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7:78
1958

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STATE OF MONTANA

TO THE HONORABLE SENATE AND HOUSE OF REPRESENTATIVES
OF THE STATE OF MONTANA
FROM THE
GOVERNOR
SUBJECT: BOZEMAN LOW-COST HOUSING
I have the honor to acknowledge the receipt of your letter of the 11th day of March, 1958, and in reply to inform you that the same has been forwarded to the proper authorities for their consideration.

Very truly yours,
[Signature]

BOZEMAN LOW-COST HOUSING

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Signature Roger Bernaf.

Date 12/16/83

BOZEMAN LOW-COST HOUSING

BY

ROGER J. BERNA JR.

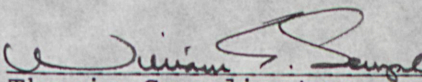
A professional paper submitted in partial fulfillment
of the requirements for the degree

of

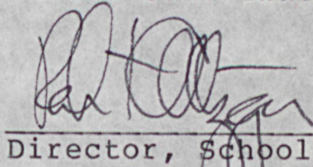
BACHELOR OF ARCHITECTURE

Approved:

Advisor



Thesis Coordinator



Director, School of Architecture

MONTANA STATE UNIVERSITY
Bozeman, Montana

June 6, 1983

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CONTENTS

Introduction.....	1
Case Studies.....	4
Site Selection.....	19
Program.....	29
Goals.....	31
Facts.....	40
Concepts.....	57
Needs.....	78
Problem Statement.....	87
Bibliography.....	90
Design Documentation.....	95

PURPOSE

The intent of this thesis will be to explore an architectural problem with a strong reality base -- Low Cost Housing for Bozeman, Montana.

INTRODUCTION

The problem of rising housing costs is a very real and pronounced problem throughout the country. This problem has affected all but the highest income levels, but has hit the low income households the hardest. These households consist mainly of young families, young singles and the elderly on fixed incomes. The traditional form of American housing -- "the American Dream" -- is the single-family, detached suburban house. This house type is just beginning to demonstrate its wastefulness in the form of its present high costs. A new, or perhaps not so new form of housing is what is needed, one that makes more efficient use of land and resources. Cluster housing, as man discovered long ago, serves just these purposes. Long ago, man's settlements were all built quite densely, until industrialization and poor living conditions persuaded people to seek residence outside of cities in green belts -- the birth of the suburb.

Attempts have long been made to reduce housing costs. These have included innovations in construction, which concentrates on prefabrication. At the sacrifice of variety and flexibility, prefabrication can reduce costs, but if individual identity is

important, this is unacceptable. I believe that more appropriate innovations will come in the area of financing, and in new challenges to life-styles. With greater amounts of cooperation, density can be increased at the ground level, more effectively utilizing land and reducing costs.

BACKGROUND

In Bozeman, the low-cost housing shortage has been due in part to a lack of awareness and appropriate supply of housing. Further problems have been caused by the university student rental market. In renting for only nine months of the year, landlords can demand higher rents. With the university population growing, there is even greater demand, and incentive for increased rents. Presently there are 821 units for \$160/month or less; however, 189 of these units are restricted to married MSU students, and 33 to MSU faculty. This leaves only 599 low rent units available in Bozeman, out of a total supply of 4,377 units. The recent increases in rents that have been occurring will only decrease this supply further.¹

New construction has also produced problems. There is a plentiful supply of land, but a low availability due to the practice of speculation. The recent depression that occurred in the housing market further added to the problem of lowered supply. When little housing is being built, no vacancies are created, causing increased rents, crowded conditions, and people being forced to live in sub-standard housing.

¹Jeffrey R. Towery, "Findings and Recommendations of the Committee to Study Low-Income Housing," Letter submitted to the Bozeman City Commission, August 23, 1982.

In Bozeman, the trend in housing has been for newcomers entering the market, to start at the bottom, renting, and then to work their way up to ownership. Unfortunately, costs for low-cost housing are rising faster than those of high-cost housing; therefore, people entering the market are forced to accept less and less quality in their housing.²

Increasing rents and inappropriate supply, have now made the need for low-cost housing in Bozeman severe. To deal with the problem, a concerned citizens group has arisen -- the Bozeman Fair Housing Coalition. This group has at present stated 3 goals: 1) to increase the availability of affordable housing, 2) to improve the present conditions of housing, and 3) to broaden community awareness of the problem.

²Bozeman City-County Planning Board, Housing Element, 1977.

CASE STUDIES

PROJECT: Banneker Homes, San Francisco -- Joe Esherick.³

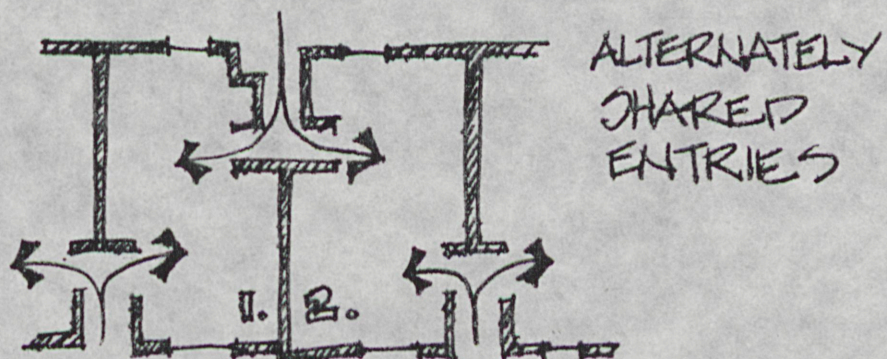
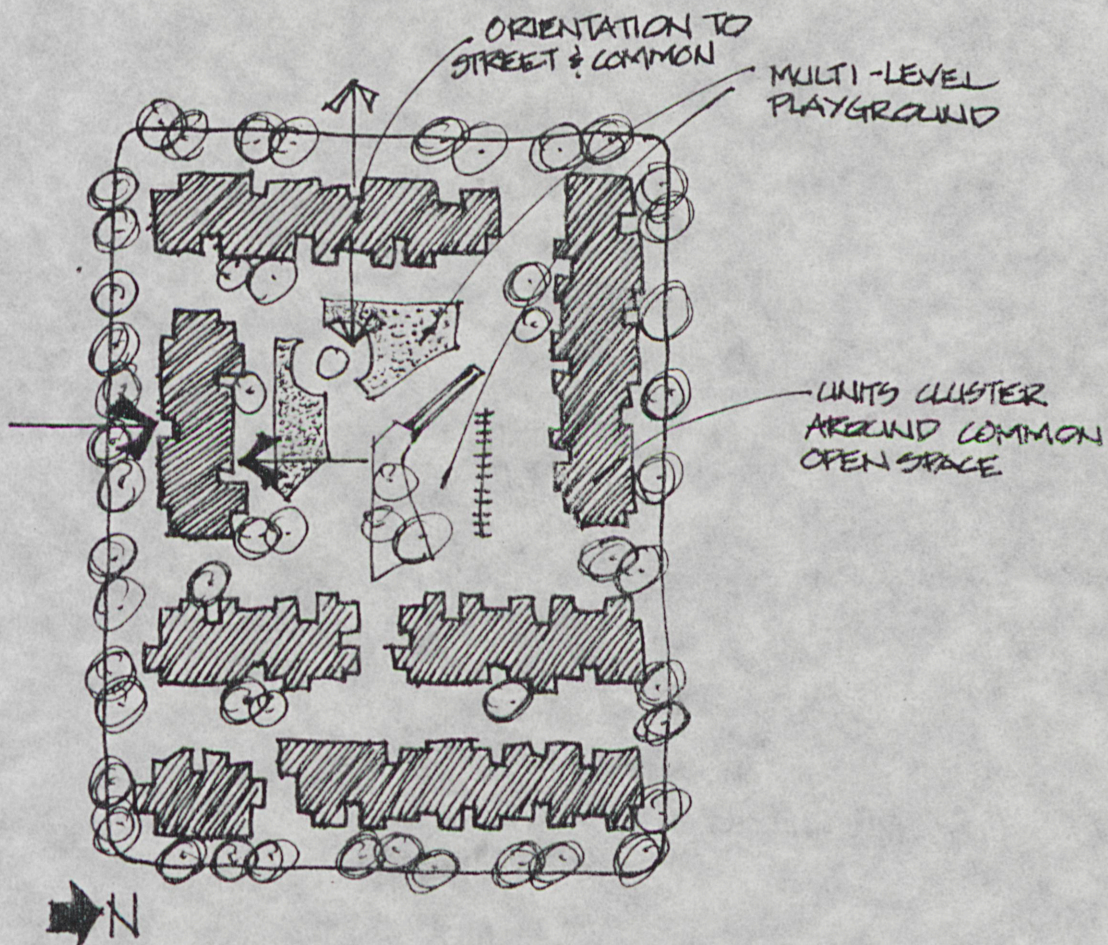
DATE: 1971

SITE: Former brewery in San Francisco.

DENSITY: 50 du/acre; 108 units total.

BUILDING TYPE: 3 story walk-up.

FINANCING: FHA 221d(3) rental housing.



PROJECT: Reno Street Housing, Philadelphia, Pen. -- Joe Jordan.⁴

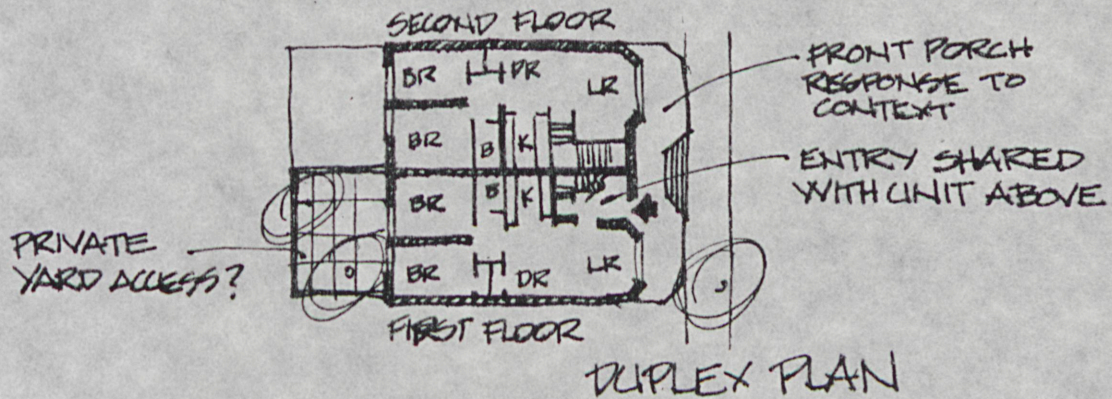
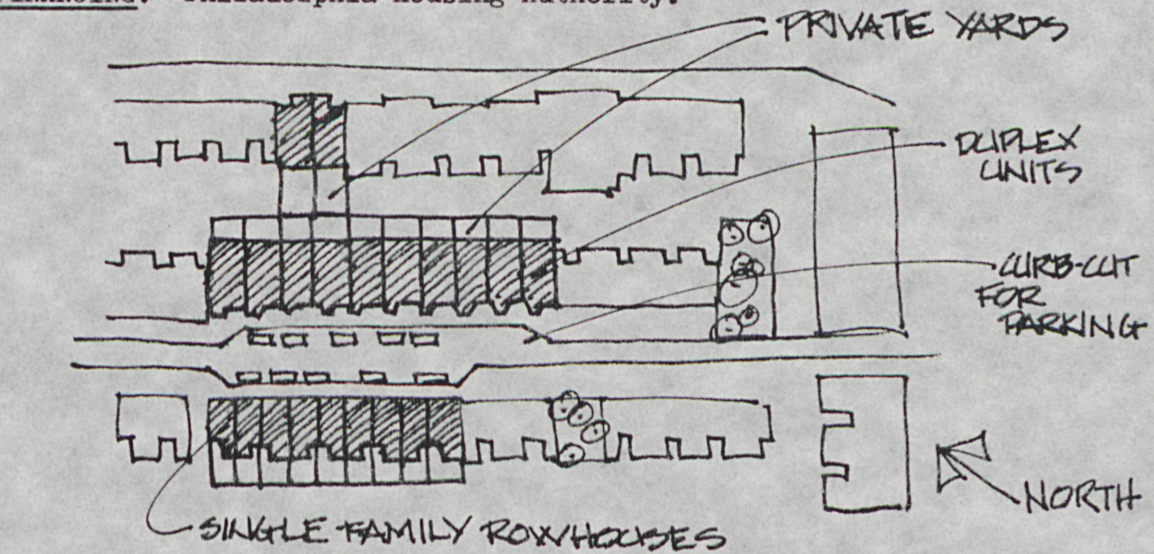
DATE: 1971

SITE: Urban infill.

DENSITY: High density

BUILDING TYPE: 2 story rowhouses.

FINANCING: Philadelphia Housing Authority.



PROJECT: Martin Luther King Jr. Community, Hartford, Conn. -- Hartford Design Group.

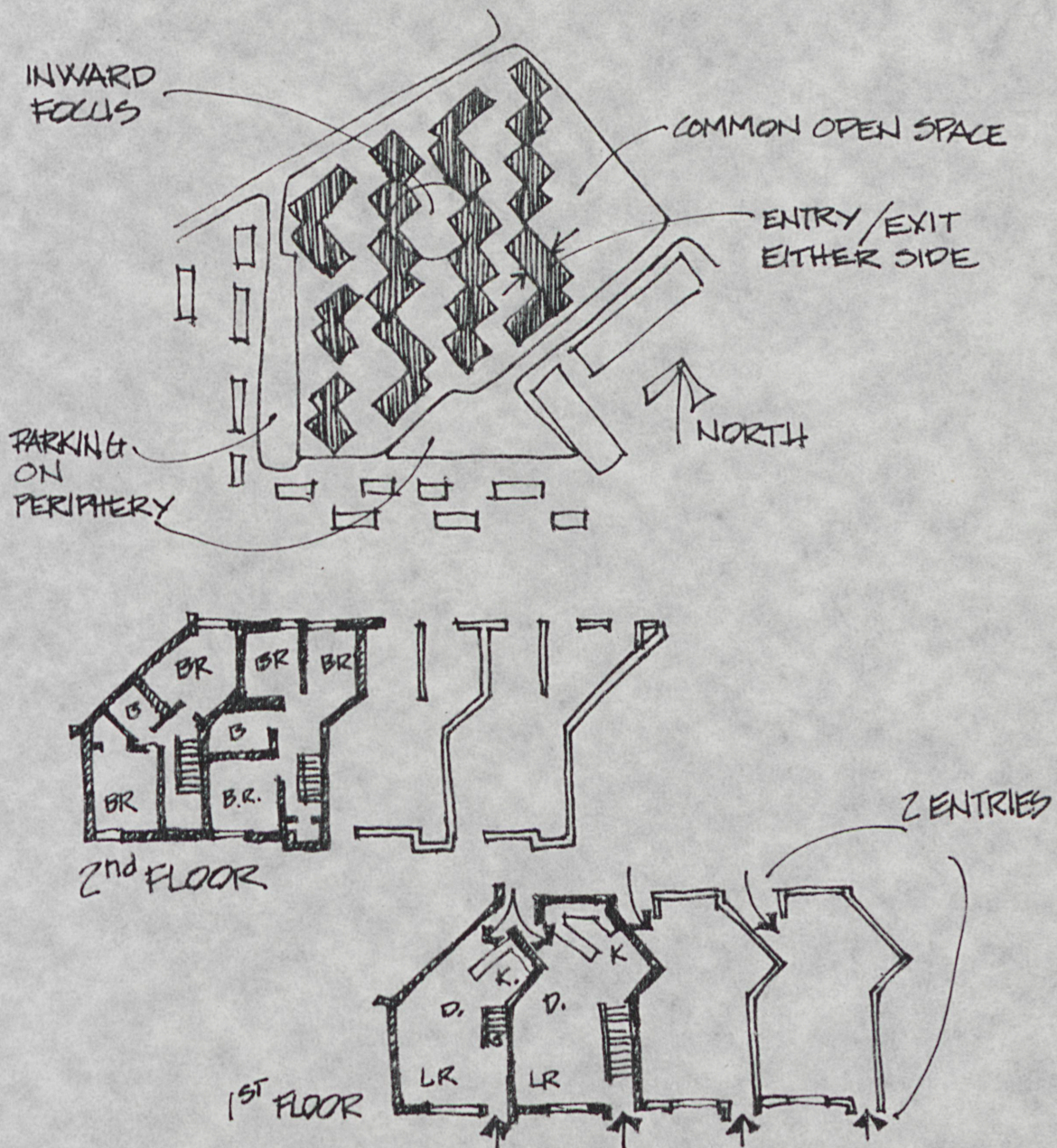
DATE: 1971

SITE: Urban residential / industrial

DENSITY: 20 du/acre

BUILDING TYPE: 2 story rowhouse.

FINANCING: 221d(3)



PROJECT: Harmony House and Canterbury Gardens, New Haven, Conn. --
Loius Sauer.⁶

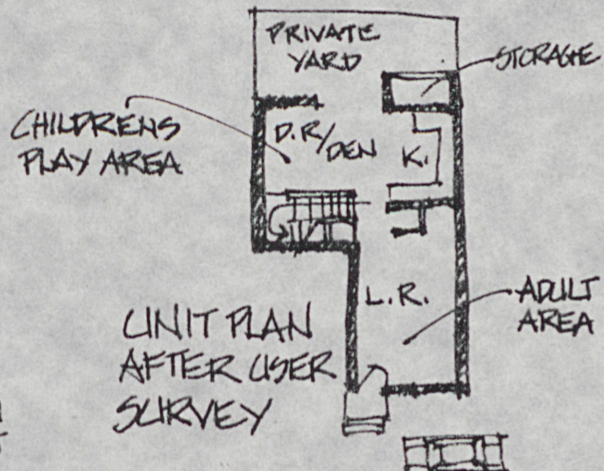
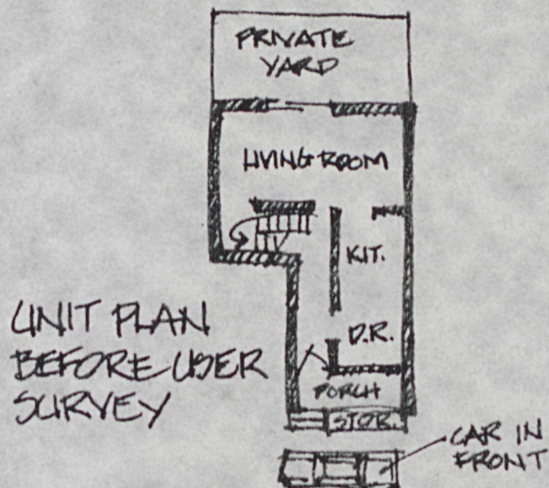
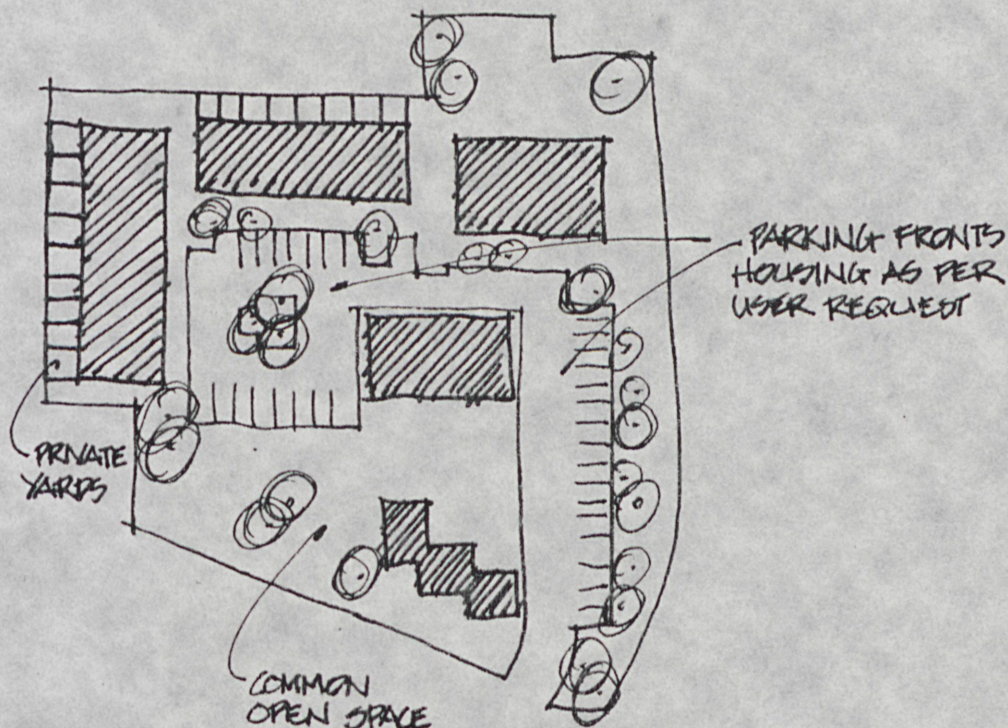
DATE: 1972

SITE: Urban renewal sites in New Haven.

DENSITY: 22 du/acre:

BUILDING TYPE: 2 story rowhouses.

FINANCING: H.U.D. 221d(3) and 236 programs.



PROJECT: Mott Haven Infill, South Bronx, N.Y. --Ciardullo-Ehmann.⁷

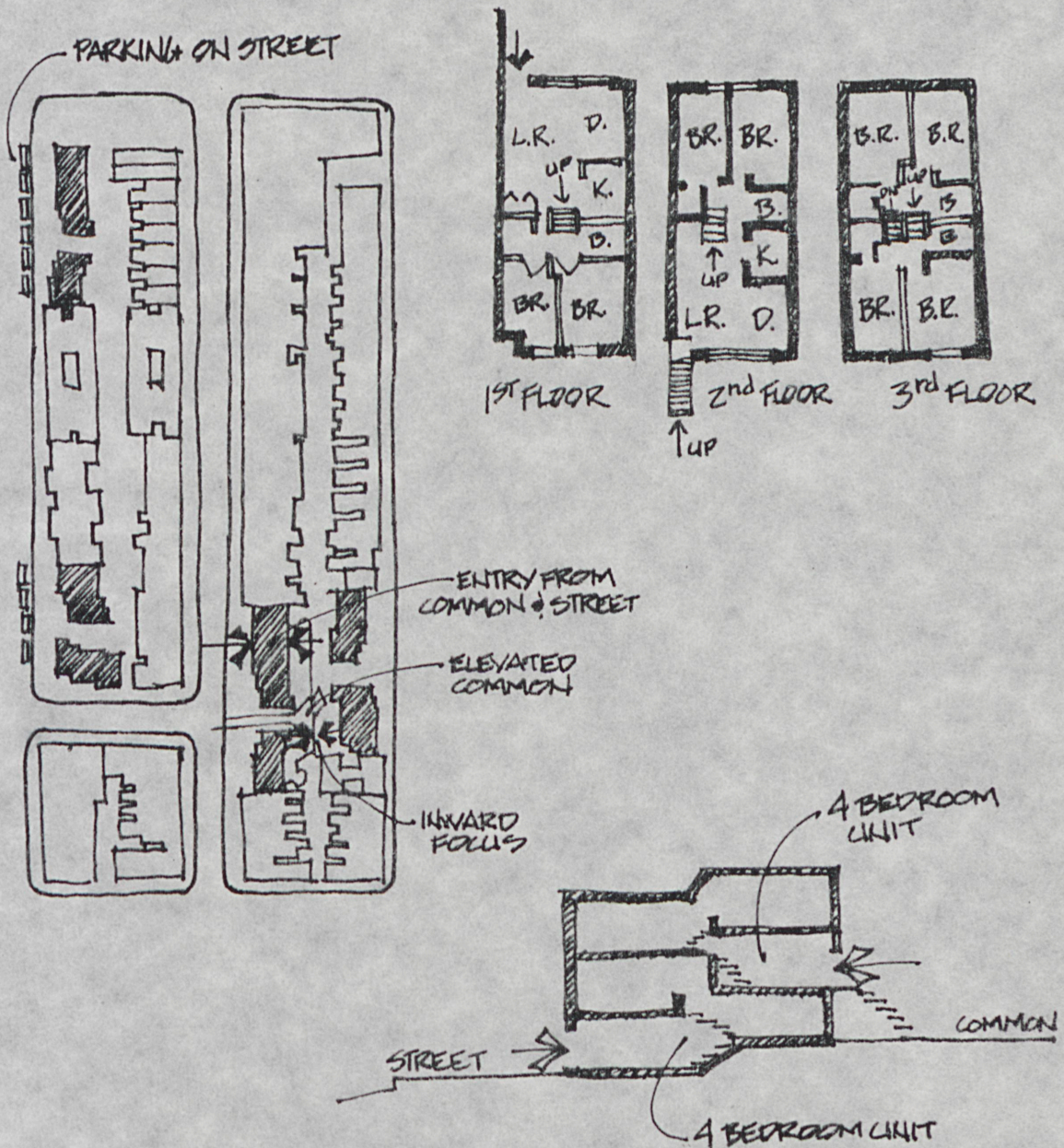
DATE: 1976

SITE: Depressed urban neighborhood

DENSITY: 50 du/acre

BUILDING TYPE: 3 story rowhouse.

FINANCING: 236 rental program.



PROJECT: Charlesview Housing, Allston, Mass. -- PARD Team. ⁸

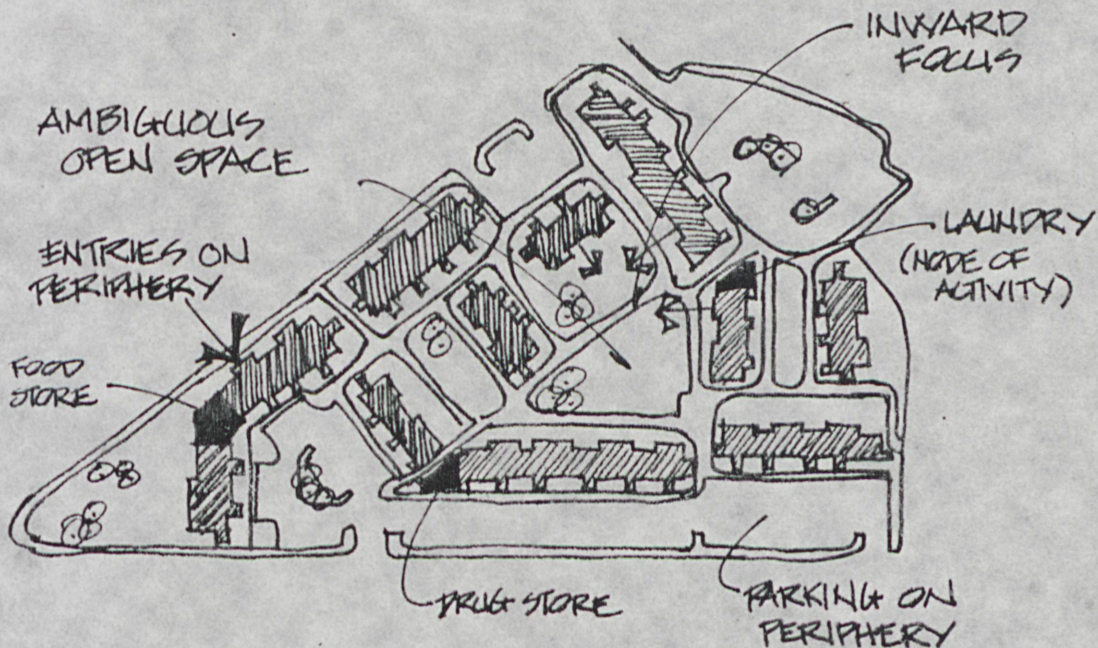
DATE: 1966

SIZE: 6.5 acres suburban.

DENSITY: 32 du/acre; 212 units total.

BUILDING TYPE: 4 story duplex apartments.

FINANCING: H.U.D. 221d(3)



"INWARD ORIENTATION TO CREATE A NEIGHBORHOOD"

THE SITE PLAN IS A FAILURE DUE TO BUDGET CUTS THAT ELIMINATED FENCES THAT WERE ESSENTIAL FOR PRIVACY AND SPACE DEMARKATION.

PROJECT: Low-income housing, Boston -- Samuel Paul.⁹

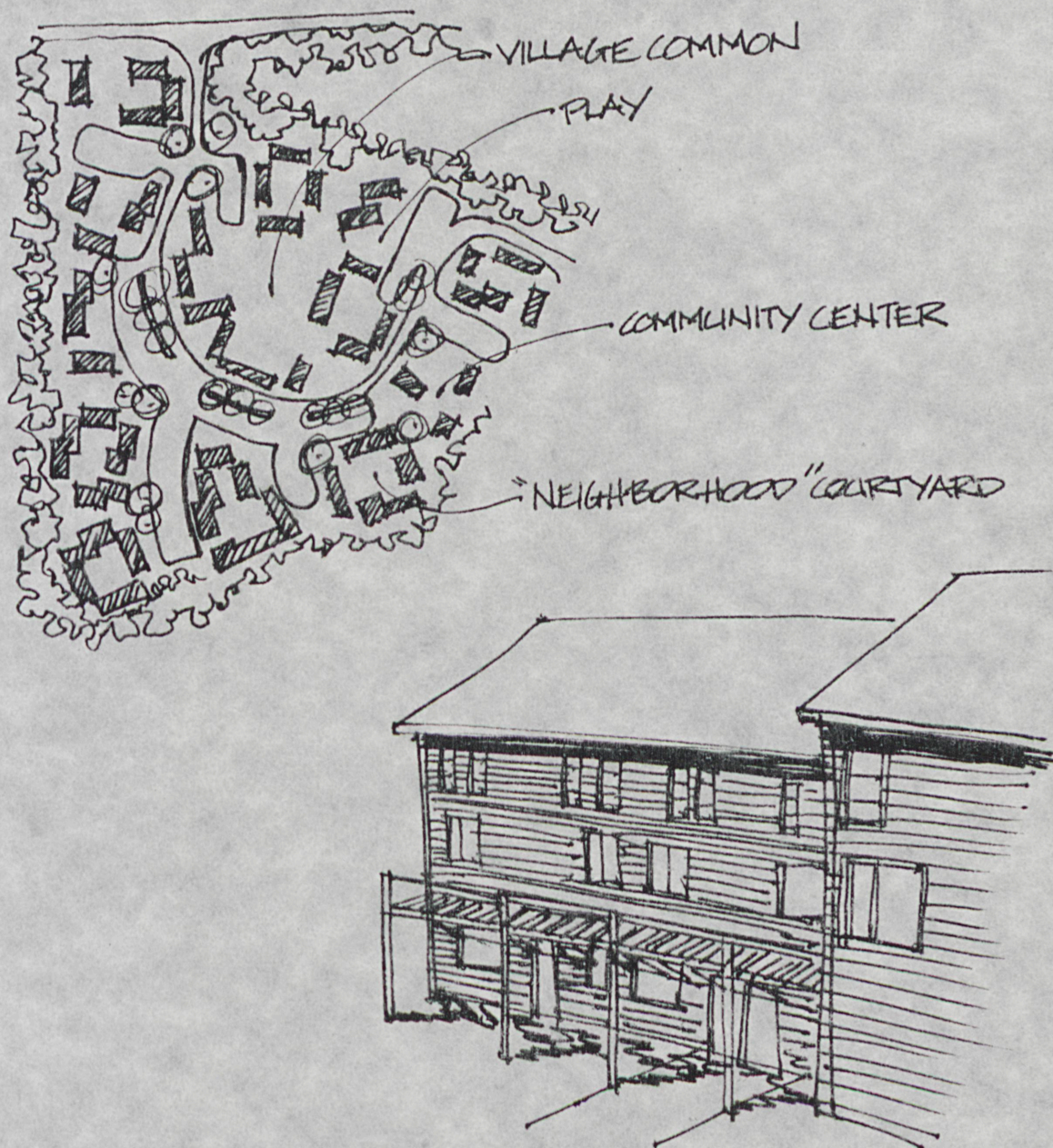
DATE: 1972

SITE: Large suburban tract (16+ acres).

DENSITY: 25 du/acre; 404 units total.

BUILDING TYPE: 3 story rowhouses.

FINANCING: F.H.A. 236 program.



PROJECT: Ramapo Housing, Suffern, N.Y. -- Meckler-Koeppel.¹⁰

DATE: 1972

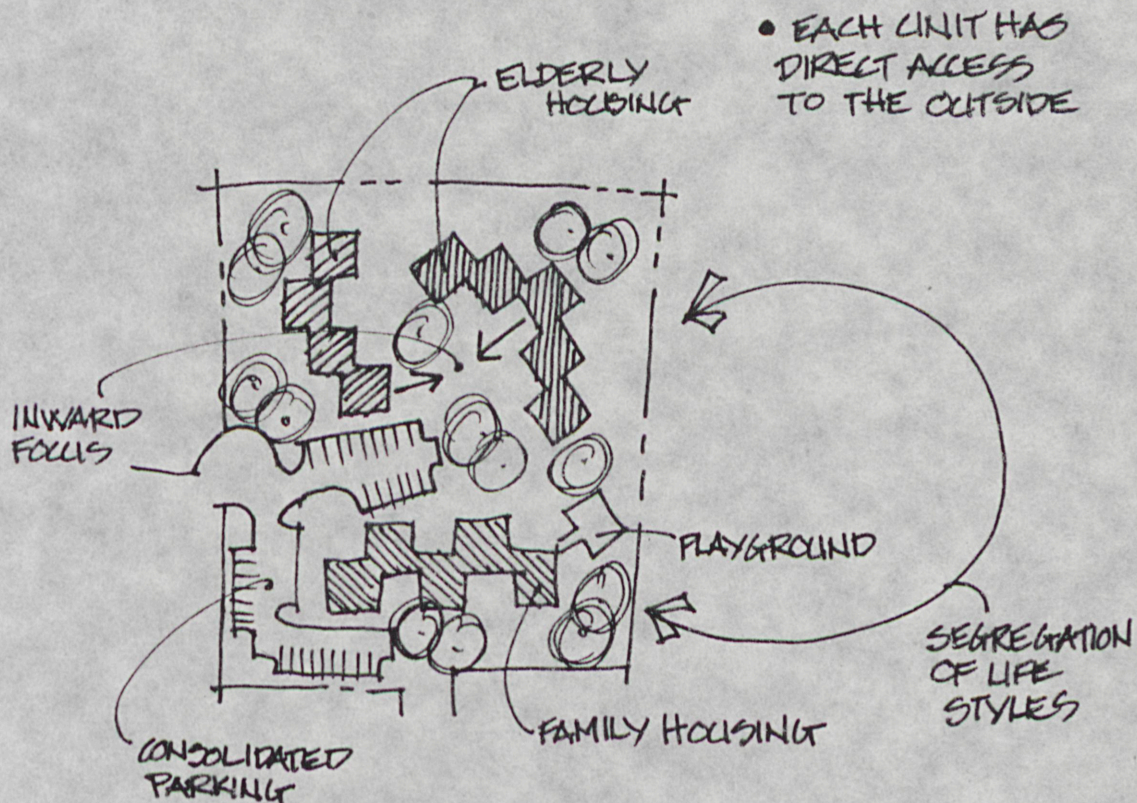
SITE: 4.6 acres, suburban.

DENSITY: 17 du/acre; 78 units total. (75% elderly and 25% families)

BUILDING TYPE: One and two-story townhouses.

FINANCING: H.U.D. turnkey.

- **COST BREAKDOWN**
TOTAL COST \$1,707,484
SITE ACQUISITION - 10%
SITE IMPROVEMENT - 10%
DWELLING CONSTR. - 60%
A&E FEES - 5%
OVERHEAD - 10%



PROJECT: Walnut Hill Apartments, Haverstraw, N.Y. -- Smotrich & Platt.¹¹

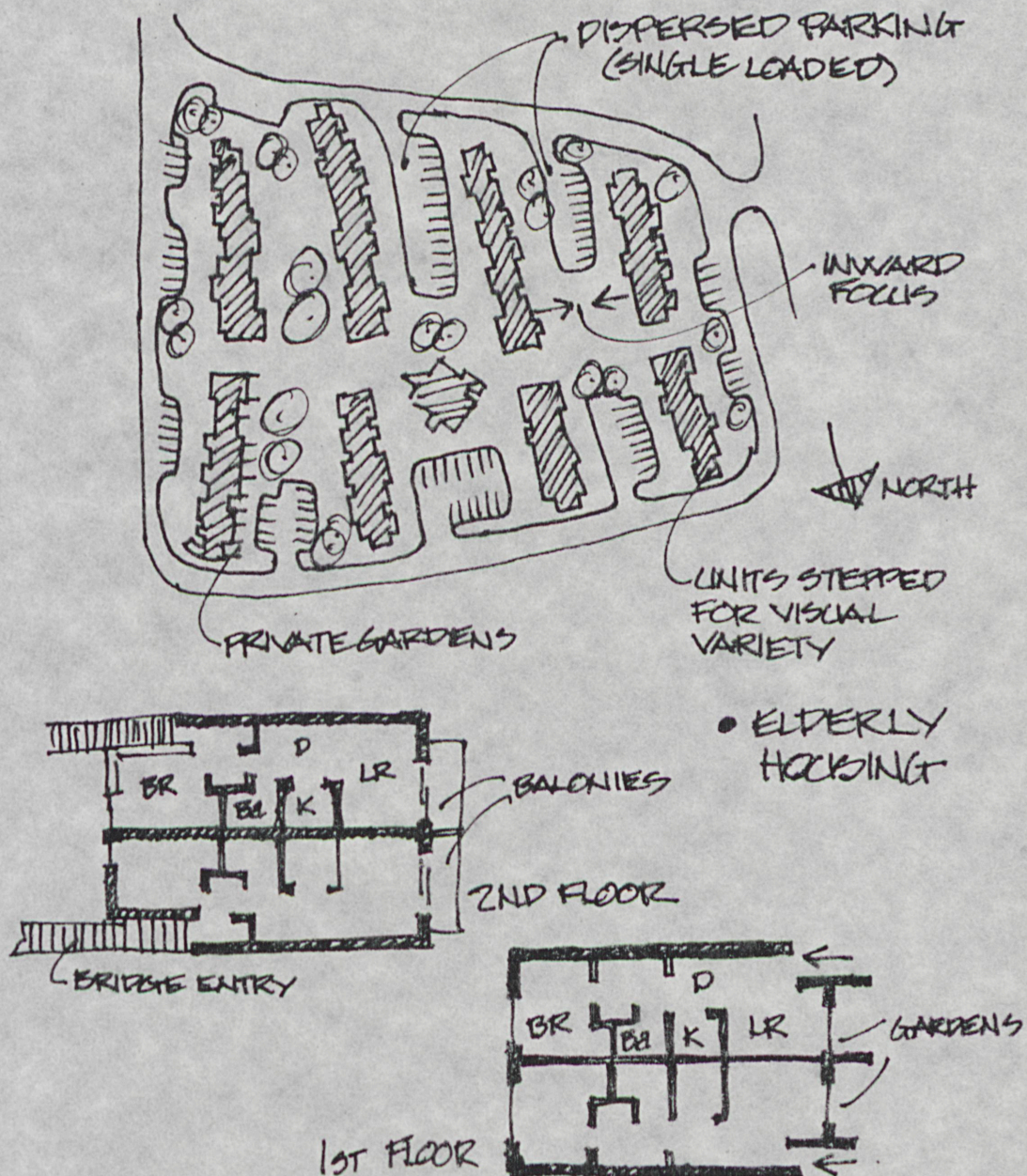
DATE: 1978

SITE: 7.75 acres, suburban.

DENSITY: 23 du/acre; 180 total.

BUILDING TYPE: 2 story rowhouse.

FINANCING: 236 Rental.



PROJECT: Jefferson Square Housing, Northfield, Mn -- Arvid Elness. 12

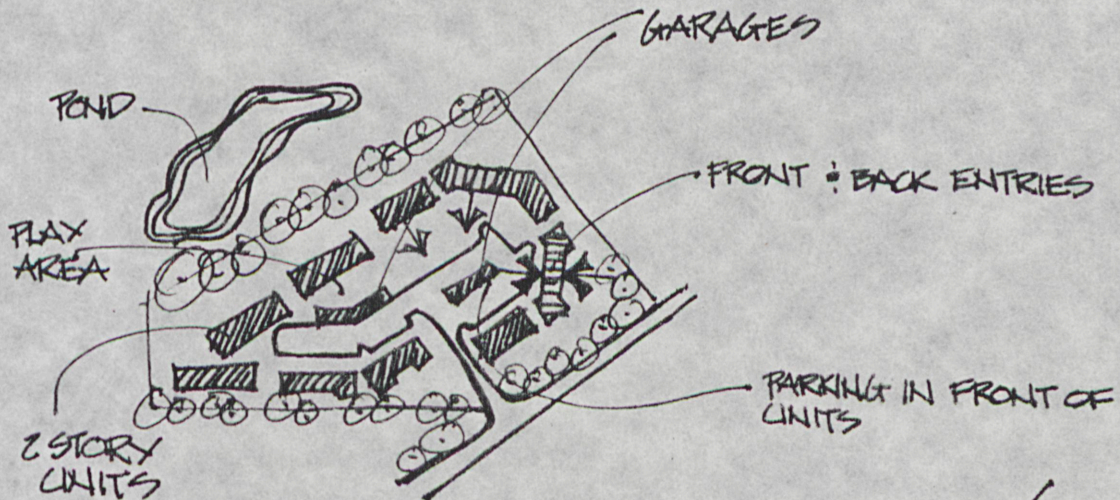
DATE: 1982

SITE: 5.5 acres, suburban.

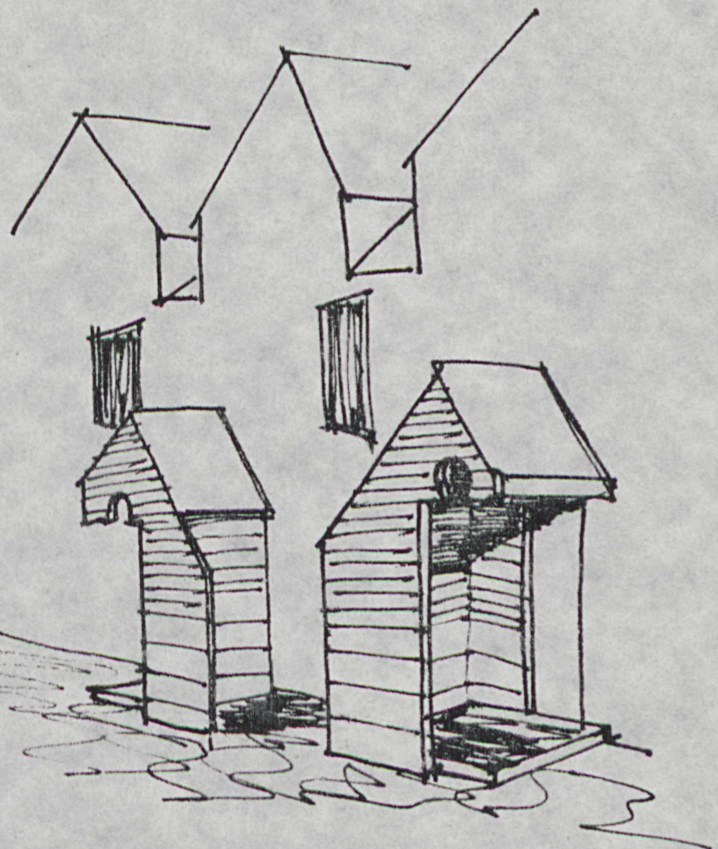
DENSITY: 9 du/acre; 50 units total.

BUILDING TYPE: 2 story townhouses.

FINANCING: H.U.D. section 8.



"ENTRY ELEMENT"
(EACH UNIT ENTERED
ON GRADE)



PROJECT: Cabrillo Village, Saticoy, CA. -- John V. Mutlow.¹³

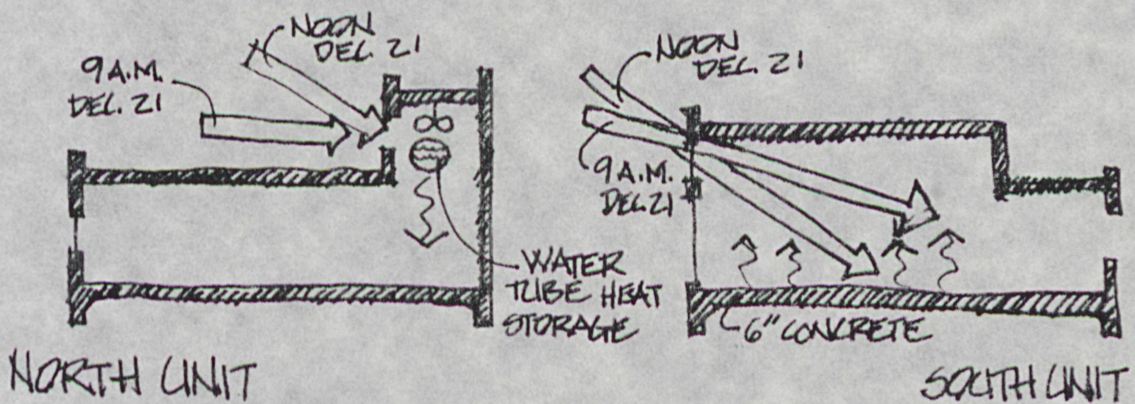
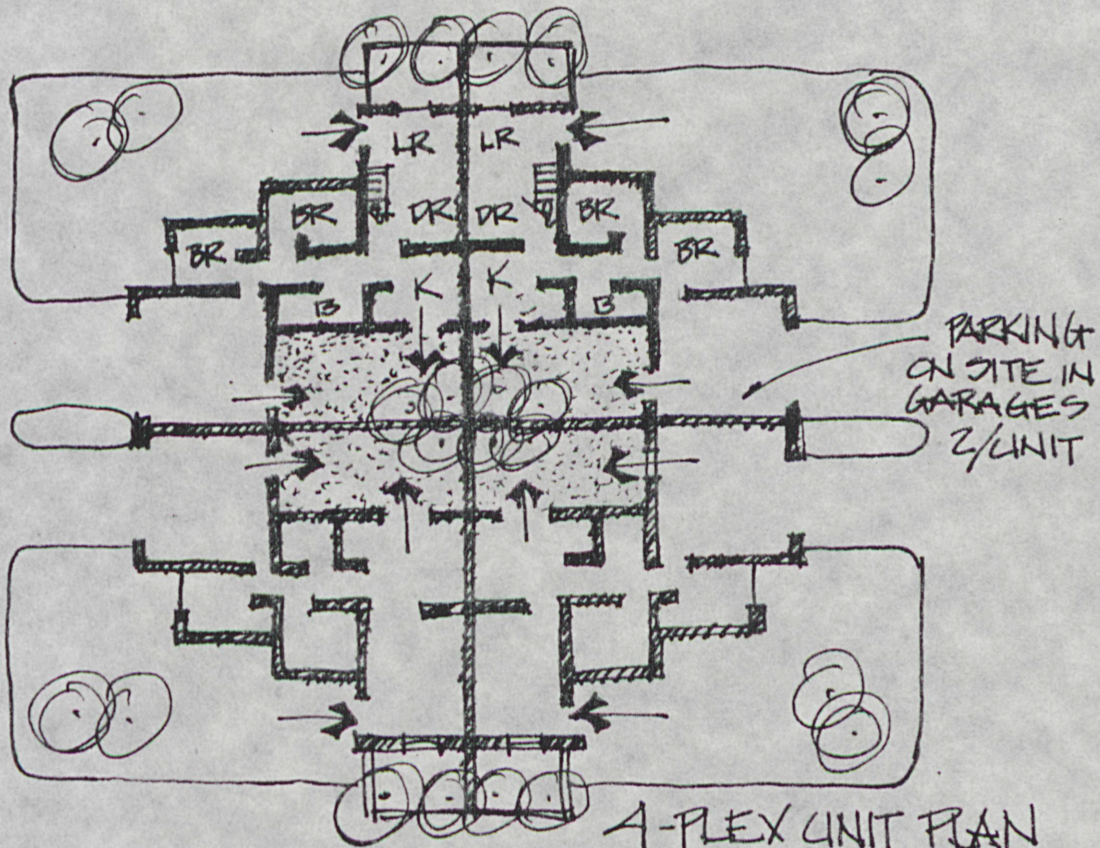
DATE: 1982

SITE: Rural farm village.

DENSITY: Medium density.

BUILDING TYPE: 2 story 4-plex units.

FINANCING: F.H.A. resident owned.



What I hoped to find in these case studies was: 1) a dominant, preferred building type, 2) site arrangement of open space and parking, and 3) something about the aesthetics -- the favored styles, details, and materials.

My findings indicate that the preferred building type is the two-story rowhouse. This building type is most preferred for families because it affords a separate ground level access to each unit. In terms of site arrangement, my findings are that parking is predominantly placed on the periphery, and that the buildings cluster around the open space. In terms of aesthetics, I find the majority of the units use conventional wood frame construction, with a finish of wood or brick. Details on the whole are very stark and plain. Styles varied greatly, and seemed more dependent upon the context of the site.

NOTES

³James D. Morgan, "Low Income Housing," Architectural Record, October 1971, pp. 130-131.

⁴Ibid, pp. 132-133.

⁵Sharen Lee Ryder, "Who's Going to Live Here, Anyhow?" Progressive Architecture, May 1971, pp. 110-111.

⁶Louis Sauer, "Differing Fates For Two Nearly Identical Housing Developments," AIA Journal, February 1977, pp. 26-27.

⁷Mildred F. Schmertz, "Design Alternatives for Low- To Moderate-Income Urban Housing," Architectural Record, August 1976, pp. 114-116.

⁸Andrea O. Dean, "Evaluation: A Subsidized Housing Development Designed to Turn Inward Upon Itself," AIA Journal, February 1977, pp. 20-25.

⁹"Apartments of the Year," Architectural Record, mid-May 1973, pp. 104-105.

¹⁰William J. Roberts, "Low Income Housing With Amenities," AIA Journal, August 1972, p. 50.

¹¹Barclay F. Gerdon, "Apartments of the Year," Architectural Record, mid-May 1978, pp. 120-121.

¹²Jennifer A. Wagner, "Low-Cost Family Housing - With a High-Cost Townhouse Look," Housing, July 1982, pp. 40-42.

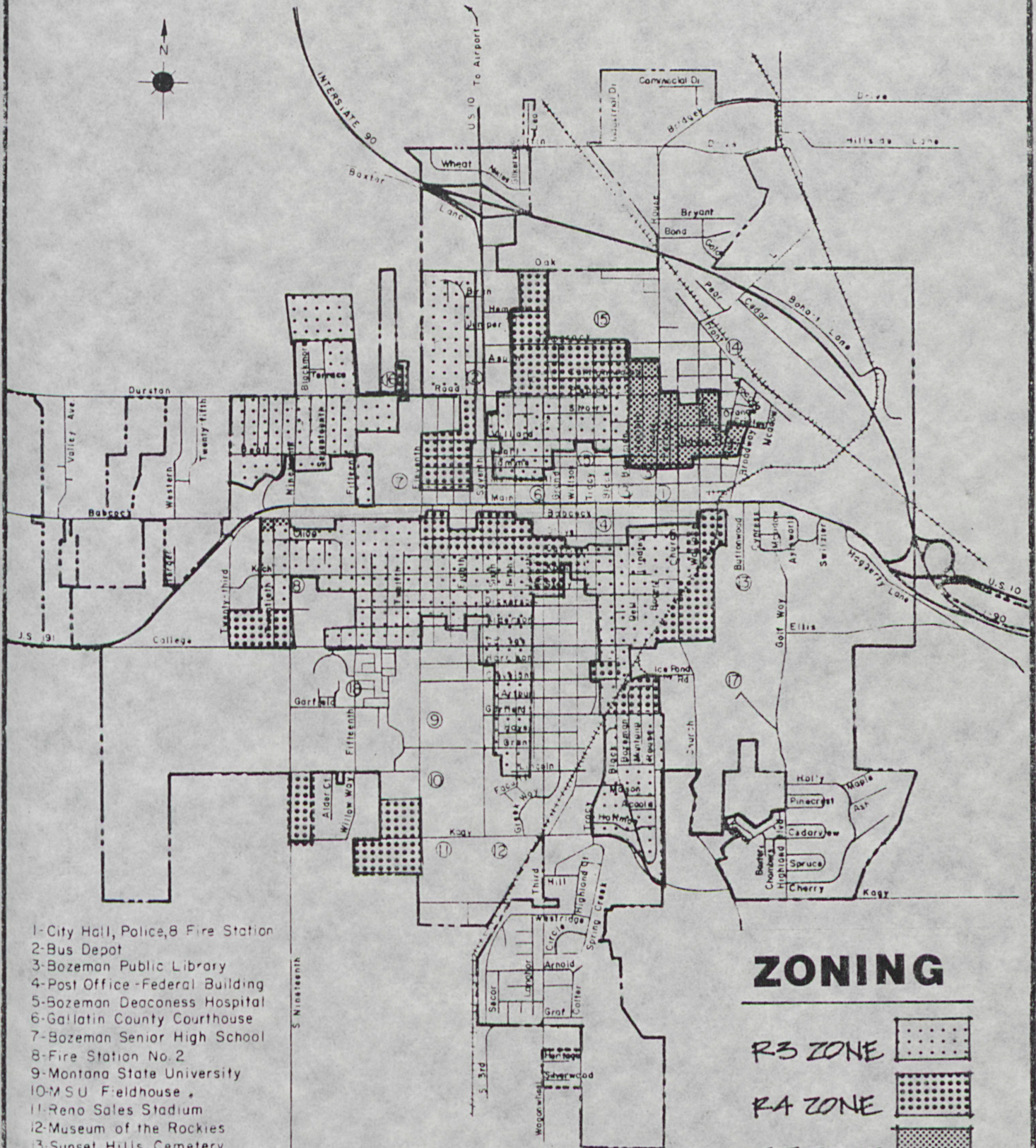
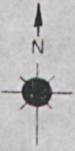
¹³Barbara Goldstein, "Harvest the Sun," Progressive Architecture, April 1982, pp. 13-15.

SITE SELECTION

The distances used in the following maps, were based on criteria for maximum acceptable walking distances, as given by Joseph De Chiriara and Lee Koppelman in their Manual of Housing Planning and Design Criteria, (Englewood Cliffs, N.J.: Prentice Hall, 1975), p. 56.

CITY OF BOZEMAN MONTANA

Revised October, 1980



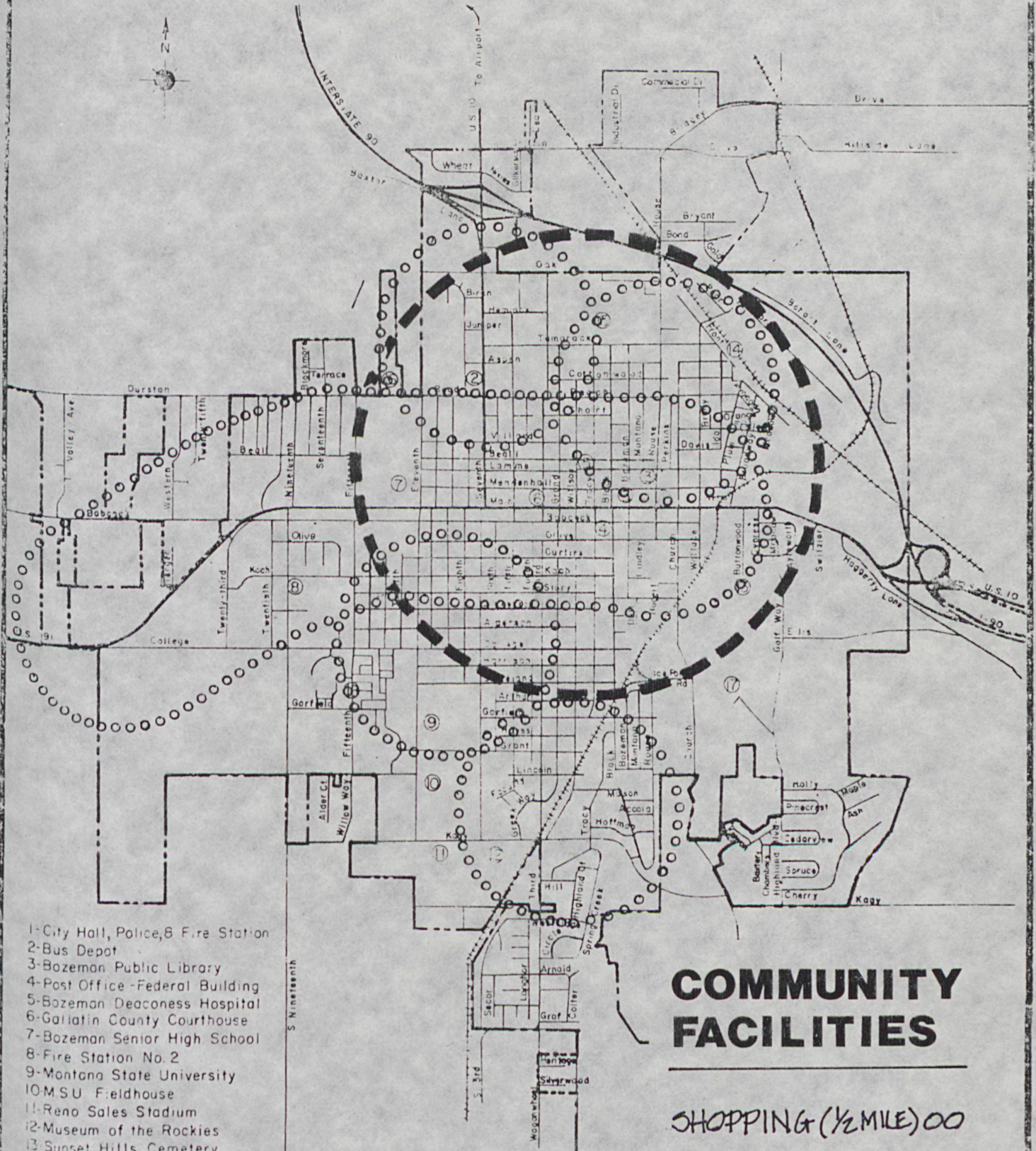
- 1-City Hall, Police, Fire Station
- 2-Bus Depot
- 3-Bozeman Public Library
- 4-Post Office-Federal Building
- 5-Bozeman Deaconess Hospital
- 6-Gallatin County Courthouse
- 7-Bozeman Senior High School
- 8-Fire Station No. 2
- 9-Montana State University
- 10-MSU Fieldhouse
- 11-Reno Sales Stadium
- 12-Museum of the Rockies
- 13-Sunset Hills Cemetery
- 14-Amtrak Depot
- 15-Gallatin County Fair Grounds
- 16-Gallatin County Rest Home
- 17-Hillcrest Home
- 18-MSU Student Housing

ZONING

- R3 ZONE
- R4 ZONE
- R5 ZONE

CITY OF BOZEMAN MONTANA

Revised October, 1980



- 1-City Hall, Police, 8 Fire Station
- 2-Bus Depot
- 3-Bozeman Public Library
- 4-Post Office - Federal Building
- 5-Bozeman Deaconess Hospital
- 6-Gallatin County Courthouse
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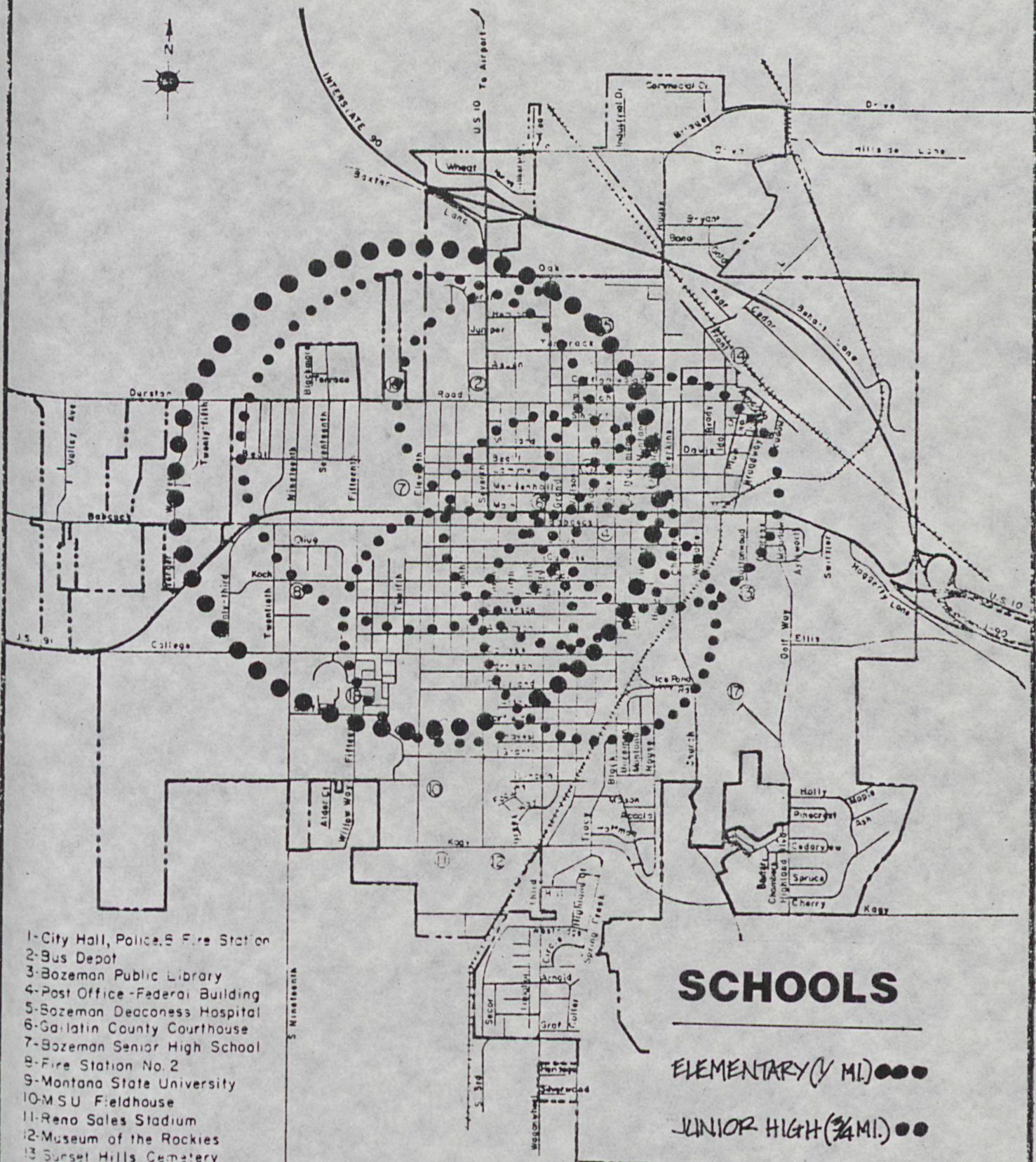
COMMUNITY FACILITIES

SHOPPING (1/2 MILE) ---

HOSPITAL (1 MILE) ===

CITY OF BOZEMAN MONTANA

Revised October, 1960



- 1-City Hall, Police, Fire Station
- 2-Bus Depot
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- 18-MSU Student Housing

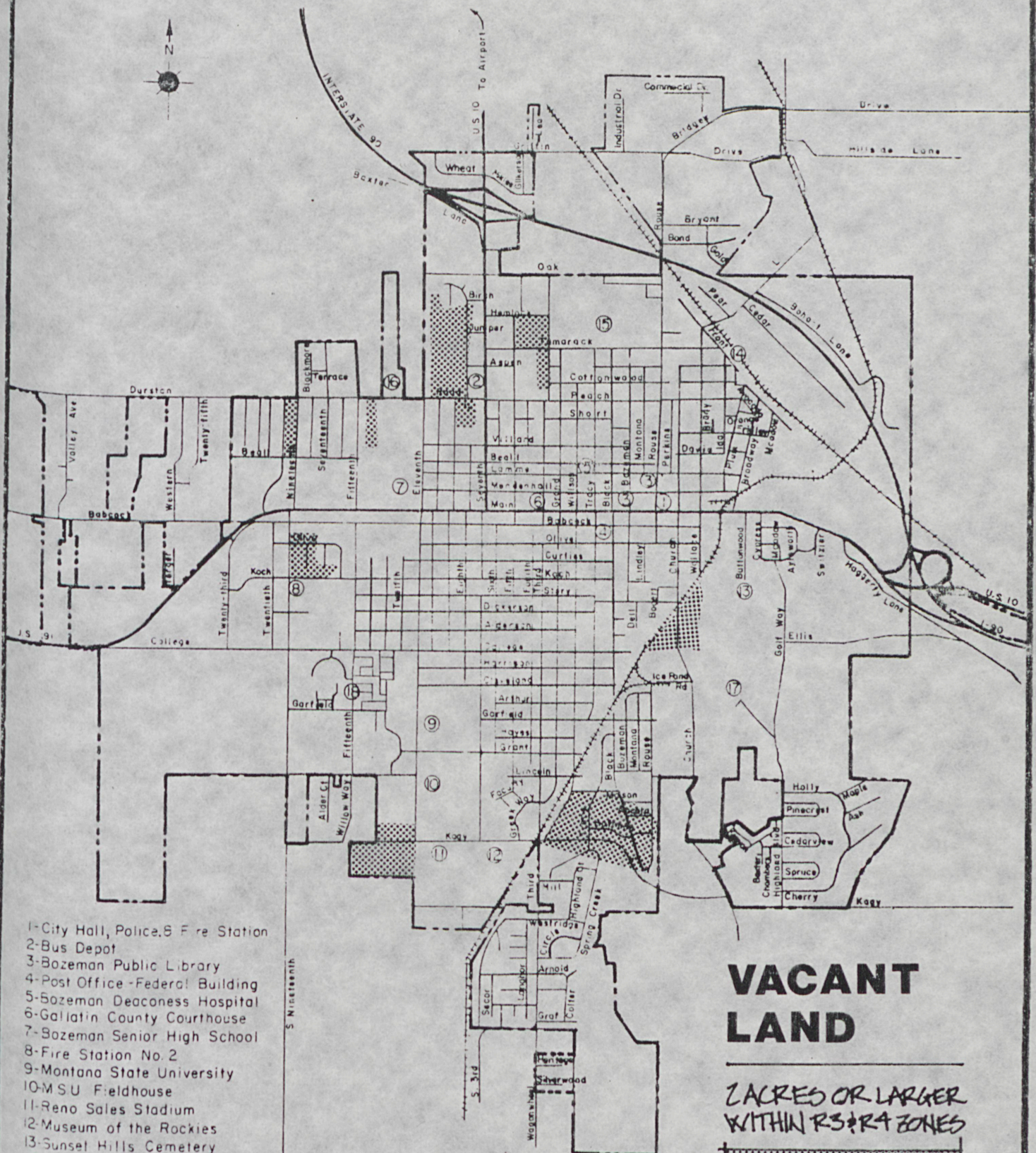
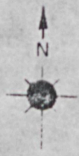
SCHOOLS

ELEMENTARY ($\frac{1}{4}$ MI.) ●●●

JUNIOR HIGH ($\frac{3}{4}$ MI.) ●●

HIGH SCHOOL (1 MI.) ●●●●

Revised October, 1980



VACANT LAND

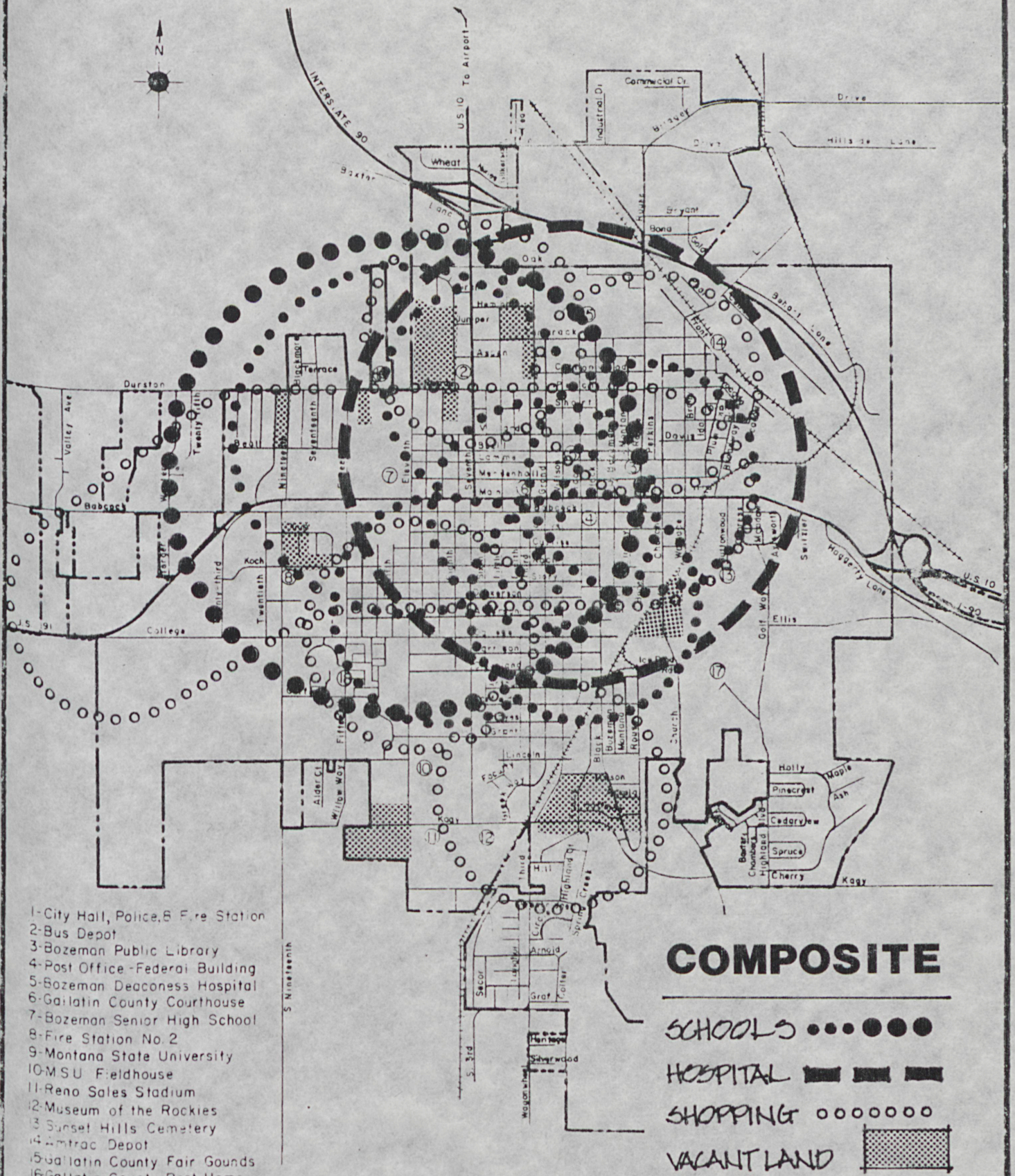
2 ACRES OR LARGER
WITHIN R3 & R4 ZONES



- 1-City Hall, Police, & Fire Station
- 2-Bus Depot
- 3-Bozeman Public Library
- 4-Post Office -Federal Building
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CITY OF BOZEMAN MONTANA

Revised October, 1960



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- 17-Hillcrest Home
- 18-MSU Student Housing

COMPOSITE

SCHOOLS ●●●●●●●●

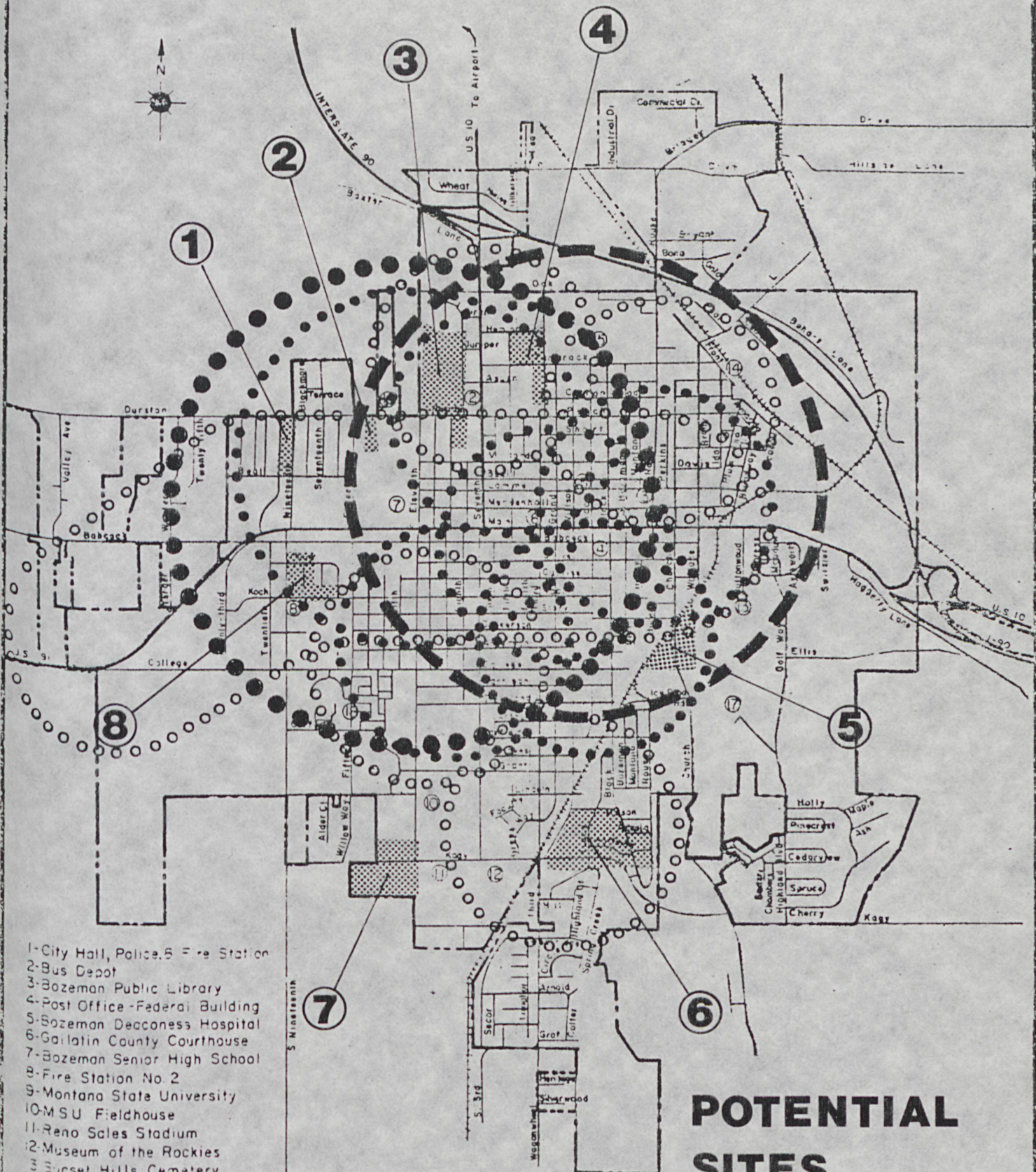
HOSPITAL ■■■■■■

SHOPPING ○○○○○○

VACANT LAND ■■■■■■

CITY OF BOZEMAN MONTANA

Revised October, 1960



- 1-City Hall, Police, Fire Station
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- 18-MSU Student Housing

POTENTIAL SITES

SITE SELECTION

SITE ONE: The lot configurations in this area, limit the ability to cluster units and increase density. This site would best be suited for duplexes and smaller developments.

SITE TWO: This site may be too small for the necessary number of units and required parking. This site would be best suited for a small, and lower density duplex development.

STIE THREE: Access to this site is a problem. The only vehicular access is off of N. 7th Avenue. Pedestrian circulation is also a problem as 7th has no sidewalks. Pedestrian /vehicle conflicts will also occur when children cross 7th to attend school. Living in this area would necessitate vehicle use as it is the only way to travel 7th -- something which is not encouraged in this project.

SITE FOUR: The R4 zoning of this site is best suited for the high density development proposed. Both its size and configuration, make this site amenable to cluster development. This site is also most convenient, with most services within acceptable walking distances. This site is my choice for this project.

SITE FIVE: This site is also known as "Pete's Hill," a popular winter sled run. Development of this site would meet with

much community opposition; in addition, the steep topography of this area would make development costly.

SITE SIX: Most of the land still vacant in this area lies in flood plains, or in too small of parcels to develop adequately.

SITE SEVEN: This site lies out of the range of convenient access. Its location also gives it greater university focus, which is not desired.

SITE EIGHT: The subdivision characteristics of this area favor smaller duplex developments. This site is also on the fringe of convenient access.

PROGRAM

The following program was developed using the method proposed by William Pena in his book, Problem Seeking, (Boston: Cohners Books International, 1977).

GOALS

A. FUNCTION - the relation to the user to the building.

MISSION

The mission of this project is first to provide quality, affordable housing for low and moderate income households, and second to serve as a model for future developments, mainly in the private sector. This project must address the present wastefulness of land in present developments and address the shortage of supply.

The number of units to be provided, can only be reasonably speculated at this time. Analyzing the present need as provided by the HRDC (Human Resource Development Council), which is in charge of administering the Section 8 rent subsidies, and by considering the effects of recent losses due to destruction of existing housing or renovation into other uses, gives some indication of the possible need. The HRDC presently has 53 families on the waiting list for rental assistance. As the HRDC's allocation of 115 units for this area is already filled, the needs of the families on this waiting list must be met in some other way.³

In terms of housing losses, 47 units were recently lost due to the destruction of the Legion Housing complex, and 24 others were

³Ed Sypinski, interview held at the Human Resource Development Council, Bozeman, Montana, January 1983.

lost in the recent renovation of the Range Hotel. Other destructions and renovations have pushed the total to more than 100 units (mostly singles).

If it is assumed that the creation of any new housing will create some vacancies, the development of a maximum of 100 units of low and moderate income housing, half of which being family units, should fill most of the present need.

Above all families should take priority in any development as they have perhaps the least amount of alternatives to choose from in supplying their housing needs, and have the least possible mobility of all the household types.

INDIVIDUAL IDENTITY

The expression of the individual within the community is a priority, since the loss of identity can further reduce a person's self concept -- something unacceptable for a person already underprivileged and limited in possible choices.

PRIVACY and INTERACTION

There are two levels of privacy to be considered; the first is that of the individual. The family home must be private and free from unwanted social, visual or noise intrusions. The second level of privacy is that of the development. Unwanted intrusions from outsiders must be prevented. Interaction, instead must occur where residents can control its extent and time of occurrence.

Interaction will be an important element in the development of the project community that is desired. Interaction among residents should be encouraged in shared spaces, such as:

gardens, greenhouses, tool libraries, recreation spaces, meeting rooms, laundry rooms, and day care centers.

It is also desired to encourage some form of interaction with the outside community to avoid feelings of isolation among the residents. To this end it has been suggested that some form of economic development be included in this project. Suggested uses have been food co-ops and laundromats.⁴

VALUES

The individual is highly valued by the client. Self-sufficiency and independence will help the low income person, both economically and psychologically through an improved self image.

ACTIVITIES

Activities that promote the development of community and a common group focus, should be encouraged. Shared facilities, compactness of design and an emphasis on pedestrian circulation, can all help to develop a strong sense of community, through common group focus and cooperation.

RELATIONSHIPS

Priorities -

1. FAMILIES -- 2. NEIGHBORHOOD -- 3. CITY

Security - The design should encourage neighborhood surveillance and discourage unwanted intrusions from outsiders.

Segregation - The most serious conflicts will occur between cars and children. Therefore, the design should strive to

⁴Bozeman Fair Housing Coalition, letter stating group's goals, 1982.

separate play areas from vehicular traffic, and encourage slow traffic in parking areas.

Conflicts can also occur between the various lifestyles. The activities of children and elderly often conflict; therefore, it is desirable to separate families and elderly, but still allow interaction when it is sought by the elderly -- segregate, but don't isolate.⁵

B. FORM - the response to influencing conditions.

SITE

It is desirable to retain and enhance any existing amenities the site may have, but it is also desired to utilize what land is obtained, to its maximum potential. The two ideals must be weighed, keeping in mind that the ultimate goal is high quality in surroundings.

CLIMATE

The climate of Bozeman must be a major influence in any design to be built in this area. In the interests of conservation and a higher quality of living, the design should utilize: 1) southern orientation of units, 2) solar heating if feasible, and 3) super-insulation if feasible.

ENVIRONMENT

The goal of this project is the creation of a residential community or neighborhood. To this end its character must be expressly residential, responding to the needs of families. Its

⁵Oscar Newman, Community of Interest, (Garden City, NY: Anchor Press Doubleday, 1980), p. 162.

location must also be such that neighboring uses will not conflict with the activities of the residents. Psychologically, the environment must create in the residents a sense of place and a feeling of belonging -- the feeling of being at home and of being part of a community.

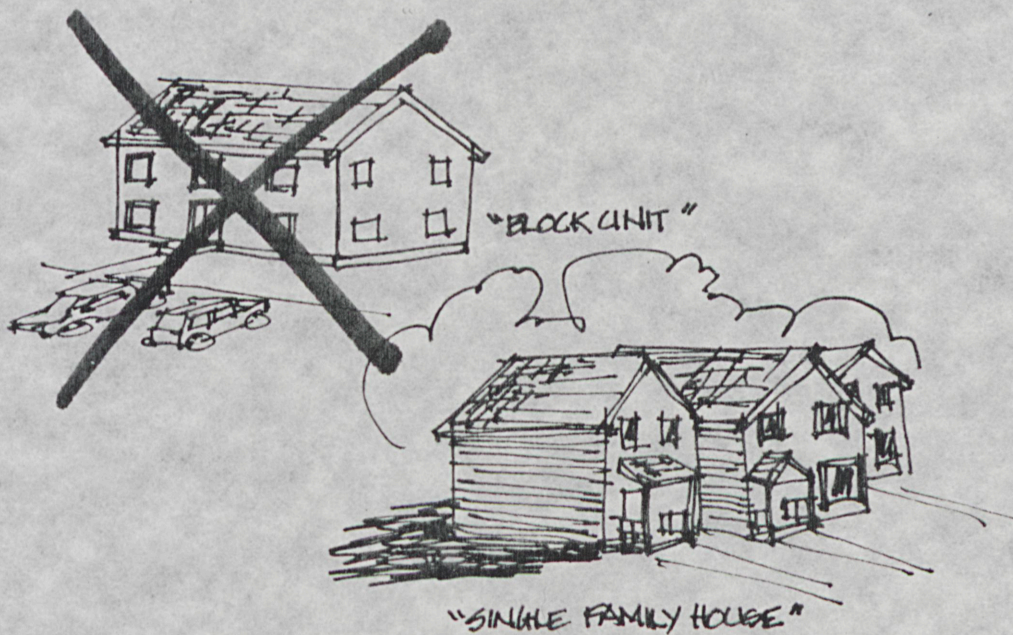
CONTEXT



QUALITY

A residential image, that responds to the local context will aid acceptance by both the surrounding neighborhoods and the residents. The units can be simple, but should not appear cheap. Care should be taken to reduce the maintenance requirements, as a poorly maintained building has a poor image.

IMAGE



ENVIRONMENT

The dwelling units must above all be safe and conform to codes. Spaces should be as generous as possible without sacrificing quality -- meet or exceed HUD standards.

C. ECONOMY - the efficient utilization of resources.

INITIAL BUDGET

Initial funds, whatever their source, will be limited. At present, \$400,000 may be available through federal CDBG (Community Development Block Grant) funds, for site aquisition, and for construction, federal mortgage guarantees through the HUD

221d(3) program are available. Regardless of the source of financing, cost effectiveness is imperative -- maximum benefits must be realized from every dollar spent.

As this will most likely be a non-profit operation, return on investment is not expected; however, operating costs must still be minimized to allow reduced rents. Energy efficiency or self sufficiency will be important in reducing operating costs. Opportunities for utilizing solar energy and other alternative energy systems, as well as energy conservation should be explored. Low maintenance will be another important feature. Without profits, future funds cannot be counted upon for major repairs.

PRIORITIES

Both initial and life cycle costs will be priorities in this project. The limited operational budget will affect both; the cost of financing the initial construction will be an operational cost as will be repairs or replacements of cheaper construction or equipment. The two costs must be balanced to keep both within an acceptable range.

D. TIME - past, present and future use.

PAST

The past is important in its establishment of context. Response to context will be important toward acceptance of this project. The use of familiar elements will also aid in the acceptance of the project, as well as the establishment of identity.

PRESENT

It is hoped that this project will have a dynamic influence, stimulating growth around it, and developments like it. The immediate goal however, is to meet the present severe need.

FUTURE

Future projects will be smaller; and it is hoped they will be constructed by private developers. The most effective means for meeting future need may be the establishment of a quota for low income units within any large housing development.⁶

⁶Bozeman Fair Housing Coalition letter.

FACTS

A. FUNCTION

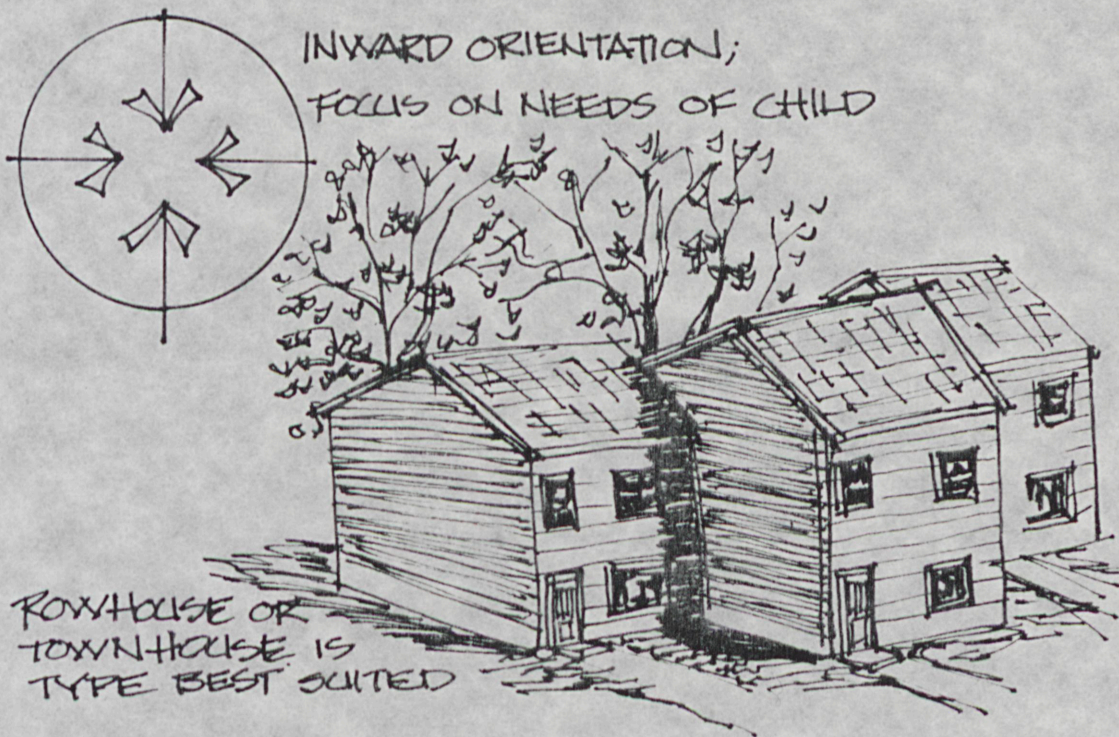
HOUSEHOLD TYPES

The major concern in this project is with three groups:

1. Young Families
2. Elderly
3. Young Singles

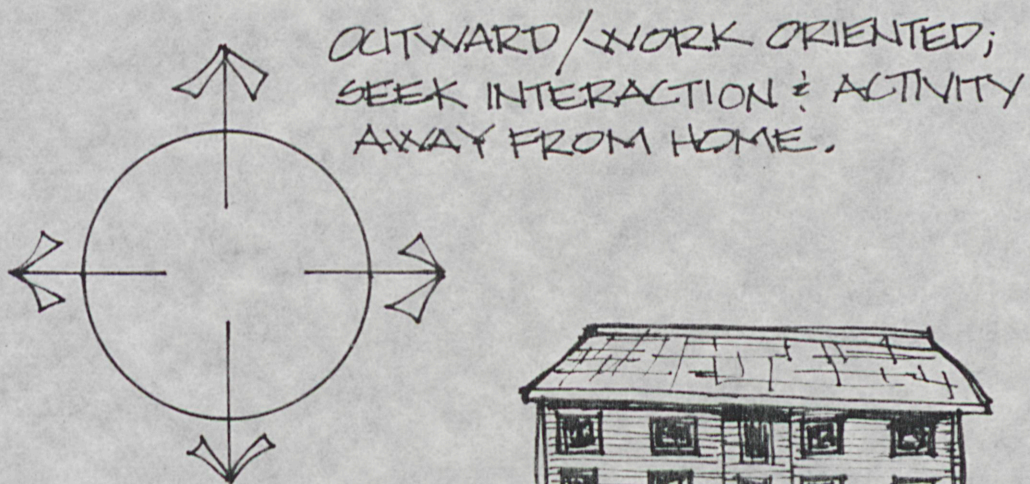
HOUSEHOLD/HOUSE TYPES*

YOUNG FAMILIES



*Household/House type relationships are based on information given by Oscar Newman in, Community of Interest (Garden City, N.Y.: Anchor Press Doubleday, 1980), p. 159-169.

WORKING ADULTS

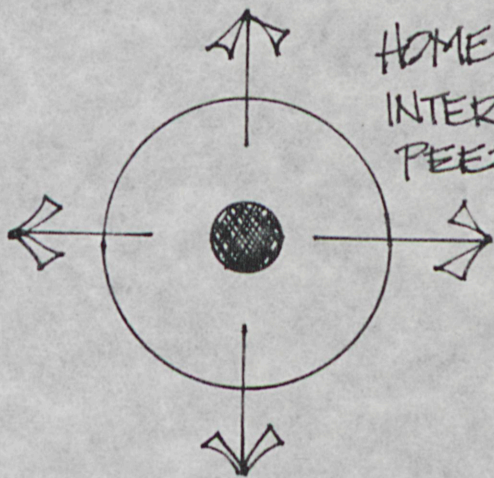


OUTWARD / WORK ORIENTED;
SEEK INTERACTION & ACTIVITY
AWAY FROM HOME.

APARTMENT IS
BEST SUITED BUILDING
TYPE



ELDERLY



HOME CENTERED, SEEKING
INTERACTION OUTWARD AMONG
PEERS.

ELEVATOR
HIGH-RISE OR
SINGLE STORY
ARE BEST SUITED.



HUMAN NEEDS

Some of the most basic and essential human needs in housing are included in the following list...⁷

- 1) Territory - the need to control access of and interaction with strangers.
- 2) Orientation - the need for sun, view, ventilation and daylight.
- 3) Privacy - the need to be alone and free from unwanted social interaction.
- 4) Identity - both group and individual, is found by adherence to group norms and in individual expression.
- 5) Convenience - the need for ready access to services.
- 6) Accessibility - the need for a dwelling that is easy to get to.
- 7) Safety - the need to be protected from dangerous conditions.

In addition to these needs, Janet E. Montgomery has added the following...⁸

- 1) Protection from danger
- 2) Sense of Place / Rootedness - fundamental needs involving the feelings one attaches to a place.
- 3) Sense of Spatial Identity - a need fundamental to function in that one must know how to use a space.
- 4) Wholesome Self Concept - the house has come to be a symbol of social status.
- 5) Need to Relate to Others - the home is a front, or stage for self presentation and impression management.

⁷Richard Untermann and Robert Small, Site Planning for Cluster Housing, (New York: Van Nostrand Reinhold Co., 1977), p. 39.

⁸Karen Mattrosy and Bonnie Maas Morrison, eds., Human Needs in Housing: an Ecological Approach, (Washington D.C.: University Press of America, 1977), p. 48.

- 6) The Need for Social and Psychological Stimulation - an environment limiting ones possible activities can stunt personal development.
- 7) Creative/ Trancendental Needs - this need involves self awareness through creation, and requires an environment conducive to creativity.
- 8) The Fulfilling of Values

AREA PARAMETERS

1. Building
2. Open Space

AREA PARAMETERS

		95		
	2 Bedroom	20 @ 975 S.F. -	19,500sf	21%
Families	3 Bedroom	16 @ 1125 S.F. -	18,000sf	17%
	4 Bedroom	4 @ 1400 S.F. -	5,600sf	4%
			43,100sf	
Singles	1 Bedroom	10 @ 700 S.F. -	7,000sf	32%
& Couples	Efficiency	25 @ 550 S.F. -	13,750sf	26%
			20,750sf	
Elderly	1 Bedroom	20 @ 700 S.F. -	14,000sf	
Total Gross S.F. =		43,100 + 20,750 + 14,000 = <u>77,850sf</u>		

NOTE: These square footages were based upon minimums given in the Michigan State Housing Authority's, Townhouse Development Process, 1970, p. 40.

RECREATION SPACE REQUIREMENTS

HOUSEHOLD	OCCUPANCY
25 - Studio	1 Adult
30 - 1 Bedroom	2 Adults
20 - 2 Bedroom	2 Adults + 1 Child
16 - 3 Bedroom	2 Adults + 2 Children
4 - 4 Bedroom	2 Adults + 3 Children

$$(1 \times 20) + (2 \times 16) + (3 \times 4) = 64$$

$$(1 \times 25) + (70 \times 2) = 165$$

$$\frac{\text{Number of Children}}{64} + \frac{\text{Number of Adults}}{165} = 229$$

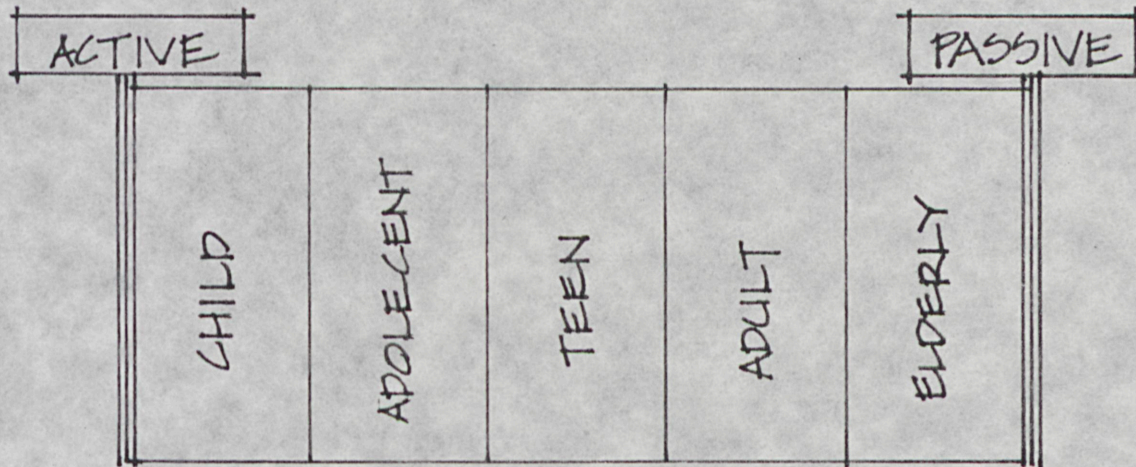
$$\frac{\text{Mixed Use Space (25sf/resident)}}{229 \times 25} = 5725 \text{ S.F.}$$

$$\frac{\text{Adult Recreation Space (100sf/adult)}}{165 \times 100} = 16,500 \text{ S.F.}$$

$$1280 + 5725 + 16,500 = 23,505 \text{ S.F.}$$

SOURCE: Joseph De Chiriara & Lee Koppelmans, Manual of Housing Planning and Design Criteria, (Englewood Cliffs, N.J.: Prentice Hall, 1975), p. 236.

THE ACTIVITY RANGE



BEHAVIORAL PATTERNS

CHILDREN - The primary activity of children is play. Play is primarily an arousal seeking behavior, that requires a manipulative environment that will elicit new responses. The behavior of children is group oriented and they make active use of outdoor space as follows:⁹

- 1) Preschool children spend most of their time near main entries within the protection of parents.
- 2) Young children (age 6 - 9) play the most in private backyards, followed by public sidewalks and community open space.

⁹William J. Mitchel, ed., Environmental Design: Research and Practice, 2 Vol. (Los Angeles: Proceedings of the edra 3/ar conference, UCLA, 1978), 1:6-2-1.

- 3) The adolescent's activities are concentrated in the streets where bike riding can occur, followed by private yards and then public and community open space.
- 4) Teenagers use public open space primarily, followed by public sidewalks, and parking areas.

ADULTS - Adults with children spend much of their time supervising children and in the performance of various household duties. Their use of outdoor space is more passive, mainly occurring in private gardens or yards. They require some indoor space for activities away from children -- the living room is their primary activity space. Most of the interaction among these adults occurs in semi-private areas -- sidewalks and shared facilities. Many friendships and social interactions among adults are also initiated by their children.

Working adults, on the other hand, seek much of their activity and interactions away from home, among their peers.

ELDERLY - Much of the elderly person's activity occurs in the home. They seek social interaction among their peers; therefore, it is important to have peers close by. The elderly use their open space passively, mainly gardening, sitting and conversing, or in casual strolls.¹⁰

B. FORM -

1. Site Analysis
2. Climate Analysis

¹⁰Newman, Community of Interest, p. 160-169.

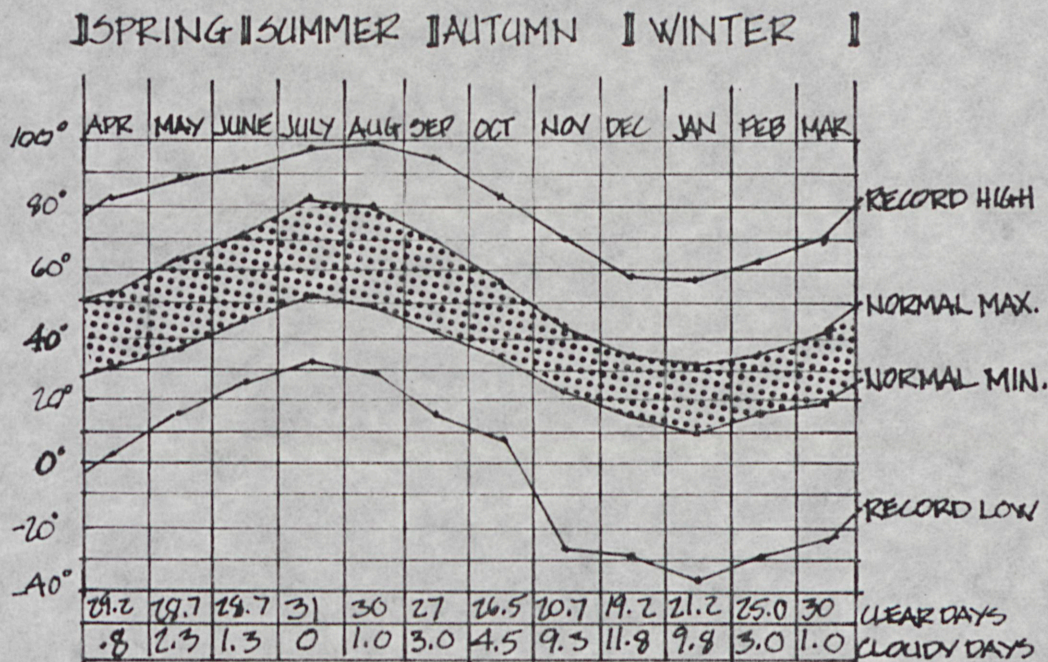
CLIMATE

Bozeman is located at the base of the western slopes of the Bridger Range, at latitude 45°4' and longitude 111°03', and an elevation of 4865' above sea level. Bozeman experiences essentially a mountain valley climate. Summers are generally pleasant and characterized by warm days, cool nights and a high percentage of possible sunshine. Winters on the other hand are relatively cold. January tends to be the coldest month, having the greatest number of days 0°F or lower. The average winter temperature is 25.4°F. On the whole Bozeman's climate is cold, with long winters and 8082 heating degree days (base 65°F).

Precipitation in the form of rain and snow averages about 18" a year. Average yearly snowfall is 83.5". The greatest daily snowfall that has occurred is 20".¹¹

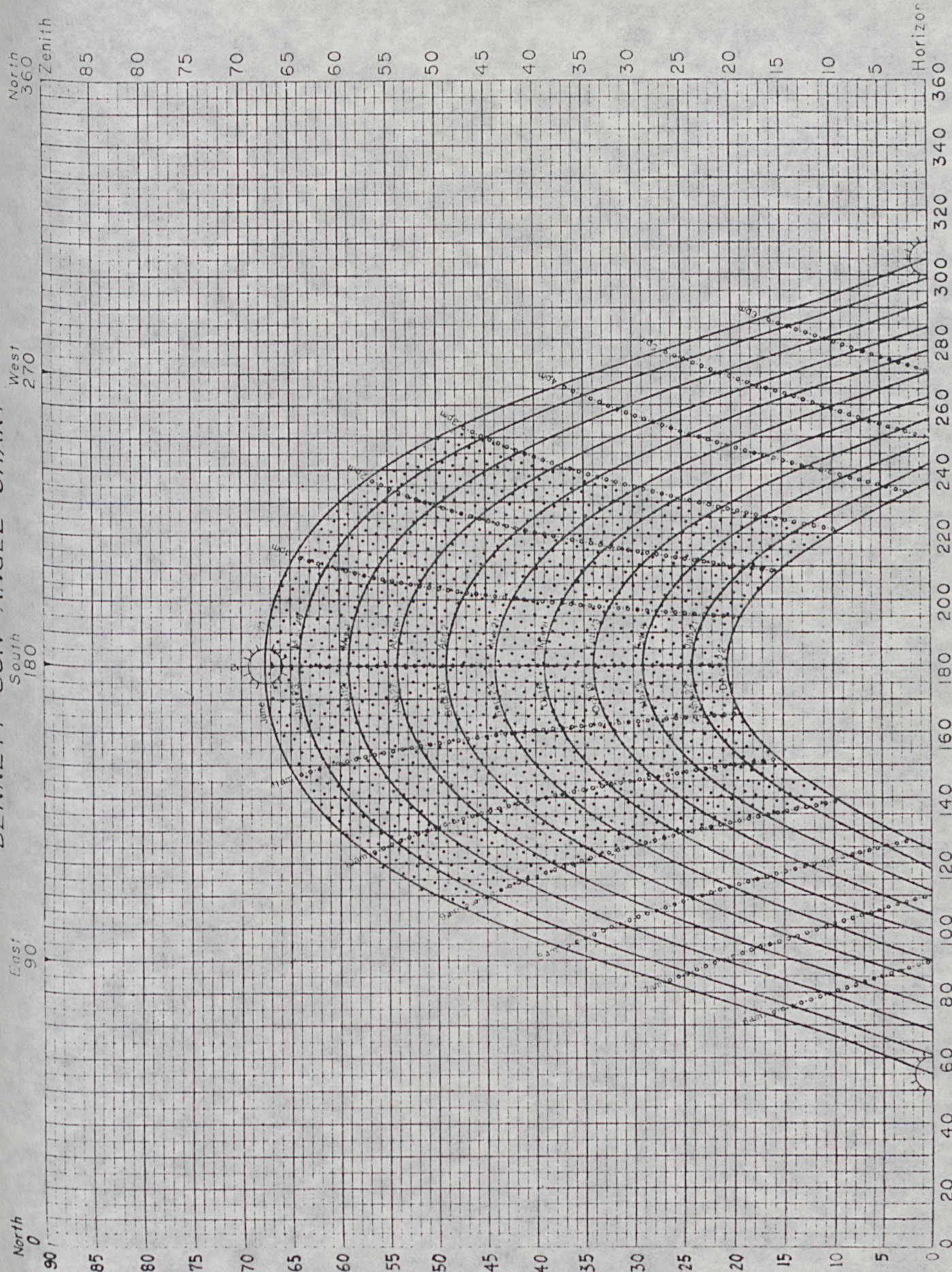
¹¹U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, "Climatological Summary for Bozeman, Montana," 1940-1969.

BOZEMAN TEMPERATURES



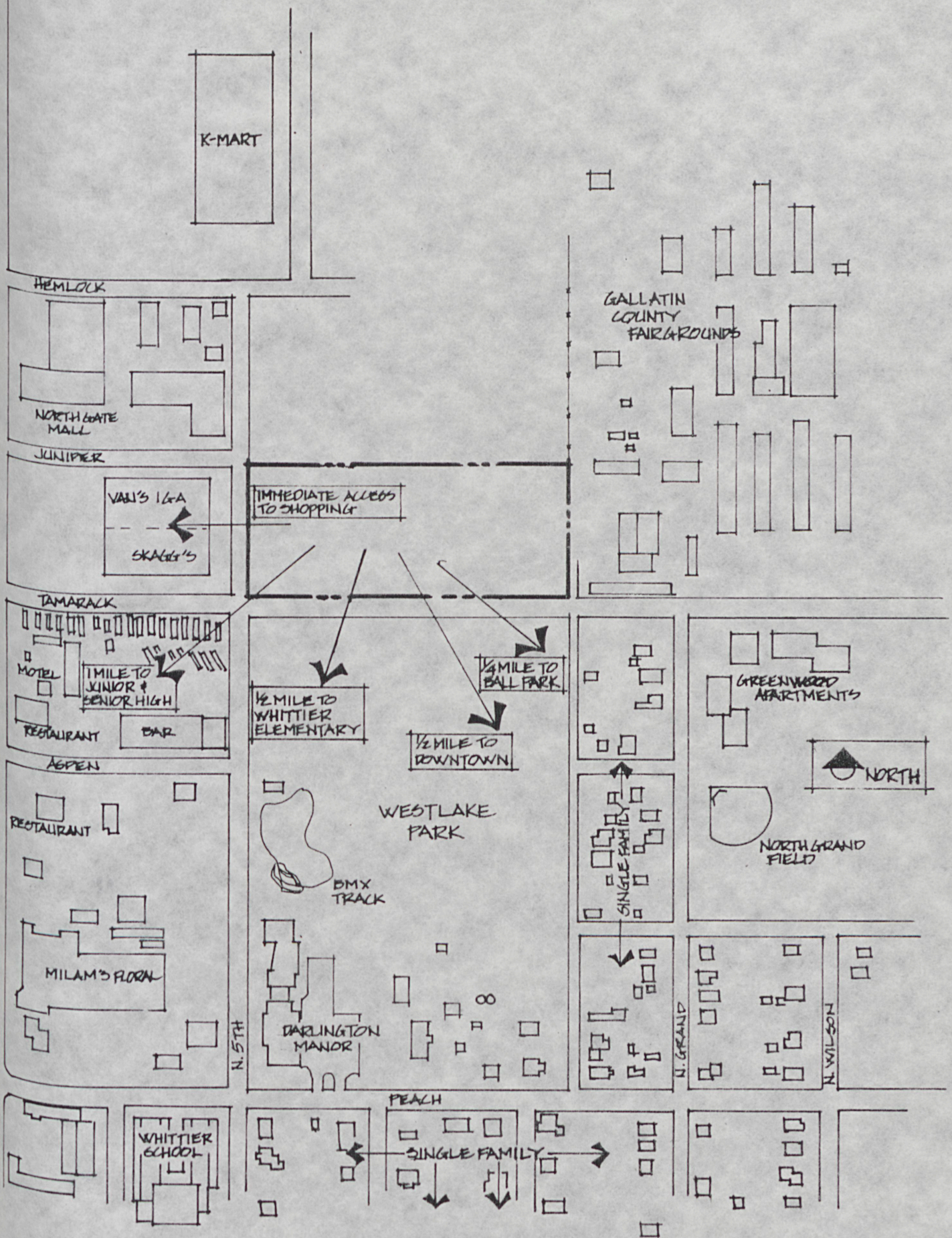
*NOTE: Clear day information is based on ASHRAE tables for a 48°N latitude.

BENNETT SUN ANGLE CHART



SOLAR AZIMUTH (Degrees)

46° NORTH LATITUDE



CODES

1. R4 Zone
2. P.U.D. (Planned Unit Development)
3. Townhouse
4. HUD Minimum Property Standards - must be adhered to if federal monies are utilized.
5. U.B.C.

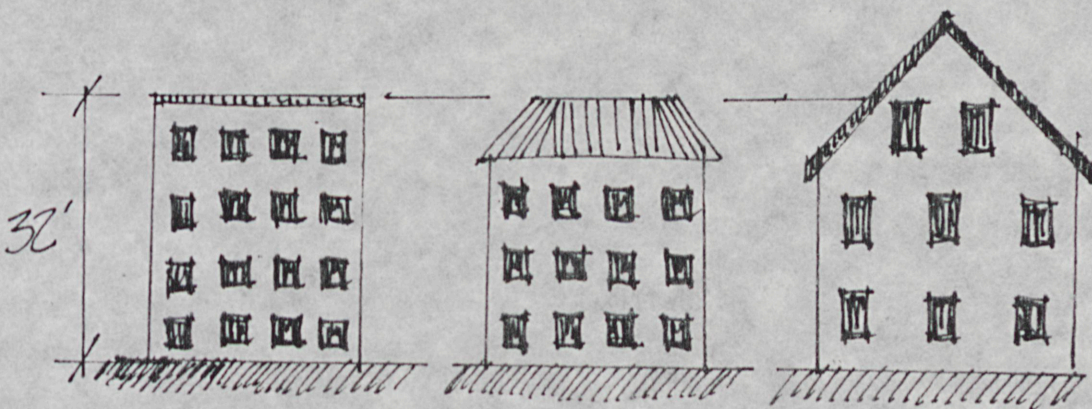
ZONING

The chosen site is located in an R4 zone as established in the Bozeman Zoning Code. In this zone, P.U.D.s are allowed enabling an increase in density of 20 du/acre. If, "Character, design excellence, architectural style variation and innovative open space utilization..." are part of the design, a density bonus of up to 35% is allowed (27 du/acre).

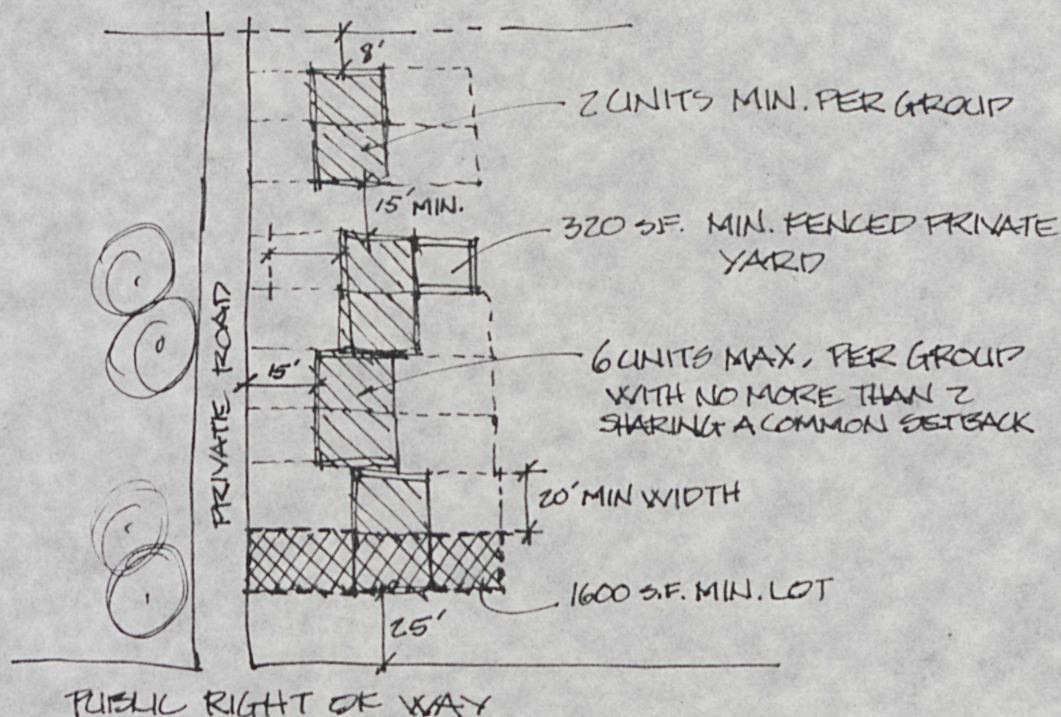
OPEN SPACE

In a P.U.D., the city requires that 30% of the total area of the P.U.D. be retained as open space. In turn, 50% of this must be held in common ownership.

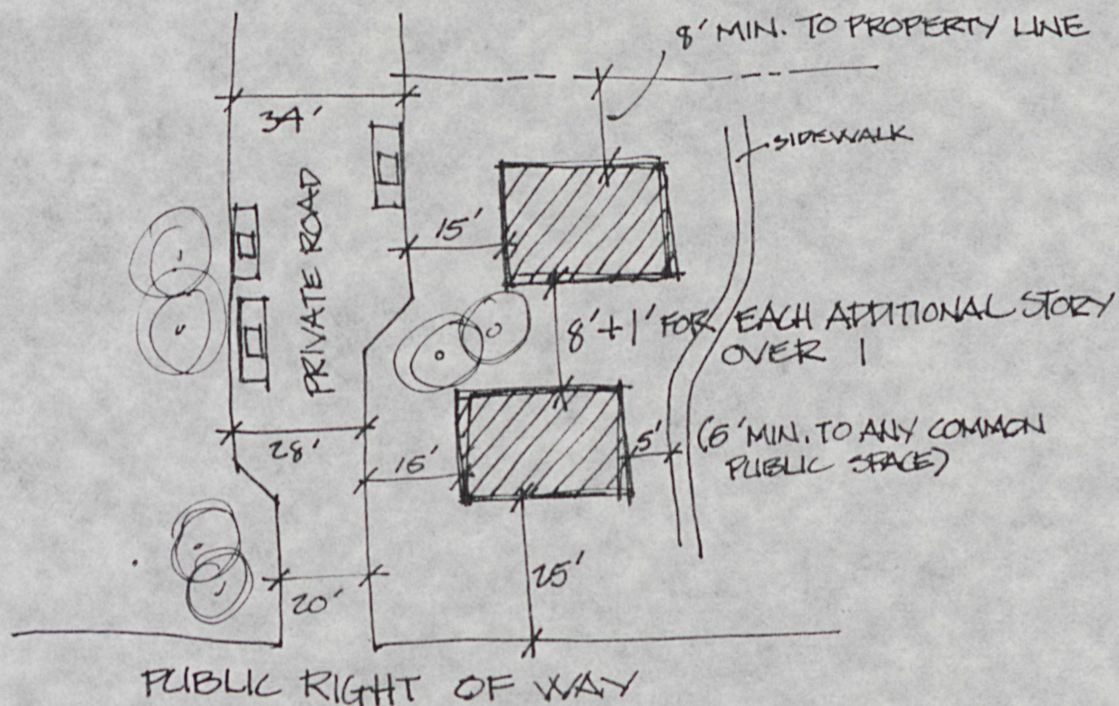
HEIGHT RESTRICTIONS



P.U.D. REGULATIONS

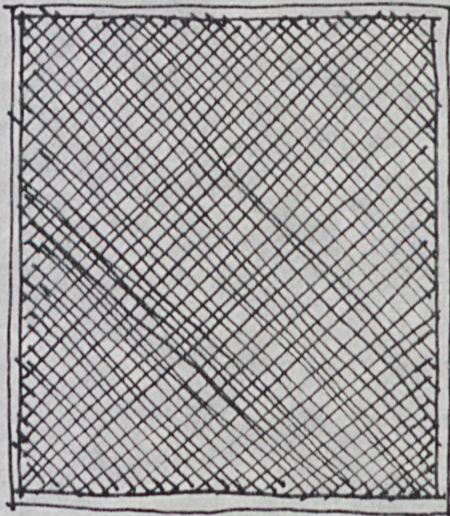


TOWNHOUSE REGULATIONS

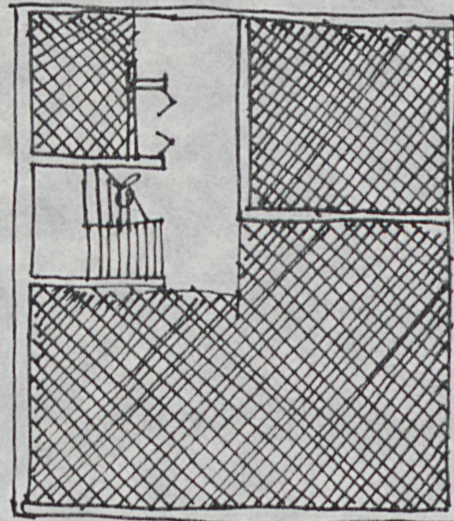


C. ECONOMY -

1. Efficiency Ratio
2. Budget



"GROSS AREA"



"NET AREA"

(The ratio of Net Area to Gross Area Should be greater than, or equal to .70)¹²

¹²Michigan State, Townhouse Development Process, p. 40.

BUDGET

COST / S.F. -- \$34.00 (includes A/E Fees)*

A. 77,850S.F. @\$34/sf	\$2.65 Million
B. Fixed Equipment (7% of A)	\$185,500
C. Site Development (15% of A)	\$397,500
D. TOTAL CONSTRUCTION	\$3.23 Million
E. Site Aquisition	\$400,000
F. Moveable Equipment (5% of A)	\$132,000
G. Contingencies (5% of D)	\$161,500
H. Administrative (1% of D)	\$ 32,300
TOTAL BUDGET (A THRU H)	\$3.96 Million

ENERGY

With over 8000 heating degree days, any investment in energy conservation in the Bozeman area will have a more rapid payback than in most other areas of the nation.

Because of its northern location and cloud patterns Bozeman receives much less solar radiation than many locations, such as Denver. The usefulness of solar radiation for water heating or active systems, is therefore reduced in Bozeman. The large losses due to cold outside temperatures in Bozeman further reduce any usefulness.

*Based on figure provided by Bob Roth at the Denver Office of Housing and Urban Development in a telephone interview in 1983.

A well insulated house seems to be the best solution in Bozeman, but by no means should passive solar designs be totally avoided -- in fact both should be incorporated if possible. Superinsulated and earth-sheltered houses seem best suited to Bozeman's Climate; however, of the two, superinsulation is the most cost effective.¹³

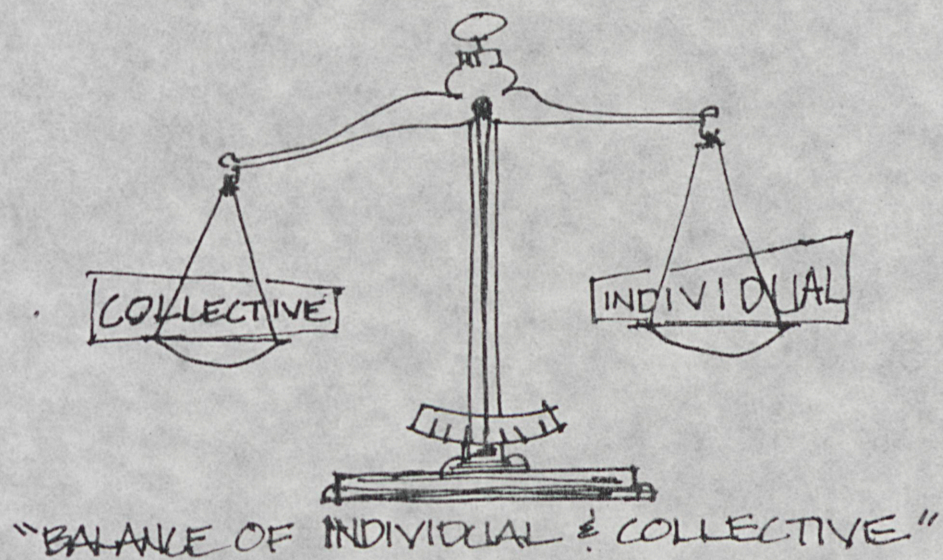
The principles behind the superinsulated house, are high levels of insulation (R-30 - R-40 walls, R-50 ceilings and R-29 - R-36 floors), airtight envelopes to avoid infiltration losses, and heating by intrinsic sources (people, lights and appliances).¹⁴

¹³Russ Helicker, Energy Element - "Bozeman Area Master Plan" (Draft Copy) 1982.

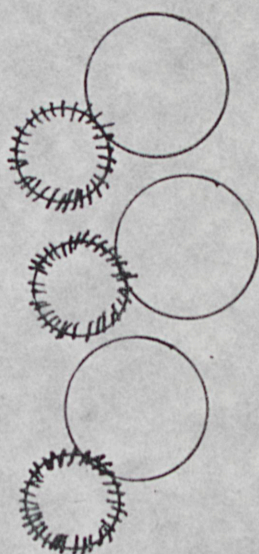
¹⁴William A. Shurcliff, Superinsulated and Double Envelope House, (Andover, Mass: Brick House Publishing Co., Inc., 1981), p. 60-65.

CONCEPTS

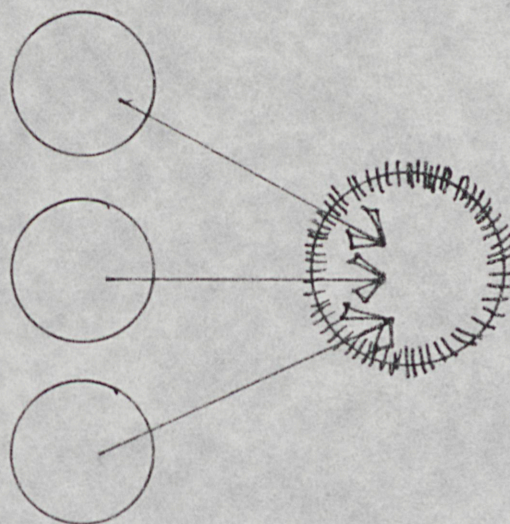
KEY CONCEPT



SERVICE CONCEPTS

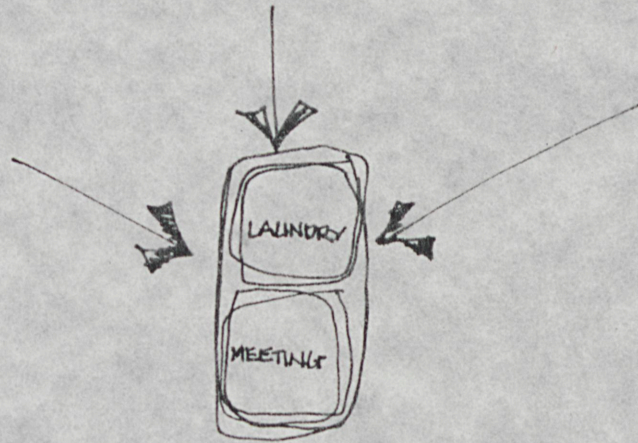


"DECENTRALIZED"

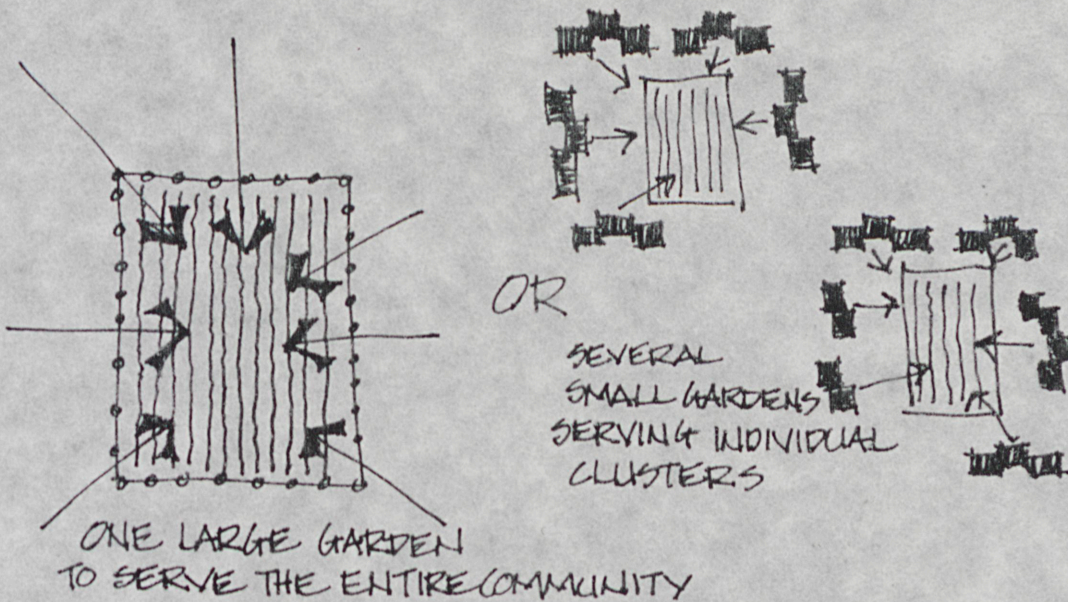


"CENTRALIZED"

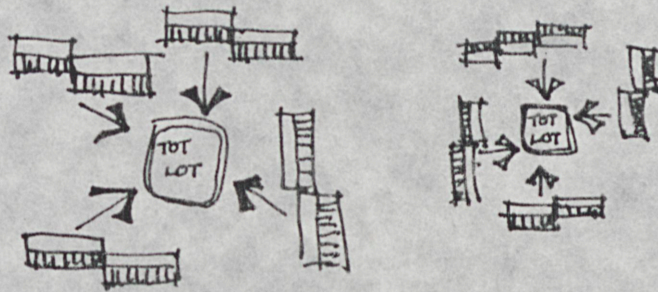
SHARED FACILITIES



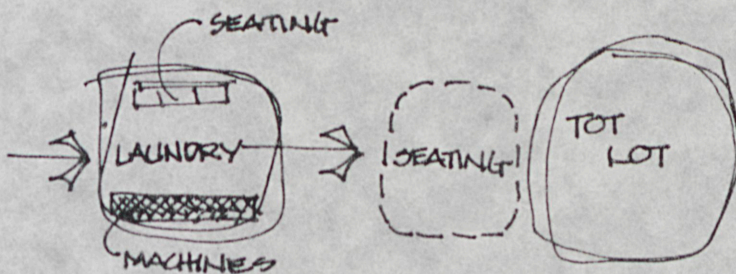
SHARED COMMUNITY BUILDING



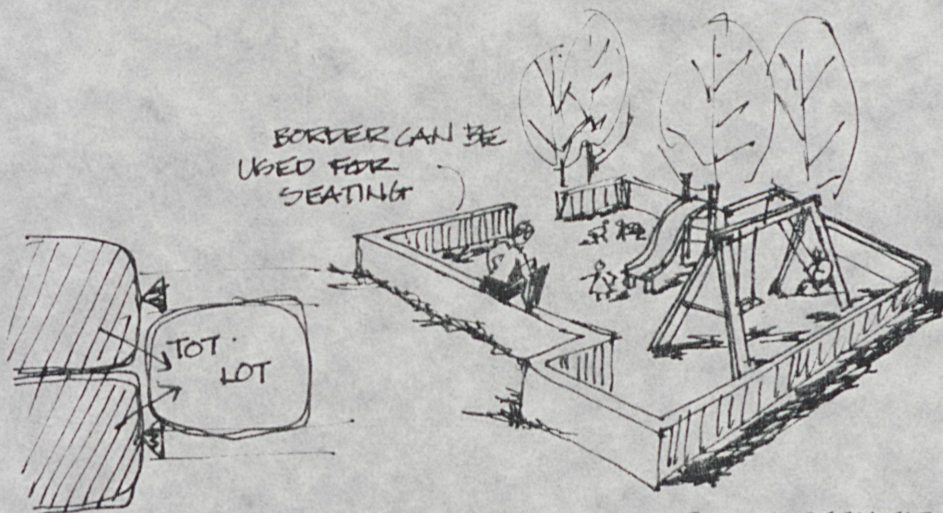
PLAY AREA CONCEPTS: TOTS



PLAY AREAS FOR SMALL CHILDREN SHOULD SERVE SMALL CLUSTERS AND SMALL GROUPS OF CHILDREN. POSITION WHERE SURVIELLANCE FROM DWELLINGS CAN OCCUR.



TOT LOT NEAR LAUNDRY WHERE CHILDREN CAN PLAY WHILE ADULTS DO LAUNDRY.



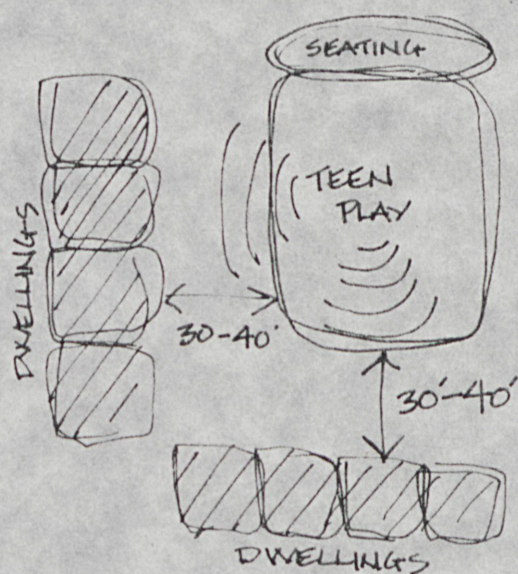
LOCATE "TOT LOT" NEAR
ENTRY

CLEARLY DEFINED
PERIPHERY



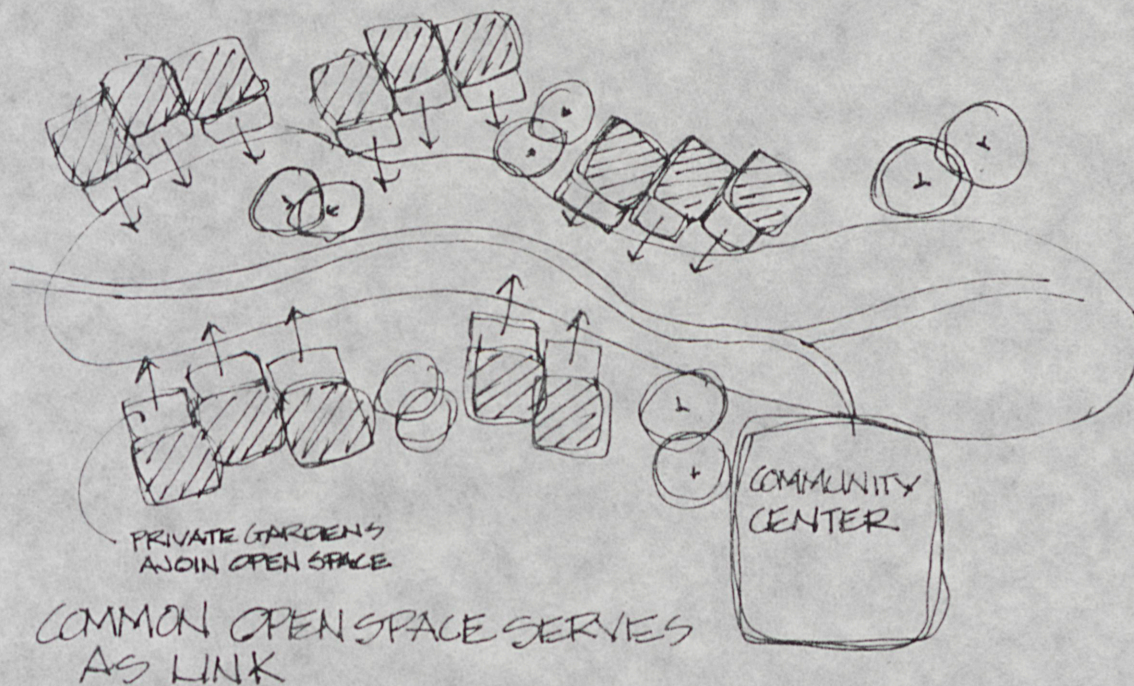
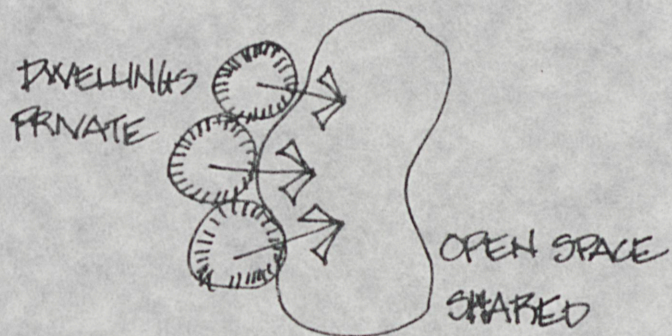
PLAN FOR
BICYCLES

TEENS*

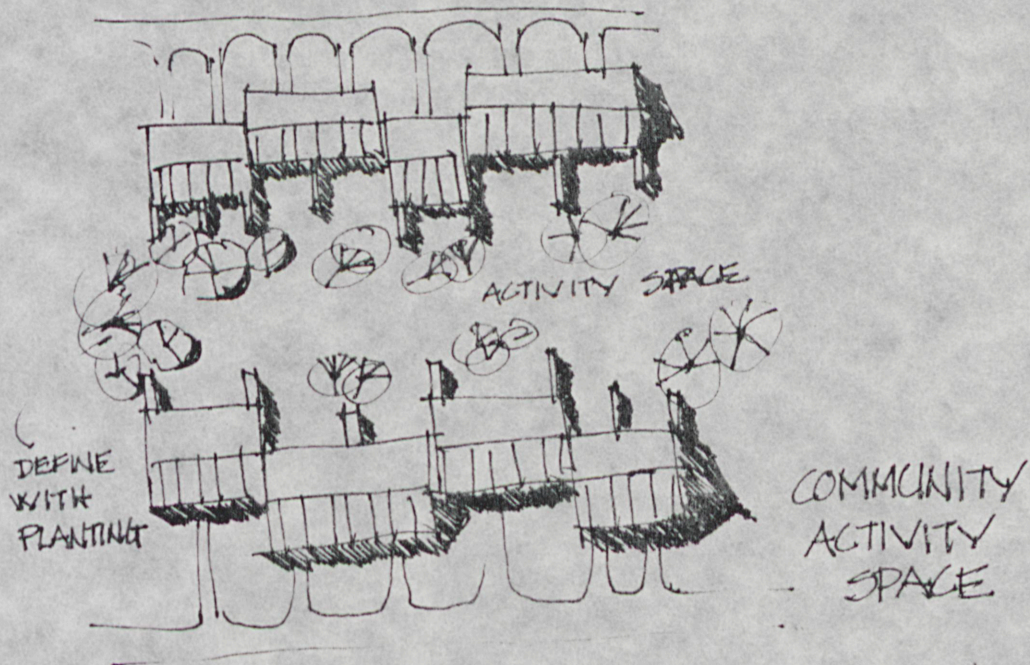


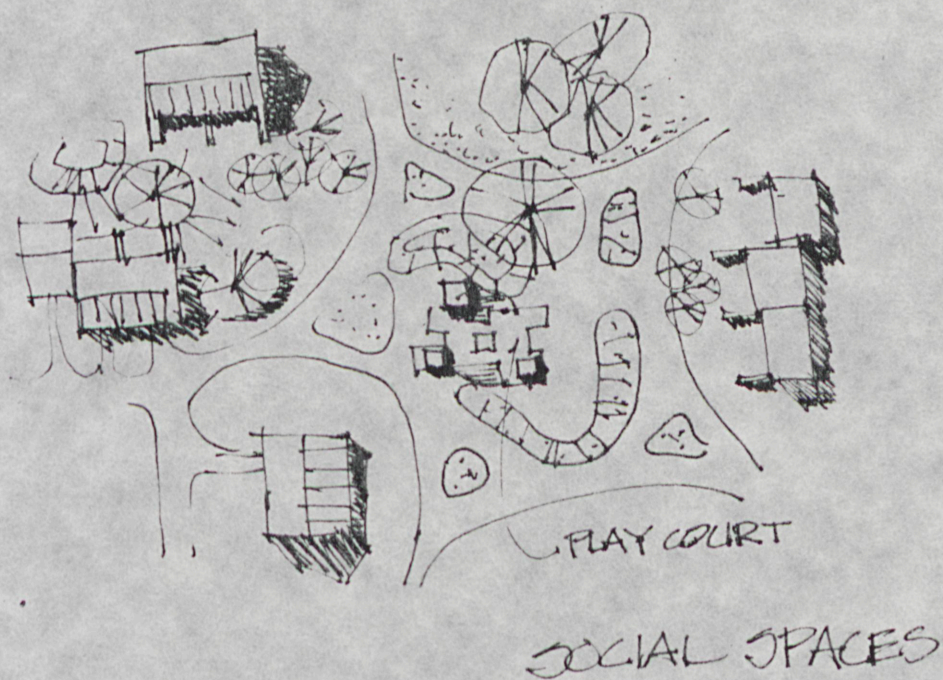
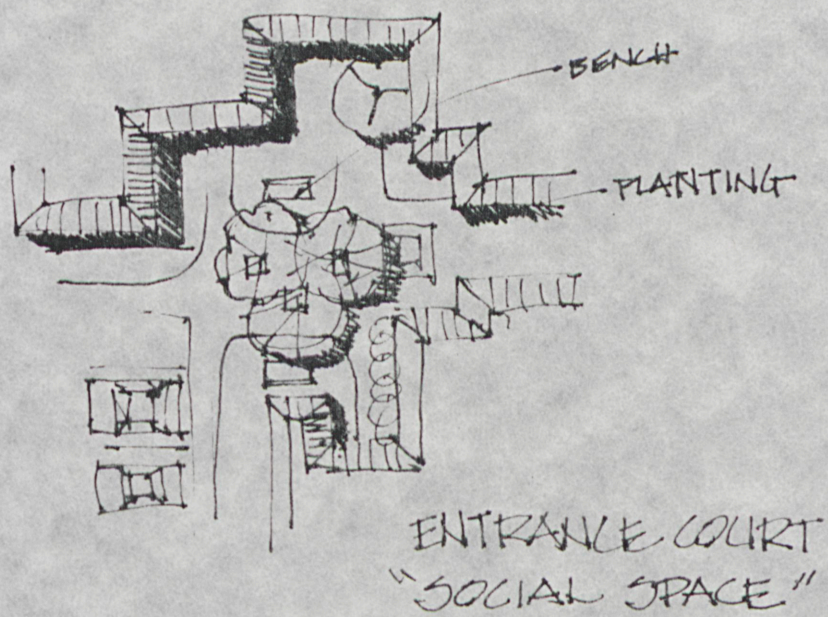
*Newman, Community of Interest, p. 202

OPEN SPACE CONCEPTS



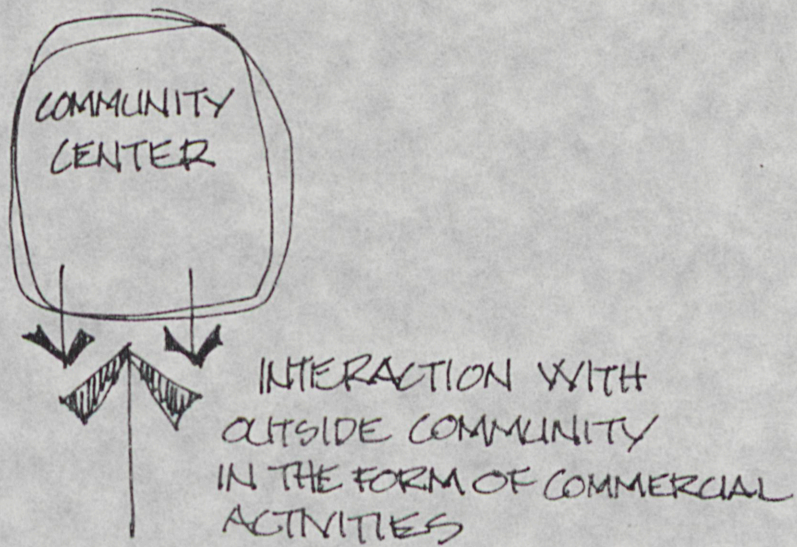
HIERARCHY OF OPEN SPACE



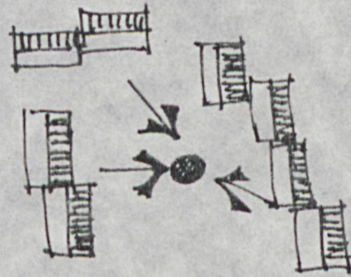


*SOURCE: Michigan State, Townhouse Development Process, p. 15-

INTERACTION CONCEPTS



CONCEPTS FOR IDENTITY

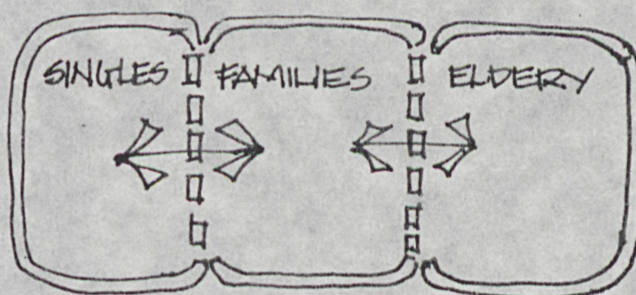


FOCUS FOR GROUP IDENTITY -
PROVIDE OR ENHANCE EXISTING AMENITY

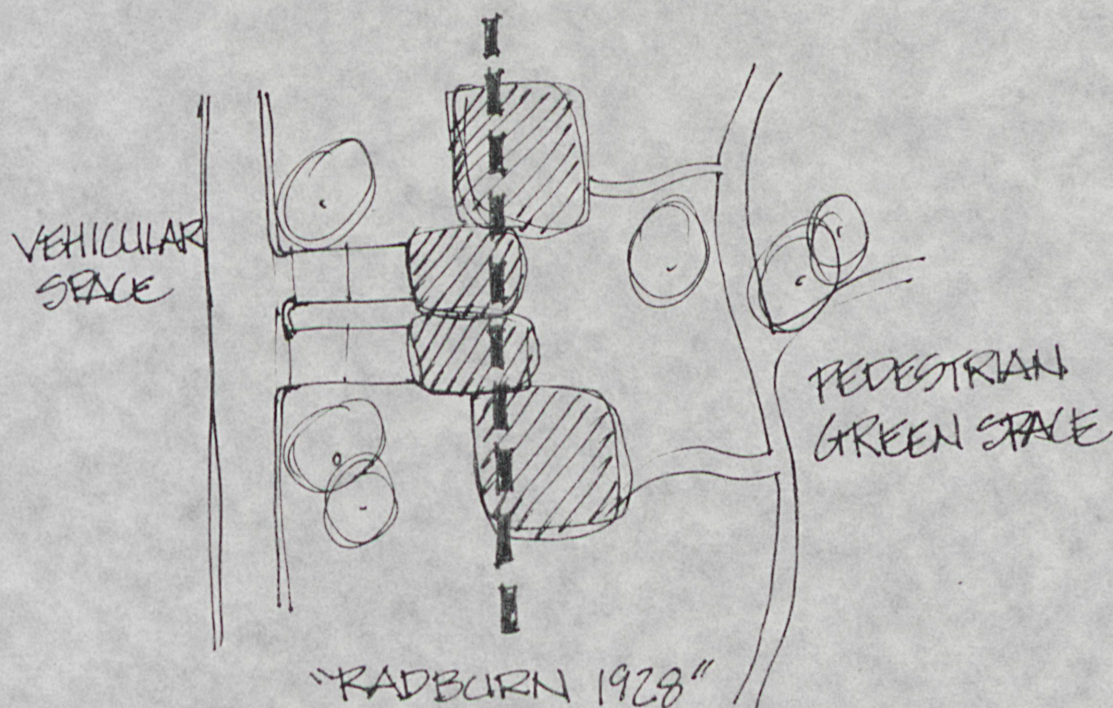


FOCUS FOR COLLECTIVE IDENTITY

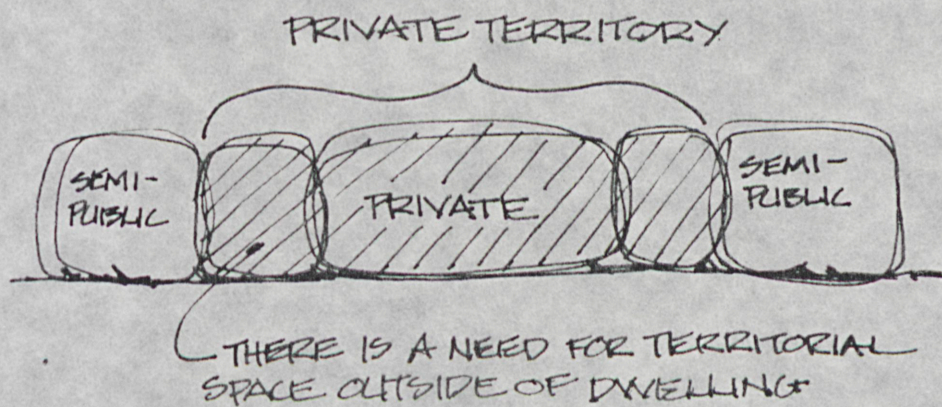
SEGREGATION CONCEPTS



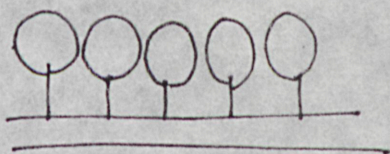
SEPARATE, BUT DON'T ISOLATE LIFESTYLES.
ALLOW RESIDENTS OF DIFFERENT LIFESTYLES TO
HAVE ACCESS TO EACH OTHER IF AND WHEN
THEY DESIRE IT.



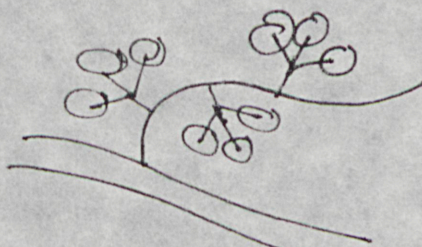
ENTRY CONCEPTS



1. DIRECT FROM STREET



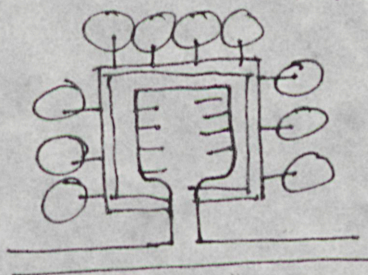
3. PATH RELATED



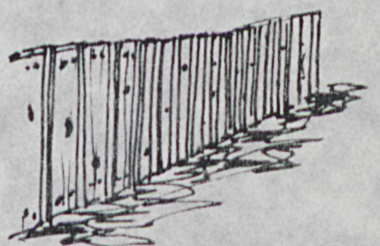
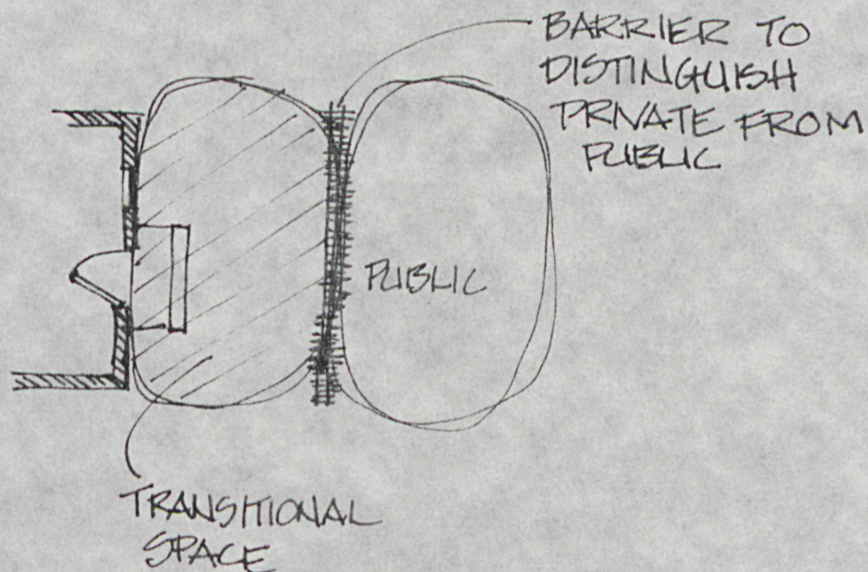
2. COURTYARD RELATED



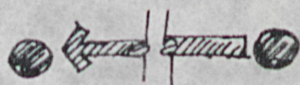
4. PARKING RELATED



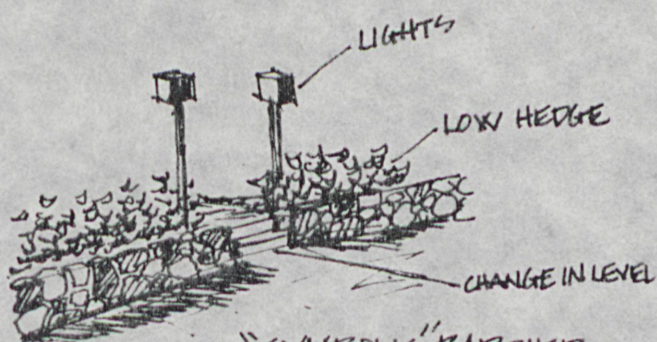
TRANSITIONAL SPACES



"REAL" BARRIER
(DEFINES & PREVENTS)

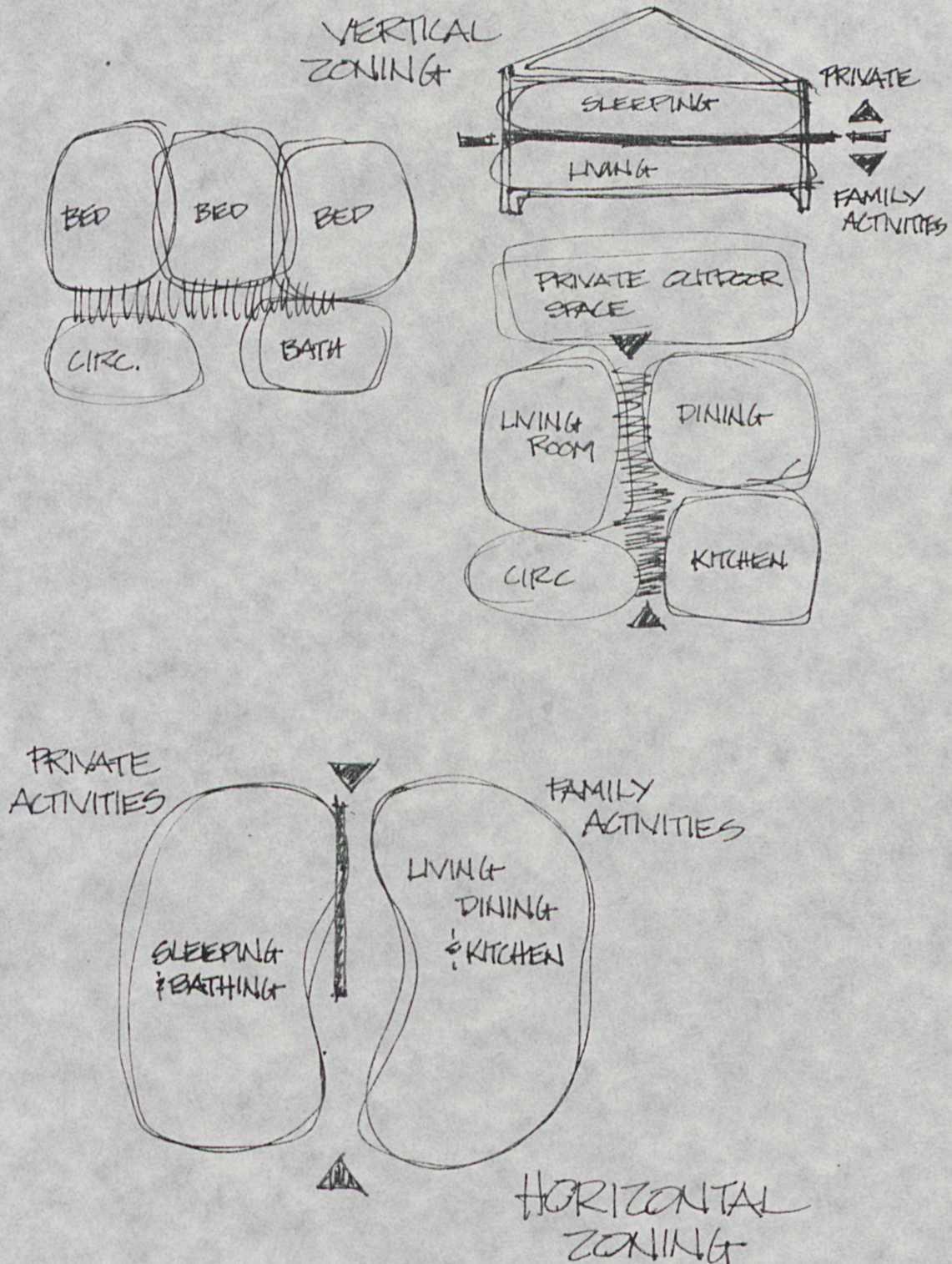


INTERRUPT THE SEQUENCE
OF MOVEMENT



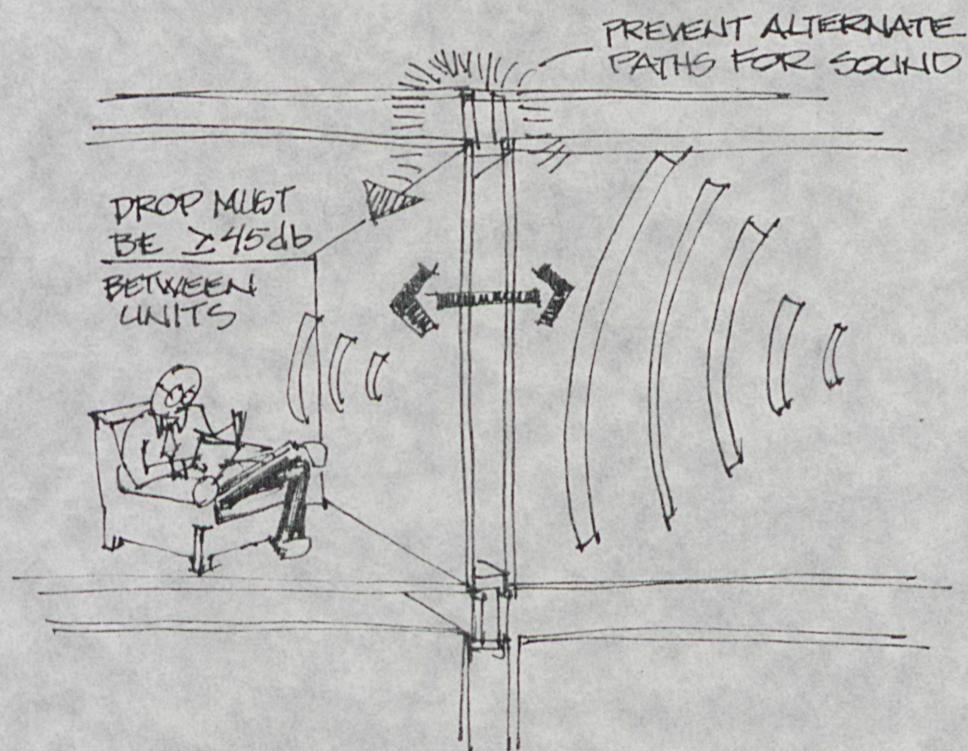
"SYMBOLIC" BARRIER
(DEFINES WITHOUT PREVENTING)

ZONING OF ACTIVITIES*



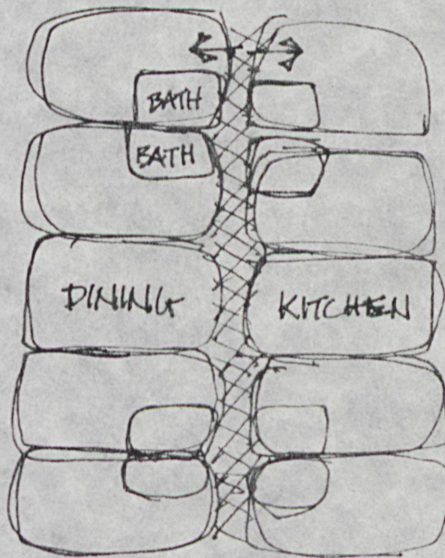
*Taken from Michigan State Housing Development Authority, Townhouse Development Process, p. 51.

ACOUSTIC PRIVACY

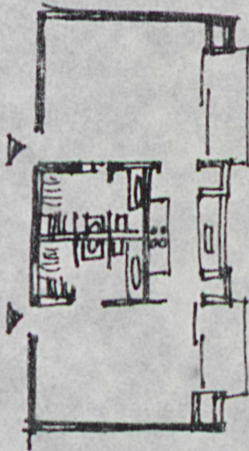


*Michigan State Housing Authority, Townhouse Development Process, 1970, p. 52.

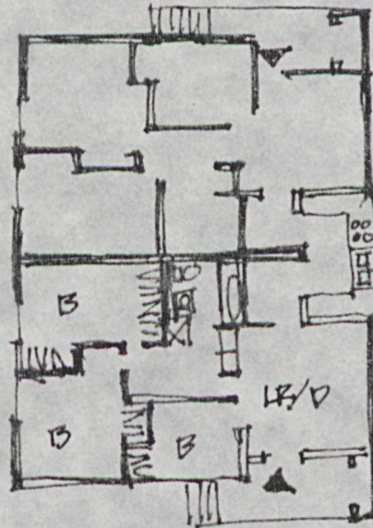
SHARED SPACE CONCEPTS*



ELDERLY HOUSING
 • EAT TOGETHER/
 SLEEP ALONE

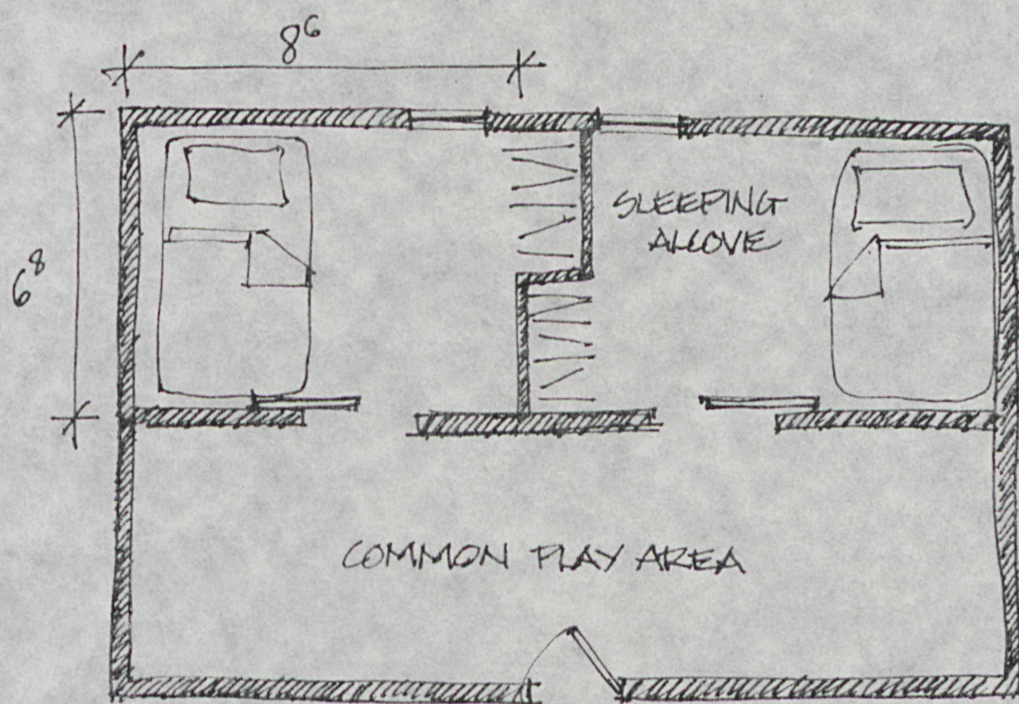


TWO SINGLES
 SHARING A
 KITCHEN



BOARDING HOUSE
 DUPLEXES SHARING A
 KITCHEN

*Barbara Behrens Gers, "The 300 sq. ft. Home and Other Ideas for the 80's," Housing (January 1981): 73.

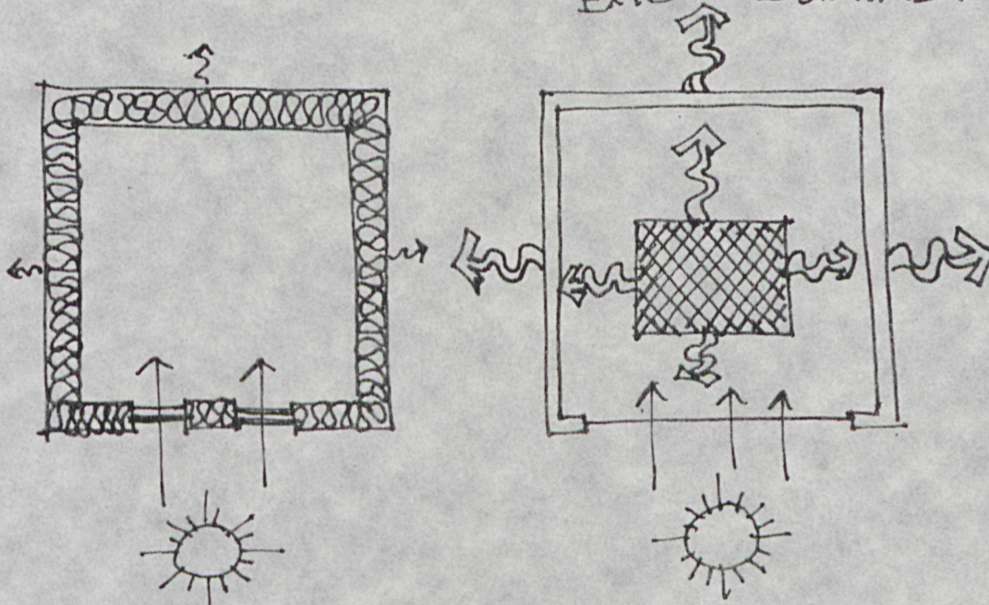


SOURCE: Becker, Design For Living, p. 17.

ENERGY CONCEPTS

HIGH THERMAL RESISTANCE -
HOLDS IN INTERNAL GAINS

HIGH THERMAL
MASS - STORES
EXTERNAL GAINS



C. ECONOMY

COST CONTROL

The creative control of costs is a very important part of this project. Costs should be cut in any way possible that will not cause quality to suffer. Some alternatives might include the use of prefabrication systems, or the use of self help or sweat equity by residents. Prefabrication offers speed in construction and low labor costs, but scarifies flexibility and variety. Self help on the other hand offers the advantage of personal involvement on the part of the residents in their housing. The disadvantage here lies in the fact that with limited skills, there is a limit to the amount the residents can do themselves. Some areas where self help would work are: painting and various finish work, as well as landscaping and playground construction.

D. TIME

FLEXIBILITY

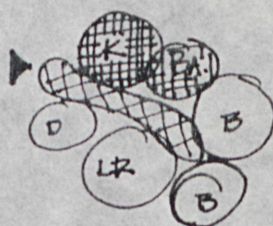
One of the most important things lacking in present public housing is flexibility. Residents have little opportunity to change and adjust their dwellings to new situations. The need is even greater now for flexibility with all the changes taking place in lifestyles and family makeup. There are families where both parents work, single parent families and even constructed families made up of unrelated people, choosing to live closely together. Flexibility is needed to accommodate these new situations, as well as the growth needs of a family. In England, Andrew Rabeneck has done much research on this subject, and suggests the following guidelines:

- 1) Avoid extremes in room sizes
- 2) Provide neutral forms and simple volumes
- 3) Position doors and windows to allow a variety of use
- 4) Avoid central lighting of spaces
- 5) Avoid the determination of room function by wall treatment.
- 6) Produce plans that allow variety in the relationship of rooms
- 7) Provide a utility room to allow the expansion of the kitchen or bath
- 8) Provide readily accessible service systems
- 9) Use no built-ins, as they predetermine use
- 10) Allow a variety of interconnections between rooms

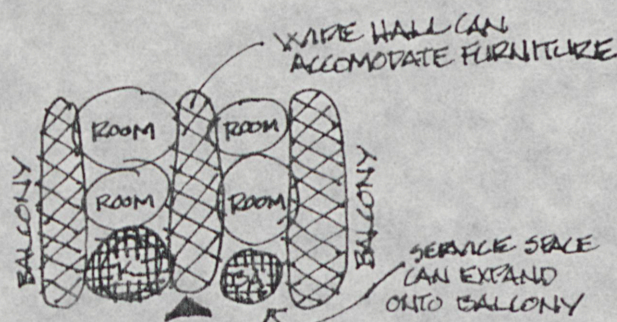
¹⁵Andrew Rabeneck, "The Structuring of Space in Family Housing: An Alternative to Present Design Practice," Progressive Architecture (November 1974): 102-103.

- 11) Treat circulation as usable space
- 12) Provide spare rooms
- 13) Use a type of construction that will allow ready alteration
- 14) Provide a wide range of use at a minimum of cost

FLEXIBILITY



"CONVENTIONAL"
PLAN



"ADAPTABLE UNIT"
• AMBIGUOUS SPACES
GROUPED AROUND A CENTRAL
HALL

The key to flexibility is a loose fit. Rooms should be spacious, but more importantly, they should be flexible in the furniture arrangements they allow. The shape of the room is more important than its size, as flexibility is perceived by the number of furniture arrangements allowed.¹⁶

¹⁶Amos Rapoport, "The Personal Element in Housing," in Human Needs in Housing: An Ecological Approach, ed. Karen Nathasy and Bonnie Maas Morison, (Wash. D.C.: University Press of America, 1977). p. 183.

NEEDS

A. FUNCTION

ROOM SIZES

SEPARATE SPACES

	0BR	1BR	2BR	3BR	4BR	LEAST DIMEN.
LIVING ROOM	140 SF.	150 SF.	150-170	170-204	180-258	11'-0"
DINING ROOM	60-70	45-60	90	110	120	8'-4"
KITCHEN	62-60	55-70	47-80	90-105	82-100	
BEDROOM ¹		120-160	120-136	120-169	120-144	9'-4"
BEDROOM ²			96-128	80-116	80-95	8'-0"
BATH	35	35-39	38	35	50	
BATH ²				28	35	

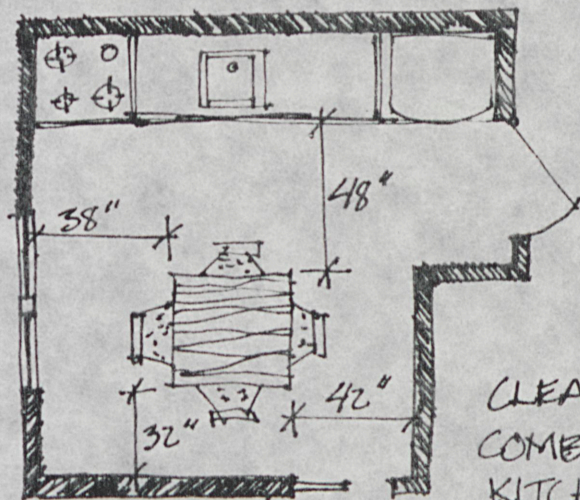
SOURCE: Becker, Design For Living, p. 233-235.

COMBINED SPACES

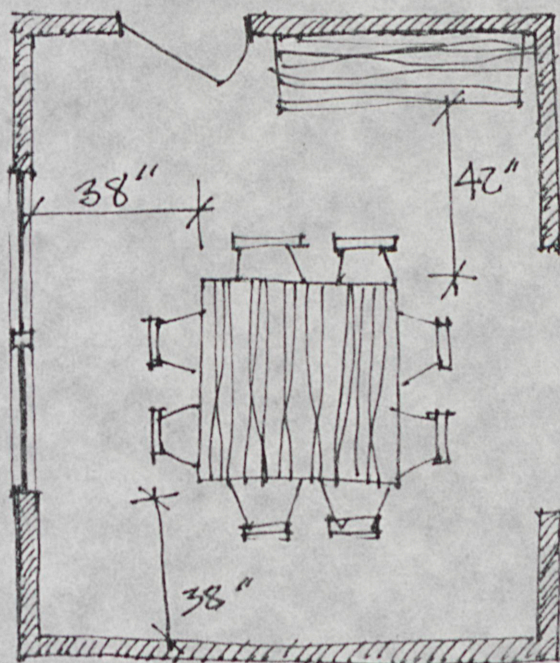
	0BR	1BR	2BR	3BR	4BR
LR-DA	257-268	210-220	210-259	230-260	250-280
LR-DA-SL	250				
LR-DA-K		270	270	300	330
LR-SL	210				
K-DA	100	120-130	120-145	140-160	160-175

SOURCE: U.S. Department of Housing and Urban Development, Minimum Property Standards, (Washington D.C., 1979), p. 4-9.

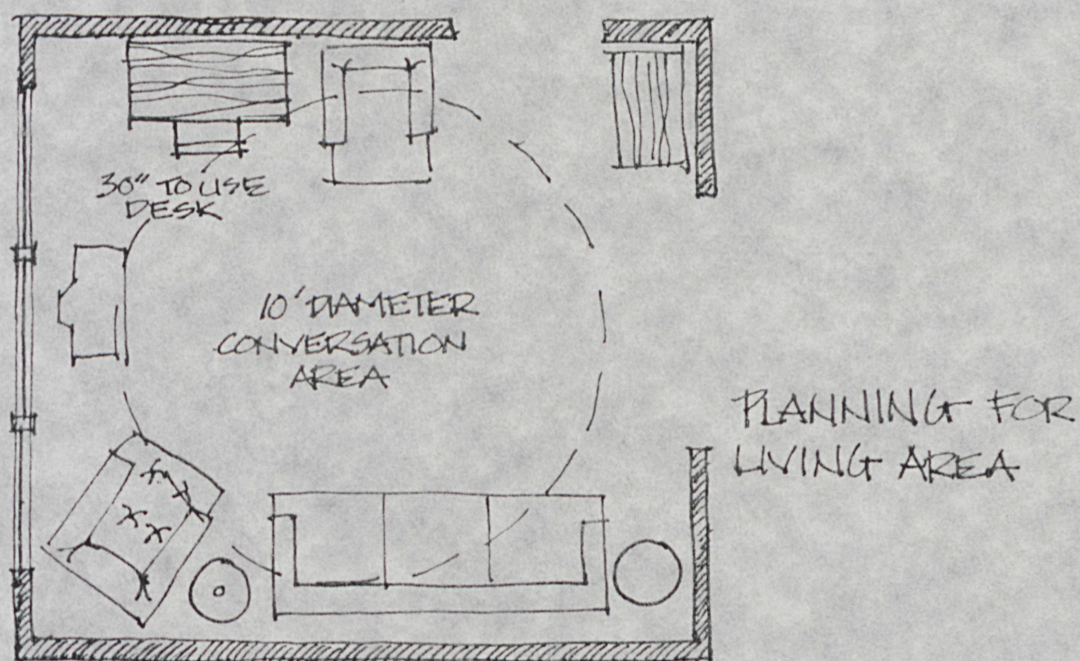
REQUIRED CLEARANCES*



CLEARANCES FOR
COMBINED DINING -
KITCHEN.



CLEARANCES FOR
DINING AREA.



*Taken from the U.S. Department of Housing and Urban Development, Manual of Acceptable Practices (Washington D.C., 1979), 4930.1.

STORAGE

BEDROOM CLOSETS - Primary Bedrooms - 2' x 5' = 10 s.f. min.
Secondary Bedrooms - 2' x 3' = 6 s.f. min.

COAT CLOSET - 2' x 2' = 4 s.f. min.

LINEN CLOSET - 1 Bedroom Unit - 1⁶ x 1⁶
2-3 Bedroom Units - 1⁶ x 2⁰
4 Bedroom Units - 1⁶ x 2⁶

BROOM CLOSET - 3 s.f. min.

KITCHEN -

STORAGE AREA

SQ FT	Number of Bedrooms				
	0	1	2	3	4
Minimum Shelf Area	24	30	38	44	50
Minimum Drawer Area	4	6	8	10	12

Notes

- 1) A dishwasher may be counted as 4 sq ft of base cabinet storage
- 2) Wall cabinets over refrigerators shall not be counted as required shelf area.
- 3) Shelf area above 74 in. shall not be counted as required area.
- 4) Inside corner cabinets shall be counted as 50 percent of the shelf area, except where revolving shelves are used, the actual shelf area may be counted.
- 5) Drawer area in excess of the required area may be counted as shelf area if drawers are at least 6 in. in depth.
- 6) In housing for the elderly, at least one half of the 10 percent of the living units with bathrooms designed for wheelchair occupants shall have kitchen equipment, work space and storage space that is accessible to and usable by wheelchair occupants.

SOURCE: HUD, Minimum Property Standards, Table 4-1.3.

COUNTERTOPS AND FIXTURES

Work Center	Number of Bedrooms				
	0	1	2	3	4
	Minimum Frontages in Lineal In.				
Sink	18	24	24	32(1)	32(1)
Countertop, each side	15	18	21	24	30
Range or Cooktop Space (2)(3)(6)	21	21	24	30	30
Countertop, one side (4)	15	18	21	24	30
Refrigerator Space (5)	30	30	36	36	36
Countertop, one side (4)	15	15	15	15	18
Mixing Countertop	21	30	36	36	42

Notes

- 1) When a dishwasher is provided, a 24 in. sink is acceptable.
- 2) Where a built-in wall oven is installed, provide an 18 in. wide counter adjacent to it.
- 3) A range burner shall not be located under a window nor within 12 in. of a window. Where a cabinet is provided above a range, 30 in. clearance shall be provided to the bottom of an unprotected cabinet, or 24 in. to the bottom of a protected cabinet.
- 4) Provide at least 9 in. from the edge of a range to an adjacent corner cabinet and 15 in. from the side of a refrigerator to an adjacent corner cabinet.
- 5) Refrigerator space may be 33 in. when refrigerator door opens within its own width.
- 6) When a range is not provided, a 30 in. wide space shall be provided.

SOURCE: HUD, Minimum Property Standards, Table 4-1.2.

GENERAL STORAGE - 0 Bedroom Unit - 100 cu. ft.
 1 Bedroom Unit - 100 cu. ft.
 2 Bedroom Unit - 200 cu. ft.
 3 Bedroom Unit - 275 cu. ft.
 4 Bedroom Unit - 350 cu. ft.

COMMUNITY FACILITIES

MULTI-PURPOSE ROOM - 800 s.f. min.

LAUNDRY - 500 s.f. (larger if a commercial facility)

OPEN SPACE

30% of total site -- 61,420 s.f.

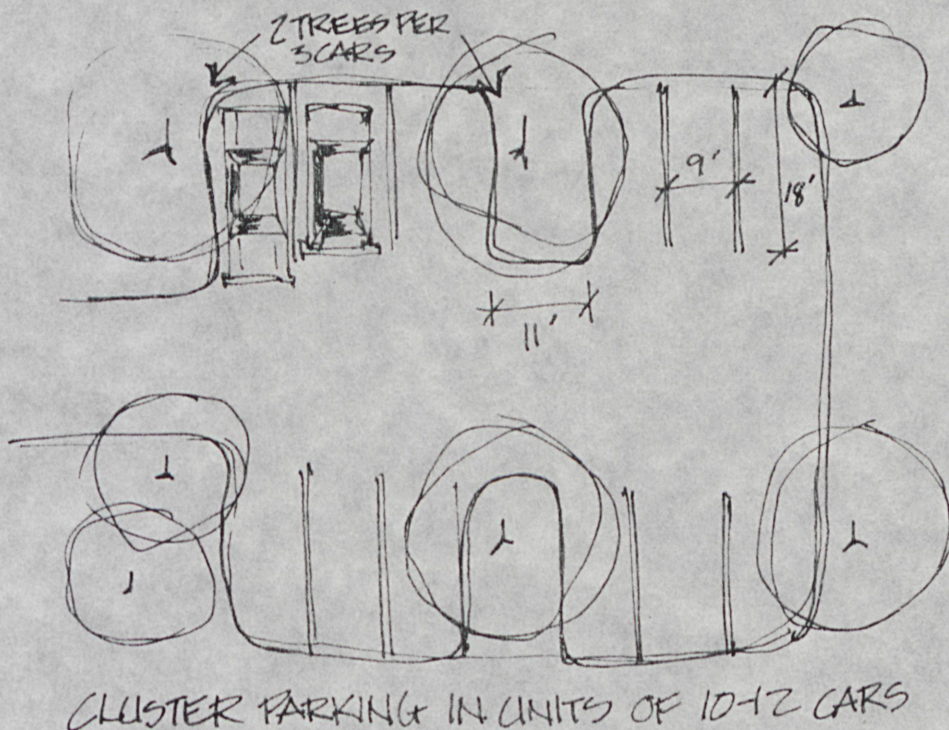
PARKING²³

TOWNHOUSES AND MULTI-FAMILY - These are structures containing 4 or less units. They are required to provide 2 1/4 offstreet parking stalls per unit. With 40 such units of family housing, and allowing 350 s.f./car for storage and circulation, the total required is:

$$2 \frac{1}{4} \times 40 = 90 \text{ spaces}$$

$$90 \times 350 = \underline{31,500 \text{ s.f.}}$$

APARTMENTS - The parking requirement for apartments is 1 offstreet space per bedroom, plus 1 guest space for every 4 units, with a minimum of 1 1/2 spaces per unit for 35.



²³Based on Bozeman Zoning Code.

1 bedroom and efficiency units for singles, and 20 1 bedroom apartments for the elderly, the requirements are:

$$35 \times 1 \frac{1}{2} = 53 \text{ spaces}$$

$$53 \times 350 = \underline{18,550 \text{ s.f.}}$$

For the elderly:

$$20 \times 1 \frac{1}{2} = 30 \text{ spaces}$$

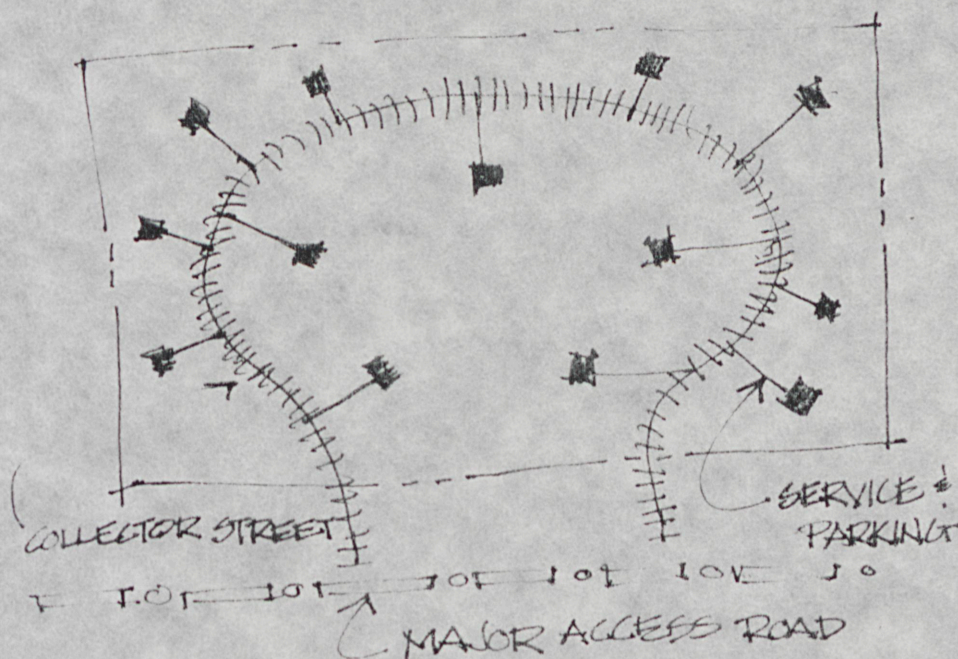
$$30 \times 350 = \underline{10,500 \text{ s.f.}}$$

LANDSCAPING - Any use parking more than 15 cars, is required to have 6% of the gross parking area landscaped as follows:

- 1) The maximum single landscaped area shall be 200 s.f.
- 2) Trees must be used to screen cars at the rate of 1 tree / 3 cars. The size of these trees shall be 1.5 caliper for deciduous trees, or 4' tall for conifer trees.

SMALL CARS - If there are more than 25 cars in a lot, it is allowed to specify that 25% of these stalls be used for small car parking. The size of such stalls is $7 \frac{1}{2}' \times 15'$.

VEHICULAR CIRCULATION



B. FORM

SITE

The site, really lacking any natural amenity of its own, requires focus to be created by landscaping or man-made features. Smaller and more intimate clusters will aid in providing focus. This focus will also aid in the development of identity for the cluster, producing a sense of place. Individual identity can be further enhanced if the individual has the opportunity to actively participate in the creation of a space. Work provided by the residents in the form of sweat equity, can both reduce costs, and serve as a means to express the individual's identity.

C. ECONOMY

Space requirements must be balanced with the budget, but quality must not suffer through poor detailing and cheap products. Simple buildings, spaces and construction is preferable to shoddy details and visual complexity. The project must be economically built, but above all economically operated.

D. TIME

If it is found that initial funds can not be obtained to finance this large a project, phasing of the project should be considered. Priority in phasing should be given to the family units, as they are the most pressing need. The singles and elderly units could be considered together as a second phase, or separately as two additional phases, with the singles taking priority.

PROBLEM STATEMENT

A. FUNCTION -

PERFORMANCE REQUIREMENTS

This development must above all be sensitive to the individual. Interaction among residents will be encouraged, but the individual must be able to choose when he wants interaction -- he must have privacy when he needs it. The individual must maintain his identity through individual expression and the ability to affect his environment. The individual must feel he is self sufficient and independent -- being forced to depend on handouts is discouraged. To this end, individual ownership would be desirable as well as the ability to grow at least a portion of one's food supply. Freedom from high energy costs would also give greater independence.

To function effectively, this development must also develop as a community. A spirit of cooperation must be created. The environment should be one of mutual support. Shared facilities, intimate spaces and a common focus will all help to create this community. This development, while providing many of the amenities of the single family detached house, must also challenge its conventions and traditional wastes of open space. The challenge is to encourage as much cooperation as possible without sacrificing necessary privacy.

B. FORM

SITE

The site as it exists now is a barren field, lacking any real amenities. The problem therefore, is to create amenity and focus

through landscaping and intimate spaces. The adjoining commercial uses must be visually buffered from the development, while the adjoining fairgrounds, being an occasional noise generator, must be visually and acoustically buffered.

BUILDING

In terms of the individual environment, flexibility and choice are the key concerns. The design must allow individual expression and adaptation to the special and changing needs of its user. Several housing types will also allow a degree of choice in living alternatives.

C. ECONOMY

BUDGET

The budget is viewed as an upper limit of expenses. The problem will be to bring the project in on, or better still, under budget. The use of sweat equity and other cost control measures, will be a major concern.

D. TIME

FUTURE DEVELOPMENTS

With about 8 acres of similarly zoned land vacant to the north of this project, future extensions or developments must be taken into account and allowed for. This project being the first of its kind will hopefully also act as a successful model and proving grounds for ideas to be incorporated in future developments.

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BIBLIOGRAPHY

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DESIGN DOCUMENTATION

The following cost estimate was developed using system costs as given in the publication, 1983 Means Residential / Light Commercial Cost Data, (Kingston, MA: R. S. Means Company, Inc., 1982).

APARTMENTS (3900 s.f. unit containg 6 apartments)

Site Work -	
excavate for walls and foundation 4' deep; utility trench	780.00
Foundations -	
continuous footings 8x18 and 12x24; concrete wall 4' high; 4" concrete slab on 4" gravel base	2118.00
Framing -	
a) floor: 2x10, 16" o.c.: 3000 s.f. @ \$3.13/s.f.	9390.00
b) exterior walls: 2x6, 24" o.c., 3/4" foil faced insulation with 5/8 T-11 siding: 4600 s.f. @ \$3.00/ s.f.	14161.00
c) roof: 736 s.f. with 2x8 rafters: 24" o.c. @ \$3.00/ s.f.	2208.00
1188 s.f. with mono pitch trusses 24" o.c. @ \$2.20/ s.f.:	2613.00
128 s.f. shed roof with 2x8, 24" o.c. @ \$1.85/s.f.:	237.00
96 s.f. shed roof with 2x6, 24" o.c. @ \$1.68/s.f.	161.00
d) partitions: 1376 s.f. with 2x4, 24" o.c. @ \$.53/s.f.	730.00
e) party wall: 640 s.f. staggered stud wall with acoustical barrier @ \$1.23/s.f.	787.00
f) glu-lam framing: 3x18 beams with 8x8 columns	4138.00
Windows -	
plastic clad casement with insulating glass	6666.00
Insulation -	
a) walls, 6x23 R18	1564.00
b) roof 12x23 R38	1393.00
c) floor 9x15 R28	593.00
Entry door - 6 wood solid core @ \$312.00	1872.00
Glass door - 6 wood @ \$460.00	2760.00
Roofing -	
240# asphalt shingles on 15# felt, with trim and gutters	3426.81
Interiors -	
a) partitions; 1/2" gypsum taped and painted	4320.00
b) firewall: 2 layers 5/8" fire resistant gypsum with staggered seams	4801.00
c) ceilings: 1/2" gypsum	3510.00
d) doors: 12 @ \$205.70	2469.00
e) closet doors	4863.00
f) carpet and padding @ \$1.49/s.f.	4973.00
g) tile @ \$1.07/s.f.	642.00

Specialties

a) kitchen cabinets: appliances; bathroom accessories:	
6 vanities @ \$4.65/s.f. x 3900 s.f.	18135.00
b) balconies: 2x10 joists, 2x6 deck and 2x4 railings	1205.00

Mechanical -

6 lavatories; 6 water closets; 6 bathtubs; 6 kitchen sinks:	
water heaters and gas heat @ \$6.60/s.f. x 3900 s.f.	25740.00

Electrical -

200 amps service @ \$1.12/s.f. x 3900 s.f.	4368.00
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Overhead -

permit and plans @ \$2.92/s.f. x 3900 s.f.	15171.00
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145,704.00

cost/s.f. = 145,704/3900=

\$37.36/s.f.

TOWNHOUSES (1383 s.f. unit)

Site Work -	
prepare for slab; trench 4' deep for foundation, utility trench	916.00
Foundation -	
continuous footing 8"x18", 4' foundation wall; 4" slab on 6" gravel base; porch slab	4092.00
Framing -	
a) upper floor, walls and roof truss framed with 2x4 trusses 24" o.c. with $\frac{1}{2}$ " CDX roof sheathing, $\frac{3}{4}$ " plywood subfloor, and exterior sheathing of $\frac{3}{4}$ " foil faced fiber-glass and $\frac{5}{8}$ " T-11 siding	2083.00
b) Tower walls; 2x6, 24" o.c.	2890.00
c) porch roof; 2x6 rafters, $\frac{1}{2}$ " plywood, 4x4 posts and 4x6 beam	215.00
d) partitions; 2x4, 24" o.c.	566.00
e) party wall: 2x4 staggered stud wall	592.00
Insulation -	
a) walls 6x23 R19, and $3\frac{1}{2}$ x23 R11	441.00
b) roof 12x23 R38	483.00
Windows -	
plastic clad casement: 16/unit	4210.00
Entry Door -	312.00
Glass Door -	460.00
Roofing -	
240# asphalt shingles on 15# felt with trim and gutters	1241.00
Interiors -	
a) walls; $\frac{1}{2}$ " gypsum taped and painted	2192.00
b) ceilings; $\frac{1}{2}$ " gypsum	1247.40
c) party walls; $\frac{5}{8}$ " fire resistant gypsum	510.00
d) doors; 5 @ \$205.76	1029.00
e) closet doors:	2859.00
f) carpet and padding @ \$1.49/s.f.	2000.00
Specialties -	
a) kitchen cabinets; 14 L.F. wall and base cabinets, counter top; medicine cabinet and stairs. \$1.87/s.f x 1400 s.f.	2618.00

b) fence, 3 rail 5' high; 35 L.F. @ \$8.60/L.F.	301.00
c) storage shed 4x6; 4" thick slab, 2x4 construction	150.96

Mechanical -

1 lavatory, 1 water closet, 1 bathtub with shower, 1 kitchen sink, 1 30 gal. water heater, gas heat @ \$4.95/ s.f. x 1400 s.f.	6930.00
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Electrical -

200 amp service @ \$1.03/s.f. x 1400 s.f.	1442.00
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Overhead -

permit and plans \$.42/s.f. x 1400 s.f.	588.00
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40,450.00

cost/s.f. = 40,450/1383 s.f. =	<u>\$29/s.f.</u>
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ELDERLY (1094 s.f. unit)

Site Work -

preparation for slab; trench 4' deep for foundation wall:
utility trench 1443.00

Foundation -

continuous concrete footing 8"x18"; 12x24 footing for mass
wall, 8" foundation wall 4' deep, 8" block wall, 4" concrete
slab on 6" gravel base. 7313.00

Framing -

a) wall; 2x6, 24" o.c., 3/4" foil faced sheathing, 5/8 T-11
siding 3634.00
b) roof: mono with trusses; 4:12 trusses, 24" o.c.; 2x10 :
rafters 24" o.c. 2560.00
c) clerestory; heavy framing, 4x10 beams, 4x4 columns,
2x10 rafters 24" o.c. 880.00
d) partitions: 2x4, 24" o.c. 498.00

Insulation -

a) walls 6x23 R19 400.00
b) roof 12x32 R38, 9x23 R28 869.00

Windows -

plastic clad wood casement 7/unit 1890.00
4x4 fixed glass 6/unit 2067.00

Entry door -

468.00

Glass door -

460.00

Roofing -

240# asphalt shingles on 15# felt with trim and gutters 2180.00

Interior -

a) walls, 1/2" gypsum taped and painted 2536.00
b) ceiling; 1/2" gypsum 985.00
c) doors 5/unit 1029.00
d) closet doors 730.00
e) carpet and padding @ \$1.49/s.f. 1222.00
f) tile @ \$1.07 s.f. 168.00

Specialties -

a) cabinets: 17L.F. @ \$95.66 1626.00
b) thermal shutters; sandwich of plywood and insulation 245.00
c) greenhouse

Mechanical -

2-3 fixture baths @ \$1581., kitchen sink, range hood, 30

gallon water heater, auxiliary gas furnace	5254.00
Electrical -	
100 amps service @ \$.94/s.f. x 1094 s.f.	1028.00
Overhead and Profit -	
\$.20/s.f. x 1094	219.00
	<u>41,400.00</u>
cost/s.f. = 41,400/1094 =	\$38/s.f.

COMMUNITY CENTER (1520 s.f.)

Site Work -

preparation for slab; trench 4' deep for foundation:
utility trench 1643.00

Foundation -

continuous 8"x18" footing; 12x24 footing for mass wall:
8" foundation wall 4' high; 12" block mass wall; 6" floor
slab on 4" gravel 12784.00

Framing -

a) exterior walls: 2x6, 24" o.c. 3/4" foil faced insulation
5/8" T-11 siding 4086.00
b) roof, 2x10 rafters 24" o.c., 1/2" plywood sheathing, ridge
beam 2-2x12 supported on 4x4 posts 4' o.c. 3370.00
c) partitions: 2x6, 24" o.c. and 2x4, 24" o.c. 503.00

Insulation -

a) walls 6x23 R19 463.00
b) roof 12x23 R38 840.00

Windows -

2x5 plastic clad casement double glazed 12 @ \$233. 2796.00
3x4 single glazed awing, 4 @ \$138. 553.00

Doors -

2-mill finish aluminum entrance doors 1972.00

Roofing -

240# asphalt shingles on 15# felt with trim 1667.00

Interiors -

a) walls; 1/2" gypsum taped and painted 2790.00
b) ceiling: 2x4 grid film faced fiberglass 5/8" thick 1762.00
c) doors 3 @ \$205.76 617.00

Specialties -

a) laundry: 7 washers and dryers 7000.00
b) greenhouse: kal-wal glazing and framing 5169.00
c) covered entries and extended rafters 1082.00

Mechanical -

a) 2 baths: 2 lavatories: 2 water closets 1964.00
b) 75 gallon water heater 565.00
c) auxiliary gas furnace 1000.00

Electrical -

200 amp service @ \$2.25/s.f. 3420.00

Overhead -

plans and permit \$2.00/s.f.

3040.00

\$59,000.00

cost/s.f. = $59,000/1520 =$

\$39/s.f.

TOTAL BUDGET

Construction -

a) Apartments 6x145,700=	874,200.00
b) Townhouses 24x40,450 =	970,800.00
c) Elderly 10x41,400 =	414,000.00
c) Community Center	59,000.00

Total Construction \$2.3 million

Site Development -

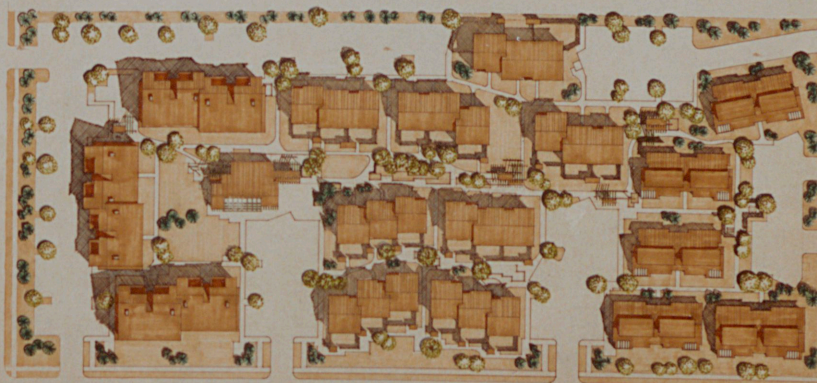
(parking, landscaping, fences, seating areas, play
areas) 15% of construction 350,000.00

Contingencies -

5% of construction 120,000.00

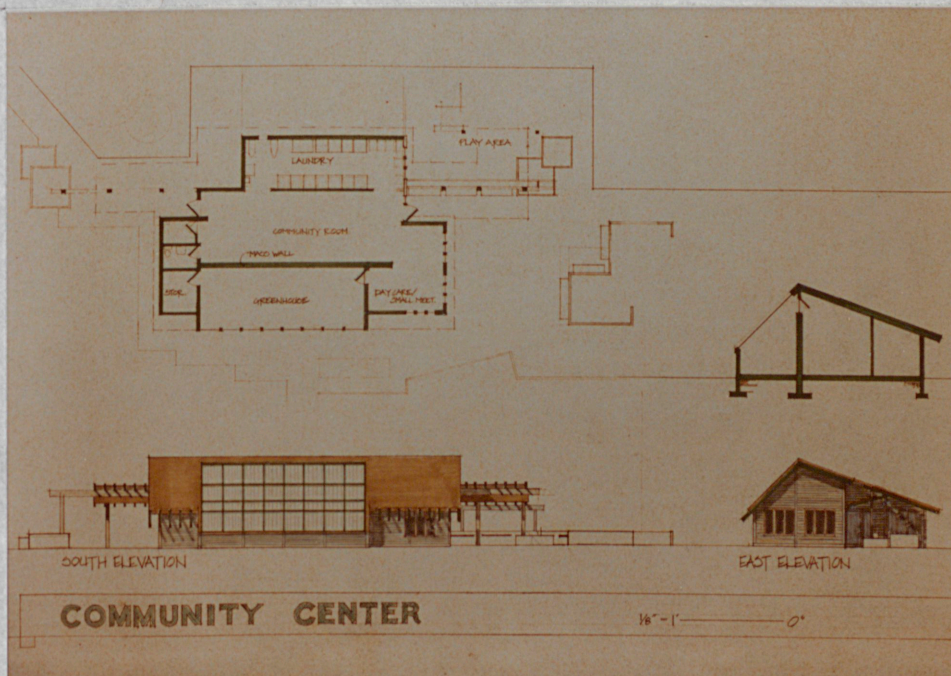
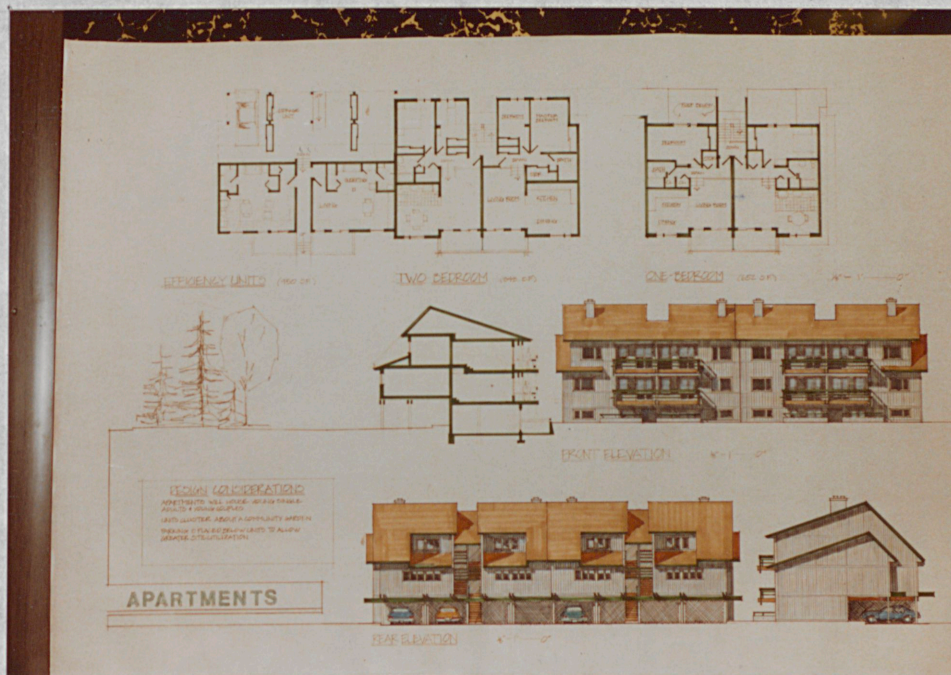
Total Budget \$2.77 million

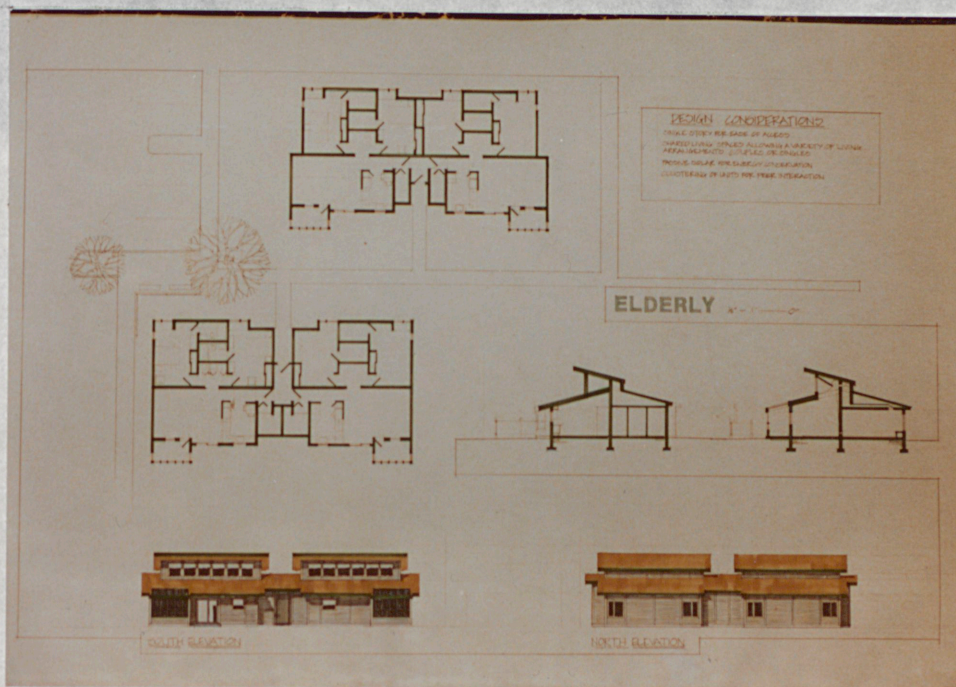
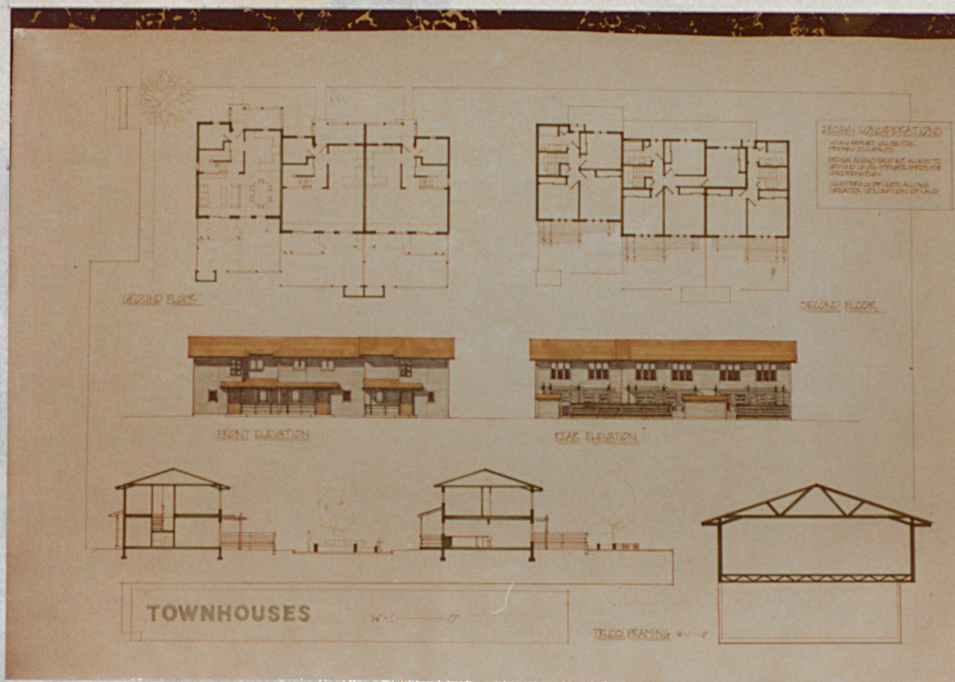
**BOZEMAN
LOW-COST
HOUSING**



DOUGLAS STREET

SITE





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FEB 27 1991

MAR 19 1991

SEP 16 1992

DEC 01 1992

NOV 02 1993

OCT 14 1993

DEC 20 1996

DEC 04 1996

MAR 22 2000

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