

DESIGN ELEMENTS AND URBAN FORM
CASE STUDY: JAIPUR, INDIA

by

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MASTER OF REGIONAL AND COMMUNITY PLANNING

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CHAPTER ONE

INTRODUCTION:

Land is the primary resource of any community. The art and science of City and Regional Planning is concerned with the regulation and control of the use of this primary resource to optimize development activities and benefit the community. The planning process, therefore, is essentially a scientific process involving the planned and unplanned development of economic activities or land uses to which the land in a city or a town should be committed.

Physical planning or City and Regional planning is thus a process through which a city attempts to make certain decisions regarding its future size, form and patterns, direction of growth, and also the machinery to implement such decisions. Once such broad decisions are taken on city a wide basis, it becomes easier to consider the day to day issues. Implementation of various such solutions, in the context of the overall framework, moves the city toward the realization of the ultimate goals and objectives because decisions are a resultant of coordination, as opposed to isolation. The overall framework in the planning terms is called a comprehensive plan. The comprehensive plan is thus a statement of policies and principles for guiding the future growth of the city.

Every city has distinct a character, mostly associated with its form and pattern. It may be the result of natural site the creations of man, or both. Both natural and manmade elements determine the form and pattern of the city, although the former give a

natural identity, and the latter, a created identity. The natural elements which determine the form of the city are the geologic history, the soil and physiography, climate and vegetation of a place, while the man-made elements created by man include - the circulation pattern, the landuses, and the architecture. Other factors which influence the form and the pattern of the city are the people who live in it, their character, material aims and social and political concepts. All these are interrelated and depend on each other, contributing in varying degrees to the character of the city.

Jaipur is a city of powerful character which has a deep hold on the affection of many people. The city has an economic, cultural and political history of staggering proportions. The visual evidence of its past accounts for much of its strong character. The present study will identify some of the natural and man-made elements, which determine the form and pattern of the city.

OBJECTIVE:

The objective of this study is to provide a guideline document that amplifies the role of design elements (natural and man-made), and their effect on urban form. A model approach is established and a demonstration is given by applying it to an actual case study on the city of Jaipur (India).

The study is an attempt to identify and analyze design elements and their relationship with urban form. The process of identification included natural design elements, (topography: landform features, slopes and relief and surface drainage), and man-made

elements (visual and functional). The combination of both type of elements had an influence on the form and design of Jaipur city.

SCOPE AND METHODOLOGY:

The study deals with

1. Historical growth of the city in relation to its design elements
2. Identification and analysis of selected design elements (natural and man-made)
3. Observations and proposals.

A land suitability plan based on the analysis of selected natural design elements (topography and surface water drainage) will be prepared to guide the future development of the city. A comparison has also been made with the landuse plan 1991 of Jaipur city, to demonstrate the importance of natural design elements.

Broad recommendations have also been made on the basis of analysis of man-made elements about the original character of the city and how it can visually be related to the new development of the city.

LIMITATIONS:

The scope of the study is limited to the study of selected natural (topography: landform features, slopes and relief and surface drainage) and man-made elements (visual and functional), due to the limitation of time and non-availability of certain data, so the outcome is not a comprehensive plan or landuse plan. The study is an attempt to identify the importance of the design elements which should be analyzed at the time of preparation of a comprehensive plan.

CHAPTER TWO

STUDY AREA: JAIPUR, INDIA

There are few cities in the world, which are unique. They are part of our history as well as reminders of styles and ideas of another age. They stand as a symbol of what we are capable of achieving in shaping our environment though their physical form is neither typical nor ideal. Their designers succeeded in symbolising the ideas of their age. The cities still function decades after their establishment.

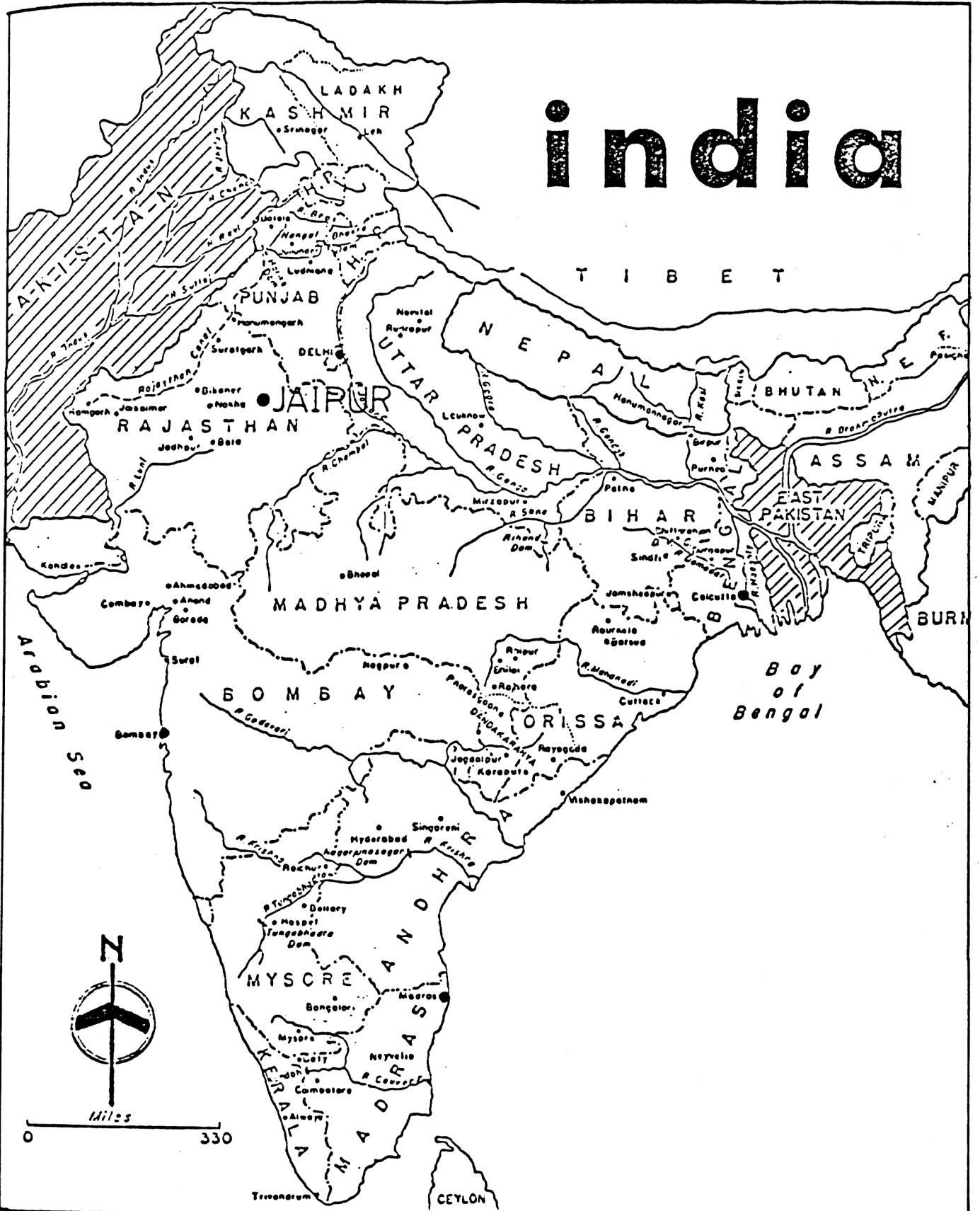
One among such memorable cities is Jaipur, which is now under constant development pressure because of population growth technological change and changing social conditions.

LOCATION:

Jaipur is the wealthiest and most populous of the native states of Rajasthan, India, covers an area of 15,579 sq. miles. The population is principally of Brahmins, Jats, Minas and Rajputs. The city is situated in the north eastern part of Rajasthan on the latitude 26°25' north and 75°50' east. It is about 200 miles from Delhi by road.

Jaipur is well known as the 'Pink City' of India. It is one of the very few planned cities in the country and is famous for its traditional architecture and civic design with well laid out roads, parks and palaces. Visitors to Jaipur can get a glimpse of the town planning principles of the late Medieval Period put into practice.

india



HISTORICAL GROWTH:

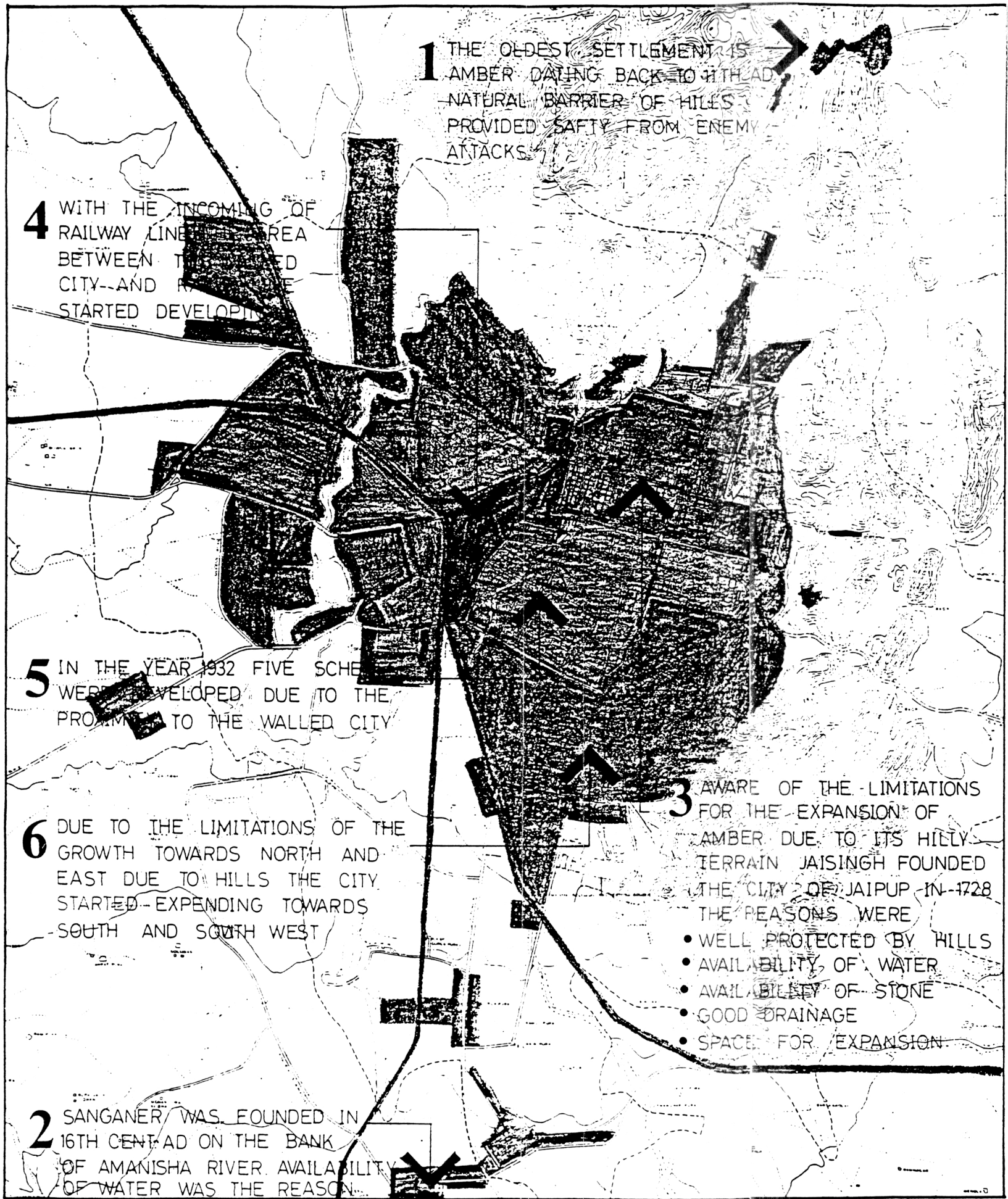
The city has an economic, cultural and political history of overwhelming proportions and the visual evidence of this past accounts for much of the strong character.

In 11th century AD., Rajdeva shifted his capital to Amber 7 miles north of the existing city and founded the town at the foothills of the mountains which continued to grow until 16th century AD.

In 16th Century AD the son of King Prithivi Raj, the ruler of Amber, founded the city of Sanganer and made his capital on the bank of river Amanisha.

Aware of the limitations for the expansion of Amber due to its hilly terrain, the walled city of Jaipur was founded in 1727 A.D. by the then Maharaja Sawai Jai Singh II who is said to have studied the Shilpa-shastras² and commissioned Vidhyadhar Bhattacharya to prepare a plan for the new city. The planner evolved a grid-iron plan, with the main road running almost east-west along the ridges in the centre and placing the palace complex as the core of the city plan. The construction work started in 1728 A.D. The buildings were built under strict architectural control. 'Harmony' was achieved by following a specific style of architecture and later by using pink color over the external facades of all the buildings along the main thoroughfares of the city. This made it famous as the "Pink City" of India. Later rulers also followed these principles and added to its beauty and architecture of Jaipur.

The original development of the city was confined to the city walls till the beginning of this century. Growth outside the walls began with the incoming of the railway line and other economic



1 THE OLDEST SETTLEMENT IS AMBER DATING BACK TO 11TH AD. NATURAL BARRIER OF HILLS PROVIDED SAFTY FROM ENEMY ATTACKS.

4 WITH THE INCOMING OF RAILWAY LINE AREA BETWEEN THE WALLED CITY AND RAILWAY STARTED DEVELOPING.

5 IN THE YEAR 1932 FIVE SCHEMES WERE DEVELOPED DUE TO THE PROXIMITY TO THE WALLED CITY.



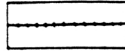
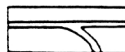



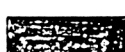

6 DUE TO THE LIMITATIONS OF THE GROWTH TOWARDS NORTH AND EAST DUE TO HILLS THE CITY STARTED EXPENDING TOWARDS SOUTH AND SOUTH WEST.

2 SANGANER WAS FOUNDED IN 16TH CENT AD ON THE BANK OF AMANISHA RIVER. AVAILABILITY OF WATER WAS THE REASON.

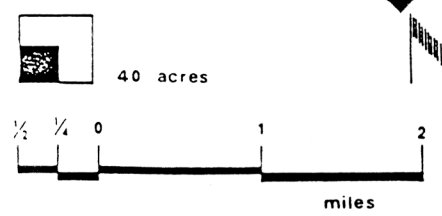
3 AWARE OF THE LIMITATIONS FOR THE EXPANSION OF AMBER DUE TO ITS HILLY TERRAIN JAISINGH FOUNDED THE CITY OF JAIPUR IN 1728. THE REASONS WERE

- WELL PROTECTED BY HILLS
- AVAILABILITY OF WATER
- AVAILABILITY OF STONE
- GOOD DRAINAGE
- SPACE FOR EXPANSION.

REFERENCES :

-  RIVER
-  CONTOUR INTERVAL 50'
-  RAILWAY LINE
-  ROADS
-  BEFORE 1728 AD
-  1728 AD TO 1880 AD
-  1881 AD TO 1920 AD
-  1921 AD TO 1947 AD
-  AFTER 1947 AD

GROWTH IN RELATION TO DESIGN ELEMENTS



DESIGN ELEMENTS AND URBAN FORM

CASE STUDY - JAIPUR, INDIA

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factors. In the 1930's, five development schemes, Fateh Tiba, area south of Ram Niwas Bagh, Ashok Nagar, New Colony in Jalupura and Beni Park, which are more commonly known as A, B, C, D and E respectively, were conceived to provide residential plots, land for public institutions and other amenities for the increasing population. The civil lines area was developed primarily to house the senior Government servants.

Jaipur experienced a phenomenal growth during the post-independence period (1947) due to influx of displaced persons from Pakistan and as a result of being made the capital of the new State of Rajasthan. After the 1948 Congress Session at Jaipur, the Bapu Nagar and Gandhi Nagar residential areas towards the South were developed. The South eastern area was developed during the 1950's when Rajasthan University was established. Development towards north-west took place in the early sixties with the establishment of the Jhotwara Industrial area.

Expansion of the city toward the north and the east was restricted because of the existing hill ranges. Further development therefore continued toward the south and southwest. Jaipur, which originally had only about 2000 acres within the fortifications, covered more than 14,000 acres in 1971. Municipal limits, however, encompass about 46,000 acres.

POPULATION GROWTH:

Population of Jaipur according to 1971 census was 615,258, increasing fourfold during the previous four decades. Growth trends are shown in the following table.

Table: 1

Jaipur Population Growth Trends 1901-1971

Year	Persons	Variation	%age Variation
1901	160,167	---	---
1911	137,098	- 23,069	- 14.40
1921	120,207	- 16,891	- 12.32
1931	144,179	+ 23,972	+ 19.94
1941	175,810	+ 31,631	+ 21.94
1951	292,130	+115,320	+ 65.59
1961	403,444	+112,314	+ 38.58
1971	615,258	+211,814	+ 52.50

(Source: Census of India, Jaipur, Rajasthan 1971)

Population Projections 1971-1991

1981	927,400	---	---
1991	1,254,600	---	---

(Source: Town and Country Planning Organization, Jaipur, Rajasthan)

It will be seen from the above table that the first major growth occurred between 1941-51. This was a result of the partition of the sub-continent and the resultant influx of displaced persons from Pakistan to the border states of Punjab and Rajasthan in India. The second important factor for this accelerated growth occurred because Jaipur was declared the Capital of the new State of Rajasthan.

Urban expansion brought many related problems, such as a shortage of living accomodations, traffic congestion, lack of sanitation and lack of urban amenities, etc. Building activity since 1947 has paid little attention to the traditional architectural and

civic design aspects of the city with the result that there is a positive threat to the city's beauty, symmetry and design for which it has been so famous.

CHAPTER THREE

DESIGN ELEMENTS AND URBAN FORM

The physical development of an area is directly related to the design elements. When these elements are pooled together and applied to the task of physical development, they create a form and pattern, which varies from city to city.

IDENTIFICATION OF THE DESIGN ELEMENTS:

Site investigation made concurrently with the formulation of program objectives ensures the flexibility of the site's potential and the integration of its natural and man-made features with the design. With the basic objectives in mind, the designer may use each of the following elements. The design elements can be categorized into two major components

Natural Elements

Man-made Elements

The natural elements which determine the form and pattern of the city are -

a) Sub-surface elements

i) Geology

ii) Soils

iii) Hydrology

Sub-surface conditions refer in particular to the foundation material and to the level of the water table. The rock and earth below ground have practical importance primarily for their

characteristics of drainage and the manner in which they will support structural foundations.

The characteristics of soils in a place depends on soil type, internal structure, and moisture content. The organic top soil which acts as the foundation material, is the essential medium for the growth of plants, and centuries are required to build it up.

Hydrographic features have a bearing on relating activities to the land and they are of primary importance in developing a system for site drainage, that makes use of existing watershed drainage pattern.

At some greater depth is the water table: the line below which the interstices between the soil grains are full of water. Where the table is too low, supply of water may be expensive and difficult. Where the table is less than six or eight feet below the surface, all development costs are increased.

Therefore certain sub-surface conditions are danger signals calling for more detailed analysis.

b) Surface Elements

i) Topography

Landform features

Slopes

Relief

ii) Vegetation

iii) Wild Life

iv) Drainage Pattern

The topographic surface, the boundary between earth and air, has particular implications for site development. It determines the organization of the plan, and affects the gradient of paths, the flow of utilities, the use of areas, the disposition of buildings.

Irregularities of the earth's surface are known as Landforms. They are the basic structures of the natural site. Landforms are derived from volcanic, glacial or erosional process. Knowledge of their kinds and the characteristics will influence the design.

Slopes may be classified according to the use for which they are suitable: the flat ground, usable for intensive activity; the easy grades, suitable for movement and informal activity; and the steep land difficult to use or to move over. Slope analysis helps in recognizing areas on the sites which lend themselves to building locations, roads, parking and recreational areas.

Topographic relief mapped in levels indicates the existing points of orientation and offers clues to vegetation and drainage pattern.

Vegetation is a key indicator of soil and climate and provides much of the town's image. The form, color and texture are important aspects to be studied about vegetation.

Wild life is important when choosing sites for parks or recreational areas. It adds color, form and movement in the landscape. Existing wooded areas inhabited by wild life should be preserved as park land in conjunction with residential subdivision.

The surface water drainage is closely related to topography and locates streams, ponds, rivers, lakes.

c) Above Surface Elements

i) Climate

Each site has a general climate which it shares with the surrounding region, and a micro climate, a modification of the general climate, which may be peculiar to a very small area. The general climate is expressed in a set of average data for the region, covering such phenomena as solar angle, days of sunlight, range of temperature and humidity, precipitation and wind direction and force. Elevation difference, character of topography, vegetation and water bodies influence the climate, which in turn affects the site.

Man has profoundly modified the microclimate in the modern times. He has simplified it to suit his own comforts resulting in 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.

The man-made elements which form an image of the city are -

a) Visual Elements

i) Image of the City

ii) Form qualities

b) Functional Elements

i) Landuses

ii) Public spaces

iii) Road network

The man-made elements are composed of various elements of town design, the creation of man, the street pattern, the building and

the architectural style. They form an image which helps to identify one city from another.

Unique character and strong sense of place in towns is often based upon the architecture, the use of local materials, a high level of craftsmanship, sensitivity of siting important buildings, cultural diversity, topographic conditions and quality of life. In other words, the total range of local conditions create the unique image or character.

Other factors which influence the form and pattern of the city are the people who live in it, their character, material aims and social and political concepts. All these are interrelated and they act together and depend on each other, each contributing in different degree and proportion to the totality which is the character of the city.

Once the major components of natural and man-made elements are identified, and graded according to their importance, a list of elements of city identity can be made.

RELATIONSHIP BETWEEN DESIGN ELEMENTS AND URBAN ACTIVITIES:

Once the design elements have been analyzed, site planning begins with the demarcation of landuses. The site plan locates two things - physical objects and human activities. Landuse not only refers to activity locations, but also implies the general physical form that permits those activities, such as residential, commercial, industrial and recreational.

Along with landuses, visual design factors and natural elements must be studied. They should be viewed as a total organization of space formed with buildings, earth, water and plant material.

The basic proposition which should be employed is that any place is the sum total of historical physical, and cultural processes, that these are dynamic, that they constitute social values, and finally certain areas lend themselves to multiple co-existing landuses.

Land, air and water resources are indispensable to life and thus constitute social values. The surface waters are a resource for water supply, recreation and disposal of effluents, but their positive value is easily abused by pollution.

Flat land with good surface and soil drainage is intrinsically the most suitable land for intensive recreation, while areas of diverse topography represent a higher value for passive recreation.

For each landuse, there will be certain factors of greatest importance and these can be selected. Moreover there will be ranking of importance and so the factors can be arranged in a hierarchy. In certain cases, some factors will be conducive to specific landuses, while others are restrictive.

As an example of conducive and restrictive factors selection of the most suitable areas for residential landuse would include -

- Attractive surroundings and scenic land features.
- Location near water will be positive factor, while excessive slopes, poor drainage and susceptibility to flooding will be negative factors.

Areas most suitable for recreation are determined separately for two kinds of recreational activity - passive and active. These two are then combined to arrive at the composite suitability for recreation.

Passive - Unique physiographic features, scenic water features, streams features of historic value, high quality forests, scenic land features, unique geological features, water associated wildlife.

Active - Existing and potential recreation areas, flat land, fresh water areas, expanses of water for pleasure craft.

Areas most suited for urban development are determined separately for the two major components - Residential and Commercial - Industrial developments. For each of these the most permissive factors are identified. These are -

Residential - Scenic land features

Riparian land

Scenic cultural features

Good soil foundation

Commercial and Industrial -

Good soil foundation

Highways and Rail-road access

The most restrictive factors which are common to these developments are -

Slopes

Poor surface drainage

Poor soil drainage

Areas susceptible to erosion

Areas subject to flooding

By considering all these above aspects a relationship between design elements and urban activities can be established to find out the most suitable land for the development. This relationship also helps in understanding the design elements which have direct bearing on urban form.

PART TWO

CHAPTER FOUR

ANALYSIS OF NATURAL DESIGN ELEMENTS:

The analysis of a site depends on the use to which it is to be put. The same piece of land may be seen quite differently for a particular use while it may not be suitable for other uses. There are site factors which by experience seem to be influential in most building development, but an unusual purpose may invalidate them. The purpose of the reconnaissance must be uppermost in mind and it determines what is being looked for, even if that purpose is simply to find out the use to which the site can best be put.

In the past, an understanding of site was often more advanced than it is today. Since earlier, people had less power to change the site, they were perforce more keenly aware of the limitations it presented. Superstitious beliefs have an even greater influence. If a locality was the home of a local spirit, one avoided disturbing that home, without due precautions. These precautions included ritual acts and the anxious study of local configuration, and entailed the careful adjustment of human structures to that configuration. The development was in consequence closely related to the site. In most cultures land is sacred, a thing not to be violated by any upstart human agency. It is enduring, powerful, extensive; the home of spirits and the dead; the productive mother upon whom human life depends.

As we discarded these religious ideas, and as we increased our power to impose site changes, we have tended to lose the useful by-product of those ancient attitudes: we no longer consciously produce developments, which work in harmony with their setting, nor erect structures expressive of locality.

Although the completely harmonious and mature site is unusual, the completely chaotic and meaningless one is almost nonexistent. Every site, however disturbed, has had sometime to experience the mutual adjustment of its elements. Surface flow has created a drainage pattern, plant and animal life has achieved an ecological balance, neighboring structures lean against each other, shops have arranged themselves in relation to the resident population, climate has weathered all alike. Any site is composed of many factors - sub-surface, surface and above surface elements, but all these factors are interrelated, and have achieved some sort of balance, whether it be static or one that is moving towards another equilibrium.

Because of the complexity of parts and their intricate patterning together, we find that each site is in some measure unique. While it may fit into some general classification, it will have a flavor, an essence of its own. These interrelations, this essential character, must be understood. Such an understanding will make clear the practical limits imposed upon the site. More important, the analysis will reveal the hidden potential of the place, where the new development can take place. The analysis of site is not only a

technique for conservation, it is also an essential prelude to successful revolution.

The present analysis of natural elements is limited to the surface elements i.e. Topography - Landform features, slopes and relief and surface water drainage pattern. These elements are analyzed on the selected case study area i.e. Jaipur, India.

LANDFORM FEATURES:

Jaipur city is situated on a small plain surrounded by the hills on three sides along the Amanisha river. The hills are crowned with forts and temples on all important points. At the end of the ridge about 500 feet above the city is Nahargarh Fort, the rock face of which is so scraped as to be inaccessible on the South or city side, while on the north the ridge slopes towards Amber, the old capital.

Various landform features are identified

Hill tops

Steep slopes

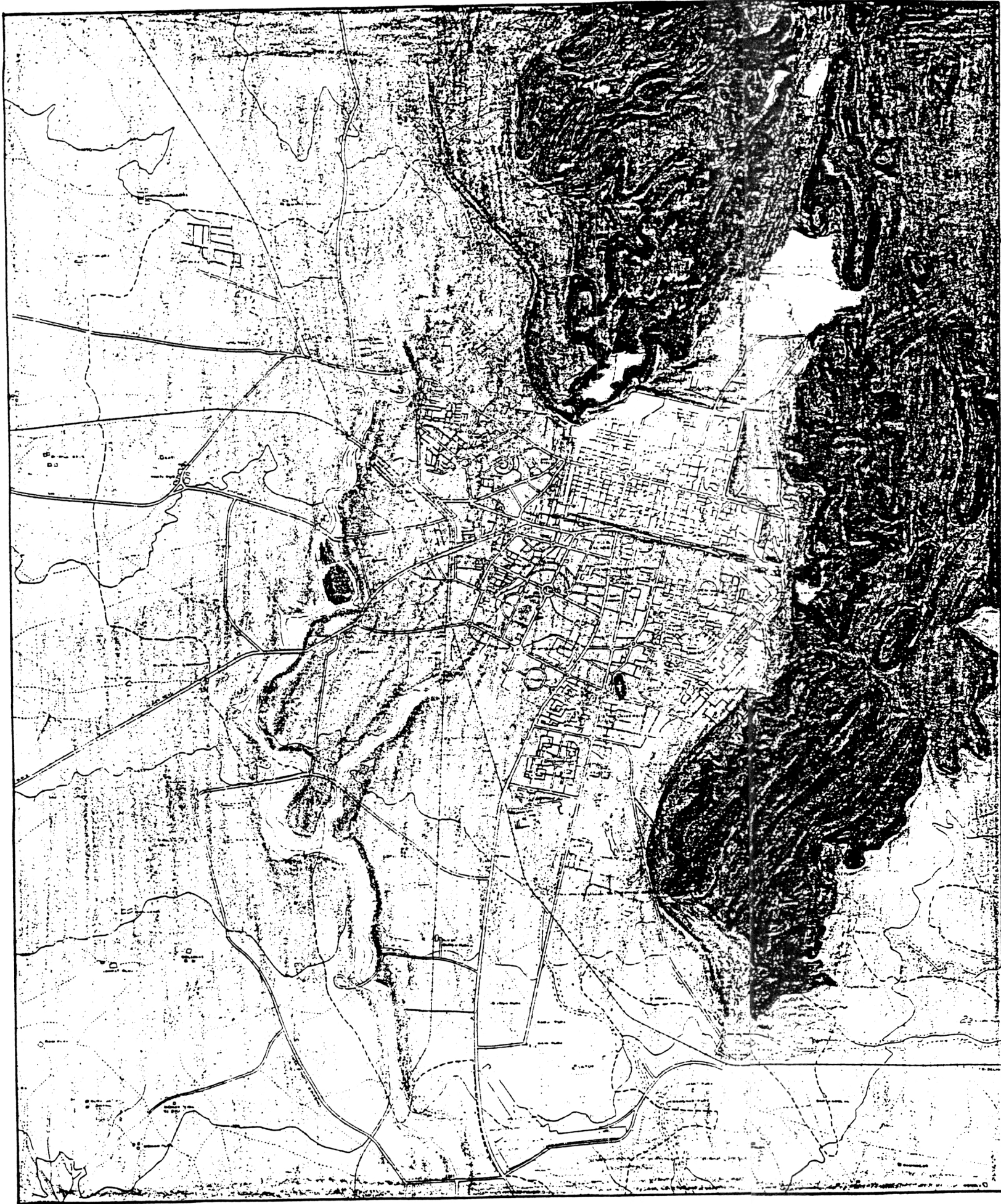
Moderate slopes

Gentle slopes



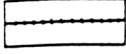
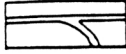
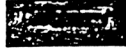

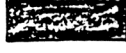

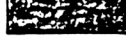

Deep valleys

Shallow valleys

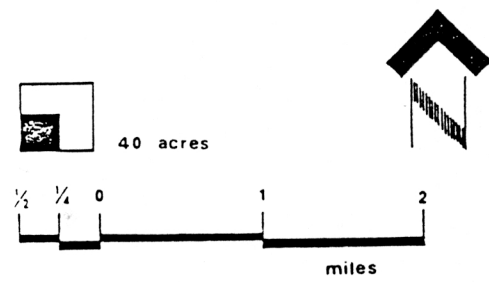
The above features can be developed for different activities. Hill tops, deep valleys and shallow valleys may be suitable for passive recreation, while moderate and gentle slopes are good for building activities and roads.



REFERENCES :

-  RIVER
-  CONTOUR INTERVAL 50'
-  RAILWAY LINE
-  ROADS
-  HILLTOPS
-  STEEP SLOPE
-  MODERATE SLOPE
-  GENTLE SLOPE
-  DEEP VALLEY
-  SHALLOW VALLEY

LANDFORM FEATURES



DESIGN ELEMENTS AND URBAN FORM

CASE STUDY - JAIPUR, INDIA

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SLOPES:

A slope analysis aids in recognizing areas on the site that lend themselves to building locations, roads and recreation areas. Development costs vary with slopes. Both structure and service systems cost more on greater slopes and they are also not easily accessible.

A typical breakdown of grades* has been adopted to make the slope analysis i.e. 0 to 2.5%, 2.5 to 5%, 5 to 10%, 10 to 20% and above 20%. These grades are established by measuring the distance between contours at a given scale and contour interval, the formula is -

$$\text{percentage grade} = \frac{\text{Contour interval}}{\text{Distance between contours}} \times 100$$

The suitable activities on various slopes are -

0% or the flat land with no slope is not suitable for any activity as there will be no drainage.

0 - 2.5% grade, most suitable for all the activities.

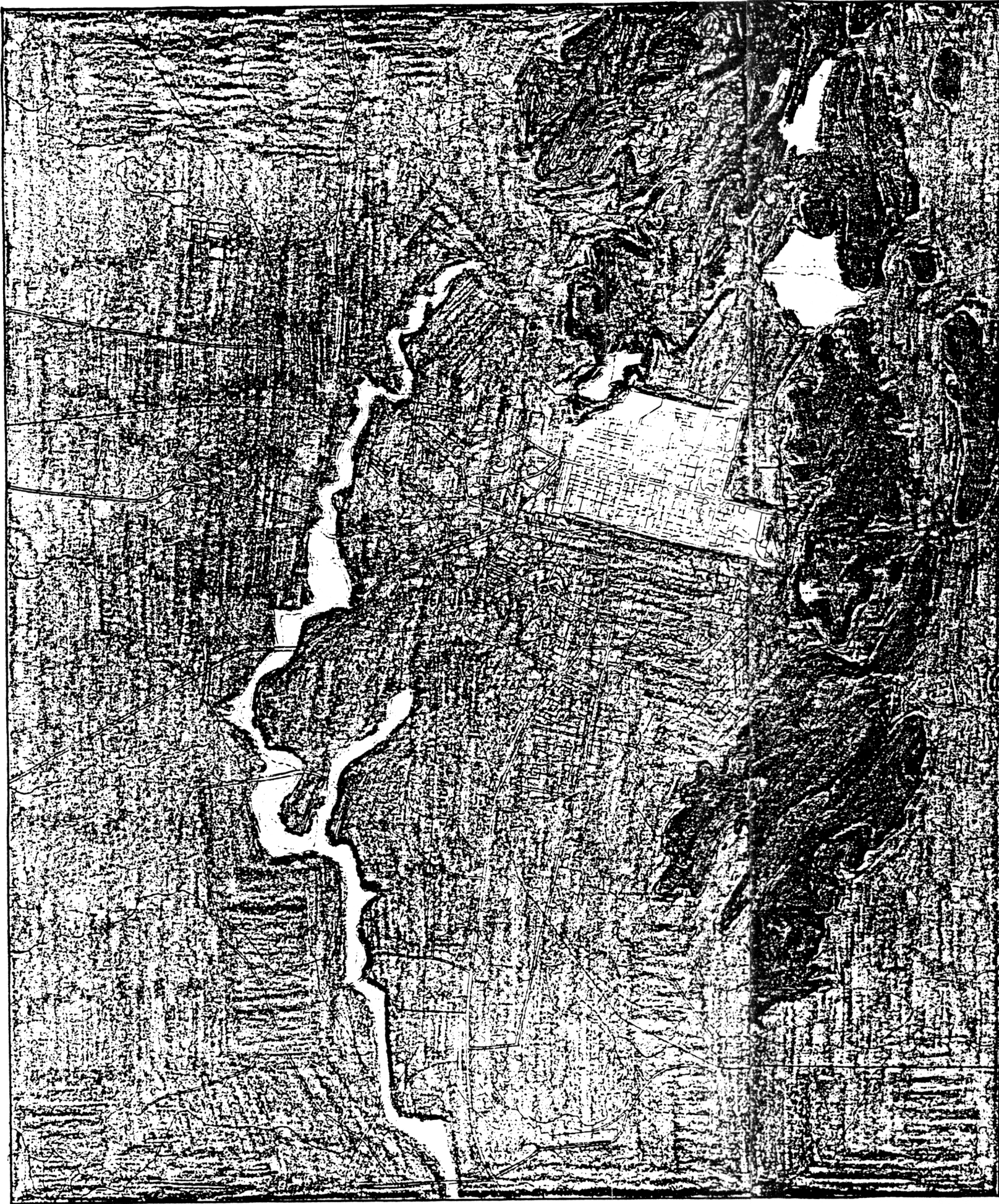
2.5 to 5% grade may be suitable for all activities.

5 to 10% grade suitable for recreation and selected building activities.



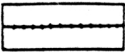



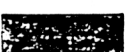


10 to 20% grade suitable only for recreation activity, specifically passive recreation.

Slopes in excess of 12% grade are not suitable for cultivation.

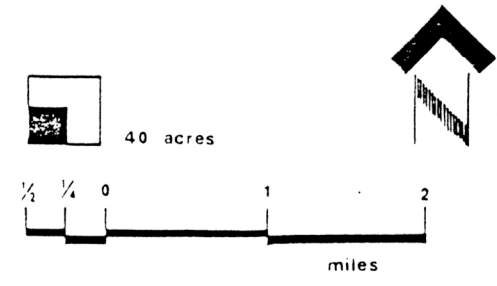
* This analysis has been prepared on the basis of the classification proposed by Ian McHarg, Design with Nature, (New York: The American Museum of Natural History, 1969).



REFERENCES :

-  RIVER
-  CONTOUR INTERVAL 50'
-  RAILWAY LINE
-  ROADS
-  OVER 20%
-  10% TO 20%
-  05% TO 10%
-  2.5% TO 05%
-  00% TO 2.5%

TOPOGRAPHY - SLOPES



DESIGN ELEMENTS AND URBAN FORM

CASE STUDY - JAIPUR, INDIA

KSU DEPARTMENT OF REGIONAL & COMMUNITY PLANNING
KANSAS STATE UNIVERSITY COLLEGE OF ARCHITECTURE AND DESIGN
 Kansas State University

ADVISORS
 PROF. RAY WEISENBURGER
 PROF. CLAUDE A. KEITHLEY
 PROF. ALTON A. BARNES

BY BHARAT BHUSHANI FALL 1985

above 20% grade is not suitable for any activity except may be for passive recreation.

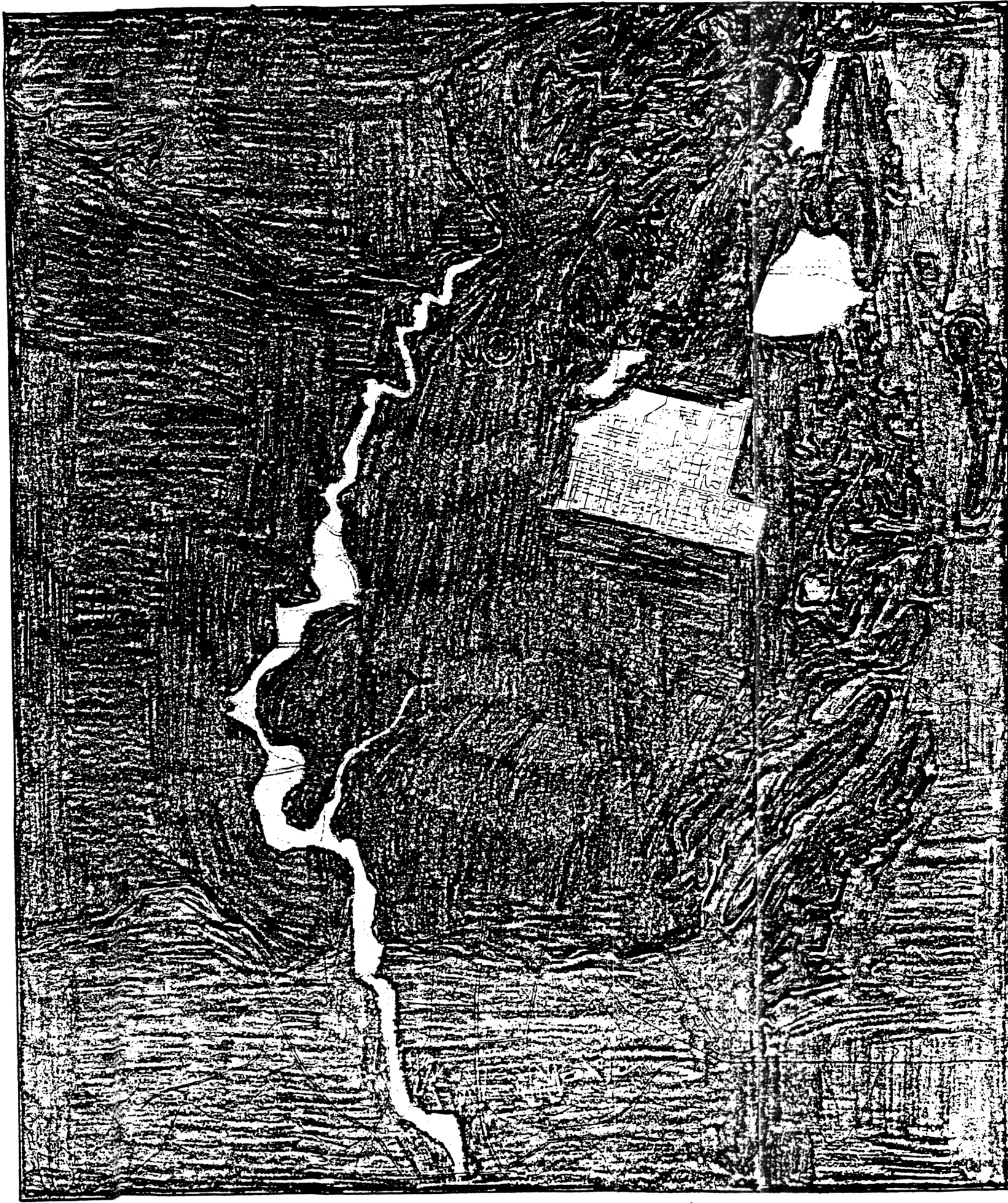
Jaipur city was developed on the flat-land, having a gentle slope i.e. 0 - 2.5% grade from north to south side. On the north and north east side of the city, due to Aravali ranges, the slope varies from 5 to 20% grade.

RELIEF:



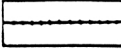



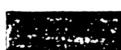



The difference between the maximum and minimum altitudes in a given area as physically measured or as determined from a contour map can be defined as relief. Contours are by far the most common and satisfactory means of showing relief, and are denoted by the heights above the sea level. Higher elevations are exposed to greater action of atmospheric agencies, particularly solar radiation and air movement.

Implications for Use in Jaipur

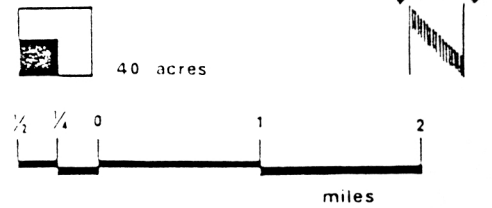
Elevation	Suitability for development
Above 1900 ft.	Least
1900 - 1750 ft	
1750 - 1600 ft.	
1600 - 1450 ft.	
1450 - 1300 ft	
Below 1300 ft.	Most



REFERENCES :

-  RIVER
-  CONTOUR INTERVAL 50'
-  RAILWAY LINE
-  ROADS
-  ABOVE 1900 FT.
-  1750 FT. TO 1900 FT.
-  1600 FT. TO 1750 FT.
-  1450 FT. TO 1600 FT.
-  1300 FT. TO 1450 FT.
-  BELOW 1300 FT.

TOPOGRAPHY - RELIEF



DESIGN ELEMENTS AND URBAN FORM

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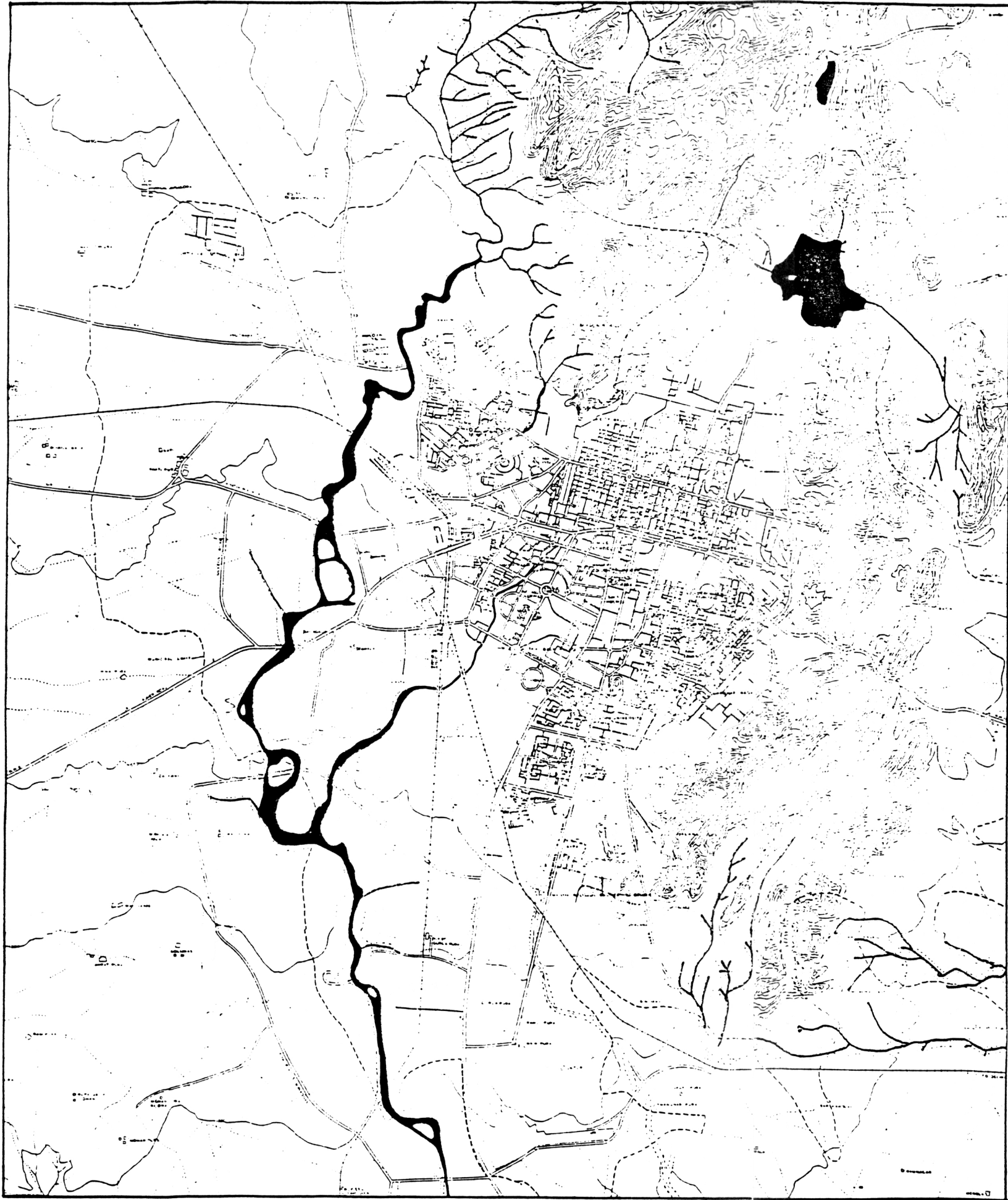
Jaipur city is developed between 1300 ft -1450 ft elevation, and is surrounded by the Aravali ranges, which vary in height from 1450 ft to above 1900 ft and above.

SURFACE WATER DRAINAGE PATTERNS:

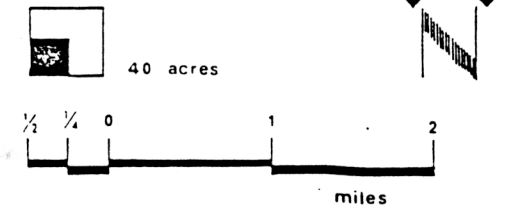
The drainage patterns on a site may greatly influence the development. All water bodies, rivers, streams and drainage channels must be traced diagrammatically in order to be assayed and used advantageously. Hydrographic features have a bearing on relating activities to the land and they are of primary importance in developing a system for site drainage that makes use of existing watershed drainage patterns.



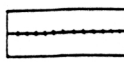

Smaller streams merge into larger ones and discharge flows into Amanisha river or one of the water bodies in Jaipur. The major stream channels and water bodies need to be protected for the purpose of recreation, pollution and flooding etc.

River Amanisha floods every year. Flood plains are hazardous areas, where development should be prohibited.



DRAINAGE PATTERN



- REFERENCES :
-  RIVER
 -  CONTOUR INTERVAL 50'
 -  RAILWAY LINE
 -  ROADS

DESIGN ELEMENTS AND URBAN FORM

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JHARAT BIUSHAZHI

FALL 1985

CHAPTER FIVE

SYNTHESIS OF NATURAL DESIGN ELEMENTS:

In order to determine the areas which qualify as suitable for urban development, a number of criteria are developed -

The land should have slopes not greater than 5%.

It must not be in the 50 year flood plain.

It must not be in high and exposed elevations.

Adequate water supply must be available.

SIEVE ANALYSIS:

On the basis of the analysis of natural design elements - Topography (Landform features, slopes and relief) and surface water drainage, all the maps are superimposed and a detailed analysis is made to delineate the areas most suitable for urban development and areas where development should be prohibited.



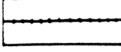


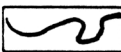

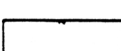
OBSERVATIONS:

The analysis of the natural design elements reveals that, unless corrective measures are taken, existing urban development in Jaipur suffers from, and future growth would be exposed to, the following major problems -

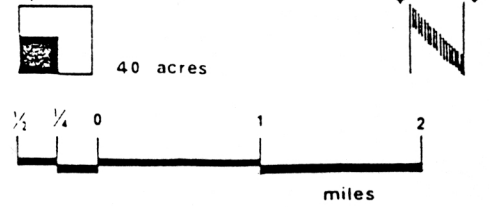
- 1) Intense residential development in the Amanisha river flood plain has been flooding regularly and will continue to flood. Life and property are continually threatened by flood waters.



REFERENCES :

-  RIVER
-  CONTOUR INTERVAL 50'
-  RAILWAY LINE
-  ROADS
-  LANDFORM FEATURES
-  SLOPES
-  RELIEF
-  DRAINAGE PATTERN

SIEVE ANALYSIS



DESIGN ELEMENTS AND URBAN FORM

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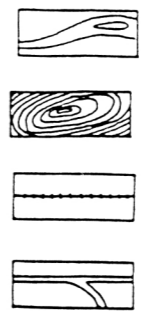
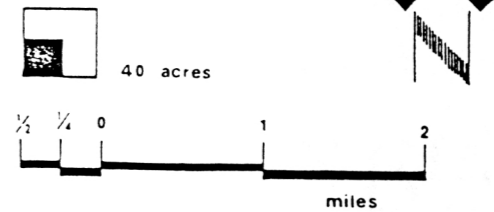
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BHARAT BHUSHATI

FALL 1985



LAND SUITABILITY



RIVER
 CONTOUR INTERVAL 50'
 RAILWAY LINE
 ROADS

REFERENCES :

KSU DEPARTMENT OF REGIONAL & COMMUNITY PLANNING
 KANSAS STATE UNIVERSITY COLLEGE OF ARCHITECTURE AND DESIGN
 KANSAS STATE UNIVERSITY

DESIGN ELEMENTS AND URBAN FORM

CASE STUDY - JAIPUR, INDIA

ADVISORS
 PROF. RAY WEISENBURGER
 PROF. CLAUDE A. KEITHLEY
 PROF. ALTON A. BARNES

BY
 BHARAT BHUSHAN

- 2) The indiscriminate indifferent blanket of development would cover stream channels, reducing ground water recharge as well as creating problems of rain water drainage.
- 3) Untreated industrial waste drains directly into the river and will continue polluting surface and ground waters, ultimately causing deterioration in health of inhabitants of Jaipur.
- 4) Residential development right upto the foothills encroaches upon the areas suitable for recreational use provided by the nature.

PROPOSALS:

As the present analysis of Natural design elements is limited to Topography (Landform features, slopes and relief) and surface water drainage pattern, so the proposals made here are related only to these elements. The other elements such as geology, soils, hydrology, vegetation, wild-life and climate should also be integrated with these elements to prepare the resource base plan. The following proposals are made on the basis of the analysis of above selected natural design elements:

- 1) Residential development should be prohibited in the areas close to river Amanisha.
- 2) Effluent from industries should only be discharged in the drain after proper treatment.

- 3) Inner slopes of the hill ranges running all along the northern and the eastern periphery of the city provide a very pleasant view and landscape towards the city. These areas are covered with green foliage during rainy season and present a very pleasant environment. These areas should be preserved.
- 4) Areas of potential vegetation provided by nature are suitable for recreational use. Those areas should be preserved and should be maintained. Encroachments should be removed.
- 5) Areas along the south and west side of the lake should be developed and tourist facilities should be provided.

The above three recommendations have not evolved from the present study, but they were found to be important on observation.

CHAPTER SIX

ANALYSIS OF MAN-MADE DESIGN ELEMENTS:

A city is a multipurpose, shifting organization, a tent for many functions, raised by many hands and with relative speed. The form of the city must be somewhat noncommittal and plastic to the purposes and perceptions of the citizens as complete specialization and final meshing, is improbable and undesirable.

Within the city lie many connotations, memories, experiences, smells, hopes, crowds, places, buildings, the drama of life and death affecting each person according to his particular predilections. From his environment each person constructs his own mental picture of the parts of the city in physical relationship to one another. The most essential parts of an individual's mental image or map overlap and complement those of his fellows. Hence we can assume a collective image map or impressions map of a city: a collective picture, what people extract from the physical reality of a city. The extracted picture is the "Image of the City".

Kevin Lynch's image survey whatever its limitations, does confirm that in the course of time, a great many people become explicitly aware of many of the significant cohesive linkages and urban indicators, characterized in his study by the identifiable - Paths, Districts, Edges, Nodes and Landmarks.

FORMATION OF THE IMAGE:

The creation of the environmental image of a city is a two-way process between the observer and observed. What is seen is based on exterior form, but the interpretation and organization, and how attention is directed in turn affects what is seen. The human organism is highly adaptable and flexible, and different groups may have widely different images of the same outer reality.

Our environmental image is still a fundamental part of our equipment for living, but for most people, it is probably much less vivid and particular today. The environmental image has its original function in permitting purposeful mobility.

Our immediate surroundings, our homes and buildings, the streets, towns and cities, are visual expressions of our way of life. The whole man-made environment carries the visual message of our society and our values; the language of cities is shaped by our beliefs and what we hold dear. Yet everyone has different reactions and most people see things in very different ways. Cities are made by people, and the man-made environment marks man. Cities reflect man's joint aspirations and his manipulation of natural surroundings for his own physical comforts.

The analysis of the man-made design elements can be divided in two basic categories.

Visual

Functional

VISUAL ELEMENTS:

The visual study of the city is based on the physical environment. Appearance evaluation is often subjective and difficult to quantify adequately to the extent that general agreement is possible. All the individual objects that we see in an urban scene are elements of urban design. These elements influence the visual pictures, both by their appearance as single objects and by their appearance in juxtaposition with one another.

Visual perception is a function of the eye, which receives messages, and the brain, which translates these messages into an image. There are different meanings given to different images. Nevertheless, the perception of space is physically experienced in much the same way by everyone having the gift of sight. To analyze the visual image of urban environment, it is necessary to look carefully at some of the following elements.

FORM refers to the physical shape of our environment. In turn, it is influenced by how we see and by our relationship to the surroundings, that is, both by our physical and mental points of views. The placement of a building in the environment immediately sets up a relationship with the space around it. The addition of other buildings makes the spatial relations more complex.

SCALE is the relationship between ourselves and our surroundings. It also describes how different parts of the environment relate, such as the buildings in a square or the furnishings in a room. It is directly related to the size of the objects. The size depends on the distance of an object from the

observer, whereas scale denotes relative size. Scale is therefore generally based on the size of the average observer i.e. 5 ft 9 inches.

SPACE is a negative volume and defines form. In a city it is the open area between buildings but it is also a hollow space inside the building which gives a building its form. Both space and scale unconsciously influence our feeling of well-being how we perceive a relationship to the environment and or how we react to the surrounding world.

SEQUENCE is continuity of visual change. Spaces are experienced by persons moving through them. The observer, in analyzing existing spaces, may find a planned sequence to be a very strong organizational device. Sequence may create motion, a specific mood, or give direction. Each element in a sequence should lead to the next without necessarily revealing it.

LIGHT and SHADOW define the visual world. Without light we see nothing. Light changes colors and colors in turn alter the light, and with it our visual environment changes.

COLOR and TEXTURE are surface qualities of materials. But texture also establishes scale and helps to define form. Color often changes the whole picture and it can also create a stimulating or depressing mood.

FUNCTIONAL ELEMENTS:

The functional problems of the city, the way the city works and the form of the city are all related. The design of these

relationships can bring greater satisfaction to the users of the city and make the city an exciting and stimulated place to be. Certainly parts of many cities today are wretched places to live, yet the cities seem to function and support the residents in their grim existence.

Every culture has its own definition of urban form because the concept is tied to the culture's idea on the nature and function of the city. The city is the product of society, and as the society changes, so will the nature of its cities.

The evolution of the city aims at the assessment of the development of the same from its prime condition to its present state. This is considered to be from all fronts, from physical growth to other forms of growth such as economical, social and political. There are fundamental functions of which the city forms may be expressive: major landuses, key public spaces and road net work.

LANDUSES:

Buildings are to cities what bricks and stones are to architecture. Like a building, the city is made of bits and pieces, and whether or not it is artful depends upon the arrangement of the pieces as much as the quality of the pieces themselves. Again like a building, the quality of the city is dependent upon the details, the quality of individual elements and as a whole. These elements may be defined as activities or landuses. Decisions concerning the location of activities are loosely controlled by the government in democratic society to prevent harmful impacts of particular landuses.

PUBLIC SPACES:

An astonishing amount of urban fabric is made up of public spaces. Each culture has produced its own version of a primary public space. The public spaces were used for religious gatherings or market place. In some cities these public spaces are called SQUARES which are little more than a wider part of the street, while in others the squares were developed as a separate, lateral extension of the street. The geometry of the public space is a major determinant of urban form.

ROAD NETWORK:

Movement systems have always been a primary factor in determining urban form. Since movement systems, or rights-of-way, are usually public they not only create the channels along which different kinds of traffic flow, but they also serve to distinguish between the space which is public and that which is private.

On the basis of the above identified man-made elements, (visual and functional) an analysis has been made on the case study area: Jaipur, to show the importance and influence of these elements on the urban form of Jaipur.

APPLICATION OF MAN-MADE DESIGN ELEMENTS ON JAIPUR:

JAIPUR: THE PINK CITY:

The city of Jaipur has always been a planner's dream come true. Ever since Vidyadhar planned this now famous Pink city in second quarter of the 18th century and King Jai Singh laid the foundations of the grandeur of this town, Jaipur has been referred to as a masterpiece in the art and science of urban planning.

The city is located in a dark green forested valley guarded by fiercely austere hill forts. This was Jaipur at the time of its birth in the eighteenth century, and still today, the walled city with its fountains, gardens, wide and ordered shopping squares, palace and observatory conjure up the image.

MAKING THE CITY:

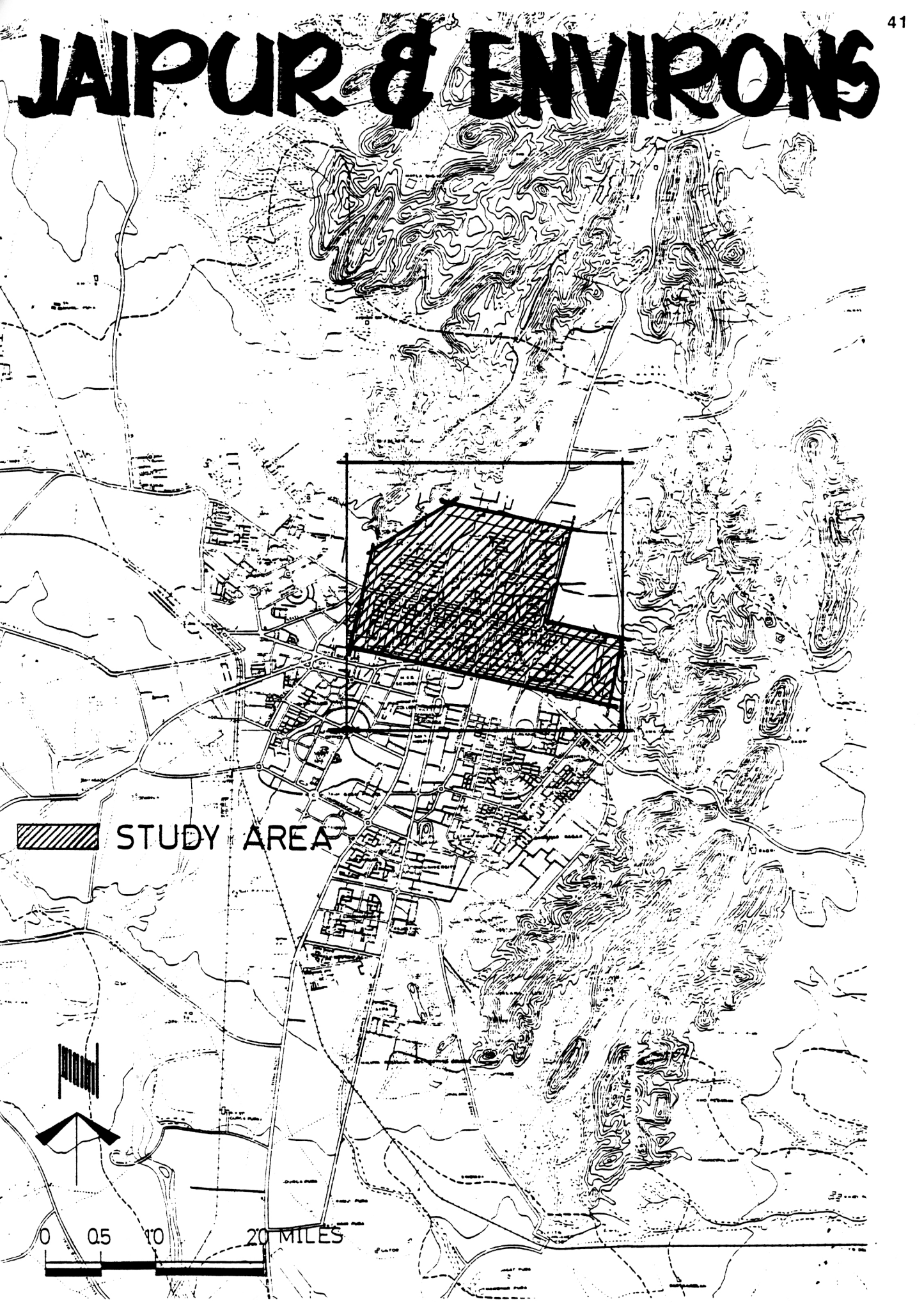
Sawai Jai Singh (fonder King of Jaipur) was an extraordinary man of his time. Able statesman and politician, enthusiastic astronomer and builder, he lived through troubled times during the Moghul Empire. Not being a man of the sword, he withdrew more and more to devote his time to contemplation and architecture.


One of the favorite hunting grounds of his youth was the valley to the south of Amber which extends from a narrow pass near the old village kingdom into a V-shaped stretch of wooded hills. This site surrounded by hills, was easily protected by strategic forts and therefore seemed an ideal position for a new dream city.

THE CONCEPT:

The concept of the city seems to be based on the notion of the nine squares of the Universe¹ or as some believe, on the directions of the ancient Hindu Shilapashastras² (texts on the social and religious hierarchy of village planning and the relationships of various quarters of different castes). The nine squares which appear in early conceptual drawings were changed but in implementation. Site constraints and position of existing structures resulted in the repositioning of one of the square blocks from the North-West corner

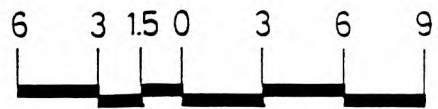
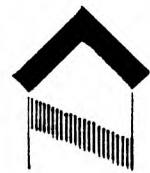
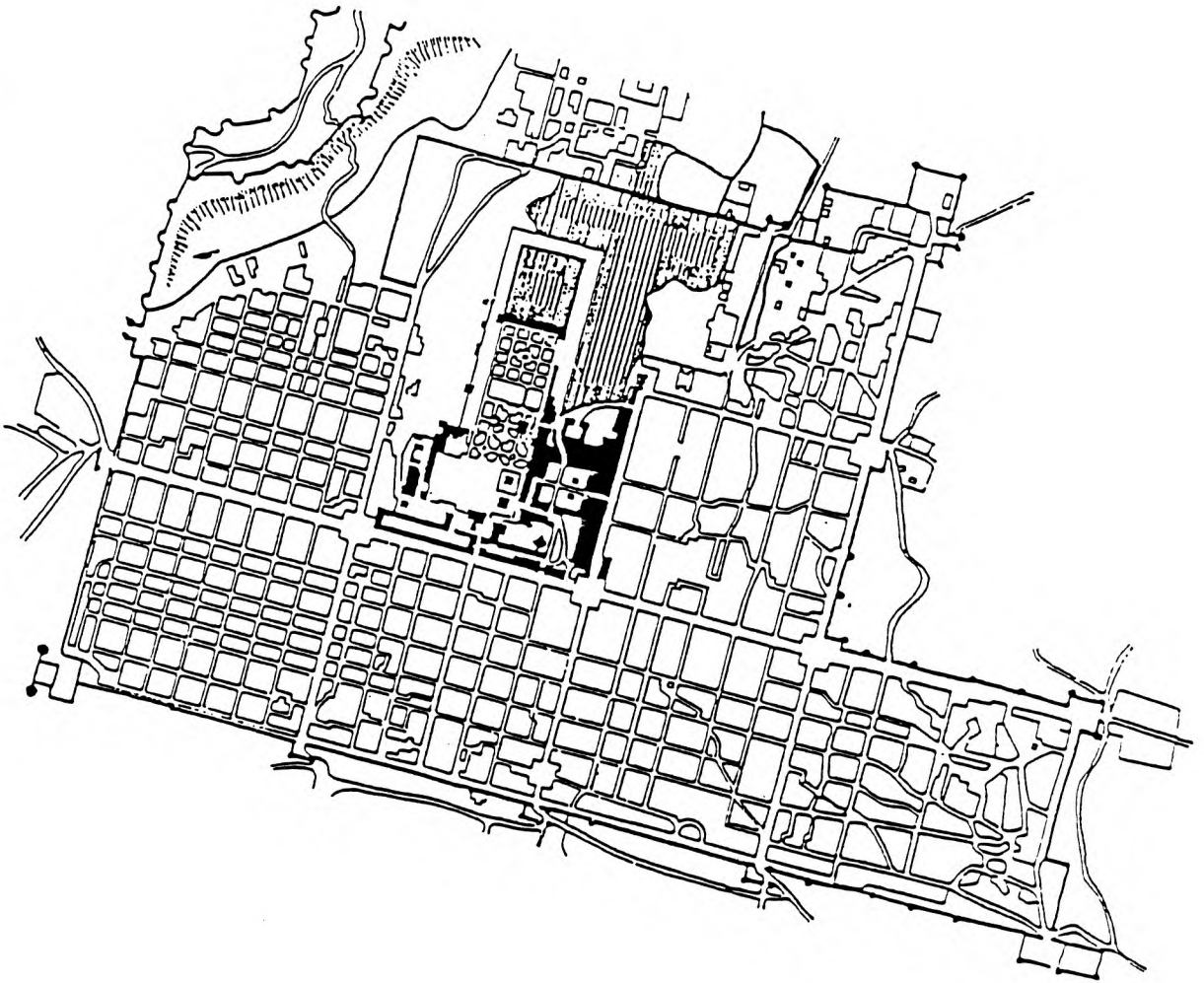
JAIPUR & ENVIRONS



 STUDY AREA



0 0.5 1.0 2.0 MILES



('000 FEET)

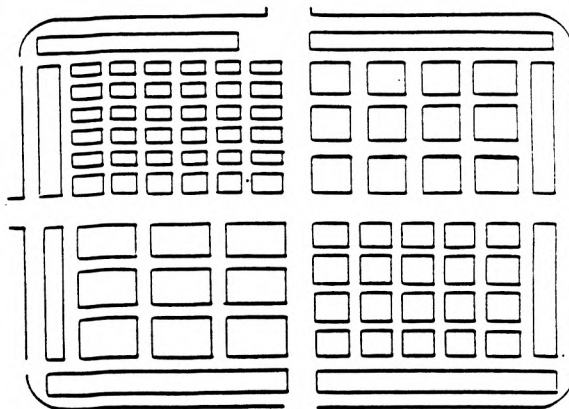
JAI PUR

PLAN WALLED CITY

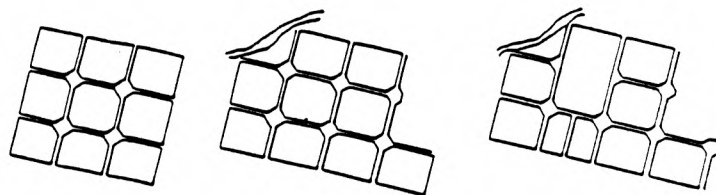
to the East, to encompass an existing village. The plan was also rotated by 15 degrees on the North-South axis to accommodate a natural ridge. This deviation has several advantages, the significant ones being, a) persons moving in the morning and evening hours do not have to face the low angle sun directly; b) It allows the early morning sun in winter which is welcome to penetrate the city and rightly avoids the evening sun in summer on buildings and; c) The angle is conducive to the wind direction for blowing in the streets.

Essentially the city's structure could be described as a grid-iron, based on the orthogonal clustering of nine squares. The major East-West road and three North-West roads divide the city into 7 distinct sectors. One of them where the palace precincts including administrative offices and the observatory occur, is twice the average sector area. The sector to the South of the palace was divided into two parts by introducing a North-South road in the late nineteenth century.

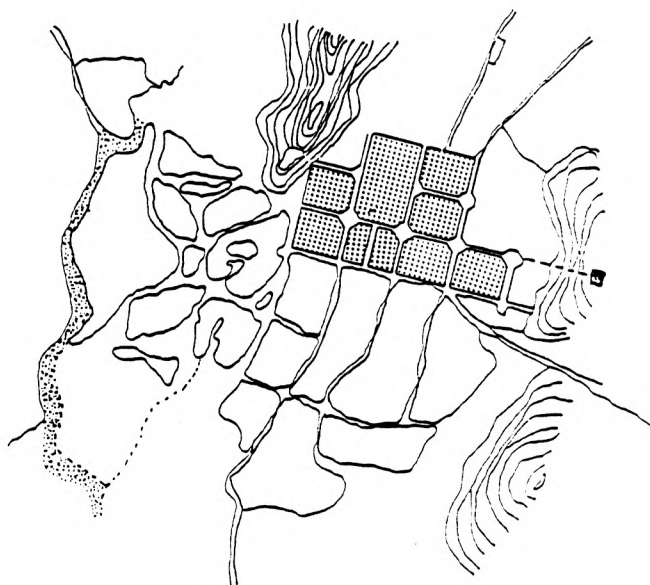
The city was built in a great hurry with limited resources. It was built of rubble and stone, rendered and painted pink to resemble local sandstone. The order and general image of the city was established by controlling all the main elements and linking spaces: not only the castellated city wall, palace complex and parks but also the main public commercial spaces.



CONCEPTUAL SECTOR PLAN



EVOLUTION OF THE NINE SQUARES



THE SETTING

VISUAL ANALYSIS:

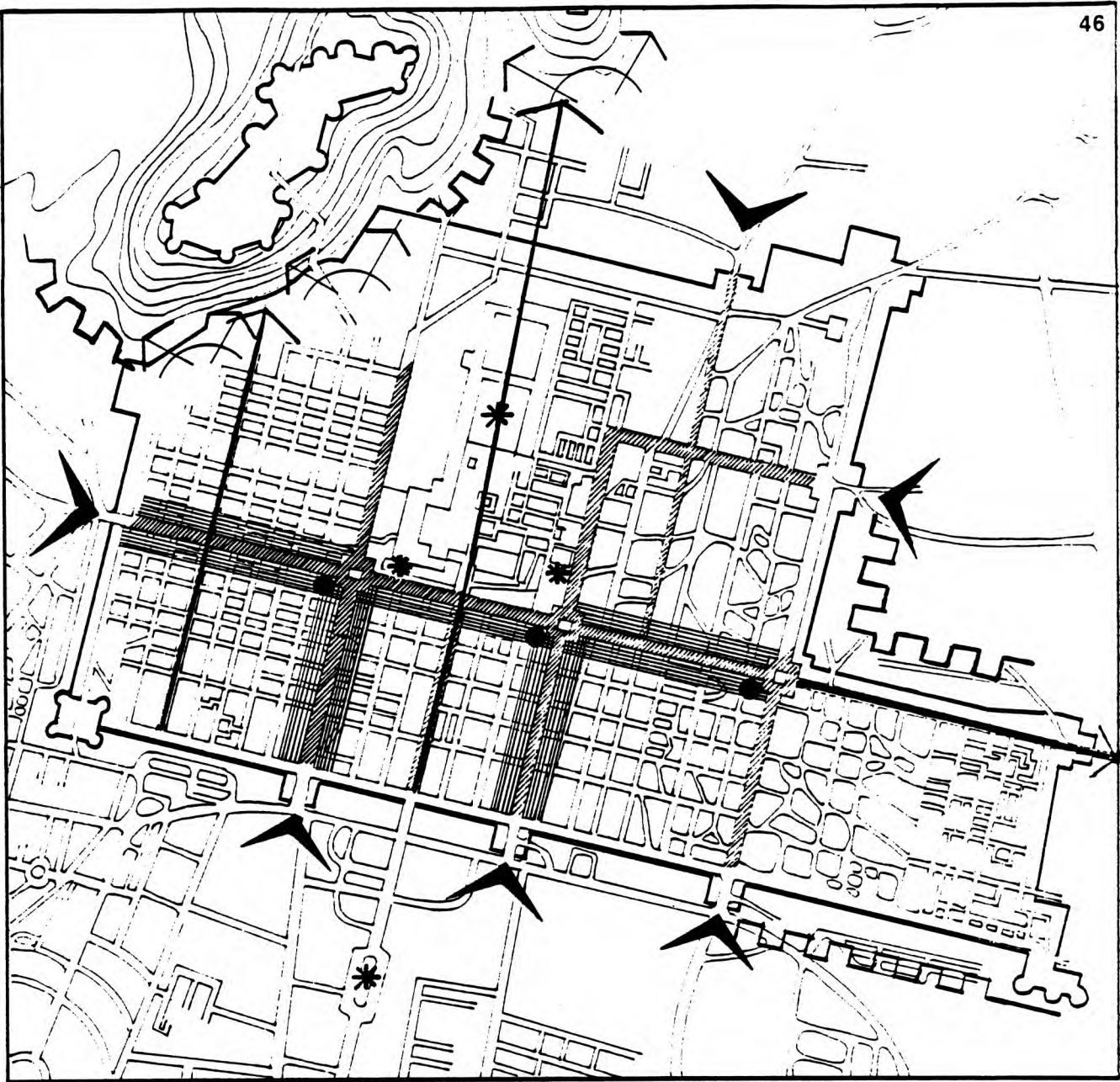
The visual analysis of the city is based on the image elements - paths, nodes, districts, edges and landmarks as identified by Kevin Lynch, in his book "The Image of the City".* These elements are found to be easy in analyzing the image of the Jaipur city. In his list of elements, two more elements are added i.e. entrances, views and vistas as these also seem to be important in the formation of the image. A further analysis is made of form qualities.




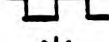


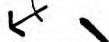

PATHS: Paths are the channels along which the observer customarily, occasionally, or potentially moves. They may be streets, walkways transit lines etc. People observe the city while moving through it.

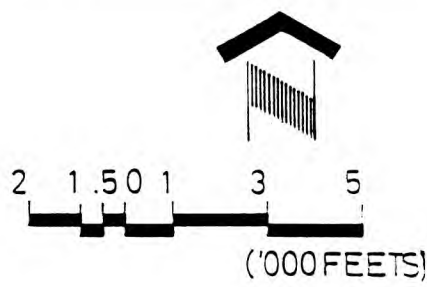
The paths in Jaipur city are divided into two major categories -

Commercial streets; meant for the major traffic. The width of the street was governed on the basis that six elephants could move together side by side, during the processions. The commercial streets are well defined and geometrically laid out. The space volume opens up in stepped formation as the height increases and this does not give the feeling of enclosure. There was strict architectural control on the lower level i.e. the shopping arcades with terraces above were at uniform height, while there was freedom on upper floors regarding the openings, projections and balconies.

* Kevin Lynch, The Image of the City, Cambridge, Ma.: The MIT Press, 1970.



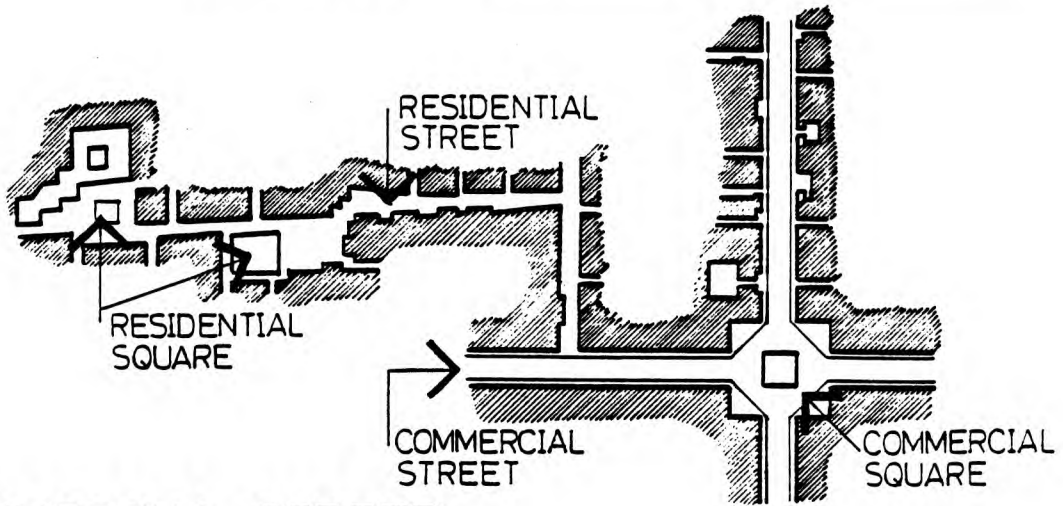
-  PATHS
-  NODES
-  DISTRICTS
-  EDGES
-  LANDMARKS
-  ENTRANCES
-  VIEW
-  VISTA



JAIPUR VISUAL ANALYSIS

PATHS

A VIEW OF
COMM. STREET



COMMERCIAL STREET :

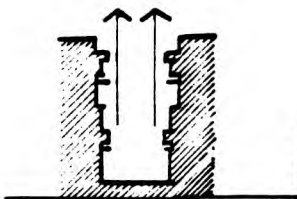
- MEANT FOR VEHICULAR TRAFFIC
- WELL DEFINED GEOMETRICAL LAYOUT
- THE SPACE VOLUME OPENS UP IN STEPPED FORMATION AS HEIGHT INCREASES
- ARCHITECTURAL CONTROL ON LOWER LEVEL WITH COMPLETE FREEDOM ON UPPER FLOORS WITH THE FORMATION OF OPENINGS PROJECTIONS AND BALCONIES
- HEIGHT USUALLY THREE TO FOUR STOREYS



SECTION THROUGH
COMMERCIAL STREET

RESIDENTIAL STREET :

- MEANT FOR PEDESTRIANS
- SPACE VOLUME VERTICALLY DEFINED
- FREEDOM OF ARCHITECTURAL CONTROL
- THERE IS A FEELING OF ENCLOSURE AROSE FROM THE NECESSITY TO KEEP OUT THE SUN AND HOT WINDS
- HEIGHT USUALLY TWO - THREE STOREYS

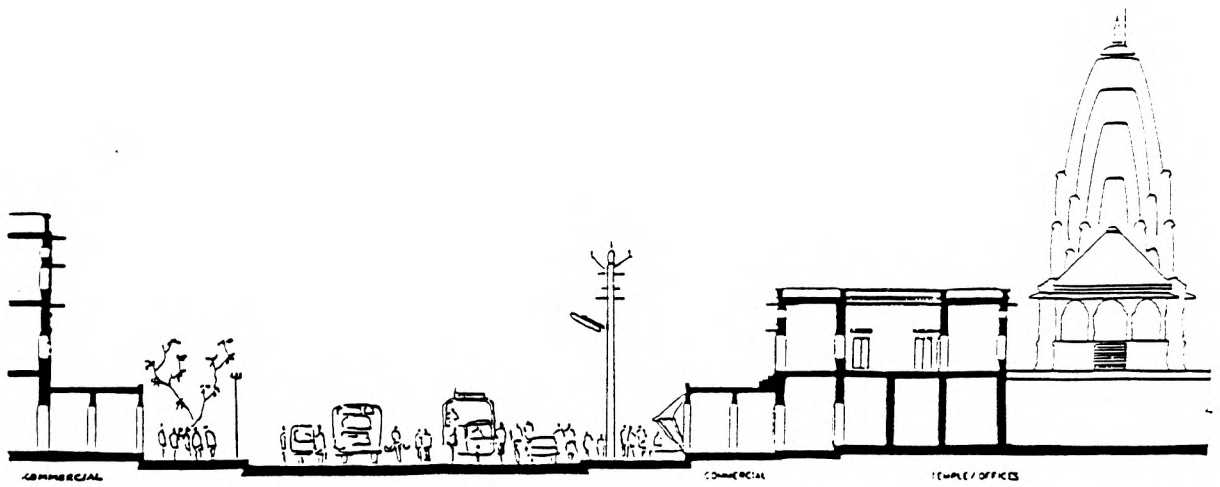


SECTION THROUGH
RESIDENTIAL STREET

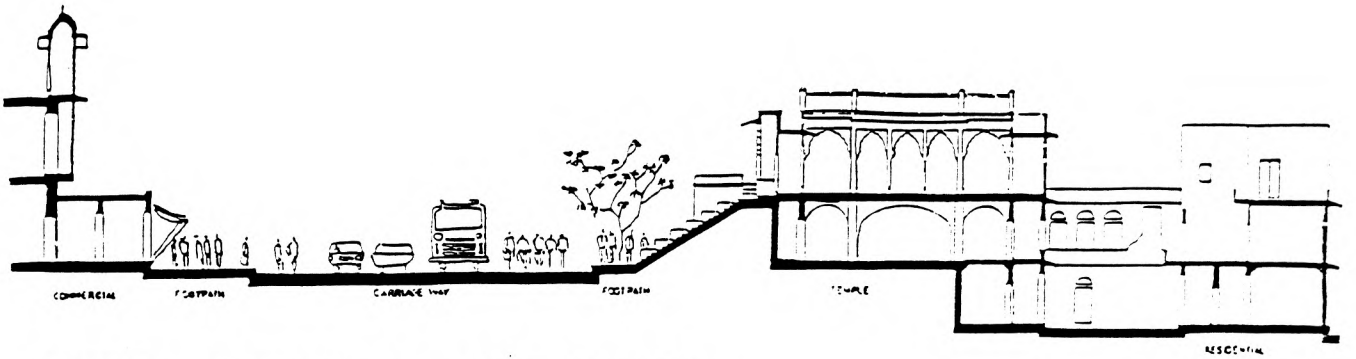


A VIEW OF RES. STREET

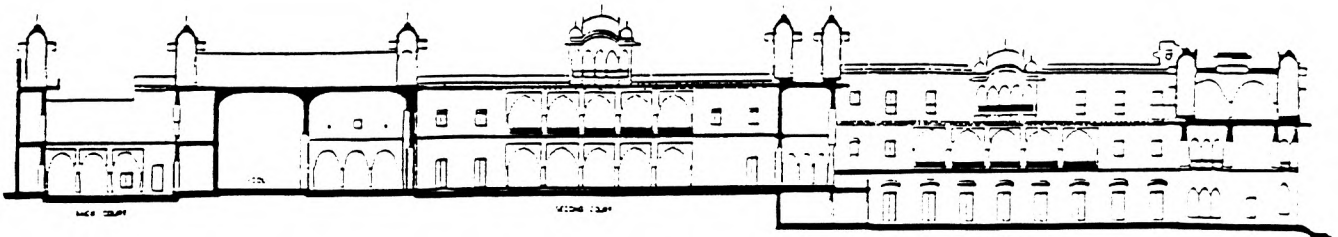
SECTIONS



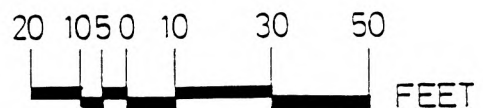
SECTION THROUGH MARKET STREET



SECTION THROUGH MARKET STREET



SECTION THROUGH PALACE COMPLEX



RESIDENTIAL



STREETS



SQUARES



Residential Streets; were meant for pedestrian movement. The width of the street is not defined and varies from sector to sector, but volume of space is well defined vertically, and gives a feeling of enclosure with the freedom of architectural control. The vertical building blocks, keeps out the summer sun and hot winds.

EDGES: Edges are the linear elements. They are the boundaries between two phases, linear breaks in continuity, walls, edges of development, railroad cuts, major roads or highways etc.

Jaipur city is surrounded by a V-shaped ridge that runs from north-west to South-East and encloses the city from three sides. This is a natural barrier. The city is also enclosed by a strong stone wall, eight feet high. The wall and the natural ridge are not only visually prominent but also continuous in form and impenetrable to cross movement.

DISTRICTS: Districts are the medium to large sections of the city, conceived of having two dimensional extent, which the observer mentally enters "inside of" and which are recognizable as having some common identifying character.

The districts in Jaipur city can be divided into two categories -

Commercial - The markets consist of shops and arcades at the lower level and an elevated walkway at upper for watching processions of festivals and other occasions. Along the commercial spine, formal shopping activity takes place which is largely dictated by the presence of a continuous arcade that runs the entire stretch of the

DISTRICTS

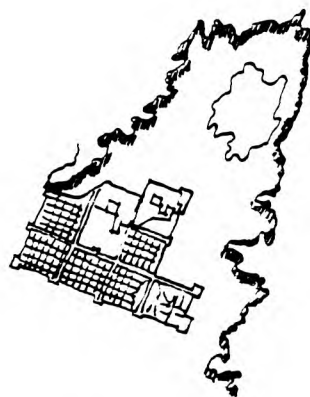


- THE BAZAARS CONSIST OF SHOPS AND ARCADES AT THE LOWER LEVEL AND AN ELEVATED WALKWAY AT UPPER LEVEL FOR WATCHING PROCESSIONS OF FESTIVALS AND OTHER OCCASIONS.
- ALONG THE COMMERCIAL SPINE FORMAL SHOPPING ACTIVITY TAKES PLACE WHICH IS LARGELY DICTATED BY THE PRESENCE OF A CONTINUOUS ARCADE THAT RUNS THE ENTIRE STRETCH OF THE SPINE
- INFORMAL SHOPPING IS ALSO VERY POPULAR IN THE CITY AND IS MAINLY CONCENTRATED ON FOOTPATHS AND SQUARES.

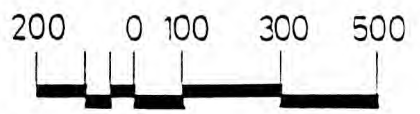
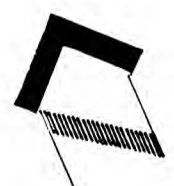
EDGES

THE CITY WALL AND RIDGE

- CITY IS FORTIFIED BY A STRONG STONE WALL WITH BIG GATES.
- A V-SHAPED RIDGE RUNS FROM NORTH-WEST TO SOUTH-EAST ENCLOSE THE CITY FROM THREE SIDES.



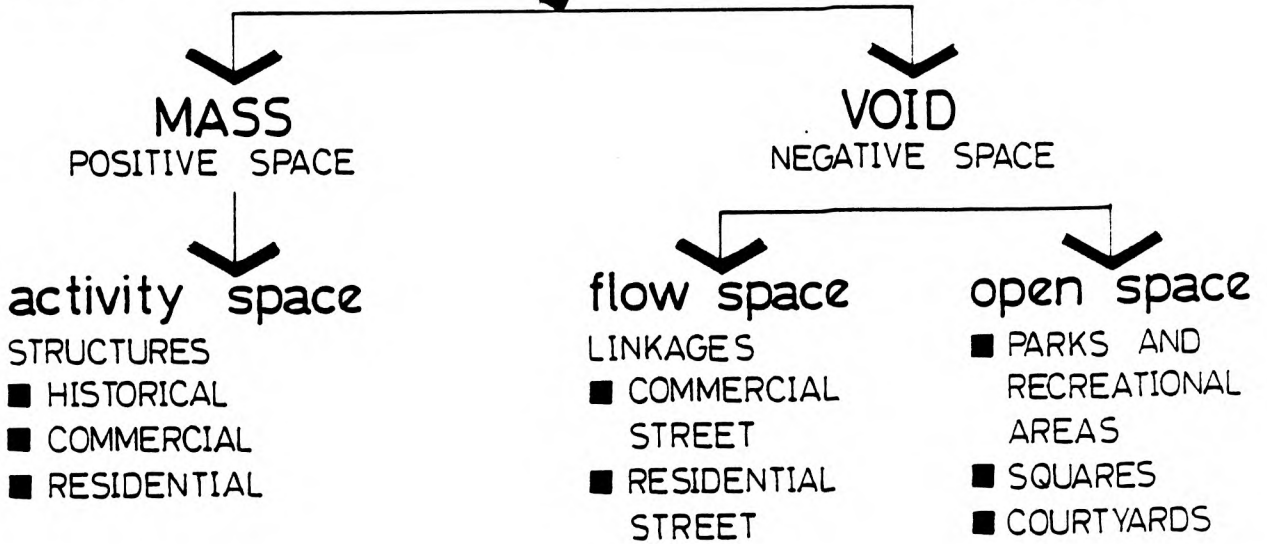
THE WALL AND THE NATURAL RIDGE ARE NOT ONLY VISUALLY PROMINENT BUT ALSO CONTINUOUS IN FORM AND IMPENETRABLE TO CROSS MOVEMENT.



FEET

SECTOR PLAN

MASS & VOID



THE RELATIONSHIP BETWEEN MASS AND VOID SHOWS THAT MORE EMPHASIS WAS GIVEN TO MASS. THE BUILDINGS WERE DESIGNED TO HAVE SOLID APPEARANCE DUE TO HOT AND DRY CLIMATE.

spine. Informal shopping is also very popular in the city and is mainly concentrated on side walks and squares.

Residential - The residential districts were developed in conformity with the guidelines of the Shilpa-shastra. Different groups of traders and craftsmen, as well as caste groups like Brahmins, Kshatriyas and Vaishyas resided in different zones. Brahmins thus were allotted areas in the North, Kshatriyas in East, Vaishyas in South and the Sudras (artisans) in the West.

NODES: nodes are points, the strategic spots in a city into which an observer can enter. They may be primarily junctions, places of a break in transportation, a crossing or convergence of paths etc.

In Jaipur, the most distinguishing features in the entire urban fabric are the squares, which are created by planning the intersections along the East-West road with the three North-South roads. The markets entered through the main gateways in the city wall, culminate at the squares with large pools and fountains, resting places, where people gather.

These squares are a kind of hole in the texture of the city and are used for, a) Informal shopping, b) Parking c) Traffic roundabout and, d) Gathering place for social and religious functions.

LANDMARKS: Landmarks are another type of reference points. They are usually a rather simply defined physical objects: building, sign, store or mountain. Their use involves the singling out of one element from a host of possibilities.

There are many buildings built in Jaipur in eighteenth century which are famous for their architectural style and act as a

NODES

SQUARES

THE BAZAAR (ROW OF SHOPS) ENTERED THROUGH THE MAIN GATEWAYS IN THE CITY WALL, CULMINATED AT THE SQUARES WITH LARGE POOLS AND FOUNTAINS, RESTING PLACES WHERE PEOPLE GATHERED. TOGETHER BAZAARS AND SQUARES FORMED THE PUBLIC SPACE OF THE CITY.

THESE SQUARES ACTS AS A KIND OF HOLE IN THE TEXTURE OF THE CITY AND ARE USED FOR

- COMMERCIAL THE INFORMAL SHOPPING
- PARKING PLACE FOR CARS TONGAS AND RICKSHAS.
- TRAFFIC ROUND ABOUT
- GATHERING PLACE FOR SOCIAL AND RELIGIOUS FUNCTIONS.



ENTRANCES

THERE ARE SEVEN ENTRANCES TO THE CITY EACH MARKED WITH A MASSIVE GATE WITH ARCHES AND DOMES. THE CHARACTER OF THE CITY IS REFLECTED AS SOON AS ONE ENTERS ANY OF THESE GATES.

THE GATES



landmark now. Some of the famous buildings are -

CITY PALACE, built in the early eighteenth century, is a seven storeyed pyramidal structure. It is surrounded by gardens, ponds and a lake. It was built as a residence of the King and is currently used as a museum.

OBSERVATORY: is part of the palace complex. It has a collection of very large instruments, built in masonry and brass for observation and measurement of solar time and the position and height of other planets.

PALACE OF WINDS (HAWA MAHAL): was constructed for royal ladies, who seated in its windows could witness the processions on the main street below, without being seen. Thousands of openings and perforations were made to catch every little breeze in the hot summer days.

MUSEUM: was built in nineteenth century as a palace, later on converted into the museum.

ENTRANCES: Entrances are important elements as they form the image about a place when one enters. The entrances may be symbolized by gates and one enters through them non-symbolic and unnoticeable.

In Jaipur, the entrances are very strong in character and symbolized by massive gates with arches and domes.

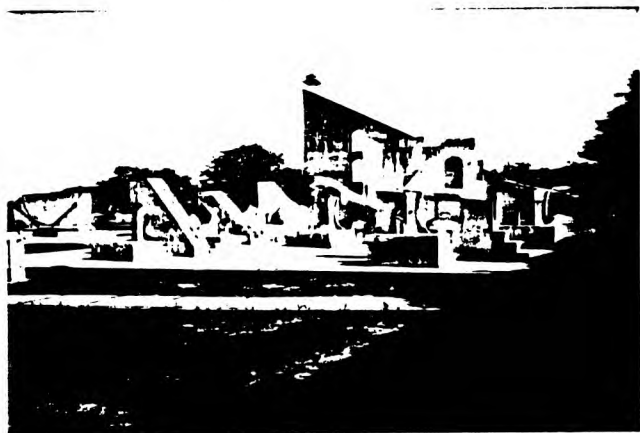
VIEWS AND VISTAS:

Views on a site may be pleasing or objectionable. They may bear heavily on the orientation of the building. Views are framed, open, enclosed, filtered or screened. A vista may be natural or

LANDMARKS

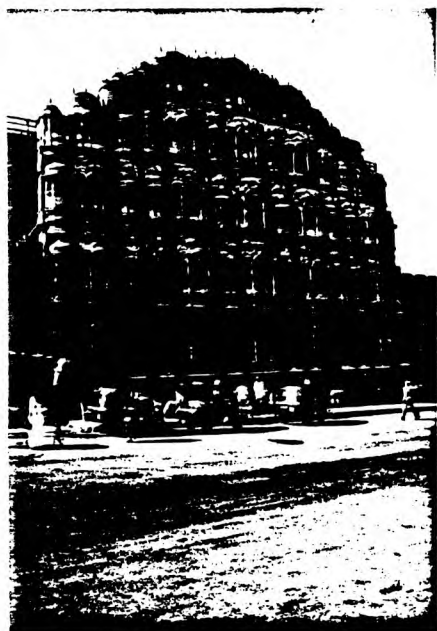
■ CITY PALACE

THE CITY PALACE, BUILT IN THE EARLY EIGHTEENTH CENTURY, IS A SEVEN STORYED PYRAMIDICAL STRUCTURE. IT IS SURROUNDED BY GARDENS, PONDS AND LAKE



■ OBSERVATORY

IT FORMS PART OF THE PALACE COMPLEX, HAS A COLLECTION OF VERY LARGE INSTRUMENTS, BUILT IN MASONRY AND BRASS FOR OBSERVATION AND MEASUREMENT OF SOLAR TIME AND THE POSITION AND HEIGHT OF OTHER PLANETS



■ PALACE OF WINDS

IT WAS CONSTRUCTED FOR ROYAL LADIES WHO SEATED IN ITS WINDOWS COULD WITNESS THE PROCESSIONS ON THE MAIN STREET BELOW, WITHOUT BEING SEEN. THOUSANDS OF OPENINGS AND PERFORATIONS WERE MADE TO CATCH EVERY LITTLE BREEZE IN THE HOT SUMMER DAYS.

■ MUSEUM

BUILT IN NINETEENTH CENTURY AS A PALACE LATER ON CONVERTED IN TO THE MUSEUM.



completely man-made view. It has a dominant focal point or terminus that is strongly emphasized and is enframed and balanced by minor elements. The open space or line of sight of the vista is a strongly directional element leading the observer toward the focal point.

The location of fort, temples and monuments on the top of hills provides very pleasing view and vistas. As one moves through the major streets in Jaipur, these views are the point of orientation.

DETAILS: There are certain elements, which are individually important and when combined with other elements form an image of the city. These elements may be the building materials used, the color of the buildings or the typical elements used in the buildings such as domes, balconies, brackets etc. All the above elements when combined together, form a style. The study of these elements in detail is necessary to analyze the image of the city.

Following are the elements most commonly used in the buildings in Jaipur -

Elements - On the roadside in Jaipur, sometimes one will see domes. Although each dome is different with regard to design, condition, setting, distance, visibility etc, its constant appearance around the city provides a continuity in the movement. These domes are located at the corner of the squares, gates and on the other buildings.

Projecting balconies and canopies, supported by brackets cause an intense play of light and shadow. Considering the extreme climate of the region, this play of light and shadow has great

DETAILS

BUILDING MATERIAL

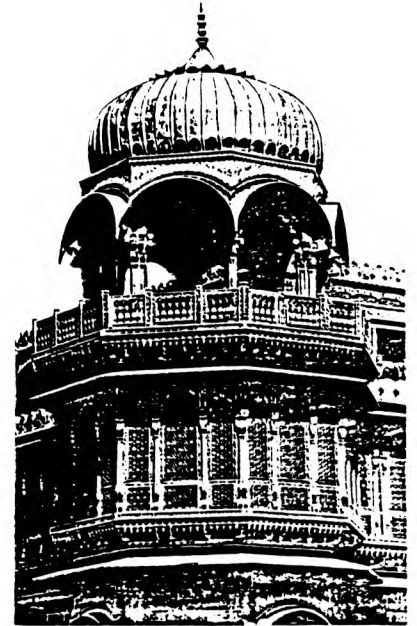
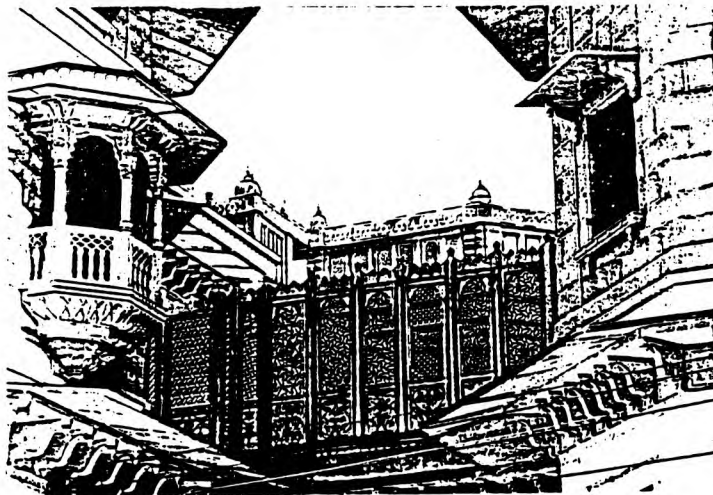
STONE WAS USED BOTH AS STRUCTURAL AND NON STRUCTURAL ELEMENT IN - ROOFS, COLUMNS, WALLS, BRACKETS, CANOPIES, RAILINGS AND SCREENS.

COLOR

JAIPUR IS KNOWN AS PINK CITY. PINK COLOR WAS USED TO RESEMBLE LOCAL SAND STONE AND TO REDUCE GLARE

ELEMENTS

COMMON USE OF DOMES AT THE CORNER OF SQUARES GATES AND OTHER BUILDINGS
FINELY CARVED SCREENS USED FOR AIR LIGHT AND PRIVACY.



PROJECTING BALCONIES AND CANOPIES, SUPPORTED BY BRACKETS, CAUSE AN INTENSE PLAY OF LIGHT AND SHADE.

CONSIDERING THE EXTREME CLIMATE OF THE REGION THIS PLAY OF LIGHT AND SHADE HAS GREAT ADVANTAGE IN REDUCING TEMPERATURE WITHIN THE BUILDINGS BY ELIMINATING DIRECT SUN LIGHT.

TRAFFIC

PEDESTRIAN:

- HIGH DENSITY OF POPULATION IN THE WALLED CITY GENERATES HEAVY PEDESTRIAN MOVEMENT
- THE RESIDENTIAL LANES ARE NARROW AND PROVIDES EASY MOVEMENT FOR PEDESTRIAN
- PEDESTRIAN TRAFFIC IS SLOW MOVING, WALKING LEISURLEY ALONG THE ARCADES AND FOOTPATHS AND IS DISORGANISED.
- CYCLES ARE PREDOMINANT AS THE DISTANCES OF LIVING WORK AND RECREATIONAL AREAS ARE BETWEEN TWO TO FOUR MILES.

A VIEW OF COMMERCIAL STREET —

- HETEROGENEOUS TRAFFIC
- KERB SIDE PARKING TO SUIT CONVENIENCE
- LACK OF ROAD SENSE PARTLY FOSTERED BY LOW INTENSITY OF FAST TRAFFIC.



VEHICULAR:

- THE VEHICULAR TRAFFIC IN JAIPUR CITY IS DOMINATED BY RICKSHAS TEMPOS CARS AND BUSES
- THE COMMERCIAL STREETS ARE HAVING MIXED KIND OF TRAFFIC FROM SLOW TO FAST I.E. FROM CYCLES AND CAMEL CARTS TO CARS AND BUSES
- STREETS AND SQUARES ARE USED FOR SOCIAL INTERACTION, INFORMAL SHOPPING, AND PARKING OF VEHICLES THIS CREATES CHAOS.
- TEMPLES, BUS STOPS, KERB SIDE PARKING, AND INFORMAL SHOPPING REDUCE EFFECTIVE ROAD SPACE.
- SERVICING OF SHOPS IS CARRIED OUT BY THE CAMEL CARTS AND RICKSHAS CREATE PROBLEM IN MOVEMENT.

advantage in reducing temperature within the buildings by eliminating direct sun light.

Finely carved screens are used for air, light and privacy.

Building Material: Stone was used both as structural and non-structural element in - roofs, columns, walls, brackets, canopies, railings and screens.

Color: Jaipur is known as Pink City of India. Pink color was used to resemble local sandstone and to reduce the glare.

FORM QUALITIES:

To heighten the imageability of the urban environment is to facilitate its visual identification and structuring. The elements identified above - paths, nodes, edges, districts, landmarks, entrances and views - vistas are the building blocks in the process of making firm, differentiated structures at the urban scale. The city form can be analyzed by certain general physical characteristics. Jaipur has various form qualities, which may be summarized as follows:

1) **Form Simplicity:** The geometrical form of the walled city - Jaipur is based on grid system. Well defined paths with squares at crossings, provide clarity and simplicity in the plan.

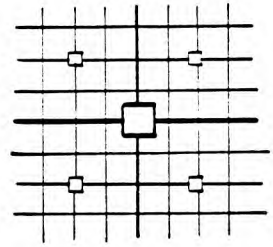
2) **Clarity of Joint:** The city is famous for its squares, which are highly visible. The squares are connecting the major paths, and are the strategic points of the city.

3) **Dominance:** Dominance of palace complex by size, location and height: City Palace, Observatory and Palace of Winds.

FORM QUALITIES ⁶²

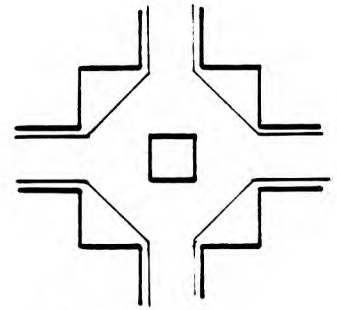
■ SIMPLICITY

NICELY LAIDOUT GRID SYSTEM, WELL DEFINED PATHS WITH SQUARES AT CROSSINGS, PROVIDES CLARITY AND SIMPLICITY IN THE PLAN.



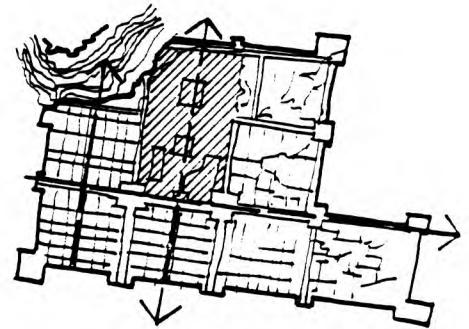
■ CLARITY OF JOINT

HIGH VISIBILITY OF SQUARES, CONNECTING MAJOR PATHS. THESE SQUARES ARE THE STRATEGIC POINTS OF THE CITY.



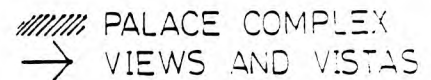
■ DOMINANCE

DOMINANCE OF PALACE COMPLEX BY SIZE LOCATION AND HEIGHT: CITY PALACE OBSERVATORY AND PALACE OF WINDS.



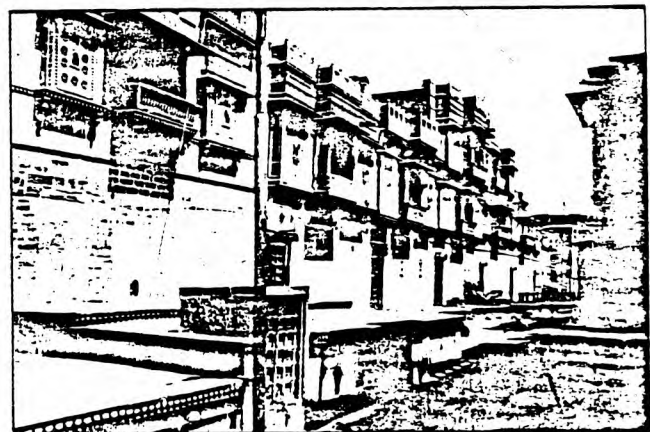
■ VISUAL SCOPE

ALL THE MAJOR PATHS LEAD TO VIEWS AND VISTAS EMPHASIZED BY LANDMARKS FORT PALACES AND TEMPLES.



■ CONTINUITY

PROJECTING BALCONIES USE OF BRACKETS CANOPIES AND FINELY CARVED MARBLE SCREENS PROVIDE CONTINUITY IN THE VISION.



■ NAMES AND MEANINGS

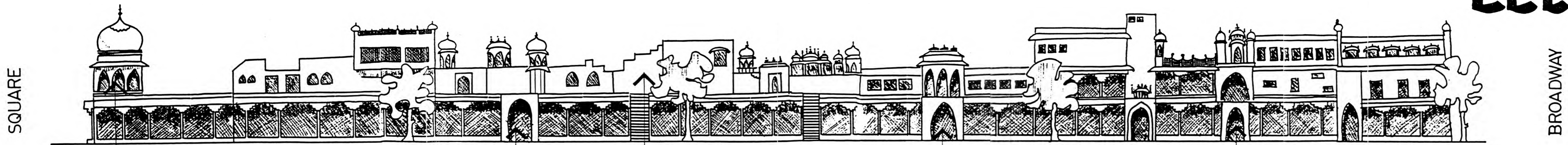
NAMES ARE IMPORTANT IN CRYSTALLIZING IDENTITY NAMING SYSTEM OF ENTRANCE GATES AND RESIDENTIAL AREAS IS ADOPTED TO GIVE LOCATIONAL CLUE - DELHI GATE, AJMERI GATE, SANGANERI GATE (BASED ON CITIES TO WHICH THEY ARE LINKED) CHANDPOLE AND SURAJPOLE (BASED ON SOLAR ORIENTATION)

■ STRONG HORIZONTAL AXIS

■ DEFINED STREET PICTURE

■ HARMONY IS ACHIEVED BY THE REPETITION OF SIMILAR ELEMENTS

STREET ELEVATION



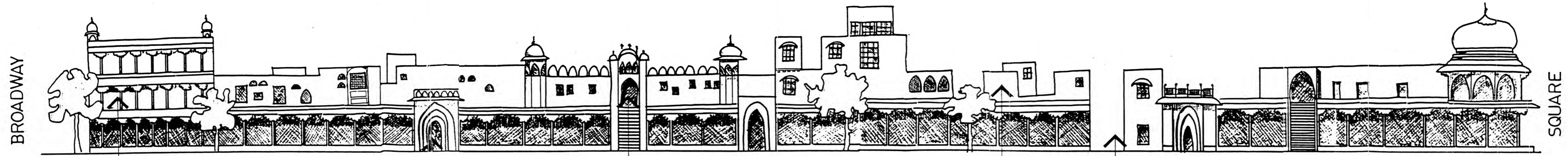
SQUARE IS EMPHASISED BY THE USE OF DOME IN THE CORNER.

ENTRANCE TO RESIDENTIAL AREAS

VARIATION IN HEIGHT DEPICTS LATER ADDITIONS

ENTRANCE TO RESIDENTIAL AREAS

ENTRANCE TO TEMPLE



HOTEL IN CHARACTER WITH THE REST OF THE BUILDINGS

ENTRANCE TO RESIDENTIAL AREAS

ENTRANCE TO TEMPLE

NEW DEVELOPMENTS NOT MATCHING WITH THE OLD STYLE

SIDE LANE

4) Visual Scope: All the major paths lead to views and vistas emphasized by landmarks, fort, palaces and temples.

Continuity: Projecting balconies, use of brackets, canopies and finely carved marble screens provide continuity in the vision.

Names and Meanings: Names are important in crystallizing identity. Naming system of entrance gates and residential areas was adopted to give locational clue - Delhi Gate, Ajmeri Gate, Sangameri Gate (based on cities to which they are linked) Chandpole and Surajpole (based on solar orientation).

FUNCTIONAL ANALYSIS:

The functional analysis of the city is made to identify the city form on the basis of the major functions the city has to perform i.e. Landuses, public spaces and road network.

Landuses:

The city was developed on grid iron pattern plan and one sector size of 2500 x 2500 feet was chosen on the basis of pedestrian movement. In absolute terms, this makes the inhabitant at the center of the sector only 1200 feet away from the commercial activities along the major roads, which is about 5 minutes walking distance.

The sectors were filled in with detached blocks called 'havelis'. The haveli, a residential/commercial block, reflected the organizational and hierarchical pattern of the city. The larger and more important havelis, planned like self-sufficient fortresses, have a complex planning and spatial organization.

Small blocks within the grid of subsector roads, are found to be varying between 300 x 500 feet to 350 x 350 feet in size, in different sectors inhabited by people of different ranks, and dwellings of varying plot sizes. Such small blocks accommodate about 40 to 50 residential plots. This number is highly conducive to make the blocks act as a cohesive social and cultural sub-group. This is more so, since they invariably belong to single cast, sub-caste and have similar trades.

A typical house sited within the close-knit town fabric is in complete harmony with other buildings. The plan organization of the house is basically introvert, around a courtyard and the treatment of the facades and openings indicates a sensitive response to the hot and dry climate of the region. This introvert character well suited the life-style of the people of that period.

The first floor is generally reserved for commercial use. Access from the street is through a gate, passing through a tunnel-like corridor into the front courtyard around which are often offices and workshops.

The development technique of the commercial/residential blocks was interesting. The markets consisted of shops and arcades on the first floor, and elevated walkway, over these at second floor. The level was reached by wide, straight stairs, often found next to entrances of temples. A further one story wall was built at second floor level screening the areas behind which were the residences developed by individuals.

PUBLIC SPACES:

Squares are the most significant feature of Jaipur's plan, which were created by planning the intersections along the major roads. Creating a square thrice the width of the major roads at the intersections has made it possible for three such squares measuring 300 x 300 feet. Considering that the city was planned for about 50,000 population, these squares could definitely be considered adequate enough for public gatherings on festive occasions. Besides these three squares, large and small pockets of open spaces occur within each of the residential sectors. These open spaces or squares usually served groups of houses that clustered around them.

ROAD NETWORK:

Based on the basic concept of grid iron plan, the road network at Jaipur is well-thought out and follows a definite hierarchy.

The major East-West road and the North-South roads which form the sector boundaries lead to the gates in the fort walls. The width of these roads is 110 ft.

Next, there is the network of 60 feet wide roads which run North-South within a sector, dividing it further and linking the sectors to the East-West road. A further grid of 30 feet and 15 feet roads in the true chess board pattern subdivides the entire sector into blocks, the smaller residential clusters.

CHAPTER SEVEN

SYNTHESIS OF MAN-MADE ELEMENTS

Since the city of Jaipur was the product of the imagination of one man, it was comparatively easy to maintain a unity of design and harmony of scale. The form, color, and scale was evolved out of a practical necessity, to give comfort to the inhabitants.

OBSERVATIONS:

From the analysis of the man-made elements - visual and functional, following observations are made, which broadly reflect the aims which were intended to be achieved through the city's planning.

IMAGEABILITY:

The character of the entire urban experience is regarded as a significant aspect of Jaipur. Moving along the major road network, and at the squares, one is not confronted by imposing edifices like the administrative offices, palaces, memorials and such structures. Despite being founded by a King, there is no expression of his authority or imposition on the lives of the people, which reflects highly of his sensitivity and humane attitude. The character is highlighted by the fact that the axial road does not terminate at any major public edifice. Visually the openness of the plan is strengthened by long perspectives along the roads which lead to temples in the distant hills.

The visual harmony and urban character along axial roads was achieved by executing the markets and abutting structures, and

applying facade controls. The vivid images created of the walled city are a result of all these factors intermingling with the rich culture and lifestyle of the people, to create a strong identity and character to which the residents and visitors relate and respond strongly.

FLEXIBILITY:

A remarkable feature of a grid-iron which is incorporated in Jaipur is that it allows for growth and change on a gradual basis. It is open ended but not endless. Shifting the sector originally sited in the north-western corner to the south-eastern corner is itself demonstrative of this potential of a grid-iron. Also, in a contemporary sense, the plan is extremely democratic in character. The city structure due to its orthogonal geometry does not stress a particular spot or activity area. Within the grid, however, despite a similar pattern, the clustering of houses and street network respond to the needs of the people and are not rigidly fixed.

EFFICIENCY:

Efficiency in terms of the city plan, the average size of a sector, measuring 2500 x 2500 feet, is found to be highly suitable to facilitate pedestrian dominated movement. Given this size, the maximum distance a person would walk to reach any major commercial or transport node would be about 1200 feet, which is approximately a five minute walk. This not only enhances safety but also attributes a human scale to the city fabric. At the cluster and residential level, the organization of community spaces and street access are planned so

as to promote social interaction and also increase the level of privacy for its residents.

The building materials used are those which are available locally and utilize the skills of the craftsmen, thus promoting their trade and expertise.

ENVIRONMENTAL CONCERN:

The planning of the walled city reflects an excellent response to the hot-dry climate of the region, which is also prone to dust-storms in summer. The close knit fabric of the city and the introvert character of the built environment helps to keep out the harsh climate. The orientation of major and minor roads is such that according to the context, the streets get varying amounts of shade. By locating the axial road running east-west, on the ridge, the city's layout takes advantage of the natural topography for drainage (It is a well-known fact that the old city was the only area that was not affected during the 1981 floods in Jaipur). At the dwelling level, the use of courtyards, shading devices and by exposing minimum wall surfaces to direct radiation, thermal comfort was achieved.

PROPOSALS:

The following proposals are made on the basis of the analysis of the man-made design elements within and outside the walled city of Jaipur. These proposals are made in order to retain the existing character of the walled city and to relate it to the future development outside the walled city.

WITHIN WALLED CITY:

1) Jaipur is famous for its traditional architecture and civic design, but the new building activity within the walled city is not consistent with the old style.

To preserve the traditional architecture, a firm policy must be formulated. For this purpose, strict enforcement of building by-laws and architectural control in the form of height regulations, setbacks, use of color and building materials is most essential.

2) The squares were the key focal points of the city plan and they need special attention. All types of encroachments must be removed so that these squares can function again in the manner they were visualized originally.

3) The main markets, which run along the major paths should be cleared of all pavement shops.

4) Besides the improvements within the walled city, positive steps should be taken for the preservation and conservation of historical monuments.

OUTSIDE WALLED CITY:

The rapid growth in urban population has led to the expansion of Jaipur. The city which originally covers 2000 acres now covers 14000 acres of land so while developing new areas, proper relationship between the walled city and the new expansions should be evolved both visually and functionally to maintain the image and character of the city.

- 1) The city's structure is based on the grid system, which is very flexible and allows for growth. The future development should follow the same planning concept.
- 2) The size of the sectors and location of activities within the walled city were planned to facilitate pedestrian movement. Still the city is dominated with cyclists and pedestrians, so the size of the neighborhoods and location of work places should be worked out on the basis of pedestrian movement.
- 3) The city is famous for its squares which are the main public spaces both in commercial and residential areas. The future planning should use squares as public spaces.
- 4) The shops in the walled city were developed along the major paths on the first floor with residences and work places on second floor and the backside. These shopping arcades provide continuity in the movement. The new residential areas and work centers should interrelate the movement from the walled city outwards.
- 5) The visual relationship between the walled city and the new development can be achieved by using some of the building elements. The use of same building materials, color and texture will also provide harmony in the development.

NOTES

1. The city was divided in nine rectangular sectors symbolizing the nine divisions of the universe. The North was called Chokri Sarhad (literally the Apex seat) symbolic of the highest point and housed the palaces and public buildings.

2. Shilapashastras are the ancient Hindu orders, or books, covering the arts including architecture and planning of temples and villages. The Manasara describes eight types of villages. The Prastara is rectangular in plan. It is walled with a perimeter road inside the wall forming a space between the wall and buildings. The town is divided into four, nine or sixteen wards by a network of appropriate number of roads of varying widths. The wards are again divided by grids by differing modules making divisions of nine, 16, 25 etc.,

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DESIGN ELEMENTS AND URBAN FORM

CASE STUDY: JAIPUR, INDIA

BY

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AN ABSTRACT OF THE MASTER'S REPORT

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ABSTRACT

Urban planning is an art of arranging a variety of landuses by selecting and analyzing design relationships and opportunities forming a landuse plan, organizing vehicular and pedestrian circulation, developing a visual form and material concept, adjusting the existing landform by grading, providing proper drainage and finally developing a comprehensive physical plan which respects social issues.

The present system of planning in India pays very little attention to the "Natural" and "Man-made" design elements of the environment. In practice, the comprehensive plan of a city is prepared on the basis of socio-economic surveys. The other aspects of the form governing factors are usually ignored. Topography, drainage pattern, existing structures and roads should be taken into consideration and should be included in the comprehensive plan, but unfortunately drainage areas are allowed to be filled, topography is drastically altered and any other feature that interferes with the development plan is changed. Plans for future development must respect the ecological factors as the basis for the design.

The present study is first an attempt to analyze and identify the natural and man-made design elements and their relationship with the urban form. The importance of these elements is emphasized by applying them on a case study.

Jaipur city (India) has been chosen as a case study because the skillful use of the design elements has enabled it to maintain its rich and unique character for over 250 years after being established.

In the seven chapter report, the first part is related to general design elements and their relationship with the urban form. The second part is the analysis of natural and man-made design elements and their application on the case study. A land suitability plan has been prepared based on the analysis of some of the natural elements and a comparison is made with the proposed landuse plan 1991 of Jaipur city to demonstrate the importance of the design elements.