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AN ELEMENTARY SCHOOL FOR BILLINGS, MONTANA

Part I

Undergraduate Thesis in Architectural Design

By

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at

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I. CONDITIONS CREATING A NEED FOR AN ELEMENTARY SCHOOL

A. Growth of Population in Billings:

The population growth is toward the west end of the city; a new school is needed in that area of the city.

School census reports show the growth of school enrollments. Individuals in all age brackets have increased steadily. There is a steady increase in elementary school age children.

The population of the City of Billings, the urban area of Billings, and Yellowstone County and its population increase is illustrated below. (Ref. #1)

Population Growth of City of Billings

Year	City Limits	Billings and Urban Area
1950	31,834	43,520
1955	42,000	56,069
1960	52,851	60,712
1965	58,970	67,775

The population growth influences the enrollment of Billings Elementary Schools; these schools serve the area within the city. The rapid growth of school enrollments began about eighteen years ago and has continued to the present time. From 1957 until 1965 there was an average increase in students (all ages) of 510 students per year. (Ref. #1)

Enclosed is the school census report which will aid in projecting future enrollments on the basis of increases in school age individuals. (Table on page 2.)

SCHOOL DISTRICT NO. 2 OF YELLOWSTONE COUNTY
Billings, Montana

SCHOOL CENSUS REPORT

Year	Total No. Under 6	Total No. Age 6-7 Incl.	Total No. Age 8-13 Incl.	Total No. Age 14-15 Incl.	Total No. Age 16-20 Incl.	Total No. Age 6-20 Incl.	Total No. Age 0-20 Incl.
1948	4,878	1,831	3,794	1,142	2,182	8,949	13,826
1949	5,133	1,960	4,080	1,221	2,206	9,547	14,680
1950	5,655	2,014	4,213	1,256	2,360	9,843	15,498
1951	6,031	2,108	4,383	1,337	2,420	10,246	16,279
1952	6,921	2,381	4,877	1,413	2,477	11,148	18,089
1953	7,243	2,546	5,360	1,529	2,639	12,074	19,317
1954	7,771	2,674	5,713	1,537	3,121	13,045	20,816
1955	8,217	2,896	6,553	1,676	3,304	14,429	22,646
1956	9,072	3,077	6,970	1,752	3,485	15,267	24,359
1957	9,195	3,123	7,310	1,804	3,570	15,007	25,002
1958	9,283	3,288	7,792	2,008	2,841	16,929	26,222
1959	9,329	3,654	8,326	2,061	3,911	17,952	27,291
1960	9,500	3,735	9,215	2,230	4,094	19,276	28,784
1961	9,515	3,288	9,014	2,496	4,831	19,061	29,176
1962	9,245	3,210	9,059	2,788	4,789	19,845	29,001
1963	9,191	3,377	9,104	2,723	5,200	20,404	29,505
1964	8,936	3,410	9,444	2,822	5,506	21,102	30,117

B. Present Conditions:

Present capacities of available Elementary classrooms is given based on statistics from an October 1966 Administration report.

In Billings the number of standard classrooms available is 233. The student capacity of all classrooms if filled with an average of 25 students is 8,325.

Twenty-five students were used to rate the capacity of the elementary schools and also to project the future needs for future classrooms. It is necessary to recognize that these classrooms will have more than 25 students during times of crowded conditions. The essential problem is to maintain equal distribution of students in all classrooms. (Ref. #1)

In Billings the following elementary classrooms are being constructed or planned. An April 1965 Elementary Bond was approved by a majority vote. Thirty-five new classrooms are to be built from this bond issue.

Classrooms needed in addition to those built from the 1965 bond issue can now be predicted. Because of the growth taking place in the west end of Billings, this need for a new school is extremely urgent and may require building in 1967-68.[1] The Board prediction:

Elementary 1-6	1968-69	1970-71	1974-75
	25 classrooms	31 classrooms	29 classrooms

C. Enrollment data:

The projected building needs for the future justifies the need for a new Elementary school in the West side. Given below is the enrollment projection proving the building needs.

Capacity using standard rooms when 1965 building program is completed.	Maximum capacity using all sub-standard rooms and over-crowded facilities.
9,200	9,725

Elementary Grades 1-6

Projected enrollment 1968-69	Projected enrollment 1971-72	Projected enrollment 1974-75
9,824	10,610	11,344

This projection was based upon an October 1965 enrollment of 8,852 students for grades 1-6.

The Growing School Enrollments

School census reports show the growth of school enrollments. Growth in all age brackets have increased steadily. A steady increase in growing enrollments in elementary school age children is apparent in Billings.

Enclosed in this report is the school census report which will aid in projecting future enrollments. The census is based upon children from six to thirteen years.

Year	Total Children Under Six	Ages 6-7 Inclusive	Ages 8-13 Inclusive
1960	9,500	3,235	9,215
1961	9,510	3,299	9,014
1962	9,245	3,210	9,059
1963	9,191	3,337	9,104
1964	8,940	3,410	9,444*

started down ?

*Montana Almanac

Due to the increased growth rate in Billings, a need has been established for construction of new classrooms.

. Presently there are 354 classrooms in use. On the following page is a list showing total number of classrooms in the buildings. A comparison showing the condition of the classrooms is shown. The report is based upon a 1965 School Board survey.

PRESENT ELEMENTARY CLASSROOMS IN EACH SCHOOL
October 1965

School	Total CR in Bldg.	Standard	Sub-Standard	Not in use (Standard)	Not in use (Sub-Stan.)
1. Bench	12	12	0	0	0
2. Bitterroot	8	8	0	0	0
& Hawthorne	4	2	2	0	2
3. Boulder	18	18	0	0	0
4. Broadwater	20	18	2	0	0
5. Burlington	19	19	0	0	0
6. Central Heights	18	18	0	0	0
7. C.P. Center (of Eastern Mont. College)	7	7	0	0	0
8. Eastern Elem.	7	7	0	0	0
9. Garfield	23	19	4	0	0
10. Grand	16	16	0	0	0
11. Highland	16	16	0	1	0
12. Jefferson*	3	3	0	0	0
13. McKinley	16	14	2	0	0
14. Meadowlark	19	19	0	0	0
& Shiloh	4	2	2	0	2
15. Miles	18	18	0	0	0
16. Newman	17	16	1	0	0
17. North Park	16	12	4	0	2
18. Orchard	13	13	0	0	0
19. Poly Drive	19	19	0	1	0
20. Rimrock &	12	12	0	0	0
Old Rim	2	0	2	0	0
21. Rose Park	18	18	0	0	0
22. Taft	14	12	2	0	0
23. Washington	20	20	0	1	0
TOTAL	354	333	21	3	8

* Does not include 8 classrooms *Jefferson) in use by Lincoln-Junior High, and one classroom used for Audio-Visual Education Center.

D. Summary of Needs Based Upon Growth Predictions:

Schools may not have any problem with enrollments in the spring when school ceases operation, but three months later when the fall term starts, there may be from 50 to 100 new students. The opposite problem may occur when an enrollment reduction occurs; therefore, planning on the basis of anticipating enrollments is sometimes faulty.

Presently in Billings students are being bussed from seven different elementary schools to help equalize class loading. Present building conditions are inadequate. It does not seem efficient to transfer students from one territory to another.

The problem occurs when the schools must have equal classroom loads. Schools must be constructed where the center of population growth is occurring.

State accreditation standards require conformity within these maximum class sizes:

Grades 1 and 2	26 students
Grades 3 and 4	28 students
Grades 5 and 6	30 students

Due to the distribution of students in the various grades an actual overload of 228 students occurs in the elementary schools from grades 1 through 6. Class sizes exceeded the recommendations of the State Accreditation Board.

Certain sections of Billings will probably grow faster than other areas. The growth of the west end should be closely watched. The school administration predicts that elementary schools will be needed in this area soon.[1]

New schools are justified since classroom additions cannot solve these problems. Existing facilities, such as libraries, physical education space, playground areas, and mechanical facilities become inadequate. The use of extended school day or half-day sessions cannot solve the problems.

II. LOCAL CONDITIONS

General Conditions

The Billings populace is situated in Yellowstone County with 79,016 people. The population density of Yellowstone County is 30 persons per square mile. Most of the land is in farms and ranches.[1]

Billings is growing towards the west. The present population is 52,851. The median age is 27.8 years in Yellowstone County.

Social Conditions

Age limits and compulsory attendance of school are open for ages of children from six to twenty-one years. There is compulsory rules of attendance for children from eight to sixteen years of age excepting those with physical or mental handicaps. in Montana.

Resident pupils may be admitted to public schools; also out-of state residents may be admitted by school boards. If students are admitted, they must pursue courses required and are subject to teachers' authorities. Willful disobedience constitutes just cause for expulsion. Insulting or abusing a teacher on school premises constitutes a misdemeanor.

Local population distribution is shown below:

1960

Urban Yellowstone Co.	Rural non-farm	Rural farm	Age Median	Over 65	Negro	Median years completed of school
82.7	11.3	6.0	26.6 yr.	7.4	1.0	12.2 yrs.

(Figures are in percentages unless otherwise indicated.)

Legal Requirements

Teachers must have certificates. Certificates are issued by the State Superintendent of Public Instruction in accordance with regulations prescribed by the State Board of Education. Except from approved teacher exchanges and from special teachers, applicants must be United States citizens. All teachers must be over eighteen years of age and have a health certificate.[B-1]

Minimum teacher requirements are listed:

1. An elementary school standard certificate is necessary.
2. A two-year course in Elementary education at a University of Montana unit or an approved equivalent is required.

The Boards of Trustees have general supervision over elementary schools including the employment and the fixing of salaries of superintendents, principals, and teachers. The Board controls the purchase, lease, and disposition of school properties. The School Board also determines subjects to be taught in addition to those required by law.[B-1]

Racial Conditions

Given below is the population statistics based upon race.[1]

Billings schools tend not to openly discriminate against non-white children. But the city has divided itself into several sections with different racial and socio-economic classes. There tends to be some discrimination. Indian and Negro citizens who live on the South side. This discrimination of apparently does not affect the education of elementary school children.

Population by Race in Yellowstone County, 1960[C-1]

White	Negro	Indian	Japanese	Filipino	Others
78,227	235	410	68	6	20

Climate

Billings has a moderate climate. The operation of the school is not limited by severe winters. Extremely cold temperatures don't inhibit travel to and from school. Severe conditions of wind, extremely wide temperature ranges, or excessive precipitation do not warrant special design consideration.

A summary of average temperatures from long-term means are given by the U.S. Weather Bureau. It is pertinent to design consideration.

U.S. Weather Bureau Summary of Climitilogical Data: Montana, 1961

	Jan.	Feb.	Mar.	Ap.	May	Ju.	July
Billings	32.2+9.3	38.6+12.5	41.0+6.9	42.8-3.4	56.6+4.6	72.7 1.7	75.0 1.7

	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
	76.2 5.2	52.5 -7.5	47.3-1.9	31.2-4.6	24.5-2.7	49.2 20

Total Precipitation and Departures from Long-term means

	Jan.	Feb.	Mar.	Ap.	May	Ju.	July
Billings	.15	.20	.12	2.33	1.57	.24	.85
	.38	.24	.21	1.28	2.3	2.37	.29

	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
	.23	3.99	1.47	1.55	.22	13.52
	.65	2.67	.33	.87	.36	.42

Economic Conditions

Social-Economic classes:

In Yellowstone County the median family income is $6,150. This illustrates that the average families are in the middle socio-economic class. The percentage of families with incomes of under $3,000 per year is 13.5%. The average percentage of families with a yearly salary over $10,000 is 15.7%[A-1]

& what?

I therefore conclude that the most students are from middle class families. The economic conditions of these families will affect the bonding ability of the school district.

The total cost of public elementary and secondary schools are listed:[A-1]

1959-1960	65,680,549.00
1958-1959	64,917,966.00
1957-1958	64,483,260.00

Public Elementary Teachers:

In Montana there are a total of 7,800 teachers. (1966 census) Within this group there are 5,100 elementary teachers. The average salary for an Elementary school teacher is $5,800 dollars per year.[B-2]

The salary distribution for teachers closely follows this pattern (1966).

Under $3,500	$3,500 to $4,499	$4,500 to $5,499	$5,400 to $6,499
1%	14.0%	37.2%	30.0%

$6,500 to $7,499	$7,500 and over
14.5%	3.3%

III. SITE CONDITIONS

Introduction:

The site shall house and influence the people who view and use this area. Natural physical conditions have been altered by builders in this area. Indigenous vegetation has been removed. The earth has been graded smooth. Tract housing bordered by other sterile structures detract from the natural character of this area. Contrast is needed in this area of Billings.

The Structure and Landscaping:

A new designed environment with a sensitive physical character and with natural landscaping shall improve the neighborhood. A school providing natural shelter and a sensitive character can enhance west Billings.

Landscape design integrated with architectural design can form an area with natural shelter and pleasing environment. Sterile tract housing borders the site; a simple contrasting area will help improve the area. Landscape design is a special problem which must be solved by cooperation between the architect and the site planner. In my solution I shall consider both of these design considerations.

The Site:

The site occupies a large area in the west end of Billings. The site is bordered by the following streets: St. Johns Avenue, Central Avenue, 18th Street West.

The site is an open field within a newly produced environment created by contractors and careless architects. The existing environment, I feel, needs a contrasting element. The new school can provide a contrasting note amidst dull box-type housing.

The distant view, the rimrocks, stand out and form a border for Billings. Upon a clear and beautiful day the distant Beartooth Mountains are visible in a soft mist. The physical environment the architecture tends to overpower us—a more natural structure is needed. In general, alteration of the ground is required. High mounds of earth can help. The natural use of fountains and water gardens can be designed with natural sculpture. Landscaping may help some to lift their eyes to the view.

The Adjacent Features of the Area:

The architecture of this area must include playground area and the school structure with open areas. The contrasting buildings in the area are designed with little regard for contrasting negative areas.

The spaces will include changes in intersecting contours and grades to contrast against the flat topography. Clusters of trees and bushes shall be planted to contrast against the treeless flat plain.

The adjacent structures include sub-division housing with little sympathy or character for those that live in this area. The New Western Manor, a nursing home, shall border the west playground of the school. Across from the nursing home is Billings West High School. This site is not in use presently; the immediate danger is that a continued subdivision may be built with little regard for the nicely designed school with its bordering open fields. If an elementary school is designed with an attractive playground, some of the play-area congestion within the adjoining subdivisions may be removed.

Available facilities in the west end allow immediate use of sewers and other utilities: electricity, water, gas, and other necessary functions.

Zoning requirements on this large site include set back requirements which will have little influence on the design of the structure. Billings

does not require special designs or limited use of materials. Architects are free to solve their problems by proposing different types of architectural solutions with cost being the main restriction.

Conclusion:

Special site problems include site and landscape planning. Other types of schools in Billings testify to this need; many existing schools lack green and open areas. Very few schools in Billings provide playgrounds which are appealing; therefore, these play areas are not used during vacation periods. A more natural type of design is required with natural structures integrated into the site. The school can provide a nice area for children to play, an attractively landscaped area with a natural structure, and an area sensitive to the needs of the school district and of the physical environment.

IV. FUNCTIONAL REQUIREMENTS

I. This section provides for the individual character of the individual child.

II. This section deals with classroom activities.

a. Classroom activities
b. Elements of the classroom
c. Auxiliary classroom facilities
d. Service details for the elementary classroom

Psychological influences

III. Maturation of the child's interest in the classroom.

The good school should harness and develop the inquisitive nature of the child in its program. There tends to be a tremendous loss of self-motivation or interest in the early school years when the young school children are eager to have answers to countless questions about learning. The school which has been considered by this designer will take advantage of the young children's changing flights of interest.

The school shall make provision for individual differences and emotions that exist among children.

Each child, as his adult predecessor, has specific traits, talents, abilities, and handicaps which arise from his heredity and from his environment. His reactions vary as his growth develops. The program must help the individual develop each special aspect of his personality.

Most schools fail in the early stage of teaching the children to read. The society is based upon a "print culture". To adjust the school program to develop reading skills is necessary.

Individual differences account for considerable overlapping between grades in the elementary school. Some children will be more advanced at

reading and other skills. To recognize that individuals vary, one must provide proper materials for developing other skills besides reading. The use of hands, sympathetic treatment of music and art, and learning to get along with others constitute a basis for the total academic program.

With elementary school children, more efficient teaching about abstract ideas is required. An abstract idea can be closely related to actual concrete experiences found in everyday life.

To show this idea many children first read about an experience or form without ever experiencing the phenomena. When children know what they are learning about, the problem of reading is simplified. Seeing the specific question will help them grasp the operation or activity. The ability to grasp abstractions, foreign to their experience, does not occur until they reach twelve or thirteen years of age.[1]

Tactile sensation is necessary for learning. Children must be able to touch, manipulate, operate, create, collect, visit, and carry on other activities that will help give them concrete illustrations.

Provision for individual success:

This need may seem trite, but most psychologists agree that children need ways to avoid a completely frustrating school experience which will inhibit their growth, both personal and social.

Specific facilities can be provided which will help insure that each child will have a maximum chance for success in school.

The nature of the physical solution will help provide facilities needed, but the architecture cannot insure individual success for each student. The teachers and students must work together in a humanistic way with mutual respect. Education of the young is a special problem independent of the architect's function.

A child learns when he is in a healthy emotional state. The atmosphere should be pleasant and reflect the ideal attractiveness of a pleasant home. At this point we overlook home situations which create poor psychological and physical environment.

Flexibility in functional design in all school arrangements, in scheduling, and in facilities shall be stressed in designing this school.

Architectural flexibility within the school spaces are achieved by these methods:

1. allowing the structure to accommodate additions to the original structure as the need for a larger capacity school grows.

2. each space within the structure should be able to serve many purposes. Spaces should serve a variety of functions.

3. spaces in the school should be convertible to accommodate changing needs of the pupils and teachers.

Key personnel in the school are the teaching staff, the administration, and the guidance staff.

The purpose of the staff of the school is to provide for the physical and educational needs of the students. A health staff is also needed in the school.

Functional relationships to be considered for an elementary school:

A. The classroom: localized interior educational spaces
   1. the primary grades (1, 2, 3)
   2. the elementary grades (4, 5, 6)

B. Assembly spaces
C. Dining spaces
D. Play spaces
E. Specialized areas
F. Administrational areas
G. Service areas
H. Outdoor spaces
   1. educational provisions
   2. recreational provisions

I. Mechanical area

Characteristics: Playroom

The largest unit includes two teaching stations with provisions for a basketball court with two volley-ball courts and three badminton courts.

There is no established optimum size for elementary school playrooms. The playroom will be used primarily as a gymnasium.

Administrative/Teacher Space:

Spaces required in the administrative unit. The basic breakdown includes the following areas:

1. General office
2. Principal's office
3. General supply room
4. Mimeograph room
5. Book storage
6. Medical and dental facilities
7. Record room and vault
8. Teachers' workroom
9. Teachers' restrooms
10. Parent-teacher room
11. Conference room

Planning for Teachers' Needs:
This section contains considerations for personal items, professional items and equipment.

The teachers shall have these separate facilities:

1. toilet facilities

2. locker facilities

3. a separate lunchroom

4. a joint professional workroom with the administrative staff

Function

Size of Site:

A ten-classroom school with a playroom requires a minimum site of five acres plus one additional acre for each 100 students to determine the school site area. Some Billings schools fail to meet this requirement.

A twenty-five student classroom is typical in Billings and best serves the purpose. The total number of students the school shall accommodate is approximately 350 students.

Teaching Staff and Adminstration:

Ten elementary school teachers are required. A public health nurse, a principal, an assistant principal and their assistants are required by the school district. A staff librarian is also included.

Instructional assistants should aid in relieving teachers and administrators of various supervisory tasks upon playgrounds, in cafeterias, and assembly areas. These additional personnel will assist with extra class activities such as special reading classes, physical education activities.

Lunchroom Staff:

Required lunchroom will need one dietician-cook and three assistants plus equipment.

A Small Nurse's Room:

This area contains a cot, first aid provisions, and is adjoining the administration office.

An Audio-Visual Aids Center:

This area stores, processes, services, and distributes technical audio-visual aids throughout the school. This area is about 300 feet square.

Hallways:

Usual hall dimensions vary from ten to fifteen feet wide depending upon traffic load.

Main Lobby or Orientation Area:

An orientation center should be near the administration area. This area can be of special beauty and exhibit student art works.

Mechanical Room:

This area will house all heavy mechanical equipment for heating the building. A necessary service drive will be required with easy accessibility.

Program:

A.	Classrooms:	
	9 Primary grade classrooms 1,000 square feet each	9,000 square feet
	paired divisions with toilets and storage room facilities between rooms	
	1 special classroom	900 square feet
	connective store room to outside playground	
B.	Community Room-Assembly Area:	
	Assembly body to seat 250 first seats	3,000 square feet
	Stage area 20 feet deep	900 square feet
	Property room	300 square feet
	Public toilets-one for each sex	200 square feet
	Public telephone access	15 square feet
C.	Lunch Room-Music Room:	
	Main lunch room to seat 200 Subdivision is allowable	2,000 square feet
	Small kitchen and serving unit	300 square feet
	Teacher lunchroom	400 square feet
	Store room main storage, 20; special, 100	300 square feet
	Dishwashing room	200 square feet
	Refuse and garbage area	75 square feet
D.	Library:	
	Reading Room	1,100 square feet
	Work room and storage	250 square feet
	Connected audio-visual aids store room	300 square feet
	Mechanical Area	1,000 square feet

E. Administration and Health spaces:

General principal's office	350 square feet
assistant principal's office	250 square feet
general administration office	300 square feet
general supply room	300 square feet
book storage	300 square feet
health room	500 square feet
teachers' lounge area	200 square feet
teachers' rest rooms	200 square feet
teachers' workroom	300 square feet
record room-vault	80 square feet

F. All Purpose Room-Gymnasium/Playroom:

Main room	3,000 square feet
instructor's office	150 square feet
store room for arts and crafts	150 square feet
out of door storage	150 square feet
storage for play purposes	150 square feet
locker rooms (20 lockers needed)	
two showers each and toilets	600 square feet
rest rooms, for each sex, 100 sq. ft. each	200 square feet

INSTRUCTIONS FOR PLANNING THE PRIMARY CLASSROOM ref 3:

Many children between five and a half and six years of age will be entering the first grade for the first time. With children younger than six and a half years, education specialists agree that a reading program will not be successful and efficient. For average young children, mental age and chronological age are the same, but "gifted" children attain mental ages higher than their chronological ages. Therefore, many young children in the first grade should have a program similar to that of a good kindergarten until they are well into the latter part of the second year, when a reading program is gradually introduced. The first grade spaces will then be similar to those in a kindergarten. Recognize the tendency to have less differentiation between kindergarten methods and the primary program.

Each classroom for young children requires direct access to two toilet rooms, one for each sex. A common wash-basin, towel rack and soap dispenser are necessary. An additional sink is provided in the general classroom area. The toilet facilities in a large school must be well designed for use by ajoining classrooms.

Clothing is a special problem for younger groups, especially in cold, wet climates. Clothes storage is necessary for the primary grades and may be provided by individual open lockers, each with a low shelf for rubbers and a hook for hat and coat. Benches should be included as an aid in the dressing process. The storage area for outer clothing should be well ventilated.

The younger children between five and six years of age require special provision for rest, especially if they have a full day program at school. Presently most schools provide mats, or individual rugs, that may be rolled up and stored after use by the children.

The centers of interest in the rooms for grades one, two, and three (primary grades) involve four major divisions: The General Teaching Area; The Personal Hygiene Area; Storage Facilities; Other Requirements for Primary Classrooms.

The General Teaching Area

The general classroom area shall equal approximately 1,000 square feet. In planning this area consider several smaller areas with varying functions of the educational work being done. These areas may be physically separated by movable bookcases, shelving, or other cabinet work. A portable chalkboard or tackboard may also serve this purpose.

Include within the general area these smaller areas:

The general work area with individual provisions for thirty pupils. Include table and chairs in a proper location of prominence in the room.

The library or study area should provide a way to group children for story telling periods or picture book browsing and for other group work activities involving written material. Provide at the center of the area a circular library table, 48 inches or larger in diameter for the children's use. Books are located on the shelves nearby. Large picture books need special display racks and shelves. Deep shelving, 10½ to 11 inches, and tilted shelves require special design work. Good natural and artificial lighting is important for this area.

The block area or play area should be sufficiently large (60 to 70 square feet) so that the children may build "play structures", i.e., a home, a firehouse, or a post office. Within this area the actual activity carried on in the structure shall correspond to the actual activities of society today. This area should not interfere with direct traffic within the room.

Storage is required.

The art area is a section designed for mutual use by four, six, or eight children. Three or four easels of smaller size for primary children shall be provided. A finger-painting table and a clay-working table with water resistant tops and about 24 inches by 36 inches in size are placed close to the windows near the clean-up area where the sink is located.

Storage for the art area includes cabinets for projects under way, storage for quart bottles of paints, boxes of crayons, charcoals, erasers and pencils, and paint brushes. Paper is stored in cabinets; large rolls of wrapping paper need special closet storage.

The nature and science area provides equipment where children may participate in the observation of growing animals and developing plant life. An aquarium and terrarium require natural light. In some cases rabbits and squirrels are observed and fed by the children. Ease of cleaning is a governing requirement.

Again storage is required for cages, simple science apparatus, aquarium or terrarium, where one or more is not in use. Collections of rocks, insects, and other displays of this character will have storage near this area.

The woodwork area should consist of one movable workbench of the proper height for primary children. A vise and unfinished materials are needed.

The motion picture projection area and visual aids area are needed since teaching trends require more work in the audio-visual aids departments.

Pictures and (or) slides may be shown to groups of ten and fifteen children. The room should be designed to adequately darken the area. Special outlets for a 16-millimeter projector are provided.

The phonograph area or music area is important to primary children.

Its use includes both dancing and rhythmics both within the area and on the playground. A portable phonograph is provided with children's records. Storage for records in small numbers should be located near the record player. The library will house the main record collection.

A general storage area for materials and projects of individual children should be designed for heavy use. In this area the children store their personal materials such as papers, pencils, paints, and other items.

The teacher's guidance area should provide for the instructor's desk and chair; this station is near a two-drawer file cabinet. The arrangement shall also have a locker for his personal belongings. A built-in work area may substitute for a desk.

A clean-up area for washing and drinking is needed with one wash-sink at a height permitting the children to clean their art materials and other utensils. Drying boards are used for draining and drying soiled clothes and other materials.

Provide drinking fountains in the teaching area.

Mechanical equipment within the classrooms includes a clock which is placed at a child's eye level so that it may be a teaching aid and also provided are electric outlets, a weather-proof duplex outlet on the exterior, which shall serve the playground.

These requirements are needed to adequately design a primary classroom. The architect shall show these areas with its necessary equipment and facilities with the contract documents, i.e., both the working drawings and specifications. Other requirements include:

1. The Personal Hygiene Area
2. Storage Facilities
3. Wall Space and Chalkboard Design Requirements

The Personal Hygiene Area

The second major section of the primary area is a room for toilets and lavatories. The children's personal health habits, ideally, should be guided within this area, i.e., being taught to wash their hands, cleaning their teeth, etc.

Shelves and soap dispensers and waste paper receptacles are needed. Often, full length mirrors are provided.

Separate toilets will be provided for boys and girls, but the washing and general hygiene area is to be planned so that teacher supervision is convenient. Standard toilet stalls will always have doors; urinals are provided in the toilet room.

A shoe cleaning area with cleaning cloths is provided here. This personal hygiene area should have direct access to the playground. Supervisional ease is a primary goal in this area.

Storage Facilities

Adjoining the primary room, and directly across from it, should be the storage room. Shelves and open bins are needed. Differing supplies have different storage space requirements.

Sleeping equipment (rugs and mats) as well as large pieces of equipment such as slides and teeters which may be used inside the classroom are stored within the general storeroom.

Outdoor storage facilities should be provided to care for garden tools, rakes, blocks, and other equipment which may be stolen or subject to damage by the weather.

Care must be taken that custodial cleaning facilities are close enough to the classroom so that efficient service can be rendered.

OTHER REQUIREMENTS: INCLUDING CHALK BOARD

Wall areas need to be used. A large amount of bulletin board space is helpful in the rooms so that children may display their art work.

The chalk board area should be liberal, with a minimum of 12 linear feet per room. Reference to the table of working heights should be made in connection with placing the equipment. Bulletin boards are somewhat higher than the baseboard in second and third grades. 3

SUMMARY

The architect will be able to plan the spaces for these grades (one, two, and three) only if he follows the details of these instructions. The primary grades are programmed within this framework which respects the children's ages and special needs. The centers of interest involve careful considerations for general teaching, for the children's health, and for mechanical requirements. ref 3

V. AESTHETICS

An individual state of mind can form ideas of unique visual, physical, or psychological qualities. Aesthetic qualities evoke feelings within each person's emotional state of mind. Each individual can make his own judgments concerning his response to aesthetic qualities.

I think each person reacts differently to sensed perceptions. The subject of aesthetics becomes very complex. Pleasing qualities, beauty, poetry, music, and form evoke feelings within each person. These feelings may vary within each type of personality. The aesthetic atmosphere of a school from my limited knowledge of aesthetics shall be discussed.

Aesthetic qualities can create a sense of joy and a feeling of wonder within each person's mind. A human environment sensitively designed can lessen the drudgery of learning. Pleasant stimulations evoked by the architecture can respect each individual's sense of beauty.

Architects are concerned with a humanistic approach which is sympathetic with the total environment. They are concerned with the harmony, contrast, variety, and recognition of the physical landscape, both buildings and open space.

Within this school all the emotions of a young elementary child shall be respected as much as possible. Designers and planners of schools are not perfectly able to determine those aesthetic qualities which shall render a school environment to be ultimately beautiful. The physical needs are much more easily determined. I contend that the physical qualities will directly influence the aesthetic nature of the school; therefore, utilitarian requirements are difficult to separate from the aesthetic nature of the school.

Aesthetic Sense

The aesthetic sense lies within the individual. Each school child needs an outlet for his creative urges. Creativity, imagination, and systematic invention are to be a part of the life in the school. The architecture must excite the imagination of those that "live" there. The ideals and goals of the educational process will be embodied in this school providing an important "house" for learning.

If this is accomplished, the school shall provide a sensitive aesthetic environment.

The Student's Relation to the School Environment

A very large number of qualities influence young minds. Bright colors, textures, interesting forms arouse a student of this age to form interesting ideas and feelings within the school. This aroused interest will help the student adjust to the school.

The relationship of the physical spaces will influence the student's aesthetic sense. Interest and variety within the building and the adjoining landscape will add interest to the student's inquisitive mind.

The solid building masses and intersecting voids can stimulate a pleasant response. The student can sense an awareness of the structures' natural order. Some sense of order must be established if the school's character is going to have an atmosphere conducive to learning.

Simple building elements, physical arrangements of window, chalkboards, door knobs and desk heights, are for the students' use and enjoyment. Simple features can add much to the aesthetic character of the school.

Informal gatherings in sympathetic surroundings can enhance the students' sense of well being. Informal education through student friendships

is desirable. Art forms, painting, and sculpture will be integrated directly with the architecture in a sensitive and pleasing manner. Within the architecture, formative artistic and literary sensitivities can be stimulated within a creative atmosphere, conducive to learning and sympathetic to individual feelings.

Relation of the School to the Site

The playground areas and landscape design shall be designed within school structure. Walkways, courts, and drives will be located in areas that will keep them warm and exposed to the sun.

The adjoining nursing home will be partially separated by trees and bushes. The occupants of the nursing home may want to observe the children on their way to school or during playground activities.

Since the site has no vegetation or contrast, proper landscape facilities must be provided. Playground space must be properly designed to harmonize with the landscape, the school, and trees and vegetation. The site is flat with a very slight change in grade. Careful landscape design must be used to break the monotony of the site. The architectural character of the area is also monotonous. A contrasting type of structure is needed to add to the neighborhood. A distinctive structure will sensitive landscaping is needed in this area.

Architectural Aesthetics

This subject is confusing to most individuals; architects cannot systematically agree on aesthetics among themselves in the profession.

The primary view held by most architectural designers is that the design must be honest, in form and structure. Materials must be used in a manner respecting their physical properties, strength, and size.

The building (school) should not disguise its structural system. Beams and columns should not be hidden or covered with elements presupposed to enhance its character. The exterior of the structure should reflect the internal form of the structure. Honesty, to my understanding, shall be very important to structural quality of the building; this character of structural honesty is pleasant to an architect's aesthetic sense.

The school's character should reflect a sense of wonder and awe to the viewer independent of the designer's personal character. Architecture should go beyond the individual style or character. Architecture is a separate realm independent of forced qualities that are often implanted by dogmatic "stylists".

The personal taste of the designer may dictate what architectural design should be. But, the good designer bases his decisions upon both personal sensitivity and engineering sense. The architect tries to respect, as well as possible, the opinions and feelings of those that use his structure.

It would be far too easy to determine what is good and ultimately beautiful for both the students and teachers in this environment. One person does not know what shall be ultimately good for others; architects are limited in determining aesthetics. All one needs to do is look at the physical environment around us for proof of this accusation.

But many architects have the personal desire and skill to create a better and more sensitive physical environment. The hope for creating a good school for Billings elementary children will involve a careful translation from a functional study of their physical and their psychological needs.

VI. BASES FOR AN ECONOMIC STUDY

The economic limitations are based upon cost, size, and quality. Cost is the most important factor since it governs the size and quality of the structure.

Often overlooked are operational costs, maintenance, and repair costs. These special problems deserve consideration during the design stage. Any equipment designed into the structure may save work for the maintenance staff. The dividend received from careful design may minimize future operating costs and add to the life of the structure.

These methods of comparing costs are generally accepted for planning schools:

1. area per student
2. cost per student
3. cost per square foot
4. average classroom cost
5. cost per ln. foot

Use of cost references vary. The cost-per-pupil method is the least accurate of comparing costs. This method does not allow for equipment provided nor for multiple use of the structure.

Bonding (History)

School Budget limitations:

The method which the school district finances is through bonding. The amount of indebtedness must not exceed 5% of the districts assessed valuation. The assessed valuation has increased each, thereby increasing the bonding capacity of the district. The increased evaluation helps pay any occurred indebtedness.[1]

School District No. 2 Assessed
and Taxable Valuations and District and County Tax Levies

Assessed Value	1959	$189,003,275
	1960	$202,453,051
	1961	$206,038,316
	1962	$210,829,630
	1963	$217,054,564
	1964	$218,925,180
	1965	$229,417,720

Presently the Elementary district has twice the number of students needed to construct new buildings for Billings, compared to the Billings High School District, but less bonding capacity. Since the increase in students generally occurs first at the elementary level, their need for new schools has been greater than in the High School district.

Construction Costs (History)

The construction costs in Billings have been much less than for other averages in other districts in the State. The average costs for constructing new classrooms and schools in Billings between 1954 and 1964 are listed below:[1]

Classrooms Built in Billings Public Schools 1955-1964

	No. Classrooms	Cost/sq.ft.	Classroom Average
Elementary-Grades 1-6	168	$10.47	$18,206.00
Secondary-Grades 7-12	147	$12.69	$30,929.00

The cost of schools includes more than just the actual classroom. Hallways, lavatories, offices, libraries, multi-purpose rooms, and storerooms are included in the average classroom cost in the table.[1]

The average classroom cost, including other necessary facilities can be used for estimating the costs of a new school. An additional $1500 must be added for equipping each classroom with desks and other necessities.

The projection of building costs is difficult. Estimated building costs increase at the rate of three percent to four percent yearly in Montana. My consideration is to be an estimate considering the present cost of construction in Montana.

With increasing numbers of students each year the cost of operations increases. More personnel, increased maintenance costs, increased equipment costs, and increased construction for building additions account for high operations costs. The Billings and Yellowstone County tax payer shall be accountable for paying increased taxes.

The elementary school system projects these costs to classroom needs. Twenty-five classrooms are needed by 1968-69. The total cost shall be $455,000.00.[1]

Two seven-acre sites are needed by 1968-69 for a total cost of $42,000 for the district.[1] The total cost for all building needs shall be $565,213. This includes:

1. classrooms and other building facilities
2. equipment for classrooms
3. architect's fees
4. school sites
5. special provision for growth

Since the elementary district shares in two-thirds of the junior high school costs (for grades 7 and 8), and the senior high district shares the projected cost for the junior high schools for ninth grade. The costs are alloted to the districts as given below:

Elementary District No. 2, Yellowstone County	1968	1970	1947
	565,213	690,780	627,927

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