HIGH- RISE
APARTMENT FOR
GREAT FALLS, MONTANA

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ARCHITECTURE 490

UNDERGRADUATE THESIS ♣ A HIGH-RISE APARTMENT FOR GREAT FALLS, MONTANA

Submitted as a partial fulfillment of the requirements of Architecture 490, on March 10, 1964 by Ken R. Sievert.

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March 10, 1964

Harold C. Rose'
Director of the School of Architecture
Department of Architecture
Montana State College
Bozeman, Montana

Dear Mr. Rose' ;

This is my submission for the written part of my undergraduate thesis, a high-rise apartment building for Great Falls, Montana.

The objective of this thesis is to have the student carry through a project on his own merits, and assimilate information concerning the problems encountered. This paper is the research for such a project. Hopefully, the preliminary design can be done from this program.

This proposal was based upon a potential need for a high-rise apartment and includes a study of the factors affecting the design.

Respectfully submitted,

Ken R. Sievert

Ken R. Sievert

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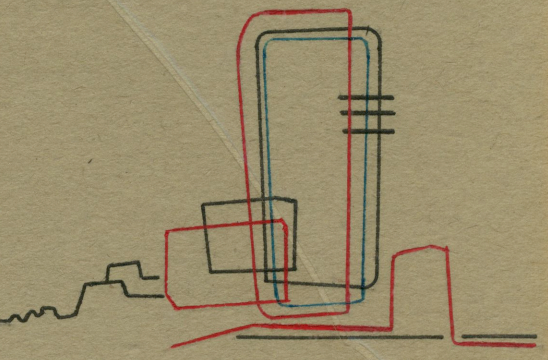
A C K N O W L E D G E M E N T S

I take this opportunity to thank Mr. S.A. Leigland of Leigland Construction Company, Great Falls, Montana for providing information regarding the Great Falls area. I also thank Mr. Bernard Sievert of that same city for his assistance, and acting as agent on my behalf.

Without the aid of professors John P. Parker and Harold C. Rose' of Montana State College, this paper would have been of lesser quality.

I also express gratitude to my many friends from Great Falls, too numerous to mention here, for their support as well as providing detailed information.

CONDITIONS
CREATING
A NEED.



CONDITIONS CREATING A NEED

Introduction

As people move from rural farm areas to urban and non-farm places, and expand in number, our cities become the economic and social centers for our population and its characteristics. This is a trend that has always followed industrial and commercial growth and settlement in an area. This dates back to the nineteenth century industrial revolution.[1] However, this is a comparitively recent trend to our state. Housing is one of many of these socio-economic conditions; it is also one of the most demanding. In 1960, 51% of the population of Montana was housed in the urban places.[2] The projection to 1970 shows a pronounced increase in urban living as can be seen and compared in Figure 4. The percentage is much greater for the industrially developed Cascade county as can be seen in Figure 6.

The Housing Potential Of Great Falls

Great Falls is one of two Standard Metropolitan Statistical Areas in Montana at this time. This means, by definition,[3] that:

1. The central or incorporated city must contain

---

1. Charles Adrian, State and Local Governments (New York, 1960) p. 10
2. U.S. Bureau of the Census. Population Of Montana-1960 U.S. Government Printing Office, (Washington D.C., 1961)
3. Ibid.

at least 50,000 inhabitants.

2. The city must identify the county in which it is located as the central county.
3. The city must show its relation with surrounding counties so that the Standard Metropolitan Statistical Area may be determined.

Further general conditions to be considered when choosing Great Falls as a site for a building of this scope are:

1. The installation of missile units on a large scale has brought numerous families to the area for a temporary time. This segment of population will probably fluctuate in number in the future.
2. The adjoining Malstrom Air Force Base has created a need for housing servicemens' families within Great Falls.
3. A limited consideration is the recent influx of small numbers of persons of the non-white category.
4. Great Falls is the largest commercial and industrial area in the center of the state.

5. The College of Great Falls creates permanent housing for staff and some temporary housing for students.
6. One example of the housing picture for the Great Falls area that cannot be neglected is the single-story Parkdale housing area. This indicates the desire for economic apartment living in the city.

These statements are treated in more detail by economic and social studies throughout the remainder of this paper.

Population data for Great Falls and comparisons with population movements of the state of Montana are found in Figures 1 through 5, pages 14 through 18.

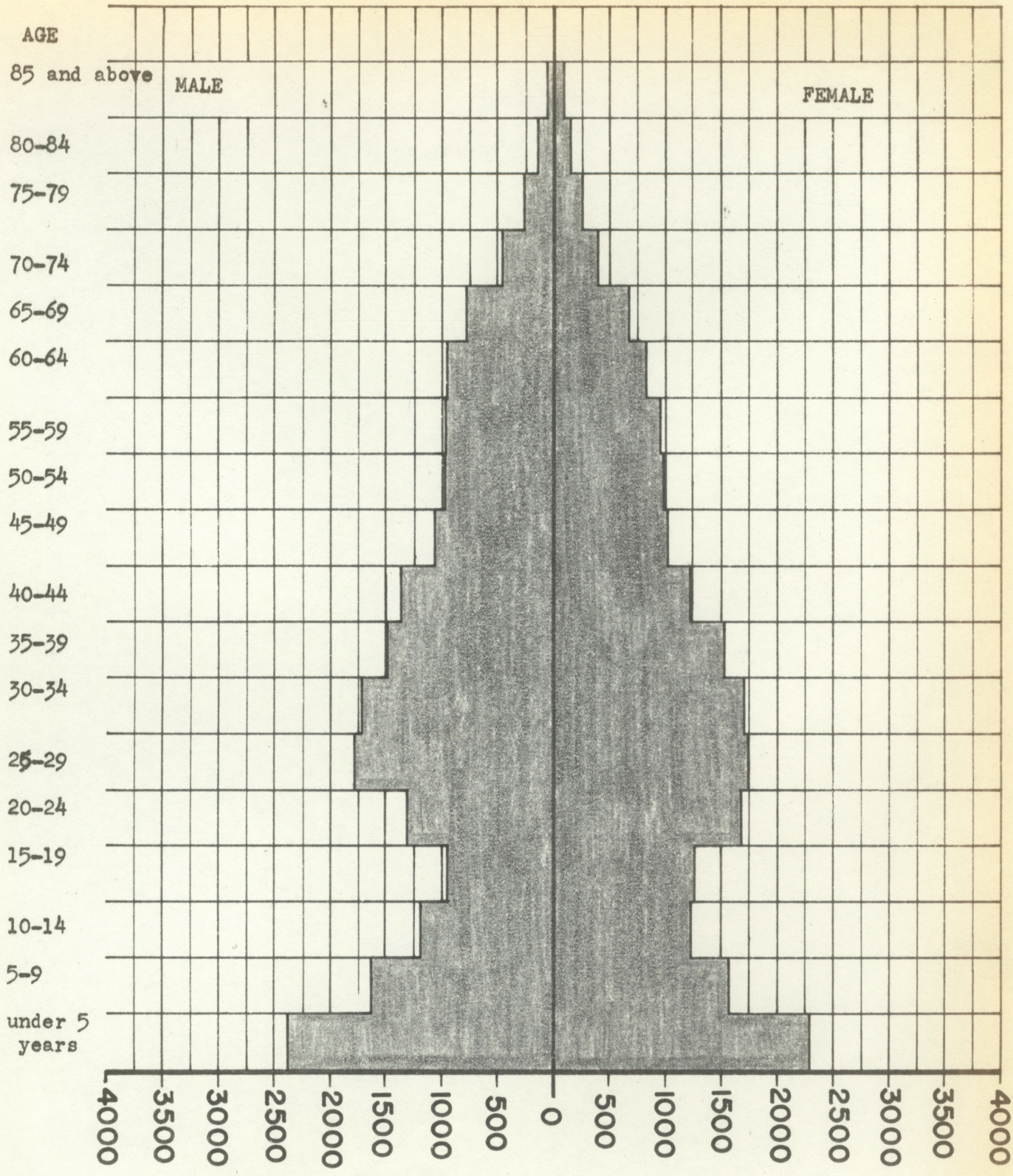
Figures 1 and 2 are population pyramids for the years of 1950 and 1960. They are broken down into five year intervals of age and separate the male totals from the female totals. I have included a population pyramid of Bozeman, Montana for 1960 as a comparison (Figure 3). It is evident that the working force for the years older than college age are much greater in percentage of the total for Great Falls than for Bozeman. The broad base for the 1960 pyramid for Great Falls also shows the extreme population expansion that the area is now undergoing.

The population growth and projection graphs, Figures 4, 5, and 6 show the population for the state and city of

Great Falls for past censuses as well as a projection to the year of 1970. The projection to 1970 is an educated guess that I based upon past performances and increases. In 1960 the percentage of Cascade County that was urban was 78.5% or 55,357 people. These graphs show the relation of industrial and commercial opportunity to the urban expansion of the Great Falls area. Figure 5 shows the longer range projection of the state's total population.

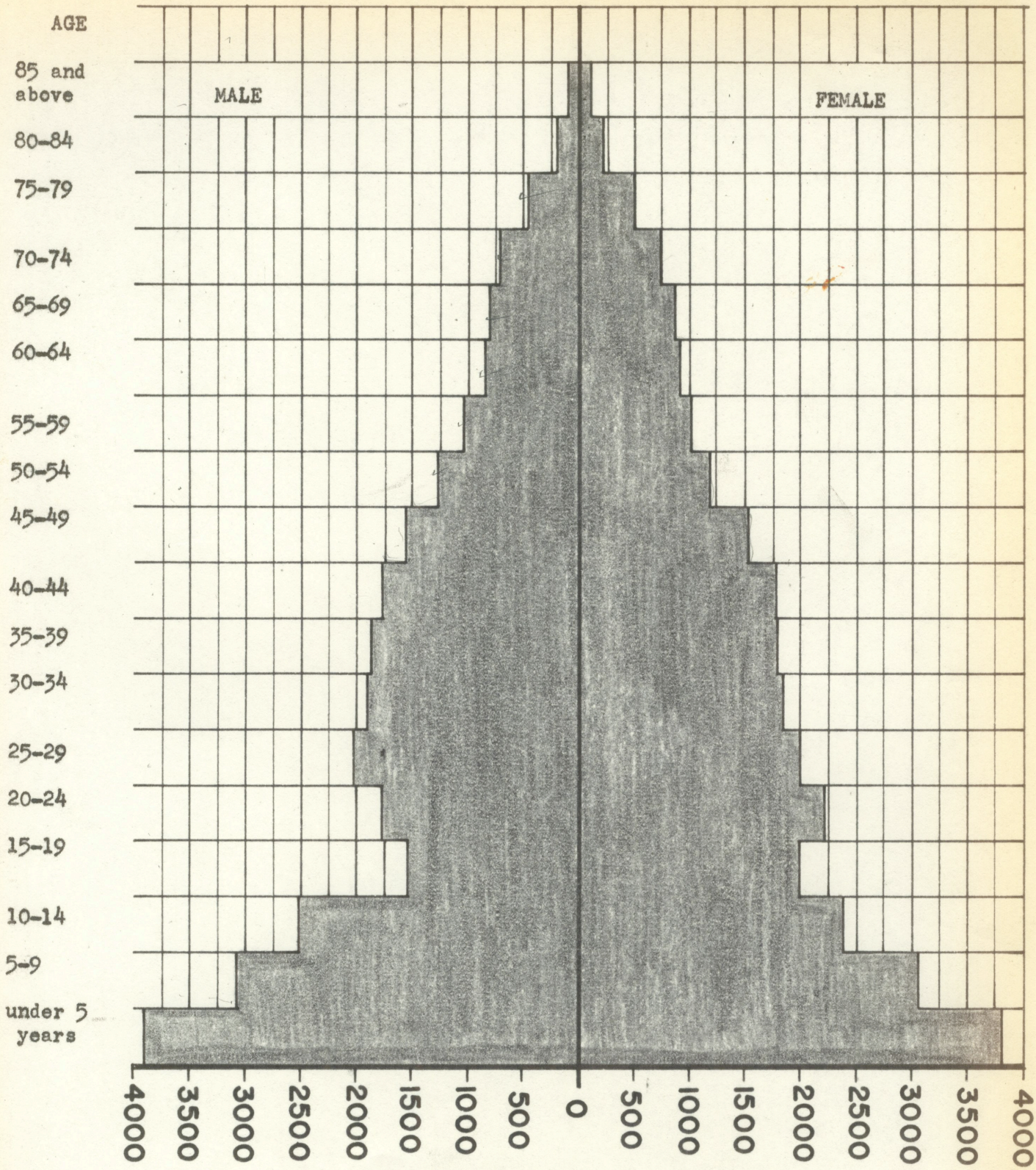
The office of R.E. Manning, secretary of the Real Estate Board in Great Falls, provided an estimate of 12-13% for the vacancy ratio in apartment dwellings in Great Falls. Although this statistic appears large at first glance, it must be remembered that there have been several multi-story apartments constructed in the area recently. The Community Facilities Administration of the H.H.F.A. bases its amortization and rental rates on a vacancy loss of 10%.

For the above reasons, I feel that Great Falls should and could accommodate a high-rise apartment or apartments. It is more than a sufficient site for a problem of this scope. It is an underdeveloped potential.



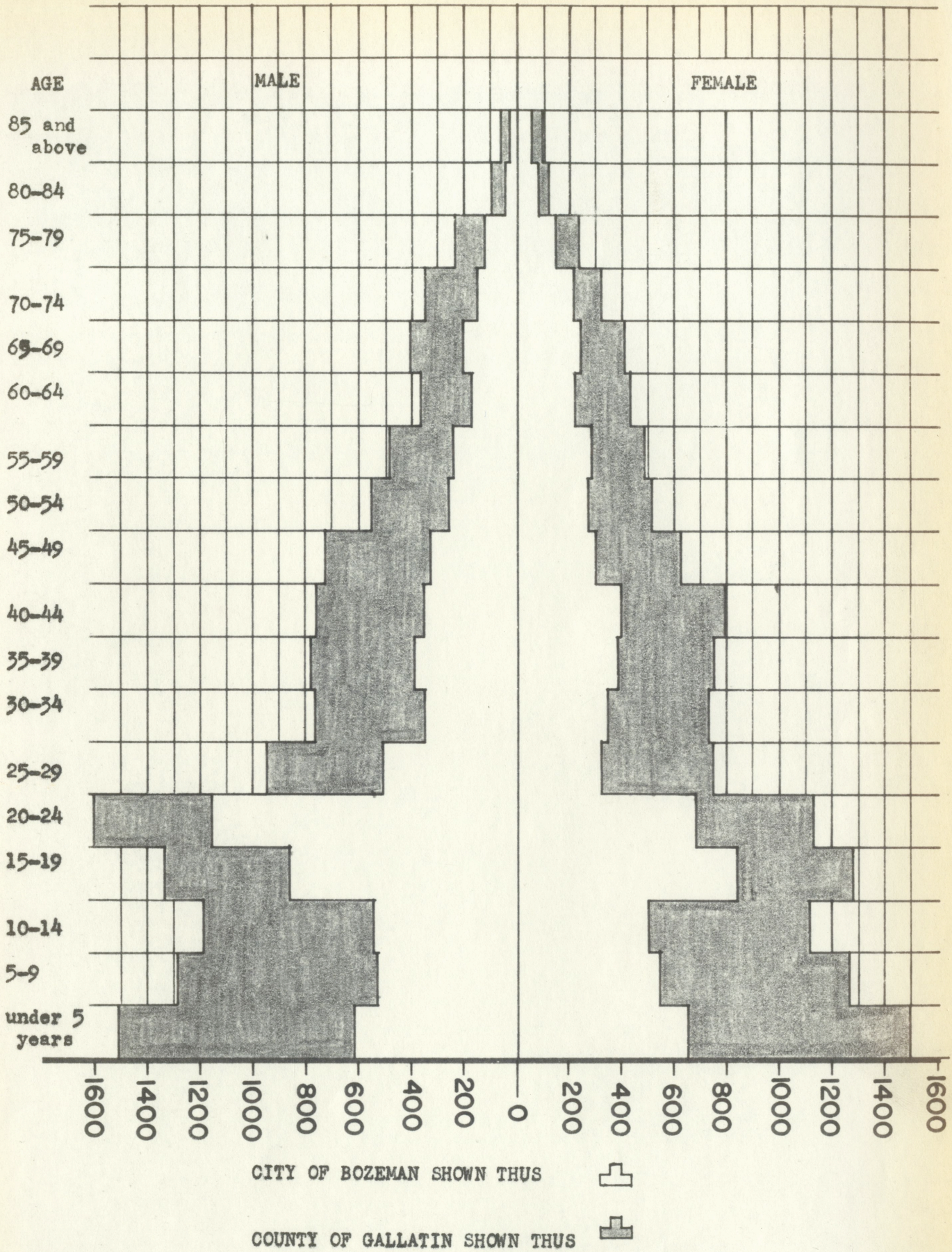
POPULATION PYRAMID FOR THE CITY OF GREAT FALLS, MONTANA 1950

FIGURE NO. 1
SOURCE: U.S. CENSUS



POPULATION PYRAMID FOR THE CITY OF GREAT FALLS, MONTANA 1960

FIGURE NO. 2
SOURCE: U.S. CENSUS

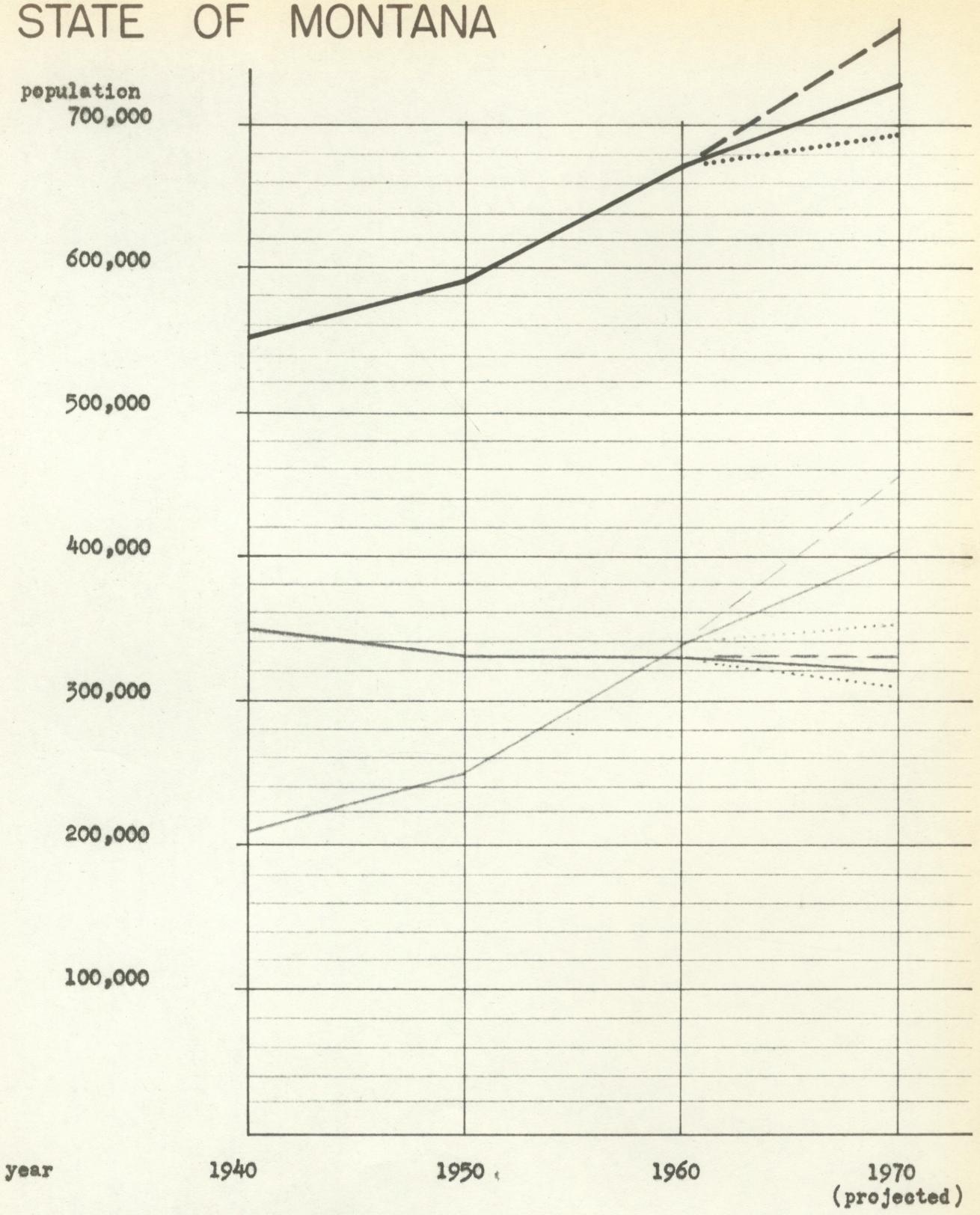


POPULATION PYRAMID FOR BOZEMAN AREA
1960 GRAPH NO. 3

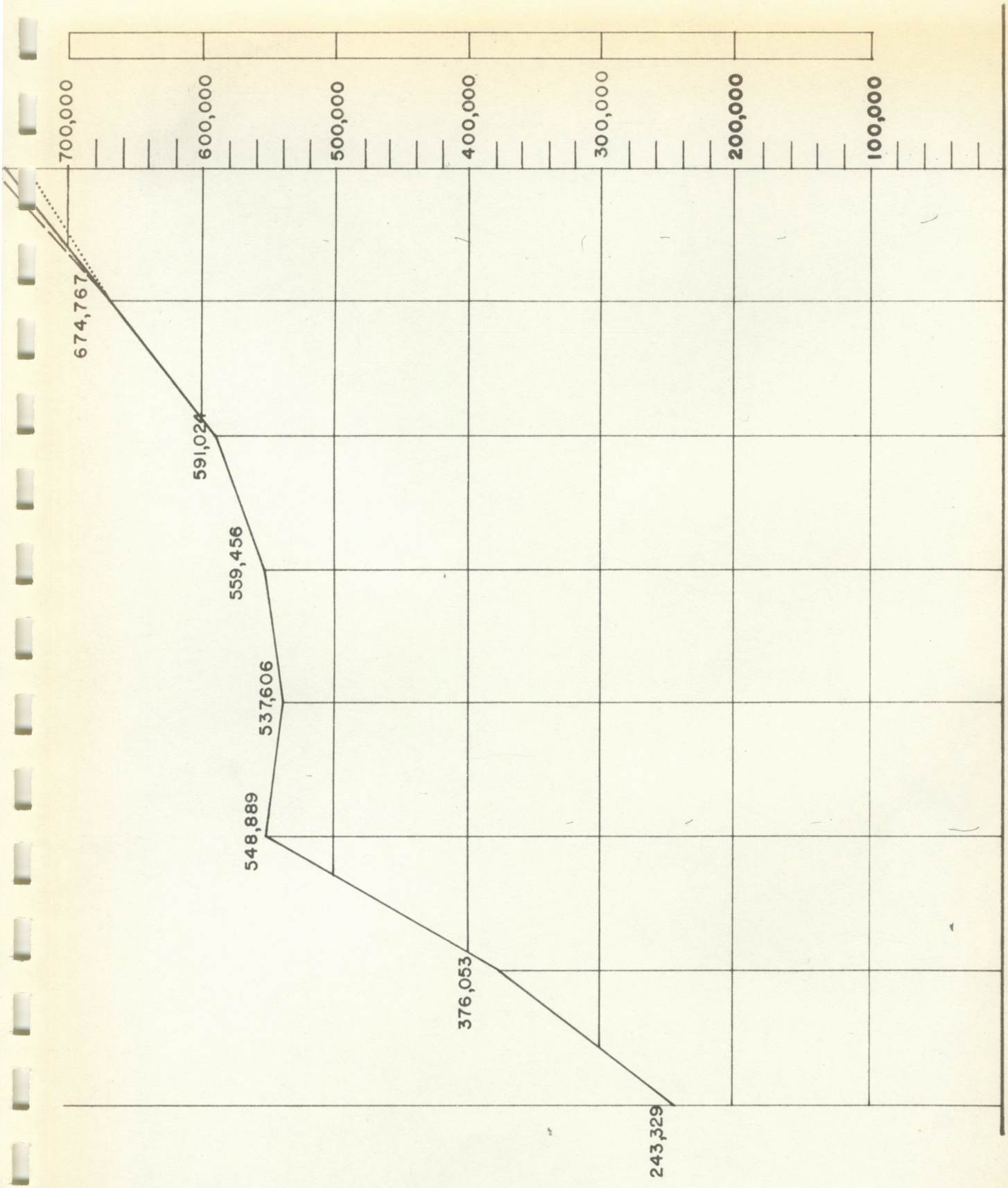
SOURCE: U.S. CENSUS

POPULATION GROWTH AND PROJECTION-

STATE OF MONTANA



GRAPH NO. 4



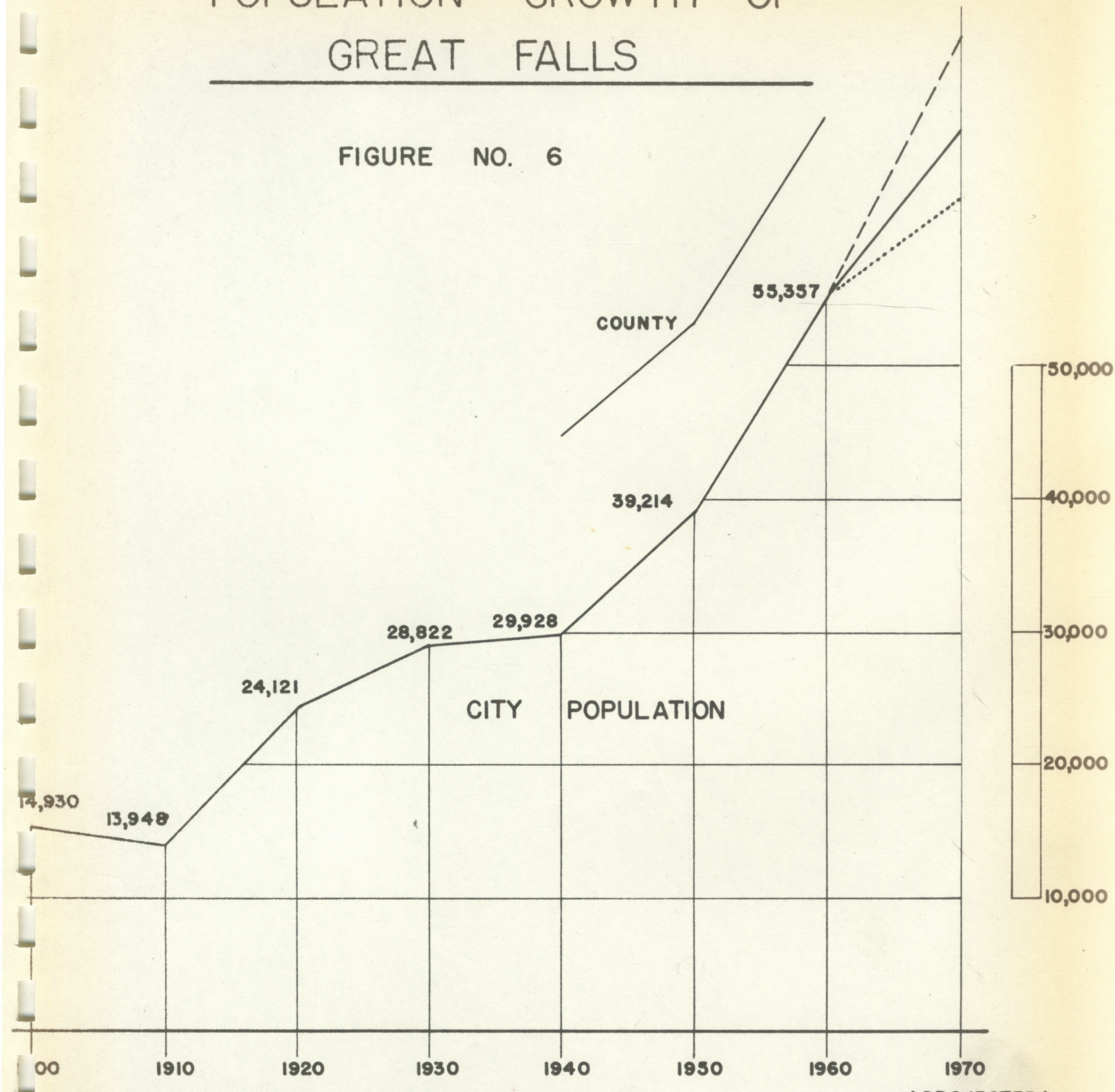
POPULATION- STATE OF MONTANA

GRAPH NO. 5

SOURCE: U.S. CENSUS

POPULATION GROWTH OF GREAT FALLS

FIGURE NO. 6



-982	10,773	4701	1106	9286	16,143	NUMBER INCREASE
-6.6	72.9	19.5	3.8	31.0	41.2	PERCENT

GENERAL INFORMATION FOR CASCADE COUNTY IN 1960.

Land area in square miles.....	2659.0
Total population.....	73,418
Density per square mile.....	27.6
Percent of total population that is urban...	78.5
Percent of increase of total population.....	38.5
Percent of increase of urban population.....	47.0
Percent of increase of rural population.....	14.3

TABLE NO. I

POPULATION OF CASCADE COUNTY AND SELECTED CIVIL DIVISIONS

FOR

1960

CASCADE COUNTY	73,418
BELT DIVISION	1500
BELT CITY	757
CASCADE DIVISION	1245
CASCADE TOWN	604
EDEN STOCKETT DIVISION	969
GREAT FALLS DIVISION	55,357
GREAT FALLS CITY	55,357
GREAT FALLS EAST DIVISION	7,391
GREAT FALLS NORTH DIVISION	3,791
GREAT FALLS WEST DIVISION	809
MONARCH NEIHART DIVISION	301
NEIHART TOWN	150
SUN RIVER VALLEY DIVISION	2055

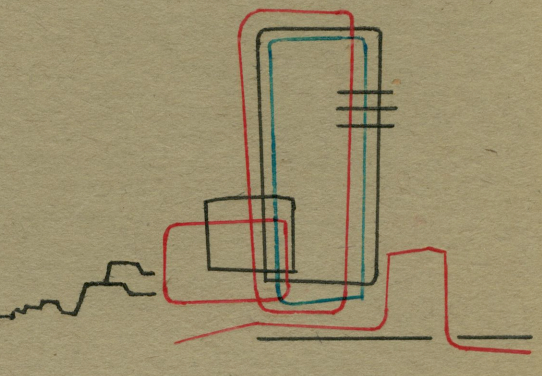
TABLE NO. 2

GENERAL SOCIAL AND POPULATION CHARACTERISTICS FOR GREAT FALLS

	1960
total population in Cascade County	73,418
total urban population in Cascade County ..	57,629
urban population in the central city ...	55,357
total rural population in Cascade County ..	15, 789
% of rural non-farm population	16.8%
% of rural farm population	4.7%
1960 total in the incorporated place	55,357
1960 population in the 1950 incorporated area	43,400
1960 population in the area annexed between 1950 and 1960 ...	11,957
1950 total population in Great Falls	39,214
increase of population between 1950 and 1960 in the 1950 incorporate area	4186
% of foreign born in Cascade County in 1960 ...	5.3%
cumulative fertility rate in Cascade County in 1960 (children ever born per 1000 women 15-44 years old of all marital classes)	1917

TABLE NO. 3

LOCAL CONDITIONS



L O C A L C O N D I T I O N S

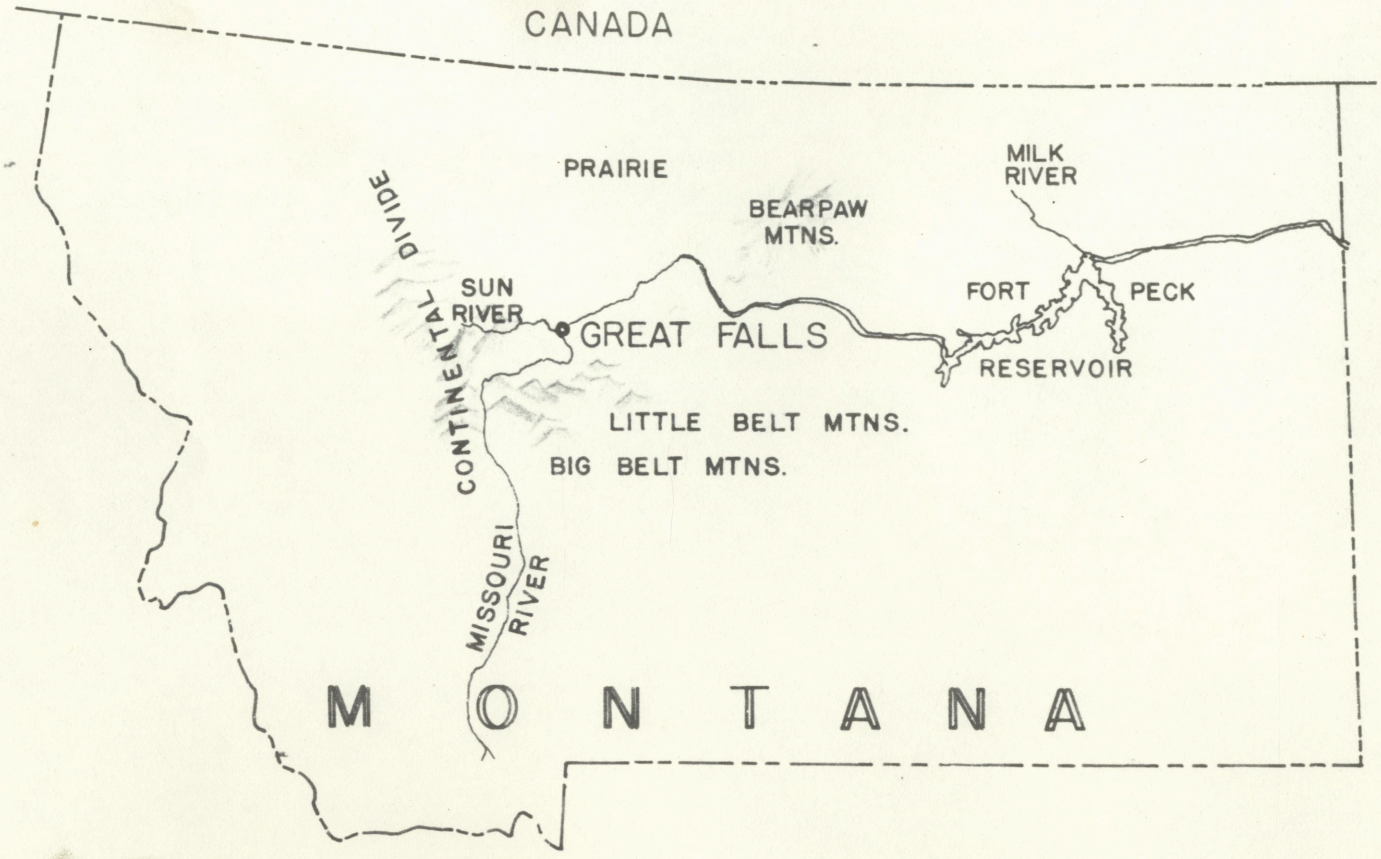
Geographical

Great Falls is located slightly north-west of the center of the state of Montana. More specifically, it is located at 47 degrees 28 minutes north latitude and 111 degrees 15 minutes west longitude. It is approximately 3300 feet above sea level.

The city lies in the transition zone between mountain ranges and plains. Much of the surrounding terrain is of rolling and grass covered foothills. Benches and plateaus are created by the passage of nearby rivers.

The view to the west is of these foothills. To the south the Rocky Mountains and Continental Divide can be seen. The eastern view shows the meeting of the Belt Mountains with the greater Rocky Mountain ranges. They join as shown on the map, page 25 . The Montana plains stretch northward from the city as far as the eye can see.

The Missouri River winds through the metropolitan area, dividing Great Falls into natural districts. The Sun River joins the Missouri within the visible fringes of the city on the south-west corner of Great Falls. The greater river then continues north-eastward through the city.



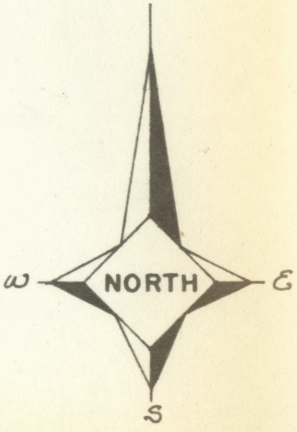


FIGURE NO. 7

GREAT FALLS MONTANA AND SURROUNDING GEOGRAPHICAL FEATURES

TRACED FROM A MAP COURTESY OF THE AMERICAN AUTOMOBILE ASSOCIATION . . . . . .

Historic

Historically, Great Falls shares much of the western tradition of the United States. It is naturally located at the joining of two rivers and on the Great Plains or eastern side of a barrier of mountains, the Continental divide. Both reasons for location were important to the transportation of the time. Also important to locating at that point was the 'Great Falls' of the Missouri for which the city was named. It provided a barrier formidable enough to stop extensive river traffic west of that point.

Lewis and Clark were forced to portage these falls a few days after April 7, 1805.

Also influential in the location of Great Falls was the nearby Fort Benton. Fort Benton is located about 40 miles north-west of Great Falls, downriver on the Missouri. It was the earliest trading post in Montana and the central northwestern area.[4] Fort Benton was started in 1846 by the American Fur Company. Pierre's hole of Jackson, Wyoming was the only rival trading establishment that preceeded Fort Benton. Fort Benton then became a military establishment and in successive years the source of supply for the western and greater portion of Montana. ~~Figure~~ TABLE 4 lists some information from the plans of Fort Ellis, Montana Territory, that aids the explanation of the role of Fort

---

4. New Standard Encyclopedia (Chicago, 1950) volume 6, see Montana history.

Benton. Of similar interest to the connection between Fort Benton and Great Falls are the many paintings of Charlie Russel depicting the freight wagons between the two places.

The site of Great Falls was occupied by settlers in 1884 and the city was incorporated in 1888.[5] The falls of the river were harnessed and industry came early to the area; one of the reasons for the city eventually becoming the leader of commerce and industry in the central portion of the state.

---

5. Ibid.volume 4, see Great Falls.

Distance to Fort Shaw Hd.Qrs. of the District - 181 miles
Benton - nearest point of Supply 241 1/4 "
Virginia City nearest Post Office 68 1/2 "
Mouth of Mussel Shell River 325 "

Fort Ellis, in Gallatin Valley. three (3) miles South of Bozman City. on Bozman Road.

Captain Robert. L. LaMotte. 13th U.S.I. Post Commander

Bvt. Major J. I. Hott Captain 13th U.S. Inf. Post. Qr. Master

FROM THE PLANS OF FORT ELLIS, MONTANA TERRITORY

TABLE NO. 4

SOURCE: WASHINGTON D.C. ARCHIVES

Economic

Most of this economic study was taken from the United States Census Bureau. As noted on the illustrations, most of the following data concerns the census year of 1960. It is primarily a study of the labor force of the Great Falls area.

This labor force has been broken down into age and sex and can be found on tables 5-6, pages 32-33. The means of transportation of the labor force have been studied and the automobile has shown its unquestionable dominance. The detailed transportation table is on page 34. The 12 major selected occupations as chosen by the Census Bureau are presented on table 8, page 35. The selected occupations show the number of persons employed in each category. The annual income has been broken down into categories by thousand dollars and lists the number of persons in each section as tabulated on page 36. The following table (10) lists the incomes of Bozeman, Montana as a comparison. The average annual income is $6032.00 for each Great Falls wage earner and his family.

In a lecture delivered to a Montana State College state and local government class on january 27, 1964, professor Kuroda listed the following as political pressure groups in the state of Montana:

1. Montana Power Company
2. Anaconda Company
3. Great Northern Railroad Company
4. Northern Pacific Railroad Company
5. Chicago, Milwaukee, St. Paul, and Pacific Railroad Company
6. Montana Taxpayer's Association
7. Montana Education Association
8. Farmers Union
9. Woolgrower's Association and Stockgrower's Association
10. Labor Unions

Nearly all of the above are quite well represented in the Great Falls area. There is no denying that these institutions are influential in the economy of the state as well as in Great Falls city. The two notoriously large firms in the state are the Anaconda Company and Montana Power Company. Anaconda Copper is especially well established in Great Falls.

Other basic industries pertinent to the economy of metropolitan Great Falls are:

1. The Air Force and missile personnel living in that area.
2. The large agricultural areas to the north and east of the city.

3. Petroleum and similar refineries and industries.

4. The Great Falls Select brewery.

A basic industry is defined as an industry that brings capital to the area as opposed to a service industry which disperses the available capital throughout the area. The merchants and businessmen who deal with trade goods that were not produced in the locality are examples of service industries.

AGE BREAKDOWN OF LABOR FORCE FOR CASCADE COUNTY

IN 1960

Age	Great Falls (S.M.S.A.)		Cascade County	
	male	female	male	female
14-17 years old	800	587	802	587
18-24 years old	1739	1542	3683	1564
25-34 years old	3856	1469	5397	1544
35-44 years old	4283	1990	4749	1934
45-64 years old	4732	2633	5798	2653
65 years old and over .	723	379	900	429

TABLE NO. 5

CASCADE COUNTY EMPLOYMENT STATUS FOR 1960

Male 14 years old and over	25,221
labor force	21,329
armed forces	4187
civilian labor force	17,142
employed	16,158
unemployed	984
not in labor force	3892
inmate of institution	137
enrolled in school	1396
other, under 65 years of age	622
other, over 65 years of age	1737
Female 14 years old and over	23,970
labor force	8661
employed	8026
unemployed	614
not in labor force	15,309
inmate of institution	100
enrolled in school	1740
other, under 65 years of age	11,099
with own children under 6	5367
married, husband present	5221
other, over 65 years of age	2370

TABLE NO. 6

MEANS OF TRANSPORTATION OF THE LABOR FORCE OF CASCADE COUNTY

FOR 1960

PRIVATE AUTO OR CARPOOL	19,734
RAILROAD, SUBWAY, OR ELEVATED	4
BUS OR STREETCAR	132
WALKED TO WORK	3079
OTHER MEANS	809
WORKED AT HOME	3278
NOT REPORTED	478

TABLE NO. 7

OCCUPATIONS OF THE LABOR FORCE FOR THE GREAT FALLS AREA

FOR 1960

Occupation	Number	
	Great Falls (S.M.S.A.)	
	male	female
employed	16,158	8026
professional, technical and kindred workers	1491	1296
farmers and farm managers	886	8
managers, officials, and proprietors, excluding farm	2344	487
craftsmen, foremen, and kindred workers	3612	51
operatives and kindred workers .	2414	327
clerical and kindred workers ..	1056	2471
sales workers	1358	789
private household workers	31	675
service workers, excluding private household	902	1471
farm laborers, unpaid family workers	417	73
farm labor, excluding unpaid and farm foremen	--	--
laborers, except farm and mine .	1116	16
occupation not reported ...	531	362

TABLE NO. 8

FAMILY INCOME FOR CASCADE COUNTY IN 1960

All Families ... 18,836

income	number
under$1000.00 dollars	507
1000-1999	904
2000-2999	1173
3000-3999	1690
4000-4999	2227
5000-5999	2541
6000-6999	2381
7000-7999	1883
8000-8999	1374
9000-9999	1006
10,000-14,999	1784
15,000-24,999	576
25,000 and above	190

TABLE NO. 9

FAMILY INCOME FOR GALLATIN COUNTY IN 1960

All families ... 6311

income	number
under $1000.00 dollars ...	216
1000-1999	488
2000-2999	643
3000-3999	804
4000-4999	701
5000-5999	842
6000-6999	744
7000-7999	559
8000-8999	434
9000-9999	262
10,000 and over	618

median family income ... $5360.00

TABLE NO. 10

Social

The social statistics are also primarily taken from the Bureau of the Census of the United States. Included in this part of the study are statistics on marital status, families, households, and school enrollments. These subdivisions are supported by illustrations in the form of tables and graphs. They are briefly discussed in the following text.

The marital and family status figures are found on tables 11-12, pages 40-41. They show the number and percentage of marriage status and single status by category. Table 12, page 41, relates the marriage statistics to families and households. All of the marital status statistics are for the census year of 1960 only.

Table 13, page 42, is the table of detailed household information and is also a cross reference for the marital status and family statistics. This is followed by a table showing the stability of residence. Again, these figures are for 1960 only.

The numbers of persons and percentages enrolled in school by age as well as by grade can be found in tables 15-16, pages 44-45, for the census years of 1950 and 1960. It is evident from the increases of the higher levels that education of these upper levels has more attraction at present than in the past.

Great Falls has the usual number of private clubs and organizations, similar to Bozeman and the surrounding area. The Great Falls Meadowlark Country Club affiliations are quite extensive with a large tract of land and numerous facilities located near the south entrance to the city.

The night life of Great Falls offers a larger degree of variation than Bozeman residents would be accustomed to, and is somewhat more expensive and exhausting.

MARITAL STATUS FOR CASCADE COUNTY IN 1960

Male 14 years old and over	25,223
single	6388
married	17,115
percent married	67.9%
separated	188
widowed	800
divorced	920
Female 14 years old and over	23,968
single	3801
married	17,022
percent married	71.0%
separated	243
widowed	2396
divorced	749

TABLE NO. II

MARRIED COUPLES AND FAMILIES FOR CASCADE COUNTY IN 1960

Married couples	16,753
with own household	16,622
with own children under 6	6814
with own children under 18	10,838
with husband under 45	10,076
with own children under 18	8477
Families	18,236
husband-wife families	16,622
with own children under 6	7062
with own children under 18	11,585
unrelated individuals	6861
persons under 18 years of age	28,359
living with both parents	25,826

TABLE NO. 12

HOUSEHOLD RELATIONSHIPS FOR GREAT FALLS IN 1960

Category	Great Falls (S.M.S.A.)
total	73,418
in households	71,103
head of household	22,187
wife of head	16,269
other relative of head ...	4393
non-relative of head	1046
in group quarters	2315
population per household	3.20
married couples, % without own household ..	0.8%
% of families with own children under 6	38.7%

TABLE NO. 13

STABILITY OF RESIDENCE FOR GREAT FALLS IN 1960

Residence in 1955	Great Falls (S.M.S.A.)
population 5 years old and over	63,195
same house as in 1960	24,593
different house in U.S.	36,170
same county	18,131
different county	18,039
same state	5913
different state	12,126
abroad	1918
moved, residence in 1955 not reported .	514

Year moved into present house	
total	73,418
1959-1960	28,701
1958	8225
1957	5768
1954-1956	10,268
1950-1953	7628
1940-1949	7372
1939 or earlier	3369
always lived in this house ..	2087

TABLE NO. 14

SCHOOL ENROLLMENT FOR CASCADE COUNTY FOR

1950

no school years completed	.....	275
elementary 1-4 years completed	...	1380
5 and 6 years completed		1505
7 years completed	....	1340
8 years completed	....	6790
high school 1-3 years completed	..	4790
4 or more years completed		8430
college 1-3 years completed	.....	3325
4 or more years completed		2095

number enrolled in school, by age

5 and 6 years old	.....	730
7 through 13 years old	.....	5580
14 and 15 years old	.....	1200
16 and 17 years old	.....	995
18 and 19 years old	.....	415
20 through 24 years old	.....	330
25 through 29 years old	.....	95

TABLE NO. 15

SCHOOL ENROLLMENT FOR CASCADE COUNTY FOR

1960

total enrolled 5- 34 years of age	18,149
kindergarten, total	1526
public	1397
elementary (1-8 years) total	11,963
public	9915
high school (1-4 years)total.....	3915
public	3183
college, total	709

number enrolled in school, by age

5 and 6 years old	2307
7 through 13 years old	10,464
14 and 15 years old	2090
16 and 17 years old	1727
18 and 19 years old	653
20 and 21 years old	229
22 through 24 years old	201
25 through 34 years old	478

TABLE NO. 16

RACES OF CASCADE COUNTY IN 1960

Total	73,418
Race	
male	37,444
white	36,609
negro	334
indian	371
japanese	32
chinese	19
filipino	54
other races .	25
female	35,974
white	35,250
negro	183
indian	377
japanese	83
chinese	7
filipino	52
other races .	22

TABLE NO. 17

Climatic

The Great Falls area is temperate in climate. It has a clear atmosphere and enjoys many bright days. The relative humidity is extremely low and would have to be classified as dry. The average annual temperature is 45 degrees F.

About 15 inches of precipitation fall upon the area during the course of a year in the form of rain. Normally, this would be a semi-arid climate. However, the snow retention of the nearby mountains and rivers serve the water supply needs. Snowfall in the immediate area of Great Falls does not remain on the ground as cover during the winter. Like the plains it borders, the Great Falls vicinity has alternate periods of snow cover and melted-off ground. The average annual snowfall for Great Falls is 60 inches.[6]

The most disturbing weather factor to the local population is the wind. Great Falls is notoriously known state-wide as the "windy city." The prevailing winds are from the south-west and have an average velocity of 25-30 m.p.h.

More complete data on the Great Falls climate can be found in tables 18 , pages 48-49.

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6. Jeffrey Aronin, Climate and Architecture (New York, 1953) p. 304

CLIMATE CHARACTERISTICS FOR THE GREAT FALLS AREA

Temperature

average annual maximum temperature	95 deg. F.
average annual temperature	45 deg. F.
average July temperature	65 deg. F.
average January temperature	20 deg. F.
average annual minimum temperature	-30 deg. F.
highest temperature ever observed	110 deg. F.
lowest temperature ever observed	-60 deg. F.

Frost

average dates of last killing frost in the spring	May 20
average dates of first killing frost in the fall	Sept. 10
average depth of frost penetration in inches	30 inches

Precipitation

average annual precipitation		15 inches
average warm-season precipitation	Apr.-Sept.	10 inches
average winter precipitation	Dec.-Feb.	2 inches
average spring precipitation	Mar.-May	4 inches
average summer precipitation	June-Aug.	6 inches
average annual number of days with precipitation of 0.01 inch or more		60-80 days
maximum precipitation (inches) in 1 hour		1.50
maximum precipitation (inches) in 24 hours		4.0

Snow

average annual snowfall in inches 60.0

average annual number of days with snow cover of 1 inch or more 100

Wind

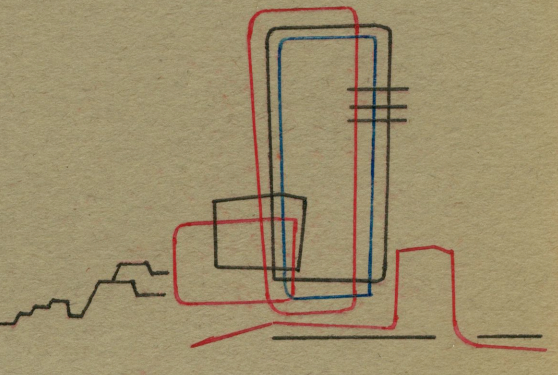
direction of prevailing wind ..... south-west

average velocity of prevailing wind ..... 25-30 m.p.h.

* All of the above averages are based on a 30 year period.

TABLE NO. 18

SITE CONDITIONS



SITE CONDITIONS

Orientation

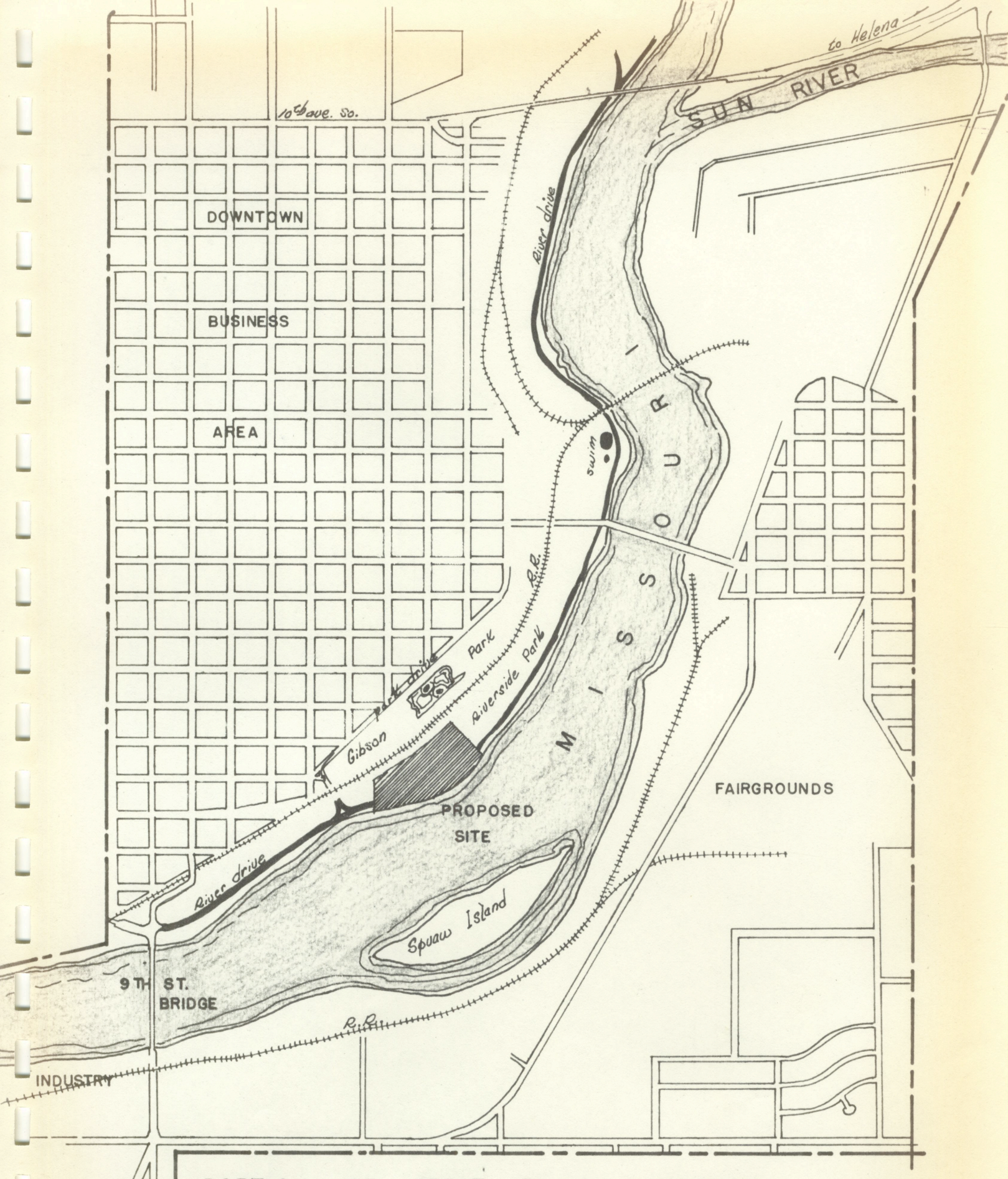
The structure is to be located on the Missouri River approximately three blocks south of the Ninth Street bridge.* The site is on an existing point of land that juts into the river and is accessible by River Drive. The Park avenue-River drive intersection is located several hundred feet north of the proposed site. The serpentine nature of the river's course would allow a building to be placed in a manner most effective for the sun angles. Squaw Island is located near the opposite shore from the proposed site. A map of the site, and site orientation is shown in Figure 8, page 52. Sun angle diagrams can be found on page 53, Figure 9.

Adjacent environment, land use, and traffic patterns.

The adjacent land is used for two municipal parks, (Gibson and Riverside parks). They have tennis courts, archery ranges, ponds, ice skating facilities, and a bandshell. The two parks are separated by the Great Northern Railroad tracks that run parallel to River Drive. The use of vegetation and the raised earth bed for the tracks provide an isolation of that transportation

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* This bridge is commonly referred to as either the Ninth or the Tenth Street bridge. An unusual S approach to the bridge is the cause of the contradiction.

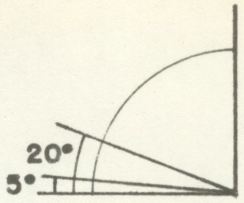


PORTION OF GREAT FALLS, MONTANA

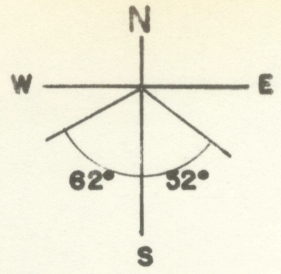
SCALE 0 500 1000

MAP NO. 8

SUN ANGLES FOR GREAT FALLS

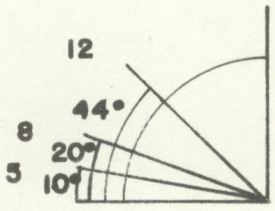


DECEMBER

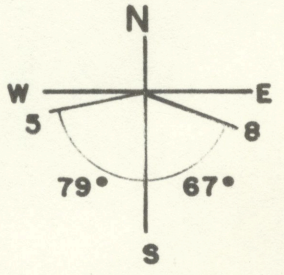


SUN ALTITUDE
AT 8:00 A.M.
12:00, & 5:00 P.M.

SUN AZIMUTH
AT 8:00 A.M.
12:00, & 5:00 P.M.



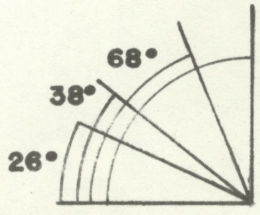
MARCH
AND
SEPTEMBER



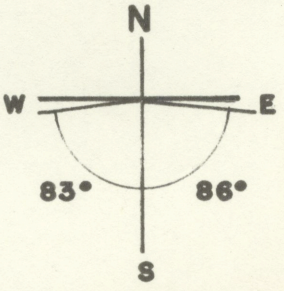
LATITUDE 47°28' NORTH

LONGITUDE 111° 15' WEST

ALTITUDE APPROX. 3300'



JUNE



GRAPH NO. 9

facility that is both successful and safe. The industrial area of Great Falls begins around a bend of the Missouri River and to the north of the proposed site. The site is located approximately 8 blocks north-west of the Central Business District. It is also about 8 blocks from the Civic Center, 10 blocks from the Russell Art Gallery, 6 blocks from the Court House, and 7 blocks from a Deaconess hospital. A new proposed library as well as public and parochial schools are within walking distance of the site. On a recent tour of the nearby area, I found it noteworthy that several new walk-up apartment houses are being constructed in the area between my proposed site and the Central Business District. I found that further details concerning these apartments can be obtained from architectural and construction offices in Great Falls. Across and down the river from the site much of the night life of the Great Falls area takes place. Directly across the river a new school is being completed. The municipal fair grounds are across the river and upstream.

Transportation

The principal rail head for the area is the Great Northern Railway. Connection with this facility is south of the site and readily accessible by River Drive. The

Chicago, Milwaukee, St. Paul, and Pacific Railroad also has tracks parallel to the Great Northern. The Greyhound bus line is located in the Central Business District. The route to the municipal air field is direct and relatively close as it is placed on the south-west fringe of the city. Although Malstrom Air Force Base is across town to the east from the site, the access route is direct through the major arteries of the city. Access to all highways leading from Great Falls is also direct and the site is located centrally in that respect.

Topography, vegetation, and natural features

The site is flat and the immediate area of the proposed building does not have planting of any kind. The site is of filled earth on the river bank and the City Engineer's office of Great Falls does not have a recorded survey of it. A small amount of native grass does grow on the site. However, the adjacent parks are rich in vegetation with well kept and planted lawns, pine and fir trees, foliage, shrubs, and a variety of elm and other deciduous trees. The river bank elevation is 3299 feet above sea level and the river elevation usually is approximately 3289.2 feet above sea level.

Zoning regulations

The zoning requirements for the Great Falls area as

apply to this proposal are found in the Pacific Uniform Building Code. Although the city of Great Falls has a code of its own, this Uniform Building code has also been adopted.

Soil analysis

As stated before, the earth is all fill for that area. Also, considering the nearness to the river and a high water table, the support would have to be a piling or slab system.

Prevailing winds

The prevailing winds are from the south-west. As stated before, the average wind velocity is 25-30 m.p.h.

Immediate and distant views

The immediate views, including the site, are shown by the photographs, Figures 10-13, pages 58-61.

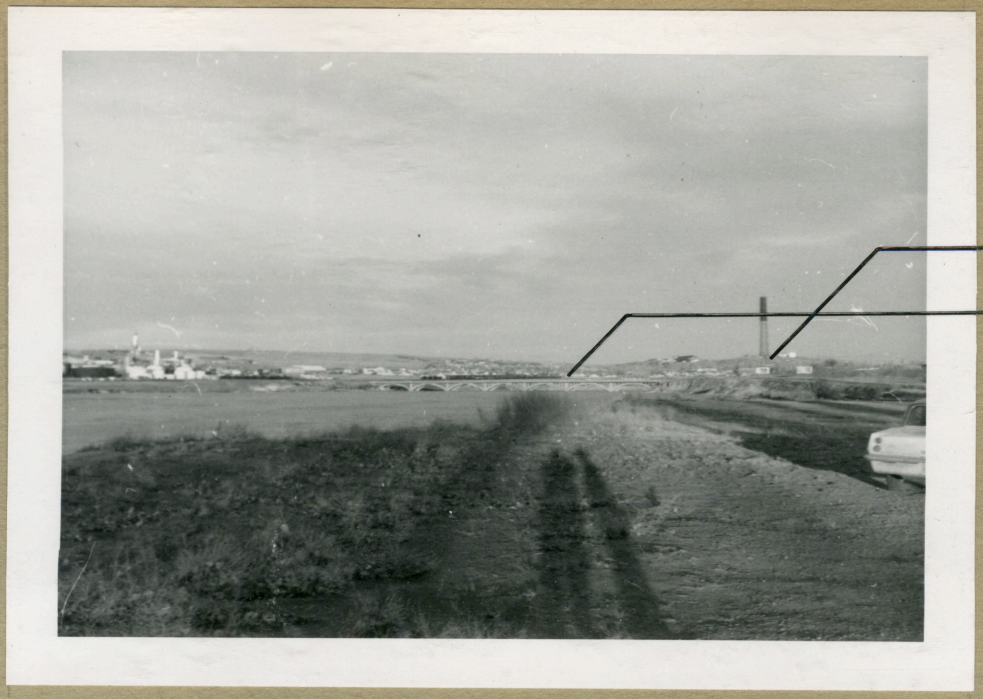
To the immediate north are the Missouri river and the ninth street bridge. In the distant north are the industrial areas and the area of Black Eagle, Montana, incorporated into Great Falls. To the west the river and Squaw Island are in the foreground. Portions of the city and the rolling foothills are viewed as the western background. The distant southern view envelops Gore hill and surrounding foothills, which are framed by the

Rocky Mountains. Immediately south of the site, River Drive winds around a bend of the river and is parallel to the municipal parks. The view to the east is blocked from the ground level by the raised railroad. All that is visible is the adjacent parks and treetops of the housing developments of the nearby part of Great Falls.

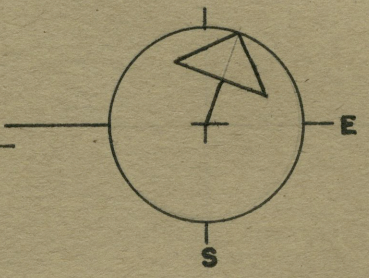
Because Great Falls lies in the embrace of two river drainages, it is difficult to see the rolling plains beyond the buttes and foothills of the surrounding area with the exception of the southern view. However, the Belt Mountains can be seen from the eastern fringe of the city and other higher points of the city. The upper portions of a high-rise , placed upon the chosen site would have a striking view of the entire city, its fringes, and the surrounding communities that make up the megalopolis.

Availability of utilities

Few utilities run to the site at the present time although they are quite close and therefore available. Again, the railway and the parks are the separating factors. The most recent information that I could ascertain from the City Engineer's office of Great Falls, was the placing of a sanitary sewer on the boundary of the proposed site as of January 18, 1958.



1. NORTH - E VIEW





2. NORTH - W VIEW

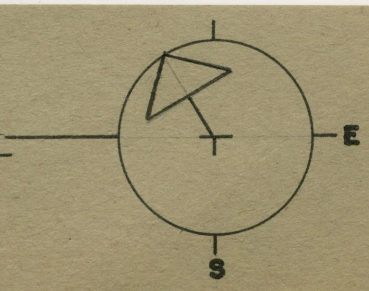
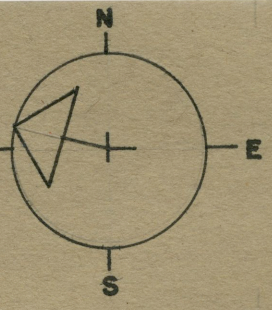


FIGURE NO. 10



3. WEST - N VIEW





4. WEST VIEW

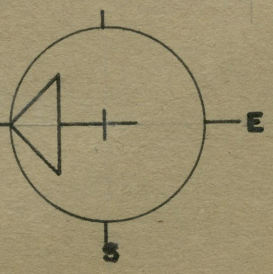
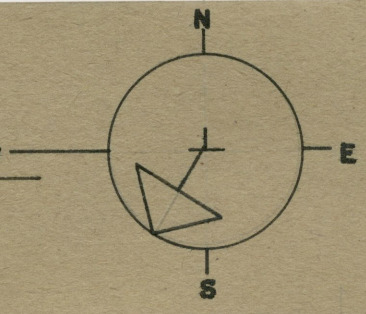


FIGURE NO. 11



5. SOUTH - W VIEW





6. SOUTH - E VIEW

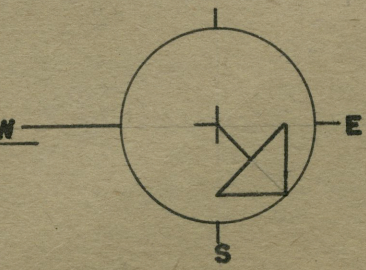
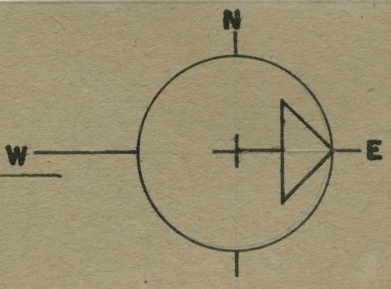


FIGURE NO. 12



7. EAST VIEW





8. EAST - N VIEW

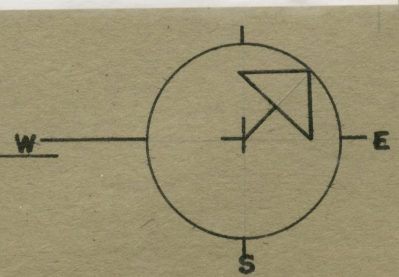
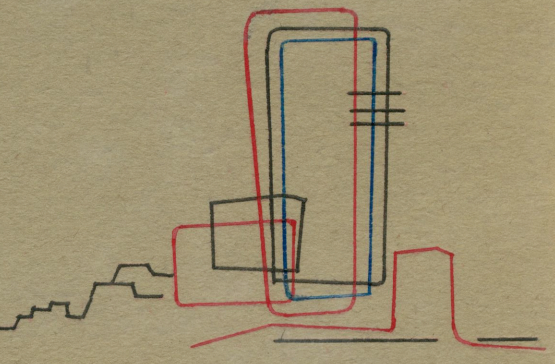


FIGURE NO. 13

FUNCTION OF THE BUILDING



FUNCTION OF THE BUILDING

Introduction

Basically, the function of the building is housing to fulfill a need. Housing, to the renter, is of great personal importance. It is his home. It produces capital gain for the producer-investor.[7] The building must be successful for both tenant and owner or the architect shall have failed. Although the desirable qualities for the renter shall also make the building successful to the owner on a long-term basis, this segment of the report shall deal with the functions desired for the renter. Factors pertaining to the owner shall be found under the economic section of this paper. Consideration of the spaces shall primarily fall in the categories of service, housing, outdoor landscaping, and recreational areas.

The housing facilities are used for sleeping, dining, relaxing, entertaining, bathing, laundering, and storage of materials, clothing, and garbage.

Elevators are an extremely important consideration to a building of this nature. Ventilation, heating, air conditioning, water distribution, electrical distribution, janatorial storage, and sewage disposal are other service considerations.

---

7. Joseph Abel and Fred Severud, Apartment Houses (New york; 1947) p. 1

The recreational or gathering areas shall include a foyer on the ground floor, utilization of the roof space for recreation, and balcony space for each living unit.

The outdoor landscaping areas will primarily be planned around automobile parking, the main entryway, and potential play and recreation areas. Landscaping will be used for screening and barrier purposes as well as to enhance the site and the structure.

Provision must also be made for accommodation of a building manager. This is both a service and housing consideration.

The following is a detailed discussion of the functions listed above.

Housing

General

For the state of Montana, figures calculated from the census bureau show the following percentages of family sizes:

Families with no children under 18 (0 and 1 bedroom units)	..... 40.1%
Families with 1 child under 18 (2 bedroom units)	..... 17.7%
Families with 2 children under 18 (3 bedroom units)	..... 18.8%

Families with 3 or more children under 18 ..... 23.4%
(4 bedroom units)

Since Great Falls shows a lower cumulative fertility rate than that of the state,[8] the above figures could be adjusted. This also does not consider the present trends in apartment renting.

It can be generally said that privacy, space, sanitation, durability, attractiveness, and economy are the very important considerations of the renter.

The following subdivisions are in compliance with the requirements of the Federal Housing Administration Agency for the Helena, Montana insuring district. This district includes Great Falls. Where applicable, the Uniform Building Code has also been used.

The dimensions of the spaces can be found within the 'building program' section of this paper.

The housing of the manager shall conform to the housing provisions of the units.

Bedrooms

According to F.H.A. standards, each living unit shall have at least two habitable rooms, one of which shall be a bedroom. The other habitable room must be a bathroom. Any or all living units shall not be acceptable if they lower the standards of the character of the neighborhood.

---

8. U.S. Bureau of the Census, Op. Cit.

All bedrooms, master bedrooms or other, are required to have closet space and must be enclosed for privacy during use. Furniture should include dressers, dressing stands, night stands, and the bed or beds.

Bathrooms

All bathrooms must adequately house a water closet, lavatory, and a tub or shower. The access to the area must provide for a 90 degree door swing unless sliding doors are used.

Living Rooms

The living room shall include furniture for the relaxing and entertaining of occupants and guests. The desired character of this area shall be extremely warm, comfortable, and cheerful, and the furniture selection should recognize these considerations. Natural light and a pleasant view are espcially important to the living room. Furniture will include comfortable chairs, a couch, coffee and / or end tables, magazine and / or book racks, space for storage of paperwork and incidentals, and areas for radio, television, etc.

Dining Room

The trend in apartments is to incorporate this area into a general space that also includes the living room. A smaller total space is thus required and a good design

of the combination certainly does not detract from the appealing qualities of the living unit. In this instance, the table and seating requirements would differ with the different size of apartment units. Provision for the family would be adequate to meet minimum standards.

Kitchen

The kitchen shall include accessible storage space for food, utensils, and equipment. There must be 50 square feet of shelving in wall and base cabinets, 11 square feet of counter top area, and 11 square feet of drawer area, not including sinks and appliances. A 40 inch lineal space must be provided for a range. The constant use of this area demands durability and ease of maintenance.

Utility

This area will house the laundering facility for each apartment. It is reasonable and within code requirement to propose space for two appliances dealing with this function, as well as counter, shelf, and storage space for maintenance and material.

Storage

Coats: A coat closet shall be accessible to the living areas and of the same minimum size as the bedroom closet requirements.

Linen: A linen closet shall be provided within easy access to the bedrooms and shall be 14-inches deep

by 18-inches wide with shelving spaced 12-inches on center; minimum. Again, the actual square footage depends upon the size of the unit.

Garbage: A space within a base cabinet of the kitchen will be provided for garbage before disposal. Disposal units within individual apartments are desirable, but a luxury only to be enjoyed if economically feasible.

Balconies

Although this part of the living space may be neglected, I personally feel it desirable, even necessary, for the following reasons:

1. It increases the relation between the occupant and the outdoors.
2. It is a means for providing further natural ventilation.
3. Its cost in comparison to the cost of the structure can be justified.
4. It allows another area for potential expression in the design of the high-rise apartment
5. Balconies have a possibility for increasing the sociability among the tenants.

Service

Elevators

Two collective control elevators shall be installed,

perhaps in a 'duplex' arrangement if the design permits. A collective elevator is one that stops at an intermediate floor if signaled while it is traveling up or down the shaft. They shall have a speed of 400 feet per minute and be powered by direct-current, overhead, electrical motors. Pit clearance shall be 12 feet and overhead clearance shall be 20 feet. Although an added expense, hallway indicators shall be provided due to the range of age of occupancy of the structure. The research governing these decisions and pertinent reccommendations may be found in chapter 2, part 3, of the book: Apartment Houses by Joseph Abel and Fred Severud. The elevator section of that book was prepared by the Otis Elevator Company.

Ventilation, Heating, and Air Conditioning

Mechanical ventilation can vary from zone control, to each individual room. The same is true of the heating and air conditioning aspects of the building. Needless to say, the greater the detail in this control, the more luxurious and expensive are the units. Also, the selection of this equipment is greatly dependent upon other criterion of the design and must be integrated, not added, to that design. The present trend in heating is toward radiant heating.[9] Similarly, a combination of the central and unit system of air conditioning has shown efficiency

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9. Joseph Abel, Op. Cit. p. 161-162

and economy, and is very suitable to the renters desires. Equipment for these two selections will be located in a separate heating and mechanical area.

The F.H.A. requirements for ventilation of housing units are as follows:

1. Habitable rooms: natural ventilation openings not less than 4% of the floor area of the room or space.
2. Appliances requiring venting shall have adequate provision for such.
3. Kitchens shall exhaust air by range hoods or fans in the ceiling or wall.
4. Bathrooms shall have an air intake grille. Exhaust fans are desirable; often required where natural venting is unobtainable.

Ventilation through the apartment, from one exposure to another, is the ideal situation.

Water and Sewerage systems

Water and sewerage feed and disposal systems shall conform to the National Bureau of Standards and the United States Department of Commerce report BMS66 on plumbing. As to the function of these systems, cores containing the working parts are desired from an economic and maintenance standpoint.

Electrical distribution

The dispersion of the electrical circuitry depends largely upon the choice of framing and floor construction. Conduit will be used for the general distribution. Due to the relative smallness of these materials in comparison with the remainder of the structure, the problem of economy and maintenance is largely one of organization and specification within the building codes.

Janatorial and Maintenance Storage

Provision shall be made on every floor for storage of equipment and materials necessary to the maintenance of the common areas of the building. This personnel can operate out of the control center of the mechanical equipment area.

Public

Gathering areas

The foyer and entryway will be the transition zone between the outside and the domain of home for the renter. Its function will be the dispersal of the occupants in the various directions of their livelihood.

Due to the fact that it is desirable to keep the solution as economical as possible, no provision will be made to extend or expand the structure. Therefore, the

use of the roof as a recreational area is both a natural and reasonable function.

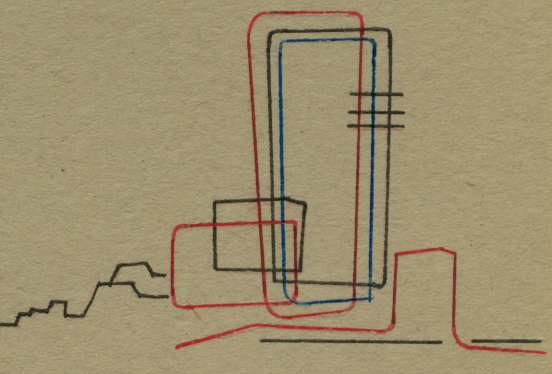
Parking

Allowances will be made for at least one car per dwelling unit or more if the site permits in a private parking lot. Street parking is also a possibility.

Play areas

This is again a site condition. It will provide entertainment for youngsters as the site allows. The nearness of the two municipal parks for this function are a decided advantage.

AESTHETICS



A E S T H E T I C S

The design of a high-rise apartment is very much limited by codes, structural considerations, and economic factors. The large amount of mechanical equipment limits the construction employed in areas such as the ceilings and, therefore, the material. Connection and integration of all the parts in a desirable solution is a complex proceedure.

As I see it, one of the many challenges of the field of architecture is the puzzling search for 'beauty'. A definite conclusion on this subject is never reached in my opinion, but designers have changing beliefs and philosophies that they apply to their creations and the justification of those works.

At this time, I personally believe in the design philosophy of simplicity. This is an appreciative type of belief. In other words, I say that beauty need not attract attention to itself, and is most successful when it approaches what it is trying to do in a direct manner. This does not eliminate the other philosophical approaches. It might be said that all work together, delightfully plying the senses of the observer, to create interesting variety. Logical planning and justification

of solution by material means are obviously a part of the desirable features of a design. This I believe in. In this structure, the economical choice of structural steel and curtain wall construction furthermore point to a simple expression of architecture.

Opposingly, to sum up my interpretation of a statement by Descarte:

> "All men temper their decisions with reason, but in the end result those decisions are ruled by passion".

Therefore, as a student of architecture, I shall try to justify my designs although there will always be considerations that are subjective and can only be explained in terms such as beauty.

Neglecting all of the many limitations that affect the design, I shall try to state what I desire and would try to convince the client of in regard to the elusive subject of aesthetics. The projected plan is a simple structure that rises boldly and simply upward. I shall not try to make it express more, or less, than what it is. Hopefully, it shall impart a feeling of freshness, crispness, order, and durability. The manufactured and commercial materials such as steel, glass, and metal are a few materials that can be integrated to produce these impressions. Those materials are used as examples;

there are many materials that can be treated to produce such feelings. An overpowering, formal appearance is not desired, but rather the casualness of the homes it will become. The relation of size of the human compared to such a large building is difficult to attain. Individuals have difficulty identifying themselves with a mass as large as this structure. I shall try to allow them to do so through the use of material detail and proportion. By so doing, I wish to eliminate the possibility of monumentality, which so easily creeps into structures of this size.

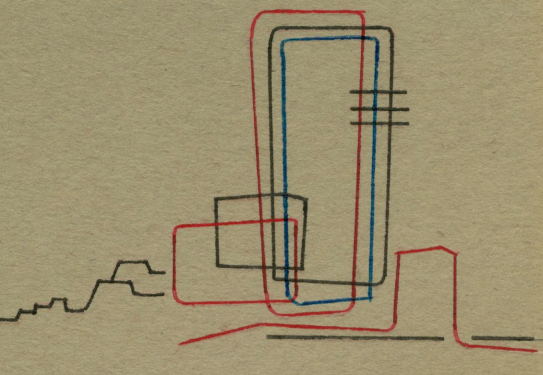
The interior spaces will be espcially important as it is here that the functions of living are carried out. Informality and warmth shall be the criteria for material, color, and texture selection. Earth colors, rough textures, and organic materials (such as wood) are a few possibilities that can successfully meet the conditions, depending upon the integration into the design. Similarly, the gathering and public areas will be informal.

Due to the flatness of the site and the nearness of the river, a unity of form between the building and the terrain will be difficult to achieve. One approach would include informal planting and an informal entryway, departing from the grid-pattern of the city. This also takes

advantage of the sun angles and the curvature of the river bank, and recognizes the curving forms of the adjacent parks and their vegetation.

I do not wish to depart from the grid build-up of the city for that reason in itself, but must recognize the irregular drainage caused by the waterway.

ECONOMIC CONSIDERATIONS



ECONOMIC CONSIDERATIONS

Recommendations

These recommendations are based on research done at Pratt Institute under a grant from the Dow Chemical Company.[10] They assumed a building life of 50 years.

Light steel framing has proven more economical than reinforced concrete framing for most areas. For the most economical solution, the design must consider the structural system from the beginning.[11] Building codes considering the Montana and Great Falls area limit this light steel framing to a building height of 100 feet[12] due to potential earthquakes. This limits the building to 10 or 11 stories. By using steel, the saving is in the neighborhood of 2% to 3% of total construction cost. A regular or modular column spacing is always the most economical in the structural system.

A saving of 7% of total cost occurs when exterior corridors are used in combination with elevators stopping only on every third floor.[13] This also allows every apartment to have through ventilation.

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10. Pratt Institute, Methods of Reducing The Cost of Public Housing, (New York, 1960) p. 1.

11. Ibid, p.33.

12. Pacific Uniform Building Code

13. Pratt Institute, Op Cit, p.135.

As stated, elevators stopping every third floor reduce total cost. Using this system, occupants never have to climb more than one flight of stairs. This also allws the designer flexibility in placing the apartment unit in tne structural bay.

Eliminate as much excavation as possible as below ground level construction is the most expensive. In this instance, ground conditions further point to minimum excavation and the use of pilings to support the structure.

Considering the speed of erection and the structural system, a curtain wall is the best enclosure. Low cost insulated metal panels or concrete panels are both within allowable fire ratings.

Use one pipe mono-flow hot water heating system. This gives an estimated saving of 16% of the total initial cost of heating equipment. Utilize copper tubing and loop venting if the code will allow it.

The recommended room heights for the housing units is 7' - 6". However, minimum room heights is specified by code as 8' - 0".

The following are some detailed material recommendations:

Use	Material	Saving in % as applied and compared to averages of study cases.
1. Interior apartment partitions	plaster on gypsum lath	10 - 25%
2. Partitions between apartments	exposed concrete block	40 - 60%
3. Floor of public corridor	vinyl asbestos tile	no saving, more durable
4. Bathroom floors	asphalt tile	90%

RENTAL CONSIDERATIONS

Financial Source

Financing of this type and scope of structure is usually by an individual or corporate private concern. Since the capital involved is large, provisions for loans are often available from housing agencies. In 1956, the federal government granted a larger percentage of funds to state and local governments for housing than all other areas of grants - in -aid.[14] This is not true of the total expenditures, but illustrates the prevalence of the federal government and its agencies in the national housing picture. Loans also can be

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14. Charles Adrian, State and Local Government (NEW YORK, 1960), p.87.

obtained on an investment basis from insurance companies or similar organizations.

Proposed services to be made available here shall be in the form of an individual client - Architect relationship.

Rental Return

An estimate on rental return can be made from the following formula as prepared by the Community Facilities Administration of the Housing and Home Finance Agency:

$$x = \frac{(i)\ (a)\quad (b)}{0.90}$$

x = the annual rental charge per unit

a = the annual cost of the construction loan per unit

b = a debt coverage factor (amortigation)

0.90 = an annual vacancy loss of 10%

Advantages to Renting

There are, of course, many disadvantages to renting. However, the three most important reasons that people give for renting are listed on the next page. [15]

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15. Joseph Abel, Op Cit., p.3.

1. The cost of living is less as there is no maintenance cost, and utilities serve adjacent units.

2. There are not as many taxes applied to the individual.

3. Renting allows the occupant to have flexibility in location. He can situate himself in a position more convenient to his livelihood.

Amortization: Debt Coverage

The amortization or debt coverage of a building is a product of the total cost and the interest rate of the loan or investment as it is paid off over a given time period. It is related to the projected life of the building. Therefore, the architect must use care and judgement when selecting the building materials for quality and durability. The sooner the building pays for itself, the sooner the investors receive a profit. However, if the building requires a great deal of maintenance due to the initial use of poor material, planning by the owners for a profit will be useless.

This project will be planned assuming a minimum building life of 50 years. This figure is specialized in that master builders in metropolitan areas plan their buildings to have a much shorter life. For instance, some types of high-rise structures on Manhattan Island are planned for a life of only 10 years. Naturally, the economic considerations are much different than those pertinent to this proposal.

Itemization of Costs

For the segregated method of estimating the total cost to the investor, the following list is suggested: [16]

1. Site Costs

   A. Cost of land
   B. Cost of utilities on site
   C. Extension of utilities to off-site mains
   D. Extra foundation work
      (filled earth, ground water c nditions, etc.)
   E. Landscape work

2. Construction Costs

   A. Labor and materials
   B. Builders fees and overhead
   C. Payroll taxes

3. Costs Incidental to Construction

   A. Architect and engineer fees
   B. Interest on loan during construction
   C. Taxes on real estate during construction
   D. Insurance
   E. Financing expense, mortgage, insurance premiums, examination fees, etc.
   F. Title and recording expense
   G. Legal expenses
   H. Organization expenses

In direct relation to the above, the following is a list of the elements composing rent:

1. Operation and Maintenance

   A. Costs of fuel, electricity, elevator maintenance, possible exterminating, gas, payroll, phones, trash removal, water, repairs, decorating, renting and administration, insurance, taxes, and miscellaneous small items.

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16. Ibid, p.10.

B. Allowance for vacancies

2. Financial Expense

A. Interest
B. Depreciation reserves
C. Maintenance reserves

3. Profit and Income Taxes.

Construction Rates

The wage scale for the Great Falls building industries can be found in tables 19-21 , pages 86-89 .

WAGE SCALE FOR CONSTRUCTION WORKERS IN

GREAT FALLS 1963

	Per Hour
Asbestos workers	$4.30
" " improvers:	
1st year	2.62
2nd year	3.04
3rd year	3.46
4th year	3.88
Boilermakers	4.00
" helpers	3.75
Bricklayers	4.00
Carpenters (Building Construction)	
Carpenters	3.85
Millwrights & machine erectors	4.10
Saw filers & stationary saw	4.00
Cement masons:	
Cement masons	3.85
power machine operators	4.10
Swing scaffold work	4.10
Electricians:	
Electricians	4.10
Cable splicers	4.10
Glaziers	3.00
Ironworkers, structural	4.10
" , ornamental	4.10
" , reinforcing	4.10
Laborers (Building Construction)	
General & building laborer & scalemen	2.85
Hod carrier and plasterer tender	3.065
Mortar man	2.975
Concrete laborer	2.84
Pipe layer (non-metallic)	3.065
Dumpman - grader	2.875
Powderman	2.975
Air vibrator, jackhammermen oper., & all other air tool operators not otherwise classified	2.065
Small concrete mixer	2.875
Asphalt raker and tamper	2.92
Concrete saw operator	2.875
Power driven concrete buggies	2.75

	Per Hour
Lathers	$3.25
Marble setters	2.90
Painters	
Painters, brush	3.25
" , swing stage	4.875
" , spray	4.875
Plasterers	3.86
Plumbers	4.00
Roofers	3.40
Sheet metal workers	3.65
Soft floor layers	3.00
Steam fitters	4.00
Stone masons	4.00
Terrazzo workers	3.00
Tile setters	3.00
Sprinkler fitters	3.975

Riggers-Welders receive rate prescribed for craft performing operation to which rigging or welding is incidental

TABLE NO. 19

APPRENTICE SCHEDULE

The apprentice rate is by percentage of the journeyman's rate unless otherwise indicated

Craft	Interval	1st	2nd	3rd	4th
Brickleyers	350 hours	40	50	65	75
Cement masons	6 mos.	70	75	80	85
Electricians	1000 hours	50	55	60	65
Painters	6 mos	55	55	70	70
Plasterers	6 mos	$1.53	$1.84	$ 2.03	$2.28
Plumbers	6 mos	55	58	61	66
Roofers	6 mos	80			
Roofers	4 mos		85	90	95
Sheet metal	6 mos	45	50	55	60
Steamfitters	6 mos	$2.20	$2.32	$2.44	$2.64
Carpenters					
	0 to 750 hrs.		65%		
	750 to 1500 hrs.		70		
	1500 to 2250 hrs.		75		
	2250 to 3000 hrs.		80		
	3000 to 3750 hrs.		85		
	3750 to 4500 hrs.		90		
	4500 to 5250 hrs.		95		
	5250 to 6000 hrs.		97.5		

TABLE NO. 20

BUILDING CONSTRUCTION

	Per Hour
Power Equipment Operators:	
A-frame truck crane	$ 3.31
Air compressor, single	3.05
Air compressor, 2 or more	3.22
Asphalt paving machine, screed	3.51
Asphalt paving machine	3.30
Belt finishing machine	3.23
Bituminous mixer paving, travel plant	3.51
Booring machine operator	3.14
Broom, self propelled	3.18
Cableway signalman	3.94
Cement silo	3.30
Chain buckets	3.23
Chip or gravel spreader, self propelled	3.23
Concrete batch plant	3.51
Concrete finish machine, paving	3.51
Concrete float and spreader	3.51
Concrete mixer, 3 bags & under	3.14
Concrete mixer, 4 bags and over	3.38
Conveyer	3.23
Crane operator, bridge & overpass construction and similar type work	3.76

TABLE NO. 21

Estimate

Because the quantities of materials will not be known until the preliminary design is complete, the segregated method of estimating will not be used. However, the following should provide a base figure that is suitable to work from.

The following estimate was made with the use of the Marshall Valuation Service. The Marshall calculator method lists 4 classes of apartment buildings.

Class A - Building having fireproofed structural steel with reinforced concrete on masonry floors and roofs.

Class B - Buildings having reinforced concrete frames and concrete or masonry floors and roofs.

Class C - Buildings having masonry exterior walls, and wood or steel roof structures.

Class D - Buildings having wood or light steel frame and roof structures.

A comparative cost is shown below. These figures include architect's fees, contractor's overhead, and profit.

Class	Type	Cost per cu. ft. in dollars	Cost per sq. ft in dollars
A	excellent	2.03	20.29 *
	low cost	1.25	12.48 *
B	excellent	1.89	18.89 *
	cold water flats	0.99	9.87
C	excellent	1.59	15.86 *
	cold water flats	0.77	7.66
D	excellent	1.40	14.02 *
	tenement	0.66	6.60

* - indicates inclusion of the cost of elevators.

For multi-story buildings add 1% to base cost for each story over 3 stories.

The Marshall Valuation Service also lists the following typical building lives based upon studies of actual mortality:

Class	A	B	C	D
	(building life in years)			
Good to excellent apartments	60	60	55	50
low cost to average apartments	55	55	50	45
Cold water flats and tenements	50	50	45	40

Using the above figures, and considering the type of building I am proposing, the total base figure is in the neighborhood of $800,000.oo to $1,100,000.oo, not including site costs. The square footage figures were taken from the building program section of this paper.

The site costs cannot be accurately estimated until the preliminary design work is done. The following illustrates some of the considerations of segregated estimating of site costs:

EXCAVATING:	Dollars per cu. yd.
With 1 1/2 cu. yd. power shovel and haul up to 1 mile.	0.97
With 1 1/2 cu. yd. power shovel and haul up to 2 miles.	1.07
With 3/4 cu. yd. power shovel and no haul	0.80
With 3/4 cu. yd. power shovel and haul up to 1 mile.	1.29
With 3/4 cu. yd. power shovel and haul up to 2 miles.	1.39

TRENCH:(by hand pick and shovel)	Dollars per cu. yd.
0 - 5 feet deep	6.00
5 - 8 feet deep	9.00
Trench with trenchers	0.98
Trench with trencher and backfill with bulldozer.	1.60
Trench in rock	11.00
Cofferdam	2.10

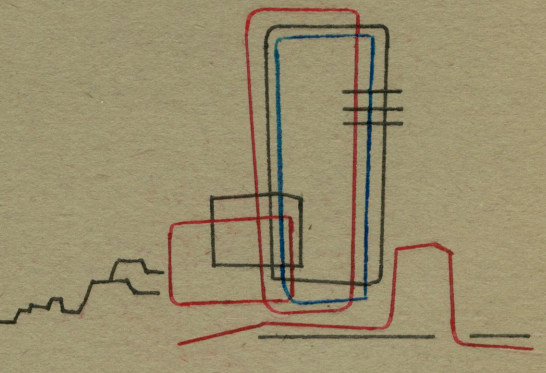
Estimate Calculations

		80 units Sq. ft. per unit	Total sq. ft. per unit type
16	4 bdrm units	763	12,228
20	3 bdrm units	673	13,460
12	2 bdrm units	548	6,576
20	1 bdrm units	458	9,160
12	0 bdrm units	338	4,056

Manager:		
	Office	250
	Living	673
Mechanical Room		2,500
	Total	48,500

Add for Public Spaces	Add 10%	Add 20%
	4890	9780
Total	53,793	58,683
Unit Costs	$14.00 / sq. ft.	$20.00/ sq. ft.
Estimate:	$753,102	$1,173,660

PLANNING THE BUILDING



PLANNING THE BUILDING

Introduction

The building must utilize the space conditions of the site to the greatest possible advantage, and also assure maximum comfort for living conditions. This must be done in the most economical possible way.

The site, building, and housing units must be considered in regard to orientation, traffic, maintenance, and utilities.

Orientation

In Great Falls, the sun always travels in the southern hemisphere. Direct glass exposure to the sun is neither desirable from the standpoint of heat from the sun's rays, or the brightness of the direct light. Sunlight is desirable; however, during the afternoon, glare and heat are caused by the sun unless the building is partially oriented away from it. Morning sunlight is more desirable and cheerful. During this period of the day, the rays of the sun do not creat a critical heat problem. As the sun rises to its zenith, it directs the light and heat onto south exposures.

For maximum comfort within the limits of the sun-angles, this high-rise apartment would be oriented with the glass areas to the south-east and north-west. This is a condition that also works well with the shape and orientation of the site.

The prevailing wind comes out of the south-west, although the blizzard winds come from the north. With the glass areas facing north-west and south-east, the natural ventilation of the apartments is not direct. Considering the prevalance of wind in Great Falls, it is not critical that the operating units open directly to the wind.

View is an extremely important consideration for the comfort of the apartment dweller. This proposed high-rise building is isolated from other tall structures. Therefore, any desired view is possible. The views to the north horizon is less interesting although the plains to the north-west of the city offer a long-distance view of a different character. Due to the vegetation and elevated railroad tracks, the view from the ground is limited and is most pleasing toward the river that is west and north of the site.

Noise and Traffic

The access to roadways from the site is directly onto River Drive. This leads directly to industrial and commercial sites. However, this drive is not a major arterial of the city. Automobile traffic noise would be light and would have its maximum effect on the ground floor of the building. The nearby railway is used once daily at the present time.

The ideal 'traffic' condition for living within the building is to go a minimum distance between areas of different functions and also have maximum space and comfort. The control of noise will affect the choice of building materials. This applies to the noise levels caused by the mechanical equipment, also.

Parking and Service

The parking and service should connect directly to an entry of the building. It should be designed in a manner that enhances the building and not be harmful to the appearance of the site. The service and parking will be treated together for economy of material and to prevent conflicting traffic patterns.

The service within the building will be direct and from a central core. Its appearance must be carefully treated to avoid a character that is detrimental to the building and still remain economical. This area must be easily maintained.

Landscaping

The necessary screening of traffic and view would be done with the use of landscaping. Other landscaping would be to make the structure more handsome and provide shade and screening of the recreation areas.

BUILDING PROGRAM

Introduction

As stated before, families of Montana consist of the following proportions:

Families with no children under 18	40.1%
Families with 1 child under 18	17.7%
families with 2 children under 18	18.8%
families with 3 or more children under 18	23.4%

There is a trend at the present time for families requiring 3 bedrooms to rent.[17]

Considering the household conditions, stability of residence, and vacancy ratio of the Great Falls area, the following figures will be used in planning this building:

0 bedroom units	15%
1 bedroom units	25%
2 bedroom units	15%
3 bedroom units	25%
4 bedroom units	20%

The site condition indicates at this time that 8 apartments per floor would be the best for planning the building. The base figure would allow for 10 - 12 units per floor, but it did not include areas of public spaces such as corridors. 8 apartment units per floor is more flexible in planning a core solution if a core solution is found to be desirable.

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17. Joseph Abel, Op Cit , p.4.

In this instance, if 8 apartments per floor are used, parking would require approximately 40% of the site.

The building height has been assumed as 100 feet. The following program assumes 10 floors of housing units with 8 apartments per floor.

Program

Housing units:

AREA	No. of bedrooms 0	1	2	3	4	Sq. Ft.
Living Room	160	160	160	180	180	

function:
relaxing and entertaining of occupants and guests

Equipment:
luminaires, chairs, couch, coffee and end tables, book and magazine storage, and radio or television storage

Finish:
warm, cheerful, and durable

Master Bedroom	—	120	120	120	120	
Other Bedrooms	—	—	90	90	90	

function:
sleeping and dressing

equipment:
bed or beds, dressing table, and night and light stands

finish:
rough, durable, and relaxing color.

	No. of bedrooms					
	0	1	2	3	4	sq. ft.
Bath	40	40	40	40x2	40x2	
function: personal hygiene	0	1	2	3	4	sq. ft.
equipment: bathtub and or shower, lavatory, water closet						
finish: durable, smooth and maintained						
Kitchen	60	60	60	70	80	
function: preparation and storage of food, and cleaning of cooking utensils						
equipment: range, sink, counter space, and shelving.						
finish: smooth and easily cleaned						
Dining	80	80	80	95	110	
function: consumption of foodstuffs in a relaxed atmosphere.						
equipment: table, chairs, and utensil storage						
finish: easily maintained, durable, and cheerful						

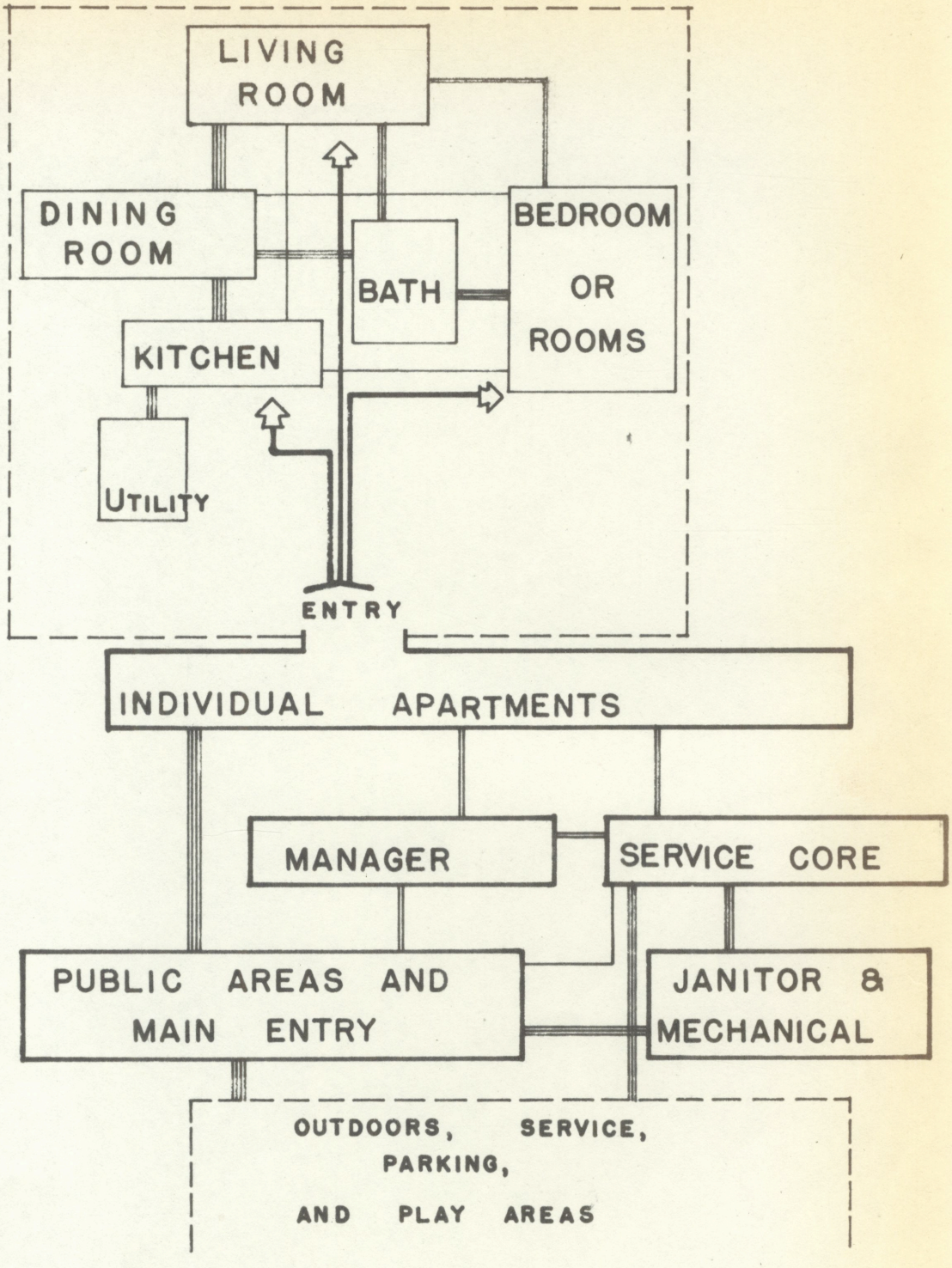
	No. of bedrooms					sq. ft.
	0	1	2	3	4	
Storage						
Clothing	8	8	8	10	10	
linen	4	4	4	5	5	
coat	6	6	6	8	8	
broom	3	3	3	3	3	
Rental manager						
office			250			
living			673			
Mechanical room			2500	total		
Janatorial			200	total		

Garbage can rack provided at service access.

Play area as site allows

Parking 160 sq. ft./ car min.

TABLE NO. 22



FLOW DIAGRAM

FIGURE NO. 14

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The Marshall Valuation Service was used for estimating of costs.

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