SLUM HOUSES AS A USER RESPONSIVE PRODUCT:
A Case Study, Indore, India.

YATIN PANDYA
School of Architecture
McGill University, Montreal
November, 1988

A thesis submitted to
the Faculty of Graduate Studies and Research
in partial fulfillment of the requirements
for the degree of Master of Architecture

To mankind's hopes...

ABSTRACT

Unplanned settlements offer a variety of houseforms to suit the needs of different users. Variation in houseform is a consequence of a wide range of socio-cultural factors. Through a structured classification of fifty-two house samples from an unplanned settlement in the city of Indore, India, this thesis documents these houseform variations. They are classified based on qualitative observations, such as: subdivision or number of rooms in a house, spatial organization of rooms, composition of built and open spaces, and number of accesses. This study also investigates the influence of household combination and the daily activities of the users, on the houseform. In addition the correlations between houseform, households, and activities, are examined quantitatively. In the conclusion, inferences are drawn, from these observations, concerning the interrelationships between users, space, and use of space.

RESUMÉ

Les regroupements d'habitations non planifiés offrent une variété de configurations de maison accomodant les besoins particuliers des différents usagers. Ces variations découlent de toute une gamme de facteurs socio-culturels. Ce travail documentera donc ces variations à l'aide d'une classification structurée d'un échantillonage de cinquante deux maisons de la ville d'Indore, en Inde. Elles sont classifiées selon des observations qualitatives telles que la subdivision ou le nombre de pièces dans la demeure, l'organisation spatiale de ces pièces, la composition des espaces bâtis et libres, ainsi que le nombre d'accès à ces maisons. Cette étude examinera également l'influence du type de maisonnée et des activités quotidiennes des habitants sur la forme des maisons. De plus la corrélation entre la configuration des habitations, les maisonnées et les activités, sera examinée quantitativement. En conclusion, on déduira de ses observations, les interrelations entre les habitants, l'espace et l'utilisation de l'espace.

ACKNOWLEDGEMENTS

I am grateful to the Vastu-Shilpa Foundation, Ahmedabad, especially professor B.V.Doshi and Himanshu Parikh, for giving me the opportunity to study at McGill university as the recipient of the CIDA fellowship.

I am indebted to my thesis advisor, professor Vikram Bhatt, for his creative comments and invaluable guidance.

My sincere thanks to professor Witold Rybczynski for his suggestions and constructive criticism during the course of study.

Thanks are also due to:

Richard Brook, for providing me with the base data for this study, and subsequent discussions;

Dr.G.B.Isherwood (Dept. of Education) for offering valuable insights on the aspects of statistical analysis;

Professor David Brown (Dept. of Urban Planning) for his observations in the early stages of this study;

Devajyoti Deka for his continued assistance in computer analysis of the data;

Jeff Armstrong for his comments and extensive help in editing the text;

Miss Anderson for her parental advice, and help concerning the administrative matters,

Hemant Wala for his timely help in sending the reference literature from India,

Richard Dulude and his family for their support in every facet of life during my stay in Montreal,

Pandya and Vaidya families for making my stay comfortable in Montreal,

Blanca and Ashok for their support and encouragement,

and all my friends, especially Roberto, Juan, Soheil, Jesus, Lia, Hector, Yamin, Danuta, Don, Peter, and Yseult for their direct-indirect support.

My family for their patience, understanding and encouragement.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

"People's houses are unique by definition - although a house is a relatively simple assembly, it has immensely complex and variable uses" (1). Being self-conceived and self-organized; traditional (e.g. old cities), vernacular (e.g. tribal settlements), as well as spontaneous settlements (e.g. slums and squatter settlements) all display varied uses and variations in the houseform (2). The question then is: what do these variations mean? Is there a logic - an order - behind these? Anthropologists have claimed that this order derives from man-environment interaction. This mutual communication can be best deciphered by asking a series of questions regarding the way in which people organize space and shape their environment (3).

These questions include: What is the nature of the typical unit (which we call a "house") in which a social unit (a family) lives? How is it organized? Who builds it, where is it located, what possessions are kept in it and where are they kept? How is this unit used; who uses which parts for what, when, and under what conditions? How is the dwelling related to the larger social organization? (4).

This thesis asks these questions in an attempt to understand slum dwellings from the dweller's point of view. A basic premise of this thesis is that housing can not be judged by what it is but rather what it does in people's lives.

THE OBJECTIVE of this study is two fold:

1) **to identify and describe the houseform variations as observed in an unplanned settlement; and**

2) **to examine the influence of household combination and the daily activities of the user on these houseforms.**

THE SCOPE

Fifty house samples from Shilnath Camp, a slum in the city of Indore, India, are used as case studies for the purpose of this thesis. Indore, like many other urban centres in India, has experienced dramatic population growth in the past years. This has resulted in a shortage of affordable housing that most greatly affects the poor. Thus Indore represents the shelter situation of the poor, similar to any growing urban centres of India.

This thesis focuses only on the house unit and does not consider other aspects of slum organization such as streets, public spaces, or settlement patterns. These house units are studied only in terms of their spatial characteristics, therefore, issues concerning health, hygiene, ventilation and sanitation are beyond the scope of this study. Although occupation, source of employment, income, education, caste structure, and place of origin have their influences on the houseform, they also lie beyond the limits of this thesis. For the purpose of this study only **household combination** and **daily activities** of the users, are examined.

THE ORGANIZATION

This thesis is organized into six chapters. The first chapter reviews the literature, from the point of view of slums as a low cost housing solution, for urban areas in the developing countries. It examines slums as an effective system for delivering appropriate housing to the poor, as a user controlled planning process, and as a culture responsive design product.

The second chapter explains in detail the research methods that have been employed for the purpose of this thesis. It describes the process by which data was collected and outlines the limits of the study with respect to the availability of data. Having considered these limitations, the methods of analysis, both qualitative and quantitative, are explained.

Chapter Three provides general background information on Shilnath Camp; its location within the city of Indore, demographic and physical characteristics of the site, the type of people living there, and a brief note on the general nature of dwellings that exist there. Three typical case studies are described with respect to their household structure, houseform characteristics, and the use of house. Clues provided by these family scenarios form the basis for classifications and comparisons of Chapter Four.

The fourth chapter examines the specific houseform data from the fifty-two house samples from Shilnath Camp. Here variations in houseforms are identified and analyzed with

regard to their room subdivisions, spatial organization, types of built and open spaces and the number of accesses to the house. These variations are documented and described, in the form of a catalogue, and then through quantitative methods, are compared with the household structure in order to examine any correlation between houseform and household.

Similarly, the fifth chapter documents the various ways in which the daily activities are accommodated by the houses. Here the influence of activities on houseform are investigated with regard to where specific activities occur, whether building components be influenced by activities, and the type of spaces these activities demand.

Based on these qualitative inferences, the final chapter proposes a hypothesis concerning the strong correlations between houseform, households, and daily activities.

1.00 THE SLUM - A PROBLEM OR A SOLUTION? A Literature review

1.10 THE SLUM - its definitions

Various terms such as slums, squatter settlements, hutments, unplanned settlements, spontaneous settlements or informal sector housing, are used to describe low-income shelters in most developing countries. Such settlements have become an inevitable and inseparable ingredient of the urban landscape due to increased pressures of land and resources to meet the housing demand. Villas miserias of Argentina, barong-barong of Philippines, bidonvilles in Morocco, favelas of Brazil, ranchos of Panama, colonias proleteriat in Mexico, gecekondus of Turkey, pueblos jovenes of Peru or bustees and jhugi-zopadis of Pakistan and India all refer to this urban phenomenon (5).

Their names and terms vary from place and time, but they are all perceived as areas characterized by overcrowding, dilapidation, faulty lay-outs, and lack of essential services (6). Slum, the term most often used in a loose sense, is a comparative concept, which designates some area as much worse in living condition than some societal norm (7). Legally they are the areas where people build houses which are mostly in violation of government rules related to either property rights, zoning, density, type of construction, or physical

condition (8). For example, the United Nations Organization defines slum as:

> "a building, group of buildings, or area characterized by overcrowding, deterioration, insanitary conditions or absence of facilities or amenities which, because of these conditions or an one of them, endanger the health, safety or morals of its inhabitants or the community" (9).

This legal definition places emphasis only on the physical condition (sanitary and structural aspects) of the buildings disregarding their otherwise lively and multipurpose living environments, hence failing to distinguish between the visual and social order. As Aristotle suggested, any system ought to be examined in their entirety. He said, "there is a need for the synoptic view, for an awareness of the city (system) as a real concrete entirety, not just as an abstraction of laws, constitutions, and book knowledge" (10). Legal definitions need to be based on the contextual norms and appropriate standards in order to best respond to local conditions and realities. Universal adoption of "borrowed" standards and their "global" application regardless of the context, increases the problem rather than resolving it. For example, the Indian legal definition of a slum is no different from that of the UNO's. As a result it more distorts the realities than portraying them. In India a slum is legally defined as:

> "an area where buildings are in any respect unfit for human habitation; and are by reasons of dilapidation, overcrowding, faulty arrangements of streets, lack of ventilation, light, sanitation facilities, or any combination of these factors, detrimental to safety, health or morals" (11).

The liberal application of this definition can result in too wide a coverage of areas considered as slums, and may include many areas quite adequate for human habitation. Shahjahanabad, the walled city of old Delhi, built in a traditional style and inhabited by millions of people for hundreds of years, yet declared a slum, provides a good example of the inappropriateness of such a general definition (12). Thus, these definitions of what constitutes a habitable dwelling do not reflect the nature of housing as it exists, instead they reflect more accurately the way in which adequate or minimum housing is perceived by the government authorities (13). Governments have traditionally perceived slums as physical entities, and have therefore focused on the constructional and aesthetic aspects, rather than spatial, organizational or social aspects. For example, the criteria for the desirable housing project, as defined by HUDCO (Housing and Urban Development Corporation of India), is as follows:

> "provide for simple, inexpensive and aesthetically pleasing layouts, economical housing design with proper land concept, and to the extent possible the use of locally available cheaper substitutes for scarce building materials and also construction techniques which reduce costs" (14).

Concern for construction, appearance and economics are very apparent in this guideline. At the same time ignorance of what constitutes appropriateness of design is also obvious. The resultant housing policies and the planning strategies of the government, have been mainly treating the "symptom" rather than the real "causes" of development problems (15). Slums

have emerged in response to socio-economic and cultural forces, such as: increasing concentration of land ownership; ever growing demand for urban housing due to increased rural-urban migration; a dwindling housing supply of public housing due to the inadequacy of government resources; segmented labour markets with many poor people; and changes in the official policies concerning investment and building regulations (16). But, until recently the Indian government had ignored these realities, interpreting the slums, as "problems" to be erased. The Government had adopted the notion of **providing** housing for the poor through strategies such as mass produced fully built housing units, core housing, and sites and services projects. All of these approaches harbored potentially damaging and regressive aspects, by incurring problems related to mis-matches (between the needs of the user and assumptions of the housing agencies), locational displacements, lack of employment resources, break-up of the socio-economic system of the neighbourhood, and above all the centralized control of decision making (17).

Thus, the real problem laid at the grass roots level, in government thinking, hence, fundamental changes were required in the attitudes of policy-makers towards the issue of shelter for the poor. As summarized by the Indian Housing Task Force, these changes included;

> "- A major shift in attitude towards people (Not an unproductive burden but a productive resource)
>
> - A new interpretation of, and approach to, people's self-initiated housing actions and self-

approaches to a solution not a problem. Not to be demolished but to be conserved and improved)
- A new definition of a house (Not necessarily pucca or permanent, status symbol but one that shelters adequately)
- A redefinition of the housing task (Not necessarily permanent buildings but livable environment)
- A new role for the traditional housing agencies (Not doers but facilitators. Not builders but promotors)
- A new relationship between housing agencies and the clients (Not donors and receivers but partners)
- A new economics (Not charity but investment)
- A new definition of scale (Not symbolic gestures but full coverage), and
- For some, a new vision (Not houses alone but overall development)" (18).

It was this shift in attitude, based on realistic concerns, that re-defined slums as "solutions" rather than "problems", both quantitatively as well as qualitatively. Slums had to be seen in terms of what **they do** for the users rather than what **they are** or what they appear to be (19). When viewed in this light they offer solutions from three angles:

1) as an effective housing delivery system; (20)

2) as a user-controlled planning process; (21)

3) and as a culture-responsive design product (22).

The following is a detailed discussion of these view points with reference to the works of scholars from the fields of architecture, planning, and anthropology. This discussion uses various terms for slums, as they appear in the source literature, but, they are basically recognized as **the self-managed unplanned settlements**, for the purpose of this study, and hence forth are referred to as such.

1.20 THE SLUM AS AN EFFECTIVE HOUSING DELIVERY SYSTEM

> "Despite its often spontaneous and improvised character, the informal sector has provided virtually the only delivery vehicle which has had any success in providing appropriate, low cost solutions to the shelter problems of the urban poor" (23).

As Payne claims, in the Third World the mass of the people have always managed to house themselves and are still perfectly capable of doing so. Even in the large urban centres there is not so much a "housing problem" as there are problems of landuse and resource planning (24). The confirmation of this view lies in the fact that, in India, every year over 1.2 million housing units of all kind are added to the housing stock, and only three percent (35,000 dwelling units) of these have been built by institutions to which public funds were made available. The remaining ninety-seven percent have been built through private enterprise and individual initiative (25).

It is not simply the capability of slum housing to meet the large proportion of housing demand that makes it an efficient delivery system. The very essence of most self-generated settlements of the poor is their ability to provide socially acceptable housing through the flexibility and economy of planning frameworks (characterized by high density, mixed land use, variety of plot sizes and above all local control over housing provision) (26).

Turner explains that there are four basic approaches to housing based on who (users or sponsors) makes the housing decisions and who provides the resources (figure no.1). These approaches are:

1) Sponsor decides and sponsor provides
   e.g. Fully built mass housing projects.
2) Sponsor decides and user provides
   e.g. Site and services projects.
3) User decides and user provides
   e.g. Slums and squatter settlements.
4) User decides and sponsor provides
   e.g. Slum upgrading schemes (27).

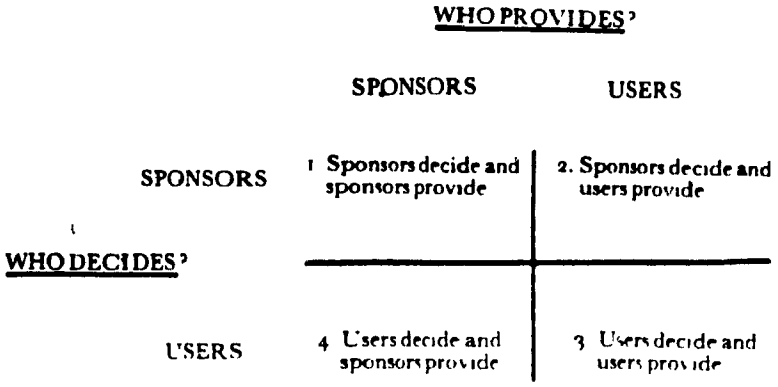


Fig.1 Four approaches to housing (Turner, 1976, p.145)

The first two approaches where the sponsor decides, represent "top-down" mechanisms. In this system decisions are made by someone other than end user based on the assumed needs and arbitrary standards. These decisions are then imposed upon the users. Such centralized decision-making processes often create

mis-matches between the needs of the users and what is provided by the sponsors, and therefore have been largely unsuccessful. Bhatt and Mulkh Raj observed that, "there exists a fundamental conflict between the planning standards with which the formal sector professional operates and the actual scenario by which the average man builds his house" (28).

As illustrated in figure no.2, users may have a different set of priorities than other agencies involved in housing. User's priorities often include location, privacy, space and affordability; while for the public agencies important criteria are often aesthetics, meeting pre-set standards, economic viability based on estimated demands and supplies, or personal ego and popularity. "as long as there is a dissonance between what people require and what planners tend to supply, the formal sector can not cater to the needs of ordinary people" (29).

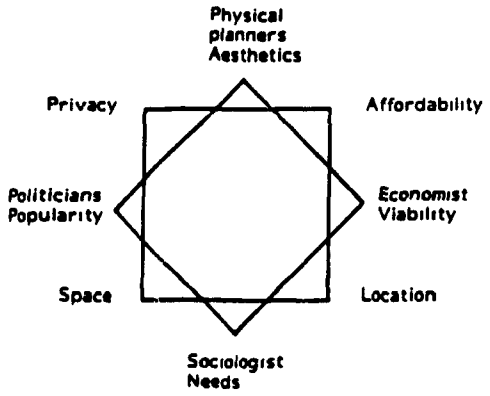


Fig.2 Mismatches between the priorities of the users and related agencies. (Bhatt and Mulkh Raj, 1986, p.45)

The third and fourth approaches, as described by Turner, where decision-making power remains in the hands of users, represent a "bottom-up" system. The demands in such a system come from the bottom - the end user - and the role of public agencies is to respond to these demands. Such approaches have been quite successful in delivering appropriate housing to the poor so far. Housing built by the squatter is much more functional in terms of user's own needs, priorities and the capital investment (30). They provide an infinite variety of opportunities for housing investment to suit every purse (31).

Slum housing is also characterized by incremental growth. Such a step by step construction process helps to meet the fluctuating financing capabilities of the individual. People's needs and priorities for housing also change over time with the family life cycle and changing circumstances of the city life, hence the housing system has to be flexible enough to accommodate these changes. The transformation of dwellings over a period of time, in terms of their space sub-divisions, spatial organization, circulation principles, usage and territories, have also been identified in settlement studies in Mexico (32). Flexibility and openendedness of the housing process appear therefore to be a universal characteristic of slums.

As Payne stated, housing is an expression of a dynamic processes, it is inevitable that the problem to be tackled will change continually (33). Explaining the process of change for the urban poor in his model of habitat mobility, Beninger

defines the phases of transformation. He identifies four diverse situations, which include: Reception (search for a job - transient shelter); Prolonged Reception (getting used to city life); Intermediate (constant income - renting a shelter); and Consolidated (migrant appraises his situation in urban environment) (34). For all these phases, unplanned settlements function as a transient camp, acting as a buffer till city and migrant can absorb/adopt each other. As El Diasty observes, these settlements deal with the rural migrants living in an urban world. Neither village nor city can provide them with an adequate mode of life that would suit their intermediary situation (35).

Thus in summary, unplanned settlements have provided a major proportion of housing by utilizing the user's own resources. They have proven to be affordable and acceptable means of housing. They have provided enough variations in plots and houses to meet the different demands of the inhabitants; have been flexible enough to facilitate the changing needs of a family over a period of time; and have functioned as a transitional camp to receive, condition and accommodate the urban poor through his stages of consolidation in the city.

Thus, slums have proven to be the most effective housing delivery system for the poor. Squatters have demonstrated that they come closer in terms of providing appropriate shelter for the poor, than professionally trained architects, planners and public administrators. By providing their own housing the

inhabitants of slums have not only compensated for the inadequacies of official housing programmes, but have also ensured the "appropriateness" of their housing (36). Housing produced this way is more realistically conceived as "process" than "product", a process in which the user is actively involved from the beginning. The following discussion focuses on the slum housing process.

1.30 THE SLUM AS A USER CONTROLLED PROCESS

> "A dwelling is not a thing that can be designed or made. A dwelling is a result. The result of a housing process. The last act in this process is that of the occupant who goes to live there. The act of living there is the only act which makes a dwelling of something.... A dwelling is an act" (37).

Housing is a "verb" rather than a "noun". If housing is treated as a verbal entity, as a means to human ends, as an activity rather than a packaged product, then power to decide and demand their needs, must remain in the hands of the users themselves (38). Housing action depends on the actor's will and in an economy of scarcity the principal actors are people themselves (39). According to Fathy:

> "man is an active creature, a source of action and initiative, and you no more have to build him a house than you have to build nests for the birds of the air. Give him half a chance and a man will solve his part of the housing problem - without the help of architects, contractors, or planners - far better than any government authority ever can" (40).

Families have the best perception of their own shelter needs and their willingness and ability to pay for these (41). Therefore, users must be free to make decisions which concern them the most. Only when dwellers control the major decisions and participate freely in the process of their house design, construction, and management, will the environment produced stimulate individual and social well being (42). Geddes recognized this early in this century. He believed in learning from the local people's achievements rather than imposing arbitrary standards. Therefore, he always insisted on undertaking detailed social and environmental surveys of the area before preparing plans for improvements. Geddes understood the distinction between visual and social order, hence, rather than advocating wholesale demolition and rebuilding, he devised a new strategy called "conservative surgery". This planning strategy was aimed at removing only the worst excesses of the local environment and replacing these with community facilities and services. This helped retain the existing community and its environment, and provided incentive for improvement (43).

When people have neither control over, nor the responsibility for, the key decisions in the housing process then it becomes a barrier to personal fulfillment and a burden on the economy (44). "In general it is far better that people should act outside the law than not act at all", says Turner (45), echoing Geddes' concern that "for fulfillment there must be a resorption of government into the body of the community. How?

By cultivating the habit of direct action instead of waiting upon representative agencies" (46).

Turner adds that even if one assumes that centralized decision and control systems (where people have no active role to play) were able to supply well matched housing services to the majority of people, people's tolerance would shrink - a phenomenon he calls the "Gift horse" syndrome. People's demands will increase and hence will never provide the satisfaction that one gets from having made a decision or having done something for one's self, no matter however imperfect (47). An Argentinian squatter's statement at the time of forced demolition of his self-built shack effectively explains this feeling. He said "it is not the discomfort of the physical situation that the people of the villas feel most bitterly - it is the humiliation of being denied the opportunity of doing for themselves what they are quite able to do" (48).

As Rapoport observes,

> "There is strong evidence that environments which are chosen are inherently supportive, and therefore responsive as against the identical environments which are imposed upon. The fact of having been chosen may be as important as what is chosen. But if one studies choice itself, one finds it also to be highly variable: culture specificity continues to operate" (49).

All these view points indicate that we need to be looking for a model that perceives housing as an activity, and in which the users are the principal actors as a matter of economic,

social and psychological common sense (50). The slum housing represents such a model. This informal sector and its households, are the dominant actors in the processes governing the production and maintenance of new housing, in the economics of scarcity, due to their capabilities for organized action on a large scale (51). As Habraken said,

> "People build with shared images, which allows them to connect to a larger structure to make a lot of decisions without controversy, as they are understood by their neighbours. This proves a very effective mechanism as it has the potential for making many buildings with many people in a very short time without any overt co-ordination" (52).

Thus to summarize, slum housing is essentially the network of independent operators - a dynamic process involving individual users - which as a result, provides the requisite variety of the "controlling system" so that locally and personally specific demands are more easily met (53). As Olivegren observed,

> "what people build is a reflection of themselves and their own particular existential situation. If the members of the household are allowed to influence the design of their home, its administration and maintenance, they become, so to speak, their own masters. In this way the physical environment becomes increasingly a real part of its inhabitants' lives, a true reflection of them, and a focal point of their existence" (54).

The following discussion looks in detail at how these individual values are reflected in unplanned or "slum" settlements.

1.40 THE SLUM AS A CULTURE RESPONSIVE DESIGN PRODUCT

> "Traditionally built form has responded effectively to culture- for example, in preliterate and vernacular contexts. Such environments communicated effectively and fully to users, whereas currently there is a concern that environments do not respond and do not communicate effectively. One can still observe effective communication in certain traditional settings, spontaneous ("squatter") settlements and, to a degree, in popular environments" (55).

Form is difficult to understand outside the context of its setting, culture and way of life it shelters. The worth of a physical product can not be assumed to lie in its physical qualities but rather in the relationships between the object and the user (56). Similarly, the utility of a house cannot be equated with the material standards of goods and services insofar as they are ascribed a "market value" and these market values are very distinct from "use values" (57). Self-built houses are analogous to any hand-made artifact and that is why, through their oddities and irregularities, they express mood, identity, and the decision-making process of the craftsman. These artifacts are the result of the constant living interaction of the man with his material (58).

> "Any artifact, whether pot or environment, is the result of a series of choices among various alternatives. Man-made environments are designed in the same sense as they embody human decisions, choices and specific ways of resolving the many conflicts implicit in all decision-making," Deetz (59).

As Fathy said, "houseform is a visible symbol of a family's identity" (60). A house is a human fact. Housing is not simply a shelter but is a part of the fabric of neighbourhood life and the whole social milieu (61). A house is not only the result of physical forces or any single factor but is the consequence of the whole range of socio-cultural factors seen in the broadest terms. Rapoport regards a house as the result of the interaction between Man and Nature (man in terms of his nature, attitudes, personality, aspirations, fashion, social organization, world view, way of life, socio-physiological needs, economic resources, and nature in terms of site, location, landscape, climate, structural laws) (62). People act differently in different settings. People make their behaviour congruent with the norms of behaviour appropriate to the setting as defined by the culture (63).

The study of vernacular houses and spontaneous settlements support this view. For instance, through the study of Indian rural dwellings Patel suggests that a dwelling is a social context. Parts of a dwelling assume a social meaning according to the character, needs and use of such components. Using the example of the kitchen, he says that location of the kitchen, the way in which it is used, and the religious overtones attached to it, all give meaning to the image formulation of a kitchen, which may be totally different from the perception and design criteria of a professional designer (64). In another study of slums from Ahmedabad, India (65), it was found that the spatial organization of the settlement was

determined mainly by socio-cultural factors such as customs of the place people come from, their traditions, nature of occupation, myths and the beliefs of the inhabitants, their notions of privacy, and the religion they practiced - in short, the way of life of the people in the settlements (66). As Mellin quotes Bhargava,

> "...slums exhibit a vigourous and vibrant culture of their own life pattern that bubbles with warmth and intimate contact. Love and scandals, factions and fights, festivals and functions are all there, touched with colour and imagination. Even in the worst slums of India... the human spirit abides" (67).

Thus in summary, slum houses embody the values of the users. In these unplanned settlements, despite constraints of a physical nature, people have built in many diverse ways which can only be attributed to choices involving cultural values (68). Squatter settlements express culture and the latent symbolic aspects of social identity and people's activities; they allow culturally valid clustering, locating people in physical and social space; they accommodate appropriate priorities in resource allocation; promote mutual help; and help mitigate stress in migrant's stages of transition, in urban life while protecting their cultures. These settlements are open-ended, allowing for upgrading and change, and adaptable because of their flexibility, variety, and cultural appropriateness, hence, preferable to designed areas (69).

This calls for the design to become more culturally

responsive. In order to do this, there needs to be a re-evaluation of prevailing housing theories, the design process and the role of the design professional. Thus, emphasis shifts to understanding, clarifying and defining the problem, before attempting to solve it (70).

The built environment provides cues for behaviour and, therefore, can be seen as a form of non-verbal communication. Using the distinction between fixed feature space (walls), semi-fixed feature space (furniture) and non-fixed gestures (people) it is possible to fit them all in a single model (71).

> "The 'language' must be understood. If the design of the environment is seen as a process of encoding information, then the users can be seen as decoding it. If the code is not shared, not understood or inappropriate, the environment does not communicate" (72).

In this regard it is essential to understand the link between culture and the built environment. One can begin to understand this link by observing how people shape their environment and what characteristics of people (as individuals or groups) are relevant in shaping of those (73).

Anthropologists and architects have long attempted to link physical form with the life patterns of the occupants, but such attempts have been confined mostly to the study of tribal or vernacular settlements. Most of the studies of slums have been at the macro scale and urban level only. Slums have

usually been evaluated in terms of their densities, landuse efficiency and cost-benefit ratios. Comparatively little effort has been made to understand them in terms of people, place and time.

The present thesis, investigates the order that exists in unplanned settlements. It aims to understand the slum dwellings from the point of view of dwellers, in terms of what they do and mean to the user. The focus of the study is on houseform variations, and the user's influence on them. The following chapter describes in detail the research method used for the purpose of this study, outlining how the data was collected, transformed, organized and analyzed.

2.00 THE RESEARCH METHOD

2.10 COLLECTION OF THE DATA

Ethnographic surveys (commonly used by anthropologists) involve the active participation of the researcher. The data usually comprises a series of observations made while living with and closely watching the "subjects". Such a method of survey appears well suited to the slums, as it helps to gain the confidence of the respondents, resulting in more accurate data. Conventional methods such as formal survey sheets based on interviews and printed pre-set questionnaires, fall short in this regard.

During a seven week visit to Shilnath Camp in January 1987, the base data for this study was collected, using ethnographic methods of survey, by Richard Brook; who is a Masters student at the Centre of Minimum Cost Housing, McGill University. Brook conducted informal conversations with various families to determine family history; family make-up; number, age, and sex distribution of the house occupants; their occupation and sources of income; the level of education of various members; their ties with their places of origin; and their duration of stay in this settlement. He also took pictures of the houses and prepared measured drawings indicating: the room lay-out, furnishings, building material, and the physical condition of each house.

The raw data was collected by Brook as a part of studies undertaken at the Centre for Minimum Cost Housing. Data had potential of generating more than one thesis. Information pertaining to the family (income, occupation, kinship, education, origin) is being used by Brook for his study (under way) of the relationship between family characteristics and plot sizes, while the observations on house lay-outs and their usage form the basis of this thesis. It is important to mention here that although Brook's data constitutes a "secondary source", the information has considerable validity (compared to usual survey sheets), because, any doubts while interpreting the data was clarified there and then through consultation with Brook, as he was always available. In addition the Author's familiarity with the city of Indore, its housing conditions, other Indian slums, people and culture also helped in visualising and interpreting the scenarios described.

The method of zone sampling was used for selecting the fifty-two house samples from the settlement. This means that the settlement was divided into various zones (four zones) based on the physical conditions of the site and samples were chosen arbitrarily from each zone while walking through the site. Samples chosen are scattered throughout the settlement, as illustrated in figure 3.

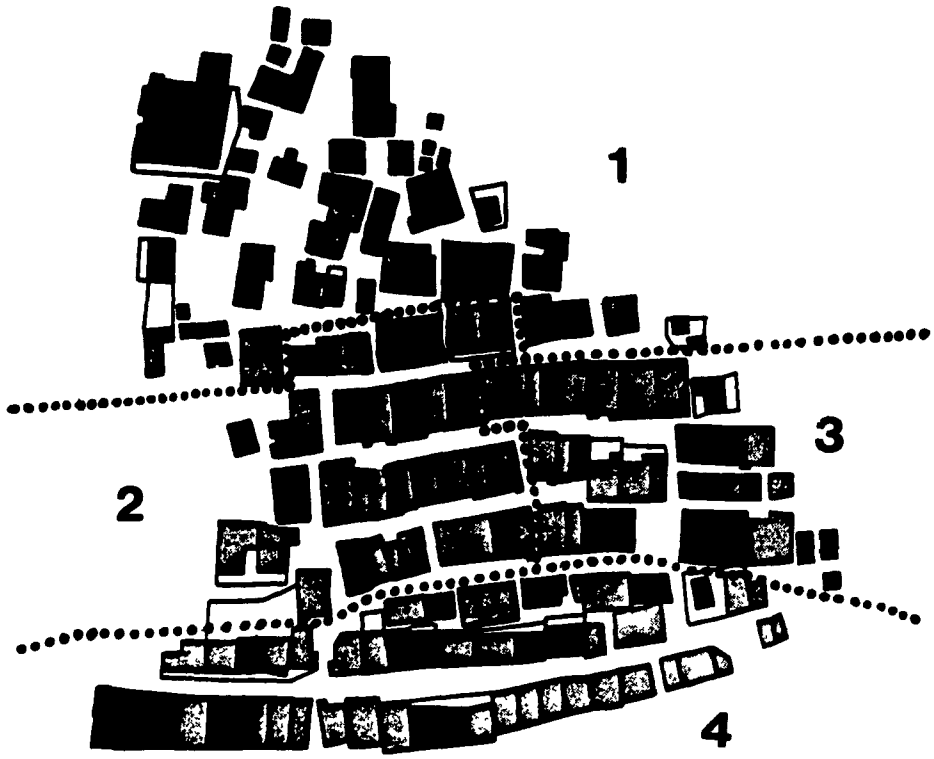


Fig.3 The lay-out of Shilnath Camp indicating the house samples surveyed. (After Rybczynski et al., 1986, p.19)

A sample size of greater than thirty is considered to be a "large sample" for statistical purposes (74). The fifty-two samples in this study, correspond to nearly fifteen percent of the households registered by a recent government survey of the settlement and as such represent a significantly representative housing sample. While selecting the samples willingness of the occupant to respond became a critical factor, implications of which are discussed later in this chapter in "limitations of the data". The way in which the data was transformed from the diary sketches to scaled/rendered drawings is now described in more detail.

2.20 TRANSFORMATION OF THE DATA

2.21 Stage 1: House plans sketched on-site (by Brook)

In addition to taking notes on each family's history, Brook made sketch plans of each house (see figure 4). These measured drawings documented the following: general lay-out of the dwelling indicating the measurements of each room, wall heights, location of openings, and the materials employed in the construction of the major building components.

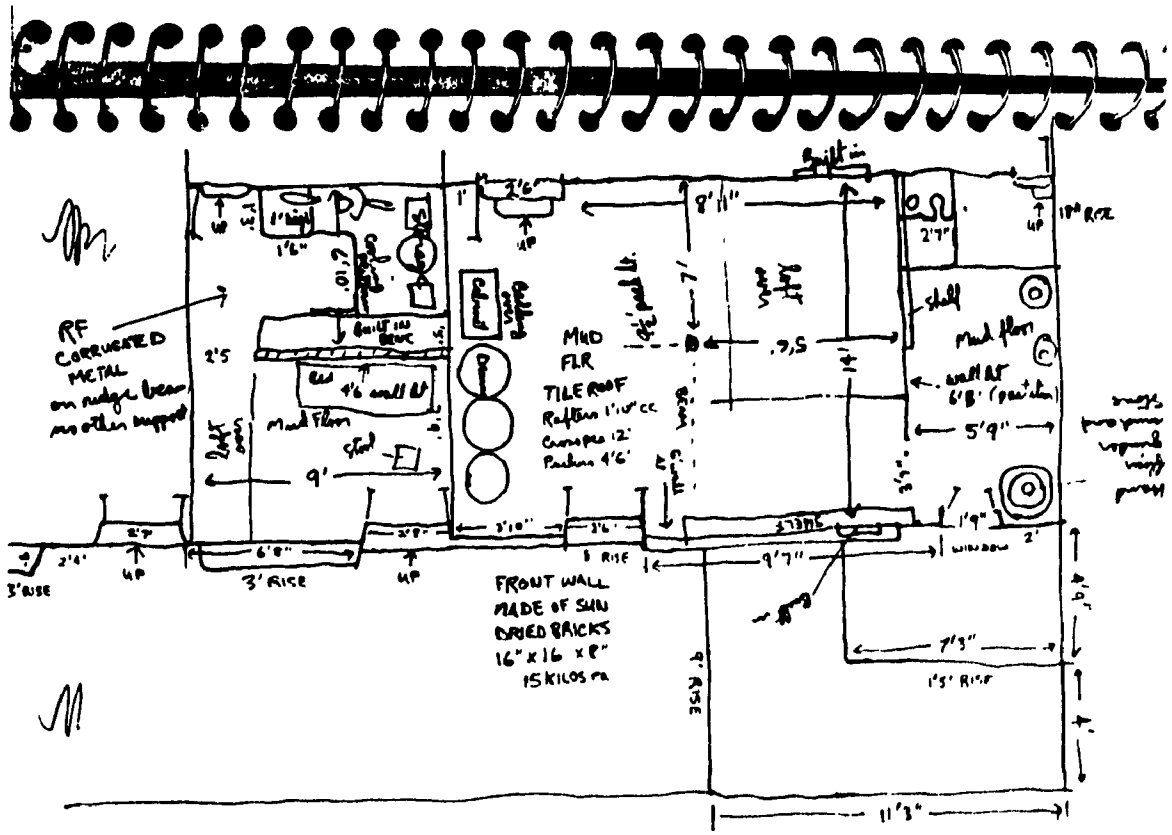


Fig.4 An illustration of house plan, sketched on-site, by Brook.

2.22 Stage 2: Plans drawn to scale (by Brook)

These sketches from Brook's diary had to be translated into scaled drawings. This helped bring about a sense of the actual proportions of spaces and building components. Since this exercise of drawing the on-site sketches to scale was done by the surveyor himself (Brook), the chances of mis-interpreting the survey drawing information were reduced to a minimum. These scaled drawings are of house plans indicating furniture, wall heights, building materials, and level changes. See figure no 5.

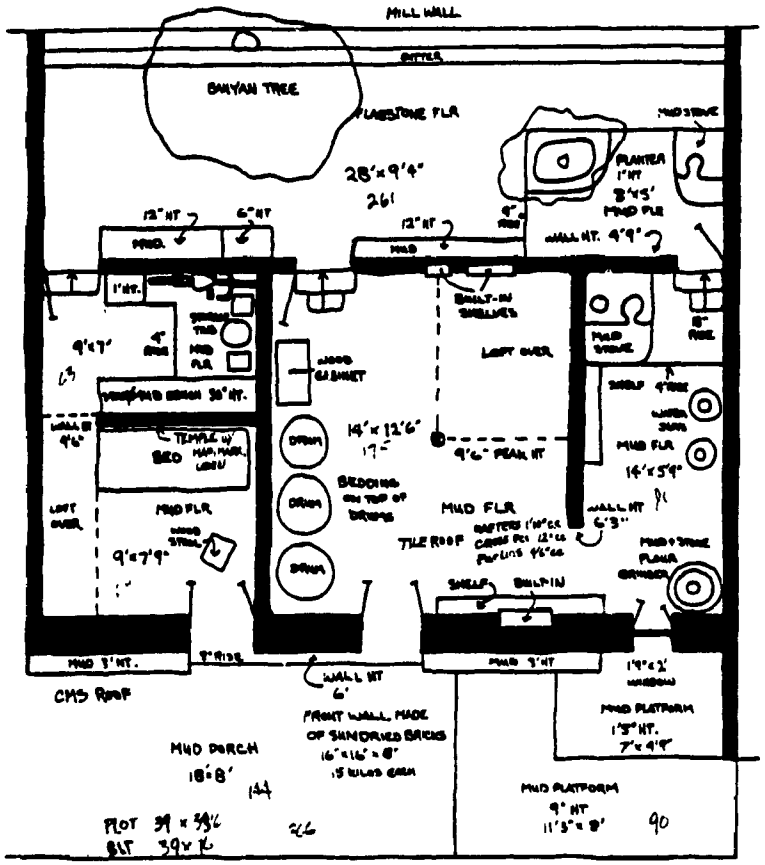


Fig.5 Example of a plan drawn to scale by Brook.

Although these drafted plans and family histories contained much important information, the author felt it necessary, to combine this information in a single visual format to help convey the maximum possible information about the house, the family, and the activities. These pictorial representations help understand house situations better in their contexts of users and spaces. Information seen out of context, can be misleading. For example, furniture labeled as a table or a bench may be understood as a working or a sitting surface but in reality most often they are used only as storage shelves. Similarly, while comparing house plans, a room in one house may appear larger than a corresponding room in another house simply on the basis of dimensions. However, once the number of occupants of each house is shown, the relative sizes of the two rooms may reverse. Moreover, a space that appears relatively large may suddenly seem uncomfortably small once the ceiling height is shown. Therefore, it was decided to re-draw the plans using standard scale with as much visual information as possible to it.

2.23 Stage 3: House sections added and drawings rendered (By Author)

Using the photographs and documented wall heights, in consultation with Brook, house sections were drawn for the first time, to give plans a sense of volume. These plans and sections were then rendered to indicate detailed furnishings, their use with respect to various household activities, the

number and sex division of the people occupying the house, and pictorial representations of important activities in the way they are performed. See figure no. 6.

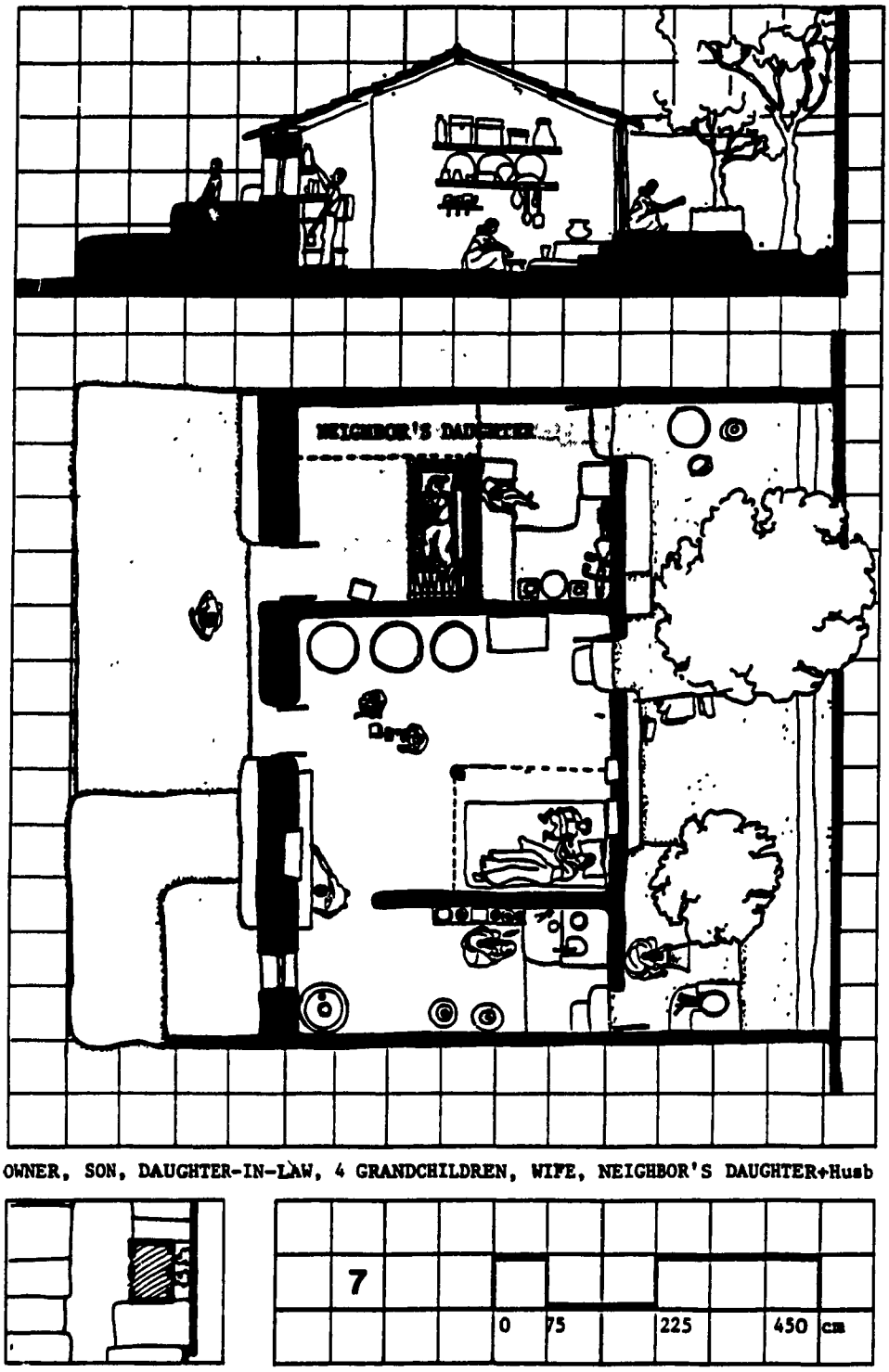


Fig.6 Example of a rendered plan and section by the author.

The grid used in the background of all the drawings provides a ready visual reference to the size, while all drawings drawn at the same scale make them comparable to each other. The small location plan situates each house in the context of adjoining houses and streets.

Care has been taken to represent the exact number of people, their sex and representative activities performed by them, in the rendered drawings, but, the medium of two dimensional drawing is not without limitations in terms of how much information it can convey. It is also important to mention that this redrawing and rendering stage proved extremely helpful in improving the author's familiarity with, and understanding of, the houses and the families.

2.30 LIMITS OF THE DATA

After looking at the data and transforming it into a new set of drawings, the restrictions of the study become apparent, which in turn sets the scope and limits of the analysis.

- Considering the representativeness of the samples collected, it would be improper to extrapolate the observations made here as conclusive statements about the phenomenon of slums as a whole. This thesis is therefore **not** designed to provide any formula for a repetitive or predictive model, but rather it is intended to convey a better understanding of the situation by using case studies. The observations are simply compared with current attitudes and practices in the field of low-income

housing.

- Furnishings were documented as they existed at the time of the survey. These furnishings were the sole indicator of the activities taking place in the houses. As a result, activities which do not require permanent furnishing (i.e. eating, chatting with neighbours) and activities which were occasional (i.e. day time leisure, outdoor sleeping or festivities) have not been documented in the house plans. Such activities, therefore, are not included in the detailed analysis. However, to illustrate the space use, they have been described on the basis of some case studies which explain and demonstrate how these activities are performed.

2.40 ANALYSIS OF THE DATA

In order to find out if daily activities and household composition influence houseform, it is necessary to identify and understand the physical characteristics of a house; the kind of activities performed in the house; and the makeup of the families who live there. To do this, three typical family scenarios, from three different household types, are described, indicating the organization of the houses they live in, and the way their daily activities are performed in and accommodated by their houses. This helps to identify relevant attributes of houseform, household, and activities, so that their interrelations can be examined. The data is then analyzed in two stages.

The first stage consists of forming a catalogue which documents and describes all the variations of houseform, family, and activities as observed in the fifty-two samples. These variations are identified through structured categorization of each type. Houseform is classified into various categories including house type, extent, spaces, organization and access. Family structure is catagorised according to kinship relations, and daily activities are classified in terms of their domestic, commercial, or religious nature. This part of the analysis is purely qualitative and without any reference to the frequency of their occurrence.

Having classified all the variations in the first stage, the second stage deals with this data quantitatively. One by one, each of the attributes of houseform are compared with various family structures and the daily activities respectively. With the help of cross tabulation and a correlation matrix, relationships between various attributes are examined. For every cross-tabulation, Chi-square values and probability figures are obtained through SAS (Statistical Analysis System), in order to verify the statistical validity of the data obtained.

It is necessary to reiterate here that the purpose of this exercise is **not** to establish any statistical model or predictive formula (because it would be incorrect to do so considering the limitations of the data), therefore quantitative analysis is done only to indicate the relative

strengths of the relationships between various attributes. The qualitative inferences are stressed rather than quantitative observations. A hypothesis, about the interrelationship between houseform and household structure, is formed on the basis of these qualitative inferences, and this hypothesis is used to pose questions concerning current housing practices and policies, and further investigations.

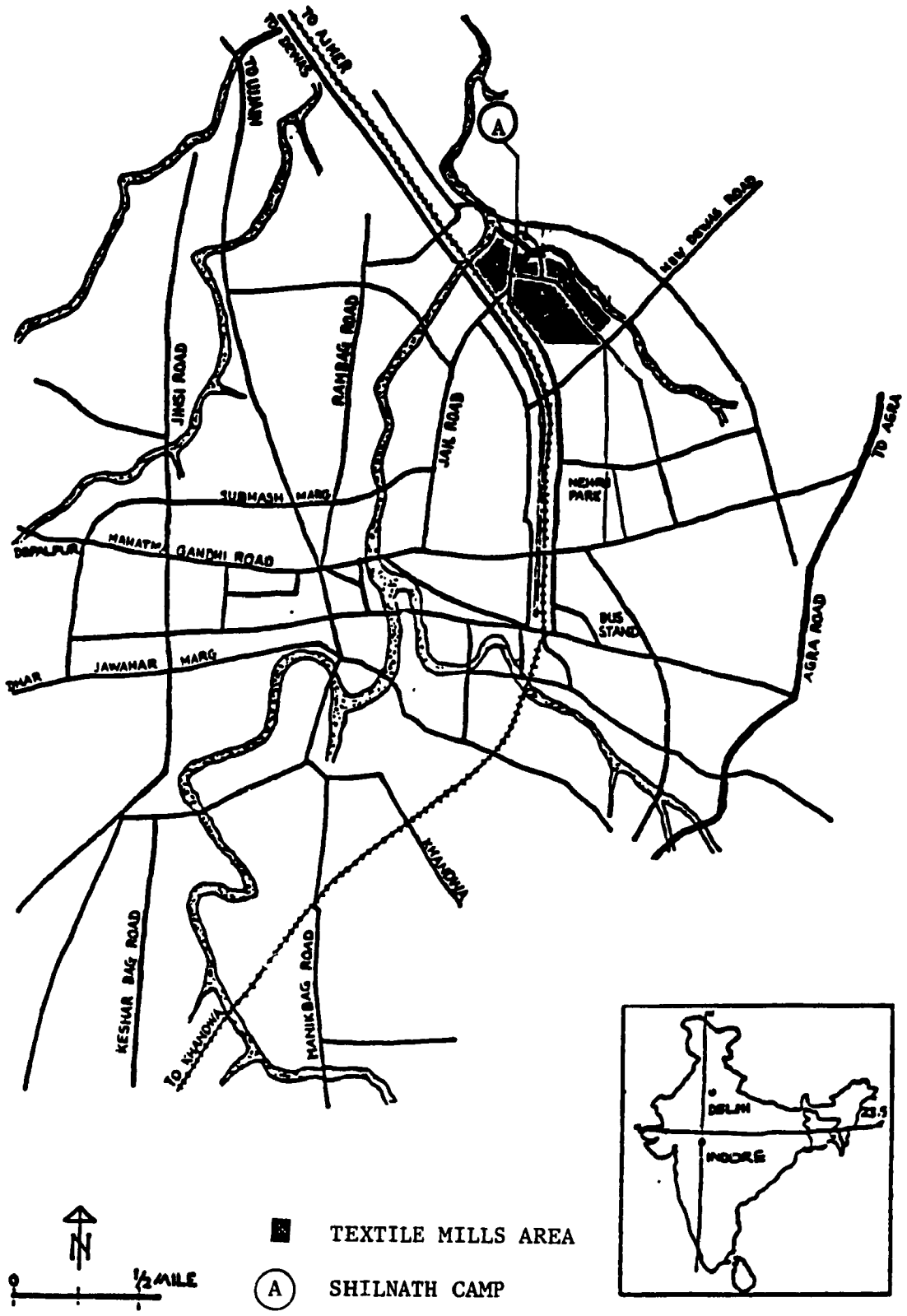
The following chapter gives a general picture of Shilnath Camp before presenting the fifty-two specific samples for detailed analysis.

3.00 SHILNATH CAMP: an overview

3.10 SITE - LOCATION, ORIGIN, AND DEMOGRAPHIC CHARACTERISTICS

Indore is a growing industrial and trading centre in the central province of India. It is known for its cloth, chemical, medicine and beedi (Indian cigarette) industries. These industries have induced large scale migration from rural areas as well as neighbouring provinces. Indore, which had a population of 561,000 in 1971, is now inhabited by over a million people, having experienced a growth rate of 47.4% during the period from 1971-81. Housing demand also increased with the growing population, which neither the existing housing stock nor municipal or state housing authorities could cope with. Housing production by the public and private agencies, from 1971-81 was about 25,000 units, while the demand swelled to over 50,000 new dwellings (75). As a result, like most other urban centre in India, several large pockets of slums, with densely packed houses and people, emerged in the city of Indore. Shilnath Camp, on the northern edge of the city adjoining the textile mills and agro-based industries, represents such a development.

Four decades ago the land where Shilnath Camp is located was used for farming, having only five to six huts on it. At that time the local government asked the owner Brij Bihari (case no. 37) to remove the huts. Failing to do so his leasehold



Source: Rybczynski et.al. p.8

Fig.7 City of Indore and the location of Shilnath Camp.

right over the land was revoked by the government. Ignoring this government decision, his son in 1947, subdivided the land into the plots of 6.0 m X 9.0 m (20 ft. X 30 ft.) along the four intermediate streets. Since then the settlement has continued to grow as the result of immigrants from neighbouring provinces. There was a major influx of people in 1960-61 and another in 1971. Today practically all the usable vacant land has been filled up and built upon. With no land left to build, people have started filling up an adjoining naala (small branch of a river) to develop new plots. Bigger plots are being continually sub-divided, reorganized and sublet to reflect changing occupancy. Now, there are over 150 plots with more than 750 households. Shilnath camp has a population of over 1,700 people with an area of 1.43 hectares, at a density of 1,200 people per hectare (76).

In 1985, under the new government policy, households in Shilnath Camp were issued patta (a lease hold right), despite prevailing government density and house construction standards which categorized the settlement as a slum. Under the Environmental Improvement of Slums policy, Shilnath camp, over a period of several years, was provided with common stand pipes, community toilets, and wash areas. These services are now being upgraded by the local government authorities. The settlement now also has street paving and storm water drain.

Despite its poor physical condition, Shilnath Camp offers a lively environment, with low-rise buildings, public squares at the human scale, varying street widths with domestic and

commercial activities spilling over, and a wide variety of houseforms.

3.20 PEOPLE

A large proportion of people living in Shilnath Camp have migrated to Indore from the neighbouring provinces as well as other parts of the country. For this reason the Camp is a heterogeneous community in terms of caste and ethnic background. Shilnath Camp, contains both nuclear and extended families. Many houses are atleast partially rented. Nearly half of the plots are occupied by more than one family, either related or non-related (77).

Family income in Shilnath camp varies from less than Rs.400/- (Can.$ 40) per month to more than Rs.1,800/- (Can.$ 180) per month. With an average of about Rs.450/- (Can.$45) per month per family, Shilnath Camp is comparatively wealthier than its counter parts in the city (78). Neighbouring industries are the major sources of employment, providing permanent and temporary jobs. Besides working in industries, other local occupations include government jobs, unskilled labour, contract or piece- work jobs in sewing, thread braiding, rolling of beedis, rolling of agarbattis (incenced sticks used mainly for worship), and running shops in the neighbourhood. Women do mainly piece-work jobs at home.

3.30 HOUSES

House plots in Shilnath Camp range from as small as 6 sq.m, to as large as 201.25 sq.m, with an overall average of 50.59 sq.m of an area (79). Both plots and houses are usually rectangular and attached to each other by the sides. With very few exceptions, the houses are one storey high, with lean-to or a gabled type sloping roofs, which are no taller than 5.0 m. They are usually built over a plinth which raises the house by 30 to 50 cm above the street level, although there are some cases where the floor is lower than the street level. In such cases raised platforms or thresholds are used to prevent the water from entering.

Houses are built mainly out of second-hand and recycled materials. Floors are of rammed earth with cow dung plaster and are often later upgraded with stone slabs, mosaic tiles or cement plaster. Walls are constructed out of mud, bricks (plastered and un-plastered), wooden planks, bamboo with mud or burlap, and even cardboard sheets. These walls are often white washed and painted with decorative patterns and motifs. Openings are either in the form of punctures in the masonry, or concrete jaali (grill), or even wooden shutters. The roofs are made out of galvanized iron sheets, flattened tar drum sheets, asbestos sheets, or clay tiles. Apart from providing shelter, the roof is often used as a storage surface where firewood or scrap materials are kept. The roof also gets used for drying wood, clothes and food, as well as for occasional sleeping.

Houses generally extend into the street. These house extensions range from simple steps, stoops, to small platforms, or even porches and verandas (80). They accommodate various activities and the varying space requirements of different families. In addition they provide pleasant house-fronts, livelier street space and a socially meaningful environment.

This can be better understood with the help of a few actual case studies. Three family scenarios, one each from nuclear, extended and non-related families, are described below.

3.40 FAMILY SCENARIOS

3.41 **Family 1: Supdu Shankar** House No.21 (Appendix-A, Page 141)

Supdu Shankar Choudhary, aged forty eight, migrated to Indore in 1954, from the neighbouring province of Maharashtra. In 1972, he moved to Shilnath Camp where he bought a plot and a dilapidated house. He planned the house layout himself and built it (roof and plinth) with the help of a carpenter.

Supdu Shankar lives in a nuclear family of five persons, which includes himself, his wife, two sons and a daughter. His eldest son, who is eighteen years old, left studies after eighth standard and is now looking for work. Supdu Shankar is the only wage earner in the family. He works in a mill located just ten minute walking distance from his house. He earns

nearly Rs.1,000/- (Can.$ 100) per month.

The family lives in a three room, single storey house with mud walls and a corrugated metal sheet roof. The house is situated between two streets, hence it gets double exposure. The plot on which Supdu Shankar lives was rectangular in shape, and shared by his brother's family and his mother. After their mother's death, the two brothers decided to separate, hence the plot and house were divided into two identical, interlocking, "L" shaped units. (figure no. 8)

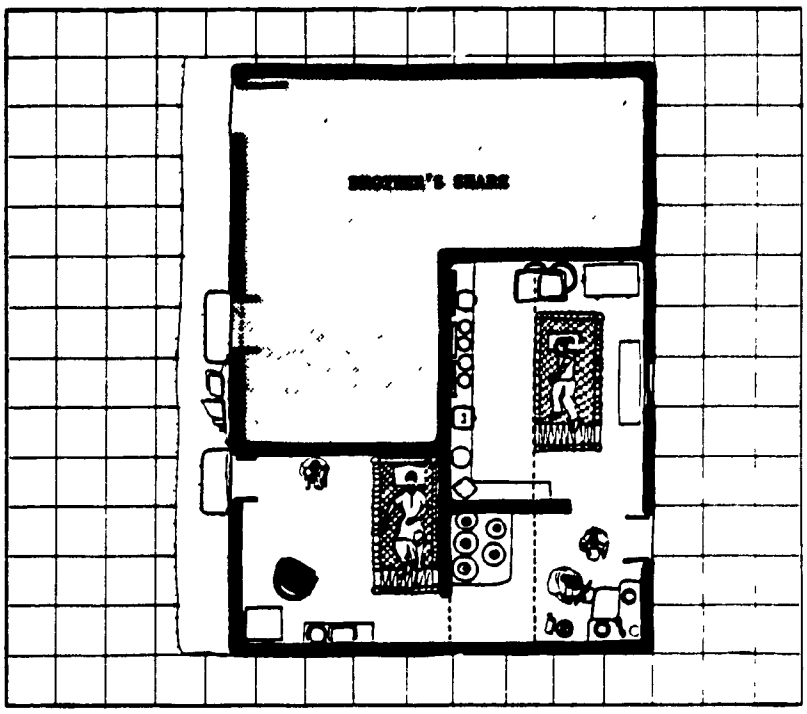


Fig.8 Plot divided into two identical "L" shaped units btn.two brothers.

Since his house fronts on two streets (at the front as well as at the back), he has taken advantage by providing two accesses to the house. One access is through the kitchen while the other through a living area, which leaves the sleeping area more or less separate from general circulation. The arrangement of rooms within the house is sequential, in a row one after the other. This form of internal circulation requires passing through one room to reach another. Being a nuclear family this hierarchical order of rooms does not pose any problem. On the other hand an additional access makes it possible to open a shop (which he intends to do in the future), or sublet it if needed. He also intends to build another storey, initially for renting purposes and later to divide the house between his two sons.

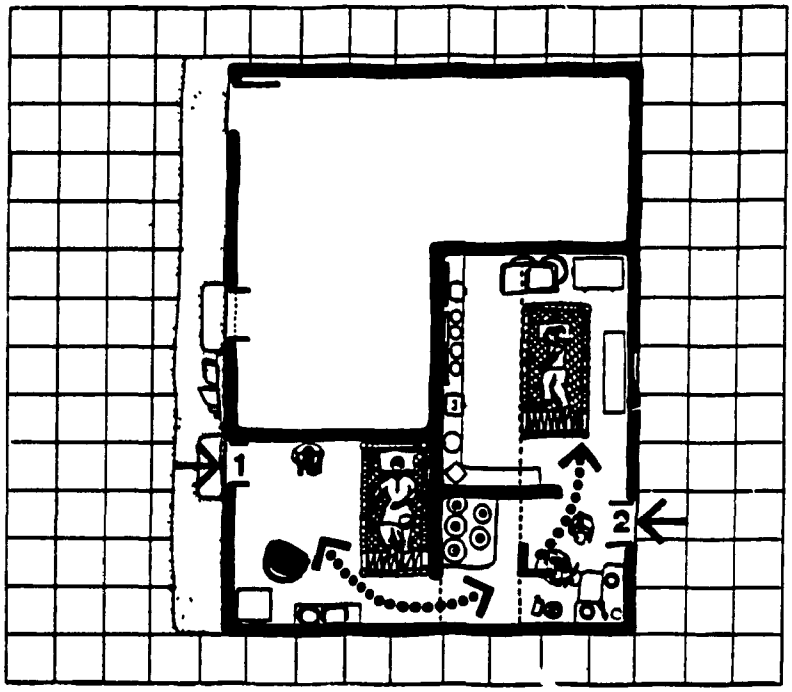
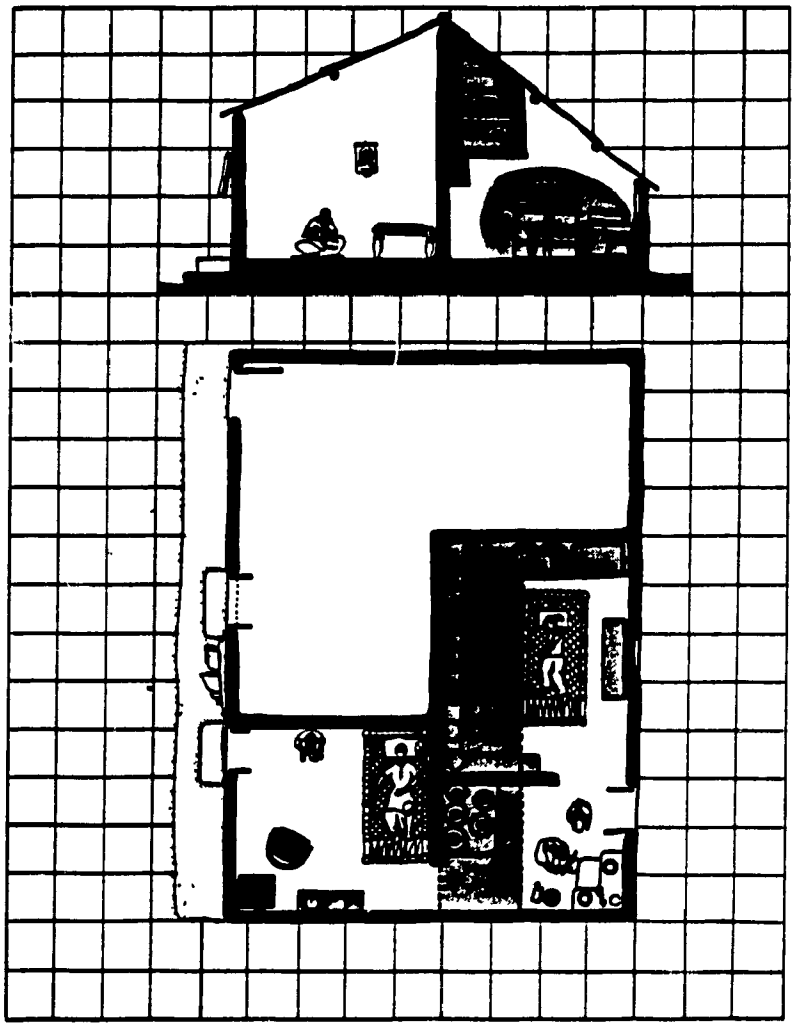


Fig.9 Access and Circulation pattern in Supdu Shankar's house.

At present, Shankar and his wife sleep in the room at the back while the children sleep in the other. Cooking, which is done while seated, takes place in a central area in a corner over a mud stove. There is large loft over two rooms which makes efficient use of the roof space for storage purposes. In addition, there are two shelves in two rooms and trunk and a tar drum also for the storage of domestic goods in a daily use.



ACTIVITIES:

Cooking
Storage

Fig.10 Activities and use of space in Shankar's house.

3.42 Family 2: Jagadish House no.7 (Appendix-A, page no.122)

Jagdish's grandfather lived in a settlement nearby, but in 1945, his father built a house in Shilnath Camp. Since then (two generation), Jagdish's family has been living in and upgrading this house.

Jagdish, aged thirty six, lives with his parents, wife, and four young children, consisting of two sons and two daughters. Thus it is an extended family made up of eight persons in all. Jagdish operates sewing machine and earns about Rs.700/- (Can.$ 70) per month. Other family members, especially his wife and mother, roll agarbatti and contribute up to Rs.100/- (Can.$ 10) per month. This is the total income that the family receives. His father has retired from work, and two of the four children go to school.

The house is a single storey mud building with a gabled roof, situated on the corner of a street and a small lane. It has two accesses, both toward the same edge of the house that faces the major street. The house is large and is subdivided into five rooms. It consists of only enclosed room spaces and no other open or semi-open spaces.

Jagdish's house is wider than deeper with respect to the major street. This makes it possible to have an additional access to the house from the street rather than a lane. This is an extended family, and functions as one large family insofar as circulation amongst the rooms of the house is sequential. Except for external circulation between two accesses, the

house has internal circulation amongst the rooms and they are sequentially arranged.

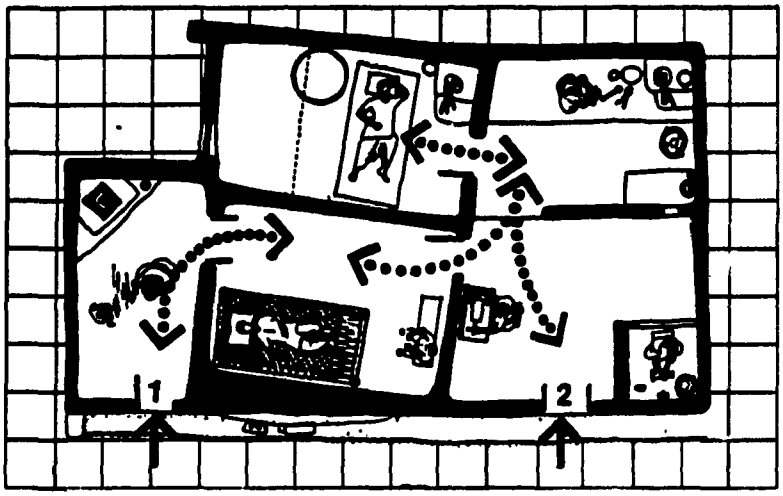


Fig.11 Access and Circulation pattern in Jagdish's house.

The innermost room in this hierarchy, and the oldest portion of the house (unchanged from the original house) is used by Jagish's father, the married couple uses the other room on the street side for sleeping, while the children and remaining members of the family use the other rooms for the same. The house has two work areas, one for sewing and the other for rolling agarbattis. Both of these areas correspond with two street accesses in order to gain the greatest exposure to the passers by. This arrangement also limits the entry of outsiders (clients) to the outermost room only, thus ensuring privacy within the living areas.

The family has built a small wash area used for cleaning clothes and utensils as well as for bathing purposes. The 1.2 meter high dwarf wall on the door side provides privacy from

the outside. The wash area is located in the front room along the street edge, so as to be able to hook up to water and drain services from the municipal network. The cooking area is in the rear due to the family's desire for privacy while cooking and eating. These activities are done while sitting on the floor, but the floor near the mud stove is raised a little to demarcate the space for this function. An elaborate shrine built over a raised platform in the other front room indicates the religious nature of the family. This location in front also makes it accessible to other people. Considering the sacred nature of religious activity, this room also gets used for rolling agarbattis rather than sewing clothes. The loft over at the rear makes good use of the gabled upper space and provides secure space for additional household goods. The tar-drum, kept in the inner room, is used for the daily storage of mattresses.

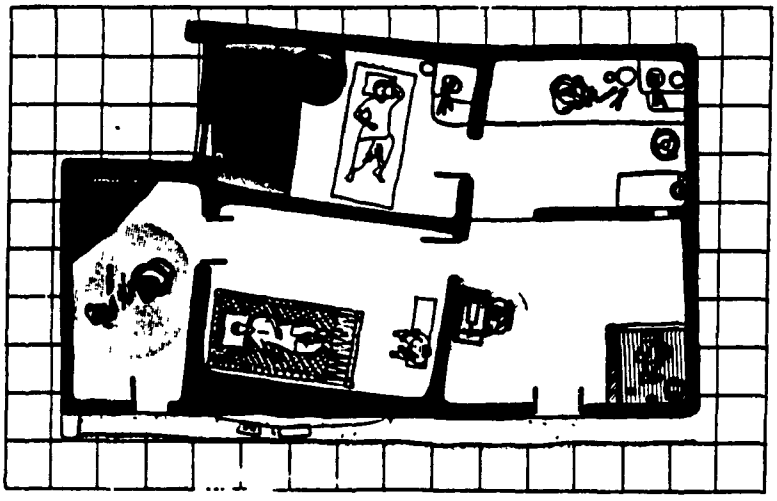


Fig.12 Activities and space usage in Jagdish's house.

3.43 Family 3: Bhogilal House no.22 (Appendix-A, page no.142)

Bhogilal, originally also from Indore, has been living in Shilnath Camp for sixteen years. He had purchased an empty plot on which he first built a provisional house. Nearly five years ago he improved the physical condition of the house and made it stronger. A year ago he added a second floor consisting of three rooms and the terrace.

The house is occupied by fourteen people in all. It consists of multi-households of the composite family type. This group is comprised of Bhogilal's extended family and a renter's nuclear family. Bhogilal, aged sixty, is the head of a family of thirteen people. His family is made up of his wife, four sons (three of whom are married), three daughters-in-law, two daughters and three grandchildren. There is a renter too.

Three married sons work in the mill close by and all together manage to earn Rs.1,000/- (Can.$100) per month (as revealed by the family). The fourth son is handicapped, and, does not work. The women manage to contribute about Rs.60/- (Can.$6) monthly, by rolling agarbattis in the afternoon. This activity is carried out inside the house. The family presently earns enough and needs more space, and is therefore trying to evict the tenant. The matter is in court for litigation.

The house is a two storey building, on a plot which has three sides exposed to the street. The house consists of three large rooms on the first floor and three smaller rooms on the second floor. In addition to enclosed rooms it also has an open

terrace on the second floor.

At present Bhogilal's family lives on the first floor, while the renter lives above. This separation by level maintains the privacy and independence of the two different non-related families. After the tenant leaves, the second floor is to be used by three married sons, while the handicapped son and parents will continue to live on the first floor. This strategy is also reflected in the house plan.

The house has five accesses which all open on to the same street. The first floor has two accesses, one for the son and work area, and the other for the family. The second floor has three accesses for each of the three families (married sons). See figure 13.

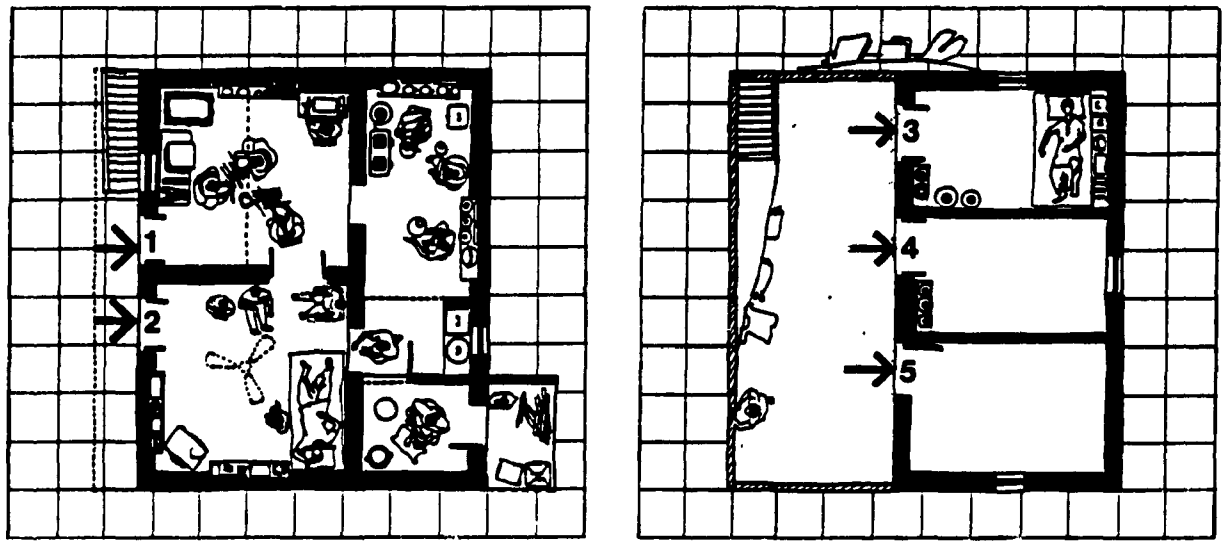
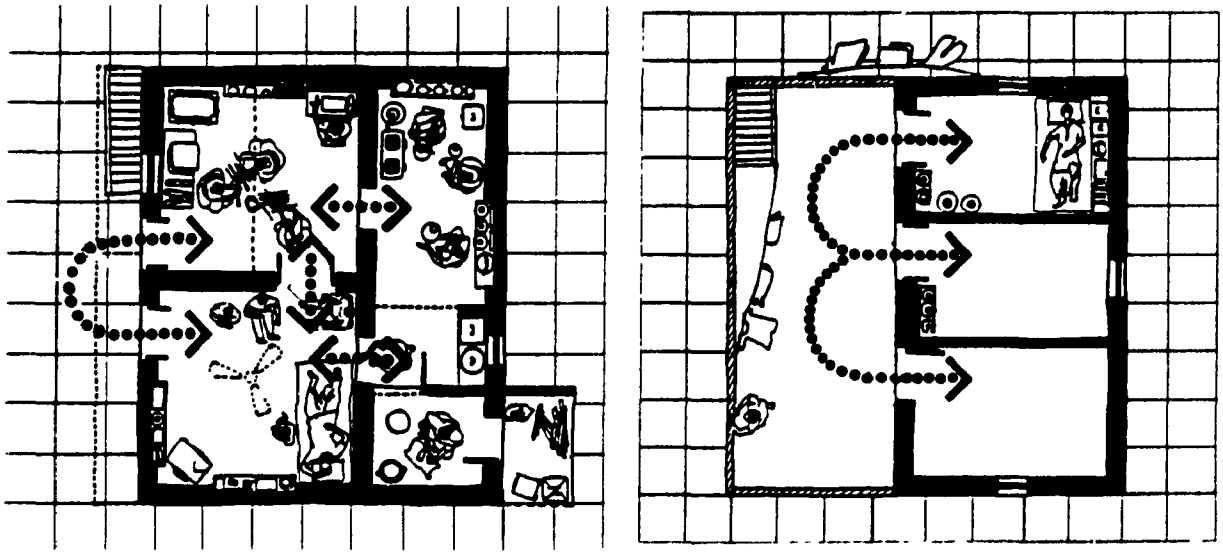


Fig.13 Access and floorwise seggregation of families in Bhogilal's house

The first floor contains three large rooms, a wash area and an adjoining store room, while the second floor has three rooms and a terrace, each of which to belong to a married son. The first floor has fewer subdivisions, as it is to accommodate a single extended family. The handicapped son will get a room, the parents will get another, the daughters will likely get married and leave, and the third room then serves as a common kitchen and dining area.

The rooms are arranged in a cluster form on the first floor which appears to suit the extended family well because of its casual relationship between spaces and an its internal circulation. The second floor has three rooms in the linear-lateral order with external circulation, which enables three families to function independently while maintaining the potential for sub-letting.



First floor Second floor

Fig.14 Circulation principal in Bhogilal's house.

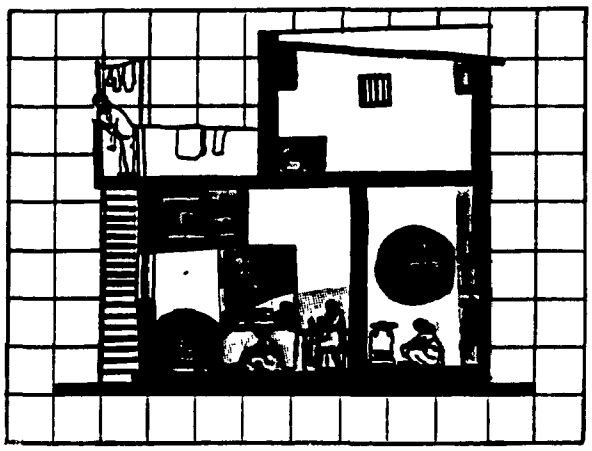
The open terrace on the second floor works as a connecting corridor between the three rooms upstairs, as well as between the two floors. In addition to these uses it also provides a space for future expansion if three families above want to build extra rooms.

At present, and until the tenant vacates, the first floor rooms find multiple uses. The living area is used as a workshop for rolling agarbattis when there is a contract, but at night this area is utilized for sleeping. The work area fronts the street and has a direct access for the outsiders. The same area also has a sewing machine for either family use as well as commercial purposes.

The kitchen is at the rear of the house and has a small ventilator in a corner in the wall. The food is cooked for the whole family using a liquid petroleum stove from a seated position. The cooking stove faces the wall that has a door leading to another room which helps it ventilate better. Adjoining the kitchen is a wash area, in the form of a small chamber with a door. It is also at the rear end of the house, but it abuts the street for the sewer connection. Bhogilal's tenant uses the terrace for washing clothes occasionally, but for daily washing and bathing purposes makes use of public facilities, provided by the authorities, in the settlement.

Storage areas in the house exist in a variety of forms. There are two lofts, one in the front work area for extra mattresses and work related storage, and another in the kitchen for

additional domestic storage. The house also has a small storage room behind the wash room. In addition to these built-in storage devices there are some shelves built into the walls in each of the rooms. These shelves are used for storing items of daily use for various activities. The table, trunk, tin and drum are all mobile devices used for storage purposes.



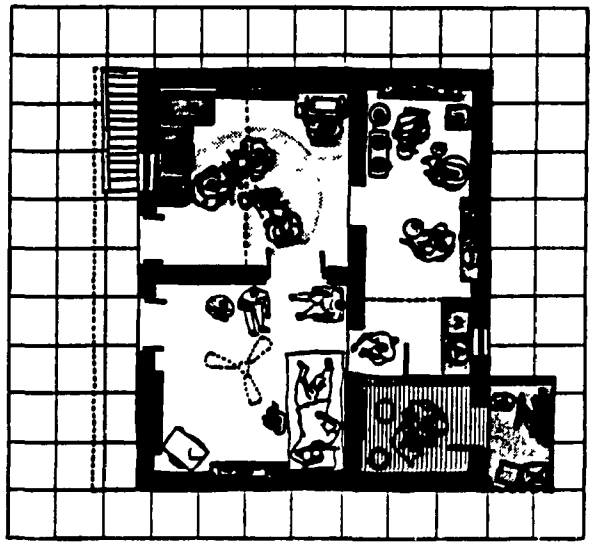
ACTIVITIES:

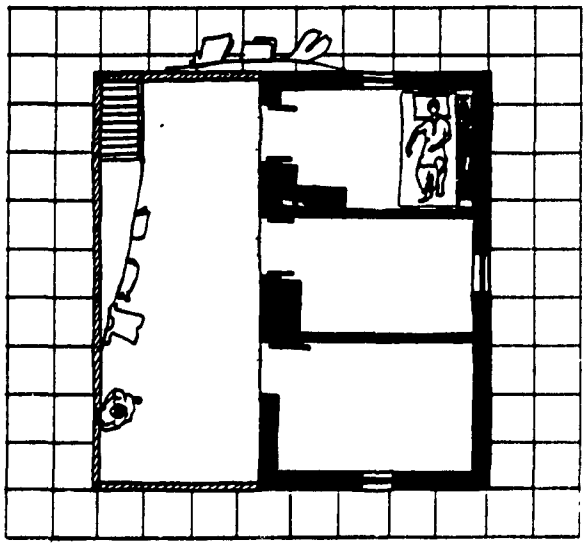
Cooking

Washing

Work related

Storage





First floor

Second floor

Fig.15 Activities and use of space in Bhogilal's house.

3.50 SUMMARY

It is evident from the family scenarios that houses which may appear disorderly in a conventional design sense, are thoughtfully organized. Houses where the layouts of different floors do not correspond, where rooms of widely varying size and shape occur, and where work and family life are closely integrated, exhibit an inherent logic only when they are understood with reference to the specific requirements and strategies of the people who live there.

The case studies also indicate that decisions regarding the various physical aspects of the house bear important consequences for the family because they affect its functioning. One of these aspects is **access**. An additional access to the house provides the option of sub-letting the rooms and therefore facilitates use by non-related families. It also determines the location of work-related and commercial activities.

Another important aspect is **room sub-division**. More the sub-division of space more are the independent/separate spaces to accommodate the private activities or the functioning of the different families.

The kind of **organization** these rooms have is also equally important. Rooms organized in a sequence and connected only from the inside will give it a hierarchical order at the cost of privacy in the front rooms. This in turn will influence the

type of family that can live there and location of the activities.

Similarly open or built spaces also play an important role in determining the function that can take place there, according to the space requirements of the activities.

Therefore, these attributes of houseform: number of accesses to the house; the subdivision of a house; the organization of rooms with respect to their circulation; and the built or open nature of spaces; along with location of various activities within the house, are important considerations for families while laying out the houseplan. Hence, these attributes of the houseform need to be investigated, and their relationship with the dwellers to be examined, in order to understand the logic of these slum houses.

The following chapter documents and describes in detail all the houseform variations identified in the fifty-two samples from Shilnath Camp. These houseform variations are then related (through quantitative methods) to the households that occupy them in order to see how, or if, they influence one another, and propose a hypothesis concerning the relationship between the user and the space, as indicated by the aforesaid family scenarios.

4.00 HOUSEFORM CHARACTERISTICS

4.10 HOUSEFORM VARIATIONS

Traditionally slum houses have been classified as pucca (permanent/strong/substantial), semi-pucca, and kuccha (raw/ weak/ provisional), in government slum surveys (81). This type of classification relies solely on the physical condition of the building, and totally disregards the spatial configuration, space efficiency, or functional merits of the house.

A house consists of several built and open spaces, which are arranged in a particular order and has a certain number of accesses, where a particular group of families live and perform various activities.

Using this definition of a house for the purpose of this study, houseform is classified based on its spatial characteristics rather than the quality of construction. As indicated by the family scenarios in the previous chapter, number of accesses, house sub-division, spatial organization of rooms, and nature of spaces emerge as influential characteristics of the houseform. The following is a detailed description of the variations found in these houseforms as observed in the fifty-two house samples chosen from Shilnath camp.

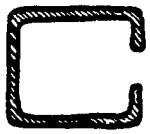
4.11 Sub divisions by the number of rooms in a house

Extent of a house is normally described in terms of its physical dimensions or total floor area. However the primary concern of this study is to explore the organizational characteristics of the house, and for this reason this study examines the sub-division and organization of space. The sub-division influences the versatility of a house, its ability to adapt to the privacy requirements and daily activities of different households. The number of rooms relative to the overall size of the house suggests how space within the house is articulated.

The 1981 Census of India, defines a room as "an enclosed space, long and wide enough for a person to sleep in, with walls on all sides and a roof overhead" (82). Using this definition of rooms, houses, based on the number of rooms they have, are divided into two categories in this study: a) **Small Houses** and b) **Large Houses**. Small houses refer to those with three rooms or less and larger houses are those with more than three rooms.

a) SMALL HOUSES

a.1) One-room houses

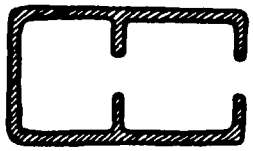


Examples:

Case no.10,23,39,45,50.
(5 out of 52 = 9.5%)

Fig.16

a.2) Two-room houses

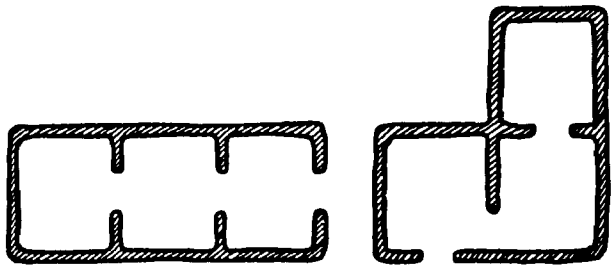


Examples:

Case no.2,12,30,32,36,37,38, 40,41,42,44,47,48,49. (14 out of 52 = 27%)

Fig.17

a.3) Three-room houses



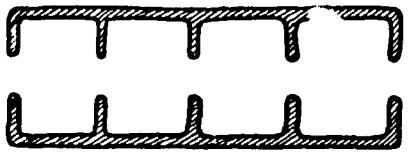
Examples:

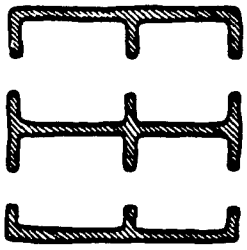
Case no.4,21,35,43,46. (5 out of 52 = 9.5%)

Fig.18

b) LARGE HOUSES

b.1) Multi-room houses (more than three rooms)





Examples:

Case no.1,3,3A,5,6,7,8,9,11, 13,14,15,16,17,18,19,19A,20, 22,24,25,26,27,28,29,31,33, 34. (28 out of 52 = 54%)

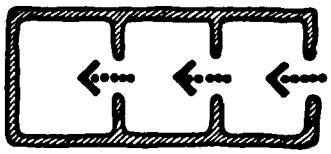
Fig.19

4.12 Spatial organization of the house

Having looked at the subdivision of a house it is important to examine the relationship between the rooms as well as the outdoors. These different room organizations generate different circulation patterns which in turn help to define shared and personal territories.

Circulation patterns are the major determinant of spatial organization. There are three distinct types of circulation that exist between two rooms or spaces: a) **Internal Circulation**, b) **External Circulation**, and c) **Mixed Circulation**.

a) **INTERNAL CIRCULATION** means a direct link between two spaces without having any exterior space as a connector. This circulation principle is found in the **Linear Vertical** room organization, where rooms are arranged in a sequential manner and are internally connected. The hierarchical order requires passing through one space to reach another.



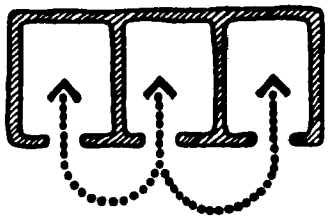
Examples:

Case no.2,11,12,16,25,26,30, 32,35,36,37,38,40,41,42,43, 44,46,47,48,49.
(21 out of 47 = 45%)

Fig.20

b) **EXTERNAL CIRCULATION** refers to spaces connected only from the exterior. This circulation principle consists of two variations: **Linear Lateral** and **Dispersed**.

b.1 Linear Lateral house organization refers to a situation where rooms are arranged in linear fashion but are entered externally. Thus they are not hierarchical and are related only laterally (not connected internally) to each other.

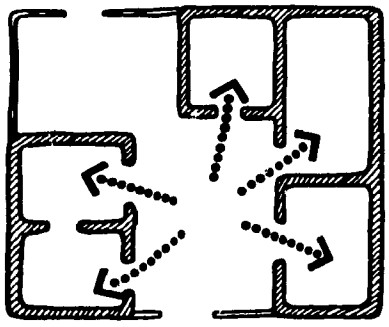


Examples:

Case no.4 (1 out of 47 = 2%)

Fig.21

b.2 Dispersed organization refers to rooms that are externally related, dispersed and usually enclosed by a fence.



Examples:

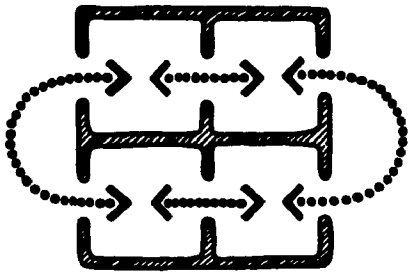
Case no.3A,19A,39.
(3 out of 47 = 6%)

Fig.22

c) MIXED CIRCULATION is a combination of both internal and external circulation principles. There are two variations found under this circulation principal: **Linear Composite** and **Cluster.**

c.1) Linear Composite house organization is basically a combination of the Linear Vertical and Linear Lateral types. It is similar to linear lateral organization but is more than one room deep. As a result, rooms have both internal and

external relationships. Due to the internal connection, rooms acquire linear vertical order while external connections give them a linear lateral order.

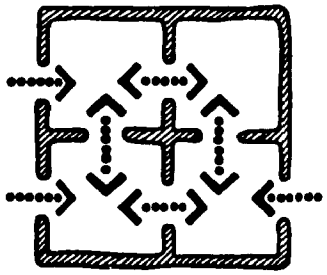


Examples:

Case no.1,3,7,9,13,19,27,28, 29,31,33,34.
(12 out of 47 = 25%)

Fig.23

c.2) **Cluster** grouping defines the type where rooms are organised in a cluster form and their relationship is casual. They can be related internally, externally or both. For example, a linear composite order will turn into cluster as soon as it receives a door connecting the lateral compartments.



Examples:

Case no.5,6,8,14,15,17,18, 20,21,22,24.
(11 out of 49 = 22%)

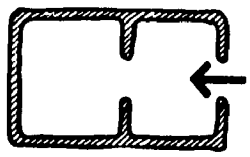
Fig.24

4.13 Access

Access connects the house to the outdoors. Access means an entry point to the house from the public space. The number of accesses a house has, and the number of sides on which they occur, relates directly to the potential for sub-letting space or accommodating different families. It also influences the location of activities within a house.

Houses, with respect to the number of accesses they have, are classified as: a) Single Access and b) Multiple Access.

a) SINGLE ACCESS means only one entry to the house from public space.



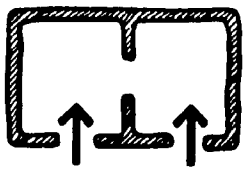
Examples:

Case no.2,10,11,12,32,35,36, 37,38,39,40,41,42,43,44,45, 46,48,49,50. (20 out of 52 = 39%)

Fig.25

b) MULTIPLE ACCESS refers to two or more entry points to the house. Entries could be from the same side of the house or from different sides.

b.1) Multiple access from the same side of a house:

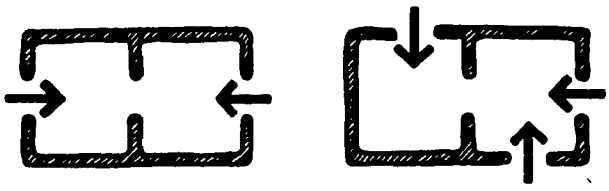


Examples:

Case no.4,5,6,7,8,15,17,22, 24. (9 out of 52 = 17%)

Fig.26

b.2) Multiple access from different sides of the house



Examples:

Case no.1,3,3A,9,13,14,16, 18,19,19A,20,21,23,25,26,27, 28,29,30,31,33,34,47. (23 out of 52 = 44%)

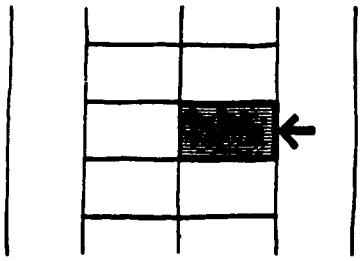
Fig.27

4.14 Exposure

While looking at the number of accesses a house has, it is important to note the location of the plot on the site. This will help determine whether provision of accesses in terms of which sides they occurred and in what numbers, was largely a function of family's decision-making or was merely a function of physical constraints (i.e. plot situation), limiting the possibility of opening out on to the different sides. Plot exposures are examined for this reason.

Exposure means number of sides of built plots that are contiguous to public open spaces such as a street, public square, or a lane. Basically there are two types of plots. a) **Single Exposure Plots** and b) **Multi-Exposure Plots.**

a) SINGLE EXPOSURE plots are usually the middle ones of the back to back row houses.



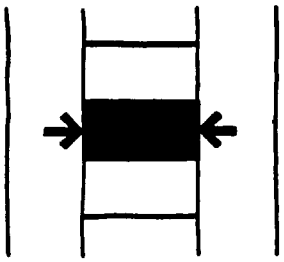
Examples:

Case no.5,7,17,35,36,37,40, 46,49. (9 out of 52 = 17%)

Fig.28

b) MULTIPLE EXPOSURE plots are the ones with two or more sides exposed.

b.1) Plots with two exposures occur in single row cluster houses or on corner plots of the back-to-back houses.

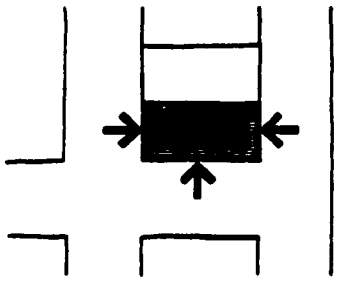


Examples:

Case no.1,2,8,9,13,15,16,20, 21,24,26,27,28,29,30,34,39, 41,42,43,44,45,47,48,50. (25 out of 52 = 48%)

Fig.29

b.2) Plots with three exposures are mainly the corner plots of single row house clusters.

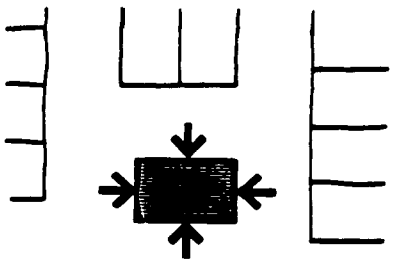


Examples:

Case no.3,22,25,32,33,38. (6 out of 52 = 12%)

Fig.30

b.3) Plots with four exposures are usually isolated, or recently created plots over an adjoining naala.



Examples:

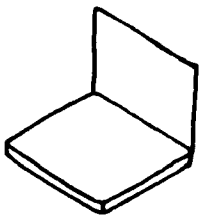
Case no.3A,4,6,10,11,12,14, 18,19,19A,23,31. (12 out of 52 = 23%)

Fig.31

4.15 Combination of Built and Open Spaces

The constraints of space (availability of land), cost (it is more expensive to build enclosed space than to build semi-enclosed), and the kind of activities performed (climate and culture suggesting extensive use of one kind of space over another for that function) requires people to make trade-offs regarding the provision of different kinds of built and un-built space in the house. The various kinds of spaces observed in the houses are: **Open**, **Semi-open**, **Semi-enclosed** and **Enclosed.**

Open spaces, mainly in the form of stoops and platforms, are open to sky with no form of enclosure such as roof, or walls on more than one side.



Examples:

Case no.2,3A,4,5,7,9,14,16, 17,19A,23,26,31,33,34,35,39, 46,50.
(19 out of 52 = 36%)

Fig.32

Semi-open space is also open to the sky, but has walls on all sides giving a space some sense of enclosure. Fenced compounds, yards, terraces and courts represent such a space in a house.

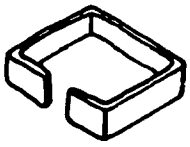
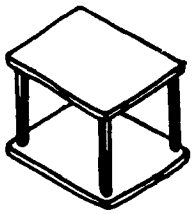


Fig.33

Examples:

Case no.3,3A,5,7,11,14,17, 19,19A,22,27,29,33,39,42,43, 46. (17 out of 52 = 32%)

Semi-enclosed space has a roof on top but is open from at least two sides; such as verandas, balconies and cattle sheds.

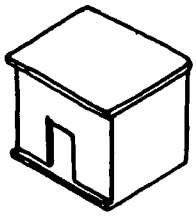


Examples:

Case no.1,3,3A,14,18,19,20, 28,29,31,33,38,42,43,48. (15 out of 52 = 29%)

Fig.34

Enclosed space refer to the rooms of a house that are completely enclosed by walls and a roof.



Examples:

Case no. all the houses.

Fig.35

Houses exhibit various combination of spaces. For the purpose of this study they are classified into two categories. a) **Single Space** and b) **Combination Space** houses.

a) SINGLE SPACE houses consist of only enclosed spaces, they do not have any other type of space in them.

Examples: Case no. 6,10,12,13,15,20,21,24,25,30,32,36,37,40, 41,44,45,47,48,49. (20 out of 52 = 38%)

b) COMBINATION SPACE house is made up of more than one type of space. It has open, semi-open and/or semi-enclosed space in addition to the enclosed spaces.

Examples: Case no.1,2,3,3A,4,5,7,8,9,11,14,16,17,18,19,19A,22, 23,26,27,28,29,31,33,34,35,38,39,42,43,46,50.(32 of 52 = 62%)

4.16 Summary

Slum houses offer a wide range of houseforms. Among these variations, some forms occur more frequently than others.

SUB-DIVISION:

In terms of room sub-divisions, they are almost equally divided into smaller (48%) and larger (52%) houses. More than half (57%) of the smaller houses are two room houses, which emerges as the most common house type among the cases studied.

SPATIAL ORGANIZATION:

Nearly half of the houses (49%) have combined circulation, and the rest except for four, have internal circulation. Vertical ordering appears to be the common type of house organization, since, in addition to linear vertical organization, even cluster and composite house organizations have an in-built verticality.

NUMBER OF ACCESS:

The majority (60%) of the families have provided an additional access to their house. Nearly two third of them have chosen to provide this additional access on a second side of the house. Which also means that one third of them have provided additional access on the same side. Though their number may not be significant, at least they have succeeded in demonstrating the need for an additional entry regardless of the constraints of plot exposure.

EXPOSURE:

It is also important to note that only about a fifth of the plots (18%) have a single exposure, the rest all have managed to get more than one exposure. This is indicative of an efficient plot grouping.

COMBINATION OF SPACES:

In terms of spaces, nearly two third of the houses have provided open, semi-open or semi-enclosed space in addition to the basic enclosed space. About a quarter of all the houses have a combination of three kinds of spaces, while only two cases have all the four types of spaces in their houses.

In addition to these individual component variations, their combination too make them vary from each other. For example a small house with one access would differ from the same with multiple access. A "small multiple access house" with a vertical organization of rooms is different from the "Small multiple access house" with a lateral organization, and so on.

It is important to clarify here that these houseform variations are seen so far without reference to how people use their houses. Therefore it would be wrong to conclude at this stage that any of the common occurrences is more desirable than any other. The question then is what do these variations mean? The review of the literature suggests that this meaning will become apparent when these variations are examined in light of how the spaces are used and by whom. When houseform

variations are analyzed with reference to the people living there, then the value of the particular houseform becomes evident.

Therefore, in the following section (4.20), various household combinations are described, which are later compared with the houseform, in section 4.30, to examine correlations between each of the attributes of the houseform and combinations of the households.

4.20 HOUSEHOLD COMBINATIONS

In Indian slums it is quite common to find more than one family living together under the same roof because: the tradition of living in an extended or a joint family still prevails in a large proportion through out the country; and it has proven to be an efficient survival strategy, both, economically as well as socially.

The 1981 Indian Census defines household as "a group of persons who commonly live together and would take their meals from a common kitchen unless exigencies of work prevented any of them from doing so. There could be a household of persons related to blood or a household of unrelated persons or a mix of both" (83).

In this definition, household is perceived more as an economic unit, without any reference to the social structure. The social structure is more crucial for the purpose of this

study. Therefore, based on the family make-up and the kinship relation; household combination per house is further categorised here as a) **Single household** and b) **Multiple households**. A Single household is comprised of a nuclear family while the multiple household is made up of more than one related or non-related family.

a) SINGLE HOUSEHOLD

a.1) Nuclear family (single household)

This household type refers to a family containing a single person or a married couple with or without children. Thus it is made up of only one immediate family.

Examples: Case no.2,10,15,17,20,21,24,32,35,36,37,38,39,40,41, 42,43,44,45,46,48,49,50. (23 out of 52 = 44%)

b) MULTI-HOUSEHOLD

b.1) Extended family (multi-household)

This type refers to a social group with kinship relations, such as two married brothers or a married couple with their parents or other relatives. Hence extended families contain two or more nuclear families but the kinship relations make it possible to function as a one large family. Income and expenses of all the members are usually shared in such situations.

Examples: Case no. 5,6,8,9,11,12,16,23,25,26,27,30,31,33,47. (15 out of 52 = 29%)

b.2) Non-related group (Multi-households)

This type consists of more than one household but without any kinship relations. i.e. friends or renters.

Examples : Case no. 4,13,22,29. (4 cases out of 52 = 8%)

b.3) Composite (Multi-households)

This type refers to a combination of an extended family with any non-related group. It is necessary to distinguish this type from the non-related because this type is a combination of non-related and related families, an arrangement which may change household requirements quite considerably. This household situation will exhibit the social demands of all the three family types (nuclear, extended, and non-related), while in cases of non-related households they can function simply as two or more nuclear families.

Examples : Case no. 1,3,3A,7,14,18,19,19A,28,34.
(10 out of 52 = 19%)

Having identified these variations of Household type and houseform independently, it is now important to examine their mutual interaction. The following cross tabulations between the attributes of houseform and households would allow inferences to be made about the relationship between household makeup and houseform.

4.30 CORRELATIONS

Each of the houseform characteristics is individually compared with the household combination through a cross tabulation. For general observations all sub-categories of attributes are included in the table, although most often their combined effect (according to major categories) is considered when making inferences. Strong relationships between the attributes are determined by identifying the frequency of "matches", (indicated by the highlighted cells in the table). In the following tables, X-axis represents physical attributes of the houseform, while the Y-axis represents household combinations.

At first, household combination is compared with the no. of accesses to the house to examine if the type of household, their related or non-relatedness, has any influence on the number of accesses.

4.31 Household combination Vs. Number of accesses to the house

HOUSEHOLD COMBINATION		NUMBER OF ACCESSES: SINGLE	MULTIPLE		Total
		one acc.	sameside	diff.side	
SINGLE	Nuclear	18	3	3	24
MULTI	Extended	2	3	9	14
	Nonrelated	0	2	3	5
	Composite	0	3	6	9
	Total	20	11	21	52

Table 1. Refer appendix-B p.170 and appendix-c p.175

OBSERVATIONS:

* ROW 1: Two thirds (18 of 24 = 67%) of nuclear families have only one access to their houses.

* ROW 2: A large proportion (9+3=12 of 14 = 86%) of extended families have provided multiple access.

* ROW 2+3+4: Most (26 of 28 = 93%) of multi family households have provided more than one accesses.

* COLUMN 1: Nearly all (18 of 20 = 90%) of single access houses belong to nuclear families.

* COLUMN 2+3: More than 80% (26 of 32) of multiple access houses belong to multi family households.

INFERENCES:

Most (90%) of the single access house belong to single family households. A closer look at the sample shows that all but two multi household houses have multiple accesses; the two exceptions to the rule happen to be extended families (with kinship relation), which implies that they function as single family units.

It appears that different households require separate accesses, thus, multiplicity of access is closely correlated to the multiplicity of household.

In the following table household combination is compared with the extent or subdivision of the house to investigate if, in order to accommodate various families, multi-households tend to subdivide houses more than single households. Whether the relatedness or non-relatedness of these multi families, make difference in this strategy.

4.32 Household combination Vs. Number of rooms in the house

NUMBER OF ROOMS

HOUSEHOLD COMBINATION		SMALL			LARGE	Total
		One room	Two room	Three room	Three room +	
SINGLE	Nuclear	4	11	4	4	23
MULTI	Extended	1	3	0	11	15
	Nonrelated	0	0	1	3	4
	Composite	0	0	0	10	10
	Total	5	14	5	28	52

Table 2. Refer appendix-B p.170 and appendix-C p.176

OBSERVATIONS:

* ROW 1: Large proportion (4+11+4=19 of 23 = 83%) of nuclear families live in smaller houses and half of them in two rooms.
* ROW 2+3+4: Most (24 of 29 = 85%) of the multi family houses have more than three rooms.
* COLUMN 1,2,3: More than three quarters (4 of 5 = 80%) of one room, two room (11 of 14 = 78%), and three room houses (4 of 5 = 80%) are inhabited by nuclear families.
* COLUMN 4: All but a fifth (24 of 28 = 87%) of houses with four or more rooms have multiple households.

INFERENCES:

Smaller houses are commonly occupied by nuclear families (especially two rooms) and larger houses by extended, non-related and composite families.

In general, multi-households are found in large subdivided houses, like the non-related families. It is important to mention however that the four exceptions to this observation are all extended families (related multi-households) which would indicate that, when compelled to do so, they can function as a single family unit because of their kinship relation. Hence, household combination has a close relationship with the extent or subdivision of the house.

Having looked at the influence of household combination on the number of rooms, it is significant to examine if this influence is carried through the organization of these rooms. Whether particular family structure affects the internal circulation pattern of the house or not? In the following table household combination is compared with the spatial organization of rooms.

4.33 Household combination Vs. Spatial organization of rooms

HOUSEHOLD COMBINATION		SPATIAL ORGANIZATION: INTERNAL CIRCUL. – Linear verti.	EXTERNAL CIRCUL. – Linear later.	EXTERNAL CIRCUL. – Disper.	MIXED CIRCUL. – Linear compo.	MIXED CIRCUL. – Cluster	Total
SINGLE	Nuclear	14	0	1	0	5	20
MULTI	Extended	7	0	0	4	3	14
MULTI	Non rel.	0	1	0	2	1	4
MULTI	Composit	0	0	3	5	1	9
	Total	21	1	4	11	10	47

Table 3. Refer appendix-B p.170 and appendix-C p.177

OBSERVATIONS:

* ROW 1: More than two thirds (14 of 20 = 70%) of nuclear families live in houses with internal circulation and linear vertical organization of rooms.
* ROW 2: Half (7 of 14 = 50%) of the houses of extended families have linear vertical organization of rooms.
* ROW 2+3+4: About two thirds (16 of 27 = 60%) of the multi-family houses have mixed circulation in the houses.
* COLUMN 1: All houses with linear vertical organization are occupied by only nuclear (67%) and extended (33%) families. No non-related or composite families are found to live in houses

with linear vertical organization.

* COLUMN 4+5: More than three quarters (16 of 21 = 79%) of the mixed circulation houses correspond with multi-family households.

INFERENCES:

Linear vertical organization is adopted only by nuclear or extended families because of its sequential and hierarchical order. Confirmation of this statement also lies in the fact that no multiple household situation without kinship relation is found to have such a spatial organization of their house.

A clustered grouping of rooms also seems to suit to nuclear and extended families due to its casual and sequential nature.

In multi-household situations, with or without family relation, linear composite organization is very common as it offers linear organization per dwelling for each individual household, but at the same time is separated laterally from other households which allows it to function as an independent unit.

The following table compares household combination with the combination of spaces in the house. This provides clues for the relationship between family types and the built or open spaces within the house. It also investigates whether houses with more than one type of space coincide with houses with multiple families.

4.34 Household combination Vs. Combination of spaces

HOUSEHOLD COMBINATION		SPACE COMBINATION: SINGLE	SPACE COMBINATION: COMBINED	Total
SINGLE	Nuclear	14	9	23
MULTI	Extended	5	10	15
	Non related	1	2	3
	Composite	0	11	11
	Total	20	32	52

Table 4. Refer appendix-B p.170 and appendix-C p.178

OBSERVATIONS:

* ROW 1: Nearly two thirds (14 of 23) of single family houses have only a single type (enclosed) space.

* ROW 2+3+4: More than three quarters (23 of 29) of the multi-family houses have a combination of spaces.

* COLUMN 1: Over two thirds (14 of 20 = 70%) houses with only an enclosed space have nuclear families living there.

* COLUMN 2: Nearly three quarters (23 of 32 = 72%) of the houses with combination space belong to multi-family houses.

INFERENCES:

More than two thirds of the houses suggests that more the number of families in the house, more varied are the types of built and open spaces in the house. House extensions are more frequent to be found with multiple family households than nuclear families.

Having compared the attributes of the houseform with the household combination, the following table examines the relationship between two of the attributes of the houseform. Namely: access and exposure. Access is compared with exposure in order to verify whether decisions concerning access are determined by the social structure of the household or by locational restrictions of the plot.

4.35 Exposure Vs. Access

EXPOSURE		ACCESS: SINGLE	ACCESS: MULTIPLE		Total
		one acc.	same side	diff.side	
SINGLE	One exp.	6	3	0	9
MULTIPLE	Two exp.	9	3	13	25
	Three exp.	2	2	2	6
	Four exp.	3	3	6	12
	Total	20	11	21	52

Table 5. Refer appendix-B p.170 and appendix-C p.179

OBSERVATIONS:

* ROW 1: A third (3 of 9 = 33%) of plots with single exposure have got more than one access.

* ROW 2: Two thirds (13+3=16 of 25 = 65%) plots with two exposures have provided more than one access.

* COLUMN 1: More than two thirds (14 of 20 = 70%) of plots with only one access have more than one exposure.

* COLUMN 2+3: Most of the (29 of 32 = 90%) of the multi access plots have mutiple exposure.

INFERENCES:

Multiple exposures have proved to be a useful feature as two thirds of the plots with additional exposure have used the opportunity to provide another access. Plot exposures do not seem to determine the numbers of accesses as one third of the single exposure plots have demonstrated that additional access can be provided even without additional exposure. Moreover, more than two thirds of the single access multiple exposure plots have ignored the option of additional access, which suggests that there are other factors involved in making decisions regarding access.

4.36 Summary

Interactive patterns of the household and space have exhibited that houseform is significantly influenced by the characteristics of the families living there. Houses having more than one family tend to provide more than one access, confirming the need for individual access for each family.

The house sub-division suggests that extent of these division comply well with the household combination. Multi household houses are generally sub-divided in to more than three rooms, while the houses with less than three rooms usually correspond with the single nuclear family.

Even the ordering of this sub-division accords well with the family structure. A Linear organization is often adopted by single or related families while non-related multi families tend to adopt the Lateral or Combined type.

The combination of spaces, in terms of open and built areas, also seems to correlate with family type. Nuclear families tend to provide only enclosed space while multi families create a greater variety of spaces.

The comparison between street exposure and number of accesses has shown that there is no significant relationship between the two. This supports the observation that the decision to provide multiple accesses is not restricted by locational constraints, on the contrary, people, by providing an additional access on single exposure plots, have demonstrated that regardless of the magnitude of the physical constraints, they need to be overcome in order to facilitate socio-cultural requirements.

Having seen the influence of household composition on houseform, the following chapter, in a similar way, looks at the influences of the user's daily activities on the built form. At first the ways in which these activities are performed is described along with a description of the forms in which they occur. Houseform characteristics are then correlated with the activities.

5.00 DAILY ACTIVITIES

A slum house is not only a place to live, it is often a temple for worship, a factory for producing goods, a work place to do piece-work or a shop to sell commodities. This wide range of activities, accommodated in the house, can be classified into three distinct categories: 1) Domestic, 2) Religious, and 3) Income generating. All these activities have different requirements hence it is important to see how these activities are performed and to look at various ways in which they are accommodated by the house.

5.10 DOMESTIC ACTIVITIES

These activities are the most basic ones, essential to all for their daily rituals. They include sleeping and leisure, cooking and dining, bathing and washing, and storage.

5.11 Sleeping Activity

Sleeping is one of the most private activities, although space limitations within a house often require that privacy be compromised. As long as the space is available, the younger couples sleep in a separate area from the rest of the family (i.e. parents, older children and relatives). Whenever possible a separate room is assigned to every married couple,

but when there are not enough rooms, the kitchen is used for the same purpose. When that is not enough, people sleep all together in the same space. In such tight situations, beds are often put on their edges or bed sheets are drawn as curtains to subdivide the space temporarily, giving some visual privacy for sexual activities.

Throughout the year and especially in warmer weather (except for cold winter nights or the monsoon) it is not uncommon to find people sleeping out-doors in the open or semi-enclosed spaces of the house.

People use mattresses and durries (carpets) spread over the floor for sleeping purpose, both during the day and at night.

5.12 Cooking and dining

Cooking is one of the most essential activities in every household. Cooking usually takes place in the semi-enclosed or enclosed spaces of the house. In the hot season portable stoves (steel buckets lined with mud, or a kerosene stove) come in handy for out-door cooking. Regardless of the cooking method, this activity is always (in all the houses surveyed) performed while sitting on the floor. Despite the existence of standing kitchen platforms in some houses, housewives prefer to cook on the floor while using the platform for storage purposes. Though available for many uses, the cooking area is often demarcated by raising the floor up to 20 cm. The stove, storage shelves, utensils and water jars are among the common

devices required while cooking.

Food is usually eaten in the same area that it is cooked; and also while sitting on the floor. In large, and especially in extended families, meals are most often eaten in turns (except for special occasions). Children are fed first, then the working men of the family, afterwards elder parents, and then at the end the wife and daughters-in-law eat the food. Besides the lack of floor space for all members of the family to sit together, and different meal timing due to work schedule, there are also some socio-cultural factors responsible for this pattern of eating. Such as: the status of the housewife as a hostess (therefore eating last); the social protocol that requires that daughters-in-law not eat in the presence of their father-in-law; the custom of preparing chapati (Indian bread) fresh and serving it hot.

5.13 Washing and Bathing

Most of the residents use stand-pipes, provided by the authorities at several locations in the settlement, for washing and bathing purposes. However, recently some houses have provided some form of private washing/bathing area. These areas are found either detached from the house, attached but with a separate entry, or sometimes within the house. These areas are generally regarded as dirty, and so they are usually placed away from the cooking, eating, and worship areas.

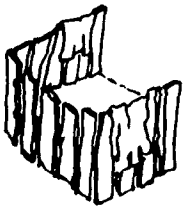
a) The primary form of washing area is a stone slab or a stone paved raised platform, usually against the wall in the corner, with or without a curb. Such areas are used more for washing utensils or clothes and seldom for bathing. In such cases bathing takes place in community bath areas within the settlement provided by the government.

Fig.36

Examples:

Case no.10,13,25,26,37,40, 46,49.(8 out of 52 = 37%)

b) Another form of washing space, which is also used for bathing, is a stone paved area with brick, plastic or wooden walls to form an enclosure.

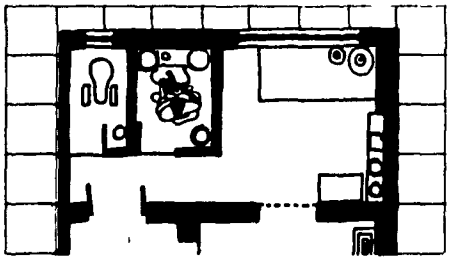


Examples:

Case no.1,2,3,6,14,20,23,25, 27,28,31,32,33,36,38,41,43, 44,48. (19 out Of 52 = 15%)

Fig.37

c) A more elaborate version is the fully enclosed space with a door.



Examples:

Case no.3A,8,11,15,16,18, 19A,22,24,28,29,34,42. (13 out of 52 = 25%)

Fig.38

5.14 Storage

Slum houses exhibit ingenious ways of accommodating storage. As the floor area is limited, interior spaces are used very efficiently. Based on their installation, convenience, and degree of permanence, they are classified as: a) Built-in, b) Plugged-on, and c) Mobile.

a) Built-in storage devices: These storage devices are the most permanent type, as they are built within the walls or floors during house construction. For this reason they are the least maneuverable hence the most certain and obvious in terms of their location. The various forms of this type of storage device are as follows.

a.1) **In-built shelves** built into the walls are the most common of storage spaces, making best use of the thick walls. They are generally located at the lower levels, where the housewife can reach without using a ladder. Such in-built shelves are used mainly to store utensils, items for daily use such as clothes or other household possessions.

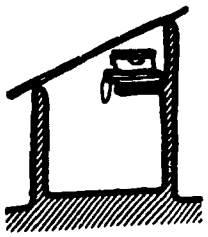
Examples:

Case no.1,2,3,5,7,8,9,12,13, 15,16,22,23,24,26,27,28,29, 32,36. (20 out of 52 = 36%)

Fig.39

a.2) **Lofts** show efficient use of the extra spatial volume under sloping roofs. Lofts tend to be located above 2 m. hence are used often for keeping extra mattresses, large trunks or

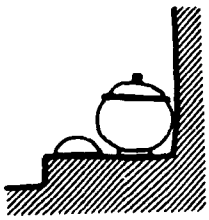
other household possessions not required for daily use.



Examples:

Case no. 1,5,6,7,8,9,14,15, 18,20,21,22,25,26,28,29,37, 38,40,41,44,46.
(22 out of 52 = 42%)
Fig.40

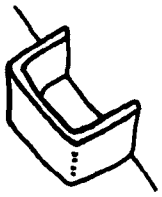
a.3) **Platforms** are commonly used for the storage of utensils, cooking equipment and water jars. Cooking and dining takes place on the floor while sitting , therefore platforms can be reached by the housewife, even while squatting. The raised level demarcates the area and keeps it undisturbed by the flow of movement.



Examples:

Case no.3,6,7,21,25,26,31, 38,40,49.
(10 out of 52 = 19%)
Fig.41

a.4) **Koondi** (a small tank-like container) made out of bricks on the floor against the wall, is used for the storage of wood fuel or fodder.

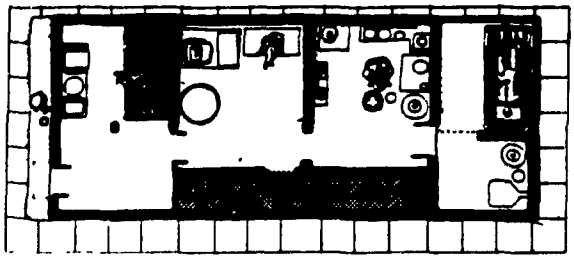


Examples:

Case no.12,16,18,26,30,33,36.
(7 out of 52 = 13%)

Fig.42

a.5) A **store room** is found only in certain exceptionally large houses, where one whole room is devoted for storage purposes (mainly wood fuel, building materials or other scrap).



Examples:

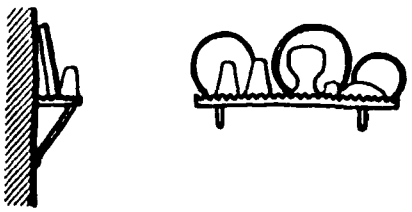
Case no.8,11,22,25.
(4 out of 52 = 8%)

Fig.43

b) Plugged-on storage devices

This is a more flexible type of storage arrangement because it does not have to be installed during construction, but can be added on to the building at a later date. It's probability makes it relatively simple to shift when required.

Most houses have **Shelves** or **Racks** hooked onto walls for the storage of utensils and other possessions used daily. These shelves are located at a height where they can easily be reached by the housewife. Sometimes these shelves are organized in tiers (hung one over the other). In such a case the top-most shelf is usually higher than 2 m. Often shelves are placed over the door lintels. These higher level shelves are used to exhibit new utensils and other proud possessions either as decorative features or status symbols.



Examples: Fig.44

Case no.1,3A,4,5,7,9,10,11,
12,13,14,16,17,18,20,21,22,
24,25,27,28,29,30,31,32,33,
34,36,37,38,39,41,44,46,48,
49. (36 out of 52 = 69%)

c) Mobile Furnishings

In addition to fixed shelves and built-in storage devices, most houses in the slum also use other furniture for storage purposes. The very mobile nature of these devices make it possible to make different uses of them at different times of the day. Commonly found storage furnishings are the following:

c.1) **Tar drums** (re-cycled) are used most commonly to store linen or rolled mattresses when not in use.

Examples: Case no. 1,2,3,5,6,7,8,9,11,14,20,21,22,24,25,26,27, 28,29,30,31,32,34,40,44,45,46,49. (28 out of 52 = 54%)

c.2) **Wooden tables** are generally used, not as a work surface, but for storage of clothing and linens.

Examples: Case no.1,8,11,15,17,21,22,24,25,28,29,33,34,41,45. (16 out of 52 = 31%)

c.3) **Racks** made out of steel or wood, bought in the market, provide low level shelves for the storage of food, groceries, spices, or cooking equipment near the cooking area.

Example: Case no. 45. (1 out of 52 = 2%)

c.4) **Cupboards** are a proud possession of a slum dweller and are often displayed in the front room. Due to lockability, such furniture is used to store valuables, documents and new clothing.

Examples: Case no. 5,7,16,24,28,33,41,46. (8 out of 52 = 15%)

c.5) The **Matka** (an earthen or metal jar) is found in every house for the storage of drinking water.

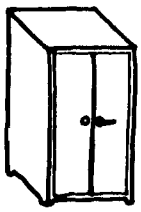
c.6) **Baskets** hung from the ceiling make good use of upper space. Food and vegetables are often stored there keeping them

safe from insects and moisture.

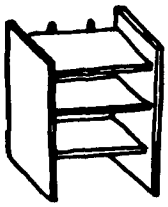
Example: Case no. 49. (1 out of 52 = 2%)

c.7) **Tin containers** are often recycled peanut oil containers. They are commonly used for the storage of food, flour and grains.

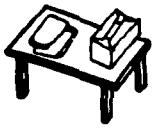
Case no.4,7,10,13,16,18,20,30,31,32,34,39,40,44,45,47,49,50. (18 out of 52 = 35%)



Cupboards

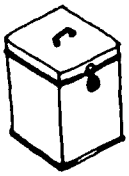


Racks

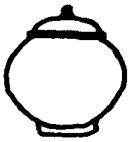


Table

Tar-drum



Tin container



Matka

Basket

Fig.45

5.20 RELIGIOUS ACTIVITY (worshipping)

Religious activities mainly consist of pooja (worship) and other related rituals during religious festivities. People often have religious shrines within the house.

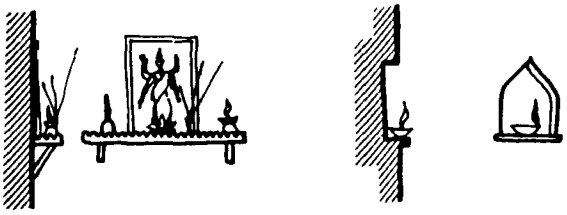
a) The most elementary version of a shrine is a picture of gods or goddesses hung or painted on a wall at eye level or just above, where one stands in front of the picture and bows down joining hands and saying prayers.

Examples:

Case no.7,50.
(2 out of 52 = 4%)

Fig.46

b) Shrine Shelf or Gokh (small indented space in the wall), allows a photograph or an idol to be placed there and also gives a space to light a lamp or incense sticks in the front.

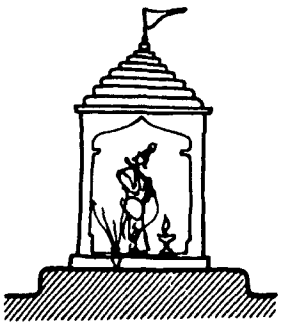


Examples:

Case no.16,28,30,44.
(4 out of 52 = 8%)

Fig.47

c) A small wooden temple installed on the floor, with or without raised platform, is the most elaborate form of shrine. It requires floor space in front to sit and pray with a lamp, agarbattis, flowers, bell and other utensils set aside for the pooja. The sacredness of such spaces demands excessive movement and certain activities be restricted in the immediate vicinity.



Examples:

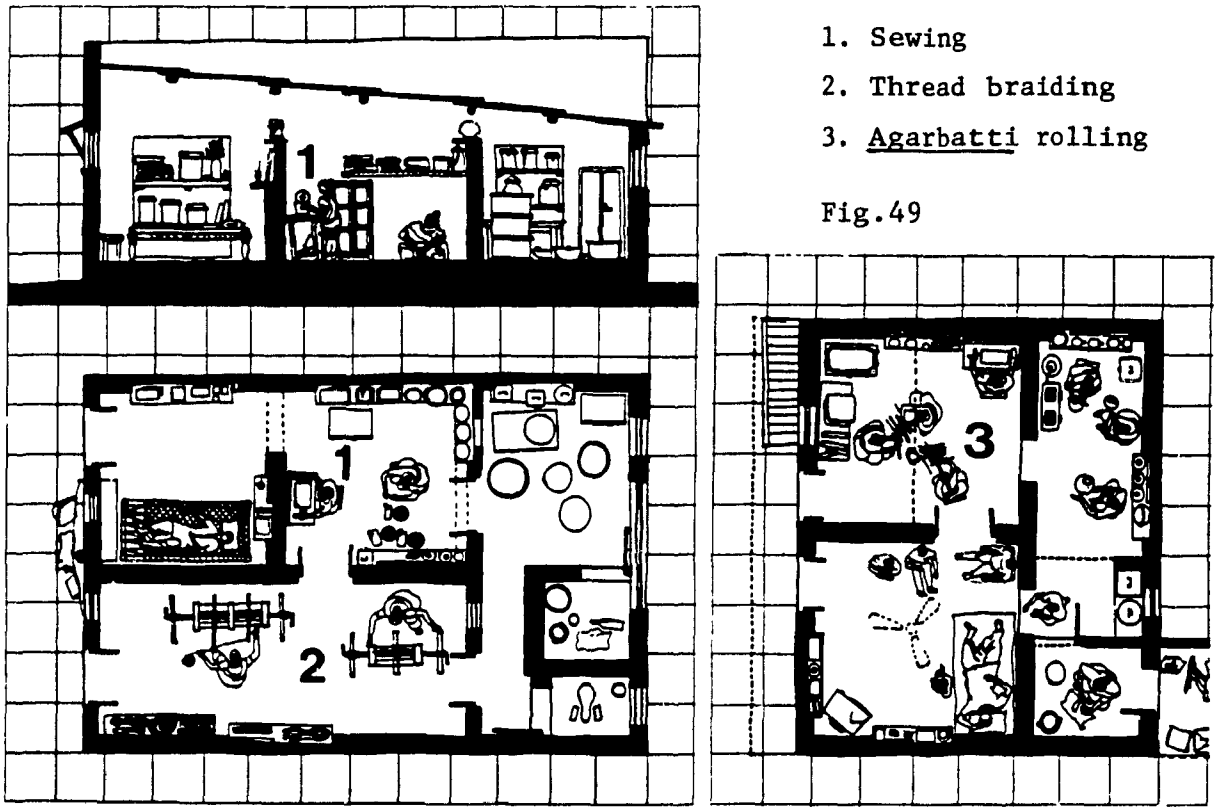
Case no.6,8,11,12,14,18,20,
33,34,36,38,41.
(12 out of 52 = 23%)

Fig.48

5.30 INCOME GENERATING ACTIVITIES

These are the activities that generate additional income for the family. These activities are accommodated in the house so that women and the other family members can participate at their convenience. These income generating activities can be classified into two categories.

a) **Piece-work** : This refers to the activities related to production, fabrication or repairs, usually on a contract basis. Examples of piece work found in the houses surveyed are; sewing clothes, making beedis, rolling agarbattis, and braiding thread.



1. Sewing
2. Thread braiding
3. Agarbatti rolling

Fig.49

b) **Commercial** : Commercial activities refer to the retail sale of goods, i.e. small grocery shop.

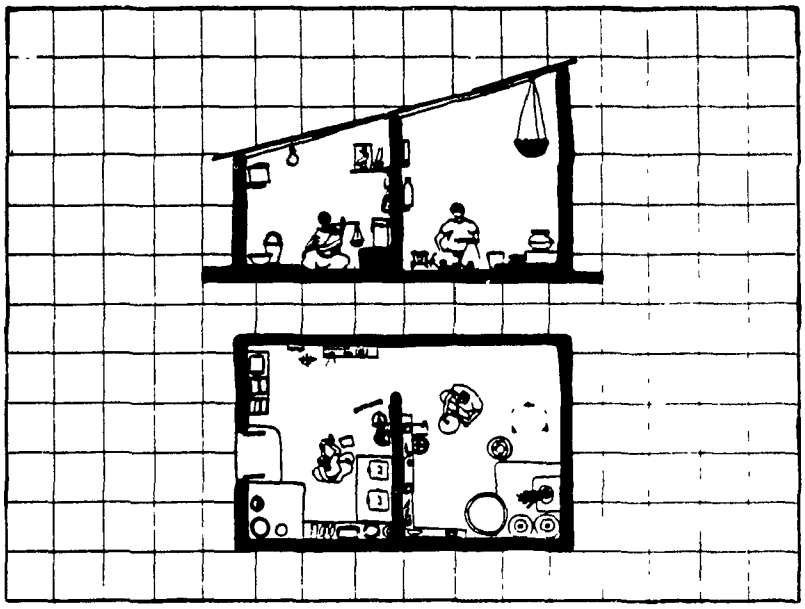


Fig.50

5.40 SUMMARY

Activities show a range of variation, not only in terms of the actual space in which they are contained, but also their location within the house and the building components they associate with.

Sleeping, cooking, and storage facilities are found in all the houses, while washing, worship, and work activities are found in some houses only. For example about a quarter of the houses (14 out of 52) have no form of washing or bathing area. In such cases people use the public facilities (stand pipes for water) provided by the government outside the house. While at the other extreme (in three cases) more than one form of washing area is provided in the same house.

The provision of lofts and separate storage rooms suggests the basic need for storage spaces within the house. This suggestion is supported by the fact there is no house without some form of storage device. On the contrary, most of the houses have used more than one form of storage device. These storage devices, by and large, make good use of the walls and upper spaces of the house rather than using floor space.

One third of the houses have provided some form of worship area, and in two thirds of those, part of the floor area (in an otherwise tight space) is designated for a shrine. This suggests the religious nature of the people and the importance of this activity in their lives.

Over a quarter of the houses have included work areas within the house demonstrating the multi-dimentional use of the space, and an extra role these houses need to play as a part of their economic suurvival strategies.

Having documented independently the various ways in which activities are accommodated, it is now important to examine their influence on built form. As indicated by the family scenarios (chapter-3) and the description of the activities, the houseform seems to be affected by: the locations of activities performed within the house, the building component that activity associates with, and the nature of spaces required for that activity. The following analysis compares location, building components, and nature of spaces, with various activities.

5.50 CORRELATIONS

Different activities have specific requirements in terms of where in the house, in what kind of spaces, and with what building components they could be performed well.

These locations with regard to their relative position from the access are classified as: front, rear, or inbetween. In case of houses with two rooms and more, first room from the entry point is considered as front and the last room as rear. While, in case of one room situations, front refers to the proximity to the access, and the rear as the farthest corner.

In case of one room as well as multi-access situations, it becomes difficult to determine the front or a rear of the house, therefore, to avoid this confusion, all the multi-access houses, and one room situations are omitted while analyzing the locations for activities.

Activities are compared with building components, such as: access, door (internal), openings (windows), street edge (house edge abutting street), floor, wall, and storage devices, relevent to each activity. Reference to access, door, opening, street edge and storage device is with regard to their proximity to the activity. The floor and wall are referred to for the additional treatments given to them.

The following tables look at different activities, one by one, as they occur in Shilnath Camp houses.

5.51 Cooking Activity vs. Houseform characteristics

	FRONT	INBETWEEN	REAR	TOTAL
ACTIVITY LOCATION	23	7	34	64
(not counting one rm/two acc)	3	6	31	40

	ENCLOSED	SEMI-CLOSED	SEMI-OPEN	OPEN	TOTAL
SPACE TYPES	57	2	0	5	64

	ACCESS	DOOR	FLOOR
BUILDING COMPONENTS	14	25	12

Table 6. Refer appendix-B p.171

Observations and Inferences

Cooking is considered to be a private activity, requiring some segregation and privacy for the women while cooking, and for the family while eating. More than three quarters (31 out of 40 = 78%, not counting two access, and one room situations) of the cooking areas are therefore situated in the rearmost spaces of the house.

Cooking areas are usually found in the enclosed spaces, but occasionally they are seen in open, and semi-enclosed spaces. Most of which are the additional cooking places.

About two thirds (14+25=39 out of 64 = 61%) of the cooking areas are in close proximity to either access (21%) or a door (40%). This allows for some ventilation, much needed for cooking activity. Proximity to doors and access also, provides visual contacts with the other areas.

One fifth (12 out of 64 = 19%) of the cooking places have elevated floor, for the reasons of defining territories, and cooking convinience.

Having looked at the cooking activity, the following table examines the religious activity.

5.52 Religious activities vs. Houseform characteristics

	FRONT	INBETWEEN	REAR	TOTAL
ACTIVITY LOCATION	10	3	5	18

SPACE TYPES	All in the enclosed space

	Wall	Floor
BUILDING COMPONENTS	5	13

Table 7. Refer appendix-B p.172

Obsevations and Inferences

All the worship areas are in the enclosed space, but more than a half (10 out of 18 = 56%) of them are located in the front making it accessible to the other members of the community.

Nearly a quarter (5 out of 18 = 28%) of the shrines have made use of the walls but the rest are on the floor.

The following table looks at the income generating activities.

5.53 Income generating activity vs. Houseform characteristics

	FRONT	INBETWEEN	REAR	TOTAL
ACTIVITY LOCATION	9	3	3	15

SPACE TYPES	All in the enclosed space.

	ACCESS	DOOR	OPENING	STORAGE-DEVICE
BUILDING COMPONENTS	8	3	6	11

Table 8. Refer appendix-B p.172

Observations and Inferences

Most of the income generating activities need dealings with the customers/clients, hence, in order to minimize out-sider's interference in the house to the least, and to increase the exposure to the passer by, these activities are located in the front portion of the houses, in almost two thirds (10 out of 16 = 63%) of the houses with work area.

All the work areas, occur in the enclosed spaces, but except for three, they are either close to the access, door, or a window. This occurance helps to provide an adequate illumination required for these activities.

All the work areas have storage devices adjacent to them in order to store the raw materials and/or the product.

Washing activity is analyzed in table 9.

Washing activity is is generally regarded as dirty, hence is preferred away from the main living area. Therefore, for this activity, it is more appropriate to examine their location with respect to the whole house instead of the rooms. Wash area's location, hence, is analyzed in terms of whether they are attached to, detached from, or within the house rather than their location in the front room or the rear.

5.54 Washing Activity vs. Physical characteristics

	DETACHED	ATTACHED	WITHIN		TOTAL
			near acc.	away acc.	
ACTIVITY LOCATION	7	13	16	10	46

	ENCLOSED	SEMI-ENCLOSED	SEMI-OPEN	OPEN	TOTAL
SPACE TYPES	25	6	4	11	46

	STREET	ACCESS
BUILDING COMPONENTS	All	34

Table 9. Refer appendix-B p.173

Obserevations and Inferences

Washing areas are the least desired inside the house. As a result close to a half (7+13=20 out of 46 = 43%) of them are located out side the house with a separate access. Even the houses where wash areas are within the house, they tend to be in close proximity to access (16 out of 26 = 62%), making their locations as exterior as possible. Overall, almost three quarters (34 out of 46 = 74%) of the wash areas are close to access, for the same reason. Nearly half (6+4+11=21 out of 46 = 46%) of the wash areas are located in the spaces other than the enclosed, confirming the tendancy of situating the wash areas outside of the rooms.

Wash areas require to be connected to the sewer drain, hence, all of them are adjunct to the street edge of the house.

5.55 Summary

Various activities and their actual functioning within the house have revealed that slum houses comply with the locational and spatial requirements of the daily activities.

LOCATION:

Cooking areas in the rear of the house for privacy, wet washing areas detached and in the exterior locations, worship areas in the front, and work-related activities in the front for the reasons of exposure and limited interferance, all seem to indicate that activities have a considerable influence, in determining the space usage of the house. Different parts of

the dwellings based on their location in relation to the street, access, and other rooms are assigned an appropriate function, as demanded by the particular activity.

SPACE:

Most of the activities occur in the enclosed spaces, but since they were observed only in a particular moment of time (as discussed in chapter 2.30), it is improper to assume that these functions do not take place in other types of spaces. Instead, regardless of their frequency of occurance, their presence in the other type of spaces is seen as an indicative of the preferences such as washing areas in open, semi-open/enclosed spaces.

BUILDING COMPONENTS:

Access in case of the washing activity; doors, openings, and the floor treatment for the cooking areas; access and the storage devices with the work-related activities; and wall surfaces to accommodate the shrines; all indicate at the space enhancement with the presence of these building components in order to perform well these activities.

Thus, influence of activities in terms of locational, and spatial preferences are apparent, and slum houses comply with them quite effectively.

Now, having identified the correlation between the attributes of houseform and households, as well as houseform and activities, this study proposes a hypothesis that, **houseform is largely influenced by the users in terms of their family make-up and the daily activities they perform.**

6.00 CONCLUSIONS

This thesis highlights the phenomenon of houseform variations rather than preaching housing solutions. Instead of attempting to provide any "ready to go" formula, this study concludes by posing some questions pertaining to prevailing housing policies and practices, using observations made in Shilnath Camp.

As this study clearly shows, slum houses exhibit a variety of houseform despite constraints of space, available land, and resources. This houseform variation does not limit itself to the facade, appearance, building technics, or construction materials, but also varies considerably in terms of its usage and spatial organization. People have combined or subdivided plots and houses in order to accomodate various family structures and their activities.

Houses in the Shilnath Camp have demonsrated that, a slum house may seem chaotic to the casual observer, but the inherent order and logic becomes apparent when the users are considered. The spatial order of the house is largely influenced by the users in terms of their family make-up and the daily activities they perform. The houseform variations have emerged in response to the tradeoffs made by the users with regard to their needs and priorities, founded on their socio-economic networks.

As observed in Shilnath Camp, sub-division and number of rooms in the houses, arrangement of these rooms, number of accesses these houses provide, circulation principle they follow, and the types of built and un-built spaces that exist, are all a function of various related and non-related families that live in there. In addition, various spaces within these houses menifest further, in terms of treatment and use of the building components (wall, roof and floor), based on the activities performed, their location within the house, and their relation with the street.

Thus, these strong correlations between users, space, and use of space, have illustrated that, **Housing is not simply a physical entity, but more a socio-cultural reality.** Provision of an additional access in some houses, regardless of their locational constraints, reinforces the statement, that physical constraints can be overcome in order to meet the social demands. This observation finds its implications in the issues concerning planning standards and housing delivery mechanism.

The planning standards need to recognize and reflect the realities of the urban poor. They ought to be realistic and contextual, responding to the specific needs and values of the beneficieries, rather than idealistic and universal, evolved out of standardized set of pre-conceived economic, consructional and aesthetic criteria. This requires better understanding of the local conditions and awareness for the socio-cultural attributes.

The user is an integral part of any house. They are the best judges of what is appropriate for themselves, and as a result houses cannot be seen in isolation of their inhabitants nor can users be ommited from the decision-making process. Housing ought to be a percieved as a "dialogue", in terms of working with the people, rather than a "monologue" in terms of simply "providing for" the houses based on the assumed needs. This changes the role of the housing agencies to facilitators instead of a providers. This can be only achieved by learning from the people themselves.

The lack of this understanding is evident in: impersonal character of mass housing and ready built dwellings; monotony and standardization, of plot size and shapes, in core housing and sites and services projects; and the loss of local control over decision-making due to policies laying restrictions regarding the adding, combining or sub-dividing the plots; as practiced today.

In this light there is ample scope for further study designed to gain insight into housing in the context of people. This study considered the built form with respect to only two socio-cultural factors (household combination and daily activities), while other studies may examine the influences of other factors such as user's occupation, ethnic background, income, education, health, religion, tenure status and so on.

In ways, similar to this, a whole organizational pattern of the settlements could be studied to obtain an insight into the functioning of a neighbourhood, a community mechanism, in its entierity.

This thesis studied a particular community in one neighbourhood. There is a room to verify the hypothesis put forward by this study, by taking broader sample base in various settlements through out the city. Similarly it could be tested for the slums in different regions, to verify the constants (correlation between the user and builtform), regardless of the regional forces. It will also determine whether these conclusions have broader applications.

These studies will help understand the design implications of the present housing norms and practices. However, looking at the diversity and range of variables, in effect every family scenario remains unique. Therefore it would be incorrect to make any attempt to devise a predictive model or a universal design formula, for low income shelter.

END NOTES

1. Turner, John F.C. Housing by People. London: A Marion Boyars Book, 1976, p.104.

2. Rapoport, Amos. "On the Culture Responsiveness of Architecture," Journal of Architectural Education, Vol-41,1987,No.1, p.12.

3. Rapoport Amos, Human Aspects of Urban Form. Oxford: Pergamon press, 1977, p.1.

4. Rapoport, Amos. The Mutual Interaction of People and Their Built Environment. Paris: Mouton Publishers, 1976, p.12.

5. Gulati, Padmini. "The Rise of Squatter Settlements: Roots, Responses and Current Solutions," in Willem Van Vliet, Elizabeth Hutman, Sylvia Fava, ed. Housing Needs and Policy Approaches. Durham: Duke University Press, 1985, p.209.

6. Planning Commission, Govt. of India. "Shelter for the Urban Poor and Slum Improvement," in Task Forces on Housing and Urban Development - Volume IV. New Delhi: September, 1983, p.11.

7. Ibid., p.11.

8. Gulati, 1985, p.208.

9. As quoted by Pandya. Yatin. SLUM AS AN ARTIFACT: The product of a way of life. Thesis at School of Architecture, Ahmedabad, India, 1985, p.8.

10. In his introduction by Percy, Johnson-Marshall. Cities in Evolution, by Sir Patrick Geddes, London: London Ernest Benn Ltd., 1968, p.vi.

11. Planning Commission, 1983, p.12.

12. Ibid., p.13.

13. Payne, Geoffery. Urban Housing in the Third World. Leonard Hill, London: 1977, p.65.

14. Sharma, S.K. Housing the Millions- The HUDCO Approach. New Delhi: 1987.

15. Murison Hamish and Plea John ed., Housing in Third World Countries: Perspectives on Policy and Practice. New york: St.Martins Press, 1980.

16. Gulati, 1985, p.206.

17. Peattie, Lisa. "Some Second Thoughts on Sites and Services," Habitat International, Vol-6, 1982, No.1/2, pp.131-139.

18. Planning Commission, 1983, p.75.

19. Turner, 1976, p.98.

20. In the writings of Payne, 1977; and Turner, 1972,1976.

21. In the writings of Turner, 1972,1976.

22. In the writings of Rapoport, 1969,1976,1987; and Fathy, 1973.

23. Rybczynski, Witold et al. How the Other Half Builds: Vol-1. Montreal: Centre for Minimum Cost housing, McGill university, 1984, p.1.

24. Payne, 1977, p.216.

25. Bhatt, Vikram, Mulkh Raj. "Towards a Housing Revolution," Open House, Vol-11, No.1, 1986, p.43.

26. Payne, 1977, p.194.

27. Turner, 1976, p.145.

28. Bhatt and MulkhRaj, 1986, p.43.

29. Ibid., p.45.

30. Gulati, 1985, p.215.

31. Peattie, 1982, p.135.

32. Andrade, Jorge. Dwelling Transformations: Santa Ursula, Mexico City. Thesis at Massachusetts Institute of Technology, Boston: 1981.

33. Payne, 1977, p.200.

34. Arora, Gurpreetsingh. Housing Mobility Process: A case study of low income households in Ahmedabad. Thesis at School of Architecture, ahmedabad, India: 1981, p.78.

35. El Diasty, Ramy. Squatter Settlements and Their Physical Improvement in Developing Countries. Thesis at McGill University, Montreal, Canada: 1976, pp. 14-15.

36. Payne, 1977, p.180.

37. Habraken, John. "Three R's for Housing," Open House International, Vol-10, No.4, 1985, p.57.

38. Turner, John F.C., "Housing as a Verb", "The Meaning of Autonomy," in Robert Fichter, John F.C.Turner, ed. Freedom to Build. New York: The Macmillan Company, 1972, p.154.

39. Ibid., p.174.

40. Fathy, Hasan. Architecture for the Poor. Chicago: The University of Chicago Press, 1973, p.32.

41. Wegelin, E. "From Building to Enabling Housing Strategies in Asia: Institutional problems," in R.J.Skinner et al. ed. People, Poverty and Shelter. New York: Mathuen & Co. Ltd., 1983, p.110.

42. Turner, 1972, p.241.

43. Tyrwhitt J., ed. Patrick Geddes in India. Land Humpshires: 1947, pp. 24-31; as quoted by Payne, 1977, p.203.

44. Turner, 1972, p.241.

45. Ibid., p.171.

46. Quotation from a pamphlet with the title- What to do. Written by Patrick Geddes in 1912; and quoted by Turner in Ward ed. Self-help Housing - A Critique. London: Mansell Publishing Ltd., 1982, p.105.

47. Turner, 1976, p.100.

48. Turner, 1972, p.243.

49. Rapoport, 1987, p.13.

50. Turner, 1972, p.154.

51. Habraken, 1985.

52. Habraken, John. The Three Ways of Seeing the Built Environment. Audio-Visual, Massachusetts Institute of Technology, Boston: 1982.

53. Turner, 1976, p.141.

54. Olivegren, Johannes. "Towards More Human Housing," Ekistics, Vol-42, No.251, 1976, p.200.

55. Rapoport, 1987, pp.11-12.

56. Rapoport, Amos. Houseform and Culture. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1969, p.17; and Turner, 1972, p.159.

57. Turner, as quoted by Ward, 1982, p.58.

58. Fathy, 1973, p.27.

59. Deetz, 1968, as quoted by Rapoport, 1977.

60. Fathy, 1973, p.33.

61. Abrams, Charles. Man's Struggle for Shelter - in an urbanizing world. New York: Massachusetts Institute of Technology Press, 1964, p.vi.

62. Rapoport, 1969, p.13.

63. Rapoport, 1977, p.3.

64. Patel, Shashikant. Constants in Dwellings. Thesis at School of Architecture, Ahmedabad, India.

65. Pandya, 1985.

66. Ibid.

67. Bhargava,1981, p.197, as quoted by Mellin, Robert. Site and Services Project Case Study: Ahmedabad, India. Thesis at McGill University, Montreal, Canada: 1984, p.41.

68. Rapoport, 1969, p.48.

69. Rapoport,1977, p.100; as quoted by Jan Turkstra and Mark Wolffe. Madras - Housing and People. Thesis at the University of Technology, Delft: 1985, p.33.

70. Rapoport, 1987, p.41.

71. Rapoport, 1977, p.3.

72. Ibid, p.3.

73. Ibid, p.1.

74. Spiegel, Murray R. Statistics. U.K: McGraw-Hill Book Company (UK) Ltd., 1972, p.188.

75. Mills Edwin and Becker Charles. Studies in Indian Urban Development. Oxford University Press for worldbank, 1986, pp.75-88.

76. Rybczynski et al., 1986, Vol-2, p.20.

77. Ibid., p.25.

78. Ibid., p.33.

79. Ibid., p.25.

80. Rybczynski et al., 1984, vol-1, pp.3-20.

81. Turkstra and Wolffe, 1985, p.vi.

82. Census of India. "Series 10- Madhya Pradesh, part IV, Housing Report and Tables", India: 1981

83. Ibid.

BIBLIOGRAPHY

Abrams, Charles. Man'Struggle for Shelter- in an urbanizing world. New York: Massachusetts institute of technology Press, 1964.

Andrade, Jorge. Dwelling Transformations: Santa Ursula, Mexico City. Thesis at Massachusetts Institute of technology, Boston: 1981.

Arora, Gurpreetsingh. Housing Mobility Process: A case study of low income households in Ahmedabad. Thesis at School of Architecture, Ahmedabad, India: 1981.

Bhargava, Gopal., ed. Urban Problems and Policy Perspectives. New Delhi: Abhinav Prakashan, 1981.

Bhatt, Vikram, Mulkh Raj. "Towards a Housing Revolution," Open House, Vol-11, No. 1, 1986.

Blitz. Special issue on "Housing and Homeless in India," January 23,1988, Volume XLVIII: No.4.

Census of India. "Series 10 - Madhya Pradesh, Part IV, Housing report and Tables", India: 1981.

El Diasty, Ramy. Squatter Settlements and Their Physical Improvement in Developing Countries. Thesis at McGill University, Montreal, Canada: 1976.

Fathy, Hasan. Architecture for the Poor. Chicago: The University of Chicago Press, 1973.

Ferguson, George. Statistical Analysis in Psychology and Education. U.S.A: McGraw-Hill Inc., 1966.

Geddes, Patrick. Cities in Evolution. 1915. With introduction by Percy Johnson-Marshall, London: London Ernest Benn Ltd., 1968.

Geddes, Patrick. What to Do. A pamphlet, 1912.

Gulati, Padmini. "The Rise of Squatter Settlements: Roots, Responses and Current Solutions," in Willem Van Vliet, Elizabeth Hutman, Sylvia Fava, ed. Housing Needs and Policy Approaches. Durham: Duke University Press, 1985.

Gupta, Devendra. "Urban Housing in India," Worldbank Staff Working Papers. Washington: Worldbank, Paper no.730, 1985.

Habraken, John. Variations. Massachusetts Institute of Technology Press, 1976.

Habraken, John. The Three Ways of Seeing the Built Environment. Audio-Visual, Massachusetts Institute of Technology Press, 1982.

Habraken, John. "Three R's for Housing," Open House International, Vol-10, No.4, 1985.

Hashmi, Shafik. The Slums of Karachi - A case study. Lahore: Aziz Publishers, 1975.

Lapierre, Dominique. City of Joy. New York: Doubleday and Co., Inc., 1985.

Mellin, Robert. Site and Services Project Case Study: Ahmedabad, India. Thesis at McGill University, Montreal, Canada: 1984.

Mills, Edwin, Becker, Charles. Studies in Indian Urban Development. Oxford press, for World Bank, 1986.

Morse, Edward. Japanese Homes and Their Surroundings. Japan: Charles E. Tuttle Company, 1984.

Murison, Hamish, Plea, John., ed. Housing in Third World Countries: Perspective on Policy and Practice. New York: St. Martins Press, 1980.

Olivegren, Johannes. "Towards More Human Housing," Ekistics, Vol-42, No.251, Oct. 1976.

Om Kumar. Sites and Services in Urban Housing in India. New Delhi: Ess Ess Publications, 1987.

Pandya, Yatin. SLUM AS AN ARTIFACT: The product of a way of life. Thesis at School of Architecture, Ahmedabad, India: 1985.

Patel, Shashikant. Constants in Dwellings. Thesis at School of Architecture, Ahmedabad, India.

Payne, Geoffery. Urban Housing in the Third World. London: Leonard Hill, 1977.

Peattie, Lisa. "Some Second Thoughts on Sites and Services," Habitat International, Vol-6, 1982, No.1/2, 131-139.

Peattie, Lisa. "Realistic Planning and Qualitative Research," Habitat International, Vol-7, 1983, No.5/6, 227-234.

Planning Commission, Govt. of India. "Shelter for the Urban Poor and Slum Improvement," in Task Forces on Housing and Urban Development - Volume IV. New Delhi: September, 1983.

Pons, Valdo et al. "Patterns of Space and Human activity in an Unplanned Settlement," Montreal: Minimum cost housing studies, McGill University, Research paper no.11, March 1988.

Rapoport, Amos. House Form and Culture. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1969.

Rapoport, Amos. The Mutual Interaction of People and Their Built Environment. The Havage - Paris: Mouton Publishers, 1976.

Rapoport, Amos. Human Aspects of Urban Form. Oxford: Pergamon Press, 1977.

Rapoport, Amos. "On the Culture Responsiveness of Architecture," Journal of Architectural Education, Vol-41,1987,No.1,10-15.

Rybczynski, Witold et al. How the Other Half Builds: Vol 1,2. Montreal: Centre for Minimum Cost Housing, McGill University, 1984,1986.

Sharma, S.K. Housing the Millions - The Hudco Approach. New Delhi: 1987.

Spiegel, Murray R. Statistics. U.K.: McGraw-Hill Book Company (UK) Ltd., 1972.

The Times of India. The Republic Day Special Issue, January, 1988.

Turkstra, Jan, Wolffe, Mark. Madras - Housing and People: a study of housing options available to low-income groups and the role of the private sector. Thesis at the University of Technology, Delft: 1985.

Turner, John F.C., "Housing as a Verb", "The Meaning of Autonomy," in Robert Fichter, John F.C.Turner, ed. Freedom to Build. New York: The Macmillan Company,1972.

Turner, John F.C. Housing by People. London: A Marion Boyars Book, 1976.

Turner, John F.C. "Mass Housing and User Participation," Open House International. Vol-3, No.3, 1978.

Tyrwhitt, J., ed. Patrick Geddes in India. Land Hampshires: 1947.

Ward, Peter M., ed. Self-Help housing - A Critique. London: Mansell Publishing Ltd., 1982.

Wegelin, E. "From Building to Enabling Housing Strategies in Asia: Institutional problems," in R.J.Skinner et.al.ed. People, Poverty and Shelter. New York: Mathuen & Co. Ltd., 1983.

GLOSSARY

Agarbatti: Incenced sticks, generally used for worship).

Beedi: Hand-rolled Indian cigarettes.

Chapati: Indian bread.

Durri: Mat/Carpet.

Gokh: Small indented space in the wall.

Jaali: Steel, concrete or wooden grill.

Kaccha: Raw/weak/provisional.

Koondi: small tank-like container (masonary construction).

Matka: Earthen or metal jar generally used to store water.

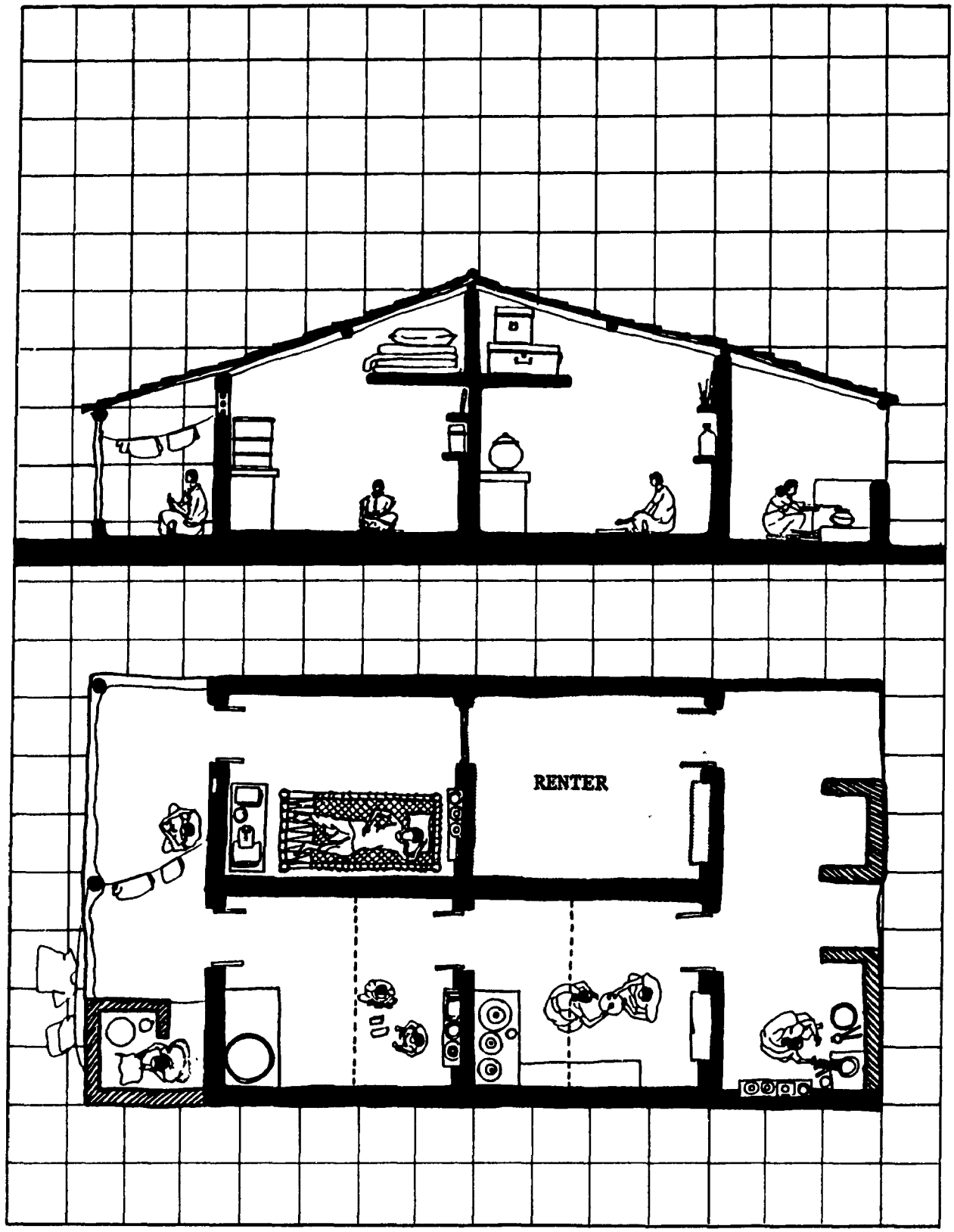
Naala: Small branch of a river.

Patta: Lease hold right.

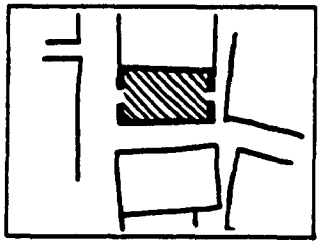
Pooja: Worship.

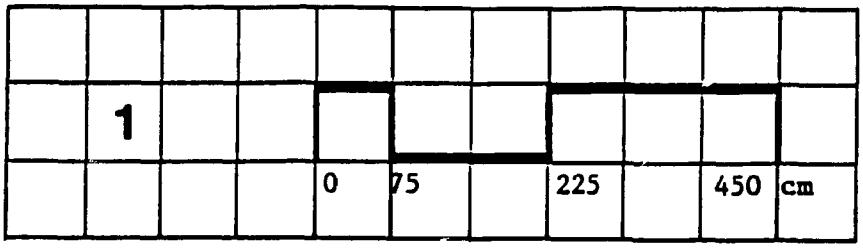
Pucca: Permanant/strong/substantial.

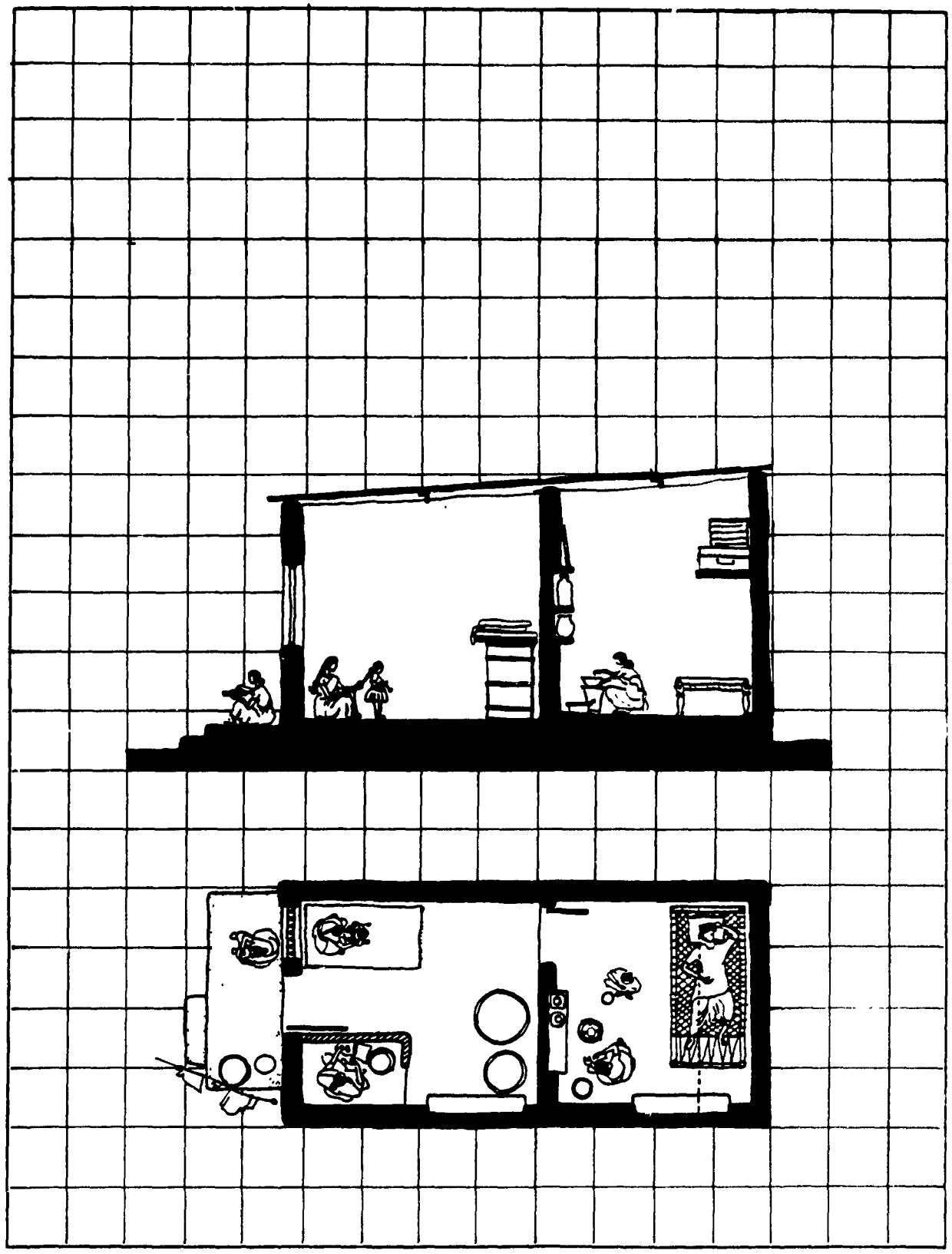
APPENDIX - A: House Plans



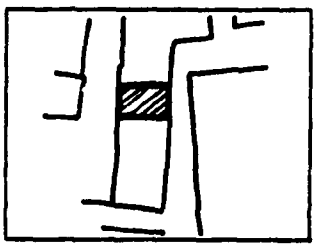
OWNER, WIFE, 3 SONS, 1 DAUGHTER-IN-LAW, 2 GRANDCHILDREN, RENTER (family of 3)

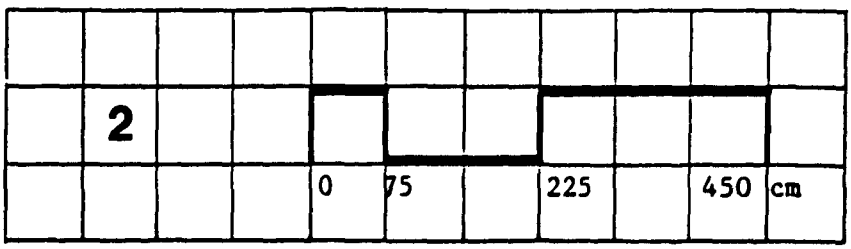


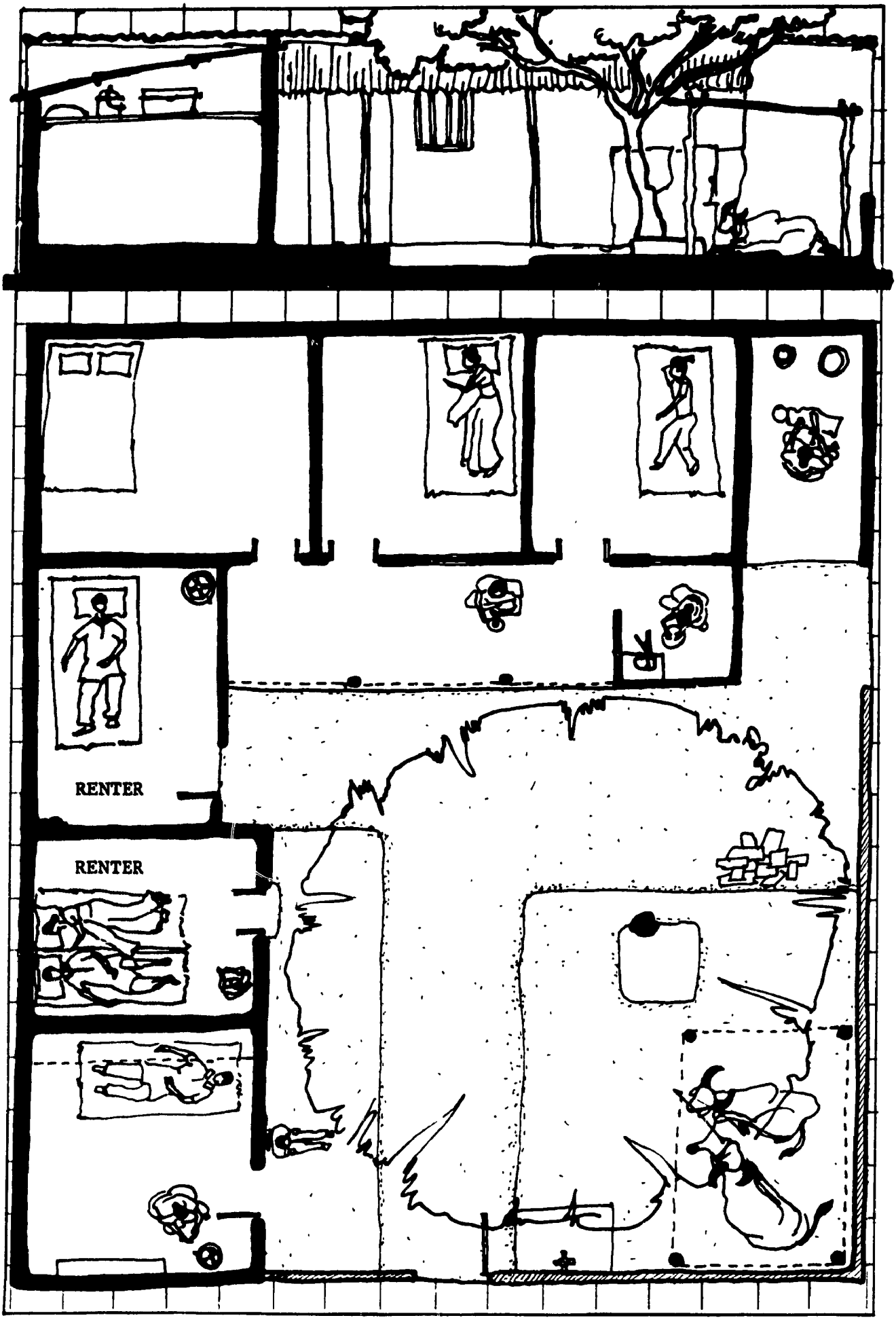


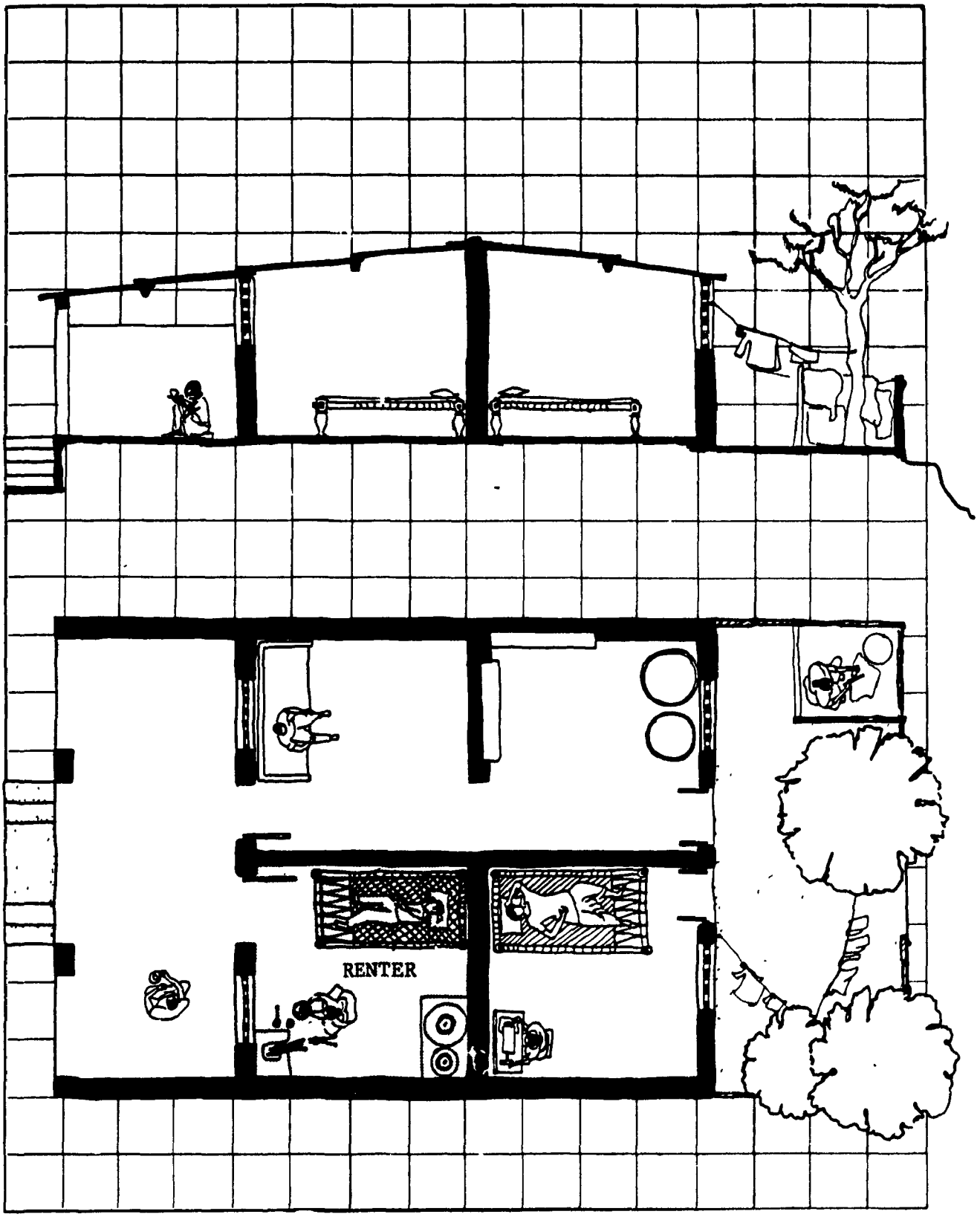


OWNER, WIFE, 4 DAUGHTERS, 1 SON. (7 Persons)

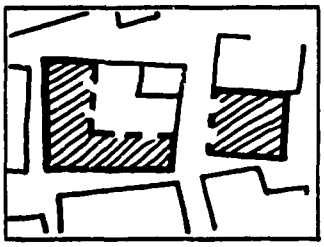


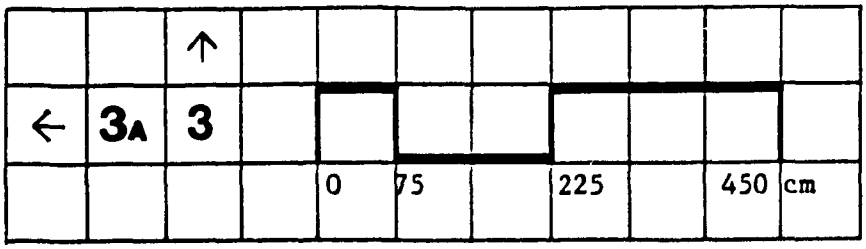


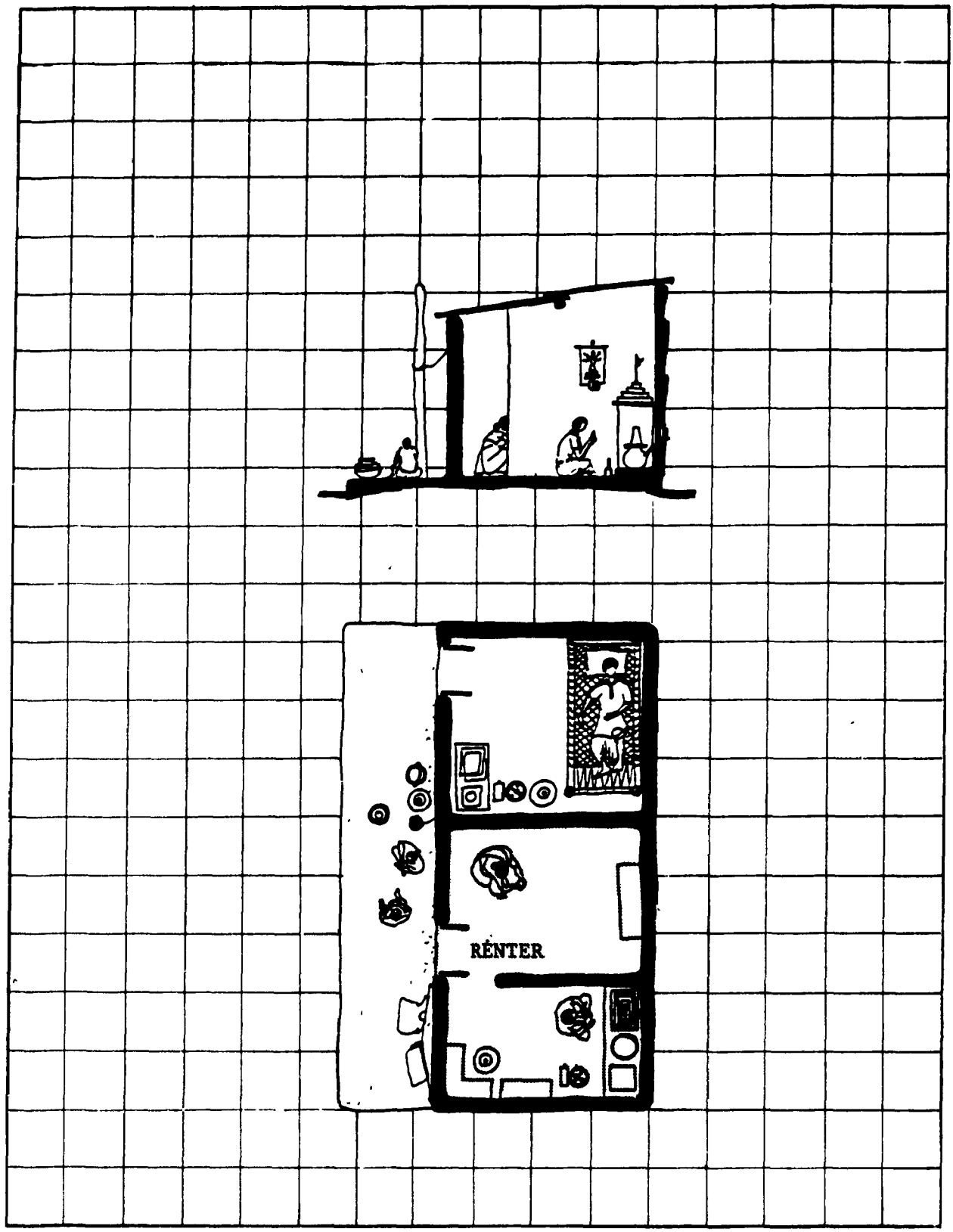

RENTER
RENTER



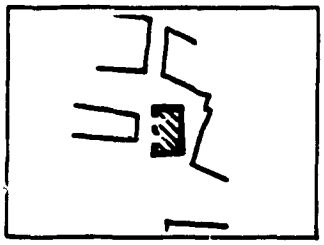
OWNER,5 SONS,5 DAUGHTERS-IN-LAW,DAUGHTER,3 GRANDCHILDREN, 3 RENTERS (1+3+4)





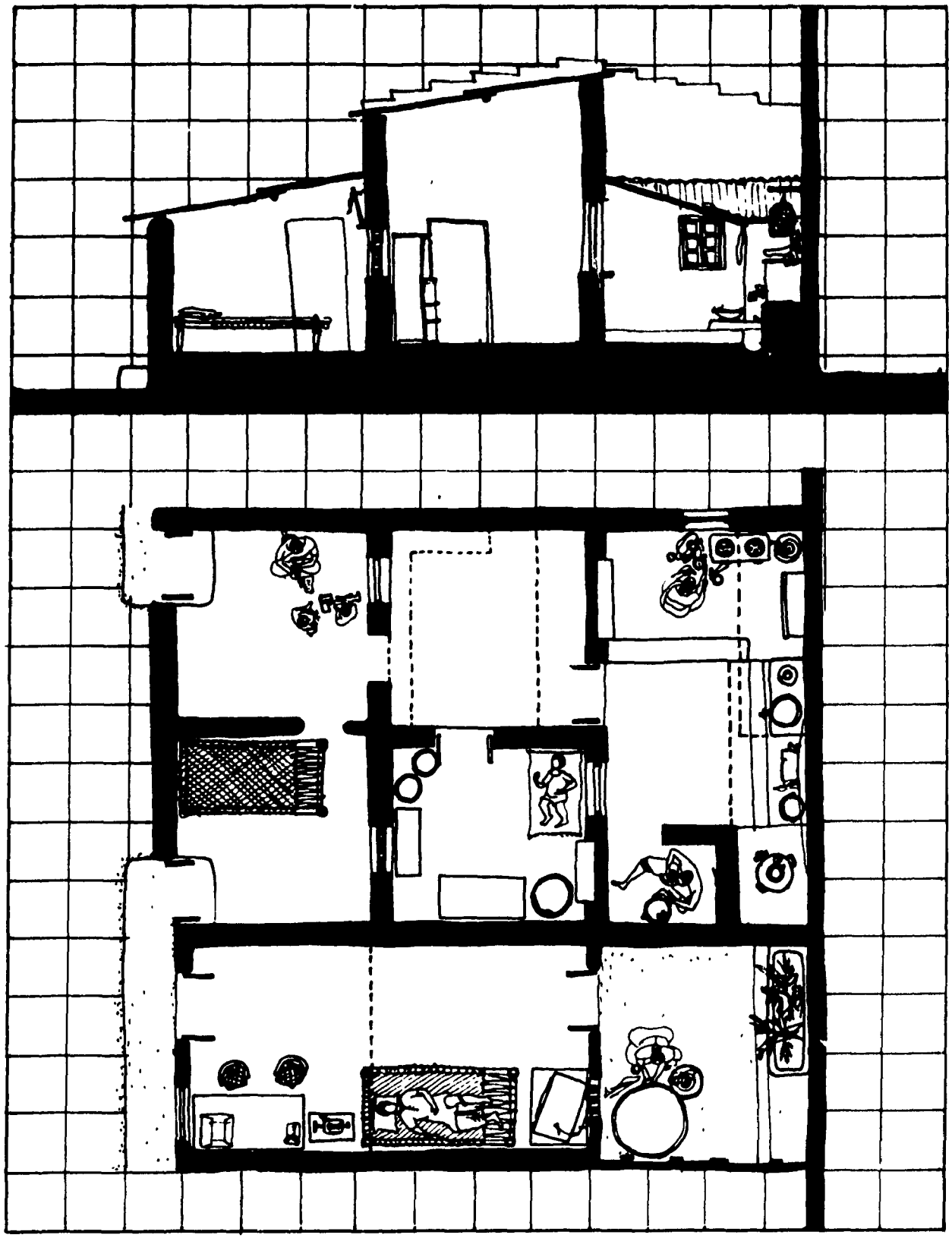


OWNER, 1 RENTER (family of 4)

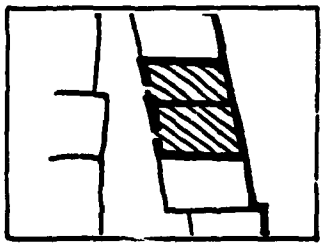


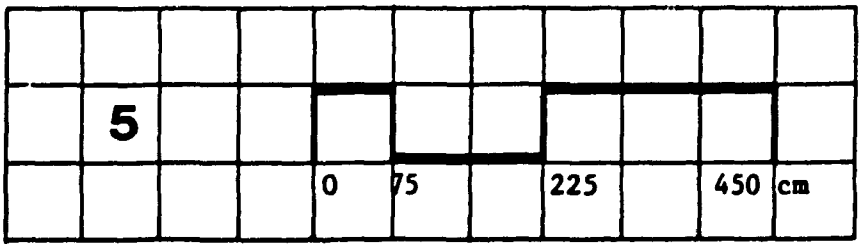
4

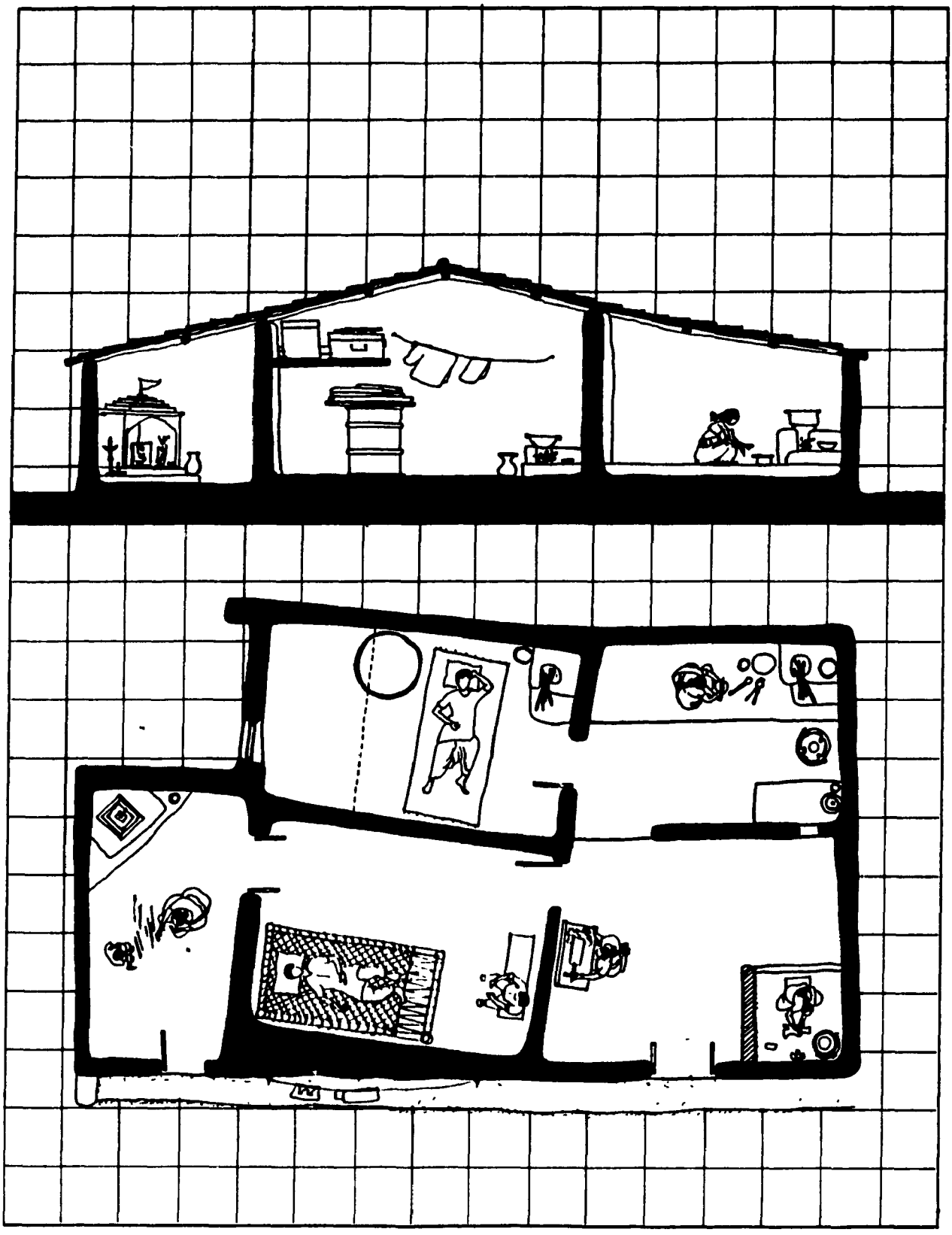
0 75 225 450 cm



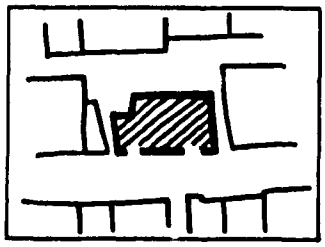
OWNER, WIFE, 1 SON, 1 DAUGHTER-IN-LAW, 4 GRANDCHILDREN, 1 DAUGHTER (9 Person)

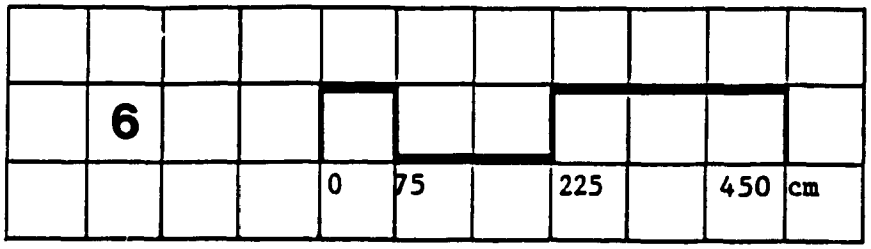


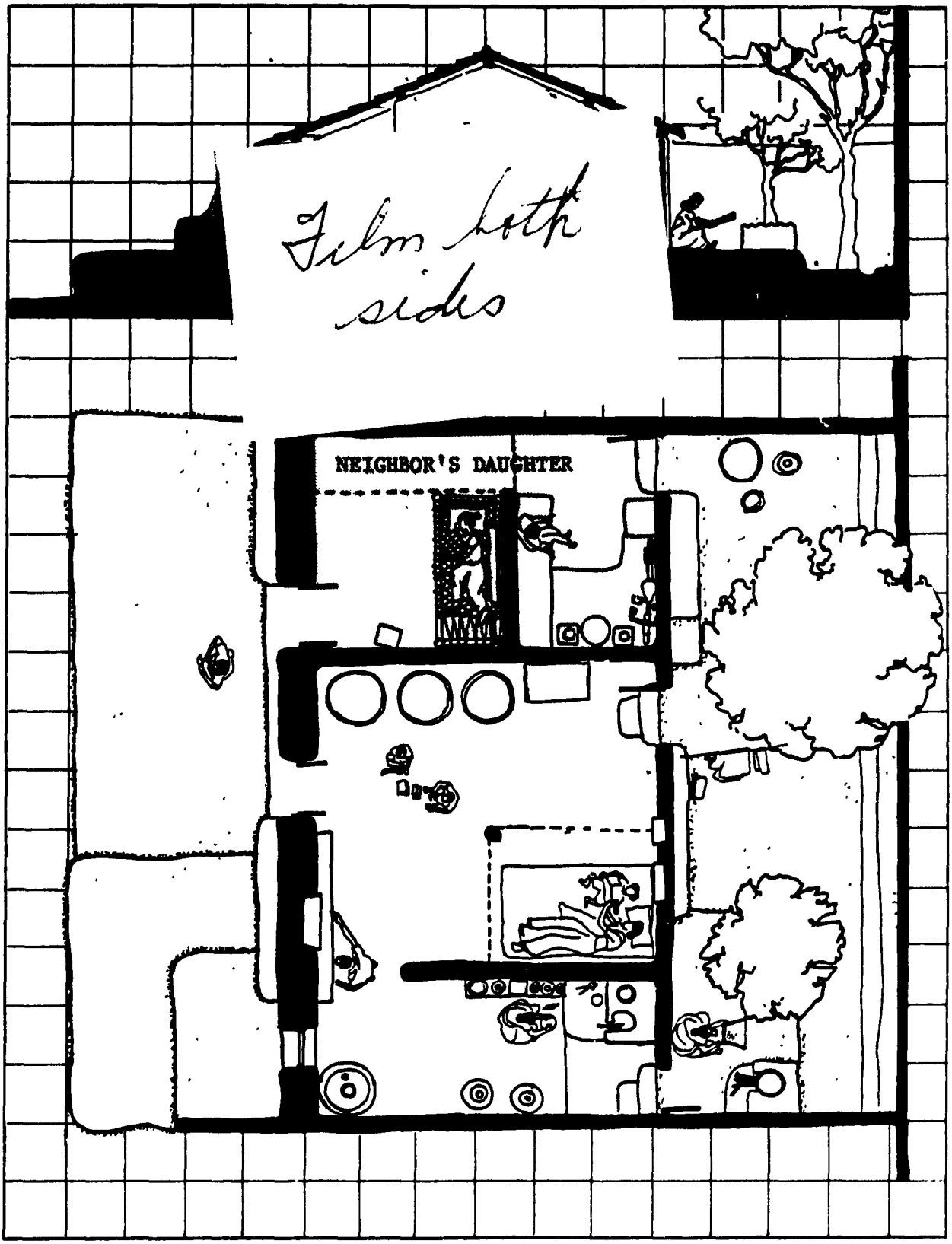




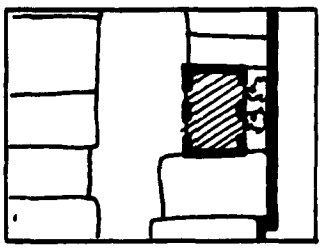
OWNER, WIFE, 4 CHILDREN (2sons, 2daughters), PARENTS. (8 Persons)





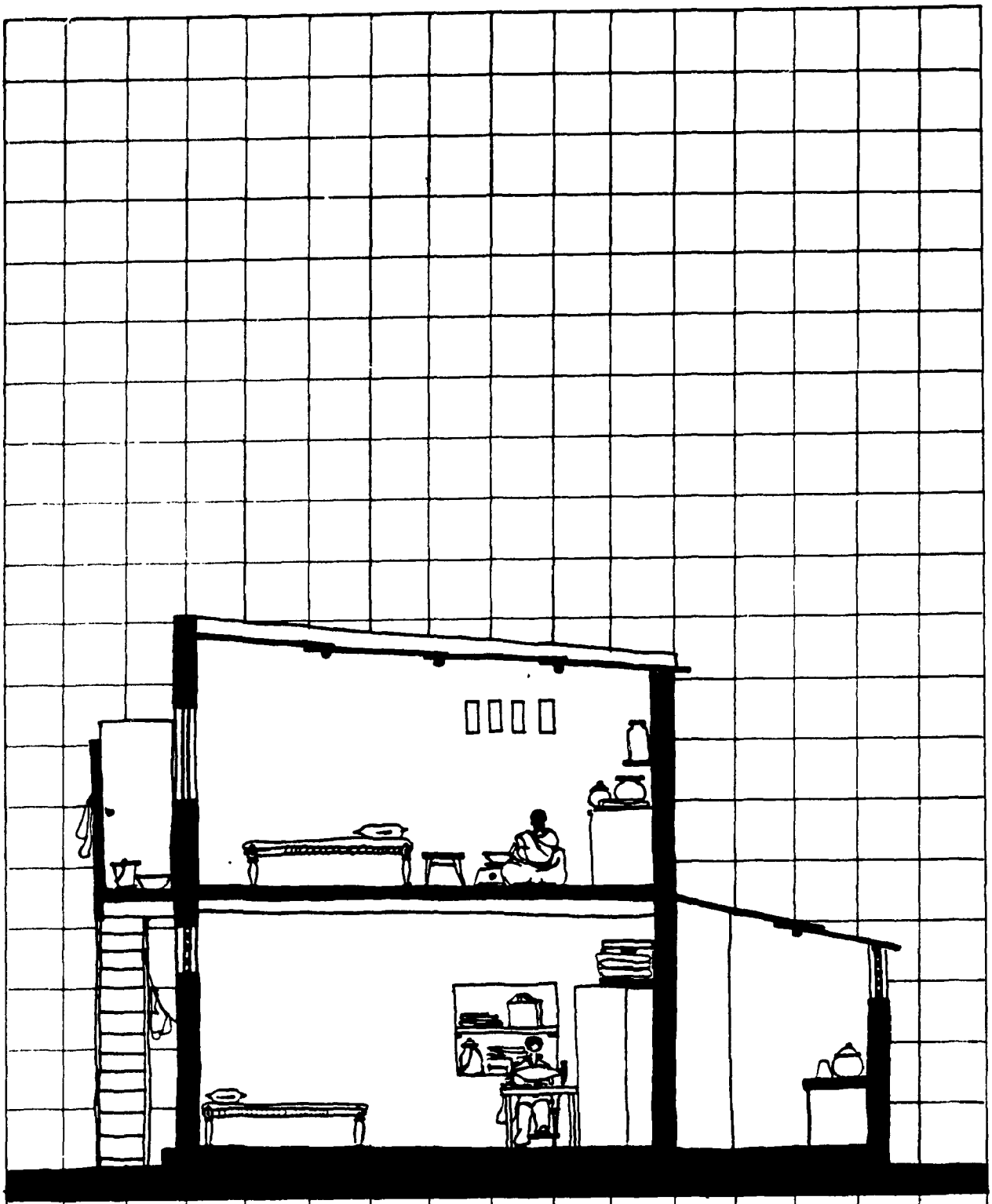


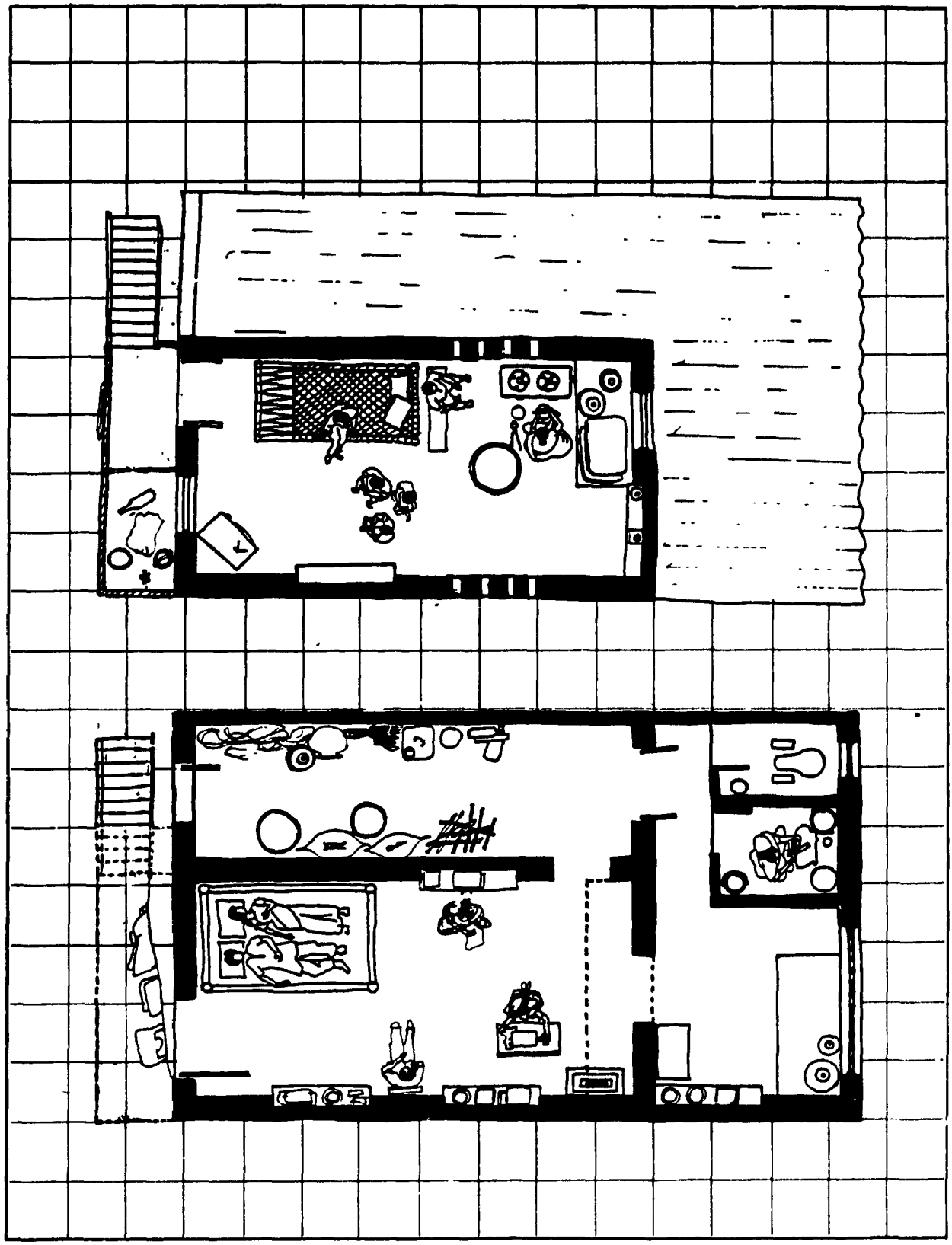
OWNER, SON, DAUGHTER-IN-LAW, 4 GRANDCHILDREN, WIFE, NEIGHBOR'S DAUGHTER+Husb.



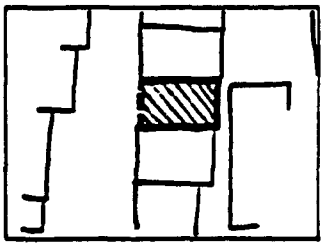
7

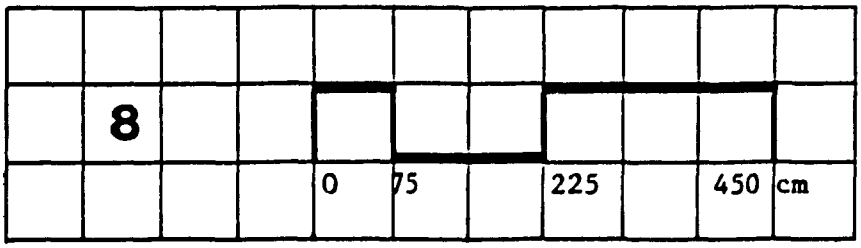
0 75 225 450 cm

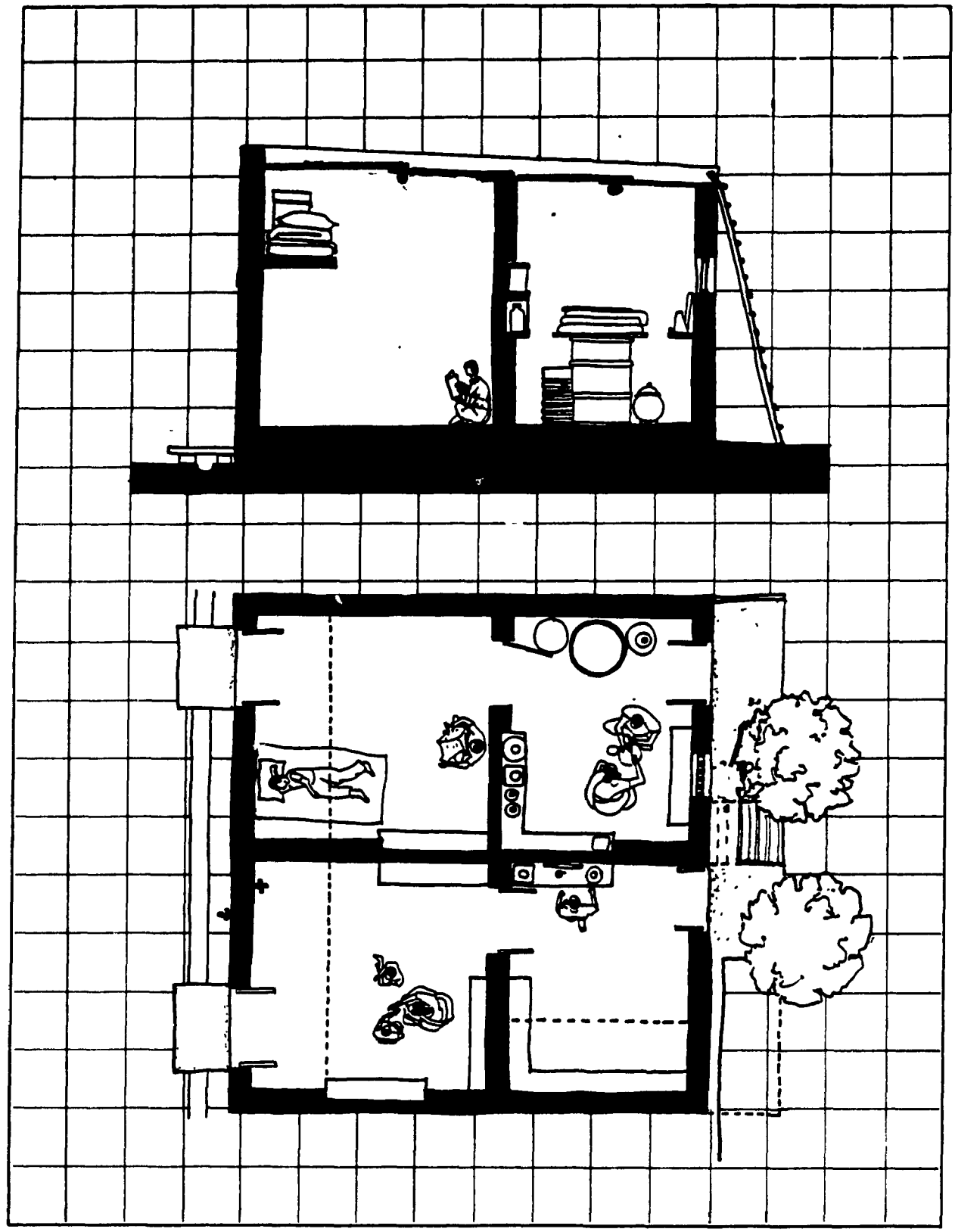




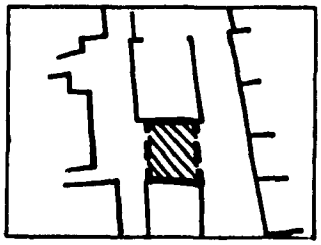
OWNER, WIFE, 3 SONS, DAUGHTER-IN-LAW, 3 DAUGHTERS, 3 GRANDCHILDREN (12 Pers.)

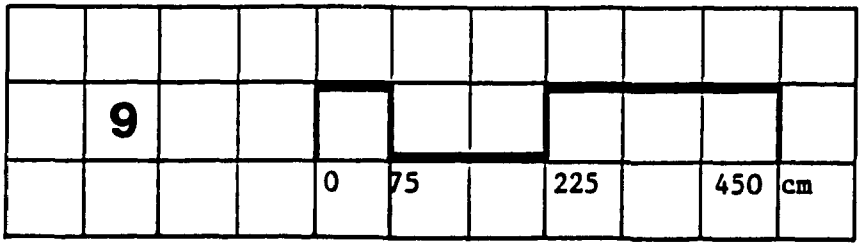


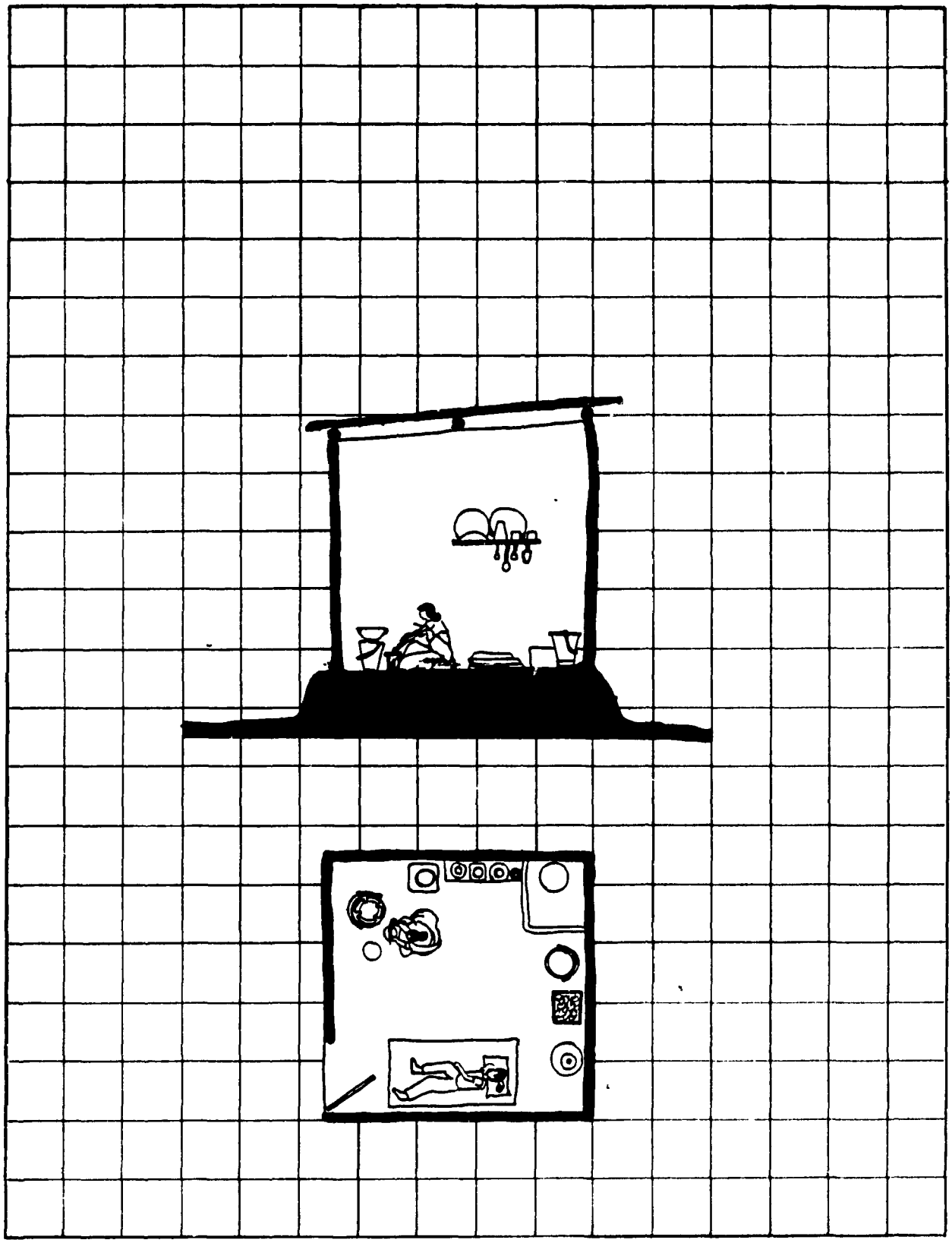




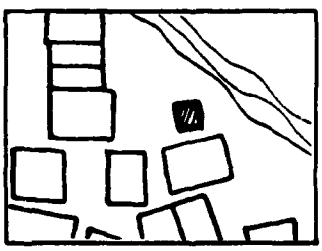
OWNER, WIFE, 3 SONS, DAUGHTER-IN-LAW, 2 GRANDCHILDREN. (8 Persons)

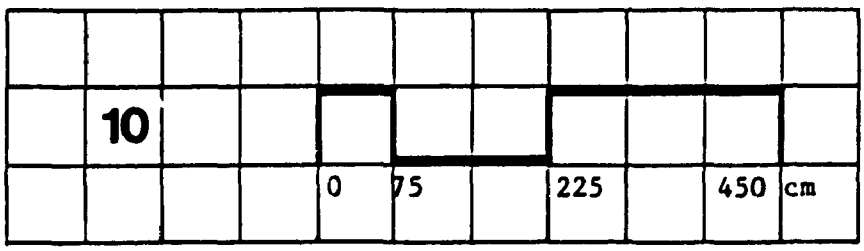


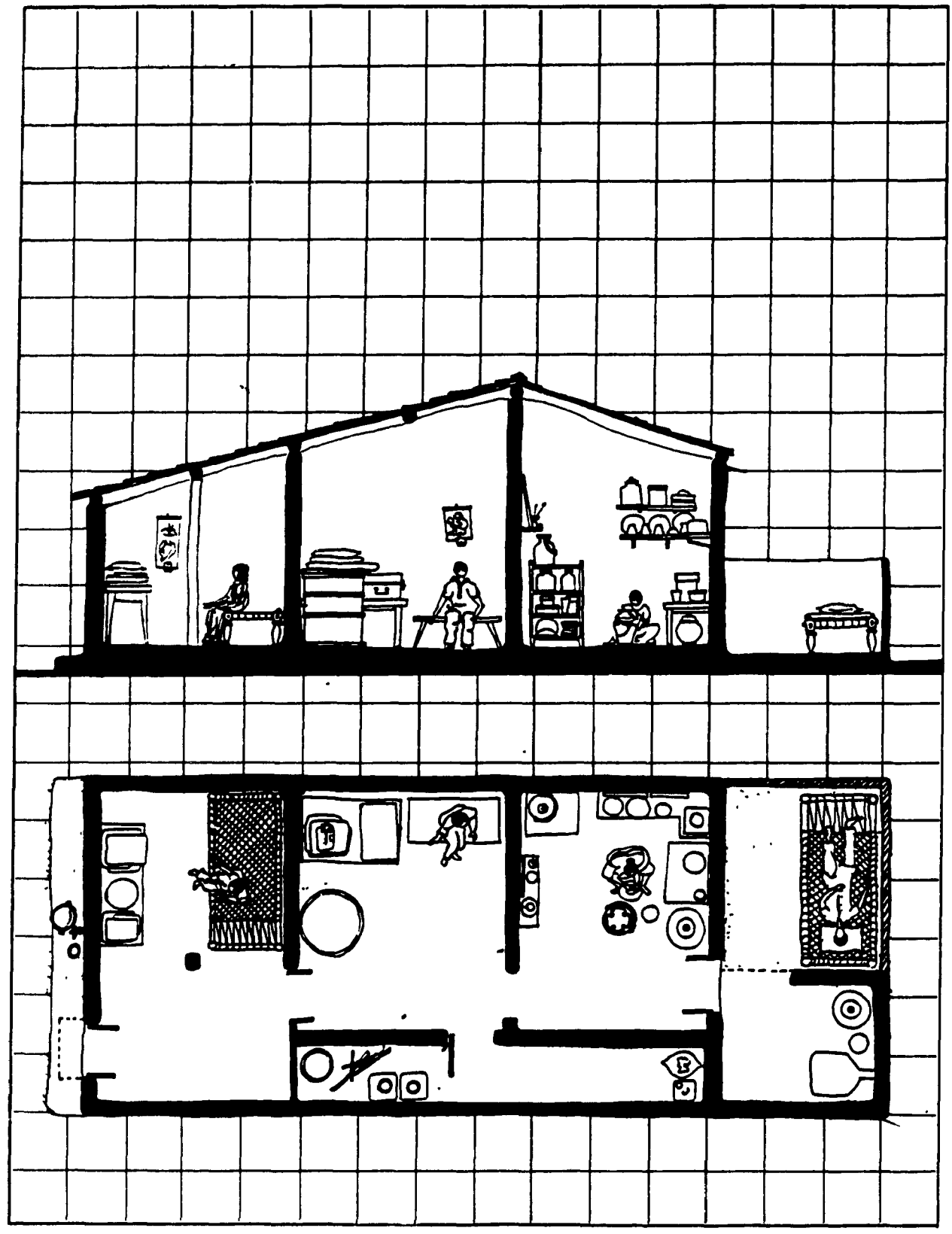




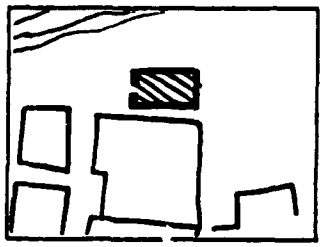
OWNER, WIFE. (2 Persons)

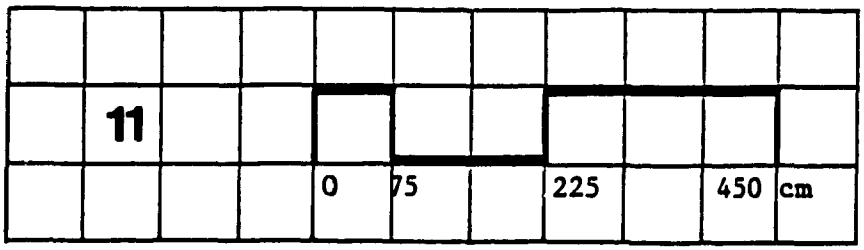


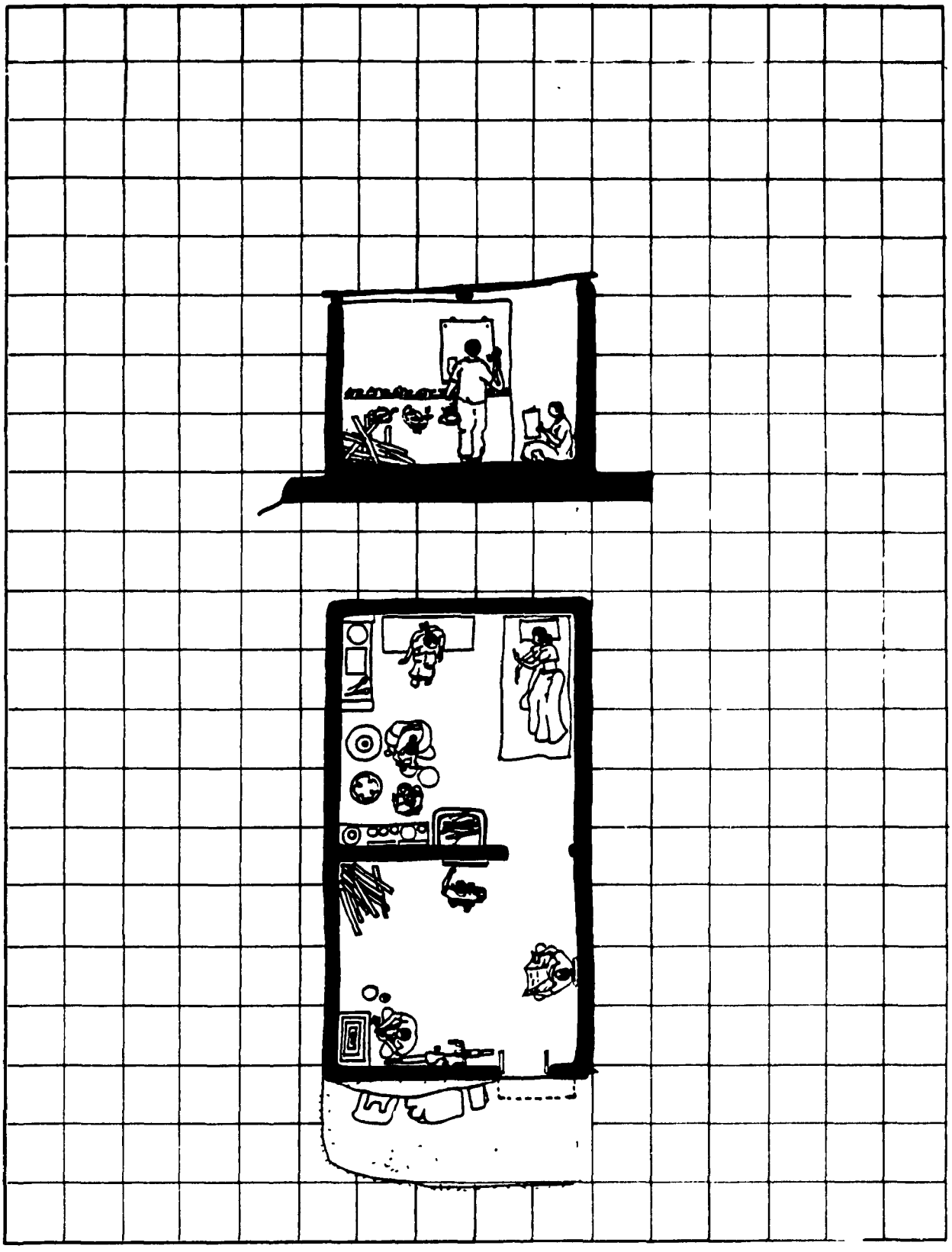




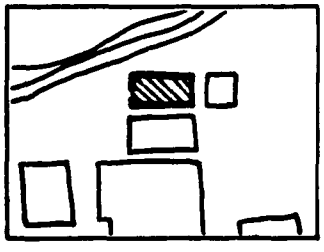
OWNER, 2 SONS, DAUGHTER-IN-LAW. (4 Persons)





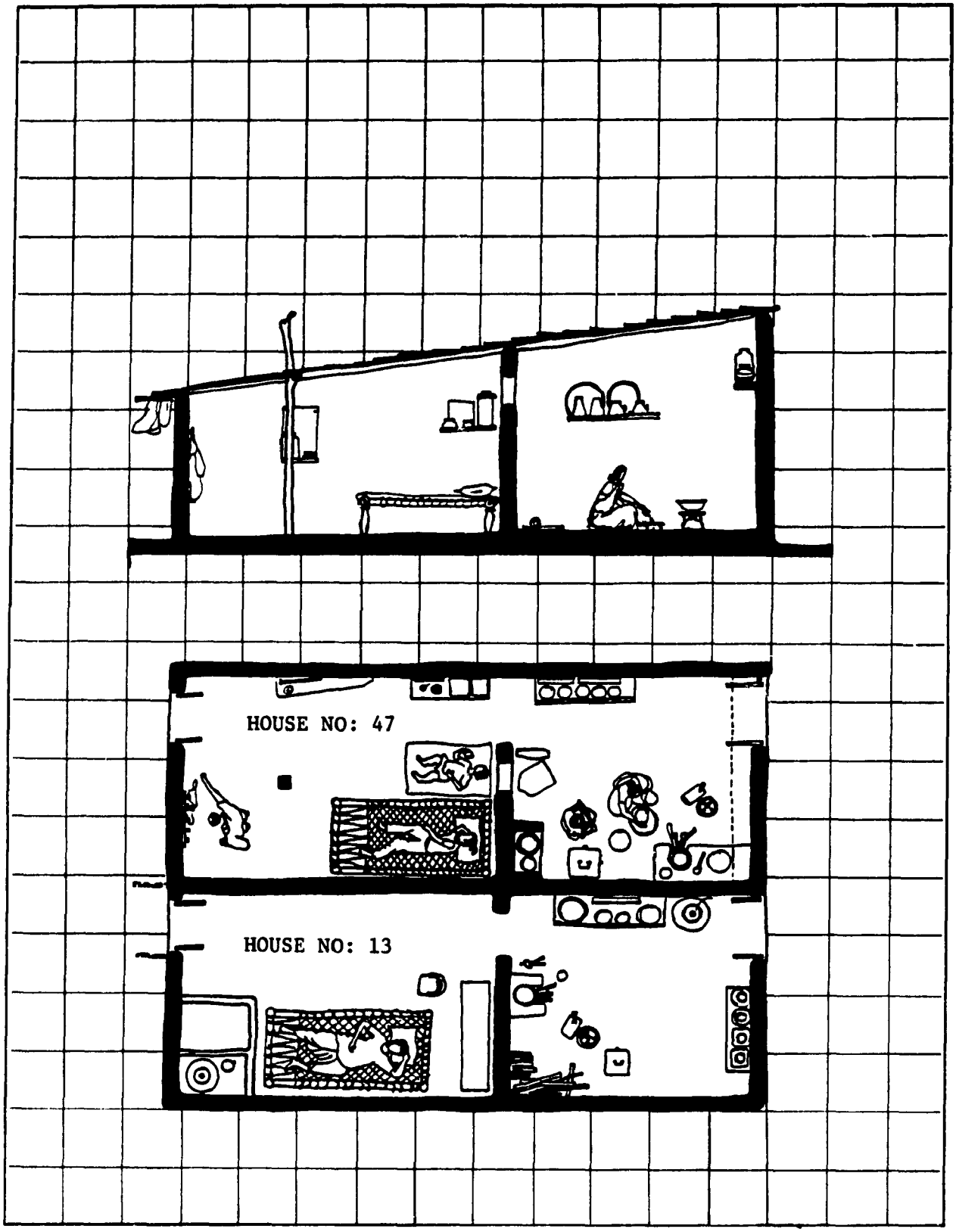


OWNER, WIFE, MOTHER, 2 SONS, 2 DAUGHTERS. (7 Persons)

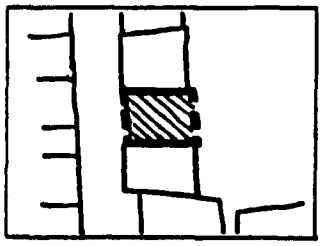


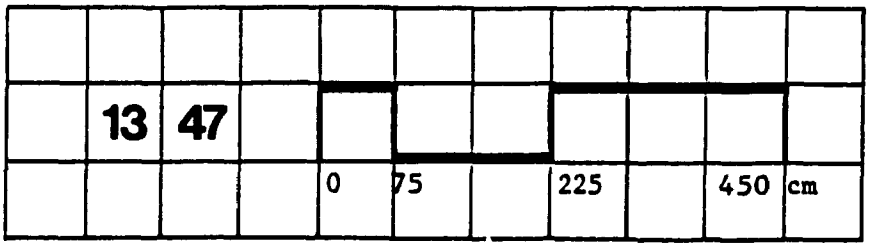
12

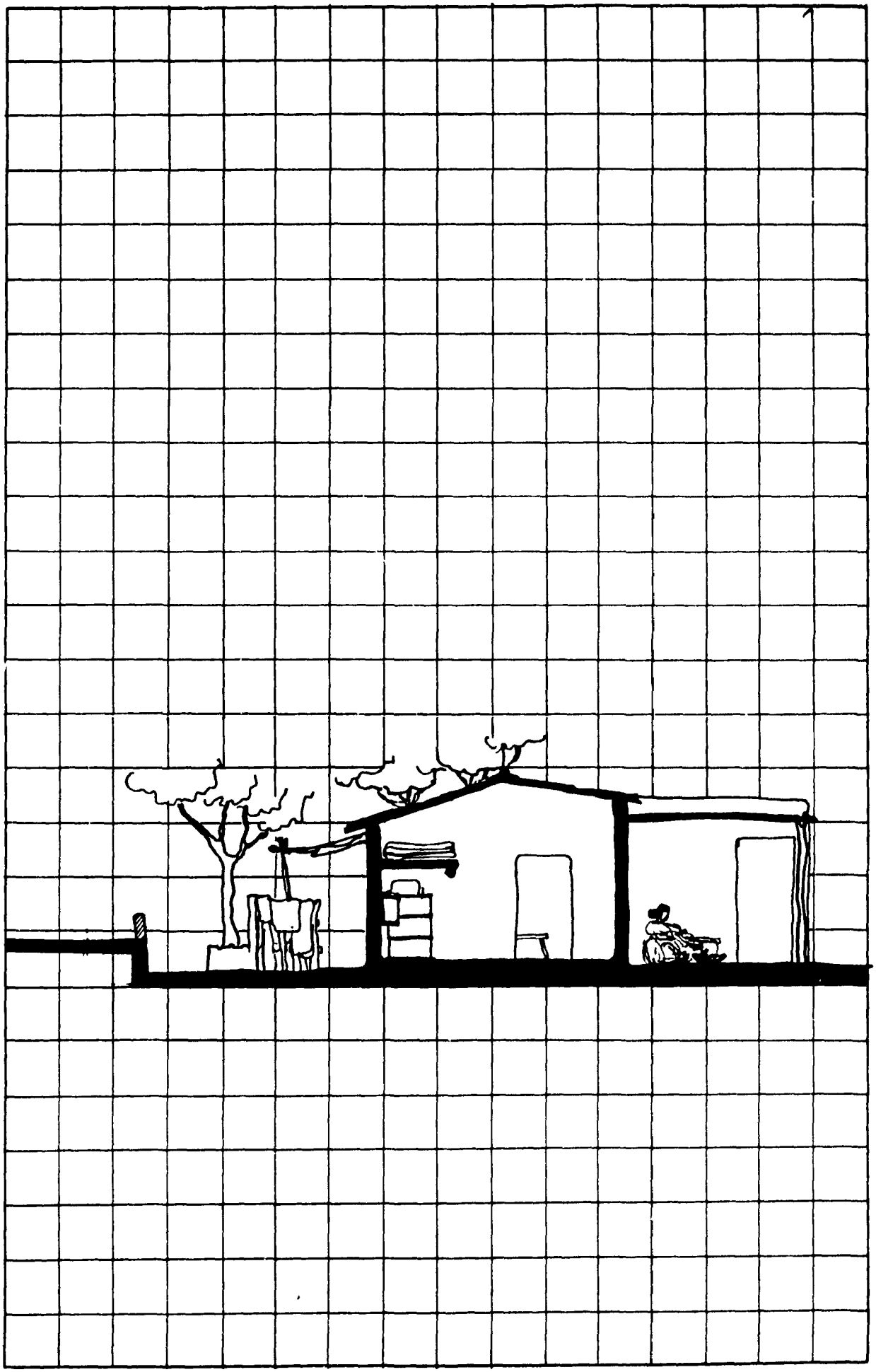
0 75 225 450 cm

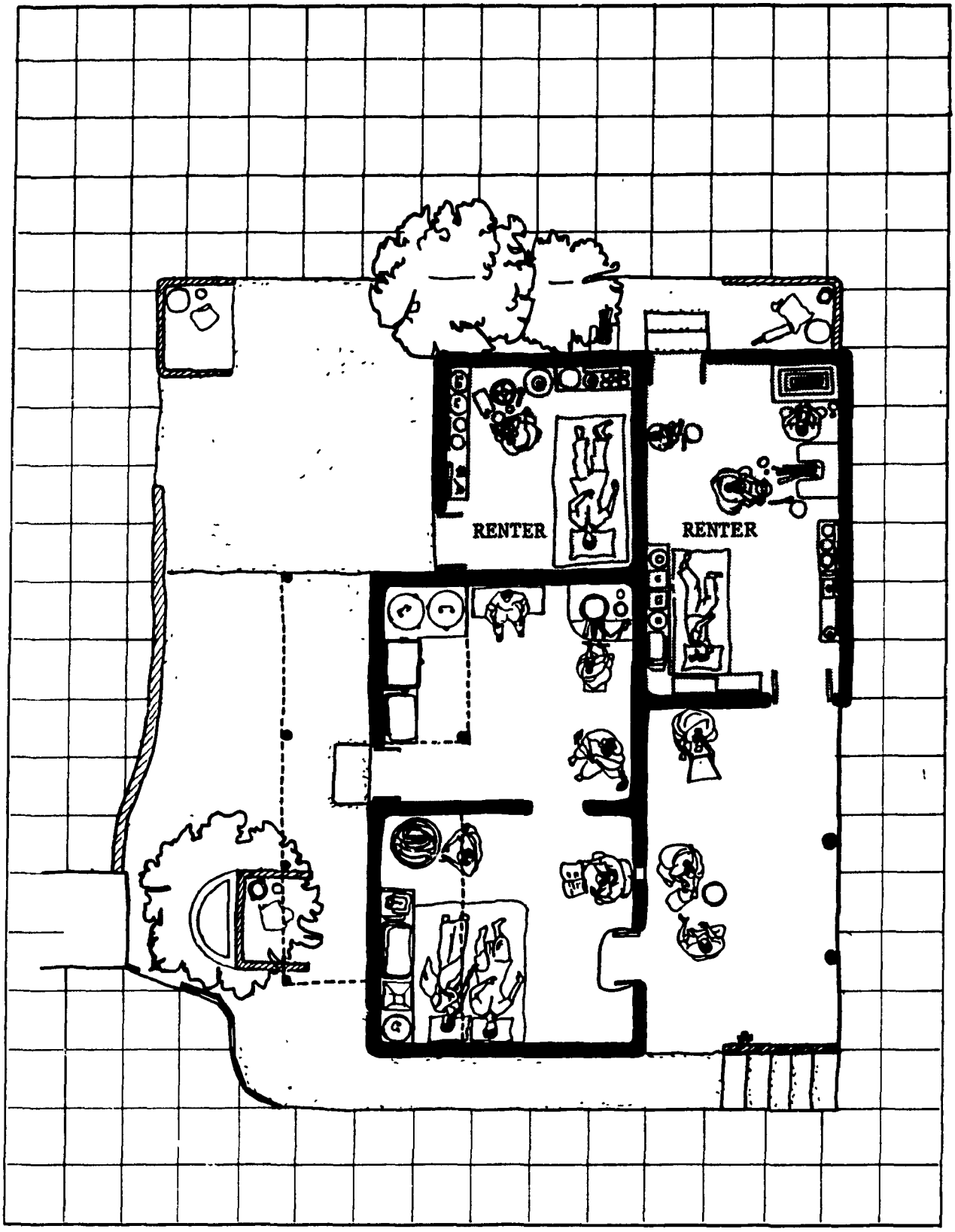


HOUSE:13) OWNER/ HOUSE NO:47) RENTER, 2 SONS, DAUGHTER-IN-LAW, GRANDCHILD

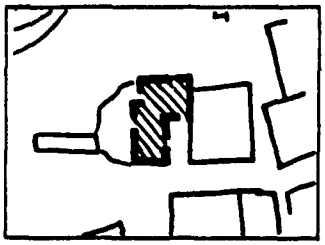






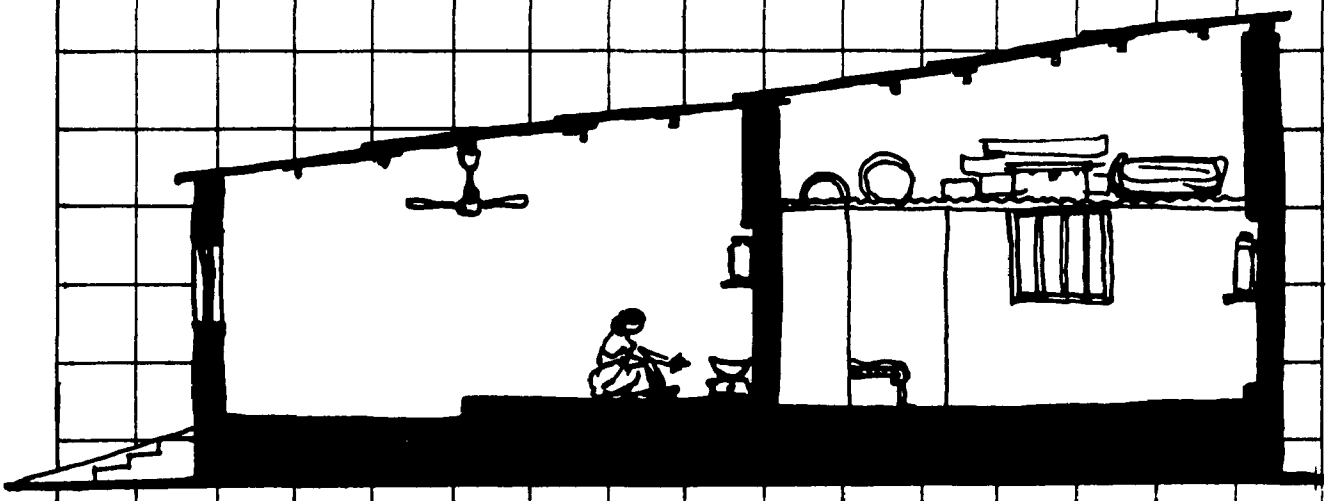


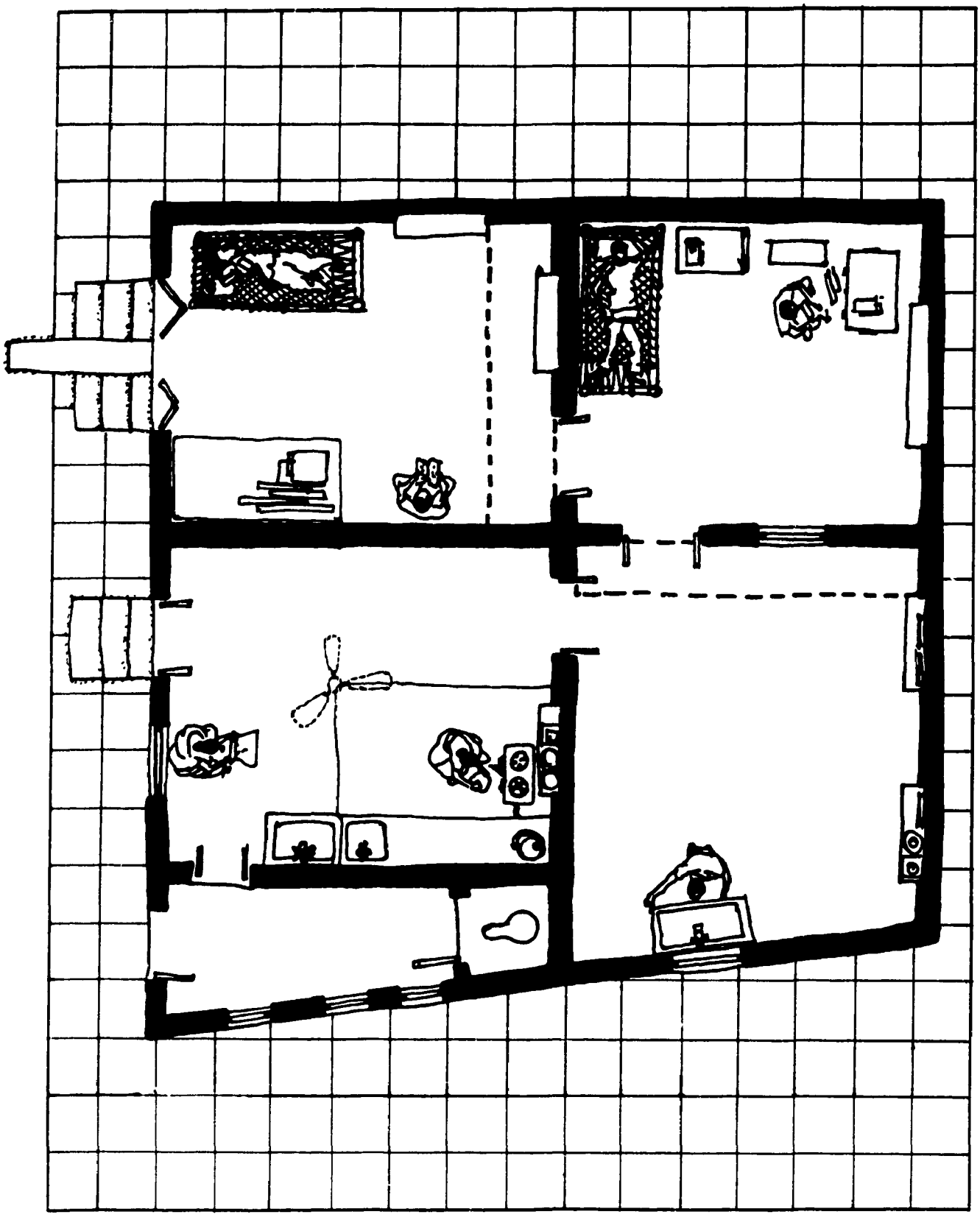
OWNER, HUSBAND, DAUGHTER, 4 SONS, 3 DAUGHTERS-IN-LAW.+ 2 RENTERS (2 prs+ 4prs)



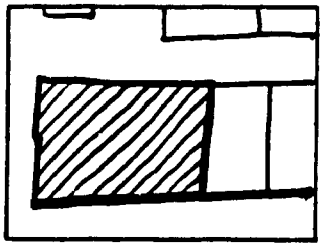
14

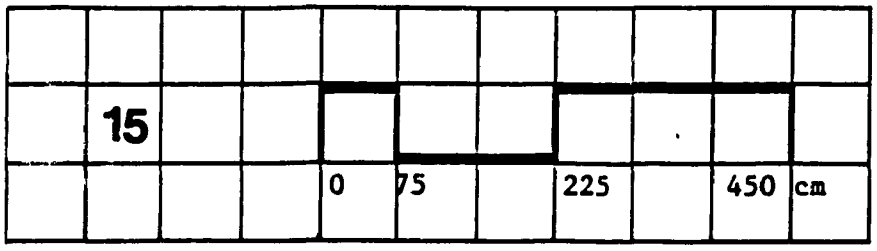
0 75 225 450 cm

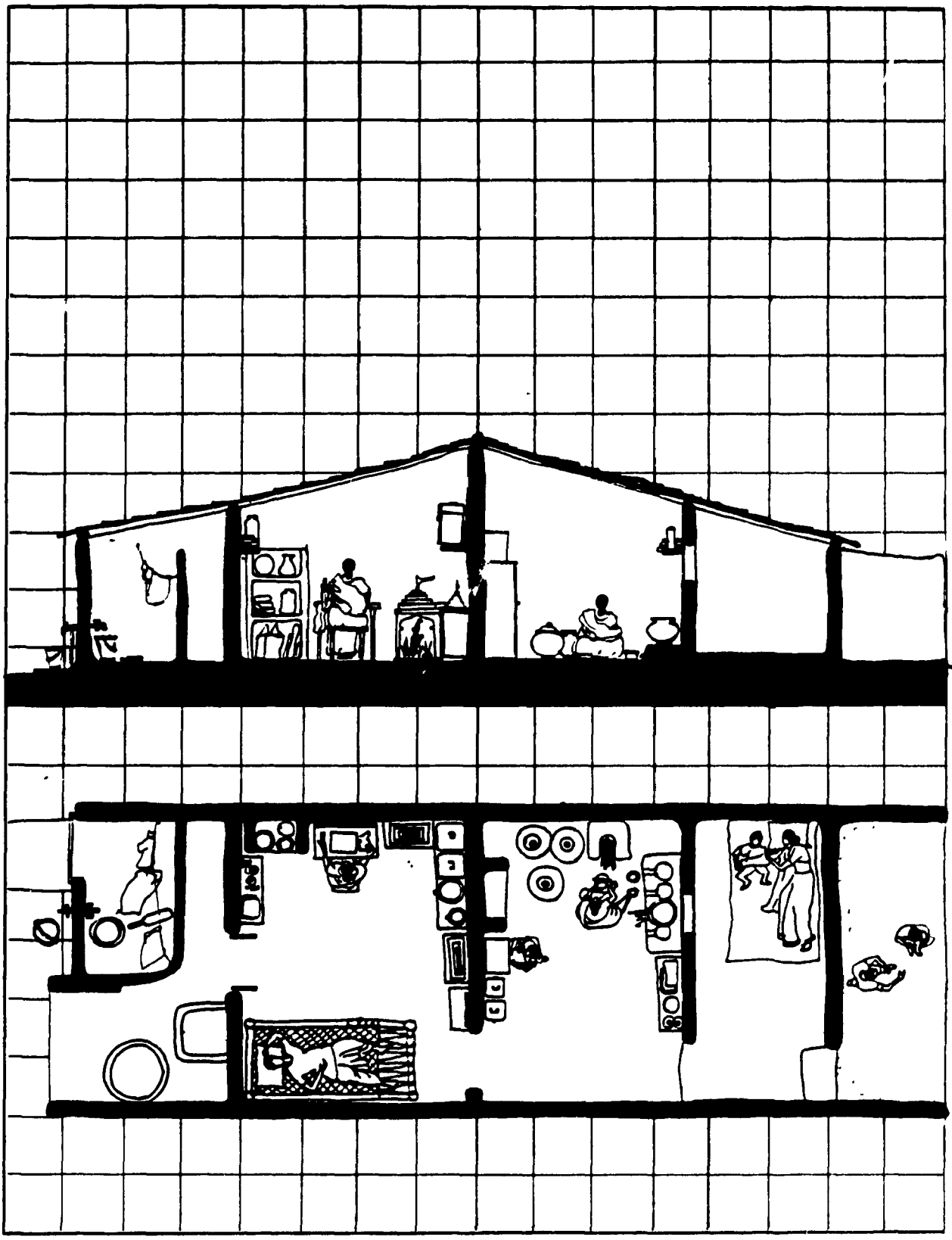




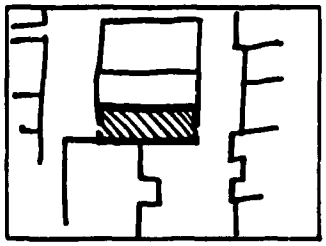
OWNER, WIFE, 3 CHILDREN. (5 Persons)





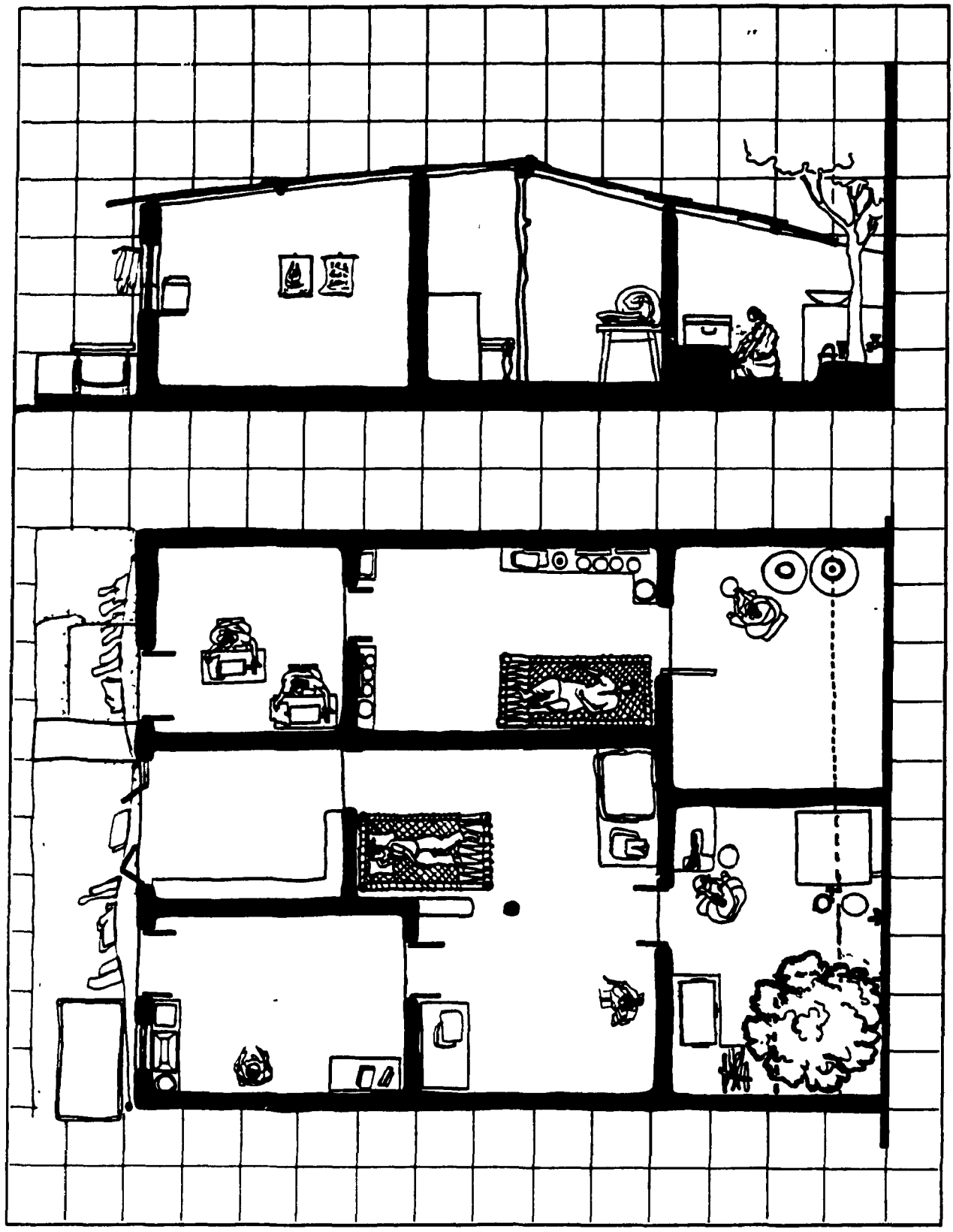


OWNER, WIFE, 3 SONS, DAUGHTER-IN-LAW, DAUGHTER, 2 GRANDCHILDREN. (8 Persons)

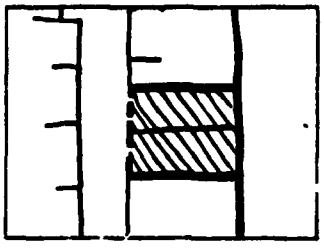


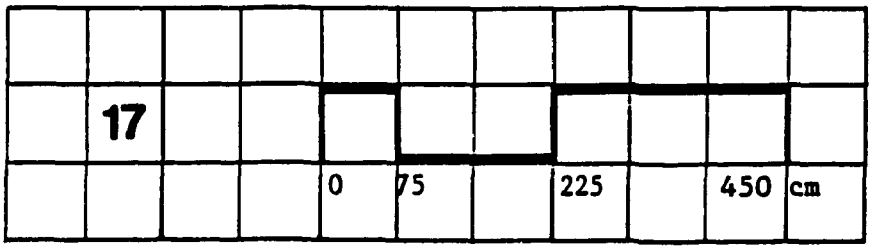
16

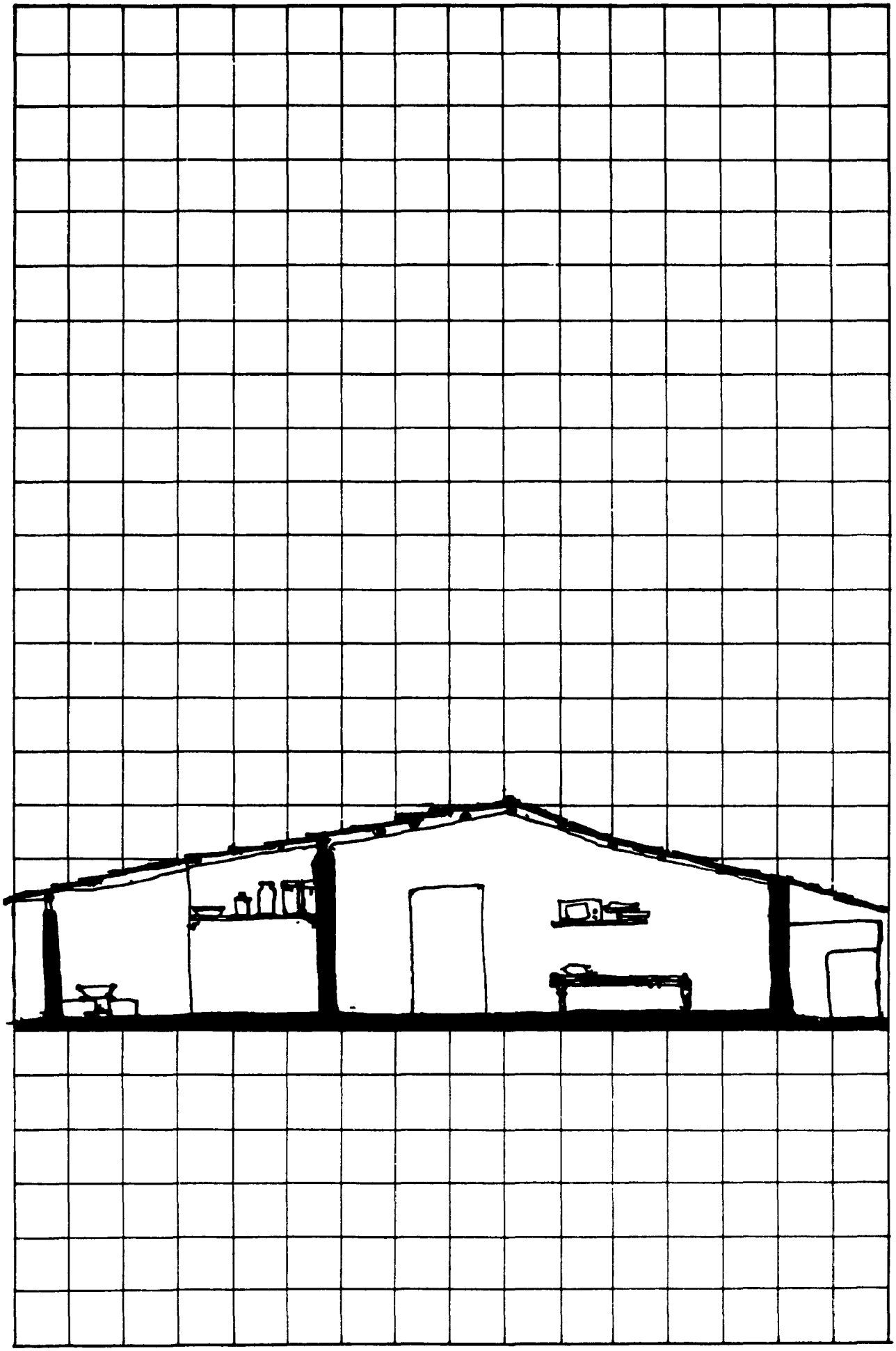
0 75 225 450 cm

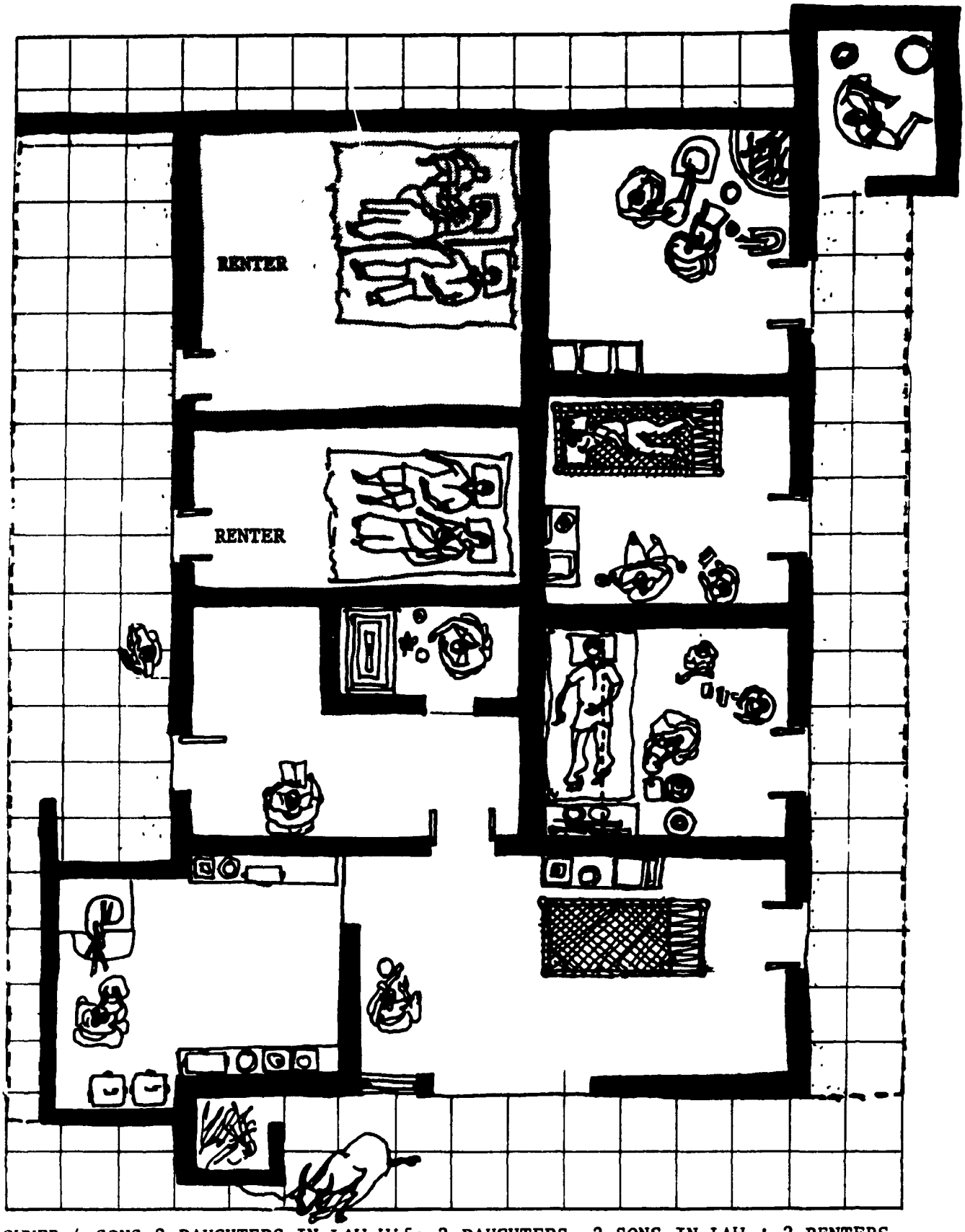


HOUSE NO:17) OWNER, WIFE, SON, DAUGHTER/ HOUSE NO:35) OWNER,WIFE,2 DAUGHTERS

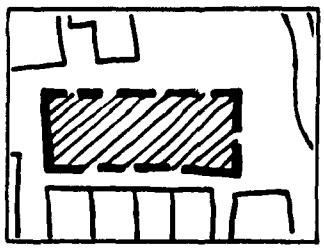


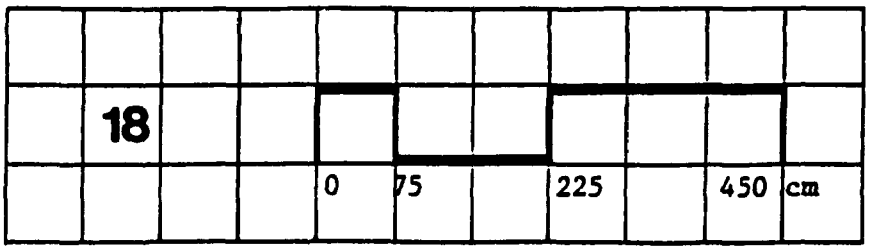


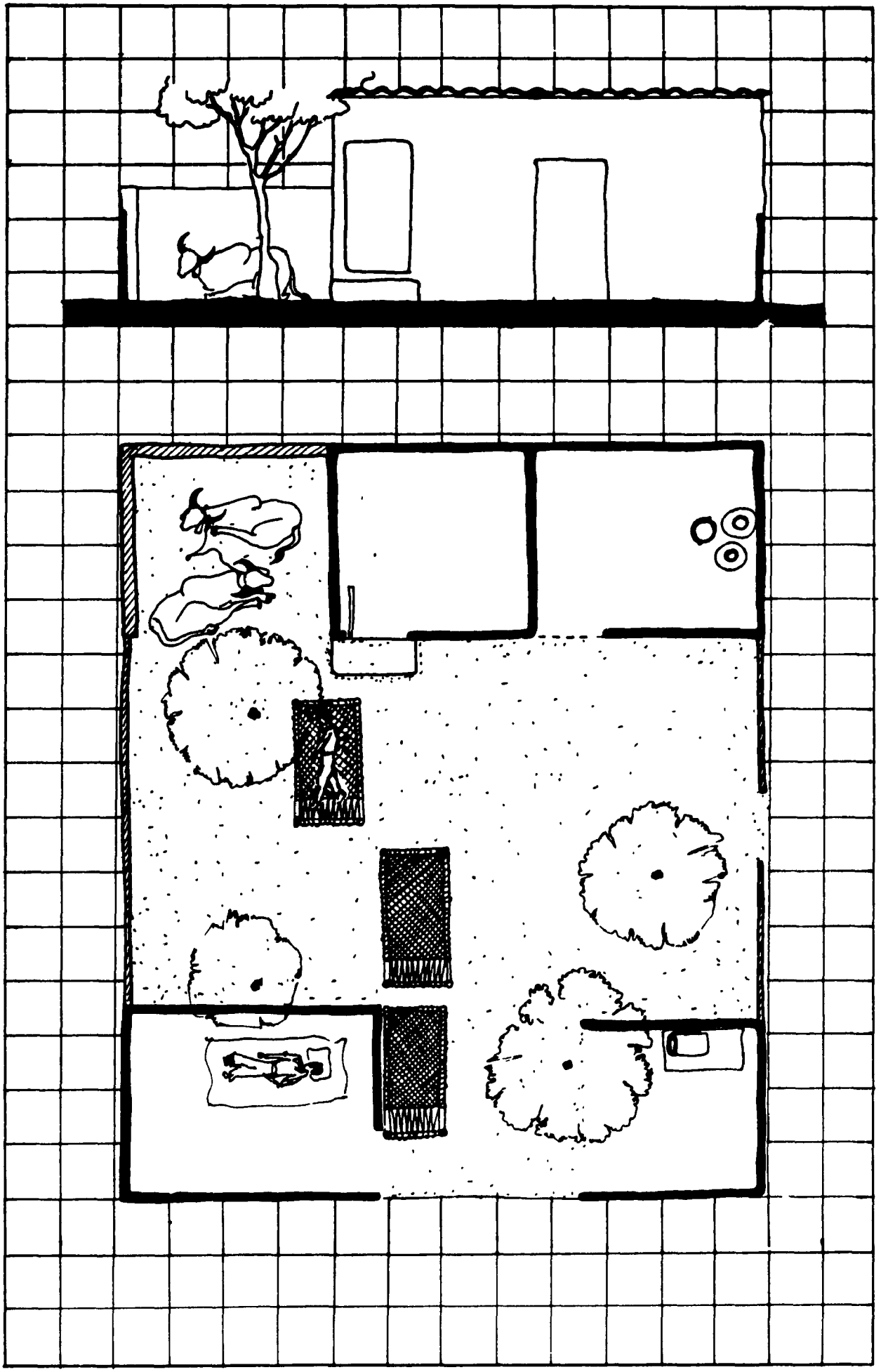


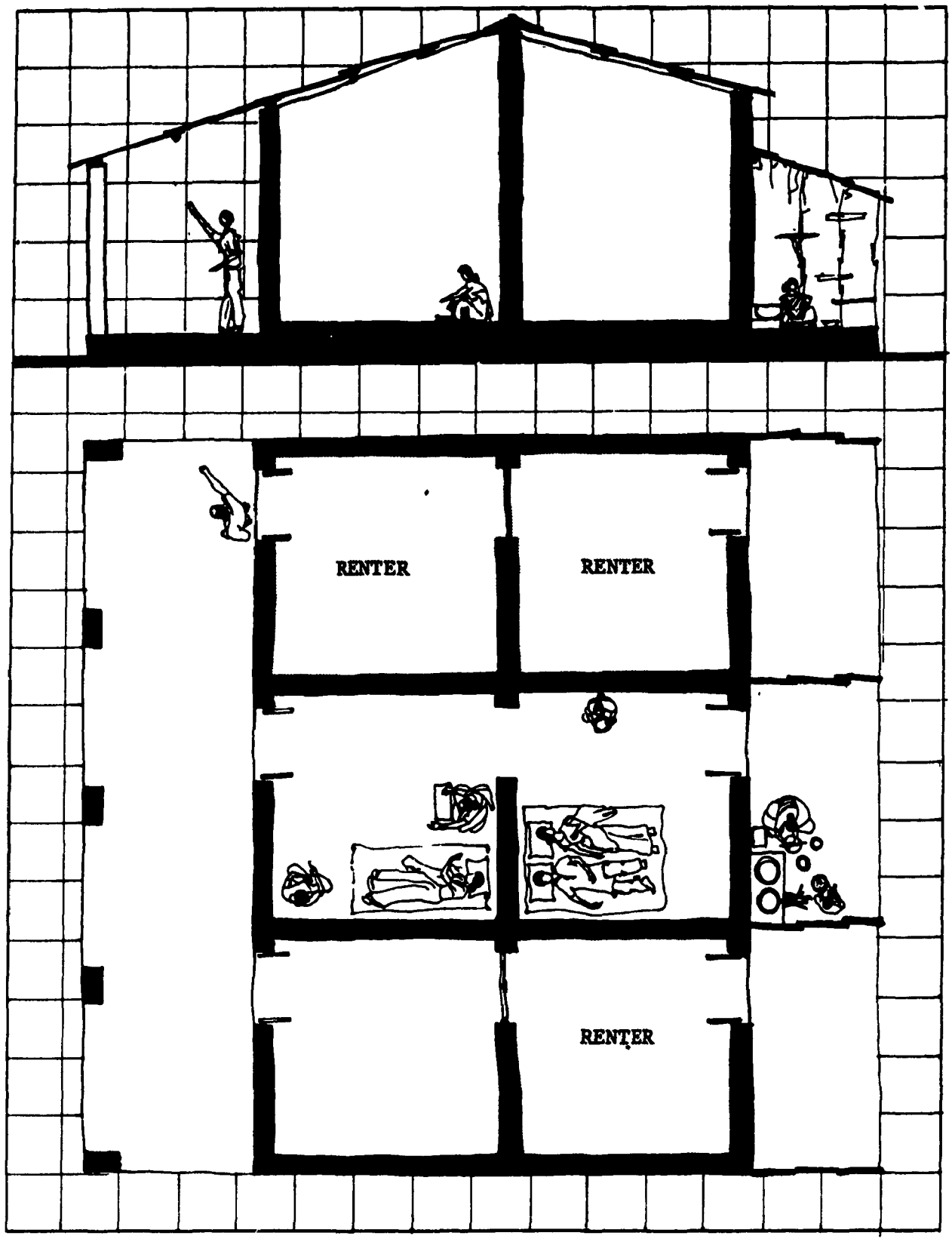


OWNER,4 SONS,2 DAUGHTERS-IN-LAW,Wife,2 DAUGHTERS, 2 SONS-IN-LAW + 2 RENTERS.

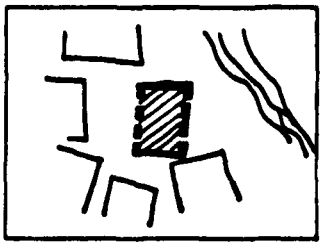


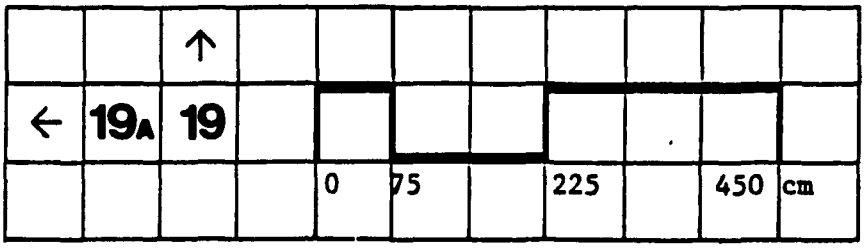


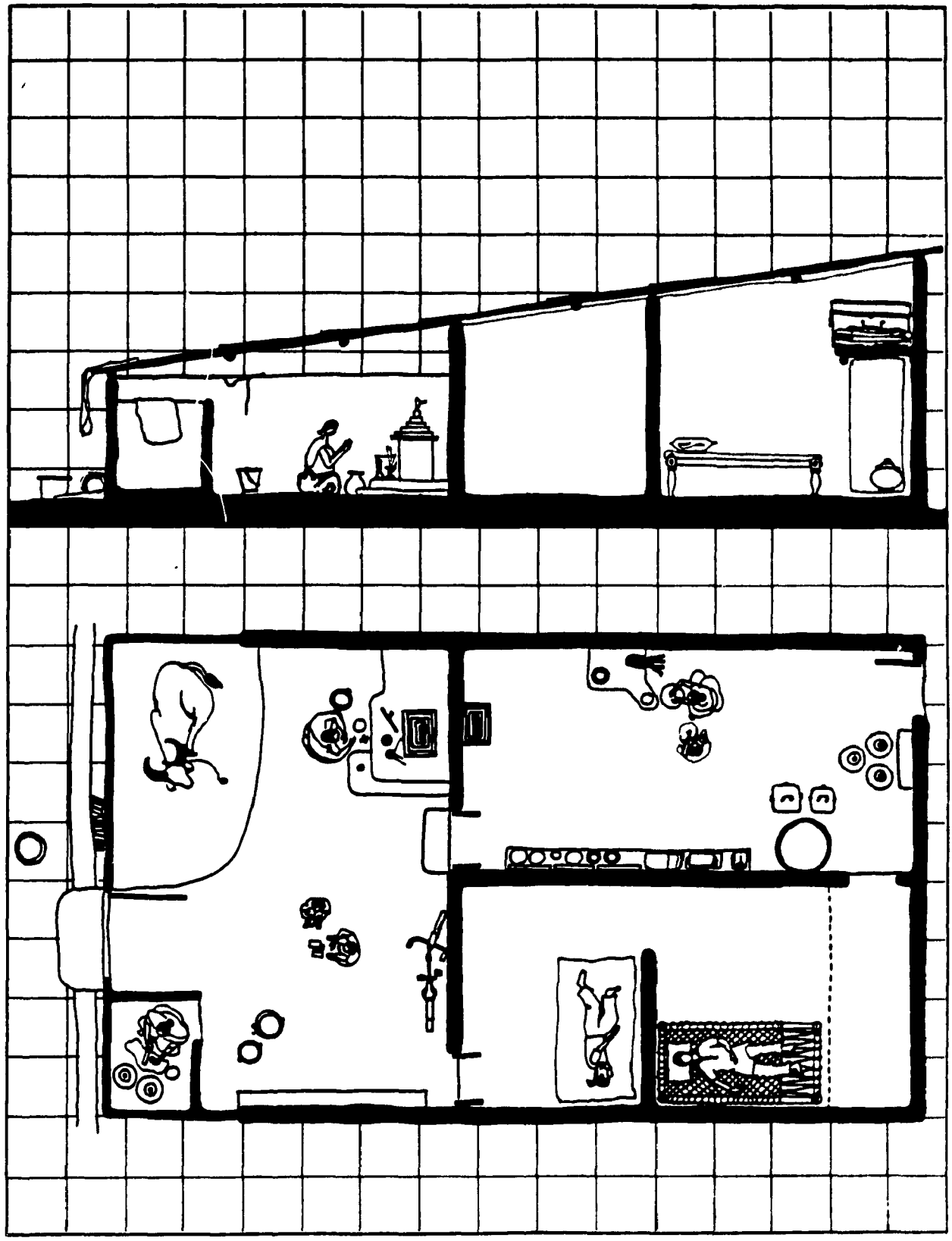




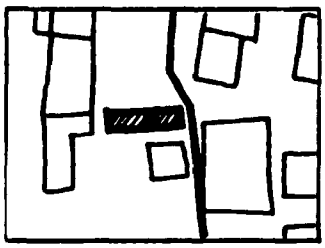
OWNER, WIFE, 3 SONS, DAUGHTER-IN-LAW, 2 GRANDCHILDREN, 2 DAUGHTERS, 3 RENTERS





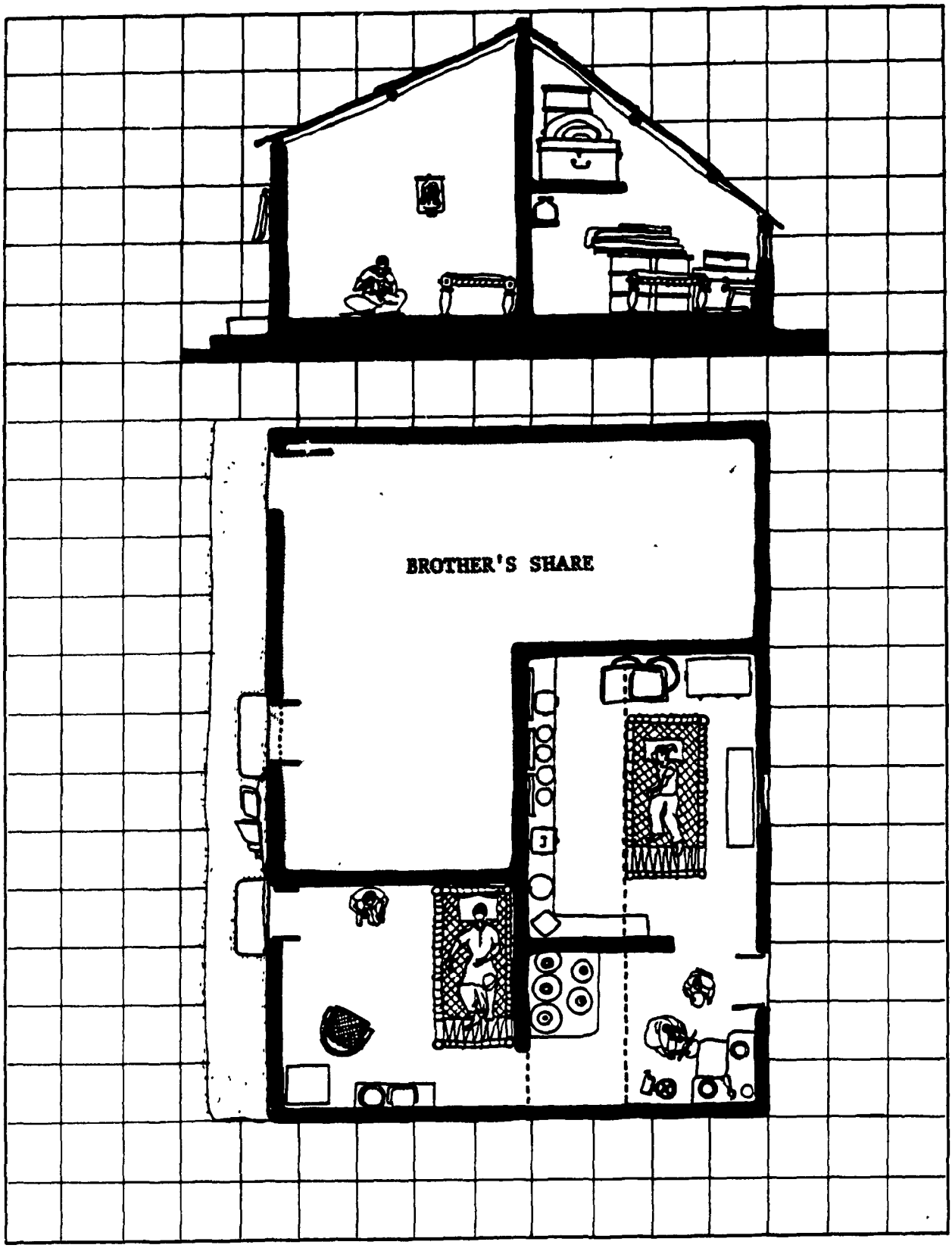


OWNER, WIFE, SON, DAUGHTER-IN-LAW, 4 GRANDCHILDREN. (8 Persons) / Cow.

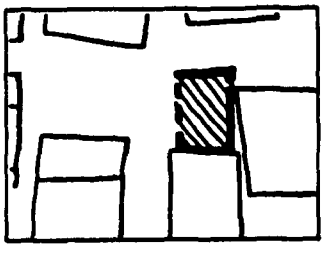


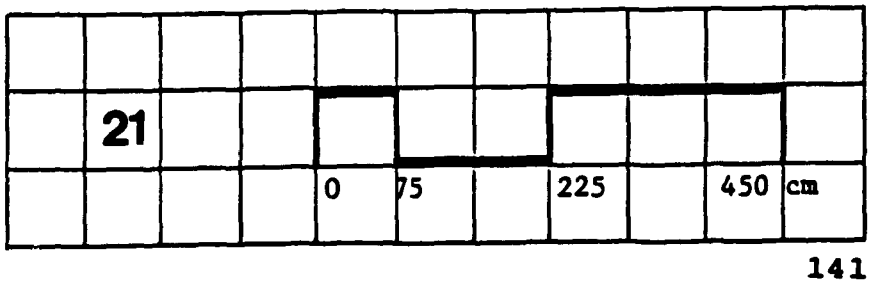
20

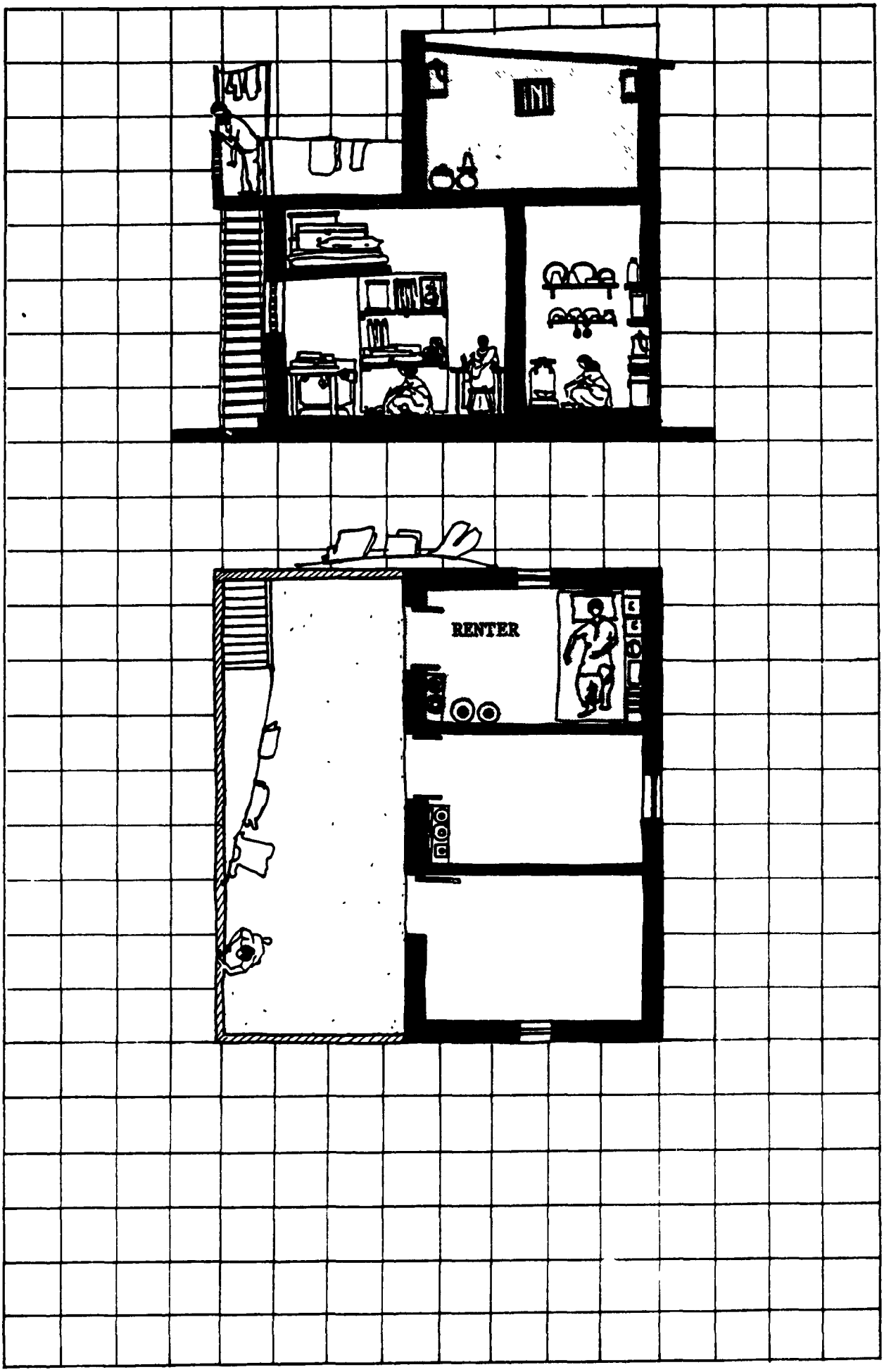
0 75 225 450 cm

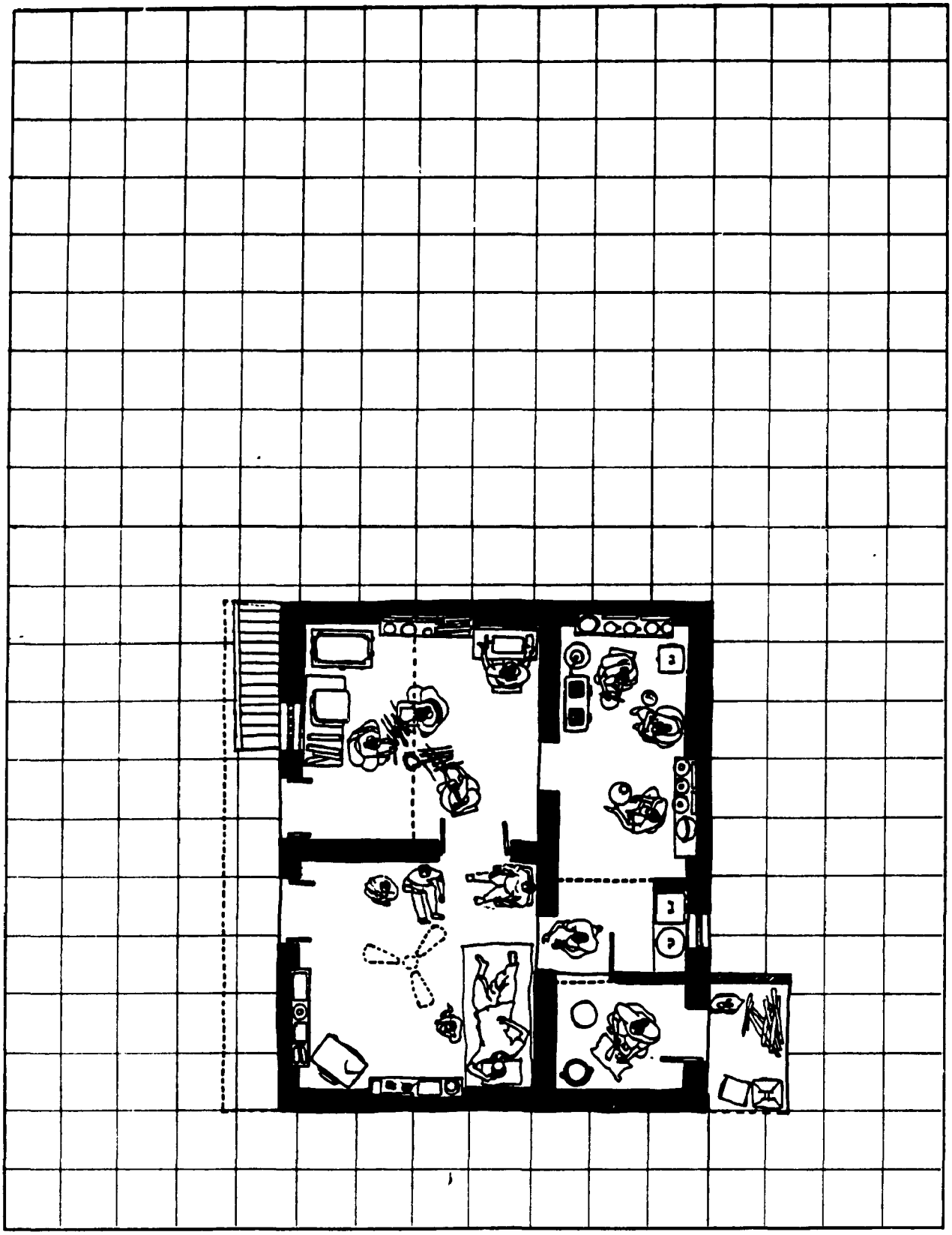


OWNER, WIFE, 2 SONS, DAUGHTER. (5 Persons)

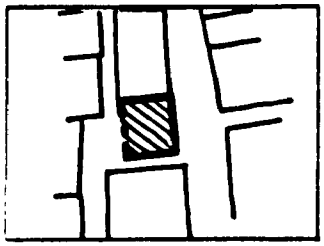


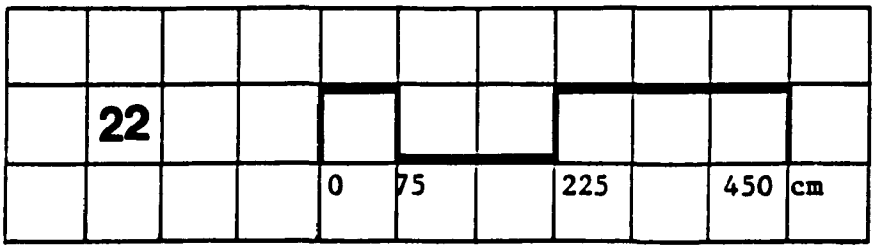


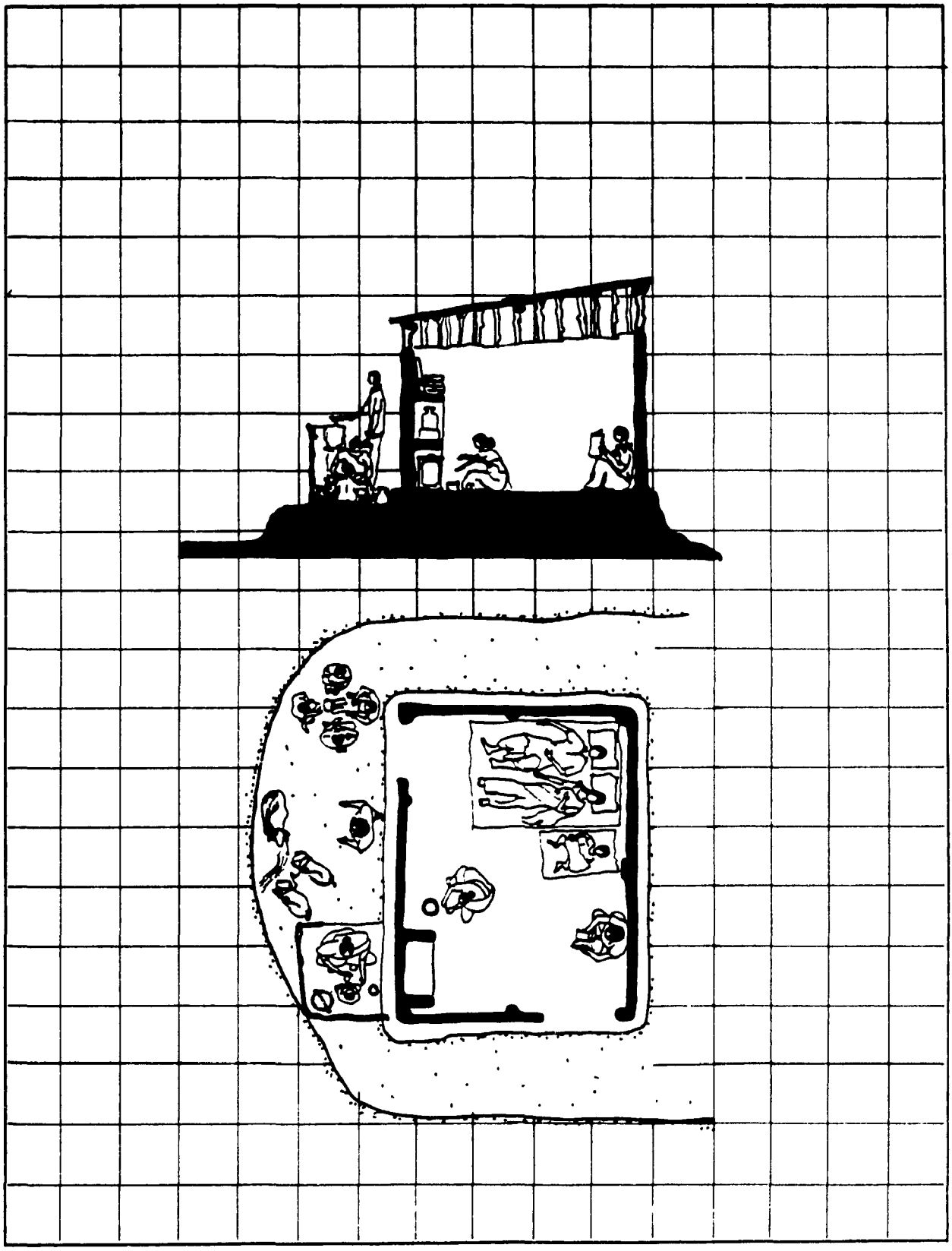

RENTER



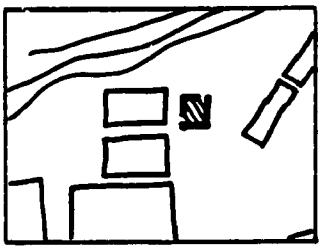
OWNER, 4 SONS, 3 DAUGHTERS-IN-LAW, 2 DAUGHTERS, 3 GRANDCHILDREN, RENTER (1Pr)

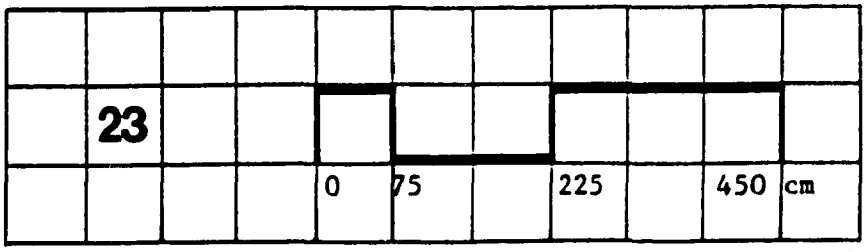


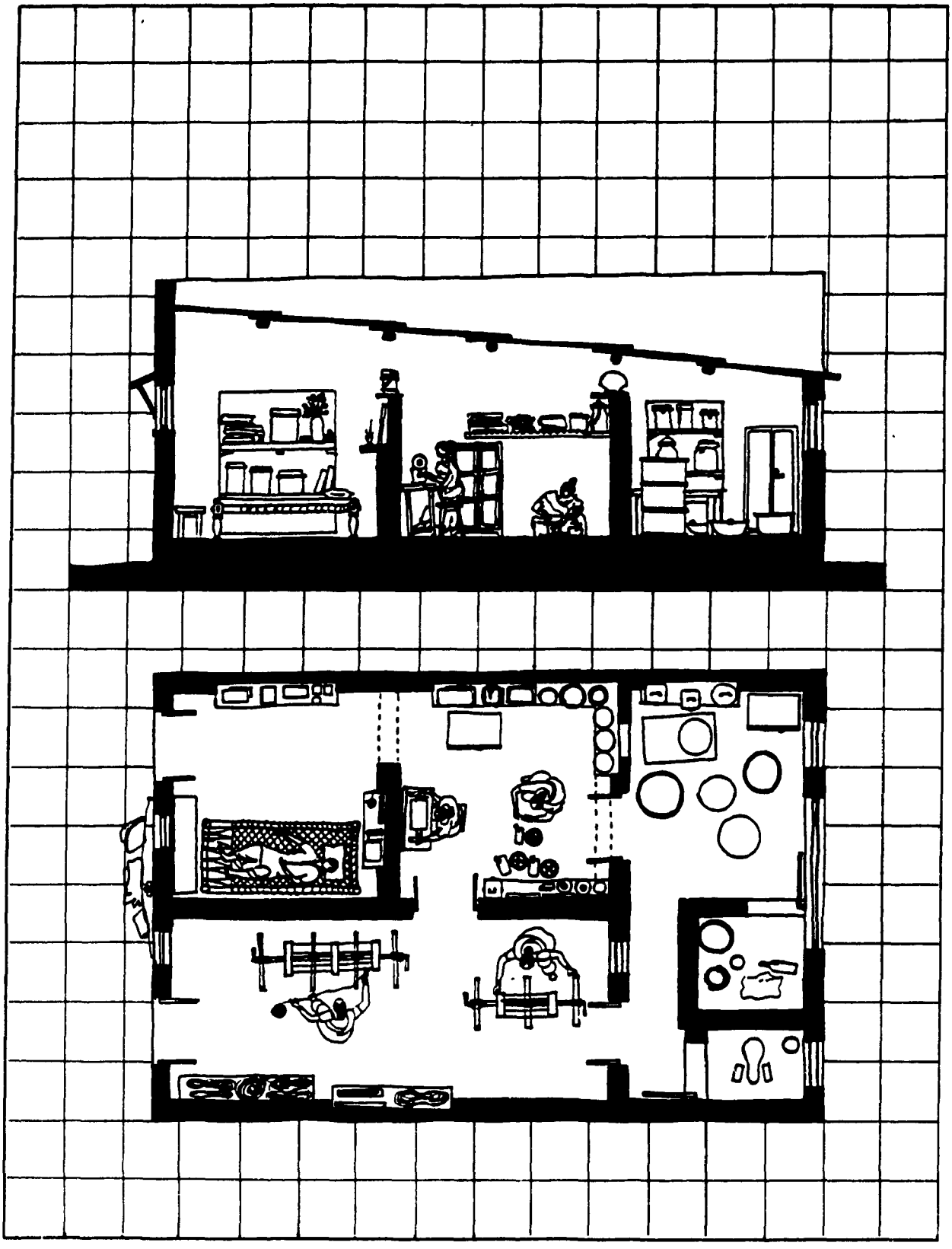




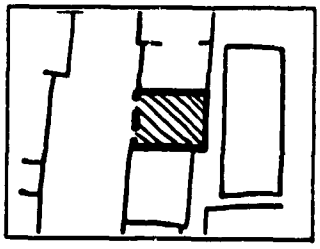
OWNER, WIFE, 2 SONS,2DAUGHTERSIN-LAW, 6 GRANDCHILDREN. (12 Persons)/Goats.





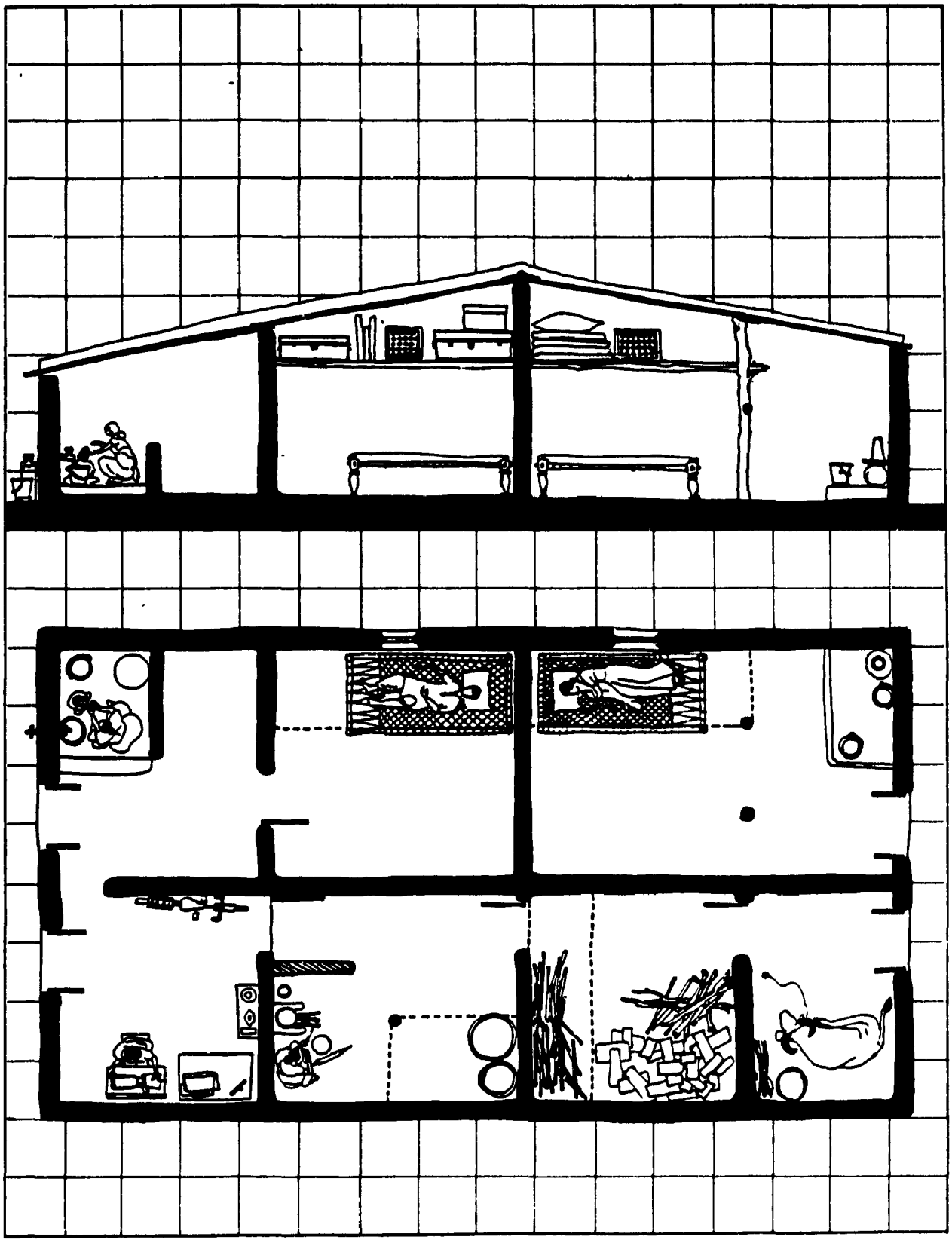


OWNER, WIFE. (2 Persons) / 3 WOMEN EMPLOYEE

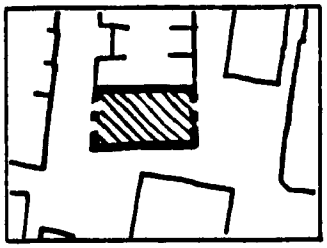


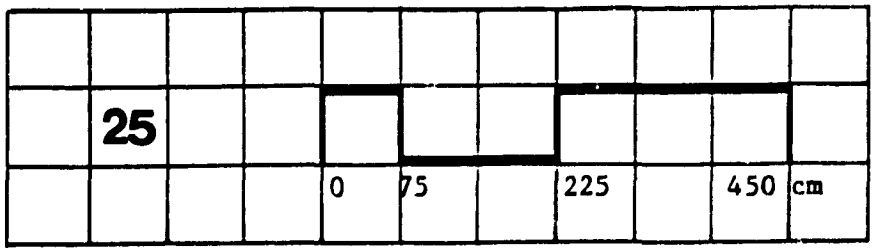
24

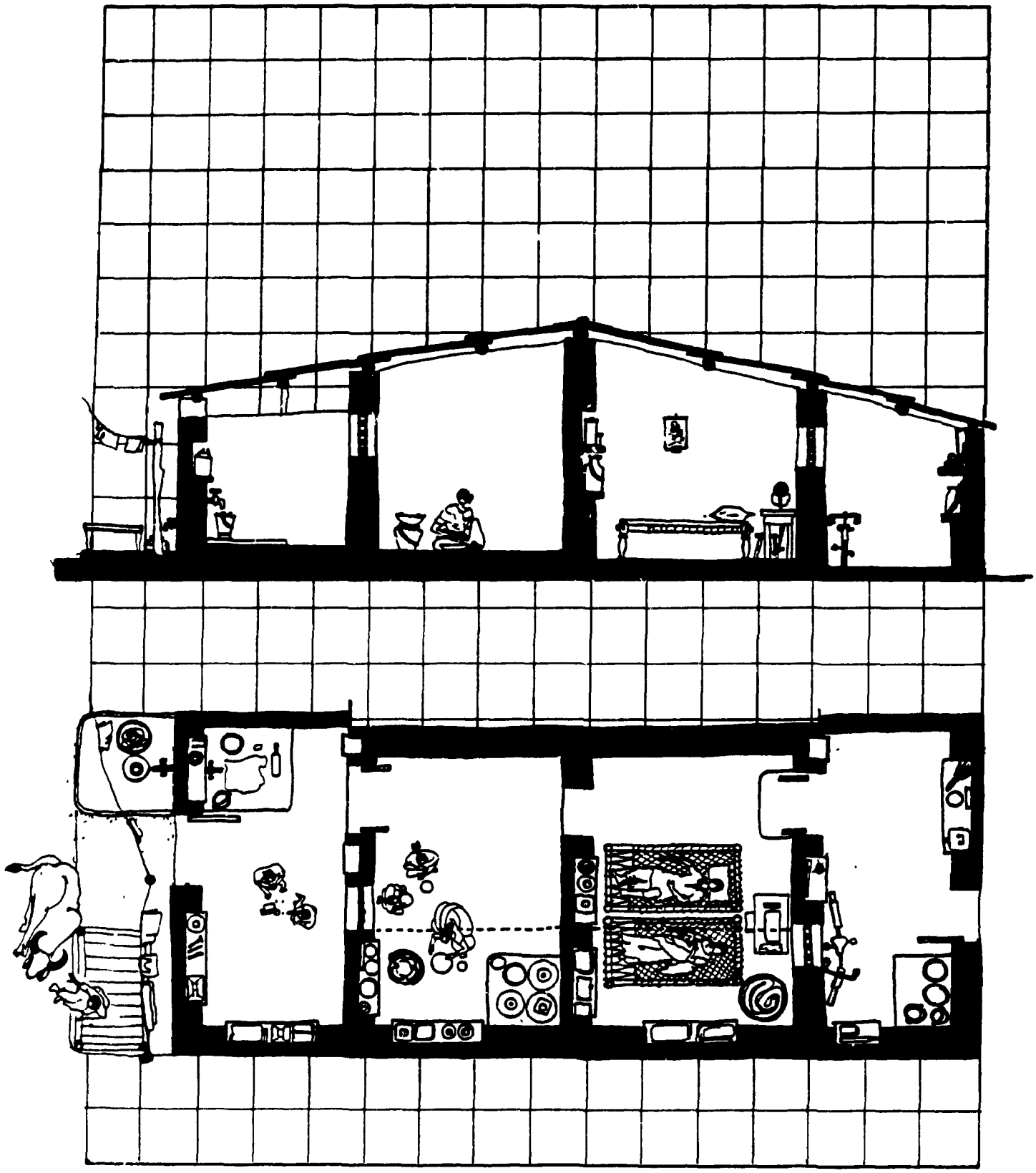
0 75 225 450 cm



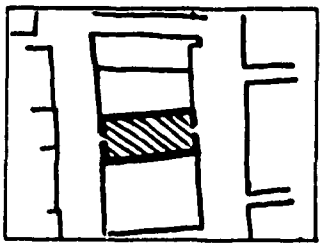
OWNER, WIFE, BROTHER, BROTHER'S WIFE, 2 NEPHEWS. (6 Persons) / Cow.

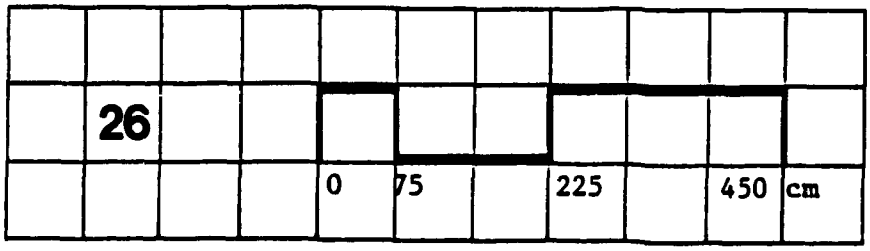


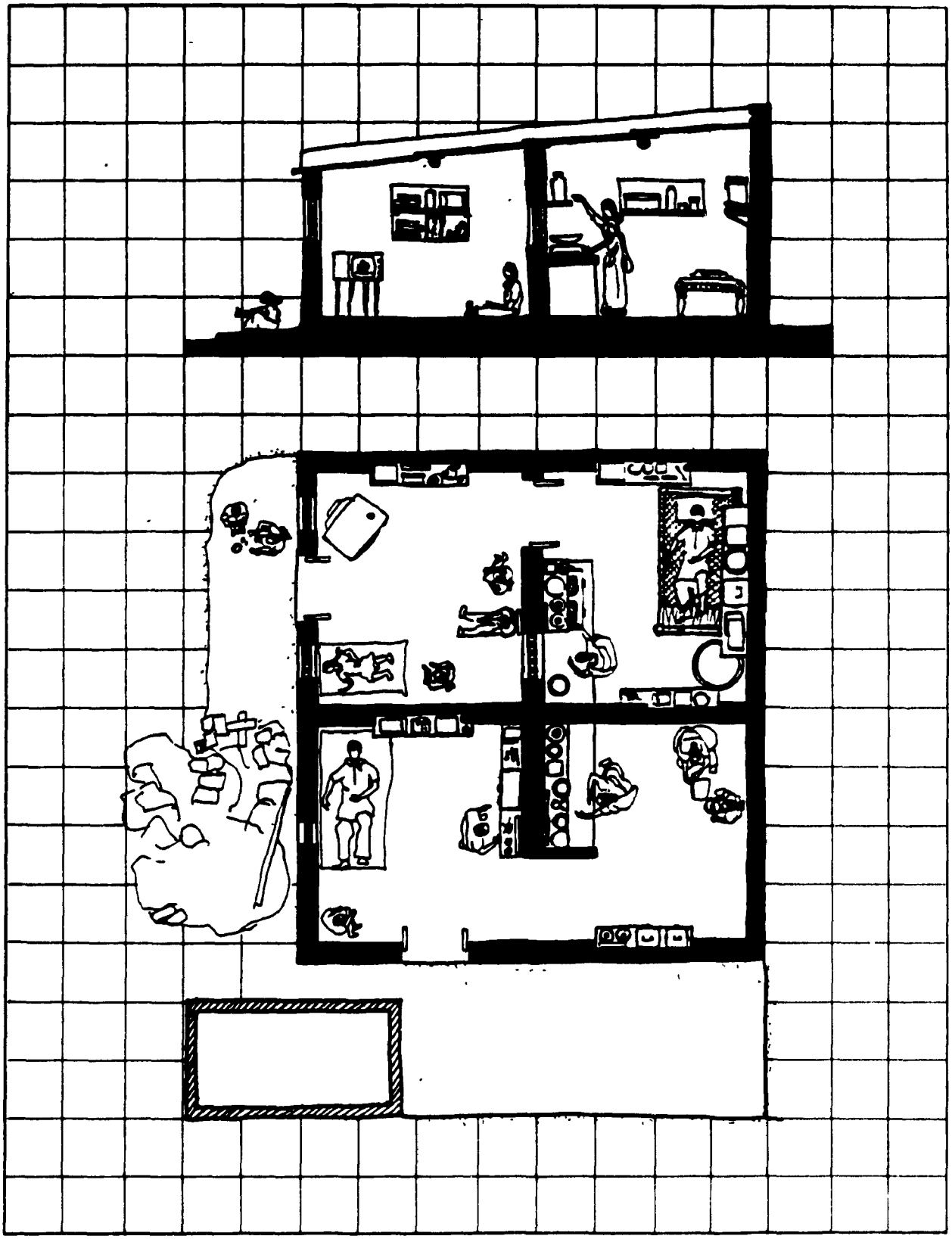




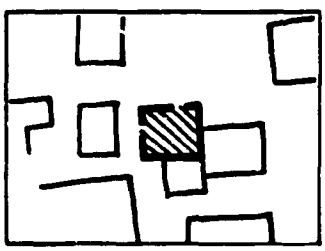
OWNER, WIFE, 3 SONS, 2 DAUGHTERS, DAUGHTER-IN-LAW. (8 Persons) / Cow.





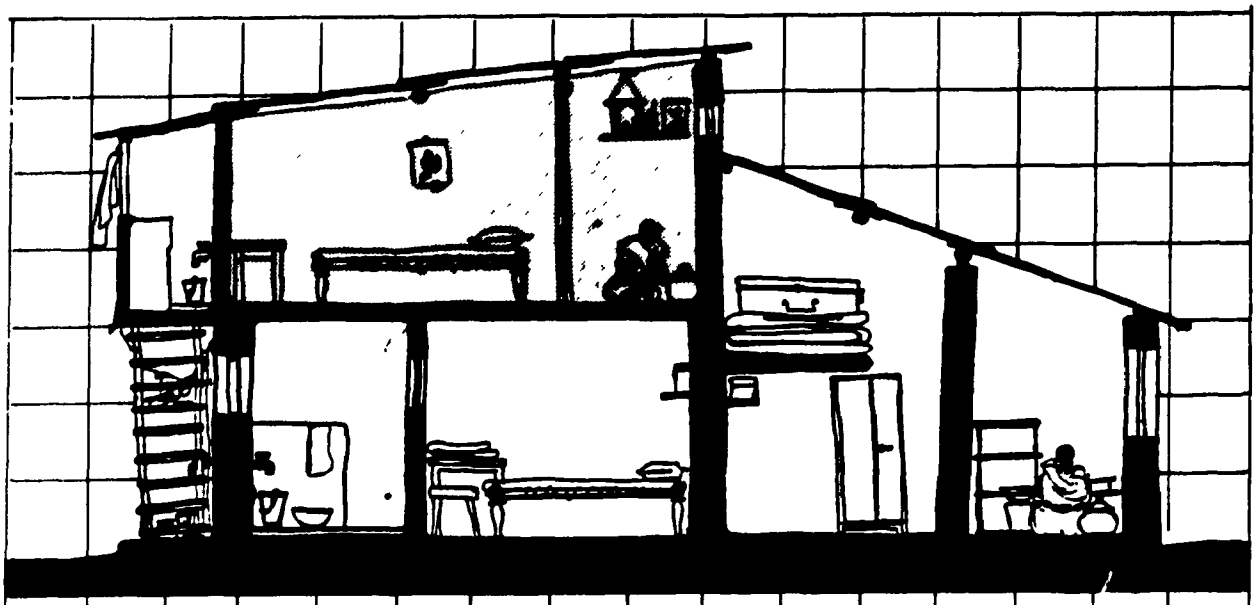


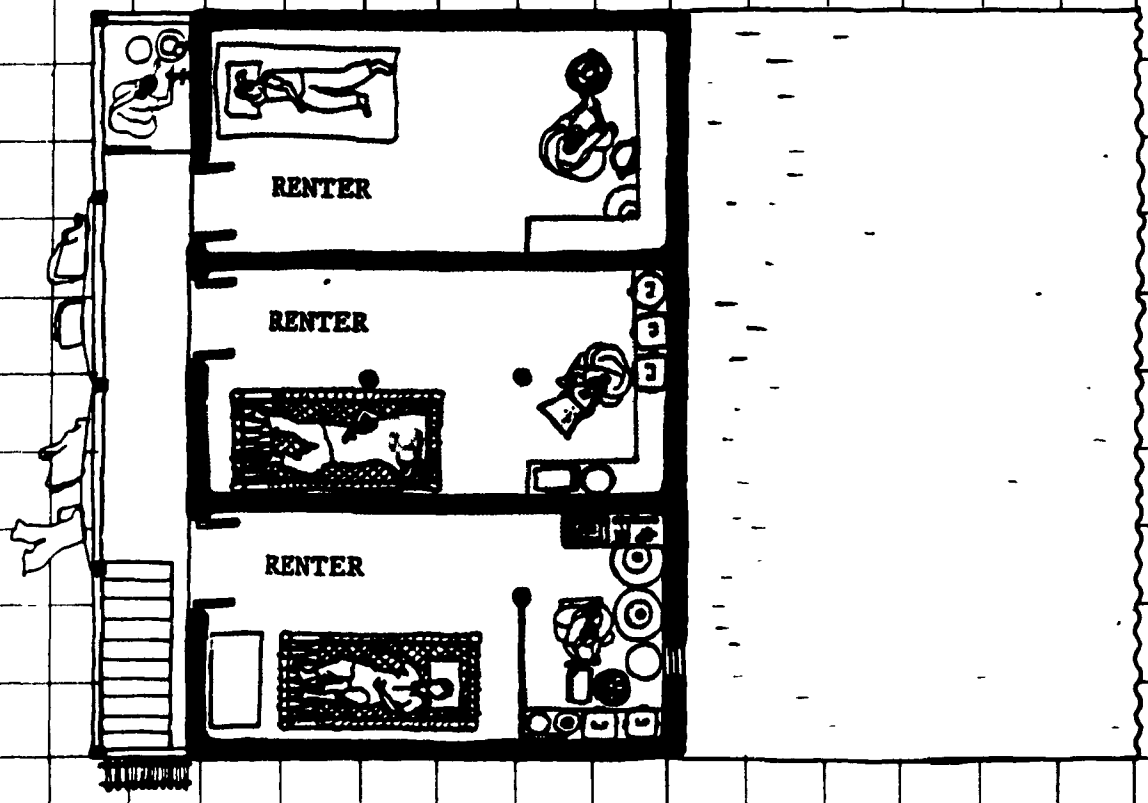
OWNER, WIFE, FATHER, 3 DAUGHTERS, SON, BROTHER, BROTHER'S WIFE, 4 NEPHEWS.

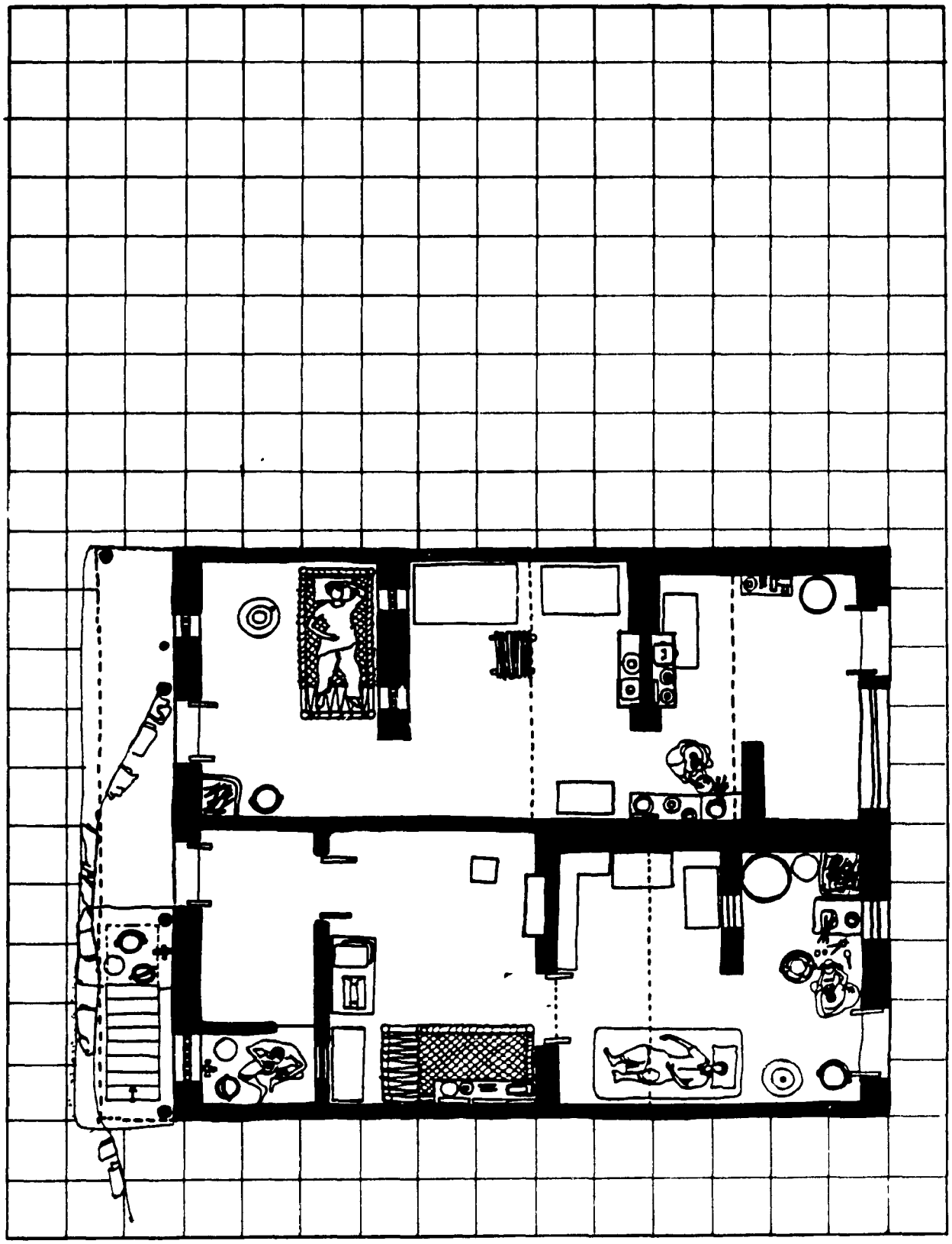


27

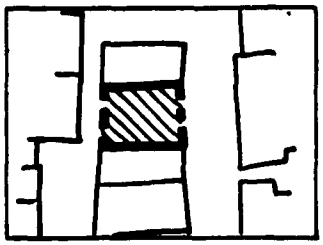
0 75 225 450 cm

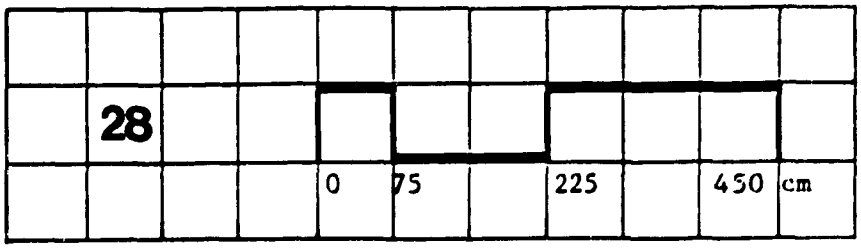


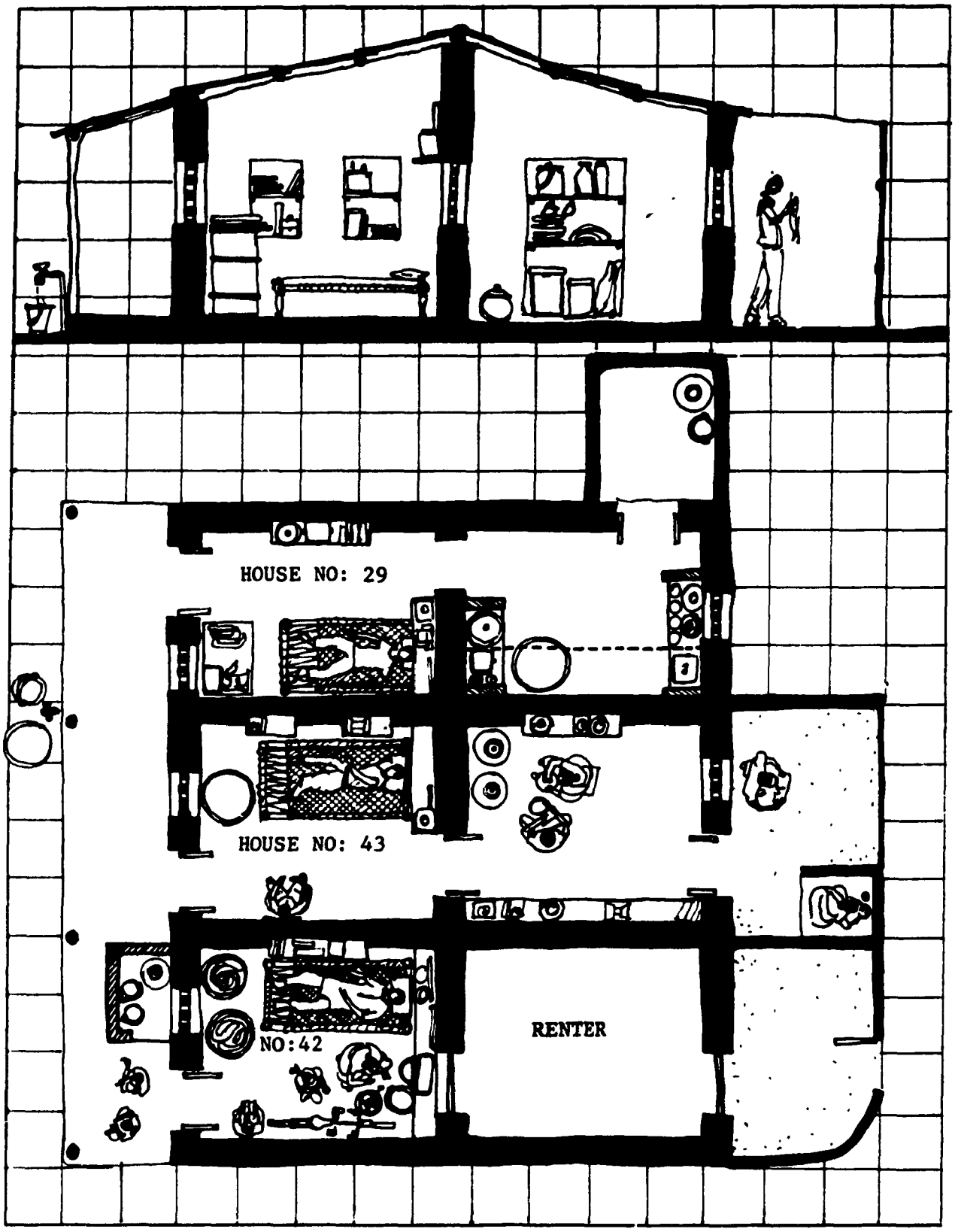

RENTER
RENTER
RENTER



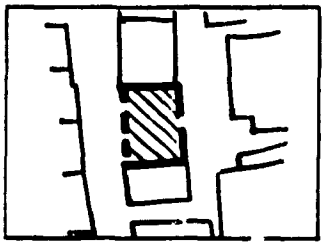
OWNER, FATHER, MOTHER, SON, DAUGHTER. (5 Persons), 3 RENTERS (2+2+3 Persons)



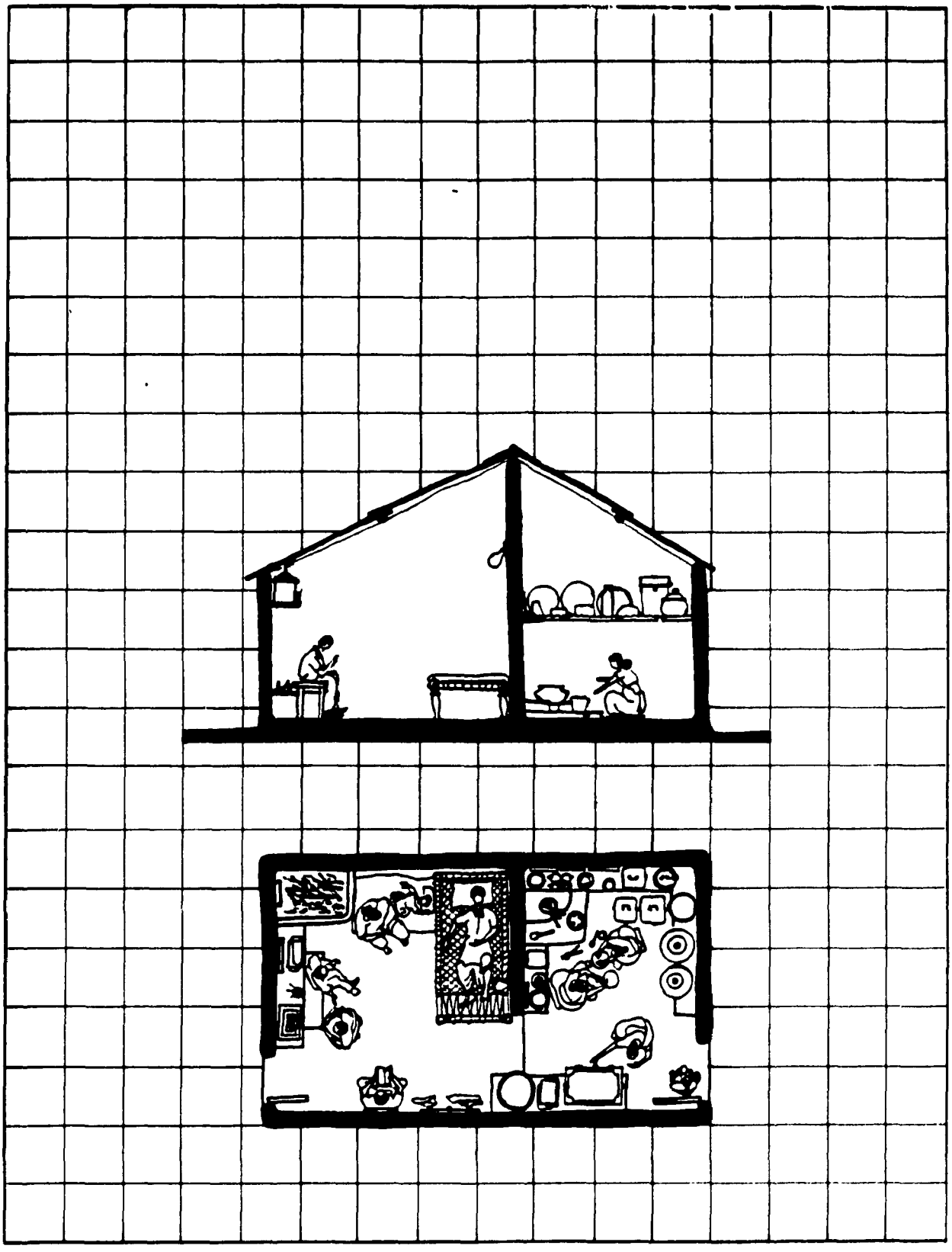




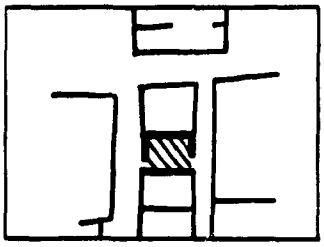
HOUSE NO:29) OWNER / HOUSE NO:42) RENTER,WIFE,4CHILDREN / HOUSE NO:43 RENTER

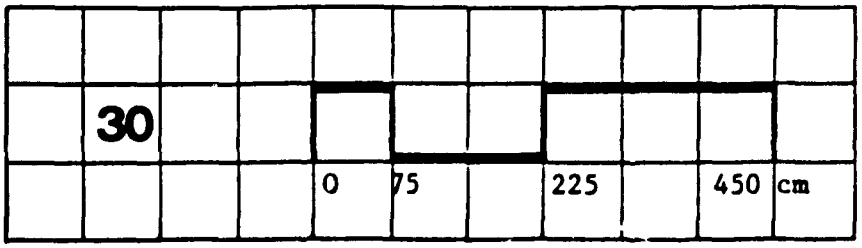


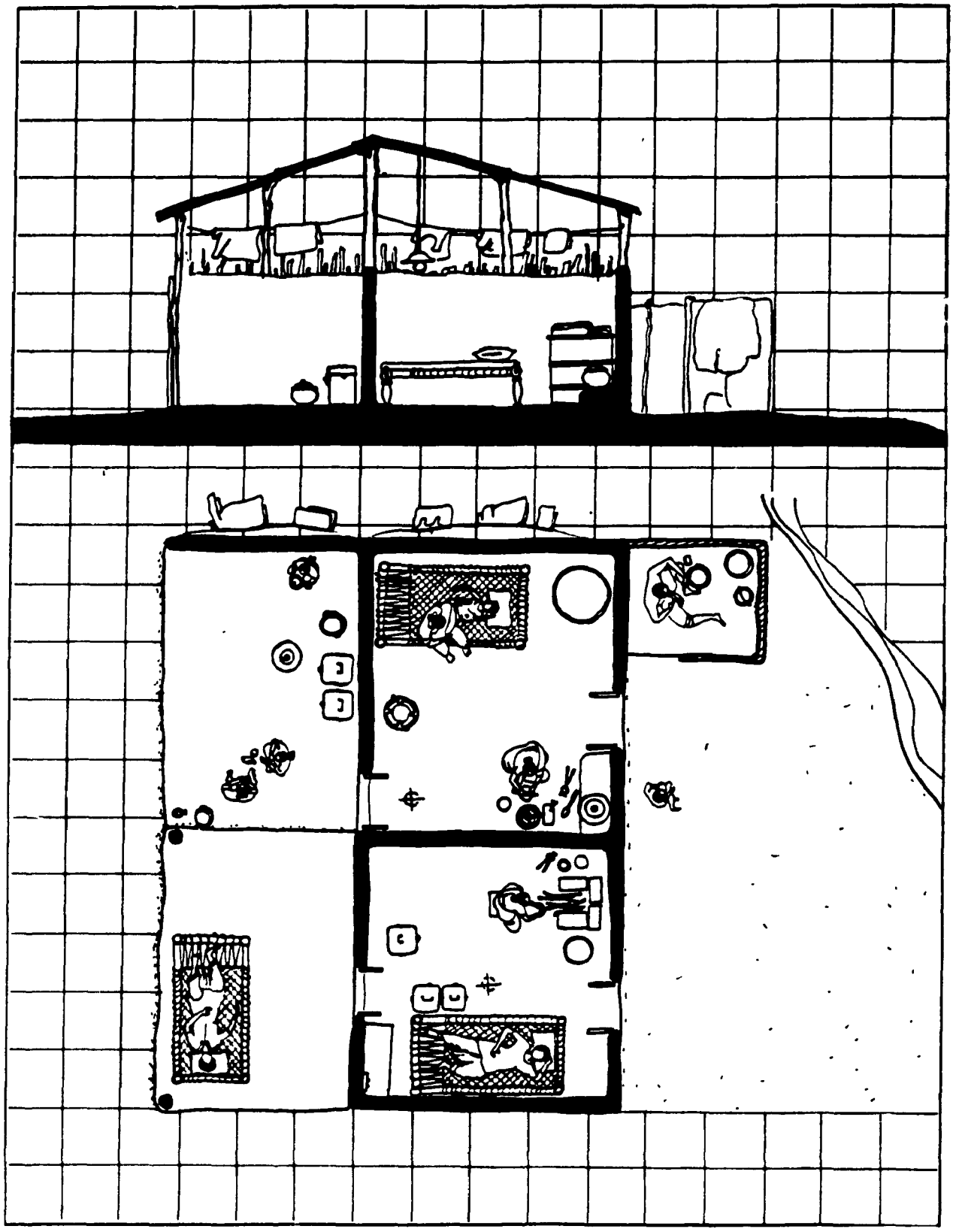
29	42	43								
				0	75		225		450	cm



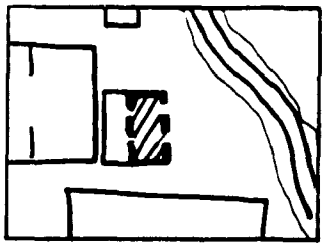
OWNER, WIFE, 3 SONS, 2 DAUGHTERS-IN-LAW, DAUGHTER, 2 GRANDCHILDREN. (10 Prs.)

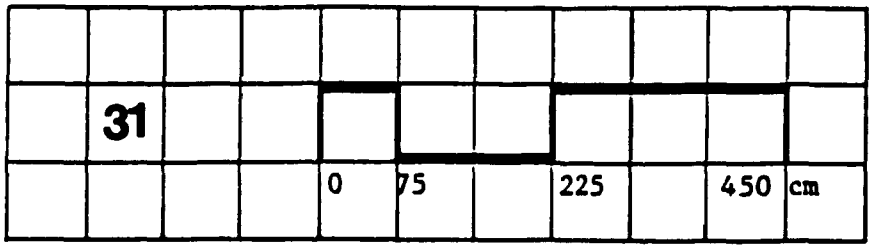


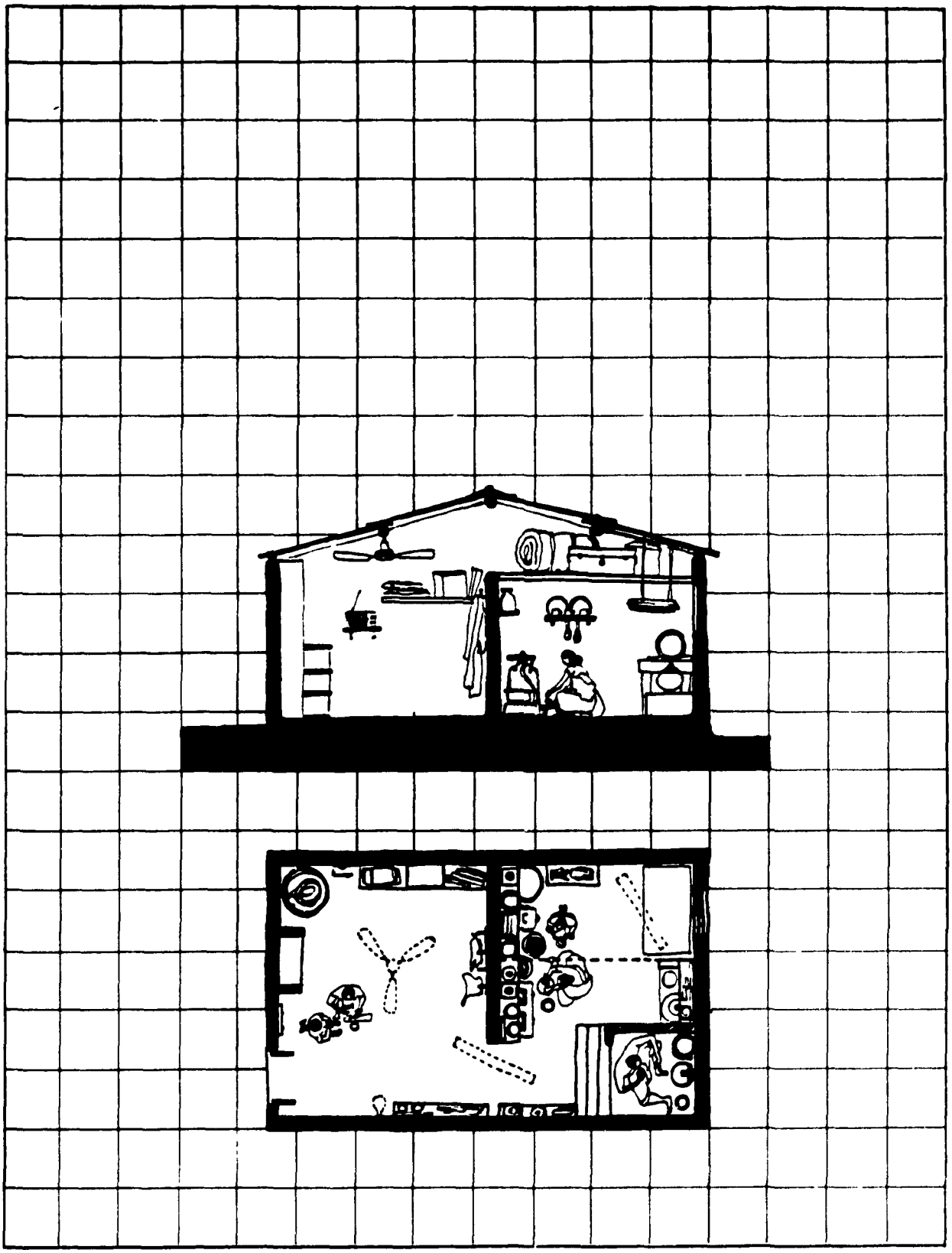




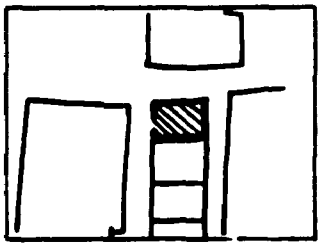
OWNER,WIFE,3 SONS,2 DAUGHTERS,MOTHER,BROTHER,BROTHER'S WIFE,NIECE.(11 Prs.)





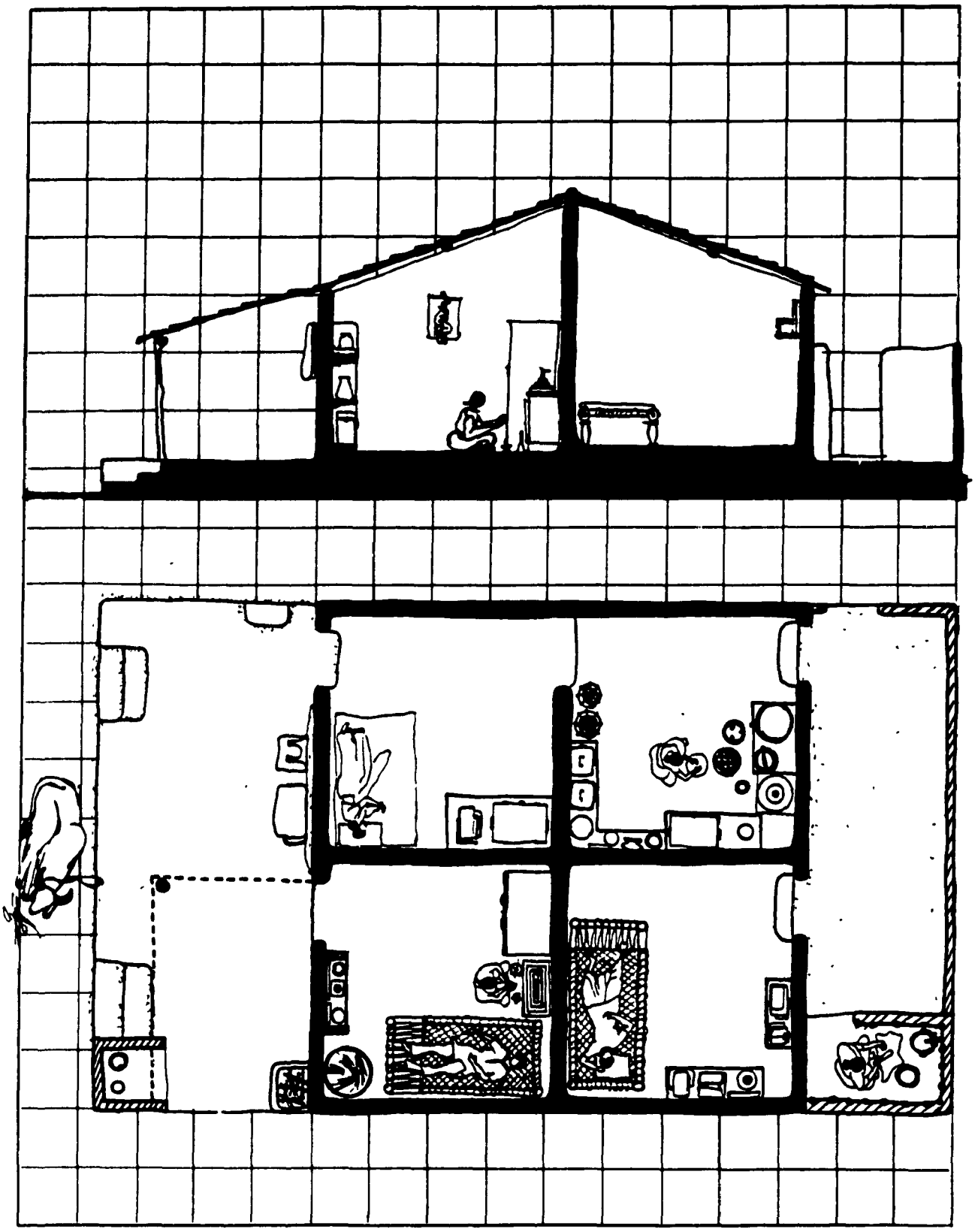


OWNER, WIFE, SON, 2 DAUGHTERS. (5 Persons)

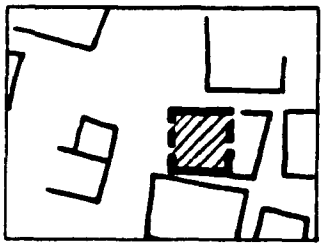


32

0 75 225 450 cm

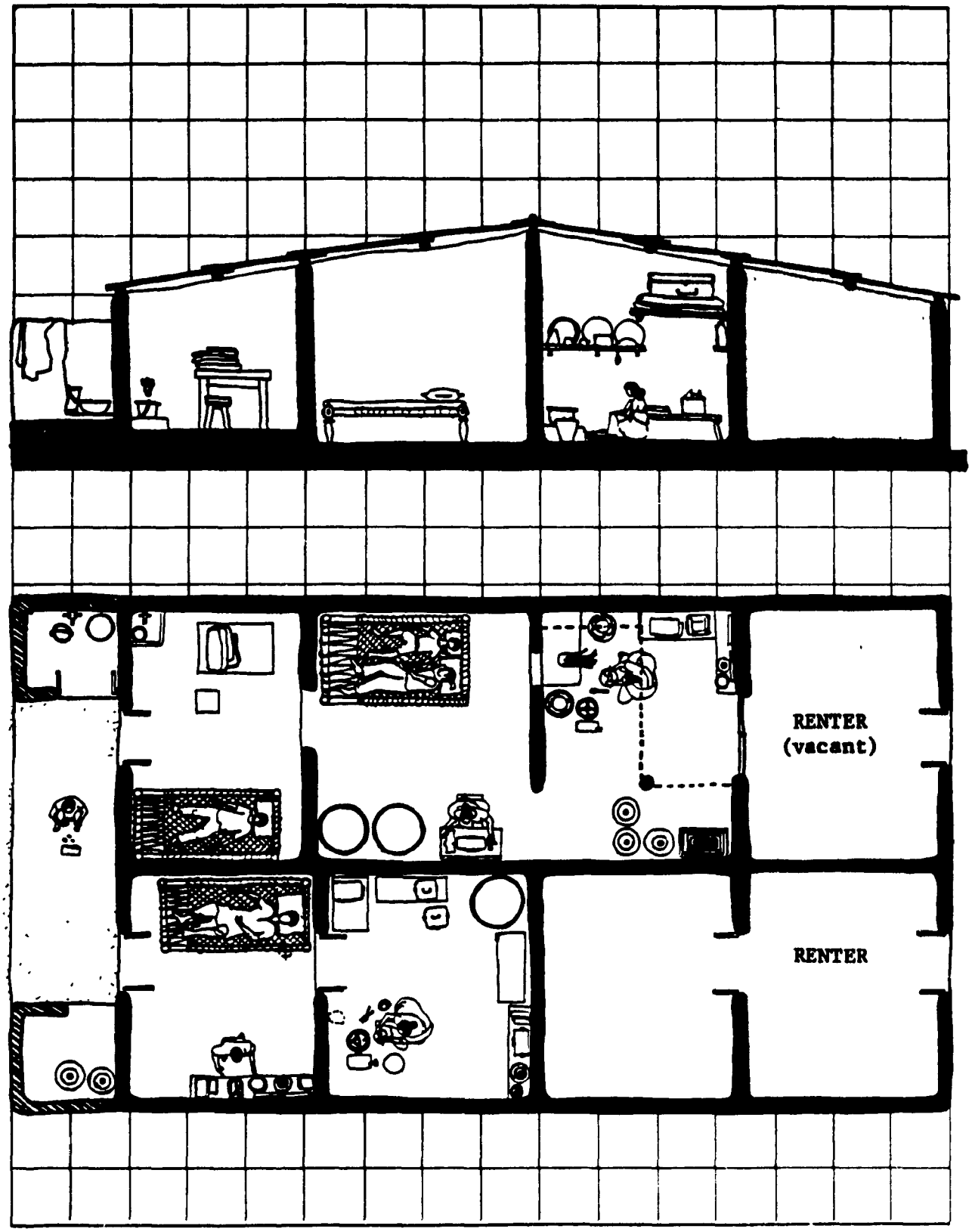


OWNER, WIFE, 2 SONS, DAUGHTER-IN-LAW, DAUGHTER. (6 Persons) / Cow.

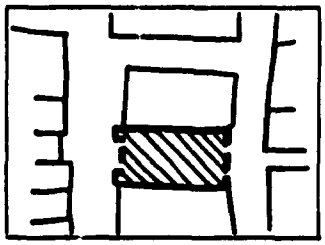


33

0 75 225 450 cm

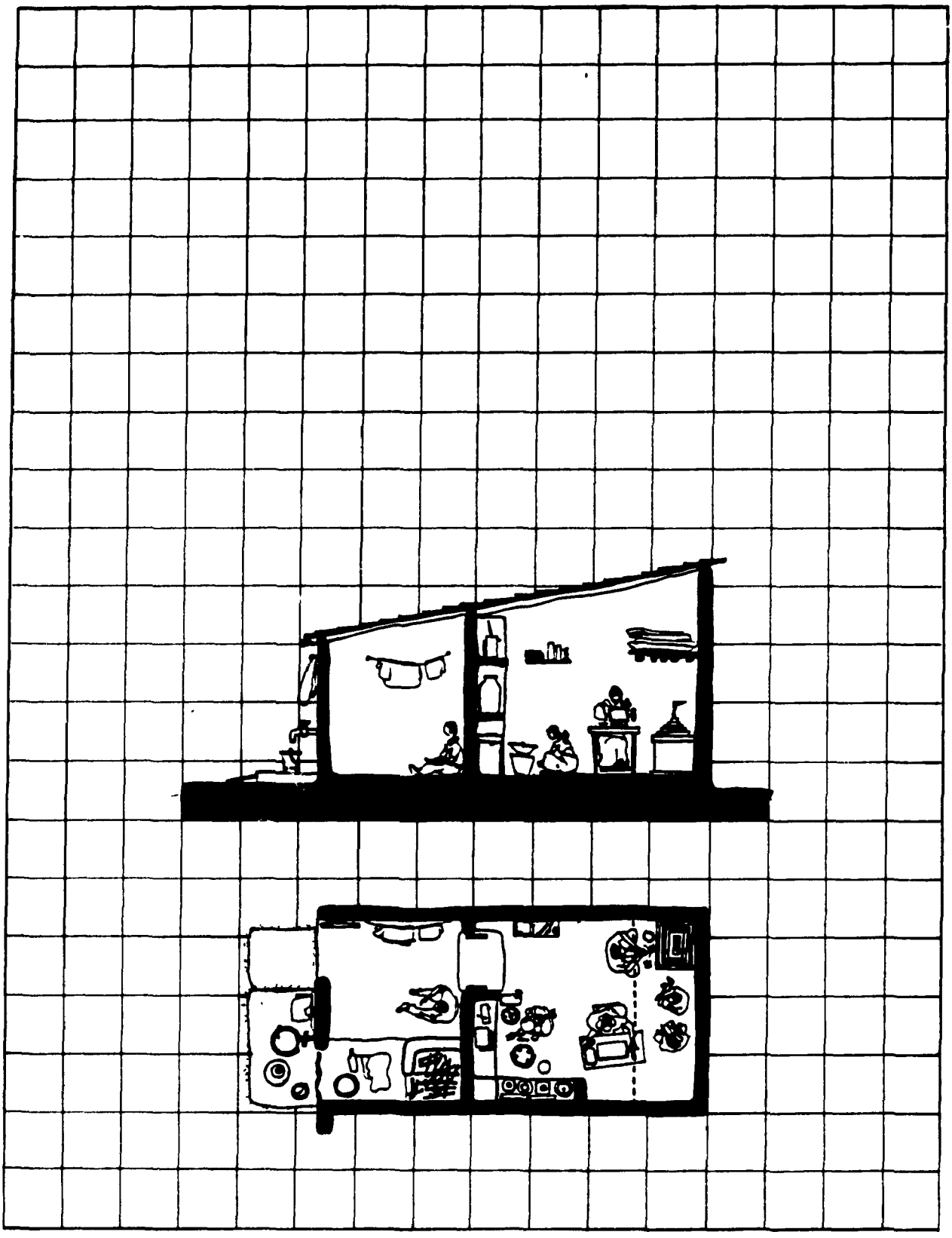


OWNER, WIFE, SON, BROTHER, BROTHER'S WIFE, 3 NEPHEWS, DAUGHTER, RENTER (4Prs)

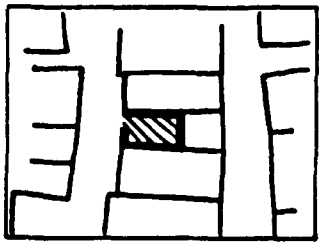


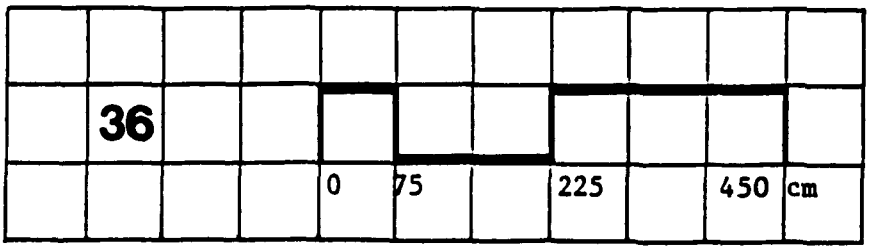
34

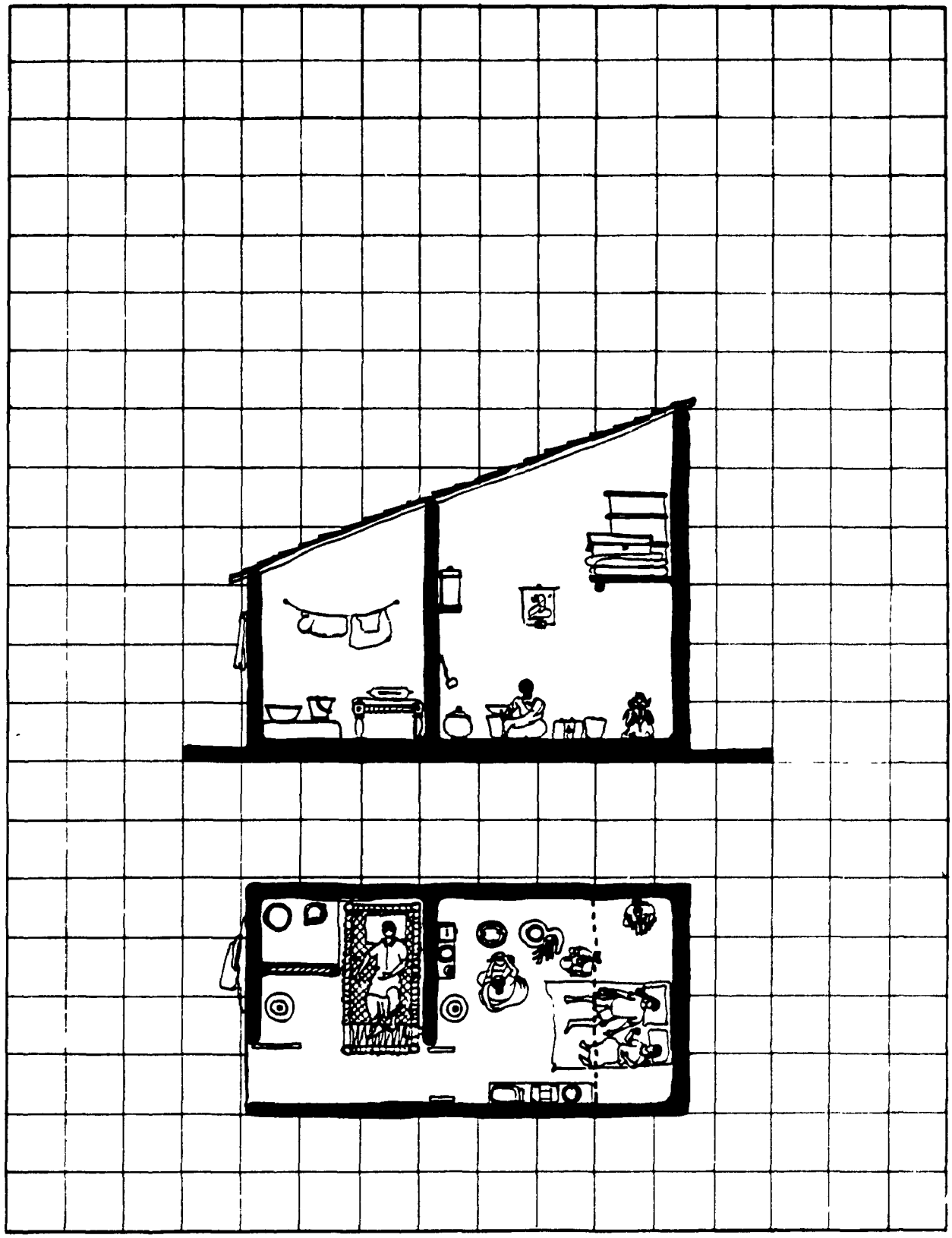
0 75 225 450 cm



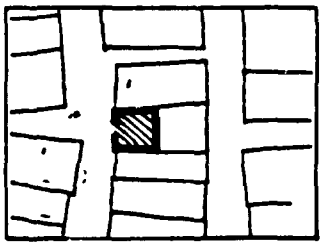
OWNER, WIFE, 3 SONS, 1 DAUGHTER (6 Persons)





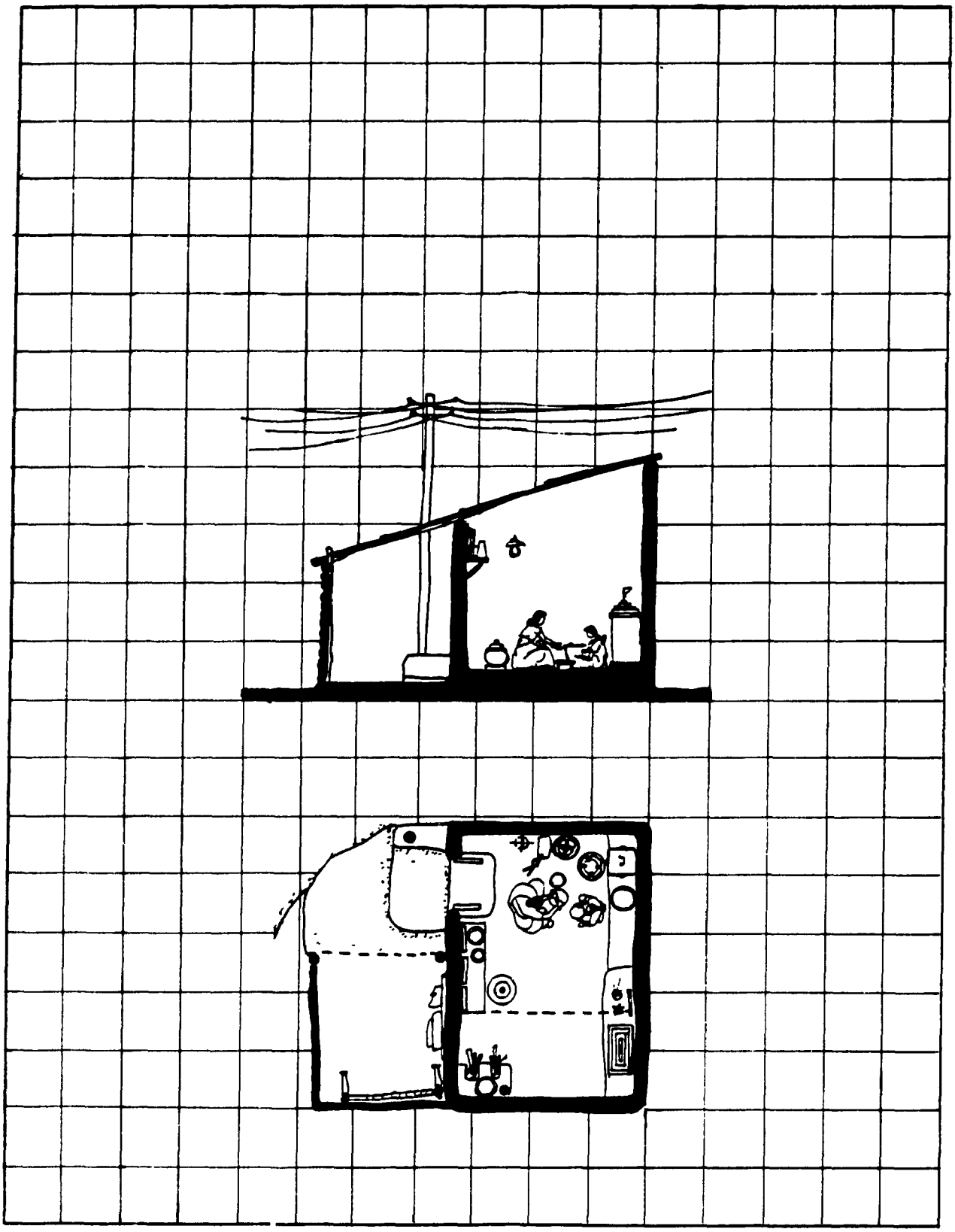


RENTER, WIFE, 4 DAUGHTERS. (6 Persons)

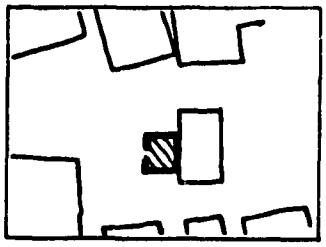


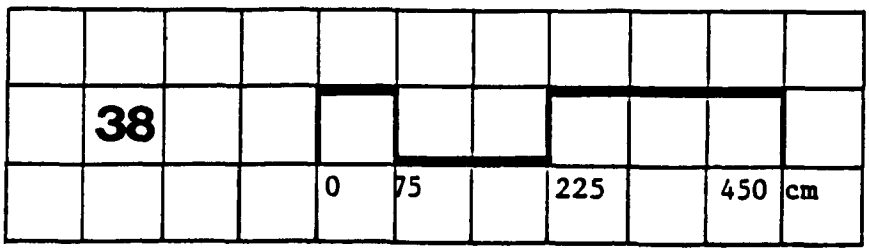
37

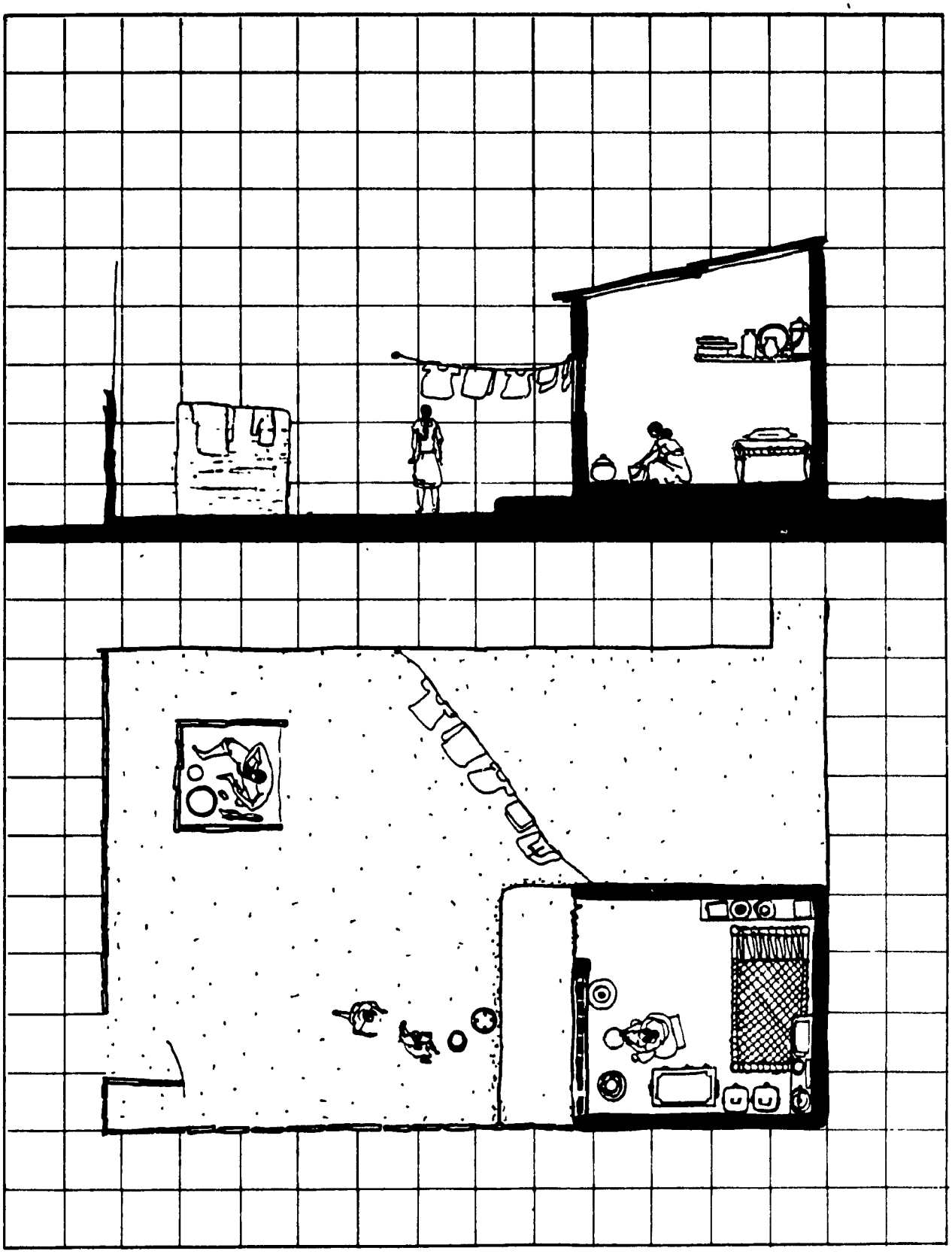
0 75 225 450 cm



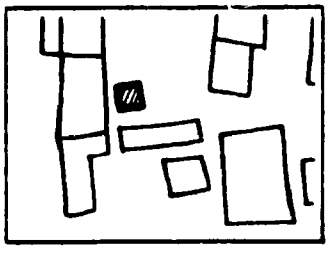
RENTER, GRANDDAUGHTER. (2 Persons)





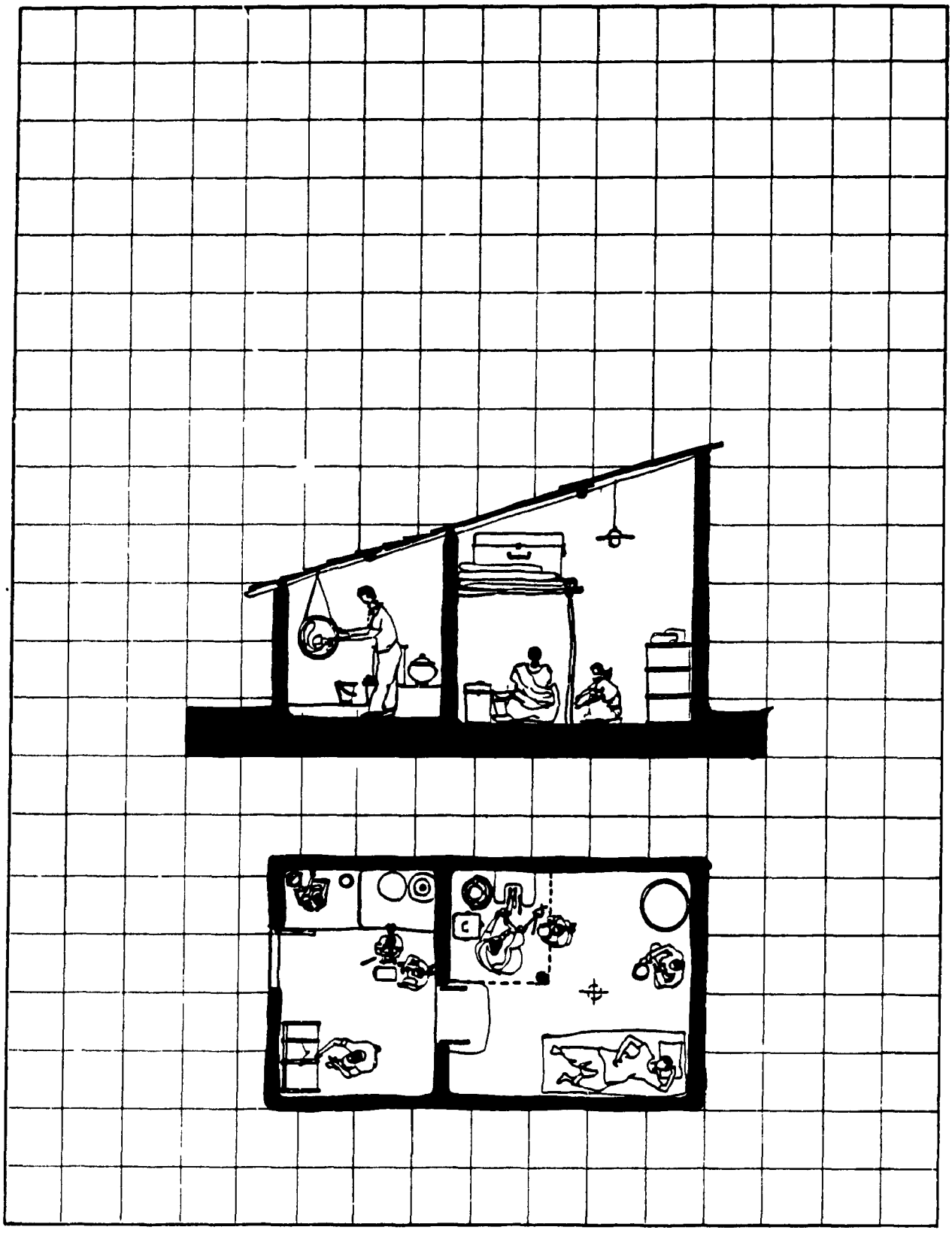


RENTER, HUSBAND, SON, DAUGHTER. (4 Persons)

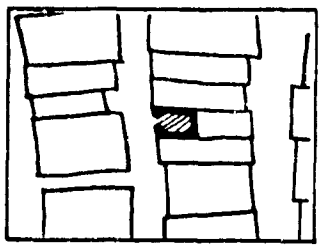


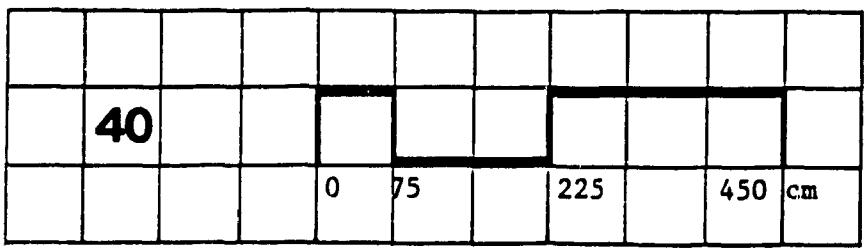
39

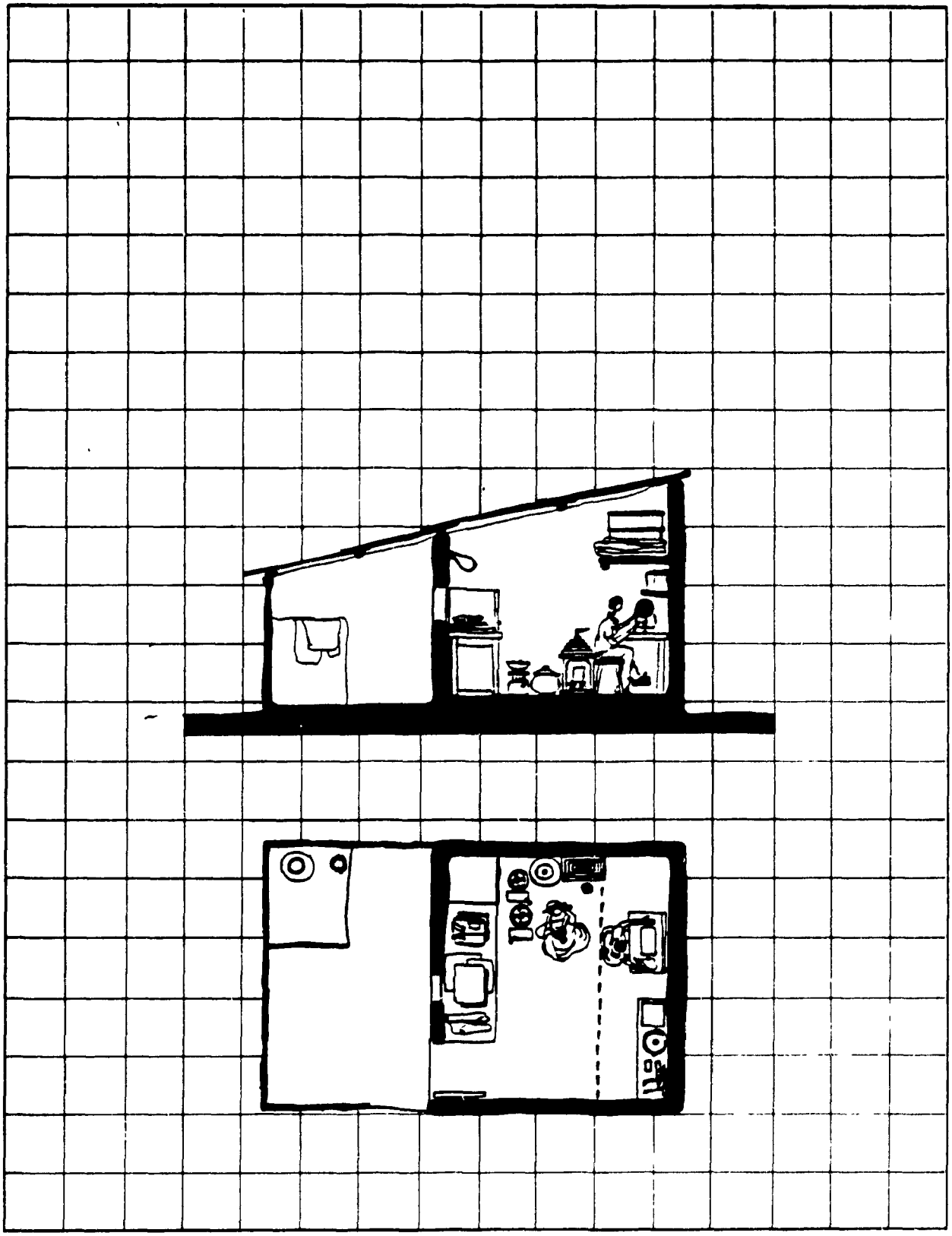
0 75 225 450 cm



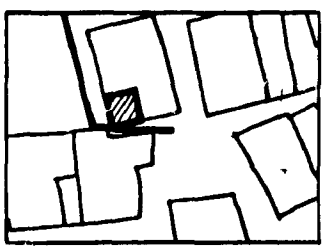
RENTER, WIFE, 2 SONS, 4 DAUGHTERS. (8 Persons)





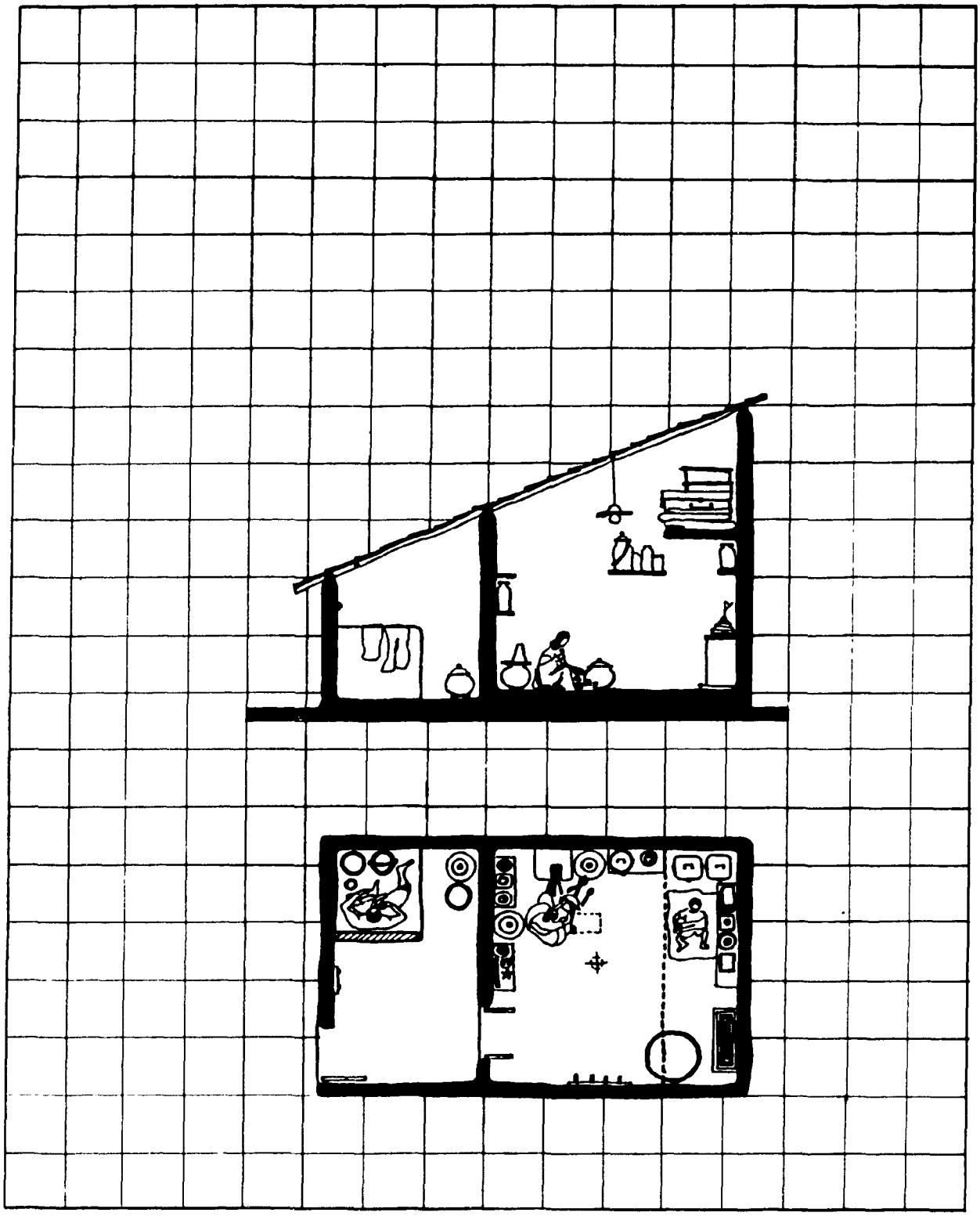


RENTER, MOTHER. (2 Persons)

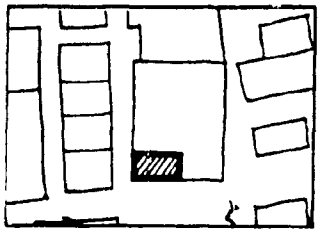


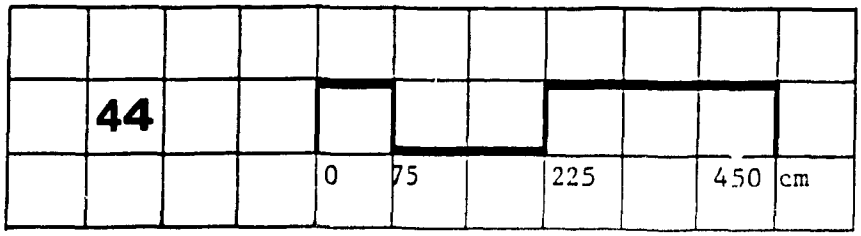
41

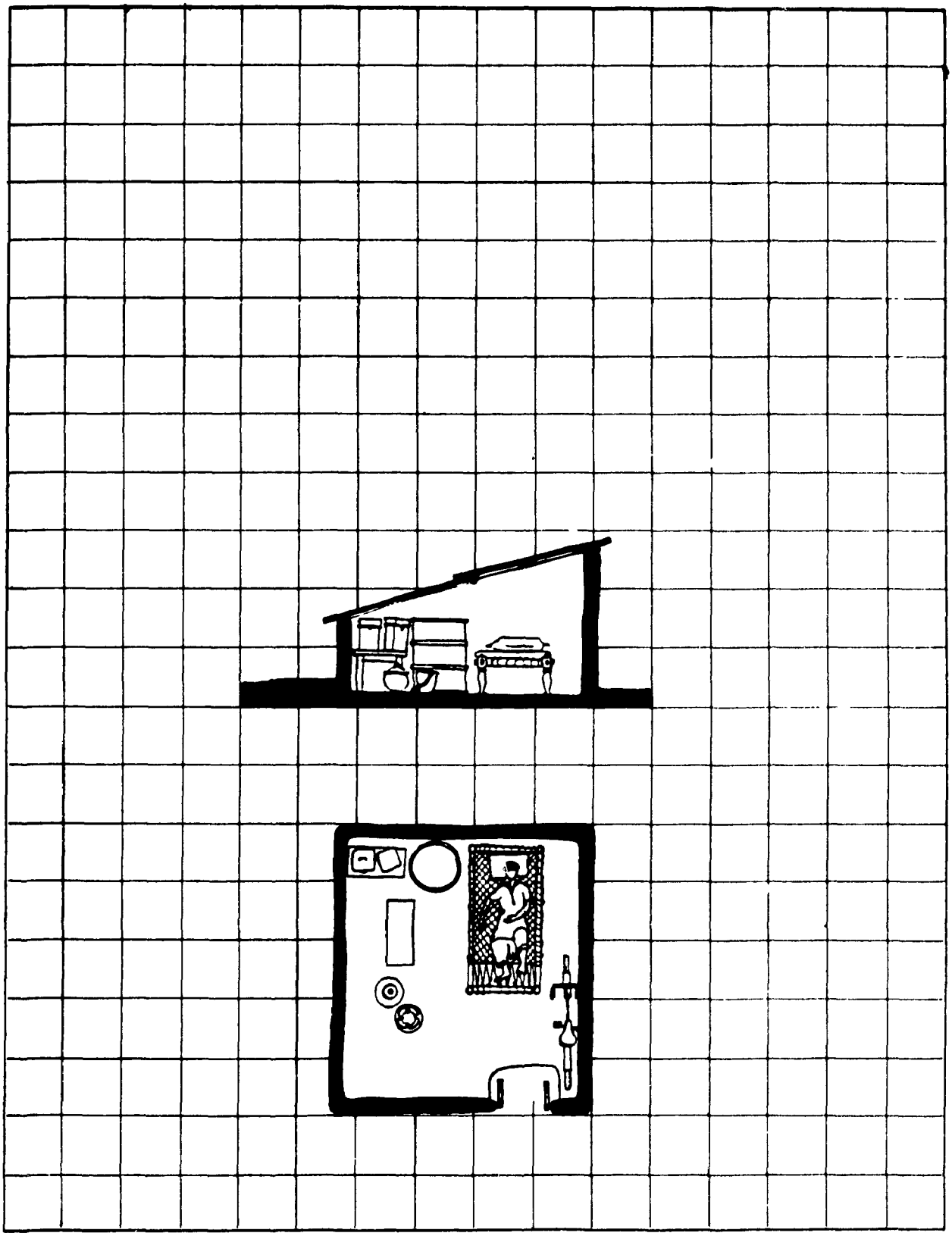
0 75 225 450 cm



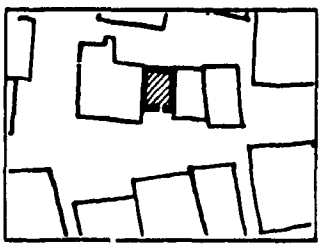
RENTER, WIFE, SON. (3 Persons)

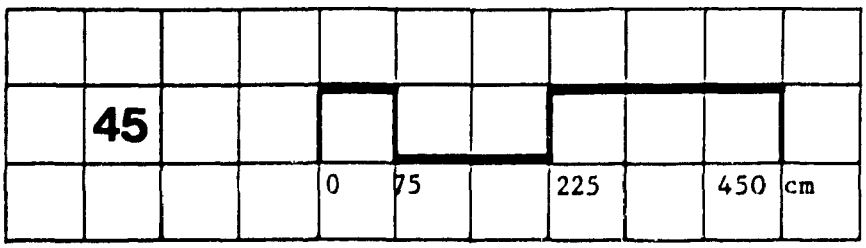


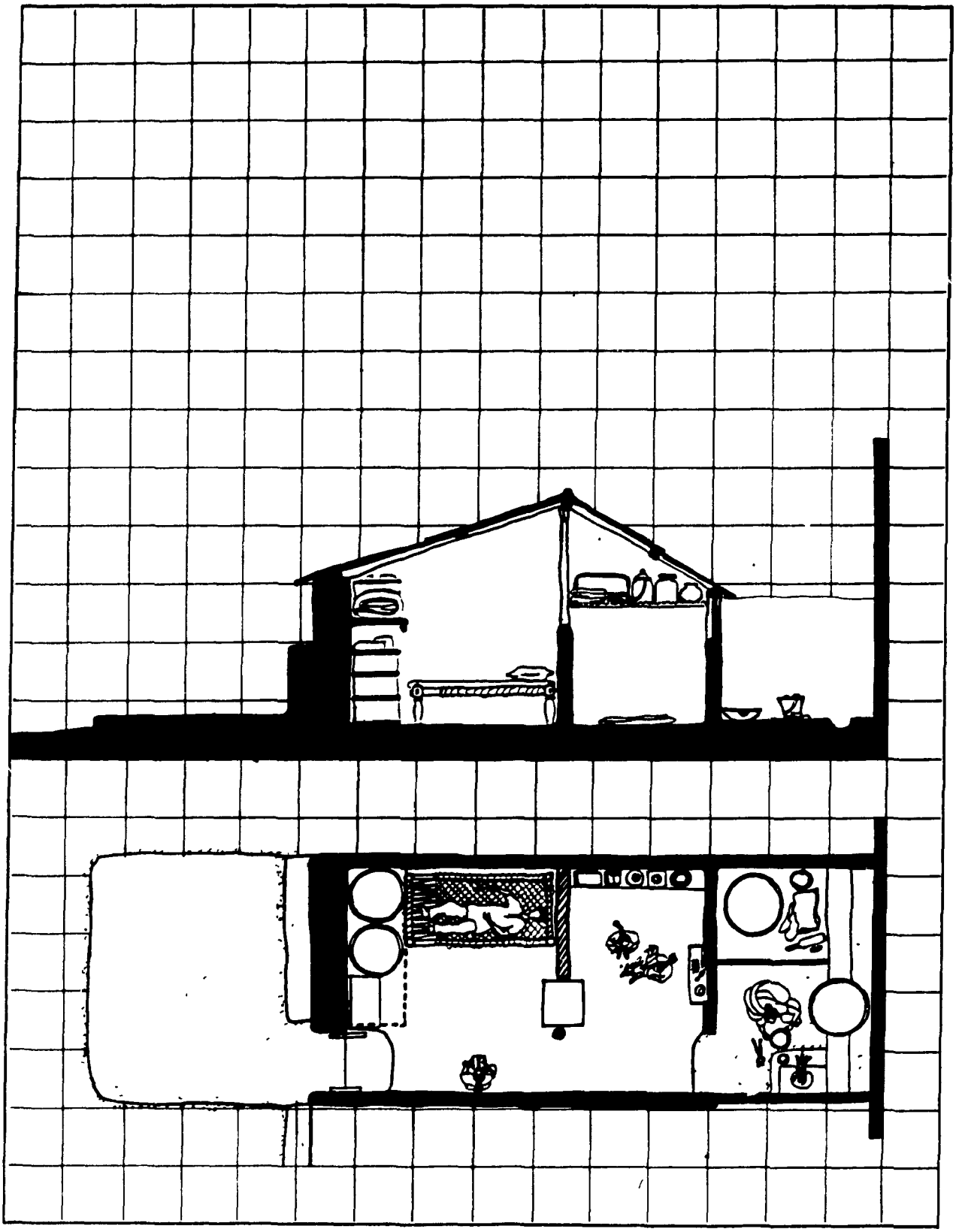




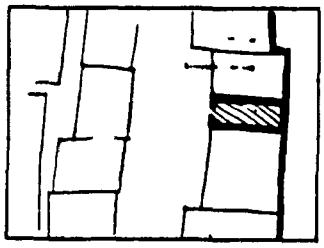
RENTER (1 Person)





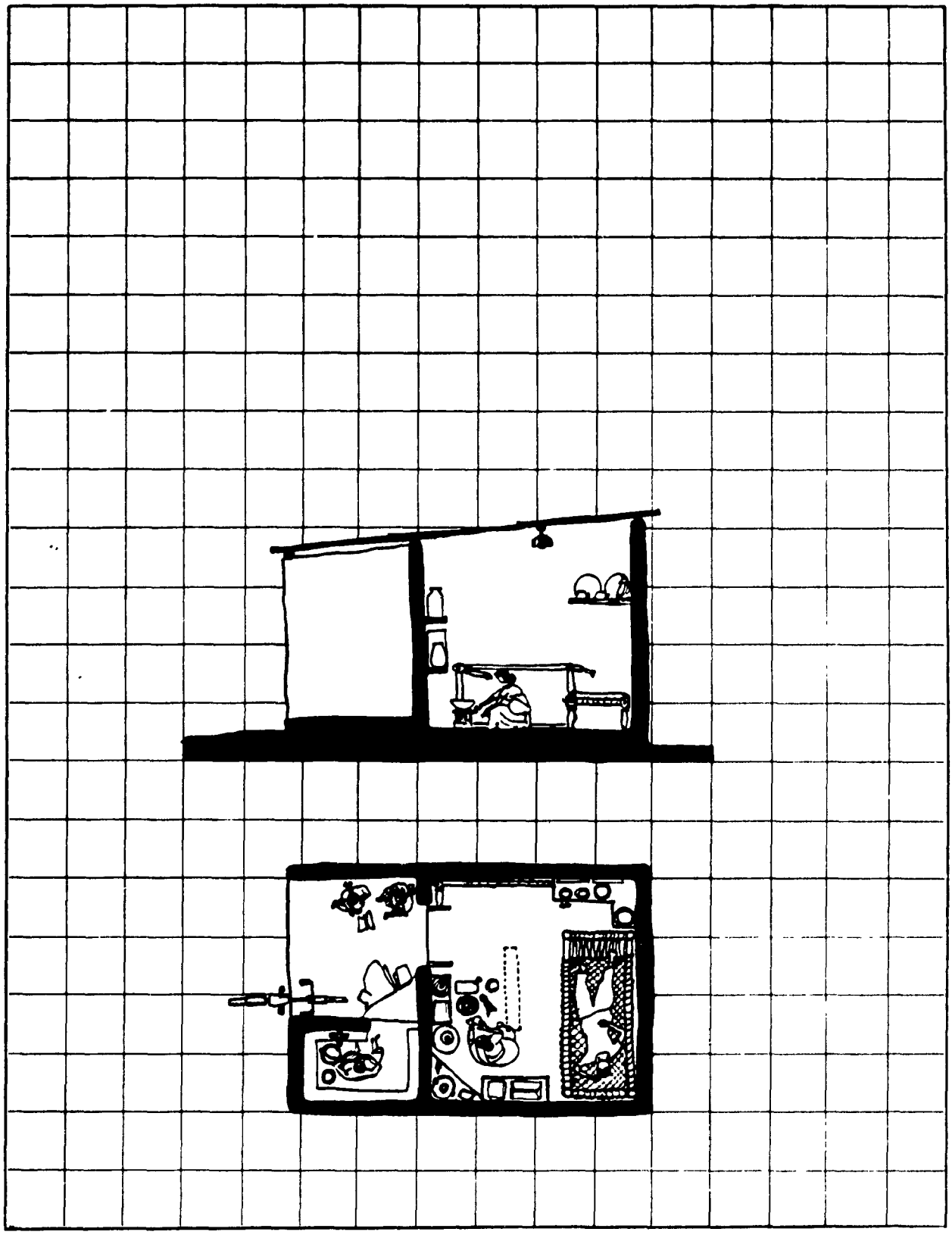


RENTER, WIFE, 3 DAUGHTERS. (5 Persons)

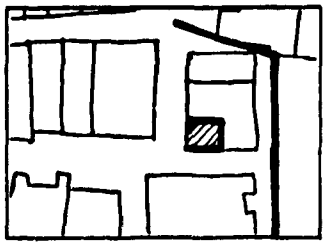


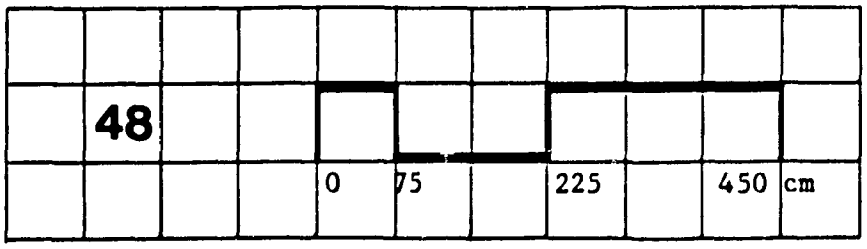
46

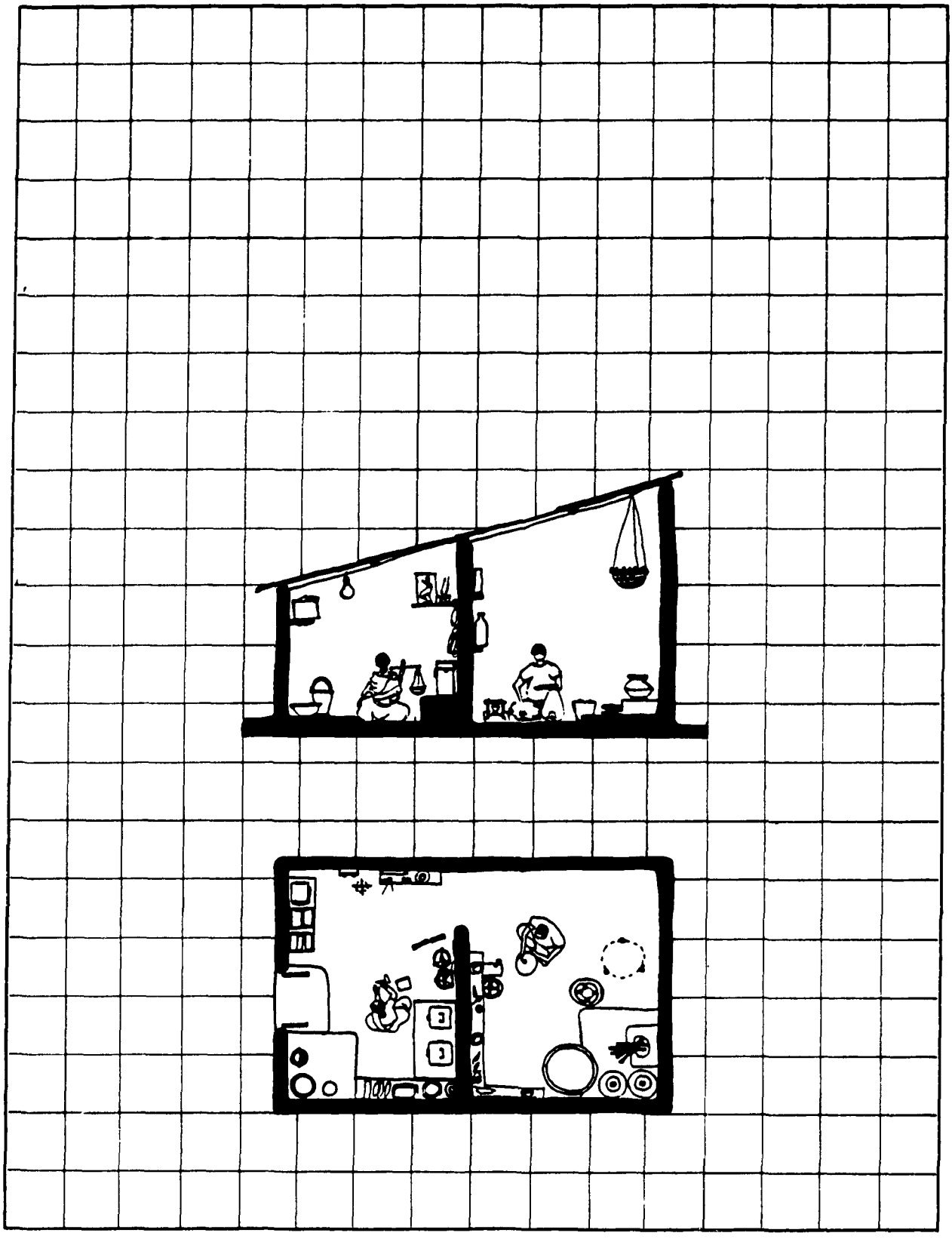
0 75 225 450 cm



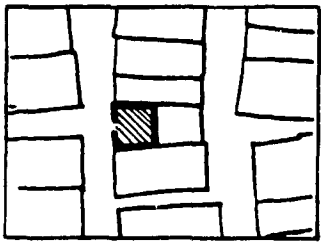
RENTER, WIFE, SON, 2 DAUGHTERS. (5 Persons)

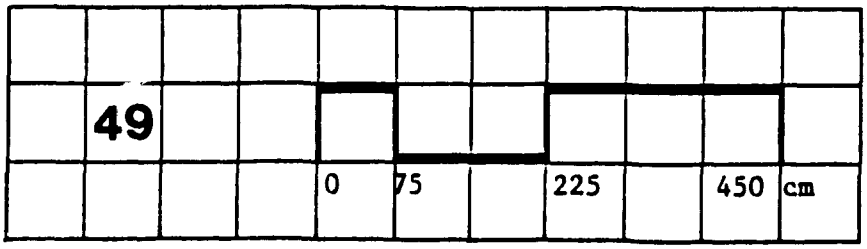




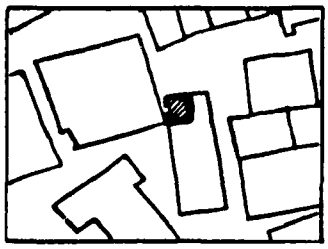


RENTER, SON. (2 Persons)





RENTER, SON. (2 Persons)



50

0 75 225 450 cm

APPENDIX - B: Data Sheets

HOUSEFORM CHARACTERISTICS

	EXPOSURE		ACCESS		EXTENT		ORGANIZATION			SPACE		HOUSEHOLD	
Cases	Single	Multi-	Single	Multiple	Small	Large	Internal Circulation	Mixed Circulation	External Circulation	Single	Combined	Single	Multi-
01	.	*	.	*	.	*	.	*	.	.	*	.	*
02	.	*	*	.	*	.	*	.	.	.	*	*	.
03	.	*	.	*	.	*	.	*	.	.	*	.	*
3A	.	*	.	*	.	*	.	.	*	.	*	.	*
04	.	*	.	*	*	.	.	.	*	.	*	.	*
05	*	.	.	*	.	*	.	*	.	.	*	.	*
06	.	*	.	*	.	*	.	*	.	*	.	.	*
07	*	.	.	*	.	*	.	*	.	.	*	.	*
08	.	*	.	*	.	*	.	*	.	.	*	.	*
09	.	*	.	*	.	*	.	*	.	.	*	.	*
10	.	*	*	.	*	.	.	.	.	*	.	*	.
11	.	*	*	.	.	*	*	.	.	.	*	.	*
12	.	*	*	.	*	.	*	.	.	*	.	.	*
13	.	*	.	*	.	*	.	*	.	*	.	.	*
14	.	*	.	*	.	*	.	.	*	.	*	.	*
15	.	*	.	*	.	*	.	*	.	*	.	*	.
16	.	*	.	*	.	*	*	.	.	.	*	.	*
17	*	.	.	*	.	*	.	*	.	.	*	*	.
18	.	*	.	*	.	*	.	.	*	.	*	.	*
19	.	*	.	*	.	*	.	*	.	.	*	.	*
19A	.	*	.	*	.	*	.	.	*	.	*	.	*
20	.	*	.	*	.	*	.	*	.	*	.	*	.
21	.	*	.	*	*	.	.	*	.	*	.	*	.
22	.	*	.	*	.	*	.	*	.	.	*	.	*
23	.	*	.	*	*	.	.	.	.	.	*	.	*
24	.	*	.	*	.	*	.	*	.	*	.	*	.
25	.	*	.	*	.	*	.	*	.	*	.	.	*
26	.	*	.	*	.	*	*	.	.	.	*	.	*
27	.	*	.	*	.	*	.	*	.	.	*	.	*
28	.	*	.	*	.	*	.	*	.	.	*	.	*
29	.	*	.	*	.	*	.	*	.	.	*	.	*
30	.	*	.	*	*	.	*	.	.	*	.	.	*
31	.	*	.	*	.	*	.	*	.	.	*	.	*
32	.	*	*	.	*	.	*	.	.	*	.	*	.
33	.	*	.	*	.	*	.	*	.	.	*	.	*
34	.	*	.	*	.	*	.	*	.	.	*	.	*
35	*	.	*	.	*	.	*	.	.	.	*	*	.
36	*	.	*	.	*	.	*	.	.	*	.	*	.
37	*	.	*	.	*	.	*	.	.	*	.	*	.
38	.	*	*	.	*	.	.	.	*	.	*	*	.
39	.	*	*	.	*	.	.	.	.	.	*	*	.
40	*	.	*	.	*	.	*	.	.	*	.	*	.
41	.	*	*	.	*	.	*	.	.	*	.	*	.
42	.	*	*	.	*	.	*	.	.	.	*	*	.
43	.	*	*	.	*	.	*	.	.	.	*	*	.
44	.	*	*	.	*	.	*	.	.	*	.	*	.
45	.	*	*	.	*	.	.	.	.	*	.	*	.
46	*	.	*	.	*	.	*	.	.	.	*	*	.
47	.	*	.	*	*	.	*	.	.	*	.	.	*
48	.	*	*	.	*	.	*	.	.	*	.	*	.
49	*	.	*	.	*	.	*	.	.	*	.	*	.
50	.	*	*	.	*	.	.	.	.	.	*	*	.
	09	43	20	32	24	28	19	22	06	20	32	23	29

COOKING ACTIVITY

Cases	LOCATION			SPACE				COMPONENTS				
	Front	between	Rear	Enclosed	Semi-enclosed	Semi-open	Open	Access	Door	Floor	Multi-access	Single room
01	*	.	.	.	*	.	.	*	.	.	*	.
02	.	.	*	*	.	.	.	.	*	.	.	.
03	*	.	.	*	.	.	.	*	.	.	.	*
	*	.	.	*	.	.	.	*	.	.	.	*
	*	.	.	.	*	.	.	*	.	.	.	.
	*	.	.	*	.	.	.	*	*	.	.	.
04	.	.	*	*	.	.	.	.	.	*	.	.
	*	.	.	*	.	.	.	.	.	.	.	*
05	.	.	*	*	.	.	.	.	*	.	.	.
	.	.	*	.	.	.	*	.	.	.	.	.
06	.	.	*	*	.	.	.	.	.	*	.	.
	.	.	*	*	.	.	.	.	*	.	.	.
07	.	.	*	*	.	.	.	.	*	*	.	.
	.	.	*	*	.	.	.	.	*	*	.	.
	.	.	*	.	.	.	*	.	.	*	.	.
08	.	.	*	*	.	.	.	.	.	*	.	.
	.	.	*	*	.	.	.	.	.	.	.	.
10	*	.	.	*	.	.	.	.	*	.	.	*
11	.	.	*	*	.	.	.	.	*	.	.	.
12	.	.	*	*	.	.	.	.	.	.	.	.
13	*	.	.	*	.	.	.	.	*	.	*	.
47	*	.	.	*	.	.	.	.	*	.	*	.
14	*	.	.	*	.	.	.	.	.	.	.	*
	.	*	.	*	.	.	.	.	.	.	*	*
	.	.	*	*	.	.	.	.	.	.	.	.
	*	.	.	.	.	.	*	.	.	.	*	*
15	*	.	.	*	.	.	.	*	.	*	.	.
16	.	*	.	*	.	.	.	.	*	.	.	.
17	.	.	*	*	.	.	.	.	*	.	.	.
18	*	.	.	*	.	.	.	*	.	.	.	*
	*	.	.	*	.	.	.	*	.	*	.	*
	.	.	*	*	.	.	.	.	.	.	.	.
19	*	.	.	.	.	.	*	.	.	.	*	.
20	*	.	.	*	.	.	.	.	.	.	*	.
21	*	.	.	*	.	.	.	*	.	.	*	.
22	.	.	*	*	.	.	.	.	*	.	.	.
24	.	*	.	*	.	.	.	.	*	.	.	.
25	.	*	.	*	.	.	.	.	*	.	.	.
26	.	*	.	*	.	.	.	.	.	.	.	.
27	.	.	*	*	.	.	.	.	*	*	.	.
28	*	.	.	*	.	.	.	.	*	*	*	.
	*	.	.	*	.	.	.	.	*	.	*	.
	*	.	.	*	.	.	.	.	.	.	.	*
	.	.	*	*	.	.	.	.	.	*	.	.
42	.	.	*	*	.	.	.	.	.	.	.	*
30	*	.	.	*	.	.	.	.	.	.	*	.
31	.	.	*	*	.	.	.	*	.	.	.	.
	.	.	*	*	.	.	.	*	.	.	.	.
32	.	.	*	*	.	.	.	.	*	.	.	.
33	.	.	*	*	.	.	.	*	.	.	.	.
34	.	*	.	*	.	.	.	.	.	.	.	.
	.	*	.	*	.	.	.	.	.	.	.	.
36	.	.	*	*	.	.	.	.	*	.	.	.
37	.	.	*	*	.	.	.	.	*	.	.	.
38	.	.	*	*	.	.	.	.	*	.	.	*
39	*	.	.	*	.	.	.	*	.	.	.	*
40	.	.	*	*	.	.	.	.	*	.	.	.
41	.	.	*	*	.	.	.	.	.	.	.	.
44	.	.	*	*	.	.	.	.	.	.	.	.
45	*	.	.	*	.	.	.	*	.	.	.	*
46	.	.	*	.	.	.	*	.	*	.	.	.
48	.	.	*	*	.	.	.	.	*	.	.	.
49	.	.	*	*	.	.	.	.	.	*	.	.
50	.	.	*	*	.	.	.	.	.	.	.	*
	23	7	34	57	2	.	5	14	25	12	11	15

RELIGIOUS ACTIVITY (Worshipping)

	LOCATION			SPACE				COMPONENTS	
Cases	Front	Between	Rear	Enclosed	Semi-enclosed	Semi-open	Open	Floor	Wall
06	*	.	.	*	.	.	.	*	.
07	*	.	.	*	.	.	.	.	*
08	*	.	.	*	.	.	.	*	.
11	.	*	.	*	.	.	.	*	.
12	*	.	.	*	.	.	.	.	*
14	*	.	.	*	.	.	.	*	.
16	.	*	.	*	.	.	.	*	.
18	*	.	.	*	.	.	.	*	.
20	*	.	.	*	.	.	.	*	.
28	*	.	.	*	.	.	.	.	*
30	*	.	.	*	.	.	.	.	*
33	*	.	.	*	.	.	.	*	.
34	.	*	.	*	.	.	.	*	.
36	.	.	*	*	.	.	.	*	.
38	.	.	*	*	.	.	.	*	.
41	.	.	*	*	.	.	.	*	.
44	.	.	*	*	.	.	.	*	.
50	.	.	*	*	.	.	.	.	*
	10	3	5	18	.	.	.	13	5

INCOME GENERATING ACTIVITIES

	LOCATION			SPACE				COMPONENTS			
Cases	Front	Between	Rear	Enclosed	Semi-enclosed	Semi-open	open	Access	Door	Opening	Storage device
03	*	.	.	*	.	.	.	*	.	*	.
05	*	.	.	*	.	.	.	*	.	*	*
06	*	.	.	*	.	.	.	*	.	.	.
	*	.	.	*	.	.	.	*	.	.	.
08	*	.	.	*	.	.	.	.	*	.	*
16	.	*	.	*	.	.	.	.	.	.	*
35	*	.	.	*	.	.	.	*	.	.	.
22	*	.	.	*	.	.	.	*	.	*	*
24	*	.	.	*	.	.	.	*	.	*	*
25	*	.	.	*	.	.	.	*	.	.	*
26	.	*	.	*	.	.	.	.	*	*	*
32	.	.	*	*	.	.	.	.	.	*	*
34	.	*	.	*	.	.	.	.	*	.	*
36	.	.	*	*	.	.	.	.	.	.	*
41	.	.	*	*	.	.	.	.	.	.	*
49	*	.	.	*	.	.	.	*	.	.	*
	10	3	3	16	.	.	.	9	3	6	12

WASHING ACTIVITY

Cases	LOCATION			SPACES				COMPONENTS	
	Detached	Attached	Within	Enclosed	Semi-enclosed	Semi-open	Open	Street	Access
01	.	*	.	.	*	.	.	*	*
02	.	.	*	*	.	.	.	*	*
03	.	*	.	.	.	.	*	*	*
	.	*	.	.	.	*	.	*	*
05	.	.	*	.	*	.	.	*	.
06	.	.	*	*	.	.	.	*	*
08	.	.	*	*	.	.	.	*	.
10	.	.	*	*	.	.	.	*	.
11	.	.	*	*	.	.	.	*	.
13	.	.	*	*	.	.	.	*	*
14	*	.	.	.	.	.	*	*	*
	*	.	.	.	.	.	*	*	*
15	.	.	*	*	.	.	.	*	*
16	.	*	.	*	.	.	.	*	*
17	.	.	*	*	.	.	.	*	.
18	.	*	.	.	.	.	*	*	*
19	*	.	.	.	.	*	.	*	*
20	.	.	*	.	*	.	.	*	*
22	.	.	*	*	.	.	.	*	.
23	.	*	.	.	.	.	*	*	*
24	.	.	*	*	.	.	.	*	.
25	.	.	*	*	.	.	.	*	*
	.	.	*	*	.	.	.	*	*
26	.	.	*	*	.	.	.	*	*
	.	.	*	*	.	.	.	*	*
27	*	.	.	.	.	.	*	*	*
28	.	.	*	*	.	.	.	*	*
	.	*	.	.	.	.	*	*	*
	.	*	.	.	*	.	.	*	*
29	.	.	*	*	.	.	.	*	.
31	.	*	.	.	.	.	*	*	*
32	.	.	*	*	.	.	.	*	.
33	.	*	.	.	.	*	.	*	*
	*	.	.	.	.	.	*	*	*
34	.	*	.	.	*	.	.	*	*
36	.	.	*	*	.	.	.	*	*
37	.	.	*	*	.	.	.	*	*
39	*	.	.	.	.	.	*	*	*
40	.	.	*	*	.	.	.	*	*
41	.	.	*	*	.	.	.	*	.
42	.	*	.	.	*	.	.	*	*
43	*	.	.	.	.	.	*	*	.
44	.	.	*	*	.	.	.	*	*
46	.	*	.	.	.	*	.	*	.
48	.	.	*	*	.	.	.	*	*
49	.	.	*	*	.	.	.	*	*
	7	13	26	25	6	4	11	46	34

APPENDIX - C: Statistical Analysis

(SAS print-outs)

SHILNATH CAMP
Cross tabulation and Chi-square test

TABLE OF FAMILY BY ACCESS

FAMILY ACCESS

Frequency Percent Row Pct Col Pct	single	multiple	Total
single	18	5	23
	34.62	9.62	44.23
	78.26	21.74	
	90.00	15.63	
multi	2	27	29
	3.85	51.92	55.77
	6.90	93.10	
	10.00	84.37	
Total	20	32	52
	38.46	61.54	100.00

STATISTICS FOR TABLE OF FAMILY BY ACCESS

Statistic	DF	Value	Prob
Chi-Square	1	27.600	0.000
Likelihood Ratio Chi-Square	1	30.653	0.000
Continuity Adj. Chi-Square	1	24.667	0.000
Mantel-Haenszel Chi-Square	1	27.069	0.000
Fisher's Exact Test (Left)			1.000
(Right)			1.10E-07
(2-Tail)			1.90E-07
Phi Coefficient		0.729	
Contingency Coefficient		0.589	
Cramer's V		0.729	

Sample Size = 52

SHILNATH CAMP
Cross tabulation and Chi-square test

TABLE OF FAMILY BY EXTENT

FAMILY	EXTENT		
Frequency Percent Row Pct Col Pct	small	large	Total
single	19 36.54 82.61 82.61	4 7.69 17.39 13.79	23 44.23
multi	4 7.69 13.79 17.39	25 48.08 86.21 86.21	29 55.77
Total	23 44.23	29 55.77	52 100.00

STATISTICS FOR TABLE OF FAMILY BY EXTENT

Statistic	DF	Value	Prob
Chi-Square	1	24.625	0.000
Likelihood Ratio Chi-Square	1	26.871	0.000
Continuity Adj. Chi-Square	1	21.914	0.000
Mantel-Haenszel Chi-Square	1	24.151	0.000
Fisher's Exact Test (Left)			1.000
(Right)			6.15E-07
(2-Tail)			7.18E-07
Phi Coefficient		0.688	
Contingency Coefficient		0.567	
Cramer's V		0.688	

Sample Size = 52

SHILNATH CAMP
Cross tabulation and Chi-square test

TABLE OF FAMILY BY ORDER

FAMILY ORDER

Frequency Percent Row Pct Col Pct	vertical	combined	lateral	Total
single	13 27.66 68.42 68.42	5 10.64 26.32 22.73	1 2.13 5.26 16.67	19 40.43
multi	6 12.77 21.43 31.58	17 36.17 60.71 77.27	5 10.64 17.86 83.33	28 59.57
Total	19 40.43	22 46.81	6 12.77	47 100.00

STATISTICS FOR TABLE OF FAMILY BY ORDER

Statistic	DF	Value	Prob
Chi-Square	2	10.451	0.005
Likelihood Ratio Chi-Square	2	10.734	0.005
Mantel-Haenszel Chi-Square	1	8.637	0.003
Phi Coefficient		0.472	
Contingency Coefficient		0.427	
Cramer's V		0.472	

Sample Size = 47
WARNING: 33% of the cells have expected counts less than 5. Chi-Square may not be a valid test.

SHILNATH CAMP
Cross tabulation and Chi-square test

TABLE OF FAMILY BY SPACE

FAMILY SPACE

Frequency Percent Row Pct Col Pct	single	combined	Total
single	14	9	23
	26.92	17.31	44.23
	60.87	39.13	
	70.00	28.12	
multi	6	23	29
	11.54	44.23	55.77
	20.69	79.31	
	30.00	71.87	
Total	20	32	52
	38.46	61.54	100.00

STATISTICS FOR TABLE OF FAMILY BY SPACE

Statistic	DF	Value	Prob
Chi-Square	1	8.749	0.003
Likelihood Ratio Chi-Square	1	8.935	0.003
Continuity Adj. Chi-Square	1	7.134	0.008
Mantel-Haenszel Chi-Square	1	8.581	0.003
Fisher's Exact Test (Left)			0.999
(Right)			3.59E-03
(2-Tail)			4.39E-03
Phi Coefficient		0.410	
Contingency Coefficient		0.380	
Cramer's V		0.410	

Sample Size = 52

SHILNATH CAMP
Cross tabulation and Chi-square test

TABLE OF EXPOSURE BY ACCESS

EXPOSURE ACCESS

Frequency Percent Row Pct Col Pct	single	multiple	Total
single	6 11.54 66.67 30.00	3 5.77 33.33 9.38	9 17.31
multiple	14 26.92 32.56 70.00	29 55.77 67.44 90.62	43 82.69
Total	20 38.46	32 61.54	52 100.00

STATISTICS FOR TABLE OF EXPOSURE BY ACCESS

Statistic	DF	Value	Prob
Chi-Square	1	3.658	0.056
Likelihood Ratio Chi-Square	1	3.569	0.059
Continuity Adj. Chi-Square	1	2.359	0.125
Mantel-Haenszel Chi-Square	1	3.588	0.058
Fisher's Exact Test (Left)			0.988
(Right)			6.38E-02
(2-Tail)			7.15E-02
Phi Coefficient		0.265	
Contingency Coefficient		0.256	
Cramer's V		0.265	

Sample Size = 52
WARNING: 25% of the cells have expected counts less than 5. Chi-Square may not be a valid test.

SHILNATH CAMP
Cross tabulation and Chi-square test

CORRELATION ANALYSIS

6 'VAR' Variables: EXPOSURE ACCESS EXTENT ORDER SPACE FAMILY

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
EXPOSURE	52	1.82692	0.38200	95.00000	1.00000	2.00000
ACCESS	52	1.61538	0.49125	84.00000	1.00000	2.00000
EXTENT	52	1.55769	0.50151	81.00000	1.00000	2.00000
ORDER	52	1.55769	0.82637	81.00000	0	3.00000
SPACE	52	1.61538	0.49125	84.00000	1.00000	2.00000
FAMILY	52	1.55769	0.50151	81.00000	1.00000	2.00000

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 52

	EXPOSURE	ACCESS	EXTENT	ORDER	SPACE	FAMILY
EXPOSURE	1.00000 0.0	0.26523 0.0574	0.20667 0.1416	0.12542 0.3756	0.05626 0.6920	0.30902 0.0258
ACCESS	0.26523 0.0574	1.00000 0.0	0.80813 0.0001	0.63534 0.0001	0.26875 0.0540	0.72854 0.0001
EXTENT	0.20667 0.1416	0.80813 0.0001	1.00000 0.0	0.55957 0.0001	0.41019 0.0025	0.68816 0.0001
ORDER	0.12542 0.3756	0.63534 0.0001	0.55957 0.0001	1.00000 0.0	0.29724 0.0324	0.46494 0.0005
SPACE	0.05626 0.6920	0.26875 0.0540	0.41019 0.0025	0.29724 0.0324	1.00000 0.0	0.41019 0.0025
FAMILY	0.30902 0.0258	0.72854 0.0001	0.68816 0.0001	0.46494 0.0005	0.41019 0.0025	1.00000 0.0