AN URBAN ELEMENTARY SCHOOL
FOR BOSTON

A Thesis submitted in partial fulfillment of the requirements for the degree of Master of Architecture at the Massachusetts Institute of Technology

August 10, 1959

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ABSTRACT

An Urban Elementary School for Boston

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Submitted to the Department of Architecture on August 10, 1959, in partial fulfillment of the requirements for the degree of Master of Architecture.

Although significant strides have been made in the design of schools for standard sites in suburban and rural areas, schools in the central districts of our metropolitan centers are on the whole quite inadequate. The urban context presents a number of problems that are not encountered in outlying areas. Limited space, diverse educational needs, mobile population, and a number of other urban conditions are formidable obstacles to good urban schools.

This thesis briefly examines some of these urban school problems, as well as some new ideas on methods of teaching and proposes an elementary school for an urban site in Boston based on this research. The proposed school will serve the 6,240 residents of the West End redevelopment. As the West End is slanted toward an adult population the size of the school is somewhat moderate. Its ultimate capacity will be about 460 pupils. The basic elements of the program are classroom space (12 conventional classrooms), administrative unit, health unit, multi-purpose space, teacher's lounges, and custodial space.

Early research encouraged the development of a school center, serving the community socially and culturally as well as educationally. Thorough examination of the West End redevelopment proposal however, suggested that such a center would more logically be associated with the junior high school, located about 800 feet from the elementary school. The junior high is adjacent to the shopping and cultural center for the development. There is a branch library in this area as well as a gymnasium (belonging to the junior high school but available for community use), two churches and a nursery.

Having abandoned the concept of a school center the author concentrated on an architectural interpretation of a new method of teaching as adapted to a highly urban setting. The method of teaching to be employed by the school would be a nongraded system with team teaching. Classes may number up to 100 pupils per class and would be taught by a team of teachers, usually three.

The intention of the author is to design a school based on this new method of teaching that adequately fits into the urban pattern. Conventional concepts and local policies pertaining to schools were avoided except for space requirements and the relationship of school components. This enabled a fresh approach to the problem which otherwise would have been impossible.
Dear Dean Belluschi:

In partial fulfillment of the requirements for the degree of Master of Architecture, I hereby submit my thesis entitled, "An Urban Elementary School for Boston."

Sincerely yours,

Paül Charles Bailly

20 Woodland Street
Belmont, Massachusetts
August 10, 1959

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ACKNOWLEDGEMENT

I wish to express a debt of gratitude to the following people whose interest, encouragement, criticism, and assistance have made presentation of this thesis possible:

Virginia, my wife

Prof. Imre Halasz, Department of Architecture, Massachusetts Institute of Technology

Mr. Paul Nelson, Visiting Critic

Mr. Norman Fletcher, Visiting Critic

Prof. Lawrence B. Anderson, Head, Department of Architecture, Massachusetts Institute of Technology

Prof. John T. Howard, Head, Department of City and Regional Planning, Massachusetts Institute of Technology

Prof. Robert H. Anderson, Graduate School of Education, Harvard University

Miss Jane Morrison, Boston City Planning Board

Mr. Charles J. Lynch, Boston School Committee

Mr. William Johnson, Boston Redevelopment Authority

Mr. William Poorvu, Charles River Park, Inc.

Mrs. Beverly Lockhart, my typist

Mr. K. M. Lockhart, a fellow student

Mr. Richard Cary, a fellow student
INTRODUCTION

Education in its simplest terms is the preparation of the individual for life in society. Man has always had to be taught at least certain basic skills to enable him to take an active place in his respective social organization. As this social organization advanced to higher levels, the problems of education became increasingly more complex. Today in our major cities we are faced with educational problems of great complexity. The task of preparing individuals for life in the complicated social and economic patterns that exist in contemporary urban communities is without precedent. Limited space, rapidly increasing populations, political pressures, population mobility, complex communication and transportation systems, segregation, apathetic citizenry and a multitude of other problems have made satisfactory systems of education in our cities extremely difficult to achieve.

These problems and the resultant inadequate educational facilities have plagued our cities for some time. In 1936 President Franklin D. Roosevelt appointed the Advisory Committee on Education to study and evaluate our public school system.¹ This group found that the strongest public school centers were among the small and middle-sized cities. The schools in the central city of our great metropolitan centers were found to be chronically handicapped with "the ills of mammoth urbanism."

In the twenty-three years that have elapsed since President Roosevelt's committee made its report, we have made little progress toward solving the problems confronting urban education. There have been significant strides made in schoolhouse design itself, but even here there is little that can be applied in the central city. Frank G. Lopez writing for Architectural Record in 1957 summed up the problem this way: "Urban conditions are at odds with educationally accepted criteria as to area, nature and location of school sites, as well as with the nature of building design considered appropriate." 2

In spite of these difficulties we can develop systems of urban educational facilities that are far superior to those that now exist. With many of our cities embarking on ambitious school building programs, this is the time to re-examine the problem and attempt to apply some of the thinking that has been done in the last twenty five years. This re-examination must go well beyond the school plant. There is some new thinking on methods of teaching that may have far-reaching results, and a profound affect on the deployment and allocation of space in the school plant. Also the modern school has complex social and economic implications which have greatly altered its position in the urban scene. Research and development in urban education must first explore the realm of basic ideas if it is to cope with the really important issues. This will provide a strong foundation for subsequent work and will eliminate the built-in obsolescence that often result from an approach that bases its hypotheses on convention.

PART ONE – BACKGROUND

"There was a child went forth everyday, and the first object he looked upon, ... that object he became, And that object became a part of him for the day, or a certain part of the day, or for many years, or stretching cycles of years."

Walt Whitman
The task of educating the young has been a responsibility of man for as long as he has existed. There is considerable evidence that even lower animals have patterns of behavior that are not instinctive and thus are learned. In the monumental work History of Technology it is observed that the wasp has developed the skill of using a stone for a hammer, and this skill is passed on from generation to generation. Another example cited is the ingenious finch who teaches its young to use a cactus spine to get insects out of cracks in rocks. Skilled behavior in man goes back to the primates. The earliest skills that were learned by man were probably skills of survival. That is, they were concerned with protection and food acquisition. In the early years of man's existence these basic skills were transmitted in an informal fashion from parent to child, the family being the social nucleus of this early paleolithic life.

Before man was to emerge out of the paleolithic age (stone age), he had acquired a certain folklore and probably some concern for religion. It has been speculated that primitive art, which decorates the walls of upper paleolithic caves, is of religious significance. Paleolithic man may have felt that the creation of images

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4 Ibid., p. 6
would give him power over those he depicted. The acquisition of folklore and primitive culture complicated the transmission knowledge. Age became something that was respected. Only the old had lived long enough to take in the whole heritage and pass it on.

It is important to note that sometime after the lower paleolithic age but before neolithic times, man had acquired all of the prime inventions necessary to human development: language, expressive arts, morality, fire, edged tools and a body of traditional knowledge sufficient to ensure physical survival and social continuity. This means that well before history was recorded by written symbol, while man was still a food collecting savage, he was confronted with a rather significant educational task. Knowledge was still transmitted to the young in a very simple and direct fashion by an older person in the family group.

When man finally left the paleolithic age he carried with him the beginnings of social organization beyond that of the immediate family. Sometime prior to the advent of the neolithic age (bronze age) families started to group together into settlements. Plants and animals were domesticated and there was some specialization of tasks. This paved the way for the development of the four great neolithic civilizations (about 3,000 B.C.) in the valleys

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5 Ibid., p. 146

6 Lewis Mumford, The Transformation of Man, (New York, 1956), p. 27
of the Nile, Euphrates, Indus, and the Wong rivers. Compared to the paleolithic age, the neolithic age saw great changes take place in a very short period of time. A deluge of inventions, the concept of division of labor, and the cultivation of storable hard grains enabled villages of 60 to 100 to grow rapidly to cities of 50,000.

Education of children was no longer the relatively simple task of an older person passing on the skills and folklore of the family or tribe to the young. It soon became impossible for any one man to know everything. The result of this was a specialization of teaching tasks. Craftsmen instructed in crafts, priests instructed in religion, and warriors instructed in military skills. This instruction was still very informal and unorganized.

Formal education, that is education as a special function of a particular group or agency, "did not arise until mankind had invented writing and arithmetic and had advanced in agriculture, metallurgy and commerce." The ancient civilizations of Egypt, Babylonia, Assyria, Persia, India, China, Greece, and Rome all had systems of formal education. These systems, however, only served the privileged and leisure classes. Much of what we now teach formally was passed on informally or by religious, political or economic groups.

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7 This fact was taken from a lecture given by Lewis Mumford on October 21, 1958 in the course Technics and Civilization

8 Kimball Young and Raymond W. Mack, Sociology and Social Life, (New York, 1959) p. 367

9 Ibid., p. 368
The beginnings of modern education had to await certain religious, social and economic changes. Education came through the Middle Ages in the hands of the ecclesiastic hierarchy of the Roman Catholic Church.\textsuperscript{10} With the Renaissance and Reformation certain important educational changes took place. The class and theological holds on education began to yield under the individualism of protestantism and the needs of the rising merchant class. Sound representative government, efficient business, and industry demanded literate well trained people. It was in the city where this demand was most significantly felt.

Here then was a great horizontal extension of the availability of education. Millions who here-to-fore had received no formal schooling now were afforded greater educational opportunity. Notwithstanding this advancement, education was still far from being available to everybody. Although it was no longer restricted to the highest social class, in effect, the less well-to-do still did not have benefit of formal education. Education for the masses developed most rapidly in the United States. The need in a growing democracy, for a well educated citizenry has been suggested as a reason for this progress.

The concept of free education for all was slow in coming about even in the United States. Early education in this country was largely in the hands of the church and the local community and it tended to benefit only the financially more able classes. The

\textsuperscript{10} Ibid., p. 368
first governmental support of education was merely an encourage-
ment for local communities to establish schools and provided little
if any financial support. Some states passed legislation concerning
the provision of schools. The General Court of the Massachusetts
Bay Colony decreed in 1647 that every town of fifty families should
have an elementary school in which children might learn to read and
write and acquire the fundamentals of religion. At this time in
New England education was thought of as a religious tool to facilitate
reading and understanding of the Bible.

Federal aid to education also was first conceived as a
means of encouraging the establishment of schools. In a 1785 or-
dinance covering a survey of the Northwest Territory, a federal land
grant was provided for schools. With the admission of the Ohio
territory in 1803, federal aid for schools became a settled policy.
Hereafter each township was granted the sixteenth section of land
for the development and support of a common school. This was an
inducement for states to set up public school systems. States
settled by New Englanders were quick to respond to these grants
and establish schools, while some southern states were extremely
slow.

12 Ibid., p. 475
The New England states were the most progressive in the United States with respect to education. Public support of schools and legislation providing free education occurred first here. By early eighteenth century most of New England had accepted support of schools by taxation. In 1827 Massachusetts passed a law providing tuition free instruction in all grades of public schools. Other states were not so quick to achieve free public education. Frequently state laws merely provided for the establishment and control of schools under public auspices, at least part of the cost of instruction had to be provided for by some means other than public funds. Most states adopted what was called the "rate bill system". Under this system the deficit was apportioned among the parents of the pupils on a per diem basis. This of course only provided education for those who could afford to pay. In many states laws were passed stating that the expense of educating the poor would be borne by parents who could afford to pay. Hard feelings were created on both sides by this policy and in the absence of laws making school attendance compulsory, it resulted in poor children not attending school. Although this system failed to secure widespread public education, it was generally adhered to throughout the early decades of the nineteenth century. Toward the 1830's states started establishing free public school systems.

13 Ibid., p. 475
14 Ibid., p. 476
In 1834 Pennsylvania instituted a free system for public education. Other northern states followed the example that had been set by the New England states and Pennsylvania. The south, however, made little progress toward free public education until after the Civil War.

The city was the most fertile ground for free public education. Cities frequently made more progress in this respect than the states in which they were located. In the late eighteenth and early nineteenth centuries philanthropic groups supplied early education for the children of the working class in American cities. In 1842 New York City established a city agency to provide and administer free public education. By 1853 this city agency had completely replaced a philanthropic group that had been providing free education since 1805. Soon after this many cities obtained charters from their respective state legislatures enabling unified city school systems with a city superintendent of schools.

While free public education was in the process of developing, methods of teaching were undergoing an evolution. One development was the "graded school", wherein children are divided into fairly homogeneous groups according to age and mental development with instruction given accordingly. Graded schools were developed for the most part in the city. The first classification was horizontal.

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15 Ibid., p. 476
16 Ibid., p. 478
rather than vertical. Boston, in 1879, maintained a Latin school for boys only, and separate reading and writing schools at which both boys and girls were received. In 1820 public primary schools were introduced which were divided into four classes. Soon the reading and writing schools were considered together with differentiation of pupils measured by periodic recitation. The next step was the "Quincy Grammar School" with a principal and a number of assistants, each of who had charge of a single classroom. This became the prevalent system throughout the United States. New theories with respect to grading are discussed in the section entitled A New Approach to Teaching.

The introduction of the graded system coincided with and facilitated development of secondary education. As in the case of primary education, states began to pass laws providing for free secondary education. In 1853 the Union Free School Act in New York State provided for the establishment of free graded schools up to and including high school. Early organization of these schools was loose with from six to eight years of elementary school and from two to five years of high school. Toward the close of the nineteenth century school grading tended to be standardized into

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17 Latin schools in New England were schools primarily designed to prepare young men for college and the ministry.

18 Op. Cit., Muntz, p. 479

19 Ibid., p. 480
eight years of elementary school and four years of high school. During the present century the trend has been to shorten both elementary and high school and insert an intermediate or junior high school thus forming a 6-3-3 system.\(^\text{20}\)

This extension of free education upwards has not stopped with high school. Many states today provide free education up through college. Here again federal land grants were an effective stimulus for the establishment of state supported colleges and universities. As education has extended upward it has also extended downward. Most authorities feel that the age of five is too old to start school and have recommended the establishment of pre-school nurseries for younger children. Today many planners and educators include the neighborhood nursery and the community college (two year or junior college) as integral parts of the educational system. Figure I gives some of the current and proposed breakdowns for educational organization.

\(^{20}\)Six years of elementary school (generally preceded by one year of kindergarten); three years of junior high school; and three years of senior high school.
### FIGURE I - SCHOOL AGE GROUPINGS
from Urban Community Requirements, a research paper by Paul Nelson, 1945

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*Under Health Dept.*
CURRENT EDUCATIONAL TRENDS

One trend we have already discussed at some length. This is the trend toward equality of educational opportunity. Although complete equality will probably never be realized, we are constantly striving to provide better education for more people. Definite regional inequities exist in the United States today. This is particularly true in the southern states where acute problems of desegregation have recently received a great deal of publicity. The south has the poorest quality of education and the lowest attainment level in the United States (see Figure IV). Some states simply cannot afford to spend as much on education as other states. Southern states are less able to pay for education and as might be expected rank the lowest in the nation in educational outlay per pupil. Figure V illustrates the amount of money per pupil various states spend on education and their respective abilities to pay. Another inequity that exists throughout the entire country is the inferiority of rural schools compared to city schools. The report by President Roosevelt's Advisory Committee on Education, mentioned above, indicated that rural communities had the most inadequate schools in the country. In the school year 1947-48, 97% of Iowa's schools were rural one teacher schools, many with low enrollments. Pupils cannot be trained adequately when one teacher has to teach children over a range of ages and attainment levels. Urban communities are concerned with

TREND OF ENROLLMENT

Millions Per Cent

School Years Ending

FIGURE II

PER CENT IN SCHOOL

School Years Ending

FIGURE III

YEARS OF SCHOOLING
(Years of School Completed)

FIGURE IV

from Sociology and Social Life by Kimball Young & Raymond W. Mack, p.388

25
Average annual expenditure per pupil:
- less than $200
- $250-$299
- $300-$499
- $500 or more

Numbers indicate how states rank in ability to pay for schools

**FIGURE V - STATE SPENDING FOR EDUCATION**

from *Sociology and Social Life* by Kimball Young & Raymond W. Mack, p.382
rural education because of the large migration from rural areas to metropolitan centers. In the city itself many inequities exist. Over-crowed slums, persecuted minority groups, poor home environments, and a multitude of other factors make truly equal educational opportunity virtually impossible.

A second trend in America is the extension of education upwards and downwards. This vertical extension, which has taken place primarily in our urban communities, expands the educational system to include nursery school and college. Extension downward results from a growing realization that the first six years of a persons life are extremely important and children need more formal guidance during this period. The extension upwards has resulted from an increasing need for a more highly educated population and "from a prodigious increase in the volume of (our) accumulated culture."22

Realization of this extension of education has been encouraging. Paul Nelson, in research done on community services, found that in 1940 only 17.5% of persons in their first two years out of high school were in colleges or universities. He projected that a postwar goal for this group should be about 40%. In 1957 almost 35% of this age group were in college. This is a significant gain. Mr. Nelson's 1940 attendance figures and projected post-war attendance goals for all levels of education appear in Figure VI. Figure VI also shows the number of persons and percent of the population enrolled in school in 1957 for the various age groups. Note

**FIGURE VI - SCHOOL ENROLLMENT BY AGE GROUP**

1940 figures and postwar goals were taken from Urban Community Requirements, a research paper by Paul Nelson, 1945, p. A33. 1957 figures are based on statistics from p. 106 of the Statistical Abstract of the United States, 1959.

<table>
<thead>
<tr>
<th>AGE GROUPS</th>
<th>1940</th>
<th>POSTWAR GOALS</th>
<th>1957</th>
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<td></td>
<td>no. of</td>
<td>% age</td>
<td>no. of</td>
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<td>pupils*</td>
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<tr>
<td>EARLY SCHOOL</td>
<td>0.6</td>
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<td>ELEMENTARY SCHOOL</td>
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<td>72%</td>
<td>8.7</td>
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<td>2 YEARS AFTER H.S.</td>
<td>0.87</td>
<td>17.5%</td>
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<td>junior colleges</td>
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<td>univ.- fr. &amp; soph.</td>
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* In millions
** No statistics could be found
how close the 1957 percentages come to Paul Nelson's projected postwar goals.

Significant changes in curricula for elementary and secondary education marks another trend in American education. The shift has been from a curriculum oriented around subject matter to one focusing on individual and social development. It is commonly felt today that schools must teach more than the basic skills of reading, writing and arithmetic. A portion of the school curriculum is frequently devoted to teaching the individual how to get along in contemporary society, including preparation for democratic citizenry. James A. Quinn, in his text *Urban Sociology*, points out that in our complex contemporary society schools must assume the responsibility of teaching children vocational skills, how to use leisure time constructively and how to solve new problems, as well as the traditional body of subject matter.23 As in the case of the two previous trends, this broadening of the curriculum is seen mainly in the city. Here there is a great demand for people with diverse talents and a need for every person to have a fairly high level of educational attainment. It is important to point out that there is a current reaction against the broadening of the school curriculum. Some authorities feel that the young people of today are not receiving an adequate foundation for future study. They contend that although pupils may be receiving a fine social training, this is at the expense

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23 Ibid., p. 271
of more important academic training. In spite of this reaction, for which I myself have some sympathy, there has existed a definite trend toward broader school curricula, even at the elementary level.

The last trend that I would like to discuss is the growing awareness of the central importance of the school. From the nineteenth century on, the school became an essential instrument in effective orientation of society toward whatever ends its members conceived. Lewis Mumford, in *Culture of Cities*, contends that the requirements and demands upon the school today put it in the central position occupied by the church in medieval Christendom. The school is an important organizing element in the urban community. Many planners, whose schemes we shall look at later, have used the school system as a basis of organization and subdivision of the city into communal units. That is, the smallest unit would be the number of families necessary to support a day nursery, the next size unit would be made up of several of the smaller units and would contain enough families to support an elementary school, and so on. The reason for this acceptance of the school as a basis for communal or social groupings is well expressed in a statement by Egon Ernest Bergel in his book on urban sociology, "... a well-functioning school system remains one of the best available means to unite heterogeneous groups, to remove tensions and to create consensus." Although we are now

aware of this central importance of the school we have been very slow in expressing this concept in our cities. Most urban schools are pretty dismal places that are not adequate for their basic purpose of providing facilities for teaching the young, let alone to assume the position of the nucleus or core of the community.

This concludes the discussion of trends in education. Associated with the four trends mentioned are four respective goals. That is, the trend in each of these cases represents movement toward a goal. These goals are:

1. Equal educational opportunity for all.
2. Higher general level of educational attainment.
3. Broader curricula oriented more toward individual and social development.
4. The establishment of the school as the basic organizing and socializing element in the community.

Naturally there is great variance of opinion on some of these matters but generally the consensus of opinion is that these are desirable goals that we should strive for. Each of these goals generally developed out of needs in the evolving urban pattern and the most significant advancements have taken place in the city. Unfortunately this advancement at times has been painfully slow due to a multitude of urban problems and complications.
PROBLEMS OF URBAN EDUCATION

One major problem which confronts all aspects of our civilization is the tremendous worldwide increase in population. The population of the world is increasing at the rate of approximately 40 million persons a year. In the United States the rate of population increase has been greatest in urban areas. Figure VII illustrates the tremendous growth of two of our major cities, Chicago and New York. Of course, all of this growth in our cities is not due to natural population increase. For some time there has been a large migration from rural areas to urban centers. Figure VIII shows the increasing dominance of urban population in the United States. An obvious result of this urban growth has been an increase in school enrollments (see Figure II, page 25). Another reason for increased school enrollments is that a greater percentage of children are enrolling in school today. This is illustrated by Figure III, page 25. Urban schools have not developed sufficiently to cope with this increase so that today we have acute overcrowding of urban school facilities. This is a major problem as implementation of effective teaching techniques is impossible with this overcrowding. It must be noted that the general school enrollment trends described here have taken place over a number of years. Recently there has been a levelling off with respect to urban school enrollments accompanying the mass exodus to suburbia. The overcrowding of urban school facilities, however, still exists.

Closely related to the problem of overcrowding is the lack of
FIGURE VII - GROWTH OF TWO MAJOR U. S. CITIES
from The Urban Pattern by Arthur B. Gallion, p. 187
From Sociology and Social Life by Kimball Young & Raymond W. Mack, p. 303
adequate space for city schools. This problem exists in virtually all cities in the United States. It is very difficult to cram a school and playground in an area with dense land coverage. Few urban schools today provide the minimum recommended standards for building areas and playground space. Most of the urban school buildings were built at least forty years ago and are totally unsuitable for today's needs. Playgrounds for existing urban schools are pathetically inadequate both with respect to area and treatment. The problem here is an extremely difficult one to solve. School site standards have been virtually impossible to apply to urban communities. The National Council of Schoolhouse Construction recommends that for an elementary school the minimum site should be five acres and one acre should be added to this for each 100 pupils placed on the site. Land acquisition in the city is extremely difficult and most school boards are doing well if they can get a single city block for a new elementary school, this is about two acres. This limited two acre site must accommodate all of the teaching and recreational facilities, including the playground, necessary for elementary education.

The difficulty of land acquisition in the city is not just a matter of availability of space. Even where space is available the city school board's budget rarely allocates sufficient funds to purchase such land. Funds for urban schools are extremely limited, and land in the city is expensive. The problem of cost is complicated by the fact that the city has an increasing need for revenue to finance its expenditures and land occupied by public schools does
not yield tax money. This means that budget-conscious city officials and citizens are not in favor of large urban school sites.

The limited funds available for education today have to satisfy greater needs. Previously we discussed the trend toward broader curricula in city schools. Contemporary schools must meet the needs of a number of different categories of pupils with different needs. A city school system must provide a variety of specialized schools and classes. Special schools or classes should be available for the blind, deaf, mentally retarded, exceptionally gifted, and other unique groups. The urban school system must also provide a variety of specialized schools in fields like art and music and some vocational skills. The provision of this specialization in the school system requires well-trained people and special equipment, all of which of course adds to the overburdened school budget.

With the provision of greater specialization urban schools must also maintain a certain continuity from school to school to cope with today's mobile population. Today there tends to be a great geographic mobility on the part of families. This tends to be a disruptive element in community organization. Children frequently transfer from school to school as their parents move within the city. This means that schools must maintain a certain consistency for those children who move from place to place, without interrupting the program for those who do not move.

Earlier we discussed equality of educational opportunity as
a social and educational goal and as a trend in America. There have been many obstacles to the achievement of this goal. Inequities exist inspite of the fact that schools are tuition free, text books and school supplies are often furnished, and medical and dental care are free or at a nominal cost. Family and neighborhood conditions are not equal. Home life which is encouraging and conducive to study is important to a child's development. The environmental influences in the neighborhood outside the home have tremendous effect on young people. Inequities, that exist in the home and in the neighborhood are manifestations of deep-rooted sociological problems that are far beyond the reach of the educational system. Somehow, however, the schools must face these problems.

This does not exhaust the problems confronting urban schools, but gives some indication of the magnitude of some of the major problems. There are many other problems that could be elaborated on such as, political pressures, public interference, conflicts with parochial school systems, religious training in public schools, poorly trained teachers, interference from mass communication, apathetic citizenry and many others. A more thorough analysis of these problems is beyond the scope of this thesis. It is sufficient here to establish the nature of our basic educational problems in the city.
The Urban School as an Organizing Element

There have been a number of schemes proposed for urban organization which have used the school as a basic element. Dean Arthur Gallion in his book The Urban Pattern explains a number of these schemes. First he defines what he, and many others, call the "neighborhood unit". This he defines as "... a physical environment in which a mother knows that her child will have no traffic streets to cross on his way to school, a school which is within easy walking distance from the home." Today this definition might be modified to say, "... her child will have no major traffic streets to cross..." Harry Weese lecturing at the University of Minnesota in 1957 expressed the opinion that children should have to cross some minor traffic streets as a part of their training.

Dean Gallion points out that Clarence Perry was one of the first to adequately define the neighborhood unit. His definition, set forth in 1929, stated that the neighborhood unit was that populated area which would require and support an elementary school of from 1,000 to 1,200 pupils. The Perry neighborhood unit is illustrated and described in Figure X. It is important to note that in his scheme Clarence Perry thought of the elementary school in conjunction with a community center.

Many others have since put forth similar ideas. Clarence Stein envisioned the grouping of several comparable basic units into

Clarence Stein's determinations of the proper areas to be included in the Neighborhood Unit.

In the upper-right diagram the elementary school is the center of the unit and within a one-half mile radius of all residents in the neighborhood. A small shopping center for daily needs is located near the school. Most residential streets are suggested as cul-de-sac or "dead-end" roads to eliminate through traffic, and park space flows through the neighborhood in a manner reminiscent of the Radburn plan.

The upper-left diagram shows the grouping of three neighborhood units served by a high school and one or two major commercial centers, the radius for walking distance to these facilities being one mile.

**THE NEIGHBORHOOD UNIT**

**FIGURE IX**
Clarence Stein's determinations of the proper areas to be included in the Neighborhood Unit.

In the upper-right diagram the elementary school is the center of the unit and within a one-half mile radius of all residents in the neighborhood. A small shopping center for daily needs is located near the school. Most residential streets are suggested as cul-de-sac or "dead-end" roads to eliminate through traffic, and park space flows through the neighborhood in a manner reminiscent of the Radburn plan.

**FIGURE X**
The Neighborhood Unit as seen by Clarence A. Perry

Perry was one of the first to give some consideration to the physical form of the neighborhood unit. It is substantially the same as that in the diagram by Stein but suggests that the maximum radius for walking distance from the home to the community center should be only one-quarter mile. Accepting the practice which was then, and still is, generally prevalent, shopping areas are situated at intersecting traffic streets on the outside corners rather than at the center of the unit.

from *The Urban Pattern* by Arthur B. Gallion, p. 279

Reproduced from New York Regional Survey
a larger unit with a population sufficient to support a high school (see Figure IX). A proposal very close to this was made by N.L. Engelhardt Jr. He presented a comprehensive pattern of neighborhoods as components of successively larger segments in the city structure (see Figure XI). The smallest unit of organization in the scheme is the number of families required to support a day nursery. By combining a couple of these there is sufficient population to support an elementary school; several of these larger units will support a middle school (grades 7 through 10), and a group of three or four of these units will support an upper school (grades 11 through 14). This scheme is based on the idea that, "The best education is the result of a well-conceived neighborhood plan in which the school has been created as an integral part of the daily life of all the people who reside in the community."27

Dean Jose Luis Sert, of Harvard's Graduate School of Design, and the CIAM have also proposed a scheme for urban organization. Here again the school is the basic organizing element. "Considered on its smallest scale, the neighborhood unit would be composed of the dwellings required to house a sufficient number of people to support an elementary school."28 Six or Eight of these neighborhood units combine into a "sub-city" or township with a population between 35,000 and 50,000 persons. At this level is the "civic nucleus"


28 Jose Luis Sert, Can Our Cities Survive?, (Cambridge, 1942, p. 70
FIGURE XI

THE NEIGHBORHOOD UNIT

The organization of neighborhood elements suggested by N. L. Engelhardt, Jr. A more complete diagram of neighborhood units grouped in relation to the various levels of school facilities. It will be noted that a radius of one-half mile is adopted as the maximum walking distance to the elementary school but playgrounds and nursery schools for small children are proposed with a radius of one-quarter mile walking distance for the families in the neighborhood.

from The Urban Pattern by Arthur B. Gallion, p. 288
and high school. The "civic nucleus" contains all the services necessary for real civic living. Local light industry should be planned with these townships. The next larger unit would be the "city proper" with the university, larger institutions, heavy industry, etc. Figure XII illustrates this proposal.

All of the schemes we have considered are similar in some respects. Each one has suggested a sort of hierarchical cellular organization of the city with related nuclei containing the services required at each level. There is one study that more or less combines much of this and other related thinking into a single comprehensive scheme. This was accomplished by Paul Nelson in the 1940's. By an analysis of the services required for community life Mr. Nelson proposes what he calls "an integrated urban community organism." The basic urban organization, as we might expect, coincides with the divisions of the educational system. Figure XIII illustrates diagramatically this organization.

One important aspect of Paul Nelson's work is that it was an analysis of all the services required by an urban community. The result of this was that the services required at each level and how they relate, part to part and part to whole, is quite clear. Others I have mentioned, such as Dean Sert, have suggested facilities that should be provided at each level of their respective organization, but no one I could find has done this more comprehensively than Paul Nelson. The need, expressed in 1929 by Clarence A. Perry, for the school to be a part of a larger, central organizing element emerges
This diagram illustrates an organization of neighborhood units suggested by José Sert. While some authorities have stated that the maximum walking distance from home to the elementary school should be one-half mile, this diagram indicates a maximum distance of about one-quarter mile, which is the standard accepted by a number of communities. In contrast to a population density of 20-25 persons assumed as a desirable average in many communities, Sert assumes a density of two or three times this number, which may account for the shorter walking distances he proposes from homes to the several schools in his scheme.

The elementary school occupies a central position in the neighborhood unit, and a group of these units—six to eight in number—constitute a "township" with a population of between 56,000 and 80,000 people. A junior high school serves four neighborhoods; a senior high school serves the eight units; these facilities are situated within a "township center" surrounded by a "greenbelt." The neighborhood unit includes the elementary school, preschool play-lots, playground, church, public library, and emergency clinic. The "township center" includes the junior and senior high schools, community auditorium and meeting rooms, concert hall, theaters, main shopping center, recreation and administrative center.

Traffic ways bypass the neighborhood units, and connect them with the "civic center," which includes the regional facilities for administration, education, hotels, trade and recreation, and transportation stations on one side, and on the other side are the locations for light industrial plants. All these elements are separated from each other by "greenbelts," and the open countryside is accessible to all the people.

from The Urban Pattern by Arthur B. Gallion, p. 289
FIGURE XIII - AN INTEGRATED URBAN COMMUNITY ORGANISM by Paul Nelson
From Urban Community Requirements, a research paper by Paul Nelson, 1945
with increased emphasis and clarity in Mr. Nelson's work.

Here then it seems is one of the basic shortcomings of our approach to schools in the city. Schools are still thought of as individual, self contained entities, and are not well integrated into the urban community. The school generally does not relate well to the people or to other services. It is frequently not open for community use and often isolated from social and recreational facilities. The result of this is a distorted and apathetic attitude about education on the part of urban residents and a wasteful duplication of facilities.

The present isolated position of the school is not a historical one. Traditionally in America the rural schoolhouse was used for public gatherings, lectures, and even entertainment. Somehow in the urban community this idea of extended use of schools was lost. It has been felt the school building should be used only for child education. This attitude toward the school is not a healthy one. Community residents lack interest in their schools because they have little direct contact with them. Also space and equipment, that could be put to good use by adult and young peoples groups, is wastefully left idle in the evenings and weekends. Some Cities were quick to see the shortcomings of this attitude. Community use of the school was permitted in New York City as early as 1888.29 It must be pointed out, however, that there are many cities today that still do not allow community use of school buildings.

Community use of schools fostered the idea of the school as a social center. This idea was first put to practical use in America in 1907 by Edward J. Ward who was the director of recreational facilities in Rochester, New York. This city rapidly developed a number of "school centers" which were open for the public and supported by public funds. Their activities included clinics, clubs, classes of various kinds, discussion groups and innumerable types of athletic and social diversion. Unfortunately Rochester seems to be somewhat unique in this respect. Few other cities have followed this fine example.

Many cities today are in the embryonic stage of developing some sort of similar approach to their schools. The schools in these cities have made at least some of their facilities available for community use. A few cities have actually gone a step beyond this and started to relate the school more directly to other social and recreational facilities. This usually takes the form of removing the street between the school and an adjacent park or some similar action. The school center concept, however, still appears to be a long way from widespread realization.

The implementation of the school center concept may be the key to solving some of our most urgent urban and urban school problems. The provision of convenient social and recreational facilities at the neighborhood level would enable city residents to make more

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30 Ibid., p. 685

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constructive use of their increased leisure time. This more direct contact with the school would hopefully increase the interest on the part of urbanites in education. More extensive use of the school facilities would eliminate the need for wasteful duplication of many of these facilities in other places. By relating schools directly to city parks and recreational facilities the major urban school problem of limited space for school sites might be somewhat alleviated. This would result in better school plants, more spacious playgrounds, and more thoroughly utilized city park and playground facilities.

One might say, "All of this is fine but how is it accomplished in a built-up urban community." First the transition would be gradual and the change might take place over a considerable period of time. As new schools are planned the "school center" idea could be applied. The siting, if at all possible, might be adjacent to existing recreational or social facilities. In planning the school and site some physical connection to these facilities might be made by a covered walk or by landscaping treatment. In the actual design of the school building provision should be made for community use of some of the spaces, such as the gymnasium, auditorium and multipurpose room. Some general purpose rooms might be added to the building program which could act as community social and game rooms. Where a whole area is redeveloped, such as the West End in Boston, the school center can be an integral part of the overall planning. At first the application might be modest and somewhat experimental in
nature; then, with encouraging results a more ambitious program may be put into effect.

The development of some sort of comprehensive social and recreational program, built around and directly related to our city school system, is badly needed in most of our major cities today. Such a program would aid in organizing the city physically as well as socially and culturally. The school would thus attain a place in the community commensurate with its central position as described earlier by Lewis Mumford. The resulting school centers, "... created for the express purpose of bringing the people of a neighborhood together by means of successfully promoted activities,"31 would establish in the urban neighborhood community a sense of order and social integration that is now sadly lacking.

31 Ibid., p. 686
A NEW APPROACH TO TEACHING

Earlier we discussed curriculum in two closely related respects: one was the trend toward a broadening of the curriculum, the other was the problem of satisfying the diverse needs in an urban community. There is a new approach to teaching that will facilitate broadening the curriculum and will probably more adequately satisfy the great variety of pupil needs. This approach is the nongraded school with instruction of a class by a team of teachers rather than an individual teacher.

The Greek mythological character Procrustes made the traveler, seeking shelter in his house, fit his bed. If the traveler was too short Procrustes put him in chains and stretched him until he was long enough for the bed. If the traveler was too long his limbs were cut off to make him fit. John I. Goodlad and Robert H. Anderson in their book The Nongraded Elementary School, liken the graded school system to Procrustes. In this system the pupil is made to fit some conceived norm called a grade. These authors contend that the graded school structure is anachronistic as well as many of the practices that accompany it.

The central problem as seen by Goodlad and Anderson is, "... the conflict between long-established graded structure on the one hand and increasing awareness of variation in children's abilities and attainments on the other." Most commonly today's elementary schools classify children by grades. The work of a grade, a year of progress,

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and a chronological year in a child's life are seen roughly comparable for school purposes. Mental age (measured by intelligence tests) is an important criterion of ability or readiness to learn. There is a great variation in the mental ages of a given group of the same chronological age.

Not only is there a great variation from child to child but within a given child there is often a wide variation in his abilities in different subjects. A child who may be exceptionally gifted in arithmetic may be only an average reader. The greatest individual variation within the pupil occurs in the children at the top and at the bottom. 33

Based on data from a number of studies Goodlad and Anderson draw six generalizations. 34

1. "Children entering the first grade differ in mental age by approximately four full years."

2. "The achievement range begins to approximate the range in intellectual readiness to learn soon after first grade children are exposed to reasonably normal school instruction."

3. "Individual children's achievement patterns differ markedly from learning area to learning area."

4. "The initial spread among pupils in intellectual readiness to learn (as determined by the mental age factor) grows still greater as children advance through their second year of school."

5. "The spread in achievement in the various subject areas also grows greater, closely approximating the spread in mental age."

6. "By the time children complete the fourth grade, the range in readiness to learn (as suggested by the mental age) and in most areas of achievement is approximately the same as the number designating the grade level."

33 Ibid., p. 15
34 Ibid., p. 8-9
The evolution of the graded system appeared to be quite natural, and the resultant widespread use of this system in our schools seemed logical. It is interesting to note however, that the variations in pupils' abilities and intellectual attainment at age levels has long been recognized. Even before the graded system had fully crystallized, at the close of the nineteenth century, educators were aware of this conflict with the graded system. This drive soon dissipated itself against the mass rigidity of the graded elementary school.

Teachers have often said that they would teach larger groups if they were completely homogeneous. Homogeneity in schools is frequently accomplished by general ability levels. This approach does not recognize the variation of abilities within the individual child. Homogeneous groups can't be formed by general ability levels. In so far as the greatest individual variation is at highest and lowest levels of intelligence, the common practice of grouping the gifted children together in "homogeneous" groups and the slow in similar groups seems ill fated.

The graded school does not accomplish effective homogeneous groups, and in the eyes of authors Goodlad and Anderson only hinders good elementary education. They believe, "... that abolition of grade barriers frees each child, whatever his ability, to move forward in his learnings as rapidly and as smoothly as possible."³⁵ It is also felt "... that such structure is in harmony with his (the pupil's) social and emotional well-being."³⁶

³⁵ Ibid., p. 21
³⁶ Ibid., p. 21
Associated with this concept of nongrading is the principle of team teaching. The idea behind team teaching is that several teachers, working as a team, can afford greater flexibility in meeting the individual needs of pupils. By collaborating on planning and presenting the curriculum to a large class of pupils, advantage can be taken of the individual skills and interests of the teachers.

The conventional method of teaching (a single teacher for a class of 25 or 30 pupils) has many drawbacks. It is difficult for the teacher to institute a program which will satisfy the variety of pupil needs. If a teacher is inexperienced or incompetent the pupils suffer. Every teacher must instruct in a number of subject areas irrespective of his or her individual skills and interests.

Team teaching programs have been instituted in schools in Flint, Michigan, Englewood, Florida, and Lexington, Massachusetts. In these schools teachers are sharing teaching tasks to take advantage of the strong interests of each teacher. Generally this system enables a more efficient elementary school program. Besides affording greater flexibility these teams have resulted in greater esprit de corps among teachers.

Teaching arrangements under these programs are varied. With a team of three teachers sometimes all three work with about a third of the class leaving the others to work alone or in small groups; sometimes two teachers work with the entire group, leaving the third free for planning or a brief rest; sometimes all three move from one small work group to another.
In Lexington the program is an enterprise of the School and University Program for Research and Development (SUPRAD). The personnel of the Franklin School were re-organized into four teams of teachers in 1957. Two small teams of three teachers and two large teams of 5 or 6 teachers. One teacher in each group was designated as "Senior Teacher" and was given the responsibility for leadership within the team. Members of Harvard University's staff shared with the administrators and teachers in Lexington in the formation of program plans and in the analysis of the program's effectiveness.

"A major objective of SUPRAD, and the Franklin School Project in particular is to discover and to demonstrate new and more promising ways of utilizing teacher competencies." The role of Senior teacher was constructed in an effort to accomplish two things: (1) provide rewarding prestigious roles, (2) create a collaborative relationship between teachers which offers promise of professional skills and insights in all personnel concerned. By making teaching roles attractive socially and economically a greater number of first-rate people would be attracted to teaching.

"Implicit in all efforts to construct more attractive conditions (economic, social, and professional) for teachers was the belief that these would lead, through more effective performance of the adults in teaching roles, to better instruction for children." It was hoped that

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37 Report to the Administrative Board of the School and University Program for Research and Development on the Franklin School Project in Lexington, Massachusetts During the Academic Year 1957-58, October 3, 1958, p. 3.

38 Ibid., p. 3
team organization would:

1. Permit establishment of more flexible and appropriate grouping arrangements to meet individual interests.
2. Stimulate children by association with larger numbers of children and with more than one teacher.
3. Provide more efficient and interesting ways of presenting lessons through group planning and through larger blocks of planning time.
4. Lead not only to stronger teaching but to better pupil adjustment and more adequate pupil guidance through the pooling of teachers' ideas and observations.

A limiting factor in the Franklin school project has been architectural. The building could not adequately accommodate the new approach due to the rigidity of its design. "The team teaching if it is to succeed over the years, calls for extremely flexible and less standardized physical space arrangements than is presently possible in American school buildings."39 This approach will almost certainly cost more than the conventional school program in space, material, and personnel.

At the completion of the 1957-58 school year some tentative general observations were made about team teaching. These observations are subjective in nature and are not intended as conclusions. The following observations appear on pages 16-20 of the Report to the Administrative Board of the School and University Program for Research and Development on the Franklin School Project in Lexington, Massachusetts During the Academic Year 1957-58, October 3, 1958:

1. The children were in no way confused or emotionally disturbed by the new program.

39 Ibid., p. 6
2. Instructional outcomes during 1957-58 appear to have been no less than they would have under a traditional system.

3. Pupil enthusiasm increased.

4. It is possible to instruct elementary school children, at all ages and grade levels, in groups two to six times the usual class size on appropriate occasion.

5. Team teaching as a vehicle for increasing teacher competency and enabling teachers to learn from each other is a most promising social mechanism. On the other hand relatively little evidence was gathered either to support or to refute the contention the hierarchical structure promotes better morale or greater incentive to superior performance.

6. The morale and cooperative working spirit of the teachers were remarkably good throughout the year.

7. One demonstrated advantage of the team teaching structure is that the teachers can create almost any size and type of group at will and at almost any time they choose. Unlike nearly every other known pattern of school organization, the plan allows for virtually total flexibility.

8. Teachers and school officials have a greater capacity to tolerate and to adopt to a variety of environmental and working conditions than is customarily assumed by research workers.

9. There are important benefits to the University personnel in an enterprise enabling them to become directly involved in the day-by-day operation of a public school.

The program was continued through the 1958-59 school year; however, there is no information available for this second phase of the program.

Thus by abandoning the graded system and introducing a system of team teaching better elementary education might be achieved. Neither departmentalization nor homogeneous grouping provides a tenable answer to the problem of teaching pupils of varied mental ages and diverse individual abilities. John I. Goodlad contends that we should, "... abandon the quest for increased teacher comfort derived from decreased pupil heterogeneity." Instead he feels that, "We must focus on arrangements that foster the best possible environment for pupil learning." 40

"I would strongly recommend, instead of one immense building, to have a small one for every professorship, arranged at proper distances around a square, to admit of extensions, connected by a piazza, so that they may go dry from one school to another. The village form is preferable to a single great building for many reasons, . . ."

Thomas Jefferson
This thesis proposes to plan and design an elementary school for an urban site in Boston. Foremost in the mind of the author is that a school in an urban setting has conditions and limitations imposed upon it which should effect a design solution quite different from that of a suburban or rural school. The educational needs of a pupil in the city are somewhat different from those of his rural counterpart. As discussed previously the social and economic implications of a school in the city are extremely important. Obviously universal application of the "finger-plan" or "cluster-plan" will not adequately solve the problem facing urban schools.

In approaching this problem everything that is now accepted practice must be questioned. Many of these practices that we now take for granted may be hindering the progress of good education. Methods of teaching and educational organization must be re-evaluated with the obsolete being replaced.

During the past two decades we have seen some rather significant educational changes. Methods of teaching have become much less formal with the emphasis on personal development rather than subject matter. The schoolhouse itself has also abandoned formality for sake of becoming what Lawrence Perkins calls "a tool for teaching." The architectural journals are filled with new and exciting schools that are being built across the country. Yet, in spite of this advance

41 Lawrence B. Perkins, Work Place for Learning, (New York, 1957), p. 6
in schoolhouse design Robert H. Anderson, educational consultant and proponent of the nongraded elementary school and team teaching, contends that almost all of the schools that are being built today are probably obsolete before they are on the drawing boards. The design and arrangement of classrooms in these schools imposes a certain approach to teaching that may soon be very much out of date.

The essence of the design of a school lies in the approach to education and the method of teaching to be employed. Although Boston itself has not been active in experimentation with new ideas concerning education, its suburban areas of Newton and Lexington have been extremely progressive in applying new thinking to their school systems. Both of these areas have already instituted a certain amount of nongrading and team teaching in some of their schools. In planning a school for Boston it seems this new thinking pertaining to grading and teaching methods should be put to use notwithstanding the fact the Boston School Committee may be a long time in accepting such ideas.

Thus although a specific site, with a specific context, will be selected, certain considerations will be more general and hypothetical in nature. This hopefully will broaden the implications of the project and eliminate the needless application of antiquated conventional ideas which otherwise would be unavoidable. Boston merely affords the site and social and physical environment for the school while the philosophy of education and the approach will be derived from the theories discussed in the section of this report entitled A New Approach to Teaching.
THE CITY OF BOSTON

Boston, the capital city of the state of Massachusetts, is located at 42° 21' 27-6" N., 71° 3' 30" W (See Figure XIV). By 1950 census it was the tenth largest city in the United States by population with 801,444 persons. The metropolitan district (25 miles radius from the State House) was sixth in the United States with a population of 2,369,986. Boston is the terminus of a number of steamship lines. It is the chief United States wool market and, combined with nearby Gloucester the chief United States fishing port. Its leading industries are woollen textiles, food products, clothing, footwear and printing and publishing.

No other city has undergone greater physical changes than Boston since the Revolutionary War. A tremendous amount of land was acquired by annexation of surrounding territory and by man-made land. Originally the city was almost an island, connected to the mainland by only a narrow strip of land. By filling in low areas 2,944 acres of man-made land which was acquired by the city. The present area of Boston including water is 42,179 acres or 65.9 square miles (land area alone is 46.1 square miles). Figure XV is the geological survey map of the central district of Boston.

The Boston area has more than its share of educational and


43 Ibid., p. 15
cultural institutions. In Cambridge just across the Charles
River are Harvard University, Radcliffe College and the Mass-
achusettts Institute of Technology. Nearby are Boston College, a
Jesuit institute, Chestnut Hill; Tufts College; Wellesley College.
In the city of Boston are Boston University; Northeastern University;
Suffolk University; Portia Law School; Emmanuel College; Emerson College;
and Simmons College. The Boston Public Library in Copley square is one
of the most famous libraries in the world. The Boston Museum of Fine
Arts and the Isabella Stewart Gardner Museum are notable art galleries.
Symphony hall is the home of the [fine] Boston Symphony orchestra and
the well known Boston "Pops". There are four first-class commercial
theaters in Boston frequently featuring pre-Broadway plays and musicals.

Rich in historical heritage Boston contains many cherished ancient
landmarks which have graciously been preserved. These include public
buildings such as the old State House, Faneuil Hall, Old South Meeting-
house; residences; old graveyards; and the Boston Common. There are a
number of points of historical interest such as Paul Revere's house,
Bunker Hill and the Old North Church to mention only a few.

Twentieth century Boston has largely lost what for generations
had given it a distinctive character, that is its heritage of Puritan-
ism. Also Boston has lost the leadership in the arts and literature on
which it once had prided itself; giving to the world the work of such
men as Ralph Waldo Emerson, Nathaniel Hawthorne, George Bancroft, Henry
David Thoreau, Henry Wadsworth Longfellow, Oliver Wendell Holmes, James
Russell Lowell and many others. Today Boston maintains its position as
a leading center of education, but basically has become a large cosmo-
politan city not too different in its general culture from other large
cities of the North Atlantic coast.

63
Proximity to the Atlantic Ocean has less influence on the Atlantic seacoast than one would expect. This is because the prevailing winds are offshore. New England is the only area bordering the Atlantic Ocean where this body of water notably influences the temperature. In New England coastal temperatures are $10^\circ$ to $15^\circ$ warmer than areas a few miles inland. This temperature differential does not exist, for the most part, along the rest of coast line. Annual precipitation in New England is 3 or 4 inches less along the coast than it is inland, and snow fall is three-fourths as much on the coast as inland.

New England, lying in the middle latitudes, comes within the influences of constant conflicts between cold, dry air masses flowing out of the great subpolar region to the northwest and the warmer, moisture-bearing, tropical marine air from the south. The tendency of most of the general cyclonic disturbances to skirt the polar front brings their path of movement through this region and results in a more or less regular succession of biweekly storms of snow or rain with intervening 2 or 3 day periods of fair weather, typically with warm west to southwest winds in summer and cold northwesterly winds in winter.

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Fortunately precipitation in New England is rather evenly distributed throughout the 12 months. It occurs on the average about one day in three. Severe droughts over large areas are uncommon, but local shortages of rainfall sometimes causes inconvenience by lowering ground water supplies.

The configuration of the New England terrain was largely shaped by action of the most recent glacial period. The terminal moraine and glacial wash of this great sheet of ice formed Cape Cod. In the Boston basin the glacier left the terrain diversified by numerous drumlins. These appear as islands in the Boston Bay.

Information on temperature, precipitation, wind and other pertinent climatic data for the Boston vicinity appears in Figure XVI.
### FIGURE XVI. CLIMATIC DATA FOR BOSTON, MASSACHUSETTS


<table>
<thead>
<tr>
<th>Normal Monthly</th>
<th>Average Temperature</th>
<th>Normal Monthly</th>
<th>Maximum Temperature</th>
<th>Normal Monthly</th>
<th>Minimum Temperature</th>
<th>Normal Monthly</th>
<th>Precipitation (inches)</th>
<th>Average Total Snow, Sleet, and Hail (inches)</th>
<th>Average Percentage of Possible Sunshine</th>
<th>Average Hourly Wind Speed (mph)</th>
<th>Normal Monthly Degree Days, 65° Base</th>
</tr>
</thead>
</table>
BOSTON'S PUBLIC SCHOOLS

Boston's school system is the oldest in the United States. The present Boston Public Latin School, established in 1635, was the first public school in America. It has been primarily devoted to preparing young men for college. The Roxbury Latin School (old Grammar school), founded in 1645, and the Boston Public Latin School both survive as free schools. In 1950 Boston maintained a teaching force of 3,514 teachers for about 100,000 pupils in all grades from kindergarten through the high schools, special schools and the Teachers College of the City of Boston.

The School Committee is the agency responsible for Boston's public schools. The School Committee consists of five members who are elected for two year terms. This committee approves projects for new schools and appropriates the necessary funds if it is to come from a tax levy and allocates the money if it is to come from a bond issue. The Mayor and the City Council must approve a bond issue. Actually the Boston Schools get only fifty cents on the tax dollar which amounts to about $700,000 a year. This is not enough to finance their building program so bond issues must be floated. Presently Boston has a continuing forty million dollar capital improvements program for new public schools.

It is interesting to note that by working with the State Building Assistance Commission a financial rebate can be realized from the state for twenty percent of the cost of the building. The state rebate has been difficult to get for city schools because the small sites in the...
city are below state standards. This is rather unfortunate because the schools really need the money and larger sites in the city seem out of the question at this time.

Boston is somewhat unique in that it is one of the few cities in the United States not building schools due to increase in population. Pupil enrollment in Boston is expected to decline and by 1975 be less than any previous year this century. Figure XVII illustrates child population and school membership trends in Boston from 1900 to 1950. Figure XVIII gives past and projected school enrollments for Boston. The school building program then is based on two factors. First is the redevelopment or housing authority projects which create a need for new schools. The second factor is obsolescence; elimination of old inadequate buildings.

Public schools today are for the most part extremely inadequate. There are a large number of very small schools which are poorly located. The Boston School system is only fifty percent efficient in the distribution of school facilities. School sites are extremely limited, sometimes occupying little more than one or two city lots. Of 172 existing school sites in 1949 only two were larger than two acres: 131 were smaller than one acre; 40 were actually less than one-half acre. Figures XIX, XX and XXI are examples of existing schools in Boston. Many schools are far over capacity while others are well beneath the enrollments they were designed to handle. Although a 6 -3- 3 system of grading organization is strived for in Boston it has

45 City Planning Board, General Plan for Boston, (Boston, 1950), p. 49
FIGURE XVII BOSTON CHILD POPULATION AND SCHOOL MEMBERSHIP TRENDS 1900-1950

A Total school membership as a percentage of all children 5-17 years of age
B Public school membership as a percentage of all children 5-17 years of age
C Children 5-17 years of age as a percentage of total population
D Parochial school membership as a percentage of all children 5-17 years of age

from Boston City Planning Board, General Plan for Boston, 1950, pp. 48-9
FIGURE XIX, ABBEY W. MAY ELEMENTARY SCHOOL IN ROXBURY.
Built in 1893 this school presently accommodates pupils in grades kindergarten to third. No playground.
FIGURE XX, PRINCE ELEMENTARY SCHOOL IN BOSTON'S BACK BAY. Built in 1875 this school presently accommodates pupils in grades kindergarten to eighth. No playground.
FIGURE XXI, ELIOT ELEMENTARY SCHOOL IN BOSTON'S NORTH END. Built in 1932 this school presently accommodates pupils in grades kindergarten to sixth. No playground.
rarely been achieved. Variations from this system are common and run the gamut of possible grading breakdowns. There is little overall continuity in the system which has been developed in a sort of piecemeal fashion over a number of years.

In the 1950 General Plan for Boston the City Planning Board estimated that by 1975 the total number of elementary and junior high schools should be reduced by one-third. An adequate school system could be worked out two-thirds of which would be existing schools and one-third of which would be new schools. In selecting existing schools to be retained, and the location of new schools, an important consideration would be an attempt to achieve unified neighborhoods and communities. Also an attempt would be made to relate schools more directly to recreational facilities. The City Planning Board's proposal for schools and recreation areas as presented in 1950 is illustrated in Figure XXII.

Presently the City Planning Board is re-studying Boston public schools and will make a revised proposal which hopefully will act as a guide for the School Committee. Basically the City Planning Board is still thinking in terms of fewer and larger schools. It is being recommended that the fifty-odd existing school districts be replaced by twelve new districts which are designed to serve more adequately the city. The existing and proposed number of schools for the three basic types are:

<table>
<thead>
<tr>
<th>Type</th>
<th>Elementary</th>
<th>Junior High</th>
<th>Senior High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing</td>
<td>155</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>Proposed</td>
<td>100</td>
<td>19</td>
<td>14</td>
</tr>
</tbody>
</table>
FIGURE XXII, BOSTON'S SCHOOLS AND RECREATION
from Boston City Planning Board, General Plan for Boston, 1950
Standards being used by the planning board are as follows:

School site a minimum of five acres with one acre added for each 100 pupils. It is admitted that this is difficult to do in the city.

One-fourth to one-half mile maximum distance from home to school.

Elementary school enrollment from 400 to 800 pupils.

Grading organization of kindergarten, six years of elementary school, three years of junior high school, and three years of senior high school.

Two-story school buildings.

Also the planning board is recommending that play space be available for use after school hours. In many cases today school play space can be used only during the school day.

A factor which complicates the public school system is the rather large parochial school system which exists in Boston (See Figure XVIII, page 69). It is difficult for the School Committee to project its needs as frequently it does not know the intentions of the parochial people. If the city builds a school to serve a community and later a parochial school is built, the city school may be left partially vacant. This very thing has caused a great fluctuation in enrollments from city school to city school.

The Boston public school system is badly in need of the planning which the planning Board is accomplishing. Major revisions are in order and many of its policies should be re-examined and brought up-to date. Historically Boston was a pioneer in free public education and today, with its adjacent areas, is a notable center of higher education. Yet the Boston public school system is extremely inadequate. There exists a pressing need for major changes in the system as well as an extensive renovation of the educational facilities.
The prime consideration in selecting a site was to locate the school in a community in Boston that represents a pattern which typifies future residential areas in the central city. Four Boston districts were considered quite thoroughly. They are:

1. Roxbury
2. South End
3. North End
4. West End

In the case of Roxbury and the South End the future character of these areas is a little difficult to ascertain. Although sections of these districts are slated for redevelopment, and the School Committee has an ambitious program of new schools for both areas, their future character is rather obscure as no formal residential redevelopment proposals have yet been made.

In the case of the North End about the same thing is true. There was an interesting redevelopment scheme for the North End done by Robert Fraska for his Master of City Planning thesis. Admirably much of the character of the North End was retained by Mr. Fraska and the scheme had a great deal of appeal. The assumptions he had made with respect to schools, however, were not consistent with the approach that I have taken and therefore the scheme could not be used effectively.

The West End seemed to offer the best site for an urban school in Boston. The design of the redevelopment scheme is complete and
demolition of existing buildings is well underway. The scheme makes provision for a new elementary school which the Boston School Committee is planning to build. From a planning standpoint the West End presents an interesting undertaking with many amenities that are seldom found in such developments. Professor Howard, who is in charge of M.I.T.'s Department of City and Regional Planning, feels that the West End represents the pattern future residential developments in the central city should and probably will assume. Figure XXIII shows the areas of Boston that are slated for re-development.
FIGURE XXIII, BOSTON AREAS FOR REDEVELOPMENT
from Boston City Planning Board, General Plan for Boston, 1950
THE WEST END REDEVELOPMENT

The West End was a badly blighted residential area near the heart of Boston. It consisted primarily of rundown three to five story walk-ups which covered virtually all available land. There were no open spaces for children to play and residents got little sun and fresh air. The juvenile delinquency rate in the West End was the worst of any Boston health and welfare area. This was valuable land near the center of the city which was adding little to the city in terms of tax revenue and certainly offering nothing in terms of a decent living environment for its residents. The location of West End is shown on the map of Boston, Figure XV, page 62.

Appropriately the West End was one of the first areas in Boston to be considered for redevelopment under the Federal redevelopment and renewal program. The Boston Redevelopment Authority after getting approval to redevelop the West End selected the Charles River Park, Inc., as the developer by competitive bidding. The developer employed Victor Gruen and Associates to do the architecture and planning of the project. The scheme that Gruen developed is pending final approval now. The land in the West End was acquired by eminent domain in April of 1958 and demolition of existing structures is well underway.

When the 46 acre site was turned over to Gruen there was a predetermined street layout and building placement which first had to be overcome. This early proposal cut the site into three pieces with

46 Department of Research and Strategy, Massachusetts Council of Churches, Boston's West End, (Boston, 1949), p. 55
The buildings were arranged haphazardly. Victor Gruen developed a scheme which replaced the interior streets with a pedestrian "common" which linked the major complexes together and enabled children to walk to the school without crossing a street. All vehicular access to buildings is by loop roads or cul-de-sacs.

The residential buildings are grouped into five clusters, each consisting of three or four buildings surrounding a plaza. Each such grouping houses 400 to 500 families. There are three basic types of residential buildings, 22 story tower apartments, 16 story slab apartments, and three story walk-ups. The complete development will house 2400 families with rents starting about $125 for efficiency apartments (It is interesting to note that 3671 dwelling units were demolished). The estimated average family size is small at 2.6 persons.

The pedestrian way connects the residential clusters to the other elements in the development. At the south end of the site is a complex of public and commercial structures as well as two buildings of historical interest. In this area, bordering Cambridge Street, are a shopping center, library, junior high school, parochial school, church, and commercial establishment. This center would serve the north side of Beacon Hill and other nearby districts as well as the West End. Along the pedestrian way are open landscaped spaces, a nursery, an elementary school (the object of this endeavor), a church and a convenience shopping area. Figure XXIV shows the placement of the various elements in the Gruen scheme. A top view of a model of this scheme appears on page 8.
FIGURE XXIV: WEST END REDEVELOPMENT

A Tower apt.
B Slab apt.
C 3-story walk-up
D Parking
E Library
F Church
G Parochial sch.
H Elem. sch.
J Jr. high sch.
K Shopping
L Bulfinch Church
M Harrison Gray Otis house
N Commercial
The main criticisms of the Geden scheme have to do with the parking and the architecture. The parking takes up a great deal of the available open space. Parking is on two levels, one four feet up the other four feet down. This system accommodates about 50% to 60% off-street parking. According to a representative of the Charles River Park, Inc., this was the cheapest method of handling the parking other than parking at one level on grade which would take more space. They considered putting the parking under the buildings but the cost of this was prohibitive. The architecture is somewhat disappointing. It certainly could be a lot worse than it is, but one can't help wishing that in a scheme of this nature the architecture would be more inspiring.

The site of the West End elementary school is indicated on Figure XXIV, page 81, in relation to the overall scheme. This school site is 105,644 square feet in size (well below the 5 acre minimum). A larger scale drawing of the site appears in Figure XXVI. It is important to note that an elevated train and a heavily travelled street run close to the north boundary of the site. At its south end is the pedestrian way previously described, with vehicular access by-way of a cul-de-sac on the west side of the site. There is a gentle slope to the site toward the street at the north boundary. The limited size of the site is compensated for by other nearby areas. Across Charles Street is a portion of the esplanade which continues on down the Charles River with a number of recreational facilities. Practically across the street from the north boundary of the West End is a public
swimming pool. The pedestrian way with its related landscaped areas within the West End development provides a certain amount of open space which can be used by children.

Early in the programming of this school certain community facilities were being planned with the school to form a community center. After more thorough examination of the West End plan and consultation with Professor John Howard this idea was abandoned. Most logically such a center would be located at the south end of the site where a number of community facilities are already planned. A gymnasium is being built for the junior high school which will also be open for community use. The library, cultural area, shopping areas with restaurants, and churches provide a good basis for a community center. Also the fact that the school site is quite small makes allocation of space, other than that necessary for elementary education questionable.

The West End is certainly not the final answer to urban redevelopment. It does however present a solution that offers a number of amenities not found in many other redevelopment projects that are being built. The fact that it is being built is important. Frequently some of the best planning and architecture is not realized because it never gets out of the paper. Inspite of some of the concessions that were made in developing the scheme the West End and similar such projects may act as stepping stones for better future urban redevelopment.
THE ELEMENTS OF THE ELEMENTARY SCHOOL

Information in this section was taken primarily from the Guide for Educational Planning of Public School Buildings and Sites in Minnesota, with modifications for team teaching and a non-graded system. Although this guide is not a publication of the Boston School Committee or the Massachusetts State Board of Education, it is applicable here because of the general way in which the material is presented. The standards presented in this guide are as relevant in Massachusetts as well as in Minnesota. It is one of the most comprehensive works on the subject that could be found which is based on recent research in elementary school planning. There is no similar guide published for Boston, or the State of Massachusetts. Other sources of information were Space for Teaching, and Toward Better School Design by William W. Caudill, and School Design, a publication put out by the North Carolina Department of Public Instruction.

I. Instructional Areas

A. General

1. Basis for Design

a. An elementary school building can be designed only in terms of a community's elementary school program. An elementary school program must grow out of a study of the needs of a particular community.

b. Instructional spaces needed will include indoor and outdoor classrooms, indoor and outdoor play areas, and assembly room.
c. Administrative and service spaces supplementing the instructional spaces will include such areas as office, toilets, teachers' rooms, food service facilities, health clinic or examination room, storage spaces, and building service spaces.

d. Equipment will include the wide variety of tools and materials that teachers, pupils, administrators and custodians will use and without which both instructional and service spaces are useless.

2. Size of Schools. While there is no hard and fast answer to the desirable size of elementary schools, there is considerable agreement among school plant planners on two conventional classrooms per grade as the most desirable in an elementary school, with one as the minimum and three as the maximum. One or two conventional kindergarten classrooms and two groups in each of the first six grades would result in an elementary school with about 400 pupils, a staff of a principal and thirteen to fourteen teachers, and a parent group of about 800. A unit of this size could operate with a minimum of the handicaps which a larger unit would face and make substantial use of the range of facilities which a modern schools should offer.

3. Class Teaching Unit Size and Design

a. Class size. Approximately 100 pupils.

b. Size of class teaching unit. Based on room occupancy of about 100 pupils, the class teaching unit size should be as follows:

(1) Kindergarten - about 60 pupils at 35 square feet
per pupil equals 2,100 square feet of floor area, including storage and toilet space.

(2) Elementary (approximately ages 6 to 11) – about 100 pupils at 35 square feet per pupil equals 3,500 square feet, including work counters, storage space, toilets and teacher's office.

c. Shape of class teaching unit. With improved methods of lighting, both natural and artificial, class teaching units may be designed of various sizes and shapes to fit the type of instruction and activities in those rooms. Class teaching units approaching a square seem particularly adapted to enclosing class teaching unit activities, although the final shape of the room will be determined by the outcome of the planning process.

d. Minimum ceiling height. The clear ceiling height of elementary school class teaching units, including kindergartens, should be 8-1/2 to 9 feet or more.

4. The Self-Contained Class Teaching Unit

a. Under the influence of the greater emphasis on the self-contained class teaching unit, departmentalization in the elementary grades has largely disappeared.

b. Facilities include activity space, work space, a room library area, facilities for work in art, crafts, nature, and science, and ample storage space for supplies, equipment, and children's work materials (See Figure XXVI).

c. Such a room requires more square footage per child than has been customary. Extreme flexibility of furniture and equipment is desirable. Figure XXVII illustrates how curriculum changes have
These areas should be given specific consideration in the planning of a class unit.

Traditional classrooms with stationary seats cannot be adapted to new teaching techniques. The “activity program” means exactly what the name implies—active children. At times the classroom must be cleared for large projects. At other times the classroom is arranged so that the children may work in small groups.
affected the classroom. There is an ample amount of chalkboard and tackboard.

d. These rooms might be a square with ample natural light. Plumbing may include pupil toilets adjacent to the room with a sink and drinking fountain in the room itself. Provision will be made for pupils' clothing storage in the room or in an adjacent room alcove. For the lower grades there is access to a sheltered play area with sunny exposure.

5. Flexibility in Use

a. The elementary school class teaching unit should be designed for maximum flexibility in use. Figures XXVIII and XXIX show various furniture arrangements and respective areas per pupil.

b. Sufficient floor space being assumed, the criterion of flexibility requires that there be a minimum of fixed equipment which limits the use of floor and wall areas. It allows only such built-in storage, shelving, work counters and other equipment as will be permanently needed by any group of pupils assigned to the room and as can be placed around the perimeter of the room in spaces where there can be no more desirable alternative use.

c. Chalkboards, tackboards, and sink counters, for which fixed locations seem desirable, are usually attached to the wall, and the area under the windows is used for bookshelving and other shelving. All other items of equipment are designed to be movable. This applies generally to pupils' desks and chairs, teacher's desk and chair, work counter units or work tables, library table,
The formal desk and chair arrangement

First, let us consider the formal arrangement of school seating; that is, where seats and desks are arranged in rows. Although this type of seating was used in the traditional classrooms, there are occasions suited to this arrangement in up-to-date classrooms that carry on the activity program. It is good for tests, writing drills, spelling drills, study periods, and others. As indicated by the chart, such an arrangement requires 10 square feet of floor space per pupil.

Closed circular arrangement.

The next furniture arrangement is to have the desks and chairs placed in a circle. Teachers find that there are many occasions when this type of arrangement can be used. This arrangement allows good control and easy attention. Notice on the chart that the desks are nearly touching and do not permit students or teacher to pass through the circle. This technique of seating requires sixteen feet of floor space per pupil.

Open circular arrangement.

Now let us examine a similar arrangement. Here the desks are placed far enough apart to allow space for walking around each desk. This is a more practical arrangement than the closed circle; however it requires more space. 25 square feet of floor space per pupil is necessary for desks and chairs in open circular arrangement.

Chairs in rows.

Chairs (detached from desks) placed in regular rows such as for assemblies require comparatively small space. Classrooms have need for this arrangement during dramatization of a historical event, or presentation of a classroom play. If these figures are to be used in determining the size of the school auditorium, space required by aisles and stage must be added. The space required by chairs in rows is 5 square feet of floor space per pupil.

FIGURE XXVIII, FURNITURE ARRANGEMENT - 1
From Space for Teaching by William W. Caudill, pp. 52-3
Table grouping.

There are occasions where individual tables or desks are grouped together. Teachers find this arrangement excellent for paper cutting work, and classroom eating. This figure may be used in determining sizes of dining halls as furniture arrangement is similar; however, it does not include main service aisles nor kitchen. Space required is 10 square feet of floor space per pupil.

Chair circular arrangement.

Often only chairs are used in class activities. This is a good arrangement for story telling, reading, oral spelling, and organization of class projects. Space necessary for circular chair arrangement is 8 square feet of floor space per pupil.

Circular chair arrangement of small groups.

Sometimes the teacher wishes to have the class work in small groups, using chairs only. This arrangement is good for committee meetings. It requires approximately the same space of that above, that is, 8 square feet of floor space per pupil.

Space for sleeping.

In the early grades of the elementary school it is desirable to have rest periods for the children. Some schools use folding beds or beds that are light and can be easily stacked. Other schools find it more economical to have blankets or mats for the children to rest at school. In most cases there is needed approximately 18 square feet of floor space per pupil for sleeping.

Figure XXIX, Furniture Arrangement-2
From Space for Teaching by William W. Caudill, p. 53
library bookshelf units, aquariums, sandtables, workbenches, easels, clay bins, etc.

6. Toilet Rooms
   a. Attractive, modern, sanitary fixtures in tiled, easily cleaned, well-lighted and well-ventilated toilet rooms should be provided near the class teaching units.
   b. Toilet rooms directly connected with the class teaching units are considered necessary because of the size of the units.

7. Clothing Storage
   a. Care should be taken that protection of children's clothing should not supplant the educational program itself in class teaching unit planning.
   b. Well planned clothing storage should take up a minimum of space yet provide sufficient, well ventilated space so that each child can have a place for:
      (1) Cap, gloves.
      (2) Hanging space for outer clothing, with garments not touching for air circulation.
      (3) Place for boots and rubbers, tennis shoes, etc.
   c. Location for clothing storage should be:
      (1) Near the class teaching unit entrance so that children will not track mud and snow over floors.
      (2) Accessible to outdoor play area.
      (3) With ample space around storage so that pupils can get in and out of clothing easily. For Kindergarten and primary
children this often involves sitting on the floor.

(4) So as to facilitate teacher control or supervision.

d. Alternative arrangements.

(1) Kindergarten. (Here there is a definite need for teacher control)
   (a) Open racks and shelves or cubicles in room alcove.
   (b) Open racks and shelves in class teaching unit near exit closed off by doors or screens.
   (c) Movable clothing storage units with cork or tackboard behind.

(2) Primary (Ages 6-8)
   (a) Open racks and shelves in classroom near exit closed off by doors or screens.
   (b) Open racks and shelves inset in corridor wall.
   (c) Wardrobe type steel lockers inset in corridor wall, with teacher controlled locking device.

(3) Intermediate (Ages 9-11)
   (a) Lockers inset in corridor wall, with individual pupil controlled locking device.
   (b) Wardrobe type steel lockers inset in corridor wall, with teacher controlled locking device.
   (c) Open racks and shelves in classroom or inset in corridor wall.
B. The Kindergarten Class Teaching Unit.  The kindergarten term is often thought of as an introductory year to the school career of the child in which he is made ready for later school experiences. A better concept is that it is the first year of a well developed sequence of learning activities, during which the child makes a transitional adjustment from the home environment to the school environment.

1. Kindergarten Activities To Be Housed. These generally include:

a. Creative efforts with blocks, boards, tools, clay, scissors, paper, crayons and paint.

b. Nature study activities such as planting and watching things grow.

c. Library experiences such as listening to stories and telling them.

d. Social studies experiences such as developing units on the home, store, circus, pet shop, community friends.

e. Musical experiences such as group singing and enjoying music by listening.

f. Rythmic activities, games.

g. Health activities such as washing hands, preparing for lunch, resting and using the toilet.

h. Language activities such as conversing and discussing.

i. Number and reading readiness activities.
2. Elements of the Kindergarten Classroom. These include:

   a. Main activity area created from the central part of the room for games, rhythms, indoor play, major construction projects.

   b. Work area including work benches of suitable size, tool storage cabinets, a work sink with hot and cold water, and storage space for wood and other supplies.

   c. Art center which may provide wall easels, a work table with a water-proof top for clay work and finger painting, storage space for clay, large sheets of newsprint, tagboard, and colored paper, paints, brushes, paste jars and other art materials.

   d. Science and nature center which may have an aquarium, terrarium, display space for science and nature study materials, and storage space for equipment for simple experiments.

   e. Library center, located near windows, in a relatively isolated and quiet section of the room, providing a library table and chairs, low, open bookshelves suitable in size for large format books, and provision for book display.

   f. Music center, including a small piano and record player in any desired spot, rhythm band instruments, storage for instruments and records.

   h. Teacher's center which should provide desk, chair for teacher, chairs for visitors, four drawer file for pupil records and teaching materials, and closet storage for teacher's wraps and other materials.

   i. Milk bar or kitchenette which may provide a hot plate,
with storage suitable to the school milk, snack, or lunch program.

Some schools prefer cart service from a central kitchen.

j. Impromptu dramatics center, which may be provided by raising one portion of the room about 6 inches above the floor of the main room or by a portable platform. (May be the library corner or music center.)

3. Supplementary Spaces. These include:

a. Toilet and lavatory facilities

   (1) A room with a junior size water closet.

   (2) A lavatory outside of toilet room adjacent to entrance for easy teacher supervision of handwashing.

b. Clothing storage alcove

   (1) Convenient to outside entrance with open racks or compartments with an upper shelf for hats, hangers for coats at a height of about 3-1/2 feet, and a lower shelf for boots and overshoes.

c. Store Room (desirable)

   (1) One, convenient to play area entrance, for outdoor wheeled toys, building boxes, sand toys, garden tools.

   (2) One for bulky types of indoor equipment such as construction blocks, cots or mats, looms, easels, supplies.

Note: Provision for a separate storeroom may not be necessary if the wide variety of materials to be stored is taken into account in planning class teaching unit storage, e.g., utilization of space under window seats and work counters; tool
cabinets; open cubicles for unfinished pupil projects, drawers for games, toys, and materials; exhibit case; special drawers or a cupboard for paper and large equipment.

d. Play area

(1) Set aside from rest of school playgrounds; sunny exposure; sheltered from winds; hard surfaced in part.

(2) Outside storage for garden tools, sand toys, wheeled toys desirable.

4. Other Equipment and Services, Kindergarten Class Teaching Units

a. Chalkboards, 6-12 lineal feet, light colored chalkboard or first quality natural slate, not dyed.

b. Tackboard. Ample tackboard and pegboard as room design permits.

c. Display. Ample hooks and clamps for charts and pictures may be placed at the top moulding of chalkboards and bulletin boards. Recessed picture moulding is desirable on all walls.

d. Clocks. An electric clock should be provided.

e. Electric Outlets. Duplex electric receptacles should be placed so as to encourage the use of radio, record player, and visual aids. An outlet should be provided over the work counter.

f. Audio-Visual. Provision should be made for darkening the room.

g. Fountains. A drinking fountain should be provided, preferably separate from work sink.

h. Acoustical Treatment. The informal kindergarten
program suggests the need for acoustical treatment of kindergarten rooms.

i. Decoration. Desirable visual environment is enhanced by the skillful use of color.

j. Other. Lighting, heating, ventilating, and provision for ease in cleaning should all receive special attention in planning the kindergarten. The need for warm floor suggests consideration of panel (radiant) heating for this room. 30 footcandles of illumination.

5. Heights

a. Chalkrails, lower edge of bulletin boards, work counters, sinks and lavatories in kindergarten should not exceed 24 inches from the floor.

b. Clothes Hangers. Pupils' clothes rod or hanger, floor to center, 40 inches.

c. Drinking Fountains in Classroom. From floor to rim, 26 inches.

C. Elementary Class Teaching Units

1. Typical Activities. The design of an elementary classroom stems from activities derived from the educational program. Below are listed some typical activities found in the school:

a. Reading

b. Writing

c. Spelling

d. Speech

e. Arithmetic
f. Science

g. Recreating Community Enterprises

h. Long Term Project (in relation to subject area units)

i. Art

j. Music

k. Using Records

l. Dancing

m. Puppetry

n. Making Models

o. Hobbies and Interest Materials

p. Growing Plants

q. Caring for Animals and Fish

r. Experiments with Foods

s. Experiments with Clothing

t. Collecting

2. Primary Class Teaching Units. These units should be large rooms accessible to the multi-purpose space, and outdoor teaching spaces. They should accommodate a variety of activities and furniture arrangements. Class teaching units usually include:

a. General work area in which most of the educational process goes on, containing desks, seats, tables, chairs, movable, and flexibly arranged to suit program.

b. Library area with chairs, tables and bookcases, book display.

c. Science center with aquarium, terrarium, exhibit and
demonstration space.

d. Art center with easels, clay table, and finger painting table.

e. Work center with work counter, work sink and suitable tools.

f. News center with bulletin board where items of interest can be displayed.

g. Teacher's space with desk, filing cabinet, and closet.

h. Drinking fountain.

i. Well ventilated clothing storage area in room.

j. Individual class teaching unit toilets.

k. Storage planned in terms of materials to be stored.

l. Facilities for music, record player, a piano.

3. Intermediate Class teaching units

a. Like the primary class teaching units, these units should be large rooms with a variety of possible working arrangements. Some school systems may wish to provide a separate art workroom where certain equipment is centered. This may be done within the class teaching unit itself.

b. Intermediate class teaching units should referably be located apart from the primary class teaching units.

c. Exits should be separate from primary exits if possible. The play area should be clearly separated from that of the primary children.

d. Class unit elements will depend upon the program that
is anticipated in the school. Major centers or elements commonly found include:

(1) General work area.
(2) Library or quiet individual study area.
(3) Facilities for social studies.
(4) Facilities for science.
(5) Facilities for art.
(6) Facilities for music.
(7) Handworking area for wood, cloth, metal, and crafts.

e. Many of the activities of the intermediate class teaching unit may be accommodated in an activity alcove equipped with work bench, work counter and sink, tool cabinets, and materials storage space. Semi-separation can be obtained by proped arrangement of movable cabinets and cases.

4. Elementary Class Teaching Units, Supplementary Spaces

   a. Toilet rooms.
   b. Clothing storage.

5. Size and Shape.


   a. Chalkboard. 16-24 linear feet. The use of reversible chalkboard and tackboard combination in variable amounts will provide multipurpose use.

   b. Tackboard. An abundance of tackboard, bulletin board, and pegboard.
(1) Light in color and durable.

(2) All or most of it placed at pupils' eye level; occasionally a part of wall covered from floor to ceiling.

c. Seats and Desks. Seats, desks, tables, and chairs should be chosen for comfort and contribution to good posture; metal parts painted with flat enamel of light color; wood surfaces light in color and with flat finish.

d. Storage. Space must be planned to meet specifications. Examples:

(1) Library area. Low book shelving, suited to grade level, for 100 to 200 books; not above 4 feet high in primary 5 feet in intermediate; some sloping counter section or shelving for book display.

(2) Language arts and social studies. Storage for large charts, cards, posters, maps, globes.

(3) Arts and crafts. Drawer for small supplies: cupboard for larger supplies; large shallow drawers (25" x 37") for 24" x 36" paper; bin or cubicle for clay; small cabinet with space for roll and cutter for heavy wrapping paper.

(4) Handworking area. Storage space for tools and materials for local program which may include woodworking, metalwork, sewing.

(5) Science and nature study. Storage for glass jars, dry cells, magnets. Aquarium and terrarium may be made moveable by equipping with casters and set screws for keeping in desired position.
(6) Music. Storage for records and record player; rhythm band instruments in primary grades.

(7) Play equipment. Storage for play equipment normally kept in room.

(8) Teacher. Closet for personal belongings and general class teaching unit supplies; four drawer filing cabinet, preferably recessed, for records and resource materials.

(9) Pupil materials. Individual cubicles, sized to grade level and type of projects (approximately 12" x 20" x 15"). A counter height, movable storage unit may be used to subdivide room for varying activities. Low, movable bookcase units may be similarly used.

e. Work counter. 16-18 feet should be provided.

f. Work sink. A work sink should be provided in or near the work counter.

g. Drinking fountain. Each elementary class teaching unit should be provided with a drinking fountain. Separate drinking fountains are desirable.

h. Display facilities

(1) Displays. A case which can be viewed from both the hall and the class teaching unit is desirable; approximately 3' x 5' x 2'.

(2) Map and screen fixtures. A recessed picture molding or map rail and a series of hooks or clips at the top of the chalkboard or tackboard should be provided to accommodate roll-up type maps and projection screen.
i. Electrical equipment. An electric clock should be provided in each classroom; duplex electric outlets on each wall which can conveniently be used for audio-visual equipment.

7. Lighting. 30 footcandles of illumination.

8. Light Control. Methods of light control should be used to permit the use of audio-visual equipment requiring darkening.

9. Walls. Should be in light colors; the ceiling in a light reflecting color.

10. Floors. Floor covering should be of durable, resilient material which will tend to reduce noise and facilitate the moving of furniture.

11. Heating and Ventilation. Warm floors are advantageous.

12. Heights

a. Figure XXX describes the critical dimensions of children at various ages. Chalkrails, lower edges of bulletin boards, work counters, sinks, and lavatories in elementary classrooms should not exceed the following:

(1) Ages 6-7 26 inches from the floor
(2) Ages 8-9 28 inches from the floor
(3) Ages 10-11 30 inches from the floor

b. Clothes hangers. Pupils' clothes rods or hangers, floor to center, should be as follows: Ages 6-8 varying heights 40 to 44 inches, ages 9-11 from 44 to 48 inches.

c. Drinking fountains in classrooms. From floor to rim of fountain; 30 inches for primary and 34 inches for intermediate.
Schools are built for the pupil. If shelves are too high to reach, seats too small to sit in with comfort, or spaces too small for individuals or groups of pupils to work in, then the school cannot function properly. These are some characteristics of the anatomy of the pupil, based on statistics prepared by the U.S. Department of Agriculture. The pupil is the yardstick, a varying measurement from one age group to another. These diagrams are based on “H”, the average height in inches indicated in circles for each age or corresponding grade.

from *Toward Better School Design* by William W. Caudill, p. 11
D. Physical Education Unit

1. Basic Considerations

   a. Physical education standards recommend a 30 minute period daily for elementary children, 5 days a week.

   b. In six hour day, twelve 30 minute periods are available for scheduling.

2. Size of Physical Education Units. Suggested physical education units for schools of various sizes are listed below:

   a. Elementary Schools with an enrollment of about 450 pupils. The physical education unit suggested for such schools is 52 feet wide by 72 feet long with a ceiling height of 16'-18'. This may be provided in a multipurpose space.

3. Location. Should be located at grade level; readily accessible from the class teaching units as well as from a major community approach; adjoin playgrounds.

4. Additional Characteristics of the Physical Education Unit.

   a. Floors. Floors should be resilient and non-slippery; hardwood, asphalt tile or linoleum are acceptable. Suitable floor plates and anchors for gymnasium equipment should be put in when the floor is laid. Floor openings should have cover plates to exclude dirt. Floor markings will include court markings for basketball, volleyball, badminton and circles for dodge ball, circle games, group dancing, and other activities.

   b. Walls. Nothing should project from the walls into the play area. Walls to a reasonable height should be finished with
non-abrasive and impervious materials.

c. Apparatus. Included may be climbing ropes and poles; basketball backboards for practice games; volleyball facilities with provisions for fastening net; horizontal bar; and horizontal ladder. Provision should be made for hanging and removing apparatus that is normally attached to the ceiling.

d. Drinking fountains. Provision should be made for recessed drinking fountains.

e. Doors. Doors opening directly on to the playing floor should be without glazed areas. Doors should not open near the main basketball goals. Sufficiently large doors without thresholds should be provided for any major storage spaces.

f. Piano. Space for a piano should be provided with room sufficient for piano and bench or chair.

g. Clock. Each physical education unit will require a clock with screened face for protection from various kinds of balls.

h. Lighting. Sunlighting should be welcomed but excessive glare should be avoided. Windows, if used, should be on the long walls; no windows on the end walls; windows, shatter resistant glass, or screened if necessary. Windows should be 8-12 feet or more above the floor. Some type of daylighting control should be provided. The use of low transmission glass may be desirable.

i. Artificial Lighting. Ample electric lighting, without shadows, is needed for cloudy days, evening games or lighting for social purposes. Fixtures should be recessed or firmly fastened to
j. Ventilation. Mechanical ventilation is required.

k. Sound Control. Accoustical treatment should be provided such as to make for the maximum deadening of play and game noises.

l. Phonograph and Loudspeaker Equipment. A built-in cabinet may be provided to house electric record player and records: compartment about 20" deep, 24" high and 48" wide, equipped with doors that lock. The electrical record player should be installed for permanence and to avoid theft or breakage. It should contain a microphone jack. Two 12" loudspeakers should be installed, one at each end of the room, so arranged that they can be used separately or together.

5. Auxiliary Physical Education Unit Spaces. Auxiliary spaces will vary widely from school to school and also by size of schools. Selections will be possible from the following spaces to meet educational programs.

a. Central Storage Space. A minimum of 200 square feet opening into the gymnasium should be provided, with hooks for hanging mats; shelves and bins for play materials; and storage for other special school programs using the physical education unit.

b. Playground Storage. Locate accessible from the playgrounds, as near as possible to central storage space, minimum dimensions 10' x 10', with open shelves 15" deep, with 2" retaining front piece. At least 6' should be without shelving for general storage.
c. Toilets for Physical Education Unit. If physical education unit is used extensively for other than regular school purposes, it will need toilets for both boys and girls directly accessible from both indoor and outdoor play areas. Criteria to be met are segregation, well separated entrances, ease of supervision and possibility of separation from the remainder of the building.

6. Outdoor Facilities Needed. 250 square feet of area per pupil.

a. Specific Areas for Elementary Schools

(1) Hard-surfaced multiple-purpose area. The all weather area should be laid out with dimensions of 100 by 120 feet. Due to the nature of the surface of this area, it can be used at all times except in inclement weather. It provides for many court activities, such as basketball, volleyball, badminton, tennis, shuffleboard, etc., which require comparatively hard, smooth playing surfaces. When separate areas are used for these activities, approximately one acre of hard surfaced area should be provided.

(2) Apparatus Area

(a) For physical education. A space approximately 25' x 120' should be provided for the following: jungle gyms, horizontal ladders, three-section chinning bars, and low bars 30 inches high and 10 feet long.

(b) For free play and recreational use. An
additional space approximately 50' by 120' with sand boxes 8' by 12'
and other small equipment suited to primary aged children's activities.

(c) The apparatus area should be located
so as not to break up any large space, and, when possible, in a
shaded spot. Ample room around all apparatus should be allowed for
safety purposes, but it should not be so scattered as to waste space
for group activities. Since it is practically impossible to maintain
turf in this area, a surface free from loose stones and covered with
torpedo sand or some similar material is desirable. The landing space
around the apparatus should be filled with sawdust, shavings, tanbark
or some similar type of soft material.

(3) Horseshoe Courts. Two horseshoe courts may
be provided. They should be set apart from other areas so as to
eliminate cross traffic. A shady spot is desirable. The approximate
area needed is 50' by 60'.

(4) Softball area. A space 250' by 250' should
be laid out for softball.

(5) Field Game area. This should be a level turf
area 180' by 140' which would provide for participation in modified
team games such as field ball, soccer, speedball, touch football, etc.
For some games this space might be divided into two separate areas of
90' by 140'.

(6) Auxiliary Facilities.
(a) One high jumping pit with standards.

(b) One broad jumping pit with a take-off board. The area needed for these two units should be approximately 80' by 120'.

(c) General purpose area. An area of 125' by 150' should be provided for informal play activities, for running, and for games of low organization. This area should either be in grass or blacktop surface.

b. Outdoor Physical Education and Recreation Facilities.

The following chart represents the various areas which should be set aside for elementary school playground.

<table>
<thead>
<tr>
<th>Types of Areas</th>
<th>Recommended Dimensions (in feet)</th>
<th>Space Required (in sq. ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple-Purpose</td>
<td>100 x 120</td>
<td>12,000</td>
</tr>
<tr>
<td>Apparatus</td>
<td>75 x 120</td>
<td>9,000</td>
</tr>
<tr>
<td>Horseshoes</td>
<td>50 x 60</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2 courts)</td>
</tr>
<tr>
<td>Softball</td>
<td>250 x 250</td>
<td>62,500</td>
</tr>
<tr>
<td>Field Games</td>
<td>180 x 140</td>
<td>25,200</td>
</tr>
<tr>
<td>Auxiliary Facilities</td>
<td>------</td>
<td>28,350</td>
</tr>
</tbody>
</table>
E. Assembly

1. Purposes
   a. The modern school assembly room (which may be a multipurpose space) properly utilized, affords an excellent environment for extending the elementary child's interest and learning beyond the home and the class teaching unit and into the larger social group which the school and community provides. It offers children the opportunity of learning such things as cooperation, courtesy, leadership, self-restraint and experience in expression and presentation. It brings to the school outside talent in many fields. It can serve as a music center and offers opportunities in broad fields supplementing audio-visual education in the class teaching unit. It has value and usefulness for adults of the community, providing a place for parent and teacher meetings, civic meetings, musical activities, amateur dramatics, forums, and lectures. Its uses are numerous and it is commonly scheduled not only for the school day but also for after-school hours and evenings.

2. Size
   a. In new elementary school plants, small assembly rooms seating 200 to 400 pupils are desirable. Area per pupil should be 7 square feet. It is generally believed by school planners that small auditoriums are best for children since they offer an environment planned to the child's size with the opportunity for an intimate and sympathetic audience.
b. Experience has also indicated that if assembly rooms can seat one-half of the ultimate enrollment, they will usually be large enough, since programs may be presented to primary children and intermediate children separately.

c. In schools with enrollments of 350-550 pupils, assembly rooms seating 200 to 400 pupils will usually be ample for both school and community use. In schools providing combination assembly, physical education units, the floor area required for physical education will usually accommodate about 400 pupils when cleared and with folding chairs set up for assembly programs.

3. Location. In locating assembly rooms in plans, provision should be made for (1) access for children from other parts of the school, (2) access for parents who walk or drive from home with proximity to ample parking facilities for cars, (3) elimination of noise conflicts between the assembly unit and other school units, (4) freedom from heavy traffic and other bothersome noises, (5) separation from the rest of the building, and (6) easy access to and zoning of service facilities for after school use.

4. Seating

a. Assembly rooms with sloping floors and fixed seats limit the use of the seating area to one function, that of viewing.

b. Flat floors, particularly in assembly rooms seating less than 400, permit the use of stackable, folding chairs, making it possible for the floor to be cleared for other activities such as
physical education, primary play activities, or for recreation. This more flexible type of assembly area is preferred in most elementary schools. Many schools use trucks with wheels of non-marring materials, to move chairs to storage provided in a nearby storage room or under the stage.

5. Shape of Assembly Space, Sight Lines, and Acoustics
   a. The shape of an auditorium is very important from the point of view of acoustics and sight lines. There should be no need for sound amplification in an assembly of this size. Sight line should be checked to be certain that everyone has a clear view of the stage area.

6. Visual Education
   a. A projection booth is not necessary in the elementary school. An operating center should be planned to which the projector truck may be wheeled. At this point there should be an electric floor outlet and an outlet for the sound cable of the projector. The floor cable should lead to convenient loud speaker outlets at the stage or to built-in loud speakers which also serve for the assembly sound system. The assembly room should be easily darkened. Many schools omit windows in the audience space, but where there is combination use, other functions must be considered.

E. Multipurpose Room

1. In large elementary schools, such activities as physical education, assembly, school lunch, and music are often housed in specialized single use spaces, each fully utilized for the full school
day or week. In smaller schools it is not economical to provide such spaces separately, since any one of them would not be used for a very large percentage of the hours of a school day. Under these circumstances, smaller schools have provided flexible, multi-use rooms designed, with auxiliary spaces, to accommodate a variety of activities during the school day.

2. Functional Planning

a. In any combination of functions, the features essential to the program of each activity must be safeguarded. For example, kitchen, storage, dining, assembly, stage, physical education and music areas, in any combination, must be given even more intensive care in planning than if each were being designed for single purpose use alone.

b. Some common characteristics of multipurpose rooms are convenient location, adequate area, flexibility, adequate storage, and attractive and durable finishes.

3. Location. In locating multipurpose rooms in elementary schools the following are primary considerations: (1) convenient entrances and exits for both pupils and parents, (2) access to convenient parking areas, (3) access to service facilities, (4) separate heating and ventilating controls, (5) sound isolation from class teaching areas.

4. Area. Including auxiliary rooms, most multipurpose areas fall in the range from 2,400 to 6,000 square feet. A large number are between 2,400 and 3,600 square feet.

5. Flexibility. Easy adaptation to various uses and purposes
is an essential characteristic of a multipurpose facility. Furniture should be folding, stackable, durable, and sturdy. In dining areas, in-wall, folding, or roll-away tables should be given consideration, with adequate storage in all cases. Multipurpose rooms used for dining should be separated from the kitchen and serving areas by partitions and doors. Some schools provide portable stages that can be rolled into appropriate storage spaces. Partitions and cabinets can be so constructed that they can be moved to accommodate an expanding program.

6. Storage. Items may include, folding chairs, tables, portable stages, physical education equipment, band instruments, pianos and a variety of other equipment, furniture, materials, and supplies. Storage in the kitchen, including refrigeration and dry storage, should be determined by the specific needs of the school.

7. Finishes. Multipurpose rooms should be made attractive and functional but should have no expensive appointments. Floors should be durable, resilient, and easy to clean and repair. Wainscots of walls should be finished with a non-abrasive material. Light fixtures may need to be guarded and protected. The colors on walls, floors, furniture, and built-in equipment should harmonize. Light reflecting qualities of room surfaces should be within recommended ratios.

II Non-Instructional Areas

A. Administrative Unit

a. Among the primary functions of administration are (1) providing effective leadership, (2) rendering services to the
teachers and pupils, (3) promoting school and community relation-
ship, (4) keeping records, and (5) supervising the total operation
of the school.

b. Characteristic activities related to administrative
functions include:

(1) Planning and coordinating a total school program.
(2) Meetings with parents and other visitors.
(3) Conferring with parents, pupils, and teachers.
(4) Carrying on routine office work.
(5) Handling communications within and outside the
school.
(6) Counseling pupils
(7) Keeping and filing pupil and other records
(8) Ordering, handling, and storing books and
office supplies
(9) Plant management

2. Administrative Spaces. Desirable spaces in the adminis-
trative unit to implement the performance of administrative functions
or activities are as follows:

a. Public Space. Waiting space for receiving pupils,
parents, and other adults.

b. General Office. Work space where routine business
of the school will be performed.

c. Administrative and Personnel Offices. Offices for
administrative, supervisory, and personnel work and conferences.

d. Storage Space. Storage for instructional and administrative supplies and books.

e. Toilets and Coat Closets. Facilities for the principal and office staff.

3. Location

a. The administrative office should be located on the first floor or the ground floor, in close proximity with health service space.

b. A location close to the main building entrance and lobby is desirable.

c. The location should be selected for convenient access to all rooms and corridors in the building.

4. Size, Location and Arrangement of Specific Areas

a. Public Space. 100 square feet.

   (1) Waiting space for receiving pupils, parents, and others accessible from corridor or lobby.

   (2) This space should be separated from the general office by a service counter. Some elementary schools, where informality is desired, prefer to omit counters.

   (3) A location should be selected where the general office and corridor will open directly into the waiting room.

   (4) The public space should be designed to provide easy passage to teachers' mailboxes and service counters and to provide comfortable seating.
b. General Office. 200 square feet.

(1) This office should be provided adjacent to the public space and should be readily accessible to the principal's office, fire-proof vault or safe and storage space.

(2) Space for a service counter, desks, work table, files, bookcase, program clock, central fire alarm station, and provision for telephones should be made.

c. Administrative and Personnel Offices

(1) Principal's Office. 150 square feet.

(a) It should open directly into the general office and be conveniently accessible to staff.

(b) It should be located to provide natural light and ventilation.

(c) Space should be provided for a desk, chairs, filing cabinets, bookcase, clothes closet, telephone, a connection for an inter-communication system, and a table for committee meetings.

(2) Assistant Principal's Office. 100 square feet.

(a) These offices should be located adjacent to and connected with the general office.

(b) The equipment, and arrangement should be similar to that noted above for the principal's office.

(c) The net, clear floor area should be not less than 120 square feet.

d. Fire-Proof Vault or Safe

(1) The school should be provided with space for
a fire-proof record vault or safe, having at least a four-hour rating.

e. Storage Space

(1) Provisions should be made for the storage of instructional and administrative supplies and textbooks.

(2) This space should be located conveniently to the general office and connected with the corridor.

(3) For the distribution of supplies and books a door with a counter is often desirable between the storage space and corridor.

(4) Consideration needs to be given to designing adjustable shelves, drawers and cabinets to store properly such items as office supplies, forms, arts and crafts materials, rolls of newspaper and large size paper, ink, paste, books, etc.

(5) Minimum storage facilities should be provided as follows:

(a) For administrative and instructional supplies 48 square feet.

(b) For books, not less than one lineal foot of shelving 9-1/2" deep, should be provided for each pupil enrolled.

f. Toilets and Coat Closets

(1) The toilet facilities in connection with the teacher's rooms or health suites may be used by the office staff if they are suitably arranged and conveniently located.
(2) Coat closets should be provided for the principal, assistant principal, and the office staff. They should be located conveniently to these rooms, preferably connected directly with the offices. Coat closets should not be less than 24" deep.

5. Equipment

a. Teachers' Mailbox

(1) In the teachers' office area a recessed mailbox divided into cubicles should be provided. For each teacher, principal, and other personnel, one open cubicle, about 8" wide by 6" high and 13" deep, should be provided for books, magazines, and letters. (8-1/2" x 11" materials will require 9 or 10 inch width)

(2) One open space for packages about 36" long by 10" high by 15" deep is desirable.

b. Service Counter

(1) It is generally desirable to provide a service counter to separate the public space and general office. Some elementary schools prefer not to separate the reception areas from the general office and omit counters.

(2) It should contain drawers and adjustable shelving on the office side and it should not exceed 32"-36" in height.

c. Bookcase

(1) An open front or glazed bookcase with at least 12 lineal feet of adjustable shelving 10" deep, should be provided in the principal's and assistant principal's offices and general office.

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d. Key Case

(1) A key case, preferably recessed, of a size adequate to accommodate keys to classroom teaching units and other rooms, should be provided in the general office for the teachers, and other personnel.

e. Display

(1) Facilities for hanging pictures are desirable in the principal's office, general office, public space, and conference rooms.

6. Electrical

a. At least two receptacles should be provided in the public space.

b. An ample number of receptacles should be provided in the general office for electrically operated business machines, such as typewriters, calculating and adding machines, duplicators, etc. Where desks are against walls receptacles 36" from the floor would be useful.

c. Connections are necessary for the program control clock, fire alarm system

d. The installation of the building telephone, switchboard, and public telephone is important in connection with the planning of the administrative suite in order to conceal conduits, provide space for switchboards, and to arrange functionally the room or space where the equipment and telephones are to be provided.
e. Connections should be provided in the general office and principal's office for a buzzer call system where no inter-communicating system is provided (and also where extension tele-phones are used and no other means of communication is provided.)

f. The general illumination in the entire administrative suite should provide the same visual comfort and efficiency as recommended for class teaching units.

7. Heating and Ventilating
   a. Provision for heating the administrative suite independently of the remainder of the building is desirable.
   b. All rooms or spaces normally occupied by persons in the administrative offices should be ventilated. In rooms or spaces where no outside windows are provided, excepting storage rooms and fire-proof vaults, ventilation should be provided.

8. Acoustics
   a. Administrative offices and public spaces should be acoustically treated.
   b. All principals' offices should be separated from each other, other offices, and the public space by full height partitions, reasonably sound isolated.

9. Suggestions
   a. Informality rather than a formal arrangement should be a keynote in planning the administrative suite, equipment, and furniture layout.
   b. Full height partitions should be provided between the public space and corridor, and the principals' offices and
general office.

c. Ceiling heights as low as 8-1/2 to 9 feet have been used with success in the administrative suites of some schools.

B. Health Service Unit

1. General

   a. The primary functions of the Health Service program are to detect health deficiencies and to protect and improve the status of all school personnel—children and teachers alike.

   b. Characteristic facilities and services of the Health Service Unit include:

      (1) Waiting Room— for those who are seeking health services.

      (2) Consultation or Examining Room:

         (a) for nurse screening of teacher referrals, following observations and screening of pupils by teachers.

         (b) for the administration of first aid, and for proper care of accident victims by a trained person, until the doctor arrives.

         (c) for vision, hearing, and other screening procedures, which may include the measurements of pupil height and weight.

         (d) for periodic medical and dental check-ups and for immunization procedures.

         (e) for health guidance.
(f) for storage of health files and records; storage of first aid and other supplies and equipment

(3) Rest Room Area or Rooms—for those, who because of health condition, require rest periods during the school day or who become ill

(4) Auxiliary areas—such as toilets and storage spaces

2. Location

a. Waiting Room. 80 square feet

(1) The waiting room should be directly accessible from the corridor and the examination room.

(2) The waiting space should be entirely separated from adjacent rooms by a full height partition.

(3) The waiting space should be designed to create a bright and cheerful atmosphere. Comfortable chairs, proper lighting, available magazines and books, help to reassure apprehensive pupils and prevent the development of tenseness. The waiting room should be equipped to suit small children's needs.

b. Examining Room. 200 square feet

(1) The examining room should be directly connected with rest rooms and waiting rooms or connected by means of a private hallway. It should have access to the toilets, and to any offices that are provided.

(2) A location should be selected so that natural light and natural ventilation can be provided.
(3) The examining room should be arranged to
assure privacy of examination. Doors leading in from the areas
of the health unit should be screened to assure privacy.

(4) Careful consideration should be given to the
space arrangement for vision testing.

(5) The examination room should be made reasonably
sound proof to facilitate audiometer examinations. A separate room
with sound proofed doors and special acoustical treatment may be
desirable for this purpose.

(6) If separate rest rooms are not provided, screened-off cot areas should be provided.

(7) Adequate space should be provided in the ex-
amining room in order that the following equipment may be properly
arranged, installed or stored:

(a) Desk, chair, typewriter, filing cabinets.
(b) Platform scale with stadiometer
(c) Snellen or illuminated eye chart
(d) Movable spotlight
(e) Blanket and linen storage
(f) Cot or couch
(g) Three-section folding screen
(h) Examining table
(i) Sterilizer and white enamel table
(j) Supply cabinet for first aid supplies,
thermometer, forceps, syringe, scissors, etc.
(k) Physicians sink or lavatory
(1) Cup and towel dispenser
(m) Waste basket and foot-operated disposal can
(n) Full length mirror
(o) Audiometer.

c. Toilet Rooms
(1) A toilet room with water closet and lavatory should be provided directly connected with the examining room.

d. Storage Closets
(1) A ventilated storage closet for linens, blankets, pillows, etc., should be provided, opening off the examining room. This closet should be about 24" deep by 42" wide with adjustable shelves 18 inches deep.

(2) A coat closet for the use of the nurse should be provided in the examining room.

4. Equipment

a. Tackboard. At least 12 square feet of tackboard 36" high should be provided in the waiting room and examining room.

b. Display. Facilities for changing pictures are desirable in the waiting room.

5. Plumbing

a. A lavatory equipped with wrist, knee or foot operated controls is desirable in the examining room. In schools where an examining room is not provided, a lavatory as suggested above should be provided in the area to be used as an examining room.
7. Ventilation
   a. All rooms in the health suite should be ventilated.
   b. The exhaust air from the isolation and rest rooms should not pass through other rooms of the health service suite and no air from the health service suite should be recirculated or exhausted into the corridor or other pupil-occupied spaces.

8. Acoustics. The examining room should be acoustically treated to facilitate audiometer examinations.

9. Other Considerations
   a. A cheerful and informal atmosphere conducive to healthful conditions is desirable.
   b. It is desirable to provide for separate entrances and exits from the examining rooms for quick file through during
inspections and immunizations.

c. Cold floors should be avoided. Inlaid linoleum, rubber tile, or asphalt tile in light colors should be provided.
d. A telephone should be provided in the examining room or nurse's office.
e. Hooks, clothes hangers, and mirrors should be provided in each rest room.

C. Teachers' Spaces

1. General

a. Personal service facilities for teachers are desirable and usually contribute to better teaching and higher morale.

2. Faculty Toilets

a. Toilets, either alone or adjoining teachers' lounge where provided, should be adequate to accommodate an ample number of fixtures. Fixtures are suggested as follows:

(1) One lavatory for each 10 teachers
(2) One urinal for each 20 men
(3) One water closet for each 7 women
(4) One water closet for each 10 men

3. Teachers' Lounge

a. Size. Approximately 200 square feet in area.
b. Furnishings. Women's lounge rooms are usually furnished with easy chairs, day bed, powder table, mirror, and with connecting toilet. Men's lounge rooms are similarly and appropriately furnished. Lockers or a clothes closet may be provided for changing garments of teachers, substitute teachers, visiting
supervisors and visitors. A small kitchenette or kitchen alcove may be desirable.

D. Custodial Facilities

1. General

a. Modern school plants must be adequately serviced and maintained if they are to render the services for which they were intended. Specific facilities are needed by the custodian and his assistants to efficiently operate the heating plant and other mechanical systems, clean the building, do minor repair jobs, supervise building care, receive and store supplies, and maintain the school grounds.

2. Facilities Needed. Workshop, supply room, janitor's service closets and supply space, outdoor tool storage, meter and switchboard room.

3. Locations and arrangement of Specific Areas

a. Workshop. This unit may be adjacent to the furnace room but not a part of it. If separated from the furnace room by a glass partition it becomes available for repair activities during off-service periods. The size will vary with the extent and methods of local repair and maintenance service. Ample space may be provided for a work bench, woodworking bench, racks for metal, pipe and lumber tool cabinets and bins, vise bench, electrically operated mechanical, and glass cutting board. If office space is not provided, desk and filing space may be located in this room.

b. Supply Room. Should be adjacent to the work shop;
of fire resistive construction; equipped with suitable shelves and bins for storage of paints, cleaning compounds, oil, grease, cartons of paper toweling, toilet paper, replacement light bulbs, mops, brushes brooms, vacuum cleaning apparatus, step ladders, etc. It should be sufficiently large to contain one-half to one year's supply of the most needed materials.

c. Janitors' Service Closet and Supply Space. A conveniently located janitors' service closet, including a sink, should be provided on each floor; one janitors' closet for about each 7,500 to 10,000 square feet of floor area. It should be of sufficient size and equipped to accommodate, in addition to the service sink, mops, brushes, brooms, vacuum cleaners, step ladder, detergents, and polishers. A ventilated supply space located as a part of the janitors' closet or convenient to the main toilet should be provided, equipped with adjustable shelves for storing and distributing paper towels, toilet tissues, light bulbs, soap and other detergents.

d. Outdoor Tool Storage. Ample and convenient storage space, directly accessible to the exterior, should be provided for tools and equipment needed for the care of lawns, shrubs, trees, drives, walks, and for snow removal. Special provision should be made for storage of yard hoses, lawn mowers, snow removal equipment and ladders. Large schools may need several such storage spaces. Storage space should be of sufficient depth and width and be provided with double doors, shelving, and hook strips or racks for hanging tools.
e. Meter and Switchboard Room. In a small school the electrical meters and the distribution panel may be located in one space. This space or room should be located convenient to the furnace room and custodian's workroom where it can be readily reached in case of fire or other emergency. It should be completely enclosed and under the lock and key control of the custodian.

f. Toilet and Dressing Rooms. Minimum facilities should include a locker for each employee and one water closet and lavatory for each ten employees. Such facilities should be separate from toilet facilities provided pupils. The number and size of rooms will depend on the size of the school and whether men and women are employed.

4. Equipment. About twelve square feet of tackboard 36 to 42 inches high should be provided in the furnace room and the custodian's workshop.
The Boston School Committee is planning to build a twelve classroom school for the West End. In addition to the twelve classrooms the school will include a kindergarten, sewing room, manual training room, multipurpose room, administrative unit and custodial spaces. This school is to accommodate approximately 445 pupils.

This program is based on conventional methods of teaching and cannot be adapted to a nongraded system with team teaching. The following space allocations are a condensation of the preceding section, The Elements of the Elementary School. They were derived to serve the same number of pupils but, as indicated previously, the program was altered to accommodate this new method of teaching.

<table>
<thead>
<tr>
<th>Space Allocation</th>
<th>Square Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kindergarten class teaching unit</td>
<td>2,000 sq ft</td>
</tr>
<tr>
<td>Elementary class teaching units</td>
<td>14,000 sq ft</td>
</tr>
<tr>
<td>4 at 3,500 sq ft</td>
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</tr>
<tr>
<td>Multipurpose unit</td>
<td>3,600 sq ft</td>
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<tr>
<td>Including physical education storage</td>
<td></td>
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<tr>
<td>of 200 sq ft and assembly storage of</td>
<td></td>
</tr>
<tr>
<td>200 sq ft</td>
<td></td>
</tr>
<tr>
<td>Administrative unit</td>
<td></td>
</tr>
<tr>
<td>General office</td>
<td>200 sq ft</td>
</tr>
<tr>
<td>Public space</td>
<td>100 sq ft</td>
</tr>
<tr>
<td>Principal's office</td>
<td>150 sq ft</td>
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<tr>
<td>Assistant principal's office</td>
<td>100 sq ft</td>
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<tr>
<td>Health service unit</td>
<td></td>
</tr>
<tr>
<td>Waiting room</td>
<td>80 sq ft</td>
</tr>
<tr>
<td>Examining room</td>
<td>200 sq ft</td>
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<tr>
<td>Teachers lounges</td>
<td></td>
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<td></td>
<td>200 sq ft</td>
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<tr>
<td>Custodial unit</td>
<td></td>
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<tr>
<td>Includes work shop of 200 sq ft</td>
<td></td>
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<tr>
<td>supply room of 100 sq ft</td>
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</tbody>
</table>

Figure XXXI is a suggested Space Relation Diagram from Space for Teaching by William W. Caudill. 135
FIGURE XXXI  NUMBERS REPRESENT AREA PER PUPIL

SPACE RELATION DIAGRAM

from Space for Teaching by William W. Caudill, p. 59
SOLUTION TO THE PROBLEM

It was established earlier that the major intention of this thesis was to explore the elementary school in a highly urban setting. Children in the city have educational needs somewhat different from those in rural or even suburban areas. Children in or near the country learn a great deal about nature from observation of the things around them. Even those in suburban areas are exposed to some animals and a certain amount of gardening. Also children who live in detached houses, whether rural or urban often receive a good manual training from watching their father working around the house and repairing household items. The child who lives in an urban apartment building has little opportunity for this kind of education, which is a by-product of an environment quite different from his. The urban school must supplement this deficiency in environmental learning. Raising and caring for plants and small animals and other nature studies are an important part of the urban school curriculum. Outdoor teaching space is thus a particularly valuable teaching aid in city schools.

In examining the possible methods of teaching in such a school the author became aware of a new approach to teaching that was particularly adaptable to an urban school. This was the previously discussed nongraded system with team teaching. As an approach to teaching it seemed more capable of serving the diverse needs of pupils in the city than conventional approaches. It offered great curriculum flexibility and encouraged collaboration on the part of teachers and pupils alike. This approach to teaching was incorporated into
the program and became an important factor in all design considerations. The solution to the problem then had to be an architectural interpretation of this new approach to teaching.

When the site for this thesis was selected as the West End it was immediately recognized that there would be a difficult scale problem in relating the generally small building components of the school to the large 16 and 22 story apartment buildings. The urban schools of fifty years ago, which were generally one large several story building, would relate much better with respect to scale than the contemporary "finger" or "cluster" plans. The West End redevelopment was conceived as a unified neighborhood. Although the architecture is not thought to be of the highest quality, there is a continuity which runs through the entire scheme. In designing the elementary school some recognition of this larger context is essential. The designer felt compelled to attempt to find a satisfactory relationship between the large apartment buildings and the school.

Here then are the three major design criteria which guided the development of the scheme.

1. In addition to the regular elementary school elements, facilities must be provided to supplement the environmental deficiencies of apartment living.

2. The final product should be an architectural interpretation of a nongraded system of elementary education with teaching by teams.

3. The school must relate to the overall design of the West End redevelopment.
With this in mind a final scheme was arrived at— a scheme quite different from the conventional elementary school. Some designers theorize that in designing a school one should start on the inside and work out. This approach was used in developing the school for the West End. First the problem of designing a teaching unit to accommodate the nongraded, team teaching system was solved. The "class teaching unit" (old classroom) is a 60 foot by 60 foot space designed to readily adjust to daily teaching requirements. Basically there is a large space for general and large group activities and several small spaces for specific areas of study. The class teaching unit has a core which contains an office for the team of teachers, toilets for boys and girls, and a room for general bulk storage.

Ideally these units would be on a single level with related outdoor areas. The limited site of the West End did not permit such an extravagant approach. With this small two and a half acre site it seemed necessary to go to more than one story in the deployment of these class teaching units. The final scheme stacks the units into two-story elements with related outdoor teaching areas only a few feet up from the low unit and down from the high unit. The multi-purpose space is half way between the floor levels of the upper and lower units. This system minimized the undesirable aspects of a two-story approach.

How to relate these class teaching units to each other and to the other elements of the school was a difficult problem. The most obvious method, and the one first attempted, was to use a system
of enclosed corridors. In addition to connecting the elements of the building, the corridors defined the outdoor teaching spaces. This system had two chief disadvantages. In the first place, the scale problem discussed above was not solved; secondly, outdoor teaching spaces in the New England area are useable only a very small part of the nine-month school year. The final solution encloses a "village" arrangement of the elementary school elements in a large translucent weather envelope. The envelope keeps out inclement weather and enables year around use of "outdoor" teaching spaces related to the class teaching units. Small animals can be kept in cages in these areas. Wheat and corn can be grown in small quantities, as well as a number of other plants. These enclosed outdoor teaching spaces will be a valuable aid in the study of certain basic sciences. In this system, the elements of the school become merely acoustic and visual enclosures which may be constructed of inexpensive non-weather-resistant materials. The elements under the envelope are arranged to form a central quadrangular space which becomes the multipurpose area. There is a hierarchy of spaces starting with the enclosed spaces of the school elements, i.e., class teaching units, administrative, etc. The second level of space is the outdoor teaching areas directly related to the school elements. These are followed by the larger multipurpose space. The major space is the aggregate of the smaller spaces which is the whole volume enclosed by the weather envelope.

The scale problem is somewhat alleviated by the employment of this large enclosing structure. The step down in scale from the large apartment buildings to the school is not as great as with
earlier proposals. The envelope becomes a scale transitional element. That is, it enables a scale which is commensurate with children to be maintained inside the envelope while the envelope itself is of sufficient size to relate to the large apartment buildings.

Certainly a system such as this creates some new problems while solving others. It is felt, however, that the major problems which are solved by the employment of such a system far outweigh the problems which are created. Here then is a school dedicated to a progressive method of teaching. It enables flexible teaching techniques to be employed in its large class teaching units and affords year-around outdoor teaching space that is free of inclement weather. The village plan of the school elements creates a fresh and inviting environment that simulates the physical organization of the world the pupil is preparing to enter.
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AN URBAN ELEMENTARY SCHOOL FOR BOSTON

PAUL CHARLES BAILLY GRADUATE CLASS 1959
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

WEST END REDEVELOPMENT PROPOSAL

SITE PLAN