

UNDER(LINING) LEH: The Order of Consciousness

by
Radhika Bagai

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School of Architecture
Center for Environmental Planning and Technology
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Signature of author:

Radhika Bagai
Department of Architecture
January 14, 1994

Certified by:

Imre Halasz
Professor Emeritus of Architecture
Thesis Supervisor

Accepted by:

Rosemary Grimshaw
Assistant Professor of Architecture
Chairperson,
Departmental Committee on Graduate Students

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'om mani padme hum'

“hail the jewel in the lotus”

'om mani padme hum' is a mantra - a powerful sacred formula - believed to invoke the deities and draw their benevolent attention. It is intended to evoke the jewel of enlightenment arising in the purified mind, symbolized by a beautiful lotus flower emerging from the mud in which it grows.

The mantra is found inscribed on prayer stones, prayer wheels, prayer flags, and wild rocks throughout the Buddhist Himalayas.



'om'

I invoke the path and experience of universality, so that

'mani'

the jeweline luminosity of my immortal mind

'padme'

be unfolded within the depths of the lotus-center
of awakened consciousness

'hum'

and I be wafted by the ecstasy of breaking through
all bonds and horizons.

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ABSTRACT

"Because it is beautiful, there must be a formal order."

- Leonardo Da Vinci

The thesis is an investigation into the idea that nothing built evolves naturally, that there is an explicit or implicit structure and an order to things. This order may be a result of clear intentions or of a collective consciousness, even behind forms that appear spontaneous. The city too is not immune from the order of a deep structure.

The thesis concerns the 17th century city of Leh, situated in the captivating, but remote, region of Ladakh in India. The royal citadel of Leh is a dramatic example of the genius deployed in the conception of the settlement as a unified, complete, and highly evolved entity. It lends credibility to the idea that form is a highly controlled and meaningful expression of content (culture). The logic and consistency that I found in Leh's settlements could only mean one thing: that there was a "method to the madness", that there was an order to the disorder, that there was in fact a "jewel in the lotus".

A fragment of the city was selected for an exploration which consists of an extensive survey resulting in a documented, original set of drawings. These original drawings and information gathered over a period of three months served as a resource for the exploration which uncovers some underlying orders in the city. The form of Leh is highly organized, where the source is not the drawing board but a consciousness among the people which exists as embedded, non-cognitive ideas about life, manifest in a clear physical form and order.

The selected foci consists of five normative elements which are found to be relevant at the macro, as well as, the micro level. These are:

1. Hierarchy
2. Position and Direction
3. Assemblage
4. Generic Dimensions and Geometry
5. Invocation of Light

The exploration reveals how these abstract normative elements translate into concrete design principles.

Thesis Supervisor: **Imre Halasz**
Title: **Professor Emeritus of Architecture**

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It is a pity that the acknowledgment got left over for the last minute for I could not have done this thesis without my many mentors, "thesis buddies", and friends. I am grateful to all who helped me during my research and travel, my analysis and drawing process, and my numerous desperate moments. I know I cannot do justice to all in this hasty note, however, I want to express my thanks to a few.

I am very grateful to **Imre Halasz**, my advisor, who patiently with peerless advice and great kindness guided me through my thesis. I would like to thank my reader, **Jody Gibbs** who warmly supported and critically reviewed my work. Thanks are also due to my readers, **Julian Beinart** and **Michael Dennis** for their valuable comments and insights. I acknowledge the help and the encouragement which I received from **Maurice Smith**, **Gary Hack** and **Leon Groisser** throughout my sojourn at M.I.T.

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PROLOGUE

An Indian Airlines Boeing 737 cruises at 33,000 ft, some 5,000 ft above the world's highest peaks.

It then drops altitude fast, bringing a palace below into dramatic focus. A city materializes gradually from the rocks, aggregate by aggregate, as the plane descends finally in a great sweeping curve to touch down at 11,800 ft , at the world's highest airport.

One has arrived at Leh in the 20th century.

I N T R O D U C T I O N



I. INTRODUCTION

Circumstance

Leh is the capital of Ladakh, the most remote region in India, located in the far reaches of the Western Himalayan Range, in the rain shadow area known geographically as the Tibetan Plateau. Running through Ladakh is the great River Indus - locally called 'Sangspo Sengge Khabab' or "the Lion River" on the banks of which, at an altitude of 11,800 ft (3500 m) is situated the royal citadel of Leh - "the City of the Lion King".

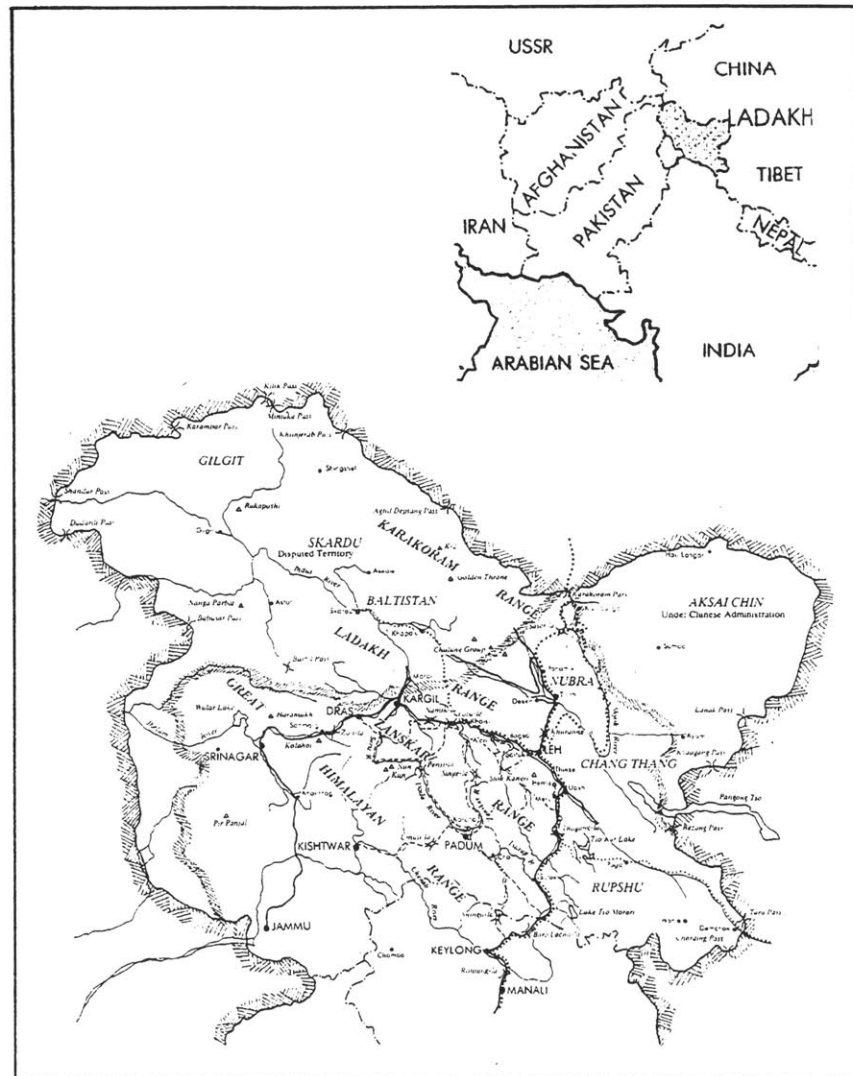


Fig. 1: Map of Northern India showing the region of Ladakh

Fig. 2 (opposite pg.): "The City of the Lion King"



Fig. 3: The flight to Leh over the Western Himalayas

Ladakh is a high altitude desert - extremely cold, extremely sunny and extremely dry. Leh conveys this intensity with extreme diurnal temperature oscillations, a high annual temperature range, almost no precipitation and high radiation. Temperatures swing from 30° C during the day in summer to -20° C at night during winter. The annual rainfall is 10 cm and the winter snowfall scarcely exceeds 5 inches. Strong, cold, dry winds - with a velocity range of 1-19 km/hr. - blow throughout the year from the north.

The extreme aridity results in a lack of vegetation. There are no original forests and wood fuel is as precious as gold. Poplars and willows are carefully cultivated solely for the purpose of building.

While Ladakh has one of the lowest population densities in the world (1/sq. km) its inhabited areas are relatively crowded, for most of the land is a stony waste. Also, despite the River Indus, both arable land and water are scarce resources since the river flows at a level lower than that of the fields. The Ladakhis therefore have to depend largely on springs and snow-fed streams to sustain life.

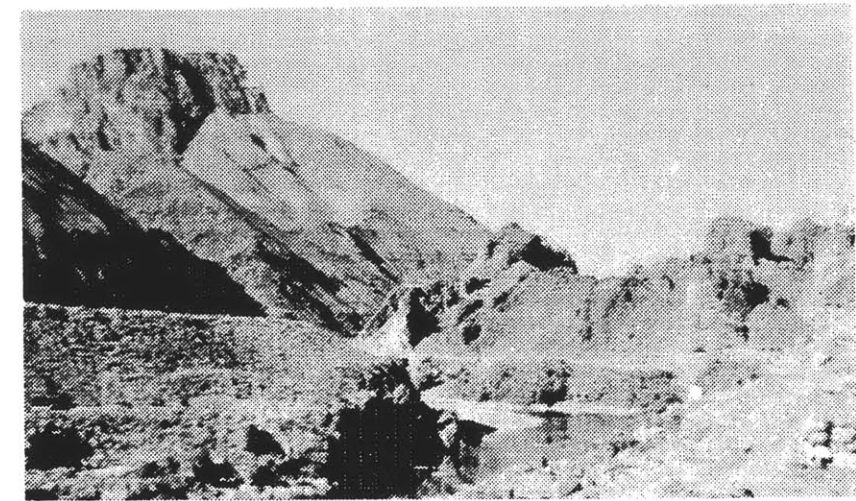


Fig. 4: The barren rockiness of the Tibetan Plateau



Fig. 5: The River Indus flowing through Ladakh

In spite of these limited resources and environmental constraints, the Ladakhis have, through resourcefulness and ingenuity, created a productive and ecologically sound economy based on agriculture and animal husbandry. Trade and commerce also provided an important economic base. Caravan trade routes crisscrossed all over Ladakh and converged at Leh, making it a mercantile town.

Culturally, Ladakh has been the seat of a unique tradition where there is no differentiation between a man's life, work, and religion. The teachings of Buddhism influence most aspects of everyday life, as they stem from the belief that maintaining an orderly way of life pleases the Gods.

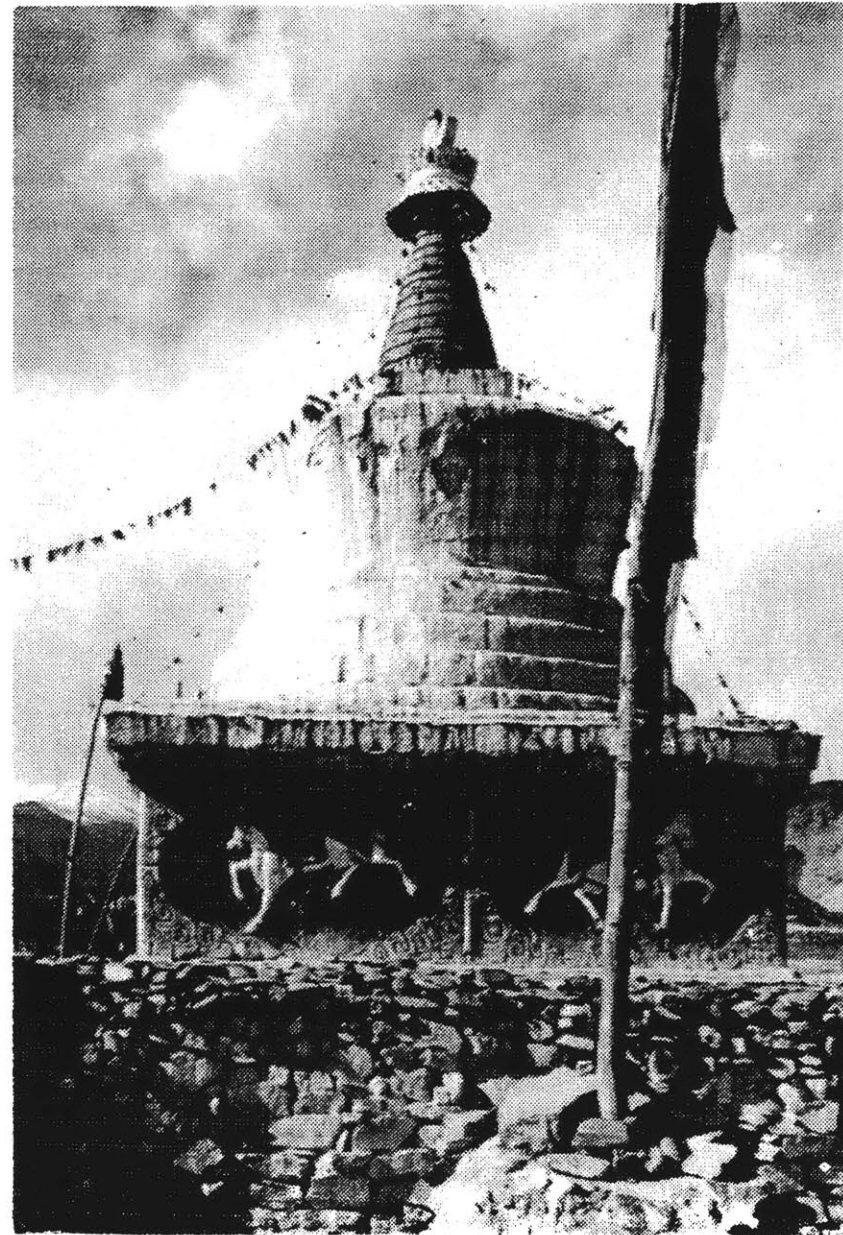


Fig. 6: Signs of Buddhism are everywhere

Area Characteristics

The city of Leh, situated at the apex of a triangular valley, was built under King Sengge ("Lion") Namgyal, the most famous of Ladakhi kings, in the first half of the 17th century. In the making of the city, the elements of the environment were restructured to satisfy both physical and cultural needs. The siting of the city itself was therefore of prime concern.

The settlement resulted from the availability of fertile land - Leh means "cultivable soil" - and the presence of a snow-fed stream running through it, with the slope of the valley providing a natural system of water supply and drainage.

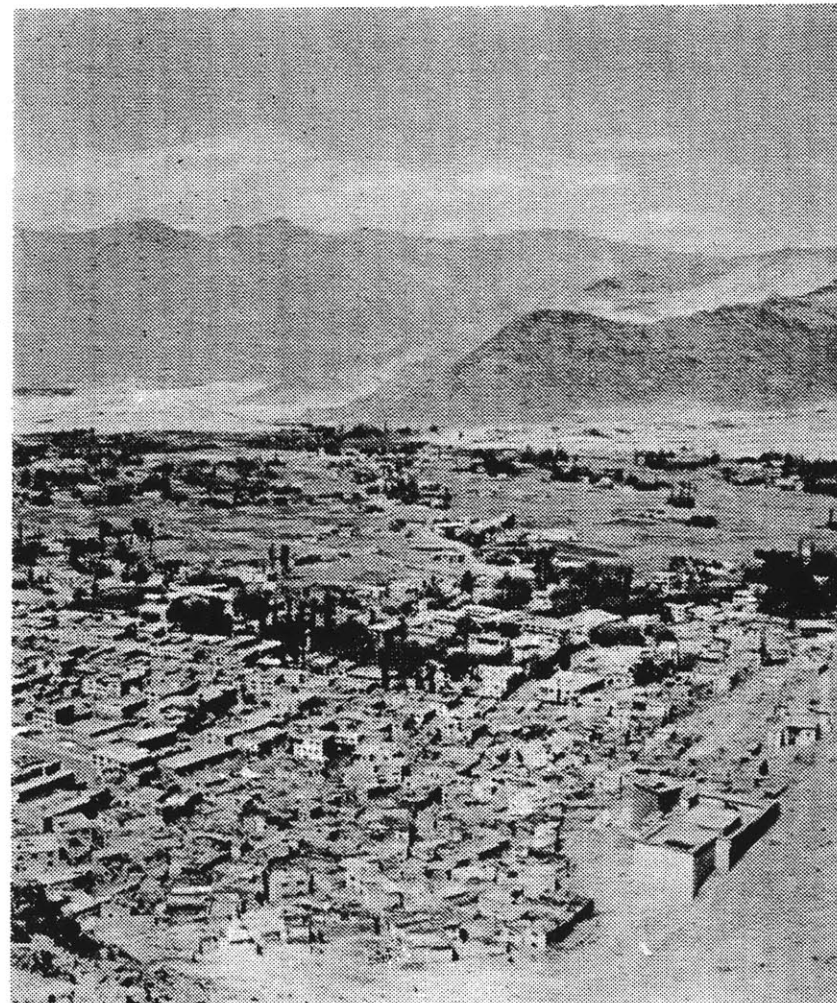


Fig. 7: View of the Leh valley

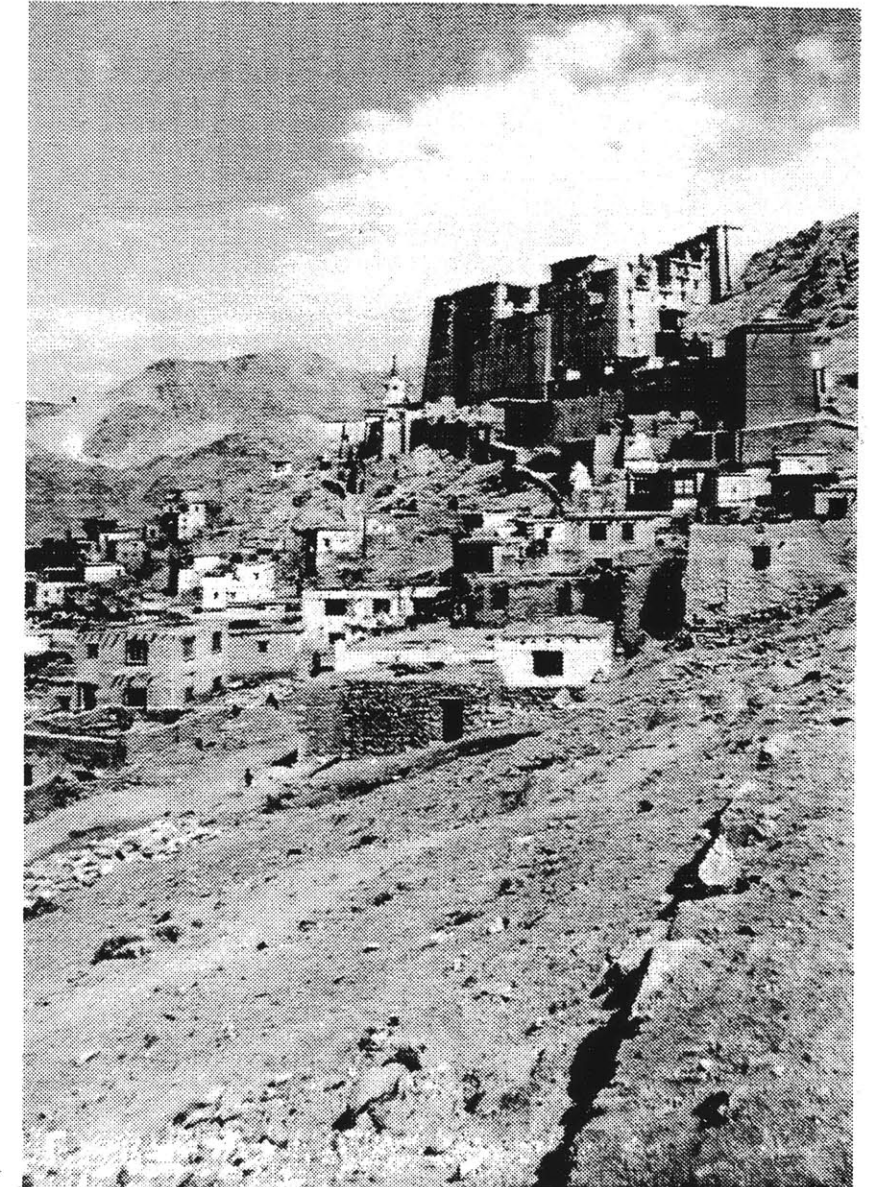


Fig. 8: The settlement on the southern slopes

The siting of the city was further determined by factors of climate, defense, land and water.

Leh was built on the southern slopes of a mountain spur, thereby not only gaining direct heat from the sun, but also indirect heat from the thermal mass provided by the rock face against which it was built. Further, this south side of the hill formed the wind shadow side, offering protection from the constant cold, northerly winds.

The steepness of the hill and the rock formations which allowed fortifications were also essential for a settlement that faced the threat of constant attacks. But the mountain is not only a natural defense: it is elevated. And nearer God.

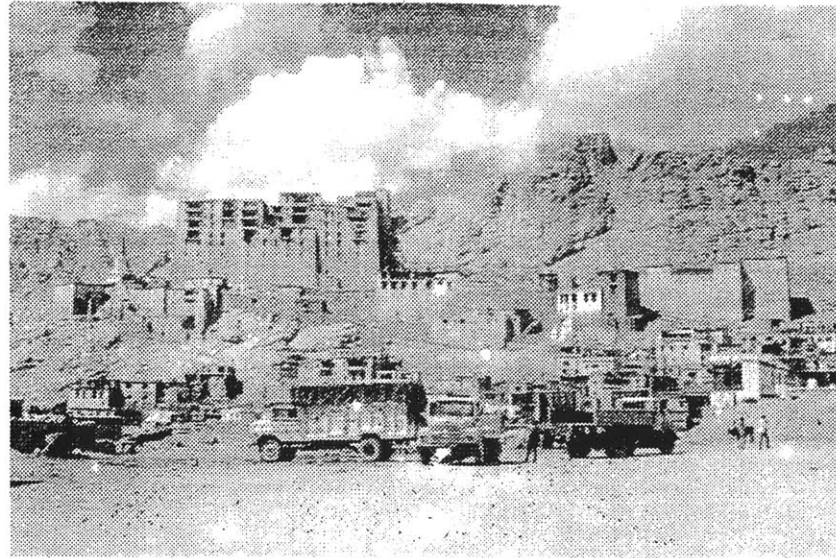


Fig. 9: Southern view of Leh

Furthermore, by situating the settlement on the lower slopes of the hill, valuable fertile valley land was reserved for agriculture. With the houses being built along the contours, the water which came from a snow-fed stream flowing along the slope could easily be channeled through the settlement. The distribution was made easier since the houses were closely situated and therefore involved the construction of shorter channels. The unused water from the channels drained into a pond built on the western base of the hill and this provided water in the winter when the snow on the peaks froze and the stream ran dry. "Utmost care had to be given to exact organization within the smallest space and to the greatest economy of means."¹

Other characteristics of the Leh area are the availability of building materials such as limestone, mud and clay and the splendid view offered by its location. Leh has been said to be situated within an amphitheater of granite and faces the snow-covered peaks of the Zaskar Range. The view of the magnificent peak, Stok Kangri, was an important consideration.

¹Giedion, Sigfried. *The Need for a New Monumentality*, pg. 551

Urban Characteristics

"Well-considered town planning must bear in mind not only the importance of local and regional circumstance in the way of topography, climate and other factors of the environment, but the more impalpable elements of tradition, historical character and social custom."²

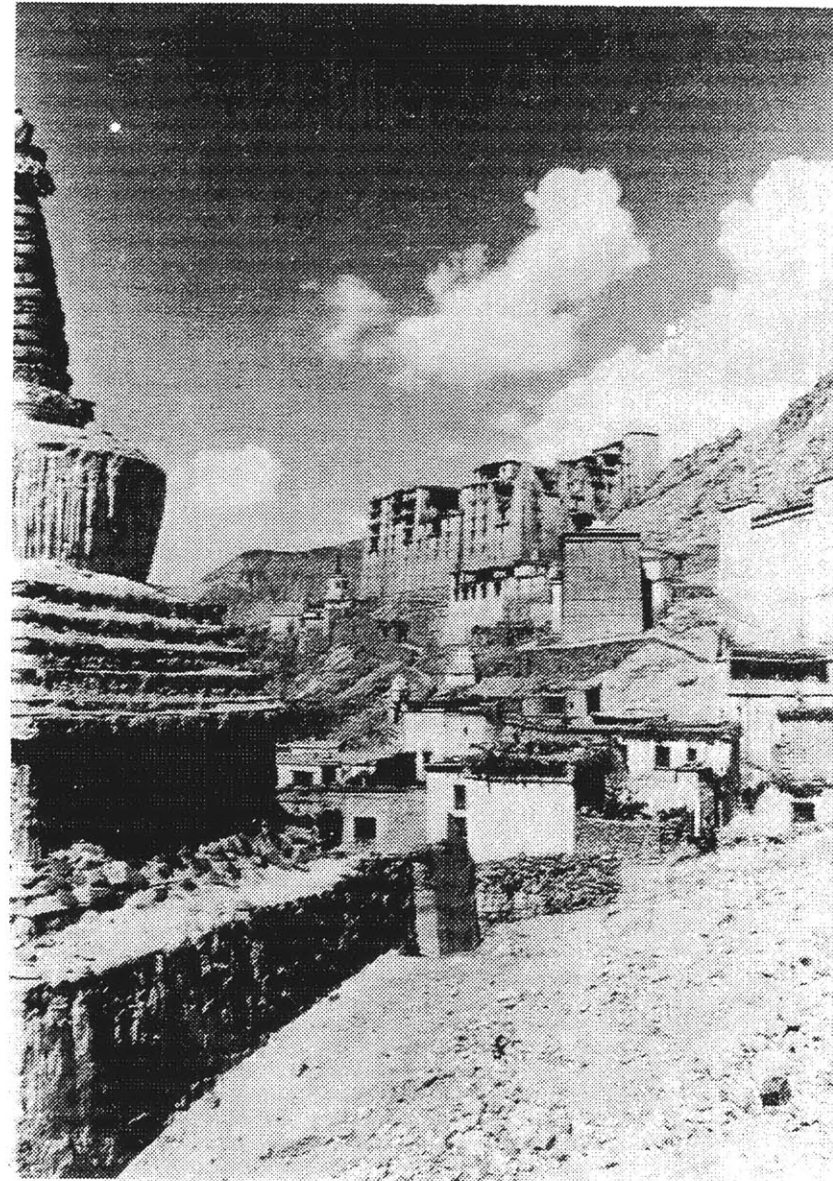


Fig. 10: The eastern approach to the Palace of Leh (Photo by John Sanday)

²Nolen, John. *New Towns for Old*, pg. 25

The palace of Leh, known as Lechen Palkhar, is part of an ensemble of structures which straddle the ridge of the Namgyal Hill. These structures constitute a series of temples devoted to various deities and a sequence of open courtyards imbued with both the magnificence of royal occasions and the solemnity of religious ceremonies. Below the palace, in one of the open spaces, is a large flat stone slab with holes along the four sides, called '*mig-mang*', meaning "many-eyed", which was used for a game of local gambling.

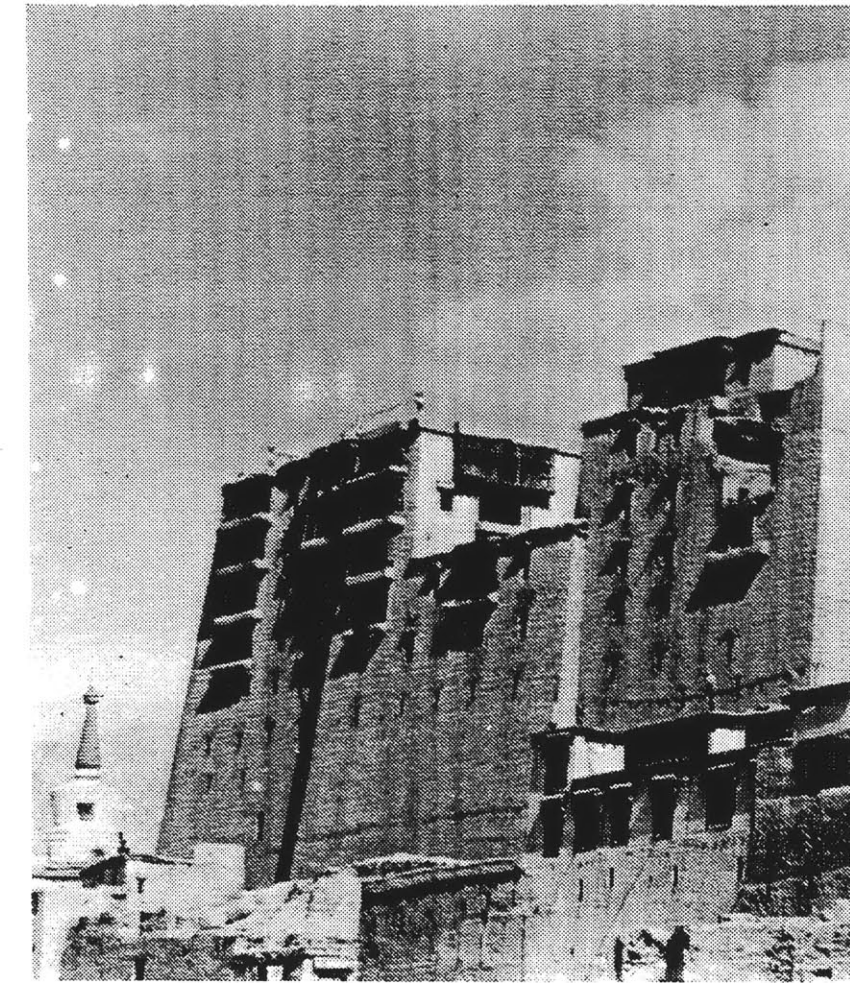


Fig. 11: Lechen Palkhar - the Palace of Leh

Located on the peak above the ridge is the monastery of Tsemo ("peak") consisting of a '*gon-khang*' devoted to the Guardian Divinities or the Lords of the Four Directions and a temple devoted to Maitreya (Chamba) or the Future Buddha.



Fig 12: The great eastern 'chorten' gateway that marks the entrance to the city

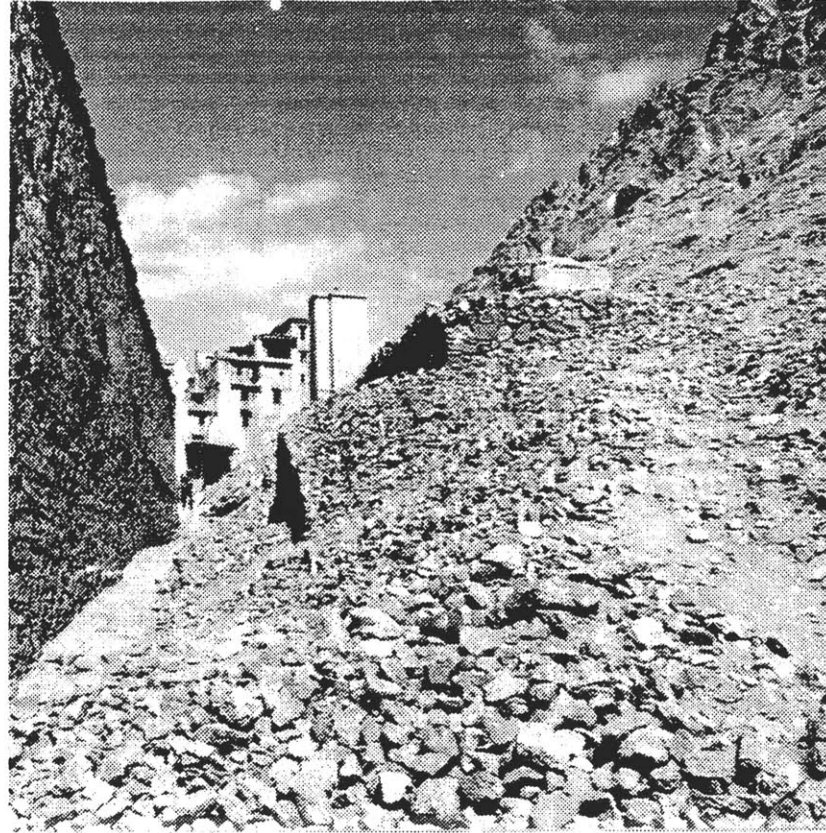


Fig. 13: The processional route to the palace



Fig. 14: Remains of fortifications above the palace

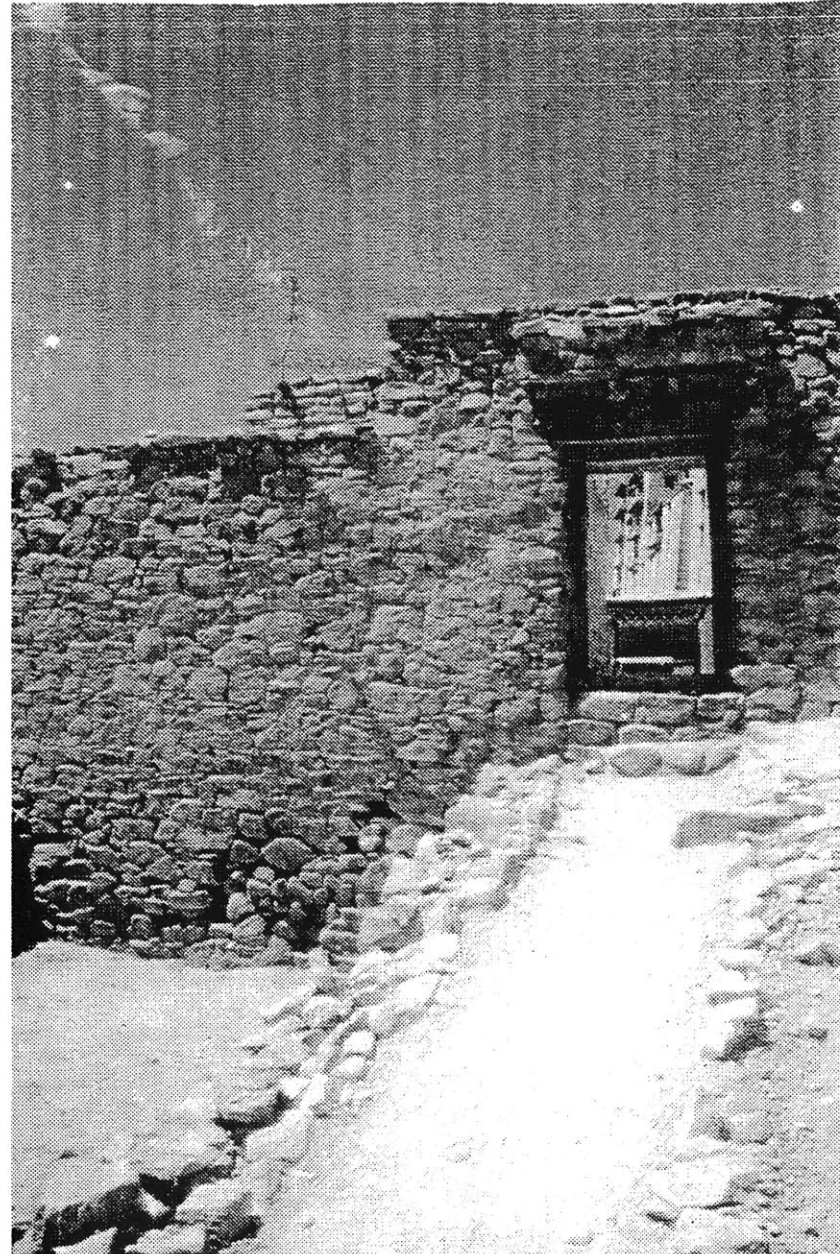


Fig. 15: The open spaces and courtyards below the palace

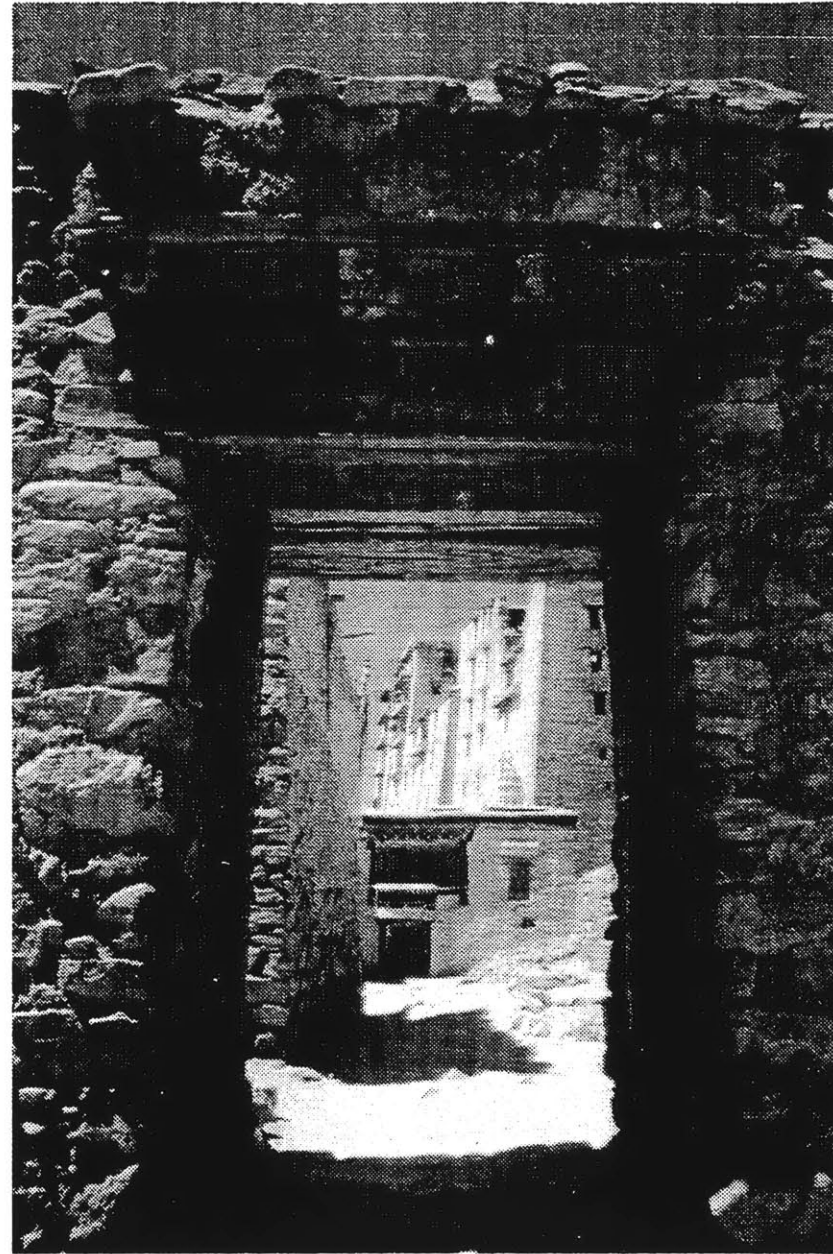
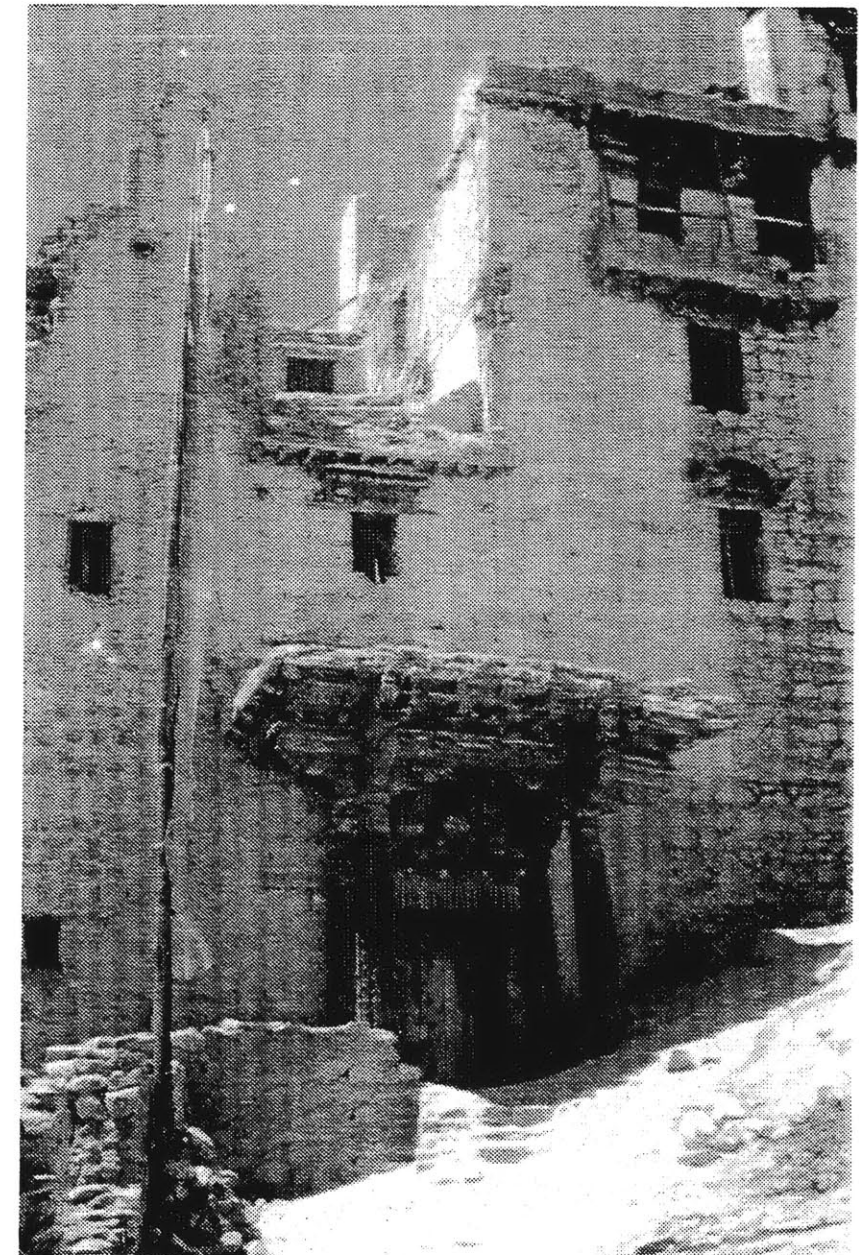


Fig. 16: View of the palace and temple courtyard

Fig. 17: The "Lion Gate" dramatizing the entrance to the palace



1. Symbolism and Meaning

The city of Leh can be considered to be a representation of a 'mandala'. "The meaning of this word has been obscured with its recent use by psychologists as a quasi-technical term. Originally it meant a 'circle' in Sanskrit and included the idea of 'center' and 'circumference'"³ especially in Indian and Tibetan ritual. The 'mandala' is "a cosmography, a diagram of universal order. The center of the 'mandala' is identified with the center of the world."⁴

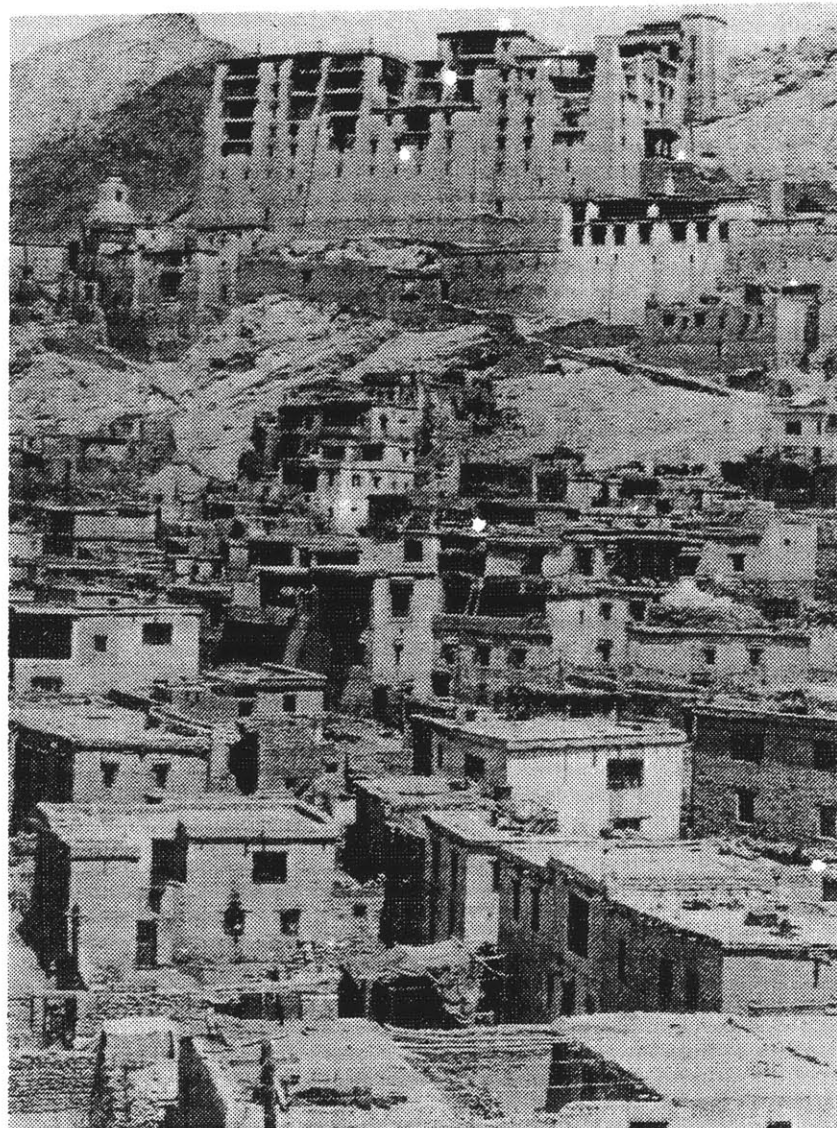


Fig. 18: Solidity and growth (Photo by Maureen Wheeler)

³Rykwert, Joseph. The Idea of a Town, pg. 163
⁴Rykwert, Joseph. The Idea of a Town, pg. 163

The city of Leh was centered by the palace crowned by the monastery, with the rest of the built fabric around it circumscribed by a fortified wall. The 'mandala' became the ground-plan on the site. "In such a context it becomes a program for the building, a metaphorical plan and a prophecy of what is going to be built on the site."⁵

It is also seen that Leh has its own characteristic identity, structure and meaning. Kevin Lynch's "Imageability" lies in the fact that the settlement, built of the materials of the environment - stone and mud - with sloping walls, creates a powerful image of solidity and growth, of structures thrust through already dramatic land forms, like formalized, geometric mountainscapes. The white-washed buildings reflect the light - the light that represents Buddha-awareness, the light of Supreme Understanding.

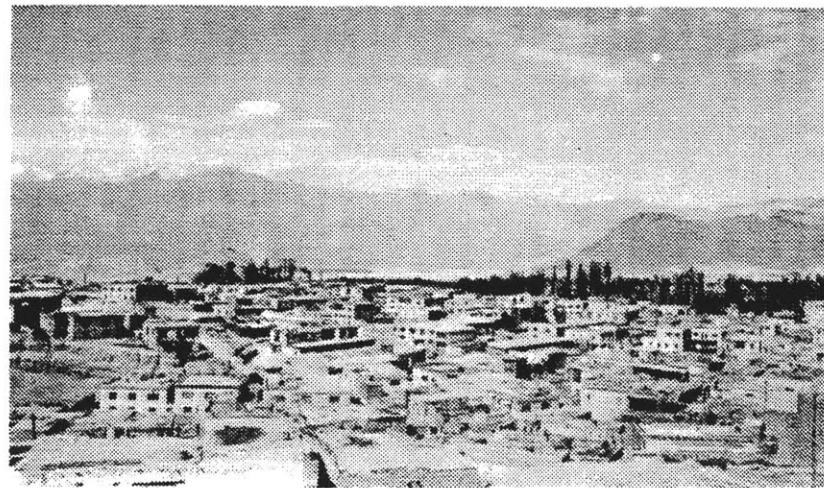


Fig. 19: The southern sprawl of the city

⁵Rykwert, Joseph. The Idea of a Town, pg. 165

2. Monumentality

"Monumentality derives from the eternal need of the people to own symbols which reveal their inner life, their actions and their social conceptions. Every period has the impulse to create symbols in the form of monuments, which, according to the Latin meaning are "things that remind", things to be transmitted to later generations."⁶

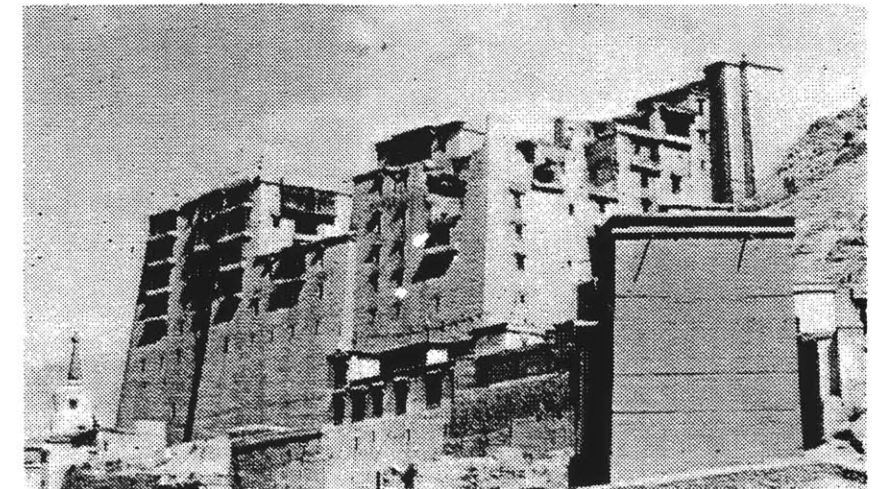


Fig. 20: The imposing structure of the palace



Fig. 21: The palace with its city

⁶Giedion, Sigfried. The Need for a New Monumentality, pg. 552 - 553

The nine-storey palace which sits on its rocky throne on the Namgyal ("Victorious") Hill, expresses its monumentality by its size and ornamentation. As it rises, tier-upon-tier, its hugeness attempts to compete with the mountains, its tapering walls reach out for the sky, its form imitates that of the mountains, symbolizing the King-mountain - Mt. Meru - which stands in the center of the Buddhist Cosmic World, the "axis mundi", the support of the Universe. Thus the palace is a symbol of power, while the richness of its facade is a symbol of its glory. It stands, forever enshrined in the golden glow of the sun, at the end of the visual axis of the caravan trade route which skirts the fortified citadel below.

"Monumentality in architecture may be defined as a quality, a spiritual quality inherent in a structure which conveys the feeling of its eternity, that it cannot be added to or changed."⁷ This quality is felt in the Leh Palace, the recognized architectural symbol of Ladakhi civilization. Furthermore, this architectural monument "indicates a striving for structural perfection which has contributed in great part to its impressiveness, clarity of form and logical scale."⁸



Fig. 22: The Palace of Leh in 1930 (Photo by G. Dainelli)

⁷Kahn, Louis. Monumentality, pg. 577

⁸Kahn, Louis. Monumentality, pg. 578

3. Settlement Patterns

The main spine of Leh runs along the hill slope following the course of water flowing through the settlement. A secondary spine then runs perpendicular to the main spine, and along it are strung the settlement's houses. These secondary spines therefore form the main streets of the settlement. The result is an overall linear form of buildings and streets, arranged in a series of layers on the hill slope. Short, narrow streets also run perpendicular to the secondary spines terminating as dead-end streets (cul-de-sacs) which generate informal community spaces within the fabric. This built fabric is further organized into various neighborhoods and localities.

"From a human point of view and from the architectonic as well, houses and blocks are not isolated units. They are incorporated in urban settlements and these are parts of a greater entity, the city."⁹

When land is easily available the houses are relatively spread out along the spines following the mountain contours. As new rooms start being added to the houses - first vertically, then horizontally, open yards and empty plots get built upon resulting in common walls and adjoining terraces. Further densification occurs with the secondary streets being built over. Negotiations occur between adjoining houses whereby rooms start spanning over streets, resulting in a dense matrix of built form. This density of houses and the narrowness of streets further helps heat retention and protection from the wind. In the mountain desert vastness, this density of form is reassuring. Compactness is a desired factor against the vast expanse that surrounds the settlement.



Fig. 23: Houses built along the mountain contours

⁹Giedion, Sigfried. The Need for a New Monumentality, pg. 552



Fig. 24: A dense matrix of built form



Fig. 25: Common walls and adjoining terraces

The massive walls of the built fabric not only protect the street against the harsh extremities of the climate, but also create close spaces of human scale and comfort where the enormity of the earth and sky outside is glimpsed through the frame of narrow street tunnels.

The elements of the town are thus manipulated "so that an impact on the emotions is achieved... The human mind reacts to contrast, to the difference between things, and when two pictures are in the mind at the same time, a vivid contrast is felt and the town becomes visible in a deeper sense. It comes alive through the drama of juxtaposition."¹⁰

¹⁰Cullen, Gordon. Townscape, pg. 9

The resultant covered passages further transform the street into realms of shadow and light. With these modulating effects of light “we are dealing with a range of experience stemming from the major impacts of exposure and enclosure.”¹¹ This streetscape of covered passages and open streets further results in sequences of “existing view” and “emerging view” as prophesied by Cullen.

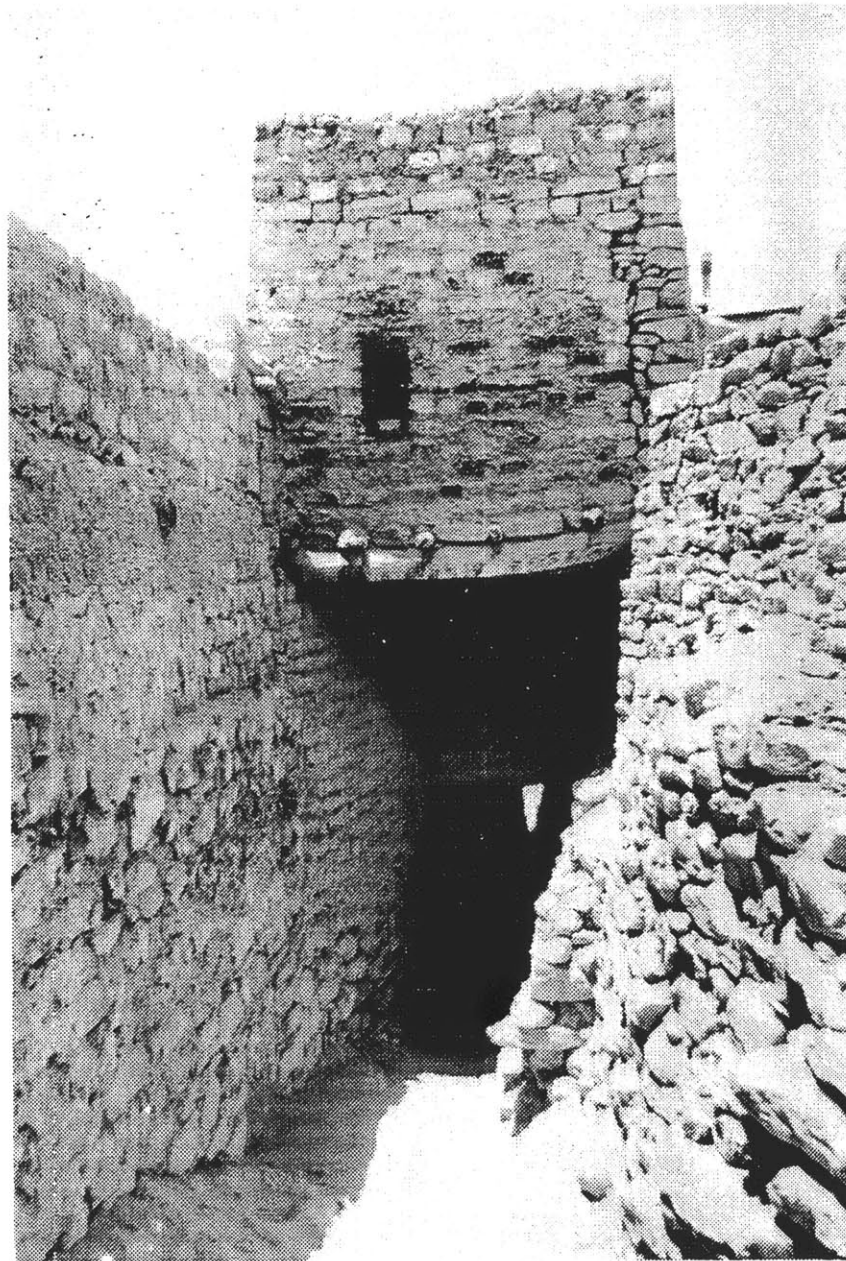


Fig. 26: A room spanning a street to form a covered passageway

¹¹Cullen, Gorden. Townscape, pg. 9

“Architecture is not exclusively concerned with construction. Architecture has to provide an adequate frame for man's intimate surroundings. Individual houses as well as the urban community have to be planned from the human point of view.”¹²

Furthermore, the covered passages enabled access points to be blocked for security reasons by fixing doors at the passage entrances.

Semi-private and private open spaces consist of yards and upper level courtyards and terraces. Public open spaces do not exist within the residential fabric but are attached to public institutions such as monasteries and schools. And, “coupled with enclosure as an artifact of possession, is the focal point, the vertical symbol of congregation.”¹³ In the enclosed walled city of Leh, the monastery at the apex serves as the focal point while the courtyards of the palace complex form the public spaces of congregation.

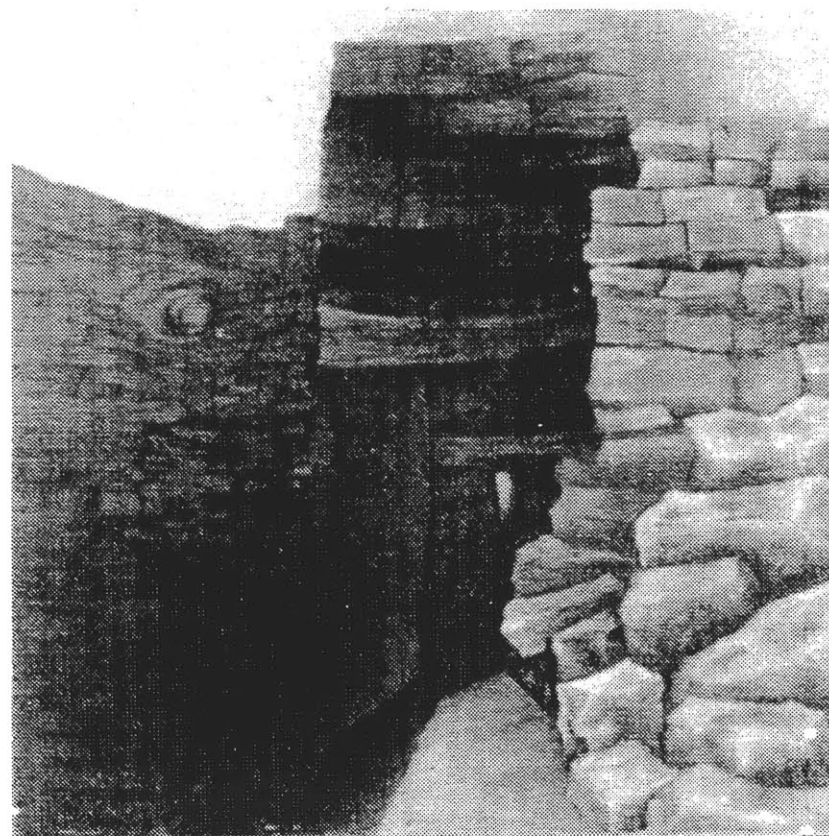


Fig. 27: Painting by Vijaya Bagai inspired by Fig. 26

¹²Giedion, Sigfried. The Need for a New Monumentality, pg. 551

¹³Cullen, Gorden. Townscape, pg. 26



Fig. 28: The roof as an elevated plan

The settlement's streets therefore function as the major spaces for casual, social intercourse. While the streets themselves are narrow, street junctions widen out to support outdoor social activity.

The flat roofs of the settlement's houses create another level of habitation and are not roofs but elevated plans. Prayers are chanted on the terraces at sunrise and mountains are viewed and worshipped.

The community threshing grounds exist on the outskirts of the settlement providing a transition between the built fabric and the fields. A willow garden - the ‘Majing’ - was located outside the southwest boundary of the city wall, while a public garden - the ‘Murtse’ - was located to the southeast of the walled city in which a polo ground or the ‘Shagaran’ was built by King Sengge Namgyal, who introduced the game from Baltistan. While the ‘Majing’ was used by all, the ‘Murtse’ garden was the pleasure garden of the King.



Fig. 29: A game of polo in the Shagaran



Fig. 30: Khwaja Soljok - the western gate of the city

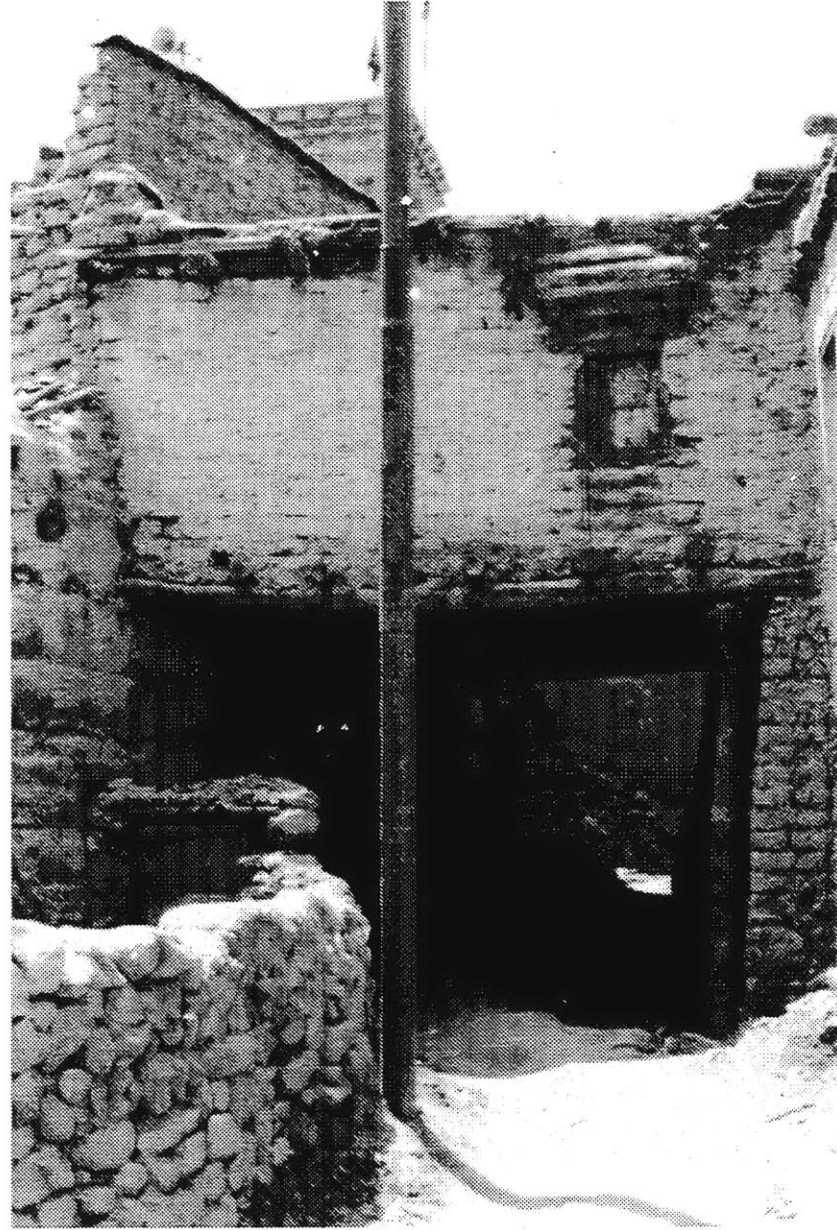


Fig. 31: A covered passageway at a turn



Fig. 32: Goji Sol - the gateway to a neighborhood

4. Streets

The streets in Leh are further articulated by various religious elements. A 'chorten' or stupa may exist as an isolated structure, with the street diverging to pass around it so that the 'chorten' may always be passed by on one's right in accordance with the cosmic turning. Prayer flags and prayer wheels also function in a similar manner to determine the path of movement and order circulation.



Fig. 33: A 'chorten' gateway marking a ceremonial route



Fig. 34: Three "housed" 'chortens' forming a covered passageway

The 'chorten' may also be a raised structure, spanning over a street, forming a gateway under which one passes. Apart from its cosmic implications, this serves as a means to demarcate various neighborhoods.

Since these street elements are elements the inhabitants can identify with, they become agents that entertain social gatherings. Further, because these elements require that the street diverge around them or pass below them or widen to accommodate them, it seems appropriate that they should encourage social activity which they can easily support.

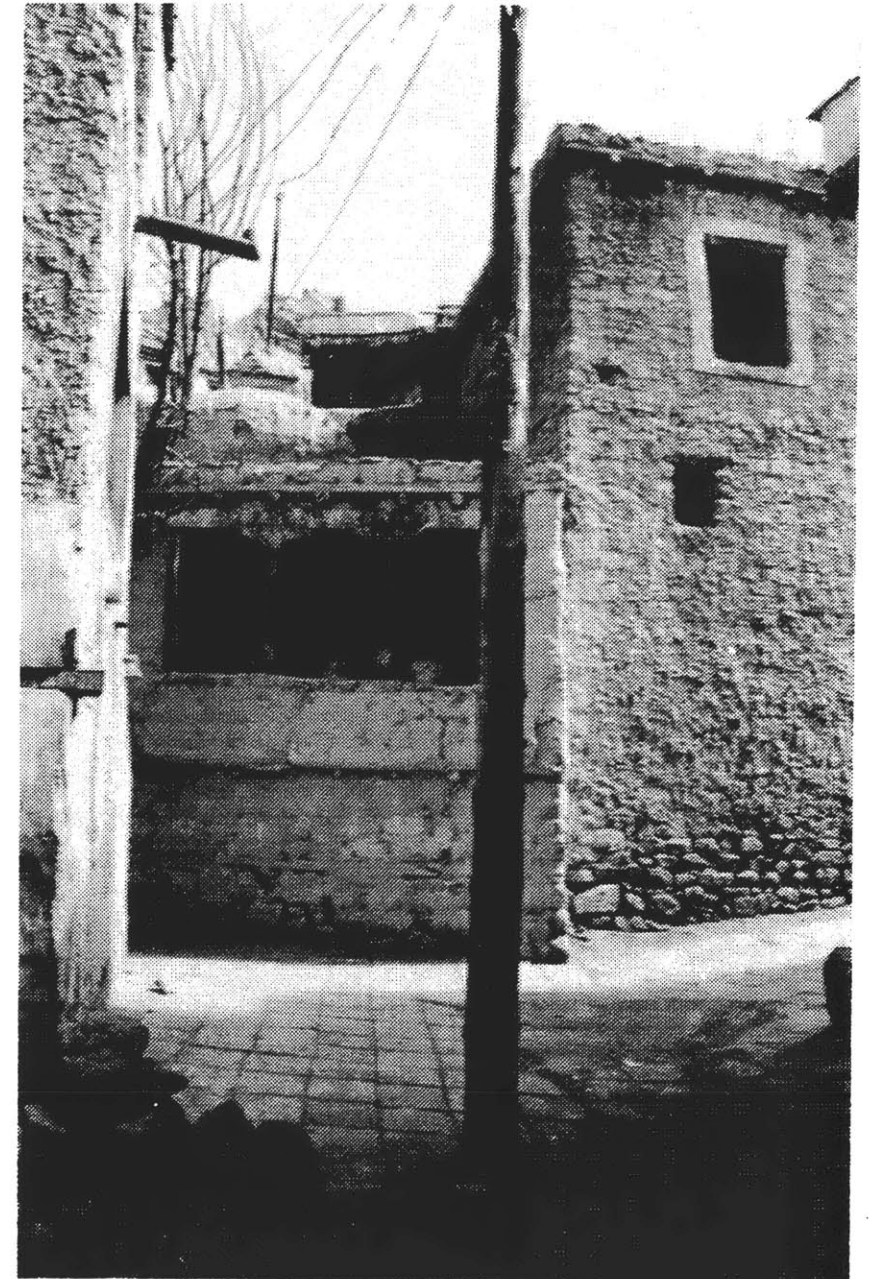


Fig. 35: Three "housed" 'chortens' articulating a street junction

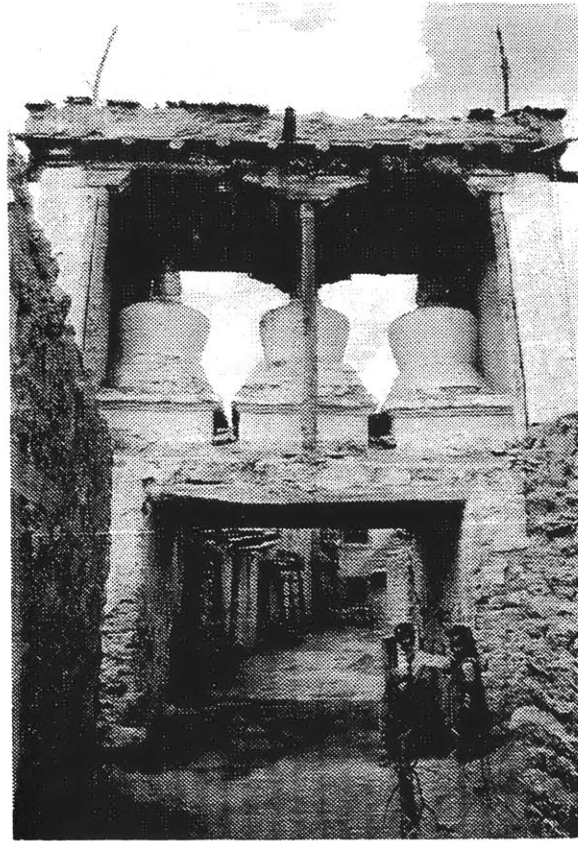


Fig. 36: Existing view - Three 'chortens' forming a gateway to a neighborhood



Fig. 37: Emerging view - the neighborhood

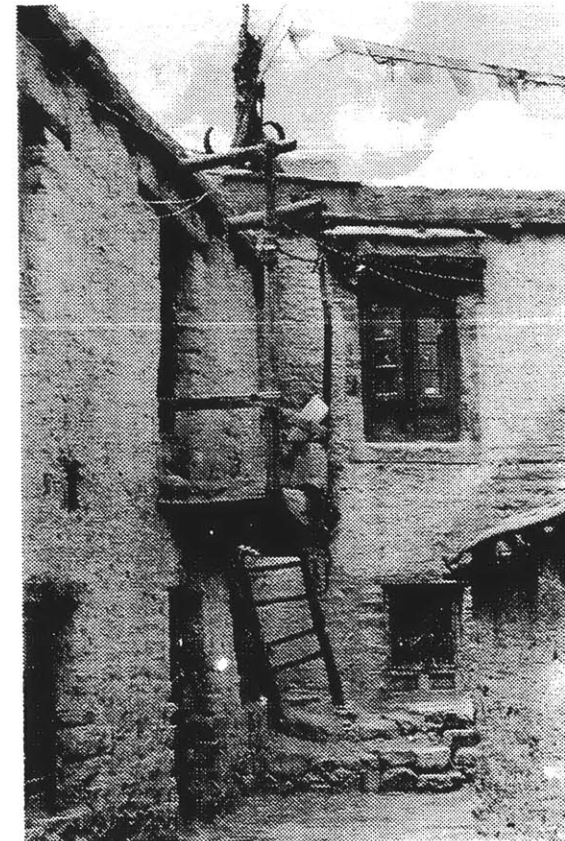


Fig. 38: Closing-in view - the cul-de-sac



Fig. 39: Back view - Three 'chortens' forming a gateway from the neighborhood

Fig. 36 - Fig. 39: Demarcation of a neighborhood

5. Functional Structuring

King Sengge Namgyal's city was built with a clear segregation of functions. The administrative core (the palace and the houses of the nobility) was surrounded by the residential areas outside which commerce and open spaces (gardens and fields) were laid.

This related to the representation of the '*mandala*' and also served to bring people out of their residential interior and into the commercial and recreational exterior thereby extending the "boundary" of the city to beyond that of its walled confines.

6. Historical Development

The historic urban texture of Leh developed further down the centuries. Attracted by the '*pashmina*' (wool) trade that made Ladakh prosperous, the Kashmiri Dogras invaded Ladakh. The Dogra rule (1834 to 1842) saw major changes in the urbanscape of Leh.

The first change came with the advent of the cannon. This meant that the town could be defended from an outpost instead of from within. Thus a fortified outpost, the Zorawar Singh Fort, was built on the outskirts of the town. The extra defense reduced the chances of attack, resulting in the expansion of the town beyond its walled confines. A "new" locality, 'Zangsti' (literally "a place for coppersmiths"), was built along the southwest of the "old" town along which the trade route passed.

Since the initial attraction of Leh to the Dogras was the '*pashmina*' trade, they wanted to improve and organize it better. They laid out the Main Bazaar on the axis of the existing trade route which skirted the old settlement. The Main Bazaar was flanked by two large '*serais*' for travelers, and was manned at either end by two toll gates. On either side of the Main Bazaar were one to two storey high structures acting as wholesale trade outlets with temporary residential quarters on the upper floors.



Fig. 40: The mosque in 1984

In addition to these functions, the Main Bazaar was so planned as to serve as a polo ground. The game had been popularized and the civilian population thronged the buildings on either side of the wide bazaar to witness games played along its length.

The Main Bazaar, shaded by a poplar avenue led up to the mosque, built at the visual base of the palace and at the physical end of the axis of the trade route. A processional avenue was thus built and this served to reinforce the monumentality expressed by King Sengge Namgyal's architectural masterpiece as it formalized the axis leading to it. The mosque itself was set back from the street to create an open public space - called the 'Lal Chowk' or the "Red Square" - for cultural activities.

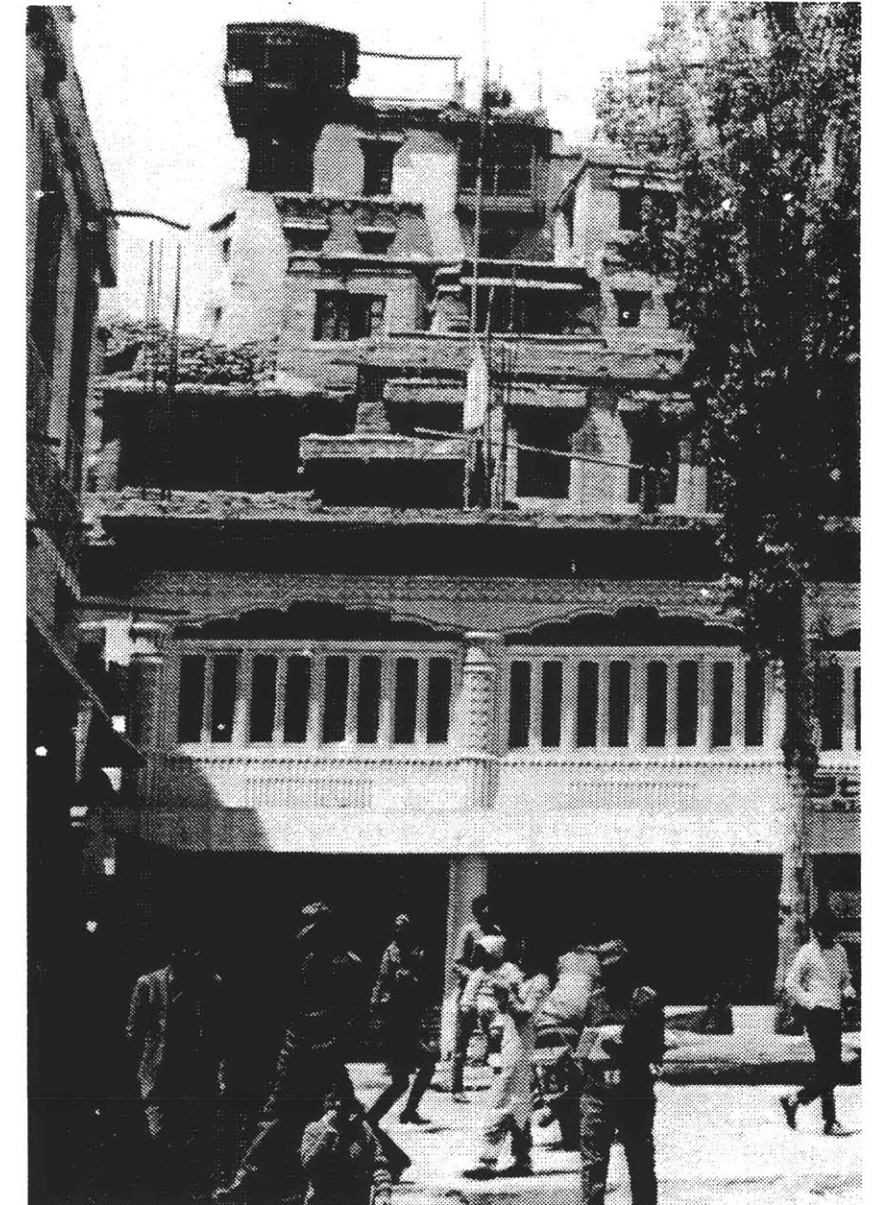


Fig. 41: The mosque in 1987

The Dogras further located their administrative headquarters (Tehsildar's office) at the end of the Main Bazaar across from the mosque. Being situated to the southwest of the mosque and lower than it, the physical relationship of the mosque (religious structure) to the Tehsildar's office (administrative structure) reflected the relationship between the monastery and the palace.

The Dogras developed the commerce area by dividing it into commercial, administrative and residential areas. The existing open spaces were thus pushed out beyond this new core where they further laid out seven gardens on the outskirts of the town - these were the pleasure gardens: oases in the desert.



Fig. 42: The mosque in 1993

During the latter part of the 19th century the Naya Bazaar or “new market” was built, by the British Joint Commissioner, perpendicular to the Main Bazaar and meeting it at the open public space outside the mosque. The junction of these two bazaars - the Lal Chowk - therefore became formalized as the important community space for both formal and informal gatherings.

Simultaneously, a back-street market called ‘Naushar’ meaning “new city” was built parallel to the Main Bazaar on its eastern side. This back-street, locally called ‘chang-gali’ was a means to enable ‘chang’ (a local alcoholic drink) to be sold in the “black market” as it could not be done so openly in the Main Bazaar.



Fig. 43: The public open space outside the mosque

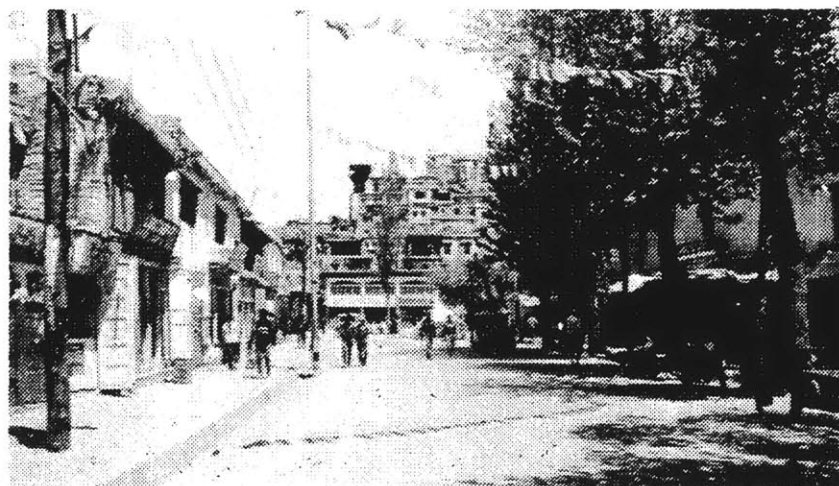


Fig. 44: The mosque at the end of the Main Bazaar



Fig. 45: The Main Bazaar on the visual axis of the palace



Fig. 46: The poplar avenue of the Main Bazaar

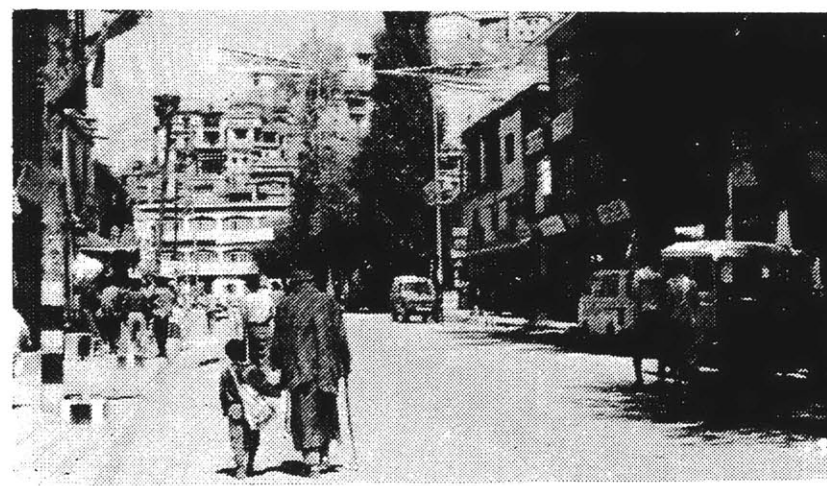


Fig. 47: The young and the old in the changing face of the bazaar



Fig. 48: Leh Bazaar in the 19th century (From a photograph by Dr. Henderson)

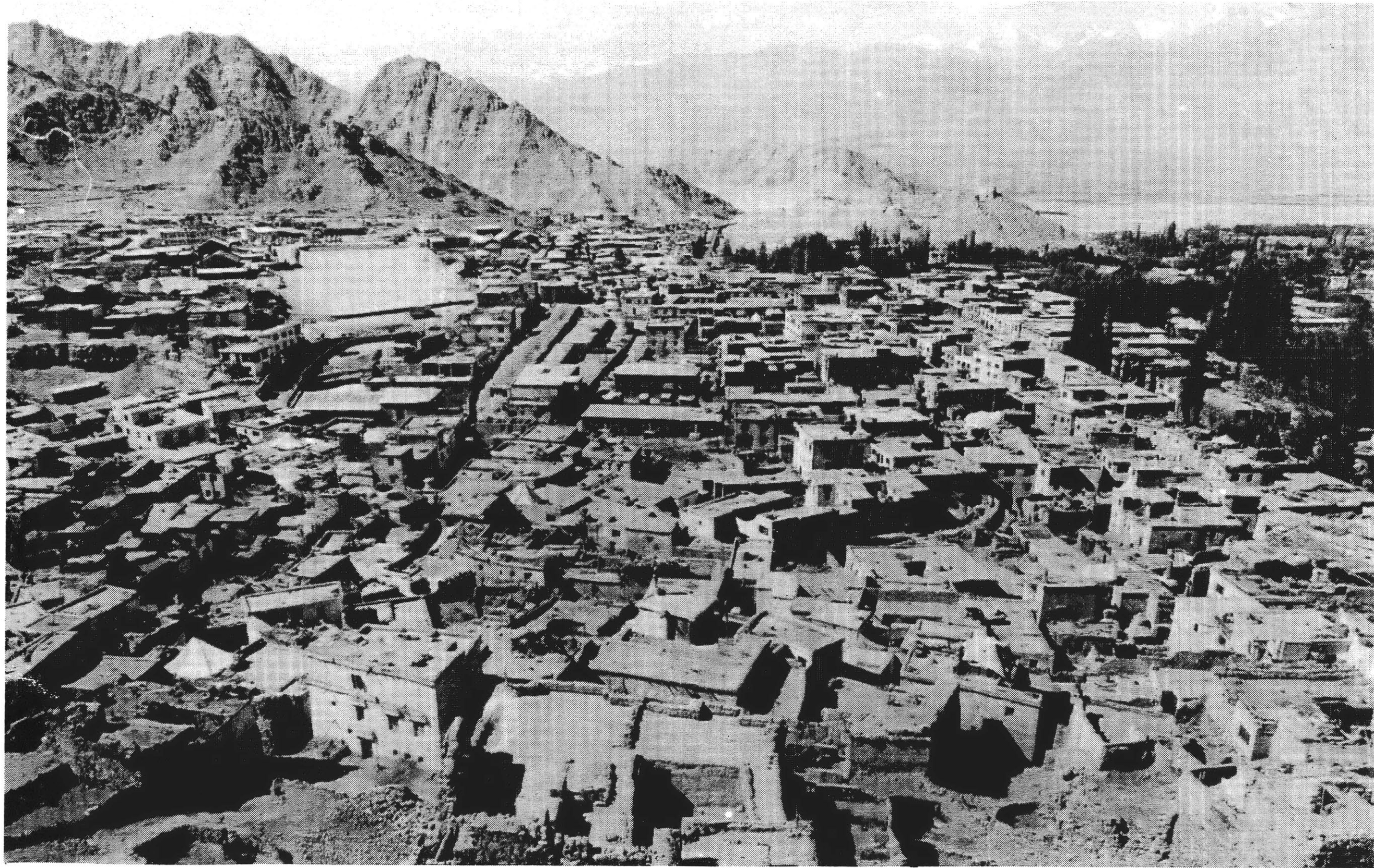


Fig. 49: View of Leh in the 20th century



Fig. 50: Entering the fragment

II. EXPLORATION

The exploration intends to study the implicit deep structure of Leh. It involves the investigation of the principles underlying the plan of the city, in order to enable another level of understanding.

The exploration focuses on five abstract normative elements:

1. Hierarchy
2. Position and Direction
3. Assemblage
4. Generic Dimensions and Geometry
5. Invocation of Light

and identifies their representation in physical terms and concrete design principles which become a framework for future design considerations.

A fragment of the 17th century fabric of the city of Leh has been selected based on the criteria which represent an "ordinary" environment:

- It is not exceptional but one that is recurring in the entire city.
- It includes significant elements of built form that appear throughout the city, such as gates and religious constructions.
- It constitutes an assemblage of elements establishing a continuity; in this case a linking between the bazaar and the palace, and between various neighborhoods.
- It represents a mixed use with both commercial and residential parts.
- It is large enough to include a wide range of sizes and built elements from private to public uses.

EXPLORATION

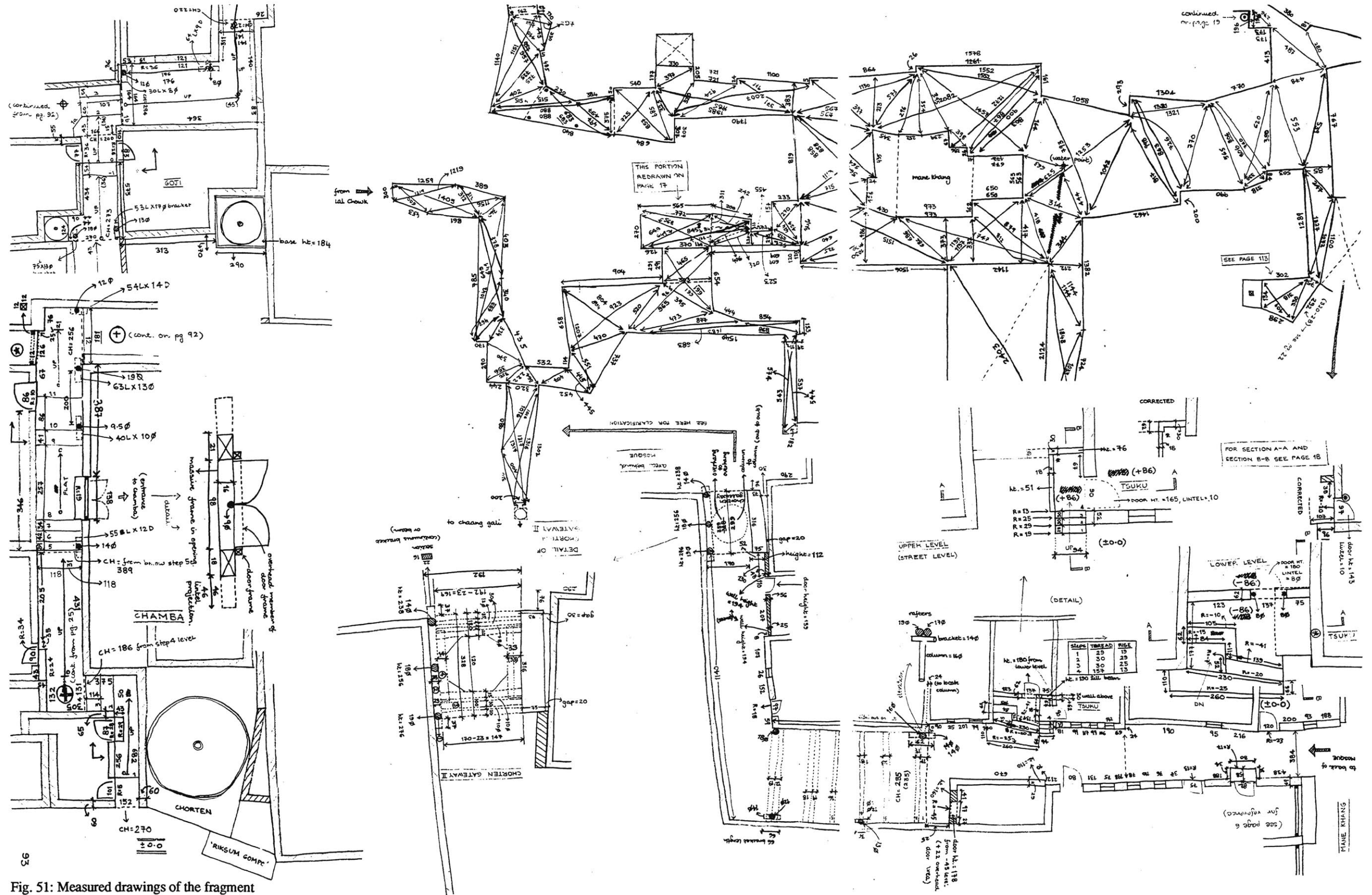


Fig. 51: Measured drawings of the fragment

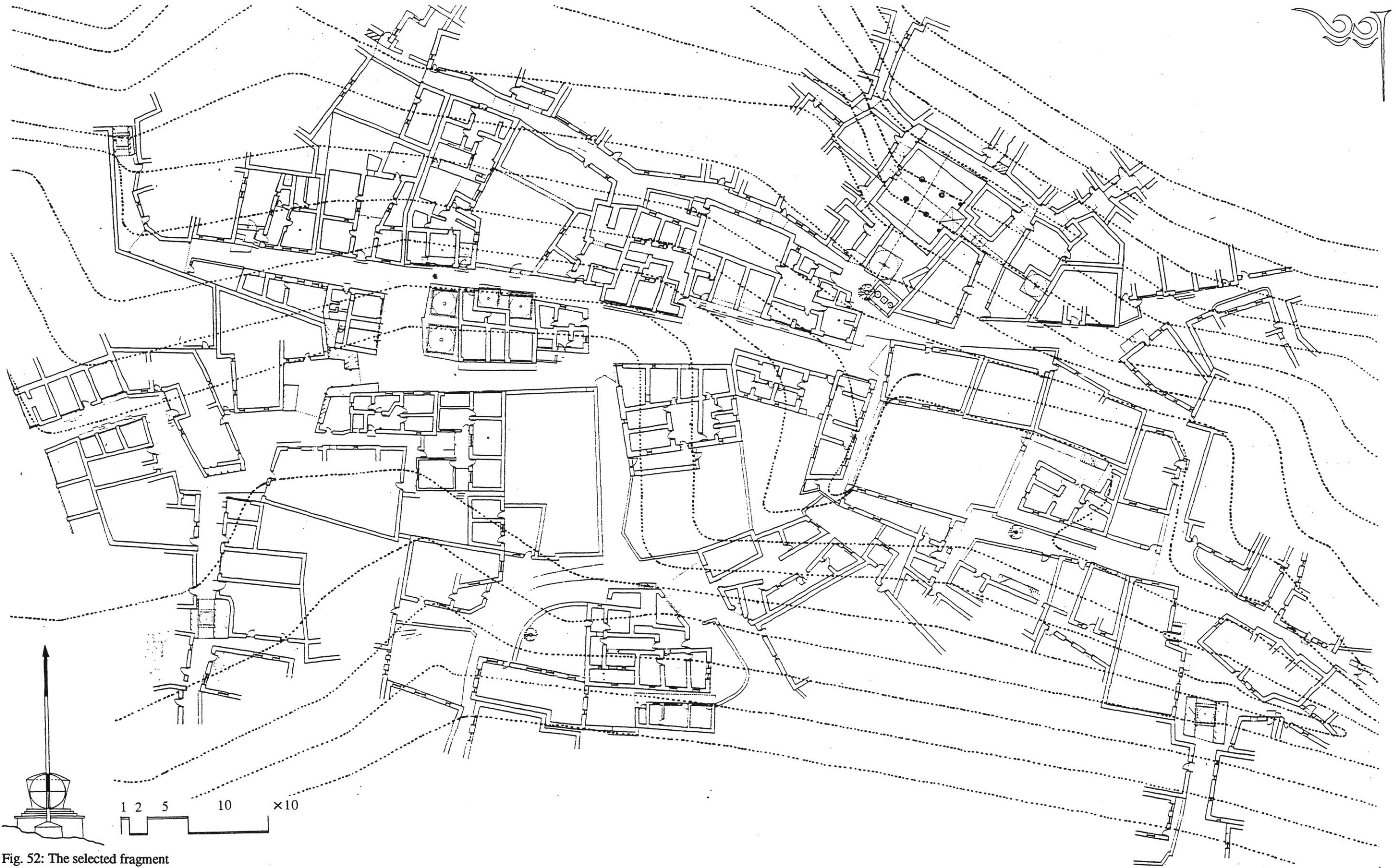


Fig. 52: The selected fragment

The selected fragment is located on the ceremonial route to the palace, just off the public square and the Main Bazaar and includes an extension of the bazaar.

It is broadly defined by three 'chorten' gateways that demarcate neighborhoods. The fragment also encompasses the prime city gate known as Khwaja Soljok which was built exclusively for defense. The three "inner" city gates lie towards the north-east of the fragment.

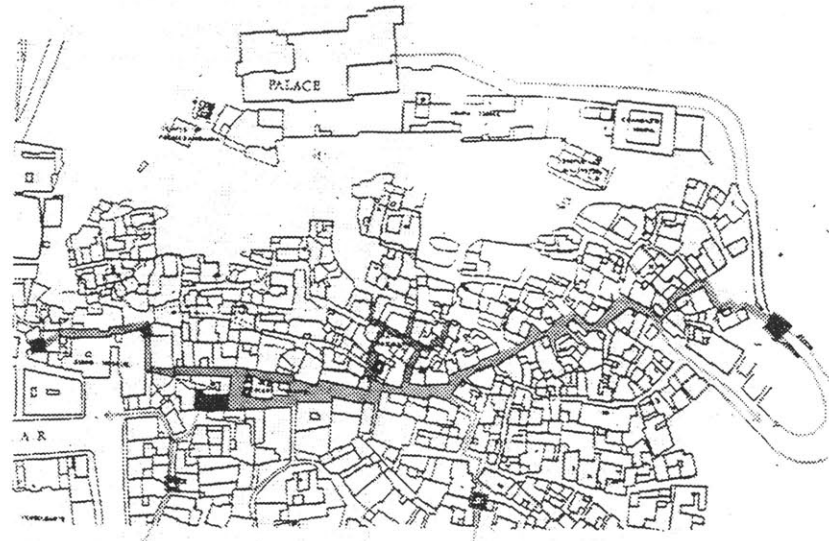


Fig. 53: Location of gates

Just below the three "inner" city gates is a temple dedicated to Maitreya, the future Buddha, known as Chamba Gonbo. Almost in the center of the fragment is a cluster of four 'chortens' from which the surrounding locality derives the name, 'Mane-Khang', literally meaning "house of mani". ('Mani' is the generic term for religious constructions such as prayer stones and 'chortens', and refers to the "jewel" in the 'om - mani - padme - hum' mantra.)



Fig. 54: Location of the fragment in the city

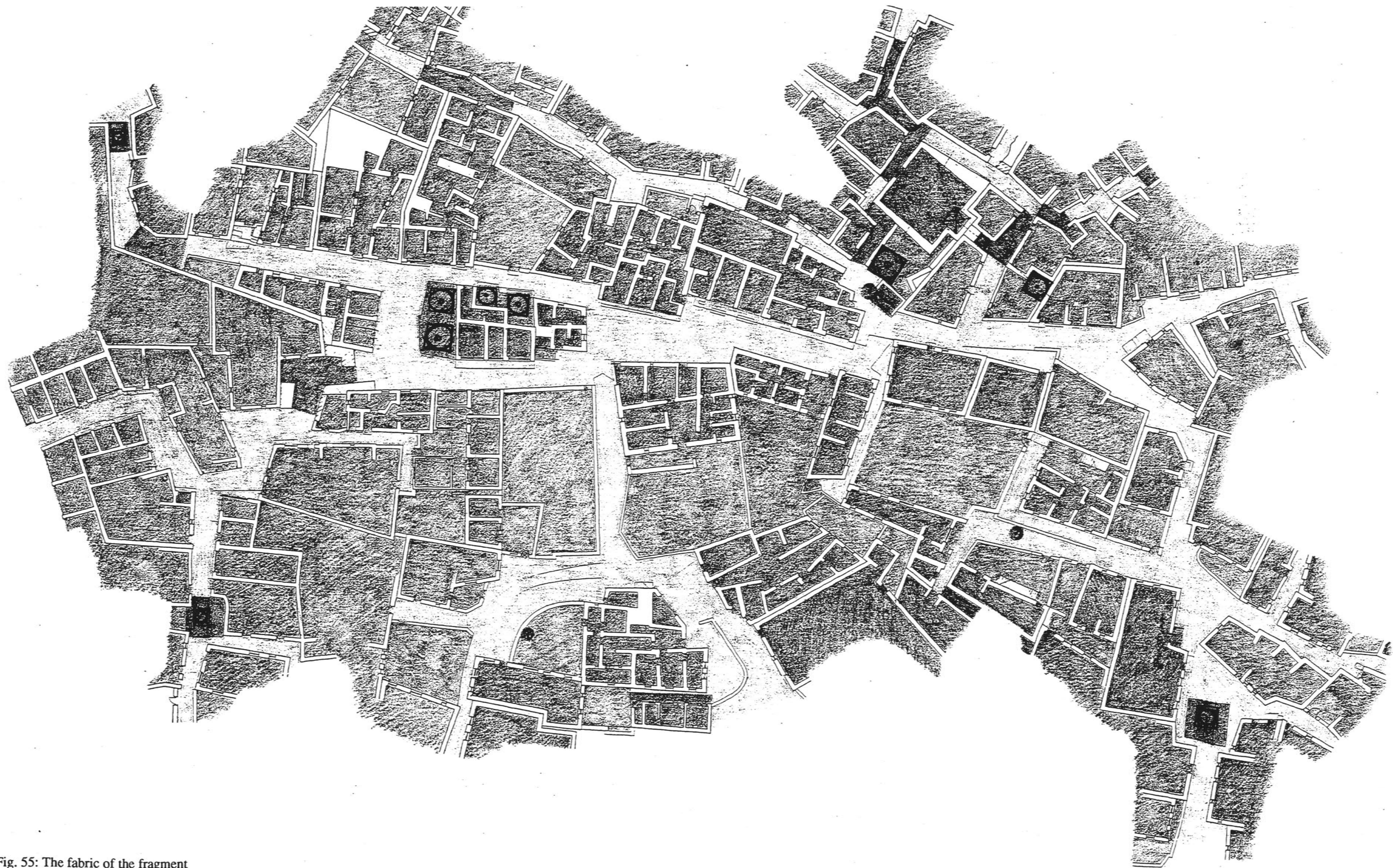


Fig. 55: The fabric of the fragment

1. Hierarchy

The city of Leh was built in accordance with Ladakhi social organization which is dominated by its religious structure, reflected physically by the placement of the monastery at the apex of the settlement. Visible from all around the valley, the monastery is an element of orientation.

King Sengge Namgyal's palace situated below the monastery, dominates in size and demonstrates clearly the subordination of royalty to the power of religion. Below the palace, on the hillside, are the houses of the nobility. The higher ranking houses of the commoners follow towards the base of the hill with the laymen's houses at the very bottom. Social hierarchy is thus directly represented in the physical structure of the settlement, enclosed by a fortified wall with the fields on its outskirts.

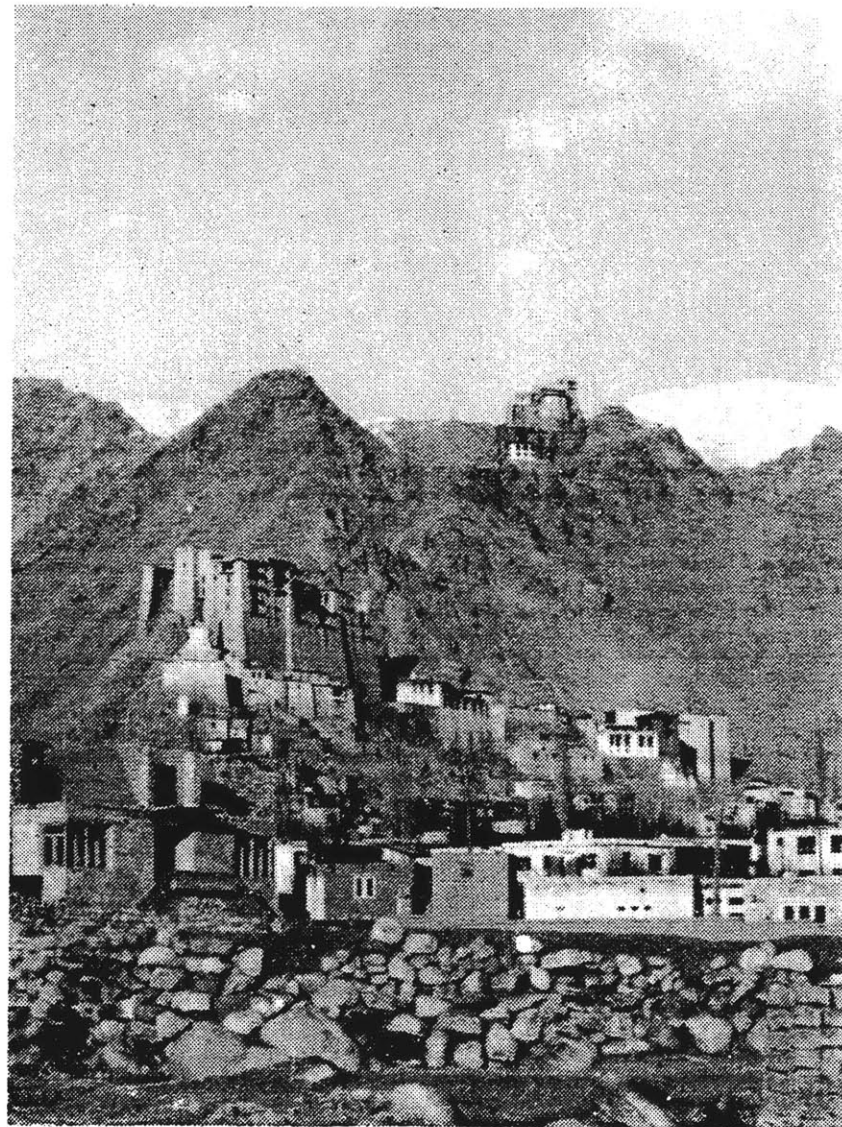


Fig. 56: Social and religious hierarchy as demonstrated in the city of Leh

Thus, the King - considered to be the ultimate creation of culture - in his high dwelling, resides furthest from the earth while the common man who ploughs the earth resides closer to the fields. The settlement is crowned by the monastery and the entire settlement itself stair-steps towards heaven.

This hierarchy occurs within the nine-story palace as well. The upper section constitutes the temples, the throne room and the royal chambers. The lower section is for staff, storage, silos and stables. This hierarchy is further emphasized by the size and ornamentation of openings, which increase towards the top with the importance of the rooms.

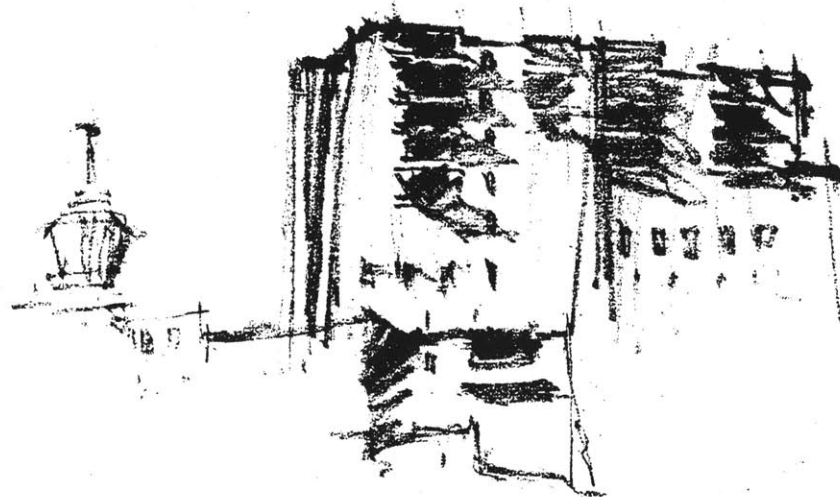


Fig. 57: External expression given to the hierarchy within the structure of the palace

At the level of the house, the hieratic structure is repeated in the vertical zoning of uses: the ground floor serves as animal quarters and storage space, the upper floors for the living areas. The prayer room is located at the topmost level. The articulation of openings further reflects this hierarchy.

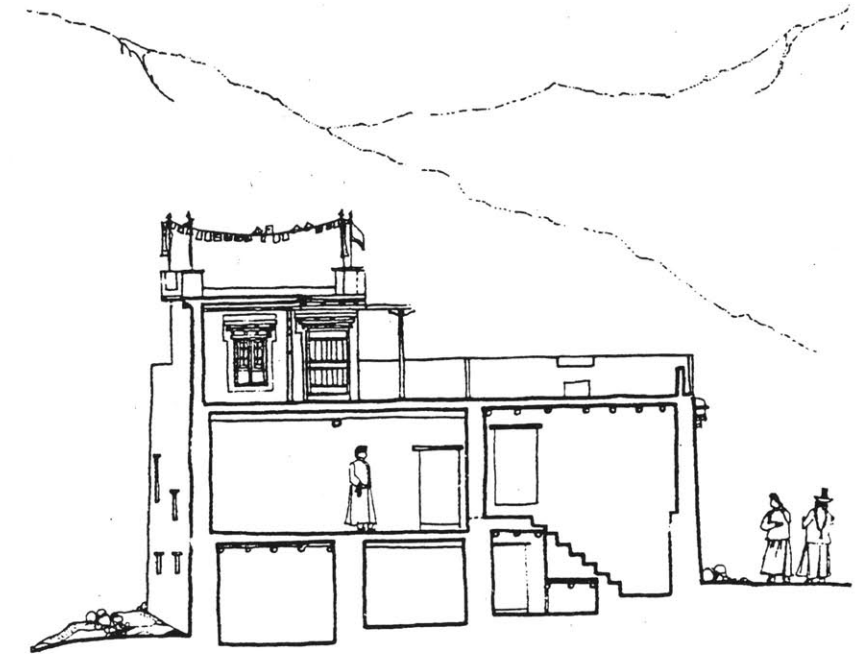


Fig. 58: The "god - man - animal" hierarchy explicit in the levels of the house

All these levels reflect the structure of the Buddhist Cosmic World: the universe is aligned both vertically and horizontally around a fixed center. This axial center is viewed as the physical and metaphysical center of the sacred. It may be marked as the sacral site by a pillar-surrogate or by the primordial mountain. Cosmograms and emblematic space-usages continue to carry this symbol.

At the city scale, the location of the main 'chortens' help define these hieratic zones. A 'chorten' is a reliquary monument representing the spiritual. 'Chorten' literally means "a receptacle for offerings" and is an object of veneration as a repository of sacred power.

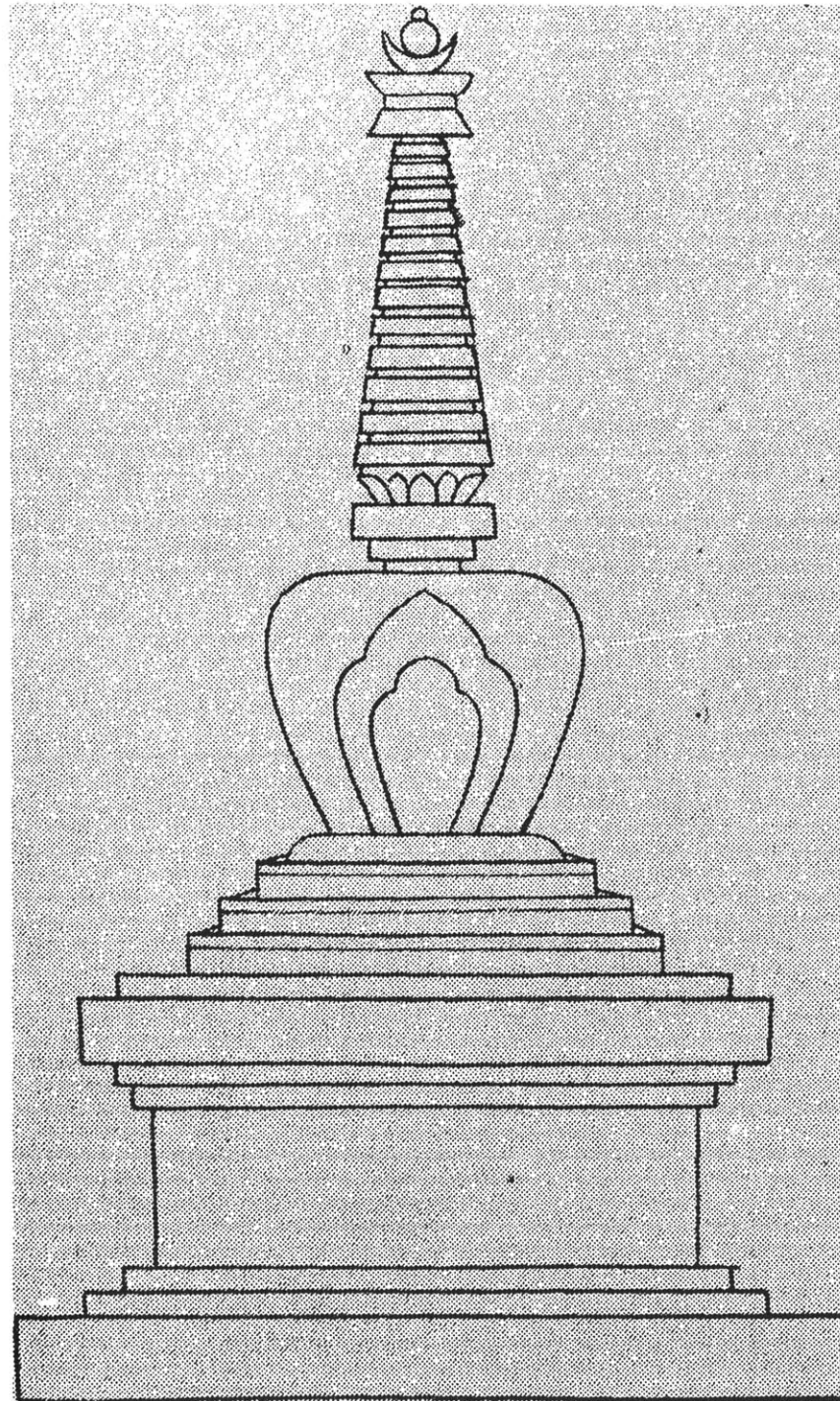


Fig. 59: The form and structure of a 'chorten'

The form of the 'chorten' symbolizes the structure of the universe and the path to salvation. It is composed of a square, a circle, a triangle, a crescent and a flame. These different parts are associated with the five elements - earth, water, fire, air and space respectively. The 'chorten' itself is therefore an abstract representation of the levels or hierarchy of the cosmic world.

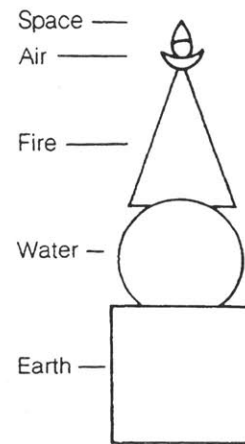


Fig. 60: The compositional elements of a 'chorten'

The isolated 'chortens' organize the city physically into various levels reflective of the social structure. The east entrance 'chorten' gateway and the 'chorten' located at the western side of the palace create the zone of the royalty and deities above and that of the nobility directly below. The next zone, of the common man, is also thus marked by 'chortens' located at an intermediate level while the "social outcasts" reside outside the southernmost 'chorten' gateways of the city.

The monastery, however, holds its ground while furthest away from it. Crowning the peak above the palace it represents the central and vertical "axis mundi" and serves to align the city with the center of the cosmos.

In plan, this spatial organization generates patterns associated with the mythical mountain at the sacred center while in elevation, the entire city becomes a representation of the cosmic Mt. Meru.

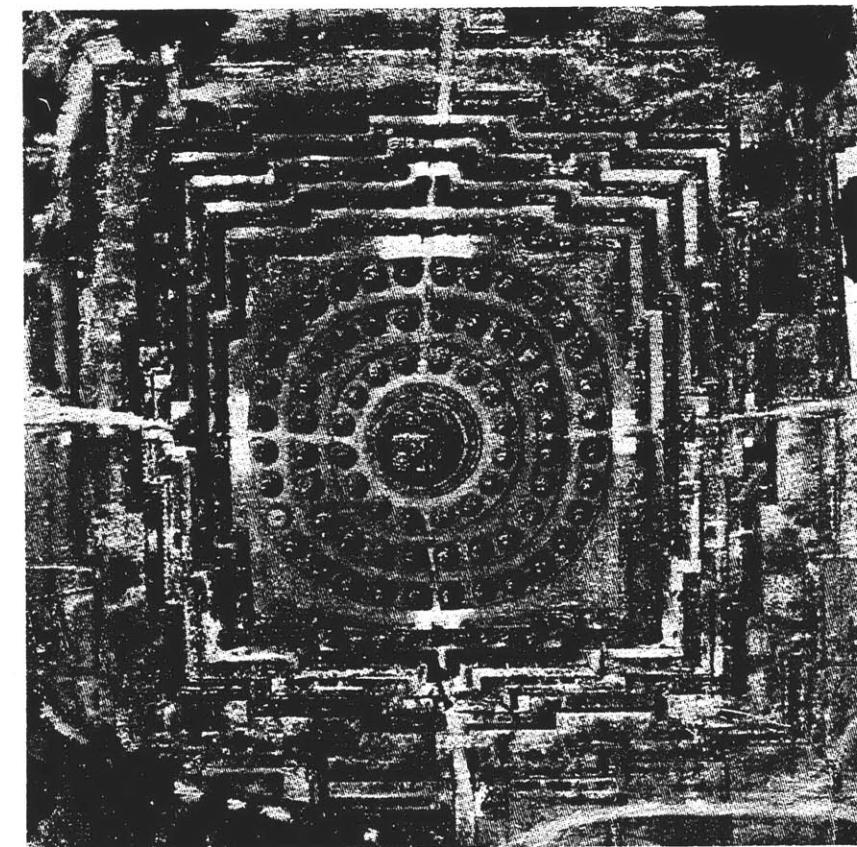


Fig. 61: Plan of Borobudur, Indonesia - cosmic hierarchy is explicit

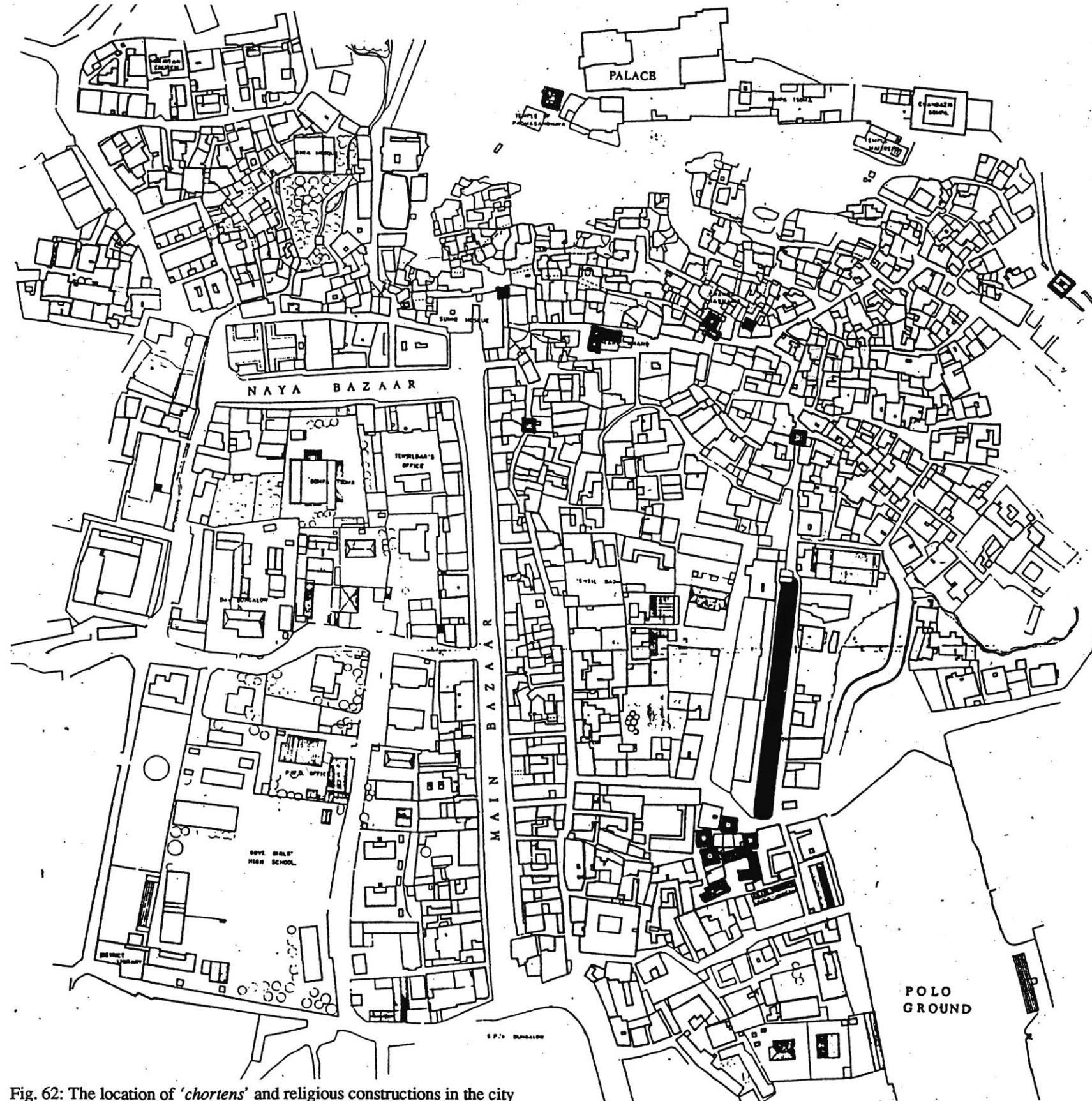


Fig. 62: The location of 'chortens' and religious constructions in the city

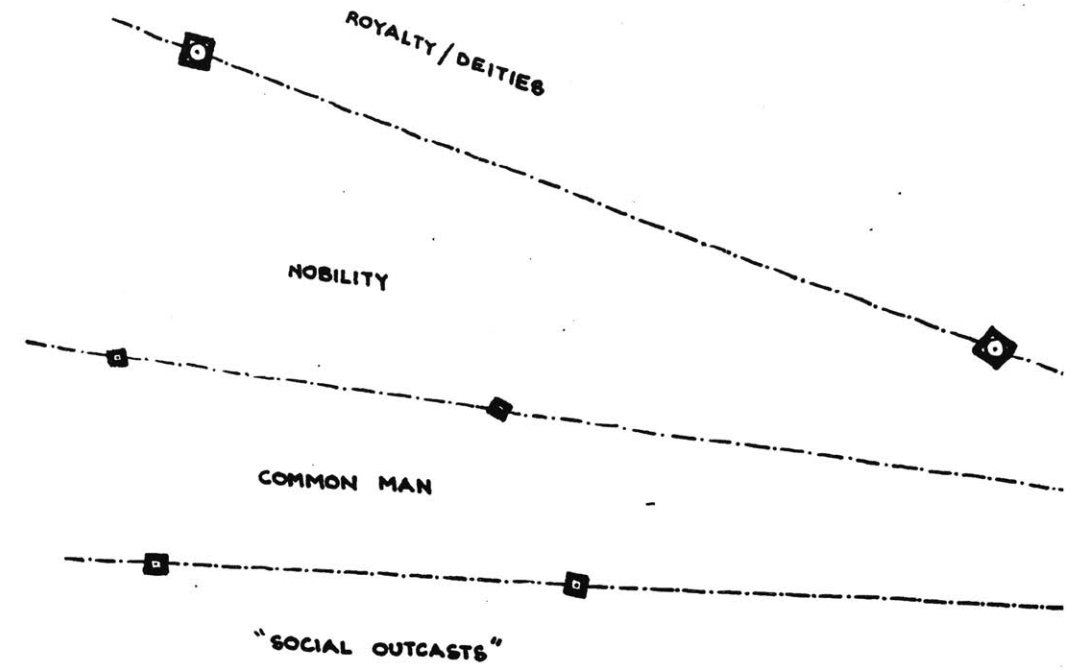


Fig. 63: The isolated 'chortens' zoning the city

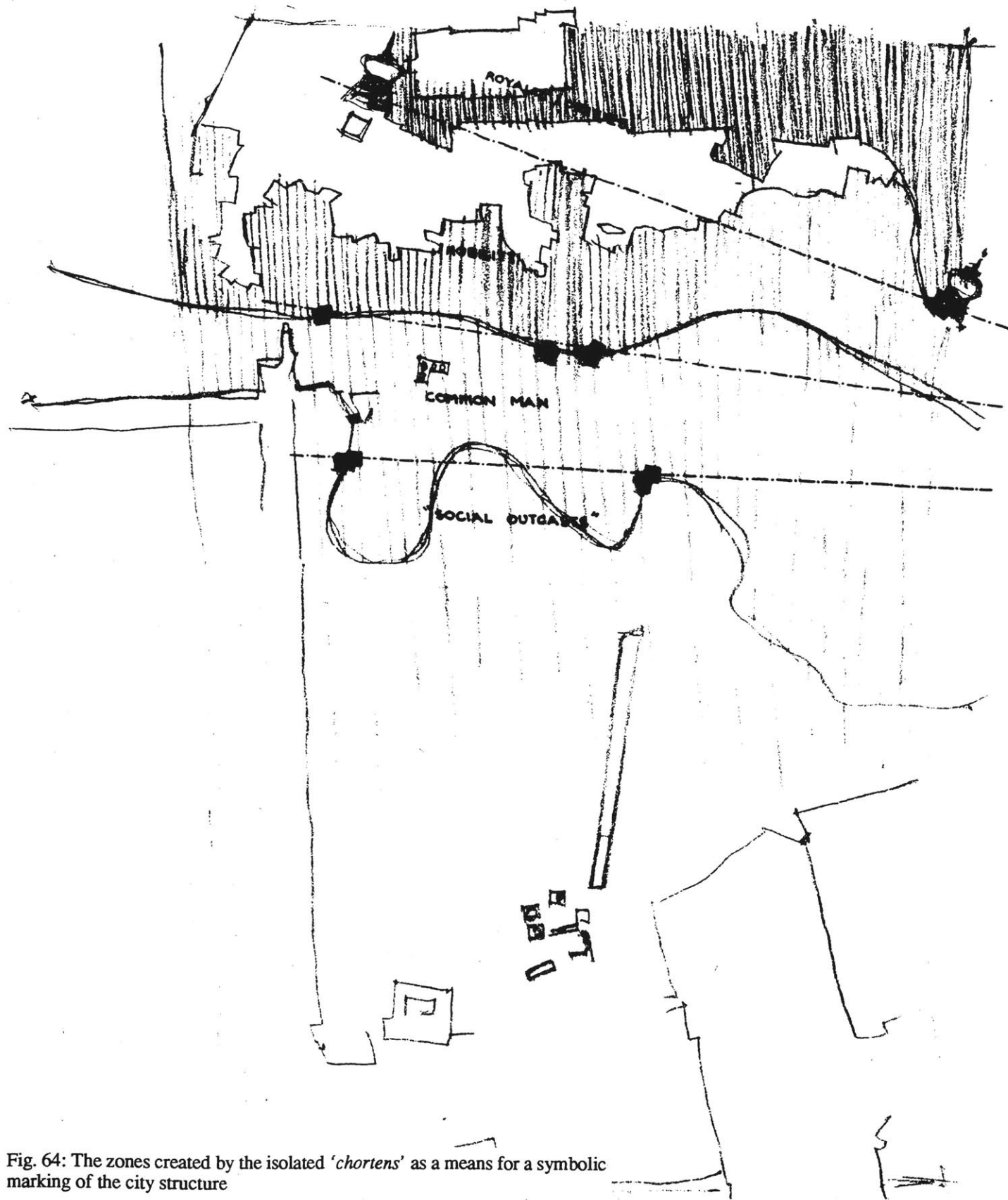


Fig. 64: The zones created by the isolated 'chortens' as a means for a symbolic marking of the city structure

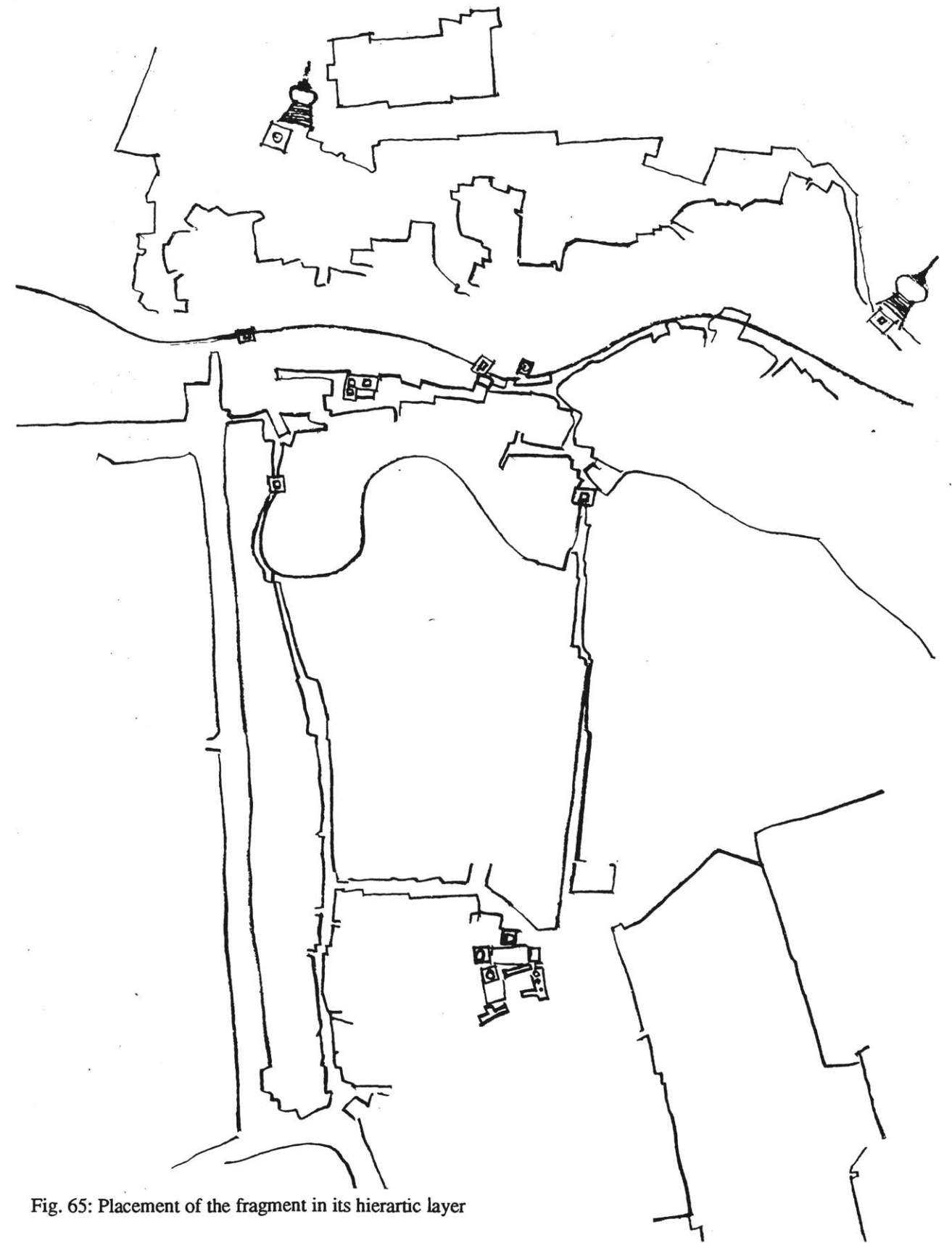


Fig. 65: Placement of the fragment in its hierartic layer

2. Position and Direction

Religious built elements and streets serve as a means of articulating movement. The movement systems, in their use and symbolic terms, reveal the directional qualities taken on by buildings. The religious built elements are used as punctuations in the city as they articulate space around them.

The '*chorten*' may simply be a "grounded" structure, isolated or comprising a cluster, or may be a raised structure forming a gateway. The raised structure allows for cosmic alignment and therefore has the same implications as that of circumambulation. Often three "housed" '*chortens*', known as '*rik-sum gompo*' call attention to the deities of the three directions - east, south, west, with the north blind - opaque.



Fig. 66: A "raised" '*chorten*'

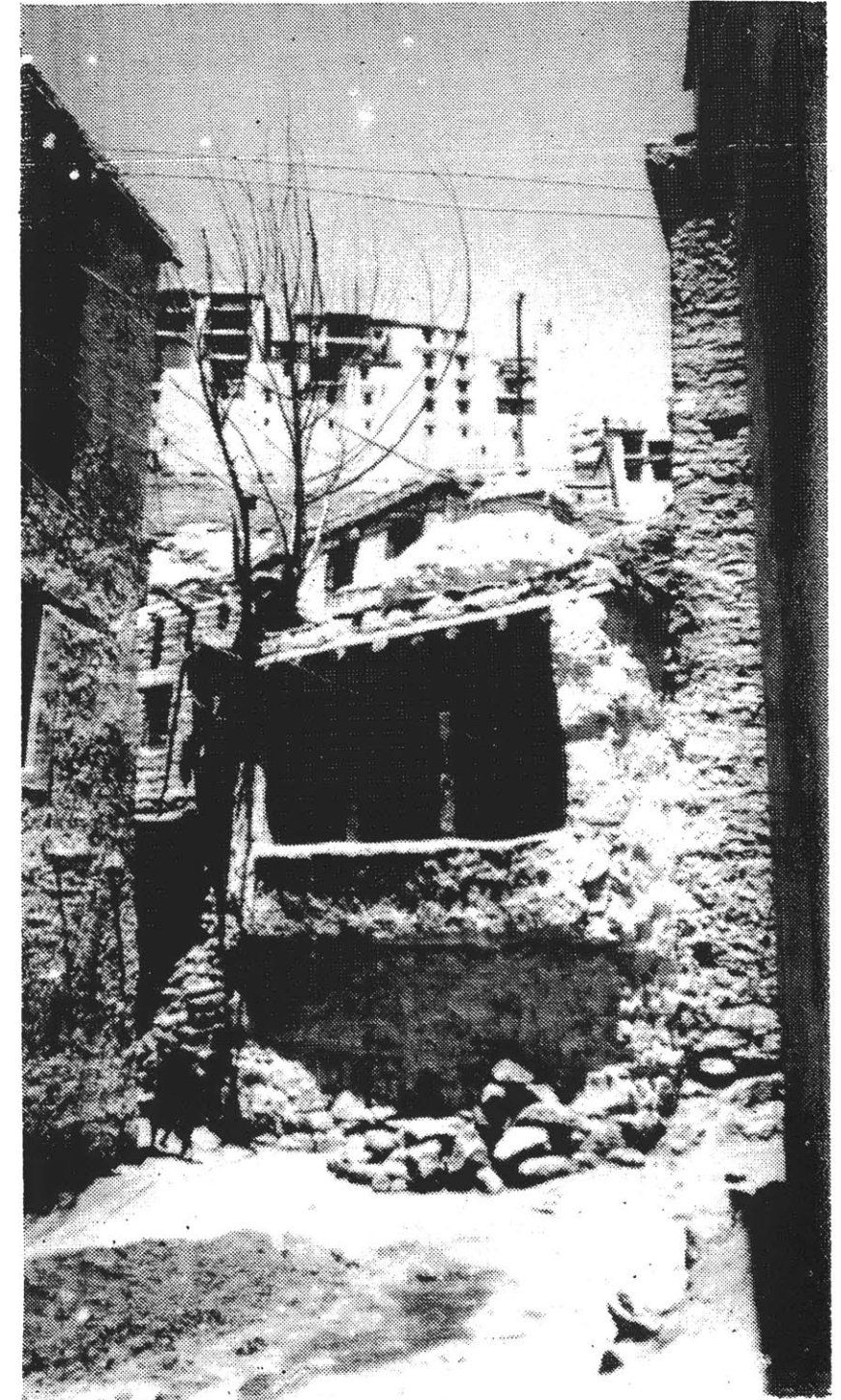


Fig. 67: A "grounded" '*rik-sum gompo*'

These religious built elements constitute primarily various forms of the '*chorten*' and '*mani*' walls. A '*mani*' wall, or '*mani-man-thang*', which literally means "jewel plain", is a long platform built of large rocks on which prayer stones are placed. These are primarily built along important routes and at crossroads. All religious constructions are circumambulated as an accepted practice by all - sunwise (clockwise) - in accordance with the cosmic turning as a means of accumulating spiritual energy and of purification of the soul.

The two main ceremonial routes - one between the palace and the bazaar, and the other between the palace and the polo ground - are traditionally recognized by the inhabitants. In each route the ascent appears to carry greater significance as it is marked by both cosmic alignment and circumambulation, while the descent routes are characterized by cosmic alignment only.

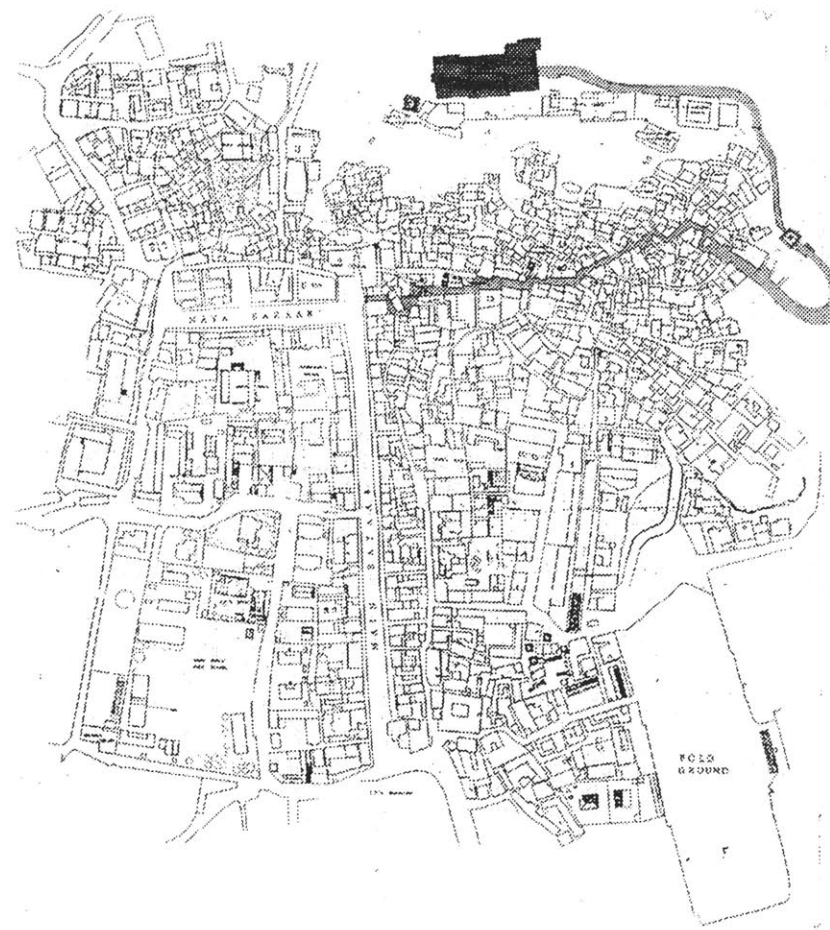


Fig. 68a: The ceremonial route between the palace and the bazaar



Fig. 69a: The processional route between the palace and the polo ground

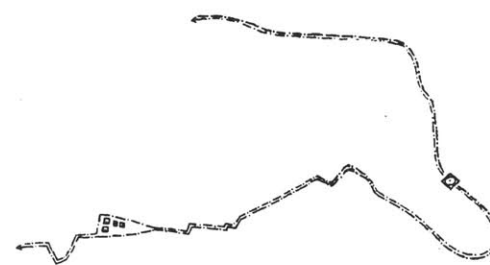


Fig. 68b: Religious constructions on the route determining movement



Fig. 69b: Religious constructions on the route determining movement

Fig. 68 - Fig. 69: Circumambulation and cosmic alignment on ceremonial routes

The entrance to the city is located on the east (in accordance with the Buddhist belief that the east is the direction of good spirits) and is marked by a '*chorten*' gateway on the ceremonial route to the palace. The significance of this '*chorten*' gateway is emphasized not only by its scale, color, and elaboration, but also by its independent structure which makes circumambulation an additional option to cosmic alignment. Another similar '*chorten*' gateway is located on the processional route to the polo ground.

There are two other '*chorten*' gateways which serve primarily to demarcate neighborhoods. Due to their lesser importance, they are simpler, less elaborate structures and are constructed as part of the built fabric. These allow only for movement through the gateway, and for cosmic alignment.

The form of the '*chorten*' gateways reflect their importance and also respond to circumambulation, directing movement clockwise.

There are also defense gates, the form of which, along with the form of the surrounding structures, sets up a series of broken axes, thereby blocking direct movement.

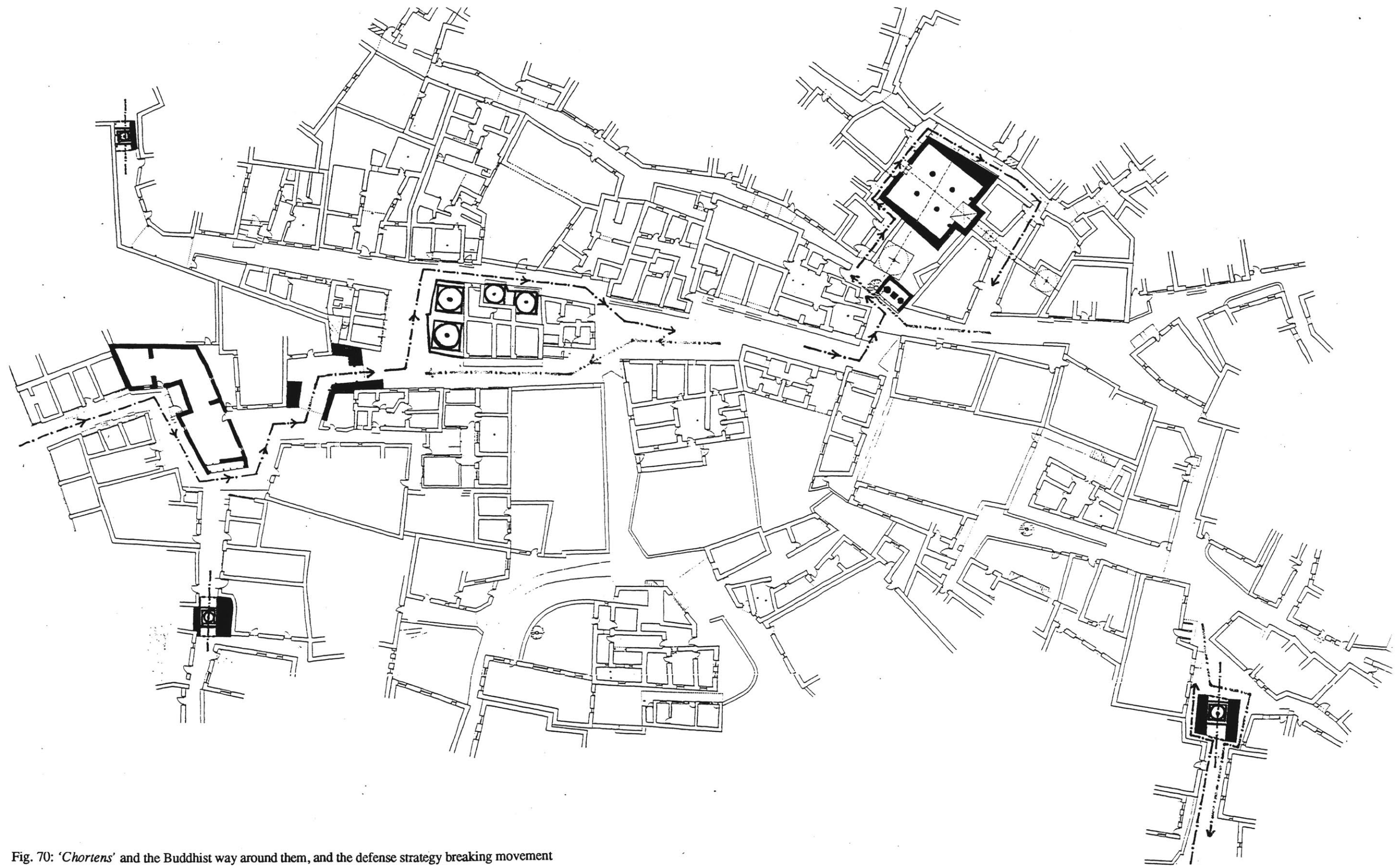


Fig. 70: 'Chortens' and the Buddhist way around them, and the defense strategy breaking movement

While the alignment of the streets follows that of the contours and the direction parallel with the contour lines remains primary, a secondary direction consists of short perpendiculars which are not continuous, but somewhat mysterious offshoots that follow the natural system of drainage lines. These secondary streets serve to connect the primary streets or end in cul-de-sacs.

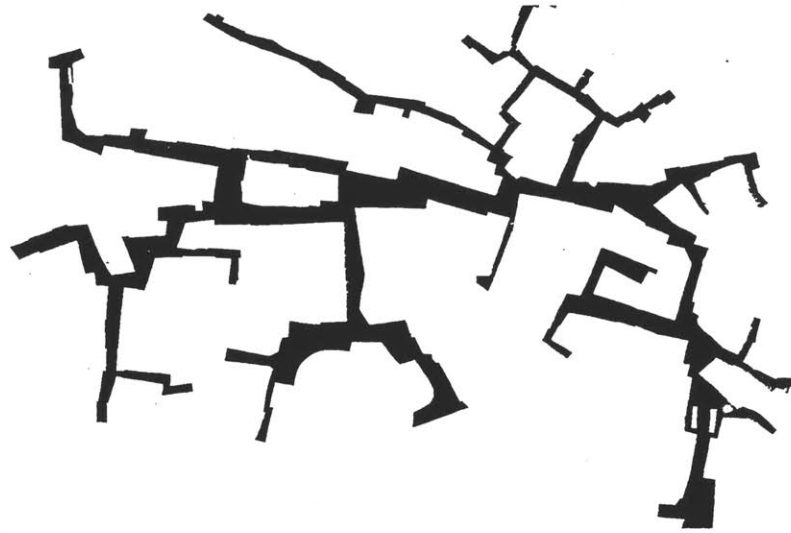


Fig. 71: Street plan of the fragment



Fig. 73: The street as part of the fragment

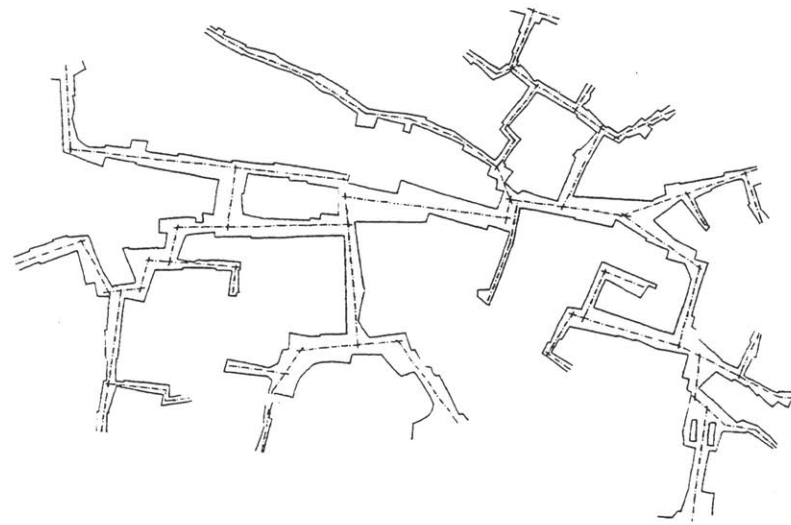


Fig. 72: Primary and secondary directions

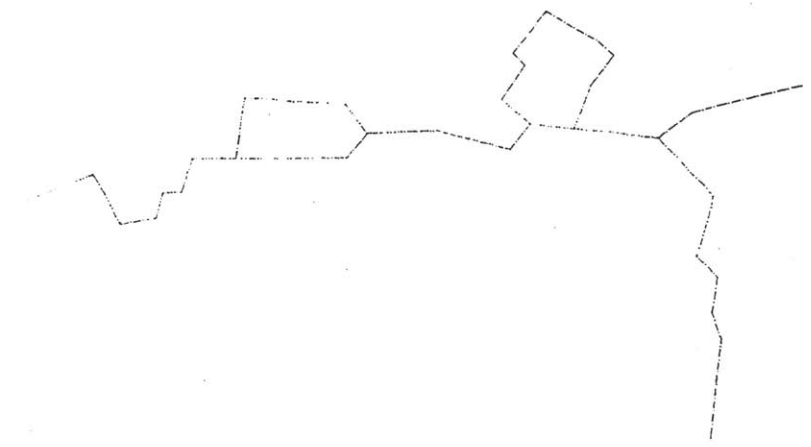


Fig. 74: Movement patterns of the ceremonial routes

Fig. 71 - Fig. 74: Directionality of streets

Temples directly affect the form of the fabric. They are circumambulated and the form around them takes on the associated directional properties. The location of the '*rik-sum gompo*' at the street junction near the temple on the fragment introduces a direction change towards it, not only to announce the presence of the temple but also to direct movement around it. The angles of the directional change of the enclosures are therefore clearly intentional.

Within the temple, the position of the four columns implies a center and the temple repeats in its internal patterns of circumambulation. Its form takes on the qualities associated with this directionality. Rituals-of-the-center circle the sacred site sunwise.

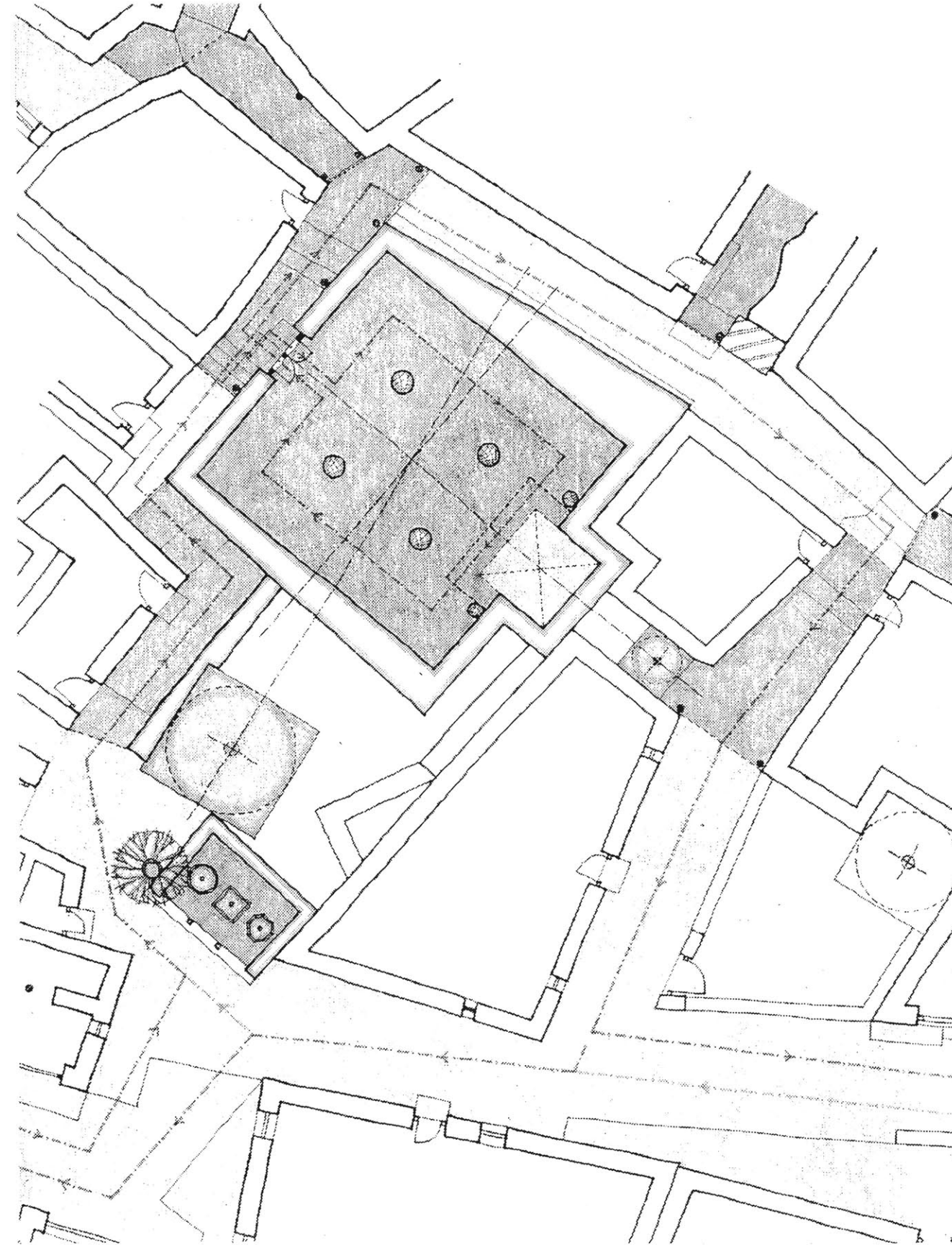


Fig. 75: The temple - Chamba Gonbo - articulates movement: the three housed '*chortens*' or '*rik-sum gompo*' direct movement clockwise towards the temple; the axes of the adjacent '*chortens*' pass through the center of the temple; the angles of the structures are intentional and determined

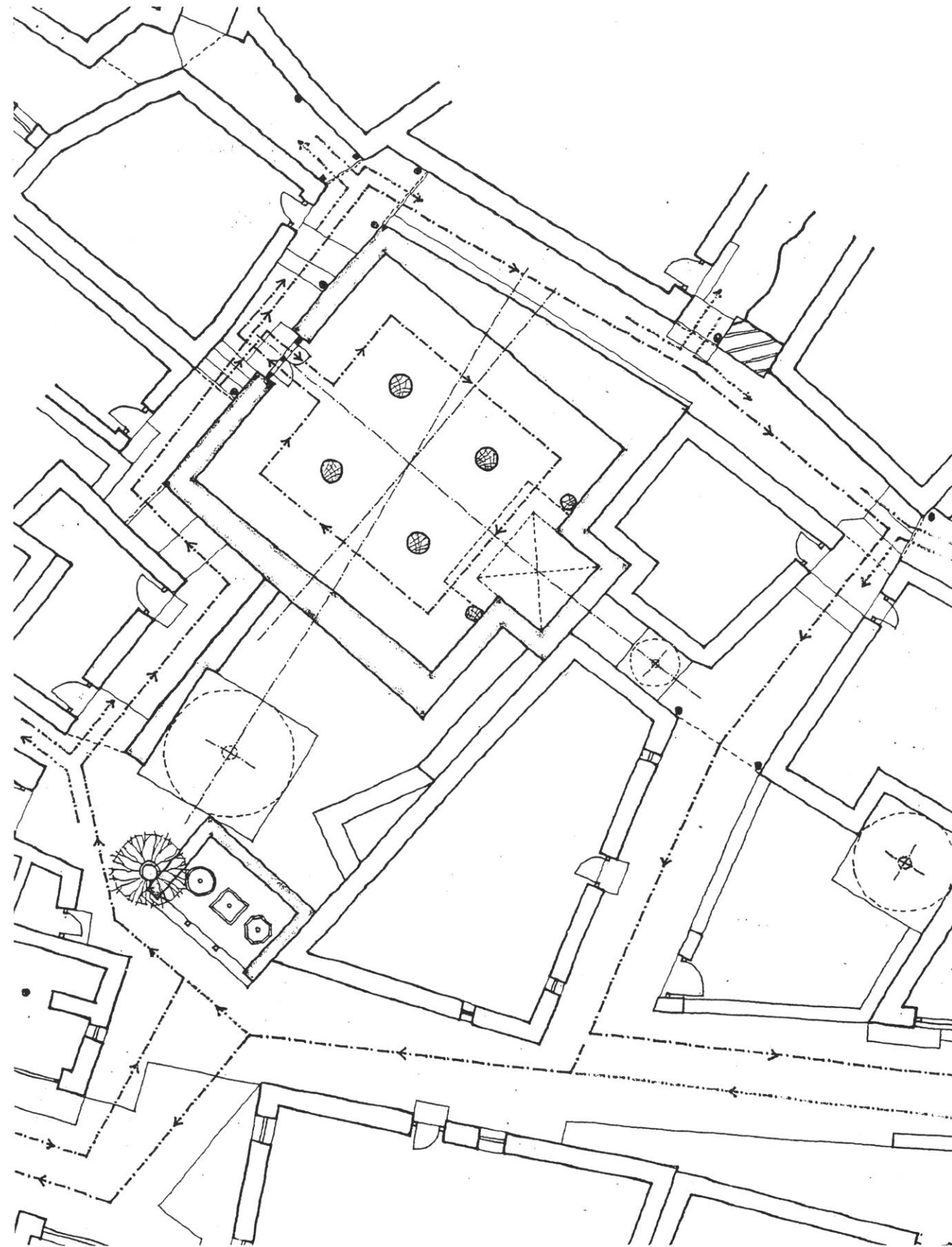


Fig. 76: The Buddhist way around the temple - externally and internally

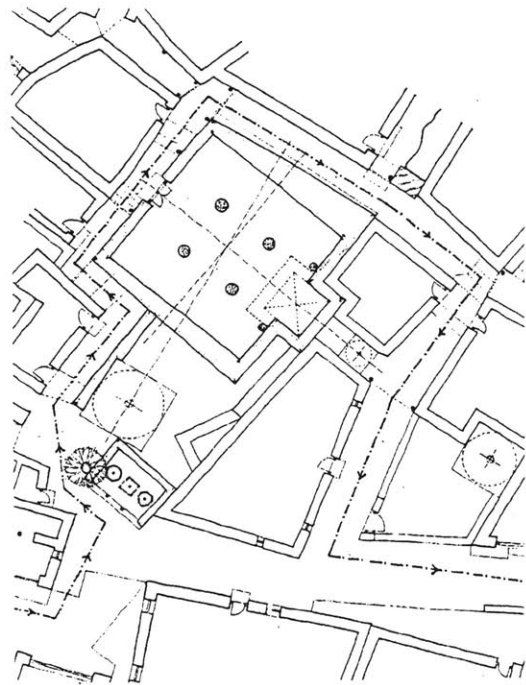


Fig. 77a: The way up - the temple is circumambulated

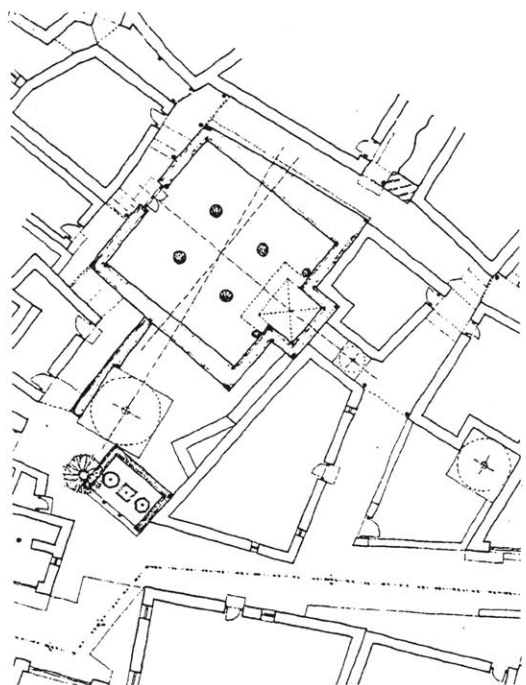


Fig. 77c: The way down - the temple is passed on the right

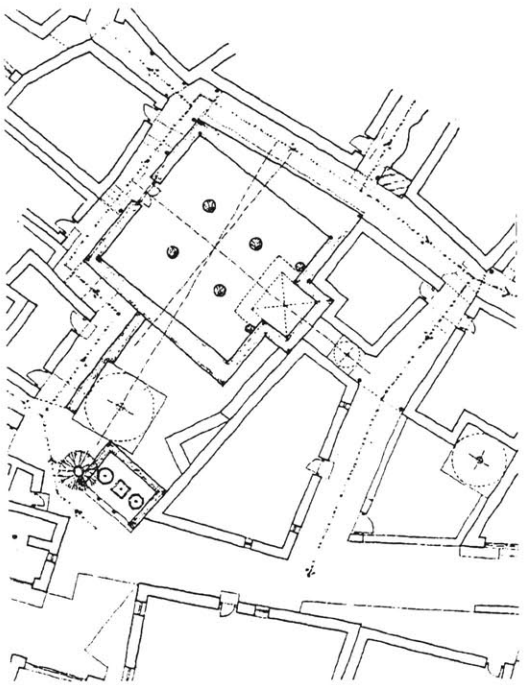


Fig. 77e: The way into the adjacent streets

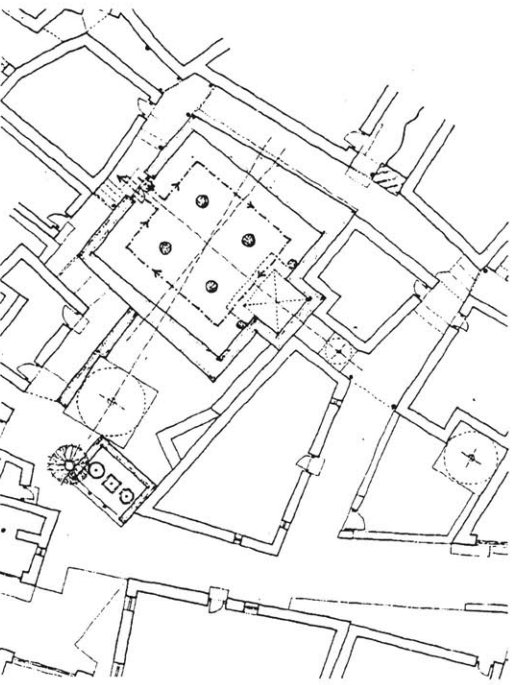


Fig. 77g: Internal circumambulation of the center of the temple

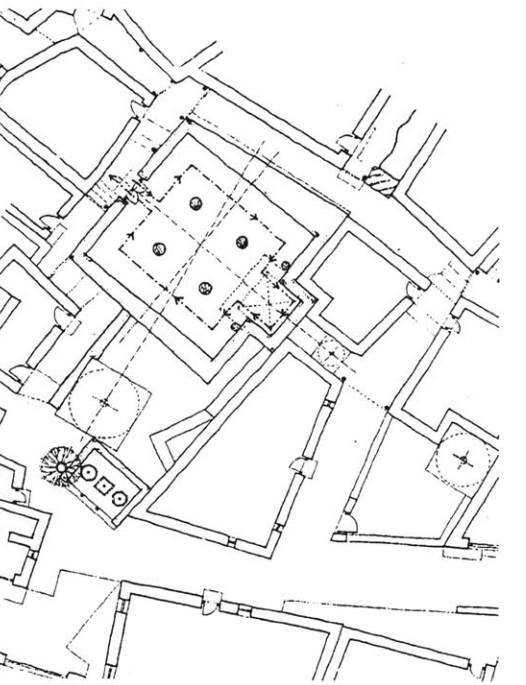


Fig. 77i: Internal circumambulation of the center and the statue

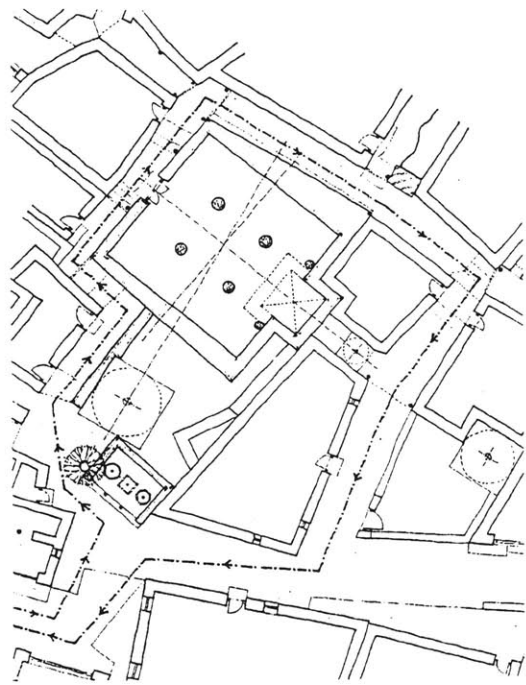


Fig. 77b: The way up specifically for circumambulation

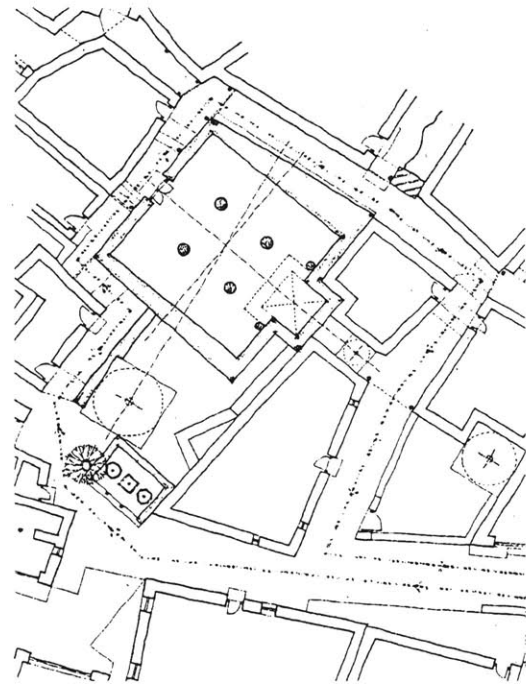


Fig. 77d: The way down specifically for circumambulation

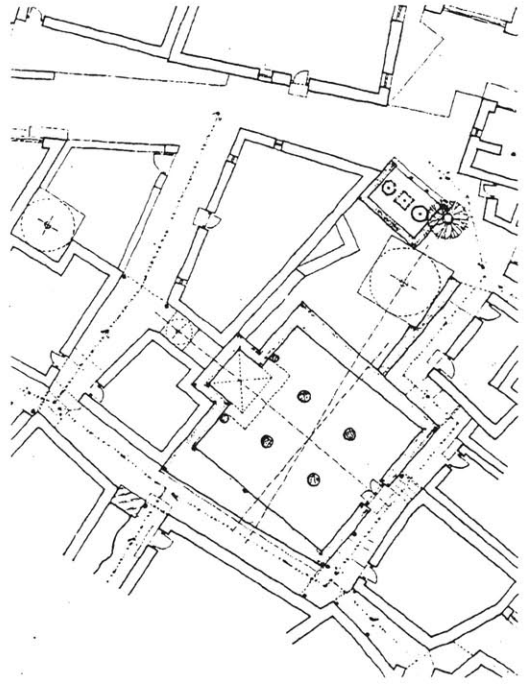


Fig. 77f: The way out from the adjacent streets

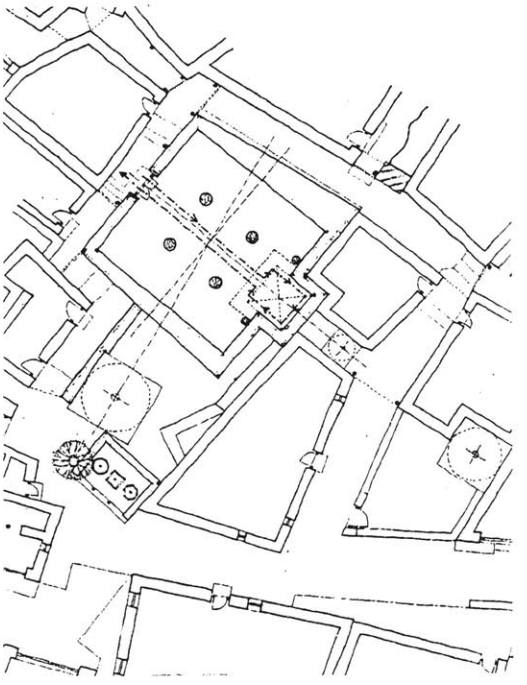


Fig. 77h: Internal circumambulation of the statue only

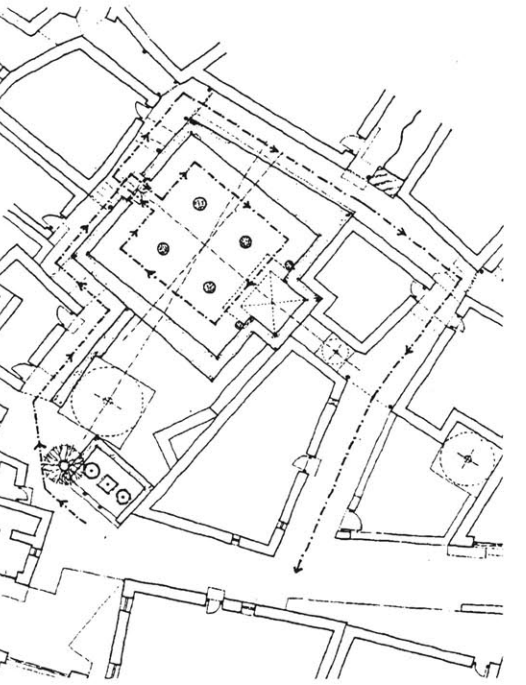


Fig. 77j: The combined external and internal circumambulation of the temple

Fig. 77: Movement systems associated with the temple

3. Assemblage

The layered form of the city emphasizes the natural form of the landscape and its contours. This however, at another level of meaning, is organized into clusters in accordance with the social norms of community living.

Open spaces, religious constructions and gates enable the built fabric of the city to form clusters, both visually and in terms of use.

The assemblage of the city is clearly additive and is derived at each level from the square, implying a center, as that of the '*mandala*' (which means "center and surrounding environment").



Fig. 79: An element of the additive system



Fig. 80: Conventional figure ground of the fragment (shows little)

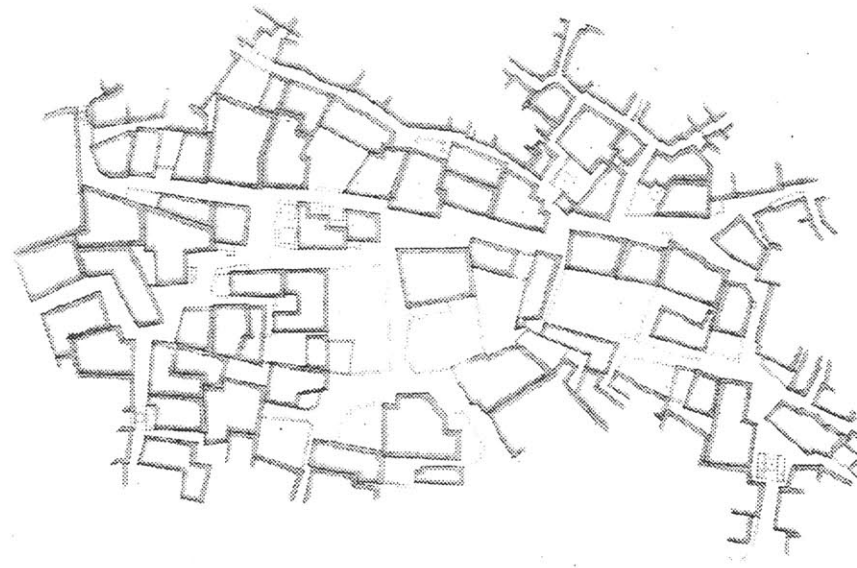


Fig. 81: Modified figure ground showing built structures and open spaces in two dimensions



Fig. 82: The fabric of the fragment



Fig. 83: The underlying cluster form

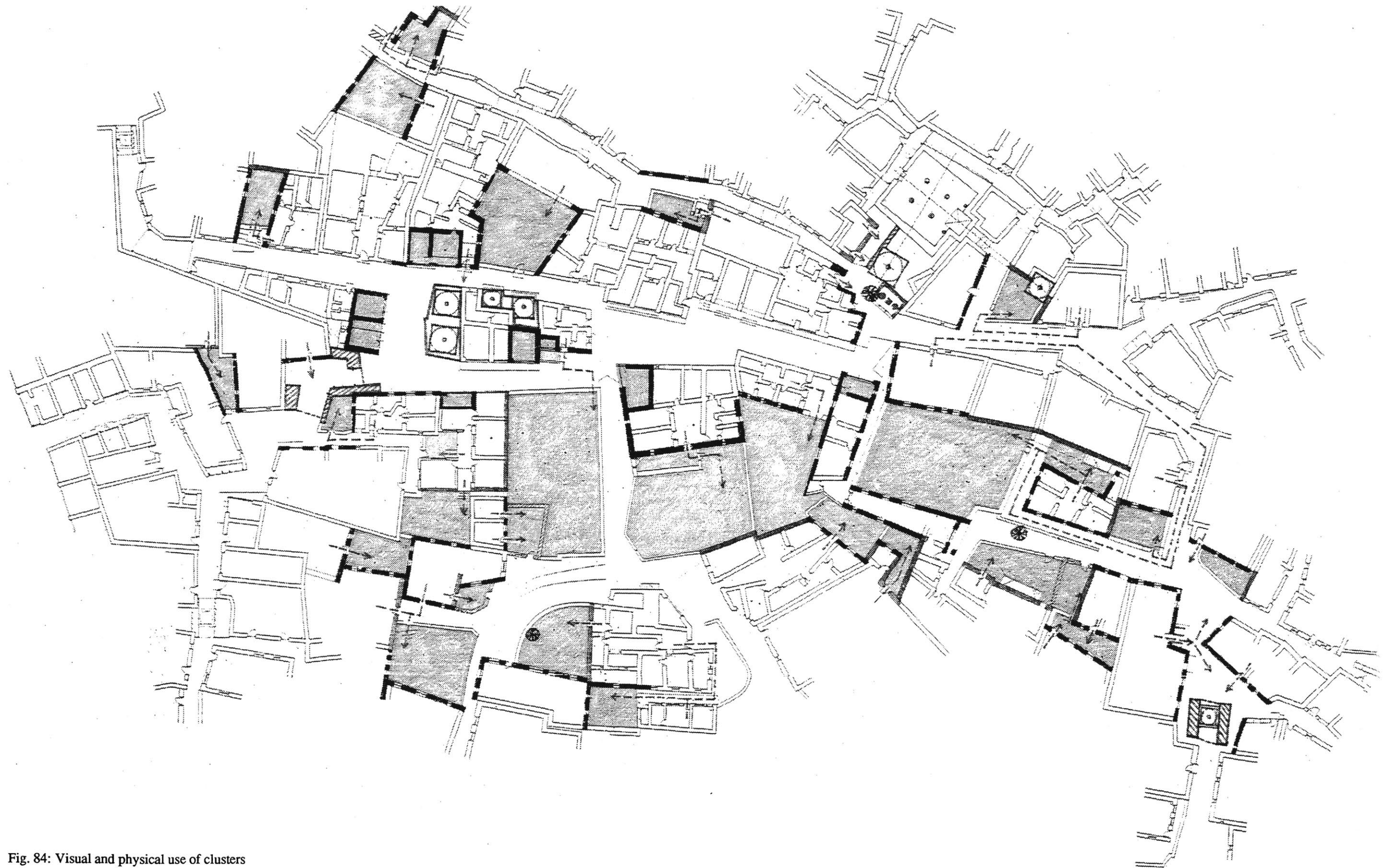


Fig. 84: Visual and physical use of clusters

Each cluster develops from a square with open spaces, religious constructions and gates at the center and the built fabric surrounding it, implying the 'mandala'. There is a dimension of the square which defines each cluster. This dimension repeats itself, consistently in the deployment of clusters.

A further observation shows that the open spaces serve as the means for reciprocity between public (street) and private (house) domains. The differentiation of the open spaces appears in terms of the following categories:

C2: larger spaces accessed from streets - most public

C3: smaller spaces accessed from houses - private

C4: small spaces enclosed by a high wall - very private

shows that the C2 spaces come together to form a node or a very public open space - C1. C1 further organizes the clusters into a larger group. Clusters come together again centered around the open space or node (C1). This node becomes a place of decision-making in the network, often resulting in Y-shaped junctions which in turn imply directional changes. Thus there are layers of meaning to the node and to the hierarchies of the clusters. The built fabric adds up from individual units, to the clusters, to groups of clusters, to a neighborhood, to a piece of the city - the fragment. These categories thus serve as elements of aggregation representing a deeper structure and an emerging order.

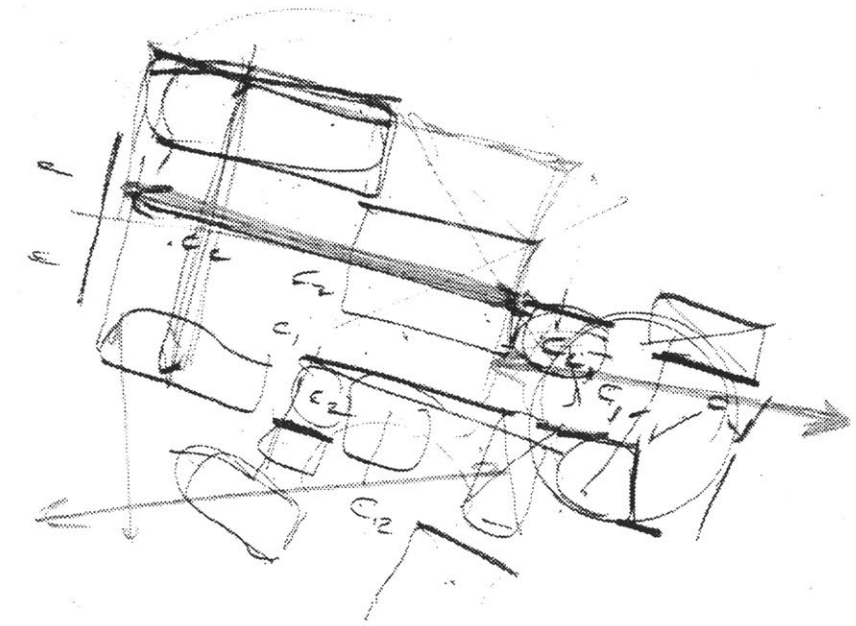


Fig. 85: Sketch showing the relationships between the different open spaces

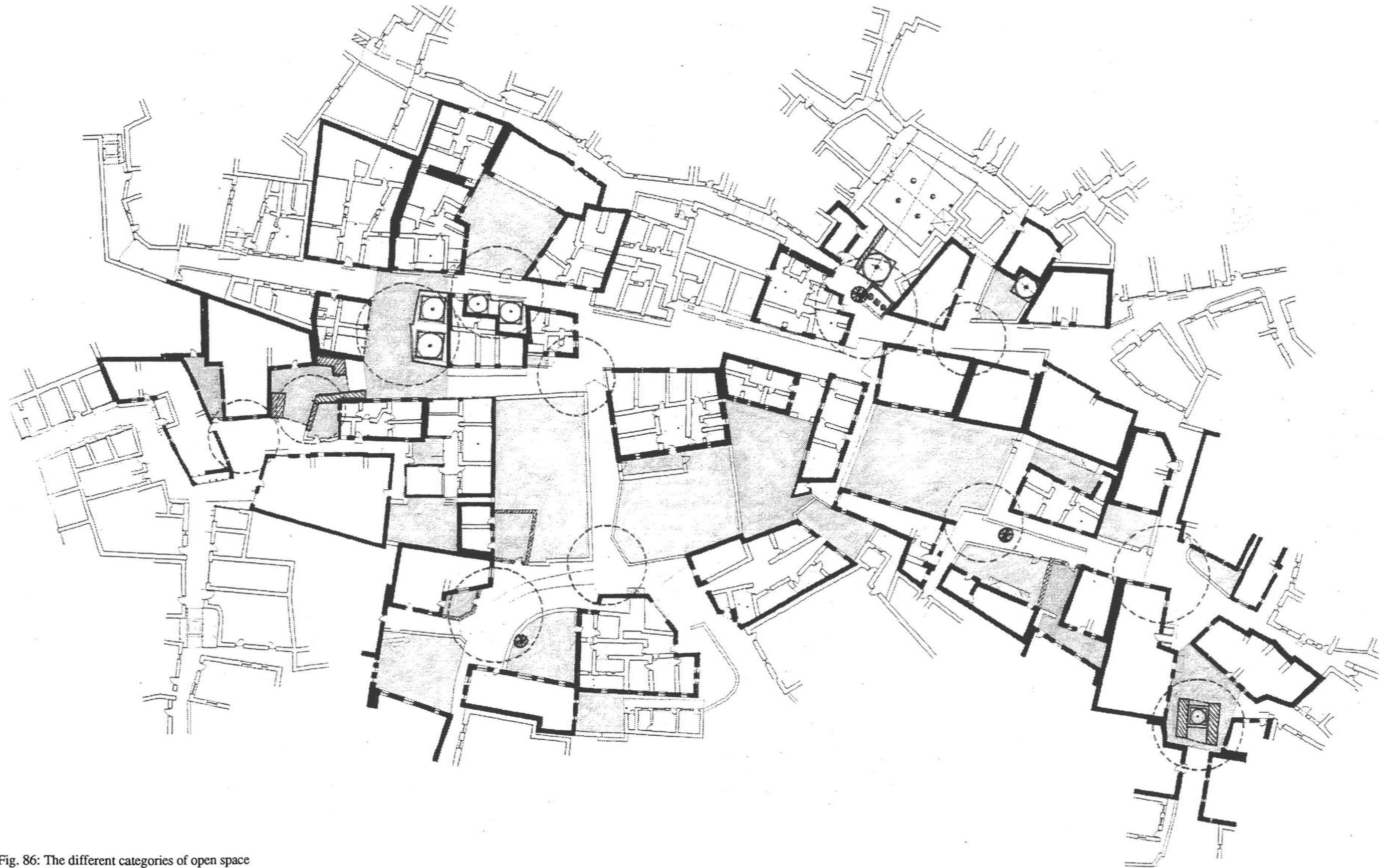


Fig. 86: The different categories of open space

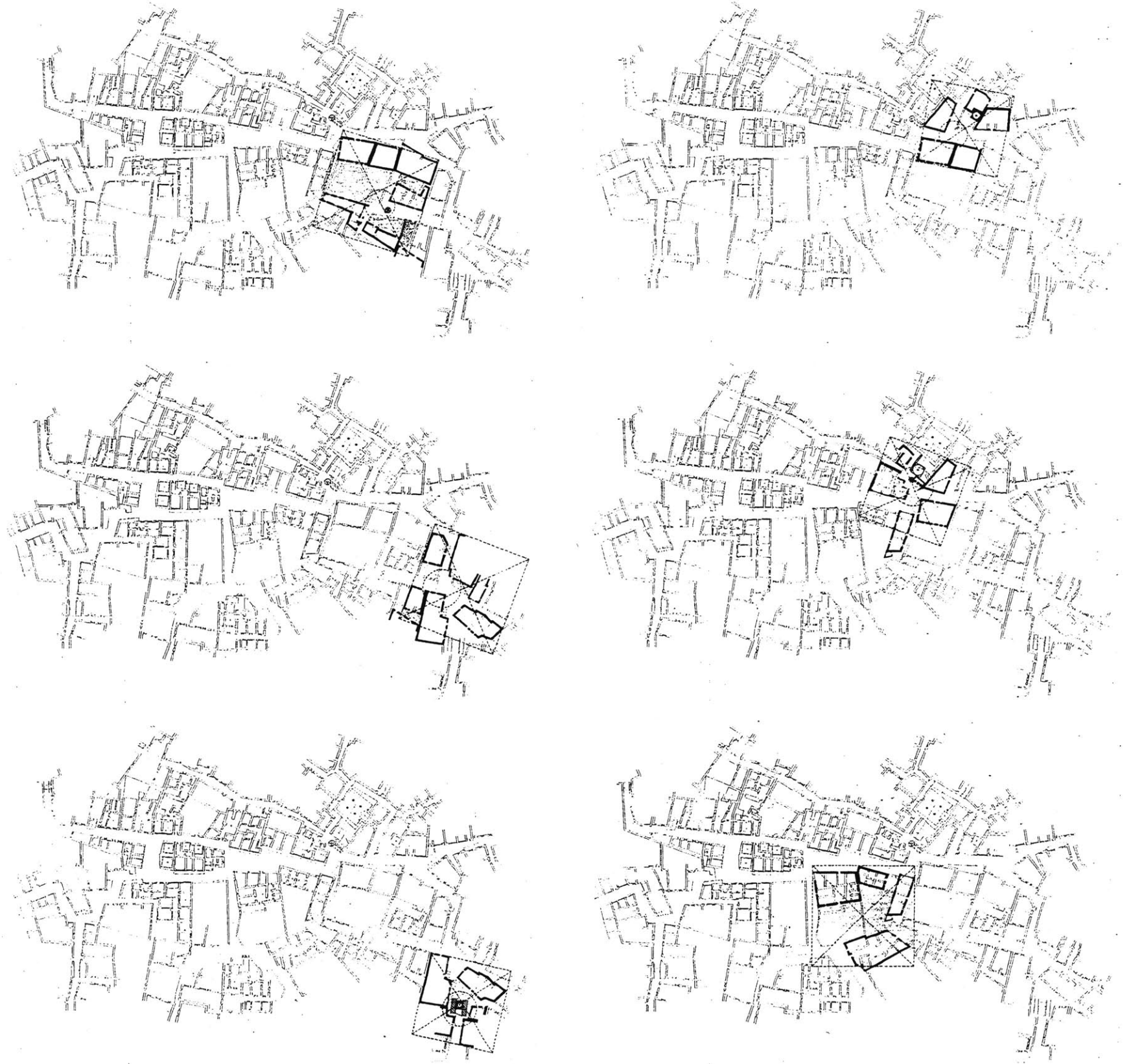


Fig. 87: The squares of the clusters

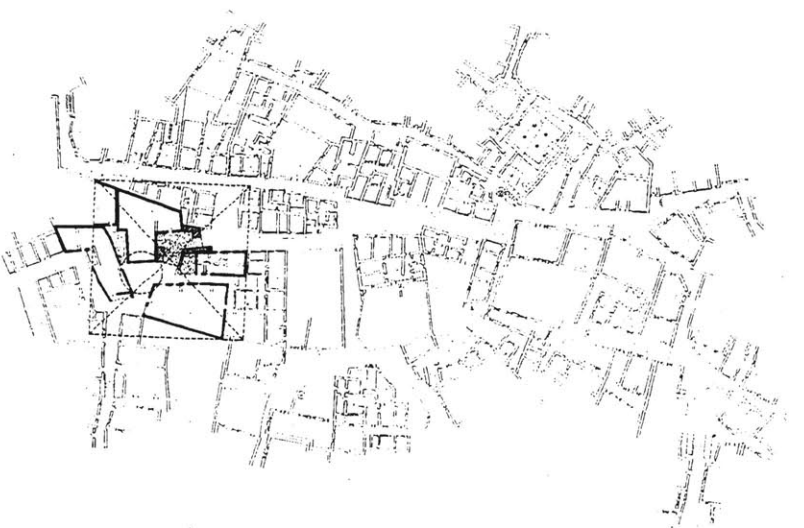
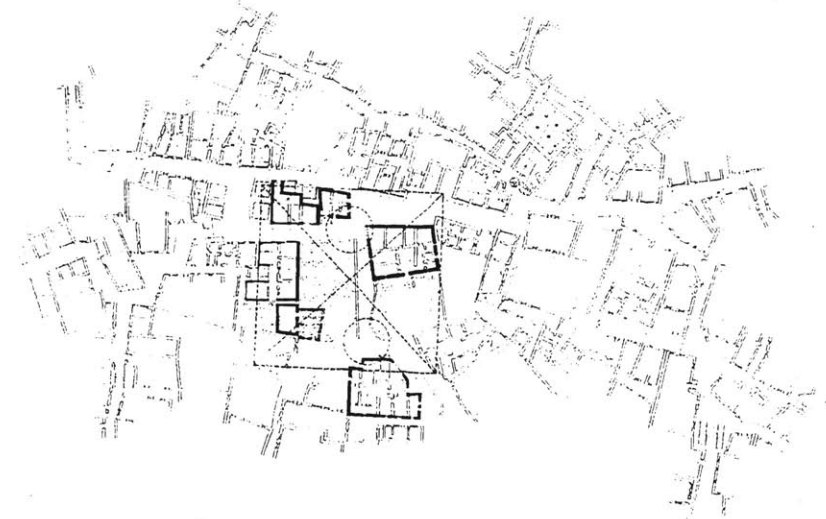
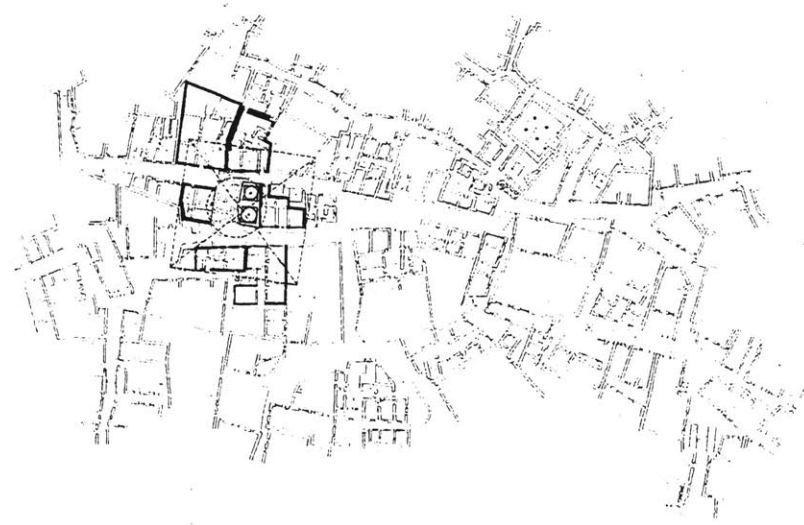
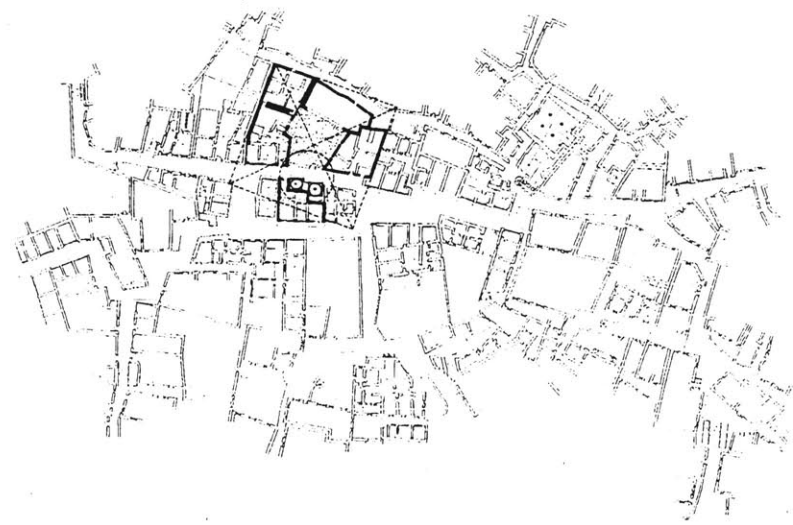


Fig. 87: The squares of the clusters (continued)

There is thus a highly controlled footprint - in which the angles are controlled by the slope, the patterns of movement and the assemblage of the formal order. Everything starts with the square but by the time the assemblage appears, the square, as an ordering device, recedes into the deep structure. At every layer of assemblage, the collective form and spirit of the place is preserved.



Fig. 88: Abstract representation of the resultant footprint - angles appear



Fig. 89: Abstract representation of the resultant footprint - the square disappears

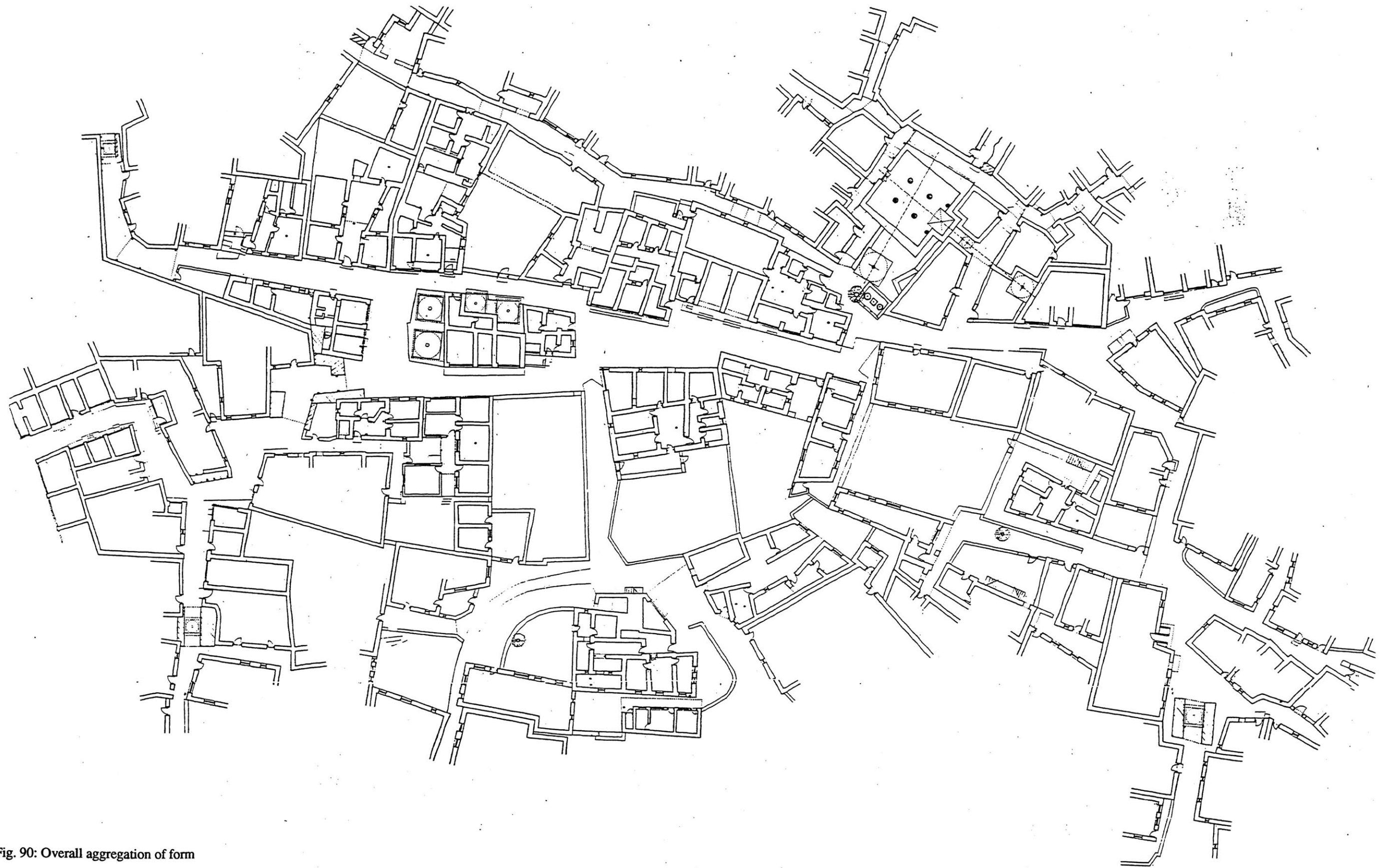


Fig. 90: Overall aggregation of form

4. Generic Dimensions and Geometry

In the exceptional (sacred) buildings of the city, the squares and the bi-axial symmetry of spaces are built and explicit. By using the temple (Chamba Gonbo) as a golden rod, a profound geometric order is revealed in the plan and the buildings of the fragment.

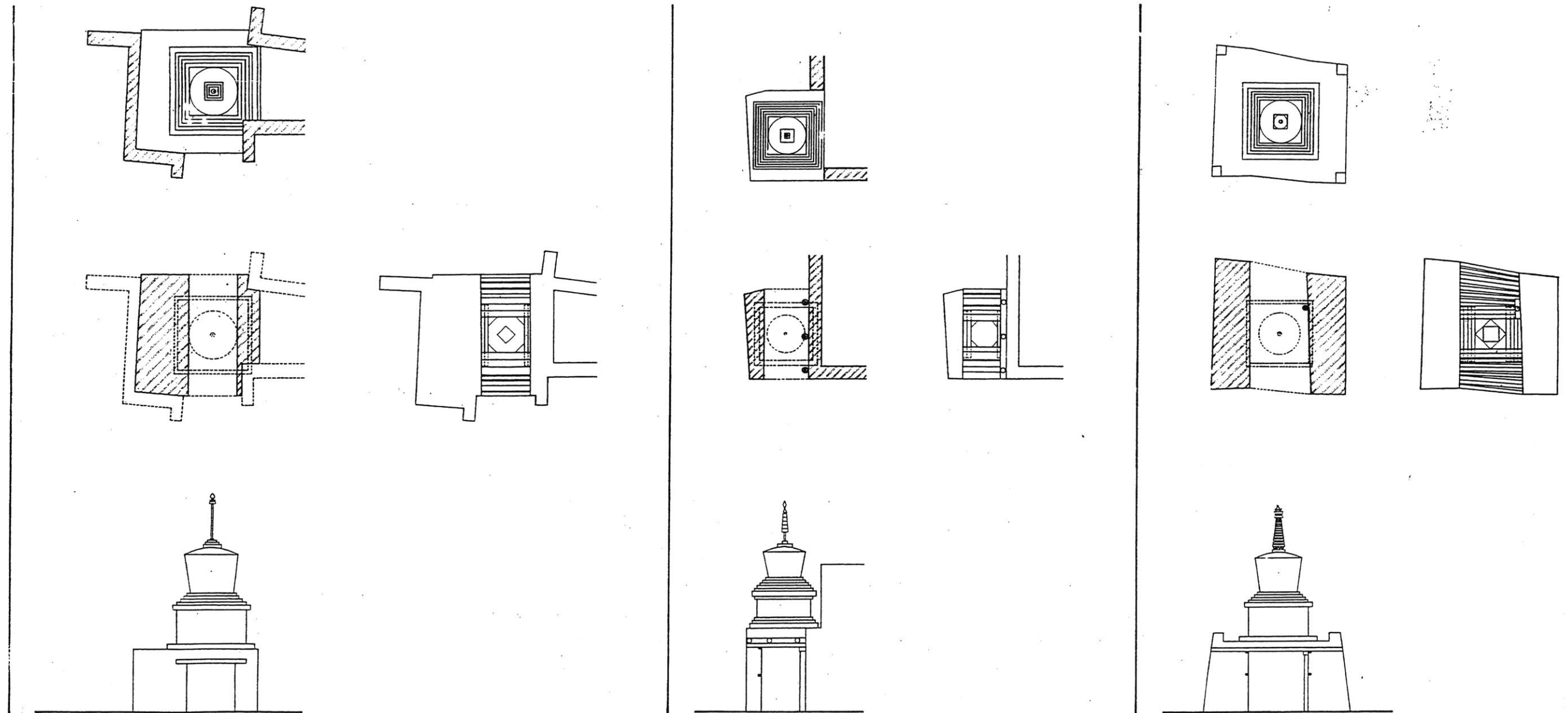


Fig. 91: The three 'chorten' gateways: plans, inverted ceiling plans and elevations

Similarly, the proportions of the 'chorten' gateways are determined by the rotation of the square reflected in their inverted ceiling plans. The inverted ceiling plan represents the 'mandala' since the 'chorten' gateways are a means of cosmic alignment. Thus, even an intermediate piece (in terms of size) of the assemblage follows the norm.

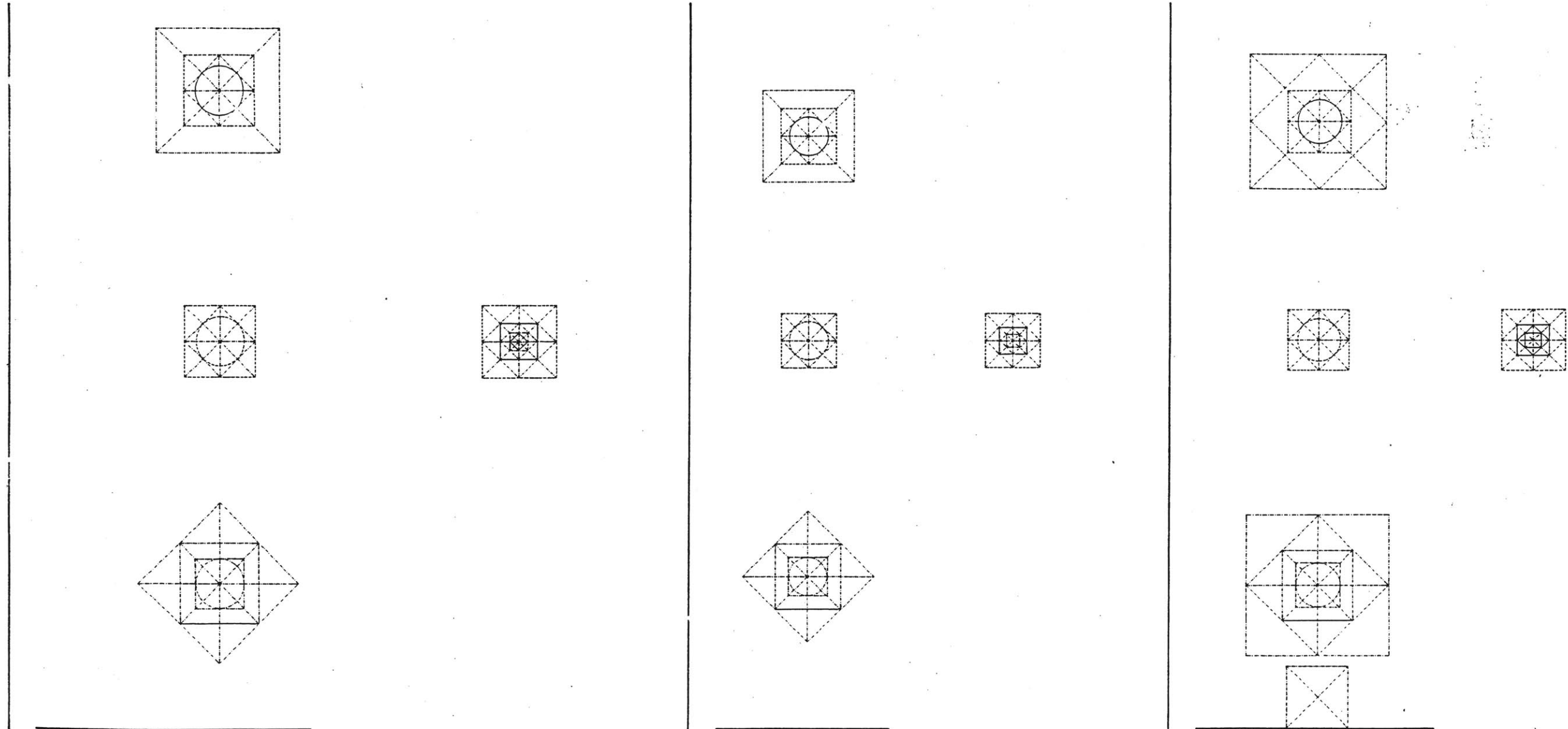


Fig. 92: The rotation of the square relating to Fig. 91

EXPLORATION

The geometric device used is the rotation of the square. The static, non-dynamic form of the square as it appears in the sacred buildings reappears as an ordering device throughout the city.

The geometric order of the rotating square establishes a proportionality, as a unit of measure, and recurs throughout the ordinary fabric. This proportionality establishes a relative ratio of dimensional arrangements embedded in the building of Leh. This appears as a norm of assemblage, read as a sign of coherence.

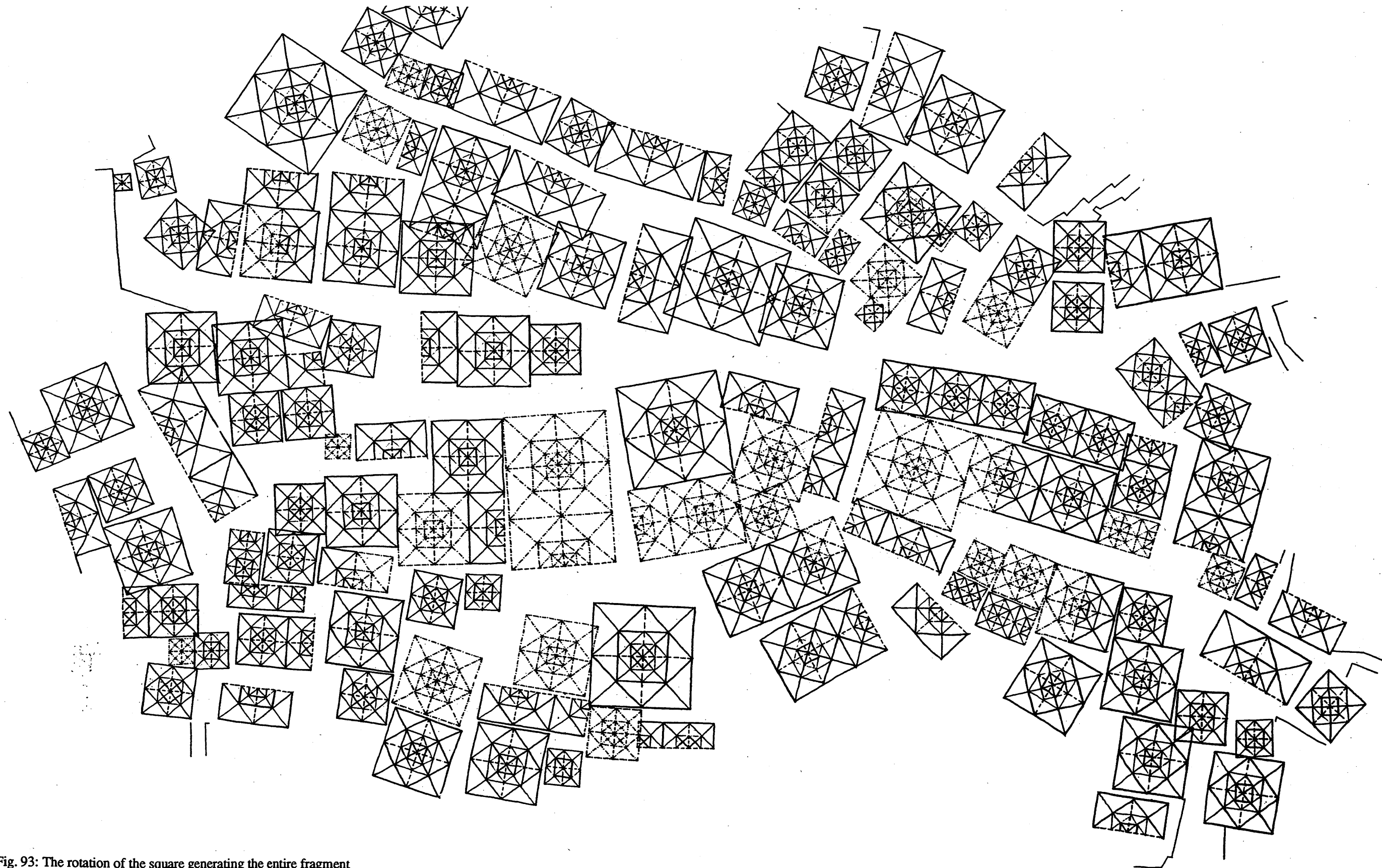


Fig. 93: The rotation of the square generating the entire fragment

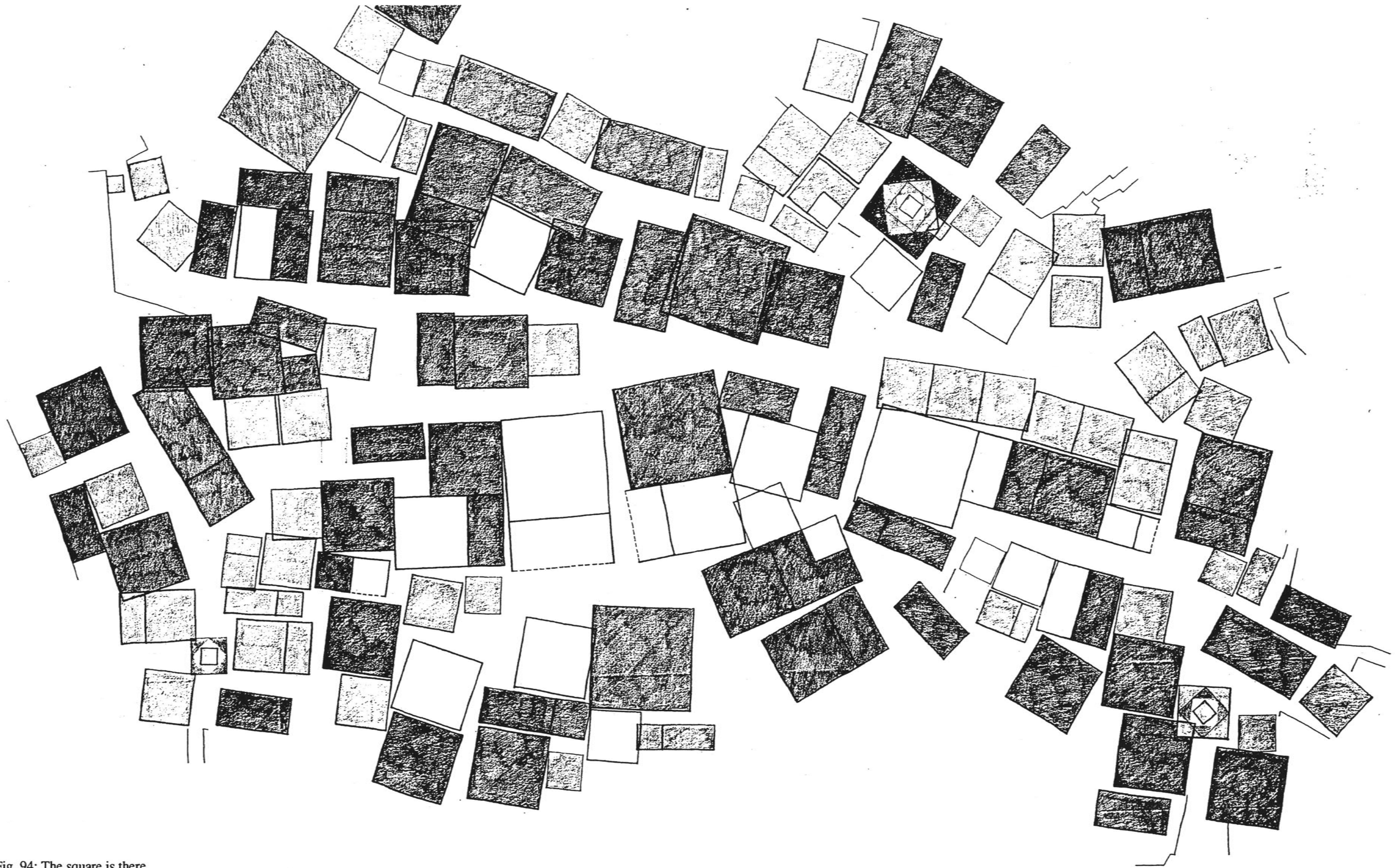


Fig. 94: The square is there

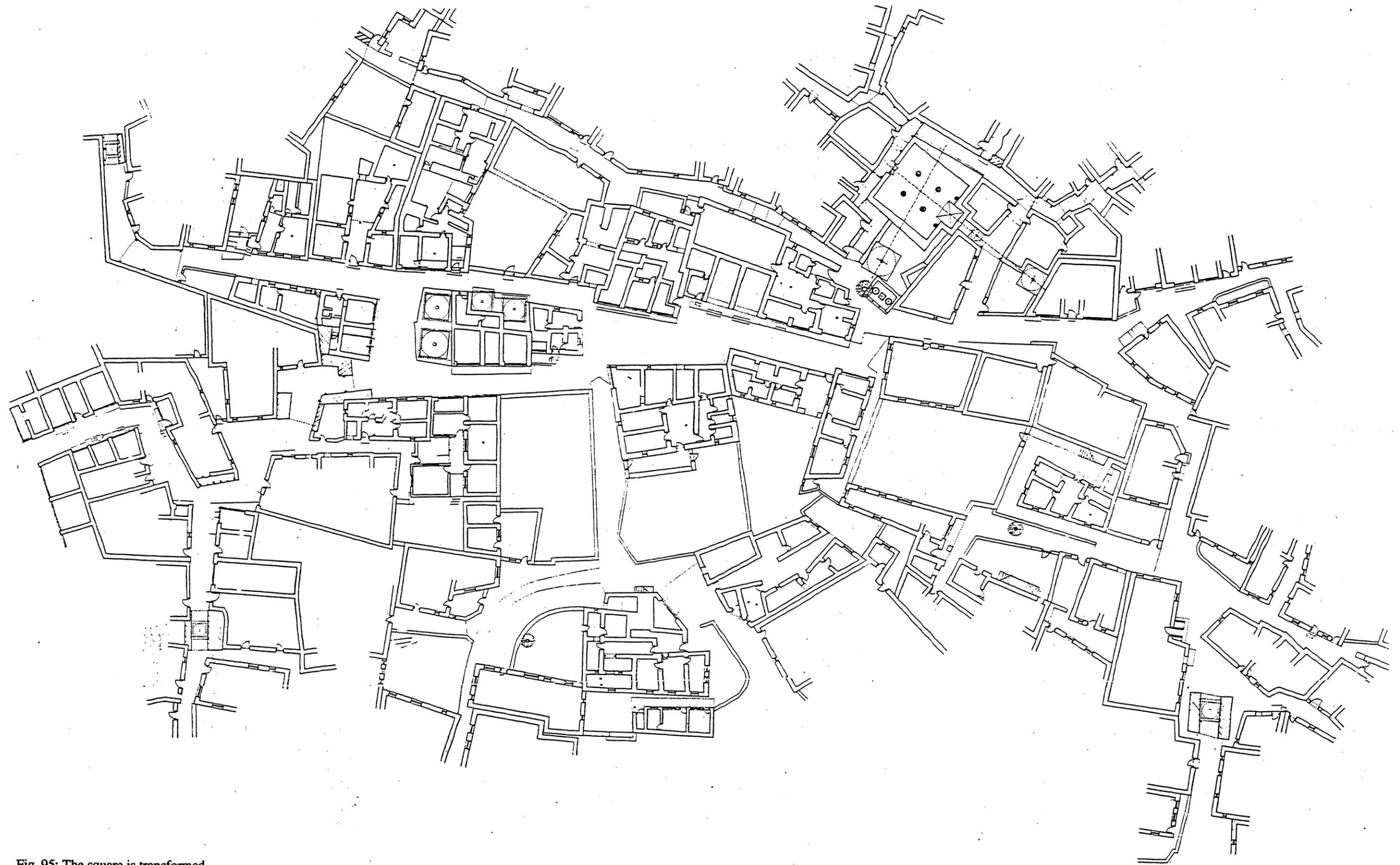


Fig. 95: The square is transformed

The ordering device then appears at each size and scale of the city as an assemblage. Starting from a piece, it reappears at each level of order of magnitude.

The column is used extensively at all levels of building. Apart from its structural logic, it becomes a centering device simulating the sacred mountain and is thus symbolic of the underlying order which informs the phenomenal world.

The assemblage of the column itself is additive and generated by the rotation of the square. The available length of timber results in columns as an additive structure. The main shaft of the column is topped by a capital followed by a bracket that "billows" out like clouds to support the main beam and joists. The square generated by the height of the shaft is rotated to determine the dimension of the capital, the spacing of the joists and even the section of the joists and column. The bracket essentially takes the slack, as the diagonals of the rectangles formed by a sequence of additive pieces (joists and their spacing) determined by the angles of the "billows".

The ideal application of the ordering device is clearly followed in the columns of sacred structures and prayer rooms. Others are "naive" versions of the norm in which the constants and variations follow the same dimensional rules.

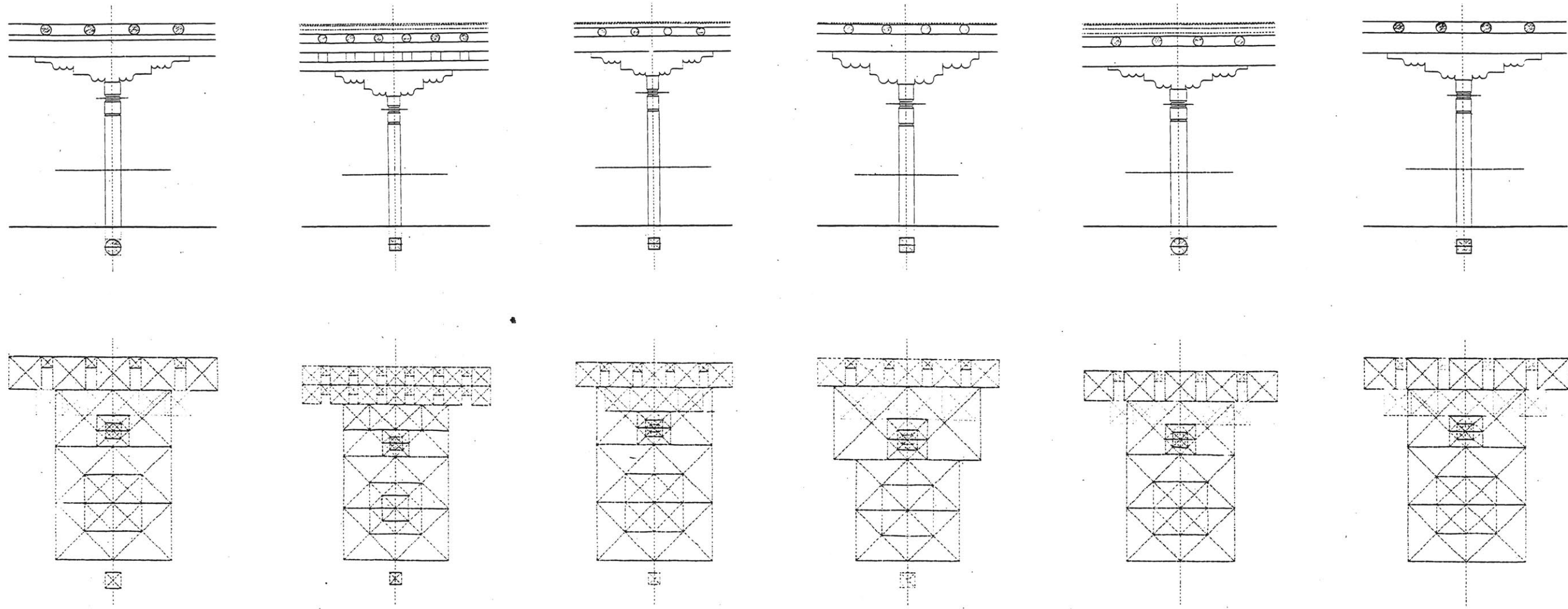


Fig. 96: The composition of the column

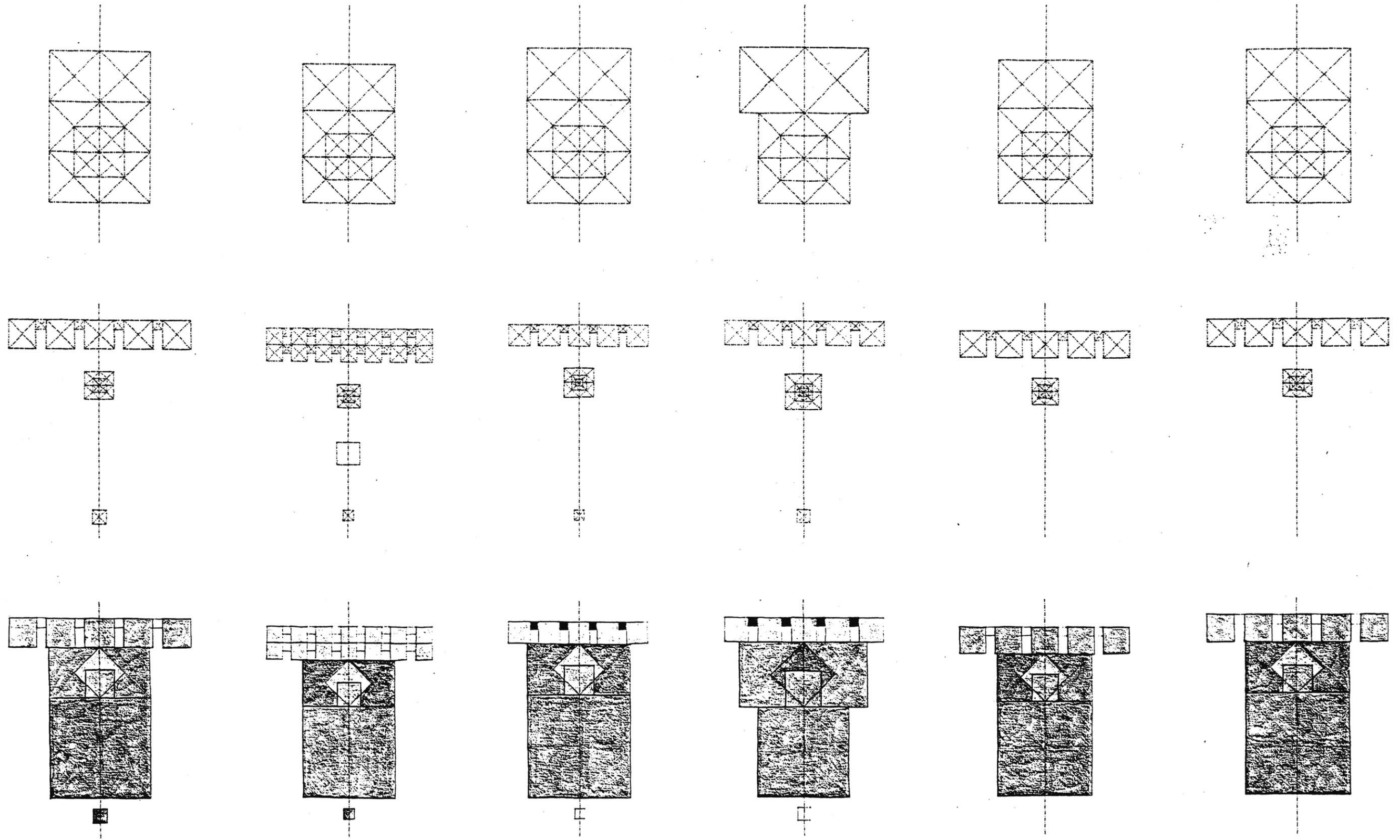


Fig. 97: The rotation of the square setting up the rules of assemblage

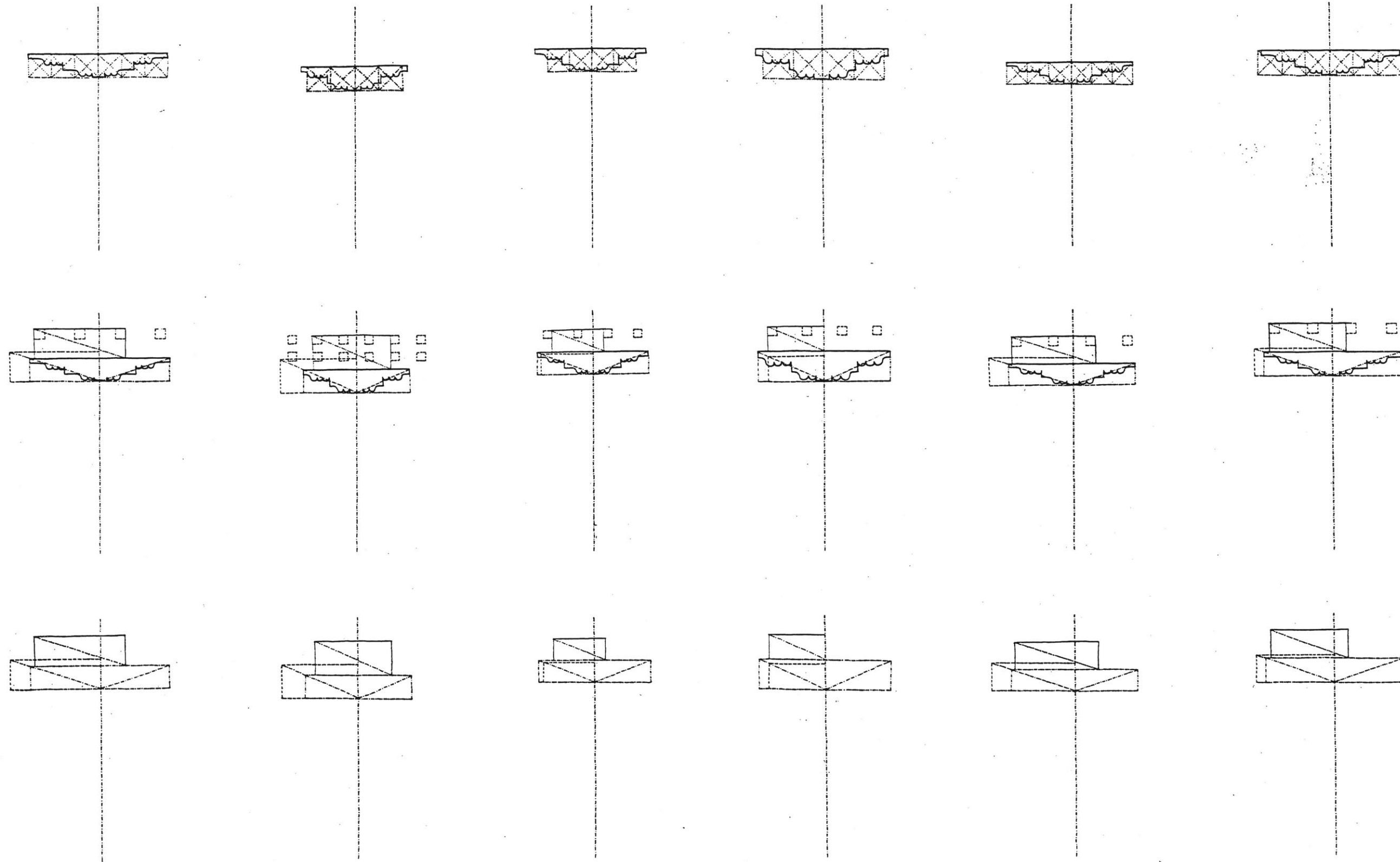


Fig. 98: The angles of the "billowing cloud" brackets determined from an additive sequence

At the level of the clusters, groups of clusters, and the fragment two sets of dimensions can be determined:

1. Visual dimensions - of public streets and open spaces - that represent a piece which is coherent;
2. Use or functional dimensions - of circumambulation and clusters - which are recognized as an organizing size.

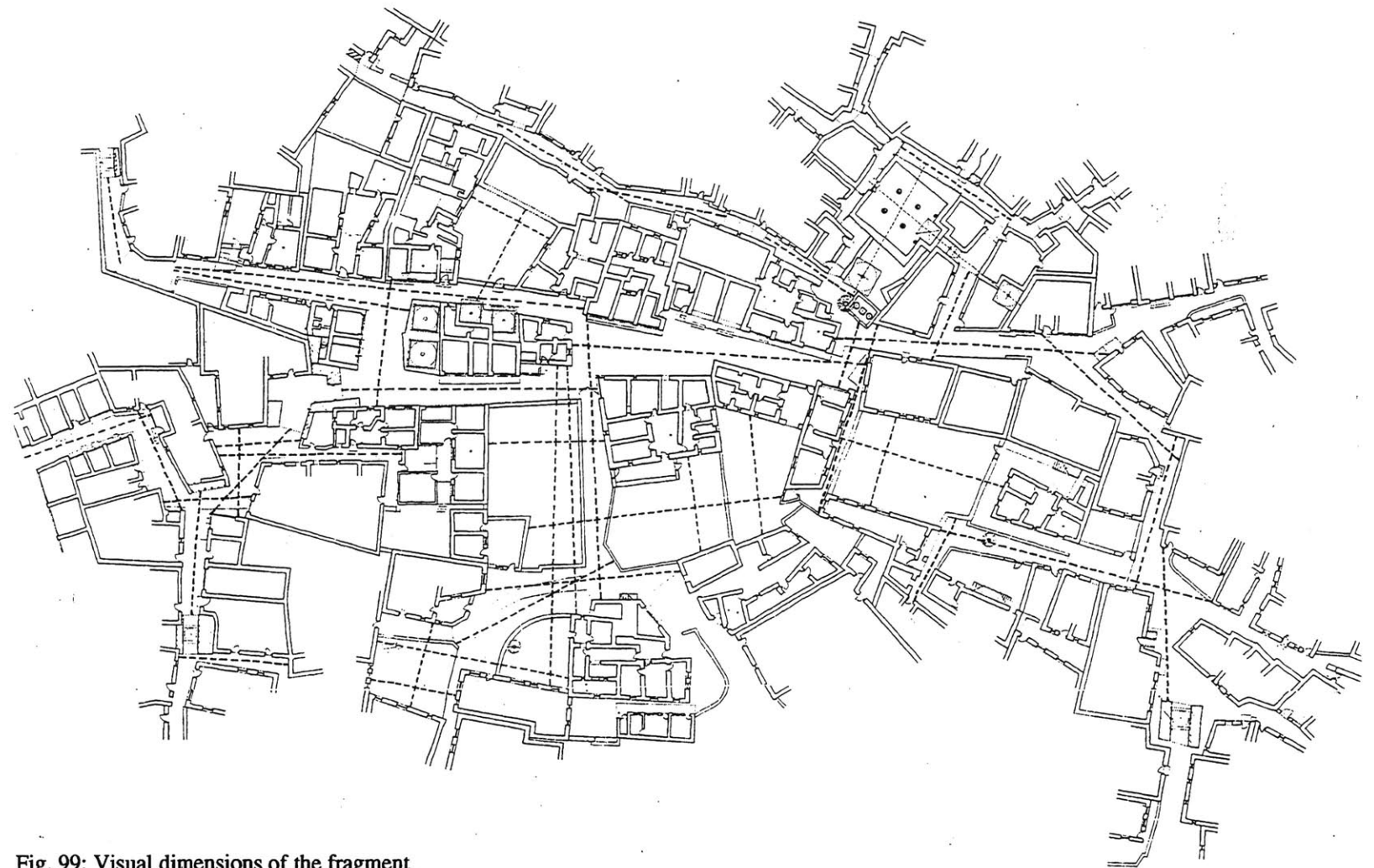


Fig. 99: Visual dimensions of the fragment

The method of assemblage in a hieratic way creates a coherence and continuity without abrupt changes of conflicting dimension. The range appears harmonious when intermediate dimensions mitigate from small to large, from room to city, from place to landscape.

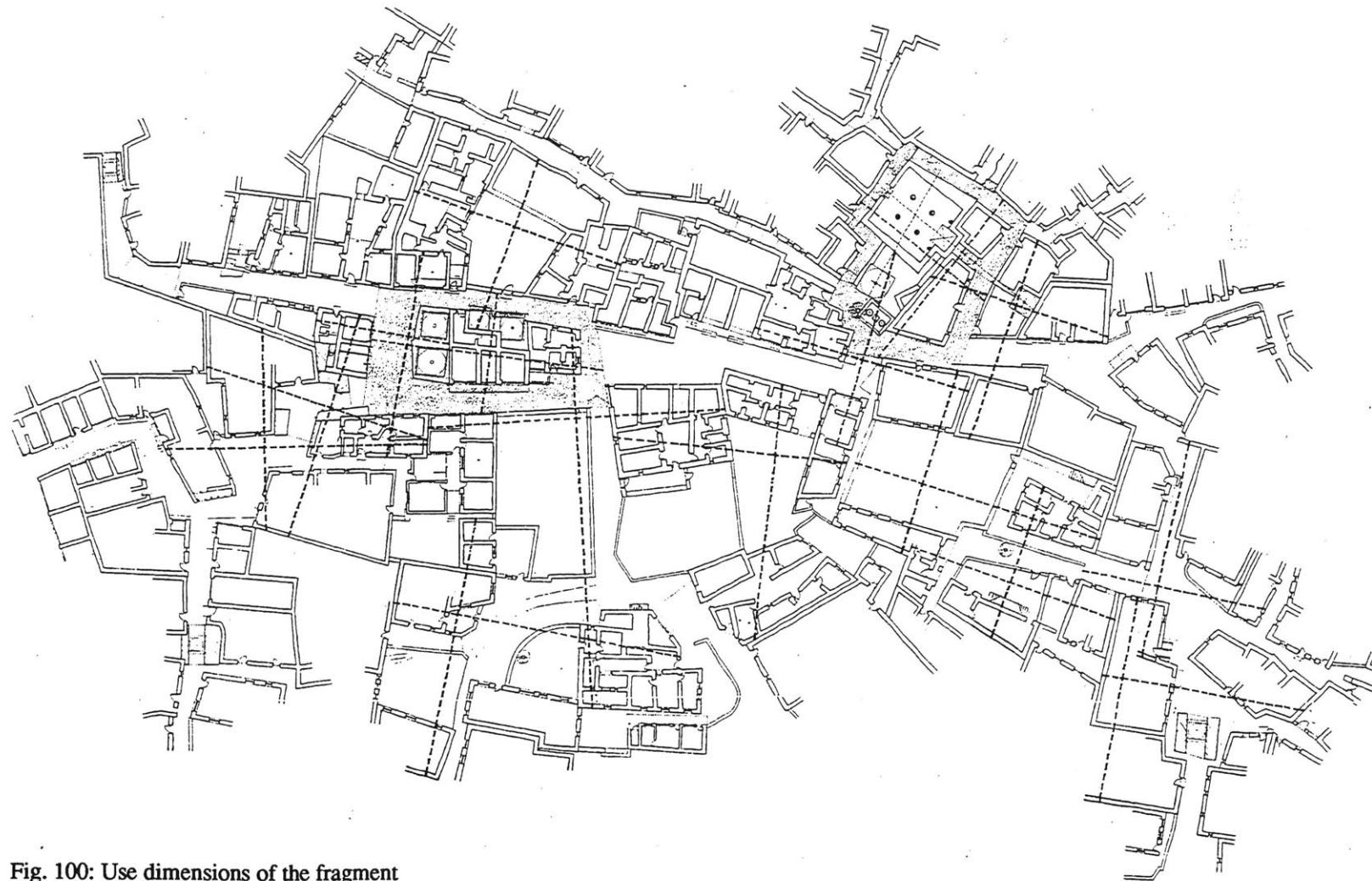


Fig. 100: Use dimensions of the fragment

The same coherence and continuity helps the dialogue between the sacred and the ordinary fabric. The fundamental geometric generating device assumes the coexistence of the different form elements of the fabric.

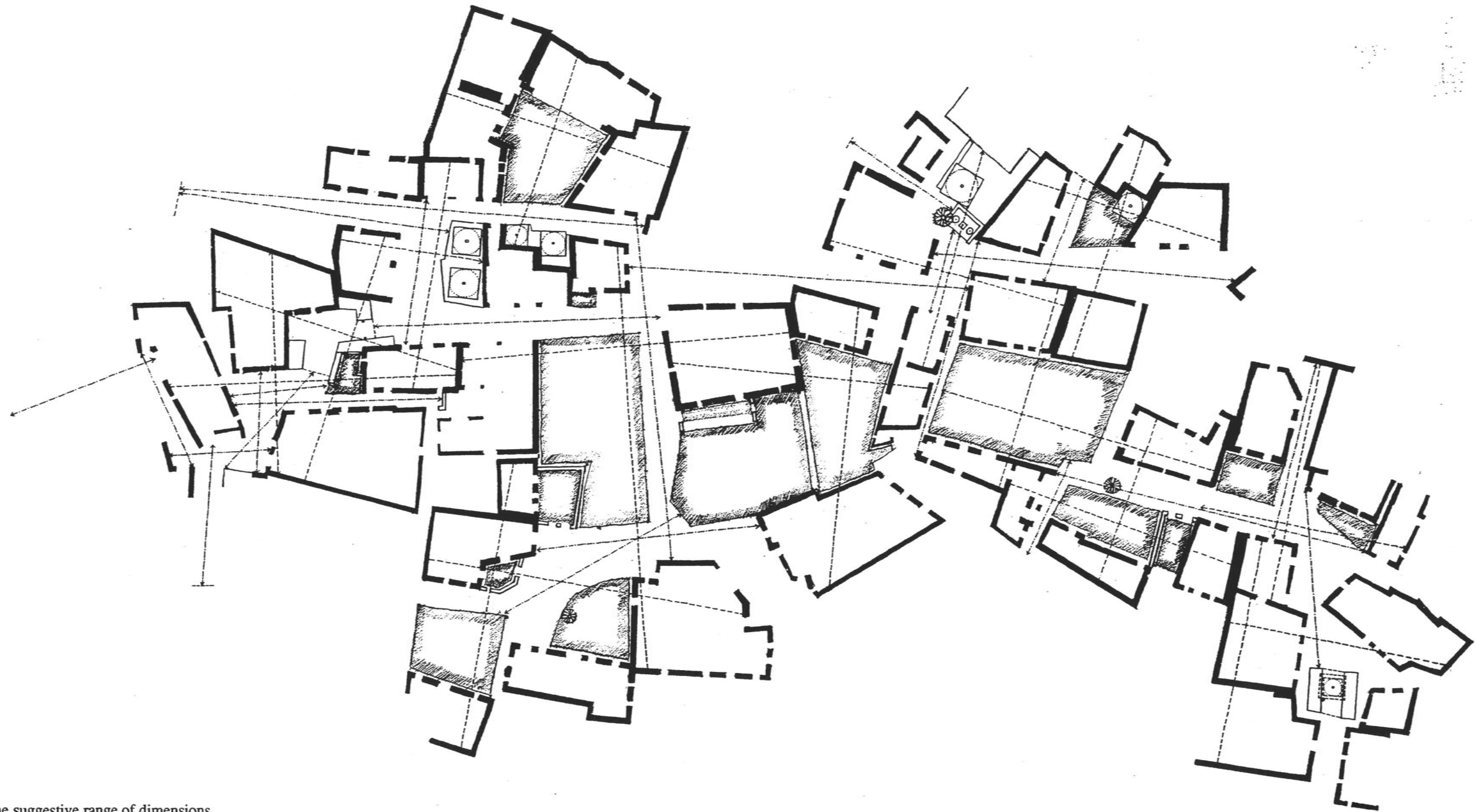


Fig. 101: The suggestive range of dimensions

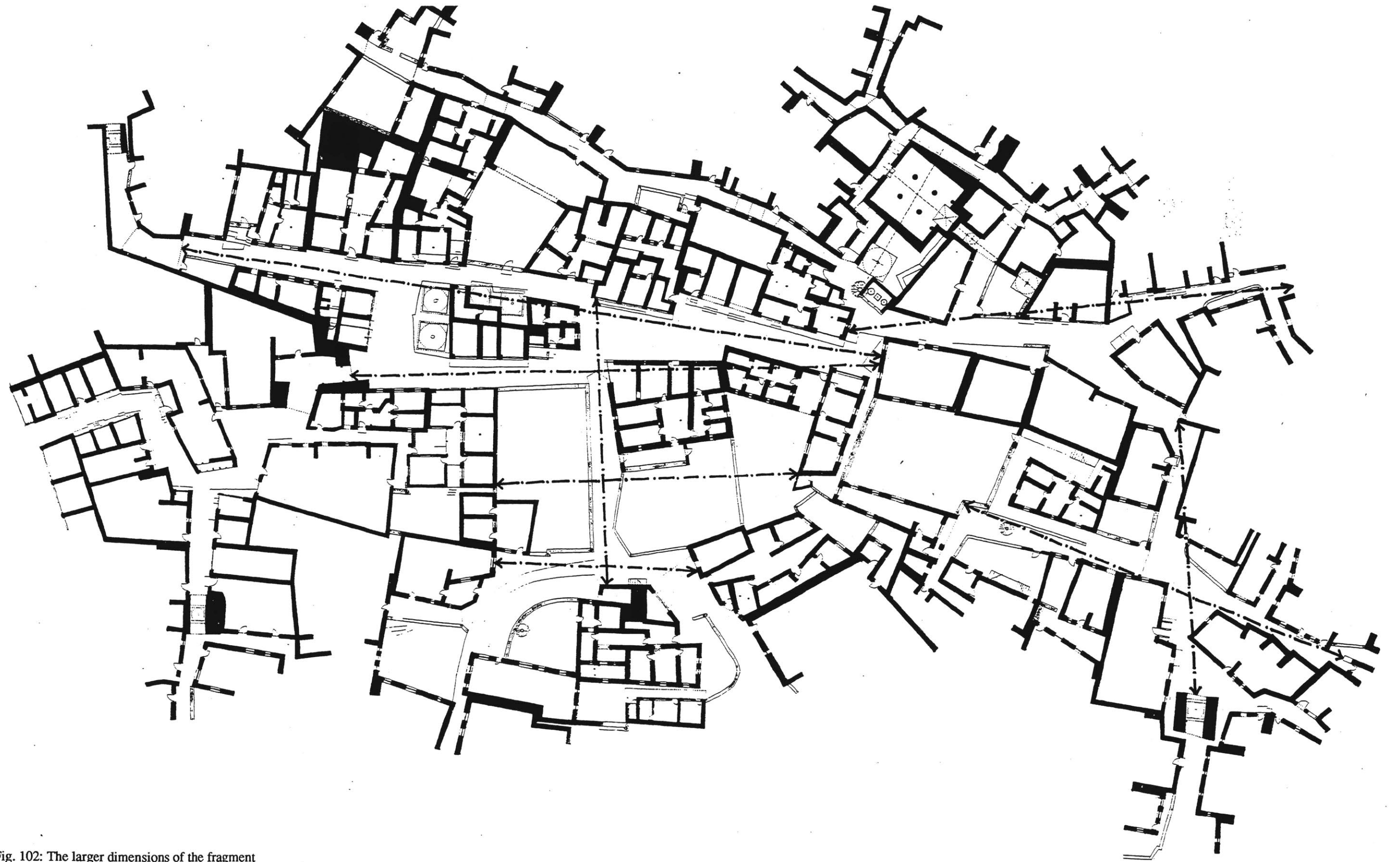


Fig. 102: The larger dimensions of the fragment

The powerful complexity of the city is achieved by the overlaps and reciprocity of the same family of forms and elements. The rotated square in the sacred building maintains a discreet peace which is embedded in the ordinary fabric. The assemblage consists of "self-similar" elements in different positions and functions, overlapping in the unity of the whole.

One can therefore conclude that -

1. There is an emerging norm which can be more generously read in the sacred structures. The actual application of this ordering device in its variations and transformations is controlling the rest.
2. The dimensions represent different components of a hierarchical deployment for additive assemblage.
3. There is a set of uniform and consistent dimensioning rules that work across different layers of scale.

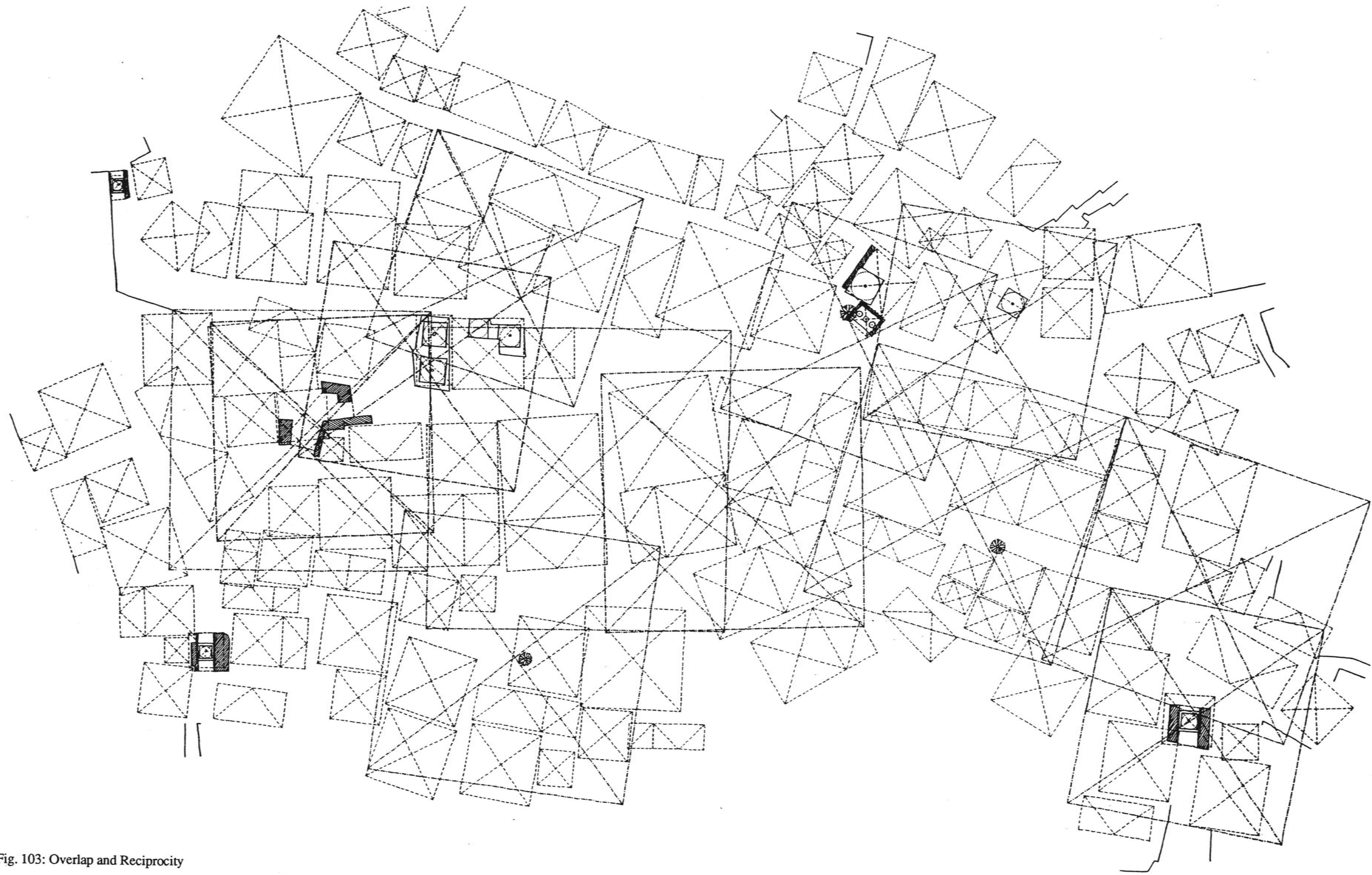


Fig. 103: Overlap and Reciprocity

5. Invocation of Light

It is impossible to understand the qualities described in the other sections without an understanding of the quality of light.

The light at a high altitude desert is unlike light as one knows it elsewhere. It is more absolute, more intense, more pure. The sensory experience of light is inescapable - the air is rarefied, the sun is big and the sky is blue.

"Light and spirituality go together.

Light and architecture go together.

Light gives value to walls, windows, materials, textures, and colors.

During hours, days, and seasons

it changes space

and is a fundamental tool for shaping our emotional response.

Light, both natural and artificial, cannot be ignored

nor used with a technical mind.

Light belongs to the heart and to the spirit."

- Ricardo Legorreta

In the city of Leh, light and structure engage each other. Structures open upwards to light. At the scale of a house, the dark spaces of the animal quarters and storage rooms at the lower level give way to wide windows on the upper levels of human habitation, while the open courtyard is at the top, high above the level of the street. The balconies allowed only on the houses of the nobility express the importance of light. At the scale of the city, the public open spaces and courtyards occur just below the palace and above the settlement - elevated towards the light - while the streets of the ceremonial routes widen to let in the light. The sun is not only timekeeper but spacemaker as well.



Fig. 104: Realms of shadow and light

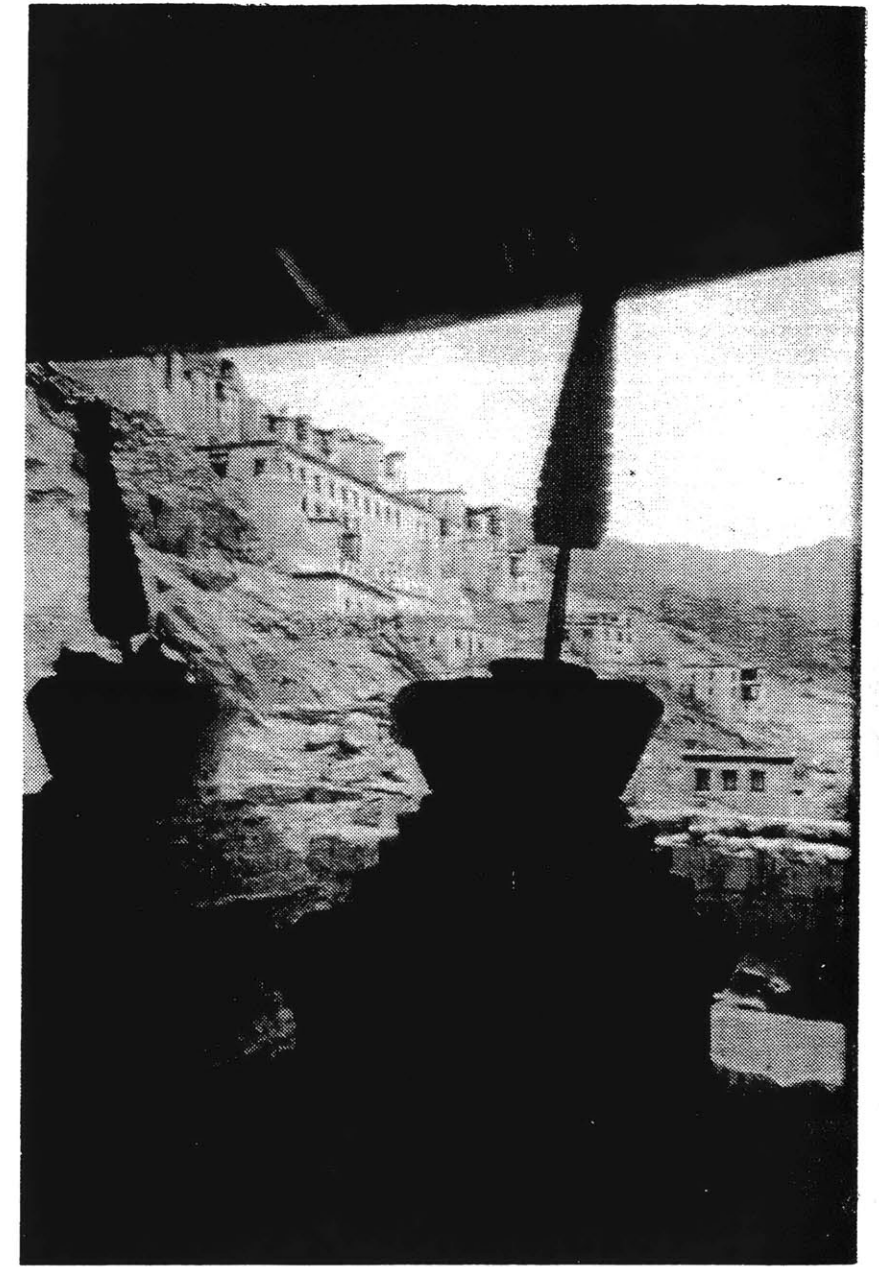


Fig. 105: The intensity of the light in contrast to areas in shadow



Fig. 106: The brightness of a wide ceremonial street



Fig. 107: The shadows in a narrow street



Fig. 108: A column "billows" its way upwards to a skylight in the roof, representing the structure of the path to enlightenment

In the monasteries and temples, the statue of the deity is enshrined in light in contrast to the dark sanctity of the room. The ceiling above the statue rises, often in tiers, where a clerestory seeks out the light from the sky. The light is believed to be the Eye of the Buddha that penetrates all masks and reveals the true nature of things.



III. CONCLUSION

This exploration has been an inductive process. I started out by opening a little window, as it were, onto the terrain of Ladakh and discovered a whole landscape of formal structures with multiple layers of meaning. As my exploration evolved and I discovered a consistency of motivating ideas across layers of scale, my fascination with form grew. Form, I realized, is an objective language that can be discussed. Architecture has its own devices in which the physical form is telling the story of its handling and reflects and represents the totality of human experience and culture without literary conceits.

In Leh, the collective form is so impressive because of the normative, formal elements and dimensions that are relentlessly followed. The consistency of the basic dimensions, the principles of hierarchical arrangement of compositional elements, the use of the geometry of the rotated square, are not limited to formal architecture. They are reflected at all levels of hierarchy, from the elaborate monastery high up to the simple houses clustered on the slopes, and at different levels of scale ranging not only from the individual buildings to clusters of houses to across the entire settlement, but even to the individual components of their making, such as the column.

The depth of the formal order here does not lie merely in the consistency of the generated patterns of physical structures. What gives it meaning and therefore beauty, is the layering of a culture in the interpretation of the physical realm. The formal order, in other words, includes the patterns of association and cultural consciousness overlaid onto the arrangement of physical structures. Form is use and use is culture and the two are so tied together that even though they are discussed separately, they are completely integrated.

The principles of design underlying the tangible consistency of the collective form of the settlement of Leh are not just rules of thumb for construction or a tradition of conventions that the builders follow for ease, rather the reflection of a collective thought that structures their universe, their society, and in effect, their entire life.

Just like the lotus, which grows out of the mire yet holds a jewel at its center, there is always an emerging order - however elusive - to inform the continuing of Leh.

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EPILOGUE

The year is in the latter half of the 17th century.

King Sengge Namgyal rides his way down from the palace, through the great eastern chorten gateway that marks the entrance to the city. Sweeping by houses so ingeniously married to the rocks, he pauses further south at the ceremonial chorten gateway where the procession is met by the inhabitants of the city. With added momentum the procession arrives at the polo ground.

The match begins amidst the sound of sacred trumpets.

All photographs and illustrations are the author's unless otherwise stated.

BIBLIOGRAPHY

- Alexander, Christopher. NOTES ON THE SYNTHESIS OF FORM.
Cambridge: Harvard University Press, 1964.
- Alexander, Christopher. A PATTERN LANGUAGE.
New York: Oxford University Press, 1975.
- Alexander, Christopher. A TIMELESS WAY OF BUILDING.
New York: Oxford University Press, 1979.
- Alexander, Christopher. A NEW THEORY OF URBAN DESIGN.
New York: Oxford University Press, 1987.
- Ardalan, Nader. THE SENSE OF UNITY: SUFI TRADITION IN PERSIAN ARCHITECTURE.
Chicago: University of Chicago Press, 1973.
- Bryant, Barry. THE WHEEL OF TIME: SAND MANDALA.
San Francisco: Harper Collins Publishers, 1992.
- Calvino, Italo. INVISIBLE CITIES.
New York: Harcourt Brace Jovanovich, 1974.
- Cullen, Gordon. TOWNSCAPE.
New York: Van Nostrand Reinhold, 1961.
- DeCarlo, Gian Carlo. URBINO.
Cambridge: M.I.T. Press, 1970.
- Doczi, György. THE POWER OF LIMITS.
Boulder, Colorado: Shambhala Publications, 1981.
- Duncan, James and Ley, David. PLACE/CULTURE/REPRESENTATION.
New York: Routledge Inc., 1993.
- Feng, Gia-Fu and English, Jane. LAO TSU, TAO TE CHING.
New York: Vintage Books, 1972.
- Genoud, Charles and Inoue, Takao. BUDDHIST WALL-PAINTINGS OF LADAKH.
Geneva: Edition Olizane, 1982.
- Gosling, David and Maitland, Barry. CONCEPTS OF URBAN DESIGN.
London: Academy Editions, 1984.
- Habraken, John N. TRANSFORMATIONS OF THE SITE.
Cambridge: Atwater Press, 1982.
- Herdeg, Klaus. FORMAL STRUCTURE IN INDIAN ARCHITECTURE.
New York: Rizzoli, 1990.
- Herdeg, Klaus. FORMAL STRUCTURE IN ISLAMIC ARCHITECTURE OF IRAN AND TURKISTAN.
New York: Rizzoli, 1990.
- Hille, Thomas. UNDERSTANDING AND TRANSFORMING WHAT'S THERE: A LOOK AT THE FORMAL RULE STRUCTURE OF THE RESIDENTIAL FACADE ZONE IN VICTORIAN SAN FRANCISCO.
M. Arch and S.M.Arch Thesis, M.I.T., 1982.
- Hillier, Bill. THE SOCIAL LOGIC OF SPACE.
New York: Cambridge University Press, 1984.
- Hoff, Benjamin. THE TAO OF POOH.
New York: Penguin Books, 1982.
- Jacobs, Jane. THE ECONOMY OF CITIES.
New York: Vintage Books, 1970.
- Jellicoe, Geoffrey and Susan. THE LANDSCAPE OF MAN.
New York: The Viking Press, 1975.
- Jung, Carl. MAN AND HIS SYMBOLS.
London: Picador, 1964.
- Kantowsky, Detlef and Sander, Reinhard. RECENT RESEARCH ON LADAKH.
London, Weltforum Verlag, 1981.
- Kaplanian, Patrick. LES LADAKHI DU CACHEMIRE.
Paris: Hachette, 1981.
- Khosla, Romi. BUDDHIST MONASTERIES IN THE WESTERN HIMALAYA
Kathmandu: Ratna Pustak Bhandar, 1979.
- Kostof, Spiro. THE CITY SHAPED.
Toronto: Bulfinch Press, 1991.
- Kostof, Spiro. THE CITY ASSEMBLED.
Toronto: Bulfinch Press, 1992.
- Lynch, Kevin. THE IMAGE OF THE CITY.
Cambridge: M.I.T. Press, 1959.
- Lynch, Kevin. WHAT TIME IS THIS PLACE?
Cambridge: M.I.T. Press, 1972.
- Lynch, Kevin. MANAGING THE SENSE OF A REGION.
Cambridge: M.I.T. Press, 1976.
- Lynch, Kevin. A THEORY OF GOOD CITY FORM.
Cambridge: M.I.T. Press, 1981.
- Lynch, Kevin. WASTING AWAY.
San Francisco: Sierra Club Books, 1990.
- Matthiessen, Peter. THE SNOW LEOPARD.
London: Picador, 1979.
- Mignucci-Giannoni, Andres. PROJECTIVE ARCHITECTURE: STUDIES TOWARD THE MEANING AND GENERATIVE LANGUAGE OF ASSOCIATIVE BUILT FORM.
M.Arch Thesis, M.I.T., 1982.
- Nolen, John. NEW TOWNS FOR OLD.
Boston: Marshall Jones Co., 1927.
- Rykwert, Joseph. THE IDEA OF A TOWN.
Princeton: Princeton University Press, 1976.
- Saunders, Peter R. SOCIAL THEORY AND THE URBAN QUESTION.
New York: Holmes and Meier, 1981.
- Schumacher, E.F. SMALL IS BEAUTIFUL.
London: Abacus, 1974.
- Snellgrove, David and Skorupski, Tadeusz. THE CULTURAL HERITAGE OF LADAKH Vol. I and II.
Warminster: Aris & Phillips Ltd., 1977.
- Spirn, Anne Whiston. THE GRANITE GARDEN.
New York: Basic Books, 1984.
- Thompson, D'Arcy. ON GROWTH AND FORM. Vol. I and II.
Cambridge: Cambridge University Press, 1952.
- Todd, John and Tukul, George. REINHABITING CITIES AND TOWNS: DESIGNING FOR SUSTAINABILITY.
San Francisco: Planet Drum Foundation, 1981.