

AN ELEMENTARY SCHOOL FOR BLACKSBURG

by

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## **INTRODUCTION**

## INTRODUCTION

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The last war stopped school building almost completely and school building standards have changed so thoroughly during the past decade that the 1940 classroom is outmoded. Consequently American communities have found themselves with a large percentage of their available instruction space either obsolete or, in many cases, in bad state of repair.

When the estimated seven million war babies started entering the first grade in 1948, the country's troubles had only begun. Some educators believe that at least eleven years of school construction is still necessary to meet the demand brought on by the new influx of pupils.

Although no extensive school building program was carried out during the recent war, much research was done in the planning field. The builders of new schools should heed this research, and incorporate proven trends in their buildings. Many fine examples, utilizing this research, have been built across the country, and stand today as prototypes of better schools for tomorrow.

The school situation in Blacksburg, Virginia proved to be typical of the one facing many American communities. The author's primary purpose was to show the need for a new elementary school in Blacksburg. His secondary purpose was to investigate present trends in educational plant design, and include those trends appropriate in detailed drawings for a building to be designated as "The Blacksburg Elementary School."

## **THESIS OBJECTIVES**

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THIS THESIS HAS FOUR OBJECTIVES:

FIRST, to investigate the need for a new elementary school in Blacksburg, Virginia.

SECOND, to show how present trends in education have affected the design of elementary schools in Virginia and in the United States.

THIRD, to analyze the requirements of the various school departments and areas.

FOURTH, to prepare detailed drawings of a school incorporating the required elements as revealed by the investigation. The school is to be designated as the "Blacksburg Elementary School."

**PART ONE - INVESTIGATION OF THE NEED FOR A NEW ELEMENTARY SCHOOL**

### INVESTIGATION OF THE NEED FOR A NEW ELEMENTARY SCHOOL

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The town of Blacksburg is in dire need of a new up-to-date elementary school. This conclusion was reached by the author after he had held a series of interviews with both the principal of the school and the superintendent of schools for Montgomery County, and after he had conducted investigations of the buildings and facilities of the existing educational plant. In every instance it was evident that the present plant leaves much to be desired. Primarily, the majority of the buildings have outlived their usefulness and, when judged by recent standards for the design of educational buildings, most of them are obsolete. To add to the conglomeration of buildings which housed the elementary grades, the school board has decided to turn the present high school into elementary instruction space when the new high school, now under construction, has been completed.

The property upon which the school stands is too small for the present enrollment. Furthermore, the school grounds are in a congested area and there is no possible chance for expansion. The property is also very valuable for the extension of the growing commercial district of Blacksburg. Other disadvantages resulting from the present location include traffic hazards and noise distractions.

Most of the present buildings offer inadequate protection for the pupils in case of fire. The major fault noted was the lack of fire towers and inclosed stairways. Consequently the buildings do not conform to the present state fire code.

## INVESTIGATION OF THE NEED FOR A NEW ELEMENTARY SCHOOL

The main reason for providing a new school plant is quite obvious. The present plant is substandard for housing the facilities so necessary for a modern elementary school of the size required for the Blacksburg community. The major fault found was poor daylighting caused by varied classroom orientation. Also, classrooms in the building group are of all sizes, and are in a bad state of repair.

The present schedule requires that half of the students in grades one and two attend classes in the morning and the other half in the afternoon. This, of course, is not at all desirable since instruction must be crowded into a very few hours, and some of the young children are required to spend the late hours commuting from school to home.

The question of inadequate space again arises when the present recreational facilities are studied. For 1000 students, the maximum enrollment expected, the present plot of five and one-half acres is much too small. A minimum plot of five acres plus one acre for every 100<sup>1)</sup> students is required by the State Department of Education. The present plot also lacks sufficient parking areas for school busses and automobiles. This is an important consideration since sixty per cent of the students are transported.

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1) Virginia State Board of Education, "Minimum Requirements and Standards for School Buildings in the State of Virginia," Richmond, Virginia, 1950, p. 5.

INVESTIGATION OF THE NEED FOR A NEW ELEMENTARY SCHOOL

According to Mr. J. A. Fetter, the school principal, the community has a great need for standard instruction for pre-school children. At present there are five different nursery schools in Blacksburg with almost as many different methods of teaching. Mr. Fetter is also of the opinion that this pre-school instruction should be made a part of the elementary educational program. In this way all children entering school would be on an equal footing and know what was expected of them.

PART TWO - THE PRESENT TRENDS OF ELEMENTARY  
SCHOOL DESIGN IN VIRGINIA AND THE UNITED STATES

The perfect school building will probably never exist. It implies a static education. It is possible that today's school buildings can approximate perfection in terms of known needs.<sup>2)</sup>

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2) Englehardt, N. L., "Trends Affecting School Building Planning," 1947 Convention Seminar Addresses on: Schools, Hospitals, Urban Planning, 1947, p. 88.

THE PRESENT TRENDS OF ELEMENTARY SCHOOL DESIGN IN VIRGINIA AND THE  
UNITED STATES

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The special nature of school design has been recognized by educators and architects. The modern educational plant is being planned in the light of the varied functions which regularly occur in the daily program of the contemporary school. Schools are being planned as vital, functioning organisms of the communities which they serve. The planners of these schools conclude that each community is individual. A standardized school cannot serve its specific needs.

Function and flexibility are two important considerations in modern elementary school design. These considerations have reached special importance in this day of rapidly increasing population. More thought is being given to future alterations and additions so that a school built today can, with certain modifications, serve tomorrow's needs. Function and flexibility assume an even greater importance when one considers the continually changing programs and curriculums.

A thorough study of school classroom design was published in 1948 by Dr. Darrell Boyd Harmon, Consulting Educationalist of Austin, Texas. The following summary outlines Dr. Harmon's concept of classroom design:

Out of Dr. Harmon's researches he has evolved the concept of the "co-ordinated classroom." Such a classroom involves the functional synthesizing of painting, daylight control, artificial illumination, seating, and other physical aspects of the surroundings. This coordinated planning balances the physical forces in the room in a manner to meet children's growth needs, and to permit purposeful educational experiences

THE PRESENT TRENDS OF ELEMENTARY SCHOOL DESIGN IN VIRGINIA AND THE  
UNITED STATES

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without distortions of sensation or restraints of performance. Classrooms coordinated in terms of the Harmon Technique are distinguishable by the following:

1. Optical control of daylight to reduce window brightness, while still using all available natural light by redirecting it to proper reflecting surfaces in the room for uniform distribution throughout the children's visual fields;
2. Painting and decoration planned to provide proper color and adequate reflectance and reflecting surfaces for brightness and contrast control within the established physiological tolerances of children performing the tasks of school;
3. Seating and other working equipment engineered to conform to the proper body mechanics of children engaged in full and free performance of educational activities;
4. Artificial lighting designed to supplement the optically balanced distribution of natural light, and maintain its quality and distribution when daylight becomes inadequate;
5. Design and treatment of chalk boards and other educational aids so as to conform with the coordinated plan.<sup>3)</sup>

Another trend today is in the use of continuous windows in classroom wings, administrative areas, and cafeteria units. Light-diffusing glass block is frequently used for continuous fenestration in conjunction with a ventilating and vision panel.

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3) "A Thumbnail Sketch of the Harmon Technique," How to Decorate Classrooms in the Harmon Technique, National Chemical and Manufacturing Company, Chicago 9, Illinois, 1948, p. 2.

THE PRESENT TRENDS OF ELEMENTARY SCHOOL DESIGN IN VIRGINIA AND THE  
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The use of semi-permanent, lightweight partitions is also a trend that has been brought on by the demand for flexibility.

Bi-lateral lighting is a device which allows a better distribution of light in the classroom. This method of lighting a room from two sides is achieved by lowering the corridor height so that clerestory windows with directional glass block can be installed above the corridor roof.

The modern elementary school is designed to serve a specific function, that of affording young Americans the maximum development of their individual aptitudes. The new school is designed to grow with the community, to accommodate changes in methods of teaching, and to allow the addition of facilities when the necessity arises.

**PART THREE - SITE SELECTION**

## S I T E   S E L E C T I O N

Two factors governed the author's selection of a suitable site. The first factor, an important one, was the size of the site. The second factor, equally important, was the central location of the plot chosen. Since the expansion of the town tends to be in the southwesterly direction, a large area of land in this section of town would be an ideal location for the new school. This location would also be in the center of the attendance area.

The plot chosen is the old Palmer Estate, bounded on the southeast by Main Street and Eheart Street on the northwest, the only large area of land centrally located. This plot of land consists of approximately forty acres, and is more than adequate in size. At present, only fifteen and one-half acres are required by the State Board of Education<sup>4)</sup> for a school of this size. It was felt that the extra acreage in the chosen lot will prevent congestion and allow for expansion when the need arises. This location is free from traffic hazards. It is doubtful that noise will ever be a distraction in this area.

Although the general topography of the plot is not ideal for a school building, the ground is mostly high. The attribute, plus the other good qualities mentioned, outweighs the irregularity of the site. The high ground commands an excellent view, and promises dry ground and good drainage. The ridges and knolls offer innumerable possibilities for attractive landscaping.

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<sup>4)</sup> Supra (1) p. 5.

#### **PART FOUR - THE VARIOUS SCHOOL AREAS**

## THE VARIOUS SCHOOL AREAS

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### Administration

The administrative areas should contain the principal's office, a general office, and waiting room, the health guidance suite, a guidance office and, possibly, a teachers' room.<sup>5)</sup>

### Principal's Office

The principal's office should be designed as the point of contact between the school and its administration, between the school and parents, and between the school and each of its students.

It is the place to receive parents and students amid pleasant surroundings. It should serve its function as a place where the principal can exercise leadership and guidance in an atmosphere that is not too precise and cold.

The principal's office is the hub around which the whole educational program revolves. It, necessarily, requires a place of importance and accessibility for all who have an interest there.

### General Office

This space should be adjacent to the principal's office, and it should include space for the necessary business functions. Desk space for office clerks and secretaries should

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5) Connecticut State Department of Education, "Public School Building Code Including Standards for Approval," 1950, p. 64.

## THE VARIOUS SCHOOL AREAS

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be included in this area. A built-in storage vault for records and valuable papers is necessary.

### Teachers' Room or Council Room

It is desirable also to allow space for a council room, at least 800 square feet in size, that may be used for teachers' meetings and similar functions.<sup>6)</sup> It is possible for this room to serve a dual purpose as a teachers' lounge and workroom. This area should be well-lighted and ventilated, and have an atmosphere conducive to relaxation. A men's toilet and ladies' powder room should be accessible from this area. Racks and shelves for magazines and books should be provided. Space should also be provided for such necessary items of furniture as easy chairs, couches, and tables.

### Storage Space

A large storage space for general office supplies is needed in the administrative unit. Shelves and cabinets are necessary equipment, and should be included in the design of this area.

### Waiting Room

A public waiting room should be combined with, or adjacent to, the general office space, and should be comfortably outfitted with chairs or couches.

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6) Perkins, Lawrence B. and Cocking, Walter R., Schools, Reinhold Publishing Company, New York, New York, 1949, p. 87.

## THE VARIOUS SCHOOL AREAS

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### Health Guidance Suite

The recent tendency has been to move the health guidance supervision from the physical education department to a place near the administrative area.<sup>7)</sup> The latest theory being that health education is an integral part of general education, and not the sole responsibility of the physical education department. This location also makes it convenient for both pupils and public.

The facilities should include a waiting room, an examination room, rest room, dressing booths, toilet facilities, and possibly a nurse's room.<sup>8)</sup>

The suite should be finished with materials that insure sanitary conditions, but a clinical appearance should be avoided. Restful, pleasant colors should be used throughout.

### Guidance Office

The guidance office is a place for counseling students and administering psychological tests. This office should include a desk for the councilor and several small tables or desks for students being tested. Storage facilities for testing materials should be included.

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7) Ibid p. 128.

8) Supra (5) p. 64.

## THE VARIOUS SCHOOL AREAS

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### Cafeteria

The cafeteria is essential in some form in all schools. It should be located on the ground floor and should be conveniently accessible from outside recreational areas. Proximity to the multi-purpose room is desirable. It should be so located that delivery trucks have direct access to it.

This area should accommodate at least half of the total enrollment at one sitting.<sup>9)</sup> The dining area should be completely closed off from the kitchen and service area. Special soundproofing has proved indispensable in separating these units.

Other points of major importance in the planning of this unit include noise reduction in both kitchen and dining areas; forced ventilation, including the use of a hood and exhaust fan over the cooking area; and sanitary finishes. These sanitary finishes should include glazed structural tile, glazed brick or waterproof, hard plaster for walls. The kitchen floor should be grease-resistant asphalt tile or terrazzo. These finishes are both sanitary and easily maintained.

Provision should be made for the following areas:

#### (a) Receiving

This area should be convenient to the kitchen, and it should be served by a loading platform. Facilities should

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9) Supra (5) p. 58.

## THE VARIOUS SCHOOL AREAS

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include shelves and storage bins.

### (b) Dry and Refrigerated Storage

The dry storage area should have an adequate number of shelves and an area for large storage cans. Proper ventilation and vermin-proofing are other points that should be considered in its design.

A walk-in refrigerator should be provided; this should be supplemented by several reach-in boxes.

### Small Kitchen Equipment Storage

This area should include adequate shelving for small utensils and utility drawers for odd storage.

### Tableware Storage

Dishes required 10 linear feet of 18 inch shelving, 12 inch clearance, per 100 meals where usual service includes 9 inch dinner plates, soup bowls, and fruit saucers. Silverware requires 1 to 1½ drawers per 100 meals. Locate convenient to service.<sup>10)</sup>

### (c) Preliminary Preparation

The preliminary preparation area should include a work table, a vegetable sink, a potato peeler, and electrical outlets. A refrigerator should be accessible.

### (d) Preparation

Equipment in this area should include heavy duty ranges, located conveniently to a two-compartment sink, a deep pot

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10) Supra (5) p. 59.

## THE VARIOUS SCHOOL AREAS

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sink, and a work table. Electrical outlets should be installed for a power mixer and a slicing machine. Bake ovens, a baker's table, and a pressure steamer should be included.

### (e) Serving

A separate serving room is not essential, but it is desirable. A service counter should be included in the design.

Essential equipment for this counter should include steam tables, milk and ice cream refrigerator, and cash registers.

### (f) Dining

This area should have direct access from school corridors, and should have convenient access from the outside. The traffic should be planned to avoid unnecessary confusion. In the way of equipment, small tables are preferable to large ones, and chairs preferable to benches, because children are more at ease in small, flexible groups. Coat racks and shelves should be included for wraps and books.

### (g) Dishwashing

A large dishwashing machine, including special hot water heaters, should be installed. An access counter from the dishwashing area to the dining hall should be provided to facilitate the handling of dishes.

### (h) Garbage and Trash Disposal

This area should be outside the building and be fly-

## THE VARIOUS SCHOOL AREAS

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proof. The floor should be of concrete and include a drain. A hot water faucet for use in washing cans should be installed.

### (i) Cleaning Equipment Storage

This area should be directly accessible to the kitchen. The facilities should include a ventilated mop closet with a utility sink. Storage facilities, including shelves for cleaning supplies, are a necessity.

### (j) Planning Center

A large school requires a large cafeteria staff, with a meal planner or a dietitian in charge. This person requires a space equipped with desk, phone, and filing cabinets to properly carry out his or her work.

### (k) Provision for Workers

A small lavatory near the kitchen is necessary to encourage frequent hand washing for all food handlers. Lockers and separate toilet facilities are also a necessity.

## Custodial Unit

### (a) Heater Room and Fuel Storage Space

The heater room should be directly accessible from the outside, and should be of fire-resistive construction. A self-closing fire door should be the only access between this area and the rest of the school.

## THE VARIOUS SCHOOL AREAS

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### (b) Receiving Room

This should be planned and equipped for unpacking and storage of school supplies. Bins and shelves are necessary. Provisions should be made for the storage of lawn mowers and other heavy equipment. Good ventilation should be provided.

### (c) Work Space

The work space is necessary for the maintenance of school property. A work bench and tool storage space should be provided, as well as a desk and filing space.

### (d) Supply Room

The supply room should be adjacent to the work space and equipped with shelves and bins for the storage of paints and cleaning compounds. This area should be well ventilated and of fire-resistive construction.

### (e) Sanitary Service Sinks

Service sinks should be installed at appropriate locations throughout the building; at least one on each floor is necessary.

## Multi-Purpose Room

Even though elementary schools do not generally participate in interscholastic competitive sports, their aim should be the health and physical well being of all of the pupils. To accomplish this aim, every school should have a well-rounded physical fitness program. This program should include various indoor and outdoor games and exercises. The only indoor facilities necessary for an elementary

### THE VARIOUS SCHOOL AREAS

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school are a large play room, an office, and an equipment storage space. The outdoor play areas should be equipped with such facilities as jungle gyms, slides, sandboxes, and provisions for informal games.

When economy demands, the large play room should have a dual function; it should also serve as a small auditorium. A stage, dressing rooms, chairs and chair storage space should be sufficient additions to the playroom to meet the needs of a small auditorium.

Visual conditions in the multi-purpose room should be given considerable thought. The source of artificial illumination should be high so as not to cause excessive brightness contrast in areas where activities are being carried on. Colors with high reflective values should be used throughout.

This area should be treated acoustically, with especial thought given to its rectangular shape. A porous wall material painted with water paint should prove satisfactory in absorbing most of the noise. Even so, this area should be somewhat isolated from the quiet areas; it may possibly be in the same unit with the heating plant and cafeteria. Its multi-use demands separate heating and ventilating controls. The first floor is the obvious place for this unit since accessibility to the outside play areas and the parking lot is of paramount importance.

### Library

The library should be given a prominent position in the quiet area of the school plant. If this is not possible, then it should at

### THE VARIOUS SCHOOL AREAS

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least be separated from noisy areas by a buffer zone of work rooms or storage spaces.

The library group should include a reading room, which allows twenty-five square feet per person for at least ten per cent of the enrollment, work rooms for repairing books, a supply room, and a conference room.<sup>11)</sup>

The library should serve as an essential service and teaching agency. It should provide opportunity for cultural experiences and be a major influence in enriching the lives of children. The adequate library provides reading guidance, varied reading materials, and actual library experience for the individual elementary students.<sup>12)</sup>

The library furniture should consist of an adequate number of tables and chairs, varying in size, to accommodate all ages enrolled in school. Open, adjustable shelving to house the book collection, and appropriate cabinets to house instructional equipment should also be included. A card catalogue, filing cabinets, and provisions for newspapers and magazines are other items that require serious consideration.

Research in library design has shown the necessity for good illumination, both natural and artificial. Adequate daylighting will insure a light and colorful interior. Windows to the east and west

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11) State Board of Education, "Library Standards for Virginia Elementary Schools with Seven or More Teachers," effective 1953-1954, p. 1.

12) Ibid. p. 1.

### THE VARIOUS SCHOOL AREAS

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create control problem, so light should be admitted by means of south or north windows or by directed reflection of sunlight to overhead diffusing surfaces. If possible, light should be admitted from at least two sides of the room. Artificial lighting should be flush with the ceiling and of low surface brightness.<sup>13)</sup>

The library program includes many recent additions to the elementary school curriculum, such as the use of audiovisual materials and recordings. The new library should be designed with the thought in mind that other developments in teaching media will continue to expand this program. For this reason, flexibility is of prime importance in the new library room.

Noise reduction treatment should be provided to guarantee a quiet atmosphere in the library. This sound deadening can be achieved in many ways with materials that will be pleasing esthetically.

### Classroom Unit

The classroom should also be located on the ground floor, and should have direct access to the playground. Recent studies, by such noted school architects as Lawrence B. Perkins and Philip Will, Jr., have shown that the square classroom has proved more versatile than the standard rectangular type.<sup>14)</sup> The square plan with movable seats allows a greater variety of seating arrangements.

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13) Wynkoop, Frank, School Management, June 1948, condensed from the Bulletin of School Library Association of California.

14) Supra (6) p. 74.

### THE VARIOUS SCHOOL AREAS

A recent trend is the use of movable furniture. Tables and chairs or individual desks may be used. All furniture, as well as the other appointments in the room, should be scaled for the occupants. If individual desks are used they should be equipped with adjustable tilt-tops so that they may be adapted to many uses. Other equipment should include bookshelves, display counters, supply storage shelves, and a built-in wardrobe. Chalkboards should cover at least one wall, and as much bulletin board space as possible should be provided. A drinking fountain installed in each room is desirable. Provisions should also be made in all rooms for the use of audio-visual equipment.

The activity alcoves for these rooms should be outfitted in much the same way as the alcoves of the kindergarten-nursery unit with the exception that a clay bin is not required.

Teacher-centered activities in which children are oriented in new educational experiences very seldom involve more than a third to a half of the group in the room at any one time.<sup>15)</sup> No single piece of school furniture can be designed to meet every curricular need. In past years it was assumed that every child must have a desk of his own. This practice lead to furnishing identical pieces of furniture for every occupant in a room. Quite naturally this restricted the floor space available in such a way that there was very little chance for

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<sup>15)</sup> Harmon, Dr. Darrell Boyd, "The Co-ordinated Classroom," A. I. A. File No. 35-B, 1949, p. 48.

### THE VARIOUS SCHOOL AREAS

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diversified individual or group activity.

The present trend in curricular organization calls for various activities to be carried out in one room at the same time. Several different types of furniture would be necessary then in a modern elementary school. Dr. Harmon mentions as an illustration of this trend, an intermediate grade classroom with thirty pupil enrollment. Suggested equipment for this room would include sixteen fully-adjustable movable-type desks, four two-place tables, a library table, and twenty-four individual chairs. This would be in addition to the other equipment mentioned above.

#### Nursery School and Kindergarten Unit

As stated earlier, Blacksburg is sorely in need of standardized pre-school instruction. The best solution to this problem in similar cases has proved to be a combined kindergarten and nursery school unit, either combined with or adjacent to, the elementary school. In combining the kindergarten and nursery units it is possible to omit duplication of such necessities as kitchenette, storerooms, entrance, and play yards.

This unit should be located on the ground floor and be served by a separate entrance that is convenient to the play area. Other exits to the play area should also be planned. The most desirable exposures for this unit are south, southeast, and east.

## THE VARIOUS SCHOOL AREAS

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### (a) Main Room

It is the opinion of many specialists that this room should be designed to accommodate approximately thirty children and <sup>16)</sup> should allow at least thirty square feet per child. All furniture and decoration should be scaled for the young. Window sills should be low enough for the children to see out. Movable bookshelves and bulletin board combinations should be planned for the semi-partitioning of large rooms. Pupil cubicles, and numerous built-in cabinets and shelves are necessary. Work benches, tables and cupboards are other items of standard equipment. Space must be provided for the storage of sleeping mats and blankets. Provisions should be made for large tackboard space; a small area of chalkboard is all that is necessary.

### (b) Activity Alcove

This area should be provided with work benches, storage shelves, a work sink, and a clay bin. This area is generally used for the noisier and more litter-producing activities <sup>15</sup> than the main room. It should be open to the main room for supervision.

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<sup>16)</sup> Architectural Forum, Time Incorporated, New York, New York, November 1950, p. 85.

## THE VARIOUS SCHOOL AREAS

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### (c) Kitchenette

One large centrally located unit should be installed in the nursery-kindergarten section. Provisions should be made for a sink, a hot plate and for a small oven for simple cooking. Dish and cooking utensil storage must be provided. Storage for juices, crackers, and food staples should be included.

### (d) Toilets

At least two junior size water closets should be installed in an alcove just adjacent to the main room of the kindergarten. The nursery toilet rooms should include at least five junior size water closets.<sup>17)</sup> Low lavatories should also be included in this room, or just outside the entrance. Teacher's toilets should be made convenient to the nursery-kindergarten unit.

### Cloak Room and Wardrobe

The wardrobe can be either locker type or hanger-type, but it should be located conveniently to the playground or outside entrance. Some partitioning of wardrobe space should be provided to prevent contact between different children's clothing. Space should also be included for the teacher's wraps.

### Stere Room

This area is necessary for the storage of outdoor toys, and it should be convenient to the play yard entrance or in the yard.

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17) Conversation with Miss Daphne Hobson, Nursery School Teacher

## THE VARIOUS SCHOOL AREAS

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Space should also be allotted for bulky indoor toys such as construction blocks, easels, and other supplies.

### Play Yard

This should be set aside from the rest of the school yard. It should have a sunny exposure, but it must have shade. Hard surfacing on part of this area is desirable and an outdoor faucet for painting and water play is necessary. Jungle gyms, slides, and sand boxes are preferred equipment for young children and should be installed in this area.

### Resource Rooms (4 required)

These rooms are recent additions to the space requirements of the State Board of Education.<sup>18)</sup> They should serve the function of housing the materials and equipment for instruction in homemaking and the practical arts.

The equipment should include an electric range, a refrigerator, work benches, storage cubicles, and shelves.

Similar space should also be provided for the instruction of elementary industrial arts. This space should include benches, tool storage, and a paint locker. Individual storage shelves or lockers are also necessary in this area.

### Music Room

This area was included in the design to meet the growing

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<sup>18)</sup> Virginia State Board of Education, "Plan for Resource Room", The Board, Richmond, Virginia, July, 1950, p. 1.

#### THE VARIOUS SCHOOL AREAS

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interest in music appreciation. It was also the desire of the principal of the school that such an area be incorporated in the educational plant.

Special acoustical treatment of this room is necessary. It should be treated to prevent excessive noise transmission to other areas.

Standard equipment includes chairs, music stands, filing cabinets, and storage facilities for music instruments.

**PART FIVE - MECHANICAL EQUIPMENT**

## MECHANICAL EQUIPMENT

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### Heating and Ventilating

Good heating and ventilating systems contribute greatly to the comfort, health, and efficiency of the occupants of a school. It is necessary then that all schools should be provided with an acceptable system; one that is not necessarily chosen for initial cost, but for economy of operation and overall efficiency. This system should provide desirable thermal and atmospheric conditions at all times and at low maintenance and operational costs.

The heating and ventilating system should also provide, (A) the supply of heat to balance the loss from the human body through radiation, conduction, and evaporation and to balance the losses of heat from the room through exfiltration; (B) the removal of excess heat; (C) the dilution and removal of unpleasant body odors and in some cases direct removal of obnoxious gases, fumes, and dust; (D) the prevention of rapid temperature fluctuations beyond or even within the total acceptable ranges; and (E) adequate diffusion of heat without excessive stratification or excessive drafts.<sup>19)</sup>

A school building can be ventilated by projected windows for approximately five months of the year in this climate. However, mechanical ventilation is necessary at times to supplement this. At other times, the school will depend entirely upon this mechanical system. Provision must be made to introduce fresh air into all rooms and to exhaust stale air from them. Minimum air changes per person of fifteen cubic feet per minute should be provided in all classrooms. <sup>20)</sup>

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19) American School Buildings - Twenty-seventh Yearbook, American Association of School Administrators, National Education Association of the United States, Washington, D. C., 1949, p. 147.

20) Ibid p. 148.

## MECHANICAL EQUIPMENT

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The comfort of the occupants of a room depends greatly on air movement. This should be taken into consideration along with the possibility of humidification and air cleaning.

Radiant heating coils in the floor have proved successful in many school installations. When used, these coils were usually supplemented by fin-type convectors just below the windows on the outside wall. These convectors heat the incoming air before it reaches the occupants of the room. The over-all effect in a room heated in this manner is a feeling of comfort. This feeling is due largely to the fact that the room's surfaces are heated to a temperature that will permit a normal heat loss from the body.

## Electrical Equipment

Although lighting equipment is the major use of electricity in school buildings, electricity is also used for audio-visual equipment, the fire-alarm system, and radio-sound systems. The latter is being used more frequently in our school systems for aid in teaching and administration. Clocks and other types of call systems may also be operated by electricity. It is even possible to make allowances for the use of television, since some stations are now broadcasting children's educational programs.

## Plumbing and Sanitary Equipment

In the nursery-kindergarten unit and in the lower elementary unit, toilet rooms should be provided for each room. The upper elementary unit should have toilet facilities for each sex, and they

MECHANICAL EQUIPMENT

should be grouped together if educational utility is not seriously impaired. Provision should also be made for toilet facilities for administrators, teachers, school employees, and the public.

The number of water closets in the upper elementary wings shall be determined as follows:

Water Closets required:

one for every 35 girls  
one for every 50 boys

Wash basins shall be provided for every toilet as follows:

Wash Basins required:

one for every 60 girls  
one for every 60 boys

One urinal for every thirty boys shall also be provided. <sup>21)</sup>

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21) Supra (1) p. 14.

**PART SIX - MATERIALS AND CONSTRUCTION**

## MATERIALS AND CONSTRUCTION

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The structural material used throughout the building is steel. This was chosen over reinforced concrete because of the time that can be saved in the erection of the frame, and because of its economy due to the elimination of construction forms. The footings and the foundation walls are concrete. Continuous steel reinforcing is placed in all footings.

### 1. Roof

A twenty-year bonded, five-ply tar and gravel roof is applied to a two inch poured-in-place gypsum slab. The roof slab is supported by steel joists. Heavy metal lath, plaster, and acoustical ceiling tile are supported by the joists. Copper is used for fascia covering, gravel stops, and drips.

### 2. Walls

All walls are of the non-load-bearing type. The exterior walls of the building are constructed of four inches of brick as a facing, and backed by six inches of cinder block. The cinder block is painted for use as a finish in most areas of the building. This finish was chosen for its acoustical properties and economy. Glazed tile is used as wainscoting in all corridors and stair wells; quarry tile wainscoting is used in all toilet rooms.

### 3. Partitions

Four inches of cinder block is used for all partitions separating classrooms and the different elements in the administrative

## MATERIALS AND CONSTRUCTION

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unit. This semi-permanent construction is used for ease in providing future expansion and reallocating existing space.

### 4. Ceilings

The reduction of noise in an elementary school is of utmost importance; for this reason most of the ceilings in the building are finished with three-quarters of an inch of acoustical tile on three-quarters of an inch of plaster. Exceptions to this finish are those in the toilet rooms, vault, covered walkways, and boiler room. The latter is a concrete slab; the former are finished with cement plaster on metal lath.

### 5. Floors

All floors are poured concrete slabs containing radiant heating coils. The ground, or first floor slab is four inches of concrete poured on a moisture barrier over six inches of gravel. The second floor is two and a half inches of concrete covering the radiant heat coils and supported by paper-backed wire mesh reinforcing which serves as both form and reinforcement for the slab. This is supported by open web steel joists, which in turn are supported by steel beams.

### Natural Illumination

The primary light source in the public school classroom is daylight. This is especially true in those classrooms of the elementary school where it is found necessary for psychological reasons, to integrate the more familiar surroundings of the child - the outdoors -

### MATERIALS AND CONSTRUCTION

with his environment away from home, the classroom - by providing a vision strip.<sup>22)</sup>

Daylight must be controlled, however, if it is to be of any use in the classroom. The diversified classroom curricula of the modern school counts heavily on controlled daylight to properly carry out the various classroom tasks. Two outstanding methods of accomplishing this control have been developed and used widely with much success. An auxiliary diffuser system, consisting of canvas covered, wood-framed rectangles placed at an angle of approximately 45 degrees with the window on the inside of the classroom, has been used in the remodeling of existing classrooms. Light-directional glass block, the other system, is more desirable for new construction. This block is an optically designed daylight-control device, which redirects the largest part of the light upward and into the room. It provides for both some horizontal direct and some downward diffuse light. This system adequately solves the daylight problems of glare, high contrasts, excessive diversity, and improper three-dimensional modeling shadows.<sup>23)</sup>

In his extensive tests, Dr. Hamon discovered that classroom lighting, or rather the lack of proper classroom lighting was affecting the whole human organism. There was a large overlapping of visual, postural, nutritional, infection, and behavior difficulties in the old

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22) Supra (15) p. 35.

23) Supra (15) p. 32.

## MATERIALS AND CONSTRUCTION

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classrooms that were tested. It was learned that the major cause of these difficulties lay in improper lighting, both natural and artificial. Other factors influencing such rooms were dark furniture, dark walls and ceilings with poor reflective qualities. A room thus outfitted subjected its occupants to unnecessary glare, high contrasts, excessive diversity, and improper three-dimensional modeling shadows.

As stated earlier, Dr. Hamon solved these difficulties by using light-directional glass block, very light natural finish movable furniture, green chalk boards, and painting and decoration planned to provide proper color and adequate reflectance.

School lighting is much more than glass area and wattage. It is fundamentally a matter of brightness balance of natural and artificial light sources and reflecting surfaces within the total visual environment. Although the eye adjusts readily to its environment, it cannot adjust to excessive brightness differences which exist simultaneously within the visual field. Such conditions result in eye strain and lowered efficiency. Brightness differences can be reduced by shielding the lamp, seating the pupils so they will not face the windows, repainting with pastel tints, using lighter furniture and chalk board, and increasing the light intensity within the room.

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24) Hamon, Ray L., Chief, School Housing, Division of School Administration, United States Office of Education, "Lighting School-rooms," United States Printing Office, Washington, D. C., 1947, p. 3.

## MATERIALS AND CONSTRUCTION

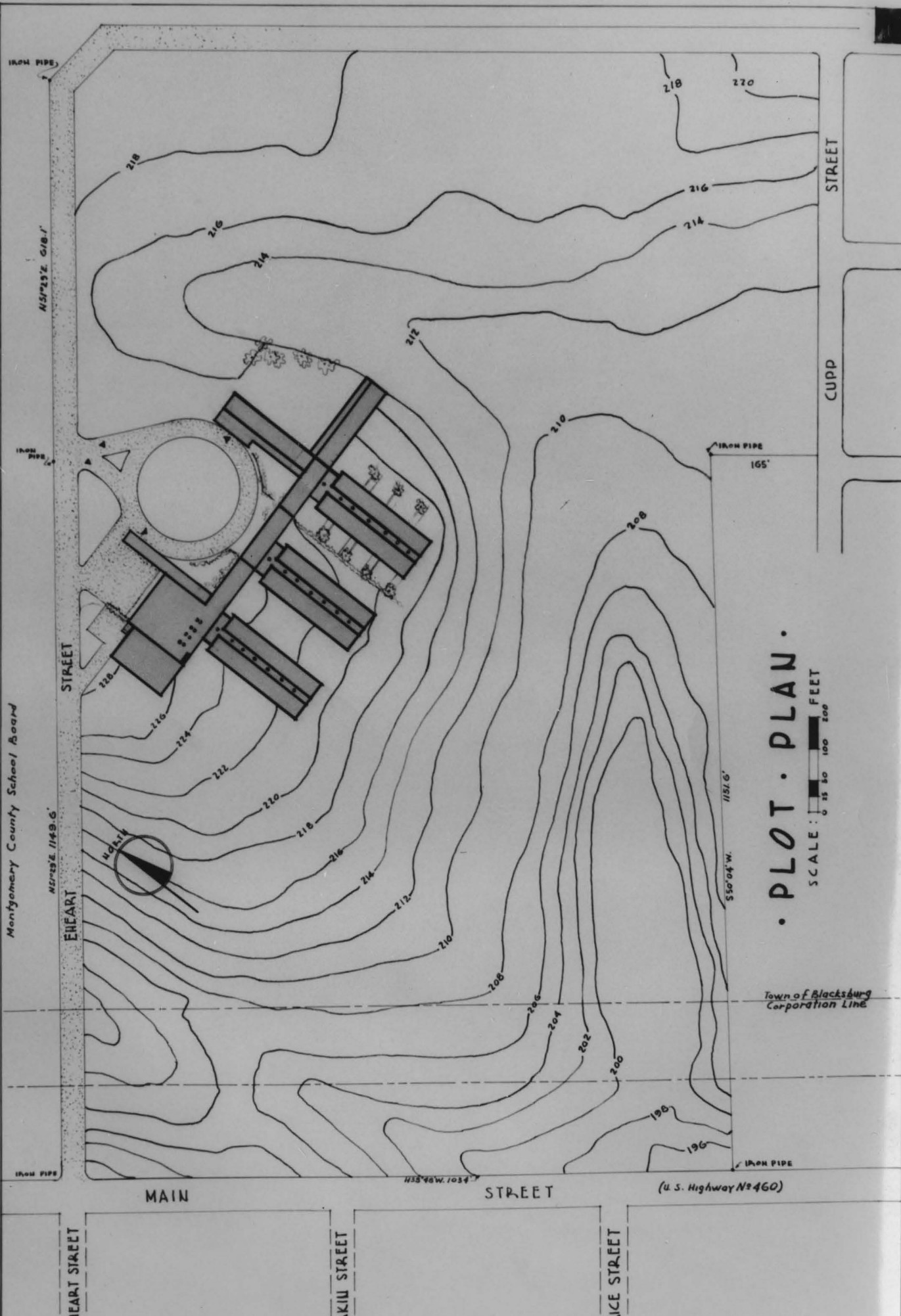
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### Artificial Illumination

The primary purpose of artificial illumination in classrooms is to supplement daylight. On overcast days, or in the evenings, this light should be distributed in the room according to the same pattern the daylight distributes. If this is not accomplished, the lighting will conflict with, rather than supplement, the daylight. The lighting equipment for such a task should be carefully chosen, and installed, not for price, but for performance.

**PART SEVEN - THE PRESENTATION**

Montgomery County School Board

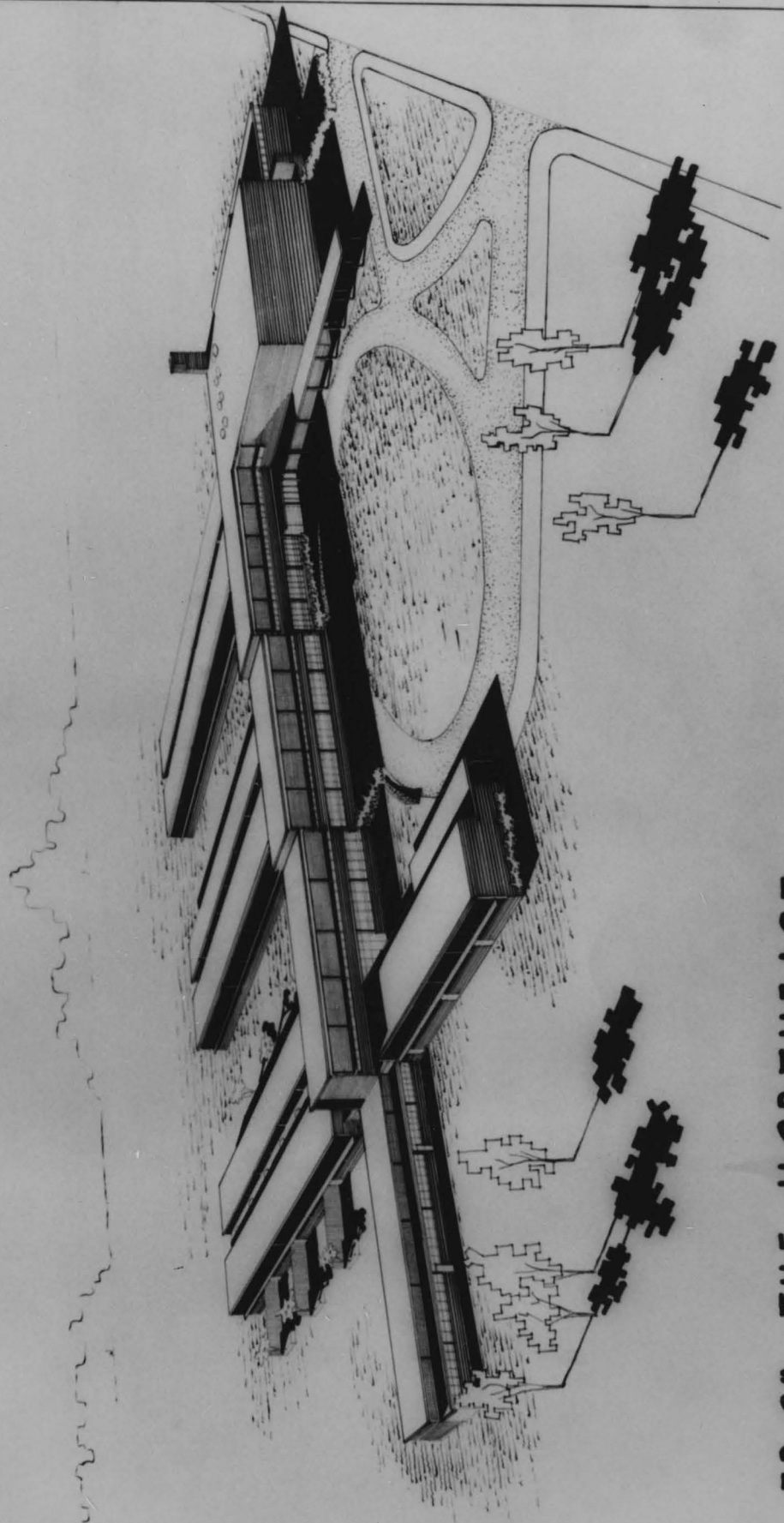


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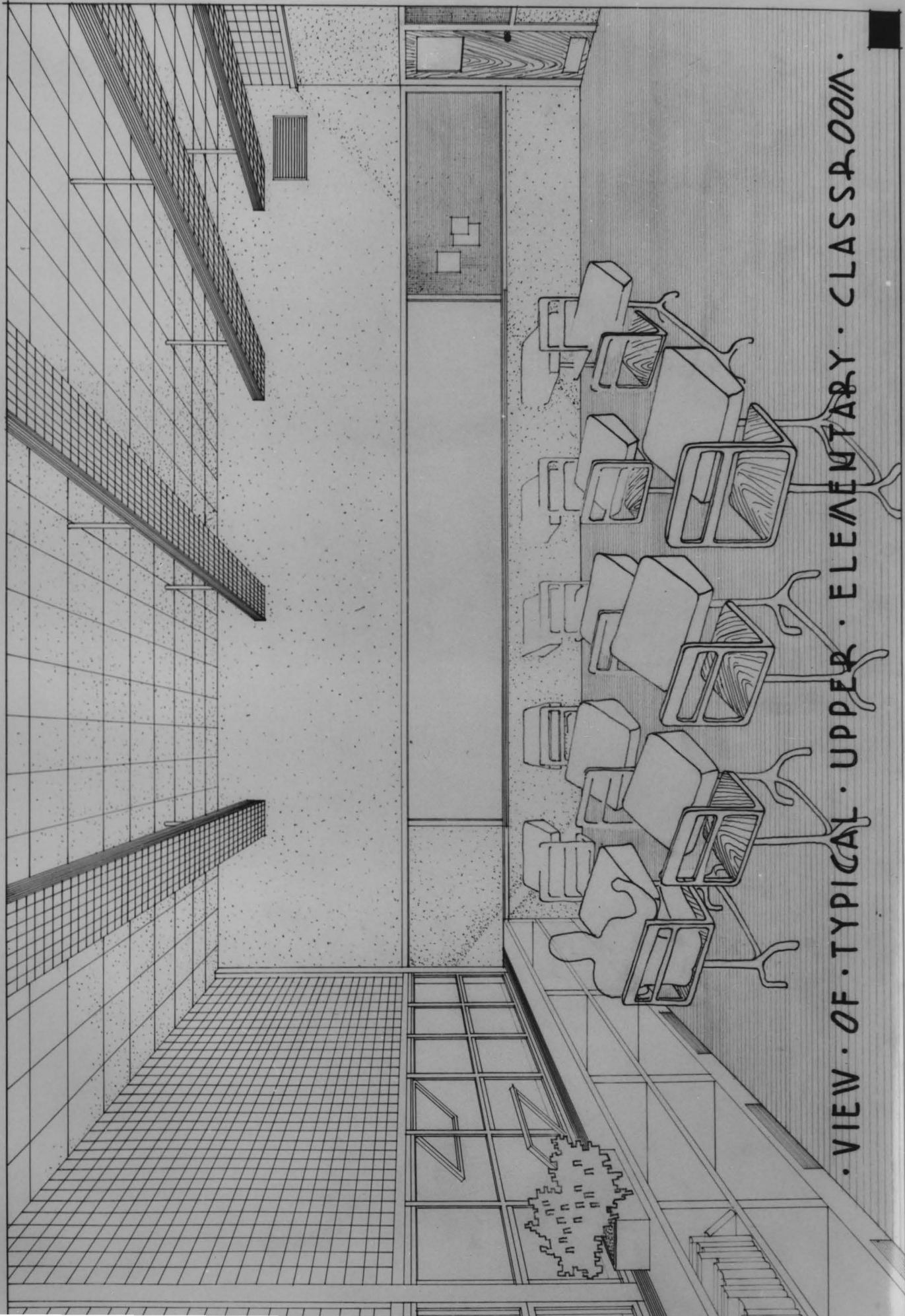
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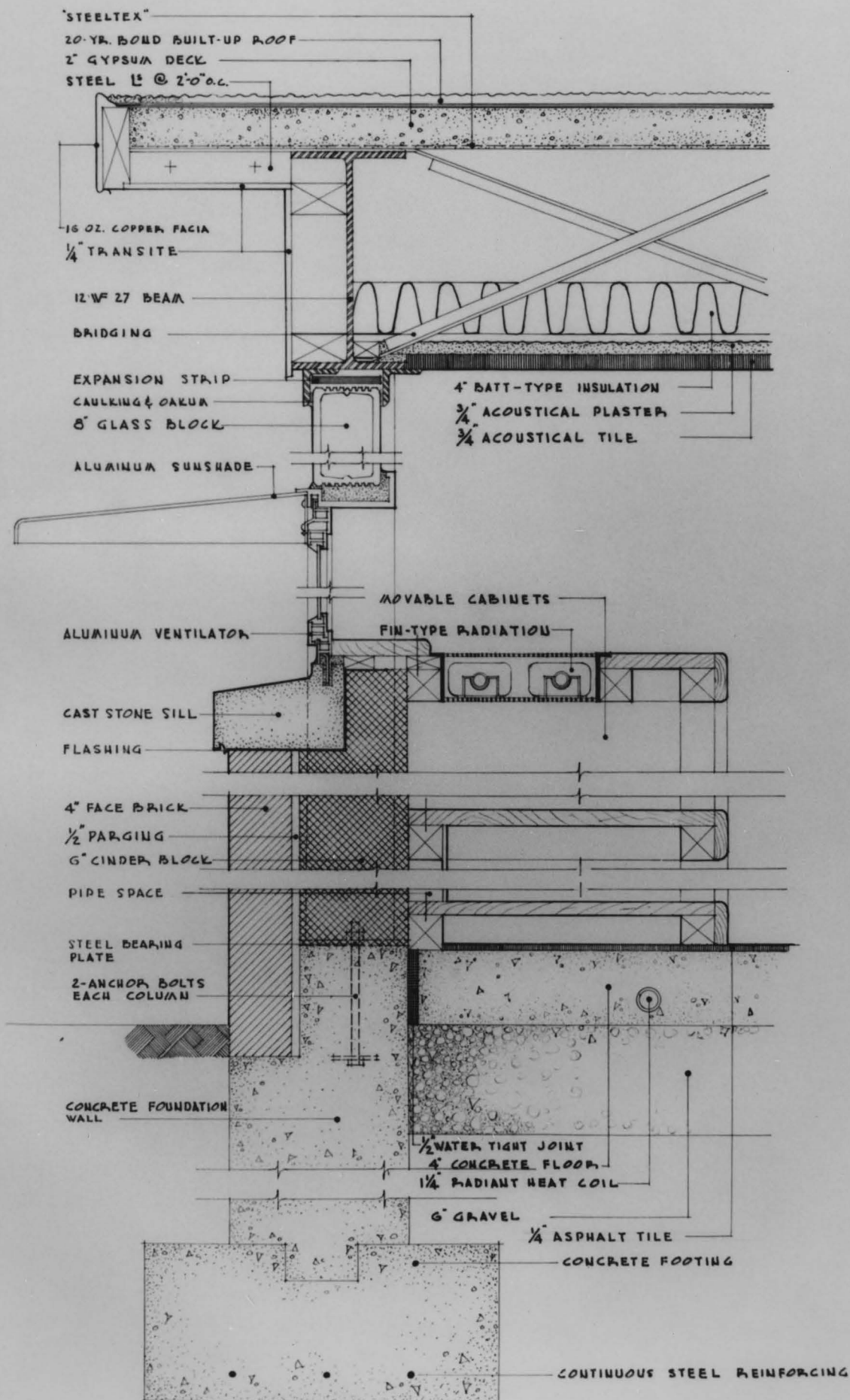
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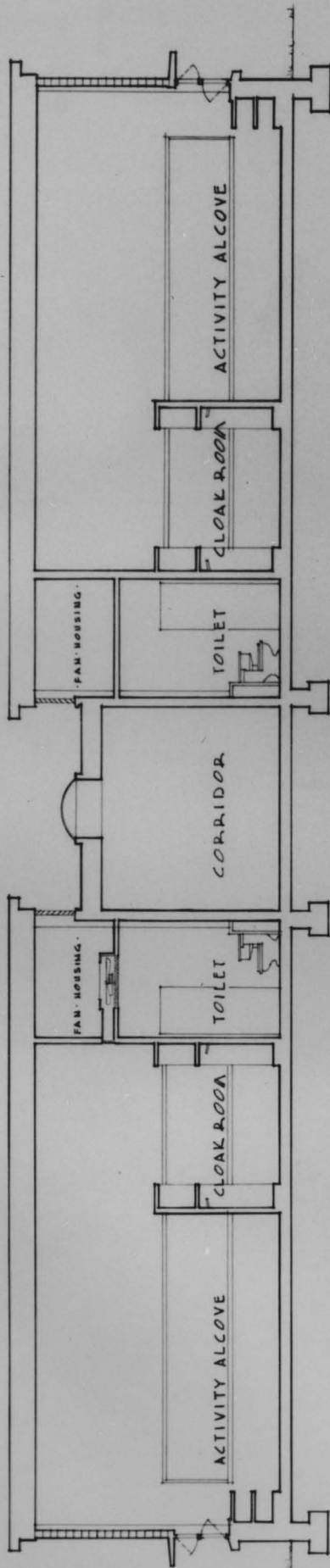


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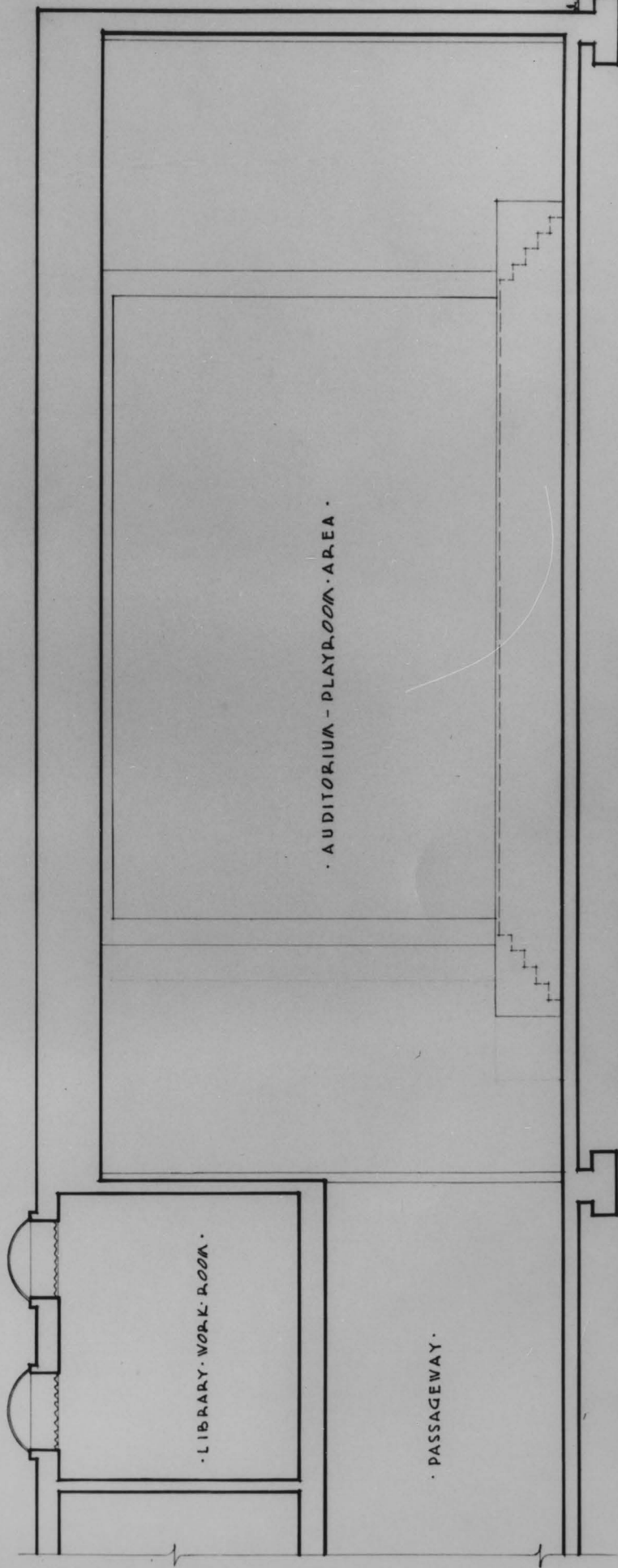


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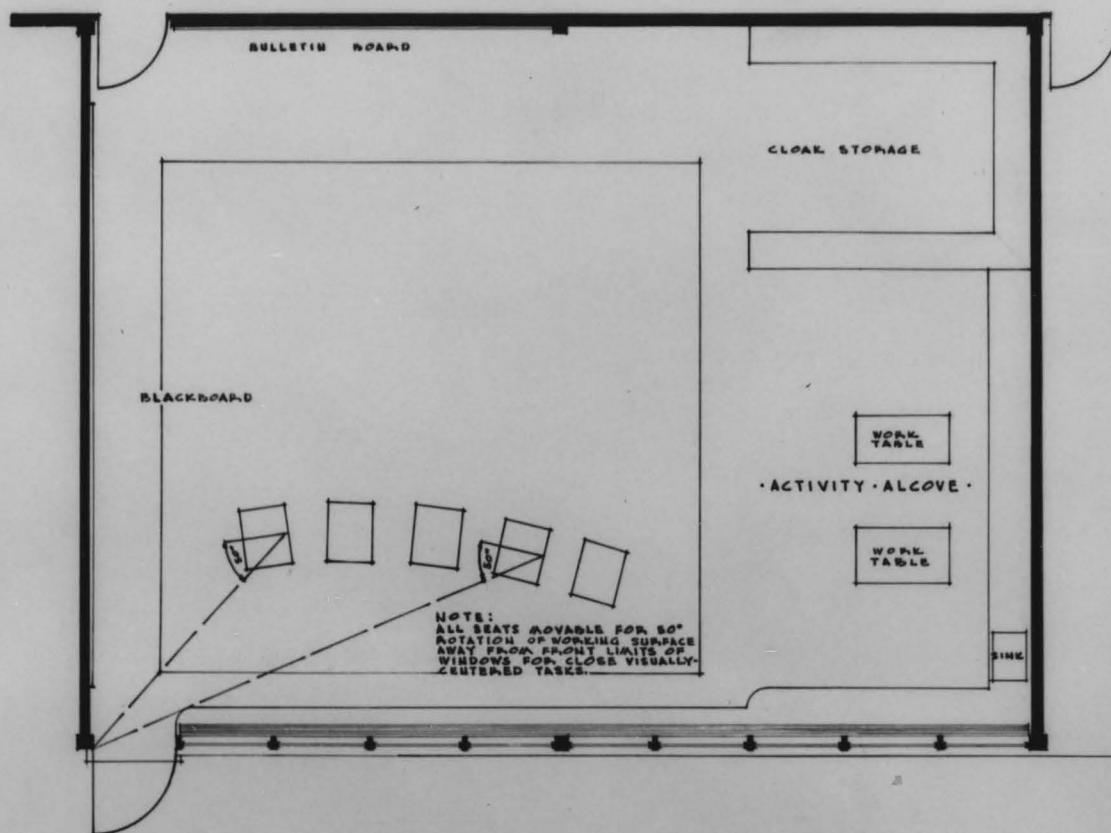


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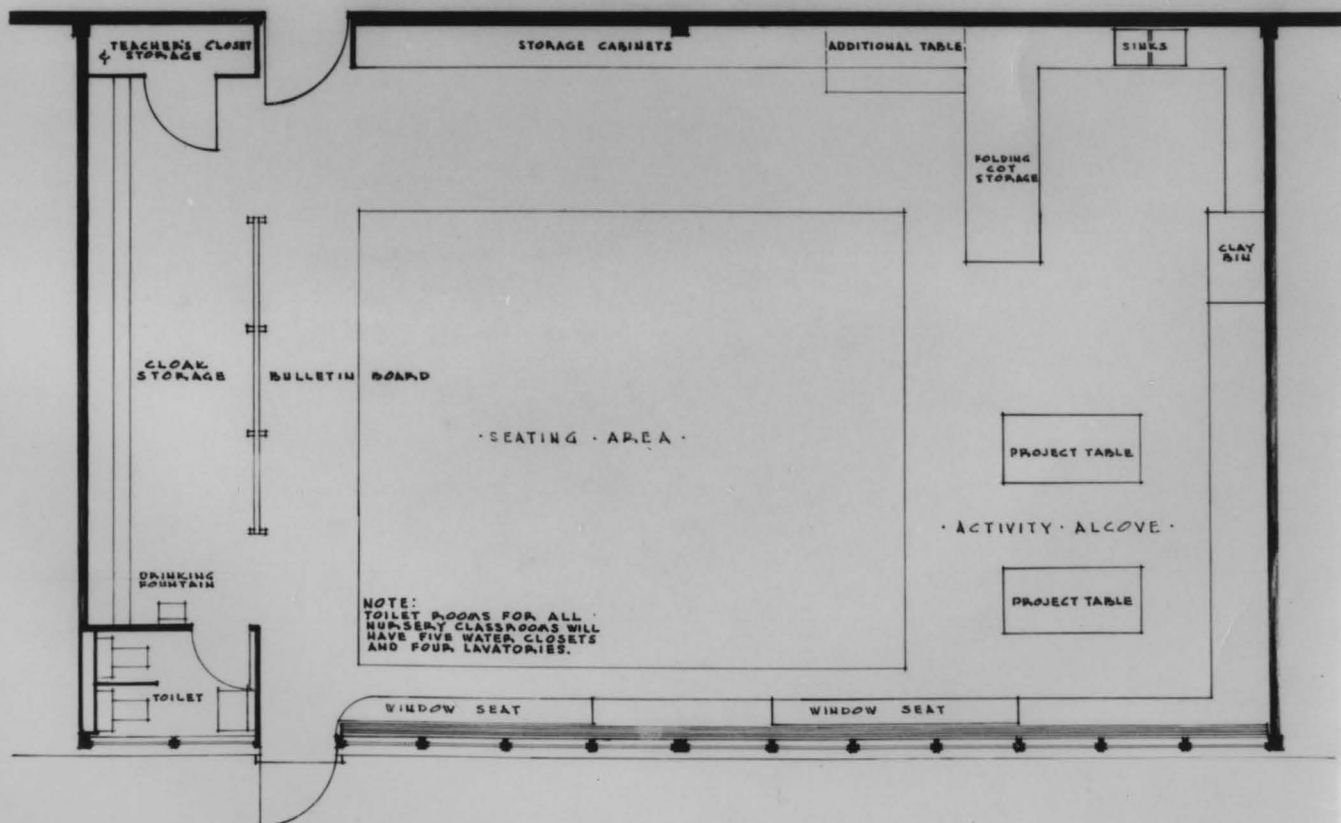


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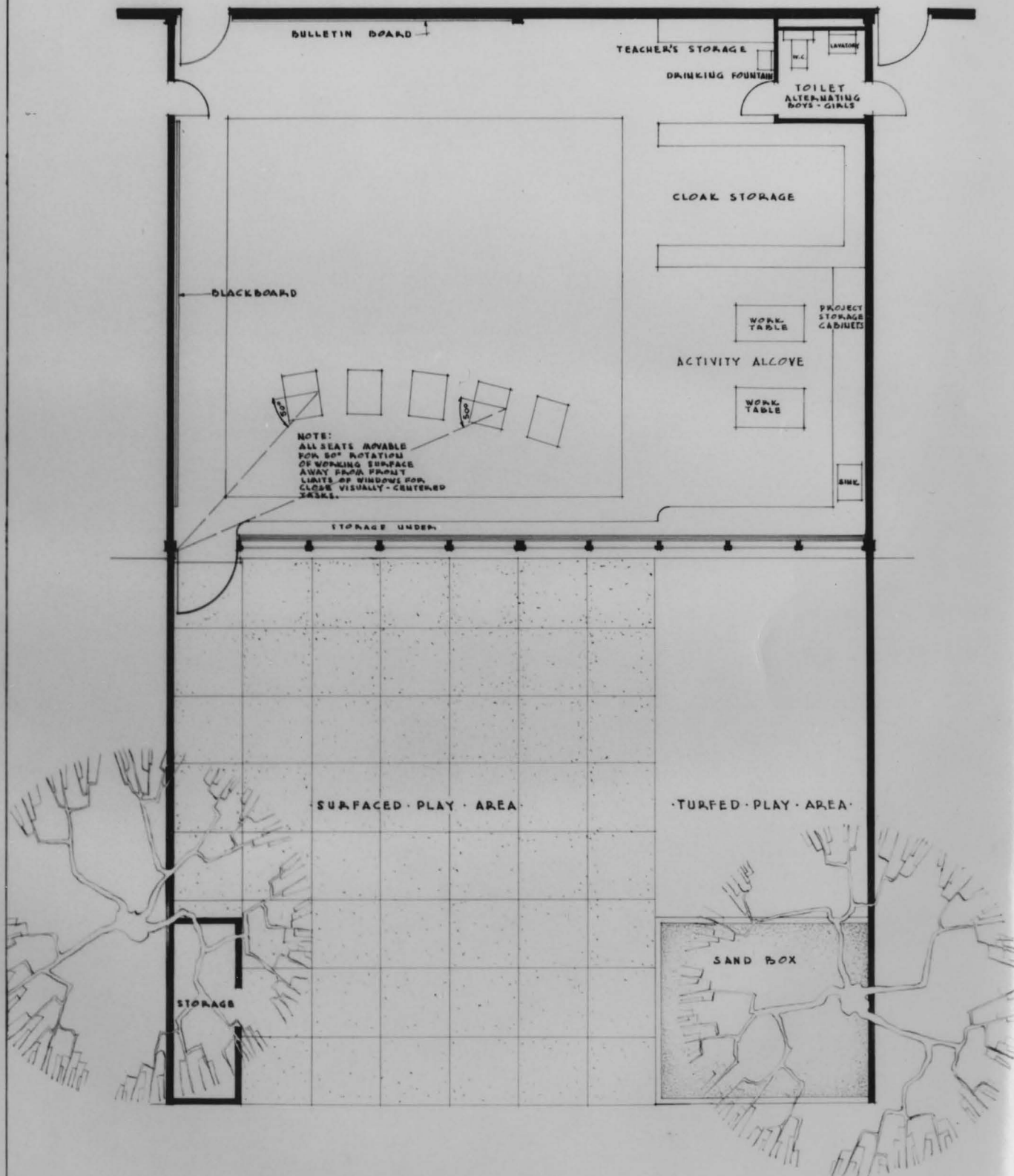


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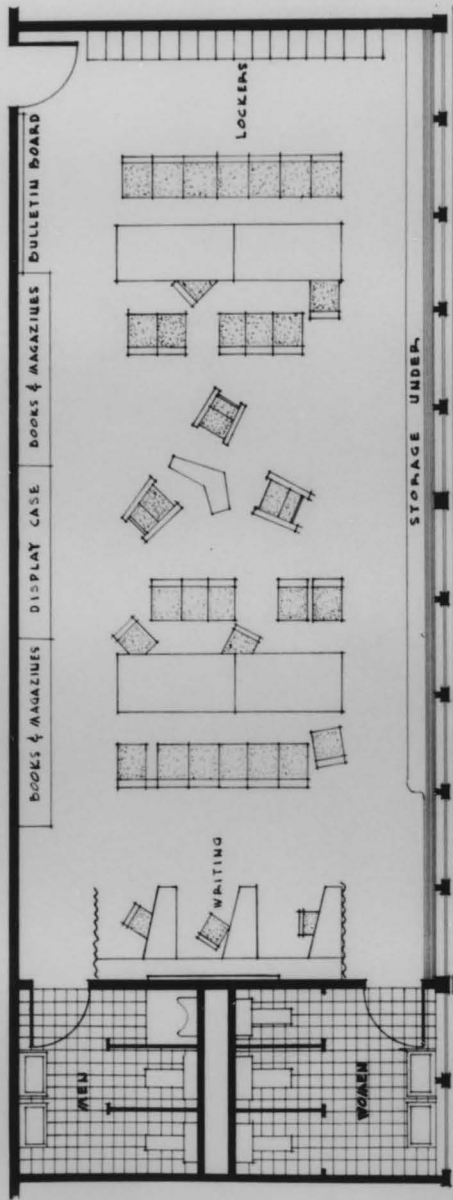
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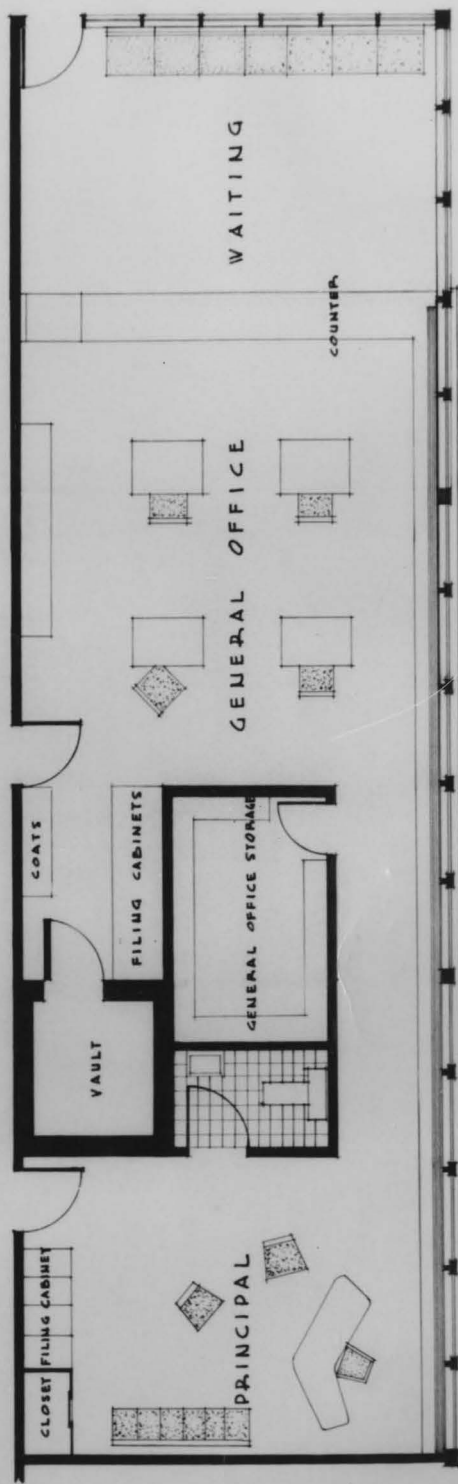


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• CLASSROOM •

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TEACHERS' LOUNGE.



ADMINISTRATION UNIT.

UNIT PLANS.

SCALE: 0 1 2 3 4 5 10 FEET

**BIBLIOGRAPHY - VITA**

## BIBLIOGRAPHY

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### Literature Cited:

American Association of School Administrators, American School Buildings, Twenty-seventh Yearbook, Washington, D. C., 1949

\_\_\_\_\_, "Schools" Architectural Forum, Time Incorporated, New York, November, 1950.

\_\_\_\_\_, "A Thumbnail Sketch of the Harmon Technique", How to Decorate Classrooms in the Harmon Technique, National Chemical and Manufacturing Company, Chicago 9, Illinois, 1948.

Englehardt, N. L., "Trends Affecting School Building Planning", 1947  
American Institute of Architects Convention Seminar Addresses  
on: Schools, Hospitals, Urban Planning, Washington, D. C., 1949.

Hamon, Ray L., "Lighting Schoolrooms", Division of School Administration,  
United States Office of Education, U. S. Printing Office, Wash-  
ington, D. C., 1947.

Harmon, Dr. Darrell B., "The Coordinated Classroom", American Institute  
of Architects, File Number 35-B, Washington, D. C., 1949.

Perkins, Lawrence B., and Cocking, Walter R., Schools, Reinhold Publish-  
ing Company, New York, 1949.

\_\_\_\_\_, "Public School Building Code Including Standards for Approval",  
Connecticut State Department of Education, Hartford, Connecticut,  
1950.

Wynkoop, Frank, "School Management", Condensed from the Bulletin of  
School Library Association of California, June, 1948.

\_\_\_\_\_, "Library Standards for Virginia Elementary Schools with Seven  
or More Teachers", effective 1953-1954.

Virginia State Board of Education, "Minimum Requirements and Standards  
for School Buildings in the State of Virginia", The Board,  
Richmond, Virginia, 1950.

### Literature Examined:

Babbitt, Harold Eaton, Plumbing. New York: McGraw Hill Book Company,  
Incorporated, 1950

# BIBLIOGRAPHY

Candill, William W., Your Schools, An Approach to Long-Range Planning of School Buildings, Research Architect for the Texas Engineering Experiment Station and Professor of Design in the Department of Architecture, A & M College of Texas, 1950.

\_\_\_\_\_, Architectural Forum, New York, New York, Time Incorporated, July, 1950.

\_\_\_\_\_, Architectural Record, New York, New York, F. W. Dodge Corporation, April, 1950.

\_\_\_\_\_, "Recommended Practice of Daylighting", Reprint of the 1950 February Issue of the Illuminating Engineer.

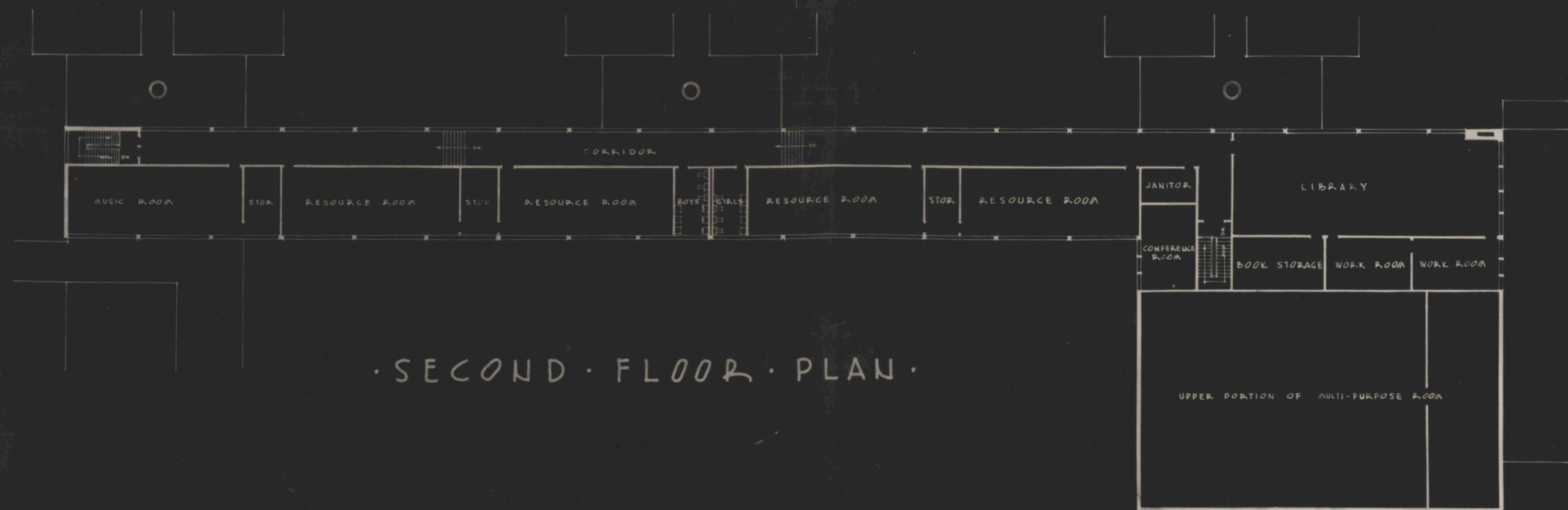
\_\_\_\_\_, "A Package of Lighting Ideas for Your Schools", published by the General Electric Company, Engineering Department.

\_\_\_\_\_, Progressive Architecture, New York, New York, Reinhold Publishing Corporation, March and June 1948, April, June, August, and October 1949.

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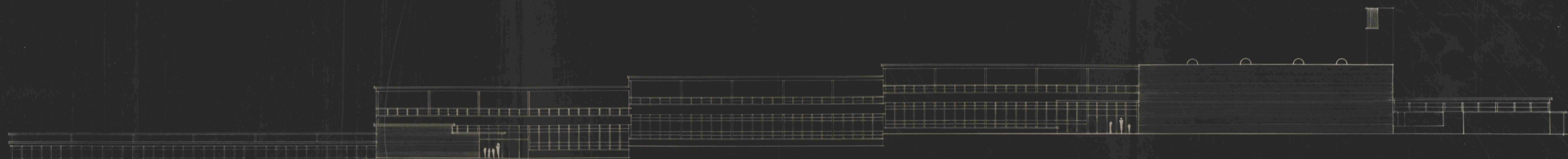


GROUND FLOOR PLAN

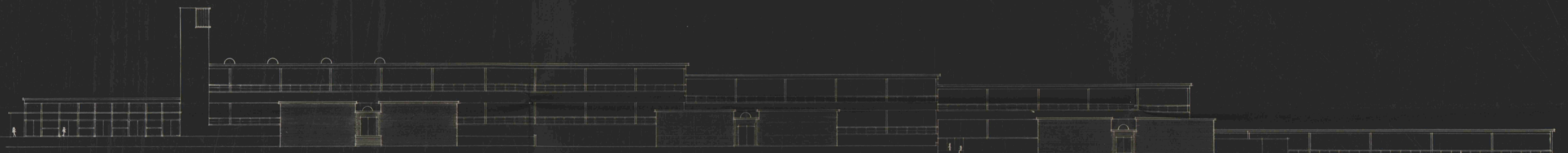


SECOND FLOOR PLAN

# ■ BLACKSBURG · ELEMENTARY · SCHOOL



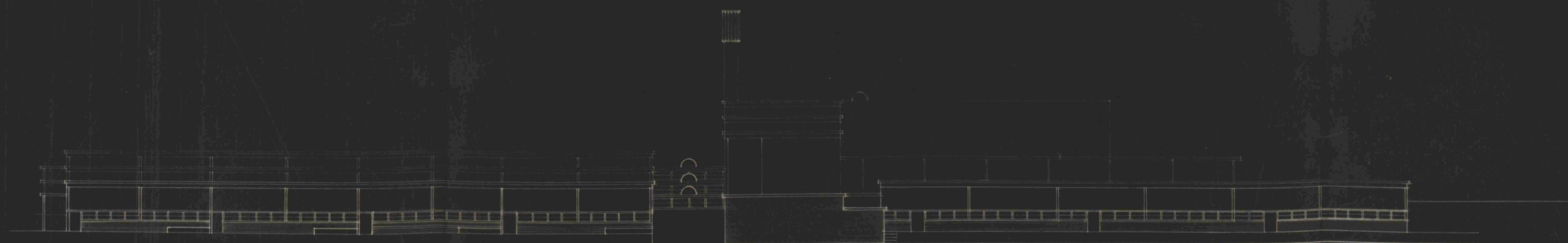
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