SCHOOL SITE SIZE STANDARDS

THESIS FOR THE DEGREE OF M.U.P.

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ABSTRACT

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by Lloyd Jerry Knox

School site size selection is important because the proper site size allows a more efficient distribution of land usage and makes the school itself more usable. But, in the past site sizes have been based upon rules-of-thumb which often proved too inflexible for modern educational concepts. By examining the existing standards in the light of actual site size selection practices, coupled with an examination of key educational concepts and policies, a new site selection guideline was formulated. The proposed guideline has the dual advantages of being flexible and explicit about why a specific sized site is needed. Use and refinement of the guideline should result in a more efficient allocation of the community's land resource base.

SCHOOL SITE SIZE STANDARDS

By

Lloyd Jerry Knox

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CHAPTER ONE

SCHOOL SITE SIZE STANDARDS

INTRODUCTION

There are several reasons to examine existing standards of any nature. Standards may be examined to determine what the practices are so they can be utilized. Standards may be studied to determine the methodology used to establish them so that a similar approach may be used to establish other standards. Finally, standards may be examined to determine and test the rationale behind them. Although this study embodies elements of all three reasons, the primary emphasis is on the rationale, in the hope that a critical examination of the reasons (or lack thereof) for the standard would enable a better standard to be drafted.

The urban planner, as a generalist, would not normally be interested in school site size standards, since this is a rather specific study area. However, such an examination may be justified on at least three grounds. The occupation of educational facilities planner or school planner is a new and growing one, due in large part to an increased awareness of the need for careful school planning. It is quite logical to expect that many urban planners, because of their broad background, will enter this field. Secondly, the entire field of education is now in a state of flux. New philosophies

and concepts are being formulated and tried. Many of these philosophies and concepts challenge the traditional approach to education and the traditional educational site requirements. The planner must take a second look at existing standards. Thirdly, there are important relationships between school policies and the overall comprehensive planning process.

One of the urban planner's fundamental aims is to make the land use pattern of the community as efficient as possible. Proper use of the community's land resource base requires the proper allocation of land to the various uses. An important aspect of an efficient land use pattern relates to the reservation of land for future school sites. If too much land is so reserved, an uneconomic use of land results. If not enough land is reserved, the school site will not adequately serve its intended purpose, and pressures for more space will result. Once the school and its surrounding area are developed, land costs soar and school site expansion becomes quite costly. The total community has a large stake in proper school site size selection as well as school site location.

Certain rules-of-thumb have been derived over the years to aid in the determination of the site size and location of educational facilities. These empirically-derived standards have been widely endorsed by educators and planners alike. However, recent years have seen such

a variety of approaches to education that these standards have often proved too inflexible for practical application.

In spite of this apparent lack of flexibility, the standards are still widely quoted and included in many references for educational facilities planning and urban planning, as Chapter Two will illustrate. Even though the standards are out-moded in many ways, they are still officially adopted for use in many communities. Why?

The answer is simple. The standards are useful and fulfill a basic need. This is true even though the standards may not be entirely satisfactory. Mr. John H. Herrick of Cincinnati offers two reasons for the use of standards for school site selection:

"Most of the advantages of the use of definite standards could be secured without formal adoption of criteria by the board of education. Such adoption, however, seems to have two strong points to recommend it."

"In the first place, the superintendent is in a better position to discharge his responsibilities in making site recommendations when such an official guide is available. He knows the standards to which he must work, and he has a pattern for guiding board discussion of his site recommendations. The chances of having his recommendations upset by last minute proposals at board meetings are reduced. When such proposals are made, his recommendation that time be given for checking against the criteria is likely to be accepted."

"A second advantage of formal adoption of site criteria by the board of education is that the hands of the staff and the board are strengthened in disposing of proposals of little merit. The enthusiastic advocate of an unsatisfactory site is by no means a rare individual when public funds are to be spent, and the added support of officially adopted standards is often most useful in bringing to a close what seems to be interminable debate

concerning the merits of his proposals."[1]

Assuming that the standards utilized are reasonable and adequate, the reasons for adopting standards, as put forth by Herrick, are valid. However, the need for flexibility in the standards is stated by the American Association of School Administrators:

"The actual size, shape, and dimensions of a site cannot be determined by generalizations and fixed formulas. Any discussion of such site characteristics as size and shape will be unrealistic unless the site is directly related to the requirements of the specific services that are to be provided there. If a fixed formula for site size and shape is followed, limitations are placed on the program. To establish the land needs of program and services without a prior comprehensive study of those needs for a specific neighborhood, community, or region is to chance being wrong in two ways. First, the full potential of community service for that site may be badly underestimated. Second, a fixed acreage formula may assign entirely too much or too little land for the needs of a specific area."[2]

Thus, we have the twin horns of the dilemna. The standards are useful to the school administrator as both a measuring stick and an instrument to promote the objective selection of sites. However, inflexibility tends to negate the usefulness of the standards. The resolution of this problem will be attempted in the latter phases of this study.

Several decades ago planning for educational facilities was relatively uncomplicated. The typical school

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[1]Lawrence B. Perkins and Walter D. Cocking, SCHOOLS; (New York, 1957), p. 35.

[2]American Association of School Administrators, PLANNING AMERICA'S SCHOOL BUILDINGS, (Washington, D. C. 1960), p. 141.

building was a two-story box with a basement. Classrooms usually were 24 feet by 32 feet by 12 feet to accommodate the normal five rows of desks (fastened to the floor) and the aisle space. The entire school building and especially the classrooms within it were based upon the educational philosophy of the times, as the following quotation aptly states:

> "The premised function of a school was to teach reading, writing, and arithmetic, and no monkey business. The integration of learning with life was better accomplished by the necessary home chores than by artificially "made" work projects. Therefore, formal individual work enjoyed not only the highest priority in the design of a classroom, it was the only awarded priority. A classroom was a place where pupils could sit in ordered regularity to absorb prescribed subject matter at an administratively predetermined rate. The youngster sat quietly at his desk until called upon. Then he rose politely to his feet and skillfully and respectfully gave back his lessons. He was and did what he was supposed to be and do. The teacher's unquestioned authority and the relative simplicity of the curriculum left no place for discussion and planning. Here was the job to be done in Latin or Math or Geography, so "no talking, now!" Hence, no group work. Hence, no space for it."[3]

But the current concept of the school's role is much broader than that of just formal education. New concepts in teaching have been introduced. These concepts apply not only to what is taught, but how it is taught. Along with the recognition that new courses, such as economics and languages in grade school, and new programs, such as hot lunches, must be provided to meet the needs of a changing society has come the recognition that the school

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[3]Perkins and Cocking, op. cit., p. 71

building and site must also be re-evaluated to reflect thought about space, light and air. Quite often what was deemed adequate even 20 years ago falls woefully short of today's needs.

A number of school policy decisions directly affect the site requirements. For example, the busing of children frees the site from many locational limitations and requires loading and/or parking space for the bus. Likewise, the use of the school site by the community-at-large puts a different burden upon the site than the traditional concept of using the school property only for activities directly related to the school program. These points are obvious, yet the typical school site size and locational standards ignore the implications of the changes in basic school policies. The typical standard for elementary school sites (grades kindergarten through six) calls for a site size equal to ten acres plus one acre for each 100 pupils enrolled, located within one-half mile of all the students.[4] Depending upon the specific circumstances, this may be entirely too large or too small.

Realistic standards for school site planning must be flexible enough to reflect the individual school's policies. Without this flexibility, any standards advanced for use will be inadequate. The development of standards capable

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[4]National Council on Schoolhouse Construction, NSCS GUIDE FOR PLANNING SCHOOL PLANTS, (East Lansing, Michigan, 1964), pp. 27-28.

of adjustment to specific policies will be the subject of this study.

Proposed Study

Subsequent chapters of this study will examine existing practices, examine the effect of the school system's policies on site requirements and develop flexible guidelines capable of translating the policies into site requirements. The study will be limited to kindergarten through grade 12, so that junior college and college standards will not be discussed.

Existing standards according to educational facilities planning literature, urban planning literature, and city master plans will be examined. To the extent possible, the standards dealing with site sizes will be classified according to the formula used. For example, several sources specify a flat acreage requirement for an elementary school, another size for a junior high school site, and another size for senior high school sites, while some authorities recommend tying the site size to the ultimate enrollment. The research performed will enable the basic methods utilized to be determined.

Once the standards recommended by the various authorities have been ascertained, actual practices as evidenced by site sizes utilized in the State of Michigan will be examined. The Michigan Department of Education has site information for all schools built within the State in recent years. These data will be used to compare the

actual practices with the recommended standards to determine the degree to which the suggested standards affect actual practice.

A separate chapter will be devoted to listing the educational policies and concepts which affect the school site, plus a brief analysis or description of the nature of the effect. This will include, but will not be limited to, busing, combination school-park sites, use of the school facilities by the community-at-large, adult education programs, the educational park concept, athletic programs, outdoor resource use, and so on.

Once all these basic studies have been accomplished, a guideline capable of translating the various educational policies and concepts into site requirements will be devised. This instrument would, by forcing the user (the school administrator) to state explicitly the policies and concepts under which the school system operates, enable the administrator to determine, in a fairly objective and precise manner, the actual size of the school site required.

Because of the basic differences between school planning in the center city and the suburbs, this study will limit itself to suburban standards. As a point of fact most existing standards were designed, implicitly if not explicitly, for suburban schools. Due to the extreme number of variables to be considered in central city school planning, it is quite often necessary to treat each

individual school as a unique project. This, of course, makes the use of generalized standards very difficult.

CHAPTER TWO

SCHOOL SITE SELECTION STANDARDS

A search of the literature in the fields of educational facility planning and urban planning was undertaken to ascertain the amount of help available to the school administrator and others interested in school site areas and location standards. The survey results are summarized in Tables 1 and 4.

Although this study is intended to examine school site size standards, not locational standards, information on locational standards is included as a convenience to the reader. The two areas are closely tied to one another, and it was felt that some utility would be derived from reproducing both sets of standards in one source.

Table 1 summarizes the minimum school site standards advanced by the various sources. The sources have been divided into three broad classes, according to origin; school planning literature, urban planning literature, and master plan reports.

As an examination of the table reveals, several basic approaches to minimum site standards are utilized. Each of these basic approaches will be discussed below.

In several instances a flat acreage requirement is stated for the type (grade level) of school under consideration; elementary (K--5 or K--6), junior high (6--8, 7--8, 7--9), and senior high (9--12 or 10--12). This approach

TABLE 1

RECOMMENDED MINIMUM ACREAGE STANDARDS FOR SCHOOL SITES

Reference Source	Bibliography Entry	Elementary School		Junior High		Senior High	
		Minimum Site Size (acres)	Additional Acres/100 Pupils	Minimum Site Size (acres)	Additional Acres/100 Pupils	Minimum Site Size (Acres)	Additional Acres/100 Pupils
A. School Literature							
Caudill	3	5	1	10	1	10	1
Connecticut Dep't. of Educ.	48	5	1	10	1	10	1
Detroit Bd. of Educ. Minimum	49	3	-	10	-	15	-
Preferred		5.5	-	20	-	30	-
Engelhardt, Engelhardt, Leggett	5	10	-	30	-	40	-
Kansas Dep't. of Publ. Instruction	48	5	1	20	1	30	1
Leu	6	5	1	20	1	30	1
Mich. Dep't. of Publ. Instruction	33	10	-	25	-	45	-
National Council on Schoolhouse Const.	8	10	1	20	1	30	1

TABLE 1 (Continued)

RECOMMENDED MINIMUM ACREAGE STANDARDS FOR SCHOOL SITES

Reference Source	Bibliography Entry	Elementary School		Junior High		Senior High	
		Minimum Site Size (acres)	Additional Acres/100 Pupils	Minimum Site Size (acres)	Additional Acres/100 Pupils	Minimum Site Size (Acres)	Additional Acres/100 Pupils
A. School Literature (cont.)							
N. J. Dep't. of Educ.	48	5	1	20	1	20	1
Perkins & Cocking							
Urban	10	80 pupils/acre		75 pupils/acre		50 pupils/acre	
Suburban		50 pupils/acre		40 pupils/acre		30 pupils/acre	
Sumption and Landes							
Minimum	11	5	1	10	1	20	1
Preferred		6	1.33	12	2	25	2
Union School District Jackson, Mich.	15	10	1	20	1	30	1
B. Planning Literature							
American Public Health Assoc.							
Park-playground	2	4.45--8.2	-	None given		None given	
Chapin	4	5	1	10	1	20	1

TABLE 1 (Continued)

RECOMMENDED MINIMUM ACREAGE STANDARDS FOR SCHOOL SITES

Reference Source	Bibliography Entry	Elementary School		Junior High		Senior High	
		Minimum Site Size (acres)	Additional Acres/100 Pupils	Minimum Site Size (acres)	Additional Acres/100 Pupils	Minimum Site Size (acres)	Additional Acres/100 Pupils
B. Planning Literature (continued)							
International City Manager's Association	7	5	1	20	1	30	1
Miller	48	4	1	8	1	8	1
C. Master Plans--Reports							
Beloit, Wisconsin	20	4 ∕ 1/100 over 200		8 ∕ 1/100 over 700		15 ∕ 1/100 over 1,000	
Chicago, Illinois	17	3.5	1/3 / 100	7	1/2 / 100	7	1/2 / 100
Contra Costa Co., Cal.	48	5	1	15	1	30	1
Detroit City Plan Comm.	35	None given		8.3--10	-	17.1--19.5	-
combined school-park		8.5--12.5	-	50--60	-	60--70	-
East Lansing, Michigan combined school-park	42	8	1	18	1	25	1
East Providence, R. I.	44	5	1	20	1	30	1

TABLE 1 (Continued)

RECOMMENDED MINIMUM ACREAGE STANDARDS FOR SCHOOL SITES

Reference Source	Bibliography Entry	Elementary School		Junior High		Senior High	
		Minimum Site Size (acres)	Additional Acres/100 Pupils	Minimum Site Size (acres)	Additional Acres/100 Pupils	Minimum Site Size (acres)	Additional Acres/100 Pupils
C. Master Plans--Reports (continued)							
Inter-County Regional (Denver)	52	5	1	15	1	25	1
Maryland-National Capital Comb. School-playground	30	5 acre school + 1--5 acre playground		10 acre school + 5 acre playground		15 acre school + 6--19 acre community rec.Ctr.	
Nashville & Davidson Co., Tenn	40	5	1	15	1	20	1
National Capital P. C.		3--5	-	8	-	12	-
Norwalk, Conn	29	5	1	10	1	10	1
Pasco, Washington	31	5	1	10	1	15	1
Pulaski Co., Arkansas Combined school-park	53	7	1.7	13	1.94	20	2.15
San Diego, Cal.	57	5	1	15	1	30	1
Toledo, Ohio	41	5	1	10	1	20	1
Spokane Co., Wash.	48	10	1	15	1	30	1
Tri-County Regional Mich.	39	5	1	15	1	25	1
Tucson, Arizona	43	10	-	20	-	40	-

is the simplest to apply, yet the least flexible, since no reference to enrollment or program is made. Five of the sources listed on Table 1 utilize this approach.

A second basic approach utilizes a ratio between school site size and ultimate enrollment, with the ratio adjusted according to the grade level of the school. This approach allows more flexibility, but it may prove unsuitable for small enrollments, since some scale economies result from using larger enrollments. Only one of the 34 sources included on Table 1 recommends this method.

A third approach represents a marriage of these first two methods. A minimum site size is stated, and this base figure is enlarged by applying the suggested ratio between enrollment and size. As in the first two instances, this formula is adjusted to reflect the grade level of the school. This approach provides the flexibility of the ratio technique while the provision of a minimum base acreage avoids the problem of low enrollment. This combination method, espoused originally by the National Council on Schoolhouse Construction in 1949,[5] is by far the most widely used and quoted standard. Twenty-five of the 34 sources included on Table 1 use some variation of the Council's basic formula.

The last approach is quite similar to the flat acreage requirement, except that it attempts to explicitly state the needs upon which the site size is based. Since

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[5] National Council on Schoolhouse Construction, op. cit., p. 27.

this is the unique among the approaches cited, a more specific discussion of it will be included. Only three of the references included on Table 1 utilize this approach or a derivative of it.

A report prepared by the Detroit City Plan Commission tries to examine the site space problem from the standpoint of actual needs as shown by a detailed examination. This study is one of the more complete studies examined, and as such it deserves some additional attention here. The more complete coverage here will also serve to provide some background to the suggested standards to be developed in the latter phases of this report.

A table showing the senior high school requirements is reproduced below. Note that recreational space is excluded, since it is assumed to be added as the park portion of a combination school-park facility and, as such, was covered by a separate report which will not be reviewed here.

Senior High School Space Requirements

	Area in Square Feet
Buildings	195,500--230,000
Outdoor Educational Space	59,000---69,000
Nature Study Area	None--part of park-playfield
Physical Education Space	3,200 plus
Driver Training Space	113,600 plus
Staff and Service Parking	10,000---12,000
Visitor Parking	3,000 plus
Community Parking	60,000---75,000
Service and Loading	7,000 plus
Landscape and Setback	293,250--345,000
TOTAL	744,550--850,800
ACREAGE	17.1--19.5

Source: Detroit City Plan Commission, "Public Educational Facilities", mimeographed report, April, 1960, p. 35.

For the most part the table is self explanatory. The building area was derived from a school enrollment of 1,700 to 2,000 pupils at 115 square feet each, a standard rule-of-thumb suggested by several sources. The outdoor educational space was estimated at 30 percent of the building area. This corresponds roughly to the home class area reserved within the building. The physical educational space requirement is based upon two classes of 27-28 utilizing 60 square feet of area per pupil. The study does not clearly identify the basis for the 2.5 acre, or 113,600 square feet drivers training area. The parking areas are based upon an average of 300 square feet per space, a fairly standardized rule-of-thumb.

Perhaps the most definitive attempt to state school site area needs is the 1966 study, "School Site Analysis and Development", prepared by the California State Department of Education.[6] Because of the uniqueness and completeness of this study, and because it will also be drawn upon when the guidelines are formulated as part of this study, this report will be discussed at length here.

Due to the nature of the standards, they could not be included on Table 1.

The guidelines were derived from an analysis of four basic factors:

> outdoor physical education facilities
>
> buildings, walkways, and landscaping
>
> parking and access roads
>
> a percentage factor to facilitate the layout of the site master plan.[7]

The space for outdoor physical education facilities was based upon a program that would conform to the legal requirements of the State of California, which sets minimum physical education program requirements. Studies to determine the actual time spent using the outdoor facilities were translated into actual space requirements.

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[6]California State Department of Education, "School Site Analysis and Development", (Sacramento, California) 1966.

[7]Ibid., p. 9.

The land required for buildings, walkways, and landscaping was based upon two formulae. The building area was based on the following California state-aid area allocations:

> 55 square feet per pupil for kindergarten and grades one through six
>
> 75 square feet per pupil for grades seven and eight
>
> 85 square feet per pupil for grades nine through twelve.

These per pupil averages are substantially lower than both the Detroit standards mentioned previously and the actual Michigan practices which will be discussed subsequently.

A ratio of 2:1 between building grounds and building area was then applied, so that an elementary school would require 165 square feet per pupil in the building site. The building site includes the building and land adjacent to the buildings, such as paved areas, walkways, lawn area, outdoor classrooms, and courtyards. This excludes area for parking, service areas, and outdoor physical education and recreation facilities.[8]

The space for parking and access roads was based upon 15,000 square feet for bus loading areas plus 300 square feet per parking space, including access roads.

Finally, a percentage factor to provide land for site layout was included. The land derived from this ratio is intended to allow the various activity spaces to be fitted

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[8] Ibid., p. 10.

together logically. The actual percentage factor used varied from 10 percent for large schools to 30 percent for small schools.[9]

A portion of one of the tables included in the California study is reproduced as Table 2 to help illustrate more precisely the nature of this method.

Table 3 was prepared to show the results obtained by using the various standards suggested on Table 1. Specifically, ultimate enrollments of 500 students for an elementary school and 1,000 students for both the junior and senior high schools were assumed, and the various standards were applied to produce the recommended site areas.

As the table shows, recommended site areas for the elementary schools vary from a low of 3.0 acres to a high of 15.5 acres. Twenty-four of the sources yielded a minimum site size of 10 acres. This conforms to the standard suggested by the National Council on Schoolhouse Construction from 1949 to 1964, when their basic formula was changed from five acres plus one acre per 100 pupils to ten acres plus one acre per 100 pupils. Only three of the sources included suggest this upgraded standard (including the Council). It would be difficult to overestimate the influence that this standard has had, at least in respect to espoused standards, if not practices.[10]

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[9] Ibid., p. 11.

[10] National Council on Schoolhouse Construction, Op. Cit., p. 27.

TABLE 2

SITE REQUIREMENTS FOR GRADES SEVEN - NINE

Enrollment	301-450	451-600	601-750
Type of Outdoor Facility			
Field area 260' x 260'		1	1
Field area 260' x 460'	1		
Hardcourt area 90' x 100'	3	4	4
Hardcourt area 100' x 120'	2	2	3
Field area 360' x 360'	1	1	1
Field area 300' x 750'		1	1
Apparatus area 1,000 sq. ft.	3	3	3
Percent Factor for Layout	25	20	20
Area Use	**Number of Usable Acres Required**		
Physical Education	8.7	13.4	13.7
Buildings and Grounds	3.0	3.6	4.2
Parking and Roads	.4	.4	.5
Total Acreage	12.1	17.4	18.4

Source: California State Department of Education, "School Site Analysis and Development", (Sacramento, California) 1966, p. 19.

TABLE 3

APPLIED MINIMUM ACREAGE STANDARDS

Reference Source	Bibliography Entry	Elementary (500)	Junior High	Senior High
A. School Literature				
California State Dep't. of Educ.	45	9.9	21.5	29.1
Caudill	3	10	20	20
Connecticut Dep't. of Educ.	48	10	20	20
Detroit Bd. of Education Minimum		3	10	15
Preferred		5.5	20	30
Engelhardt, Engelhardt, & Leggett	5	10	30	40
Kansas Dep't. of Public Instruc.	48	10	30	40
Leu	6	10	30	40
Michigan Dep't. of Public Instruc.	33	10	25	45
Nat. Council on Schoolhouse Const.	8	15	30	40
New Jersey Dep't. of Educ.	48	10	30	30
Perkins & Cocking Urban	10	6.25	13.3	25
Suburban		10	25	33.3
Sumption & Landes Minimum	11	10	20	30
Preferred		12.67	32	45
Union School Dist., Jackson, Mich.	15	15	30	40
B. Planning Literature				
American Public Health Assoc.	2			
park-playground		4.45-8.2		
Chapin	4	10	20	30
Miller	48	9	18	18
International City Manager's Assoc.	7	10	30	40
C. Master Plans--Reports				
Beloit, Wisconsin	20	7	11	15
Chicago, Illinois	17	5.2	12	12
Contra Costa County, Cal.	48	10	25	40
Detroit City Plan Comm.	35	-	8.3-10	17.1-19.5
combined school-park		5.5-10	40-50	45-55
East Lansing, Mich. Comb. school-park	42	13	28	35
East Providence, R. I.	44	10	30	40
Inter-County Regional (Denver)	52	10	25	30
Maryland National Capital	30			
combined school-playground	40	6-10	15	21-34
Nashville & Davidson Co., Tenn.	55	3-5	8	12
National Capital P. C.		10	20	20
Norwalk, Connecticut	29	10	20	20
Pasco, Washington	31	10	20	25

TABLE 3 (continued)

APPLIED MINIMUM ACREAGE STANDARDS

Reference Source	Bibliography Entry	Elementary (500)	Junior High	Senior High
C. Master Plans--Reports				
Pulaski County, Arkansas	53			
combined school-park	57	15.5	32.4	41.5
San Diego, California		10	25	40
Toledo, Ohio	41	10	20	30
Spokane County, Washington	48	15	25	40
Tri-County Regional, Michigan	39	10	25	35
Tucson, Arizona	43	10	20	40

Frequency of Distribution--Elementary

1/4 to 1/2	xxx
1/4 to 3/4	x
1/2	xxxxx
1/2 to 3/4	xxxxxx
3/4	xxxxxx
1	x

The recommended maximum walking distances for junior high school children vary from three-fourths to two miles. The one and one-half, one to one and one-half, and one mile ranges, in order, are the most widely promoted standards.

Frequency of Distribution--Junior High

3/4 to 1	xx
1	xxxx
1 to 1 & 1/4	x
1 to 1 & 1/2	xxxxxx
1 to 2	x
1 & 1/2	xxxxxxx
1 & 1/2 to 2	x

Maximum recommended walking distances for senior high school students vary from one to three miles, as Table 4 shows. The two mile and one and one-half to two mile ranges are easily the most widely recommended.

Frequency of Distribution--Senior High

1	x
1 to 1 & 1/2	x
1 to 2	x
1 to 3	x
1 & 1/2 to 2	xxxxxxx
1 & 1/2 to 3	x
2	xxxxxxxxx
2 to 2 & 1/2	x

TABLE 4

RECOMMENDED MAXIMUM SCHOOL WALKING DISTANCE

Reference Source	Bibliography Entry	Elementary	Junior High	Senior High
A. School Literature				
Connecticut Dep't. of Educ.	48	1/2-3/4	1-1½	1½-2
Engelhardt, Engelhardt, & Leggett	5	1/4-1/2	1-2	1½-2
Kansas Dep't. of Public Instruction	48	3/4	1½	2
Mich. Dep't. of Public Instruction	33	3/4	1½	2
Nat. Council on Schoolhouse Const.	8	3/4	1½	2
Perkins & Cocking	10	1/2-3/4	1-1½	1½-3
Sumption & Landes	11	3/4	1½	2
B. Planning Literature				
American Public Health Assoc.	2	1/2-1/2	-	-
International City Manager's Assoc.	7	1/4-1/2	3/4-1	1-1½
Miller	48	1/2	1	1
C. Master Plans--Reports				
Beloit, Wisconsin	20	1/4-3/4	3/4-1	1-2
Contra Costa Co., Cal.	48	1/4-1/2	1-1½	1½-2
Detroit City Plan Comm.	35	3/4	1½-2	1½-2
East Lansing, Michigan	42	3/4	1½	2
Inter-County Regional (Denver)	52	1/2	1	2
Kingsport, Tennessee	37	1/2-3/4	1-1¼	2-2½
Norwalk, Connecticut	29	1/2-3/4	1-1½	1½-2
Pulaski County, Arkansas	53	1/2-3/4	1-1½	1½-2
San Diego, California	57	1/2	1	1-3
Toledo, Ohio	41	1/2-3/4	1-1½	1½-2
Tri-County Regional, Michigan	39	1/2	1	2
Tucson, Arizona	43	1	1½	2

The ranges derived for the junior high schools varies from eight to 40 acres, while the range for senior high schools is from 12 to 55 acres. There is much less agreement among the authorities for both junior and senior high school standards than for elementary standards. Nine sources suggest a 20 acre site for a junior high school designed to accommodate 1,000 students, while eight suggest 25 acres, and eight more 30 acres. Eleven of the authorities recommend a minimum site area of 40 acres for a senior high school of 1,000 students, and another seven suggest 30 acres as minimum. Again, the various standards at least approximate the 30 acre junior high school site and the 40 acre senior high school site recommended by the National Council on Schoolhouse Construction.

It should be noted that, with few exceptions, these standards assume suburban locations. In recognition of higher land costs coupled with a scarcity of large land parcels in the central cities, several of the authorities, e.g., Perkins and Cocking, Sumption and Landes, suggest different, less stringent, standards for central city locations. This raises an interesting question concerning the concept of <u>minimum</u> standards deemed suitable or adequate for a given school. The standards respond to economic pressures linked with the central city. There are, however, also pressures in the central city for more land in open space use. A child in the central city certainly requires as much room, if not more, for physical activity

as does the child of the more spacious suburbs. This allows focus to be made on two observations. First, as previously stated, economics can be a very prime consideration overriding what would seem to be more basic human needs. Secondly, it raises the question of validity of the standards. How can a minimum standard, if based upon actual needs, vary according to locale? Patently, if economic factors can exert an influence, the minimum standards are not truly minimal but can be further pared down. Or, if they do represent minimum standards, the central city child is being cheated.

Walking Distances

Table 4 summarizes the standards from the various sources as they apply to walking distance from the pupil's home to school. A number of authorities that suggested site area requirements did not include recommendations for maximum walking distances. The references that list a range do so in recognition of density differences (primarily) between central city and suburban areas.

The recommended maximums for elementary school children varies from one-fourth to one mile. As the following frequency of distribution chart illustrates, the three-fourths, one-half to three-fourths, and one-half mile ranges include nearly all of the standards advanced.

For the most part, there is general agreement concerning the maximum walking distances for various age groups. The elementary standards vary the most, which is logical because of the wide variance in physical size and stamina in an age group that includes six to 12 year olds. In fact, there is increasingly more agreement among the authorities as the age group advances, simply because physical variations diminish.

The walking distance standards are based upon three related factors. The most basic of these considerations deals with the distance a certain age group of children could be reasonably expected to walk. This is more of a factor for small children than for older ones, to emphasize the obvious.

Secondly, a closely related factor is the amount of time that a child of a given age group could reasonably be expected to spend in a journey to school. This time usually equals 20 to 30 minutes for an elementary student and 45 minutes to one hour for junior and senior high students, according to the quoted authorities. The close relation between time and distance is obvious. One can be derived from the other with little difficulty. (This is the prime reason that only one of these two measures was included on Table 4, plus the fact that more references included the distance measure than the time measure.)

The third factor upon which maximum walking distances are based is the population density of the area. One

authority, for example, states that an ideal elementary school enrollment would be from 400 to 800 students.[11] The service area (walking distance) is then determined by the population required to provide this number of students. The recommended standards thus become a function of density, decreasing as density increases.

This third technique is the farthest removed from the basic reason for having the standard, the physical capabilities of the child.

The walking distance is also related to the availability of bus service, whether public transit or school operated. Where busing is utilized, the whole home-school relationship changes and the distance to school loses importance. The time required for the journey, however, is still important.

All of the standards that suggest a maximum walking distance include the warning that hazards and natural barriers affect the service area of the school and must be taken into consideration.

Summary

This chapter has summarized the recommended minimum school site areas and maximum walking distances to school, according to a variety of sources in the fields of educational facility planning and urban planning. The following

[11] American Public Health Association, Committee on the Hygiene of Housing, PLANNING THE NEIGHBORHOOD, (Chicago, 1960).

chapter will discuss the actual site size practices as evidenced by available data, including a national survey as well as more recent Michigan data from the State Department of Public Schools.

CHAPTER THREE

SCHOOL SITE SELECTION PRACTICES

The recommended school site selection standards according to a number of authorities have been examined. In general, most of the authorities echo the National Council on Schoolhouse Construction's pre-1964 standard of five acres plus one acre per 100 pupils for elementary schools, while they also tend to endorse the Council's 1953 and 1964 recommendations for junior and senior high schools, namely, 20 acres plus one acre per 100 pupils and 30 acres plus one acre per 100 pupils, respectively.

How closely have the school site selection practices followed the guideline? While exact data is difficult to acquire, and, once acquired, it is difficult to make compatible with the measures suggested by the standards, several sources are available, including 1953 and 1964 publications from the U. S. Department of Health, Education and Welfare,[12] as well as a series of annual (unpublished) statements issued by the Michigan Department of Public Instruction. Both of these sources will be relied upon in this section of the study.

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[12] Collins, George H., National Inventory of School Facilities and Personnel, 1962, U. S. Department of Health, Education and Welfare, Office of Education, (Washington, D. C., 1964) and U. S. Office of Education, School Facilities Survey, U. S. Department of Health, Education and Welfare, (Washington, D. C., 1953).

The data from the Department of Health, Education and Welfare include all existing school sites, whether urban or rural. The Michigan data also includes urban and rural school sites, but it only pertains to complete school buildings built during the years shown. Before examining the data from these two sources, several points concerning their reliability must be made. These general comments apply to the national and especially the Michigan surveys.

1. The ultimate enrollment is an unknown. At least some of the school sites were bought with future expansion in mind.

2. In the case of some of the excessively large sites, they may have been purchased with the idea of selling part of the site at a later date. In some instances land is only available for sale in large parcels.

3. Some of the land on the site may be unusable or may have only marginal value due to topography, high water table, etc.

4. To these observations must be added the general comment that there is not necessarily a direct relationship between site size and utility. A ten acre school site may be entirely adequate for one type of educational program while it may be lacking for another. Size of site is merely a convenient measure, not a perfect one.

National Practices

Table 5 shows the percentage of elementary (K-6 and K-8), secondary (7-12 and 9-12), and combined (K-12 and 1-12) schools within several ranges of site sizes for the nation. Data for 1951 and 1962 are both included, although data on enrollment is unavailable. The 1951 data include all public schools in operation in 1951, while the latter data shows the same information as of 1962. It is

TABLE 5

PERCENTAGE OF SCHOOLS BY THE SITE SIZE

1951

Acres	1-5	6-10	11-24	25 and over
Elementary	89.8	7.1	2.7	.3
Secondary	45.0	23.0	24.0	7.6
Combined	44.4	31.6	20.8	3.2
Total	81.3	11.2	6.4	1.2

(Data from 43 states)

Source: U. S. Office of Education, SCHOOL FACILITIES SURVEY, (Washington, D. C., U. S. Department of Health, Education and Welfare, 1953).

1962

Acres	1-5	6-10	11-30	31 and over
Elementary	67.7	20.2	10.5	.7
Secondary	30.7	16.4	35.6	16.7
Combined	38.9	25.9	29.5	5.1

(No totals given; rows do not equal 100.0% because a slight percentage were recorded as "unreported" on the original table.)

Source: Collins, George J., NATIONAL INVENTORY OF SCHOOL FACILITIES AND PERSONNEL, SPRING, 1962, (Washington, D. C., U. S. Department of Health, Education and Welfare, Office of Education, 1964) p. 49.

impossible to reconcile the two periods exactly, hence the 1951 data uses an 11 to 25 acre range while the 1962 study uses an 11 to 30 acre range. This has only minor effects upon the macro-scale analysis planned, however.

Although all of the tables are largely self-explanatory, several of the statistics contained on Table 5 will be highlighted here since they reveal rather major changes between 1951 and 1962 conditions.

Because the data reported for both periods is inclusive, i.e., includes all existing school plants at the time of the survey, the changes are even more remarkable, since the inertia factor caused by including all existing schools tends to lessen the impact of newer and larger sites.

A full 89.8 percent of the elementary sites in 1951 were under five acres in size, while this proportion had dropped to 67.7 percent by 1962. Although the 1962 figure is still quite large, the progress made in the 11 year period was substantial. A vast number of extremely small elementary school sites were being used in 1951, as the following breakdown shows.

Elementary School Sites, 1951

Size in Acres	0 to .9	1 to 2.9	3 to 4.9
Percent	27.8	52.6	9.5

According to these figures, 80.4 percent of the elementary school sites were under three acres in size, and 27.8 percent were under one acre in size. This is far

below the recommended standards. A comparable breakdown for 1962 is not available, although the situation had undoubtedly improved over the 1951 figures.

The percentage of secondary schools with sites of less than five acres also dropped substantially, from 45.0 percent in 1951 to 30.7 percent in 1962. Most references recommend at least a minimum site of 20 acres, so the 1962 situation in relation to recommended standards is still quite poor, although the progress made is encouraging.

The percentage of large secondary school sites increased during this 11 year period. In 1951, 31.8 percent of the secondary schools had sites in excess of 11 acres, while only 7.6 percent had sites of 25 acres or more. By 1962, 52.3 percent of the secondary schools enjoyed sites of 11 acres or more, while 16.7 percent had sites of 30 acres plus.

Although many school sites still (1962) are substandard in size according to the references consulted in Chapter Two, a definite trend towards larger school sites at both elementary and secondary levels is in evidence. Table 6 shows the general trend in school site size by time period, which permits a closer examination of the trend in site sizes to be made.

The extremely small one acre elementary school sites and three acre secondary school sites of the pre-1920 period matched the somewhat Spartan educational philosophy of the times. The main purpose of the school was to

TABLE 6

MEDIAN SCHOOL SITE SIZES

Time Period	Elementary	Combined	Secondary
Before 1920	1	1	1
1920-1929	3	2	6
1930-1939	3	2	8
1940-1949	4	2	10
1950-1959	8	3	20
1959-1963	9	3	26
Overall Median	3		11
Overall Mean	5	2	18

Source: Collins, George J., NATIONAL INVENTORY OF SCHOOL FACILITIES AND PERSONNEL, SPRING, 1962, (Washington), U. S. Department of Health, Education, and Welfare, Office of Education, 1964, p. 49.

transmit skills in the "3 R's". A spacious site with ample room for outdoor recreation was not seen as particularly advantageous, especially in light of the increased cost involved in the larger site. In addition, this was the era of the one room rural schoolhouse with its small site and matching small enrollment.

For the 1920 and 1930 decades the typical elementary school was built on a three acre site, the approximate equivalent of a city block. The trend towards larger sites which began in the 1920's did not continue during the 1930's, perhaps due in large part to the economic conditions of the times. A modest increase in the median site size of elementary schools was experienced during the 1940 to 1949 decade, due at least in part to the trend in school architecture towards one story school buildings, although WWII undoubtedly put a damper on the increase. The decade of the 1950's brought a substantial increase in site sizes. This trend slowed down considerably during the 1959 to 1962 period, perhaps reflecting the 1959 recession. On the basis of these national data, a clear and fairly consistent trend towards larger elementary school sites can be established.

The growth in secondary school sites has been consistent since 1920, although the decades of the 1930's and 1940's witnessed a decrease in the rate of increase, if not in actual site sizes. Again, the depression followed by WWII are sufficient reasons to explain this slowdown.

Growth from 1950 to 1959 and 1959 to 1962 was especially strong, and the factors causing a slowdown in elementary sites between 1959 and 1962 were evidently not operating on secondary school sites, since they continued to increase in size, from 20 to 26 acres, in this period. Waves of children associated with the WWII baby boom first entered high school in the 1950's. This undoubtedly helped change educational philosophy in favor of larger secondary school sites to handle the increased demands on facilities. Perhaps the era of "Sputnik" and its associated pressures for quality education in our universities and colleges spilled over sufficiently to loosen monies for secondary schools also.

The larger increase in the size of school sites that began in the 1940's and has continued into the present has its basis in several related factors. The great population movement to the suburbs began during this period. The availability of large tracts of land coupled with comparatively lower suburban land values made the acquisition of larger school sites more feasible than it had been previously. The prevailing generally favorable economic conditions also made the expenditures for larger school sites more acceptable. The changing educational philosophy towards a broader role for the school helped promote acceptance and implementation of the school site standards. The effect of this changing educational philosophy can also be seen in the large number of school district reorganiza-

tions directed towards creating school districts with large enough populations and resources to provide a full educational program. The reorganization of school districts resulted in eliminating many small rural one room schoolhouses and replacing them with larger schools on larger sites, thereby serving to boost school site sizes in two ways. In Michigan alone, for example, the number of school districts dropped from 3,491 in 1956, to 977 in 1966, according to the State Department of Public Instruction.

Michigan Practices

Tables 7, 8, and 9 have all been prepared from data compiled by the Michigan Department of Public Instruction. An average (the arithmetic mean) school capacity and school site size have been computed for each school year beginning with 1957-58 (and omitting 1958-59) for all new public elementary, junior high, and senior high schools approved by the State for construction during the years covered on the tables. Additions to existing school plants are not included on the tables. The term "capacity" is used by the Department of Public Instruction and is based upon the following formula:

Elementary	30 pupils per teacher station plus 50 pupils per kindergarten
Junior High	23 pupils per teacher station with 90 percent utilization
Senior High	25 pupils per teacher station with 80 percent utilization

Also shown on the tables is the recommended site size for the "average" school as depicted by each year's data. This recommended site size was derived from the National Council on Schoolhouse Construction's guidelines. It is included as a yardstick against which actual practices in Michigan can be measured.

Table 7 deals with elementary schools. The Michigan average school exceeded the recommendation for seven of the nine years shown. None of the average site sizes is less than ten acres, which reinforces the generally good impression the elementary school site selection practices vis a' vis the national figures makes.

There is some danger inherent in utilizing averages. Extremes are largely ignored. Pertinent to this study is the number of small elementary school sites which fall far short of the recommended standards. The following breakdown shows this information by year.

New Elementary School Sites

Year	1 Acre	2-3 Acres	4-5 Acres	% under 5	Total
1966-67	3	4	3	22.2	45
1965-66	-	4	4	14.3	56
1964-65	1	4	6	26.8	41
1963-64	2	5	4	20.0	55
1962-63	1	10	9	37.0	54
1961-62	-	3	3	13.7	44
1960-61	1	8	4	24.1	54
1959-60	2	4	4	14.9	67
1957-58	1	1	10	19.7	61

As this breakdown shows, from 13.7 percent to 37.0

TABLE 7

AVERAGE SITE SIZE AND CAPACITY OF
NEW ELEMENTARY SCHOOLS IN MICHIGAN
1957-58 through 1966-67

Year	Average Capacity	Average Site (acres)	NCOSC* Site Size (acres)
1966-67	469	16.8	15
1965-66	526	14.7	16
1964-65	448	12.5	15
1963-64	477	11.9	10
1962-63	386	10.2	9
1961-62	462	12.1	10
1960-61	433	11.5	10
1959-60	429	13.1	10
1958-59	Information not available		
1957-58	390	11.4	9

Source: Michigan Department of Public Instruction, Lansing, Michigan

*Based upon 5 acres plus one acre per 100 pupils for 1957-58 through 1963-64, and 10 acres plus thereafter.

percent of the new elementary schools built in recent years have been under five acres in size. There are even a few one acre lots still being utilized for elementary school sites, probably indicating the construction of new schools on existing sites after removal of the old school buildings. This more detailed examination indicates that, in spite of the excellent statewide showing, a significant number of new schools each year are built on extremely small sites. The school systems utilizing one acre sites for new schools tend to be the larger urban centers in the state, such as Detroit, Grand Rapids, and Ann Arbor. These new schools are undoubtedly central city locations on sites already owned by the school district.

Table 8 presents the average enrollment and site sizes for junior high schools in Michigan. The average school site size exceeded the NCOSC recommendations in four of the nine years. However, the difference in the recommended and actual sites was very slight except for 1962-63, when the actual average site was only 17.6 acres, compared to the recommended 30 acre site. Insofar as averages go, Table 8 demonstrates the relatively strong Michigan position in relation to the recommended standards.

Again, to eliminate some of the inherent shortcomings of the average, the following breakdown was prepared to indicate more exactly the number of extremely small junior high school sites.

TABLE 8

AVERAGE SITE SIZE AND CAPACITY OF

NEW JUNIOR HIGH SCHOOLS IN MICHIGAN

1957-58 through 1966-67

Year	Average Capacity	Average Site (acres)	NCOSC* Site Size (acres)
1966-67	1,013	26.0	31
1965-66	872	26.0	29
1964-65	780	26.3	28
1963-64	781	38.9	28
1962-63	935	17.6	30
1961-62	867	31.1	29
1960-61	749	31.9	28
1959-60	917	34.6	30
1958-59		Information not available	
1957-58	829	24.1	29

Source: Michigan Department of Public Instruction, Lansing, Michigan

*Based upon 20 acres plus one acre per 100 pupils.

New Junior High School Sites

Year	10 Acres & under	11-14 Acres	15-19 Acres	% under 20	Total
1966-67	1	-	2	20.0	15
1965-66	1	-	2	23.1	13
1964-65	2	-	1	17.7	17
1963-64	1	1	1	27.3	11
1962-63	4	4	2	59.0	17
1961-62	2	1	2	35.7	14
1960-61	-	-	1	14.3	7
1959-60	-	-	-	-	5
1957-58	-	2	1	33.3	9

The percentage of junior high school sites in Michigan of less than 20 acres varied from zero in 1959-60 to 59.0 percent in 1962-63. With very few exceptions these small sites are located in the Detroit area.

The average site size and capacity for senior high schools in Michigan are shown on Table 9. The state average exceeded the NCOSC recommendation in each of the nine school years shown on the table. In fact, the actual practices as measured by the statewide average exceeded the standards substantially in all save a few years.

The following breakdown shows the number of extremely small senior high school sites in comparison to the standards.

TABLE 9

AVERAGE SITE SIZE AND CAPACITY OF
NEW SENIOR HIGH SCHOOLS IN MICHIGAN
1957-58 through 1966-67

Year	Average Capacity	Average Site (acres)	NCOSC* Site Size (acres)
1966-67	938	43.7	40
1965-66	814	47.6	39
1964-65	637	38.1	37
1963-64	863	44.1	39
1962-63	688	42.0	37
1961-62	696	42.3	37
1960-61	781	41.7	38
1959-60	566	45.5	36
1958-59	Information not available		
1957-58	480	38.3	35

Source: Michigan Department of Public Instruction, Lansing, Michigan

*Based upon 30 acres plus one acre per 100 pupils.

New Senior High School Sites

Year	10 Acres & under	11-19 Acres	20-25 Acres	% under 26	Total
1966-67	-	1	1	15.4	13
1965-66	-	1	-	7.1	14
1964-65	-	1	2	16.7	18
1963-64	2	1	1	23.6	17
1962-63	2	1	5	27.6	29
1961-62	-	3	1	26.7	15
1960-61	1	1	2	19.0	21
1959-60	2	1	4	20.6	34
1957-58	1	3	5	33.3	27

The percentage of senior high school sites under 26 acres in size varied from 7.1 percent in 1965-66 to 33.3 percent in 1957-58. Very few high schools have been built on sites of ten acres or less in Michigan in recent years, and the above figures indicate that the high school site under 20 acres in size is also something of a rarity. Very few high schools were built within the central cities in the period covered. A forty-plus acre site in an urban location would be nearly impossible to acquire from the economic standpoint alone. However, the high school, because of the age of the students, can be quite flexible in its location, so there is rarely a real need to locate in the highly developed core area of the city. Perhaps this helps explain the absence of small high school sites.

School Location Practices

It is difficult to examine school location practices without the benefit of costly and time-consuming surveys

to furnish precise information. However, it is possible to make some general comments and observations about apparent trends.

The educational philosophy towards the school has changed gradually since the 1930's. The concept of the elementary school as the focus of the neighborhood enjoyed nearly universal support during this time. Safety was the primary factor governing the school location. The elementary school standards called for placement of the school on local streets in the center of the neighborhood. This insular position was designed to protect the child from traffic, among other reasons. It was assumed that the child would walk to school. Consequently, the optimum enrollment standards were based upon the number of school age children in the neighborhood. The optimum enrollment during this period usually ranged around 300 to 400 students.

In recent years the concept of the neighborhood school has been abandoned in many areas. Perhaps more than any other factor, the utilization of busing gave a degree of freedom to the location of the school. The school enrollment could be based upon reasons other than safety. Many authorities began to base the optimum enrollments upon factors such as administrative efficiency. Approaches of this type include an enrollment standard based upon the number of teachers that a principal could reasonably

administer.[13] The Michigan Department of Public Instruction's official attitude toward high school enrollment, to use another example, states that an enrollment of 1,000 pupils is required before a full high school program is feasible, from the per capita budget standpoint.[14]

The specific location of the school has also been affected by the practice of busing, since a location on an arterial or major street facilitates bus access to the site, whereas a minor street hinders access.

Currently, there is no clear concensus among school authorities as to the optimum enrollment of the school. The neighborhood school concept, still advocated by many, dictates one set of standards, while other concepts require a different set of standards.

Summary

National and Michigan practices of school site selection, as evidenced by school site sizes, have been examined. Although certain shortcomings in the data were noted, these were unavoidable and do not materially alter the findings. Michigan schools have done quite well in regard to meeting the school site standards. This is true at the elementary, junior high, and senior high school

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[13] American Public Health Association, Committee on the Hygiene of Housing, Planning The Neighborhood, (Chicago, Public Administration Service, 1960) p. 45.

[14] Michigan Department of Public Instruction, "High School Status Report", (Lansing, Michigan, 1967) p. 1.

levels. Schools in Michigan are still being built on very small sites, but they represent a minority of the new schools.

The national picture is not quite as bright as the local situation. As late as 1962 a substantial number of elementary and secondary schools were located on sites of under five acres. However, the overall condition had improved substantially from 1951.

What are the factors behind this increase? It would be impossible to pinpoint the causal factors exactly, but some general observations can be made with at least a degree of accuracy and validity.

There are six basic factors underlying the increased school site sizes of recent (postwar) years:

1. The "baby boom" which began in the early 1940's and continued after the Second World War generated tremendous demands for new school facilities.
2. The exodus to the suburbs took on huge proportions in the postwar years. Less expensive land available in large tracts could be found in suburban locations.
3. The site standards promulgated by the National Council on Schoolhouse Construction and other authorities were undoubtedly utilized as guidelines when construction of new schoolhouses was contemplated. Suburban locations also made the use of these standards much more feasible than

previously. (Perhaps an increased use of the master plan and/or mapped improvements to reserve large school sites should be added as an accompanying factor.)

4. It seems quite likely that a number of extremely small school sites were either abandoned or enlarged to comply with the suggested site standards.

5. The educational philosophy changed substantially resulting in the acceptance of a broader role for the school. In fact, the development of site standards undoubtedly rests upon this change in basic philosophy.

6. For the most part, economic conditions have been quite good since WWII. As a result, more monies were available for school expenditures.

It is suggested that one combination or another of these basic factors working together in varying degrees, depending upon time and locale, are responsible for the increase in the size of school sites in recent years. A more precise and exacting statement of the forces behind the increase would be beyond the scope of this report. These six observations do provide a glimpse, however brief, into the causal factors related to increase school site sizes.

CHAPTER FOUR

EDUCATIONAL CONCEPTS AND THE SCHOOL SITE

This will not be an exhaustive study of current educational practices. It will provide an overview at a relatively general level, and, as such, it will provide an insight into the more specific site needs to be covered in the next chapter.

Each policy or concept that might affect school site requirements will be discussed separately. Where necessary, a brief definition and/or description of the concept or policy will be given, followed by a discussion concerning the nature of the effect upon the site.

One point which should be stressed here is the need for an explicit statement of each school system's position in relation to each of these concepts and policies. A proper description of the site needed to help effectuate a school's educational program relies upon a thorough discussion of the program's goals and objectives. Programs not contemplated and issues not faced in the planning stages of schoolhouse and school site design are difficult, if not possible, to implement or deal with after site acquisition and development. A conscious attempt to examine each issue thoroughly is necessary. This chapter and the following one are aimed at helping the school administrator perform such an examination.

Enrollment

One of the most obvious elements of the site size is the enrollment. Unfortunately, the optimum enrollment is often not a stated school system policy, as the great number of schoolhouse additions aptly testify.

It is not the purpose here to examine what the "ideal" or optimum enrollment for a given school should be, however interesting and intriguing this question may be. Suffice it to say that this is a question of concern to educators and no real concensus exists, as the discussion in the previous chapter pointed out.

It is the intent to emphasize the obvious: enrollment has a great impact upon site size. Chapter Two contains a great number of site size standards, all of which rely upon enrollment as the chief determinant of space needs. If the school site size is to be responsive to the educational program, the optimum and ultimate enrollment must be explicitly included in the planning stages of the school program. (The availability of busing allows some freedom in the selection of optimal enrollment, since geographical restraints based upon pupil population can be overcome.) A site designed to accommodate an educational program at one scale cannot reasonably be expected to perform satisfactorily at a much larger scale. If the site is not increased in size while enrollment grows, the only ways to accommodate the increased student population are to expand the building into the portion of

the site devoted to playground or to build up into the air space. Both would result in reducing the effectiveness of the site.

Class Size

The question of optimum class size is also related closely to the question of optimum enrollment. Again, no discussion of the actual class size deemed optimal will be included.

The class size does not have as pronounced an effect upon site requirements as does the total school enrollment. It directly affects the building size and thus indirectly the site size. The number of classrooms needed is determined by total enrollment and class size. An elementary school designed for 300 pupils would need ten classrooms for a 30 pupil class size, but two more classrooms would be required if 25 were utilized as the desirable class size. The effects of the class size in relation to the total school system are especially far-reaching. The question of total classroom needs for a school system of 35,000 students is profoundly influenced by the size of the class. The number of classrooms in a particular school also influences site size if the standards for outdoor activities are kept constant. Twelve classes require more outdoor space than ten, even though the enrollment is the same. This difference disappears when some unit other than the individual classroom is used as a basis for a physical education program.

Organizational Format

Organizational format used here refers to the division of the grades into various groups by level. For example, the elementary grades might include kindergarten through grade six, junior high might include grades seven through nine, and senior high grades ten through twelve. The actual format selected influences the site.

The more divergent the age groups included in a single school, the greater the need for a larger site. This is especially true of the elementary grades. Kindergarten classes usually have a separate play area, for example, because the normal activities of this age group, as well as their physical size, require that they be sheltered from the older, more boisterious, children. Similarly, a school housing kindergarten through grade six requires a larger site than a school of the same enrollment housing grades four through six. Physical separation of play areas is more important at lower age groups, due to the fact that physical differences are more pronounced. A 9-12 high school and a 10-12 high school of the same enrollment could be accommodated on identically-sized sites, since differences in physical size as well as educational programs would differ very little between the two.

Community Use of Building and Grounds

The use of the school building and grounds by the community-at-large includes, at least potentially, a wide array of uses: use of the building for meetings, use of

the library, use of the site for recreational purposes (including adult, pre-school, and school age groups at various time periods), use of the swimming pool by all age groups at all seasons, use of the shop facilities for hobbies and crafts, adult education programs, and so on.

Many of these uses require special facilities to help provide for community-wide use. For example, a separate entrance to the school library, plus a ground floor location, would facilitate its use by non-school persons during school hours by minimizing the impact of the extra traffic to and from the library. A larger library facility may also be required. Nearly all of these "extra" uses of the school building and grounds would require additional automobile parking space, although after-school and off-season uses could utilize teacher and staff parking.

For the sake of convenience and simplicity, the space needs associated with the various recreational activities will not be discussed here. These space needs have been adequately documented in a number of sources which are readily available, including several already referred to in this study.[15]

It is important to note that these uses must be anticipated before plans for the school and site are finalized.

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[15] The Michigan Department of Public Instruction Study, The California State Department of Education Publication, The Detroit City Plan Commission Report, Op. Cit.

Whether or not community-at-large use of the school and site should be permitted should be a decision made early in the planning stages for the new school. If the entire community is to be allowed use of the school property, the uses permitted plus an estimate of the amount or volume of use should be included so that space needs as well as special facility needs can be spelled out. A library facility on the second floor of a high school would not easily lend itself to adult use, especially during school hours.

Combination School-Park Sites

Combination school-park sites have been utilized by school and park authorities in a number of areas. Properly used, the combination facility presents economies to both school and park authorities while at the same time providing a larger open space for both school and community recreational use. The school would still provide paved play areas and play apparatus but the field areas would be provided by the park. (The practice of separating combined school-park facilities by a woven wire fence, an all-too-common sight, is so patently absurd and deplorable that no further mention of it need be made.)

The additional land not otherwise available to the school can be used for recreational space. In addition to school recreational needs, provision of tot-lot facilities as well as adult recreational facilities would commonly be made. Additional parking facilities, depending upon anticipated user volumes, may also be desirable.

Educational Park

The educational park has also been referred to as the school village plan, campus plan, and the school within a school. Although it is still a relatively untried idea, many school systems are beginning to use it. One definition of the educational park that seems to fit most of the current efforts fairly well is:

> "...the clustering on one site of large groups of students with wide age differences and varying socio-economic, ethnic and religious backgrounds. Student groups are decentralized within the total site which shares use of specialized staffs, programs, support services and facilities. The cultural educational park provides educational, cultural, recreational and social services to public, private, and parochial students and coordinates these programs with other public service institutions: city planning, public housing, transit systems, parks, libraries, museums, higher education, health, highways, and so forth."[16]

Although scale economies in the use of site, facilities, and personnel are normally associated with the educational park, they do not represent the sole rationale for the concept. It would also bring together students from a wide array of socio-economic backgrounds, help to reduce inequalities inherent in "neighborhood" schools, and provide more program flexibility, among other reasons.

Crucial to this study are two elements that are inherent in the educational park concept. The first of these is the large site requirement. A total enrollment

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[16]Leu, Donald J., "Educational Parks--The National Scene", undated mimeographed monograph, Michigan State University School of Education, East Lansing, Michigan, pp. 2-3.

in one educational park of 5,000 to 10,000 students would not be unusual. Obviously, an extremely large tract of land would be required, effectively ruling out central city locations. This leads directly to the second point. Busing, or some other form of mass transportation, would be required by the necessarily suburban location and the fact that the large enrollment must be based upon a large geographical area except in very densely-populated urban areas. Walking to the neighborhood school would be eliminated.

Outdoor Resource Service

Outdoor resource service refers to the use of the entire school site as a place for learning, or an outdoor classroom. Although the number of educational uses that can be made of a properly developed site is virtually endless, some of the commonly provided facilities include a nature trail, wildlife habitat settings (a brushpile for small animals, a pond, and a marsh), a glass-walled nature interpretation center where students can watch wildlife while unobserved, tree specimens, and an outdoor classroom for more formal instruction. This list could easily be expanded.[17]

Although the size of an outdoor resource service center could be quite variable, a minimum of about 40 acres seems appropriate. For comparison purposes, the

[17] Miller, James A., and Jerry Fair, "Exploring Nature's Classroom", undated mimeographed report available from Fair Associates, Coldwater, Michigan.

Coldwater site comprises 110 acres in addition to the elementary school site, although a city park and the county fairgrounds are also included.[18] An 80 acre tract adjacent to the school site in Gwinn, Michigan, was utilized.[19]

Athletic Programs

Perhaps the biggest space users of the modern school are the various facilities for interschool athletic programs. Although most school systems provide for football, basketball, baseball, and track, some of the larger systems also include swimming, tennis, golf, and so on. Although many of these facilities would be required in conjunction with the required (in Michigan) physical educational programs, some are not. A stadium for football is perhaps the most obvious extra. The provision of adequate parking facilities must also be considered in conjunction with the athletic program.

Since the cost of both the additional land and the facility can be great, some consideration to the desirability and advisability of a varsity sports program should be given in the planning stages of a new high school. (The current trend in education is to play down the junior high school in favor of the middle school. Sports programs, junior proms, and other typical high school events

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[18] Ibid., p. 11.

[19] University of Michigan, "School Site Planning project Seeks Full Use of Educational Resources", in LETTER TO SCHOOLS, Volume XV, No. 2, November, 1962, (Ann Arbor, Michigan) p. 3.

are discouraged at the middle school level. Accordingly, the athletic programs will be discussed only at the senior high school level.) Given current attitudes and values now prevalent, it is assumed that such a consideration would produce a position in favor of an athletic program.

Especially in the case of larger school districts which have more than one high school, the sharing of certain facilities may be possible, so that costly duplication of facilities may be avoided. Sharing of systems is also an avenue worth exploring. The extent of involvement in the high school athletic program is something that should be subject to a policy decision when a new school is being contemplated.

Again, for the sake of convenience and simplicity, the specific space needs of these programs, all of which are available elsewhere, will not be discussed here.

Curricula

The type of curriculum emphasized by the high school and, to a more limited degree, the middle school, affects the site requirements of the school indirectly. A technical or vocational preparation program would require different facilities than the typical college preparatory curriculum. Most of these differences would be in the provision of additional space in the form of shops and buildings housing other special equipment or facilities. This type of consideration is of more concern to the architect who would be required to translate the curricula

requirements into buildings. Although the curriculum would affect site size requirements, the degree or extent of the effect would best be determined by the school architect. Since schoolhouse design is a field separate from, but related to, site planning, no attempt will be made to ascertain the site effects. The assumption that the architect will act upon the educational specifications presented to him will be made instead.

The main exceptions to the statement that the curriculum affects the schoolhouse directly but the site only indirectly concerns two special programs. Vocational agricultural courses require, quite obviously, agricultural land. The land need not be owned by the school but could be rented, nor does the land need to be adjacent to the school. Consequently, this will not be considered as of prime importance to the question of adequate site size.

The State of Michigan requires that all public high schools provide a course in driver's education. Although a driving range is not absolutely essential, it is desirable. One set of educational specifications recommends a four acre tract for a driving range and parking.[20] The Detroit City Plan Commission recommends a two and one-half acre minimum area for the driving range only.[21]

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[20]Sault Ste. Marie School System, "Specifications for Education Plaza", undated mimeographed report, Sault Ste. Marie, Michigan.

[21]Detroit City Plan Commission, "Produced Standards for Public Education Facilities", Detroit, Michigan, 1960, p. 31.

Busing

The effects of busing upon site location have already been discussed under the headings Enrollment, Educational Park, and Integration. This discussion will center around the space requirements of the bus.

The space needs of the bus may be divided into three categories. Loading and unloading space, parking and storage space, and shop space for maintenance and repair must be provided. Only the first of these need be on the school site.

The California State Department of Education recommends a loading--unloading area of 15,000 square feet for busses, exclusive of parking and storage space.[22] When storage of busses is included on the school site, approximately 700 to 750 square feet per vehicle should be provided (based upon a storage area of 12 by 50 feet, plus access drives.)

Parking

The question of school related parking areas has been touched upon briefly in several of the above sections. Parking needs for the school can be divided into several types, including space for faculty and staff, students, visitors, special events (such as athletic events), and community use of the school building and site. An estimate of the number of space required for each of these types of use should be made, and approximately 350 square

[22]California State Department of Education, "School Site Analysis and Development", (Sacramento, California) 1966, p. 11.

feet per parking space should be allocated. This figure will provide space for the auto as well as the access drives.

As an example of one approach to providing parking for the school, the previously mentioned Detroit study estimated that a senior high school with an enrollment of 1,700 to 2,000 students would require, based upon 1.5 persons per auto, 33 to 40 spaces for faculty and staff, ten spaces for visitor use and exceptional demands, 200 to 250 spaces for student parking and adult use during non-school hours, and 7,000 square feet of land for service areas. The total are for these uses, which includes an allowance for access drives, ranges from 55,500 to 67,000 square feet.[23]

Building Size

The size of the school building itself has an effect upon the site required. Although the actual size of the schoolhouse would be determined by the school architect based upon the educational specifications, the Michigan Department of Public Instruction has kept rather detailed records of all new schoolhouse construction since 1955-56. These records can be utilized to give a rough approximation of the area per pupil provided in the new schools, as well as the trends.

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[23]Detroit City Plan Commission, Op. Cit., pp. 31-34.

Whether or not the school is a one or multi-story building would affect how the rough measure afforded by Table 10 is used. In any event, the table can give only a general view, through a twelve year time span, of schoolhouse construction practices in Michigan. It cannot be used as a substitute for an architect's detailed analysis.

The Department of Public Instruction also lists all the complete school buildings built each year according to type, i.e., elementary, junior high, and senior high. The data is not summarized in this detail, however.

Based upon Table 10 and the more detailed information provided by the Department of Public Instruction, it was decided to use 70 square feet per elementary pupil, 100 square feet per junior high pupil, and 150 square feet per senior high pupil as reasonable indices of current trends in schoolhouse construction. Each of these figures is slightly inflated in recognition of the trend, most evident in secondary schools, towards providing more space per child.

Innovations

There are a number of educational concepts now in the experimental stages that are worthy of mention, even though their unique nature lifts them out of the realm of school standards. All of these innovations are intended to alleviate the situation created by the high cost and scarcity of land in the central city.[24]

[24]All of these examples have been extracted from the April, 1968, issue of Progressive Architecture, which is devoted entirely to schools.

TABLE 10

PER PUPIL AREA OF COMPLETE SCHOOL BUILDINGS CONSTRUCTED IN MICHIGAN 1955-56 THROUGH 1966-67

PER PUPIL AREA IN SQUARE FEET

Year	Elementary	Secondary (7-12)	All
1955-56	60.4	113.1	81.7
1956-57	59.2	114.9	81.2
1957-58	62.4	131.8	94.2
1958-59	62.4	134.4	106.0
1959-60	63.1	136.8	96.5
1960-61	62.3	135.7	98.2
1961-62	63.6	134.2	100.2
1962-63	63.3	126.3	102.3
1963-64	61.6	130.5	94.3
1964-65	64.7	118.1	95.3
1965-66	62.4	140.6	96.2
1966-67	66.0	123.0	98.0

Source: Michigan Department of Public Instruction, Lansing, Michigan.

In Chicago and New York City, school authorities are utilizing the air space above schools to provide apartment and office facilities. The income derived thus is used for debt service on the school bonds.

Plans in Baltimore have been formulated to build an educational park to house 6,000 students from the pre-kindergarten (age four) level to the grade nine level on air rights above the interstate highway system. Specifically, air rights amounting to 5.5 acres over the highway, 5.9 acres of adjacent land, and 10.0 acres of terraces, decking play areas, and other space created on the structural platform combine to make the equivalent of a 21.4 acre school site.

Another New York City innovation is the utilization of rooftop space for play area. Elevating the school on stilts to gain a covered playground area underneath the school is a related feature built into a New Orleans school by architect Charles Colbert. A combination of these two methods could also be utilized to provide playground space.

There are two relevant points derivative from the above discussion. First, the attention being devoted to the problems of the central city school is resulting in innovations that have potential for the alleviation of those problems. Secondly, the very uniqueness of the innovations precludes the development of standards. Each new concept must be applied individually to the specific governing circumstances.

Summary

A number of concepts and policies that can affect the school site were discussed briefly in this chapter. Many of these are very complex issues which do not lend themselves to such a brief examination. A complete discussion of the educational park concept certainly deserves more space than the few brief paragraphs devoted to it here, for example. However, of necessity this discussion has been kept brief. It was not the intent to thoroughly explore all of the ramifications of the many concepts and policies discussed. The intent was to furnish an overview of the factors that could affect the school site. This has been done.

The underlying theme of this chapter has been to accent what is already quite obvious: if the school is to be used for a specific purpose or purposes, it must be planned with that purpose or purposes in mind. This theme has been reiterated time and again throughout this chapter. Redundancy notwithstanding, it is an obvious and important principle that is often ignored by citizens and school officials alike.

CHAPTER FIVE

A PROPOSED GUIDELINE FOR USE IN DETERMINING SCHOOL SITE SIZES

The following guideline has been developed in an attempt to help the school planner make reasonable estimates of the site size needed for schools in suburban locations. Use of the guideline helps the school planner be explicit about the educational philosophy and policies envisioned for the school. The guideline serves as a tool to help translate these philosophies and policies into site requirements.

Nine factors are utilized in the guideline. Empirical evidence has been used to make the use of these as realistic as possible. However, reliable data simply do not exist from some factors, while Michigan data were relied upon for some others, simply as a matter of convenience.

The utility of the guideline derives from two sources: the accuracy of the standards use, e. g., the recreational area per pupil; and the fact that the school planner is forced to be explicit about the school program. It seems quite likely and desirable that use of the guideline could lead to future improvements to both. In the first instance, empirical data could be used to help strengthen the space standards. In the latter, additional factors may be added to the original nine.

Tennis, one court (60' x 120') 7,200

Swimming--Outdoors 25,000

5. Layout Factor--Percent

Enrollment	Elementary	Junior High	Senior High
To 300	15	25	25
300--600	10	20	20
600-1,200	10	20	20
1,200--2,000		20	15
2,000 and over			10

Recreational Area _____

Athletics Area _____

Subtotal _____

X's Factor = _____

6. Driver Education Range (2.5 acres) 113,600 _____

7. Park

Neighborhood (3 acre minimum) _____

Community (20 acre minimum) _____

8. Outdoor Resource Service (40 acre minimum) _____

9. Total Acreage Required

Building and Grounds _____

Recreational Areas _____

Athletic Programs _____

Layout Factor _____

Driver Educ. Range _____

Parking _____

Park _____

Outdoor Resource _____

Total Square Feet _____ Acres _____

A brief discussion of the nine factors selected for use in the guideline follows.

Enrollment and Class Size

The ultimate enrollment and class size, according to the grade level, are the first data to be supplied on the form. The number of pupils by grade level is probably the main determinant of the required site size. If the school is to be built in stages, it is important that the ultimate enrollment be used so that sufficient site will be acquired initially. Hopefully, the school system will have set an optimum enrollment and class size by type of school as a matter of official policy. For the present purpose, however, the main point is that a reasonably accurate estimate of the ultimate enrollment be given, whether or not this is the optimum enrollment according to official policy. A number of subsequent steps in the guideline are dependent upon accurate enrollment figures. The class size is used primarily to determine the size of the staff upon which to base parking needs.

Building and Grounds

The building size is dependent upon the number of pupils and the type of educational program. It may also be tempered by unique and unpredictable site factors, such as drainage and topography. While the standards used in the guideline cannot be substituted for specific information from the school architect, they can be used to give a general idea of building size which would be useful for

long range planning where specific details from an architect are necessarily lacking. The figures also assume a one story building, so would have to be adjusted to reflect any change in this state. When more specific information is available, the suggested standards should be ignored. Lacking detailed information, however, the standards should provide a reasonable basis for estimating the size of schools based upon Michigan experience.[25] To estimate the total requirement for building and grounds, a 2:1 ratio is suggested. This provides the additional space necessary for courtyards, lawn areas, walkways, and the like.[26]

Recreational Areas

The area in square feet required for each 100 pupils, according to grade level, is utilized to estimate the total outdoor recreational area needed for the school. These standards are derived primarily from studies by the California State Department of Education,[27] and the American Association of School Administrators.[28] Because of the differences in requirements due to size (age), the enrollment must be broken down to fit the format shown, even

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[25]Michigan Department of Public Instruction, unpublished annual statements, Lansing, Michigan.

[26]California State Department of Education, p. 10.

[27]California State Department of Education, pp. 16-20.

[28]American Association of School Administrators, PLANNING AMERICA'S SCHOOL BUILDINGS, (Washington, D. C., 1960) pp. 142-144.

though the organizational format selected for the school may differ. The area for the kindergarten is based upon a 50 pupil class. It could accommodate two classes of this size if half day sessions are utilized. This factor should be borne in mind when using the guideline to help prevent overestimating space needs.

The space for recreational areas has been based upon outdoor recreation. Unless unusual circumstances such as a severe climate prevail, the provision of outdoor recreational facilities allows more space at a lower cost. However, more intensive activities could be accommodated within the school plant itself. From an economic viewpoint, great additional building expenses would be incurred by providing that all recreation take place within the building. For this reason and others, the guideline assumes that outdoor facilities will be utilized.

Athletic Programs

Standard areas for various sport activities have been utilized to estimate the required space needs. Football, track and field events have been combined since this is customarily done. In addition, the area for a football practice field has been included as a desirable feature to help preserve the game field. The dimensions for the practice field are smaller because no provision for spectators need be made. Baseball, tennis, and swimming are the only other activities included. The dimensions for these areas were extracted from one of the standard textbooks on

community recreation.[29]

Golf was omitted because it is a great space user and because of the general availability of golf courses, which eliminates the need for the school to provide one. Other sports, such as soccer, archery, and field hockey, have been omitted due to their lack of popularity in the United States.

To reiterate an earlier point, space for athletic events need not be provided on the school site proper. If economies can be obtained by using existing facilities elsewhere or by acquiring land elsewhere, there are no compelling reasons why this should not be done.

Layout Factor

The dimensions listed under recreational areas and athletic programs only provide for the specific activity under consideration. Extra space is needed to provide a buffer between the various activity areas and to allow the various components to be fitted together in a logical manner. For example, space needs based upon safety may require that a buffer be provided between a field area for playing softball and an area containing gym apparatus. Since the specific activity areas mentioned do not provide extra space for a buffer, the extra layout factor is required. To accomplish the site layout, the guideline

[29]Meyer, Harold D., and Charles K. Brighbill, COMMUNITY RECREATION: A GUIDE TO ITS ORGANIZATION AND ADMINISTRATION, (D. C. Health and Company, Boston, 1948) pp. 448-449.

utilizes a layout percentage factor. A percentage of the site area devoted to recreation areas and athletic programs is used to provide the space needed for proper site layout. Depending upon enrollment, the suggested factor varies according to the following table.

Layout Factor

Enrollment	Elementary	Junior High	Senior High
to 300	15	25	25
300--600	10	20	20
600--1,200	10	20	20
1,200--2,000		20	15
2,000 and over			10

Source: California State Department of Education, "School Site Analysis and Development", (Sacramento, California. 1966) pp. 16-20.

Driver Education Range

If a driver education range is desired, a minimum area of 113,600 square feet (2.5 acres) should be provided.[30] The State of Michigan requires that all public high schools provide driver's training, although a special range is not absolutely necessary.

Parking

The space needs for parking can be obtained by multiplying the total number of parking spaces needed by 300 square feet, a figure that includes a factor for access drives. Estimating the number of parking spaces needed is a bit more difficult.

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[30]Detroit City Plan Commission, "Proposed Standards for Public Educational Facilities", mimeographed report, (Detroit, Michigan, 1960) p. 31.

The faculty and staff parking needs can be estimated by assuming that normal occupancy is 1.5 persons per auto. The national average is 1.5 persons per vehicle, but it varies from 1.2 persons per auto for a work trip to 2.0 persons per auto for a social-recreational trip.[31] The 1.5 figure should be regarded as minimal. Parking for faculty can be estimated by dividing the enrollment by the average class size, while parking for visitors and excess demand can be estimated at approximately 20 percent of the faculty-staff spaces.

Parking for events to be held in the auditorium or stadium can be estimated by providing one parking space for each four seats in the auditorium or stadium, whichever is greater. If these facilities are separated by a great distance, parking for both should be provided. This figure is based upon the aforementioned Detroit study,[32] plus a conversation with Dr. Lloyd Fales of the Michigan Department of Public Instruction.

The space requirements for bus loading and unloading and the services area are 15,000 and 7,000 square feet, respectively, as discussed in the previous chapter.

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[31]Detroit City Plan Commission, "Proposed Standards for Public Educational Facilities", mimeographed report, (Detroit, Michigan, 1960) p. 31.

[32]Goodman, William L., and Eric C. Freund, editors, PRINCIPLES AND PRACTICES OF URBAN PLANNING, International City Managers' Association, (Chicago, Illinois, 1968) p. 152.

Adult parking, based upon use of the library, adult education classes, use of the building for meetings, and the like could be accommodated in the space provided for special events and/or faculty-staff parking, assuming that adult use takes place during non-school hours. Parking for students could be accommodated in the area provided for special event parking. If this type of parking is not provided for, additional space for student parking would be required. A ratio of one space per 20 students is suggested, if local knowledge concerning the number of students with cars is lacking.

Park Area

A minimum site of three acres is suggested for the park portion of a neighborhood school-park facility, based upon a population of 2,500.[33] A playfield designed to serve a population of 15,000 to 20,000 should have a minimum area of 15 acres.[34] Both of these figures have been reduced slightly in recognition of the trade-off benefits accrued because of the adjacent school site.

Outdoor Resources Service

If outdoor resource is to be provided, a minimum site area of 40 acres is recommended, as discussed in the previous chapter.

Use of the Guideline

To demonstrate the use of the guideline, several

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[33]Detroit City Plan Commission, Appendix.

[34]Meyer and Brightbill, p. 454.

theoretical examples will be used, one each for the elementary, junior high, and senior high levels.

The theoretical elementary school will have a total enrollment of 350 pupils, with 50 in a single kindergarten class and two sections each of grades 1-6 with an average class size of 25, or 150 each in grades 1-3 and 4-6. No provision for a combination school-park or outdoor resource is intended, since these are not commonly provided.

The building size is obtained by multiplying 350 by 70 square feet, the per pupil building size for elementary levels. This figure is then doubled to determine the space needed for the building and grounds. This equals 49,000 square feet.

The recreational areas can be estimated by multiplying the enrollment in grades 1-3 and 4-5 by the respective factors and adding these totals to the required kindergarten space. This amounts to 188,850 square feet.

The layout factor, which is ten percent in this instance, is then applied to the recreational area, adding an additional 18,850 square feet.

The sections dealing with athletic programs and the driver education range do not apply to the elementary school, so these can be ignored.

The parking is estimated by first determining the number of teachers and staff. Two kindergarten teachers, 12 elementary level teachers, one principal, and one custodian equal to a total of 16. Utilizing the 1.5

persons per car ratio, the number of parking spaces needed for the faculty and staff comes to 11. Two additional spaces (20 percent of the faculty and staff) for visitors brings the total to 13. Applying the 300 square feet of parking space standard, it can be determined that 3,900 square feet of parking space are needed. To this figure must be added the 15,000 square feet for bus loading and unloading and the 7,000 square foot service area, making a total of 25,900 square feet.

Since the school in the theoretical example will not utilize an area for outdoor resource nor for a park, these two factors will be ignored.

ELEMENTARY SCHOOL

Factor		Area in Square Feet
Building and Grounds		49,000
Recreational Areas		
Kindergarten	7,000	
1-3	69,000	
4-6	112,500	
		188,500
Athletic Programs		N. A.
Layout Factor (10%)		18,850
Driver Education Range		N. A.
Parking, Bus, and Service Area		25,900
Park		N. A.
Outdoor Resource Service		N. A.
Total Area Needed		282,250 or 6.5 acres

The junior high school will have an ultimate enrollment of 800 students in grades seven to nine, with an average class size of 28. No facilities for athletic events will be provided, nor will park, outdoor resource, and

driver education areas be utilized. The following table summarizes the space needs for this school.

Junior High School

Factor	Area in Square Feet
Buildings and Grounds	160,000
Recreational Areas	608,000
Athletic Programs	N. A.
Layout Factor (20%)	121,600
Driver Education Range	N. A.
Parking, Bus, and Service Area	30,400
Park	N. A.
Outdoor Resource Service	N. A.
Total Area Needed	920,000 or 21.1 acres

The senior high school has an ultimate enrollment of 1,400 students with an average class size of 30. A full athletic program is planned, including a 1,500 seat stadium for football and track/field events, a practice field, and a baseball field. A driver education range will also be provided. No provision will be made for a park or outdoor resource service. The space needs for this school are summarized below.

Senior High School

Factor	Area in Square Feet
Buildings and Grounds	410,000
Recreational Areas	651,000
Athletic Programs	248,900
Layout Factor (15%)	134,985
Driver Education Range	113,600
Parking, Bus and Service Area	39,700
Park	N. A.
Outdoor Resource Service	N. A.

Total Area Needed 1,744,685 or 40.0 acres

Comparison With Other Standards

One method available to test the reasonableness of the site sizes derived from the guideline is to compare its results to other standards. Since the most widely accepted standards are those of the National Council on Schoolhouse Construction, they will be used for comparative purposes.

Comparative Site Standards, in Acres

Grade Level	NCOSC	Guideline
Elementary (350 pupils)	14	6.5
Junior High (800 pupils)	28	21.1
Senior High (1,400 pupils)	44	40.0

As the above table illustrates, the guideline produces consistently smaller site sizes than the recommended NCOSC standards. This disparity is especially noticeable at the elementary level.

Assuming that the guideline is reasonable, are there valid reasons why the NCOSC standards should be excessive? Several possible reasons or pressures for excessive standards are listed below:

1. Past experience with extremely small sites, many of which are in use today, created an over-reaction in favor of larger sites.
2. Similarly, past experience with numerous additions to existing school plants has produced pressures to acquire a site large enough to provide for all

possible contingencies.

3. Uncertainty about the future role of the school--enrollment, type of program offered, changing educational concepts, etc.--has made the "better too much than not enough" philosophy easy to accept.
4. Site needs have rarely been broken down into components and critically analysed to ascertain real needs.
5. The psychology of having high standards for comparison purposes may be additional reason.

There is no effective way to quickly test the authenticity of these points. However, they do appear to be logical arguments and therefore, acceptable.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

This study was premised on the notion that school site standards could be improved if they were made both more flexible and more explicit. Based upon this notion, a rather detailed study of current school site standards and practices was made. This was followed by an examination of some educational concepts and policies thought to affect the school site. The study culminated in the development of a procedural guideline to help in the determination of school site sizes.

The examination of school site size standards according to school facility planning literature, urban planning literature, and master plan reports revealed four distinct approaches:

1. A flat acreage requirement based upon the grades to be served.
2. A ratio between school site size and the ultimate enrollment.
3. A combination of the first two methods utilizing a minimum site size and enlarging this by applying a ratio between site size and enrollment.
4. A flat acreage requirement based upon a more explicit statement of the facilities to be provided.

The National Council on Schoolhouse Construction espouses the third approach summarized above, and, due largely to their influence, this is the most widely quoted method.

The study of school site practices as evidenced by national data showed that the size of all public school sites in use in 1951 and 1962 fell substantially short of the standards. However, the 1962 situation was noticeably improved over the earlier period.

Michigan data on new public schools built between 1957-58 and 1966-67 indicated that, for the most part, new schools were built on sites which met or exceeded most standards. Because these data dealt only with new schools built in recent years, it was impossible to compare Michigan practices with national ones.

A number of reasons were advanced to help explain the increase in school site sizes: the postwar baby boom; growth in the suburbs where land was at the same time less expensive and more available; the relatively good economic conditions; a change in educational philosophy towards a broader role for the school; school reorganization; and, finally, increased recognition of the school standards.

A brief examination of a number of educational policies and concepts was made to assess the effect of each upon the school site needs. Factors studied included ultimate enrollment and class size, building size, use of the site for outdoor resource service, athletic programs, recreational areas, community use of the school, busing, and parking. Several recent innovations such as the educational park and the use of air rights were also discussed.

A final phase of this study was the development of a guideline for use in the determination of school site sizes. The guideline focuses upon nine factors basic to the school site; enrollment and class size, building and grounds, recreational areas, athletic programs, the additional space needed to logically arrange the components on the site, driver training, parks, and outdoor resource service.

The guideline shares two basic shortcomings with the other standards. Basic research upon which to base the standards is lacking. This is especially true in the case of recreational area. Unfortunately, it appears that many of the existing standards must take part of the blame for this lack, since they have been widely advertised and accepted as authoritative statements of what the school site should be. Hence, the need for such research was not made clear.

Secondly, the guideline cannot be applied to the special needs of the school in a highly urbanized locale without reducing the standards. Patently, a minimum standard that can be reduced is not a minimum standard. This further points out the need for basic research dealing with minimal requirements.

Finally, as with the other standards the guideline provides little assistance to the educator contemplating the utilization of one of the innovative approaches, such as the use of air rights. It is difficult, if not

impossible, to encompass the unique within the framework of general standards.

Use of the guideline offers several potential advantages.

1. The guideline requires some rather basic policy questions be answered before it can be effectively utilized, thereby helping to formulate an explicit statement of the school's educational philosophy.
2. The school planner using the guideline can be more flexible in the application of the standards, since the guideline reduces the site to basic components. If no facilities for drivers education are required, for example, the site size can reflect this.
3. The guideline can be self-corrective. If the school administrator sees that the guideline provides too much or not enough land for a specific purpose, a correction can be made so similar errors can be avoided in the future. Additionally, the guideline could be improved by adding to the original factors, based upon experience gained from using the standard.

By examining in some detail a rather specific phase of educational facility planning, it is hoped that this study will offer insights to both urban planners and

educational facility planners. The proper delineation of school site area needs is a prerequisite to the reservation of adequate school sites to serve the community. This study can be used to improve one important input to school and urban planning.

Use of the recommended guideline should suggest improvements to it. The guideline should not be regarded as a "finished" product. Only through use can it be refined and made more useful.

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