A Study on the Spatial Organization of the Houses of Panam Nagar, Sonargaon

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Abstract

The ancient city of Panam was established in late 19th century in a non-urban setting in Dhaka region. Panam was famous for cotton manufacturing and trading during British rule. The cotton traders built a good number of closely located and nicely ornamented buildings with narrow street frontage. According to history these buildings were owned by merchants who were absentee landlords, coming Panam once or twice a year. However, history explained little about their life styles and function of these buildings.

The area was well protected by cannels which run around Panam Nagar. The buildings apparently similar from outward had a variety in terms of their spatial organizations which remains unexplained without any evidence of their use pattern. In their study Asiatic Society of Bangladesh classified the buildings of Panam into three basic typology-'the double heighted hall type', 'the courtyard type' and 'the consolidated type'. Apparently the layouts of large houses of Panam, with courtyards, are similar to the urban houses of Dhaka region having courtyards with encircling corridors giving access to series of rooms. But the double heighted hall remained uncommon in the house forms of Dhaka. Again the consolidated houses of Panam do not have any kind of similarity with the prevailing consolidated houses of Dhaka. Although researchers attempted to classify those buildings into common residential types available in this region, a large number of buildings of Panam remain unexplained due to their idiosyncrasies and dissimilarities with the available types.

With the help of space syntax this thesis tried to find out the genotypes of the houses of Panam Nagar. Space syntax transforms the buildings into the form of adjacency graphs to represent, quantify and interpret spatial pattern in such a way that their underlying 'social logic' is understood. In search of genotypes, the syntactic data compiled here are compared to find any difference in the spatial organization among the different type of houses of Panam and to explain the ordering of space in these buildings in relation to the prevailing types in Dhaka region. However, spatial analysis reveals that ringiness became the major character of these buildings. In fact, the houses of Panam have overlapping rings connecting most of the interior spaces along with the exterior suggesting the depth of the buildings of Panam much shallower than the buildings of Dhaka. From graph analysis it is quite clear that the halls were distributed with the exterior in a ring, thus become shallower and easily permeable for the visitors. It can be interpreted as the need of privacy was low indicating that buildings have less residential quality in respect to the socio-cultural background of Dhaka. Interestingly, spatial analysis suggests that the consolidated type buildings with segregated central spaces and integrated frontal rooms are completely different from any prevailing typology of Dhaka. Thus with the support of space syntax analysis this research suggests that perhaps some of the houses of Panam were not residential type; rather they have some other commercial use which is not clear from their history.

Glossary

Space Syntax-Space Syntax is a method for describing and analyzing the relationships between spaces of urban areas and buildings.

Graph is a figure representing the relationships of permeability between all the convex spaces or axial spaces of a layout. The spaces are represented by circles or dots (called nodes) and the links with lines. It is possible to also use links in order to represent relationships of visibility between spaces.

Justified Graph- A justified graph is a diagramming technique for revealing the topology of a spatial organization. A justified graph organizes the spaces in a building in relationship to each other with the carrier at the bottom and the other spaces arranged in rows above corresponding to the number of steps in from the carrier.

Convex Space- Convex space is a space where no line between any two of its points crosses the perimeter. A concave space has to be divided into the least possible number of convex spaces.

Root Point/Node-The point inside or outside of a building from where syntactic measures of other spaces are taken.

Ring- When one space is linked to another space with more than one link in syntactic measure it is called ring.

Ringiness- Having rings in a space syntax tree is a special character of the tree. This character is called ringiness. It describes the arrangement and distribution of spaces in a building. Those spaces that share a ring can be accessed from any point of that ring. Ringiness determines the level of privacy and relation between spaces of a building.

Syntactic step is defined as the direct connection or permeable relation between a space and its immediate neighbours or between overlapping isovists. In an axial map a syntactic step may be understood as the change of direction from one line to another.

Integrated space- A space where the more there will be a tendency to the integration of social categories-such as the categories of inhabitant and stranger can be defined as an integrated space.

Segregated space- A space where the more there will be a tendency to segregation of social categories can be described as segregated space.

Integration- **Integration** is a static global measure. It describes the average depth of a space to all other spaces in the system. The spaces of a system can be ranked from the most integrated to the most segregated.

Depth- **Depth** between two spaces is defined as the least number of syntactic steps in a graph

Uni-permeable cell- A cell with one entrance can be defined as an uni-permeable cell

Bi-permeable cell- A cell with more than one entrance can be identified as bipermeable cell.

Control- **Control** is a dynamic local measure. It measures the degree to which a space controls access to its immediate neighbours taking into account the number of alternative connections that each of these neighbours have.

Permeable space-spaces that can be accessible from other spaces.

Genotype-The genotype is the generic makeup of a building or an individual space usually with reference to a specific characteristic under consideration.

Uni-linear sequence- Uni-linear sequence is such a series of bi-permeable spaces which are linked to their next space but does not form any ring and thus ends in a terminal uni-permeable space.

Correspondent system-A system which does not need strong control, strong boundary and internal hierarchy of spaces. It must seek to maximize local encounters regardless of labels and global encounters regardless of spatial group

Non-correspondent system-A system which needs strong control, strong boundary and internal hierarchy of spaces.

Spatial Solidarity- A spatial solidarity builds link with other members of the group by contiguity and encounter. It stresses not the separation of the interior but the continuity of the interior and the exterior. Movement across boundary is the fundamental condition of for existence of spatial solidarity. In a spatial solidarity, the weakening of boundary is associated with the weaker structure of the interior. (Hillier & Hanson, 1984:145)

Transpatial Solidarity- A transpatial system is a class of spatially independent but comparable entities which has global affiliations, not by virtue of proximity but by analogy and differences. Solidarity will be transpatial to the extent that it develops a strong and more homogenous interior structuring of space and emphasizes the discreteness of the interior by strong control of boundary (Hillier & Hanson, 1984:145).

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Chapter 01

Introduction

1.1 Introduction:

Architecture is the visual expression of a people in time and space. The basic factors shaping it are the local climate and indigenous materials. Another important factor that influences it is the external forces generally caused by social, political and cultural contacts and interactions. Thus architecture becomes an archive of the social, political and economical position of the time of its establishment. Since religion was considered sacred in Bengal, attention was consistently given to make religious structures more durable. As a result social life of the urban dwellers remained less attended through architectural evidences until the establishment of Dhaka as the urban core (Ahmed,1967). In 19th century when Dhaka was established as a prominent urban center, a small area in Sonargaon named 'Panam' has been flourished and came into prominence as an urban settlement having a series of high quality buildings along a narrow road. But nothing much can be found in the historical references about this small township and its built forms. This thesis will therefore focus on the house forms of Panam and try to link it with the social and architectural background of Dhaka.

1.1.1 Sonargaon in the Context of Bengal:

Sonargaon literally known as "golden village" was originally a village named Suvarnavati or Suvarnagram probably came into history only in the early years of the fourteenth century when Shamsuddin Firuz Shah, a governor of the Delhi sultan, declared independence and issued coins from Sonargaon. It was the capital city during the time of Fakruddin Mubarak Shah within the years 1338-1353.During the time of the independent sultan Sonargaon was a provincial metropolis and a port city known for its beautiful cloth called Muslin and as an international trade centre (Gulshan,1976:14).

As an international trade center Sonargaon sustained more than 2500 years (Chowdhury,1997:2). It was the capital of Vanga and was always been a very rich metropolis of Bengal. Being the core of cloth looming, for thousands of years, Bengal took the topmost place in international trade in this sector and Sonargaon remained the center of all business activities. With the establishment of the Mughal capital in Dhaka the city have fallen fast into decay. And it was intensified by the shifting of the river courses which carried away all walls, palaces and streets.

A part of the city named Panam Nagar came into prominence in the later part of 19th and early 20th century. With the decay of the once flourishing cotton manufactures, for which the tract of land between the Sitalakhya and the Meghan was famous, fell into oblivion only to be revived by the emergency of the town Panam, which had been acted as a place of trade by a group of the Hindu merchants, who must have set up their residence on this historical site

(Hussain,1997:24). After the Second World War, the town started to loss its glory. Finally after the liberation war of 1971 the town became deserted. The place is reputed to have been built over the remains of an old city. So it can be said that Panam is the only successor of the glorious Sonargaon.

1.2 Background of Panam:

Sonargaon is now a township about 27 km to the south east of Dhaka. The land is surrounded by two important rivers Meghna and Sitalakhya. About a half mile from Sonargaon “lokshilpo” museum to the north are the ruins of Panam. The two cannels surrounding Panam one of which was artificial proves that it was once a well protected city. Both of the cannels run parallel to the central street on either side. The habitants here were mostly the Hindu traders.

The existing archeological remains in Panam are not earlier than the British colonial period, still there is very little that can be known about this settlement from historical references. Asiatic Society had had initiated a research on Sonargaon and made a publication in 1997, where Panam was also included in the study. The Asiatic Society of Bangladesh (ASB) had completed partial documentation of these buildings in this publication. But that study was basically focused on the history of Sonargaon rather on the architectural significance of Panam as an urban settlement or on its buildings. Moreover that research did not attempt to explain the spatial layouts in terms of function or zoning. Till now, very little study has been explored on the existing built forms of Panam Nagar.

1.2.1 Geographical Background:

Situated in the tract of land between the Brahmaputra and the Sitalakhya which is well formed and at places has lateritic soil, Panam remained significant for its geographical location. The Menikhali, a small rivulet, after emerging from the Brahmaputra, runs from Kaikar Tek in a slightly northeasterly direction, forming the southern boundary of the Mograpara union, and joins the Meghna near Baidyer Bazar. The flow of the Menikhali was utilized to create the moats and canals of the Mograpara area around which grew the

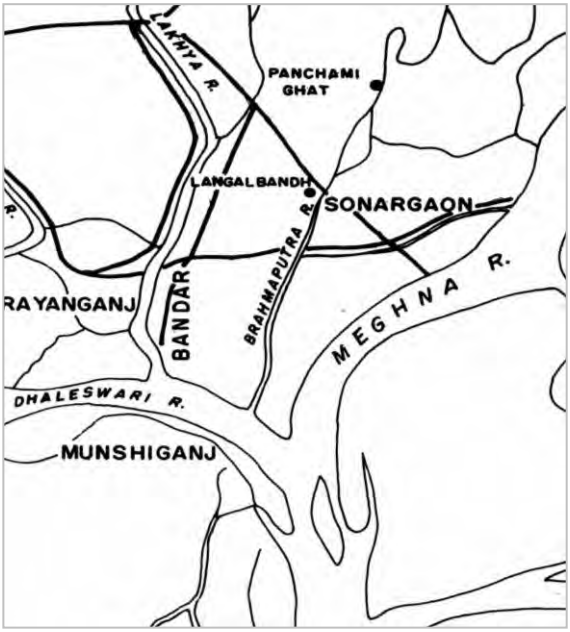


Fig-1.1: Geographical location of Sonargaon, Asiatic Society, 1997

medieval settlements of a part of Sonargaon along with Panam. Another natural stream from Manikhali to Brahmaputra passed by the northern periphery of Panam named 'Pankhiraj khal' which along with the artificial moats created a natural protection system around the medieval settlement of Panam.

1.2.2 Historical Background:

Panam had experienced many ups and downs with the flow of time. In 1586, Ralph Flitch described Panam as "is a town six legues from Serripur, where there is the best and finest cloth made in all India. But in the references of British travelers it is found that the production of muslin had been stopped during 19th century, but the area was still vibrant with its distinct characteristics and lifestyle. In 1840 AD James Tailor, in his book "A Sketch of the Topography and Statistics of Dacca" has given a brief description of Panam. He mentioned that Panam was the ancient city of Sonargaon which was well protected by motes and grooves and was almost inaccessible in rainy season. (Tailor,1840:24-25). During his visit to Sonargaon (Jan 1872), James Wise found the area Goaldi to Mograpara and adjacent territory in a decaying condition. The manufacture of fine Muslin, for which Sonargaon was famous, was already extinct except a variety of Malmal. But Panam has developed into a great trade center of cotton and English piece-goods (Hussain, 1997: 4) at that time. He also gave an account of the inhabitants and trade in Panam which says that there was not a single Muhammadan lived in Panam. The householders are chiefly Taluqhdars who pay Government revenue direct to Dhaka treasury (Hussain,1997:4).

From different historical references it is clearly found that, Panam remained a worth mentioning part of the history of Sonargaon. Until 16th century Panam was famous for the finest cloth Muslin and after a long period of decay and dilapidated condition it regained its glory with the establishment of trade by the Hindu merchants in mid 19th century.

1.2.3 Architectural Background:

The unique settlement of Panam draws attention of the researchers. Panam was an exceptional case of mature township in a non-urban setting. Hindu merchants who resided in Panam built closely located street front houses in mid 19th century and Panam continued to flourish till the 2nd world war (Hussain, 1997: 41).

Physical organization as indicated in the C.S. Map of Mouza Panam revealed an elongated plot division with narrow street frontage. This type of 'bargage plots' were common in many trading towns ensuring a commercial interface to a large number of merchants within a limited area. However, little is known about the buildings in Panam. As a result, their compactness remains

unexplained without any evidence of their use pattern. It is found from historical references that, here in Panam, there were a large number of buildings containing 90 families. These buildings are single to three storied high, organized on both side of a six hundred meter long and six meter narrow street (Hussain,1997:113). Such a large assemble of buildings of that time exists nowhere in Dhaka region. The cartographic survey shows that, among them only fifty two buildings remain in a very dilapidated condition at present.

It is the most prominent early example of Street Front Houses in a non-urban setting (Hussain,1997:113). The road extends from west to east, slightly turns towards north-east after it is half-way through. The road moves with delicate curves that offer changing vistas of the street facade. Majority of the houses are two storied. Large houses are partially three storied. In its present state of disuse and dilapidation, one can still feel the vibrant life of Panam in its hay days. Each house was presenting a facade to Panam street in order to enrich the visual symphony of the ensemble, where each building keeping its own identity blended with the harmonious whole. Different type of spatial organization is seen in different houses. These houses also vary in size and shape. Larger buildings have courtyard or double heighted hall in their center and the smaller ones excluded these spaces. Rather they have a large backyard which had been shared by adjacent two or three buildings. The extensive use of various materials in ornamentation of street front façade and double heighted hall is a significant character of Panam. Besides the extensively decorated double heighted hall is a very unique architectural element of these buildings.

Therefore, it can be said that, the houses of Panam assembled a large number of unique architectural element and a diversified spatial organization which is needed to be analyzed extensively.

1.3 Problem Statement:

The diversity in architectural elements made Panam a laboratory for the researchers to study in any branch of Architecture. Besides their richness in ornamentation, the spatial organization of these buildings draws attention of the researchers to unveil their origin and use. The uniformly developed buildings, the homogeneous facade treatment, the different type of spatial distribution of buildings inspire the researchers to explain their organizational pattern.

The Department of Archeology has evacuated and sealed the land in year 2007 and took step to preserve Panam Nagar. In the first phase of conservation, they had started documentation of these houses. This organization has started making detailed drawings of some of these buildings as a part of this documentation but still the process is incomplete. The Asiatic Society

of Bangladesh had also initiated a research and completed partial documentation of these buildings in one of their publications. But the research did not attempt to explain the spatial layout in terms of functional zoning.

From the previous studies very few are known about the spatial organization of these house forms of Panam. Asiatic Society has identified three types of buildings in Panam. But it is still unknown what were the functions of the indoor spaces, what were the reasons behind these kinds of compact buildings in such a remote area. Why there are so many types of buildings in such a small and bounded area. There is still much to know about the people who lived there, their social life, the purpose of the buildings, how these buildings served the inhabitants and the visitors as well. It remains unknown, how similar are they to other types of house form that had evolved in Dhaka at the same time period, what were their genotypes and origin? It is, therefore, important to understand the architectural morphology and to find out the origin of these buildings. As Architecture is basically represented through the articulation and organization of spaces within the buildings, this thesis, therefore, will focus on the spatial organization of the buildings of Panam.

1.3.1 Research Question:

On the basis of above discussed problems, two research questions are developed here. They are:

1. How the spaces were organized and linked with one another in these house forms?
2. How they are similar or dissimilar to the prevailing house forms of that time in Dhaka?

These questions try to unveil the social and spatial dimensions of the house forms of Panam with an intention to understand the use pattern and will help to find the genotypes of these house forms.

1.3.2 Objective of the Research:

Therefore the objectives of this research are

1. **To explain the organizational pattern of different types of houses of Panam Nagar in spatial as well as functional terms.**
2. **To identify the genotypes of this collection of buildings by putting them in the broader range of residential buildings of Dhaka region.**

1.4 Rational of the Study:

The area of Panam which is under the present study is a very mature urban settlement in a non-urban background with large assembles of different types of houses on both sides of a central linear street and protected by cannels all around. In different historical evidences, it is found that it played an important role in the economy and trade of Sonargaon and eventually Bengal. Hence it is very clear that Panam is an ancient settlement that holds a significant place in the history of Sonargaon. Still very little is known about the social and architectural background of Panam from these historical references. Though it is found in the literature review that Panam was the abode of Hindu Zamindars (Hussain, 1997:vii), the organization of spaces within the building that prevail in Panam doesn't complement this comment apparently. The buildings are very small and compact in size in comparison to the residential houses of Zamindars (Reza, 2003). The logic behind the difference in layout pattern among the buildings of Panam is still undiscovered which generates curiosity among the researchers to know more about these houses. Again, such a large assemble of secular buildings of different types with minimum transformation from the period of its construction, is found nowhere in Bangladesh. The house by house analysis would help to find out unknown spatial characteristics of the secular buildings of Dhaka. The building to building difference in spatial organization in spite of the harmonious elevation treatment raises much inquisitiveness among the researchers. The proper and extensive study of these buildings will surely enhance the resources in the field of architectural study especially in the ground of secular architecture of Dhaka region.

In the field of conservation this area is similarly important as other parts those posses the sultanate monuments. From this point of view too, there is ample scope of study on this particular area in every angles of social, political, economical and architectural point of view. Therefore the morphological study would have been an opening to a new window which has a hand full of treasures behind it.

1.5 Limitations:

In the prevailing literatures on Panam, no description is found regarding the functioning that took place within the buildings of Panam. Many buildings of Panam are in very dilapidated conditions now days. The floors and walls of the buildings are severely damaged which can cause life hazard as well. For this reason and to protect these buildings from further damage by curious people, the department of archeology has been sealed almost all the

buildings. So these buildings are completely inaccessible for physical survey. As a result many data could not be verified and many plans cannot be developed.

More over there is not a single family in or around Panam who has minimum connectivity with the original owners or the inhabitants of these buildings. The available literature sources also have very brief description of the social background of this area which is not sufficient enough to support the building to building analysis.

1.6 Methodology:

This particular study will be conducted thorough literature review, physical and cartographic survey as well as syntactic analysis. The first part of this research looks at the historical significance of the study area, the socio-economic structure of Panam as well as Dhaka as a revelation of the context for the present problem. It mainly deals with the available cartographic maps and the background history of Dhaka and Sonargaon-Panam along with the economy and trade history of Bengal. The physical layout of the houses has been studied from different cartographic references. The area under Panam Nagar, specially the main street has been surveyed to understand the setup of the buildings under consideration. This part also deals with the evolution of house forms of Dhaka through different literature review and the study of the spatial layout of the prevailing type of house forms of Dhaka till 19th century. The second part of the research will analyze the spatial organization of different house forms of Panam and Dhaka and brought them under comparison to find out the genotypes of the houses of Panam. (Fig-1.2)

1.6.1 Literature Survey:

Available relevant literature based on published articles, books, web sites, atlas and drawings in national archive, Department of Archeology, Public Works Department(PWD), Capital Development Authority(RAJUK), Dhaka City Corporation, Upozilla land office, Sonargaon and other unpublished records and documents which provides the primary plan for designing the fieldwork and the method of data collection and documentation has been studied. As the proposed site has a glorious history, the historical background of this region was needed to study. Therefore, the published books and journals were collected and studied from different relevant sources such as, Asiatic society of Bangladesh, Department of History, Dhaka University, the national museum and Bangladesh University of Engineering and Technology (BUET) to understand the historical background, architectural and social structure of Bengal especially the Dhaka region along with Panam Nagar and to study the buildings of Panam Nagar.

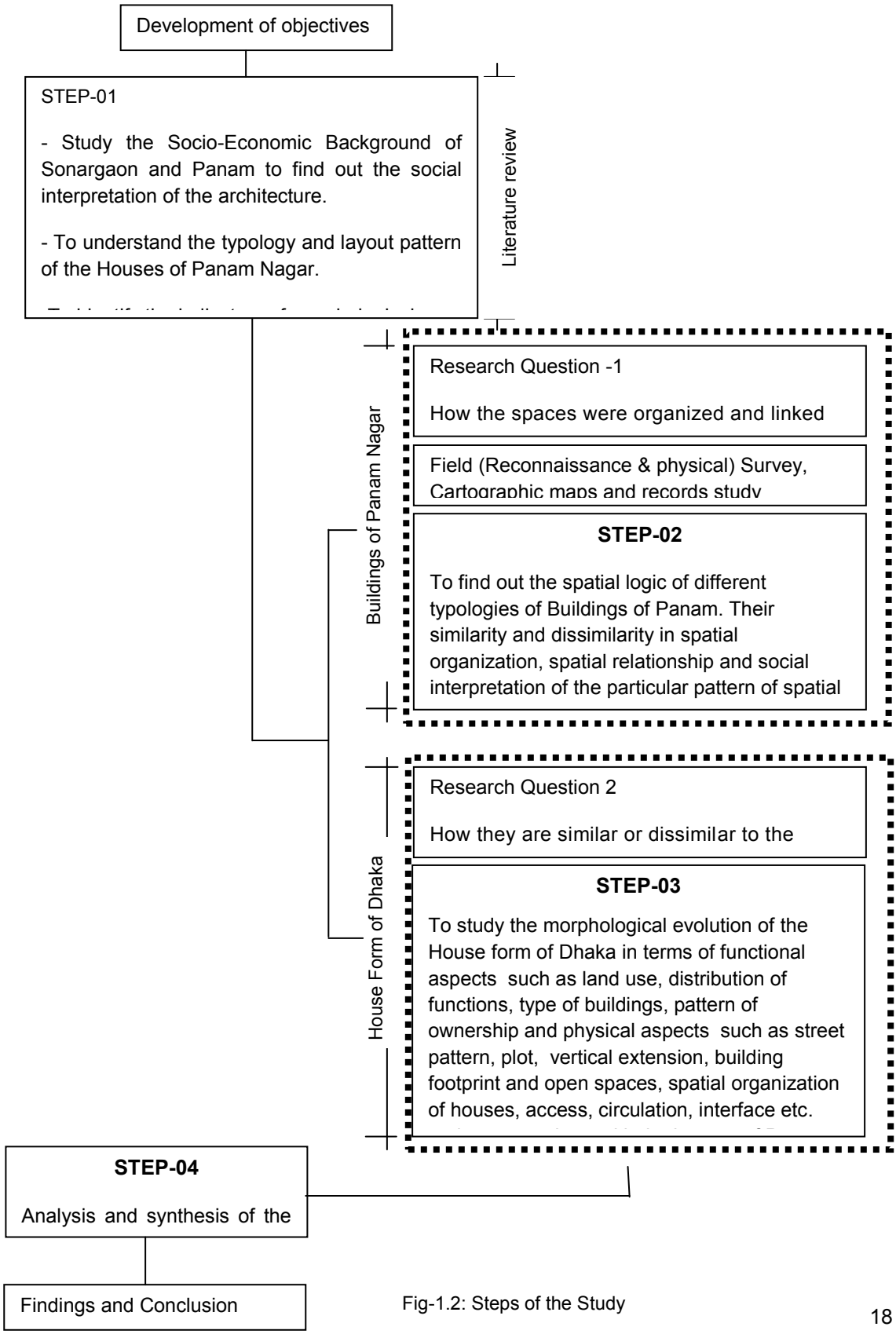


Fig-1.2: Steps of the Study

1.6.2 Study of Cartographic Maps and Archeological Documentations:

Cartographic maps of Panam and the surrounding area has been collected from different government sources such as, the C.S and R.S map from Union Porishod Office, Sonargaon (Fig-1.3) and Asiatic Society of Bangladesh. Asiatic Society and Department of Archeology both prepared a master plan identifying the buildings of Panam. This research will follow the master plan prepared by the department of Archeology in 2007 and their identification number for the buildings (Fig-1.4).

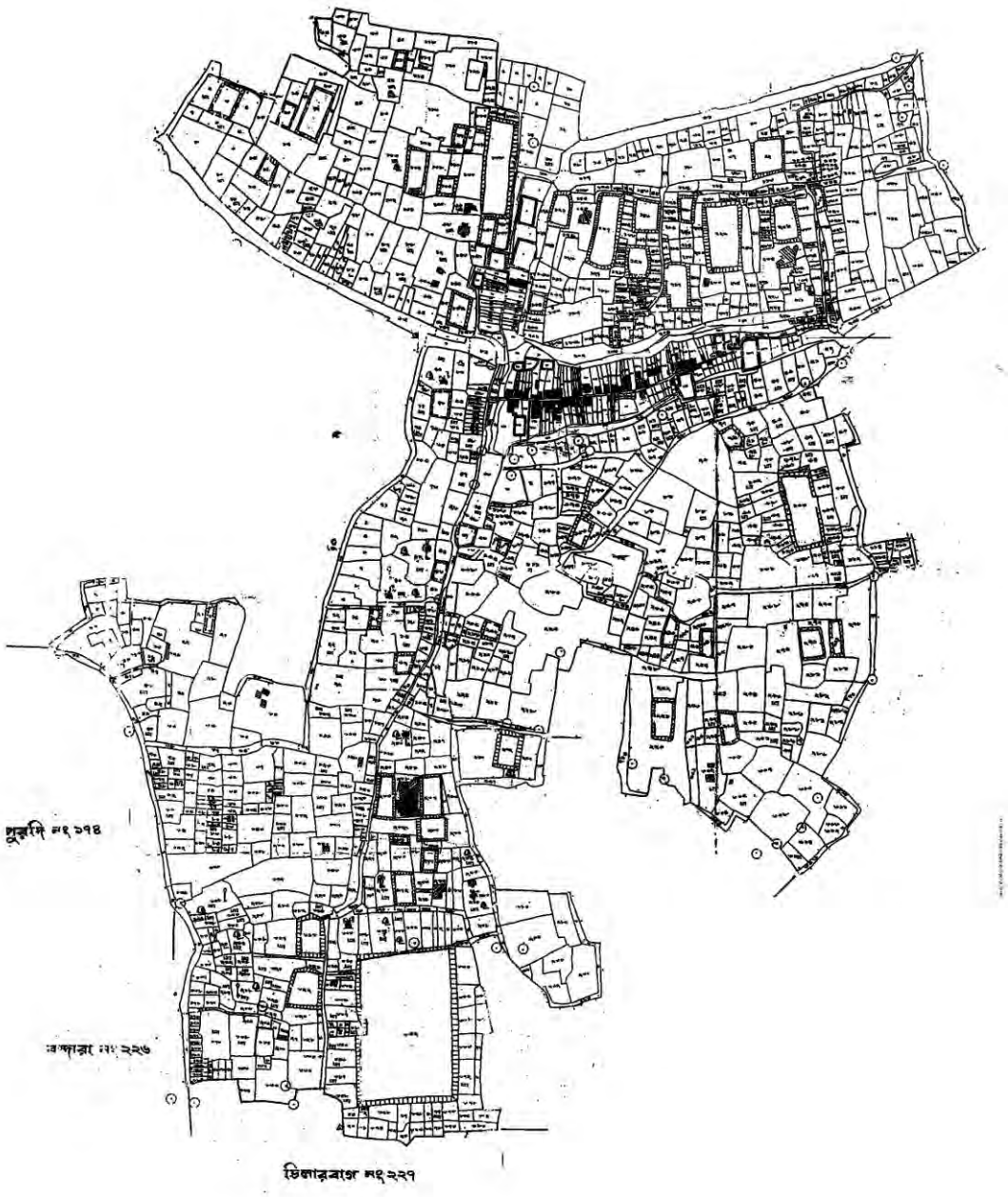


Fig-1.3: Mouza map of Panam-Aminpur, Source: Upozila Porishod, Sonargaon,

Fig-1.4 map

1.6.3 Field Survey and Selection of Case Study:

The area under Panam Nagar, specially the Panam Street has been surveyed to understand the setup of the buildings under consideration. There are now forty eight buildings exist in Panam Nagar. Hence, a base map was updated from maps prepared by the department of Archeology identifying buildings under study and their surroundings. The buildings in this map have been numbered according to the numbers given in the map prepared by the Department of Archeology, Bangladesh (Fig-1.4).

The department of Archeology had prepared the architectural drawings of twenty six buildings, among which only eighteen buildings have complete plan. Two plans have been collected from the unpublished B.Arch thesis of Khulna University in 2006, 'Revitalization of Panam Nagar' by Pushpita Eshika and one partially drawn plan had been completed by physical survey as that particular building was still accessable(Fig-1.4).The single roomed buildings have been deducted from the present study. Therefore, this thesis will conduct physical analisis of twenty two buildings which incorporates one building that has only ground floor plan as this building has a double heighted hall in the middle of the configuration and is one of the largest buildings of Panam. But the syntactic analysis will be conducted upon only those buildings which have complete plans of all the floors to make the analysis more aqurate. As there is no evidence of the services in the plans of Bangladesh Archeology Department and other unpublished sources, a physical survey has been done for the sake of this study.

1.6.4 Syntactic Analysis:

The study has been conducted in two steps by using space syntax method (annex-1) to understand the spatial organization of the buildings of Panam and to find out the genotypes of these houses. They are-

i. The study of the spatial organization of the house forms of Panam Nagar.

ii. A comparative study of the spatial characteristics of the house forms of Panam and different types of prevailing house forms of Dhaka at that time.

To find out the pattern of spaces, their organization and interrelation of spaces to each other, an analysis of house plans will be undertaken with the use of Space Syntax method.

Space Syntax is a method for describing and analyzing the relationships between spaces of buildings. Space Syntax is a research program that was developed by a team led by Professor Bill Hillier in the unit of Architectural Studies in University College London (Hillier, 1996; Hillier, 1984). Since then, it has grown into an independent research area with an increasing international community. Primarily, Space Syntax is a method of investigating spatial complexes

in an attempt to identify its particular structure that resides at the level of the entire configuration. The method is based upon the theory that the form-function relation in buildings and cities passes through the structural properties of its configuration (Hillier, 1998).

A method of Space Syntax named '**Justified Graph'** analysis (Fig-1.5) has been used as the simulation program to find out the interrelation between spaces of the selected samples. The invention of justified graph is more than a simple illustrative tool to clarify space configuration in buildings. So far 'space syntax' theory is concerned, the configurational variables 'depth' and 'rings' (annex-1) turn out to be fundamental properties of architectural space configurations and also the means by which architecture can carry culture.

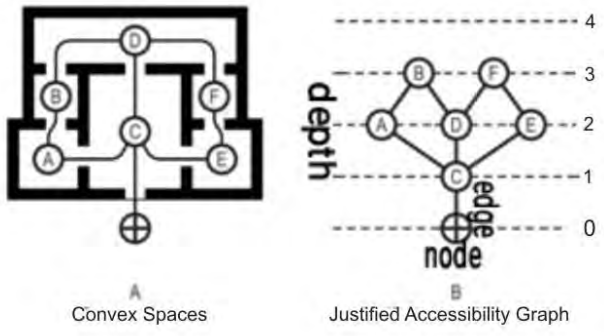


Fig-1.5: Justified Graph Analysis

Justified graph is restructured so that a specific space is placed at the bottom, "the root space". All spaces one syntactic step away from root space are put on the first level above, all spaces two steps away on the second level, etc. **Depth** (annex-1) between two spaces is defined as the least number of syntactic steps in a graph. Justified graphs offer a visual picture of the overall depth of a lay-out seen from one of its points.

Every space is identified in this graph as a node and the line connected these spaces are known as edges. Through this simulation software the relationships between spaces become clearer.

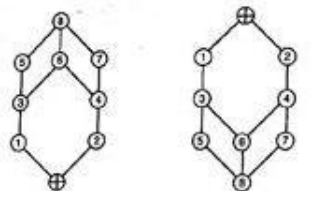


Fig-1.6: Ringy Graph

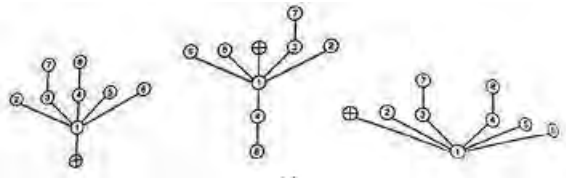


Fig-1.7: Graph without rings

Different variables are use in this process to understand the morphological character of a building. They are control, connectivity, depth, integration, number of rings (Fig-1.6 & 1.7), space-link ratio etc (annex-1). Rings add extra permeability up to a theoretical maximum where ever space is connected to every other. This enables us to begin to measure the degree of

depth and relative ringiness of a complex, to capture in numbers the kinds of difference we find in architectural objects (Hanson, 1998:27).

In this present study, the frontal entrance (outdoor) in Panam Street has been taken as the root space in all cases. By measuring depth, integration value, control value and ringiness, this thesis will try to understand the spatial hierarchy and the reason behind the spatial organization of these buildings. This thesis also tries to find out the genotypes[1] of these buildings by using these measurements while comparing these buildings to the prevailing types of residential house forms of Dhaka at that time.

1.7 Structure of the Thesis:

The entire research is compiled in this thesis within six chapters. The initial chapter defines the problem and set out the argument to examine the spatial layout of Panam for an explication of morphological order of spaces within these houses and thus search for their genotypes. This chapter also selects the methodology for directing the present research towards the ultimate objective that has been set for this research.

The second chapter reviews the socio, political and historical background of Panam along with the topographical study. Thus this chapter justifies the reason for this study.

The third chapter describes the evolution of house forms of Dhaka till 19th century, their character and typology. The socio-economic reasoning for the evolution of these house forms. This chapter also extracts key issues which need to be considered for the present purpose.

After establishment of the theoretical argument, the fourth chapter will study the architectural ambivalence of Panam Nagar, its settlement pattern, the types of house forms and their physical layout by analyzing the gathered drawings prepared by different source and physical survey. A descriptive study has been done for selected house forms of Panam and characterized thereby. The spatial analysis with the help of Space Syntax will be done in chapter five to find out the morphological characteristics of the house forms of Panam.

And finally chapter six will include 'Space Syntax' as a tool to analyze the morphological structure of the houses of Dhaka as well as the houses of Panam. Therefore this chapter will made a comparison between the syntactic properties of the house forms of Panam and the prevailing house forms of Dhaka till the colonial period.

[1] The **genotype** is the generic makeup of a building or an individual space usually with reference to a specific characteristic under consideration.

Thus through a systematic unfolding of social as well as the spatial structure of the house forms of Panam Nagar, this thesis will try to find out the generic characteristics of the house forms of Panam Nagar. It will examine the spatial structure of discreet spaces as perceived by different literature review, the social life and behavioral pattern of the inhabitants of these house forms. In this way this research will develop the understanding how the spaces within these houses are connected to each other and to the exterior. And whether there is seemingly any relation between the social structures with the spatial configuration of these buildings. Hence the social and spatial characteristics of these houses are investigated here to reveal the morphological order of these houses. Finally, attempts will be made to explain the social environment of Panam Nagar through the organization of spaces of these house forms of Panam and this thesis will also try to find out where these buildings of Panam suit among the house forms of Dhaka region. It is believed that, this study would create such understanding that will give a new dimension to the study of secular architecture of Dhaka in historic context. Thus this study may open a new window in the field of historical research especially in the field of architectural conservation.

Chapter 02

Context

2.1 Introduction:

Historically the land of Bengal[2] has its own distinct 'regional identity' since the antiquity. The geographers also consider Bengal as a definite geographical region in the entire subcontinent. This entire geographical situation, especially the geographical location of Bengal has played the foremost significant role in the construction of the distinct identity if Bengal as such: the distinct socio-cultural efflorescence, its tradition and continuity, diverse religious life, art and architectural individuality, the vibrant trade and commerce, economic prosperity, and above all, formation of Bengal's regional personality (Chowdhury, *et al*.1982:148-160; Dani, 1997). Sonargaon remained as a crown jewel in these kingdoms of glory of Bengal. Panam, situated in deep core of Sonargaon, made itself more significant historically as well as architecturally.

2.2.1 Historical Location of Sonargaon in the Context of Bengal:

The three geo-political units of Bengal, Vanga, Samatata and Harikela, may well be grouped under a single greater territorial unit with the common name of Vanga corresponding roughly to the southeastern Bengal. In thirteen century, the modern state of Bengal was split up into a number of divisions and chiefdoms. Hence, 'Vanga' denoted south east Bengal, which included Sonargaon, Vikrampur, Sylhet and Chittagong. It was sultan Shamsuddin Ilyas Shah (1342-1357) who united the territories of Lakhnauti, Satgaon (Southwest Bengal) and Sonargaon (Southeast Bengal) and laid the foundation of the independent Sultanate of Bengal in 1352 (Mohsin *et al*, 2007:xxvi).

According to the world map "Theatrum Orbis Terrarum" vol. II (Fig.-2.1) published in 1650 AD from Amsterdam, (Blockmann, 1968) Sonargaon was a port city by the Bay of Bengal. Ibn Batuta described, "It was a very important port city where merchant-mariners of China and Java came with their merchant ships for trade" (Abdullah, 1978:78). Sonargaon, the medieval capital of eastern Bengal is currently the name of an administrative *Upazilla* in the district of Narayanganj. It is situated about 21 km south-east of Dhaka city and about 5 km west of Narayanganj town. The geographical situation of the *Upazilla* Sonargaon at the junction of the river Meghna and Brahmaputra made it one of the most flourishing centers of trade and commerce.

2.2.2 Sonargaon in the History of Bengal:

Sonargaon came into prominence as an administrative center in the early medieval period, when Vikrampur, the ancient capital of Vanga, lost its importance. With the establishment of Muslim rule in this area in the closing years of the 13th century Sonargaon came to occupy the

[2] The term Bengal denoted here implies the pre-1947 province of Bengal in British India.

position of the capital of the territory of Bengal and a mint town. It continued to enjoy this prominence, with various vicissitudes, till the occupation of this area by the Mughal in the early part of the 17th century, whence the capital was shifted to Dhaka. Though shorn off the prestige of a capital, Sonargaon continued its prominence till the end of the 18th century (Hussain,1997:1).

Sonargaon remained a significant part of the history of Bengal from 13rd century and an international trade center for centuries (Husain,1997:1). Sonargaon was described by numerous

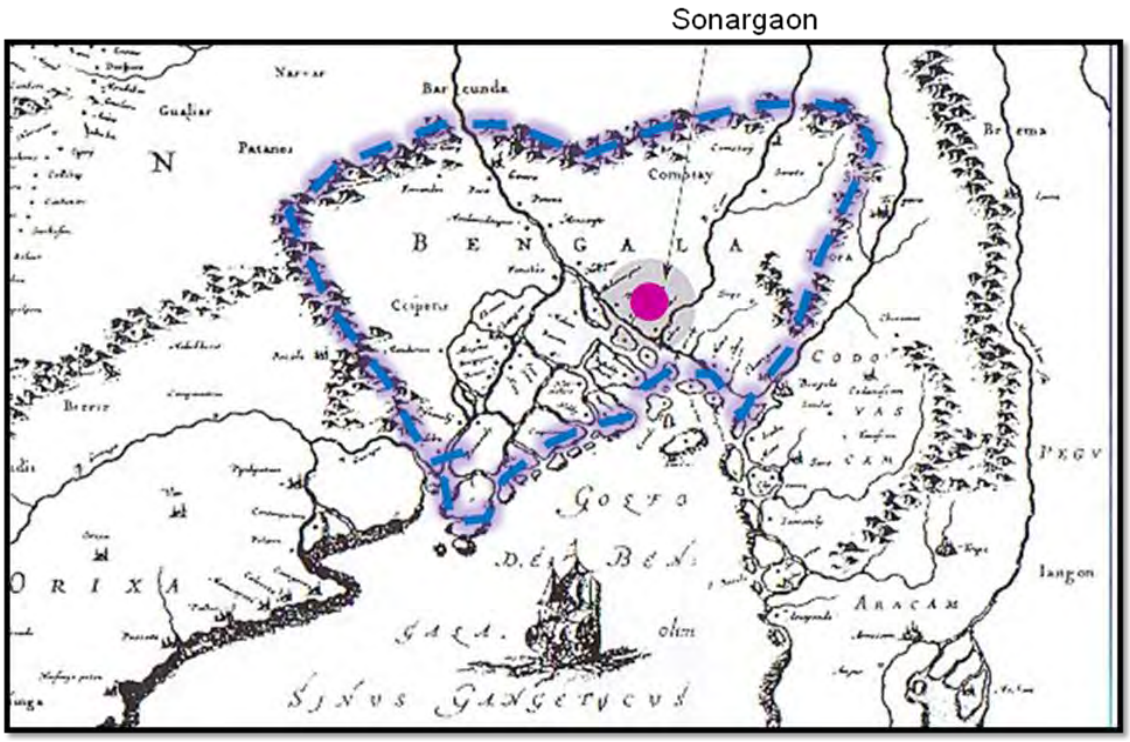


Fig-2.1: Sonargaon in World Trade map published in 1650 Ad
Source: Asiatic Society of Bangladesh,1997.

historic travelers, including Ibn Battuta, Ma Huan, Niccolò de' Conti and Ralph Fitch, as a thriving center of trade and commerce on the silk route (Hussain,1997:8-13). By the 14th century Sonargaon became a commercial port. Trade activities were mentioned by travelers like Ibn Batuta, Ma Huan and Ralph Fitch. Maritime ships travelled between Sonargaon and southeast/west Asian countries (Khan, 2009). Finest cotton Muslin was produced in this region. Ralph Fitch, who visited Sonargaon under Isa Khan in 1586, mentioned about the finest cloth of this place along with other export goods. He mentions, 'Great store of cotton cloth goeth from hence, and much rice, wherewith they serve all India, Ceilon, Pegu, Malacca, Sumatra and many other places' (Hussain,1997:9) By Abul Fazl in 1582 it is celebrated for the manufacture of beautiful cloth. So it is clear from the descriptions of every historian that, Sonargaon was

once a very prosperous business center and its chief trade item was various kinds of fine cotton fabric especially Muslin. Remains of the Muslim period are strewn over a vast area, a part of which grew the existing remains of the Colonial period. The extant sites of archaeological interest in and around Sonargaon may, for the sake convenience, be divided into three groups on the basis of their location. They are, 'Nothern Group', 'Southern Group' and 'Bandar Group'. Panam is situated in the northern group, which has much evidence of having muslin industry in that area including a large pond in the close vincity of Panam, named Khashnagar Dighi. The Khashnagar Dighi (Fig-2.2), a very large tank (365 x 182.5m), is traditionally known to be favorite to the Muslin weavers, as its water made their Muslins remarkably white (Hussain,1996:16).

The Khashnagar area was earlier known as Keorsundar, same as Katare *Sundar* of Sonargaon mentioned in the Ain-i-Akbari, where the special quality of the water of this tank for making muslin remarkably white is also mentioned. So it is evident that, there are a group of muslin-workers of Sonargaon who must have had their habitation Near Panam Nagar.

Fig-2.2: Khashnagar Talao, W, Branden, 1872.
Source: Archeological Survey of India Collection

With the establishment of the cotton mills by East India Company, this flourishing trade finally came to a decay in the middle of 19th century (Awal,2004:1). With the decay of the once flourishing cotton manufactures, for which the tract of land between the Sitalakhya and the Meghna was famous, Sonargaon fell into oblivion only to be revived by the emergence of the town of Panam, an abode of the Hindu merchants, who must have settled on an older site sometime in the 19th century and into the 20th century and conducted different kinds of business from here (Husain, 1997:24).

2.3 Panam- In the Context of Sonargaon:

Sonargaon attracted the attention of the English officials of Bengal from the middle of the 19th century (Hussain, 1997:9) when Panam a part of this decaying urban area came into prominence. Dr. B. Hamilton, who visited this part of the country round about 1820, writes, 'This is reputed to have been once a large city, the provincial capital of the eastern division of Bengal,

before Dacca was in existence, but it is now dwindled down to a village situated on one of the branches of the Brahmaputra, about 13 miles southeast from Dacca, lat 23° 39' N., long 90° 43' E' (Hussain, 1997: 9-10). Other historians who visited this place in 19th century also described similarly about this place.

Fig-2.3: Google image of Panam, 2007

Panam was a prosperous village of Sonargaon. In different historical evidences, it is found that it played an important role in the economy and trade of Sonargaon and eventually Bengal. Very little is known about the history of Panam Nagar from the texts. James Taylor (1840 A.D.) describes Panam as an ancient city of Sonargaon. He found the area inaccessible except by small boats and by elephant or horseback. The area was hidden within dense foliage of tropical vegetations.

James Tailor, in his book "A Sketch of the Topography and Statistics of Dacca" gave a brief description of Panam. He mentioned that, Sonargaon was a purganah of considerable size between Luckia and Meghna, in the northern division of Dhaka. Its agricultural products are rice, cotton, turmeric ginger, betel-nuts and betel for which it is celebrated. The principle villages are Panam, Nagulbandh (Langalbandh), Baroodi, kadua abd Morapara. According to James Tailors inscription, the Havillee Sonargaon of the early Muhammedan rulars was in this part of the area, though there is not much tress of the pre-British colonial buildings or monuments in Panam. Panam is situated about two miles inland from the Brahmaputra creek, in a groove of areca, tamarind, mango and various other trees interspersed with dense thickest of bamboos which completely conceal the village from view until within a few yard of it. This sequestered spot is approached in the dry season by narrow winding footpaths, but in rainy season it is partially inundated, and is almost inaccessible except by small boats or to a person on elephant

or horse. It consists of two narrow rows of straw huts and good brick built houses of two and three stories in height. Surrounding it there is a deep, muddy and stagnant cannel, which appears originally to be a moat for protection. Upon an old bridge across this mote there were a gateway which remained closed at night and no person was allowed to enter or exit until the following morning (Tailor, 1880:79-82).

2.4 Commercial Interface of Panam Nagar-Sonargaon in the Context of Bengal:

From ancient time, there was an intense trade and consequent religious and cultural intercourses and exchange between Bengal and other regions of the subcontinent and the outer world, especially central Asia, south East Asia and China. Different historians gave description of the historical trade routes connecting different part of Bengal (Alam, 2007:15). A comprehensive description of communication routes between Bengal and beyond is found in history (Roy, 1993:153-159), where the existence of Sonargaon is found.

Bengal's external trade and commerce flourished tremendously in the reign of Muslims. Merchants from all over the known world flocked to the coastal and inland ports to buy cotton and silk fabric of various kinds, rice, sugar, salt, spices, oil, pearls, ivory, alloy-wood and other exotic merchandise with gold and silver bullions in this period (Mohsin, Ahmed,2007:406). With the increasing power of the British Indian company, the well established commerce and trading of Bengali merchants gradually started to fall into decay. All the businesses were seized by the company. Their principal exports were cloths, indigo, betel nut, safflower, pat, soap, skins, shell bracelets, jewellery, copper utensils, cheese and preserved fruits. The former consists chiefly of flowered muslins, which were sent to different parts of the country, and of khasseidas or embroidered cloths, which were exported exclusively to Middle East from where they were exported to Egypt and turkey. Their import comprised of mustard and til seeds, sugar, lime, timber, cotton, ivory, pepper, arsenic, wax, gold and silver, moogah or tussar silk etc. from various parts of Bengal and subcontinent. Dhaka and Narayanganj were the mart for the products of the surrounding districts (Mohsin, Ahmed, 2007:406-409).

Cotton textile of every sort-fine, superfine and coarse-were once manufactured in abundance in the province of Bengal. The product of looms not only fully met the internal demand of her population and also exported to distant lands where it was held in high esteem. Among the manufacturers, Sonargaon was in the most prestigious position of manufacturing and exporting finest quality cotton fabrics and Muslin throughout the world. With the establishment of mills by East India Company, this flourishing trade finally came to decay in the middle of 19th century (Awal, 2004:1).

Sonargaon remained an international trade center for hundreds of years. Besides cotton there were extensive trade of rice, turmeric, betel, coconut and various types of spices. The shifting of the capital to Dhaka made Sonargaon lost its importance as an administrative center. Sonargaon started losing its trade with the growing power of East-India Company over Indian Sub-Continent. Their over-powering aggressive trade policy made once flourishing muslin industry fall into decay. Still there were obviously some business interest remained in Sonargaon especially in the northern group (consisting Panam Nagar) of Sonargaon which was proven as the abode of the muslin weavers in earlier period. The presence of a 'Kuthi-Bari' beside 'Pankhiraj khal' is the evidence of the fact (Fig-2.4).

Fig-2.4: Cotton Factory in Panam, W, Branden, 1872.
Source: Archeological Survey of India Collection

From historical references it is found that, the inhabitants of the settlement of Panam were traders and merchants (Hussain,1997, Jamal, 2007, Kabir et al, 2006 etc.); so it is assumed that the development pattern of such a settlement should be influenced by commercial activities. There are forty eight houses in Panam organized on both side of a linear street at present. But historical reference gives the account of ninety houses all of which were owned by Hindu merchants (Hussain,1997:47) The area was densely built with single to three storied buildings with extensive openings towards the street. This kind of settlement pattern is a very common feature in trading towns to ensure a commercial interface to a large number of merchants in a limited extent. Dr. J. Wise (Jan, 1872) gives an account of the trade in Panam which says, 'A great trade in cotton, chiefly English piece goods is carried out. The majority of the residents are prosperous merchants who make extensive purchases in Calcutta & Dhaka, which are disposed of in the villages around. At Panam they made extensive trade in cotton fabrics and English piece goods'. He also speaks of a variety of pan, known as Kafuri, and a special variety of *Mung-dal* to be the esteemed products of the area. The manufacture of fine Muslin, for which Sonargaon was famous,

was already extinct except a variety of *Malmal.* But Panam has developed into a great trade center of English piece-goods' (Husain,1997:17).

In all probability Panam grew as a by-product of the commercial activities of the English East India Company and the Permanent Settlement. The existence of two Mughal bridges at this place and lakes enclosing it on the three sides perhaps indicate that it was a suburban area of the medieval city. The archeological survey of India refers that, Panam was a centre of trade in cotton fabrics carried out by the East India Company (Hussain,1996:24). Again, it can also be said that, the geographical location of Panam, gave it every possibility of being a medieval village which got the 'English Kuthi' nearby and intelligently explored the European businessmen by being their middleman in the local market and gradually made wealth and purchased Zamindaris like other 'benias' in the large cities in India. But as there is no evidence, it is only a conjecture about the inhabitants of Panam Nagar.

2.5 Population and Social Structure of Panam Nagar:

The architectural development of Panam Nagar was confined in Hindu settlements. In Sonargaon, Hindu community always lives alongside maintaining a Socio-Religious border dividing the Hindu and Muslim settlement (Wise, 1872). Panam is in the eastern part of northern group which was populated by Hindu majority. The settlement pattern and building layout of Panam thus regulated by the respective socio-religious rules of spatial organization. For example, all the ponds of Panam are north-south elongated, which is a common feature of Hindu settlement (Hussain,1997:104).

Fig- 2.5: Entry level, Panam Street, W, Branden,1872
Source- Archeological Survey of India Collection

Panam Nagar was such a Hindu settlement that there was not a single Muhammadan found. Dr. James Wise gave an account of the inhabitants of Panam Nagar in 1872 in his book. He described that, the householders are chiefly Hindu Taluqhdars who pay Government revenue direct to Dhaka treasury. But the majority of the people were traders and money-changers" (Hussain,1997:41). There are

ninety of them in Panam. There is also a superfluity of Brahmans. In Panam the caste are as follows: thirty houses of Brahmans; sixty five of Sahas, five Bhuimalis and the remainder of Barbers and etc. (Hussain,1997:35).

Fig: 2.6 Panam-Street in 1872, W, Branden
Source-Archeological Survey of India Collection

James Wise in his excellent *Notes on Sunargaon,* published in 1874 after a visit to the area, also records his impression about Sonargaon along with a survey of the extant buildings and a sketch of the history of Sonargaon. During his visit to Sonargaon, which he calls 'jungle of Sunargong', he found the area (Panam-Goaldi to Mograpara and adjacent territory) 'covered by dense vegetation, and the people poor, diseased and emaciated, and the swamps and pools abode of largest alligators'. Tailor mentioned about the people of Panam that, many of the people were very rich. They lived on rice, milk and fruits (Hussain, 1997:8). This indicates that the inhabitants were simple living people.

From Ralph Flitch's description it is found that, in 16th century Panam was a prosperous village of Sonargaon. Most of the people were rich. Again, comparing the accounts given by Taylor and J. Wise at a difference of 32 years, it is evident that the years after 1840 was a period of decline and the years following 1872 was a period of reincarnation for Panam. This reincarnation, in all probability, was due to the East India Company's activities in that area of Sonargaon. Therefore it is clear that the inhabitants of Panam were not the decedents of the muslin wavers, rather a different class of people who selected the trace of land for some other profitable purpose in between early 19th to early 20th century (Hussain,1997:17) which was related to the East India Company as well as this specific locality.

2.6 Physical Layout and Settlement Pattern of Panam Nagar:

Panam Nagar appears to be well protected by artificial canals all around (Hussain,1997:17). Two fairly wide canals run parallel to the street on its either side, joined by a small canal on the western side, over which is the entrance bridge. On the eastern side the canal on the south swerves rightward and goes eastward crossing the north-south road that passes

through the Panam Bazar. The northern canal, which is designated as the *Pankhiraj Khal,* derives its water supply from the river of the same name, which originates from the Brahmaputra, runs eastward to meet the Meghna- Menikhali stream. The PanamDulalpur Bridge is actually on this river stream (Hussain,1997:17). The well planned canal enclosure for the Panam Nagar clearly shows that they served the dual purpose of protection and sanitation. It can very well be surmised that this well-planned water system around Panam Nagar must have grown under a well organized government. The present buildings of Panam Nagar can at best be dated back to the late 18th or early 19th century (Hussain,1997:17). So it is very likely that the colonial period structures grew up on the site of an earlier occupied site of the Muslim period. Only archaeological excavations in the area can either prove or disprove this hypothesis.

Surviving buildings of Panam show a significant shift in architectural concept, character and building typology preceding period. Buildings were secular in nature as opposed to the religious structures that characterize the architecture of the pre-colonial period of Bengal. Architecture entered into a private realm that prompted individuality based on certain shared values. Buildings increased in volume and complexity. Uniformity of building craft, material and structure generated a harmonious pattern of development. The decorative treatments were transported from European architecture and blended places with local motifs (Hussain, 1997:103).

Though Sonargaon was the capital of Bengal in Musilm rules between 1296 and 1608 and developed as a center of Islamic culture since the later part of 13th century, Muslim dominance declined before 19th century (Hussain,1997:41). The area was stagnated for a considerable period. So it is obvious, the secular buildings of Panam Nagar were not the continuation of the predominated architectural form of earlier phase of development. Rather it was a unique development in this historic piece of land, which enhances the historical value of Sonargaon. Historical evidences says that, the highly ornamented, apparently residential buildings of Panam represents a phase of economic affluence in colonial period that flourished between early 19th to early 20th century(Hussain,1997:17) and continue to flourish till the end of second world war (Hussain,1997:41).

The establishment fall into decay after the partition of India in 1947 and finally in the time of liberation war of Bangladesh, the last remained inhabitants of Panam abandoned the place. Very few are known about the social life of the inhabitants of Panam from the literature review and field survey. But it is certain; the area was much vibrant in the time of colonial rule. The highly dense buildings with frontage towards the road explain the value of the land and the importance of the central road to the inhabitants of Panam. This kind of settlement is seen in the

commercial part of Dhaka city where the traders and artisans lived. Moreover, the indication of commercial activities in the literature survey refers Panam to a rich commercial zone of Sonargaon.

Panam had a very cohesive society participating in similar religion and cast which is evident in shared use of backyard, pond and other social facilities. Most of the houses having a street side veranda on ground and upper level illustrate a very close relationship to the street life with the buildings (Kabir, *et al*, 2010).

A 'Pancha Ratna' Shiva temple in the middle part of Panam Street was mentioned in Tailor's description which has been completely demolished except the base of a building at that part. But there are several single roomed building are seen in this part of the city which indicates that the temple was a significant part of the city and probably those single roomed buildings served the religious purpose as the place locally known as 'Thakur Bari' which means the abode of the God. This temple complex divided Panam in two distinct parts. The comparatively larger but closely built buildings mostly two to three storied were situated in the eastern part of the temple and the smaller buildings mostly single storied were situated in the western part of the temple complex. It indicates to the social segregation of the inhabitants of Panam as well as the commercial value of the eastern part of the city. So from the field survey, it can be easily said that, the rich and upper class people occupied the eastern part of the Panam city and the temple complex served a connection or buffer between the social classes. The placement of the temple complex in the center of the city and its adjacent facilities and open spaces indicates that it was probably the place where the public activities were held in Panam.

From field survey and literature survey, it is seen that, most of the adjacent buildings shared the backyard facilities and the water bodies. The existence of four ponds which are not enclosed in any building compound shows that those were used commonly which is another evidence of the sharing neighborhood (Kabir *et al*, 2010). The pond behind the Shiva temple was connected to the mote of the southern part of Panam. There were three Ghats with flight of stairs are seen in all three sides of the pond except the southern side. The connection with the cannel indicates that, these Ghats probably used for transportation purpose. (kabir *et al*, 2010).

2.7 Conclusion:

Panam Nagar is a very uncommon example as an urban settlement in a non-urban area in the context of Dhaka region. The urban settlement of Dhaka had grown organically regulated by the increasing trade and commerce and the administrative demand. From different literature, it is found that social and economic status of Panam partially spread around a large span of time till the end of the colonial period. The settlement pattern was

unique in many ways in Panam Nagar. Nevertheless the social behavior and the reason behind the establishment of such an urban settlement in this remote area, at a very close distance of Dhaka remained still unexplained.

Again, Dhaka had been developed as the regional center of administration and trade from pre-colonial to colonial period. Hence, there is a possibility that the house forms of Panam might have some similarity with the house forms of Dhaka of Pre colonial and colonial period. Therefore, the house forms of Dhaka need to be studied to have a better understanding of the house form Prevailed at that time in Dhaka and thus to compare these house forms with the house forms of Panam Nagar to find out the genotypes of the house forms of Panam Nagar.

Chapter 03

House Form of Dhaka- Its Evolution and Typology

3.1 Introduction:

The house form' is an expression of family demands and in physical manifestation varies widely in time, space and groups. But the seminal cultural constraints are embodied in rules of arranging space which is all pervasive and recognizable. Houses everywhere serve the same basic needs of living, cooking and eating, entertaining, bathing, sleeping, storing etc. but a glance at the architectural record reveals an astonishing variety in the ways in which these activities are accommodated in the houses of different historical periods and cultures. The important thing about a house is not that it is a list of activities or rooms but that it is a pattern of space, governed by intricate conventions about what spaces there are, how they are connected together and sequenced, which activities go together and which are separated out, how the interior is decorated, and even what kind of household objects should be in different parts of the home (Hanson, 1998:2).

The history of urbanization in Bengal can be dated back till 5th century BC (Ahmed & Rashid, 2007:6). In earlier stage of urbanization, the urban centers were more of glorified villages with greater concentration of people, providing wider opportunity for socio-economic exchanges. The process of urbanization was slow and measured. Rural traditions strongly dominated the socio-cultural sphere. Hence the life-style of the rural and urban people was almost similar (Akhtaruzzaman, 2009: 127). As the study area is in Dhaka region, this chapter put emphasis on the growth and evolution of house form of Dhaka based on the literatures.

The history of Dhaka begins with the existence of urbanized settlements in the area that is now Dhaka dating from the 7th century CE. The city area was ruled by the Buddhist kingdom of Kamarupa before passing to the control of the Sena dynasty in the 9th century CE. After the Sena dynasty, Dhaka was successively ruled by the Turkish and Afghan governors descending from Delhi Sultanate before the arrival of the Mughals in 1608 (Akhtaruzzaman, 2009).

3.2 History and Evolution of House-Form of Dhaka Region:

As a major city and the capital of Bengal, Dhaka always had its importance in history. During the Muslim realm, from 1608, Dhaka used to be one of the main administrative center as well as an important trade center of Bengal. Historically, the house form of Dhaka has been divided between two classes- the royal and upper class people and the general people. During the Muslim rule, the high officials and the royal people used to live in the fort or near the fort (Imamuddin, 1986:33). On the other hand the mass people preferred the comfortable village dwellings. They used to come to the city in day time for different business and other purposes but returned to their villages with the night fall (Roy, 1993:308). But with the passing of time, different artesian and businessmen started living in the city. The urban houses of Dhaka took

shape with the increase of trade with East India Company (Mohsin & Ahmed,2007:407).The morphological characteristics of the city and its houses has changed substantially over time. The growth of Dhaka shows two distinct pattern 'indigenous pattern' and 'formal pattern' of development (Imamuddin, 1982: i.26).

3.2.1. Indigenous Pattern:

Indigenous pattern is characterized by compact and densely built areas with narrow and irregular road pattern. The houses were mostly inward looking, built from the edge of the plot, attached to the adjacent building forming a continuous facade along the road buildings in this pattern of urban area were used for multi-functional purpose, such as living and business. (Imamuddin,1982: i.27).

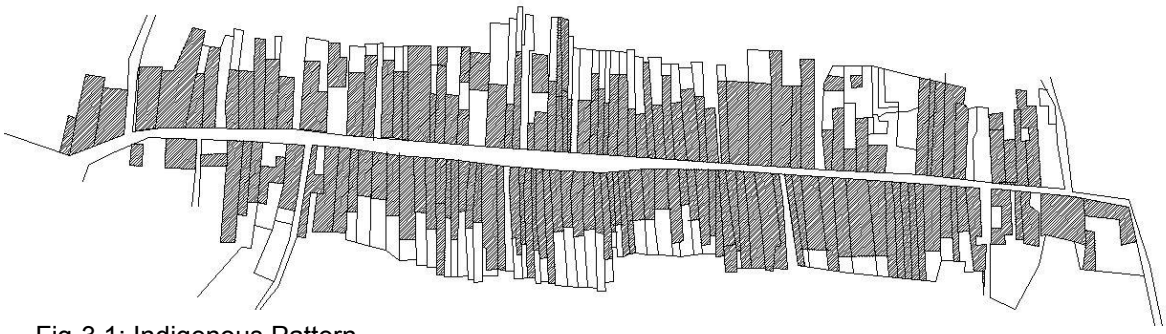


Fig-3.1: Indigenous Pattern

The houses of Panam are closely built and adjacent to one another. All the buildings are arranged on both side of a narrow irregular road. The attached adjacent buildings formed a continuous façade towards the street. From this point of view, the buildings of Panam can be characterized as indigenous pattern.

3.2.2. Formal Pattern:

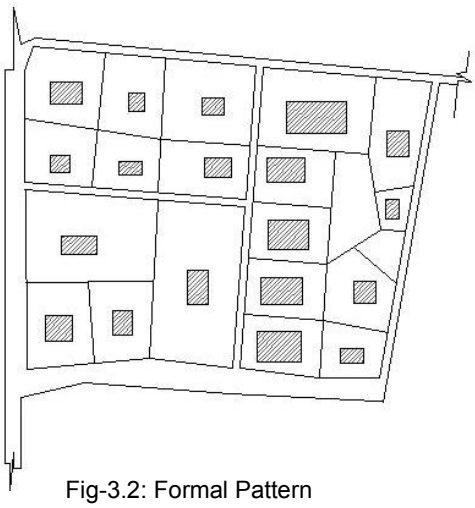


Fig-3.2: Formal Pattern

The planned new city developed during the colonial period, in contrast to the indigenous pattern with detached buildings and wide roads in regular layout. The traditional system of mixed use areas were replaced by single use zones like residential, administrative and recreational. Detached, outward looking houses became popular primarily influenced by the colonial residential bungalows (Imamuddin, 1982:

i.29) where a strong distinction is found between the served and service zone.

In late 19th century urban living was popularized among the local elites. They incorporated the formal pattern of the classical order along with the practicing indigenous pattern of house form. Lavishly built houses in a large compound with colonial formal pattern in out-house which had been used as 'kachari' or office of the house lords and informally built interior (vithor bari) with a courtyard in the center has been popularized among the urban elites. A large number of houses were built by mingling the two patterns in the undivided Bengal. Though there are some examples of this type are found in the urban center of Dhaka, but these buildings are more seen in the country side (Reza, 2008).

3.3 Forces Influencing the Evolution of House Form of Dhaka Region:

From different literature it is found that various socio-political, cultural, economical and physical forces have acted in different degrees at different time on the growth of urban pattern, design and organization of the houses. (Imamuddin, 1982:1.22-1.25).

From the very beginning, agriculture remained as the main force of the economy of the Bengal. Therefore the society developed here were basically agrarian society. The initial urbanization in Bengal was based on the trade and marketing of the agricultural products as well as other necessary items of day to day life. The earliest urban society in this region was based on trade. Some group of artisans started living in Dhaka and operated their business from their houses as they did in the villages. Gradually a specific urban pattern of linear street facing extended houses on both sides. The indigenous houses of such patterned in urban area of Dhaka were mostly built under this consideration of business with living (Imamuddin, 1982:2.12).

Originally people with homogeneous occupation grouped together in different Mohallas and accordingly the Mohallas were identified and named. Later due to the diversity of urban occupation, population of Mohallas represented the mixed social, occupational and income group in the informal part of the city. The rich and the poor lived together in close conformity within the same community. On the other hand, the segregation was being made according to income class in the formal/ non-vernacular part of the city. Housing and jobs were inter-related from the earlier times. Mohallas originated as working community, provided accommodation for its workers. Previously, a new migrant's location in the city was predetermined and relatively fixed. It was a social rule that, one who provides the job is also responsible for providing accommodation (Imamuddin, 1982:1.25).

For thousands of years, religion had played a vital role in housing the people. Apart from the pre-historic evidence, these religious philosophies had been forming the socio-cultural and

philosophical ideals of the society that reflected in the indigenous culture and psychological attitude of the people of the urban society. In the societies of this region, the Hindu and the Muslim were the major community lived in close contact based on the land and land generating agriculture (Haque,1997:15-17). In house design, two separate philosophies of the religious customs were followed respectively. The 'mandala' the cosmic order of the house design was widely practiced in the Hindu society, while the 'purda' the privacy custom of Muslim female was the key concern of Muslim house form in this region. The open courtyard in both societies, played as the main spatial context of ritual and festivals of the family from rustic hut to brick built building. Every Hindu house had a 'tulsi manch' (a sacred place for daily worship) in the internal court of the house. On the other hand, there were no such elements in the houses of the Muslims (Haque, 1997:23). Thus different aspects influence the evolution of urban house form of Dhaka.

3.4 Typology of House-Forms of Dhaka Region:

The primary house form of the region is deep rooted in its rural counterpart. Therefore the house form of Dhaka region can be divided into two basic types, Rural House Form and Urban House Form.

3.4.1 The Rural House-Form:

The basic house form is a cluster of covered shelter around a central court (Fig-3.3). The buildings are loosely spaced, usually a single room opening on the court. The toilet, baths are not considered as the part of the proper house and kept at a distance. Most of the spaces within the physical form have multiple uses. So it can be said that all spaces are living spaces as it overlaps the function. Court is the center of most of the family functions as very few functions needed a roof (Khan, 1982:6.5). Privacy is specified by the distinct segregation of male/female domain. These two domains are symbolically represented in the house form. The open court is identified with the family. It is the female domain and was separated from the outer world with the cluster of rooms in all four sides. In primordial form it had a religious implication and family rituals were held here. The out-house (Bangla Ghar) was the male domain. It locates the family

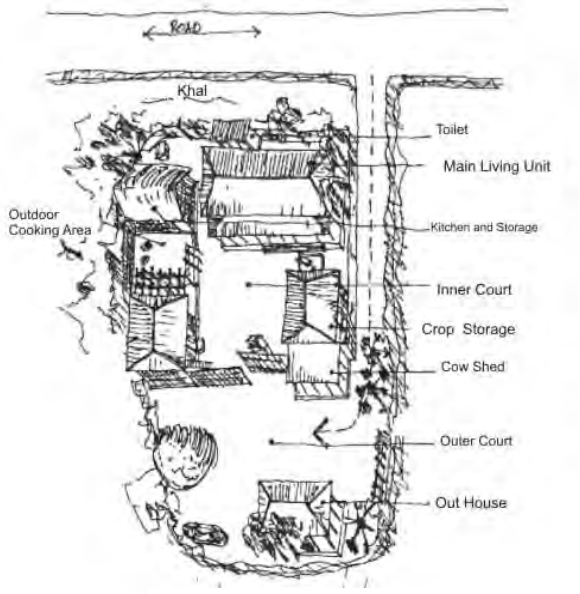


Fig-3.3: Rural House

within the community. It is shown in the architectural expression, usually well built though least used. It is always situated in the entrance of the house. In a wealthy family, it is at a distance from the main house block where family functions were held (Haque, 1997:19-20).

3.4.2 Urban House Form:

Dhaka, as a meeting point of major riverine routes, served as an outland of a vast hinterland. The matrix was a 'constellation of villages' (physical built up but no different from rural counter parts), which for different reasons at different times became political center and acquired administrative symbols to be deemed as a 'town'.

The early urban houses, until the introduction of the classical order and occidental architecture by the British, were no difference from their rural counterpart in layout. The process was a gradual transformation of rural houses into a massive brick masonry structure, conceived in piece meals. From different historical reference, it is found that, among the variables that characterized the urban house form in Dhaka, the religion, economy, social class and profession were intermingled. The pre-Muslim urban settlement of Dhaka was formed on the basis of economy and trade (Nilufar,1997:104). Until mid 20th century different ethnic groups had distinct traditional profession and lived together in multi-functional houses which served both purposes; commercial and residential (Imamuddin:1982:1.24). Different business streets of old Dhaka possessed these multifunctional houses. Some of the streets had been named after different artisan groups who have been conducting business from the houses along with the living purpose. These houses were generally multistoried. The front part of the houses acted as the shops and the rear part and the upper floors were used for living purposes. Access to the inner part of the houses was through corridors placed at the side of the house. These corridors were usually divided by a party wall to provide access to other rooms and to upper floors through stairways and ultimately terminate to service areas at the rear. Upper floors were mostly used for residential purposes. (Badruddin, 2010).

The toilets were kept out of the building and the houses developed on clearly demarcated domains. The narrow frontage and deep inside was a common character of these houses. This was probably for the dependency on the natural system for water and waste disposal and with further subdivision the houses became a narrow strip of nominal frontage (Imamuddin,1982, Haque, 1997:29). However illogical it may appear, it embodied the essential qualities needed to make an appropriate dwelling of the society prevailed that time. The dwelling stayed self sufficient in access and service while the length allowed for the maximum separation of family domain and service area. It allowed for physical arrangement along a defined privacy gradient (Imamuddin, 1982). The mail domain which was the public zone of the house belonged to the

frontal part of the house overlooking the adjacent street. Most of the time there was a small court in the middle part of the house which segregates the mail and the female domain. The service area was situated in the rear part of the building connected to the service alley or the adjacent water body. This part was dominated by the female members of the house and remained as the private zone of the building (Haque, 1997:25-28).

From pre-colonial period, the house forms of Dhaka had been followed two distinct styles based on the social grouping and functional use (Haque, 1997:29). Over time, the city's street pattern and subdivision into building lots gave birth to two distinct types of *mahalla*. One contained buildings that were deep and narrow — as much as 40m. deep — with a road frontage of approximately 2.5–3.5m. and a height of up to four stories(Haque, 1997:29). This pattern took shape in the pre-colonial period when this indigenous city was dependent on natural and manmade canals for drinking water waste disposal, transport and communication (Haque,1997:30). These long, deep sites had both formal (front) road access and informal (rear) canal or service-lane access. The use of such plots for commercial along with residential uses in shop houses played a further role in establishing this pattern (Rahman & Haque, 2001).

When Dhaka became the administrative center and Capital of Bengal under the Muslim in 1610, the social hierarchy had been changed to certain degree. As a result new types of dwelling units had evolved for the rulers and the higher ranked administrative officials. Again in colonial period the colonial rulers segregated the society of Dhaka in an occidental style. The obvious influence was on the house form which leads towards another typology of *mahalla.* This *mahalla* typology was more loosely structured. Its dwellings could generally be found on regular (oblong) plots. But because these were served by an intricate network of lanes and by-lanes, the extent of individual parcels might often only be perceived by the construction of peripheral walls. Such areas were basically developed for residential purposes (Rahman & Haque, 2001).

3.5 Types of Urban House Form:

Urban houses in Dhaka can be divided into various types according to their functional use pattern. Such as- Shop Houses, Kuthi Bari, Zamindar houses, Satellite township houses, and Professional patties etc (Khan, 1999:64). By ownership, these were both government and private houses. But, According to the spatial organization all these houses follows two distinct typology that has been accepted in different literature (Imamuddin, 1982: 2.10-2.20). The dwelling of Dhaka can be categorized into two broad groups 'Introverted' and 'Extroverted' on the basis of spatial organization and built form. (Imamuddin, 1982: 2.10-2.20; Haque,1997:29-35).

3.5.1 Introverted houses:

Introverted houses referred to inward looking courtyard houses. It is the earliest type of urban house found in Bangladesh (Imamuddin, 1982). This type basically evolved from the rural house form of Bengal, where court is the center of all major activities and functions.

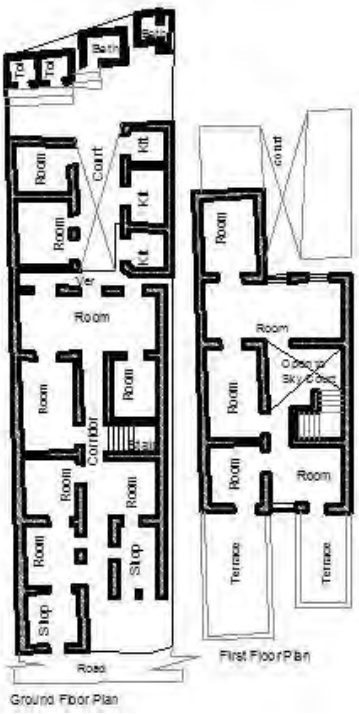


Fig-3.4-Introverted House,
Source: Khan, 2013

In general cases most of the introverted houses were basically, in arranging a series of rooms with transitional spaces like stair, corridors etc. The male and female domain had been separated by internal court (Khan, 1982;6.20). The ground floor contained services and other family activities which made it the functional part of the house, where the upper floors remained comparatively less used and were allocated for living purpose like bed rooms, family livings etc and remained more private in respect to ground floor spaces. The living spaces are placed around the court yard. In urban houses this court came in a modified way. In pre-colonial merchant houses, the courtyard was for loading and unloading, in craftsman houses it was a spill over area of the workshop and in burghers house it was regular farmyard (Imamuddin, 1982). The introverted houses of Dhaka were divided into two sub group based on the organization of court yard and its adjacent spaces. They are:

3.5.1.1 Detached Type:

The detached model (Fig-3.5) taken from the archetype rural houses reflecting in its urban model. In rural houses, a number of single detached huts clustered around one or more courtyard. The courts may connect to each other, but the huts were never connected. This type prevails in a dominant urban house form where there is enough space to accommodate in such a setting (Imamuddin, 1982). In many houses, however, the construction materials have changed keeping the form constant.

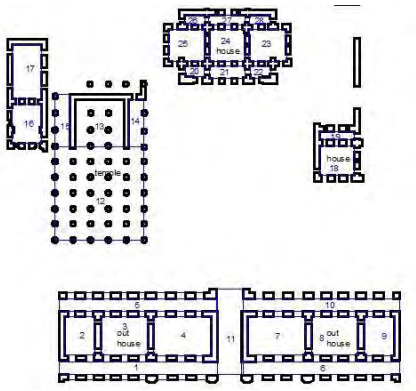


Fig-3.5: Detached House
Source: Khan. 1999

3.5.1.2 Enclosed Courtyard Type:

The enclosed courtyard type of house form (Fig-3.6) may refer as the most indigenous urban house form in our country as its rural counterpart is not seen in our national entity. This type of house is usually enclosed around a central courtyard. Sometimes, this court is so small that it only acts as a light well for the multistoried linear buildings. In ground floor, rooms are arranged around the court, giving access inward. In upper floor, a continuous veranda is provided projecting the court to which rooms are open. Entry to such a house of Dhaka was normally through a sitting room (also named the drawing or living room), a feature synonymous with the front or formal domain of the rural compound. This was sometimes fronted by a verandah or court. Behind this public area, the private part of a house would surround an internal court, sometimes with a colonnaded verandah. The inner court occupied the juncture between public and private space, and served as the conceptual focus of the house. Rooms, if not directly accessible from the court, maintained a conceptual relationship to it, which defined their degree of privacy. In an urban setting, such a court also created a pleasant microclimate (Rahman & Haque, 2001). As in the traditional houses, the rooms had multi functions. In day time these rooms were used for working purposes and at night for sleeping purpose. This particular kind was evolved due to the demand of street frontage and scarcity of land in the urban area (Rahman & Haque, 2001).

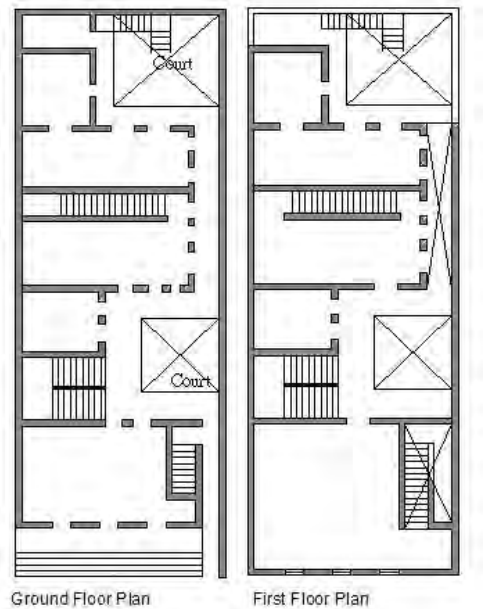


Fig-3.6: Enclosed Courtyard House.
Source: Khan, 2013

3.5.2 Extrovert Houses-Bungalow:

Extroverted type refers to the outward looking houses and their component parts exist in free relation to one another. It was relatively a new model, primarily adopted in the local context as a consequence of marked socio-cultural changes under the influence of colonial rule that introduced new life-style, living pattern and values in urban dwellers.

The colonial cities grew on western contemporary concepts in contrast to native cities with wide open and straight road pattern, isolated bungalows with spacious gardens. This inspired the local elites to follow the model of colonial residential architecture. It was a complete different setup than our traditional setting. The bungalow itself is an improvised form, suitable for the

British rulers in Indian subcontinent. Bungalows were isolated structure built in the center of a large compound and extroverted in nature. The main block was generally square in shape and had veranda all around the four sides of the mass. It was created to keep the hit out from the living zone. The veranda was extensively used for various purposes. The main building block had a living room connected to a dining and several bed rooms with attached bathroom and dressing through corridors or veranda. The type became so popular to the British rulers, that all the government quarters of the British government were designed following the functional zoning of these bungalows (King, 1984). Gradually a new type of bungalow named consolidated bungalow evolved which merged the service block in the same building mass. The segregation between the master and servant was no longer needed as these were designed for the native employees of British Government. These were comparatively small in size with the same functional zoning as in the compound bungalow (King, 1984). Hence, the extroverted type houses too, represent two different types of house forms:

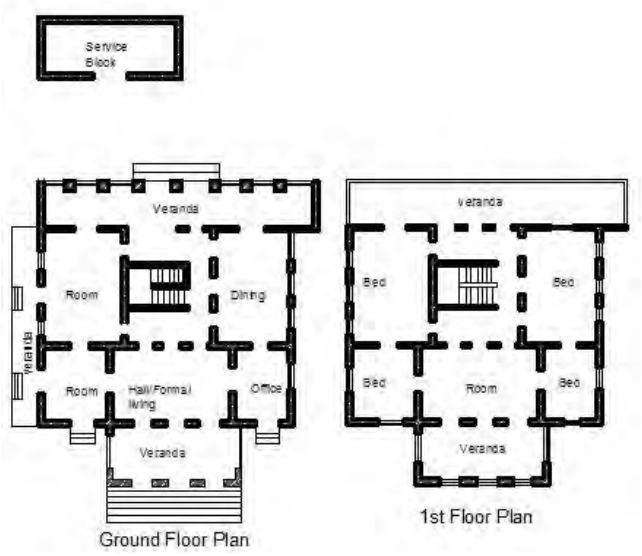


Fig-3.7: Extroverted Composite Bungalow,
Source: Khan, 1999

3.5.2.1 Composite Type:

The pattern of composite extroverted houses (Fig-3.7) has been adopted from the colonial bungalows with certain modification. It represents a free standing, outward looking courtyard less house which has detached service functions in its backyard of a large compound.

The main house is one or two storey having spacious rooms connected to a central hall room in the ground floor or to a spacious veranda throughout the building. The rooms of the first floor are all generally opens to a similar veranda. The service is detached from the main house. The distinct zoning of class difference between the served and servant is clear in this type of house form.

3.5.2.2 Consolidated Type:

Distinctiveness of consolidated type (Fig-3.8) is the integration of the living and service part into a single mass. In earlier version of consolidated type design shows apparent efforts to maintain the socio-cultural distinctions between classes and distance relations associated with different

domestic spaces and functions like served and services, functional and living spaces, private and public spaces etc. Such consideration lids to a general typology where service part with toilet, kitchen, store and servants living became a separate wing attached to the main building block. In some large houses, these two wings could operate independently. This arrangement inevitably followed either L or U shaped plan and became a popular among the urban elites of the region. Nevertheless, the house became separated into three distinct zones-public, private and service (Haque, 1997:35-36).

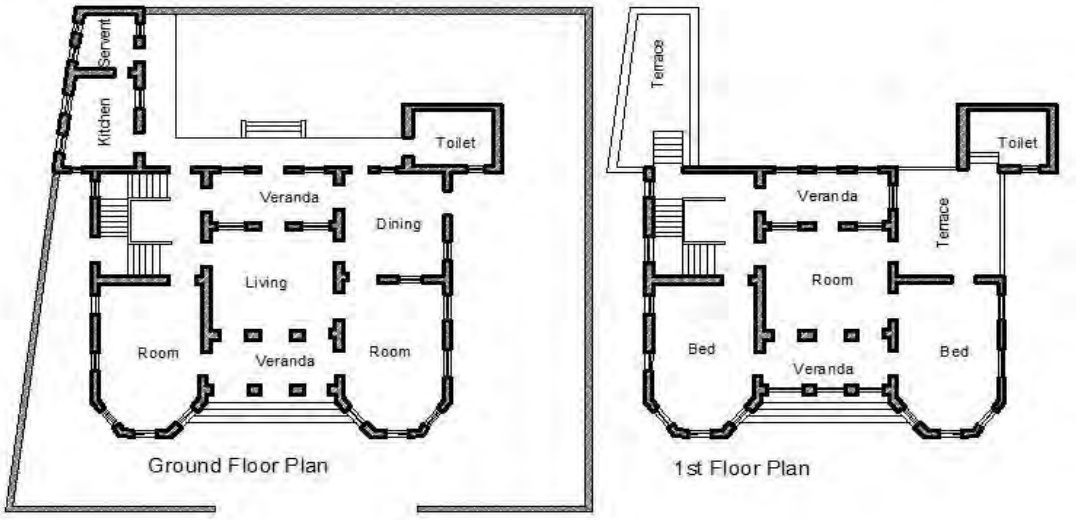


Fig-3.8: Consolidated Bungalow, Source: Khan, 1999

Beside these two basic types, there were another typology has been popularized among the native elites in colonial period. Those are the combination of introverted and extroverted typology in Zamindar houses or the large houses of the urban elites (Reza,2008:25).

3.5.3 Zamindar Houses:

The final product of the urban elites is a combination of both introverted and extroverted house form in the planning layout of their residence. Most of the building compounds of Zamindars are of this category. This type of houses reflects our traditional rural house form in a grand scale. There is always an outhouse in this type of buildings which were outward looking and sometimes detached from the main building block connected by colonnade verandas or corridors. This was the public zone of the house which was strict male zone. There were temples and other public functions in the outer part of these houses which were occasionally open for the ladies of the house. The main house blocks were generally arranged inwardly around one or more central courtyard circulated by a colonnade veranda in every floor. The privacy of this part was maintained by its inward looking introverted type. The service block was

always detached from the residential block. This type of houses kept all the traditional values along with the colonial modernity of the society. (Reza, 2008).

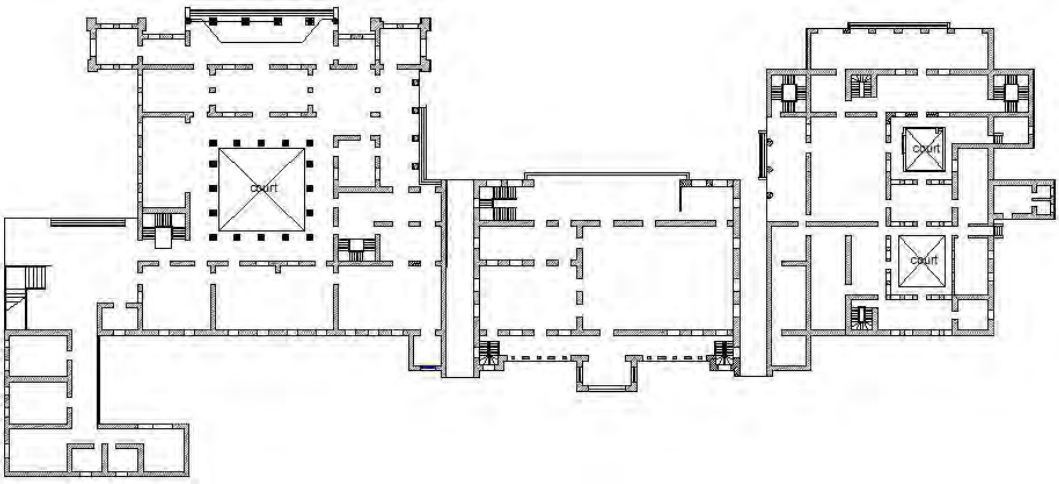


Fig-3.9: Zamindar Houses, The Compound Plan of Ruplal House
Source: Architectural Conservation. Asiatic Societv. 1996

3.6 Conclusion:

From above literature review it is seen that, in indigenous pattern of houses, the courtyard integrated the spaces within the buildings. On the other hand, the colonial rulers avoided this court to make a perfect segregation between served and service. The street front houses of Panam are apparently seems to be compact in nature. But it remained unknown how similar or dissimilar the house forms of Panam to the house forms of Dhaka. The arrangement of buildings on both side of a central street; such a plot division giving the road a frontage; the deep interior etc. are found in Panam which is very common in the commercial zones of Dhaka where commercial and residential purposes had been served together within the building (Fig-3.10, & 3.11). The physical arrangement of the buildings of Panam shows that, the layout pattern of the buildings of Panam have similarity with the layout pattern of the commercial part of Dhaka (Fig-3.12). All the buildings of Panam are extensively open towards the street and welcome the visitors with a highly ornamented street front façade.

Consequently, it is important to examine the plans of the buildings in Panam in comparison to prevailing type. Physical and spatial differences and similarities needs to be identified to determine the genotypes of the house forms of Panam. Further scientific analysis is needed to testify spatial and formal zoning of this front elevation. The indigenous pattern of houses in Dhaka occupied by the professionals, craftsmen and same ethnic groups, who had conducted

business from their residents, are found having similar character in settlement pattern as Panam. These house forms are, hence, to be examined to find out whether they are also symmetric to the houses of Panam buildings. Therefore the houses of Panam are needed to analyze both physically and syntactically to find out the spatial and morphological characteristics of these buildings in comparison to the residential house forms of Dhaka.

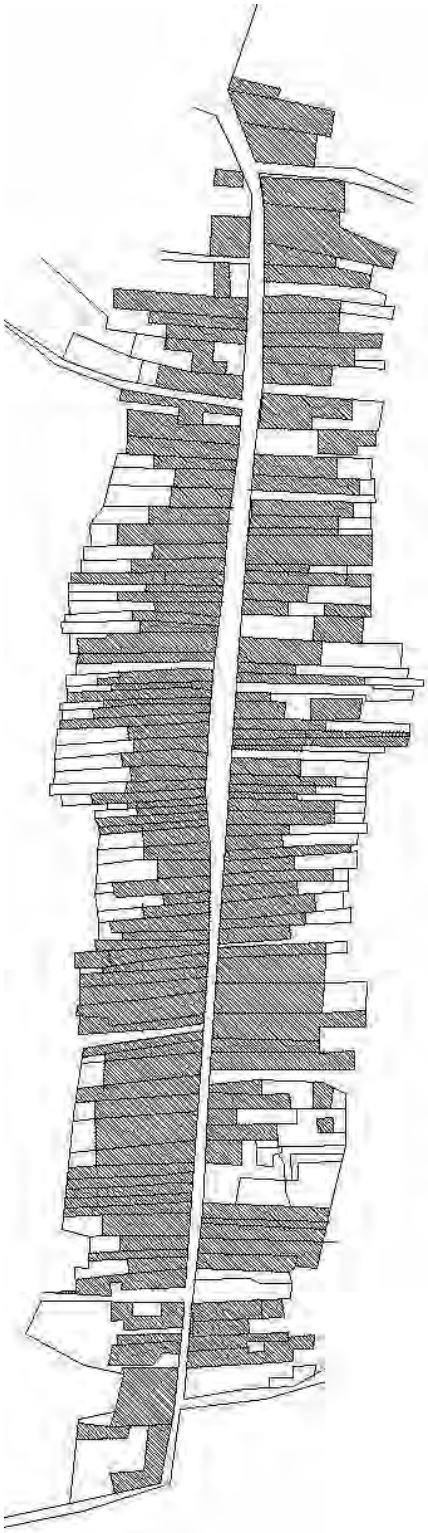


Fig-3.10: Settlement Pattern of Shankhari Bazar, a Commercial Street of Dhaka, Source: Nilufar, 1997

Fig-3.11: Settlement Pattern of Tanti Bazar, a Commercial Street of Dhaka Source: Khan, 2013

Fig-3.12: Settlement Pattern of Panam, Source: Mouza map, 2012

Chapter 04

House Form of Panam Nagar

4.1 Introduction:

Architecture as a vehicle of personal gratification appeared during the colonial rule by the emerging merchant class. In Panam, the Hindu merchants locally known as Shahas and Poddars were the main contributors of the secular buildings of Panam Nagar in colonial period (18th to 19th century).

4.2 Settlement Pattern of Panam and Around:

The buildings in and around Panam followed two distinct patterns in respect of location and layout. In pattern one; the building occupied the central position in a large compound surrounded by land developed with ponds, trees and gardens. These houses were identified as compound house, number of which is very little and situated in a close distance from Panam. The other pattern, inside Panam Nagar, is urban in nature in which large and small buildings were lined up in a row along a road having considerably large backyards with ponds, wells and trees(Hussain, 1997:105). This pattern may be referred as Street Front Houses. However, this thesis will concentrate on the street front houses of Panam Nagar as Panam Nagar has a large assemble of secular building which is not found anywhere in Dhaka region.

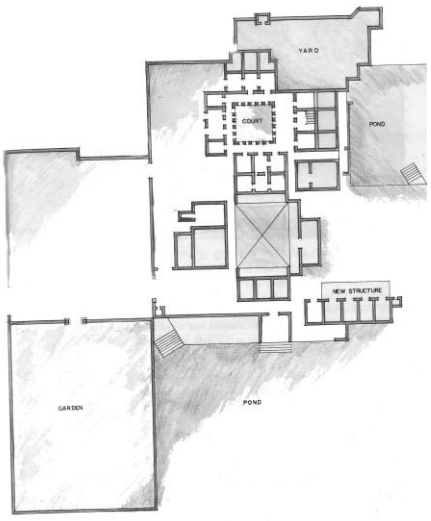


Fig-4.1: Compound House Plan near Panam

4.3 Physical Organization:

Pattern of physical organization as indicated by the C.S. Map of Mouza Panam Dulalpur and Thana Baidder Bazar show extremely elongated plot division with narrow street frontage.The building facades follow the alignment of the road. While the buildings are placed at one extreme end of the plot on the road front, the toilets are placed on the other extreme end on the water front. Water of the river and the moat was used for sanitation purpose (Hussain, 1997:116). Four large ponds, North-South oriented, exist in Panam. All are located at the southern part of the settlement. The

ponds are placed almost at regular interval from one another. Two on them are connected directly to the moat in the south and the other two are independent in nature. The pond probably served the purpose of bathing. Two adjoining single roomed buildings are identified beside one of the ponds which are speculated as changing rooms (Hussain, 1997:117). A great number of paved 'ghat' to the surrounding cannels has been found in the physical layout of Panam. A shared use of backyard facility among the adjoining houses can be observed from the layout of pond, 'ghat' and well of Panam city ((Hussain, 2007:383, Kabir, et, al, 2010).

Fig: 4.2-Street View of Panam (West)

All these houses of Panam Nagar have the character of urban Street Front Houses. These Street Front Houses were placed with little or no set back from the road in a row which refers to their commercial interface which is found in the literature review (Hussain,1996: 24). Buildings represent considerable variety in size, ornamentation and organization of spaces.

Fig-4.3: Street View of Panam (Middle)

Panam is the most prominent early example of Street Front Houses in a non-urban setting. Panam Nagar is a unique township in Sonargaon stretched in a single road 5 m. wide on the average and 600 m. in length (Hussain,1997:113). The road

Fig-4.4: Street View of Panam(East)

extends from west to east, slightly turns towards north-east after it is half-way through. The road moves with delicate curves that offer changing vistas of the street facade. The road is linked with the Dulalpur road by a humped bridge at the west and Thana road on the east. The area is isolated by 'Pankhiraj' cannel running almost parallel to the road on the north and a moat separates the land from west and south. Forty eight houses are still standing in dilapidated and disused condition in the settlement. The area is densely built with single to three storied attached and detached houses of varying types and sizes (Hussain,1997:113). Majority of the houses are two storied and large houses are partially three storied.

The comparatively large and decorative houses are situated in the western end to the middle of Panam Street. In the eastern end of the street, the buildings are less dense, very small having three to four rooms and very simple treatment of elevation unlike the ornamented buildings of the western part of the city.

4.4 Building Layout:

Most of the buildings of Panam are attached to each other by sharing the same wall as well as the backyard. These buildings are elongated in the north-south direction along the plot. The synchronized elevation treatment in the street front façade indicates that, each owner presented a facade to Panam Street in order to enrich the visual symphony of the ensemble, where each building keeping its own identity blended with the harmonious whole. The elevation of the buildings followed a pattern language of opening treatment, use of material and ornamentation by which a unity had been achieved.

The buildings are mostly rectangular in shape. The depth is greater than frontage in most houses. The width of the building varies widely. Smallest being building no. 4 which is only 3.5 m. wide. The largest are building no. 3 and 43, both are around 15 m. wide. Average width of the building varies between 6 m. to 9 m. Raised plinth and verandah created the transition space between the house and the street (Hussain, 1997:119).

In physical and literature survey, different types of spatial organization are found in the houses of Panam Nagar. Some houses have enclosed court yard in the middle of the house surrounded by the transitional spaces; some houses have decorated double heighted hall in the middle instead of courtyard; some other doesn't have any of these properties. These houses have series of rooms connected by single or multiple corridors. Single roomed and compartmental buildings (Shaikh & Rahman, 2006:288) are also seen in this area which were assumed to be warehouses and temple (Kabir, *et al*, 2010).

4.5 Classification of Buildings on Physical Properties:

The buildings of Panam has been reffered as introverted type of buildings by Asiatic Society of Bangladesh(Hussain, 1997:105). From physical analysis and classification made by Asiatic Society, buildings of Panam nagar can be broadly divided into three groups according to their plan layout. They are-

i. Double Heighted Hall type Buildings

ii. Courtyard type Building

iii. Consolidated type Building

Another typology is found in physical survay which contains both a double heighted hall and enclosed courtyard. Only two buildings(building no-3 and 43)fall under this category.

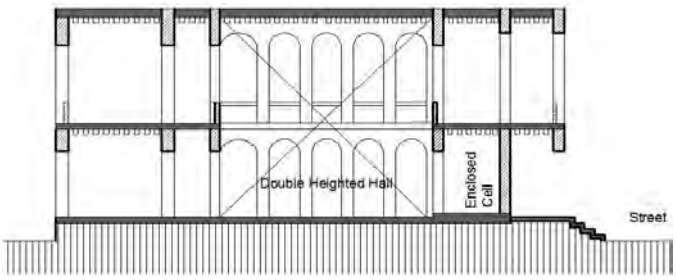


Fig-4.5: Conceptual Section of Double Heighted hall type Building

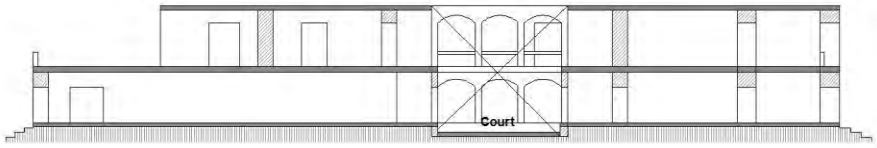


Fig-4.6: Conceptual Section of Courtyard type of Building

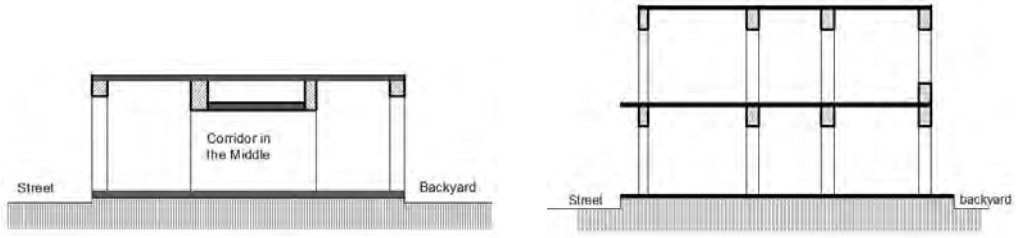


Fig-4.7: Conceptual Section of Consolidated Type Buildings

Fig-4.8

4.5.1 Double Heighted Hall type Building:

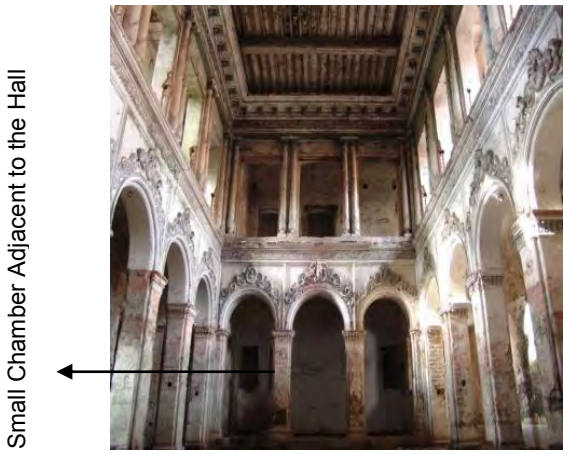


Fig-4.9 View of Double Heighted Hall
Source: Field Survey, 2012

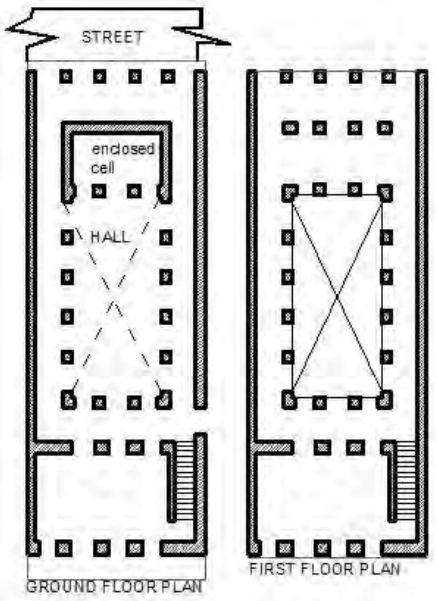


Fig-4.10: Plan of Building no-9,
Source: Archeology Dept. Bangladesh

The double heighted hall didn't evolve from any British inspiration; rather they are transformation of courtyard in Indian practice of organization of rooms around a central courtyard, the court's place take in these houses by the large central hall (Chattopadhyay, 2007: 175).

The design of these hall type generated with a double height covered hall room as the main focus of the layout plan. However, the central hall does not mean the physical center of the plan, but the conceptual center from which the rest of the plan is originated (Hussain, 1997). In Panam there are five buildings (1, 3, 9, 39 and 43) of this type. Among them Building no 3 have features, a double heighted hall and an enclosed court in the middle part of the building. Therefore Building no 3 will be described separately for its special properties.

Building no 1, 9 39 and 43 have double heighted hall in the ground floor surrounded by continuous colonnade corridors in both ground and first floor. All these halls were richly ornamented with different materials from terrazzo ornamentation to plaster detail. A small chamber is seen adjacent to the hall in all cases. This small chamber is always highly ornamented and only accessible from the double heighted hall. In the prevailing types of residential building of Dhaka, the presence of such ornamented double heighted halls was not found anywhere.

Based on the survey by the department of archeology and field survey, this chapter will give a

complete physical description of building no-1, 9 and 39 and a partial description of building no-43.

Building no-1: Building no 1 is the first building placed in the southern part of the western end of Panam Nagar. The building has a double heighted hall which is placed in the physical center of the building surrounded by continuous colonnade corridors in three sides.

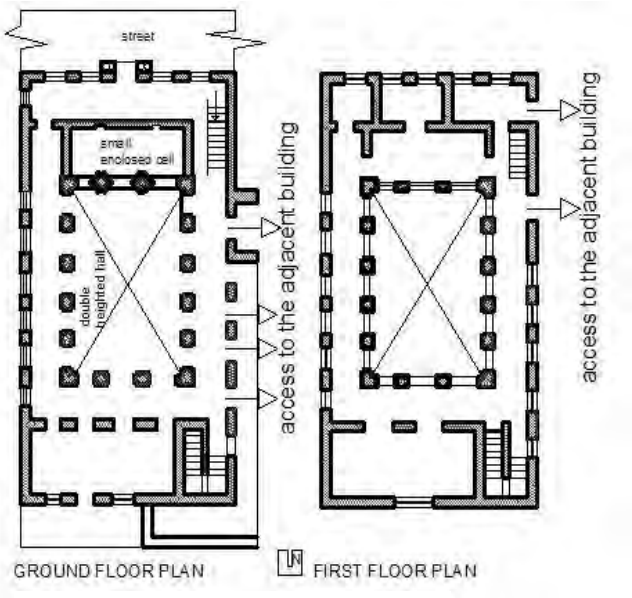


Fig-4.11: Plan of Building no-1

Fig-4.12: Double Heighted Hall of Building no-1
Source: Field Survey, 2013

A small chamber is seen in the northern end of the hall with highly ornamented colonnade opening only towards the hall. This small chamber is one step high from the floor level of the hall which made it look like a stage or raised platform.

Another significant characteristic of this building is that, the building is deliberately connected to the adjacent building internally in both ground and 1st floor (Fig-4.11). All the openings in the eastern façade of the hall in the ground floor lead to the adjacent building (Building no-2).

The 1st floor also contains continuous colonnade corridors flanked over the hall in all four sides of the hall. From this corridor, the hall is clearly visible. These corridors are equally decorated as those of ground floor. But the other parts of the building are much simple and without any decoration. From this survey it is found that the hall and the small chamber adjacent to the hall got the highest emphasis in terms of ornamentation as well as the spatial organization.

Building no-9: Building no 9 (Fig-4.10) is a linear rectangular shaped building which has the rectangular hall in its physical center. The central double heighted hall is surrounded by continuous colonnade corridors in all three sides. The building as well as the hall is north south

oriented and symmetric in nature. The small chamber adjacent to the hall is in the northern arm of the hall which created a visual buffer for the hall from the street as the front room was extensively open towards the street. This front room leads to the continuous corridor that enfolds the hall, from two sides of the small chamber. Almost three fourth of the building is covered with this double heighted hall and its adjacent corridors. The rest of the building contains a room in the rear part in both ground and first floor. In ground floor this rear room is connected to the shared backyard of the neighbouring buildings.

Building no-39

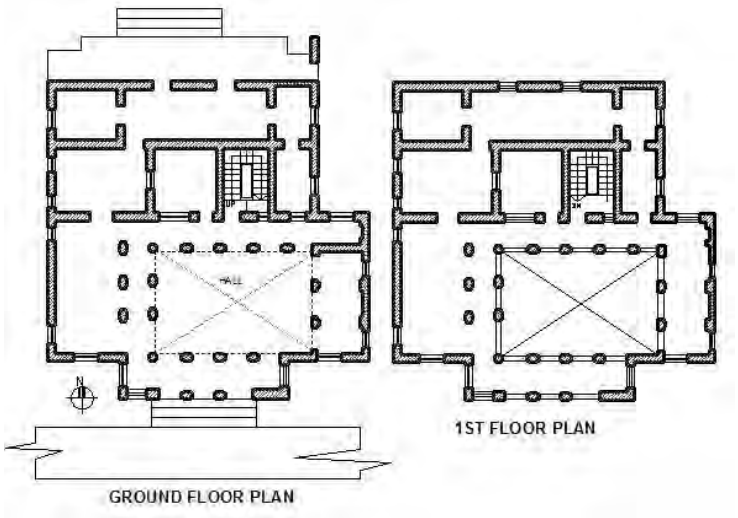


Fig-4.13: Building no-39, Source: Eshika, 2005

Building no 39(Fig-4.13) has a double heighted hall in the frontal part of the building in an off centric position. The hall of this building directly approached fron the street without any veranda or preparetion space. The frontal part of the building consists of the double heighted hall along with the corridors and the rear part contains interconnected small rooms.The hall is highly ornamented. The small chamber which is adjacent to the hall and only accessable from the hall is found in the eastern façade of the building. The rear most room is connected to the backyard which was once demarketed by walled boundary.

4.5.1.1- General Characteristics of the Double Heighted Hall type Buildings:

From the case studies some common characteristics of central hall type buildings are identified. Such as-

- Though these buildings have halls but their location within the plan is not similar, even Sizes and orientation also varied one from another. In Building no 1and 9 the hall is rectangular

in shape with north-south orientation but in Building no 39 it is almost a square with larger arm in east-west direction.

- Building no 1 and 9 has simple symmetric Plan with the hall in the physical center of the building. But the rest of the buildings had complex layouts with a large number of rooms apart from the hall. More over the hall is not always in the physical center of the configuration.

- The halls were located mostly in the front side of the house and were surrounded by arcaded corridors. These halls were very easily accessible from the street through small transitional spaces like corridor or veranda.

- The hall synchronizes the spaces of the interior in these buildings. In Building no 1 and 9 all the rooms are arranged in respect to the double heighted hall. In Building no 39 and 43 the necessity of the halls location in the frontal part of the building arranged its other functions in the rear part. This particular organization of the hall drives to the conjecture that it was probably such a place that incorporated the outsiders within the building.

- In all cases, the Halls give direct access to a small chamber at ground level, which seems to be a chapel/temple, because of its ornamentation, orientation and accessibility from the hall. In Hindu temples, the sacred place where the god or goddess are placed, are always been isolated from the other spaces. These isolated spaces are always open to such a space which is most of the time a less bounded space and where a mass gathering can be possible. The hall and its adjacent chamber have these characteristics. As there is no evidence of this small chamber being a temple, this thesis assumes it as a temple and will try to find out the generic character of these spaces.

- Except the above two characters (Hall with surrounding arcaded corridors and adjacent chapel) these four buildings had no similarity among them. So there was a possibility that the Halls served the same functions but the buildings as a whole could not be ascribed similar in function.

- One important finding is that the Hall Type buildings rarely had enclosed corridors to connect rooms. Rather, most spaces were accessed from arcaded open corridors which surround the halls. Halls thus acted as central position of the houses and most circulation pivoted around the Halls, whether they were in the physical center or not. Besides, ancillary Courts are found along with Halls in few cases. Location of those courts is in rear parts giving an idea of service yards, although reasonable large in some case.

4.5.2 Courtyard type Buildings:

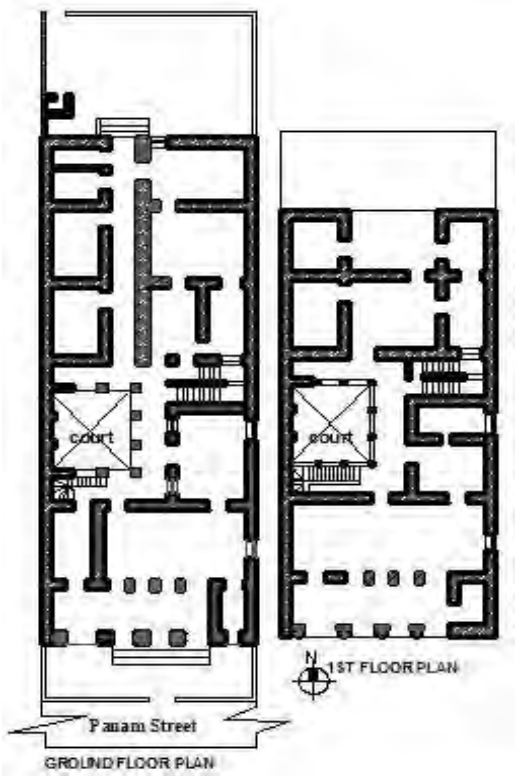


Fig-4.14: Plan of Building no-33,
Source: Department of Archeology

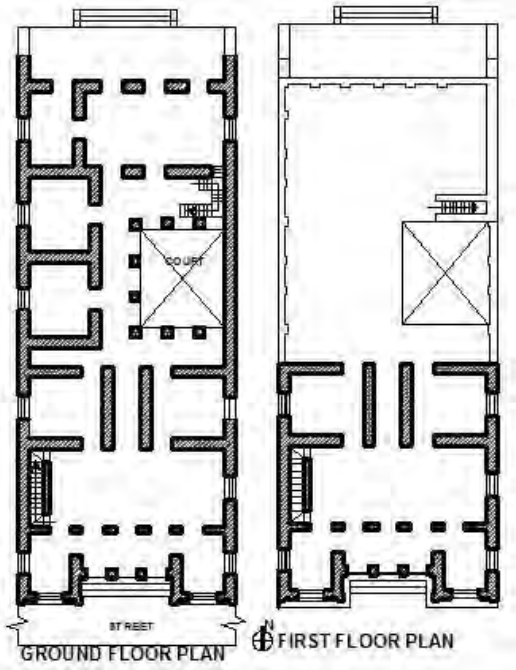


Fig-4.15: Plan of Building no-34,
Source: Eshika, 2005

Courtyard is a very common part in the traditional living of Bengal. This type of buildings may derived from traditional rural house form centering on a courtyard, but in respect to Panam, it is quiet hard to put a conclusion to the point. In this case also the central courtyard does not refer to the physical centre of the house; it means that the building activities and layout are arranged around the courtyard. The courtyards are essentially enclosed, paved and open to sky. The inner house overlooks into the courtyard. In general the courtyards are surrounded by verandah on three sides having arched openings and one end of the court is lined with the boundary wall. The surrounding verandah acts as corridor and gives access to individual rooms adjacent to the courtyard and also to the inner part of the building. The enclosing walls of the courtyard are extensively delineated with arched openings and pilasters but are less ornamented than the double heighted halls though the circulation pattern around the court and the hall are almost similar.

Asiatic society has identified four buildings as central courtyard type building, these are, Building no-5, 32, 33, and 34. Among these buildings, Building no 33 and 34 has been completely surveyed by the department of archeology and has been analyzed in this category.

Building no-33: Building no 33(Fig-4.14) has a small enclosed court in the middle part of the building. This court measures 3.05mX4m. It is surrounded by colonnade veranda in three sides except the eastern side which is covered by a high wall. This veranda connects the front and the rear part of the building. There are two staircase in this building. Both are placed in the middle part and connected to the internal veranda. In the rear part there are a number of rooms which are connected through a small corridor. Most of the rooms are interconneced with its adjacent room. There is a large enclosed backyard seen in this complex which has an access from the rear end towards the pankhiraj canal.

Building no-34: It is a two storied building(Fig-4.15) and have a small enclosed courtyard. In the western part of the court is a high wall and the other three sides are enclosed by a continues collonade veranda. in this building the frontal part consists more rooms than the rear part unlike building no-33. There is a small corridor in this part connecting the front room to the internal veranda. The middle part have the court and two adjacent rooms which are open to the colonnade veranda around the court. The rear part has two unequal rooms and a staircase. Again the front and rear part of the building are connected to eachother by the colonnade veranda around the court.The upper floor is comparetively small in size. Its in the frontal part of the building. The spatial layout is same as ground floor. The rest of the first floor is left as terrace. There are beautiful colonnade veranda in both ground and first floor.

4.5.2.1 General Characteristics of Courtyard Type Buildings:

- One important finding is that in the Courtyard Type buildings some rooms/spaces in ground floor were accessed from arcaded corridors which surround the courts.

- These buildings sometimes had ‘enclosed corridors’ to connect rooms in some other parts of the buildings.

- However, the position of courts is not physically centralized like many Halls of previous group. Rather they are off-centered and may be called as ‘internal courtyards’ acting as light wells.

- The internal circulation are distributed around these courtyard. the front and rear part of the building are connected to each other through the circulation verandas around the court.

- In addition to the internal courtyards, some cases had rear courtyards indicative as a service yard, although were reasonably big in size.

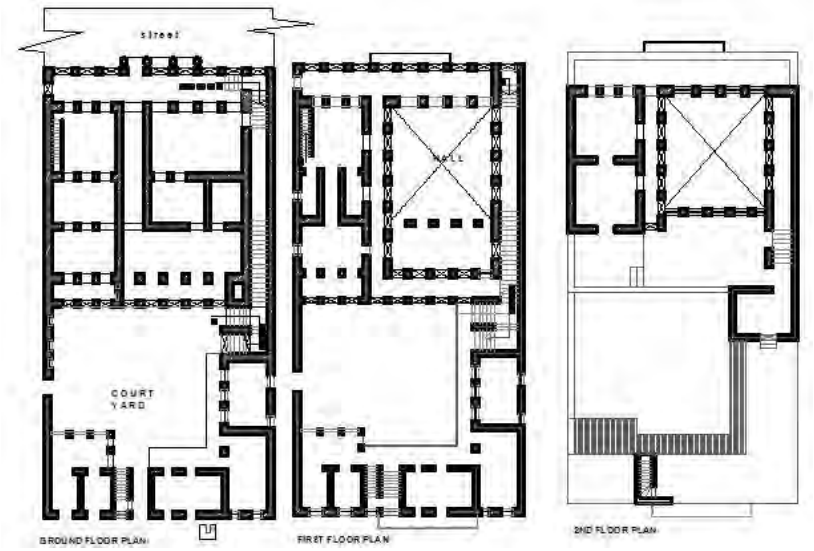


Fig-4.16: Building no-3:
Source: Dpt. Of Archeology and Field Survey

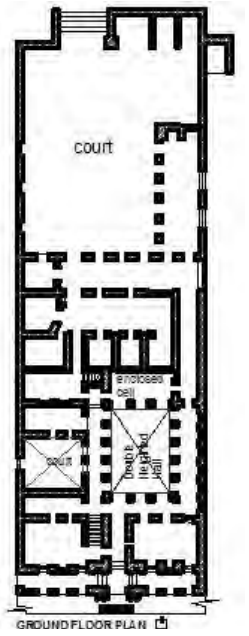


Fig-4.17:Building no-43
Source: Dept. of Archeology

Again, there are such examples which have both double heighted hall and an enclosed courtyard. such as Building no-3 and 43(Fig-4.16, 4.17). Building no-3 and 43 are both among the largest buildings of Panam Nagar.

Between these two buildings Building no-3 (Fig-4.16) is the most atypical case. This building is partially three storied with both a double heighted hall and an enclosed court yard, which is not common in the houses of Panam Nagar. The courtyard divided the house in two parts. The frontal part was larger in size containing the main building block which has the double heighted hall in its first and second floor and the rear part is comparatively small carrying a series of adjacent rooms connected to a continuous veranda in both ground and first floor. Physical survey shows that, the hall is highly ornamented and surrounded by colonnade corridors in both first and second floor. Though the hall is in the first floor, still it is situated in such a place where anybody could access easily from Panam Street through the staircase which ends in the front veranda adjacent to the street. This stair was extensively decorated with rot iron and wood curving. The other staircases were

Fig-4.18: Partial View of Street Front Façade of Building no-3

simple and without any decorations. The frontal part of the ground floor has been divided into two asymmetric blocks by a corridor connected the frontal veranda to the internal veranda adjacent to the inner court. Physical survey shows that, these two parts could operate independently.

Building no-43 (Fig-4.17) is known as 'Nach Ghar'(hall of dance) among the local people. It is also a three storied building. This building has a double heighted hall in the ground floor which is surrounded by continious colonnade corridors in both ground and first floor . This hall is directly connected to the Panam Street by a linear corridor between two front rooms. A small chamber is found adjacent to the hall which is accessable from the hall only.

The rear part of the building is compact in nature having large number of small rooms with minimum or no openings except their entrences. A court is seen in the nothern part of the house which leads towards the Pankhiraj canal with a flight of stairs. The evedence of toilet facilities is found in the northern end of the complex over pankhiraj cannel. There is another small court in the western part of the house which could be approached from outside and leads directly towards the hall. The department of archoelogy has only drawn the ground floor plan of this building. As it is not accessable due to its detorating condition, further study of this building was not possible.

4.5.3 Consolidated Type:

These buildings don't have the property of the prevailing consolidated type of houses of Dhaka (Chapter-3). This typology refers by Asiatic Society of Bangladesh to those houses of Panam who don't have any inner court or hall. Majority of houses in Panam belong to this typology. The consolidated types are designed with either an entrance portal or a verandah or a high plinth as transition space from street to inner house. The physical survey and cartographic survey shows that, the organization of inner cells and rooms are much similar in most of the houses. Corridors played very important role in connecting the different parts of the house. The spaces within these buildings are arranged in such a way that, without these connecting corridors one cannot go from the frontal part to the rear part of the buildings in many cases. Therefore, this thesis has been distributed the Consolidated type of houses into three groups based on the arrangement of these corridors to have a better understanding of the spatial arrangement of these buildings. They are-

i. Single Corridor Buildings Multiple Corridor Buildings

ii. Buildings without Corridors

Among all the consolidated types, this thesis will analyze fourteen buildings those have a complete plan. For proper analysis, these fourteen buildings have been distributed among the above three groups.

4.5.3.1 Single Corridor Buildings: There are some buildings in Panam in which internal spaces are connected, especially in the ground floor, with a linear corridor. In most cases the frontal part of the ground floor is directly connected to the rear part only with this corridor. Four cases have been taken under this sub-class. They are:

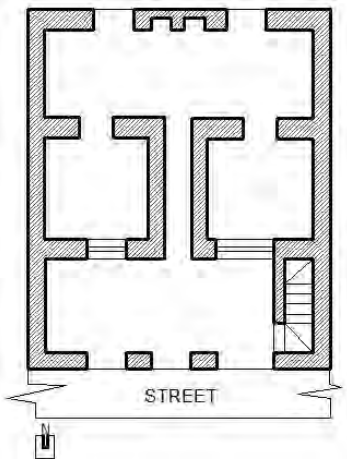


Fig-4.19: Plan of Building no-23, Source: Dept. of Archeology

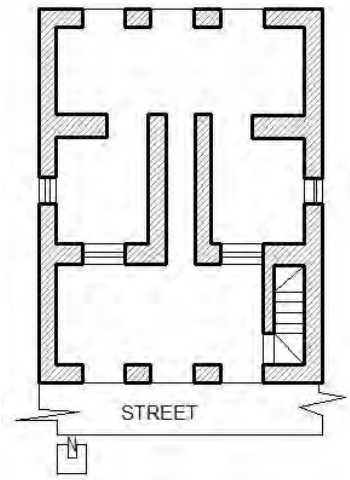


Fig-4.20: Plan of Building no-24, Source: Dept. of Archeology

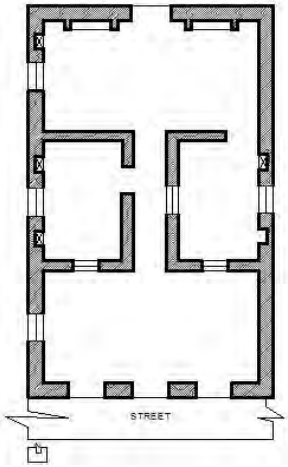


Fig-4.21: Plan of Building no-25, Source: Dept. of Archeology

Building no-23 and 24: Both 23 (Fig-4.19) and 24(Fig-4.20) no buildings are one storied small building having similar physical layout. There are two small enclosed rooms in the middle part of the building which are only open in the rear room. A small corridor in between these two rooms in the middle part connects the frontal and the rear part of the building. The front room and the rear room are same in size and have a length of the buildings total length.

Building no-25: Building no-25(Fig-4.21) is a small single storied building with two small rooms in the middle measuring 2mx3m. The spatial organization of the building remained same as Building no 23 and 24. Only exception is that there is no stair case in this building. There is a linear corridor in the middle of the layout connecting the larger rooms of frontal and rear part. One of the central rooms opens to the corridor and other is open to the room of back side.

Building no-45: Building no-45(Fig-4.22) is a single stored building. Except the front room adjecent to the street the rest of the rooms are small in size.The mean measurement of these rooms is 1.83 m X 2.14m. the front room is linear lerctangular in shape. All the rooms are connected to the front room. one part of the building has a small linear corridor which connects

the front room and a part of the rear block of the building. the rear rooms are open to the outdoor in the back of the building which is shared among the adjacent buildings.

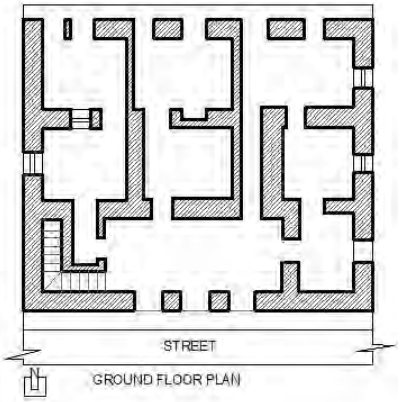


Fig: 4.22-Plan of Building no-45, Source: Dept. of Archeology

4.5.3.2 Multiple Corridor Buildings:

Comparatively large buildings of Panam have more than one corridor where the frontal rooms are connected to the rear part with multiple corridors. In some cases these corridors are open to all the rooms adjacent to it, especially in the first floor. Most of the consolidated type of buildings of Panam has multiple corridors. Among them available cases has been studied in this thesis.

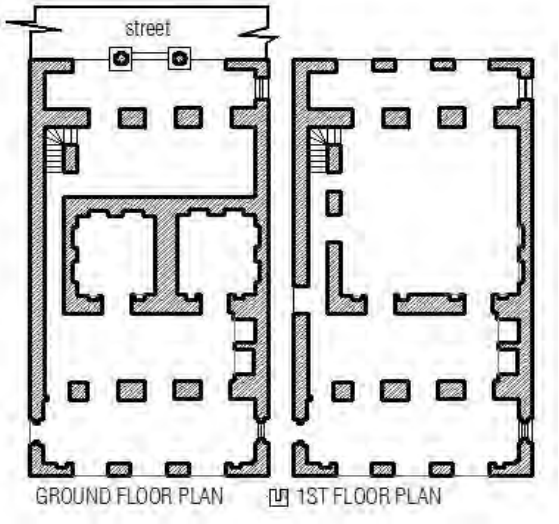


Fig-4.23: Plan of Building no-2, Source-Dept. of Archeology

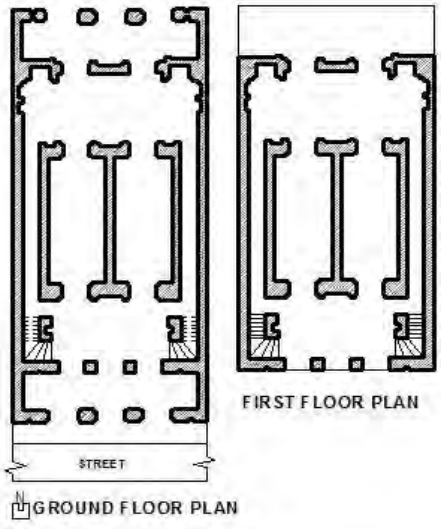


Fig-4.24: Plan of Building no-27, Source-Dept. of Archeology

Building no-2: It is a two storied building (Fig-4.23) which is connected to one of the central hall type of buildings (Building no-1) internally. Small enclosed cell placed in the central part of the building segregated the frontal part from the rear part. These cells can only be accessed from their adjacent room in the rear part of the building. The front part and the rear part of the building are connected by a very linear and dark corridor through which only one person can pass at a time. There is another such linear corridor in the first floor with more openings. The first floor rooms are also interconnected.

Building no-27: Building no-27 (Fig-4.24) is a two storied building. Both the floors have the similar layout. Two very linear dark corridors connected the frontal and rear part of the building in two sides. In between these two corridors there are two small linear rooms which are also connected to both the front and the rear part of the building. Such a small room with the circulation in its central location is very unsuitable for habitation. Therefore these rooms were probably non-habitable rooms. The rear room similar to the front room is a larger rectangular room opened towards the rear veranda. This veranda lids to the backyard which was shared by adjacent buildings.

Buildin no-37: Building no-37 is a single storied building(Fig-4.25) with two linear corridors.One is in the western wall and the other is in the central part of the building. The central corridor divided the building into two unequal parts. In the eastern part there are four rooms placed one after another gradually and connected both within themselves and with the adjacent corridor. The western part has two small enclosed room open in the rear part of the building. Both the corridor ends in that rear room with which the central rooms are connected. The central corridor is the only link between this two part of the building. the front and the rear room connecting the outdoor are larger in size and other rooms are more like a cubicle.

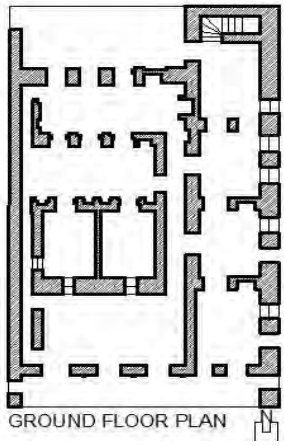


Fig-4.25: Plan of Building no-37
Source: Dept. of Archeology.

Building no-38: Building no 38(Fig-4.26) is a two storied building. The department of archeology had drawn only ground floor plan of this building. It has three small rooms in its central part all of which can be approached from both the frontal and the rear part of the building. Three linear corridors are placed in between these rooms which only connects the front and the rear rooms. The front part has colonnade veranda adjacent to the street and the rear part is directly open to the outdoor without any veranda.

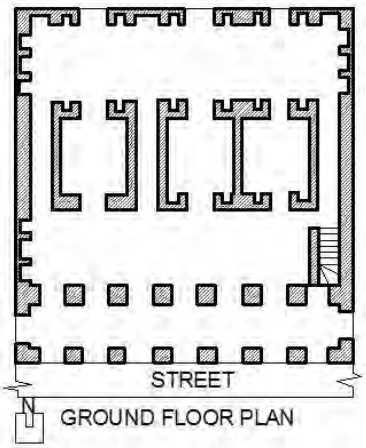


Fig-4.26: Plan of Building no-38
Source: Dept. of Archeology.

Building No-41: Building no-41 (Fig-4.27) is a two storied building. The ground floor is divided into two parts with a continuous wall. The two separated parts are connected from out side. A series of small rooms are seen in the ground floor of this building. In both parts rooms

are placed serially one after another and approached from a linear corridor. These corridors work as the main circulation spine of this building. In first floor there are three inter connected comparetively larger rooms placed one after another followed by two terraces in different level.

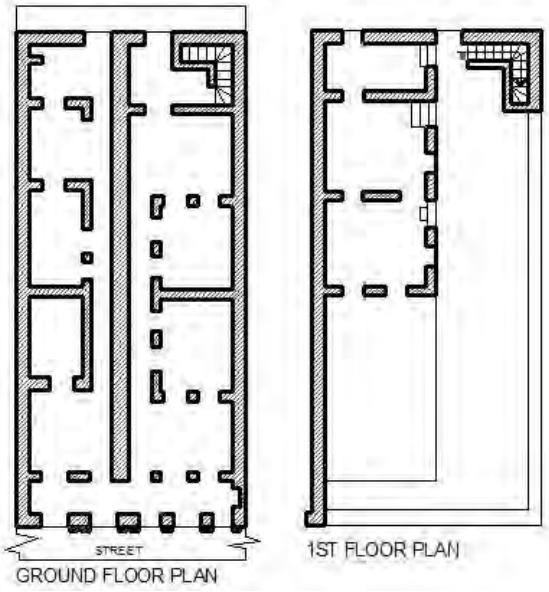


Fig-4.27: Plan of Building no 41
Source: Department of Archeology

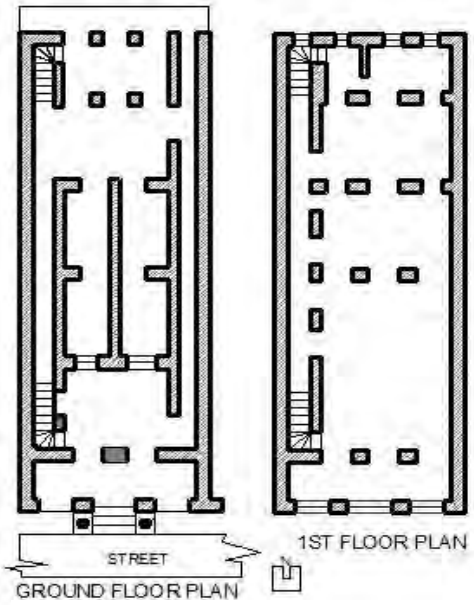


Fig-4.28: Plan of Building no-42
Source: Dept. of Archeology.

Building no-42: It is a two storied building that shared the same wall with building no 41(Fig-4.28). There are four small compartment in the center of the ground floor plan followed by two larger rooms in front and back part. Two staircases are seen in this building. One is from the fromtal part and the other is from the rear part. Two lenear corridors (which doesn't have any opening except the entry and exit)are seen in the eastern and western end of the building. These corridors connected the frontal room and the rear room. the central rooms are

accessable from the rear part of the building. In first floor, instead of small compartments there are 3 larger rooms connected to one another. A corridor has been run through the western facade from southern end to northern end which is accessable to all the rooms unlike the corridor of the ground floor. Both the staircases are lead to this corridor.

Building no-42A: It is a single storied building with the similar layout as building no 38. Only the difference is that, in this building, the central chambers are enclosed in all three sides and only open to the rear part of the building(Fig-4.29). there is a colonnade veranda in the front of the building which can be directly approached from Panam Street which is followed by the linear rectangular room with two stairs in two sides. Three linear corridors connects the front and the

rear part of the house.Three small chambers are seen the middle part which are open towards three rear rooms.

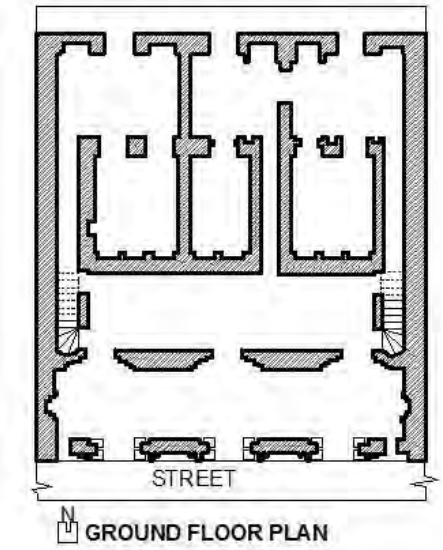


Fig-4.29: Plan of Building no-42A,
Source: Dept. of Archeology

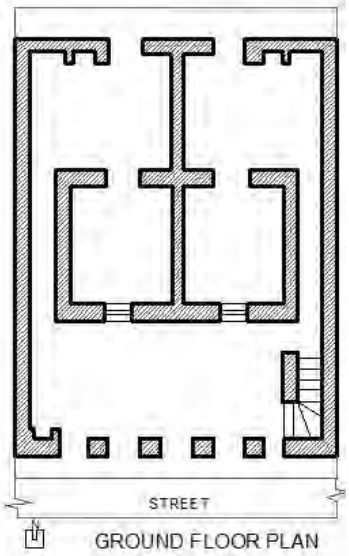


Fig-4.30 Plan,Building no-44,
Source: Dept. of Archeology

Building no-44: (Fig-4.30) is a two storied building. Only ground floor plan is available. Like most other buildings of Panam, this building also have small chambers in its center which opens towards the rear room. There are two linear corridor which connects the rooms of front and rear part of the building.

4.5.3.3 Buildings without Corridor:

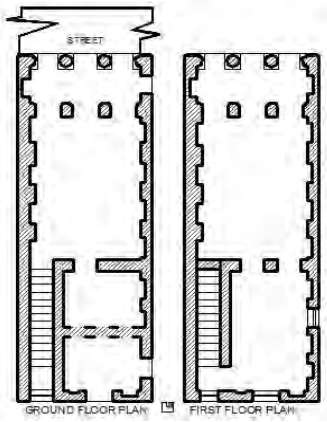


Fig-4.31: Plan of Building no-4,
Source: Dept. of Archeology

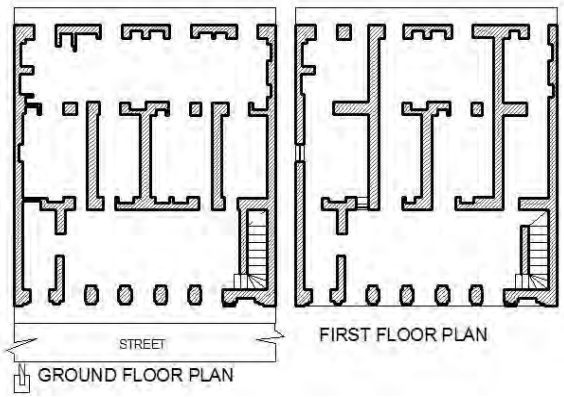


Fig-4.32: Plan of Building no-26,
Source: Dept. of Archeology.

In this type of buildings there are no separate circulation space like corridor. Rather rooms are set serially and connected to one another. A good number of cases are found in Panam houses which nether have any courtyard or hall nor any corridor. This type of houses are comparetively small in size. Only house no-26 is the exception. Which is one of the largest house of Panam and all the rooms are connected to one another ether way. Four cases has been taken for physical analysis under this group.

Building no-4: Building no-4(Fig-4.31) is the thinnest building in Panam Nagar. It is entered from the street through a colonnade veranda. Inter connected rooms are placed serially one after another. The room adjacent to the entry level is comparatively larger than the other two rooms measuring 5.2m in length. A single flight staircase connects the ground floor to the 1st floor from this room. 1st floor has two rooms one after another and finally ends in the colonnade veranda projected to the street below.

Building no-26: Building no-26(Fig-4.32) is a two storied wide building of Panam. The front and the rear rooms are the largest in the building. The rest of the rooms are small chambers measuring 1.22mX2.74m. All the rooms are connected to the front and rear rooms. Like other buildings of Panam, backyard was shared by adjacent buildings.

Building no-31:

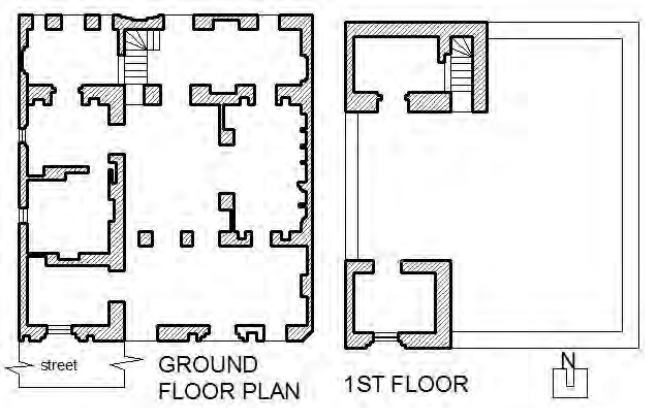


Fig-4.33: Building no-31,
Source: Dept. of Archeology.

The physical layout of building no-31(Fig-4.33) is not similar to the other buildings described in this chapter. This building has different arrangement of rooms within the building. A comparetively large room in the center connects most of the other rooms in this buildings which is not found in any other cases of consolidated type of buildings of Panam. small chambers are arranged in a row as it is seen in building no 41(Fig-4.27)

4.5.3.4 General Characteristics of Consolidated Type Buildings:

In all the sub-groups of consolidated type of buildings the arrangement of the spaces are more or less simmetric to each other. Such as-

- The front and the rear part of the buildings have the largest rooms almost as the width of the buildings. These rooms are linear rectangle in shape and can be directly approached from outdoor. These rooms are connected to each other through corridors.

Fig-4.34: Linear Corridor in Building no-5
Source: Eshika, 2005

- The corridors are very linear (Fig-4.34) and without any opening in ground floor. They are all north south oriented and only connects the front and the rear rooms of the buildings. Sometimes these corridors also opens in intermediate rooms. These corridors are so linear that it is impossible for two people to pass through them together. This indecates that, probably these corridors were the service space that connected the formal and informal part of the building.

- As the street can be termed as the formal axis of Panam city, therefore the front room can be identified as the formal part of the building. The extensive opening of these rooms in all buildings towards the street indicates that these rooms have a inviting character. The organization of the large rooms in the front, their extensive openings towards the street all indicate the commercial interface of these buildings. Thererfore there is a strong possibility that these rooms were used for commercial purpose by incorporating the outsiders that means the byers.

- In almost every cases the front room has the vertical circulation that connects the firstfloor. This again show the absence of privacy in these buildings as the outermost formal room which is easily accessible for the outsiders are directly connected to the firstfloor of the building.

- Every building have small chambers in the middle part of the building which are ether enclosed in all three sides or open in northern and southern large rooms. These small rooms are so small in size that it is very unsuitable for habitation. Moreover, in most of the cases these rooms doesn't have proper ventilation inside them.

- The property line of these buildings are not significantly bounded. Rather all the consolidated type of buildings share the rear outdoor which was probably used as the backyard of these buildings. these sharing character is another uncommon character in the residential buildings of Dhaka where privacy is a very important factor.

4.6 General Discussion of the Building Layouts:

From above descriptions, some common physical properties have been found in these buildings of Panam. Such as Courtyard, Hall, Corridors, Frontal room, Rear room etc. These spaces played a significant role in the spatial organization as well as accessibility to the internal spaces of the buildings. Thus they help to determine the physical as well as the spatial character of these buildings. Therefore it can be said that these elements are organized based on access and connection of the spaces of these buildings. From the above analysis three types of spatial arrangement has been found. They are:

(i) Rooms around Internal Court/Hall surrounded by continuous colonnade corridors;

(ii) Rooms accessed by enclosed corridors

(iii) Rooms accessed through rooms

Physical survey shows that, the organization of spaces around the hall and the court are much similar. Being in the frontal part of the building and surrounded by continuous colonnade corridor connected to Panam street, in all cases, the hall is more accessible from Panam street and thus to the visitors, where the court and its surrounding continuous corridor is in the middle part of the building from where the street was not directly accessible. So it is comparatively less accessible from the street than the hall. In building no-1,9and 39 the hall is directly accessible from the front street by its adjacent continuous colonnade corridor. Though in building no 3 the hall is in the first floor of the building still can be approached directly from the street by a decorated cast iron staircase that connects the front veranda towards the street in the ground floor and the hall on the first floor.

Fig-4.35: Street Front Façade of Building no-33 & 34

Fig-4.36: View inside the Court

Some double heighted hall type buildings are ether connected internally to the adjacent building(Building no-1) or there are more controlled private space in the rear part of the

building (building no 39 and 43) which are not visible from the hall and cannot be directly approached from the street. These spaces are approached from Panam Street through a number of spaces overlooking the hall. Sometime this hall remained completely isolated from other spaces of the building (Building no-3. In building no 3 the double heighted hall can be separately accessed from the front street without interrupting the inhabitants).

Survey shows that in most of the cases the spatial arrangement and physical elements of the different parts of the courtyard and hall type houses (except the court hall and their adjacent corridors) are more alike the consolidated type of houses of Panam Nagar. The series of rooms, arrangement of corridors, enclosed small cells all these features are seen in consolidated type of houses. From the above plan analysis, it can be said that, a part of the 'double heighted hall type' and 'courtyard type houses' are similar to the consolidated houses of Panam Nagar which were in most of the cases placed in the rear part of the building.

The consolidated type houses have small chambers in the center of the physical layout. This central part creates visual and physical segregation between the rear part and the frontal part of the building. The frontal part of the building has larger room which is directly connected to the street. In consolidated types of buildings, other than those rooms which are physically or visually connected to the exterior, none of the rooms have proper natural lighting or ventilation. Moreover, in most of the cases, these rooms in the middle part of the building are very small in size and have only one opening towards the larger room adjacent to them in the rear part of the building. That large room was connected to the front part by linear dark corridors in the central part. The frontal part was extensively open towards the street with at-least three entrances. Sometimes there was a colonnade veranda acted as a semi-outdoor space to enhance indoor-outdoor relationship. Otherwise there were only plinths that leaded people from the street to the frontal room of the house.

In all cases the frontal part and the rear part of the house is separated by the central space whether there is a court or a hall or small enclosed chambers. Therefore it can be said that, these courts, halls and enclosed chambers divided the buildings into three distinguished part.

a. **The Frontal Block**
b. **The Court/ Hall/ Middle Block.**
c. **The Rear Block.**

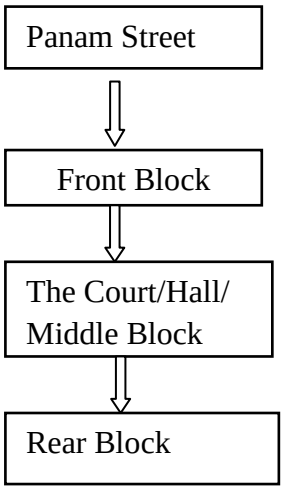


Fig-4.37: Zoning of Interior Spaces within Buildings

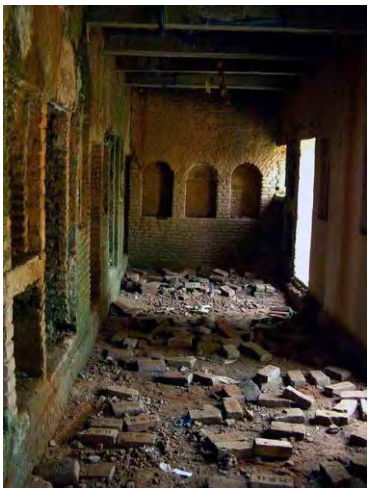


Fig-4.38: Front Room of a Consolidated Type Building

As the frontal block is directly connected to the street, it can be classified as the public zone of the building. Its façade treatment, ornamentation, spatial quality, size and shape lids to this conjecture that the frontal block behaved as the formal zone of the complex where some kind of interaction between the visitors or probably the buyers and the dwellers took place. The spatial order, number of openings and opening treatment towards the street indicates that the visitors were expected in this block.

The rear blocks (Fig-4.39) have also a great number of openings towards the rear court and have at least one larger room as the frontal block. But this area was not least ornamented like the frontal block and was not directly connected to the Panam Street. Rather there was a secondary informal circulation space created within the backyards of these buildings on both northern and southern part of Panam Nagar. This secondary circulation has been created due to the shared facilities like pond, well and other services among the inhabitants.

Fig-4.39: Rear Part of Consolidated type Houses

The middle block acted as the transitional zone which connected and altogether segregated the frontal and the rear block. The rear block seems to be remained as the informal zone of the complex as all the service facilities are in this area apart from the main building block adjacent to the cannel which is found from physical survey. This block remained private for those visitors who were willing to approach the building from the street, whether it was fully approachable for those visitors who enter the complex from rear part.

No function could be identified from the layout plan prepartd by Department of Archeology, Bangladesh or any other refferences including Asiatic society of Bangladesh who had an

Fig-4.40 Present view of the 'Kuthi Bari' of East India Company.

extensive study on the houses of Panam Nagar. So the samples here studied has no functional laveling. Moreover, from cartographic survey and historic reference it is found that, there is a 'kuthi bari'(Fig-4.40) used by 'East India Company' situated beside the northern canal in the periphery of Panam Nagar which has similar plan layout as the houses of Panam. This house was used by the East India Company officers who used this space for both work and residential purpose (Chattopadhyay, 2007:179). It is named as 'Kompany ka Kothi' from where different kind of business were conducted by the 'East India Company'. This establishment indicates to the conjecture that perhaps the houses of Panam were not absolutely residential type. Rather they might have some other commercial use which is not clearly identified.

In the prevailing type of houses of Dhaka, in any literature, such spatial organization is not found often. The introverted enclosed courtyard type houses though have some similarity with the courtyard and hall type of houses in Panam around the courtyard. But the other spaces of these houses are completely different in the physical layout in comparison. Again, the consolidated type of houses in Panam is completely different in physical properties in comparison to any type of house forms especially consolidated houses that prevailed in Dhaka at that time.

Therefore a syntatic analysis is undertaken in this research along with the physical analysis to revail the social logic of these spaces and find out the genotypes of these house. The following chapters will conduct a syntatic analysis of these buildings of Panam and compare them to the prevailing type of houses of Dhaka at that period. Moreover, no description of function or activity type is revealed in prevailing history of these houses. So it is important to study the organization of spaces of these by morphologically comparing house with the prevailing types of houses of Dhaka region to determine the genotypes and thereby to give some clue regarding the functions of these houses.

Chapter 05

Spatial Analysis of the Buildings of Panam

5.1 Introduction:

It is the fact of space that creates the spatial relation between function and social meaning in buildings. The ordering of space in buildings is really about the ordering of relations between people. Because this is so, society enters into the very nature and form of buildings (Hillier & Hanson, 1984:1-2). A building may therefore defined abstractly as a certain ordering of categories, to which added a certain system of controls, the two conjointly constructing an interface between the inhabitants of the social knowledge embedded in the categories and the visitors whose relation with them are controlled by the building (Hanson J, 1998:6). Space syntax is therefore, a tool by which buildings are transformed into dimensionless forms (Bandyopadhyay, 2007:426) or into the form of adjacency graphs to represent, quantify and interpret spatial pattern in buildings in such a way that their underlying 'social logic' can be understood. The syntactic data compiled thus, are compared to find any difference in the spatial organization among the different type of houses of Panam Nagar. In this study, those buildings are taken for analysis with the Space Syntax for which complete plan is available. This study goes further in quantitive analysis by looking closely at the distribution of spaces within the building and how each space is integrated with other spaces. This measure is a powerful predictor of how busy or quite that particular space is likely to be. Integration[3] values will be measured in each house and in the samples as a whole to see how different functional spaces integrate or segregate the complex to different degrees. It is the key to understand the social content of architecture and show how buildings function at a collective level (Hanson,1998:1).

In physical analysis it is found that, the arrangement of court, hall and small cells in the middle of the buildings, divided the buildings of Panam into three distinct blocks with different characteristics. Here the frontal block seems to perform as the formal zone of the building where the rear block appeared as the informal zone. By connecting these two blocks with corridors, courts and halls the central part remained as the transitional zone of these buildings. The major circulations had been provided around the central spaces. Hence, this chapter will focused on the spaces of these three blocks, especially the courts, halls, corridors, front and rear rooms etc. in the ground floor. Thus by using and analyzing the measures of space syntax, this chapter will try to characterize the syntactic properties of these particular spaces and find out the pattern of spaces within these buildings. Through space syntax analysis, these spaces

[3] Integration is an important measure of space syntax analysis which has been used in this thesis. If the integration value of a space is found more than one then the space can be termed as a high integrated area of the building from where the spatial character of the complex can be controlled. On the other hand the value below one represents the segregating tendency of the complex. This indicates to the degree of privacy of a space.

can be interpreted as elaborations on the inhabitant-inhabitant and inhabitant-visitor interfaces which are the fundamental social generators of buildings (Hanson, 1998:22).

5.2: Syntactic Analysis of the Houses of Panam Nagar:

The twenty one samples of three types of buildings, **Double Heighted Hall type**, **Courtyard type** and **Consolidated type,** collected from different sources have been analyzed to find out the morphological character of the buildings of Panam Nagar. Therefore this chapter will only emphasize on the found complete samples of these three types of buildings. In all the cases, the carrier or the root space has been taken from frontal entry of the building on Panam Street as the buildings are directly approached from the street. All the spaces outside the building have been taken as one point. As the functional labeling could not be identified in any prevailing literature, the present study has been identified different convex spaces[4] and labeled by numbers for analyzing properly. The continuous corridors around the halls and courts have been divided into different convex spaces.

5.2.1 Double Heighted Hall type Buildings:

Three complete samples had been found of double heighted hall type buildings. These are building no 1, 9 and 39 which will be studied in this chapter to find out the social logic of the spaces through syntactic analysis, especially the double heighted halls and spaces around them.

From Justified graph analysis it is seen that the configuration of double heighted hall type buildings of Panam are moderately deep and ringy graph. Building no-1 (Fig-5.1,5.3) and building no-9 (Fig-5.2,5.4) is six steps deep and building no-39 (Fig-5.5) is nine steps deep from the carrier. In this type of buildings the hall is always found in the shallower zones of the configurations. In building no-1 and 39(Fig-5.3&5.5) the hall is two steps away from the carrier and in building no 9, it is three steps away from the carrier (Fig-5.4).

The graphs show that, ringiness[5] is one of the major characteristics of these buildings. Most of the spaces of building no 1 and 9 are distributed in one or another ring. This ringiness made the entire configuration syntactically shallow. For example, building no 39 has fewer rings. As a

[4] Convex space is a space where no line between any two of its points crosses the perimeter. A concave space has to be divided into the least possible number of convex spaces.

[3] When one space is linked to another space with more than one link in syntactic measure it is called ring. Having rings in a space syntax tree is a special character of the tree. This character is called ringiness. It describes the arrangement and distribution of spaces in a building. Those spaces that share a ring can be accessed from any point of that ring. Ringiness determines the level of privacy and relation between spaces of a building.

result, building no 39 is deep sequence having more non distributed segregated spaces (Fig-5.5).

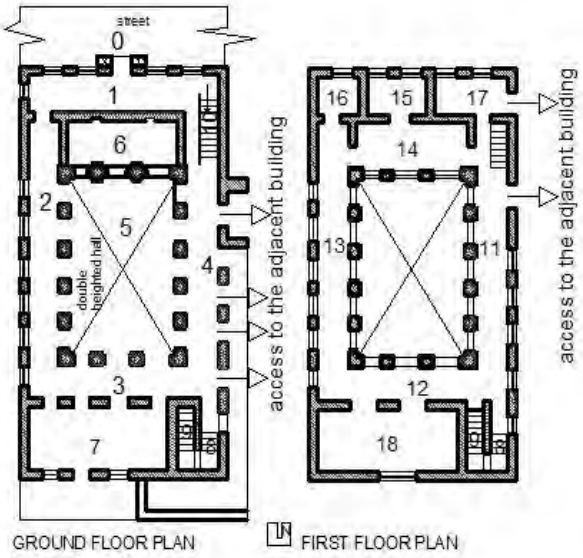


Fig-5.1: Plan of Building no 1
Source: Department of Archeology

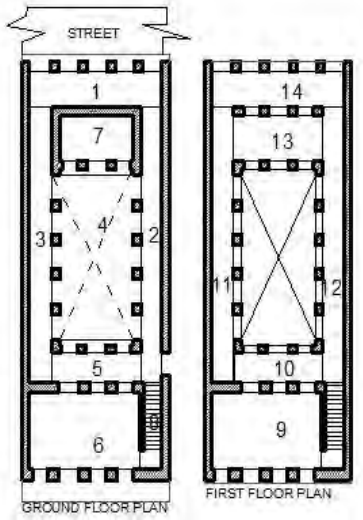


Fig-5.2: Plan of Building no 9
Source: Department of Archeology

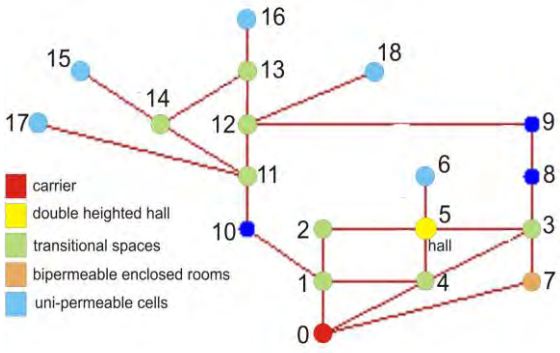


Fig-5.3: Justified Graph of Building no-1

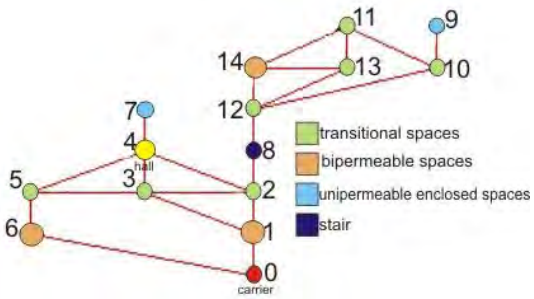


Fig-5.4: Justified Graph of Building

Table 5.1 shows syntactic values of Building no 1. In Building no 1, the integration value of the double heighted hall is 1. All the transitional spaces around the hall in both ground floor and first floor are strongly integrated. The highest integration 1.25 is found in space no-4 and 11. These are the transitional[6] spaces around the double heighted halls in the middle block of the

[6] Transitional spaces are the spaces through which circulation of the system can be carried out.

configuration in ground and first floor consecutively and also connected to the next building internally. On the other hand, the enclosed and uni-permeable cell adjacent to the hall has very low integration value 0.625 as well as very low control[7] value 0.25 which proves that, these spaces have high segregating quality.

Table-5.1: Space Syntax Analysis of Building no-1

Name	Space number	Control value	Depth	Mean depth	Integration(1/RRA)
Carrier	0	1	0	3.06	1
Front room/veranda	1	1.4	1	2.6	1.25
Corridors around double heighted hall	2	0.75	2	3.11	1
	3	1.3	2	3.22	0.885
	4	1.6	1	2.6	1.25
	11	2.1	3	2.6	1.25
	12	2.1	4	2.8	1
	13	1.6	5	3.3	0.83
	14	1.6	4	3.1	0.91
Double Heighted Hall	5	2	2	3.2	0.885
Cell adjacent to the Hall	6	0.25	3	4.2	0.625

All these three buildings have small uni-permeable chamber adjacent to the double heighted hall (Fig-5.3, 5.4 & 5.5). In building no-1 and 9, all the spaces of ground floor except these uni-permeable small chamber adjacent to the hall, are distributed[8] in a ring with the exterior. In building no 39 (Fig-5.5) half of the ground floor spaces along with the hall are distributed in the ring with the outdoor. We know that, the links between the interior and the exterior of a house is an important dimension of configurational analysis to understand the relative importance and inhabitant-visitor relationship for the planning and organization of the house. That is, when spaces are distributed with the exterior in a ring, the interior spaces become shallower and easily permeable for the visitors (Hillier & Hanson, 1984:147-155). However, it is quite clear that rings with outdoor made the ground floor spaces shallower in these buildings.

Again, the hall is also distributed in all the internal rings that link ground floor spaces (Fig-5.3, 5.4 & 5.5). Thus the hall has become the intersection point of more than one ring which made

[7] **Control value** is a dynamic local measure. It measures the degree to which a space controls access to its immediate neighbours taking into account the number of alternative connections that each of these neighbours have. If the control value is less than 1, the control of the space becomes week.

[8] Distributedness is a syntactic measure of spaces linked to each other. That is when more than one spaces are interconnected to each other with in a ring, those spaces are identified as distributed space in the configuration.

the hall an integrated space of these configurations. On the other hand, non-distributed and uni-permeable[9] spaces remained most segregated spaces in the configuration[10].

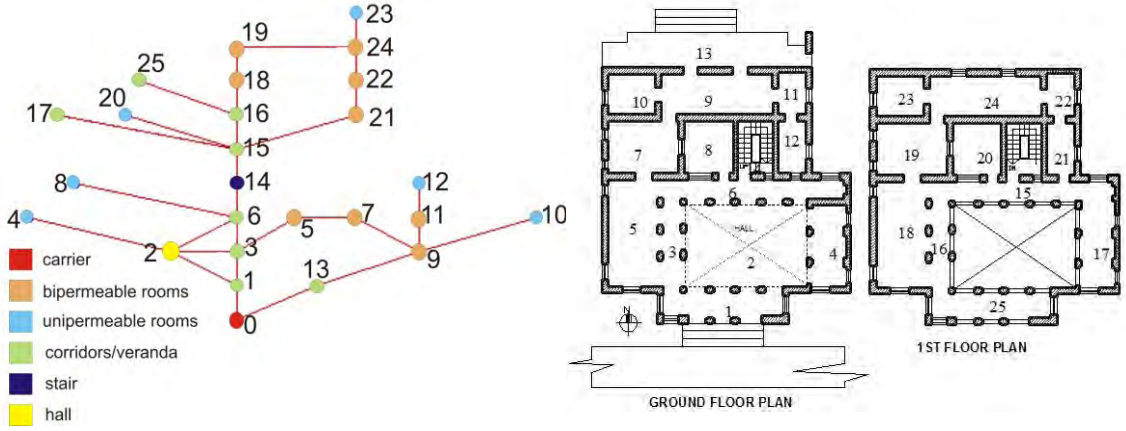


Fig-5.5: Justified Graph and Plan of Building no-39

All the transitional spaces in the middle block of the configurations 1, 9, and 39 have high control values (table-5.1, 5.2 & 5.3) which indicate that, these spaces have a very strong control over their neighbouring spaces (Hillier & Hanson, 1986: 109). The table 5.2 shows that, all most all the spaces of building no-9, most of the spaces have low integration value. Only the transitional spaces around the hall are integrated spaces. The highest integration (1/RRA) 1.43 is found in a central transitional space (space no-2), adjacent to the hall. The mean integration of this configuration is 0.9 and the mean depth is 6. In building no 39(table-5.3) the highest integration 1 is found in the hall and the spaces around the hall in ground floor. The rest of the spaces remained segregated with strong control.

From above analysis, it can be said that, the double heighted hall and the spaces around the double heighted hall show similar syntactic properties. Such as-

a. In these graphs the hall is placed in shallower positions, which are two to three steps deep from the root point of the configuration. The hall is also an integrated space around which

[9] A cell with one entrance can be said an uni-permeable point while a cell with more than one entrance can be conceptualized as bipermeable point (Hanson,1998:7)

[10] Spatial relation exists when there is any type of link between two spaces. Configuration exists when the relation that exists between two spaces are changed according to how we relate each to a third or indeed to any number of spaces. configurational description therefore deal with the way in which a system of spaces is related together to form a pattern (Hanson,1998:23).

strongly integrated spaces of the configuration are located. All these integrated spaces are the transitional corridors around the hall.

From Table 5.4 it is found that, the hall is always two to three steps deep from the frontal road. The hall remains integrated in building no-9 and 39 with the value of 1 in both cases and slightly segregated in building no1 with the value of 0.885. But in all cases, it has high control value which again indicates a strong control over its neighbouring spaces. These syntactic measures are the characteristics to represent the hall as a space where visitor inhabitant relation took place.

Table-5.2: Space Syntax Analysis of Building no-9

Name	No of Spaces	Control Value	Depth	Mean Depth	Integration (1/RRA)
Carrier	0	0.8	0	3.5	0.67
Front Room	1	1.1	1	2.8	1
Corridors around the Double Heighted Central Hall	2	1	2	2	1.43
	3	1	2	3	0.77
	5	1	2	3	1
	10	1.6	5	3	0.77
	11	1	6	4	0.6
	12	1.5	4	2.5	1
	13	1	5	3.2	0.77
Double Heighted hall	4	2	3	3	1
Small Cell adjacent to Hall	7	0.25	4	4	0.625

Table-5.3: Space Syntax Analysis of Building no-39

Name	Rooms	Control Value	Depth	Mean Depth	Integration (1/RRA)
Carrier	0	0.8	0	4.5	0.67
Corridors around the Double Heighted Hall	1	1	1	4	0.77
	3	1.3	2	3.4	1
	6	2	3	3.3	1
	15	3.3	5	3.5	0.9
	16	1.7	6	4.2	0.77
	17	0.2	6	4.5	0.67
	25	0.3	7	5.1	0.5
Double Heighted Hall	2	1.8	2	3.6	1
Enclosed Chamber with Hall	4	0.25	3	4.6	0.67

Table-5.4: Syntactic Measures of the Double Heighted Central Hall of Building no-1, 9 and 39.

Building no	Control Value	Depth	Mean Depth	Integration (1/RRA)
Building no-1	2	2	3.2	0.885
Building no-9	2	3	3	1
Building no-39	1.8	2	3.6	1

b. The position of the hall is in the intersection point of more than one ring among which at least one connects the exterior (Fig-5.3, 5.4 & 5.5). This made the hall as the locus of the visitor-inhabitant interface. Thus the hall is distributed among the internal as well as external spaces and encourages the outsiders or the visitors to participate and experience the indoor activities. As we know that, the distributed system is the set of spaces through which the visitors, subjected to more or less control, may pass. That is, visitors, during the course of their activities, are moved from one place to another, and often can experience much of the interior as a series of spaces (Hillier & Hanson, 1984:167). The ringy interior of these buildings allow the visitors to move from one space to another linked space which reduce the privacy of these buildings.

c. Though the hall is placed in the intersection point of different rings, still there are always different choices of path for a person who enters these configurations to move from one space to other overlooking the hall. That is, though the hall is distributed with all the spaces of ground floor through series of linked spaces, but it is not necessary for a person to pass through the hall every time he goes from one space to another within the building. Still the hall has a strong control (control value-2 in building no 1 and 9 and 1.8 in building no 39) over its neighbouring spaces and strong visual connectivity with the transitional spaces around it. Thus, without being involved in the day to day activities of the configurations, the hall still remained as a strong controlling space in these configurations.

d. The transitional spaces around the double heighted hall in the ground floor have the highest integration value of these configurations and also have a strong control over their neighbouring spaces (Table-5.5). In Building no 1 the mean integration of the colonnaded corridors around the hall is 1.1 in ground floor and 1 in first floor. In Building no 9 the mean integration is 1.1 in ground floor and 0.8 in first floor and in Building no 39 the mean integration of the colonnade corridors around the hall in the ground floor is 1 and first floor is 0. 735. These integrated corridor are neither enclosed by continuous façade nor completely open towards the

hall. Rather these corridors are easily permeable spaces with a series of colonnade openings towards the hall. Therefore it can be said that, the hall is surrounded by integrated corridors which are organized by a continuous system of boundaries. These corridors also have permeabilities towards their neighbouring spaces and are distributed to the bipermeable spaces in the ground floor as well as with outdoor.

In an ideographic language for architecture it can be said that the space organized for *social purpose* are always neither purely continuous nor purely bounded. The effective space organized for human social purpose are a conversion of spatial continuum by a system of boundaries and permeabilities (Hanson, 1998:6). The hall and its adjacent corridors support this theory of socialization both physically and syntactically. Moreover the rings that distributed the internal spaces to the outdoor made these configurations more permeable for the visitors.

Table-5.5: Space Syntax Analysis of Transitional Spaces around the Hall

Name			Control value	Depth	Mean depth	Integration (1/RRA)	Mean Integration
Building no-1	Ground Floor	2	0.75	2	3.11	1	1.1
		3	1.3	2	3.22	1	
		4	1.6	1	2.6	1.25	
	First Floor	11	2.1	3	2.6	1.25	1
		12	2.1	4	2.8	1	
		13	1.6	5	3.3	0.83	
		14	1.6	4	3.1	1	
Building no-9	Ground Floor	2	1	2	2	1.43	1.1
		3	1	2	3	0.77	
		5	1	2	3	1	
	First Floor	10	1.6	5	3	0.77	0.8
		11	1	6	4	0.6	
		12	1.5	4	2.5	1	
		13	1	5	3.2	0.77	
Building no-39	Ground Floor	1	1	1	4	0.77	1
		3	1.3	2	3.4	1	
		6	2	3	3.3	1	
	First Floor	15	3.3	5	3.5	1	0.735
		16	1.7	6	4.2	0.77	
		17	0.2	6	4.5	0.67	
		25	0.3	7	5.1	0.5	

e. The small cell adjacent to the hall is found, in all the three cases, have a strong segregating character. The small chamber adjacent to the hall remained non-distributed and segregated from other spaces (table-5.6). Being in the shallower part of the system, this space remained extremely segregated. The integration value of this cell in building no-1and 39 is 0.67

and in building no-9 is 0.625. This didn't happen accidentally in these genotypes. The pattern itself is usually capable of more than one interpretation. This ambiguity is inherent in the meaning of the shallow arm of the plans. In the first place, it can be interpreted functionally, as a convenient place to do house hold work; but its only connection to the double heighted hall and similar syntactic value in all three cases doesn't support this theory. So, in second instance, it had to be assigned a symbolic value, as a separate but shallow place appropriate to the celebration of special and therefore more formal events, such as the celebration of prayers. When a separate shallow uni-permeable space is surrounded by integrated and distributed bi-permeable spaces, the uni-permeable space represents different kind of functional segregation (Hanson, 1998:78). More over it is in the center of the highest integration zone of the configuration. Therefore it reinforces the conjecture that, this small chamber was probably a temple or a very special space as this particular space was highly decorated with ornamented columns and floral motifs and opens only towards the hall and was raised one step up from the other spaces of ground floor. This particular space probably held such a function which all together needed people in front of it and still needed a strong privacy for its own. So, it can be assumed that, the double heighted hall was probably a space for public gathering in special occasions which was dedicated to this uni-permeable cell. Therefore, it can be said that, this particular chamber was, most probably, the reason for the double heighted hall.

Table-5.6: Syntactic Measures of the Small Chambers adjacent to the Hall.

Building no	Control Value	Depth	Mean Depth	Integration(1/RRA)
Building no-1	0.25	3	4	0.67
Building no-9	0.25	4	4	0.625
Building no-39	0.25	3	4.6	0.67

5.2.2 Courtyard type Buildings:

In courtyard type houses the court situated in the middle part of the building separated the building into two blocks. The frontal block has one or two rooms and the rear block contains most of the rooms of the configuration. Among the courtyard houses of Panam, this chapter will analyze two buildings, building no-33 and building no-34 with Space Syntax to find out the spatial pattern of this type.

From physical analysis it is seen that both the buildings have small court in the middle block of the building which is surrounded by colonnade verandas in all three side and closed by the boundary wall in another side. These shaded verandas are the only link between the front and rear block.

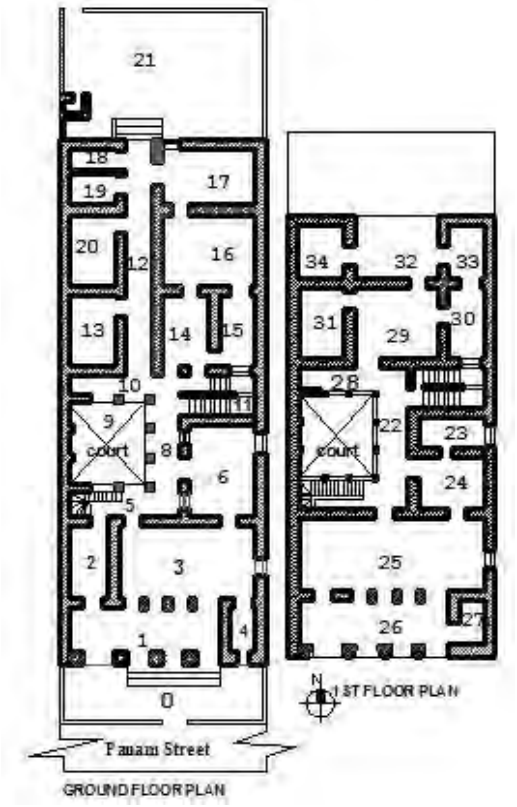


Fig-5.6 Plan of Building no-33

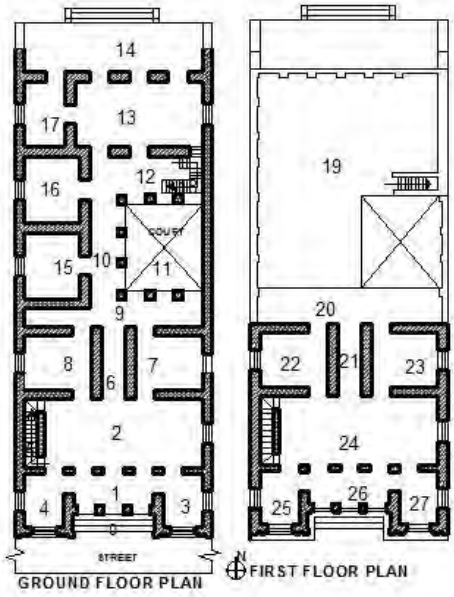


Fig-5.7: Plan of Building no-34

Syntactic analysis shows that, both the buildings have deep ringy sequence with a large number of bi-permeable spaces. A great number of uni-permeable spaces are also seen in these buildings. Both the configurations formed uni-linear sequential branches[11]. The spaces in the graph are linked to each other by transitional spaces like stairs, corridors and verandas situated in the middle of the justified graph and thus forming small rings (Fig-5.8 & 5.9).

Building no 33 (Fig-5.6 & 5.8) is a nine steps deep system with a number of segregated uni-permeable spaces. The mean integration of this configuration is 0.8 (Table-5.7). In building no-33, the highest integration 1.4 is found in the ground floor corridor adjacent to the court (space no-8) which is placed in the middle block of the configuration. This corridor is 4 steps deep from the carrier. The mean depth of this space is 3, the control value is 2.2 (Table-5.7). Therefore this corridor can be identified as the most integrated space of this configuration and has strong control over its neighbouring spaces.

[11] Uni-linear sequence is such a series of bi-permeable spaces which are linked to their next space but does not form any ring and thus ends in a terminal uni-permeable space.

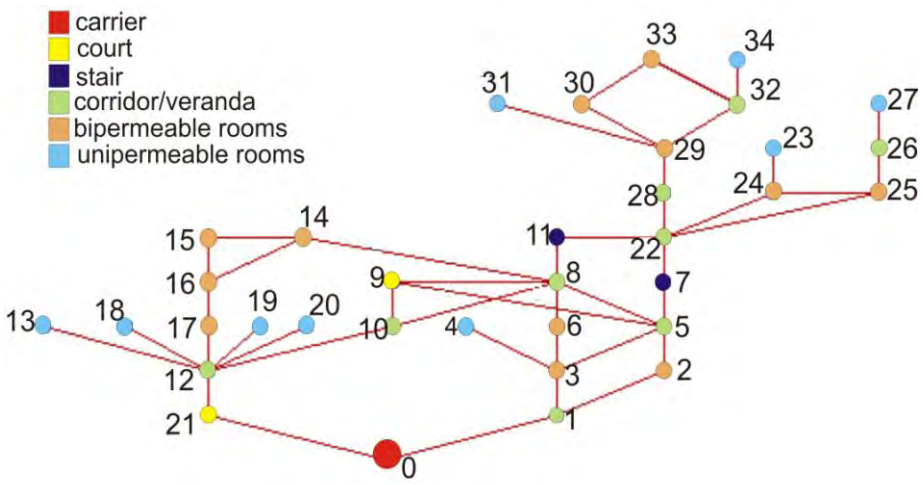


Fig-5.8: Justified Graph of Building no-33

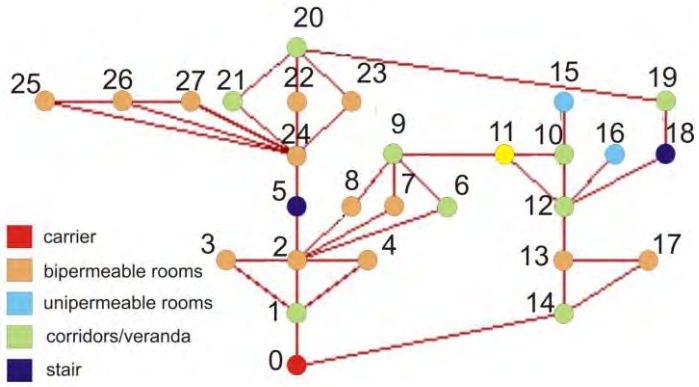


Fig-5.9: Justified Graph of Building no-34

The central transitional spaces both in the ground and first floor of Building no-33 remain as the most integrated spaces of the configuration. The front room and other bi-permeable rooms directly linked to the transitional spaces remained integrated. The rest of the spaces of the configuration remained segregated. The frontal part of this building also remained integrated. But the rooms in the rear block are found strongly segregated.

From table 5.8, it is found that, Building no 34 is shallower than Building no 33. The highest integration (1/RRA) 1.37 is found in space no-2 which is the front room in the formal part of the building. This room has the highest control as well. The control value of this room is 3.25 which refer to such a space which has very strong control over its neighbouring spaces.

The court along with the surrounding corridor in the middle block of the configuration remained integrated. These corridors also have strong control in both ground and first floor. But the

enclosed rooms in the middle and the rear part of the building remained segregated with a very low integration value (Table-5.8).

Therefore it is clear that the front room being two steps away from to Panam Street is a strongly integrated space which as well controls the inhabitant-inhabitant and visitor- inhabitant relationship. The middle block around the court also is an integrated part of the building but the rear block remained strongly segregated as it is seen in the case of Building no-33.

Table-5.7: Space Syntax Analysis of Building no-33

Space Name	Space Number	Control Value	Depth	Mean Depth(MD)	Integration(1/RRA)
Carrier	0(Carrier)	0.83	0	5	0.73
Central Court	9	0.7	4	3.5	1
Corridors/Verandas	1	1.25	1	4.29	0.83
	5	1.75	3	3.18	1.25
	8	2.2	4	3	1.4
	10	0.64	3	3.44	1
	12	5.3	2	3.85	0.96
	22	2.2	5	3.2	1.25
	28	0.45	6	3.8	1
Bipermeable Enclosed Spaces	2	0.53	2	3.97	1
	3	2.03	2	3.85	1
	6	0.42	3	3.7	1
	14	1	5	3.8	1
	15	0.7	5	4.5	0.77
	16	1.3	4	4.2	0.83
	17	0.5	3	4.65	0.74
	24	1.53	6	4	0.91
	25	1.03	6	4	0.91
	29	2.33	7	4.5	0.7
	30	0.75	8	5.4	0.625
Uni-permeable Spaces	4	0.25	3	5	0.7
	13	0.14	3	5	0.7
	18	0.14	3	5	0.7
	19	0.14	3	5	0.7
	20	0.14	3	5	0.7

Table-5.8: Space Syntax Analysis of Building no-34

Space Name	Space no	Control Value	Depth	Mean Depth	Integration(1/RRA)
Carrier	0	0.6	0	3.6	0.95
Corridors/ veranda	1	1.64	1	3.25	1.1
	6	0.34	3	3.15	1.14
	9	2.1	4	3.2	1.1
	10	1.73	4	3.3	1.05
	12	2.42	3	3.26	1.1
	14	1.33	1	3.8	0.87
	19	0.75	5	3.7	1
	20	2	6	3.67	1
	21	0.39	5	3.63	1
	26	1.14	5	4.15	0.77
Court	11	0.65	4	3.37	1.03
Bi-permeable spaces	2	3.25	2	2.8	1.37
	7	0.34	3	3.15	1.14
	8	0.34	3	3.15	1.14
	13	1.03	2	3.7	1
	17	0.67	2	4.26	0.75
	22	0.4	5	3.63	0.92
	23	0.4	5	3.63	0.92
	24	3.33	4	3.26	1.08
Uni-permeable spaces	15	0.25	5	4.3	0.74
	16	0.2	4	4.22	0.75

Table-5.9: Syntactic Data of Court in Building no 33 and 34

Building No	Space no	Control Value	Depth	Mean Depth	Integration
33	9	0.7	4	3.5	1
34	11	0.65	4	3.37	1.03

a. If we see the syntactic values of these configurations, we will find that the frontal block in ground floor and transitional spaces in the middle block are mostly integrated and the rest of the configurations remained much segregated. The continuous verandas around the court have strong integration values (table-5.10) and have strong control over their neighboring spaces. Therefore it can be said that, the central part of the configuration plays a significant role in connecting the system locally and globally. That is, the central part of these configurations plays a significant role to integrate the system and also strongly control the permeability to their neighboring spaces.

b. The front room adjacent to the Panam Street in the shallower arm of the justified graph always remained an integrated space in both the configurations. The rear blocks having lower integration value remained as segregated spaces of the system. The peripheral rooms in both front and rear block have strong control in ground floor which refers to the controlled permeability of the visitors in the interior of the building.

c. The ground floor spaces of both the configurations are distributed in one or other overlapping rings (fig-5.8 & 5.9) both internally and externally. These rings with the outdoor made the system shallower. The transitional spaces in the upper floor remained distributed with external rings; the rest of the spaces remained distributed internally.

d. Again rear rooms with low integration value in both the configuration remain in shallower arm of the justified graph and distributed with the outdoor with external rings[12]. The high permeability of the low integration areas seems geared to allowing the inhabitants out more than letting the strangers' in. The system as a whole is geared to the accessing, but at the same time to the control of strangers (Hillier & Hanson, 1984:122).

Table-5.10: Syntactic Data of Transitional Spaces around the Court in Building No 33 and 34.

Name			Control Value	Depth	Mean Depth	Integration (1/RRA)	Mean Integration
Building no-33	Ground Floor	5	1.75	3	3.18	1.25	1.22
		8	2.2	4	2.97	1.4	
		10	0.64	3	3.44	1	
	First Floor	22	2.2	5	3.2	1.25	1.125
		28	0.45	6	3.8	1	
Building no-34	Ground Floor	9	2.1	4	3.2	1.1	1.08
		10	1.73	4	3.3	1.05	
		12	2.42	3	3.26	1.1	

Therefore, it can be said that rear part of the system has a certain degree of control over the visitors. In this part, the external ring, rather encouraging the visitors to enter the configuration, encourages the inhabitants towards the exterior.

[12] External rings-rings that links the outdoor spaces with the indoor spaces.

From this analysis it is seen that the courtyard type houses have their front rooms integrated and the rear rooms segregated. These two blocks are linked by the integrated transitional spaces in the middle block around the court.

5.2.3: Consolidated type Buildings:

From physical analysis it is found that, the consolidated type of buildings can be divided into three sub-groups; **Single Corridor type**, **Multiple Corridor type** and **Buildings without Corridors**; based on the circulation pattern in physical organization. Thirteen buildings of Consolidated type have been analyzed with Space Syntax to find out the morphological character of these buildings.

5.2.3.1 Single Corridor type Buildings:

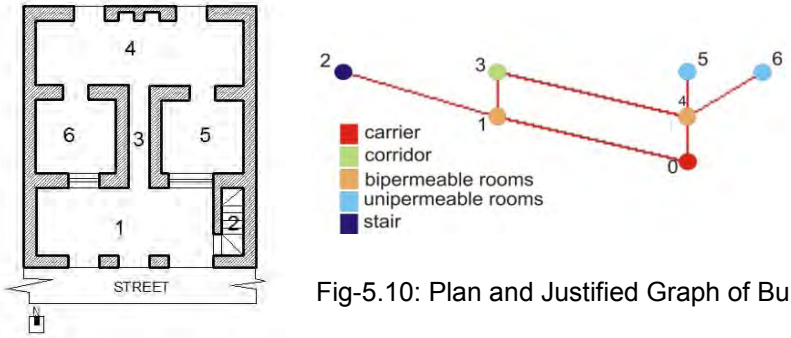


Fig-5.10: Plan and Justified Graph of Building no-

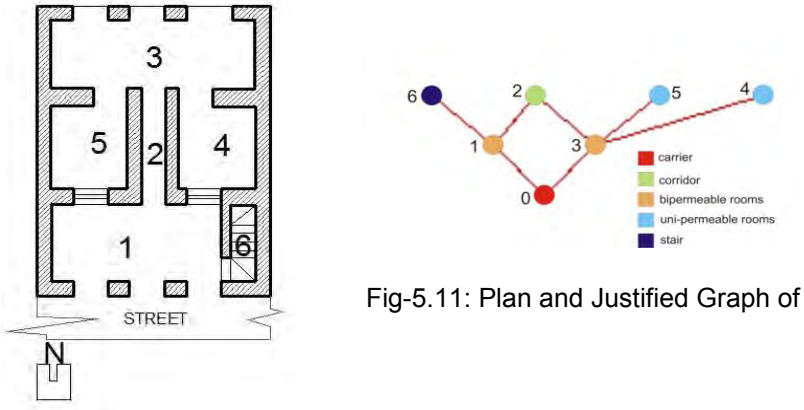


Fig-5.11: Plan and Justified Graph of Building no

In this group, Building no- 23, 24, 25 and 45 will be analyzed with Space Syntax. Space Syntax analysis shows that, building 23, 24 and 25 (Fig-5.10, 5.11 & 5.12) have similar syntactic properties. All these configurations have non-distributed uni-permeable cells in the middle of the configuration. The front block of building no 23 and 24 are integrated in with the value 1, and have strong control with the value of 2 for both buildings. In Building no 25, the front room remained segregated with the value 0.87 and has weak control over its adjacent spaces. The

control value of the front room (Space no-1) of building no 25 is 0.83. In all these three cases the rear rooms connected to the outdoor are strongly integrated with the value 1.67 for Building no 23 and 24 and 1.75 for Building no 25. These rooms also have strong control over their neighbouring spaces (Table no-5.11, 5.12 & 5.13).

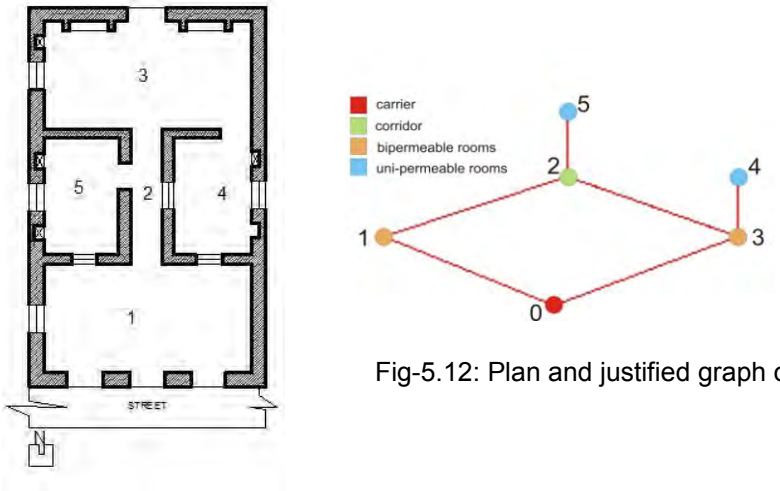


Fig-5.12: Plan and justified graph of Building no: 25

Table-5.11: Space Syntax Analysis of Building No 23

Space name	Space no	Control Value	Depth	Mean Depth	Integration (1/RRA)
Carrier	0	0.6	0	1.67	1.25
Bipermeable rooms	1	2	1	1.83	1
	4	3	1	1.5	1.67
Corridor	3	0.6	2	1.67	1.25
Uni-permeable cell	5	0.25	2	2.33	0.625
	6	0.25	2	2.33	0.625

Table-5.12: Space Syntax Analysis of Building No 24

Name	Space no	Control Value	Depth	MeanDepth	Integration (1/RRA)
Carrier	0	0.6	0	1.7	1.25
Bi-permeable Rooms	1	2	1	2	1
	3	3	1	1.5	1.67
Corridor	2	0.6	2	1.67	1.25
Uni-permeable Rooms	4	0.25	2	2.3	0.625
	5	0.25	2	2.3	0.625

Table-5.13: Space Syntax Analysis of Building No-25

Name	Space no	Control Value	Depth	Mean Depth	Integration (1/RRA)
Carrier	0	0.8333	0	1.8	0.873
Bi-permeable Rooms	1	0.8333	1	1.8	0.873
	3	1.83	1	1.4	1.75
Corridor	2	1.83	2	1.4	1.75
Uni-permeable Rooms	4	0.33	2	2.2	0.6
	5	0.33	3	2.2	0.6

From these case studies it is seen that-

a. All these three configurations are shallow ringy system and show a segregating character. Such a shallow system is generally unsuitable for residential use. Therefore the house form of Dhaka needs to be analyzed to find out whether there is any similarity with this type of houses of Panam Nagar.

b. In all cases, the middle blocks of the configuration contains uni-permeable cells which are strongly segregated. These spaces have very low control value as well and their permeability is controlled from the adjacent room in the rear block or from the adjacent corridor. These uni-permeable small cells remained non-distributed. As we know that the non-distributedness indicates a tendency towards a unitary super ordinate control[13] (Hillier & Hanson; 1984:97), so these spaces were controlled by their adjacent spaces.

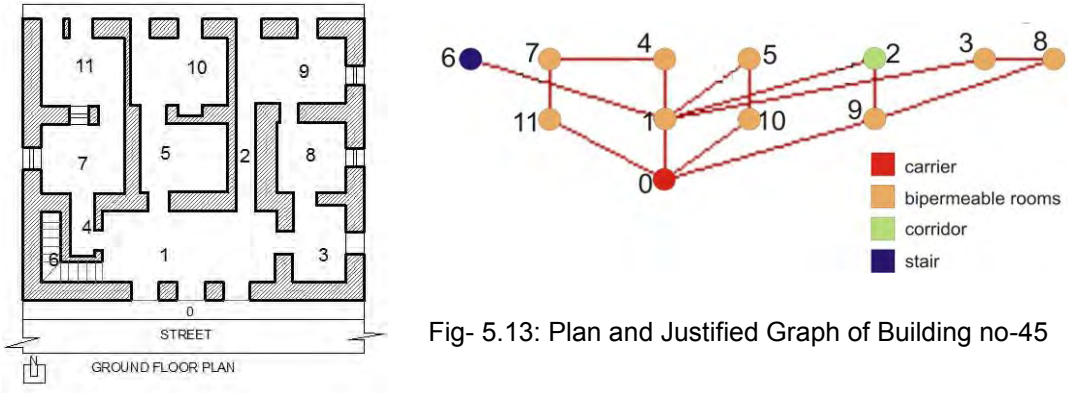


Fig- 5.13: Plan and Justified Graph of Building no-45

Again, in Building no-45, there is no uni-permeable cell, rather all the spaces of Building no-45 are linked to one another through different rings. These spaces are strongly integrated with a

[13] Super ordinate Control of space- the space that strongly controls its neighbouring spaces which are comparatively weak.

weak control over their neighbours which ensures the easy permeability of these spaces. But the front room holds strong control with the value 3.25 (Table-5.14).

Table 5.14 shows that the front room (space no-1) of Building no-45 is the most integrated space of the configuration. The integration value (1/RRA) of space no-1 is **3.125** which confirm strong integration of this space in the configuration. This space also has a strong control over its neighbouring spaces with control value of **3.25**. Again, it is only one step away from the root point.

Being in the shallowest part of the configuration, space no 1 confirms the permeability of the visitors in this space. Such strong integration in the front room which is the place of visitor-inhabitant interface of the configuration is very uncommon in the residential buildings of Dhaka. Moreover, all the spaces in a ring with the outdoor indicate the absence of privacy of this building, which is also a very uncommon character for residential buildings.

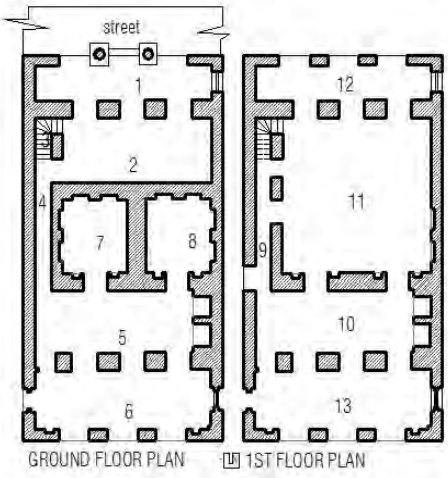
Table-5.14: Space Syntax Analysis of Building no-45.

Name	Space no	Control Value	Depth	Mean Depth	Integration (1/RRA)
Carrier	0	1.5	0	1.63	2.22
Bi-permeable Rooms	1	3.25	1	1.45	3.125
	3	0.67	2	2.1	1.31
	4	0.67	2	2.1	1.31
	5	0.67	2	2.2	0.33
	7	1	2	2.54	0.91
	8	0.83	2	2.45	1
	9	1.25	1	2.1	1.31
	10	0.75	1	2.36	1
	11	0.75	1	2.27	1
Corridor	2	0.5	2	2.1	1.31

5.2.3.2 Multiple Corridor type Buildings:

In this group Building no 2, 27, 41, 42 and 42A will be analyzed with space syntax. Among these buildings, building no 42A is single storied.

Building no 2 and 42 (Fig-5.14 & Fig-5.17) has non-distributed uni-permeable cells in the middle block of the configurations. Building no-41 (Fig-5.16) has also non-distributed uni-permeable cells. But the pattern of the spatial organization is different from Building no 2 and 42. On the other hand, all the spaces of Building no 27 (Fig-5.15) are distributed and bi-permeable.



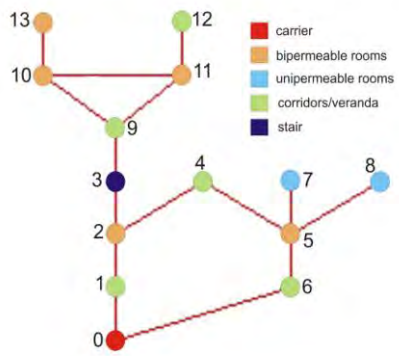
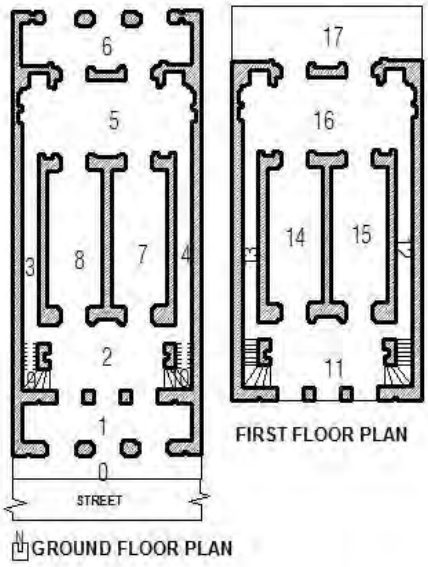


Fig-5.14: Plan and Justified Graph of Building no-2



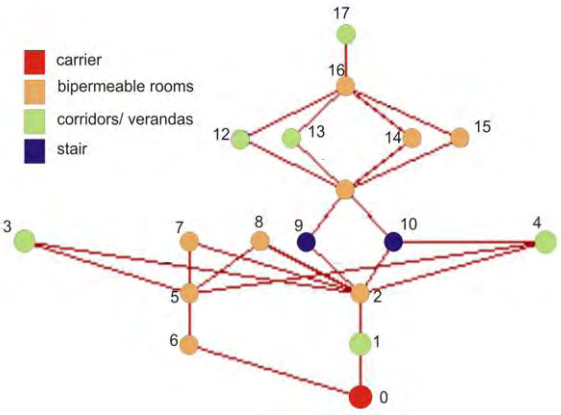


Fig-5.15: Plan and Justified Graph of Building no-27

From Space Syntax analysis it is found that, the bi-permeable rooms in the front and in the rear blocks of these buildings remained integrated as it was found in single corridor building. The middle block remained segregated. The transitional spaces especially corridors that connects the front and rear blocks also remained integrated with a weak control over their adjacent spaces. All the buildings are moderately deep sequence with number of intersecting rings.

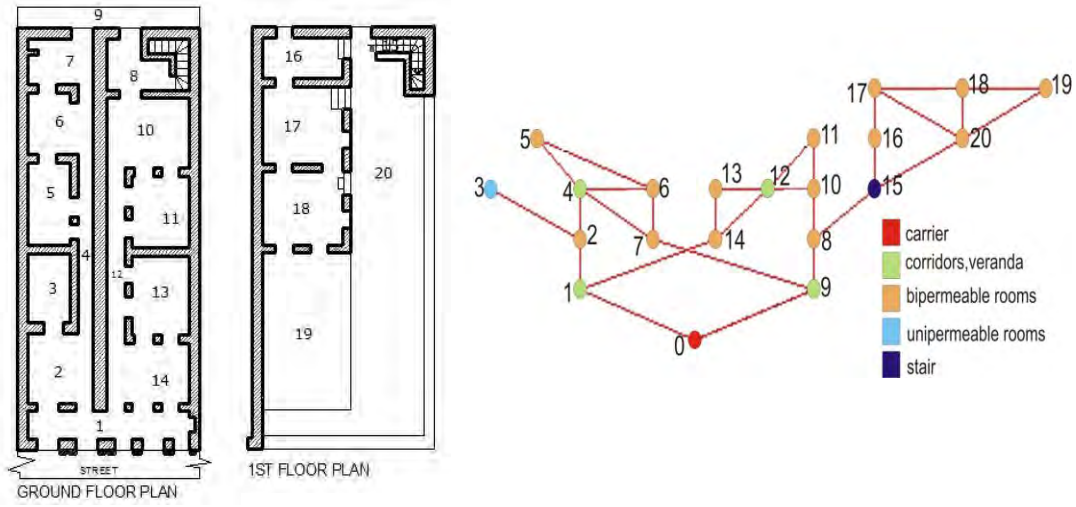


Fig-5.16: Plan and Justified Graph of Building no-41

In all cases the ground floor spaces are distributed with the outdoor. The outer most rooms are strongly integrated and the middle blocks of the configurations are segregated in all these cases. In Building no 2 and 27 the front room are found integrated (Table-5.15 & 5.16). The integration value of front room of Building no-2 is 1.1 and Building no 27 is 1.61. These spaces also have strong control over their adjacent spaces. All the spaces of Building no-27 are bi-permeable and linked to each other with internal rings in different floors.

Table-5.15: Syntactic Data of Building no-2

Space Name	Space no	Control Value	Depth	Mean Depth	Integration(1/RRA)
Carrier	0	1	0	3.4	0.67
Bi-permeable Rooms	2	1.5	2	2.46	1.1
	5	3	2	3.07	0.77
	10	1.67	5	3.5	0.625
	11	1.67	5	3.5	0.625
Corridor/ Veranda	1	0.83	1	3.1	0.77
	4	0.6	3	2.77	1
	6	0.75	1	3.7	0.6
	9	1.16	4	3	0.83
	13	0.33	6	4.46	0.46
Uni-permeable Space	7	0.25	3	4	0.53
	8	0.25	3	4	0.53

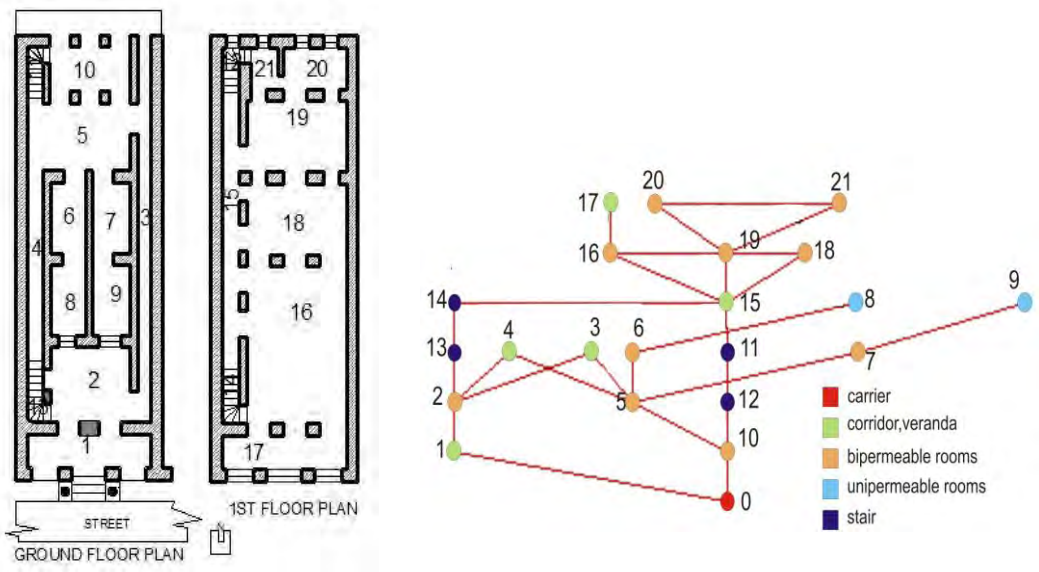


Fig-5.17: Plan and Justified Graph of Building no-42

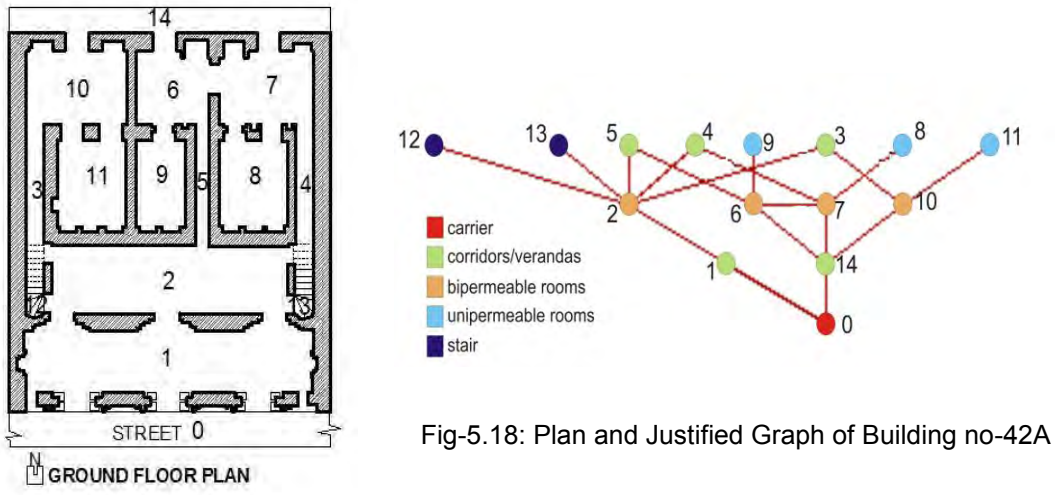


Fig-5.18: Plan and Justified Graph of Building no-42A

In Building no 41, the frontal block of the system is divided into two small enclosed bi-permeable rooms (space no-2 & 14). In this building the rear block is more integrated than the front and the front rooms (2&14) are segregated in nature. The highest integration 1.25 is found in one of the rear rooms (space no-8) in Building no 41(table-5.17). Again, in Building no-42 and 42A the outer most rooms are strongly integrated. The integration value of the front room in Building no-42(space no-2) is 1 and in 42A it is 1.96. The middle blocks of all these buildings are segregated in nature with small uni-permeable and bi-permeable cells. These cells also have

weak control over their adjacent spaces. These cells also creates visual and physical buffer between front and rear block which are the formal and informal zones of these configurations. These two zones are only connected by these corridors. But the permeability to these corridors is controlled by integrated frontal and the rear rooms.

Table-5.16: Space Syntax Analysis of Building no-27

Space Name	Space no	Control Value	Depth	Mean Depth	Integration(1/RRA)
Carrier	0	1	0	3.6	0.735
Bi-permeable Rooms	2	3.5	2	2.17	1.61
	5	2.5	2	3.23	0.85
	7	0.34	3	3	1
	8	0.34	3	3	1
	11	3	4	2.4	1.35
	14	0.37	5	3.11	0.9
	15	0.37	5	3.11	0.9
	16	3	6	3.6	0.735
Corridor/ Veranda	1	0.64	1	2.8	1
	3	0.34	3	2.9	1
	4	0.34	3	2.9	1
	6	0.7	1	4	0.67
	12	0.36	5	3.1	0.91
	13	0.36	5	3.1	0.91

Table-5.17: Space Syntax Analysis of Building No 41

Space Name	Space No	Control value	Depth	Mean depth	Integration (1/RRA)
Carrier	0	0.67	0	3.1	1
Bi-permeable Rooms	2	1.6	2	3.6	0.8
	5	0.6	4	4.35	0.625
	6	1.08	3	3.7	0.77
	7	0.92	2	3.15	1
	8	1	2	2.6	1.25
	10	1.08	3	3	1
	11	0.58	4	3.65	0.77
	13	0.58	3	3.8	0.75
	14	1.08	2	3.35	0.88
Corridors/ Verandas	1	1.17	1	3.15	1
	4	1.5	3	3.4	0.87
	9	1.17	1	2.7	1.25
	12	1.67	3	3.25	1
Uni-permeable Room	3	0.33	3	4.6	0.6

Table-5.18: Space Syntax Analysis of Building No-42

Space Name	Space no	Control value	Depth	Mean depth	Integration (1/RRA)
Carrier	0	0.83	0	3.57	0.83
Bi-permeable Rooms	2	2	2	3.1	1
	5	2.33	2	3.1	1
	10	1.2	1	2.95	1.1
	6	1.2	3	3.95	0.7
	7	1.2	3	3.95	0.7
Corridors/ Verandas	1	0.75	1	3.71	0.8
	3	0.45	3	3.33	0.9
	4	0.45	3	3.3	0.9
	15	1.92	4	3	1.07
Uni-permeable Rooms	8	0.5	4	5	0.55
	9	0.5	4	5	0.55

The front and the rear rooms, situated in the shallower arm of justified graph pose strong control over their neighbouring spaces. These spaces therefore can be defined as the spaces which play a significant role in determining the visitor-inhabitant and also inhabitant-inhabitant relationship.

5.2.3.3 Buildings without Corridors:

Three buildings (4, 26 and 31) without corridor have been analyzed in this chapter. Among them Building no 4 has a sequential trees[14] having little or no branches. On the other hand, Building no 26 and 31 are deep ringy configurations.

Building no 4 (Fig-5.19) is an atypical case of Panam which has a deep sequence with only one ring in the ground floor. The first floor rooms remained sequential and unilinear. Therefore it is a segregating configuration where the front room in the ground floor is moderately integrated with the value of 1. The rest of the spaces remained segregated. The strong control of frontal room in both floors strengthened this high degree of segregation. The mean integration of the system is 0.625.

Building no 26 (Fig-5.20) is a deep ringy system and Building no 31(Fig-5.21) is again a shallow system which is four steps deep from the carrier. All the bi-permeable spaces are distributed in these configurations. The front room of both the configuration is strongly integrated with a value

[14] Sequential tree-the justified graph that does not have any ring. In such graph bi-permeable spaces are linked with their adjacent spaces and ends in a terminal uni-permeable space.

of 1.31 for building no-26(Annex-2) and 1 for building no 31(Annex-2). The control value of this space in both configurations is also very strong.

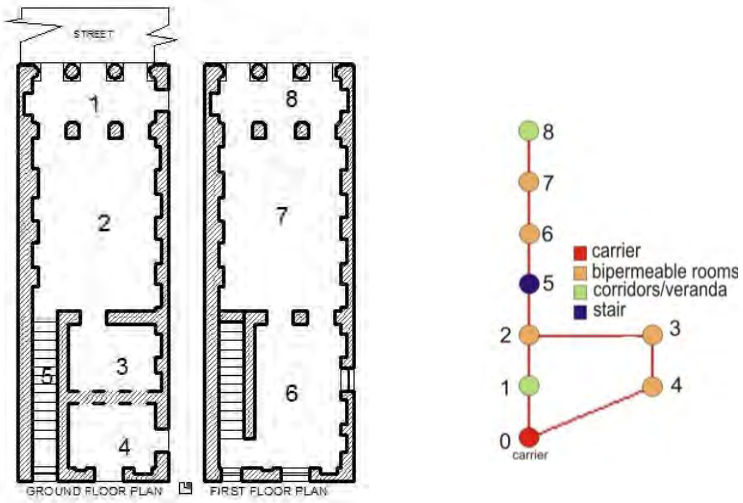


Fig-5.19: Plan and Justified Graph of Building no- 4

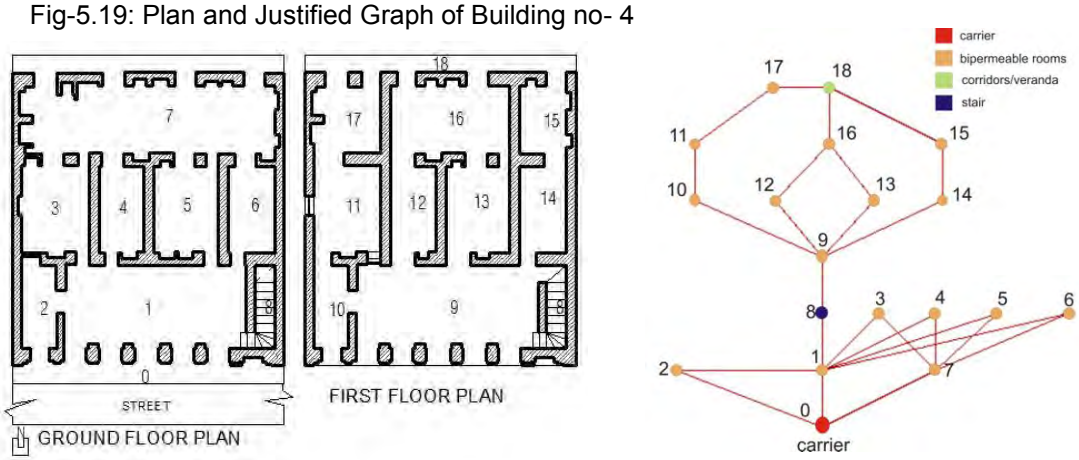


Fig-5.20: Plan and Justified Graph of Building no- 26

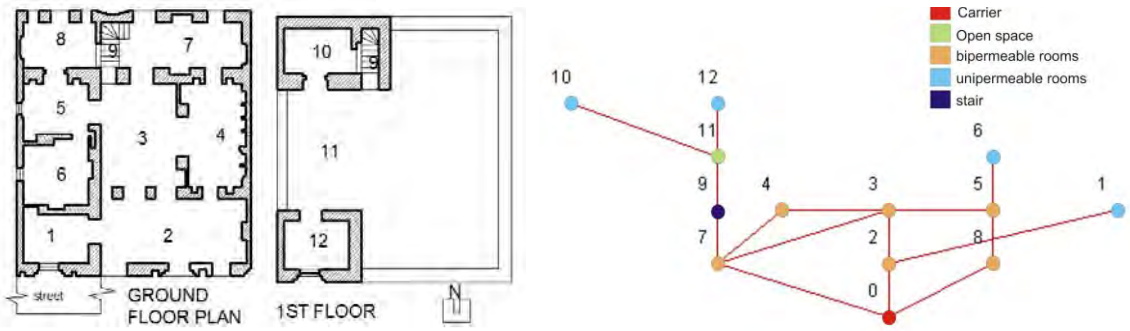


Fig-5.21: Plan and Justified Graph of Building no -31

5.2.3.4 General Discussion of Consolidated type of Buildings:

From above analysis, it is seen that, though corridors are important means of circulation in consolidated type of buildings, but the number of corridors doesn't influence the integration pattern of the systems, because in all cases of these sub groups based on corridors, either the front room next to Panam street or the rear rooms which also linked to the exterior poses the highest integration value. The number of corridors has some influence over the ringiness of the configuration; still there are other factors that had determined the spatial organizations of these buildings. Such as-

- Among the configurations of these three sub-classes, some have their front room as the most integrated space in the system. As the front part is the more formal part of the building it can be said that the inhabitant-inhabitant and visitor-inhabitant relationship in the rear block was more informal in respect to Panam Street. That is probably through a secondary entry or by the sharing backyard facility. However both the peripheral rooms, those opens to the exterior, have strong control over their neighbouring spaces. On the other hand, in almost all the cases, the uni-permeable and bi-permeable rooms in the central part of these systems have a tendency of segregation which is directly opposite to the model of centrally integrated systems which are also available in Panam in 'Double heighted hall type' and 'Court yard type' buildings.

- The social interpretation of integration is to incorporating the major activities of a system. The most integrated spaces therefore can be expected to hold the most important function or circulation of these configurations. As in consolidated type of houses, the bi-permeable rooms in the front and the rear part of the building which has a direst linkage with the outdoor and which were obviously functional spaces rather than transitional space, are most integrated parts of the system. Therefore it can be said that the functions, whatever they are, that the front and the rear rooms hold are the reason behind the particular genotypes.

- Again, it is obvious that the formal visitors and strangers are expected to enter the systems from Panam Street through the front room. From this point of view, the integrated front rooms surely have such functional use that incorporates the outsiders in more formal way from Panam Street. That is there must be a functional need to visitor-inhabitant interface. Furthermore, these spaces have high control values above 1 which indicates that, though these spaces incorporate the visitors frequently, still they had the authority and choice to control the accessibility of the formal visitors in the interior of the configuration. On the other hand, the integrated rear block indicates the more informal way of visitors-inhabitants interface. This room again has strong control as well as the front room.

- In all sub-classes the central block of the system remained segregated. Theoretically, the shallow graphs will tend to be configurationally more integrated (Hanson, 1998: 27). But in case of Panam there are several shallow ringy trees have segregating tendency.

- The enclosed small uni-permeable cells in the central part of many of the consolidated houses are terminal spaces, which are not the end points of the justified graph but are linked to the rest of the complex by only one entrance. Such spaces only accommodate movement to and from themselves. So it is in their nature that they are intended mainly for static occupations, ether by people or things (Hanson, 1998:173). As the enclosed central rooms in consolidated type buildings are not apparently habitable by their physical property and size, therefore these spaces most probably had accommodated goods rather accommodating people. So, it can be said that, situated in the physical center of a shallow distributed system, these central enclosed chambers, still remaining non-distributed and segregated, were probably used as the store for valuable goods. These non distributed uni-permeable chambers were surrounded by distributed systems. Therefore these central non-distributed uni-permeable spaces were built to serve some kind of purpose which needs insulation from everyday transaction as well as immediate surroundings. To achieve this it must be unlinked as far possible from the surrounding spatial system (Hillier & Hanson, 1984:159). The syntactic values of these spaces express this requirement. These non-distributed uni-permeable spaces in the center of the consolidated type of buildings have the lowest integration value and remained strongly segregated.

5.3 General analysis of the Buildings of Panam Nagar:

If we put the integration order of the convex spaces of all the samples, we can compare the integration value of different spaces of each building.

- In Double Heighted Hall and Courtyard type buildings the Transitional spaces around the hall or the court in the middle block as well as the front block remained integrated and the rear block always remained segregated. On the other hand, the consolidated type buildings are mostly integrated in the frontal block and the rear block of the building and segregated in the middle block.

- All the buildings are distributed among more than one internal and external ring that show their tendency towards diffusion of spatial control. Other than the small uni-permeable enclosed cells and the non distributed vertical circulation, the spaces are found distributed in ether internal or external rings in almost all the buildings. Ringy complexes usually support social situations where the dominant interface in the dwelling is between an individual host and

his guests or between some group of residents in the house and their visitors (Hanson, 1998:278). Therefore, the outsiders or visitors were very dominant part in these strongly distributed ringy systems of the houses of Panam.

- In central hall and central courtyard type houses, the court and the hall both have transitional space around them through which the frontal block and the rear block are connected. In both typologies, these transitional spaces in the center of the configuration are strongly integrated. The hall and court are also integrated spaces, but the difference between the hall and the court is that, the hall posses a strong control over its neighbouring spaces where the court has a very weak control over its adjacent spaces. This difference in the choice of permeability made the court and the hall syntactically two different kinds of spaces despite their physical similarity.

- In all typology the systems remained as non corresponding system[15] where the system depends on weak rules, weaker boundaries and lack of spatial hierarchy (Hillier & Hanson, 1984:141-142). The systems tend to encourage the encounter between social groups and within groups; whether the integration is high in the front room, in the rear room or in the transitional space. Most of the systems has released in spatial solidarity[16] and some in transpatial solidarity[17] in the central part of the configuration.

- In case of consolidated type of buildings, the external rooms directly approached from the outdoor remained strongly integrated. The front rooms in consolidated type buildings which can be directly approached from Panam Street are strongly integrated as well as have strong control. Though the transitional corridors remained as integrated spaces, but unlike the buildings with courtyard and hall, these transitional corridors in consolidated type buildings have very weak control value. The permeability of these spaces was rather controlled by the adjacent front or rear room connecting the outdoor. The rest of the central block remained segregated and sometimes non-distributed.

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[15] A system which does not need strong control, strong boundary and internal hierarchy of spaces. It must seek to maximize local encounters regardless of labels and global encounters regardless of spatial group.

[16] A spatial solidarity builds link with other members of the group by contiguity and encounter. It stresses not the separation of the interior but the continuity of the interior and the exterior. Movement across boundary is the fundamental condition of for existence of spatial solidarity. In a spatial solidarity, the weakening of boundary is associated with the weaker structure of the interior (Hillier & Hanson, 1984:145)

[17] A transpatial system is a class of spatially independent but comparable entities which has global affiliations, not by virtue of proximity but by analogy and differences. Solidarity will be transpatial to the extent that it develops a strong and more homogenous interior structuring of space and emphasizes the discreteness of the interior by strong control of boundary (Hillier & Hanson, 1984: 145).

5.4 Classification of Buildings on Syntactic Properties:

The house by house review of the taken case suggests that, there is evidence of at least two underlying spatial functional genotypes in terms of more or less standard way of constructing the house and arranging its rooms. Here 'genotype' is defined in terms of some sets of underlying relational and configurational consistencies which shows themselves under different 'phenotypical' arrangements (Hanson, 1998:99). From justified graph analysis of the samples taken, a classification can be made for these houses of Panam Nagar. The house by house review suggested a dominant type based on the existence of central hall or courtyard with the four dominant properties of space syntax analysis of being **'Shallow**', '**Most Integrating**', **'Lying on all Rings'** and **'Linking or Separating Functional Spaces in the Interior'**.

Disregarding those buildings which are too small and atypical, we have five possible cases of the dominant '**Courtyard'** and **'Hall'** genotype and eleven cases of **'Consolidated Type'** with different syntactic properties. Two opposite characters in spatial organization is found in these cases. They appear to be of two distinct spatial-functional tendencies, each of which expresses itself through several different configurations of spaces. Therefore these buildings had certain distinct genotypical tendencies.

i. To Integrate the Functional Spaces with the Central Part.

ii. To Segregated the Spaces with the Central Part.

All the buildings having courtyard and halls have the tendency to integrate most of the functional space with the central transitional space. In this type, the court or the hall remain in the center of all the rings that links the internal spaces and the exterior of the building. The highest integration value remains in one of the transitional spaces adjacent to the court or the hall. These spaces have strong control on their neighbouring spaces as well. The court and the hall is permeable from most of the part of ground floor as well as from outside of the building and visible from the corridors of the first floor over the court or the hall. In these types of buildings, the small segregated rooms in the center of the building are not seen. Rather they are seen in the rear part of the building. This genotypical pattern creates strong spatial differences among internal spaces, incorporates the exterior into its pattern of strong integration in the central spaces.

On the other hand, buildings without a central courtyard or hall have a tendency to segregate the internal spaces into parts. But there are variations in the spatial layout of this kind of buildings. Among all the buildings some have their central spaces most segregated and non-distributed. Their permeability was strongly controlled by the adjacent rooms from where these spaces could be accessed. Others have their central spaces in sequence of two or three bi-

permeable rooms. In all cases, these spaces either distributed or non-distributed, have the lowest integration value as well as the lowest control value. The highest integration remains in the front or rear rooms that are one or two steps away from the exterior. These rooms also have the highest control value. In this type of buildings more internal segregation is found among functional spaces. It separates certain functions more clearly from outside and has a less integrated exterior. These genotypes do not appear to be correlated either with size or with the overall geometry of the building.

From above analysis, apart from Asiatic Society, a classification of house forms can be derived in the context of Panam Nagar. The houses can be divided into two genotypes-

i. The buildings with integrated central space.

ii. The buildings with segregated central space.

In the buildings with integrated central spaces, the central space visually, physically and syntactically integrates the total complex. On the other hand the houses with segregated the central spaces have a tendency to segregate the total complex. The visual segregation is clearly found. Spatial segregation has been done by the negative spatial quality, scale and proportion of the corridors along with the small rooms in the center of the buildings.

5.5 Conclusion:

Domestic interiors have strong boundary of control and certain spatial hierarchy. At the interior of the dwelling, control of territory within the house occurs differently in the private areas and in the intimate areas (Hanson, 1998). Whereas the shared private areas are controlled by the group in a general way, and temporarily by individuals. The intimate areas are controlled by individuals, some spaces temporarily (bathrooms), others exclusively (bedrooms). The structure of the house contributes to the demarcation of the household as a private community, and to the development of community cohesion and individual territory and the pattern of informal relations between people, spaces and time (Robinson, 2001).

But the buildings of Panam this intimate boundary of spaces are almost absent. From the Space Syntax analysis of the buildings of Panam several significant characters can be identified which are very unique in comparison to the definition of domestic interiors. Such as:

1. Strongly integrated front room which lacks privacy but at the same time posses the highest control in the distributed system which again confirms the choice of permeability of the outsider in the internal spaces.

2. Deliberate distribution of internal spaces with the outdoor in more than one ring which again lacks privacy.

3. Non-habitable, uni-permeable and segregated cells in the center of the configuration which probably were used as the store of valuable goods.

4. Double Heighted Hall and its adjacent uni-permeable cell which characterizes a temple rather a residence.

5. Weak boundary between interior and exterior spaces etc.

Therefore, the previous idea related to the buildings of Panam being residential is now questionable referring to the general concept of dwelling. The spatial configuration of house layouts may be different in different periods, regions, cultures, and societies. Societies establish order in their livelihood spaces and reflect their personalities in these spaces. There is a mutual relationship between space and human relations. The differences in social systems reveal morphological diversity in house layouts (Robinson, 2001). From this point of view, a comparative analysis need to be done among the house form of Dhaka and the house form of Panam to have a better understanding of the buildings of Panam.

Chapter-06

Comparative Spatial Analysis of the House Form of Dhaka and Panam Nagar

6.1 Introduction:

Houses everywhere serve the same basic needs of living, cooking and eating, entertaining, bathing, sleeping, storing etc. but a glance at the architectural record reveals an astonishing variety in the ways in which these activities are accommodated in the houses of different historical periods and cultures. The important thing about a house is not that it is a list of activities or rooms but that it is a pattern of space, governed by intricate conventions about what spaces there are, how they are connected together and sequenced, which activities go together and which are separated out, how the interior is decorated, and even what kind of household objects should be in different parts of the home (Hanson,1998:2).

From the physical analysis in chapter three and four it is found that the plot distribution of Panam Nagar is quite similar to the business streets of Dhaka. As there is no evidence such mature settlement is found in the peripheral areas of Panam and as Dhaka had been developing for four hundred years with great maturity, in the same region, it is conjectured that the houses of Panam might have some similarities with the houses of Dhaka.

Apparently the courtyards, halls and spaces around the courtyard and double heighted hall look alike with the introverted enclosed courtyard type houses of Dhaka. However the prevailing literatures never attempted to compare the house forms of these indigenous settlements of Dhaka with the house forms of Panam Nagar. Again the location of a 'Company ka Kuthi'(Fig-2.4) in the closest periphery of Panam refers to the probability of colonial influences over these buildings. Therefore it is very necessary to compare the houses of Panam to the house forms of Dhaka to find out the genotypes of these buildings. From this understanding this chapter will examine the buildings of Panam in comparison to the house forms of Dhaka until colonial period to find out how much similar they are to each other.

6.2 House Form of Dhaka:

Literature review shows that, until the end of colonial realm, two significant typology of house forms-'**introverted**' and '**extroverted**' were seen in Dhaka.

The introverted type houses developed chronologically with the development of the business core of Dhaka city (Imamuddin, 1982; Haque, 1997). In the introverted houses of Dhaka, the courtyard was a mandatory functional space which played a very significant role in organizing spaces according to their hierarchy and provides light and ventilation to the deep interior of the house. The spatial organization of introverted types of houses varies widely with the change of the number of the court yard. From the analysis in chapter three it is found that, introverted

houses can be divided into two sub-groups-'Enclosed Courtyard Type' and 'Detached Type'. As the detached type of houses have no similarity with the physical layout of the compact buildings of Panam Nagar and the enclosed courtyard type of houses are rather similar to the house forms of Panam, this thesis will focus only on the enclosed courtyard types of houses of Dhaka. This chapter will therefore study and analyze four cases of introverted houses with different spatial organization and compare the cases with the previously studied cases of Panam to find out the genotypes of the houses of Panam.

Again, as the present settlement of Panam is dated back to 19th and early 20th century and as there were a number of references of conducting business with the East India Company by the inhabitants of Panam; the extroverted house forms derived by the British rulers are also need to be studied. Without the study of extroverted house forms, this research will be incomplete. Therefore this chapter will take two cases of extroverted houses of Dhaka and compare these cases with the cases of Panam Nagar. These cases have been selected randomly from different published and unpublished literatures which had been conducted on the house forms of Dhaka.

6.2.1. Case Study-1:

18, Bashi Chandra Lane, Tanti Bazar, Dhaka
Type: Introverted

The building was built in mid 19th century as a residential building. The ground floor of the building has a linear court in the rear part of the building which separated the living and service zones. From literature review it is found that, the front part of the building was used for commercial purpose and the rest of the building were used as residential purpose (Khan, 2013).

Space Syntax analysis shows that the building has a complex ringy tree and is seven steps deep from the root point that has been taken from outside. The transitional spaces remained strongly integrated. The highest integration is found in the corridor no 8(Fig-6.1&6.2) in ground floor. The integration value of this space is 1.43 (Table-6.1). This corridor has also the highest control value of 3 which means this corridor has strong control over its adjacent spaces. This corridor links the outdoor with the indoor spaces and is linked to almost all the spaces in the ground floor. Among the enclosed rooms, room no 9 (Fig-6.1) in the middle of the building acted as the transitional space between the indoor spaces and the rear court. As a result, it remained a strongly integrated space with a value of 1.22 (Table-6.1) in the configuration. The rest of the living and functional spaces of this configuration remained segregated.

The court in the rear part of the building can be directly approached from the exterior but it still remained segregated with an integration value of 0.86 (Table-6.1). Thus the court segregates

the living zone and the service zone both physically and syntactically. Therefore it can be said that in this case the court was used for domestic services and acted as light and ventilation shaft for the deep interior of the building.

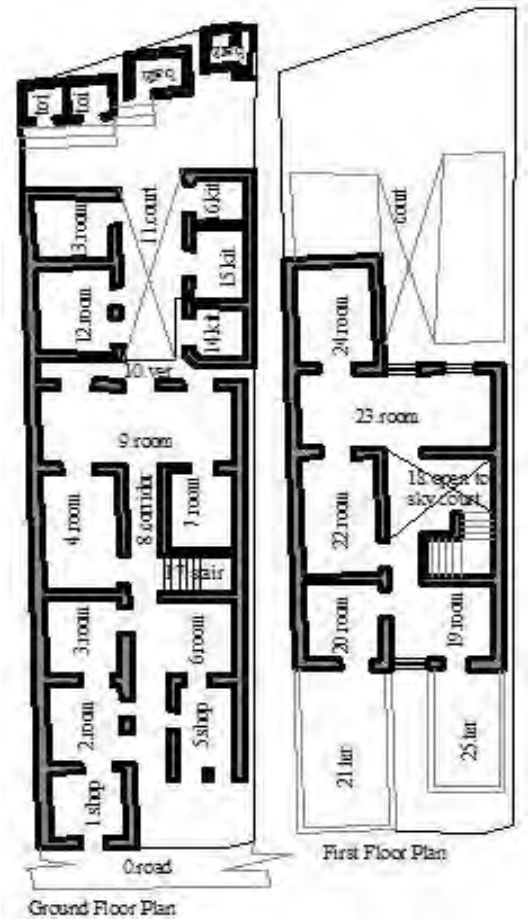

Fig-6.1: Plan of 18, Bashi Chandra Lane, Tanti Bazar
Source: Khan, 2013.

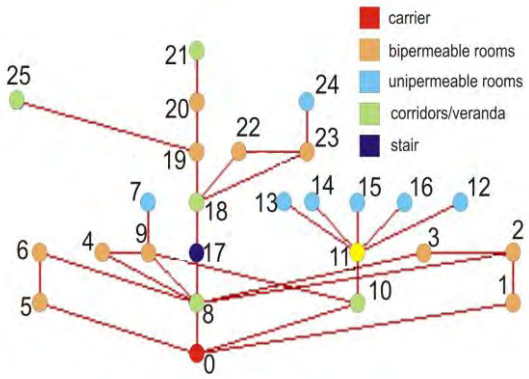

Fig-6.2: Justified Graph of 18 Bashi Chandra Sen Lane, Tanti Bazar, Dhaka.

Table-6.1: Syntactic Data of Spaces of 18, Banshi Chandra Lane

Space Name	Space no	Control Value	Depth	Mean Depth	Integration (1/RRA)
Carrier	0	1.5	0	3	1.25
Entry Corridor	8	3	1	2.64	1.43
Shop	1	0.6	1	3.72	0.86
	5	0.75	1	3.76	0.85
Courtyard	11	5.3	2	3.72	0.86
Transitional Spaces	10	0.67	1	3.16	1.1
	17(Stair)	0.4	2	3	1.2
	18(1st Floor Court)	1.7	3	3.36	1

Ground Floor Room	9	2	2	3	1.22

The transitional spaces are distributed with the outdoor in large external rings and the internal spaces are linked to each other by small rings. The rooms in the frontal part of ground floor are also distributed in external rings. But the internal spaces like kitchen and other rooms and the first floor spaces remained non-distributed with the outdoor. Rather they are distributed in small internal rings or remained non-distributed as uni-permeable cells.

In overall analysis it can be said that the transitional spaces in the middle part of the configuration remained as the integration core of this building. These transitional spaces determined the visitor-inhabitant relations with in this building. The living and functional spaces remained strongly segregated which ensures their privacy. The mean integration of the building is 0.8.

6.2.2 Case study-2

27, Kotwali, Tanti Bazar, Dhaka
Type: Introverted

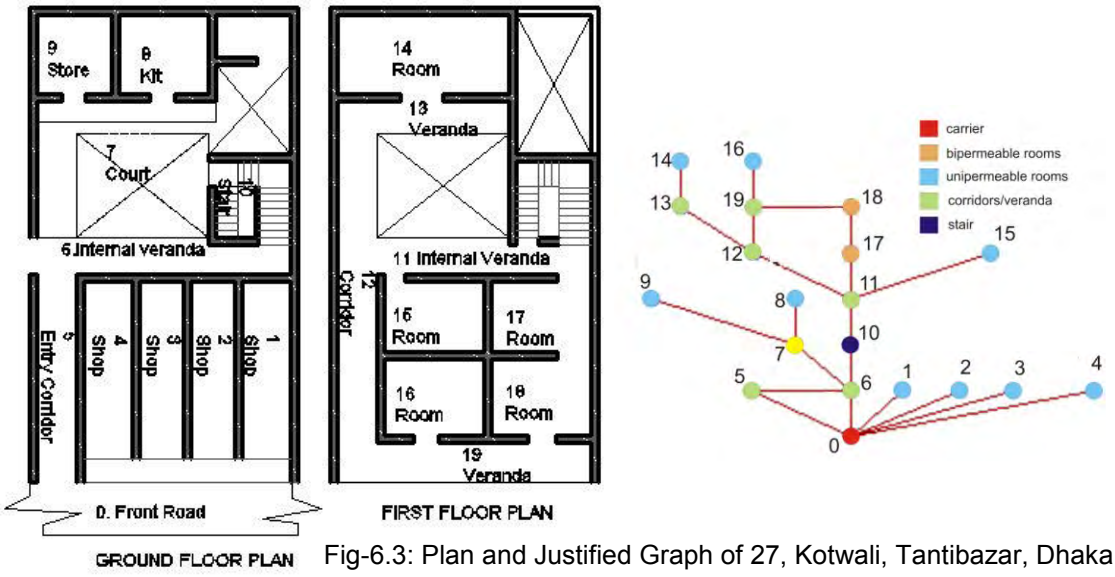

Fig-6.3: Plan and Justified Graph of 27, Kotwali, Tantibazar, Dhaka
Source: Khan, 2013

It is a mid 19th century building which has an enclosed court which separates the living and service zones of the building. The courtyard is placed in the middle part of the building separating the commercial and residential block of the house. It also segregates the functional and the living area of the building. The habitable rooms are placed in the first floor.

In space syntax analysis it is seen that the configuration is a moderately deep tree with six steps. The highest integration is found in the stair (space no-10) which is placed in the middle part of the configuration (Fig-6.3). It is two steps deep from the carrier and have a low control value of 0.5; but the integration value of the stair is 1.28 (Table-6.2). The court remained as a segregated space with an integration value of 0.87, still the transitional spaces around the court remained integrated (Table-6.2). It is such a character that is seen in the courtyard type houses of Panam. But unlike Panam, the transitional spaces in the first floor remained segregated along with the rest of the spaces in this configuration. Again, though the court is a segregated space in the configuration, still it poses a strong control value of 2.25 (Table-6.2) Thus being a segregated space, the court still strongly controls its neighbouring spaces which is again is not found in the buildings of Panam.

In spite of being in large external rings the spaces in this configuration is found distributed in small internal rings. It indicates the sharing of spaces among the inhabitants rather with the visitors.

In overall analysis it can be said that, the commercial and residential area of this building has been separated both physically and syntactically by a number of integrated transitional spaces. The commercial part of the building remained strongly segregated both locally and globally from the rest of the residential spaces of the building. Thus the integrated transitional spaces ensure the privacy of the domestic interior.

Table-6.2: Syntactic Data of 27, Kotwali, Tanti Bazar, Dhaka

Space Name	Space no	Control Value	Depth	Mean Depth	Integration(1/RRA)
Carrier	0	4.75	0	3.05	1
Entry Corridor	5	0.42	1	3.26	1
Shop	1	0.17	1	4	0.67
	2	0.17	1	4	0.67
	3	0.17	1	4	0.67
	4	0.17	1	4	0.67
Courtyard	7	2.25	2	3.31	0.87
Transitional Spaces	6	1.5	1	2.6	1.25
	10	0.5	2	2.58	1.28
	11	2.3	3	2.7	1.2
	12	1.1	4	3.16	0.94
	13	1.33	5	4	0.67
Living Spaces	15	0.25	4	3.6	0.77
	16	0.33	6	5	0.5
	17	0.75	4	3.42	0.83
	18	0.83	5	4	0.67

6.2.3 Case Study-3

64, Shankhari Bazar, Dhaka.
Type: Introverted

This building was built in late 18th century. It is a two storied building in the commercial street of Shankharibazar where a group of 'shell cutter' of same ethnic group lived. The front part of the building was used for commercial purpose (Haque, 1997:94). There is a small court in the middle of the building which is connected by a long and very narrow dark corridor. This corridor links almost all the spaces in the building in ground floor. The building is accessed through a number of interconnected corridors in ground floor. The upper floor consists of a series of rooms linked by the upper floor corridor. The first floor corridor is also partially open to the sky to bring light in the dark interior of the building.

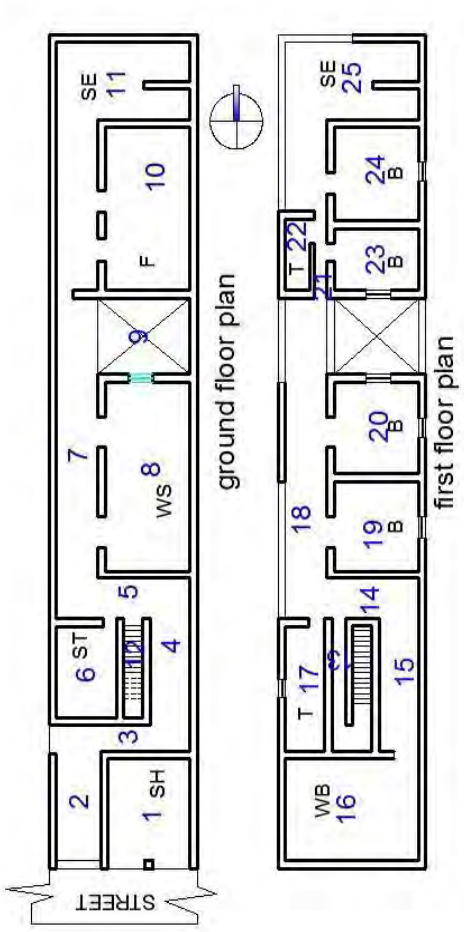

Fig-6.4: Floor Plan of 64, Shankhari Bazar.
Source: Haque, 1997

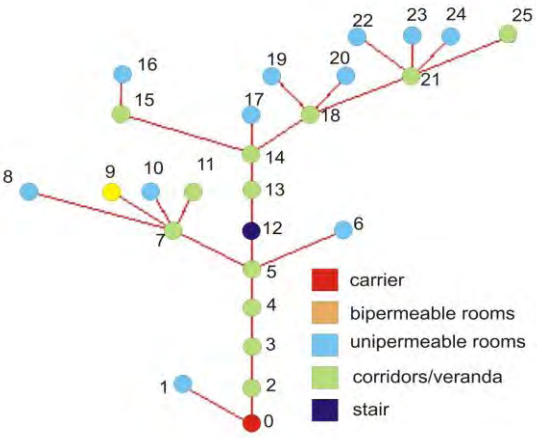

Fig-6.5: Justified Graph of 64, Shankhari Bazar.

In Space syntax analysis it is found that the building is a deep uni-linear sequence without any ringy property. The highest integration 1 (Annex-2) is found in the stair and the corridors adjacent to the stair. The rest of the spaces remained strongly segregated. The transitional spaces remained the only bi-permeable spaces in this configuration. The court is a uni-permeable space placed in the rear part of the building with a strong segregating value of 0.6 (Annex-2). This courtyard separates the living and service zone of the building. Here the court acted as the light well and ventilation shaft for the deep interior of the configuration. The commercial part of the building remained segregated in the shallower arm of the configuration.

6.2.4 Case Study-4

10, Bashi Chandra Sen Lane, Tanti Bazar, Dhaka
Type: Introverted

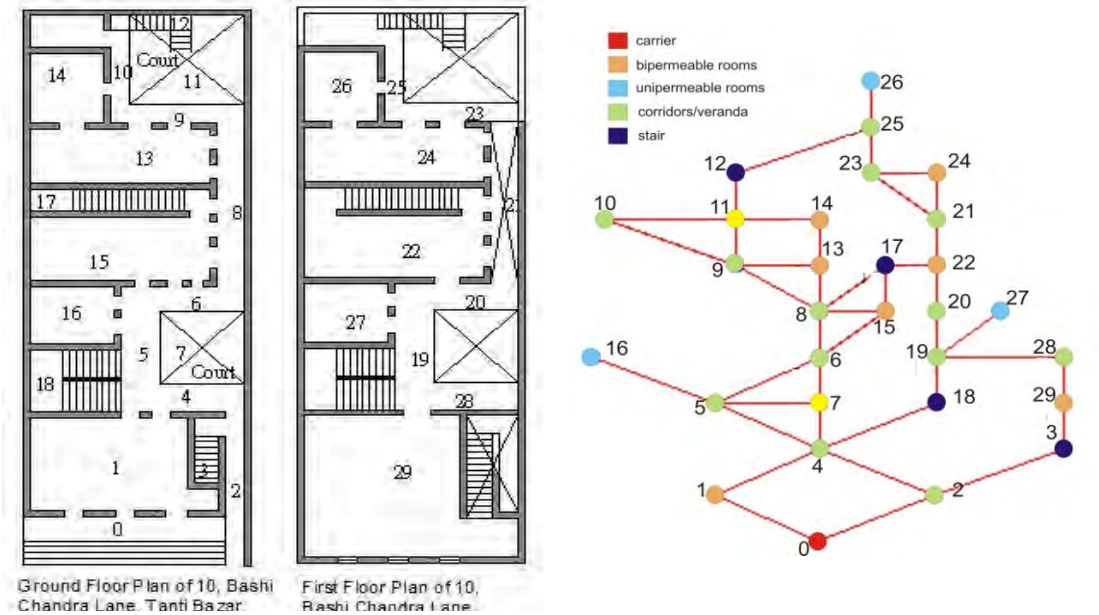

Fig-6.6: Plan & Justified Graph of 10 Basi Chandra Sen Lane, Tanti Bazar.
Source: Khan, 2013

This introverted type building has two courts. The pattern of spatial organization around the court is much similar to the courtyard type of houses of Panam. The highest integration (Rn) 1.2 (Table-6.3) is found in the ground floor transitional corridor (space no-8) that links the front court and the rear court. This corridor also has strong control value of 1.8 (Table-6.3). The front court has a weak control over its neighbouring space; on the other hand, the rear court though remained segregated have a strong control of 1.1 (Table-6.3). All the transitional spaces around the front court and front court itself are integrated. The living spaces in the central part of the

building are also remain integrated in the ground floor. But the rest of the spaces remained segregated.

The building is ten steps deep from the carrier which has been taken from the street. A large number of rings are seen in this building. Both the ground floor spaces and the first floor spaces are distributed in external rings. But the segregating nature of the functional and living spaces of the deep interior of the house encourage the inhabitants to go out more than to encourage the visitors to enter as the high permeability of the low integration areas seems geared to allowing the inhabitants out more than letting the strangers' in. The system as a whole is geared to the accessing, but at the same time to the control of strangers (Hillier & Hanson, 1984:122). Therefore the deep ringy tree of this house at the same time ensures the privacy of living and functional areas of the building from the visitors and gives the inhabitants the freedom to go out of the house.

Table-6.3: Syntactic Data of 10 Bashi Chandra Sen Lane, Tanti Bazar, Dhaka.

Space Name	Space no	Control Value	Depth	Mean Depth	Integration (1/RRA)
Carrier	0	0.83	0	5.27	0.6
Entry Corridor	2	1.7	1	4.38	0.75
Front Room	1	0.7	1	4.45	0.735
Front Court	7	0.7	3	3.5	1
Rear Court	11	1.1	7	4.17	0.8
Ground Floor Transitional Spaces	4	2	2	3.5	1
	5	1.8	3	3.45	1
	6	1.12	4	3.31	1.1
	8	1.5	5	3.14	1.2
	9	1.2	6	3.65	1
	10	1.1	7	4.34	0.76
First Floor Transitional Spaces	19	2.5	4	3.62	1
	20	0.6	5	3.5	1
	21	1.17	7	4	0.87
	23	1.17	8	4.45	0.75
	25	1.8	9	4.72	0.67
	28	0.75	4	4.34	0.76
Stair/Vertical Circulation	3	0.33	2	5.34	0.67
	12	0.67	8	4.6	0.7
	17	0.87	6	3.34	1
	18	0.45	3	3.72	1
Bi-Permeable Rooms	13	1	6	4	0.9
	14	0.67	7	4.5	0.71
	15	0.8	5	3.4	1
	22	1.2	6	3.3	1.1
	24	0.67	8	4.65	0.71
	26	0.33	10	5.7	0.5
	29	1	3	5	0.65

Uni-Permeable Rooms	16	0.25	4	4.4	0.77
	27	0.25	5	4.5	0.71

6.2.5 General Syntactic Properties of Introverted Houses:

Though the physical layouts of introverted houses vary case to case, but several common syntactic properties are found in the above case studies. They are-

i. The highest integration remains in the transitional spaces in the middle part of the building. The transitional spaces around the courtyard remain strongly integrated in introverted houses when the court is situated in the central part of the configuration but when it is placed in the rear part the court and transitional spaces around the court remained segregated. In case study-4, the front court which is situated in the middle part of the house remained integrated with the value **1** but the rear court remained segregated with integration value **0.8**. Similar examples are seen in other cases. In all cases most of the living and service spaces remained strongly segregated.

ii. Most of the courts in these case studies have weak control over their neighbouring spaces. However, the transitional spaces in the middle part of the building posses strong control as well. In case study-1 and case study-3, the courts remained segregated and have weak control over their neighbouring spaces. But the transitional spaces in the middle part of these building always have strong control over their neighbouring spaces.

iii. As in most of the cases the existence of a secondary entry is found in the rear part of the introverted houses, the ground floor spaces especially the transitional spaces are distributed in external rings. But the living spaces like bed rooms remain non-distributed from the ring.

iv. In over all analysis it can be said that in introverted houses the transitional spaces always remained as the integration core of the configuration and the living service spaces always remained segregated whether they are in the shallower arm or in the deeper arm of the justified graph.

6.2.6 Case Study-5

House of Debendra Mohan Das, Nawab Street, Warri
Type: Composite Bungalow Type extroverted house.

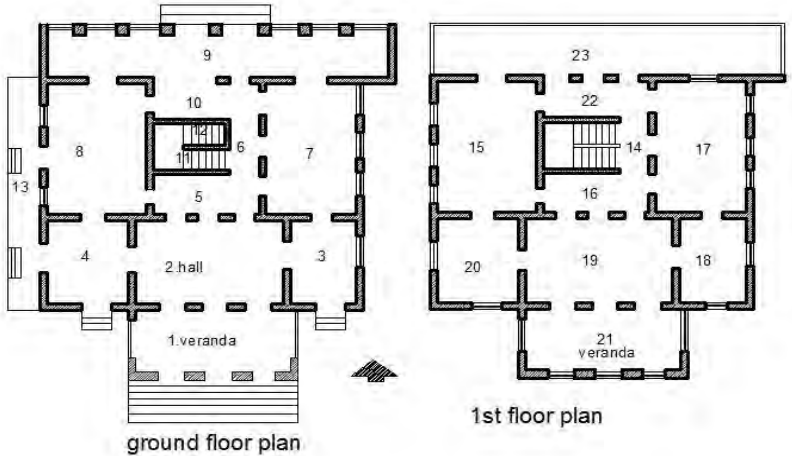

Fig-6.7: Plan of the House of Debendra Mohan Das
Source: Khan, 1999

This is an early 20th century two storied extroverted bungalow type house in a spacious compound. The service zone is separated from the main building block. The living block of the building is formally approached by a shaded veranda or logia. All the spaces of this configuration are bi-permeable. The staircase is situated in the central of the configuration which is surrounded by continuous transitional spaces which connects all the living and functional spaces in the configuration. The service block is linked to the main building block by a shaded veranda in the rear part of the building. The upper floor is consists of several interconnected bed rooms which can be approached from the transitional space in the center of the configuration. No particular segregation of male and female domain is found in this building. Rather the segregation between master and servant is extreme in entire complex.

6.2.7 Case Study-6

House of Engr. Gulzar Ahmed, Dhaka

Type: Consolidated Extroverted House:

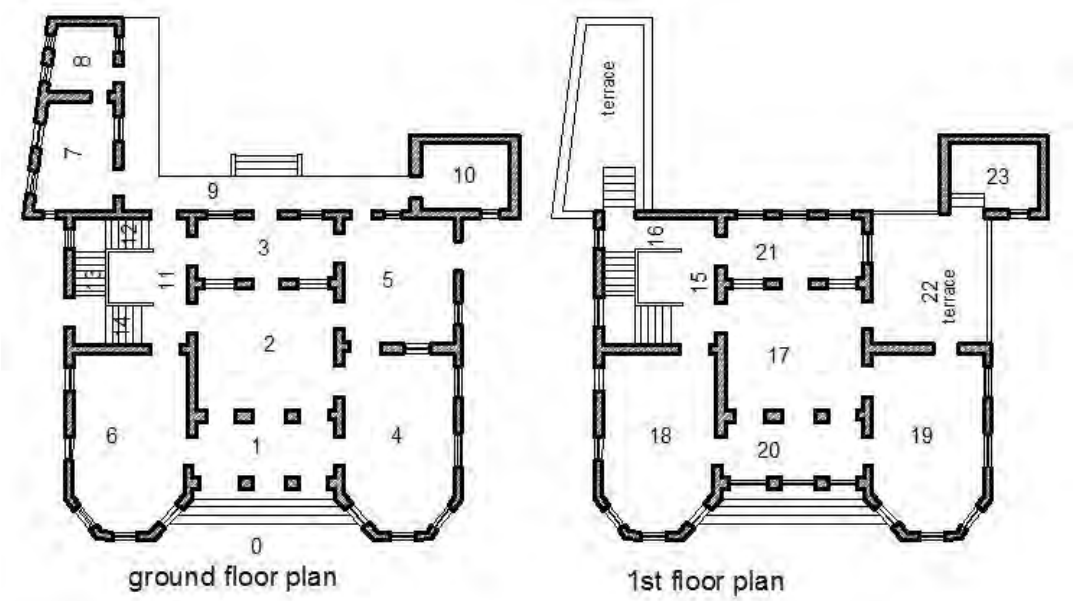

Fig-6.8: Plan of the House of Gulzar Ahmed
Source: Khan, 1999

This is a two storied building of early 20th century having its service area outside but adjacent to the main living area. The lavatory and bathing places (space no-10 & 23) are with the main living area which is comparatively modern concept. The service block consists of the kitchen and the servant's room (space no-7&8) in it. All the formal and family functions are distributed around the hall room (space no-2) which is used as the formal living of the building. The first floor has three rooms which are used as bed rooms. The dining (space no-5) and the formal living are connected to the service area by a continuous shaded veranda. The servants used this veranda to provide all the service to the main building.

6.2.8 Syntactic Analysis of Extroverted House:

- These two cases of extroverted houses have similar syntactic properties. The graphs show extremely ringy tree with deep interior. But unlike the introverted type, the rings are internally distributed in main building block. The service area is linked to the exterior but is not a part of the internal rings. In case study 5, the service area is separated from the main living block of the masters. Though in case study-6 the service area is physically arranged with the main living block, still it is separated syntactically with transitional spaces and as uni-permeable sells. Both the configurations are nine steps deep from the carrier (Fig-6.9 & 6.10). The mean integration of case study-5 is 0.71 and case study-6 is 0.7.

- In both cases, all the spaces of the main living quarter are bipermeable and are separately distributed into different intersecting rings which indicate that, though the complex is

strongly segregated from outdoor and the service area, but the internal spaces are easily permeable for the members of the family and the ground floor has comparatively more encouraging environment for the visitors along with the members of the family.

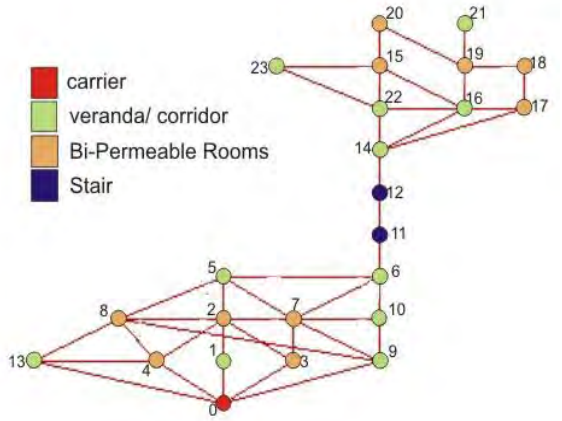

Fig-6.9: Justified Graph of Case Study-5

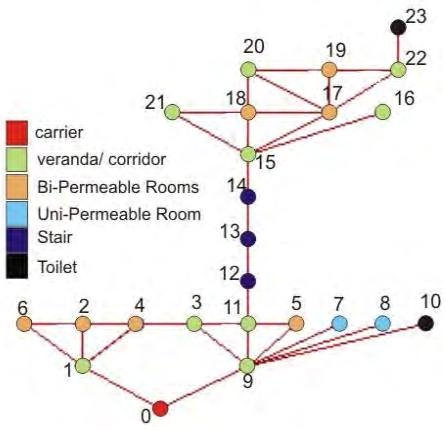

Fig-6.10: Justified Graph of Case Study-6

From the table-6.4 it is found that, other than a few transitional spaces in ground floor all the spaces are strongly segregated in case study-5 with a strong control over their neighbouring spaces except only those rooms which were probably used as bed rooms. In case study-6(Fig-6.8) the central transitional spaces are integrated and the rest of the spaces remained segregated. The highest integration 1.03(Table-6.4) in case study 5 is found in space no 6 which is a transitional space that links the ground and first floor. In case study 6 the highest integration(Rn) 1(Table-6.5) is also found in central transitional spaces (space no-11 and the stair). Hence it is seen that, in both type of extroverted house form the transitional spaces around the vertical circulation remained integrated. The other living and functional spaces remained segregated with low integration value as well as control value.

Table-6.4: Syntactic Data of House of Debendra Mohan Das (Case Study-5)

Space Name	Space No	Control Value	Depth	Mean Depth	Integration (1/RRA)
Carrier	0	1.67	0	4.565	0.625
Transitional Spaces	1	0.45	1	4.8	0.6
	5	0.9	3	3.52	0.9
	6	1.2	3	3.17	1.03
	9	0.85	1	4.04	0.74
	10	0.9	2	3.565	0.87
	11	0.75	4	3.17	1
	12	0.75	5	3.26	1
	14	1.25	6	3.43	0.93
	16	1	7	4	0.77
	22	1.25	7	4.04	0.74

Bi-Permeable Rooms	2	1.33	2	4.09	0.73
	3	0.65	1	4.08	0.73
	4	1	1	4.6	0.625
	7	1.33	2	3.565	0.88
	8	1.33	2	4.04	0.74
	15	1.5	8	4.6	0.625
	17	1.25	7	4	0.75
	18	0.5	8	4.7	0.61
	19	2.25	8	4.61	0.625
	20	0.5	9	5.3	0.53

Table-6.5: Syntactic Data of House of Gulzar Ahmed(Case Study-6)

Space Name	Space No	Control Value	Depth	Mean Depth	Integration (1/RRA)
Carrier	0	0.4	0	4.3	0.67
Transitional Spaces	1	1.53	1	4.35	0.67
	3	0.8	2	3.7	0.83
	9	4.2	1	3.56	0.88
	11	1.6	2	3.17	1
	12	0.7	3	3.17	1
	13	1	4	3.26	1
	14	0.7	5	3.43	0.91
	15	2.7	6	3.7	0.83
	20	1.03	8	5.1	0.55
Bi-Permeable Rooms	2	1.3	2	3.8	0.81
	4	0.7	2	4.4	0.67
	5	0.93	2	4.26	0.7
	6	0.45	2	4	0.76
	17	1.7	7	4.26	0.7
	18	0.53	7	4.5	0.64
	19	0.87	8	5.04	0.55
Uni-Permeable Rooms	7	0.14	2	4.5	0.64
	8	0.14	2	4.5	0.64

6.3 Comparative Analysis of Panam Houses and the House form of Dhaka:

Several significant syntactic properties have been identified in the house form of Dhaka, which are not found in the buildings of Panam. Such as-

1. In both introverted and extroverted type of houses the highest integration value remains on the central transitional spaces. In Panam buildings the highest integration varies between typologies. In the houses with integrated central space (Courtyard and Hall type) of Panam, the strong integration is found in the spaces around the double heighted hall and the enclosed courtyard. But in the buildings with segregated central spaces (Consolidated Type) the central spaces of the configuration remained strongly segregated.

2. In the 'buildings with integrated central spaces' of Panam, the double heighted hall type buildings poses certain unique characteristics that is very uncommon in the cases of Dhaka. In

these buildings, the double heighted halls remained strongly integrated as well as have strong control over their neighbouring spaces. In prevailing type of house form of Dhaka, there are no evidence of such space is found, however, these halls are much similar in physical layout to the introverted houses with enclosed court yard where the courtyard is situated in the center of the configuration. But the syntactic properties of the hall are quite different from the courts of introverted houses of Dhaka. These buildings with double heighted hall have their highest integration in one of the transitional spaces around the hall. Moreover, other than the uni-permeable cells, almost all the spaces of Panam houses are distributed both internally and externally in one or another ring which is also an uncommon character in the house forms of Dhaka. In the residential buildings of Dhaka, other than transitional spaces, very few spaces are distributed with the exterior. Being in the physical center as well as in the syntactic center, the hall remains integrated and strongly controls its neighbouring spaces. This is again not found in the courtyards of the introverted houses of Dhaka that has been studied in this thesis. Therefore the hall cannot be syntactically termed as the covered courtyard of these houses.

3. In residential buildings, large rings, that incorporate the exterior, intend literally to turn the inside out and integrate the system with the exterior (Hanson, 1998:280). In the house forms of Dhaka, different kinds of spatial distribution has been observed in the studied cases. In almost all the cases of introverted types of houses the outdoor is distributed with the indoor spaces with at least one large ring. But this ring almost always carries the transitional spaces while the living spaces remained in uni-linear sequence[18]. Thus ensuring the privacy of the living zones of the building. On the other hand, in the studied cases of extroverted houses, almost all the spaces are distributed in small intersecting internal rings but do not link the exterior. The exterior and the service area have been strongly segregated from the main living zone of these buildings. In Panam, the highly ringy complexes incorporated the exterior spaces within the building interior in more than one ring which made the configurations shallower and reduces privacy in the interiors. This is also a very uncommon character of a domestic interior in the prevailing type of the house form of Dhaka.

4. Again, in 'houses with integrated central space' of Panam, the buildings with enclosed courtyard are physically similar to the introverted enclosed courtyard type houses of Dhaka. These buildings also have some syntactic properties which are similar to the introverted enclosed courtyard type of houses of Dhaka. Such as, strong control in central transitional

[18] Uni-linear sequence is such a series of bi-permeable spaces which are linked to their next space but does not form any ring and thus ends in a terminal uni-permeable space.

spaces, comparatively weaker control in the courtyard; highest integration in the central transitional spaces etc. In both cases of courtyard type buildings of Panam, Building no 33 and 34, all the transitional spaces in the central part of the configuration remained strongly integrated. This is a significant character of the introverted house form of Dhaka that has been found from the studied cases in this research. But, the frontal block of building no 33 and 34 are also integrated spaces. More over these spaces also have a strong control over their adjacent space. In building no 34 of Panam, the highest integration is found in the front room(table-5.8). Hence, this special character of the buildings of Panam is a very uncommon in introverted houses as well as in extroverted houses of Dhaka that has been analyzed in this research.

5. Like introverted house of Dhaka, court plays the role of integrating or segregating different types of spaces in the configuration and acted as a breathing space in the buildings of Panam. From physical and syntactic analysis therefore it can be said that the courtyard type houses of Panam have some similarity with the introverted enclosed courtyard type houses where the court is placed in the central part of the introverted buildings.

6. Therefore it can be said that, in the typology of 'integrated central spaced buildings', those buildings which have courtyard in the middle of the configuration have some common syntactic properties with both the introverted and the extroverted houses of Dhaka. Therefore they might have some residential properties, but those buildings with double heighted halls are quite different in comparison to the house form of Dhaka both physically and syntactically. The hall is clearly visible from almost all the neighbouring spaces in both ground and first floor. It is one or two steps away from Panam Street and can be easily permeable from the outdoor. Almost all the spaces of this type of buildings are linked to the outdoor with more than one external ring. The hall is situated in the locus of different intersecting rings which carries almost all the spaces of the configuration. Thus not only the hall but the other spaces are also easily permeable for the outsiders in double heighted hall type buildings. Though the central transitional spaces remain strongly integrated in these buildings like the house forms of Dhaka, the strong visibility, easy permeability and strong integration and control of the hall are not found in the prevailing house form of Dhaka. Moreover the segregated uni-permeable cell coupled with the strongly integrated hall remained as the unique characteristic of this type of building which is never found in any types of house form of Dhaka.

7. From literature review it is found that, the prevailing houses of Dhaka had strong boundary, spatial hierarchy and distinguished pattern, which is also absent in both types of buildings of Panam with 'i**ntegrated central space**' and '**segregated central space**'. In the buildings with 'integrated central spaces', the spaces within the buildings are neither purely bounded nor purely continuous, especially in those buildings with double heighted hall. In

buildings with segregated central spaces the formal zone of the building is strongly integrated and the central part of the building is segregated.

8. Though there are some buildings which have significant boundary of the property, but most of the buildings have very trivial boundary. Different literature ensured that the buildings shared backyard facilities. Shared use of ponds and services is also found in Panam. This is also an uncommon character in the prevailing house forms of Dhaka. Common service facilities are seen in those buildings which are used by a large number of people. In residential buildings this type of common service is not very popular among the inhabitants.

9. Buildings with segregated central spaces are completely different from any prevailing typology of Dhaka. These are the buildings that have highest integration value in the frontal rooms adjacent to the Panam Street which probably incorporated the visitors in the most integrated space of the configuration. It is a very uncommon character in the prevailing types of houses of Dhaka. Moreover, the highest segregation in the physical center of the configuration is also an uncommon character in the house forms of Dhaka. When the center of the house is segregated from the system it surely contains some very important space which needs isolation as well as protection. In the '**buildings with segregated central spaces**' these segregated cells must have been used for such a function which needs isolation. The strongly integrated peripheral room with a strongly segregated middle block made this type of buildings very uncommon in the house forms of Dhaka.

10. In the residential houses of Dhaka, the upper floor spaces always remained as the private part of the house and non-distributed from the ground floor spaces in all of the cases. The spaces which are connected to the exterior never connects the private part of the building directly. Rather the integrated transitional spaces link the private zones with the public zones of the building. But in most of the buildings of Panam the privacy in the internal spaces are minimized by distributed external rings. In almost all the buildings of Panam, except few exceptions, the front room which can be directly approached from the street is directly linked to the upper floor. Moreover, there are some examples where the upper floor spaces are distributed with the outdoor which is again not a residential property. Therefore the upper floor cannot be classified as a private space of these buildings. In other words, the privacy seems to be absent in the buildings of Panam which once again is not a character of residential type of houses of Dhaka.

11. In several buildings of Panam all the spaces are found distributed with the outdoor. It is also a very uncommon character in the residential type of houses of Dhaka. Distributedness

encourages permeability and makes the space shallow to the system which results in the lack of privacy. In almost all the cases, the absence of privacy is seen in Panam buildings.

6.4 Conclusion:

The comparative analysis of the houses of Panam with the house forms of Dhaka indicates towards some definite assumptions. Such as-

a. In spatial order, Panam buildings cannot be positioned entirely in any category of the prevailing house forms of Dhaka. Though some syntactic property of introverted enclosed type and also extroverted type are similar to the genotypes with integrated central spaces, still further extensive study in a broader scale needs to be executed to prove the hypothesis.

b. In courtyard type buildings with integrated central spaces, the courtyard and the transitional spaces around the court much similar to the introverted houses of Dhaka. But the double heighted hall doesn't have this similarity. Though in double heighted hall type buildings the central transitional spaces remained integrated. Therefore it can be said that, the buildings with integrated central spaces might have some similarity with the house forms of Dhaka. But the buildings with segregated central spaces are very unusual in comparison to the prevailing type of houses of Dhaka. These buildings do not facade any similarity to any types of house forms of Dhaka. Both the physical and syntactic analysis show that, these buildings with segregated central spaces of Panam possessed unique characters which are not found in the studied cases of the house forms of Dhaka.

c. Therefore it can be said that, buildings with segregated central spaces are completely different from any prevailing typology of house forms of Dhaka. The syntactic values of these buildings remain completely different from those of the prevailing type of houses of Dhaka. Space syntax analysis shows that, these seem to be a very uncommon type among the residential buildings of Dhaka. The integrated front room, extensively ringy shallow complex, the strongly segregated central spaces and lack of privacy and boundary of area are not found in the studied cases of the house forms of Dhaka. Therefore it is quite possible that these buildings of Panam Nagar with segregated central spaces probably were not being used for residential purpose. As this particular type of buildings does not possess any residential characteristics, rather they probably had only commercial use which had easy access for formal visitors who approached from Panam Street as well as for the informal visitors from the rear part of the building.

From above discussions it can be said that, buildings with integrated central spaces especially those buildings with the courtyard might had some similarity with the house forms of Dhaka and

therefore might had been used for living purpose. But the shallow ringy complexes of ‘double heighted hall type’ and ‘segregated central space type’ buildings are probably were not used for residential purpose as they have a very less residential quality. The consolidated buildings of Panam with ‘segregated central spaces’ are a unique type of built form which has not been found in any previous study of the house form of Dhaka.

Again, this thesis had undertaken only six cases of different types of house forms of Dhaka. So it is still unknown whether there are any genotypes found among the secular houses of Dhaka which had not been listed in the literatures that had been surveyed in this thesis. So extensive study in a broader scale is needed to prove the hypothesis and find out the genotypes of the built forms of Panam Nagar.

Chapter 07
Conclusion

7.1 Introduction:

This research has been focused on the morphological pattern of spaces within the buildings of Panam Nagar which remained unexplained throughout the history of Bengal. Besides having historic importance the built forms of Panam Nagar have some generic qualities which made these buildings unique. The spatial pattern of these buildings must have some strong social logic that represents the traditional as well as historical articulation of spaces. Over and above it has been observed that the physical properties of these buildings remained completely unchanged from its hay days which help to preserve its historic and social vocabulary. Therefore the main objective of the present research was to find out the morphological characters of these buildings and also the genotypes from the house forms of Dhaka of the same time period.

7.2 Panam Nagar and its Context:

7.2.1. Historical Background:

Panam was a glorified village of the historic land of Sonargaon. From different historical reference it is established in this thesis that the area Panam and its peripheral land were one of the major weaving zones of the finest cloth 'muslin' for which Sonargaon was once famous. Besides the production of 'muslin', various trades of agricultural products, spices and betel leaf also had been conducted from this area. But with the establishment of the cotton factories by the East India Company in Bengal, the flourishing trade of Sonargaon started losing its importance. As a result, the entire area fell into decay. Sonargaon again revived only by the reemergence of Panam Nagar in 19th and 20th century by a group of Hindu merchants. These Hindu merchants who were both traders and money changers selected Panam Nagar as a place for their business and occasional living sometime between 19th and 20th century. From Panam they conducted a large trade of cotton and different English goods in the peripheral area. These absentee land lords used to come to Panam Nagar once or twice in the year.

7.2.2. Physical Background:

Panam Nagar is a unique settlement in Dhaka region. The well organized settlement of Panam is stretched on both side of a linear street which gives frontage to every building those exists in Panam. More over this area is protected nicely with surrounding water body. Beside the central formal circulation of Panam Street, the existence of a secondary informal circulation system with shared service facilities in the backyard is also found in different literature resources which are supported by physical survey in this thesis.

From the physical analysis it is found that, though these buildings give a harmonious façade to the central street, they are quite different in spatial organization. Different types of spatial organization are found in Panam. Such as- 'Double Heighted Hall type' (Fig-4.5, 4.9); 'Courtyard type' (Fig-4.6, 4.14, 4.15); 'Consolidated type' (Fig-4.7). There are some other buildings which have both a double heighted hall and an enclosed courtyard (Fig-4.16 & 4.17). A number of single roomed buildings are also seen in Panam.

Double heighted hall type generated with a double heighted covered hall room as the main focus of the layout plan. Thus this hall remained as the conceptual center of the building. Court yard type represented those buildings which has an enclosed courtyard in the middle part of the building. Again, the consolidated types of buildings are those buildings which have neither a court nor a double heighted hall. Rather this types of houses consists of series of small rooms without any open space in between.

In double heighted hall and courtyard type buildings the hall and the court remained in the middle part of the building surrounded by the transitional corridors or verandas both lower and upper floors. These corridors were open towards the hall and the Court. The front and the rear part of the buildings were connected through these transitional corridors. In consolidated type buildings, instead of hall or court, the middle block has been covered by small enclosed rooms with minimum openings. The front and rear rooms are comparatively large and are connected by very linear, dark and enclosed corridors (Fig-4.34) adjacent to the small rooms in the middle part. Some of these buildings have only one corridor, some have multiple, and others have none.

The plot division and arrangement of buildings on both side of a narrow central road gives Panam a similar character as the commercial streets of Dhaka of pre-colonial period (Fig-3.9, 3.10, 3.11). The historical references identified these buildings as colonial buildings. So it was important for this research to have a compact knowledge of the house forms of Dhaka that prevailed from pre-colonial to Colonial period.

7.3 House Forms:

Panam is a unique settlement in Dhaka region where such a large assemble of different types of buildings are found together. Therefore, to have a better understanding of the house forms of Panam, the spatial organizations of the house form of Dhaka needs to be understood properly. Hence, this thesis has conducted a study on the House forms of Dhaka that prevailed at that time, from available literature review, with the intention to find out the typology where the buildings of Panam fit among the basic and known typologies of the house forms of Dhaka.

7.3.1. The House Form of Dhaka:

The house form of Dhaka had been divided into two basic types-'the Introverted type' and 'the Extroverted type'. Introverted houses were developed with the organic development of the city with enclosed courtyard surrounded by functional spaces. These types of houses are found in the pre-colonial commercial streets of Dhaka like Shakharibazar, and Tanti Bazar. In introverted houses courtyard played a very important role in providing the light and ventilation in the deep interior of the house. In most of the introverted houses the frontal part were used for commercial purpose. The courts remained as the buffer between the commercial and residential part of the house. The service and functional zones of the house remained in the ground floor and the living zone remained in the upper floors. Strong privacy had been maintained between the formal and the living zones of the buildings.

The Extroverted houses were the improvisation of bungalows by the colonial rulers. These type of houses posses completely opposite physical characteristics than introverted houses. The Extroverted houses are outward looking courtyard less buildings situated in the middle of a large compound. Two sub groups of extroverted houses are found in Dhaka-'Composite type' and 'Consolidated bungalows'.

In 'Composite type' houses the service block remained separated from the main building block by a large backyard. The main building consists of formal living, dining area and bedrooms and the service block posses all the service facilities including servant's room. In Consolidated type houses the service blocks had been included in the living block of the building. But the functional zoning of the houses remained similar to the composite type of houses.

7.3.2. The House Form of Panam:

Apparently the 'Double Heighted Hall' and 'Courtyard type' houses seem to have some similarity with the introverted houses of Dhaka in terms of organization of spaces around the enclosed courtyard. But the 'Consolidated type' buildings of Panam, as they are termed in the Asiatic Society Research, are very different from the basic 'Consolidated' type. These buildings may be termed 'Consolidated' as these buildings don't have any court or a double heighted hall in the middle of the configuration. In fact, these buildings are quite different from any typology of house forms of Dhaka.

As very little is found in the prevailing literature about the spatial organization and functional zoning of the buildings of Panam, a syntactic analysis has been conducted to find out the social interpretation of the spaces of these buildings of Panam and also how these buildings are similar or dissimilar to the house forms of Dhaka that prevailed at that time.

7.4 Syntactic Properties & Identification of Types:

7.4.1. Syntactic Characteristics of the house form of Dhaka-

a. Integration- In both Introverted and Extroverted type of house forms of Dhaka, the central transitional spaces remained strongly integrated and the living zones strongly segregated. Strong segregation between formal and family zone has been observed in introverted houses. Again, a strong segregation in living and service block has been found in extroverted houses.

b. Ringiness- In introverted houses, the transitional spaces are found distributed in external rings but other non-transitional functional and living spaces remained non-distributed and segregated. In extroverted houses a large number of small intersecting internal rings have been observed. The external spaces remained non-distributed in extroverted houses.

c. Depth- In general the house forms of Dhaka have deep interior. The formal part remained in the shallower zone of the complex and the family and the living part remained in the deeper zone.

d. Control- The highest control in the houses of Dhaka has been found in their transitional spaces. The functional and the living spaces remained in segregated zones with weak control over their neighboring spaces. The permeability of these rooms was controlled by the transitional spaces.

7.4.2. Syntactic Properties of Panam Buildings:

Several syntactic properties have been observed in the buildings of Panam and selected cases from Dhaka houses. Such as-

a. Integration- From syntactic analysis it is found that the buildings of Panam follow two distinct genotypes in respect to their integration order. One, which have their middle block strongly integrated and the other type which has equally strong segregated middle block. Therefore, this thesis has been able to make two different typologies on the basis of spatial pattern; apart from the given typologies by the Asiatic society of Bangladesh. They are-

i. Building with Integrated Central Space

ii. Building with Segregated Central Space.

In double heighted hall and courtyard type buildings the transitional spaces around the hall and the court holds the highest integration of the configuration as well as the highest control value. These buildings are classified as the buildings with integrated central space. Again, in

consolidated type of buildings, the central part of the building remained as the collection of small, enclosed, segregated cells. So these buildings are termed in this thesis as the buildings with segregated central space. In both types of buildings, the front room, which has a direct interface with the central street of Panam, is an integrated space. This front room remained as the highest integrated zone of the buildings with segregated central space.

b. Ringiness- Ringiness is a very common feature in the buildings of Panam Nagar. The buildings of Panam can be termed as shallow configurations due to excessive ringiness.

In buildings with integrated central spaces, almost all the spaces along with the hall and the court are distributed with the outdoor in more than one ring. It confirms the easy permeability of the outsiders in the interior of the building. Furthermore, the hall and the court are placed in the locus of different intersecting rings which made them a very significant space in the configuration and locus of visitor inhabitant relationship.

In buildings with 'segregated central spaces', other than the unipermeable spaces, all the spaces are distributed in external rings. The integrated and ringy front room was surely a place for visitor-inhabitants interface in buildings with segregated central spaces.

c. Depth- The depth of the buildings of Panam varies according to their size and spatial organization. The hall always remained in the shallower zone of the building. It is found two or three steps deep from the carrier on Panam Street. The court remained in the middle of the configuration.

d. Control- In the buildings with integrated central spaces, the hall posses strong control over its neighboring spaces. It is also coupled with a uni-permeable non-distributed segregated cell which has a very weak control. The accessibility to this space is controlled by the hall. Therefore the hall and its adjacent spaces are probably a place for public gathering with some significant purpose rather a simple household functional space. On the other hand the court has a very weak control which determines the functional difference between the court and the hall though the hall apparently looks like a covered court.

In buildings with segregated central spaces the strongly integrated peripheral rooms in the front and the rear part of the buildings have strong control as well. It indicates that, thought the buildings are much shallow in terms of depth and ringiness, still the permeability of the visitors are locally controlled by the peripheral rooms of these buildings. Again, in buildings with segregated central space, the uni-permeable segregated rooms in the middle of the configuration have very weak control. The permeability of these rooms is controlled by their neighboring spaces which refer to the conjecture that, these rooms were non-habitual and probably used for the storage of valuable goods.

7.5 Conclusion:

From Space Syntax analysis, some significant characteristics of the buildings of Panam has been identified. Though some of the buildings of Panam have few similarities with the house forms of Dhaka, but in general these buildings are quite different in many ways. For example-

1. The buildings with integrated central space are similar to the introverted houses of Dhaka in some physical and syntactic properties. In both genotypes the central transitional spaces with enclosed courtyard is found integrated. But in the buildings of Dhaka the rest of the spaces remained segregated to ensure privacy between formal and family blocks, whereas, in buildings of Panam, apart from the central transitional spaces the peripheral rooms in the front and the rear part of the buildings are also found integrated.

2. High degree of ringiness made Panam buildings shallower and easily permeable from the exterior which is uncommon in the residential houses of Dhaka. Though the hall has a similarity in integration pattern with the introverted houses of Dhaka, the easy permeability in the hall is surely a very different character which is not common in the houses of Dhaka. Moreover, in many buildings almost all the spaces are distributed with the outdoor and thus internal spaces can be easily permeable from outside. This again is uncommon in Dhaka houses.

3. The strong integration and control, easy permeability, location in the shallower part of the configuration, strong ringiness and finally beautiful ornamentation made the hall a very special place among the other internal spaces of the building. The spatial organization of hall indicates it as a place for mass gathering rather a typical household function. This also is not found in the house forms of Dhaka.

4. The integrated front room is also a very uncommon character among the house forms of Dhaka. None of the studied cases have their front room integrated. Rather these spaces remained as the formal zone of the house and remained segregated in both introverted and extroverted houses. The segregated central space too is found nowhere among the house forms of Dhaka.

Therefore, it can be said that, though the buildings with integrated central spaces have some similarity with the house forms of Dhaka in syntactic as well as physical properties, still these buildings are much different from the houses of Dhaka. So there is very less possibility of these buildings being houses. Rather they might serve some other purpose with a controlled residential use.

Besides, the buildings with segregated central spaces are completely different from any type of house forms of Dhaka that has been studied in this thesis. Due to its unique spatial organization this type of buildings is neither physically nor syntactically similar to the house forms of Dhaka. Rather they might be a new type among the house forms of Dhaka.

From all the case studies it is quite clear that these buildings of Panam are unique in nature and are completely new in the context of house forms of Dhaka that has been studied in this thesis. Their spatial layout, distribution and pattern are different both physically and syntactically from the residential type of houses of Dhaka. So it can be said that, these buildings were probably not used for residential purpose. Rather they probably have some very significant commercial use which was the reason to form this particular genotype.

Again, it is found in several historic references that a great trade of cloth and other items held in Panam in 19th century (chapter-2). The historic references also give evidence of a cotton factory directed by East India Company in the closest fringe of Panam. Therefore there is a strong possibility that these buildings of Panam are related to this cotton trade and also with the business of East India Company.

From the above study and analysis it is almost clear that, the buildings of Panam are not the symmetric genotype of the residential house form of Dhaka. They are some unique built form which posses a very less physical as well as syntactic characteristic of a house which has a more private use pattern. Rather they have such syntactic properties that refer to a more public use. Hence this research ends with this speculation that-

i. The buildings of Panam were not residential type of buildings. Rather with minimum residential use, these buildings were most likely open for a more public use related to the commercial purposes.

ii. The building with segregated central spaces is a unique type of building which is found nowhere in the house forms of Dhaka and almost certainly were not made for residential use.

As the comparative analysis in chapter six only includes six cases among the house forms of Dhaka, this hypothesis would not be proved with this limited study. Again the spatial analysis could only identify the morphological characteristics of these buildings with the established logic of space syntax. Still the origin and use of the spaces of these buildings remained unknown. So a broader range of comparison needs to be done in a broader scale to find out the origin and possible use pattern of these buildings. Therefore an extensive study will be needed in a much larger scale to find out the unuttered sentences beneath the beautifully ornamented buildings of Panam. The entire study of this thesis is just a doorway to disclose the extensively rich socio

cultural aspects of the region as the unwritten history of Panam is believed to be intertwined with spaces within the buildings and engraved in each bricks of the city, a city that contained a significant time period of the region of Bengal.

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Annex-1

Space Syntax

The term **space syntax** encompasses a set of theories and techniques for the analysis of spatial configurations. It was conceived by Bill Hillier, Julienne Hanson and colleagues at The Bartlett, University College London in the late 1970s to early 1980s as a tool to help urban planners simulate the likely social effects of their designs. This analysis method is designed to identify the topology of social relationships, how people are organized in space. It is adapted from Hillier and Hanson's Gamma Analysis as described in The Social Logic of Space. It can be used to see who inhabits positions of power and who does not. It can also be used to understand the accessibility of individuals to each other and the degree of freedom in circulation between points.

Space syntax has been considered an important theory and analytical tool to investigate how space influences not only movement but also all activities by quantifying spatial configuration (Hillier & Hanson, 1984). It has also become a computer-based analysis to describe the spatial pattern of building and the urban space. This analysis suggests certain general principles for the analysis of building as a spatial pattern. First, space is intelligible if it is understood as being determined by two kinds of relations, rather than one; the relationship among the 'inhabitants' and the relationship between the 'inhabitants' and 'visitors' (Hillier and Hanson, 1984:15). *Inhabitants* are those in whom power is vested, i.e. the controllers, whereas *visitors* are those who enter and stay as subjects of the controllers. In some cases ("reversed buildings" like prisons), the visitors may actually spend more time in the building than the inhabitants.

Therefore, Space Syntax can be defined as the *syntax* of space, i.e. the organization of its individual units that determines the relationships between individuals in a social unit. Spatial relations influence the level of access between individuals and the level of control each can have over one another. The buildings here are termed as systems or configurations and the spaces are termed as nodes.

Types of Spatial Relationships:

Asymmetrical Spatial Relationships-Where two or more spaces (points) have indirect relationships with each other and which leads to "tree-like" graphs (Fig-2).

Symmetrical Spatial Relationships- where two or more spaces (points) have direct relationships with each other and leads to "ringy" graphs (Fig-3).

A group of buildings can be termed as symmetric genotype when their spatial pattern have similarity in syntactic measures and have a similar genotypical origin. Thus, the socio spatial pattering of the perceived local areas seems most likely to be divulged by the spatial analysis of space syntax.

Space Syntax is a set of descriptive technique for representing, quantifying, and modeling spatial configuration in building and settlement. Different measures are used to establish the relation between the space and the inhabitants or the relation of inhabitants and visitors with the space. Among the three transcription which are commonly used to break up its layout into its constituent element – axial, convex and visual field – this study has been carried out with the use of convex space (Fig-1)- defined by polygons where no line drawn between any two points in the space goes outside it. A concave space (Fig-2) has to be divided into the least possible number of convex spaces to transform into graph.

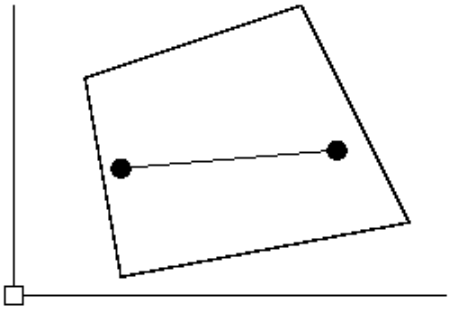

Fig-1: Example of Convex Space

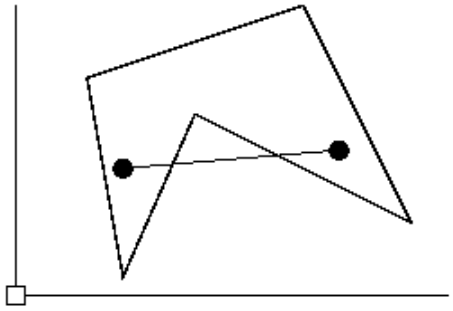

Fig-2: Example of a concave space

Graph is a figure representing the relationships of permeability between all the convex spaces of a layout. The spaces are represented by circles or dots (called nodes) and the links with lines.

Among different diagramming technique of space syntax, justified graph is one which has been used in the present research. Human space is not just about the properties of individual spaces, but about the interrelations between the many spaces that make up the spatial pattern of a building. These interrelations can be presented by a justified graph.

A *justified graph* (Fig-3) is a diagramming technique for revealing the topology of a spatial organization. A justified graph organizes the spaces in a building in relationship to each other with the carrier at the bottom and the other spaces arranged in rows above

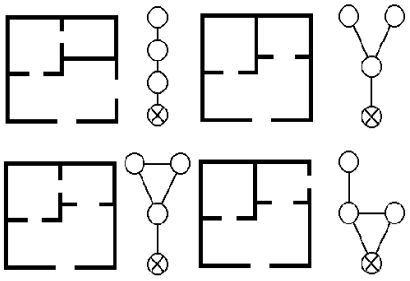

Fig-3: Justified Graph

corresponding to the number of steps in from the carrier. It is restructured so that a specific space is placed at the bottom, “the root space”. All spaces one syntactic step away from root space are put on the first level above, all spaces two spaces away on the second level, etc. Justified graphs offer a visual picture of the overall depth of a lay-out seen from one of its points.

A tree-like justified graph has most of the nodes many steps (levels) away from the bottom node. In such a system the mean depth is high and described as deep. On the other hand, in a bush like justified graph nodes remain close to the root space. That means they are few steps away from the bottom node. This type of system has low mean depth and described as shallow system.

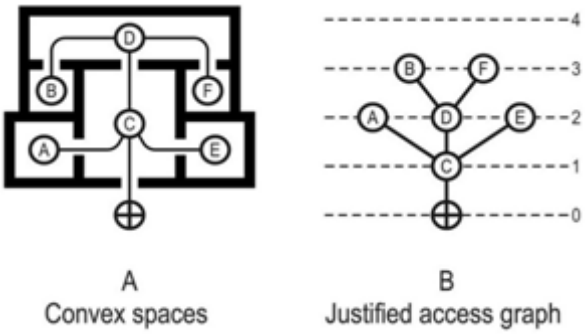

Fig-4: Tree like Justified Graph

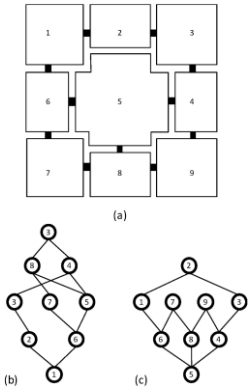

Fig-5: Ringy Justified Graph

Graphing conventions in Justified Graph:

- The carrier represented by a single point (0) and each space represented by a point which is called node
- Physical connections through doors and passageways are diagrammed as solid lines between two nodes. These lines are termed as links.
- Stairways are considered individual spaces.

Spatial Measures used in Space Syntax: Different measures of space syntax help to establish the social logic of configurational organization of spaces from a graph. Such as-

Integration: Among the all measure the first and the most important measure of Syntactic analysis is Integration. It is a derivative measure which is used to eliminate possible effects owing to the number of convex spaces of a system, and thus to compare systems of different syntactic sizes (Guney & Wineman, 2008).The integration of a space is a function of the mean number of lines and changes of direction that need to be taken to go to all other space in the

system. Integration is therefore about syntactic not about metric accessibility and the word depth rather than distance is used how far a space is lies. The integration or real relative asymmetry (RRA) value of a space expresses the relative depth of the space from all others in the graph (Hillier et al, 1987). Lower values of RRA indicate higher integration and the higher values show greater segregation. Mean integration expresses how shallow or deep on average spaces in the complex are from one another (Hanson, 1998). Integration is a global static measure in that every convex space is assign a value which characteristic its relation to all other spaces in the configuration, thus provide a global index of relative integration and segregation for that line relative to all others. These values of well below 1 – of the order of 0.4 to 0.6 indicate more segregation and while the value ending to and above 1 show strong integration.

Depth: Depth (Fig-6) as a Syntax measure is defined as the least number of syntactic steps that are needed to reach from one line to another; the number of steps refers to changes in direction. The mean depth can be calculated from the justified graph by multiplying the number of lines on a level by the level number, summing across levels and dividing by the number of levels in the system. This value reflects the integration value for a line; the least the number shows shallower in the graph and more integrated, whereas larger the number indicates deeper in the graph and tends more segregated. The concept of integration became a central point in all implications of the theory and methodology of space syntax. The genotype describes the integration (and segregation of space) as per their access relations.

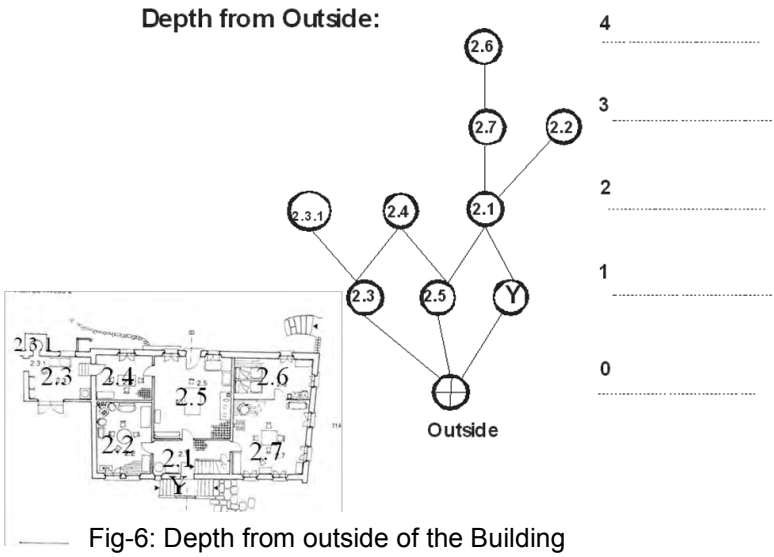

Fig-6: Depth from outside of the Building

The mean depth is generalized by how deep the system is from a particular point(carrier) with how deep or shallow it theoretically could be-the least depth existing when all the spaces are directly linked to the original space and the most depth when all the spaces are in a unilinear sequence Away from the original space(carrier). This generalization is represented through **'relative asymmetry' (RA) value**, which is the mean depth expressed as a fraction of the maximum possible range of depth values for any node in a graph with the same number of nodes as the system. This is calculated by:

$$RA = \frac{2(MD-1)}{n-2}$$

This will give a value between 0 and 1. Low value indicates a space from which the system is shallow (more integrated) and high value indicates a space from which the system tends to be segregated. However, if comparisons are to be made across systems that differ significantly is size, one has to make some transformations in the RA values to eliminate the effect of size on the 'levels' of RA values in the real system. These transformed RA values are known as 'Real relative asymmetry' (RRA) values. The transformation of RA to RRA values is shown as:

$$RRAi = \frac{RA}{Dn}$$

where RRAi is the Real relative asymmetry value of space *i,* and Dn is the transforming factor. The Dn values may be calculated by a formula which is:

$$Dn = \frac{2(n(\log(n+2)/3)-1)+1}{(n-1)(n-2)}$$

The spaces are then arranged as per the order of integration (or RRA) values. RRA value will not be simply between 0 and 1. But above and below 1. Values well below 1 (of the order of .4 to .6 will be strongly integrated, while values tending to 1 and above 1 will be more segregating. This arrangement reveals a set of patterns that partially manifest a culture's social presuppositions in a way plans themselves do not immediately reveal.

Ringiness of Space: The second configurational property of 'choice' is measured by the number of alternative'routes' from one node to another in a *j-graph.* Ringiness is such a measure which influences the depth of the system and determines the permeability of a space. It is also sets the inhabitants-inhabitants and visitor-inhabitant relationship. The spaces of a ringy system are shallower than the spaces of a non ringy system. The spaces within a ring are termed as distributed space. When a ring is distributed with the outdoor it is called external rings. These external rings make the internal spaces much shallower and permeable for the visitors. Thus a distributed system is a set of spaces through which the visitors, subject to more or less control, may pass; while the nondistributed system is the domain of the inhabitants with stronger sanction against penetration by the visitors.

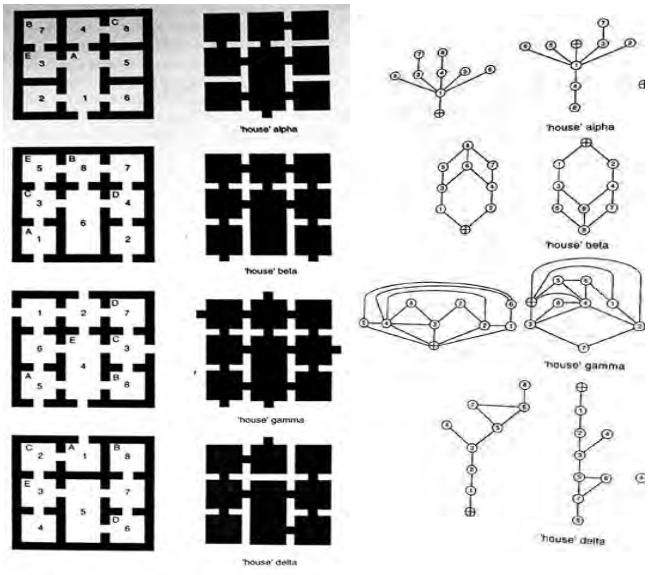

Fig-7: Ringy and Non-ringy complex

Sometimes one space becomes the center of more than one intersecting ring. This space then becomes one of the most integrated spaces of that configuration.

Control: Control is a measure of the extent to which a given space controls the access to the spaces that are adjacent (immediately connected by an edge) to it. If each space has a certain number of *n* immediate neighbours, then each space gives to its immediate neighbours 1/n, and these are then summed for each receiving space to give the control value of that space (Hiller and Hanson, 109). The control of space is inversely proportional to the connectivity of the adjacent spaces. When the control value of a space is above 1, that space then represents having strong control over the permeability of its adjacent spaces. On the other hand, when this value is around 0.5, the space has a weak control over its neighbouring spaces and its own permeability depends on one or more of its adjacent space. Thus control value interprets the local behavior of spaces.

Relationship of a Building with its Inhabitants and Visitors: Every building even a single cell, identifies at least one 'inhabitant', in the sense of a person with special access to and control of the category of spaces created by the boundary. Inhabitant is thus a categoric concept, and therefore a transpatial entity. In that sense inhabitant is part of a global categoric reality as a result of being mapped into local bounded space of the interior. With the visitors the effect is different. Every building selects a subset of 'visitors' who may enter the building temporarily but may not control it. Thus an abstract system of these relations can perhaps clarify their underlying genotypes.

Annex-2

Syntactic Data of the Buildings of Panam

Table-1:Syntactic Data of Building no-1

Name	Space No	Control Value	Depth	Mean Depth	Integration
Carrier	0	1	0	3.06	1
Front Room/Veranda	1	1.4	1	2.6	1.25
Corridors around Double Heighted Hall	2	0.75	2	3.11	1
	3	1.3	2	3.22	0.885
	4	1.6	1	2.6	1.25
	11	2.1	3	2.6	1.25
	12	2.1	4	2.8	1
	13	1.6	5	3.3	0.83
	14	1.6	4	3.1	0.91
Double Heighted Central Hall	5	2	2	3.2	0.885
Uni-Permeable Cell Adjacent to the Hall	6	0.25	3	4.2	0.625
Enclosed Rooms in the Rear and Upper part of the Building	7	0.6	1	4	0.71
	15	0.3	5	4.1	0.625
	16	0.3	6	4.3	0.6
	17	0.25	4	3.5	0.77
	18	0.25	5	3.7	0.735

Table-2: Syntactic Data of Building no-9

Name	Number	Control Value	Depth	Mean Depth	Integration (1/RRA)
Carrier	0	0.8	0	3.5	0.67
Front Room	1	1.1	1	2.8	1
Corridors around the Hall	2	1	2	2	1.43
	3	1	2	3	0.77
	5	1	2	3	1
	10	1.6	5	3	0.77
	11	1	6	4	0.6
	12	1.5	4	2.5	1
	13	1	5	3.2	0.77
Double Heighted Hall	4	2	3	3	1
Small Cell with the Hall	7	0.25	4	4	0.625
Enclosed Rooms in rear and Upper Part of the Building	6	0.75	1	3	0.71
	9	0.33	6	4.1	0.5

Table-3: Syntactic Data of Building no-26

Name	Control Value	Depth	Mean Depth	Integration Value (1/RRA)
0	0.84	0	3.34	0.86
1(Front Room)	3.33	1	2.5	1.31
2	0.47	1	3.33	0.83
3	0.34	2	3.33	0.83
4	0.34	2	3.33	0.83
5	0.34	2	3.33	0.83
6	0.34	2	3.33	0.83
7	2.33	1	3.8	0.71
8(Stair)	0.34	2	2.3	1.47
9(Front Room,1st Floor)	2.5	3	2.3	1.54
10	0.7	4	3	1
11	1	5	3.5	0.77
12	0.53	4	3	1
13	0.53	4	3	1
14	0.7	4	3	1
15	0.83	5	3.5	0.8
16	1.33	5	3.4	0.82
17	0.83	6	4	0.65
18	1.33	6	4	0.7

Table-4: Syntactic Data of Building no-31 of Panam Nagar

Name	Space No	Control Value	Depth	Mean Depth	Integration
Carrier	0	1.1	0	2.25	1.22
Uni-permeable Room	1	0.33	2	3.5	0.61
Front Room	2	1.6	1	2.6	1
Middle Room	3	1.42	2	2.1	0.885
Bi-Permeable Room	4	0.5	2	2.5	1
Bi-Permeable Room	5	1.75	2	2.6	1
Uni-permeable Room	6	0.3	3	3.5	0.61
Rear Room	7	1.6	1	2	1.5
Rear Room	8	0.67	1	2.75	0.87
Stair	9	0.6	2	2.42	1.1
Uni-permeable Room	10	0.3	4	4	0.52
uni-permeable Room	12	0.3	4	4	0.52

Table-5: Syntactic Data of Building no 39

Name	Space No	Control Value	Depth	Mean Depth	Integration
Carrier	0	0.8	0	4.5	0.67
Rear Veranda	13	0.8	1	5	0.6
Corridors around Double Heighted hall	1	1	1	4	0.77
	3	1.3	2	3.4	1
	6	2	3	3.3	1
	15	3.3	5	3.5	0.9
	16	1.7	6	4.2	0.77
	17	0.2	6	4.5	0.67
	25	0.3	7	5.1	0.5
Stair	14	0.5	4	3.4	1
Double Heighted Hall	2	1.8	2	3.6	1
Small Chamber adjacent to Hall	4	0.25	3	4.6	0.67
Bi-permeable Rooms in the Rear Block	5	0.8	3	4	0.77
	7	0.8	3	4.5	0.67
	9	2.5	2	5	0.6
	11	1.3	3	6	0.5
	18	0.8	7	5	0.625
	19	0.8	8	5.5	0.5
	21	0.7	6	4.2	0.7
	22	0.8	7	5	0.6
	24	2	8	5.52	0.5
Uni-permeable Rooms in the Rear Block	8	0.3	4	4.2	0.7
	10	0.3	3	6	0.5
	12	0.5	4	7	0.4
	20	0.2	6	4.5	0.67
	23	0.3	9	6.5	0.43