

A MILITARY SCIENCE BUILDING
for montana state college

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A NEW MILITARY SCIENCE BUILDING FOR MONTANA STATE COLLEGE

Architectural Thesis

Architecture 490

Montana State College

School of Architecture

Bozeman, Montana

Thomas A. Overturf

March 13, 1964

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LETTER OF TRANSMITTAL

522½ South Tenth
Bozeman, Montana
March 13, 1964

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

Dear Professor Rose':

The following research report on a proposed new Military Science Building for Montana State College is submitted as partial fulfillment of the requirements of Arch. 490.

The information presented in this report was obtained from authoritative sources in the M.S.C. Library, the Architectural Library, and the Military Science Building and is supplemented by personal interviews with military personnel and various members of the M.S.C. faculty, administration,and staff. I would especially like to thank Lt. Col. Brown, Major Ray, Capt. Helm, Mr. William Johnstone, Mr. Martin Whalen,and Mr. Bob Marta for their valuable assistance and suggestions.

I will use this information as the basis for the design of a new Military Science Building during Spring Quarter, 1964.

Sincerely,

Thomas A. Overturf

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A PROPOSAL

The present Military Science Building, erected in 1947 as a "temporary" facility for the rapidly expanding, post-war ROTC program, has long ago fulfilled its original purpose and intent and now nears the end of its usefulness as the center of military activities at M.S.C. It must soon give way to the growing pains that rapidly increasing enrollment has inflicted upon the campus.

There is currently underway at M.S.C., a study and evaluation of all facilities by the Educational Research and Services Program headed by Mr. William Johnstone. This study attempts to analyze the current effective use of all facilities by each division and department. When completed the study is to serve as the determining basis for all new campus construction and similar studies at the University System level will eventually provide a priority schedule of construction for all units of the University System of Montana.

Although this evaluation is not yet complete, Mr. Johnstone feels that construction of new facilities for the Military Science Department will definitely be among those facilities requested as top priority items on the Ten Year Building Program. When the research is completed, I feel certain that the need for a new Military Science Building at M.S.C. will be greatly emphasized__ even though actual construction is probably 10 years away.

For these reasons--plus a personal interest in the Military Science Program-- I have chosen to do as an architectural thesis, a new Military Science Building for Montana State College. In order to make my research as valid as possible, I have utilized factual information from a wide variety of sources as well as from expert opinion gained through personal interviews with military and civilian personnel directly connected with the Military Science Program.

I propose to present my research material in the following manner:

First Quarter (Winter Quarter, 1964)

(1) Inquire into the general conditions that make a new Military Science Building necessary.

(2) Propose and describe a possible site suitable for a new structure.

(3) Investigate the aesthetic and economic conditions under which the building is to be created.

(4) Analyze the necessary function of the facility.

(5) Present an architectural program on which the design of a new Military Science Building can be based.

Second Quarter (Spring Quarter, 1964)

(6) Present a design solution for a new Military Science Building utilizing all previously gathered research material.

LOCAL CONDITIONS

History of Montana State College (1:17-43)*

On August 30, 1890, the U.S. Congress passed the Second Morill Act which made available an annual grant of $15,000 for each state college of agricultural and mechanical arts. This sum of money coupled with an additional $15,000 made available by the Hatch Act of 1887 to provide for an Experiment Station in connection with the state college, was the determining factor in inducing state leaders to create the University System of Higher Learning in Montana.(1:17)

After a heated discussion in the legislature, the bill creating the Agricultural College of Montana and locating it in Bozeman became a law on February 16, 1893. On April 17, 1893 the Agricultural College of Montana opened its doors to an enrollment of 8 students on a proposed budget of $48,940.(2:23) Classes were carried on in abandoned skating rink building owned by Nelson Story and located at the corner of West Main and South Third Ave. Courses were offered in Agriculture, Domestic Economy, and Applied Science.(1:43)

Today, only 71 years after those first students entered M.S.C., the enrollment has grown to nearly 4800 students using 32 main campus buildings. The college has become a "university" with three major functions: resident instruction,research, and extension. Financing is now obtained through biennial legislative appropriations, special congressional enactments, trust funds, student fees, private

* The method of documentation used in this thesis contains the number of the reference(see References) and the specific page refered to. They will be set off by parenthesis and separated by a colon.

gifts, miscellaneous grants, and federal land grant income.

History of Reserve Officers Training Corps (ROTC) (3:1-10)

The ROTC program had its formal beginning in 1862 when Congress passed the First Morrill Act, which established the so-called "land grant colleges". This act provided that schools would be given grants of land if they offered military training for all able-bodied male students. In an effort to comply with the provisions of this act and also the Second Morrill Act of 1890, and thus become eligible for federal land grant income, M.S.C. established an ROTC unit in the fall of 1896. At that time 40 eligible students received instruction in military arts from civilian faculty members.

In 1916, provisions were made through the National Defense Act to grant commissions to those students who completed the Senior Division ROTC course. In 1920 an ammended and strengthened National Defense Act was passed by Congress and the ROTC program became the principal source of officers for the Army. As a result of this act, 135 college graduates received commissions in the Army Reserve in 1921. By 1928 6,000 officers a year were being commissioned through the ROTC program and in 1942 the ROTC program produced 10,000 second lieutenants as the U.S. entered World War II.

By 1928 6,000 officers a year were being commissioned through the ROTC program and in 1942 the ROTC program produced 10,000 second lieutenants as the U.S. entered World War II. By this time 56,000 reserve officers, most of them ROTC graduates, had been called to active duty.

General George Marshall, Chief of Staff of the Army during World War II, later wrote:

> "Though the ROTC graduates composed 12% of the war officers, its most important contribution was the immediate availability of its product. Just what we would have done in the first phases of our mobilization and training without these men I do not know. I do know that our plans would have been greatly curtailed and the cessation of hostilities on the European front would have been delayed accordingly. We must enlarge and strengthen the system." (3:8)

Since World War II the ROTC program has been enlarged, strengthened, and accelerated; more units have been established and more schools are participating in the program. Over 250,000 students receive ROTC training each year and over 20,000 graduates are awarded commissions.

The ROTC program at M.S.C. is classified as a General Military Science Unit under provisions of the National Defense Act of 1920. As such, its graduates are commissioned in all branches of the Army or Air Force.

Many M.S.C. ROTC graduates have served their country

with great honor. General Dean, of Korean War Fame, personally cited one of the graduates of M.S.C. -- Rick Roman. He called Roman one of the finest, bravest soldiers he had ever met. Roman later lost his life in World War II. (3:9)

Another M.S.C. graduate who distinguished himself in World War II was William Galt who won the nations's highest award for valor, the Congressional Medal of Honor, for his heroic action in Europe. While leading an Infantry Battalion against enemy anti-tank guns and trenches, he personally killed forty German soldiers and wounded many others. Although wounded himself, he continued to lead the attack until killed by an artillery round. (3:9)

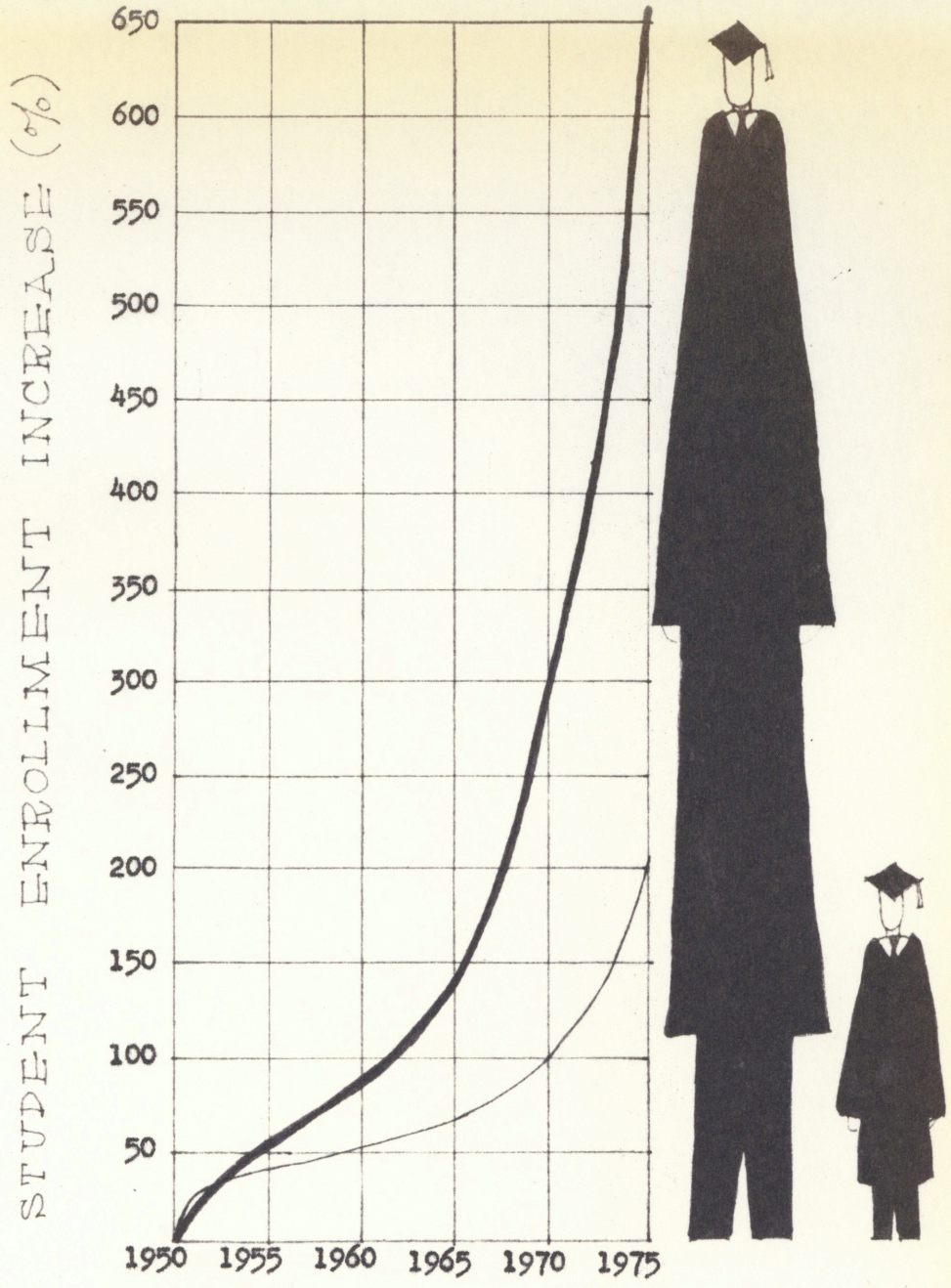
Social Conditions

The first students entered M.S.C. in the spring of 1893. That fall 135 students enrolled. That was too many for the one existing campus building. (4:2) This feature is still prevalent -- M.S.C. simply does not have the necessary classrooms and laboratory space for the students who come here. The task of providing adequate facilities seems endless.

As shown in Fig. 1, M.S.C. is growing much faster than the average college or university. This high growth rate is partially the result of a lack of similarly equipped universities in a rather wide area of the Northwest. Also Montana had an unusually large post-war baby crop thus accounting for the newest enrollment surge. (4:4) However, the most important reason for growth is that the percentage of Montanans attending college has nearly tripled since World War II. (2:18)

Military Science enrollment is directly proportional to the total enrollment. This is due to the mandatory nature of the basic program and the limiting factors imposed by the advance program. (see -- Persons Using the Building for a description of the ROTC program)

For the purposes of this study, it will be assumed that the ROTC program at M.S.C. will continue to function



PERCENTAGE OF ENROLLMENT INCREASE AT M.S.C. COMPARED TO AVERAGE*(4:7)

The giant above and the heavy black line running upward to almost 650%, represents the increase in student enrollment at Montana State College from 1950 to 1975. The smaller figure and the lighter line on the graph represent the average increase in enrollment for all colleges and universities in the United States for the same period.

FIGURE I

as it does at the present time. Therefore, the basic enrollment will be about 95% of the total male enrollment during the freshman year. This total will drop about 25% along with the total male enrollment as these freshmen become sophomores. In other words, the enrollment is directly proportional to male student enrollment. Approximately 40% of the total male students at M.S.C. will be involved in the Military Science program. (5:1)

Geographic Conditions (7:9)

Montana State College is located in Bozeman, the county seat of Gallatin County. The city is situated on the east slope of the continental divide in south central Montana near the Montana-Wyoming border and only 90 miles north of Yellowstone National Park. Bozeman, (population 15,000) lies on the east edge of the fertile Gallatin Valley at 45 degrees, 42 minutes north latitude and 111 degrees, 3 minutes west longitude.

Two major highways intersect at Bozeman: Interstate 90 or U.S. 10, an east-west arterial; and U.S. 191, a major entrance to Yellowstone National Park. Travel connections are provided by Greyhound Buslines, Northern Pacific Railroad, and Northwest Airlines. The city lies at an altitude of 4800 feet above sea level and its boundaries encompass an area of 2,688 acres.

The main campus of Montana State College is located on the southwestern corner of Bozeman and is about one-half mile from the central business district. The central campus and farm encompass an area of 921 acres. (see Fig. 2, A Map of Bozeman)

Map of
BOZEMAN
Montana

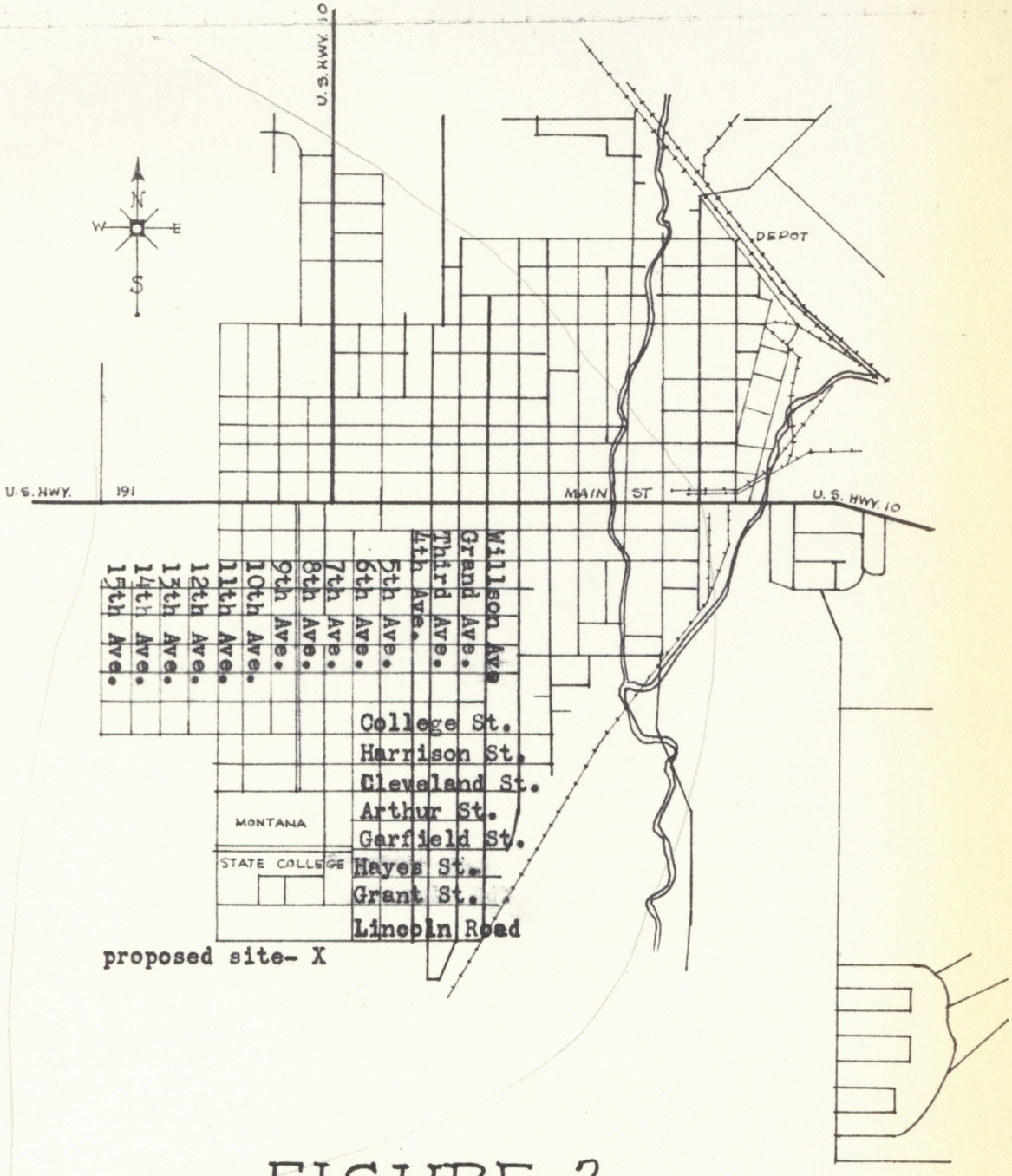


FIGURE 2

Climatic Conditions (9:122)

The climate of Bozeman is generally of a temperate nature. The winters are relatively cold and severe. The average winter temperature is approximately 25 degrees with occasional lows of minus 35 degrees. However, January temperature averages have exceeded 30 degrees so mild weather is not unusual. The average snowfall is 30-50 inches falling mostly between November and March. The winter ground-frost depth is about two feet.

Summers in the Bozeman area are warm and pleasant. Periods of extremely high temperatures are infrequent, and high humidity conditions are rare. High temperatures may reach 100 degrees occasionally but extreme temperature conditions seldom last more than a week at a time. Precipitation falls mostly in the form of showers with some hail. The average rainfall is nearly 18 inches with more than one-half of the annual precipitation falling during May through July.

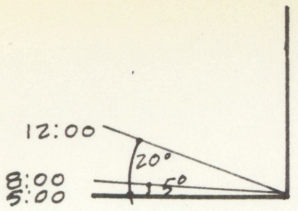
The average mean temperature is 43 degrees F. A one-hundred-day growing season lasts from late May to early September. Table I shows monthly climatic data and Figure 4 shows the sun angles for the Bozeman area. Bozeman's prevailing winds are from the southwest; the storm winds are often from the east.

MONTH	MEAN TEMPERATURE(degrees,F.)	PRECIPITATION(in.)
1. Jan.	20.2	0.92
2. Feb.	23.2	0.76
3. Mar.	27.8	1.53
4. Apr.	42.5	1.73
5. May	51.1	2.34
6. June	57.3	3.06
7. July	66.4	1.18
8. Aug.	64.9	1.12
9. Sept.	55.8	1.65
10. Oct.	46.0	1.45
11. Nov.	32.1	1.07
12. Dec.	24.8	0.91

BOZEMAN'S MONTHLY CLIMATIC DATA *(8:217)

TABLE I

SUN ANGLES *(11-156)



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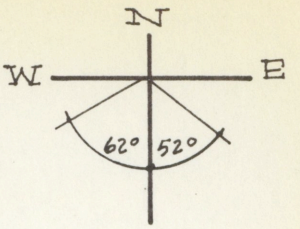
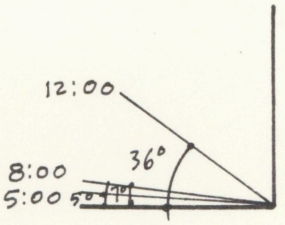
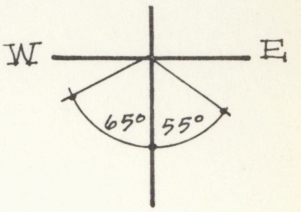
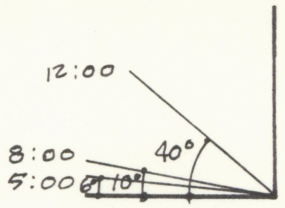


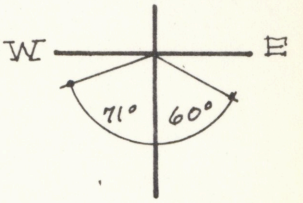


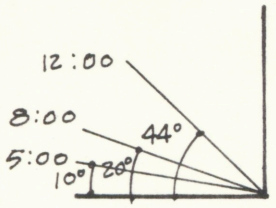
JAN & NOV



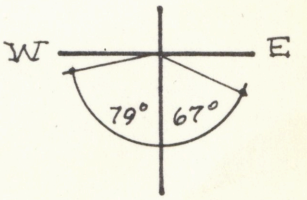


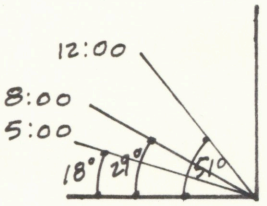
FEB & OCT





MAR & SEPT





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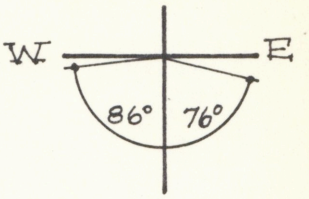
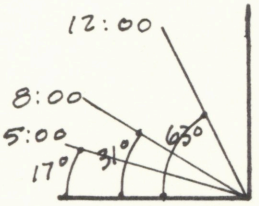
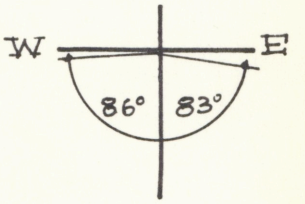
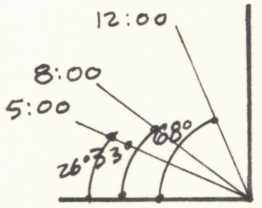


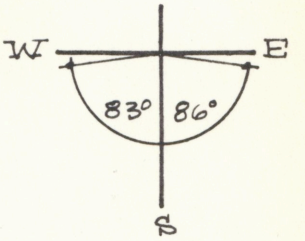


MAY & JULY





JUNE



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

SUN AZIMUTH
AT 8:00AM-5:00PM

FIGURE 4

CONDITIONS CREATING A NEED

General Conditions

At the present time the military science facilities at M.S.C. are housed in the quonset-hut-type buildings located near the corner of Eleventh Avenue and College Street on the north boundary of the campus. (see Map, Fig. 6) These buildings were placed on a concrete foundation to serve as "temporary" facilities for the growing needs of the ROTC program in 1947.(10:417) The temporary intent of these facilities indicates the minimum conditions under which they were originally erected. Under the following headings, I will describe how the existing conditions make the present building inadequate:

(1) Poor Acoustics

(2) Inadequate Ventilation

(3) Inadequate Natural Light

(4) Inefficient Functional Relationship

(5) Overcrowding

Poor Acoustics

Many acoustical problems arise from the basic interior shape of the quonset-hut buildings on the main floor. (see App. I, main floor plan) This curvature causes reflected sound waves to be concentrated at a focus of the curvature -- the center aisle of the room. Sound intensity is reinforced along the central aisle and diminished near the walls. Students along the aisle will notice a slight "echo" effect or "masking" effect as these sound waves are reflected from ceiling to floor and other surfaces near them. This reverberation of sound waves interferes with original sound from the primary source.

The sound reflectance characteristics of curved walls is somewhat bothersome in all the office areas on the main floor. In certain locations in a room, the sound will be reinforced and in others it will be diminished thus creating a very non-uniform and annoying situation.

Due to a general lack of acoustical consideration, noise-control features in the existing building are almost non-existant. No provision is made to isolate the rifle range from the rest of the building. Consequently, whenever a round is fired, the sharp "crack" startles everyone in the building. It is almost impossible to

schedule all firing for hours when the rest of the building is not in use.

The type of construction used in the building (fiber wall board on metal frame or wood studs) has such a low sound transmission-loss that an officer in room number four (see Appendix I) can easily hear a conversation in room number two. When class changes and the halls are filled with students, the noise throughout the offices makes any concentration impossible. As is shown by nearly all comments on the questionaires in Appendix III, noise control is one of the most harrassing, bothersome, and critical problems in the building.

Inadequate Ventilation

Ventilation in the building is provided by 4'X4' awning-type windows. In the classrooms these windows must be kept open nearly all year around when class is in session-- otherwise the atmosphere is unbearable. Even with cold outside temperatures, the classrooms are very stuffy and it is nearly impossible to maintain an even temperature. In warm weather the problem of ventilation is magnified. Some classrooms have four windows-- others have only two. (in these rooms satisfactory ventilation is impossible).

In rooms where cross-ventilation is possible, it is impractical because of the distracting noise from the open window of the adjoining classroom. In the early fall and late spring, hot weather makes it impossible to keep these adjoining windows closed and consequently it is difficult to remain attentive not only for the student but also for the instructor. For this reason, afternoon classes are not scheduled.

The ventilation in the offices is at least as difficult to control. Most of the main floor offices contain at least one window but if it is opened, the office is either too drafty or there is no circulation of air. Once again it is impossible to maintain a constant temperature; due in part to inadequate insulation as well as to poor ventilation and circulation. Air-conditioning is an absolute

necessity during summer months.

The basement has no means of ventilation other than the exit doors and service doors. Due to the relative coolness of the basement area, however, ventilation is not a major problem in this area. During the summer months when the doors are used for ventilation, control is the main problem.

Inadequate Natural Light

Although natural light is not physically necessary, it is certainly a pleasant advantage in a psychological sense. Although view is not directly related to natural light, it too is a pleasant advantage especially in the office areas. Once again the small windows of the present building are inadequate.

Some offices in the present facility do have adequate natural light but none have a pleasant view. In most cases the height of the window prevents direct vision to the outside; which probably is just as well since the surrounding facilities are generally unsightly and drab.

The basement facilities have no windows and thus no natural light except when a door is left open. Appendix III contains some appropriate personal comments on the working conditions in the basement created in part by the lack of natural light.

Inefficient Functional Relationship

Due to the makeshift arrangement of space, the academic offices are scattered throughout the building. This creates a problem of communications between the various levels of command. Clerical assistance and reception of visitors is also cumbersome due to functional relationships of offices and clerical help.

Another example of functional inefficiency is the disturbance created by students changing classes. The main traffic pattern is directly between the two unit clerical offices.

The staff lounge-- supposedly the most pleasant relaxation area in the building-- is located in the center of the windowless basement area. It has no view, no natural light, no ventilation, and is in the center of traffic flow. The rifle range is so close that firing is extremely annoying.

Overcrowding

Probably the most critical area of overcrowding is the storage area. Due to an increase in the number of students and also in the amount of equipment per student, all storage areas are jammed to overflowing. (see Fig. 5) The supply personnel feel that they currently need almost twice the storage area that is currently available.

It should be noted that during the summer months when all uniforms are turned in to the ROTC department for cleaning and storage, it becomes necessary for both units to acquire additional space to accommodate this influx of uniforms. The Air Force takes over the Army Storage Area and the Army uses the rifle range for its summer storage area. Of course, when Autumn Quarter begins the uniforms are issued to students and the pressure on storage space is relieved somewhat. Due to the temporary nature of this storage problem, it is the consensus of military supply personnel that a similar arrangement be considered for a new building.

Although actual floor area is currently adequate in most classrooms and offices according to college requirements and national standards, usable floor area is not completely adequate. This apparent discrepancy is due to the curvature of the walls in all main floor areas. In offices, the effective area is up to 20% less than the actual floor area and the classrooms have about 10-12% less effective floor area than actual floor area.



Main Entry to Present ROTC Building

FIGURE 5: "Conditions Creating A Need"



Staff Lounge Conditions

FIGURE 5



Storage Conditions



General Office Conditions

FIGURE 5



SITE CONDITIONS

Location

The proposed site is located on the southwest corner of the intersection of Lincoln Road and the extension of South Seventh Avenue. As shown in Fig. 6, (a campus map). Seventh Avenue presently does not extend to the site. However, due to official commitments to the Forest Research Laboratory, Seventh will be extended in the near future from Grant Street to Kagy Lane. (22:1)

Since the site is currently part of the M.S.C. campus, no definite site boundaries are shown. Fig. 6 also shows areas allotted to other academic divisions. No city zoning regulations govern this site which are pertinent to the construction of a new Military Science Building. Also since the site is very close to the Central Heating Plant and stream line, heating facilities and other utilities are very close at hand and readily available.

KEY

1. Intramural Fields
2. Fieldhouse
3. Forest Research Lab
4. Heating Plant
5. Proposed Engineer Building
6. Gatton Field
7. Faculty Housing
8. Ryon Lab
9. Roberts Hall
10. Student Union
11. Library
12. Math-Physics
13. Gymnasium
14. Chemistry
15. Reid Hall
16. Hamilton Hall
17. Montana Hall
18. Lewis Hall
19. Agriculture
20. Herrick Hall
21. Hannon Hall
22. Hapner Hall
23. Quadrangle
24. Lewis & Clark Hall
25. Langford Hall
26. Married Housing
27. New Men's Dorms
28. Military Science

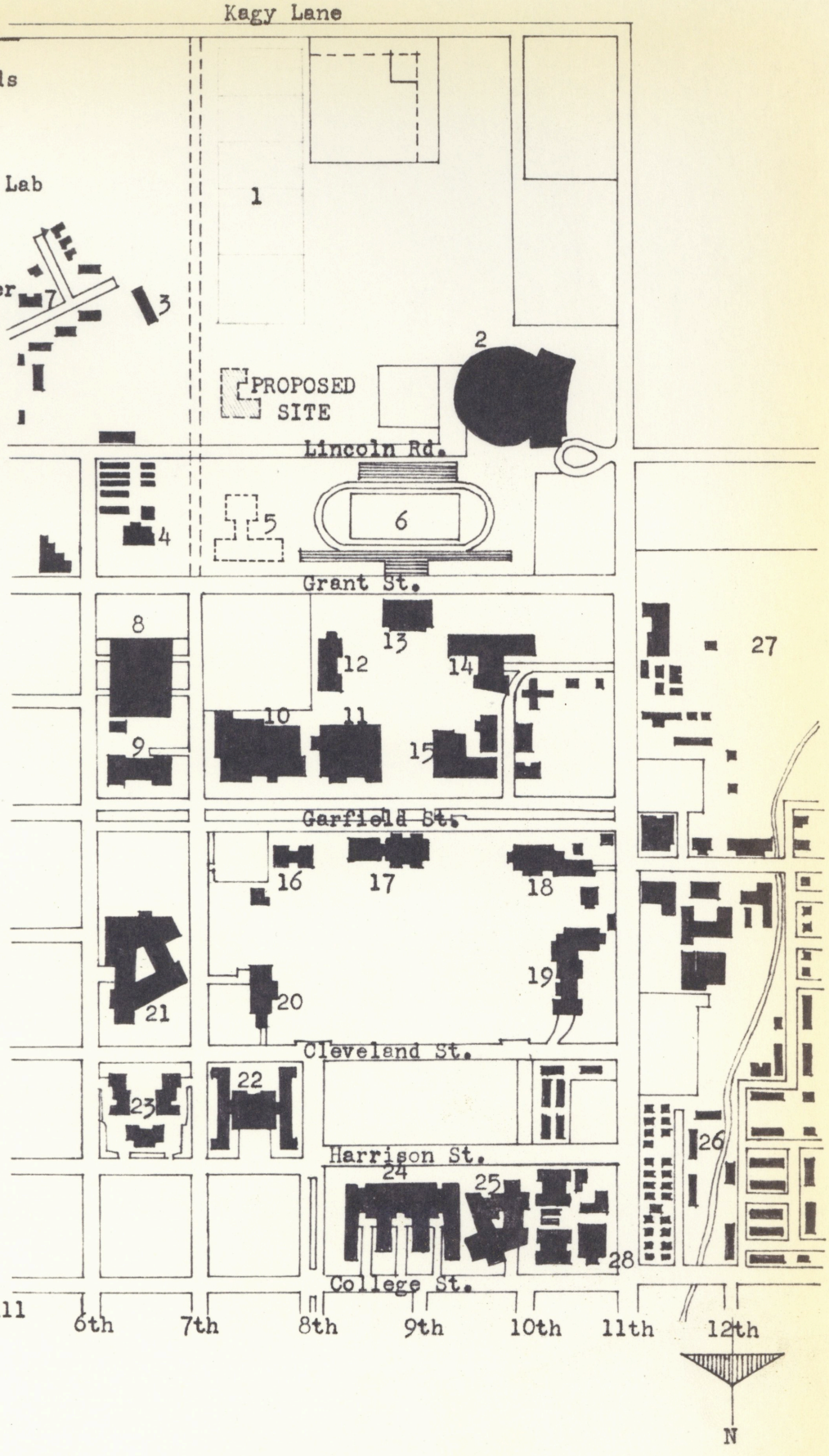


FIGURE 6

MAP OF MONTANA STATE COLLEGE

Topography

The proposed site slopes less than two per cent downwards from south to north; the slope downwards from west to east is less than one per cent. The present site topography is shown in Fig. 7. (a topographical map) The existing ground cover consists of various cultivated small grains, weeds, and grass. No trees grow on the site. Although some topographic changes will be necessitated by the construction of the extension of Seventh Avenue, any earthwork will be very minor for site preparation.

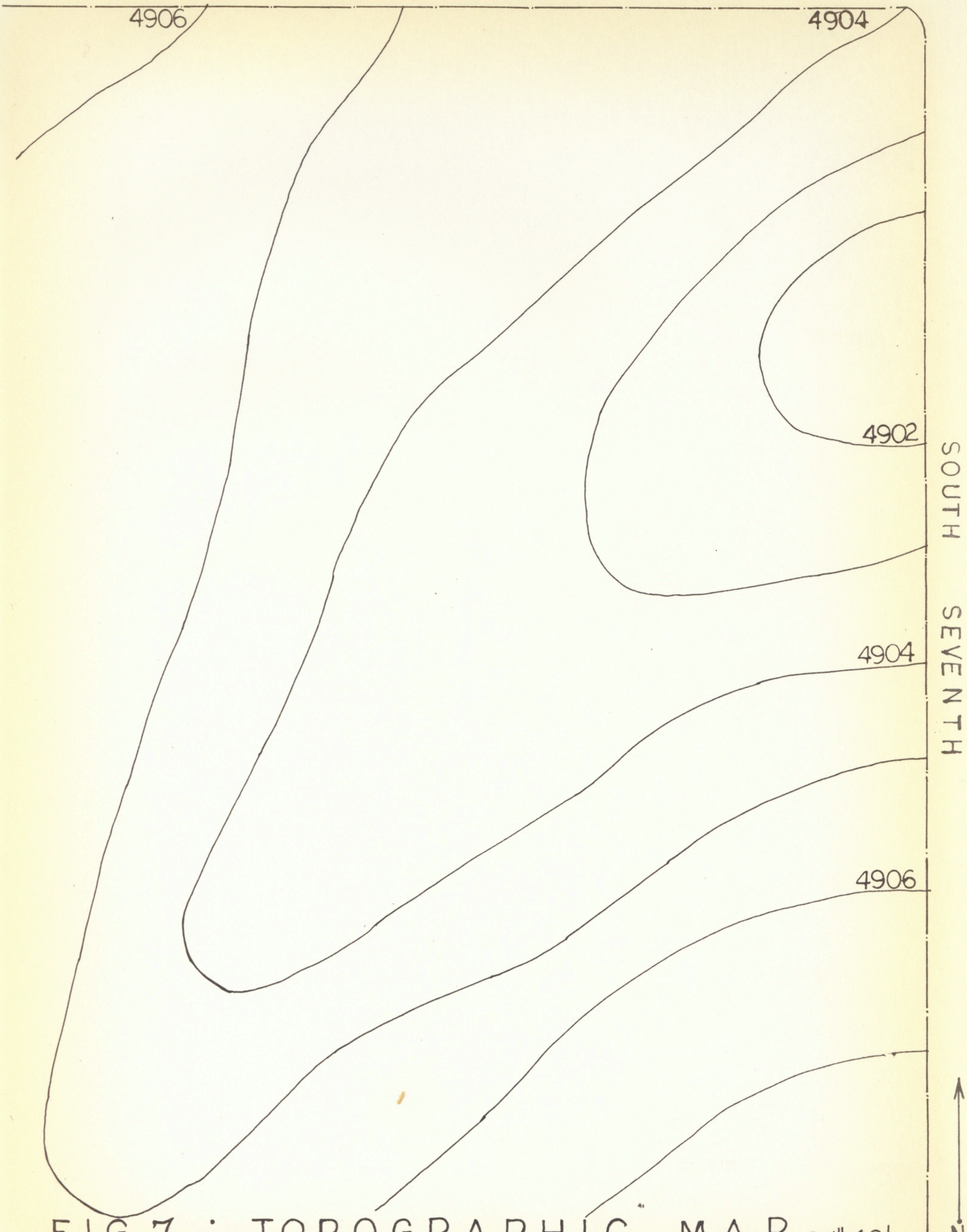


FIG 7 : TOPOGRAPHIC MAP @ 1"=40'

Soil Analysis

Although no precise soil analysis for the proposed site is available, a comparison of soil studies for other campus buildings makes possible a general prediction of subsoil composition. The first 12 - 16 feet consists of a sandy clay with only a shallow layer of gravelly topsoil on the surface. The sandy clay lies above a heavy layer of gravel having good soil bearing properties. Water can probably be found at a depth of 12 - 15 feet in this area.

Adjacent Environment

The building nearest the proposed site is the Forest Research Laboratory. The Fieldhouse is less than 300 yards away and is easily accessible from the proposed site along Lincoln Road. Also, as shown in Fig. 6, the Student Union Building is only about 200 yards away; the main library about 250 yards away. A paved 400 car parking area is located between the site and the Student Union.

Probably the most imposing structure near the site is the Heating Plant Building. This large brick structure is, despite its unromantic service, a rather charming old building. Its tall smokestack has long been a campus landmark.

As the campus grows it will spread to the south. The most recent master plan calls for Gatton Field to be moved to the south of Kagy Lane to make room for new classroom facilities on the present site of the football stadium. Therefore, as the campus expands, the proposed site will tend to become more centrally located.

One of the most important environmental features of the proposed site is the view. In three directions, beautiful mountain peaks form a jagged frame around the rolling farmland. To the north the city spreads out and down into

the fertile Gallatin Valley. Any building placed in such a setting must take maximum advantage of the scenic surroundings if the design is to be successful.

Drillfield Considerations

In designing a new military science building, one of the most important site considerations is the availibility of adequate facilities for military drill. As shown in Fig. 6, the area directly south of the proposed site is to be used as intramural fields. This will also become the primary military drill field for dry weather conditions. During late fall or early spring when the ground is often too wet for drill, the large parking area south of the Fieldhouse will be used as an alternate drill area. This parking lot is currently gravel-surfaced but as the public athletic facilities move to their new locations, the parking area will be paved.

Often it becomes necessary to hold an assembly of all students in ROTC. Under inclement weather conditions the only available area of sufficient size is the field-house. Occasionally the Army or Air Force units will drill a portion of their cadets in the fieldhouse. Usually the use of the fieldhouse is divided between the Army and Air Force on a rotation basis for an inclement weather schedule. Since all drill units and color guard units usually practice all year around, it would be advantageous to have the fieldhouse as close to the ROTC facilities as possible.

Traffic Patterns

The proposed site is presently isolated from the major automobile and pedestrian traffic of the campus. As Fig. 6 shows, the extension of Seventh south to Kagy Lane will create a main north-south thoroughfare. Seventh will become the main campus entrance to the athletic stadium as well as to the intramural and baseball fields. Heavy pedestrian traffic to and from the new Military Science Building will necessitate sidewalk construction from the site to the fieldhouse and also to the existing sidewalks on Grant Street.



Looking Southeast Toward Forest Research Lab

FIGURE 8: "Site Conditions"



Looking Southwest From Site



Looking West Across Site

FIGURE 8: "Site Conditions"



Looking South From Site



Looking North Across Site

FIGURE 8: "Site Conditions"

AESTHETIC CONSIDERATIONS

Unity

One of the first prerequisites of good architecture is the creation of unity among buildings of a certain area.

> "A building stands or falls, even as a pure work of art, by its just relation to the city around it." (12:177)
>
> Lewis Mumford

The importance of unity is emphasized by the architectural conglomeration on the M.S.C. campus today. The architectural character of Montana State College was set in 1896 with the building of Montana Hall and this character was carried through into the 1930's with such buildings as Roberts Hall, Herrick Hall and Lewis Hall. Since that time however, a steady deterioration of aesthetic unity has marked each new building on campus. Each new architect introduced his own style with no consideration of the campus as a whole. Today our campus is a conglomeration of building types that have little relation to each other.

Although the proposed site for a new Military Science Building is somewhat apart from the original campus buildings, I feel that this new building should attempt to recapture and bring up-to-date, the design precedents established by our earlier buildings. This is not to say that the Fieldhouse and the Forest Research Laboratory should be ignored, but perhaps a common ground between

M.S.C.'s traditional character and these contemporary designs can be found and established.

Regionality

As previously mentioned under Site Conditions, the proposed site provides a challenging setting. The surrounding rugged mountains, the heavy snows, and the brisk mountain climate, provide the architect with the possibility of creating a distinct regional design.

> "The ignorance of regional resources is not incompatible with grand effects, or even on occasion with decently good architecture. But it does not profit by that fine adaption to site, that justness of proportion in the size of window and slope of roof, which is earnest to the architect's mastery of the local situation." (12:137)
>
> Lewis Mumford

Once again it is possible to point out bad examples at M.S.C. The Library, Lewis and Clark Dormitory, and Reid Hall are examples of the aesthetic neglect of the natural surroundings of the Bozeman area. They fail because they have no regional roots -- they do not become an aesthetic complement to the particular region they propose to enhance.

On the other hand, Montana Hall, Lewis Hall, and Roberts Hall, reflect the architect's desire to harmonize with the rugged mountains and to protect against the heavy snows and cold winds. Here again, the older campus buildings reflect the careful aesthetic consideration that should be inherent to any new structure.

Materials

Materials themselves cannot establish Unity or Regionality. However, the way in which they are used can greatly effect the Unity or Regionality of the building. For example, most of the newer buildings on campus follow the older ones in the exterior use of brick. There, however, the resemblence ends, for the brick is used in almost every conceivable color, texture, and bond.

Indigenous materials should be used wherever possible. Wood for example, has been successfully used in several buildings -- the new portion of the Student Union Building, for example -- and its use should be strongly considered because it is indigenous to this region. Stone should also be strongly considered as an indigenous material even though its previous use has not been extensive. Brick should also be considered as a basic material but the choice of color, texture, and bond will determine the relative success of the use of brick.

Interior materials should be selected not only for their keeping with the character of the building, but also for their durability, ease of maintenance, and cost. The use of these materials should provide spatial continuity throughout the building while emphasizing certain areas. Above all, these materials should create a feeling of warmth and security within the building to help bring about pleasant working conditions for the occupants.

ECONOMIC CONSIDERATIONS

Economic Fundamentals

The three economic considerations of any building-- cost, size, and quality-- act upon one another. For example, if the size of a building is predetermined, the total cost will depend upon the quality of construction. As another illustration, if the total cost is predetermined, the maximum size is proportional to the quality of construction.

Since the size of a Montana University System facility for a specific academic area, such as Science, Education, or Engineering,is usually determined by the number of students using the facility, the funds appropriated according to this standard also arbitrarily determine the quality of construction since the size is dictated also by the number of students. In other words, to get a certain amount of space for a certain amount of money, a certain quality of construction must be used. The practice of appropriating funds before the quality of construction has been agreed upon is a dangerous one. Often the architect is forced to perscribe inferior quality of construction in order to meet the spatial requirements within the appropriated funds.

This practice also leads to situations of over-building exemplified by the new library and further discussed under the Campus Evaluation on page 49 . If certain appropriated funds are to provide a certain quality of construction in a building, there is a definite limit to the area that the

facility can adequately enclose.

The most logical solution to economic problems of this nature is to agree upon the purpose of the building--its spatial requirements and its quality of construction--and then appropriate the funds necessary to do the job properly. Since it is almost impossible to catagorize the function of the Military Science Building under any of the regular academic headings, it is therefore difficult to accurately measure the spatial and qualitative requirements according to an absolute planning standard. For this reason, a thorough study of the spatial, functional, and qualitative requirements of the ROTC program should be made and a design approved by the military staff as well as the school administrators before the request for appropriated funds is sent to the Board of Regents.

The quality of construction is dependent upon two interrelated factors-- the initial cost and the maintenance cost.

Means of achieving initial economy

The most significant means of achieving initial economy is to provide for flexibility of space. (17:24) Architectural flexibility may be provided through expansibility, convertibility, and versatility.

Expansibility can be defined as the capacity of a building to accommodate additions to the original structure without undue expense. A modular structural system lends itself to expansibility.

Convertibility is the capacity of a building to accommodate interior changes to suit the changing needs of the students, instructors, and administrators. In an ever-changing program such as ROTC, convertibility may be achieved on a day-to-day basis by the instructor or on a long-range basis as determined by the unit administrators. This can be accomplished through the use of movable partitions and screens.

Versatility is the capacity of spaces within a building to accommodate a variety of different functions. Multipurpose areas combining the function of a lecture hall with that of an auditorium is an example of possible versatility in a new Military Science Building.

In addition to these spatial features, flexibility can be achieved to a certain degree,through efficient scheduling. Versatility of a space can be achieved only when scheduling permits various uses at different times. For example, rifle firing on the present range should not occur during class hours. It is also important that certain minimum numbers of students per day must use each facility in order to justify the construction of new facilities. With proper scheduling, these conditions can be met.

One-Story Versus Two-Stories

In the recent past, much controversy has arisen over the relative merits of one-story and two-story school construction in the Bozeman area. Since a new Military Science Building could become the subject of a similar controversy, I will try to point out some real advantages-- both economic and educational-- of one-story construction over two-story construction.

Some advantages of the one-story building, as reported by the Michigan Department of Public Instruction, include:(18:62)

1. Economics brought about by simple, light-weight framing materials.
2. Easier clearing of the building in case of fire or panic.
3. Elimination of stairway construction cost.
4. Opportunities for more efficient arrangement of the many functional elements of the plan.
5. Opportunities to isolate activities which produce noise or odors.
6. Ease and economy of maintenance. No expensive scaffolding for repainting, glazing, and other maintenance functions.
7. Ease in moving equipment and furniture within, as well as into and out of the building.

Cost Comparisons

For the lack of a more precise method of analyzing the probable cost of a new Military Science Building at M.S.C., I will use the Marshall Valuation System (1962) to present a preliminary cost analysis.(19: Sect. 15 pg. 15) Due to a thoroughness in standardization of evaluation methods and regional factors, the Marshall Valuation System is considered to be one of the most accurate methods of preliminary cost analysis. Many of the variables normally found in cost-per-square foot or cost-per-cubic foot methods have been eliminated.

The costs indicated in the following table from the Marshall Valuation System, are the average of final cost including built-in equipment, architectural fees, and contractor's overhead and profit. The costs do not include movable equipment and furnishings.

The Marshall Valuation System is brought up to date each month and is adjusted for regional and economic conditions.

Table II — Estimation of Cost

Type	Description	Cost Range	Average Cost
Science	Buildings with large amount of laboratory space. Good quality construction.	$17.50-25.00/sq.ft. $ 1.75-2.50 /cu.ft.	$21.55/sq.ft. $ 2.16/cu.ft.
Classroom	Buildings divided into classrooms and offices. Good quality construction.	$17.00-25.00/sq.ft. $ 1.65-2.45/cu.ft.	$21.45/sq.ft. $ 2.15/cu.ft.

ESTIMATED AVERAGE COST PER SQUARE FOOT $ 21.50

TOTAL ESTIMATED COST OF PROPOSED NEW MILITARY SCIENCE BUILDING CONTAINING APPROXIMATELY 43,200 sq. ft. $928,800.00

The Campus Evaluation

In April 1964, Mr. William Johnstone, head of the Educational Research and Services Program at M.S.C., will present to the Board of Regents a detailed report of his study of current utilization of all campus facilities and his group's recommendations for the priority of construction of future facilities. Similar reports from the five other units of the University System will be presented and all reports will be reviewed and evaluated. By comparing current and projected space-per-student figures of each facility on each campus with an accepted standard figure, the Board of Regents will be able to recommend that certain facilities at the various units be built.

The recommendation is subject to the approval of the State Controller and is then sent to the Governor who makes the formal request for appropriation of necessary funds to the State Legislature. The same procedure will take place every two years as a part of the Ten Year Building Program which attempts to predict the University System's physical needs ten years in advance. (13:1)

Donovan Smith, nationally recognized authority on physical planning for colleges and universities, is currently making an evaluation of the physical facilities at all

units of the University System and making recommendations to aid in improving the effectiveness of physical planning.

1. Over-built existing buildings

> "The principle of constructing the maximum amount of 'enclosed space' apparently has developed as a form of institutional self-defense against the State's feast-or-famine funding of new buildings since World War II, if not longer. The resulting thousands of square feet of un-equipped building space ... hold generally excellent promise of meeting long-range space requirements of the specific departments for which the buildings were designed. However, ... these 'enclosed spaces' would continue to represent no prospect of relief for the many departments still crowded in obsolete buildings." (15:2)
>
> Donovan Smith

Smith lists the new M.S.C. library as the prime example of overbuilding in the University System; but certainly the new Chemistry building and the new high-rise dorm at M.S.C. must follow closely on the list of examples of overbuilding. Not only do these facilities offer no relief to overcrowding and obsolescence in other departments, but they also tie up capital investments that could otherwise be used elsewhere.

2. Inadequacy of old buildings

The older buildings lack an adequate number of offices and laboratories in relation to the number of classrooms. There are not enough staff facilities for the numbers of academic staff required for good utilization of instructional rooms.

In addition to these observations, Donovan Smith's report indicates a definite need for adoption of a standardized rating system by the University System. This standardized rating system would allow an accurate priority of construction list to be formulated by each unit and by the University System as a whole. Under this system, Smith considers three general areas critical: (1) present space, (2) enrollment projection; and (3) planning standards.

(1) Present Space

An inventory of present space includes the square footage of each room, its departmental assignment, its use, and the number of available stations in the room. (see Appendix I)

(2) Enrollment Projection

By surveying the number of children at all school levels in Montana and applying certain factors to compensate for out-of-state and foreign students, it is possible to accurately estimate the enrollment at M.S.C. in the near future. Mr. Johnstone's committee has prepared the following total enrollment projection figures for M.S.C.:

1963-64 -- 4,739
1965-66 -- 5,310
1970-71 -- 6,687
1975-76 -- 8,474

However, a much more detailed projection, including a departmental breakdown, is needed in order to

adequately plan for future physical needs. Due to the fact that all schools are in Montana, a standardization in method of computation is possible and the projection is more reliable and more easily evaluated.

(3) Planning Standards

The adoption of a standardized rating system to measure the degree of efficiency in utilization of space, is an absolute necessity both in planning for new facilities and in evaluation of present space. As an example of the rating standards, Smith proposes that a teaching lab should have 20 hours of scheduled use per week with at least 80% of its available stations occupied. Less use than this standard would indicate inefficiency of use and excess space. A greater scheduled load would indicate a need for more facilities.

The design of a teaching lab, for example, should be such that it will meet these standards within a short period of time--usually from two to five years after construction. If it is designed to meet these standards in 10 years, those first 10 years of use will be inefficient in the use of space. If on the other hand, the building is so designed as to reach its maximum use capacity five years after construction, the capital outlay is not so great and this savings can be used in another area.

Theoretically, when all facilities of the University System have been accurately measured by this standard, they should fall into a numerical order as to priority of need. There

are, however, several flaws in this theory. First of all, this study has not confromted the problem of quality of space. It is simply impossible to measure quality on an absolute numerical scale. Such factors as mood, feeling, and expression are impossible to evaluate accurately on a standard scale and such factors as lighting, acoustics, ventilation, and functional efficiency are difficult at best, to absolutely evaluate.

Secondly, some provision must be made for special facilities such as the Military Science Building. It is very difficult to catagorize the ROTC program under Engineering, Education, or Science. For example, all ratings for any facility are dependent upon the number of Full Time Equivalent (FTE) students who use the facility. An FTE student rating is determined by dividing the total number of credit-hours produced by the facility, by the average student load of 15 credit-hours. Due to the large number of students and the few hours that each spends in class in the ROTC building, the FTE rating for the present building is deceptively low. This figure is lower than a comperable facility in other departments because of the fact that in order to receive 1 ROTC credit, the student must spend from two to three hours in class compared to the normal one-for-one ratio in other departments.

Thirdly, the floor area shown in the Current Space Inventory (a copy of which is found in Appendix I) has always been measured as the actual wall-to-wall area rather than the usable floor area. As an example of the effect of this type

of area calculation, consider the ROTC building. On the main floor where the curved walls (see Fig.5) prevent effective use near the wall, the effective floor area is decreased up to 20% in some offices and up to 12% in some classrooms.

Local Economic Conditions

Montana State College, being one of the six units of the University System, is financed and controlled through the State of Montana. Any construction is, therefore, subject to approval by the State. Where State funds or new functions (such as a School of Medicine) are Involved, the State Legislature must approve the project. Otherwise, the Board of Regents is authorized to approve the construction.

Under the provisions of the Morrill Act of 1890, M.S.C. is obligated to provide adequate facilities for a Military Science program. Due to this provision, the responsibility of providing a new Military Science Building rests squarely with the State of Montana and the college.

The only possibility of obtaining federal funds seems to be through a cooperative effort with the U.S. Army Reserve. However, the recent re-classification and the resulting de-activation of most phases of the Army Reserve program in Bozeman makes this cooperation impossible. If the Unit were bigger, perhaps the Federal Government would share the cost of a new Military Science Building at M.S.C. which would be used for both the ROTC and the U.S. Army Reserve.

Since federal funds are, at best, difficult to obtain for

a new Military Science Building at M.S.C., the building must be financed through one of the following means:

(1) Appropriation

The State Legislature can approve the appropriation of tax money for the new building. One suggestion is that this tax money come from a two or three cent state cigarette tax which currently produces a revenue of 2¼ million annually and is presently used to pay off Korean Veteran Bonuses -- all of which will be paid off in 1965. This money can also be directly appropriated by the legislature. An example of this type of appropriation is the $80,000 appropriated in 1962 for the completion of the third floor of Reid Hall.

(2) Bonds

Much the same as a municipal school district can sell general purpose bonds, so M.S.C. could also be bonded through the State of Montana. The bonds could be paid off through property taxes, cigarette taxes or other state funds.

(3) Grants or donations

It is possible that grants or donations given to M.S.C. could be used to finance the new building.

Due to the nature of the building, student fees cannot be used for its construction. Any special levy would seem impossible to obtain since a vote of the taxpayers is necessary. Another financial difficulty arising is the lack of means of producing any revenue such as a dormitory of fieldhouse is capable of doing. (13:1)

Although the financing of a new Military Science Building seems to be a difficult problem it is by no means impossible. The need for a new facility must be proven to the administration of M.S.C. and to the Board of Regents. For this reason, I have emphasized the shortcomings of the present facility under Existing Condition. In my opinion the most effective and realistic method of financing a proposed Military Science Building at M.S.C. is through a legislative appropriation.

This can be easily accomplished by diverting the state cigarette tax directly into a University System building fund as soon as the Korean Bonus has been paid off. This alone would produce almost 5 million dollars for each session of the legislature to apportion to the various units of the University System.

The procedure for receiving appropriated funds begins with each units' submission of its priority of construction list and its standardized evaluation ratings of existing facilities to the Board of Regents of Montana in Helena.

The Board then arranges an overall priority list of all construction within the University System and recommends to the legislature that funds be appropriated for facilities needed within the next two-year period. The State Controller and the Governor must also approve the request for appropriation.

Once the funds have been appropriated, the unit involved appoints an architect -- subject to Board of Regent's approval -- who completes the necessary plans and specifications. After the Board has officially approved the plans and specifications, a public bid letting is advertised and held. The contract is finally awarded to the low bidder.

THE FUNCTION OF THE BUILDING

General

The elements of this proposed building are programmed according to estimated requirements of the ROTC program at M.S.C. in 1975. As previously mentioned, the assumption that the ROTC program will continue essentially unchanged has been made. The only change in the program will occur in numbers of students as the size of the program will increase in direct proportion to the growth in total enrollment of male students. Therefore we can expect all phases of the program to approximately double in size in the next 11 years.

It should be made clear that this program is general in scope and is by no means unchangeable. Unforeseen changes in the world situation could quickly and radically change the scope of the ROTC program. This would immediately change the requirements of a new Military Science Building at M.S.C. Therefore, a high degree of flexibility must be incorporated into the design.

Persons Using the Building

Students

According to projected enrollment figures, the new Military Science Building should be programmed for approximately 2500 students. Since the program will continue essentially unchanged, the staff requirements will grow proportionately and the building should be programmed for approximately 44 staff members.

The primary purpose of ROTC at M.S.C. is to train young men for positions of leadership and management in the military organization of tomorrow. Opportunity in the military service is unlimited for the foreseeable future. Both regular and reserve commissions can be awarded to men successfully completing all phases of the program.

Students who desire to concentrate on Military Science may do so by selecting a Military Science concentration under the General Studies curriculum. Such a concentration does not assure appointment as a regular or reserve officer.

Montana State College maintains two units of the Senior Division ROTC-- an Army Unit and an Air Force Unit. The program for each unit consists of two parts; the Basic Course, and the Advance Course.

1) The Basic Course consists of formal classroom instruction for six quarters(two academic years) and two hours of military drill each week during Autumn and Spring

quarters. Either the Army or Air Force basic course is a graduation requirement for all physically fit male citizens.(20:161)

2) The Advance Course also consists of formal classroom work for six quarters, plus a two hour drill period each week during Autumn and Spring quarters. A summer camp of four weeks for the Air Force and six weeks for the Army is also required. In addition, both units offer a flight program which leads qualified students to a private pilots liscense.

All basic cadets are furnished the necessary uniforms, equipment, and textbooks. In addition to uniforms, equipment, and textbooks, the advance cadets receive a subsistence allowance of about 90 cents per day. During the summer camp, cadets receive the same pay as Army Private plus travel allowances, equipment, rations, uniforms, and textbooks.(20:162)

Staff

According to projected enrollment figures, the ROTC staff will need to double in number in order to keep pace with the number of students in 1975. The Army Unit will require five more officers as instructors and five more NCO's as assistant instructors, making the total military staff number 10 officers and 10 enlisted men.(21:1) The Army Unit now employs two

civilian clerical assistants and by 1975 will require two additional civilian clerical assistants.

The Air Force Unit will require seven more officers as instructors and three more NCO's as assistant instructors, Making a total of 12 officers and 8 enlisted men by 1975. The Air Force will also need four civilian clerical assistants by 1975.

Types and Functions of Space

Montana State College maintains two units of ROTC-- an Army Unit and an Air Force Unit-- both of which are organized along traditional military lines. Although each unit functions independentally of the other, the organization and function within the units is essentially the same. Therefore, I will discuss the function of the Army Unit and indicate the Air Force equivalent in parenthesis where it differs from the Army nomenclature.

1) Office of the Professor of Military Science(Professor of Air Science)

The P.M.S. is a Regular Army Officer in command of the Army ROTC Unit. Under his jurisdiction are all phases of the Military Science program at M.S.C. He works closely with his Executive Officer, Staff Officers, and the Sergeant Major, in formulating all policies, decisions, plans, and appointments.

2) Office of the Executive Officer

The Executive Officer is the chief administrative assistant to the P.M.S. He acts as the P.M.S. in case of his absence or disability and is responsible for the function of the staff.

3) Offices for the Staff Officers

The staff is comprised of three officers-- the S-1 or Administrative Officer, the S-3 or Operations Officer, and the S-4 or Supply Officer. Each staff officer is individually responsible for a distinct function within the unit (such as Supply) and the staff as a whole serves in an advisory capacity to the P.M.S. Presently the staff officers also act as instructors but by 1975 their sole and full-time duty will be in staff function.

4) Offices for Instructors

Instructors are commissioned officers with primary duty similar to that of college professors. They will teach an average of four hours per day and the remainder of each day will be spent in their offices in preparation, counseling, and research. It is important that these offices be located near clerical assistance, near all reference sections, and as close as possible to the teaching aids and reproduction room.

5) Offices for Assistant Instructors

Assistant Instructors are Non-Commissioned Officers (NCO's) whose primary duty is aiding the Instructors, both in instruction and in preparation. These offices should be located near the offices of the Instructors.

6) Offices for Assistant Staff NCO's

(a) The Sergeant Major is the administrative NCO in

charge of all clerical services including the keeping of all records, filing reports, carrying on correspondence, and giving other clerical assistance.

(b) Supply NCO's office handles all supply records for the unit. The Supply Sergeant controls all equipment and material issued by the unit.

(c) Range NCO's office keeps all records of the Rifle Range. The Range NCO is responsible for instruction of rifle marksmanship and safety to military students and also to regular P.E. classes.

(d) Training NCO's Office is responsible for all training equipment such as manuals, visual aids, etc.

7) Unit Clerical Office

The Unit Clerical Office will be the depository for all student records and the central clerical assistance office. Each clerical worker will be assigned to a certain section, such as supply, and therefore it is important that the clerical worker be near her assigned section and also near the central office facilities. Reception is another function of the general office.

8) Library

Each unit will maintain its own library of reference material. Study within the library must be provided.

9) Supply and Storage Area

Adequate area must be provided to store all expendable supplies, clothing, and equipment. Ventilation is required for the proper storage of some supplies. Provision must be made for issuing equipment and for summer storage of all uniforms.

10) Training Aids and Reproduction Room

Military instruction is supplemented by a variety of training aids, such as model rifles at twice the actual size, overhead projectors, motion picture projector, maps, aerial photographs, and models of rockets, missles, aircraft, and vehicles. A separate storage area for all training aids of each unit is necessary because such a storage area must be near the instructor's office and reference area. Mimeograph machines, photostat machines, and similar equipment will also be located in this room.

11) Drafting and Reproduction Work Room

Each unit needs a space for reproduction work and drafting equipment for map work. Outdoor maneuvers must be carefully plotted on maps and cross-country routes are laid out on large scale maps. Organizational

charts, displays, diagrams, and posters are to be made within this area.

12) Conference Rooms

Although much counseling work is done within each office, it is desirable to have central conference rooms for each unit. Interviews will occassionally be held in which a board of officers interviews prospective advance cadets. Movies and other projection equipment will sometimes be used in this area. Staff meetings usually will be made in such a room.

13) .22 Caliber Rifle Range

All cadets will receive instruction in rifle marksmanship and rifle safety. P.E. courses are also taught in this area. Adequate lighting, ventilation, and safety measures are an absolute necessity.

14) Vehicle Garage

Storage for two sedans, and 1½ ton truck and one 3/4 ton truck must be available. Maintenence will not be handled by the ROTC units.

15) Lounge

Personnel from both units will relax during breaks within this area. Limited facilities for refreshment and

entertainment should be provided. Coffee and doughnuts are the usual refreshment with reading material the usual entertainment. Comfortable seating, privacy, relaxing atmosphere, and desirable view are features necessary for the lounge.

16) Cadet Orderly Room

Cadet organizations will require a meeting place. The room will also be used as a cadet lounge. All cadet gatherings, meetings, and conferences will take place here. Provisions must be made for posting announcements and for showing films.

17) Classrooms

(a) Teaching labs for basic cadets (freshmen and sophomores) are used for instruction and practical exercises in military tactics and organizations. All training aids available will be used within these rooms.

(b) Classrooms for advance cadets will be similar to basic teaching labs. Provision must be made for discussion group learning. For example, the class could be broken down into small discussion groups gathered around large tables or the entire class could be small enough to be conducted as a seminar. Practical

exercises are often practiced on sand tables or maps.

(c) The lecture-assembly room will be a large room where groups of several hundred students may be brought together for lectures, movies, or other programs. Ceremonies such as award presentations or commissioning exercises could also be held in such an area.

THE PROGRAM

The following program represents the culmination of this research effort. From this program the actual design will emerge.

The general flow plan is shown on the following page. It is merely an attempt to show the relationship of major areas in the building to each other. No scale or arrangement is intended.

PRELIMINARY FLOW PLAN

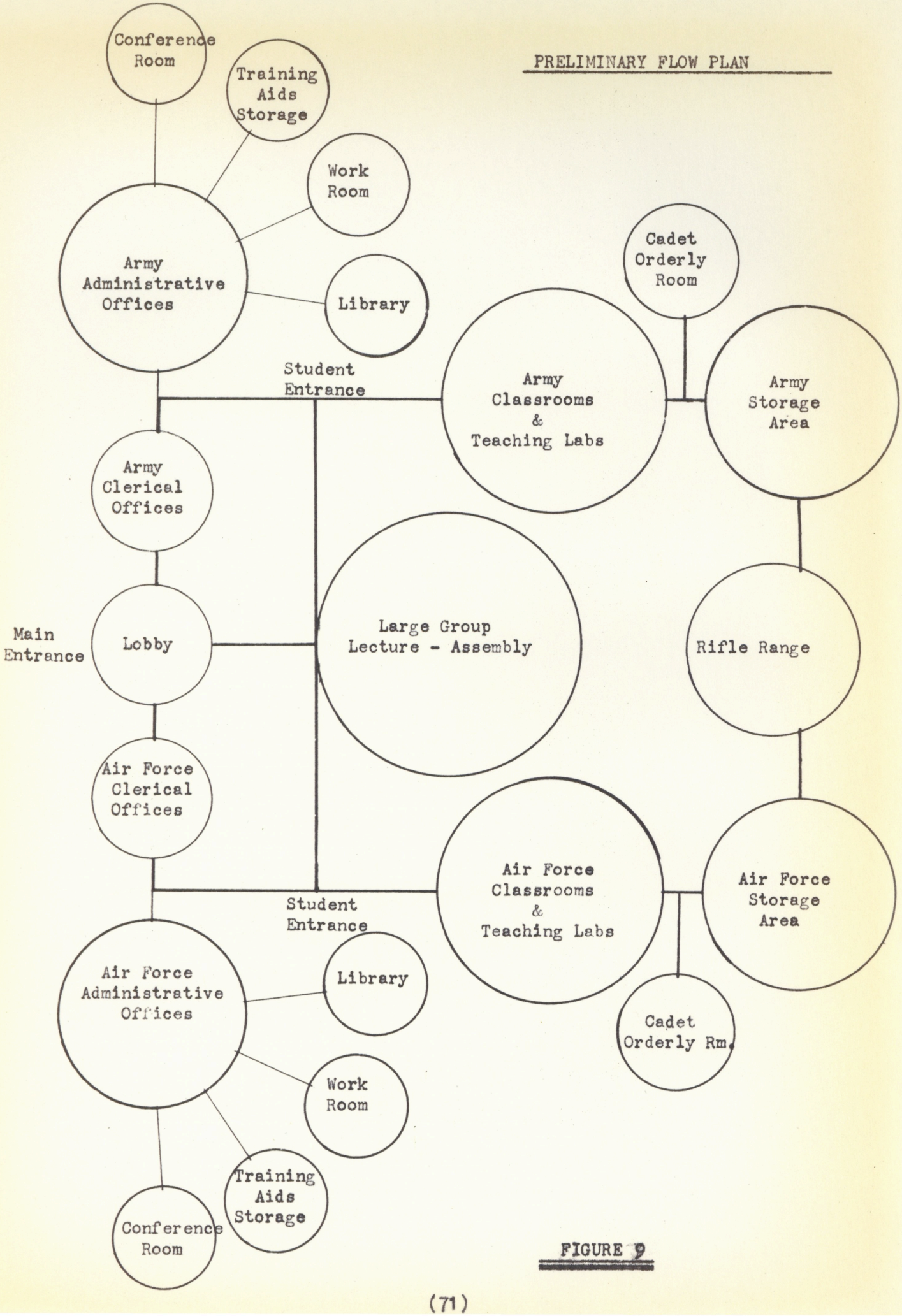


FIGURE 9

SPACE	QUANTITY	AREA
Office of the P.M.S. - P.A.S. Function: Office work, receiving callers, counseling. Equipment: Large desk, filing cabinets, work table, four occasional chairs. Finish: Good quality. Related: Adjacent to Staff offices, Executive Officer, Unit Clerical Office.	2 @ 225	450
Office of the Executive Officer Function: Office work, receiving callers, counseling. Equipment: Desk, filing cabinets, work table, three occasional chairs. Finish: Good quality. Related: Adjacent to P.M.S.-P.A.S., Staff offices, Unit Clerical Office.	2 @ 175	350
Staff Offices: Function: Office work, counseling. Equipment: Desk, filing cabinets, small work table, two chairs. Finish: Good quality. Related: Adjacent to Executive officer, Unit Clerical Office, P.M.S. - P.A.S.	6 @ 150	900
Instructor's Offices Function: Office work, class preparation, counseling. Equipment: Desk, filing cabinets, two chairs. Finish: Good quality. Related: Adjacent to Unit Clerical Office, training aid storage, library.	12 @ 120	1440

SPACE	QUANTITY	AREA
Unit Clerical Office	2@ 600	1200

Function: Office space for clerical workers and reception.

Equipment: 6 desks and chairs, large work table, reception desk, vault, filing cabinets, 6 chairs.

Finish: Good quality, durable.

Related: Adjacent to Main Entrance and Lobby and near the offices of the Staff Officers and the PMS/PAS.

Assistant Instructor's Offices	2 @ 400	800

Function: Office space for class preparation and office work.

Equipment: 4 desks and chairs, filing cabinets, work table and 4 chairs.

Finish: Good quality, durable.

Related: Near Instructors and the Unit Clerical Office, near Training Aid Storage and Library.

Training Aids and Reproduction Room	2 @ 250	500

Function: To provide an area for the use of duplicating machines and for storage of training aids.

Equipment: Locking cupboards, shelves, work-counter space, 3 duplicating machines.

Finish: Durable.

Related: Adjacent to Unit Clerical Office, near Instructor's Offices.

SPACE	QUANTITY	AREA
Library	2 @ 450	900

Function: Storage of reference material, reading.

Equipment: Book shelves, four study tables, twenty-four chairs.

Finish: Good quality, durable.

Related: Instructor's offices, classrooms, Unit Clerical Office.

Conference Room	2 @ 200	400

Function: Meetings of students, instructors, or staff.

Equipment: Large table, twenty chairs, coat closet, projection equipment.

Finish: Good quality,durable.

Related: Near main Unit offices.

Staff Lounge	1 @ 240	240

Function: To provide relaxation area for staff personell.

Equipment: Three tables, twenty-four comfortable chairs, magazine storage, coffee maker, storage.

Finish: Good quality.

Related: Adjacent to Entry Lobby, away from student areas.

Cadet Orderly Room	2 @ 175	350

Function: To provide space for cadet organizational work and meetings.

Equipment: Two work tables, twelve chairs, group seating, filing cabinets, magazine and coat storage.

Finish: Good Quality, durable.

Related: Near student entrance, library.

SPACE	QUANTITY	AREA
Large Group Assembly Room	1 @ 2200	2200

Function: To provide lecture and meeting space for 300 students.

Equipment: Seating with folding, tablet-arm chairs, movable speakers platform, projection equipment.

Finish: Good quality, durable, with acoustic treatment.

Related: Adjacent to Main Entrance.

Classrooms for Basic Students	6 @ 1200	7200

Function: Lecture and instruction for up to 35 students.

Equipment: Movable and wall-mounted blackboards, projection equipment, tablet-arm chairs.

Finish: Durable.

Related: Adjacent to student entry.

Classrooms for Advance Students	4 @ 950	3800

Function: Lecture, instruction, and group discussion area for 24 students.

Equipment: 8 tables with three chairs each, chalkboards, sand table, projection equipment, tack boards.

Finish: Durable.

Related: Adjacent to student entry.

Classroom Storage Areas	2 @ 175	350

Function: Materials and project storage space for each Unit Classroom area.

Equipment: Storage shelves, map storage racks, cupboards.

Finish: Rough.

Related: Near Unit Classrooms.

SPACE	QUANTITY	AREA
Rifle Range	1 @ 8500	8500

Function: To provide a space in which 22-caliber rifles can be fired on 25 points(stations) simultaneously.

Equipment: Target carriers, bullet stop, special lighting and ventilation equipment, small enclosed gallery.

Finish: Rough with special acoustic consideration and treatment.

Related: Adjacent to service area, apart from all classrooms and offices.

Range Storage Room	1 @ 150	150

Function: Storage area for 22-caliber rifles, ammunition,targets, equipment.

Equipment: Shelves, ammunition vault, gun racks, coat racks, cupboards.

Finish: Rough.

Related: Near Range Office and adjacent to Rifle Range.

Range Office	1 @ 150	150

Function: Office work, counseling, range records storage.

Equipment: Desk, 3 chairs, filing cabinets, work table.

Finish: Durable.

Related: Near Range and Range Storage Room.

Range Toilets	2 @ 85	170

Function: To provide segregated toilet facilities for those using the Rifle Range.

Equipment: (Men) 1 lavatory, 1 water closet, 1 urinal. (Women) 1 lavatory, 2 water closets.

Finish: Durable.

Related: Near Range area.

SPACE	QUANTITY	AREA
Army Storage Area	1 @ 2500	2500

Function: Storage of expendable, supplies, clothing.

Equipment: Built-in shelves, cupboards, clothes racks, issue counter.

Finish: Rough.

Related: Adjacent to Arms Storage, Supply Office.

Arms Storage Room	1 @ 750	750

Function: Storage of rifles, cleaning of rifles.

Equipment: Built-in rifle storage racks, cleaning table.

Finish: Rough.

Related: Adjacent to Storage Area, Supply Office.

Supply Office	2 @ 325	650

Function: Office work, record keeping.

Equipment: Filing cabinets, two desks, work table, four chairs.

Finish: Good quality.

Related: Adjacent to Storage Area, Arms Storage Area.

Air Force Storage Area	1 @ 2500	2500

Function: Storage of supplies,clothing.

Equipment: Built-in shelves,cupboards, clothes rack, issue counter.

Finish: Rough.

Related: Adjacent to Arms Storage, Supply Office.

SPACE	QUANTITY	AREA
Student Toilet Rooms	2 @ 200	400

Function: To provide toilet facilities.

Equipment: 6 water closets, 8 urinals, 6 lavatories (total) .

Finish: Durable.

Related: Near student entry and Unit Classroom area.

Staff Toilet Rooms	2 @ 125	250

Function: To provide segregated toilet facilities for all staff members.

Equipment: (Men) 2 water closets, 2 Urinals, 2 lavatories. (Women) 3 water closets, 3 lavatories, powder benchand mirror.

Finish: Durable.

Related: Near the Staff Lounge.

Janitors Room	1 @ 75	75

Function: Storage of custodial equipment.

Equipment: Slop sink, floor drain, storage shelves.

Finish: Rough.

Related: Near service area.

Mechanical Room	1 @ 175	175

Function: To provide space for all necessary heavy equipment.

Equipment: Air-conditioning equipment, hot and soft water tanks, steam controls.

Finish: Rough, fire resistant.

Related: Near service area.

SPACE	QUANTITY	AREA
Lobby	1 @ 200	200
Function: Waiting area for visitors or callers, relaxation area.		
Equipment: Comfortable seating for 10, coat space, magazine storage, small tables.		
Finish: Good Quality.		
Related: Adjacent to main entry.		
Halls	@ 15%	5,750
Function: To provide circulation for traffic between various elements of the building.		
Equipment: Drinking fountains, display cases, bulletin boards.		
Finish: Durable.		
Related: As required for proper circulation.		
Vehicle Storage	1 @ 900	900
Function: Storage area for 2 sedans, 1 truck (1½ ton).		
Equipment: Work bench, storage cabinets floor drains.		
Finish: Rough.		
Related: Near service area.		
TOTAL ESTIMATED AREA ---		43,200 sq.ft.

APPENDIX I

- CURRENT INVENTORY -
of
Existing Military Science Facilities
at
Montana State College

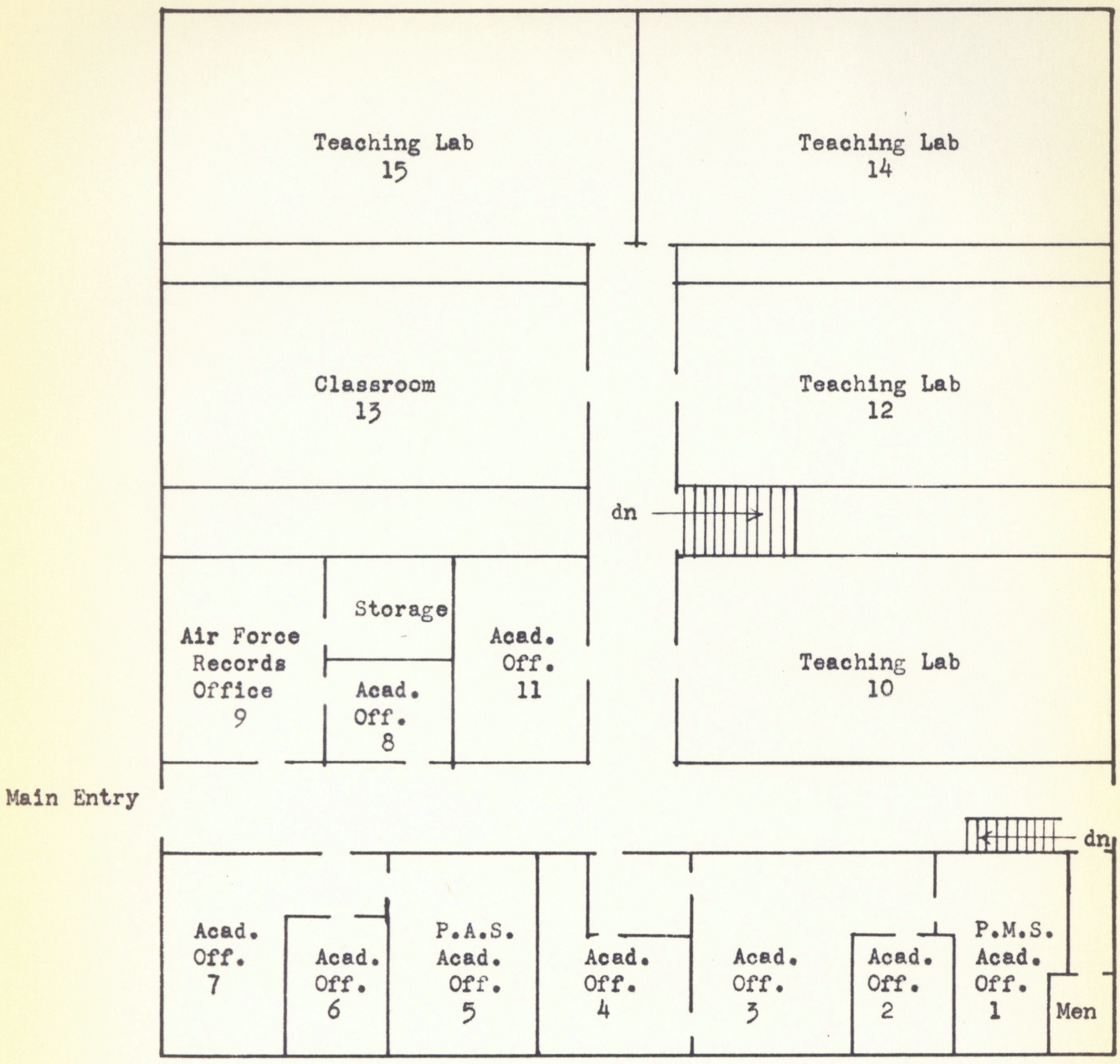
Room No.	Type of Room	Departmental Assignment	Assignable Floor Area	Existing Stations	
				Primary	Secondary
1	2	3	4	5	6
19	Armory	Army	492		
B-9	Air Force Supply	A.F.	1100		
B-9	Army Supply	Army	708		
B-8	Lounge	Joint	163		
B-3	Academic Office	Army	120	1	
B-3	Academic Office	Army	120	1	
	Service Area	Army	206		
Rifle Range	Armory	Joint	1960		12
Rifle Range	Armory	Joint	1784		8
1	Academic Office	Army	227	1	
2	"	"	120	1	
3	"	"	311	3	
4	"	"	156		2
5	"	A.F.	257	1	
6	"	"	98	1	
7	"	"	222	3	1
8	"	"	306	2	
1st	Storage	Army	176		
1st	Storage	Army	175		
9	Academic Office	A.F.	306	3	
10	Teaching Lab	Army	667	36	
11	Academic Office	A.F.	277	3	
12	Teaching Lab	Army	667	46	
13	"	A.F.	810	34	
14	"	Army	909	54	

CURRENT INVENTORY

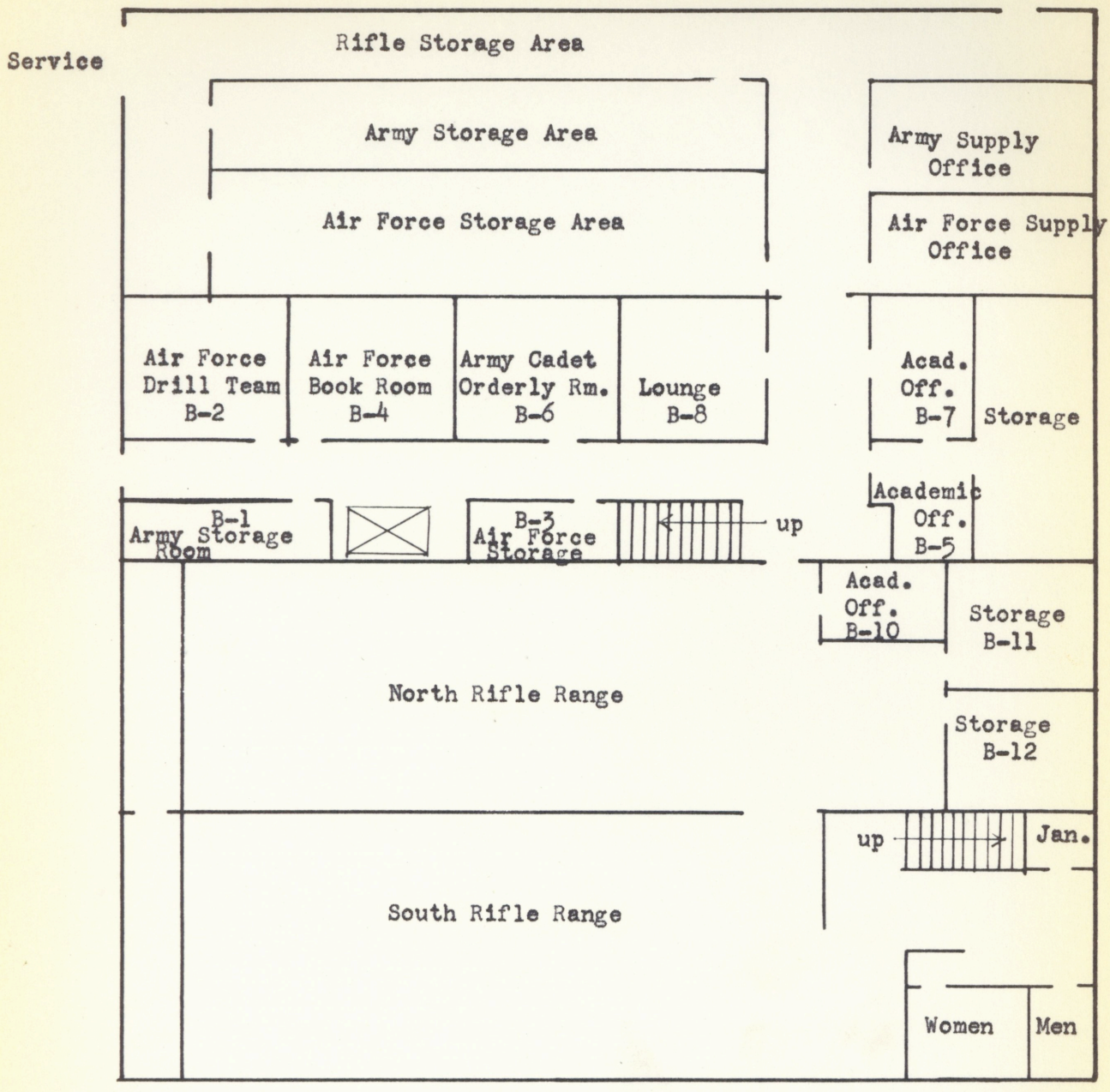
(continued)

Room No.	Type of Room	Departmental Assignment	Assignable Floor Area	Existing Stations Primary	Secondary
1	2	3	4	5	6
15	Classroom	A.F.	909	50	
B-2	Academic Office	A.F.	232	2	
B-3	Storage	A.F.	150		
B-6	Academic Office	Army	208	1	

TOTAL - 13,816 sq.ft.



MILITARY SCIENCE MAIN FLOOR
scale: 1/16" = 1'-0"



MILITARY SCIENCE BASEMENT
scale: 1/16" = 1'-0"

APPENDIX II

Appendix II REFERENCES

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APPENDIX III

TO: Tom Courtney

INFORMATION FOR NEW MILITARY SCIENCE BUILDING

Staff Member CAPT RAY

Duty Assignment ASST PMS - SI

Army or Air ARMY

Current Office Space 255 sq. ft.

Office Space Needed 255 sq. ft. (but without Two desks (clerks)

Current Storage Space none cu. ft.

Storage Space Needed 25 cu. ft. Filing CABINET SPACE Required but not so that CABINETS protrude out into office SPACE itself - Built into WALL set-up.

Other Equipment (desks, files, etc.)

Do you have adequate

(1) Natural light? yes

(2) Artificial Light? yes

(3) Ventilation? NO

(4) Noise Control? NO

*Please explain any "No" answers and offer possible solutions.

ONE EXTREME to ANOTHER as CONCERNS VENTILATION. AIR CONDITIONER helps, but TIN ROOF in SUMMER months makes heat a problem. IN WINTER, VERY difficult to keep CONSTANT and COMFORTABLE TEMP.

NO SOUND PROOFING. RIFLE RANGE downstairs with NOISE factor a PROBLEM

Other Remarks: OFFICE LOCATION should be OUT of MAIN flow of TRAFFIC but ARRANGED so that flow could be CHANNELLED into office without DISRUPTION to other office SPACE

INFORMATION FOR NEW MILITARY SCIENCE BUILDING

Staff Member Capt. Gunther H Hehn

Duty Assignment S-3

Army or Air Army

Current Office Space 130~~150~~ sq. ft.

Office Space Needed 150 sq. ft.

Current Storage Space 260 cu. ft.

Storage Space Needed 500 cu. ft.

Other Equipment (desks, files, etc.)

Do you have adequate

(1) Natural light? No

(2) Artificial Light?

(3) Ventilation? No

(4) Noise Control? No — Rifle Range Disturbing

*Please explain any "No" answers and offer possible solutions.

Schedule Practice Firing to hours when no classes are in session. I would suggest firing be limited to 1600 to 1800 or 2000 hrs 5 days a week. Students seriously enough interested should not object to these hours. If this cannot be effected, a new ~~rifle~~ indoor rifle range should be selected.

Other Remarks:

INFORMATION FOR NEW MILITARY SCIENCE BUILDING

Staff Member _____

Duty Assignment Supply SgT

Army or Air ARMY

Current Office Space 243 sq. ft.

Office Space Needed ~~400~~ NONE sq. ft.

Current Storage Space 700 cu. ft.

Storage Space Needed 2100 cu. ft.

Other Equipment (desks, files, etc.) _____

Do you have adequate

(1) Natural light? No

(2) Artificial Light? yes

(3) Ventilation? NO

(4) Noise Control? NO

*Please explain any "No" answers and offer possible solutions. Supply

(1) Room is located in basement with no natural light

(2) There is no ventilation unless someone ~~Forgets~~ forgets and leaves a door open and then we get To much ventilation

(3) We get quite a bit of noise from movies shown upstairs in classrooms.

Other Remarks: When it get cold—(below zero) our office is cold

INFORMATION FOR NEW MILITARY SCIENCE BUILDING

Staff Member Major Lee A Brewer

Duty Assignment Asst PAS

Army or Air Air

Current Office Space 225 sq. ft. (ONE OFFICE WHICH HOUSES OFFICE OF THE AIR FORCE COMMANDANT OF CADETS & THE CADET ORDERLY ROOM.)

Office Space Needed 144 sq. ft. FOR COMMANDANT OF CADETS OFFICE

Office Space Needed for cadet Orderly Room 225 sq. ft. (ADJACENT TO C.O.C.'s OFFICE)

Current Storage Space NONE cu. ft.

Storage Space Needed 160 cu. ft.

Other Equipment (desks, files, etc.) 1 desk & bookcase (1'x3'x3') for COC.

5 desks, 1 filing cabinet for Cadet orderly Room

Do you have adequate

(1) Natural light? ~~No~~ YES
(2) Artificial Light? NO
(3) Ventilation? NO
(4) Noise Control? NO

} for C.O.C. office only

*Please explain any "No" answers and offer possible solutions.

(2) one window 2½'x3' now → more windows

(3) Drafty... three window only → air conditioning

(4) Rifle Range Noise → Soundproof range

Other Remarks: Indoor space needed for drill*

Also an auditorium to seat at least 500

* This item was used for an item of justification for building the MSC fieldhouse... but we have no priority in using it now.

INFORMATION FOR NEW MILITARY SCIENCE BUILDING

Staff Member MSgt Russell R Bucklew

Duty Assignment Asst Instructor Air Science

Army or Air Air

Current Office Space 97½ sq. ft.

Office Space Needed 97½ sq. ft.

Current Storage Space 0 cu. ft.

Storage Space Needed 0 cu. ft.

Other Equipment (desks, files, etc.) Desk provided by Dept of Air Force;

2 filing cabinets

Do you have adequate

(1) Natural light? yes

(2) Artificial Light? yes

(3) Ventilation? not in summer months

(4) Noise Control? no

*Please explain any "No" answers and offer possible solutions.

(3) ventilation - extremely hot and stuffy in summer months

(4) noise control - office directly over range and extremely noisy and distracting

Other Remarks:

INFORMATION FOR NEW MILITARY SCIENCE BUILDING

Staff Member MSgt Kenneth A Johnk

Duty Assignment Asst to MPC

Army or Air Air

Current Office Space _____ sq. ft.

Office Space Needed _____ sq. ft.

Current Storage Space _____ cu. ft.

Storage Space Needed _____ cu. ft.

Other Equipment (desks, files, etc.) Need Storage vault for Ammunition - 2 desk, 1 file Cabinet, racks for books and expendable supplies

Do you have adequate

(1) Natural light? no

(2) Artificial Light? Yes

(3) Ventilation? no

(4) Noise Control? no

*Please explain any "No" answers and offer possible solutions. Supply Room is located in area with solid concrete walls with no windows - Solution for natural light, install windows - There is no ventilation system - The Supply Room is located on same level as rifle range - The noise from students shooting on range can be heard in Supply Room -

Other Remarks: Book cases are used for reference books - However, for textbook, bookshelves are required -

INFORMATION FOR NEW MILITARY SCIENCE BUILDING

Staff Member Mrs. Marlene Ferguson

Duty Assignment Secretary

Army or Air Air

Current Office Space 97½ sq. ft.

Office Space Needed 97½ sq. ft.

Current Storage Space 0 cu. ft.

Storage Space Needed 0 cu. ft.

Other Equipment (desks, files, etc.) Desk provided by Dept of Air Force

Do you have adequate

(1) Natural light? yes

(2) Artificial Light? yes

(3) Ventilation? no

(4) Noise Control? no

*Please explain any "No" answers and offer possible solutions.

(3) Ventilation - extremely stuffy and hot in summer months

(4) Noise Control - extremely noisy and distracting as office is directly over rifle range

Other Remarks:

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