a
junior
high
school
for
bozeman
montana

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letter

of

transmittal

521 South Sixth Ave.
Bozeman, Montana
March 6, 1963

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

Dear Professor Rose':

I am submitting this report on a proposed junior high school for Bozeman, Montana as a partial fulfillment of the requirements of Architecture 490.

The information in this report was obtained from sources in the Montana State College Library and from personal interviews with members of the Montana State College faculty.

I will use the information contained in this report as the basis for the design of a junior high school for Bozeman during Spring Quarter 1963.

I would like to thank Mr. William E. Grabow, Mr. William Johnstone, Mr. John Parker, and Mr. Willis Vandiver for their valuable assistance and suggestions.

Respectfully submitted,

Ken Richardson

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conditions

creating

a

need

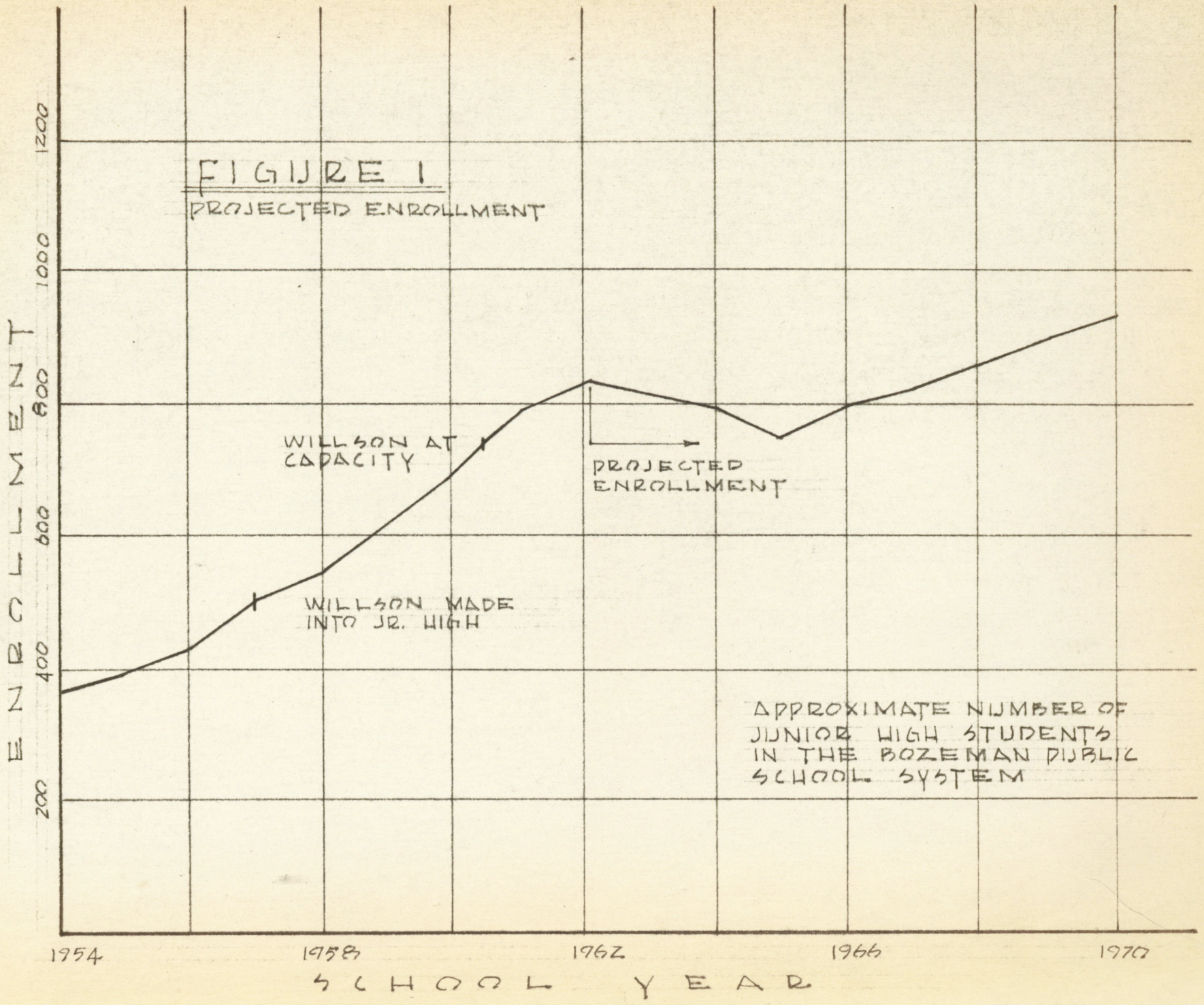
In the past few years, the Willson Junior High School at Bozeman, Montana has become much overcrowded. Since 1957, when Willson was converted from a high school into a junior high school, the number of junior high students in the public school system has increased by more than 13 per cent per year.[2] Although this high rate of increase is expected to decline during the next two or three years, the total number of junior high students will increase slightly within the next 5 years. During the next 10 years, the junior high school enrollment is expected to increase by more than 100 students.[6] (See Figure 1)

The enrollment at Willson Junior High School is, at present, nearly 830 students. Since Willson has an acceptable capacity of 750 students, this school is currently carrying an overload of more than 75 students.

The spaces required for these additional students were fabricated by the most expedient methods: existing classrooms were subdivided into smaller class area; students were crowded into existing classrooms; storage spaces in the basement were diverted into classroom use. The influx of students at Willson has overburdened all existing laboratory, shop,

2. Ref. 2 (Superscripts refer to similarly numbered entries in the Bibliography.)

6. Ref. 6 p. 5


FIGURE 1
PROJECTED ENROLLMENT
ENROLLMENT
1200
1000
800
600
400
200
WILLSON AT CAPACITY
PROJECTED ENROLLMENT
WILLSON MADE INTO JR. HIGH
APPROXIMATE NUMBER OF JUNIOR HIGH STUDENTS IN THE BOZEMAN PUBLIC SCHOOL SYSTEM
1954
1958
1962
1966
1970
SCHOOL YEAR

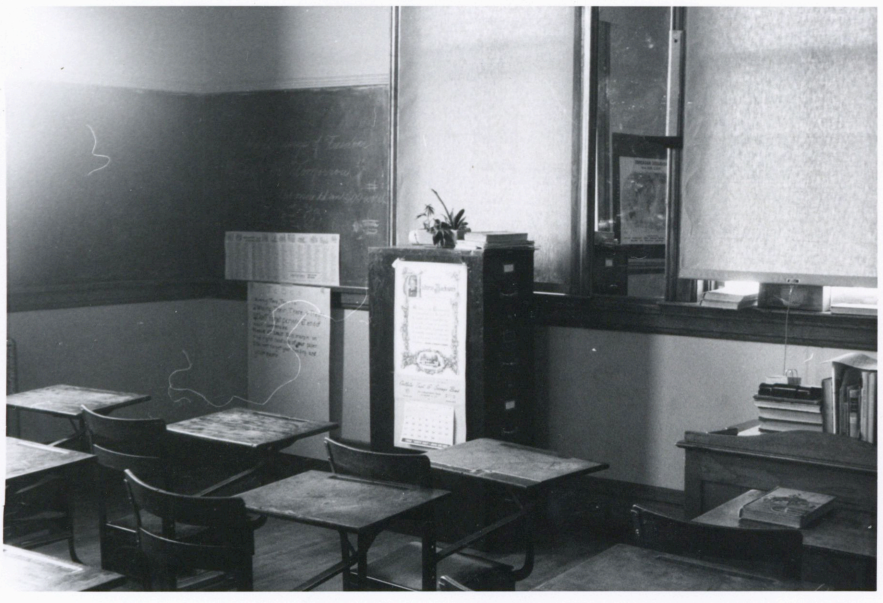
and gymnasium facilities. Playground facilities are grossly inadequate for the number of students enrolled in Willson. Lockers which were designed to serve two students now serve three. The average teacher load at Willson Junior High is between 30 and 33; the state recommended load is 25. Because of these inadequate and overcrowded facilities, the junior high school accreditation may be in danger.[6] (See Figure 2)

A new junior high school would indirectly alleviate several other educational problems existing in Bozeman. The present Willson Junior High School would be used to house the fifth and sixth graders now attending the city wide Emerson School. The Emerson would then be used as a local kindergarten through fourth grade (k-4) school to house many of the students now attending the four outlying k-4 schools. These four k-4 schools would then be able to house the increased enrollment expected as Bozeman expands in size. (See Figure 3)

6. Ref. 6



A. Classroom conditions



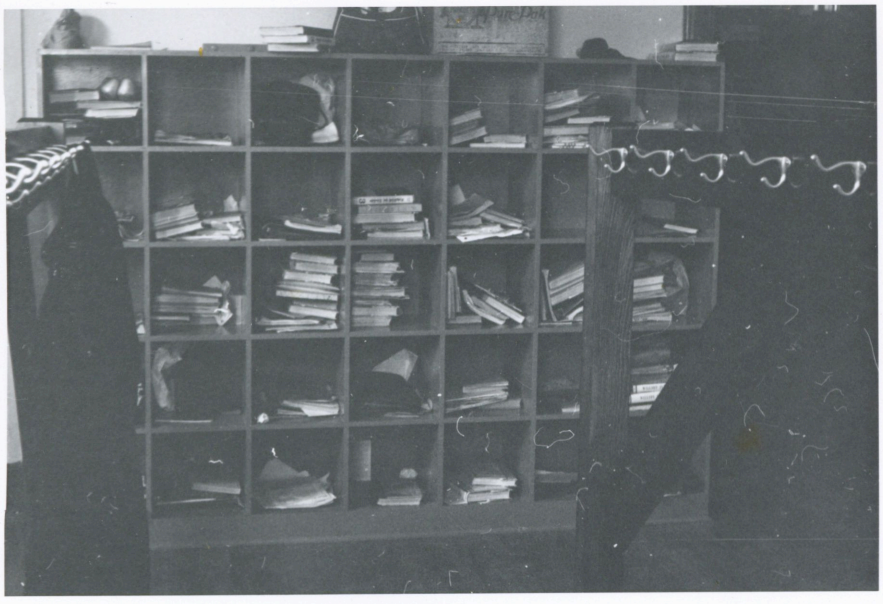
B. Classroom Conditions.



C. Hall conditions.



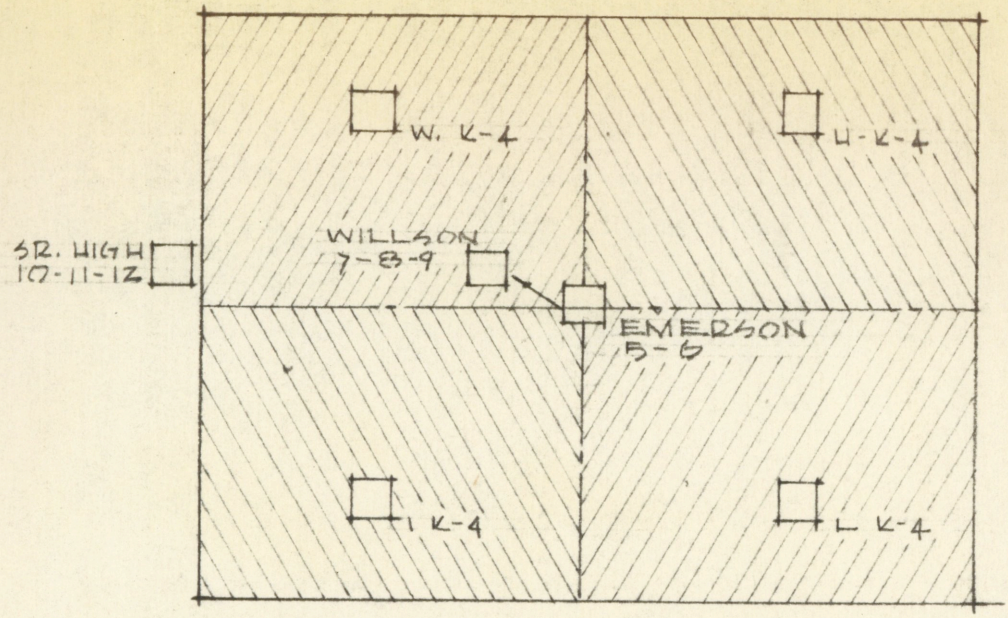
D. Hall conditions.



E. Storage conditions.

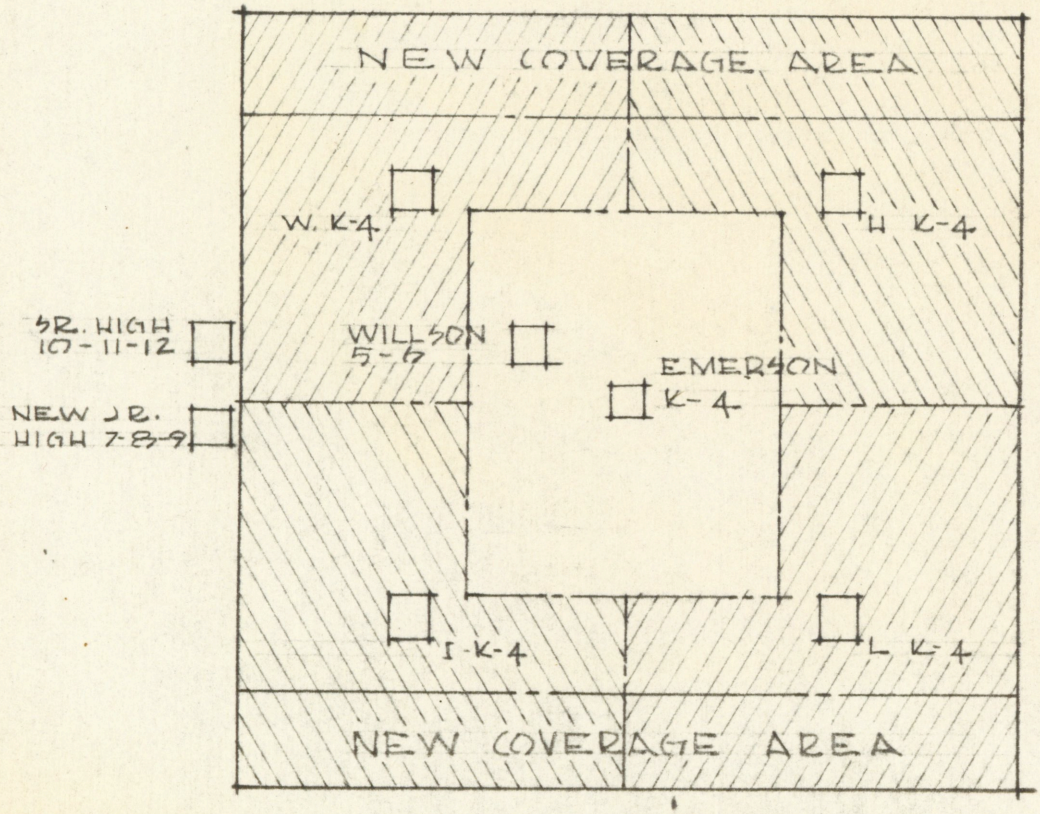


F. Storage conditions.



SCHEMATIC DIAGRAM OF EXISTING SCHOOL COVERAGE IN BOZEMAN

FIGURE 3



SCHEMATIC DIAGRAM OF PROPOSED SCHOOL COVERAGE IN BOZEMAN

local

conditions



Geographic Conditions

Situated on the east slope of the continental divide, near the southern edge of Montana, is the Gallatin Valley. On the east edge of this valley at 45° 42' north latitude and 111° 03' west longitude is Bozeman, Montana, the county seat.

Bozeman is located centrally in the state 143 miles west of Billings, Montana and 192 miles to the south of Great Falls, Montana. Bozeman is at the junction of two major highways: U.S. 10 or Interstate 90, a east-west arterial; and U.S. 191, a major entrance to Yellowstone National Park.

Bozeman contains 2,688 acres or 4.2 miles of land and its altitude is 4,793 feet above sea level.

Climatic Conditions

Bozeman's climate is mild and dry. The average mean temperature is nearly 43°F.; the average yearly rainfall is more than 17.5 inches. The growing season is approximately 100 days, ranging from late May to mid September. Bozeman's prevailing winds are from the south west; the storm winds are from the east.

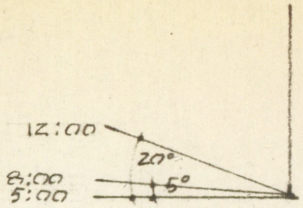
Page 11 shows the monthly climatic data. Ref. 18.

Page 12 shows the monthly sun angles. Ref. 14. p. 502.

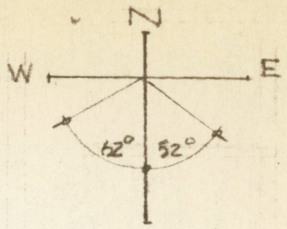
MONTH	MEAN TEMPERATURE	PRECIPITATION
January	20.2 °F	0.92 in.
February	23.2	0.76
March	27.8	1.53
April	42.5	1.73
May	51.1	2.34
June	57.3	3.06
July	66.4	1.18
August	64.9	1.12
September	55.8	1.65
October	46.0	1.45
November	32.1	1.07
December	24.8	0.91
Annual	42.9 °F	17.62 in.

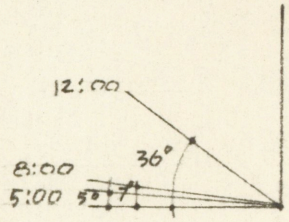
TABLE 1

SUN ANGLES

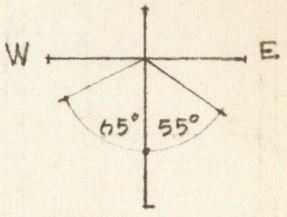


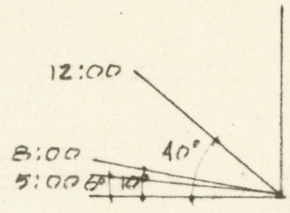
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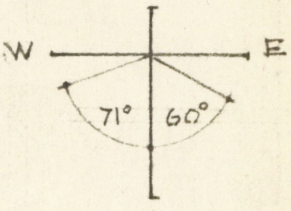


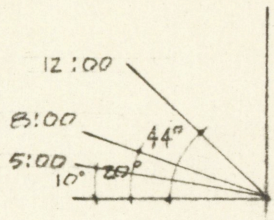
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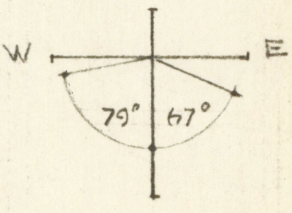


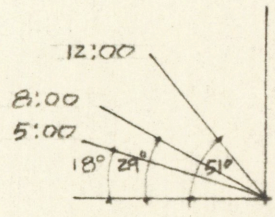
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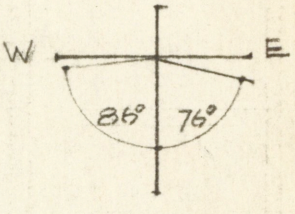


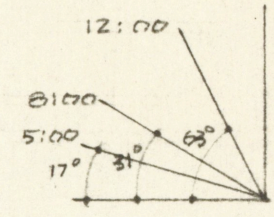
MAR. & SEPT



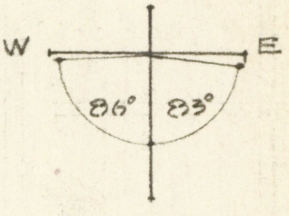


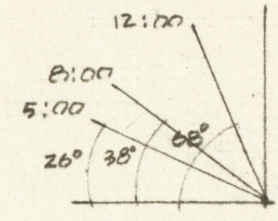
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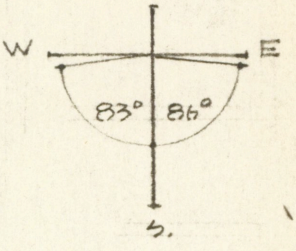


MAY & JULY





JUNE



SUN ALTITUDE
AT 8:00AM·12:00·5:00PM

SUN AZIMUTH
AT 8:00AM·5:00PM.

FIGURE 4.

Social Conditions

The population of Bozeman is steadily increasing; the 1940 census showed a population of 8,665, the 1950 census 11,325, the 1960 census 13,336. During the period 1909 to 1950, the city population increased at an average of 27.5 per cent during each ten year period. The population increased 28.4 per cent during the period 1950 to 1959.[1] Bozeman is the sixth largest city in the state.

The median age of Bozeman residents is 27.7 years. The non-white constitute 0.2 per cent and those over 65 constitute 8.9 per cent of the population. For adults, the average school attendance in Bozeman is 12.4 years; this is the highest level of school attendance of any city in Montana.[1] This high level of education is principally due to the location of Montana State College in Bozeman. A lack of heavy industry in Bozeman also causes this educational level to be high, because few non-skilled workers are attracted to Bozeman.

The occupational distribution as presented by Dr. Pedersen of the Montana State College Sociology Department in 1962 is shown in Table 2.

1. Ref. 1

OCCUPATIONAL DISTRIBUTION OF BOZEMAN

Professional	23.1 per cent
Managers	11.7
Clerical	15.0
Sales	7.9
Craftsmen	7.5
Operatives	8.5
Private Household	3.4
Service	14.1
Laborers	5.8
Armed Forces	0.0
Unemployed	2.8

TABLE 2

Economic Conditions

The economy of Bozeman is built primarily on revenue income from agriculture, tourism, forest industries, and Montana State College. Agricultural operations, which are the main sources of income, are divided among small grain production, dairying, and livestock breeding and raising.

The principal industries in the city are the flour and cereal mills, employing 313; an electronics firm, employing 100; heavy construction, employing 250; and 41 manufacturing businesses, employing 725 persons.[1]

Bozeman is served by three banks with total resources of $28,607,160 and total deposits of $26,475,968.[1]

According to a 1959 local estimate, there are 201 retail and service outlets with 945 employees and an annual payroll of $2,752,000. Major retail outlets include 8 department stores, 3 variety stores, 7 drugstores, and 7 supermarkets.[1]

1. Ref. 1

site conditions

"The site is usually the cheapest educational expense there is. A properly chosen site and a well maintained school ground adds greatly to the appearance of the school and tends to promote a safer and more enjoyable place for attendance and recreation."[3]

Site Size

"An ample site is more important in most instances than a centrally located one, particularly for a secondary school."[9]

According to regulation #91 of the Montana State Law, there is a definite minimum school site size. This minimum size is determined by the following formulas: For an elementary school, the site must be a minimum of 5 acres plus 1 acre per 100 students in attendance. For a high school, the site must be a minimum of 10 acres plus 1 acre per 100 students in attendance.[10] Most existing Bozeman elementary schools do not meet this minimum requirement.

Since a junior high school consists of two-thirds elementary students (7th and 8th grades) and one-third high school students (9th grade), an average of the two formulas must be used to calculate the minimum site size. For 1000 students this minimum size is 16-2/3 acres. (See appendix I for computations.)

9. Ref. 9 p. 2

10. Ref. 10 p. 18

Site Location

The site proposed for the new junior high school is located directly north of the existing senior high school. (See Figure 5, Ref. 1)

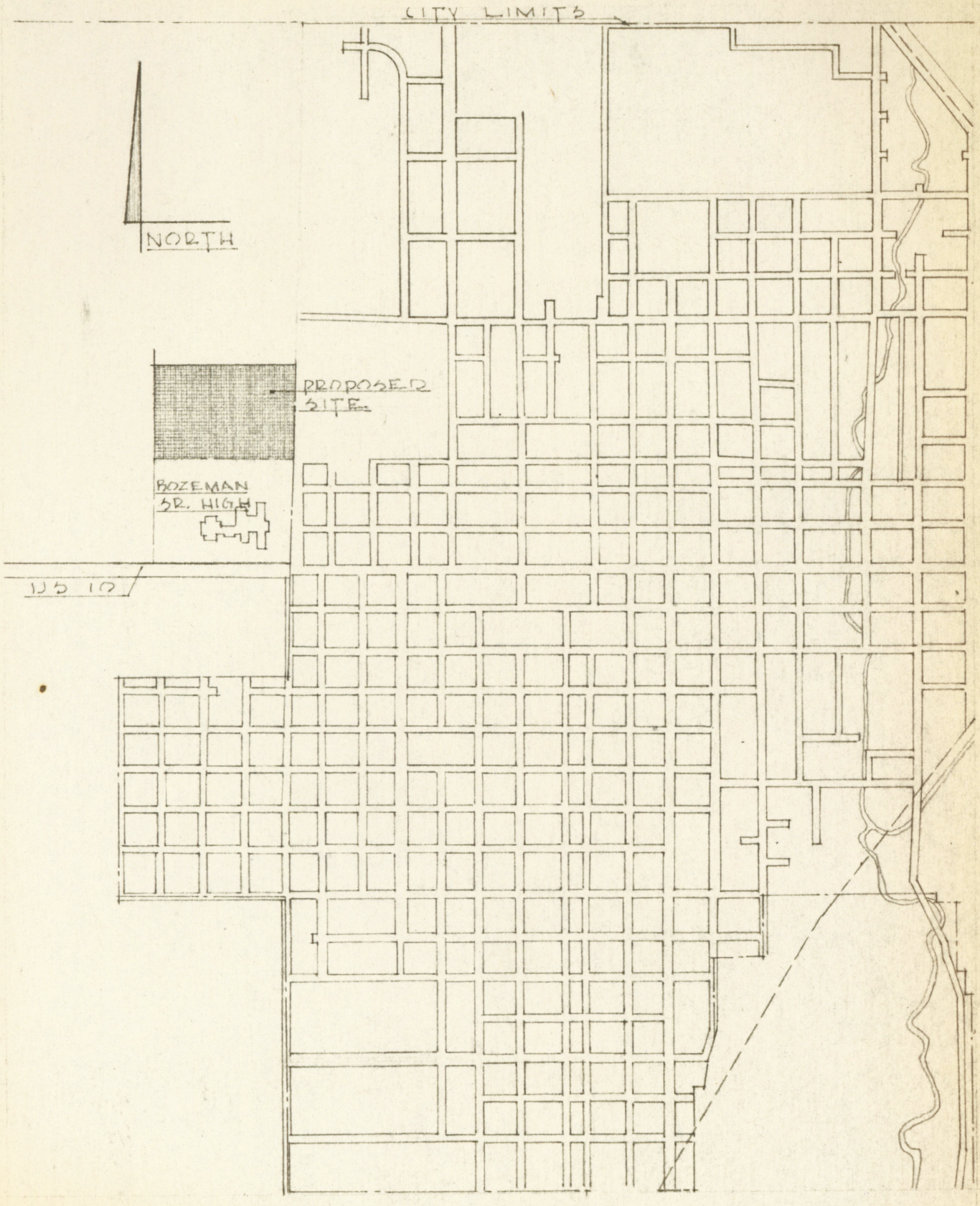
Because this site is adjacent to the high school, it offers many desireable features not to be found elsewhere in Bozeman. An interchange of students and faculty between the two adjacent buildings would result in increased class scheduling flexibility. Playfields and outdoor recreational areas could be used interchangeably between the two schools. School bus routes would not have to be extended or altered; a central arrival and departure point would serve both schools.[6] The site is centrally located in relationship to the present north-south population distribution of the city. Since the expected expansion pattern of Bozeman is to the south and west, this site would tend to become more centrally located.[1]

6, Ref. 6 p.7

1, Ref. 1

FIGURE 5

BOZEMAN



Adjacent Environment

The environment adjacent to the proposed junior high school site is principally rural in character. Across Eleventh Avenue to the southeast of the site are scattered single family residences; to the south of the site is the high school; immediately to the north and west of the site are farmlands; and to the southwest of the site is a large commercial shopping center. (See Figure 6.)

Site Topography

The site is rectilinear with the exception of a skew in the east property line. The site slopes approximately 2 per cent downwards from south to north; the slope from east to west is negligible. A shallow, slow-moving irrigation ditch bounds the site on the south and east. The existing ground cover consists of various cultivated small grains, weeds, and grass. No trees grow on the site. The dimensions of the site are approximately 630 feet by 1350 feet; the approximate land area contained is 850,000 square feet or 19.5 acres. The figure of 19.5 acres is well over the required minimum area of 16.66 acres required by Montana Law. (See Figure 7.)

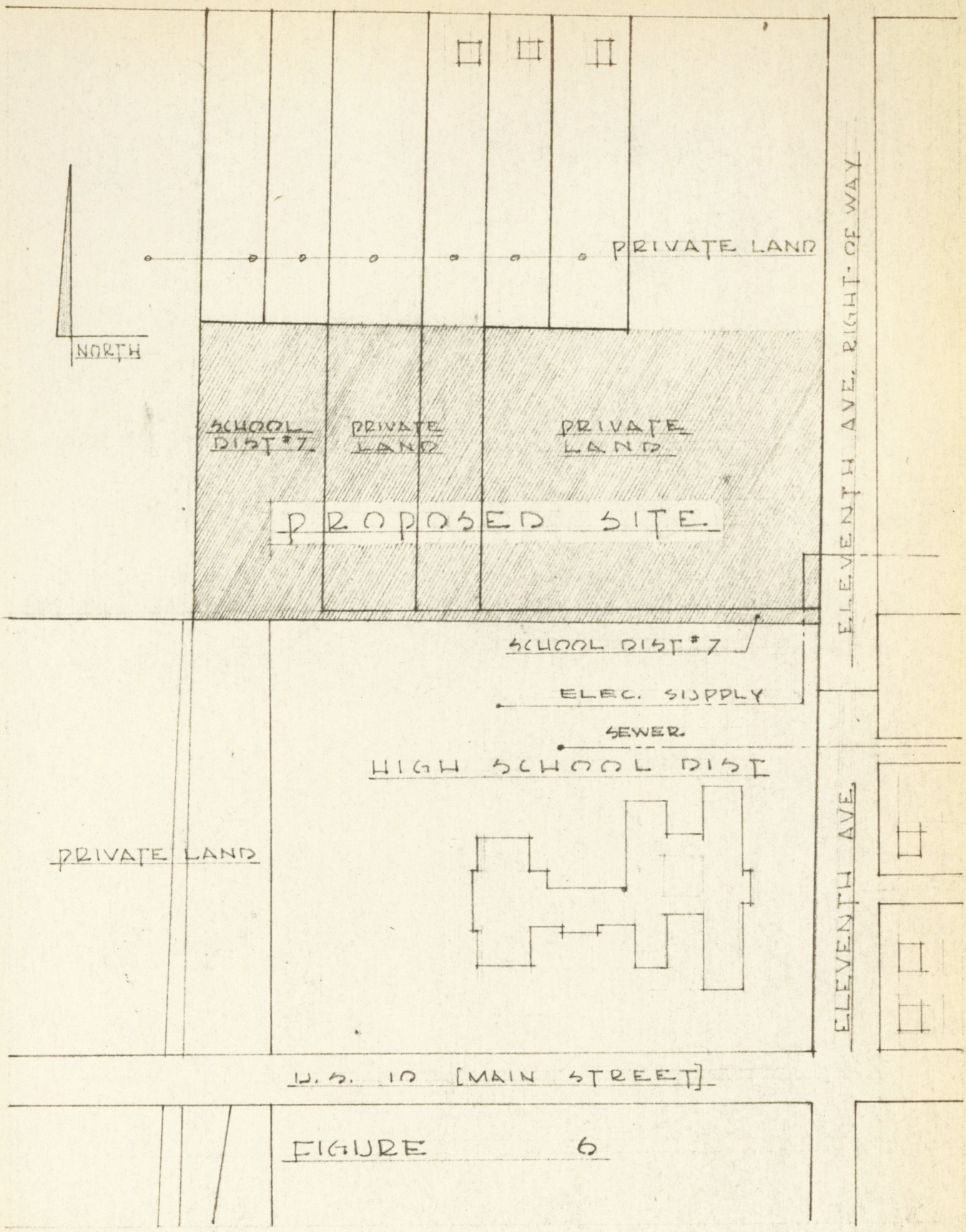
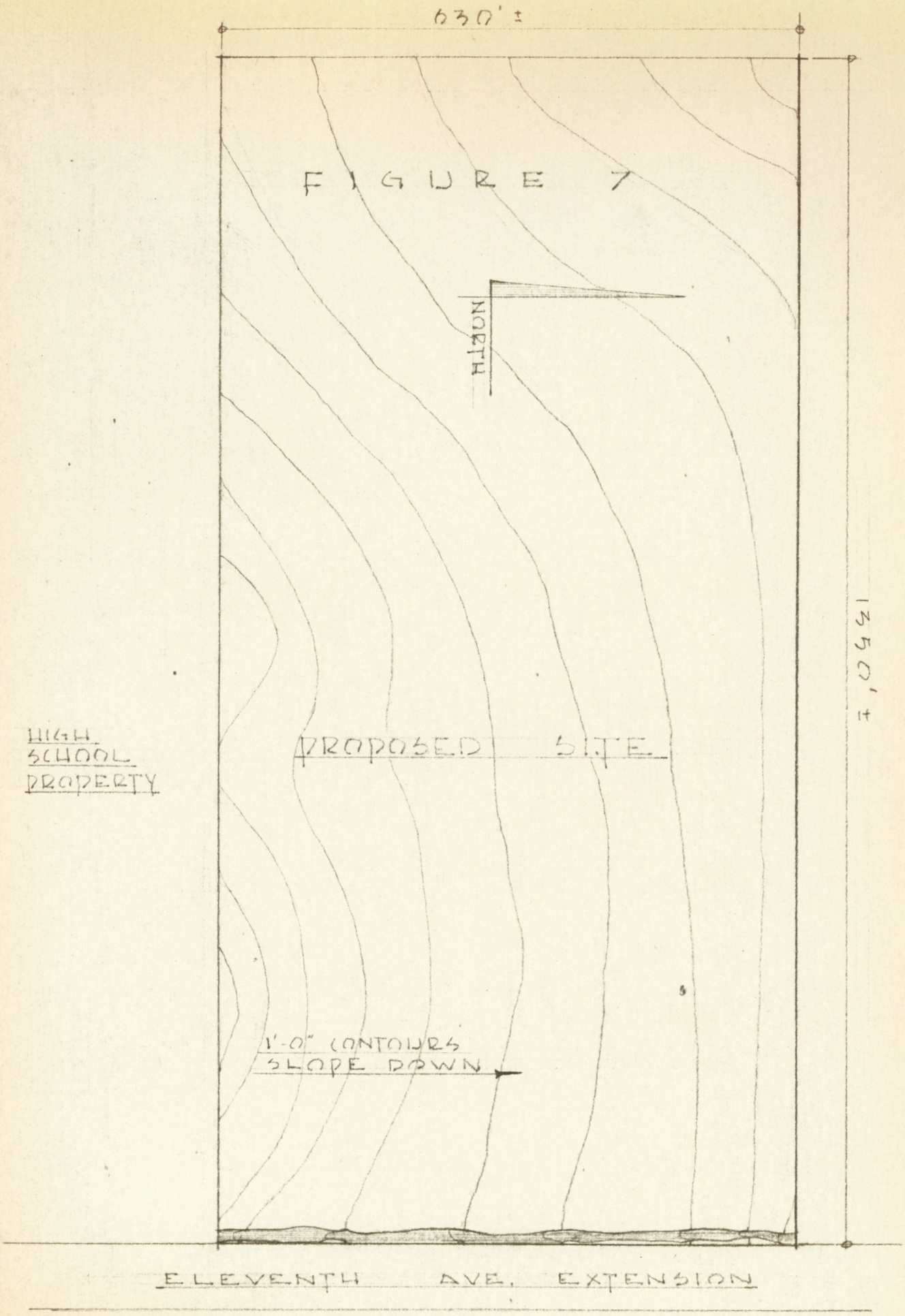

PRIVATE LAND
NORTH
SCHOOL DIST #7
PRIVATE LAND
PRIVATE LAND
PROPOSED SITE
ELEVENTH AVE. RIGHT-OF WAY
SCHOOL DIST #7
ELEC. SUPPLY
SEWER
HIGH SCHOOL DIST
PRIVATE LAND
ELEVENTH AVE.
U.S. 10 [MAIN STREET]

FIGURE 6


630' ±
FIGURE 7
NORTH
1350' ±
HIGH SCHOOL PROPERTY
PROPOSED SITE
1'-0" CONTOURS
SLOPE DOWN
ELEVENTH AVE. EXTENSION

Zoning Regulations

Since the proposed site is inside of the Bozeman city limits, certain city zoning regulations are applicable. For educational institutions, the minimum property frontage is 75 feet; the minimum front yard is 60 feet; the minimum side yard is 25 feet; the minimum rear yard is 35 feet. The Montana State Board of Health also has school site regulations; the one applicable regulation states that the school building should be located a minimum of 50 feet inside the property line from any street, driveway, or other public throughfare.[3]

Immediate and Distant Views

The immediate views to the north and northwest consist mainly of rural scenes. The view to the west is into the parking lot of a shopping center. The immediate view to the south is partially blocked by the slight ground rise; however, portions of the senior high school are visible. The immediate view to the east is into the city residential and commercial areas. These immediate views are subject to change as the city expands to the west. Within 20 years, the site could be virtually surrounded by residential or commercial areas.

There are very pleasant views of distant mountains to the north and east of the site. There is relatively little

9. Ref. 9 p.2

possibility that these distant views will be blocked by future building. The distant views to the south and west are rather susceptible to any future buildings which could block them. (See Figure 9.)

Traffic Patterns

The proposed site is presently isolated from the major automobile traffic by the high school land. When Eleventh Avenue is opened to automobile traffic, means should be devised to prevent it from becoming a major north-south throughfare.

Until the land to the north, and west is developed, pedestrain traffic will be heaviest from the east. Provisions should be provided for pedestrain traffic between the new junior high school and the existing high school.



A. Looking north along the east property line



B. Looking north-west over the site.



C. Looking south towards the high school.



D. Looking west along the south property line.



E. Looking south-east.



F. Looking north-east.

the function of the building

"The form they (schools) assume is determined by the organization of the school and school system, the nature and details of the curriculum, the teaching methods, and the way the school is related to the community."[5]

The program for this school is organized in accordance with the Trump report. (See Appendix Two)

5, Ref. 5 p. 45.

persons

using

the

building

Students

According to projected enrollment figures, the junior high school (grades 7, 8, and 9) should be programed for 1000 students. (See Figure 1)

These students range in age from 12 to 14 years; however, they vary greatly in physical, mental and social maturity.[4] The Trump Report assumes a degree of maturity greater than educators generally grant; however, students who are average for their age should be able to progress satisfactorily under this plan.[11] Students who are immature for their ages may not be able to adhere to the complete individual study program. These students, as well as those students who are mature for their age, must have special programs of instruction within the basic Trump plan.

The special programs may consist of shortened or lengthened individual study periods, emphasis on a particular subject, or extra tutoring by qualified instructors. Although the exact details of these programs will be left to the educators, the building must have facilities for these deviations from the norm.

4. Ref. 4 p. 12

11. Ref. 11

Students of junior high age may tend to be overly unruly in their use of a school building; therefore, the physical environment should be sturdy and durable to withstand the rigors of this youthful enthusiasm.

Although quiet areas for student contemplation and study will be provided, much of the environment should be colorful, lively, and interesting if it is to keep the students from becoming bored or disinterested with school.

Instructors

The State Board of Education recommends a teacher-student ratio of 1 to 25.[6] If this recommendation is to be met, the junior high school should have 40 teachers. However, under the Trump program many of the specialized or non-teaching duties are taken over by other competent personnel.

Staff specialists for guidance, research, health, reading, curriculum, audio-visual, and special children problems will relieve the teacher of many specialized duties.

General aides will relieve the teacher of various supervisory tasks on playgrounds, in halls, cafeterias, and auditoriums. Ordinarily, general aides will be required for 120 hours per week for 1000 students.

6. Ref. 6 p. 5.

Instruction assistants will perform those tasks falling below the professional level of teaching but above clerical chores. The instruction assistants will read and evaluate themes and science reports, confer with students about their educational progress, serve as laboratory assistants, and assist with extra class activities. They will be employed for 500 hours per week for 1000 students.[17a.]

These additional personnel will reduce the number of required teachers from 40 to about 25.[17b.]

In addition to in-school personnel, teachers will call upon community consultants who will make special presentations or provide special information pertinent to their professional training.

17a. Ref. 17 p. 35.

17b. Ref. 17 p. 36.

types and functions of spaces

The greatest single concept stressed by the Trump program is flexibility - flexibility in all school arrangements, in scheduling, in facilities, in architecture, in staff use, and in the organization of instruction.[17]

Architectural flexibility may be achieved by the following methods:

1. EXPANSIBILITY: The capacity of a building to accommodate additions to the original structure without undue expense. A modular structural system lends itself to expansibility.

2. CONVERTIBILITY: The capacity of a building to accommodate interior changes to suit the changing needs of students and teachers. Convertibility may be achieved through day to day changes by teachers, or it may be achieved through year to year changes by maintenance men. Spatial dividers readily lend themselves to convertibility.

3. VERSATILITY: The capacity of spaces within a building to accommodate a variety of functions. Multipurpose rooms are an example of spatial versatility.[4]

To reflect the flexibility of the Trump program, building spaces will be varied in size and will be planned specifically for large group instruction, small group discussion, and independent study.

17. Ref. 17 p. 24

4. Ref. 4 p. 12

Large group instruction spaces

Large group instruction will require an auditorium capable of seating one-half of the student body (500 students). This auditorium will be readily convertible into four smaller spaces each seating 125 students, or any combination of these spaces which totals 500 seats. In addition, two smaller spaces of about 1250 square feet each will be arranged to seat a total of 250 students for large group presentations. Each of these large group spaces will be furnished with tablet-arm chairs, a speaker's platform, and a screen for film projectors. Since an extensive television system is contemplated, it is not imperative that these few spaces accommodate such large numbers of students. If linked by a closed circuit television system, a greater number of smaller spaces accommodating 50 to 100 students would accomplish a similar purpose. [17]

Small group discussion spaces

For small group instruction, 19 or 20 spaces of 200 to 250 square feet each will provide adequate facilities. Each of these spaces will contain a large table which will accommodate the chairs of 12 to 15 students, their teacher, and one or two guests. In addition, each space will contain

17. Ref. 17 p. 38.

a portable blackboard, a bulletin board, and a film screen.

Independent study spaces

More than one type of space will be used for independent study. The largest of these spaces, the library reading room, will have an area of approximately 4000 square feet. It will be furnished with sufficient tables and chairs to seat 50 students.

Adjacent to the library will be one listening room, seating 30 to 35 persons; one reading room, seating 30 to 35 persons; and eight conference rooms, each seating 5 persons. In or near the library will be 5 sound-proof booths for study with electronic devices, and a 1000-square-foot room for automatic instruction devices (teaching machines).

A total of 250 study cubicles, one for each four students, will be constructed within easy access to the library. These cubicles will:

1. Contain about 24 square feet of area.
2. Be simple in design.
3. Be separated by partitions on three sides.
4. Contain a two foot by four foot flat desk top.
5. Have storage provisions for 4 students.[17]

17. Ref. 17 p. 40

Laboratory spaces, each with about 1250 square feet of area, will be used for both independent and group studies. These spaces will include 3 health-physical education-recreation laboratories, 3 science laboratories, 2 mathematics laboratories, 1 English language laboratory, 1 social studies laboratory, 1 foreign language laboratory, 2 practical-arts laboratories, and 1 fine-arts laboratory.[17]

Adjacent to the three physical education laboratories will be equipment storage spaces and dressing rooms. These laboratories will not be designed specifically for basketball games as they have been in the past; they will accommodate indoor physical educational activities such as calisthenics, small group games and individual sports. No provisions will be made for spectator seating.

The science laboratories will be equipped with standard experiment tables, chalkboards, and a demonstration lectern. Provisions will be made for natural gas, water and electrical outlets.

The mathematics laboratories will be equipped with chalkboards on all walls to allow a maximum number of students to perform board work.

The English language laboratory, social studies laboratory,

17. Ref. 17 p. 40.

and foreign language laboratory will be equipped with tablet arm chairs, lecterns, moveable chalkboards, and provisions for recording devices.

One practical-arts laboratory will be equipped with small hand wood-working tools, metal-working tools, and leather-working tools. Adjacent to the practical-arts laboratory will be a material storage room, a painting room, and a project room.

The other practical-arts laboratory will be equipped for home economics activities. It will contain 4 small kitchens, individual storage baskets and spaces for sewing and ironing.

The fine-arts laboratory will be equipped for painting, sculpting, and drawing. Individual work desks with storage provisions for materials and equipment will be used jointly by three or four students. Chalk boards, tackboards, display space, and an instructor's supply and equipment room will be necessary in this space.

Teacher's Spaces

The teacher's instructional materials center will correspond to the student's independent study area. The center will contain 25 cubicles, each 10 feet square, for

lesson preparation and research by the 25 teachers; a 2000-square-foot work space for teachers assistants; and four meeting rooms, one with a capacity of 50 persons, the other three with capacities of 10 each.[17]

Cafeteria spaces

The facilities for the school hot lunch program may be combined into three basic areas. The dining area, the largest of these three spaces, will contain approximately 4200 square feet of area. It will be used in three shifts of 30 minutes each, a total of 90 minutes a day. Because of problems with acoustics, sanitation, and equipment handling, this area will not be used for major functions other than dining.

The second basic area required for the hot lunch is the kitchen. Approximately 2100 square feet will be required to provide facilities for food preparation, food serving, and dishwashing.

The third basic area, an auxiliary space containing approximately 1300 square feet, will be required to provide facilities for dry food storage, non-food storage, food receiving, maintenance, employees lockers, and an office.[19]

17. Ref. 17 p. 40.

19. Ref. 19 p. 59

Music area

The music area will consist of one instrumental practice room, one vocal practice room; 5 individual practice rooms, and storage areas.

The instrumental practice room and the vocal practice room will be 1500-square-foot spaces designed for good acoustical qualities. The individual practice rooms will be 8 foot by 8 foot spaces with walls that are treated to absorb sound. The storage areas will consist of one sheet music room, one instrument storage room, and two uniform storage rooms. A small toilet room with a lavatory and a water closet should be adjacent to the uniform storage rooms.

Concerts by the school vocal group and the school instrumental group will be given in the large auditorium.

Administration spaces

The school administration coordinates the school education program, and acts as a liaison between the public and the school personnel. The spaces required for these functions will consist of private offices, a work room, a vault, and a main office. The offices for the principal and vice-principal will be approximately 150 square feet in area. Within each office will be a desk, two or three chairs

small filing cabinets, and personal equipment.

The work room will be a space approximately 15 feet square, in which the school secretaries may store and reproduce written materials.

The vault will serve to hold money, school records, and other important items.

The main office will contain secretarial areas, teacher's mail boxes, and an inter-school communication device. An area of approximately 1000 square feet will be needed for the functions in this office.

Additional spaces

The mechanical room will contain all heavy mechanical equipment. It will be centrally located within the building, and will be accessible to a service drive. The area required for this function will be approximately 1000 square feet.

In accordance with state law, the toilet rooms will contain 9 water closets, 16 urinals, and 9 lavatories for the boys; and 25 water closets, and 8 lavatories for the girls.[10] In addition, there will be separate toilet rooms for the teachers, administration, and instruction assistants.

10. Ref. 10 p. 24.

A teacher's lounge containing easy chairs, couches, lamps, magazine racks, and facilities for coffee preparation will be needed. This space of approximately 800 square feet will be located near the teacher's toilet rooms.

A small nurse's room containing a cot, first aid provisions, and a small toilet room will be located within easy access of the administration area.

An audio-visual center will be required to store, process, distribute, and service all audio-visual materials used within the school. This space of 1000 square feet will be located within easy access of the instruction-materials center.

Halls of an as-yet undetermined area will be required to link the various elements of the school into a single entity. These halls will be 10 to 15 feet wide and will be well suited to withstand heavy student use.

A main lobby for student and public entrance and circulation will be located within close access to the administration area.

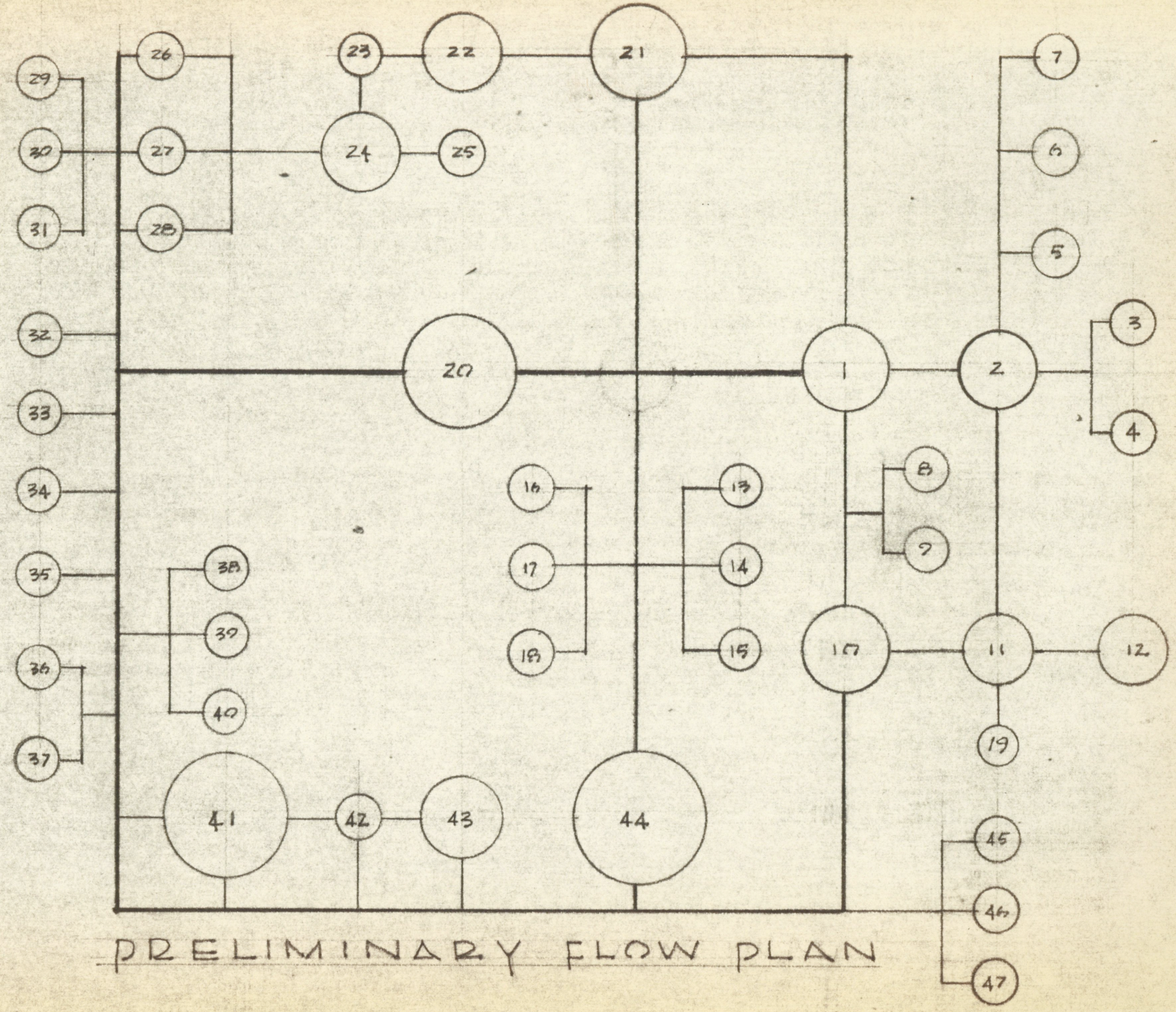
p r e l i m i n a r y

f l o w

p l a n

The purpose of this plan is to show the relationships between the various spaces in the proposed junior high school. No scale is intended in this preliminary drawing.

1. Lobby
2. Main Office
3. Principal's office
4. Vice-principal's office
5. Nurse's room
6. Work room
7. Vault
8. Meeting room
9. Meeting room
10. Teachers assistants' room
11. Teacher's cubicles
12. Teacher's lounge
13. Individual study room
14. Individual study room
15. Individual study room
16. Reading room
17. Viewing room
18. Automatic instruction devices room
19. Teacher's toilet room
20. Library
21. Cafeteria
22. Kitchen
23. Auxiliary space
24. Service area
25. Boiler room
26. Physical education laboratory
27. Physical education laboratory
28. Physical education laboratory
29. Shop
30. Music room
31. Fine-arts laboratory
32. Home economics laboratory
33. English language laboratory
34. Foreign language laboratory
35. Social studies laboratory
36. Mathematics laboratory
37. Mathematics Laboratory
38. Science laboratory
39. Science laboratory
40. Science laboratory
41. Four large lecture rooms
42. Audio-visual aids room
43. Two large lecture rooms
44. Independent study area
45. Meeting room
46. Meeting room
47. Meeting room



PRELIMINARY FLOW PLAN

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

The relation of the building to the students

"A humanistic approach to school design must have real concern for total environment. It should do more than concentrate on how to pour air over a child, throw light on his book, fit his contours to the seats. It should also be a place that children would love." [5]

A properly designed school environment will fulfill the students' physical and emotional needs. The physical needs may be fulfilled by the purely necessary or functional portions of the environment: lighting, heating, and ventilation. The students' emotional needs are fulfilled by those portions of the environment that pertain to the aesthetic. These two environmental factors are interdependent; a student may react physically to an emotional upset, or he may react emotionally to a physical upset.

The primary emotional need of junior high school students is for security and a sense of belonging in the school. Because the building is used by a great number of students, the individual student may not have this need realized. He may feel lonely or insecure in his environment. This sense of loneliness may be alleviated through the design of a proper aesthetic environment.

5. Ref. 5 p. 44.

Bright colors, interesting textures, and exotic forms will arouse a student's interest in his surroundings. This aroused interest may lessen the feeling of loneliness and contribute to a further awareness of the other students and their activities.

The size and shape of spaces within the building will tend to influence the students' feeling of security. Large vast spaces will overpower or awe the student; small windowless spaces will give the student a feeling of confinement. A median between these two extremes is most desireable.

The physical arrangement of furnishings and building elements will affect the students' feeling of belonging in the building. Windows, chalkboards, light switches, and door knobs that are placed at standard heights for an adult may be too high for convenient student use. Through proper placement, the students may feel that these building elements are for their use and enjoyment.

Areas for informal student gatherings will give the students' an opportunity to become better acquaited with their fellow students, thereby increasing their feeling of security within the school and adding to their informal education.

The use of art forms such as sculpture, painting, and the

architecture of the building itself may increase the students' appreciation of fine art.

Relation of the building to the site

Because of low sun angles during the mornings and afternoons, north-south exposure for the classrooms is desirable. Walkways, courts, and drives will be located to the south of the building where the sun will keep them warm and free of snow. The mountains to the north of the site offer the opportunity to bring a pleasant view into many rooms of the building. The creek to the east of the site offers an opportunity to create a landscaped area which may be used as a student park.

Relation of the building to the community

Although Bozeman has no well defined architectural style, there are certain building materials, forms, and structural systems that are predominately used. The pitched roof is the roof form most often used in Bozeman. This form is brought about by a need to shed the heavy snows that Bozeman often receives. Because of high freight rates, building materials are predominately indigenous to the area. For light construction, the most commonly used material is wood; brick, block, and stone are commonly used where heavier construction is

necessary. In Bozeman, the skeletal or post and beam structural system is commonly used for structures similar to the proposed junior high.

economic conditions

"A school plant must satisfy certain basic requirements: It must fulfill today's educational needs and be adaptable to tomorrow's; it must be healthful and safe; and it must achieve these ends with a minimum use of resources."[1]

1. Ref. 1 p. 55.

economic considerations

"Nothing in the world is too good for our kids."

- anonymous -

"What are we building anyway, a palace?"

- anonymous -

Since the earliest days of public education, these two cries have been an inevitable sound in the school building process. School construction today is no exception; the cost of a school is still a very controversial subject. Few entire school plants, fully equipped, cost as much as a mile of super-highway; yet it is the schools that are under the sterner cost pressure.[8]

Building obsolescence

The problem of building obsolescence and its relation to construction is well summarized by the following quotation.

"The small school of light construction intended for 25 to 30 years of use would meet the changing pattern of community need much better than the heavy buildings, whose life span of 50 years will probably far out-last their useful life. This is not only because school need is likely to recede, it is also because today's rapid developments in design and technology mean a more rapid rate of building obsolescence."[16]

8, Ref. 8 p. 81.
16, Ref. 16 p. 91.

One-story versus two-stories

Much controversy and misunderstanding exists between private citizens over the relative merits of one-story and two-story school construction.

Evidence from a number of sources seems to indicate that there is no definite difference in cost between one-story and two-story construction;[5] however, there are many real educational advantages in the one-story school.

Some advantages of the one-story school, as reported by the Michigan Department of Public Instruction, include:

1. Economies brought about by simple light framing materials.
2. Easier clearing of the building in case of fire or panic.
3. Elimination of stairway construction costs.
4. Opportunities for better arrangement of the many functional elements of the plan.
5. Opportunity to isolate activities which produce noise, or chemical and cooking odors.
6. Easier maintenance. No expensive scaffolding for re-painting, glazing, and other repairs.
7. Ease in moving furniture and equipment within, as well as into and out of the building.

5. Ref. 5 p. 62.

e c o n o m i c

f u n d a m e n t a l s

The three economic fundamentals of building, cost, size, and quality act upon one another. For instance, if the size of a building may be predetermined, the total cost of this building will depend upon the quality of construction. If the total cost of a building is predetermined, the maximum size of the building will be proportional to the quality of construction.

Since the size of a school is usually proportional to the number of students in attendance, this economic variable may be predetermined. For a school of a predetermined size, the total cost is proportional to the quality of construction.

The quality of construction of a school is dependent upon two inter-related factors: the initial or construction cost and the continuing or maintenance cost.

Means of reducing maintenance and operation costs

In construction, the cost of maintenance and repair is often overlooked in favor of the more immediate initial economy. Using inexpensive materials to reduce construction costs generally results in increased maintenance and replacement costs. This is true whether the life of the building is deliberately set low in anticipation of rapid obsolescence, or whether the building is a stop-gap to

provide temporary housing to meet crowded conditions.

To reduce the cost of maintenance and repair, certain practices are important: Materials should be durable and long-lived; they should be easy to clean, renovate and replace; apparatus and equipment should be proven and dependable.[7]

Means of achieving initial economy

In addition to providing the necessary functional flexibility for the proper operation of a school plant, architectural flexibility provides one means of achieving economy in school construction. As is previously mentioned, architectural flexibility may be achieved through expansibility, convertibility and versatility. (See Page 35)

Expansibility is one method of achieving long range economy in school construction. Without expansibility, much undue expense may be incurred if the school plant is to be expanded.

Convertibility and versatility are methods of achieving relatively immediate economy in building. If drastic changes are necessary to accommodate minor variations in the cur-

7. Ref. 7 p. 64.

riculum, the school plant is uneconomical. Planned convertibility and versatility will prevent this from happening.

Economy through standardization

Standardization, the foundation of our industrial development, may be readily applied to school construction. The use of standardized parts in quantity eliminates much costly field work and on-site material wastes without sacrificing product quality. If the school is to be unregimented in design, large numbers of standardized parts and materials must be interchangeable through modular co-ordination.

cost comparisons

The three most common cost references are:

1. Cost per square foot.
2. Cost per cubic foot.
3. Cost per pupil.

Since these cost references are commonly used to compare new school plants to existing school plants, the limitations applying to these references should be recognized.

The cost-per-square foot of a particular school may or may not include the cost of built-in equipment, furnishings, architectural fees, the contractors' profit, or landscaping. The method of determining the cost-per-square foot may vary; one person may include the thickness of exterior walls, another may not.

The cost-per-cubic foot method of referencing is susceptible to the same discrepancies as the cost-per-square foot method. In addition, a particular cost-per-cubic foot calculation may or may not include attic space, floor slabs, or crawl spaces.

The cost-per-pupil method is the least accurate means of comparing school costs. This method does not make allowances for the facilities provided, the number of students per classroom or multiple use of the building.

A disadvantage common to all three methods of referencing

is the disregard of maintenance and upkeep factors.[8]

The Marshall Valuation System is a reasonably accurate method of comparing school costs. Although the two methods of referencing in this system are the cost-per-square-foot and the cost-per-cubic-foot, many of the variables normally encountered in these methods have been eliminated.

The costs indicated in the following table from the Marshall Valuation System are the averages of final costs including built-in equipment, architectural fees, contractors' overhead and profit. These costs do not include movable equipment and furnishings. The Marshall Valuation System is brought up-to-date each month and is adjusted for regional climatic and economic conditions.[7]

8. Ref. 8 p. 86.

7. Ref. 7 p. 15-3

TYPE OF SCHOOL		MATERIALS USED
Good School		Exterior: Steel columns, bar joists, face brick, ornamentation. Interior: Plaster, asphalt tile, ceramic wainscot, terrazzo. Lighting and Plumbing: Good quality fluorescent lighting, tile rest rooms. Heating: Hot water.
Cubic foot cost	$ 1.63	
Square foot cost	$16.34	
Average School		Exterior: Brick, block, concrete, steel frame, or bearing wall. Interior: Plaster, acoustic tile, hardwood, asphalt tile. Lighting and Plumbing: Adequate lighting and plumbing. Heating: Hot water.
Cubic foot cost	$ 1.39	
Square foot cost	$13.78	
Low Cost School		Exterior: Brick or block bearing wall, wood joists, plain. Interior: Painted, acoustic tile, hardwood, asphalt tile, soft wood. Lighting and Plumbing: Minimum. Heating: Wall furnace.
Cubic foot cost	$ 1.04	
Square foot cost	$10.55	

TABLE 3

building program

SPACE	QUANTITY	AREA
Large group instruction space	1 @ 5000	5000*

Function: To provide lecture space for 500 students.

Equipment: Tablet-arm chairs, movable speaker's platform, movable chalk boards, and a screen for film projectors.

Finish: Durable with acoustical treatments.

Related: This space will be easily convertible into 4 spaces, each of which will seat 125 students.

Large group presentation spaces	2 @ 1250	2500

Function: To provide lecture rooms for 125 students.

Equipment: Tablet-arm chairs, movable speaker's platform, movable chalk boards, and a screen for film projectors.

Finish: Durable with acoustical treatments.

Related: Near the large group instruction space.

Small group instruction spaces	20 @ 225	4500

Function: To provide discussion space for a teacher and 12-15 students.

Equipment: Large table to seat 15 people, portable chalkboard, bulletin board, film screen.

Finish: Durable.

Related: Near the large group instruction spaces.

* All figures are in square feet.

SPACE	QUANTITY	AREA
Library reading room	1 @ 4000	4000

Function: To contain books, pamphlets, magazines, records, and tapes. Serves as the main reading and browzing area.

Equipment: Book shelves, tables and chairs for 50 students, librarian's desk.

Finish: Good quality.

Related: Near the library work room, listening room, reading room, conference rooms, A.I.D. room.

Listening room	1 @ 500	500

Function: To provide space for student use of recorded library materials.

Equipment: Chairs and tables for 30 students, and space for recording devices.

Finish: Durable.

Related: Near the library.

Reading room	1 @ 500	500

Function: To provide space for student use of written library materials.

Equipment: Tables and chairs for 30 students.

Finish: Durable

Related: Near the library.

SPACE	QUANTITY	AREA
Library work room	1 @ 250	250
Function: To provide a space for the repair and storage of books.		
Equipment: Workbench, sink and storage space.		
Finish: Simple and durable.		
Related: Near the librarian's desk.		
Sound proof booths	5 @ 12	60
Function: To provide spaces for study with electronic devices.		
Equipment: Table for electronic devices and storage drawers.		
Finish: Durable.		
Related: Near the library.		
Automatic instruction device room (AID)	1 @ 1000	1000
Function: To provide a space for the use of teaching machines.		
Equipment: Tables and chairs for 50 students.		
Finish: Durable and simple.		
Related: Near the library.		
Study cubicles	250 @ 20	5000
Function: To provide semi-private space for individual study.		
Equipment: A 2 foot by 4 foot flat desk top, storage provisions for 4 students.		

SPACE	QUANTITY	AREA
Finish: Simple and durable. Related: Near the library.		
Health and physical education laboratories Function: To accommodate indoor physical education activities; basketball, small group games, calisthenics. Equipment: Basketball baskets, tumbling mats, game and exercise equipment. Finish: Hardwood floor, walls very durable. Related: Near storage areas dressing rooms, and service area.	3 @ 2500	7500
Health and physical education storage rooms. Function: To store the equipment used in health and physical education activities. Equipment: Storage shelves. Finish: Rough. Related: Adjacent to the health and physical education laboratories.	3 @ 150	450
Dressing rooms Function: To provide segregated areas for student preparation for gym activities. Equipment: 4 shower heads, 30 - 1 foot by 1 foot by 5 foot lockers, 200 - 12 inch by 9 inch by 20 inch lockers, 2 water closets, and 2 lavatories. Finish: Water resistant. Related: Near health and physical education laboratories.	4 @ 600	2400

SPACE	QUANTITY	AREA
Science Laboratories	3 @ 1250	3750

Function: To provide space for the performance of chemistry and physics experiments.

Equipment: Standard experiment tables; chalkboards; demonstration lecterns; natural gas, water and electrical outlets.

Finish: Durable, acid resistant floors.

Related: Adjacent to the science storeroom.

Science storerooms	3 @ 150	450

Function: To contain the apparatus used in performing science experiments.

Equipment: Storage shelves.

Finish: Rough.

Related: Adjacent to the science laboratories.

Mathematics laboratories	2 @ 1250	2500

Function: To provide space for the students to work mathematical problems at chalkboards, and to provide space for the use of small calculators.

Equipment: Movable chalkboards, wall-mounted chalkboards, tablet-arm chairs, small calculators.

Finish: Durable, much artificial light.

Related: Near the science laboratories.

English, social studies and foreign language laboratories	3 @ 1250	3750

Function: To provide spaces for specialized lectures to 25 - 30 students.

SPACE	QUANTITY	AREA
Equipment: Tablet-arm chairs, lecterns, movable chalkboards, film screens, and recording devices.		
Finish: Good quality.		
Related: Near the library and reference areas.		
Practical-arts laboratory (shop)	1 @ 2000	2000
Function: To provide space for the use of hand tools.		
Equipment: Hand wood-working tools, metal-working tool, leather-working tools, benches.		
Finish: Rough.		
Related: Adjacent to the material storage room, painting room, and project room.		
Material storage room	1 @ 250	250
Function: To provide a locked space for raw material storage.		
Equipment: Storage shelves.		
Finish: Rough.		
Related: Adjacent to the shop.		
Painting room	1 @ 250	250
Function: To provide a well ventilated space for the use of paints and other finishes.		
Equipment: Storage shelves.		
Finish: Rough.		
Related: Adjacent to the shop.		

SPACE	QUANTITY	AREA
Project room (shop)	1 @ 250	250

Function: To provide a space for the storage of student shop projects.

Equipment: Storage shelves.

Finish: Rough.

Related: Adjacent to the shop.

Tool room	1 @ 150	150

Function: To provide a locked space for the storage of hand tools.

Equipment: Storage shelves.

Finish: Rough.

Related: Adjacent to the shop.

Practical-arts laboratory (home economics)	1 @ 1500	1500

Function: To provide space for the use of kitchen appliances, sewing machines, and ironing equipment.

Equipment: 4 small kitchens, 4 sewing machines, 1 washer, 1 dryer, 8 ironing boards.

Finish: Durable, stain resistant.

Related: Adjacent to the material storage area and the project area.

Project room (home economics)	1 @ 250	250

Finish: To provide a space for the storage of student projects.

Equipment: 250 - 8 inch by 12 inch by 12 inch storage baskets.

SPACE	QUANTITY	AREA
Finish: Durable. Related: Adjacent to the home economics laboratory.		
Material storage room (home economics) Function: To provide a locked space for raw material storage. Equipment: Storage shelves. Finish: Rough. Related: Adjacent to the home economics laboratory.	1 @ 250	250
Fine-arts laboratory Function: To provide space for painting, sculpting and drawing. Equipment: Individual work desks with storage provisions, chalk boards, tack boards, display cases, 2 sinks. Finish: Durable. Related: Adjacent to an instructor's supply and equipment room.	1 @ 2000	2000
Supply and equipment room Function: To provide space for material and equipment storage. Equipment: Storage shelves. Finish: Rough. Related: Adjacent to the fine-arts laboratory.	1 @ 250	250

SPACE	QUANTITY	AREA
Teacher's cubicles	25 @ 100	2500

Function: To provide spaces for lesson preparation and research by the 25 teachers.

Equipment: Desks, 2 or more chairs, file cabinet, book shelves.

Finish: Good quality.

Related: Adjacent to assistant's work area, meeting rooms.

Meeting rooms	5 @ 150	750

Function: To provide space for meetings between students, teachers and parents.

Equipment: Tables and chairs for 10 persons.

Finish: Good quality.

Related: Adjacent to teacher's cubicles.

Teachers assistant's work area	1 @ 2000	2000

Function: To provide general office space for teachers assistants.

Equipment: Desks, chairs, file cabinets, storage shelves.

Finish: Durable.

Related: Adjacent to the teacher's cubicles.

Dining area	1 @ 4200	4200

Function: To provide space for student and faculty dining.

Equipment: Tables and chairs for 350 persons.

SPACE	QUANTITY	AREA
Finish: Durable, floors and walls water resistant. Related: Adjacent to the kitchen, serving area, and dishwashing area.		
Kitchen	1 @ 1500	1500
Function: To provide spaces for food preparation. Equipment: Commercial range, oven, cooler, freezer, mixer, vegetable peeler, and small miscellaneous equipment. Finish: Durable, stain resistant, easy to clean. Related: Adjacent to dining area, storage areas, serving area.		
Dishwashing area	1 @ 300	300
Function: To provide space for dishwashing. Equipment: Scullery sinks, commercial dishwasher. Finish: Durable, easy to clean. Related: Adjacent to kitchen, dining area and storage areas.		
Serving area	1 @ 500	500
Function: To provide space for cafeteria style serving. Equipment: Beverage servers, steam tables, silverware and tray stands. Finish: Durable. Related: Adjacent to the kitchen, dining area, and dishwashing area.		

SPACE	QUANTITY	AREA
Kitchen receiving area	1 @ 200	200

Function: To provide space for receiving and moving incoming kitchen supplies.

Equipment: Loading dock.

Finish: Rough.

Related: Near the storage areas, kitchen, and service area.

Storage areas	2 @ 100	200

Function: To provide storage space for dry food and non-food items.

Equipment: Storage shelves.

Finish: Rough;

Related: Near the kitchen and storage areas.

Maintenance area	1 @ 50	50

Function: To provide space for mops, brooms, and cleaning equipment.

Equipment: Service sink, storage shelves.

Finish: Rough.

Related: Near the kitchen, dining and serving areas.

Garbage area	1 @ 100	100

Function: To provide an isolated space for garbage can storage and can washing.

Equipment: Hot water hoses, central drain.

SPACE	QUANTITY	AREA
Finish: Rough, easy to clean. Related: Adjacent to dishwashing, kitchen and dining areas.		
Employee's locker room	1 @ 100	100
Function: To provide a changing area for kitchen employees. Equipment: Lavatory, water closet, personal lockers. Finish: Durable. Related: Near the kitchen, dishwashing area, and serving area.		
Kitchen office	1 @ 100	100
Function: To provide space for menu planning and bookkeeping. Equipment: Desk, chairs, file cabinet. Finish: Good quality. Related: Near the kitchen, dining room, and serving area.		
Instrumental practice room	1 @ 1500	1500
Function: To provide space for large group band and orchestra practice. Equipment: Chairs and music stands. Finish: Durable with acoustical considerations. Related: Near individual practice rooms and storage area.		

SPACE	QUANTITY	AREA
Vocal practice room	1 @ 1500	1500

Function: To provide space for large group vocal music practice.

Equipment: Risers.

Finish: Durable with acoustical considerations.

Related: Near individual practice rooms and storage areas.

Individual practice rooms	5 @ 70	350

Function: To provide individual practice space for instrumental and vocal students.

Equipment: Chairs and music stands.

Finish: Durable with sound absorbing walls.

Related: Adjacent to both large practice rooms.

Sheet music library	1 @ 100	100

Function: To provide storage space for all sheet music.

Equipment: Storage shelves.

Finish: Rough.

Related: Adjacent to both large practice rooms and individual practice rooms.

Instrument storage room	1 @ 250	250

Function: To provide a locked storage space for school and private instruments.

Equipment: Storage shelves.

SPACE	QUANTITY	AREA
Finish: Rough. Related: Adjacent to practice rooms and instrumental practice room.		
Uniform storage areas	2 @ 50	100
Function: To provide a locked storage area for vocal and instrumental uniforms. Equipment: Coat rods and storage shelves. Finish: Rough. Related: Near the instrumental practice rooms and vocal practice rooms.		
Principal's and Vice Principal's offices	2 @ 150	300
Function: To provide private space for the principal and vice principal. Equipment: Desk, 2 or 3 chairs, filing cabinet, and personal equipment. Finish: Good quality. Related: Adjacent to the main office.		
Main office	1 @ 1000	1000
Function: To provide space for the administration of the school. Equipment: 2 or 3 secretarial desks, chairs, an inter-school communication device, and teacher's mail boxes. Finish: Good quality. Related: Adjacent to the vault, private offices, work room; near the nurse's room and main lobby.		

SPACE	QUANTITY	AREA
Vault	1 @ 200	200

Function: To provide a fire-resistant space to contain money and school records.

Equipment: Storage shelves.

Finish: Fire resistant.

Related: Adjacent to the main office.

Work room	1 @ 250	250

Function: To provide space for the storage and reproduction of written materials.

Equipment: Mimeograph machine, multilth machine, storage shelves, sink.

Finish: Durable.

Related: Adjacent to the main office.

Nurse's room	1 @ 150	150

Function: To provide space for the treatment of minor injuries and sicknesses.

Equipment: Cot, first-aid provisions, and a small toilet room.

Finish: Good quality.

Related: Near the main office.

Audio-visual aids area (AVA)	1 @ 1000	1000

Function: To provide space for the processing, storing, servicing and distributing of all audio-visual materials.

SPACE	QUANTITY	AREA
Main lobby	1 @ 1000	1000

Function: To provide space for a public and student entrance.

Equipment: Trophy case.

Finish: Highest quality.

Related: Near the main office.

Teacher's lounge	1 @ 1000	1000

Function: To provide space where teachers may spend their off-duty hours.

Equipment: Easy chairs, couches, lamps, magazine racks, and coffee facilities.

Finish: Good quality.

Related: Near the teacher's cubicles, and the teacher's toilet rooms.

Teacher's toilet rooms	2 @ 100	200

Function: To provide segregated toilet facilities.

Equipment: 2 water closets, and 2 lavatories.

Finish: Good quality, durable.

Related: Near the teacher's lounge and the teacher's cubicles.

Student toilet rooms	4-6 @ 200	1200

Function: To provide segregated student toilet facilities.

Equipment: (total boys) 9 water closets, 9 lavatories, 16 urinals. (total girls) 25 water closets, 9 lavatories.

SPACE	QUANTITY	AREA
Finish: Durable.		
Related: Located conveniently within the school plant.		
Mechanical room	1 @ 1000	1000
Function: To provide space for all heavy mechanical equipment.		
Equipment: Boiler, air conditioner, hot water and soft water tanks.		
Finish: Rough, fire resistant.		
Related: Centrally located within the school complex.		
Janitor's closets	3-4 @ 50	200
Function: To provide space for janitorial equipment and supplies.		
Equipment: Storage shelves, service sinks.		
Finish: Rough.		
Related: Located conveniently within the school plant.		
Sub total		75,000
Halls	At 15%	12,000
Function: To provide circulation between the various school elements.		
Equipment: Drinking fountains.		
Finish: Durable.		
Related: As required for circulation.		
Structural space	At 5 %	5000
TOTAL AREA		92,000

appendix one

calculation of the minimum site area

Elementary Schools: Minimum of 5 acres + 1 a. / 100 students.

High Schools: Minimum of 10 acres + 1 a. / 100 students.

Total of 1000 students

1/3 senior high students	10 acres
2/3 elementary students 2 @ 5 =	10 acres
	20 acres

20 acres/3 = 6.67 acres.

1000 students/ 100 students per acre = 10 acres.

10 acres + 6.67 acres = 16.67 acres.

appendix two

the trump theory

The Trump report, a theory for more efficient secondary education, was developed by Professor J. Lloyd Trump of the University of Illinois. Professor Trump developed his theory while acting as the Director of the Commission on the Experimental Study of the Utilization of the Staff in the Secondary School of the National Association of Secondary School Principals. (NASSP)

Supported by the Ford Foundation and the Fund for the Advancement of Education, a distinguished group of educators has worked for more than two years with Dr. Trump to evolve theories for the qualitative improvement of the nation's secondary schools.[1] Their most important suggestions may be summarized as follows:

1. REORGANIZATION OF INSTRUCTION: Most instruction should be ordered so as to provide more opportunity for individual study, more participation in small discussion groups, and increased attendance at large classes given by gifted teachers.

2. REARRANGEMENT OF CURRICULUM AND CLASS SCHEDULES: In the school of the future these elements should be much more flexible. There should be less reliance on

1 Ref. 1 p. 6. (Superscripts refer to similarly numbered entries in the Bibliography.)

the standard 40-50 minute period, and adult supervision should be available as needed.

3. CHANGES IN STAFFING PATTERNS: Much greater utilization of instruction assistants, clerks, general aides, and other types of relatively unskilled educational labor is foreseen. There should be greater reliance on team teaching and the highly skilled specialist.

4. MORE EXTENSIVE USE OF TECHNOLOGICAL AIDES: We are at the beginning of a period in which television, tape recordings, teaching machines, and electronic devices of all kinds will be enormously significant.[1]

Dr. Trump's committee recommended that the above objectives be achieved through the programing of the following spaces:

A. Spaces where individuals can keep their materials, study, use teaching machines, read, draw, listen to music, write, and engage in manifold other activities. At present the only place which a student can call his own is a steel locker, and a locker "is not a very good place to study, develop a spirit of inquiry, and exercise independent responsibility for learning." Students must have places with privacy and accessibility; probably about 300-350 such areas would be needed for every 1,000 students.

1 Ref. 1, p. 6.

GROUP ORGAN.	LARGE GROUP INSTRUCTION	SMALL GROUP DISCUSSION	INDIVIDUAL STUDY
TEACHING-LEARNING EXPERIENCES	INTRODUCTION MOTIVATION EXPLANATION PLANNING GROUP STUDY ENRICHMENT GENERALIZATION EVALUATION	GROUP EXAMINATION OF TERMS AND CONCEPTS AND SOLUTIONS OF PROBLEMS. IMPROVE INTER-PERSONAL RELATIONSHIPS	READ, SELF-APPRAISE LISTEN TO TAPES AND RECORDS VIEW, QUESTION, ANALYZE, THINK, EXPERIMENT, EXAMINE, INVESTIGATE, CONSIDER EVIDENCE WRITE, CREATE, MEMORIZE, RECORD, MAKE VISIT
SPACE ALLOCATION	AUDITORIUM, LITTLE THEATRE, CAFETERIA, STUDY HALL, CLASS ROOMS, OTHER LARGE SPACES, JOINED VIA TELEVISION OR REMODELING	CONFERENCE ROOM, CLASS ROOM	LIBRARY LABORATORIES WORK SHOPS PROJECT & MATERIAL CENTERS, MUSEUMS, INSIDE OR OUTSIDE THE SCHOOL PLANT
TIME DIVISION	ABOUT 40 PER CENT	ABOUT 20 PER CENT	ABOUT 40 PER CENT

ORGANIZATION OF INSTRUCTION

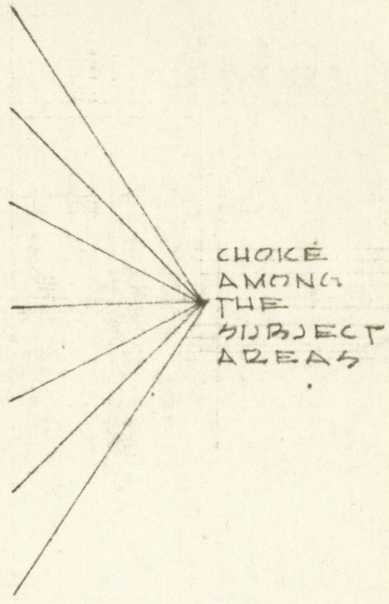
FROM IMAGES OF THE FUTURE BY J. L. TRUMP.

FIGURE A-1

FIGURE A-2

HOW AN AVERAGE 14 YR. OLD MIGHT SPEND HIS SCHOOL TIME

AVERAGE MINUTES PER WEEK

	REQUIRED BASIC EDUCATION			AS SELECTED BY PERSONAL AND PROFESSIONAL DECISION	
SUBJECT	LARGE GROUP	SMALL GROUP	INDIV. STUDY	GROUP ACTIVITIES	INDIVIDUAL STUDY
MATH	80	40	60		
SCIENCE	80	40	70		
ENGLISH	100	50	40		
SOCIAL STUDIES	100	50	40		
FOREIGN LANGUAGE	60	40	40		
FINE AND* PRACTICAL ARTS	80	40	30		
HEALTH AND PHYSICAL EDUC.	40	40	80		
TOTAL	540	300	360	240	360

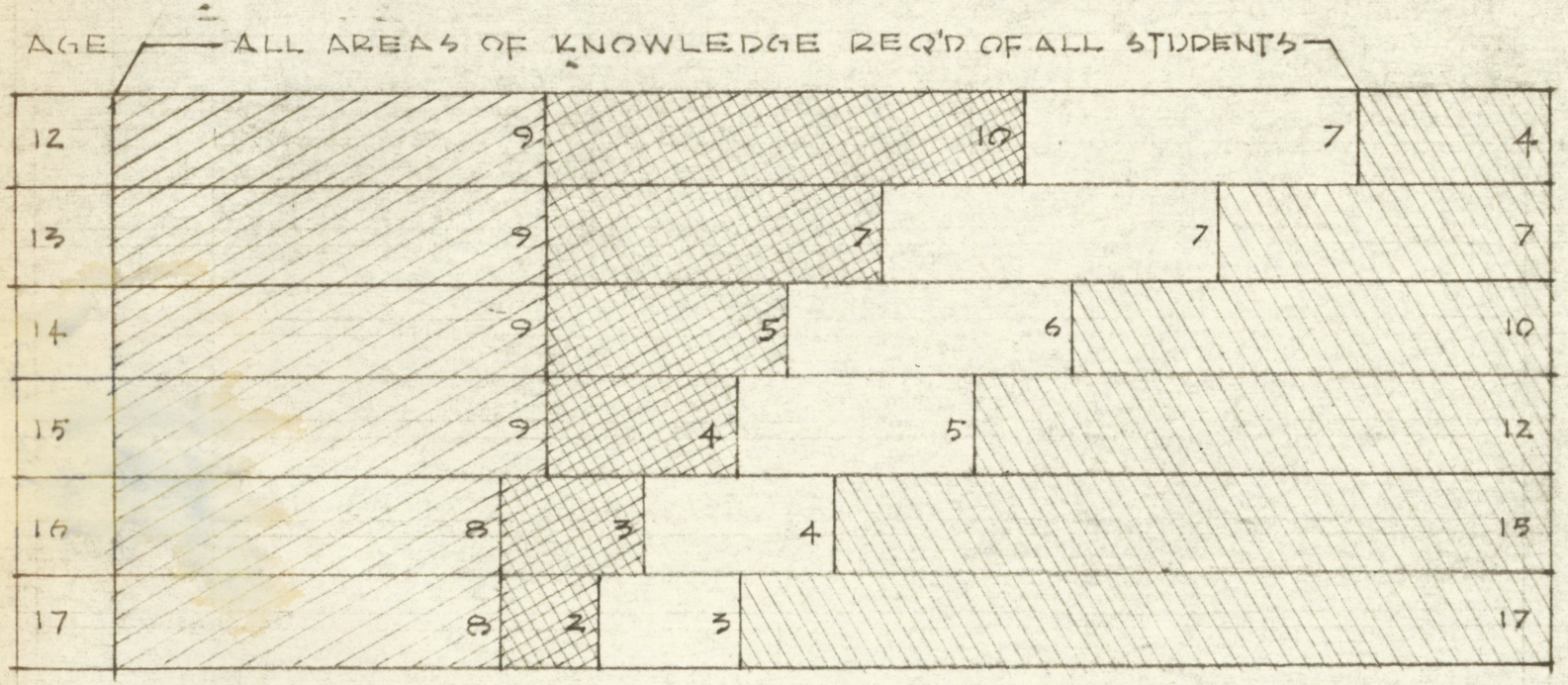
*MUSIC, ART, SHOP, MECHANICAL DRAWING, HOME ECONOMICS

EXTRA HOURS AVAILABLE FOR INDIVIDUAL STUDY WITH SUPERVISION BEFORE AND AFTER REGULAR SCHOOL HOURS

FROM FOCUS ON CHANGE BY J. TRUMP

FIGURE A. 3

DIVISION OF HOURS IN A 30 HR. WEEK



LARGE GROUP

SMALL GROUP

INDEPENDENT STUDY

DEPTH IN HIS OWN AREAS

NUMBER OF HOURS

FROM FOCUS ON CHANGE BY TRUMP

B. Spaces where 12-15 people can gather for small group discussions. For this purpose the typical 30'x30' classroom is costly and wasteful. In a school with 1,000 students about 15-20 such spaces would be required.

C. Spaces where large groups-100, 200, 500, or more, depending on the size of the school-can meet. For 1,000 students, 5 spaces for large groups might be needed. One might be a cafeteria and one an instruction center (formerly called an auditorium). The center should permit presentations to two to four groups or to a single group depending on the arrangement of its constituent spaces. Shops, libraries, art areas, and laboratories will also have to be provided, but will be changed to serve students in the new patterns of instruction.[1]

The teacher's spatial needs were also considered by the Trump committee. The traditional teacher's desk will no longer do; teachers need individual cubicles for privacy and they must also have spaces for small group meetings. Clerical help must be easily available, facilities for making instructional aids must be present, and books and other kinds of materials must be on hand.

1 Ref. 1 p. 10.

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