MORE THAN JUST A SCHOOL:
An Exploration in Tractable Neighborhood Building Stock

by
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ABSTRACT

Shortages in land and resources are stiffling new construction and forcing the pursuit of alternate means to satisfy society's space needs within the existing building stock. Most existing buildings were not designed for alternate use, however, and an enormous price is being paid to convert these buildings to new functions. Architects and builders need to transcend what has proven to be a shortsighted preoccupation with short term, single function buildings and establish a more protracted outlook on new building design. By incorporating multi-use (over time as well as space) characteristics into building design we can expand the potential uses of the available building stock and provide a solid basis for future growth.

The objective of this thesis is to provide a preliminary investigation into these types of multi-use buildings. Housing is explored as an alternate use for educational facilities in an attempt to develop a piece of versatile neighborhood building stock which can respond to the needs of the community. An initial investigation of issues is made through a series of design explorations employing an existing school facility as a study vehicle. The information and insight gathered in the study is then used to develop the spatial characteristics of a building framework which could accommodate a variety of housing and education use patterns.

Thesis Supervisor: Chester Sprague
Title: Associate Professor of Architecture

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I would like to express my appreciation to my advisor, Chester Sprague, for his incite and guidance throughout this thesis study. I would also like to thank my readers, John Habraken and Jack Myer, for their help and encouragement.

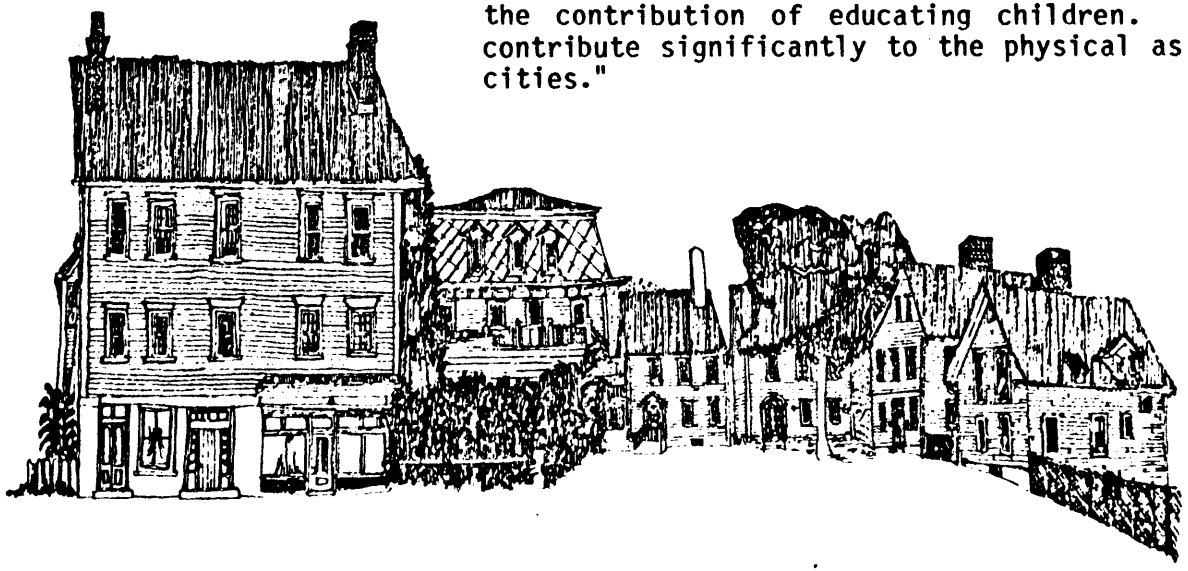
To my wife, Peggy, without whose understanding and devotion
this would never have been possible.

CHAPTER 1

Conceptual Framework

"We cannot assume that land for schools can be put aside in perpetuity and never contribute to the fiscal health of a city beyond the contribution of educating children. To survive, schools must contribute significantly to the physical as well as human renewal of cities."

Evans Clinchly



MULTI-USE BUILDINGS:

An opportunity to expand the use of available building stock

Despite warnings from environmentalists, modern society - with its faith in the rescuing power of technology - continues to move ahead into a future of questionable existence. Architecturally, we have built up our cities to unprecedented levels of technical sophistication; often, in the process, providing unique building solutions for each individual space need. Recent crises in economic and natural resources, however, have made it difficult to afford the luxury of such singular use buildings. Increasing shortages in available land have intensified the situation and we are steadily being forced to pursue alternate means of supplying society's space needs within the existing building stock. Buildings originally designed to serve the transient needs of society are being given new life through renovation and rehabilitation; an enormous price, however, is being paid to convert these short term, single function (throw away!) buildings to new uses. The extensive modifications necessary to accommodate the new uses often require levels of investment (time, money and energy) approaching those encountered in new building construction.

Architects and builders need to transcend what has proven to be a shortsighted preoccupation with throw away buildings and establish a more protracted outlook on new building design. The potential life of the building stock is being extended and buildings should be designed to facilitate future changes in use through the incorporation of multi-use characteristics. By expanding the concept of multi-use to include changes in use over time, we can permit multi-use options to be available in the present. Buildings could then be kept up to date through small and periodic expenditures instead of waiting for costly major renovation.

The importance of adaptability in the building stock can be seen in almost any typical main street store grouping. Over a few decades time, a single 100-foot development may have changed its use at least a dozen times, yet the basic building framework remains

unchanged. The internal flexibility of these buildings is primarily responsible for their adaptable quality; a concept that has been used in many contemporary office, commercial and industrial buildings. However, these buildings are still essentially single-use buildings and generally allow only for adaptability to varying use patterns within their respective building types (office, commercial, industrial). Rarely do they go beyond this limited concept of adaptability and intentionally provide the opportunity for the development of a wider spectrum of radically different uses.

The concept of multi-use can offer an opportunity to expand the potential range of uses in the building stock by providing buildings which are adaptable to a variety of uses. This is not to say that buildings should be designed to accommodate every possible use, for indeed, this would be unrealistic; but judicious selection of foreseeable use options could lead to the development of new building types with increased long-term utility. By providing the available building stock with multi-use characteristics, we may well fulfill many of the changing needs of today's world and provide a sound basis for future growth.

PUBLIC EDUCATION FACILITIES:
A community resource during periods of change

Public buildings may have a good potential for the development of alternate use options. Unlike our existing privately-owned, single-use buildings, multi-use public buildings may provide unique economic advantages to the community. As competition for land and construction cost increase, it is becoming more difficult to secure the land or funds to build public facilities. Due to a dwindling property tax base, most cities are facing a frightening fiscal crisis. In the city of Boston, for instance, about fifty percent of the available land is already occupied by public and other tax-exempt buildings (8, p. 4).* Every time land is

* First number in parenthesis refers to the source number as listed in the Selected References; the second number refers to page number within that source on which the material may be found.

allocated for a new public facility, the tax base of potential revenue-producing properties is decreased. Resentment is growing in many communities against high property taxes and taxpayers are looking carefully at the cost of public facilities, often rejecting bond issues because of the potential increases in the tax rate. Multi-use may offer a way for communities to build public facilities without losing potential revenue-producing property. By providing alternative private-use options to these buildings, they can contribute to the tax base during periods of under-utilization by public agencies. Communities may then be more willing to pay for public facilities, since they would be able to respond more fully to the changing needs of the taxpayers.

Education facilities, which usually represent the largest part of a municipal building program, are becoming a growing concern in many communities. Temporary shortages in school-age children, resulting from the diminishing size of the family unit, and changes in the community aging cycles have forced consolidation in school systems. The liabilities associated with the resulting vacated schools generally force the school district to relinquish the buildings to developers for demolition or permanent conversion to other uses. Besides the obvious loss in potential educational space, this process results in a diminished return on the taxpayers original investment. Communities which once cherished their neighborhood schools are finding themselves with little or no control over the building and its playground found down the block.

As the family composition patterns of the community change and the current "baby boom" continues, many of these communities may find themselves in a situation where new educational space is again necessary. However, with increasing construction costs and scarcity of land, they may not be able to provide new educational facilities. If the original schools had been designed with alternate uses in mind, they could be converted temporarily to another use without sacrificing the possibility of reclaiming some, or all, of the educational space. By providing opportunities for the development of housing, office, commercial,

industrial or other alternate uses, educational facilities could represent a durable asset rather than a liability to the community.

EDUCATION/HOUSING ALTERNATIVE:
A beginning point for multi-use development

Although there exist several possibilities for alternate use of educational facilities, this thesis concentrates on exploring housing as a viable option for alternate use. This is a narrow choice of uses, but it was felt that some initial explorations needed to be made; the education/housing alternative could constitute a step in the right direction. In addition, this initial investigation of alternate uses is made in a hope that some light may be shed on the larger issues involved in multi-use and that this study may serve as a beginning point for further and wider explorations.

The selection of housing as an alternate use for education facilities was not made at random; there are several reasons for their potential compatibility. Population shifts and changing patterns in life styles are creating an increasing need for more and different types of housing in most communities. More and more schools are being closed due to decreasing enrollments and many of these abandoned schools are being converted to housing. The education/housing alternative could provide a useful option to communities by allowing the development of potential housing as well as educational space.

Recent high-use and mixed-use projects, such as those developed by the New York City Educational Construction Fund, have attempted to integrate schools with housing and other uses. However, a strong architectural separation has usually been made with virtually permanent divisions between uses. If a school is to respond effectively to enrollment fluctuations and changes in educational programs, it must be allowed to expand and contract its portion of the building. In general, this type of flexibility (interpenetration of uses) has not been achieved or even attempted in these projects (18, p. 91). A building with multi-use characteristics, on the other hand, could allow for expansion and contraction of user

space and be more responsive to needs of the occupants.

TRACTABLE EDUCATIONAL/HOUSING ENVIRONMENTS:

An opportunity to explore neighborhood building stock

The United States is in the midst of a severe housing shortage. Rising and unstable interest rates are stifling the growth of new housing stock and inhibiting the sale of existing housing. Rising transportation costs are intensifying the situation in many urbanized areas as people begin to look for more conveniently located housing. Densification strategies are currently being explored in many cities as an effort to accommodate some of the housing needs within existing residential areas. Recent studies indicate that nationally, between three and six million new living units could be established through subdivision of single family dwellings (35, p. 12).

Many current projects in mass housing are grossly institutional and force residents to assume predetermined lifestyles within minimally dimensioned spaces. The limited variety of unit plans employed in such housing schemes are based on the needs of "the typical nuclear family." Recent figures show that only seven percent of the U.S. population is currently living in this type of traditional family setting (31, p. 102). Society does not consist of a predictable, unchanging set of lifestyles and we cannot hope to meet the variable space needs of the "invisible" client in mass housing through stereotyped living scenarios.

The innovative work of Habraken, Rabeneck and others has attempted to abolish the notion of institutionalized mass housing by developing new concepts for flexible housing. These efforts put forth a strong belief that users must participate more decisively and personally in the creation of their own living environments. Considering the variety of use patterns associated with today's changing lifestyles, flexibility seems to be an essential quality in any viable housing scheme. Providing a more responsive building framework can allow the development of a variety of use patterns which

can reduce environmental alienation through user participation. Therefore, if a piece of building stock is to provide a useful and durable framework for future housing, it needs to be tractable (easily manageable, readily changed).

The development of a neighborhood building stock with tractable educational/housing characteristics suggests a different means of achieving flexibility than that proposed by the SAR and other flexible housing research groups. Many flexible housing projects attempt to achieve flexibility by maximizing the number of choices available to the user. The method proposed by the SAR is basically a bipartite form of construction. A framework of permanent "support" elements (utilities, structure, etc.) is provided into which a system of standardized "detachable" units (external wall, partitions, fixtures, etc.) can be added to form dwellings (27, p. 721). By choosing from an elaborate system of building components, the occupants can construct and adapt their living arrangements to suit their individual needs. The resulting housing environments may be extensively redeveloped, since only a minimum number of elements are permanent.

A neighborhood building stock with educational/housing use alternatives may find increased utility through expansion of the framework of permanent elements. This is not to dispute the basic principles of the SAR, but the method was not designed with this type of adaptability in mind and may not function in terms of long range tractability. The option intended to be explored in this study involves the establishment of a framework of fixed and movable (sliding) building components with dimensional and functional relationships to both uses. Although some removable elements may be necessary, tractability in the building stock could be explored primarily through reinterpretation of space, rather than redevelopment.

SUBURBAN PRIMARY SCHOOL ENVIRONMENTS:

A desirable prototype for neighborhood building stock

Preliminary explorations into the issues involved in tractable educational/housing environments have singled out suburban primary schools (or small junior high schools) as having promising potentials for this type of development. There are several reasons for this.

1. Suburban primary schools tend to be smaller in size and scale than secondary schools and generally more intimately associated with residential neighborhoods, thus presenting a good basis for the development of housing uses.
2. Primary schools seem to be more vulnerable to unforeseen population shifts than do secondary schools where fluctuations can be foreseen and planned.
3. Communities generally have only one or two centralized secondary schools; whereas, they may have several localized primary schools. Although population shifts may allow temporary conversion of specific areas to other uses, the chances of totally closing a secondary school, as compared to a primary school, are low.
4. Primary school classes tend to remain stationary in specific learning areas and a "home-like" setting can provide the desired richness in the learning environment. Secondary school students find richness through hourly movements from one specialized (less richly equipped) space to another.
5. Recent educational philosophies have required more flexibility in school facilities. This is especially true in primary schools where the stationary nature of the educational groupings demand a high degree of versatility in the immediate surroundings.

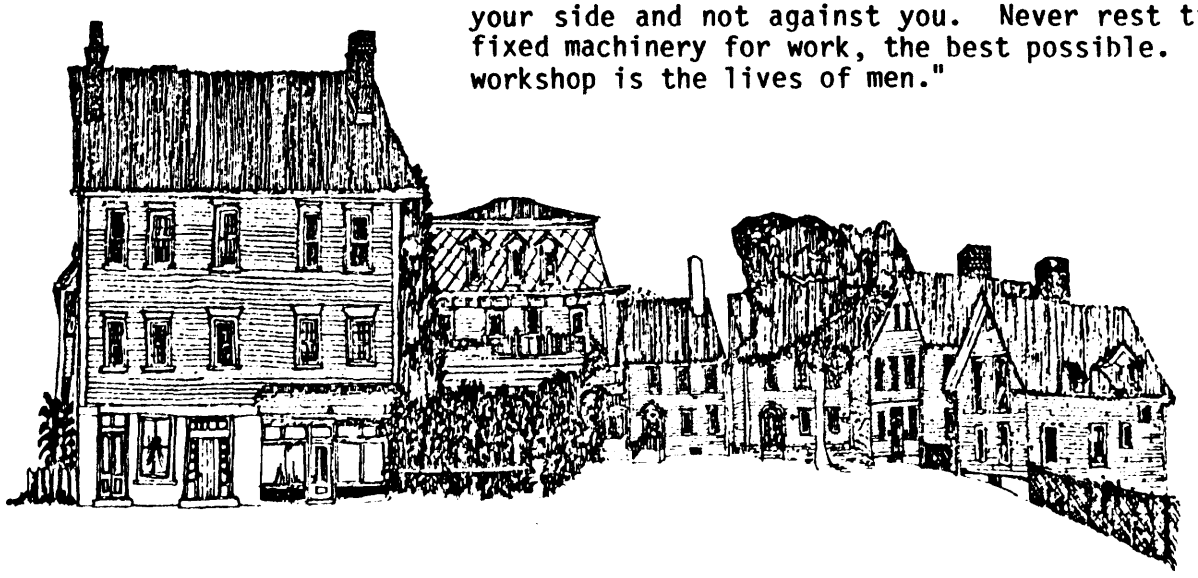
It is this type of educational environment (the suburban primary school) which is explored in this study. The intent is to undertake a beginning in the exploration of multi-use versatility by developing a piece of neighborhood building stock with tractable housing characteristics.

CHAPTER 2

Education & Flexibility

"Whatever men say or think, the Almighty wall is, after all, the supreme and final arbiter of schools. I mean no living power in the world can overcome the dead, unfeeling, everlasting pressure of the permanent structures, of the permanent conditions under which work has to be done . . . Never rest till you have got the Almighty Wall on your side and not against you. Never rest till you have got all the fixed machinery for work, the best possible. The waste in a teacher's workshop is the lives of men."

Edward Thring



CONTEMPORARY PUBLIC EDUCATION:

An on-going evolution in educational thinking

In order to understand the current situation in our educational system, we need to look at the general history of its development. Public education, as we know it today, has only been in existence in the United States for a little over 150 years. Before this time, education was a matter of family or religious community concern often allowing only the affluent the luxury of education. Following the Revolutionary War many Americans began to realize that a general education was necessary in order to provide equality, unity and freedom to our new democratic nation. The first public high school was opened in Boston in 1821 and, beginning in the 1830's, state systems of public schools began to emerge. With the aid of leaders such as Horace Mann and Henry Barnard, the public school system expanded swiftly during the 19th century as the United States sought to become the first nation in the world to provide equal educational opportunities to its people.

Architects of the late 19th century were often unfamiliar with the specific educational needs of the growing society and responded eclectically by looking to classic buildings as references for new public educational facilities. As a result, thousands of schools, many of which are still in existence today, were built with monumental Gothic, Greek, Renaissance and Baroque references. These buildings were often simplistic in spatial organization with axial orientations of oversized spaces. As programs became more developed and complex, school buildings began to be designed with more sensitivity to the educational needs.

Progress in school planning was slowed during the war and depression years (1915 - 1945). However, efforts were made to upgrade and standardize the quality of educational environments by the development of codes and regulations for schools. These laws governed the size, orientation, lighting and ventilation of classrooms. Originally intended to insure uniformity in schools, these codes inhibited the development of new building concepts (7, p. 16).

A turning point in the history of school architecture occured in 1950. A group of Chicago architects, headed by Dwight Perkins and John Donovan, pushed for the development of a new approach to school design. Educators, architects and administrators were brought together in an attempt to solve the educational problems. Codes were revised and new concepts in school planning began to emerge centered on expanded educational curriculums (7, p.16). During the 1950's and 1960's sharp increases in population, coupled with economic growth, created a seemingly unlimited demand for new schools. New towns and suburbs virtually sprang up over night and schools were built quickly and methodically, employing many technological advances in building construction.

The post-war years in Europe saw a different development in educational facilities. In the process of rebuilding, many European countries saw an opportunity to develop not only new educational facilities but new educational theories as well. Developments in educational psychology pushed pedagogic techniques toward individualized learning and the child became the subject rather than the object of education (30, p. 27). The temporary educational pavilions erected after the war became the testing ground for these new educational theories. These makeshift buildings were highly flexible, adapting readily to the changing educational needs and they can be seen as forerunners of today's flexible schools.

The concept of individualizing education caused a revolution in educational thinking in the United States during the late 1960's and 1970's. Reacting primarily to the strict confines and regimented instruction imposed by the conventional classroom and curriculum, educational theorists pushed for more openness and flexibility in educational facilities. The whole way of thinking about school planning underwent a transformation; rather than thinking first of uniform classes, teachers, texts, classrooms, grades and curriculum units, the innovating educators were thinking first of the individual student and the wide variety of options, modular units of time, space, personnel, materials and experiences at his/her command (14, p. 14). Architects responded by

altering the form of school buildings until, eventually, much of the traditional classroom concept was abolished; i.e., the development of the "open-plan school" in the late 1960's.

Throughout the 1970's a debate raged over the merits of the "open-plan school," with repercussions still being heard today. At that time, few disputed the basic educational principles behind the "open-plan," although, many educators and administrators expressed real concern over the issues involved in its implementation. Open-planning concepts were usually developed and tested using carefully selected students and instructors in experimental schools that were out of the mainstream of public education. Most early applications of the open plan could not reproduce these laboratory-like conditions and resulted in ineffectual learning situations, due in part to the inability of conventionally-trained educators to adapt to the system (24, pp. 44-46).

Subsequent applications seemed to indicate that something beyond the mere newness of the open-plan was attributing to it failure. Educational psychologists stressed the importance of closed-off areas in learning environments where children could escape the distracting atmosphere of the open-plan and find peace within a space they could personalize as their own (9, p. 69). Consequently, the open-plan has been undergoing a series of transformations leading it away from total openness toward an organization which combines the flexibility of openness with the necessity of closure.

Today, public education is a conglomerate of the achievements of the recent and not so recent past history of education. Declines in enrollment beginning in the 1970's have caused increasing numbers of school closings and severely hampered the development of new school facilities. Dwindling financial resources have forced most communities to "make-do" with their existing educational facilities. The result is that the vast majority of public schools are trapped in conventional educational facilities, making the implementation of individualized learning philosophies of modern education difficult if not impossible.

FLEXIBILITY IN EDUCATION:

A major difficulty in school design

The rallying cry of modern educators against their pedagogical traditions has been embodied in the term "flexibility." This highly obscured catchword, however, has often been used to mask the uncertainties and indecisions of educators and has shifted the educational problems to the architect without adequate indication of the desired solution. In reality, the notion of "flexibility" includes many separate ideas each with different architectural implications. Architect William Caudill abandoned the term altogether in favor of more specific terms:

1. **expansible space** - that which can allow for ordered growth;
2. **convertible (adaptable) space** - that which can be economically adapted to different uses;
3. **versatile (multi-purpose) space** - that which can serve a variety of functions;
4. **malleable space** - that which can be changed "at once and at will." (14, p. 15).

Of the categories described, convertible or adaptable space has become one of the most problematic. Architectural responses to this type of flexibility have resulted in the use of relocatable or demountable partitions. Attempts to implement such devices to facilitate variations in the size and shape of learning spaces have led to uniformity in almost every other aspect of the school environment. Uniform ceiling heights, floor finishes, lighting, etc. were seen by many architects as the way of reducing the difficulties of relocation. In some cases, a totally artificial internal environment was proposed in order to avoid the problems associated with natural light and ventilation. Relocatability of partitions often necessitated corresponding relocatability of many of the other building elements such as ventilation inlets, control switches, lighting fixtures, etc. (26, p. 96).

The results have been surprisingly unsuccessful and strangely paradoxical - sacrificing needed variety through the development of a sophisticated system of mechanical flexibility, the logistics of which negated the very premise

of their development. In fact, except for minor changes, most facilities developed on this principle have experienced little change from original partitioning patterns suggested by the architect. (So many people are involved in the moving of relocatable partitions - teachers, administrators, maintenance personnel, etc. - that the process often requires the same administrative effort needed to move a conventional block and plaster wall [3, p. 39].) Adaptability should not be abandoned as a concept for flexibility, however, for it can provide a valuable means for allowing future change by incorporating built-in second guesses.

Another inadequate expression of flexibility can be found in the architectural responses to the idea of versatile or multi-purpose space. Unlike convertible space, versatile space achieves flexibility primarily by allowing occupants to project different uses into a space without major adaptation of building components. Versatility is an essential element in modern learning spaces, but many school architects and planners have misinterpreted the scale of its usefulness. Through the development of large, rather undetermined spaces, they hoped to achieve high levels of versatility by creating a space in which nearly everything was possible and almost nothing was predetermined. Besides the lack of acoustical privacy and enclosed personalized space already mentioned, the lack of sufficient architectural use definition forces educators to improvise in the role of architect as they attempt to develop a useable learning environment out of these vast undifferentiated spaces (40, p. 137).

Versatility is increased in many cases through mobilization of the equipment and furnishings, many of which are normally fixed, such as sinks, storage and display units. The educational schemes also tend to rely on these movable furnishings and equipment for subdivision of space and facilities are often invisioned without the need for interior partitions. Although these facilities can provide a high degree of flexibility, the learning environments often lack spatial variety (26, p. 100). In addition, some sociologists feel that

they may represent an obstacle to the stability of groups and their appropriation of space, thus handicapping the development of essential social relations (2, p. 6).

Malleable space seems to offer useful potentials for the development of workable flexibility, but has been overlooked by most school designers. Beyond the incorporation of accordian and folding doors, few attempts have been made to incorporate such spaces into educational facilities. The emphasis in recent school designs seems to be on providing education facilities which are capable of extensive future changes rather than providing immediate changeability in the learning environment. There is no denying that school buildings will need physical alteration over time in order to meet the changing requirements of the users. In many cases, however, flexibility tends to be provided where it is least required by the present education system and it is not available in the immediate learning spaces where the educational system demands it (26, p. 89). Of the types of flexibility outlined by William Caudill, malleable space seems to provide the most immediate flexibility to the users.

Modern educational philosophies often require a space to accommodate several different activities - either simultaneously or in quick succession. The activities may require different degrees of acoustical and visual separation. By incorporating variable building components such as sliding wall panels which can be moved "at once and at will," a space may find increased utility by allowing variation in dimension and closure without extensive physical changes. If properly designed, malleable space could allow the contemporary presence of a diverse range of opportunities for space utilization within the learning environment.

Educational thinking now favors the development of facilities with "built-in" flexibility. This type of intrinsic flexibility provides a positive variety of architecturally delineated learning spaces with a multiplicity of use options. The system can incorporate any or all of the physical expressions of flexibility outlined above. A greater reliance should be placed on "human flexibility," which allows immediate change, not by altering a

space, but by altering a person's relationship to it. If the components of the building framework (partitions, furnishings, equipment, etc.) have a multiplicity of possible interpretations, flexibility can be achieved by allowing the user to project new uses into the educational environment.

Proponents believe that although flexibility is essential to the development of individualized learning, total flexibility is neither workable nor desirable and limits must be established in order to maintain the necessary variety in the educational framework. They outline a learning environment providing "a variety of surroundings for children with small and large spaces, high and low ceilings, strong light and shadows, changing light, long and short views, rough and smooth textures, hard and soft materials" with activities both inside and outside (24, p. 14). Within this variety, there also needs to be the possibility of change in the immediate surroundings of the learning environment. The architectural solution should establish a sort of "predetermination or structuralization of the space," which can allow the educational environment to be transformed during the learning process (40, p. 137).

MODERN EDUCATION NEEDS:

A reflection of individualized learning modes

Despite all the current discussions of educational philosophy and "flexibility," the question of how to create a desirable environment for modern education still remains. Although different architectural expressions have been developed with varying degrees of success, the basic pedagogic principles are the same. The student is not a passive observer in the education process but an active participant in the fulfillment of his/her own educational needs. The variety of learning spaces necessary in the educational framework can be seen as a reflection of the various avenues of learning available for exploration in the educative process.

One of the recent vehicles for individualized learning has come to be known as "independent study." This type of individual

investigation allows students to engage in their own education by setting their own goals, devising their own procedures and learning from their own mistakes. The underlying principle is that independent study is a natural learning process which begins at birth and continues through all phases of life and the educational system might do well to encourage this type of personal exploration. The spaces provided for independent study can vary from individual carrels amid a resource area to small niches or alcoves adjacent to learning spaces. Ideally, one would seek to develop a variety of intimate spaces throughout the educational framework (14, pp. 13-27).

Contemporary research in the field of behavioral science has indicated that small group discussions may be the most beneficial mode of learning. Similar in form to the university "seminar," it can provide unique opportunities for intellectual growth through the stimulation of interaction and discussion among students (14, pp., 31-33). It is through small and medium group discussion that students have a chance to compare and test their individual discoveries and ideas with those of their peers. Sometimes these "seminar" spaces will be used for tutorial sessions, while at other times they may serve as informal meeting places for groups of students.

Though vital to the learning process, these small and medium group spaces are difficult to achieve in an educational framework. Permanent delineation of such spaces leads to excessive amounts of committed space, yet experience has shown that these types of group discussions do not function properly in open spaces (2, p. 23). Therefore, a desirable educational environment would allow the formation of separate small and medium group spaces through the development of a framework of readily available and easily moveable definitions (sliding and folding wall panels, etc.).

Despite vehement objections by many modern educators to the traditional classroom, the conventional "classroom" size does have its educational uses. In lower primary grades it serves a valuable psychological purpose as it smooths the transition from the stability of home life to the new world of school. In

addition, it allows the child to establish a sense of group identity and encourages the development of social relations. Later on in the primary grades these large group spaces can serve an important function in expository teaching as the teacher introduces new material in a one-way communication mode. In short, there seems to be a need for the traditionally sized classroom space in the learning environment but this cannot be the only size available as is the case with so many existing schools. A desirable framework for education should, therefore, allow such spaces to form but not to the detriment of other modes of learning.

Current "team teaching" practices often require the development of spaces which can accommodate a larger number of students (30 to 100). These large spaces can make more economic use of teaching resources and time by allowing large group presentations of material in pure one-way communication. Moveable enclosures can be used to combine smaller learning spaces to create these large spaces. They may also be developed as separate multi-purpose teaching spaces within the educational framework, but should be easily divisible into a collection of useful smaller spaces (14, pp. 33-38).

Beyond the specialized areas such as gymnasiums, auditoriums, cafeterias and administration offices, the above discussion outlines the basic needs of a primary education facility. A desirable framework for education would allow any and all of these learning spaces to develop throughout the educational environment. The arrangment should allow the individual educator the option of choosing which learning modes to employ. The emphasis should not be on providing a "close-fit" to the momentary educational needs, for this is consistent only with progressively shorter life buildings. There must exist a degree of "necessary indetermination" in order to allow for future changes in educational theory and practice (24, p. 33).

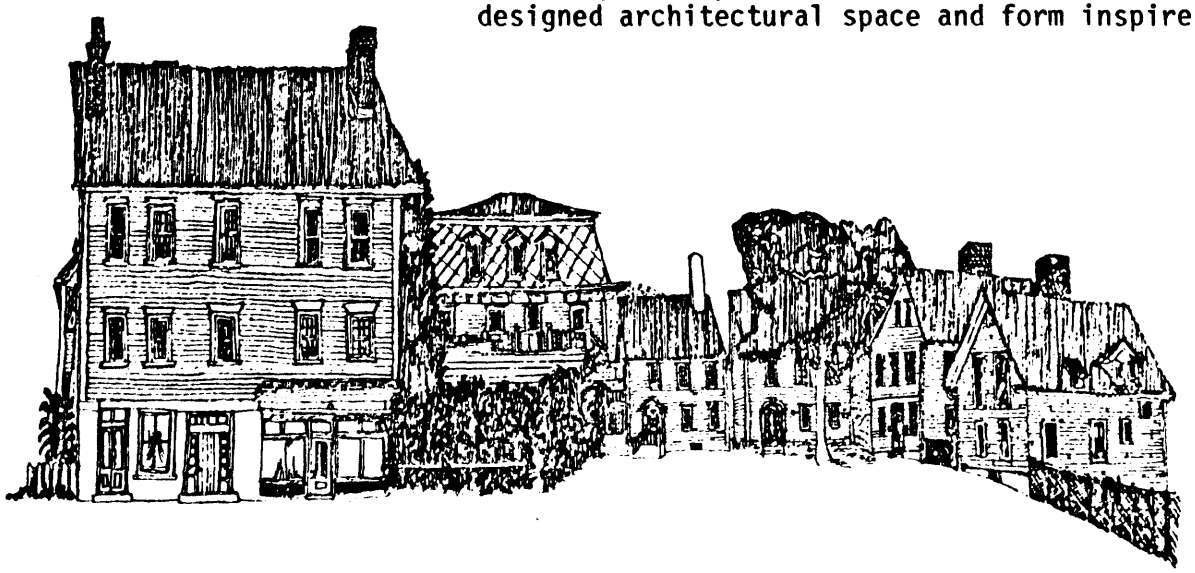
> "The best guarantee for flexibility in educational environments is called 'loose-fit' - the design attribute responsible for making the Palladian Villa or the English Georgian House adaptable to innumerable functions which were never conceived by their designers" (41, p.xxi).

CHAPTER 3

Reference Studies

"Like music that raises the spirits and aspirations of the listener, like a painting that evokes the emotions of the viewer, skillfully designed architectural space and form inspire the learner."

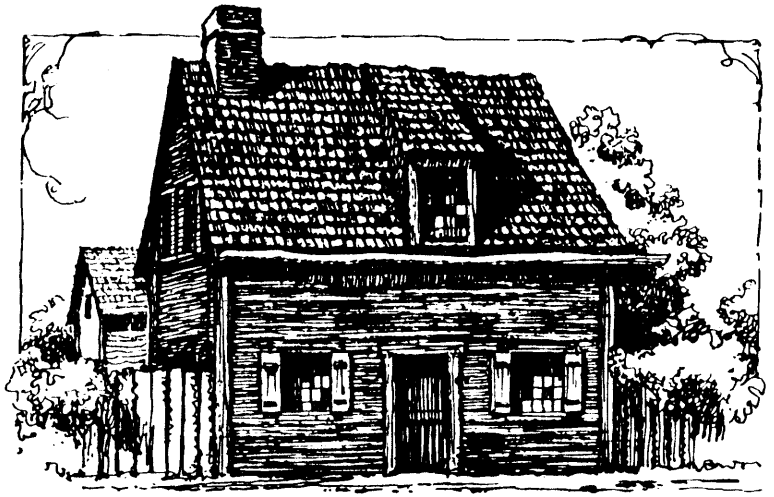
William Caudill



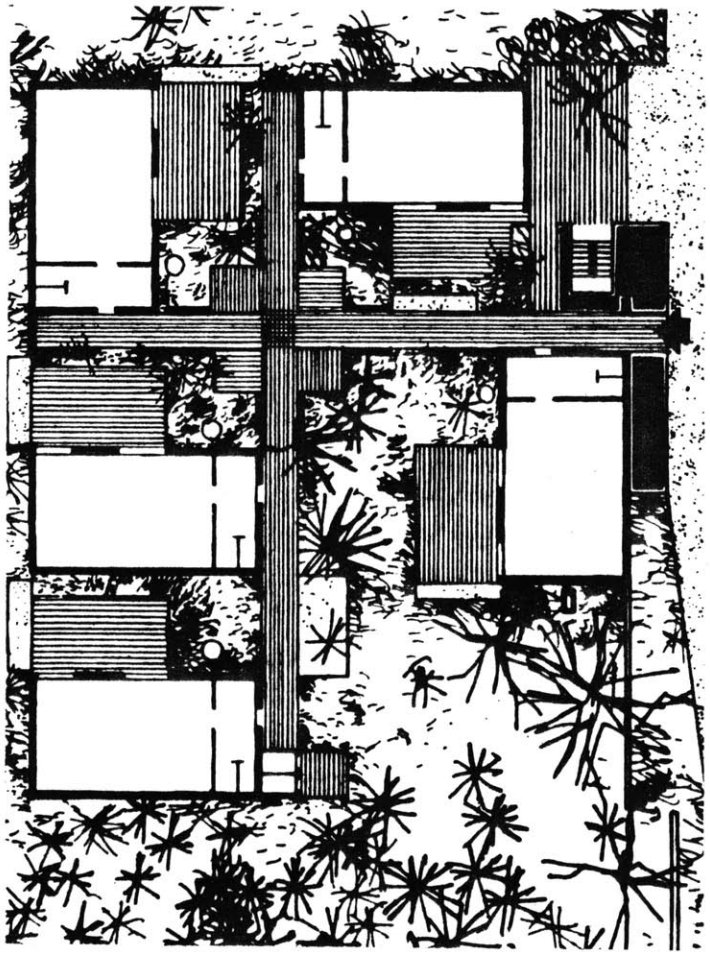
REFERENCE STUDIES

The search for possible building form references which could help to develop both housing and educational use characteristics uncovered some interesting findings. It was found that by equating the classroom module with a housing unit, many of the schools began to bear strong resemblances to common housing types. This was especially true in kindergartens and primary schools where the classroom has traditionally been seen as a self-contained unit.

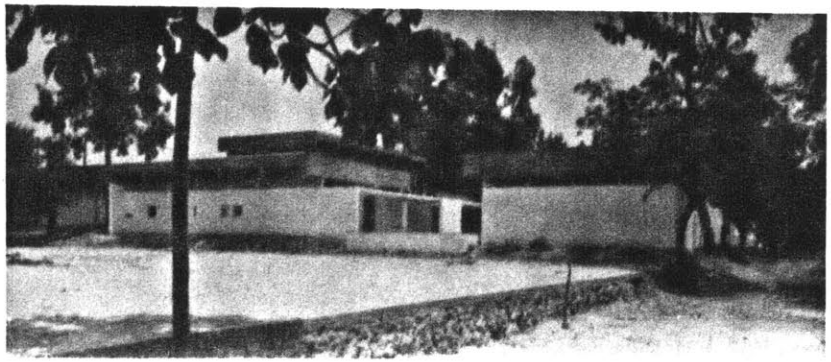
As far back as 200 years ago, Heinrich Pestaloggi, the Swiss pioneer of modern education, outlined "the living room, the house, the yard and garden and the things in them" as the necessary requirements for an active education (30, p. 294). The study seemed to indicate that many architects have used housing references in the design of primary schools. Some of the schools investigated exhibited housing qualities in section and elevation as well as plan. Resemblances were much clearer in schools located in temperate climates where the primary circulation was exterior. Many of the schools with interior circulation, however, could still find corresponding housing forms. Due to general lack of interior space definition and excessive depth of section, most of the modern open-plan schools investigated did not correspond to housing forms. The next few pages present some of the schools encountered in the reference study and a brief discussion of the housing forms they resemble.



"Oldest Wooden School Building"
St. Augustine, Florida



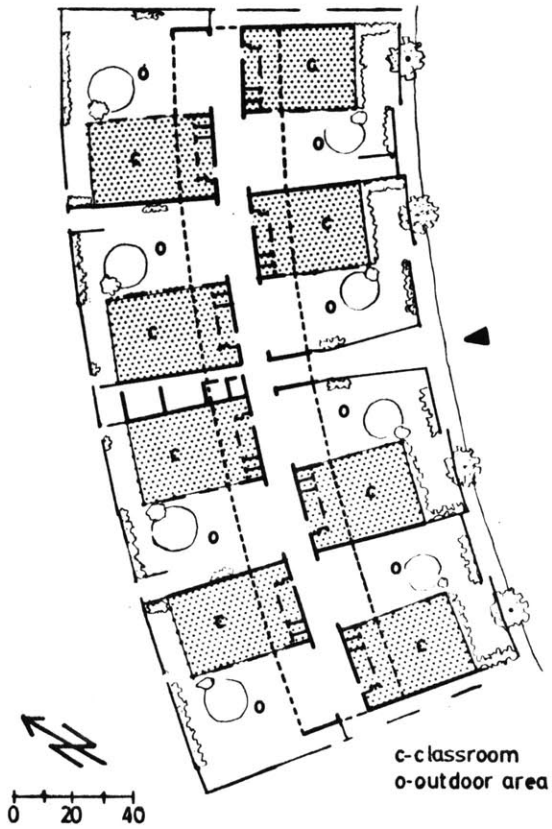
PLAN 1:400

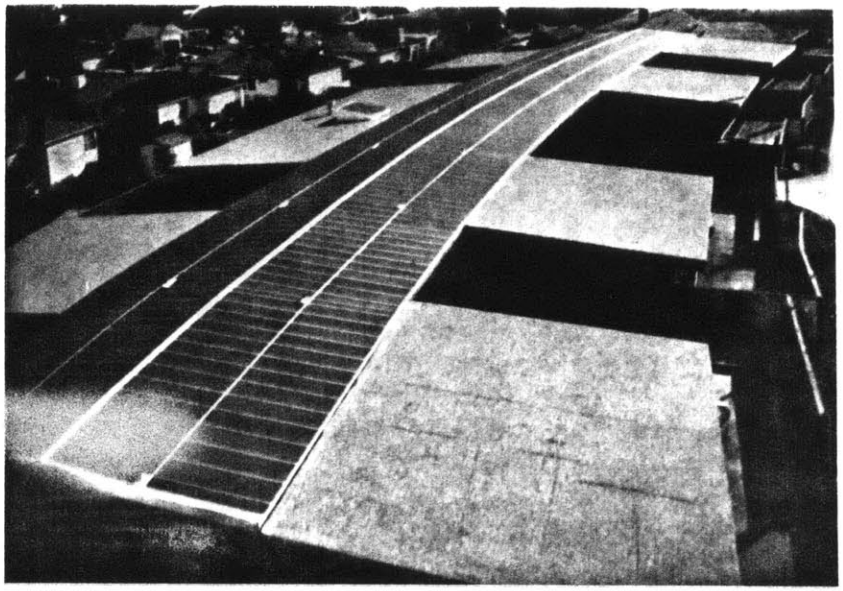


KINDERGARTEN AT CONVENT OF OUR LADY OF NAZARETH

Beitut, Lebanon
Jacque Liger and Claude Belari, Architects

Historically, the one-room schoolhouse was often exactly what the name implies - a one room house which was used as a school. The essence of these early schoolhouses can be seen in this example. The exterior circulation allows the kindergarten complex to exist as five discrete classroom modules with their own private outdoor space. The resulting form is essentially the same as a cluster of single family dwellings (32, p. 82).

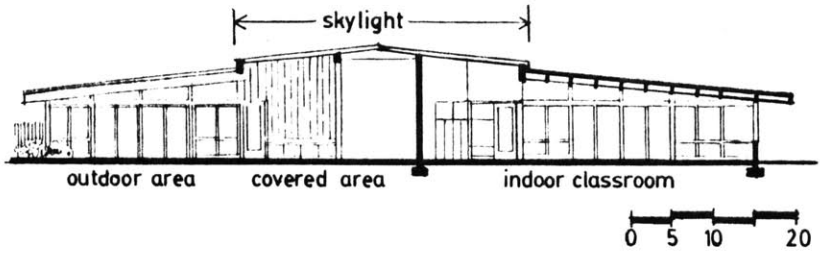


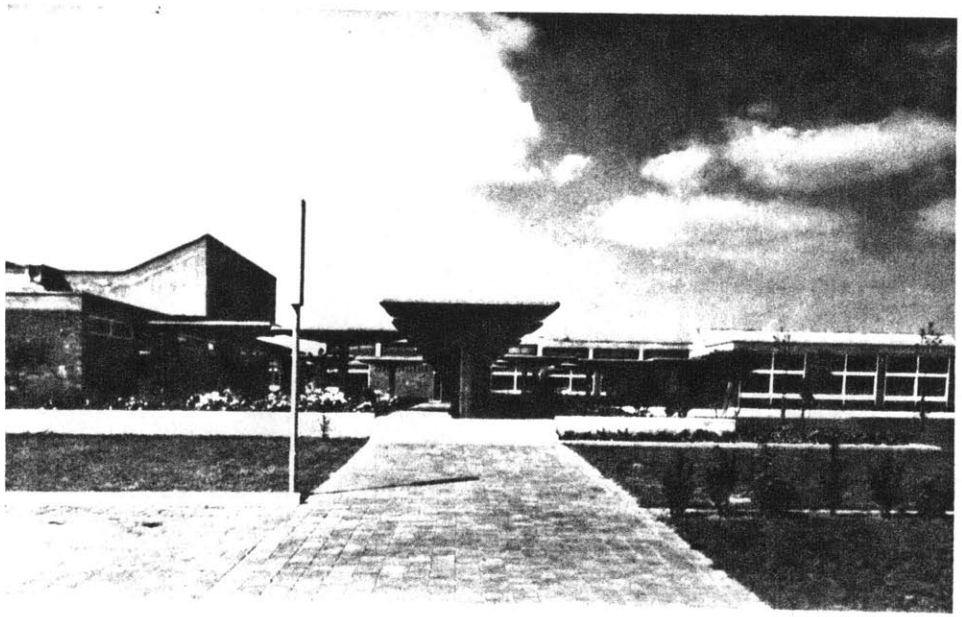


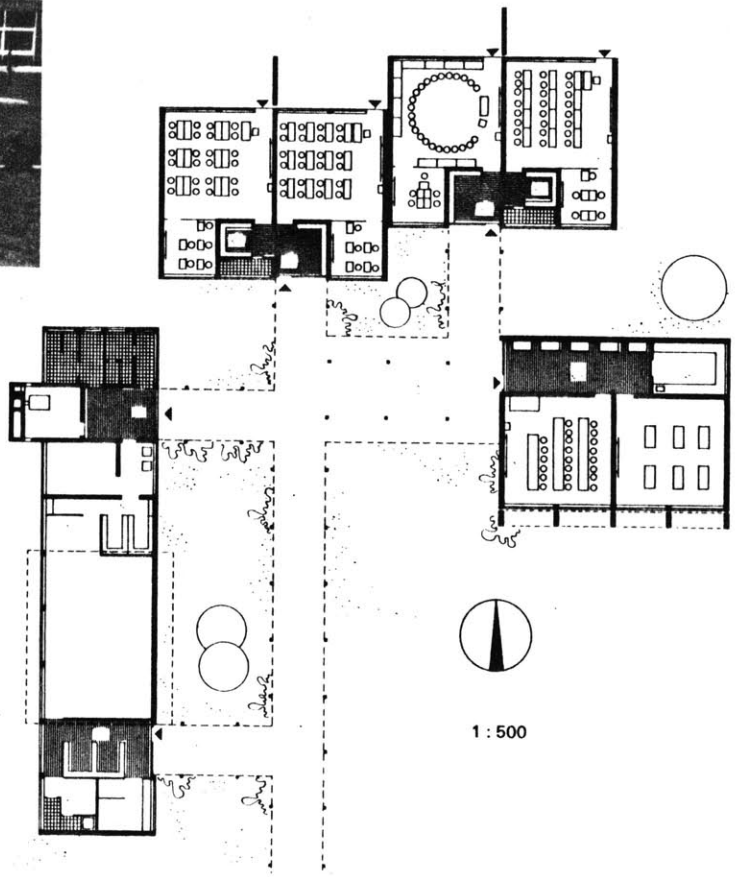
WHITE OAKS ELEMENTARY SCHOOL ANNEX

San Carlos, CA
John C. Warneche, Architect

Efforts to blend into a tight residential site resulted in the concept for this school which articulates each classroom as a separate little house, complete with covered outdoor space and fenced yard. A central skylight area ties the complex together and creates what the architect calls "a lighthearted main street (19, p. 121- 123).



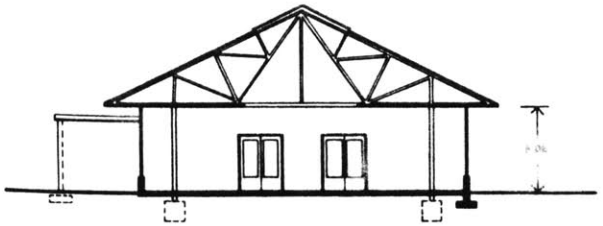




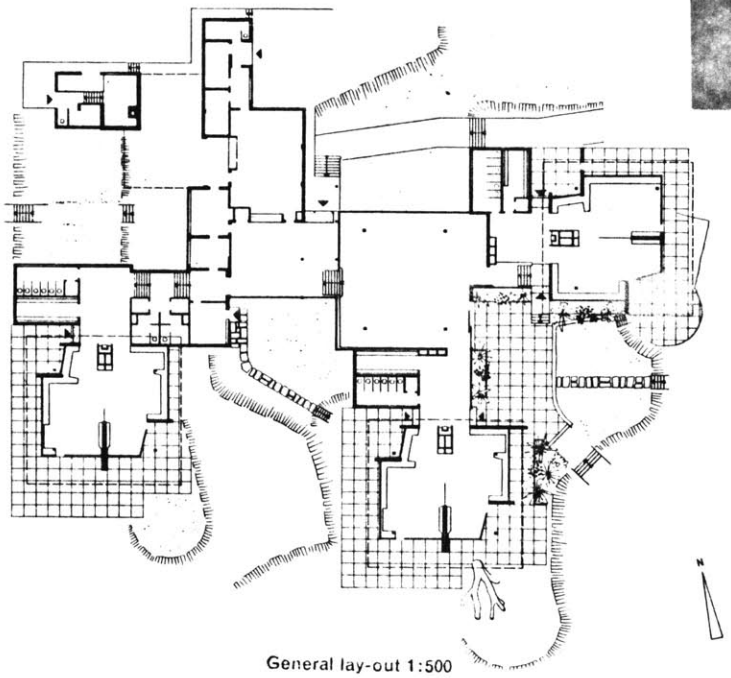
SONDERSCHULE

Gescher, Germany
Harald Deilmann, Architect

Although not apparent in section or elevation, the plan of this school resembles a cluster of duplex housing units. The use of exterior circulation in this fairly harsh climate seems to reinforce the concept of separate "schoolhouses" with a shared multi-purpose building (13, pp. 185-187).



Cross-section of classroom unit 1:300

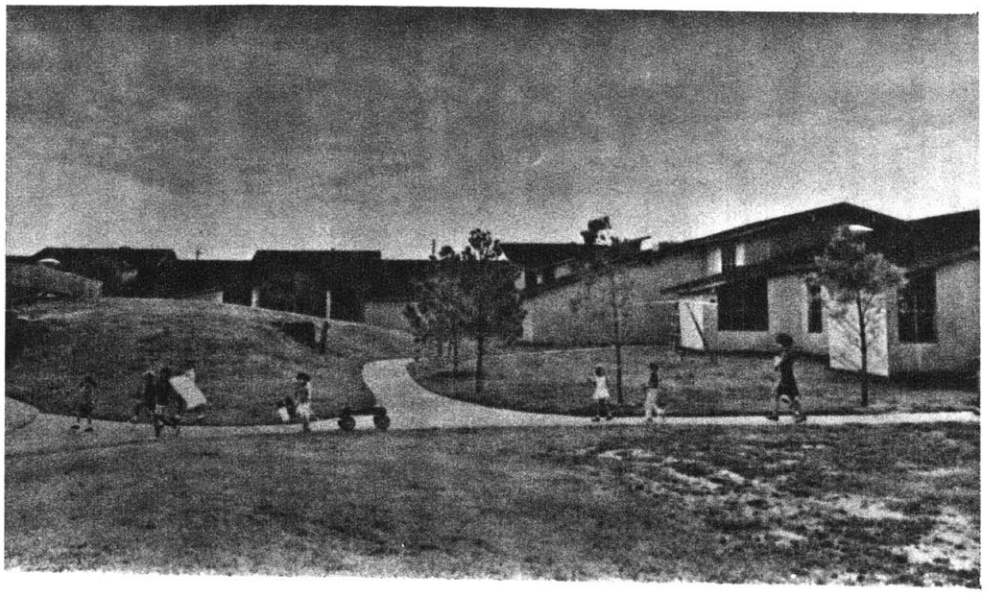


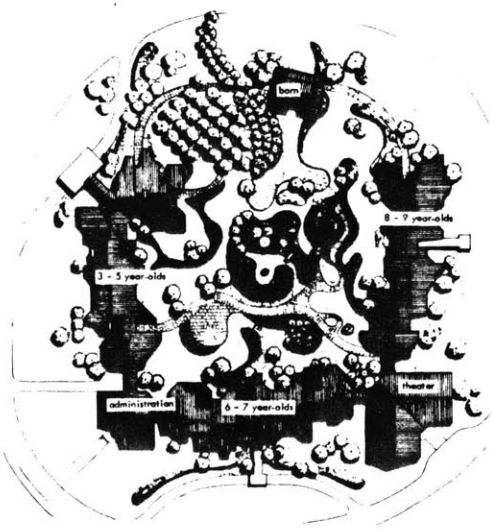
General lay-out 1:500

HIGH LAWN PRIMARY SCHOOL

Bolton, England
Bernard Calyden and John Foy, Architects

Interior circulation connects the dual classroom modules of this primary school to the general use areas of the facility. Each module incorporates a movable partition which allows the two classrooms to combine into a single learning space. Individual gable roofs help give the pavillion-like modules a strong residential character (30, pp. 64-64).

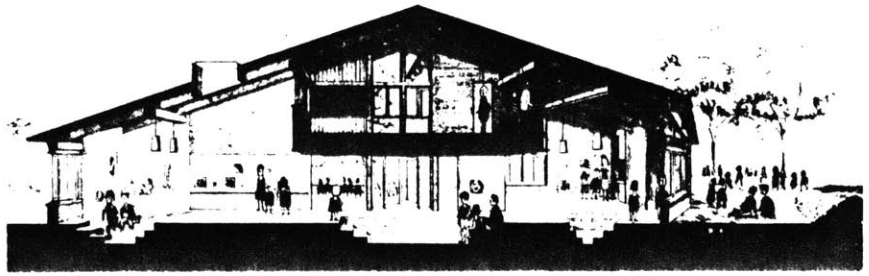


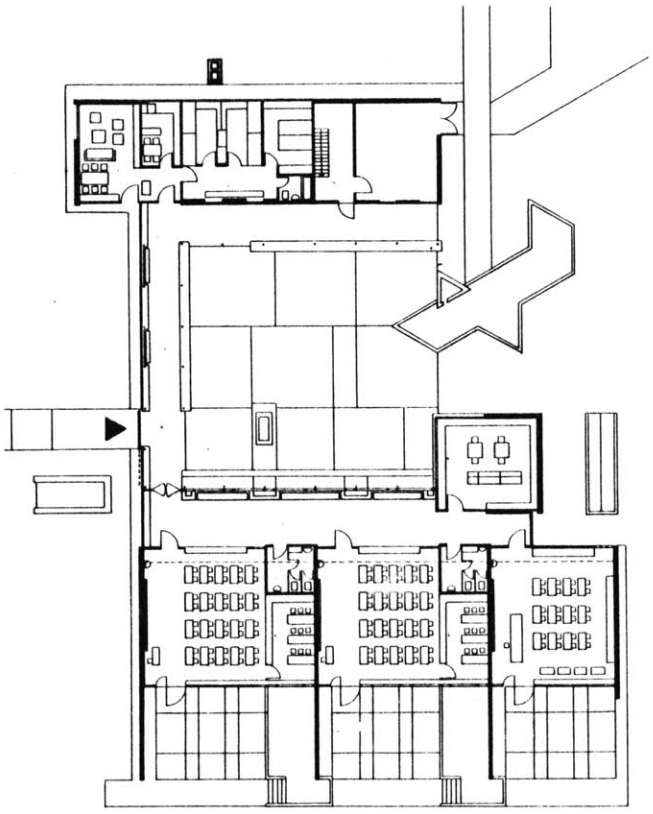


LAMPLIGHTER SCHOOL - KINDERGARTEN

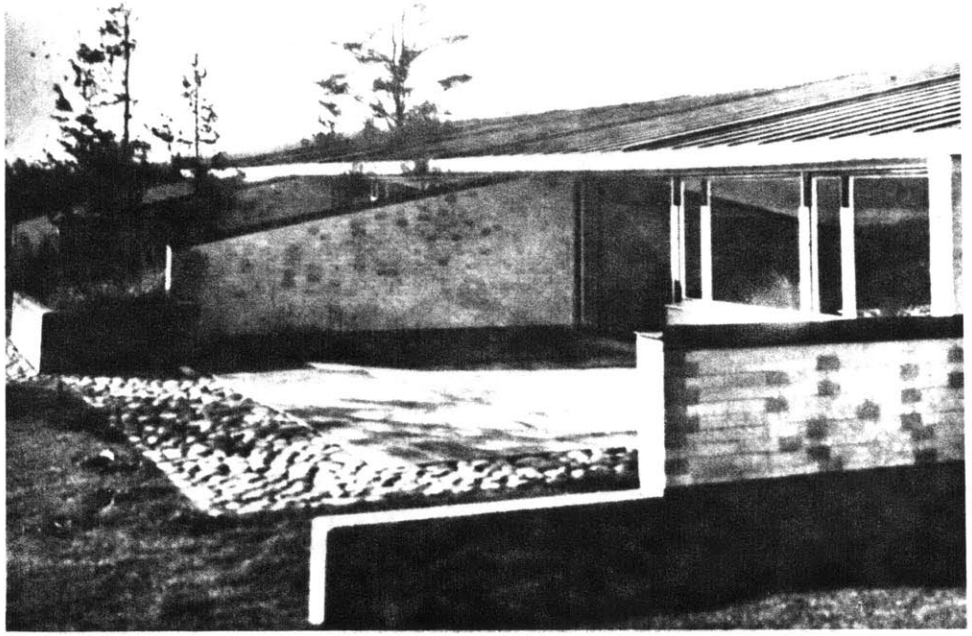
Dallas, Texas
Ford, Powell, Carson & Babbett, Architects

The design of the Lamplighter School complex creates the image of an entire residential community. The complex consists of a series of classrooms clustered around a central shared space. The residential character is enhanced by use of a post and beam construction system. The overall complex is reminiscent of many contemporary cluster housing projects (32, pp. 66-67).





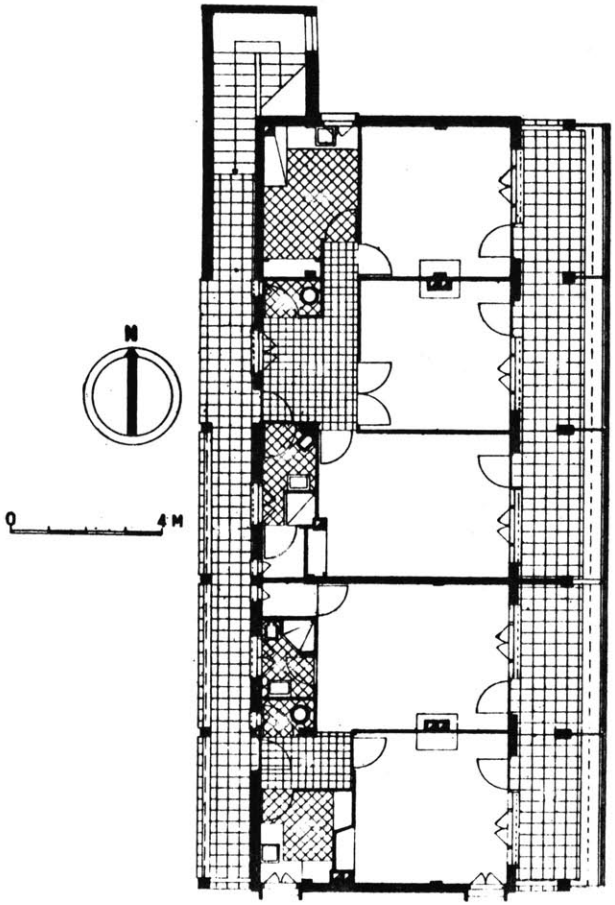
floor plan 1:500



AESCH PRIMARY SCHOOL

Neftenbach, Switzerland
Ulrich Baumgartner, Architect

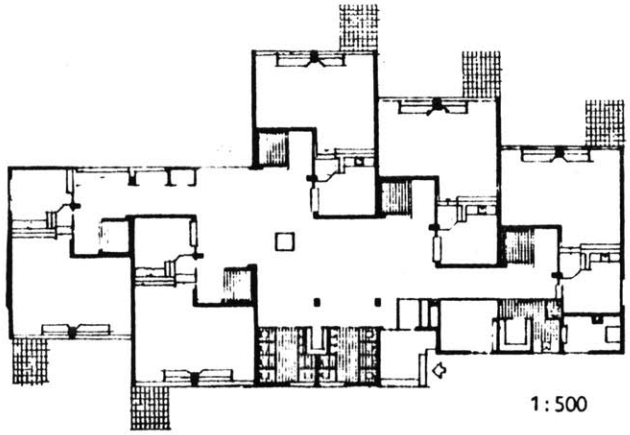
The classroom modules in this small school are similar to one story row houses. The bearing wall divisions resemble "party" walls and extend beyond the perimeter of the building to define private outdoor space for each module (30, pp. 78-79).

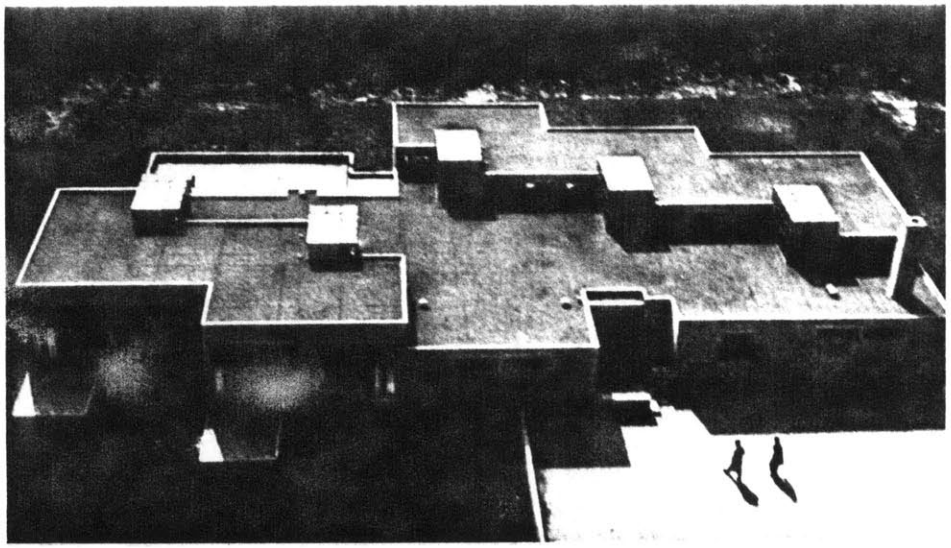


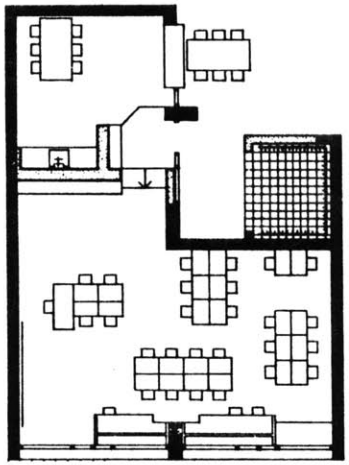
PRIMARY SCHOOL

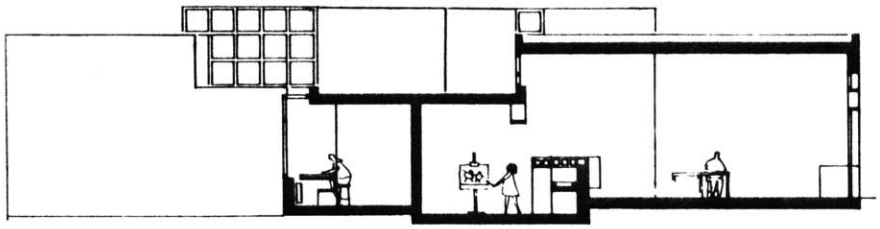
Mechtias, France
P.A. Emery, Architect

The overall form of this school is very similar to walk-up apartments. Even the classroom modules seem to resemble housing units with separate wet areas and balconies. The protruding structural frame divides the facade into vertical segments which accentuate the apartment-like image of the building (25, p. 34).





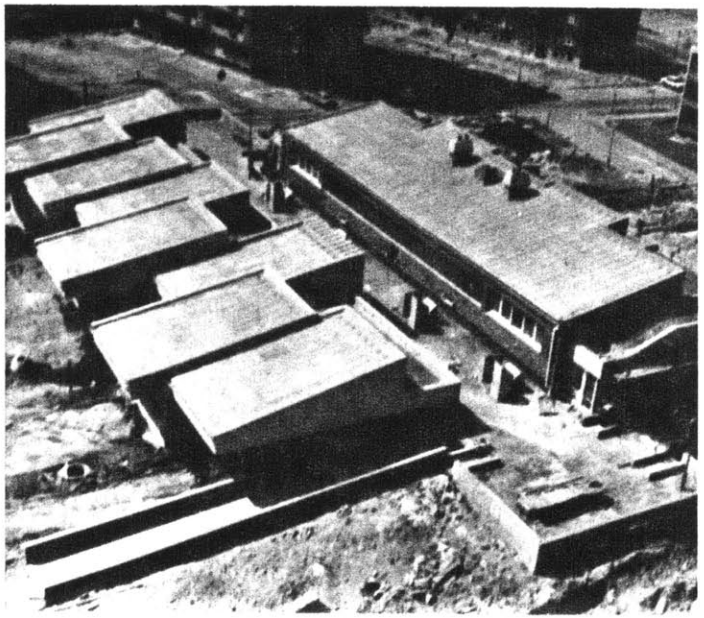


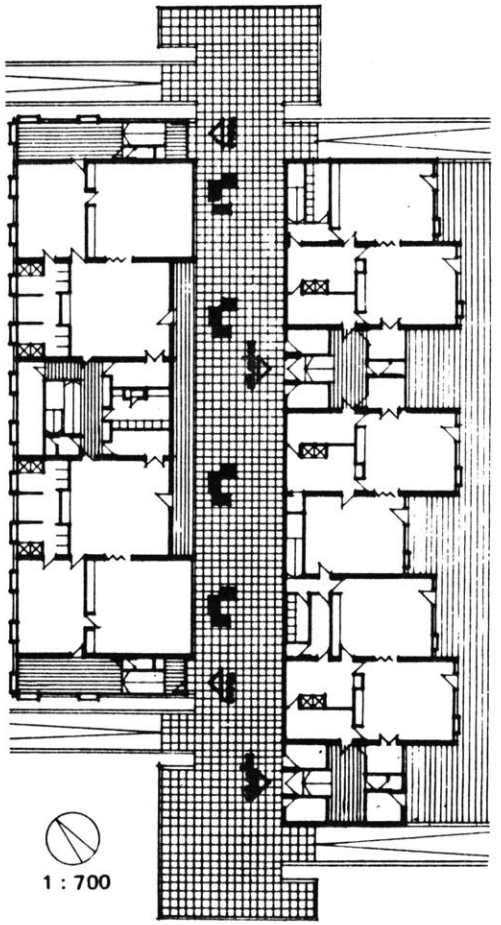


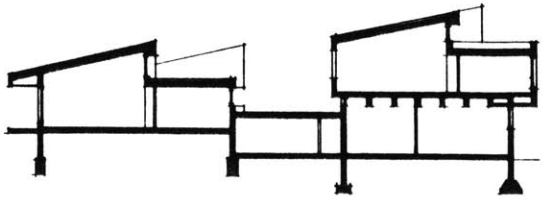
MONTESSORI PRIMARY SCHOOL

Delft, Holland
Herman Hertzberger, Architect

Hertzberger conveyed his concept for this school quite clearly: "Each classroom is considered and equipped as a complete unit, a house in itself. The houses open onto a central space, 'the street'; here all activities take place between students of many ages, interrupting the unity of the classroom groups, which are merely children of similar age" (3, p. 58).



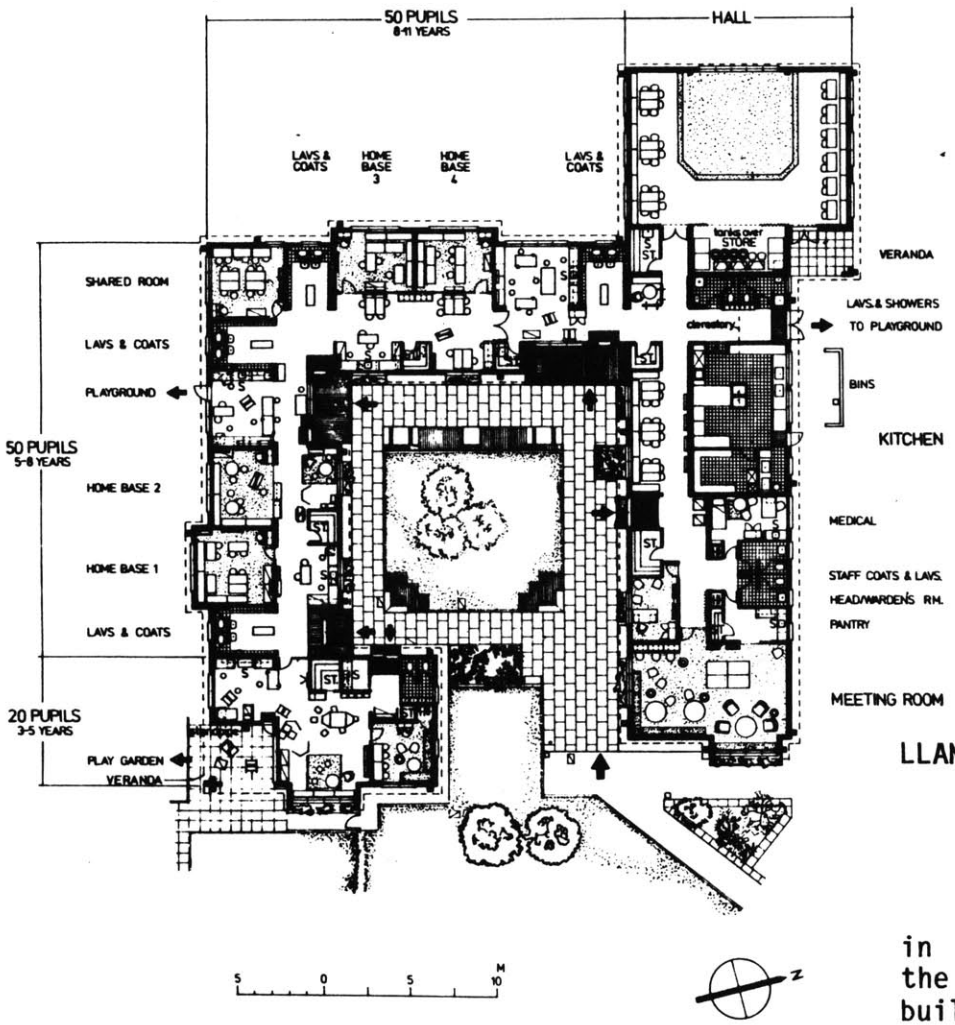


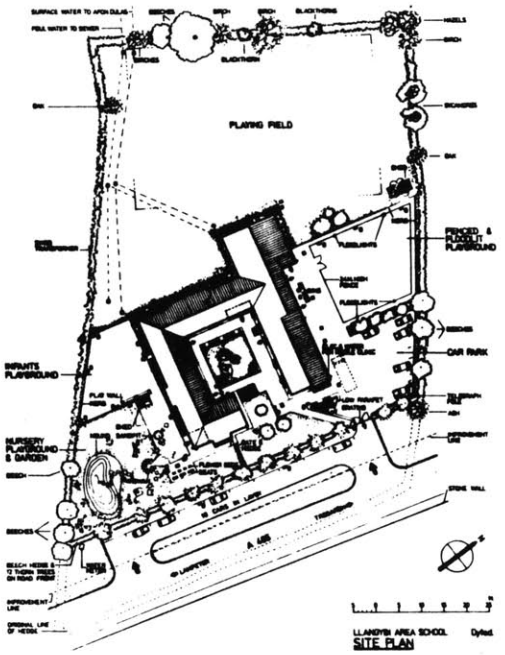


KINDERGARTEN AND PRESCHOOL

Budapest, Hungary
Miklos Agoston, Architect

This unique school complex has the form of an entire residential street with row house forms on each side. The highly articulated south side gives each classroom module a separate identity. Although the northern part of the complex is not as highly developed, the overall character of the facility is remarkably residential (32, p. 77).





LLANGYBI AREA SCHOOL

Wales, United Kingdom
T. Powys, Architect

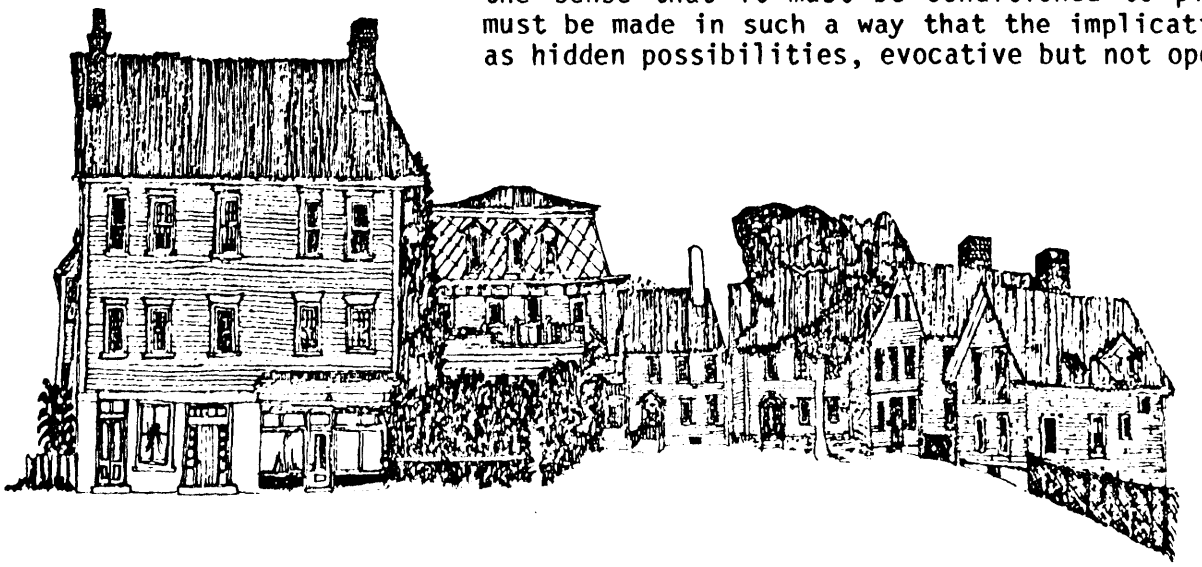
Courtyard forms, Similar to the one used in this school, have been used frequently in the development of housing schemes. The building is unusually residential in scale with many "living room" size learning spaces. The courtyard accommodates most of the primary circulation but a secondary circulation system is provided for more localized movement between learning spaces (4, p. 71).

CHAPTER 4

Study Vehicle Exploration

"A thing, exclusively made for one purpose suppresses the individual because it tells him exactly how it is to be used. If the object provokes a person to determine in what way he wants to use it, it will strengthen his self identity. Merely the act of discovery elicits greater self-awareness. Therefore, a form must be interpretable - in the sense that it must be conditioned to play a changing role. It must be made in such a way that the implications all posed beforehand as hidden possibilities, evocative but not openly stated."

Herman Hertzberger



EXPLORATION PROCEDURE

In order to begin the exploration of the issues involved in the development of a tractable educational/housing environment, a fairly typical educational facility, exhibiting many of the obstacles and disappointments encountered by current educational philosophies, was selected as a study vehicle. Through analysis and modification of the physical and conceptual organization of the existing facility, the exploration was allowed to proceed from what is presently known and understood to the development of new concepts and alternatives. The intent of the exploration was not to propose a redesign of the study vehicle, but rather to use the study vehicle as a means by which the major issues involved in this type of multi-use (education/housing) could be explored.

The study basically consisted of two sets of design exercises with distinctly different focuses. Phase I focused on establishing a housing environment within the existing educational framework, while Phase II focused on establishing a new educational environment within the housing framework developed in Phase I. The separation of the study into these two phases was made in an effort to limit the parameters and reduce the complexity of issues in the individual explorations. By exploring the use alternatives separately rather than simultaneously, the multi-use problem was simplified and the issues were explored gradually throughout the study.

A similar exploration procedure was used in both phases of the study (Figure 1). In order to set the basic parameters of the study, the first step was the establishment of evaluation criteria for desirable housing (education) environments based on resource material and previous work. The criteria was then used to focus a series of housing (education) schemes developed in the study vehicle - each of the schemes based on an increased capitol investment. The iterative exploration process involved a mental redesign of the study vehicle at each level of investment. The final step in the process was a synthesis of the information and insight gained through the study and a

determination of limitations to multi-use in the study vehicle.

The increasing levels of investment were explored in an attempt to determine to what extent the building, as it was originally designed, needed to be changed in order to achieve compatability between housing and education uses. By investigating minor changes first and then proceeding to more extensive changes, it was possible to evaluate the benefits derived from subsequent levels of investment. Due to the generic intent of the

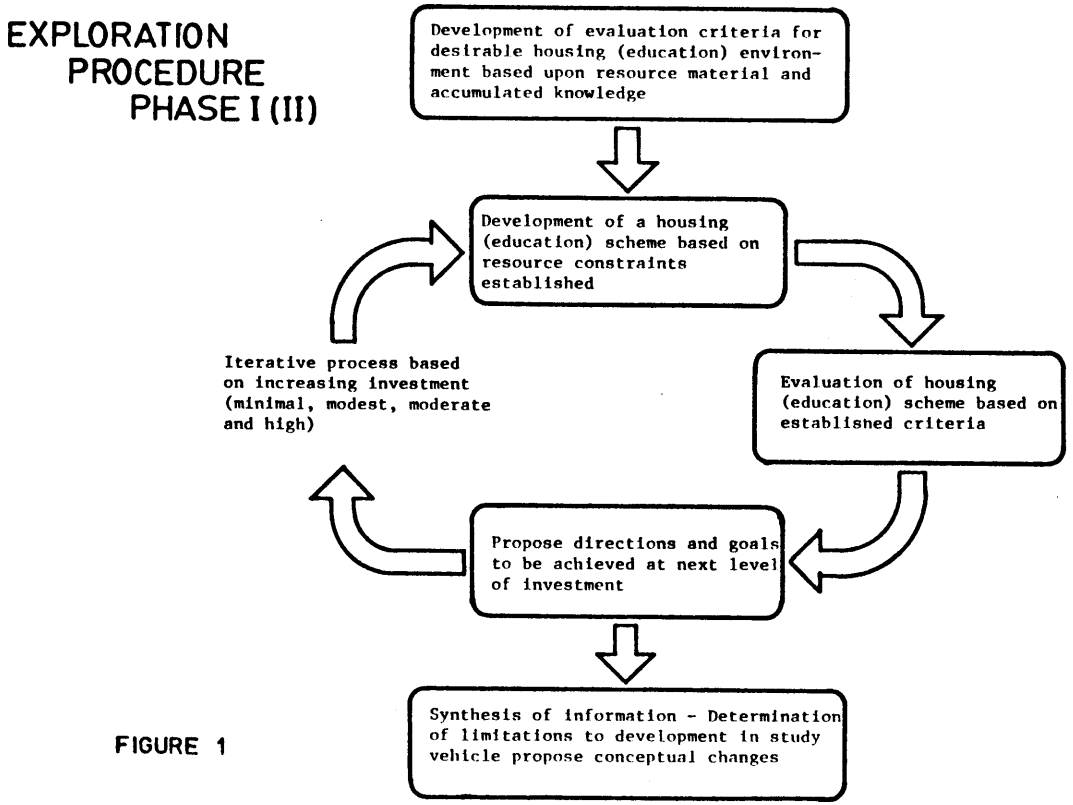


FIGURE 1

study, accurate cost analyses were not attempted but general guidelines were established, based on current trends in renovation projects.

Four levels of investment were investigated in the housing (education) schemes: minimal, modest, moderate and high. The iterative process was cumulative; i.e., higher levels of investment included the investment made at previous levels. Minimal investment (scheme 1) explored alternatives which made the least changes to the existing building. The intent of this scheme was to determine the changes that were essential in order to achieve a minimally feasible framework for housing (education) uses. Modest investment (scheme 2) explored minor changes in the building which did not involve structural changes; e.g., adding and subtracting non-bearing partitions. Moderate investment (scheme 3) explored minor structural changes to the building which did not require new foundations; e.g., small openings in bearing walls and/or roof. High investment (scheme 4) explores more extensive changes in the building; e.g., major openings in bearing walls and/or roof, small additions to building, removal of a segment of the building, etc.

The interior activity spaces within the housing were categorized by size (primary, secondary and tertiary). Primary spaces were capable of containing primary activities such as lounging/entertaining (living room), eating (separate dining room), cooking (large eat-in kitchen), or sleeping (large bedroom). Secondary spaces were smaller and could support a separate kitchen, informal dining area, small bedroom, etc. Tertiary spaces were the smallest activity spaces and contained household activities; such as storage, bathing, dressing, etc. The tertiary spaces were restricted to those not less that 20 square feet with a minimum dimension of 3 feet. Although there can be smaller tertiary spaces such as closets for clothing, food storage, etc., they were classified as built-in equipment or furnishings (36, p. 49). There can also be three types of exterior activity spaces (primary, secondary and tertiary); but they were not explored individually in this study.

The interior activity spaces for eduction were also classified by size. The types of learning spaces corresponded to the various student groupings used in modern eduction (see pages 20-22): independent study space (1 - 5), small group space (5 - 10), medium group space (10 - 20), large group space (20 - 30), and assembly space (30 - 100). There were also corresponding sizes in exterior activity spaces but they were not explored individually. The specialized use areas (gymnasium, auditorium, cafeteria, offices, toilets, etc.) were not investigated in this study.

Circulation spaces were categorized into three major types: primary circulation, secondary circulation and through circulation. Primary circulation was that which received substantial architectural definition in order to separate the circulation space from the activity spaces it served; e.g., corridor, vestibule, stairway, etc. Secondary circulation was defined as additional circulation between activity spaces which was not primary in nature. It often took the form of links between adjacent activity spaces; e.g. doors, portals, etc. Through circulation was that which necessitated passage through the space of another activity without the option of by-passing the space as in primary circulation (36, p. 54a).

The following sets of evaluation criteria were established in the study based in part on the works of Habraken, of Rabeneck and of Sprague (see references 29, 36, and 37). The criteria took the form of some basic questions in four major areas of concern: dimensions, circulation, environment and flexibility. Many of the questions were fairly general since this was intended as a preliminary investigation. The questions in the first three catagories were used to assess the possibilities of flexible use of the individual activity spaces; while the questions in the last category went further to assess the overall flexibility of the spatial framework of the building. The answers to these questions formed the basis for the subjective evaluations of the housing (education) schemes developed during the course of the study. (Please refer to the Appendix.)

HOUSING EVALUATION CRITERIA - BASIC QUESTIONS

1. Dimensions

a. Can any primary activity be accommodated dimensionally in any primary space; i.e., be used interchangeably? Secondary spaces? (For example, can the equipment and processes of people engaged in a lounging or entertaining activity be contained within a space which could be used as a large bedroom?)

b. Can a variety of outdoor activities be dimensionally accommodated in any main exterior use space; e.g., work, play, entertaining, gardening, parking, etc.?

c. Are the dimensions and proportions of activity spaces within the limits of current housing standards?

2. Circulation

a. Does the location and type of connection to interior circulation allow the interchangeable use of primary spaces? Secondary spaces? (For example, does the articulation and placement of interior circulation allow a dining space to be converted to a bedroom?)

b. Does the interior circulation have a variety of potential uses; e.g., overflow from activity spaces, storage, display, etc.?

c. Does the circulation (interior and exterior) allow for privacy, both inside and ouside, within the limits of current housing standards? (For example, does the unit entry circulation allow bedroom spaces, wherever they may develop, to have aural/visual privacy?)

3. Environment

a. Do interior primary spaces have their own access to natural light? Secondary spaces? (For example, does a kitchen have to receive natural light through a dining room?)

b. Do interior primary spaces have their own access to natural ventilation? Secondary spaces? (For example, does a dining space have to ventilate through a living space?)

c. Are the levels of aural/visual privacy between activity spaces, both inside and outside, within current housing standards? (For example, is there adequate aural/visual privacy between the activity spaces of adjoining dwelling units?)

4. Flexibility

a. Can the activity spaces within the dwelling unit be reapportioned to accommodate a variety of use patterns? (For example, can a dwelling unit be re-zoned on the basis of formal/informal, day/night, children/adult, or noisy/quiet activities?)

b. Do the adjacencies of the various spaces allow for interchangeable use; i.e., are the activity spaces grouped together in desirable combinations? (This question was not dealt with extensively in the study.)

c. Can the aggregation of dwelling units be reorganized into a variety of unit types and sizes? (For example, can a dwelling unit expand or contract to form a larger or smaller unit?)

EDUCATION EVALUATION CRITERIA - BASIC QUESTIONS

1. Dimensions

a. Can any large group activity be dimensionally accommodated in any large group space; i.e. be used interchangeably? (For example, can the equipment and processes of 30 students viewing a film be dimensionally accommodated in any large group space?) This question should be asked of all the various group spaces.

b. Can a variety of outdoor activities be dimensionally accommodated in any exterior use space; e.g., outdoor instruction, play, art and science projects, gardening, etc.?

c. Are the dimensions and proportions of the various group spaces within current education standards?

2. Circulation

a. Can any large group space have access to primary circulation? Medium group spaces? (For example, can a large group space operate privately?)

b. Can a given area of the learning environment operate independently of primary circulation? Secondary circulation? (For example, Can a cluster of large group spaces operate privately without using primary circulation for movement between spaces?)

c. Does primary circulation have a variety of potential uses; e.g., overflow activity, student projects, storage, socializing, etc.?

3. Environment

a. Do the various group spaces have their own access to natural light? (For example, does a small group space have to receive natural light through an adjoining learning space?)

b. Do the various group spaces have their own access to natural ventilation? (For example, does a large group space have to ventilate through a primary circulation space?)

c. Are the levels of aural/visual privacy between group activity spaces, both inside and outside, within current education standards? (For example, can adequate aural/visual privacy be achieved between adjoining large group spaces.

4. Flexibility

a. Can the various sized group activities be accommodated within a given area of the learning environment? (For example, can a cluster of medium group spaces be used for a large group activity?)

b. Do the adjacencies of various sized group spaces allow for interchangeable use; i.e., are the learning spaces grouped together in desirable combinations? (This question was not dealt with extensively in the study.)

c. Can the aggregations of learning spaces be reorganized into a variety of educational patterns? (For example, can an open plan cluster be changed to a corridor serving separate learning spaces?)

OBSERVATIONS AND CONCLUSIONS

The Appendix contains the actual housing and educational schemes developed in the study vehicle during the investigation. Examination of the schemes and evaluations will yield an understanding of the specific details and problems encountered in the study. The nature of a study vehicle approach, however, makes the issues and insight gained through the study of more importance than the specific aspects of the individual explorations. Therefore, a general discussion of some of the issues encountered is presented here, along with desirable characteristics discovered during the course of the study.

DIMENSIONS

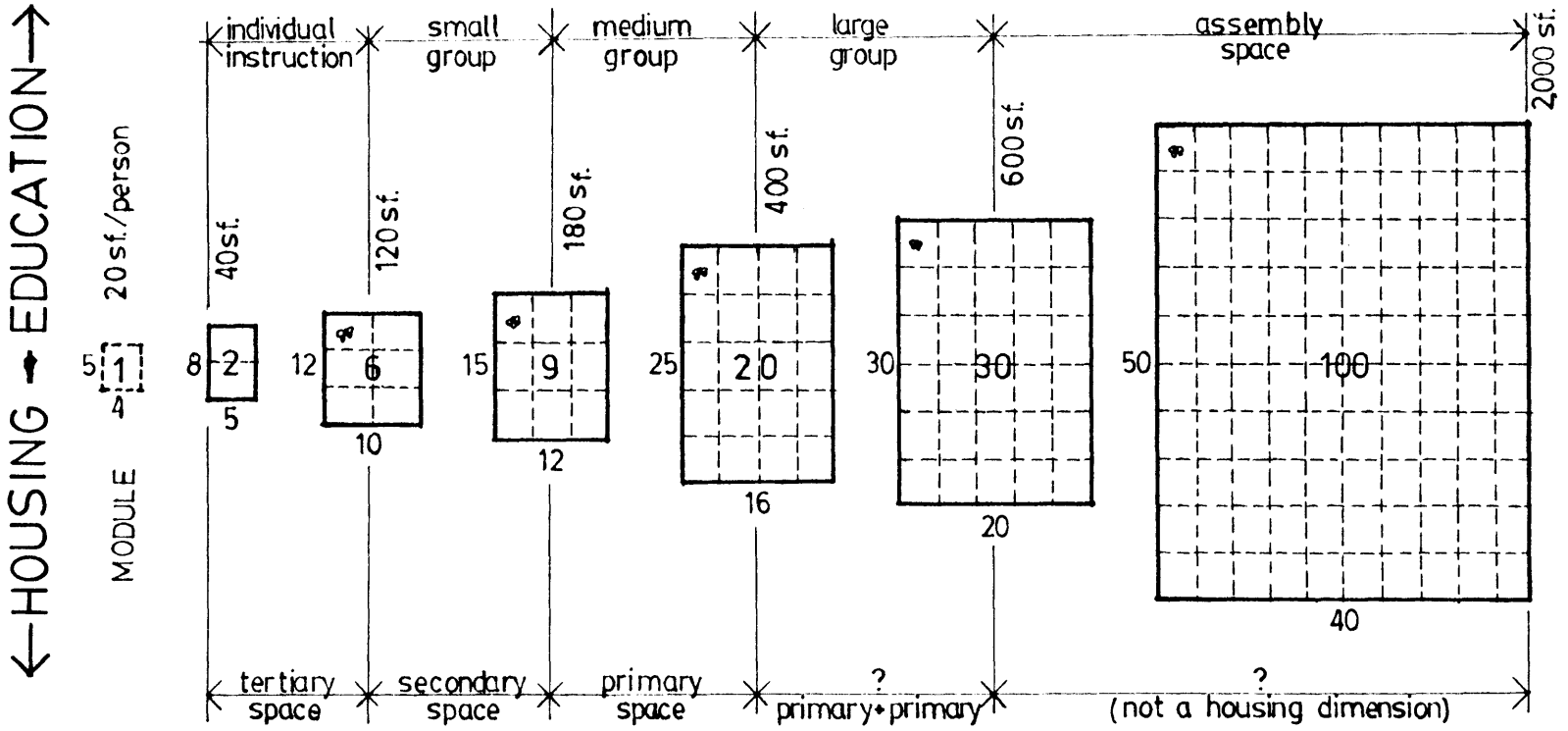
One of the major issues confronted in the study involved the dimensional compatability of housing and educational uses. A recurring conflict was found between the desires of housing to produce a more articulated environment of smaller spaces and the educational desires for flexibility and a wide range of dimensional variety. Some resolution was found through analysis of planning modules used in the development of education spaces. Traditionally, classrooms have been designed on a module called the "30 by 30 classroom" which meant that a 30 foot by 30 foot classroom could accommodate 30 students. This module was developed for an education system where students remained in a single classroom for the majority of a school day. Thus, the rule of thumb of 30 square feet per student included all of the circulation and activity space required to support the variety of activities which would be housed in the classroom. Modern educatonal philosophies have attempted to abolish this rigidity. The traditional classroom has been transformed into a variable framework of flexible learning spaces and, therefore, the traditional planning module is no longer valid. A new rule of thumb of 20 square feet per student was proposed in this study for the sizing of learning spaces. On

the surface, this may appear to have reduced the available space for each student, but since major circulation was not included and the "classroom" consisted of several learning spaces, the actual gross square footage per student may have actually been increased.

An interesting coordination between education and housing space sizes emerged when this module (20 sf/student) was used to size the various learning spaces (Figure 2). Individual, small and medium group education spaces corresponded nicely to tertiary, secondary and primary housing spaces. Large group education spaces did not find corresponding housing space sizes but some dimensional correspondence could be made between these spaces and groupings of housing activity spaces. For example, two large primary spaces (300 sf.) could be combined to form a large group space (600 sf.). The assembly size spaces, however, were far beyond the range of housing sizes and little dimensional correspondence to housing uses was possible.

The dimensioning of activity spaces for housing was not based on current housing standards. These standards provided only the minimum dimensions for a household activity and generally did not allow for more than one orientation of activity in a room. Since interchangeable use of spaces was desired, the dimensions of a space needed to accommodate a variety of household activities and arrangements. Therefore, spaces were dimensioned to accommodate the largest activity invisioned. For example, a primary space was dimensioned to allow various orientations of the largest primary activity (for specific dimensions of activity settings see reference 10, pp. 16-27).

The provision of movable storage units was also made to increase the potential for interchangeable use. Built-in storage areas (closets, cupboards, etc.) tended to limit the potential use of spaces by predetermining the possible arrangements of furnishings and activities. Therefore, additional slack (appropriately generous dimensions) was introduced in order to accommodate various positionings of movable storage units.



EDUCATION/HOUSING SPACE SIZE COORDINATION

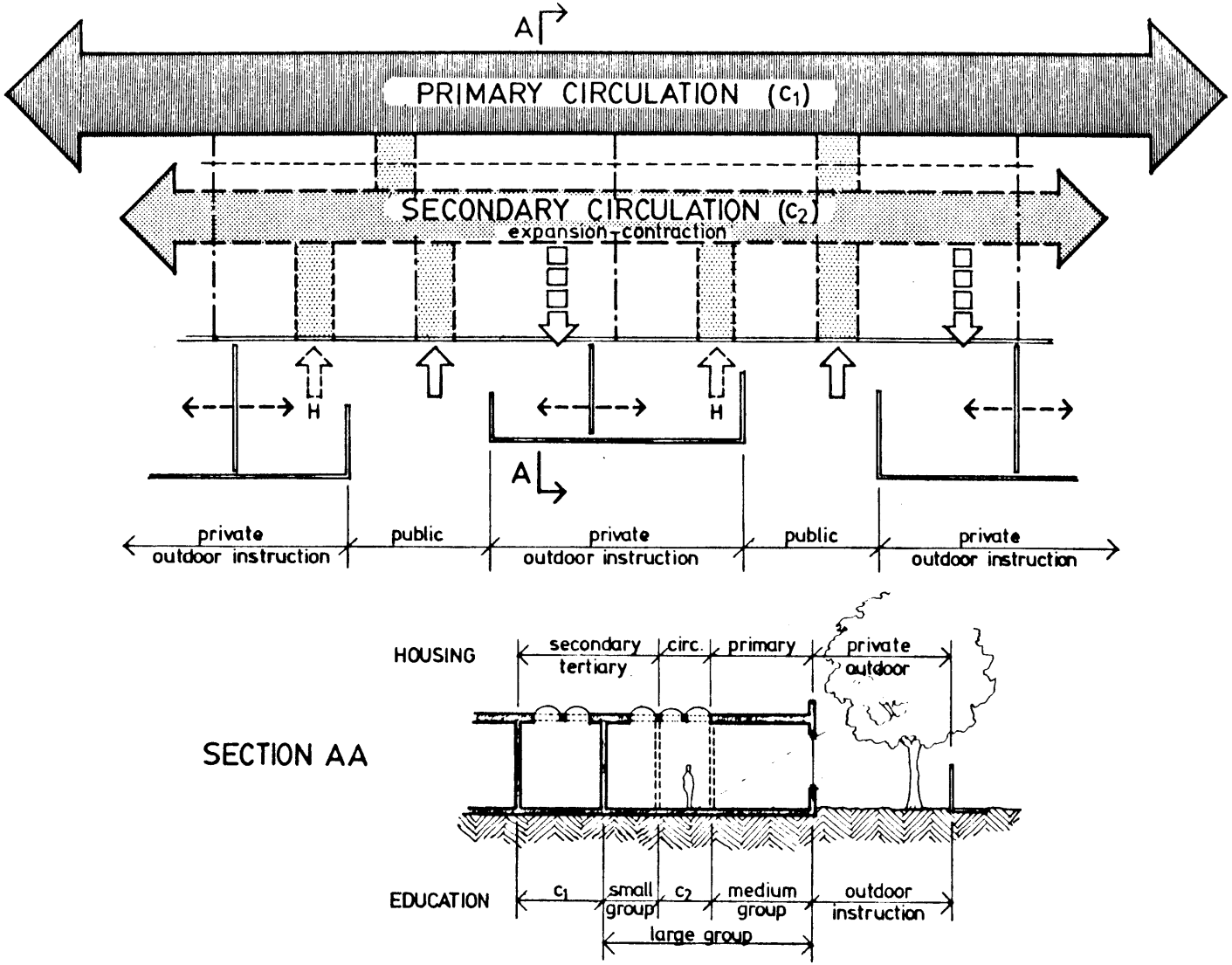
FIGURE 2

CIRCULATION

Circulation has typically represented over 20% of the gross square footage in most educational facilities. Large corridors have traditionally been designed exclusively to accommodate primary circulation, with little or no provision for alternate useage. In light of the current economic situation, the enormous expense of such a singular use space should not be tolerated. Futhermore, if properly designed, these spaces can become a valuable asset to the education system. Providing working surfaces (benches, counters, carrels, etc.) instead of rows of lockers can allow primary circulation spaces to be used for various classroom related activities and independent student projects. Unlike the typical 3 foot doors, variable openings (i.e. those which can be changed from broad to narrow) between classrooms and primary circulation can allow the classrooms to use these areas for overflow activities. The "hall," therefore, can become an extension of the surrounding learning spaces with a variety of dimensions which can elicit a multiplicity of educational uses.

Through circulation tended to limit the types of activities which could be developed in the spaces through which it passed. It was seen as undesirable in the housing environment because it inhibited the interchangeable use of activity spaces. For example, passage through a living room to reach a bedroom may have been tolerable, but passage through a bedroom to reach a living room was not (36, p. 54b). Non-limiting (non-through) circulation was also seen as essential to the development of a flexible education system. By providing learning spaces with the option of independence from primary circulation, a variety of education patterns could be developed - from open-plan clusters to traditional classrooms off a corridor.

The transformation of the traditional classroom into a flexible framework of learning spaces necessitated the development of a secondary circulation zone within the educational environment to facilitate localized movement between learning spaces. The mutable secondary circulation zone was capable of



CIRCULATION/EXPANSION CONTRACTION DIAGRAMS

FIGURE 3

providing non-limiting circulation between medium and small group spaces or of being incorporated into the learning area of large group spaces. In the housing environment, this zone corresponded to the primary circulation between activity spaces within the dwelling units. Allowing the path of secondary circulation to be continuous over several classroom modules increased the tractability of both the housing and the educational environments. This secondary circulation system allowed for various groupings of learning spaces to operate privately within the educational environment. In the housing environment, it provided a vehicle for expansion and contraction of user space, producing a variety of possible unit types and sizes. Figure 3 shows a diagram of desirable circulation framework for a tractable housing/education environment as developed in this study. With the exception of the need for more frequent entry zones for housing, the framework seemed to correspond nicely to both uses.

ENVIRONMENT

Developed primarily to maintain an acceptable environment for learning, decades of educational codes have produced schools with classrooms of uniform orientation (generally east-west), dimensions (30' x 30') and access to natural light and ventilation (generally one-sided). In order to achieve compatability in the building stock, the environmental qualities must be acceptable to both housing and education uses.

The housing environment desired more access to natural light and ventilation than the existing education facility provided. If activity spaces were to be used interchangeably, they needed to have the capability of operating independently from other spaces. Therefore, they desired their own access to natural light and ventilation. Efforts were made to increase the availability of natural light and ventilation through the provision of operable skylights in the interior zones of the building (Figure 3). In addition to providing natural light and ventilation opportunities to

interior secondary and tertiary spaces, this improved the overall environment of interior circulation areas.

An issue evolved in the study over the potential uses of the educational primary circulation space in the housing environment. The dimensions of these corridor areas were generally large enough to support primary household activities; however, due to the double-loaded corridor condition in the study vehicle the environmental qualities of these spaces were only adequate for tertiary and certain secondary activities. The study seemed to indicate that a single-loaded primary circulation system for education would increase the potential for housing uses by creating two-sided access to natural light and ventilation and allowing primary activity spaces to be developed in corridor areas.

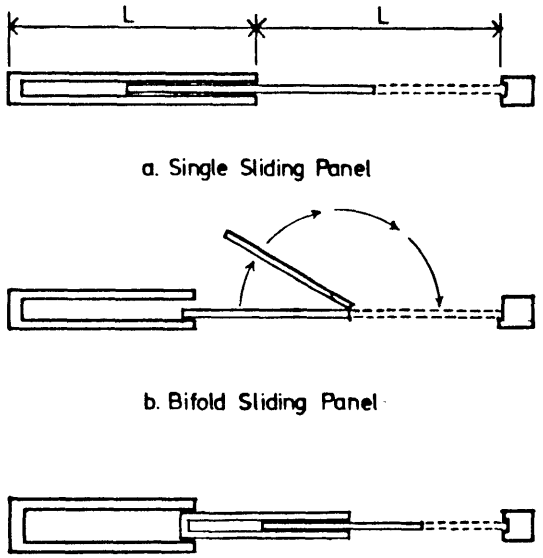
Acoustical privacy was essential to both the housing and educational environments. The sound absorption provided by acoustical panels and carpeting can improve the general acoustical qualities of the educational environment, but additional means need to be provided to insure adequate acoustical and fire separation between housing units. This was especially true if a tractable framework was to be developed, since the position of partition walls between dwellings needed to change in order to accommodate new unit configurations.

BUILDING SYSTEM

Observations were made concerning the general characteristics of a building system which could provide a desirable environment for a tractable neighborhood building stock with education and housing use options. The study seemed to indicate that an open-frame structural system; i.e., columns, beams, girders, etc. could provide more flexibility than the bearing wall system originally used in the study vehicle. An open-frame system can minimize the amount of permanent structural elements and increase the potential for variable space utilization. Contrary to the suspended ceiling system encountered in the study vehicle, the ceiling structure should be able to accommodate readily the attachment of

partitions at various locations. The infrastructure system (electrical services, plumbing, heating, etc.) should be provided at a greater frequency than is generally provided in educational facilities. Providing these services at the frequency needed for housing uses could be beneficial to the educational system - allowing a diversity of potential locations for fixtures and equipment. Furthermore, provisions should be made for individual control and metering of utilities to correspond to the variety of possible dwelling unit aggregations.

The major interior building component explored in the study was a sliding wall panel. Its "wall-like" qualities seemed to offer the most advantages in a variable opening providing acoustical and visual separation as well as useable wall surface and a sense of permanency. The wall panels were internally stored and could be readily moved by the users to create various closures and opening sizes. The study initially explored single sliding wall panels which required an area of fixed wall surface equal to the size of the opening for storage (Figure 4). As the educational desires for more openness and flexibility were imposed on the study, new sliding panel systems were developed requiring less fixed wall surface for panel storage (Figure 4b and 4c). The complexity required in the panel system increased



a. Single Sliding Panel

b. Bifold Sliding Panel

c. Telescopic Sliding Panel

SLIDING WALL PANELS

FIGURE 4

until, eventually, the technology became inhibiting and unrealistic (see educational scheme 4a in the Appendix). In the end, it was found that the two uses could not find adequate dimensional resolutions within a single variable framework of sliding wall panels and that new types of mutable building components needed to be developed. The incorporation of removable wall panels, for example, could have resolved some of the dimensional difficulties between housing and education uses.

The concept of sliding panels need not be abandoned because of the technical problems encountered in this study. Through restrained use and judicious placement, many of the technical problems can be avoided and the sliding panels can offer a useful alternative to traditional space definition in both educational and housing environments (Figure 5). Educational theorists have continually favored building solutions which approach ultimate space flexibility but, as noted earlier, recent criticisms voiced by educators indicate more interior definition is required in order to produce a workable educational environment. A sliding wall panel system may provide a viable means of transforming the "open-space" concept into a workable system for educational flexibility.

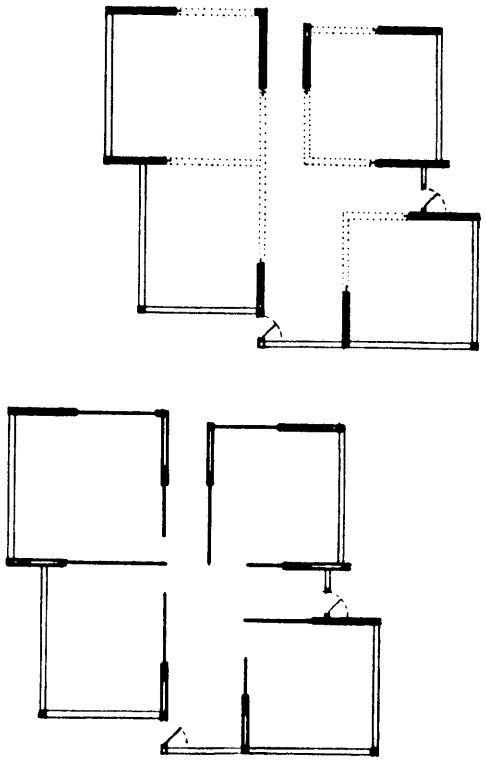


FIGURE 5

ASSESSMENT AND LIMITATIONS

The examination of the study vehicle began with a fairly simple goal in mind, but the complexity increased steadily as the study progressed. The concept of using an existing educational facility as a vehicle for preliminary investigation of issues allowed the study to include physical, as well as conceptual, changes. However, the conceptual framework was thought to be more important than the specific dimensional and functional relationships between activity spaces. Therefore, the study did not adequately illustrate the potential usefulness of the framework in either the housing or the education alternative.

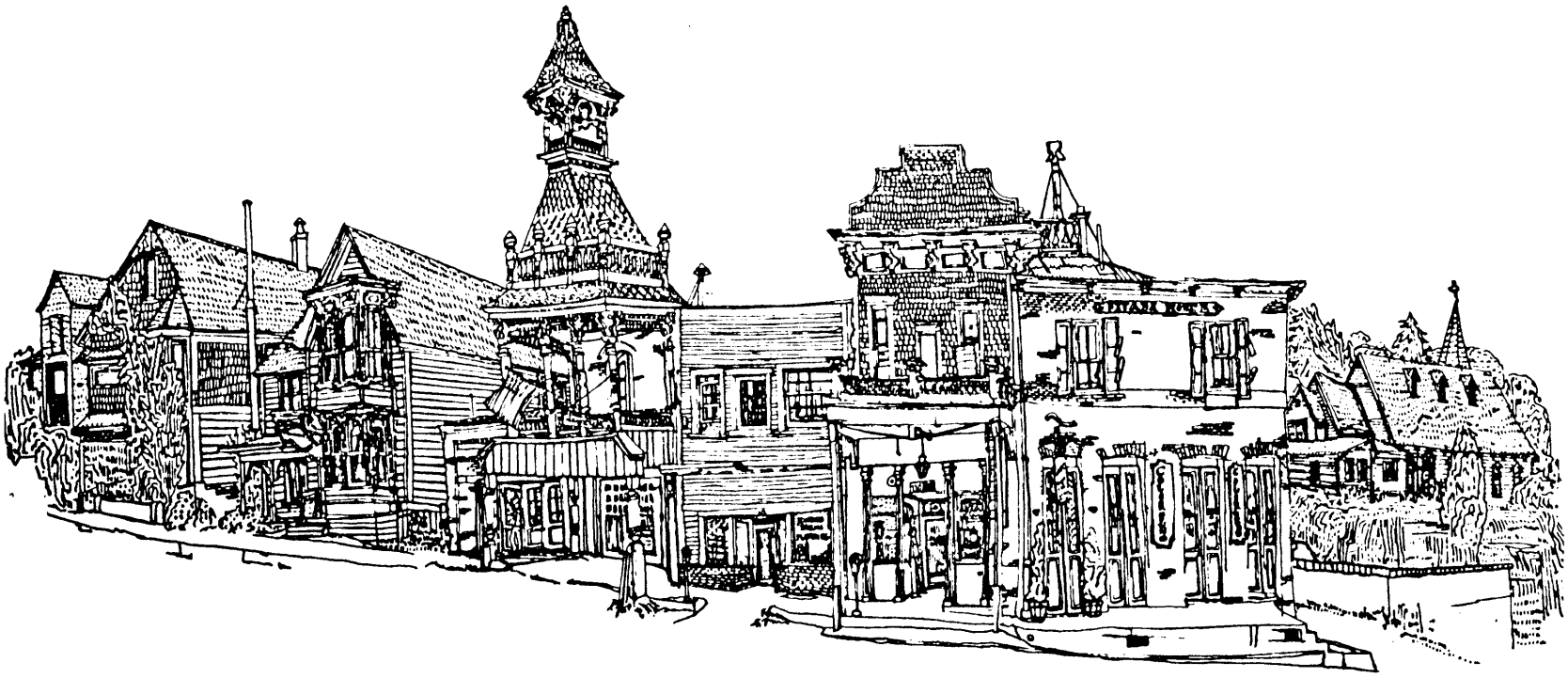
Contextual issues involved in the development of a facility of this type were not addressed in the study. Preliminary observations were made concerning the potential uses of the building and its site, but the relationships between the facility and the surrounding neighborhood were not explored. The exploration concentrated on developing a building framework which could accommodate either housing or education uses, but the study did not investigate the possibility of simultaneous occupation of the facility by both uses.

The selection of such a traditionally designed school imposed several limitations on the study from its inception. The rigid layout of similar classrooms along double loaded corridors limited the development of housing uses by allowing primarily single-sided access to natural light and ventilation. The coincidence of the bearing wall structure system with the rigid classroom module limited the variety of dimensions which could be established in the framework. The study was confined primarily to explorations in plan since the unyielding flat roof construction afforded few opportunities for the development of sectional properties.

Overall, the study vehicle did serve its purpose. It not only allowed a preliminary understanding of the issues involved in tractable housing and educational compatibility, but allowed a deeper appreciation of the problems encountered by many educators as they attempt to implement modern pedagogic techniques in traditional classroom settings.

"Aim for adaptability with the least effort. The goal is not 'total' flexibility, the idea is to make sure that those elements that have to change to answer future development in life styles can induct change. This must be studied. What are the changes that can be expected? What are the patterns that reflect peoples' behavior? It is as easy to give too much flexibility as it is possible to give too little. Both are wrong. This is also a problem of design. A few detachable elements of the right kind in the right place can give more adaptability for less costs than a lot of 'flexible' elements that are of the wrong kind and are located in the wrong places."

N. J. Habraken

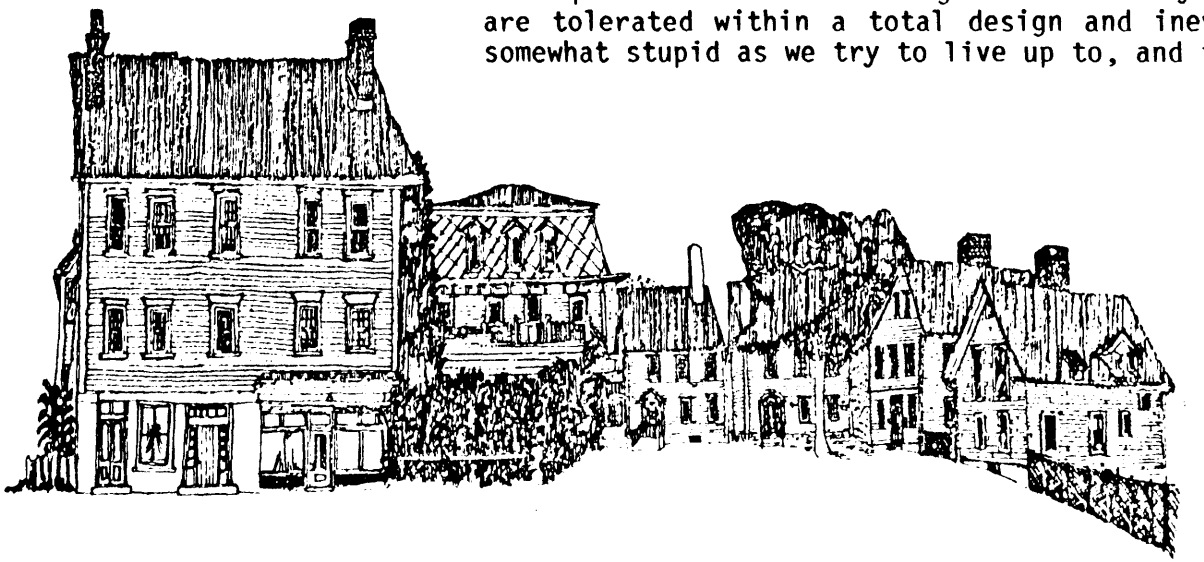


CHAPTER 5

Synthesis & Design

"It is the concept of 'completeness' whereby well designed buildings do not require our personal contributions that is one of the major inadequacies of modern 'design.' Ultimately (and condescendingly) we are tolerated within a total design and inevitably are made to look somewhat stupid as we try to live up to, and in, it."

Peter Prangnell



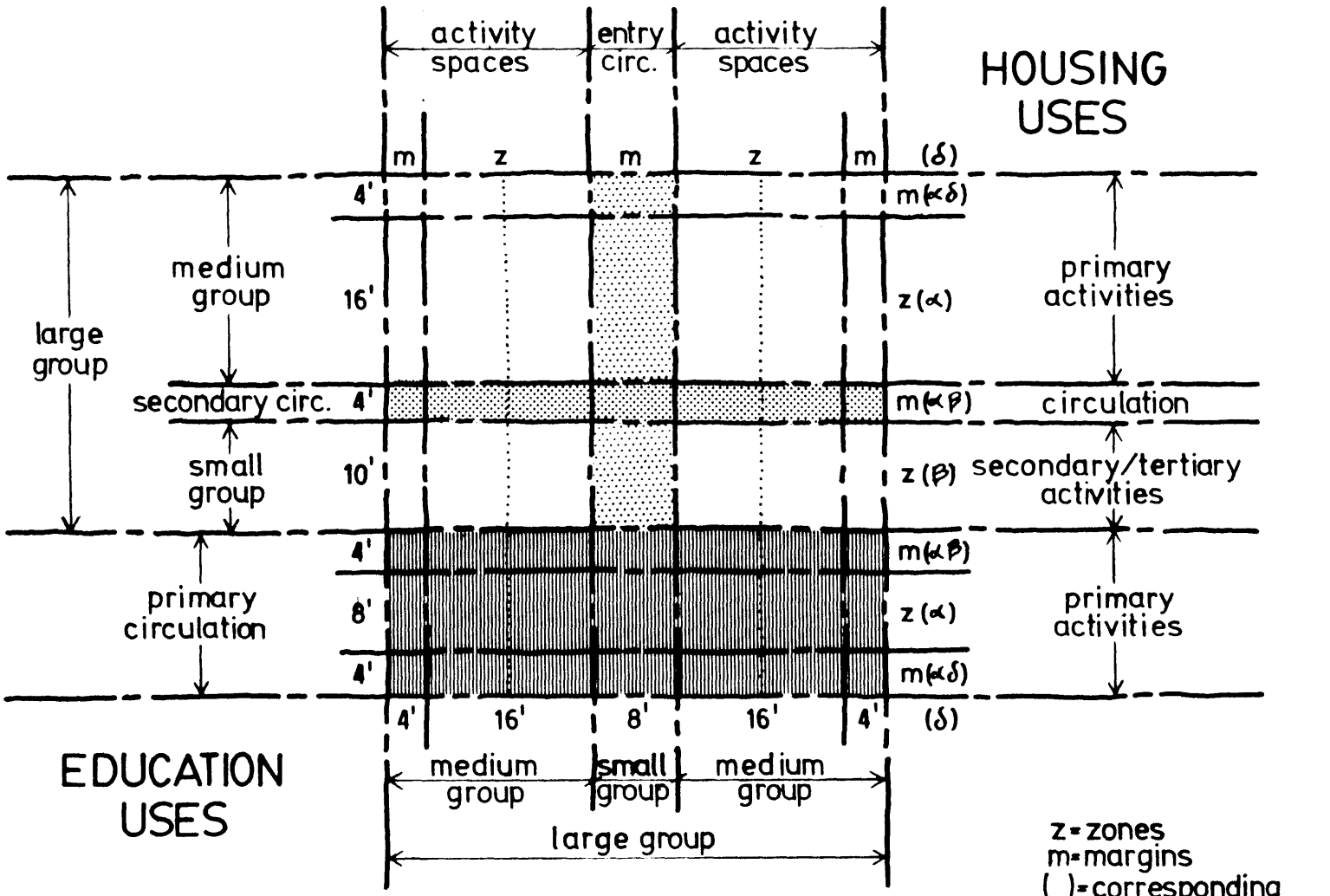
MODULE DEVELOPMENT

The focus of the vehicle study centered on achieving compatibility of education and housing uses within an existing framework which had not been designed for adaptable use. By removing the constraints imposed by the study vehicle, the exploration now focused on the development of a new framework for compatible use in which adaptability becomes the initial design concept. Using many of the preliminary findings of the vehicle study, a basic module was developed for a compatible framework (Figure 6).

A system of "zones and margins" was employed in the module similar to the approach used by the S.A.R. (see reference 17). The zones corresponded to potential activity spaces within the module and the surrounding margins allowed for variants in space sizes. General dimensions were established for the zones and margins based on vehicle study observations. The dimensions were not intended to be rigid or precise, but merely to serve as a preliminary basis for investigation.

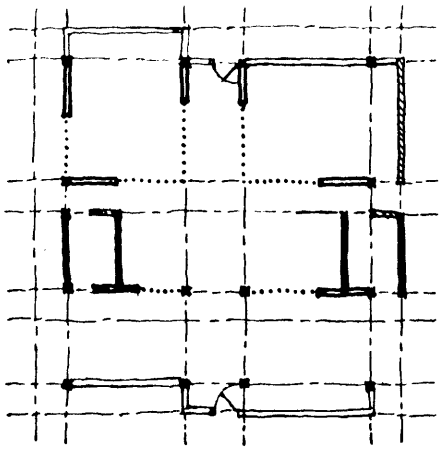
Corresponding housing and education use implications were established for the zones and margins in the module. The housing use zones were developed assuming two-sided conditions similar to those of a row house where primary use zones occupy the edges with a core zone of secondary and tertiary uses in the middle. Potential entry and circulation zones were also established with sufficient dimension to allow for a variety of uses and interpretations. Education use zones were established assuming a primary circulation system with "classroom space" on one side.

The potential locations of the various education group sizes (small, medium, large, etc.) were also delineated in the module. The dimension of the primary circulation zone (12-16 feet) was enlarged from that of a typical corridor (8-10 feet) in order to increase its potential for educational uses and to accommodate primary activities in the housing mode. In response to discoveries made in the vehicle study, a secondary circulation zone was established to facilitate localized movement between learning spaces. The

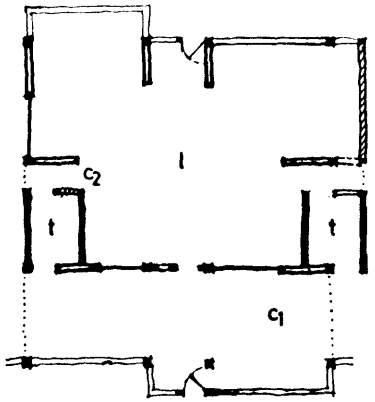


BASIC MODULE

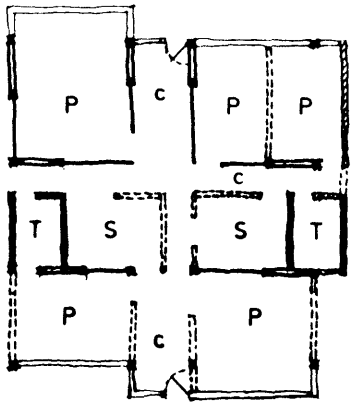
FIGURE 6



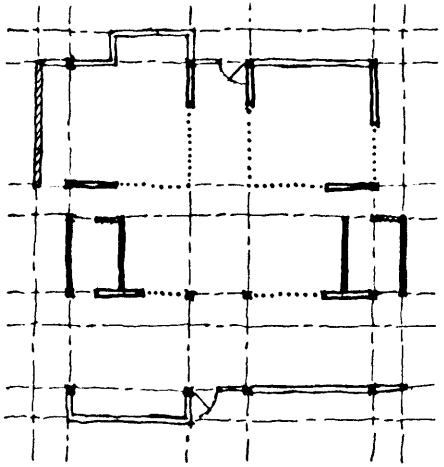
plumbing walls
sliding walls
removable walls
other walls
exterior walls



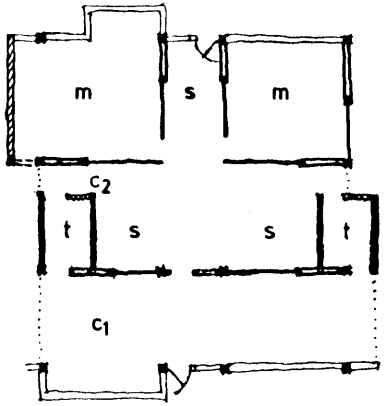
c_1 - primary circulation
c_2 - secondary circulation
l - large group space
m - medium group space
s - small group space
t - toilet/storage



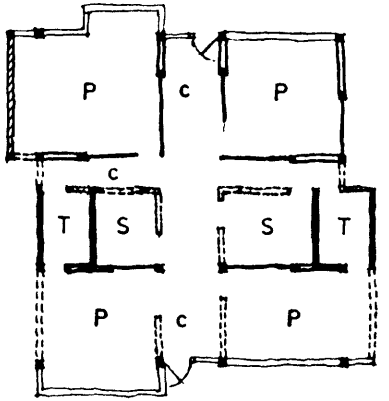
c - circulation
P - Primary space
S - Secondary space
T - Tertiary space



BASIC FRAMEWORK



EDUCATION



HOUSING

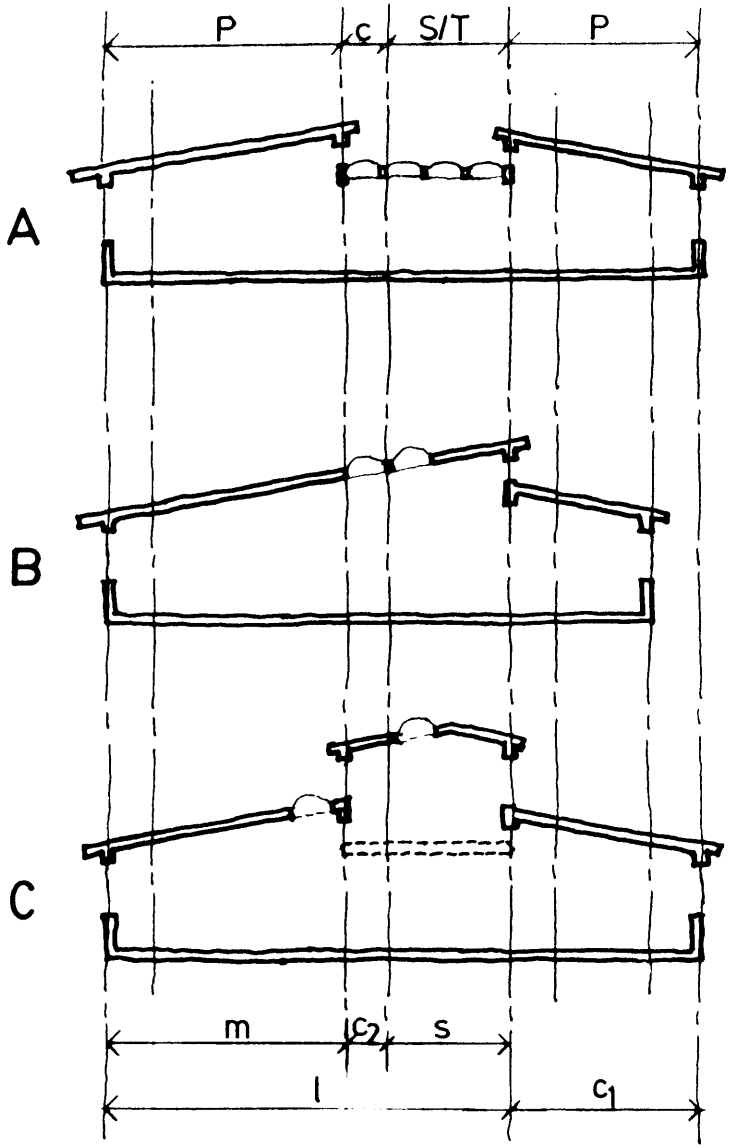
FIGURE 7

secondary circulation was allowed to correspond to the housing circulation zone in order to allow for expansion and contraction.

The two basic frameworks developed using the module are illustrated in Figure 7. Sliding wall panels, similar to the system explored in the study vehicle, were used along with a system of removable wall panels. Possible alternatives for education and housing uses in the framework are also shown.

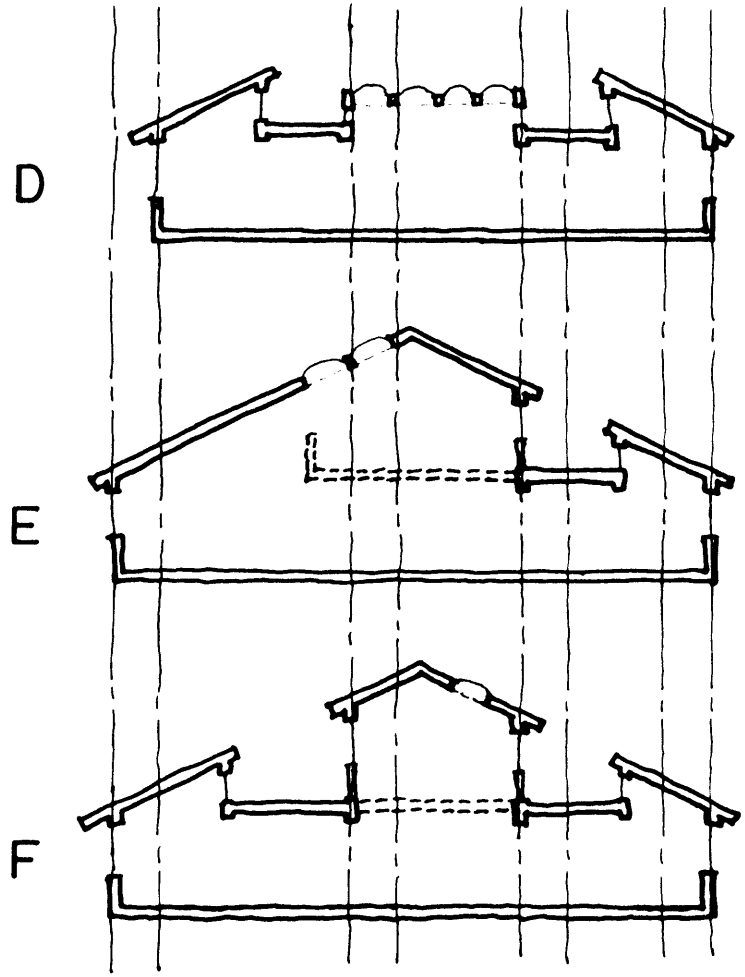
Figure 8 diagrams some of the possible sections which can correspond to the zones in the module. Pitched roofs were explored in an attempt to develop a residential character. The use of fairly continuous roof pitches over the entire section tended to produce double height spaces in the core area even when fairly gentle slopes (10°) were employed. Although these spaces were potentially useful in residential units, they seemed to have questionable utility in educational settings. When steeper pitches were investigated, it was found that by removing some of the unusable areas in the roof zone, new possibilities for outdoor use areas could be introduced. These terraces use surfaces proved to be potentially beneficial to the housing environment, but tended to have limited uses in the education environment. The roof locations of these areas, however, were already substantially unusable to the education system and, since their development as housing use surfaces seemed to have little or no effect on the educational framework, they tended to increase the possibilities for alternate use. By confining the pitched roof areas to the outer edges, it was found that a residential character could still be achieved and the inner area could then be articulated in a variety of ways.

The depth of section (approx. 50 ft.) made it necessary for the housing to provide natural light and ventilation to interior zones (core areas). Although it was possible to borrow light from adjacent spaces or ventilate through the entire section, attempts were made to provide separate natural light and ventilation opportunities to activity spaces in order to increase their potential for interchangeable use. Figure 9 illustrates some natural light and ventilation opportunities for Section F, Figure 8.



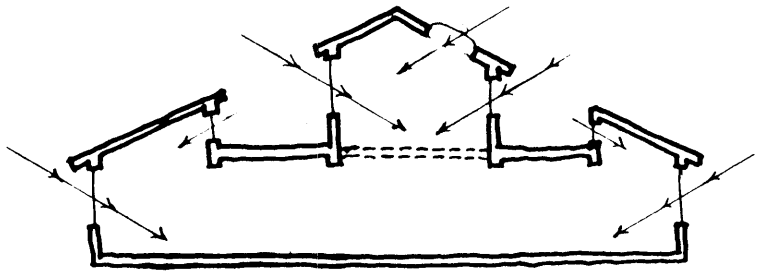
BASIC SECTIONS

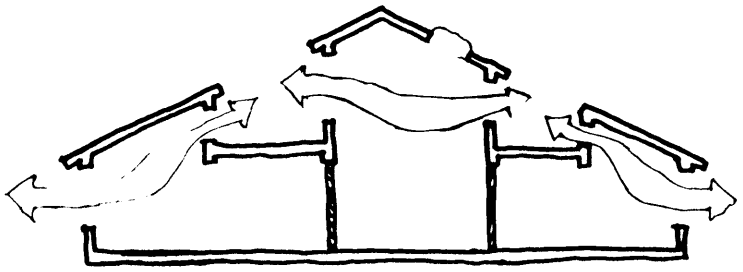
FIGURE 8

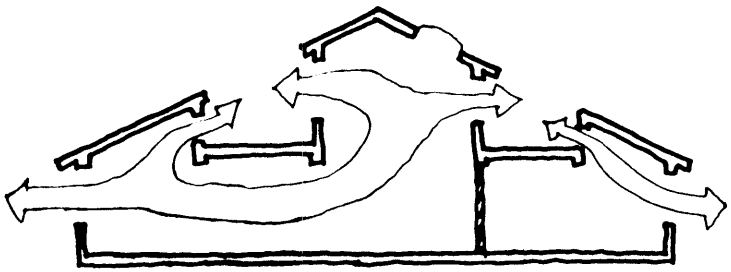


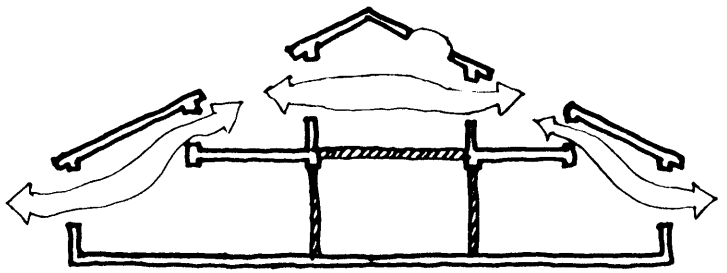
HOUSING
c-circulation
P-Primary space
S-Secondary space
T-Tertiary space

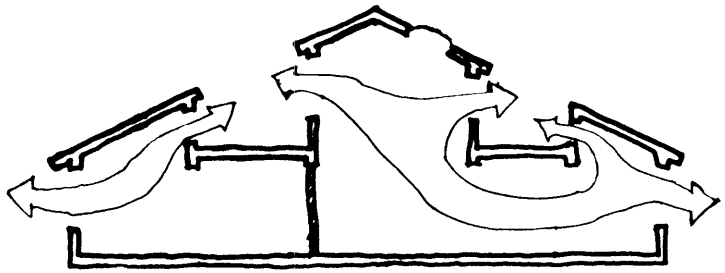
EDUCATION
c_1-primary circulation
c_2-secondary circulation
l - large group space
m-medium group space
s-small group space











NATURAL LIGHT & VENTILATION
(Basic Section F)

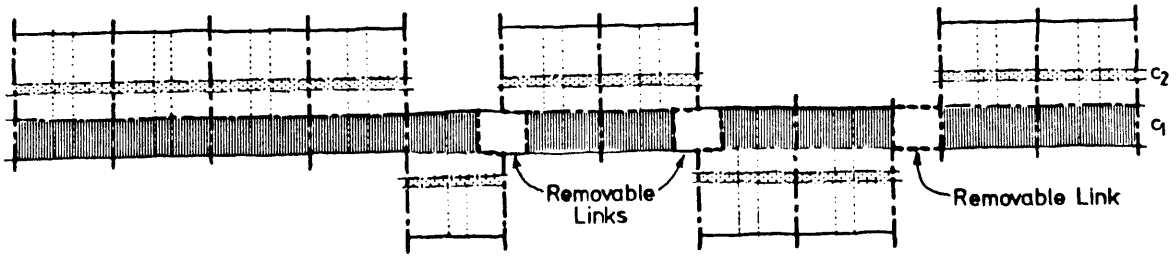
FIGURE 9

AGGREGATIONS

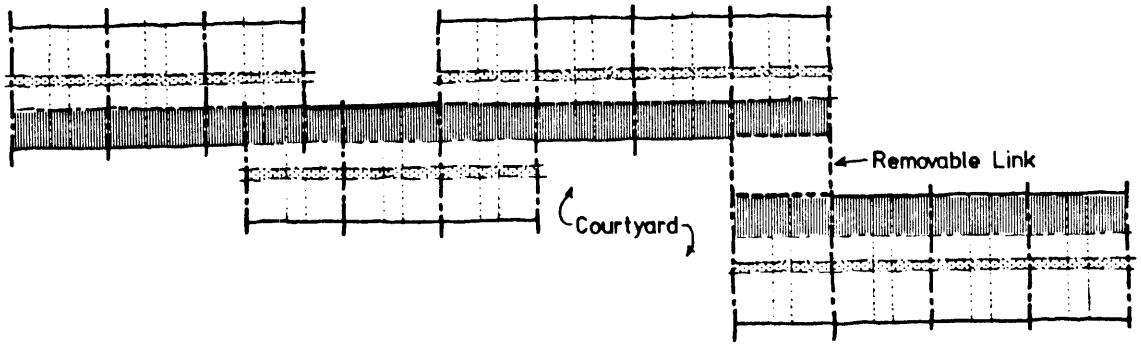
The next step involved the aggregation of the modules into a larger framework. Preliminary explorations involved linear aggregations of the module in an effort to provide a continuous primary circulation for education uses (Figure 10). By placing the "classroom" area on alternate sides of the primary circulation zone, partially surrounded outdoor areas could be developed. Aggregations with no overlap tended to be conducive to "row house-like" housing developments, but seemed to create an overly segmented and extended environment for education. Overlapping the modules increased the potential uses of primary circulation and allowed a more integrated educational framework to develop. However, the overlapping increased the depth of section and tended to inhibit the development of primary activity spaces in corridor areas by limiting the access to view, natural light and ventilation. Minor overlaps could be developed into "corner" housing units with exterior access on adjacent sides. The aggregations with extensive overlaps were similar to the general condition explored in the study vehicle and tended to create one-sided housing arrangements.

In order to produce more variety in the aggregation of modules, possible "joint" configurations were explored which could accommodate a change of direction in the primary circulation. Joints at the end and in the middle of aggregations were investigated (see Figure 11). Tightly jointed areas could result in more collective learning spaces and increased utilization of circulation zone, but they tended to create back to back housing unit configurations. Efforts were made to avoid these "dead-end" situations by allowing exterior access in joint areas.

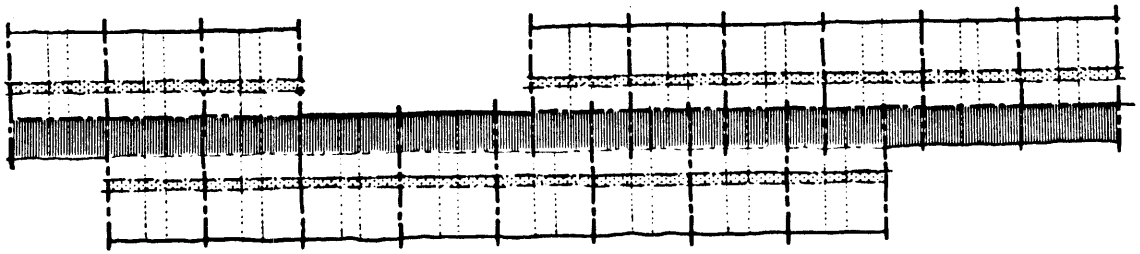
Opportunities for detaching portions of the aggregations were also explored. By offsetting the modules and connecting the primary circulation zone with a removable link, pieces of housing environment could be separated to achieve more residential sizes and allow passage through the complex (Figures 10 and 11). In addition, removable links which did not require offsetting of modules were investigated.



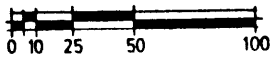
NO OVERLAP



MINOR OVERLAP

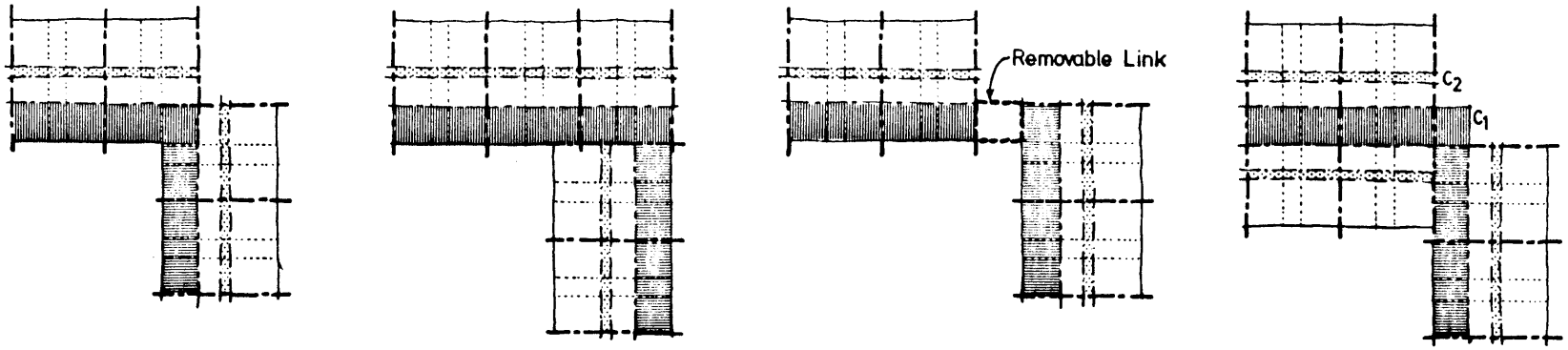


EXTENSIVE OVERLAP

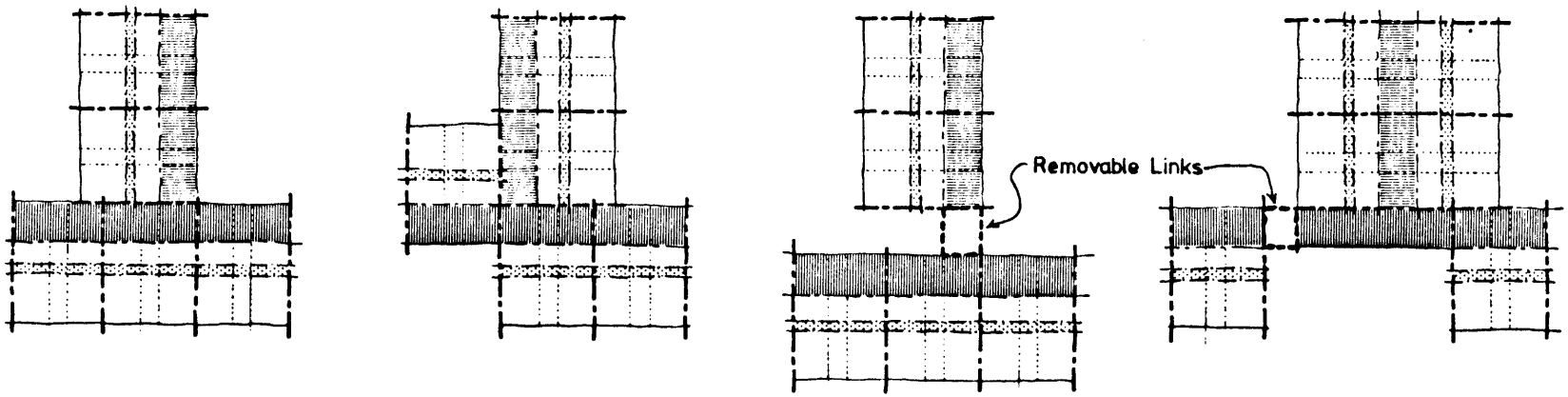


LINEAR AGGREGATIONS

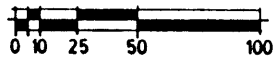
FIGURE 10



END JOINTS



MIDDLE JOINTS



JOINT AGGREGATIONS

FIGURE 11

These tenuous joints could also separate the learning environment into sections if carefully positioned within the framework.

Having introduced the need for overlapping modules, possible sectional properties of these deep regions were investigated. Similar to the double-loaded corridor condition encountered in the study vehicle, the deep section (approximately 84 feet) tended to create an abundance of secondary and tertiary use areas. Figure 12 illustrates some of the sectional options explored. Those which allowed the opportunity for primary spaces to develop above inner regions seemed to be the most attractive. A potential conflict emerged between the desire to provide these upper primary regions and the desire to allow light and ventilation into the areas below.

Section D exhibits some sectional qualities which can support both housing and educational uses. The double-height area defines the primary circulation zone in the educational framework and allows the development of upper primary spaces in housing. Increasing the height of the

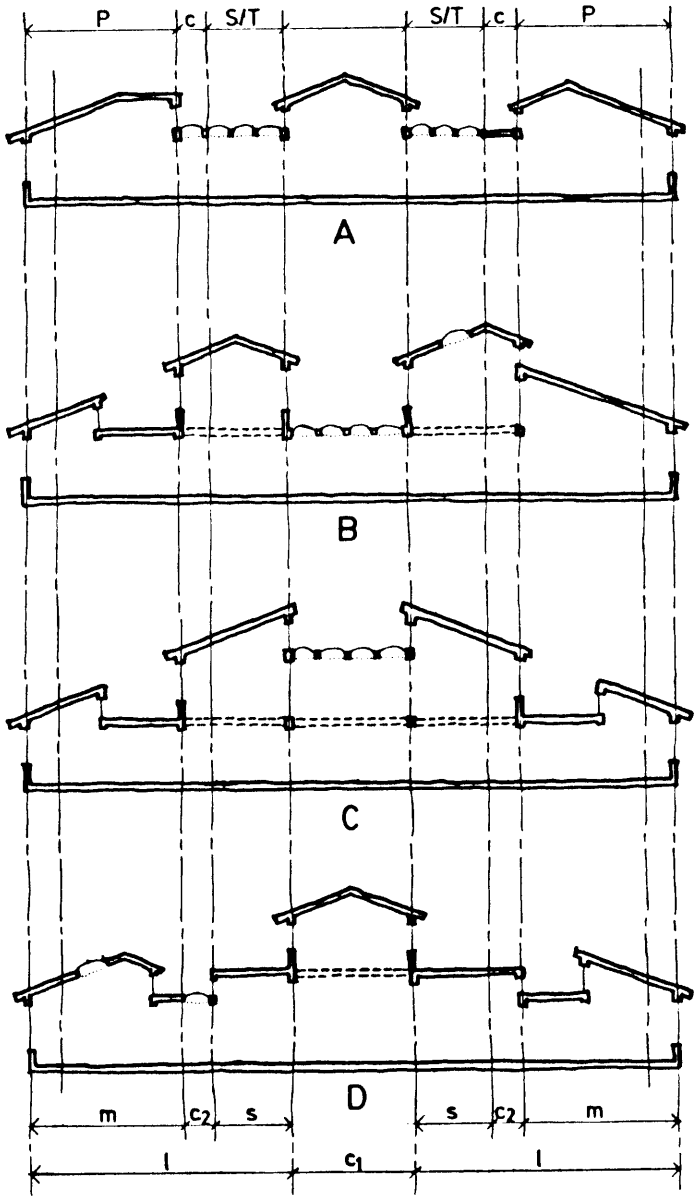


FIGURE 12 DEEP SECTIONS

secondary and tertiary zones allows light and ventilation in these areas and establishes larger space definitions in the primary circulation zone which could potentially support large group learning activities. Figure 13 illustrates some of the natural light and ventilation opportunities of Section D using various internal configurations.

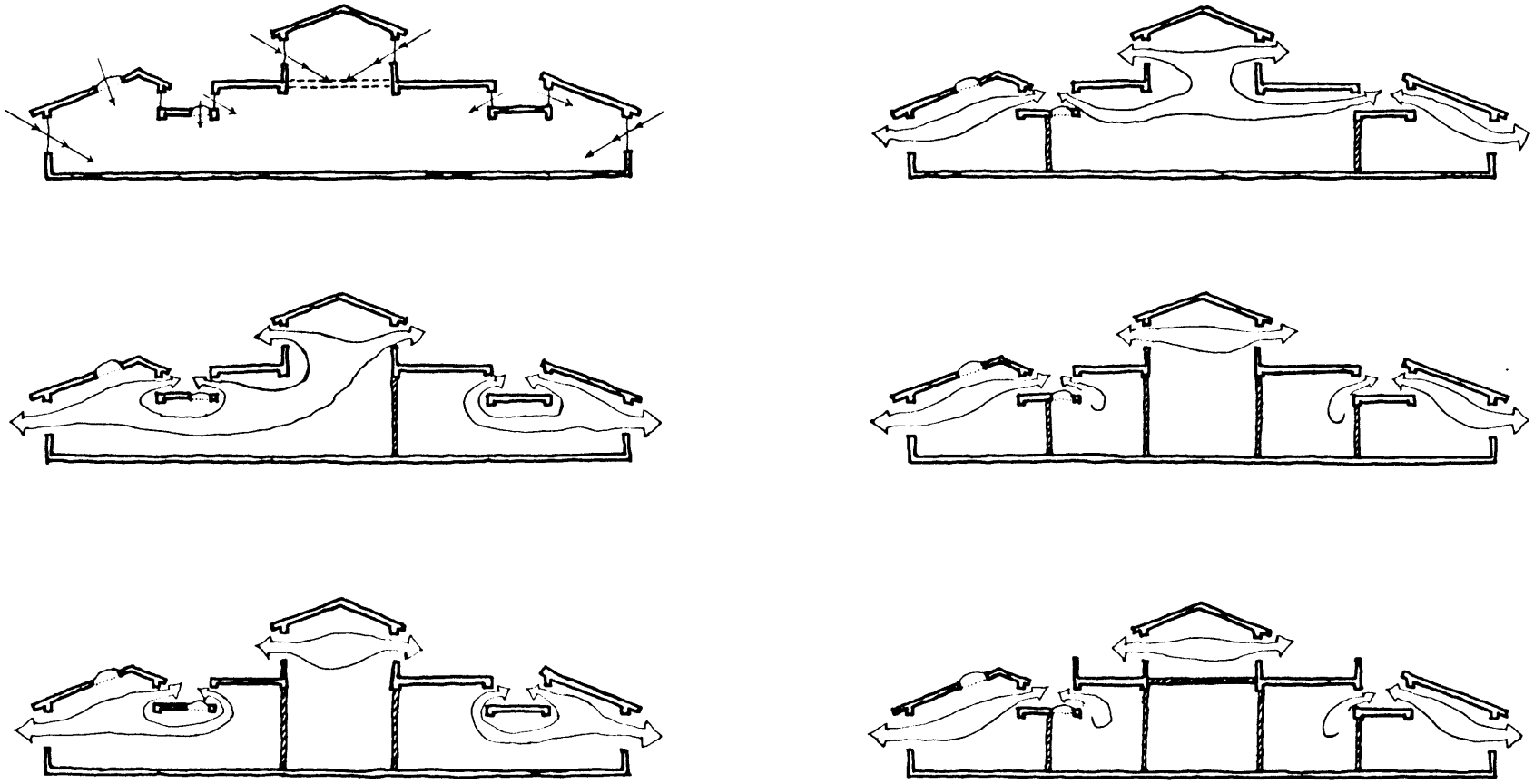


FIGURE 13 NATURAL LIGHT & VENTILATION

SITE PLANNING

A specific site was not used in this study, therefore, many of the traditional site planning issues; such as, climate, orientation, surrounding context, etc., were not addressed. It was felt that the general issues inherent in the planning of this type of facility were sufficiently complex; further complication was not warranted in this preliminary study.

In order to provide a workable framework for alternate use, the facility must be able to function in each of three major modes:

1. education mode - entire facility used for education;
2. housing mode - entire facility used for housing (with community center);
3. Joint-use mode - education and housing uses occupy the building simultaneously.

Although several issues are involved in planning a compatible building layout for the pure education and housing modes, additional issues must be resolved to achieve feasibility in joint-use mode.

The spaces outlined in primary school programs fall roughly into three main categories: classroom spaces, special use spaces and general use spaces. The types of classroom or learning spaces (independent study, small, medium and large groups) were discussed earlier and can be used individually or collectively by teachers. Special use spaces include gymnasiums, auditoriums, cafeterias and administrative services. Many school planners have attempted to combine some of the special use areas in multi-purpose rooms such as cafetoriums. General use spaces tend to be used randomly by the entire school. Although many schools have other general use areas, libraries are the most common.

It was discovered in the vehicle study that special use spaces tended to be difficult to adapt to housing uses, due primarily to their large volumes. In addition, it was noted that these spaces should not be dispersed throughout the building, since they tended to inhibit the development of an intimate residential environment. Ideally, these spaces

could be grouped together to form an identifiable unit which could function independently from the rest of the facility. By developing this potential "community center" piece, it can more easily become a useful amenity to the surrounding neighborhood. Since these special use areas tend to have scheduled use, they do not need immediate accessibility from classroom spaces. Therefore, this "community center" piece can be placed in a variety of positions relative to the other program elements and the community, and need not be centrally located in the facility.

Modern education philosophies have expanded the notion of the quiet library space to a highly active area called the learning resource center. This multi-media information center has become the heart of the learning environment and should be conveniently located relative to classroom areas in order to provide equal accessibility. These resource centers are generally designed as large open spaces with smaller associated use spaces and alcoves along the perimeter. Although these areas can potentially be used for housing, they may not adapt as readily as the smaller group spaces and will probably require higher levels of investment to achieve housing uses. The resource center, however, also has a good potential for after-hour use and could be logically located near the "community center" piece (Figure 14A).

To be used effectively by the community, the resource center should also be zoned into an area independent of classroom spaces for purposes of security and minimum disturbance of other activites. It should, therefore, probably not be planned as a central open area surrounded by classrooms, but rather as a joint piece centrally convenient to the classroom facility. The resulting building form would then consist of wing-like classroom areas extending out from the resource center (Figure 14B). In the housing mode, the resource area could act as a transition element between the housing area and the community center piece with the option of incremental adaptation to housing over time.

The number of classroom wings developed is a function of the size of the facility envis-

ioned. With a ratio of twenty-five students per class, a small primary school (400 to 500 students) would require between sixteen to eighteen classroom modules. Traditionally, educational systems divide students into age groups or "grades." Primary school facilities are often further divided into lower grades (kindergarten through second) and upper grades (third through sixth). If we divide this small primary school into these two groups, there would be about eight or nine classrooms per wing. This size could be advantageous in the joint-use mode, since each wing would be capable of accommodating a small school.

Figure 14C diagrams the basic configuration of the facility with two major classroom wings. Since the resource center and special use areas tend to be necessary in most educational settings, this arrangement allows the school to expand outward (or contract) from these areas. In addition, housing uses can occupy the remote edges of the facility and expand or contract in response to the educational space needs.

There are three major types of access to

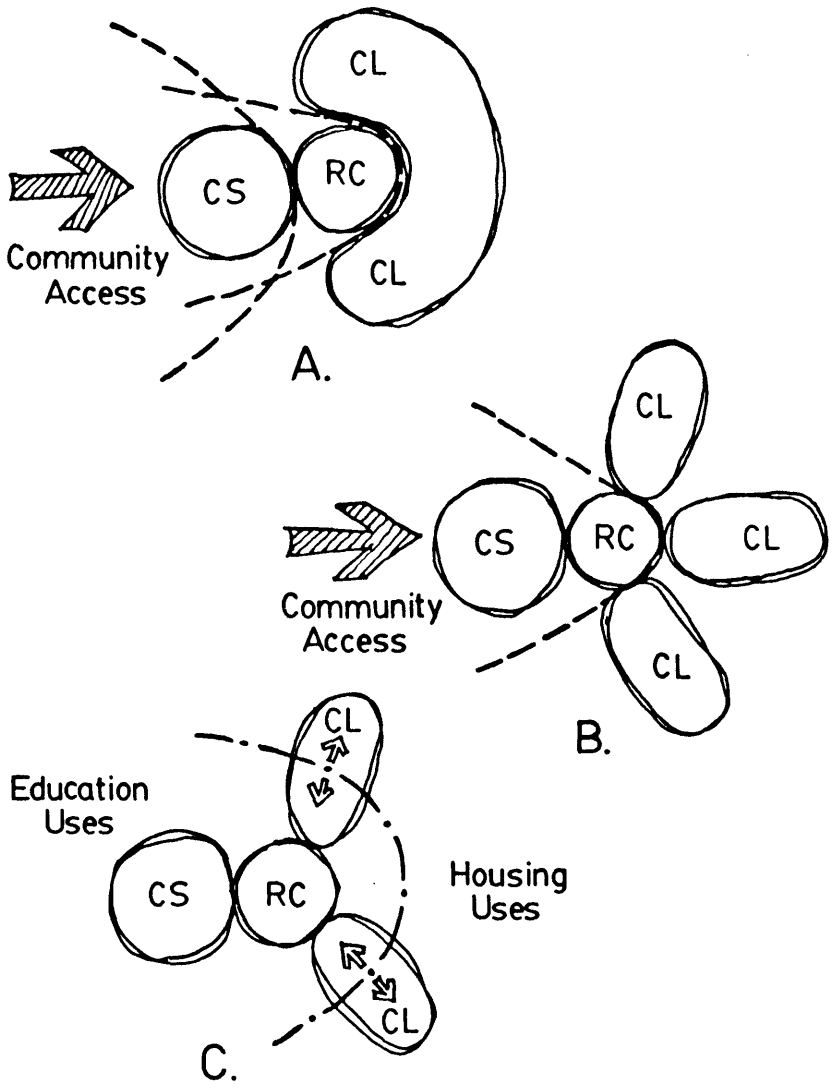


FIGURE 14

CL=Classroom/Learning spaces
CS=Community center/Special use areas
RC=Resource Center

the facility: school access, community access and housing access. Access to the community center could easily be combined with the main school entrance to form a single public access zone, but the housing areas would tend to need separate access points in order to maintain security and privacy. Similarly, visitor and staff parking areas for the school could also be used in conjunction with the community center, but parking for housing areas should typically be associated with the individual dwelling units. Housing access points should be located near the ends of the classroom/housing wings and parking areas should be carefully designed to expand and contract incrementally without sacrificing the safety of school children (Figure 15). These localized parking areas need not have a "parking lot" appearance and could potentially be used as hard top play areas in the education mode.

The joint-use mode introduces a more complex set of issues into the planning process. If both education and housing uses are to occupy the building, some means of allowing the uses to retain their own identity should be provided. Many mixed use projects have attempted to solve this problem by breaking down the building into identifiable forms which allow several focuses to develop in the facility. Although on a much smaller scale, the same principle could be used in an education/housing complex. By giving the classroom wings (and the community center piece) their own exterior focuses, they can have a separate identity in the complex. This could create a workable arrangement for joint-use, provided the forms used for classroom wings were not centrally focused. A centrally focused form (such as a courtyard) tends to allow occupation by only one use and, therefore, inhibits expansion and contraction between uses. Ideally, the form of the classroom wings would be segmented with many possible focuses. Although it is unlikely that the form could ever achieve separate identity of uses in all possible configurations, a segmented form could allow incremental expansion and contraction while maintaining a adequate amount of use identity.

The overall form of the facility could resemble a "village" of potentially separable "house-like" pieces. By allowing some of the remote pieces to have a close relationship with the existing streets, they could become mergers with the surrounding residential patterns. The facility could then become physically and visually an integral part of the surrounding community rather than a discrete building set off from the residential fabric.

Even if a workable framework for joint-use is established in the building, expansion and contraction of user space would not be possible unless compatible policies are established for flexible rental of the non-educational space. One possible arrangement could be a sliding scale of leases for housing tenants. Those closest in proximity to the edcuational space could have shorter leases than those farther away. This would allow the school to respond more effectively to the enrollment fluctuations by planning its occupancy of more or less space (18, p. 92). The user groups within the housing space may also vary in the joint-use mode. The housing space in closest proximity to the education space could be occupied by households which are generally vacant during school hours.

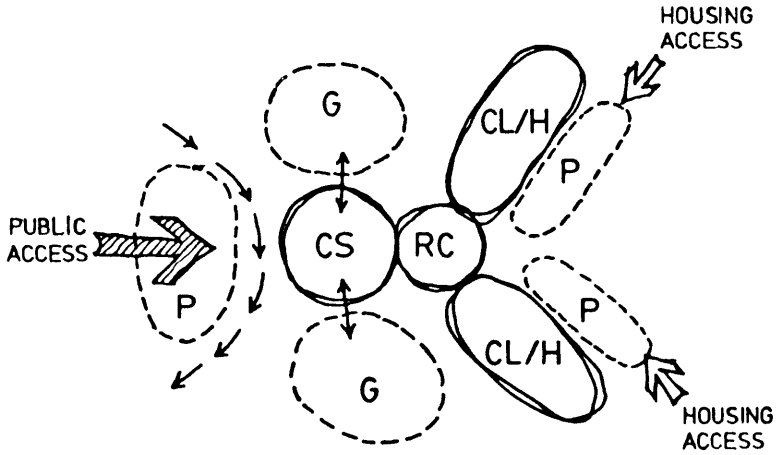
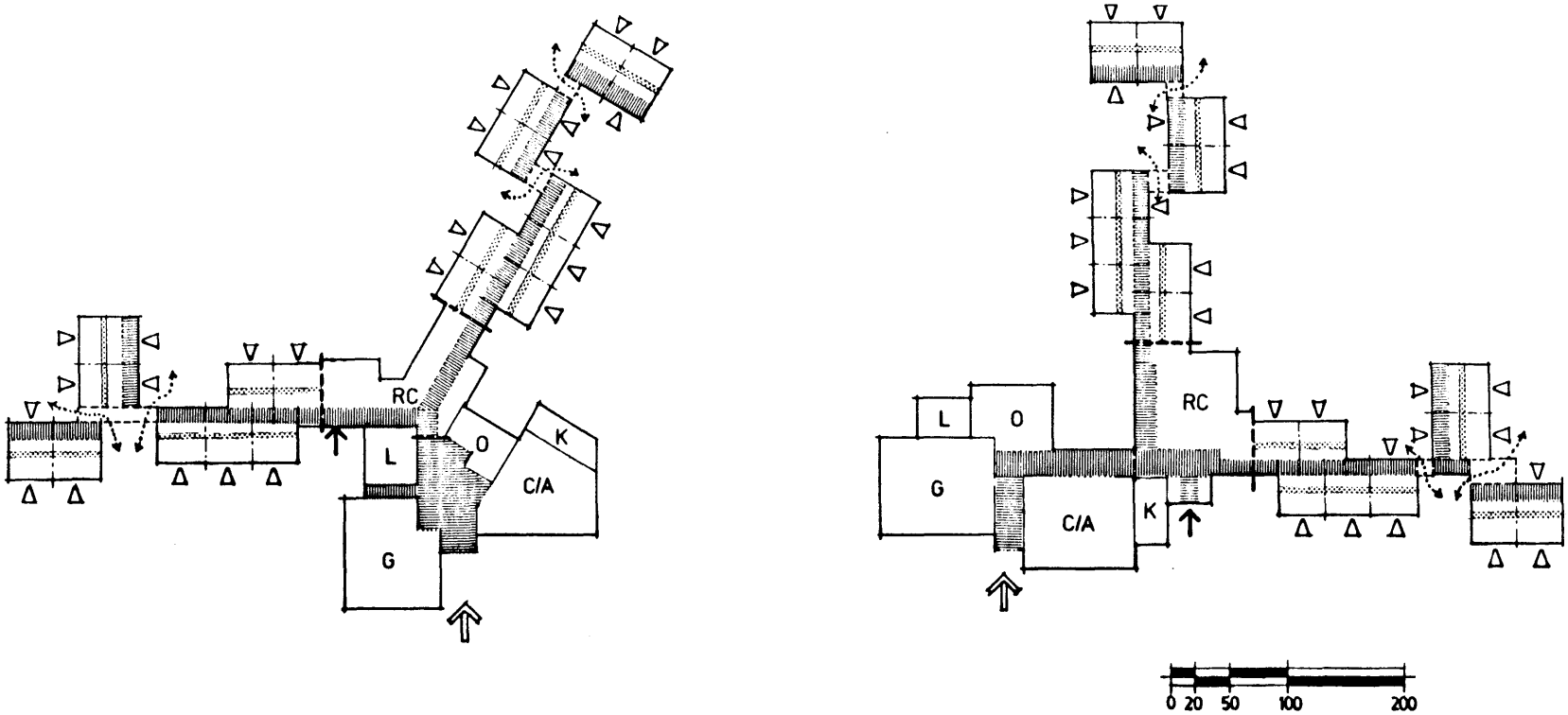
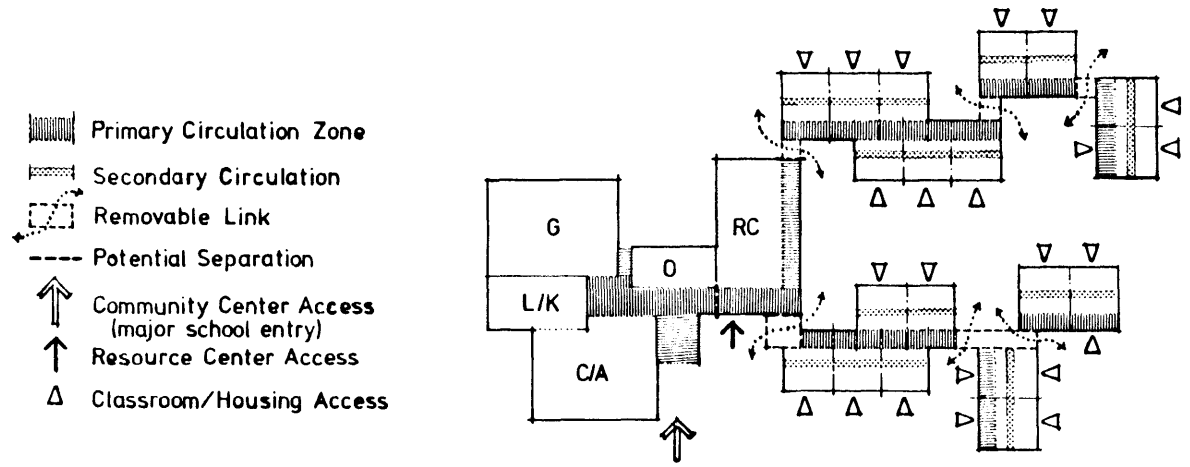


FIGURE 15

CL/H Classroom/Housing area
CS Community center/Special use areas
G Game fields
P Parking
RC Resource Center





Primary Circulation Zone
Secondary Circulation
Removable Link
Potential Separation
Community Center Access (major school entry)
Resource Center Access
Classroom/Housing Access

FIGURE 16

C/A-Cafeteria/Auditorium
G-Gymnasium
K-Kitchen
L-Locker rooms
O-Offices
RC-Resource Center

DESIGN PROJECTION

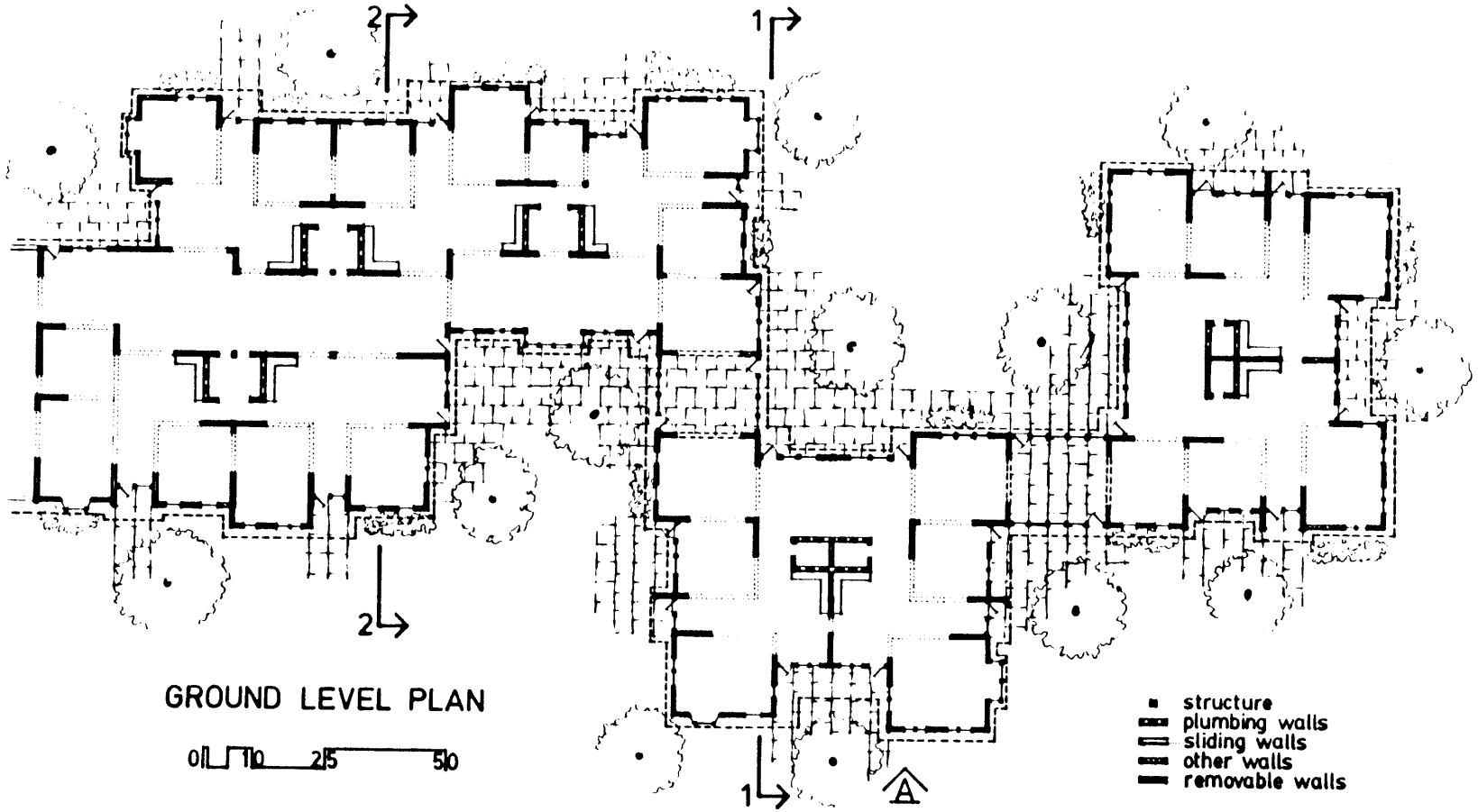
The final section of the study involved a design projection of a piece of building framework which could accommodate housing and education uses. The intent of the exploration was to investigate the architectural implications of concepts which have evolved in previous sections of the study.

Three potential building configurations were developed for a small primary school (400 to 500 students) employing the basic module and site planning concepts discussed earlier (Figure 16). The basic configurations consisted of two classroom wing forms and a "community center" piece which was comprised of the special use areas of the school complex. Segmented forms were explored for the classroom wings incorporating removable links to allow detachment of portions of the building. The segments near the remote ends of classroom wings were developed as "house-like" pieces which could easily be detached and adapted to housing.

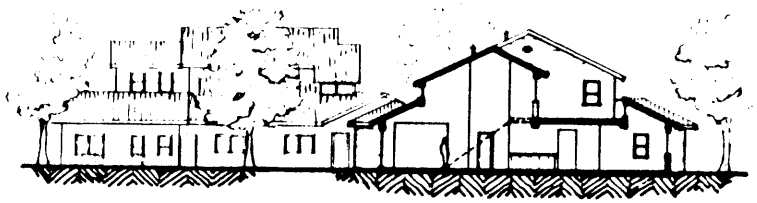
A design exploration of one of these classroom wings is presented on the next two pages, followed by an indepth study of one of the detachable wing segments. The exploration included the provision of potential upper level spaces in the housing environment but these areas need not be developed initially and could be added incrementally to the framework over time. Potential use surfaces were developed in the roof zone for associated outdoor activities in the housing mode.

A steel frame construction system was used with exterior masonry walls below and metal siding above. Sliding wall panels, similar to the ones developed in the vehicle study, were employed, along with a system of removable wall panels. Plumbing walls were positioned to provide a variety of possible locations of fixtures (toilets, sinks, bath tubs, etc.) and sized to allow multiple interpretations of tertiary areas; e.g., in the education environment - work room, restroom, cloakroom, storage, etc.; in housing environment - bathroom, laundry, small kitchen, etc.

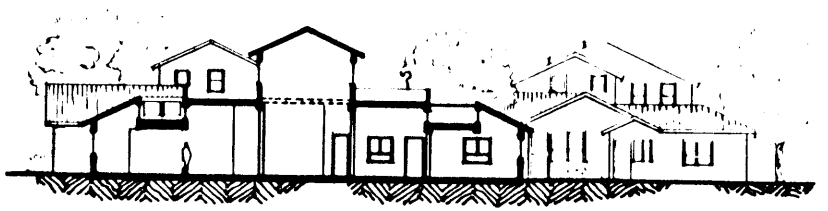
The aggregation of modules in the classroom wing created a range of overlap



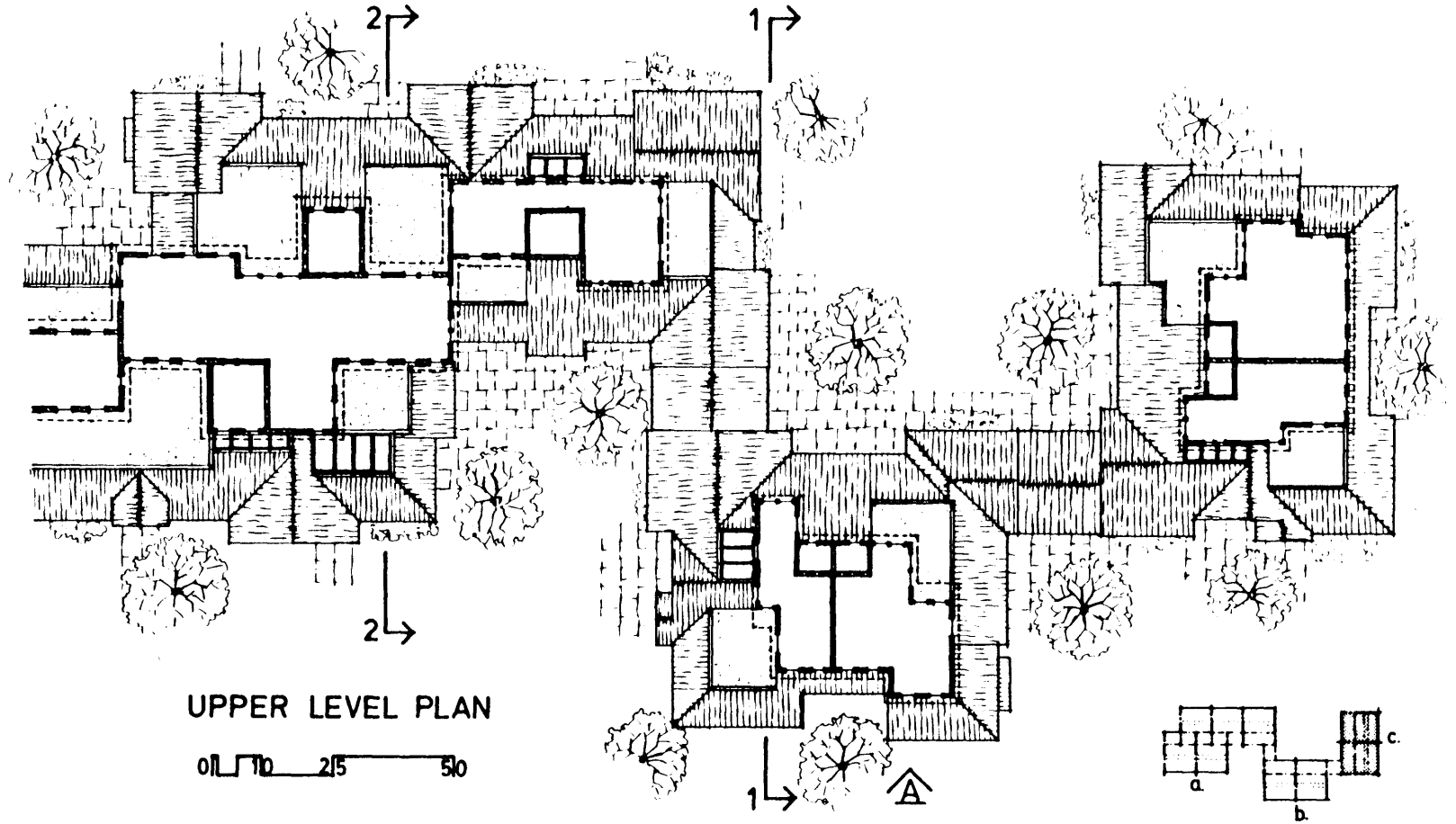
GROUND LEVEL PLAN



SECTION 1-1

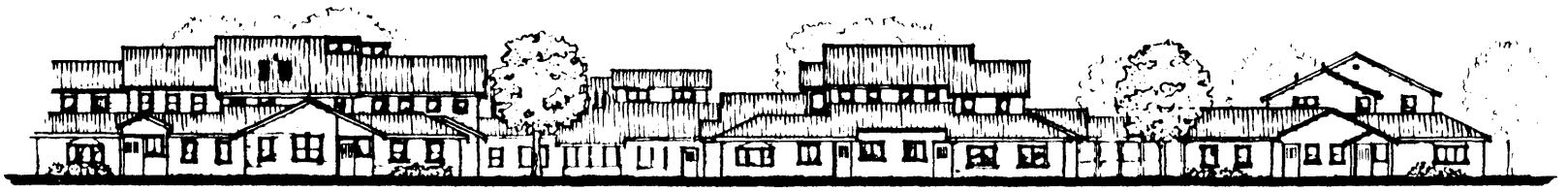


SECTION 2-2



UPPER LEVEL PLAN

0 1 5 10 25 50

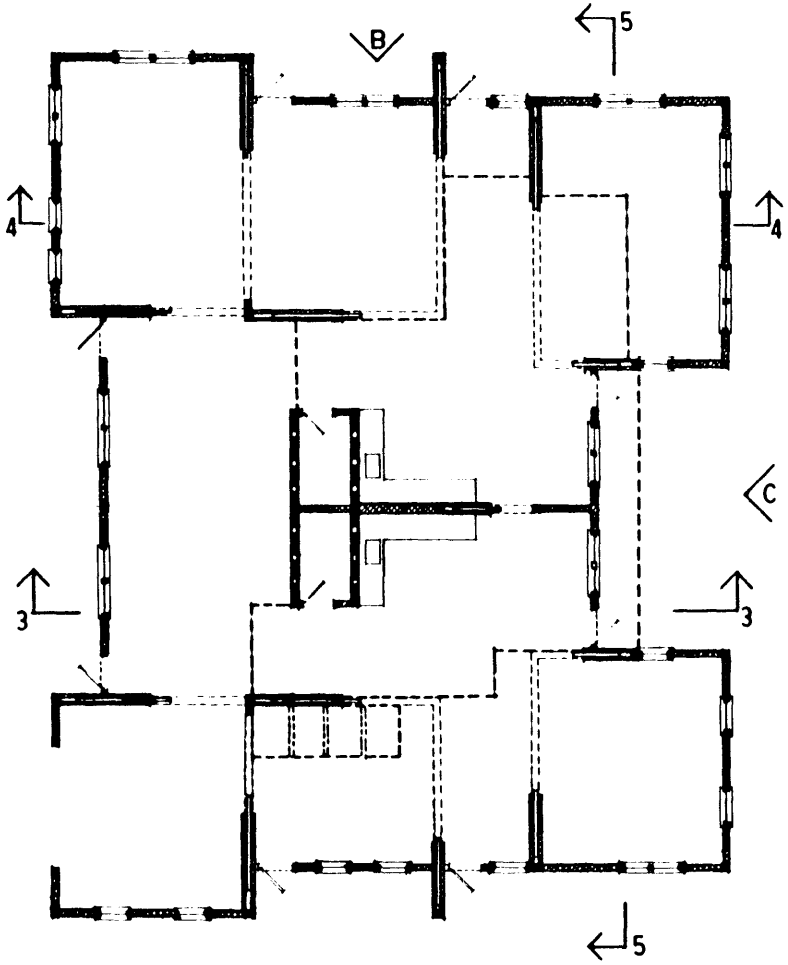


ELEVATION A

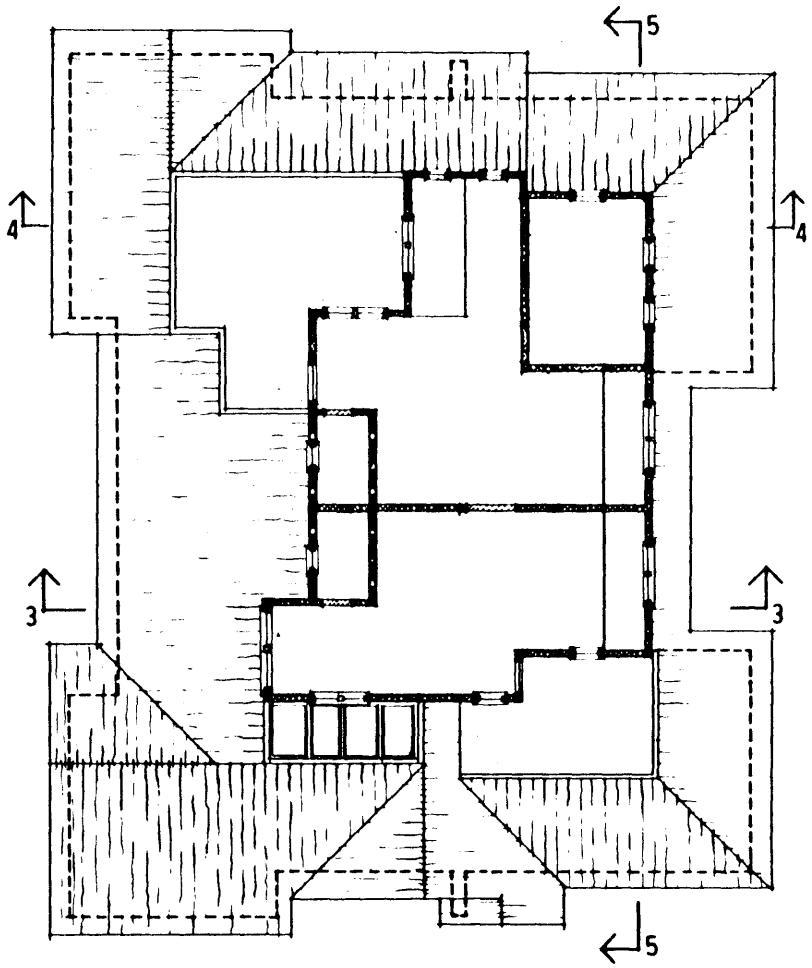
conditions from extensively overlapped areas (Segment a) to areas with little or no overlapping (Segments b and c). Several of the sectional alternatives discussed earlier were employed to provide natural light and ventilation possibilities throughout the framework. Small changes in floor level (2-3 feet) were investigated in an attempt to increase the spatial variety of the learning environment, but they were eventually rejected, due to their tendency to limit possibilities for space utilization by predetermining divisions between activity areas. Removable links between classroom segments were articulated as temporary structures (with light metal framing) which could readily be disassembled to separate the framework into "house-like" segments.

The exploration attempted to create a strong residential character in the framework. The intention was to provide a housing environment which could accommodate primary school activities. It was felt that housing has established conventions which people associate with homelike settings and that a primary school could easily adapt to a "house-like" environment. No attempt was made to project an image for a school since there has been little agreement among educators as to what image a school should take. The conventional "school" image has been criticized by some educators for its tendency to restrain learning experiences to a conventional education. As Williwm Caudill has suggested, "the word 'school' is semantically tired. "It implies there are certain prescribed courses that must be taken at a certain time during certain months by a certain age group . . . 'school' presupposes a schoolhouse . . . most schoolhouses shape, then freeze the educative process . . . Even more significant the educative process doesn't necessarily need a schoolhouse" (6, pp. 13-14).

The following pages illustrate a further exploration of one of the detachable "house-like" pieces (segment C). The basic framework is presented first, followed by some of the possible education and housing use alternatives which were developed during the exploration.



GROUND LEVEL

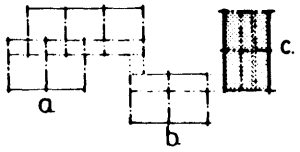


UPPER LEVEL

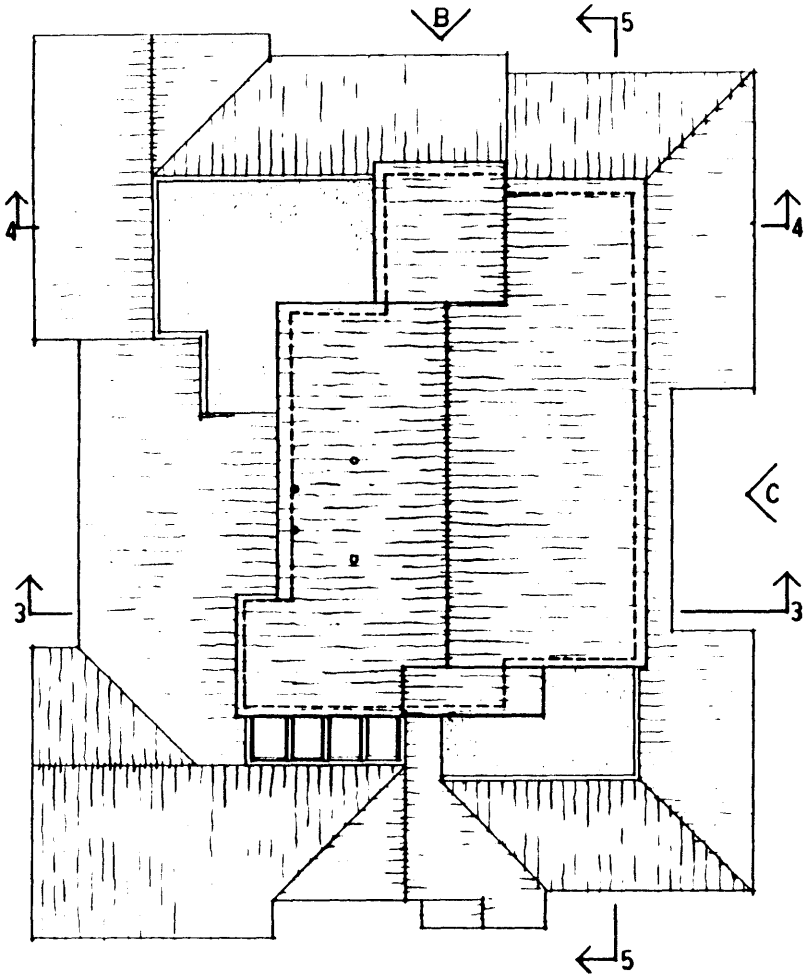
BASIC FRAMEWORK

Segment 'c'

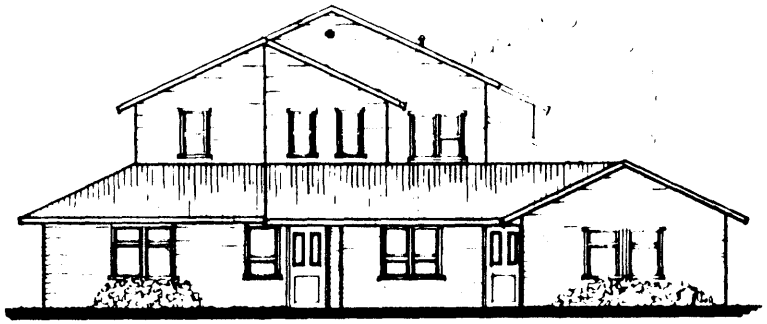
0 1/0 2/0



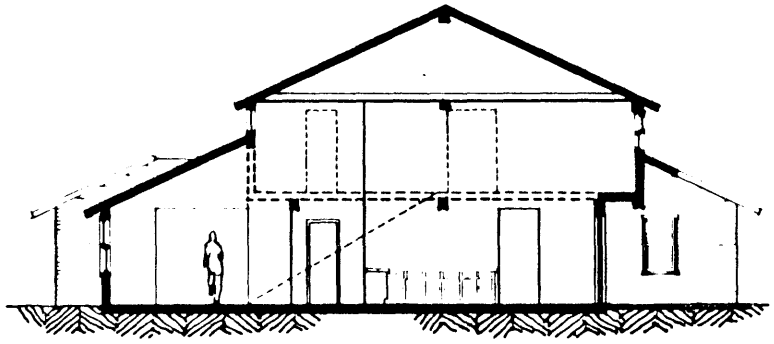
- structure
- plumbing wall
- sliding wall
- removable wall
- exterior/partition wall



ROOF PLAN

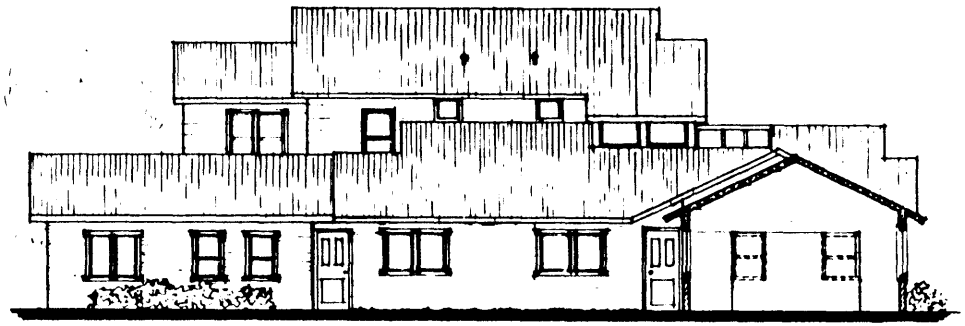


ELEVATION B



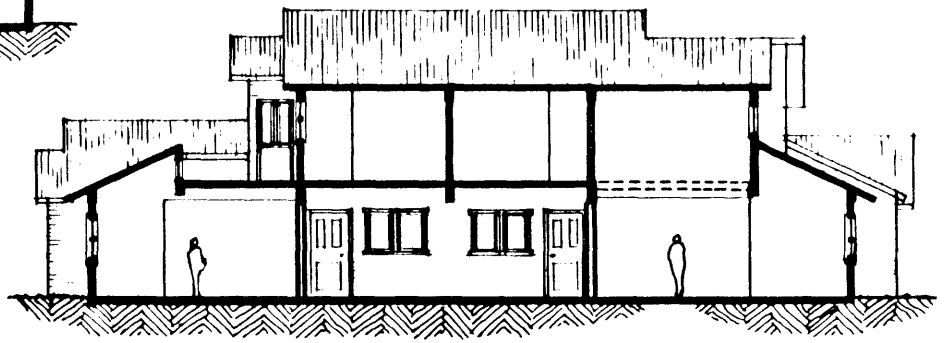
SECTION 3-3

0 10 20



ELEVATION C

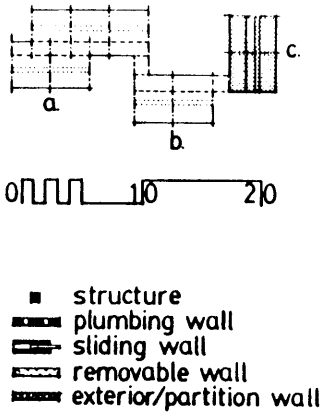
SECTION 4-4

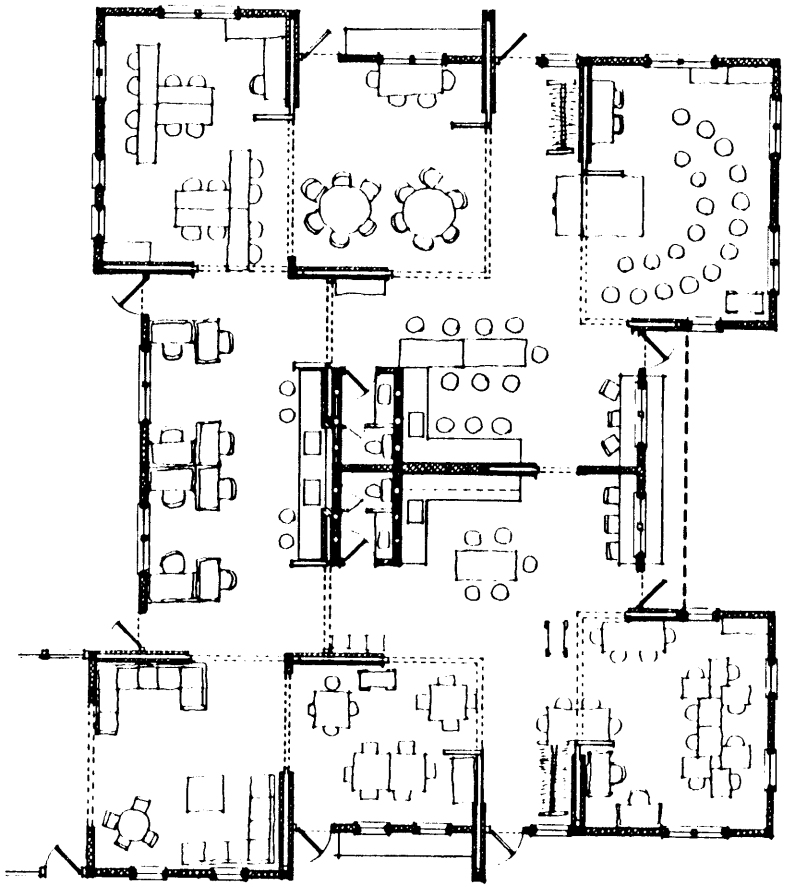


SECTION 5-5

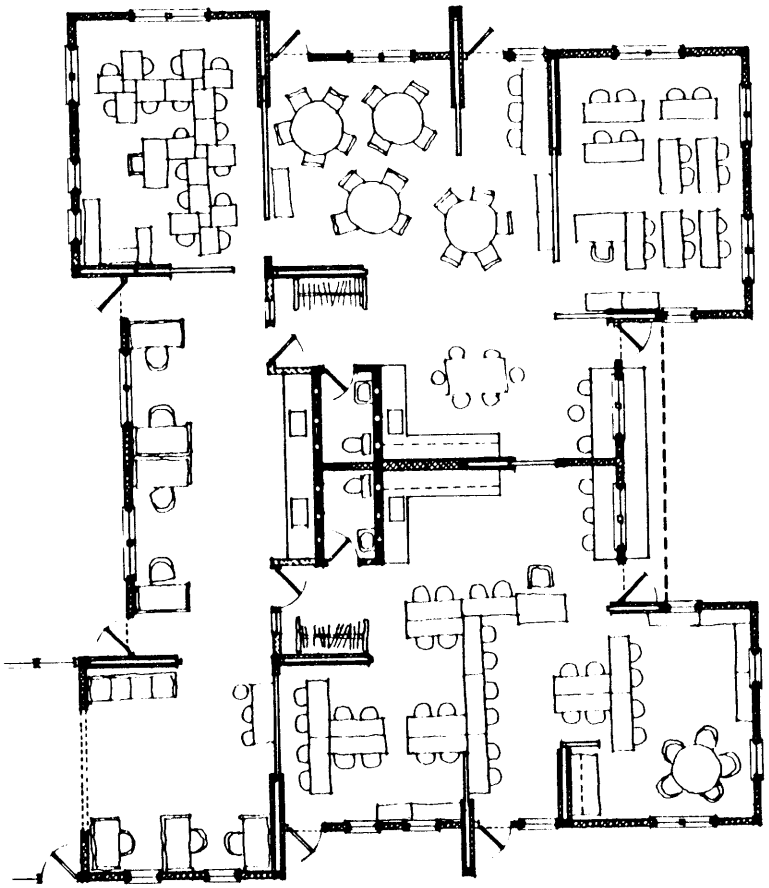
USE ALTERNATIVES

By varying the positions of sliding and removable wall panels, the framework was transformed to accommodate a variety of education and housing use patterns. The investigation indicated that various learning situations could be achieved primarily through the positioning of sliding wall panels with few changes to the original framework. The upper level areas were developed in the housing alternatives and removable wall panels were added to create various dwelling configurations.

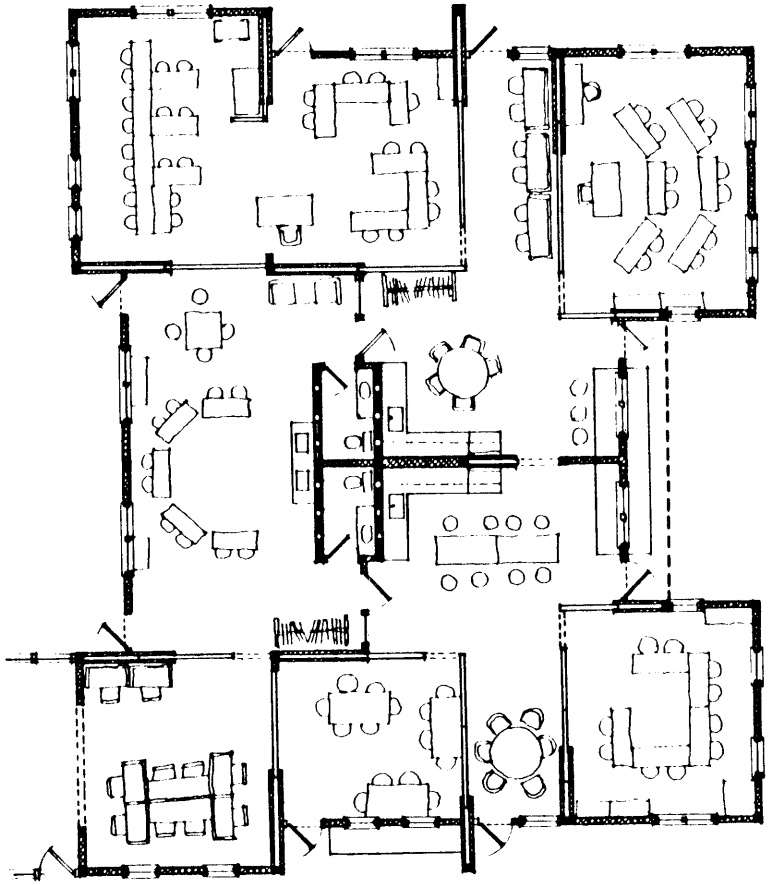




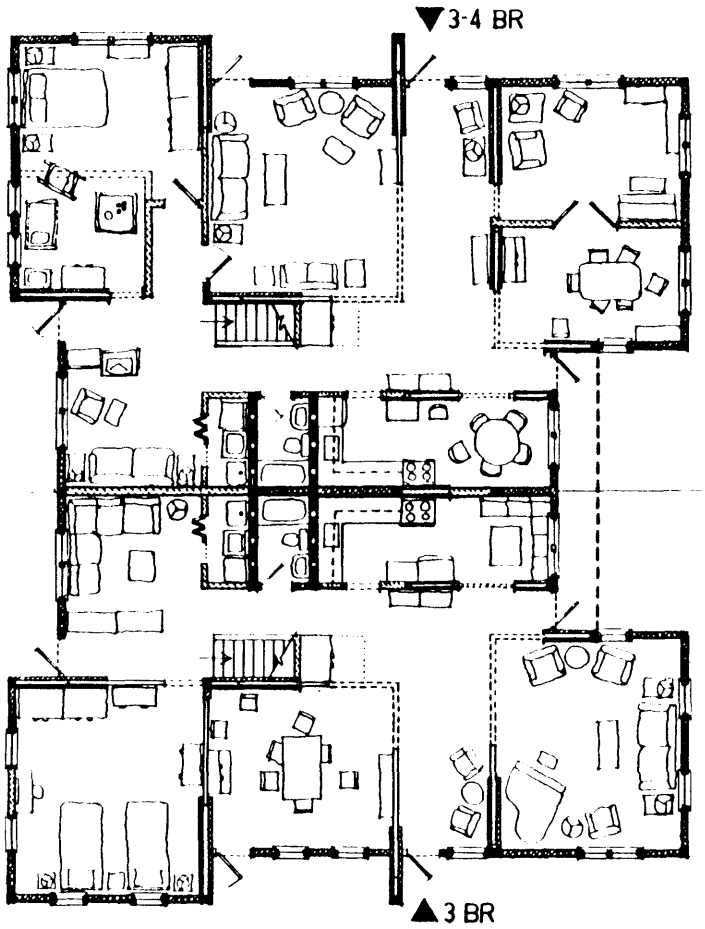
EDUCATION ALTERNATIVE 1



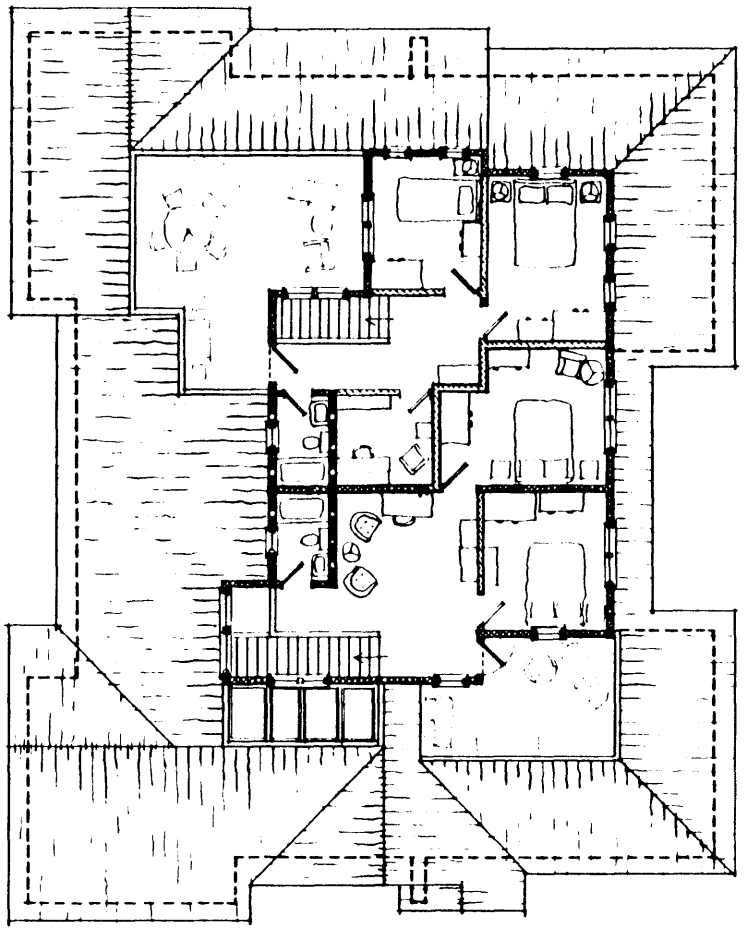
EDUCATION ALTERNATIVE 2



EDUCATION ALTERNATIVE 3



GROUND LEVEL

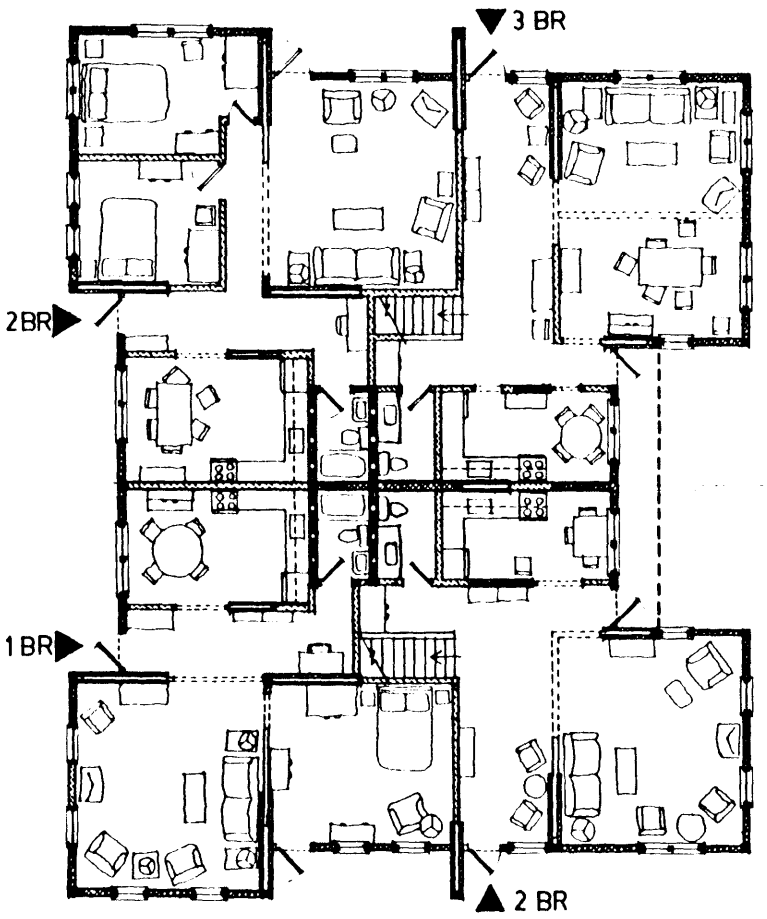


UPPER LEVEL

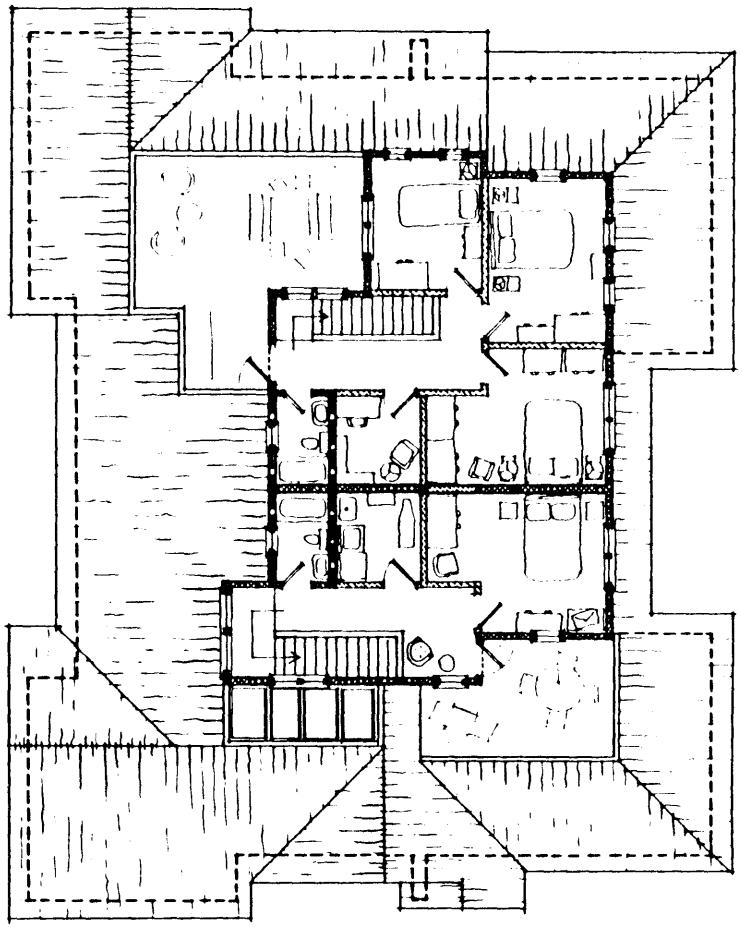
HOUSING ALTERNATIVE 1

0 1|0 2|0

- structure
- plumbing wall
- sliding wall
- removable wall
- exterior/partition wall



GROUND LEVEL

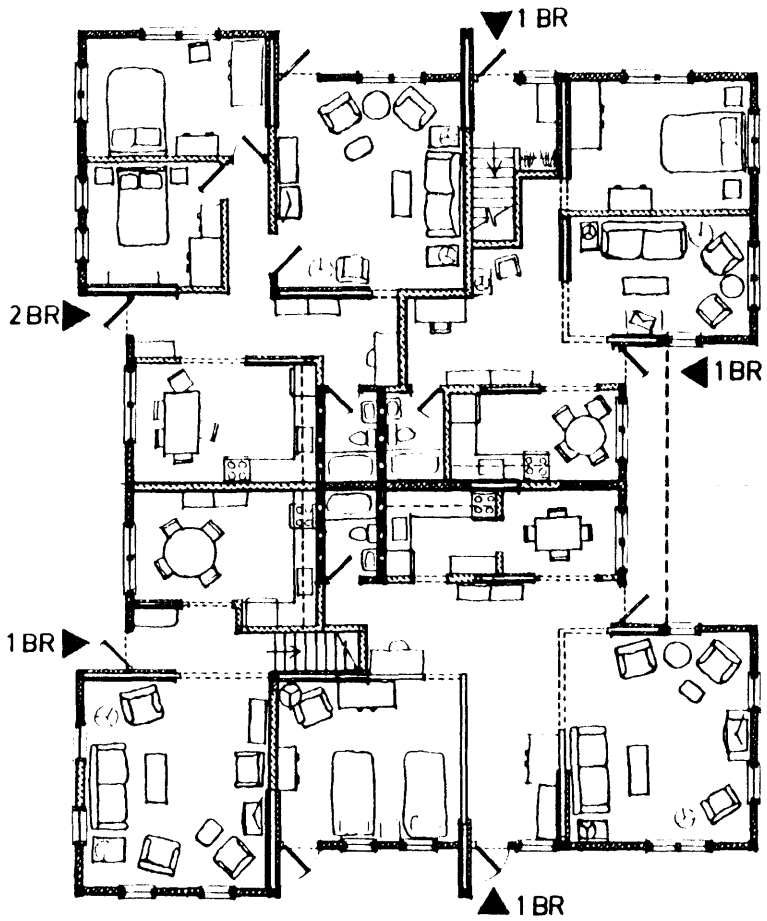


UPPER LEVEL

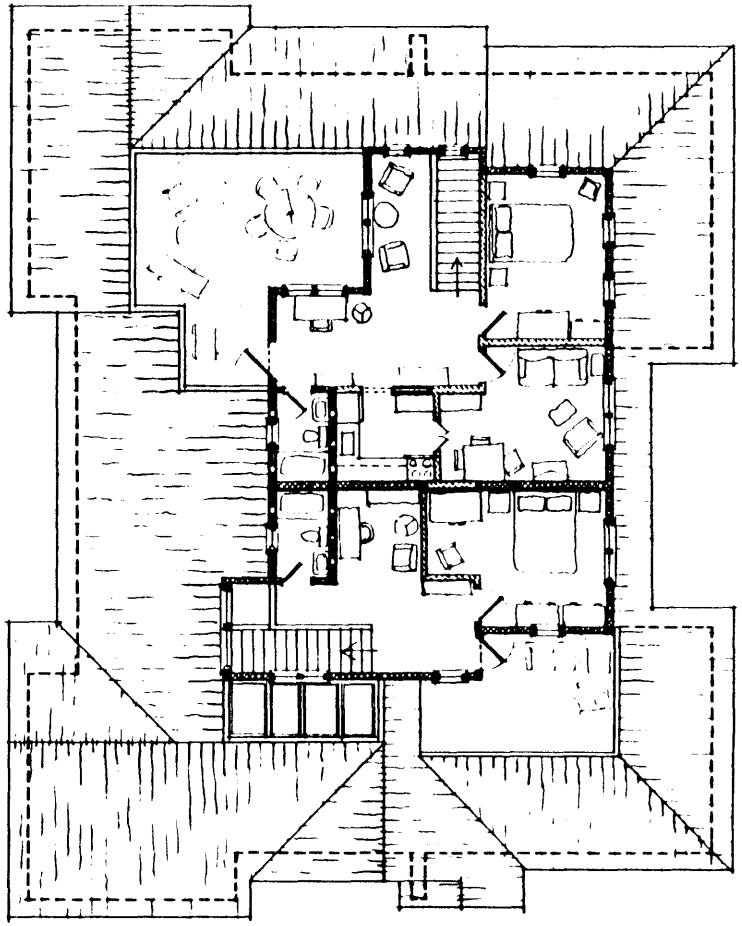
HOUSING ALTERNATIVE 2

0 1|0 2|0

- structure
- plumbing wall
- sliding wall
- removable wall
- exterior/partition wall



GROUND LEVEL



UPPER LEVEL

HOUSING ALTERNATIVE 3

0 1 0 2 0

- structure
- plumbing wall
- sliding wall
- removable wall
- exterior/partition wall

CRITIQUE

The intent of the design projection was not to propose a definitive building solution for education and housing uses but merely to examine some of the physical realities of the concepts developed in this investigation. The exploration seemed to indicate that a potentially useful framework for education and housing could be developed; however, several issues were revealed in the study which deserve further examination.

The types of exterior use spaces and their relationships to the building framework were not extensively explored in this investigation. The articulation of these outdoor areas may be fundamentally important to success of multi-use in the building stock and they should be given as much attention as interior activity spaces. The inclusion of covered outdoor areas could increase the variety of available activity spaces and provide opportunities for expansion of interior spaces through enclosure of these areas. Relationships between parking and private spaces in various housing unit configurations and densities need to be investigated, as does the potential uses of these outdoor areas in an educational setting; e.g., outdoor instruction, hard-top play, art and science projects, etc.

If the building stock is to provide a desirable framework for alternate use, the building edges will remain relatively permanent. Therefore, the articulation of the edges should allow a variety of possible interpretations. A wide range of opening types and sizes should be provided to accommodate incidental future changes in the framework; e.g., alteration of a window to a door opening, addition of a bay window, expansion of an interior space, etc. The incorporation of utilities (water, sewer, electric, etc.) into the particularity of the edges can provide exterior spaces with services and increase the available options for kitchen and bath arrangements in the housing environment.

The design explorations in this preliminary study were generic in nature and specific site related issues (orientation, sun, wind, etc.) were not addressed. Subsequent

investigations could serve to increase the depth of understanding in this area through site related design explorations. The surrounding context could constitute a major component in the design of this type of neighborhood building stock. Associations with the immediate residential community as well as relationships to other public and private facilities in the area should be closely examined.

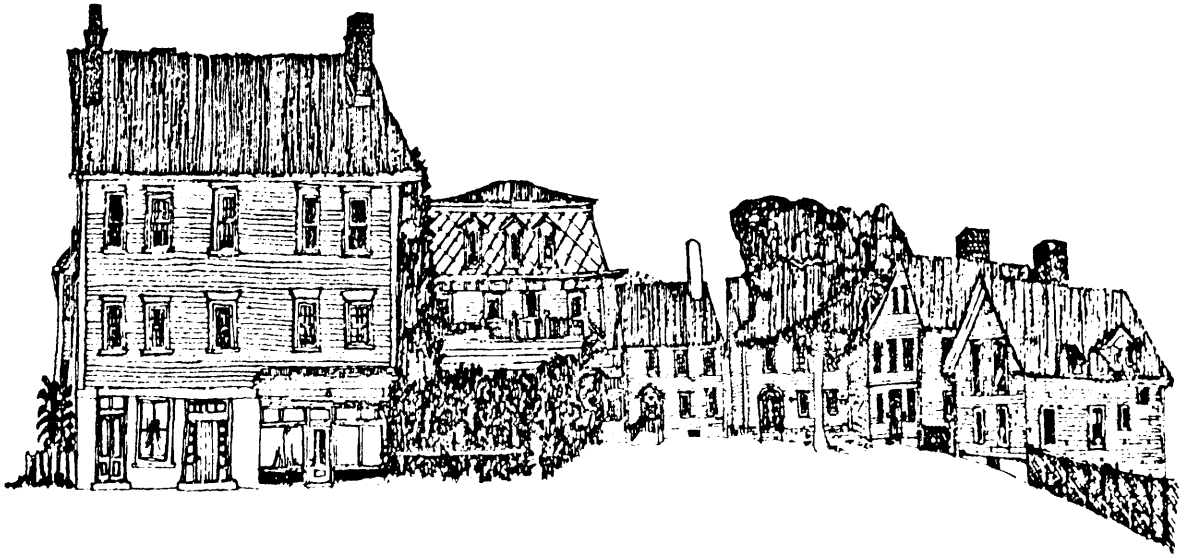
The interrelationships of the building complex also deserve further investigation. Separate explorations of the building framework as a residential neighborhood and as an educational facility should be made. Joint-use may be the most beneficial mode of operation for the facility, allowing efficient space utilization through incremental expansion and contraction between uses. However, the issues involved in joint-use (identity, access, security, etc.) are complex and require additional study.

In retrospect, this thesis has explored one potential for a public education facility to be more than just a school - the education/housing alternative. Through the incorporation of other alternate uses; such as office, commercial, light industrial, etc., these facilities could constitute a neighborhood resource in periods of change, providing a variety of potential uses to the community. In addition to expanding the use of available building stock, multi-use buildings can be conceived as engendering strong ties between the school, the home and the business community.

APPENDIX

"The most important aspect of flexible or adaptable housing is that it is in tune with the general conceptual framework which governs our collective consciousness. It is process oriented rather than object oriented, concerned with what housing does to you rather than what it is . . . No longer will technology define the objectives for and constraints on our behavior. There are no more alibis for becoming involved with home-life objectives of the designed-for."

George Maurios



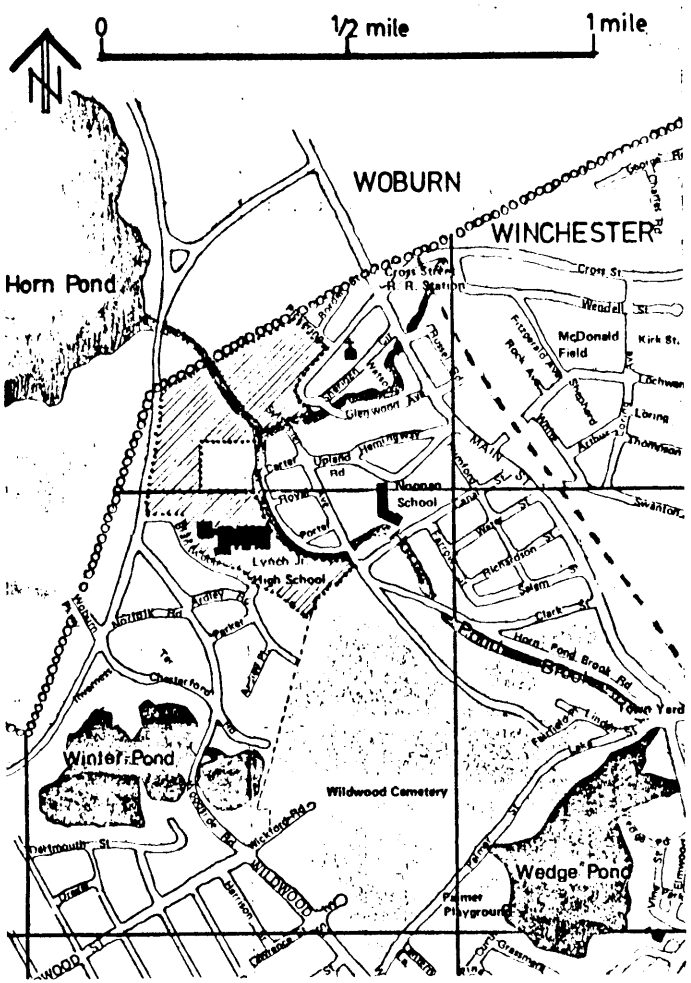
STUDY VEHICLE:

Lynch Junior High/Elementary School
Winchester, Massachusetts

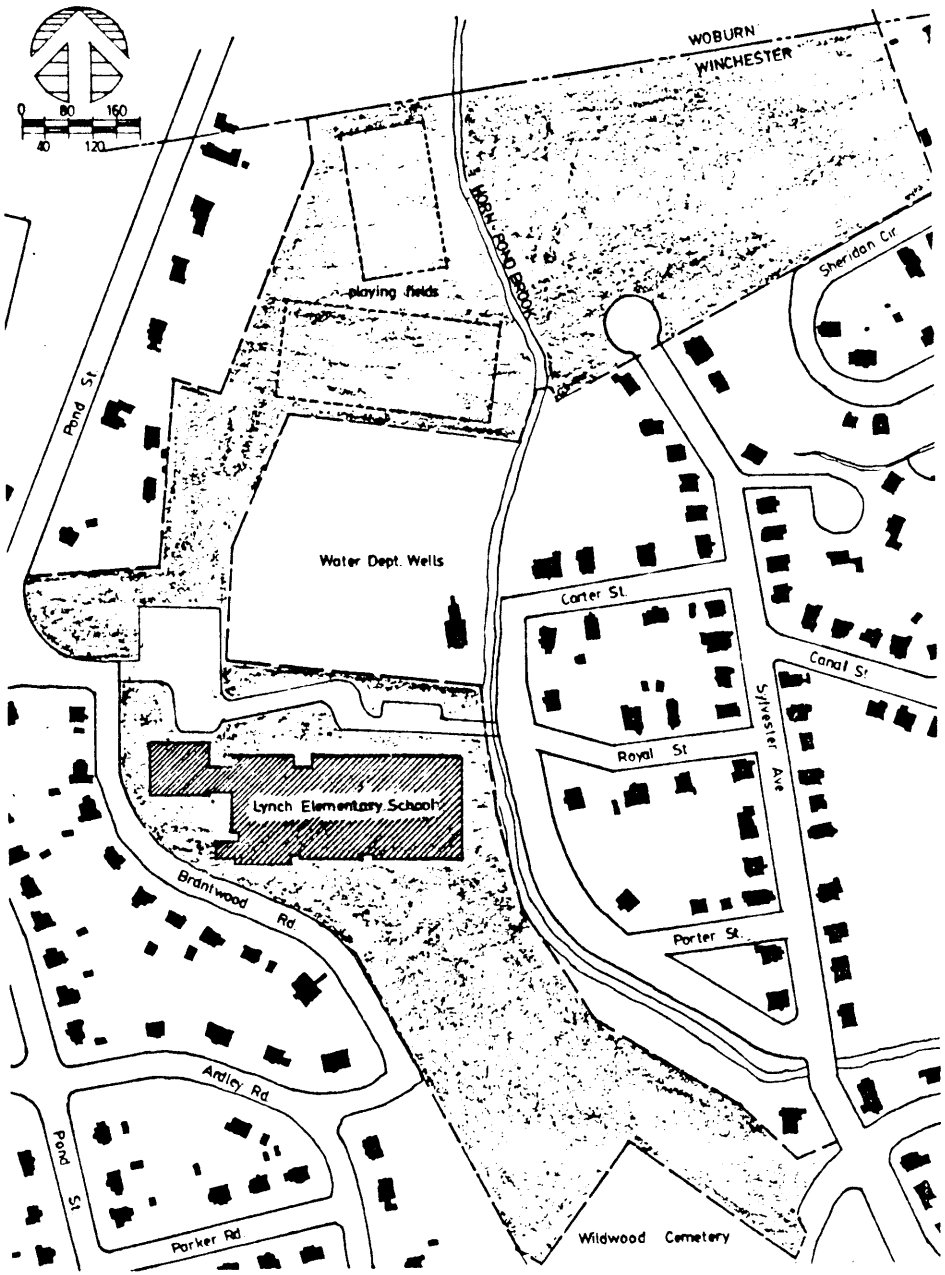
Lynch Junior High School was built in 1961 on a prime piece of town property situated between two lakes and surrounded by residential neighborhoods (Figure A1). The ample site is at the present highly under-utilized and, due to its configuration, has several territories which identify with the surrounding community (Figure A2). The Winchester Water Department's well site occupies a large piece in the overall site. This area is highly forested and adds a visual amenity to the area. The school is primarily a one-story building but steps down the hillside to a double-story arrangement on the west (Figure A3). The layout of the facility reflects educational trends of the 1950's with uniform 30 foot by 30 foot classroom modules and special function spaces arranged along corridors and courtyards. The construction system consists of open web steel joist and masonry bearing walls with a masonry and curtain wall exterior facade.

The Winchester School System has recently been undergoing consolidation efforts and several area schools have been closed or converted in the last few years. Lynch Junior High was converted to an elementary school in 1980 and currently utilizes less than one-half of the available space in the facility. The school is fighting for survival, due to wavering enrollments and increasing political pressure for more efficient utilization of the building and its grounds.

The selection of Lynch School as a study vehicle was based upon my familiarity with the facility and its surroundings. In addition, it seemed to represent a fairly typical example of existing educational facilities and their problems. In order to facilitate a more in-depth analysis, the study was limited to the western half of the building (Figure A4).



LOCATION PLAN
figure A1



SITE PLAN
figure A2

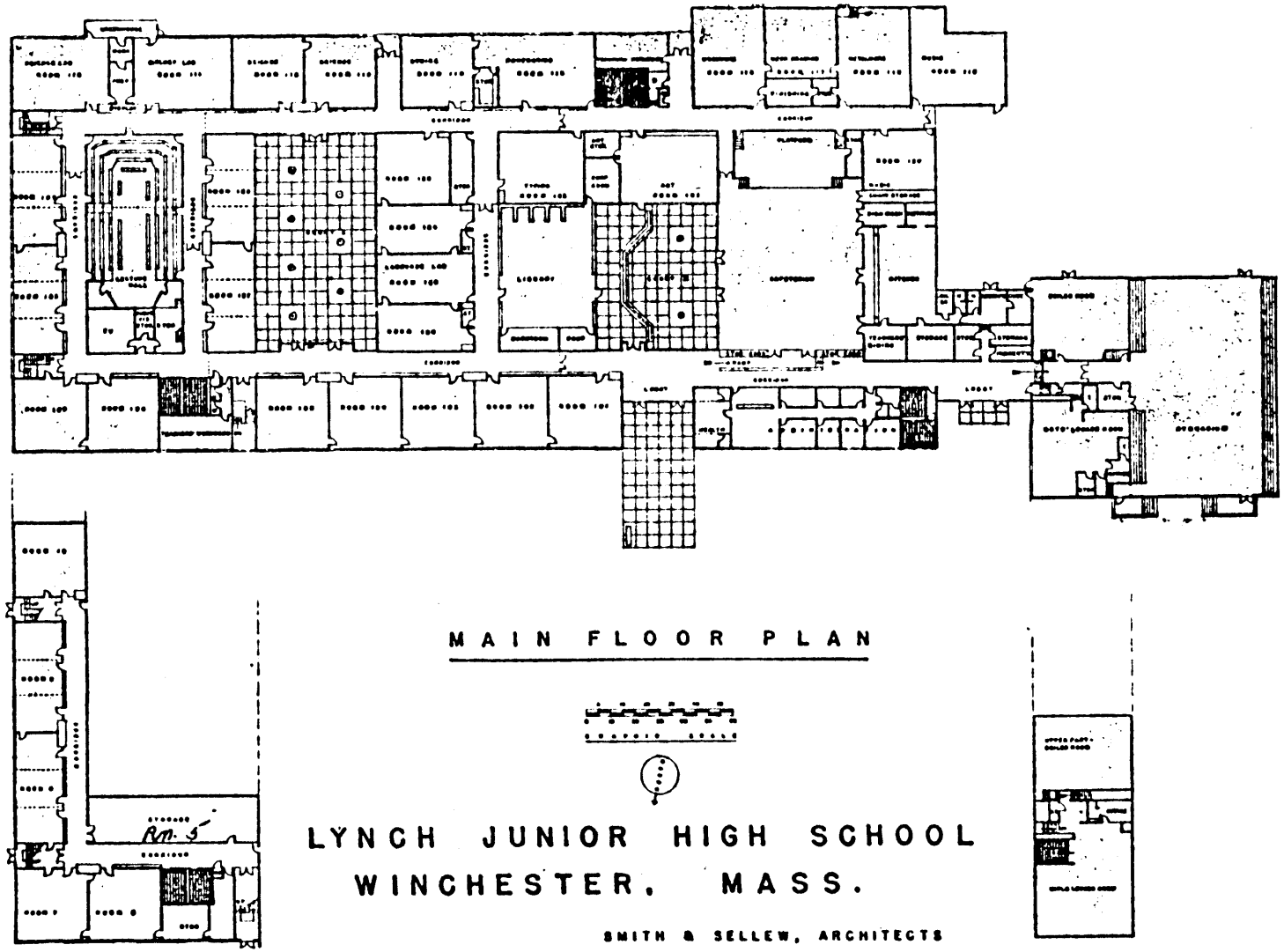
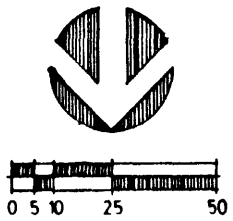
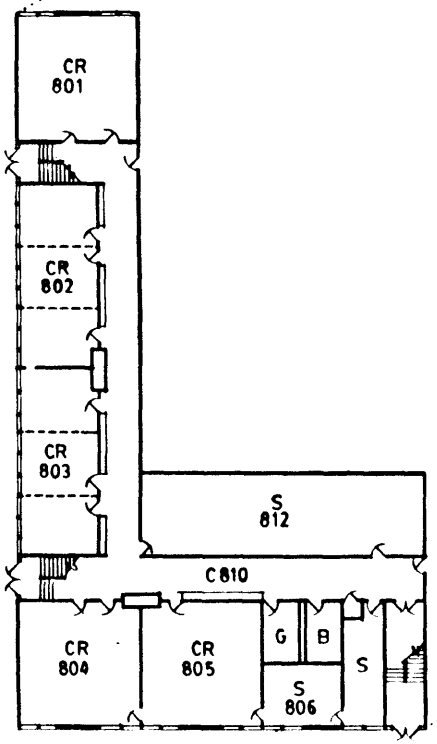

MAIN FLOOR PLAN
LYNCH JUNIOR HIGH SCHOOL
WINCHESTER, MASS.
SMITH & SELLEW, ARCHITECTS
EXISTING BUILDING LAYOUT
LOWER FLOOR PLAN
UPPER LEVEL PLAN

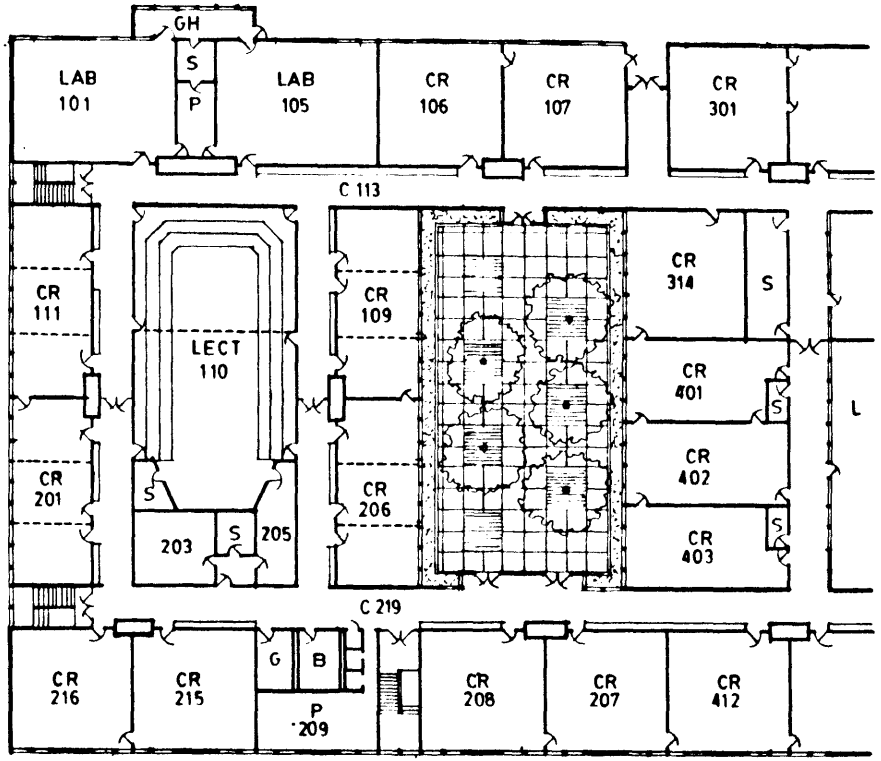
figure A3



STUDY VEHICLE

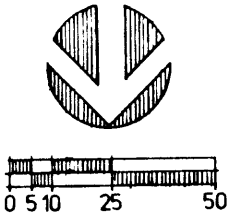
EXISTING PLAN STUDY AREA





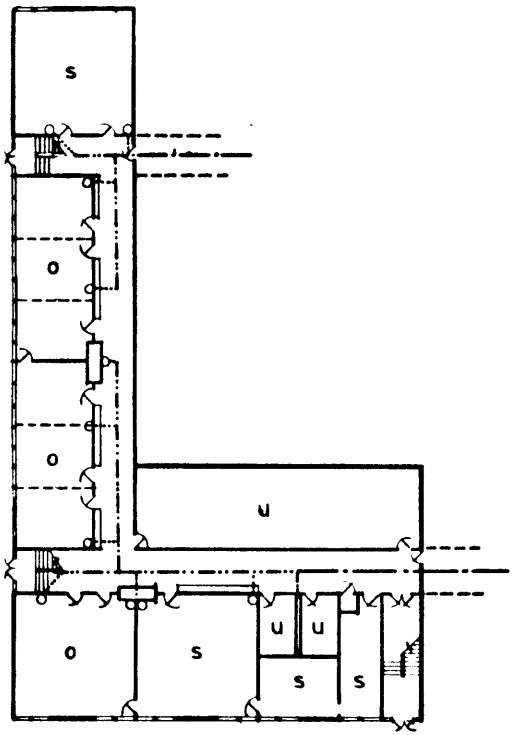
B = BOY'S ROOM
C = CORRIDOR
CR = CLASSROOM
G = GIRL'S ROOM
GH = GREEN HOUSE
L = LIBRARY
LAB = LABORATORY
LECT = LECTURE HALL
P = PREPARATION
S = STORAGE

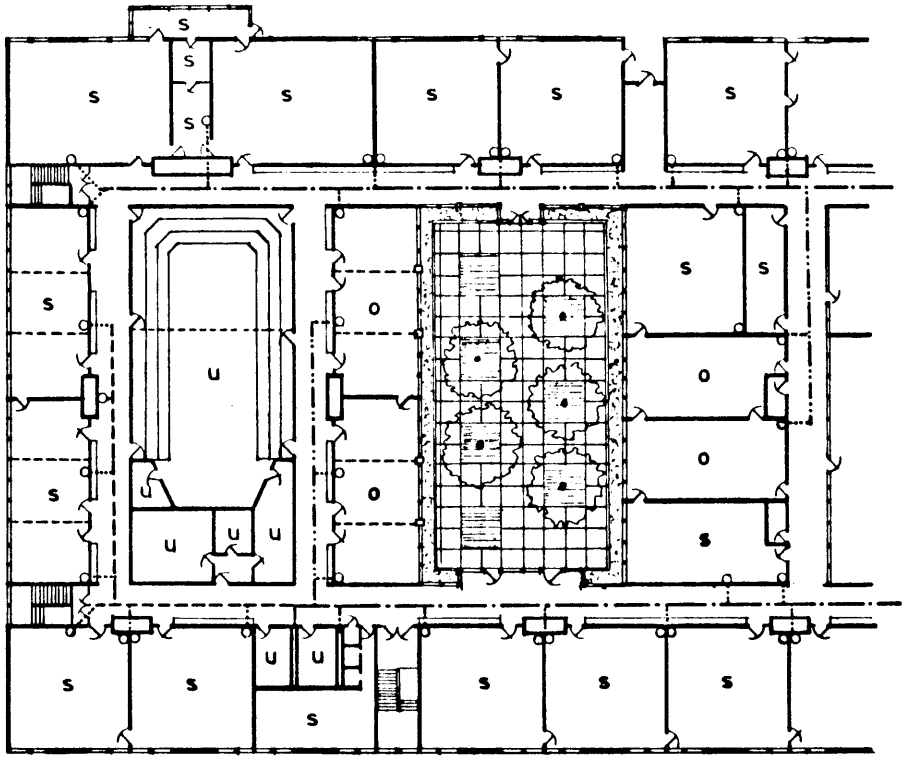
FIGURE A4



STUDY VEHICLE

HOUSING SCHEME NO. 1
MINIMAL INVESTMENT





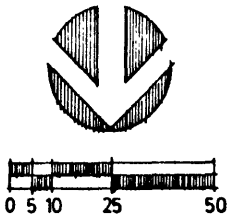
—·—existing utility lines
– – – –new utility lines (modest investment)
——— new utility lines (high investment)
·····o new utility stubs

o = suitable for office development high investment for housing suitability

s = suitable for housing development

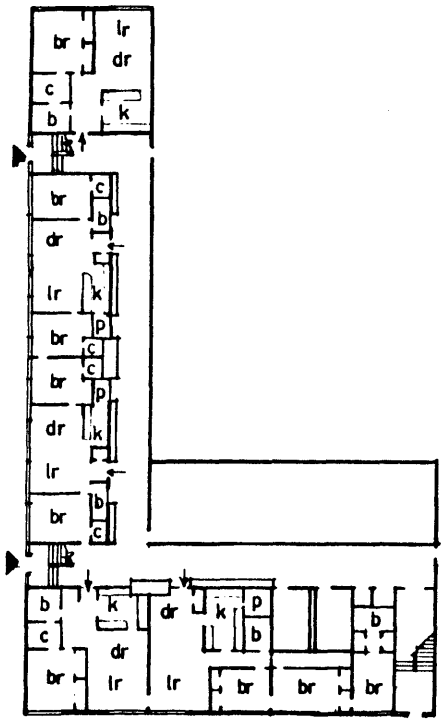
u = unsuitable for housing uses without extensive alterations

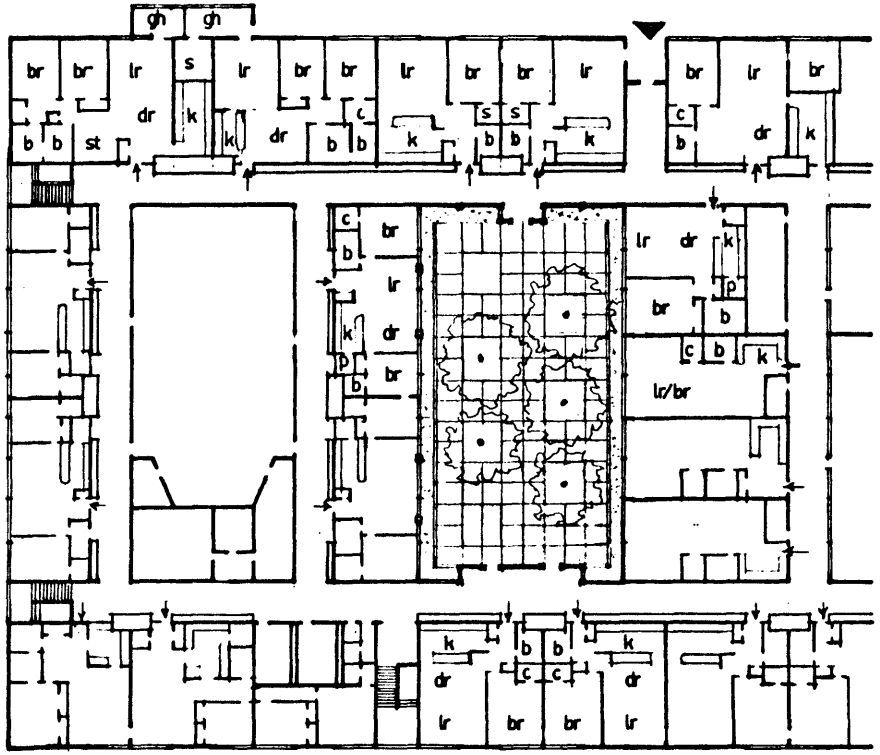
VEHICLE STUDY - LYNCH SCHOOL HOUSING SCHEME NO. 1	GOOD	FAIR	POOR	UNACCEPTABLE	IMPROVED	LEVEL OF INVESTMENT ◉ Minimal ○ Modest ○ Moderate ○ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS	◉	◉	◉	◉	◉	Minimal investment provided only the infrastructure for housing uses. Dimensional characteristics of activity spaces could not be assessed since the dwellings are to be developed by the occupants.
a. Dimensional adequacy for interchangeable use of spaces	○	○	○	○	○	
b. Variety of outdoor activities dimensionally accommodated	○	○	○	○	○	
c. Dimensional qualities of spaces by housing standards	○	○	○	○	○	
2. CIRCULATION	◉	◉	◉	◉	◉	Major circulation is the same as the existing education system - extremely institutional and undesirable for housing environment. Interior circulation is undeveloped and hence not assessable.
a. Individual space access to allow interchangeable use	○	○	○	○	○	
b. Multiplicity of potential circulation uses	○	○	○	○	○	
c. Level of space privacy afforded by circulation	○	○	○	◉	○	
3. ENVIRONMENT	◉	◉	◉	◉	◉	In general, spaces are not environmentally acceptable. Natural light is only available at exterior zone (+15) of the building. Natural ventilation is not available and existing HVAC system cannot be individually zoned or metered.
a. Individual space access to natural light	○	○	○	◉	○	
b. Individual space access to natural ventilation	○	○	○	◉	○	
c. Level of aural/visual privacy between activity spaces	○	○	○	○	○	
4. FLEXIBILITY	◉	◉	◉	◉	◉	Although this scheme presents an interesting development alternative with minimal investment, the system is fairly intractable. Owner/renter development pushes the scheme towards permanent conversion.
a. Diversity of possible use patterns within dwellings	○	○	○	○	○	
b. Desirability of various space adjacencies	○	○	○	○	○	
c. Ability to accommodate new unit types and sizes	○	○	○	○	○	
GOALS AND OBJECTIVES FOR SCHEME 2	· Improve feasibility of system by developing housing units through partitioning of education modules. Begin with common housing unit configurations so that tractability can be explored within an existing housing context.					



STUDY VEHICLE

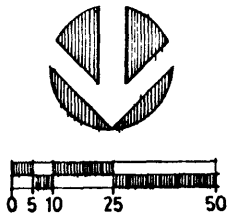
HOUSING SCHEME NO. 2
MODEST INVESTMENT





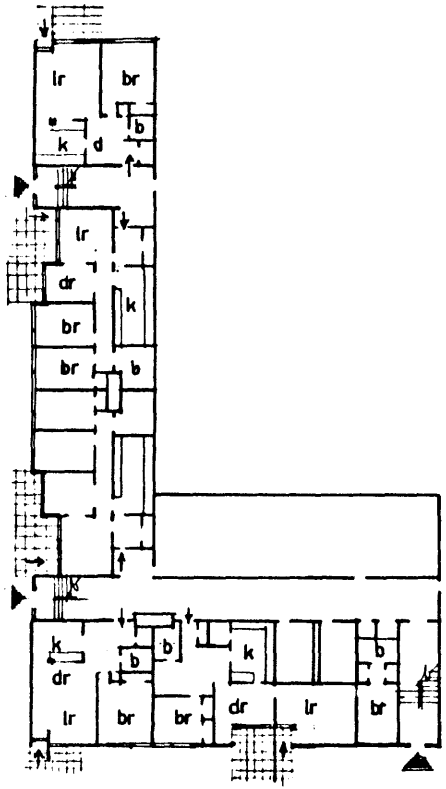
b-bath
br-bedroom
c-closet
dr-dining room
gh-green house
k-kitchen
lr-living room
p-pantry
s-study

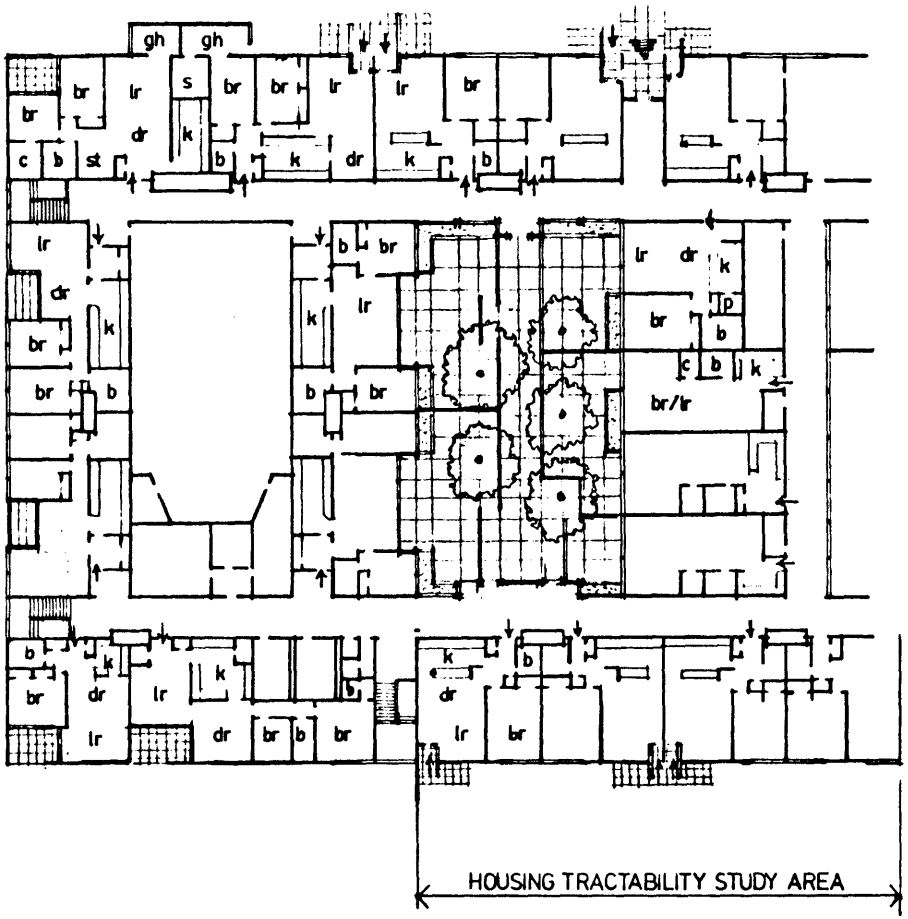
VEHICLE STUDY - LYNCH SCHOOL HOUSING SCHEME NO. 2	GOOD	FAIR	POOR	UNACCEPTABLE	IMPROVED	LEVEL OF INVESTMENT ○Minimal ◪ Modest ○Moderate ○ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS						The 30' x 30' classroom module is not ideal for housing, especially in one sided arrangement. No exterior use spaces provided for dwelling units.
a. Dimensional adequacy for interchangeable use of spaces		◪				
b. Variety of outdoor activities dimensionally accommodated				◪		
c. Dimensional qualities of spaces by housing standards	◪					
2. CIRCULATION						Contemporary unit configurations imposed exhibit extensive use of through-circulation which negates most possibilities of interchangeable use. Slack spaces occur along circulation, but location limits their use possibilities.
a. Individual space access to allow interchangeable use				◪		
b. Multiplicity of potential circulation uses			◪			
c. Level of space privacy afforded by circulation			◪			
3. ENVIRONMENT						One sided access to natural light and ventilation forces open planning of living spaces. Although the addition of carpeting is beneficial, the open planning and existing suspended ceiling provide poor acoustical separation within units.
a. Individual space access to natural light				◪		
b. Individual space access to natural ventilation				◪		
c. Level of aural/visual privacy between activity spaces			◪			
4. FLEXIBILITY						Existing suspended ceiling creates difficulties in the attachment and moving of partitions. Overall aggregation of units is fairly rigid allowing little possibility for expansion and contraction of units.
a. Diversity of possible use patterns within dwellings				◪		
b. Desirability of various space adjacencies				◪		
c. Ability to accommodate new unit types and sizes				◪		
GOALS AND OBJECTIVES FOR SCHEME 3	Improve housing environment by providing adequate natural light and ventilation; exterior use spaces, and direct exterior access where possible.					



STUDY VEHICLE

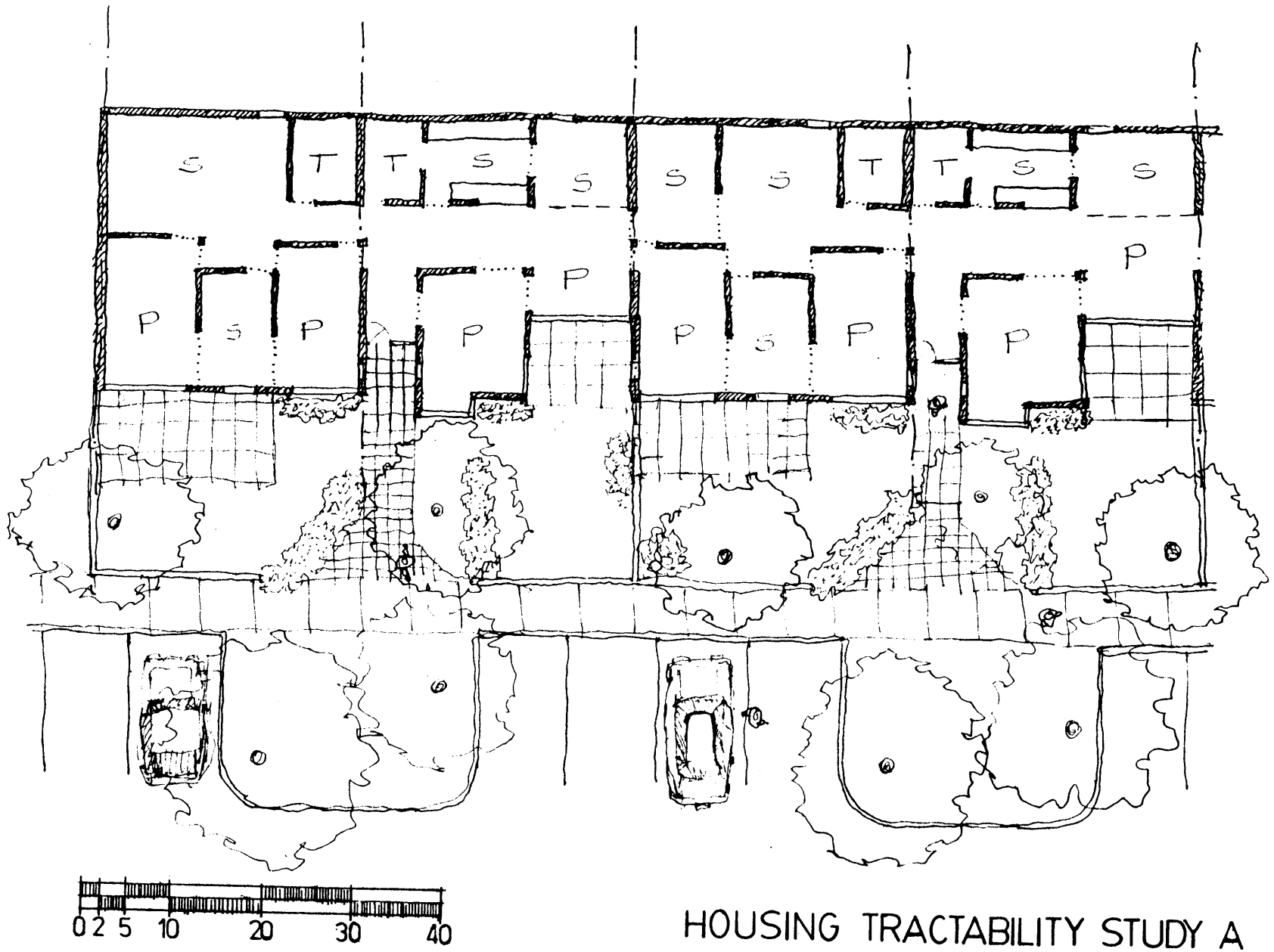
HOUSING SCHEME NO. 3
MODERATE INVESTMENT



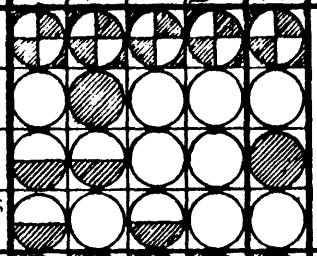
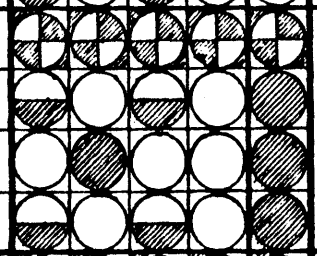
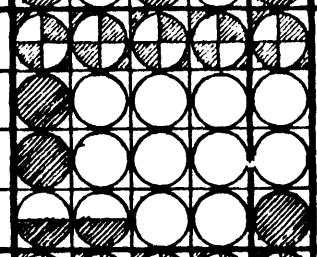
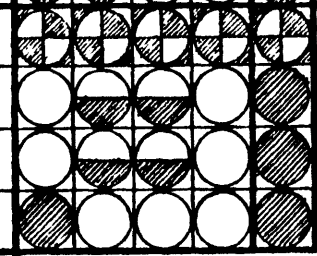


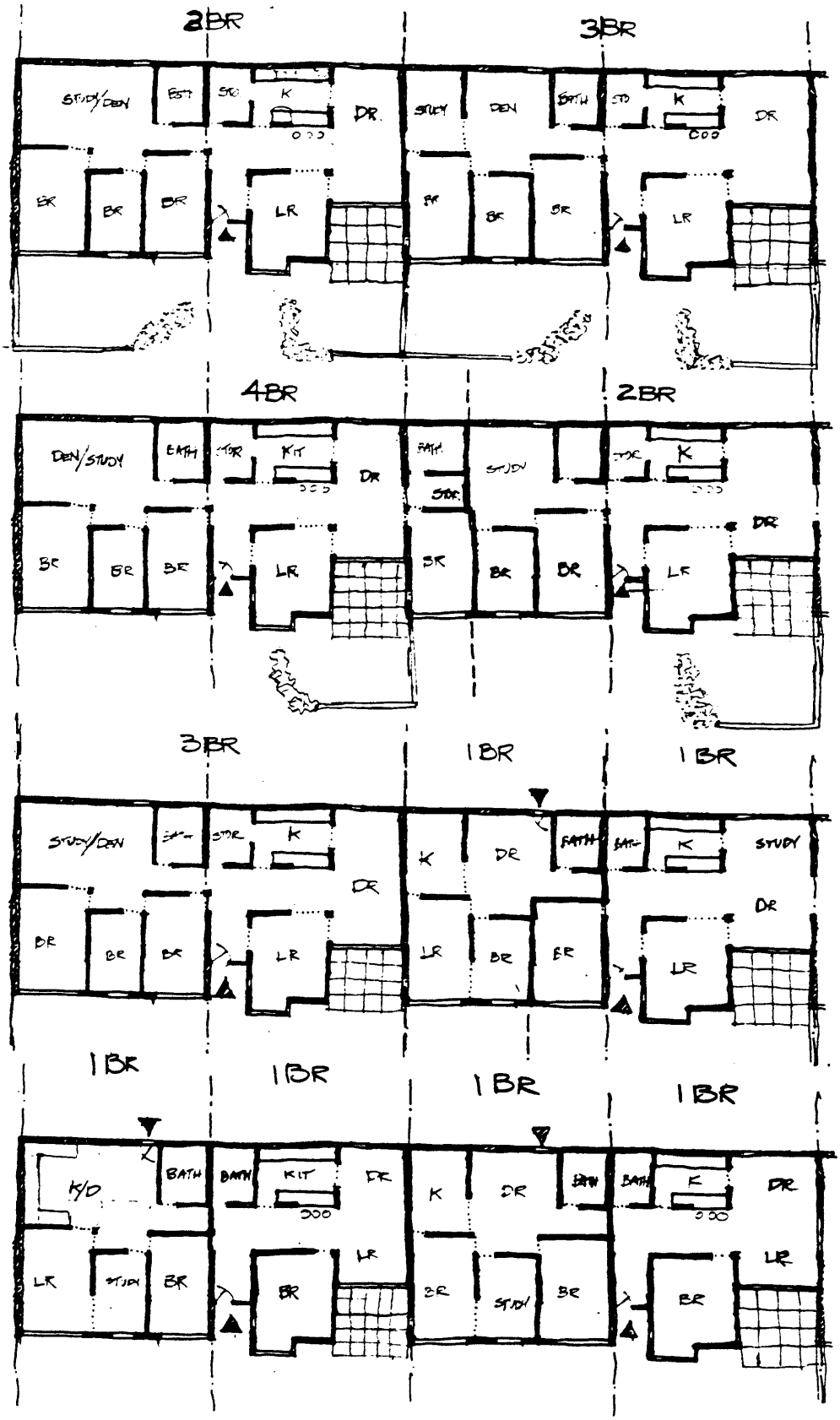
b-bath
br-bedroom
c-closet
dr-dining room
gh-greenhouse
k-kitchen
lr-living room
st-study

VEHICLE STUDY - LYNCH SCHOOL HOUSING SCHEME NO. 3	GOOD	FAIR	POOR	UNACCEPTABLE	IMPROVED	LEVEL OF INVESTMENT ○Minimal ○ Modest ◍ Moderate ○ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS						Development of north-south corridors improved the dimensional qualities of adjoining units. Most terraced outdoor areas, although typical of contemporary housing, are inadequate in dimension and useage is limited.
a. Dimensional adequacy for interchangeable use of spaces						
b. Variety of outdoor activities dimensionally accommodated						
c. Dimensional qualities of spaces by housing standards						
2. CIRCULATION						Providing exterior entries allows dual access to many units, but increases through-circulation problems in many cases. Inhabitation of some corridor areas and removal of lockers improves the interior unit access circulation; but overall quality is still poor.
a. Individual space access to allow interchangeable use						
b. Multiplicity of potential circulation uses						
c. Level of space privacy afforded by circulation						
3. ENVIRONMENT						Development of operable skylights along interior zones improves natural light and ventilation to units with roof access However, improving environment of lower level units is not feasible without conceptual change.
a. Individual space access to natural light						
b. Individual space access to natural ventilation						
c. Level of aural/visual privacy between activity spaces						
4. FLEXIBILITY						Housing framework remains relatively intractable and new unit configurations tend to require re-definition of use spaces.
a. Diversity of possible use patterns within dwellings						
b. Desirability of various space adjacencies						
c. Ability to accommodate new unit types and sizes						
GOALS AND OBJECTIVES FOR SCHEME 4	Improve the qualities of exterior spaces and internal circulation. Focus on increasing the tractability of the housing environment, by concentrating on development of study area within the vehicle.					



HOUSING TRACTABILITY STUDY A

VEHICLE STUDY - LYNCH SCHOOL HOUSING TRACTABILITY STUDY A	GOOD	FAIR	POOR	UNACCEPTABLE	IMPROVED	LEVEL OF INVESTMENT ◯Minimal ◯ Modest ◯Moderate ◒ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS a. Dimensional adequacy for interchangeable use of spaces b. Variety of outdoor activities dimensionally accommodated c. Dimensional qualities of spaces by housing standards						Development of exterior spaces increases their potential for outdoor activities. Although movable storage units are assumed, the smaller primary spaces have limited use alternatives.
2. CIRCULATION a. Individual space access to allow interchangeable use b. Multiplicity of potential circulation uses c. Level of space privacy afforded by circulation						Improvement can be seen in exterior access to units, but interior access remains poor. Interior circulation allows interchangeable use of most primary spaces, but through-circulation inhibits the flexible use of many secondary spaces.
3. ENVIRONMENT a. Individual space access to natural light b. Individual space access to natural ventilation c. Level of aural/visual privacy between activity spaces						The development of variable sliding closures improves the acoustical environment within the units. Divisions between units require added material to assure acoustical privacy.
4. FLEXIBILITY a. Diversity of possible use patterns within dwellings b. Desirability of various space adjacencies c. Ability to accommodate new unit types and sizes						The exploration of use alternatives shows that the adaptability of the system is greatly improved by the development of an interior circulation spine which extends through several modules allowing expansion and contraction of units. Space adjacencies inhibit flexibility.
GOALS AND OBJECTIVES FOR TRACTABILITY STUDY B	Improve tractability of housing in study area by eliminating through-circulation and increasing possibilities for interchangeable use.					


2BR
3BR
STUDY/DEN
EST
STO
K
DR
BR
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BR
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STUDY
DEN
BATH
STO
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BR
BR
BR
LR
4BR
2BR
DEN/STUDY
BATH
STOR
KIT
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STUDY/DEN
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BATH
BATH
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STUDY
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BATH
KIT
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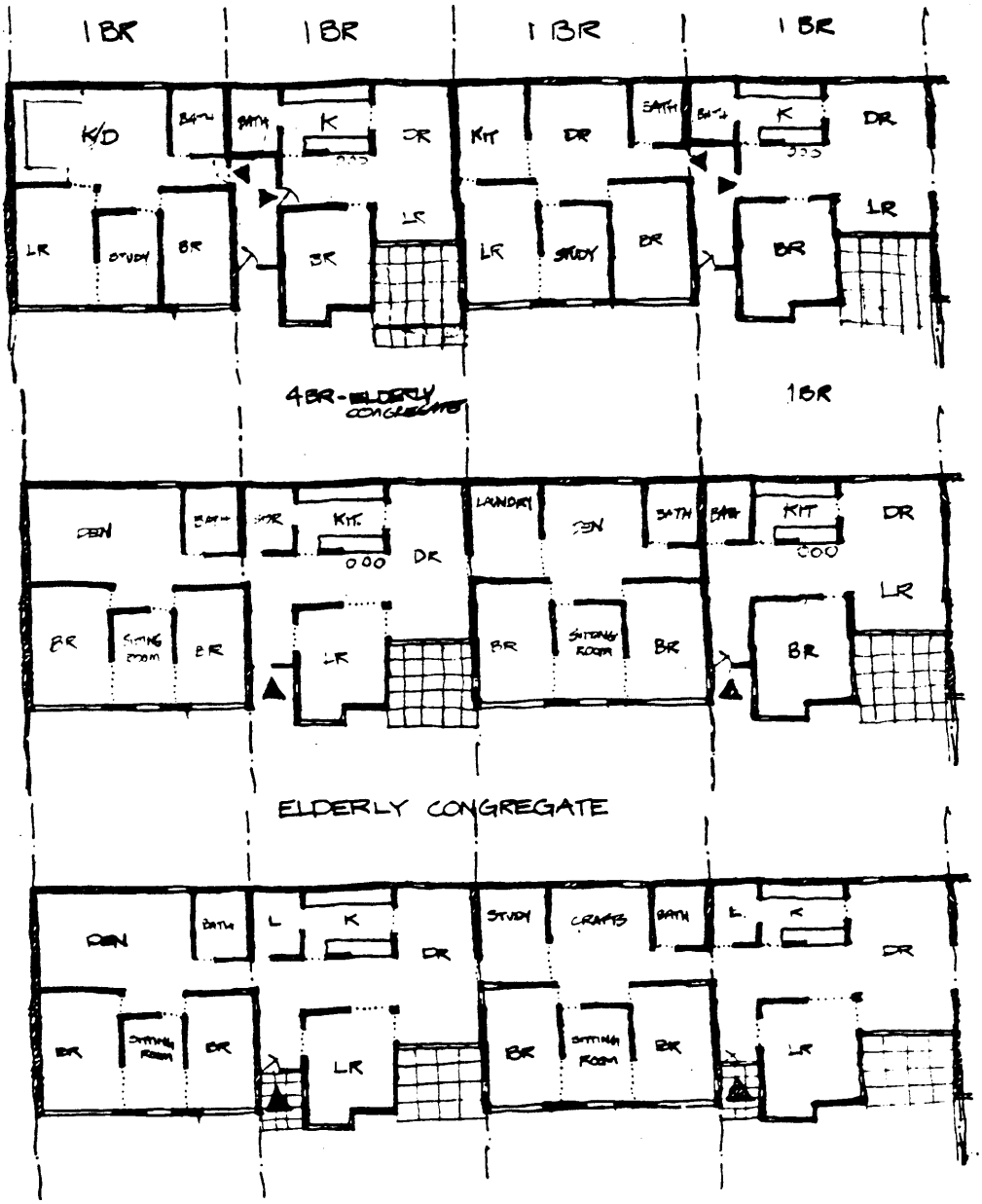
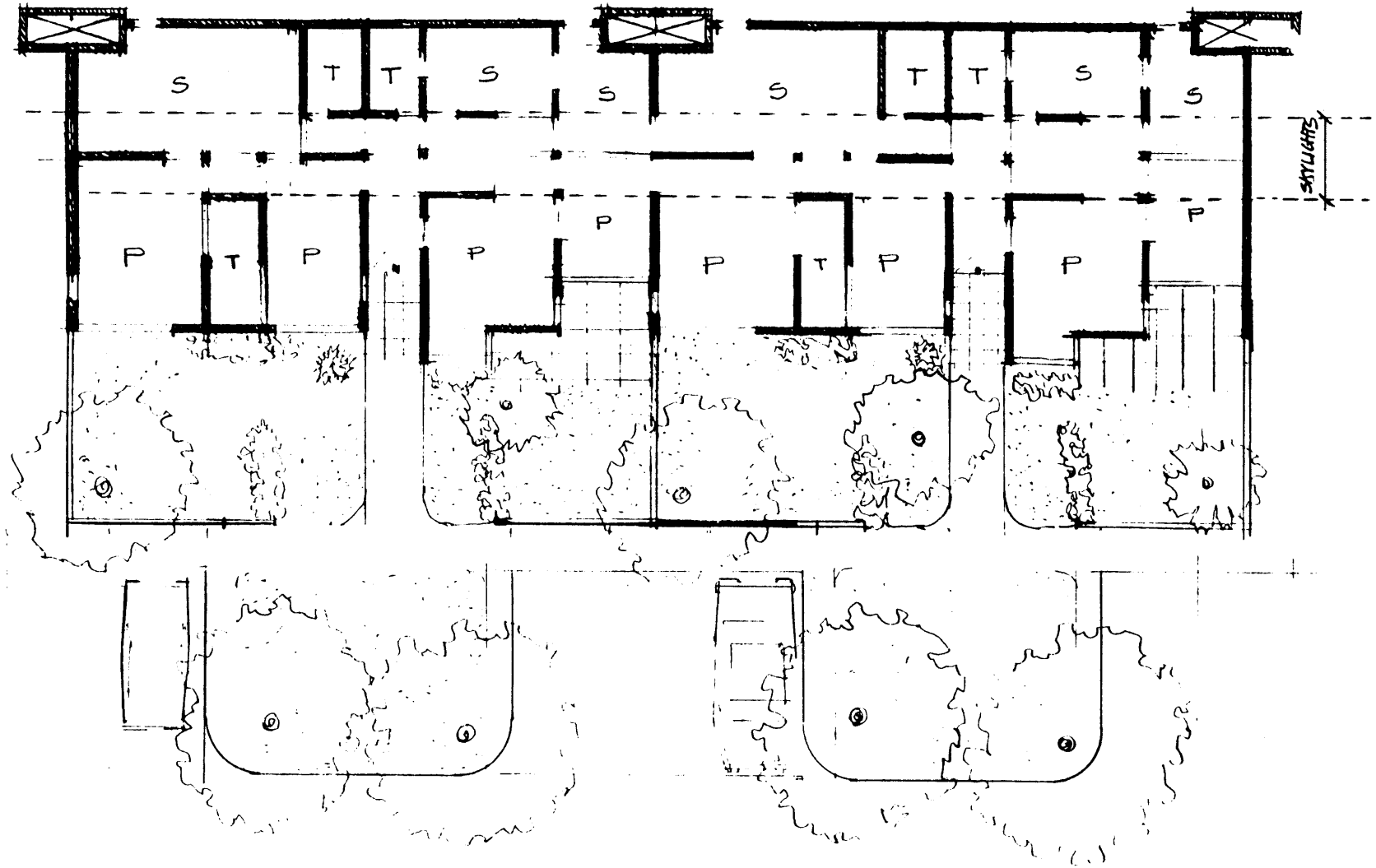


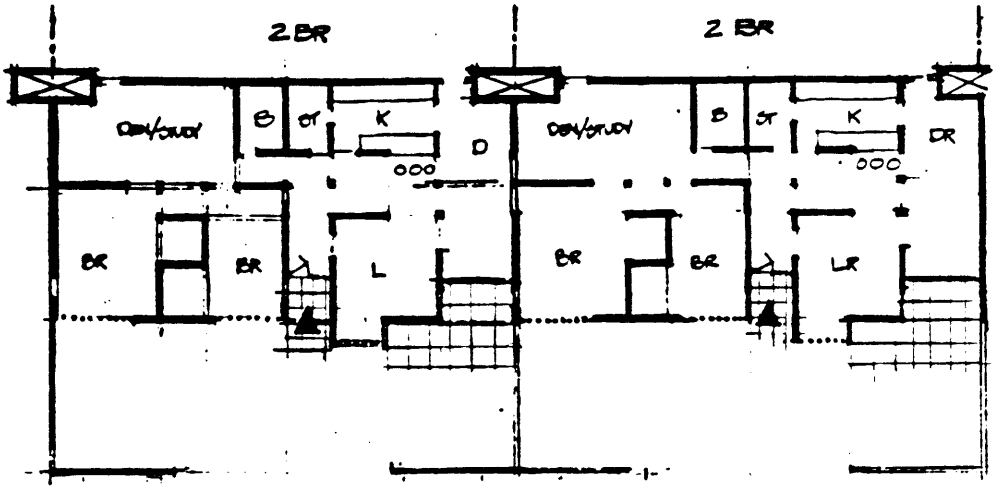
HOUSING TRACTABILITY STUDY A

USE ALTERNATES EXPLORATION



HOUSING TRACTABILITY STUDY B

VEHICLE STUDY - LYNCH SCHOOL HOUSING TRACTABILITY STUDY B	GOOD	FAIR	POOR	UNACCEPT-ABLE	IMPROVED	LEVEL OF INVESTMENT ◯Minimal ◯ Modest ◯Moderate ◒ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS						Enlarging of some primary spaces and creation of a combined tertiary space improves the use alternatives of these spaces. Some secondary spaces are larger than primary spaces, but environment is unsuitable for primary activities.
a. Dimensional adequacy for interchangeable use of spaces						
b. Variety of outdoor activities dimensionally accommodated						
c. Dimensional qualities of spaces by housing standards						
2. CIRCULATION						Except for large secondary spaces, through-circulation is eliminated. Larger units have provisions for circulation to reach outdoor areas through the use of a slack primary space.
a. Individual space access to allow interchangeable use						
b. Multiplicity of potential circulation uses						
c. Level of space privacy afforded by circulation						
3. ENVIRONMENT						No noticeable change from Study A
a. Individual space access to natural light						
b. Individual space access to natural ventilation						
c. Level of aural/visual privacy between activity spaces						
4. FLEXIBILITY						Although the variety of use alternatives is similar to Study A, use flexibility within given unit configurations is improved. Undesireable relationships between baths and entries inhibit flexibility in some configurations.
a. Diversity of possible use patterns within dwellings						
b. Desirability of various space adjacencies						
c. Ability to accommodate new unit types and sizes						
GOALS AND OBJECTIVES FOR TRACTABILITY STUDY C	Extend study area to opposite wall of corridor and develop externally focused housing environment.					


2 BR
2 BR
DEN/STUDY
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DR
BR
BR
L
BR
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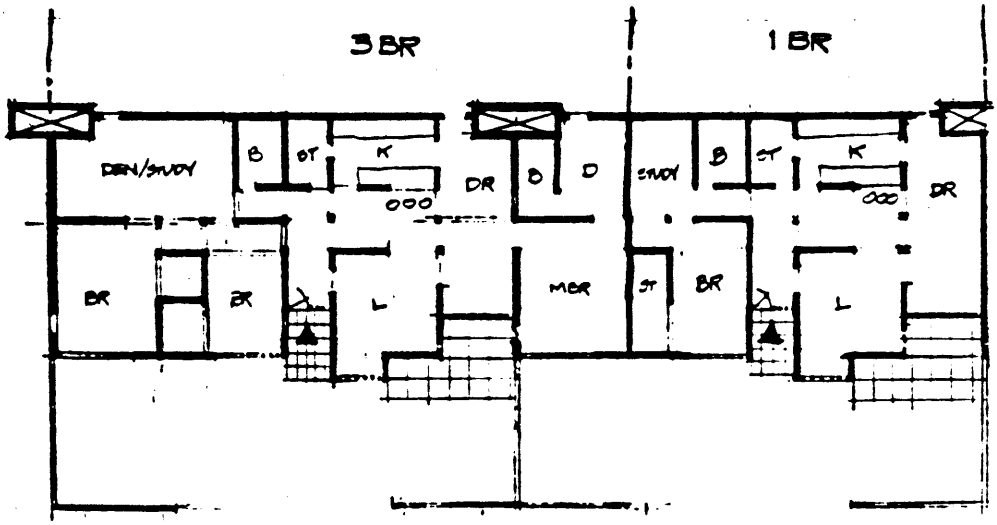
LR


3 BR
1 BR
DEN/STUDY
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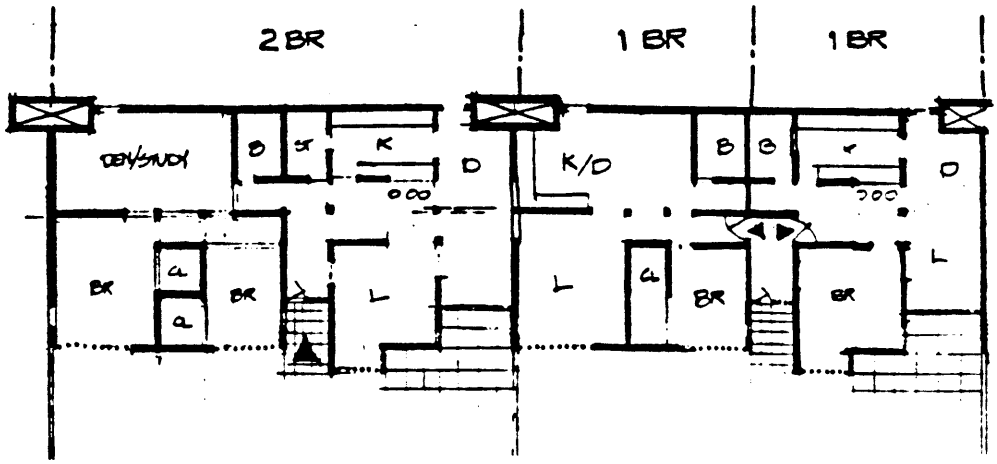
2 BR
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DEN/STUDY
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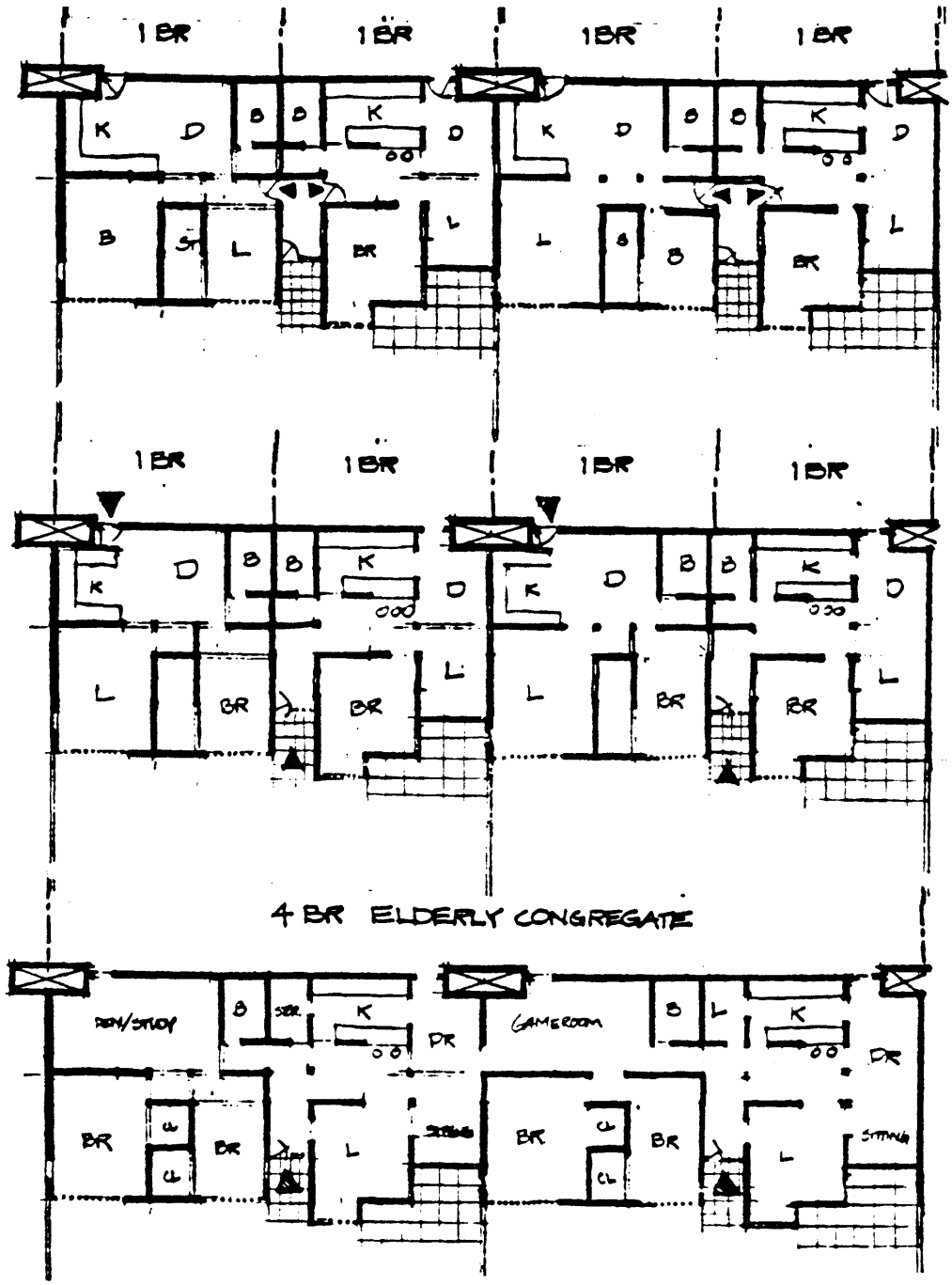
BR



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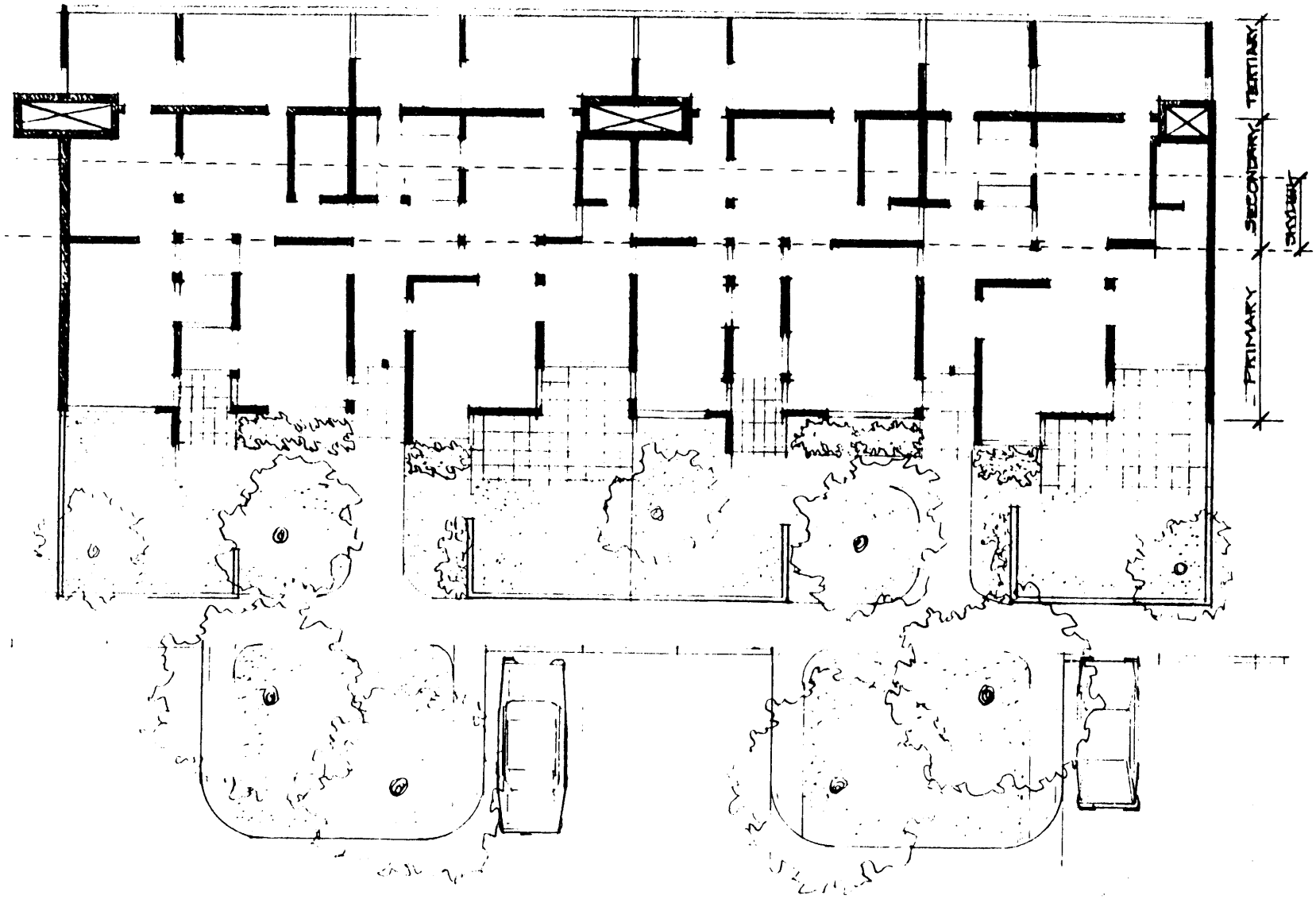
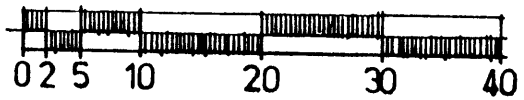
HOUSING TRACTABILITY STUDY B

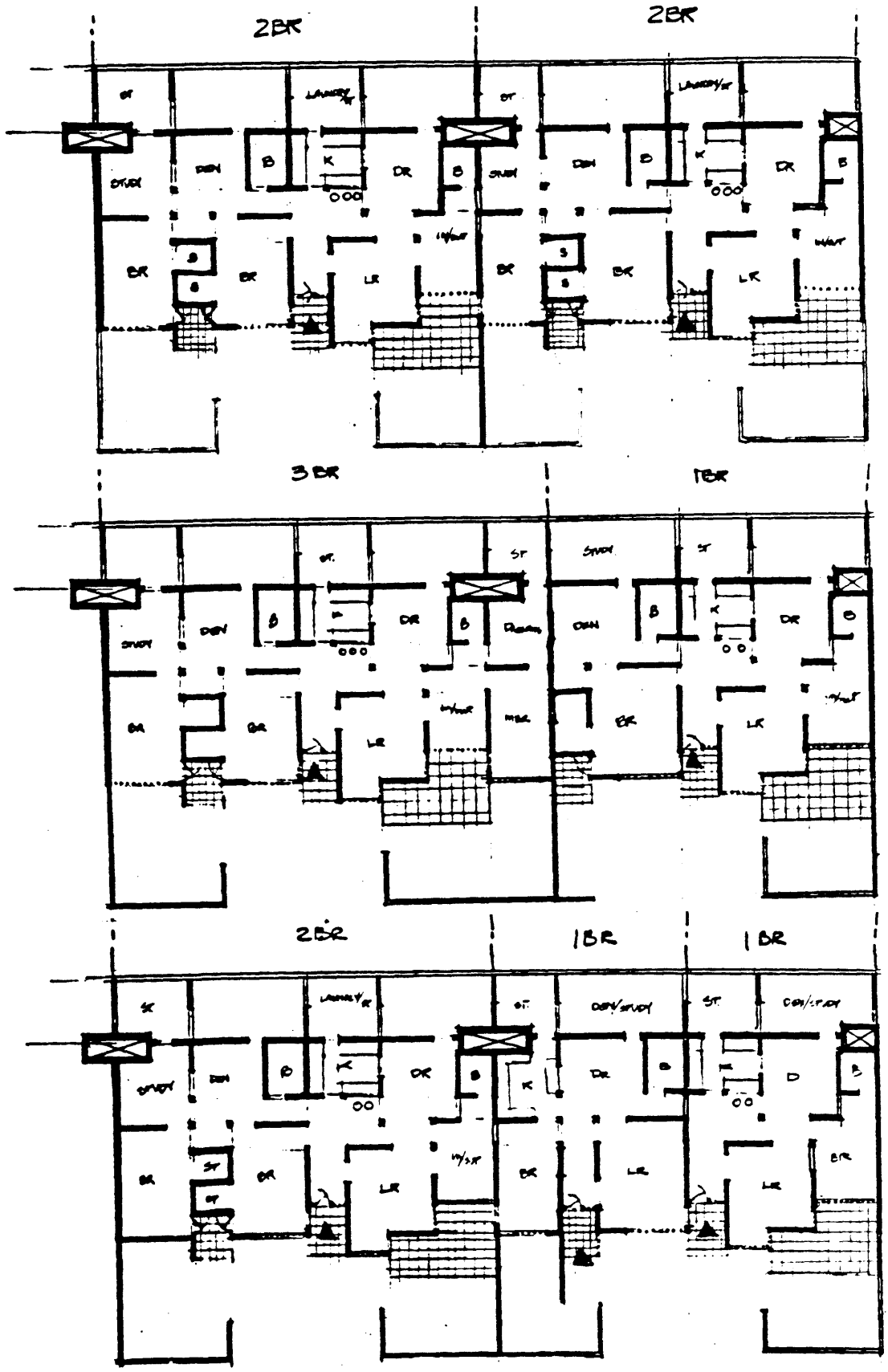
USE ALTERNATIVES EXPLORATION





HOUSING TRACTABILITY STUDY C

VEHICLE STUDY - LYNCH SCHOOL HOUSING TRACTABILITY STUDY C	GOOD	FAIR	POOR	UNACCEPT-ABLE	IMPROVED	LEVEL OF INVESTMENT ◯ Minimal ◯ Modest ◯ Moderate ◒ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS	◒	◒	◒	◒	◒	Incorporation of corridor area into housing framework provides generous zone of tertiary and extended secondary activities.
a. Dimensional adequacy for interchangeable use of spaces	◒	○	○	○	○	
b. Variety of outdoor activities dimensionally accommodated	◒	◒	○	○	○	
c. Dimensional qualities of spaces by housing standards	◒	○	○	○	◒	
2. CIRCULATION	◒	◒	◒	◒	◒	Elimination of interior access strengthens the circulation pattern within units, but tertiary areas developed in corridor must be accessed through secondary spaces. The numerous posts required for sliding closures inhibit usage of circulation.
a. Individual space access to allow interchangeable use	◒	○	○	○	◒	
b. Multiplicity of potential circulation uses	◒	○	◒	○	○	
c. Level of space privacy afforded by circulation	◒	◒	○	○	○	
3. ENVIRONMENT	◒	◒	◒	◒	◒	Although adequate dimensionally for secondary use, the environment of corridor area is suitable only for tertiary uses.
a. Individual space access to natural light	◒	○	○	○	○	
b. Individual space access to natural ventilation	◒	○	○	○	○	
c. Level of aural/visual privacy between activity spaces	◒	◒	○	○	○	
4. FLEXIBILITY	◒	◒	◒	◒	◒	The tertiary space near the exterior is developed into an alternate entry by the incorporation of a system of removable panels. The flexibility in the housing is increased by the improvement of relationships between entry and bath.
a. Diversity of possible use patterns within dwellings	◒	○	○	○	◒	
b. Desirability of various space adjacencies	◒	◒	○	○	◒	
c. Ability to accommodate new unit types and sizes	◒	○	○	○	◒	
GOALS AND OBJECTIVES FOR TRACTABILITY STUDY D	Improve the useability of circulation by providing adequate dimension and closure possibilities. Improve the quality of exterior use spaces and incorporate alternate entry possibilities.					


2BR
2BR
3BR
1BR
2BR
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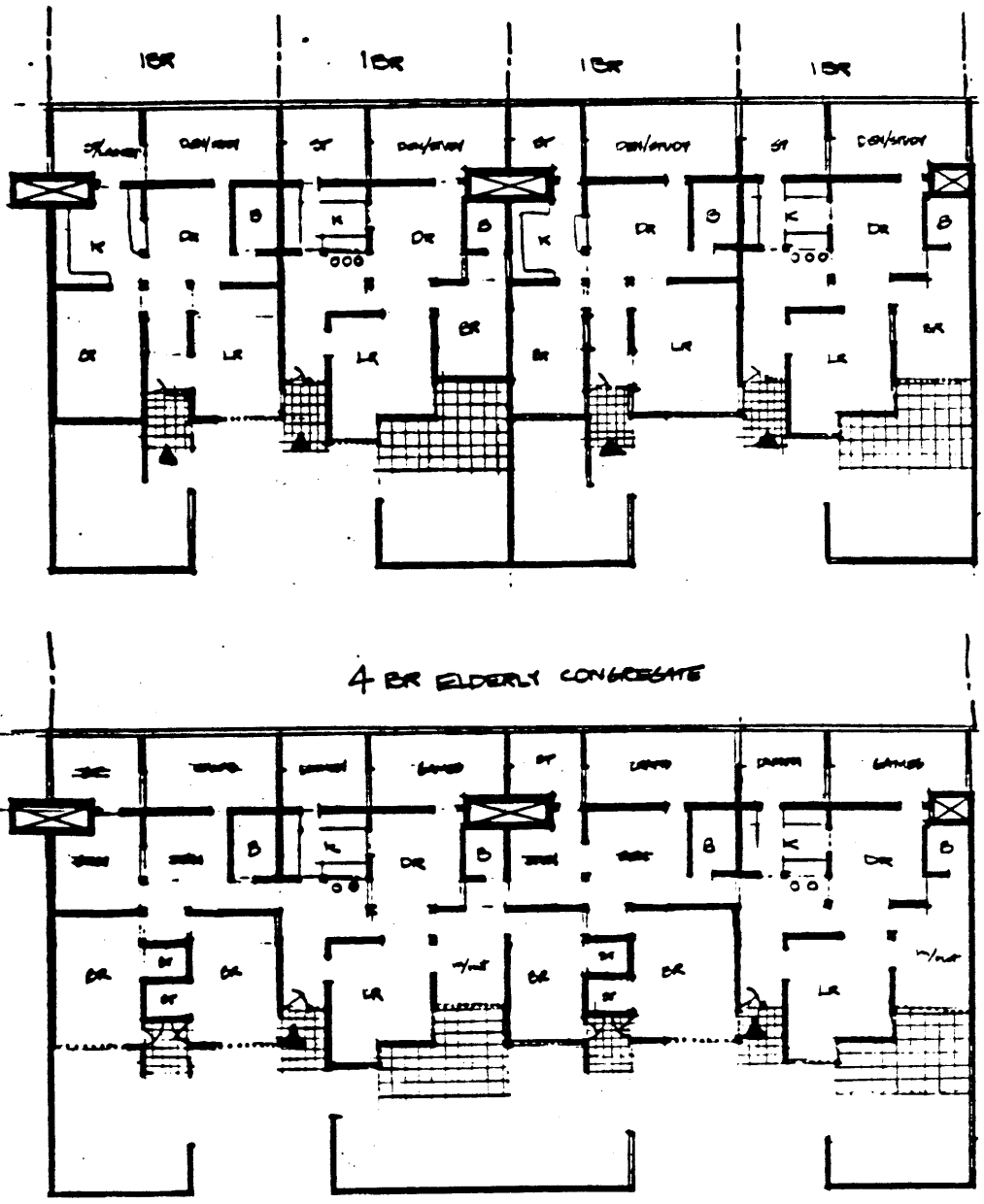
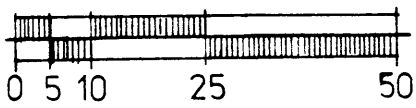
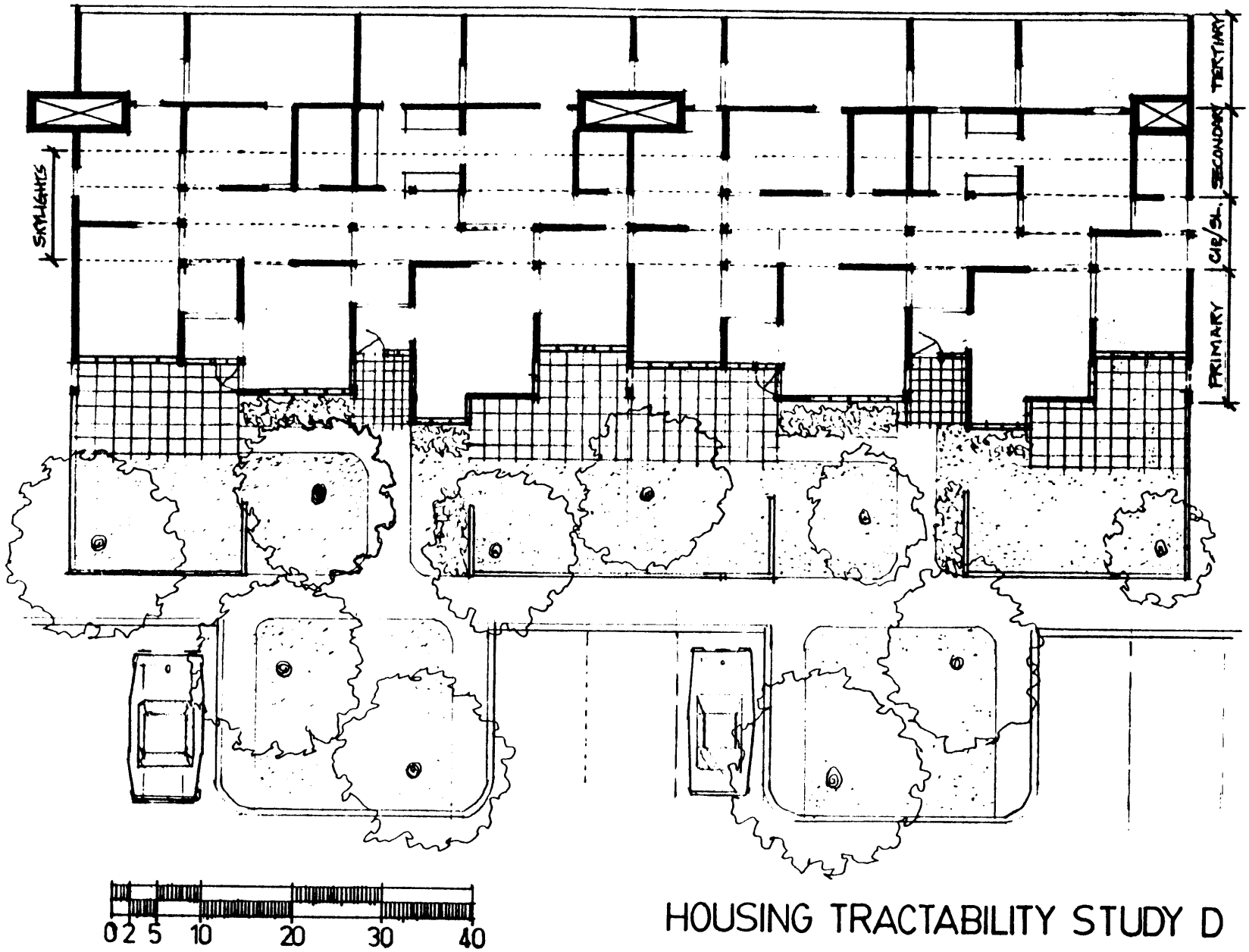
1BR





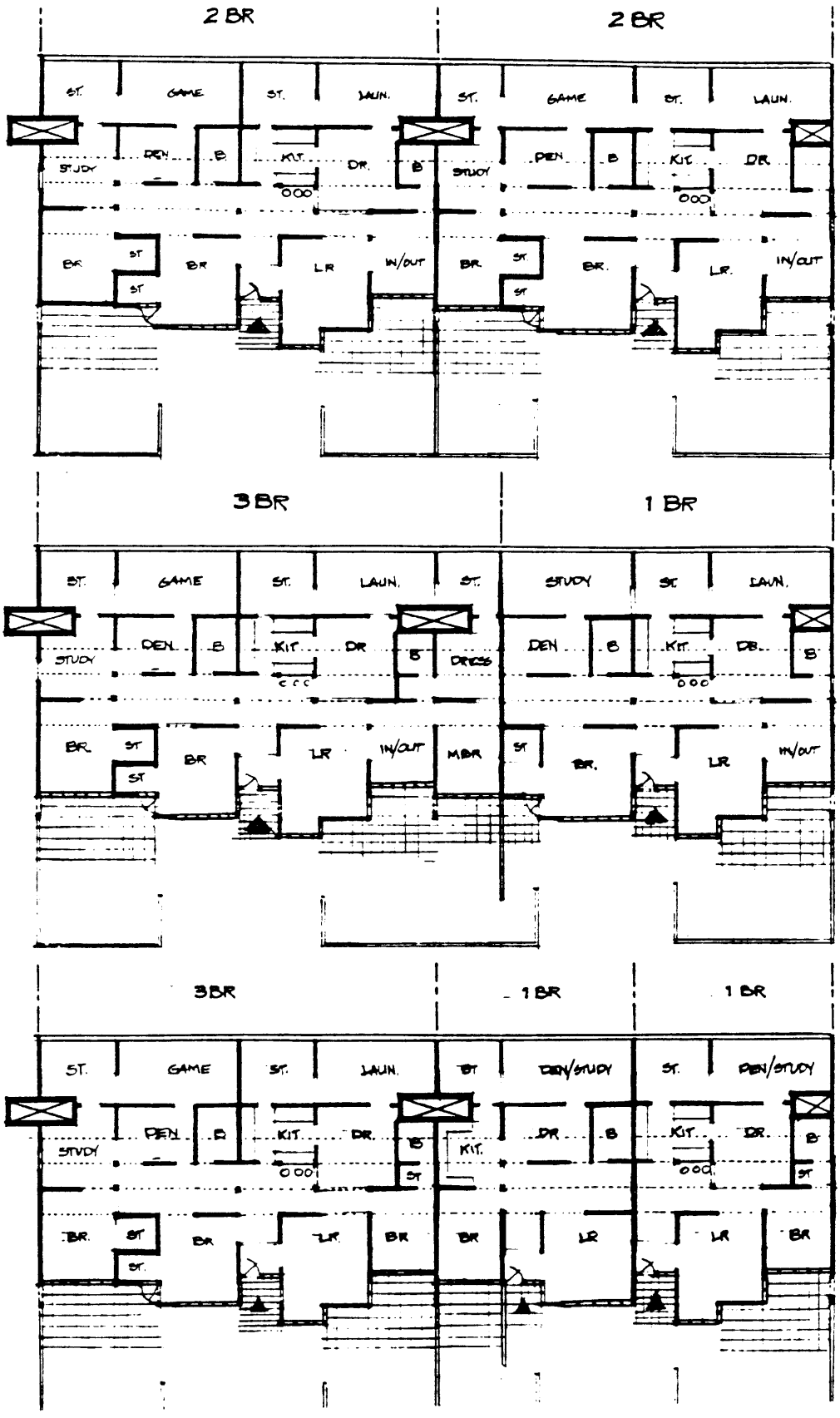
HOUSING TRACTABILITY STUDY C

USE ALTERNATIVES EXPLORATION



HOUSING TRACTABILITY STUDY D

VEHICLE STUDY - LYNCH SCHOOL HOUSING TRACTABILITY STUDY D	GOOD	FAIR	POOR	UNACCEPT-ABLE	IMPROVED	LEVEL OF INVESTMENT ○ Minimal ○ Modest ○ Moderate ◐ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS						Further development of outdoor areas increases useability and allows flexible interpretation with varying unit configurations.
a. Dimensional adequacy for interchangeable use of spaces						
b. Variety of outdoor activities dimensionally accommodated						
c. Dimensional qualities of spaces by housing standards						
2. CIRCULATION						Interior circulation possesses many space-like qualities and has a variety of potential uses.
a. Individual space access to allow interchangeable use						
b. Multiplicity of potential circulation uses						
c. Level of space privacy afforded by circulation						
3. ENVIRONMENT						No noticeable change from Tractability Study C.
a. Individual space access to natural light						
b. Individual space access to natural ventilation						
c. Level of aural/visual privacy between activity spaces						
4. FLEXIBILITY						Overall flexibility is good, allowing several possibilities for the development of alternate unit types and sizes.
a. Diversity of possible use patterns within dwellings						
b. Desirability of various space adjacencies						
c. Ability to accommodate new unit types and sizes						
GOALS AND OBJECTIVES FOR HOUSING SCHEME 4	Using the insight gained through inset studies improved the tractability of the overall housing environment.					


2 BR
2 BR
ST.
GAME
ST.
LAUN.
STUDY
DEN
B
KIT.
DR.
BR.
LR
IN/OUT
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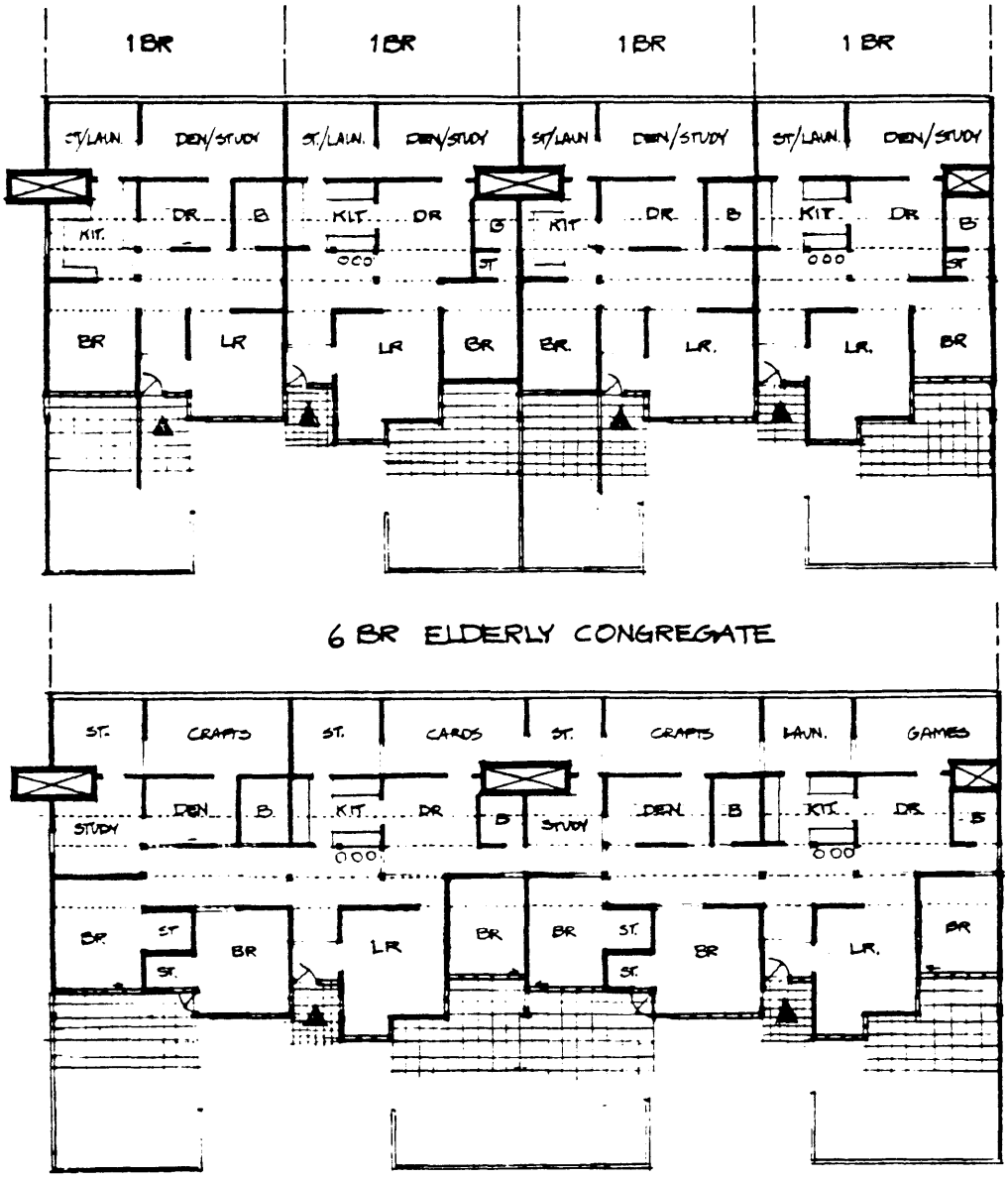
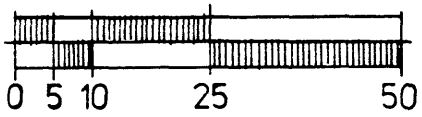
1 BR
DRESS
MBR
3 BR
1 BR
1 BR
DEN/STUDY





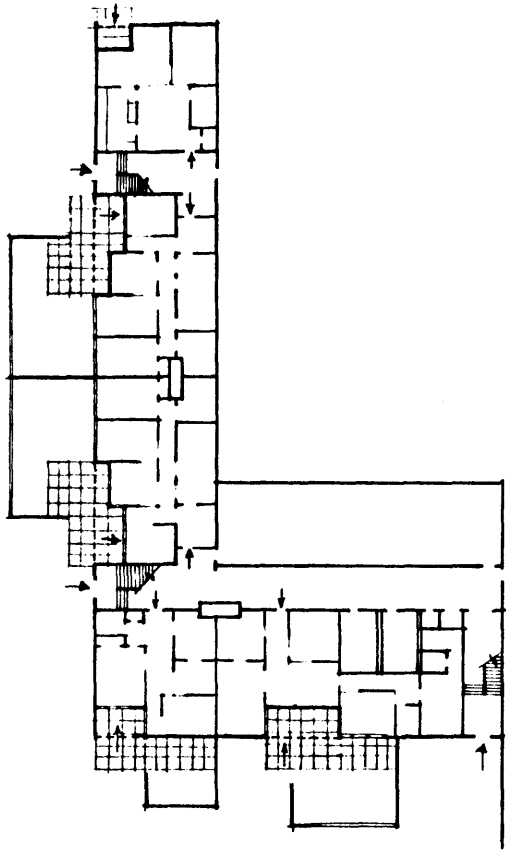
HOUSING TRACTABILITY STUDY D

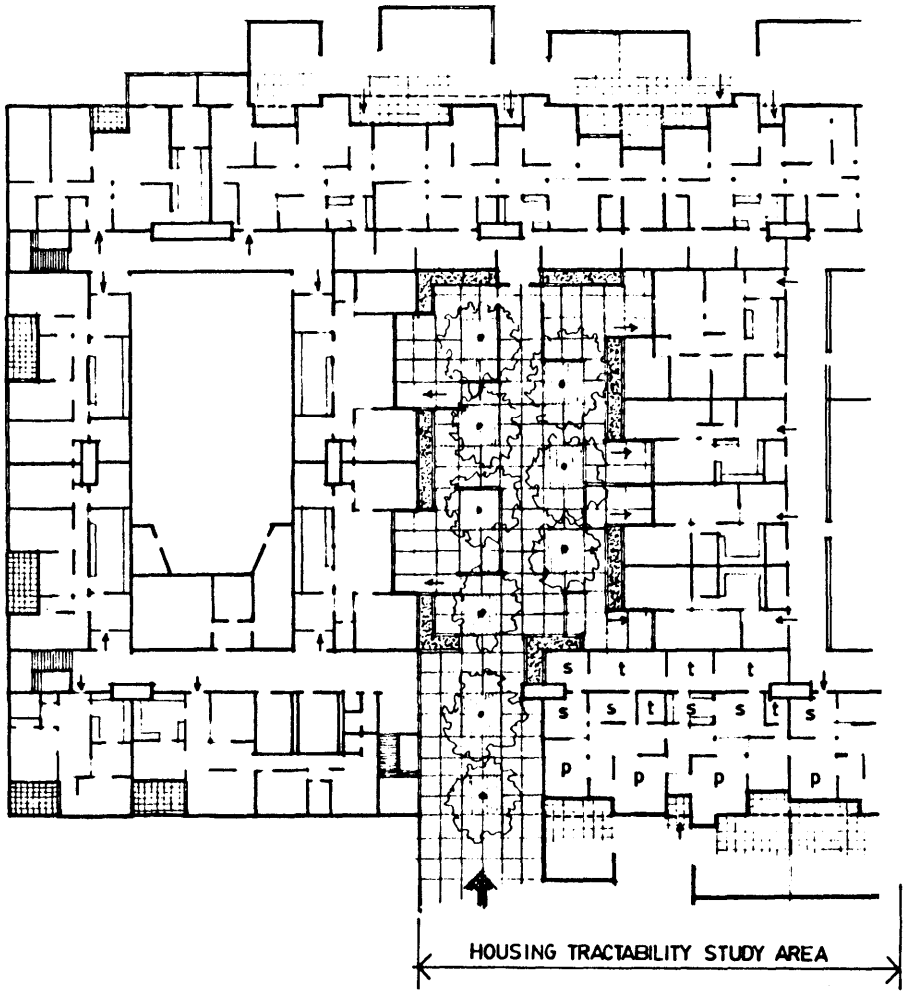
USE ALTERNATIVES EXPLORATION

0 5 10 25 50

STUDY VEHICLE

HOUSING SCHEME NO. 4
HIGH INVESTMENT





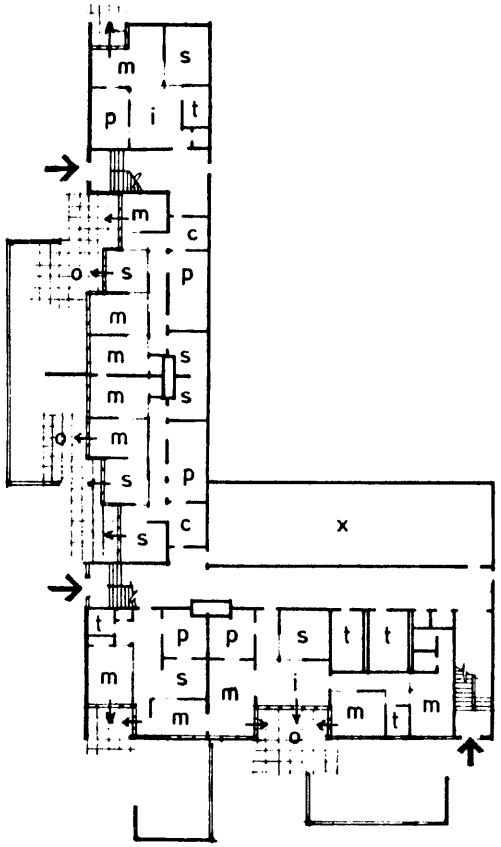
p=primary activity space
s=secondary activity space
t=tertiary activity space

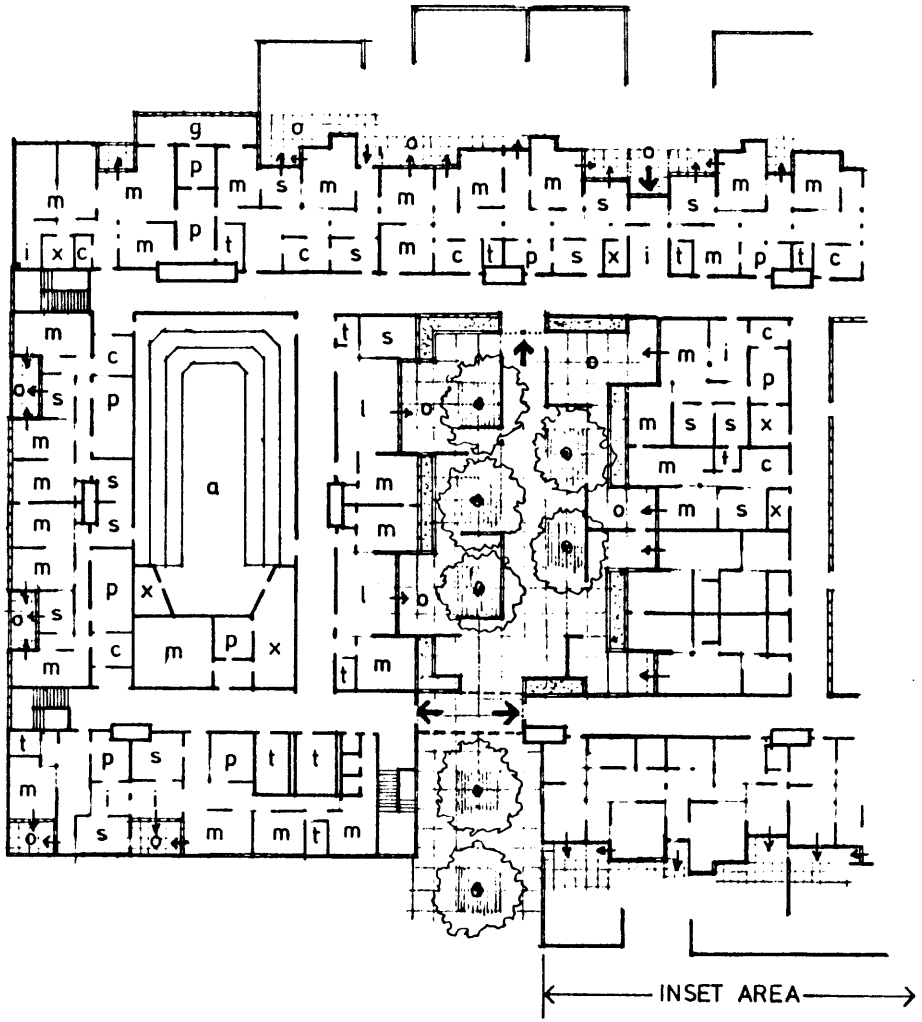
VEHICLE STUDY - LYNCH SCHOOL HOUSING SCHEME NO. 4	GOOD	FAIR	POOR	UNACCEPTABLE	IMPROVED	LEVEL OF INVESTMENT ○Minimal ○Modest ○Moderate ◪High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS						(In reference to Housing Scheme No. 3) Although extensive changes have been made the dimensional adequacy of interior spaces remains good and the possibilities of interchangeable use are increased.
a. Dimensional adequacy for interchangeable use of spaces						
b. Variety of outdoor activities dimensionally accommodated						
c. Dimensional qualities of spaces by housing standards						
2. CIRCULATION						Inhabitation of corridor areas improves the quality of unit access circulation by creating semi-private entry corridor segments. The development of an interior circulation zone with space-like qualities allows a multiplicity of use interpretations.
a. Individual space access to allow interchangeable use						
b. Multiplicity of potential circulation uses						
c. Level of space privacy afforded by circulation						
3. ENVIRONMENT						Except for the interior of lower level units the overall environment of the housing remains good. The removal of a segment of the building improves the environment of courtyard and surrounding areas.
a. Individual space access to natural light						
b. Individual space access to natural ventilation						
c. Level of aural/visual privacy between activity spaces						
4. FLEXIBILITY						The development of an interior circulation system which is continuous over several modules becomes a desirable means for expansion and contraction. The provision of variable openings by the development of a system of sliding panels produces a highly flexible system.
a. Diversity of possible use patterns within dwellings						
b. Desirability of various space adjacencies						
c. Ability to accommodate new unit types and sizes						
OVERALL EVALUATION	Scheme 4 illustrates that a desireable housing environment can be developed within the existing educational framework. Although the level of investment is high, the resulting framework is highly flexible.					

0 5 10 25 50

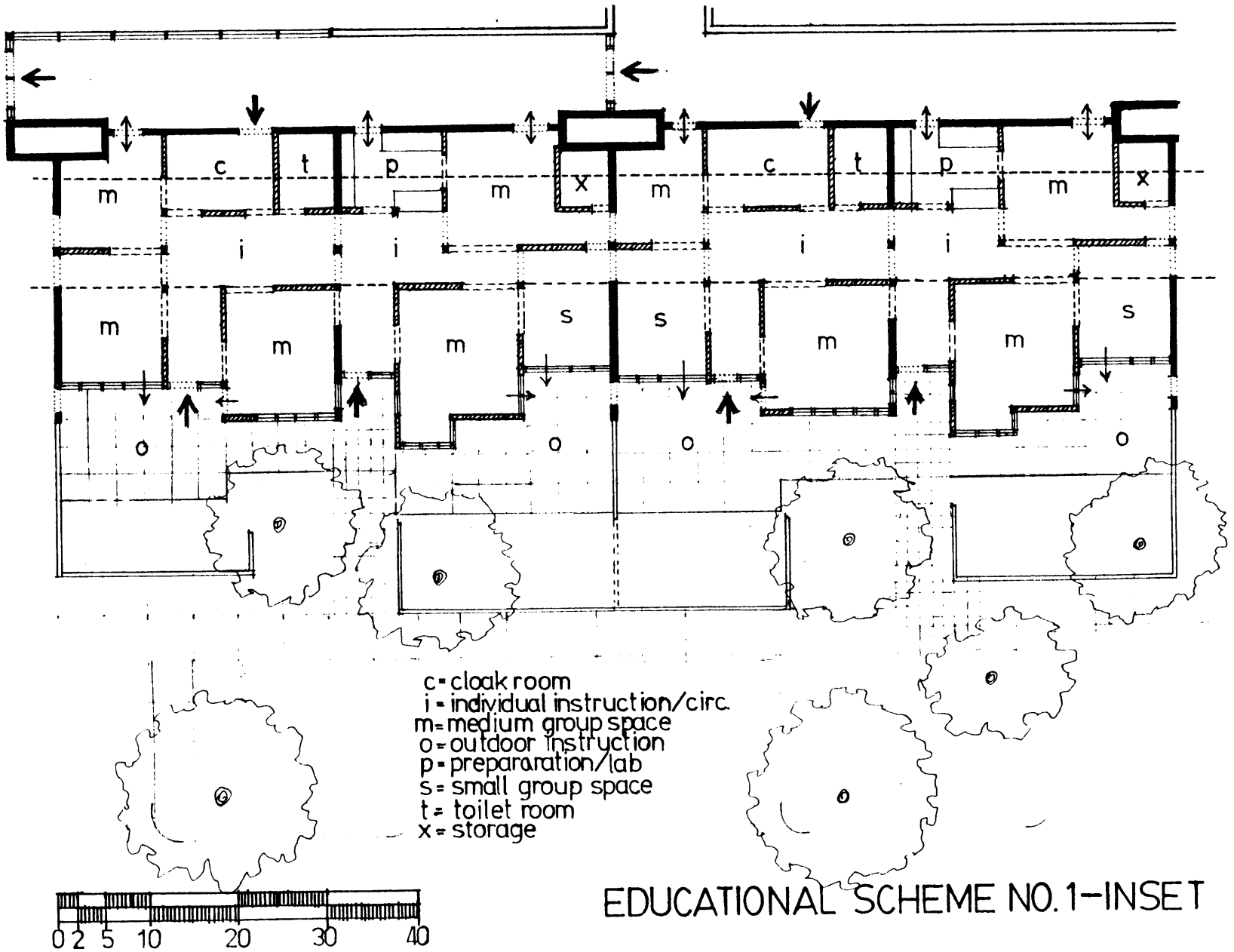
STUDY VEHICLE

EDUCATIONAL SCHEME NO.1
MINIMAL INVESTMENT





a = assembly (large group) space
c = cloak room
i = individual instruction
l = large group (20-30)
m = medium group (10-20)
o = outdoor instruction
p = preparation/lab
s = small group (5-10)
t = toilet room
x = storage



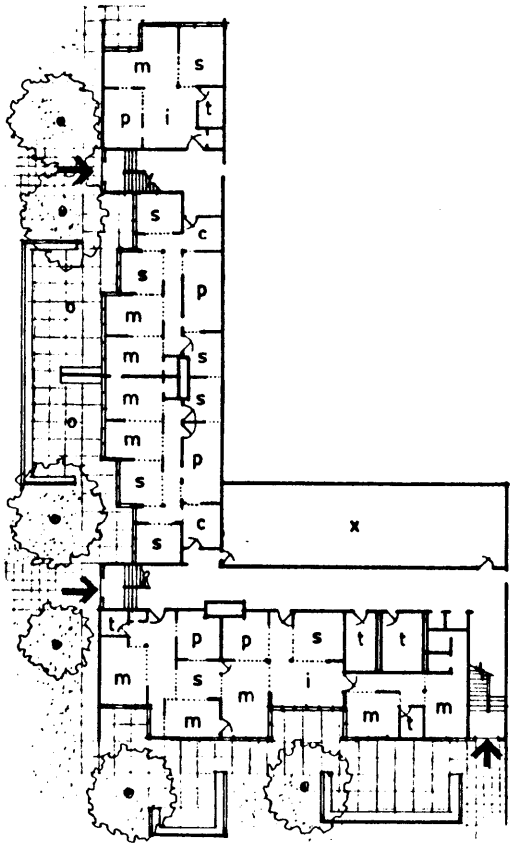
EDUCATIONAL SCHEME NO. 1–INSET

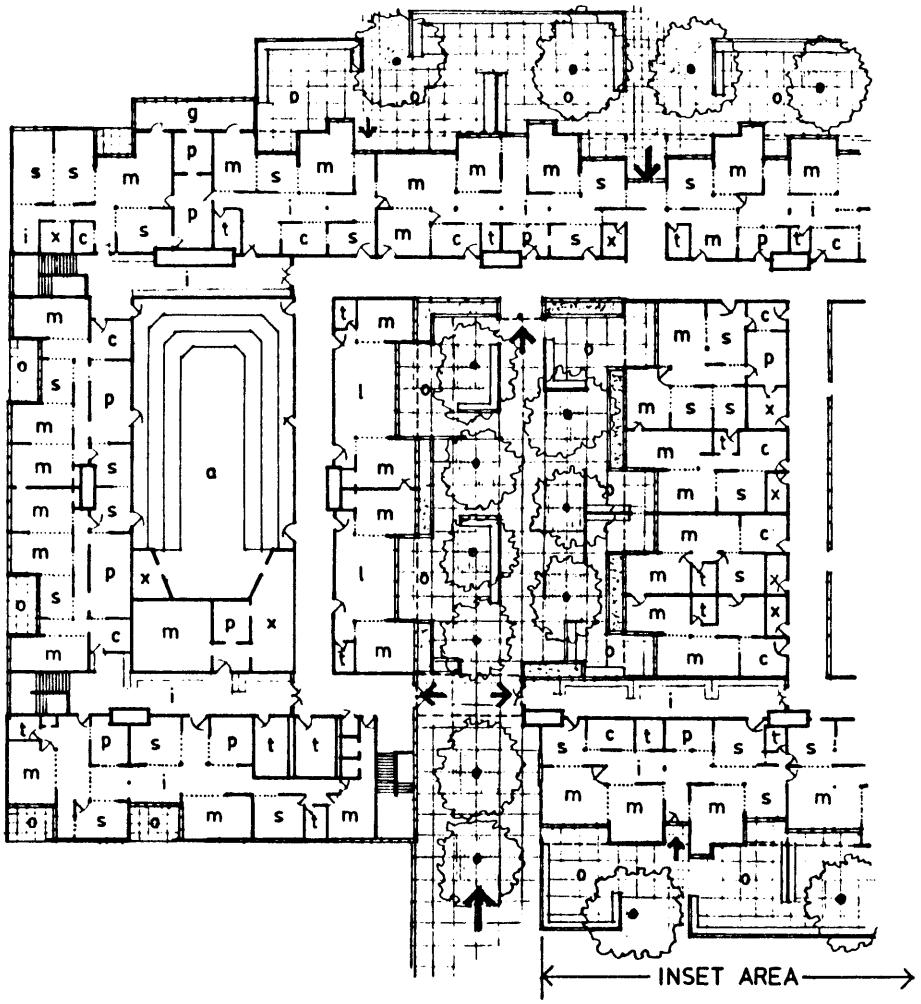
VEHICLE STUDY - LYNCH SCHOOL EDUCATIONAL SCHEME NO. 1	GOOD	FAIR	POOR	UNACCEPT-ABLE	IMPROVED	LEVEL OF INVESTMENT ●Minimal ○ Modest ○Moderate○ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS						Although a variety of group sizes are available, large group spaces cannot be adequately accommodated. Terraced outdoor areas are too small for educational uses.
a. Dimensional adequacy for interchangeable use of spaces						
b. Variety of outdoor activities dimensionally accommodated						
c. Dimensional qualities of spaces by education standards						
2. CIRCULATION						Several corridor areas needed to be re-established to allow movement in education environment. Primary circulation has limited uses, but secondary circulation system allows many opportunities for movement between learning spaces.
a. Accessability of group spaces to primary circulation						
b. Ability of learning areas to operate privately						
c. Multiplicity of potential uses for primary circulation						
3. ENVIRONMENT						Primary circulation zones have poor access to natural light and ventilation.
a. Individual spaces access to natural light						
b. Individual space access to natural ventilation						
c. Level of aural/visual privacy between group spaces						
4. FLEXIBILITY						The level of space definition desired for housing conflicts with the educational desires for open space and limits the possible uses of learning spaces.
a. Diversity of space sizes available in a learning area						
b. Desirability of various group space adjacencies						
c. Ability to accommodate various educational patterns						
GOALS AND OBJECTIVES FOR EDUCATIONAL SCHEME 2	Incorporate large group spaces into educational framework by exploring possibilities of combining smaller spaces. Improve potentials for the development of open spaces in learning environment.					

0 5 10 25 50

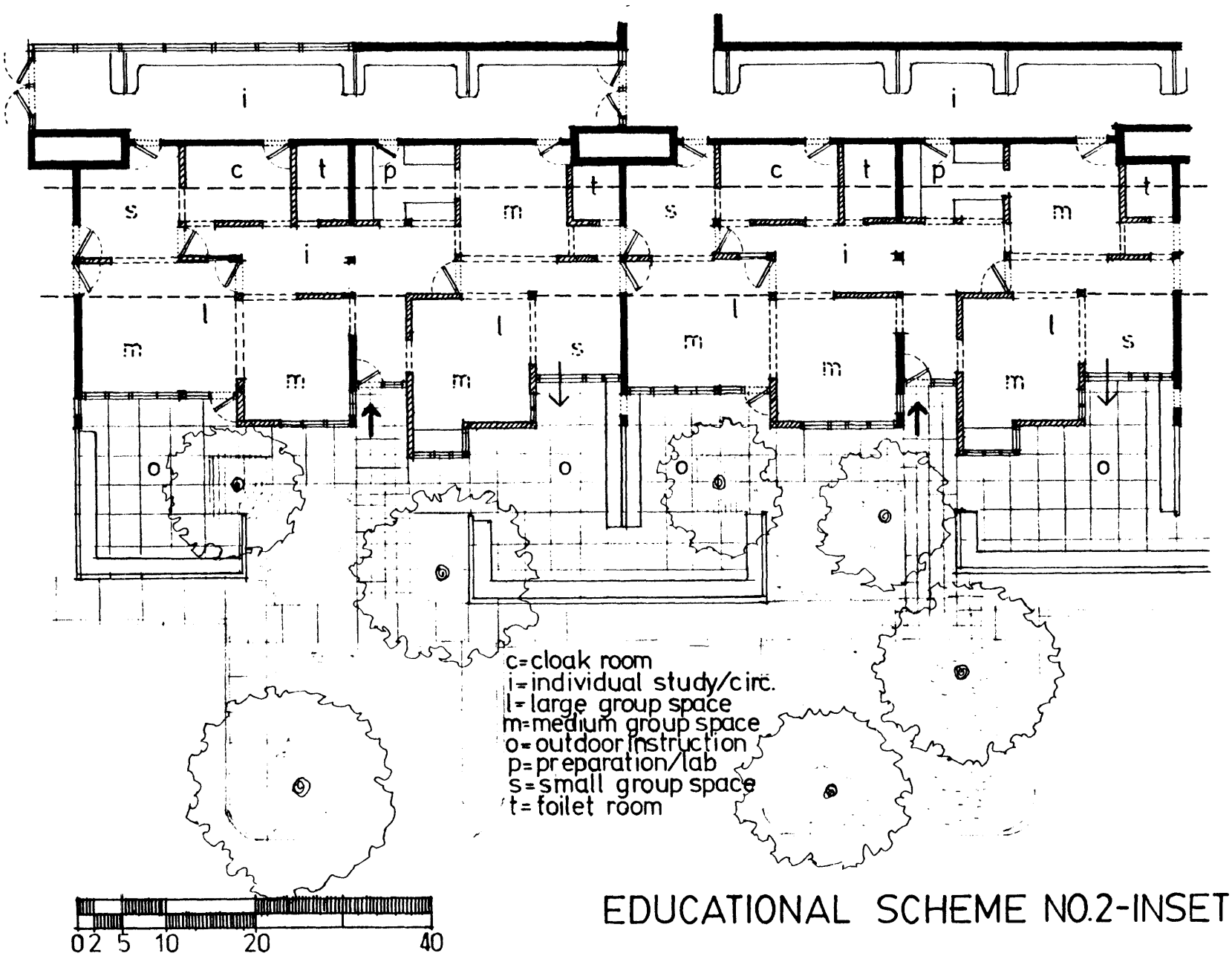
STUDY VEHICLE

EDUCATIONAL SCHEME NO.2
MODEST INVESTMENT

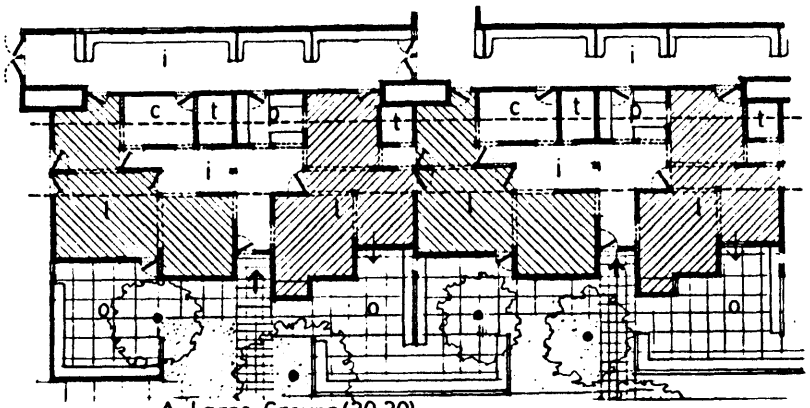




a = assembly space (100)
c = cloak room
i = individual instruction
l = large group (20-30)
m = medium group (10-20)
o = outdoor instruction
p = preparation/lab
s = small group (5-10)
t = toilet room
x = storage

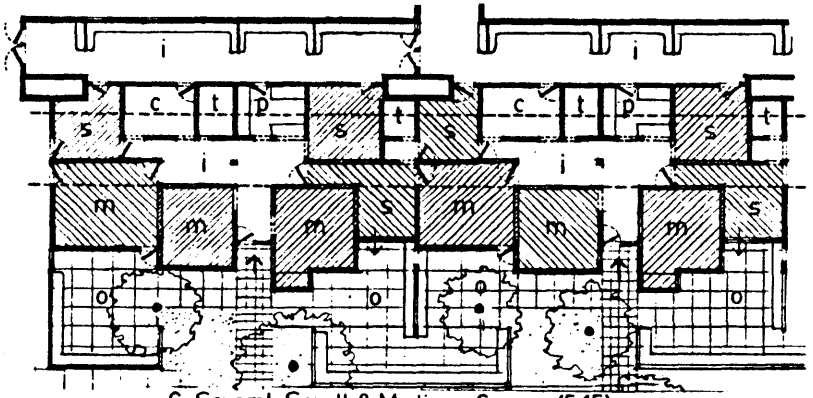


EDUCATIONAL SCHEME NO.2-INSET

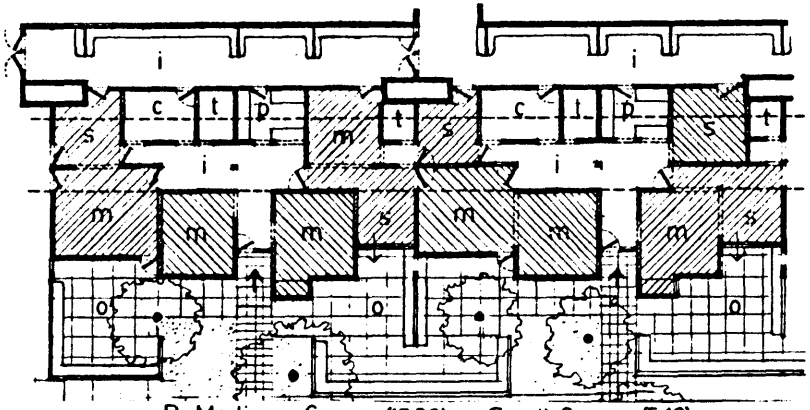


A. Large Groups (20-30)

c-cloak room
i-individual study/circ.
l-large group space
m-medium group space
o-outdoor instruction
p-preparation/lab
s-small group space
t-toilet room



C. Several Small & Medium Groups (5-15)



B. Medium Groups (15-20) w/ Small Groups (5-10)

EDUCATIONAL GROUPINGS

0 2 5 10 20 30

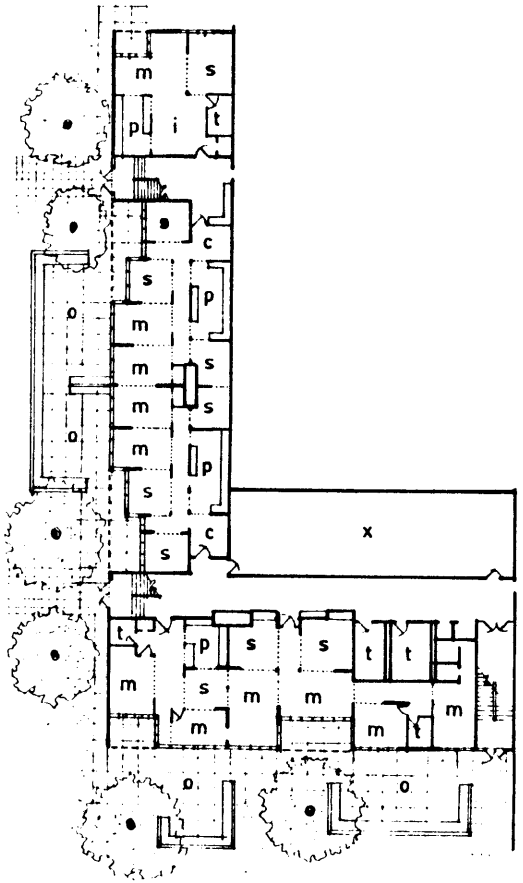
SCHEME NO. 2

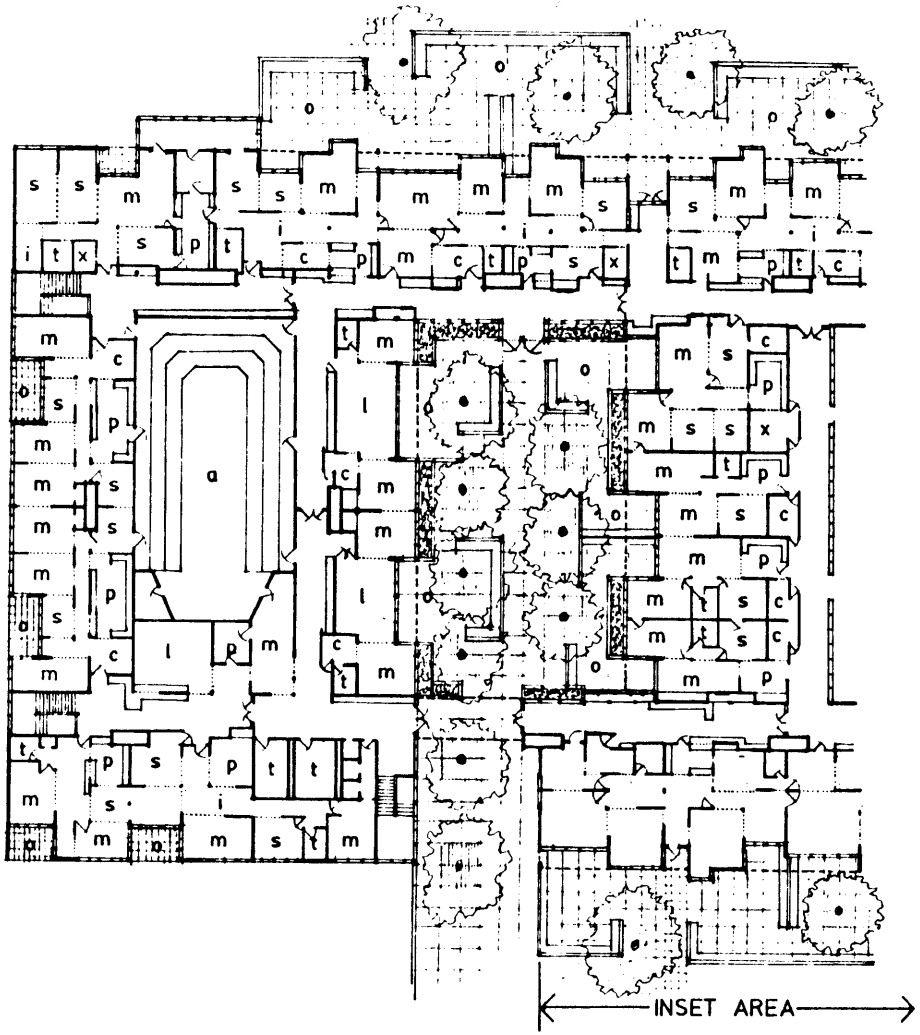
VEHICLE STUDY - LYNCH SCHOOL EDUCATIONAL SCHEME NO. 2	GOOD	FAIR	POOR	UNACCEPT-ABLE	IMPROVED	LEVEL OF INVESTMENT ○Minimal ◍ Modest ○Moderate○ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS						Large group spaces can be achieved through combinations of primary and secondary housing spaces, but the unusual alcove shapes limit their use-ability. Further development of exterior spaces increases their potential for outdoor activities.
a. Dimensional adequacy for interchangeable use of spaces						
b. Variety of outdoor activities dimensionally accommodated						
c. Dimensional qualities of spaces by education standards						
2. CIRCULATION						The addition of work surfaces increases the useability of primary circulation, but the potential activities remain independent of adjoining learning spaces.
a. Accessability of group spaces to primary circulation						
b. Ability of learning areas to operate privately						
c. Multiplicity of potential uses for primary circulation						
3. ENVIRONMENT						Although acceptable by current education standards, the environment of internal lower level areas is poor.
a. Individual spaces access to natural light						
b. Individual space access to natural ventilation						
c. Level of aural/visual privacy between group spaces						
4. FLEXIBILITY						The introduction of a new sliding panel system requiring only one-half the opening dimension for storage improves the potential for development of open spaces.
a. Diversity of space sizes available in a learning area						
b. Desirability of various group space adjacencies						
c. Ability to accommodate various educational patterns						
GOALS AND OBJECTIVES FOR EDUCATIONAL SCHEME 3	Explore potentials for the incorporation of corridor areas into classroom environment. Attempt to clarify relationships between primary and secondary circulation.					

0 5 10 25 50

STUDY VEHICLE

EDUCATIONAL SCHEME NO.3
MODERATE INVESTMENT





a = assembly space (100)
c = cloak room
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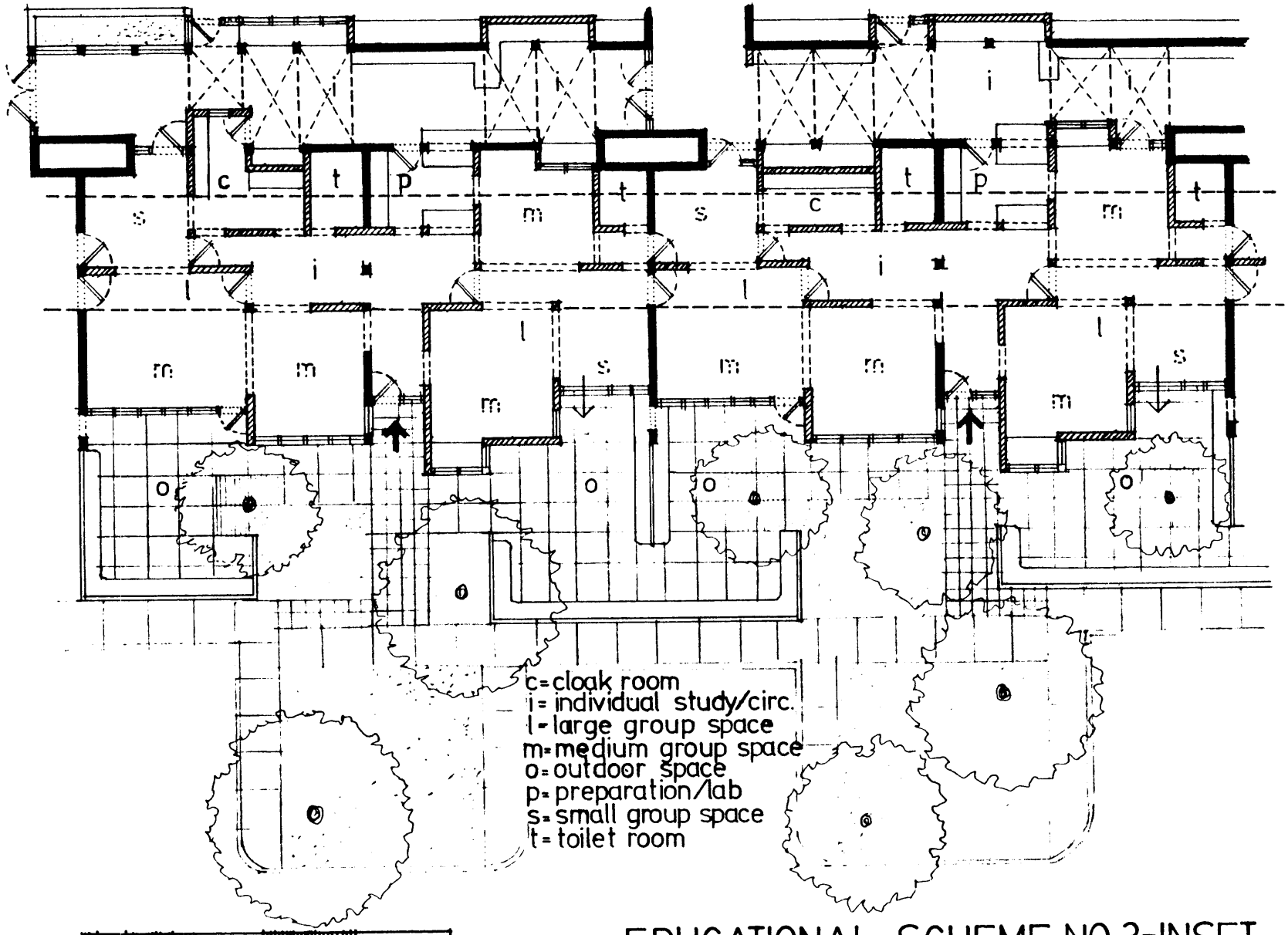
m = medium group (10-20)
o = outdoor instruction
p = preparation/lab
s = small group (5-10)
t = toilet room
x = storage



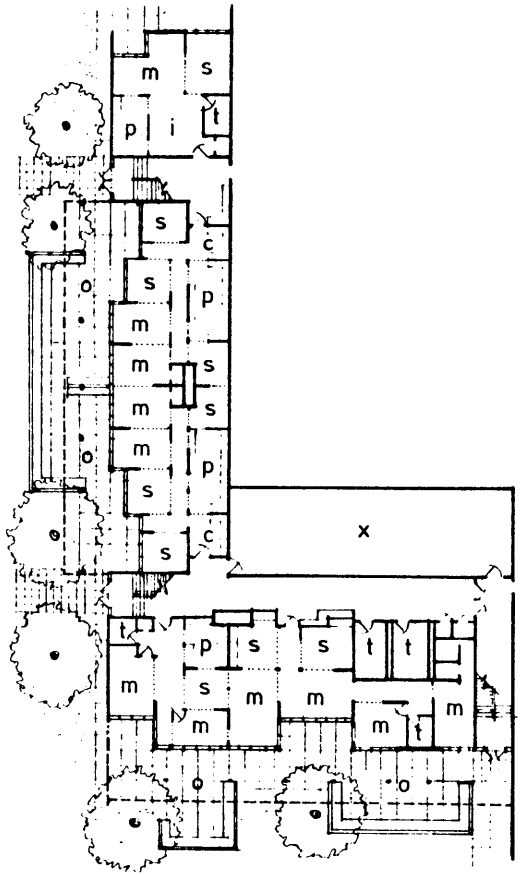
EDUCATIONAL SCHEME NO. 3-INSET

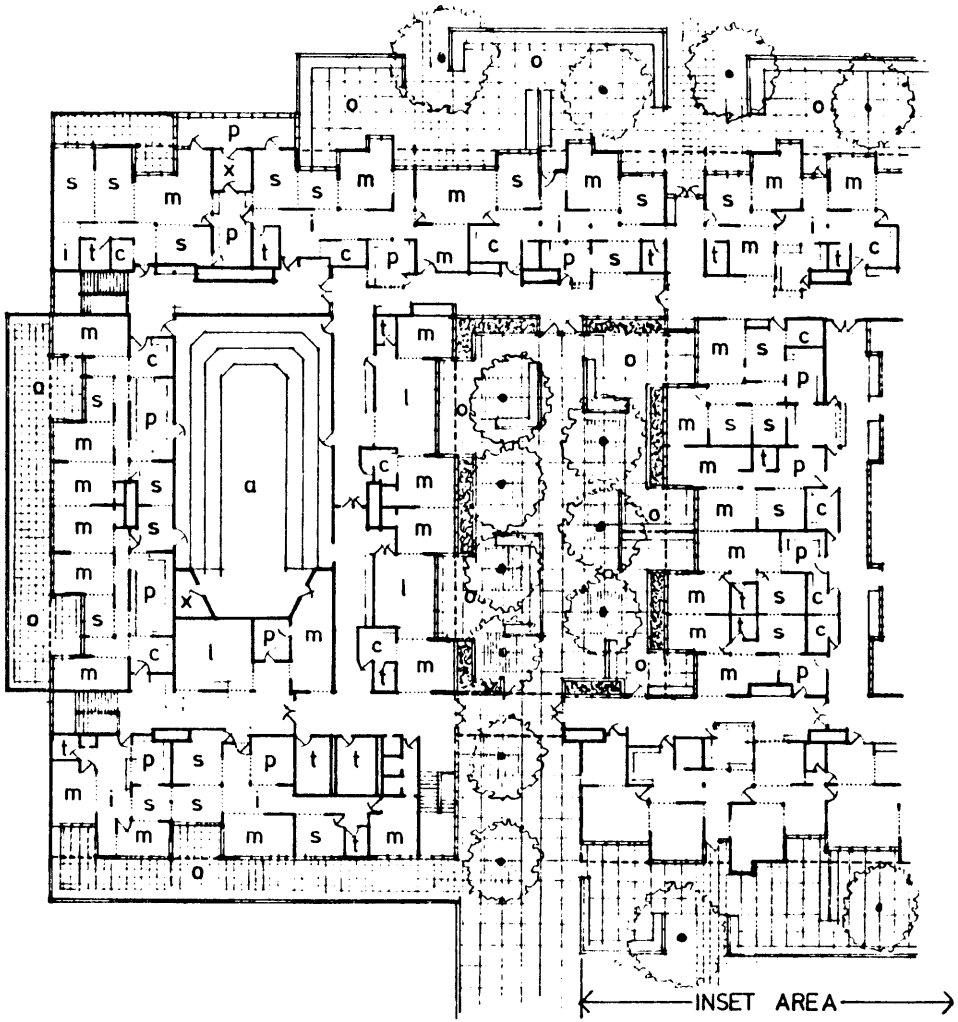
VEHICLE STUDY - LYNCH SCHOOL EDUCATIONAL SCHEME NO. 3	GOOD	FAIR	POOR	UNACCEPTABLE	IMPROVED	LEVEL OF INVESTMENT ○ Minimal ○ Modest ◍ Moderate ○ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS a. Dimensional adequacy for interchangeable use of spaces b. Variety of outdoor activities dimensionally accommodated c. Dimensional qualities of spaces by education standards						Little change is detected in the dimensional qualities of spaces. Terraced outdoor areas remain dimensionally inadequate for education uses.
2. CIRCULATION a. Accessability of group spaces to primary circulation b. Ability of learning areas to operate privately c. Multiplicity of potential uses for primary circulation						Although improvement can be seen in the useability of primary circulation, supported activities remain separated from learning spaces. Links between primary and secondary circulation remain unclear despite improvement efforts.
3. ENVIRONMENT a. Individual spaces access to natural light b. Individual space access to natural ventilation c. Level of aural/visual privacy between group spaces						The environment of primary circulation zone is improved in many areas by the addition of skylights.
4. FLEXIBILITY a. Diversity of space sizes available in a learning area b. Desirability of various group space adjacencies c. Ability to accommodate various educational patterns						Visual surveillance in some areas is still inhibited by space dividers. Opening of preparation/lab spaces to primary circulation increases the potential uses of built in equipment and furnishings.
GOALS AND OBJECTIVES FOR EDUCATIONAL SCHEME 4	Improve useability of terraced outdoor areas by increasing dimensions. Increase potentials for use of primary circulation zone by surrounding learning spaces.					

0 5 10 25 50

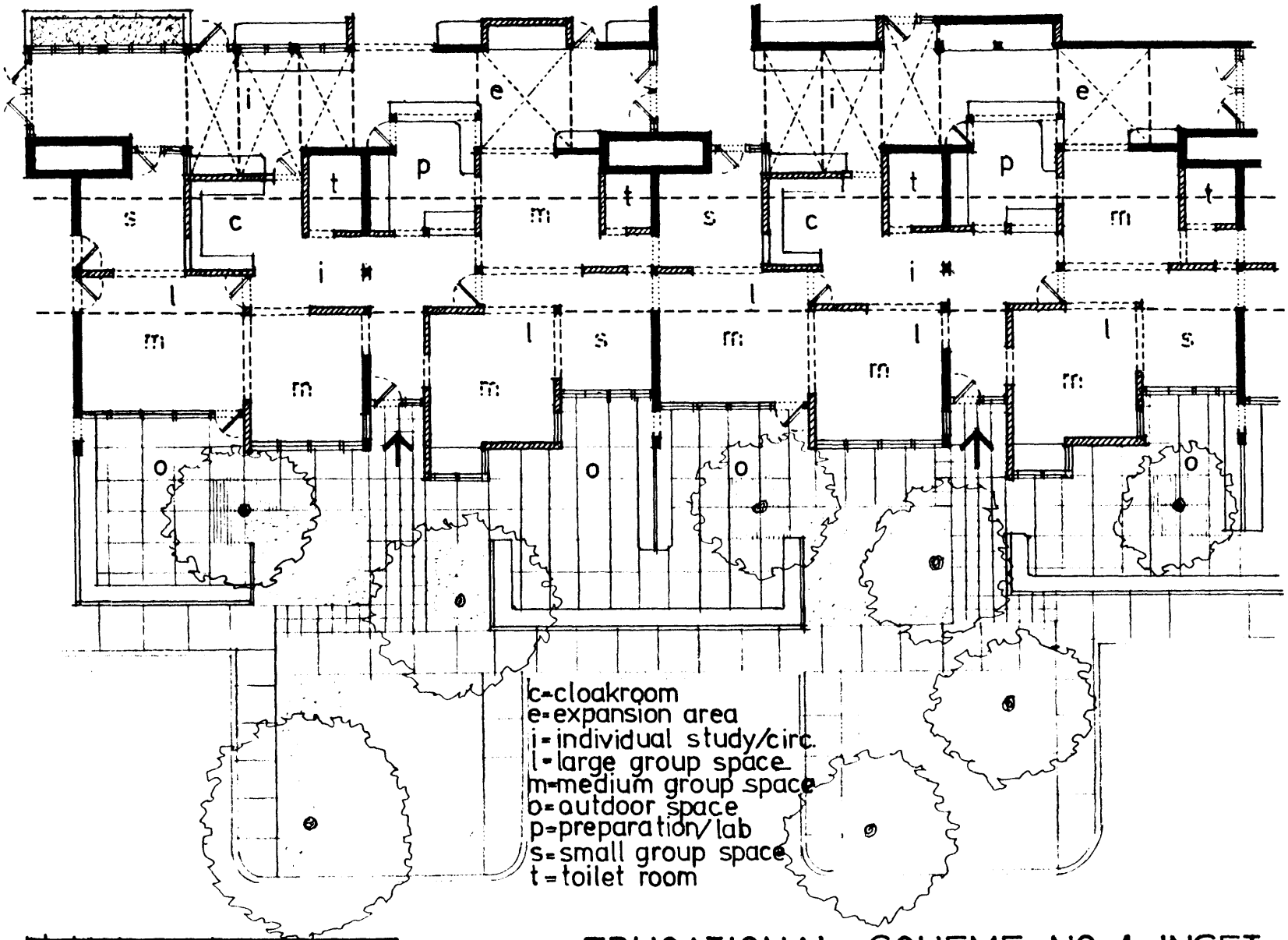
STUDY VEHICLE

EDUCATIONAL SCHEME NO.4
HIGH INVESTMENT



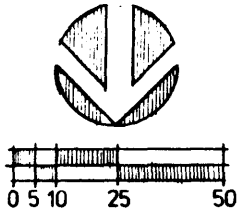


a = assembly space
c = cloak room
i = individual instruction
l = large group
m = medium group
o = outdoor instruction
p = preparation/lab
s = small group
t = toilet room
x = storage



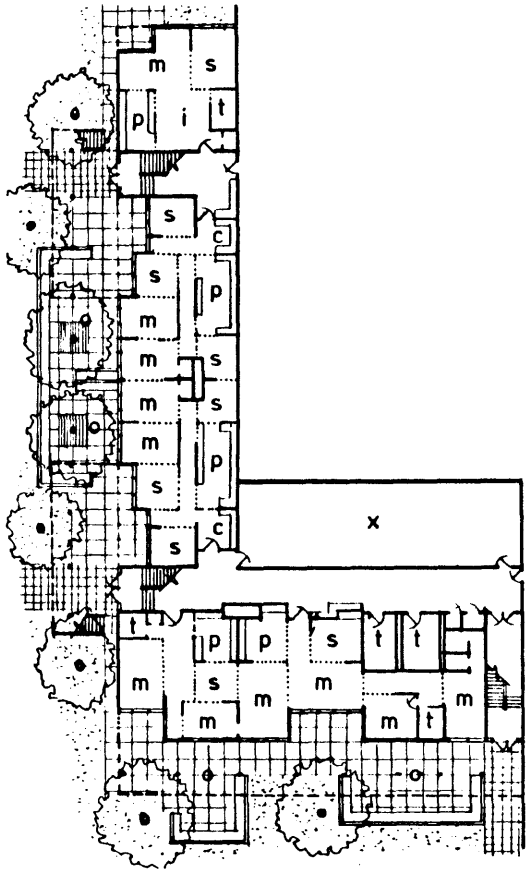
EDUCATIONAL SCHEME NO. 4-INSET

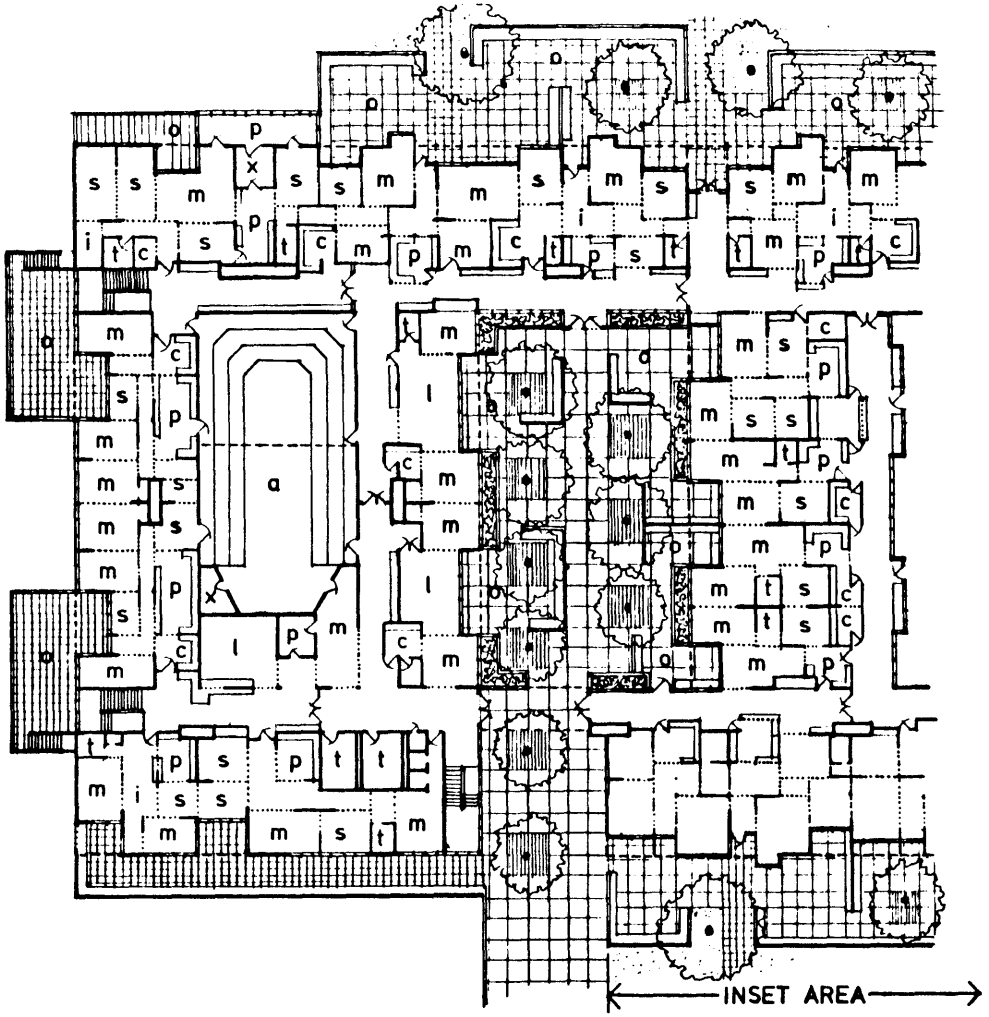
VEHICLE STUDY - LYNCH SCHOOL EDUCATIONAL SCHEME NO. 4	GOOD	FAIR	POOR	UNACCEPTABLE	IMPROVED	LEVEL OF INVESTMENT ○ Minimal ○ Modest ○ Moderate ◍ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS	◍	◍	◍	◍	◍	Useability of terraced outdoor areas is greatly enhanced by the deck-like additions.
a. Dimensional adequacy for interchangeable use of spaces	○	◍	○	○	○	
b. Variety of outdoor activities dimensionally accommodated	◍	○	○	○	◍	
c. Dimensional qualities of spaces by education standards	○	◍	○	○	◍	
2. CIRCULATION	◍	◍	◍	◍	◍	Variable openings along corridors allow surrounding learning spaces to use circulation zone for overflow activities.
a. Accessability of group spaces to primary circulation	○	◍	○	○	◍	
b. Ability of learning areas to operate privately	◍	○	○	○	○	
c. Multiplicity of potential uses for primary circulation	◍	○	○	○	◍	
3. ENVIRONMENT	◍	◍	◍	◍	◍	The deck-like additions to terraced outdoor areas reduce the environmental quality of lower level spaces by further limiting access to natural light.
a. Individual spaces access to natural light	◍	○	○	◍	○	
b. Individual space access to natural ventilation	◍	○	◍	○	○	
c. Level of aural/visual privacy between group spaces	◍	○	○	○	○	
4. FLEXIBILITY	◍	◍	◍	◍	◍	Variety of potential educational patterns is increased by the incorporation of openings to primary circulation zone. Visual surveillance is still impaired in many areas and alcoved shapes of large group spaces inhibits their useability
a. Diversity of space sizes available in a learning area	○	◍	○	○	○	
b. Desirability of various group space adjacencies	○	◍	○	○	○	
c. Ability to accommodate various educational patterns	◍	◍	○	○	◍	
GOALS AND OBJECTIVES FOR EDUCATIONAL SCHEME 4A	Extend study by developing an additional scheme to explore alternate possibilities. Assess the potentials of the overall building framework to accommodate both housing and education uses.					



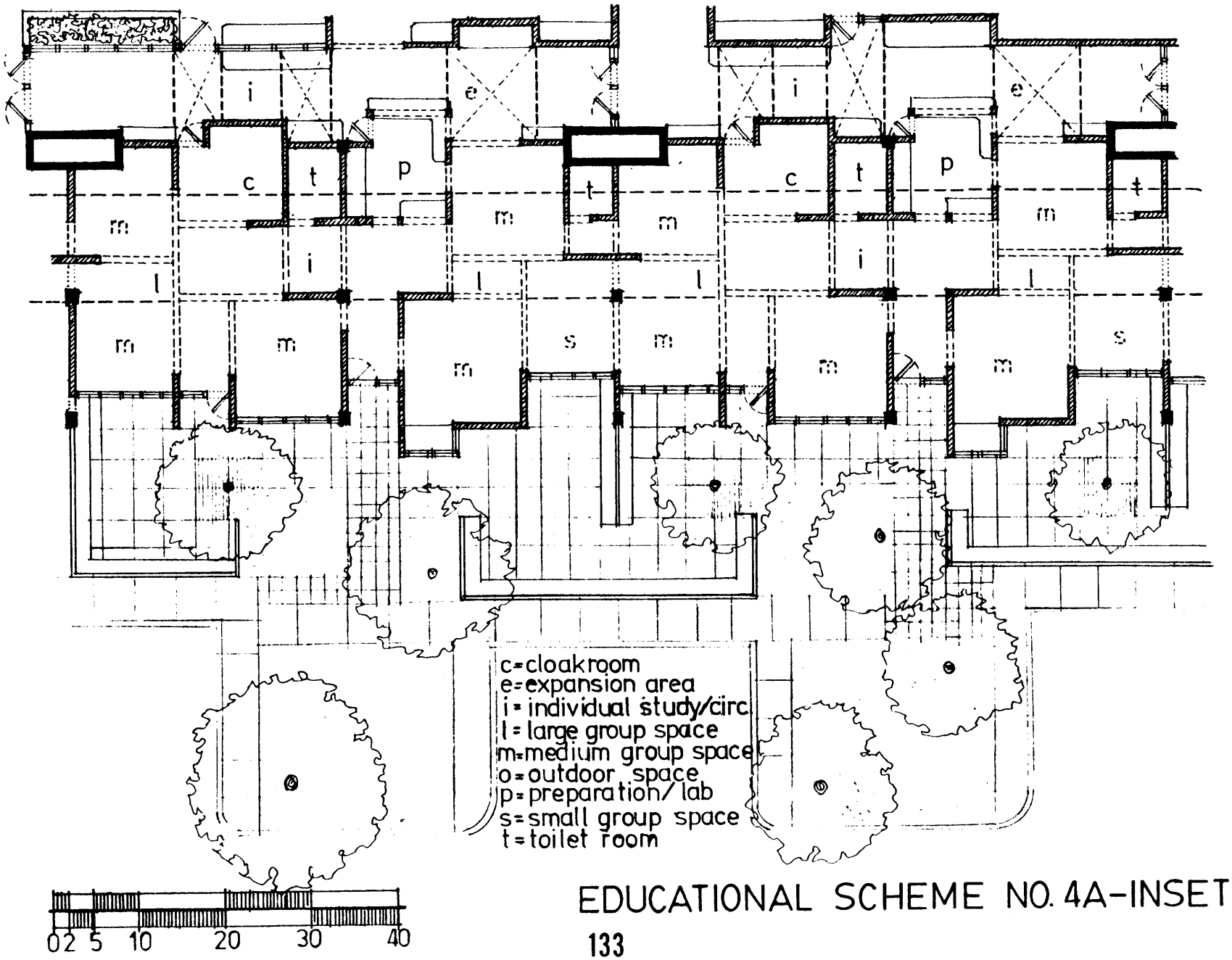
STUDY VEHICLE

EDUCATIONAL SCHEME NO.4A



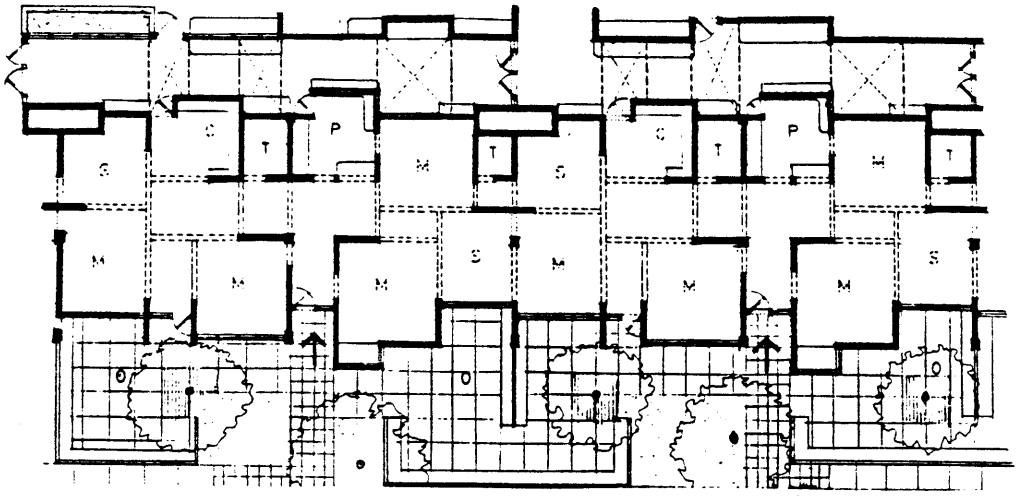


a = assembly space
c = cloakroom
i = individual study
l = large group
m = medium group
o = outdoor instruction
p = preparation/lab
s = small group
t = toilet room
x = storage

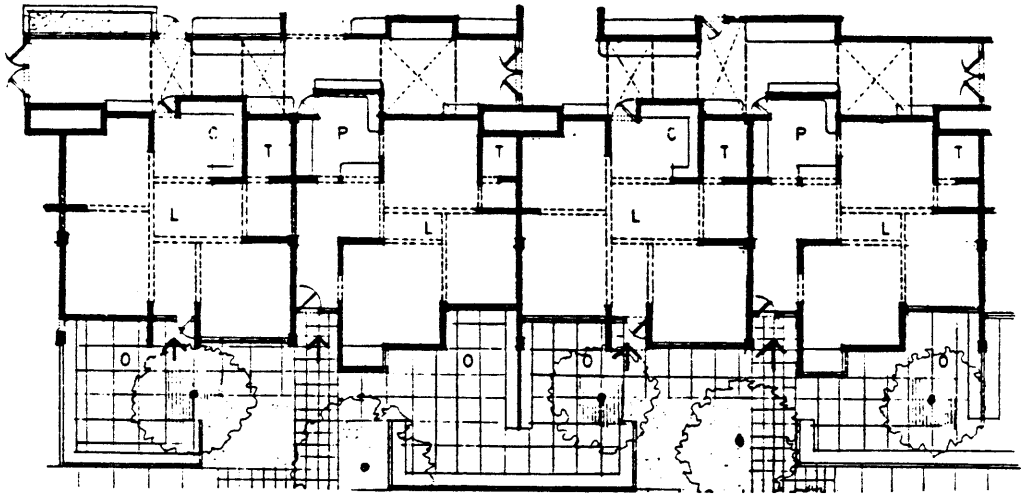


EDUCATIONAL SCHEME NO. 4A-INSET

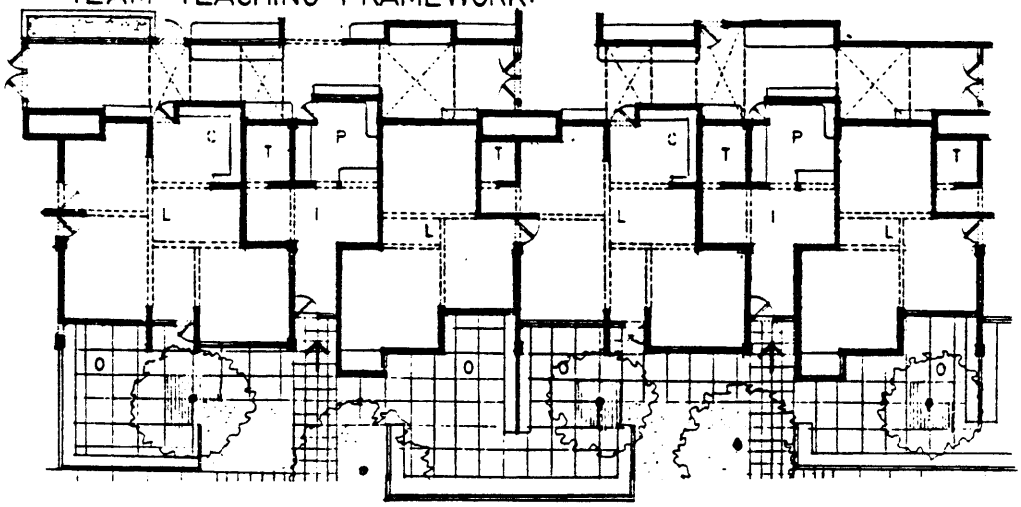
MODIFIED OPEN CLASSROOM:



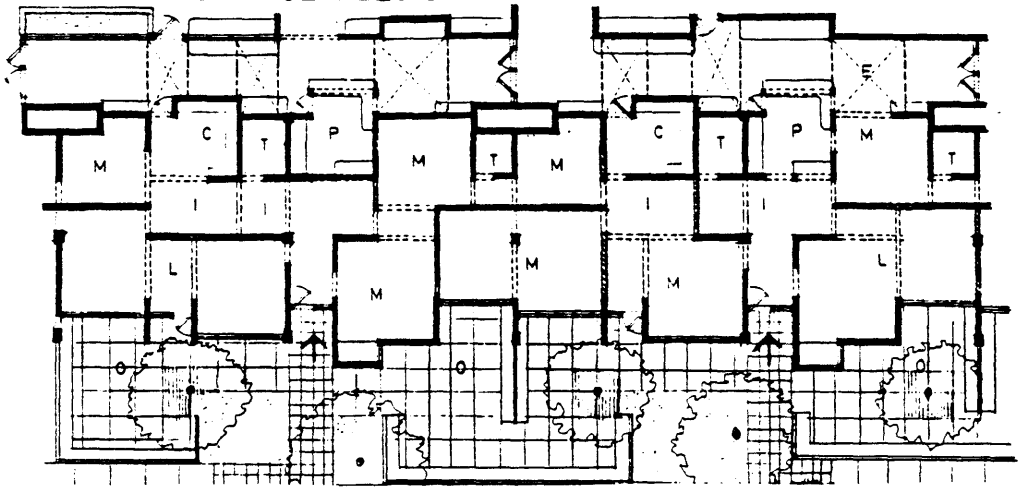
4 MULTI-OPTION CLASSROOMS:



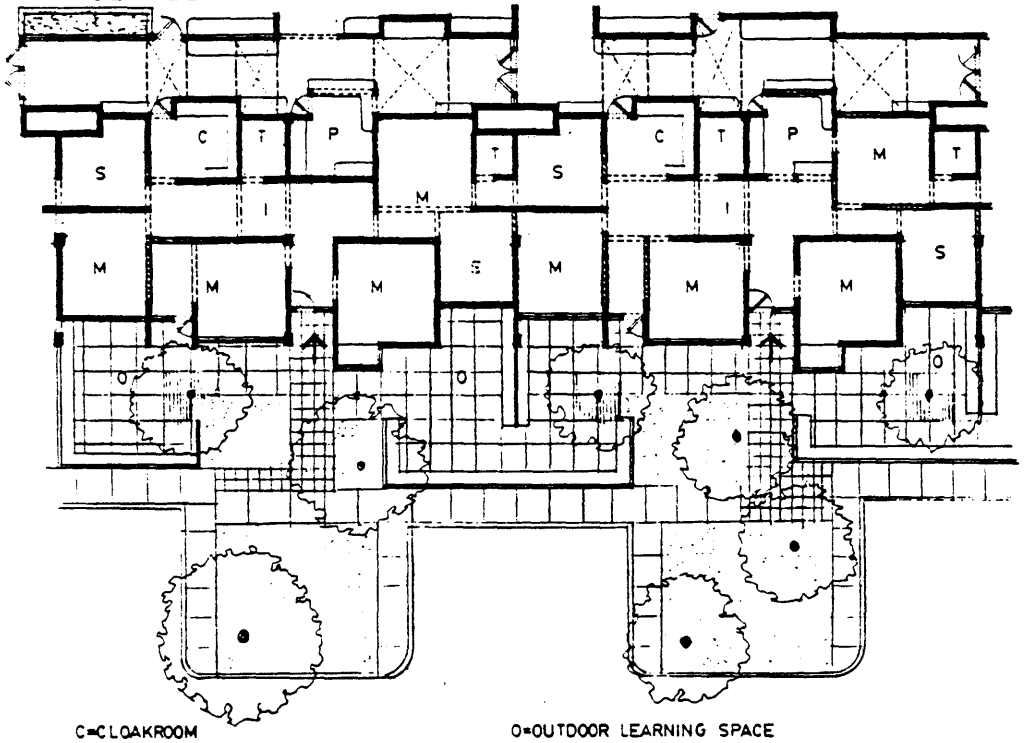
TEAM TEACHING FRAMEWORK:



VARIABLE SPACE SIZES & GROUPINGS:

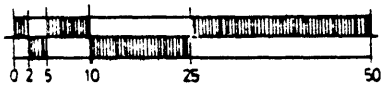


MULTIPLE STUDY GROUPS:

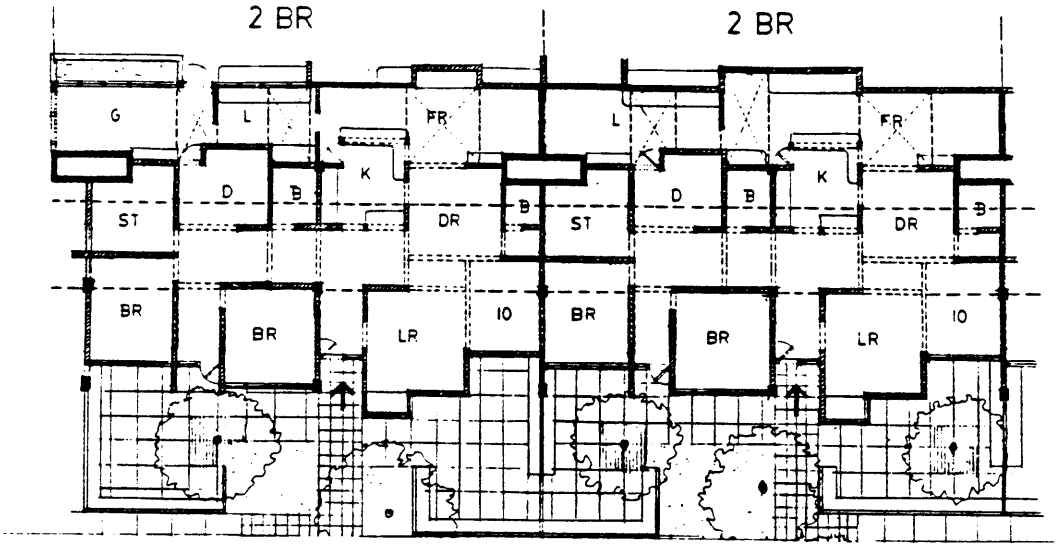


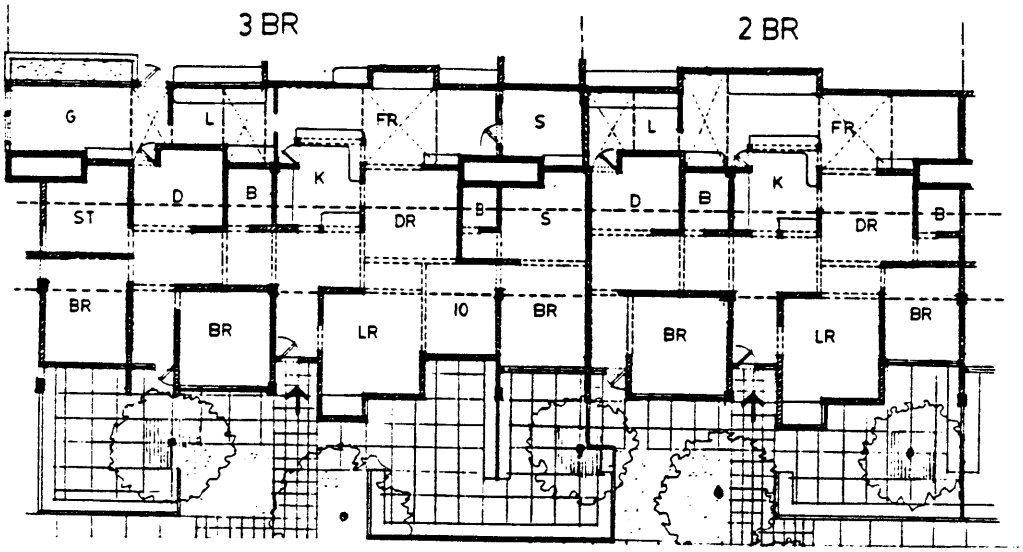
C=CLOAKROOM
E=EXPANSION AREA
I=INDIVIDUAL STUDY/CIRC.
L=LARGE GROUP SPACE
M=MEDIUM GROUP SPACE

O=OUTDOOR LEARNING SPACE
P=PREPARATION/ LAB
S=SMALL GROUP SPACE
T=TOILET ROOM



EDUCATIONAL TRACTABILITY STUDY


2 BR
2 BR
G
L
FR
K
D
B
ST
DR
BR
LR
10


3 BR
2 BR
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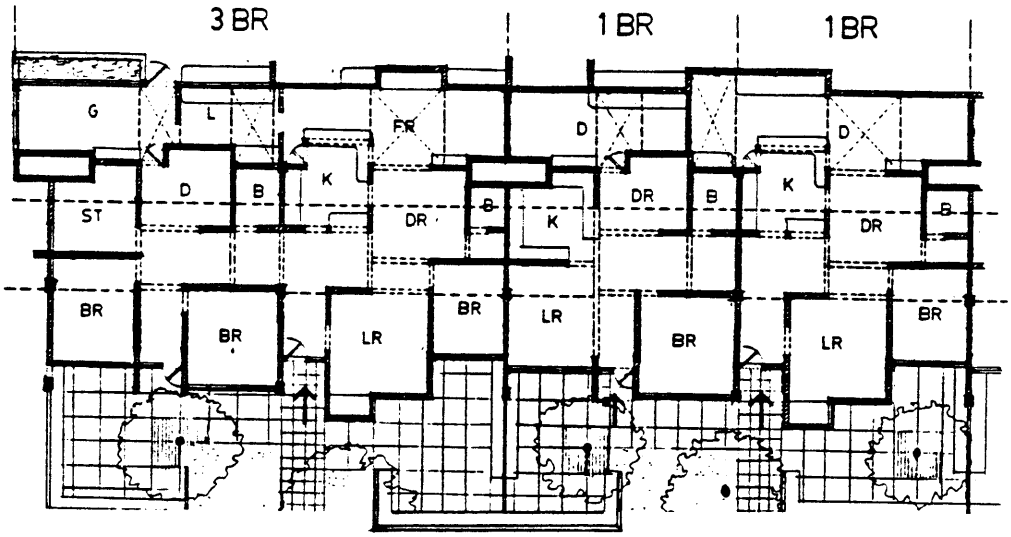
10


3 BR
1 BR
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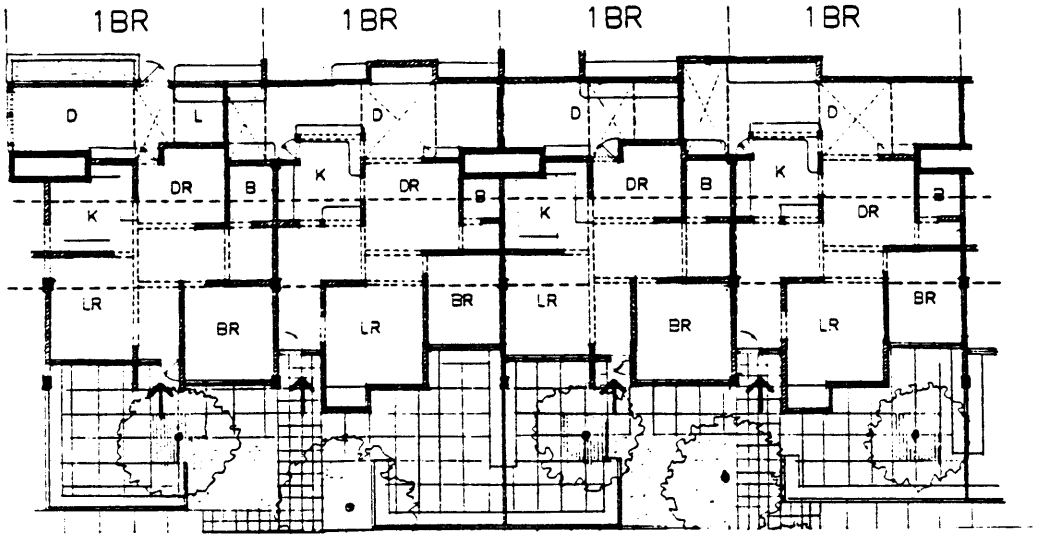
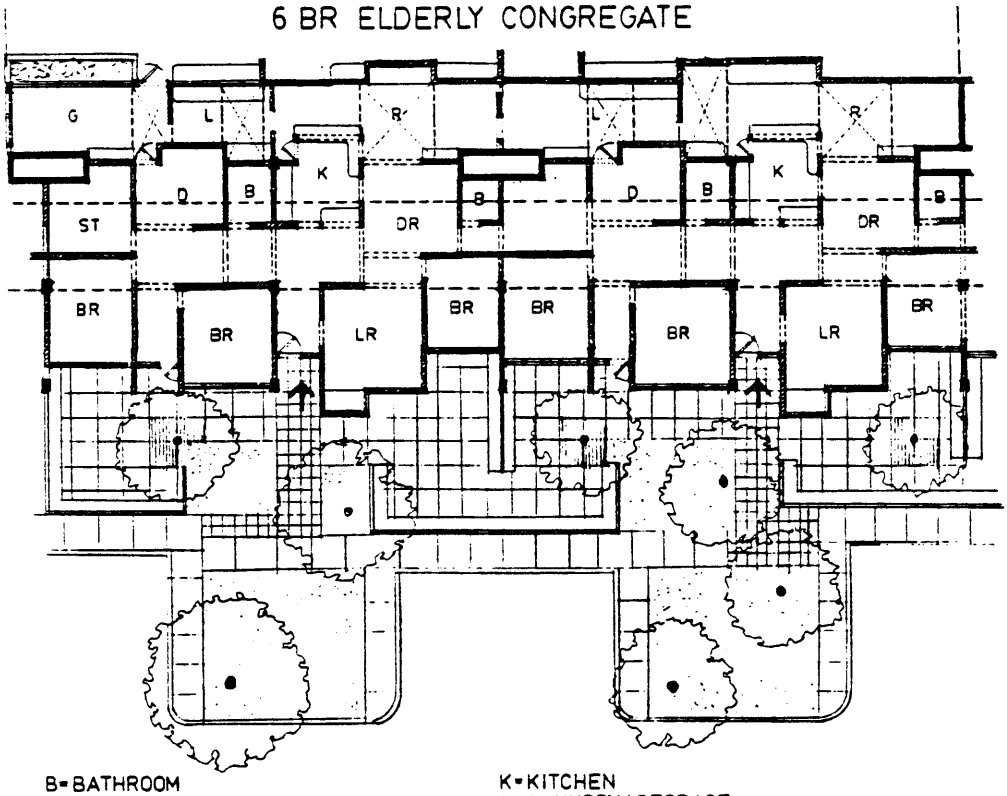


6 BR ELDERLY CONGREGATE



B = BATHROOM
BR = BEDROOM
D = DEN
DR = DINING ROOM
FR = FAMILY ROOM
G = GAMES/CRAFTS

K = KITCHEN
L = LAUNDRY / STORAGE
LR = LIVING ROOM
R = RECREATION ROOM
S = STORAGE
ST = STUDY

HOUSING TRACTABILITY STUDY

VEHICLE STUDY - LYNCH SCHOOL EDUCATIONAL SCHEME NO. 4A	GOOD	FAIR	POOR	UNACCEPTABLE	IMPROVED	LEVEL OF INVESTMENT ○ Minimal ○ Modest ○ Moderate ◍ High
EVALUATION CRITERIA						REMARKS
1. DIMENSIONS	◔	◔	◔	◔	◔	Bearing wall structural system was conceptually changed to a frame - like system. Moving the receptors for sliding panels to the edges of spaces improves the dimensional qualities of large group spaces.
a. Dimensional adequacy for interchangeable use of spaces	◔	○	○	○	◔	
b. Variety of outdoor activities dimensionally accommodated	◔	○	○	○	○	
c. Dimensional qualities of spaces by education standards	◔	○	○	○	◔	
2. CIRCULATION	◔	◔	◔	◔	◔	Overall quality of circulation is good, providing many possibilities for interchangeable use of learning spaces.
a. Accessability of group spaces to primary circulation	◔	○	○	○	◔	
b. Ability of learning areas to operate privately	◔	○	○	○	○	
c. Multiplicity of potential uses for primary circulation	◔	○	○	○	◔	
3. ENVIRONMENT	◔	◔	◔	◔	◔	Further development of deck-like additions increases their useability and improves the environment of lower level learning spaces.
a. Individual spaces access to natural light	◔	◔	○	○	◔	
b. Individual space access to natural ventilation	◔	◔	◔	○	○	
c. Level of aural/visual privacy between group spaces	◔	○	○	○	○	
4. FLEXIBILITY	◔	◔	◔	◔	◔	Tractability studies indicate that the overall framework is highly flexible and can accommodate a diverse range of housing and educational alternatives.
a. Diversity of space sizes available in a learning area	◔	○	○	○	◔	
b. Desirability of various group space adjacencies	◔	○	○	○	◔	
c. Ability to accommodate various educational patterns	◔	○	○	○	◔	
OVERALL EVALUATION	The study indicates that a tractable education /housing environment can be developed in the study vehicle. However, the complexity of the sliding panel system employed may inhibit its feasibility.					

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