SARAH JANE BRIGHT
A STUDY OF APARTMENT
PLANNING

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A STUDY OF APARTMENT PLANNING

by

Sarah Jane Bright

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

of

Bachelor of Arts

in

Architecture

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To G. B., whose faith and confidence in me never waivered, whose attitude toward life is a constant source of inspiration to me, and whose friendship and guidance I treasure dearly.

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THESIS TOPIC: A STUDY OF APARTMENT PLANNING

Thesis Statement: If the steps in the process used by the designer climaxing in detailing, construction documents and cost estimating are thoroughly understood and explored, a more appropriate, realistic and rational product will result.

The cost of any given building is one of the important aspects of design. Often it is a deciding factor on whether or not construction can be undertaken. Technology, man-power and materials to build almost anything are available, if the money is there. But the problem of how to get the most building per dollar in terms of such things as square footage and materials is the real crux of the matter. Total cost must in turn be balanced against other design variables such as functional criteria, aesthetics and utility. The role of the designer is many and varied, but one of the important ones is a basic and thorough knowledge of building costs. This knowledge should be used from the first schematic down to the last detail.

With every design decision, relative costs of alternate ways of meeting the program should be investigated. Advantages and disadvantages of each alternative, in relation to both initial and life-cycle costs, must be considered also.

Costs are but one element to be weighed along with other intangibles such as convenience, aesthetics, uniqueness, function, etc. But the more a designer can put actual dollar figures on what that convenient, aesthetic, unique or functional feature actually costs, the better he will be able to design realistically, stay within a budget, and/or get the most for every dollar.

Many alternatives are considered during the design and development of any plan, and it is the purpose of this thesis to explore the consequences of as many of these decisions as possible in the light of the estimated cost. Among these considerations are the degree of construction difficulty, durability of materials, appropriateness, client needs, maintenance, etc., both in dollars and value gained. A thorough exploration of the alternatives will logically lead to the best solution available and these will be completely detailed in the production of working drawings and contract documents. The more thoroughly a designer understands his decisions in terms of what it costs to build it, the more rational, appropriate and realistic his building will be in terms of the best possible and cost effective use of any dollars available.

PART I

SCHEMATICS

Procedure

There are certain logical steps to follow in developing a design program. The sequence goes from the very general, to allow freedom of choice, to more and more specific, as decisions are made. On the following pages, this sequence is given in outline form. Part One-Schematics, in a broad, general tone, encompasses the work undertaken during the research and exploration stage needed to develop a preliminary design. Part Two-Design Development is more specific and enlarges upon and refines the program. Decisions can now be on the basis of a definite design. Each choice can be tied more and more concretely to the original broad criteria plus additions to, and redefinition of the program, which grew out of the needs of the building as it developed.

Procedure List

Schematics

1. Study the locality and site. Analyze its desirable and undesirable points, its strengths and weaknesses. Begin a building program outline.

2. Explore with schematic plans, as many different types, sizes, varieties and combination of rental units as possible on this site. Enlarge building program to include all possibilities.

3. Study possible future rental clients and their needs. Redefine the building program to cover this aspect.

4. Compare estimated building costs with estimated income from rents to determine financial feasibility. Update the building program.

5. Analyze each different plan and determine to what degree each meets the criteria of the building program, possible financial feasibility and needs of the rental clients.

6. Weigh all information and choose one plan with which to proceed.

Design Development

1. Begin the process of enlarging and improving the chosen plan in order to explore alternative construction methods appropriate to the site, plan, program, etc., keeping in mind variations in cost.

2. Continue the process of refining and improving the plan on the basis of materials. Consider at each design decision a choice of several different materials, methods, techniques, etc., whenever possible.

3. Develop the plans following the format of AIA construction documents. Detail these working drawings to a point where accurate initial costs can be obtained.

4. Estimate how much income will be necessary to justify such an expenditure. This will include maintenance, replacement funds, costs of insurance, utilities, management, etc.

Site and Area Information

Anchorage began its existence in 1914 as a construction camp in the building of the government-owned Alaska Railroad. Anchorage is located 96 miles north from the ice-free port city of Whittier where the construction started. From Anchorage, the railroad leaves the coast of Cook Inlet and turns inland to Fairbanks, 346 miles north. The camp was first called Ship Creek, along whose banks the first tent city grew. As the town grew, the name was changed to Anchorage, because anchoring boats and barges was only possible far from shore. Unloading freight was difficult due to treacherous 30-foot tides, extensive mud flats and winter freeze-up. Therefore, it was and still is very dependent upon the railroad (see Figure 1).

The first permanent structures were built on the bluff on what is now 4th Avenue, 92 feet above sea level and to the south of Ship Creek. As the town grew, the area to the west of the flat bluff main area began to be used for residential purposes to take advantage of the beautiful view of Cook Inlet and the distant mountains to the west. This area became known during the Prohibition Era as Bootlegger Cove and has been chosen as the site for the purpose of this thesis. Most of the land slopes gently at 2-10% to the west and is effectively screened and divided from the downtown business district on the bluff above by a very steep drop off (see Figure 2). The whole area was originally covered by a dense vegetation of 25-30 feet high birch and black spruce, little of which remains today.

The Bootlegger Cove neighborhood today is going through a transition period. The original, small frame houses and cabins from the 20's, 30's and 40's are giving way to luxury townhouses, condominiums

Figure 1.

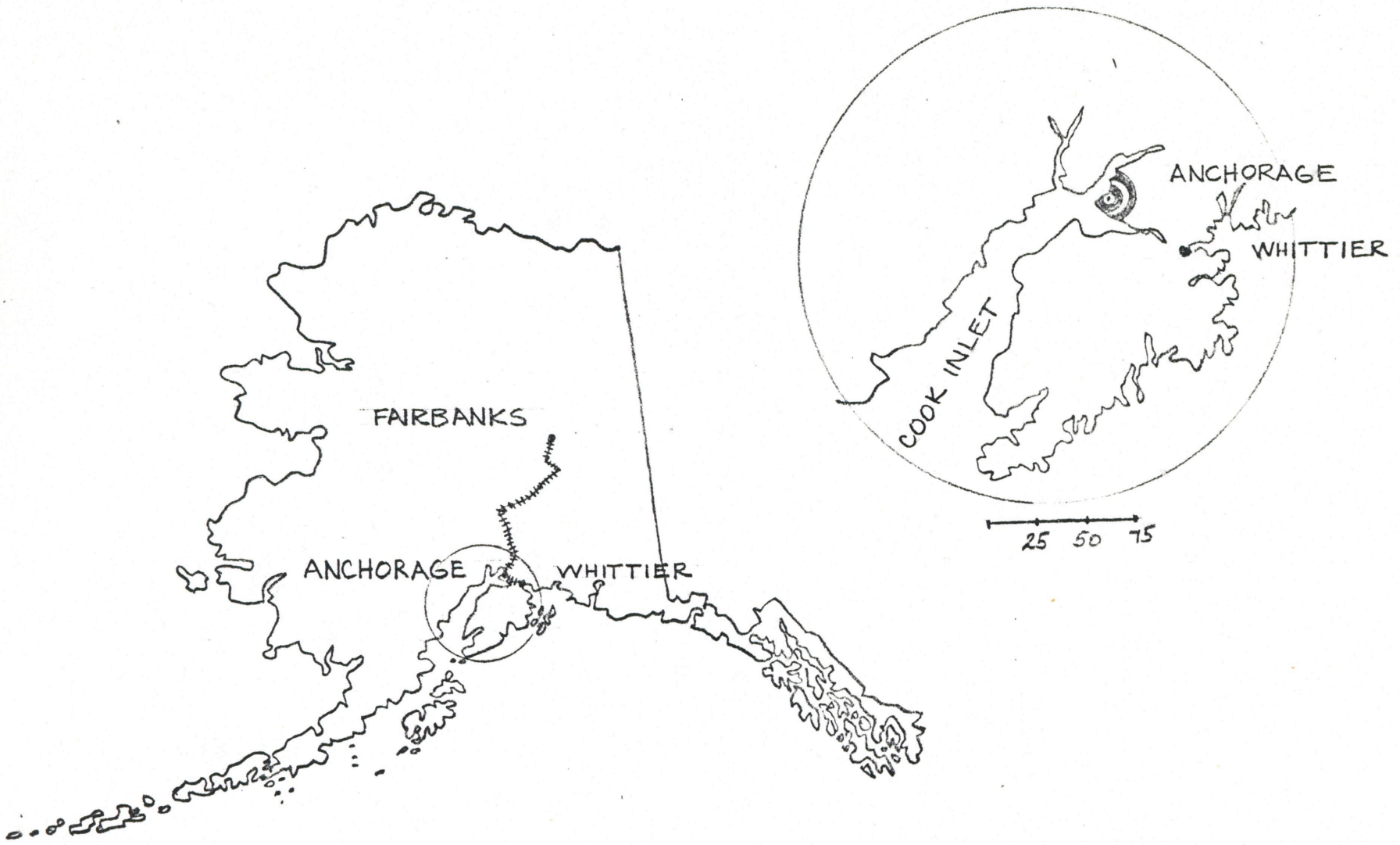
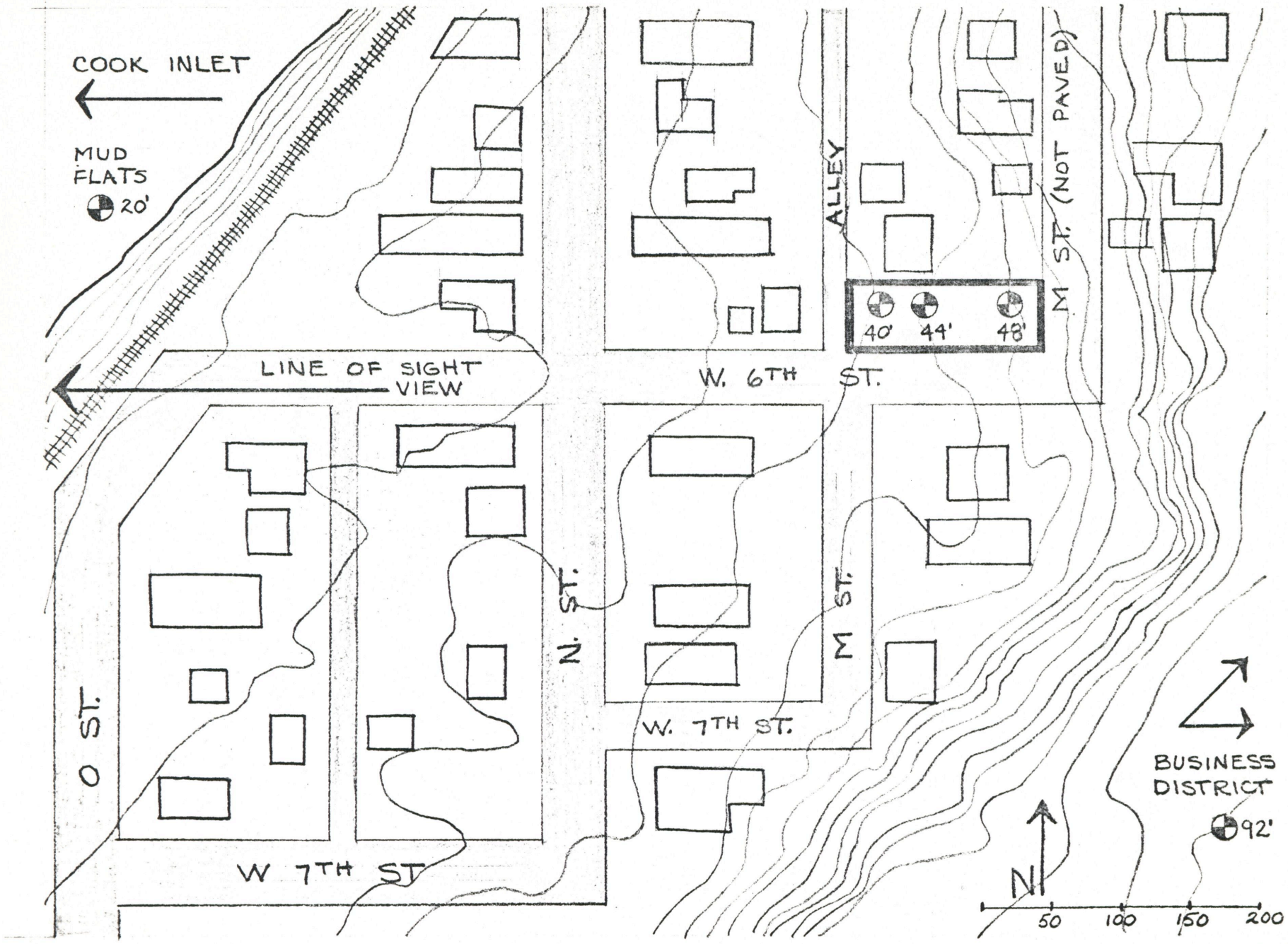

ANCHORAGE
WHITTIER
COOK INLET
25 50 75
FAIRBANKS
ANCHORAGE
WHITTIER

Figure 2.


COOK INLET
MUD FLATS
20'
LINE OF SIGHT VIEW
W. 6TH ST.
ALLEY
M ST. (NOT PAVED)
40'
44'
48'
O ST.
N ST.
M ST.
W. 7TH ST.
W 7TH ST
BUSINESS DISTRICT
92'
N
50
100
150
200

and apartments. Some of the larger and most substantial frame houses built in the 40's and 50's have been remodeled or divided into apartments. It is a neighborhood of sharp residential contrasts from real dumps to mansions. Rents range from $200 to $1,000 per month and condominiums sell from $65,000 to $200,000.

Bootlegger Cove is a very desirable neighborhood because of its close proximity to downtown, its lack of through traffic, limit of three arterial entrances, its physical secludedness and potentially magnificent view. It probably will retain its small neighborhood flavor and will remain secluded as it is bounded by the steep bluff on one side and the Inlet on the other. In the long-range Anchorage Land Use Plan, Bootlegger Cove is scheduled to remain residential because this area was damaged in the 1964 earthquake and soil conditions do not permit heavy construction.

The population in the neighborhood is varied. Old families who grew up within the area still live in the older houses and cabins (some second and third generation residents by now). The apartments and condominiums are inhabited by younger, professional people and pipeline-affiliated executives who have to have good paying jobs to afford the high rents. Non-working housewives and children are noticeably absent. As the traffic problem of commuting to the suburbs grows, its location will become more valuable, and the homes and cabins gradually give way to more apartments, townhouses and condominiums.

The particular lot chosen for this thesis study is a 50 x 150 foot lot at the corner of West 6th and M Street (See Figure 2). Its present value is $80,000 to $100,000. It presently has two small cabins on it which rent monthly for $250.00 apiece and would have to be removed. It is zoned R-2 in Anchorage Municipal Building Code, which limits the number of units to four and the height to three

stories or 35 feet from grade. The side setbacks must be 10 feet, and the end setbacks at the alley and M Street are 20 feet. M Street in this area is only 2 blocks long and is not paved between West 5th and 6th Streets. The alley between M and N Streets must be given special consideration as it is used for main access to the lots just next door to the north of the study site (see Figure 2).

The lot faces south on to West 6th, and care should be taken to maximize the limited sun benefits available at 61°N latitude. The slope from M Street to the alley is 12 feet. From the setback at M Street to the setback at the alley, the lot slopes 8 feet. This slope can be used to advantage to give individual identity to each of the four units. The elevation at mid lot is 44 feet, and it is about one block to the Inlet where the view expands at sea level. Because this lot is tucked back near the bluff, no view is available now at ground level except at the very top of the lot due to the surrounding buildings. A view of the Inlet down the line of sight of West 6th Street will always be available from the second and third stories. To the west, north and northwest, a limited view of the Inlet will sometimes be available from the second story and a good view from the third, even when the neighboring buildings, which are now one story, grow to two or three stories. Every effort should be made to capture all views possible from each of the four units.

Preliminary Building Program

The following concepts and requirements are purposely broad and general to allow for experimentation to cover as many possibilities as can be utilized on this site. This allows freedom to explore as many different sizes, shapes and configurations of plans as time allows.

1. Four units
2. Parking: Code requirements -
   1 3/4 off-street spaces for 2 bedroom over 800 sq. ft.
   1 3/4 off-street spaces for 3 bedroom under 900 sq. ft.
   2 1/2 off-street spaces for 3 bedroom over 900 sq. ft.
3. 10 foot side setbacks, 20 foot end setbacks
4. Individual entries (as opposed to common entry and one stair for all four units)
5. Units to function either as apartments for rental or sold as condominiums
6. Each unit to focus on vertical circulation--entry and stairs to receive utmost design care and detailing--natural light and open vertical spaces desirable in this area
7. Open planning: flow of space and sharing of space between rooms and functions to enlarge apparent size whenever possible--open ceilings, minimum halls and horizontal circulation space
8. Exploit view to southwest, west and northwest
9. Minimize heat loss (degree days 10865; little or no fenestration to north, northeast and east; use of south for passive heat gain)
10. Minimum total square foot balanced with design amenities which will enable these units to command high rental or selling price: high initial land costs demand high return
11. Unusual form and spatial concepts desirable (as opposed to all square or rectangular rooms, spaces and overall shape)
12. Possible tenants will include persons who have an appreciation for the beautiful and unusual in architectural design and who have the income to be able to afford it

Exploring the Field

On the following pages are presented six plans (see Figures 3 through 8) which explore many different possibilities of sizes, room combinations and spatial concepts. The designs, numbered in the order in which they were done, are preliminary and schematic in nature. Each has errors, omissions and bugs which could, with time and skill, be worked out. They are offered here only as a starting point for comparison of what is possible to build on this size lot and to compare the financial feasibility of different sizes and types of apartments. Also each of the plans attempts to fulfill as many of the concepts of the building program as possible. In a general overall context, the program themes do emerge clearly in all, although some compromises can be noted in some units more than others. Cost has been considered in each of the six plans by attempting to keep the total square footage down while still providing some amenities and architectural interest.

On the four pages following each plan (see Tables 1 through 24) are preliminary cost and rental income estimates. The main purpose of these estimates is to arrive at building costs for each plan in Anchorage, but Billings and Bozeman costs are included to allow local consultants to better grasp the situation.

The first preliminary cost estimate table that follows each plan is from Means Building Construction Cost Data. A 1.3 multiplier was used to cover inflation and bring prices up to date. Costs were adjusted to the Anchorage and Billings localities by using a 1.347 and .91 multiplier, respectively. "Means" offers four categories or qualities of house construction and their 50 and 75 percentile

brackets are used. Costs are figured separately on gross square footage of living area and garage (includes mechanical and storage area). Also computed separately are gross cubic feet which occur above 8 foot high (caused by cathedral ceilings and open two-story vertical space).

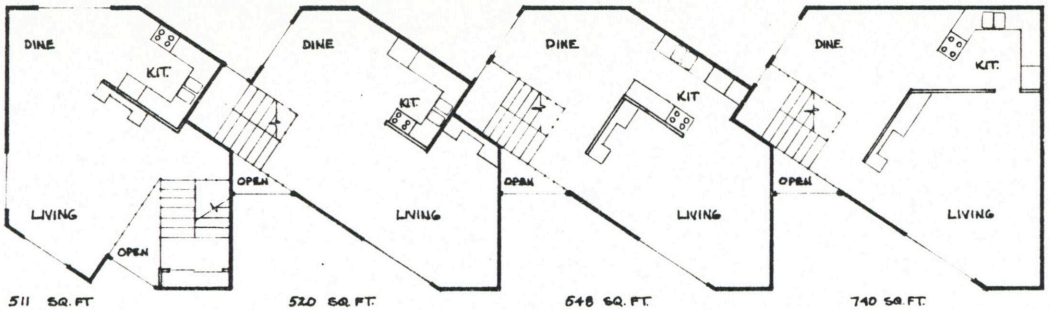
Marshall and Swift Appraisal formulas are also applied to each plan in an attempt to get an entirely different slant on cost analysis. They have four qualities of construction and the third, or above average category, was used. Here a 1.2 inflation factor is used; and 1.56, .95 and .96 locality multipliers are used for Anchorage, Billings and Bozeman, respectively. A table on this method occurs for each house plan also.

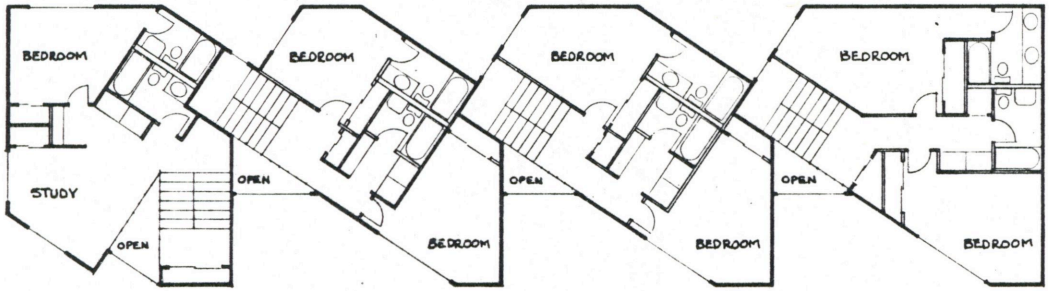
Not only is it important for the designer to be able to estimate the cost of a building; often he is called upon to predict the financial feasibility of a project. Therefore, an attempt to arrive at possible rents which might be expected to be generated by various sizes of apartments is presented for each house. Total square footage and numbers of bedrooms, studies and baths are the main qualifying elements. The sample form used by four realtors (two in Anchorage and two in Bozeman) who specialize in apartment management is found in the Appendix, page 131. None of the realtors saw any of the actual plans so these figures are at best a rough estimate based on stereotypes. A more accurate estimate of rents will be available when one plan is enlarged and refined and can be studied in detail by the realtors. These rents, along with the author's estimate (who has owned rental property in both Anchorage and Bozeman), are averaged for each city.

Also included in the preliminary analysis of each plan is a synopsis of the individual units that make up each plan. A partial list of advantages and disadvantages is given to help understand better the degree to which the plan meets the program.

The ratio figure found on each rent analysis page is arrived at as follows: The average rents (for Anchorage and Bozeman, separately) are multiplied by 100. This is a rule of thumb used by banks to determine loan ceilings. In other words, this figure represents how much your monthly payment at the bank would be if you borrowed the maximum amount allowable. Also, the total building costs are averaged for each locality. Then the rents are divided by the costs, giving a ratio ($\text{ratio} = \frac{\text{costs}}{\text{rents}}$). In very broad and general terms, this number gives a means of comparing possible return of the six plans. The further the number is above 1, the more rent you receive in return for what the building cost. If the number is below 1, then your income does not cover the monthly mortgage payment. This figure does not consider items which are not constant to all plans due to different sizes, such as cost of maintenance, management and replacement funds necessary to operate an apartment over a long term. Also, this figure is to be used for comparison purposes only. They are to be used only to help choose one of the plans. When one is chosen, redefinition and refining of that plan can take place. Building costs can be estimated more closely when materials and methods are considered and expected rents will then be computed on that basis, giving a more realistic ratio.

Figure 3.



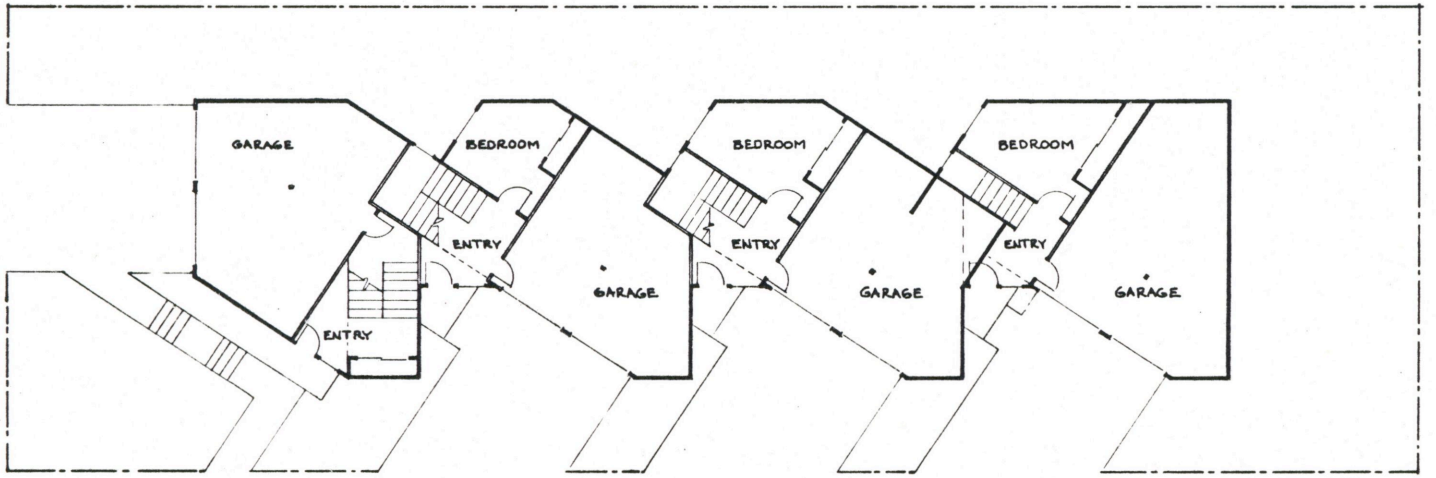


UNIT 1: 1317 SQ. FT.
1 BEDROOM

UNIT 2: 1389 SQ. FT.
3 BEDROOM

UNIT 3: 1464 SQ. FT.
3 BEDROOM

UNIT 4: 1871 SQ. FT.
3 BEDROOM



house one 6401 sq. ft.

TABLE 1.

MEANS COST ANALYSIS

House #1

Factors Applied
3 year update: 1.3
Anchorage: 1.347
Billings: .916
Bozeman: Martel Construction Company

	sq. ft. living area 6,041		sq. ft. garage area 1,809		cu. ft. cathedral open space 6,000		Total	Sq. Ft.
For 50 Percentile	@$22.40 (M)	Anchorage $236,900	@$11.20 (M)	Anchorage $36,400	@$2.35 (M)	Anchorage $24,600	$297,800	$49.29
	$39.22 (A)	Billings $161,000	$19.61 (A)	Billings $24,100	$4.11 (A)	Billings $16,300	$201,900	$33.24
	$26.67 (B)		$13.33 (B)		$2.79 (B)			
	@$35.00	Bozeman $210,500	@$7.50	Bozeman %13,500	+5% of total	Bozeman $11,200	$235,200	$38.92
For 75 Percentile	@$35.25 (M)	Anchorage $327,000	@$11.20 (M)	Anchorage $36,400	@$2.95 (M)	Anchorage $31,000	$394,400	$65.28
	$52.97 (A)	Billings $217,600	$19.61 (A)	Billings $24,100	$5.16 (A)	Billings $21,100	$262,800	$43.50
	$36.02 (B)		$13.33 (B)		$3.51 (B)			

Codes: M - Means, no factors
A - Anchorage
B - Billings

TABLE 2.

MARSHAL AND SWIFT APPRAISAL

House # 1

Factors Applied

1 Year Update	1.2
Anchorage	1.56
Billings	.95
Bozeman	.96

		Anchorage	
6,041	sq. ft. @ $22.48	$254,300	
12	plumbing fixtures @ $275.00	6,200	
6,000	cu. ft. @ $2.20	24,700	
1,809	sq. ft. garage Q $7.92	26,900	
0	decks @ $7.75		
8 flights of stairs		8,000	
7 appliances		12,000	
4 fireplaces		6,500	

		Billings	Bozeman
Total	$338,600	$206,200	$208,400
Sq. Ft.	$56.05	$34.13	$34.49

TABLE 3.

RENTS

House # 1	Unit 1	Unit 2	Unit 3	Unit 4
	2 bedroom 2 bath 2 car garage 1,317 sq. ft.	3 bedrooms 2 bath 2 car garage 1,389 sq. ft.	3 bedrooms 2 bath 2 car garage 1,464 sq. ft.	3 bedrooms 2 baths 2 car garage 1,871 sq. ft.
ANCHORAGE				
Authors Est.	700	775	775	875
Polar Realty	750	750	750	800
Marston Realty	700	800	800	850
Average	715	775	775	840

Total average monthly income (x 100) $310,500

Total average construction price (without land) $343,600 Ratio: .903

BOZEMAN				
Authors Est.	425	440	470	500
United Agency	450	450	450	450
Associated Agency	345	360	360	360
Average	405	415	425	435

Total average monthly income (x 100) $168,000

Total average construction price (without land) $227,100 Ratio: .73

TABLE 4.

House #1

Sq. Ft.	6,041
Extra Cu. Ft.	6,000
Garage Sq. Ft.	1,809

Unit 1	Unit 2	Unit 3	Unit 4
1,317 sq. ft.	1,389 sq. ft.	1,464 sq. ft.	1,871 sq. ft.
2 bedrooms	3 bedrooms	3 bedrooms	3 bedrooms
2 baths	2 baths	2 baths	2 baths
--	--	--	--
2 car garage	2 car garage	2 car garage	2 car garage

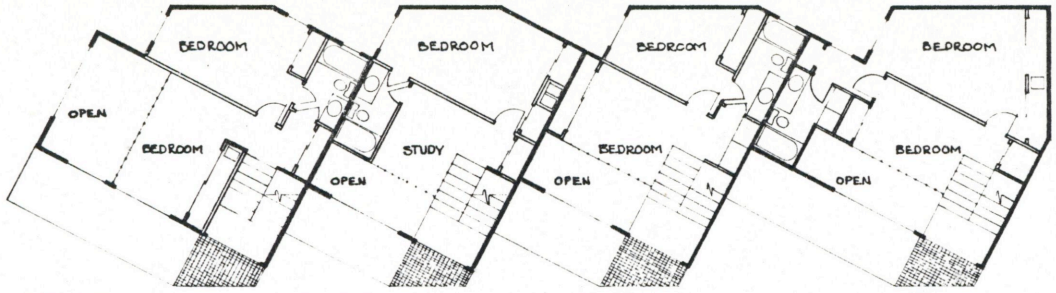
Advantages

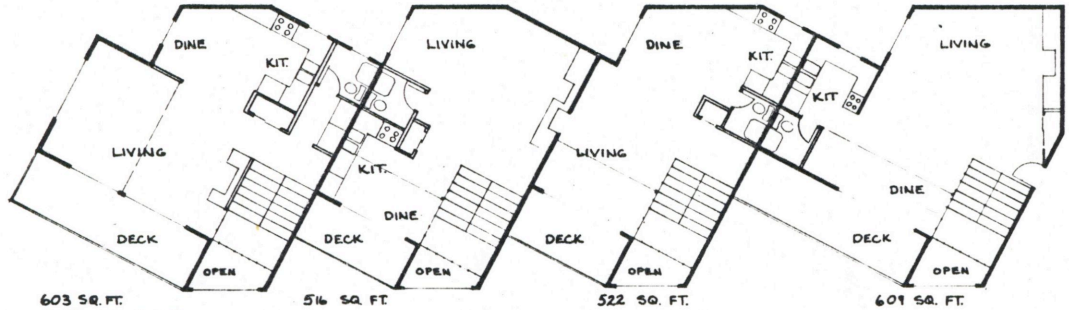
1. light wells at stairs
2. entrances at same level as garages (except unit #1)
3. good variety inside
4. good pattern outside
5. living area on 3rd floor
6. cathedral ceilings available

Disadvantages

1. no 1/2 bath on 3rd level
2. no decks
3. no 2 story open spaces
4. 4½' vertical difference essential between units - cut and fill needed
5. 2 garage stalls not regulation size
6. no mechanical room in garage in units 2 and 3

Figure 4.



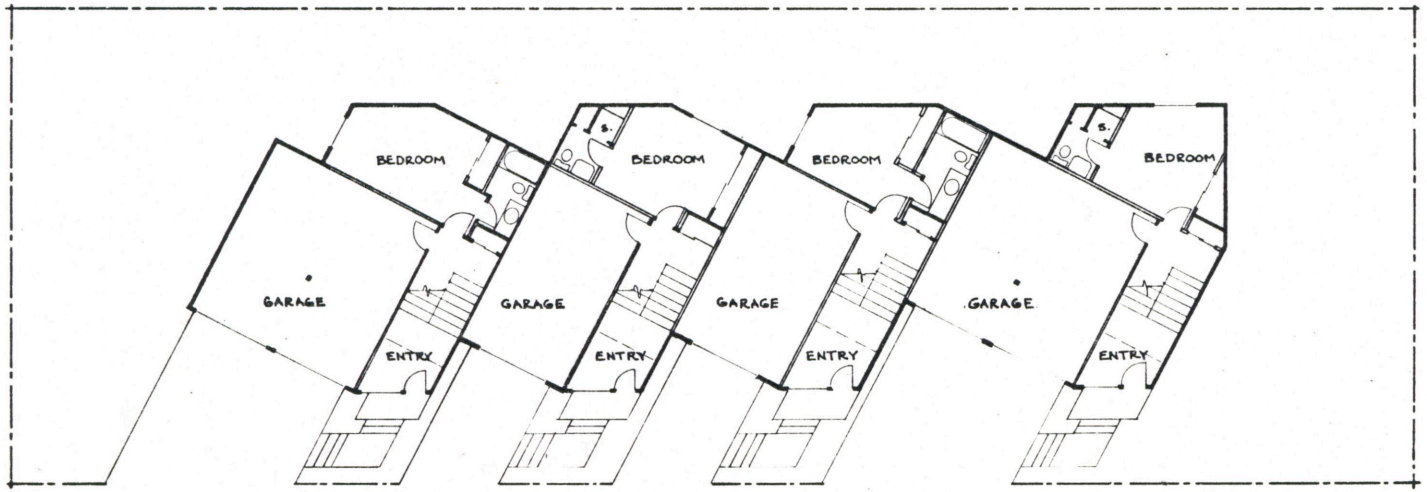


UNIT 1: 1357 SQ FT
3 BEDROOM

UNIT 2: 1296 SQ. FT.
2 BEDROOM

UNIT 3: 1258 SQ. FT.
3 BEDROOM

UNIT 4: 1439 SQ. FT.
3 BEDROOM



house two 5300 sq. ft.

TABLE 5.

MEANS COST ANALYSIS

House #2

Factors Applied
3 year update: 1.3
Anchorage: 1.347
Billings: .916
Bozeman: Martel Construction Company

	sq. ft. living area 5,300		sq. ft. garage area 1,240		cu. ft. cathedral open space 3,600		Total	Sq. Ft.
For 50 Percentile	@$22.40 (M)	Anchorage $208,000	@$11.20 (M)	Anchorage $24,300	@$2.35 (M)	Anchorage $14,800	$247,100	$46.62
	$39.22 (A)	Billings	$19.61 (A)	Billings	$4.11 (A)	Billings		
	$26.67 (B)	$141,300	$13.33 (B)	$16,500	$2.79 (B)	$10,000	$167,800	$31.66
	@$35.00	Bozeman $185,500	@$7.50	Bozeman $ 9,300	+5% of total	Bozeman $ 9,700	$204,500	$38.59
For 75 Percentile	@$35.25 (M)	Anchorage $289,800	@$11.20 (M)	Anchorage $24,300	@$2.95 (M)	Anchorage $18,600	$323,700	$61.07
	$52.97 (A)	Billings	$19.61 (A)	Billings	$5.16 (A)	Billings		
	$36.02 (B)	$190,800	$13.33 (B)	$16,500	$3.51 (B)	$12,600	$220,000	$41.49

Codes: M - Means, no factors
A - Anchorage
B - Billings

TABLE 6.

MARSHAL AND SWIFT APPRAISAL

House # 2

Factors Applied

1 Year Update	1.2
Anchorage	1.56
Billings	.95
Bozeman	.96

		Anchorage		
5,300	sq. ft. @ $22.48	$223,000		
20	plumbing fixtures @ $275.00	10,300		
3,600	cu. ft. @ $2.20	14,800		
1,240	sq. ft. garage Q $7.92	18,400		
384	decks @ $7.75	5,600		
8 flights of stairs		8,000		
7 appliances		12,000		
4 fireplaces		6,500		
			Billings	Bozeman
Total		$298,600	$185,300	$187,200
Sq. Ft.		$56.33	$34.96	$35.32

TABLE 7.

RENTS

House # 2	Unit 1	Unit 2	Unit 3	Unit 4
	3 bedrooms 2½ bath 2 car garage 1,375 sq. ft.	2 bedrooms 2½ bath study 1 car garage 1,246 sq. ft.	3 bedrooms 2½ bath 1 car garage 1,258 sq. ft.	3 bedrooms 2½ bath 2 car garage 1,439 sq. ft.
ANCHORAGE				
Authors Est.	775	725	750	800
Polar Realty	800	750	750	800
Marston Realty	800	770	780	800
Average	790	750	760	800

Total average monthly income (x 100) $310,000

Total average construction price (without land) $289,800

Radio: 1.069

BOZEMAN				
Authors Est.	400	375	375	450
United Agency	450	450	450	450
Associated Agency	370	330	330	370
Average	405	385	385	425

Total average monthly income (x 100) $160,000

Total average construction price (without land) $194,900

Radio: .82

TABLE 8.

House #2

Sq. Ft.	5,300
Extra Cu. Ft.	6,040
Garage Sq. Ft.	1,240

Unit 1	Unit 2	Unit 3	Unit 4
1,357 sq. ft.	1,246 sq. ft.	1,258 sq. ft.	1,439 sq. ft.
3 bedroom	2 bedroom	3 bedrooms	3 bedrooms
--	study	--	--
2½ bath	2½ bath	2½ bath	2½ bath
2 car garage	1 car garage	1 car garage	2 car garage

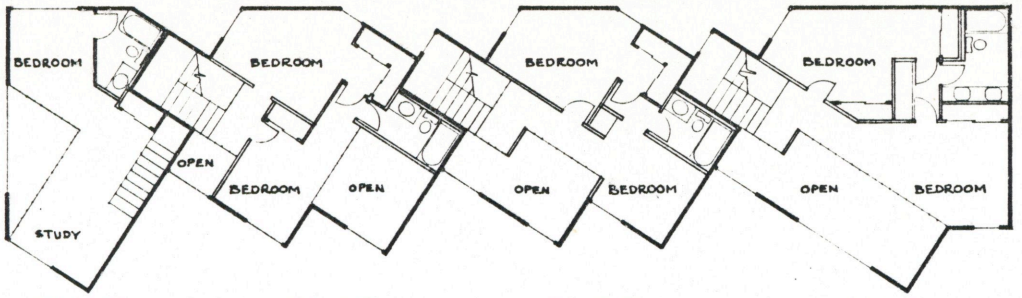
Advantages

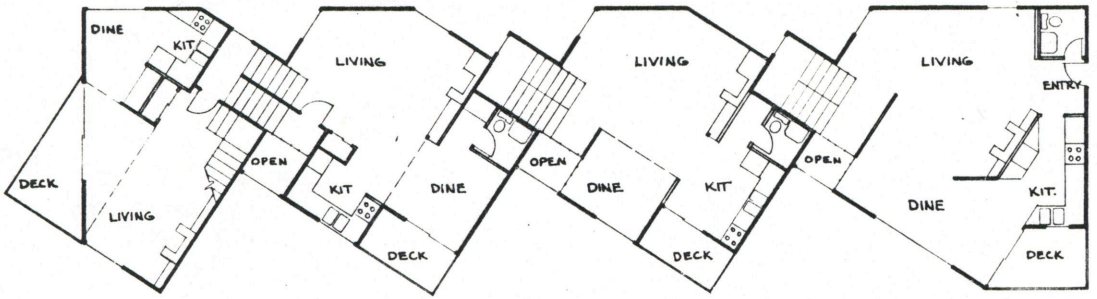
1. 2 plumbing stacks
2. light wells at stairs
3. 2 story open spaces above living or dining
4. good variety inside
5. some pattern variety outside
6. decks

Disadvantages

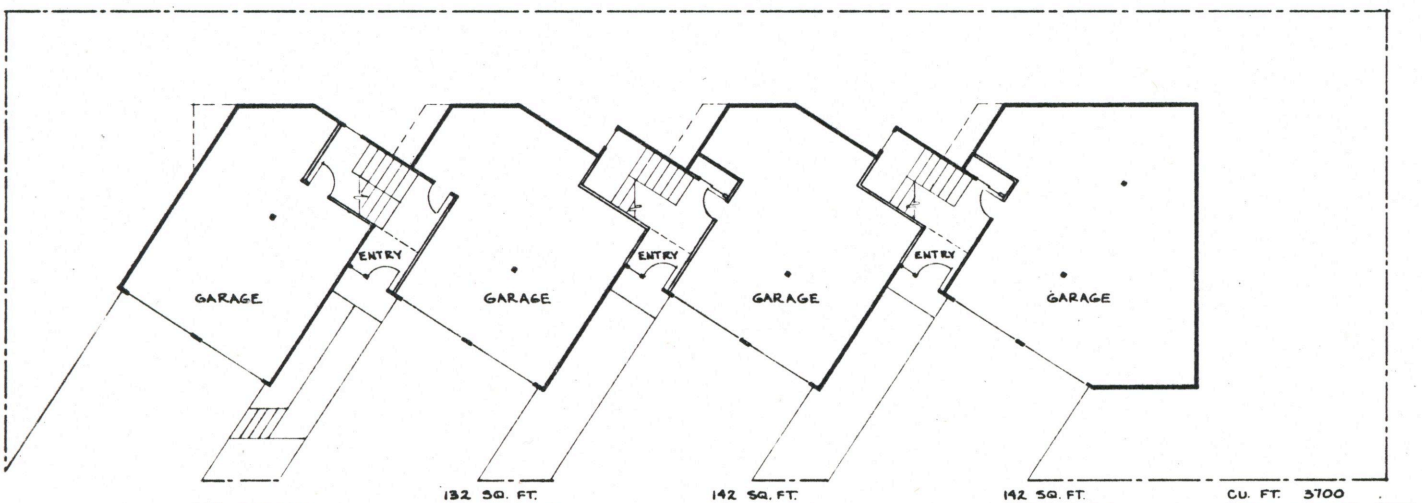
1. limited or no cathedral ceilings
2. only 6 garage stalls - all regulation
3. no mechanical or storage space in garages
4. people entrances up 1/2 flight from garage entrance (outside steps)

Figure 5.





UNIT 1: 780 SQ.FT. 1 BEDROOM
UNIT 2: 1106 SQ.FT. 2 BEDROOM
UNIT 3: 1134 SQ.FT. 2 BEDROOM
UNIT 4: 1546 SQ.FT. 2 BEDROOM



house three 4566 sq. ft.

TABLE 9.

MEANS COST ANALYSIS

House #3

Factors Applied
3 year update: 1.3
Anchorage: 1.347
Billings: .916
Bozeman: Martel Construction Company

	sq. ft. living area 4,566		sq. ft. garage area 2,034		cu. ft. cathedral open space 3,700		Total	Sq. Ft.
For 50 Percentile	@$22.40 (M)	Anchorage $179,000	@$11.20 (M)	Anchorage $39,900	@$2.35 (M)	Anchorage $15,200	$234,100	$51.27
	$39.22 (A)	Billings $121,800	$19.61 (A)	Billings $27,000	$4.11 (A)	Billings $10,300	$159,100	$34.85
	$26.67 (B)		$13.33 (B)		$2.79 (B)			
	@$35.00	Bozeman $160,000	@$7.50	Bozeman $15,200	+5% of total	Bozeman $ 8,800	$185,000	$40.29
For 75 Percentile	@$35.25 (M)	Anchorage $241,800	@$11.20 (M)	Anchorage $39,900	@$2.95 (M)	Anchorage $19,100	$300,800	$65.87
	$52.97 (A)	Billings $164,400	$19.61 (A)	Billings $27,000	$5.16 (A)	Billings $12,600	$204,000	$44.67
	$36.02 (B)		$13.33 (B)		$3.51 (B)			

Codes: M - Means, no factors
A - Anchorage
B - Billings

TABLE 10.

MARSHAL AND SWIFT APPRAISAL

House # 3

Factors Applied

1 Year Update	1.2
Anchorage	1.56
Billings	.95
Bozeman	.96

		Anchorage		
3,466	sq. ft. @ $22.48	$192,100		
6	plumbing fixtures @ $275.00	3,200		
3,700	cu. ft. @ $2.20	15,200		
2,034	sq. ft. garage Q $7.92	30,200		
248	decks @ $7.75	3,600		
8 flights of stairs		8,000		
7 appliances		12,000		
4 fireplaces		6,500		
			Billings	Bozeman
Total		$269,800	$168,400	$169,100
Sq. Ft.		$59.08	$36.88	$37.03

TABLE 11.

RENTS

House # 3	Unit 1	Unit 2	Unit 3	Unit 4
	1 bedroom 1 bath study 2 car garage 780 sq. ft.	2 bedrooms 1½ bath 2 car garage 1,106 sq. ft.	2 bedrooms 1½ bathrooms 2 car garage 1,134 sq. ft.	2 bedrooms 1½ bathrooms 2 car garage 1,546 sq. ft.
ANCHORAGE				
Authors Est.	550	600	600	700
Polar Realty	600	700	700	725
Marston Realty	650	700	700	750
Average	600	665	665	725

Total average monthly income (x 100) $265,500

Total average construction price (without land) $268,200 Ratio: .989

BOZEMAN				
Authors Est.	235	370	370	475
United Agency	195	340	340	450
Associated Agency	240	340	340	340
Average	225	350	350	420

Total average monthly income (x 100) $134,500

Total average construction price (without land) $179,000 Ratio: .75

TABLE 12.

House #3

Sq. Ft.	4,566
Extra Cu. Ft.	3,700
Garage Sq. Ft.	2,034

Unit 1	Unit 2	Unit 3	Unit 4
780 sq. ft.	1,106 sq. ft.	1,134 sq. ft.	1,546 sq. ft.
1 bedroom	2 bedrooms	2 bedrooms	2 bedrooms
study	--	--	--
1 bath	1½ bath	1½ bath	1½ bath
2 car garage	2 car garage	2 car garage	2 car garage

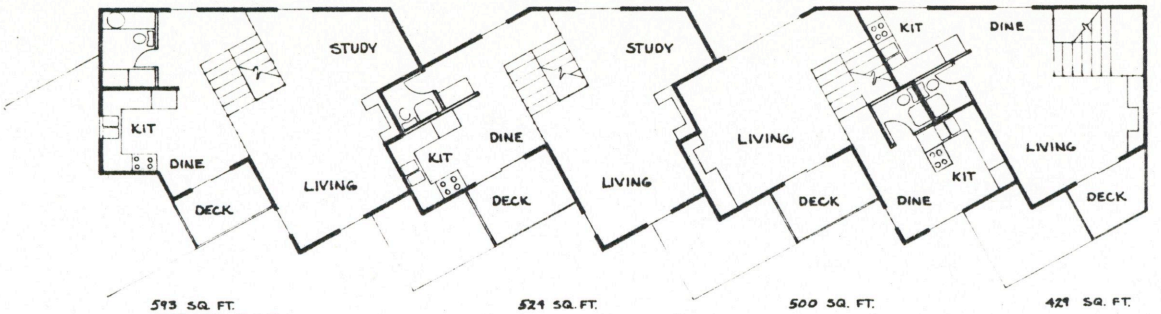
Advantages

1. light wells at stairs
2. 2 story open spaces above dining
3. good variety inside
4. good pattern outside
5. decks
6. entrances on same level as garages (except unit #1)
7. units 1 and 2 must be 4½' vertical difference between levels - establishes pattern
8. 8 garage stalls - all regulation

Disadvantages

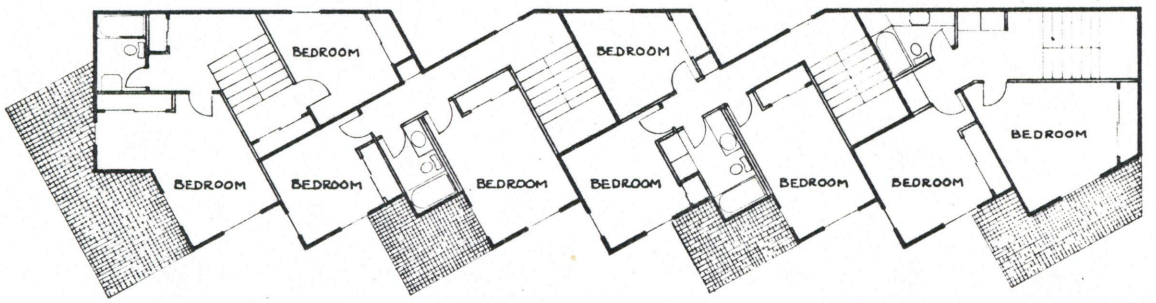
1. living area on second
2. little or no need for cathedral ceilings
3. units 1 and 2 share entrance and stair

Figure 6.



593 SQ. FT.
524 SQ. FT.
500 SQ. FT.
429 SQ. FT.

3RD. FLOOR



583 SQ. FT.
545 SQ. FT.
663 SQ. FT.
595 SQ. FT.

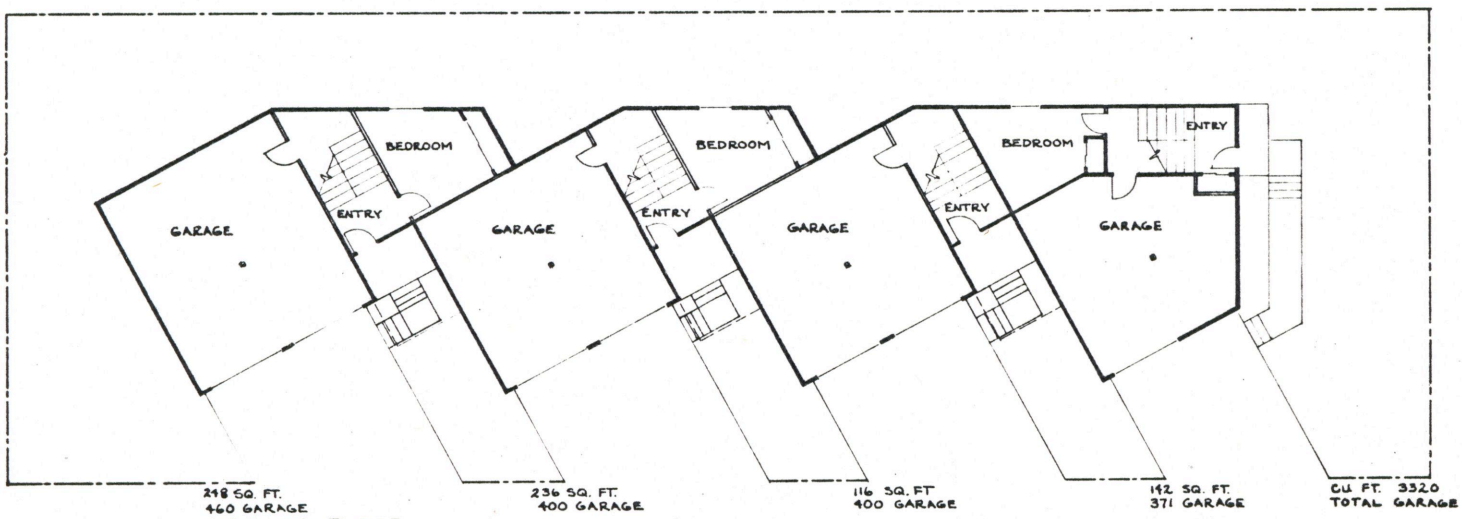
2ND. FLOOR

UNIT 1: 1424 SQ FT
3 BEDROOM

UNIT 2: 1303 SQ FT
3 BEDROOM

UNIT 3: 1279 SQ. FT.
3 BEDROOM

UNIT 4: 1266 SQ. FT.
3 BEDROOM



248 SQ. FT.
460 GARAGE
236 SQ. FT.
400 GARAGE
116 SQ. FT.
400 GARAGE
112 SQ. FT.
371 GARAGE
CU FT. 3320
TOTAL GARAGE 1631

GROUND FLOOR

house four 5272 sq. ft.

TABLE 13.

MEANS COST ANALYSIS

House #4

Factors Applied
3 year update: 1.3
Anchorage: 1.347
Billings: .916
Bozeman: Martel Construction Company

	sq. ft. living area 5,272		sq. ft. garage area 1,631		cu. ft. cathedral open space 3,320		Total	Sq. Ft.
For 50 Percentile	@$22.40 (M)	Anchorage $206,700	@$11.20 (M)	Anchorage $32,000	@$2.35 (M)	Anchorage $13,600	$252,300	$47.85
	$39.22 (A)	Billings $140,600	$19.61 (A)	Billings $21,700	$4.11 (A)	Billings $ 9,200	$171,600	$32.54
	$26.67 (B)		$13.33 (B)		$2.79 (B)			
	@$35.00	Bozeman $184,500	@$7.50	Bozeman $12,200	+5% of total	Bozeman $ 9,800	$206,500	$39.17
For 75 Percentile	@$35.25 (M)	Anchorage $279,200	@$11.20 (M)	Anchorage $32,000	@$2.95 (M)	Anchorage $17,100	$324,900	$61.62
	$52.97 (A)	Billings $196,200	$19.61 (A)	Billings $21,700	$5.16 (A)	Billings $11,600	$229,500	$43.54
	$36.02 (B)		$13.33 (B)		$3.51 (B)			

Codes: M - Means, no factors
A - Anchorage
B - Billings

TABLE 14.

MARSHAL AND SWIFT APPRAISAL

House # 4

Factors Applied

1 Year Update	1.2
Anchorage	1.56
Billings	.95
Bozeman	.96

		Anchorage	
5,272	sq. ft. @ $22.48	$221,900	
8	plumbing fixtures @ $275.00	4,100	
6,963	cu. ft. @ $2.20	28,500	
1,631	sq. ft. garage Q $7.92	24,200	
200	decks @ $7.75	2,900	
8 flights of stairs		8,000	
7 appliances		12,000	
4 fireplaces		6,500	
		Billings	Bozeman
Total		$308,100	$191,100	$194,000
Sq. Ft.		$58,44	$36.24	$36.79

TABLE 15.

RENTS

House # 4	Unit 1	Unit 2	Unit 3	Unit 4
	3 bedrooms 1½ bath study 2 car garage 1,424 sq. ft.	3 bedrooms 1½ bath study 2 car garage 1,303 sq. ft.	3 bedrooms 1½ bath 2 car garage 1,279 sq. ft.	3 bedrooms 1½ bath 1 car garage 1,266 sq. ft.
ANCHORAGE				
Authors Est.	775	750	725	700
Polar Realty	800	775	750	750
Marston Realty	825	800	775	750
Average	800	775	750	735

Total average monthly income (x 100) $306,000

Total average construction price (without land) $295,100 Ratio: 1.036

BOZEMAN				
Authors Est.	475	460	400	390
United Agency	450	450	350	350
Associated Agency	405	405	355	355
Average	445	440	370	365

Total average monthly income (x 100) $162,000

Total average construction price (without land) $200,400 Ratio: .808

TABLE 16.

House #4

Sq. Ft. 5,272

Extra Cu. Ft. 3,120

Garage Sq. Ft. 1,631

Unit 1	Unit 2	Unit 3	Unit 4
1,424 sq. ft.	1,303 sq. ft.	1,279 sq. ft.	1,266 sq. ft.
3 bedrooms	3 bedrooms	3 bedrooms	3 bedrooms
1½ bath	1½ bath	1½ bath	1½ bath
study	--	--	--
2 car garage	2 car garage	2 car garage	2 car garage

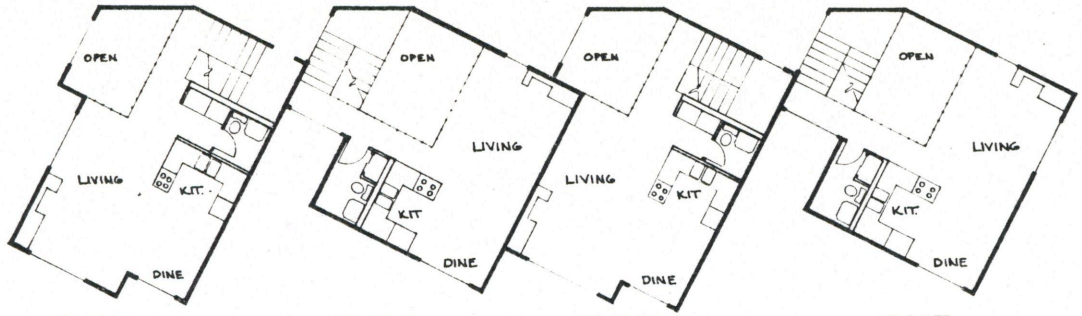
Advantages

1. decks
2. excellent variety inside
3. good pattern outside
4. cathedral ceilings available
5. Living area on 3rd floor
6. ½ flights of stairs used to good advantage to tie levels together
7. 7 garage stalls - all regulation size (maybe 8)

Disadvantages

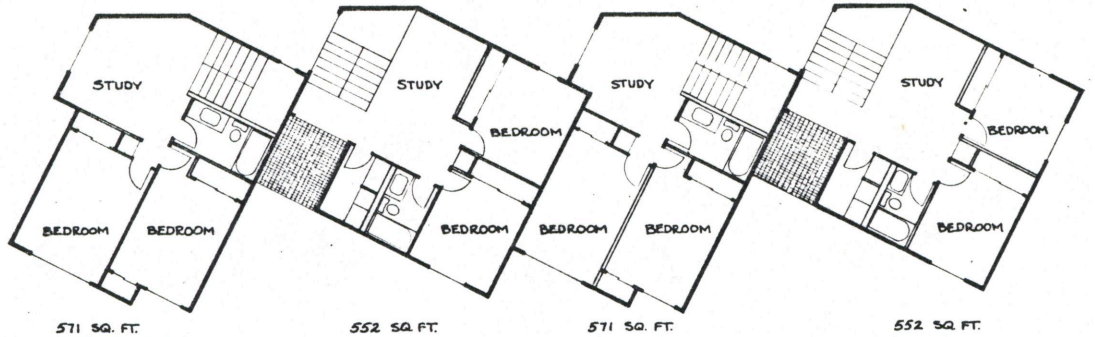
1. no 2-story open spaces
2. no lights wells at stairs
3. poor use of view to M.W.
4. no mechanical and storage in units 1, 2 and 3
5. 4½' vertical difference essential between units - makes cut and fill
6. people entrance up 1/2 flight from garage entrance (outside steps)
7. difficult to sound insulation

Figure 7.



403 SQ. FT. 376 SQ. FT. 403 SQ. FT. 376 SQ. FT.

3RD. FLOOR



571 SQ. FT. 552 SQ. FT. 571 SQ. FT. 552 SQ. FT.

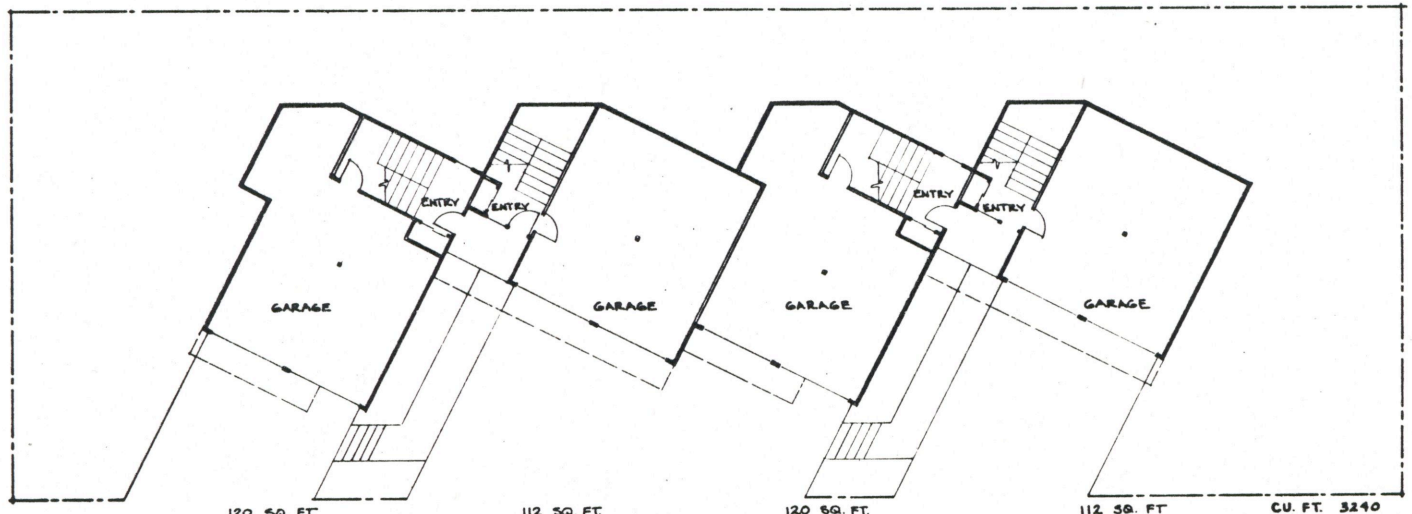
2ND. FLOOR

UNIT 1: 1094 SQ.FT
2 BEDROOM

UNIT 2: 1010 SQ.FT.
2 BEDROOM

UNIT 3: 1094 SQ.FT
2 BEDROOM

UNIT 4: 1010 SQ.FT.
2 BEDROOM



120 SQ. FT. 418 GARAGE
112 SQ. FT. 380 GARAGE
120 SQ. FT. 418 GARAGE
112 SQ. FT. 380 GARAGE
CU. FT. 3240 TOTAL GARAGE 1596

GROUND FLOOR

house five 4208 sq. ft.

TABLE 17.

MEANS COST ANALYSIS

House #5

Factors Applied
3 year update: 1.3
Anchorage: 1.347
Billings: .916
Bozeman: Martel Construction Company

	sq. ft. living area 4,208		sq. ft. garage area 1,596		cu. ft. cathedral open space 6,040		Total	Sq. Ft.
For 50 Percentile	@$22.40 (M)	Anchorage $165,100	@$11.20 (M)	Anchorage $31,300	@$2.35 (M)	Anchorage $24,800	$221,200	$52.56
	$39.22 (A)	Billings $112,200	$19.61 (A)	Billings $21,200	$4.11 (A)	Billings $16,800	$150,200	$35.69
	$26.67 (B)		$13.33 (B)		$2.79 (B)			
	@$35.00	Bozeman $147,300	@$7.50	Bozeman $12,000	+5% of total	Bozeman $ 8,000	$167,300	$39.74
For 75 Percentile	@$35.25 (M)	Anchorage $223,000	@$11.20 (M)	Anchorage $31,300	@$2.95 (M)	Anchorage $31,200	$285,500	$67.84
	$52.97 (A)	Billings $151,600	$19.61 (A)	Billings $21,200	$5.16 (A)	Billings $21,200	$194,000	$46.09
	$36.02 (B)		$13.33 (B)		$3.51 (B)			

Codes: M - Means, no factors
A - Anchorage
B - Billings

TABLE 18.

MARSHAL AND SWIFT APPRAISAL

House # 5

Factors Applied

1 Year Update	1.2
Anchorage	1.56
Billings	.95
Bozeman	.96

		Anchorage		
4,208	sq. ft. @ $22.48	$177,100		
8	plumbing fixtures @ $275.00	4,100		
6,040	cu. ft. @ $2.20	24,900		
1,596	sq. ft. garage Q $7.92	23,700		
0	decks @ $7.75			
8 flights of stairs		8,000		
7 appliances		12,000		
4 fireplaces		6,500		
			Billings	Bozeman
Total		$256,300	$159,600	$161,200
Sq. Ft.		$60.90	$37.92	$38.30

TABLE 19.

RENTS

House # 5	Unit 1	Unit 2	Unit 3	Unit 4
	2 bedrooms 1½ bath study 2 car garage 1,094 sq. ft.	2 bedrooms 1½ bath study 2 car garage 1,010 sq. ft.	2 bedrooms 1½ bath study 2 car garage 1,094 sq. ft.	2 bedrooms 1½ bath study 2 car garage 1,010 sq. ft.
ANCHORAGE				
Authors Est.	650	625	650	625
Polar Realty	675	675	675	675
Marston Realty	700	700	700	700
Average	675	665	675	665

Total average monthly income (x 100) $268,000

Total average construction price (without land) $254,300 Ratio: 1,053

BOZEMAN				
Authors Est.	360	350	360	350
United Agency	340	325	340	325
Associated Agency	320	320	320	320
Average	340	330	340	330

Total average monthly income (x 100) $134,000

Total average construction price (without land) $168,000 Ratio: .79

TABLE 20.

House #5

Sq. Ft.	4,208
Extra Cu. Ft.	6,040
Garage Sq. Ft.	1,596

Unit 1	Unit 2	Unit 3	Unit 4
1,094 sq. ft.	1,010 sq. ft.	1,094 sq. ft.	1,010 sq. ft.
2 bedrooms	2 bedrooms	2 bedrooms	2 bedrooms
1½ bath	1½ bath	1½ bath	1½ bath
study	study	study	study
2 car garage	2 car garage	2 car garage	2 car garage

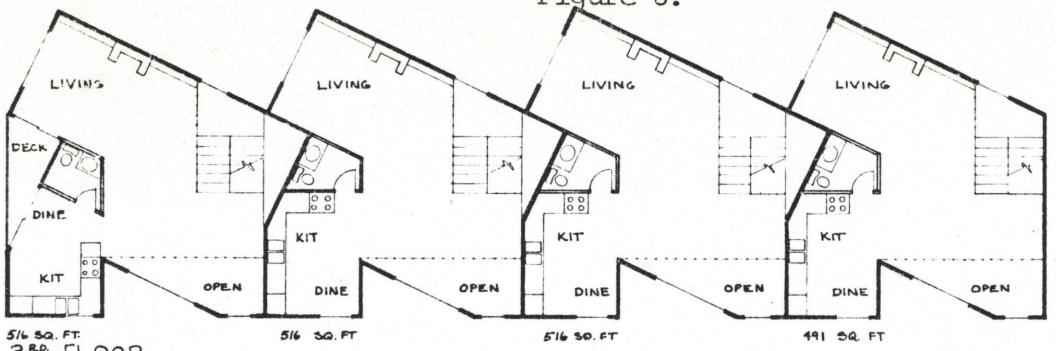
Advantages

1. 2 story open spaces above studies
2. living area on 3rd floor
3. cathedral ceilings available
4. good pattern outside
5. units 1 and 2 must be 4½' vertical difference in levels, also 3 and 4; 2 and 3 can be the same
6. 8 garage stalls - all regulation

Disadvantages

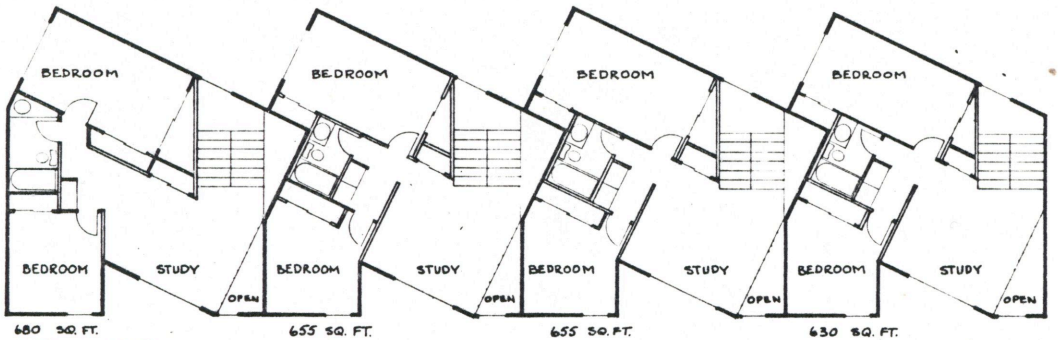
1. some repetition inside
2. no decks
3. variance needed
4. no light wells at stairs
5. units 2 and 4 do not have mechanical and storage room in garage

Figure 8.



516 SQ. FT. 516 SQ. FT. 516 SQ. FT. 491 SQ. FT.

3RD. FLOOR



680 SQ. FT. 655 SQ. FT. 655 SQ. FT. 630 SQ. FT.

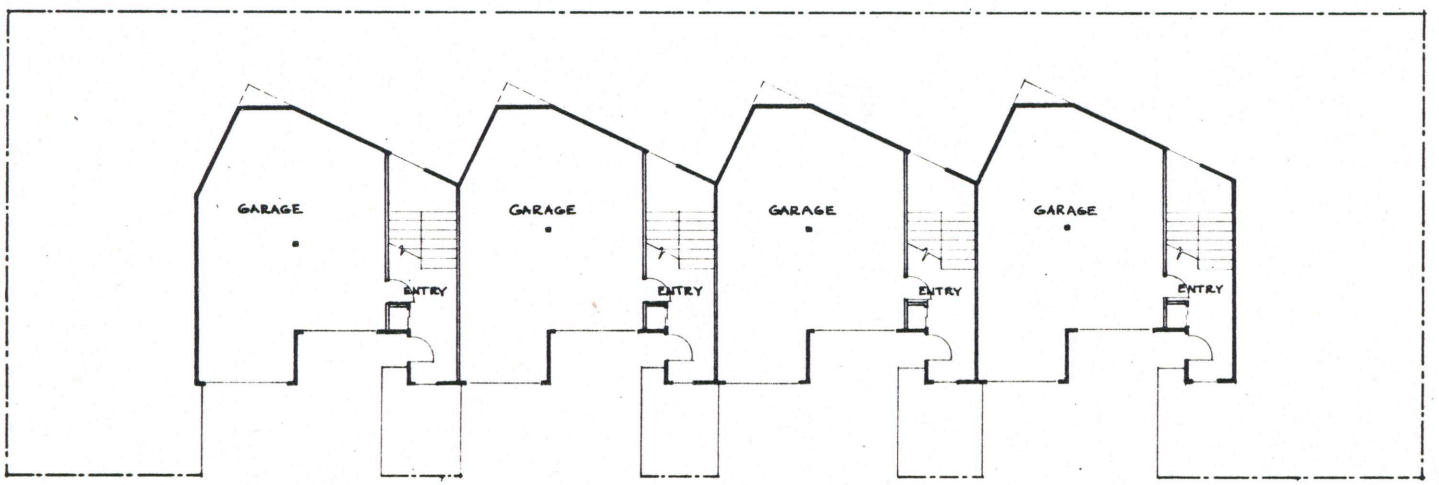
2ND. FLOOR

UNIT 1: 1362 SQ. FT. 2 BEDROOM

UNIT 2: 1337 SQ. FT. 2 BEDROOM

UNIT 3: 1337 SQ. FT. 2 BEDROOM

UNIT 4: 1281 SQ. FT. 2 BEDROOM



166 SQ. FT. 470 GARAGE

166 SQ. FT. 470 GARAGE

166 SQ. FT. 470 GARAGE

166 SQ. FT. 470 GARAGE

CU. FT. 6360 TOTAL GARAGE 1880

GROUND FLOOR

house six 5348 sq. ft.

TABLE 21.

MEANS COST ANALYSIS

House #6

Factors Applied
3 year update: 1.3
Anchorage: 1.347
Billings: .916
Bozeman: Martel Construction Company

	sq. ft. living area 5,348		sq. ft. garage area 1,880		cu. ft. cathedral open space 6,360		Total	Sq. Ft.
For 50 Percentile	@$22.40 (M)	Anchorage $209,800	@$11.20 (M)	Anchorage $36,800	@$2.35 (M)	Anchorage $26,100	$272,700	$50.99
	$39.22 (A)	Billings $142,600	$19.61 (A)	Billings $25,100	$4.11 (A)	Billings $17,800	$185,500	$34.68
	$26.67 (B)		$13.33 (B)		$2.79 (B)			
	@$35.00	Bozeman $187,200	@$7.50	Bozeman $14,100	+5% of total	Bozeman $9,000	$210,300	$39.32
For 75 Percentile	@$35.25 (M)	Anchorage $330,100	@$11.20 (M)	Anchorage $36,800	@$2.95 (M)	Anchorage $32,800	$399,700	$74.74
	$52.97 (A)	Billings $224,400	$19.61 (A)	Billings $25,100	$5.16 (A)	Billings $22,300	$271,800	$50.82
	$36.02 (B)		$13.33 (B)		$3.51 (B)			

Codes: M - Means, no factors
A - Anchorage
B - Billings

TABLE 22.

MARSHAL AND SWIFT APPRAISAL

House # 6

Factors Applied

1 Year Update	1.2
Anchorage	1.56
Billings	.95
Bozeman	.96

		Anchorage		
5,348	sq. ft. @ $22.48	$225,100		
8	plumbing fixtures @ $275.00	4,100		
6,360	cu. ft. @ $2.20	26,200		
1,880	sq. ft. garage Q $7.92	27,900		
0	decks @ $7.75			
8 flights of stairs		8,000		
7 appliances		12,000		
4 fireplaces		6,500		
			Billings	Bozeman
Total		$310,000	$188,700	$190,800
Sq. Ft.		$57.96	$35.29	$35.67

TABLE 23.

RENTS

House # 6	Unit 1	Unit 2	Unit 3	Unit 4
	2 bedrooms 1½ bath study 2 car garage 1,362 sq. ft.	2 bedrooms 1½ bath study 2 car garage 1,337 sq. ft.	2 bedrooms 1½ bath study 2 car garage 1,337 sq. ft.	2 bedrooms 1½ bath study 2 car garage 1,287 sq. ft.
ANCHORAGE				
Authors Est.	750	725	725	725
Polar Realty	750	750	750	750
Marston Realty	780	780	780	780
Average	760	750	750	750

Total average monthly income (x 100) $301,000

Total average construction price (without land) $284,500 Ratio: 1,057

BOZEMAN				
Authors Est.	375	375	375	375
United Agency	340	340	340	340
Associated Agency	320	320	320	320
Average	345	345	345	345

Total average monthly income (x 100) $138,000

Total average construction price (without land) $188,700 Ratio: .73

TABLE 24.

House #6

Sq. Ft.	4,740
Extra Cu. Ft.	6,360
Garage Sq. Ft.	1,880

Unit 1	Unit 2	Unit 3	Unit 4
1,362 sq. ft.	1,337 sq. ft.	1,337 sq. ft.	1,287 sq. ft.
2 bedrooms	2 bedrooms	2 bedrooms	2 bedrooms
study	study	study	study
1½ bath	1½ bath	1½ bath	1½ bath
2 car garage	2 car garage	2 car garage	2 car garage

Advantages

1. light wells at stairs
2. 2 story open spaces above studies
3. people entrance same level as garage entrance
4. living area on 3rd floor
5. Cathedral ceilings available
6. 8, possibly 9 garage stalls - all regulation size
7. excellent design on stairs to tie levels together
8. rational roof line expected

Disadvantages

1. severe repetition inside and out
2. bedrooms small
3. no decks
4. variance needed
5. poor use of view to S.W. on level 3
6. closet and storage space limited

Narrowing the Field

On the following page, a ranking of a rent vs. cost ratio is given for each plan (see Table 25). The ratio is arrived at as follows. Each column uses the averaged rents in the numerator. The first column uses only the Means Cost Analysis 50 percentile in the denominator. The second column uses an average of Means 50 percentile, Means 75 percentile and Marshall and Swift prices in the denominator is the figure found on each of the preceding rent analysis pages. The third column is for Bozeman and is included only to tie the project to local conditions. But it does show that Bozeman does not, at this time, have a market for these luxury-type apartments.

In analyzing the rankings, plan #2 came out consistently best and needs to be thoroughly analyzed as to what elements led to ranking. Plan #1 came out consistently worst and likewise needs to be analyzed so that those elements which gave it the poor ranking can be avoided. Plans #3, #4, #5, and #6 will be considered further to determine what caused their inconsistent ranking.

Pure cost should not be the only criteria in choosing one plan with which to proceed, however. In an effort to determine which house best met the building program and design criteria, a functional matrix was evolved (see Table 26) which can be see on page 53. In this matrix, each house and unit was described as to square footage, number of bedrooms, studies, baths, garage stalls and other aspects of the building in very specific small elements.

TABLE 26.

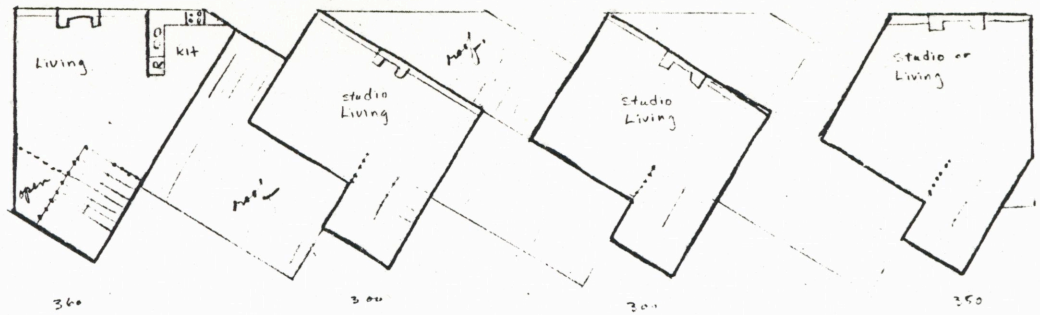
functional analysis

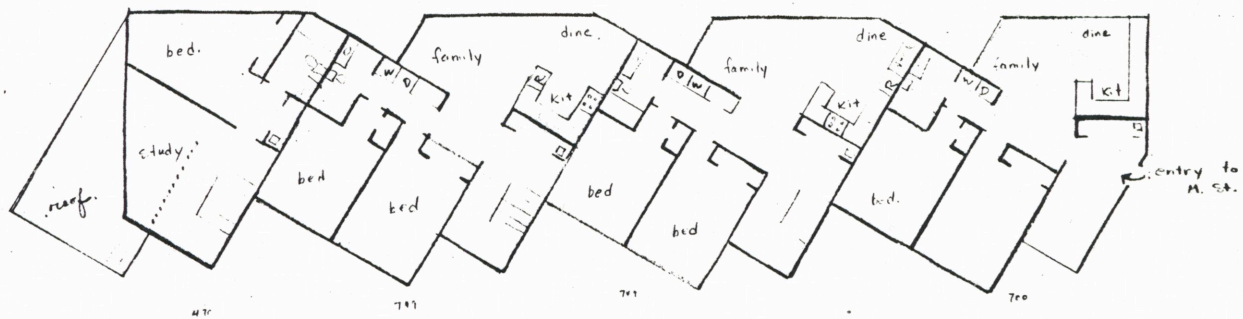
○ SUPERIOR - 3
△ GOOD - 2
■ ADEQUATE - 1

		1 BEDROOM	2 BEDROOMS	3 BEDROOMS	STUDY	1 BATH	1½ BATHS	2 BATHS	2½ BATHS	DINING	LIVING	KITCHEN	1 CAR GARAGE	2 CAR GARAGE	MECH. & STOR. SPACE AVAILABLE	EASE OF ACCESS - LEVEL SLOPE	INTERIOR ENTRY	EXTERIOR ENTRY - PLACEMENT - PROTECTION - PRIVACY	OUTSIDE ENTRY STEPS	LIGHTED AT BOTH LANDINGS	OPEN SPACE LIGHT WELLS	STAIR OPENS INTO ADJACENT AREAS	USE OF VIEW	LIVING ROOM ON BOTH	NO WINDOWS ON NORTH	PRIVACY - VIEW INTO NEXT APT.	USE OF SOUTH FOR SOLAR GAIN	INTERESTING SHAPED ROOMS	FLOW OF SPACE FROM ONE ROOM TO NEXT	2 STORY OPEN SPACES	CATHEDRAL CEILINGS	HORIZONAL CIRCULATION - HALLS TRAFFIC PATTERNS	WASHER-DRYER NEAR BEDROOMS	WASHER-DRYER ELSEWHERE	BEDROOM CLOSETS	COAT CLOSET	LINEN CLOSET	DECKS	MASSING - PROPORTION - SHAPE	RHYTHM & PATTERN ESTABLISHED	RELATIONSHIP TO STREET	USE OF EXTERIOR SPACE LANDSCAPING - PRIVATE GARDEN	VARIETY OF APARTMENTS AVAILABLE	EASE OF PLUMBING	EASE OF SOUNDPROOFING	CUT & FILL NEEDED	RATIONAL ROOF	EASE OF FRAMING	NUMBER OF CORNERS	LINEAR FEET OF EXTERIOR WALL	VARIANCE NEEDED	TOTAL	
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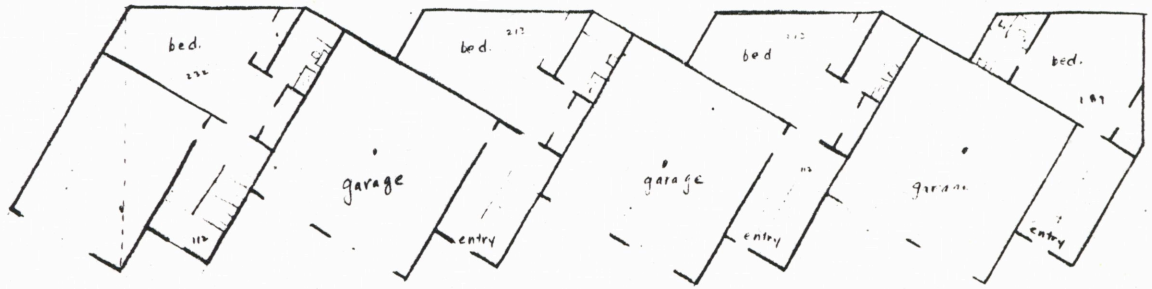
The next step was to evaluate the houses in the light of their numerical matrix ratings and their cost-rent ratios. Because of its excellent ranking as shown in Table 25 (Income Comparison), Plan #2 was considered first for refinement. It was decided to move the living area to the third floor to take better advantage of the view and to take advantage of heat rising to active areas rather than sleeping area. Attempts were made to give the entries more privacy and protection from the elements. Another goal was to try to vertically step back the building from the street. Results of these efforts can be see in Figure 9. This revised plan, called #2-A, was never examined in the functional matrix. Plan #2-A (3 bedrooms, 2 baths, family room, kitchen-dining area and living room) and the original Plan #2 were analyzed, however, as being too family- and children-oriented for the type of neighborhood Bootlegger Cove was becoming. Young working couples, professional people or even families with one child did not need that many or that kind of rooms. However, dwellings of this type do bring in a greater return per square foot. Further analysis showed no wasted space on the ground floor; the one-car garages in units 2 and 3 and the lack of cathedral ceilings in the original plan contributed to the good ratio. This was just the wrong location for it and so Plan #2 was put aside.

Figure 9.


Living
kit
Studio Living
Studio Living
Studio or Living
360
350


bed.
study
reserv.
bed
bed
family
dine
kit
bed
bed
family
dine
kit
bed.
family
dine
kit
entry to M. St.
700
1174 sq ft
1374 sq ft.
1351
5273 SQ. FT TOTAL.

2-A


bed.
bed.
bed
bed.
garage
garage
garage
entry
entry
entry
1420 sq ft garages.

Plan #5 was the next candidate for refining and improvement because it ranked third in cost-rent ratio and because it was smaller and would require the least initial investment. A working model was built to study the form and shape. Several improvements were easily made, but the roof solution never appeared. Also it was readily apparent from the model that units 2 and 3 merged their identity too much, and individuality was lost due to units 1 and 2 combining their entry as did units 3 and 4. Work on the floor plan was commenced to correct these deficiencies as well as to enlarge some of the smaller rooms and gain interior architectural interest. Attempts were made to help all units of Plan #5 address West 6th Street more and the end units address M Street and the alley (to square it up someplace). None of these efforts bore much fruit and Plan #5 was discarded.

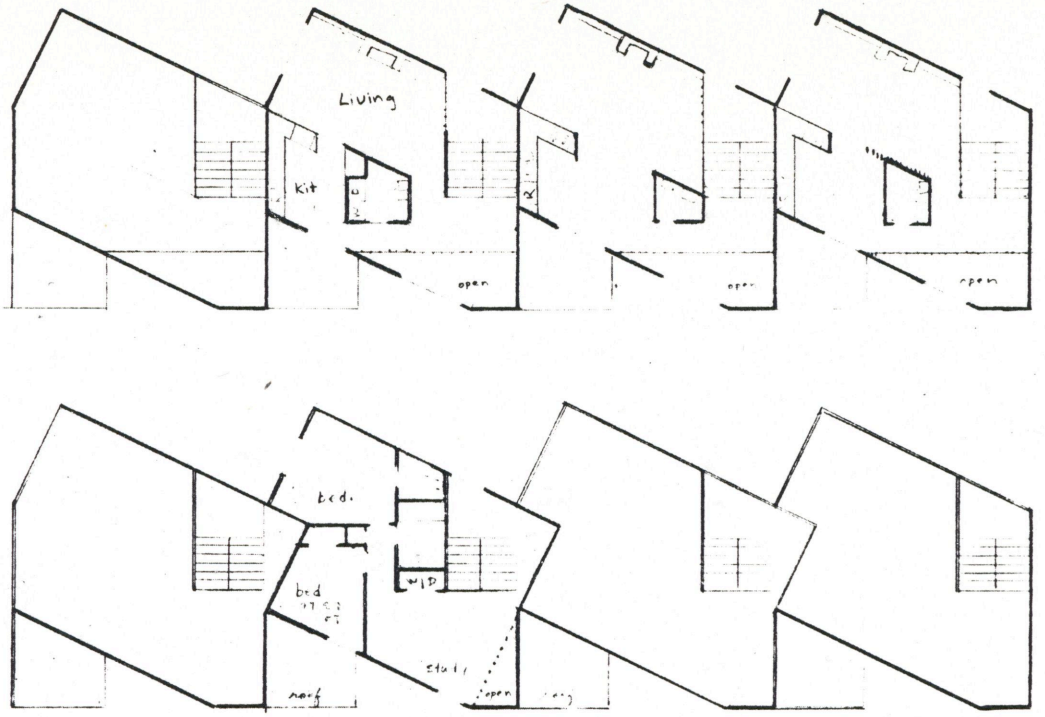
Plan #1 was momentarily considered at this point. It was 748 square feet larger than any other plan and had come in second on the matrix. This could be expected with that much more space available to work with. It was eliminated, however, because of its poor cost-rent ratio and the high initial investment required for so large an area.

Plans #3 and #4 had many points of merit, but there were several impractical, functional features of their floor plans. Hence they had received a low matrix rating and had not been given detailed refining. No further consideration was given to them.

As can be seen by the matrix, Plan #6 fulfilled the building criteria, the functional and conceptual program by far the best (see Table 26). However, its cost-rent ratio was inconsistent (see Table 25). The initial plan (see Figure 10), which had not been fully worked out, was revised in the

6

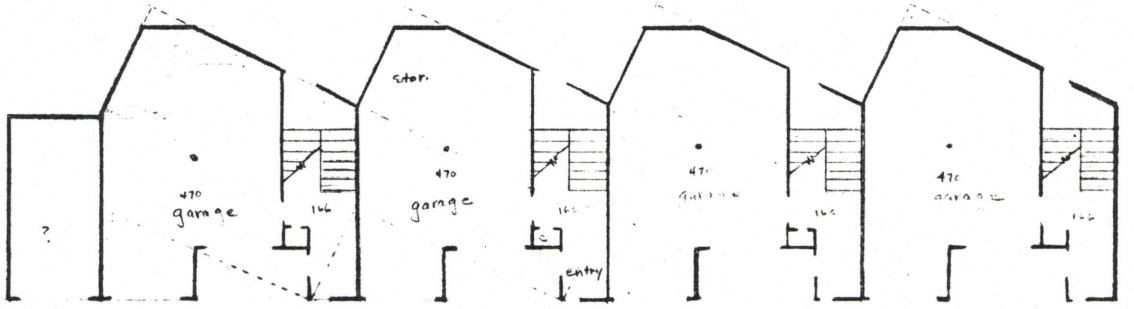
Figure 10.



1180 SQ. FT. ea

4740 total

6



1880 SQ FT
garages
& stor.

Figure 11.



light of lessons learned from Plans #2 and #5. A model was built with pleasing results. This model was revised several times to make the area slightly larger and more related to the type of tenant expected and to get better roof lines. A preliminary furniture arrangement and landscaping scheme was studied to see how usable and functional the unusual spaces were (see Figure 11). Everything seemed to show great promise, so Plan #6 was definitely chosen as the basis for a more concrete, specific and detailed study of cost analysis.

This process of choosing one plan was a compromise between a quality plan, estimated costs, ability to meet the building program and client and site considerations. Having chosen a plan that does not have the most favorable rent-cost ratio, but with many architectural amenities will tend to favor choices of materials and construction methods which can save money in other ways. Plan #6 has built-in expenses and care must be taken to avoid adding to the costs. The possibility is there to let the shape, form and geometry carry the design loan and use inexpensive materials. A fine line must be maintained, however, between simple clarity and materials which would cheapen the design concept. Having chosen this plan narrows many avenues of cost comparison. Only those materials and methods remain which "fit" this plan. Also care must be taken to let such influences as site, climate, client needs, as well as costs, have a voice in choosing best use of dollars spent in estimating the total budget of this project.

PART II

DESIGN DEVELOPMENT

Defining the Requirements

In the process of design development, many alternatives on detailing, finishing and materials are available to the designer or client. The selection is often arbitrarily done according to whim or budget and results in loss of intent or a hodgepodge effect. It is the purpose of Part II of this thesis to study the cost of each design decision while providing a clear, dominant theme or concept by which judgments can be made. More realistic judgments can be made now that Plan #6 has been chosen. More detailed and specific criteria can now be added to the building program given in Part I. In an effort to define "what is right" for this project, the following list of requirements is presented to allow a background against which different methods, materials and their comparative costs can be evaluated.

1. Establish a sense of belonging to the site and neighborhood

2. Each unit express individuality while at the same time all four units have coherence as a whole.

3. Meet the building program.

4. Express a controlled, stable pride and consistency of design

5. Avoid feeling of institutionalism or mercantilism

6. Create a comfortable residential feeling

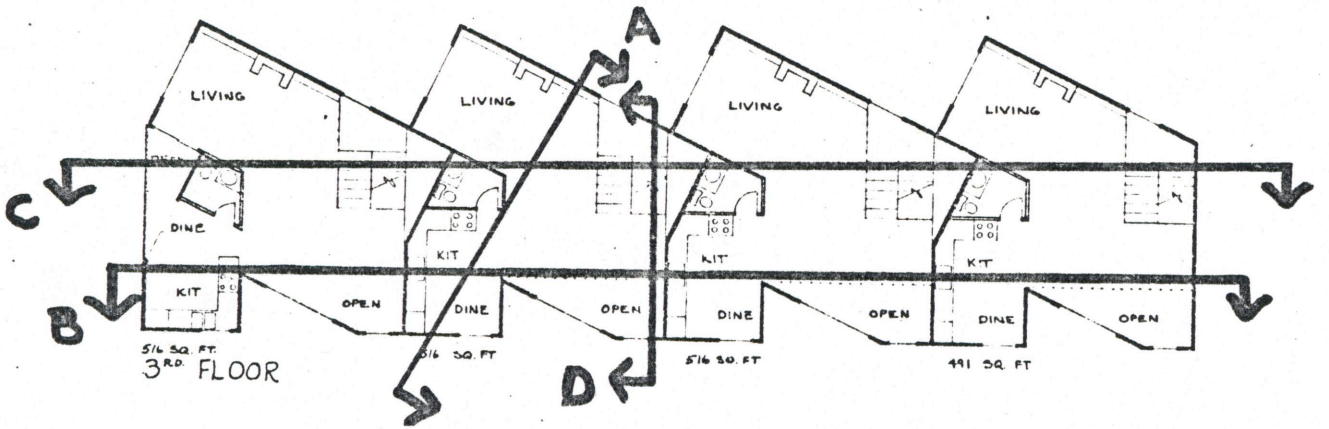
7. Avoid extremes of ultra modern or traditional; avoid fads which might "date" the building

8. Let the built-in geometry be focus of plan

9. Create feeling of simplicity, but walk the thin line to avoid "simple stark" and "simple cheap" and strive for "simple elegant" without using elegant materials

Before undertaking a thorough breakdown of materials, methods and cost, drawings for Plan #6 were enlarged to 1/4" = 1/0" scale and four preliminary sections through the building were studied (see Figure 12).

Figure 12.



As a result, several modifications were made to the second and third floors and are shown on the following two pages. These plans are labeled #6-A (see Figures 13 and 14). The changes that occurred on the second floor in the area of the bath consisted of juggling walls to better use space. On the third floor, the directionality of the balcony was changed and the open space enlarged to give a more useful, but smaller dining area out of the traffic pattern. Also the deck at the west end of unit 1 was abandoned. This added to the gross square footage cost but saved in the framing cost by lowering the length of exposed exterior wall. This adjustment requires one less window and will also will lower the heat loss. Overall construction savings can also be realized by eliminating two corners and decking costs. At this time Plan 6-A is the current best effort and is the basis for further study.

Figure 13.

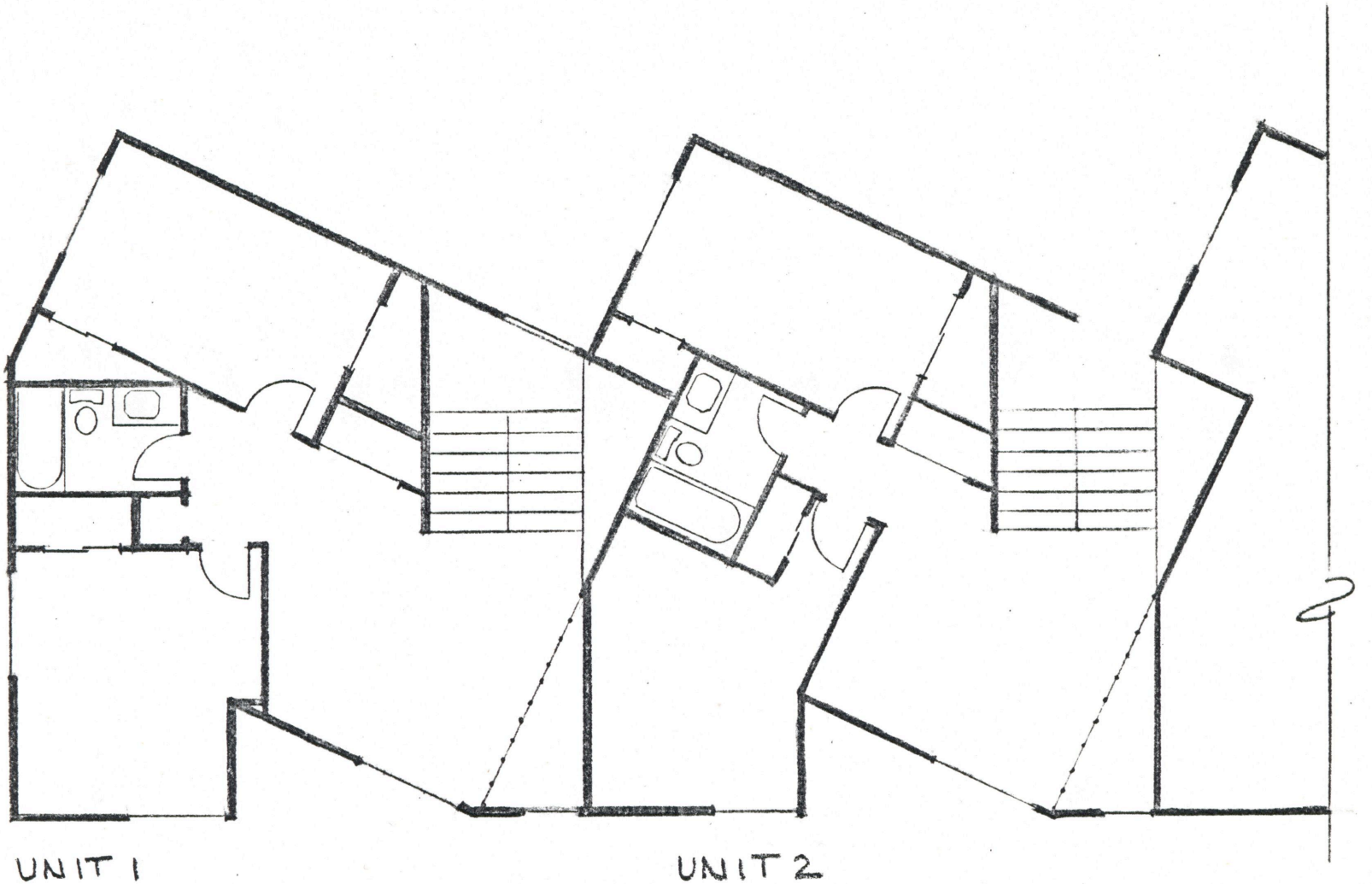
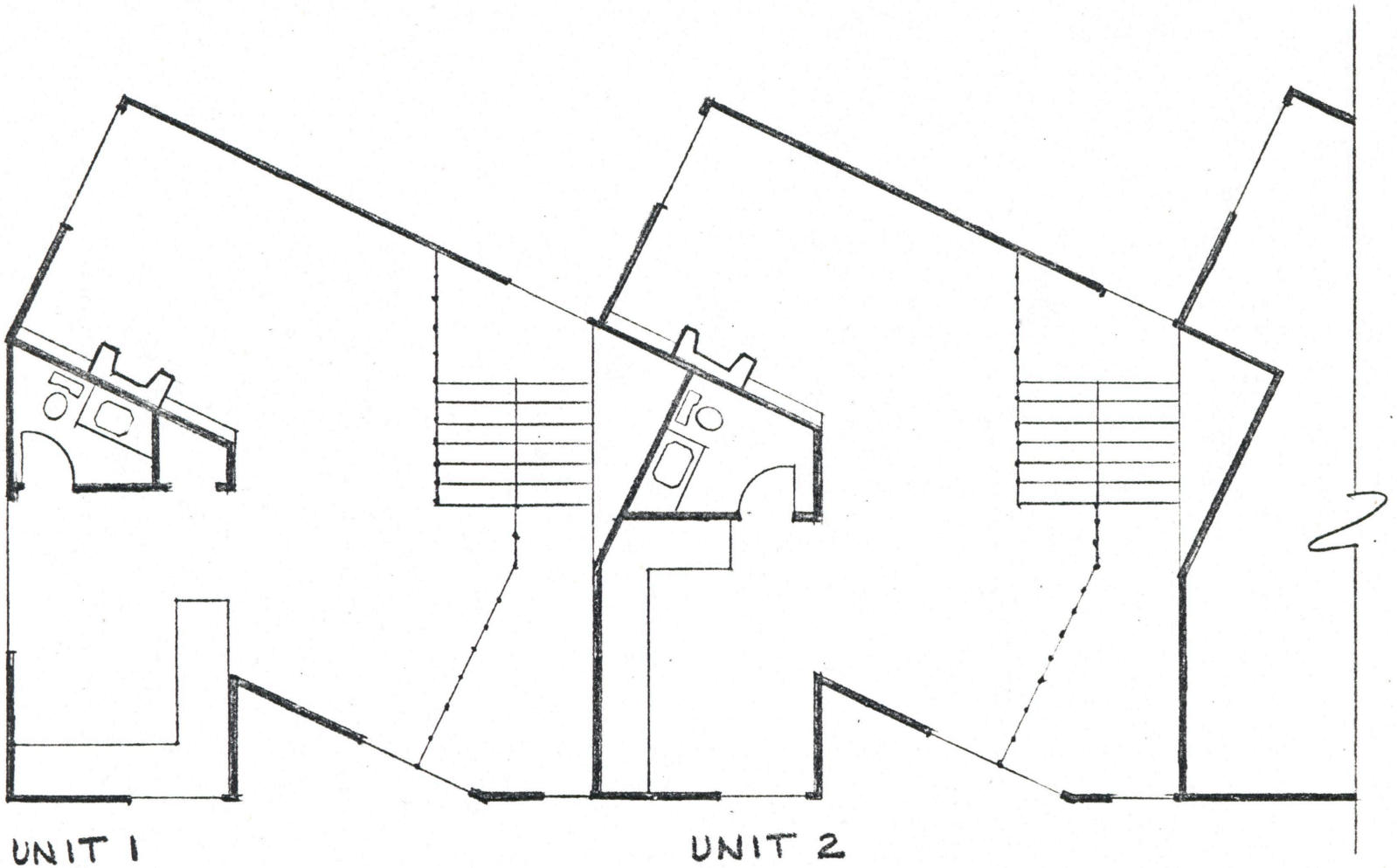


Figure 14.



Framing

The process of selecting materials to frame Plan #6 began with analysis of the site and locality as well as the needs of the particular building. This evaluation resulted in the selection of wood framing as the most logical material to meet the building program. The following list can now encompass elements of the building program in more specific terms as applied to wood framing.

1. The units should contrast with the nearby downtown business district which is concrete and steel.

2. The units should express an individual residential character.

3. The units should blend in with the best buildings of the neighborhood which are of wood construction.

4. The units should blend in with the native "woodsy" vegetation by use of a wood building. Reinforce the native vegetation by use of landscaping to contrast with downtown.

5. In a cool damp climate, exposed wood framing produces a psychologically warmer feeling than steel or concrete.

6. Relative Cost Index in Anchorage--poured in place concrete 1.47, tilt up slab 1.56, structural steel 1.397, cement blocks 1.42, stick built wood 1.37.

7. Ease of insulating wood structures as compared to cementitious products.

8. High R value of wood vs. other products.

9. Wood can more easily be adapted to construction difficulties presented by unusual site and building angles.

Having decided on wood frame construction, the selection between wall bearing vs. post and beam must be evaluated. Post and beam has several advantages, such as the frame going up faster, enabling

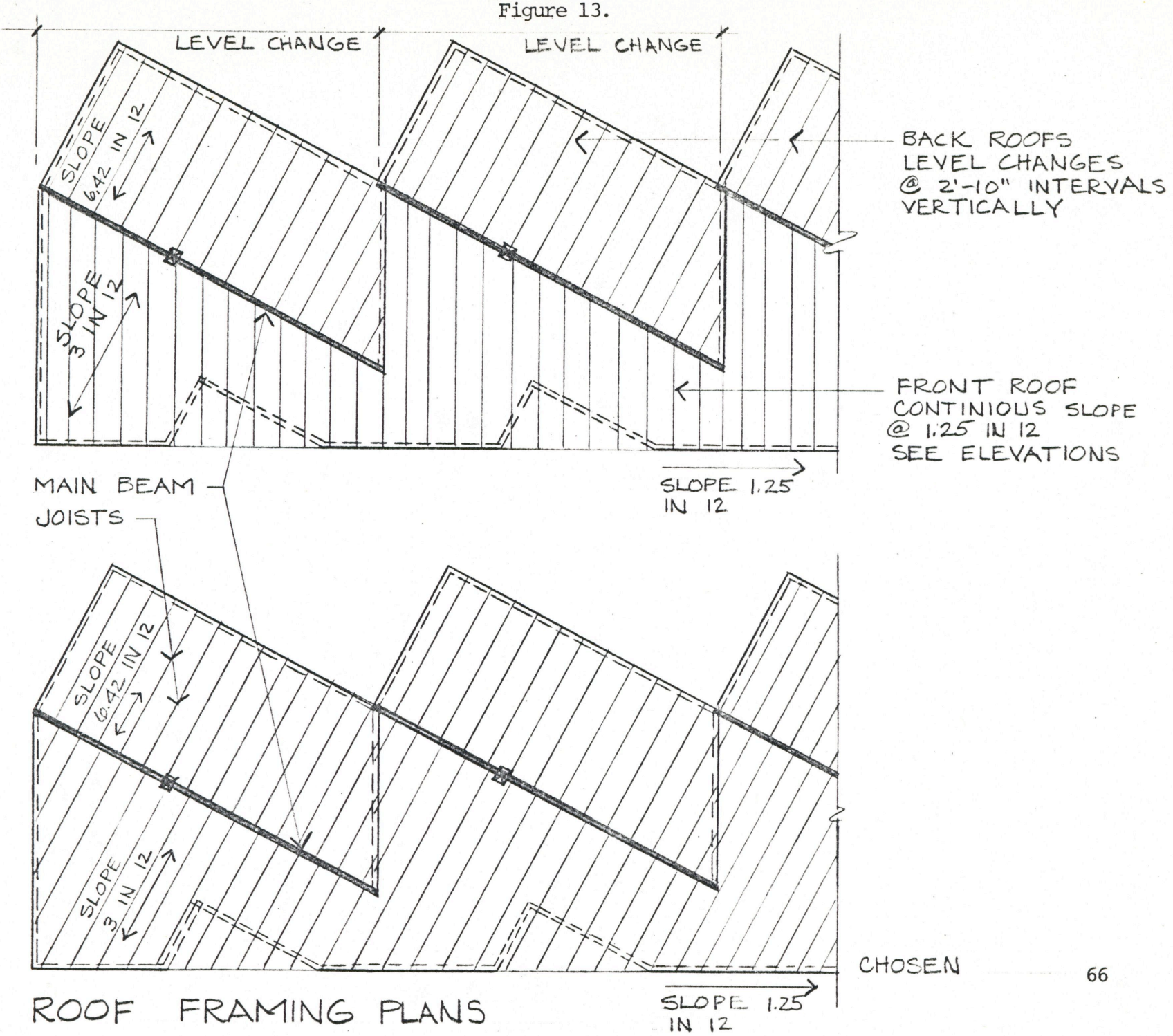
protection in case of bad weather construction. However, in analyzing the plan, especially the limited openings and fenestration of the exterior walls, there is no reason to not take advantage of them as bearing walls. But another advantage of post and beam is that it enables flexibility for future remodeling and adapts to the open planning on the interior of this design. It also simplifies a difficult framing plan as much as possible. However, those interior walls that can be used for bearing will be utilized. In essence then, both are used as there are advantages in this plan for each.

In deciding the directionality of the individual framing members, the following list of factors must be kept in mind, given the limits of the plan.

1. Avoiding excessive waste of materials
2. Avoiding excessive cuts
3. Streamlining a difficult plan as much as possible to shorten man hours of labor
4. Avoiding change of directionality whenever possible to simplify application of sheathing and blocking
5. Correlation of framing and mechanical

On the following pages, several sketches for each level of framing are presented. The solution for the roof could be handled two ways (see Figure 15). Disadvantages of the top plan are that the thrust of the roof joists against the main beam is not directly aligned. To alleviate that, the joists must join the center beam at the same angle (as shown in the bottom plan). Framing of the 3 in 12 slope can be figured more easily when measured parallel to the joists as in the bottom plan (see 1-A2, page 95 for full details of roofing plan).

Figure 13.



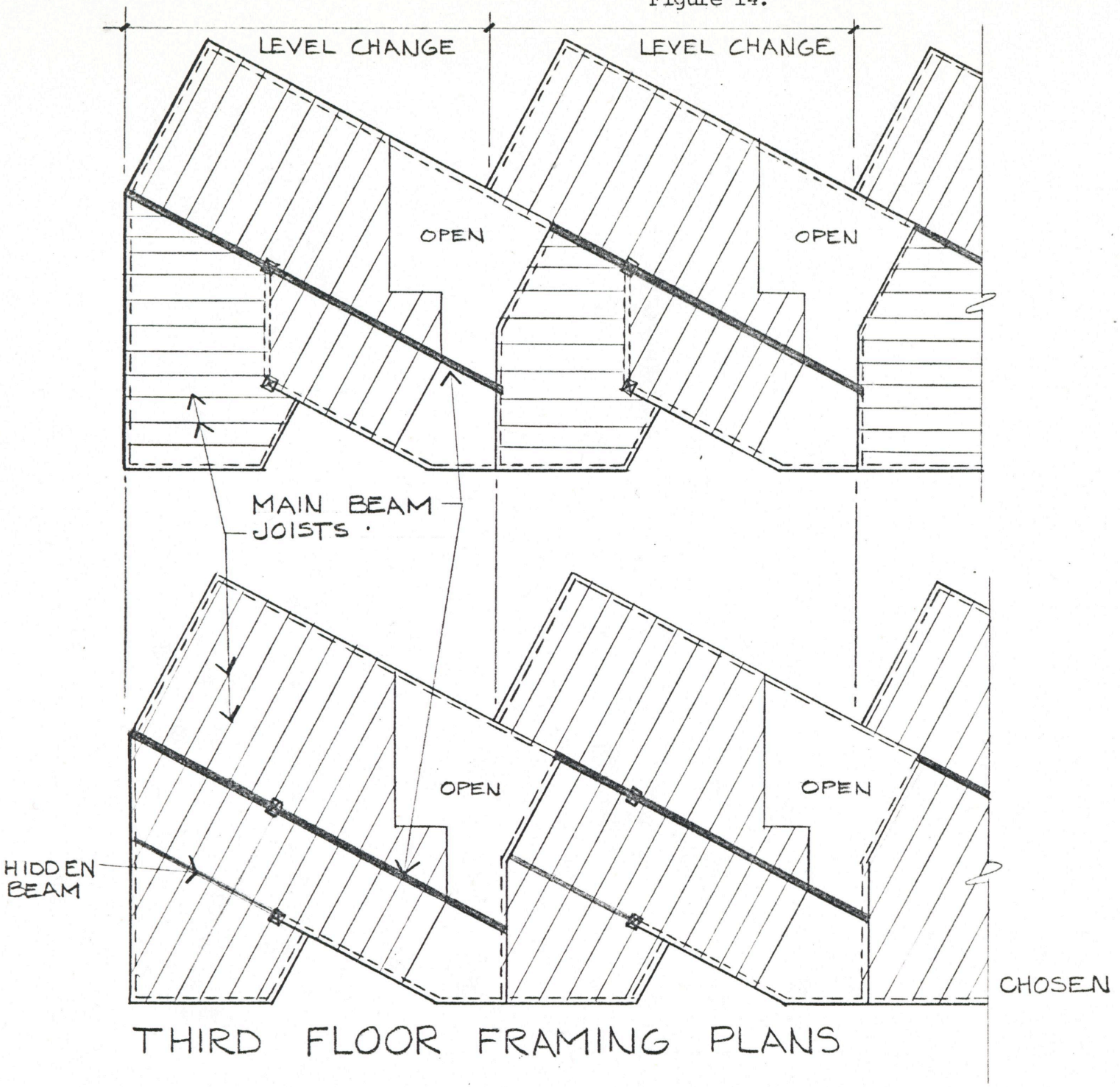
ROOF FRAMING PLANS

In analyzing the third floor framing plan, again two alternate solutions were tried (see Figure 16). The disadvantage of the top plan is that the directionality of the joists is not kept constant.

However, keeping the joists aligned in the bottom plan entails an extra hidden beam across the guest bedroom (see 2-A2, page 95) but is the better solution of the two and will be used. It also frees all the walls to be non-load bearing. Two alternate plans are presented for the second floor framing plan (see Figure 17). This time keeping all the joists going the same direction does not work due to having to support the alcove and plumbing wall (see 3-A2, page 95). Running the joists perpendicular to the garage stall below is the only way to support this wall adequately, even if it makes the solid blocking between the joists more difficult (see 5-A3, page 94).

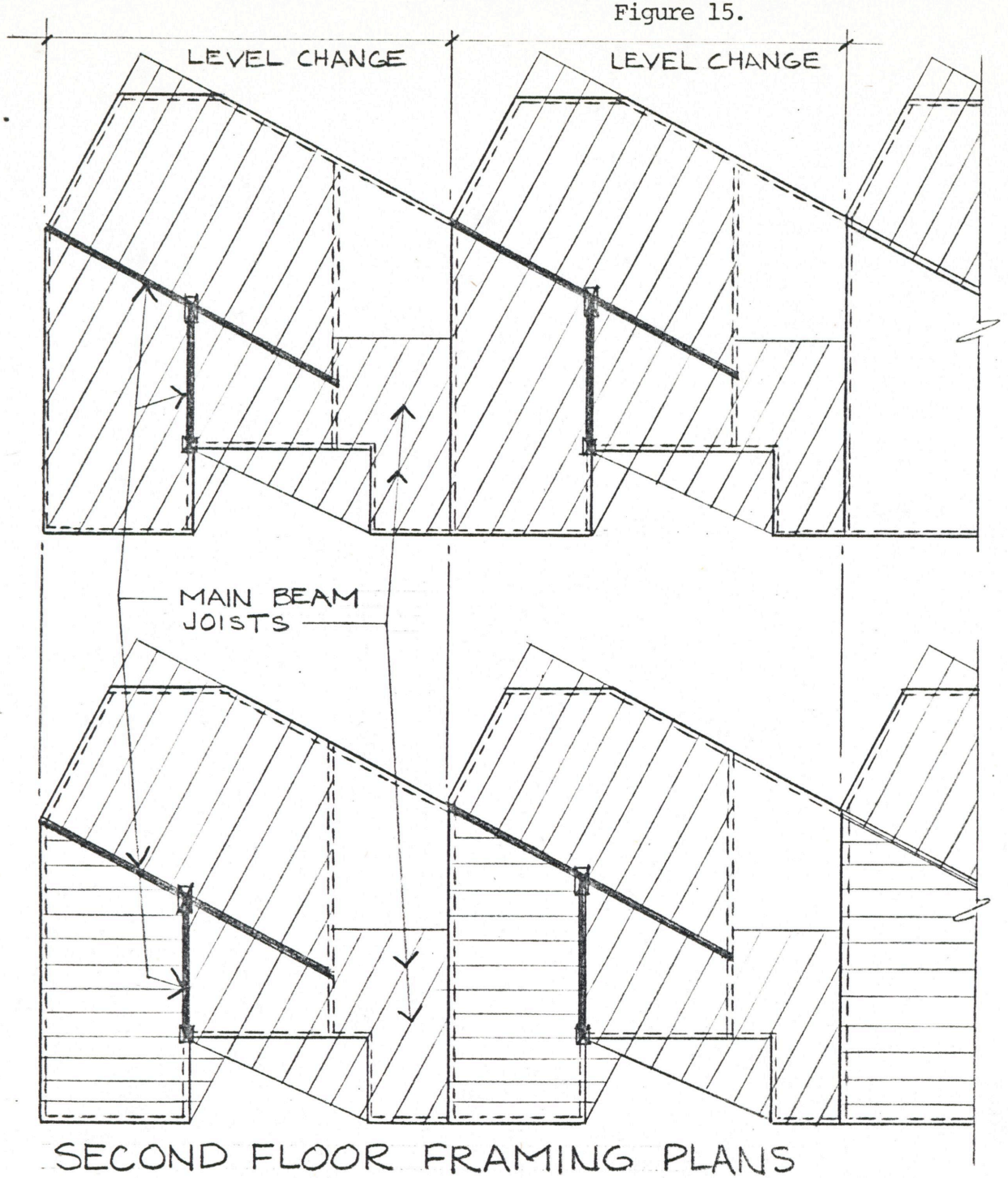
In working with the framing plans, all solutions necessitated a major concentrated load coming down in the middle of the bedroom hall of the second floor. More wall juggling was called for resulting in a new Plan 6-B (see Figure 18).

Figure 14.



THIRD FLOOR FRAMING PLANS

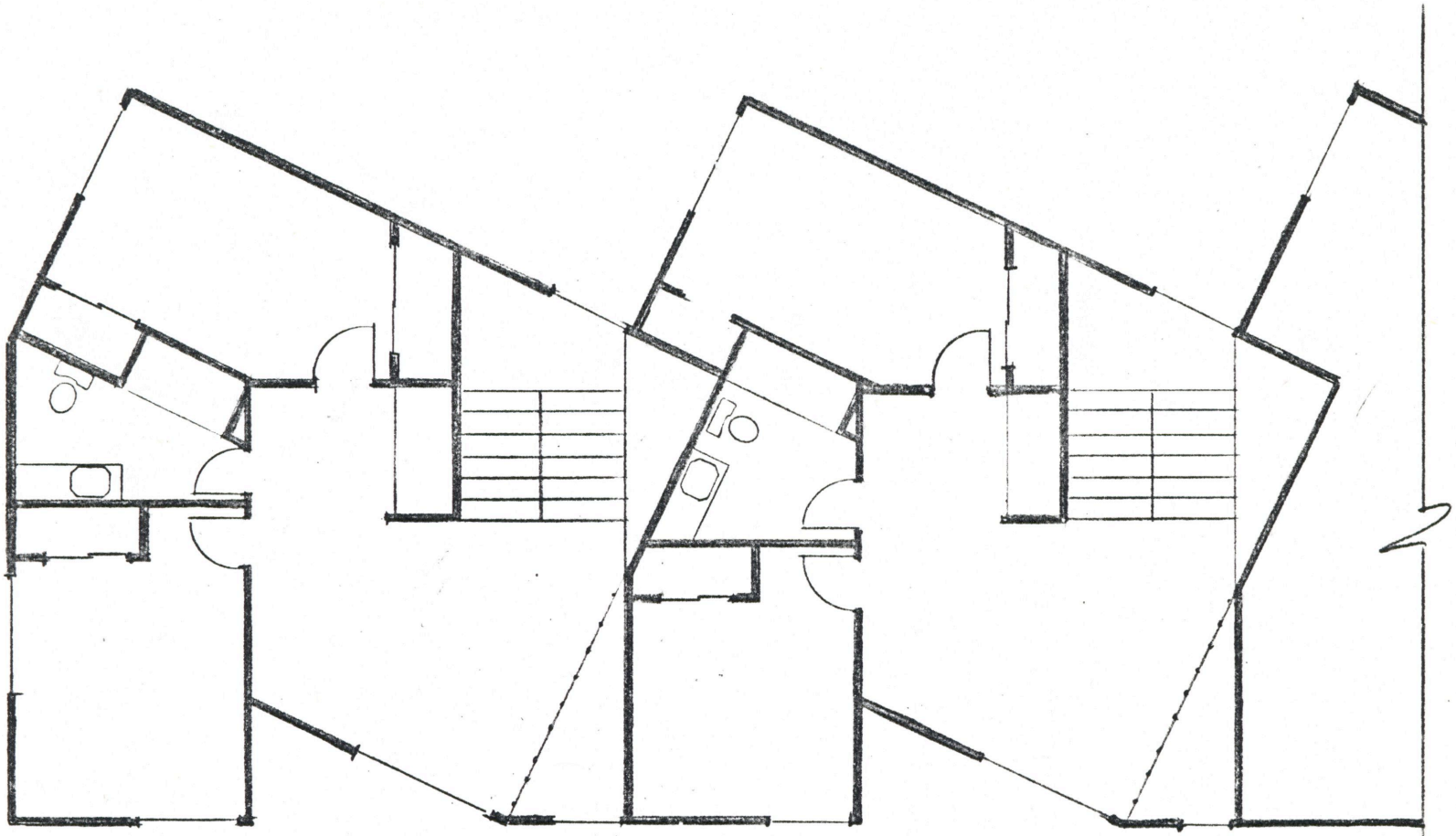
Figure 15.



SECOND FLOOR FRAMING PLANS

CHOSEN

Figure 18.



Spatial Concept Adjustments

In an effort to better visualize the interior and see if the unusual spaces and angles were pleasing or merely chaotic, a 1/4" model was built for each floor and fitted together. Attention seemed to focus on the acute angle created on the front by the line set up by the garage wall which is perpendicular to the street, meeting the diagonal created by the wall overhead. This angle would add to the framing cost. Plan changes undertaken to correct this were most difficult, as the loads from above still had to come down on the line perpendicular to the street. Advantages, however, were reinforcing the diagonal setup on the second and third floor to better capture the view, getting the washer and drier closer to the bathroom plumbing, better privacy for the half bath on the third floor and better overall use of space. (Compare Plan 6-C seen in Figures 19 and 20 with Plan 6-B, Figure 18). Plumbing and framing savings will probably cover the cost of the few added square feet.

Another area which demanded attention by its lavish use of space for non-functional purposes was the two-story open space to the left of each stair. This space, while adding to the openness and setting up the diagonal on the second and third floor, will add to the cost of framing and sound-proofing. Structural analysis as to whether that alcove would be needed as part of a shear wall, and if that shear wall would be weakened by the corners, was undertaken. Analysis showed that the building was thoroughly tied front to back for the entire ground floor and would be tied also at the roof line. This, along with stiff floor diaphrams and the 11' x 24' high entry wall at each unit, would create enough shear resistance that the alcove did not need to be removed for that reason.

Figure 19.

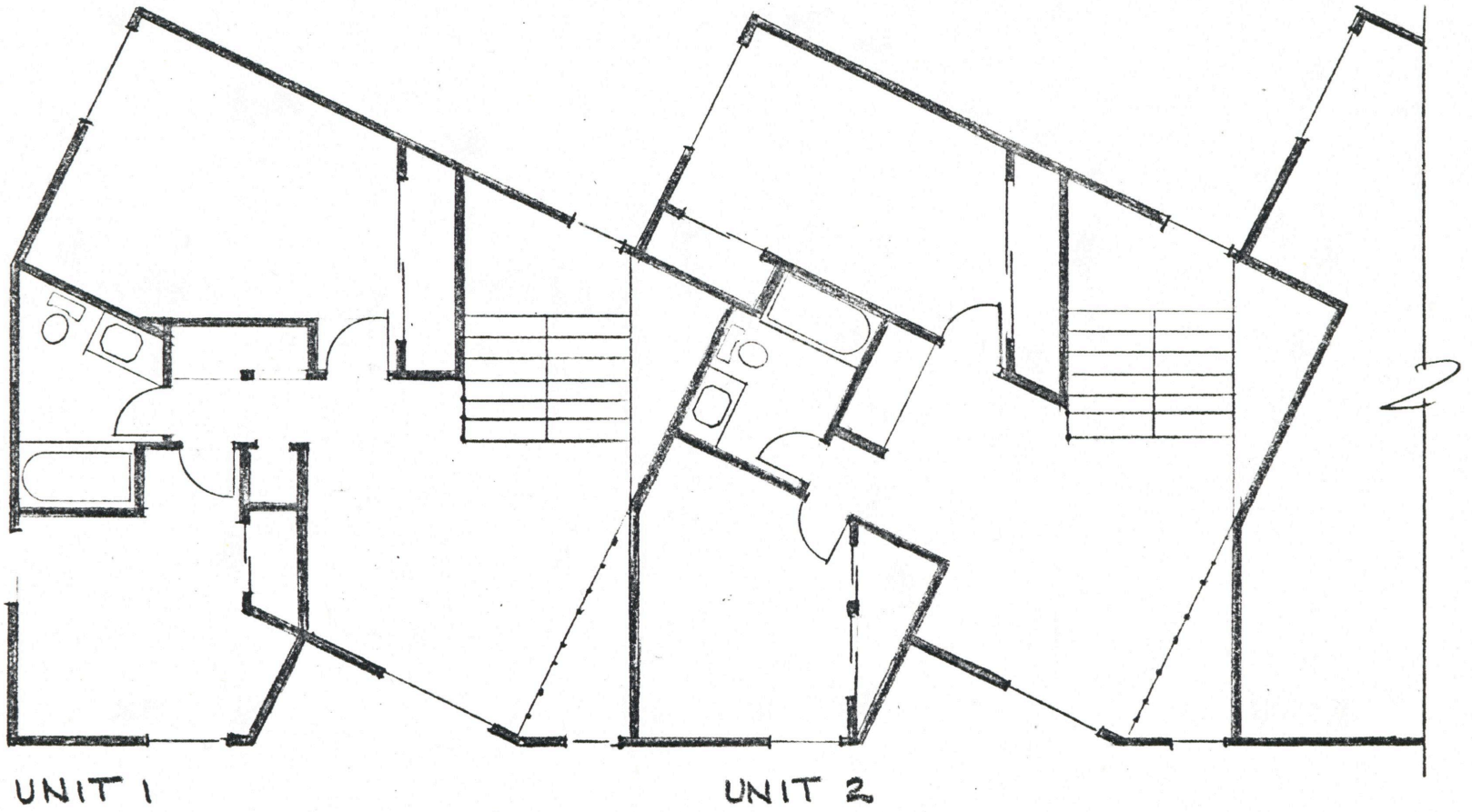
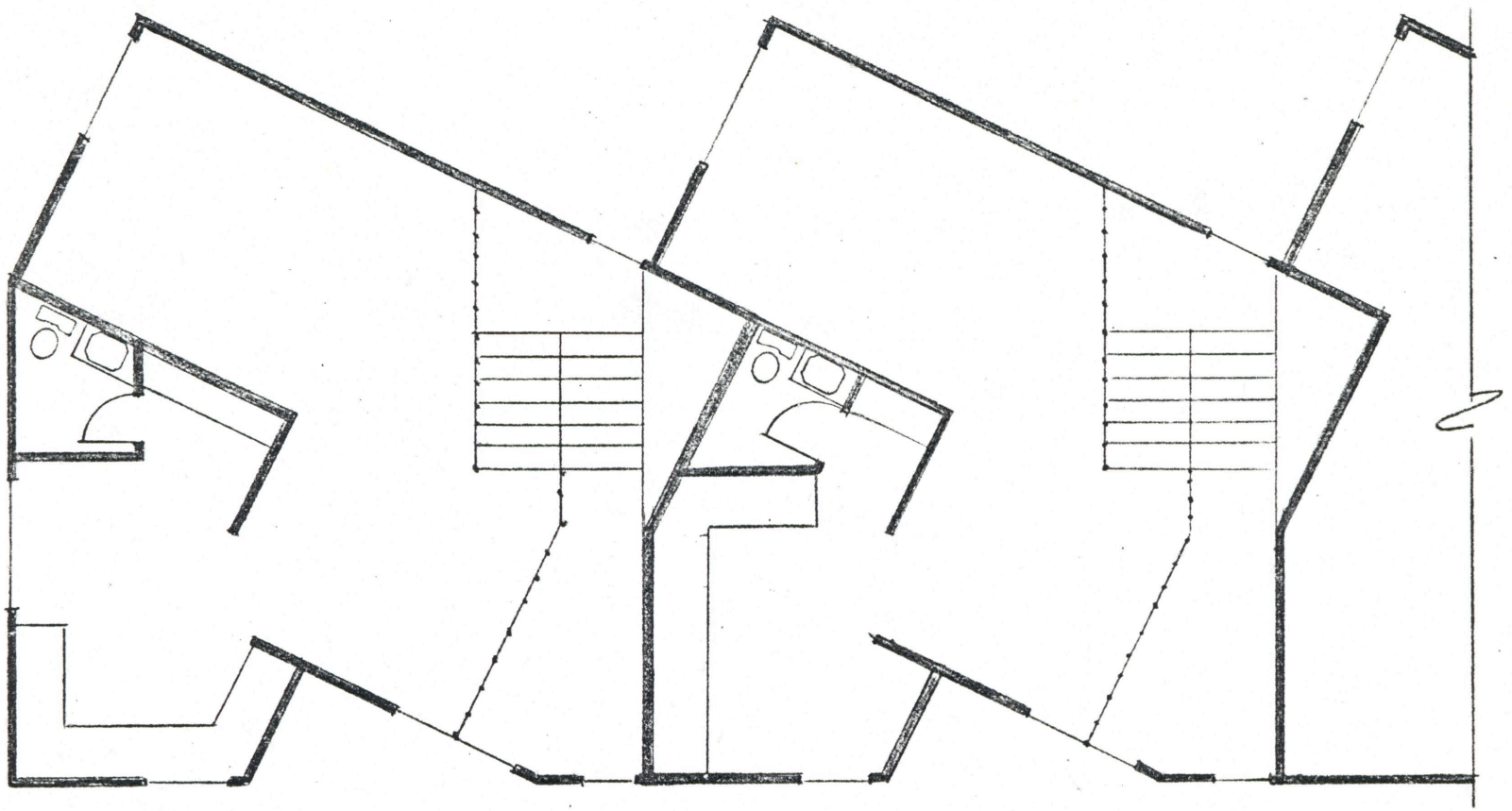


Figure 20.



Studies were undertaken to see if the space could be more useful if it was part of the next unit rather than the stairwell. Attempts can be seen in plans 6-D (see Figures 21 and 22). A different bath arrangement resulted, giving private entrance to the bath from the master bedroom. The closets in the master bedroom were reduced from 2 to 1. Also the plumbing for the washer and drier is not quite as close to the bath (Compare Plan 6-C and 6-D). But is the space more useful and functional when used as part of the bath? Does one bath plan have an advantage over the other? Not much difference can be seen in the baths, but a great deal of visual openness and flow of space has been lost from the stairwell. So even though this alcove does cost more, it will be retained. Its walls can be used by renters or owners for gallery space, hanging a long chandelier or to place a tall statue. Care will be taken to properly detail and light it, and it will be made into the major focal point of each unit. Space, well used, does not have to have any other function than to be beautiful and will add to the selling price or monthly rent that can be charged. Therefore Plan 6-D will be discarded and 6-C will be the basis for further analysis.

Figure 21.

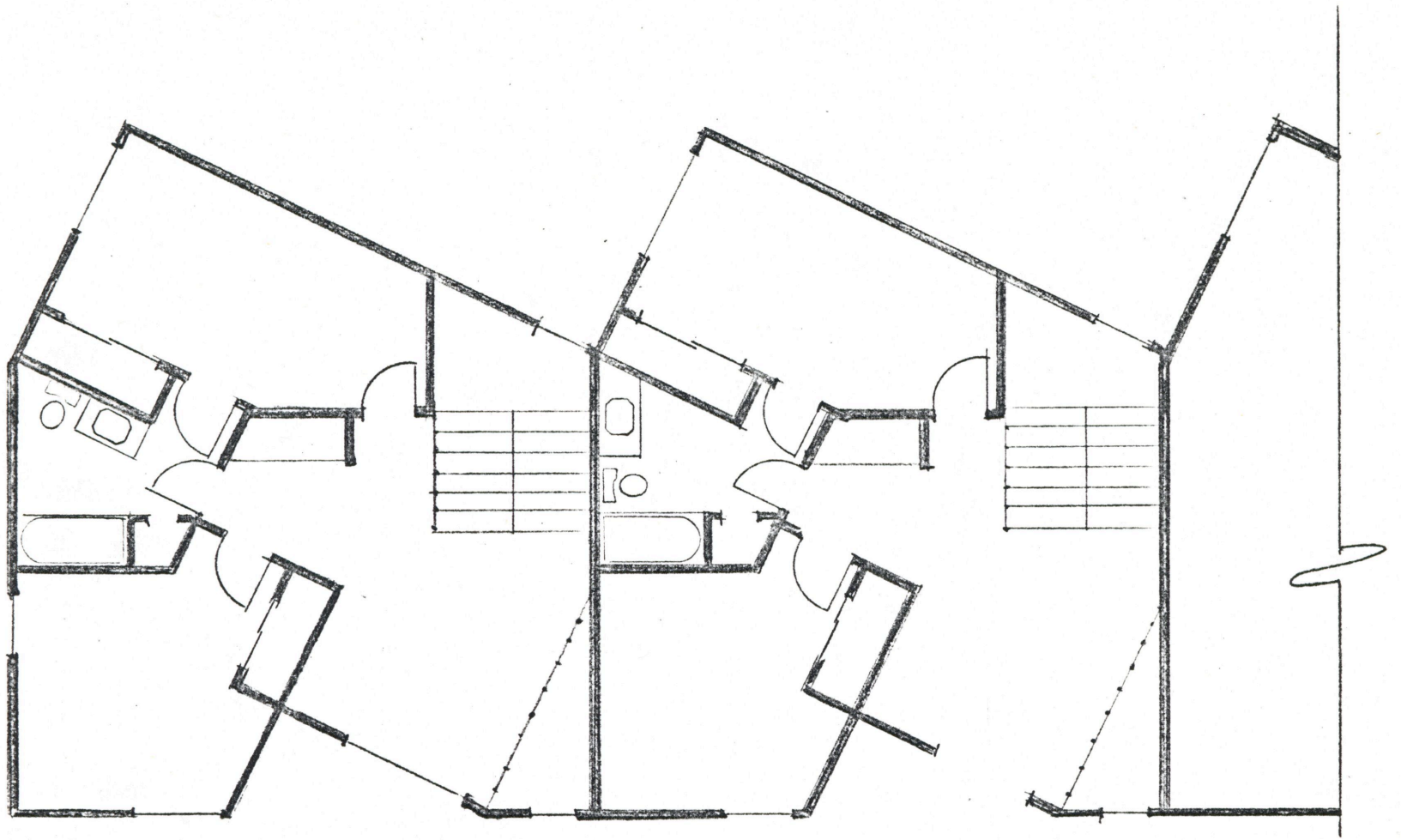
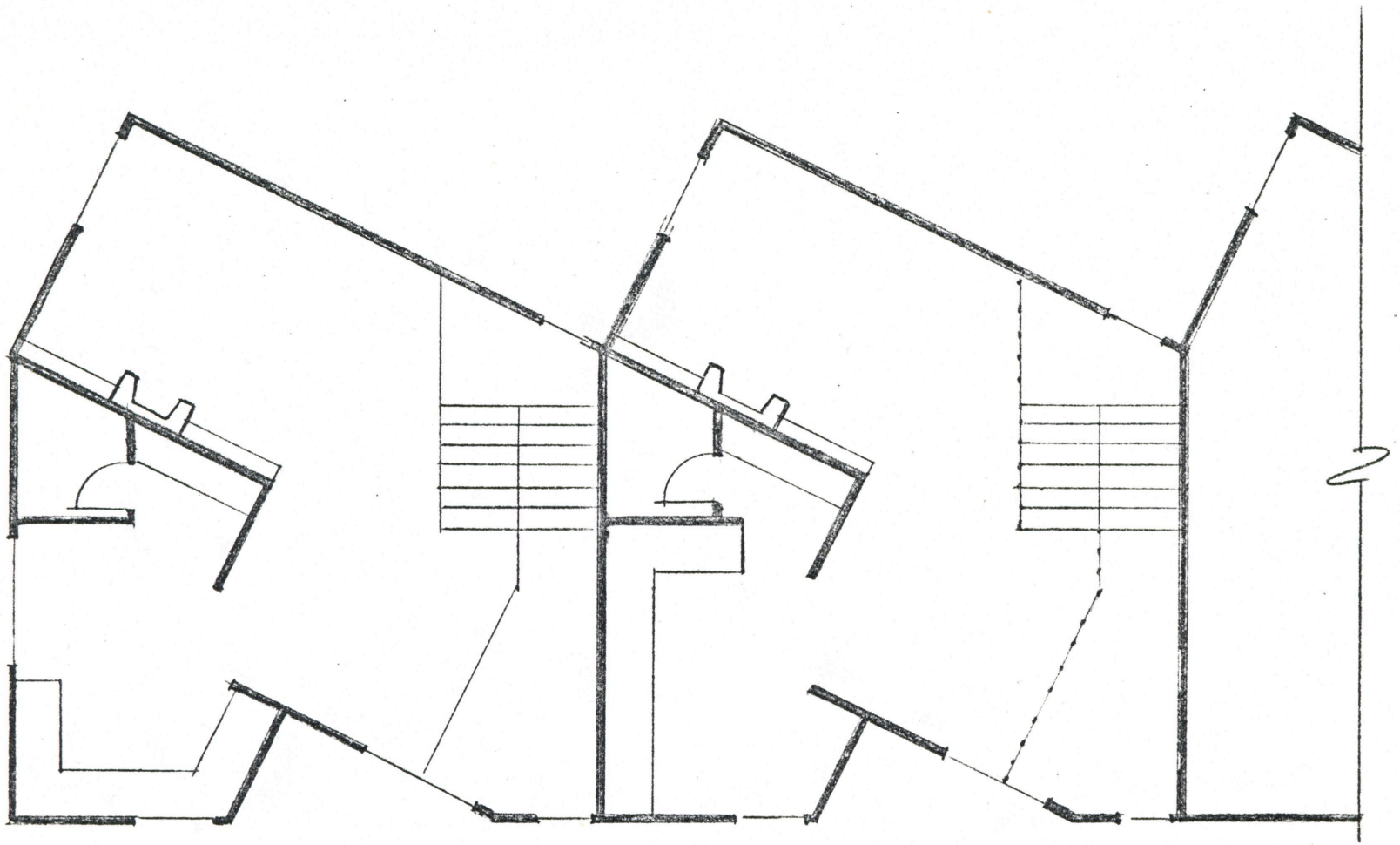


Figure 22.



Sound Wall Isolation

In working with sound isolation of the party wall, an attempt was made to remove the plumbing pipes from that wall in order to improve the possible S.T.C. rating (see Plan 6-E, Figure 23 and 6-F, Figure 24). Advantages of the changes are as follows:

1. Elimination of plumbing from sound wall
2. Cleaning up closet in guest room
3. Reinforcing diagonal in study

Disadvantages are as follows:

1. Plumbing wall does not align with half-bath above
2. Plumbing waste and vent stacks must jog around structural beam
3. There is no room in units 2, 3, and 4 for washer and drier both; a combination unit will have to be used.

In weighing the factors above, the cost in labor and of materials to align the plumbing and jog around the beams was prohibitive in relation to the S.T.C. rating. It was decided to retain the plumbing in the party wall. But, in order to cut down on sound transmission which occurs when holes are cut in the sound wall for pipes, it was decided to enlarge the plumbing wall from 6" to 8" to allow room for sound insulation batt to go between the pipes and the apartment next door (see 2-A8, page 101). This, in combination with resilient channels under the gypsum board in the stair well and alcove will give a satisfactory S.T.C. rating. Analysis also showed that a satisfactory rating in this plan can be lower than normal due to the open space of the stair well which effectively cuts down building-born

Figure 23.

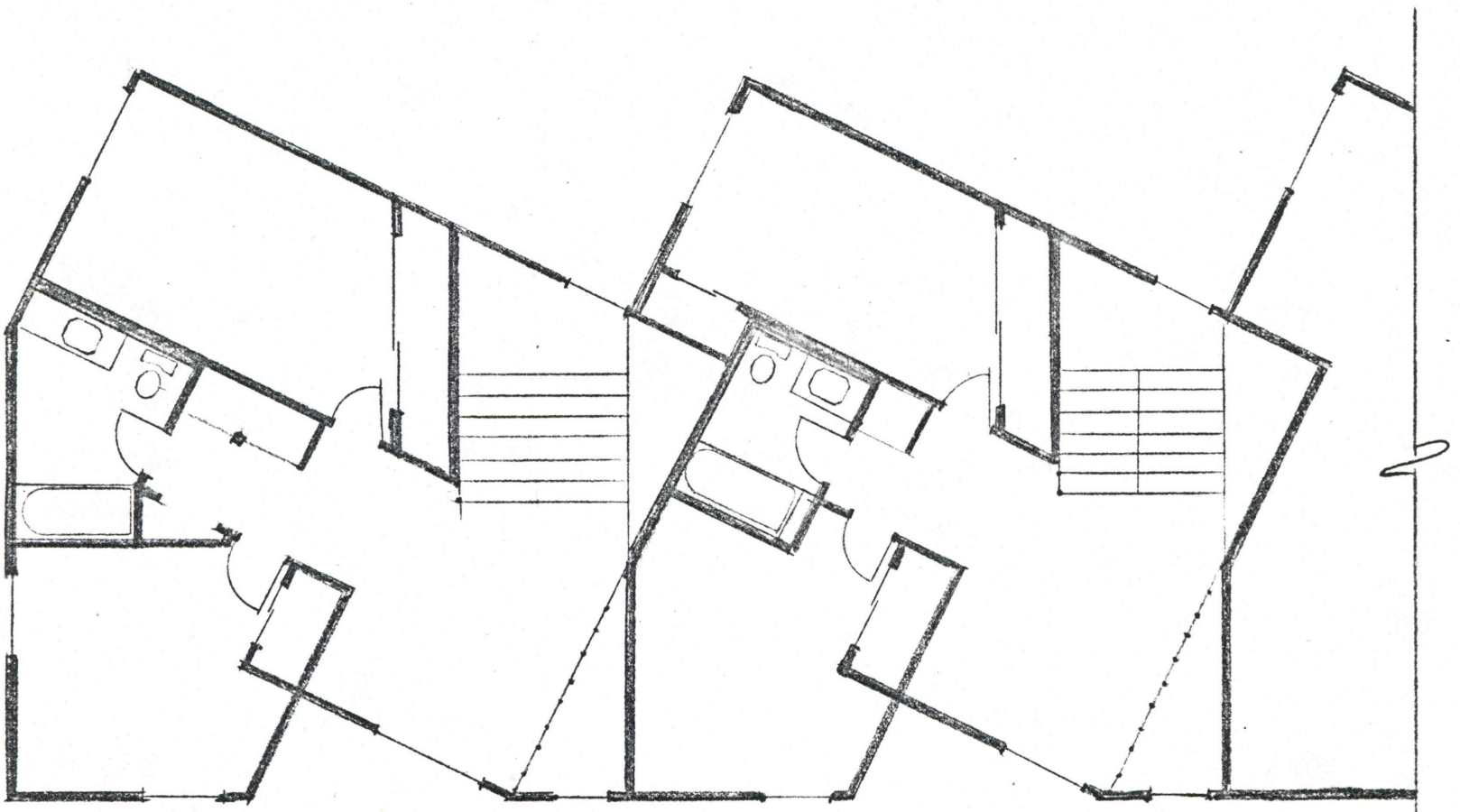
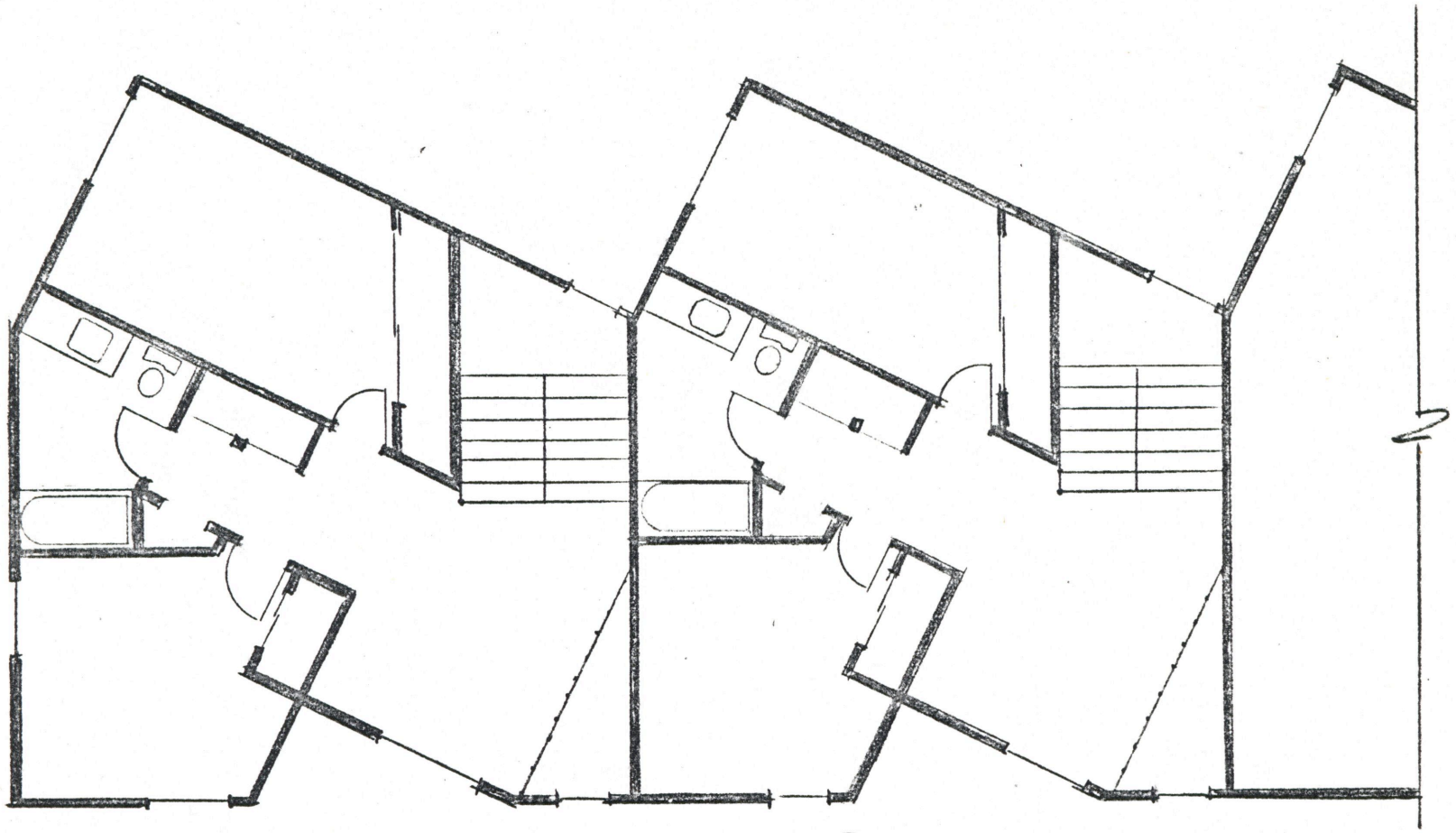


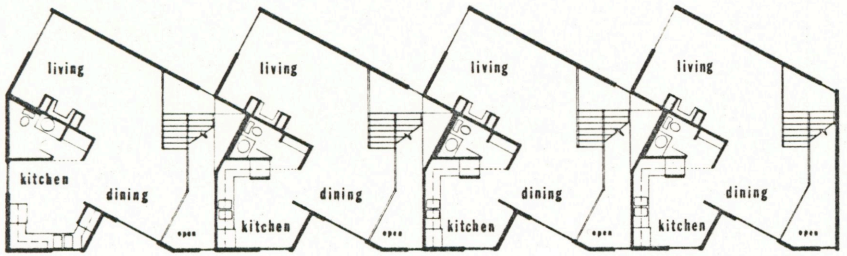
Figure 24.



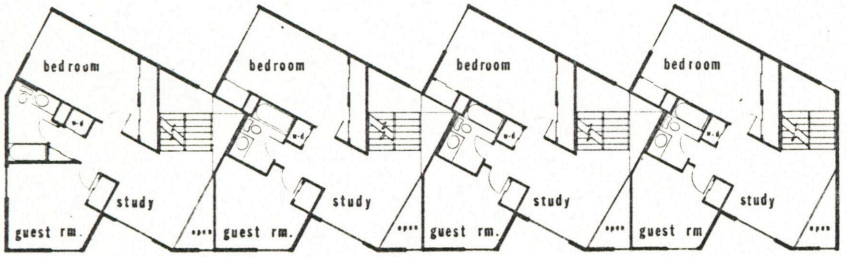
sound transmission from one apartment to the next. This will more than make up for lost S.T.C.'s resulting from holes in the plumbing wall on the bath side.

As a result of this problem, though, it was determined that the Plan 6-E guest room and a combination washer-drier was a better arrangement. Both details helped simplify and unify the second floor. This completed the floor plan configuration changes needed to adapt to functional needs (see Figure 25 for the finalized schematic of all three floors).

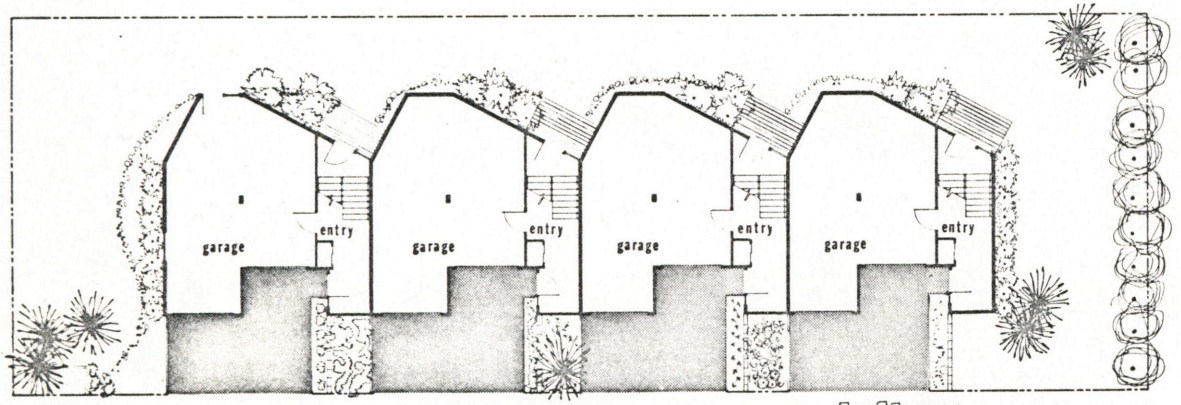
Figure 28.



third floor



second floor



ground floor

analla apartments

anchorage, alaska

PART III

CHOOSING THE MATERIALS

Procedure

In this part of the thesis study, building elements such as floors, doors and walls or sub-contracted parts such as roofing, windows and plumbing have been singled out to be treated in isolation. Each element, finish, material or method can more easily be compared with others in its category and priced per square foot or lineal foot. Evaluation will be made only of those materials which "fit" the needs of the building. The advantages and disadvantages to this plan of each will be discussed. Reasons will be given for the choices made, keeping in mind durability, aesthetics, function, etc., as well as cost.

The prices quoted on the following pages are from Means Construction Cost Data and include costs of materials, labor, overhead and profit and are to be used here as comparison only. An attempt will be made in evaluating possible choices in how readily each material or method can be adapted to the irregularities of the plan and the cost of such adaptation. After the choices are made, factors will be added for inflation and locality when compiling total costs of the project.

TABLE 27.

FOUNDATIONS AND FIRST FLOOR WALLS

		Size	Height	Width	Insulation	Outside Finish	R value	****Cost
*	Cement block (C.M.U.)	8"x8"x16"	8'	10½" with furring	1½" rigid on 2x2 furring at 24" o.c.	-	8	$28.00
		8"x8"x16"	12'			-	8	$35.80
		8"x8"x16"	4'			-	8	$21.00
**	Concrete	8"	8'	10½" with furring	1½" rigid on 2x2 furring at 24" o.c.	-	7.5	$41.44
		8"	12'			-	7.5	$52.16
		8"	4'			-	7.5	$30.34
***	All Weather Wood and Insulation	2x6	8'	6 5/8"	6"	3/4" pressure treated plywood	19	$24.42
		2x6	12'	6 5/8"	6"		19	$29.20
		2x8	8'	8 1/2"	8"		26	$30.66
		2x8	12'	8 1/2"	8"		26	$36.09

All garage walls must have 5/8" type x gypsum board for fire separation, the cost of which will be added later.

strip footings, reinforced 12" x 24"	$14.15
4" slab on grade, 6 x 6/10 x 10 W.W.M, 4" gravel under 6 mil V.B.	$ 1.25

* horizontal reinforced every 2nd course, vertical reinforced every 48" o.c.
** horizontal reinforced to and bottom, vertical reinforced 60" o.c.
*** price estimate from Western Wood Products information as applied to Means.
**** per lineal foot

Foundations and First Floor Walls

In analyzing the information in Table 27 and applying it to the final plan, it was decided to go with a combination of concrete strip footings, concrete block (C. M. U.) foundation and all-weather wood for first floor walls (see 3-A8, page 101). The advantages of the construction are:

1. The all-weather wood walls have better R values which result in savings of heat costs over the years.

2. Wood walls have a thinner profile giving more usable space.

3. Savings in cost.

4. C. M. U. foundation walls are all sub-grade and will not require the odd angles carefully finished. If all corner blocks at the odd angles had to be sawed, poured-in-place concrete might be cheaper.

5. Wood adapts to the odd corners easily for above-grade construction.

6. Since all first floor south and east facades are exposed and more than half of the others are exposed and a warm residential atmosphere is desired, the wood finish will give the warm residential feeling wanted and seem less imposing than concrete.

7. Wood "flexes" and returns to original shape in case of earthquakes with less repair than concrete or block construction.

Disadvantages of the construction are:

1. Exterior needs restaining every six to eight years.

2. Not fire resistant on exterior (type x gypsum board will protect the interior).

Second and Third Story Exterior Walls

The choice for the second and third floor exterior wall framing is relatively simple. Either 2 x 4 or 2 x 6 studs would serve structurally, so the choice is restricted to the R values of insulation that each can offer.

stud size	insulation thickness	R	cost per lineal foot	average lineal foot of exposed wall per unit	difference in cost per unit
2x6	6" fiberglass	19	$7.70	69	$531.30
2x4	3½" fiberglass	11	$5.32	69	$367.08
DIFFERENCE			$2.38		$164.22

Using Montana Power's rule-of-thumb formulas (Anchorage's gas costs are very comparable to Bozeman's), each unit, when insulated with 6" insulation in the walls, would cost $292.00 for gas heat for the entire year, and with 3½" insulation, $326.00. This is a $34.00 a year savings per unit, per year. Since the initial cost of extra insulation and thicker studs is $164.22, it will take about 4.8 years to pay for the extra thickness. The thicker insulation should therefore be chosen.

TABLE 28.

SIDING

Siding (per square foot in place, finished)	Costs
Aluminum continuous vertical board and batton, colored	$1.00
Vinyl siding 8" to 10" wide - solid PVC panels	$ .90
Plywood T-111 fir 5/8"	$ .91
Plywood T-111 cedar 5/8"	$1.15
Plywood rough sawn fir 1/2"	$ .87
Plywood rough sawn cedar 1/2"	$1.15
Cedar, bevel clear grade 3'-16' lengths	$1.05
Cedar, 3/4" x 10" B grade	$1.00
Cedar, rough sawn, 1" x 4" A and B btr	$1.35
Cedar, rough sawn board and batten 1" x 12" 3 and btr	$1.15
Redwood, clear vertical grain 1" x 5"	$1.60
Redwood, clear vertical grain 1" x 8"	$1.65
Infill Panels (per sq. ft.)	
Asbestos cement 1/8"	$1.60
Epoxy panels, small exposed aggregate	$3.45
Sheathing (Per sq. ft.)	
Plywood, 3/8"	$ .46
Plywood, 1/2"	$ .54
Plywood, 5/8"	$ .62
Plywood, 3/4"	$ .72

Siding

To determine the best siding for this building, appearance was the most important criteria. The effect desired can be seen in the elevations (see 1-A5, page 98). The most economical would be a T-111 plywood or something similar as it produces exterior surface and shear resistance in one application (plus staining). Its main drawback is that the horizontal joints show where the sheets meet, even with the most careful application. Since T-111 did not meet the appearance requirements, two layers will have to be used, even if it is more expensive.

Not enough information about aluminum or vinyl siding concerning gauge, durability, availability, cleanability, fading, etc. was given in Means. Time does not allow more intensive research into these products, but they should be kept in mind if this project ever came into actual construction. Their advantages include less initial cost and factory applied finish.

This leaves wood sidings to be considered. All present a good appearance, but periodic restaining of any will be required. Clear bevel siding was chosen at $1.05, to be sheathed underneath with 1/2" plywood at $.54. At the areas of infill between the windows, only sheathing that has a rough-sawn finish (at $.87) will be used. Care must be taken to have no joints showing in these areas.

TABLE 29.

FLOORS

Subfloor per sq. ft.	Cost
Plywood, standard grade 1/2"	$ .41
Plywood, standard grade 5/8"	$ .49
Plywood, standard grade 3/4"	$ .57
Plywood, standard grade 1 1/8" 2-4-1 including underlayment	$ .93
Underlayment per sq. ft.	
Plywood, underlayment grade 3/8"	$ .42
Plywood, underlayment grade 1/2"	$ .48
Plywood, underlayment grade 5/8"	$ .54
Particle board 3/8"	$ .35
Particle board 5/8"	$ .44
Hardboard (4' x 4') .215"	$ .32
Hardwood per sq. ft.	
Maple 25/32" x 2 1/4" 2nd and btr.	$2.45
Oak 25/32" x 2 1/4" clear	$2.40
Oak parquetry 5/16"	$2.86
Carpet, commercial grade per sq. yd.	
Nylon 28 oz. with pad, heavy traffic	$13.15
nylon 20 oz. with pad, medium traffic	$11.15
Resilient Vinyl per sq. ft.	
.093" average price range	$ .98
.125" average price range	$1.20
Kitchen Carpet, commercial grade per sq. yd.	$10.25

Flooring

In analyzing the floor construction, 5/8" plywood subfloor was chosen to give the shear resistance necessary to the floor diaphrams. Hardwood flooring was then eliminated due to price and difficulty of upkeep. The advantage, though, of hardwood would have been almost no waste.

An underlayment was therefore necessary, and it was determined that 3/8" particle board was thick enough to be handled without breaking, but not cost too much. During installation, care should be taken to insure that the seams of the sheeting and underlayment alternate and are perpendicular to each other for added resistance. A 20 percent cost increase will be added in the final tabulation for waste and extra labor in adjusting to angles and corners.

Nylon was the only fiber considered for carpet due to its durabilility. A short, tight weave will be chosen, and 28 ounce used in the entry, stairs, study, living room and dining areas; 20 ounce will be used in bedrooms. If a weave without nap can be found in 12-foot widths, only a normal 5 percent waste will be encountered.

Resilient, vinyl flooring was chosen for the kitchen and bath areas because of their easier upkeep and durability. The only other possibility considered was kitchen carpet, but it was feared that rentors might not give it the care necessary to keep its appearance up.

Windows and Doors

In determining the kind of windows to be used, maintenance-free life, trouble-free operation and easy installation were the deciding factors. Pre-assembled, vinyl clad units then were the obvious answer. The difference in cost between clad wood and primed wood windows averages only $10.00 for a 4' x 4' unit. It would not even take one repainting to make clad windows pay for themselves. Awning windows were chosen for the clerestory areas and casement type for all other locations, both for their ease of operation.

For exterior doors, steel was chosen for durability. The difference in price between such a door and a good quality solid wood entrance door is about $55.00 more for steel. The R values of a steel, insulated door and the solid wood door are about equal.

The choice for closet doors was between bifold or sliding. Bifold gives more total access and is slightly less expensive due to less labor for installation; hence they were chosen. All closet and interior doors will be hollow core, mahogany, pre-hung units.

Roofing

Due to the extreme differences of slope between the front and back parts of the roof (3 in 12 and 6.42 in 12, respectively), the choice for roofing is severely limited. Cedar shakes would be a natural choice for the steep part but cannot go on the low slope. A built-up roof with gravel chips would be a natural choice for the low slope, but cannot go on the steep slope. One possibility that would accommodate both slopes and be very durable and excellent for the cold and rainy climate would be a corregated metal roof. In spite of its desirable qualities, it was eliminated due to its ribbed industrial appearance and difficulty of installation on such a complex roof. The only remaining choice is composition shingles. They give the correct residential feeling, are available in a variety of dark earth tones and are relatively inexpensive. However, self-sticking tab shingles must be used rather than the regular type for installation on the low slope.

Lighting

The treatment of lighting is very important in this plan. The placement and quantity of light is to be strictly controlled. This can be done rather inexpensively with bare flourescent tubes behind simple wood valances that direct the light in a diffused manner along ceiling or wall. This treatment will be the only fixed lighting in the living, dining and nook area of the kitchen, stair and alcove. Any ceiling fixtures that will occur in bedrooms and hall will be simple and unadorned and need not be expensive to look elegant. Flourescent tube lighting fixtures will be placed above work areas in kitchen and above vanity in the bath.

Only in the open space above the entry on the third floor will a "spectacular" lighting fixture be placed. This might have to be custom made or custom assembled from several hanging swag-type lights. Some parts of it will hang down to the second and first floor. In this thesis, $1,000.00 per fixture will be allowed in the budget for a light such as this, but more research needs to be done to find or design something simple, elegant, spectacular and "just right" if construction was to be undertaken. The outside entrances will have a recessed fixture in the overhang to light the second garage door and entrance door at the same time. In addition, an exterior down light will be placed near the top of each entrance wall to dramatize the sloping roof line.

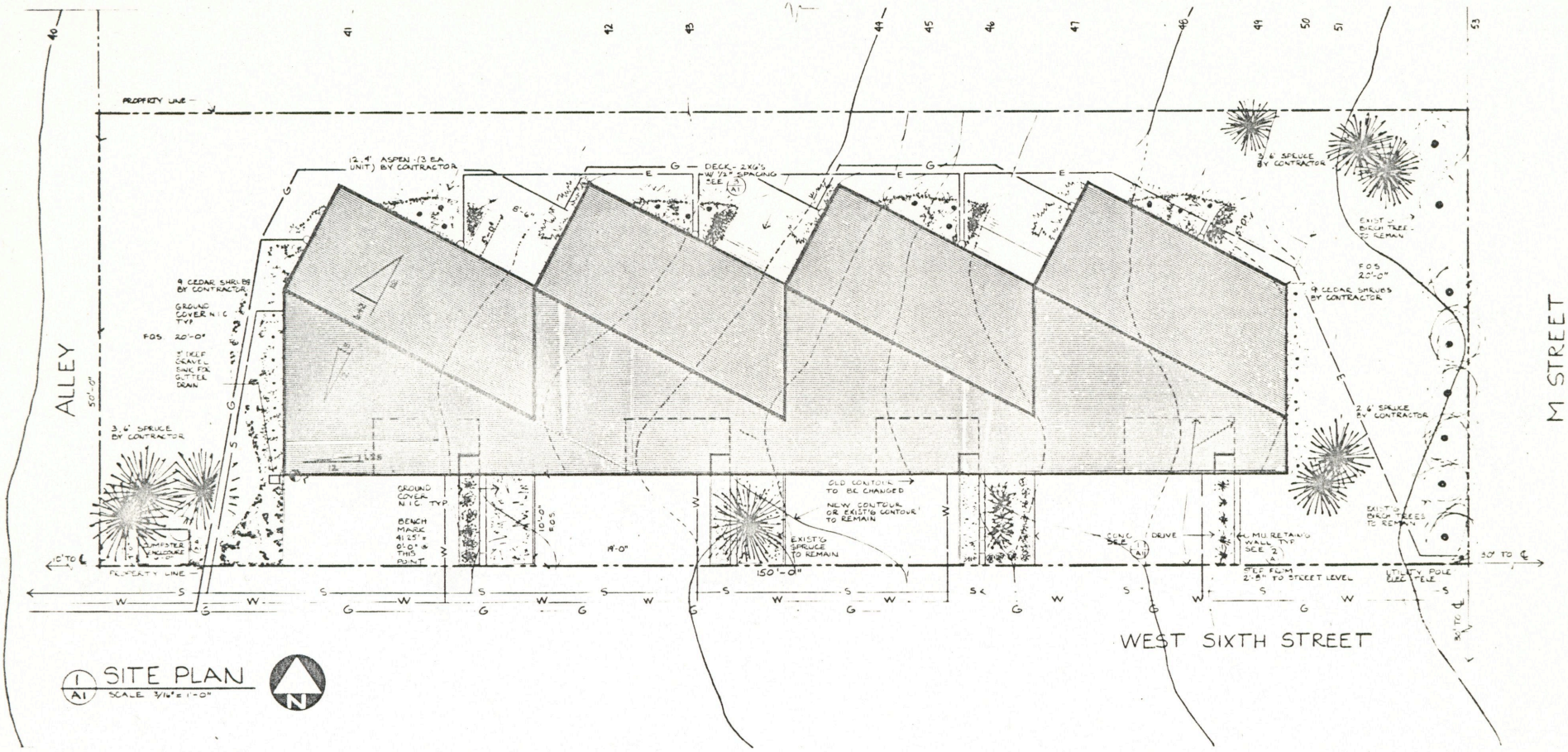
Conclusion

The preceding pages of Part III of this study have attempted to show the procedure of choice, elimination, pricing, etc. that should accompany the design and detailing of each element that goes into a plan. Any of the subparts could have been studied in much more depth to gain a better background and understanding of the field and to make the cost estimates closer. The studies undertaken here are meant to be representative of the least that should be done.

There are many other areas that should be studied in detail such as the stair and balcony railings, cabinetry, roof framing, fireplaces, etc. Time does not allow such research for this thesis at the present time, but if this project should be constructed, it would need to be done before bidding. These pages are only presented here to represent a sample of how to proceed in exploring each element of a building as a tool in making design decisions.

PART IV

CONTRACT DOCUMENTS



1/A1 SITE PLAN
SCALE 3/16"=1'-0"

INDEX	
A1	SITE
A2	FOUNDATION - FRAMING
A3	FRAMING - GROUND FL
A4	2ND, 3RD FL
A5	EXT ELEVATIONS
A6	SECTIONS
A7	SECTIONS - STAIRS
A8	WALL SECTIONS
A9	INT ELEV - WINDOW DET
A10	MISC DETAILS
A11	SCHEDULES
A12	
M1	ELECT HEATING
M2	PLUMB MISC DETAILS

SYMBOLS
(1) WINDOW NO
(1) DOOR NO
101 ROOM NO
INTERIOR ELEVATION
SECTION CUT

MATERIALS

ABBREVIATIONS

analla apartments

anchorage alaska

DRIVEWAY DETAIL SCALE

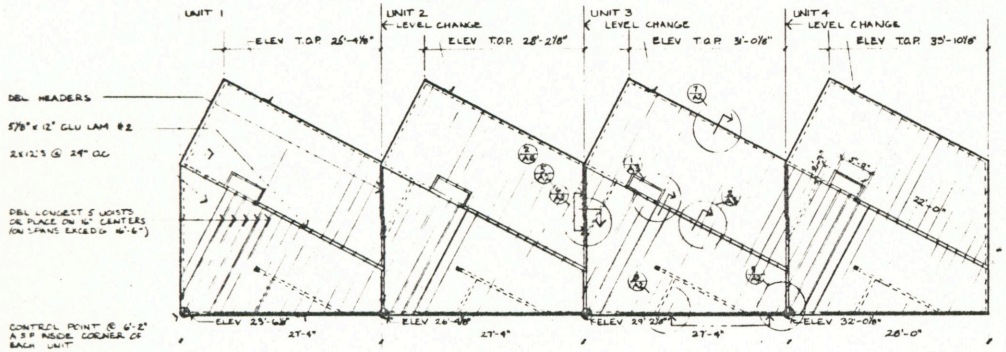
RETAINING WALL SCALE

DECK DETAIL SCALE

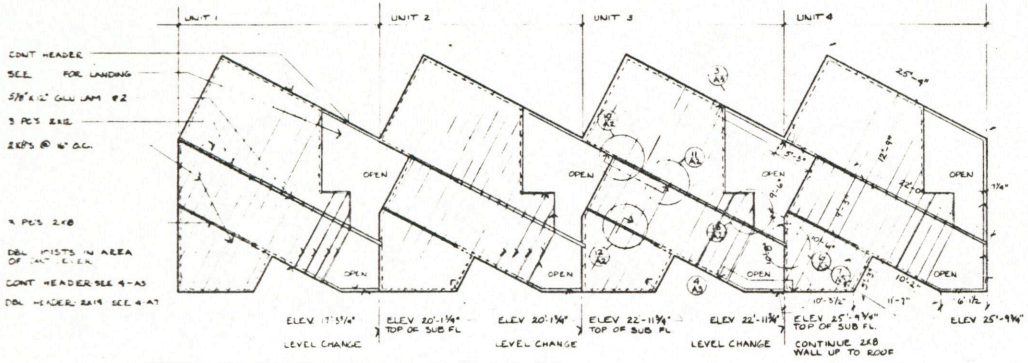
GARBAGE ENCLOSURE SCALE

JOB NO
DATE
SHEET 1 OF 4

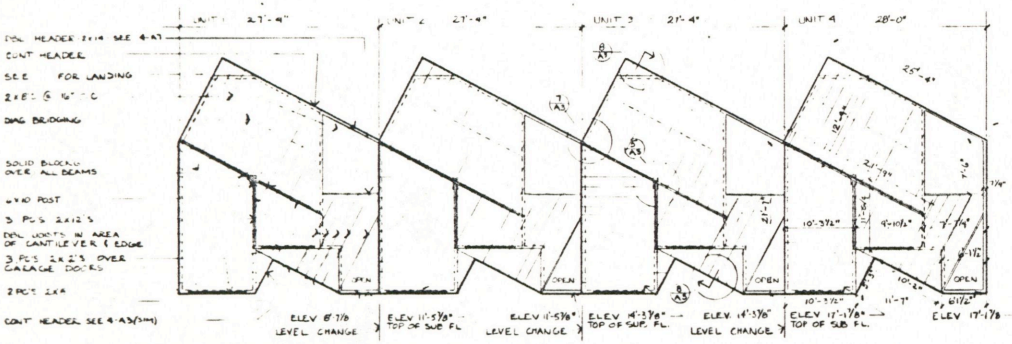
a-1



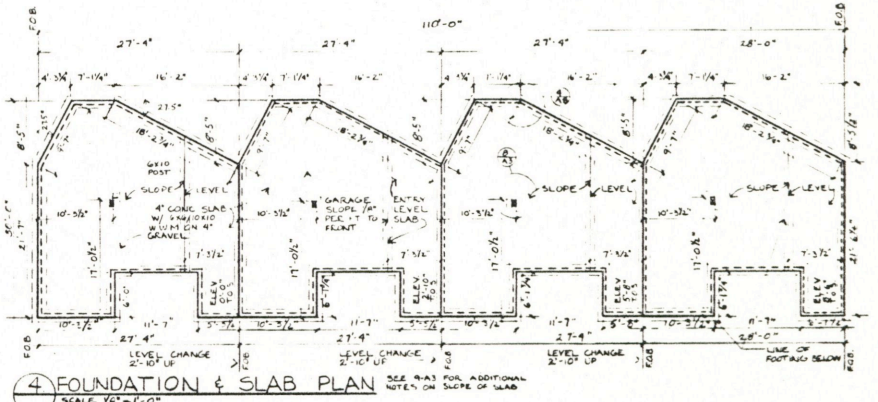
1 ROOF FRAMING PLAN
SCALE: ⅛" = 1'-0"



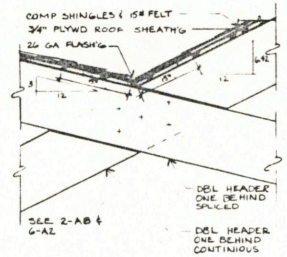
2 THIRD FLOOR FRAMING PLAN
SCALE: ⅛" = 1'-0"



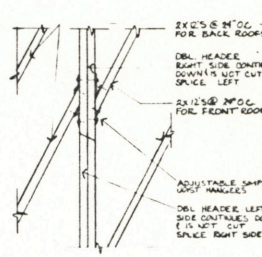
3 SECOND FLOOR FRAMING PLAN
SCALE: ⅛" = 1'-0"



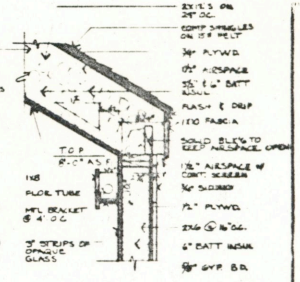
4 FOUNDATION & SLAB PLAN
SCALE: ⅛" = 1'-0"
SEE 9-A3 FOR ADDITIONAL NOTES ON SLOPE OF SLAB



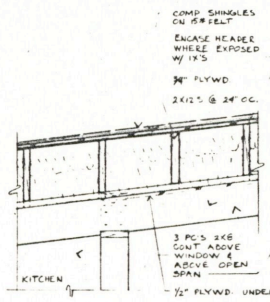
5 ELEV. GABLE INTERSECTION
1"=1'-0"



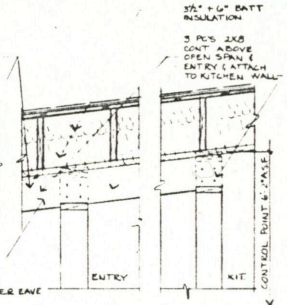
6 PLAN GABLE INTERSECTION
1"=1'-0"



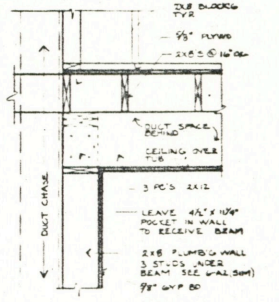
7 SECTION - ROOF EDGE
1"=1'-0"



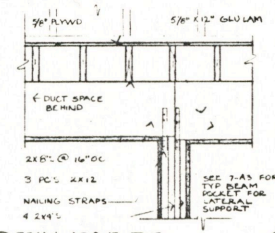
8 ELEV - HEADER @ ROOF SPAN
1"=1'-0"



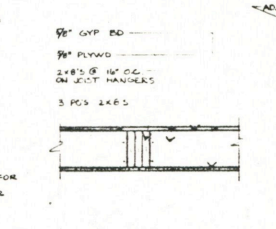
9 ELEV - HEADER @ ENTRY
1"=1'-0"



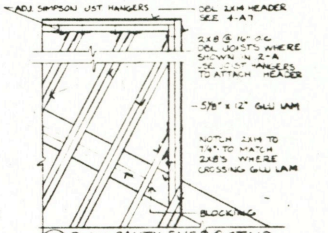
10 BEAM ABOVE TUB
1"=1'-0"



11 BEAM ABOVE TUB
1"=1'-0"

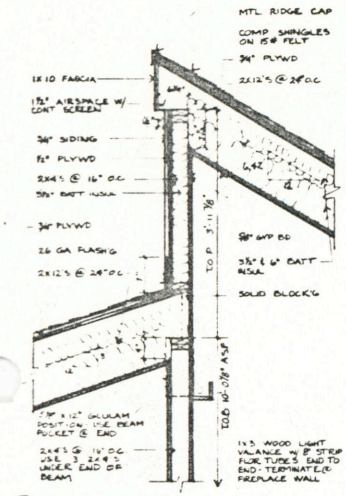


12 SECTION - BEAM
1"=1'-0"

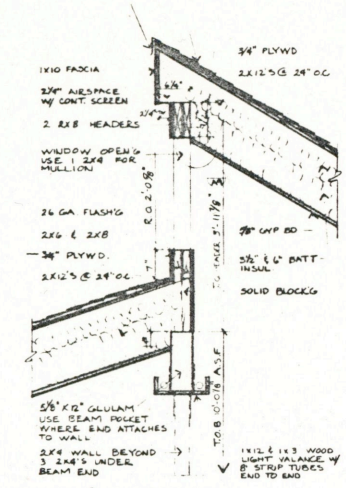


13 PLAN CANTILEVER & STAIR
1"=1'-0"

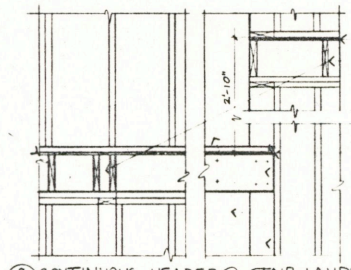
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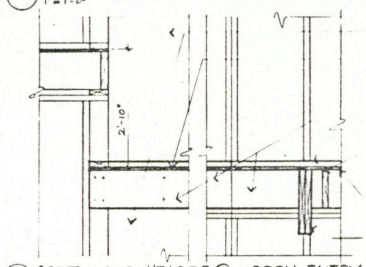
1 ROOF CONNECTION
1" = 1'-0"



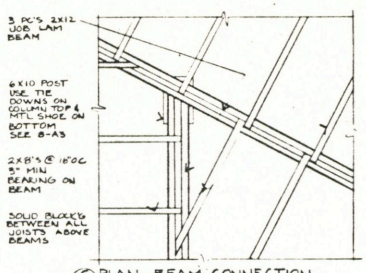
2 ROOF @ CLERESTORY
1" = 1'-0"



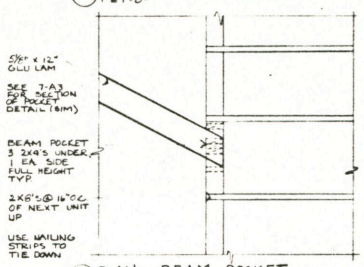
3 CONTINUOUS HEADER @ STAIR LANDING - ELEV.
1" = 1'-0"



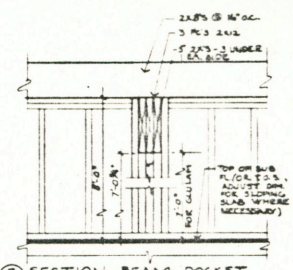
4 CONTINIOUS HEADER @ OPEN ENTRY - ELEV.
1" = 1'-0"



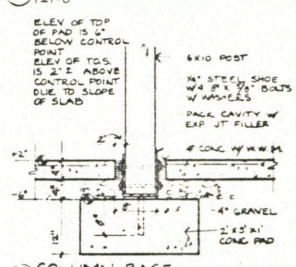
5 PLAN - BEAM CONNECTION
1" = 1'-0"



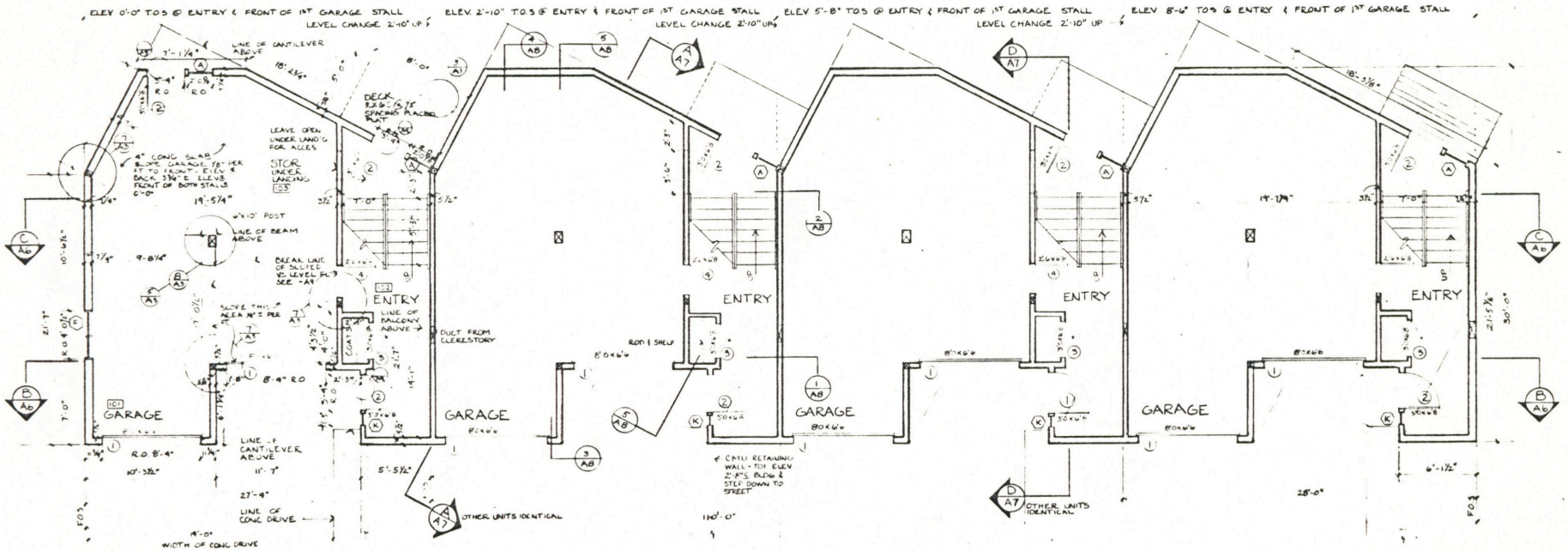
6 PLAN - BEAM POCKET
1" = 1'-0"



7 SECTION - BEAM POCKET
1" = 1'-0"



8 COLUMN BASE
1" = 1'-0"



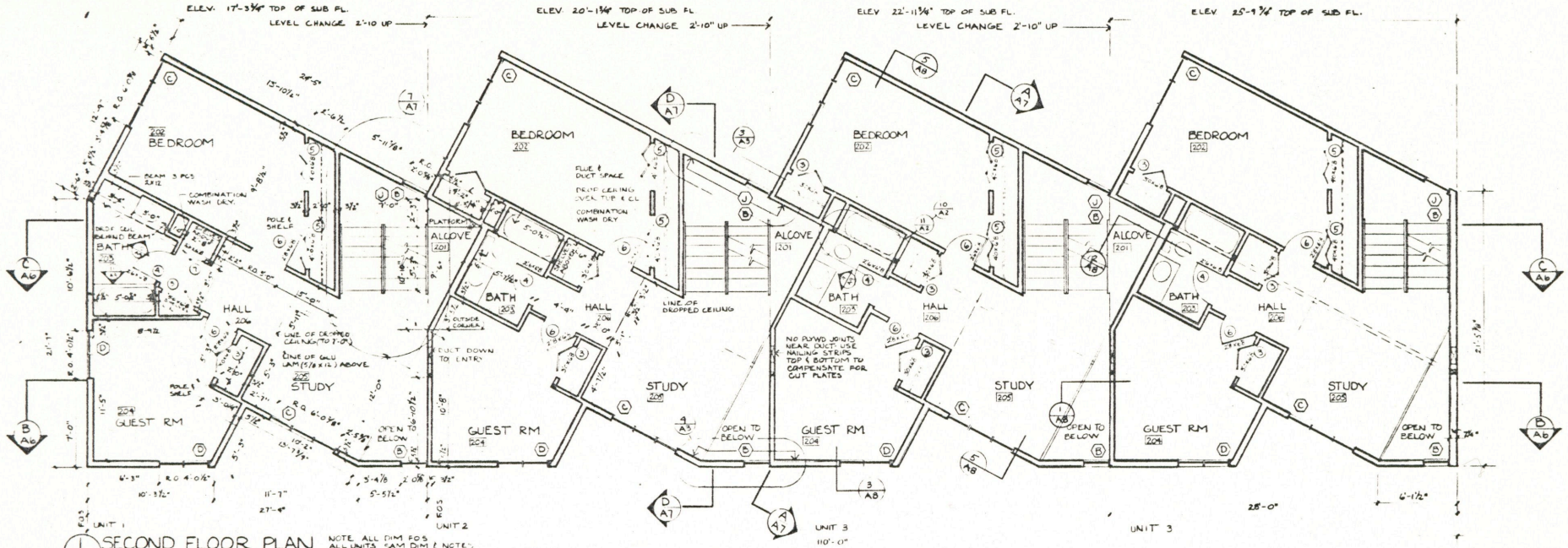
9 GROUND FLOOR PLAN
SCALE ¼" = 1'-0"

NOTE ALL DIM. FACE OF STUDS - ALL UNITS SAME DIM. & NOTES UNLESS SEPARATELY NOTED

ALL EXTERIOR WALLS @ GROUND FLOOR ARE 2X6'S EXCEPT FRONT WHICH IS 2X4'S

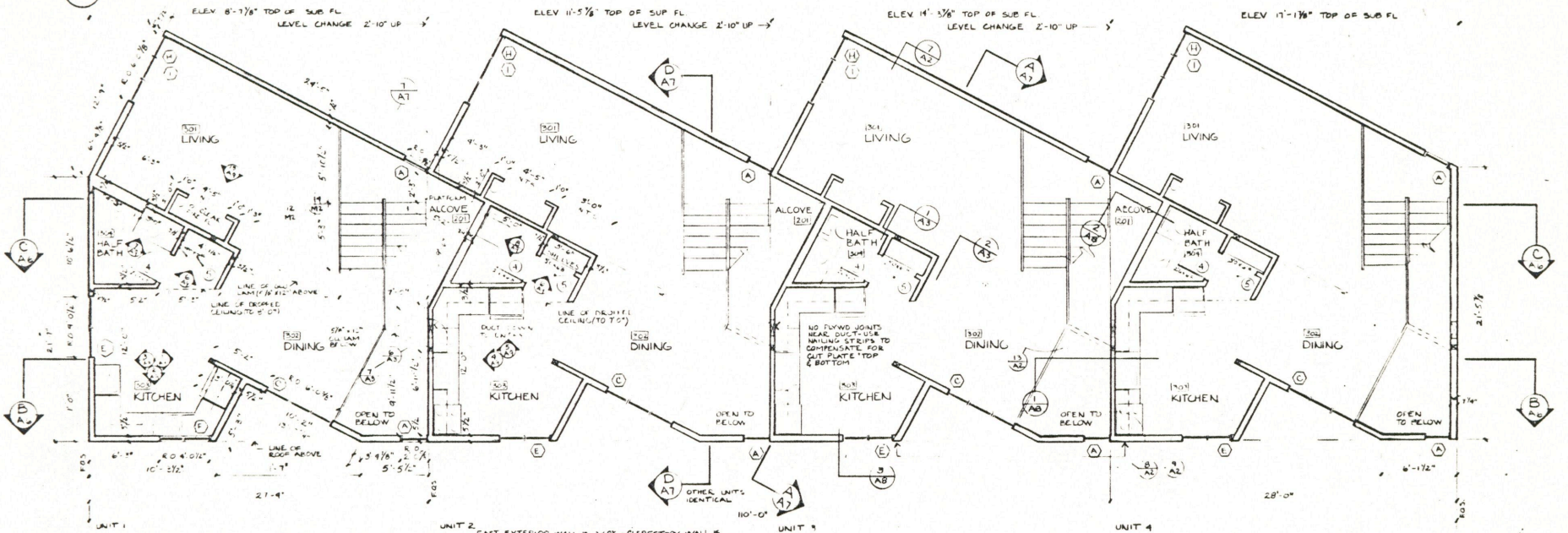
PARTY WALL IS 2X6'S @ GROUND FLOOR - ALL OTHER INTERIOR WALLS ARE 2X4'S

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1 SECOND FLOOR PLAN

NOTE: ALL DIM. FOS ALL UNITS - SAME DIM & NOTES UNLESS SEPARATELY NOTED



2 THIRD FLOOR PLAN

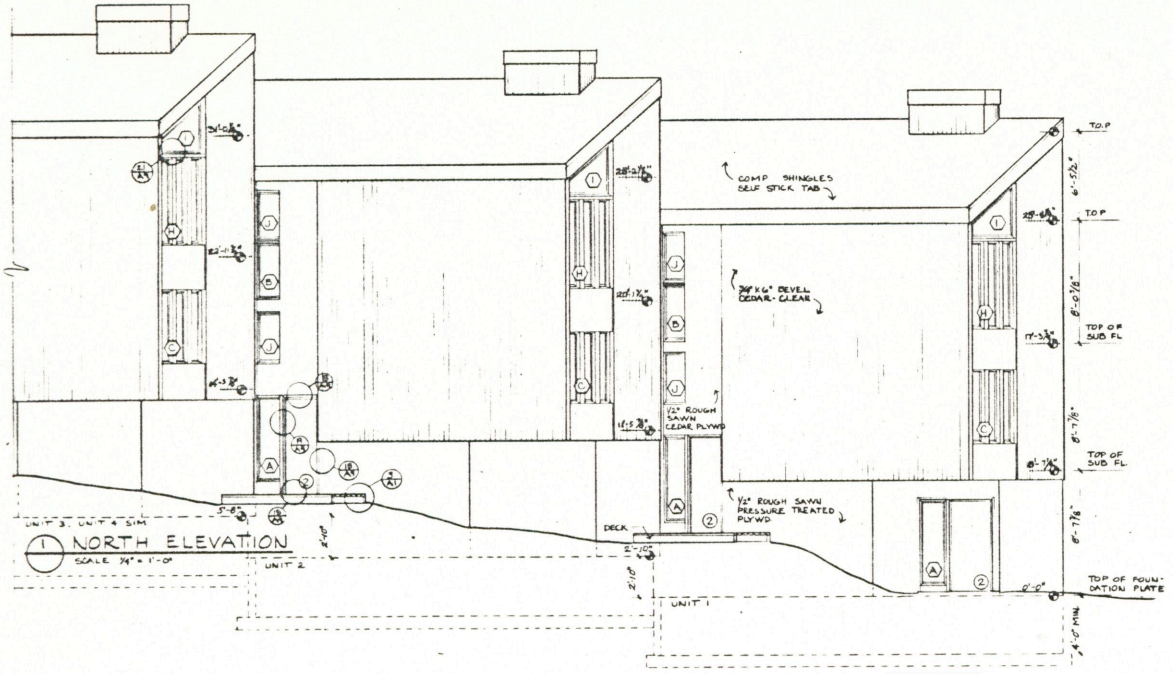
SCALE: 1/4"=1'-0"

NOTE: ALL DIM. FACE OF STUD
ALL UNITS - SAME DIM & NOTE - UNLESS SEPARATELY NTED

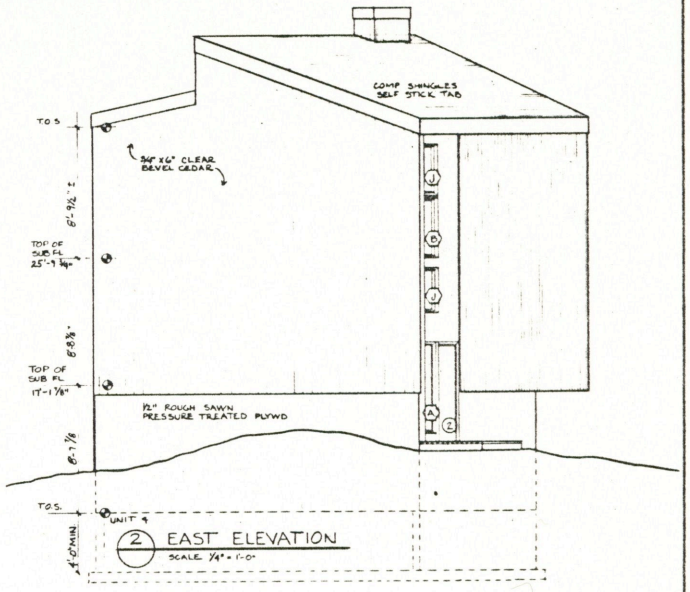
EAST EXTERIOR WALL IS 2X8'S - CLERESTORY WALL IS 2X4'S. ALL OTHER EXTERIOR WALLS ARE 2X6'S
PLUMB'G WALL - UNIT 1 IS 2X6"
UNITS 2, 3 & 4 ARE 2X8'S - ALL OTHER INTERIOR WALLS ARE 2X4'S

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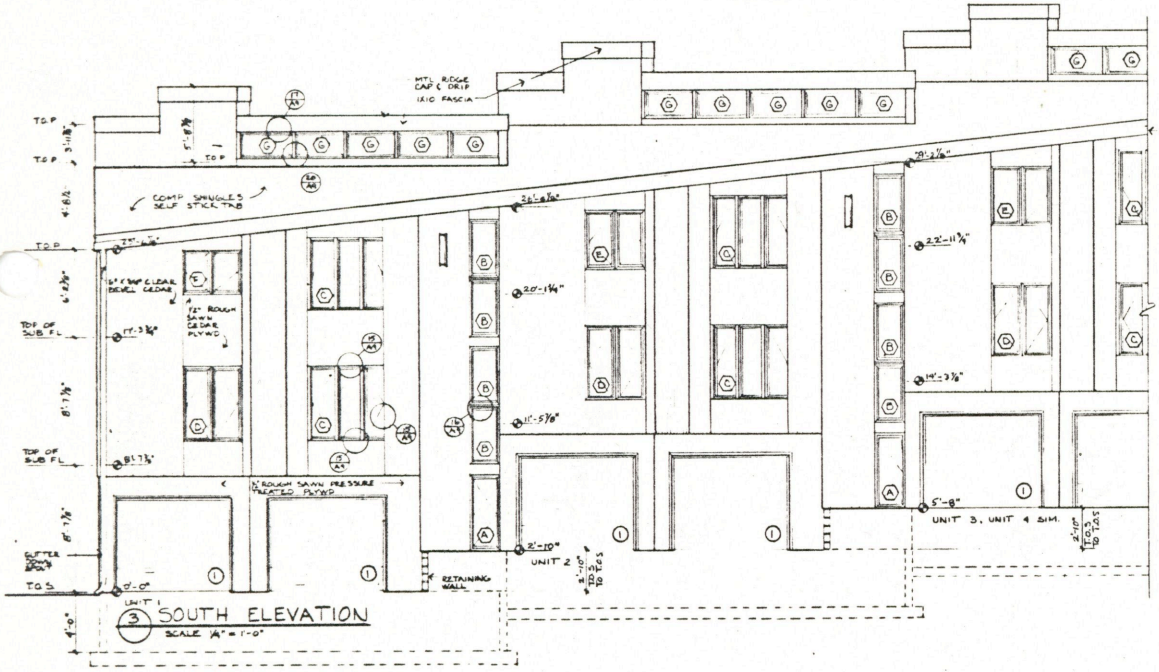
a4



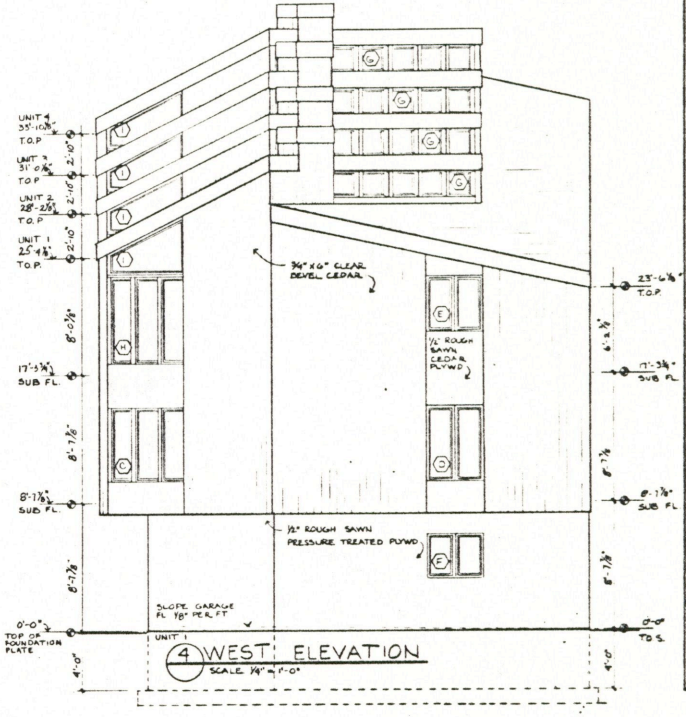
1 NORTH ELEVATION
SCALE 1/4" = 1'-0"



2 EAST ELEVATION
SCALE 1/4" = 1'-0"



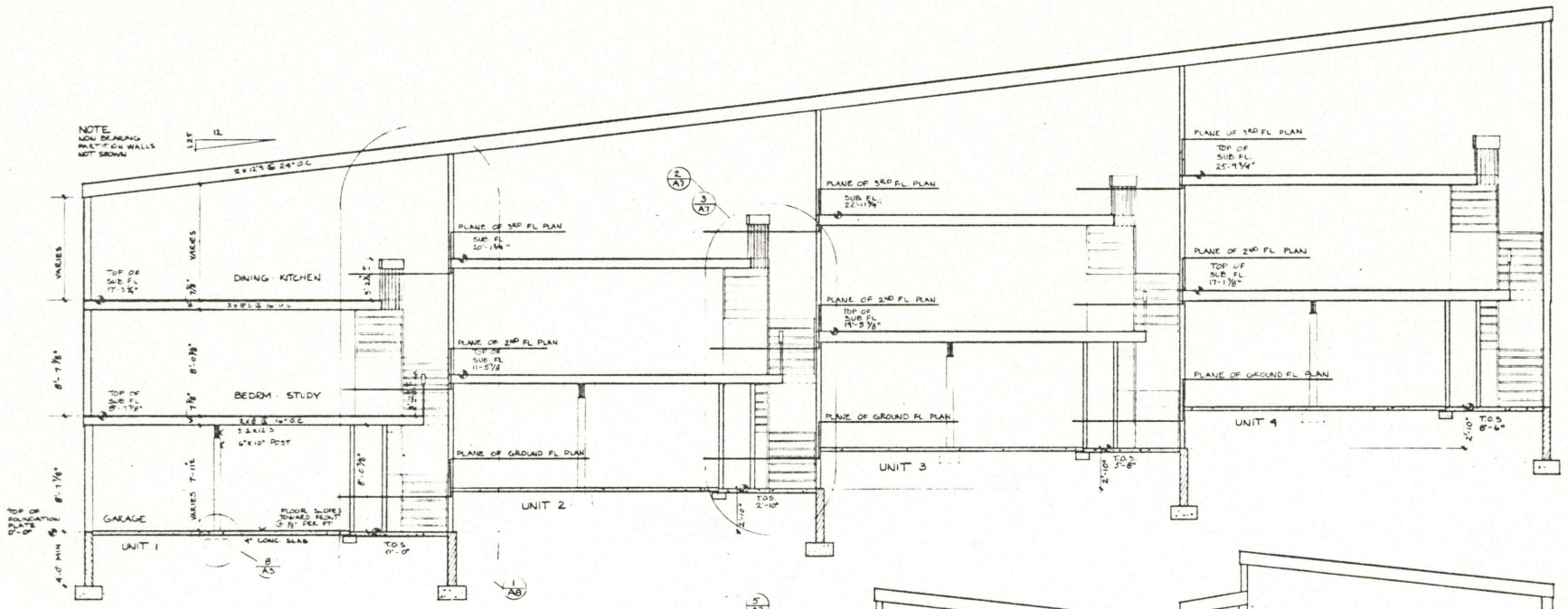
3 SOUTH ELEVATION
SCALE 1/4" = 1'-0"



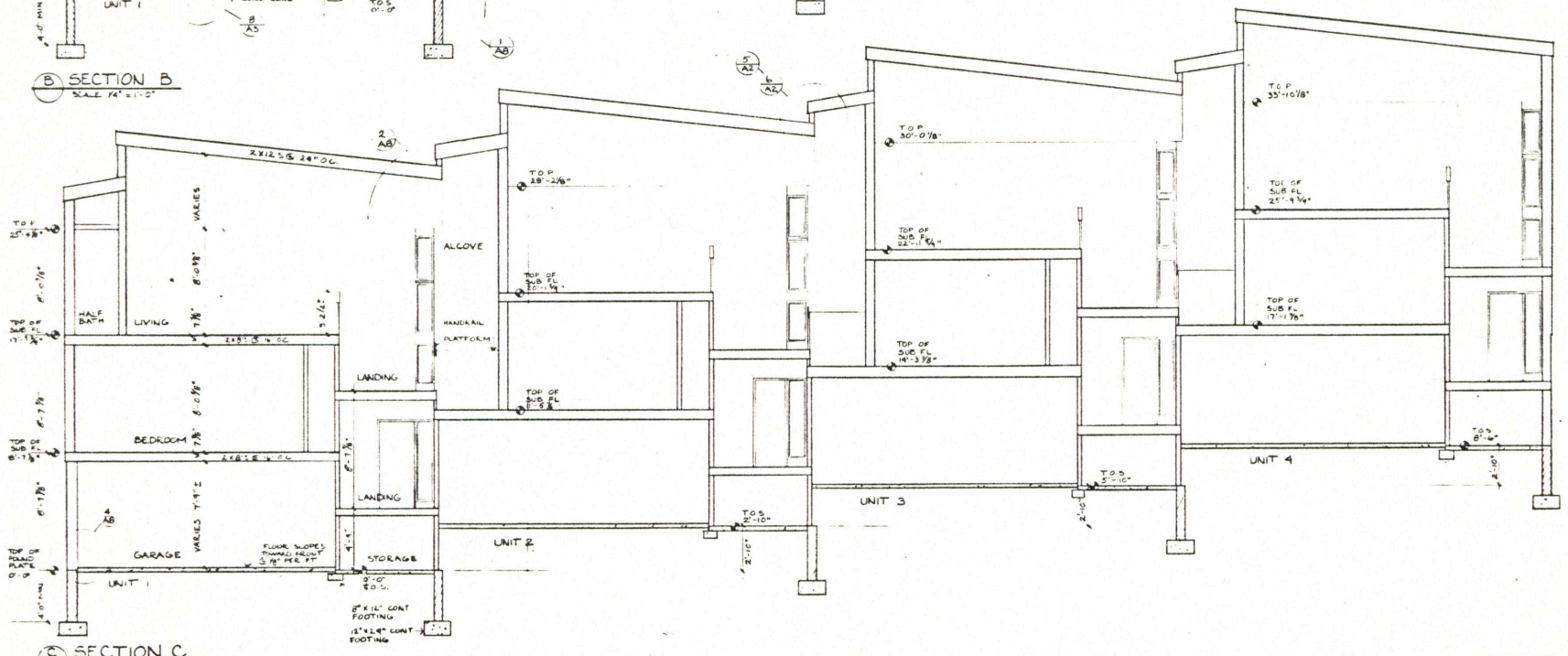
4 WEST ELEVATION
SCALE 1/4" = 1'-0"

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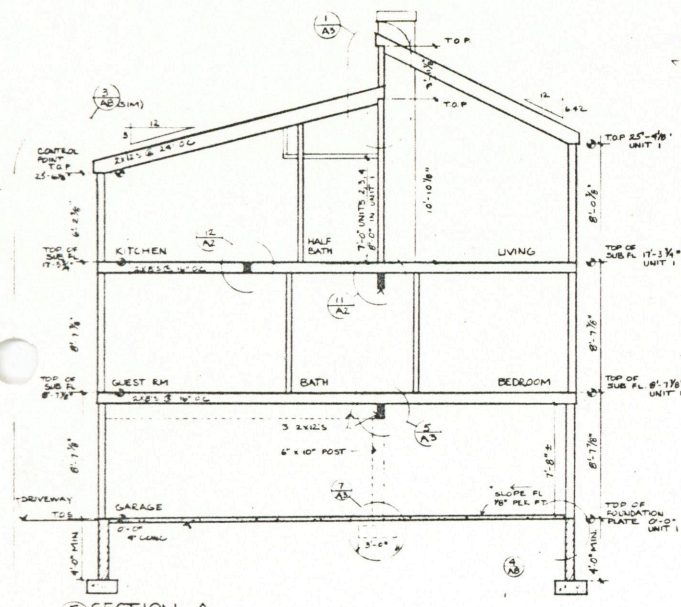


B SECTION B
SCALE 1/4" = 1'-0"

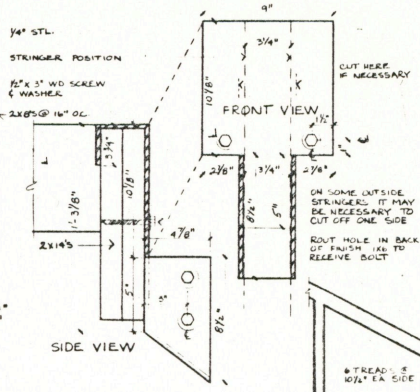


C SECTION C
SCALE 1/4" = 1'-0"

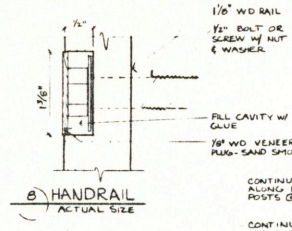
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5 SECTION A
SCALE: ¼" = 1'-0"



8 STAIR HANGER
3" = 1'-0"

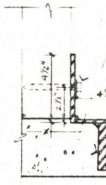


8 HANDRAIL
ACTUAL SIZE

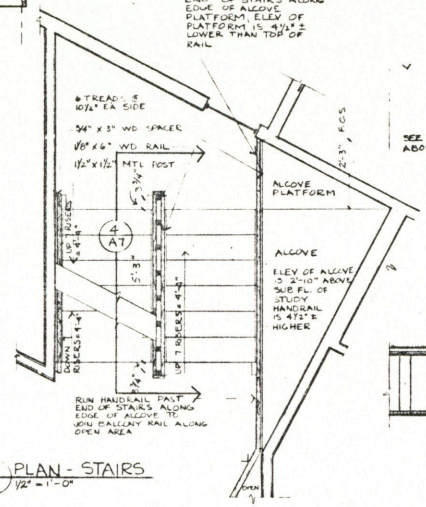
CONTINUE HANDRAIL ALONG EDGE OF DINING POSTS @ 1'-0" O.C.

CONTINUE HANDRAIL ALONG EDGE OF ALCOVE PLATFORM

LINE OF PLATFORM

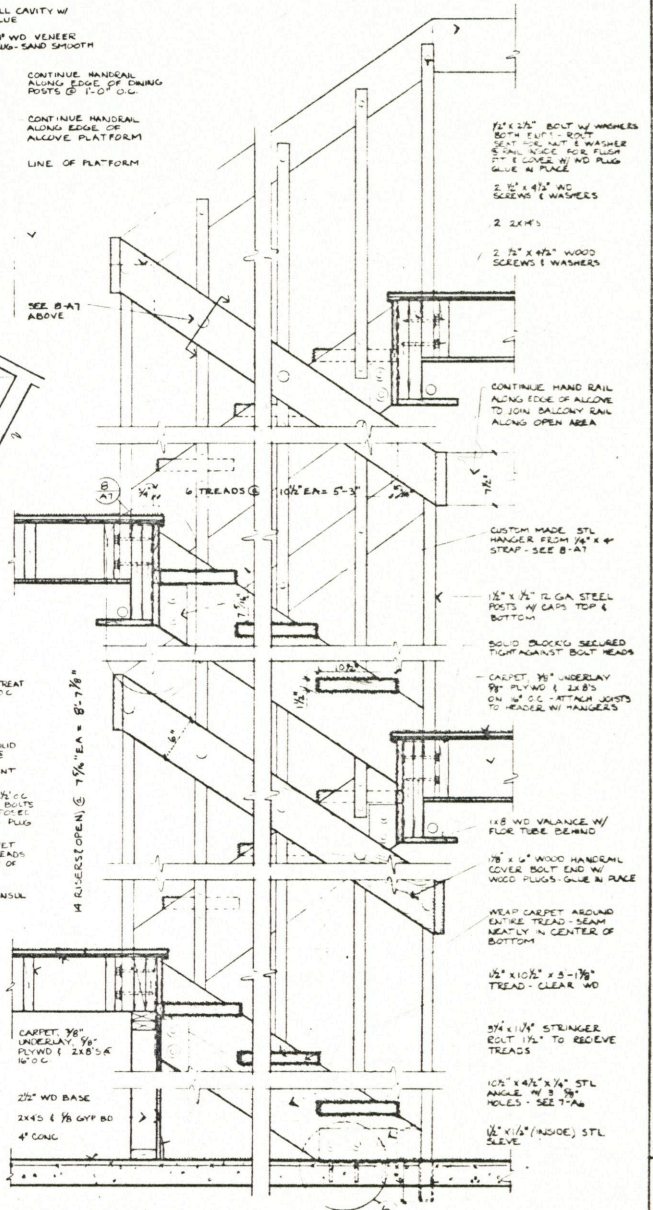


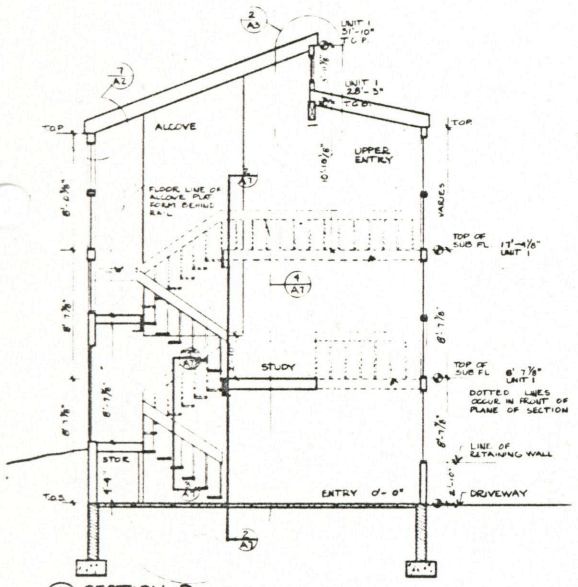
6 STAIR ANGLE
3" = 1'-0"



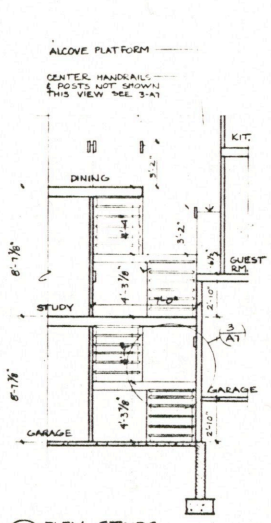
7 PLAN - STAIRS
½" = 1'-0"

SEE B-A7 ABOVE

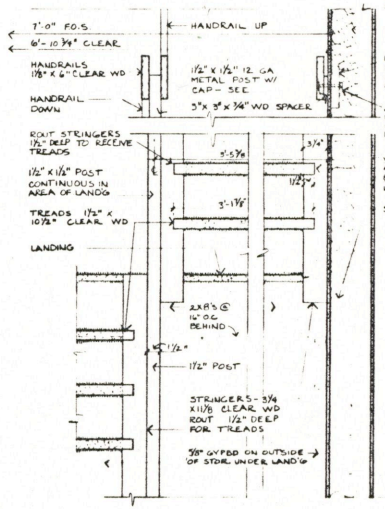




1 SECTION D
SCALE ¼" = 1'-0"



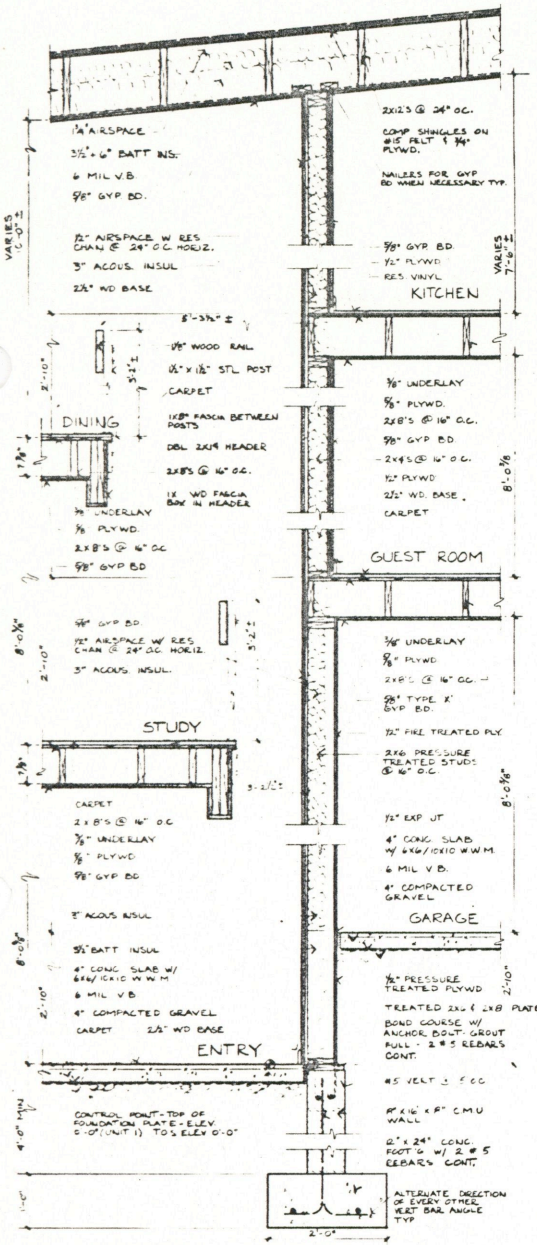
2 ELEV STAIRS
SCALE ¼" = 1'-0"



3 SECTION - STAIRS
SCALE ½" = 1'-0"

4 LONGITUDINAL SECTION - STAIRS
SCALE 1½" = 1'-0"

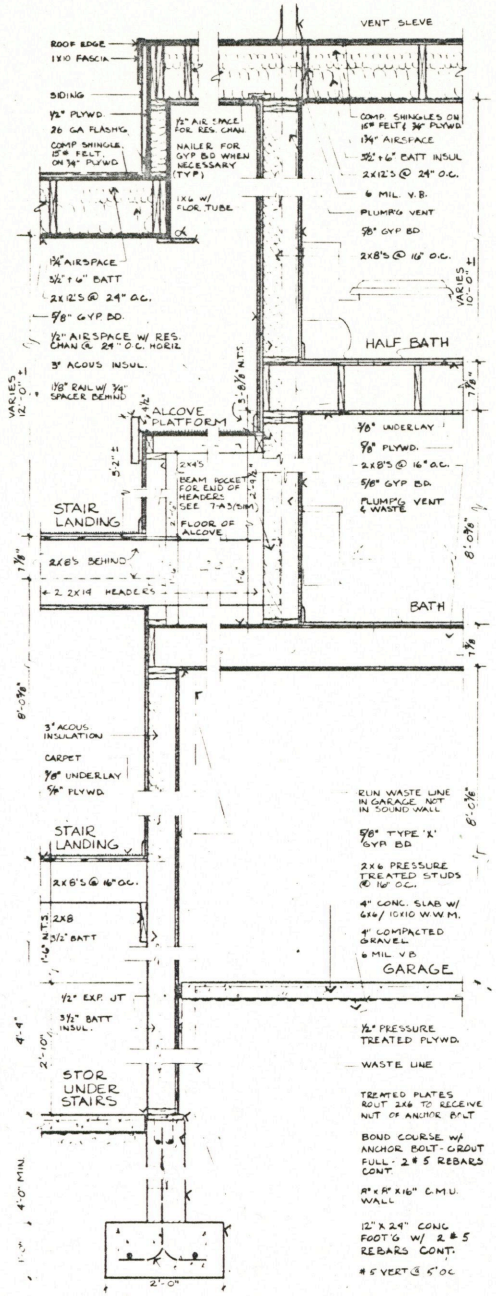
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1 PARTY WALL @ ENTRY

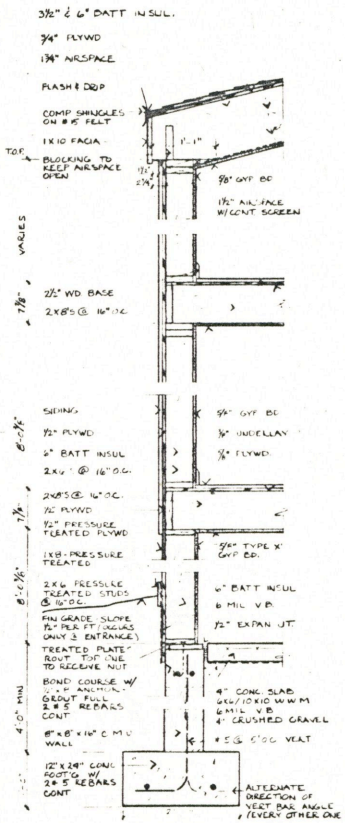
SCALE 1" = 1'-0"

SHEAR WALL - ALTERNATE PLYW JOINTS - SEE NOTE ON 1-A3 & 2-A3 THAT NO PLYWD JOINTS CAN OCCUR NEAR DUCT



2 PARTY WALL @ STAIR LANDING

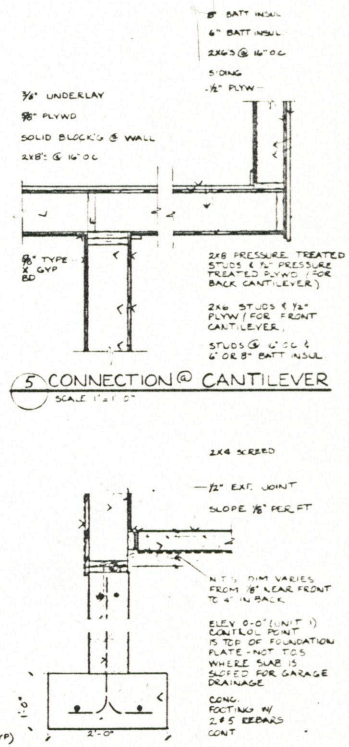
SCALE 1" = 1'-0"



3 TYPICAL EXTERIOR WALL (FRONT)

SCALE 1" = 1'-0"

FOR SIDE & BACK EXTERIOR WALLS USE 2x8's FOR GROUND FL. STUDS



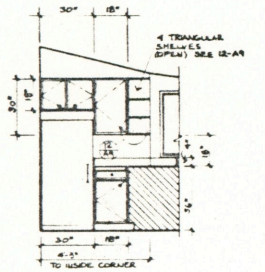
5 CONNECTION @ CANTILEVER

SCALE 1" = 1'-0"

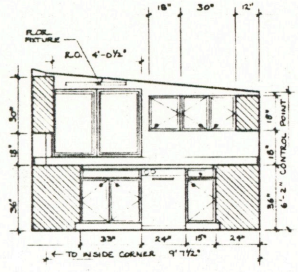
4 CONNECTION @ SLOPED SLAB

SCALE 1" = 1'-0"

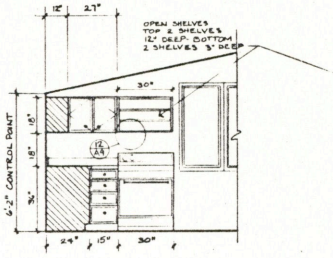
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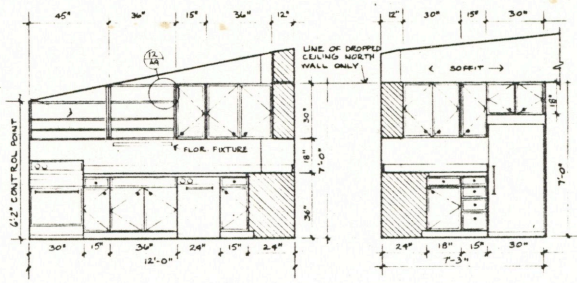
1 UNIT 1 KITCHEN - EAST
3/8" = 1'-0"



2 UNIT 1 KITCHEN - SOUTH
3/8" = 1'-0"

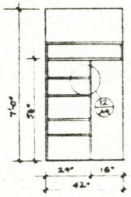


3 UNIT 1 KITCHEN - WEST
3/8" = 1'-0"

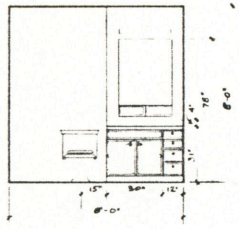


4 UNITS 2,3 & 4 KITCHEN - WEST
3/8" = 1'-0"

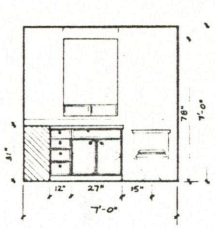
5 UNITS 2,3 & 4 KIT - NORTH
3/8" = 1'-0"



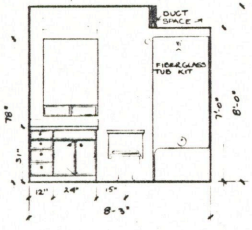
6 STOR UNITS 2,3 & 4
3/8" = 1'-0" UNIT 1 SIM



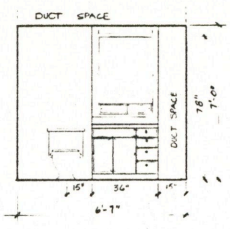
7 UNIT 1 HALF BATH
3/8" = 1'-0"



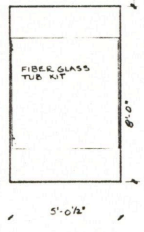
8 UNITS 2,3 & 4 HALF BATH
3/8" = 1'-0"



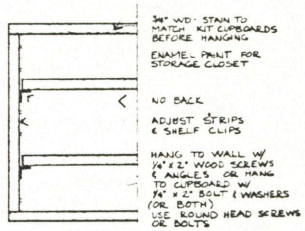
9 UNITS 2,3 & 4 BATH
3/8" = 1'-0"



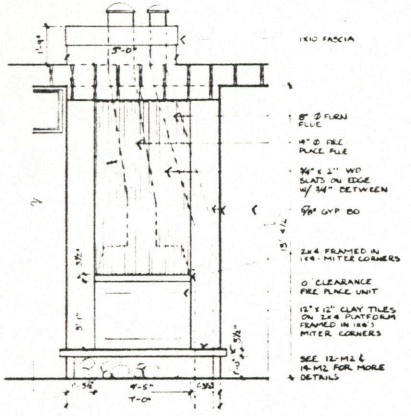
10 UNIT 1 BATH - NORTH
3/8" = 1'-0"



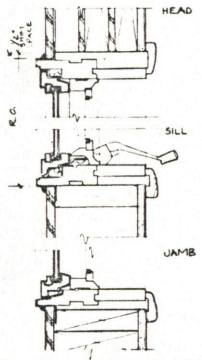
11 UNIT 1 BATH - SOUTH
3/8" = 1'-0"



12 OPEN SHELF DETAIL
3" = 1'-0"



13 FIREPLACE
3/8" = 1'-0"



14 TYPICAL WINDOW DETAILS
3" = 1'-0"

15 EXTERIOR DOOR DETAILS

16 INTERIOR DOOR DETAILS

17 BIFOLD DOOR DETAILS



18 FIXED WINDOW DETAILS

19 FLOOR LEVEL TRANSITION

20 THREASHOLD @ ENTRY

21 THREASHOLD @ DECK

22 SIDELITE @ ENTRY

23 SIDELITE @ DECK

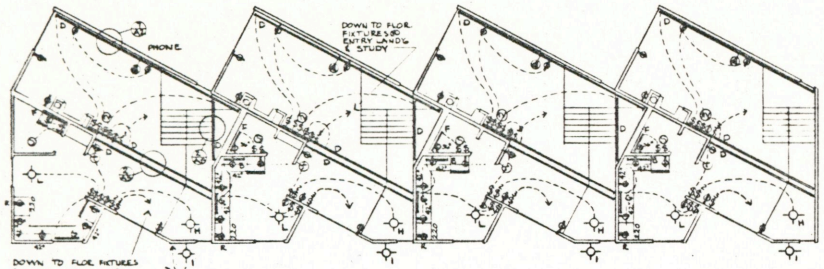
24 CLERESTORY HEAD

25 VERTICAL MULLION

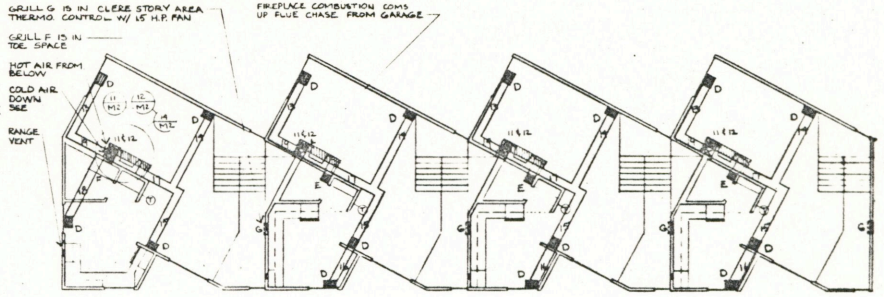
26 HORIZONAL MULLION @ ENTRY

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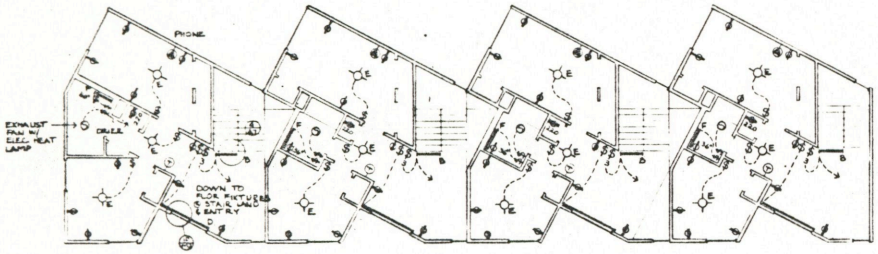


1 THIRD FLOOR LIGHTING PLAN
SCALE 1/8" = 1'-0"

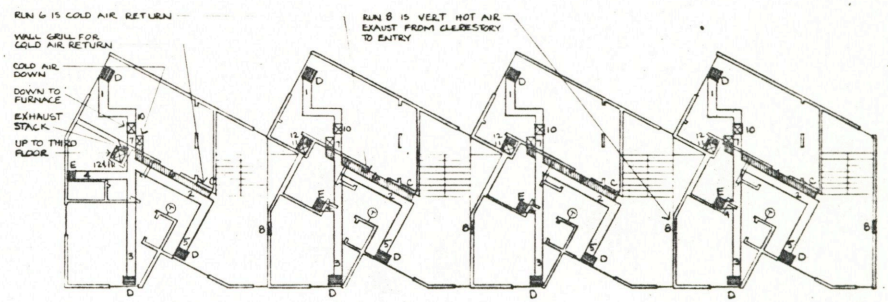


4 3RD FL. HEATING PLAN
1/8" = 1'-0"

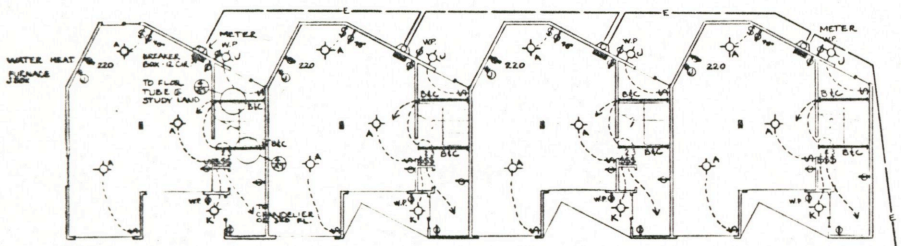
SEE 1 & 2-M1 FOR DUCT & GRILL SCHEDULES



2 SECOND FLOOR LIGHTING PLAN
SCALE 1/8" = 1'-0"



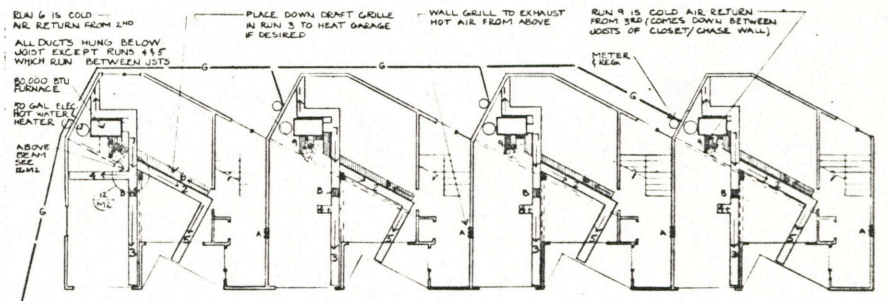
5 2ND FL. HEATING PLAN
1/8" = 1'-0"



3 GROUND FLOOR LIGHTING PLAN
SCALE 1/8" = 1'-0"

UNDERGROUND ELEC. ENTRY FROM STREET

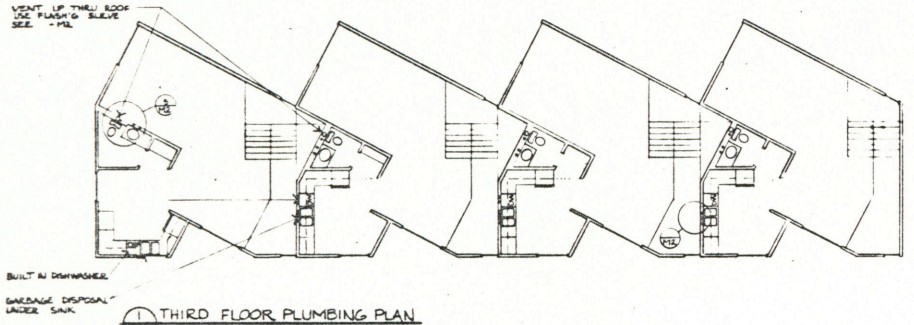
UNDERGROUND GAS ENTRY FROM STREET



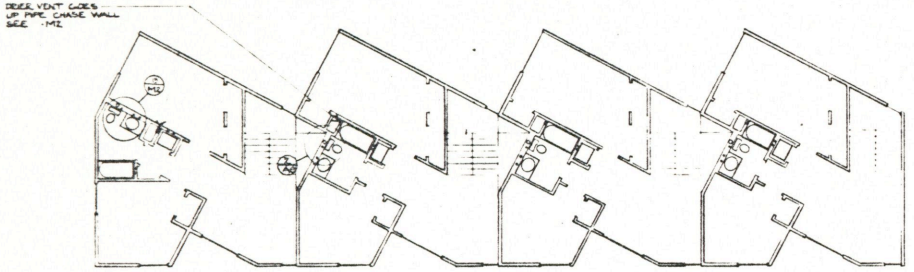
6 GR. FL. HEATING PLAN
1/8" = 1'-0"

NOTE: KEEP EA UNIT COMPLETELY SEPARATE

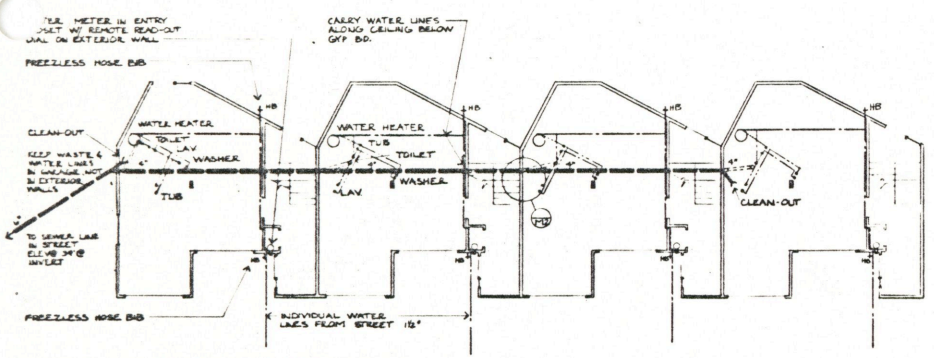
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1 THIRD FLOOR PLUMBING PLAN
1/8" = 1'-0"



2 SECOND FLOOR PLUMBING PLAN
1/8" = 1'-0"



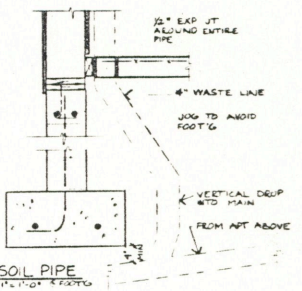
3 GROUND FLOOR PLUMBING PLAN
1/8" = 1'-0"

4 LIGHTING SCHEDULE

	DESCRIPTION	NO	REMARKS
A	BARE BULB HOLDER - GARAGE	12	
B	2' FLOR. STRIP	16	
C	4' FLOR. STRIP	8	
D	8' FLOR. STRIP	36	WIRE END TO END
E	CEILING - HALL & BEDROOMS	12	
F	BATH - FLOR. - 2 TUBES	18	DIFUSSER COVER
G	KIT. SINK - FLOR. - 2 TUBES	4	DIFUSSER COVER
H	CHANDELIER	4	CUST. M
I	MERC. VAPOR EXT.	4	PHOTO CELL
J	EXT. WALL @ DECK	4	
K	EXT. RECESSED @ ENTRY	4	
L	KIT. FULL DOWN @ EATING	4	

7 SYMBOLS

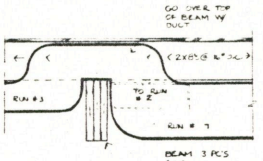
	CEILING LIGHT
	WALL LIGHT
	FLUORESCENT TUBE
S	SWITCH
S(3W)	3 WAY SWITCH
	DUPLEX OUTLET
W.P	WATER PROOF OUTLET
	220 OUTLET
H.B.	HOSE BIB
	COLD WATER
	HOT WATER
	SEWER BELOW GR.
T	TELEPHONE
T	THERMOSTAT



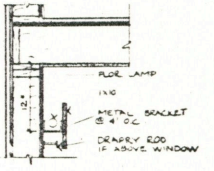
8 SOIL PIPE
1" = 1'-0" X FOOTG

5 GRILLE & REGISTRER SCH

	SIZE	POSITION	ADJUSTABLE	NO	REMARKS
A	2 X 29	WALL		4	
B	12 X 12	CEILING	X	4	DOWNDRAFT
C	24 X 12	WALL		4	
D	12 X 16	FLOOR	X	28	
E	12 X 12	FLOOR	X	7	
F	24 X 3	TOE SPACE	X	1	
G	12 X 24	WALL			THERMO CONTROL 1.5 H.P. FAN



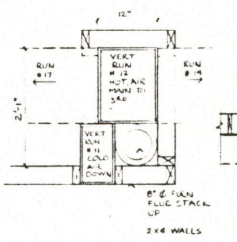
9 DUCT & BEAM DETAIL
1" = 1'-0"

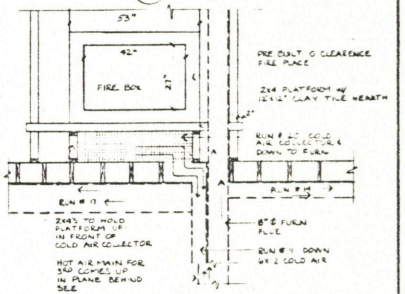


10 LIGHT VALANCE
1" = 1'-0"

6 DUCT SCHEDULE

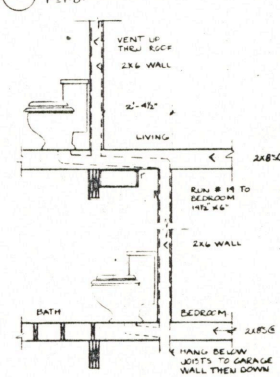
	SIZE	POSITION	REMARKS
1	14 X 6	HORIZ - BELOW JST'S	
2	14 X 6	↓	
3	14 X 6	↓	
4	6 X 6	HORIZ - BETWEEN JST'S	
5	14 X 6	↓	
6	16 X 12	HORIZ - BELOW JST'S	
7	14 X 12	↓	
8	14 X 7½	VERT - BETWEEN JST'S	
9	12 X 16	HORIZ (CONT'D FR 6)	COLD AIR FROM 2ND
10	14 X 12	VERT	H.T. AIR MAIN TO 2ND
11	6 X 12	VERT IN CHASE/CL. WALL	C.A.R. AIR FR/M 3RD
12	14 X 12	VERT	HOT AIR MAIN TO 3RD
13	14 X 6	HORIZ - BETWEEN JST'S	
14	14 X 6		
15	14 X 6		
16	14 X 6	↓	
17	14 X 12	HORIZ - BELOW JST'S	FUR DOWN HALL CEIL'G
18	6 X 8	HORIZ - BETWEEN JST'S	
19	14 X 6	HORIZ BELOW JST	FUR DOWN CL. CEIL'G
	8" ⌀	FURNACE STACK	DPL WALL
	19" ⌀	FIREPLACE STACK	DPL WALL - ALL FUEL
		RANGE VENT	
		DRIER VENT	
20			



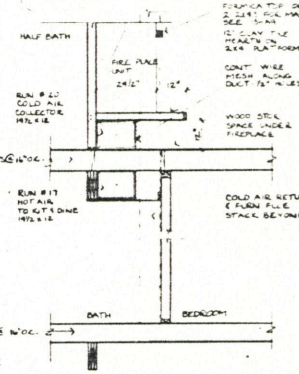


11 PLAN - CHASE
1" = 1'-0"

12 DUCT SECTION @ FIREPLACE



13 PLUMBING DETAIL UNIT 1
½" = 1'-0"



14 DUCTS @ FIREPLACE
½" = 1'-0"

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PART V

TOTAL COST ESTIMATE

INTRODUCTION TO COSTS

On the following sixteen pages are the costs for this building. The prices are mainly taken from Means Building Costs Data and Means System Cost Guide. All prices include basic material cost, estimated labor and installation costs, overhead, profit (10%) and contingencies (2-3%). To apply these prices to the unusual shapes and odd angles of Plan 6, a difficulty factor varing from 1.05-1.20 has been added. This has been added only to those items which would incur extra materials or labor above and beyond those occurred in more "normal" construction. A note to that effect can be found in the remarks column whenever it has been applied. All prices are taken from 1976 data and will be adjusted later for inflation. At that time, a factor will also be added for the difference in price caused by the locality.

The format for this estimate is not set up primarily for contractors or subcontractors to prepare bids from, although with some modification it could be developed into that. Rather it is set up as a tool to aid the designer and owner in comparing elements of buildings such as entire wall sections, framing plans, plumbing configurations, stair plans, etc. In arriving at the methods and materials used in Plan 6, prices of comparative elements had already been determined and transferred easily to this estimate.

TABLE 30.

COST ESTIMATE

No.	ITEM		Amount	Unit Meas.	Means Cost Per Unit	Total
1	MOVE CABINS	Clear & grub - removing old foundations				5000
2	EXCAVATION	Piling topsoil; stockpiling on site; backfill; spreading topsoil	3705	C.F.	$ .39	1445
3	TRENCHING	For utilities @ 6' depth includes backfill	192	L.F.	$1.71	328
4	STRIP FOOTINGS	Excavation & backfill 1'x2' 2#5's cont.	410	L.F.	$14.15	5801
	4" column pads	2' x 3' x 1' deep	4	Ea.	$100.00	400
	Bearing wall footings	8" x 16"	76	L.F.	$6.60	501
5	FOUNDATIONS	Includes excavation and backfill; 4' CMU; 2 #5 rebars cont. in bond beam horiz; & 2 #5 @ 60" o.c. vert x 1.05 for corners	410	L.F.	$21.00	9040

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
6	SLAB ON GRADE	4" conc. w 6 x 6/10 x 10 W.W.M.; includes 4" compacted gravel	2505	S.F.	$ 1.25	3131
7	First Floor Walls ALL WEATHER WOOD	Includes 1/2" pressure treated plywood; 6" insulation; pressure treated studs; V.B. below grade on ext.; V.B. cont. on interior; gravel 1' out from wall down to footing				
	2 x 8 exterior	8' high (no consideration given for openings except garage doors)	324	L.F.	$30.66	10487
	2 x 6 party (1st floor only)	11' high (includes pressure treated plywood & V.B. first 3') regular plywood for 8'; does not include acoustical insulation or gypsum board.	77	L.F.	$29.20	2248

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
8	2ND & 3RD EXTERIOR WALLS	Includes 6" insulation; 1/2" plywood sheathing; V.B. cont; 2 x 6 studs				
	Window Strips	Rough sawn exterior plywood @ $.87; plus two coats stain	96	L.F.	$24.30	2332
	All Other Walls	Regular Plywood	545	L.F.	$13.48	7346
9	INTERIOR PARTITIONS	Stud and plates only				
	2 x 4	8' high	418	L.F.	$ 4.40	1839
	2 x 4	Higher than 8' (average 10')	130	L.F.	$ 5.50	715
	2 x 8	Plumbing chase	48	L.F.	$ 8.80	422
	Shear Wall	@ 2nd and 3rd floor;2 x 4's; studs & plates; 1/2" plywood	33	L.F.	$ 7.76	256

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
	Columns	6 x 10 Wood	4	Ea.	$39.00	156
10	FLOOR FRAMING	2 x 8's @ 16" O.C.; 5/8" plywood-2nd & 3rd floor, x 1.20 for extra labor & waste	4932	S.F.	$ 1.13	6687
	Beams	3 pc's 2 x 12 job laminated	185	L.F.	$ 3.50	647
11	ROOFING FRAMING	2 x 12@ 24" O.C.; 5/8" plywood sheathing; 10" insulation; V.B. cont.x 1.20 for extra labor & waste	3253	S.F.	$ 1.66	5401
	Glulam Beams	5 1/8" x 12"; #2 quality; no finish	176	L.F.	$ 7.69	1353
12	ROOFING	350# self-stick tabs; includes #15 felt	3254	Sq.	$88.90	2892
	Flashing	26 ga. aluminum	188	L.F.	$1.25	235
	Gutters		110	L.F.	$1.70	187

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
	Downspout		30	L.F.	$1.50	45
	Metal Roof Edge		679	L.F.	$ .42	285
13	WINDOWS	All windows preassembled, vinyl clad				
	A	2 x 5 non-operable	5	Ea.	$96.38	385
	A	2 x 5 operable	4	Ea.	$122.00	488
	B	2 x 4 non-operable	20	Ea.	$76.10	1522
	C	5 x 5 operable	12	Ea.	$281.75	3381
	D	4 x 5 operable	5	Ea.	$241.20	1206
	E	4 x 4 operable	5	Ea.	$240.64	1023
	F	3'6" x 5' non-operable	5	Ea.	$156.31	796
	F	2'0" x 3'6" non-operable	12	Ea.	$32.86	394

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
	G	2'0" x 3'6" operable	8	Ea.	$41.60	332
	H	6 x 6 operable	4	Ea.	$618.56	2434
	I	Custom made - trapazoid thermopane	4	Ea.	$122.00	488
	J	2 x 3 non-operable	8	Ea.	$34.70	277
	K	1 x 6 non-operable custom-made thermopane side-light	4	Ea.	$34.70	138
14	EXTERIOR DOORS					
	3'0" x 6'8"	Insulated hollow metal; prehung; hollow metal frame; primed	9	Ea.	$261.00	2352
	6'6" x 8'0"	Overhead garage; no lites; no frames	8	Ea.	$296.00	6368
15	INTERIOR DOORS	All doors, hollow core, mahogany, prehung				
	2'6" x 6'8"		12	Ea.	$116.00	1392

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
	2'8" x 6'8"		8	Ea.	$118.00	944
	4'0" x 6'8"		13	Ea.	$82.00	1066
	3'0" x 6'8"		12	Ea.	$109.00	1308
16	EXTERIOR FINISH					
	Siding	Clear bevel siding & 15# felt; 2 coats stain	4878	S.F.	$1.33	6487
	Fascia	1 x 8; 2 coats stain	36	L.F.	$ .74	269
	Window brickmold	includes frame & brickmold around garage openings; caulking; 2 coats stain	1260	L.F.	$1.17	1474
	Paint People Door		9	Ea.	$13.00	117
	Paint Garage Door		4	Ea.	$49.50	198

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
18	FLOOR FINISH					
	Subfloor	3/8" particleboard; 4 x 8 sheets x 1.05 waste & labor	4932	S.F.	$ .35	1726
	Carpet	28 oz. nylon	393	S.Y.	$13.15	5177
	Carpet	20 oz. nylon	139	S.Y.	$11.15	1550
	Vinyl		712	S.F.	$1.98	698
19	INTERIOR FINISH					
	Window Frame	Prefinish wood frame & sill	1160	L.F.	$ .40	464
	Base	Prefinish	1048	L.F.	$ .62	649
	Light Valance	1 x 8 fascia; 2 coats stain	416	L.F.	$1.17	486
	Closet Rod & Shelf	8' Sections	16	Ea.	$20.00	320

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
17	DRYWALL	All walls include taping & finish (2 costs mud)				
	Garage	5/8" type x walls & ceiling (tape & 1 coat mud; no paint)	4268	S.F.	$ .38	1621
	All 8' walls	5/8"	14102	S.F.	$ .37	5217
	2nd Floor Ceiling	5/8" (no texture)	2842	S.F.	$ .41	1083
	3rd Floor Ceiling	5/8" (no texture)	2910	S.F.	$ .44	1280
	All walls over 8'	5/8" average 10'	2600	S.F.	$ .38	988
	Party Wall	Entry side only	1350	S.F.	$ .40	540
	Paint	Entry, 2nd & 3rd floor walls & ceilings (primer & 1 coat latex)	23804	S.F.	$ .11	2618
	Resilient channels	For sound wall @ 24" O.C. vert; includes caulking top & bottom of gypsum board	780	L.F.	$ .10	78
	Acoustical Batt	3"	1560	S.F.	$ .45	702

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
20	STAIRS		8	Flights	$900.00	2700
	Handrails	1 1/8" x 6" (& balcony rails); clear pine; 3 coats stain & varnish	91	L.F.	$3.14	286
	Posts	1 1/2" x 1 1/2" black steel, 12 ga. w/metal caps, tops & bottom, 2/4 bolts ea, ave. 38" long (for ea. step + 12" O.C. for balcony"	132	Ea.	$3.40	448
21	CABINETS	Preassembled, factory finish, oak - medium price range x 1.05 for odd corners				
	Base	1'-2'	15	L.F.	$54.00	810
	Base	Drawers	4	Ea.	$84.00	336
	Base	Sink Front	4	Ea.	$36.00	432

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	
	Wall	30' high; 1'-2'	17	L.F.	$ 40.00	680
	Wall	30" high, 3' & over	9	L.F.	$ 30.00	270
	Wall	18" high, 1'-2'	16	L.F.	$ 36.00	576
	Vanity	2'-3'	18	L.F.	$ 41.00	738
	Vanity	Drawers	8	Ea.	$ 65.00	520
	Countertop	Includes backsplash	79	L.F.	$ 10.20	803
	Custom Shelving	Kitchen: storage closet & over washer-drier; 3 coats stain & varnish	182	L.F.	$ 5.25	955
22	BATH AND PLUMBING	All fixtures include rough-in				
	Toilets	2 pc. floor mounted	8	Ea.	$ 3.85	3080

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
	Lavatory	18" x 20" cast iron	8	Ea.	$220.00	1760
	Tubs	5' fiberglass, includes 6' walls	4	Ea.	$505.00	2020
	Kitchen Sink	Stainless steel, double	4	Ea.	$385.00	1540
	Garbage Disposal		4	Ea.	$150.00	600
	Water Heater	50 gallon, gas, glass lined	4	Ea.	$245.00	980
	Dish Washer	24" undercounter, fixed in place, 2 cycle	4	Ea.	$265.00	1060
	Washer-Drier Combination	w/14' of vent	4	Ea.	$309.00	1236
	Vent to roof	2" plastic	88	L.F.	$6.50	572
	Supply pipe	1½" to each unit	130	L.F.	$11.25	1562
	Hose Bib	1/2" pipe; 8 spigot @ $3.20 ea.	130	L.F.	$5.20	701
	Soil Pipe	5" lead and oakum	167	L.F.	$12.20	2037

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
23	ACCESSORIES	-package per unit: 2 mirrors w/storage cabinet under, @$60 ea.;4 towel bars @ $7.50 ea.; 2 toiletpaper holder @ $5.50 ea.; 1 shower curtain bar @ $5.25 ea.	4	per unit	$156.00	624
	Exhaust Fan	for bathrooms	8	Ea.	$35.00	280
	Stove	30" Jenn Air w/6' venting to roof	4	Ea.	$555.00	2220
	Refrigerator	30" 12 c.f.	4	Ea.	$370.00	1480
24	LIGHTING					
	Flourescent Tubes	8' bare strip tubes	48	Ea.	$44.00	2112
	Chandeliers	Custom	4	Ea.	$1000.00	4000
	Flourescent Fixtures	2 1/2' length for baths; 2 tubes	8	Ea.	$34.00	476

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
	Fluorescent Tubes	3' bare strip tubes under cabinets in kitchen (8 at landings)	14	Ea.	$34.00	476
	Fluorescent Fixture	above kitchen sinks	4	Ea.	$55.00	220
	Incandescent	Above dining nook	4	Ea.	$72.00	288
	Incandencent	Bedrooms and halls	12	Ea.	$52.00	628
	Exterior	Wall incandescent (at back deck)	4	Ea.	$36.00	144
	Exterior	Recessed incandescent (at front entry)	4	Ea.	$60.00	240
	Exterior	Mercury vapor wall (at front roof line) with photo cell	4	Ea.	$140.00	560
	220 Plugs	Rough in and box	12	Ea.	$45.00	540
	110 Plugs	Rough in and Box	136	Ea.	$15.00	2040
	Breaker Box	12 Circuits	4	Ea.	$350.00	1400
	Bare Bulb Holders	for garage	12	Ea.	$24.00	288

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
	Fixture Rough-In		88	Ea.	$20.00	1760
25	HEATING					
	Furnaces	80,000 BTU gas fired	4	Ea.	$680.00	2720
	Duct	6 x 14	312	L.F.	$7.20	2246
	Duct	3 1/2 x 14, 6 x 8	208	L.F.	$6.80	1414
	Duct	12 x 24	60	L.F.	$8.40	504
	Grill	sizes vary--price is average	52	Ea.	$19.85	1032
	Finish Carpentry	For dropped ceiling				400

Cost Estimate continued

			Amount	Unit Meas.	Means Cost Per Unit	Total
	Tall Cedar Shrub	4' to 5'	18	Ea.	$34.00	612
	Retaining Wall	concrete footings 3 blocks average height, C.M.U.	70	S.F.	$3.95	278
	Drive	3½" concrete (W.W.M.) on 4" crushed gravel	1064	S.F.	$1.20	1276
				MEANS TOTAL COST		$175,830.00
				TOTAL *		$301,036.00

*Total includes a 1.3 factor for inflation for 3 years and a 1.317 factor (Means) for the Anchorage area. The same building in Billings would cost $208,006, which includes a 1.3 inflation factor and .91 (Means) locality factor.

COST BREAKDOWN

SITE WORK	
Includes preparation of lot, excavation trenching, landscaping decks	$ 9,500
CEMENT AND C.M.U. BLOCK	
Includes footings, foundations, slabs on grade and concrete drive	$20,000
FRAMING	
Includes studs, sheathing, insulation, vapor barrier, stairs	$43,500
ROOFING	$ 3,500
WINDOWS	$13,000
DOORS	$13,500
EXTERIOR FINISH	
Includes siding, trim, stain	$ 8,500
DRYWALL	
Includes paint	$14,000
INTERIOR FINISH	
Includes trim, base, cabinets, shelving, fireplace louvers	$ 8,500
PLUMBING	$16,000
APPLIANCES	
Includes stove, refrigeration, combination washer-drier	$ 4,700

Cost Breakdown, continued

LIGHTING		$15,000
HEATING		
Includes fireplaces		$11,500
		$176,000
Anchorage:	times 1.3 times 1.317	$302,000
Billings:	times 1.3 times .91	$208.00

DISCUSSION OF INITIAL COSTS AND LONG-TERM COSTS

The estimate of $301,036 for Plan #6 has increased by 5 percent from the $284,500 estimate which used gross square footage as seen in Table 23, page 49. This was to be expected as the plan was somewhat unusual in configuration and the estimates were adjusted accordingly in some areas. The price per unit now is $75,259 and is $54.65 per square foot.

For someone who already owned the land, it would be necessary to charge about $800 a month rent per unit to make a positive cash flow. Using the bank rule of thumb (monthly income x 100 = mortgage payment(800 x 4 x 100 = $320,000). Using $301,036 as the bid price to be totally financed x 3 percent closing costs, the mortgage would be $310,000 which includes taxes and insurance. This leaves $10,000 per year to pay the water bill and garbage costs and set up a maintenance and replacement fund for future emergencies. If the owner mowed the grass and shoveled the snow as well as collecting the rents, a tax-free salary for that purpose could be taken out of that $10,000 a year, also.

It is difficult to say at this time if the project is financially feasible. Not enough information is available from this distance to properly evaluate the rental market in Anchorage. A more accurate cost estimate would need to be taken using actual, on the scene, price, labor and material availability figures. Financing procedures in Anchorage would need to be studied.

The purpose of this thesis was to make a theoretical project as realistic, down to earth and practical as possible, not to actually build an apartment building. Any evaluation of it should

weigh heavily on procedure. The process can be very valuable in thoroughly understanding the planning that should go into making any architectural statement more realistic, appropriate and rational.

CONCLUDING STATEMENT

In analyzing my involvement in this thesis project, many factors came to the surface: The first and most obvious is having fulfilled my desire to better equip myself for the first few years of work in an architectural office by sharpening up my drafting, detailing and design development skills. In producing a set of working drawings from an original design, the entire process unfolds, step by step. The documentation of those steps from conception, exploration, selection, down through detailing was a valuable experience. Knowing that each choice would have to be justified with words and drawings made the whole project very true to life. I chose cost estimating as the approach to this thesis project. I can unquestionably say that I gained an immense insight into the field of using cost estimating as a design tool, but only scratched the surface. I am not saying that I did not thoroughly squeeze this particular apartment building dry as far as learning everything I could about estimating its cost; I am saying that the process used here could be used on all types of buildings, schools, high-rises, shopping center, office buildings, etc. When I have had the experience of doing just that many times, then I can say I know something about cost estimating. Then I will be in a position to pick and choose and do "comparative shopping" in selecting methods and materials in controlling the cost of <u>any</u> given building. So I only have a start on using dollars wisely as possible in architecture. But having gone through the process with this apartment building, I feel much more secure applying this tool and procedure to other projects and building types.

APPENDIX

RENT ESTIMATATION FORM

Background -

Units are in a 4-plex in the best part of town. Building is three stories tall and is attractive and well designed. Each unit has asphalt drive, concrete sidewalk and protected front entry. All units are nicely landscaped in front and have a small area (20 x 30) in back for semi-private garden or lawn. End units can have larger areas for gardening or landscaping.

Each unit has an enclosed 1 or 2 car garage and entry at or near ground level. Passage from garage directly to entry can occur without going outside. From entry, a carpeted stair (no risers) goes up to the living areas on the second and third levels. Vertical circulation is vital and stairway will receive heavy use by occupants and detailed attention by way of design and materials by architect. All units have limited view from second floor and a great view to southwest and northwest from third floor.

All units have wall to wall carpet, fireplaces, dining area, plenty of storage and closet space in addition to the variables as listed on next page. Units are to be rented unfurnished. However, the following appliances are included: refrigerator, dishwasher, Jenn-Air range and garbage disposal. Space for a washer and dryer is provided.

In trying to arrive at the most optimum financial use of space, the following combinations of garage spaces, bedrooms, baths and study areas are being considered. In some cases the second and third bedroom can ideally be used as a study. But when the study is listed separately, it cannot be used as a bedroom due to lack of privacy, storage, space, etc.

Square Feet	Number of Bedrooms	Study	Number of Baths	Garage	Rent
700-799	1	1	1	2 car	_____
1000-1099	2	1	1½	2 car	_____
1100-1199	2	1	1½	2 car	_____
1200-1299	2	1	2½	1 car	_____
1200-1299	3	0	1½	2 car	_____
1200-1299	3	0	2½	1 car	_____
1300-1399	2	0	2	2 car	_____
1300-1399	3	0	2	2 car	_____
1300-1399	3	0	2½	2 car	_____
1300-1399	3	1	1½	2 car	_____
1400-1499	3	0	2	2 car	_____
1400-1499	3	0	2½	2 car	_____
1400-1499	3	1	1½	2 car	_____
1500-1599	2	0	1½	2 car	_____
1800-1899	3	0	2	2 car	_____

How much additional rent is a small private deck or balcony worth _____

How much additional rent would cathedral ceilings or a 2-story open space room with balcony overlooking into it be worth _____

Would you prefer living room on second or third floor _____

Comments: _____

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