

LIBRARY
Montana State University
BOZEMAN

A S P O R T S A R E N A
C O N V E N T I O N C E N T E R

by

Raymond J. Murphy

441

Submitted to the School of Architecture as partial fulfillment of the
requirements for the degree of Bachelor of Architecture

at

Montana State University

Bozeman, Montana
August 17, 1965

P378
.M957

~~720.6~~ ~~NA 251/0~~
~~M 16~~
M957

ARCHITECTURE 490
Undergraduate Thesis
A SPORTS ARENA CONVENTION CENTER
for
Great Falls, Montana

Submitted as a partial fulfillment of requirements of
Architecture 490 on August 17, 1965 by Raymond J. Murphy

August 17, 1965

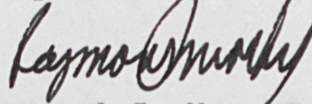
Harold C. Rose
Director of the School of Architecture
Department of Architecture
Montana State University
Bozeman, Montana

Dear Mr. Rose:

This is my submission for the written part of my undergraduate thesis, a sports arena-convention center 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 from which the preliminary design will be done is the research for such a project.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "Raymond J. Murphy". The signature is stylized with a large, looped initial 'R' and a cursive 'J'.

Raymond J. Murphy

Proposal

My thesis to meet the requirements for the degree of Bachelor of Architecture shall be a design of a multi-purpose convention center for the city of Great Falls, Montana. The work, divided into two quarters, shall be: Summer Quarter, 1965--collection of research material, selection of a site, analysis of conditions and a building program of the new building. Fall quarter, 1965--design presentation of the proposed center including drawings and model.

TABLE OF CONTENTS

Subject	Page
Letter of Transmittal	1
Contents and Illustrations	2-3
Acknowledgements	4
Proposal	6
Introduction	8110
Conditions Creating a Need	12-22
Local Conditions	24-29
General	29
Climate	25
Precipitation	26
History	27-28
Social	28-29
Site Conditions	31-47
General	31
Location	32
Orientation	33
Adjacent Environment	33
Topography, Vegetation and Natural Features	33
Soil Analysis	34
Zoning Regulations	34
Prevailing Winds	34
Views	35
Utilities	36
Overnight Stays	36
Traffic	41-42
Parking	43-44
Present Facilities	45
Aesthetics	49-51
Economics	53-63
General	53
Construction Costs	53-59
Insurance	60-61
Money Supply	62
Operation and Maintenance	63
Building Program	65-89
Function of the Building	65
Building Program	66-87
Flow Diagram	88

MAPS AND CHARTS

Subject	Page
General Information for Cascade County	15
General Social and Population Characteristics for Great Falls	16
Age Breakdown for the Labor Force for Cascade County	17
Occupations of the Labor Force of the Great Falls Area	18
Cascade County Employment Status	19
Population Growth of Montana	20
Population Growth of Great Falls	21
Precipitation Chart	26
Sun Angles for Great Falls	35
Photos of the Site	36-40
Map of the Site	46
Map of the City	47
Wage Scale for Construction Workers in Great Falls	56-57
Building Construction	58
Apprentice Schedule	59

i n t r o d u c t i o n

Introduction

The facilities now available for Great Falls are very limited and awkward for planning. Community Concert Association holds their annual programs in the Civic Center, but due to a lack of seating each program must be held for two consecutive nights. Some of the seating is very poor and the turnout is not as good as it could be. Also in the Civic Center is an ice arena used for the annual figure skating show which is held on three consecutive days and the Great Falls Ice Hockey Association hockey meets during the winter. The facilities at the arena are highly inadequate with poor seating, lighting and traffic patterns. Basketball and football games are held at the two highschools now in operation, but again because of lack of seating capacity many are turned away. The new Charles Russel High which is due to open in September, 1965 will have facilities for its enrollment. The Rainbow Hotel offers facilities to conventions consisting of food, rooms, convention hall, and display rooms. These are

situated in the downtown area of Great Falls, but due to a space problem they are limited to only smaller groups. Also available for the use of the general public for smaller gatherings than previously mentioned are the auditoriums at Great Falls High School, Russell High School and the College of Great Falls. The College of Great Falls is now nearing completion of its new olympic size swimming pool which will be a boon to the various swimming teams of Great Falls. There is at present only one indoor pool which can be used for year around practice. This is the YMCA. Another pool, the Morony Natatorium has been closed for the past year and future plans call for renovating and remodeling it. The fairgrounds on the west side of Great Falls offers facilities for car and boat shows, rodeos, horseshows, circuses, and parimutual horse-racing. The rodeos, horseshows, racing and circuses are held in the main grandstand. It is an ideal place as long as the weather co-operates. There are complete facilities for the storage of the livestock and equipment. Some of the traveling circuses also perform at the Legion Ball Park.¹

The purpose of my paper will be an attempt to consolidate all of these varied activities under one roof with ample parking, pedestrian circulation,

¹"Great Falls" a pamphlet by the Great Falls Chamber of Commerce, 1965, p. 3.

storage facilities, etc. One very recent problem was the fact that there was no available place for the graduation exercises for the high schools. The existing facilities would not hold the graduates and their parents.

c o n d i t i o n s c r e a t i n g
a n e e d

CONDITIONS CREATING A NEED

General

Great Falls, an expanding city with a present population of about 72,000 has no facility capable of holding a large sports event or convention.²

Facilities now in use include the Civic Center which can seat 2500 in the theater. The ice arena is totally inadequate for any use including ice shows, as the surface is too small, the seating is poor and the machinery is antiquated for maintenance. The highschools gymnasiums of Great Falls High and Great Falls Central do not seat the student bodies of the schools and the auditoriums are even smaller.³

This lack of any area in Great Falls of sufficient size to hold a large group of people and many months of inclement weather force activities inside. There is a desperate need for the city to have proper facilities to meet the needs of the community not only now, but for the next ten years to correspond with the projected growth of Great Falls. Such facilities would draw groups not only from the immediate area, but regionally and nationally. The boost to the economy of the city at its present growth would also be very desirable.

²Op. Cit. Chamber of Commerce, p. 2.

³Ibid. p. 7.

A center of this sort would not only pay for itself, but prove to be an asset to the community by bringing in outside money. As an example, in 1964 Rapid City, South Dakota, (population 42,339) held fifty-three conventions of which seven were national conventions. A total of 25,000 convention badges were issued by the Chamber of Commerce. It was figured that approsimately \$1,363,500 was spent in the city by the conventioners.⁴ This alone would be reason enough for Great Falls, a city twice the size of Rapid City, to build and draw convention dollars.

A building of this sort has been proposed to the Great Falls people and was rejected. Dan Thurber, member of the planning commission gave the following reason: "Not on its merits or use to the community but through petty political jealousies."

By 1975, Great Falls is projected to have a population of 100,000 plus and with the surrounding business area will easily be able to support this arena in sports events, exhibitions, circuses, and conventions. The building will also be used in connection with the State Fair giving it year around use.

⁴Rapid City Business Survey and Market Guide, p. 1.

Louis Mumford once said, "We must provide an environment and a routine in which the inner life can flourish, no less the outer life; in which fantasies will not depend wholly on film; in which song will not depend on radio."⁵

The future needs of such an arena would include the ease of changing from one use to another and the ability to fulfill the expanded growth rate of the city.

I feel a building of such as this is needed and would be a real asset to the community life.

⁵Encyclopaediatric Guide to Planning and Establishing an Auditorium, Arena, Coliseum, or Multi-Purpose Building, H. Penn, Penn-Fleming Publications, Inc. Greenville, S. C. 1963, p.

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

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 1960 and 1960.....	11,957
1950 total population in Great Falls.....	39,214
Increase of population between 1950 and 1960 in the 1960 corporate area.....	4,186
% of foreign born in Cascade County in 1960.....	5.3%

AGE BREAKDOWN OF LABOR FORCE FOR CASCADE COUNTY
IN 1960

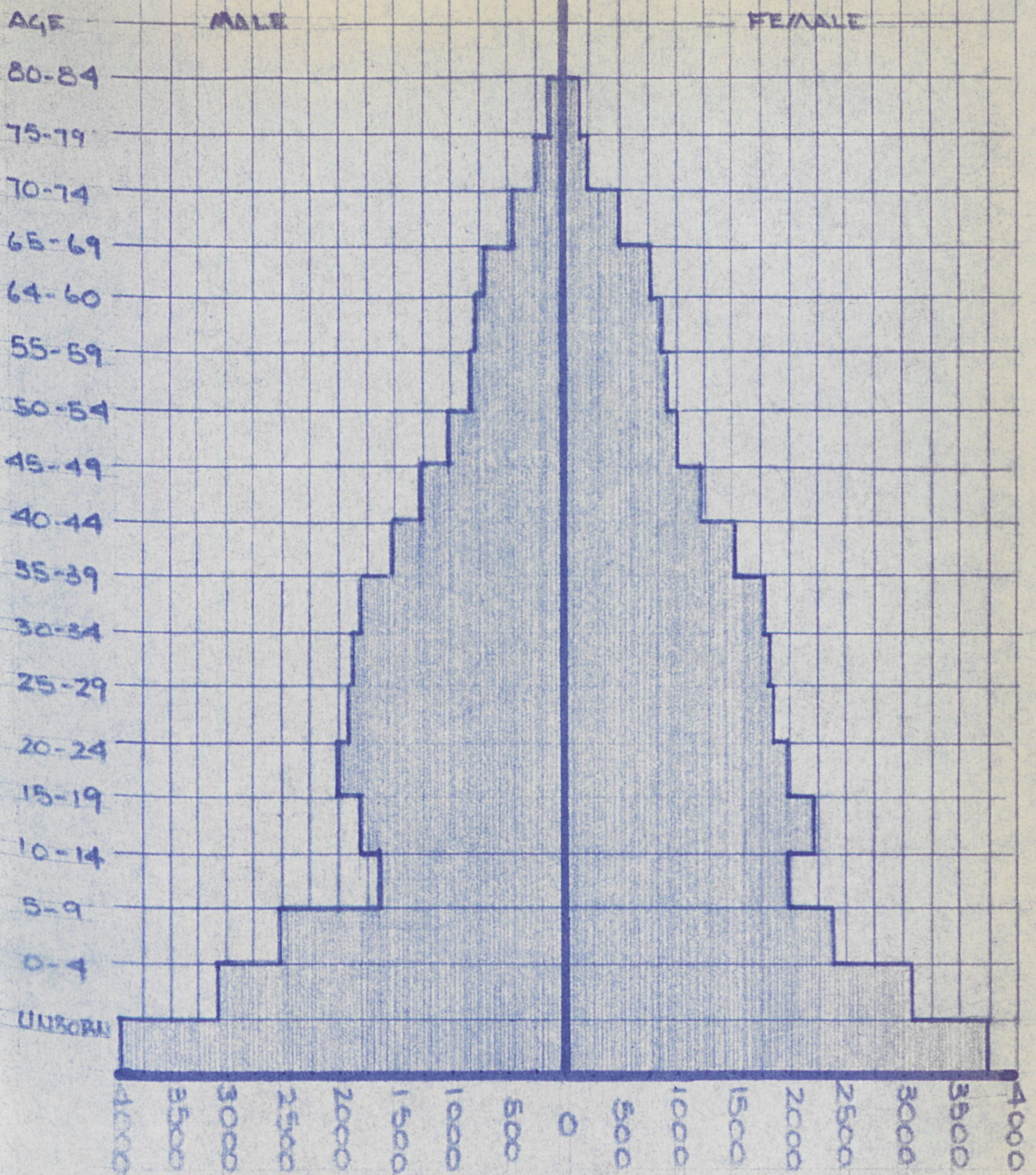
Age	Great Falls (S.M.S.A.)		Cascade County	
	Male	Female	Male	Female
14-17 years.....	800	587	802	587
18-24 years.....	1739	1542	3683	1564
25-34 years.....	3856	1469	5397	1544
35-44 years.....	4283	1990	4749	1934
45-64 years.....	4732	2633	5798	2653
65 years and over,.....	723	379	900	429

OCCUPATIONS OF THE LABOR FORCE OF THE GREAT FALLS AREA
FOR 1960

<u>Occupation</u>	<u>Male</u>	<u>Female</u>
Employed	16,158	9,026
Professional, technical and kindred workers	1,491	1,296
Farmers and farm amanagers	886	8
Managers, officials, proprietors excluding farm	2,344	487
Craftsmen, foremen, and kindred	2,414	327
Operatives and kindred workers	3,612	51
Clerical and kindred workers	1,056	2,471
Sales workers	1,358	789
Private household workers	31	1,471
Service workers, excluding householders h	902	675
Farm laborers, unpaid family workers	417	73
Farm labor, excluding unpaid and farm foremen	0	0
Laborers, except farm and mine	1,116	16
Occupation not reported	531	362

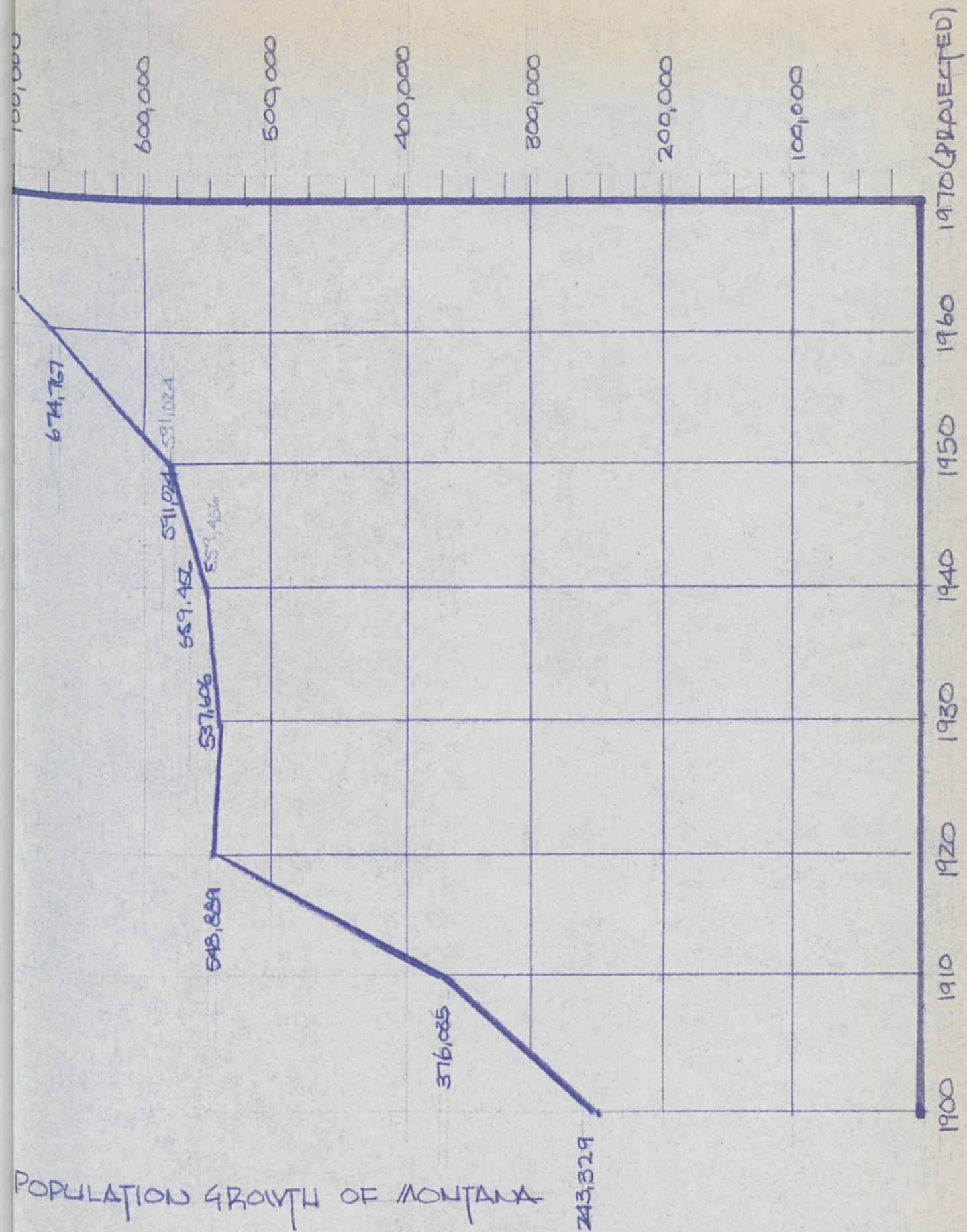
CASCADE COUNTY EMPLOYMENT STATUS FOR 1960

MALE 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.....	622
other, over 65 years.....	1,737
FEMALE 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.....	11,099
with own children.....	5,367
married,.....	5,221
other, over 65 years.....	2,370



POPULATION PYRAMID FOR GREAT FALLS
MONTANA 1960

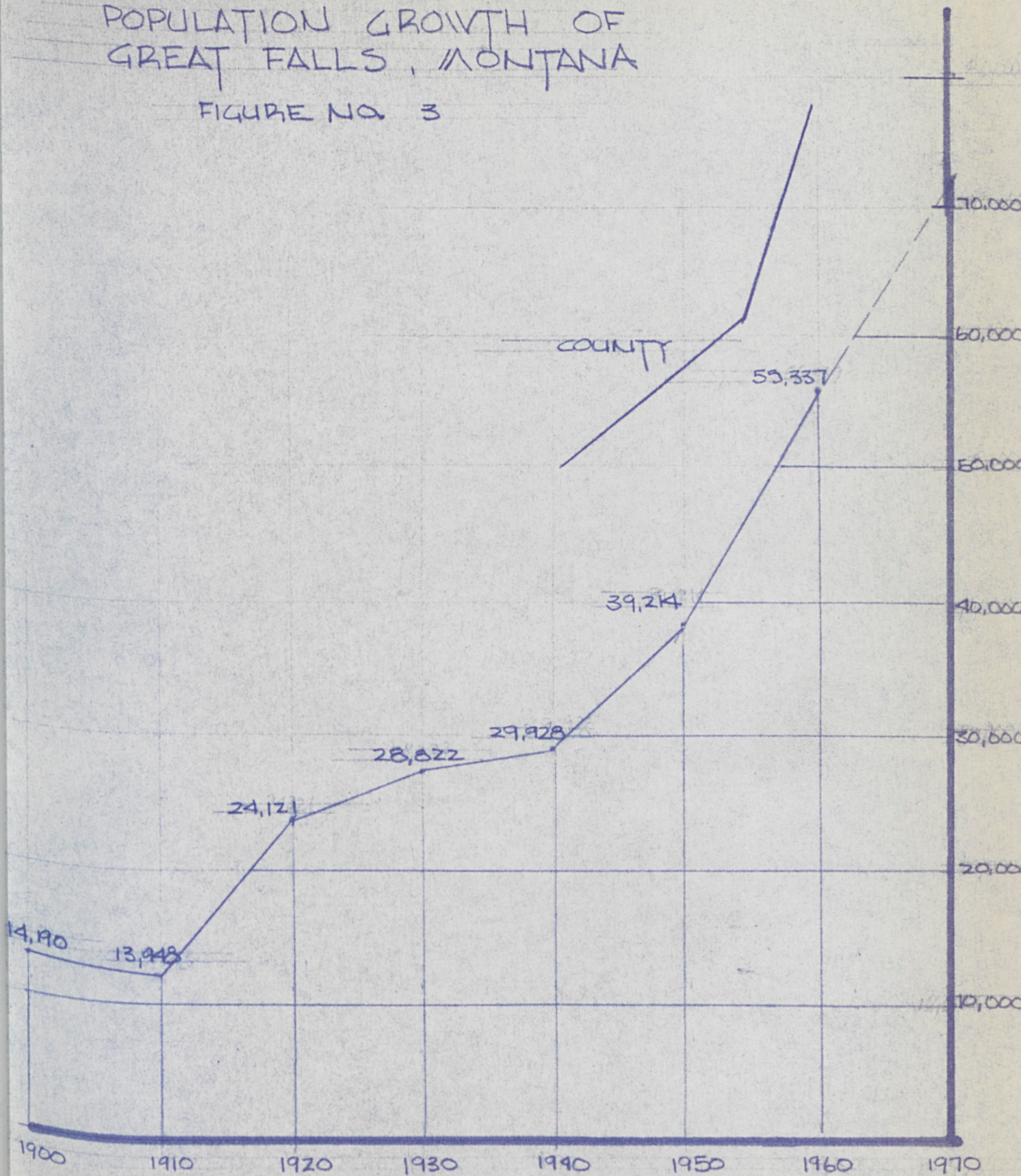
SOURCE: U.S. CENSUS FIGURE 1



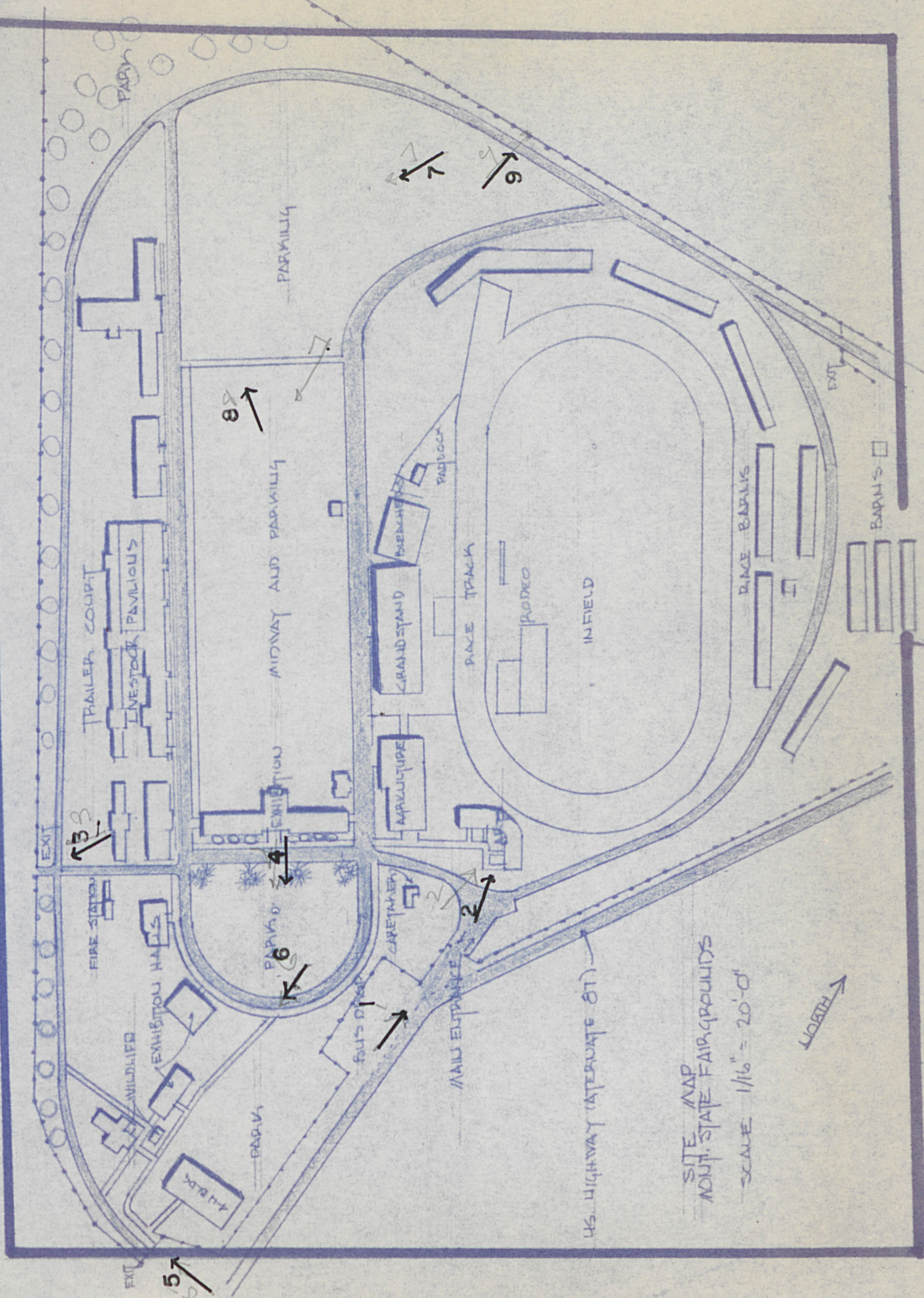
SOURCE: U.S. CENSUS
FIGURE 2

POPULATION GROWTH OF GREAT FALLS, MONTANA

FIGURE NO. 3



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



l o c a l . c o n d i t i o n s

LOCAL CONDITIONS

Site

The site is located in Great Falls, Montana at 47°29' latitude and 111°21' west longitude at an elevation of 3333'. Great Falls is located on the Missouri River in a relatively flat area surrounded by mountains on all sides except north and northeast. These mountain ranges range from thirty to one hundred miles away. The city lies in a transition zone between these mountains and the ranges and plains. Much of the surrounding terrain is rolling, grass covered foothills, benches and plateaus. The Missouri River divides the metropolitan area into two natural districts and is bisected by the Sun River in the southwest corner of the city.

Climate

The climate is moderate with sunny summer days, but cool refreshing nights. There is very little hot or humid weather. The average summer temperature is 69°F. There are no freezing temperatures in July or August, but usually a few in May, June, and September. Chinook winds prevent very cold snowy periods. The average winter temperature is 23.6°F. Although there are some sub-zero days, because of the chinook winds they are usually for only a few days at a time. The major disadvantage of Great Falls is that it is known as the "windy city". This is a disturbing factor to some, however, most of the residents hardly seem to notice the winds which average 25-30 miles per hour in velocity.⁶

Precipitation

The annual precipitation is 14.40". Seventy percent or 10" falls from April to September with the majority falling in summer showers and thunderstorms. See Chart .⁷

⁶Climate and Architecture. J. Aronin, New York, 1953, p. 304.

⁷Great Falls Weather Bureau Chart, January, 1964.

PRECIPITATION CHART

<u>MONTH</u>	<u>MEAN TEMPERATURE</u>	<u>PRECIPITATION</u>
January	23.0	.66 inches
February	25.2	.78 inches
March	31.3	.90 inches
April	44.0	1.02 inches
May	55.6	2.35 inches
June	60.2	2.92 inches
July	69.7	1.28 inches
August	67.6	1.07 inches
September	57.8	1.28 inches
October	48.5	.74 inches
November	34.9	.84 inches
December	28.7	.56 inches

Mean temperature 45.4° F

Mean precipitation 14.40 inches

History

Great Falls, the largest city of the state of Montana, is situated on the Missouri River, opposite the mouth of the Sun River. It is served by Chicago, Milwaukee and St. Paul, the Pacific, and the Great Northern railways, state and federal highways, three branches of airlines. The city was named for the Great Falls of the Missouri that were discovered by Lewis and Clark. The city was laid out in 1883 by Paris Gibson, founder, and chartered as a city in 1888. The falls were utilized and industry thus came early to the city which is one of the main reasons why the city became a leader of commerce and industry in the central part of the state.

The city government consists of a mayor and city council. It is the commercial, financial, industrial and shipping center of a fertile farming and grazing section and mining district. Minerals of the area include copper, zinc, lead, silver, and petroleum. The city's leading industries are copper and zinc smelting and refining and the fabrication of copper wire and cables, but it also has three meat packing plants, two grain elevators, a brewery, oil refinery, iron works, and manufacturers flour, feed, refrigeration equipment, electric signs, furs, brick, tile, and glass. It is also the headquarters of the Idaho-Montana customs district.⁸

⁸Encyclopedia Americana, Volume M, p.

The city is well planned and has extensive parks, playgrounds, hospitals, a public library, civic center, the College of Great Falls, the Charles M. Russel Art Gallery, a conservatory of music and several radio and television stations. The state school for the deaf and blind is located in the eastern section of the city along with Malmstrom Air Force Base, one of the largest SAC bases. It is strategically located to protect the northern boundary of the United States. Approximately 5,000 people are stationed at Malmstrom and an additional 1500 civilians are employed there. The Boeing company has been in Great Falls off and on for the past five years installing and replacing the Minuteman Missiles which are located around the city proper and to the north along the high line of Montana.⁹

Social

Great Falls has a variety of clubs, fraternal organizations, institutional groups, and church organizations. An excellent recreational program for the younger set is provided and covers baseball for all age groups, swimming, tennis, baton, basketball, and creative arts. There is a definite need for a place for the teenagers to gather for dances and other social functions. The DeMolay Memorial

⁹"Great Falls", p. 4.

and the high school gyms are now used, but are too small to meet the present day number of students. The Meadowlark Country Club offers golf, boating, tennis, swimming and a wide array of social events to its members. There are two other golf courses, the Municipal for all area residents and the ACM course for employees of the Anaconda Copper Mining and Smelting plant located across the Missouri River in Black Eagle, Montana. At present one swimming pool is available, but plans call for the design and construction of three more. Through the efforts of an interested group a theater in the round has been opened and has shown much success.

SITE CONDITIONS

General

The choice of the site is most important because it is essential to the cultural life of the community. Also, as a non-profit, self-sustaining organization the site location is important. The following things must be taken into consideration when the selection of a site is made: 1. determine the communities need; 2. selection of type, size, and facilities; 3. location; 4. management; and 5. financial policy. The site must also offer ample parking for a variety of sizes of crowds, accessibility to the city center, hotels, restaurants, and entertainment.¹⁰

Location

For my site I have chosen to place the arena on the Montana State Fairgrounds located in West Great Falls. An exact location will be chosen later when upon further study the needs and parking areas are known. Also needing further study will be the advisability of whether or not to demolish some of the existing buildings and whether to incorporated their usage into the arena. This area is easily accessible to all residents and non-residents for the year around use that the arena will dictate. There are large areas already available for parking and livestock storage. The land is city owned and would therefore keep the initial cost of the building program down. The fairgrounds are located in the northwest section of the city within a three mile radius of the city center. It is within easy driving distance of every section of the city and there are a few motels and eating facilities nearby; but the main group of them are located in the city center a five minute drive away. See map **2**.

Orientation

See Map 2.

Adjacent Environment

The site is bordered to the east by a semi industrial area. Small businesses, machine shops motels, and service stations are located in this area. To the east (see map 2) is a major road, being used mainly as an artery between residential areas running north and south. The main traffic load on this road is at 8:00 A. M. and 5:00 P.M. during the rush hour traffic.

To the north is a spur railroad for the use of the stockyards and to bring in animals. To the west is residential area. It is a class B residential area, but recent building activity is resurrecting this area. To the south is a commercial area with stores, some motels, and a small business area.

Topography, Vegetation, and Natural Features

The site is generally flat with no large hills or grades, but a gentle slope from north to south. The northern end is treeless being used now for parking. The area south of the race track is wooded with many fine old trees. This is a pleasant shady area. (SEE VIEW 2+4)

Soil Analysis

The soil analysis is a clay and sandy loam requiring the use of pilings. Not much fill if any will be required. Borings show the H₂O table at 7½'.

Zoning Regulations

Zoning regulations at the present time are Class C for commercial use.

Prevailing Winds

As previously mentioned the winds are well known to all. The prevailing winds are from the southwest over Gore Hill in the summer and from the northwest in winter.

Immediate and Distant Views

Because of the facilities served by this arena the need for a view is diminished. However, the view is one of industry and residential (far view) showing the rapid growth rate of Great Falls.

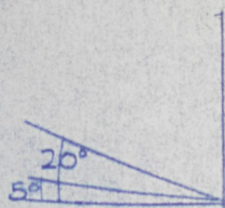
Availability of Utilities

All utilities are in and easily accessible.

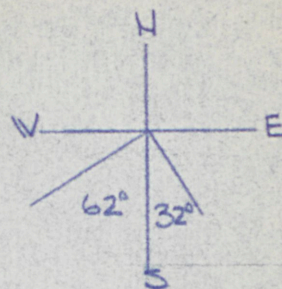
Accommodations for Overnight Stays

As already mentioned there are facilities across from the main entrance and also in downtown Great Falls, a drive of five minutes. Altogether there are thirty two motels with facilities of up to 110 units per motel. There are 27 hotels with similar facilities and several parks for summer camping and trailer use.

SUN ANGLES FOR GREAT FALLS

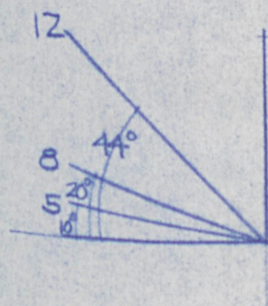


DECEMBER

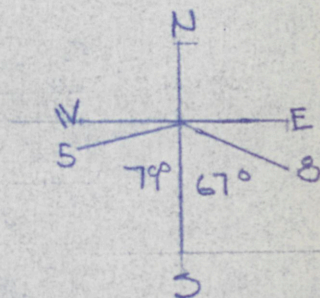


SUN ALTITUDE
AT 8:00 A.M.,
12:00 & 5:00 P.M.

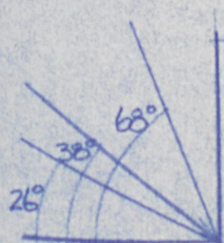
SUN AZIMUTH AT
8:00 A.M., 12:00
AND 5:00 P.M.



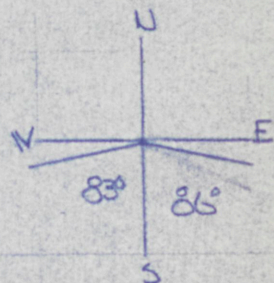
MARCH
&
SEPTEMBER



LATITUDE $47^\circ 28''$ NORTH
LONGITUDE $111^\circ 15'$ WEST
ALTITUDE 3300 FEET



JUNE



VIEW

1

AUG 1965



AUG 1965

VIEW

2

VIEW

3



AUG 1965



AUG 1965

VIEW

4

VIEW

5



AUG 1965



AUG 1965

VIEW

6

VIEW

7



AUG 1965



AUG 1965

VIEW

8

V I E W

9



AUG 1965

Traffic

Existing traffic patterns play an important part in the selection of a site. These patterns have been developed to carry the population to and from the area. Obviously, the addition of an arena will add to the flow of traffic, but only at times when the building is in use.

Our recreation facilities must be located so that the benefit we receive from them is not cancelled by the strain and inconvenience of traveling to them and home again.¹¹

Traffic flow into the area is one of the major problems with this site. There is only one major entrance to the grounds, that being on the eastern side. During a heavy traffic flow this becomes a bottle neck backing traffic on the road.

Third Street northwest, the major road, is used mainly as an artery between the residential areas running north and south, with the heavy traffic during the rush hours. The daily average number of cars to use this road is 4957 with 335 between the hours of 8 A. M. and 9 A. M. and 475 between 5 P. M. and 6 P. M.

The other problem occurs at the intersection of Central Avenue West and Third Street. Central Avenue West is a heavily traveled road (16,146 cars use it each day) and during a period of

heavy traffic flow, this is a bottle neck to traffic leaving the area. Some can be routed through the exit to the west, but this is a dirt road and runs through a residential area and therefore, cannot handle any quantity of traffic.¹²

A bus shuttle operates from the Rainbow Hotel (see map 2) to the fairgrounds and it is only a five minute ride. By being so situated, the area is easily accessible, yet far enough out to get adequate, lowpriced parking.

In the solution of this design problem it would seem advantageous to devise a method of egress and access to the grounds which would release these two bottlenecks and make driving to an event in the arena a little more enjoyable.

¹²From statistics prepared by the Traffic Department, City of Great Falls, January, 1965.

Parking

One of the more important problems in connection with an arena is the need to meet attendance requirements. One of the greatest ways to meet this need is to insure the prospective patrons that there will be adequate, easily accessible parking for his car. The fairgrounds at this time has room (during the peak fair season) to accomodate 10,000 cars with relative ease.¹³ The parking is available in one large graveled lot to the west and north of the race track. Another 5000 cars can be parked in the area of the midway to the southwest of the track when the midway is not in session. This parking is adequate though it may be a little far from the building area and if it is decided to place the building in this area additional parking will have to be provided. This will pose no large problem however, as there is a large enough area inside the grounds to facilitate the added parking. Two methods that will affect the parking are:

1. the side by side parking in which the cars are parked in an open parking area; and 2. the multi-level garage. The open parking area requires a great amount of land and also deters from the aesthetic effect of the building. If it is placed

¹³From an interview with Dan Thurber, July, 1965.

any distance away it becomes a hindrance to the patron. The second idea, the multi-level garage is more expensive in original cost, but requires less upkeep and also has the advantage that it can, if used properly, fit into the overall design of the proposed building.

Consideration must be given at this time to the future needs of the city and the arena. With a growth in population and therefore, cars, the addition of such modes of transportation as subways, trams, etc., must be taken into consideration to assure the easy adjustment to the future. If, with the advent of mass public transportation, the future brings fewer privately owned cars, then one can see the advisability of the open parking lot as possible expansion area of the proposed building.

PRESENT FACILITIES AND BUILDINGS ON THE SITE

At the present time many exhibition buildings and animal barns exist on the 102 acre site. Among these is the one-half mile race track, a grandstand seating 8,000 and a permanent stage to which a moveable stage can be attached.

There are forty-eight buildings on the grounds (see map ~~2~~) which house exhibitions and stock animals. There are provisions for six hundred horses (see map ~~1~~ for location) and four hundred cattle. In conjunction with these are poultry, rabbit and swine barns.

There are also facilities for trailers on the site for any traveling shows that use the grounds.

The grounds has its own fire station which is used mainly during the week of the State Fair.

With the multitude of facilities available here I feel this site is an excellent location for a sports arena and convention center.

GREAT FALLS, MONT. AND VICINITY

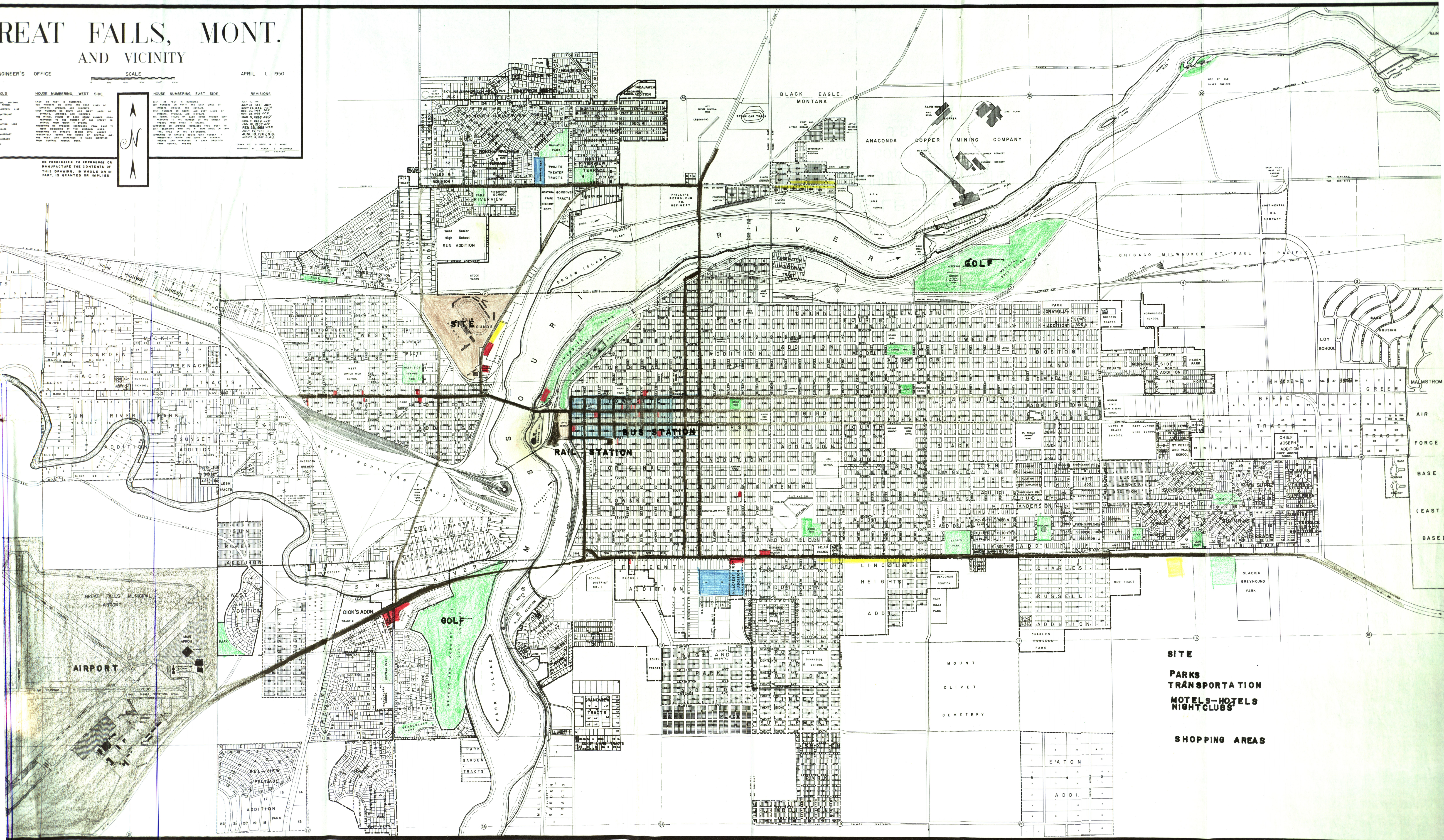
ENGINEER'S OFFICE

SCALE

APRIL 1, 1950

HOUSE NUMBERING, WEST SIDE
HOUSE NUMBERING, EAST SIDE
REVISIONS

NO PERMISSION TO REPRODUCE OR
MANUFACTURE THE CONTENTS OF
THIS DRAWING, IN WHOLE OR IN
PART, IS GRANTED OR IMPLIED



SITE
PARKS
TRANSPORTATION
MOTELS-HOTELS
NIGHTCLUBS

SHOPPING AREAS

a e s t h e t i c s

AESTHETIC CONSIDERATIONS

Aesthetic impacts influence us at all stages of our development, from childhood to graveside. Consciously or as in most cases subconsciously, they provoke friendly or hostile reactions. This means aesthetic values are no simple trimmings but indeed have their roots in the depth of the soul. Their impact on man's decisions reaches even into the most practical problems, into the shaping of things of daily use--cars, bridges, and above all, our human environment.

6 In dealing with the aesthetics of a large sports arena we first must look to the aesthetic ideals and relationships of the entire urban scene. We must consider how this structure, being in itself a large building will fit in, hinder or help, the urban scene of Great Falls.

From this over-all view of the area we must then condense our view to a smaller area within the confines of the area adjacent and within the site.

The adjacent areas will be fairly well isolated from the building itself by a series of buffer zones consisting of existing buildings on the fairgrounds site, parks in the area, and a vast parking lot.

When we condense our view to the immediate site a large problem arises as whether to blend with the surrounding site and buildings or to go completely the other way and ignore all existing conditions on the site.

8 At this time I am not going to argue two varying points of view but merely mention the two opposite possibilities.

On this site the buildings existing are not architectural masterpieces nor are they architectural defeats. (see photos) A blend of the old and new can be reached I feel by keeping the present feeling in the area and to keep the building as inconspicuous as possible.

Going to the interior of the building it would seem that because of the need for the variety of seating and uses that a building with a large clear span area would be desirable. This would indicate a type of shell structure to span the area.

The smaller use areas need not have the clear span and can or cannot be included in the arena structure.

The lobby and public areas should give a feeling of warmth and friendliness. It should feel intimate yet give a feeling of openness and spaciousness.

The arena itself will have to reflect various moods that the auditorium will need for various needs. It must be airy and open for rodeos, sports, etc. It must be changeable to an intimate feeling for banquets. It must have good acoustical properties for stage shows and must be readily changeable for each of these feelings.

This can be done with lighting, lowering ceilings, curtains, and many other methods can be used to change the mood of the arena.

The character or mood of the building will be affected greatly by the surrounding area, the materials, and the functions. From this a check list or a list of prerequisites for determining the physical appearance of the building can be set up:

1. A thorough study of the area around the site, including any changes that may be anticipated.
2. A study of materials.
3. A study of existing buildings.
4. A complete realization of the function of the building.

These points can be used to guide a logical solution of the problem of aesthetics.

ECONOMICS

General

Architecture and economics walk hand in hand. The dollar has a very important effect on when, where, and how a building is built and how it is operated. Today, when public and private buildings alike are dominated by various forms of credit, the far-seeing architect is increasingly concerned with such factors as money supply, construction cost, rental fees, operation and improvement costs, and insurance costs. The architect and the client must build within the means of the community.

Construction Costs

A rough idea must be given to the client about the cost ;of the building even during the preliminary stages.

A comparison exists with the MSU Fieldhouse which will accomodate 11,000 for the basketball and 14,000 for boxing. The total cost of this building was \$1,700,000. This figure is equal to approximately \$14.00 per square foot. These figures are for a building constructed in 1957. ~~See table~~ .

From an interview with Bud Purdy, MSU Fieldhouse manager.

The most important fact for financing is to get enough money available not only for the cost but for many hidden costs. After the cost is estimated about 20 to 25% should be added to cover all hidden costs.

Itemization of Costs

For the segregated method of estimating the total cost to the investor, 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 conditions, 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.
 - B. Allowance for vacancies
 2. Financial Expense
 - A. Interest
 - B. Depreciation reserves
 - C. Maintenance reserves
 3. Profit and income taxes
-

WAGE SCALE FOR CONSTRUCTION WORKERS IN GREAT FALLS

	<u>Per Hour</u>
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 and machine erectors	4.10
Saw filers and 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 and building laborer and 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 and 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
Lathers	3.25
Painters	
" brush	3.25
" swing stage	4.875
" spray	4.875
Plasterers	3.86
Plumbers	4.00

WAGE SCALE CONTINUED

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.

BUILDING CONSTRUCTION

<u>Power Equipment Operators</u>	<u>Per Hour</u>
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 and under	3.14
Concrete mixer, 4 bags and over	3.38
Conveyer	3.23
Crane operator, bridge and overpass and similar type work	3.76

APPRENTICE SCHEDULE

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

<u>CRAFT</u>	<u>INTERVAL</u>	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4</u>
Bricklayers	350 hours	40	50	65	75
Cement masons	6 months	70	75	80	85
Electricians	1000 hours	50	55	60	65
Painters	6 months	55	55	70	70
Plasterers	6 months	\$1.53	1.85	2.03	2.28
Plumbers	6 months	55	58	61	66
Roofers	6 months	80			
Roofers	4 months		85	90	95
Sheet metal	6 months	45	50	55	60
Steamfitters	6 months	\$2.20	2.32	2.44	2.64
Carpenters	0 to 750 hours	65%			
	750 to 1500 hours	70			
	1500 to 2250 hours	75			
	2250 to 3000 hours	80			
	3000 to 3750 hours	85			
	3750 to 4500 hours	90			
	4500 to 5250 hours	95			
	5250 to 6000 hours	97.5			

INSURANCE

Any building that is used for public use is obviously wanting of protection. This protection is best found in the form of insurance. The International Association of Auditorium Managers state that the ~~best~~ method for providing protection is as follows: The auditorium contract should require that the lessee provide, ten days in advance of the event, evidence of comprehensive public liability insurance with a minimum of \$50,000 for bodily injury to one person, \$500,000 for one accident, and \$50,000 for property damage. The contract should provide that if the lessee fails to provide such a policy, the auditorium manager is authorized to arrange for such insurance and charge it to the lessee.

Furthermore, the insurance should be subdivided into the following categories:

- A. Construction period
 - B. Operation period.
 - 1. Liability
 - 2. Workmen*s Compensation
-

3. Fire and theft
4. Participation in personal hospitalization
5. Protection against weather elements during events
6. Wind and tornado damage
7. Damage to auditorium property and contents
8. Protection against vandalism
9. "Hold Harmless" clause in tenancy contracts
10. Tenant's participation in building's liability policy

The pre-occupancy period, covering the construction of the building, involves specific types of insurance. These costs and encumbrances during this period must be included in the original appropriation charged to the cost of construction, not to the operation of the building.

It is vital to include in the contract with general contractors, and sub-contractors, provisions for adequate protective coverage of the building against all construction hazards.

MONEY SUPPLY

A building of this type is generally a community supported project and therefore must be voted in a bond issue. Once this has been accomplished there are two ways it can be supported.

One it can be deemed a worthy enough establishment and can be supported by taxes if it can not pay its own support yet brings in enough capital to the area to justify taxing the population. The second method is making the building self-supporting. This way the rental of the building pays for operational costs and also the construction costs.

A combination of these two is sometimes used wherein it is generally self supporting but using tax monies to cover any deficits in operating costs. This system allows the rental fees for the building to be competitive with other buildings in the area and still all but meet the expense of daily operation.

Auditoriums and Arenas, International Association of Auditorium Managers, 1961, p.

OPERATION AND MAINTENANCE

These two costs are most important in the financial structure of an auditorium. A similar building, the MSU fieldhouse in Bozeman, has an annual payroll to permanent people of \$20,000 per year.

An estimate of the mechanical cost would be approximately \$10,000 per year.

Added to these major costs are payment on loans, insurance, payment for entertainers, etc.

These costs must be defrayed through public use of the building and to do this the building must be in use 300 days each year earning roughly \$500 dollars a day.

b u i l d i n g
p r o g r a m

FUNCTION OF THE BUILDING.

The term sports arena-convention center depicts many different functions combined under one or two centralized areas. This building will entertain conventions as well as hold any sports function from ice skating to rodeos.

Entertainment will be one main use of the arena. The area must provide for boxing, ice skating, basketball, stage shows, jazz concerts, circuses, track and rodeos.

Exhibitions will also be held here. Such things as boat, horse and dog shows are examples. Also there will be many different displays and exhibits.

Conventions will bring new money into the Great Falls area and so the building should definitely be designed to hold large as well as small conventions.

Also, as a side use, there is a possibility that this building could be used as the offices of the Montana State Fair Board and could be used during the fair as a multi-use area.

BUILDING PROGRAM

Main Auditorium

The main auditorium is to be an area to serve a general use and house entertainment. Such things as rodeos, circuses, horseshows, boxing, basketball, stage events, conventions, track, banquets, and for use as an exhibition hall during the Montana State Fair.

I have eliminated ice skating as a use because after talking with Mr. Thurber I find that these facilities are inadequate, but have no use in my building at present.

The size: 28,000 square feet in floor area
The capacity: minimum; (basketball) 12,000
maximum; (boxing) 20,000

Following is a list of the various size crowds that can be accomodated:

1. Banquet: 700
2. Circus: 12,000
3. Convention: 15,000
4. Track meet: 12,000
5. Concert: 10,000

Windows--none are needed for view, questionable for
light.

Equipment Storage (Adjacent)

1. portable seating
2. Basketball floor
3. Boxing ring
4. Staging
5. Wood track
6. Exhibition material
7. Rodeo fences, tractors, etc.

Permanent Equipment

1. Score board
2. Lights
3. Heating system
4. Ceiling system
5. Ventilation system
6. Public address system

Character

The auditorium faces many moods and must therefore,
change character often. The materials used must be
durable and maintenance free.

Special Equipment for the Arena

Temporary Seating

One of the most important items in a multi-purpose arena is the temporary seating, where movement of equipment means labor dollars; therefore, the type of equipment chosen and the design of storage is extremely critical.

The building must have a diversified use and must be changed quickly; therefore the seating must be quickly stored and unstored and easily erected. The building must be designed so there is no blockage of view from the permanent seats when the temporary seats are erected and for these reasons they become quite an important part of the design.

Lobby

The lobby is an area to serve as a traffic control.

Size: must be large enough to serve people and eliminate bottle necks.

must be able to serve traffic to concessions.

Adjacent Areas

The adjacent areas include the main hall, circulation area, offices, tickets, entrance, restrooms, and access to parking.

Windows and View

It is debateable if this area should have a view: I rather think not as once inside the building the activity turns inward, but there should be no question as to where the outside is.

Equipment

1. Provision for displays
2. Ticket controls
3. Ventilation
4. Lighting
5. Heating and Cooling
6. Fountains (drinking)
7. Disposal units
8. Public Address system

Character

The character is intimate and warm atmosphere.

The materials must be durable.

Small Banquet and Meeting Areas

These rooms should serve as general ;meeting areas for conventions or civic groups, small dinner parties for meetings of any small groups.

Size

Should seat 150-200 for lecturings. Other smaller rooms should be able to seat 20-50 for meetings.

Adjacent Areas

1. Kitchen
2. Service entry
3. Circulation areas
4. Storage
5. Partitions to divide space into smaller areas.

Windows and View

It may be desirable to have a good view out, but no view in.

Equipment Storage

1. Seating
2. Tables
3. Bar
4. Rostrum
5. Projection equipment

Character

Because of its variety of uses this group of meeting areas should have variable moods and good acoustical quality. Again durable material should be used.

Kitchen

The purpose of the kitchen is to serve direct table service for banquets and small dinner meetings with a preplanned menu or smorgasboard type service. There will be no individual orders as in a nightclub.

Size

The size of the kitchen will be approximately 2100 square feet with room for 40 waiters, storage, service facilities to accomodate and serve 700 persons and employees rooms and rest areas to accomodate 50 people.

Adjacent Areas

1. Main hall
2. Service
3. Small Dining areas

Windows and View

There will be none.

Equipment

1. Ventilation
2. Ramps or automatic movement of food
3. Drains
4. Sinks, stoves, etc.
5. Work tables
6. Storage for staples
7. Freezers
8. Refrigerators

Dishwashing areas

1. Preliminary cleaning area
2. Refuse disposal
3. Pre-flushing equipment
4. washing equipment
5. Glass washer
6. Storage pantry

Hot Food

Hot Food Preparation

1. Pressure cookers
2. Fryers
3. Ovens
4. Grills
5. Tables
6. Sinks
7. Storage
8. Fans over cooking area

Service Area

1. Fountain equipment
2. Dishes
3. Linens
4. Storage
5. Coffee urns

Character

The character of the kitchen is to be the idea of sparkling cleanliness. It must be well lighted with durable materials used throughout.

Public Rest Rooms

There must be serveral rest rooms to serve all areas with no crowding during rush times

Size

Should be large enough to accomodate 30 people.

Adjacent Areas

1. Circulation areas
2. Lobby
3. Main hall
4. Smaller rooms

Windows

There will be no windows

Equipment

1. Good ventilation
2. Water closets
3. Urinals
4. Lavatories

Character

Must have easy maintenance, be durable and clean.

Performers Shower and Toilet Facilities

The performers must have two areas, one for men and one for women. These facilities should be versatile enough to serve all functions taking place in the building itself.

Size

Each area should be able to serve a minimum of 30 people.

Adjacent Areas

They must have an entrance to the arena and also an entrance to the exterior.

View

There will be no view.

Equipment:

1. ShowERS
2. Mirrors
3. Toilets
4. Lavatories

Materials

The materials used must be impervious, durable, and easy to clean.

Locker Rooms

These areas should be quite versatile, easy to maintain, and be readily accessible to both the arena and an exterior entrance.

Size

There must be area to serve a minimum of 30 people in each locker room.

Adjacent Areas

1. Showers and toilets (storage areas)
2. Arena
3. Access to lobby and exterior

Windows and View

There will be none.

Equipment

1. Lockers
2. Benches
3. Dressing tables (portable)
4. Mirrors
5. Chalk boards

Materials

The materials used must be durable, easily cleaned and attention should be given to the acoustical properties of the room.

Storage Areas

These areas should be adjacent to the locker rooms to store materials, towels, etc.

Size

Approximately an area that will store moveable equipment for the locker room.

Adjacent Areas

1. Locker rooms
2. All other areas requiring storage

Managers Office

This area is the work space for the manager and will hold all files, etc., and should be kept fairly quiet while having immediate access to the arena, lobby and an outside entrance.

Size

This area should be fairly large as the manager may wish to hold small meetings and conferences here.

Windows and View

If possible it would be nice to give the manager natural light and a view.

Adjacent Areas

1. Secretarial offices
2. Lobby
3. Arena
4. Kitchen
5. Small meeting rooms
6. genraally it should be centrally located

Equipment

1. Desk
2. Conference table
3. Shelving
4. File cabinets
5. Vault
6. Seating
7. Intercome both to secretary and arena

Materials

The materials hould be plush and rich looking without overdoing it.

Secretarial Offices

This area is for the manager's secretary, receptionist, and bookkeeper. This area can also double as a location for advance ticket sales and reservations.

Size

It must be large enough to accomodate five people waiting for the manager plus three employees and assorted equipment.

Adjacent Areas

1. Lobby
2. Manager's office

Windows and View

Here, as in the manager's office, natural lighting and a view out but not in would be nice but not mandatory.

Equipment

1. Three desks
2. Filing cabinets
3. Counter
4. Typewriters, etc.
5. Entrance to vault

Materials

Business like, warm, expensive appearing, durable, and easy to clean materials should be used.

Announcer's Booth

This area must be located in direct view of the arena and shall serve to direct lighting as well as the public address system.

Size

The booth must be large enough for two people and their assorted equipment.

Adjacent Area

In immediate view of the auditorium.

Windows and View

Windows will be necessary to provide the announcer with an overall view of the arena.

Equipment

1. Work desk
2. Public address system
3. Lighting controls
4. Seating for two
5. Intercom to manager

Materials

There must be sound absorption in the booth through the use of acoustical materials.

Children's Room

General

Since the advent of television, theaters, stadiums, and auditoriums have suffered immeasurably. It would be nice therefore to offer the added attraction of a babysitter during performances for small children. This would be especially useful during the annual fair.

Size

The Children's Room must be large enough to accomodate 50 children with various tway and an adequate area in which they can play.

Adjacent Areas

1. Children's toilet facilities
2. Circulation areas
3. Exterior entrance

Windows and View

It would be advisable to have a view with natural lighting.

Equipment

1. Children's play-room equipment
2. Storage areas

Materials

The materials used must be very durable.

Concession Area

General

There are three methods of controlling the concessions:

1. Leasing them to a national or regional concern
2. Leasing them to a local bidder
3. Conducting them as a self-owned operation

For the building in question I will use the third method whereby profits to the building are greatly increased.

Size

These areas should be large and quite attractive and should be designed to create a minimum waiting period for the patron.

Adjacent Areas

1. Arena
2. Circulation areas
3. Lobby

Windows and View

A view for the patrons may be quite pleasing.

Equipment

1. Soft drink dispensers
2. Coffee urns
3. Hot dog and sandwich facilities
4. Service counter
4. Cash registers
6. Candy, cigarette, etc., displays

Materials

The materials used must be simple to maintain and give the appearance of cleanliness.

Radio Booth

General

This area is to be used by radio announcers, and arrangements should be made to provide facilities for two different networks through the employment of moveable partitions.

Size

The booth must be able to conveniently hold 8 people with no crowding.

Adjacent Areas

1. Arena

Windows and View

There will be no natural lighting required but there must be a direct unobstructed view of the arena.

Equipment

1. Seating for 8
2. Work tables
3. Telephones
4. Power connections

Materials

The materials used should be very durable and the acoustical properties employed are very important. The booth should require little maintenance.

Television Booth

General

This area will be the same as the radio booth but with provisions for the television equipment instead of radio equipment. From this booth an unobstructed view of the auditorium is mandatory.

Press Box

General

This area is an area where the press and magazine reporters may cover events and prepare stories.

Size

The press box must have adequate room for 10 persons to be seated and move around.

Adjacent Areas

1. Arena

Windows and View

There is no need for natural lighting but a view of the arena floor is necessary.

Equipment

1. Seating for 10
2. Writing tables
3. Telephones

Materials

The materials must be durable. Care should be taken to insure good acoustics.

Ticket Booth

General

This area is to be used to purchase admission to an event in the arena prior to the performance. This area is not to be used for reservations or advance purchase of tickets.

Size

Enough booths should be employed so that 10,000 persons per hour may purchase tickets.

Adjacent Areas

1. Lobby
2. Circulation areas to arena

Windows and View

A view would be nice but not mandatory.

Equipment

1. Counter
2. Burglar-proof window
3. Seating for teller
4. Cash boxes
5. Burglar alarm
6. Intercom to manager's office

Materials

The materials used should be similar to the lobby (warm and firendly) and very durable.

First Aid Room

General

This room shall serve any performers who have been injured and any patrons. It should be set up to handle any emergency short of a major operation.

Size

This area should be large enough to hold the medical equipment, a doctor, a small nurse's area to be in full use during a performance, and at least two cots.

Adjacent Areas

1. Arena
2. Direct access to the exterior

Windows and View

There will be none.

Equipment

1. Air conditioning
2. Ventilation
3. Lavatory
4. Water closet
5. Telephone
6. Cots
7. Stretcher
8. Other medical equipment

Maintenance Department

General

This area should be provided with:

1. A superintendent's office with phones, a desk, file cabinets, and a method of posting seating diagrams and an intercom to the manager. All major electrical controls for heating, air conditioning, stage lighting, etc., should be immediately visible from this office.
2. A maintenance room that should contain bins for screws, nails, bolts, etc. It should contain storage for small hand tools that are in constant use.
- 3.. Other rooms should include a carpentry shop, a paint shop, a plumbing shop, and a salvage area.
4. Adequate storage areas which can be locked and can store tools from measuring tapes to a fork-lift truck.

Adjacent Areas

1. Arena
2. Exterior

Materials

The materials used should be durable and relatively maintenance free.

Mechanical Room

General

This area is to be designed to contain the mechanical equipment needed for the efficient operation of the auditorium.

Size

The size should be approximately 2,000 to 3,000 square feet.

Adjacent Areas

1. Maintenance
2. Service entry

Windows and View

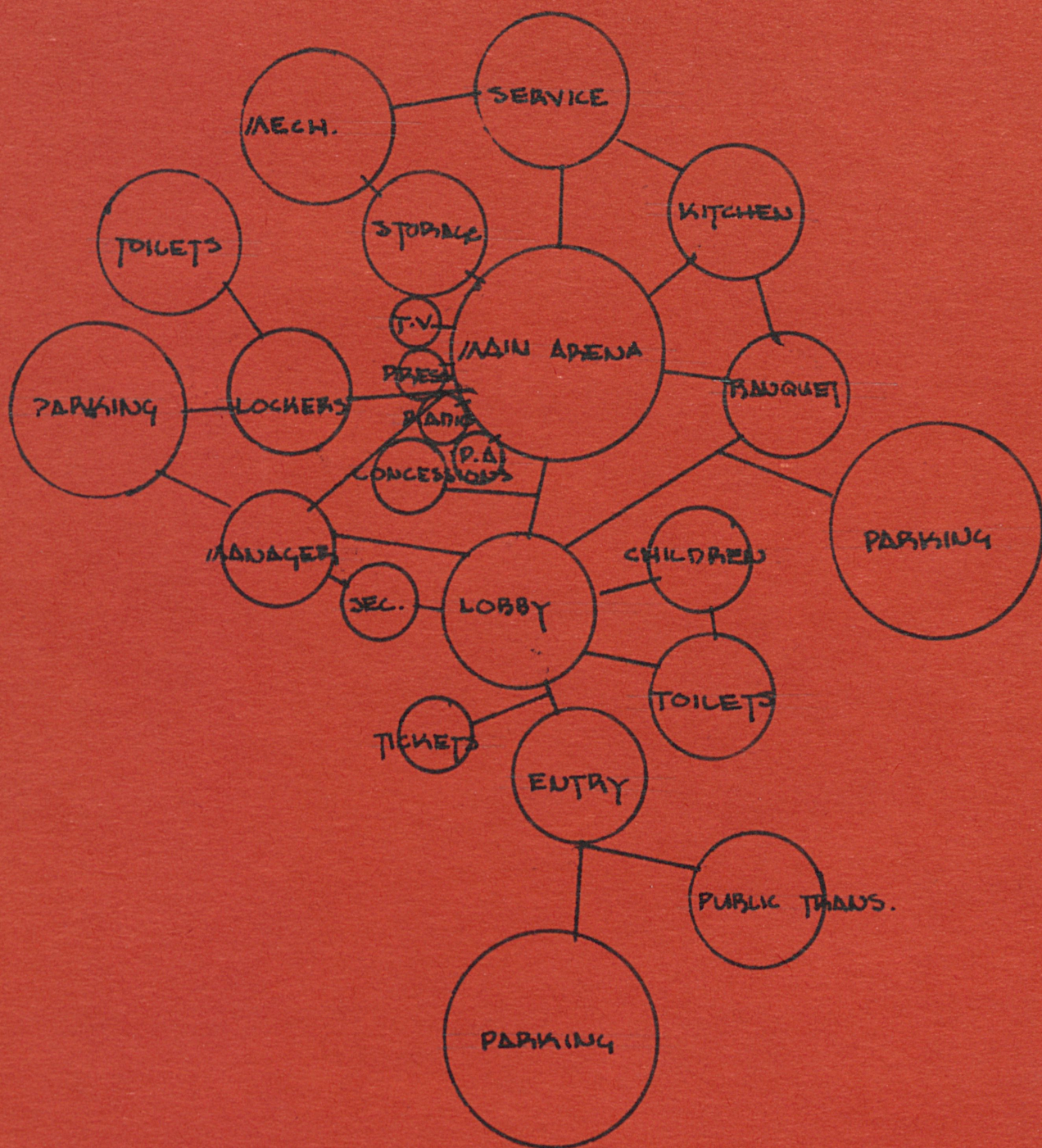
none.

Equipment

All the mechanical and electrical equipment required to run the arena.

Materials

The materials must be functional, inexpensive, durable, and maintenance free.



FLOW DIAGRAM

REFERENCES

- A Municipal Coliseum, Gene Kolstad, Architectural Thesis, Montana State University Architectural Library, 1962.
- Auditoriums and Arenas, International Association of Auditorium Managers, New York, 1961.
- Climate and Architecture, L. Aronin, Rheinhold Publishing Corporation, New York, 1953.
- "College Arena, Assembly Hall," University of Illinois, Architectural Forum, September, 1963.
- Encyclopedia Americana, Volume M, Americana Corporation, New York, 1964.
- Encyclopediatic Guide to Planning and Establishing an Arena, Coliseum, or Multi-Purpose Building, H. Penn, Penn-Fleming Publications, Inc., Greenville S. C., 1963.
- "Great Falls," a pamphlet by the Great Falls Chamber of Commerce, June, 1965.
- Great Falls City Engineer's Office, traffic surveys 1965.
- Great Falls Weather Bureau, precipitation charts, weather reports.
- Interviews with Dan Thurber (State Fair Director) and Bud Purdy (MSU Fieldhouse Manager) July, 1965.
- Portland, Oregon Chamber of Commerce, Pamphlets, May, 1965.
- "Rapid City Business Survey and Market Guide," Rapid City, South Dakota, 1965.
- Shell Architecture, Jurgen Joedicke, Reinhold Publishing Corporation, New York, 1963.
- Spokane, Washington Chamber of Commerce, Pamphlets, June, 1965.
- "Stadiums: Latest Crop of Sports Arenas From All Over the World," Architectural Forum, September, 1963.
- United States Census Bureau, statistic sheets and information.

MONTANA STATE UNIVERSITY LIBRARIES
stks 720.6.M76M957 CA
A sports arena convention center /

3 1762 00158312 7


720.6
M76
M957

~~LIB. USE ONLY~~

