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MUSEUM OF THE ROCKIES FOR BOZEMAN, MONTANA

Part 1

Undergraduate Thesis in Architectural Design

By 441

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

at

Montana State University

Bozeman, Montana
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NEED

1.0 CONDITIONS CREATING A NEED

In listing the conditions creating a need for a new campus museum facility, I have not forgotten the fact that a museum does exist on campus now, (though some would argue that point by definition), but I have made an attempt, rather, to define and reaffirm the need for any museum at all. More specifically, I have tried to show why Montana State University, and the Northern Rockies region in general, needs a larger, more comprehensive museum facility. By pointing out the interests that would benefit from such a facility, one planned expressly for the best functioning possible, I hope to illustrate that the need does indeed exist.

With the explosion of human knowledge which we are now witnessing goes a lamentable disorientation or alienation of man in society. Often the pressures and changes that shape man's behavior are too great for him to comprehend. Specialization narrows outlook and understanding. Mechanization disrupts personal involvement. Communication media multiply the ideologies, (often conflicting), to which man is exposed. The result is becoming an increased sense of disorientation in society's collective mind. What is needed is a more cosmopolitan viewpoint, coupled with greater understanding of what, who, and where we are.

It is in the interest of achieving this understanding that man has devised museums. Too often museums are shrugged off as cemeteries for antiques. They are, on the contrary, becoming the catalyst for an awareness of man's place in his own understanding. "...The museum has become a storehouse of human values, a cultural bloodbank." ¹ Museums give definitive pictures of man's modification of and by his environment. From these pictures man can identify himself, and with a little open-mindedness, foresee his direction. There exist few other places where man can experience artifacts of his heritage so vividly. Museums add a tactile dimension to the textbooks and personal

experience to the references from which man must draw an understanding of change.

1.1 EDUCATION

With the trend in education toward involvement of the senses in the learning process, museums will certainly play an increasingly important role in tomorrow's education. Teachers could supplement audio and visual aids with first-hand experience in a museum. Students would enjoy an enrichment of the text to a degree impossible within the classroom. There are few departments, and therefore few students, at M.S.U. that couldn't benefit from a larger, more modern, and more thorough museum on the campus. Students of agriculture, geography, sociology, art, and history are but a few of those that would benefit directly from the added depth that a museum can provide.

Montana State University students are at enough of a disadvantage in scope because of the school's location far from the cultural mainstream. But that very location, so close to history, in a region so untapped in terms of exploration, research, and interpretation, affords students here the rare opportunity, through a campus museum, to experience the dynamic story of a region's evolution from wilderness to civilization.

A museum on campus with the proper facilities would be an invaluable asset to student and teacher alike as a center for research and information. The students of the area's elementary and secondary educational systems would be exposed to a richer store of "touch-and-see" learning experiences.

The museum, in terms of research and learning, could be a focal point for all the archeological, anthropological, sociological, geological, and historical studies that will be made in and of this area.

1.2. COMMERCE

As an attraction for tourists and as an added enticement for their return trips, the expanded campus museum facilities would be a boon to the area's commercial tourist industry. Whether coming to Montana's vacationland for the first time, or for a return visit, people from other areas would benefit from the museum by using it as a reference to correlate and explain the phenomenon that is our mountain region. They would come bringing much-needed tourist dollars, and leave taking with them a sharpened appreciation of Montana's heritage.

1.3. COMMUNITY

Aside from the educational value derived by themselves as well as their children from a new museum, residents of the Gallatin valley could take pride in the new facilities as a cooperatively established link between the community and the university. Rather than being a place where everyone goes but once a year, it could become a community meeting place. With rotation displays, changing scenery, and the addition of more and newer exhibits, the museum would be far from a static influence on the cultural enjoyment of the people of Bozeman. Being a documentary of their heritage, the museum would hold a special place in the lives of the valley residents.

1.4. EXISTING FACILITY

Housing the present Museum of the Rockies here on the campus is a partially renovated dairy barn. As a museum building the barn is functionally and spatially inadequate. (see accompanying photos, figure 1, page 12, and figure 2, page 13).

Although the rustic character of the barn itself if anything adds to the richness of the exhibits, the antiquated lighting system hinders full enjoyment. Many of the collections, set up in

glass cases around booths along the pattern of visitor flow, are illuminated by a single bare bulb in the center of the display booth. The resulting glare and reflection, coupled with the fact that you are always reading and looking at objects obscured by your own shadow, makes it impossible to scrutinize small details. The windows confuse the issue further as a spot source of bright light which reflects itself on the glass cases.

The building itself does little or nothing to stop the collection of dust and moisture on the valuable and fragile old exhibits.

Several excursions to the Museum left me with admiration for the work done by the staff and respect for the quality of the artifacts, but also pointed out to me the need for more functional space. The collections now housed by the Museum include:

- a. Traphagen Geological
- b. Hawkins Botanical
- c. Hannon Indian and Art
- d. McGill Collections
- e. Hamilton Indian and Art
- f. Prescott Early American
- g. Crouse Guns
- h. Murdock Minerals

- i. Black-Neff Antiques
- j. Pallfy and Morse Indian Displays.

There are other collections in the community which are part of the Museum of the Rockies, but which are excluded from the building because of space limitations. For example:

- a. Gallatin Pioneers exhibits in the new Gallatin County Courthouse.

With more collections expected and no room for some of the ones they have now, the Museum staff's plea for more space is certainly justifiable. Another factor in control of acquiring new exhibits, and protecting the old, is that the present facility is anything but fireproof. With the acquisition of safer, more physically controllable facilities the Museum of the Rockies can hope to get better and more precious artifacts.



Figure 1. REFLECTION AND GLARE



Figure 2. CROWDED, ANTIQUATED, AND DILAPIDATED

LOCALE

2.0 LOCAL CONDITIONS

2.1 GEOGRAPHICAL

Bozeman, Montana, the home of Montana State University, is located in the shadow of the Bridger range of the Rocky Mountains at an elevation of 4793 feet above sea level. The surrounding area is rich farm and ranch land, and the residents are justly proud of their wildlife and recreation areas. Hunting and fishing in the area are favorite sports of local people as well as sportsmen from all over the nation. The Gallatin River is rated as the fourth best trout stream in the United States, and the nearby Madison River is rated as the best in the country.

2.2 CLIMATIC

Bozeman's clean, dry, mountain air is one of the area's important assets. With about 20 inches of rainfall per year, and an average temperature of 43 degrees, Bozeman is not a climatologically unfriendly place.

An important consideration in construction of any type is the expansion and contraction caused by a wide variance in temperature. Fragile museum exhibits are of special concern in this respect. In a mountain climate like Bozeman's, extra heating requirements and resultant extra construction costs are to be expected with the wide range in temperature. Temperature means for the area are as follows:

1. Spring minimum = 26 maximum = 80
2. Summer minimum = 39 maximum = 102
3. Autumn minimum = 34 maximum = 70
4. Winter minimum = -25 maximum = 50

With a temperature range of more than 130 degrees some winters, extra care and cost will be required in the proposed museum building's heating and ventilation systems, as well as in the consideration of insulation and joint detailing.

Wind conditions in the Bozeman area are such that prevailing winds, (usually between 4 to 12 miles per hour), are generally from the northwest,

while occasional storm winds come from the east. Only rarely are wind conditions severe.

2.3 ECONOMIC²

The economy of Bozeman is built primarily upon income from agricultural sources, together with Montana State University, which employs hundreds of people for the faculty and staff. MSU officials estimate the total contribution of the school to the Bozeman community to be \$30,000,000 annually. Agricultural operations are divided among small grain production, livestock, (including numerous cattle breeders), and dairying.

Although not an industrial center, the Bozeman area does include several small plants engaged in lumbering operations, cement manufacturing, food processing, grain milling, and several other small manufacturers. Tourism is an increasingly important source of revenue.

The financing of the new museum will be a joint "town-gown" endeavor, the particulars of which will be discussed later. (See Source of Revenue, page 68). The economic background for this endeavor, however, is of sufficient importance to the whole project that I outline it here.

2.31 Financial data - Bozeman is served by three banks with total assets of over \$54,000,000 and deposits of over

\$54,000,000 and deposits of over
\$49,000,000.

- 2.32 Retail - Bozeman is classified as one of the State's major retail centers. The retail trade area covers 24,465 square miles, with a population of more than 65,000. Retail sales in the county in 1963 totaled \$42.3 million. The principal shopping areas are comprised of eight blocks on Main Street, and six blocks on North Seventh Avenue. There are neighborhood shopping areas on College Street between 8th and 11th Avenues, and on West Main.
- 2.33 Agriculture - In Gallatin County there are 939,700 acres in farmland. There are 858 farms and ranches, with an average acreage of 1,179. Cash receipts from marketing in 1964 were \$11.1 million.
- 2.34 Labor Force - Gallatin County, (1966 estimate). There are more than 7350 people employed in major industries. The breakdown is as follows:
1. Agriculture (hired workers) - 600
 2. Construction - 340
 3. Logging - 400

4. Manufacturing - 360
5. Transportation and Utilities - 300
6. Wholesale and Retail Trades - 2000
7. Services and Finance - 2,700
8. Government - 650

2.4 SOCIAL

2.4 SOCIAL

Bozeman is a conservative town in a conservative state. This fact, however, coupled with the fact that Montana is located outside of the cultural mainstream, has not dampened the Bozemanite's desire to better himself through cultural exposure, and to provide opportunities for his children to do the same. Although there has been some disagreement in the past between the community and the University, for the most part, the two cooperate as best they can. A situation in which the University student population is so great a proportion of the total population of the area is bound to result in some problems, but responsible, broad-minded people on both sides acknowledge readily that the symbiosis of the town and the University has advantages that far outweigh the disadvantages. Most Bozeman businessmen will bend over backwards to assist students in research projects such as this. The University brings a wealth of cultural opportunities

to the area in the form of theatrical, musical, and oratorical performances in which the townspeople are encouraged to partake. Art exhibits from all over the country are displayed for the benefit of all by the University. Some of the work of the art students is exhibited and sold downtown. This mutual give and take arrangement forms a basic part of the sociological character of the community.

By deciding to cooperate on the new museum venture, the town and the University have evidenced their faith in each other, and in the benefits both will realize.

2.5 HISTORIC²

One of nine counties carved by the territorial legislature in 1865, this county was named Gallatin to honor Albert Gallatin, U. S. Secretary of the Treasury.

The Indians called it "The Valley of Flowers"; it was neutral ground used by all for hunting, by none for homes. From the North came Blackfoot and Piegan, from the east, Crow and Cheyenne, from the west, the Shoshone.

First settlements in Montana were the gold camps of Bannack, Alder, and Last Chance Gulch, but the settlement of the Gallatin was different, for

here the settlers brought their women with them, seeking homes and farms.

In 1864 John Bozeman led a wagon train over the Bozeman Pass and into the valley, where he and his friends staked out the townsite for the city of Bozeman. Other settlers followed and with the threat of Indian troubles, Fort Ellis was established three miles east of Bozeman in 1867.

The mines provided markets for farm products, a score of streams flowing across the valley provided cheap irrigation and the richness of the soil earned for the valley the title "The Egypt of America".

The cattle industry thrived. A Bozeman pioneer, Nelson Story, brought the first trail herd to Montana from Texas in 1864. Four or five decades later Charles Anceney and Harry Childs built up Montana's largest single ranch, the famous Flying D, situated some 25 miles southwest of Bozeman. Today the valley is the most populous purebred cattle area in America.

5 Historical points of interest in the area include:

1. Museum of the Rockies (MSU campus)
2. Gallatin Courthouse Museum
3. Lewis and Clark Camp (Three Forks)
4. Old homes on South Willson Avenue
5. Virginia City

Because historic background is of prime interest in this paper, I think it is fitting that a brief account of the origins of the McGill Museum, (or, as it is now known, The Museum of the Rockies), be included:

The McGill Museum had its origin in August, 1956. At that time Caroline McGill, a skilled Butte Physician since 1911, gave her collection of Victorian furniture, rare glassware, books, pictures, and many other exhibit items to Montana State College. Dr. McGill knew intimately many members of the older Montana families, and through them she managed to gather an impressive collection dealing mostly with the home furnishings of the Victorian era. Through gifts from her extensive and varied collections to the Montana School of Mines, University of Montana, and Montana State College, she hoped to stimulate the state and several communities toward greater effort in preserving certain aspects of Montana's cultural heritage.²

SITE

3.0 SITE CONDITIONS

In an attempt to keep this problem as real as possible, I have decided to use the site which has been allocated for a museum by the University Campus Planning Committee. There are other sites which would be interesting to develop, but their use would be rather facetious for this problem in view of the fact that they have been designated as sites for other future campus facilities. So to keep the challenge of the thesis as close to reality as I can, by working with what I have, I hope to at least approximate some of the problems that will be encountered by the actual architect who will be commissioned to design the museum someday.

3.1 ORIENTATION AND CHARACTER

The site, as tentatively suggested by the Planning Committee, consists of about five acres of land on the southwest corner of the intersection of West College and South Eleventh Avenue. (see maps, p. 27 and p. 28. 3, pp.

Dropping about one foot in every fifty from its southern boundary to the northern edge, the site is generally flat, and has a small creek flowing from south to north. No significant vegetation is seen, with ground cover of grass and small shrubs predominant. No soil data is available on this site at present, but Mr. Van Teylingen, campus architect, assured me that conditions on the site should probably be closer in character to those of campus land to the east (adequate bearing, water table 6' below grade), than to those of more troublesome areas to the South.

3.2 ADJACENT ENVIRONMENT

For design considerations, I have seen fit to consider the surrounding environment of this site from two points in time - present and future:

3.21 Present

(See figures 4, (p. 28), 6, (p. 30), 7, (p. 31) 8, (p. 32).

Married student housing exists and is developing to the west of the site. On

the other side of South Eleventh Avenue, to the East of the site, are the Military Science Buildings, the Wool Laboratories, and a vacant lot. (All of these structures are temporary.) On the North is a Montana Power Company substation which is also temporary. On the opposite corner of the intersection of West College and South Eleventh from the site is a drive-in and some small stores.

3.22 Future

Although campus development plans are not comprehensive, the study that has been done makes South Eleventh Avenue one of the main arteries of traffic to the campus from town. Proposals show it ending in a cul-de-sac almost adjacent to the site I am considering. South Eleventh and whatever will be built at its end turn-around will form visitors' first impressions of the campus. A large parking area will be located on both sides of South Eleventh after its intersection with West College. This could accommodate museum parking requirements as well as academic parking.

In the future then, the "adjacent environment" of the site might be con-

siderable different from what it is now. To the west could be further development of the married student community, as well as open land for campus expansion. To the south could be an increased number of academic buildings, and the west end of the academic area and housing. Toward the east will be the presently existing dormitory block, and more academic buildings. To the north will be an off-campus residential district. Not that this will inevitably be the case, but it seems to be a logical approach on the part of the Planning Committee, and therefore, a valid assumption on my part. To design with respect for adjacent structures necessitates an indication of what they might be.

In either case, the site has a good view of the mountains which surround Gallatin Valley in almost all directions. On the site itself, at present, are several temporary residential and storage structures. The maze of power and telephone lines that obscure the site at present could be relocated underground.

3.3 ZONING REGULATIONS

The Montana State University campus is not at the present time subject to the building codes as usually recognized, but a common sense adherence to the National Building Code and the Uniform Building Code would be advisable.

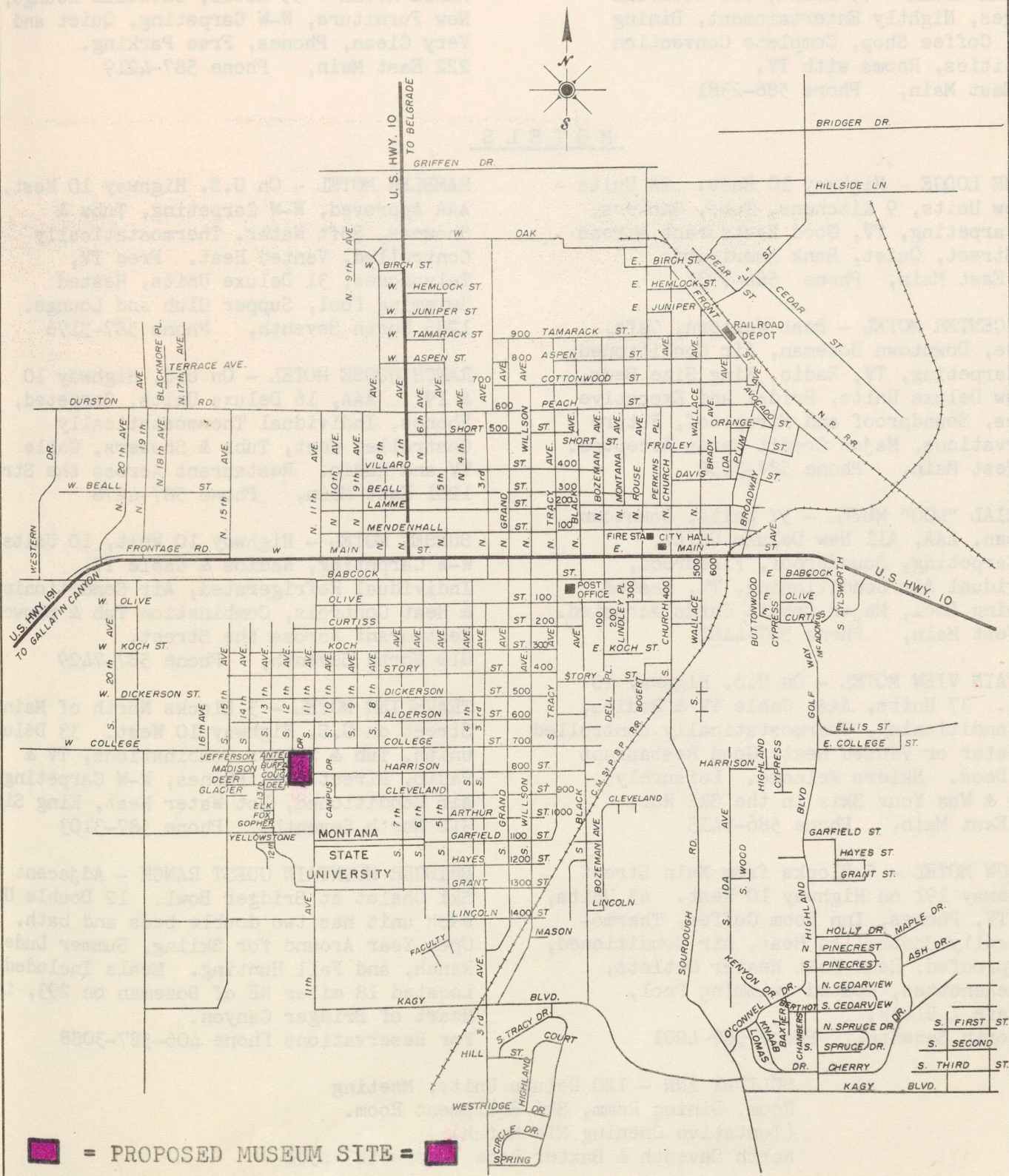
3.4 AVAILABILITY OF UTILITIES

Adequate service is present on the site:
(See figure 5 , p. 29).

3.5 TRAFFIC PATTERNS

South Eleventh Avenue is at present one of the major arteries from downtown Bozeman, West College continues on out west to intersect directly with U.S. Highway 191. If present trends continue, and if the Campus Development Committee's plans are at all indicative of what will happen in the future, this site would indeed be a great choice for the new campus museum. Tourists and visitors coming from highway 191 or from downtown could make the museum a focal and reference point on the campus for their entire visit.

MAP OF BOZEMAN MONTANA



HOTELS

BAXTER HOTEL - 73 Rooms, Cocktail Lounge
Dining Room, Coffee Shop. Complete
Convention Facilities. Room TV
105 West Main, Phone 586-2351

BOZEMAN HOTEL - 75 Rooms, Two Cocktail
Lounges, Nightly Entertainment, Dining
Room, Coffee Shop, Complete Convention
Facilities, Rooms with TV.
321 East Main, Phone 586-2381

KESTER HOTEL - 36 Rooms, Quiet &
Comfortable, Phones, Free Parking
440 East Main, Phone 586-5451

RANGE HOTEL - 55 Rooms, Cocktail Lounge,
New Furniture, W-W Carpeting, Quiet and
Very Clean, Phones, Free Parking.
222 East Main, Phone 587-4219

MOTELS

ALPINE LODGE - Highway 10 East. 28 Units -
18 New Units, 9 Kitchens, Tubs, Showers,
W-W Carpeting, TV, Good Restaurant across
the Street, Quiet, Bank Americard.
1017 East Main, Phone 586-9932

CITY CENTER MOTEL - Best Western, Cafe,
Coffee, Downtown Bozeman, Air Conditioned,
W-W Carpeting, TV, Radio, King Size Beds,
30 New Deluxe Units, Bridal and Executive
Suites, Soundproof and Fireproof, Future
Reservations, Major Credit Cards Accepted.
507 West Main, Phone 587-3158

IMPERIAL "400" MOTEL - 37 Units, Downtown
Bozeman, AAA, All New Deluxe Units,
W-W Carpeting, Soundproof, Fireproof,
Individual Air Conditioning, TV, Heated
Swimming Pool, Major Credit Cards Accepted.
122 West Main, Phone 587-4481

MOUNTAIN VIEW MOTEL - On U.S. Highway 10
& 191. 37 Units, AAA, Cable TV & Radios,
Air Conditioning, Thermostatically Controlled
Hot Water or Vented Heat, Good Restaurant
Next Door. Skiers Welcome. Leisurely
Clean & Wax Your Skis in the Ski Hut.
1010 East Main, Phone 586-5415

RAINBOW MOTEL - 5 Blocks from Main Street
& Highway 191 on Highway 10 West. 43 Units,
AAA, TV, Phones, Inn Room Coffee, Thermo-
statically Controlled Heat, Air Conditioned,
Soundproofed, Head-Bolt Heater Outlets,
5 Kitchenettes, Heated Swimming Pool,
New Cafe 1 Block.
510 North Seventh, Phone 587-4201

RAMBLER MOTEL - On U.S. Highway 10 West.
AAA Approved, W-W Carpeting, Tubs &
Showers, Soft Water. Thermostatically
Controlled, Vented Heat. Free TV,
Telephones, 31 Deluxe Units, Heated
Swimming Pool, Supper Club and Lounge.
1235 North Seventh, Phone 587-3176

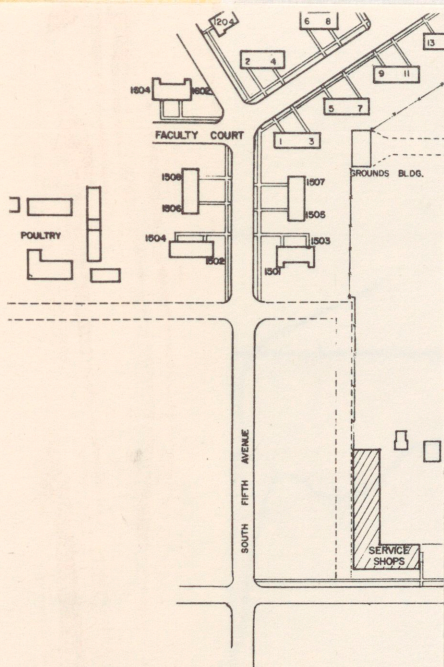
RANCH HOUSE MOTEL - On U.S. Highway 10
& 191. AAA, 16 Deluxe Units, Carpeted,
Phones, Individual Thermostatically
Controlled Heat, Tubs & Showers, Cable
TV and Radio. Restaurant Across the Street.
1201 East Main, Phone 587-4278

SUNSET MOTEL - Highway 10 West, 10 Units,
W-W Carpeting, Radios & Cable TV,
Individual Refrigerated, Air Conditioning
& Heat Controls, Combination Tub & Shower
Restaurant Across the Street.
810 North Seventh, Phone 587-7429

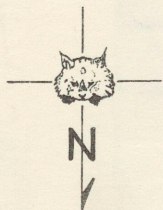
TRAVELIER MOTEL - 3 Blocks North of Main
Street on U.S. Highway 10 West. 33 Deluxe
Units, Tub & Shower Combinations, TV &
Radio, Direct Dial Phones, W-W Carpeting,
Air Conditioned, Hot Water Heat, King Size
310 North Seventh, Phone 587-3103

BRIDGER MOUNTAIN GUEST RANCH - Adjacent to
Ski Chalet at Bridger Bowl. 12 Double Units,
each unit has two double beds and bath.
Open Year Around for Skiing, Summer Lude
Ranch, and Fall Hunting. Meals Included.
Located 18 miles NE of Bozeman on 293, in
Heart of Bridger Canyon.
For Reservations Phone 406-587-3088

HOLIDAY INN - 120 Deluxe Units, Meeting
Room, Dining Room, Ski Equipment Room.
(Tentative Opening Mid March)
North Seventh & Baxter Lane Phone 587-4561



MONTANA STATE UNIVERSITY CAMPUS MAP



SCALE 1"=100'

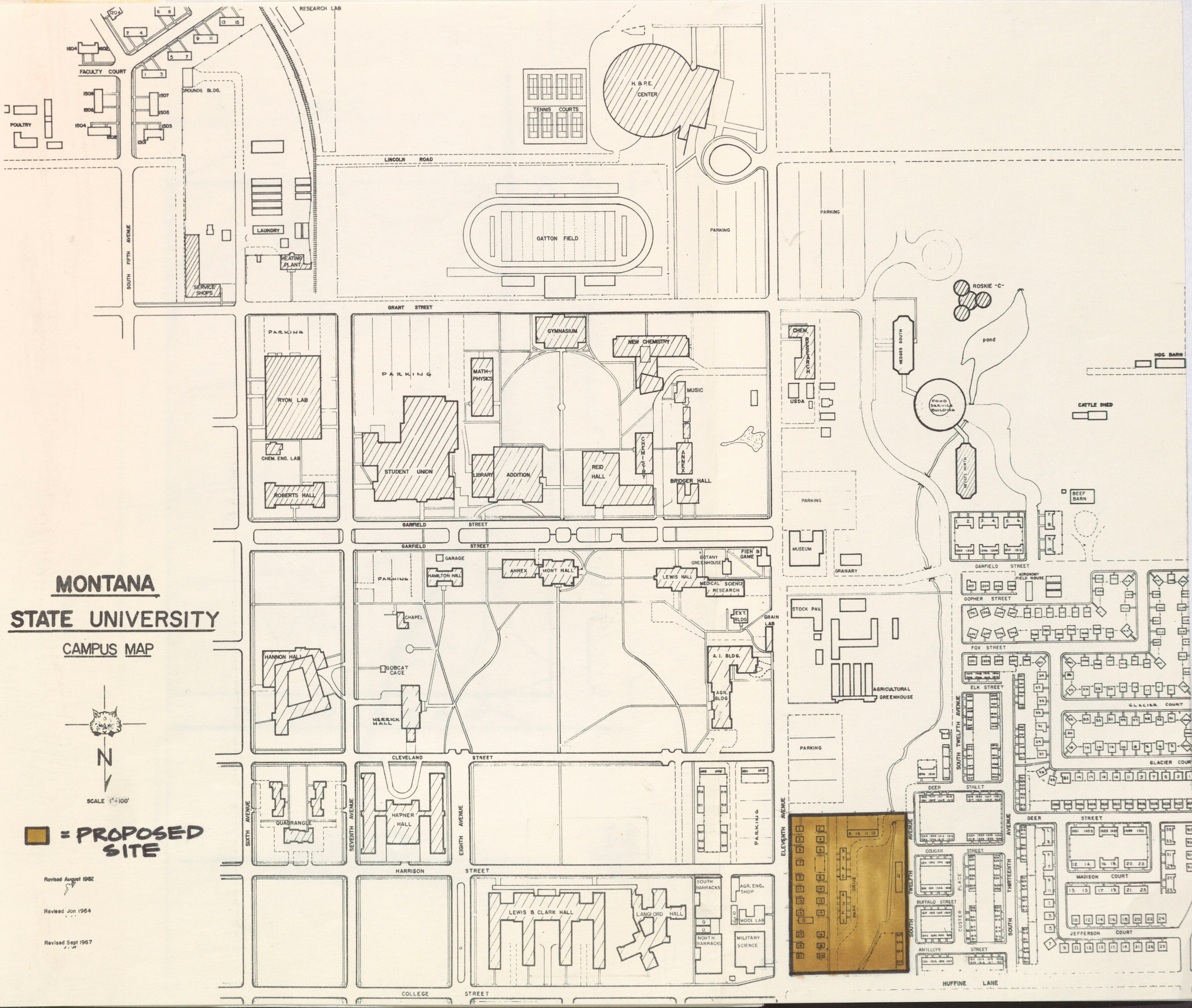
 = PROPOSED SITE

Revised August 1962

Revised Jan 1964

Revised Sept 1967



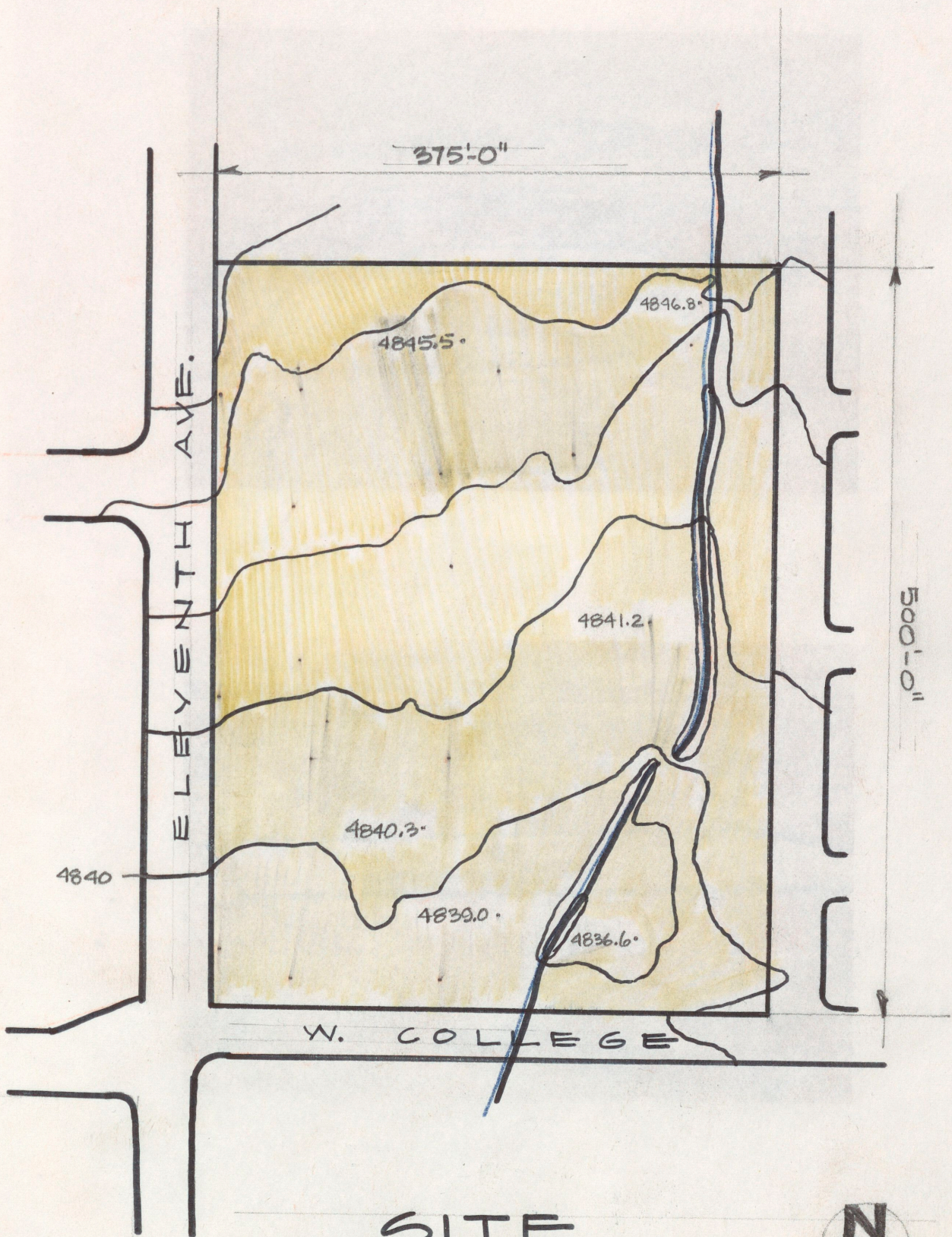


MONTANA **STATE UNIVERSITY** **CAMPUS MAP**



■ = PROPOSED SITE

Revised August 1982
 Revised Jan 1964
 Revised Sept 1967



SITE
SCALE: 1" = 100'-0"



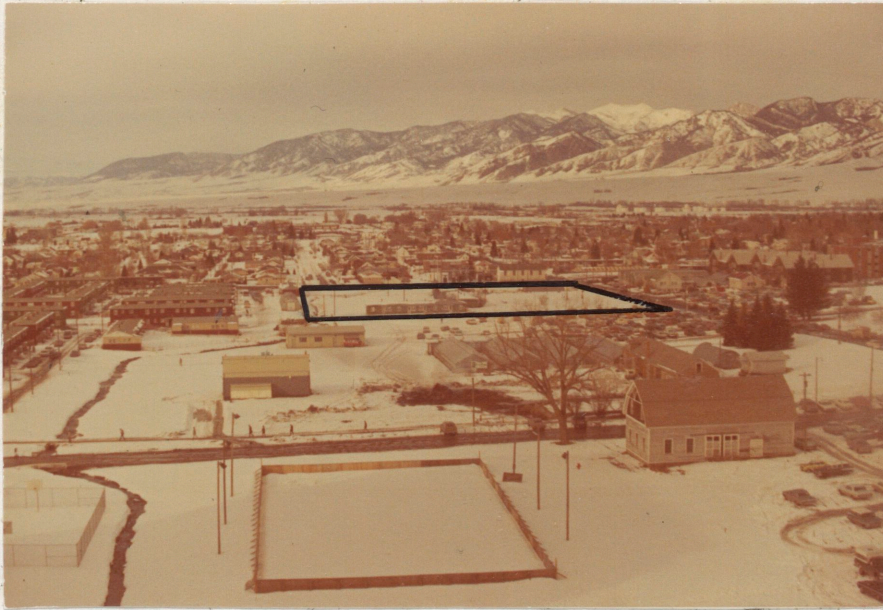


Figure 6. PROPOSED SITE FROM TOP OF HEDGES



Figure 7. SITE FROM NORTHWEST

SITE FROM SOUTHWEST



Figure 8. SITE FROM SOUTHEAST

SITE FROM NORTHEAST

AESTHETICS

4.0 AESTHETIC CONSIDERATIONS

Webster's defines aesthetics as, "The study, or philosophy of beauty, art, and good taste." I think that the word has a deeper, more definite meaning. In fact, I detect a dichotomy of definition.

A new Chevrolet Corvette Sting Ray, with its sleek, graceful lines and streamlined appearance gives the illusion of motion even while it is standing still. It has what I call "aesthetics of form". Every line, every contour, even the cockpit's material finish and appointment is calculated to evoke an emotion of awe and respect in the observer.

A new Volkswagen, on the other hand, is far from being graceful. Its abrupt, to-the-point form epitomizes economy and functionality. It has what I call "aesthetics of function". From its painted-

rather-than-upholstered interior to its stubby and homely exterior, the Volkswagen reads function.

This is not to say that the Corvette StingRay is not functional, or that the Volkswagen is ugly, because answers different design criteria. Each in its own right is aesthetically pleasing if one acknowledges the two aspects of "aesthetics" that I am trying to illustrate. The Volkswagen, with its complete lack of frills and its economy of materials, is a study in functionality. The Sting-Ray is in a different realm, sacrificing roominess and comfort for a pleasing form.

Architecturally speaking, these two aspects of aesthetics have long plagued designers. Warehouses are rarely noted for their beauty, just as art galleries or churches entail much more than that which is adequate to protect a given number of people from the elements.

A museum must be a curious mixture of form and function. A compromise, if you will, between the functionality of a warehouse and the emotional impact and permanence of an art gallery or church. Somehow, through its materials, form, and arrangement, a museum must convey a permanence greater than most buildings, yet not become burdensome or oppressive in its character. The building must stand out

and be recognizable as a place of importance, yet not dominate the campus. Its interior arrangement and materials must speak out clearly the fact that a museum is a permanent, durable, and secure container of valuable objects and yet not overpower or detract from the very exhibits it is intended to show off. The exterior materials, by reason of practicality as well as aesthetics, should give an impression of durability and permanence, as well as tie in somehow with the natural materials and feeling of this region.

FUNCTIONS

5.0 FUNCTIONS

With such a concrete heading for this section, one might expect what follows to be cut-and-dried. But a closer look at the functions of a campus museum reveal that there are many bits and pieces of the aspects of museum functional design that defy a general classification under the heading "function." For this reason I will divide the section into two basic headings:

1. Functional Aspects
2. Functional Space Requirements.

5.1 FUNCTIONAL ASPECTS.

This section, I hope, will make the reader aware of the feeling that is a basic part of museums. Because too, the architecture of a museum is related directly to all of the functions therein, a discussion of the individual functional aspects might help the reader get a clearer idea of the basis of design decisions which are to follow.

What is a Musuem?

There are several answers to this question that, when considered altogether, hint at the character, and meaning of "museum": The dictionary's (3) archaic definition of "museum" hints first at the origin of the word:

The Muses were originally the nymphs, or goddesses of inspiration. According to Hesiod, they are the nine daughters of Zeus and Mnemosyne, each one associated with a different area of endeavor. Clio was the daughter associated with History.

A museum then, was originally a temple, or sanctuary of the Muses. Later, it became a place dedicated to the work of the Muses, in association with a library and an observatory. (Witness the complex established at Alexandria by Ptolemy Philadelphus in the third century B.C.).

Today, we think of a museum, definitely at least, as a building devoted to the collection and preservation of works of nature, art, and antiquity, or to the exhibition of rare and instructive articles of the arts, science, or literature.

Marshal McLuhan, the former Director of the Center for Culture and Technology at the University of Ontario, says it in a more up-to-date manner:

"...A museum is a kind of garden of the Muses-the various faculties of the human mind-extended out into environment. Our new computer world is an extension of our nervous system into a total environment, not just around the planets, but around the cosmos. What the muse of the computer will be; Heaven only knows. But the muses are the human faculties, mental, spiritual, sensory, extended out into the environment. A museum is, presumably, a collection of all of them in a kind of consciousness."⁴

At first, museums were the endeavors of the rich. As people in a position of wealth and power extended their influence, they collected material objects from their far-flung empires. Treasures and precious art objects were acquired and housed in a safe place by those affluent enough to do so. These collections and their "safe places" became, eventually, what we know as museums, but they were limited in their exposure to only the chosen, wealthy few. Probably, some of those that were privileged to see these early collections made an attempt to analyze and classify them. This paved

the way to a clearer understanding of man's position in relation to nature, history, art, science, and society.

"...We know that the first glimmerings of descriptive science had their origin in such world-wide collections as those of Alexander, on which most of Aristotle's observations were based. So museums, or their primitive equivalents, over the centuries must have been instrumental in freeing men's minds for a more rational view of what had been a strange, chaotic, and hostile world.

Opportunity to see with one's own eyes, not a word description, not a photograph, not even a television image, but the genuine, authentic, irrefutable "real thing", is a concept which we must not take lightly, or dismiss as an outdated item in man's confrontation with the natural world and with himself. It is the very basis of the world today - our thorough acquaintance with the materials of the earth, inanimate and living, their manipulation in the service of man, and especially their significance for man beyond his food, shelter, and reproductive needs. On top of his individual, personal, and essentially selfish considerations, man has philosophical and esthetic yearnings to be assuaged. He cannot think productively in any of these levels without a firm, first-hand knowledge of the "things" he is expected to conceptualize and intellectualize in coming to decisions in his adjustment to his world. This is the function of a museum, at every level, from the man-in-the-street to the intellectual leader who will shape the world of tomorrow."⁵

I would add that since museums and their collections have now largely passed into the hands of the public, the experiences and educational opportunities which were at first reserved for only a wealthy few, are now afforded to people from all

strata of economic, social, and educational backgrounds. This fact, justifies a close examination of the function of a museum in respect to those for whom it is designed. To maintain some sort of continuity in this section of the paper, I will continue on with defining the museum and its functions, and leave the consideration of the types of people who frequent a museum, as well as the functions of each particular area, till later.

Within the scope of this paper, perhaps it is now time to qualify the type of museum I will design.

Museums in general may be divided into two distinct types: the public museum, and the university, or college museum-(hereafter referred to as the "campus" museum). It is the latter with which this paper is concerned, although I would like to show that the two can be compatible.

In the course of my research, I found some discussion, arising out of the above-mentioned distinction of museum types, as to where the emphasis should lie in a town-gown situation. Proponents of the campus museum say that since such a museum is part of the academic community, its primary allegiance lies with the school, and therefore, it should specialize in academic research. In his book, College and University Museums, Laurence Vail Coleman holds that:

"...The first duty of a university or university museum is to its parent establishment, which means that the faculty and the student body have a claim prior to that of townspeople and outsiders in general. Public service, including cooperation with schools and other work for children, is no more the first business of a college museum than that of a college library.⁶

This opinion, however, was written in 1942, and since that date the whole scene and orientation of museums has changed. In fact, museum visits have increased (in this country) 500% in the last thirty years, to 300 million annually.⁷ A more recent, (1958), work, Museum Facilities for a University Community, by Dean Harold C. Rose of Montana State University,⁶ asserts that the campus museum would do well to take on some of the aspects of the public museum in view of the support it can derive from non-academic quarters. The campus museum's function as a research and academic center would not be impaired in such an instance, if it would attempt a:

"...display of items of general interest backed up by comprehensive collections available for study by the specialist"⁸-p.9.

Therefore, the campus museum is like any other museum. If its emphasis shifts to all research it will lose support from the community because it isn't actively contributing to the informational and cultural level of its community. Unless the

endeavors of the campus museum are recognized as being beneficial by the academic community, the college won't appreciate and support the museum.

"...A campus museum which collects, preserves, arranges, and makes its collections ready for research, which pursues active and productive research with its own facilities and which, above all, makes a tangible contribution to the cultural tone of the community, both intra-and extra-mural, is not likely to find itself lacking in support."⁵

Aside from the educational and academic aspects of museum function, the essential function or "reason for being" of a museum lies in its capacity as a "container" or "safe place", (see above) for the various exhibits and precious articles. It is this container aspect that gives one directive to the museum designer. The building which will successfully serve as a museum should probably be "inward oriented", or directed within, rather than be open and airy, as are some other functional buildings. One of the foremost architects of modern times, Le Corbusier, called the museum the "magic box".⁷ This phrase hints at the functional form he perceived for the museum, which, one might assume goes along with my "container" feeling. With this frame of mind we can begin to see definite indications of design directions:

"...The architectural maxim that 'form must follow function', is the basic requirement of a successful museum plan".⁹

The subjugation of the building form to its

content appeals to common sense when the building's reason for existence is its content. Whether or not the architecture itself can justifiably overpower the exhibits, etc. within a museum seems to be becoming controversial. Citing the examples of modern museum architecture done by some of the most respected contemporary architects, Ada Louise Huxtable, Architecture Critic of the New York Times has this to say:

"Ideally, the good museum is a synthesis of content, creative direction, and appropriate form. But with art getting more minimal and architecture developing the environment, (see Oakland), the examples...suggest that there is a good chance for the 20th century museum to end up as the whole show."⁷

This tongue-in cheek prophecy points out differences in interpretation of museum design today, but also gives a poignant reminder that the museum building should not dominate the exhibits.

Many of the ideas related to the functional aspects of a museum which I will include in this section are not included as design decisions, but through their inclusion, I hope to achieve a broader base on which to stand when making decisions during the design work which will come next quarter.

"One cannot overstress the importance of gathering complete and accurate information, for these are the essential architectural tools required by the architect in order to create a graphic concept of the museum building. Hastily and superficially conceived programs of requirements will be reflected in preliminary plans."¹⁰

Resulting from the "container" function I have described, there goes the function of a museum that is the basis of public museums: By observing the collections in a museum, people can do more than learn - they can be motivated, they can experience, they can visualize other cultures and other times, and they can even relax. Not everyone comes to the museum with academic fulfillment in mind. For many, the trip to the museum is just an interesting or relaxing time-filler between classes or during a slack afternoon. For others, as I have shown, the museum is a source of information. The types of people and the kind of visit they make are just as varied, if not more so, than the numbers of people visiting a museum. (The existing campus facility accommodates approximately 5000 visitors each year in addition to 115 - 130 public school groups for lectures on specific topics.)¹¹

A campus museum, then, must recognize the public in which it exists. This public, comprising undergraduates, graduates, faculty and staff, townspeople, and visitors, is a fair cross-section of our national population. They are not all biologists, or anthropologists, or historians, or any other one group. They are in fact all of these and more. They include bankers, merchants, and housewives off campus, while on the campus itself they are

largely sociologists, agriculturalists, economists, engineers, architects, and even football coaches.

Because, as I have illustrated, people do come to the museum to relax, a consideration must be given to rest areas and relaxing visual effects. Even those that do come primarily for instruction find themselves, sometimes, beset by a phenomenon known as "museum fatigue". This phenomenon results from a lack of diversity, and most often occurs when a visitor is confronted with a tedious array of detailed, monotonous displays in one exhibit area. One good way to combat museum fatigue is through the use of diversity in scale, color, lighting, and maybe even volume, floor level change, and floor covering of exhibit areas. The rest areas and diversities, however, should be of such a nature so as not to cause the viewer to completely lose interest in what he was looking at.

As for the actual functions of the new Museum of the Rockies, an outline might help to clarify:⁹

5.11 Curatorial Functions

- a. collection, preservation, identification, documentation, study, and restoration.
- b. storage of collections.

5.12 Display Function

Thematic and changing displays of selected objects and documents, from the collections, arranged to tell a story.

5.13 Display Preparation Function

The preparation of exhibits.

5.14 Educational and Public Functions

- a. lectures, school tours, society meetings, films, and social functions.
- b. reception, information, sales, and supervision of display galleries.
- c. public requirements.

5.15 Other Services

- a. mechanical
- b. janitorial

5.20 The following principles describe methods of approach that should be followed to achieve success in the design and operation of a museum:⁹

5.21 Functional Organization

The first step needed to begin planning for an efficient and practical building requires the drawing of diagrams showing functional relationships and space organization.

5.22 Efficiency

Efficiency is the result of successfully achieving the desired relationship of; the spaces provided, the tasks to be performed, and the size of the staff.

Distances that exhibits have to be moved should be kept to a minimum. If basements are to be used for storage, the inclusion of an ample sized elevator is mandatory. It is more desirable to locate storage rooms on ground level, if possible, with direct access from the workrooms and proximity to the display areas. This will allow for easy exhibit changes and cross-referencing of curatorial records located in the office-work area and collection-storage area.

5.23 Separation of Functions

A separation of each basic function from other functions is very desirable to insure that any one function does not appear to be of less importance. Public areas have to be separated from staff areas. Access from the public areas to the staff areas should be by means of effective control. Stored collections, workrooms, and offices should be accessible from the staff area. Access from the

staff areas to specific display areas should be direct, and by means of locked doors.

Display galleries, lecture rooms, and meeting rooms should be individually and directly accessible from the lobby or orientation area. This will allow any one of these areas to be closed independently of the others. The necessity of this arrangement arises when the lecture rooms are to be used at times when the galleries are closed, such as in the evenings.

5.24 Display Relationships

When a visitor enters a display room, he should be presented with the beginning of the story and from there, follow a natural sequence around the exhibits without confusion. In most cases, an elongated room is the most effective shape to promote this type of movement.

Rectangular spaces provide maximum perimeter space for display cases or panels. The center of such a space can be used for seating or for feature displays.

Outdoor displays should not be overlooked, climate permitting, for they can provide a stimulating change of exhibit space and material. This is especially true if a courtyard can be used in the summer for outdoor displays, say, of agricultural implements. The courtyard should be enclosed, with or without a roof, depending upon the type of objects

to be displayed, and should be directly accessible from the staff areas as well as the public area.

5.25 Future Expansion

Museums by their very nature are expanding organizations. The building must, therefore, be planned to allow for expansion without disrupting the relationships previously mentioned, and still allow for an aesthetically pleasing structure. It must also be remembered that one cannot design a building to be expanded indefinitely to accommodate growth. A point is reached where a new building must be provided to suit changing requirements.

5.30 Considerations Affected by Museum Function

5.31 Structure

Dr. Leslie Drew, Director of the Museum of the Rockies, believes,¹² that the design of the display areas should be quite flexible, almost to the point of merely providing large, open, (column-free), areas within which the individual displays and patterns of traffic, etc., of the exhibits would be placed at the design discretion of the curator of the museum. Though this approach is encroaching on design, it does illustrate the definite need for flexibility of exhibit areas in

museum design. With such flexibility mandatory, a definite advantage can be seen in the use of long-span roof members, widely spaced columns, (if columns are used at all), avoidance of bearing walls, and a development of systems of lighting, heating, electrical supply, and humidity control that would function properly regardless of changes in spatial requirements.

5.32 Mechanical

Because large spaces will probably be broken up by exhibits, because wall areas will often be used for display, and because the fragile nature of some display articles necessitates strict attention to air temperature and moisture control, heating by warm air is a likely choice for museums.

5.33 Walls

Because a large area of wall space might be used for display of exhibits, consideration should be given to the walls in respect to how exhibits that are not free-standing might be hung. Part of the walls in display areas might form a mounting rail of some sort, or might be of a "nailable nature". Since walls will be a big factor in display in that they will surround all "hung" exhibits, careful treatment of their finish and color must be used to

prevent detracton from, or competition with, the exhibits themselves.

5.34 Ceilings

Again restraint must be exercised to prevent the ceiling form or material from overpowering exhibits. Because **most** of the heating ducts and lighting system are likely to be overhead, maybe a suspended type ceiling should be used.

5.35 Floors

Because much of the time the staff and the visitors are in the museum will be spent standing, floor coloring, texture, and resiliency must be used to reduce museum fatigue. Variations in floor level also provides feelings ranging from relaxation to excitement, if handled properly. Even pedestrian traffic patterns can be controlled by floors, both by level changes, and by the tasteful use of inlaid graphics.

5.36 Doors

Aside from their obvious function in security, doors must be of adequate width and height to permit ease of movement when large, bulky exhibits are concerned. Location of doors must be considered in view of which part of the museum might or might not

be used at night.

5.37 Windows

There is some controversy over whether or not windows should be used in a museum, especially in the display areas. I have witnessed what the fluctuations of natural light can do to the glass surfaces of exhibit cases in the present museum facility. Although the windows in the diaramas of early rooms do enhance the authenticity of the display, the reflections and glare caused by them are rather distracting. Problems in security, as well as problems of light control, especially if the museum is to be used at all during the periods of darkness, arise from the use of windows in the display areas. Dust and moisture can also enter through the cracks around a window, unless extreme care is used in its construction detailing.

Although windows don't seem to be desirable in the display areas proper, natural light is an asset in other areas, such as offices and rest areas.

5.38 Lighting

To facilitate careful study of some exhibits, a high-level, glare-free, and diffuse lighting condition is needed. For other exhibits, and maybe for rest areas, more contrast and a lower level of lighting might be desirable. Design for museum

lighting, then, must encompass at least these two extremes. Therefore no one, overall solution to the lighting problem is readily apparent. Point-sources, linear sources, luminous surfaces, incandescent types, and fluorescent types of lighting might all have their place in the interesting, functional museum design. As I pointed out in the structural considerations, flexibility might dictate a moveable or modular lighting system, but special areas and specific requirements would surely necessitate additions to any modular lighting system.

5.39 Acoustics

Because museums are usually handling a large number of individuals or small groups at any one given time, acoustic control must be developed within the building's layout, structure, use of materials, and flow pattern to prevent confusion, distraction and chaos. Although museums are generally thought of as "quiet, somber" places, I don't think they should be as dead as a library. Some exhibits might justifiably include a sonic, or even olfactory presentation along with the visual, to clarify and heighten experience. Still, care must be taken that these exhibits remain localized, by acoustical con-

trol, and don't detract from the enjoyment of nearby displays. Variation in noise level, with control of course, is yet another way to change mood and prevent museum fatigue.

5.3.10 Fire Protection and Prevention

Because of the valuable nature of most of the articles in display in a museum, a more-than-adequate number of strategically-located fire extinguishers should be provided for in the design. These should probably be of a "dry" type to prevent, or at least minimize, damage to the exhibit materials in the event a fire should occur.

As the cliché goes, "An ounce of prevention is worth a pound of cure". Even if there were no fire prevention construction codes, a museum should be as "fire proof" as possible. This ties in with its function as a "container" of artifacts, most of which are rare and priceless. Use of approved construction details and techniques, as well as use of durable, fire-resistant materials is highly advisable. Though "no-smoking" signs cause some amount of visitor inconvenience, insurance policies on valuable exhibits might be hard to get without them. (Adequate provision for smokers can be included in the rest areas or lounges.) Added incentive for

donors can also be derived from the knowledge that their heirlooms will be safe from fire.

5.3.11 Security

In a museum of this size, some reliance can probably be placed on the presence of the staff to deter the few thieves and vandals who do come to the museum. Because a great part of the Museum of the Rockies' philosophy is based on the visitor's being able to touch and feel artifacts of some of the exhibits, elaborate systems to prevent such an occurrence are unnecessary. More valuable articles will be enclosed in glass cases, yet a control over the comings and goings of visitors should be maintained at or near the entrance. Doors and windows should be of adequate construction and should have proper locking facilities to prevent unauthorized entrance to the building at night.

5.40 FUNCTIONAL SPACE REQUIREMENTS

With consolidation and double usage of space, a regimented appropriation of square-foot areas to each function can be misleading. Often priorities change in the design stage because of many factors, not the least of which is economics. Therefore, what follows should not be considered unalterable, but only a guideline of relative areas. One rule

of thumb put forth by a prominent museum expert¹³
goes as follows:

"In a given space and at a predetermined cost, the architect must provide approximately 15 percent for circulation together with space for administrative offices, cloak room facilities, information desk, sales counter, elevator shafts, stairwells, lecture rooms, utilities, washrooms, reception and telephone booths. If after accommodating all these features, one has any space left, it is usually considered necessary to cut it into halves - one for receiving, shipping and storage; the remaining half for exhibition space."

The following area requirement outline is similar to the one used by Harold C. Rose for his proposed museum for the University of Florida:⁸

5.50 AREA REQUIREMENTS

5.51	<u>Public Areas</u>	<u>Square Feet</u>
	1. Lobby and Orientation	1000
	2. Sales	300
	3. Auditorium (150 persons)	3000
	4. Public Services. (rest rooms)	500

5.52 Administration

5.	Secretarial Office	200
6.	Director's Office	250
7.	Conference Room	500
8.	Reference Room	600
9.	Mailing Room	200

5.53

Galleries

Square Feet

10.	Pioneers and settlers	7000
11.	Gross Geology and Ecology	5000
12.	Anthropology	7000
13.	Current Research and Geography	1700
14.	Paleontology	6000
15.	Transportation and Agriculture	3000

5.54

Interpretation

16.	Carpentry and Painting	1000
17.	Layout and Assembly	1000
18.	Photography	600
19.	Taxidermy	600

5.55

General Services

20.	Shipping and Receiving	1500
21.	Loading Platform (covered)	outside
22.	Cleaning and Restoration	1000
23.	Janitor	200
24.	Storage	8000
25.	Stairs, elevators, corridors	2000
26.	Rest Rooms	400

Total Area 53,300

6.0	AREA NO.	DESCRIPTION	AREA REQUIRED
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6.10 PUBLIC AREAS

6.11 Lobby and Orientation 500

Function - control of entrance area for all visitors, and provision of general information on the museum, its purpose, and its special facilities. Familiarize and orient the visitor with regards to the exhibits and the building.

Equipment - Informal lounge facilities, information desk, telephones, coat storage area.

Finish - warm, inviting materials of good quality and durability.

6.12 Sales 300

Function - Display of books, prints, post cards, etc.

Equipment - booth or desk with display rack or case, cash register (or cash box), chair for attendant (if any)

Finish - Related to, and in harmony with lobby and orientation area.

6.13 Auditorium 3000

Function - Lectures, shows, demonstrations, and classes for larger groups of people.

Equipment - Seating for 150 people, raised platform, projection equipment, booth, and storage.

Finish - Acoustics and light control important, carpeted?

AREA NO.	DESCRIPTION	AREA REQUIRED
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6.14	<u>Public Services</u>	500
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Function - rest rooms for museum visitors.

Equipment - see Graphic Standards and National Building Codes.

Finish - durable and easily maintained.

6.20	<u>ADMINISTRATION</u>	
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6.21	<u>Secretarial Office</u>	200
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Function - Stenography, records, accounting.

Equipment - desk, chair, filing cabinets, storage.

Finish - good quality, easily maintained.

6.22	<u>Director's Office</u>	250
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Function - Individual work, appointments.

Equipment - executive desk, chair, chairs for visitors, storage, bookshelves, work table, filing cabinet, clothes rack.

Finish - high quality, as befitting a director's status.

6.23	<u>Conference Room</u>	500
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Function - Intra, as well as inter-museum personnel meetings.

Equipment - Conference table and chairs, storage, bulletin boards, provision for movie screen, projector storage.

Finish - related to executive office, lighting and acoustics important.

AREA NO.	DESCRIPTION	AREA REQUIRED
6.24	<u>Reference Room</u> <u>Function</u> - For published re- search material of interest to museum personnel and scholars. <u>Equipment</u> - racks, shelves, table, chairs. <u>Finish</u> - good quality, acousti- cally considered.	600
6.25	<u>Mailing room</u> <u>Function</u> - service area for pre- paration or reproduction of out- going information. <u>Equipment</u> - work table, copier, cabinets, files, shelves. <u>Finish</u> - utilitarian, durable.	200
6.30	<u>GALLERIES</u>	
6.31	<u>Pioneers and settlers</u> <u>Function</u> - display of exhibits relating to regional history, sociology. <u>Equipment</u> - period settings, display tables, cases, panels, free standing display artifact. <u>Finish</u> - undetermined as yet, except that distraction is un- desirable.	7000
6.32	<u>Gross Geology and Ecology</u> <u>Function</u> - display of exhibits of mineral samples, environmental diaramas. <u>Equipment</u> - diaramas, blacklight display booths, cases, panels. <u>Finish</u> - see 6.31	5000

AREA NO.	DESCRIPTION	AREA REQUIRED
6.33	<u>Anthropology</u> <u>Function</u> - display of anthropological specimens, artifacts. <u>Equipment</u> - free standing displays, cases, panels, diaramas. <u>Finish</u> - see 6.31.	7000
6.34	<u>Current Research and Geography</u> <u>Function</u> - display of panels showing maps, weather, new trends. <u>Equipment</u> - panels, diaramas, free standing models. <u>Finish</u> - see 6.31.	1700
6.35	<u>Paleontology</u> <u>Function</u> - displays of plant and animal fossils. <u>Equipment</u> - special consideration of light, display cases, panels, free standing cases. <u>Finish</u> - see 6.31.	6000
6.36	<u>Transportation and Agriculture</u> <u>Function</u> - display of the machines, methods, and artifacts of the development of these topics. <u>Equipment</u> - free standing artifacts, large scale, panels. <u>Finish</u> - see 6.31.	3000
6.40	<u>INTERPRETATION</u>	
6.41	<u>Carpentry and painting</u> <u>Function</u> - preparation of exhibits, rough-in work.	1000

AREA NO.

DESCRIPTION

AREA REQUIRED

Equipment - exhaust for paint overspray and fumes, workbenches, hand power tools, electrical outlets.
Finish - durable, utilitarian, good lighting, storage.

6.42 Layout and Assembly 1000

Function - more exacting and refined work in preparation of exhibits.

Equipments - work tables, storage, electrical outlets.

Finish - see 6.41.

6.43 Photography 600

Function - taking pictures and developing them in recording and preparing exhibits.

Equipment - work table, back-drop, storage for materials, chemicals, dark room, sink ventilation, supplemental light control.

Finish - see 6.41.

6.44 Taxidermy 600

Function - preparation of wild-life specimens for exhibit.

Equipment - racks, work tables, sink, storage of chemicals, odor control, lighting important.

Finish - see 6.41.

6.50 GENERAL SERVICES

6.51 Shipping and receiving 1500

Function - the hub of general service activity with space for inspection of incoming exhibit materials, and final packing of shipments.

AREA NO.

DESCRIPTION

AREA REQUIRED

Equipment - workbench, storage of wood for crating.
Finish - abuse resistant, durable, functional materials.

6.52 Loading Platform

outside

Function - exit and entry to museum from trucks.
Equipment - overhang or conopy to protect unloading and loading operations in inclement weather.
Finish - dictated by exterior of building.

6.53 Cleaning and Restoration

1000

Function - maintenance of museum exhibits as far as deterioration with age goes.
Special consideration... fumigation area, with all its inherent precautions-ventilation, enclosure, light.
Equipment - exhaust to the outdoors, tightly sealed door on fumigation room, etc.
Finish - abuse resistant, durable, functional materials.

6.54 Janitor

200

Function - storage of materials required for maintenance of the museum, janitor's tools.
Equipment - slop sink, shelves, racks for brooms, mops, etc.
Finish - utilitarian and durable.

6.55 Storage

8000

Function - organized area for storage of materials not currently in use in the exhibit areas. (Includes exhibit artifacts, miscellaneous materials, etc).

AREA NO.

DESCRIPTION

AREA REQUIRED

Equipment - shelving, cases for
fragile artifacts, security.
Finish - utilitarian and durable.

6.56 Rest Rooms

400

Function - rest rooms for
museum and staff personnel.
See 6.14

Total specified area = 51,300

Additional area requir-
ed for stairs, elevators
and corridors..... 2000

NET SQUARE FEET

53,300

ECONOMICS

7.0 ECONOMIC CONSIDERATIONS

The purpose of this section is twofold: first; to determine a rough estimate of construction costs at an early stage in planning, and second; to hint at how the money for construction could be provided.

7.1 Cost Estimate

In his thesis, Facilities for the New Montana State College Museum, John Falat explained estimating procedures very clearly:

In general there are four different methods by which building cost estimates can be made in the early design stage. These are:

1. The square foot cost method. In this method the total building cost is determined by estimating the cost of the building per square foot of floor area.

2. The cubic foot method This method makes use of the volume of buildings, and is estimated in dollars per cubic foot of total volume.
3. The segregated cost method In this method the cost of various portions of the building ~~is~~ calculated separately until all the parts of the building are accounted for. The cost of these parts is then added together to determine total construction cost. This is, perhaps, the most accurate process, but it is also the most difficult. In order to determine a reasonable estimate, the design of the building must be near the final stages.
4. The per capita cost method This is a very rough way of estimating the cost of a building in relation to the local population. In this method, cost is estimated in dollars per person. The method is mainly used in dealing with public buildings. (14)

Because design will not begin in depth until the completion of this paper, the segregated cost method, although it is the most accurate, will be ruled out. The per capita cost method will be excluded because it is far too broad to be as accurate as either the square foot or cubic foot cost methods. Because to know cubic feet would be to know more about the final design than is possible at this time, I have decided to base my estimate on the square foot cost method.

The reference for appraisal of cost will be the Marshall Valuation Service.¹⁵ Using this system, one can arrive at a reasonable cost per square foot, based on building occupancy, grade of construction, and construction type, as modified by degree of permanency, desired degree of maintenance, climate, availability of materials, and costs of labor.

Because Marshall does not list a museum under typical occupancy types, I used a composite of several other types that are, I feel, close in character to a museum, as far as cost goes. Under the heading, "Churches, Theatres, and Auditoriums", a designation of "good-class A", is estimated at \$27.96 per square foot. Under the heading, "Offices, Public Buildings, and Schools," a designation of "good-Class A", is estimated at \$33.31 per square foot. Under the heading, "Stores and Commercial buildings", a designation of "good - class A" is estimated at \$26.29. The average of these figures is \$27.19.

In keeping with the function of a museum as a "container" for valuable objects, as well as its permanent character, I would tend to place the cost in the high range of any price bracket. There are several other reasons for this. Because the University will be providing the maintenance, it will probably insist that maintenance costs be kept to

a minimum. To do this, more durable materials would have to be used in the original construction. This, of course, adds to the cost. Other factors tending to place the cost of a museum in the high range would be those linked to Bozeman's geographic location. Labor costs are higher here than many other areas in the country, materials for construction are not as readily available as they might be in some more centrally located areas, and even the relatively short construction season of this locale, due to inclement weather, would have a cost-increasing effect on cost. Weather also adds to cost in terms of necessary added protection from temperature extremes, and heating costs.

A figure of \$28.00 per square foot would not be unreasonable in view of the factors I have mentioned. This would place the cost of the proposed museum somewhere in the neighborhood of \$1,492,400.00. (53,300 sq. ft., page 64, multiplied by \$28.00 per sq. ft., page 68.)

7.2 Source of Revenue

"On July 12, 1966, the citizens of Gallatin County and Montana State University entered into an agreement to support and foster a non-profit corporation: The Museum of the Rockies. The museum,

financed by private monies, will be built on the campus of the University, and its staff will be members of the faculty." 11

Because the Museum of the Rockies is incorporated as a non-profit institution, the Internal Revenue Service has granted it a "Certificate of Charitable Exemption". This should encourage contributions to the building fund considerably.

In an article entitled, "Federal Programs Which May Provide Support for Museums", compiled by the U.S. Office of Education,¹⁶ many programs, their purpose, eligibility, funding, and application information, are listed.

S U M M A R Y

This summary is intended to clarify the reasoning behind some of the decisions I made in the design evolution of this thesis project. To facilitate this intent, I have decided to explain my solution, as well as discuss some of the problems that arose in the design stage in relation to what was written in the research report during the first quarter's work.

Because of the "container" function I see in a museum, (page 42, this report), I have tried to use the form of the building to accent the isolation and protection of the exhibited artifacts. There are no windows in the gallery areas. From the outside of the building this increases the feeling of impenetrability and protection. On the inside, an absence of windows facilitates exhibit enjoyment by eliminating glare, as well as increases the degree of exhibits' protection from the elements. By visibly elevating the gallery levels, (and forms), above the ground, (ala Indian "burial" techniques), I hoped to accent the container feeling. Even the finish material, granite, is used for its feeling of permanence and impenetrability. (Brick as a finish was discarded because of its overuse on the campus, as well as the fact that the Museum of the Rockies is a combined effort of the university and the town. As such it should depart in appearance from exclusively campus facilities).

Because campus development plans call for a cul-de-sac termination to South Eleventh at the northeast corner of my site, I gave special consideration to the treatment of on-site space in this area, as well as on-site building orientation. The plaza-type development at the corner would give a pleasing first impression of the campus, as well as form a lead-in to the museum itself. The plaza might even be used as display space for large, weatherproof exhibits.

The building itself is actually a two-story complex sunken one-half story into the ground. This serves a three-fold purpose: First, it enables the gallery levels to be elevated, (for reasons outlined in the beginning of this summary). Second, by elevating the galleries only a half floor above ground, ramps up to the gallery level and down to the central court are permitted, thereby accommodating wheelchaired visitors to the museum. Third, the storage areas feel safer partially below ground, and light can still get to the work areas.

Within the building, numerous broad walkways and rest areas on the gallery level provide opportunity to combat "museum fatigue", let information "sink in", and observe the larger exhibits in the central court from above. The wider portions of the walkways, as well as the walls of the lower level inner court, would also be used for display. The galleries themselves are exposed as elements, and are connected functionally as well as aesthetically by the light-and-air scoop forms of the rest areas.

Plan relationships,(inter-gallery, intra-gallery, and gallery-rest), are all calculated to lead the visitor through a looping, counterclockwise path, along which display material may be presented in a sequential order. Because I am designing a museum for exhibits which do not as yet exist, and because the changing of displays is a must if a museum is not to stagnate, the flexibility I talked about in my research formed a very important part of my solution. Each gallery is essentially a big, open,(free from columns), space, linked to its own storage area vertically by an elevatable platform. Exhibits will be primarily of a diarama, or "booth" type, and visitors will move from exhibit to exhibit along a path roughly following the perimeter of the gallery. The sides and rear of the "booth" will be of a temporary nature to ease the changing of display area requirements. Typically, a booth would be closed off to the public, constructed from behind by the museum staff, then reopened to the public. This "from-the-rear" access permits behind-the-scene construction and exchange of artifacts to occur in one or two booths at a time, leaving the rest of the gallery open to the public.

The large lecture room and its lobby form a definite entrance statement, and can be used at night without opening up the whole museum. The lowered ceiling of the museum lobby and orientation area serves to heighten the impact of the large inner court along the transition from entrance to exhibit.

The small exterior courtyard lets natural light into

the offices and research library, as well as subtly drawing visitors' attention to the crafts and artwork for sale in the lobby next to the orientation desk.

The main "bone of contention" with my preliminary presentation was that the proposed design is not staged to permit construction in phases as funds permit. In desinging, I was concerned with the final outcome. To design a half of a museum would, in my estimation, be ignoring the intent of this course. Although the building could be "roughed in" except for one or two finished galleries, using the remaining galleries for temporary storage until money is available for finishing them off, this is an admittedly inadequate solution because of the relatively high percentage of total cost that "rough-in" entails. In considering the economics of this project, I based my thoughts on the optimism of Dr. Leslie Drew, Museum of the Rockies Director. As Mrs. Smyrl, architecture instructor, pointed out, this can be dangerous in that a director, by his very nature, must be optimistic, and in his optimism may lack the appreciation for money matters that would be had by a board of directors-(the actual "client"). In several personal interviews, Dr. Drew assured me that, "...The money will be available.", and, that, "...You get what you pay for.".

My optimism, reflecting Dr. Drew's, probably accounts for the only major deviation from the program. Last quarter my research ended in an estimation of total area for the

building. This figure, (53,000 sq. ft.), dictated probable cost, (derived from a cost-per-square-foot multiplier). As completed, my solution totals about 89,000 sq. ft. This increase in area, and the subsequent increase in total cost, is attributable to three causes:

First, as design progressed, an error caused by a gross underestimation on my part became evident. In area requirements, under the heading, "corridors and stairs", I had designated only 2000 sq. ft. Knowing of no "rules of thumb" concerning percentage of stair and corridor area in relation to total area for a museum, and not being into the design at that point, I guessed, and inaccurately so, as it turns out. Mr. Carver, my advisor, pointed out later that a rule of thumb for educational buildings designates roughly 30% of total area to stairs, corridors, and wall thickness. I think that this rule might well be applied as a minimum to museums, which are primarily circulation-oriented. At any rate, 4%, (2000/53,000) is grossly underestimated.

Second, in area requirements, under the heading "storage", my report calls for 8000 sq. ft., or about 15% of total area. In an issue of Museum News published subsequent to my research, another rule of thumb suggests that even with half, (50%), of the total area devoted to storage, a shortage can occur. I think that the validity of this rule is economically questionable in the case of

large museums, so my solution devotes about 30% to storage. (More reasonable, I believe, than 15%, for a museum of this size).)

Third, the increases in area mentioned above necessarily increased total cost from the preliminary research figure... a sticky situation to face the client with if this were an actual office project. But because the bulk of the increase is attributable to more storage area, (which is relatively cheaper by virtue of its utilitarian finish), I decided to depart from the figures arrived at last quarter and include the extra area in the interest of function. Although the resultant increase in total cost places my solution at a disadvantage with respect to reality in view of the method of funding proposed, (donations), Dr. Drew wasn't bothered at all by the increase when I explained the situation to him. Again, as Mrs. Smyrl pointed out, in a real situation I would be dealing with the board of directors as a "client", and monetary limits would be worked out before the architect was ever hired.

Although almost all architecture is dictated or limited by economics, this is a design course and not an economic study, so I feel the end justifies the means. A lesson to be learned, however, is that of the importance of accuracy in preliminary assumptions, as well as the sagacity of being generous on preliminary area, (and therefore cost), figures. This generosity might permit the happy occurrence

of coming out " below the money", on finals, rather than
"going over", and having to cut back.

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