ADAPTIVE REUSE OF POL HOUSES IN AHMEDABAD

A DISSERTATION

Submitted in partial fulfillment of the requirements for the award of the degree of

MASTER OF ARCHITECTURE

By

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CANDIDATES DECLARATION

I hereby certify that this report entitled **"ADAPTIVE REUSE OF POL HOUSES IN AHMEDABAD"**, which has been submitted in partial fulfillment of the requirement for the award of the degree of **Master of Architecture**, submitted in the Department of Architecture and Planning, Indian Institute of Technology- Roorkee, is an authentic record of my own work carried out during the period from July 2011 to June 2012, under the supervision and guidance of **Dr. P.S. Chani** , Department of Architecture and Planning, Indian Institute of Technology, Roorkee, India.

The matter embodied in this dissertation has not been submitted by me for the award of any other degree of this or any other institute.

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CERTIFICATE

Certified that the report entitled **"ADAPTIVE REUSE OF POL HOUSES IN AHMEDABAD"**, which has been submitted by **Ms. AMANJEET KAUR**, for partial fulfillment of the requirement for the award of the degree of **Master of Architecture**, submitted in the Department of Architecture and Planning, Indian Institute of Technology- Roorkee, is her own work done by her under my supervision and guidance. The matter embodied in this dissertation has not been submitted by her for the award of any other degree of this or any other institute.

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ABSTRACT

The old walled city of Ahmedabad with its bustling narrow lanes, intermingling pols, community announcement boards, the bird feeders, the timeless darwajas (city-gates), temples, Indo-Islamic monuments, day markets transforming into night food joints and various other images become identity of the Amdabadi's. The beauty of a Pol-house stands testimony to the intimacy of a traditional Gujarati lifestyle that is still alive in this part of the city - a living culture. One will be mesmerized and captivated by the row-house form of architecture. Detailed study reveals that besides being architectural masterpieces, these houses are planned keeping in mind the social beliefs, climate and culture of the place. The methods of construction adopted and the materials used are also responsive to the local context of the place. There are many lessons to be learnt from these houses and their organizational pattern to solve the problems of today. Moreover, these houses are becoming popular among the tourists (both domestic and international) therefore conservation of these is a matter of prime concern. This work starts with study of Pol houses and how they behave in context to various design considerations. The data is then analyzed and used to suggest adaptive reuse options in order to make the preservation of rich urban fabric of Pol Houses in a self-sustained way.

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EXECUTIVE SUMMARY

A. Introduction

The Pol houses in Ahmedabad showcase rich tradition and culture of the bygone era. There are some planning concepts and construction technologies which can guide us through problems faced in present context. Though these houses cannot fulfill the requirements of present lifestyle but certain modification in the main activity areas like Manek Chowk and Heritage walk route can result in perfect urban centers which would be feast for the local and foreign visitors coming to Ahmedabad. The houses can be restored or adapted for reuse to meet the changing needs.

The physical form of the walled city is organic, with narrow streets and neighbourhoods. There are twelve gates in city, with 6000 'Pols' approximately and around 65,000 properties. Recently with four bridges connecting the walled city to the eastern Ahmedabad, the Pol houses are facing heavy through traffic, congestion and high commercial ingress leading to lack of infrastructure and services etc. As a result, the traditional environment has started decaying, due to neglect and ignorance towards the traditional heritage. The ever-increasing commercialization in the core areas of our cities is another reason for the decay of the rich traditional architecture of the cities.

People are moving out of the place because of lack of services like lack of educational facilities, health, fire-fighting facilities etc. and heavy congestion. The growth in technology and changing lifestyle of people requires infrastructure which the pol houses are not able to incorporate. The streets which are designed 600 years back for pedestrian movement only cannot efficiently support vehicular traffic. Moreover, there is shortage of parking spaces and adequate road widths for heavy vehicles. With the increasing number of vehicles, the road congestion is increasing. Lack of open spaces is another problem faced by the inhabitants as there is no play areas left for the kids to play.

Some of the families who have shifted to other areas are beginning to appreciate their former properties in the walled city. They are willing to conserve their properties if given proper guidance and financial support. Ahmedabad Municipal Council is

working constantly for the promotion of conservation and adaptive reuse activities. They are also trying to get the Heritage status for the Pol houses.

B. Purpose of study

The study is done keeping in mind the rich urban fabric of Pol houses and their potential to teach the present generation with lessons of sustainability and climate responsive architecture. The Pol houses show the grandeur and rich culture of the bygone era. The settlement pattern and house design is also influenced by the political conditions prevailing in the area.

Due to changes in culture and political forces with the course of time the degradation is taking place. Other factors affecting include increase in population, collapse of textile business, shift in systems of production, introduction of new means of transport and displacement of housing sector. In the absence of unplanned conservation and restoration measures the unique architectural and urban heritage is under threat. Some initiatives are being taken at different levels by government and non-government organizations to save the heritage from getting extinct. One such solution lies in adaptive reuse of these houses. To start with Heritage walk route is taken up as it is much frequented by tourists both domestic and international.

The Heritage Walk was initiated through the old neighborhoods by AMC and the programme was well publicized through brochures and posters. Group of people from various walks of life, (generally 10-150 persons) everyday take a walk across different pols to experience the rich heritage and architectural forms of the pols. This route covers almost 12 pols and covers very significant places like Residence of Kavi Dalpatram, Kala Ram ji temple and underground Jain temple. The walk acts as an effective tool whereby the inner areas of the city shall be explored in terms of the architectural heritage, cultural heritage and the craft heritage. The walk shall in its due course take the people through specific routes penetrating through the inner areas and habitats of the people, exploring the beautiful temples, heritage buildings, haveils, pols, shops and a lot more.

C. Project Methodology

The methodology adopted includes collection of data, literature review, case studies, analysis and design solutions in response to the local context. The work started with collection of data from various primary and secondary sources related to the evolution, development and present situation of Pol houses in detail. Feedback of various stakeholders is also taken in order to understand the problems faced, reasons behind the existing problems and possible solutions for preserving the rich urban fabric of pol houses. Detailed study helped in identifying the problems posed in preserving and maintaining pol houses and based on the same aim is identified as to explore the viability of Adaptive reuse and objectives are formulated including identification and proposing most viable uses along the Heritage Walk, choosing the best possible option and proposing design solutions for identified 'Use'. The objective also stressed on understanding the risks involved and their solutions. To facilitate a focused study scope is taken as study only of pol houses and identifying adaptive reuse options for them. The limitations include that the viable uses and design ideas proposed cannot be generalized for other housing typologies existing in Ahmedabad and buildings with heritage will only be considered for adaptation. The whole of the process is focused on providing new life and avoid depilation of rich urban fabric. Literature study is done to understand the importance of preserving heritage building, steps taken for the same at national and international level, understanding the process of adaptation, its benefits, risks involved and considerations related to various stakeholders. Field and literature studies are done in order to understand the practical implications of reuse process, feasibility and success rate. The case studies include Pragpur- Garli heritage zone buildings-Kangra, Mangaldas ni haveli – Ahmedabad and Choona Mandi Haveli Complex, Lahore. Conclusions are drawn by comparing the case studies done. Analysis of the data collected is done and based on that heritage elements typical to pol houses are identified for preservation through defining new use to them. Traditional art and culture is also studied to propose reuse solutions which are relevant to the context of promoting the cultural values and architecture of Gujrat.

D. Project Outcome

As the conservation process requires huge investments, it is difficult to protect all the houses in order to save the rich urban fabric of pol houses. Therefore identifying and proposing reuse options involving local people will result in preservation of pol houses and in addition it will generate income. Minor modifications can be made to adapt these houses to compatible new uses. Systems installed can be upgraded to meet modern building requirements and codes. If the adopted solutions are good economically, they will help to preserve our heritage through sustainable practice.

Adaptive reuse is an effort to slow down the process of deterioration and increasing the life of built heritage. It is preferred that effective action is minimum and able to cope up with future interventions. The scope of Adaptive Reuse in any historic built environment can vary from minor consolidation of artifact to vast town planning preservation.

In order to preserve the Pol houses in a self-sustained way, Adaptive Reuse can offer possibilities which are easy to be incorporated and easily blend with the existing cohesive cultural, traditional and architectural heritage of the area.

E. Conclusion

Preserving our heritage is vital as it adds to our intelligence. One can learn from the good and bad practices of the past as the result of the same are visible today. We can strengthen principles on which we can base our future strategies for development. As the architecture of the Pol houses is in conjunction to the climatic, social and cultural requirements, it can act as a model for present and future generations for learning the principles of sustainability originated to meet the basic needs of the inhabitants. The process of preservation should not only to exhibit the old houses as objects but to successfully adopt them to contemporary context so that they become self-sustained and inspirational models.

Traditional structures should be upgraded to recreate quality habitats and sources of technical knowhow as they are based in response to climatic and social factors keeping in mind the human requirements. Sustainability can be achieved by

successfully adopting these structures into contemporary uses which will save our already built heritage and also conserve the embodied energy used to build these houses. This will help in reducing the burden on the available resources and economy.

F. Recommendations

The recommendations include that the design proposal should suit to local context. Once the maintenance of the houses takes place, the new uses should generate enough income to maintain and add to the economy. The proposed functions should reflect the traditional Gujrati lifestyle and should not be something which is not native to the place. Local participation will help in accelerating the process of adaptation and will generate income to maintain the buildings in their original form as much as possible. The proposals given for reuse should focus on promoting traditional art, architecture and culture of Gujrat so that it efficiently supports tourism.

CHAPTER 1 INTRODUCTION

Pol houses of Ahmedabad showcase distinct cultural, social and architectural heritage. Due to modernization and unplanned urban growth, the heritage of old walled city is decaying. The neighbourhood units of walled city are developed in response to the social, cultural, economic and climatic factors resulting in buildings which are rich in cultural and architectural heritage. There are many lessons which can be learnt from the planning and architecture of these Pol houses as they are sustainable even in today's context. By suitably adopting these houses, the architectural heritage can be preserved and sustainable practices can be showcased for the generations to come.

The old walled city of Ahmedabad attracts people with its busy narrow lanes, pols, the bird feeders, temples and Indo-Islamic monuments. The day markets transforming into night food joints, richly carved houses, women dressed in traditional clothes performing daily household chores and various other images become identity of the Amdabadi's. Besides being architectural masterpieces, these houses are planned keeping in mind the social beliefs, climate and culture of the place. This report gives a brief idea of what a Pol house is, how it behaves in context to various design parameters and what considerations can be taken in order to protect them. Adaptive Reuse proposals are suggested at the end in order to prevent people from abandoning Pol Houses and making the process of preserving this heritage in a self-sustainable way.

1.1 NEED FOR STUDY

Both the sites taken for development have huge potential provided they incorporate some basic infrastructure, in terms of proper paving, cleaning up of the streets, provision of street lights, signage, universal accessibility and public amenities. The development of these areas can bring about changes in the landuse pattern of the area as by adaptively reusing some of the heritage buildings into a cafeteria or into a paying guest accommodation which will provide the tourists with the actual feel of the cultural heritage by staying within the precincts of it. This can allow a total change in the economy of the area wherein the tourists can stay in and spend at these inner areas.

1.2 AIM AND OBJECTIVES

The **Aim** of the study is to:

Explore the viability of Adaptive Reuse of Pol houses in Ahmedabad.

The **Objectives** include:

- To identify and propose most viable uses for Pol Houses along the Heritage Walk
- To choose the best possible option and propose design solutions for identified 'Use'
- To understand risks involved and propose solutions for the same
- To enhance the urban landscape, adding to the tourism potential of study area

1.3 SCOPE AND LIMITATIONS

The **Scope** of the study is related to:

- Study the Pol houses in Ahmedabad
- Areas which are much frequented by tourists i.e. route of Heritage Walk.
- Adaptive reuse of Pols to other viable solutions

Limitations include:

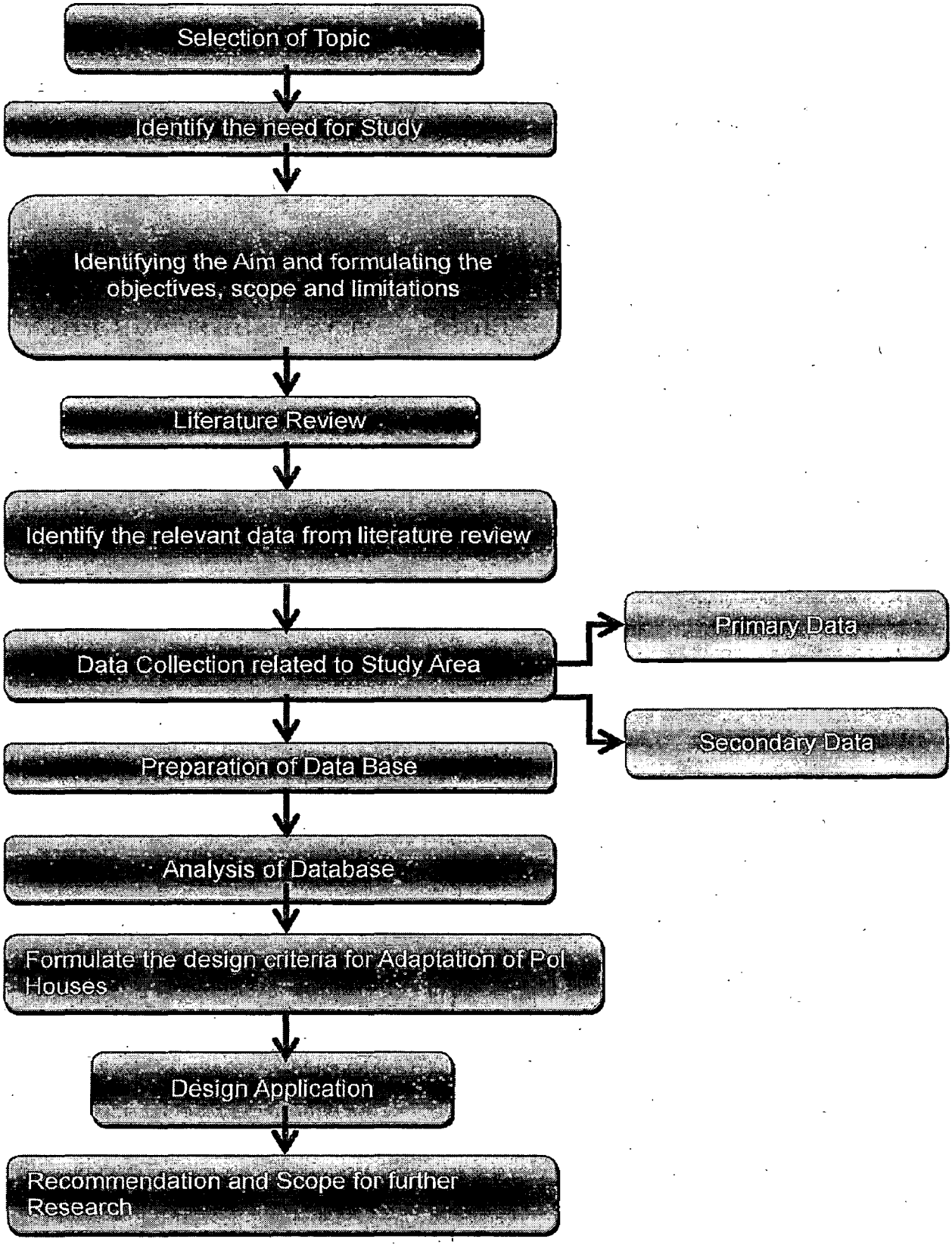
- Area outside the walled city will not be considered
- Viable uses and design ideas proposed cannot be generalized for other housing typologies existing in Ahmedabad
- Heritage value buildings will only be considered for adaptation

1.4 METHODOLOGY

The study started with study on various aspects of Adaptive Reuse with identification of study area and its need. This background study helped in the formulation of the aims and objectives of the research work. It is followed by literature review with focus

on the understanding the need of protecting our heritage, context of Pol houses and need for Adaptive Reuse. Studies were carried on the viability of adaptive reuse, its process, risks involved, stakeholders, financial viability and options for design with focus on Pol Houses of Ahmedabad. The main case studies include Judges Court – A Heritage Resort, Garli-Pragpur Heritage zone-Kangra (Himachal Pradesh), Mangaldas ni Haveli– Café and Craft Centre, Ahmedabad (Gujrat) and Choona Mandi Haveli Complex– Women College,Lahore (Pakistan). Two other secondary studies are also taken up that helped in drawing conclusions regarding Adaptive Reuse options for residential buildings. With the help of these inferences and literature review, set of parameters will be framed based on which the Adaptive Reuse options will be worked out for Pol Houses.

These parameters will finally be used for identified study areas through design solutions.


Selection of Topic
Identify the need for Study
Identifying the Aim and formulating the objectives, scope and limitations
Literature Review
Identify the relevant data from literature review
Data Collection related to Study Area
Primary Data
Secondary Data
Preparation of Data Base
Analysis of Database
Formulate the design criteria for Adaptation of Pol Houses
Design Application
Recommendation and Scope for further Research

1.5 Project Viability

1.5.1 Tourism Potential of Ahmedabad

1. It is the economic hub of the nation therefore the commercial activity adds to people visiting Ahmedabad from India and abroad.
2. There are many institutions of international repute in Ahmedabad including Indian Institute of Management, National Institute of Design, Centre for Environment Planning and Ahmedabad University where people from India and abroad are employed and studying. The large student population adds to the tourism potential as friends and family members visiting them visit major tourist attractions.
3. Presence of eminent architects like Architect B.V. Doshi, Hasmukh Patel etc. also add to the interest of the tourists all over.
4. The city is well connected to other major tourist places of India.
5. Exchange programmes organized within institutes and organizations (CEPT, IIM, NID, Sangath, Footprints etc.) also add to the people visiting the place. Also when they go back home their feedback also prompts people to visit Ahmedabad.
6. Extensive published material on works of Corbusier and Doshi encourages students and professional to visit and explore Ahmedabad.

7. Hometown of Mahatama Gandhi encourages various historians and politicians to show interest in visiting the place.

CHAPTER 2 LITERATURE REVIEW

The chapter discusses the importance of heritage, need to preserve and means to preserve heritage. Global and local initiatives taken to preserve heritage are also discussed. Adaptive reuse as one of the options of preserving heritage is discussed with its merits and demerits.

Last segment of the chapter discusses about the study area i.e. the Pol houses, Ahmedabad in detail. This will give an insight to the potential of pol houses for adaptation and constraints that one has to face while taking up the process for adaptation.

2.1 HERITAGE

2.1.1 Defining Heritage

Heritage is our legacy from the past, with which we live today, and what we will pass on to future generations. Our cultural and natural heritage is a great source of life and inspiration. (*Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972*). They mark our identity and act as points of reference.

Heritage is priceless and irreplaceable asset of humanity as a whole. The loss of this heritage through deterioration or disappearance will result in failure of the heritage of all the people of the world.

2.1.2 Need to Conserve Heritage

Preserving historic buildings is essential to understanding our nation's heritage. They help us to know our points of reference and evolution with time.

Heritage gains importance to become an integral part of the urban identity for the present and the future of cities in their bid to set themselves apart from one another. (*Lawrence Chin, 2009*)

Our heritage is increasingly threatened with destruction by the traditional causes of decay in addition to changing social and economic conditions which aggravate the

situation with irreversible phenomenon of destruction or depilation. (*Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972*)

Deterioration or disappearance of any heritage results in harmful impoverishment of the heritage of all the nations of the world. In addition, preserving heritage is an environmentally responsible practice as we can reduce burden on our economies and resources by using the built heritage and not raging it stupidly to create new structures.

2.1.3 Means for Protecting Our Heritage

Our heritage can be protected considering the four main interrelated approaches of conservation implementation. (*Horayangkura, 2005*) These include:

Conservation: The conservation of cultural heritage must be continuously and permanently undertaken and maintained. The conservation of distinct cultural elements should be coherent with the site; and no components could be removed from the site unless under special conditions which would provide better protection.

Preservation: It refers mainly to maintaining the existing state, while retarding further deterioration.

Restoration: It emphasizes that reconstruction works should be in accordance with the original conditions.

Adaptive Reuse: Old buildings are to be modified and restored to serve proposed new functions while their historical and / or architectural values are maintained. This option reclaims the economic value of the building if implemented thoughtfully.

2.1.4 Global Initiatives for Protection

There are many global and local guiding forces for the protection of heritage buildings. An insight through these helps to understand various adaptations, merits and validity of the most recognized Building Conservation Charters like the Venice Charter and the Burra Charter. Contributions of the UNESCO World Heritage Centre are also significant in order to promote the protection of world's heritage. Besides global strategies, interventions are also being undertaken at national level by Indian National Trust for Art and Cultural Heritage (INTACH) in promoting the protection of

our national heritage. (*Iqbal, 2006*) The study of documents, charters, recommendations helps in putting them in three tiered system, i.e.

Tier 1: It is concerned with conservation philosophy and theory being the aims of conservation e.g. The UNESCO Recommendation Concerning the Safeguarding and Contemporary Role of Historic Areas.

Tier 2: It centers on the objectives and principles of conservation being the methods of achieving the philosophical aim e.g. ICOMOS Charter for the conservation of Historic Towns and Urban Areas

Tier 3: It is related to the practical policies and guidelines for achieving the objectives e.g. Guidelines for the restoration and Renovation of the Old City of Aleppo.

2.1.4.1 WORLD HERITAGE LIST

The World Heritage List includes 936 properties forming part of the cultural and natural heritage which the World Heritage Committee considers as having outstanding universal value. These include 725 cultural, 183 natural and 28 mixed properties in 153 States Parties. As of November 2011, 188 States Parties have ratified the World Heritage Convention. (*Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972*)

2.1.4.2 INDIAN CONTEXT

The Indian National Trust for Art and Cultural Heritage (INTACH) is a non-profit organization set up in 1984 to involve its members in protecting and conserving India's vast natural, built and cultural heritage. In 2009 they celebrated their silver jubilee and so far they have identified more than 60,000 sites covering major cities of India. One of the major and continuous activities carried out by the Architectural Heritage Division of INTACH is the listing and identification of unprotected historical buildings of architectural and aesthetic value. INTACH is perhaps the only organization which has such a vast database of heritage buildings in the country. Its mission is to:

i. Sensitize the public about the pluralistic cultural legacy of India;

ii. Instill a sense of social responsibility towards preserving our common heritage;

iii. Protect and conserve our living, built, and natural heritage by undertaking necessary actions and measures;

iv. Document unprotected buildings of archaeological, architectural, historical and aesthetic significance; and cultural resources, as this is the first step towards formulating conservation plans;

v. Develop heritage policy and regulations, and make legal interventions to protect our heritage when necessary;

vi. Provide expertise in the field of conservation, restoration and preservation of specific works of art; and encourage capacity building by developing skills through training programs;

vii. Undertake emergency response measures during natural or manmade disasters, and support local administration whenever heritage is threatened;

viii. Foster collaborations, Memoranda of Understanding (MoUs) and partnerships with government and other national and international agencies; and

ix. Generate sponsorships for conservation and educational projects.

Some of the prestigious projects completed by them include Restoration and Reuse of the Old Palace of Tripura at Old Agartala, Pattachitra Painting Orrisa, Monuments at Lodhi Garden, Delhi, Aali Masjid, Srinagar and Bhau Daji Lad Museum, Mumbai.

2.2 Adaptive Reuse

2.2.1 Definition of Adaptive Reuse

Adaptive reuse is the process of using an ineffective or used item into a new item for a different purpose. At times only the use of the item changes, rest all remains the same.

"Adaptation is derived from the Latin ad - to and aptare - fit. It includes any work to a building over and above maintenance to change its capacity, function or performance" (Douglas, 2006)

2.2.2 Adaptive Reuse as a Solution

While using historic building for adaptive reuse, it should be kept in mind that the change should have minimum impact on the heritage value of the building and its surroundings. Heritage status of a building should be analyzed properly before pursuing with the process of adaptation. It can be disastrous if it fails to protect the heritage value of the building and on the other hand be successful if it respects and retains the buildings heritage significance and add contemporary layer providing value for future. It is the only option by which the building envelope will be taken care of and used aesthetically by putting the building into use.

Adaptive reuse is an effort to slow down the process of deterioration and increasing the life of built heritage. It is preferred that effective action is minimum and able to cope up with future interventions. The scope of Adaptive Reuse in any historic built environment can vary from minor consolidation of artifact to vast town planning preservation. (*Iqbal, 2006*)

Minor modifications can be made to adapt the old buildings to compatible new uses. Systems installed can be upgraded to meet modern building requirements and codes. These solutions are good economically, help to preserve our legacy and are an inherently sustainable practice.

2.2.3 Benefits of Adaptive Reuse of Heritage Buildings

Benefits can be discussed under four categories (*Iqbal, 2006*):

Environmental Benefits: These buildings offer so much to landscape, identity and amenity of communities they belong to. One main benefit is saving of embodied energy which makes the project more viable as compared to new construction. It saves around 95% of embodied energy which will otherwise be wasted.

Social Benefits: A long term benefit is on the communities that use these buildings. Adaptive reuse can restore and maintain heritage significance of a building. It also

helps to ensure its survival. Government and other agencies are looking for options to reduce environmental, social and economic costs of continued urban development and expansion.

Economic Benefits: Several financial savings in terms of saving the embodied energy are there. Reused heritage buildings are also popular because of their historic value and are an asset for owners if sympathetically adapted.

Promoting Innovation: They pose challenge to present day architects and planners to provide innovative solutions within constraints of heritage buildings.

2.2.4 Risks Involved

Without doubt one can say that there are potential risks involved in the building adaption process. These are based on the fact that new construction is always preferred functionally and aesthetically as it can be designed according to the client's brief and an architect's vision. But the adaptive reuse buildings limit the scope of an architect to adjust within the formwork given to him. At times cost of refurbishment may exceed the cost of the new building or maintenance costs can be higher than the new construction. (*Sasidharan, 2011*) Some of the risks involved include:

- Only viable where cost and benefits are factored in over the life of the building
- Building owners see no economic benefit in reuse
- Older buildings may require extensive and costly refurbishment
- Inability to match the performance of a new building
- Ongoing maintenance costs may be higher than a new building
- Older buildings may be unable to meet current sustainability standards
- Availability and price of matching existing materials may create problems
- Maintaining the structural integrity of older buildings may be difficult

2.2.5 Elements Changed During Refurbishment

Importance of certain characteristics will vary from project to project. One should know which general characteristics are significant during the adaptive reuse of

buildings. The research and survey done by David (Kincaid, 2003) indicate the relative importance of the characteristics and their impact on 'change of use' decisions. The investigations carried by him have identified certain characteristics that need to be changed most frequently in conversions to new uses. They are:

- Building Services
- Means of Fire escape
- Building Core
- Building Access
- Building Cladding

In addition to above characteristics for change in buildings, there are certain factors which are taken care of to add to the marketability of refurbished property. These factors include:

- Building Character
- Period Features
- Floor to ceiling height
- Window height

2.3 Pol Houses

2.3.1 History of Walled City

Roots are found 5000 years back when there was a town known as 'Ashaval' and 'Karnawati'. Near this town, King Ahmed Shah developed the present city of Ahmedabad, after his name, in 1411 on the Western bank of Sabarmati River. Many developments have taken place in the city after that. In 1582 A.D the fort wall was built. As the city grew, it attracted people of varied communities and religious belief. The city had Hindu, Muslim and Jains living together which

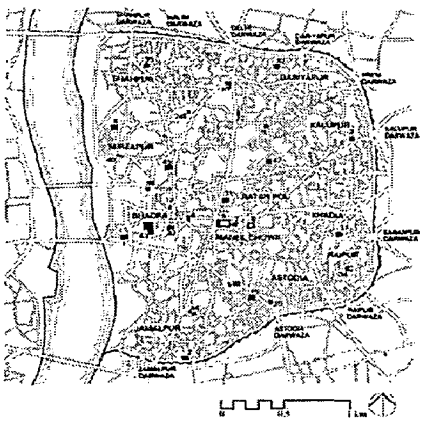


Figure 1 *Plan of Walled City Ahmedabad*

resulted in communal clashes in 18th century. As a result, the city reorganized leading to community wise segregation within the walled city and hence the neighbourhood units became closer knit and self-sufficient with each household capable of storing their livestock and water in case of communal instabilities. This resulted in deep communal divide between people of different religions. Post-Independence, the city witnessed growth in all the sectors and the population of Ahmedabad increased many folds. With its ever-increasing population, people started moving out of walled city to contemporary settings that suited the new lifestyle and tastes of the people.

The walled city exemplifies the amalgamation of the Hindu Islamic traditions in its urban morphology and the civic architecture of its fort mosque and tomb. First establishment started with the eastern part of river with the referential axes in a cardinal direction comprised of primary elements like Bhadra fortwall. Due to the importance to commercial activities became a major commercial spine of the city large number of immigrants from nearby village came and settled close to Manek Chowk and thus the first settlement came about acquired the status of "pura". Puras are the influence of rural settlement pattern on the urban form due to the immigration. Puras comprised of territorial street and residential blocks known as a sociocultural unit " Pol", "Khadki", "Khancha" and "Dela". Pol is also the reflection of "Khadki within village" in the urban form.

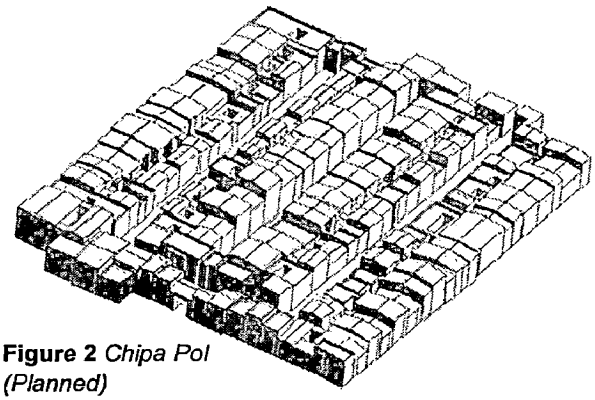


Figure 2 *Chipa Pol (Planned)*

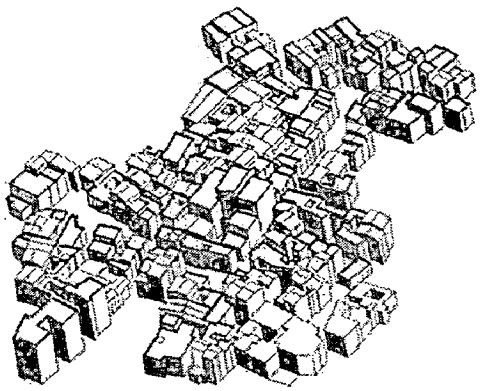


Figure 3 *Akasheth Kuva Pol (Organic)*

2.3.1.1 Demographic Data

The present population of walled city is 3,75,000 which dropped from 5,00,000 in 1991. Area of the walled city is approximately 5.78 sq.km with a density of 650

ppl/ha. There are around 360 Pols in the walled city. Each Pol consists of about 45-60 houses of varying size with shorter side facing towards the street. There are 12 entrance gates to enter into the old city with 9 distinct areas connected to the western part of Ahmedabad through two major roads i.e. Gandhi road and the Relief road and four bridges.

2.3.2 Introduction to Pol Houses

The walled city of Ahmedabad is inhabited on close knit neighbourhood pattern. These neighbourhood units are known as Pols. It is one of the finest surviving examples of urbanism and domestic architecture in the Indian tradition.

"A 'Pol' can be defined as a micro neighbourhood consisting of a narrow street with houses of varying sizes on both sides. The word 'Pol' is derived from the Sanskrit word 'Pratoli' meaning gate or entry"- AMC

"*A house in a pol conforms to the idea of being a part of group dwelling units packed in a row.*" The houses are deep with narrow frontage which open into narrow street and its longer side shares a wall with the adjoining properties which do not allow any kind of fenestration. The rectangular house form expressed a strong linear hierarchical organization as a result of life style and culture. The three storied house forms cover almost the entire plot of land available resulting in a dense environment. Due to its physical form, privacy is increased along its main axis. The larger dwellings of rich and prominent family were located on the main street of pol with wider and more embellished street façade. The general disposition of the dwellings, within the hierarchical fabric of pol and their façade treatment varied from dwelling to dwelling, highlighting the individual status of the occupants.

Initially, people staying in any Pol belonged to same caste and most times are blood relations. Narrow plots are completely built up to have an introvert planning and provide sense of safety and security among the inhabitants. This kind of close knit building pattern also protects the inhabitants from the harsh climate of the area.

2.3.3 Evolution of Pol House Form

Urban tissue of such a large dimensions Ahmedabad could not have been the result of particular time but the spontaneous growth of the over period of time. Various

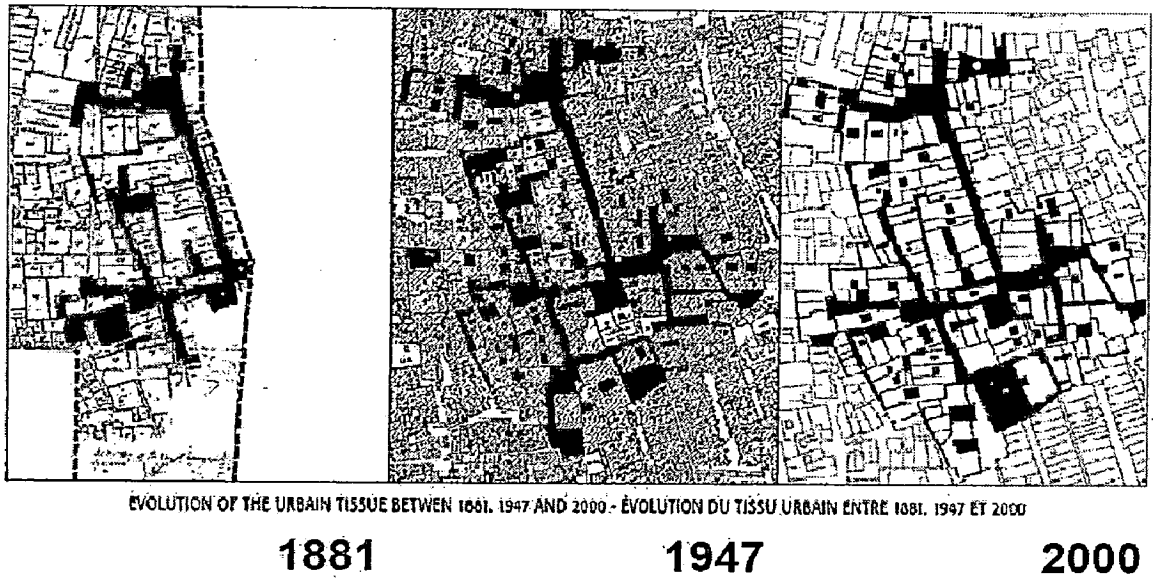


Figure 4 *Evolution of a pol*

forces like political, material, socio-cultural aspect etc. has changed form of the pol and its spatial character. City has adopted new skill and pattern of traditional social organization, during the various phases maintain the continuity of past and present. Ahmedabad's urban history can be divided into two phases: preindustrial phase (medieval city) and industrial phase (modern city). Within each phase various forces have contributed in the manifestation of house form.

2.3.4 Preindustrial Phase

POLITICAL FORCE: in medieval time decline of Mohammedan instability and also disordered life with insecurity. Maratha period led them to the planning of the past due to hostile environment, defense became important criteria, people had to make their arrangement for safety. During Maratha period people were allowed to enter their house on any land even in the middle of the . Consequently distortion and haphazard development took place. This has given rise to interesting patterns full of twists and turns with strong line and meandering in nature. This is reflected in the shape of house form.

SOCIO-CULTURAL SCENARIO: socio cultural has been the strongest force and had governed all the principle of law, social structure, economics and the principles of aesthetics in the house form. In medieval time, there was a strong caste system and plus the roti and beti "vayavaha" was limited within caste and subcaste. So, social

division of population was done on the basis of caste or profession, which reflected on the morphology of the city. Group of people of same caste or profession came together for greater interaction and formed a community to support each other. Therefore the governing authority called 'Panch' or 'Mandal' came into existence. House became the property of the whole pol. During this phase market systems did not exist. People used to work at home except when they want to sell their wares to the markets at the Maidan-e-Shah or Manek Chowk. Their profession closely knit with residential house form, which led them to provision of space for production in their house form. This provided easy access to work force. During this earlier phase, some of the superstitions related to the house form were regarding the placement of ridge location of the door and shape of the house plan. It was also believed that house with front width slightly less than the back is auspicious, while its opposite vaghamukha brings ruins and despair. Also, articulation in the façade element provides a protective function to ward off the evil rather than just being aesthetical. Lot of importance has been given to commercial activities in Muslim and Mughal period caused migration of individuals from near- by villages. Mixing of various castes influenced the house form. Open space became part of the house for private purpose and khadki retained as a gate. So their life became introvert that has caused deep narrow house and linear spatial organization, consequently climate responsive too.

PHYSICAL FORCE (CLIMATE & TECHNOLOGY): The most practical aspects like material availability and its limitations, technological constraints and climatic condition also affect the house form. The existing hot dry climatic condition of Ahmedabad reflected in compact wall to wall clustering house forming narrow street which remain shaded all the time. In early times stone and wood were the basic construction material but wood was found more flexible in terms of availability, lighter construction material which is easy to carve and good weather resistant. The most common trabeated structural system is adopted like tomb and temple. Wood was used as frame structure with mud brick and lime. Due to limitation of wood in terms of spanning also govern the spatial organization and create a kind of order in construction techniques, which provide cohesiveness in the character of the house form.

2.3.5 Industrial Phase

SOCIO-CULTURAL SCENARIO: In modern city, under the British rule, the major structural change is occurred in cultural set up in Ahmedabad. A kind of decay and deformation within walled city started with the rapid industrialization and urbanization and there is influence of Britishers on the house form. Due to foundations of new institutions like transport and services etc. and the expansion of the city in the suburban side caused migration and resultant change in the demographic patterns. Pol structure started loosening its single caste identity due to the assimilation of an entirely different cultural group. This has influenced the relationship between the units and led them to introvert planning. Due to the mixing of more compatible caste, inhabitants started feeling insecure. So, the moment of affluent class/ caste took place out of the pol. Subsequently renting out of the pol house took place, so house by dividing into number of parts by providing partitions. Nuclearization of a family structure and change of economic status of the family structure and change of economic status of the family affected the house form and their spatial organization. More rooms are added by the vertical expansion or horizontally expansion. Additional services were provided because of their convenience. With socio-cultural pattern, people have changed their house form to suit their changing need. Due to installation of sewage system and water supply, introduction of services took place. But the strong idea of pollution brought the toilet in front of the house. Subsequently, it has disturbed the continuity of the otlas aligning the street. The affluent class had adopted the colonial motifs at the level of façade mainly rather than adoption of European house plans and forms. This resulted in for example incorporation Corinthian column capital over old wooden columns. Application of colonial motives, use of cast iron railings, relief work in plaster and other popular colonial influence at work can be seen within these wall to wall dwelling units.

TECHNOLOGY: there was a radical change in material. New materials imply of different techniques of construction and change in expression of house form. Use of new material like Jack arches made of I-section with kota stone or brick and concrete took place in the construction techniques of the house form. With the change in material resulted in change in structural system and thus in expression, size, and amount of opening. Due to new material and structural system, they were allowed to

have larger size opening on external wall which has provided the house with better light and ventilation and also established the relationship between the internal open space and public realm- street. Because of new technology change in various elements and components has occurred which has consequently effected the house form and elemental character. With this, evolution of house form continuing till today to suit the new context. In present situation, with intense commercialization activity and communal riots due to caste composition has partly affected the pol environment and become major influencing factors for the breaking of the pol norms. Due to political riots the character of street has not remained as before. Streets are opening out, breaking the territory of community and become the thoroughfares which caused maximum movement. So the density of both people and traffic on the street has increased. Over the years change in vertical growth changed the scale of street which has affected the relationship between the house and open space in addition to change in street character.

2.3.6 Typical Characteristics of a Pol

A Pol will necessarily have a temple, a notice board and an entrance gate with a guard room above. The temple will belong to the religious belief of the inhabitants of that particular pol. A pol may have more than temple according to the scale and economic status of the inhabitants of the cluster. Some big houses known as havelies also have a temple of their own within the household. Other distinct elements include bird feeder, elaborate facades, narrow streets and secret passages to be used during emergencies as exits.

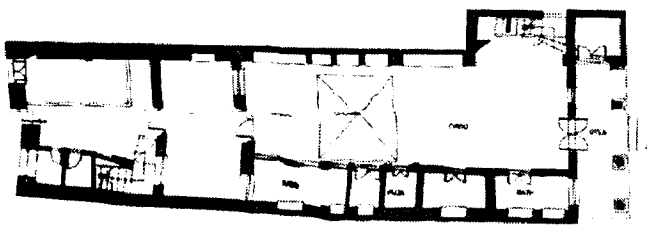


Figure 5 *Typical Plan of Pol*

Figure 6 *Typical Section of Pol House*

2.3.7 Components of Pol House

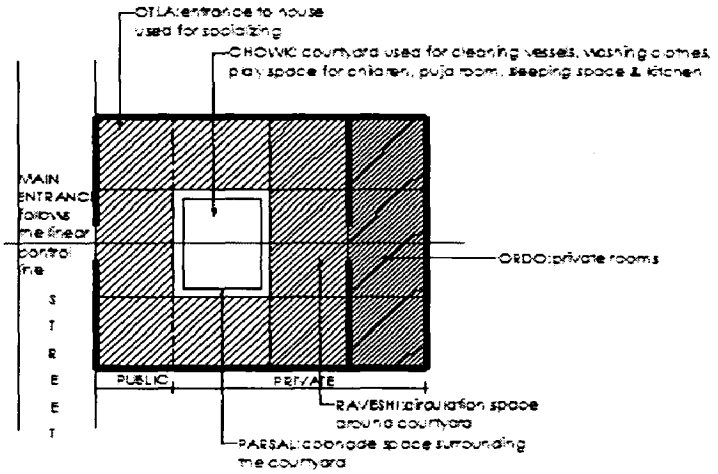


Figure 7 *Organizational Pattern of Pol House*

'Otla' or 'Otta'–It is the space connecting street to the entrance of the house, defined by narrow raised plinth. This space acts as communication zone between the outsider and house residents. It is also used for washing dishes and clothes.It is the front most spatial element of house form in a form of raised platform , overlooking the street. The level difference demarcates the boundary and also helps in attaining privacy. Otla has a colonnade, supporting upper floor extending outwards there by providing shade and rain protection. It provides a transitional space between public realm and private house.

Baithak/Khadki–The second band next to otla is called 'khadki' which functions as a public space in the house for receiving strangers and guests. In some of the dwellings a staircase connects this space to the upper levels. Sometimes in case of larger space a 'hinchko' is provided for relaxing and sleeping in summer time because sunlight never enters in this portion, so it remains cool at all times.

Chowk – Next to *Baithak*, it is main nodal element of the house connecting all the spaces together. The interior façade facing the chowk is richly carved same as the front façade. It also represents the religious center of the dwelling.This is the central space, open to sky, is the major focus and main characteristic spatial element within the house form. It holds all the other spaces and functional elements are built around it, so all the activities take place around it, so all the activities take place around it. Therefore it became a 'womb' of house form.

Directly associated with the chowk are the rasodu, paniyaru and puja – all these spaces being considered as sacred space. The 'tanko' was usually located below the

floor level of chowk. It became the main space for social gatherings and festivities. Chowk represents the religious centre of house. Not only social and family needs are satisfy by the chowk, but it is also the most significant single element responding to climatic need. It is served as a light well and ventilation shaft. Next in sequence is a semi-covered space around the chowk known as 'osri' which becomes the transition space between chowk and private living area(parsal)

Role of 'Chowk'

The 'chowk' or the courtyard divided the house into two distinct realms of public and private. It was generally symmetrical along the central axis of the layout. Area abutting to the street is used as a public area for men and the rear of the house is private area meant for women.

Courtyards provide light in the interiors and in addition provide breezes in hot climate. Air from small apertures of windows increase the wind velocity through venture effect and reduces the temperature due to Bernoulli's principle.

Transformation over time i.e. light and time adds to the richness of the court. Though it is a static element but it manifests differently with change in time and its intensity, direction and hue of illumination. The changing shadow patterns render space dynamically creating interest. Landscaping and vegetation also help in changing the static container to dynamic experience through its growth and decay.

Rasodun – Kitchen

Paniyaro – Space for storing water

Puja – Prayer room

The *'rasodun', paniyaro* and *'puja'* are considered as sacred spaces and are connected to the *'chowk'*.

Parsal – It connects *'chowk'* to other living areas at the rear end of the house. The name is derived from Sanskrit word 'Prashala' meaning the front of the room which is used as a multi-functional areas during the day time. One side is facing the 'chowk' through which light and air enters in the house. Staircase is provided is this area leading to upper floors. At times 'hichko' is provided in this space.

'Ordo' or 'Ordoo' –Last room, furthermost room from the street and most private room. Generally this room is dark as it receives less light. It opens in narrow streets (*chhindi*) by means of small windows provided for cross ventilation. This is completely a private room where usually outsiders are not allowed. This was used mostly in summer for sleeping purpose and specially was used by ladies. The function of this room is essential for storing grains or other valuables throughout the year. It may be further divided into smaller rooms if required.

Divankhanu – A room provided at the upper floor used for business transactions.The room is just above the khadki used as a guest room, overlooking to street and internal open spaces. Its location provided privacy required for business. It became sign of one's status and wealth.

Agasi – The top most part is of the house is known as 'Agasi' used for sleeping in summer due to high temperature in interiors at night.

Tanko – It's an underground storage tank located beneath the chowk to store rain water. It is generally coated with limestone which purified water. Water is carried through copper pipes from roof to the tank.

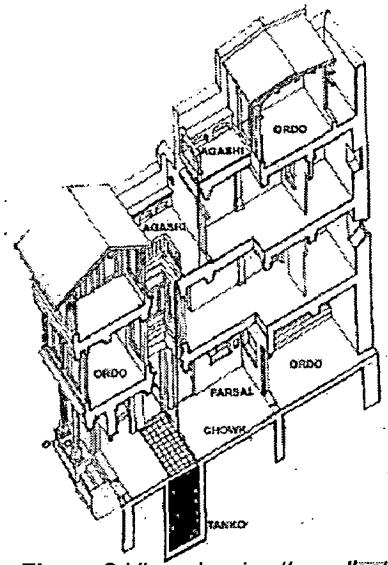


Figure 8 *View showing the collection of rain water in 'Tanko'*

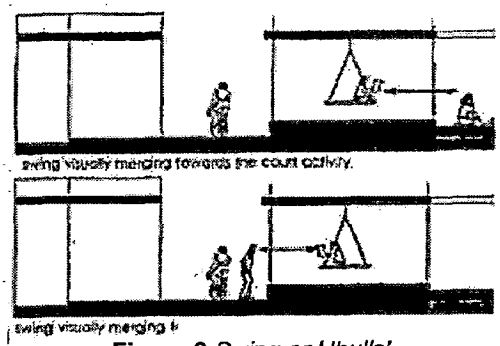


Figure 9 *Swing or 'Jhulla'*

Jhulla' or **'Hichko'**- Most vital element of a house.

2.3.8 Societal Influence of Pols

It is a cohesive neighbourhood unit with people of different but related occupations staying together. House layout clearly shows gender divide within the house and the

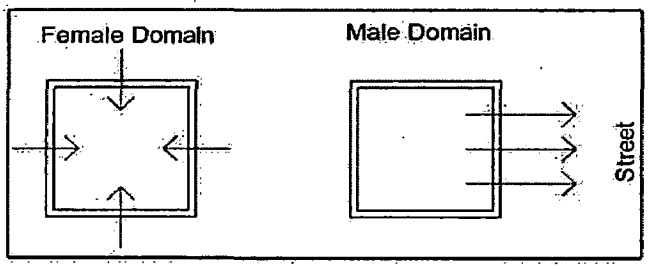


Figure 10 *Strict Gender divisions in a Pol House*

overall planning was introvert keeping privacy in mind with courtyard as the focal point of all the activities. Streets were main interactive areas for the inhabitants. These narrow streets helped in providing thermal comfort to houses abutting to it, making a house and its neighbourhood inseparable from each other. That is why it became a characteristic settlement of not only Gujarat but whole of India.

2.3.9 Structure of a Pol House

The Pol houses can be described as non-engineered construction. The structure consists of wooden posts and beams with infill walls of brick. The walls are plastered on both the faces to protect them from the weather. Street façade of the house is heavily treated with wooden structural and decorative elements i.e. columns, brackets, window shutters and balconies. The materials and construction techniques used for the pole houses are traditional, offering certain advantages for making them earthquake resistant. Layout of these houses is such that they have the main parallel walls supported by cross walls at regular intervals in both directions and during earthquakes, these perpendicular walls act like shear walls. The general plan configuration follows complete masonry box system with perpendicular shear walls.

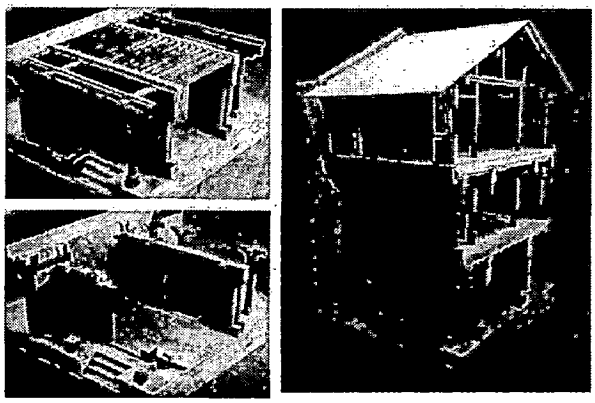


Figure 11 *Structure of a Pol House*

According to the IS codes, courtyards in the building tend to weaken the diaphragm at most critical location diaphragms with abrupt discontinuities or variations in stiffness, including those having cut-out or open area greater than 50% of the gross enclosed diaphragm area. But the courtyard constructed with structure and material of its own helps it to act as a separate unit not transferring forces on to the adjoining

diaphragms. The appropriate change in the nature of the diaphragms gives the building parts enough flexibility to move separately during earthquakes.

Another aspect is the structural symmetry in section. It is very important as an earthquake resistance principle. Because a building possessing symmetrical conditions responds with regular displacements along height and almost negligible floor rotations due to insignificant torsional effects, in consequence their deformation pattern is well distributed among the structural elements. Ahmedabad houses have all walls matching their respective floor layout at every level, which helps the gravitational and horizontal load transmission easily to the foundation.

For earthquake resistant design, it is important that center of mass and center of rigidity of building is nearly coincident. If it is not so, the distance between center of mass and center of rigidity will cause torsion in the building. Center of mass and center of rigidity of Ahmedabad buildings nearly coincide with each other. Ahmedabad houses are narrow, deep, consist of two bodies with courtyard in between, and linked up by passageways, The general rule in making of these units is that the rear body is higher than the body looking on to the street. Stress concentration at the notch, generated due to different periods of vibration for different parts of building, generates high diaphragm forces to transfer at the setback.

Timber and other organic materials are vulnerable to fungi and decay. Traditional methods of building with highly effective construction details, like overextending its roof eaves, protect these vulnerable materials against moisture, rain and humidity.

Projection in buildings helps as the floor joists, which extended through the wall to supports the balconies, were more successful at stabilizing the walls than were wooden joists terminating in pockets and makes conjunction with brick wall to hold.

Materials used in Pol houses are light making the structure perform better as earthquake forces are, proportionate with the weight of the structure. Elastic properties of materials allow uniform deformation and absorb more energy during the earthquake.

2.3.10 Climatic Responsiveness

The performance of a Pol house in response to the climate can base on the three main seasonal variations i.e., summers, monsoons and winters.

Strategies of planning of the Pol houses in response to occupant migration, shading, earth coupling and evaporative cooling work in resonance to create a microclimate comfortable within the house premises.

Hot- dry "Summers" - During the summer months, the house envelope functions as a protective layer between the exterior heat and resultant microclimate of shade, cool surfaces and cooler, more humid air within the house. Internal and external temperature can be clearly defined during the summer season.

Shade is required in the summer months as a fundamental response to daily temperature and solar radiation. The longer sides are shared therefore they are not exposed to solar radiation. The exposed wall surface is narrow on streets shading the house facades most of the time with slight variations based on orientation. One successful technique is presence of wooden ornamentation on the façade. The low thermal capacity of the carved wood elements acts as a protective shield between incident solar radiation and thermal mass of the house. Thermal capacity of the building materials used is one of the prime factors of providing thermal comfort.

As the season move towards 21st june, the sun is at an angle of 89.5^{0} overhead. Therefore the amount of solar radiation entering the chowk increases heating up the internal mass. In order to check this, the proportions of the chowk are kept tall and narrow. Self-shading of chowk helps in reducing the heat gain. The elevation of chowk having wood ornamentation also reduces the penetration of heat to interiors. Cleanliness is an obsession of Gujarati household, therefore chowk is washed several times a day resulting in evaporative cooling.

Window openings have wooden shutters without any glazing. These are opened at night to exhaust the hot air from coming inside and receiving the cooler air from outside. Family occupies ground floor during day and shift to top floor at night.

Hot– Humid "Monsoon" - As the temperature reaches 45-48^0 C by the end of May, people start looking forward to the coolness of the rains. Daily pattern of occupancy and operation changes with more interaction to the exteriors. During this season, lack of exposed surfaces becomes a problem as there is insufficient cross-ventilation

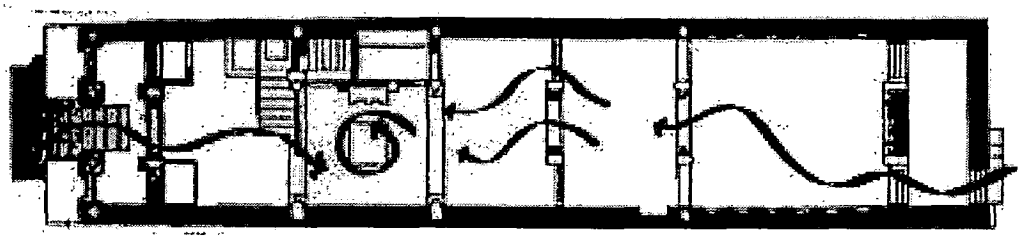


Figure 12 *Circulation of air through 'chowk'*

resulting in stagnant and damp interiors. Some people cover the chowk with plastic during rains which results in humidity indoors and it becomes unbearable with time.

Temperate-Dry "Winter" – As temperature goes down, the house starts functioning on diurnal basis. Upper floors and terraces become comfortable places during day. Chowk does not receive much solar radiation with sun at an angle of 42.5^0 but it provides a stable environment protecting from winter winds.

2.3.11 Pol Houses today

With technological advancements and boom in the business activities, the walled city is facing problems of heavy through traffic, congestion and high commercial ingress leading to lack of infrastructure and services. As a result, the traditional environment has started decaying and there is neglect and ignorance towards the traditional heritage. People having strong economic background have moved out of the walled city leaving economically weaker sections in the area. This has resulted in deteriorating of the Pol houses as the people living there do not have funds to maintain the properties. People are moving out of the place because of lack of preferable living standards and services like lack of educational facilities, health, fire-fighting facilities etc. and heavy congestion.

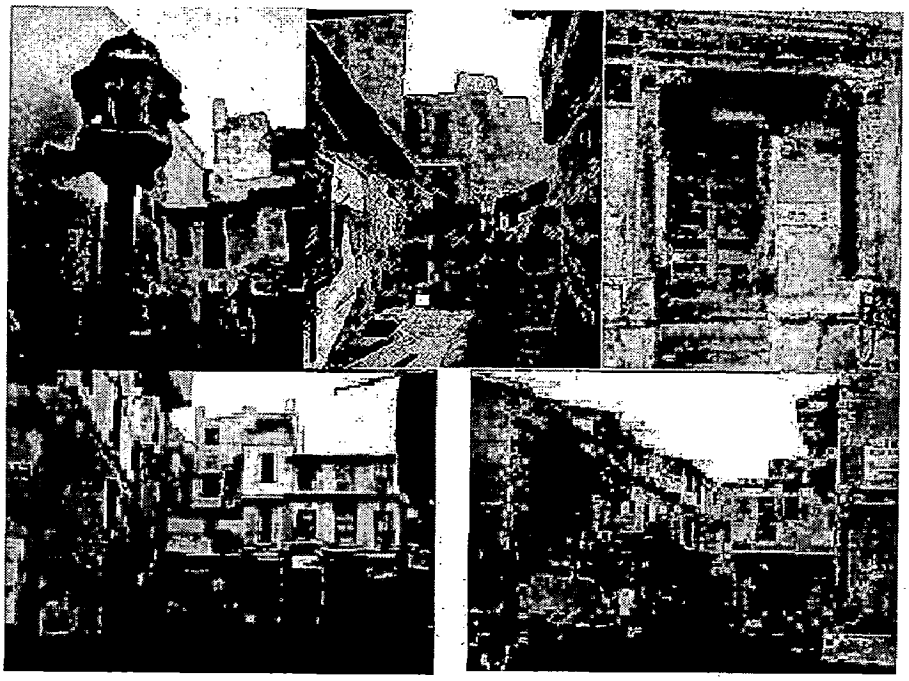


Figure 13 *Glimpses of Pol Houses, Ahmedabad*

2.4 Analysis of Pol Houses

2.4.1 Structure

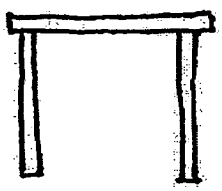


Figure 14 *Post & Beam Structure*

The structure is trabeated i.e. post and beams. It modulates in sequential manner. Spanning is done along narrow side with wooden beams. Partition walls are not load bearing. The rear portion is having load bearing walls as it is three storeyed. Only common walls shared between adjacent houses are load bearing.

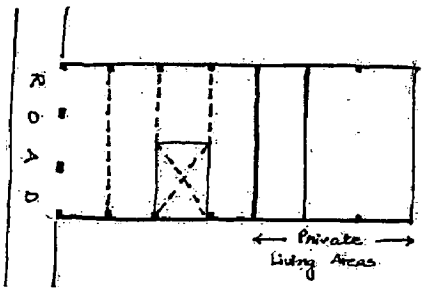


Figure 15 *Spanning along narrow side*

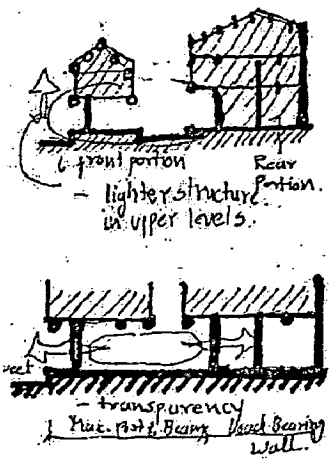


Figure 16 *Placement of Structural members*

2.4.2 Shape and Size

Pol houses are generally rectangular in shape with 5-6m width and 12-18 m depth. Originally one house occupied the entire plot. Urban transformations, particularly over the last couple of centuries have resulted in both divisions of plots into separate properties, as well as conversion of two or more plots into one large plot.

Variations in the width of the house more in Pol houses compared to overall height and length of the house form.

Ratio between frontage vs height of the façade results square or rectangle shape façade of the houses.

2.4.3 Height

The height of the houses varies only marginally comprising a ground floor built on an otlo or podium, at the entrance and one or two floors built over it, height of each floor ranging from 2.3 to 3 m. houses consist of two bodies with courtyard in-between and linked through passages along the shared wall.

As a general rule, the rear body is higher than the part looking onto the street. Roofs are double pitched with the roof-crest running parallel to street. The rear building is partly covered by a terrace for rainwater collection connected to an underground water tank occupying part of the basement for storage.

2.4.4 Materials

Walls	Load Bearing	lime mortar and brick masonry, cement mortar and brick masonry
	Non-load Bearing	brick masonry as a infill material
	as a partition wall	wooden panelling
		wooden frame and asbestos sheet or G.I. sheet
Roof	Flat Roof	wooden spanning element
	Hipped Roof	rafter, purlin members
		Steel section roof

	Structural member	wooden column, girder and beam
		Steel angles
Flooring	Floors	stone, manglore tiles, glazed tile, mosaic tile
	Staircase	wooden
	Roof covering	Wooden plates with mosaic tile
	Doors, windows	wood, M.S. grill

CHAPTER 3 CASE STUDIES

The chapter discusses about projects already done at national and international level in the field of Adaptive Reuse. Keeping in mind the nature and context of study area, the following case studies have been identified:

- Judge's Court- A Heritage Resort, Garli Pragpur Heritage zone, Kangra – *India's first heritage village*
- Mangaldas ni Haveli – Café and Craft Center, Ahmedabad
- Choona Mandi Haveli Complex – Women College, Lahore
- Al - Bastakiya Conservation, Dubai
- Fahadan Rehabilitation, Yazd- Iran

3.1 Judge's Court- A Heritage Resort, Garli Pragpur Heritage Zone, Kangra–India's First Heritage Village

Heritage villages of Garli and Pragpur are ideally suited to explore Kangra valley .These area has several streams that drain into river Beas with its suitable climate, easy access, safe passage, rich flora and fauna and treasure of architecture. Pragpur and its surroundings offer an ideal location to explore new horizon. This part of Himachal Pradesh has long been praised for its natural beauty, its low rolling hills cover with a variety of sub-tropical vegetation-grassland and scrub. The Dhauladhar mountain range raised behind this picture of pastrol perfection and needy frames it with tall peaks that are draped with snow for the better part of the year. By a notification dated 9th December 1997 the state Government has classified Pragpur as a "Heritage Zone".

3.1.1 History

Heritage Village Pragpur is located in the Kangra Valley which is panoramic and replete with history. The area of Pragpur was a part of the principality of Jaswan whose chief, in the late 16th or early 17th century charged a band of the learned men led by a Kuthiala Sood to find a suitable place to commemorate Princess "Prag" of his royal Lineage. *Prag* in Sanskrit translates to pollen. In a way it aptly describes the

area of Pragpur, which in spring is afire with blossoms. The core area of Pragpur is a

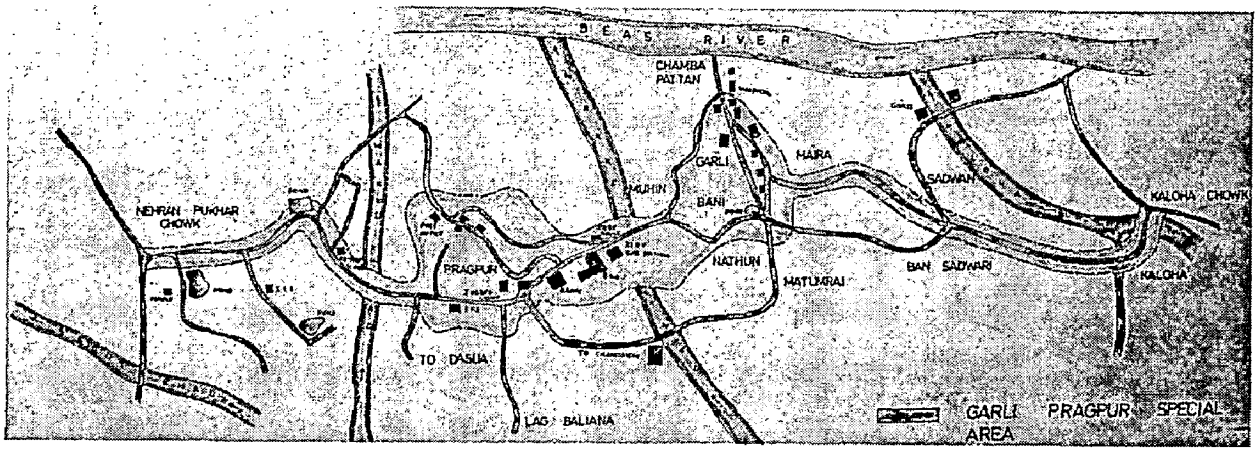


Figure 27 *Garli Pragpur Heritage Zone*

notified "Heritage Village". Founded about three centuries ago Pragpur has held onto the essence of an earlier era- unchanged shops, cobbled streets, ornamental village tank, mud plastered and slate roofed houses.

3.1.2 Settlement Pattern of Pragpur

Pragpur is a village of mohallas and *gallies* (streets). A mohalla consists of dwelling units surrounded by *gallies*, forming socially coherent system. Rather than a mere mean of communication, the *gallies* reflect a variety of everyday human activities of works. Recreation, commerce and informal interactions make them public places. As per the traditional modes of segmentation, there was a distribution of various social groups across the mohallas.

Dwelling is acted as a base of cultural and public activities. Each person is identified with his dwelling units. Even mohalla names revealed characteristics unique to it. Dwelling units in Pragpur developed around a distinct activity node-a haveli, a temple, a water body or simply an open space that acted as an integrated element orienting all public activities around it. This nucleus developed a residential quarters or dwelling units around itself. The dense street pattern within mohalla defined dwelling units. Each block consisted of plots with back to back houses. The built form developed a built to edge character, responding to the street in the form of, balconies, and verandahs, making close interaction between the occupants and passerby on the streets.

3.1.3 Characteristics of Dwelling Units

Pragpur is a mélange of dwelling units of traditional mud plastered houses and colonial wooden architectures Sun-baked houses stand in close harmony to the wooden facades of the colonial style buildings. All dwelling units are ornate and the facades very interesting by themselves are accentuated by coloured patterns, intricate painted motifs and further embellished by use of decorative doors. Most of the dwelling units have brick walls and sloping roof of slate supporting upon wooden members. The interiors resemble those of the princely era with fire places and antique furniture profuse detailing and stuccowork around the buildings are general features. Majority of the dwelling units have three column arched jharokha along the exterior façade. The old layout consists of two or three storeyed high structures with shops at the ground level and residential area at the upper level.

3.1.4 Issues to be addressed for protecting this Heritage

The main objectives of the plan are:

- To determine the rate and direction of permitted change in the historic environment of Pragpur.
- To provide with better living conditions for the local communities.
- To emphasis on the participatory and conservation based approach for sustainable development.

Pragpur has unique cultural as well as natural resources; these are under some pressure and may be destroyed due to the unplanned tourism and urban development if not planned sensitively.

There is a need to address all the issues of infrastructure development, provision of basic facilities, economic sustainability and visitor management.

Because of the Pragpur historical and cultural associations, as well as its tourism potential there is a strong interest among the local administration in addressing some of its social, physical and economic problems. In this context, INTACH wish to act as catalyst for the cultural heritage conservation in the village.

The conservation focus in terms of the repair and restoration historic building would be used to improve social services. Financing the restoration and rehabilitation of historic building for schools and community-based activity may address issues of using existing with minimum interventions.

To address the infrastructure and economic development of Pragpur, the project funds are required for the upgrading of the water supply, sewerage, drainage, paths and roadways, solid waste collection, electricity and traffic management and there is a need for all this to be co-ordinate and integrated in the planned manner so that the development is sustainable.

3.1.5 The Judge's Court

Completed in 1918 this is a splendid country manor designed in Indo European tradition. It stands in 12 acres of land and is just a short walk away from the village core and Taal. It is **adaptively reused** by the owner as a heritage hotel. The building

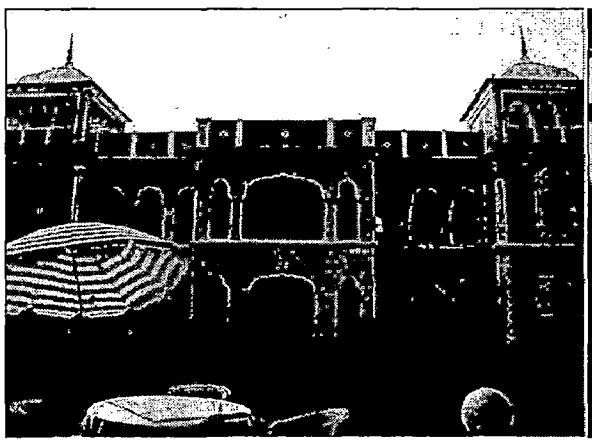


Figure 18 *Front View of Judges Court, Pragpur*

Figure 3 *Side View of Judges Court, Pragpur*

is European with touches of Mughal art blend- carved windows, onion domes and gothic arches. Winding staircase and airy verandahs skirt the rooms, which by no means are any less cheery, bright upholstery enlivening the grand feathery wood. Beautiful giant chandeliers hang from the ceilings and all corners have a Victorian fireplace.

Figure 20 *Interior of Guest Room*

Figure 21 *Bay Window in Guest Room*

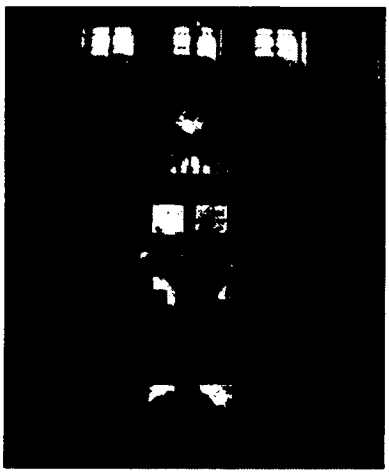


Figure 22 *Main Staircase leading to Guest Rooms*

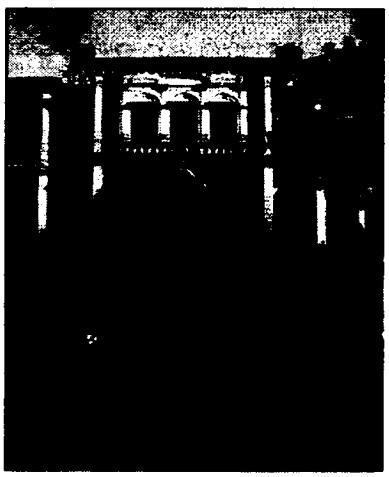


Figure 23 *Back View of Judges Court, Pragpur*

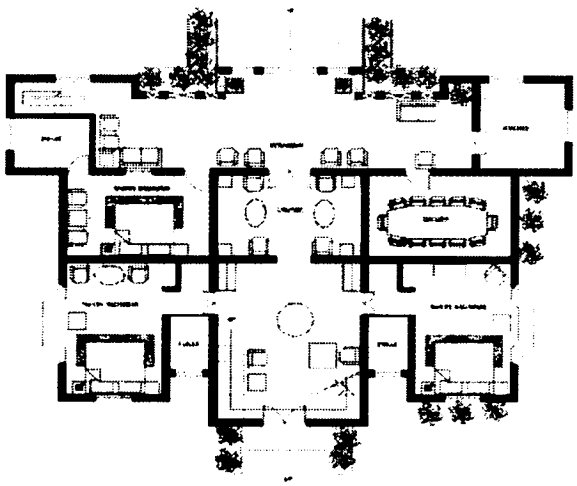


Figure 24 *Ground Floor Plan of Judges Court, Pragpur*

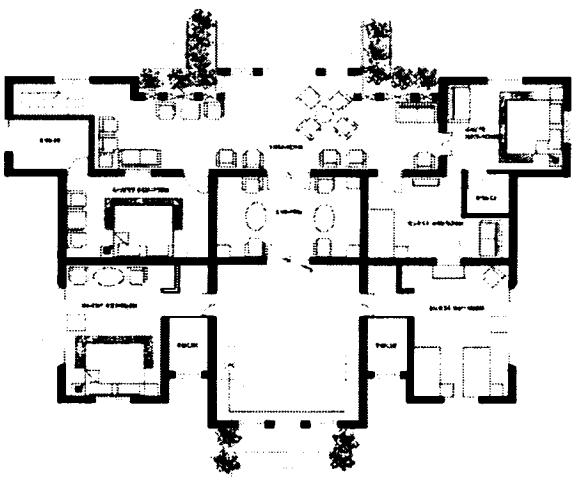


Figure 25 *First Floor Plan of Judges Court, Pragpur*

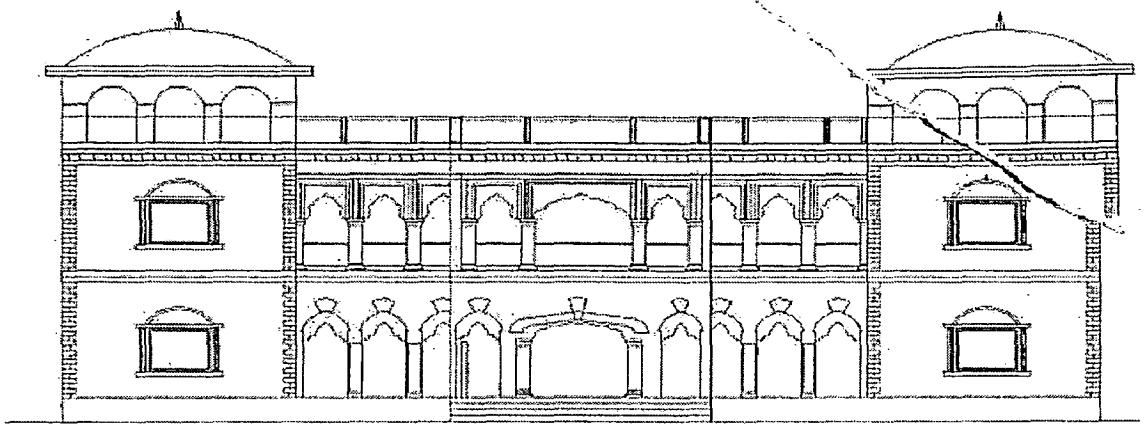


Figure 26 *Front Elevation*

3.1.6 Inferences

- Traditional techniques are adopted for restoration
- Addition of services like attached toilets and new electrical fixtures
- Addition of Ancillary blocks like kitchen and Café to add to the potential of tourism

3.2 Mangaldas Ni Haveli-Café and Craft Centre, Ahmedabad

Mangaldas ni Haveli was earlier known as Bholanath Divetia ni Haveli. It is situated deep inside a narrow lane, called Lakha Patel Ni Pol, Khadia area of the old city of

Figure 27 *Woodwork facing the 'chowk'*

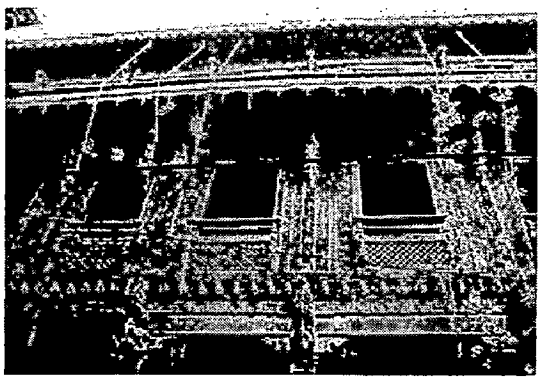


Figure 28 *Front View Mangaldas Ni Haveli, Ahmedabad*

Ahmedabad. This haveli is believed to have been built about 200 years ago and was passed from owner's heirs in the hands of an old lady.

Later the last owner approached the renowned industrialist and heritage conservationist Abhay Mangaldas – of the House of MG group. The project requirement was to reuse the haveli as a Cafe and a Craft Center - a celebration of architecture, craft and culture of this region that would act as a catalyst to the revitalization of the entire area. The Haveli is a classified category-A heritage structure (as defined by the Ahmedabad Municipal Corporation).

3.2.1 Scope of Conservation Project

The retrofitting and the interior refurbishing of the project is done for the purpose of adaptive reuse from a residence to a Café and Craft Center. The projectwas completed in over 18 months and the work was carried in three phases.

Phase 1 was to make the haveli structurally sound and to make modifications on the second floor of replacing a sloping roof with a slab for a terrace.

Phase 2 was to reinstall all the services like electrical, plumbing and drainage and

Phase 3 was to refurbish the interior spaces for the required purpose.

3.2.2 Design

The entire look of the old haveli is retained, withholding all the structural and interior

Figure 29 *Terrace used as Café*

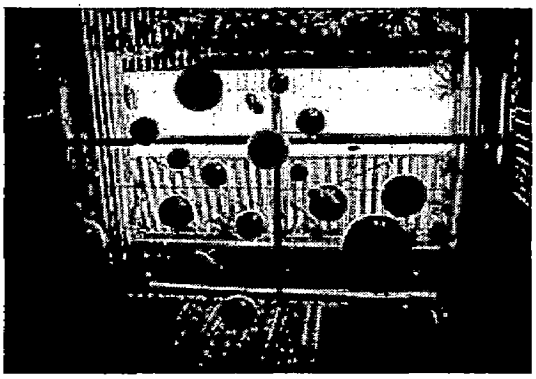


Figure 30 *View from 'chowk'*

elements, except the elements on the second floor. All the restoration work is kept visible without any attempt to blend it with the old. The new addition of dumbwaiter and terrace is totally modern in material (exposed cement, glass and steel) as well as designed to create a sense of co-existence between the old and the new. The outcome should reflect preservation of our traditional values, along with benefits of a modern lifestyle.

3.2.3 Technical issues of restoration and solutions

The main retrofitting needed was in one of the primary wooden beams of the structure. The entire building was leaning on one side as the junction of this beam with a supporting pillar was damaged. Instead of replacing the beam, the haveli was

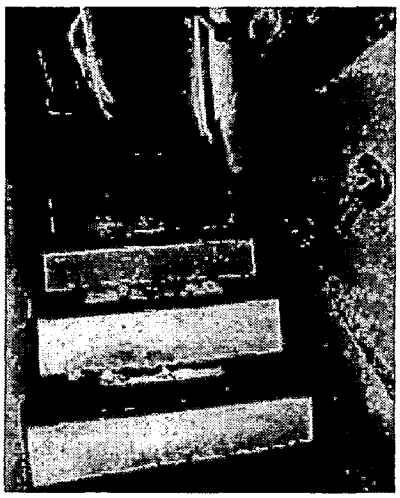


Figure 31 *Steps leading to Upper Floor*

Figure 32 *Flooring re-laid matching with previous flooring*

jacked up from this corner and the beam was reinforced with steel. The damaged plaster on walls was repaired in lime, the plumbing and drainage was newly laid in the ground or in the walls (concealed). The electrical wiring was put in a wooden conduit running at lintel level on all the floors and the existing underground water tank and recharge well were reactivated. The rainwater harvesting system was already in place. The cement tile flooring on ground floor and portion of first and second floor was replaced with reclaimed clay tiles and the bathrooms were completely refurbished with stone floor and modern fixtures. Damaged frescos were cleaned up, but not repaired. The wood carving was repaired where broken and thoroughly cleaned, and varnished without any touchup in colour (this haveli is unique as its carvings are painted).

Figure 33 *Interior of Craft Center at F.F.*

Figure 34 *Internal Finishes matching with Existing Elements*

3.2.4 Restoration Program

The restoration process included:-

1. Documentation of Haveli
2. Structural restoration
3. Restoration of finishes
4. Construction of new structures to adapt programmatic requirements

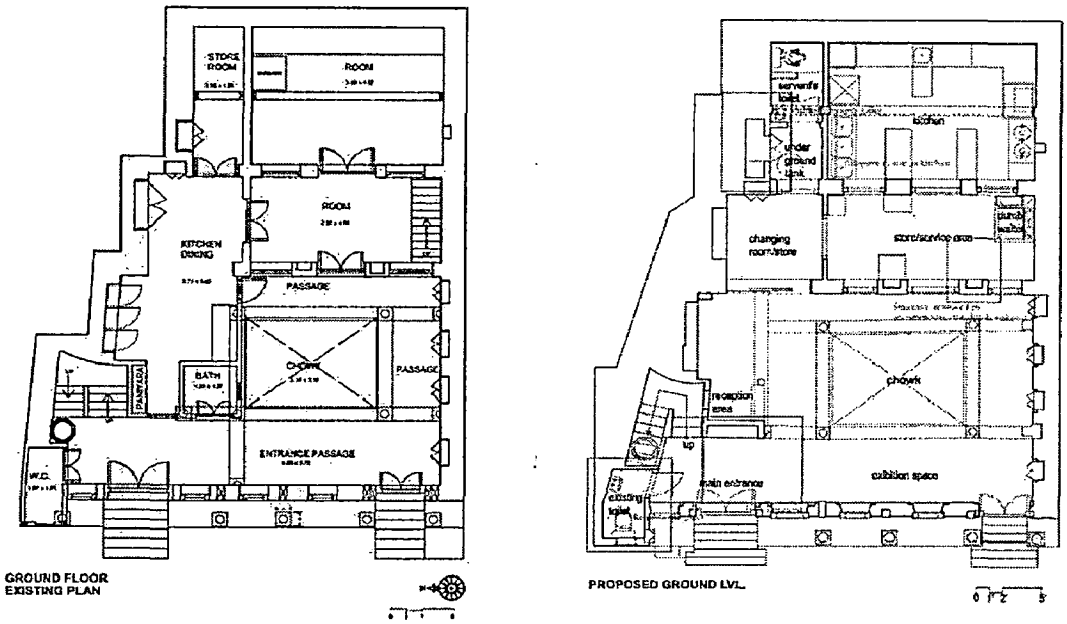


Figure 35 *Existing and Proposed Ground Floor Plans*

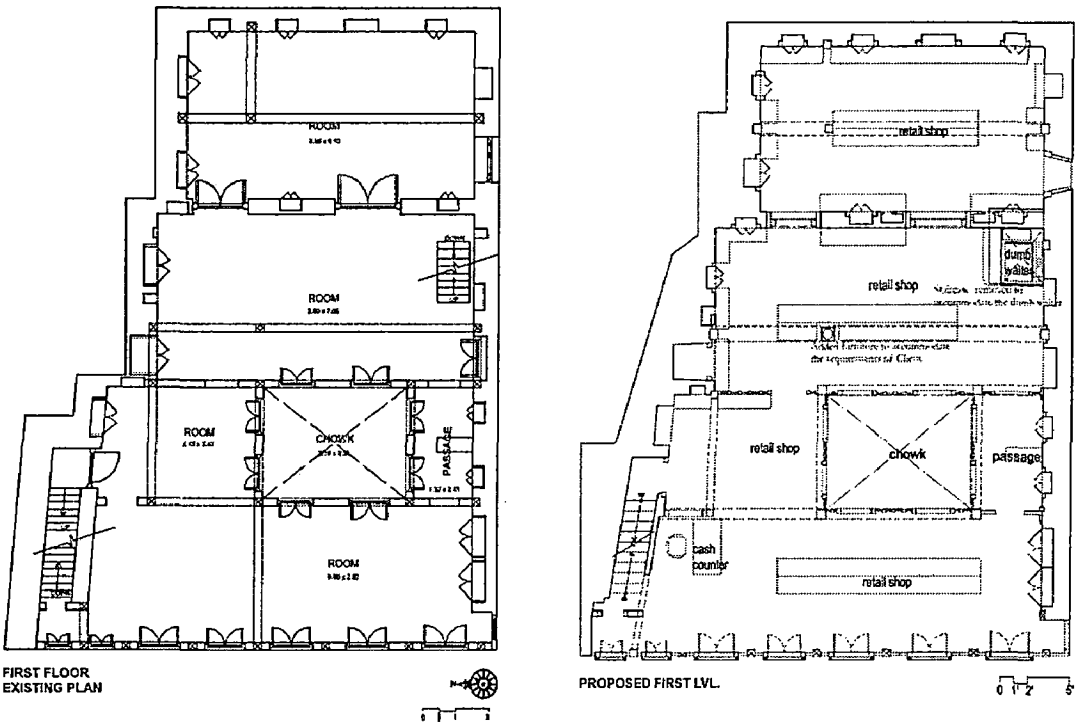


Figure 36 *Existing and Proposed First Floor Plan*

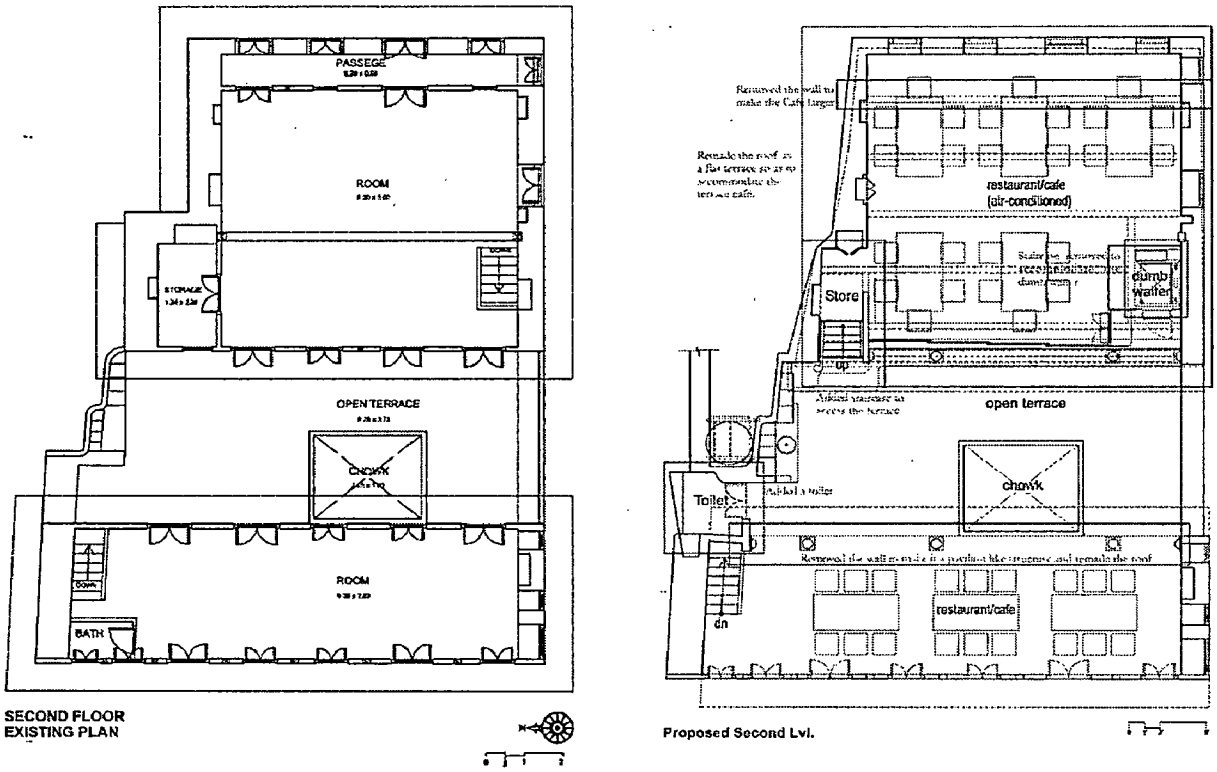


Figure 37 *Existing and Proposed Second Floor Plan*

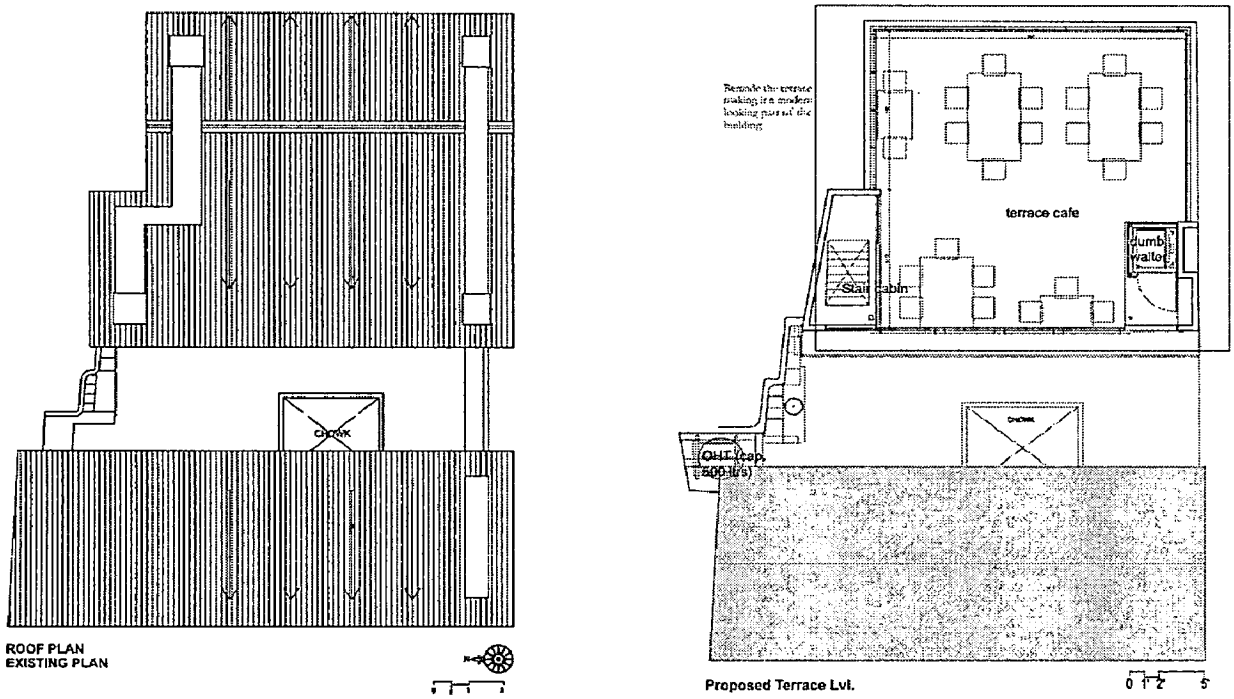


Figure 38 *Existing and Proposed Terrace Plan*

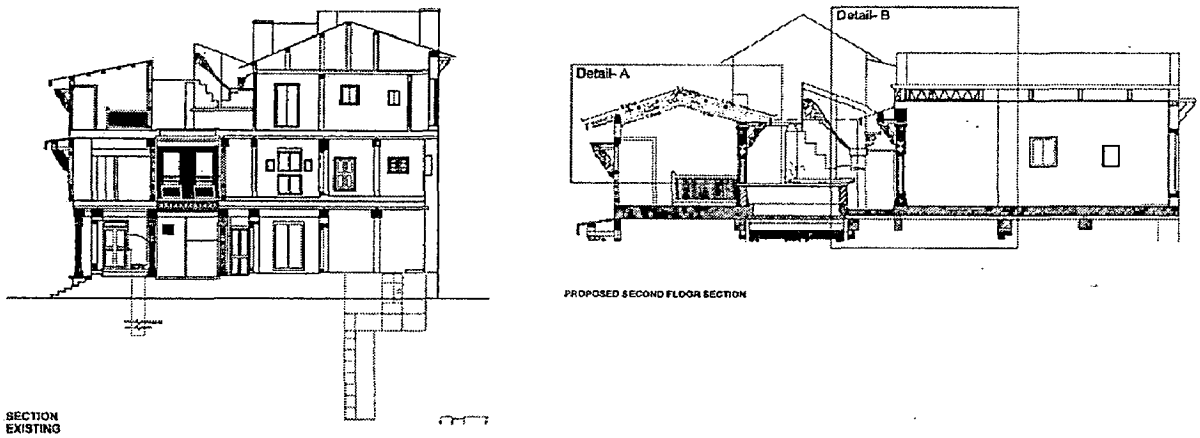


Figure 39 *Existing and Proposed Section*

3.2.5 Stages of Work

1. **The Documentation**: There was no drawings and information available on the haveli. Therefore, first step was the documentation of the haveli. A detailed study of the structure and documentation of architectural, structural and nonstructural damages was done to facilitate the design of the haveli.
2. **Structural Restoration**: The restoration was done to preserve the original façade and other elements in the building. The structural restoration complied with the heritage bylaws. The adaptive use of old materials helped preserve the ethos of the building.
3. **Restoration of Finishes**: The original flooring was repaired and restored in almost all the places. The remaining floor areas were refurbished with mosaics tiles. All other finishes like paints, frescos, parapet walls were reclaimed following the old methods of construction.
4. **Construction of new structures to adapt programmatic requirements**: There were many challenges faced while adding new structures to the building. The plumbing had to be redone to accommodate bathrooms on the upper floors. A whole new plumbing system was installed to accommodate them.

5. There was no ventilation for the kitchen, with walls on both the sides. So the kitchen was equipped with an exhaust, which ran on the side of the building. There was a staircase added to go to the terrace and another stair-well was converted into a dumbwaiter shaft, for easy access. The 'tanko' underground tank was restored for collecting rain-water, which would flow into the river.

3.2.6 Inferences

- Structural stability is one of the key issues in Adaptive reuse.
- Blend of traditional and modern techniques.
- Restoration work kept as it is.
- Lack of parking facility for the visitors.
- No signage's or maps guiding the tourists to the haveli, therefore it is difficult to locate the Art and Craft Centre.

3.3 Choona Mandi Haveli- Women College, Lahore

The Walled City of Lahore covers an area of 256 ha with a population of 200,000. The city walls were destroyed shortly after the British annexed the Punjab in 1849 and were replaced with gardens, some of which exist today. The Circular Road links the old city to the urban network. Access to the Walled City is still gained through the 13 ancient gates, or their emplacements. The convoluted and picturesque streets of the inner city remain almost intact but the rapid demolition and frequently illegal rebuilding, which is taking place throughout the city, is causing the historic fabric to be eroded and replaced by inferior constructions. Historic buildings are no exception and some have been encroached upon. The Walled City ceased to be a center of power some 140 years ago. Process of preservation and conservation started in 1986 and since then several projects have been implemented. The infrastructure of the Walled City was upgraded, some social facilities were provided and ten government-owned buildings of historic and architectural merit, including five of the six remaining city gates, a hammam, a former haveli, etc., were restored and/or adapted and reused along with some landscaping projects carried out Although the Choona Mandi Haveli was identified in the Conservation Plan as worthy of documentation and conservation, the project was implemented independently of the plan; however, it progressed along its general lines.

3.3.1 Location of Choona Mandi Haveli Complex

The Choona Mandi Haveli Complex is located near the Fort, on the northwest edge of the oldcity, in a triangular lot of 2.7l ha, hemmed in between the Moti Bazaar on the West, the Choona Mandi Bazaar on the Northeast and Gali, street Jamaadar Khushhal Singh on the South. One can access the area from the North through the Masti Gate, or the Moti Bazaar, which links the complex to the southern quarters of the Walled City. The area is densely populated. Buildings date from the early-20th century to recent, in simplified Art Deco style, mostly three storeys high.

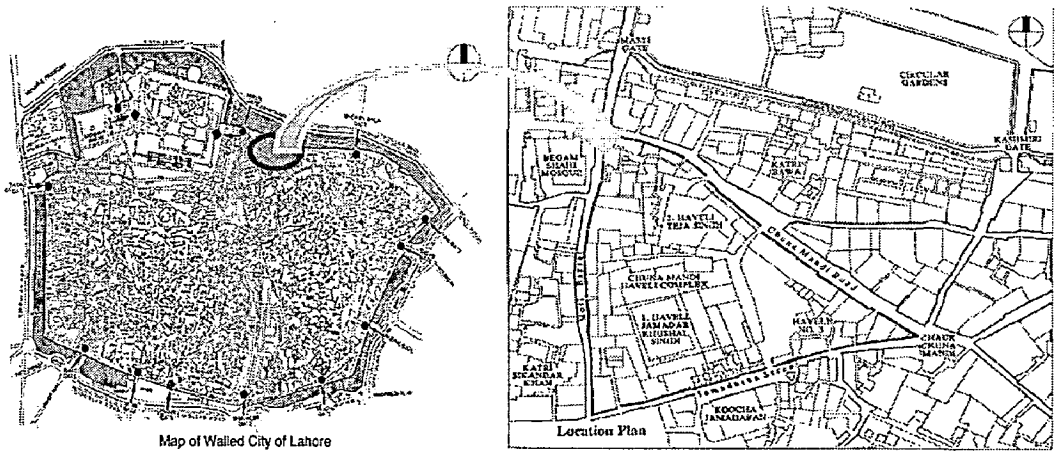


Figure 40 *Location Plan of Choona Mandi Haveli, Lahore*

There were three havelis in this complex: a large fortress-like compound on the South, a smaller one in the North and an isolated three-storey British-period house on the Southeast. One can enter the complex through the emplacement of two former gates, both leading to open grounds on the East, formerly the front lawn and driveway. The main entrance on the Northeast was near the middle of a long row of British-period, two-storey shops-cum-houses, running along Choona Mandi. The huge arched doorway and vestibule existed as late as1950. The marble fountain, once in front of the gate, was removed in 1986 in preparation for an inaugural visit. On the south side of the open grounds there was a smaller gate next to a faruch khaneh or reception hall, with a fine nishastgah or living room on its first floor.

3.3.2 Scope of Conservation Project

In June 1986, the new civilian government handed over the early I9th century Choona Mandi Complex, formerly occupied by the Central Investigation Agency (CIA) of the Punjab Police, to the Education Department, to establish a girls' college. This complex contains the largest extant haveli, or palatial house, to have survived in the Walled City of Lahore. After the transfer of the premises in 1986, the Education and Building Departments started making changes to convert the main haveli into a college. Parts of the deteriorated structure were demolished and the existing timber roofs were replaced with precast concrete slabs. The work was conducted without much concern for the fragility of the old buildings, which were still deteriorating. In the same year the conservation plan of the Walled City had just been commissioned

to PEPAC (Pakistan Environmental Planning and Architectural Consultants Ltd) and the Choona Mandi project, which offered a suitable opportunity to set an example for other restoration projects. Thus PEPAC put forward proposals and in an interim report described the current dismal state of the current repair and reconstruction works, which were accelerating the already advanced decay of the two havelis' and recommended:

- An accurate topography survey
- Precise recording of structural conditions
- The preparation of measured architectural drawings of extant and ruined buildings aswell as the documentary reconstitution of structures, which no longer exist

3.3.3 Objectives

The general objectives of this programme were:

- To adapt the existing haveli to suit the college, already functioning in the complex
- To save a historic monument, representing the extinct living patterns and domestic architecture of the l9th century
- To set a model for future similar interventions regarding historic buildings of the Walled City

3.3.4 Functional Requirements

The initial programme of the Education Department was the construction of a new two-storey building with a total floor area of l'223 m2 including offices, a library, 14 classrooms and laboratories. The architect's brief comprised the following:

- Classrooms to accommodate degree classes, science laboratories, library, multipurpose hall, administration offices, staff rooms, common rooms, prayer hall, principal's residence, and open grounds
- Conservation and re-use of existing structures together with the construction of new facilities, to suit the needs of the college

- Structural consolidation of dilapidated buildings
- Countering the adverse effects of previous interventions
- Removal of private dwellers from the complex

In 1997 the creation of an enclosed park for women and children in the complex was added to the original brief in response to popular demand.

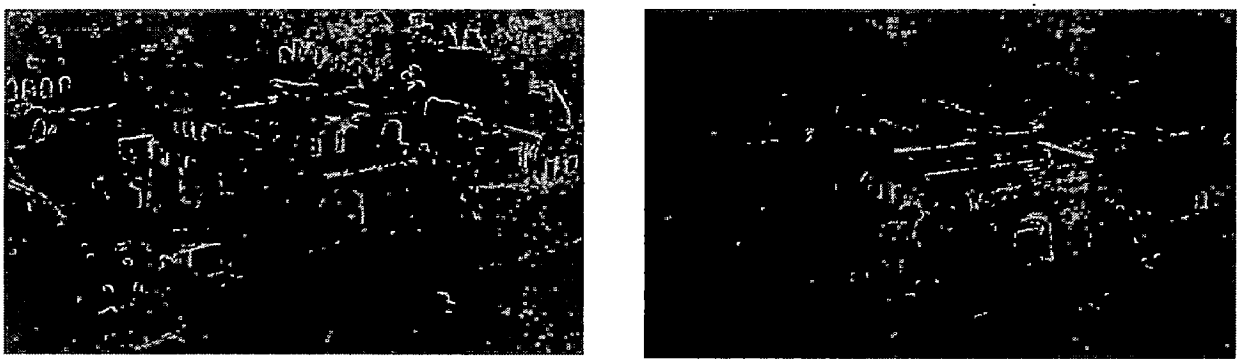


Figure 41 *View of Choona Mandi Complex before and after Adaptation*

Main architectural components of the main haveli could be summarized as follows:

The East Wing:

The dewrhi or the main gate is an imposing three-storey structure in the middle of the east wing. It is high enough to allow the elephants and their howdahs to pass through a bent hallway, which prevented direct physical contact between the exterior and the interior of the haveli. An opening on the upper part of the central wall seems

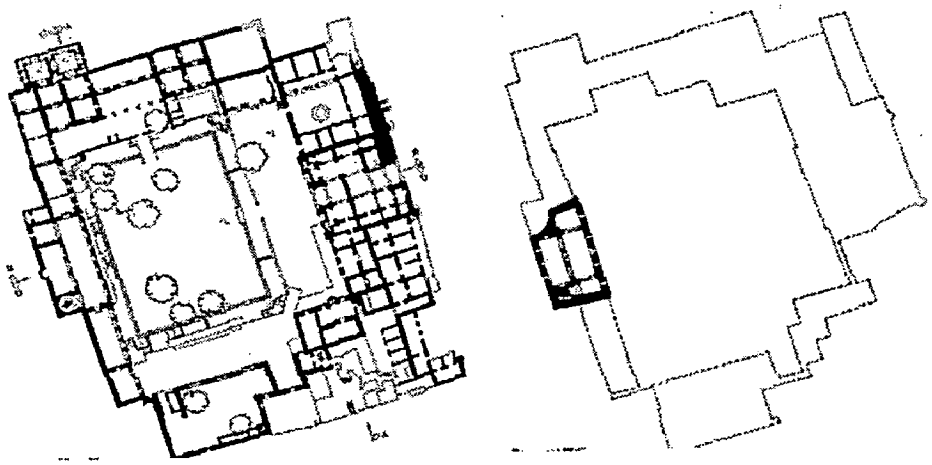


Figure 42 *Existing Plan of Choona Mandi Complex*

to be for the viewing of the main door from the western hall. The two masonry towers on the exterior corners of the gate were probably once crowned by chhatris or pavilions. The third floor, a later addition, was found in a very decayed state. Its western veranda was gone with what might have been a fine Sikh period wooden jharoka or balcony. This floor is totally reconstructed with the exception of the eastern veranda, which is preserved. The dewrhi is used as the main entrance. On each side of this gate along the eastern wing, there is a two-storey structure. The one on the north is re-built and recreates the volume of the former mardana hujra or men's quarters, surrounding a small courtyard on three sides. On the fourth side a tall wall separates this small courtyard from the main one. This compound houses offices and classrooms. Open colonnades provide its internal circulation.

The West Wing:

The diwan-e-khas or private audience hall is located across from the dewrhi. It consists of a central double dalan or hall, the one in the rear having an altar and, formerly, a vaulted roof. During the colonial period, this open veranda was enclosed with brickwork and windows. More recently, roofs and floors of this wing were re-constructed with pre-cast concrete. A basement with Mughal-period style cascades under lays the central part of the west wing. The original space and colonnade are recreated, the frescoes are partly revived, and anew timber false ceiling recalls the original aspect of the roof. The front staircase is built according to the partly existing foundations and the stairway details of the second haveli. This wing houses open and enclosed classrooms.

The North Wing:

The central part also consists of a double dalan, flanked on both sides by two groups of four rooms arranged in a cross-like formation. The open veranda was almost completely demolished, it is reconstructed with respect to the existing column layout and some details of the western dalan. A part of the interior wall in the adjoining jeel—khana, the elephant house, is left intact in order to display its past condition. The main rooms are used as classrooms and the smaller ones as laboratories. Due to some drainage problems that have since been resolved, heavy cracks have occurred in the back rooms of a laboratory. In the hammam, a hall leading to two low-domed rooms covered with frescoes, has remained intact. The floor has been re-

laid on original short stone pillars permitting hot air circulation underneath. The supporting structure is exposed in two locations through glass covers. The frescoes

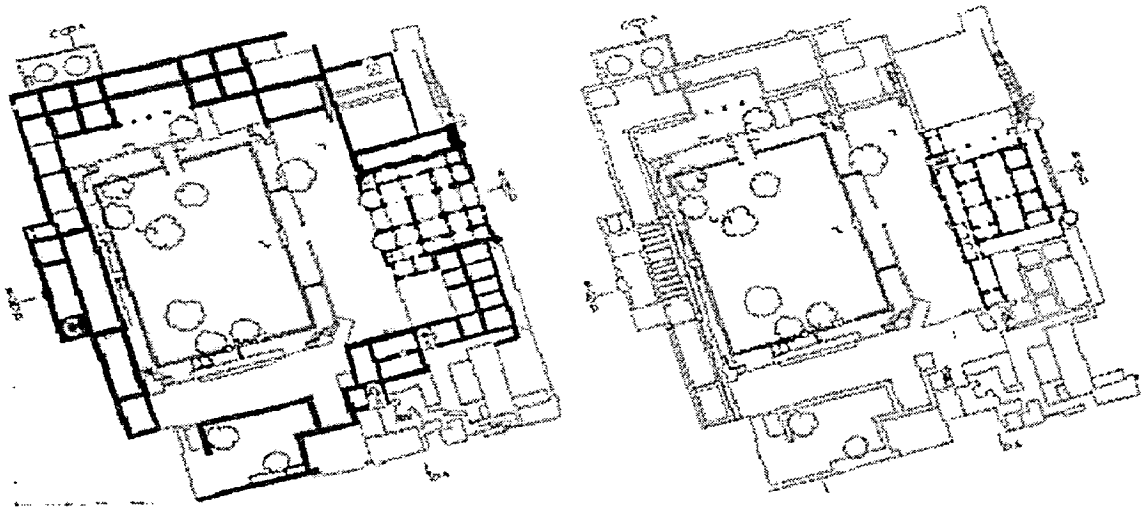


Figure 43 *Proposed Plan of Choona Mandi Complex*

are revived. This part is not used and is kept for its historic appeal.

The South Wing:

The diwan-e-am or public audience hall has also a double dalan. It was demolished in 1951 when part of it caved in and caused fatalities to police personnel. A Sikh period seh-dara or three-arched facade was the only remaining feature. The wall and its frescoes are untouched and show the former condition of the building. This wing houses open and enclosed classrooms and a library, A new construction on the southeast corner, housing a multi—purpose hall, with brick walls and exposed concrete roof, is the only addition not based on the ibmier layout of the haveli.

Landscaping: The interior courtyard and the exterior garden are the largest remaining open spaces in the neighbourhood. The courtyard space a 50 by 70-metre rectangle was cleared of all ancillary structures of the CIA period. This courtyard is one-and-a-half to two metres lower than the surrounding buildings. The wide steps built along the southern and northern wings are sometimes used for outdoor classes. In old photographs the courtyard seems to be covered with vegetation and trees. Some of the trees were lost during construction and some were removed after an inaugural visit in order to be replaced by cedars, but no planting has been done yet. The pardeh bagh or the enclosed garden for women and children can be reached via

a newly created independent entrance from the eastern street, where two storey British-period shops- cum-houses were formerly situated. The existing trees were retained and the layout of the fountains is original. The garden is enclosed all around by a brick wall matching the main haveli and is overlooked by the dewrhi and the smallest haveli.

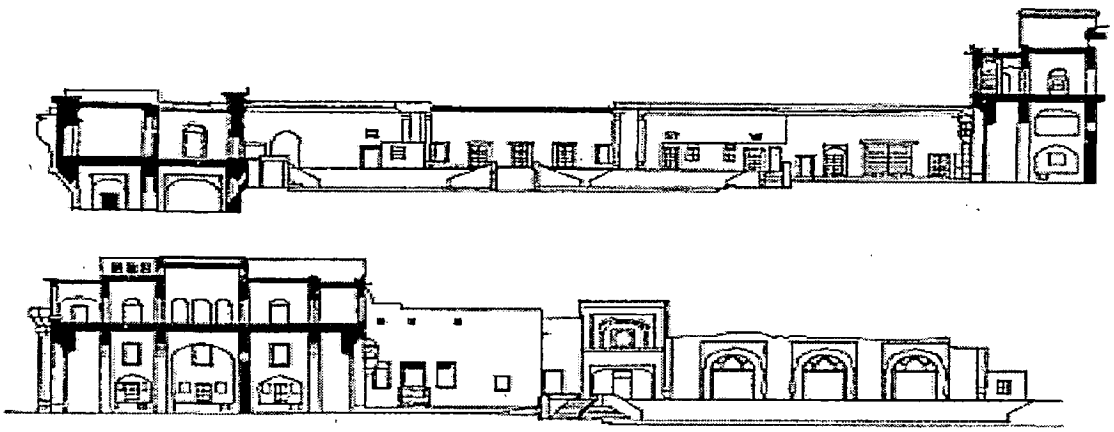


Figure 44 *Sections (after restoration) of Choona Mandi Complex, Lahore*

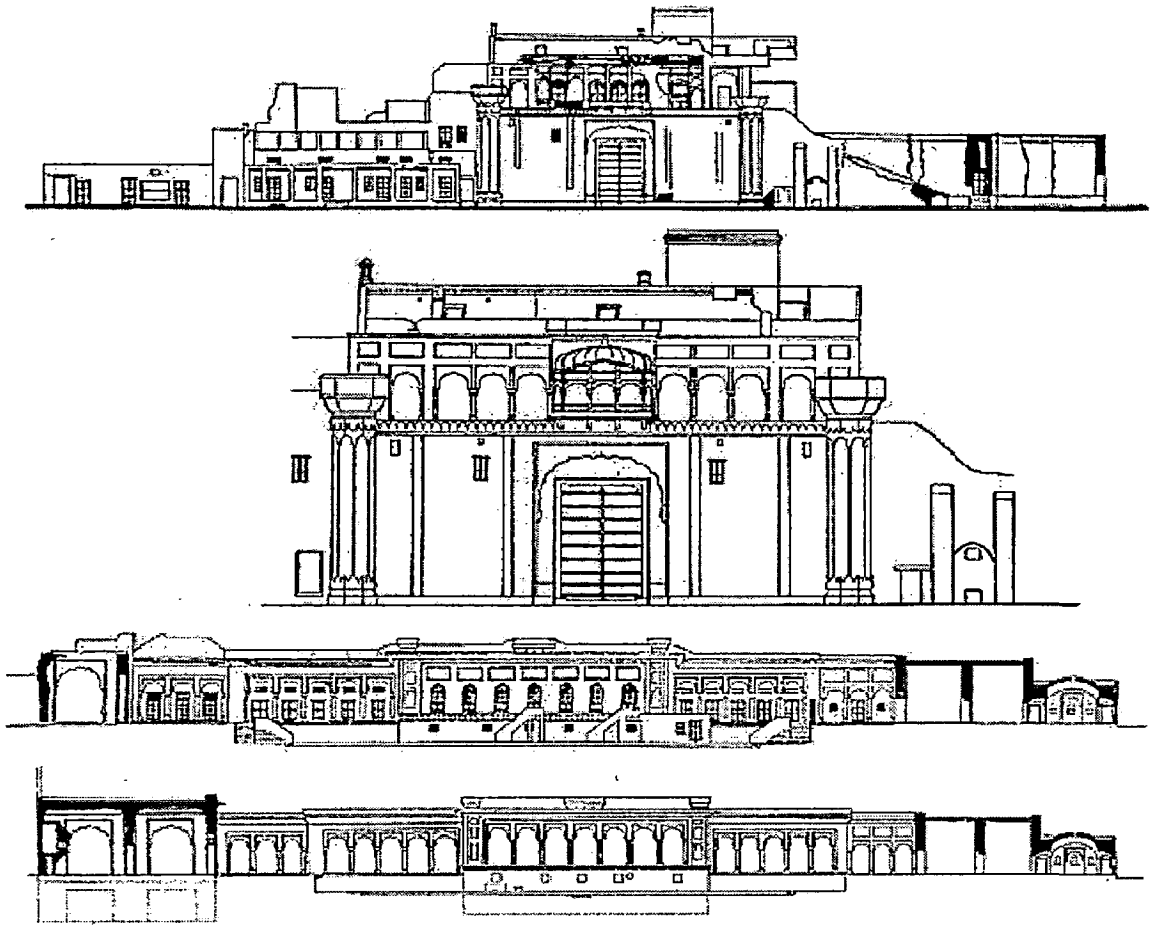


Figure 45 *Elevations (after restoration) of Choona Mandi Complex, Lahore*

Structure, Materials, Technology: The main haveli was built in the early 19th century presumably on the site of an earlier haveli using some of its foundation and layout. The materials mostly consist of small kiln—fired bricks with mud or lime mortar, lime plaster, timber roofs, and wooden or stone lintels. In the basement two false arches were built of masonry and lime plaster reinforced with bamboo and flat iron strips. Construction materials like steel joists and trusses, pre-cast concrete roofs, reinforced brick slabs, reinforced brick lintels, arches and walls made of large bricks have been used in repair works dating from mid-1940s onward. The structure of the haveli was mainly affected by sub soil movements and ageing factors such as the disintegration of lime mortar and the decay of timber roofs as well as encroachments on the exterior.

3.3.5 Inferences

- Group of residential buildings can be combined to increase the reuse potential of an area.
- Overall cost of restoration and reuse is balanced by proposing use suitable for the masses.
- In parts where cost of restoration is more than new construction, the latter should be preferred.
- The raw material of demolished structure can be reused to reduce overall cost.

3.4 Al - Bastakiya Conservation, Dubai

Based on a phased programme of preservation and adaptive re-use of the historic bastakiya district of Dubai, the project has, since 1995, conserved 56 residential units of this group of traditional wind tower court houses that were under threat of demolition due to the development pressures in this rapidly growing city. The project has marked out a 'preservation area' where through adaptive re-use there are now art galleries, cafes, specialized museums, a traditional market and a majlis for the local community. In addition, planning controls and design guidelines have been developed for the area.

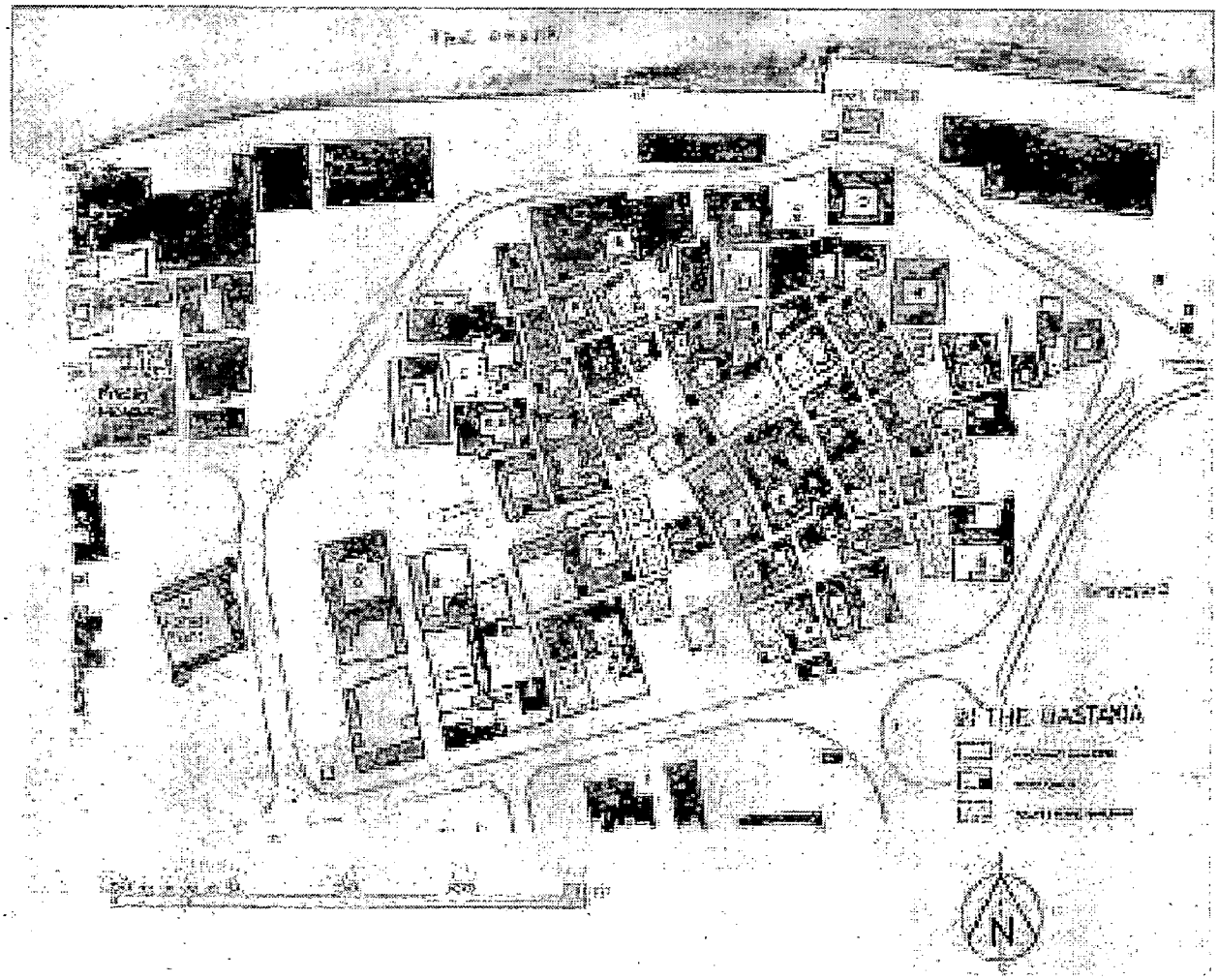


Figure 46 *Site Plan of Al - Bastakiya Conservation, Dubai*

Figure 47 *Houses before and after Adaptive Reuse*

3.5 Fahadan Rehabilitation, Yazd – Iran

Fahadan is the most important historic district of Yazd. This project comprises the adaptive reuse of a number of historic houses to create a hotel complex, both to facilitate tourism and to educate visitors about the domestic culture of Persia. An important characteristic of the original urban fabric is the unique relationship between the individual dwellings and their entries. One group of houses is centered on a 'darband', a semi-private route through the buildings, while another group leads from a 'hashti' or enclosed space.

The sequential hierarchy that these routes dictated has informed the decision

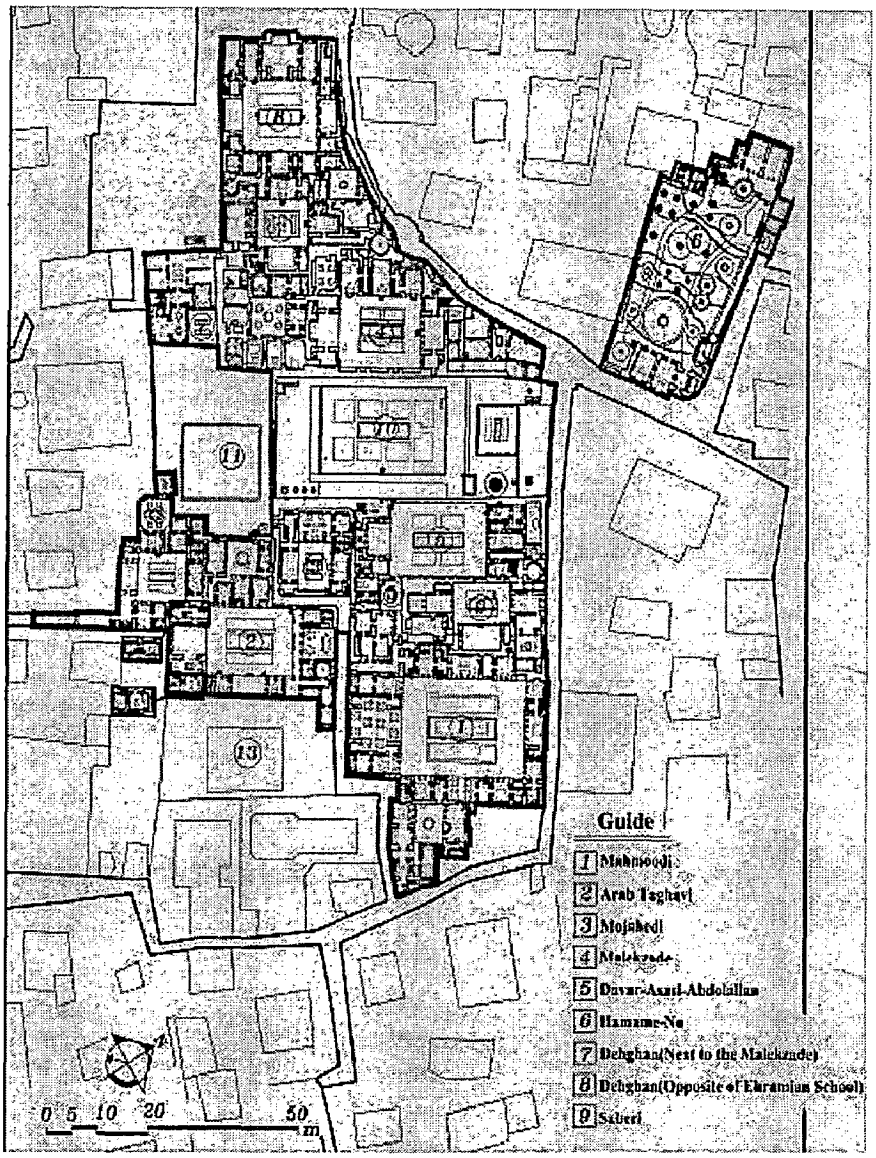


Figure 48 *Site Plan of Fahadan Rehabilitation, Yazd - Iran*

Figure 49 *Houses Before and After Adaptive Reuse, Fahadan Rehabilitation, Yazd - Iran*

making regarding new functions.

.The collection of the Arab houses is located in the historic sector of Fahadan in Yazd. The Fahadan district is a uniform collection consisting of the neighboring of valuable building such as the "Twelve Imam" monument dating back to the 5th Islamic century and the "Ziaeye" school (the Alexander prison) dating back to the 6th Islamic century and the "Masjed Jameh", the " Vaghtal Sa'at" square , the " Seyyed

Roknoddin" monument and the "Chel Mehrab" mosque dating back to the 8th Islamic century, and many historic houses. The district with its unique uniform city texture and important famous buildings plays a special part in attracting tourists from in and out of the country. It is because of this situation as well as the social reputation of the people who resided there in the past that the Fahadan district has many qualities which have remained resolute to this day and the provisions needed to revive and create new social movements in its exist.

This assortment creates a shell for a lifestyle, introduction which will lead to the understanding of people with one of the cultural characteristics of this land regarding the subject of the culture of habitation. In the order to achieve such a purpose in this reviving project this assortment of houses has been changed into a hotel complex so that it provides the chance to get to know the culture and the architectural shell of it better.

In this assortment there are a few houses with independent and different identities and characteristics (regarding the way of accessing the texture , inner correlation and partitioning) and way preserve these characteristics and identities is by turning them into unified complex functioning as traditional rest house.

By studying the ways of access between the units and the correlation between them we understand the unique relations between the houses. These connections are clearly the result of a great familial relationship between the owners and are one of the qualities that make up the identity of this assortment. the assortment of houses as well as their unique architectural characteristics , the way of the sitting of them next to each other introduces two types of adjoin in the form of the darband and the hashti. The Arabs darband in this assortment is in fact a covered and to some extent semi- private crossing which provides the access for many of the houses. On the other hand, the hashti for the malekzade house is also a semi- private space which provides the possibility for interactions between the few houses.

Keeping in mind the relatively unharmed state of this assortment and the unique characteristics of the aforementioned darband, the need to save and care for it is clearly felt. The Arabsdarband and the assortment of houses making up the surrounding are the shell for a way of life which when introduced will lead to people

understanding one of the cultural characteristics of this land regarding the category of the culture of habitation.

Each one of the residential units of the Arabs darband as well as having a unique personality also acts as one of an assortment of familial houses, the assortment of which is itself a part of the entire darbad it belongs to. This subject is important because of the fact that in the reviving project the hierarchical placing of the compartments according to importance and status should be way it used to be in the past.

Considering the inner interactions between the units and in order to get a full understanding of the assortment by the beneficiaries we need to move the people through the original routes of access to the units and to abide by the hierarchy needed in order to approach the building. Therefore the assortment of the houses which have closer relationship will be put in a bundle together such that the original understanding of the assortment remains unchanged. With this assumption, the houses which have direct access from the Arab darband are put in to one set and collection of the houses opening from within the hashti at the beginning of the two sets as well as having limited correlations with the Malekzade assortment also has a different opening from within the pathway and can therefore be thought of as an individual unit.

Encountering the assortment in this way requires that in securing the infrastructure installations and conducting the correlations between the beneficiaries and the utility workers and also the way this assortment is managed, the aforementioned division has to happen. In a way that considering the management of the assortment can be used in any of the ways mentioned below:

Assigning the entire assortment to one company with a centralized management and sorting the units inside the assortment with internal managers.

Assigning the entire assortment of the Arabs darbands and the malekzade to two companies with different managements and giving the mahmoodi (afshin) house to one Utilities Company in order to provide help for other two.

Separating and grouping the units together in little sets (the houses which have internally defined interactions within them can be sorted into one group) and assigning them all to independent companies with different management.

The issues raised and the pragmatic experience of the reviving the assortment of the historic Arabs houses in the Fahadan district show that paying attention to the quality of the skeletal space of historic houses itself can be influential in the shaping of today's appropriate behaviors and in conclusion it can create an appropriate accordance between the shell and the conduct. The process of this accordance can automatically create an identity which hasn't only been brought about by the historical existence of the building. In fact the preservation of the unique qualities in historic houses has an essential role in giving personality to them and can help guide fundamental decisions regarding new requirements and functions.

3.6 Comparison of Case Studies

	JUDGES COURT, PRAGPUR	MANGALDAS NI HAVELI, AHMEDABAD	CHOONA MANDI HAVELI COMPLEX, LAHORE
ORIGINAL USE	Private Mansion	Private Residence	Private Residence
PROPOSED USE	Heritage Resort	Art Craft Center and Restaurant	Girls College
DESIGN INTERVENTION	Original spaces maintained with addition of toilets and other ancillary blocks in the vicinity	Service areas and toilet blocks added in addition to some renovation of internal spaces	Three different residences around a courtyard joined with passages to serve a single use
RESPONSE TO EXISTING ENVIRONS	Taken care of in a proper way, original character of space maintained	Maintained with renovation and minor additions	Many new things added to complement the existing infrastructure
LOCAL PARTICIPATION	No	No	Yes
FUTURE MAINTENANCE	Self-supportive	Dependent on the owner's finances	Self-supportive
SUCCESS	Partial as local residents cannot afford	Negligible	Highly successful as the new use proposed was meant for the masses

REASON FOR SUCCESS OR FAILURE	Lack of community participation	Facilities like parking and signage slacking	Design in response to requirement of society

Table 1 *Comparison of Case Studies*

CHAPTER 4 ANALYSIS

Analysis is based on three points:

1. Feedback of the people involved with Heritage walk: feedback of various people is taken and based on that conclusions are drawn about expectations of the people involved, stakeholders and tourists.
2. Typical elements of Pol Houses: Elements which are typical of Pol houses are identified so that they can be restored.
3. Study of local culture: It is done to understand the festivals, traditional dresses, handicrafts, cuisines and art forms so that these can be promoted and exhibited in the reuse options proposed in the Pol houses.

Based on these observations, adaptive reuse options are found and implemented on the house plans taken for restoration.

4.1 Feedback of People Involved with Heritage Walk

Residents	Tourists	People Associated	Students of Architecture	Professionals (Architects/Conservationists)
Positive				
Take pride in their heritage	Nice Experience	Feel proud in sharing their rich urban heritage and culture with people from outside	Enriching experience in terms of knowledge gained about construction technologies, ornamentation and traditional architecture of Ahmedabad	Showcase of rich urban heritage with a potential of generating economic and cultural exchange
Generates income	Covers variety of elements associated with Pol houses	Sense of belongingness increases as they share the experience being a part of this initiative	Philosophies related to planning and designing in context with climate and sustainability issues	Model for architects, planners and artists for learning sustainable elements
Property rates high	Exposed to art, architecture and lifestyle of Ahmedabadi's		Considering safety and security of the Pol residents as the area is prone to communal riots	Much scope of urban renewal
	People are very cooperative and helpful		Layers of intervention seen at a single platform	

Negative				
Interference of outsiders in their daily routine	Lack of public conveniences like drinking water, toilets, eating areas etc.	Route not cleaned and maintained properly	Facts and important information not available	Route does not cover important commercial hubs (phoolon wali gali, dhal garwal, manel chowk, etc.) present in the walled city
	Lack of signage's forcing the tourists to follow the guide	Stray animals create nuisance	Lack of public spaces to enjoy the beauty of the place	Adaptive reuse projects done so far are not able to sustain themselves as they are done keeping in mind foreign tourists only
	Less time available to appreciate and capture the beauty of Pol houses	Poor maintenance of restored places and their surroundings	Lighting arrangements not proper in case someone visits the place at night	Supporting facilities (parking) along with commercial activity are not provided discouraging people to use them
	Typical elements of Pol house are not shown	Tourists complain of early morning timing of the walk	Fails to create much interest	
	Information available is limited as one has to depend on the guide for the same		Map showing directions is not available in case one is lost	
	Complete gujrati experience is missing as one has to search for places to have local cuisine, shop and find literature of the place.			

4.2 Typical Elements Identified

1. **Brackets**: A bracket is an architectural and structural member used to support ceilings reinforcing the columns. They can be made of wood, stone, or metal.

   In the case of Pol houses they are used below projected balconies and with columns. These are made of wood and are elaborately carved. Patterns of brackets vary with the status of the family as we can see variations in every house.

Figure 50 *Typical Bracket, Pol Houses Ahmedabad*

2. **Wooden Façade**: The façade facing the streets or inner courtyard known as "chowk" is made of arcade with wooden columns and brackets. These are richly carved and cut the sun from coming in the inner rooms thus providing thermal comfort in the interiors.

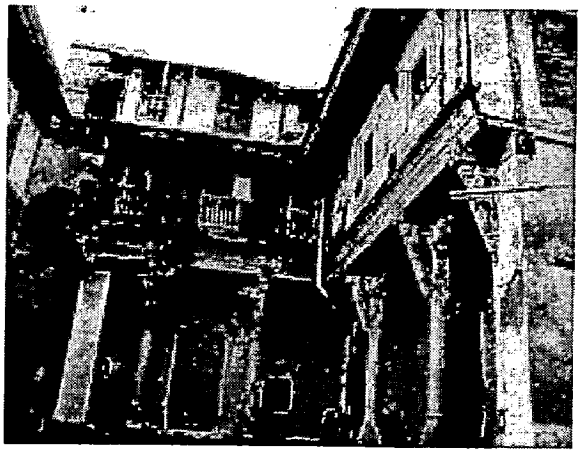


Figure 51 *External Facade,Pol Houses Ahmedabad*

3. **Projected Balcony**: Balconies in an upper storey projected from the wall plane is used both for adding to the aesthetics of the building and overlooking a street, court or any other open space. It may be supported on two or more brackets or corbelling, has two pillars or pilaster, balustrade and a cupola or pyramidal roof; closed by jallies but generally partly open for the inmates to peep out to see passing processions. The chajjas or sloping eaves that project out above the balconies provide protection from both the summer sun and monsoon rain. Overall a projected balcony is used due to:

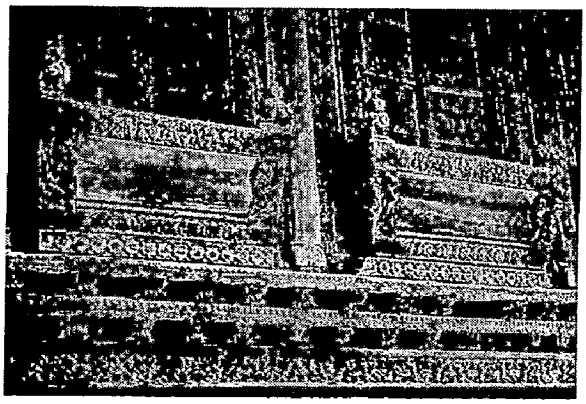


Figure 52 *Wooden Projected Balcony, Pol Houses Ahmedabad*

i) Aesthetic appearance
ii) Climatic aspects
iii) Elevation treatment
iv) Allow women to see the events outside

These projected balconies in Pol houses are generally made of very finely carved wood. The openings are generally covered by wooden jallies which cut the sun from coming inside and providing thermal comfort for the residents.

4. **Bird Feeders**: These are small platforms hanged from the chajjas over windows provided to feed the birds. This is a typical characteristic of Pol houses.
5. **Bird Col**: These are small resting spaces on the external walls meant for birds to sit and relax. These add life to otherwise dead walls of Pol houses.

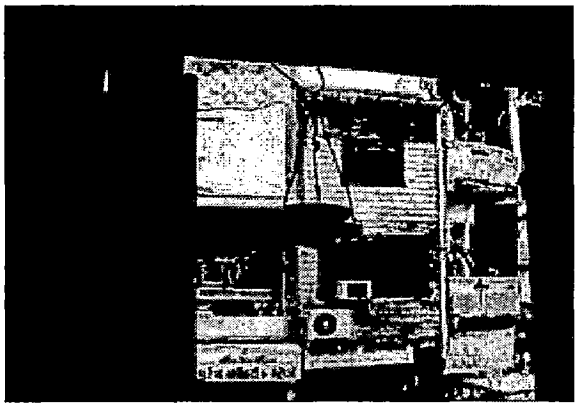


Figure 53 *Bird Feeder in a House, Pol Houses Ahmedabad*

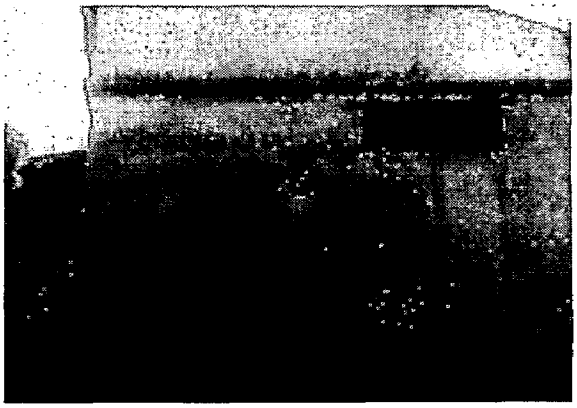


Figure 54 *Bird Col, Pol Houses Ahmedabad*

6. **Swing or "Hichko"**: This is a typical feature provided in the covered verandah next to "chowk" or inner courtyard. Earlier they were provided inside the rooms also as there were no furniture in the rooms but now-a-days it is present only in the verandah.

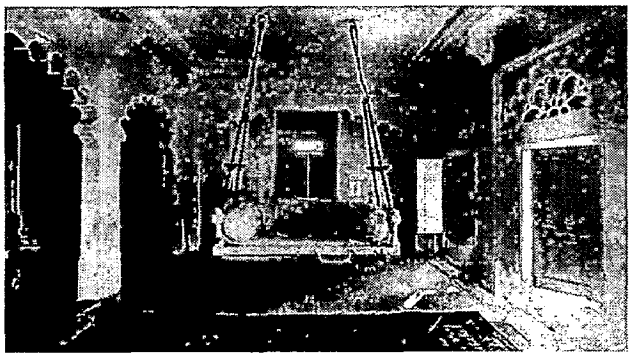
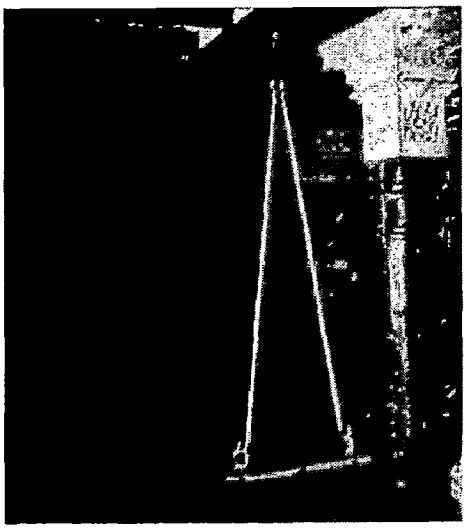


Figure 55 *Swing or 'Hichko', Pol Houses Ahmedabad*



7. **Underground water tank or "tanko"**: Rain water was collected from the roof and stored below the "chowk" in an underwater tank. This water was used for drinking by the residents of the house.


Figure 56 Tanko, Pol Houses Ahmedabad

8. **Doors**: A door is a movable structure used to open and close off an entrance, typically consisting of a panel that swings on hinges or that slides or rotates inside of a space.

   Doors of Pol houses are made of wood and in status family houses they are richly carved having the jambs covered with nice carvings. The top member of the door frame is covered with richly carved plate with some element in the center showing the religion of the family staying in the house

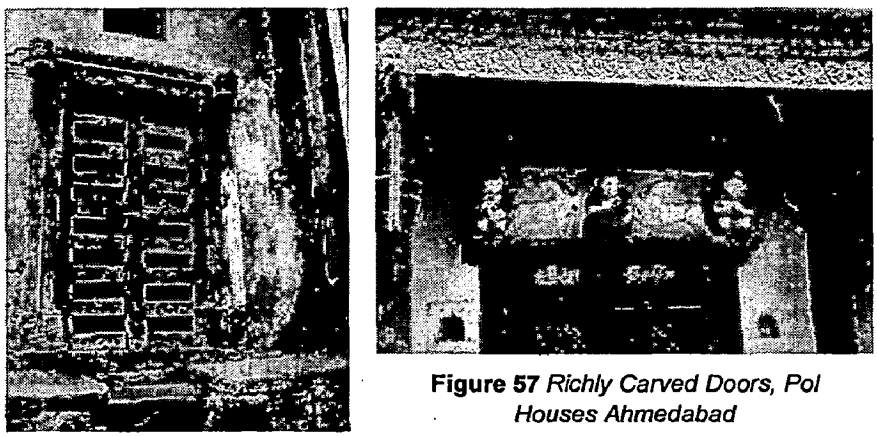


Figure 57 *Richly Carved Doors, Pol Houses Ahmedabad*

9. **Windows**: A window is an opening in a wall allowing passage of light and if not closed air and sound. It is held in place by frames, which prevent them from collapsing in. Windows may be opened, to allow ventilation, or closed, to exclude extreme weather.

Windows in Pol houses are small in size and are made of wooden panels. There is no glazing in traditional window panels. Jambs of these windows are nicely carved adding to the aesthetic value of facades.

Figure 58 *Richly Carved Windows, Pol Houses Ahmedabad*

10. **Columns**: A column or pillar in architecture and structural engineering is a structural element that transmits, through compression, the weight of the structure above to other structural elements below.

    Columns in Pol houses are made of wood with a base of stone and having a bracket.

Figure 59 *Wooden Columns, Pol Houses Ahmedabad*

4.3 Study of Main Festivals, Art, Crafts and Culture of Gujrat

In order to identify possible Adaptive reuse options, it is necessary to study the traditional festivals, art and cultural forms of Gujrat.

4.2.1 Festivals

Major festivals of Gujrat include:

- Utrayan
- Navratri
- Diwali

Utrayan (Makar Sakranti) : Celebrated on 14 and 15th January

1. The focus is on food, lots of local delicacies made – most common are Til ki Chikki and Undhiu
2. Get together's are organized at this festival within families
3. Kite flying festival organized

Navratri : Celebrated before Dussehra in the month of October

1. Small kids made sand mounds and place idol of Goddess over it
2. No stress on food as most of the people are fasting
3. Get together's organized at public places for evenings where people play dandiya

Diwali : Celebrated 20 days after Dussehra

1. Celebrated in same way as other parts of India
2. Various local delicacies are made within every household.

4.2.1 Traditional Dress

The typical traditional dress of Gujrati's is :

Female – Chaniya Choli

Male – Kedyu, Pagdi, Choinni with dhoti

4.2.3 Local Cuisines

Gujrati's are famous for preparing variety of snacks and other food items at home. The major snacks include:

Papad, Aachar, Chips, Sabodana papad, fafada, khakhara, gaathia, bhajia, gota, daal vada, khaman, dhokla

4.2.4 Art Forms

Dance- Garbha, Dandiya, Sword dance, tribal dances of Daang district

Paintings- Bhat Chitra, Rangoli

Drama- Sheri Natak, Nat Bajania

Traditional Decorations – Moti Bharat, Toran, clay horses

Music – Daayero

Clothes – Bandhani, Kutch Shawls, khaadi

4.4 Identification of Possible Reuse Options

Potential Activities that can be proposed as adaptive reuse options:

1. **Art, Craft and Cultural Center**: To promote and showcase folk dance, music, dramatics, paintings and handicrafts cultural centers with provision of training can be proposed providing a glimpse of these traditional art forms in the form of shows and interested people can also learn the skills.

2. **Food and Snack Joints**: Tourists visiting the place would love to savor the local cuisine therefore restaurants and snack joints serving gujrati food will add to the exciting and fun of the people taking heritage walk.

3. **Hospitality Services**: Accommodations in various capacities like Bed and Breakfast, Self Catering, Guest House, Cultural Resort etc. so that tourists can experience the daily routine and lifestyle of residents.

4. **Public Spaces**: At present this is missing throughout the heritage route. Places for tourists at the chowks or the otla of houses can give tourists a chance to relax and appreciate the architectural beauty of the Pol houses.

5. **Shops**: As the tourists are always interested in buying souvenirs of the places they have visited therefore shops selling literature, artifacts, handicrafts, food stuff, apparels, accessories and other local paraphernalia can be provided in the Pol houses.

6. **Cooking Workshops**: Gujrati's are known for their appetite therefore there are variety of food items and snacks which are made in the Gujrati household. The ladies are expert in making these so cooking workshop for the locals and tourists visiting for longer duration this can be another viable and income generating option for Adaptive reuse.

7. **Formal and Informal Gathering spaces**: Place for interaction at formal and informal level should be provided for locals and tourists so that they can discuss and exchange views about the history, culture, art and architecture of the place. It can be a good learning experience for the residents and guests.

8. **Art Galleries and Museum**: Such facilities focusing on the history and culture of the walled city can be proposed within the Pol houses. This will help them to understand the place and its importance in a better way. Involving the local people and display of evolution and status of various Pols will create a sense of belongingness and pride among the residents.

9. **Workshops**: As the heritage walk is frequented by professionals from all over the world therefore a common platform can be provided as workshops for them to get inspiration, work and interact with professional from other streams and countries. Professionals visiting Ahmedabad include photographers, artists, poets, painters, architects etc.

10. **Street Commerce**: Wherever possible street shopping can be provided in order to add colour to the heritage walk. Such street shopping can be accommodated in the "otlo" of houses.

11. **Weaving Areas**: As Ahmedabad is the place where Father of the Nation Mahatma Gandhi spent most of his time therefore how can one forget the traditional khaadi cloth made from the charkha at domestic level. Weaving areas can be provided for the tourists to revive the movement initiated by Gandhi ji and to popularize the traditional Indian fabric.

While providing new uses it should be kept in mind that they should be native to the place, sustainable, income generators, match to international standards and can be executed with local participation. The success of one such initiative can become a model for other heritage cities like Amritsar, Jaisalmer, Jaipur, Bhuj and others.

4.5 Conclusions

1. Restoration work carried should match with the original
2. While providing new uses minimum intervention with the existing should be there
3. All decorative elements and other typical features to be preserved and restored matching to the existing.
4. New uses should not interfere with the existing lifestyle and routine of people
5. Identifying and using the typical elements like brackets, motifs, windows, doors, wall paintings etc.
6. New uses like hospitality services and shops should preferably be provided at the junctions to facilitate ancillary facilities like public transport, parking, etc.

Work should be authentic to the surroundings and should not act as an odd imposing element

CHAPTER 5 ADAPTIVE REUSE DESIGN PROPOSALS

Heritage route starts from Swaminarayan temple, Kalupur and terminates at Jumma Masjid, Manek Chowk. The houses documented are taken from different pols along the heritage walk route.

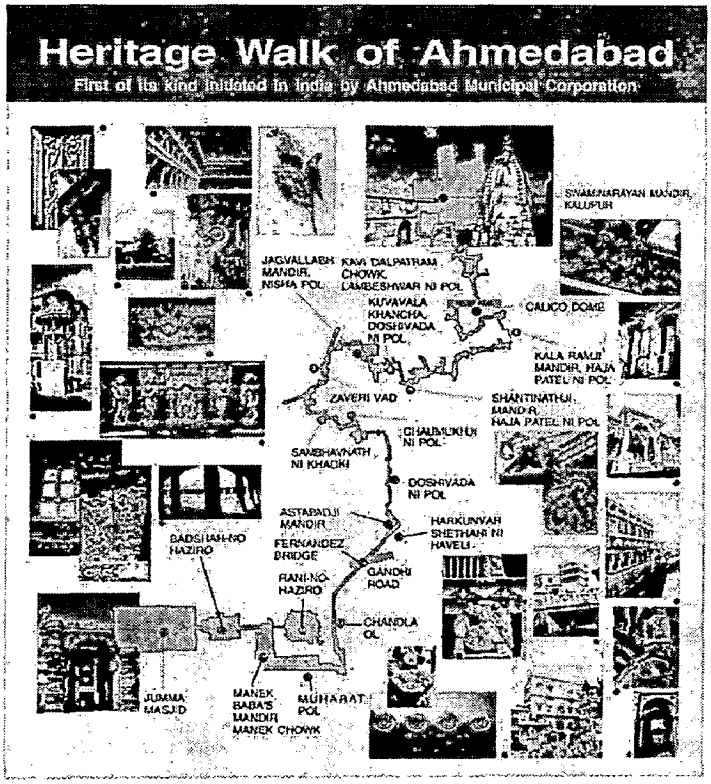


Figure 60 *Heritage Walk Route*

The process adopted for adaptive reuse includes collection of data from various sources including interviewing different people residing in the walled city of Ahmedabad, volunteers of Heritage walk, students, architects and conservationists. Detailed drawings are prepared of the selected houses and based on visual survey condition assessment through table and drawings are done. Further, based on the feedback of the stakeholders, local context and economic viability new uses are proposed. Five houses are taken for the purpose of study at various locations through the Heritage walk route.

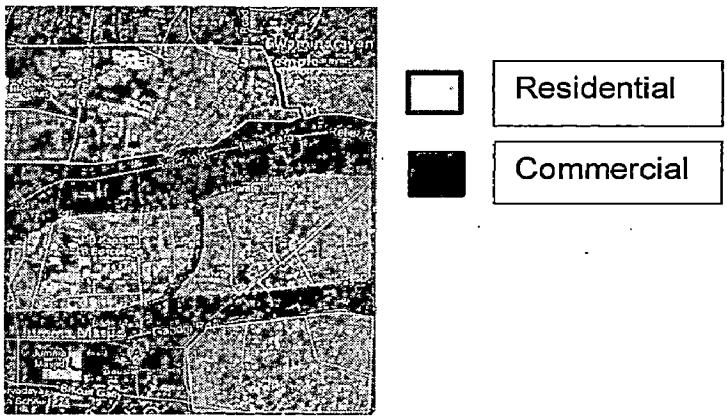


Figure 61 *Landuse Pattern along the Heritage Walk Route*

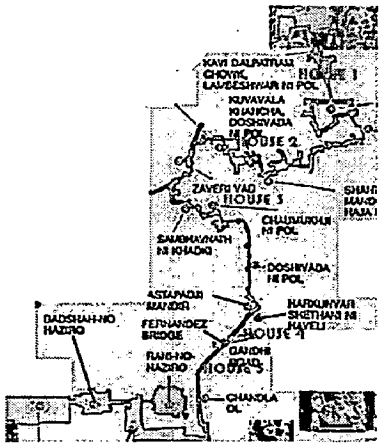


Figure 624 *Location of Documented Houses along the Heritage Walk Route*

PROCESS OF STUDY AND PROPOSING REUSE OPTIONS

STEP 1 Documenting existing house

STEP 2 Investigating existing condition –

- Condition Assessment Drawings
- Condition Assessment Table

STEP 3 Action required to conserve and restore house is proposed

STEP 4 Suggesting Use suitable to the house size and interest of the house owner

5.1 House-1,Dariyapur Ward II

Owner: Salil Patel

House No. 1202 Survey No. 1202

Location : Lal Pol Kadva Pol

Location Character : House at Narrow street

House Character : Large House

Occupancy: Three different users, two are part of one family belonging to same caste staying at the ground floor and occupying the second floor too. First floor is occupied by tenants

Change Alterations: - Flooring and kitchen

Age of the house(approx.) : More than 150 years

Family Composition

Cast : Patel

No. of person in the family: 11

No. of Male : 5

No. of Female: 6

5.1.1 Existing D rawings

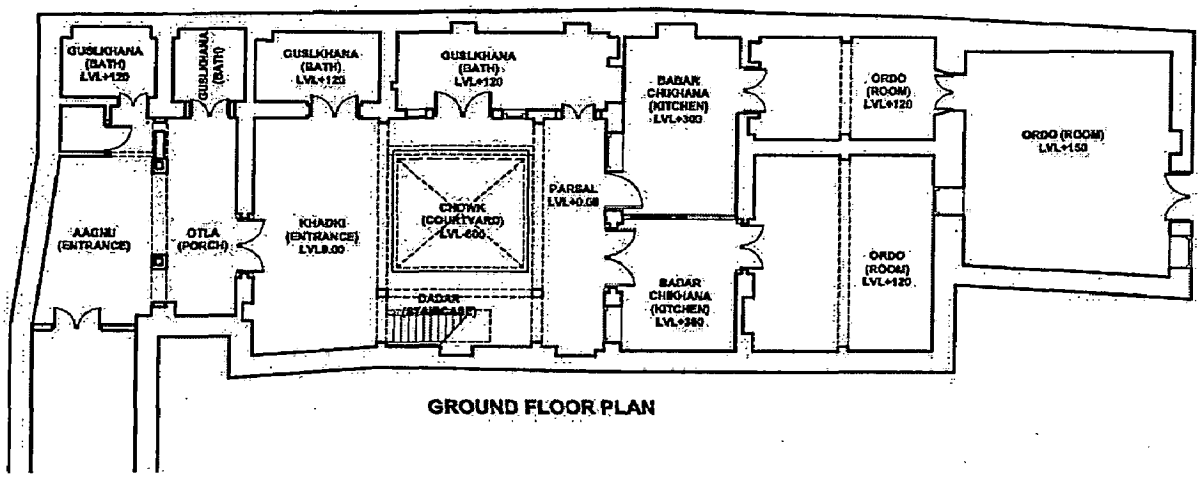
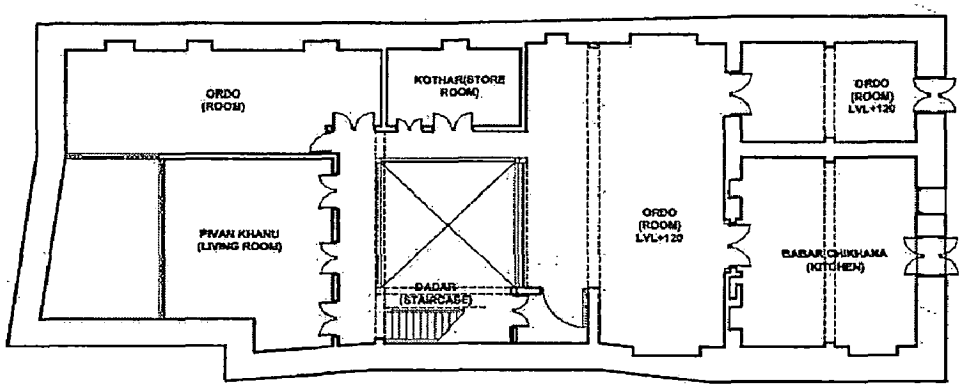
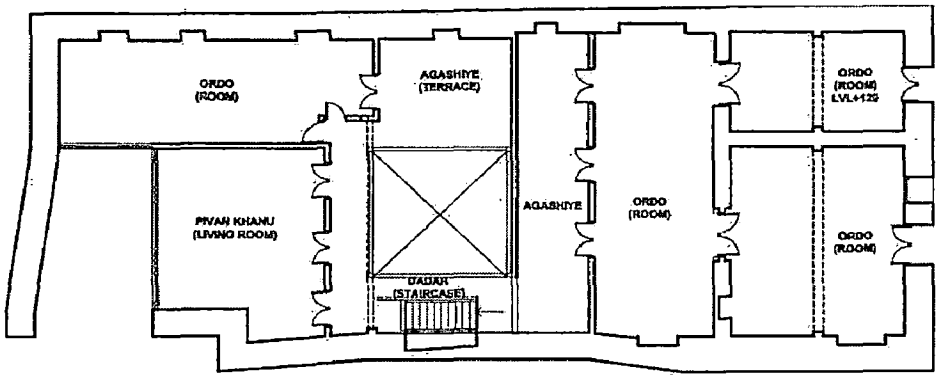


Figure 63 *Existing Condition of House 1*

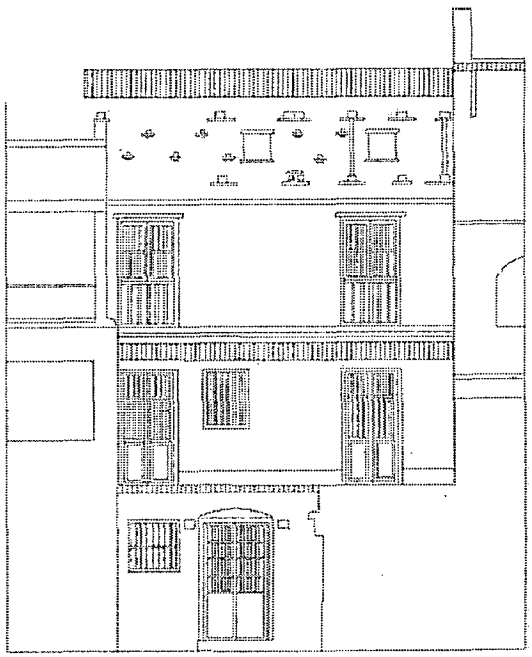


FIRST FLOOR PLAN



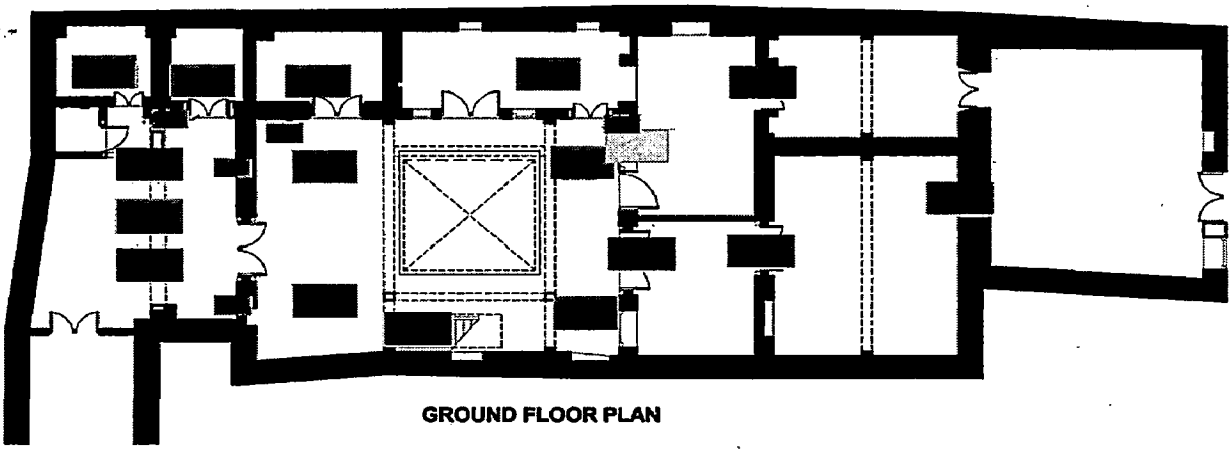
SECOND FLOOR PLAN

FRONT ELEVATION

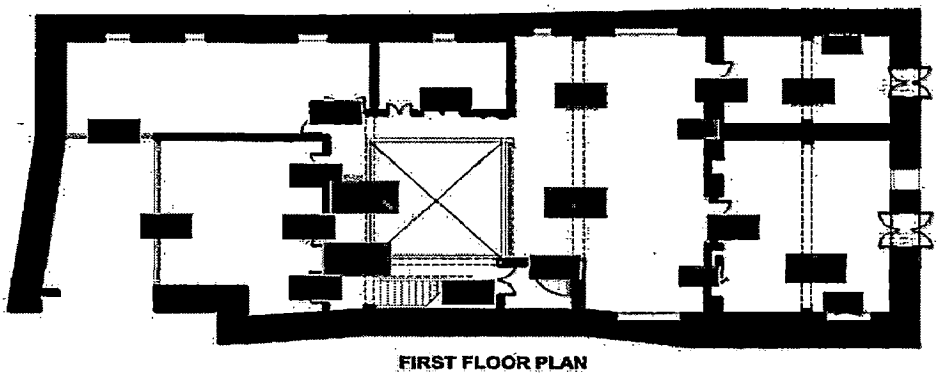


REAR ELEVATION

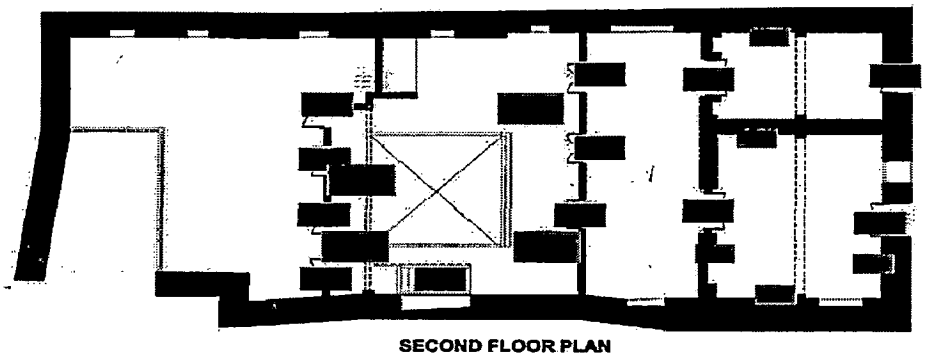
5.1.2 Condition Assessment Drawings and Table



GROUND FLOOR PLAN



FIRST FLOOR PLAN



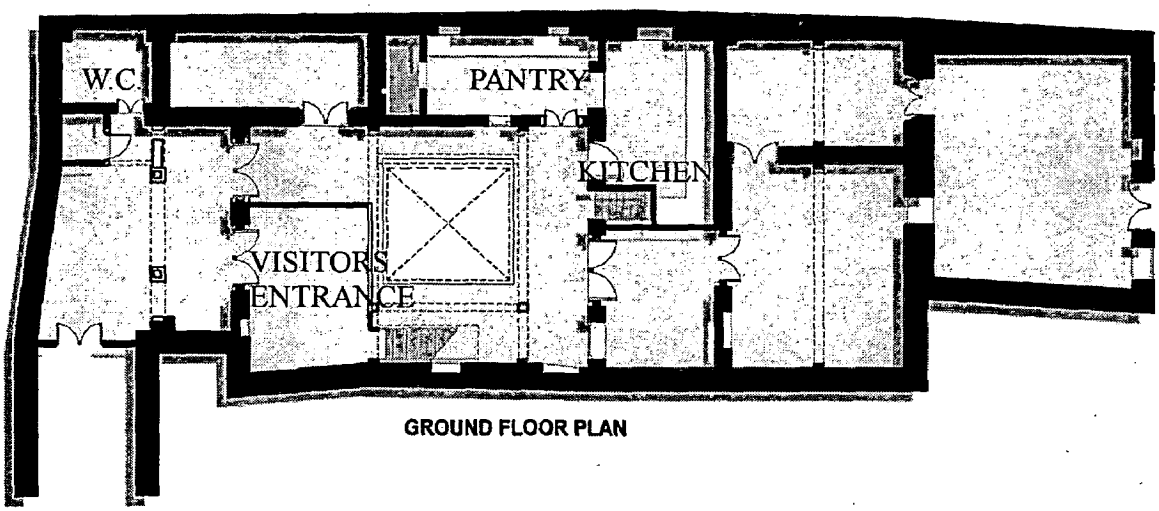
SECOND FLOOR PLAN

- Patches in Flooring
- Defects in Woodwork
- Later Additions
- Cracks in Wall or Plaster
- Structural Defect

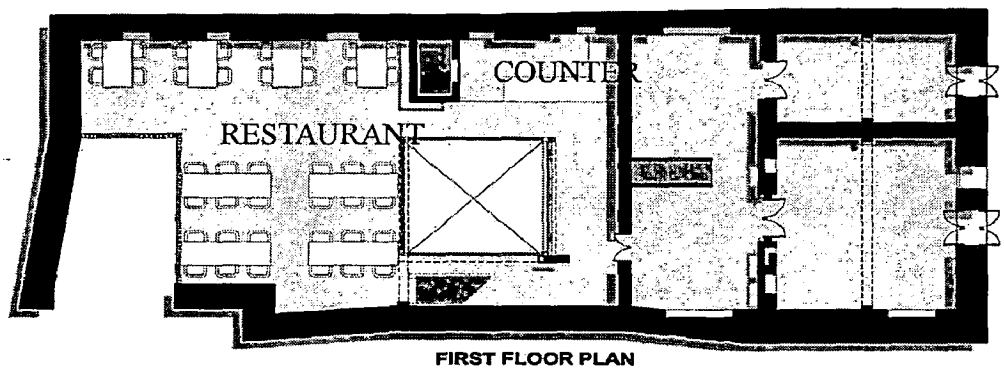
House1	STRUCTURE	WALLS	WOODWORK	FLOORING	CEILING	LATER ADDITION/ ALTERATION
PHYSICAL CONDITION	Columns in good condition except damage to paint. Rust on beams of steel section	Damaged plaster due to lack ofmaintenance	In good condition except damage to paint.	Uneven settlement of stone due to lack of maintenance.	In good condition exce lack of maintenance.	Doors added not matching with the existing doors.
PHOTOGRAPH						
SUGGESTED ACTION	Removal of old coating and applying fresh plasteon columns. Removing rust and applying protective coating	Removing the damage plaster and applying fresh plaster	Application of wood preservatives and varnish to enhance the carvings	Relaying flooring with proper leveling and matching stone	Applying varnish over wooden beams and fresh plastering ofiling	Adding feature to the door to match with the existing doors

5.1

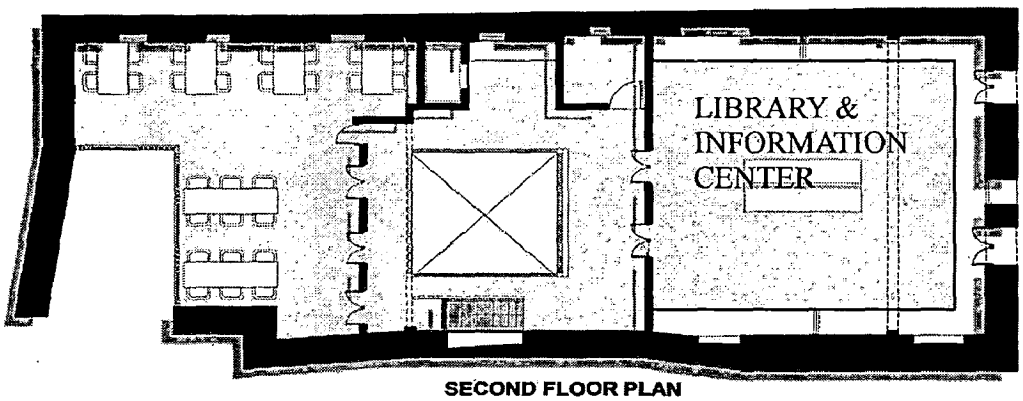
.3 Adaptive Reuse Drawings



GROUND FLOOR PLAN



FIRST FLOOR PLAN

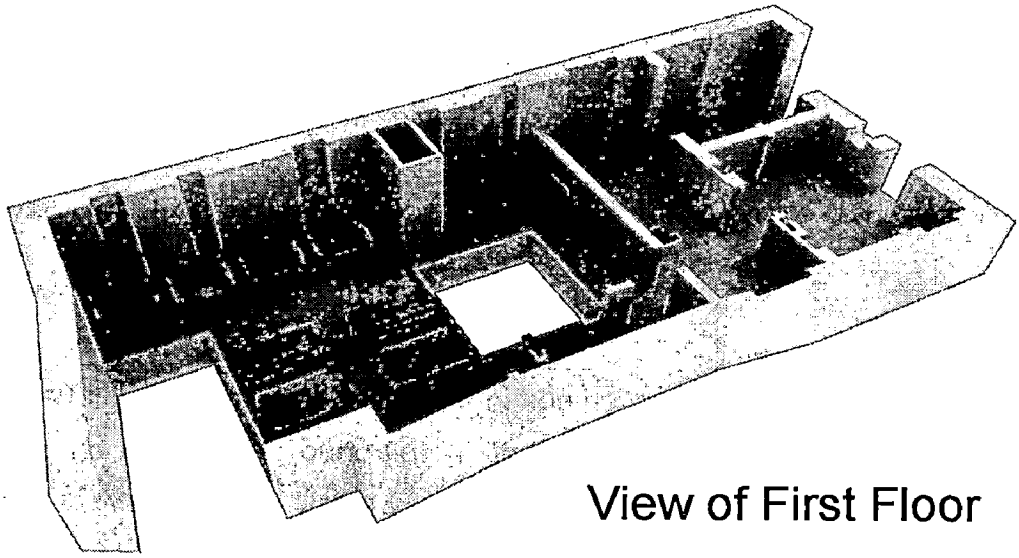


SECOND FLOOR PLAN

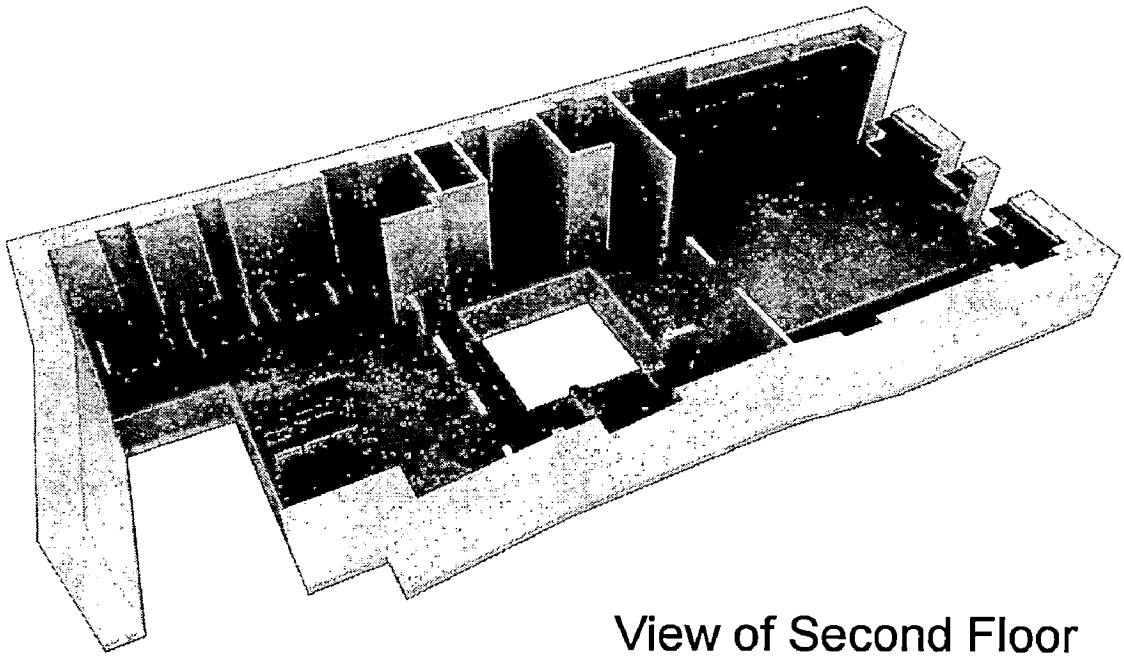
Proposed Use

Existing Use

The proposed use for the house is a restaurant in the front portion of house at first and second floor and a library and information centre in the rear portion of the house at the second floor. The ground floor is to be retained by the owner and a separate entrance is created for the visitors without disturbing the residents of the house.



View of First Floor



View of Second Floor

5.2 House-2, Kalupur

Owner: Effie Ben

House No. 1509 Survey No. 1509

Location : Moti Hamaam Ni Pol

Location Character : House at Narrow street

House Character : Medium sized house

Occupancy: Two families belonging to different castes. Ground floor occupied by Effie ben (owner) and the first floor is given to tenants.

Change Alterations: -

Age of the house(approx.) : More than 120 years

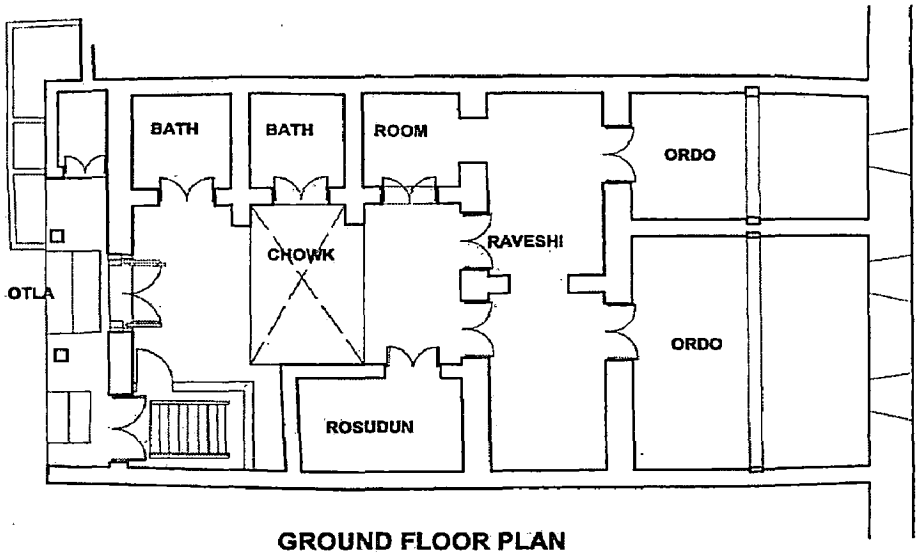
Family Composition

Caste : D'Souza (owner), Dave (Tenant)

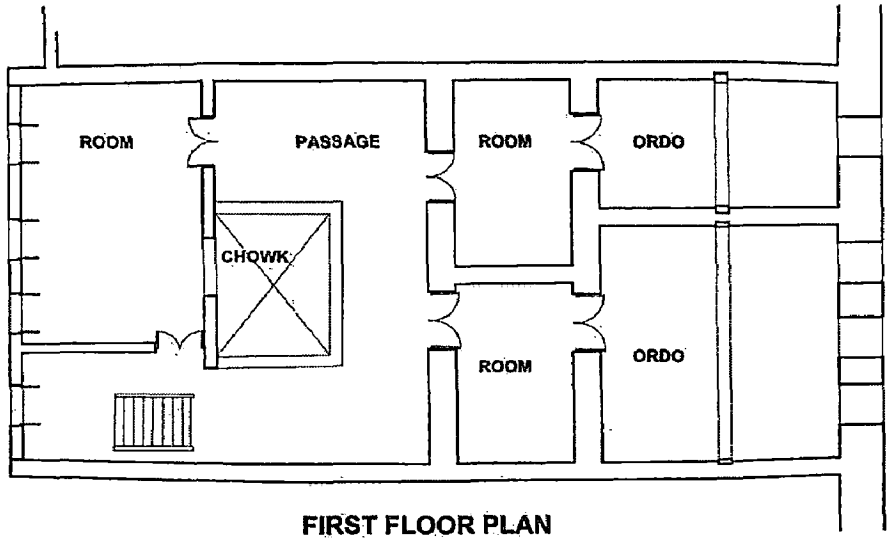
No. of person in the family: 8

No. of Male : 4 No. of Female: 4

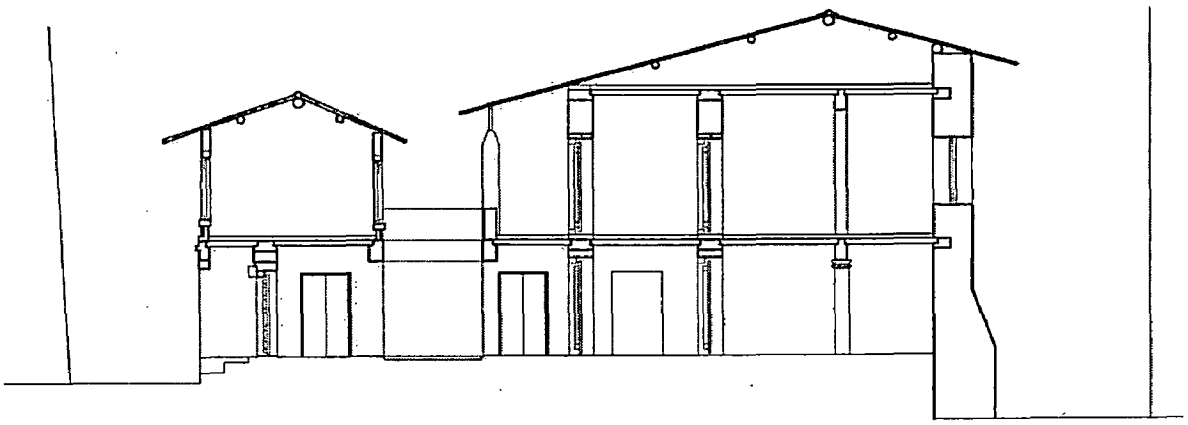
5.2.1 Existing Drawings



GROUND FLOOR PLAN

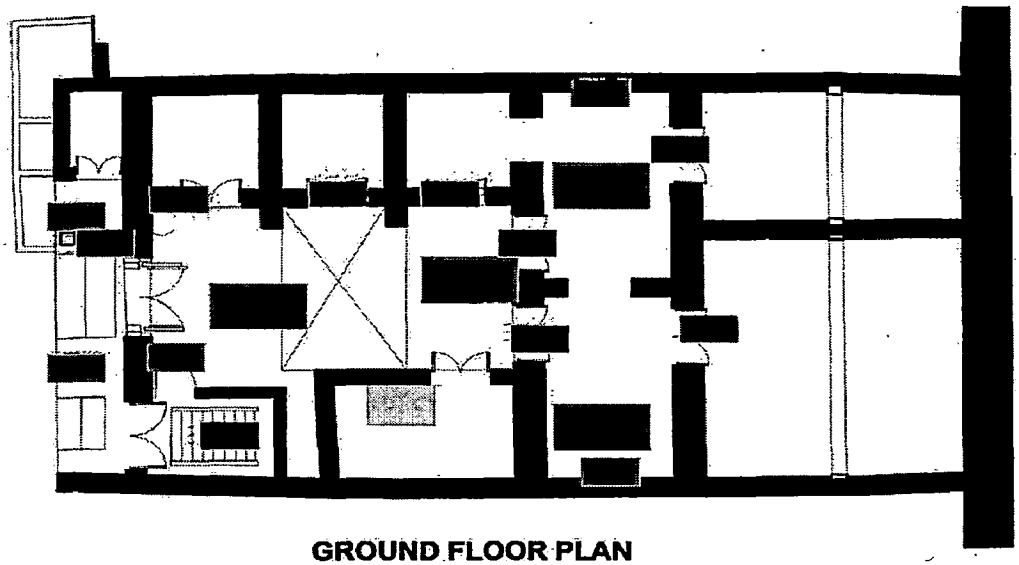


FIRST FLOOR PLAN

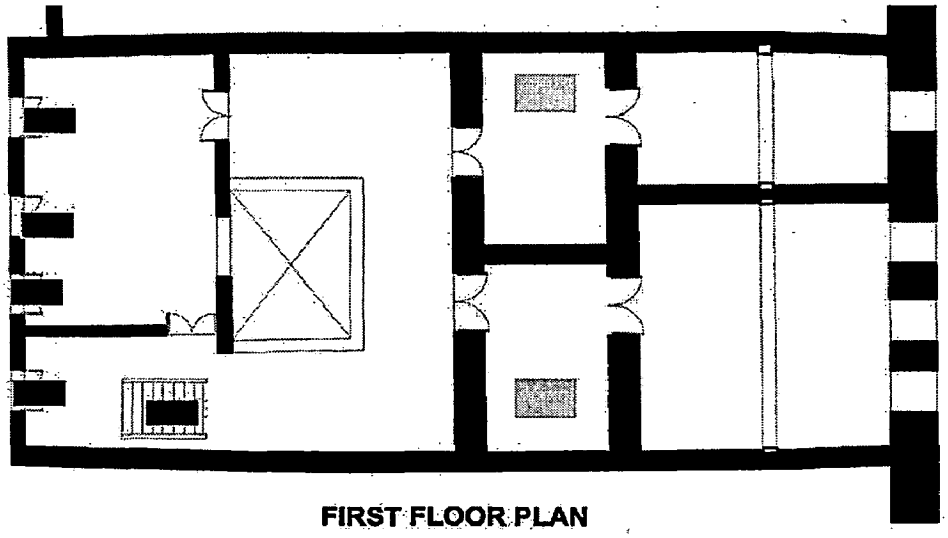


SECTION

5.2.2 Condition Assessment Drawings and Table



GROUND FLOOR PLAN



FIRST FLOOR PLAN

Patches in Flooring

Defects in Woodwork

Later Additions

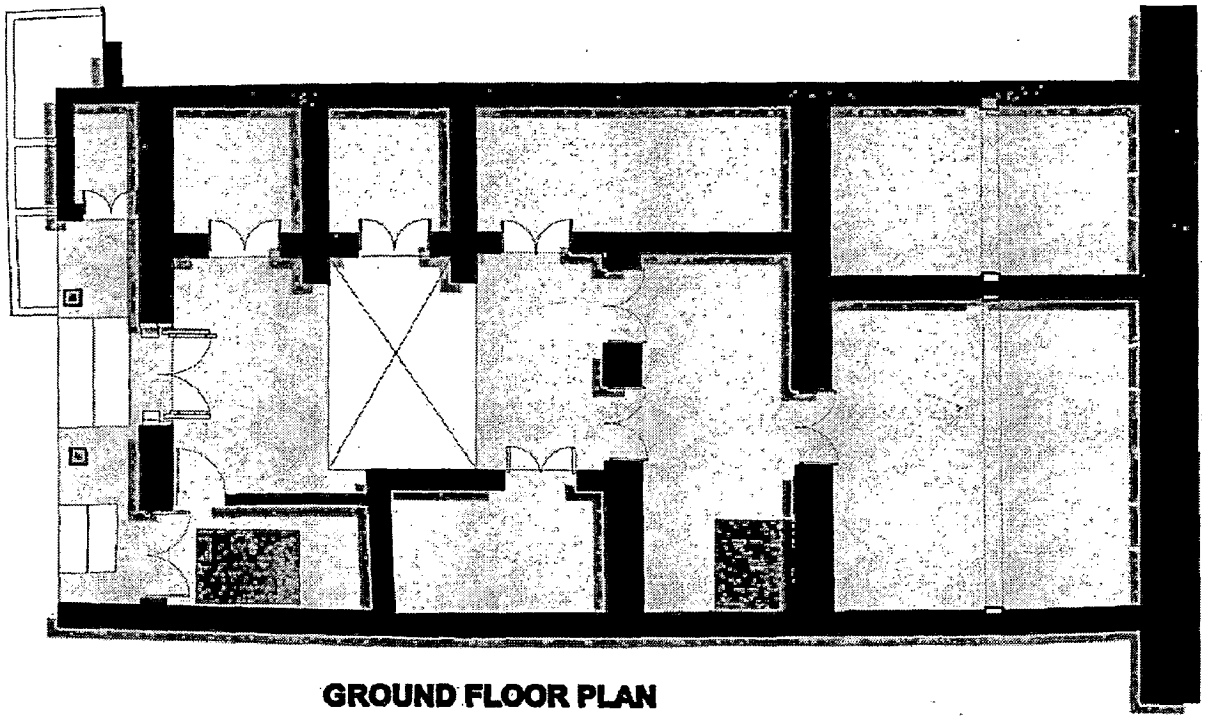
Cracks in Wall or Plaster

Structural Defect

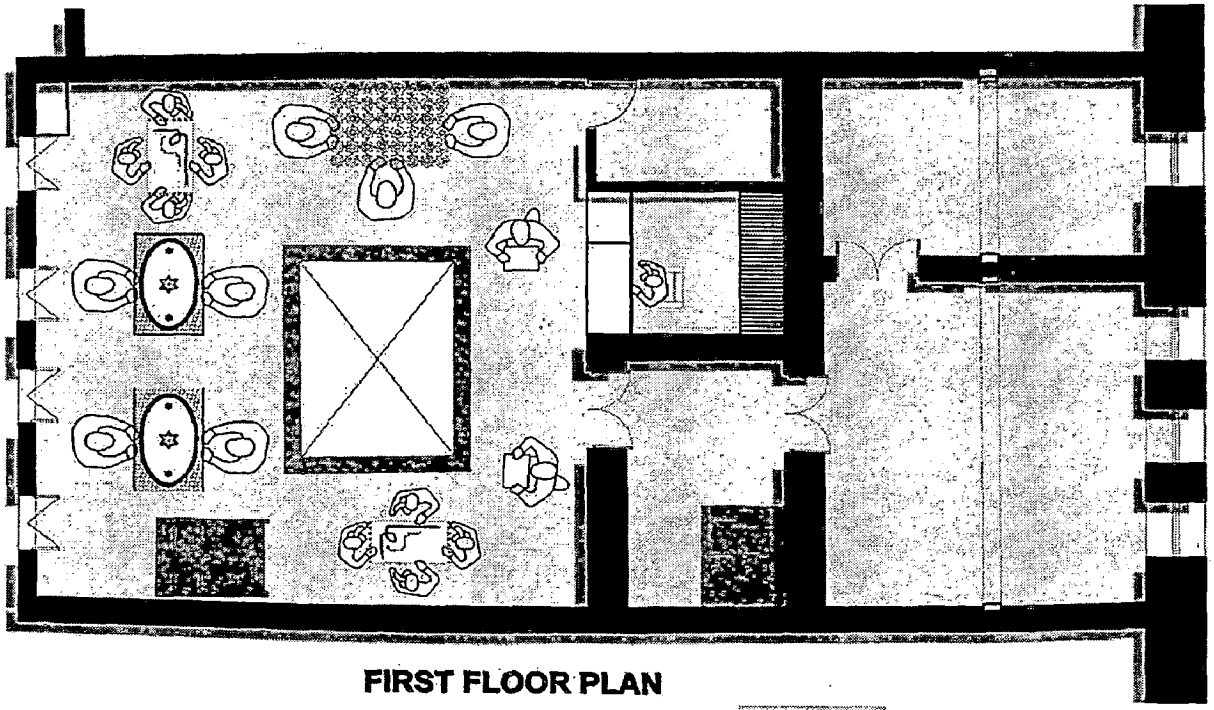
House No-2	STRUCTURE	WALLS	WOODWORK	FLOORING	CEILING	LATER ADDITION/ ALTERATION
PHYSICAL CONDITION	In good condition except lack of maintenance	Damaged plaster due to lack of maintenance	Some portions missing, lack of maintenance in general	Lack of maintenance in general, stone flooring in otla uneven	In good condition except lack of maintenance.	Kitchen elements added to match the modern trends
PHOTOGRAPH						
SUGGESTED ACTION	Removal of old coating and applying fresh varnish/paint	Removing the damaged plaster and applying fresh plaster	Add wooden members matching with the existing woodwork, Application of wood preservatives and varnish to enhance the carvings	Cleaning and maintaining the existing floor, Relaying stone floor of otla with proper leveling and matching stone	Applying varnish over wooden beams and fresh plastering of ceiling	

Table 3Condition Assessment House 2

5.2.3 Adaptive Reuse Drawings



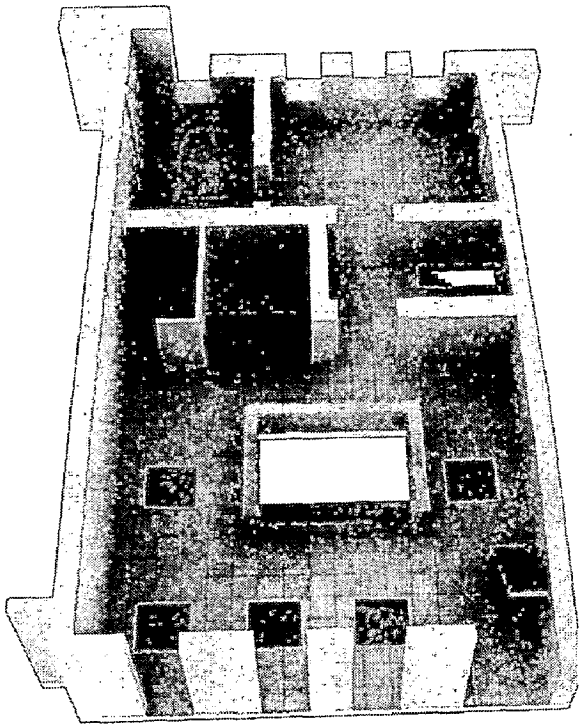
GROUND FLOOR PLAN



FIRST FLOOR PLAN

Proposed Use

Existing Use



The proposed use is handicraft workshop at the front portion of the house at first floor. The rear part of first floor and ground floor is to be retained by the owner of the house. The handicraft workshop will be run by the ladies of the house.

View of First Floor

5.3 House-3, Kalupur

Owner: Ramneek bhai

House No. 1023 Survey No. 2133

Location : Chaumukhi Ni Pol

Location Character : House at Narrow street

House Character : Narrow house

Occupancy: Abandoned Change Alterations: -

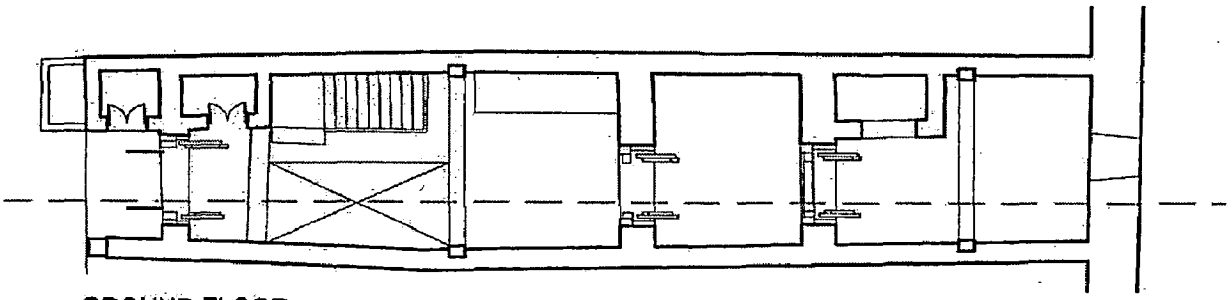
Age of the house (approx.) : More than 160 years

Family Composition

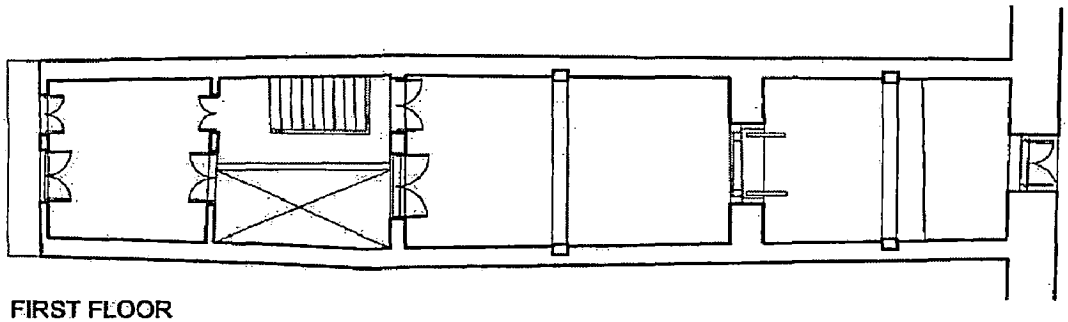
Caste : - No. of person in the family: -

No. of Male : - No. of Female: -

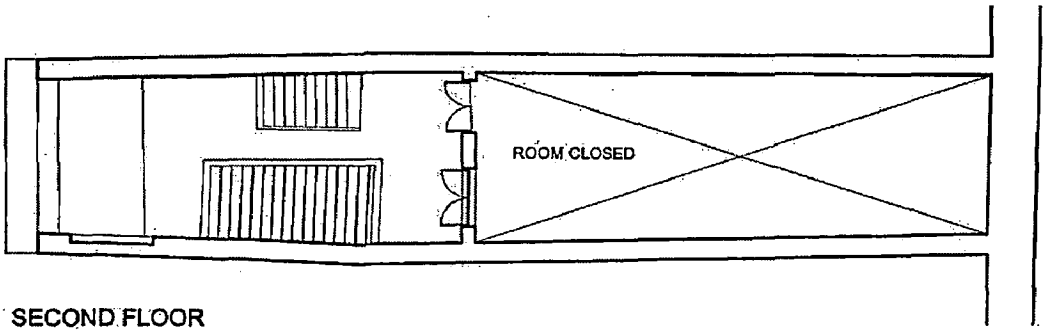
5.3.1 Existing Drawings



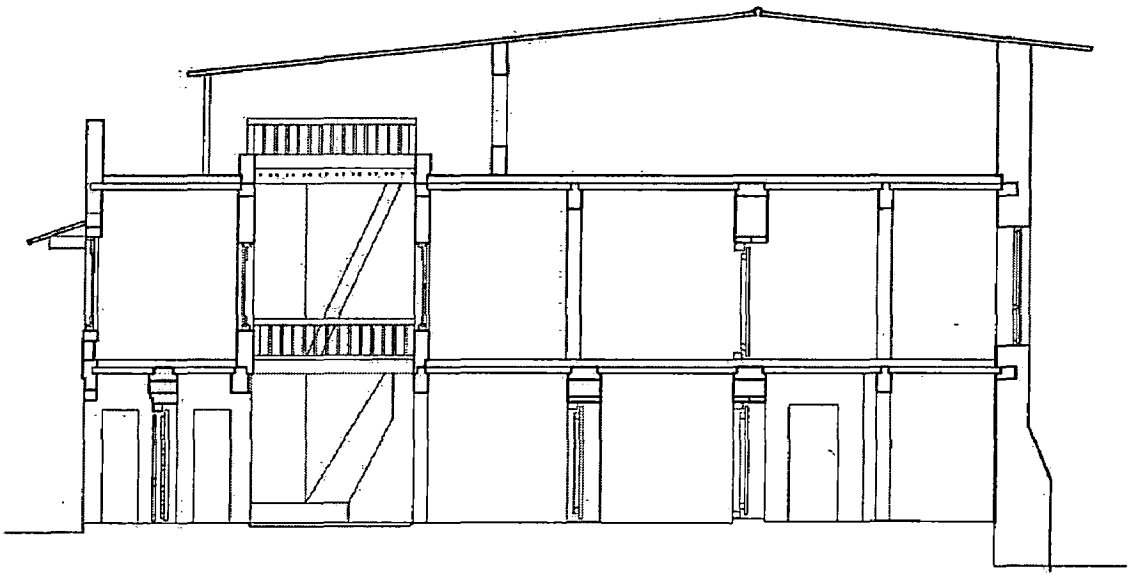
GROUND FLOOR



FIRST FLOOR

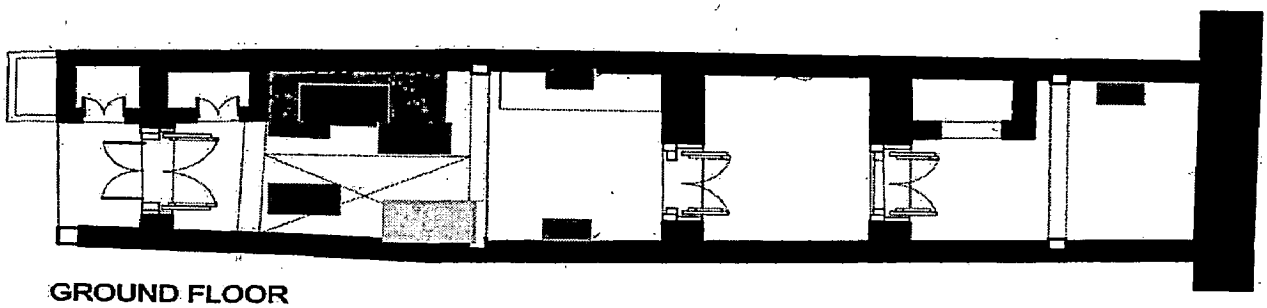


SECOND FLOOR

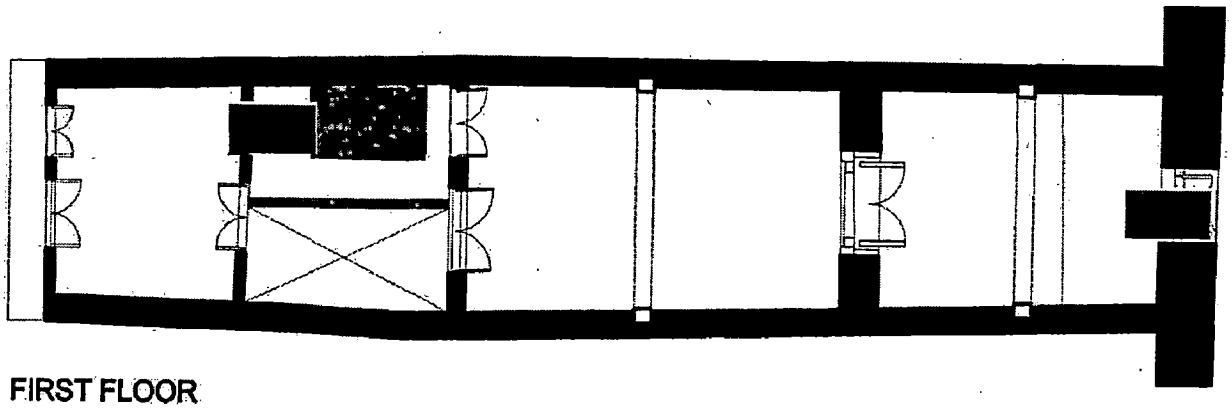


SECTION

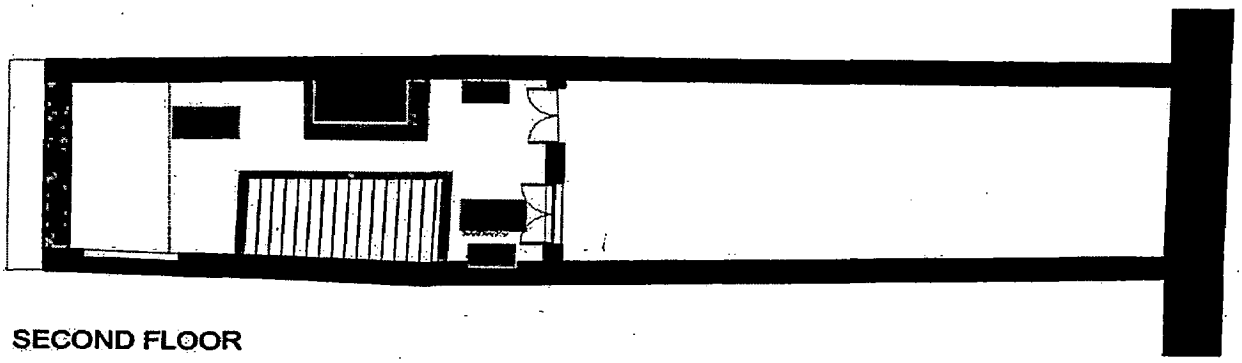
5.3.2 Condition Assessment Drawings and Table



GROUND FLOOR



FIRST FLOOR



SECOND FLOOR

Patches in Flooring

Defects in Woodwork

Later Additions

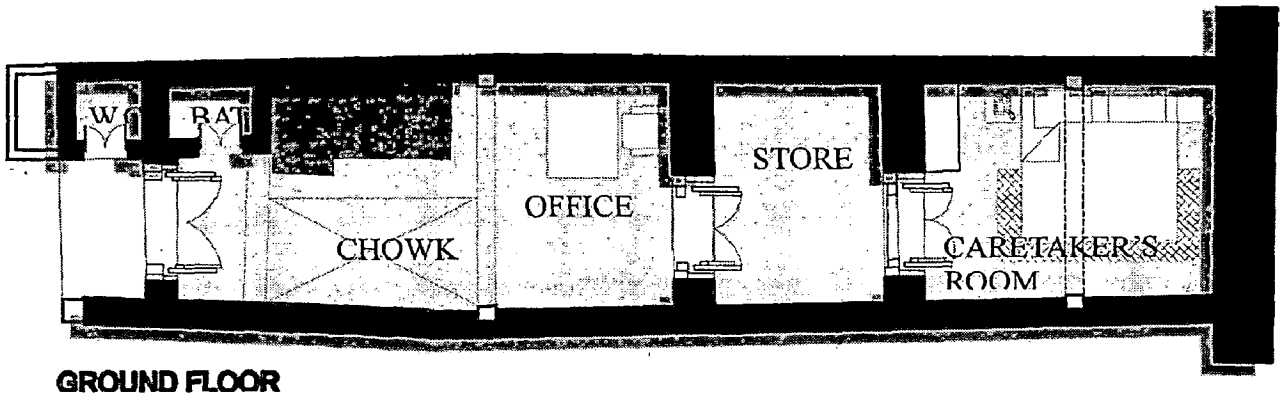
Cracks in Wall or Plaster

Structural Defect

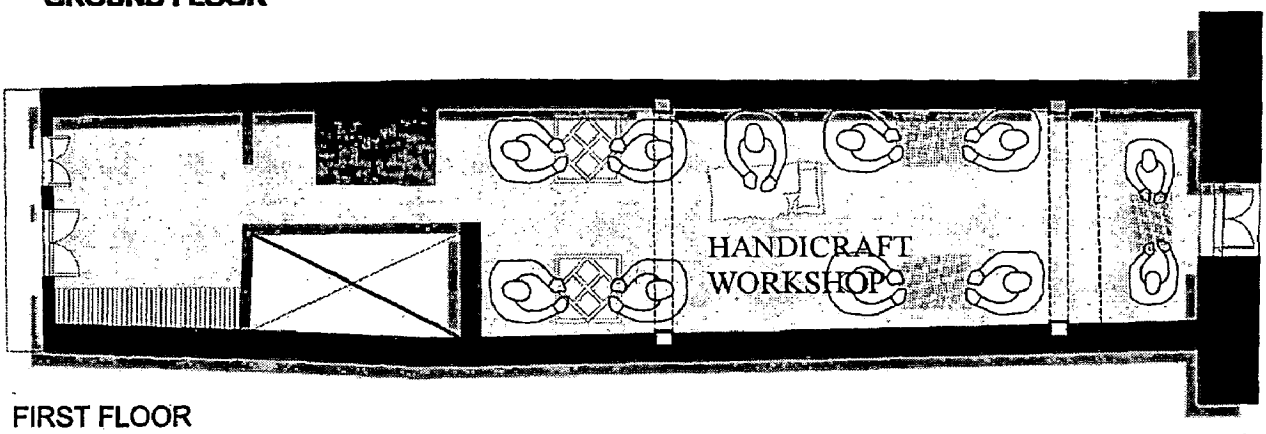
HOUSE NO.-3	STRUCTURE	WALLS	WOODWORK	FLOORING	CEILING	LATER ADDITION/ ALTERATION
PHYSICAL CONDITION	In good condition except lack of maintenance, second floor roof covering needs to be replaced	Damaged plaster due to lack of maintenance	Lack of maintenance in general, staircase needs maintenance	New flooring done in many parts, remaining parts need attention	In good condition except lack of maintenance, second floor ceiling needs attention	Change in flooring
PHOTOGRAPH						-
SUGGESTED ACTION	Removal of old coating and applying fresh varnish/paint	Removing the damaged plaster and applying fresh plaster	Application of wood preservatives and varnish	Cleaning and maintaining the existing floor	Applying varnish over wooden beams and second floor ceiling can be redone	

Table 4 Condition Assessment House 3

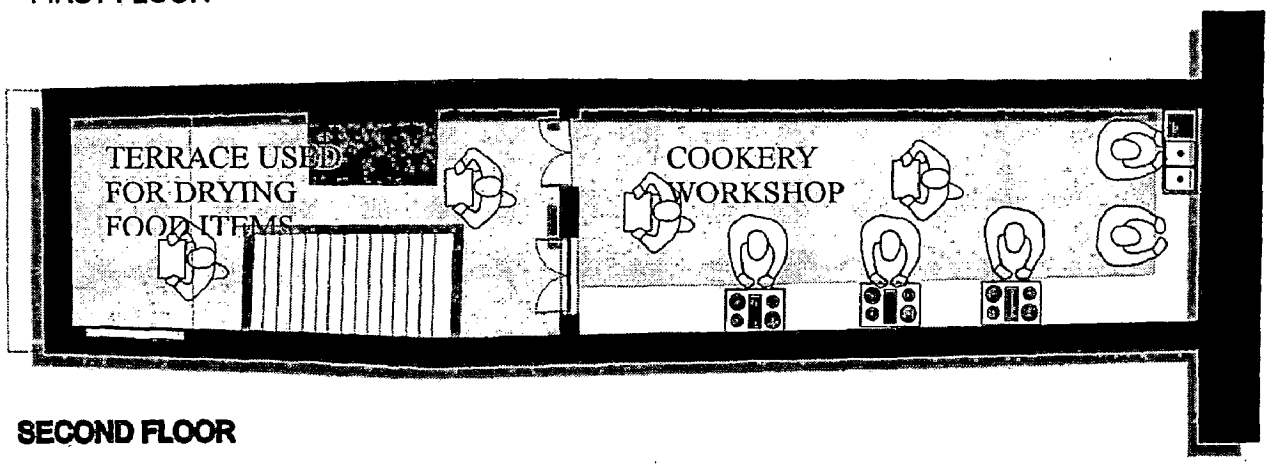
5.3.3 Adaptive Reuse Drawings



GROUND FLOOR



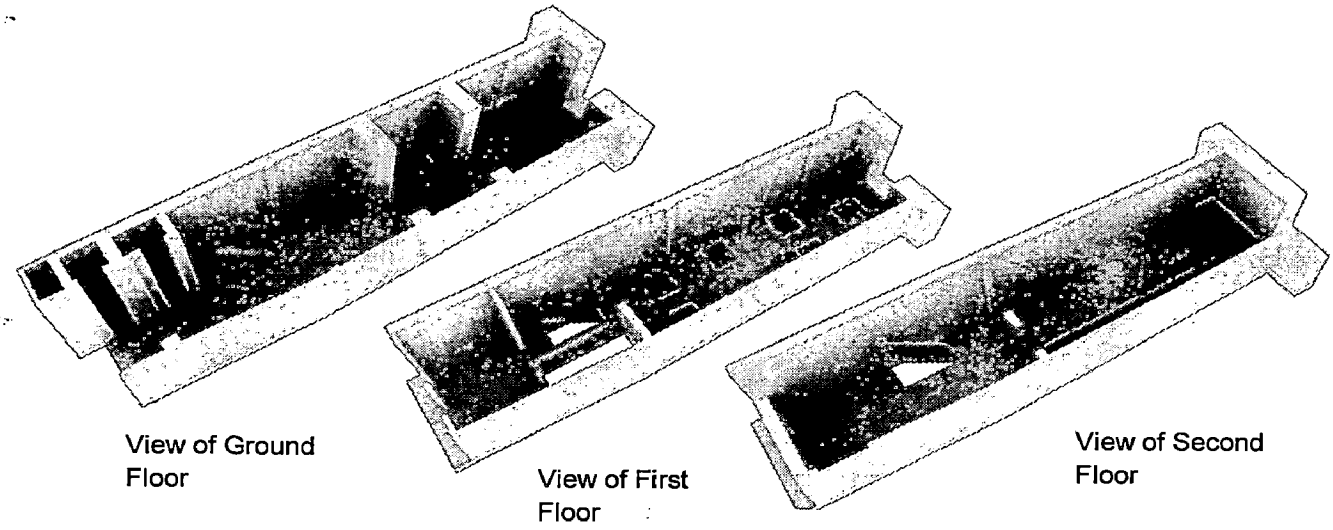
FIRST FLOOR



SECOND FLOOR

Proposed Use

Existing Use



View of Ground Floor

View of First Floor

View of Second Floor

The house is completely given a new use by providing office and residence for the care taker at ground floor, a handicraft workshop at the first floor and a cookery workshop at the top floor with terrace to be used as drying space for food items. The workshops will be run by ladies staying in the neighbourhood.

5.4 House-4,Khadia Ward No. III

Owner: Yadukant Dave

House No. 579 Survey No. 970

Location : Devji Ni Sheri, Lakha Patel Ni Pol, Sankadi Sheri

Location Character : House at a dead end (cul-de-sac)

House Character : Middle sized house

Occupancy: Single family Change Alterations: -

Age of the house(approx.) : 160 years

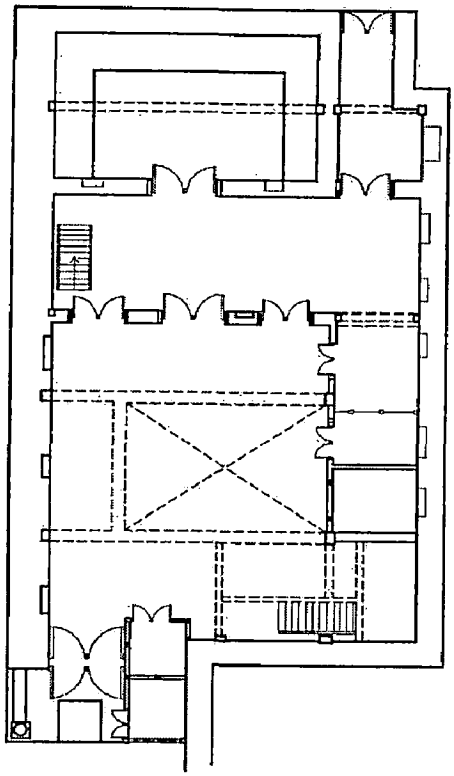
Family Composition

Cast : Nagar

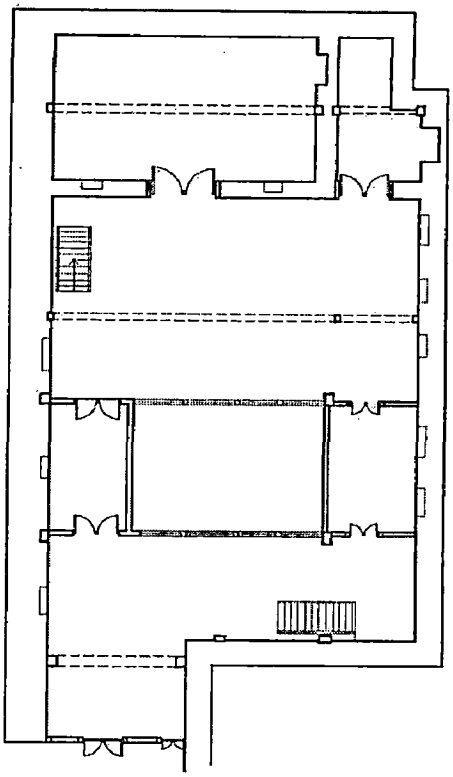
No. of person in the family: 6

No. of Male : 5 No. of Female: 1

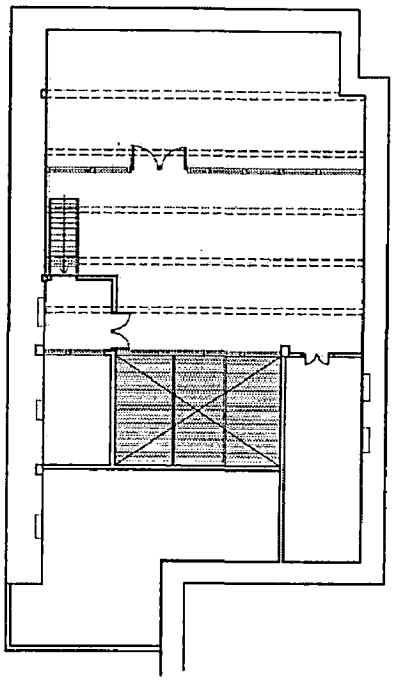
5.4.1 Existing Drawings



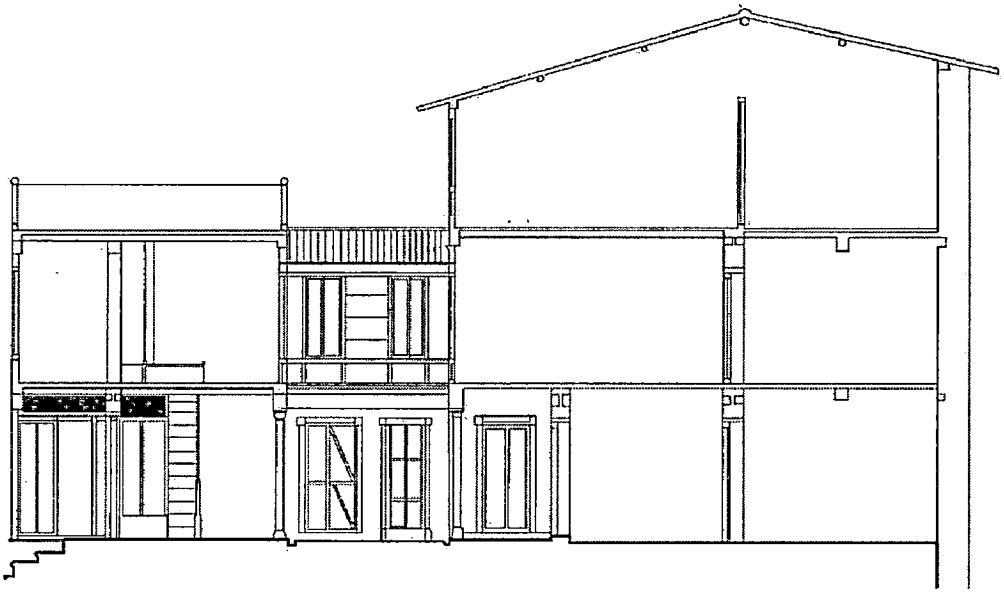
GROUND FLOOR PLAN



FIRST FLOOR PLAN



SECOND FLOOR PLAN



LONGITUDINAL SECTION

5.4.2 Condition Assessment Table and Drawings

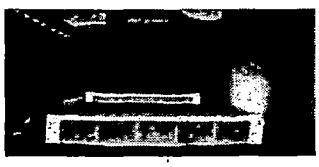
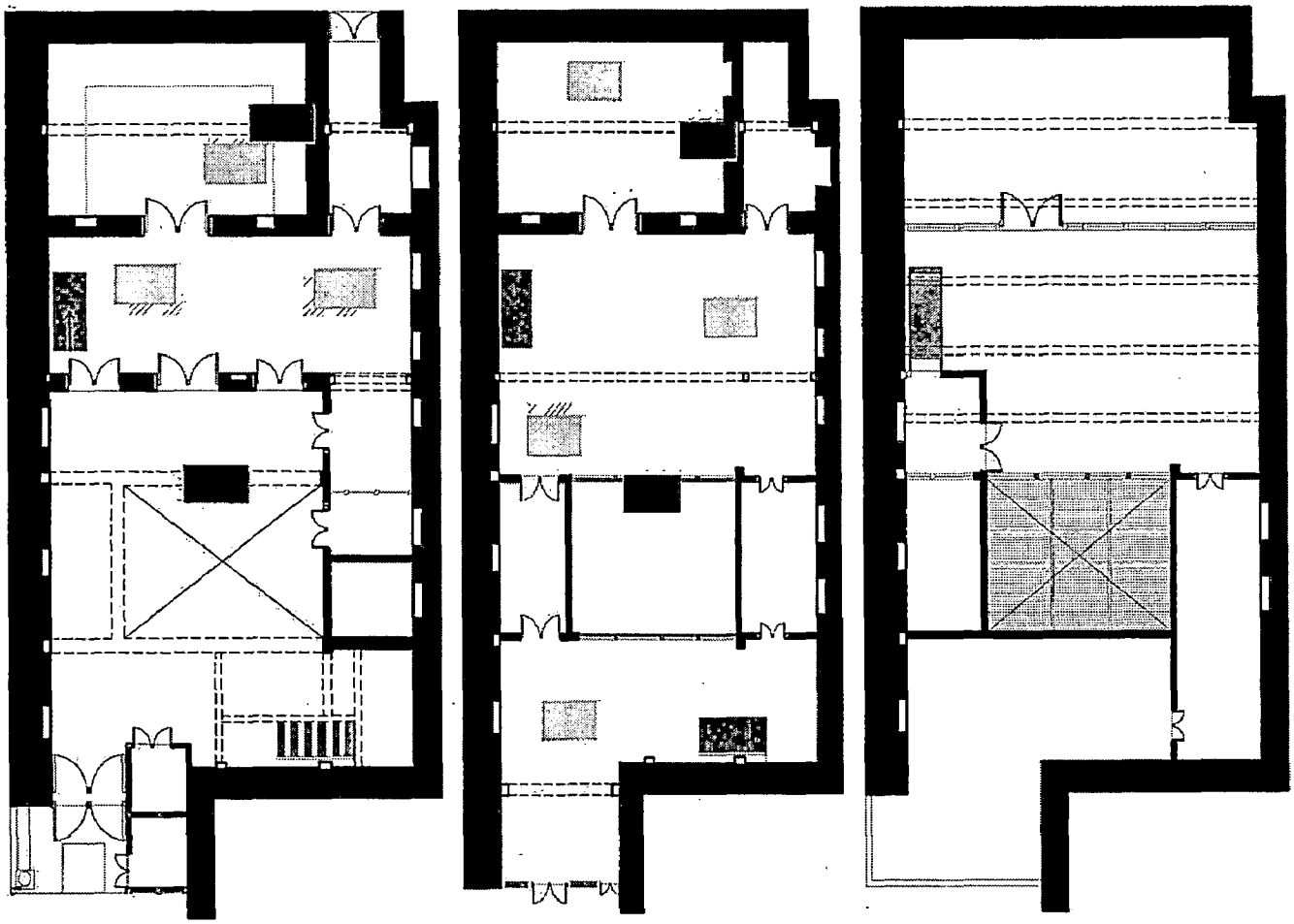
House No. 4	STRUCTURE	WALLS	WOODWORK	FLOORING	CEILING	LATER ADDITION/ ALTERATION
PHYSICAL CONDITION	Cracks developed in some members, in general the structure is sound	Damaged plaster due to lack of maintenance	Lack of maintenance in general, staircase needs maintenance	New flooring done in all the rooms	In good condition	Change in flooring, ceiling etc.
PHOTOGRAPH						
SUGGESTED ACTION	Replacing with new members and maintaining the overall structure	Removing the damaged plaster and applying fresh plaster	Application of wood preservatives and varnish	-	-	Care should be taken to match the new with the old.

Table 5 Condition Assessment House 4



GROUND FLOOR PLAN

FIRST FLOOR PLAN

SECOND FLOOR PLAN

Patches in Flooring

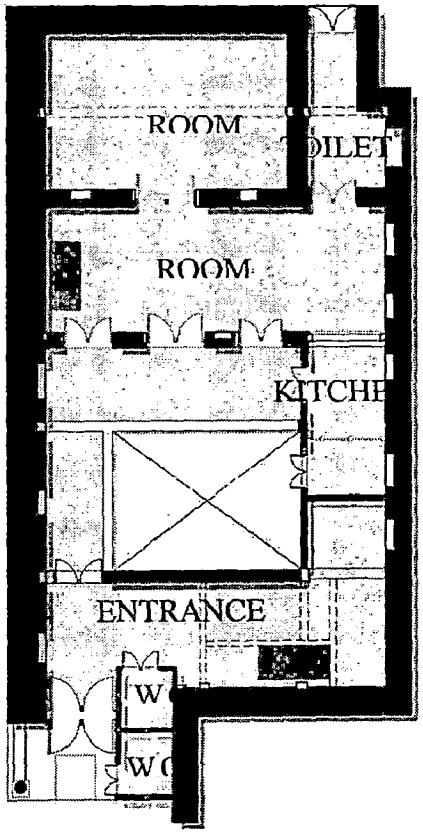
Defects in Woodwork

Later Additions

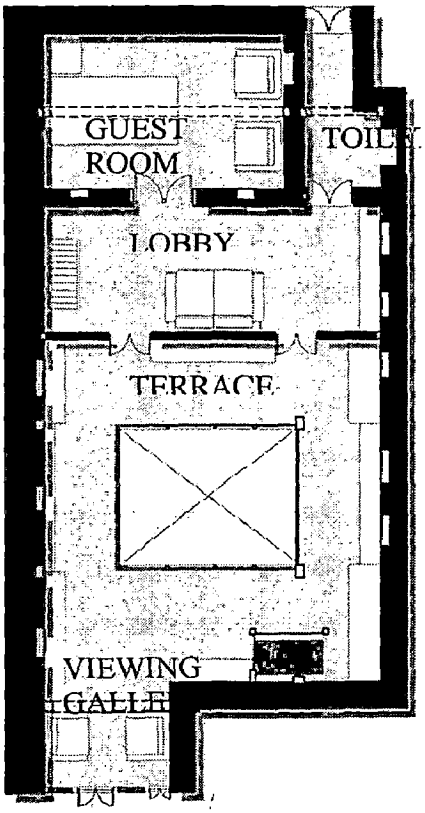
Cracks in Wall or Plaster

Structural Defect

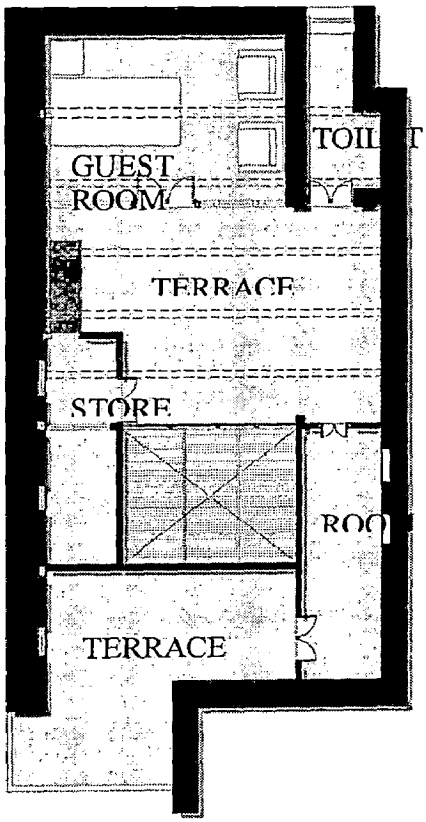
5.4.3 Adaptive Reuse Drawings



GROUND FLOOR PLAN



RST FLOOR PLAN



ECOND FLOOR PLAN

Proposed Use

Existing Use

The proposed use is bed and breakfast accommodation at first and second floor. Viewing galleries are also provided at the front portion of the house in order to facilitate professional like photographers, artists, poets etc. to appreciate the beauty of Pol houses. The rear portion of ground floor will be retained by the owner.

5.5 House-5, Jamalpur Ward No. II

Owner: Kantaben Rasiklal Soni

House No. 1033/2

Survey No. 1033/2

Location : Lalabhai Ni Pol, Mandvi Ni Pol, ManekChowk

Location Character : House at narrow street

House Character : Very Narrow house

Occupancy: Two different users are part of one family belonging to same caste.
Upper levels are partly ground floor is occupied by one person(Madhukantaben)
Lower level is used by single family (Nainesbhai and his family)

Change Alterations: -

Age of the house(approx.) : More than 100 years

Family Composition

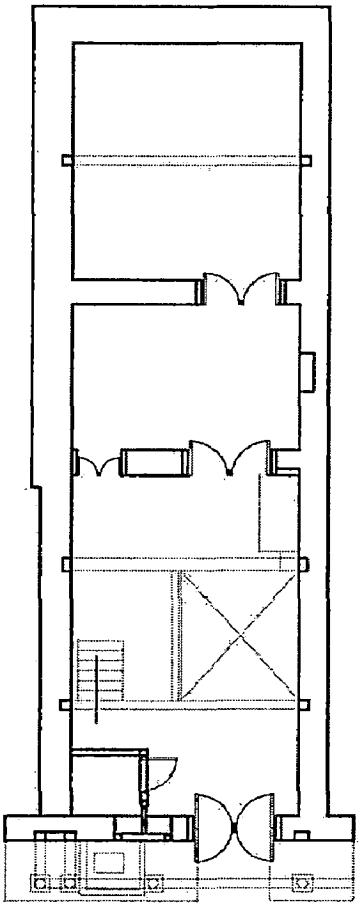
Cast : VaishnavBania

No. of person in the family: 5

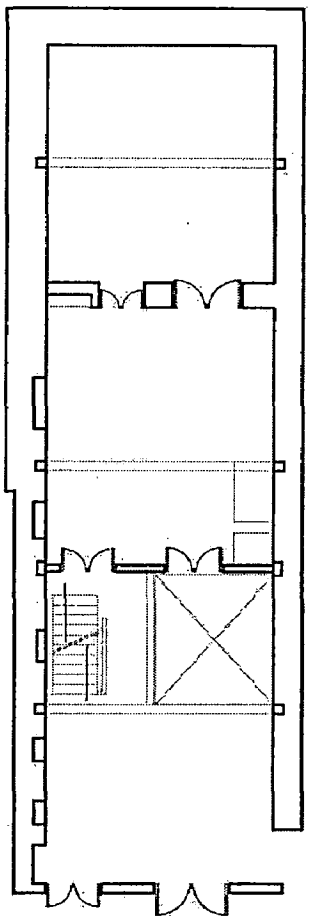
No. of Male : 2

No. of Female: 3

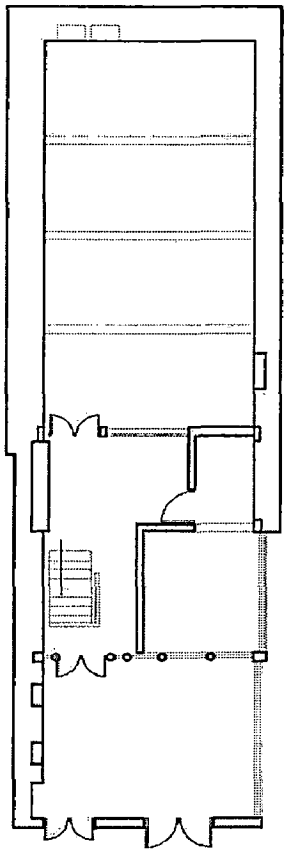
5.5.1 Existing Drawings



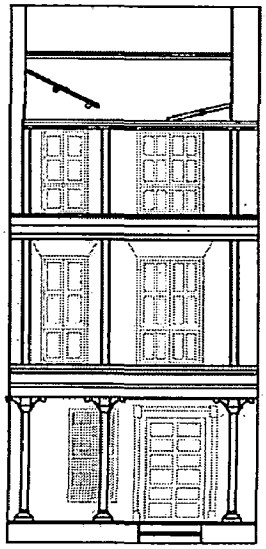
GROUND FLOOR PLAN



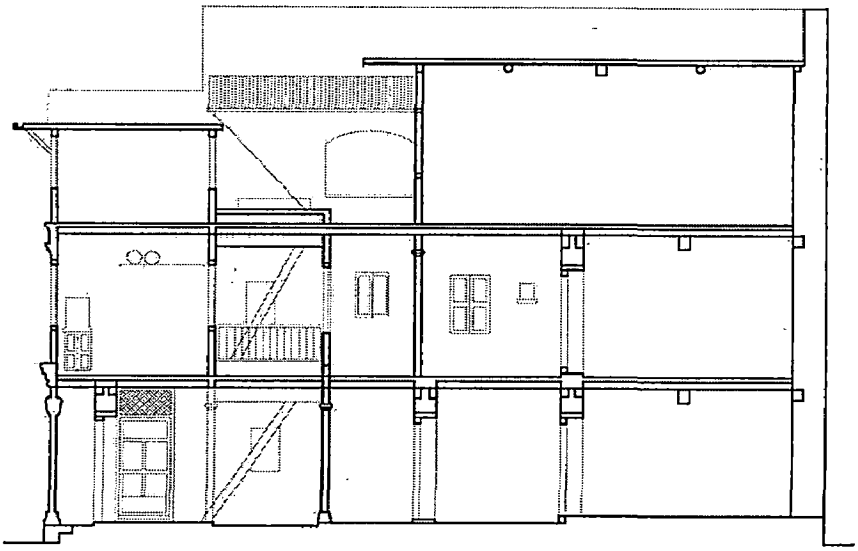
FIRST FLOOR PLAN



SECOND FLOOR PLAN



SECTION



LONGITUDINAL SECTION

5.5.2 Condition Assessment Table and Drawings

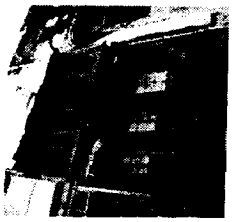
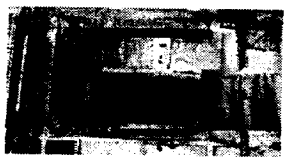
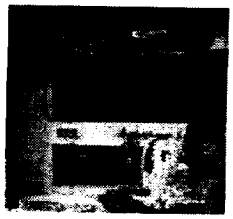
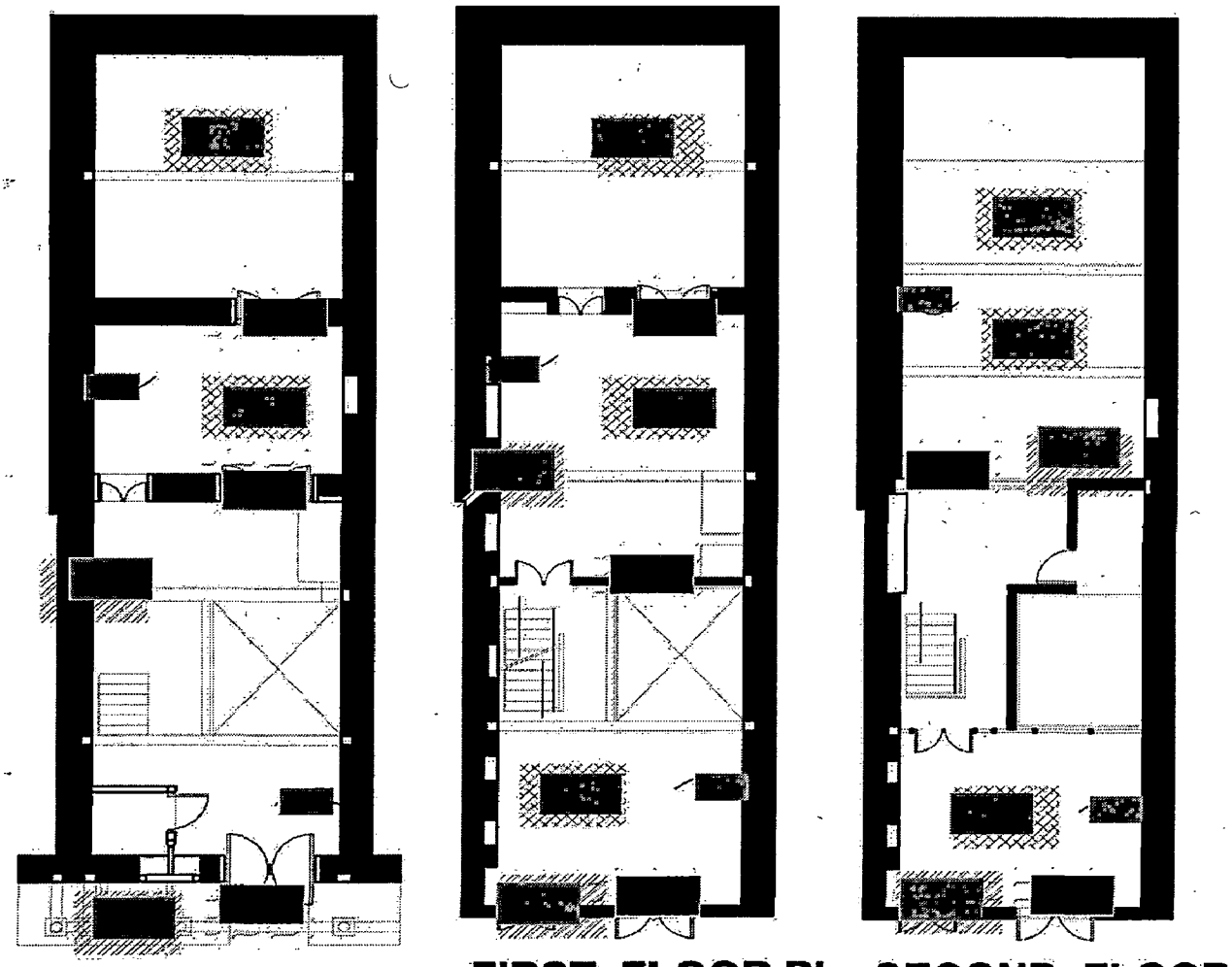
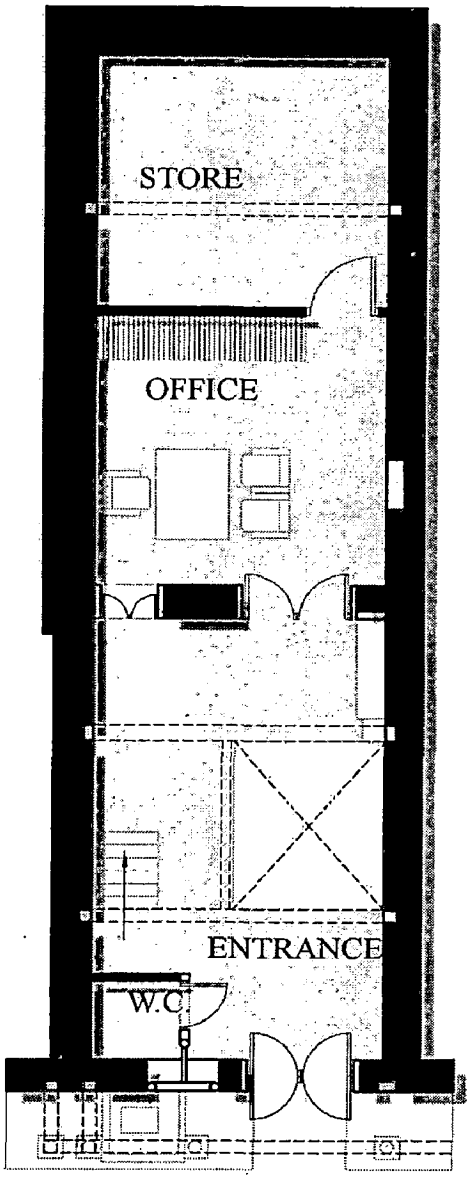
House No.:5	PHYSICAL CONDITION	PHOTOGRAPH	SUGGESTED ACTION
STRUCTURE	In poor condition, some beams cracking, lack of maintenance		Structural beams need to be replaced,
WALLS	Plaster coming out,		Plaster to be redone and maintained
WOODWORK	In good condition but lack of condition		Needs to be repainted and maintained
FLOORING	In bad shape, uneven settlement		Flooring to be re-laid matching with the existing flooring
CEILING	Crumbling at many places		Removing the existing and applying fresh plaster
LATER ADDITION/ ALTERATION	Nothing done so far		

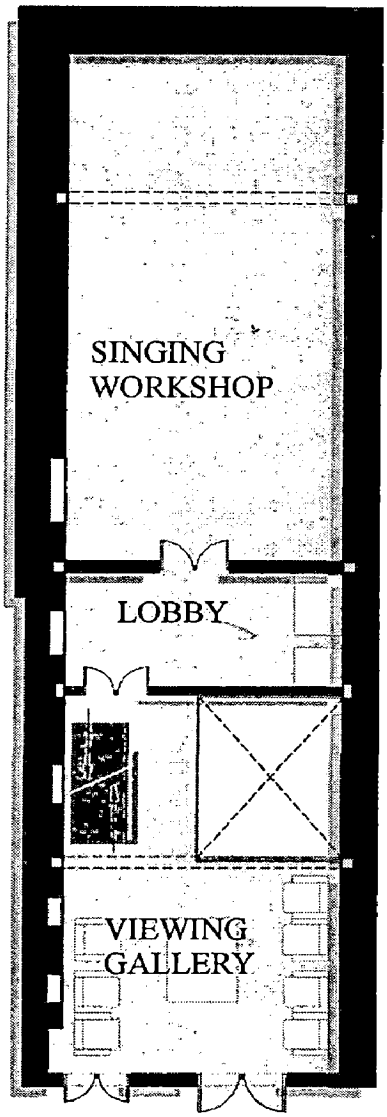
Table 6 Condition Assessment House 5


GROUND FLOOR F
FIRST FLOOR PL
SECOND FLOOR
Patches in Flooring
Defects in Woodwork
Later Additions
Cracks in Wall or Plaster
Structural Defect

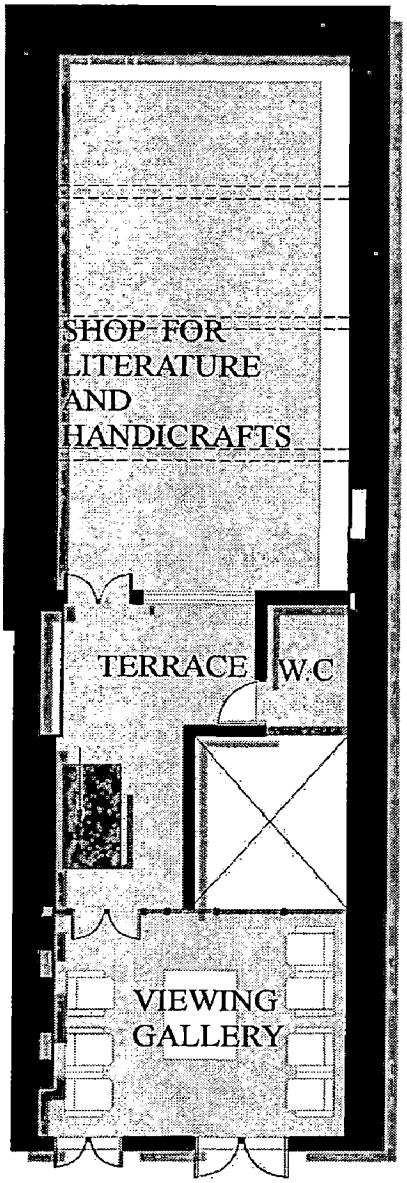
5.5.3 Adaptive Reuse Drawings



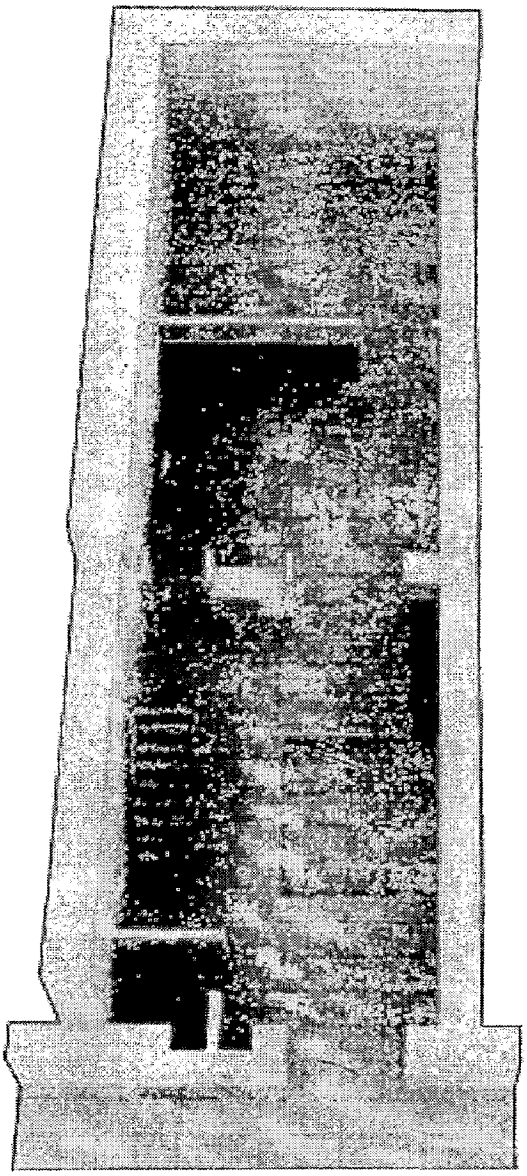
GROUND FLOOR PLAN



FIRST FLOOR PLAN

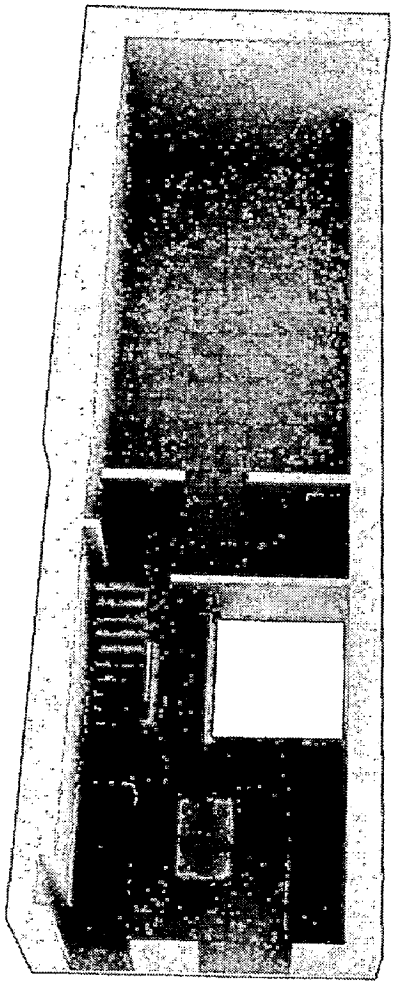


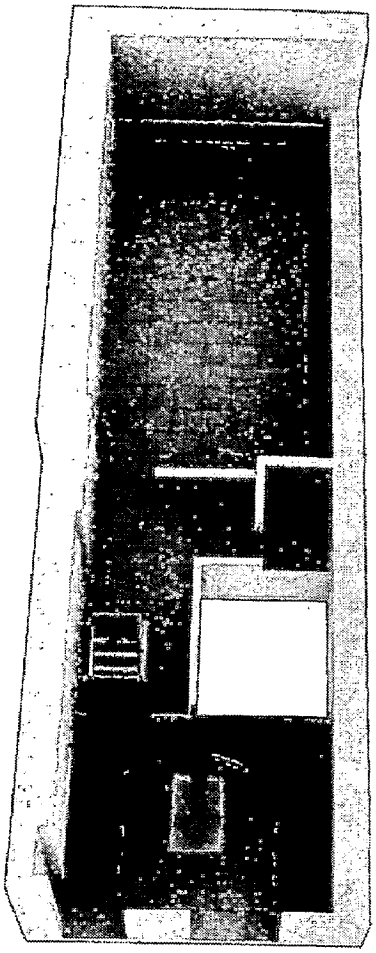
SECOND FLOOR PLAN



Proposed Use

Existing Use





The proposed use consists of office and store at ground floor, a singing workshop and viewing gallery at first floor and a retail shop for literature and handicrafts at second floor with viewing gallery at the front.

CHAPTER 6 RECOMMENDATIONS

The chapter suggests parameters which should be kept in mind while taking a residential project of adaptive reuse having rich heritage value. The recommendations are given stressing on economic viability, local participation and suggesting reuse options local to context of adaptive reuse project.

6.1 Recommendations

1. Suitability to Local Context: The new uses proposed and changes incorporated should blend with the existing fabric of the Pol houses. This will help in maintaining the original character of the place.
2. Self-Sustained Concept: Once the maintenance of the houses takes place, the new uses should generate enough income to maintain and add to the economic status of the inhabitants.
3. Activities or uses which are not native to the place should be avoided: The tourists coming to the area wants to experience the local traditions so any use which is not traditional in nature will not be appreciated by them. A strong traditional fervor will be welcome by domestic and international tourists.
4. Local participation should be taken care: People residing there should be trained so that whenever they renovate their houses they should not destroy or damage the heritage elements.
5. Income generator: The proposed uses should generate income for the up keeping of the heritage fabric of the place.
6. Promoting traditional art, architecture and culture: This is very important as by promoting native traditions, a global consumer market can be created for traditional art, architecture and culture which in turn will generate funds for the development and maintenance of such heritage.
7. Efficient to support tourism: The reuse options suggested should be such that they can cater to the international standards in providing facilities to the tourists.
8. Revival of systems used like tanko, wooden carvings: It is very necessary that the art of wood carvings should be kept alive as it will help in replacing the old elements of the Pol houses.

9. Focus on information, exposure, experience and interventions: Proper information about the heritage site should be available to the tourists in the form of print media and electronic media. Exposure and experience to local life style, traditions and architecture should be encouraged through wise selection of heritage sites with proper facilities for tourists. Interventions with changing life style and technology should be monitored and guided in a way such that minimum effect on the existing fabric.

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