

**A
VOCATIONAL
SCHOOL
FOR
BOZEMAN**

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A LETTER OF TRANSMITTAL

To: John Parker and John DeHaas

From: Robert Bruce

Subject: Undergraduate thesis report on A Vocational
School for Bozeman, Montana

Date: August 14, 1968

As you requested in class June 19, I have done research on a vocational school for Bozeman, Montana. Attached is a paper on my findings.

Milton Negus, Woodrow Wold, Gilbert Carter, William Ball, and Wallace Forsgren gave much of their time in answering questions and giving suggestions about a vocational school for Bozeman. I hope the information that I have compiled and my future design of a vocational school can be of some help to them in their effort to get a vocational school for Bozeman, Montana.

Thanks to my wife, Jean Bruce, for helping with the typing and proofreading.

Respectfully,

Robert Bruce

A VOCATIONAL SCHOOL FOR BOZEMAN, MONTANA

Part I

Undergraduate Thesis in Architectural Design

by

Robert D. Bruce

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

at

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INTRODUCTION

The following is an excerpt from Byram and Wenrich's book, Vocational Education and Practical Arts in the Community School, which I feel best answers the question, What is vocational education?

"When a person learns 'how' to work, he is receiving vocational education. In acquiring marketable skills the individual discovers what he needs to know, what he needs to be able to do, and how well he must be able to do it to meet standards set by his employer, by the consumer, or by society. In addition to acquiring this knowledge and ability, he acquires habits and attitudes necessary for success on the job. He learns what he must do to qualify for a better job or to advance in the work in which he is engaged. The way people should be taught their life work is very well summarized by Keller:

People should learn to work wherever they can do so most economically in terms of time, energy, and money and where the environmental influences will be such as to make them desirable social beings as well as skillful workers. Such places of work-learning should be accessible and available to everyone. They should be called schools.

"From the school's point of view, then, vocational education is 'teaching people how to work effectively.' This succinct definition applies to all fields of endeavor even though in some the worker may not be thought of as being employed--at least for compensation. An example is homemaking. It is, however, productive activity.

"Some people enjoy their work so greatly that they would rather be 'working' than doing anything else. The

workers Hoppock studied in his research on job satisfaction derived more satisfaction from their work than from their leisure. What is one man's work may be another man's recreation. So we may say that vocational education takes place when an individual or group of individuals acquires information, an understanding, an ability, a skill, an appreciation, an interest and/or an attitude, any or all of which enable him to begin or to continue in activity of a productive or service nature and to which he intends to devote a major portion of his nonleisure time in order to provide food, shelter, clothing, education, entertainment, and other necessities and wants for himself and his family members."¹

In the October, 1964 issue of the N.E.A. Journal, J. Chester Swanson summarized the need for vocational education: "Our political and social survival may depend to considerable extent upon our ability to provide for the adequate employment of our nation's youth. Although the unemployment problem is so big that it must be approached from all angles, vocational education can play a considerable part in providing a solution."

CONDITIONS
CREATING
A
NEED

Introduction

What happens to the high school graduates of Montana?

Of the 1966-1967 high school graduates, 60 per cent enrolled in post-high school programs according to a study made by Max L. Amberson of institutions of higher learning. The following is a summary of his investigation.

Type of school or program

Higher education institutions

Montana University system	4,533
Public community and junior colleges	343
Private colleges	537
Total	5,413

Other post-secondary programs

Public high schools	171
Schools of cosmetology	233
Business colleges	702
Miscellaneous programs	123
Total	1,229

Total graduates during the 1966-67 school year	10,273
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While more than four times as many of these recent graduates enrolled in collegiate programs as enrolled in other types of post-high school programs, together they represent almost 60 per cent of the total graduating group. Undoubtedly there were, in addition to these, some who enrolled in schools outside the State. It would seem that young people in Montana have "got the message that education pays." In considering the larger proportion of these 1967 graduates who were attending college institutions compared with those enrolled in other types of post-high school programs, it must be recognized that Montana has a considerable number (for the size of population) of institutions of the collegiate type, and that, while there are quite a number of private schools for specialized training (e.g., business, nursing, cosmetology), there are almost no opportunities for less-than-college programs in public institutions. If there were available State schools which would provide high school graduates with comprehensive post-secondary educational opportunities, it is

likely that not only would the proportion of enrollments in college programs to enrollments in post-secondary programs have been quite different, but also that even more of the recent graduates might have been attending school the autumn after their graduation from high school.²

Existing Conditions

What is Bozeman School District #7 offering to students for post-high school training?

A daytime full-time program of vocational courses will start in the fall of 1968 with an anticipated enrollment of 62 students. Courses are offered in health occupations and business occupations. According to Woodrow Wold, director of the vocational program in Bozeman, these classes will be held at Willson School and at the vacated Post Office Building. Wold says that there is enough room for these courses, but that Bozeman needs a larger and more comprehensive vocational program to satisfy the needs of the community.³

Reasons for Change

Milton Negus, Superintendent of School District #7, says that high school courses now offered are mainly directed toward the student who wishes to go on to college. According to Negus these courses are not enough. If we want to give all of our students adequate preparation for their endeavors, vocational training is needed for approximately 40% of our students. He believes that grades 13 and 14 should be added to the high school program so that

when students complete their high school training, they will be prepared for either college or concentrated vocational training.⁴

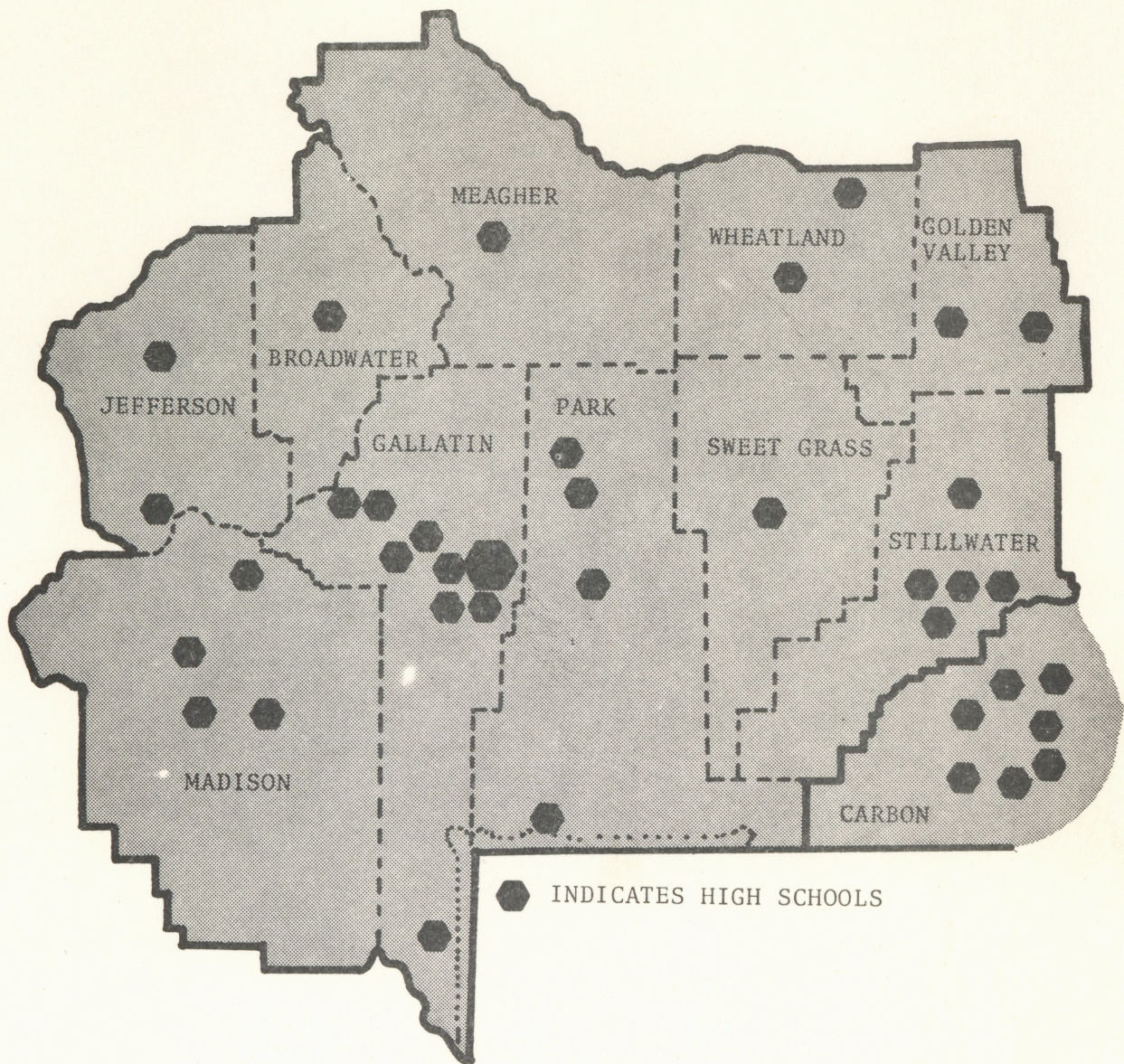
Bozeman would also like to have area designation. Because of Bozeman's size, location, and desire, William Ball, director of vocational education for the state of Montana, anticipates that a state area designation will be given to Bozeman.⁵ With an area designation, Bozeman will receive federal funds to provide vocational training for Gallatin and surrounding counties. This will probably not be a reality before 1976.

In Formal Application for Area Designation for Bozeman, Montana, Gallatin County and 10 surrounding counties are predicted to have a population of 80,000 by 1970. A map included in this application (shown on the following page) shows that Bozeman High School is the near geographic center of the 38 high schools in this area.⁶

A comprehensive program for grades 13 and 14 and area designation would require an expansion of the present vocational program and facilities because of the larger anticipated enrollment and variety of courses needed. Wold suggests a consolidation of these facilities to better utilize and administer the expanded program.⁷

Other Reasons for Change

The community would benefit from these new facilities. Evening adult education courses could expand and make use



BOZEMAN COULD SERVE AS AN AREA VOCATIONAL SCHOOL FOR THE 11-COUNTY AREA SHOWN ABOVE. THE AREA HAS 38 HIGH SCHOOLS AND 80,000 PEOPLE.

of the new area and equipment. Local business would benefit from the better qualified graduates and new business would be encouraged to the Bozeman area because of qualified employees, which, in turn, would bring more tax dollars to the community.

Job Opportunities.

According to the U.S. Department of Health, Education, and Welfare, graduates from vocational schools are placed in jobs in the field or related field that they were trained. The following is a breakdown of a national sample of 606,872 graduates (October 1966).

Persons available for placement.....	347,370
Placed in field trained or related field.....	80%
Placed unrelated to training.....	12%
Placed part-time.....	4%
Unemployed.....	4%
 Persons not available for placement	 219,482
Entered armed forces.....	45,517
Continued school full-time.....	141,302
Other reasons.....	32,663
 Information not available.....	 40,020 ⁸

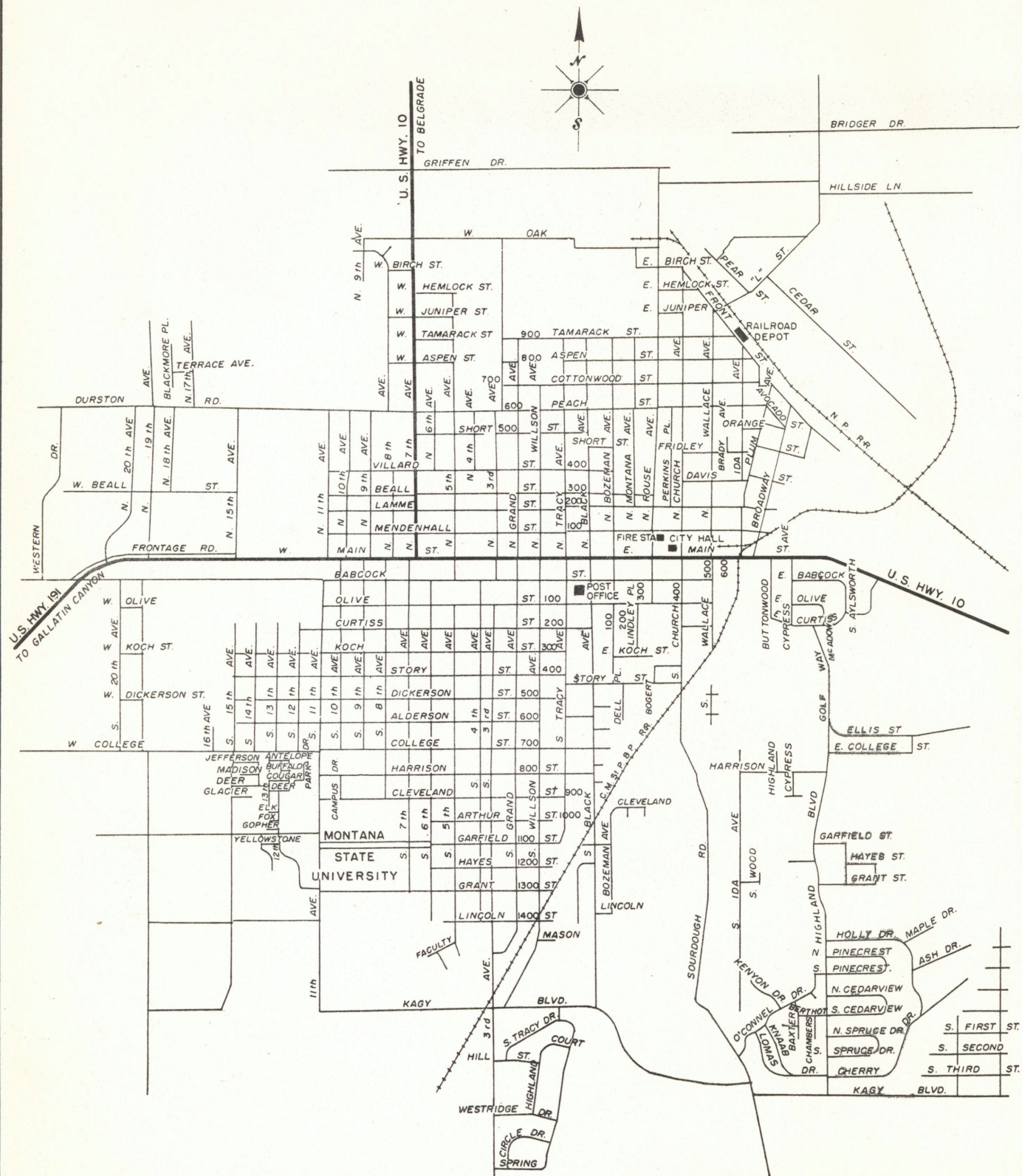
Wold suggests that Butte and Helena vocational schools follow the national average of 80% of their graduates available for placement getting jobs in the trained or related fields.

Summary

In order to include grades 13 and 14 in Bozeman's high school system and with area designation, Bozeman

will need an expanded and up-to-date vocational center. This center will provide the needed facilities and allow the larger enrollment and more complex curriculum to be administered efficiently.

LOCAL
CONDITIONS



Information for the following sections was obtained from the Bozeman Chamber of Commerce.

Geographic

Bozeman, a city of south-central Montana, is located a bit north and east of the center of Gallatin County. The exact location is 45°42' N. Lat. and 111°31' W. Long. Bozeman is in a broad, fertile valley with the Bridger Mountains visible to the north and the Gallatin Range to the south. The valley, once a lake, has 6 to 12 feet of clay and loam soil over a loose gravel bed. Bozeman covers an area of 7.55 square miles and is 4,793 feet above sea level. It is located on U.S. Highway No. 10, a major east-west highway, and U.S. Highway No. 191, south. Highway 10 is part of the Federal Interstate Highway No. 90. Bozeman is the county seat of Gallatin County. It has the sixth highest population in Montana with 13,361 people according to the 1960 U.S. Census. The current estimate is that there are 15,700 people within the city limits including married students at Montana State University.

Historical

First settlements in Montana were the gold camps of Bannack, Alder, and Last Chance Gulch, but the settlement of the Gallatin Valley 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 his friends William J. Beall and Daniel E. Rouse staked out the townsite for the city of Bozeman. It was made the county seat in 1867. That year Fort Ellis was established three miles east of the town, and the protection and trade it offered attracted additional residents. It remained active until 1886.

The mines of Bannack, Alder, and Last Chance Gulch provided markets for farm products and a score of streams provided cheap irrigation. 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 from Texas to Montana in 1864. Today the valley is the most populous purebred cattle area in America.

Montana State College of Agriculture and Mechanic Arts and the Montana Agricultural Experiment Station were established at Bozeman by the state legislature in 1893. The college has developed into Montana State University and had an enrollment of over 6,700 students in the fall of 1967.

Climatic

The average mean temperature of Bozeman is 43°F. The February average minimum is 13.8°F. and the average maximum is 33.8°F. The mean temperature in February is 23.8°F. The July average minimum is 51.3°F. and the average maximum is 81.5°F. The mean temperature for

July is 66.4°F. The average rainfall is 17.38 inches with almost 1/3 of this falling in April and May. The growing season is approximately 107 days, with the last killing frost coming about May 28 and the first killing frost about September 12. Prevailing winds are from the northwest, while the storm winds blow from the southeast.

The monthly temperatures and the sun angles are found on the next two pages.

Social and Recreational

Bozeman and the State University have become hosts to conventions the year around. The Museum of the Rockies, community theatre, a symphony orchestra, and lectures are available for the culture conscious. The Montana Winter Fair held in Bozeman is among the Northwest's finest. The fieldhouse at MSU that seats 13,000 offers a variety of activities at different times of the year from athletics, to "name" attractions, to dog shows.

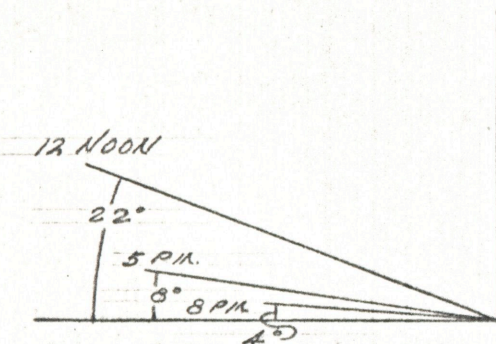
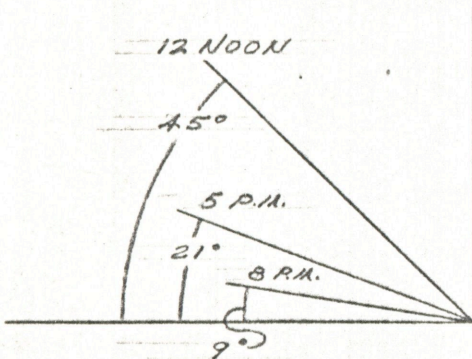
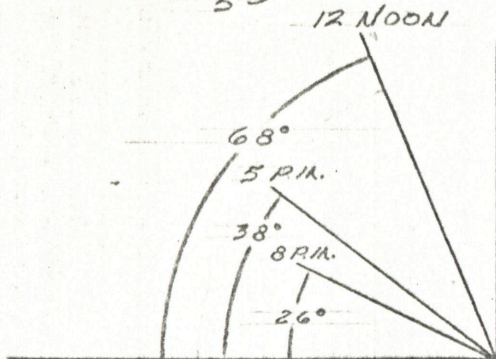
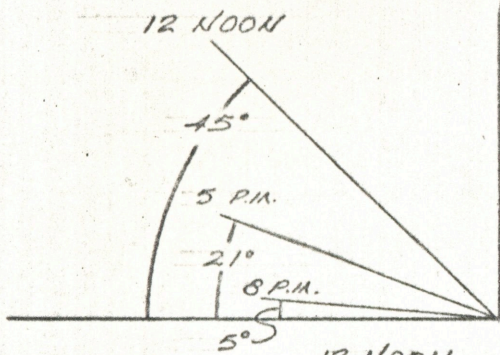
Recreational areas within the city limits of Bozeman include picnic areas, playgrounds, softball and baseball parks, a heated swimming pool open during the summer months, tennis courts, ice skating rinks open during the winter months, and supervised recreation for children. There are also two nine-hole golf courses located adjacent to the city.

Within an hour's drive of Bozeman are man-made and natural lakes in beautifully forested country which are

Table 1. Bozeman Temperature and Precipitation⁹

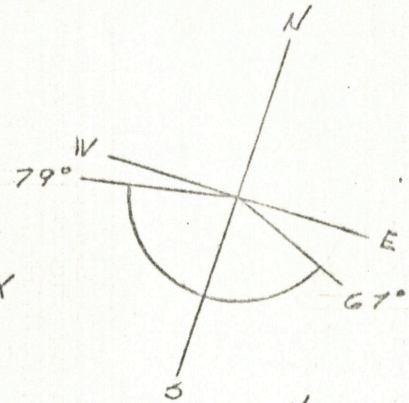
Months	Mean Temperature (degrees F.)	Precipitation (inches)
January	20.2	.92
February	25.2	.76
March	27.3	1.55
April	42.5	2.34
May	51.5	3.06
June	57.3	1.08
July	66.4	1.12
August	64.9	1.65
September	55.8	1.45
October	46.0	1.07
November	32.1	1.30
December	24.8	.91

VERTICAL

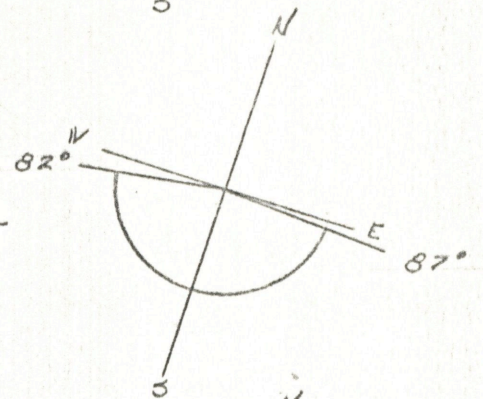


HORIZONTAL

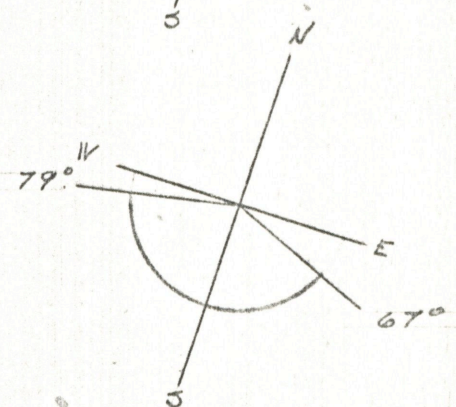
SPRING
EQUINOX



SUMMER
SOLSTICE



FALL
EQUINOX



WINTER
SOLSTICE

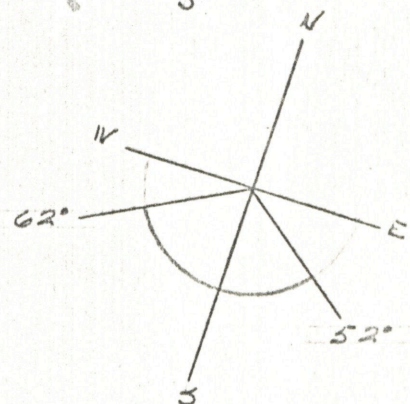


DIAGRAM #1

BOZMAN SUN ANGLES

good for fishing, boating, and water skiing. Hunting and fishing in the area are favorite sports of local people as well as sportsmen from all over the nation.

Bozeman has an excellent ski area called "Bridger Bowl."

It has a large number of civic clubs for men and women. Nearly every national organization is represented.

Economic

The economy of Bozeman is built primarily upon income from agricultural sources, together with Montana State University, which employs hundreds of people as 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 grains 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, food processing, grain milling, and several other small manufacturers. Tourism is an increasingly important source of revenue.

The retail area covers 24,465 square miles, with a population of more than 65,000. Bozeman is classified as one of the state's major retail centers. Retail sales in the county in 1963 totaled \$42.3 million. In 1966 there were 196 retail and service outlets in Bozeman. The 1963 U.S. Census Bureau report indicated an annual payroll of

\$6.1 million for retail and service establishments in Gallatin County. Major retail outlets include six department stores, two variety stores, seven drug stores and four supermarkets. The principal shopping centers are eight blocks on Main Street, two blocks north and south of Main, and six blocks on North Seventh; with neighborhood shopping centers at College Street between 8th and 11th Avenues, and on West Main Street.

Education

The Bozeman City School System is based on a 5-2-3-3 plan which includes: 2,500 children in kindergarten through grade four in five elementary schools and a city-wide fifth and sixth grade school; 900 children in a city-wide Junior High School, including grades seven through nine; and 1000 students in a city-wide Senior High School. Also located in Bozeman are Holy Rosary High School (Catholic) and Mount Ellis Academy Grade and High Schools (Seventh Day Adventist). Montana State University, the oldest and largest unit of the Montana University System, is located in Bozeman. In the fall of 1968 a vocational education program will start with an anticipated enrollment of 62 students. There is also an adult education council, with sponsorship of evening classes for adults in a variety of subjects.

Transportation

Railroads: Bozeman is served by two railroads. The main line of the Northern Pacific Railroad passes through

Bozeman and offers two daily east and west bound passenger trains. Both the Milwaukee Railroad and the Northern Pacific can supply carload freight shippers with schedules and services to meet their particular needs. Carloads of freight can be switched from one railroad to the other at Bozeman for added service to business located on trackage within the city.

Airlines: Daily east-west airline service is provided by Northwest Orient Airlines whose present schedule serves the Gallatin Valley with four flights daily. Frontier Airlines provides Bozeman with four flights daily north and south. Bozeman is also served by two base operators at Gallatin Field offering charter, instruction, crop spraying, air ambulance, etc.

Bus Lines: Greyhound Lines serves Bozeman east and west with numerous daily local and express schedules. Karst Stages operates between Bozeman and West Yellowstone daily. Also, the Belt Mountain Transportation Company, Inc. operates daily from Bozeman to Great Falls via Livingston and White Sulphur Springs.

Motor Freight Carriers: Truck lines include Garrett Freight Lines, Inc., Butte-Bozeman Delivery Service, Northern Pacific Transport Co., and several local moving and hauling carriers.

A
SITE
FOR
A
VOCATIONAL
SCHOOL

Choice of Site

Because of the rising cost of property, School District #7 has adopted the policy of buying land for future school sites instead of waiting until the school is needed and the property is more expensive. New facilities have been anticipated for the high school, and for this reason property around the existing Junior and Senior High Schools has been purchased. The diagram #2 on the next page of this report shows property now owned.

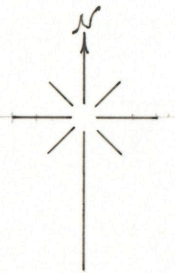
Future plans for the "high school" site are: (1) The site is to be for grades 9-14 with a campus atmosphere. (2) New junior high (grades 7-8) facilities will be located on another site with grades 9-10 occupying the present junior high building. (3) Grades 11-12 will occupy the present senior high building. (4) A vocational building (grades 13-14) will be constructed for those students who show an interest in vocational training rather than in going on to college at the end of grade 12.

New structures will be added with the increase in students, and it is possible that a building for each grade (9-14) will be needed in the final plans for this site. In the campus plan, it is expected that cross-circulation between buildings will take place in order to reduce the overlapping of facilities within each building.

I feel that locating the vocational school on this site is essential for these reasons: (1) The school district now owns the land and anticipates construction of a

DIGRAM #2 EXISTING SITE CONDITIONS

NO SCALE



15th AVENUE

PRIVATE PROPERTY

PRIVATE PROPERTY

PROPERTY LINE

DURANTON ROAD

ATHLETIC FIELD

JUNIOR HIGH BLD'G.

SENIOR HIGH BLD'G.

PARKING LOT

MAIN STREET

11th AVENUE

vocational school. (2) Some of the existing high school facilities could be used by the vocational students, such as, the library and cafeteria, thereby reducing the need for overlapping facilities. (3) Students in the lower grades (9-10) could be introduced to some vocational training, and students in grades 11-12 who do not wish to go on to college could concentrate their studies in vocational training.

Proposed On-Site Location

I have studied two on-site locations in relation to the existing conditions. Diagram #2 shows the existing conditions of the site, and diagrams #3 and #4 show the two on-site studies.

Proposed Condition #1 (See diagram #3)

Access to the vocational school by vehicular traffic, leaving room for expansion of grades 9-12 facilities, and non-interference with the existing facilities was the major goal of this study.

Advantages

1. There would be access to the building and parking from two directions, north and east.
2. Expansion of the grades 9-12 facilities is possible to the north and west of the present junior high building.
3. The area used in this proposal is now a field of alfalfa and is not presently used by the school system.

Disadvantage

1. Access to a building by students of any other building would require a lot of walking.

Proposed Condition #2 (See diagram #4)

A new location of the vocational school was explored because of the disadvantage involved in the Proposed Condition #1.

Advantages

1. The vocational building would be located next to the high school. This would reduce the walking distance between the two buildings.
2. Expansion of the grades 9-12 facilities is possible to the north and northwest of the senior high school.
3. The parking lot would be located off Durston Road. In this position the parking lot would have several directions of departure.
4. By location the parking is this position, future buildings can be located along 11th and 15th Avenues. This would create a mall in the center of the site for use in outdoor sports and pedestrian traffic.

Disadvantage

1. The present parking lot would have to be relocated.

Conclusion

I suggest using the Proposed Condition #2 because the advantages outweigh the disadvantage. Although moving the parking lot will incur some expense, I feel the advantages gained will save more time and expense than the relocation costs.

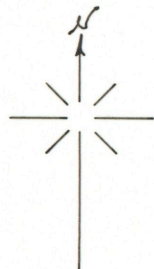
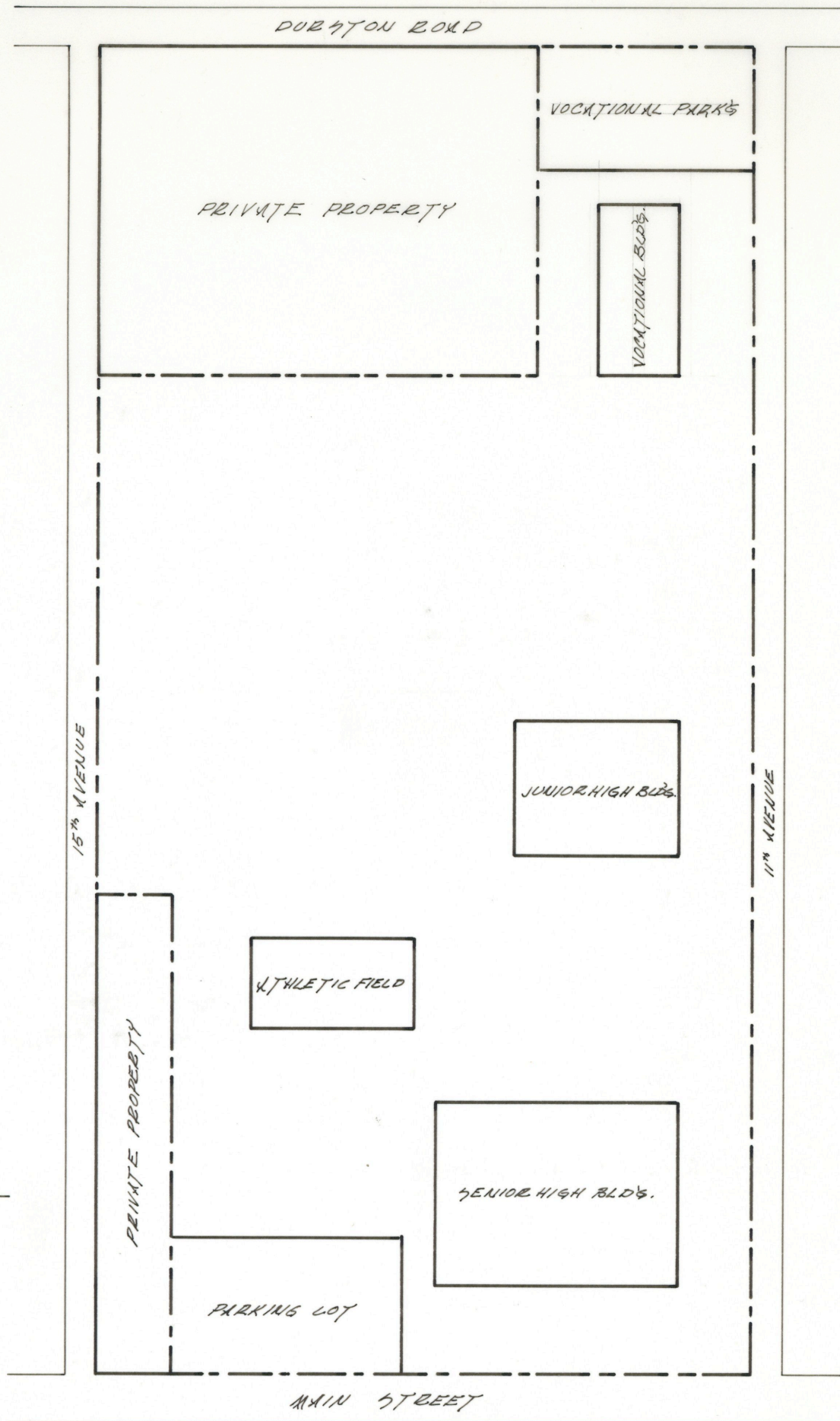


DIAGRAM #3 PROPOSED CONDITION #1

NO SCALE



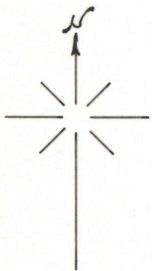
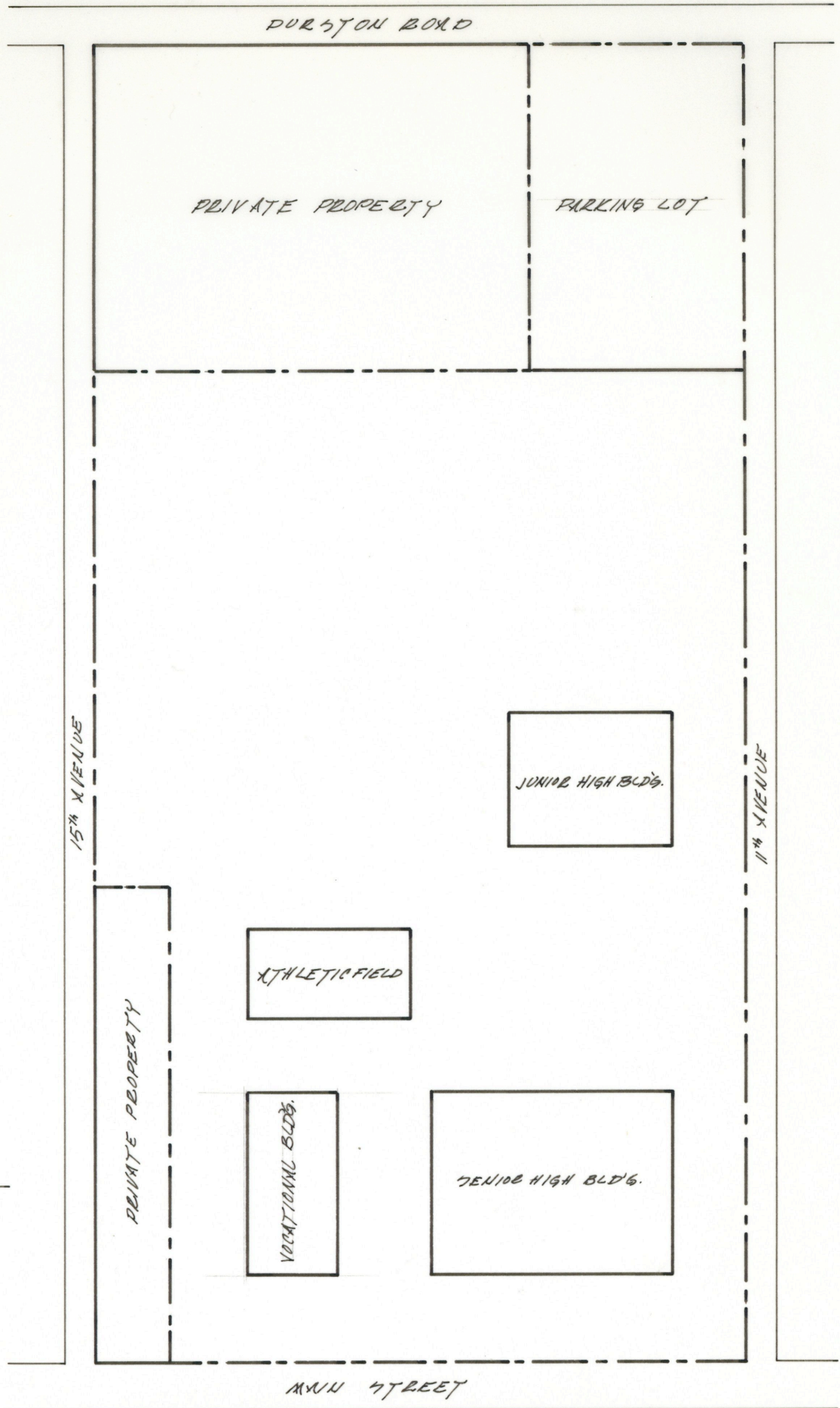


DIAGRAM #4 PROPOSED CONDITION #2

NO SCALE



**VOCATIONAL
PROGRAM
OUTLINE**

General Requirements

Statement of Objectives

The design of a vocational school in Bozeman, Montana involves two objectives at this time. The first objective is that the design meet the needs of those students who wish vocational training. At the present time the high school curriculum is oriented to the student who wishes to go on to college, while the student who wishes to work after completing high school has not been given training for a particular job. Therefore, the high school needs a curriculum for the job-oriented student. A vocational school would provide vocational training as grades 13 and 14 while offering courses to interested 10-12 graders.

The second objective is that the design be flexible for the future. School District #7 anticipates area designation from the state for vocational training. To receive area designation, as described previously in this paper, requires that the main program emphasis does not duplicate other existing programs in the state. Bozeman will be eligible for area designation by 1976; therefore, a flexible program is desired so that any duplication with existing state programs can be eliminated at that time.

The two objectives to be considered at this time for designing a vocational school for Bozeman are first a building that will satisfy the present need

and second a building that will be flexible to allow for future changes.

Proposed Programs

The anticipated enrollment for grades 13 and 14 vocational training is 200 to 400 students according to Negus. A large investment is required to build, equip, and maintain a vocational school for these 200 to 400 students. To fully utilize this school, three programs are suggested by Negus: (1) A vocational program for grades 13 and 14, (2) an introduction to vocational training program for students in grades 10-12, and (3) an adult education program. Wallace Forsgren, Curriculum Director, suggests that a segregation of these programs be conducted on a time schedule: 7 AM to 2 PM for grades 13 and 14, 2 PM to 5 PM for grades 10-12, and 6PM to 10 PM for adult education. This time schedule would allow up to 400 students to use the facilities during each time period.¹⁰

With these three programs, as many as 1,200 students can use the vocational school. Students from grades 10-12 who are interested in job training can begin vocational training prior to their high school graduation. Vocational training can be given to students in grades 13 and 14 to prepare them for a specialized job, and adult education courses can be offered to further educate the people of the community.

Specific Requirements

Types of Courses

Because Bozeman is primarily an agricultural and service community, courses in the vocational program should be oriented toward agriculture and the services offered in the community. Following is a list of suggested courses to be offered under the vocational program and the number of students expected to enroll in each course, as suggested by Woodrow Wold.

Agricultural Occupations

- 1) Agricultural Accounting.....32
- 2) Farm Equipment Maintenance.....24
- 3) Agricultural Marketing.....32

Business Occupations

- 4) Accounting and Small Business Management.48
- 5) Tabulating Equipment Operation.....24
- 6) Secretarial Science.....42
- 7) General Clerical.....32

Health Occupations

- 8) Practical Nursing.....40
- 9) Medical Secretary.....28
- 10) Physical Therapy Technician (Masseur)....14

Home Economics

- 11) Food Preparation.....12
- 12) Tailoring.....12

Trade Occupations

- 13) Automotive Mechanics.....24

14) Welding.....	10
15) Appliance Repair.....	<u>24</u>
Total	398

Space Requirements

Montana's Board of Education is in the process of developing guidelines for realistic planning of schools of a vocational nature; and therefore, these guidelines are not available at this time. A check list for facility planning for schools of vocational, technical, and adult education and suggested guideline standards for facilities from the Wisconsin Board of Vocational, Technical and Adult Education are on the following pages.¹¹ This material will be used as a starting point for the designing of spaces for this vocational school.

B. THE BUILDING

1. Curriculum Dictates the Design

A prime factor in the planning of facilities for vocational and technical education is the realization that each of the areas has specific requirements which must be met. Further, these programs may vary with the specific training needs of each community. Since the building and other facilities are basically educational tools, they are essential to the educational process and will help to achieve the purposes of the program. Building design is, then, an expression of how the problems of educational program planning have been solved.

2. Design Considerations

a. Flexibility

- (1) Creation of a building which can be readily adapted to future learning requirements, enrollments, and methods of teaching
- (2) Rearrangement of space in the building without major structural changes
- (3) Multiple use of space for both day and night classes

b. Expandability

- (1) Increase in the floor area of a structure, either by expansion on the same level or by the addition of another story

c. General environment

- (1) Proper control and balance of acoustics, heating, ventilating, lighting, and color

d. Aesthetics

- (1) Imagination and creativity to meet emotional as well as physical needs

e. Safety

- (1) Overall structural safety, traffic control, proper lighting, space for each item of equipment, removal of exhaust fumes, and suitable firefighting equipment for each area.

f. Economy

- (1) Adaptation of the building to the site; building spaces that are related functionally; building perimeter lines straight, simple, and short

	Yes	No
3. <u>Program Considerations</u>		
a. General classrooms for lecture or discussion-type activities _____		
b. Laboratories and shops for demonstration and project activity _____		
c. Preparation rooms and instructional supply storage _____		
d. Project storage and student lockers _____		
e. Library and resource materials _____		
f. Classroom equipment and furniture _____		
4. <u>Administration Considerations</u>		
a. Private and general offices _____		
b. Guidance, counseling, and conference rooms _____		
c. Health clinic _____		
d. Cafeteria and food service _____		
e. Personnel records vault _____		
f. Custodial and maintenance shops _____		
g. Central supply receiving and storage rooms _____		
h. Toilets, drinking fountains, and rest rooms _____		
5. <u>Environmental Controls</u>		
a. Proper heating and ventilation to control room air temperature, humidity, purity, and distribution _____		
b. Accoustical treatment to control or minimize sound transmission in and between classrooms, shops, laboratories, and other areas _____		
c. Balanced electrical lighting, natural light, and interior finishes _____		
6. <u>Auxiliary Needs</u>		
a. Electricity, gas, and water _____		
b. Sewage and waste disposal _____		
c. Inter-communication system _____		
d. Program clock and emergency bell system _____		
e. Closed circuit TV _____		
7. <u>Area and Space Relationships</u>		
a. Proper relationships of each area to others to facilitate traffic flow, reduce noise and confusion, and to complement program planning _____		
b. Noisy areas separate from other areas _____		
c. Ease of movement of supplies and equipment _____		
d. Accessibility of parking areas to the administrative offices and instructional learning areas _____		
e. Various rooms or areas zoned for independent use as needed or desired _____		

NOTE: All reactions should be made in light of established guidelines and all negative reactions must be justified in detail.

SUBJECT: SUGGESTED GUIDELINE STANDARDS FOR FACILITIES

A. Ceiling Heights:

1. Offices 8' 0" to 9' 0"
2. Corridors 8' 0" to 8' 6"
3. Class Rooms 9' 0" to 10' 0"
4. Laboratories 9' 0" to 10' 6"
5. Shops
 - a. Drafting Room 9' 0" to 10' 0"
 - b. Electronic Lab 9' 0" to 10' 0"
 - c. Woodshop 9' 6" to 18' 0"
 - d. Welding Shop 9' 6" to 12' 0"
 - e. Machine Shop 9' 6" to 12' 0"
 - f. Auto Mechanic Shop 9' 6" to 12' 0"
 - g. Metals Shop 9' 6" to 12' 0"
6. General Assembly Room 9' 0" to 12' 0"

B. Class Room, Office Laboratory and Shop: Size and Shape

The relationship of length to width should approximate a ratio of 1 to 1 rather than the old concept of a 2 to 1 ratio, a ratio of 3 - 2 may also be considered in some shops

1. Offices

- a. General Administrative Office 24' x 18' or 432 sq. ft.
- b. Director's Office 18' x 14' or 252 sq. ft.
- c. Board or Conference Room 24' x 16' or 384 sq. ft.
- d. Secretary Office 18' x 16' or 288 sq. ft.
- e. Business Managers Office 16' x 14' or 224 sq. ft.
- f. Finance Office 12' x 12' or 144 sq. ft.
- g. Storage for above offices 30 to 40% of the above total.
- h. Instructor's offices 10' x 12' or 120 sq. ft.
(Grouping Instructors by Area or department into office carrels rather than individual offices at classroom, lab or shop should be given careful study.)

2. Class & Conference Rooms

The Wisconsin Administrative Code Rules of Industrial Commission Building Code chapter Ind. 56.11 "Floor space & ceiling heights"

(1) All class and recitation rooms shall have a minimum floor space of 23 sq. ft. per person. Rooms used only for study purposes shall have a minimum floor space of 15 sq. ft. per person. (2) In colleges or universities classrooms seated with tablet arm chairs or seats without desks shall have a minimum floor space of 10 sq. ft. per person.

C. Laboratories

1. Physics 50 sq. ft. per student + 15% additional space for storage
2. Chemistry 45 sq. ft. per student + 15% additional space for storage
3. Mechanics 60 sq. ft. per student + 20% additional space for storage
4. Hydraulics 65 sq. ft. per student + 25% additional space for storage
5. Fluid Power 70 sq. ft. per student + 25% additional space for storage
6. Special laboratories must be given special consideration.

D. Library

1. The library in a modern and progressive school for vocational and technical education will be one of the most important facilities of our schools. The library could well be the center hub in the relationship of facilities. A separate wing for library and student lounge in a one building school or separate building to house library and student lounge in the campus type school would be a sound approach.
2. Library Areas to be considered
 - a. Reading and work areas
 - b. Informal reading areas
 - c. Individual study carrels
 - d. Circulation area, card catalog, checkout, etc.
 - e. Open shelf area
 - f. Conference rooms
 - g. Work rooms
 - h. Reference room
 - i. Current periodicals area
 - j. Typing carrels
 - k. Audio-visual center (recording and viewing including closed circuit television.)
 - l. Material development center.
3. Seating capacity suggested minimum 25% of full-time enrollment
4. Size of Library
25 to 30 sq. ft. per reader exclusive of stack and work area
5. Size of stack area
 - a. 15 volumes per sq. ft. of floor space
 - b. 2 volumes per cubic foot if the standard 76 inch high book stack is used.
 - c. 6 books for lineal foot of shelf space
 - d. 125 books for 3 foot section 76 inch high stack
 - e. Minimum 2' 6" lineal foot table edge per student.
6. It may be well in planning a new library facility to take a close look and examine all the newer furniture, equipment, etc. now on the market for the newer concept of library operation.

E. Business and Distributive Education

1. Typing Lab. 25 to 60 students 25 sq. ft. per student
 2. Steno Lab. 18 to 24 students 40 sq. ft. per student
 3. Office Machine Lab. 20 to 24 students 32 sq. ft. per student
 4. Accounting Lab. 18 to 24 students 35 sq. ft. per student
 5. Dictation Lab. 24 to 30 students 30 sq. ft. per student
 6. Marketing Lab. 20 to 24 students 45 sq. ft. per student
 7. Marketing classroom 30 students 25 sq. ft. per student
- All of the above labs to have 10 to 15% additional space for storage

F. Home Economics Education

1. Home and Family Living Area

- a. Clothing, Textiles and Related Laboratory 15 to 20 students 70 sq. ft. per student + 10% added wall storage.
2 labs of this type needed
- b. Meal Management and Laundry Area Laboratory 15 to 20 students 85 sq. ft. per student + 10 to 20% added wall storage
- c. Housing and Home Furnishing Area Laboratory 15 to 20 students 65 sq. ft. per student + 15% added wall storage

All of the 4 laboratories could be equipped with acoustical folding doors to divide the labs into 2 rooms for smaller groups.

2. Wage Earner Area

- a. Food service workers kitchen area + 1500 sq. ft. with acoustical folding door divides into 2 kitchens + 300 for cafeteria service area and + 6000 sq. ft. for multi purpose room dividable into 4 smaller areas
- b. Child care and management aids 15 to 20 students 60 sq. ft. per student + 15% added wall storage.

G. Trade and Industrial Education

1. Drafting
20-24 students 65 sq. ft. per student + 5% additional space for storage
2. Machine Shop
18-20 students 150 sq. ft. per student + 15% additional space for storage
3. Welding Shop
18-20 students 100 sq. ft. per student + 10% additional space for storage
4. Auto Mechanic Shop
15-18 students 300 sq. ft. per student + 10% additional space for storage
5. Auto Body Shop
15-18 students 210 sq. ft. per student + 20% additional space for storage

6. Electronic Shop
16-20 students 110 sq. ft. per student + 12% additional space for storage
7. Sheet Metal Shop
18-22 students 115 sq. ft. per student + 10% additional space for storage
8. Cabinet and Carpentry Shop
15-18 students 125 sq. ft. per student + 20% additional space for storage
9. Graphic Arts, Printing Shop
15-20 students 130 sq. ft. per student + 15% additional space for storage
10. Nursing Education Lab.
20-24 students 85 sq. ft. per student + 20% additional space for storage
11. Medical Assistant Lab.
18-20 students 95 sq. ft. per student + 15% additional space for storage
12. Dental Assistant Lab.
18-20 students 95 sq. ft. per student + 15% additional space for storage
13. Special shops to be given special study and consideration

H. Data Processing and Computer Lab.

1. Computer Laboratory

24 students, 35 sq. ft. per student sq. ft. or room 24' 0" x 35' 0", air conditioned with under floor raceway on grid of 1' 6" o.c. + 10% added space for storage.

2. Key Punch, Electro Mechanical Machine and Classroom

24 students, 80 sq. ft. per student 1920 sq. ft. air conditioned with acoustical folding doors to divide room into 3 parts. Also acoustical ceilings + 15% added space for storage.

I. Guidance Complex

1. See VE-AD-71
2. One full-time counselor for 500 full-time students.
3. Individual office 10' 0" x 12' 0"
4. Steno and reception office 15' 0" x 20' 0"
5. Individual testing room 9' 0" x 9' 0"
6. Group testing room 6 to 8 students 11' 0" x 14' 0"
7. Conference room 10 to 12 students 15' 0" x 15' 0"
8. Storage

J. Land - Size of Site

1. Campus Type

- a. 1000 students 40 acres minimum
- b. Add 1 acre for each 25 students up to 2500 students

2. Visitor Parking (Minimum of 20 parking spaces)
3. Student Parking
 - a. One parking space for each full-time day student
 - b. 150 cars per 1 acre
4. Distances between classrooms, labs and shops
 - a. 1500 feet +
 - b. Normal walking speed 3 miles per hour or 5.6 minutes to walk 1500 feet

K. Corridors, Stairways, Elevators and Escalators

1. Corridors

Corridors have long been a problem for both the educator and the architect. Corridor size and planning depend on many factors such as student flow, traffic patterns, classroom utilization and student station utilization. The above factors will determine circulation requirements and corridor density. Corridor width will also depend on the arrangement of student lockers, i.e. no lockers in corridor, lockers on one side of the corridor only, and lockers on both sides of the corridor. In general a recommended procedure would be to provide about 1000 square feet of corridor for every 200 to 250 student stations or about 4 to 6 square feet of corridor per station.

2. Stairways

The Wisconsin Building Code requirements will have to be met as it pertains to number, location and size of stairways. Each project plan will require individual approval to meet Code requirements.

3. Elevators and Escalators

Elevators and escalators are a means to handle heavy student vertical traffic and must be employed in the development of high rise structures. The cost of elevators and escalators must be carefully analyzed in relationship to land acquisition and the development of two and three story structures. The following quotation from a study by the University Facilities Research Center, 816 Living Place, the University of Wisconsin, Madison, Wisconsin analyze the problem this way:

**AESTHETIC
CONSIDERATIONS**

What is a vocational school? As was stated in the introduction to this paper, "vocational education is 'teaching people how to work effectively'...So we may say that vocational education takes place when an individual or group of individuals acquires information, an understanding, an ability, a skill, an appreciation, an interest and/or an attitude, any or all of which enable him to begin or to continue in activity of a productive or service nature..."¹²

A vocational building for Bozeman requires three aesthetic considerations in helping to achieve the goal of "teaching people how to work effectively:" (1) The building has to be flexible to meet changing demands. (2) The building has to relate to the student's future place of business. (3) The building has to relate to the student. (4) The building has to relate to the surrounding buildings.

(1) Flexibility

As mentioned previously in this paper, a flexible vocational school is a primary requirement because of the anticipated curriculum changes. This flexibility is not only concerned with the ability to rearrange existing covered-spaces, but also is concerned with the addition of new spaces. The inherent problem with a flexible building is that with changes the original character of the building can be lost and that the end result looks more like Grandma's patch-work quilt than it does like a

vocational building. The original character of the building should be of a place for "teaching people how to work effectively" and not a conglomeration of bits and pieces forced together to gain additional teaching spaces.

(2) Relation to place of business

Vocational training is concerned with teaching the student how to work in a trade. To better accomplish this task, the trade should be taught in surroundings similar to the actual business surroundings. This means that if the student is learning how to repair automobiles, the surroundings should be similar to an auto-repair shop. The same is true for nursing. The instruction area should be representative of a hospital. All vocations should be taught in an area representative of the actual working situation in order to prepare the student for the actual job.

(3) Relation to student

There seems to be both a physical and a mental relationship of a person to a building. There is first of all the physical requirement that a building control the elements of weather for human usage. Second, the building must inspire the person using it to achieve mental satisfaction.

The physical services rendered by the building used to be quite simple and dogmatically applied, such as, protection from sun, wind, rain, and extreme temperatures; however, recent studies have shown that this is a more

complex problem than previously thought. According to Bruno Leon, director of the architectural department at the University of Michigan at Ann Arbor, visual considerations are more complex than merely illuminating the room to the proper candle power for a particular task. Changes are necessary to reduce eye fatigue. Changes not only in the level of illumination, but also in the field of focus increase productivity according to Leon.¹³ For example, the illumination of a room might change from 100fc to 120fc to 90fc throughout the day. The change in field of focus is usually accomplished by looking outside. If rooms do not have visual access to the outside, a significant change in distance is hard to achieve. I feel that it is important to have plenty of windows.

The mental relationships to a building are harder to define because each person is different and sees things in a unique way. Generalizations as to how a person will react to a space can be made, though. For instance, a person in a large room with a high ceiling will feel small and insignificant or even lost, while a person in a small room with a low ceiling will feel cramped. If there are no openings in the small room for visual relief, he may become fearful. The use of color can be used to stimulate people. For example, a bright red color is warm and stimulating, while a light blue color is cool and refreshing. In a vocational school different functions require different treatment. By the use of different size rooms and

different color treatments, feelings can be created to mentally complement the task of the area.

(4) Relationship to surrounding buildings

A campus atmosphere is desired on the high school site. This atmosphere is to be created by having different buildings house different grade levels and different functions. Although there will be many buildings on this site, there should still be a unifying element that ties all the buildings together and makes it apparent that the buildings are all for educational use. The present junior and senior high buildings are distinctly different in character; however, they have unifying elements that seem to tie them together, brick walls and flat roofs. I think that these two preset elements should be incorporated into the vocational building and used in such a way as to present an inviting and pleasant appearance.

The aesthetic requirements of this building are controlled by flexibility, relation to places of business, relation to the student, and relationship to the surrounding buildings, all of which are oriented toward the end result of "teaching the person how to work effectively." This end result should then become the character of the vocational building.

**ECONOMIC
CONSIDERATIONS**

Building Support

In considering a vocational program for Bozeman's high school district, state and local support are major concerns. State support is needed to receive area designation. This area designation means that federal funds will then be available for a building program. William Ball, State Education Director, anticipates that Bozeman will have state support for area designation in 1976.¹⁴

Local support is needed because federal funds will not pay the full amount of construction and local tax money will have to be used. Past bond issues have shown that Bozeman residents are in favor of acquiring educational facilities. In 1957 voters approved a high school building at a cost of \$1,344,266. In 1965 voters approved an addition to the high school for \$238,390 and a junior high school building at approximately the same cost as the original high school. Three high school bond issues have been passed since 1957 and none has failed the voters' approval. Upon viewing bond issues alone, it seems that Bozeman will be in favor of building a vocational school. According to Negus, Bozeman's school board is in favor of a vocational building; however, they are waiting for the next legislature to convene in hopes of getting state support prior to 1976.

Building Cost

At this point in the development of a vocational building for Bozeman, there are two methods of approximating the construction cost: (1) cost per square foot of floor, and (2) cost per pupil. Milton Negus suggests that the building should be designed for 200 to 400 students, and William Grabow, AIA, states that 100 to 120 square feet per person (including classrooms, halls, administrative facilities, washroom facilities, etc.) is a general accepted average for the preliminary design consideration of high schools.¹⁵ According to the U.S. Department of Health, Education, and Welfare, \$15/sq.ft. or \$1850/pupil is a national average for conventional construction of a vocational building.¹⁶

(1) Cost per square foot of floor area

400 students
120 sq.ft./student
48,000
\$15 /sq.ft.
\$720,000 total cost of construction

(2) Cost per student

400 students
\$1850 per pupil
\$740,000 total cost of construction

The results of the two methods of determining the cost of construction are approximately the same; however, the cost per pupil will be used because of the higher estimate. These figures include cost of construction and furnishings.

Total Cost of Building

1. Land acquisitions--property acquired under previous bond issue
2. Construction, furniture, and equipment..\$740,000
3. Architect's fees and consultants' services
(According to AIA schedule of recommended basic rates)
8.0% of first \$100,000.....8,000
7.5% of next 200,000.....15,000
7.0% of next 500,000.....30,800
4. Administrative and legal expenses¹⁷.....250
5. Site development 1%¹⁸.....7,400
6. Contingencies 5%¹⁹.....37,000
- Total cost of project.....\$838,450

Building Financing

There are two ways that Bozeman's high school district can finance a vocational school: (1) If Bozeman's high school district wishes to construct a building at this time, they will have to pass a bond issue and assume the entire cost of the project. (2) The Vocational Education Act of 1963 (P.L. 88-210) allocates funds on an equalization ratio which means that Bozeman's high school district will only pay 50% of the project cost. These funds are coordinated through the state education board and according to Ball will not be available to the Bozeman area until 1976-1977 biennium.

Can Bozeman's high school district afford to build a vocational school at this time? The following is a

financial analysis to show that the district can afford a vocational building program based on figures from Gilbert Carter, Gallatin County Treasurer.

Bozeman High School District assessed valuation.....	\$56,958,796
Maximum bonding ability.....	2,849,940
(By state law 5% of assessed valuation)	
Total indebtedness as of July 1, 1968.....	1,397,000
This leaves a bonding ability as of July 1, 1968 of.....	1,452,940

The total cost of the project is \$838,450; therefore, the district can afford a vocational building at this time. In order to finance the vocational building, the tax levy would have to be increased by 5.25 mills. The following is a breakdown of the determination of this mill levy raise.

Interest on a 20-year bond has in the past, according to Gilbert Carter, been between 4.2 and 4.8% straight interest on the unpaid balance.

4.8% of \$838,450 for the first year.....\$40,246

Amount to be paid the first year.....84,181
(1/20 of the total bond issue plus interest)

The tax value of Bozeman High School District is \$16,025,845.²⁰ A one mill levy, therefore, would bring a return of \$16,025 per year. A 5.25 mill levy would bring the needed \$84,181 to pay for the bond issue the first year. The mill levy requirement

would be less each year due to previous payments on the principal bond.

Conclusion

Since enough money can be raised by Bozeman High School District and they have been in favor of educational facilities in the past, I recommend that Bozeman assume the cost of the project at this time. If federal help is gotten as a result of an anticipated decision by the next state legislature, Bozeman High School District will not have to bear the entire cost.

FOOTNOTES

1. H.M. Byram and R.C. Wenrich, Vocational Education and Practical Arts in the Community School (New York: Macmillan Co., 1956), p. 50.

2. Dr. W.R. Flesher and others, Improving Opportunities for Vocational-Technical Education in Montana (Columbus, Ohio: School Survey Service, 1968), p. 22.

3. Woodrow Wold, Formal Application, Area Designation for Bozeman, Mont., 1968, p. 17.

4. Milton Negus, Personal interview, June, 1968.

5. William A. Ball, Personal interview, June, 1968.

6. Wold, p. 1.

7. Woodrow Wold, Personal interview, June, 1968.

8. Office of Education, U.S. Department of Health, Education, and Welfare, Vocational Education, The Bridge Between Man and His Work, OE-80053, 1968, U.S. Government Printing Office, Washington, D.C.

9. U.S. Weather Bureau, Climates of the States, yearbook, 1941, U.S. Government Printing Office, Washington, D.C.

10. Wallace Forsgren, Personal interview, July, 1968.

11. Wisconsin Board of Vocational, Technical and Adult Education, Guidelines for Realistic Facility Planning for Schools of Vocational, Technical and Adult Education, Madison, Wisconsin.

12. Byram, p. 50.

13. Bruno Leon, Lecture at Montana State University, Bozeman, Montana, Fall Quarter, 1967.

14. Ball, Interview.

15. William Grabow, Personal interview, July, 1968.

16. Office of Education, U.S. Department of Health, Education, and Welfare, Basic Planning Guide for Vocational and Technical Education Facilities, OE-80040, Special Publication No. 11, 1966, U.S. Government Printing Office, Washington, D.C.

17. Bob Hiers, A Vocational Training Building for the Pine Hills School for Boys, March, 1968, Bozeman, Mont., p.41.

18. Ibid.

19. Ibid.

20. Gilbert Carter, Personal interview, July, 1968.

REFERENCES

- Ball, William A., Personal interview, June, 1968.
- Byram, H.M. and Wenrich, R.C., Vocational Education and Practical Arts in the Community School. New York: Macmillan Co., 1956.
- Carter, Gilbert, Personal interview, July, 1968.
- Flesher, DR. W.R. and others, Improving Opportunities for Vocational-Technical Education in Montana. Columbus, Ohio: School Survey Service, 1968.
- Forsgren, Wallace, Personal interview, July, 1968.
- Grabow, William, Personal interview, July, 1968.
- Hiers, Bob, A Vocational Training Building for the Pine Hills School for Boys, March, 1968, Bozeman, Montana.
- Leon, Bruno, Lecture at Montana State University, Bozeman, Montana, Fall Quarter, 1967.
- Negus, Milton, Personal interview, June, 1968.
- Office of Education, U.S. Department of Health, Education, and Welfare, Basic Planning Guide for Vocational and Technical Education Facilities, OE-80040, Special Publication No. 11, Washington, D.C.: U.S. Government Printing Office, 1966.
- Office of Education, U.S. Department of Health, Education, and Welfare, Buildings, Equipment, and Facilities for Vocational Agriculture Education, OE-81003, Vocational Division Bulletin No. 284, Washington, D.C.: U.S. Government Printing Office, 1960.
- Office of Education, U.S. Department of Health, Education, and Welfare, School Sites, Selection, Development, and Utilization, OE-21020, Special Publication No. 7, Washington, D.C.: U.S. Government Printing Office, 1962.
- Office of Education, U.S. Department of Health, Education, and Welfare, Vocational Education, The Bridge Between Man and His Work, OE-80053, Washington, D.C.: U.S. Government Printing Office, 1968.
- Progress Report: Vocational-Technical Facilities Project. Ohio State University, Columbus, Ohio.
- Struck, F. Theodore, Vocational Education for a Changing World. New York: John Wiley and Sons, Inc., 1945.
- U.S. Weather Bureau, Climates of the States, yearbook, Washington, D.C.: U.S. Government Printing Office, 1941.

Wisconsin Board of Vocational, Technical and Adult Education, Guidelines for Realistic Facility Planning for Schools of Vocational, Technical and Adult Education, Madison, Wisconsin.

Wold, Woodrow, Formal Application, Area Designation for Bozeman, Mont., 1968.

Wold, Woodrow, Personal interview, June, 1968.

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