

A HIGH SCHOOL FOR POUND, VIRGINIA

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Blacksburg, Virginia

Make no little plans; they  
have no magic to stir men's  
blood.....

Daniel Burnham

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To my parents, whose undying devotion and guidance have been largely instrumental in making this work a reality, I can only offer my sincere appreciation in partial repayment for my insurmountable indebtedness to them.

To the faculty, and especially to \_\_\_\_\_, chief design critic, I extend my gratitude for instruction and advice in the field of architecture.

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PART I.....INTRODUCTION

This is an actual project. The high school under current construction in Pound, Virginia, was designed by D. R. Beeson, Architect, Johnson City, Tennessee. With Mr. Beeson's permission, I am using the educational program for Pound High School as a basis for this work.

The most challenging aspect of this problem is not simply designing a functional secondary school, but designing one which will fit the rising irregularities of the steep slopes of the site. The approach to this problem will be an attempt to accomplish a fusion of architecture and landscape into an organically integrated whole which will express man's inherent oneness with nature. Such a building must shape itself as a symbol of the inspiration of the site.

PART II.....OBJECTIVES



1. To investigate the present principles and criteria of secondary school planning.

2. To design a secondary school for Pound, Virginia, using the actual educational program for Pound High School and utilizing the knowledge accumulated through research.



From the shores washed by the caustic spray of the Atlantic Ocean to the towering redwoods of the Pacific coast, the doors of the American secondary school stand open to all. Never before in the entire history of mankind has it been the common practice of any nation to provide all its people with the equal opportunity to attend secondary schools. With all its failures and shortcomings this is an achievement of truly heroic proportions.

But, if these proportions are to be maintained, the ever-increasing complexity of our society must be equalized by a dynamic program of school planning and construction. During the second World War, the building of schools was stopped almost completely. But, these war years represent a period in which architects and educators were granted the opportunity to execute extensive research in the realm of school planning.

In 1948, when seven million war babies entered the first grade, the inadequacy of existing educational facilities made itself manifest. The necessity for an immediate program of school construction was intensified by the complete obsolescence of many schools. In 1956 the swollen school enrollment will be having its effects upon secondary education. Thus, today is the crisis of school construction.

Obviously, the planning of all educational facilities must begin with the definition of the objective of education; for the goals of education must be established before they can be realized. The definition of these educational objectives is necessary to the intelligent formulation of a school program. In turn, the school program will stipulate the

physical facilities which must be provided for the fulfillment of the defined educational objectives.

Broadly, the purpose of the school as an instrument of society is twofold. First, and of primary importance, is education for individuality. The present day high school has changed from a program aimed at the education of one type of student of high intellect and bookish inclination to the education of all. The school cannot disqualify human beings with talent and ability merely because they do not fit into the traditional pattern of high school book learning. It has, therefore, become the responsibility of the school to teach not only basic skills, but also to discover and develop special talents in individual pupils. Our present educational philosophy must recognize the uniqueness of each student and the importance of spontaneous expression rather than regimentation, and discipline from adults. For the deepest meaning of democracy is found in its emphasis on the dignity and worth of each human being, and in its moral demand that each person be treated as an individual. This ideal can be expressed in the classroom only through the recognition of each child's unique characteristics and, above all, recognition of his capacity to develop a mind and personality of his own. The school of the present must therefore be a place where students learn from their own first-hand experiences as well as from texts and teachers; where skills and knowledge are acquired in a purposeful effort to develop means for the achievement of ends that have direct and vital appeal rather than by a process of dull, rote learning; and where emphasis is placed upon significant and rich living in the present rather than upon the preparation

for a remote and indefinite future.<sup>1</sup> Through such educational experiences the child will learn to think for himself, understand himself, and develop in accordance with the unique demands of his own personality, for these are the rewards of education for individuality.

The second purpose of the school is education for democracy. Democracy places a great importance on the individuals of the society, because it is their duty to make all the major decisions. It is therefore important for our society that there be no decrease in the average citizen's ability to make wise decisions about a widely varying range of subjects. The position of America in the world of tomorrow will depend not upon numbers, for our population represents an increasingly smaller fraction of the world's population, but upon the ability of our nation to produce citizens of the highest quality.<sup>2</sup> Education plays an important role in the struggle to defend and extend democratic values, for democratic civilization and democratic education are concomitant.

Succinctly, education for individuality and education for democracy stand as the two great goals of education in our civilization. But they also reflect the inner consistency of our way of life: that of the individuals responsibility to society and society's responsibility to the individual.

Educational objectives are an integral part of educational philosophy. Thus, in order to understand their full significance we must plot them against a background of the factors which have accounted for the form-

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1. Hoak, S.; John Dewey; Philosopher of Science and Freedom. New York, Dial Press, 1950, p. 154.
  2. Engelhardt, N.L., Engelhardt, N.L.Jr., and Leggett, S.; Planning Secondary School Buildings. New York, Reinhold Publishing Corp., 1949, p.1.

lation of our contemporary philosophy of education.

The early years of the twentieth century constitute a period which experienced revolutionary changes in educational ideas and ideals. These years brought with them the primary steps in the evolution of our contemporary educational philosophy. This fact is most completely demonstrated by the school buildings themselves, because they are physical manifestations of the current philosophy of education. In the architecture of ideas which shaped the secondary school of the nineteenth century, the building came first as a grand and glorious edifice which could be pointed to with pride. Then, into this preconceived structure would be fitted the various instructional spaces, falling as chips where they might. The plight of the pupil was of secondary importance when compared to the false monumental grandeur of the building. But the contemporary school is first conceived as a functional entity which can successfully fulfill the demands of the educational program. In the design of the present-day school, the major consideration which transcends all others is the convenience, safety, and general well-being of the pupils who are to be housed.

Probably the most important factor which precipitated the introduction of our new educational philosophy was that of psychology.<sup>3</sup> The school of the past stands in deep conflict with the present-day conception of the nature of the mind and the process by which it develops. With the advent of the twentieth century, educators began to realize the importance of understanding the mind before it can be successfully educated. During

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3. Mart, P.R. and Vincent, W.S.; Modern Educational Practice. New York, McGraw-Hill Book Co., 1950, ; p.13.

this period mental barriers were laid back and, in the years that followed, much was learned through scientific study and observation about the mental processes by which people learn. This fact has accounted for the evolution of an intricate pattern of educational psychology which has formed the foundation for the formulation of our contemporary educational philosophy. Educators perceived that the prerequisite for all learning is motivation. This facet of psychological development has forced a realism into the school program and an emphasis on the pupil taking an active part in educational processes which are stimulating and meaningful.

Another important factor which has introduced changes in educational philosophy is the improved insight into the nature and needs of society.<sup>4</sup> Through the keener knowledge gained during the years of investigation and observation, secondary education has received a clarification, redefinition, and reorientation which places it in a more direct relation to the needs and demands of our society.

Great advances in the biological arts and sciences have accounted for the ever increasing emphasis upon safety and health in the contemporary secondary school. As a result, the school is charged with both the intellectual and physical development of its pupils. It must therefore be a wholesome place for learning and growth.

A better understanding of the objectives of education and the methods through which these objectives are attainable has enabled the school to utilize the great scientific advancements of our age. This has occasioned the introduction of a widely diversified collection of educational

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4. Supra 3., p.13.

aids and devices -- ranging from simple maps and pictures to motion picture projectors and television sets. In addition, the reorientation of educational philosophy has given the architect an opportunity to employ the timely new building materials and methods of construction which are unique to this age of technological advancement. For it is the duty of the architect to understand the nature and purpose of the secondary school and translate that understanding into forms and space arrangements which are expressive and organic.

We can see but dimly into the future. Nevertheless, an attempt must be made to prognosticate the demands that will be placed upon the secondary school by future changes in educational philosophy. If an attempt is not made to anticipate the needs of the educational program of the future, the school, although built to last fifty years, will plunge into complete obsolescence with respect to function in less than half that time. This will result in an extravagant waste of effort and resources. It is, therefore, advisable to hazard a few guesses concerning future developments that may be of value in the planning of school buildings; exercising all the caution that is necessary to examine the future, yet not allowing caution to conceal progress.

Probably the aspect of the future secondary school that can be predicted with the most certainty is that the use of the out-of-doors will increase tremendously in importance.<sup>5</sup> The mechanization of our civilization has gradually uprooted the student from the soil, until now a major task of the school is to help the student re-establish contact

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5. Supra 2., p.6.



with earth and nature.

The school of the future will also experience a redefinition of the conception of the class. The classroom will become more of a laboratory where evidence and material gathered from a wide variety of sources in the school and community will be studied. Instead of reviewing text books, there will be a greater reliance on original documents.<sup>6</sup> The preconceived standard which stipulates the number of students per class will give way to class numbers which are related to the problem at hand. The number of pupils per class will vary as widely as from two or three students receiving special instruction in their observation of an esoteric problem, to hundreds of pupils studying the activities of the United Nations on television.

To an increasing extent, the secondary school of the future will be charged with the development of special skills in individual students. Such a school must have an expansive and multifarious range of resources and equipment with courses allowing varying depths of experience in each. No work for which a particular student is gifted shall be beyond the level of attention of the school of the future.<sup>7</sup>

Finally, future secondary schools will coordinate the resources of the school with those of the community. The facilities of the school will be used by members of the community in their various activities, and students will be allowed to sample the educational experiences available in the community.

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6. Supra 2., p.6.

7. Supra 2., p.7.

Educational philosophy is the architecture of ideas which shapes the educational lives of boys and girls: it forms the basis for the intelligent determination of the scope of the school program, curriculum content, and basic educational methods to be employed. The architect must therefore understand this philosophy before he can provide the physical facilities necessary for the efficient execution of the educational program to be housed.

PART IV.....SELECTING THE SCHOOL SITE

The advice of the architect is frequently requested when the school site is being selected. However, whether or not the architect is directly influential in the selection of the site, he should be acquainted with the factors which determined its selection. For it is his responsibility to take the site delivered to him and organize the various school areas in a manner which will utilize the advantages of the site and satisfactorily overcome its disadvantages.

#### A. Location

It is obvious that for the sake of sheer convenience the school should be located within a residential community in order to be easily accessible to all the pupils it is to serve. In many cases the school location can be more vulnerable to obsolescence than the school building itself. Therefore, a detailed estimate of the future community-site relationship should be studied, analyzed and interpreted. Consideration should be given to school program trends, relative population density, changes in the character of population, and the possibility of commercial and industrial expansion.

If adequate sites are available, the school should be located near the center of the school community. Of course, the site must be accessible to state and county roads, but it should be located so that pupil hazards from arterial highways or heavy street traffic will be reduced to a minimum. A site's desirability is greatly enhanced if it enjoys a location free from noises, odors, and other objectionable outside disturbances that tend to produce an unfavorable educational environment.

It is also desirable to choose a site that will enable the school to utilize all available public service facilities such as water, gas, sewers, fire protection, and electricity for power and light.

In the selection of the school site, specific consideration should be devoted to travel distances, travel times and walking distances. Travel time will, of course, vary with travel distances, efficiency of vehicular methods of conveyance, and local road conditions. Maximum travel time on vehicles for transported secondary school pupils has been established at one hour. For students walking to school, the distance should not exceed two miles.<sup>8</sup>

In the selection of a site with respect to its location, all the factors discussed above should be considered simultaneously. But, if it becomes necessary to give any one factor preference over the others, the safety and convenience of the student should be the primary consideration which takes preference over all others.

#### B. Size

The size of the school site will be determined by the nature and scope of the educational program to be executed. For secondary schools, it is suggested that a minimum site of ten acres plus an additional acre for each one hundred pupils of predicted ultimate maximum enrollment.<sup>9</sup> However, it should be emphasized that this is only a minimum standard and should not be allowed to govern maximum achievement.

Fifty years ago, the size of the secondary school site was not

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8. Plant Guide Committee; Guide for Planning School Plants. National Council on School house Construction, 1949, p.18.  
 9. Advisory Committee for School Building Research; A Guide for the Planning of School Buildings for Virginia. Richmond, Virginia, Chapter One, Article III, Section 1301.

important because little consideration was given to the educational value of play. But today, more and more of the physical education program is taking advantage of the healthful value of outside recreation. In addition, classes themselves are now moving out-of-doors to conduct educational exercises in areas especially provided for this purpose.

This trend toward more site area per pupil has been made more momentous by the rising recognition of the common sense of the single story school. Added to this is the growing use of the school ground for the whole community. The above factor taken in conjunction and coupled with the need of adequate site area for future expansion often necessitate a much larger site than has been stipulated by the minimum requirements. Of all the educational resources utilized by the school, land is the cheapest.

### C. Physical Characteristics

Still other important decisions in the realm of site selection must be made with respect to the physical features of the site itself. The contour of the land will determine how extensive and costly will be the necessary grading, excavation, installation of drainage systems, and protection against seepage and flood waters. In general, rectangular shaped sites are more desirable than odd shapes. But, no matter what the shape and contour of the site, it must provide a suitable spot for the location of the school building.

No site should be purchased until soil test borings have been analyzed. The subsoil must provide a suitable base for the foundations of the building. A good topsoil properly balanced to support vegetation is necessary and should permit surface drainage without erosion. For school sites

a sandy loam is the best topsoil.<sup>10</sup>

There are many advantages in favor of wooded sites. First, trees and other forms of vegetation act as windbreaks that can cut wind velocities as much as twenty percent and thereby account for appreciable reductions in heating bills. On warm days, trees reduce temperature in two ways: (1) shade, or reduction of radiant heat from the sun, and (2) vaporization of moisture given off by foliage.<sup>11</sup> Also, forms of vegetation act as dust filters. In addition, wisely planted or preserved trees and shrubs are very efficient sound dampers which can keep the noises of the playground from disturbing the classrooms.

#### D. Site Planning and Development

School site development involves landscape designing and land use planning and includes the solution of such engineering problems as drainage, roads and walk construction, and adjustment of grade and the solution of such horticultural problems as the development of lawns and the selection of vegetation suited to varying requirements and conditions. Plans for such site development should be made concurrently with the plans and specifications for the building.<sup>12</sup>

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10. *Supra* 8., p.22.

11. Perkins, L.B. and Cacking, W. D.; Schools. Reinhold Publishing Corporation, 1949, p.29.

12. Connecticut State Department of Education; Public School Building Guide. Hartford, Connecticut, 1950, p.29.

PART V.....GENERAL ASPECTS OF SECONDARY SCHOOLS



The various spaces of the school cannot be designed as isolated entities. First of all, consideration must be given to such general aspects of educational facilities as orientation, flexibility and multiple use of space, expansibility, etc. Through such an approach the judicious integration of the various aspects of school design may be realized and the school will emerge as a coherent unit capable of efficiently fulfilling its purpose.

#### A. Architectural Character

During those periods in history when truly great styles of architecture were evolved, they were first conceived with respect to the nature and needs of society. The form and purpose of these styles of architecture was predicted by the materials and methods of construction known at the particular time. Therefore, each style of building was true to its time and purpose.

But, in the past few centuries, architectural expression has become enslaved to tradition. Consequently, our architecture during these centuries has been composed of little more than a series of hodge-podge revivals of forms of classical antiquity. This fact has accounted for the profane pomposity and fake monumentality of the school of the past. Schools are built primarily for the use of boys and girls, and there is nothing about youthful students or their educational activities which suggest a monumental design. Outmoded monuments are only appreciated by pigeons: our schools must be appreciated by pupils.

Just as the school of the past was ornate and monumental, all too

often the school of the present has taken on that factory-like appearance of harsh and austere over-simplification.

The school building of today should be inviting and intimate in scale and appearance. The very character of the building will influence the reaction of the students toward the entire school and its work: it may stimulate their pride and welcome them to come within, or it may provoke them to throw rocks at the windows. Architectural excellence may be achieved through the skillful use of materials, composition of form and space, and harmony with surroundings.<sup>13</sup>

#### B. Plan Types

There are two very distinct types of school plans. The first type is the compact multi-story unit. Although this type enjoys economy of foundation and roof construction, it has many definite disadvantages.<sup>14</sup> The second type of plan is the one-story unit in which all the elements are spread out and organized on one floor. Because of its many advantages, this type of plan is receiving ever-increasing recognition.

When land costs are high and large sites are not available, the multi-story school will probably come as the last resort. However, when land costs are average and large sites are available, the advantages of the one-story school should be considered. Tersely, these advantages are:<sup>15</sup>

- "(1). Economies resulting from the use of simple, light framing materials.
- (2). Easier exit from the building in case of fire or panic.
- (3). Elimination of stairway construction costs.

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13. Supra 12., p.33.

14. Supra 9., Chapter Two, Article 1, Section 2102

15. Supra 9., Chapter Two, Article 1, Section 2102

- (4). Less congestion in corridors and entrances.
- (5). Opportunities for better arrangement of the many functional elements of the plan.
- (6). Opportunities to isolate the less desirable elements such as those producing noise and objectional odors.
- (7). Opportunity for better control and supervision of certain areas which may be used at night by adults.
- (8). Opportunity for bilateral fenestration.
- (9). Easier maintenance: window washing, repainting, glazing, caulking, etc.
- (10). Ease of moving furniture and equipment within and in and out of the building.
- (11). Easier expansibility because an informal plan and an asymmetrical exterior lend themselves well to future extensions."

### C. Expansibility

In planning the school, it is important that consideration be given to future addition. Increasing birth rates and population shifts will place new demands upon the school. These future demands must be anticipated in order that provisions may be made for the necessary future expansions.

Future buildings or additions should be planned as an integral part of the whole school plant rather than as separate units which are hard to reach and difficult to administer and supervise.<sup>16</sup> After the present needs of school are satisfied, expansion for future demands should be possible without the need for the destruction of any space provided in the original unit. The most satisfactory means of achieving this is by incorporating the plans for the present with those for the future. Preliminary sketches for all proposed educational facilities should include plans for the anticipated needs of the future.

Present buildings should be located so they will fit logically into the pattern of future growth. They should be oriented so that, as

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16. Supra 11., p.30.

expansions grow, there will be no interference with proper sunlight and ventilation. In a plan for expansion, corridors should be carried through to outside walls, or at least to very small temporary rooms. Any wall that will some day be removed for additions should be regarded as a temporary wall and should not be the location for any important windows.<sup>17</sup> Satisfactory provision for expansibility should also be made for service systems such as heating, ventilating, plumbing, lighting, and cleaning.

#### D. Flexibility and Multiple Use of Space

Gone are the days when the student sat rooted rigidly to a stationary desk and was forced to learn by listening and prove it by echoing.<sup>18</sup> The pupil of the present learns by doing. He is active. This activity has made it necessary for the classroom to be informal and flexible. In the classroom of today interior flexibility is a quality necessary to farsighted planning.

One way of achieving flexibility in classrooms and other school spaces is by the use of light-weight, movable partitions and freestanding furnishings. Through this method the size and layout of a room may be varied to meet the varying demands of the function which is being housed.

Flexibility in the secondary school should also be studied with respect to the demands of our dynamic philosophy of education and changing curricula content. In future years secondary education will doubtlessly change significantly. Methods of teaching will improve, class

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17. Supra 9., Chapter Two, Article I, Section 2103.

18. Supra 11., p.42.

sizes will be redefined, and new equipment will be introduced.

All of these factors will have their direct repercussions on the physical fabric of the school. A well-planned school must be capable of making the physical adaptations which are necessary to house the changing educational program of the future.

But this flexibility doesn't just happen: it must be planned. The building should be a skeleton-like structure with few load bearing walls. Another important consideration of flexibility is its relationship to mechanical and utility installations. Movable partitions must be free from all plumbing and electrical installations. Heating systems must be designed so they can compensate for heat losses from spaces which will change their size and shape. Also, consideration must be given to the relation between fenestration and flexibility. One satisfactory solution is continuous fenestration rather than grouping the windows for each room.

Another important aspect of flexibility is the multiple use of space. The space provided in the school is utilized for educational purposes only eight hours a day, five days a week, and nine months a year. Therefore, this space lends itself to a variety of usages for community activities. For this reason the principle that a school should be planned and used for regular educational exercises as well as for various community activities has received wide acceptance.<sup>19</sup> For example, the primary purpose of the school cafeteria is to provide a large, cheerful space for students to eat lunch. But, the room is used for this purpose only

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19. Supra 8., p.75.

two hours a day. Hence, an attempt should be made to use this space during the other hours of the day for educational purposes. At night the cafeteria can become the location for community meetings, dinners, and dances. Only through intelligent planning for flexibility can the community receive a maximum return from its investment in space.

Although desirable in many cases, multiple use of space is not always a virtue. The very term itself implies conflict. Probably the most frequently attempted and infrequently successful example of inappropriate multiple use is the gymnasium-auditorium combination.

In any event, one thing can be said of the school of the future with certainty; flexibility will be a problem which will demand ever increasing attention.

#### E. Orientation

Many factors will effect the ultimate orientation of the building on the site. During the nineteenth century the problem of orientation was of little importance: it was blindly approached and blindly solved. Tradition demanded that the building present a magnificent facade which could be painted to with pride. Hence, all other factors were conveniently ignored, and position of the building with respect to the road or street became the factor which determined orientation.

But today the architect must know the specific topography, micro-climate, direction of prevailing winds, angle and direction of the sun, location of present vegetation, intended plant expansion — and many other factors — before making the final decision of orientation.<sup>20</sup>

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20. Supra 11., p.40.

With respect to topography, the building must be located and oriented on the most adaptable spot offered by the site. All too often, the building emerges first as an entity planned with complete disregard for the landscape upon which the building must recline. The result of this nonsensical method of planning is expressed by the extensive and costly grading which must be executed in order to reshape the natural topography of the site to fit the preconceived structure. Instead, the building should be designed to fit the site upon which it must rest; it should be made to follow the contour of the landscape, climbing and reclining and spreading itself out in accordance with the demands of the topography of nature. Instead of being involved in a constant conflict with its surroundings, the building should harmonize with them. The result will be a fusion of nature and the human purpose without a sacrifice of the character of either.

Through a knowledge of microclimate and the direction of prevailing winds, the building can be assigned a location which will enjoy protection from many adverse weather conditions. The layout and orientation of the building can take advantage of favorable weather and thereby account for appreciable savings in heating bills.

The numerous advantages of natural forms of vegetation have been given previous attention in this work. In planning orientation, the building should be located and shaped in a manner that can take advantage of the natural trees and shrubs on the site. The removal of natural vegetation should be executed only if it is absolutely impossible to utilize it: for the unnecessary and unmerciful destruction of natural vegetation accounts for the dissipation of one of the richest

resources of nature. If the natural advantages of the school site are not wisely utilized, the expensive and vicarious methods of mankind will have to be substituted. No good can come of destructive living.

One of the most important aspects of orientation is the location of the building with respect to the sun. However, orientation of schoolrooms for efficient daylighting has been a point of violent controversy among school planners for many years. East, west, north, south, and practically all other points of the compass have been proclaimed as the only proper exposure for schoolroom windows.<sup>21</sup>

The sole purpose of sun orientation is to gain the greatest amount of controllable daylight in all the rooms. The solution to this problem will vary with the indigenous needs of the particular school and section of the country. Thus, present performance, rather than past criteria, should be the yardstick which measures the efficiency of good orientation for daylighting.

The importance of orientation cannot be overemphasized. But only through the simultaneous consideration of all the factors effecting orientation and the concomitant planning of both building and site may good orientation be realized.

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21. *Supra* 8., p.148.



PART VI.....INSTRUCTIONAL SPACES

### A. The Secondary School Classroom

It has been previously observed that the physical fabric of the school is a reflector of educational philosophy. But, in the specific case of the classroom, what is the procedure by which philosophy is translated into terms of architecture?

The classroom of the nineteenth century was a "rigid mechanical box".<sup>22</sup> Its size was determined by floor dimensions which would accommodate a foreordained number of desks that were fastened to the floor. The general layout of the room was always virtually the same. The ceiling height was always half the width of the room. This criterion produce ceilings which were not only awesomely high, but also in violent contrast to the youthful scale of the activities housed. In short, all the physical facilities of the classroom were determined from well established criteria.

But, this classroom of the nineteenth century was a perfectly logical expression of the educational philosophy of the age. There was only one recognized method of instruction. In this educational process the student took his place at a fixed desk which forever faced forward toward the seat of authority and dutifully rose and recited when his name was reached in the roll book. Little attention was given to individual needs or learning through activity. This merely illustrates that the educational philosophy which shaped the traditional classroom was one of few tasks and rigid concepts which produced one well standardized

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22. *Supra* 11., p.72.

design.

In our present concept of the secondary school the classroom has become the basic unit which occupies the focal point for all planning considerations. The building is planned around the classrooms; each of which is designed to do a specific job. It is obvious that the physical features of the classroom have changed considerably. But what are the philosophical considerations which have accounted for these changes?

Intense specialization is integral with the spirit of our age. Therefore, the school as an instrument of our society has been the recipient of the new and specialized demands of our time. To meet these demands the school has been forced to develop a broader and more profound curriculum. In addition, the contemporary secondary school is charged with the discovery and development of special talents. It must therefore offer specialized and diversified courses to meet intensified demands. This has resulted in a divergence of needs for different classrooms. The physical facilities of contemporary classrooms must be designed to satisfy the needs of a more widely varying range of subjects.

New methods of instruction have also affected the design of classrooms. Our contemporary educational philosophy emphasizes the importance of individual activity and knowledge gained through first-hand experience. The student of today takes an active role in educational processes. The classroom of today must be designed for dynamic educational experiences.

Another characteristic of the modern secondary classroom is a significantly wider variety of sources of information available to the student.<sup>23</sup>

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23. Supra 2., p.96.

Instead of reliance upon a single text, there has been a tremendous increase in the number of books, pamphlets, and documents containing information on the subjects under investigation.

There is also an attempt to utilize in the classroom to a maximum degree the new educational devices produced by science. Devices such as radio, moving pictures, and television are being used to make learning more complete through multi-sensory channels. Therefore, consideration must be given to the darkening of rooms, provision of electrical outlets, and adequate storage space for these educational devices.

Slowly the barrier that separates the school from the community has been recognized as a rich source of material and experience. The student of today goes out into the community and collects vital information and material which will be analyzed and digested in the classroom. Theory and reality are therefore more intimately associated in the modern classroom. Through meaningful experiences in the community the student can perceive the practicality of otherwise abstract subject matter.

In general, the subject matter and educational practices employed in our contemporary schools are so varied that no set of standards can be established which will apply to all the special cases of classroom design. However, the fundamental principle of classroom design is this: a classroom should be specifically designed to do a specific job for a specific school. This means uniqueness, not standardization. For standardized classroom design suggests an emphasis on tradition and artificiality, rather than upon reality and actual needs.<sup>24</sup>

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24. Supra 2., p.100.

The contemporary classroom must be created in accordance with its own unique needs. The size of the room, its general layout, its furniture, and all the other facilities must be directly related to the functional demands of the particular subject matter and methods of instruction. Only in such an environment can the student catch the spirit of the subject being investigated.

The student must be placed in classrooms which are inspirational: rooms which reflect the unique atmosphere of the subject to be taught. Such a classroom will inspire the student to creativeness and promote his natural desire to enter into the adventure of the search for knowledge. This is the key to the design of the classroom as a unique and functional unit.

#### 1. Language Arts Classrooms

When expressed in terms of specific courses offered, the language arts program of a senior high school will include english, speech, foreign languages, classical languages, journalism, dramatics, and a wide variety of special courses which have been evolved from local needs. All the facilities for teaching the above courses should be closely related to each other in a location which is close to the library and social studies unit.<sup>25</sup>

Somewhere in the language arts suite should be a relatively large room containing a low stage. This room will be particularly useful to dramatics and speech classes. Through the use of two folding partitions the stage may be made available to two classrooms or serve as an independent reading, conference or work area.<sup>26</sup>

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25. Supra 12., p.80.

26. Supra 1., p.108.

Book cases and magazine racks should be prominent features in the plans of language arts classrooms. Of course, chairs and desks must be provided in a number which corresponds to the class size. In addition, some chalkboard and abundant tackboard should be provided.

## 2. Mathematics Classrooms

Educators are becoming more aware of the ever increasing importance of quantitative thinking in the interpretation of the world today. The practicality of mathematical concepts is being injected into the secondary school program through the approach to actual problems which are found in the social and natural sciences. For this reason mathematics classrooms should be closely related to the science units.

In determining the size of mathematics classrooms, approximately twenty-five square feet per pupil should be provided.<sup>27</sup> A relatively large amount of chalkboard area is necessary. This should include a spherical board and a circular section of flat board for angular work. Open display cabinets for the housing of mathematical instruments will add to the unique character of the room. In addition, space for the specific purpose of display should include bulletin boards, cases for models, and multiple exhibits racks. Ample bookshelves and storage space should be provided. Also, a magazine rack is necessary for displaying magazines of mathematical interest.<sup>28</sup>

## 3. The Social Science Suite

The increasing interdependence of communities and nations and the growing complexity of the economics problems of our age have placed

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27. Supra 12., p.80.

28. Supra 2., p.110.

intensified demands upon the social sciences. For this reason the secondary school has been forced to provide more elaborate facilities for instruction in geography, economics, history, sociology, and political science.

The location of the social science unit should permit close association with the library and language arts unit.<sup>29</sup> Adequate chalkboard and an abundant amount of tackboard should be provided. Map files and racks, exhibit cases, and book cases are necessary equipment.

A breakdown of the areas of the social science unit might include a general instruction area; a slightly elevated area to be used as a stage or study area; a conference room; and a work room. This sort of an arrangement would permit a wider diversification of resources and media used and a more significant amount of committee work.<sup>30</sup>

#### 4. Business Education

The ever increasing complexity of social and economic forces has precipitated the development of many new branches of specialization within the business field. This has caused a great increase in the percentage of high school students enrolled in business education.

In large high schools the facilities for the business education department should include rooms for bookkeeping, typing, stenography, general secretarial training and other courses in business.<sup>31</sup>

To facilitate the multiple use of office machines, it is often desirable to locate the business education unit in close proximity to the school administration unit. Such a location has the added advantage of

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29. Supra 12., p.85.

30. Supra 2., p.110.

31. Supra 9., Chapter Two, Article II, Section 2208.

giving students the opportunity to take part in the business procedures of the school itself.

The bookkeeping room should provide a minimum of eighteen square feet of floor space per student. The front wall and corridor wall may be lined with chalkboard and tackboard. It is desirable that some of this chalkboard be permanently ruled for ledger sheets, balance sheets, and other accounting forms. If student storage space is not provided in the bookkeeping room tables, a large storage cabinet with individual drawers is necessary. Student chairs should be in keeping with high-grade commercial office practice.<sup>32</sup>

A business machines laboratory with calculating, bookkeeping, and electrical transcription machines should be provided in large secondary schools. This unit should communicate directly with the bookkeeping room. Special attention should be given to the reduction of noise and provision of adequate electrical outlets. Besides business machinery, the equipment of this room should include work counters, bookshelves, tackboard area, and a lavatory.<sup>33</sup>

Space for instruction in typing should be adjacent to the bookkeeping room. Depending upon the type of furniture used, the typing room should provide from twenty to thirty square feet of floor area per pupil. The use of individual desks and chairs for each typewriter is desirable. The arrangement of desks should be such that there will be no interference between pupil chairs and the desks immediately behind them. Other essential equipment includes bookshelves, magazine racks, storage

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32. Supra 2., p.170.

33. Supra 12., p.77.



cabinets, and a lavatory. The front wall of the typing room should accommodate chalkboard, whereas the side walls may be equipped with display space for charts used in the teaching exercises. If possible, it is desirable to provide a small, separate typing practice room for use by pupils during their free periods.<sup>34</sup>

Instruction in stenography requires a minimum amount of special equipment and may be carried on in the bookkeeping room where tables and chairs are available. Abundant chalkboard space is necessary: some of this should be permanently ruled as a stenographic notebook. Other equipment should include a bulletin board, display case, teachers desk and chair, and ample storage space. If a separate space for instruction in stenography is provided, it should be adjacent to the typing room.

#### 5. Music Facilities

The wider contacts made by the American people with the radio, motion picture, television, and other communicative agencies of our age has, in a large measure, accounted for the important position music has assumed in our secondary school programs. It has now become necessary for all schools to provide special facilities to house the needs of the music program. The music unit should be located near the auditorium stage and conveniently accessible for community use. In addition, it should be isolated and insulated against noise interference with the rest of the school.

A choral room and a band and orchestra room are the essential space subdivisions of the music unit. Where enrollments are large, a music

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34. Supra 9., Chapter Two, Article II, Section 2208.

classroom and library should also be provided. For vocal work sixteen square feet per student will usually prove sufficient; at least twenty square feet per student is necessary for instrumental work.<sup>35</sup> These requirements do not include storage and other auxiliary spaces. In connection with both choral and orchestra rooms, small practice rooms of about one hundred square feet each should be provided.

In the orchestra room wall cases or a separate room should be provided for the storage of instruments. Bands and orchestras are frequently provided with uniforms owned by the school. Hence, lockers and uniform storage space are necessary.

It is often desirable if the floors of both orchestra and choral rooms are terraced. Also, special attention must be given to the acoustical correction of all music rooms.<sup>36</sup>

## 6. The Art Studio

Art in the modern secondary school is more closely linked with the interests of young men and women. With its more direct appeal, art demands more facilities for the developments of skills and techniques.

Art studios should contain the following elements: work space for creative expression in both graphic and plastic media, storage space for materials, washing and lavatory space, exhibit area, and discussion and study area.

The art studio should be located near the homemaking unit and general shop. The size of the studio should be large enough to provide from twenty-five to thirty-five square feet of floor area per pupil.<sup>37</sup>

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36. Supra 12., p.67.

37. Supra 12., p.74.

The major equipment for the art studio is easels and stools. In addition, the studio should be provided with an abundance of storage shelves and drawers, exhibit counters and working counters, a large tack-board area, and a small amount of chalkboard. Several long tables are essential.

In general, the art room should be designed as an informal laboratory rather than as a conventional classroom.

#### 7. The Homemaking Unit

The educational experiences offered in the homemaking department of the secondary school represent an effort to achieve more successful and efficient home living. Because of the relationship between the home arts and general arts, it is desirable to locate the homemaking unit adjoining or convenient to the art studio. Often, due to similarity of activity, the homemaking unit is located close to the cafeteria and its kitchen.

The usual space subdivisions of the homemaking unit are: a food laboratory, a living area, and a clothing shop. In the food laboratory, food will be prepared, served, and eaten. In addition, class demonstrations and discussions will be conducted. The provision of a series of self-contained unit kitchens, designed on home kitchen patterns, and accommodating four pupils each, is accepted as good practice. The equipment of these unit kitchens should approximate average conditions found in local homes, with emphasis on efficiency of arrangement. For example, the provision of a variety of types of ranges found in the community will be more profitable than providing only one type. Central refrigeration should be located near each group of two or four units. Also a dining area equipped with a table and chairs should be provided. Aside from

the usual counter and cabinet space, the kitchen area should be provided with storage space for aprons, towels, brooms, linen, etc. Some display board and chalkboard are necessary.

A living laboratory for experience in home furnishing, house care, and hospitality should be located adjoining to bath, the food laboratory and clothing shop. This area will also be used for many school social activities. Therefore, it should be directly accessible from the main travel corridor of the school. The living center should be equipped with home-type furnishings including chairs, bookcases, lamps and a roll-away bed. It is desirable to provide connecting bathroom facilities.

Space should be provided in the clothing shop for the design and fabrication of clothing, care and repair of clothes, selection of materials, and planning of clothing expenditures. Sewing machines, cutting and sewing tables, and ironing boards constitute the essential equipment. Storage space for finished and unfinished work, display area, and chalkboard should be provided. In large schools, it is desirable to provide a small laundry area in conjunction with the clothing laboratory. This area should be equipped with built-in tubs, one or more washing machines, a drier, and an ironing machine.<sup>38</sup>

### 8. Physical Science Facilities

Secondary school science rooms must provide facilities for demonstration, lecture, experimentation, recitation, and audio-visual teaching. The most widely accepted procedure of accomplishing this is to plan each laboratory as a flexible unit which is capable of adapting itself to many types of scientific activity.

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38. Supra 2., p.176.

The floor area of science rooms will depend upon their layout and function, but it is suggested that from thirty to forty square feet of floor area be allotted to each pupil, exclusive of storage space. Where possible, it is desirable to locate science facilities close to home-making and mathematics units.<sup>39</sup>

In larger secondary schools the sub-divisions of science facilities will include areas for instruction in general science, biology, physics, and chemistry. Because of the similarity of function, special equipment is often desirable to combine the physics with the chemistry laboratory and the biology with the general science laboratory.

For most science courses, movable tables and stools will be acceptable equipment. These tables should be equipped with drawers for the storage of books and materials. Sinks, installed along the wall convenient to each student working station, should be provided at the rate of one sink to every four students.<sup>40</sup>

Combination desk-tables are often used in the chemistry laboratory. These desks are usually fixed to the floor with each two units sharing a sink and gas and electrical outlets. A demonstration desk completely equipped with a sink, water supply, gas connections, and electrical outlets will be required in each laboratory. In biology and general science laboratories, space should be allotted for a growing table and aquarium.

Abundant storage space will be needed for scientific supplies and materials. Such space is best provided in a separate storeroom which can be shared by two or more laboratories. A minimum of 125 square feet

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39. Supra 12., p.80.

40. Supra 2., p.144.

of floor area should be provided for science laboratory storage. Where two laboratories share the same storeroom, a minimum of 150 square feet of floor area is needed.<sup>41</sup> Storage space for chemical supplies should be separated from other storage space and of fire-resistive construction. Some chalkboard, abundant tackboard, and display area should be provided in all science rooms.

#### B. The Secondary School Auditorium

The school auditorium is a center for expression in various media; it draws upon the resources of the entire school. The art rooms design stage scenery and decorations. The shops supply the skill and technique necessary for the construction of stage scenery and furniture. Home economics pupils cut and sew costumes. The library contains vital information about the presentation of plays and pageants. And the skill which is necessary to handle electricity is learned through science. Therefore, many of the activities which take place in the auditorium represent the integration of educational experiences gained in many different school areas.

If the auditorium is to satisfy the needs of the various activities it will house, it must be flexible. Musical and dramatic productions are two of the most important media of expression. In addition, forum discussions, lectures, demonstrations, and assemblies will take place in the auditorium. Also, provision must be made for educational activities which use the radio, television and motion pictures. In the design of the auditorium, all of these media of expression must be given consideration in

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41. Supra 9., Chapter Two, Article II, Section 2204.

order that the necessary provisions may be made for their use.

The school stage is the projection point from which a wide variety of performances will be presented to the audience. It must, therefore, provide a location for speakers, plays, musical concerts, and moving pictures. In many cases, the floor area of the stage should be able to provide levels of varying height for musical presentations. Provision must be made for the reduction of the height and width of the proscenium. This may be easily accomplished by means of movable drapes. The forestage must be directly accessible from the seating area by steps at its sides. Also, doors at the sides of the proscenium opening should connect backstage area and seating area. The backstage area must include dressing rooms, storage space for costumes and sets, and space and equipment necessary for scene shifting. The essentials of stage lighting equipment are baby spotlights, several floodlights, and a switchboard equipped with dimmers. The primary criteria in planning for lighting equipment is simplicity and flexibility of installment.

The audience area of the school auditorium serves to seat comfortably the audience assembled to witness the performance. Fundamentally, the needs of the school and the community taken in conjunction with the extent and nature of the school program are the criteria which determine the seating capacity of the auditorium. In general, relatively small auditoriums are much more desirable and effective than larger ones. In the development of the auditorium seating plan, the spectator's comfort in seeing and hearing should be the basis for all planning. If the seats are arranged in straight rows, seven square feet should be allowed for each seat. Whereas, if a curved row seating arrangement is employed,

eight square feet should be provided. Sufficient space between seats will allow for comfortable travel to and from seats. Aisles should be wide and as free from steps and obstructions as possible. They should lead straight to exit doors placed directly in the line of travel. In general, the floor of the auditorium should slope down from the rear toward the stage. The degree of this slope is a function of good sight lines. The size, shape, and finishing surfaces of the auditorium must insure good acoustical conditions. If natural illumination is used, provision must be made for darkening the auditorium.

The seating area of the auditorium should be directly connected to a lounge which will be used as a place for relaxation and social intercourse. Rest rooms for both men and women should be readily accessible from the lounge. A box office and cloak room are other spaces which are necessary to the functioning of the lounge area.

Although the function of the auditorium is closely allied with that of the school, it requires a degree of isolation for concentration of work and effect. With respect to the community it is one of the most popular and best utilized areas of the school. This fact demands that the auditorium be located in a prominent position which is readily accessible to the community.

The auditorium must be capable of functioning separately from the rest of the school because it will be used at irregular times during the day and night. Therefore, the lighting, heating, and other service facilities of the auditorium must be capable of independent operation.<sup>42</sup>

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42. Supra 12., p.55.



### C. The Gymnasium

Physical education is an integral part of general education, for its objective is to improve the health and physical well-being of all of the pupils. Along with muscular exercise, physical education makes major contributions to the growth of students in the realms of character development, sportsmanship, and ability to work together as a team.

A thriving intramural program is an indication of a vigorous physical education program that is reaching a significant portion of the student body. Out of the basic physical education program of the school stems the secondary feature of the provision of facilities for interscholastic competitive sports. Consequently, it is not educationally sound to plan a gymnasium for basketball alone, where one of the primary considerations is to provide seats for a maximum number of spectators. Instead, the ideal situation is to provide sufficient space for a thorough physical education program for all of the students and seating space for a reasonable number of spectators.

The gymnasium is the workshop of the physical education plant. Therefore, it should be planned as an integral part of the school plant. Ease of pupil, community, and spectator accessibility; close relation of the structure itself to outdoor physical education facilities; and separation of noisy recreational areas from quiet areas are factors which determine the location of the gymnasium. Under no consideration should the gymnasium be located in the basement.

The floor area of the gymnasium will be determined by the activities which are represented in the physical program for students and adults. In general, it should be a large, well-lighted, well-ventilated room,

suitable to the activities of the school and community. For secondary schools that participate in interscholastic sports, it is recommended that a minimum size gymnasium of 76' by 96' be provided. This space will accommodate five hundred spectators in folding bleachers and can be divided by a folding partition into two 48' by 76' physical education areas.<sup>43</sup>

The floor of the gymnasium playing area should be resilient and non-slippery. The best type of floor construction in current use is a hardwood finished floor (rock maple, if possible) laid over a subfloor supported by sleepers.

The minimum desirable ceiling height for secondary school gymnasiums is twenty-two feet. Lower walls should be smooth to avoid injury to players. Upper walls are best constructed of simple, unplastered materials such as cinderblock. Where possible, acoustical treatment of the interior surfaces is desirable.

The area of windows in the gymnasium should provide adequate natural lighting and circulation of air. In order that the glare from the windows will not interfere with the recreational activities, their location should not be determined until after the layout of the playing areas has been established. Shading devices should be provided to control and diffuse direct sun rays. Consideration should also be given to the provision for easy operation of window sashes for ventilation.

Most of the activities which take place in the gymnasium require an entirely clear floor space; therefore, all gymnastic apparatus should be

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43. Supra 9., Chapter II, Article II, Section 2210.

of a character which permits easy removal. In connection with the equipment of the gymnasium, storage rooms must be provided in terms of things that need to be stored. This storage space should be directly connected to the game area in a location that is near the instructors office. Double doors without elevated thresholds should be installed for ease in moving large equipment in and out.

A well-planned gymnasium should be provided with offices for departmental instructors of each sex. These offices should be located in direct relation to the playing area, locker rooms, and equipment storage rooms. In each office, a lavatory is essential and individual toilet and shower facilities are desirable.

Gymnasium dressing and shower facilities should be of a size and number that corresponds to the maximum size class that is to use such facilities. One of the most satisfactory methods of providing the necessary locker facilities is to provide enough street clothing lockers to accommodate the largest section of students who will use the recreational area at one particular time and, in addition, enough small lockers, only large enough to house gymnasium clothes of each student who will use the gymnasium. Locker rooms should be located so that they are directly accessible to both indoor and outdoor recreational areas. A location at grade level is high desirable because more adequate provisions can be made for the problems of sanitation and ventilation.

Showering facilities must be provided near the locker rooms. It is desirable to connect the shower and locker facilities with a drying area. For boys, common showers with one shower head per four pupils in the class will usually be sufficient. The current tendency is to provide

similar facilities for girls. Immediately adjoining toilet facilities should be provided for all dressing rooms. The floors and walls of locker and shower rooms should be of non-abrasive and non-absorptive materials.

It is universally accepted that the combination auditorium-gymnasium is undesirable. Superintendents and architects agree that it cannot be justified from the functional or administrative viewpoint. For it is physically impossible to combine the characteristics of a good auditorium with those of a good gymnasium and produce a successful hybrid. The result of such a combination will be a constantly conflicting compromise between two widely diversified activities. It is a difficult task to present a play to an audience seated in uncomfortable seats arranged on a level floor and constantly straining to see the performance; a more difficult task, to play basketball on a sloping floor.

PART VII.....SPACES OTHER THAN INSTRUCTIONAL

A. The Administrative Unit

The administration unit of the secondary school is concerned with the provision of the necessary space and equipment for the principal and his staff. The principal is the officer of the school who is responsible for the educational program in all its phases. In addition, he is the connecting link between the school and the community, as well as between the whole school and each of its parts.

The size of the administration unit will vary with the size of the school, type of school, and number of community activities provided by the school. Its location should be one which features ease of access for students, teachers, and members of the community. Therefore, a central location on the ground floor near the main entrance is highly desirable. The administrative spaces of the school should include a general office for the execution of routine clerical work, a principal's office, and a waiting space for the general public.

The public waiting room should be located and designed so that the public can find it easily and understand its purpose. It should have direct connection with the school corridor, the general office, and the principal's office. The public space must be equipped with seats which are comfortable and inviting. Exhibits of school work may be used to heighten the interest of visitors.

The general office is the work space where the routine business of the school will be performed. Therefore, it should be provided with all the equipment necessary to the execution of its clerical function.

The principal's office must be large enough to accommodate conferences with students, parents, and teachers. It must also be a convenient and efficient work space for a busy executive. This office must be easily accessible, but at the same time, have privacy and freedom from disturbance. The general office should control entrance into the principal's office. However, a separate and direct entrance should connect the corridor with the principal's office.

If the school is to develop the students ability to participate in the processes of democracy, the administration of the school must be democratic in its relationship with the student, the teacher, and the community.

#### B. The Cafeteria and Its Kitchen

Educational philosophy now recognizes that the activities of the school cafeteria are an integral part of education since they can make effective contributions in satisfying basic physical and educational needs. The school cafeteria can provide the opportunity for the learning of many lessons in the realm of social intercourse. In planning the cafeteria to fulfill the function of feeding pupils, no opportunity for the achievement of educational gains should be overlooked.

The dining area of the secondary school cafeteria should be one of the most attractive rooms in the entire school center. Openness, sunlight, and cheerfulness are the drawing features which characterize cafeterias conceived in accordance with the demands of health and good digestion. In many climates, this room may be placed so that easy access is afforded diners to the out-of-doors where a terrace has been

provided for the extension of facilities. At any rate the dining area of the cafeteria should be on the ground floor where it is directly and conveniently accessible from the outside and adapted to independent use. A location which is in close proximity to the gymnasium and auditorium is desirable.

The size of the service and dining areas of the school cafeteria will depend upon the maximum number of pupils to be served at one time. It is often estimated at forty percent of the enrollment. From ten to twelve square feet per person should be allowed in the dining area for the largest lunch shift. There are several methods of furnishing the dining area, but the most widely accepted method is the use of tables and chairs. As concerns seating arrangements, informal schemes are more desirable although formally regularized arrangements allow for larger capacities at the cost of social advantage.

It is desirable to give consideration to the separation of the dining area from the food preparation and service area. This can be accomplished by a soundproof partition which serves to separate the two areas. In such a scheme the dining area may be effectively used for many purposes besides its primary function. Time honored among these is its use as a study hall. Other multiple uses of the dining areas are audio-visual room, music room, banquets, and recreational and social programs. If the dining room is to be used for purposes other than dining, storage space should be provided for the special equipment and materials used in the other activities.

The size of the storage and food preparation areas of the school cafeteria will depend upon the total daily meal load. The kitchen area,



including dishwashing but excluding storage space, will usually require one and one-half square feet of floor area per meal served, with a minimum of three hundred square feet. The location of the kitchen should be such that delivery and refuse service may be readily and directly made from the outside.

The kitchen should be planned so as to provide for the natural flow of raw and prepared materials with a maximum degree of efficiency. The arrangement of the various areas of the kitchen must conform to the activities which will take place in the kitchen and immediately related areas. These activities are as follows:

1. Receiving of food
2. Storage of food and kitchen equipment
3. Preliminary preparation
4. Preparation
5. Serving
6. Dishwashing
7. Garbage and trash disposal
8. Cleaning facilities
9. Planning

In the layout of the kitchen, the following units should be considered: baker's unit, cook's unit, vegetable preparation unit, salad and sandwich unit, soup unit, and dishwashing unit. The type, size, and amount of equipment needed for each of these units will depend upon the lunch program and number of pupils to be served.

The kitchen should be planned with reference to natural as well as artificial lighting. The ventilating system for the kitchen should be

separated from the ventilating system for the rest of the school. Provisions must be made for maintaining sanitary conditions and for the comfort and convenience of the employees. All kitchens and related spaces must be in conformance with the requirements of the State Department of Health.

The materials of construction of the kitchen should be such as to provide for a maximum of sanitation. Walls and floors should be readily cleansible. The floor covering should be of non-slippery material not readily destroyed by grease.

The general storeroom of the kitchen must be vermin as well as burglar-proof. It may be divided into two sections; one for surplus foods and one for surplus equipment. The size of this storeroom will depend upon the policy of central and local storage, but usually a minimum of one-half a square foot of storage area per meal served is required. Concrete floors, smooth plaster or concrete walls, metal bins and shelves, and adequate artificial lighting are desirable characteristics of the food storage space.

The cafeteria workers should be provided with personal service facilities including locker accommodations, washing facilities, and rest rooms.

Facilities must be provided for the collection and removal of garbage and refuse at periodic intervals. An alcove or platform should be provided for the placement of garbage containers. This alcove should be readily accessible to collectors. Hot and cold water should be provided so that the containers may be cleansed after every use. Complete screening of garbage alcoves is essential.

If possible, it is highly desirable to provide a small office area for the cafeteria manager. The location of this office should be such that supervision is possible from inside the office. Regular office equipment, including a desk, chairs, filing cases and a typewriter are necessary.

### C. The Custodial Unit

If the secondary school is to render the services for which it was built, it must be properly serviced and maintained. Therefore, every school must be provided with facilities for custodial employees. These skilled employees are responsible for the operation and maintenance of the school plant and can execute their duties more effectively if suitable equipment and working space are available to them.

One of the most important divisions of the custodial unit is the heater room and fuel storage space. These rooms must be directly accessible from the outside. If interior entrances are provided, the doors must be of the metal clad, self-closing type. All construction must be fire-resistive and if coal is to be used, provisions must be made for ash removal.

Workshop facilities for repair and maintenance work are essential. They must be accessible from the exterior. The workshop may be located adjacent to the furnace room, but it should not be a part of it. Maintenance equipment and power outlets must be provided. Toilet and shower facilities should be provided for use by the custodial employees. These facilities should be located so that they are easily accessible to the workshop but separated from those used by teachers and pupils. A supply room should be provided adjacent to the workshop. It should be

equipped with shelves and bins for the storage of service and maintenance materials.

Every school should be provided with a central storage room which is equipped with the necessary shelving and racks for the storing of various types of supplies. Other well arranged and properly protected storage facilities throughout the school will aid in administration and protection of the materials stored.

Custodial service closets should be conveniently situated on each floor. Each closet should be equipped with a slop sink with hot and cold water and storage space for mop trucks and cleaning equipment.

#### D. The Health Suite

One of the major services rendered to the students of the contemporary secondary school revolves around health services. In the health suite periodical checks on the health status of each pupil will be executed. In addition, this area serves to house the driving force of the school's constant campaign against communicable diseases.

The location and make-up of the health suite will depend upon the policy of health education of the particular school. Many schools place the responsibility of health guidance and education upon the department of physical education. In such schools, the health suite is best located near the other physical education facilities. In other schools, health education is considered as an integral part of general education. In these schools the health guidance suite should be located near the administration unit where it is convenient to both pupils and public.

A waiting room and an examination room are the minimum facilities

should be provided in the health suite. In addition, the provision of a nurse's room, dressing booths, and rest rooms is strongly recommended.

The waiting room should be directly accessible from the corridor and communicating with the examination room. The size of the waiting room will vary with the size of the school, but seating space for at least ten students should be provided. The furniture in this space should be easy to clean and of simple but attractive design.

The examination room should be directly accessible from the waiting room and dressing booths. There should be adjoining toilet and storage facilities. The equipment of this room should include an instrument and medicine case, examination table, and a desk and chairs. A rest room holding one or more cots should be provided adjoining to the toilet and directly accessible to the examination room.<sup>44</sup>

#### E. The School Library

The scope of services offered by the secondary school library has increased rapidly in recent years. The newer concept of the library emphasizes the educational services rendered by an adequate library rather than the guarding of them. The school library is the service and instruction agency of the school. It is the place where all sorts of teaching materials are classified, stored, and made readily available to students, teachers, and members of the community. An efficiently planned and adequately equipped library is of paramount importance to the school because the fundamental objective of the library is identical with the basic principle of the school itself.

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44. Supra 2., p196.

In many communities the school library will be used extensively by members of the community. In such cases, one of the first considerations in the location of the library must be given to community use. It is better to have the students slightly inconvenienced than to have members of the community completely discouraged in the use of the library. Centrality of location, remoteness from noise and orientation are other important factors which will affect the location of the school library.

In order to successfully fulfill its function, the library must have a main reading room plus several smaller auxiliary rooms. These smaller spaces should include a librarian's work room, a conference room, library classroom and storage area and book stacks. The main reading room forms the center of all library planning. The size of this room will be determined by the school enrollment as well as the number of services offered by the library. If the school enrollment exceeds five hundred pupils, the main reading room should seat at least seventy-five pupils plus ten percent of the enrollment in excess of five hundred at twenty-five square feet of floor area per pupil. However, percentage figures of this kind are somewhat misleading because the library is constantly taking on new functions and should not be planned in such a restricted manner as to prevent the fulfillment of new demands. Sound absorbing materials should be used on walls, floors, and ceilings because it is desirable for the reading room to be as quiet as possible. The essential equipment of the reading room consists of tables and chairs for patrons, a charging desk, book shelves, display boards and stands, catalog cases, and newspaper and magazine racks.<sup>45</sup>

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45. Supra 2., p.126.

In most secondary schools, the librarian's work room also acts as the librarian's office. Doors should connect this room to the library as well as to the school corridor. The central piece of equipment in the work room is a large work table. Another piece of essential equipment is a sink with hot and cold water. The walls should be lined with shelving.

A conference room designed for use by students, teachers, and adult groups should adjoin the main reading room. This room should be equipped with a table and chairs to accommodate at least fifteen persons, shelving, and a section of chalkboard and display board.

The library classroom is often an enlargement of the conference room and acts as a space for the presentation of audio-visual aids. It should be equipped with shelves, chalkboard, display space, tables and chairs, and all the other equipment necessary to the use of audio-visual aids.

Of course, a stock room must be provided for the storage of materials not in current use. Often, this space is combined with the librarian's work room.

The provision of adequate space and equipment does not necessarily mean that the library is a successful one. It must also provide that intangible quality of pleasant atmosphere. The school library must be a place which provides an environment where the mind is instinctively inspired to respond to subject matter.

#### F. Teachers Rooms

All too often, the school of the past neglected to provide the facilities which are necessary for the convenience and comfort of teachers.

A reasonable expenditure for such facilities will, in the long run, pay dividends in terms of teacher morale and quality of instruction.

In connection with facilities for the comfort of teachers, a teacher's workroom should be provided which communicates with both men and women teacher retiring rooms. The workroom should be sized to accommodate from one-fifth to one-seventh of the total number of teachers in the school. It should be furnished with study tables, easy chairs, a book case, and a bulletin board. The adjoining retiring rooms should include a connecting toilet, a day bed and individual lockers.

#### G. Student Toilet Rooms

The inculcation of habits of health and sanitation is a social necessity and, therefore, an appropriate part of general education. It is imperative that our schools translate theory into reality by providing toilet facilities that are adequate and sanitary.

Previous mention has been made of the necessity of providing toilet and lavatory facilities in connection with the larger service spaces of the secondary school. In addition, general student toilets are necessary, at least one for each sex, on each floor of the building. The size of pupil toilet rooms will, of course, depend upon the number of fixtures provided.

Where possible, ground floor toilets should be located adjacent to playgrounds. Under no circumstances should student toilet rooms be relegated to basement locations. All toilet rooms should be provided with direct ventilation and an abundance of natural sunlight by means of window space which is not less than ten percent of the total floor area.



The interior surfaces of toilet rooms should be light in color to promote sanitation and cleanliness. Glazed tile is preferred for wainscoting and floors. Walls above the wainscoting and ceilings should be of waterproof, non-absorbent materials. Soap dispensers, paper dispensers, trash cans, and mirrors should be provided in a number that corresponds to the number of fixtures in the toilet.<sup>46</sup>

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<sup>46.</sup> Supra 2., p.119.

PART VIII.....LIGHTING THE SECONDARY SCHOOL

One of the most important problems to be solved in the planning of secondary schools is that of lighting, both natural and artificial. The history of recommendations made in this sphere of school planning shows an emphasis upon the quantity of light introduced into the enclosed spaces. However, in recent years the recognition of the relative importance of brightness, brightness-differences, and total visual fields has broadened the narrow footcandle concept. The current approach to the problem of lighting the school takes into consideration the entire visual environment as it affects the physical, mental, and emotional welfare of the pupil. The following discussion will be concerned with the presentation of the elements which must be understood in order to objectively evaluate the environment of the secondary school as it is related to the visual comfort and efficiency of the pupil.

A. Definition of Basic Lighting Terms:<sup>47</sup>

1. The central field is synonymous with the immediate visual task. If the visual task is reading a book, the book is the central field.
2. The surrounding field extends approximately thirty degrees on each side of the line of sight.
3. The peripheal field lies outside the surrounding field and includes an area which extends 120 degrees vertically and 160 degrees horizontally centering on the optical axis.
4. The footcandle is used to measure the intensity of light at a given point. It is defined as the illumination produced on a surface, all points of which are a distance of one foot from a uniform point source of one candle.

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47. Supra 8., p.139.

5. The reflection factor of a given surface is the percentage of the total amount of light falling upon the surface which is reflected by the surface.
6. Brightness is the luminous intensity of any surface. It may be produced by either reflection or direct transmission of light.
7. The footlambert is the unit used to measure the brightness of any surface. The brightness of a particular surface in footlamberts is the product of the illumination in foot-candles and the reflection factor of the surface.

### B. Brightness-differences

A balance between surface brightness differences is the key to visual comfort and efficiency. In general, an acceptable condition of brightness-balance can be established in a visual environment if the brightness-differences within the central field are kept high, whereas those between the central and peripheral fields are kept low.

A desirable goal for visual efficiency would be that no area or light source within the total visual field be brighter than, nor less than one-third as bright as, the task: while the general level of illumination is kept high. Brightness-differences occasioned by natural or artificial sources of light should not exceed a ratio of five to one.<sup>48</sup>

### C. Reflection Factors

The opaque objects and non-luminous surfaces of the classroom are only made visible by the light they reflect. Hence, the reflection factor of an object or surface will determine the brightness of the light it reflects. It is, therefore, necessary that reflection factors be regulated in order to achieve the desired conditions of brightness-balance

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<sup>48</sup>. Supra 9., Chapter Three, Article VI, Section 3603.

and brightness-difference and thereby insure visual comfort and efficiency.

The ceiling should be an effective light reflecting surface. One accepted method of achieving this condition is by refinishing the ceiling with flat or non-glossy white paint which has a reflection factor of approximately eighty-five percent. However, a ceiling reflection factor of eighty-five percent is usually difficult of accomplishment because painting destroys many of the desirable acoustical properties of a material. When painted, perforated acoustic tile loses fewer of its acoustical qualities than any of the non-perforated materials. Therefore, it is one of the best compromises between a sound-and-sight-conditioned ceiling.

Upper walls from the ceiling to the wainscot should have finished surfaces which furnish reflection factors of at least sixty percent. The lower walls from the wainscot down to and including the baseboard should have minimum reflection factors of forty percent. Where maintenance conditions permit, it is considered good practice to finish the entire wall from floor to ceiling with a minimum reflection factor of sixty percent.

Floor finishes, desks, and equipment should have reflection factors ranging from thirty to forty percent. For floors, light shades of tan have proved satisfactory because of their color and ease of maintenance.

#### D. Light Sources

The illumination of the school is usually dependent upon a primary source of natural light and a secondary artificial source which is used to supplement natural light when acceptable brightness levels cannot be

maintained without it. In most cases, the maximum utilization of natural light will greatly reduce the need for supplementary artificial light in the daytime.

In the unilateral classroom, lighting scheme, natural light is admitted through one primary source on one side of the classroom. The bilateral lighting scheme makes a more efficient use of natural light through the introduction of light from both sides of the room. However, in bilateral lighting great care must be exercised in the control of this light in order to eliminate the excessive brightness occasioned by the entrance of direct sunlight into the classroom.

Irregardless of the method employed to introduce natural light into the classroom, the net area of glass shall equal or exceed twenty-five percent of the floor area. The most satisfactory types of windows for use in schools are double-hung, awning, and architectural projected. They may be of steel, wood, or aluminum.<sup>49</sup>

The provision of artificial light may be achieved in a great variety of ways: different arrangements of incandescent or fluorescent luminaries may be used as either direct or semi-direct, indirect or semi-indirect sources of light. Some of the important factors which influence the choice of an artificial lighting scheme are visual comfort, initial cost, operating cost, and maintenance. All school spaces which will be used at night should be equipped with artificial lighting systems which will produce the desired intensities and brightness conditions without daylight.

The desired intensity of illumination in the various school spaces

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49. *Supra* 9., Chapter Three, Article VI, Section 3602.

will vary with the activity and visual task to be executed. For tasks common to the classroom, intensities ranging from twenty to forty footcandles are considered to satisfy visual requirements. In auditoriums, gymnasiums, and other spaces which are not used for study, an intensity of ten footcandles is sufficient.

PART IX.....MECHANICAL EQUIPMENT



A. Heating and Ventilating

The heating and ventilating system of the secondary school will make important contributions to the comfort, health, and efficiency of its occupants. It is, therefore, necessary for all schools to provide heating and ventilating systems which conform to the minimum design and performance standards.

The main functions of a heating and ventilating system are:

1. To supply heat to balance losses from the human body through conduction, evaporation, and radiation.
2. To remove excess heat.
3. To remove unpleasant or injurious gases, vapors, fumes, and dusts.

Satisfactory heating results may be obtained in a variety of ways. Water, steam, air, and electricity are the common media for the transfer of heat to enclosed spaces. Regardless of the heat transfer media used, heat dispensing units may be located within the room, direct; wholly outside of the room, indirect; or within the walls, ceiling, or floor of the room, radiant. The selection of a particular type of heating and ventilating system should depend, not so much on first cost as on economy of operation, flexibility of control, and efficiency of capacity to provide desirable thermal and atmospheric conditions at relatively low maintenance and operational costs.

Consideration should also be given to the availability of a constant and economical supply of fuel near the location of the school. Ordinary warm-air or high pressure steam systems are not generally acceptable for schools.

Auditoriums, gymnasiums, and other areas of the building that will be susceptible to independent use at irregular hours, should be zoned so that separate operation of the heating and ventilating system is possible.

### B. The Uses of Electricity

The artificial lighting of the secondary school constitutes the primary use of electricity. In addition, electricity will also be used for audio-visual equipment, intercommunicating and radio systems, clock systems, and fire alarm systems. The use of radio systems is receiving rising recognition in connection with more efficient teaching and administration. In many locations, it is wise to give consideration to the future use of television as an educational device.

### C. Sanitary and Plumbing Facilities

Adequately designed, well organized, and maintained sanitary facilities are essential to the health and comfort of secondary school students. The water supply of the school must be safe and adequate: at least twenty-five gallons per pupil per day should be available.

Drinking fountains should be provided in a ratio of one fountain to every seventy-five students; with a minimum of one drinking fountain on each floor. Drinking fountains of the frost-proof type should be located on outdoor play areas.

For pupil toilet rooms the following minimum ratio of fixtures to pupils should be established:<sup>50</sup>

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50. Supra 9., Chapter Three, Article IV, Section 3402.

	Water Closets	Lavatories	Urinals
Girls	1:45	1:50	
Boys	1:90	1:50	1:30

Previous consideration has been devoted to the provision of toilet facilities in connection with the larger school areas.

The design of the sewage disposal system will require the technical advice of a sanitary engineer. The type of installation will depend upon local codes, character of soil, location of wells, and sources of water supply.

PART I.....THE PROGRAM FOR A HIGH SCHOOL FOR POUND, VIRGINIA

X THE PROGRAM FOR A HIGH SCHOOL FOR POUND, VIRGINIA

A. Educational Program

The following statistics show the progress of Pound High School between 1943 and 1950.

SCHOOL YEAR	GRADES					TOTAL ENROLLMENT
	8	9	10	11	12	
1943-1944	65	22	21	11	19	138
1944-1945	67	50	24	17	10	168
1945-1946	78	49	43	33	14	217
1946-1947	69	57	38	42	32	238
1947-1948	100	47	39	25	33	242
1948-1949	109	68	41	36	19	273
1949-1950	99	97	46	41	29	312

Based on the past seven years, the enrollment of Pound High School has increased 220 percent. Using only 200 percent as an estimate for 1956, the total enrollment will be 624.

A letter from the district school board to D. R. Beeson, architect, stated that "in order to accommodate high school students in the Roberson District ..... we should prepare to accommodate a minimum of six hundred students", and presented the following outline of studies for six hundred pupils.

PROGRAM OF STUDIES FOR POUND HIGH SCHOOL

<u>Course</u>	<u>No. of Sections</u>	<u>No. of Pupils</u>
8th Grade		
General mathematics	6 sections	198
Elementary science	6 sections	198
Social Studies	6 sections	198
English	6 sections	198
Civics	6 sections	198
Exploratory work in music.		

## PROGRAM OF STUDIES FOR FOUNDED HIGH SCHOOL (Cont'd.)

<u>Course</u>	<u>No. of Sections</u>	<u>No. of Pupils</u>
<u>9th Grade</u>		
English	6 sections	194
General Science	5 sections	160
World History	3 sections	90
Algebra	6 sections	194
Home Making I	2 sections	50
Latin I	1 section	20
French I	1 section	20
Spanish I	1 section	20
Agriculture	2 sections	50
General Arithmetic	1 section	30
<u>10th Grade</u>		
English	3 sections	92
Biology	2 sections	60
Social Studies	2 sections	60
Algebra II	2 sections	50
Latin II	1 section	20
French II	1 section	20
Spanish II	1 section	30
Business Education, General	1 section	30
Diversified Occupations	1 section	25
Home Making II	1 section	35
<u>11th Grade</u>		
English	3 sections	82
Chemistry	1 section	30
Plane Geometry	1 section	20
Home Making III	1 section	20
Typing I	2 sections	40
Bookkeeping	1 section	30
Shorthand I	1 section	30
Latin III	1 section	15
U.S. History	3 sections	82
<u>12th Grade</u>		
English	2 sections	58
Solid Geometry & Trigonometry	1 section	15
Civics	2 sections	58
Physics	1 section	15
Journalism	1 section	20
Advanced Arithmetic	1 section	20
Dramatics	1 section	30
Economics	1 section	30

Under the preceding program of studies, Industrial Arts would be continued on the present plan at Wise Vocational School, each pupil

staying a half a day at the shop.

The physical education program would include twelve sections at fifty-two pupils per section. Two health rooms would be necessary since two groups could be handled in the gymnasium at the same time, two groups would be in health classes.

### B. Architectural Program

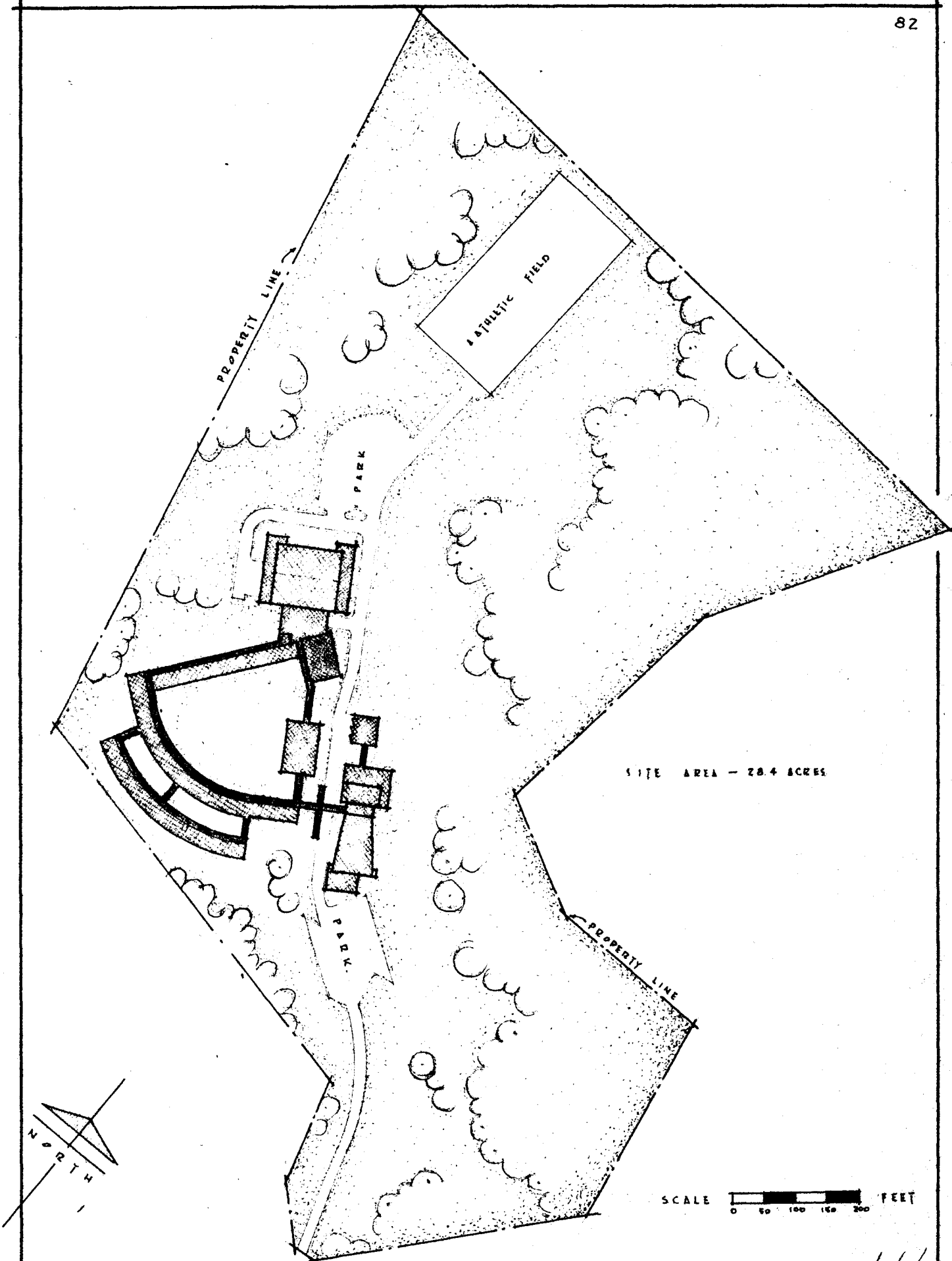
An analysis of the educational program produced the following program of required facilities:

1. Classrooms		
a. English	——	4 at 616 sq. ft. each
b. Language	——	2 at 548 sq. ft. each
c. Social Studies	-	4 at 616 sq. ft. each
d. Mathematics	——	3 at 616 sq. ft. each
e. Health	——	2 at 616 sq. ft. each
2. General Science and Biology Laboratory	——	1,050 sq. ft.
3. Physics and Chemistry Laboratory	——	1,050 sq. ft.
4. Business Department		
a. Typing	——	500 sq. ft.
b. Bookkeeping and stenography	——	700 sq. ft.
5. Homemaking Department		
a. Kitchen	——	450 sq. ft.
b. Living	——	500 sq. ft.
c. Sewing	——	350 sq. ft.
6. Art Studio	——	700 sq. ft.
7. Music Unit		
a. Chorus room	——	850 sq. ft.
b. Band room	——	1,100 sq. ft.
8. Library		
a. Reading room	——	2,000 sq. ft.
b. Conference room	——	300 sq. ft.
c. Librarian's office	——	150 sq. ft.
d. Storage	——	150 sq. ft.
9. Cafeteria		
a. Dining area	——	2,400 sq. ft.
b. Kitchen	——	1,000 sq. ft.

10.	Administration Unit		
	a. Principal's office	=====	400 sq. ft.
	b. General office	=====	300 sq. ft.
11.	Auditorium		
	a. Seating capacity for 600	=====	
	b. Stage	=====	1,500 sq. ft.
	c. Lobby area	=====	1,000 sq. ft.
12.	Gymnasium		
	a. Playing area	=====	9,000 sq. ft.
	b. Locker, shower and toilet facilities for each sex		
	c. Public toilets		
	d. Visiting team facilities		
	e. Instructor's office	=====	100 sq. ft.
	f. Storage	=====	250 sq. ft.
13.	Health Suite		
	a. Waiting room	=====	150 sq. ft.
	b. Examination room	=====	300 sq. ft.
	c. Dressing booths	=====	30 sq. ft.
	d. Rest rooms	=====	100 sq. ft.
14.	Teachers Room		
	a. Work room — desks for five	=====	200 sq. ft.
	b. Rest rooms for each sex		
15.	Custodial Unit		
	a. Heater room	=====	900 sq. ft.
	b. Fuel room	=====	500 sq. ft.
	c. Workshop and supply room	=====	500 sq. ft.
16.	Pupil Toilet Facilities for each sex		



PART XI.....THE DESIGN



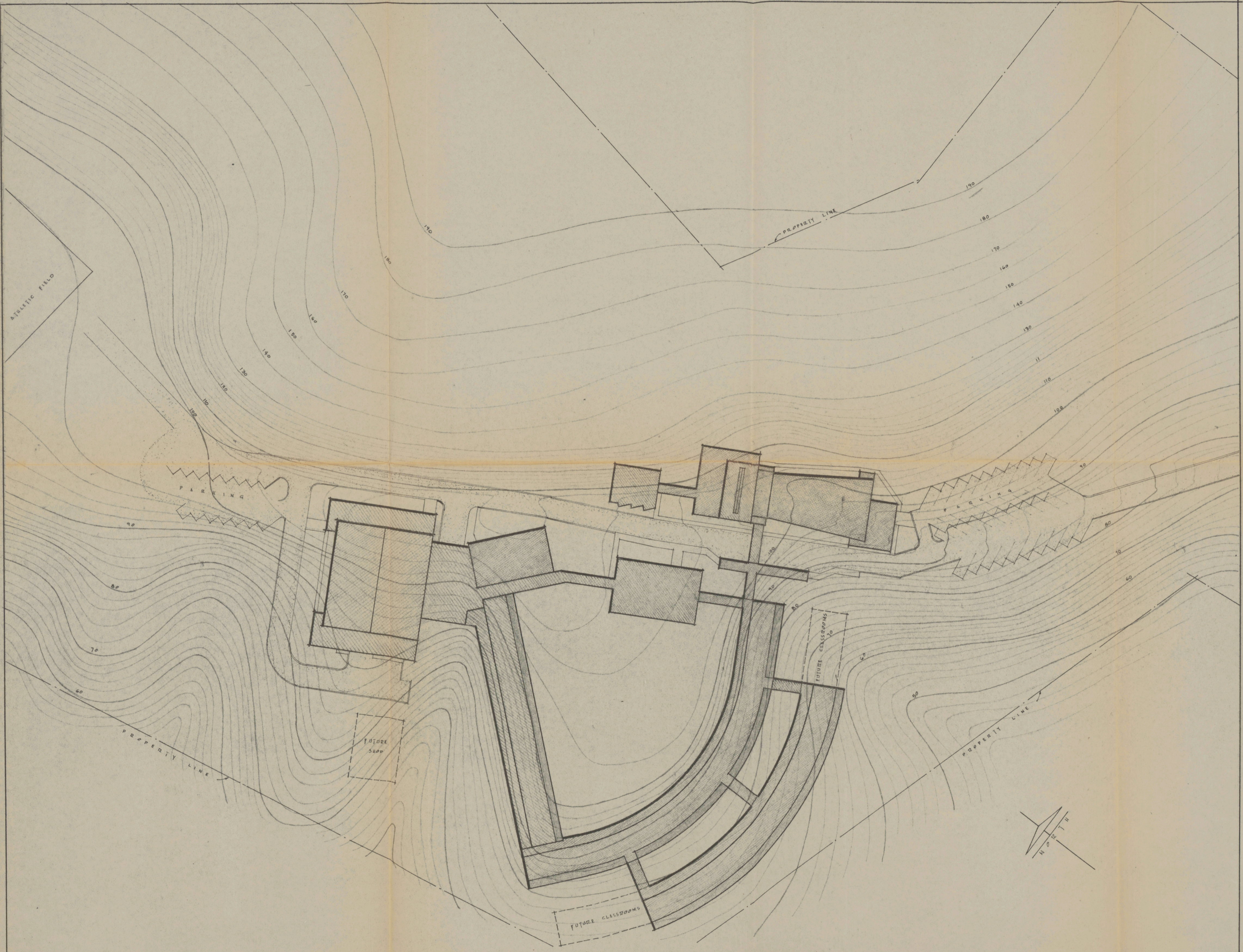
SITE AREA - 28.4 ACRES



SCALE 0 50 100 150 200 FEET

S I T E P L A N

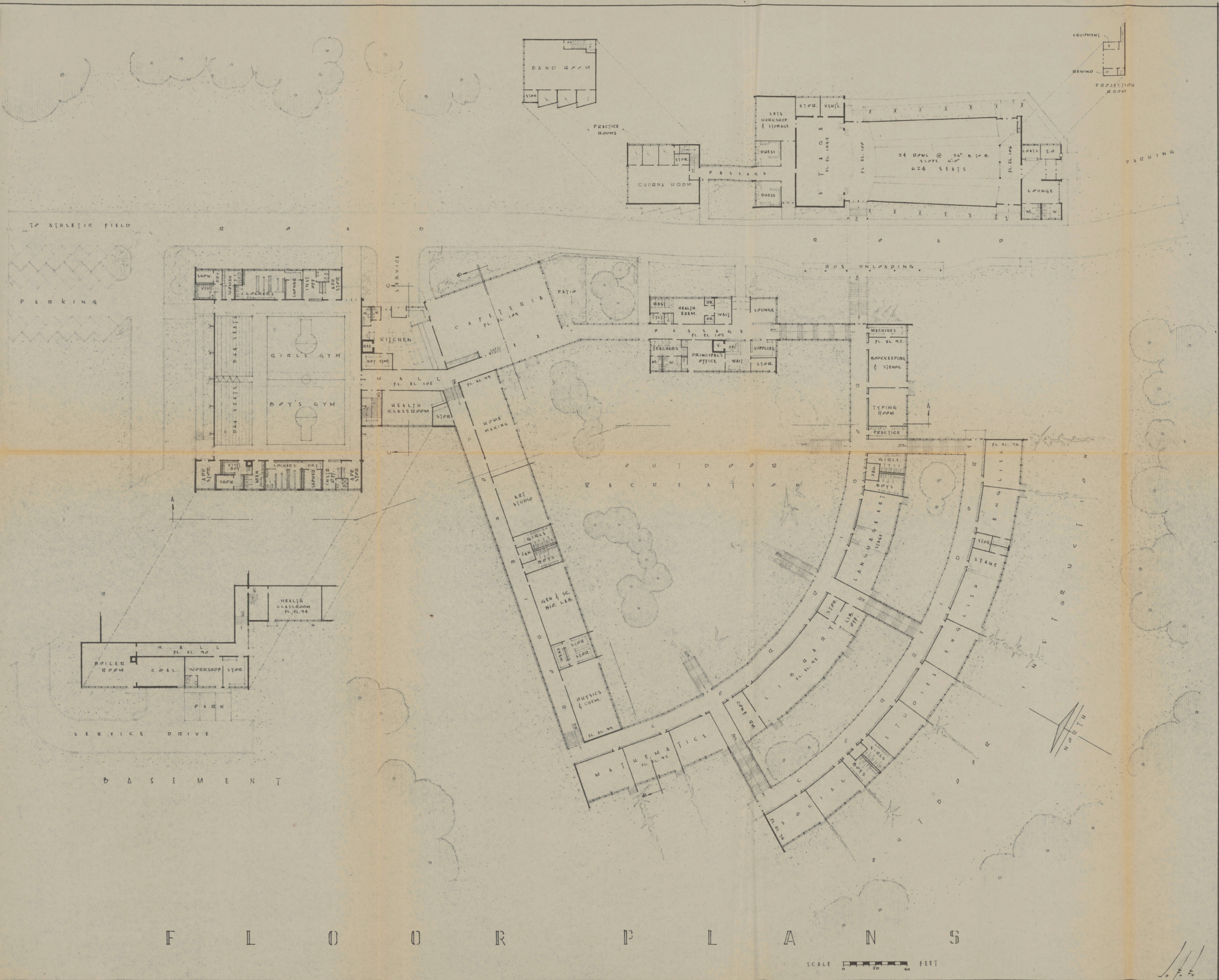
E.E.



F L O T F L A N

SCALE 0 60 FEET

J. F. F.



TO ATHLETIC FIELD

PARKING

PARKING

BUS UNLOADING

OUTDOOR RECREATION

STRUCTURE

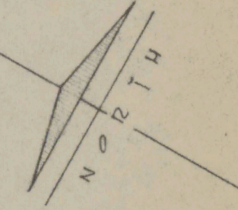
BOILER ROOM  
COAL  
WORKSHOP  
STOR.

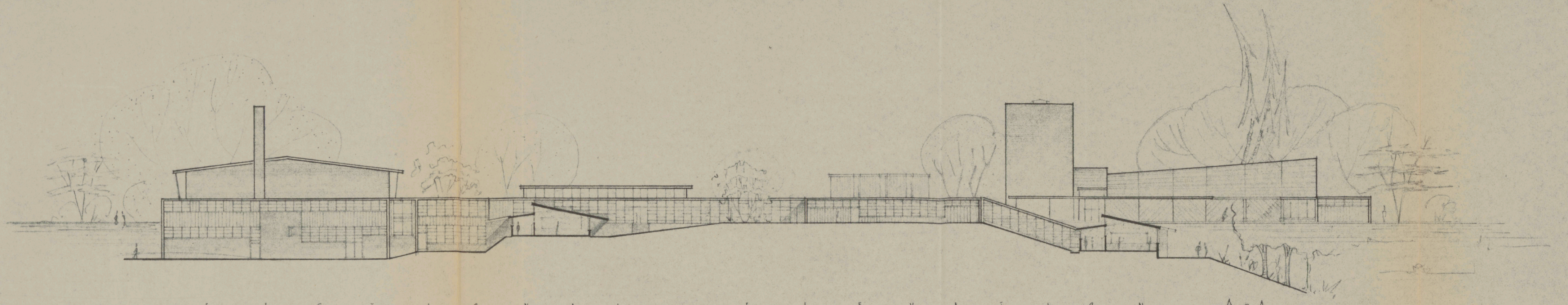
SERVICE DRIVE

BASEMENT

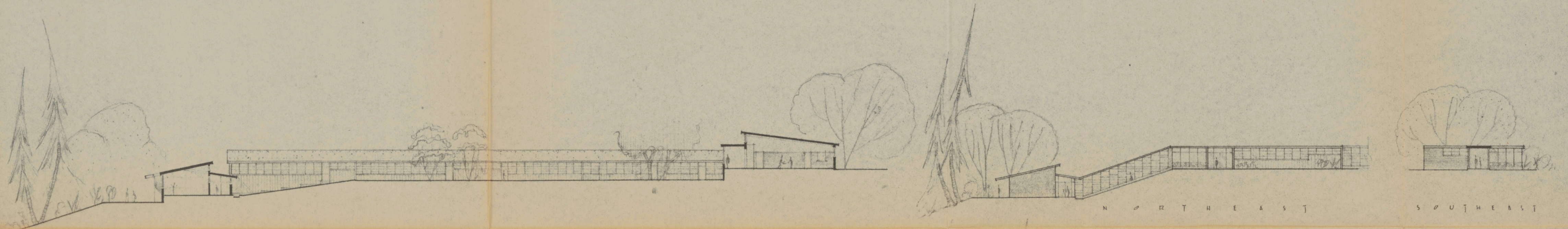
F L O O R P L A N S

SCALE 0 20 40 FEET





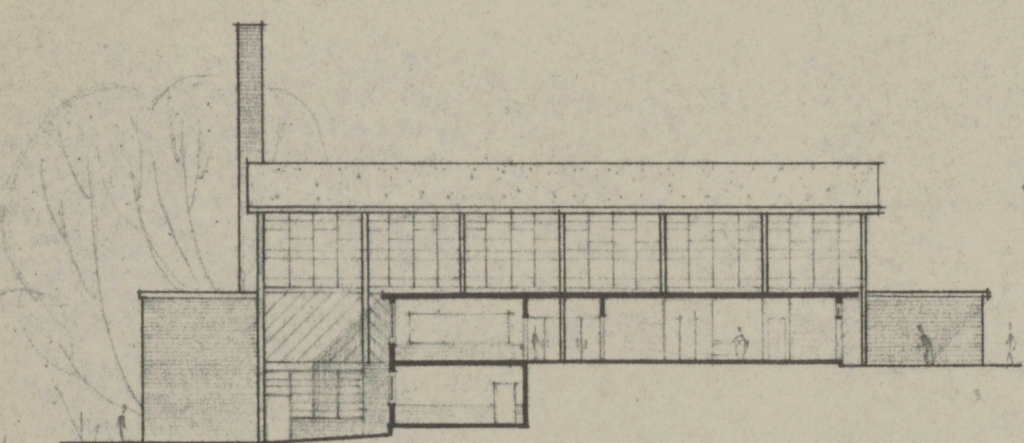
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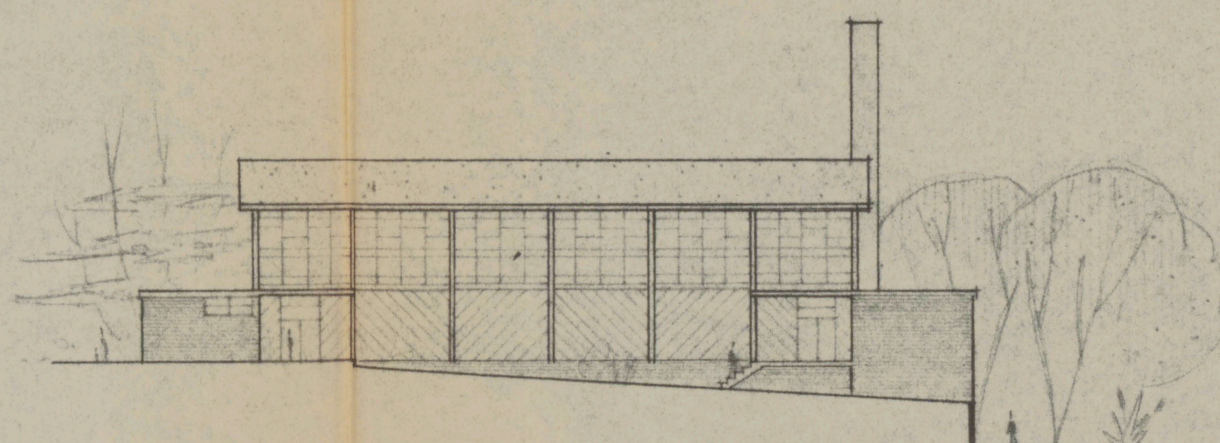
S E C T I O N A L E L E V A T I O N B - B

N O R T H E A S T S O U T H E A S T

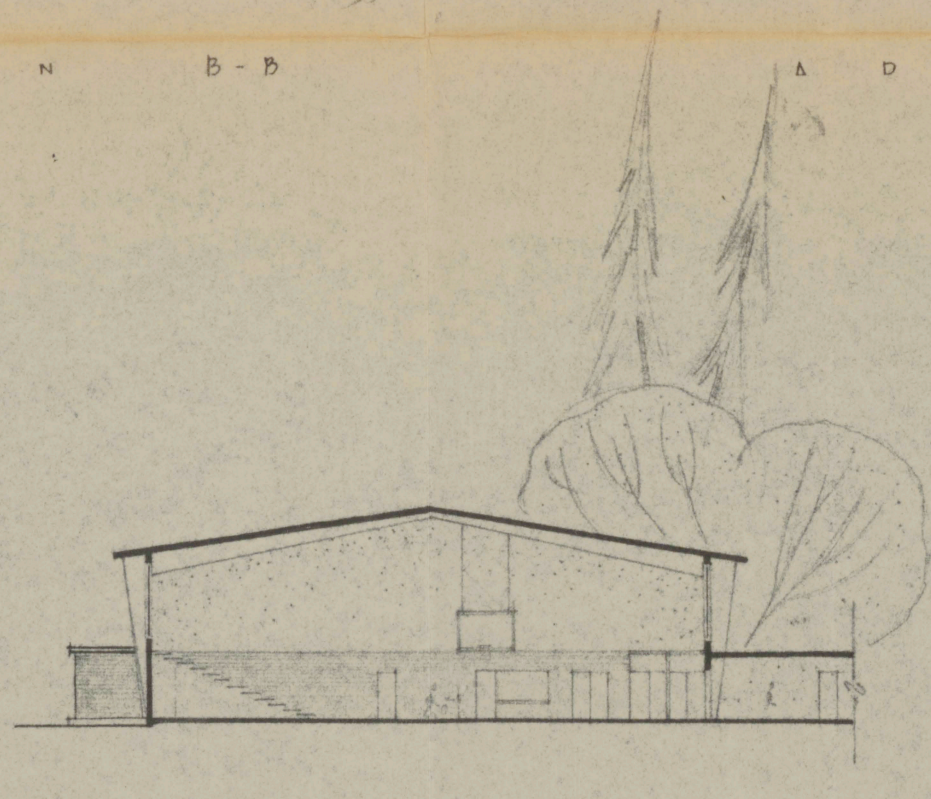
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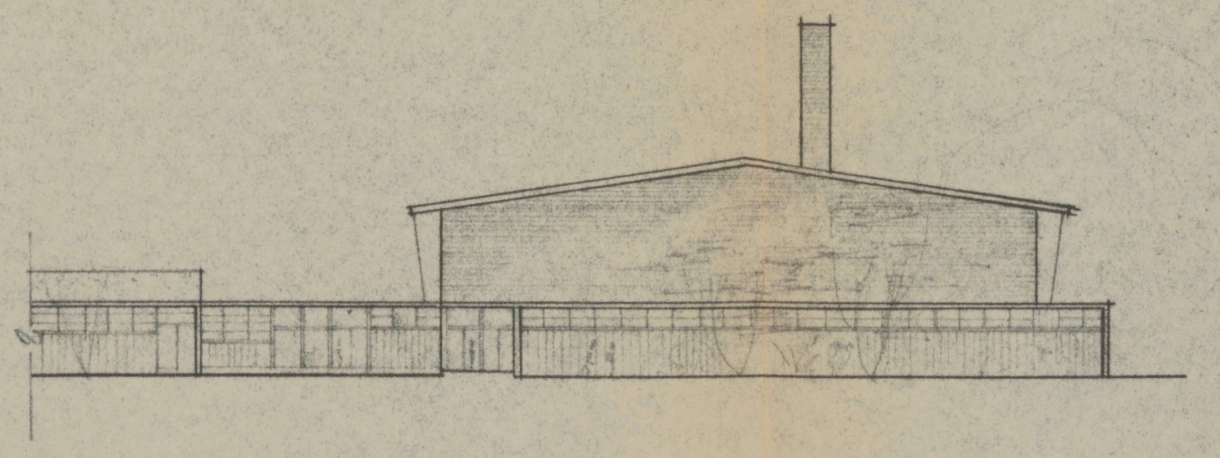
S E C T I O N C - C  
T H E



N O R T H W E S T

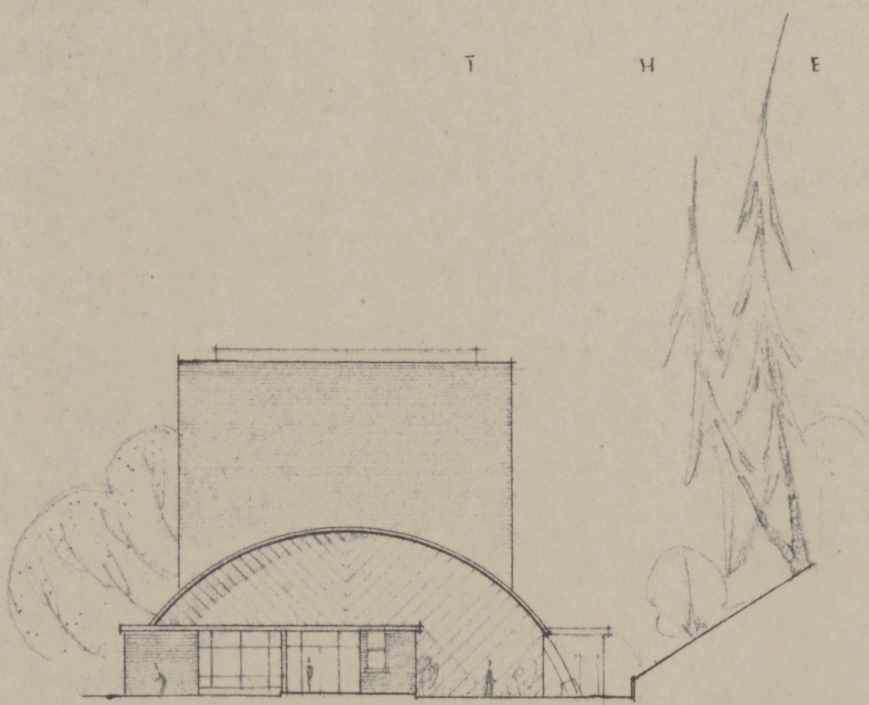


C R O S S S E C T I O N

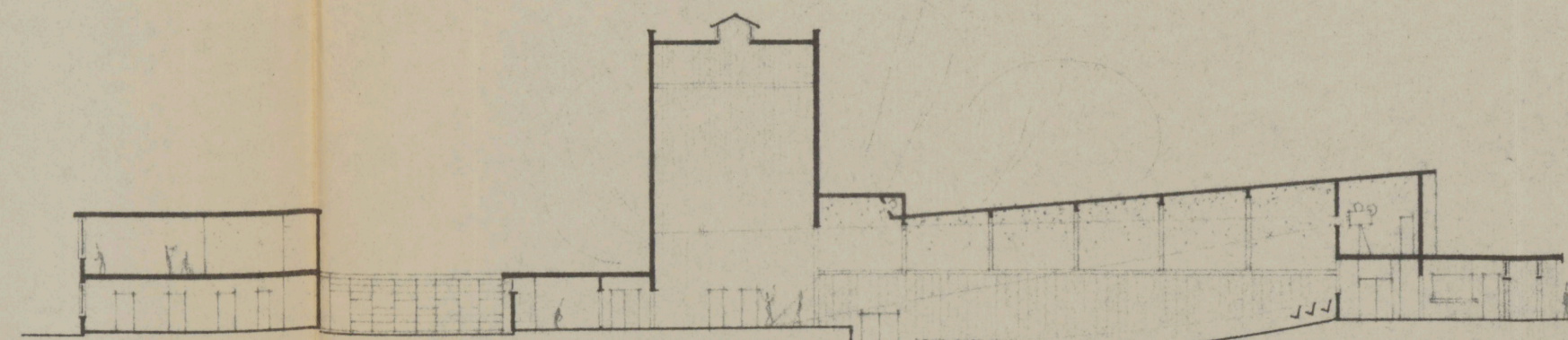


N O R T H E A S T

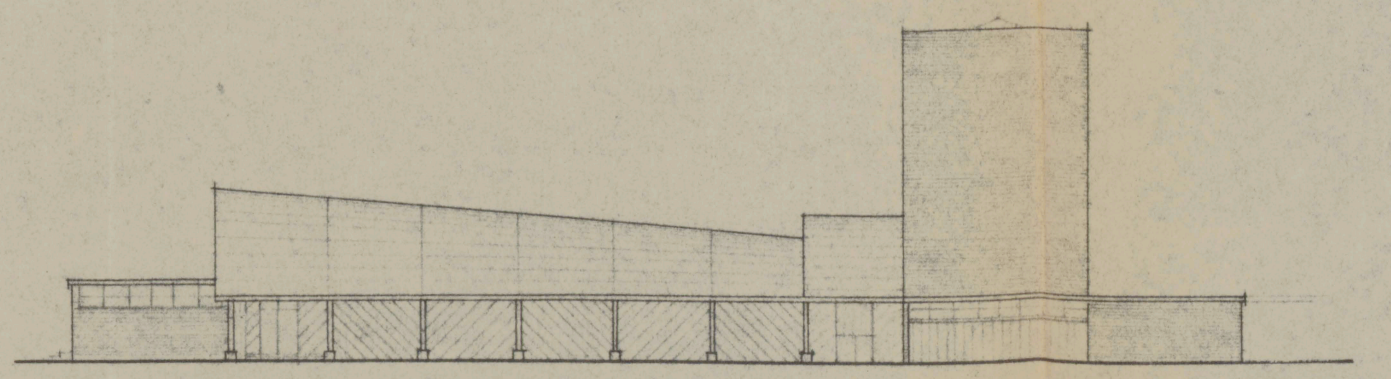
G Y M N A S I U M



S O U T H E A S T



L O N G I T U D I N A L S E C T I O N

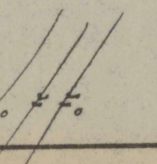


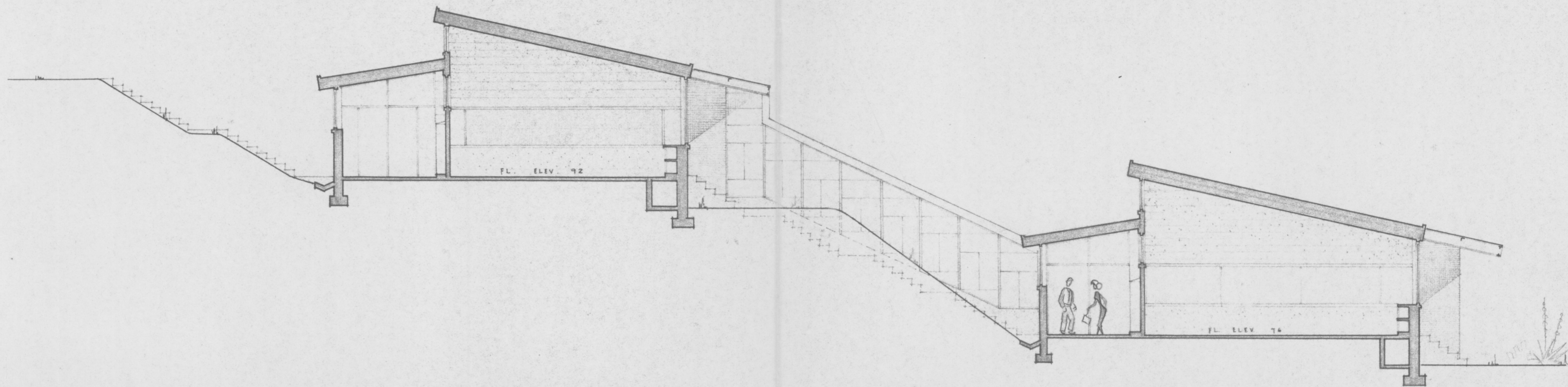
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T H E A D U D I T O R I U M

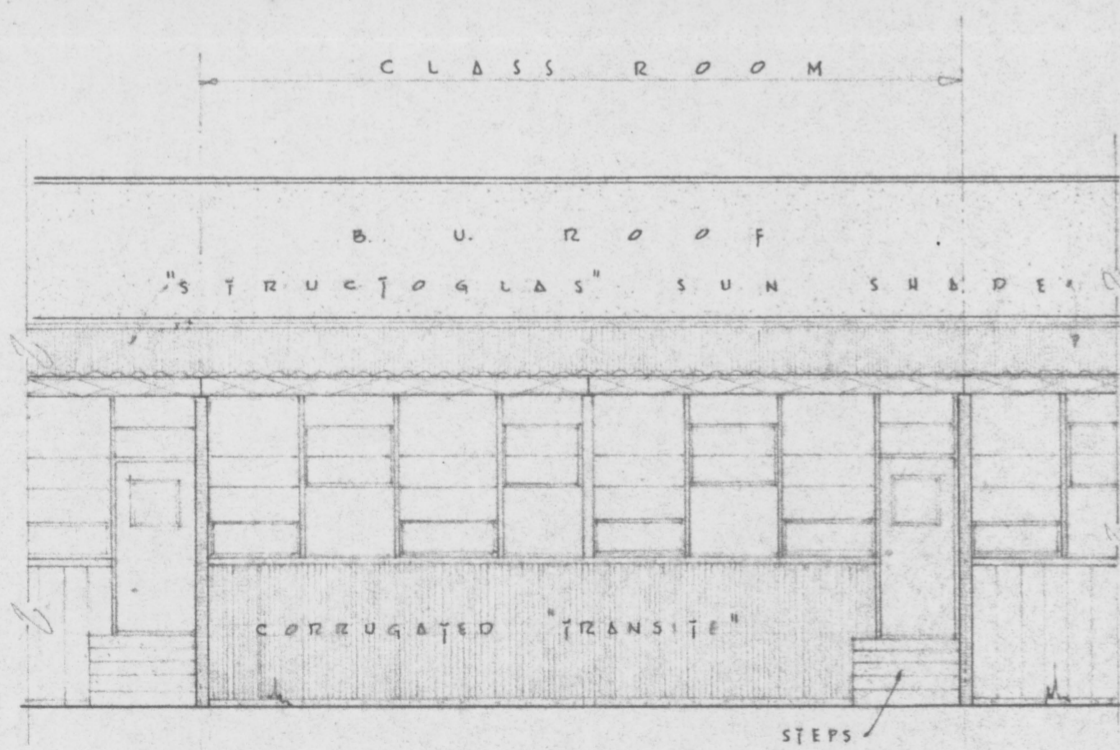
S E C T I O N S & E L E V A T I O N S

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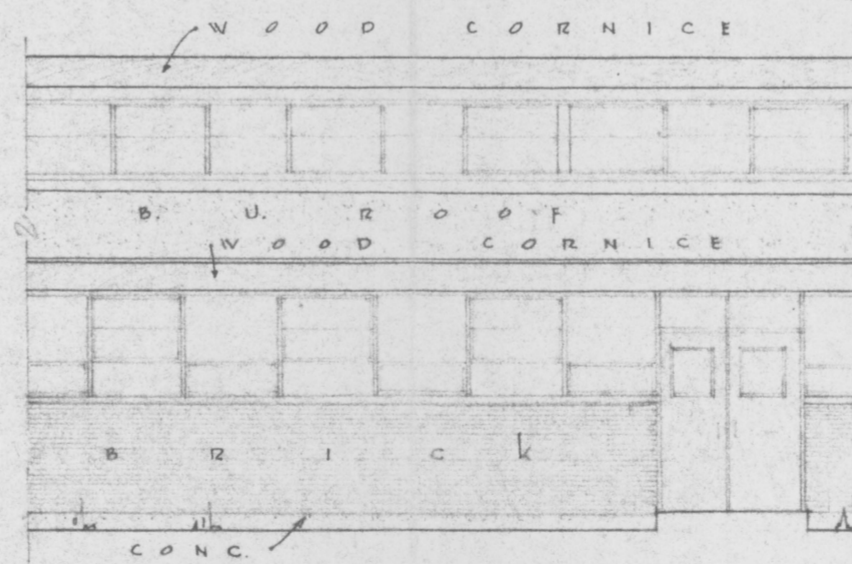




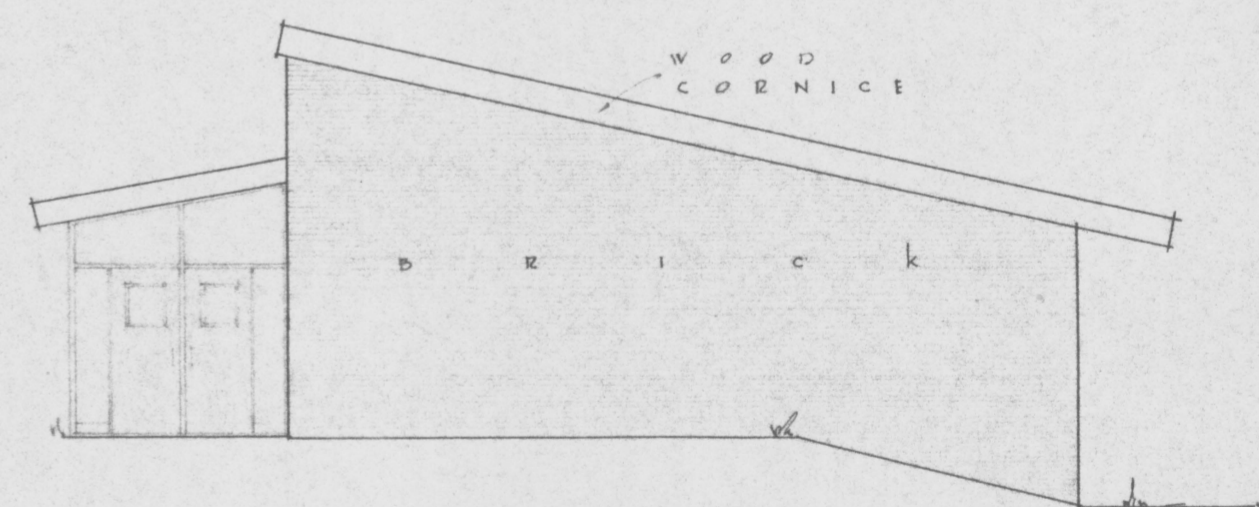
CLASSROOM CROSS SECTION E-E



CLASSROOM WALL



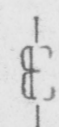
CORRIDOR WALL



END WALL

TYPICAL CLASSROOM ELEVATIONS

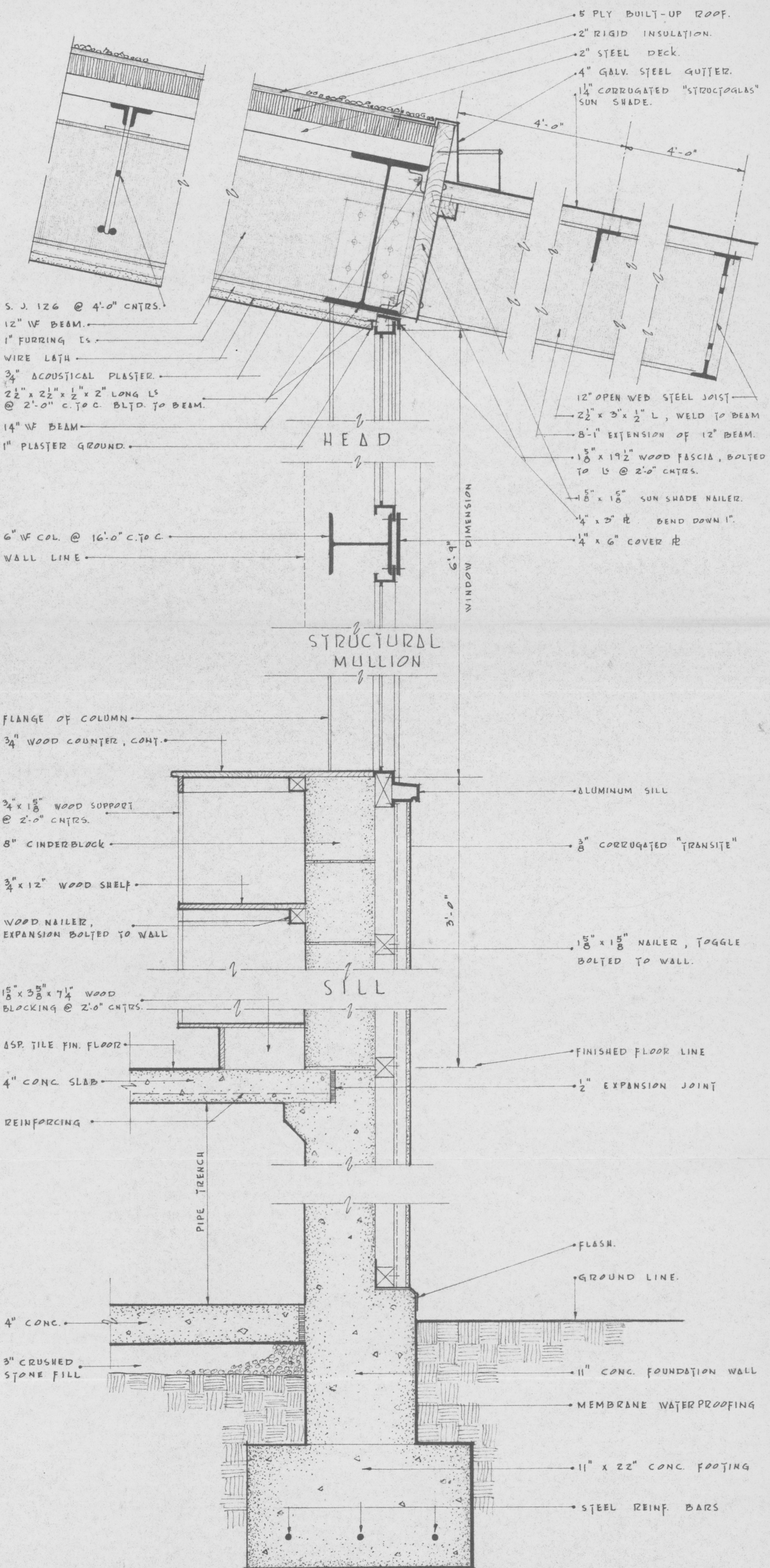
CLASSROOM SECTIONS



ELEVATIONS

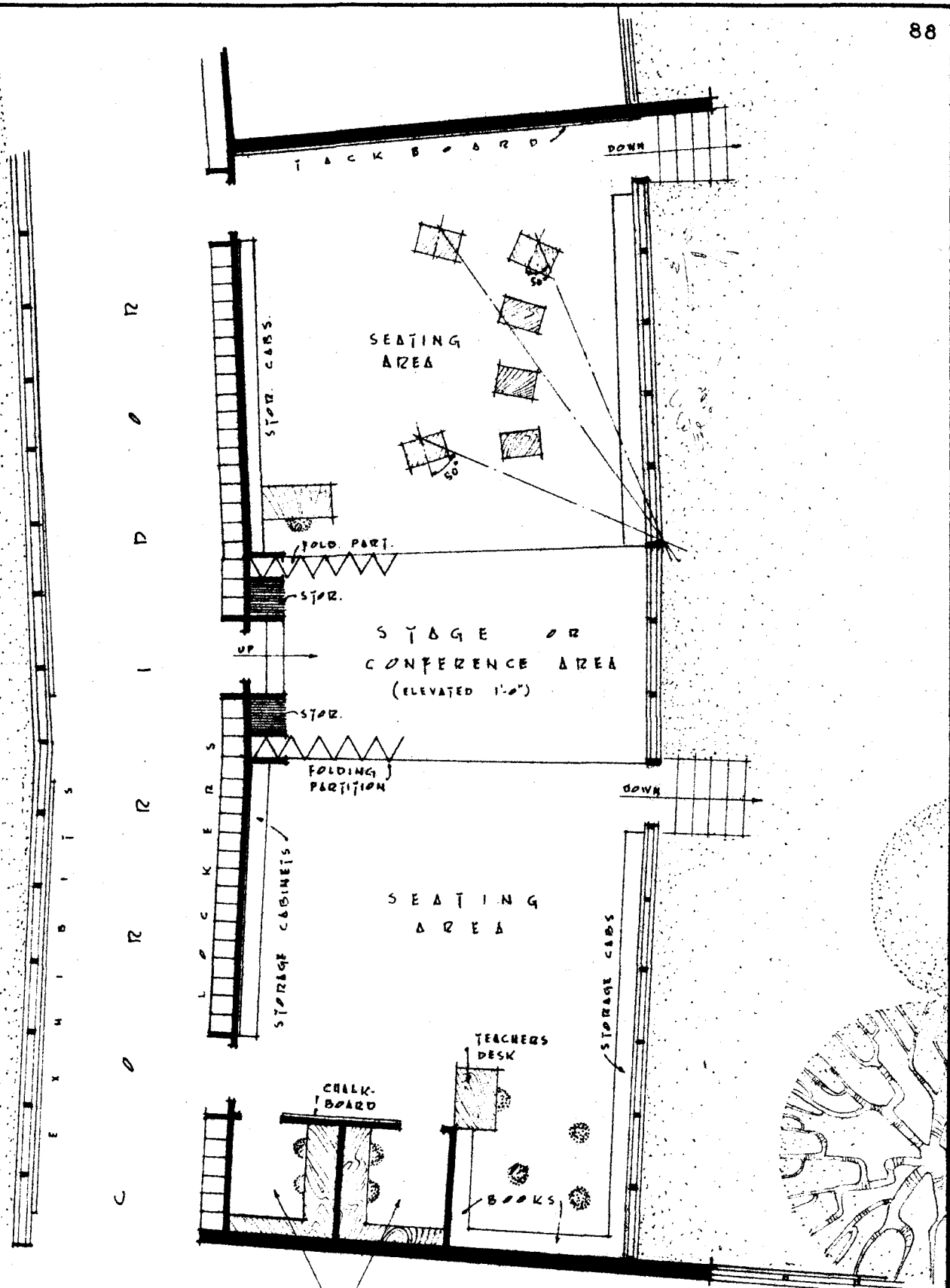
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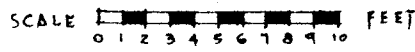


CLASSROOM WALL SECTION

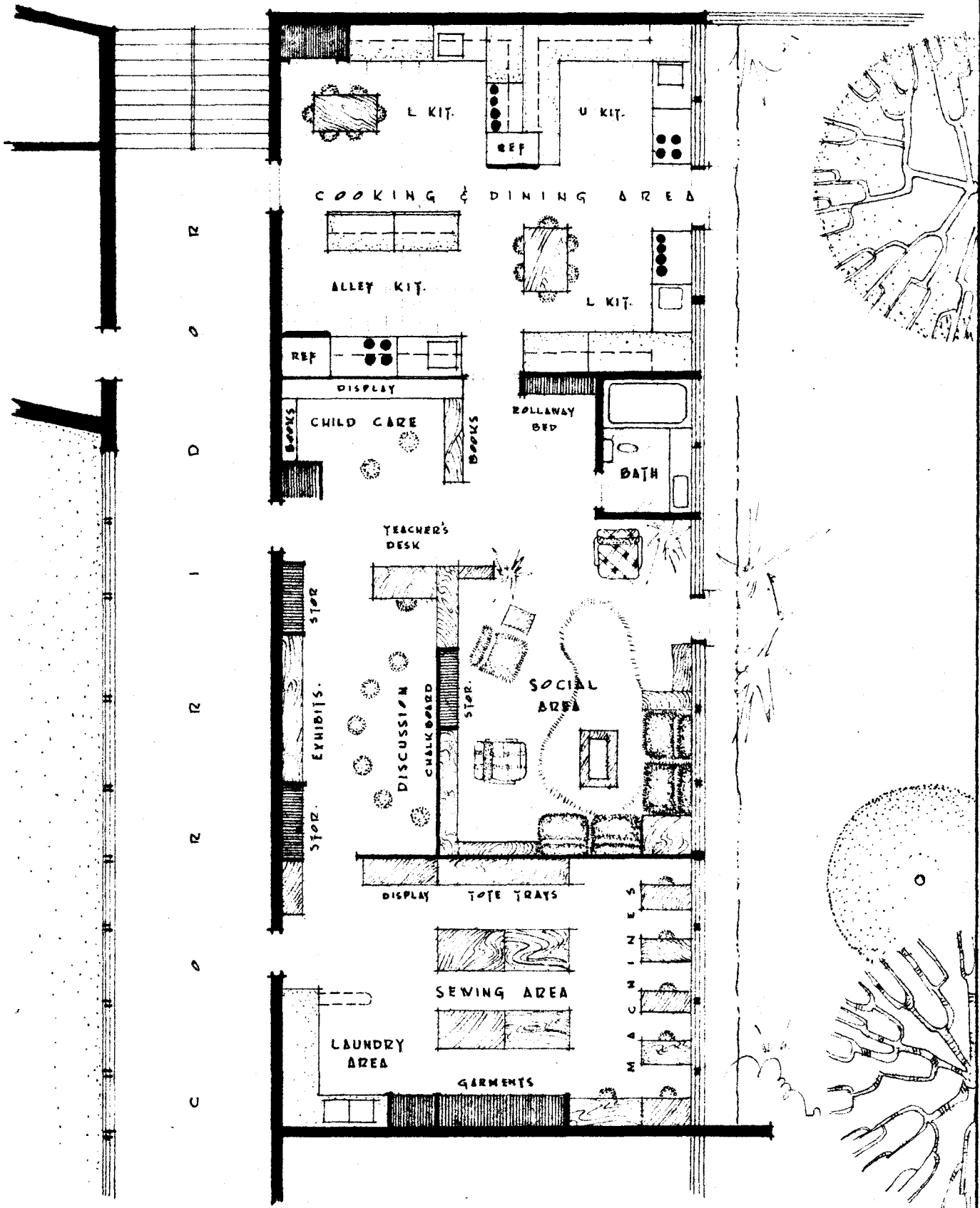
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# LANGUAGE ARTS SUITE







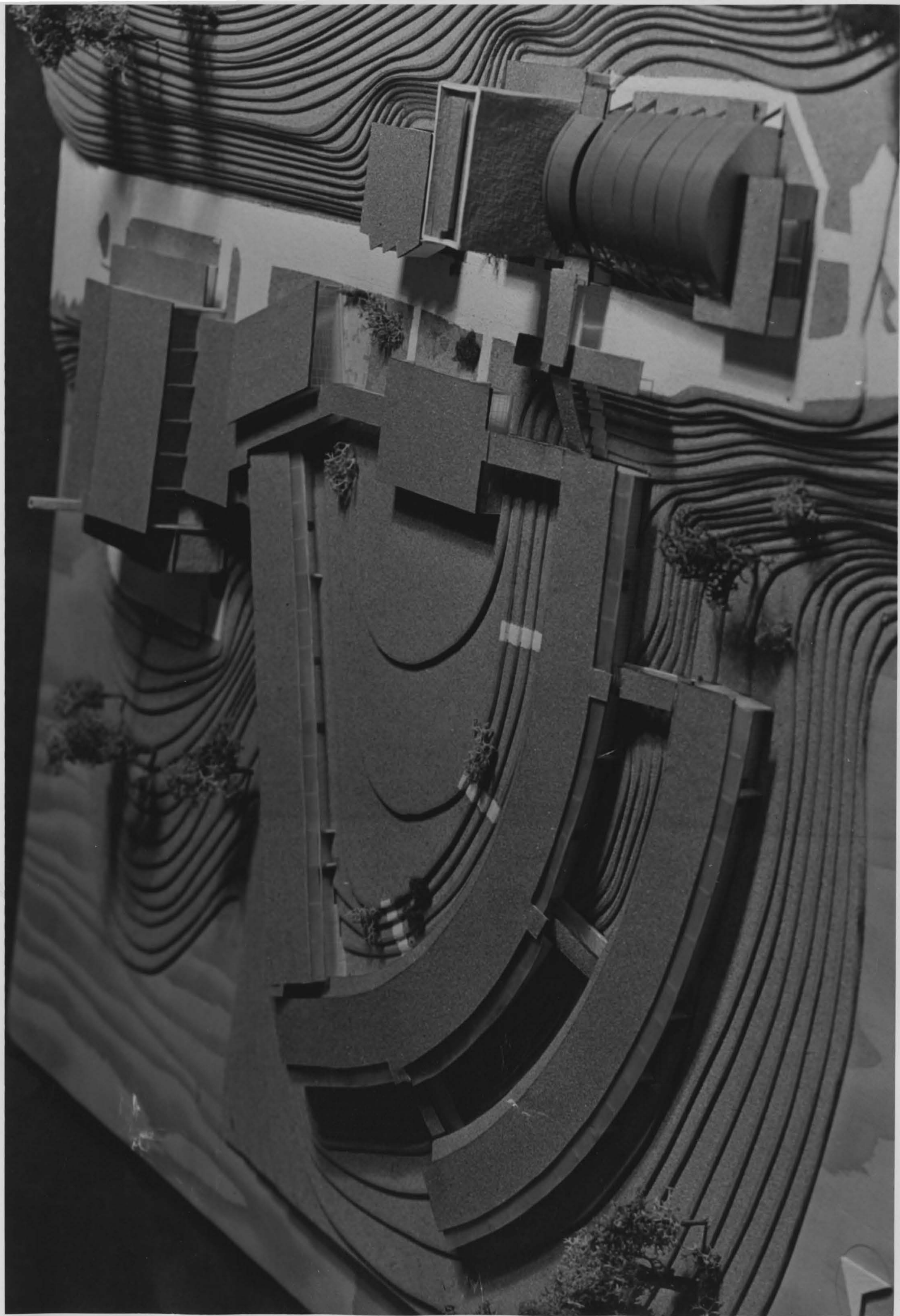
# HOMEMAKING UNIT



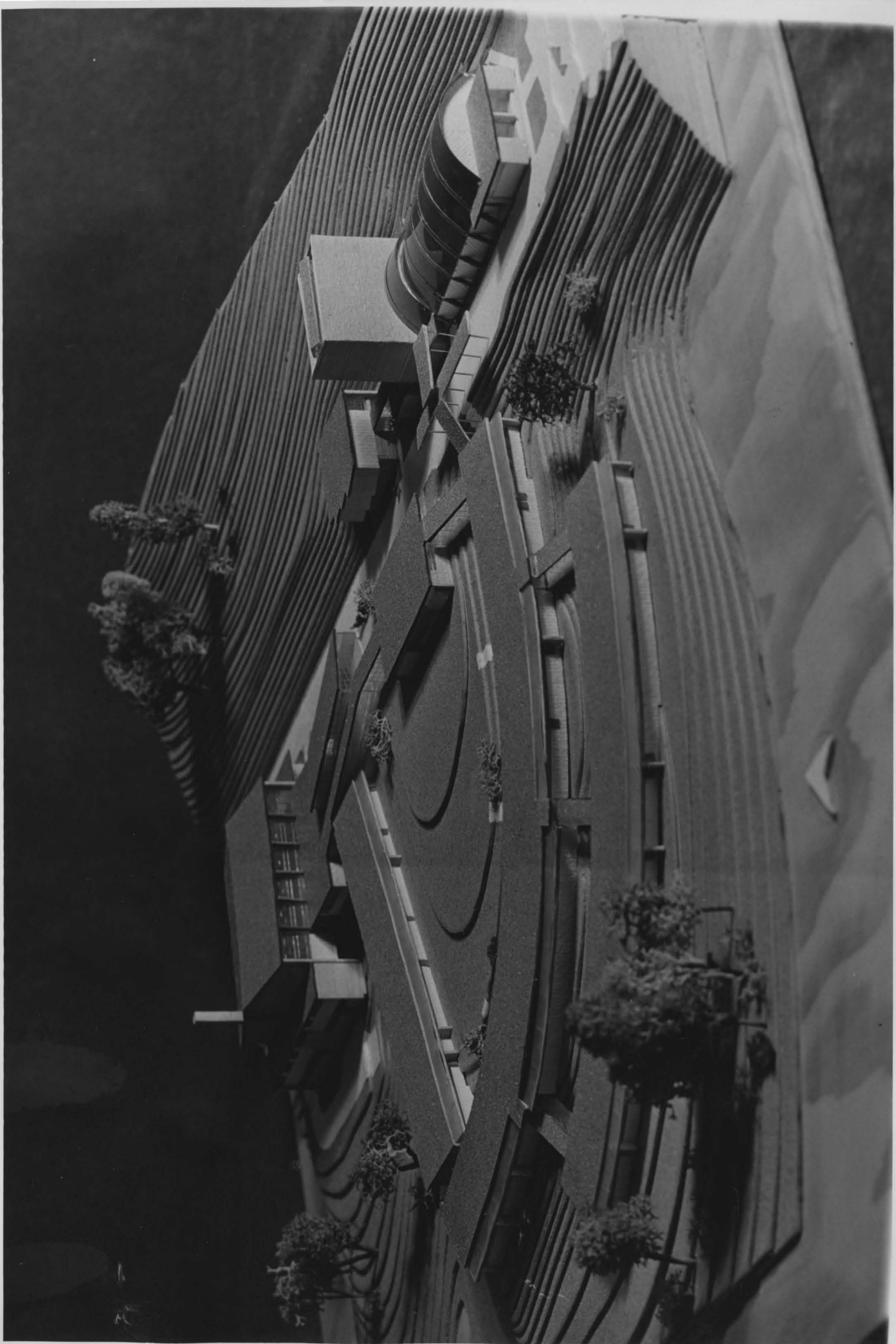
VIEW OF MODEL FROM EAST



VIEW OF MODEL FROM SOUTHEAST



VIEW OF MODEL FROM SOUTH

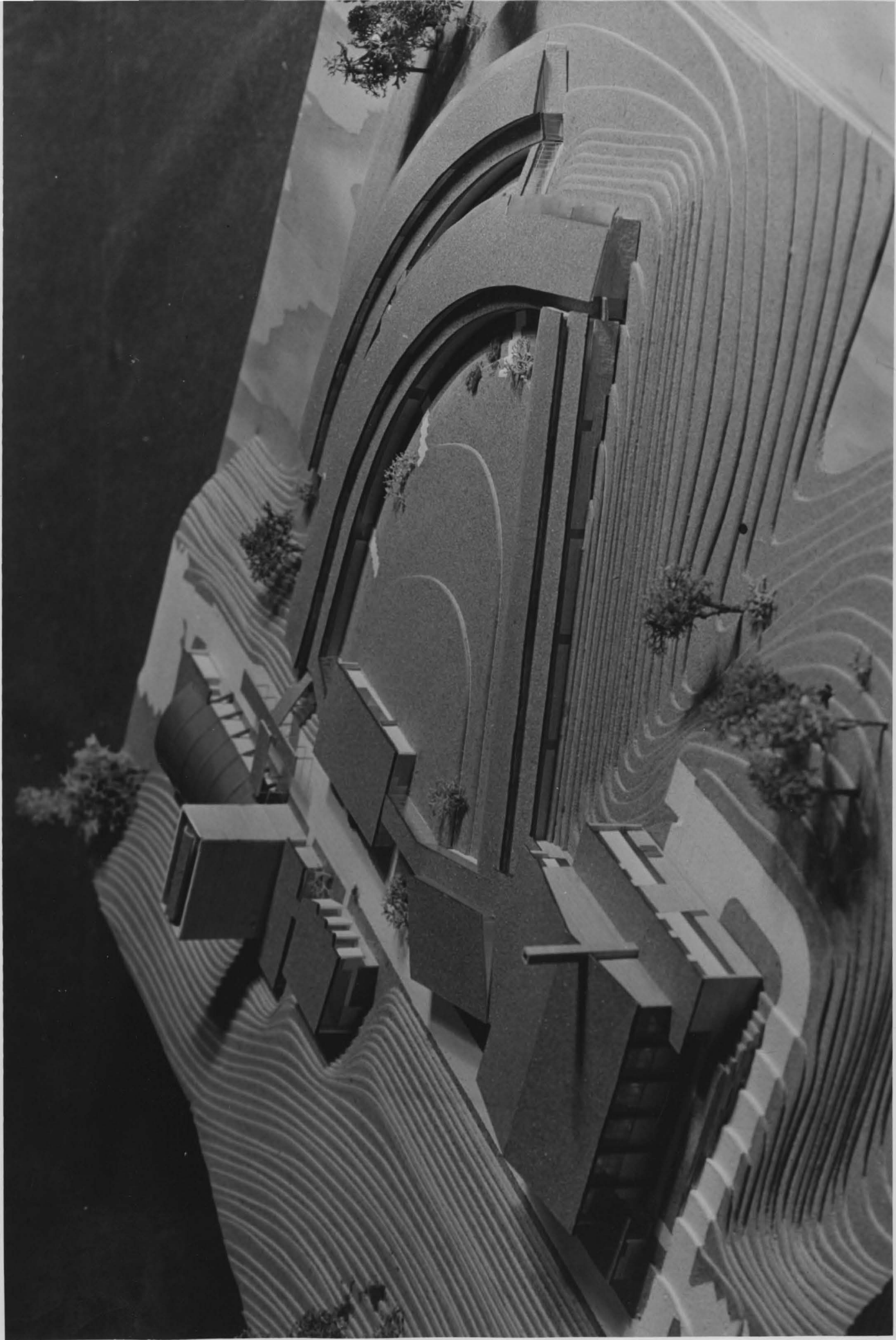


VIEW OF MODEL FROM WEST





VIEW OF MODEL FROM NORTHWEST



PART XII.....CONCLUSION

The design of Pound High School is an architectural embodiment of all the conclusions resulting from the execution of this work.

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