

PRELIMINARY RESEARCH FOR
A MULTI-STORY PARKING
GARAGE IN GREAT FALLS,
MONTANA

by

Roger H. Cook

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A
Multi-story
Parking
Garage

FOR GREAT FALLS, MONTANA

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Bozeman, Montana
December 14, 1964

Prof. H.C. Rose', Director
School of Architecture
Montana State College
Bozeman, Montana

Dear Sir:

I am submitting this preliminary research in compliance with the autumn quarter requirements of Architecture 489, the undergraduate thesis.

In this thesis I have presented research material for a multi-story parking garage in Great Falls, Montana. The material presented covers the following:

1. Conditions creating a need
2. Local conditions
3. Site conditions
4. Function of the building
5. Aesthetic considerations
6. Economic considerations

It is the purpose of this part of the thesis to provide research material necessary in the design of a multi-story parking garage.

Respectfully Submitted,

Roger H. Cook

Roger H. Cook

**Preliminary Research For A Multi-story
Parking Garage in Great Falls, Montana**

Part one of an undergraduate design thesis

**Submitted to the School of Architecture at
Montana State College to fulfill curriculum
requirements toward a degree of Bachelor of
Architecture**

By: Roger H. Cook

December 14, 1964

ACKNOWLEDGEMENTS

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I also wish to thank Professor H. C. Rose' and Professor D. G. Stevens for their assistance and guidance throughout the preparation of this research document.

TABLE OF CONTENTS

	Page
Letter of Transmittal	2
Title Page	3
Acknowledgements	4
Table of Contents	5-6
List of Illustrations	7-8
Proposal	9-10
Conditions Creating a Need	11
analysis of parking conditions and needs	13
Local Conditions	30
geographical	31
history and development	32
development	35
economic	37
social	40
climate	42
Site Conditions	61
Location and orientation	62
adjacent enviroment	62
topography, vegetation, and nat. features	64
zoning regulations	65
soil analysis	66
prevailing winds	66
views	67
availability of utilities	67
traffic patterns	67
Function of the building	79
customer circulation	82

TABLE OF CONTENTS

(cont.)

number	description	page
Table 1	service station	83
Table 2	enviromental protection	85
Table 3	lot	85
Aesthetics	meter vehicle registration	87
Economics	Comparison of growth indicators for Great Falls	91
	introduction	92
Table 4	Vehicle type into Great Falls	93
	construction costs	93
Table 5	site and site improvement costs	101
	operation and maintenance costs	101
Table 6	rental return	101
Table 7	amortization	102
	means of financing	103
References	Table 8	105
	Table 9	27
	Table 10	28
	Table 11	28
	Table 12	44
	Table 13	45
	Table 14	46
	Table 15	47
	Table 16	48
	Table 17	49
	Table 18	50
	Table 19	51

List of Illustrations

<u>number</u>	<u>description</u>	<u>page</u>
Table 1	Population growth	17
Illus. 1	Population trends	18
Table 2	Motor vehicle registration	19
Illus. 2	Motor vehicle registration trends	20
Table 3	Comparison of growth indicators for Great Falls	21
Table 4	Vehicle trips into Great Falls and destination	22
Table 5	Modes of travel within Great Falls	23
Table 6	Vehicle trips within Great Falls and destination	24
Table 7	Type of parking used by Great Falls motorists	25
Table 8	Pay and free offstreet parking facilities	26
Table 9	Distance and time analysis	27
Table 10	Major parking generators	28
Table 11	Current need for parking spaces	29
Illus. 3	Great Falls Montana and surrounding geographical features	44
Table 12	Cascade county employment status for 1960	45
Table 13	Age breakdown of labor force for Cascade County in 1960	46
Table 14	Occupations of the labor force for the Great Falls area for 1960	47
Table 15	Family income for Cascade County for 1960	48
Table 16	Means of transportation of the labor force for Cascade County, 1960	49
Table 17	Marital status for Cascade County in 1960	50
Table 18	Married couples and families for Cascade County in 1960	51

List of illustrations
(cent.)

Table 19	Household relationships for Great Falls in 1960	52
Table 20	Stability of residence for Great Falls in 1960	53
Table 21	School enrollment for Cascade County for 1950	54
Table 22	School enrollment for Cascade County for 1960	55
Table 23	Races of Cascade County in 1960	56
Table 24	Temperature	57
Table 25	Percipitation	58
Table 26	Relative humidity	59
Table 27	Wind	60
Illus. 4	Sun angles for Great Falls	69
Illus. 5	Location of site in Great Falls	70
Pictures of site and sorrounding area		71-78
Illus. 6	Construction rates for Great Falls	97
Illus. 7	Apprentice schedule	99
Illus. 8	Power equipment opperator wage scale	100

Proposal

My thesis shall be the design of a multi-story parking garage for Great Falls, Montana. The work will be divided into two parts.

The first quarter, autumn quarter 1964, shall consist of collection and presentation of the research necessary for the design of the building. This research will cover:

1. Conditions creating a need for the particular project.
2. Local conditions (geographical, economic, social, historic, climatic, etc.)
3. Site conditions (orientation, adjacent environment, topography, vegetation and other natural features, zoning regulations, soil analysis, prevailing winds, immediate and distant views, availability of utilities, traffic patterns, etc.)
4. Function of the building---the activities and the people it is to house (the numbers and types of people and their circulation, the various activities to take place within the building, the space and equipment needed for them, circulation of items other than people, possible organization of these activities with respect to division of space, etc.)
5. Aesthetic considerations (the building as a part of the total environment, the desired mood or character to be expressed).

6. Economic considerations (construction costs,site and site improvement costs, operation and maintenance costs, rental return, amortization, etc.)

The second and final quarter of thesis work shall be spent in completing a preliminary design solution for the problem as presented in the building program, based on the research data obtained.

The final presentation drawings, and or models shall constitute a complete concept covering all the important aspects of design. They will include such things as:

- Sitework (grading, paving, landscaping).

- Basic type and layout of heating and or cooling systems.

- Selection and identification of construction materials, both structural and finish materials. Consideration of color and texture.

- Basic structural system.

- Large scale details of the construction.

CONDITIONS CREATING NEED

CONDITIONS CREATING A NEED

Today the american citizen has more leisure time and more of a disposable income than at any other time in our nations history. It is evident that each person of legal driving age has greater access to a motor vehicle for his use, has more leisure time to drive, and has more available family income to encourage free use of the vehicle. This greater individual freedom of movement, combined with the rapid population expansion in the United States, has contributed to the substantial increase in traffic on the streets throughout the United States. In Great Falls this is especially true, as I will show in the next few pages.

Along with the obvious increase in traffic, residents of Great Falls have become more aware of a parking problem in the Central Business District each time they go shopping. This problem has become more accute during the past few years in spite of the effort of the city officials to keep pace with the growing demand by developing several excellent off-street parking lots. The competition from shopping centers in locations where parking is no problem has emphasized the prime importance of well-located off-street parking facilities in the Central Business District. The continued prosperity of the Central Business District may well depend upon the availability of an adequate supply of parking space. (ref. 6 , page 20) VOL. I .

Analysis of Parking Conditions and Demands

Two major means of evaluating the growth of an area are through population increases and motor vehicle registration increases. From 1950 to 1960, the population of Great Falls has increased 41%, Cascade County has increased 38%, Montana has increased 14%, and the United States has increased 18%. (table 1 , page 17) (illustration 1 , page 18) During the same period, the motor vehicle registrations increased 117% in Great Falls, 113% in Cascade County, 44% in Montana, and 50% in the United States. (table 2 , page 19) (illustration 2 , page 20) A more detailed breakdown of growth indicators for Great Falls is shown on Table 3 , page 21 .

On an average week day in 1961 there were 115,906 motor vehicles that entered the city of Great Falls from outside the city limits. The average occupancy of these vehicles was 2.1 persons. Approximately 20% of these vehicles were going to the Central Business District. A detailed breakdown of these entering vehicles, as to trip purpose, is shown on table 4 , page 22 .

On the same or a comparable average day in 1961 there were 178,017 person trips made by residents within the Great Falls area. 109,533 of these trips were made by automobile drivers. Other modes of travel are shown on table 5 , page 23. The average occupancy of these 178,017 trips within Great Falls was 2.4 persons. 42,687 of these trips were made to the Central Business District. A more detailed breakdown of these trips, as to trip purpose, is shown on table 6 , page 24 .

Many of the approximately 45,000 vehicles that enter the Central Business District on an average day will need a parking place once they reach their destination. Of course there are not 45,000 parking places in downtown Great Falls but one must realize that not all cars will be parking at the same time. A breakdown of the 20,756 available parking places in downtown Great Falls is shown on tables 7 and 8 , pages 25 and 26. This breakdown concerns the type of parking and whether these spaces are free or pay spaces.

Two more points which directly influence the parking situation in Great Falls are the average distance walked by the parkers and the average time each parked. The average parking duration was 47 minutes for legal curb spaces, 2 hours and 10 minutes for off-street

facilities, and an average of 1 hour and 8 minutes for all parking facilities.

The average distance walked to primary destinations after parking was 227 feet from parking spaces at the curb, 320 feet from the off-street facilities, and 251 feet was the average distance walked from all parking facilities.

These distances are considerably less than the recognized average walking distance of approximately 350 feet for cities in the population range of Great Falls.

(ref. 6 , page 27) A breakdown of the time and distance walked, as to trip purpose, are shown on table 7 , page 27.

From these facts one can see that if new parking spaces are to be provided in Great Falls, they must be easily accessible and in such a location that they provide parking within a short distance of major businesses in downtown Great Falls. I believe my site meets these requirements.

According to the survey done by the Montana Highway Commission there are 16 major parking generators in the Central Business District. Three of these are within 5 blocks of the site, 1 within 4 blocks, four within 3 blocks, five within 2 blocks, and two within 1 block. This shows that 6 of the 16 are within the average walking distance. Table 10 , page 28, lists these major

parking generators and the number of parkers and parking spaces required.

The parking survey also lists five major blocks showing a parking deficiency of parking spaces within a walking distance of 350 feet. These blocks are shown on table ,
page . These deficiencies are figured from the number
of person trips to the specific locality, the average time each trip parked, and the number of parking "space hours" available.

Two of the deficiency blocks, Central Avenue between 4 th and 5th streets and Central Avenue between 5th and 6th streets, are within the recommended walking distances of the proposed multi-story parking ramp. These two blocks have a deficiency of 260 parking spaces. (ref. , page)

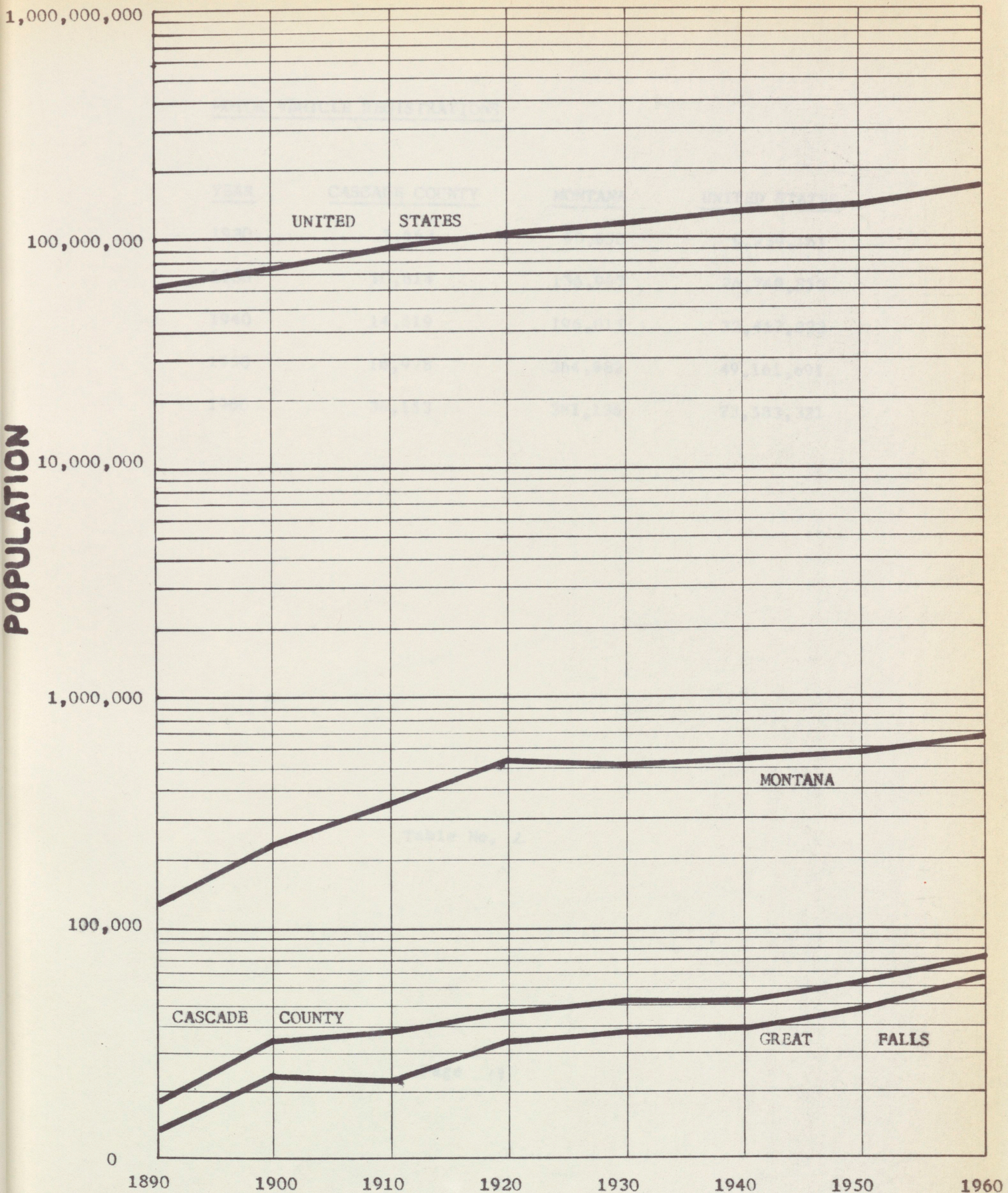
I believe this deficiency of parking spaces is justification for the proposal and selected location for a multi-story parking garage at the corner of First Avenue North and Fifth Street.

POPULATION GROWTH

<u>YEAR</u>	<u>GREAT FALLS</u>	<u>CASCADE COUNTY</u>	<u>MONTANA</u>	<u>UNITED STATES</u>
1890	3,979	8,755	142,924	62,947,714
1900	14,390	25,777	243,329	75,994,575
1910	13,948	28,833	376,053	91,972,266
1920	24,121	38,836	548,899	105,710,620
1930	28,822	41,146	537,606	122,775,046
1940	29,928	41,999	559,456	131,669,275
1950	39,214	53,027	591,024	150,697,361
1960	55,357	73,418	674,767	178,464,236

Table No. 1

POPULATION TRENDS



MOTOR VEHICLE REGISTRATIONS

<u>YEAR</u>	<u>CASCADE COUNTY</u>	<u>MONTANA</u>	<u>UNITED STATES</u>
1920	2,663	60,650	9,239,161
1930	10,614	136,997	26,749,853
1940	14,519	196,015	32,453,233
1950	16,978	264,982	49,161,691
1960	36,153	381,136	73,583,321

Table No. 2

MOTOR VEHICLE REGISTRATION TRENDS

REGISTRATIONS

100,000,000

10,000,000

1,000,000

100,000

10,000

0

1920

1930

1940

1950

1960

UNITED STATES

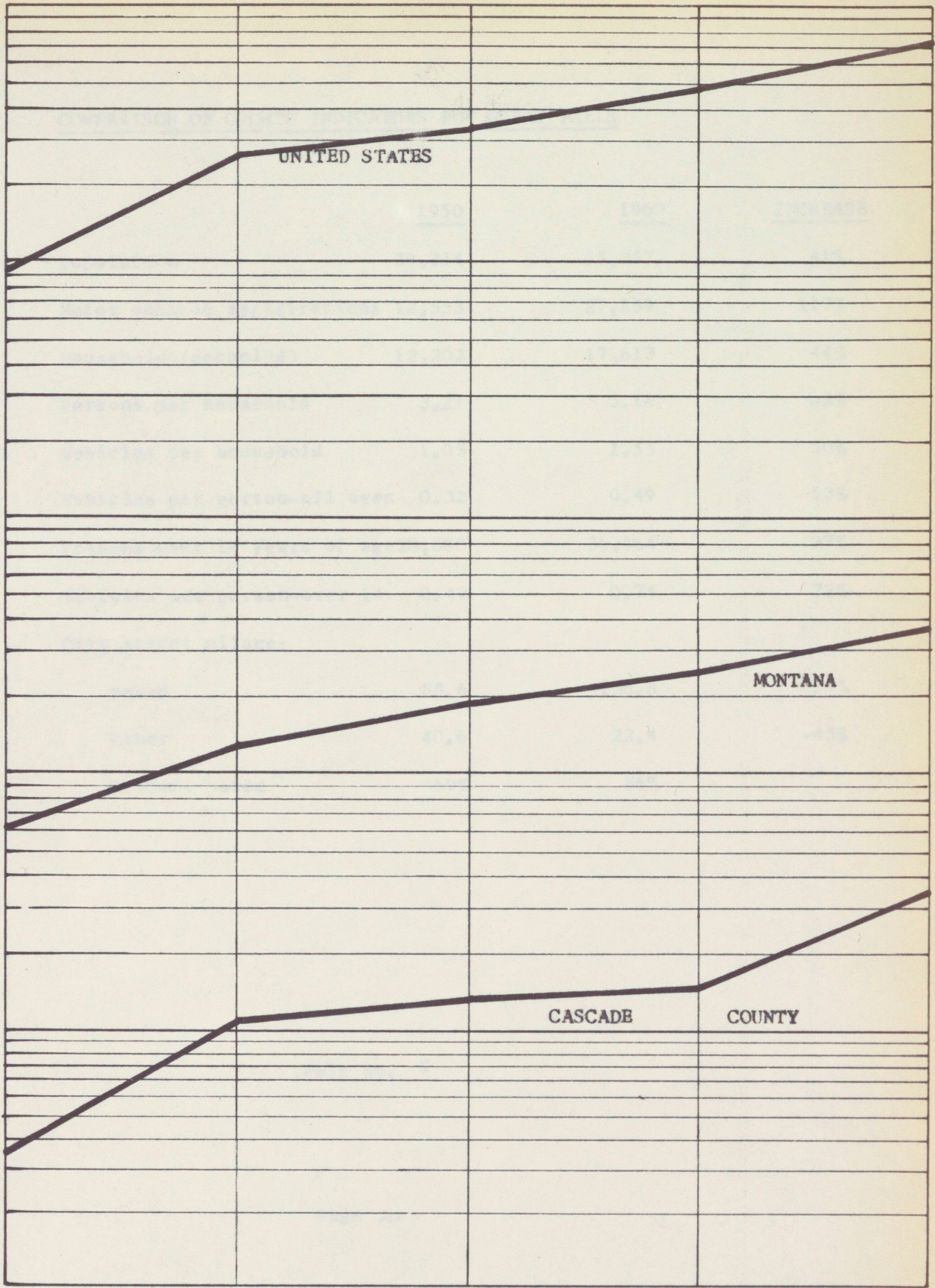
MONTANA

CASCADE

COUNTY

Illustration No. 2

Page 20



COMPARISON OF GROWTH INDICATORS FOR GREAT FALLS

	<u>1950</u>	<u>1960</u>	<u>INCREASE</u>
Population	39,214	55,357	41%
Motor vehicle registrations	12,555	27,259	117%
Households(occupied)	12,202	17,613	44%
Persons per household	3.21	3.14	-2%
Vehicles per household	1.03	1.55	50%
Vehicles per person-all ages	0.32	0.49	53%
Persons over 14 years of age	28,880	36,564	27%
Vehicles per person-over 14	0.43	0.74	72%
City street milage:			
Paved	88.6	136.8	54%
Other	40.6	22.4	-45%
Percent paved	69%	86%	

Table No. 3

VEHICLE TRIPS INTO GREAT FALLS AND DESTINATION

(Average Day)

<u>Trip Purpose</u>	<u>No. of Trips</u>	<u>Average Occupancy</u>
Work	4,126	1.4
Business	4,874	1.8
Medical-Dental	362	2.7
School	44	1.9
Social-Recreational	4,926	2.7
Change Travel Mode	34	2.1
Eat Meal	82	2.2
Shopping	1,063	2.5
Serve Passenger	395	2.3
Total	15,906	2.1

Table No. 4

MODES OF TRAVEL WITHIN GREAT FALLS

<u>Travel Mode</u>	<u>Number of Persons</u>	<u>%</u>
Auto Drivers	109,533	61.5
Auto, Truck, Taxi passengers	63,853	35.9
Schoolbus Passengers	3,874	2.2
Walk to Work	<u>757</u>	<u>0.4</u>
TOTAL	178,017	100.0

Table No. 5

VEHICLE TRIPS WITHIN GREAT FALLS AND DESTINATION

(Average Day)

<u>Trip Purpose</u>	<u>No. of Trips</u>	<u>Average Occupancy</u>
Work	37,531	1.3
Business	18,586	2.1
Medical-Dental	2,607	2.7
School	5,982	3.1
Social-Recreational	60,598	3.2
Change Travel Mode	184	2.3
Eat Meal	4,023	1.5
Shopping	28,829	2.4
Serve Passenger	<u>19,696</u>	<u>2.3</u>
TOTAL	178,017	2.4

Table No. 6

TYPE OF PARKING USED BY GREAT FALLS MOTORISTS

<u>Type of Parking</u>	<u>Number Parked</u>	<u>%</u>
Legal curb	14,324	69%
Illegal curb	<u>957</u>	<u>4.6</u>
Subtotal-curb	15,281	73.6
Lots	5,439	26.2
Garages	<u>36</u>	<u>0.2</u>
Subtotal-offstreet	5,475	26.4
TOTAL VEHICLES PARKED	20,756	100.0

Table No. 7

PAY AND FREE OFFSTREET PARKING FACILITIES

<u>Type of facility</u>	<u>Number of facilities</u>	<u>Available Spaces</u>	<u>Percent of Total spaces</u>
Public free lots	4	124	4.6
Private free lots	54	1,120	41.8
Private free garages	<u>1</u>	<u>7</u>	<u>0.3</u>
Subtotal-Free facilities	59	1,251	46.7
Public pay lots-metered	13	477	17.8
Public pay lots-attendant	2	137	5.1
Public pay garages	2	120	4.5
Public pay lots Monthly rates	<u>25</u>	<u>695</u>	<u>25.9</u>
Subtotal-pay fac.	42	1,429	53.3
TOTAL-all facilities	101	2,680	100.0

Table No. 8

DISTANCE AND TIME ANALYSIS

<u>Trip purpose</u>	<u>Percent of All parkers</u>	<u>Average Dist. Walked</u>	<u>Ave. Time Parked</u>
Shopping	26.8	292 feet	39 min.
Business	22.4	238	32 min.
Work	14.4	336	2 hours 52 min.
Sales-service	5.7	184	40 min.
Load-Unload	1.3	109	29 min.
Other	20.6	199	53 min.
Unknown	<u>8.8</u>	<u>113</u>	<u>2 hours 16 min.</u>
TOTAL	100.0	251	1 hour 8 min.
Civic Center	34.7		
Bullseye's Supermarket #1	31.8		
Bullseye's Supermarket #2	20.2		
Garber Building	29.0		
Monteale Bank	30.6		
Mr. States Tel. & Tel.	24.1		
Coast to Coast Store	23.0		
Radisson Hotel	13.3		
Bullseye's Dept. Store	22.2		
TOTAL	5,875		832

Table No. 9

MAJOR PARKING GENERATORS

<u>Name</u>	<u>Number of Parkers</u>	<u>Parking Spaces Required</u>
Post Office & Fed. Bldg.	1,116	85
Safeway Supermarket	567	57
1st Nat. Bank Bldg.	416	70
Grear Falls Bank and Ford Bldg.	409	79
Sears-Roebuck Co.	386	53
J.C. Penney Co.	368	61
Paris of Montana	344	70
Civic Center	343	65
Buttrey's Supermarket #1	318	27
Buttrey's Supermarket #2	302	22
Barber Building	299	55
Montana Bank	296	29
Mt. States Tel. & Tel.	241	58
Coast to Coast Store	239	18
Rainbow Hotel	235	68
Buttrey's Dept. Store	<u>200</u>	<u>35</u>
TOTAL	6,079	852

Table No. 10

CURRENT NEED FOR PARKING SPACE

<u>Street</u>	<u>Between</u>	<u>Number of additional spaces required</u>
Central Ave.	Park Drive & 2nd Street	64
Central Ave.	3rd & 4th streets	103
Central Ave.	4th & 5th streets	105
Central Ave.	5th & 6th streets	155
Third Street	1st Ave. No. & Central Ave.	<u>88</u>
TOTAL Spaces Required		515

Table No. //

LOCAL CONDITIONS

Geographical

Great Falls is located approximately twenty five (25) miles north and seventy five (75) miles west of the center of the state of Montana. The specific global location is: 47 degrees 28 minutes north latitude and 111 degrees 15 minutes west longitude. The city is approximately 3330 feet above sea level.

Two rivers join in the south-west corner of Great Falls. The Missouri River enters the city from the south and the Sun River joins it from the west, as can be seen on the map on page 44. The Missouri River then continues through the metropolitan area, dividing Great Falls into two natural districts, east Great Falls and west Great Falls. The east side is the location of the main business district. In the northern part of town the river turns to the north-east forming a natural boundary between the city proper and the suburb of Black Eagle.

The city lies in somewhat of a transition zone between mountain ranges and plains. Much of the surrounding terrain consists of rolling, grass covered foothills. There are also many plateaus and benches in the Great Falls area, the majority of them being formed by the Missouri River several centuries ago.

The view to the west is of the foothills of the Rocky Mountains. Ranging from the north-west to the south-west are the Rockies themselves, which can be seen from Great Falls on a clear day. To the east and south one can view the Little Belt and Big Belt mountains which join the Rockies in the south-west. To the north are many of the plateaus and benches I have mentioned. Great Falls proper rises slightly from west to east.

History and Development

Great Falls is located near the confluence of the Sun River and the Missouri River. The name Great Falls is derived from a series of falls of the Missouri River located over a distance of about 15 miles downstream from the city. The first of these falls, Black Eagle Falls, is located on the north city limits of Great Falls and gives reason for the name Black Eagle to be given to the suburb to the north.

It is probable that trappers and explorers may have reached the Great Falls area during the 18th century, however, there is no historical record of such a visitation. During this period the Great Falls area was the domain of the warlike Blackfeet Indians and the range for immense herds of buffalo, elk, deer and antelope. The first recorded visit of a white man occurred during the Lewis and Clark Expedition of 1805-1806. (ref. 6 , page 9) Vol. I.

"The Great Falls area was originally part of the territory claimed by France. It was ceded to Spain in 1762, but was recovered by France 40 years later. It was sold to the United States as part of the Louisiana Purchase of 1803. Successively, it has been part of the Territory of Louisiana, Territory of Dakota, Territory of Nebraska, Territory of Idaho, Territory of Montana, and State of Montana, when statehood was achieved in 1889." (ref. 6 , page 9) VOL. I

Soon after the Louisiana Purchase, President Jefferson appointed Captains Meriwether Lewis and William Clark as heads of an expedition to explore these newly-acquired lands. Captain Lewis entered in his diary that the expedition had reached the Great Falls vicinity on June 14, 1805. He also mentioned the existence of an island below the uppermost falls on which an eagle had built a nest. Today, this is known as Black Eagle Falls, and is located near the Anaconda Company smelter and electrolytic refinery.

In 1806, on their return trip, Lewis and Clark again visited the Great Falls area and explored the area to the northwest of Great Falls which they omitted during the trip upstream in 1805.

From 1807 to 1845, the trapping and trading activity

grew considerably along the Missouri River. Trading forts were established in 1832 at Fort McKenzie, about 50 miles downstream from the Great Falls area, and in 1846 at Fort Benton, about 40 miles downstream.

"The Great Falls of the Missouri, which were later to provide the impetus for the founding of the city, were an obstacle to travel through the area in early days. The Lewis and Clark expedition had to portage its boats and supplies around these falls, and when navigation of the river developed, the head of the navigation was established at Fort Benton, about 25 miles below the lower falls." (ref. 6 ,page 9) vol. I.

As was the case in California, the discovery of gold in Montana brought in many prospectors, miners, and settlers. Fort Benton soon became a "boom town" because of its location at the head of river navigation. In 1867 an estimated 10,000 riverboat passengers passed through Fort Benton. The city also became the eastern end of a military road, located by Captain John Mullan in 1858, from Fort Benton to Walla Walla, Washington.

Because of the series of falls, the Great Falls area was inaccessible by regular travel and therefore was relatively inactive during this period. However in 1881 an engineer by the name of Paris Gibson, whom the founding of Great Falls is credited to, visited the

Great Falls area and recognized "the industrial potential of the area created by the undeveloped water power and the imminent construction of the Great Northern Railway through the northern part of the state." (ref. 6, page 10) VOL. I

In 1887, with the financial backing of James F. Hill of the Great Northern Railway, Mr. Gibson incorporated the Great Falls Waterpower and Townsite Company and in 1888 the city itself was incorporated.

Soon the falls of the river were harnessed which started industry in the Great Falls area. One of the first industrial ventures in Great Falls was a dam and hydro-electric plant at Black Eagle Falls. Other early established industries were a flour mill, smelting plant and a meat-packing plant.

By 1890 the population of the Great Falls area had reached 3,979 persons and in the next ten years the population grew to 14,390. The city experienced a slight decrease in population from 1900 to 1910 and has had a steady growth in population since. (table 1 , page 17)

Development

Much of the growth of Great Falls is due to the construction and operation of several hydro-electric dams at the various falls of the Missouri River. Because of this abundance of power, Great Falls has

been identified as the "Electric City." As of 1962, power production capacity amounted to about 220,000 kilowatts.

Because of this abundance of power many industries have developed in Great Falls. One of the principal industries, which was established near Great Falls as a result of the available power, is the large electrolytic refinery and mill near the Black Eagle Falls. Other industries include large railroad yards, a brewery, and an oil refinery.

Great Falls development also includes an International Airport with an average of 16 flights per day, two railroads, four bus lines, and nine truck lines.

Another big step in the development of Great Falls has been the establishment of Malmstrom Air Force Base. Today it is manned by 5,000 military personnel and 500 civilian employees.

Agriculture has also played a big part in the development of Great Falls.

Economic

The economic status of Great Falls has developed constantly along with the physical development. Many or all of the industries mentioned under the development of Great Falls play an important roll in this economic status.

"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. Great Northern Railroad Company
3. Anaconda 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 the 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." (ref. 9 ,page)

The Malmstrom Air Force Base has been an important contributor to the economy of the city for the last two decades. Originally established as a bomber-training base during World War Two, it has been used in later years as a center for bombers, fighters, military transport planes, and aerial refueling tankers. The latest and most important function is as a central center for a vast missile complex located within a radius of about 100 miles around the city. It is estimated that if dependents are considered, about one-fifth of the population of the city is connected in some manner with the activities of the air base.

The importance of agriculture to the area is reflected in the large number of business houses and related facilities that are associated with agriculture and livestock raising. Numerous agricultural equipment distributors and dealers have established in the city. It is estimated that 67 per cent of the grain production in Montana is processed through Great Falls mills.

"The comprehensive trade area of Great Falls ranges over a group of 20 counties with 242,000 population and an annual agricultural income of about \$208,000,000. The primary trade area covers 12 counties with a population of 166,000." (ref. 6 , page 10) Vol. I

Two other, just as important, industries to the Great Falls economy are the petroleum refineries and industries and the Great Falls Select Brewery.

Of course I can not begin to mention the numerous service industries in Great Falls. These are the industries which deal with trade goods not produced in the locality.

In the next few paragraphs, with the aid of tables taken from the 1960 United States Census, I would like to illustrate some facts on the labor force of the Great Falls area and their earnings.

The labor force has been broken down into age and sex and can be found on tables 12 and 13, pages 45 and 46. The 12 major occupations as chosen by the census bureau are presented on table 14, page 47. 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 shown on table 15, page 48.

Because my thesis is directly concerned with the automobile situation in Great Falls I have also included a detailed transportation breakdown on table 16, page 49.

All of these points help to show that Great Falls is economically sound and that a business venture such as a multi-story parking garage would not fail because of the economic status of the city.

Social

The social aspect in a specific locality is one that is very hard to analyze. This is basically due to the reason that the social category is more personal than it is public. Because of this we must rely more on facts that we can gain through such sources as the Bureau of the Census of the United States. This statistical analysis will cover marital status, families, households, and school enrollments. These subdivisions are supported by illustrations in the form of tables. They are briefly discussed in the next few paragraphs.

The marital and family status figures are found on table 17, page 50. They show the number and percentage of marriage status and single status by category. Table 18, page 51, relates the marriage statistics to families and households. All of the marital status statistics are from the census year of 1960 only.

Table 19, page 52, is a 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 in Great Falls. (table 20 , page 53) Again, these figures are for the year of 1960 only.

The numbers of persons and percentages enrolled in school by age, as well as by grade, can be found in table 21 , page 54, 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. (ref. 9 ,page)

A breakdown of the races of people in Cascade County is shown on table 23, page 56.

As in any town, Great Falls has the usual number of private clubs and organizations. There are seven fraternal organizations. They are:

1. BPO Elks Lodge
2. Demolay
3. Eagles
4. Elbon Club
5. Shriners
6. Masons
7. Scottish Rite

There are 10 private membership clubs. They are:

1. AAA Membership
2. Arlington
3. Electric City Boat Club
4. Elks
5. Great Falls Figure Skating
6. Great Falls Sports Car
7. Meadow Lark Country Club
8. USO
9. Union Club
10. V.F.W.

The Great Falls Meadow Lark Country Club affiliations are quite extensive with a large tract of land and numerous facilities located near the south entrance to the city.

Of course there are numerous smaller clubs and organizations which are not mentioned.

The night life of Great Falls offers a large degree of variation. There are 39 bars, 15 beer parlors, 6 bowling alleys, 10 cocktail lounges, 14 night clubs, 4 pizza parlors, 64 restaurants, and 5 taverns.

Climate

The climate of the Great Falls area can be considered as temperate. The atmosphere is generally clear allowing the city many bright days. The relative humidity is extremely low and would have to be classified as dry. The annual average temperature is 45 degrees Fahrenheit.

Approximately 15 inches of precipitation fall upon the Great Falls area in the course of a year in the form of rain fall. This would normally be classified as a semi-arid climate. However, the snow retention of the nearby mountains and rivers serve the water supply needs. Because of the winter "Chinook" winds, the 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 snow fall for Great Falls is 60 inches. (ref. 9 , page)

The major point of concern about the weather of Great Falls is the wind. Great Falls is known state-wide as the "windy city." The corner of Fourth Street and Central Avenue is sometimes called the windiest corner in the United States. The prevailing winds are from the south-west and have an average velocity of 25-30 miles per hour.

Frost is not a major problem in Great Falls. The average date of the first killing frost is September 10. The average date for the last killing frost is May 20. The average depth of frost penetration is 30 inches.

More complete data on the Great Falls climate is found on tables 24 - 27 , pages 57 - 60.

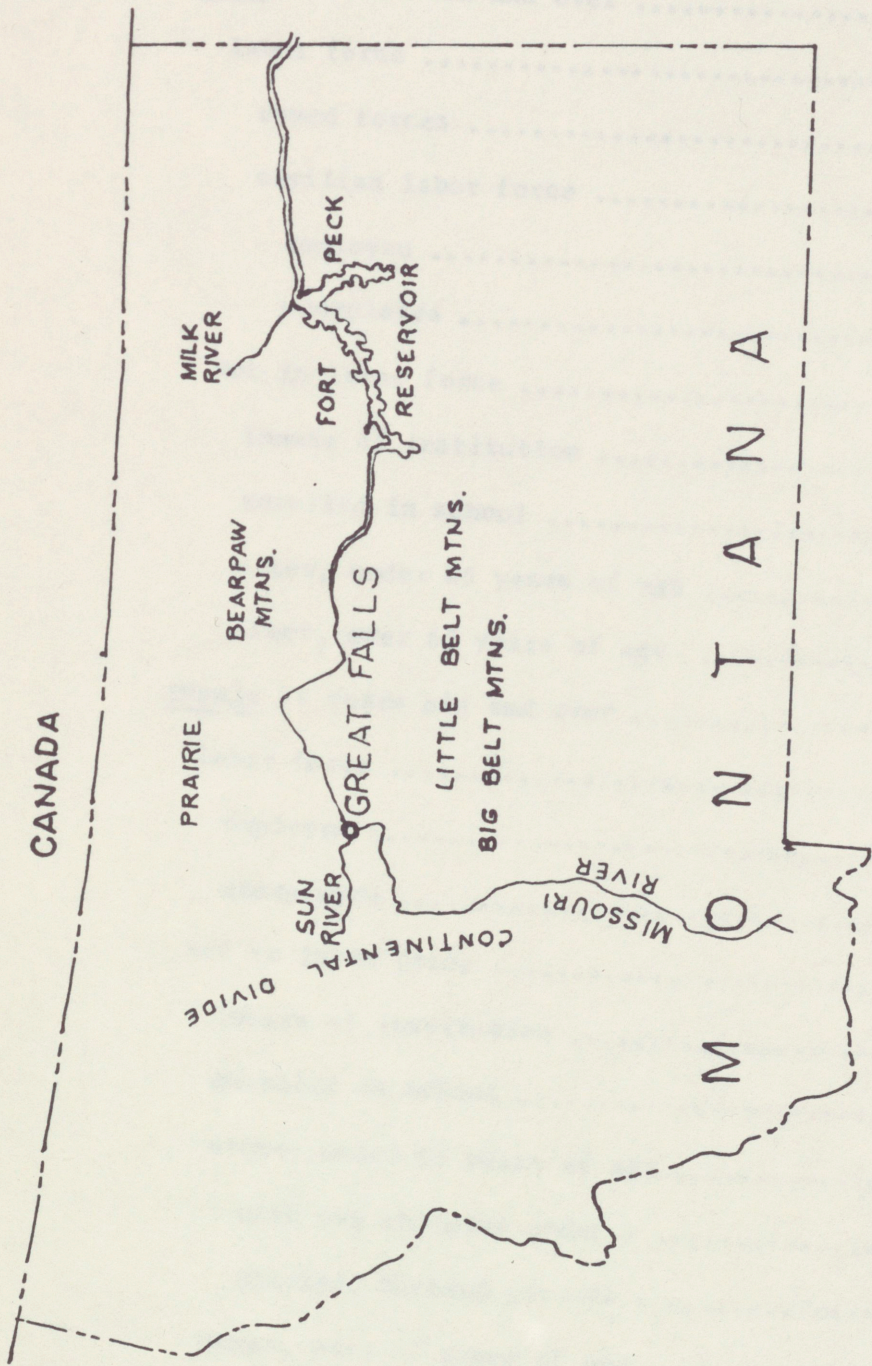


Illustration No. 3

GREAT FALLS MONTANA AND SURROUNDING GEOGRAPHICAL FEATURES

CASCADE COUNTY EMPLOYMENT STATUS FOR 1960

<u>Male</u> 14 years old and over	25,221
labor force	21,329
armed forces	4,187
civilian labor force	17,142
employed	16,158
unemployed	984
not in labor force	3,892
inmate of institution	137
enrolled in school	1,396
other, under 65 years of age	622
other, over 65 years of age	1,737
<u>Female</u> 14 years old and over	23,970
labor force	8,661
employed	8,026
unemployed	614
not in labor force	15,309
inmate of institution	100
enrolled in school	1,740
other, under 65 years of age	11,099
with own children under 6	5,367
married, husband present	5,221
other, over 65 years of age	2,370

AGE BREAKDOWN OF LABOR FORCE FOR CASCADE COUNTY

IN 1960

<u>Age</u>	<u>Great Falls (S.M.S.A.)</u>		<u>Cascade County</u>	
	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 or over .	723	379	900	429

Table No. 13

FAMILY INCOME IN CASCADE COUNTY IN 1960

OCCUPATIONS OF THE LABOR FORCE FOR THE GREAT FALLS AREA

FOR 1960

<u>Occupation</u>	<u>Number</u>	
	<u>Great Falls (S.M.S.A.)</u>	
	<u>Male</u>	<u>Female</u>
employed	16,158	8,026
professional, technical and kindred workers	1,491	1,396
farmers and farm managers	886	8
managers, officials, and proprietors, excluding farm	2,344	487
craftsman, foreman, and kindred workers	3,612	51
operatives and kindred workers ..	2,414	327
clerical and kindred workers	1,056	2,471
sales workers	1,358	789
private household workers	31	675
service workers, excluding private household	902	1,471
farm workers, unpaid family workers	417	73
farm labor, excluding unpaid and farm foreman	-	-
laborers, except farm and mine ..	1,116	16
occupation not reported	531	362

Table No. 14

FAMILY INCOME FOR CASCADE COUNTY IN 1960

All Families ... 18,236

<u>income</u>	<u>number</u>
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 over	190

Table No. 15

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. 16

MARITAL STATUS FOR CASCADE COUNTY IN 1960

<u>Male</u> 14 years old and over	25,223
single	6,388
married	17,115
percent married	67.9
separated	188
widowed	800
divorced	920

<u>Female</u> 14 years old and over	23,968
single	3,801
married	17,022
percent married	71.0
separated	243
widowed	2,396
divorced	749

Table No. 17

MARRIED COUPLES AND FAMILIES FOR CASCADE COUNTY IN 1960

Married couples	16,753
with own household	16,622
with own children under 6	6,814
with own children under 18	10,838
with husband under 45	10,076
with own children under 18	8,477
Families	18,236
husband-wife families	16,622
with own children under 6	7,062
with own children under 18	11,585
unrelated individuals	6,861
persons under 18 years of age	28,359
living with both parents	25,826

Table No. 18

Page 51

HOUSEHOLD RELATIONSHIPS FOR GREAT FALLS IN 1960

<u>Category</u>	<u>Great Falls (S.M.S.A.)</u>
total	73,418
in households	71,103
head of household	22,187
wife of head	16,269
other relative of head	4,393
non-relative of head	1,046
in group quarters	2,315
population per household	3.20
married couples, % without own household	0.8%
% of families with own children under 6 ...	38.7%

Year moved into present house

total	73,418
1959-1960	22,241
1958	8,329
1957	3,768
1954-1956	10,268
1950-1953	7,628
1940-1949	7,572
1939 or earlier	5,989
always lived in this house	2,087

Table No. 19

HOUSEHOLD RELATIONSHIPS FOR GREAT FALLS IN 1960

<u>Category</u>	<u>Great Falls (S.M.S.A.)</u>
total	73,418
in households	71,103
head of household	22,187
wife of head	16,269
other relative of head	4,393
non-relative of head	1,046
in group quarters	2,315
population per household	3.20
married couples, % without own household	0.8%
% of families with own children under 6 ...	38.7%

Year moved into present house

total	73,418
1959-1960	22,701
1958	8,247
1957	3,768
1954-1956	10,266
1950-1953	7,422
1945-1949	7,572
1939 or earlier	3,399
always lived in this house	2,082

Table No. 19

STABILITY OF RESIDENCE FOR GREAT FALLS IN 1960

<u>Residence in 1955</u>	<u>Great Falls (S.M.S.A.)</u>
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	5,913
different state	12,126
abroad	1,918
moved, residence in 1955 not reported	514
 <u>Year moved into present house</u>	
total	73,418
1959-1960	28,701
1958	8,225
1957	5,768
1954-1956	10,268
1950-1953	7,628
1940-1949	7,372
1939 or earlier	3,369
always lived in this house	2,087

SCHOOL ENROLLMENT FOR CASCADE COUNTY FOR

1950

no school years completed	.....	275
elementary 1-4 years completed	.....	1,380
5&6 years completed	.....	1,505
7 years completed	.....	1,340
8 years completed	.....	6,790
high school 1-3 years completed	.....	4,790
4 or more years completed	....	8,430
college 1-3 years completed	.....	3,325
4 or more years completed	.....	2,096

number enrolled in school by age

5 and 6 years old	.....	730
7-13 years old	.....	5,580
14 and 15 years old	.....	1,200
16 and 17 years old	.....	995
18 and 19 years old	.....	415
20-24 years old	.....	330
25-29 years old	.....	95

Table No. 21

SCHOOL ENROLLMENT FOR CASCADE COUNTY FOR

1960

total enrolled 5-34 years of age	18,149
kindergarten, total	1,526
public	1,397
elementary (1-8 years) total	11,963
public	9,915
high school (1-4 years) total	3,915
public	3,183
college, total	709

number enrolled in school, by age

5 and 6 years old	2,307
7-13 years old	10,464
14 and 15 years old	2,090
16 and 17 years old	1,727
18 and 19 years old	653
20 and 21 years old	229
22-24 years old	201
25-34 years old	478

Table No. 22

RACES OF CASCADE COUNTY IN 1960

total 73,418

Race

male 37,444

white 36,609

negro 334

indian 371

japanese 32

chinese 19

filipine 54

other races 25

female 35,974

white 35,250

negro 183

indian 377

japanese 83

chinese 7

filipine 52

other races 22

Table No. 23

CLIMATE CHARACTERISTICS FOR THE GREAT FALLS AREA

TEMPERATURE

Month	Averages			Extremes			
	Daily Max.	Daily Min.	Monthly	Highest	Date	Lowest	Date
Jan	24.6	0.9	12.8	55	7	-26	11
Feb	48.1	25.4	36.8	64	6	-13	2
Mar	50.0	28.7	39.4	71	22	16	12
Apr	53.6	32.2	42.9	79	14	19	2
May	65.9	39.8	52.9	85	31	30	4
Jun	72.8	50.0	61.4	90	18	38	23
Jul	84.5	53.2	68.9	100	22	42	1
Aug	84.2	53.3	68.8	97	7	44	2
Sep	77.9	50.1	64.0	91	27	38	16
Oct	66.3	41.9	54.1	85	2	23	31
Nov	48.6	28.6	38.6	65	14	-4	21
Dec	31.8	15.2	23.5	59	31	-19	13
Year	59.0	34.9	47.0	100	Jul. 22	-26	Jan. 11

Table No. 24

CLIMATE CHARACTERISTICS FOR THE GREAT FALL AREA

PRECIPITATION

Month				Snow, Sleet		
	Total	Most in 24 hrs.	Date	Total	Most in 24 hrs.	Date
Jan	1.71	0.37	9	17.7	3.9	9
Feb	0.32	0.25	1	3.2	2.5	1
Mar	0.35	0.13	5	3.9	1.1	5
Apr	1.24	0.56	16-17	11.1	5.6	31-1
May	1.27	0.66	11-12	-	-	11
Jun	2.88	0.78	21	0.0	0.0	
Jul	0.96	0.62	5	0.0	0.0	
Aug	0.49	0.17	25	0.0	0.0	
Sep	0.87	0.39	15-16	0.0	0.0	
Oct	0.63	0.29	5-6	0.0	0.0	
Nov	0.21	0.19	20-21	2.1	2.1	20-21
Dec	1.02	0.40	8-9	10.6	4.0	8-9
Year	11.95	0.78	Jun. 21	48.6	5.6	Apr. 31-1

Table No. 25

CLIMATE CHARACTERISTICS FOR THE GREAT FALLS AREA

RELATIVE HUMIDITY

Month	5:00 A.M. MST	11:00 A. M. MST	5:00 P.M. MST	11:00 P.M. MST
Jan	66	61	63	69
Feb	65	53	45	64
Mar	59	43	32	54
Apr	72	51	44	66
May	71	45	37	57
Jun	76	49	44	63
Jul	63	36	27	48
Aug	61	35	23	42
Sep	64	42	33	51
Oct	58	42	35	53
Nov	48	38	37	44
Dec	63	57	58	61
Year	64	46	40	56

Table No. 26

CLIMATE CHARACTERISTICS FOR THE GREAT FALLS AREA

Month	<u>WIND</u>		Fastest Mile		
	Aver. hr. Speed	Prevailing dir.	Speed	Dir.	Date
Jan	16.2	SW	44	NW	9
Feb	14.1	SW	41	SW	3
Mar	14.6	SW	35	SW	29
Apr	12.5	SW	36	SW	15
May	10.1	WSW	34	NW	7
Jun	11.2	SW	38	SW	29
Jul	10.4	SW	43	W	14
Aug	8.9	WSW	33	W	6
Sep	10.1	SW	34	SW	14
Oct	12.5	SW	38	SW	25
Nov	16.4	SW	42	SW	26
Dec	14.2	SW	51	SW	31
Year	12.6	SW	51	SW	Dec. 31

Table No. 27

S I T E

SITE CONDITIONS

Location and Orientation

The site I have chosen is in the heart of the Central Business District of Great Falls. It is located on the south-west corner of the intersection of Fifth Street and First Avenue North. The site is a full one-quarter block, extending from First Avenue North to the alley between First and Central Avenue, and west from Fifth Street approximately one half the distance (160 feet) to Fourth Street.

Fifth Street runs due North and South and First Avenue North runs due East and West. Because of this and the orientation of my proposed building with respect to the surrounding buildings, it will be necessary to take only morning sun conditions into consideration. Sun angle diagrams can be found on table 4 , page 69. A map of Great Falls and the location of the site is found on illustration no. 5 , page 70.

Adjacent Environment

The adjacent land is used for a variety of business establishments. On the one-quarter block to the west of the site is the Firestone building which includes a service station, a wholesale tire shop, and a tire repair shop. This building is two stories high with

a two story concret block wall adjoining the site. This wall has no openings in it and extends approximately three-quarters the distance from First Avenue North to the alley.

Directly behind the site, just across the alley, is a three story building which houses a photo shop, a sewing shop, a finance company, a beauty salon, a women's style shop, and a jewlery store, on the ground floor. The second and third floors are professional offices and the Russel apartments. Right next to this building is the Johnson Hotel building.

Just north of the site, across First Avenue North, is the Montana Bank. Going west from the Montana Bank on First Avenue North is a realty company, an office supply firm, a land and title company, a paint store, and the Mountain States Telephone district office.

North-east, across the intersection of First Avenue North and Fifth Street, is a professional building, a realty company, and a bowling alley.

East of the site, across Fifth Street, is the Great Falls Federal Savings and Loan building. Also in this building is a beauty shop, a record shop, and a title and insurance company.

South of the Great Falls Savings and Loan building, on the same side of the street, is the Buttrey's Department Store building. To the east of the Savings and Loan building is another professional building. This building includes approximately 25 offices.

Two other important buildings in the immediate location are the Court House, two blocks away, and the post office, three blocks away.

The two bank buildings which I have mentioned have been built within the last 10 years, while the remainder of the surrounding buildings are more than 20 years old. The two new buildings use glass fascades, while the older buildings are mostly masonry.

As one can see, the building must act as a transition from old to new.

Topography, Vegetation and Natural Features

The site chosen can be considered perfectly flat.

It is the standard curb height of 6 inches above the two adjoining streets. It is bounded by streets on the north and east and an alley on the south. For this reason it is accessible from three sides.

There is no vegetation on the site; however, I do propose that vegetation will be incorporated into the design of my building.

At present the site is occupied by a service station and an 8-stool restraunt. A utility pole is located on the south-west corner of lot.

Zoning Regulations

Great Falls adopted its present Zoning Ordinance about 1960. Along with this ordinance it has also adopted the use of the Pacific Uniform Building Building Code.

In the Great Falls Zoning Ordinance the proposed building would be refered to as a "Public Garage." Thus the building falls into the "D" classification as far as height and area are concerned. Two regulations must be met from this ordinance: (ref. 3 , pages 7, 10, and 12)

1. 4-9-16: "D" AREA DISTRICTS:

"Building Area: No building with its accessory buildings shall occupy, at the sill level of the second story windows nor higher than twenty feet (20') above the curb level, more than ninety per cent (90%) of the area of an interior lot. A building situated on a corner lot may occupy the entire lot.

2. 4-9-23: "D" HEIGHT DISTRICTS:

"In "D" Height Districts no building shall be erected or altered to a height in excess of one hundred feet (100') or eight (8) stories.

All other compliances there do meet with the Pacific

Uniform Building Code unless specifically stated differently in the city zoning ordinance.

Soil Analysis

A soil profile shows that water will be a definite problem if any excavation is to be done below the 4 foot level on the site. This becomes a deciding factor in picking a foundation system.

Bedrock lies at a depth of 22 feet. Piles can easily be driven to this depth to set the building on.

The top 4 feet is a composite fill material. From 4 feet to 12 feet down the soil is a saturated sand. From 12 feet to 22 feet down lies a layer of wet plastic clay.

It is evident that below 4 feet water will become a major problem and that if a slab is to be poured it must be a "floating" slab. This naturally adds expense during construction.

Prevailing Winds

The prevailing winds are from the south-west. The average wind velocity is 25 to 30 miles per hour. The maximum wind velocity is 70 miles per hour.

Immediate and Distant Views

The only views available from street level are those of the surrounding buildings. However, from the proposed second, third or fourth floors one would be able to view most of Great Falls and the surrounding area to the north and east.

The immediate views of the site and surrounding buildings are shown by the photographs, illustrations on pages 77 - 78.

Availability of Utilities

All utilities are readily available to the site.

Power and telephone lines run down the north side of the adjacent alley. These utilities are hung from poles. There is also a gas line buried in this adjacent alley.

Buried beneath Fifth Street are the water and sewage lines; both sanitary and storm sewers are located here.

Traffic Patterns

The site is bounded on the north and east by streets.

Fifth Street, running north-south, is a two way street. First Avenue North, running east-west, is a one way

street going east.

Fifth Street consists of two traffic lanes and two parking lanes at the curbs; there are 3 parking meters at the site.

First Avenue North consists of three traffic lanes and two parking lanes at the curbs; there are 6 parking meters at the site.

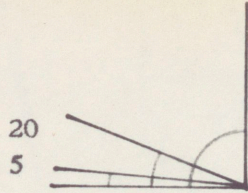
90% of all traffic activity on these two streets takes place from 6 A.M. to 10 P.M. During this time 616 cars go south on Fifth Street; 695 cars go north. Of these, 932 cars turn onto First Avenue North. Also, during this time 7630 cars pass the site on First Avenue North. Of these, 190 cars turn right and 168 cars turn left onto Fifth Street. (ref. 6 , page 30) VOL. III

Between the above mentioned hours an average of 13.2 cars park in the available parking spaces, per space. (ref. 6 , page 62)^{VOL. I} The majority of these parkers are on business, not shoppers, and park on an average of nearly 15 minutes.

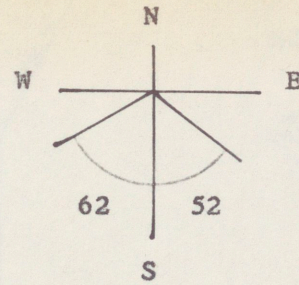
The intersection is controlled by electric stop lights.

It is not ranked as one of the 10 most dangerous corners as far as accidents.

SUN ANGLES FOR GREAT FALLS

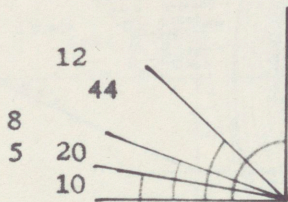


DECEMBER

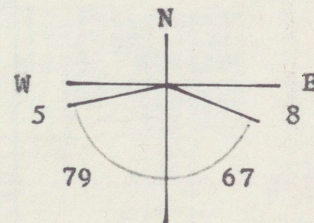


SUN ALTITUDE
AT 8:00 AM
12:00, 5:00 PM

SUN AZIMUTH
AT 8:00 AM
12:00, 5:00 PM

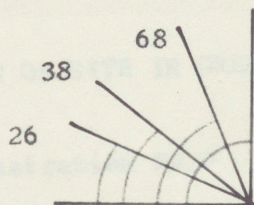


MARCH
AND
SEPTEMBER

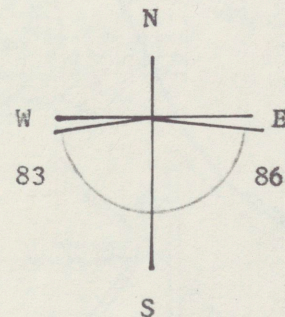


LATITUDE 47 28' NORTH
LONGITUDE 111 15' WEST

ALTITUDE APPROX. 3300'

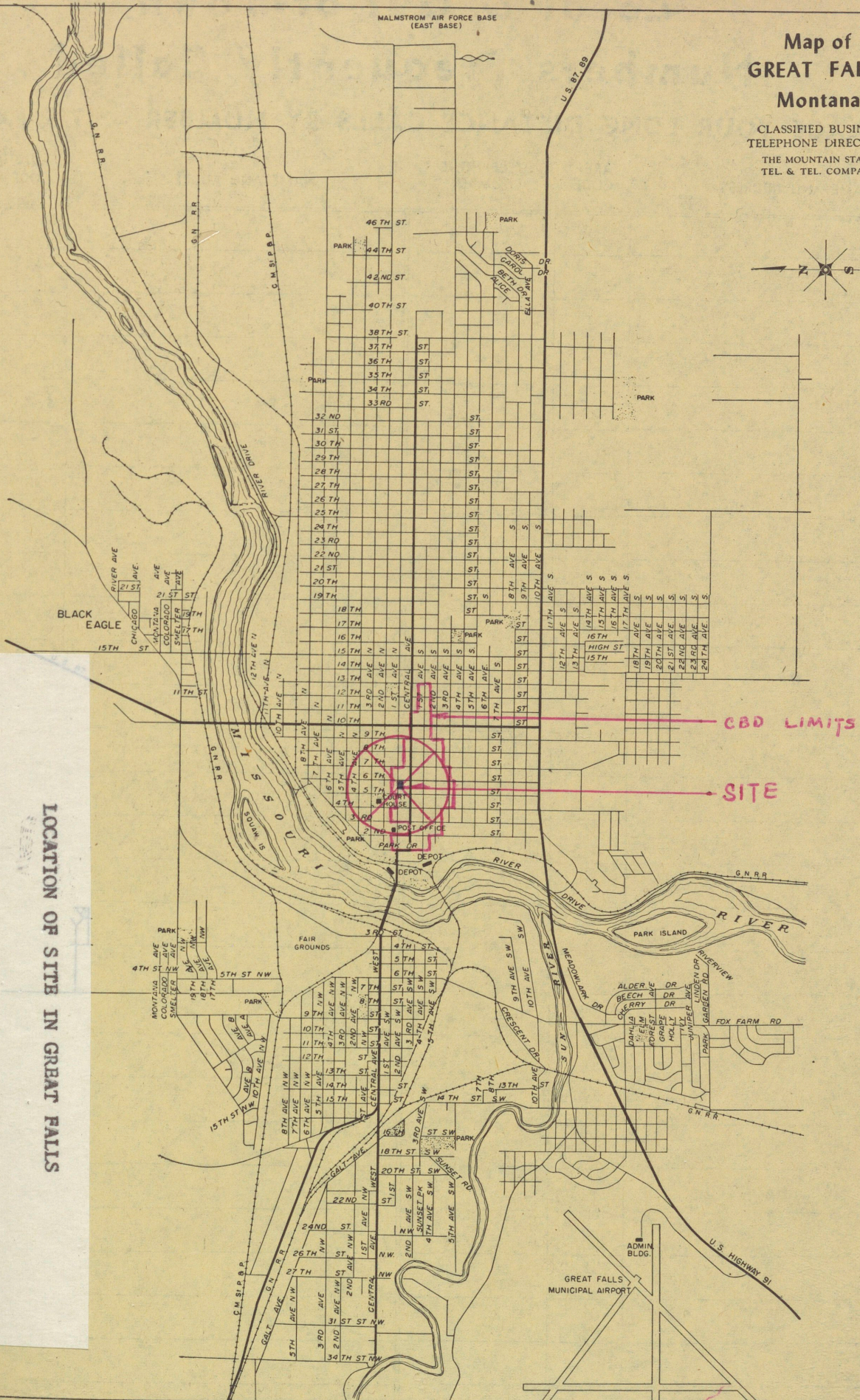
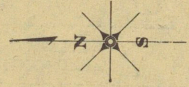


JUNE



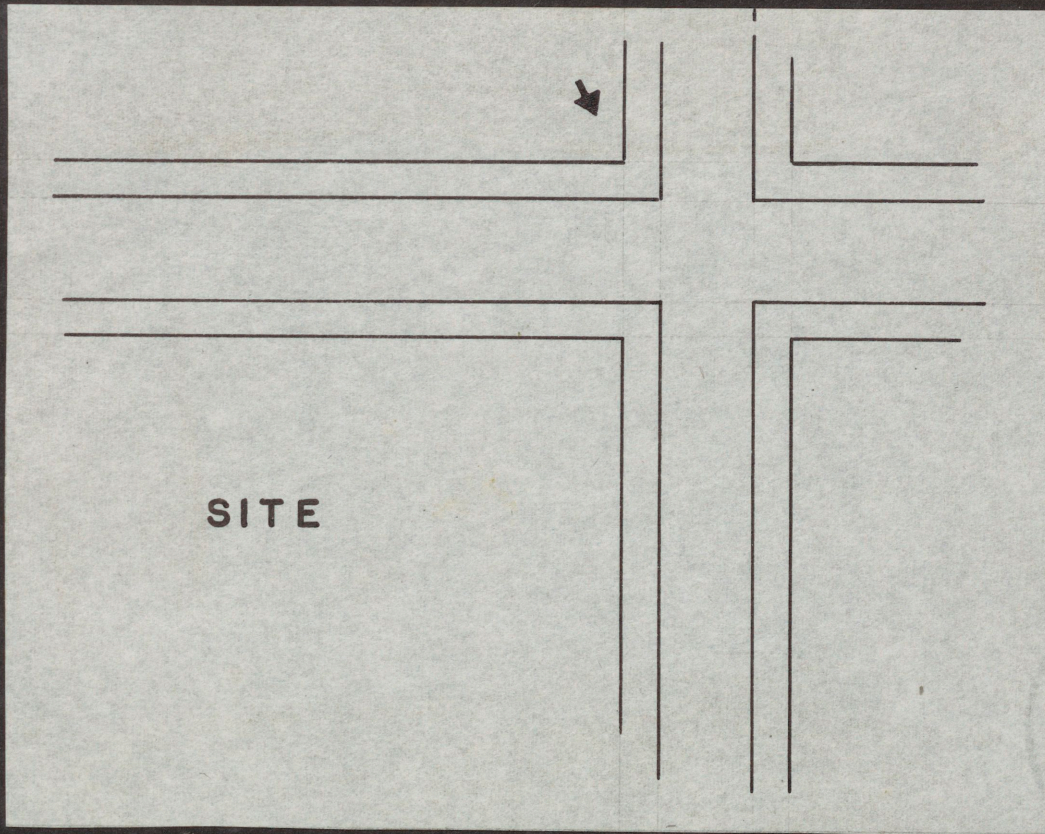
Map of GREAT FALLS Montana

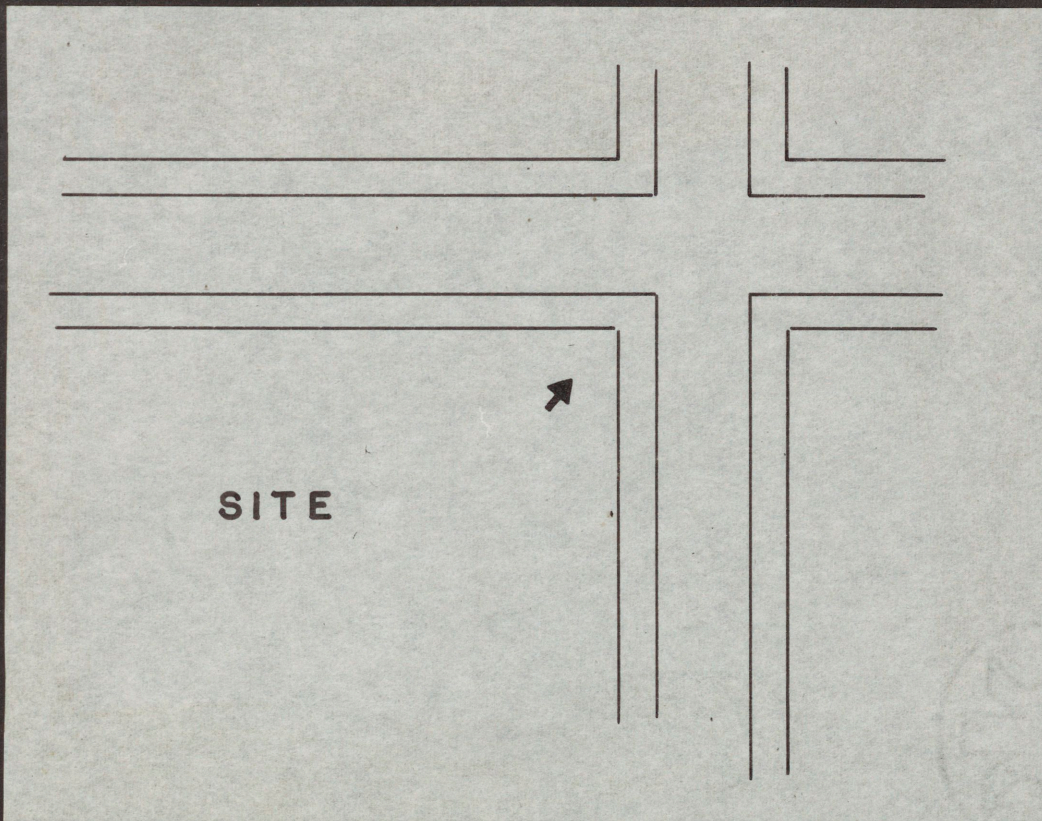
CLASSIFIED BUSINESS
TELEPHONE DIRECTORY
THE MOUNTAIN STATES
TEL. & TEL. COMPANY

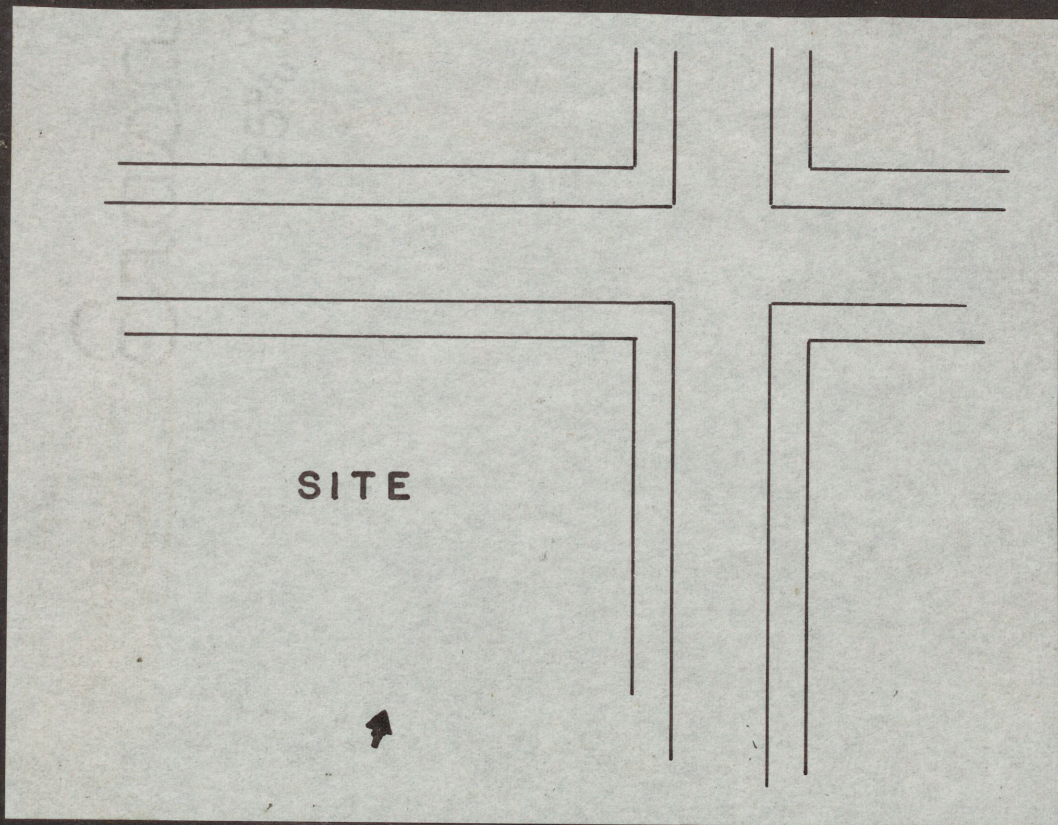


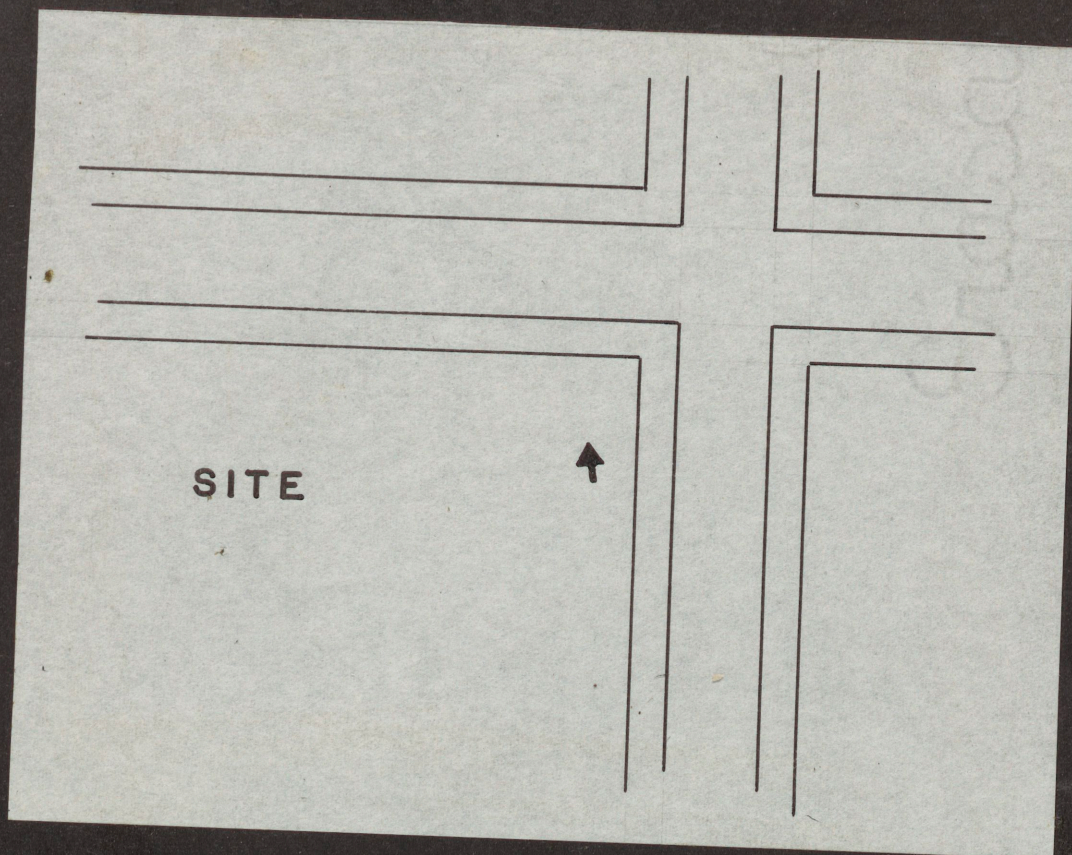
LOCATION OF SITE IN GREAT FALLS

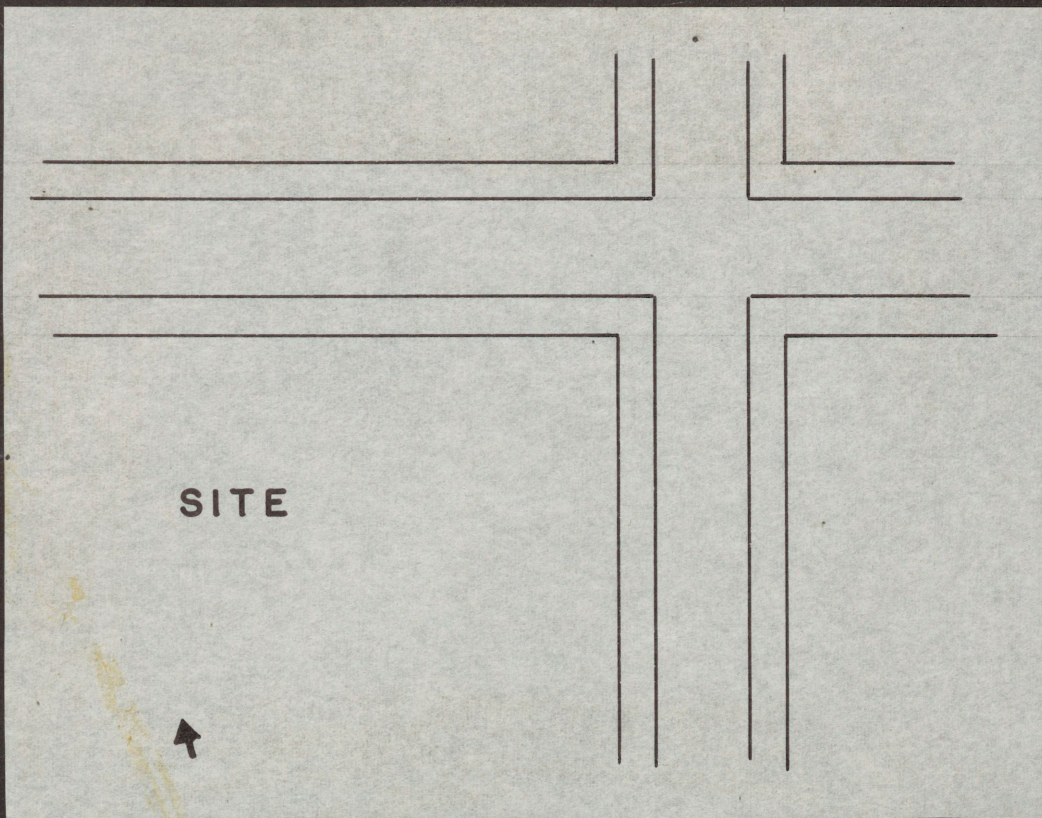
Illustration No. 5

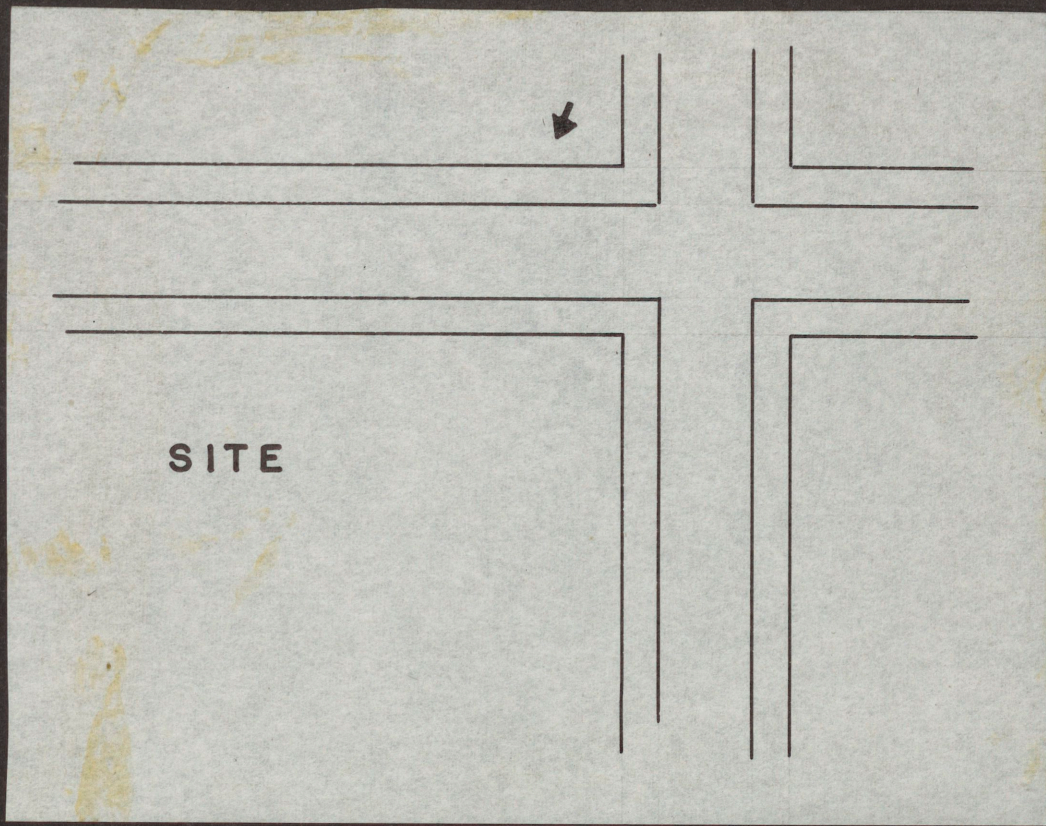


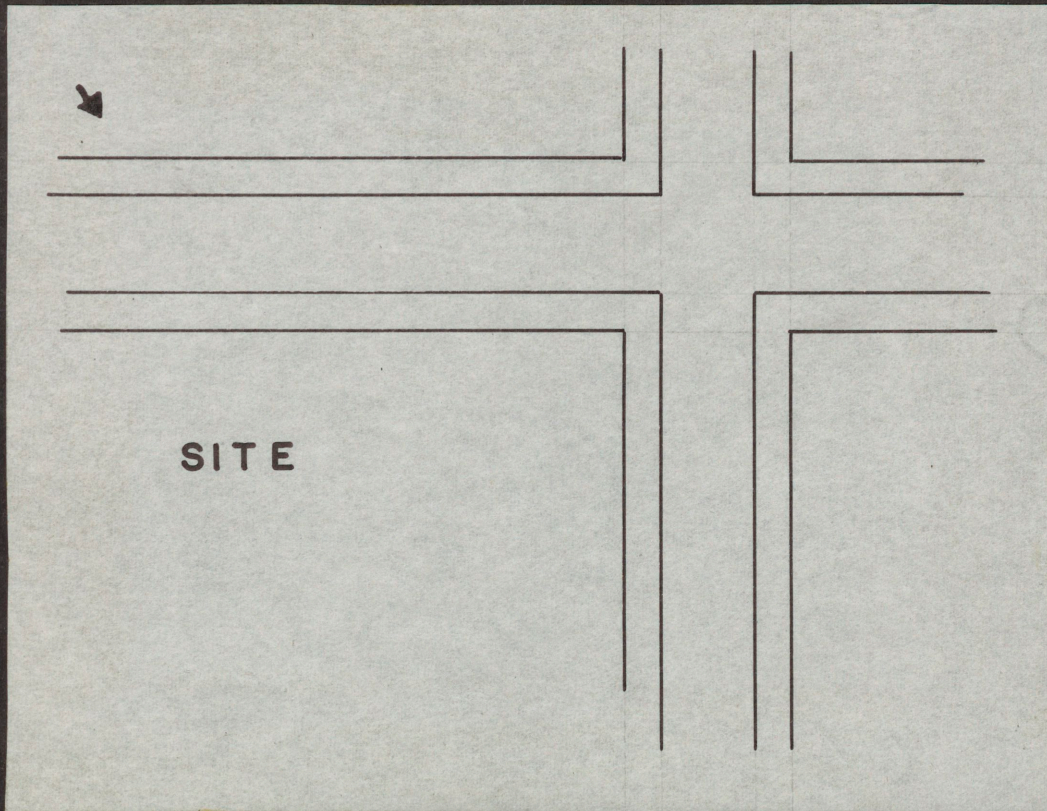


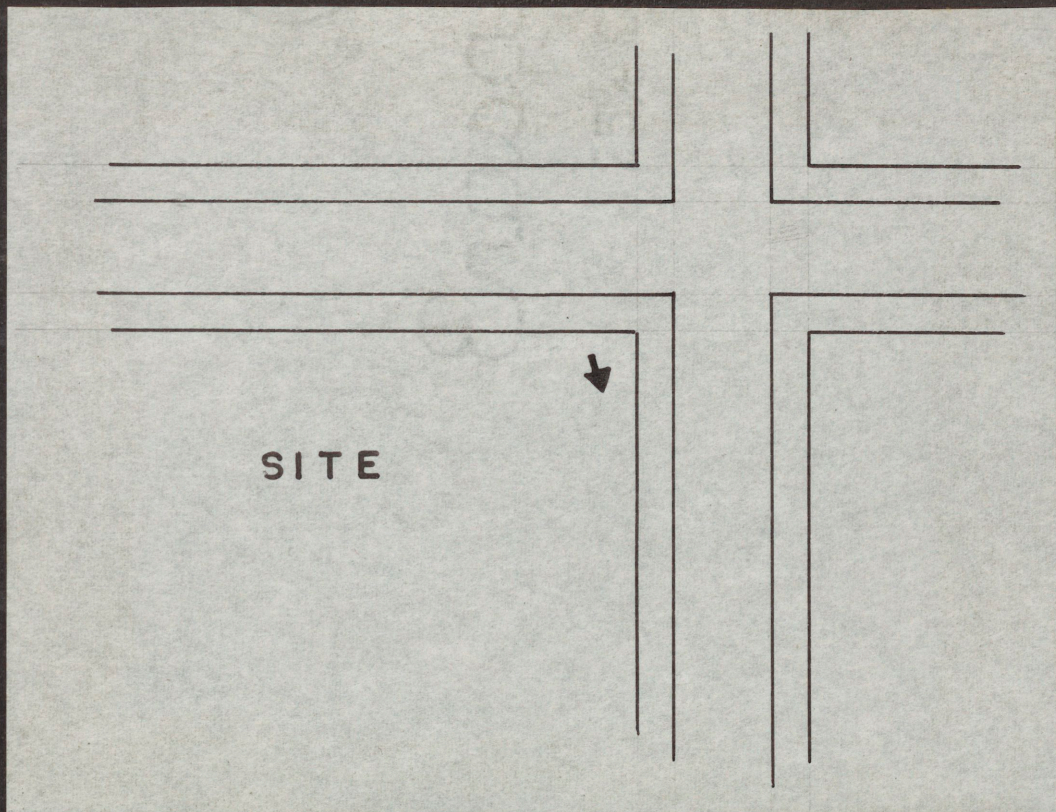












FUNCTION

FUNCTION OF THE BUILDING

The major function of the building is to provide space to park automobiles. Two other functions to be considered are to provide adequate circulation of the parkers once they leave their car and to house a service station.

The building will be approached from the fifth street side. This approach will also provide access to the service station area. Upon entering the building the customer will stop at one of two gates. These gates will be coin operated. On the drivers side of each lane of traffic will be a coin box and change machine combination. When a customer deposits the required coins in the coin box, the gate will automatically go up. The machine will also provide each customer with a card which has been automatically punched as to the time he entered. If he overparks he simply presents the card to an employee at the exit and pays for the overparked time. From this point the customer has two choices; he may continue on to a parking area or he may let an employee attend to his car.

There will be parking on all four floors of the building. Electric signs will show if a floor is full. The ground floor entry will be immediately ahead and to the left of the building entry. If it is necessary for an auto to continue to one of the three upper floors he will proceed forward and to the right, where the two lanes of traffic will converge and lead to a ramp. These

ramps connecting the floors will have a grade no greater than four (4) per cent and be 12 feet wide. Once leaving the ramp on one of the floors, arrows painted on the floor will direct customers, who wish to park their own cars, to a parking stall.

Each parking stall will be 8 1/2 feet wide and 20 feet long. The stalls will be at a 60 degrees^s to the lane of traffic for ease of parking.

The main floor will have accommodations for approximately 50 cars, while each of the remaining three upper floors will accommodate approximately 80 cars.

The top floor will be reserved for businessmen who will be parking by the month. It is my feeling that these businessmen would not have any objection to having to park on this floor. Also, it would leave the more desirable floors for the customers who are more concerned with time. Most customers are in a hurry and would therefore be hesitant on parking on the top floor.

Of course, an efficient means of exit is as important as that of entering. Therefore, I have proposed a separate set of ramps for the exit route. These ramps will be identical to those at the entrance, except

that they will be on the south side of the building and will come out on the alley side of the service station. This set of ramps will have a control booth at the exit point. This control booth will be manned by one employee. Upon approaching this booth the customer will present his time card to the employee. The employee will examine the card for overparking. If the customer has overparked he will pay his remaining fee and the employee will push a button and raise the gate. The customer can proceed onto the street.

Customer Circulation

It is important that a customer that parks his own car be able to exit the building in a safe, swift manner. For this reason I have provided three means of egress. Each of the ramp systems will have a 4 foot walkway on the interior side. These ramped exits provide a good means of egress for handicapped persons.

The third means of egress will be an open stairway in the center of the building providing easy access for all parkers. These stairs must be fairly wide, approximately 6 feet, as they will be the principal means of foot traffic. These stairs will be connected with all parts of the building with safety areas laid out on the floors, so that one's life is not endangered by auto traffic on the floor.

I have chosen not to incorporate elevators, neither public nor automobile, because of the major added expense and increase of time consumption per trip.

Service Station

The Service station will be located on the Fifth Street side of the building and just south of the center of that side. The station will be set back under the structure so that protection from the weather is provided for the customers.

It is imagined that some of the parkers will patronize this station daily.

The station is to include:

1. Office
2. Restrooms
3. Service area
 - a. grease rack
 - b. wash rack
4. Tire repair area
5. General Storage area
6. Two pump islands

The office will include a desk and ample display area.

Enough room should be provided for vending machines.

The restrooms shall be large enough to service the station and the parking garage. Therefore, the restrooms should have two sets of doors in each, one set entering from the station and one set from the garage side.

The service area shall include the two racks mentioned and all the facilities included in these two areas. In the front of this area shall be the work area and work bench. Adjoining this area would be the tire repair area.

Behind the service and tire repair area would be the general storage area. In this area would be room for tires and all petroleum goods, such as oil.

Beneath the station would be the mechanical room for the station and the entire parking garage. In this room would be all of the electrical controls for lights and electrical equipment. Also included would be the heating system and pumping system for the radiant slab heating for the garage. The station would be heated by a local heater in the storage area. The hydraulic system for the racks would be in this room. The air compressor for the islands would also be included.

The pump islands would be in front of the station on the Fifth Street side. Each island would include two pumps with each pump containing a regular and ethyl pump. No display will be provided on the islands.

The lighting in the entire building, service station

pump area included, will be incorporated into the ceiling.

Enviromental Protection

Due to the fact that the building will be housing automobiles, it will be necessary to have the building partially open. What I mean is that the sides will not be enclosed by walls or glass. However, a certain amount of enviromental protection must be incorporated. For these reasons I have proposed that the south and west walls shall be solid and the north and east walls, the two street sides, be open with the exception of the service station.

On the north and east fascades I have proposed vertical, parallel uprights approximately 2 feet on center. These uprights will furnish a pleasing look to the building and some protection from the winds. They will also act as a sunscreen so that a minimun of glare is produced on the interior of the building.

Lot

On the south side of the lot, the alley side, the building will be set back 20 feet on the ground floor. I have done this to provide an area for the burial of the gasoline storage tanks and to provide parking

for eight cars. This should be more than enough room for the cars of the employees.

On the west side is the Goodyear building which has a solid, two-story wall which can be use as a party wall for the first two floors of my building.

On the north side, the First Avenue North side, the building will extend right up to the sidewalk. This is legal under the Great Falls City Zoning Ordinance.

On the east side the ground floor will be set back 30 feet to provide room for the service station pump islands and to make room for the cars to pull up to the entrance gates. The upper floors will overhang this area out to the sidewalk.

A planter area is proposed between the service station area and the entrance area, to provide for vegetation.

The overall building will be approximately 130 feet by 160 feet and four stories high.

With the major function of the building being to house automobiles, it is only natural that the most consideration be given to the parking and circulation layout on each floor and therefore the service station will gain the least attention during the design and planning stages.

AESTHETICS

AESTHETIC CONSIDERATIONS

The aesthetics of a building such as a multi-story parking garage are governed by many factors which fall into the areas of city and national building codes, structure, and economy. The necessity of having major portions of the building open to provide proper ventilation, and height limitations are decisive factors in the choice of materials. Fire regulations and the functionability of the building give reason for a cubical box-type proportions. Plus, the building must be built for as low a price-per-square foot as reasonably possible. Putting these restrictions, and many more, together and coming up with an aesthetically pleasing solution has been a problem man has faced since the opening moments in the field of architecture.

I believe that the aesthetics of a building are a very personal thing, that is, no two people will ever agree on what beauty really is. Therefore, I feel it necessary to explain my feelings on this topic. My philosophy is that beauty lies in simplicity. This simplicity can be created through the use of materials, modular layout, organized random layout, choice of color and many other such topics. I do not believe in the "frilly lace" approach which is beautiful or striking today but grows old and sickening by tomorrow. However, being a student of architecture, I must accept the fact that man will

sometimes design with a feeling of compassion rather than a logical reasoning process.

Neglecting the many limitations that affect a design, I shall try to put forth my ideas on the subject of aesthetics, those I would try to get across to my hypothetical client for the proposed structure. The structure must be simple and self-explaining with a feeling of security. This can be accomplished by using a concrete structure rather than a steel structure. The concrete structure will be more massive and the simple horizontal and vertical lines will require very little in the line of a facade. The structure will explain what is going on inside the building as well as what is on the outside. This building should be dignified and not a sore thumb for the downtown business district of Great Falls. This can be achieved through the use of a concrete screen wall or other architectural faces. However, the faces must be used sparingly and with extreme thought and decision concerning their placement. Very few interior partitions should be used so that one does not create a tight or boxed-in feeling within the structure.

The surrounding environment is created by the two new

banks and the several loan companies. Therefore, the building should create a feeling of dignity. As I have stated before, this can be accomplished without adding frills and sticking to a simple, modular, break-up of the exterior.

Due to the fact that the ground floor will incorporate a service station, one must incorporate a pleasing focal point in such a location that the service station will not become, or appear to be, the main function of the building. This can be achieved through the use of a pleasing section of landscaping. This would give the building a touch of elegance without the frills or gaudiness of such a thing as a neon sign.

The lot being a corner lot and extending from the street to the alley, gives the building an alley face on the south and a possible party wall on the west. This gives reason for a nearly solid wall on the mentioned sides, thus offering weather protection to my building.

The interior of the building must be elegant, simple, organized and clean. One must not feel ashamed to park his auto in any part of the building.

ECONOMICS

ECONOMIC CONSIDERATIONS

Introduction

Because the quantities of materials will not be known until the preliminary design is completed, the segregated method of estimating will not be used. However, if a segregated estimate is ever needed, the following list is suggested:

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 condations, 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 realestate during construction
- D. Insurance
- E. Financing expenses, 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 elements composing rent:

1. Operation and maintenance

- A. Costs of fuel, electricity, gas payroll, phones, trash removal, water, repairs, renting and administration, insurance, taxes, and miscellaneous small items.

B. Allowance for slack parking hours

2. Financial expenses

- A. Interest
- B. Depreciation reserves
- C. Maintenance reserves

3. Profit and income taxes

Construction costs

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

Class A - Building having fireproof 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 fees, overhead, and profit.

Class	Type	Cost per sq.ft. in dollars
A	Average parking	9.52
B	Good parking	7.32
	Average parking	5.90
	Low cost parking	4.88
C	Parking basement	4.91
D	Parking basement	4.64

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

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

<u>Class</u>	<u>A</u> <u>Building</u>	<u>B</u> <u>life</u>	<u>C</u> <u>in</u>	<u>D</u> <u>years</u>
Average and good parking garages	40	40	-	-
Low cost parking garages	-	35	-	-

Using the above figures and a rough estimate of \$40,000 for the proposed service station, the total base figure is approximately \$764,248. This is figured in the following manner:

Assuming the structure to be a class B, good structure, the price per sq. ft. is \$7.32.

Area is approximately 140 ft. by 160 ft.	=	22,400 sq. ft. per floor
Four floors and a roof	=	112,000 sq.ft.
\$7.32 per sq. ft.	=	\$819,840
Average story reduction factor 0.934	=	\$765, 730.56
Perimeter reduction factor for rect. building 0.949	=	\$724,248
\$40,000 service station	=	\$764,248

One other factor which should be considered is an increase in cost because of locality. The increase for Great Falls is 1.04. This gives a final estimate

for my building of \$794,817.92

On pages 97 thru 100, I have included a breakdown of the wages and equipment costs for the Great Falls area. I feel these figures help to show the reason for the 1.04 factor which was considered for the Great Falls area.

Concrete masons	
cement masons	4.00
power machine operator	4.25
swing scaffold work	4.25
Electrician	
electrician	4.25
cable splicer	4.25
Glaziers	3.15
Iron workers, structural	4.25
" " , ornamental	4.25
" " , reinforcing	4.25
Laborers	
millling laborer and assistant	3.00
hoist carrier and plaster trower	3.21
mortar man	3.12
concrete laborer	2.90
pipe layer (non-metallic)	3.21
dumpman-grader	3.02
packman	3.22
air vibrator, jackhammer operator, and all other air tool operators not otherwise mentioned	2.21
small concrete mixer	4.02
asphalt mixer and tapper	3.07
concrete saw operator	3.02
power driven concrete buggies	2.90
Lather	3.40
Marble setter	3.03
Painter	
brush	3.40
swing stage	3.02
spray	3.02
Plasterer	4.01

Construction Rates
for Great Falls

	wage per hour
Brick layer	\$4.00
Carpenters	
carpenter	4.00
millwrights and machine erectors	4.25
saw fillers and stationary saw	4.15
Cement masons	
cement masons	4.00
power machine operator	4.25
swing scaffold work	4.25
Electrician	
electrician	4.25
cable splicer	4.25
Glaziers	3.15
Iron workers, structural	4.25
" " , ornamental	4.25
" " , reinforcing	4.25
Laborers	
building laborer and scaleman	3.00
hod carrier and plaster tender	3.21
mortar man	3.12
concrete laborer	2.99
pipe layer(non-metallic)	3.21
dumpman-grader	3.02
powderman	3.22
air vibrator, jackhammer operator, and all other air tool operators not otherwise mentioned	2.21
small concrete mixer	3.02
asphalt raker and tamper	3.07
Concrete saw operator	3.02
power driven concrete buggies	2.90
Lather	3.40
Marble setter	3.05
Painter	
brush	3.40
swing stage	5.02
spray	5.02
Plasterer	4.01

Construction Rates

(cont.)

Plumber	Interval	1	2	3	\$4.15
Roofer					3.55
Sheet metal worker					3.80
Soft floor layer					3.15
Steam fitter					4.15
Stone mason					4.15
Terrazzo work					3.15
Tile setter					3.15
Sprinkler fitter					4.02

Apprentice Schedule

The apprentice rate is by % of the journeyman rates unless otherwise indicated

Craft	interval	1	2	3	4
Bricklayer	350 hrs.	40	50	65	75
cement mason	6 mos.	70	75	80	85
electrician	1000 hrs.	50	55	60	65
painter	6 mos.	55	55	70	70
plasterer	6 mos.	\$1.53	\$1.84	\$2.03	\$2.28
plumber	6 mos.	55	58	61	66
roofer	6 mos.	80			
roofer	4 mos.		85	90	95
sheet metal	6 mos.	45	50	55	65
steam fitter	6 mos.	\$2.20	\$2.32	\$2.44	\$2.64
carpenter					
	6-750 hours	65%			
	750-1500	70			
	1500-2250	75			
	2250-3000	80			
	3000-3750	85			
	3750-4500	90			
	4500-5250	95			
	5250-6000	97.5			

Illustration No. 7

Power Equipment Operator wage scale

A-frame truck crane	\$3.31
Air compressor, single	3.05
" " , 2 or more	3.23
Asphalt paving machine, screed	3.51
" " "	3.30
Belt paving machine	3.23
Bituminous mixer paver, travel plant	3.51
Booring machine opp.	3.14
Broom, self opp.	3.18
Cableway signalman	3.94
Cement silo	3.30
Clam bucket	3.23
Chip or gravel spreader-self prop.	3.23
Concrete batch plant	3.51
Concrete finish machine	3.51
Concrete float and spreader	3.51
Concrete mixer, 3 bags and under	3.14
Concrete mixer, 4 bags and over	3.38
Conveyor	3.23

Illustration No. 8

Site and site improvement costs

It would be impossible to tell at this time what the site would cost. However, the site is in the lowest assessed value half-block in the Great Falls Central Business District.

I will assume that there will be no charge for the removal of the present service station because it will be replaced in the proposed building.

According to the Marshall Valuation Service , a price of \$0.03 can be figured for the site excavation and landscaping. This would amount to approximately \$900.00.

Operation and maintenance costs

The cost of operation and maintenance for the proposed building would be a very small amount and could be covered by the rental income from the service station.

I have assumed this because of the low maintenance concrete structure and the very few employees needed.

Rental Return

As I have mentioned, I will assume that the rent from the service station will cover most overhead.

As far as rental income from the garage itself, I have chosen figures of 25¢ per hour for the hourly parkers and \$15 per month for the monthly parkers.

Assuming that each parking stall would be used only 50% of the time, this takes into consideration the slack hours during the night, the garage would have a monthly income of approximately \$2,800 or \$63,6000 per year. Assuming this income to be constant, it would take approximately 20 years to pay off the building.

Amortization

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 is paid off over a given time period. It is related to the project life of the building, therefore, the architect must use care and judgement when selecting the building material 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 materials, planning by the owners for a profit will be useless.

Means of Financing

A building of this scope and size would not usually be thought of as a private firms undertaking. It is my opinion that such a building would be the undertaking of a city government. Under this condition, the building would be financed by a bond issue in that city. In this case the city of Great Falls would probably use such a bond issue.

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