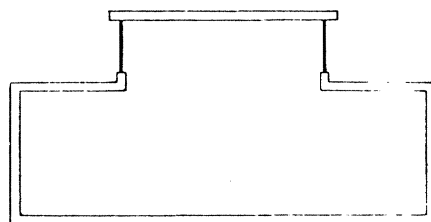
Single-story construction greatly increases freedom of daylighting design. Almost any version of sidewall lighting or toplighting, or combinations of the two, can be used. The following diagrams illustrate various types of sidelighting and toplighting that would be advantageous to consider in court house design. (8:924)



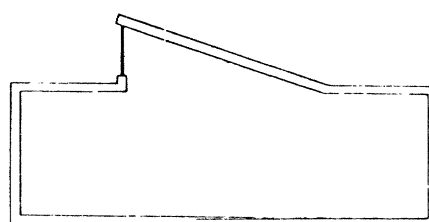
Unilateral



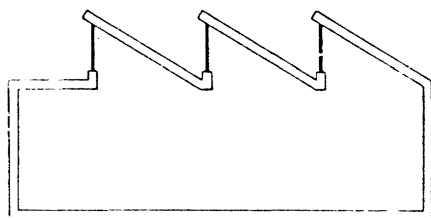
Bilateral



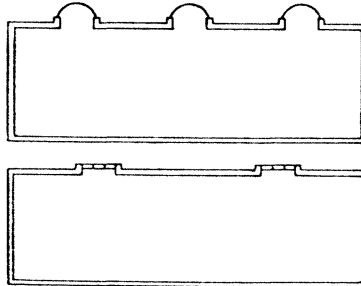
Monitor



Clerestory

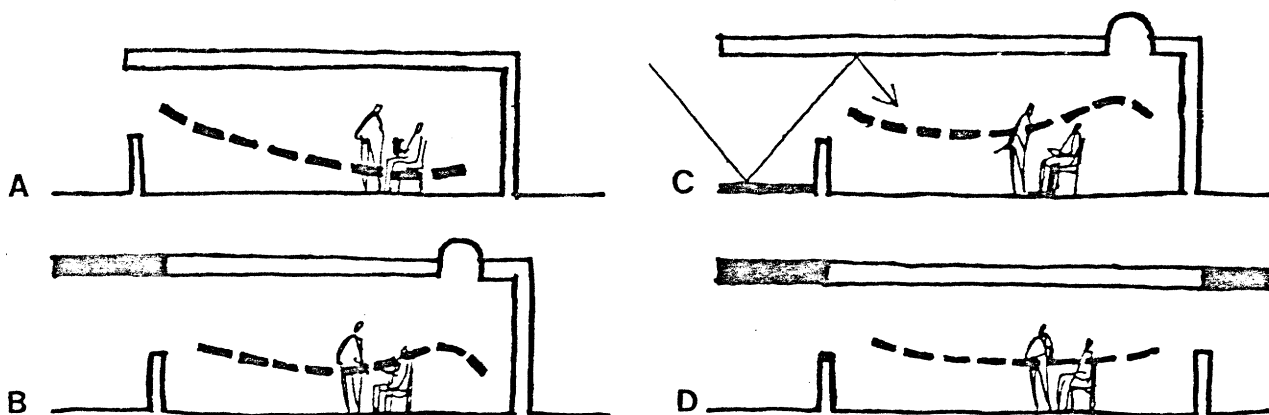


Sawtooth



Skylights

The energy crisis has caused renewed interest in natural lighting of spaces. From a lighting viewpoint alone, it is obvious from Wenzler's analysis that daylighting is economical. His study points out that for equal levels of illumination there is less heat per foot-candle for daylighting than there is for electric lighting. (10:99) We know very little about how building forms respond to daylight. Overhangs, skylights, and ground reflection all affect natural light differently as shown in the following sketches. Sketch A is a unilaterally lighted space with a window on only one side. The light level is much higher near the window, but diminishes as one moves away from the window. In Sketch B an overhang has been added along with a skylight near the solid wall. The light curve shows that the light intensity is lowered near the window, but the skylight provides a light distribution which is considerably better. Sketch C shows that by increasing ground reflection near the window, that light bounces to the ceiling and raises the illumination level near the overhang. In Sketch D the skylight is eliminated and a second window and overhang are added, providing an excellent bilaterally lighted space--nearly a straight line distribution curve. The overhangs keep the sun away from the glass and provide a better quality of lighting free from direct sun and sky glare. (2:47)

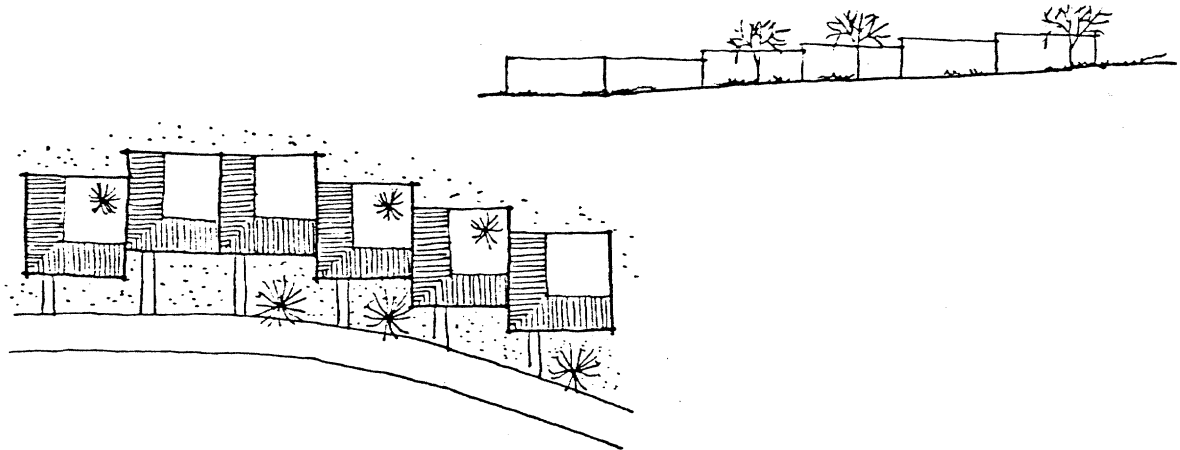


With the inward directed design of the urban court house, fenestration design becomes another important point of consideration. The urban court house sets up its own views. Glass is an ineffective thermal barrier. Heat flows through it with relative ease. Energy conscious people seem to dislike windows. Double panes, reflective glass, and various combinations of double glass divert the sun's hot rays, but in winter reflective glass prevents winter solar radiation. Regardless whether glass is effective or ineffective as a thermal barrier, it must be used in buildings occupied by people, especially residences. (2:22)

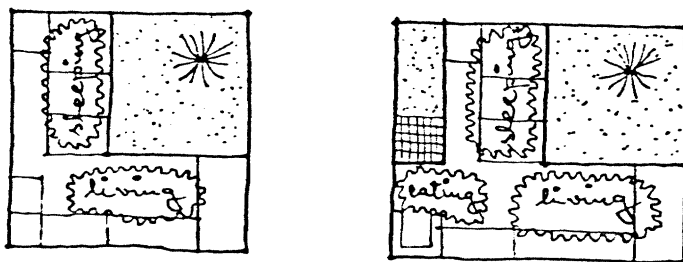
The maximum amount of glass used in the urban court house becomes mandatory. Glass helps to create the warm friendly atmosphere that leads to the architectural experience. It helps to humanize mere buildings--raising them to a higher plateau where human values exist. Glass provides a view by bringing inside beautiful outside things. It eliminates the depressed feeling of confinement. Glass is controversial, but it might well be the saving grace of human existence. We decided long before the energy crisis that it is much better to be a little cold than to have no view of snow on the ground. That it is much better to be a little warm than not to be able to see the beautiful summer green trees and shrubs. We like natural light, the way it changes every hour. We like to work and live in spaces which are adequately lighted by the sky. We don't like the monotony of electric lighting. We like to have openings in walls to be cooled by the breeze on hot humid days. We like nature and to bring it into our buildings. Glass helps to give us buildings which fulfill certain basic human needs--to see the sky, to hear a bird, to feel a breeze, to smell the flowers, to see the hills, or to look down from a high rise on

an exciting urban scene. (2:22)

Court houses can be adapted to horizontal and vertical derivations as dictated by the existing topography. This flexibility often permits a more varied street scene while retaining the character of the land. More than any other conventional single-storey dwelling-type, the court house lends itself to open planning and the creation of zoned-living areas within the house. The court house, consisting generally of two or more wings depending on whether it is a L, U, T, or Y-shaped building, lends itself to the separation of living functions into wings with only one side of the area adjacent to the next. (3:117)



ADAPTATION to TOPOGRAPHICAL FEATURES

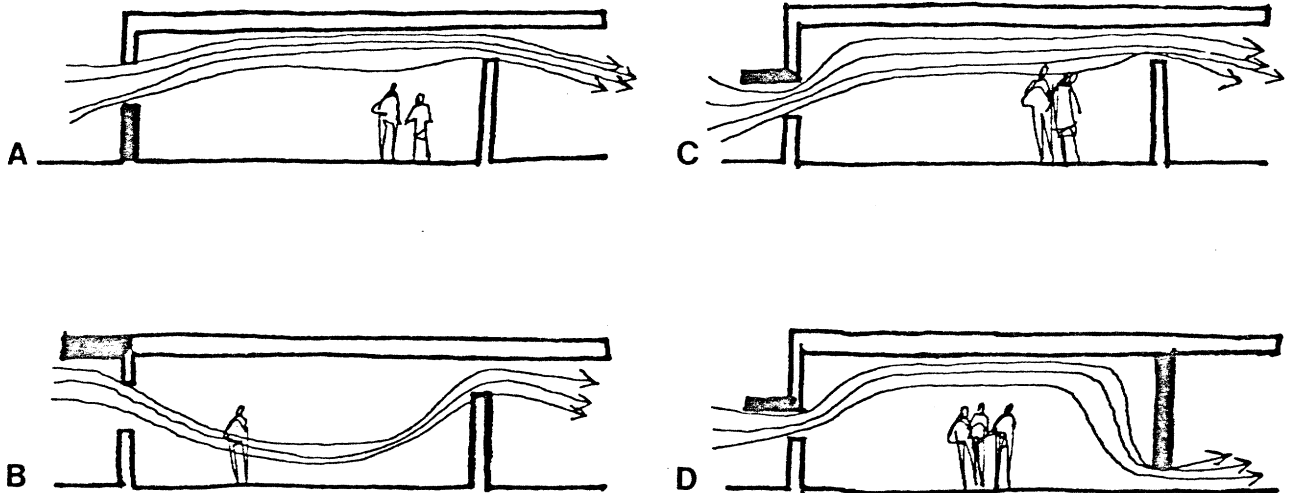


SEPARATION of LIVING FUNCTIONS

Since the urban court house is attached to its neighboring dwelling units, the length of exposed exterior wall is about the same as that of a conventional home. The heat loss of the two would thus appear to be the same. However, in the court area, where most of the fenestration occurs, there is a maximum shelter from the wind. This results in less infiltration of cold air into the house and consequently greater fuel economy. The effects of solar radiation on the court house will be discussed in greater detail in Chapter 4.

A slight disadvantage of the urban court house is the partial lack of cross-ventilation. Since the houses adjoin each other on the sides, there is no provision for natural cross-ventilation except through mechanical ventilation in the roof. Cross-ventilation was a common phrase a decade ago. With abundant cheap fuel, air-conditioning nearly erased it from our vocabulary. But now the wind is very popular. Certainly natural ventilation doesn't do as good a job as air-conditioning, but it uses no energy. (2:50) Ventilation by natural means is very desirable and with the previous disadvantage in mind, the urban court house lends itself to cross-ventilation in several ways. Since direct air currents most usually will pass above the wall-enclosed court garden, there will be a lower pressure in this outdoor space, resulting in a movement of air from the house to the court. This effect is increased by the fact that almost all of the fenestration opens onto the court while air vents from the street are small. (3:153) Natural ventilation can be used to supplement air-conditioning to conserve energy. The following sketches give a rough idea of how air flow from the wind is affected by building form. Sketch A shows a bilaterally vented envelope. The pattern of air flow is upward,

caused by the ground effect and the solid walls. That is a good way to take the heat off the ceiling, but the air flows over the people's heads. So it has a minimum cooling effect. In Sketch B an overhang has been added which forces the air down and around the people. In Sketch C the overhang has been moved to the window head, the air will flow upward again. By relocating the window on the leeward wall, shown in Sketch D, the air still flows upward over the heads of the people and down the wall. It would seem that the air would flow directly from one window to another. A window is like a nozzle that controls direction of the air. The size of the opening controls the velocity. (2:50)



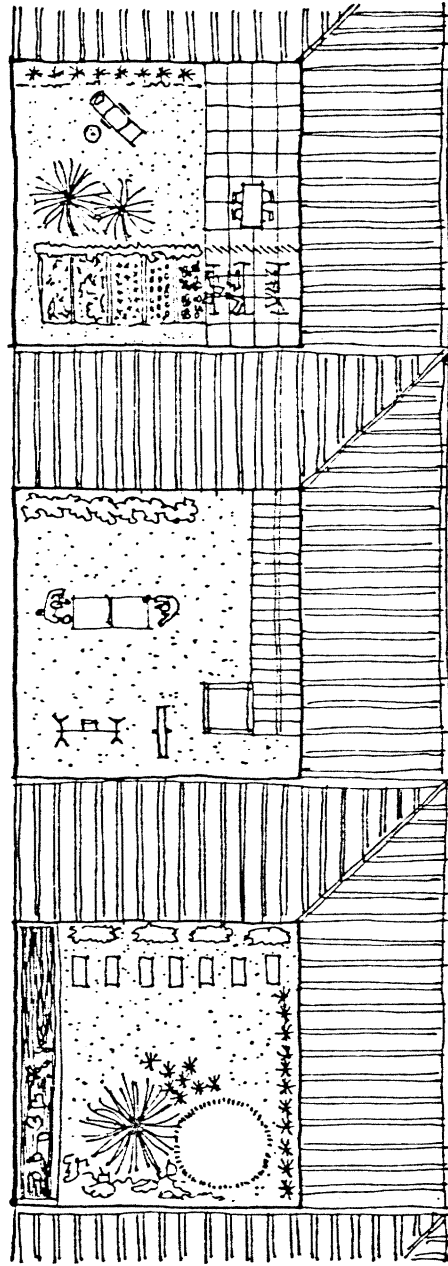
The court house has the same potential for pleasant exterior appearances as other building types. Clusters of court houses are most successful when they are of similar mass and scale, and make use of the same building materials. Warmth and interest can be introduced by piercing the court wall occasionally with metal grill work and gates, and with high

planting which rises above the top of the court wall. (3:119)

Finally, the construction costs of the urban court house compare with those of the conventional house. There are fewer wall openings, and usually shorter spans reduce floor and roof framing to a minimum. Expansion is a less costly affair, consisting mainly of extension of the existing framing. (3:121)

THE COURT GARDEN

The third aspect is that of the court itself. Essentially it is an outdoor living room, serving many of the living functions: dining, gardening, entertaining, outdoor recreation, children's play, etc. Its use is not limited to only one of these, but may include a number of activities. During the day the court may serve as a play area for the entire family, even lunches and barbecues can be enjoyed in complete privacy. In the evening with the aid of the sliding glass walls and indirect lighting of the garden, the court may be used as an extension of the indoors for entertainment of guests.



**THE COURT GARDEN MAY
INCLUDE MANY ACTIVITIES**

The sun's radiation, essentially composed of infra-red, visible, and ultra-violet light rays, can be controlled to a great extent in the court garden. The luminosity (brightness) of the visible rays can be increased or decreased by use of light or dark colors and smooth or rough textured surfaces on the court floor and its surrounding walls. Intense bright light can be considerably softened by the use of rough, nonreflective

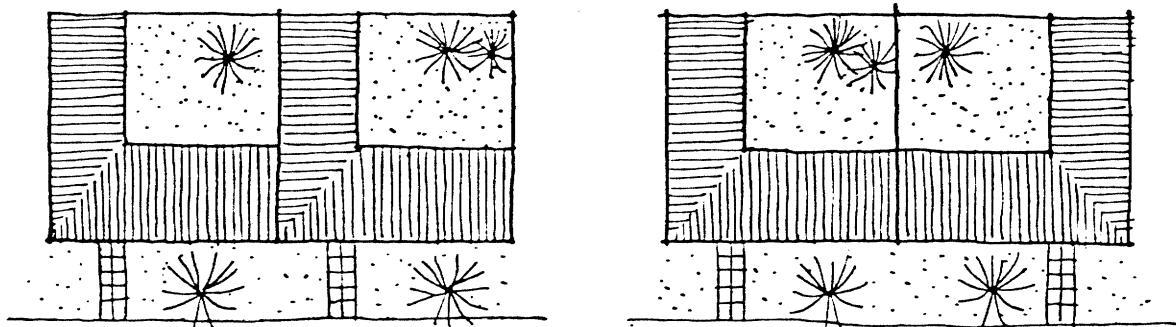
13

wall surfaces in dark colors together with dense foliage in the court. An additional source of light in the winter would be provided by smooth light-colored walls and an undisturbed blanket of reflective snow on the court floor. In addition to light, the sun's rays provide us with an additional source of heat with the sun's low angle in winter. Vertical walls receive a lot more heat per square foot in the winter than horizontal roofs or surfaces. To aid in this natural heat source, the exterior walls of the house can be painted in dark tones which are heat-absorbent, in contrast to the light-reflecting court walls facing its windows.

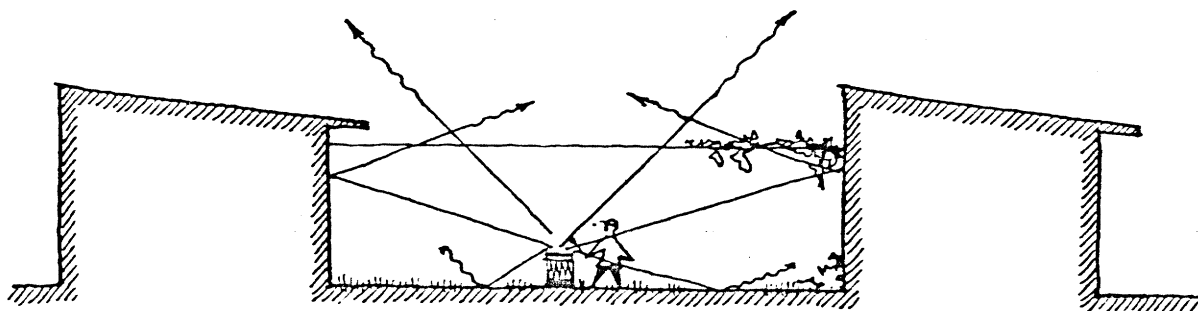
During the hot summer months, when heat and excessive light are not desirable, the above arrangements do not necessarily work against our desires. Since the angle of the sun's rays during the summer is high, a relatively narrow eave will prevent the heat rays of the sun from reaching the house wall. Planting of deciduous trees and creepers along the court walls will reduce the amount of reflected light from the light-colored walls. Finally grass sod, ground covers, and flowering beds reduce undesirable reflections during the summer months. The use of deciduous trees rather than coniferous evergreen varieties is recommended, since their branches are bare during the winter months and will not obstruct direct or reflected light. (3:147) Landscaping and gardening will be discussed in greater detail in Chapter 5.

The house with a court garden has distinct advantages over the single-family detached house with respect to the reduction of noise originating in the outdoor court garden. There are two basic arrangements of adjacent court gardens; one in which the enclosed outdoor spaces are separated by an intervening building mass, and the other in which the two court gardens

abut each other and are separated by a wall.



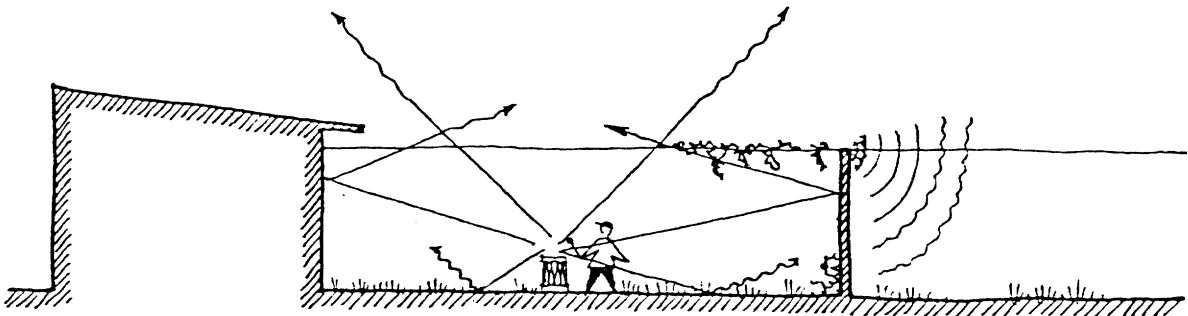
In the first case, noise originating in one court space will scarcely be audible in the neighboring court garden. The building mass and distance between the two courts greatly reduce the noise level. In the single-story urban court house, to-and-fro reflections of unwanted noise do not occur. Most of the sound waves are either absorbed by ground surfaces or by the air above the court garden. (3:124)



NOISE in the COURT GARDEN

In the second instance, where the two courts are adjacent to one another, noise disturbances are undoubtedly greater, but their intensity is certainly less than in conventional back yards without any wall

separation. Sounds of a shorter wavelength or high-frequency sounds will tend to propagate in a rectilinear fashion and therefore prove less important as noise disturbance. A negligible amount of low-frequency sound might, through diffraction, enter the neighboring court garden and be audible. (3:125)



NOISE in the COURT GARDEN

In both instances discussed above, the most important factor of noise control is the size of the court garden, or the relationship of the dimensions to the height. The higher the enclosure, the greater the area required in the court garden. As a general rule of thumb, the proportions should be adjusted so that the width and length of the court are each at least twice its largest height dimension. (3:125)

It should be noted that some noise generated in the court garden will be heard in the house itself. One can usually stand the noises he makes himself, but the noises made by someone else are often distracting and irritating. Brain pressures are often increased as much as 400 per cent by sudden loud noises which can cause loss of temper and undue excitement. Noise disturbs the blood vessel apparatus and not only affects general

conduct, but prevents deep and sustained thinking. (9:114) People do not object so much to noise disturbances caused by members of their own family, since they are more within their personal control.

The climatological factors affecting man's physical comfort are essentially the sun's rays, air temperatures, winds, precipitation, and humidity. As stated earlier, we try to exclude the sun's rays in the summer for comfort and to reduce heat gain and to ease cooling loads. But in winter we try to capture and use the sun's rays to our advantage. With the exception of the summer time, sunlight is a desirable element. By concentrating the fenestration around the interior court, a large amount of sunlight and daylight can be gained within the house through reflection from light-colored ground surfaces and walls. It is important that the court have a southerly exposure so as to obtain a maximum of sunlight in the court area. (3:145)

An enclosed court garden is effective in the control of air temperature both in and around the house. In winter a higher temperature can be gained within this outdoor space by trapping the heat rays of the sun and by reducing, if not eliminating, the wind chill factor in the wall-enclosed area. In contrast, during the hot summer months, trees provide ample shade and moisture to reduce the air temperature of the court. Lawns and beds function in a similar way. It is evident then, that through careful planting and the use of certain species noted for their shading qualities, a high degree of temperature control can be achieved.

Another climatological factor affecting man's comfort is wind. Since most direct winds are deflected by the court walls, there is a minimum of infiltration of the cold air into the house as compared to the conventional

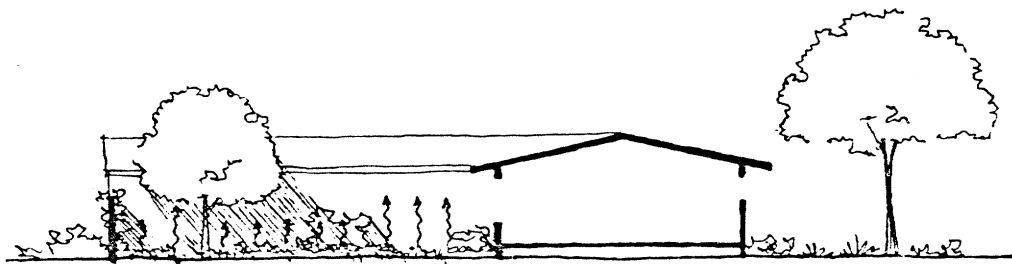
house. A wall six to seven feet high will provide an effective protection from direct horizontal winds for a distance of thirty to forty feet beyond the wall. (3:151) Thus wind gust, harmful to delicate plants, is kept above the destructive level, thereby allowing the cultivation of a greater variety of flowers. Also important is the exclusion of cold winter winds on sunny late-season days, bringing spring flowers even earlier than otherwise, and allowing healthy outdoor play. (3:153)

Various types of precipitation are rain, snow, hail, fog, sleet, and mist. Precipitation eventually ends up as water to nourish the plant materials, cool the court garden by evaporating, and wash away dirt. However, before melting, snow and hail can cause damage to the plant materials. If the court house is in a severe winter and snow level area, it is economically feasible and practical to install a radiant-heating and drainage system in the ground of the court garden. The court garden should be equipped for drainage anyway.

The final climatological factor for analysis is that of humidity. The moisture level of the ground and air in the immediate vicinity of the dwelling has a decisive bearing upon our comfort. (3:159) Evaporation of moisture from a body surface causes heat loss resulting in the cooling of the body mass, which in turn cools the surrounding air. Thus evaporation can be used as a climate control within the court garden. When artificially watered, the court garden will provide a more extended period of cooling in comparison to the conventional house lawns. Two of the four surrounding walls of the court garden will always cast a shadow upon the ground, preventing rapid drying. The exclusion of winds from the court floor will also aid in extending the period of evaporation and cooling in

the court area.

The greatest single moderator of humidity in the court garden is the presence of vegetation, preferably the deciduous variety, which absorbs excessive dampness after a rain and then relinquishes the moisture into the air gradually by transpiration. This is pleasant in the hot summer when humidity is desirable along with the shade of deciduous trees. (3:160)



GRADUAL EVAPORATION of MOISTURE

THE PSYCHOLOGICAL AND SOCIOLOGICAL BENEFITS

The fourth and final aspect consists of the psychological and sociological benefits which may derive from living in court house developments. In conventional housing on the community level, the matter of conformity to generally accepted notions of landscaping, washdays, fences versus hedges, and so on are extremely important, and rob the individual of much of his freedom of self-expression. He cannot very well go against local taste and usage. The court house, however, returns this freedom entirely. If one wishes to dry the washing on a Tuesday, cultivate Japanese moss-gardens, or allow the children to run about with nothing on in the court, one is at perfect liberty to do so without reference or

annoyance to any other person.

The enclosed court garden may also prove to have an important mental effect upon the homeowner with respect to gardening. Firstly, there is a well-defined garden limit. It does not extend visually in any way into the street or into the neighboring yard, which under ideal circumstances is attractive; unfortunately, it is not always so, and too often constitutes a discouragement before one even begins to garden. Maintenance can easily be reduced with additional areas of pavement. Thus the homeowner is not as easily discouraged in the undertaking of some horticultural ventures of his own, and a small start will often convert him into an avid gardener with the accompanying satisfaction of personal accomplishment.

Secondly, one can see an end to the work. It finishes at the wall; it does not drop dejectedly off at the sidewalk or at the back or side fence. It is one's personal responsibility, and since it is so much a part of the house proper, linked with every room in a specifically visual way, its care and the enhancement of its beauty become not only important but imperative. If, however, one prefers to neglect the court, it becomes detrimental to his own home only and not to his neighbors'. There is a great incentive here towards interest in gardening in general and appreciation of natural beauty, whether it be in one's own home environment or in public parks and gardens.

Finally, there exists a strong human need to be in contact with the earth and its growth, a need which cannot always be satisfied by the potted plant on balcony or window-sill of the multistory housing unit. The court house, while economical in its use of land, retains a private

garden which, though limited in size, is still sufficient for the fulfillment of this need.

The sociological implications of court housing are not unimportant. Court house developments may prove helpful in diminishing the segregational tendencies in our existing neighborhoods. Since there is provision for more privacy between neighbors living in court houses, it is conceivable that people of different age-groups, social standing, and various ethnical or religious backgrounds may find it easier to live side-by-side. In fact, we already know that the court house, in countries where it is an indigenous dwelling-type, does not reflect evidence of social stratification or grouping.

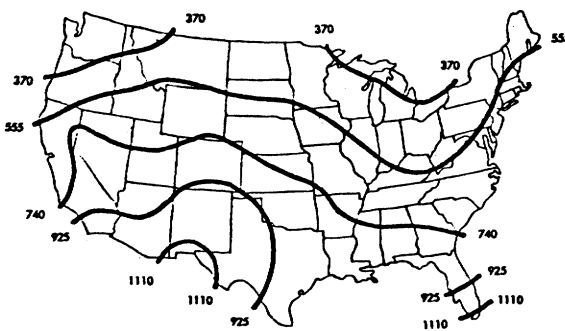
Serious consideration of a concept of balanced, integrated neighborhoods is essential in urban as well as suburban parts of the United States, where many different traditions are venerated by their respective groups. Mixed neighborhoods can, if provisions are made for privacy, eventually result in greater understanding between different types of people. Most important of all, it should be increasingly possible to bring about the realization that common ties between human beings outnumber those divergencies inherited by tradition. Hence, clashes resulting from the forced and precipitate throwing-together of families in cultural opposition are avoided; the inevitable realization of basic human solidarity can, in time, bring about a greater interest in and respect for the various cultures of our fellow citizens, and can result in a greater understanding and more harmonious integration of cultures. (3:132)

4. THE COURT HOUSE AND SOLAR EFFECTS

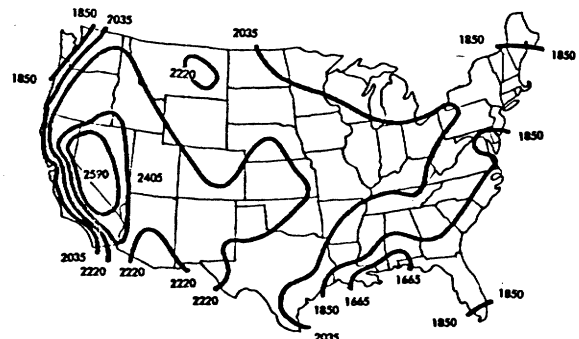
Glass is great for a view and it does a great job of stopping the wind. It permits wanted winter solar radiation, but is a poor thermal barrier. Because glass is such a poor thermal barrier special consideration must be given to proper solar treatment of it because windows and glass play a very large role in the design of the urban court house. In the midst of the energy crisis it not only makes sense to use solar control to our advantage to conserve energy, but also in economy's sake to reduce utility bills.

SOLAR LOADS ON GLASS

The direction a wall faces makes a considerable difference in the heat impact it receives. Due to similar construction materials and techniques, the court house receives approximately the same amount of solar radiation through its roof and walls as do conventional homes with the exception of the increased amount of glass used around the court garden. This increased amount of glass calls for careful consideration to be given to the solar gains this glass could pick up if left untreated. The following charts illustrate the amounts of sun energy received in January and July. (4:58)

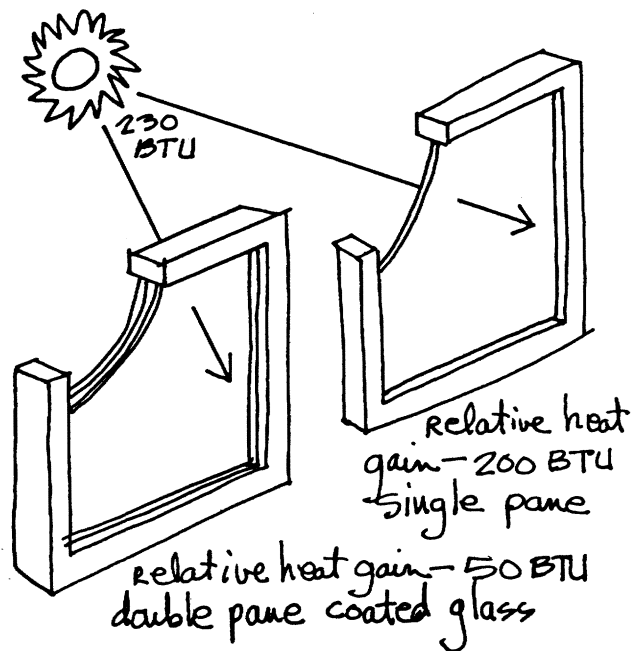


Average daily sun energy received in January.



Average daily sun energy received in July.

Solar loads vary with latitude, orientation, ratio of glass to solid wall, type of glass, and degree of shading. (8:806) Except for the first, all these factors are normally controlled by the architect. Solar loads through glass can be extremely high. The incident solar load received by a vertical surface often exceeds 200 BTU/(hr.)(sq.ft.), and if the surface is glass, most of this heat is transmitted instantaneously to the building interior as shown in the diagram below. (2:27)



The following chart illustrates the various types of glass and their effect on solar load. (8:107)

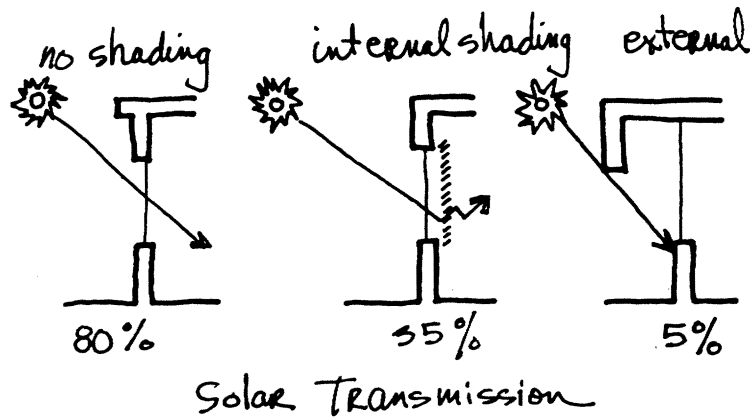
Types of glass and their effect on solar load

Type	Approximate cost, \$/sq ft	Per cent reduction in solar load per sq ft
Single clear plate, 1/4 in.	1.75	0
Double clear plate, 1/2-in. air space	4.50	22
Single heat absorbent	2.25	47
Double, 1 clear plate, 1 heat absorbent, 1/2-in. air space	5.50	55
Double, coated glass	6.50	70
Double, clear plate with venetian blind in air space	7.00	70

Due to the inward-directed nature of the court house and the emphasis placed on the view of the court and the use of the court, it seems most practical to use clear glass. However, use it properly, that is shade it adequately with trees, fins, overhangs, awnings, etc. Therefore, large areas of glass can be used without significantly increasing the solar load if they are completely shaded from the direct rays of the sun.

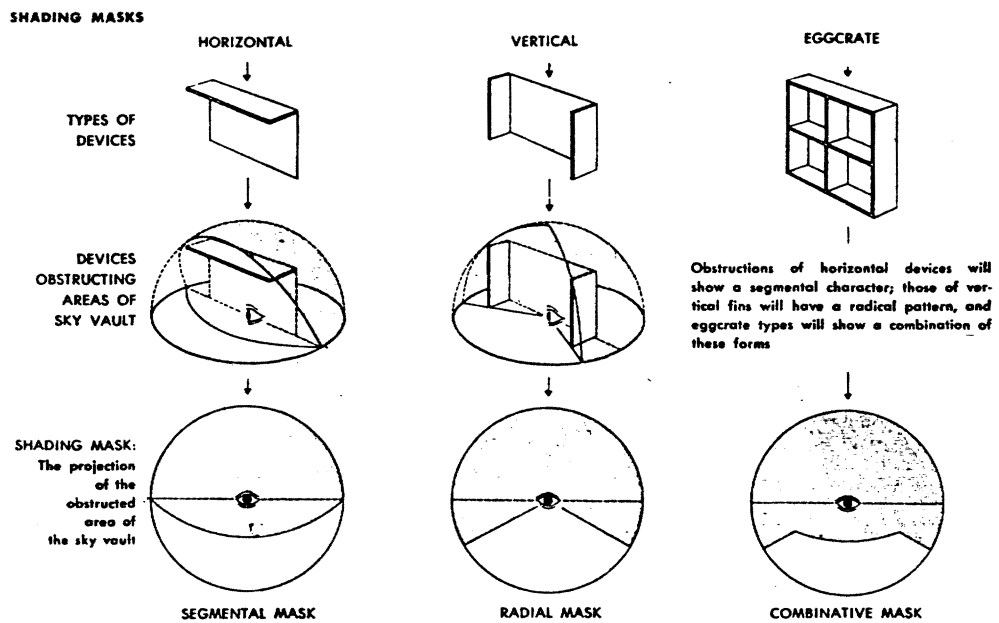
SOLAR SHADING DEVICES--IN GENERAL

Shading devices can be applied either externally, internally, or between double glazing. They may be fixed, adjustable, or retractable and of a variety of architectural shapes and geometrical configurations. Internal shading devices include venetian blinds, roller blinds, curtains, etc. Usually they are retractable, i.e., can be lifted, rolled, or drawn back from the window. External shading devices include shutters, awnings, overhangs, and a variety of louvers: vertical, horizontal, and a combination of both (egg-crate). Shading between double glazing includes venetian blinds, pleated paper and roller shades; these are usually adjustable or retractable from inside. (7:213) The following illustration shows the effectiveness of shading devices against solar transmission. No shading allows for about 80% of the sun's energy to penetrate into the space. Internal shading devices help reduce solar transmission through glass, but are less effective than external shading. Under best conditions, internal devices can only reduce transmission by about 65%. External shading devices are the most effective against solar transmission, thus allowing only 5% of the sun's energy to penetrate the glass. (2:26)



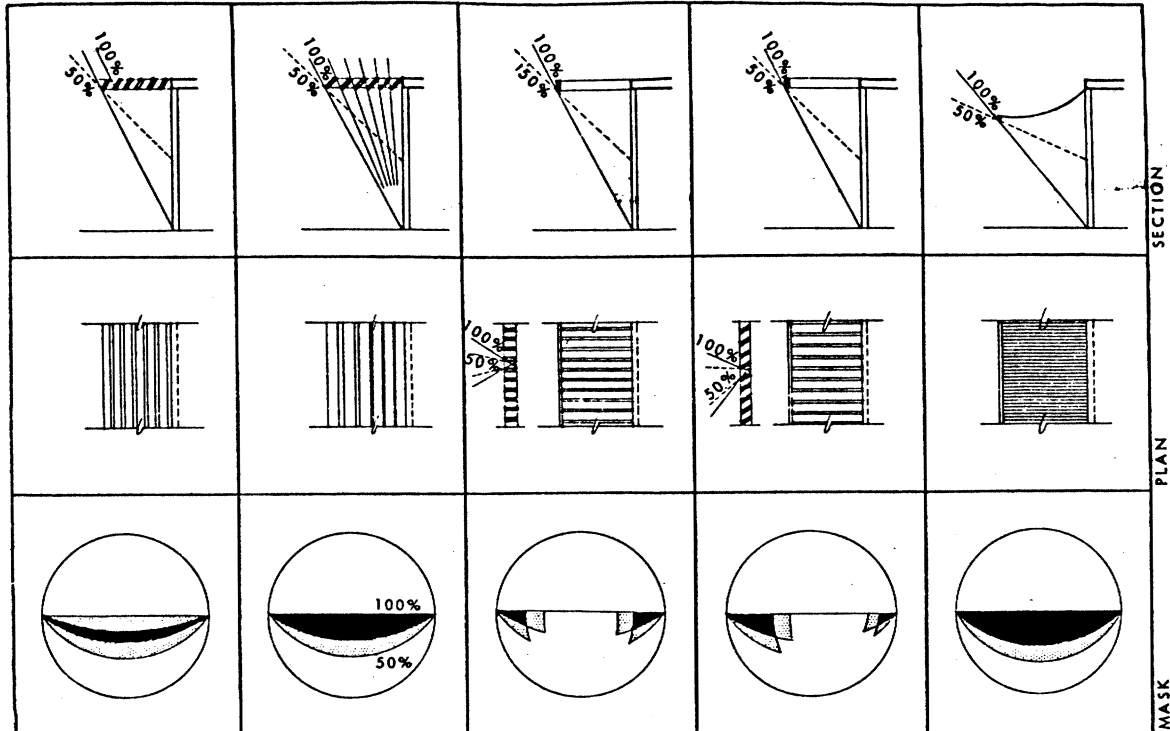
DEVICES SUITABLE FOR THE COURT HOUSE

A shading mask is a projection on a horizontal plane of the sections of the sky which are obscured by any object from an observer standing at the center of the diagram. The shading masks of vertical, horizontal and egg-crate shading devices (all external) are shown below: (8:812)



The internal shading devices (blinds, curtains, etc.) work well around the court garden in conjunction with the prescribed external shading devices (see following diagrams). The internal shading devices will give added protection against unwanted solar transmission as well as providing adjustable natural lighting control. Shading devices between double glazing are also an effective means to limit and control solar transmission but should be adjustable and retractable, not fixed.

The following illustrated shading devices seem to be best suited for shading in the court house. The majority of the devices are of the horizontal type, since they will be mounted up and out of eye level. Some vertical devices were chosen but no egg-crate devices were chosen due to them being in the field of view of the court. The vertical and egg-crate devices must be chosen with extreme care so as not to spoil the esthetic beauty of the court garden. Elevations, plans, and sections are shown with their schematic angular lines with which the mask can be determined by the use of the protractor. The masks show the 100% shading as a black area and the 50% shading as gray. (4:88)



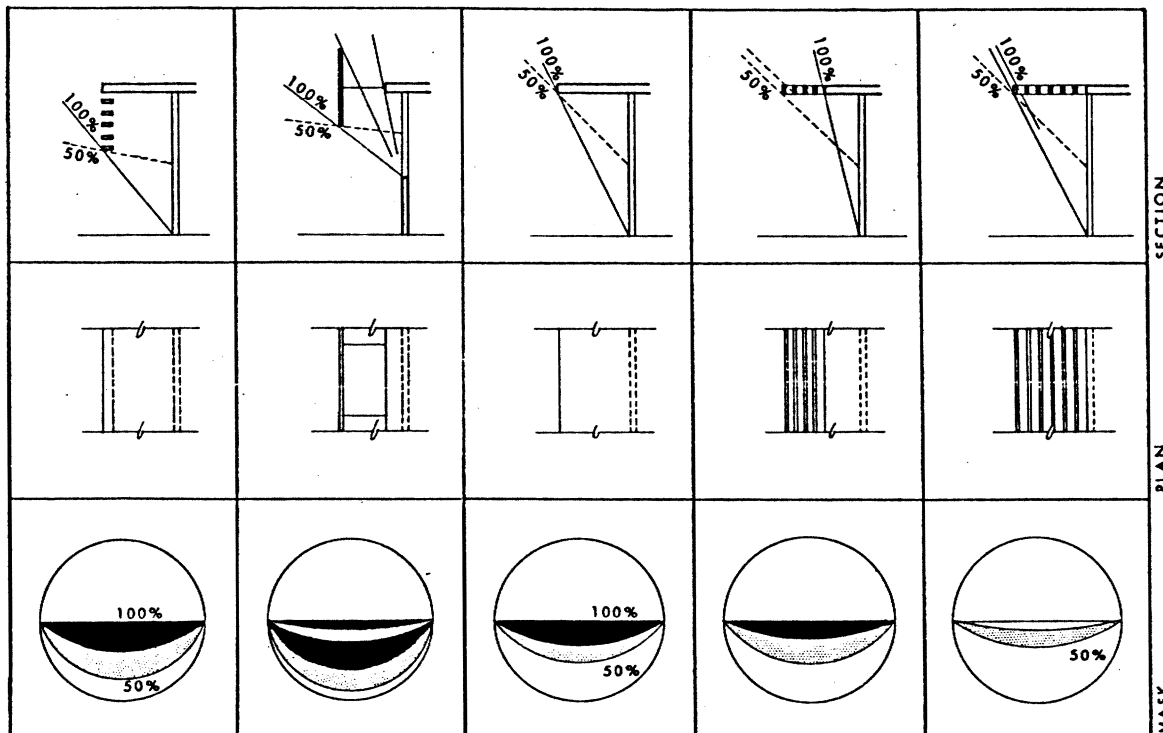
Tilted louvers parallel to wall let in some sunrays at high altitudes, as shown in mask.

Tilted louvers parallel to wall, but unequally spaced will secure 100% shading at high sun altitudes also.

Overhangs with louvers perpendicular to wall will cut out sunrays from the sides.

Tilted louvers perpendicular to wall will have the same characteristics as type F, but the mask will be asymmetrical.

Canvas canopy will have some characteristics as a solid overhang.



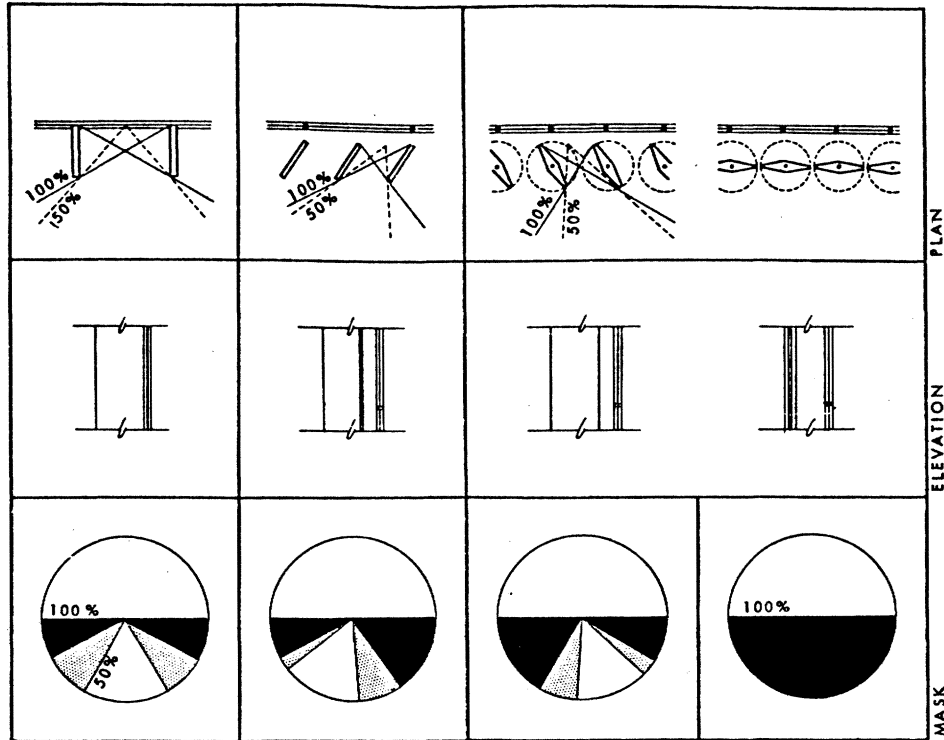
Horizontal louvers hanging from solid overhang might result in a large segmental mask.

A solid strip parallel to wall cuts out the lower rays of the sun. If the strip is made of heat-repellent glass, it will not secure 100% shading.

Solid horizontal overhang with 100% and 50% segmental mask.

Overhang partially solid, partially louvered.

Louvers parallel to wall, which do not secure 100% shade, therefore the mask shows only 50% shading.



Solid vertical fin with 100% and 50% radial mask. Vertical fin oblique to wall will result in an asymmetrical mask. Movable vertical fins can shade the whole wall, or open up in varied directions, but their mask will always have radial characteristics.

GENERAL ORIENTATION REQUIREMENTS

In general, southerly orientations call for shading devices with segmental mask characteristics, and horizontal devices work in these directions efficiently. For easterly or westerly orientations, vertical devices serve well, having radial shading masks. The egg-crate type of shading works well on walls facing southeast and is particularly effective for southwest orientation. Because of this type's high shading ratio and low winter heat admission, its best use is in hot climate regions. For north walls, fixed vertical devices are recommended, but their use is needed only in hot regions. In the very low latitudes (under 23°) horizontal devices work well also for this orientation. The movable types can be most efficiently utilized where the sun's altitude and bearing change rapidly: on east, southeast, and especially, because of the afternoon heat, on the southwest and west. (8:813)

5. THE COURT GARDEN AND LANDSCAPE DESIGN

It is apparent that landscape design is an immensely important factor in court house design since the court is a visual as well as physical extension of the house. Presumably the major function of landscaping the court garden is for visual and esthetic reasons, then next for functional reasons such as shade control, and finally for various other reasons such as for cuttings, for collections, for fragrance, for interest in the plant and its setting, for horticultural activity such as propagating and hybridizing, for health and welfare and occupational therapy.

MICROCLIMATE OF THE CITY

Macroclimate refers to the normal range of temperature, humidity, winds, and precipitation of a large region. Microclimate, on the other hand, designates the climate of a small area affected by its immediate topography, vegetation, man-made structures, etc. Man has modified the microclimate over much of the earth. He has also invented a new microclimate, that of the city, which is the result of the extensive paving, the dense structures, and the emission of heat, noise, and impurities. A "heat island" is formed over the city, and the upward convection within this "island" generates clouds overhead and draws land breezes in from the surrounding countryside. Rainfall increases; clouds and haze cut down on solar radiation. The urban areas are warmer, dustier, drier, and yet have more rain, cloud, and fog than their rural counterparts. The noise level is higher; there are high levels of pollution; and there is more glare but less sunlight. Wind velocities are lower while floods are more frequent and more sharply peaked. (6:77) The inner city is especially hard on plants because of the reduced amounts of water, light, and humus, and because of the air pollution, the heat reflected from the pavements, and

the poisonous chemicals used. (6:81) Despite the city's microclimate, the court house sets up its own microclimate making possible the cultivation of plants of the warmer climate variety due to the protection provided by the court walls from cold winds and reduction of evaporation. The court walls also provide additional backdrops for planting. (3:129)

PLANT SELECTION

Plants for the court garden should be selected to carry out the desired arrangements which have been developed in the plan and to suit the expected maintenance desires or possibilities which have been programmed. Thus the physical factors basic to the selection of plants for landscape use are as follows: (1:227)

1. The plan (desired arrangement) for surfacing, enclosure, shelter, and enrichment
2. Cultural requirements (maintenance)
3. Ultimate size, rate of growth, and length of life
4. Natural form--silhouette and structure
5. Texture--size, form, and arrangement of foliage and structural members
6. Color--foliage, bark, stems, flowers, and fruit
7. Fragrance

Species are first screened for those which are hardy for the given climate, microclimate, and soil condition. The choice of court garden plants is influenced by their fit with the setting: the relation of their shapes to the shape and size of the court, their apparent harmony with climate and native vegetation. In terms of pure height, planting materials are sorted into the following typical categories: (1:227)

Tall trees-----over 50 feet
 Medium trees-----to 50 feet
 Tall shrubs or
 or small trees-----to 20 feet
 Large shrubs-----to 10 feet

Low shrubs-----to 3 feet
 Ground cover-----to 18 inches
 Tall vines-----over 10 feet
 Moderate vines-----to 10 feet

The previous list of plants categorized by height alone proves to be more useful to the landscape architect in plant selection if the list is further categorized as follows: (14:8)

Broadleaf evergreen trees
 Broadleaf evergreen shrubs
 Broadleaf evergreen ground covers and vines
 Narrowleaf evergreens--upright
 Narrowleaf evergreens--spreading (including ground covers)
 Large deciduous trees
 Small deciduous trees
 Large deciduous shrubs
 Medium deciduous shrubs
 Small deciduous shrubs
 Deciduous vines

CATEGORIZED PLANT LIST FOR THE COURT GARDEN

However, due to the court garden's limited size and the amount of glass used around it, some of the plants such as large deciduous trees, narrowleaf upright evergreens, large evergreen and deciduous shrubs, and medium deciduous and evergreen shrubs would not be practical for the court garden since they would provide too much shade and visual screening. Specific size requirements, foliage color, and texture, flowering and fruiting habits, and rate of growth must be considered for appropriate court garden plant selection. The following list is a combination of the previous two lists in order to form a categorized plant materials list used in court garden plant selection.

1. Shade trees--to 50 feet
 Medium to small deciduous trees
 Medium to small broadleaf evergreens

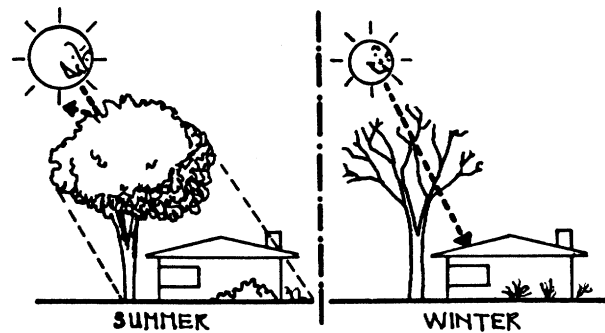
2. Tall shrubs--small trees--to 20 feet
Large deciduous shrubs
Medium deciduous shrubs
3. Low shrubs--to 3 feet
Broadleaf evergreen shrubs
Small deciduous shrubs
4. Ground cover--to 18 inches
Broadleaf evergreen ground covers
Narrowleaf evergreens--spreading
5. Vines
Broadleaf evergreen vines
Deciduous vines

FUNCTIONS OF SELECTED PLANT MATERIALS IN THE COURT GARDEN

The scientific use of trees can accomplish any or all of the following:

1. Deflect, absorb, and reduce heat radiation
2. Reduce free air temperatures
3. Filter the atmosphere
4. Reduce intensities and glare
5. Increase visual privacy
6. Reduce the transmission of airborne sound

In general trees have a stabilizing effect upon their immediate surroundings (microclimate) reducing all environmental extremes. Rudolph Geiger, in his excellent study on the microclimate, found that a mixed forest growth of spruce, oak, and poplar cuts off 69% of the sun's heat from the ground. He found that forests are cooler in summer, warmer in winter than clear land; and that a belt of trees would reduce wind velocities by as much as 63%. (11:3) Deciduous trees have a specific functional value, in that they provide shade in summer when it is needed and let in the sun in winter when it is needed (see following diagram). This simple fact makes deciduous trees the most relevant large trees for use anywhere close to buildings, or over garden spaces which are to receive fairly intensive use. (1:180)

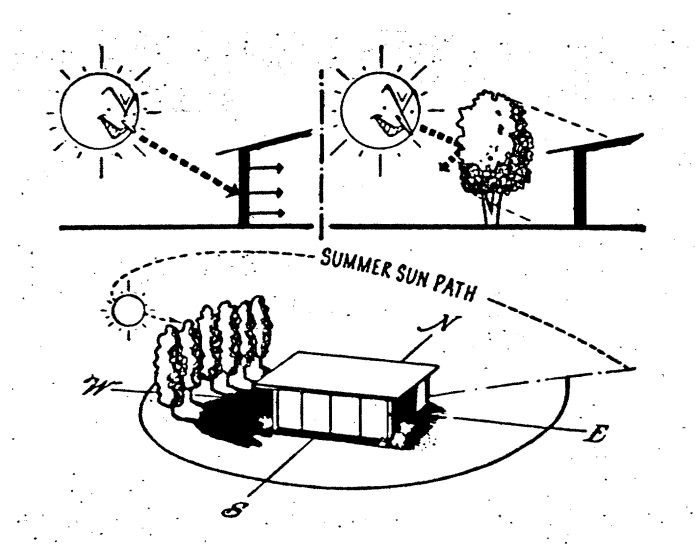


Deciduous shade trees are automatic sun controls. Plant them to the south, west, or east, close to the house. Their leaves provide shade during the summer; in the winter, the bare branches allow the sun's rays to penetrate and warm the house. Deciduous vines such as wisteria can be used as localized controls.

It is desirable to transplant shade trees in as large a size as practicable. Certainly for a tree to give results in a comparatively few years, it should be planted in the fifteen- to twenty-foot heights. It does not, however, take some trees as long to mature to their full usefulness as is often assumed; generally when a fast growing five-year tree is planted, it takes only five more years to grow to 80% of its full shading effect. (4:52) Normally, the appearance of new homes and housing developments suffers for years from lack of mature trees. However, in a wall-enclosed space a young tree or clump of trees is in scale with its surroundings relatively soon after planting. For similar reasons, a small well-designed garden in a wall-enclosed court can be as effective as a much larger garden in an open environment. (3:129)

To achieve efficient shading, trees have to be placed strategically. As the sun passes in the morning and late afternoon at a low altitude angle, trees give their best performance on the east, south-east, and on west,

and south-west sides. Low sun rays cast long shadows, which can be utilized effectively on those sides otherwise difficult to protect from the sun's heat (see diagram below). At midday, the sun's path is high and the rays can be intercepted easily with an overhang. One must keep in mind two things when choosing a tree for its shading purposes: the shape and character of the tree itself both in summer and winter, and also the shape of its shadow. The first perhaps demands an esthetic judgment, the second requires a calculated answer. (4:54)



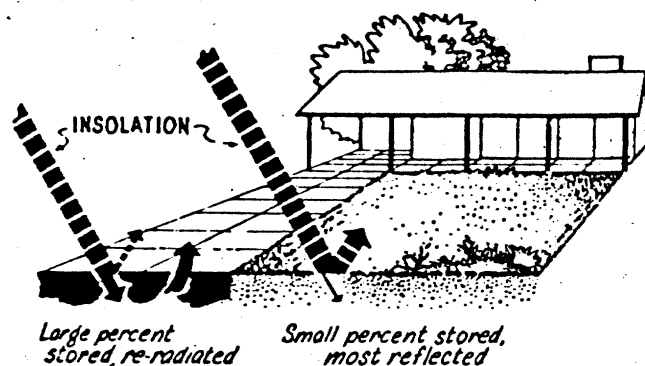
Solid west walls may eliminate the glare of the sun, but they also absorb heat that is radiated into the house. To lessen the demand on your air conditioner, use plantings to deflect the sun. When choosing the range of the planting screen, note that the summer sun can also hit from the northwest before it sets.

Small trees of the ornamental, flowering, or fruit type can be used in the court garden to afford color and fragrance. These smaller trees can be used for more direct solar shading and to provide variety and interest in height. The low shrubs reduce the amount of reflected light and ground reflection in the summer months. Small trees and shrubs can

also be used to espalier blank court walls where a special interest plant is desired to relieve monotony created by continuous shrub groupings. The espaliered plant becomes a living sculpture in the court garden.

Basically any plant whose horizontal dimension exceeds its vertical dimension is potential ground cover material. Wherever paving or cultivated beds are not desirable, ground cover is an excellent choice in the court garden. Larger shrubs which grow to eye level and below become enclosure elements. Below eye level there is a considerable range in heights within which very rich and interesting relations in form, color, and texture are possible. It is this range below eye level that becomes so important in court garden design. Besides the esthetic qualities of ground cover, it has a major functional quality that is important in court garden design (see diagram below). Dense ground covers in the court garden tend to reduce the following four environmental factors: (11:4)

1. Temperatures
2. Glare
3. Dust
4. Noise



Low heat storage makes plants the coolest ground cover. While paving holds up to 70 percent of the sun's heat, grass retains only about 5 percent. It turns heat away, absorbs glare, and its color is psychologically cooling. Even a narrow strip of grass in front of an expanse of window is a good baffle against heat.

Sun, heat, and glare are usually best controlled by filtering through open patterns such as vegetation, lattice, treillage, or netting. The use of deciduous and broadleaf evergreen vines overhead are an esthetic way to provide a greater sense and definition of space overhead the urban court house. Overhead vines also provide for a greater connection between the house and court garden. However, careful consideration must be given to the placement and use of vines overhead. The urban court house will tend to create more shade in the court garden due to shadows cast from court walls, trees, and overhead vines and lattice work. Planting materials should be screened; then selected with this added shade in mind.

THE OVERHEAD PLANE--OVERHEAD TREATMENT

The court garden may require overhead control in addition to the sky or shade trees for added solar control or for esthetic reasons. As stated previously, sun, heat, and glare are usually best controlled by filtering through open patterns such as vegetation, lattice, treillage, or netting. Open patterns allow greater circulation of air which is usually an essential partner in the reduction of sun, heat, and glare. Additional control is given by canvas, plastics, louvers, beams, planks, etc. If pierced or partially opened, the overhead plane is not in itself as important visually as are the shades and shadows it casts. Generally, the man-made spatial ceiling is kept simple because it is to be sensed more often than seen. (12:103)

THE BASE PLANE--PAVING

Surfacing creates the floor of the court garden. Depending on the design of the court garden, the remaining space that is not cultivated

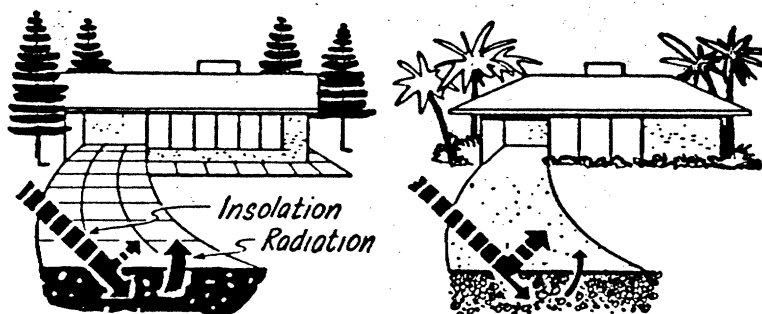
into gardens or beds should be surfaced with hard or soft paving. Hard paving requires the least maintenance, stands the most wear and tear and gives the most permanent and precise control of surface drainage which is an important factor of court garden design. On the other hand, hard paving absorbs heat and creates glare. (see diagram below). Hard paving can be done with:

1. Poured concrete
2. Brick
3. Stone
4. Tile
5. Precast concrete blocks
6. Stabilized adobe
7. Wood blocks
8. Decking

Soft surfacing is not as permanent as hard paving and is more flexible to use. Soft paving materials include the following: (1:129)

1. Gravel
2. Asphaltic concrete
3. Macadam

Ground surfaces, therefore, can be used to modify temperature extremes. Because it is such a good heat absorber and radiator, paving is a desirable surface in mild or cool climates. But in hot sections of the country, gravel is a better driveway or sidewalk surface, because its air spaces are poor heat conductors and hold down the temperature of the air above them. So to raise temperatures, pave the areas around your house as much as possible; to reduce them, plant grass or other leafy materials.



COURT GARDEN ENRICHMENT

In addition to plantings, paving, and overhead controls, court garden enrichment elements need to be included to make the court garden rich, warm, intimate, domestic, colorful, and imaginative. The elements of the court garden are many. They include ornamental water, rocks, driftwood, and other forms of "man-made" art. Included also are "man-made" elements, such as fixed and movable furniture, equipment such as barbecues and lighting fixtures, color by painting or staining, its refinement in wall or mural painting, mosaic, relief, sculpture, and other objects of art--ceramics, glass, metal, etc. All of these must be considered in relation to the possibility for rich and interesting detailing in the primary surfacing, enclosure, and shelter elements.

NIGHT LIGHTING

Court garden lighting at night poses specific problems. The problem arises partly from the desire to use the garden at night, and partly from the increased amount of glass used around the court itself. The close union of house and garden which large glass areas accomplish during the day has certain strange contradictions at night. Without light outside, the glass becomes a mirror, reflecting accurately everything inside. This is quite an uncomfortable experience, for which there are only two solutions. Drapes could be installed and used each night, or garden lighting could be installed with approximately the same intensity as the indoor lighting. This will maintain the same visual continuity from inside to outside as during the day. Court garden lighting has to be made indirect, either by screening the source with structure or planting, or by enclosing it in frosted glass, plastic, canvas, or other diffusing medium. Typical

floodlights and spotlights placed on eaves or walls of the house simply isn't the solution to court garden lighting. Court garden lighting should be concerned mainly with use and beauty. The esthetic possibilities of court garden lighting can and should accomplish the following: (1:207)

1. Spotlighting of special plants
2. Silhouetting of trees and shrubs
3. Bringing out special colors
4. Use of various colored lights
5. Control of light horizontally or vertically in quite precise forms

Court garden lighting can be accomplished by placing lights or outlets in the tops of trees or in the ground below them, in front of or behind selected groups of trees or shrubs, in front of flower beds, in the bottom or sides of pools or near special objects of art. Variable 12-volt garden lighting systems are gaining in popularity; this allows for different lighting levels which might be required for different garden functions.

MAINTENANCE

The beautiful court garden, unlike a painting, mobile, or sculpture, does not stay the way the landscape architect designed it. It changes each season and from year to year, and someone must guide new growth, clean debris, and choose new plants. One of the greatest factors in the design of the court garden is the question of who will maintain it. (9:196)

Due to the location of the court in relation to the house and the size of the court, it seems important that the court garden be designed with low or minimum maintenance as a prime consideration. Garden elements requiring the most maintenance work are: (1:242)

1. Lawns, particularly in its more refined and pure form, and in complex shapes with edges to trim
2. Annual and perennial flowers

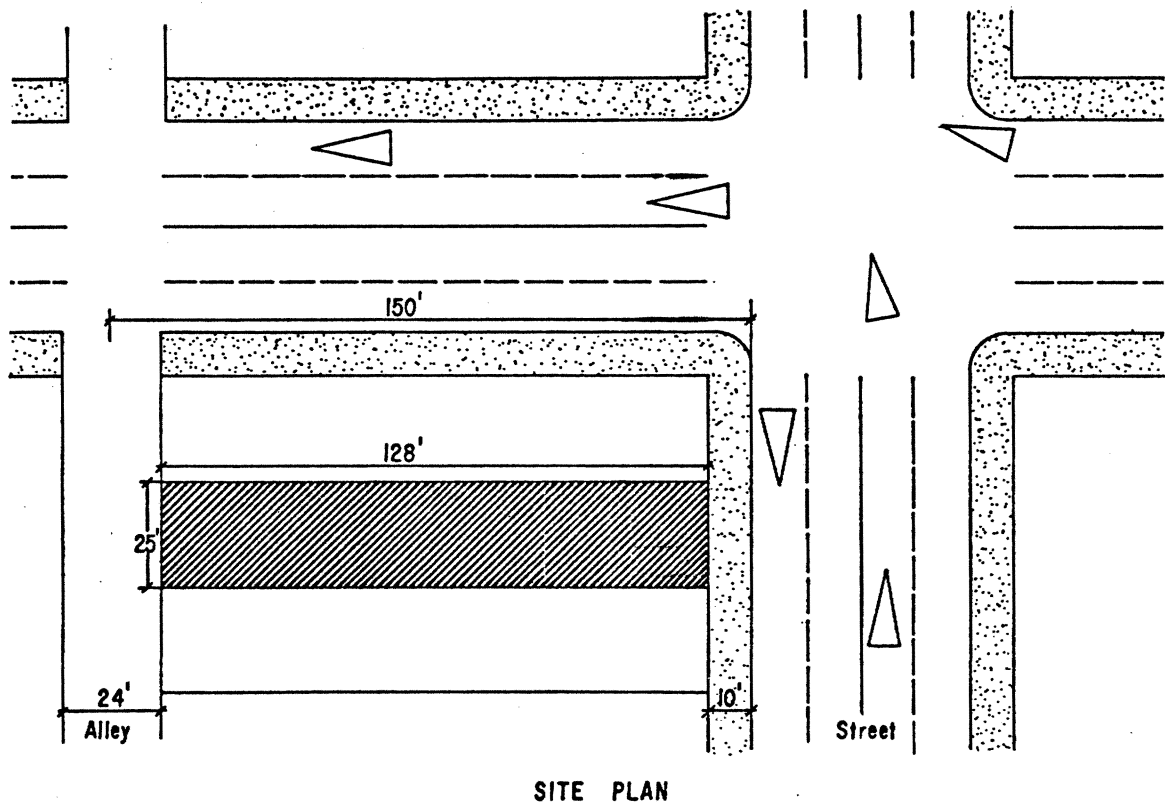
3. Trimmed hedges
4. Trimmed shrubs and trees
5. Plants requiring special soil, continuous watering, or continuous spraying for pests.

Maintenance is basically concerned with feeding, watering, spraying, training and pruning, breeding, propagation, hormones and other growth regulators. The court garden should be designed considering all the aspects of low maintenance.

6. APPLICATION OF DESIGN CRITERIA

SITE DESCRIPTION

As stated previously, the court house makes efficient use of the valuable urban land and can be planned at densities at which adequate public transportation and community facilities can be provided. The site chosen for this project is actually a small part of any arbitrarily chosen city block, usually 300' x 300'. The following diagram shows the limited and restricted site and gives the specific dimensions for this project.

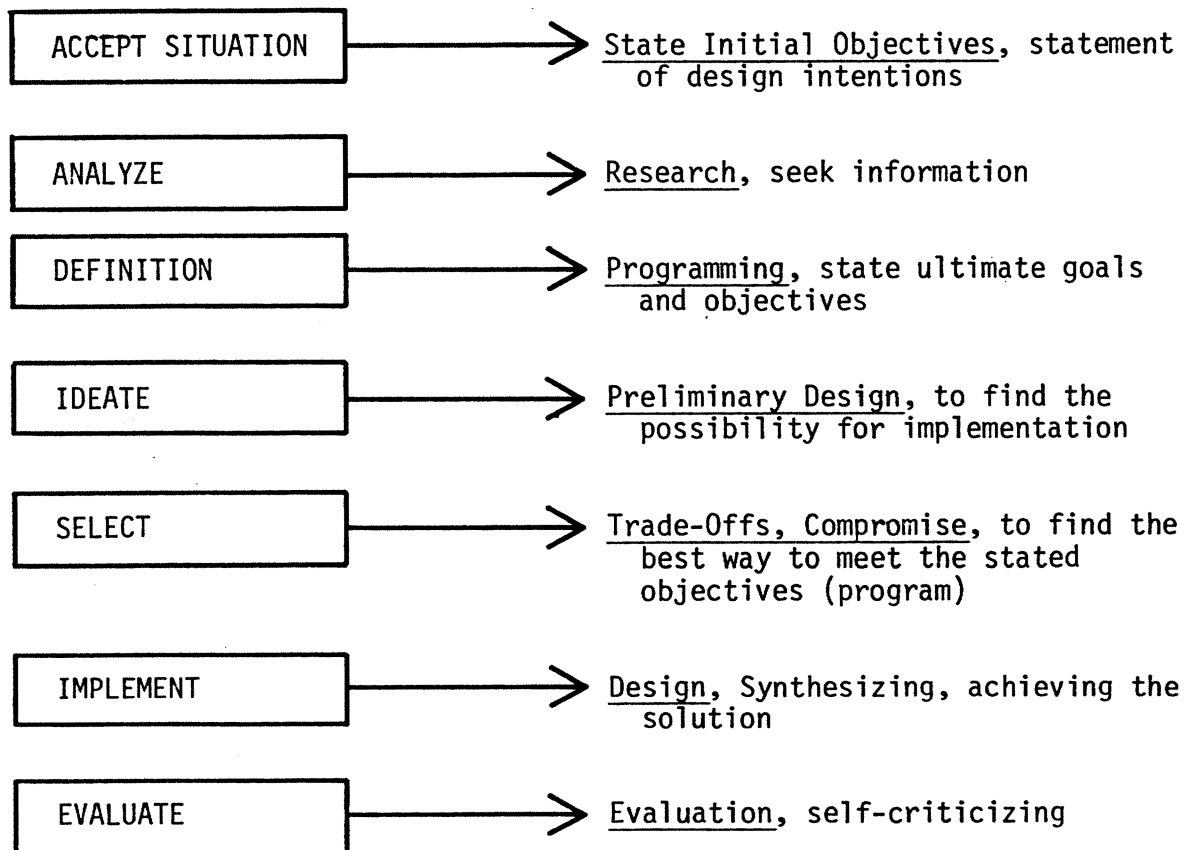


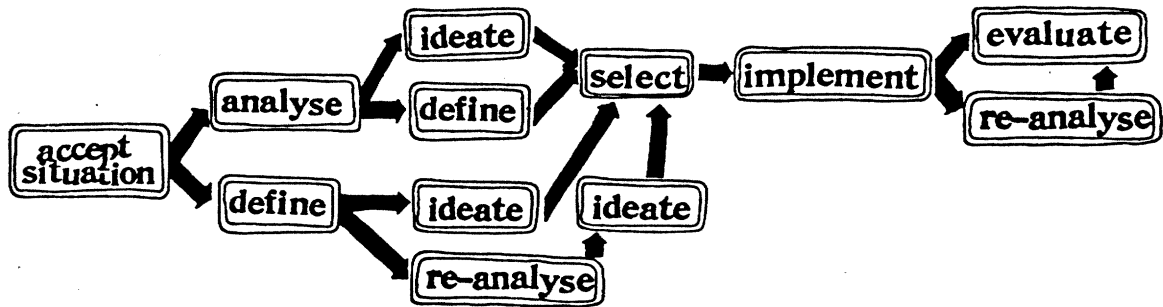
In this urban site, area is at a premium. Due to necessity, the plan will be compact and will be designed to expand the actual space by multiple use of areas. Since the city imposes a sense of confinement and oppression on the city dweller, it is this oasis, court house, where he can feel secure and seek relief and release from the city's daily pressures. In

this dwelling, the hard, rigid, and confining forms will become less rigid, meandering, and free. This urban site has a "fishbowl" quality resulting from the proximity of the neighbors. Privacy is a prime design consideration and is achieved by orientating the dwelling inward to the private gardens and courts.

DESIGN PROCESS

The "design process" is a process which demands creative, constructive behavior. . .it is an exercise in the activity of intending to improve existing conditions. Design is recognized as the process of creative problem-solving. It is not only a product, but a sequence of events. The normal, logical sequence of events included in the design process is: (21:17)





PROGRAM

The five basic steps to programming are:

1. Establish goals
2. Collect, organize, and analyze facts
3. Uncover and test concepts
4. Determine needs
5. State the problem

The key to programming is to provide a sound base for the design. Four considerations of programming are:

1. Function
2. Form
3. Economics
4. Time

Following is the space program set up for the design of the court house for this project keeping in mind the previously mentioned considerations.

This program calls for a one-story residence for a family of four of approximately 2,000 square feet. The urban site (25' x 128' = 3,200 sq.ft.) has been previously described.

<u>SPACE</u>	<u>APPROXIMATE SQUARE FEET</u>
Living Room-----	250
Formal Dining Room-----	120
Kitchen-----	100
Double Sink	
Oven/Range	
Dishwasher	
Trash Compactor	
Refrigerator	
Breakfast Area	
Laundry-----	80
Washer	
Dryer	
Mechanical Room-----	60
Hot Water Heater	
Heating and Cooling System	
Roof-Mounted Compressor	
Storage	
Master Bedroom-----	180
Master/Guest Bathroom-----	60
Son's Bedroom-----	120
Daughter's Bedroom-----	120
Children's Bathroom-----	60
Study/TV Area-----	100
Closet/Storage-----	(As required)
*Double Garage, Carport, or Parking-----	400

*Optional

The following chart illustrates suggested lists of appropriate solar orientations for various rooms of a residence that were considered in the court house design. (13:62)

RESIDENCES (private dwellings and apartments)

	N	NE	E	SE	S	SW	W	NW
bedrooms	●	●	●	●	●	●		
living				●	●	●	●	
dining			●	●	●	●	●	
kitchen			●	●	●	●		
library	●	●						●
laundry	●	●						●
play				●	●	●	●	
drying yd				●	●	●	●	
bathrooms	●	●	●	●	●	●	●	●
utility	●	●						●
garage	●	●	●	●	●	●	●	●
workshop	●	●						●
terraces			●	●	●	●	●	
sun porch				●	●	●	●	

OBJECTIVES

The design should:

1. Provide the maximum amount of court garden space in relation to the house as possible.
2. Orientate the maximum number of rooms toward the court gardens.
3. Make use of the maximum feasible amount of clear glass around the court gardens to provide views and solar heating in winter months.
4. Provide security and privacy.
5. Provide a flat roof to keep the court gardens as light and airy as possible.
6. Make maximum use of southern orientation.
7. Make use of an economical and practical building system.
8. Make use of appropriate landscape plant materials in the court gardens for low maintenance.
9. Provide generous amount of storage.
10. Minimize the amount of hallways by using certain defined spaces for multi-uses.
11. Make use of low maintenance exterior building materials.

12. Provide for ease of maintenance of court gardens.
13. Provide maximum amount of natural daylighting.
14. Keep in mind the vertical dimension and the overhead plane.
15. Design rooms for movable furniture; minimum of built-in furniture for flexibility in room arrangement.
16. Keep courts as open as possible for the benefit of plant materials and to take advantage of natural daylight and winter solar radiation.

FINAL DESIGN

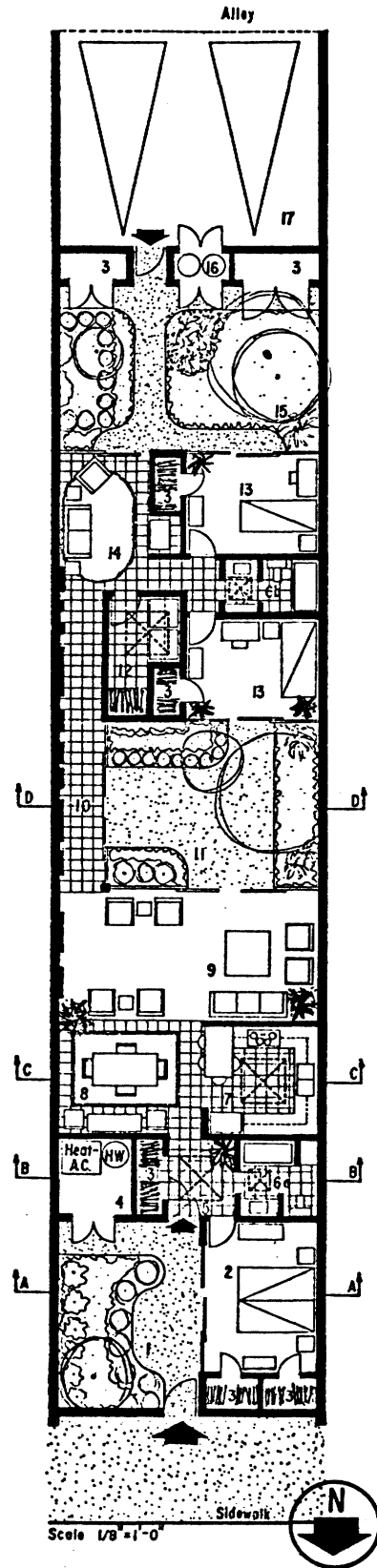
Following are the final design and related drawings of the court house based on research and as specified in the program and site requirements. Below is a square footage breakdown of the house, garage, and court gardens showing the percentages of the site devoted to the court gardens and the house and garage.

Total Lot-----	3,200.0 sq.ft.
Court Gardens: Entry Court Garden-----	214.5
Formal/Entertaining Court Garden--	285.0
Play/Utility Court Garden-----	325.5
	825.0 sq.ft.
House-----	1,725.0 sq.ft.
Garage/Storage-----	650.0 sq.ft.
House and Garage-----	2,375.0 sq.ft.

House and Garage-----	74% of Total Lot
Court Gardens-----	26% of Total Lot

Legend

SPACE	DIMENSIONS	SQ. FT.
1 Entry Court Garden	13' x 16½'	214.5
2 Master Bedroom	10' x 14'	140.0
3 Closet/Storage	(As required)	
4 Mechanical Room	6½' x 7'	45.5
Hot Water Heater Heating and Cooling System Storage Optional Trash Collection		
5 Entry Hall	6' x 7'	42.0
6 Bathroom	(6a) 7' x 7'	49.0
Toilet (6b) 5' x 9'		
Single Lavatory Linen Storage		
7 Kitchen	10' x 10'	100.0
Double Sink Oven/Range Dishwasher Trash Compactor Refrigerator Snack Bar		
8 Dining Room	10' x 10½'	105.0
9 Living Room	12' x 23½'	282.0
10 Gallery	4' x 16'	64.0
11 Formal/Entertaining Court Garden	15' x 19'	285.0
12 Laundry Room	6' x 7½'	45.0
Washer Dryer Clothes Storage		
13 Bedroom	9' x 12'	108.0
14 Den/TV Room	8' x 12'	96.0
15 Play/Utility Court Garden	15' x 23½'	352.5
16 Trash Collection	2½' x 5'	12.5
17 Garage, Carport, or Parking	20' x 23½'	470.0

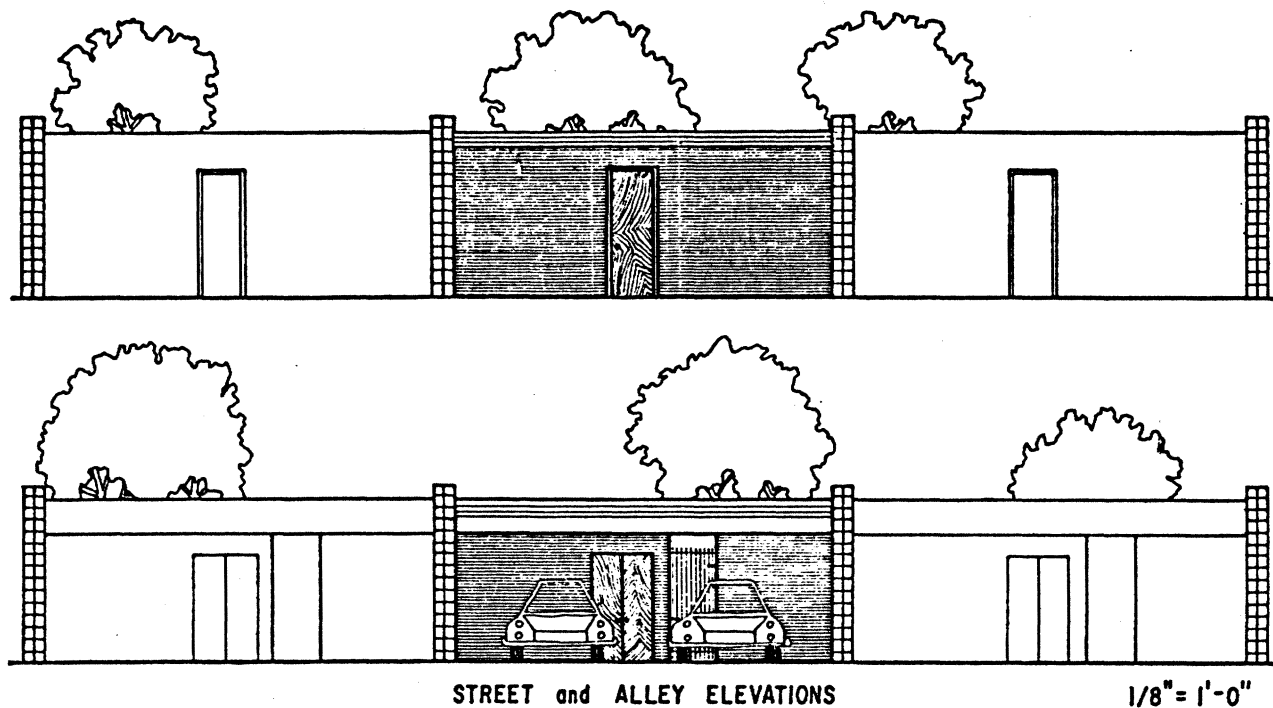


There is an immediate awareness that the house is a court house as one steps off the busy and crowded city sidewalk into the entry court garden. The entry court garden serves as an informal outdoor receiving area and provides a view and natural daylight for the master bedroom. The placement of the mechanical room at the front of the house provides ease of maintenance of the heating and cooling system and hot water heater so repairmen need not track through the house. Immediately inside the front door is the entry hall with a through vista to the centrally located formal-entertaining court garden. This vista serves to reinforce the initial feeling the court house creates. Opening onto the entry hall are a convenient guest closet, master bedroom, and master-guest bathroom. There is a skylight over the entry hall as well as both bathrooms, the kitchen, and the laundry room (interior rooms with no natural daylight) to provide highly desired daylight. Rows of narrow court houses give a shoebox-like feeling inside if the spaces are not developed to avoid the tunnel effect. Therefore, skylights are a means of giving the extra third-dimension feeling to these interior spaces. Skylights over these spaces open up the solid ceiling and give a sense of extra height even with the flat ceilings. The master bedroom is located at the front of the house away from the children's bedrooms for privacy and quietness. The master-guest bathroom is compactly designed and is semi-compartmentalized. It is appropriately located to serve as the private bathroom for the master bedroom as well as the guest bathroom. From the entry hall, moving toward the living room, the formal dining room is found on the left and the kitchen on the right. The kitchen was designed around a convenient and workable U-shape and contains a generous amount of cabinets and counter space. It is also equipped with

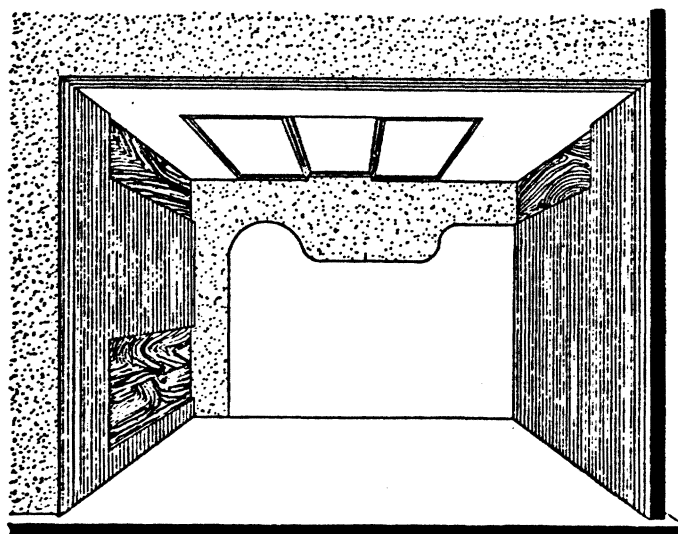
a snack bar or breakfast bar and is brightly lighted by the skylight. The entry hall, master-guest bathroom, kitchen, and dining room are entirely tiled since this is a high traffic area. The hallway between the kitchen and dining room is not explicitly defined by walls, but implicitly defined. The proximity of the kitchen to the dining room provides easy service to the dining room, living room, and formal-entertaining court garden. The living room is the largest room in the house since this is where the family lives and entertains. The living room was designed to relate to the formal-entertaining court garden. Both the living room and dining room take advantage of the view of the garden through the all glass window-wall provided by the sliding glass doors. This glass window-wall eliminates the barrier between the living room and the court garden and provides a natural extension of the living room to the outdoors. A design consideration of the living room as well as most of the other rooms in the house was to minimize the amount of built-in furniture so as to provide flexibility of furniture arrangement. The house can accommodate almost any size furniture, since large and long pieces can be moved in or from room to room through the large sliding glass doors. Access to the children's bedrooms is gained through the gallery (hall). The paintings and pieces of art would be spotlighted at night as well as the court garden and would provide very pleasing night views. At the rear of the house is a small den (TV area) or study provided for the children. This study also serves as the rear entrance to the house. The children's bedrooms are located at the opposite end of the house to isolate them from the parents, as previously mentioned. They are served by a common, compact bathroom, again compartmentalized and provided with a skylight. Due to a recent

trend, the laundry room was located close to the bedrooms, since this is where most of the washing comes from. The laundry is again provided with natural daylight from the skylight. Adequate room for the washer, dryer, and ironing board space is provided along with some clothes storage. Again this high traffic area (study, bathroom, laundry room, and gallery) is entirely tiled. This provides easier maintenance of the house when work on the court gardens is being done. The third court garden is placed at the back of the house near the children and was designed to be a play-utility court garden. It is provided with generous tool storage as well as overflow storage from the house or garage. The double garage was placed at the rear to make use of the alley and to free the front of the house and sidewalks of the automobile. Besides, many large cities prohibit parking on the front street. Trash collection was intended to be made through the garage or carport through the special double-lock trash bin. The rear court garden, therefore, can be totally secured as well as the front entry court garden.

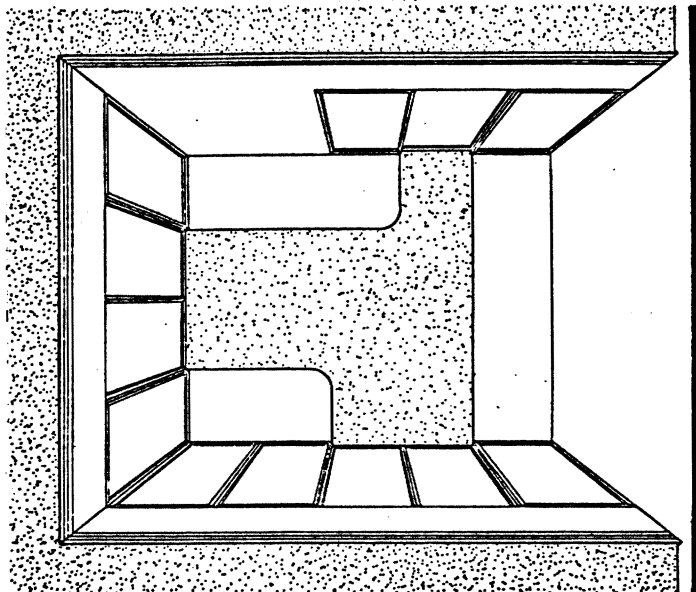
Due to the high amount of vandalism in urban areas, the street and alley elevations were kept very simple and were constructed of durable masonry (see following illustration).



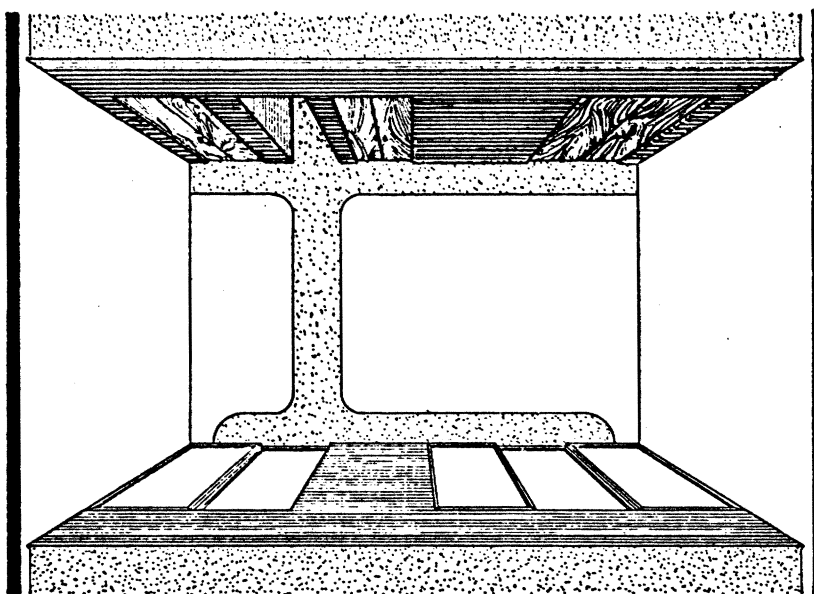
Following are illustrations of the court gardens showing the amount of glass in relation to the solid walls. The side (party) walls could be left as natural or painted concrete block, or stuccoed, or finished with wood siding or shingles, etc. The house walls, perpendicular to the party walls, can be brick to match the street and alley elevations, or vertical siding, stucco, shingles, etc.



Entry Court Garden

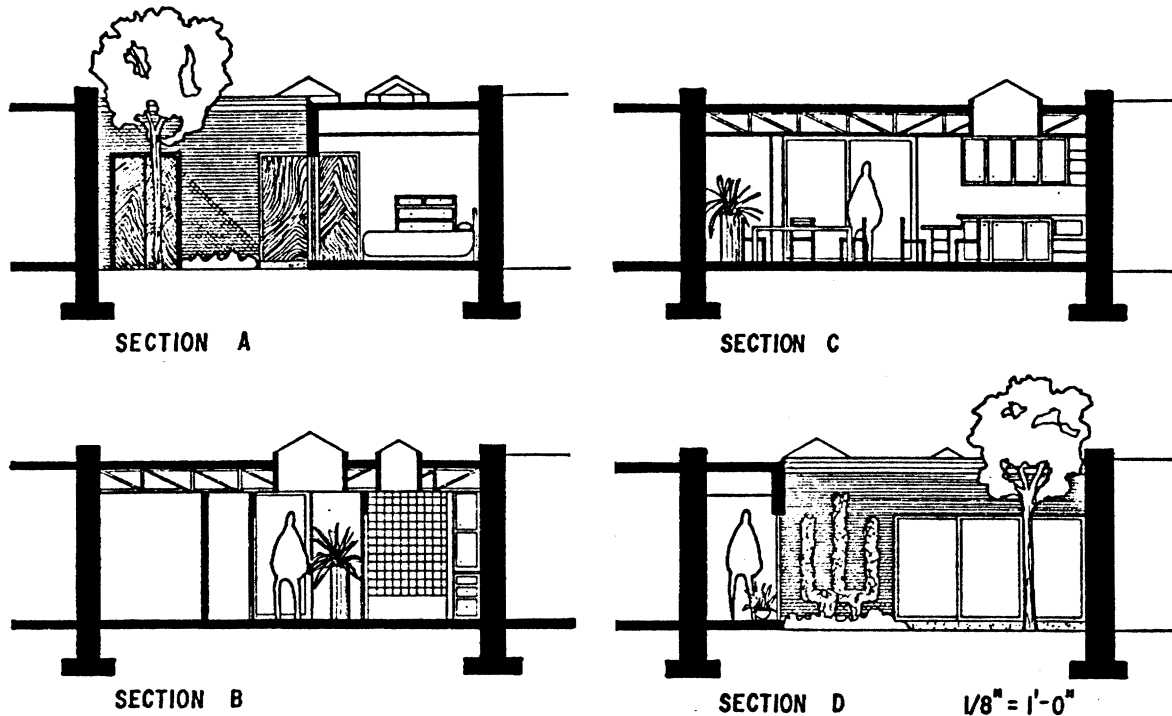


Formal/Entertaining Court Garden

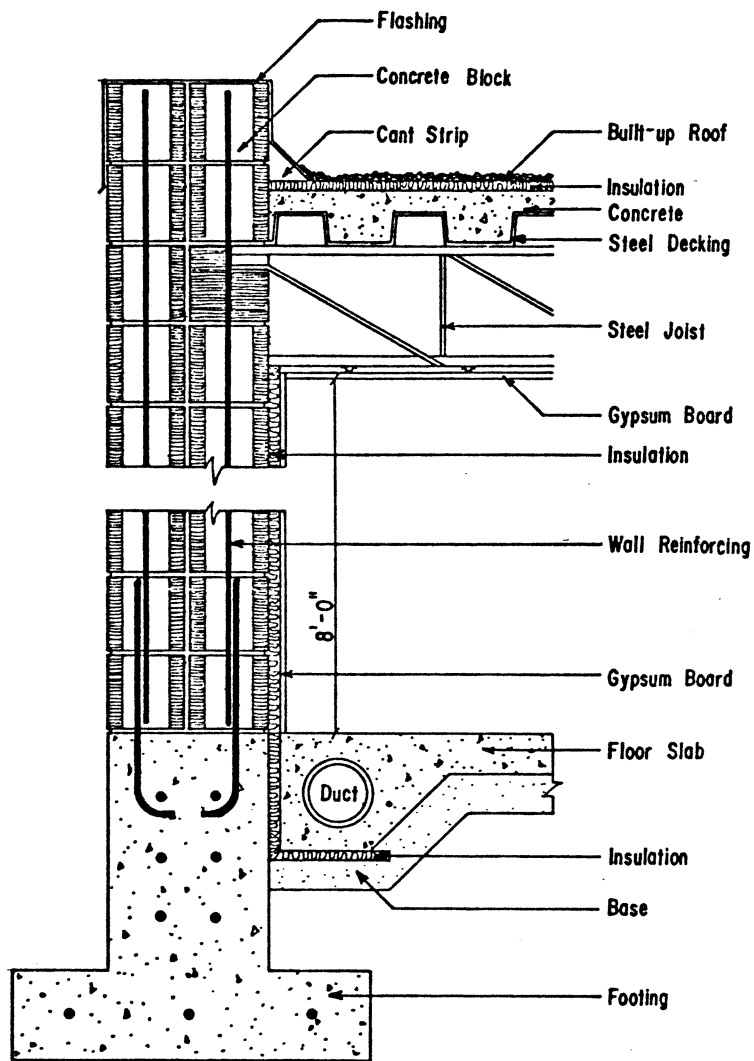


Play/Utility Court Garden

In the following diagrams, Sections A, B, C, and D illustrate the various wall, floor, and roof thicknesses, the scale of court garden wall height to room height, placement and penetration of skylights into the roof system, roof span system, slab on grade, and footing placement.

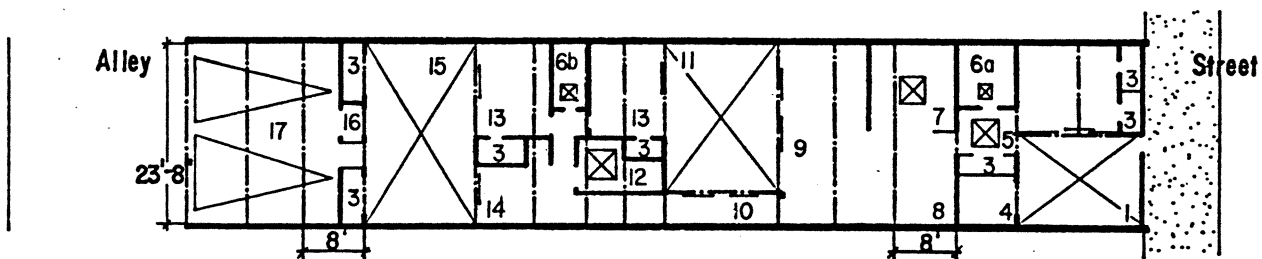


Going into further detail of the wall sections is the typical wall detail (see following diagram). The detail shows the common (party) wall with its spread footing. Perhaps some areas would require grade beams and piers, etc., or other foundation treatments. The party wall is a thermally and acoustically insulated concrete block wall. The roof system is made up of open-web steel joists (1½ foot depth) spanning the distance between the party walls (see following diagram). The intermediate roof span, perpendicular to the open-web joists, is accomplished by using 6-inch steel decking covered with a 2-inch layer of concrete. The built-up roof seals the whole roof structure. All interior walls will be steel or wood studs and gypsum board, and the concrete block wall will also be covered with gypsum board when it is in the house, not in the garden. The floor system is a reinforced 4-inch slab on grade with duct work embedded in the slabs.



Scale 1" = 1'-0"

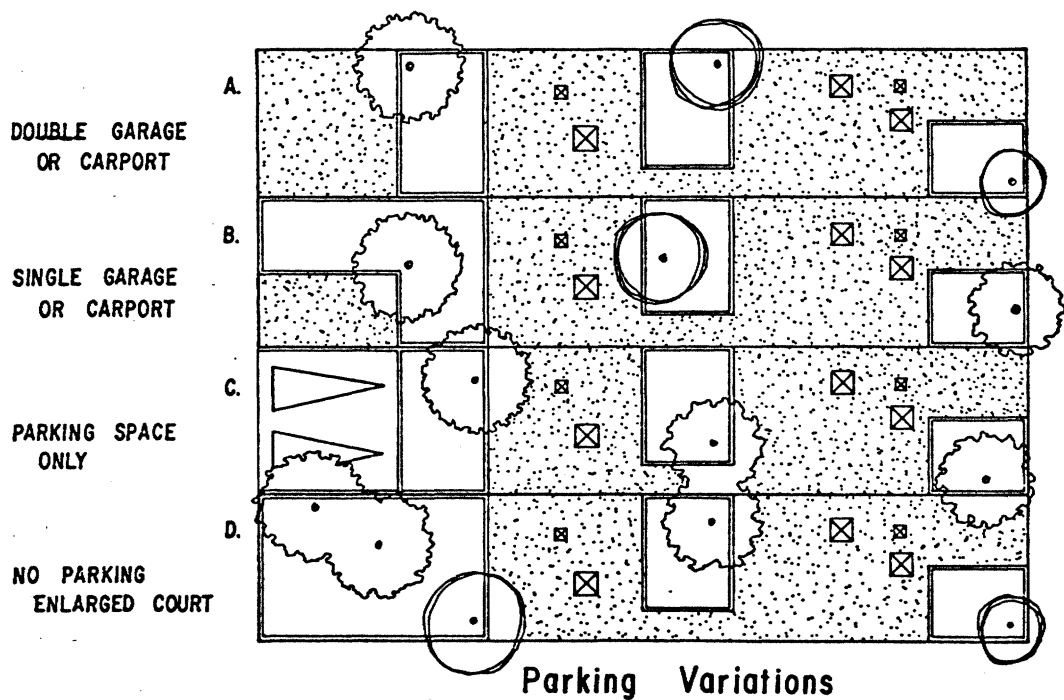
Wall Detail



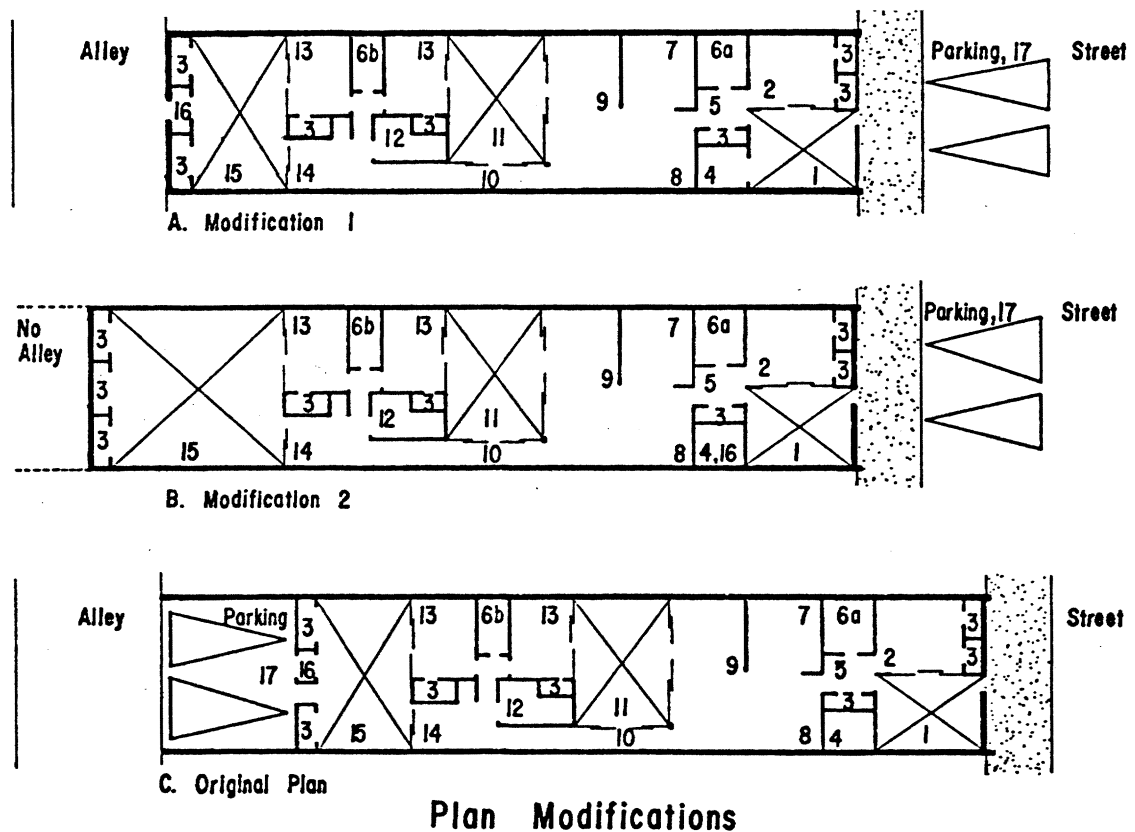
Steel Joist Span — 23'-8"
 Steel Joist Spacing — ~8'-0" O.C.
 Intermediate Span — 6" Steel Deck

Roof Span Diagram

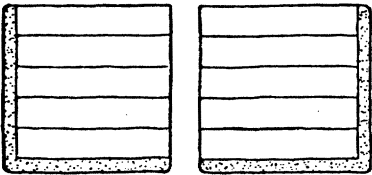
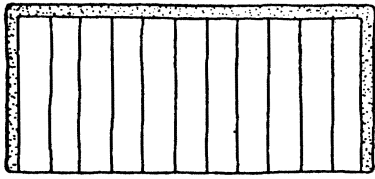
The house was designed for garage and parking at the rear of the lot accessible through the alley. However, the double garage is not mandatory, and various modifications of parking are illustrated in the following examples. The enclosed double garage or open carport is shown in A. In B the single garage or carport is shown, which provides additional court garden space or which could be devoted to an uncovered parking space. Parking space only is shown in C where climate doesn't require covered parking space or where costs are being cut. In D the court garden has been enlarged eliminating all parking or garage space. This situation could occur when elderly people have gotten rid of their automobiles, or parking is provided elsewhere in a lot or parking garage.



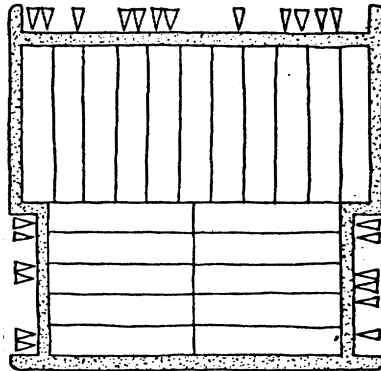
The following plan modifications are shown to allow the court house to adapt to a variety of arrangements and densities on the city block as shown in later examples. Examples A and B can be compared to the original plan, C. In A the rear garage and parking has been moved to the front of the site to provide off-street parking. The alley was retained and trash collection still occurs at the rear of the house. In B the alley has been removed allowing the play-utility court garden to be enlarged. Trash collection now occurs through the entry court garden and trash cans are housed in the mechanical room. The same off-street parking, provided at the front of the site retaining the rear parking and garage, is highly desirable in the heart of the urban center where traffic needs to flow rapidly and smoothly. However, on the fringes of urban centers, off-street parking as shown in A and B could work well where traffic is not as heavy and has slowed down somewhat.



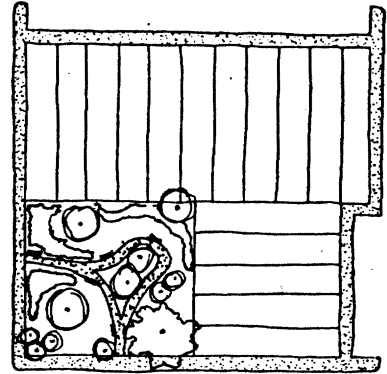
The court house was ideally orientated so that the court gardens and many of the rooms could take advantage of the southern exposure. East-west orientations are not as desirable as the original orientation, but still provide a generous amount of daylight and winter solar radiation. The least desirable orientation for the court house is when the entrance is on the south. This orientation minimizes the natural daylighting and winter solar radiation. Following are some examples illustrating the different densities, orientations, and parking locations. In A the maximum density is achieved while retaining the alley and rear garages. This arrangement allows for 21 court houses per block, housing 21 families, with an average of 4 people per family, giving a high density of 84 people per city block. In B there is a combination of rear parking and off-street parking provided by using modification B of the plan as shown previously. The same density level is maintained. The alleys and rear garages have been totally eliminated in C providing maximum density again with total off-street parking. In D the north-south orientation is eliminated relying completely on the east-west orientation. This arrangement is an appropriate solution for off-street parking on secondary streets (north-south) with ease of traffic flow on major arteries (east-west) not affected with parking problems. Both E and F illustrate lower density levels where part of the block is devoted to park or open space. These small pockets of green space pleasantly break up the solid, built-up fabric of the urban centers. The park in F is provided with parking space for people that should have to drive to the park. Also, the court houses in F benefit by having the play-utility court garden open onto the park. The court house is a definite tool the city can use to replace decaying residential property in highly dense urban areas.



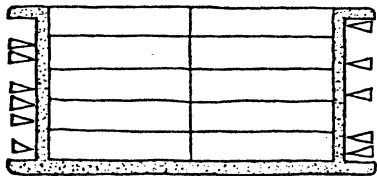
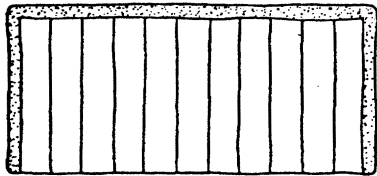
A.



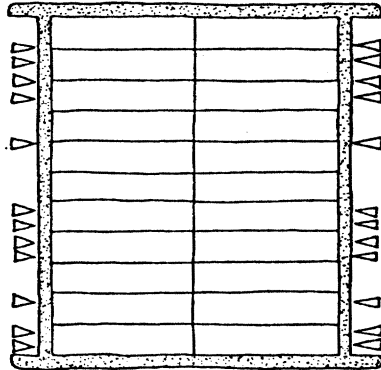
C.



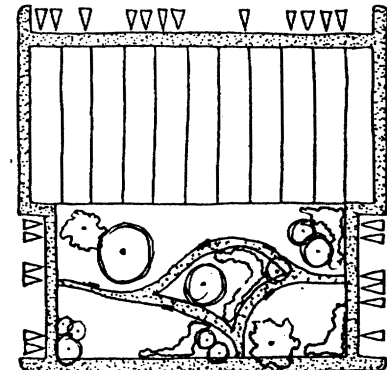
E.



B.



D.



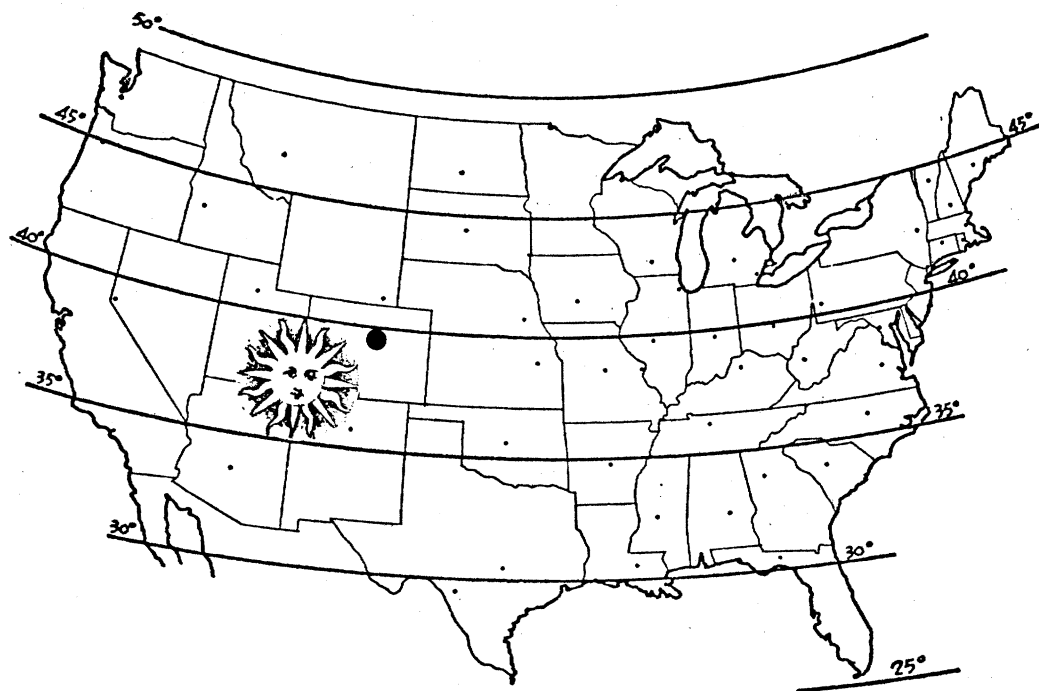
F.

Adaptations to the City Block

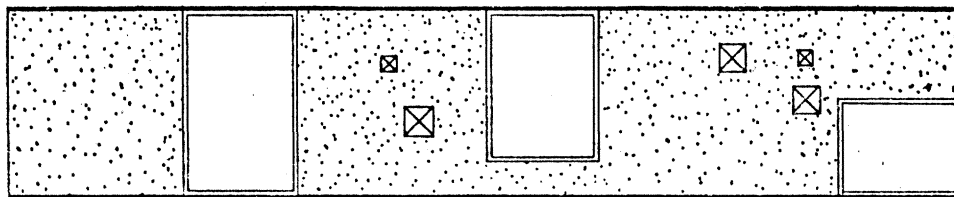


Chapter 7 is made up of three case studies in three cities to illustrate the adaptability of the court house in the United States. The cities are: Denver, Colorado; Houston, Texas; and Phoenix, Arizona. These cities were chosen because they present three totally different climates, plant materials' lists, and solar requirements.

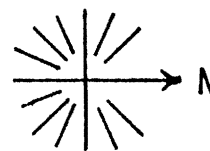
A. DENVER, COLORADO



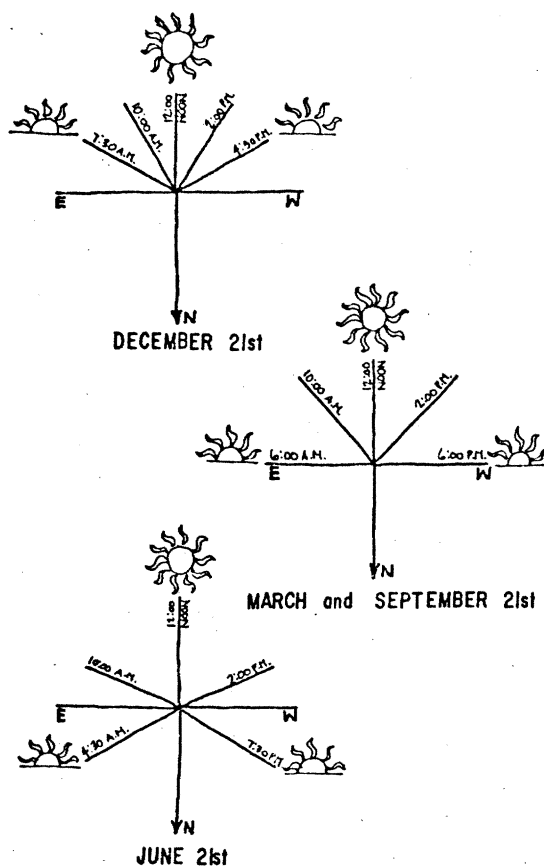
Orientation. Denver, Colorado is located at 39° North Latitude and 104° West Longitude as shown on the above map. Denver's elevation is 5,283 feet above sea level. For this particular study, the basic court house design from Chapter 6 was orientated as shown on the following page. This is the best orientation for the house and Denver's climate allowing the rooms to receive the maximum natural daylighting as well as maximum solar radiation in the winter months.



Orientation - Denver, Colorado



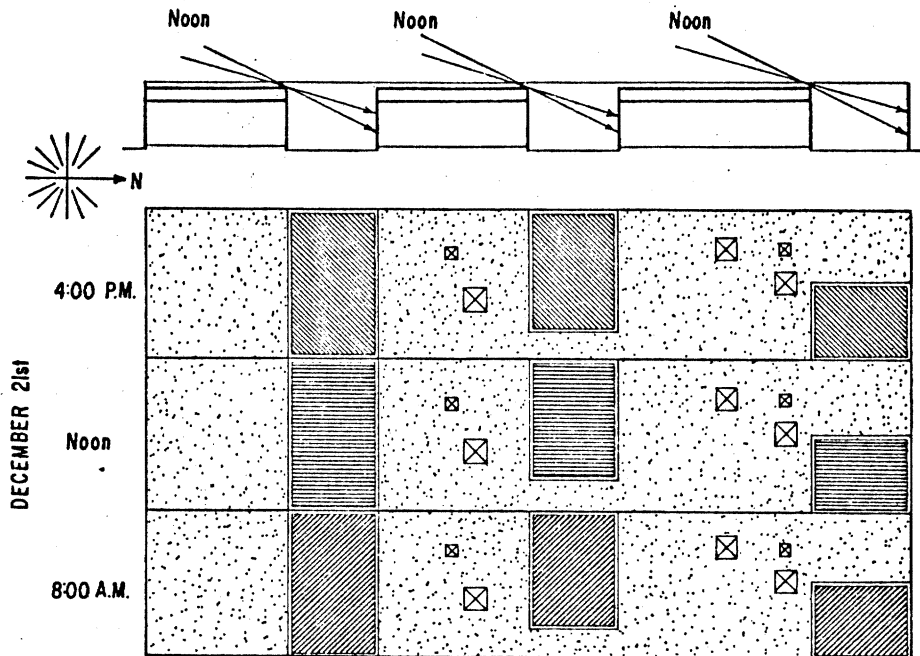
Solar Shading Plots and Treatment in the Court Garden. The position of the sun with respect to any point on the earth's surface is defined by the angle of the azimuth and the angle of the altitude. These angles are determined by the latitude, the date, and the hour. The azimuth is simply the angle measured horizontally from the North meridian. For morning hours it is measured in an Easterly direction; for afternoon hours, Westerly. The following diagram shows the sun's azimuth at various times of the day and seasons of the year for Denver, Colorado at 39° North Latitude.

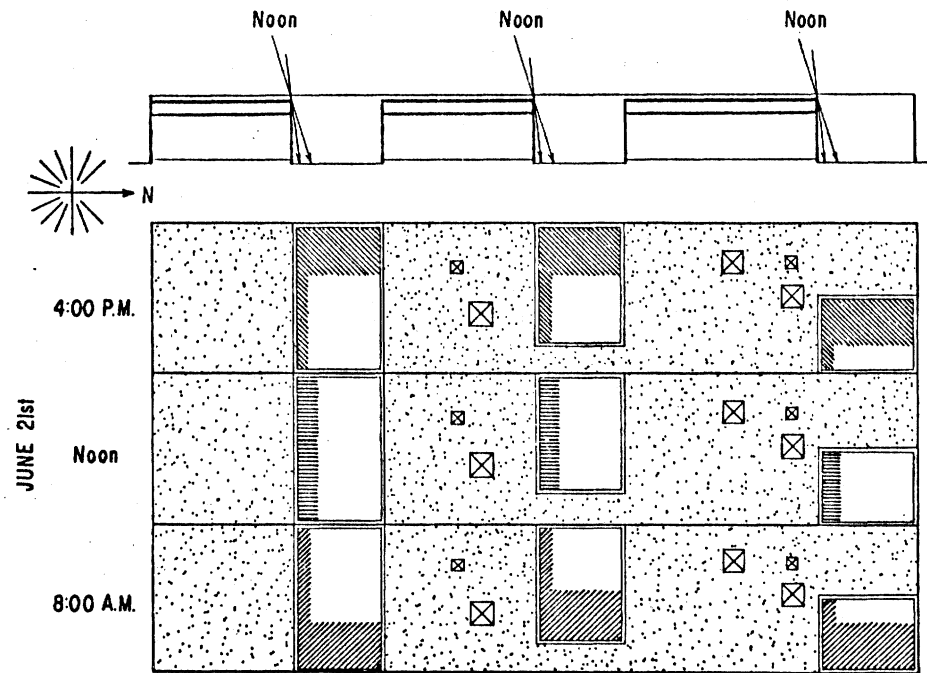
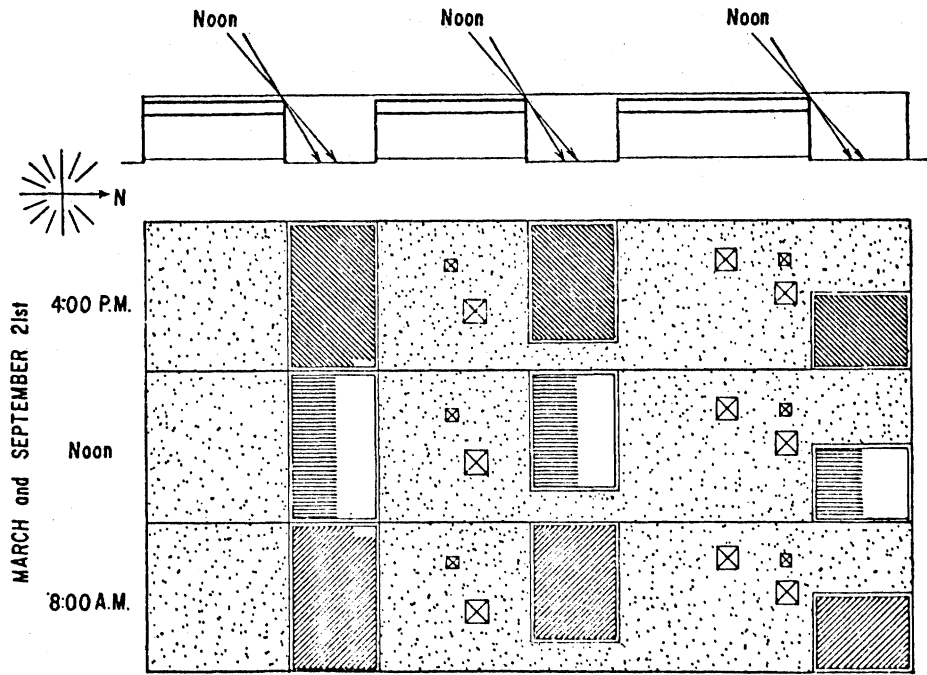


The altitude is the angle, measured vertically, between the sun and the horizontal plane of the horizon. Following is the altitude chart for Denver, at 39° North Latitude, for different seasons of the year and times of day. (8:75)

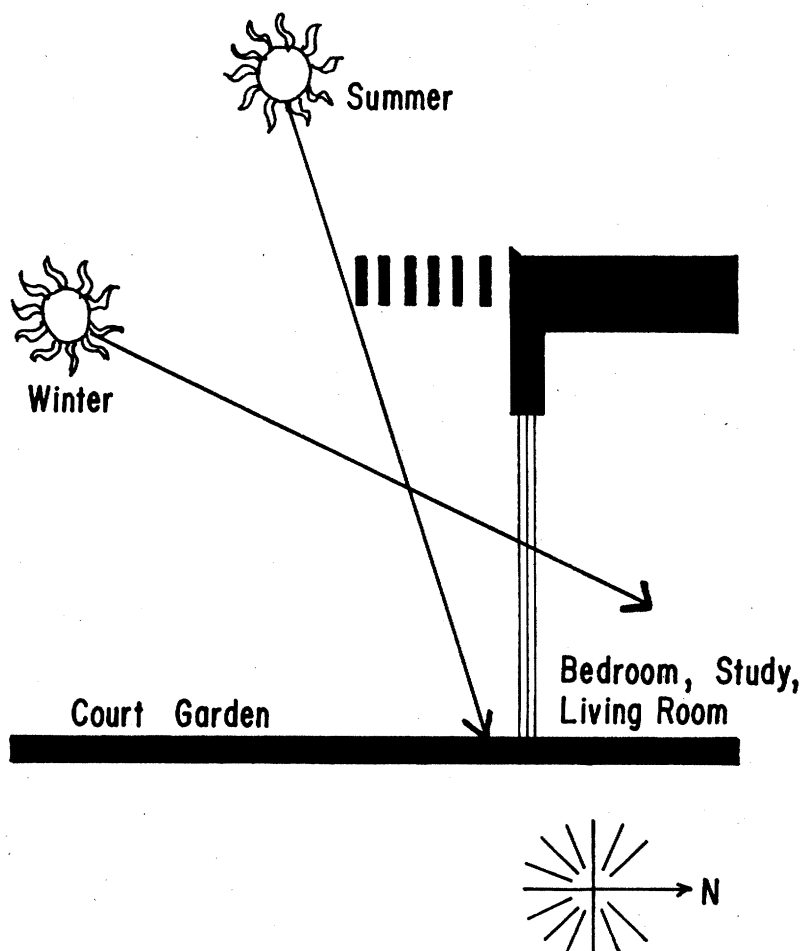
DECEMBER 21st				MARCH and SEPTEMBER 21st				JUNE 21st			
A.M.	P.M.	AZIMUTH	ALTITUDE	A.M.	P.M.	AZIMUTH	ALTITUDE	A.M.	P.M.	AZIMUTH	ALTITUDE
	Noon	180°- 0'	26°-30'		Noon	180°- 0'	50°- 0'		Noon	180°- 0'	73°-30'
10:00	2:00	150°-30'	20°-30'	10:00	2:00	138°- 0'	41°-30'	11:00	1:00	138°- 0'	69°- 0'
8:00	4:00	127°- 0'	5°-30'	8:00	4:00	110°-30'	22°-30'	10:00	2:00	114°- 0'	60°- 0'
7:30	4:30	121°- 0'	0°- 0'	6:00	6:00	90°- 0'	0°- 0'	8:00	4:00	89°- 0'	37°-30'
								4:30	7:30	59°- 0'	0°- 0'

Both the azimuth chart and altitude chart were used to study the effect of shadows in the court gardens. The following three solar plots show how much of the court garden is in shade for various dates and hours of the year. The section shown on each plot also shows how much of the glass court garden walls are receiving sunlight and solar radiation at noon.





To avoid harsh glare and solar overloads through the glass during the day, an examination of solar shading was called for. With the house orientated as previously described, the following rooms receive direct solar radiation: son's bedroom, study, and living room. Since these rooms have totally glass walls, an effective solar shading device was needed. To keep the courts as open as possible, a horizontally louvered sun shade (from Chapter 4) was chosen rather than a solid overhang to shield the glass in the summer months as shown in the following illustration. The shading device shields the glass 100% in summer months, but also allows desired solar radiation in the winter months. The previously mentioned rooms with southern exposure will all have the same shading device.



CLIMATOLOGICAL DATA. Climate is a prime factor in determining the form and type of human habitation, and its effect upon the court house is the result of interplay of the macro- and microclimate. Any modification of the various climatic conditions in the immediate proximity of the court house could make the court gardens more useful for longer periods of time. It is logical to say that the control of the immediate exterior climate may be an aid to the control of the interior climate. The following chart was used in the study and description of Denver's climate.

NORMALS, MEANS, AND EXTREMES

LATITUDE 39° 48' N
LONGITUDE 104° 53' W
ELEVATION (ground) 5283 Feet

DENVER, COLORADO
STAPLETON INTERNATIONAL AP

Month	Temperature							Precipitation											Relative humidity		Wind		Mean number of days																											
	Normal			Extremes &				Normal degree days		Normal total		Maximum monthly		Minimum monthly		Year		Maximum in 24 hrs		Year		Snow/Slush			Standard 11m wind speed		Mean hourly speed		Prevailing direction		Fastest mile		Pct of possible sunshine		Sunrise to sunset		Partly cloudy		Cloudy		Precipitation		Thunderstorms		Heavy fog		Ice and snow		Temperature	
	Daily maximum	Daily minimum	Monthly	Record highest	Year	Record lowest	Year	(a)	(b)	33	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year						
J	42.1	14.8	28.5	85	1964	-25	1963	1132	0.55	1.44	1948	0.01	1952	1.02	1962	8.7	23.7	1948	12.4	1962	40	43	47	61	9.6	5	43	NW	1951	73	5.4	10	10	11	6	3	0	1	0	0	6	30	5							
F	44.6	18.3	31.5	76	1963	-18	1962	938	0.69	1.66	1960	0.03	1949	1.01	1953	8.3	18.3	1960	9.5	1953	87	45	46	66	9.7	5	49	NW	1957	77	5.8	8	11	11	6	3	0	2	0	0	5	26	2							
M	45.9	22.8	36.4	83	1963	-6	1962	887	1.21	2.08	1964	0.13	1945	1.48	1959	12.6	29.2	1962	18.3	1952	28	42	47	56	10.3	5	57	NW	1952	71	5.8	8	11	12	6	3	0	1	0	0	4	26	1							
A	60.5	32.3	46.4	84	1965	13	1966	558	2.11	4.17	1962	0.03	1963	3.25	1967	9.3	28.3	1955	17.3	1957	85	35	31	56	10.6	5	56	NW	1960	65	6.1	6	11	13	9	3	1	1	1	0	14	0								
M	70.5	41.8	56.2	91	1964	26	1967	288	2.70	7.31	1957	0.38	1966	3.29	1957	1.7	13.8	1950	10.7	1950	68	27	28	58	9.8	5	43	SW	1964	68	6.5	6	12	13	10	4	1	1	1	0	2	0								
J	82.0	51.0	66.5	96	1963	40	1961	66	1.44	4.48	1967	0.10	1960	2.77	1965	5.7	0.3	1951	0.3	1951	13	42	40	34	9.3	5	47	S	1958	10	5.1	9	13	8	9	0	10	1	4	0	0									
J	86.4	57.4	72.9	99	1963	48	1961	8	1.53	4.41	1965	0.17	1959	3.43	1965	0.0	0.0	0.0	0.0	0.0	71	36	36	59	8.7	5	56	SW	1965	32	4.9	9	16	8	9	0	11	4	17	0	0									
A	86.8	56.2	71.5	100	1962	41	1964	9	1.28	4.47	1961	0.06	1960	3.43	1951	0.0	0.0	0.0	0.0	0.0	89	37	36	59	8.5	5	42	SW	1962	32	4.9	10	14	7	8	0	8	1	19	0	0									
S	79.0	47.0	63.0	97	1960	29	1961	117	1.13	4.67	1961	0.1	1946	2.44	1936	1.6	21.2	1926	19.4	1936	71	40	28	62	8.4	5	47	NW	1955	35	4.3	13	10	7	6	0	3	1	1	0	0									
O	66.8	38.2	51.4	87	1962	19	1964	428	1.01	3.41	1967	0.09	1962	1.71	1967	2.8	11.8	1959	9.2	1962	59	30	30	54	8.3	5	45	NW	1958	76	4.2	3	10	8	5	1	1	1	0	0	7									
N	51.7	23.8	37.7	74	1967	-2	1961	819	0.89	2.97	1966	0.01	1949	1.02	1966	7.4	39.1	1966	15.5	1966	67	42	48	64	8.9	5	48	W	1962	66	5.2	11	10	9	9	2	0	1	0	2	25									
D	45.2	18.0	31.6	71	1964	-16	1961	1035	0.47	1.50	1960	0.04	1946	0.70	1941	5.8	17.8	1966	9.6	1956	65	44	51	64	9.3	5	51	NE	1953	68	5.2	11	10	10	9	2	0	1	0	5	30									
YR	63.9	35.0	49.5	100	1962	-25	1963	4283	14.81	7.31	1957	0.1	1946	3.43	1951	58.3	39.1	1946	19.4	1936	67	37	40	61	9.3	5	56	SW	1964	70	5.3	11	14	11	15	87	18	41	11	23	23	162	11							

Denver's climate could be termed a highland or mountain climate of a continental location. Its climate is cool and invigorating. Denver receives only 14 inches of rainfall during a typical year. Most of this precipitation falls in thunderstorms during April, May, and June. Denver's summer maximum temperatures average above 85° F and winter day maximums average in the 40's except during short periods when the region is invaded by dry polar air. Lying at the eastern edge of the Rocky Mountains in the foothills, there are a number of significant changes in climate as compared to the rest of the state. Average wind movement is less, but very near the mountains there are periodic, severe, turbulent winds caused by westerlies moving over the mountains. Temperature changes from day to day

are not as great; summer temperatures are lower and winter temperatures are higher. Descending air currents frequently prevent the stratification of air necessary for the occurrence of excessive cold. As a consequence, the winter climate is milder than elsewhere in the State. The sun shines an average of 300 days a year. The thin atmosphere allows greater penetration of solar radiation and results in pleasant daytime conditions even during the winter. (17:2, 20:329)

Landscape Design. Since the court garden has definite limitations in size as compared to conventional dwellings, special consideration of plant material size and scale is important. Small to medium sized shade trees provide the overhead plane, but down at eye level and at the base plane. The court garden seems to almost call for a dwarf variety of plants. The variety of plants should be minimized also due to the small scale of the court garden. A large variety of plants could make it difficult to retain the unity of the design as well as increase the amount of maintenance. The variety should include, however, a mixture of evergreen and deciduous plants so that the court garden doesn't completely die in winter. The following plant materials were carefully screened and selected adhering to the categorized plant list developed in Chapter 5. (5:1-24)

Plant Materials List

SHADE TREES--to 50 feet

Northern Catalpa--*Catalpa speciosa*
 Narrowleaf Cottonwood--*Populus angustifolia*
 Honeylocust (Thornless)--*Gleditsia triacanthos inermis*
 Horsechestnut--*Aesculus hippocastanum*
 American Linden--*Tilia americana*
 Sugar Maple--*Acer saccharum*
 Bur Oak--*Quercus macrocarpa*
 English Oak--*Quercus robur*
 Black Oak--*Juglans nigra*

TALL SHRUBS--SMALL TREES--to 20 feet

Quaking Aspen--*Populus tremuloides*
 European Weeping Birch--*Betula pendula gracilis*
 Crabapples--*Malus* spp.
 Golden Rain-Tree--*Koelreuteria paniculata*
 Hawthornes--*Crataegus* spp.
 Littleleaf Linden--*Tilia cordata*
 Newport Plum--*Prunus "Newport"*
 Theves Improved Poplar--*Populus nigra "Theves"*
 Redbud--*Cercis canadensis*
 Russian Olive--*Elaeagnus angustifolia*

LOW SHRUBS--to 3 feet

Japanese Barberry--*Berberis thunbergii*
 Redleaf Barberry--
 Blue Mist Caryopteris--
 Dwarf Ninebark--
 Bush Cinquefoil--
 Flowering Almond--
 Dwarf Winged Euonymus--
 Froebel Spirea--
 Garland Spirea--
 Rock Cotoneaster--*Cotoneaster horizontalis*
 Weeping Forsythia--*Forsythia suspensa*
 Farrer Cinquefoil--*Potentilla fruticosa farreri*
 Indian Current Coralberry--*Symphoricarpos orbiculatus*
 Rocky Mountain Juniper--*Juniperus communis*
 Sargent Juniper--*Juniperus chinensis "Sargent"*
 Creeping Juniper--*Juniperus horizontalis*
 Prostrate Singleseed Juniper--*Juniperus squamata prostrata*

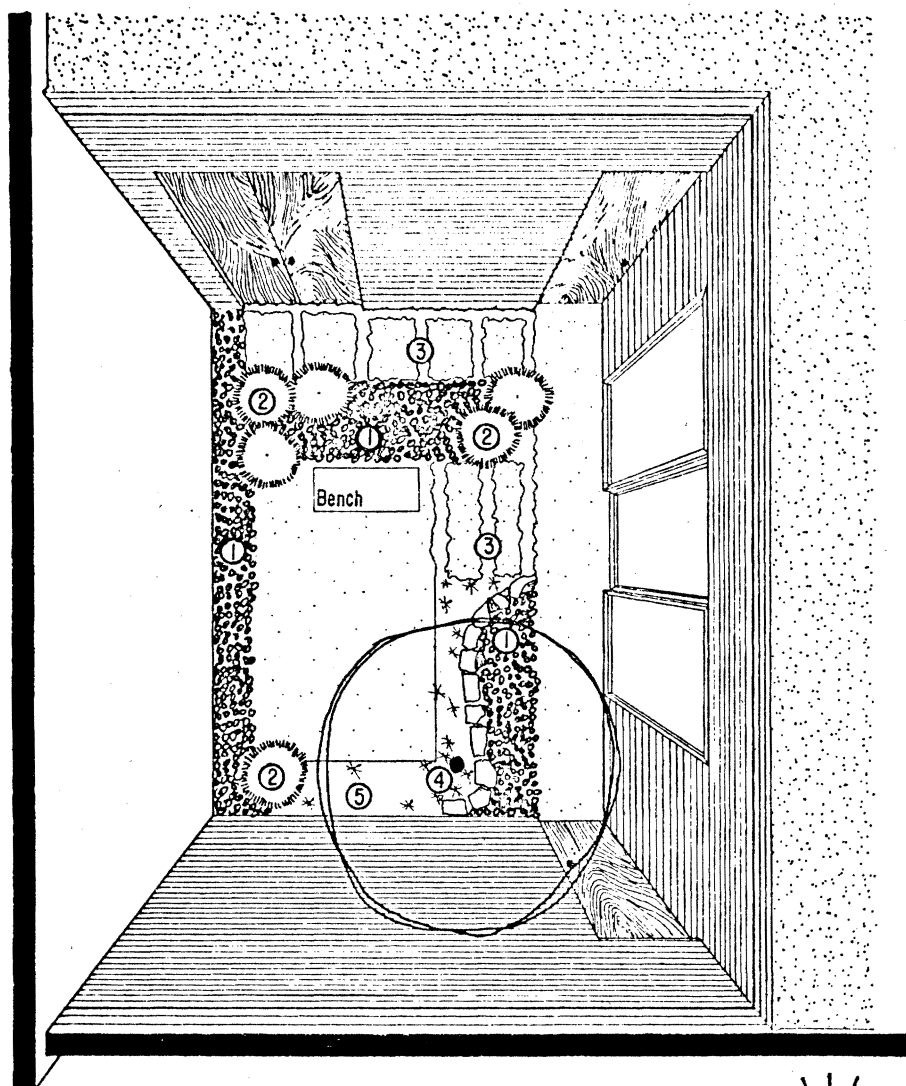
GROUND COVER--to 18 inches

Carpet Bugle--*Ajuga reptans*
 Curly Bugle--*Ajuga metallica crispa*
 Mountain Alyssum--*Alyssum montanum*
 English Ivy--*Hedera helix*
 Candytuff--*Iberis sempervirens*
 Creeping Holly--Grape--*Mahonia repens*
 Stonecrops--*Sedum* spp.
 American germander--*Teucrium canadense*
 Common periwinkle--*Vinca minor*
 Wintercreeper Euonymus--*Euonymus fortunei* vars.
 Rock Cotoneaster--*Cotoneaster horizontalis*

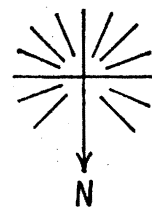
VINES

Trumpet Vine--*Campsis radicans*
 American Bittersweet--*Celastrus scandens*
 Matrimony Vine--*Lycium halimifolium*
 Boston Ivy--*Parthenocissus tricuspidata*
 Englemann Virginia--Creeper--*Parthenocissus quinquefolia "Englemann"*
 Silverlace--*Polygonum auberti*

Plant materials selections were made from the above list for the landscape development of each of the following three court gardens: entry court garden, formal-entertaining court garden, and play-utility court garden.

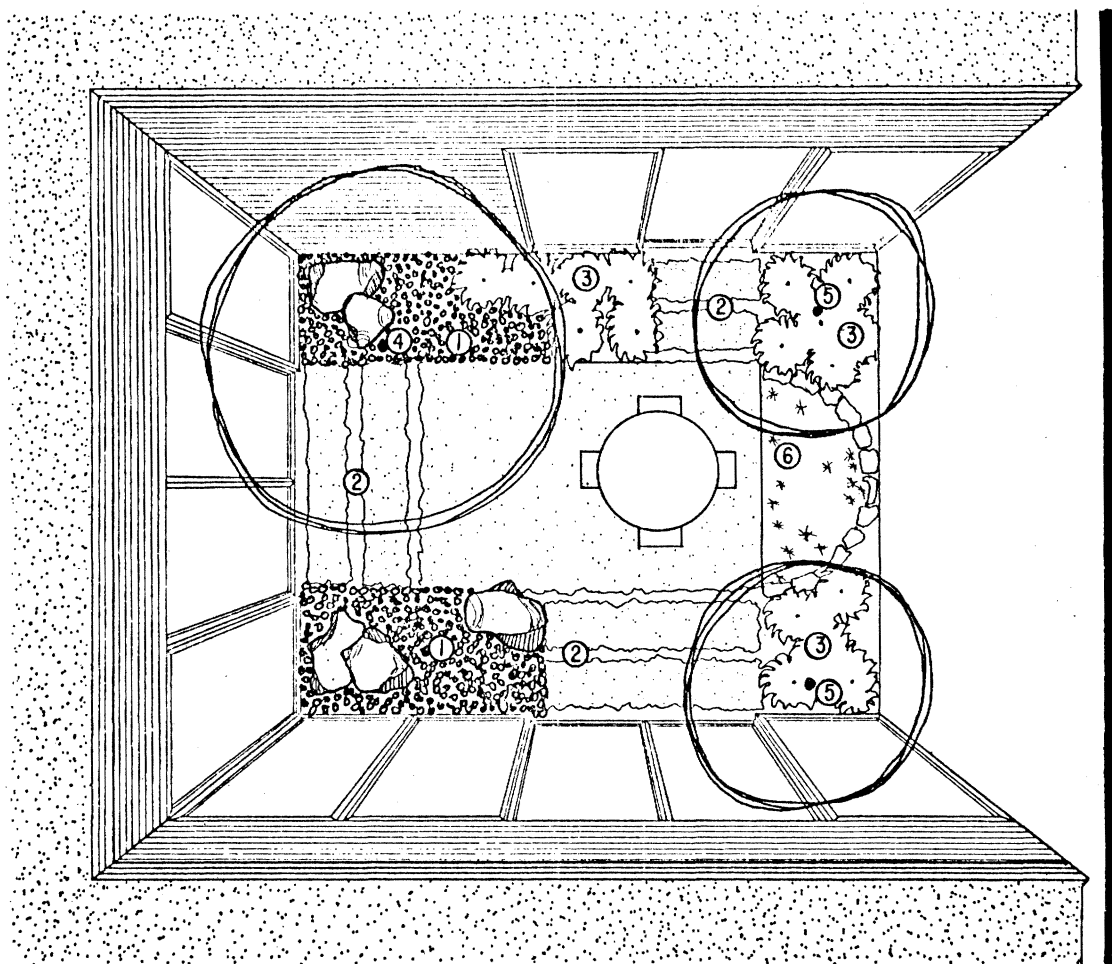


Entry Court Garden

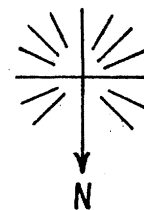


Legend

1. Carpet Bugle--*Ajuga reptans*
2. Barberry--*Berberis thunbergi*
3. Sedum--*Sedum 'goldmoss'*
4. Redbud--*Cercis canadensis*
5. Perennial Bed

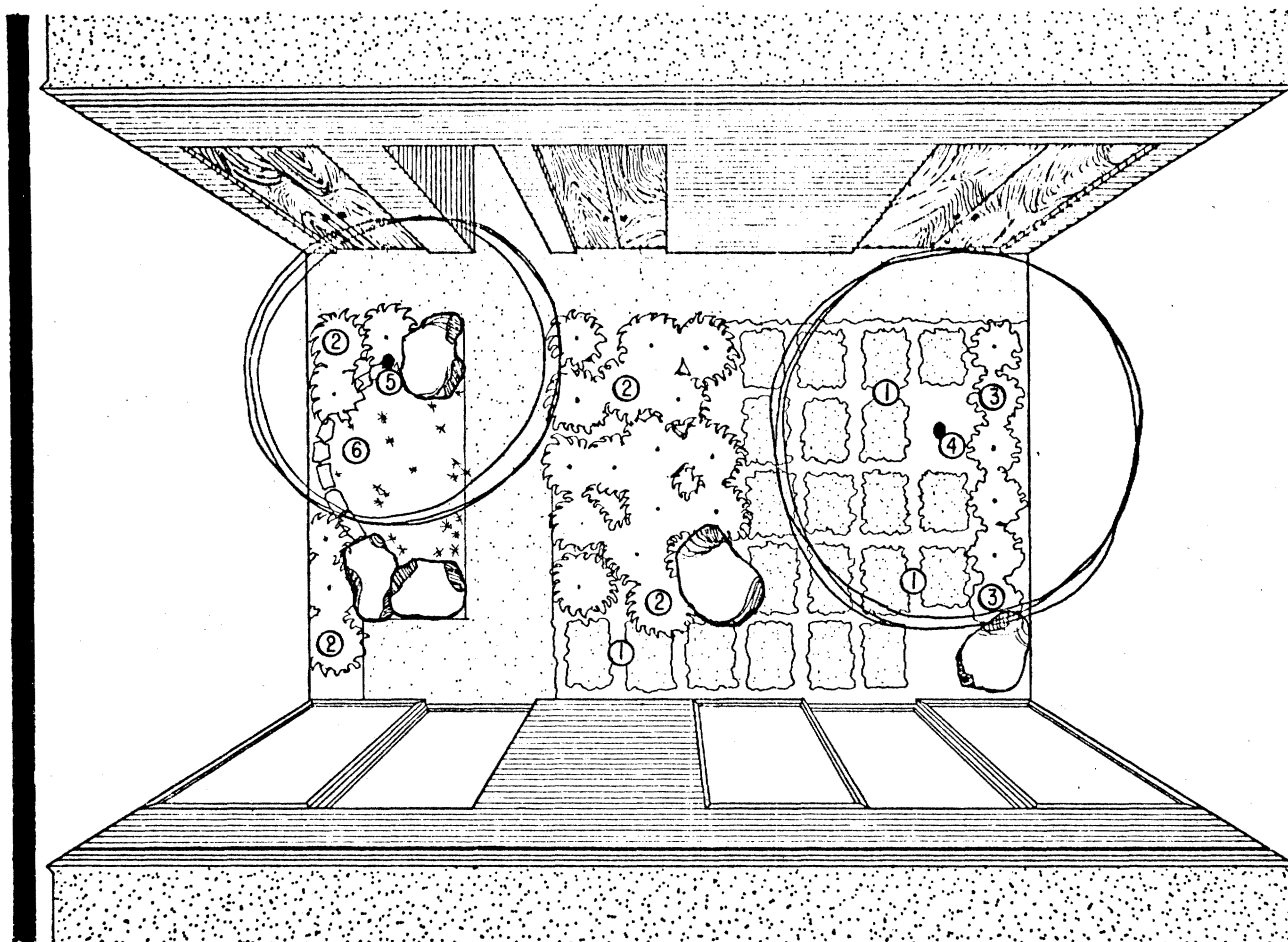


Formal-Entertaining Court Garden

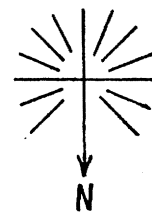


Legend

1. Carpet Bugle--*Ajuga reptans*
2. Sedum--Sedum 'goldmoss'
3. Rocky Mountain Juniper--
Juniperus communis
4. Bur Oak--*Quercus macrocarpa*
5. Hawthorne--*Crataegus* spp.
6. Perennial Bed



Play-Utility Court Garden



Legend

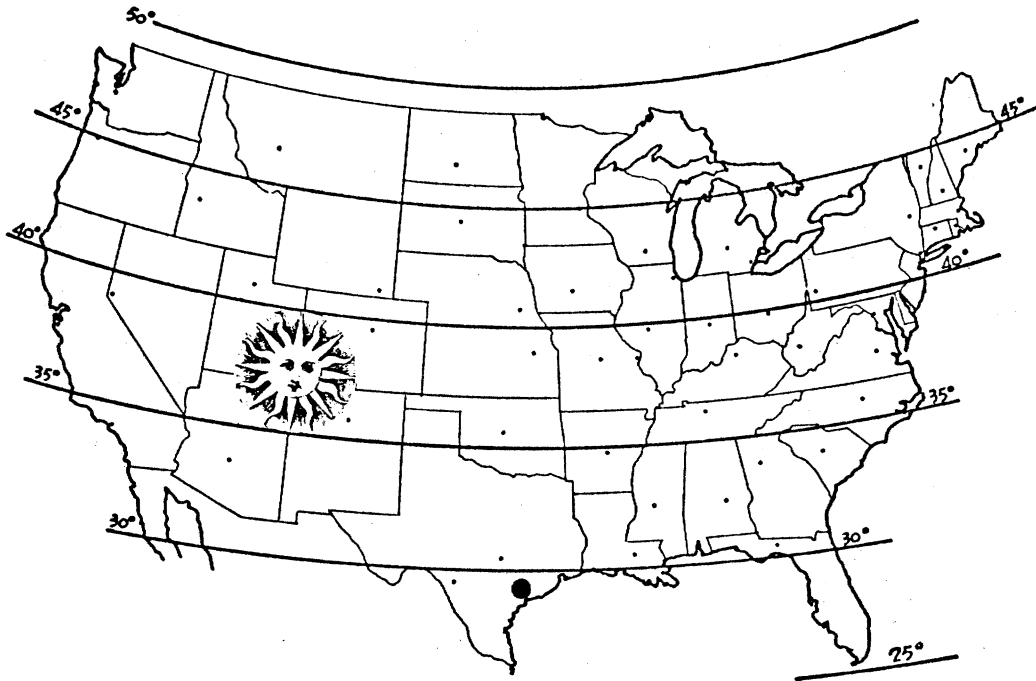
1. Sedum--Sedum 'goldmoss'
2. Rocky Mountain Juniper--
Juniperus communis
3. Rock Cotoneaster--
Cotoneaster horizontalis
4. Bur Oak--Quercus macrocarpa
5. Russian Olive--Elaeagnus
angustifolia
6. Perennial Bed

The entry court garden still functions as the entrance but also as a private sunning spa. Paving in all three courtyards is exposed aggregate concrete. Where the paving isn't highly used, goldmoss stonecrop is planted between the concrete paving panels. Ground cover is also used extensively to minimize maintenance and also to reduce temperature, glare, dust, and noise in the court garden. The paving in all three court gardens is fairly formal, but the plantings are natural and flowing to soften the rigid property lines. Both the Barberry and Redbud tend to introduce some color and height into the entry court garden. Complete with a bench, the entry court garden is a pleasant space to relax in.

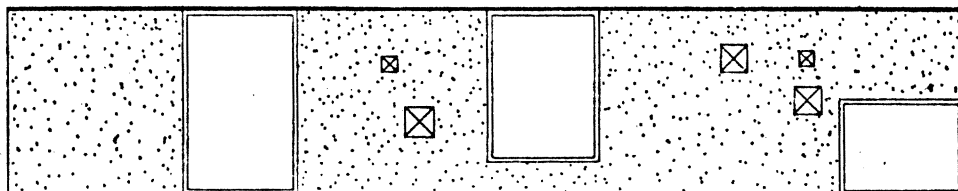
The formal-entertaining court garden contains the same ground cover (Carpet Bugle) as the entry court garden, mixed in and around large natural boulders. The Rocky Mountain Juniper provides greenness as well as the Ajuga throughout the winter. There is a perennial bed provided for the cultivation of flowers. The Bur Oak and Hawthornes shade the living room glass in summer from the hot sun rays. The Hawthornes also provide spring and fall color as well as attract birds.

The play-utility court garden contains a large shady paved area for the children to play on. The plant materials are basically the same as for the formal-entertaining court garden. Boulders and Rocky Mountain Juniper surround another perennial flower bed that can be viewed from the study. Both the Bur Oak and Russian Olive trees shade the southern exposed glass. All three of these court gardens provide pleasant spaces to be in as well as create pleasant views from the house. They all require a minimal amount of maintenance.

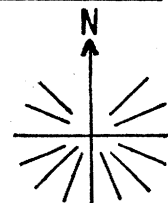
B. HOUSTON, TEXAS



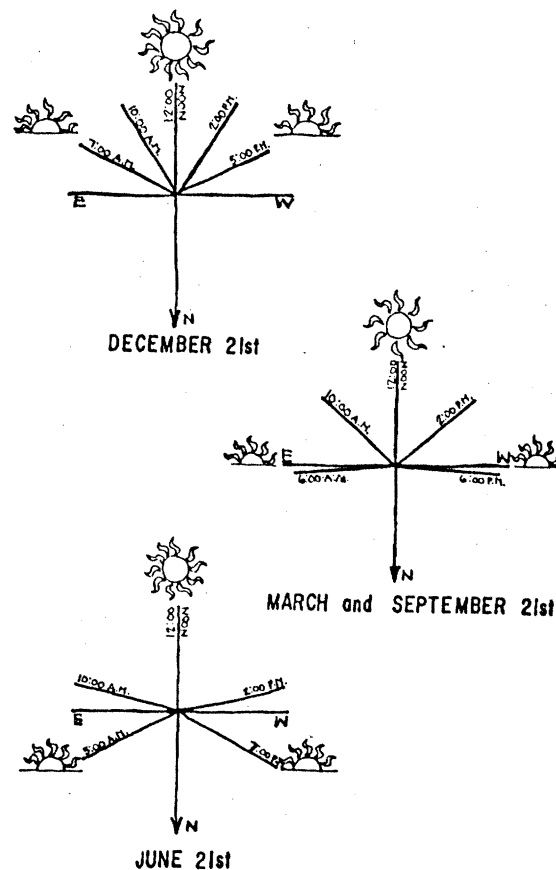
Orientation. Houston, Texas is located 29° North Latitude and 95° West Longitude as shown on the above map. Houston's elevation is 50 feet above sea level. The orientation of the basic court house design for Houston is shown below. This east-west orientation is not as good as the original north-south orientation, but it still provides for plenty of natural daylighting. The winter solar radiation is somewhat decreased.



Orientation - Houston, Texas



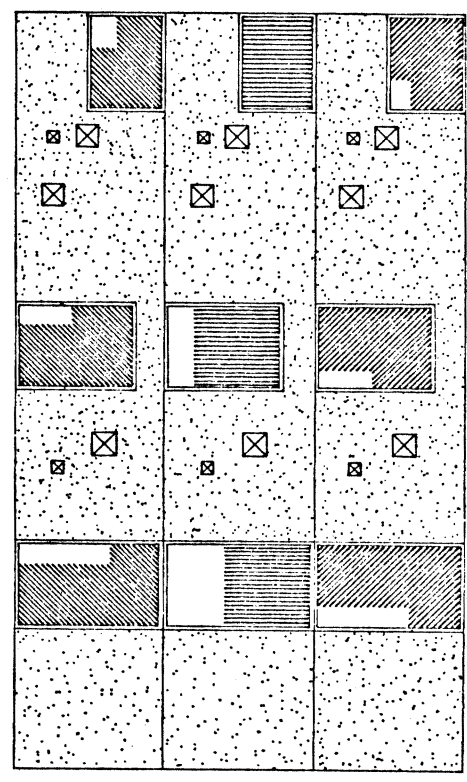
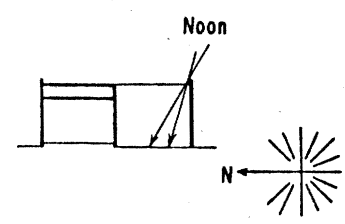
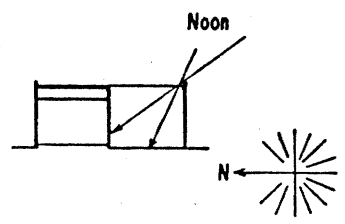
Solar Shading Plots and Treatment in the Court Garden. The following diagram shows the sun's azimuth, horizontal angle measured East of the North meridian, at various times of the day and seasons of the year for Houston, Texas at 29° North Latitude.



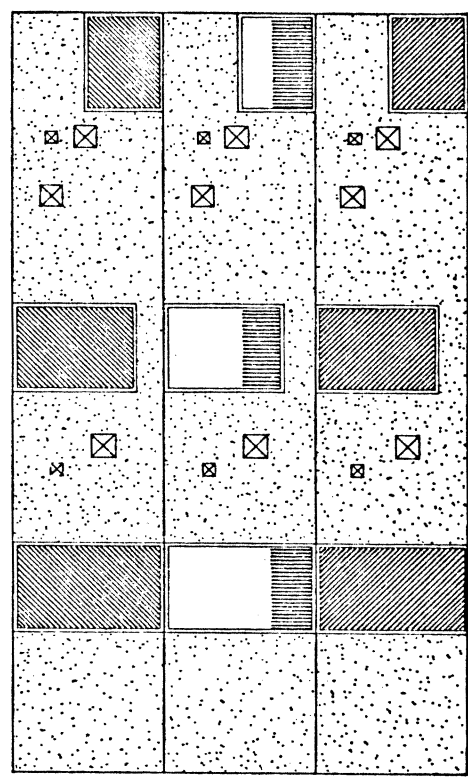
Following is the altitude chart, the angle measured vertically between the sun and the horizon, for Houston at 29° North Latitude for different seasons of the year and times of day. (8:75)

DECEMBER 21st				MARCH and SEPTEMBER 21st				JUNE 21st			
A.M.	P.M.	AZIMUTH	ALTITUDE	A.M.	P.M.	AZIMUTH	ALTITUDE	A.M.	P.M.	AZIMUTH	ALTITUDE
Noon		180°- 0'	36°-30'	Noon		180°- 0'	60°- 0'	Noon		180°- 0'	83°-30'
10:00	2:00	148°-30'	29°- 0'	10:00	2:00	131°- 0'	48°-30'	11:40	12:20	144°-30'	82°- 0'
8:00	4:00	126°- 0'	11°-30'	8:00	4:00	106°- 0'	25°-30'	11:00	1:00	112°-30'	75°- 0'
7:00	5:00	117°-30'	0°- 0'	6:00	6:00	90°- 0'	0°- 0'	8:00	4:00	81°-30'	36°-30'
								5:00	7:00	62°-30'	0°- 0'

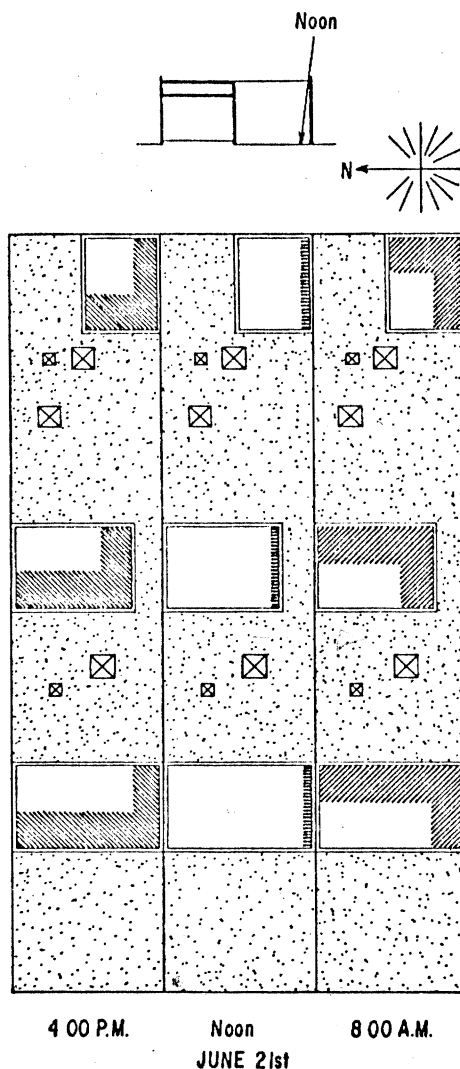
Both the azimuth and altitude charts were used to study the effect of shadows in the court gardens. The following three solar plots show how much of the court garden is in shade for various dates and times. The section on each plot also shows how much of the glass court garden walls are receiving sunlight and solar radiation at noon.



4:00 P.M. Noon 8:00 A.M.
DECEMBER 21st



4:00 P.M. Noon 8:00 A.M.
MARCH and SEPTEMBER 21st



To avoid harsh glare and solar overloads through the glass during the day, an examination of solar shading is required. The master bedroom is the only room that receives direct solar radiation, therefore, it is the only room requiring a solar shading device. The other rooms facing the court gardens still receive plenty of daylighting, but solar radiation is somewhat decreased. A solid shading device is used, as shown on the following page, to shield the glass. This was chosen to serve also as a protective covering over the entryway. However, it is important to keep the court gardens as open as possible. The overhang blocks the sun 100%

Houston has a humid subtropical climate with hot summers and receives an average of 46 inches of rainfall annually. Torrential rains of 10 to 20 inches or more may accompany a tropical storm as it moves inland across Houston. Rains occur most frequently in late spring as a result of squall-line thunderstorms. The mean annual temperature is 70° F. The average winter maximum temperature is 64° F and average minimum is 46° F. The average summer maximum is 91° F with an average minimum of 75° F. Houston has an average annual relative humidity of around 75%. Prevailing breezes of Tropical Maritime air flow across Houston from the south and southeast most of the year. There is an average of 13 days of freezing temperatures each winter but snow is rare. Houston has an annual average of 82 clear days compared to an average 152 cloudy days per year. Houston receives about 60% of the total possible sunshine annually. (18:16, 20:637)

Landscape Design. Since the court garden has definite size limitations as compared to conventional dwellings, special consideration of plant material size, scale, texture, and light requirements is important. Shade trees provide the overhead plane, but smaller scale (dwarf) plants are required in the court garden below the canopy overhead. As stated before, the variety of plants should be minimized to retain the unity of the court garden design. It is important to have a balanced variety of evergreen and deciduous trees and shrubs. Following is a carefully screened and selected plant materials list suitable for court garden landscaping in the Houston area. (16:1-30)

Plant Materials List

125

SHADE TREES--to 50 feet

River Birch--*Betula nigra*
Hackberry--*Celtis occidentalis*
Ginkgo--*Ginkgo biloba*
Kentucky Coffee Tree--*Gymnocladus dioica*
Southern Magnolia--*Magnolia grandiflora* (for espallier only)
Chinese Pistachio--*Pistachia chinensis*
Bradford Flower Pear--*Pyrus calleryana bradfordii*
Chinese Elm--*Ulmus parvifolia*
Bur Oak--*Quercus macrocarpa*

TALL SHRUBS--SMALL TREES--to 20 feet

Flowery Senna--*Cassia corymbosa*
Texas Persimmon--*Diospyros texana*
Loquat--*Eriobotrya japonica*
Cassine Holly--*Ilex cassine*
Deciduous Holly--*Ilex decidua*
American Holly--*Ilex opaca*
Foster Holly--*Ilex cassine X opaca*
Yaupon Holly--*Ilex vomitoria*
Wilson's Holly--*Ilex altacalarensis*
Crepe Myrtle--*Lagerstromia indica*
Oleander--*Nerium oleander*
Mock Orange--*Philadelphus virginialis*
Cherry Laurel--*Prunus caroliniana*

LOW SHRUBS--to 3 feet

Dwarf Abelia--*Abelia grandiflora prostrata*
Aspidistra--*Aspidistra elatior*
Kurume Azalea--*Azalea (Rhododendron) obtusum japonicum*
Crimson Pigmy Barberry--*Berberis thunbergii atropurpurea nana*
Rock Cotoneaster--*Cotoneaster horizontalis*
False Heather--*Cuphea hyssopifolia*
Boxleaf Euonymus--*Euonymus pulchellus*
Dwarf Gardenia--*Gardenia radicans*
Red Yucca--*Hesperaloe parviflora*
St. John's Wort--*Hypericum moserianum*
Evergreen Candytuft--*Iberis sempervirens*
Dwarf Chinese Holly--*Ilex cornuta rotunda*
Dwarf Burford Holly--*Ilex cornuta burfordii*
Dwarf Yaupon Holly--*Ilex vomitoria nana*
Creeping Juniper--*Juniperus horizontalis* and varieties
Japanese Garden Juniper--*Juniperus procumbens*
Savin Juniper--*Juniperus sabina*
Lavender--*Lavandula officinalis*
Dwarf True Myrtle--*Myrtus communis compacta*
Dwarf Nandina--*Nandina domestica nana*
Wheeler's Dwarf Pittosporum--*Pittosporum tobira*
Rosemary--*Rosemarinus officinalis*
Lavender Cotton--*Santolina chamaecyparissus*
Green Lavender Cotton--*Santolina virens*
Pigmy Bamboo--*Sasa pygmaea*
Adam's Needle--*Yucca filamentosa*

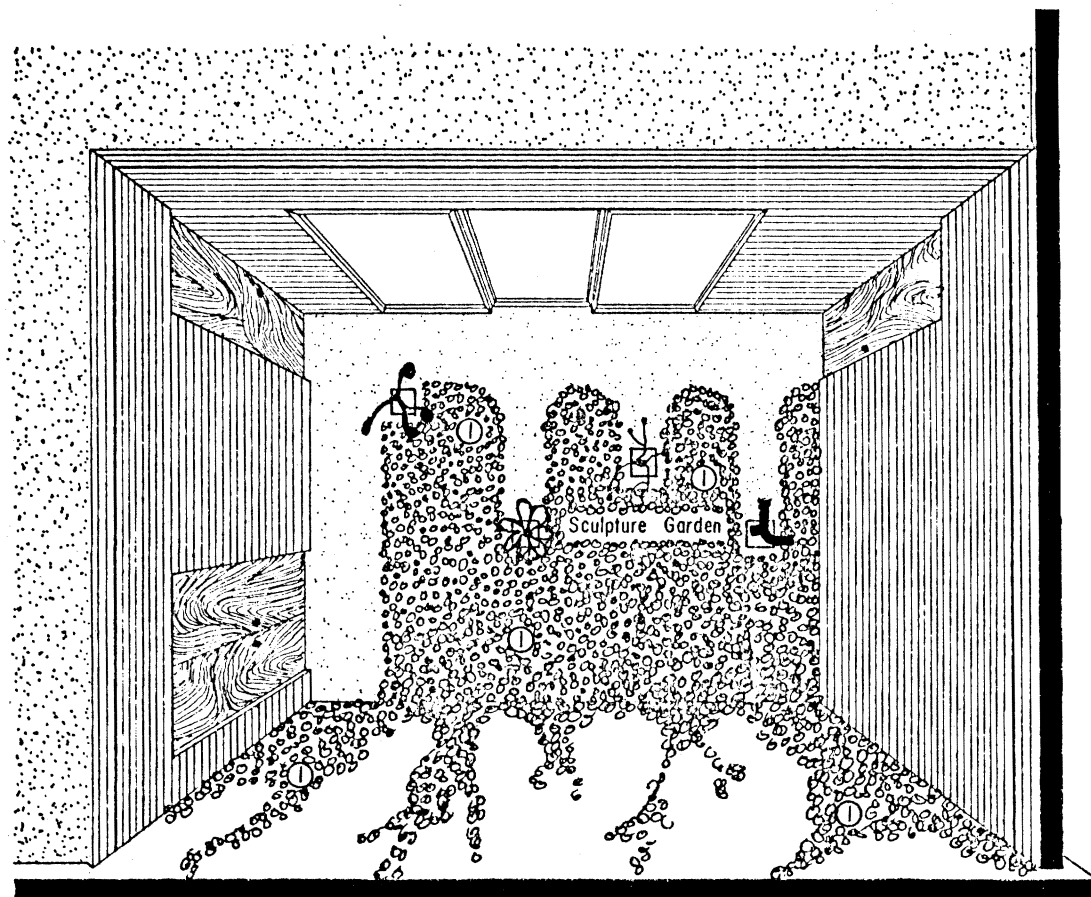
GROUND COVER--to 18 inches

Carpet Bugle--*Ajuga reptans*
Wintercreeper Euonymus--*Euonymus fortunei*
Blue Fescue--*Festuca glauca*
Carolina Jessamine--*Gelsemium sempervirens*
Algerian Ivy--*Hedera canariensis*
English Ivy--*Hedera helix*
Evergreen candytuft--*Iberis sempervirens*
Lantana--*Lantana camara*
Liriope--*Liriope muscari*
Hall's Japanese Honeysuckle--*Lonicera japonica halliana*
Lily Turf--*Ophiopogon japonicum*
Santolina--*Santolina chamaecyparissus*
Confederate Jasmine--*Trachelospermum jasminoides*
Vinca--*Vinca major*
Running Myrtle--*Vinca minor*

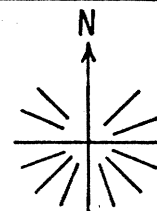
VINES

Coralvine--*Antigonon leptopus*
Trumpet creeper--*Campsis radicans*
Clematis--*Clematis* spp.
Carolina Jessamine--*Gelsemium sempervirens*
Algerian Ivy--*Hedera canariensis*
English Ivy--*Hedera helix*
Low's Boston Ivy--*Parthenocissus tricuspidata lowii*
Confederate Jasmine--*Trachelospermum jasminoides*
Wisteria--*Wisteria* spp.

Plant materials selections were made from the previous list for the landscape developments of each of the three court gardens: entry court garden, formal-entertaining court garden, and the play-utility court garden.

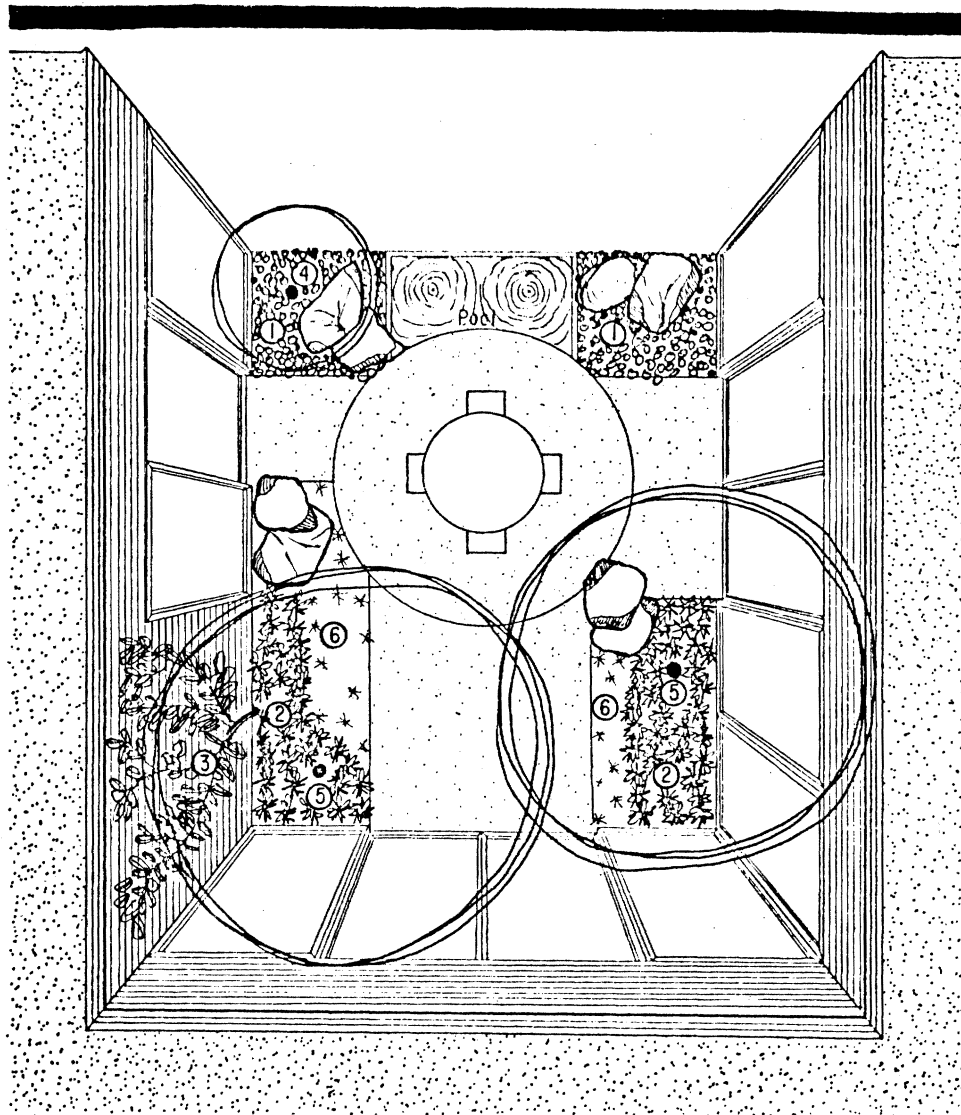


Entry Court Garden

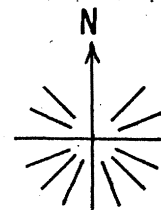


Legend

1. English Ivy--*Hedera helix*

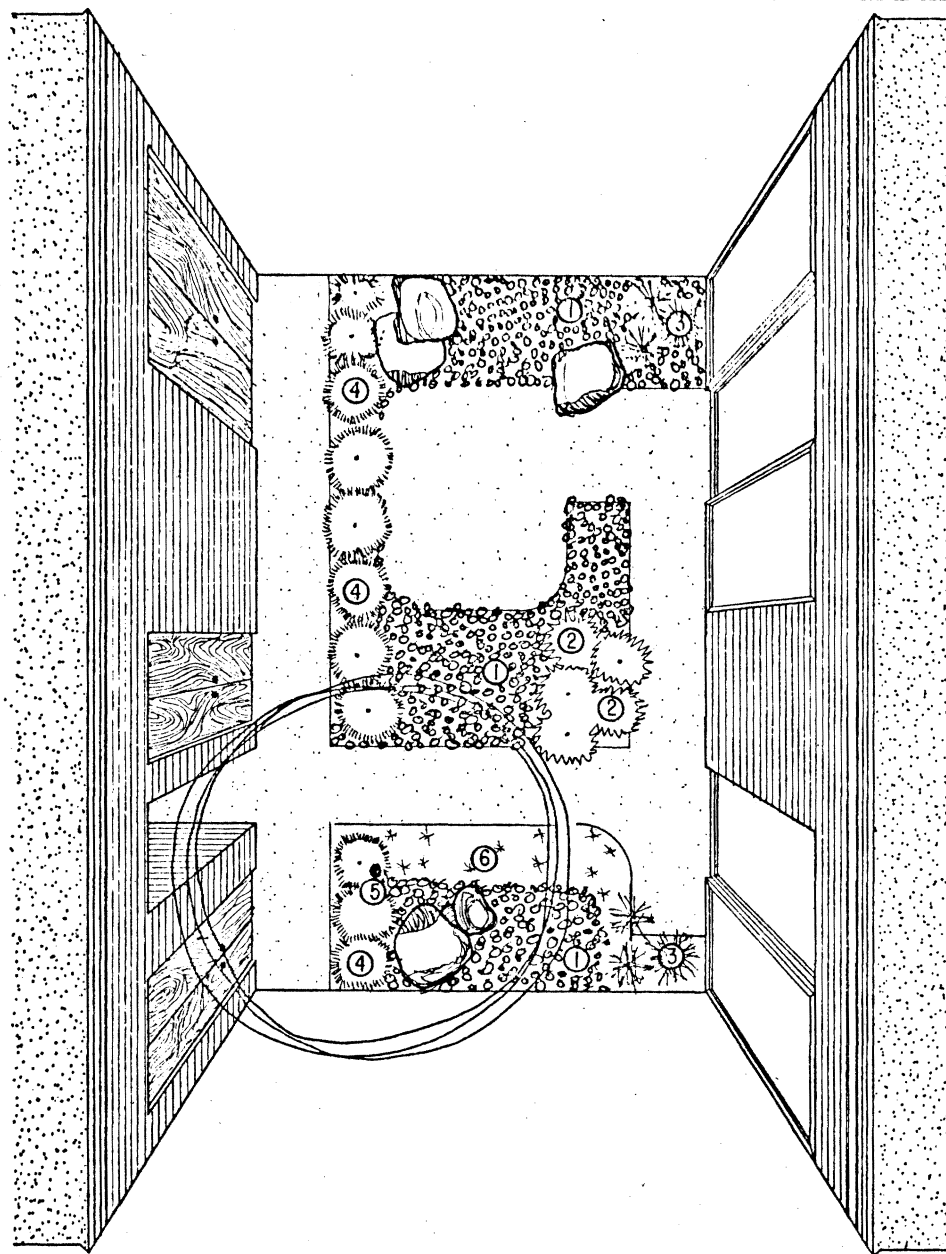


Formal-Entertaining Court Garden



Legend

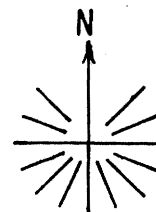
1. Japanese Garden Juniper--
Juniperus procumbens nana
2. Monkey Grass--*Liriope muscari*
3. Southern Magnolia--*Magnolia grandiflora*
4. Yaupon Holly--*Ilex vomitoria*
5. Bur Oak--*Quercus macrocarpa*
6. Perennial Bed



Play-Utility Court Garden

Legend

1. Carpet Bugle--*Ajuga reptans*
2. Dwarf Yaupon Holly--*Ilex vomitoria nana*
3. Dwarf Nandina--*Nandina domestica nana*
4. Dwarf Burford Holly--*Ilex cornuta burfordii*
5. Kentucky Coffee Tree--*Gymnocladus dioica*
6. Perennial Bed

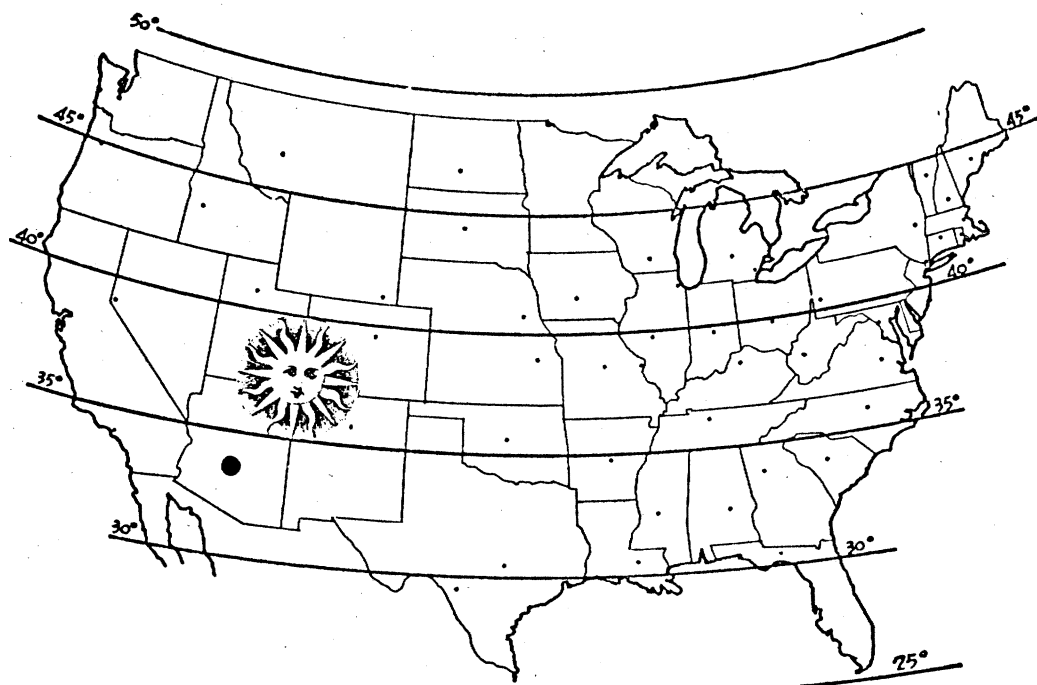


The paving material used in all three court gardens is exposed aggregate concrete. The paving is somewhat formal, but more relaxed than in the Denver example. The curves tend to soften the straight lines. The entry court garden has been transformed into a sculpture garden as well as still serving as the main entranceway. The garden is totally planted in English Ivy which is also trained on the south court wall to create a solid green mat and backdrop for the sculpture or statues displayed on the pillars. The view from the master bedroom is very nice.

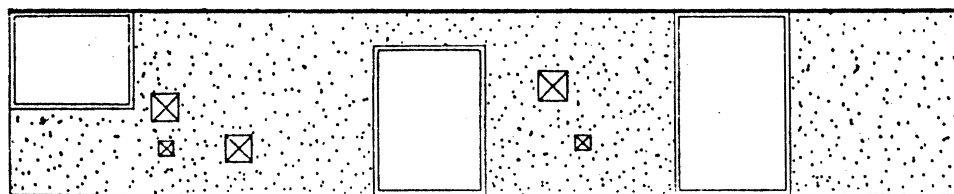
The formal-entertaining court garden was designed around a central circular paved area, suitable for an outdoor dining table. Adjacent to this area is a reflecting pool (with or without a fountain). It is preferable to include a fountain since man can relate to the sound of moving water. The fountain also drowns out outside noise entering the court garden. Plantings again are informal including large boulders, two types of ground cover, and a small amount of perennial flower beds. There is a magnolia espaliered on the solid west wall to be viewed from the living room. Shade is provided by two Bur Oaks which are deciduous and allow sunlight to warm the garden in the winter.

The play-utility court garden has the necessary paving including a large shady paved area for the children to play or to work outdoors. A row of Burford Holly serves to create a partial visual barrier of the trash and storage wall. Boulders and ground cover (Carpet Bugle) cover the remainder of the court garden that is not paved and create pleasant views from the study and son's bedroom. Shade is provided by a deciduous Kentucky Coffee Tree. All three of the court gardens require minimal maintenance and are pleasant spaces to be in.

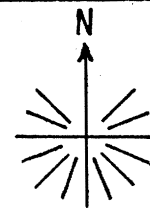
C. PHOENIX, ARIZONA



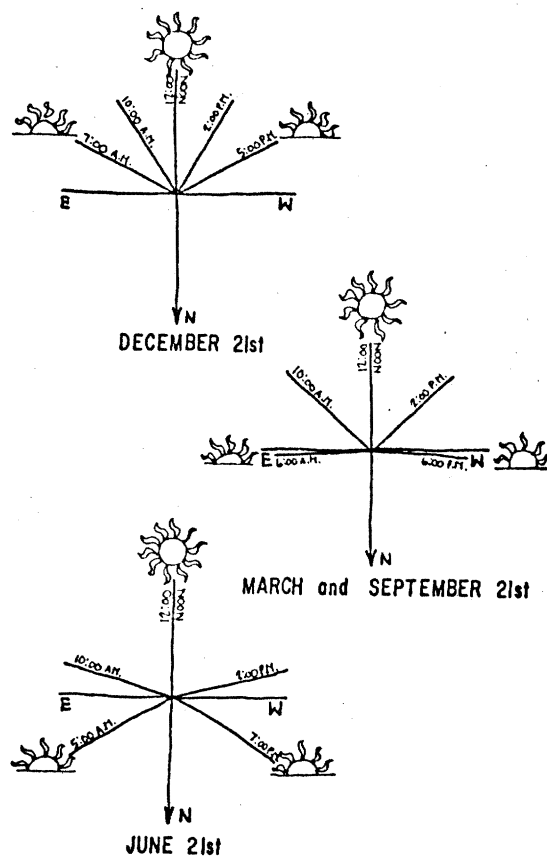
Orientation. Phoenix, Arizona is located at 33° North Latitude and 112° West Longitude as shown in the previous map. Phoenix has an elevation of 1,117 feet above sea level. The orientation of the basic court house design for Phoenix is shown below. This east-west orientation is not as good as the original north-south orientation, but it still provides plenty of natural daylighting. However, the winter solar radiation is somewhat decreased.



Orientation - Phoenix, Arizona



Solar Shading Plots and Treatment in the Court Garden. The following diagram shows the sun's azimuth at various times of the day and seasons of the year for Phoenix, Arizona at 33° North Latitude.

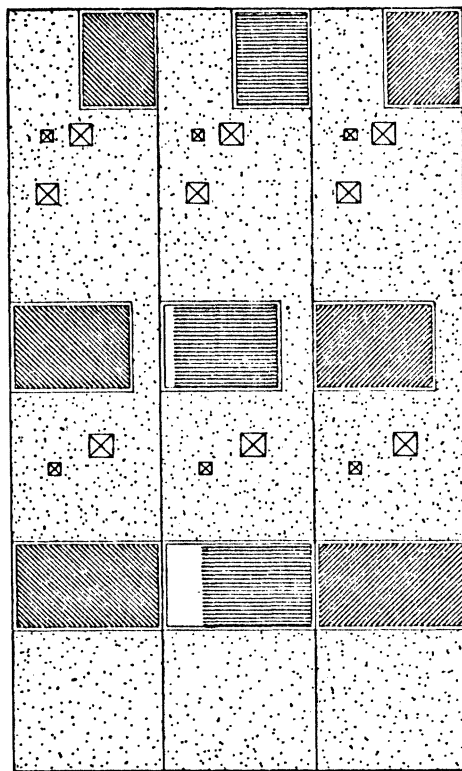
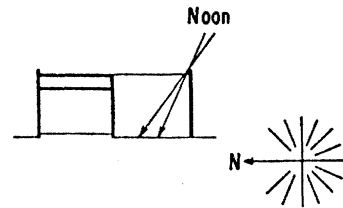
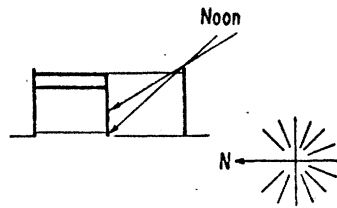


Following is the altitude chart for Phoenix located at 33° North Latitude for different seasons of the year and times of day. (8:75)

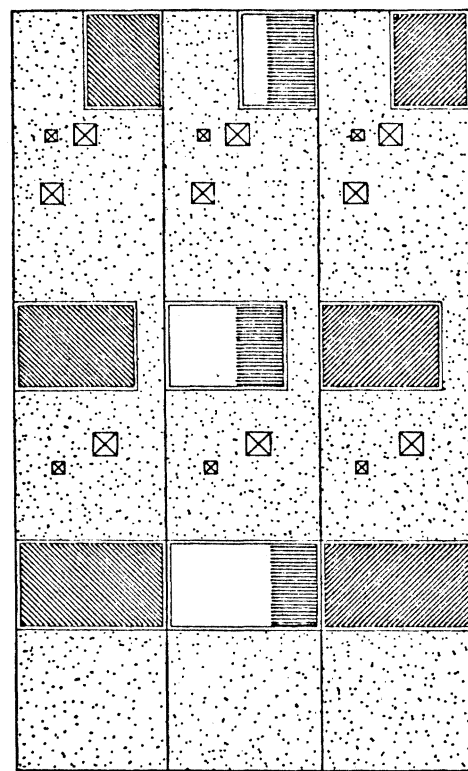
DECEMBER 21st				MARCH and SEPTEMBER 21st				JUNE 21st			
A.M.	P.M.	AZIMUTH	ALTITUDE	A.M.	P.M.	AZIMUTH	ALTITUDE	A.M.	P.M.	AZIMUTH	ALTITUDE
Noon		180°- 0'	31°-30'	Noon		180°- 0'	55°-0'	Noon		180°- 0'	78°-30'
10:00	2:00	149°-30'	25°- 0'	10:00	2:00	135°- 0'	45°-0'	11:00	1:00	127°-30'	72°-30'
8:00	4:00	126°-30'	8°-30'	8:00	4:00	108°-30'	24°-0'	10:00	2:00	105°-30'	61°-30'
7:10	4:50	119°- 0'	0°- 0'	6:00	6:00	90°- 0'	0°-0'	8:00	4:00	85°-30'	37°- 0'
								4:50	7:10	61°- 0'	0°- 0'

Both the azimuth and altitude charts were used to study the effect of shadows in the court garden. The following three solar plots show how

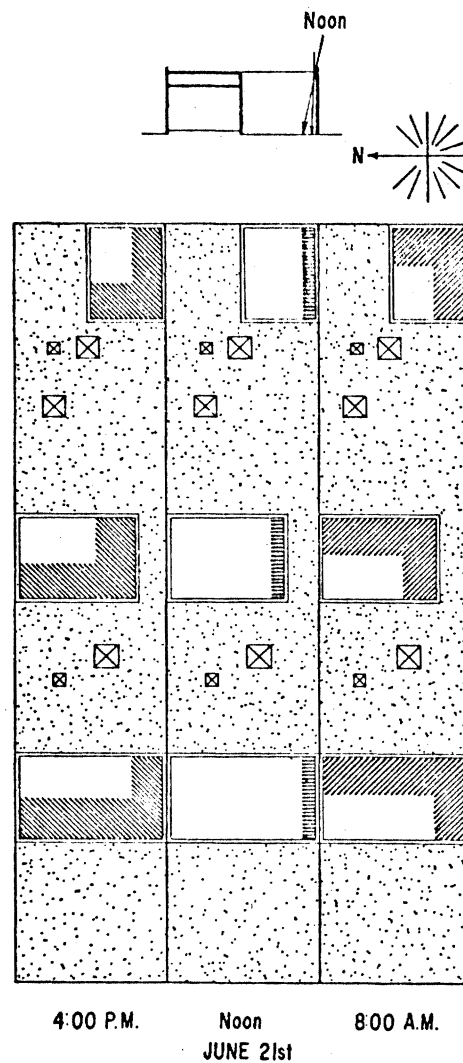
much of the court garden is in shade for various dates and times. The section on each plot also shows how much of the glass court garden wall are receiving sunlight and solar radiation at noon.



4:00 P.M. Noon 8:00 A.M.
DECEMBER 21st



4:00 P.M. Noon 8:00 A.M.
MARCH and SEPTEMBER 21st



To avoid harsh glare and solar overloads through the glass during the day, an examination of solar shading was required. The gallery is the only space that receives direct solar radiation, therefore, it is the only room requiring solar shading. The other rooms facing the court garden still receive plenty of daylighting, but solar radiation is reduced in the winter months. The same horizontal shading device was used as the one on the Denver study. It provides 100% shading, but it is not as solid and heavy as the typical overhang. The louvered shading allows light and breezes to not be blocked.

Phoenix is noted for its healthful, dry, and warm climate. Phoenix has a yearly average of 34 days with measurable precipitation. It receives very little rainfall, about 7 inches annually. During the winter, the temperature is usually in the 70's and during the summer in the 90's. Phoenix has an annual average of 15 days of 32° F weather and an average of 162 days with 90° F or above. The air is generally dry and clear, with relatively low humidity. The annual average humidity for Phoenix is 38%. Due to high temperatures, the dryness of the air, and the high percentage of sunshine, evaporation rates in Phoenix are high. High winds accompanying heavy thunderstorms during July and August sometimes peak gusts of 100 miles per hour. Phoenix has a yearly average of percent of possible sunshine of 86% compared to Tucson with 86% and Yuma with 92%. April, May, and June are the months with the greatest number of clear days, while July and August, as well as December, January, and February, have the cloudiest weather with the lowest percent of sunshine. Phoenix generally has hot, dry summers and mild winters. (19:1, 20:762)

Landscape Design. Special consideration of plant material size, scale, texture, light requirement, etc., is important due to the limited and defined size. The court garden seems to call for a dwarf variety of plant materials. As stated before, the variety of plants should be minimized to retain unity of the court garden design. Following is a carefully screened and selected plant materials list suitable for court garden development in Phoenix, Arizona. (15:2-20)

Plant Materials List

SHADE TREES--to 50 feet

Arizona Ash--*Fraxinus velutina*
 China Tree-of-Heaven--*Ailanthus altissima*
 Chinese Elm--*Ulmus pumila*
 Arizona Mesquite--*Prosopis velutina*
 Kingan Fruitless Mulberry--*Morus* spp.
 Russian Olive--*Elaeagnus angustifolia*
 Chinese Pistachio--*Pistacia chinensis*
 Desert Willow--*Chilopsis linearis*
 Hackberry--*Celtis occidentalis*
 Japanese Loquat--*Eriobotrya Japonica*
 Common Olive--*Olea europaea*
 Seville Orange--*Citrus aurantium*

TALL SHRUBS-SMALL TREES--to 20 feet

Silver Wattle Acacia--*Acacia baileyana*
 Bottle Brush Callistemon--*Callistemon viminalis*
 Flowering Peaches--*Prunus* spp.
 Orchid Tree--*Bauhinia purpurea*
 Ornamental Citrus Fruits--*Citrus* spp.
 Redbud--*Cercis canadensis*
 Flowering Hawthorne--*Crataegus* spp.
 Fringe Tree--*Chionanthus virginica*

LOW SHRUBS--to 3 feet

Acuba--*Acuba japonica*
 Barberry--*Berberis thunbergi*
 Boxwood--*Buxus "Harlandi"*
 Boxwood--*Buxus sempervirens*
 Cotoneaster--*Cotoneaster horizontalis*
 Dusty Miller--
 Euonymus--*Euonymus*
 Gardenia--*Gardenia radicans*
 Lavender--*Lavandula vera*
 Dwarf Nandina--*Nandina domestica nana*
 Oregon Grape--*Mahonia aquifolium compacta*
 Privet--*Ligustrum lodense*
 Pyracantha--*Pyracantha coccinea lalandii* (for espalier)
 Raphiolepis--*Raphiolepis indica*
 Rosemary--*Rosemarinus foresteri*
 Santolina--*Santolina*
 Yucca--*Yucca glauca*
 Yucca--*Yucca pendula*
 Deutzia--*Deutzia gracilis*
 Snowberry--*Symphoricarpos racemosus*
 Mugo Pine--*Pinus mugo mugo*
 Andorra Juniper--*Juniperus horizontalis plumosa*
 Bar Harbor Juniper--*Juniperus horizontalis*

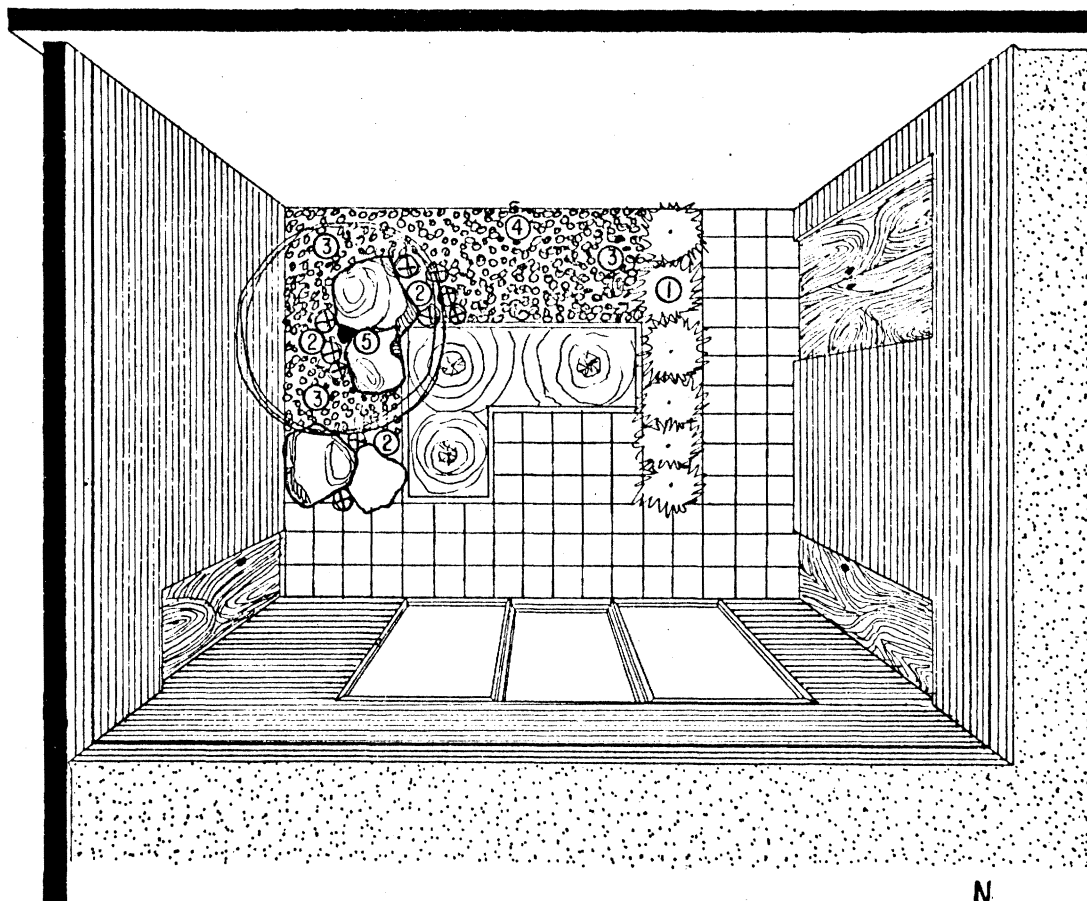
GROUND COVER--to 18 inches

Sea Spray Juniper--*Juniperus chinensis "Sea Spray"*
 Wilton Carpet Juniper--*Juniperus horizontalis "Wiltoni"*
 Broadmoor Juniper--*Juniperus sabina "Broadmoor"*
 Japanese Garden Juniper--*Juniperus procumbens "Nana"*
 Cotoneaster--*Cotoneaster horizontalis*
 Euonymus--*Euonymus*
 Germander--*Teucrium chamaedrys*
 Pyracantha--*Pyracantha "Santa Cruz" prostrata*
 Lantana--*Lantana*

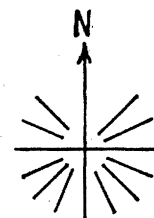
VINES

English Ivy--*Hedera helix*
 Algerian Ivy--*Hedera canariensis*
 Star Jasmine--*Trachelospermum jasminoides*
 Grape--*Vitis* spp.
 Common Trumpet creeper--*Campsis radicans*
 Bougainvillea--*Bougainvillea* spp.
 Boston Ivy--*Parthenocissus tricuspidata*
 Carolina Jessamine--*Gelsemium sempervirens*
 Wisteria--*Wisteria floribunda*
 Hall's Japanese Honeysuckle--*Lonicera japonica Halliana*

Plant materials selections were made from the previous list for the landscape developments of each of the three court gardens: entry court garden, formal-entertaining court garden, and the play-utility court garden.

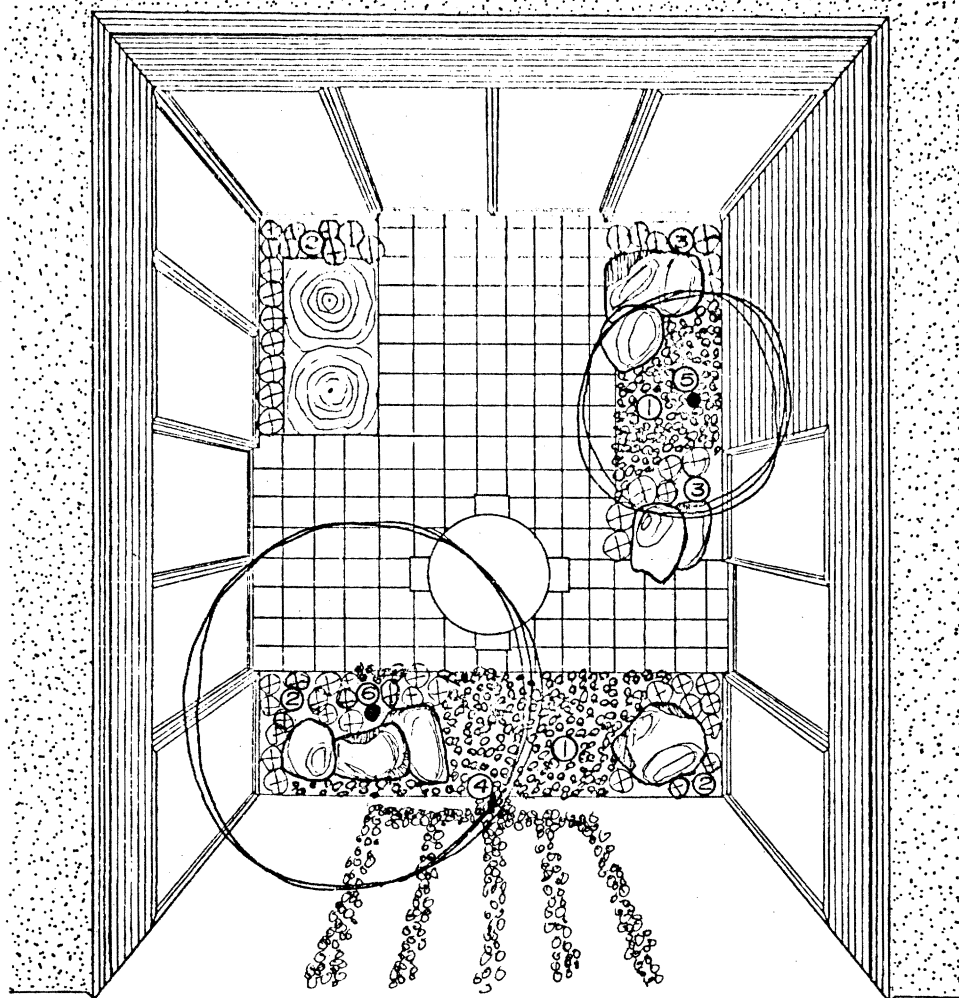


Entry Court Garden

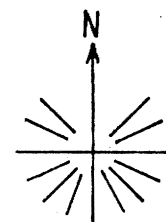


Legend

1. Sea Spray Juniper--*Juniperus chinensis* 'sea spray'
2. Gray Santolina--*Santolina chamaecyparissus*
3. Japanese Garden Juniper--*Juniperus procumbens nana*
4. Pyracantha--*Pyracantha coccinea*
5. Hawthorne--*Crataegus* spp.

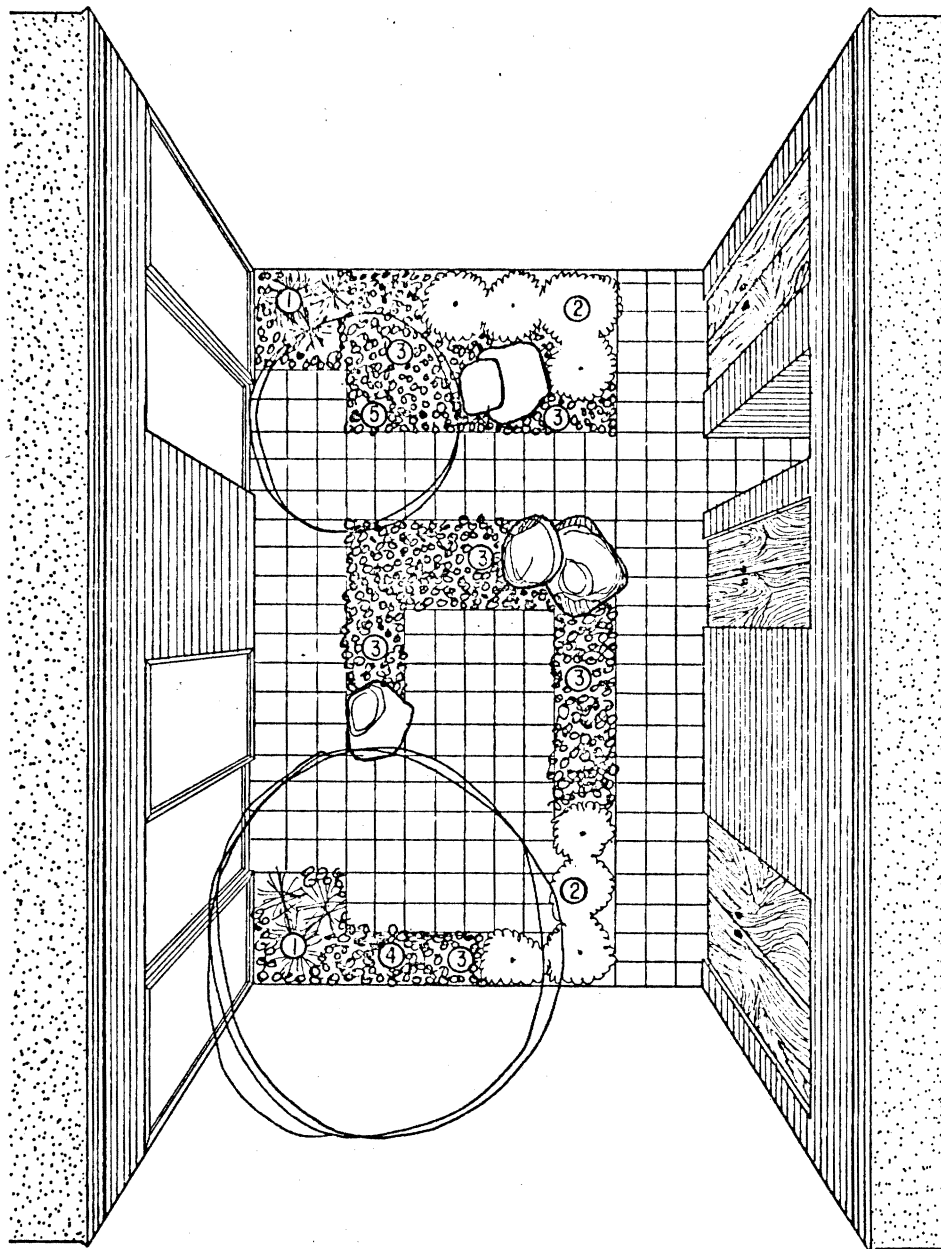


Formal-Entertaining Court Garden



Legend

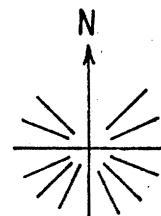
1. Japanese Garden Juniper--
Juniperus procumbens nana
2. Green Santolina--*Santolina virens*
3. Gray Santolina--*Santolina chamaecyparissus*
4. Pyracantha--*Pyracantha coccinea*
5. Hawthorne--*Crataegus* spp.
6. Russian Olive--*Elaeagnus angustifolia*



Play-Utility Court Garden

Legend

1. Dwarf Nandina--*Nandina domestica nana*
2. Acuba--*Acuba japonica*
3. Japanese Garden Juniper--
Juniperus procumbens nana
4. Russian Olive--*Elaeagnus angustifolia*
5. Hawthorne--*Crataegus* spp.



The paving material used in all three court gardens is the same square tile used in the house (terrazo or glazed tile, etc.). Using the same paving indoors and out tends to increase the visual limits of the house. Due to the tiles themselves, the lines are very rigid. An attempt was made to soften them by using informal random plantings. The entry court garden is dominated by a large fountain/reflecting pool. The water should be a welcome sight in the hot, dry Phoenix weather. The remainder of the garden that is not paved is devoted to ground cover (Japanese Garden Juniper) and large boulders. Gray Santolina provides a nice contrast against the ground cover. The north wall is espaliered with Pyracantha providing a nice view from the master bedroom. A Hawthorne provides a minimal amount of shade; also spring and fall color.

The formal-entertaining court garden is predominantly paved. The remaining garden area is planted with Japanese Garden Juniper and green and gray Santolina. Boulders create some vertical depth as well as provide backdrops for the Santolina. There is another small fountain/reflecting pool situated in the northwest corner of the garden. The south wall is again espaliered with Pyracantha. The Hawthorne against the blank solid wall provides some shade, but more importantly, spring and fall color. The garden is shaded by a graceful Russian Olive.

The play-utility court garden is also predominantly paved with border plantings. The Acuba provides some shielding of the trash and storage wall as well as introducing some color. Japanese Garden Juniper is the ground cover mixed with large boulders again. The Nandina and Hawthorne provide some color and shade is provided by the Russian Olive. The greatest amount of maintenance would be required in sweeping the paving and cleaning the pools.

SUMMARY

Historically, the court house is an ancient dwelling-type. It has existed for more than four thousand years. Geographically, it is indigenous to many regions. It is at home in Eurasia, Africa and Latin America. Its usefulness is not limited climatically, however, to the regions of its origin. This is proven by the success of the increasingly numerous developments being built in northern climates.

The court house is intrinsically urban in character. Advantages such as privacy and the economic use of land make it ideal for housing developments in large urban centers with high population-densities. Its many advantages are difficult to obtain by means of other residential building-types. The homogeneous appearance of the court house and its adaptability to natural terrain make possible the planning of pleasant streetscapes with a distinct local character. The court house fulfills all the basic requirements of contemporary living patterns. Open-planning, zoned-living areas, family privacy combined with a proximity to nature: all the integral elements of this dwelling-type provide answers to the problems of modern urban living.

The court house concept is equally adaptable to suburban and central urban residential areas. This concept is not limited by the size of the house, and its inherent advantages may be applied to both large and small homes. The court house is a dwelling that satisfies the need for individual expression without impinging on neighbors' peace and privacy. Its acceptance and success are furthermore assured by its adaptability within complex social structures, and by its potential for controlling the micro-climate of the court garden.

Finally, as energy shapes our buildings, so will it shape our cities,

particularly in the business districts. People will move back to the inner city. Cars may have to leave. So sun, wind, and view will become increasingly important to the amenities of life. People will play in the inner city; so city parks, squares, and promenades will become vital. People will worship and learn there, so there will be churches and schools for all ages. People will shop and live there, so the inner city will be a multi-purpose and multi-use conglomerated area. This return to the inner city seems to call for the further development and extensive use of the court house there now and, more importantly, in the constantly changing future.

BIBLIOGRAPHY

1. Eckbo, Garrett, The Art of Home Landscaping, McGraw-Hill Book Company, New York, New York, (1956).
2. Bullock, Thomas A., William Wayne Caudill, and Frank D. Lawyer, A Bucket of Oil, Cahners Publishing Company, Inc., Boston, Mass., (1974).
3. Schoenauer, Norbert, and Stanley Seeman, The Court-Garden House, McGill University Press, Montreal, Canada, (1962).
4. Olgyay, Aladar, and Victor Olgyay, Solar Control and Shading Devices, Princeton University Press, Princeton, N.J., (1957).
5. Feucht, James R. and William A. Macksam, Plant Materials Pamphlets, Colorado State University, Ft. Collins, Colo., (1973).
6. Lynch, Kevin, Site Planning, The M.I.T. Press, Cambridge, Mass., (1972).
7. Giovoni, B., Man, Climate and Architecture, Elsevier Publishing Company Limited, New York, New York, (1969).
8. Callender, John Hancock, Time-Saver Standards, McGraw-Hill Book Company, New York, New York, (1974).
9. Rogers, Kate Ellen, The Modern House, U.S.A., Harper & Brothers, New York, New York, (1962).
10. Solar Effects on Building Design, Publication No. 1007, Building Research Institute, Washington, D. C., (1962).
11. School of Urban Planning and Landscape Architecture, The Integration of the Environments, Michigan State University, East Lansing, Mich.
12. Simonds, John Ormsbee, Landscape Architecture, McGraw-Hill Book Company, New York, New York, (1961).
13. Aronin, Jeffery Ellis, Climate and Architecture, Reinhold Publishing Company, New York, New York, (1953).
14. Ownby, J. Steve, Oklahoma Plant Materials Handbook, Horticulture Department, Oklahoma State University, Stillwater, Okla., (1972).
15. Tate, Harvey F., et.al., Plant Materials Pamphlets, Q-302, Q-192, etc., The University of Arizona, Tucson, Ariz., (1967).
16. Dewers, Robert S., et.al., Plant Materials Pamphlets, MP-1151, MP-966, etc., Texas A & M University, College Station, Tex., (1971).
17. U.S. Department of Commerce, Climate of the States--Colorado, U.S. Government Printing Office, Washington, D. C., (1968).

18. U.S. Department of Commerce, Climate of the States--Texas, U.S. Government Printing Office, Washington, D. C., (1969).
19. U.S. Department of Commerce, Climate of the States--Arizona, U.S. Government Printing Office, Washington, D. C., (1966).
20. Encyclopedia Americana, Volumes 2, 8, 25, Americana Corporation, New York, New York, (1974).
21. Bagnall, Jim and Don Koberg, The Universal Traveler, William Kaufmann, Inc., Los Altos, California, (1973).