

A COMPARATIVE STUDY OF SELECTED
COSTS THAT CONDITION DECISIONS
LEADING TO REHABILITATION OR
ABANDONMENT OF SCHOOL FACILITIES

Thesis for the Degree of Ed. D.
MICHIGAN STATE UNIVERSITY

Kenneth M. Glass

1963

This is to certify that the
thesis entitled
A COMPARATIVE STUDY OF SELECTED COSTS
THAT CONDITION DECISIONS LEADING TO
REHABILITATION OR ABANDONMENT OF
SCHCCL FACILITIES
presented by

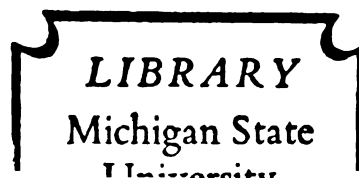
Kenneth M. Glass

has been accepted towards fulfillment
of the requirements for

Ed. D. degree in General
Administration


Major professor

Date April 29, 1963



ABSTRACT

A COMPARATIVE STUDY OF SELECTED COSTS THAT CONDITION DECISIONS LEADING TO REHABILITATION OR ABANDONMENT OF SCHOOL FACILITIES

by Kenneth M. Glass

This investigation is concerned with a comparative study of selected operating and maintenance costs that condition decisions leading to rehabilitation or abandonment of school facilities. In a period of increasing enrollments and concern for improvements in educational programs, the atmosphere and environment of a school plant must be such that it contributes to the full growth of each pupil's mental, physical, and spiritual potentials.

The City of Detroit has 300 public school buildings. Over one-third of these facilities are more than forty years old. Three groups of elementary school plants were selected for study in Detroit, Michigan. In the study old plants are those facilities fifty-four to seventy-three years old; middle-aged plants include facilities thirty to forty-eight years old; recent plants represent those facilities four to ten years old. For each of the thirty plants being studied, square-foot computations were made of the building area. Selected operating and maintenance cost figures covering a four-year period were obtained and described for each plant.

When the analysis of data was completed, demonstrable cost differences between school plants of similar age were noted. There are significant operation and maintenance cost differences between old, middle-aged, and recent school plants. The total expenditures

for operating and maintaining old plants are greater than the cost for maintaining and operating middle-aged or recent plants. More money is expended for maintenance and operation of middle-aged buildings than for recent buildings.

The adequacy of aging school plants and the economy of operation and maintenance is dependent upon the use of sound principles, judgments, and decisions by the specialists charged with the responsibility for creating and preserving the learning environment. The recommendations of the study concentrate upon ways in which specialists in Detroit and other school districts might utilize the findings of this study and develop an understanding of ways to effect greater economies in housing school children.

The study recognizes that operation and maintenance expenditures are an important factor in making judgments about the advisability of rehabilitation or abandonment of aging school facilities. It is to be noted, however, that few buildings' fates are decided on this factor alone. It seems essential that each school district should examine certain criteria before making a final decision. Therefore, a final section of this study is devoted to criteria that help determine when a school building should be abandoned or rehabilitated.

These criteria may be grouped in the following areas:

1. Need for continued use of the building.
2. Adequacy of the site.
3. Community characteristics.
4. Educational program implications.
5. Condition of the building.
6. Health and safety criteria necessary to conform with code regulations.
7. Economies affecting the decision.

Each building and site should be evaluated on the basis of its individual characteristics by a team of men. The personnel involved in the process would include school plant personnel and consultants, architects, engineers, curriculum specialists, and laymen. This recommendation is based on the premise that a difference of judgments are desirable and that those people who are most intimately involved in the decision-making process would contribute a greater range of knowledge to the problem.

**A COMPARATIVE STUDY OF SELECTED COSTS THAT
CONDITION DECISIONS LEADING TO REHABILITATION
OR ABANDONMENT OF SCHOOL FACILITIES**

By

Kenneth M. Glass

A THESIS

**Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of**

DOCTOR OF EDUCATION

College of Education

1963

ACKNOWLEDGMENTS

The author would like to recognize the assistance and encouragement he has received in this research endeavor. It is the result of the efforts of many people.

During the preparation of this work, the writer has had opportunity to establish a close professional association with fellow colleagues of the Detroit Public Schools and with staff members of the College of Education of Michigan State University. Appreciation is expressed to Dr. Anthony Adinolfi, former Assistant Superintendent, School Housing Division, Detroit Public Schools, for providing the writer with the opportunity, encouragement, assistance, and cooperation to undertake a doctoral program. The other members of his staff were especially helpful during the process of gathering data and were patient and cooperative while answering the many questions pertinent to the study.

Special appreciation is given to Dr. Floyd Parker, chairman of the doctoral committee. His inspiration, the sharing of his time and experience, wise counsel, and encouragement, not only as an advisor but as a friend as well, has made this study most interesting and meaningful.

The writer is indebted to Dr. Donald Leu for his help in the early phase of the study and his continued interest throughout the past year. His professional advice and friendship will long be remembered.

The other members of my committee, Dr. Charles Blackman and Dr. James McKee have been stimulating teachers and cordial friends always willing to give counsel and advice when it was needed.

In addition to the members of the guidance committee, the writer has also grown through his contacts with other graduate students in the College of Education and particularly appreciates the relationship with James Giddis, Herb Sheathelm, Fred Brieve, and Richard Dempsey with whom he shared school survey experiences for an eventful year.

The acknowledgment would not be complete if the writer did not express appreciation to his wife, Rose, for her generous understanding of the many problems faced throughout the year and for the liberal use of her time in repeated typings of the manuscript. A special tribute is extended to the writer's four sons, Kenneth, Richard, Robert, and Philip for making a seemingly difficult year a most enjoyable one.

TABLE OF CONTENTS

CHAPTER	Page
I. INTRODUCTION AND NATURE OF THE PROBLEM .	1
STATEMENT OF THE PROBLEM	1
IMPORTANCE OF THE PROBLEM	2
Historical development of cities	2
Public school pupil enrollments	3
Population growth patterns	5
Detroit school buildings	7
Platoon schools	9
Safety in school buildings	11
Financing building programs	12
Capital outlay expenditures	14
The life cycle of school buildings	18
Age of Detroit schools	19
Summary	25
ASSUMPTIONS	26
HYPOTHESES	27
DEFINITIONS OF TERMS	27
LIMITATIONS OF THE STUDY.	32
II. REVIEW OF THE RELATED LITERATURE.	34
Recognizing the problem	34
Educational usefulness	39
Human values	42
Maintenance and operation	45
SUMMARY	49
III. METHOD OF THE STUDY	50
METHOD OF RESEARCH.	50
The design	52
The population	52
The sample	53
The stratified randomization procedures	55
Collection and recording of the data	55
SUMMARY	56

TABLE OF CONTENTS - Continued

CHAPTER	Page
IV. EVALUATION OF COST DATA	58
Building and site maintenance expenditures . .	59
Heating expenditures	78
Electrical expenditures.	83
Salaries for custodial services.	86
Custodial supplies	92
Statement of hypothesis.	96
Conclusion	98
V. SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND MAJOR OBJECTIVES OF REHABILITATION OR ABANDONMENT OF SCHOOL FACILITIES.	100
SUMMARY	100
CONCLUSIONS.	105
RECOMMENDATIONS	106
MAJOR OBJECTIVES OF REHABILITATION OR ABANDONMENT OF SCHOOL FACILITIES . .	108
BIBLIOGRAPHY	115
APPENDICES	122

LIST OF TABLES

TABLE	Page
1. Detroit School Enrollments, Grades K-12, Detroit, Michigan--1838-1960.	4
2. Population Trends, Detroit, Michigan--1820-1960 . . .	8
3. Platoon Schools in Detroit--1918-1923	10
4. Detroit Building and Site Fund Expenditures for Years 1950-51 Through 1959-60, Both Inclusive	15
5. Number of Detroit School Buildings Forty Years or Older, September, 1960	19
6. Proposed School Building Changes in Detroit for a Five-Year Period	20
7. An Analysis of Building Maintenance Costs of Ten Old Detroit Elementary Schools. July 1, 1956-June 20, 1960	60
8. An Analysis of Building Maintenance Costs of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956-June 30, 1960.	60
9. An Analysis of Building Maintenance Costs of Ten Recent Detroit Elementary Schools. July 1, 1956-June 30, 1960	61
10. An Analysis of Site Maintenance Costs of Ten Old Detroit Elementary Schools. July 1, 1956-June 30, 1960.	61
11. An Analysis of Site Maintenance Costs of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956-June 30, 1960	62
12. An Analysis of Site Maintenance Costs of Ten Recent Detroit Elementary Schools. July 1, 1956-June 30, 1960	62

LIST OF TABLES - Continued

TABLE	Page
13. An Analysis of Heating Operating Costs of Ten Old Detroit Elementary Schools. July 1, 1956-June 30, 1960.	63
14. An Analysis of Heating Operating Costs of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956-June 30, 1960	63
15. An Analysis of Heating Operating Costs of Ten Recent Detroit Elementary Schools. July 1, 1956-June 30, 1960.	64
16. An Analysis of Electrical Operating Costs of Ten Old Elementary Schools. July 1, 1956-June 30, 1960 . . .	64
17. An Analysis of Electrical Operating Costs of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956-June 30, 1960.	65
18. An Analysis of Electrical Operating Costs of Ten Recent Detroit Elementary Schools. July 1, 1956-June 30, 1960.	65
19. An Analysis of Custodial Operation Salaries of Ten Old Detroit Elementary Schools. July 1, 1956-June 30, 1960	66
20. An Analysis of Custodial Operation Salaries of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956-June 30, 1960.	66
21. An Analysis of Custodial Operation Salaries of Ten Recent Detroit Elementary Schools. July 1, 1956-June 30, 1960.	67
22. An Analysis of Custodial Supplies Costs of Ten Old Detroit Elementary Schools. July 1, 1956-June 30, 1960.	67

LIST OF TABLES - Continued

TABLE	Page
23. An Analysis of Custodial Supplies Costs of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956-June 30, 1960.	68
24. An Analysis of Custodial Supplies Costs of Ten Recent Detroit Elementary Schools. July 1, 1956-June 30, 1960.	68
25. A Comparative Relationship of Maintenance and Operation Costs of Old, Middle-Aged, and Recent Detroit School Plants.	97

LIST OF FIGURES

FIGURE	Page
1. Detroit Public Schools Predicted Enrollment, 1960-1970.	6
2. Building and Site Fund Expenditures, July 1, 1951, to June 30, 1960, Detroit Public Schools.	17
3. Age of Present Detroit School Buildings, September, 1960.	21
4. Age of Present Detroit School Buildings, 1970, With No Planned Changes	22
5. Percentage of Detroit Public School Pupils in Buildings Forty Years or Older, 1960-1970	24
6. A Four-Year Average of Annual Building Maintenance Costs in Ten Selected Detroit Elementary School Plants, 54-73 Years Old.	69
7. A Four-Year Average of Annual Building Maintenance Costs in Ten Selected Detroit Elementary School Plants, 30-50 Years Old	71
8. A Four-Year Average of Annual Building Maintenance Costs in Ten Selected Detroit Elementary School Plants, 4-10 Years Old	72
9. A Four-Year Average of Site Maintenance Costs in Ten Selected Detroit Elementary School Plants, 54-73 Years Old.	75
10. A Four-Year Average of Site Maintenance Costs in Ten Selected Detroit Elementary School Plants, 30-48 Years Old.	76

LIST OF FIGURES - Continued

FIGURE	Page
11. A Four-Year Average of Site Maintenance Costs in Ten Selected Detroit Elementary School Plants, 4-10 Years Old.	77
12. A Four-Year Average of Annual Heating Operation Costs in Ten Selected Detroit Elementary School Plants, 54-73 Years Old	80
13. A Four-Year Average of Annual Heating Operation Costs in Ten Selected Detroit Elementary School Plants, 30-48 Years Old	81
14. A Four-Year Average of Annual Heating Operation Costs in Ten Selected Detroit Elementary School Plants, 4-10 Years Old	82
15. A Four-Year Average of Annual Electrical Operation Costs in Ten Selected Detroit Elementary School Plants, 54-73 Years Old	84
16. A Four-Year Average of Annual Electrical Operation Costs in Ten Selected Detroit Elementary School Plants, 30-48 Years Old	85
17. A Four-Year Average of Annual Electrical Operation Costs in Ten Selected Detroit Elementary School Plants, 4-10 Years Old	87
18. A Four-Year Average of Annual Custodial Operation Salary Costs in Ten Selected Detroit Elementary School Plants, 54-73 Years Old	89
19. A Four-Year Average of Annual Custodial Operation Salary Costs in Ten Selected Detroit Elementary School Plants, 30-48 Years Old.	90
20. A Four-Year Average of Annual Custodial Operation Salary Costs in Ten Selected Detroit Elementary School Plants, 4-10 Years Old	91

LIST OF FIGURES - Continued

FIGURE	Page
21. A Four-Year Average of Annual Custodial Supplies Costs in Ten Selected Detroit Elementary School Plants, 54-73 Years Old.	93
22. A Four-Year Average of Annual Custodial Supplies Costs in Ten Selected Detroit Elementary School Plants, 30-48 Years Old.	94
23. A Four-Year Average of Annual Custodial Supplies Costs in Ten Selected Detroit Elementary School Plants, 4-10 Years Old.	95

LIST OF APPENDICES

APPENDIX	Page
A. Chart depicting a description of Detroit Public Schools listed by year of original construction. September, 1960.	123
B. Map of Detroit Public Schools Forty Years or Older	132
C. Map of Detroit Public School Districts--Selected Elementary Schools	133
D. School Building Rehabilitation Check Form.	134

CHAPTER I

INTRODUCTION AND NATURE OF THE PROBLEM

The construction and rehabilitation of school buildings and related costs are often discussed and debated in cities and school districts. No group of buildings is more publicly planned and financed than schools. The typical citizen raises many questions as to the adequacy of present plants, construction of new facilities, or rehabilitation and modernization of old buildings. The question is quite often resolved by the cost and by the values placed on the education of the citizen's children.

When a community assumes long-term financial responsibility, the initial cost is only a part of the cost of providing adequate facilities. Yearly maintenance and operation cost is a major budget item. As age of buildings increases, maintenance and operation costs increase. Any large school system with many old school buildings necessarily must spend a considerable amount of public tax funds each year to maintain plants to house an educational program.

The present investigation, dealing with one aspect of the problem area, is an attempt to compare selected cost relationships between various aged school buildings.

STATEMENT OF THE PROBLEM

The specific problem is to make a comparative study of selected operating and maintenance costs in Detroit elementary school buildings and sites that condition decisions leading to rehabilitation or abandonment. In addition, it is recognized that many factors condition the final decision of a building's further use. The study seeks to identify elements relevant to rehabilitation of school plant facilities.

IMPORTANCE OF THE PROBLEM

It will be necessary to objectively view the historical development of school buildings and population trends in Detroit to understand fully why so many old plants exist at the present time. Further, by looking carefully at the financial record and subsequent construction of school facilities, the result of a successful vote for additional millage in 1959, the reader will have a basis for better comprehending the need for the present study.

Historical development of cities. Detroit, like other large cities in the United States, has a history of development dating back several hundred years. With a few notable exceptions most of the great cities in America were not planned, and their growth was by stages and as needs dictated. Often the growth pattern was influenced by natural restrictions such as rivers, lakes, hills, and mountains. As cities grew larger, they followed these physical barriers; when it became necessary to extend the boundaries and make new streets, old Indian trails and stage-coach roads were followed. Later, with the advent of railroads and the industrial revolution further gerrymandering of streets and boundaries were needed to conform with population growth induced by industrial development.

Throughout the years cities have experienced spurts of population growth and, similarly, leveling-off periods. Programs of extensive construction of buildings naturally accompanied population growth. Building growth was due in part to disaster such as fires, earthquakes, hurricanes, floods, and other destructive phenomena; or it may have been the result of providing for an all-out war effort. This has resulted in periods of extreme growth with little planning. United States cities have large segments of buildings of approximately the same age dispersed throughout the urban area. Obviously, the history of schools and

school house construction has paralleled the fortunes of cities. Further, the very existence of the schools depends upon population patterns within a city.

Public school pupil enrollments. Looking at patterns of pupil enrollment it is interesting to note that in 1755 first mention of a school in Detroit's early history occurred in a marriage register of St. Anne's Church. Jean Baptise Rocoux is identified as "Director of the Christian Schools."¹ Education was fragmentary until the Michigan legislature passed the first free public school act of 1842. All of the schools were tuition-charging institutions and of the ungraded one-room type.

After passage of the 1842 act, educational leaders of the day desired to establish an unbroken series of schools from the primary grades through the state university and to develop in Detroit the idea of a comprehensive school system open to all who cared to take advantage of the opportunity.

In 1843 there were 1,158 pupils enrolled in the Detroit schools. The expenditure for schooling then was \$2,718 or approximately \$2.00 per pupil. Enrollment in September, 1961, was 288,146 and an expenditure of \$438.88 per pupil.² Comparison of these figures reveals the extent of the Detroit school system's growth.

A steady rise in school enrollment was experienced in Detroit from 1838 to the present time. Pupil enrollment and the average annual enrollment change is presented in Table 1. Only twice during this span

¹Arthur B. Moehlman, Public Education, Detroit Growth of City Schools and American Ideals (Bloomington, Illinois: Public School Publishing Company, 1921), p. 33.

²Commentary to the Cost Report of the Board of Education of the City of Detroit, (1960-61), p. 12.

Table 1. Public School Enrollments, Grades K-12 Detroit, Michigan--
1838-1960

Year	Enrollment*	Average Annual Enrollment Change	
		Number	Per Cent
1838	507		
1839	687	180	35.5
1840	895	208	30.3
1858	4,000	169	18.9
1863	7,986	664	16.6
1870	8,602	90	1.1
1880	11,513	291	3.4
1890	18,735	722	6.3
1900	19,571	84	0.4
1910	47,857	2,829	14.4
1920	122,690	7,483	15.6
1930	250,994	12,830	10.4
1940	254,968	397	0.2
1950	232,080	-2,289	-0.9
1951	238,557	6,477	2.8
1952	250,329	11,772	4.9
1953	261,718	11,389	4.6
1954	265,342	3,624	1.4
1955	272,796	7,454	2.8
1956	277,266	4,470	1.6
1957	281,234	3,968	1.4
1958	283,224	1,990	0.7
1959	282,812	-412	-0.1
1960*	285,304	2,492	0.9

Source: Detroit Board of Education, Office of Administration Research
Digest of Membership, Detroit Public Schools.

Enrollment figures include the following miscellaneous groups in addition
to K-12 pupils:

Postgraduates in Senior High	Special Education
Trade in Senior High	Special Foreign
Job Upgrading in Senior High Schools	Trade: Boys, girls
Apprentices: Cass	Practical Nursing
Adult Day School: Elementary, Secondary	

*NOTE: The 1960 figure reflects a September pupil enrollment. The pre-
ceding years reflect the pupil enrollment for the month of October.

of years was the steady increase of enrollment interrupted. In 1950 a -0.9 per cent of change occurred, and in 1959 a -0.1 per cent of change deviated from the steady growth pattern.

In the period from 1960 to 1964 pupil enrollments are predicted to continue in a steady climb and will peak at between 299,000 and 300,000.¹ By 1965 a gradual drop-off is predicted and by 1970 pupil enrollment should decrease to approximately 285,000² pupils (see Figure 1).

It is reasonable to expect that during the next decade enrollment will vary somewhat from the predicted totals. Any number of factors not easily discernible at this time could possibly present a different picture by 1970 such as:

1. In- and out-migration of families.
2. Urban renewal projects.
3. Total war effort.
4. Increase or decrease of industrial development.
5. Drastic changes in the birth rate.
6. General economic conditions associated with the auto industry.
7. Ability of the schools to hold more of the over-sixteen year old pupils.
8. Changes in the socio-economic make-up.

Population growth patterns. Obviously, a similar population growth pattern was experienced in Detroit concurrently with the growth of Detroit Public Schools. In 1820, the year of a first recorded census

¹Citizen's Advisory Committee on School Needs, Highlights of Factual Data (Board of Education, City of Detroit, November, 1958), p. 47.

²Detroit Board of Education, Projection based on a report prepared by the Detroit School Housing Division, (January, 1961).

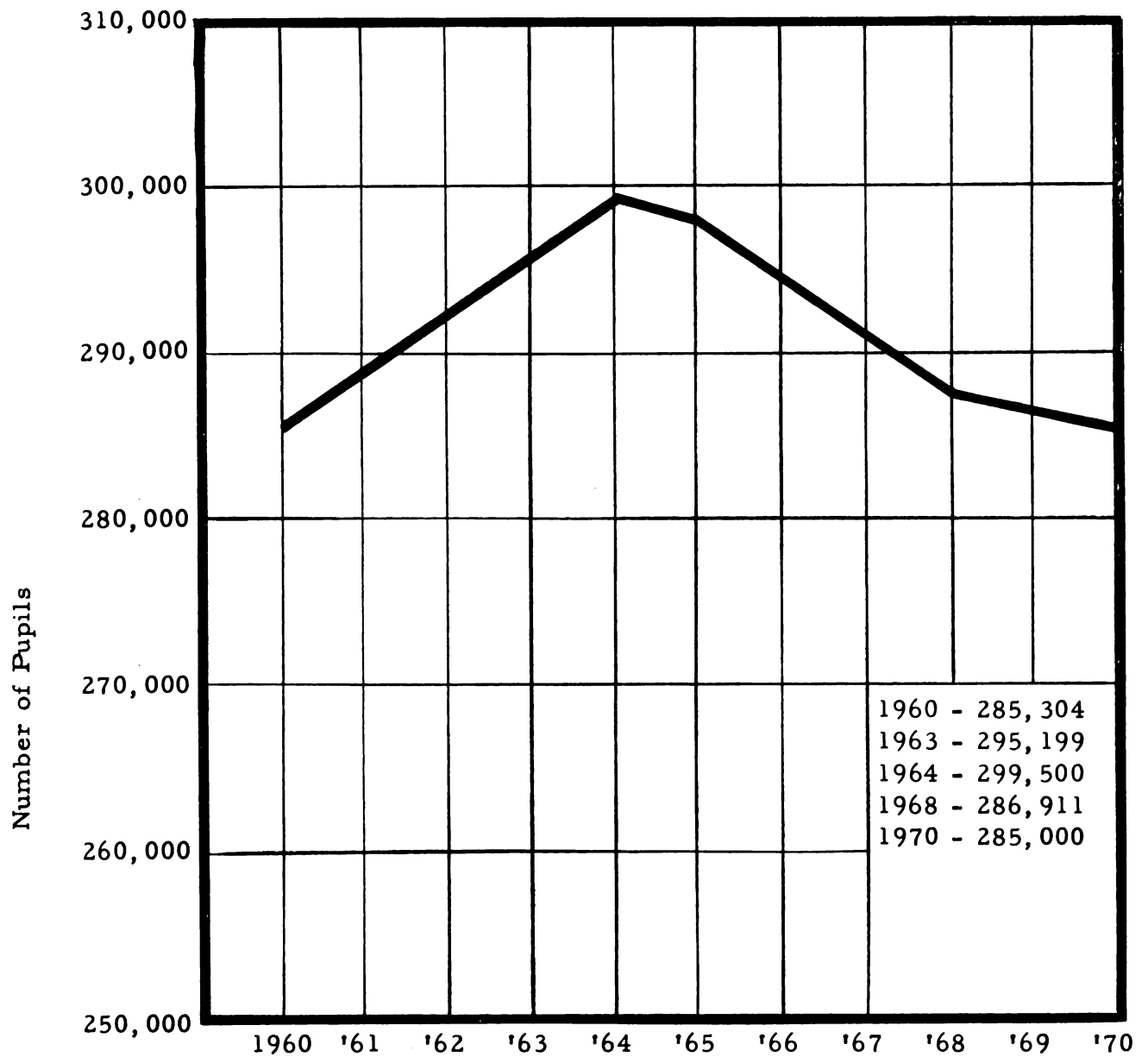


Figure 1. Detroit public schools predicted enrollment, 1960-1970.
(From Citizens Advisory Committee on School Needs, 1958,
and Division of School Housing, 1961.)

in Detroit, a population of 1.422 people lived within the city boundaries. The 1950 census revealed a population of 1,849,568 inhabitants. By 1960 the population of Detroit had decreased to a total of 1,670,144 inhabitants. Table 2 presents these data in a more complete form. It is important to note that Detroit's total population decreased 9.7 per cent between the 1950 and 1960 census, while the number of housing units in Detroit increased by 6 per cent during the same period.¹ Resident births during the same period also show a steady climb to a peak of 61,872 births² in 1957. The two-year period following 1957 witnessed a declining birth rate in Detroit. In 1959 the number of recorded resident births in Detroit was 54,670, a drop of 7,202 from the peak year. The paradox of a declining population and an increase in resident births can be explained by the fact that in the past ten years Detroit has observed a tremendous out-migration of families to suburban communities. Families remaining in Detroit have more children per family unit than the group moving to suburban communities.

Detroit school buildings. In Detroit older school buildings reflect the traditional design advocated by architects of the time. The Riverside elementary school, constructed in 1874, is presently the oldest building in Detroit. Its box-like appearance typifies many Detroit schools. Later building additions transformed the Riverside into its present T-shape. School building construction in Detroit through 1917 was exemplified by two stories and a basement. In addition to the usual engineering spaces, the basement is utilized in many schools for instructional purposes. The only noticeable variation in this pattern is an

¹U. S. Department of Commerce, Bureau of the Census, Preliminary 1960 Census of Housing.

²Detroit Department of Health, Resident Births (Detroit, Michigan, 1949-1959).

Table 2. Population Trends, Detroit, Michigan, 1820-1960

Year	Population	Increase Over Previous Census	
		Number	Per Cent
1820*	1,422		
1830	2,222	800	56.2
1840	9,102	6,880	309.6
1850	21,019	11,917	130.9
1860	45,619	24,600	117.0
1870	79,577	33,958	74.4
1880	116,340	36,763	46.2
1890	205,876	89,536	77.0
1900	285,704	79,828	38.8
1910	465,766	180,062	63.0
1920	993,678	527,912	113.3
1930	1,568,662	574,984	57.9
1940	1,623,452	54,790	3.5
1950	1,849,568	226,116	13.9
1960**	1,670,144	-179,424	-9.7

*1820: Year of first recorded census in Detroit, Michigan.

Source: Seventeenth United States census reports, 1950; Bureau of Census, U. S. Department of Commerce.

** 1960 Census of population; Michigan; U. S. Department of Commerce. Bureau of Census.

occasional building with three stories, a different style roof, or a designed front reminiscent of architecture from other periods.

In the foregoing discussion of the evolution of school building construction, it was noted that most of the buildings erected in 1920 were in their essential elements almost replicas of those constructed in 1848, "a box-like structure comprising a group of rooms uniform in size and equipment, is still a popular model today."¹

Platoon schools. Following World War I, school authorities in Detroit, "actuated by a feeling that the traditional organization was obsolete and out of step with modern educational ideals, in 1919 officially adopted an entirely new semi-departmentalized form of elementary school organization called the platoon school."²

The platoon organization is best described as it was visualized by its originator, William Wirt of Gary, Indiana.

The twentieth century public school saves the taxpayers money by providing, first, classrooms and libraries where the child can study books and recite from books; second, the playgrounds, gymnasiums, and swimming pools where the child can play and secure a general physical training; third, shops, gardens, drawing rooms, and laboratories where the child can work and learn to do efficiently many things by doing them; fourth, an auditorium whereby lectures, recitals, dramatizations, phonograph, player-piano, stereopticon lantern, and motion pictures, the visual and auditory education of the child may be done efficiently. Four separate and distinct places are provided for each child, but the total per capita cost is not increased four-fold. Each child can be in only one of the four places at the same time. The new school so arranges the classes that different sets of children are in the four departments all the time.³

¹Charles L. Spain, The Platoon School (New York: The Macmillan Company, 1924), p. 134.

²Ibid., p. 134.

³N.E.A. Proceedings (1912), p. 493.

To obtain these objectives in Detroit, a platoon organization was developed and put in operation in two buildings. These two schools were selected because they contained auditoriums and gymnasiums which are a prerequisite to the established objectives.

To satisfy the requirements of the platoon system, Detroit in 1919 entered upon an extensive building program. This program, as stated by Spain, included:

1. Remodeling existing school buildings in harmony with the new organization.
2. Planning and erecting new buildings specifically designed to meet new requirements.¹

The new plan received an enthusiastic endorsement from principals, teachers, pupils, and parents. This favorable sentiment spread throughout the entire system. The growth in the platoon school is indicated in Table 3.

Table 3. Platoon Schools in Detroit--1918-1923

Dates	Number of Platoon Schools
1918-1919	6
1919-1920	15
1920-1921	29
1921-1922	42
1922-1923	77

"Between 1920 and 1924, seventeen new buildings were constructed to fit the Platoon System; forty-two buildings had additions to accommodate

¹Spain, loc. cit.

the plan and eighteen existing buildings were reorganized."¹

During the twenties and early thirties most Detroit elementary schools participated in the platoon system.

The platoon system obviously was responsible for the multitude of additions attached to existing school structures at this time. As previously mentioned, prerequisites for a successful platoon program are the inclusion of an auditorium and gymnasium, and the additions invariably include the two aforesaid facilities.

Safety in school buildings. In 1912 the official adoption of building codes and safety regulations by a City of Detroit ordinance was put into effect. From this time, construction materials used in Detroit school buildings were fire resistant.

In the early days of school architecture, the factor of safety seems to have been overlooked. History records numerous school buildings placed near main highways; cracked stoves and chimneys; of falling plaster; and buildings in a dangerous and dilapidated condition. Spain states that "schools in large towns and cities were often built three or four stories high, of non-fireproof material, with steep narrow stairways and without fire escapes. Not infrequently on the top floor of one of these high buildings an auditorium was provided in which as many as seven hundred people were at times assembled."²

The idea of safe living has made slow progress in this country and even today in many of our most enlightened communities there are three-story school buildings which are not fireproof. It is true that building codes and safety regulations require such devices as fire

¹Dorothy M. Perry, "Patterns of Selected Innovations in Detroit Public Schools, 1895-1945" (unpublished Ph. D. dissertation, Wayne State University, 1950), pp. 251-253.

²Spain, op. cit., p. 132.

walls and doors, sprinkler systems, and fire escapes; but unfortunately many hazards still continue to exist in old structures.

Detroit presently houses pupils in sixty-four school buildings which were constructed before 1912. This represents approximately 22 per cent of the total school buildings. Stated in another way, approximately 52,552 pupils in September, 1960, were housed in schools constructed of combustible materials. A complete list of Detroit public schools by year of original construction¹ appears in Appendix A.

In summation, one could conclude that construction of school facilities in Detroit has been conditioned by the following factors:

1. Growth of Detroit as an urban center has resulted in periods of extensive school construction programs and, conversely, periods of little or no activity.
2. Conformity with accepted school architectural design at a given time.
3. Conformity with changing educational program concepts.
4. Initiation of building codes and safety regulations resulting in construction of school buildings with fire resistant materials.
5. Ability of the school district to finance new construction.

Financing building programs. Historically the pattern of school building growth in Detroit has paralleled the need for new facilities. In the past, citizens of Detroit have been generous in providing necessary funds for construction of school facilities. For example, in 1949 the voters approved a millage proposal providing sufficient funds to build twenty-three new schools and additions to some fifty-three previously

¹Architectural Planning Department, list of schools by year of original construction date gathered from existing records of the Detroit Board of Education (November, 1960).

constructed buildings. As a result of the 1949 millage vote, the last new school opened its doors in 1956. The pattern of voter approval for necessary funds and its harmonious relation to the school board abruptly ended in 1957 when the people of Detroit rejected a millage increase. The schools could ill afford to lose such support and as a result, a school building construction lag occurred at a time when school enrollments were reaching a new peak.

Following defeat at the polls in 1957, the Detroit Board of Education and school administrators undertook a program to inform the people about requirements for the future needs of the schools. It was determined that the best possible way to educate the public was to involve members of the community in a total effort of fact-finding which would result in recommendations to be considered by the Board of Education.

William D. Merrifield, then president of the Detroit Board of Education, defined the problem in a letter of invitation to a citizen asked to serve on a committee.

The Board of Education is convinced that one of the most important jobs for the City of Detroit is to develop an adequate program of education for the years ahead. It is, therefore, appointing a city-wide Committee and eight Regional Citizen's Advisory Committees on School Needs. These committees are asked to study the school needs of the community, then to formulate recommendations to the Board of Education as to the school services and facilities which they believe Detroit should have.¹

Following the work of 1500 citizens, one of the many recommendations adopted by the Board and later approved by a favorable vote was the adoption of a budget which would provide funds, beginning July 1, 1959, to initiate a wide program of recommended improvements in the schools.

¹Findings and Recommendations (abridged) of the Citizen's Advisory Committee on School Needs, Detroit, Michigan (November, 1958).

This action provided 90 million dollars for improvement of existing school buildings and sites and for the acquisition of new sites and construction of new buildings. The 90-million-dollar budget was established by a Citizen's Committee and school authorities to cover the school building needs for the five-year period, 1959-1964. At the end of this five-year period the Committee recommended that the Board of Education go to Detroit voters and ask for an additional 68 million dollars to provide more needed building improvements and new construction during the second five-year period, 1964-1969.

Readers should be cautioned at this point that the author is fully aware of many unforeseen changes which could take place in the building program for the five-year period through 1964. Further, the proposed plan for the five-year period, 1964-1969, could bring additional changes not now anticipated. The remaining section is devoted to objectively reporting conditions and facts found in September, 1960, in the Detroit schools and is based on the planned changes for a ten-year period.

Capital outlay expenditures. In view of the rising pupil population in Detroit and the need for additional facilities as established by a Citizen's Committee, it would be well to review the volume of school construction in the ten-year period, 1951-1960. During the five-year period, 1950-51 to 1954-55 capital outlay expenditures remained fairly constant.

During the five-year period, 1955-56 to 1959-60, capital outlay expenditures have been decreasing. A low of \$2,686,621.41 was expended in 1959-60. Table 4 presents the above data in more complete form.

Figure 2 graphically illustrates the drop in capital outlay expenditures during the same period of time.

In Detroit no new building construction took place from 1956 until early 1962. This building lag increased the difficulty of contending

Table 4. Detroit Building and Site Fund Expenditures for Years 1950-51 Through 1959-60 Both Inclusive. Detroit Board of Education

	Purchase of Land	Improvements to Grounds	New Buildings and Additions	Architects and Engineer Fees
1950-51	\$ 142,100.38	\$ 244,825.04	\$ 8,924,506.29	\$ 377,760.31
1951-52	276,983.44	453,908.33	6,140,105.99	391,692.32
1952-53	94,494.52	423,261.08	8,974,241.17	364,558.87
1953-54	476,340.69	376,088.16	8,813,204.45	425,231.31
1954-55	1,074,860.70	359,398.89	11,340,412.84	524,089.45
1955-56	1,127,117.47	457,984.79	7,824,146.53	319,288.06
1956-57	235,804.02	438,430.29	5,896,386.00	428,775.90
1957-58	437,034.74	462,237.20	1,605,845.64	56,079.86
1958-59	207,413.50	251,692.54	68,233.87	46,319.46
1959-60	160,505.98	134,695.05	8,548.77	4,225.56
TOTAL	\$4,373,533.61	\$3,602,521.37	\$59,595,631.55	\$5,769,417.32

Source: Annual Audited Financial Report, 1960, The Board of Education of the City of Detroit.

- NOTE: 1. Building and Site Fund Expenditures in the 1949-50 fiscal year as herein reported to not include expenditures for long term leases.
2. Reimbursable capital outlay expenditures have been excluded throughout.
3. The 1959-60 fiscal year does not include expenditures for bond validation expense nor does it include the expenditure of \$9,999,724.81 for the purchase of temporary investments from bond sales receipts.

Alterations	Equipment	New Temporaries	TOTAL
\$ 885,213.97	\$ 521,049.93	\$	\$11,095,455.92
887,809.41	537,942.09		8,688,441.58
705,226.81	468,126.16	139,320.44	11,169,229.05
874,842.75	392,269.28	273,274.75	11,631,251.39
1,310,438.16	809,373.10	131,927.94	15,550,501.08
1,039,805.43	701,284.94	255,711.81	11,725,339.03
1,209,281.70	772,888.67	466,402.40	9,447,968.98
1,796,579.63	393,087.86	47,688.62	4,798,553.55
2,011,673.52	309,939.86	211,102.92	3,106,375.67
1,792,432.50	436,791.66	149,421.89	2,686,621.41
\$12,513,303.88	\$5,342,753.55	\$1,674,850.77	\$89,899,737.66

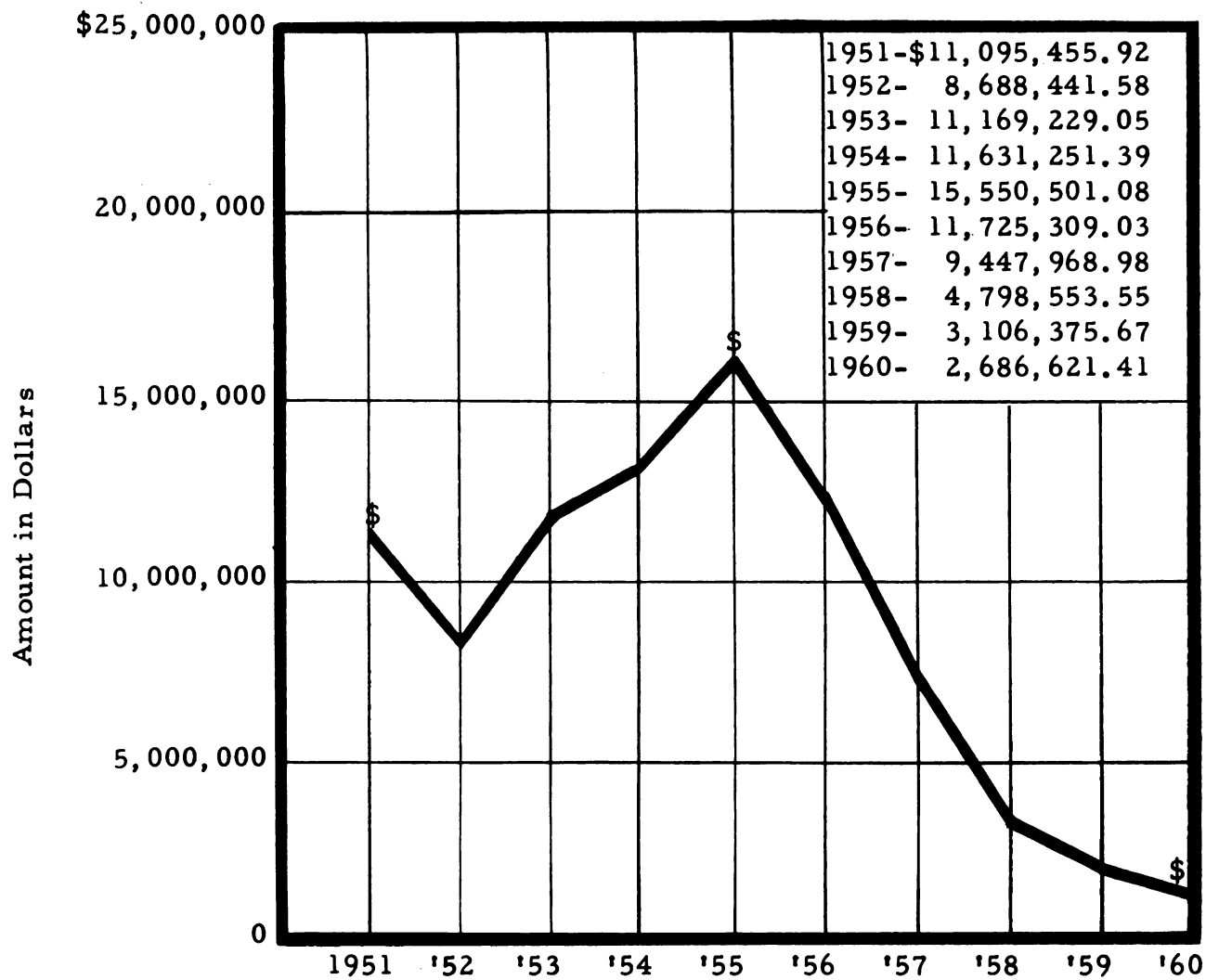


Figure 2. Building and site fund expenditures, July 1, 1951, to June 30, 1960, Detroit public schools. (From Annual Audited Financial Report, Detroit Public Schools.)

with mushrooming school enrollments, continuing obsolescence of over-aged buildings, shifting populations, overcrowded classrooms, and the need for continued improvements in educational programs for Detroit's children.

The life cycle of school buildings. The significance attached in this study to school buildings forty years and older is due in part to Handler's descriptive portrayal of the life cycle of school buildings. He states that a turning point in the process of deterioration is reached between the ages of forty and fifty years or even earlier.

The process of deterioration is not arrested, and defects continue to mount until between ages 40 and 50, or even earlier. A climax occurs. The cry of educational obsolescence may already have been raised. Teachers and schoolmen are quite likely to have concluded that the building as it stands no longer permits the teaching of a modern curriculum by modern pedagogical methods and that it no longer conforms to modern standards of school environment. Gradually this feeling spreads to the public at large.

At the same time, the accumulation of symptoms of several kinds of deficiency reaches a peak. The incidence of site, location, environmental and perhaps educational inadequacy is greater among school buildings than ever before.

Beyond 50, even with a record of previous modernization treatment, a pattern of steadily growing maintenance costs is repeated or, what amounts to the same thing a steady decline occurs in the serviceability of the building. Increasing major repairs will be needed. More frequent breakdowns in service will occur. Frustrated discussions will often result in an unenthusiastic decision neither to replace or remodel the old school but to maintain and operate it until such time as it can be replaced.

Thus around the age of 60, the deficient school which survived will become increasingly obsolescent educationally. Site, location, environment, and service systems become worse. Only the structure continues to be kept in good shape.

The building acknowledged to be unsatisfactory does not deserve further major expenditure. It may be scheduled for retirement, but as long as it continues to serve as a school its upkeep and lack of serviceability will cost the community dearly.

Schools of the future by no means need to follow the life cycles of past and existing schools. If a building is properly constructed and well maintained, structure and fire hazards should present no problem.¹

Age of Detroit schools. In view of Handler's remarks, the writer thought it pertinent to determine the number of Detroit's present school buildings that are forty years or older. Table 5 indicates that Detroit presently has 126 buildings forty years or older.

Table 5. Number of Detroit School Buildings Forty Years or Older, September, 1960*

Building Age in Years	Schools
80-89	3
70-79	11
60-69	18
50-59	25
40-49	69
Total	126

* For year of original construction date, see list of schools in Appendix A.

¹A. Benjamin Handler, Economic Planning for Better Schools (Ann Arbor, Michigan: University of Michigan, 1958), A Department of Architecture Research Publication.

From the above information it is evident that:

1. The average age for these 126 buildings is approximately fifty-three years.
2. These buildings represent approximately 45 per cent of the total school buildings in Detroit presently housing pupils.

Figure 3 graphically illustrates the age of present buildings in 1960.

By 1970, if all the present facilities are in use, a total of ninety-nine more Detroit school buildings will be forty years or older. This would represent some 80 per cent of the total buildings now in use. Figure 4 graphically illustrates this data.

The assumption can be made that Detroit has a high percentage of aging buildings that will reflect characteristics as described earlier by Handler.

A school building status report dated December 27, 1960, as indicated by Table 6, reveals that the 90 million dollars approved by Detroit voters was recommended to be spent during the next five years as follows:

Table 6. Proposed School Building Changes in Detroit for a Five-Year Period

Proposed Changes	Number of Buildings*
Present buildings to be replaced	19
Present buildings to be rehabilitated	24
New buildings on new sites	25
Present buildings with new additions	6
Completion of existing buildings	3
Conversion of existing buildings	5
Total	82

*Detroit Board of Education, School Housing Division, Site - Planning - Construction Status Report.

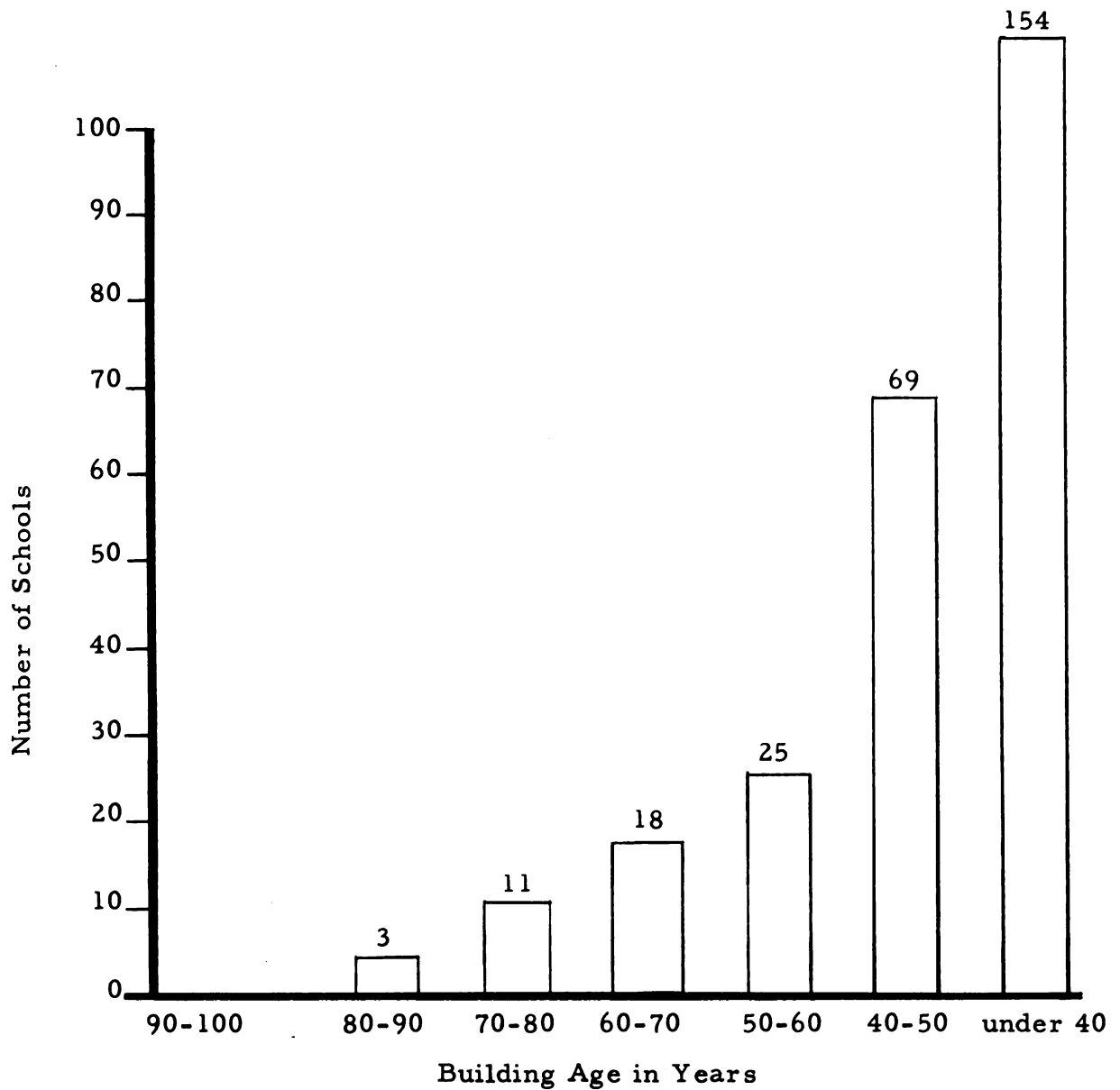


Figure 3. Age of present Detroit school buildings, September, 1960.
(From the Architectural Planning Department, Detroit
Public Schools.)

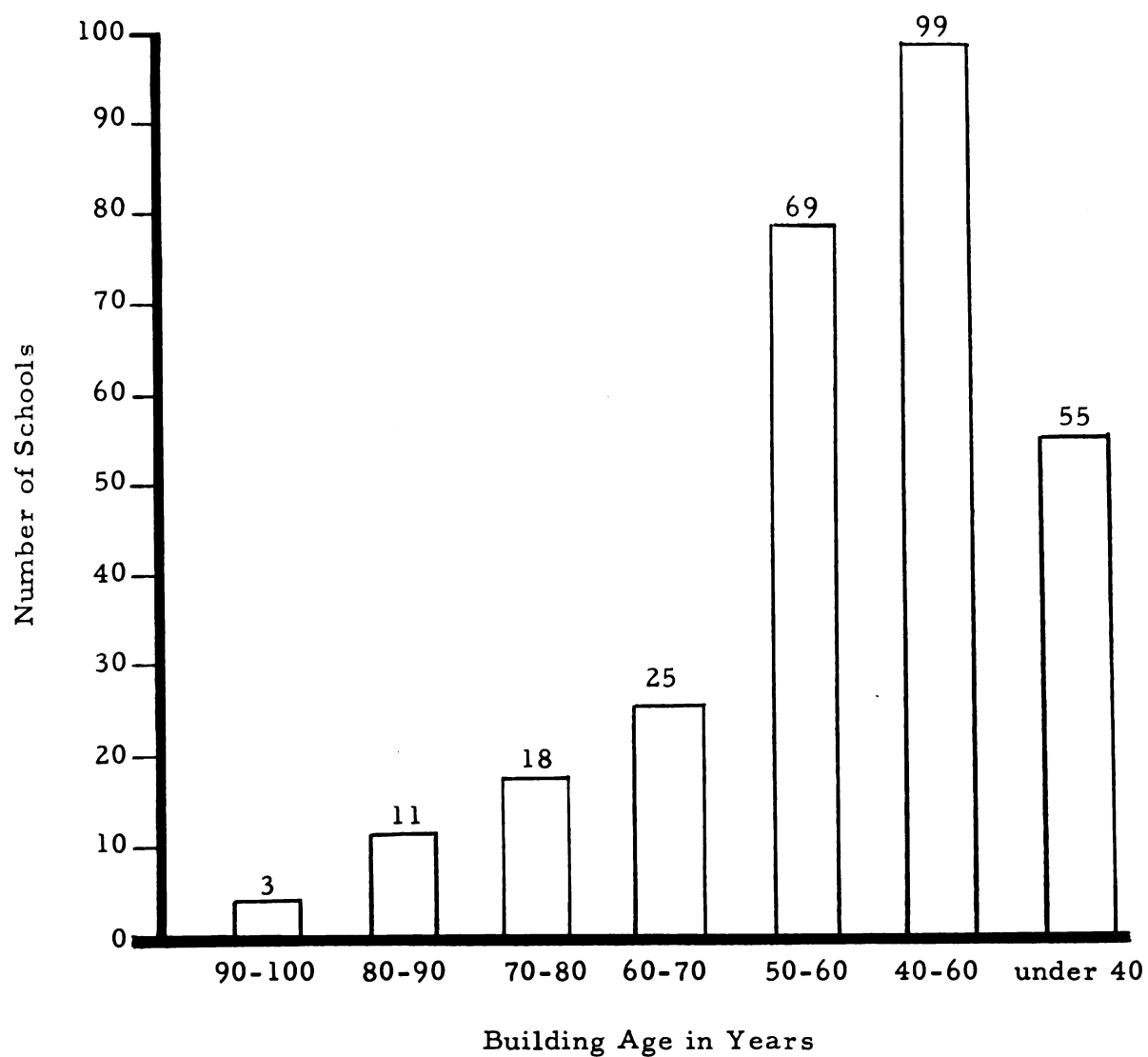


Figure 4. Age of present Detroit school buildings, 1970, with no planned changes. (From the Architectural Planning Department, Detroit Public Schools.)

It should be noted that 43 of the present 126 buildings that are forty years or older are scheduled for replacement or rehabilitation.

Referring to the figures from the above status report, it can be stated that by 1965 Detroit would have approximately 300 buildings housing school pupils.

As indicated earlier, fifty-four more buildings will be forty years or older by 1965. If the recommendations as outlined in the status report are adopted, the following facts can be concluded with some assurance:

1. By 1965 buildings forty years or older would constitute approximately 52.5 per cent of the total buildings.¹
2. In the five years beyond 1965 or by 1970, Detroit is scheduled to replace fifteen existing buildings and construct an additional ten units.

Projecting the figures from items 1 and 2, 62 per cent of Detroit's total school buildings will be forty years or older by 1970.

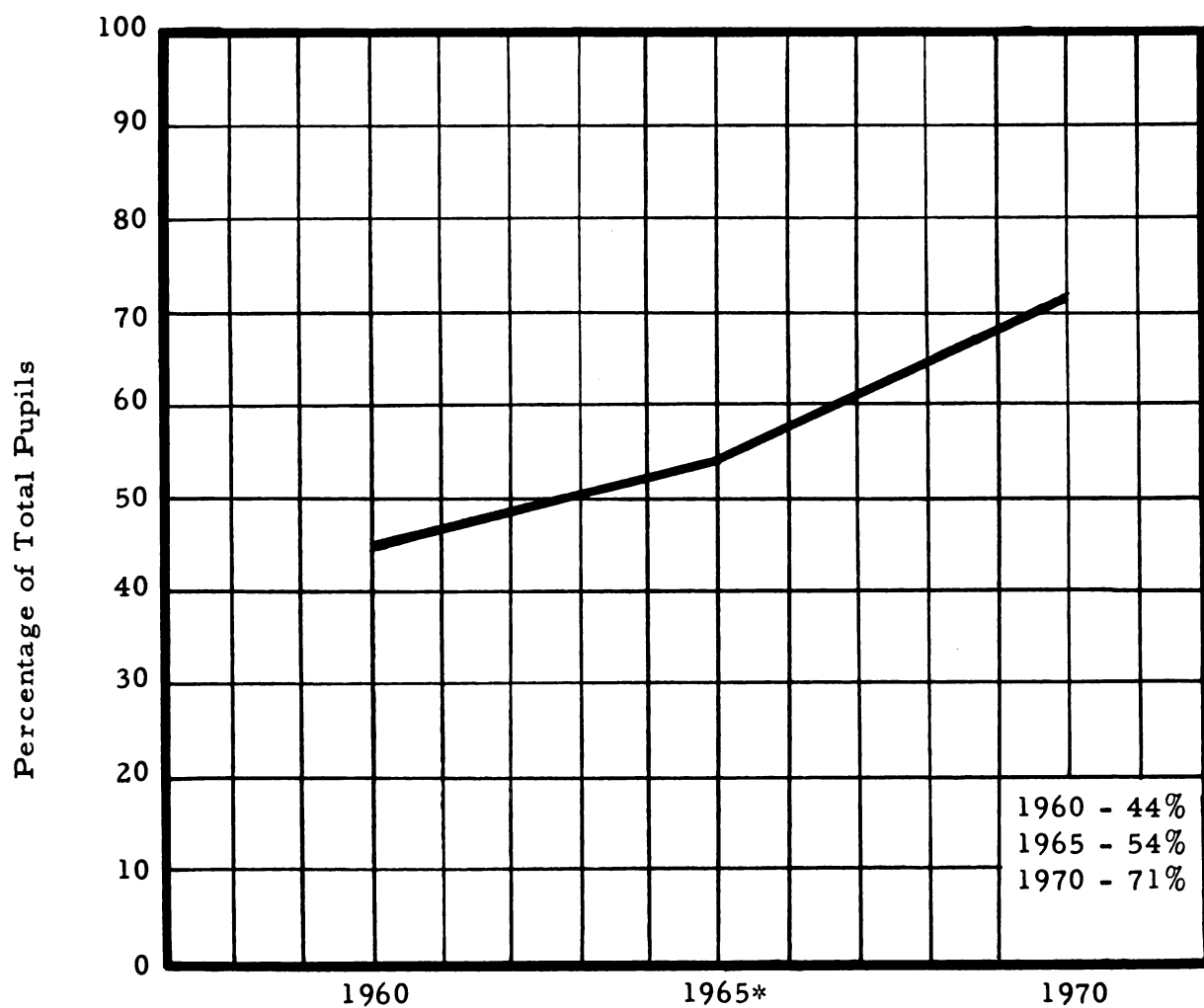
Despite the intensive program of replacement and new units under construction, Detroit will continue to be faced in the immediate years ahead with the problem of large numbers of buildings forty years or older.

The predicted pupil enrollment in Detroit schools for the period 1960 to 1970 shows that the enrollment will fluctuate between 285,304 and 300,000.²

Figure 5 portrays what percentage of Detroit Public School pupils will be enrolled in schools forty years and older by 1965 and 1970.

¹This figure includes the twenty-four school buildings scheduled for rehabilitation.

²See Figure 1, page 7.



* Estimated enrollment based on 1960 pupil enrollment data.

Figure 5. Percentage of Detroit public school pupils in buildings forty years or older, 1960-1970. (From the Office of Administrative Research, Detroit Public Schools.)

If it is assumed that class size in 1965 and 1970 will remain approximately the same as the present ratio of thirty-two pupils per teaching station, one can estimate the percentage of pupil load for these facilities.

1. By 1965, 162,602 pupils will be in school buildings forty years or older. This represents 54 per cent of the total predicted pupil load for 1965.¹
2. By 1970, 203,025 pupils will be in schools forty years or older. This represents 71 per cent of the total predicted pupil load for 1970.²
3. A high percentage of public school enrollments will continue to be found in older buildings.

Summary. Historically the growth pattern of schools has paralleled the rise of Detroit as a large urban center. The economic fortunes of the city have resulted in alternate periods of extensive school building construction and preservation of the status quo.

Significantly, the architectural design of buildings has been a reflection of the purposes and limitations of the period. Two hundred years ago schools were simply constructed to house a given number of pupils. Beginning about 1848 the design of the facilities began to reflect the purpose of a program. To date the concept of a platoon program has provided the greatest impact in structuring school plants in Detroit.

Equally important was the adoption in 1912 of codes requiring buildings to be constructed of fire-resistant materials. From 1912 to the present time, codes have been improved and re-defined to attain the highest possible degree of health and safety standards for the building

¹Pupil numbers based on September, 1960, enrollment; data from the Detroit Board of Education, Office of Administrative Research, Digest of Membership, Detroit Public Schools.

²Ibid.

occupants. This has resulted in new concepts of construction and use of building materials. Detroit presently has some 280 school buildings of varying age reflecting a design apropos to a particular period or program.

The recognized need for additional facilities and the subsequent approval of funds has insured a building program for the five-year period 1959 to 1964. The need also provided opportunity for school officials to evaluate existing buildings in light of present-day standards. Decisions were made that have resulted in a proposed program of eighty-two projects for a five-year period. The projects included new construction, abandonment of old buildings, and conversion of buildings to fit a changed program. This is an ambitious venture and one that has had the judgment and resourceful consideration of laymen, professional building experts, and planners. In the five years beyond 1964 a program of equal magnitude is considered necessary.

Will this ten-year program result in the building needs of Detroit being met for an extended period? It has been suggested in this chapter that despite the purposeful building program, Detroit is now and will be faced in the future with an increasing percentage of school facilities forty years and older that will require decisions to rehabilitate or to abandon in favor of new construction.

ASSUMPTIONS

The following assumptions are basic to this study:

1. Operating and maintenance cost differences exist between buildings of varying age.
2. Maintenance and operating differences in individual buildings of similar age will vary.
3. For each building in the study an itemized breakdown of cost data can be obtained.

4. Square-footage computations for each building can be obtained from a Detroit Board of Education architect using the Standard American Institute of Architects formula.
5. Due to large numbers of Detroit school buildings forty years or older, a study of school facilities would be valid and of importance to the Detroit school system.

HYPOTHESES

A hypothesis is a possible explanation for events expressed as a generalization or proposition seeking to explain conditions or events that have not yet been confirmed by facts. There are numerous methods employed by researchers to prove or disprove stated generalizations. In the present study an attempt will be made to uncover facts that differences do exist in maintenance and operating costs in varying aged Detroit school buildings and sites.

These hypotheses are:

1. Old buildings are expensive to operate and maintain.
2. Middle-aged buildings are less expensive to operate and maintain.
3. Recent buildings are least expensive to operate and maintain.

DEFINITIONS OF TERMS

There are terms used universally throughout the literature which have a specific connotation relating to this study. In recent years, the need for more preciseness in the use of terms has resulted in a rather extensive study by the United States Office of Education. Their definitions will be used in this study.¹ Additional terms unique to the Detroit

¹Paul Reason and George Tankard, Property Accounting for Local and State School Systems (Washington, D. C.: U. S. Government Printing Office, 1959). U. S. Department of Health, Education, and Welfare,

Public Schools will be so identified.

1. School Site:

The site for a given school plant consists of all the land serving the school, together with all improvements to the site (other than structures), such as grading, drainage, drives, parking areas, walks, plantings, playcourts, and playfields.

2. School Plant:

A school plant is composed of the site, buildings, and equipment used by a single school, or by two or more schools sharing the use of common facilities.

3. Fire-Resistive Building:

A building constructed entirely of fire-resistive materials; or a building with fire-resistive walls and partitions, floors, stairways, and ceilings. A building of this type may have wood roof construction over a fire-resistive ceiling.

4. Semi-Fire-Resistive Building:

A building with fire-resistive exterior and bearing walls and fire-resistive corridor and stairway walls, floors, and ceilings; but with ordinary construction otherwise, such as combustible floors, partitions, roofs, and finish.

5. Combustible Building:

An all-frame building; a building with fire-resistive veneer on wood frame; or one with fire-resistive bearing walls, but otherwise of combustible construction.

6. Mixed Construction:

A building with one or more sections of one type of construction

Office of Education; see also, Paul Reason and Aopheus L. White, Financial Accounting for Local and State School Systems (Washington, D.C.: U. S. Government Printing Office, 1957), U. S. Department of Health, Education, and Welfare, Office of Education.

and one or more sections (as additions) of another type of construction.

7. Salaries for Custodial Services:

The full-time, part-time, and prorated portions of salaries of custodians, firemen, custodian helpers, matrons, general utility men, dairymen, night watchmen, and other such personnel who sweep, clean, polish, mop, care for buildings and livestock, operate the heating and ventilating systems, and perform any other housekeeping duties, for all purposes except direct expenses for Pupil Transportation, Food Services, Student-Body Activities, and Community Services.

8. Electricity:

Expenditures for electricity for artificial lighting and power, except for heating buildings, for all purposes except direct expenses for Pupil Transportation, Food Services, Student-Body Activities, and Community Services.

9. Heat for Buildings:

Expenditures for all coal, steam, electricity, gas, gasoline, fuel oil, and wood used for heating, including transportation costs, involved in securing them, except direct heating expenses for Pupil Transportation, Food Services, Student-Body Activities, and Community Services.

10. Building and Site Maintenance Costs:

Maintenance cost consists of activities that are concerned with keeping the grounds, buildings, and equipment at their original condition of completeness or efficiency. Reported here are expenditures for repair and replacement of school property. Expenditures for total replacement of a building or for additions to existing structures are not classified as "Maintenance, " they are considered Capital Outlay.

For the purposes of the present study the following defined terms apply specifically to Detroit Board of Education school building facilities and sites:

1. School building:

Those elements within a specified school attendance area designated by the Detroit Board of Education for educational use.

2. Obsolescence:

A building is considered obsolete when it fails to meet the following conditions:

- A. It no longer serves the need of an educational program established as standard for Detroit Public Schools.
- B. Varying degrees of physical deterioration causes conflict with existing state and local building codes regarding the safety and health of building occupants.
- C. Reorganization, pupil centralization in some other spot, population shifts, or other factors occur which make use of the building undesirable or uneconomical.

3. Cost data:

Cost data involve those costs directly concerned with the school structure and the school site. This study should have a greater degree of validity than a similar investigation comparing Detroit school buildings to school buildings constructed outside of the city, because factors affecting operation and maintenance costs differ from community to community.

In comparing school costs for Detroit schools it is assumed that the quality of materials and finishes used in construction has been essentially the same for schools of similar age periods.

4. Square-foot computation as applied by the A. I. A. Document Number D 101 Formula -- The Architectural Area of Buildings:

The following rules are applied by the Detroit Board of Education Architectural Department for computing square-foot areas of school buildings in Detroit:

A. All measurements are to be made from exterior rough wall lines.

B. Totally enclosed space should be counted as full area.

Among the areas included are:

- (1) Each floor of the building
- (2) Boiler, transformer and fan rooms
- (3) Stairways and corridors
- (4) Usable basement

C. Covered, unenclosed space shall be counted as one-half of the actual area. Included in such spaces are:

- (1) Open, covered passages and porches
- (2) Overhangs and sun control devices so designed and located that they function as, and in lieu of, covered walks
- (3) Mezzanines for storage purposes

D. Areas which should not be counted include:

- (1) Eaves and sun control devices except as noted in C (2) above
- (2) Unsheltered platforms and steps
- (3) Mechanical tunnels or crawl spaces under 6' in height
- (4) Unexcavated areas

5. Rehabilitation: :

The act or process of putting into good repair or of restoring to a previous good state a school building.

6. Abandonment:

Leaving or giving up the use of a school building.

LIMITATIONS OF THE STUDY

1. The study is limited to thirty elementary school buildings and sites in the city of Detroit, Michigan, divided into three groups of ten school buildings and sites:
 - A. Ten "old" buildings -- range in age from fifty-four to seventy-three years.
 - B. Ten "middle-aged" buildings -- range in age from thirty to forty-eight years.
 - C. Ten "recent" buildings -- range in age from four to ten years.
2. The selected operating and maintenance cost figures will cover a period of time beginning with the fiscal year July 1, 1956, and ending with the fiscal year June 30, 1960. Data considered in the study will include the following:
 - A. Building and site maintenance cost.
 - B. Electrical and heating operating cost.
 - C. Custodian salary and custodial supply cost.
3. The cost differences in individual buildings of similar age will be investigated only incidentally as they relate to the study.

Despite these limitations the factual cost data and square-foot computations obtained by this researcher are believed to be reliable and worthy of investigation. Further, recognizing that many factors condition a decision to rehabilitate or abandon school facilities, a review of the literature will include a discussion of educational adequacy and human values associated with buildings of varying age and architecture.

Moreover, a concluding chapter based on the author's background and experience while working with old buildings will deal with major objectives that determine when a school building should be abandoned or rehabilitated.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

Many factors condition a decision to rehabilitate or abandon school facilities, therefore this study will review research material and current literature including a discussion of educational adequacy and human values associated with buildings of varying age and architecture. Various theories and opinions in the area of educational school plant facilities are discussed so that the data and conclusions of this study may be viewed in proper perspective. The flurry of school building construction in this country and the increased number of published materials on the subject in recent years precludes complete coverage in the study area to be considered.

Recognizing the problem. In 1955 the Committee for the White House Conference on Education made the following statement in a Report to the President:

In the richest nation in all history, there is no valid reason for the grimy, dilapidated and overcrowded school buildings which too many children now occupy. It is an ironic truth that most Americans would not permit their children to live in a house which is as bad as the school buildings which many pupils are forced by law to attend.¹

One may wonder whether it was the same committee when it wrote a few pages later:

¹House of Representatives, Committee for the White House Conference on Education, 1954-1955. Federal Aid to States for School Construction, Hearings Before a Sub-Committee of the Committee on Education and Labor, 85th Congress, 1st Session, p. 6.

. . . The American people are not inclined to stint themselves when it comes to building schools. . . . It is easier to get a bond issue passed for a good school than for a poor one. The school building apparently has become the chief expression of American concern for children. Often the school is the finest building for miles around, a center of community pride, as well as of community activities.¹

Seemingly, a paradox exists in communities throughout the country. Why one community apparently has solved the problem of providing acceptable buildings in light of present day standards and another community is struggling with plant facilities is unknown by the Committee. In large urban centers both types of communities exist.

Sargent, writing in 1955, offers his opinion that the following conditions are peculiar to old cities:

- (a) decline of population at core of metropolitan city
- (b) stagnation of school plant development
- (c) blight in education through sterile adaptation to obsolete environment.²

In 1954 a profile was drawn of the 221 school buildings in Boston.

This typical but mythical school is located on a site which is between one-half and nine-tenths of an acre. (Only 18 have more than two acres.) Building is located in area which has adjacent combination of residential and industrial structures. It was built between 1900 and 1920. (Only 22 have been constructed since 1920, whereas 75 were built before 1900.) It will be between $2\frac{1}{2}$ and $3\frac{1}{2}$ stories and odds are that it will have more than $3\frac{1}{2}$ stories, rather than less than $2\frac{1}{2}$. (Only four buildings in the city are one-story structures.)

Classrooms with exception of kindergartens have fixed furniture throughout. Classrooms are poorly lighted (probably less than 20-foot candles) and there are excessive brightness contrasts present because of dark woodwork, unshielded light

¹Ibid., p. 25.

²Cyril G. Sargent, "Urban Schools," School Plant Studies, Washington 6, D. C.: American Institute of Architects, BT 1-20, May-June, 1955).

sources, natural or artificial. Toilets are located in poorly ventilated basements. Most handwashing facilities are located in same sink as drinking fountains.¹

Not all cities, of course, exhibit these same conditions. Each urban area presents its unique combinations and characteristics of growth, development, blight, or decay. But amid all variations are certain more or less common features which in composite can be said to represent urban problems of America.

How serious is this problem of seemingly obsolete school plant facilities? Writing about the present school building situation Cocking indicates that since 1950 new construction has been moving forward at a rate of 9,000 elementary and secondary buildings a year.² More recent studies conducted by the U. S. Office of Education indicate that new school construction is at a correspondingly higher peak each year.³ Nevertheless, "a shortage of at least 130,000 public school classrooms today exists in the U. S., according to former Secretary of Health, Education, and Welfare Arthur Fleming."⁴

The editor of the American School Board Journal writing in March of 1961 pointed out that:

Figures released by the U. S. Office of Education about January 1, 1961, show the shortage of classrooms has risen by 6,900 over the autumn of 1959 and now stands at 142,000. The shortage includes 66,100 rooms needed to relieve overcrowding and 76,000 to replace unsatisfactory facilities.⁵

¹Harvard Graduate School of Education, Center for Field Studies, Look to the Schoolhouses, Report of Study Made at Request of Boston School Committee (Cambridge, Mass., 1953).

²Walter D. Cocking, "The School Building Situation," Our Schools (New York: School Executive Magazine, Vol. 20, No. 11, November, 1957).

³U. S. Office of Education, National Goals in the Staffing and Construction of Public Elementary and Secondary Schools (April, 1960).

⁴Golemon and Rolfe, Environment for Learning (Syracuse, N. Y.: Carrier Corporation, February, 1960), p. 3.

⁵"Classroom Shortage," An Editorial. American School Board Journal. Vol. 142 (March, 1961), 42.

In a school facilities survey conducted by the U. S. Office of Education, the authors listed three factors which affect schoolhousing needs in the United States:

- (a) Population phenomena
- (b) Educational changes and improvements
- (c) Financial problems¹

There was a virtual cessation of schoolhouse construction during the depression years and during World War II. This, plus the large influx of new pupils and stringent limitations on financing school construction, have combined to create a wide gap between the nation's school plant needs and the necessary construction of adequate facilities.

To this must be added the sudden emergence of the age of science and space. A schoolhousing "need" depends almost entirely upon the educational program in all its aspects. Today's school is viewed in terms of the structure of organization of the program, what instructional methods will be used, and what uses the community will make of the school plant. Not only must the aims, organizations, and methods of the present program be considered, but its future direction also must be ascertained so that future generations will not be impeded by inappropriate physical arrangements.

Cocking indicates that the growing obsolescence in present school buildings is due to a lack of educational planning for a majority of buildings constructed prior to 1920.

Many of these older buildings are totally unable to accommodate present programs and procedures. The cost of modernizing these structures is more, in many cases, than the cost of a new building.²

The School Facilities survey in 1952 stated that: "Many existing schoolhouses are so grossly inadequate that preservation through

¹U. S. Office of Education, School Housing Section, School Facilities Survey (Washington 25, D. C.: 1952), p. 14.

²Cocking, loc. cit.

rehabilitation is no longer economical."¹

Handler, writing in the field of school plant, spells out rather carefully that buildings have a life cycle. Deterioration and problems occur from the start and become increasingly evident as the building ages.

Site, location, environment, and service systems become worse and worse. Only the structure continues to be kept in good shape. As long as it continues to serve as a school its up-keep and lack of serviceability will cost the community dearly.²

Jordan and Jackson wrote in the National Elementary Principals Yearbook, 1959:

The average useful life of school buildings is 50-75 years. It is regarded as uneconomical to spend as much as half of the cost of new construction on altering or adding to a building which has only half its useful life remaining. If, on the other hand, the cost of the alterations is less than one-third, the cost of new construction, renovation may be economically feasible.³

A survey staff studying schools in Highland Park, Michigan in 1957 stated that "most school plant consultants regard 50-60 years as a maximum use span for such facilities, even though the shell of the building might withstand the elements for 100 years or more."⁴

An A.A.S.A. School-Building Commission writing in 1960 stated:

There is a natural tendency to continue to use a school building as long as it remains sound, simply because it is there and has functioned satisfactorily for 20 or 30 years. . . . the decision to remodel or to rehabilitate may do nothing more than

¹U. S. Office of Education, loc. cit.

²Handler, loc. cit.

³Marion Jordan and David M. Jackson, "The Schools We Already Have, Elementary School Buildings Design for Learning," The National Elementary Principal, Vol. XXXIX, No. 1 (September, 1959), 181.

⁴Michigan State University, Bureau of Educational Research, Planning for School-Community Development. Highland Park (East Lansing, Michigan: Michigan State University, January, 1957), p. 26.

to extend the life span of a structure that is already obsolete so far as its educational usefulness is concerned.¹

Writing about school facilities obsolescence Freeman said:

The safest way to estimate replacements probably is by the average age of the buildings. Assuming a 50-year life, all classrooms built prior to 1920 should be replaced by 1970. Many buildings will serve longer, others will be retired sooner. But the average 1920 building should be abandoned by 1970.²

If one were to consider the physical condition of a school building merely from the standpoint of health, safety, and soundness; or when the maintenance and operation costs of an old structure become unbearable to the taxpayers, it would be a great temptation to use buildings fifty to one hundred years or longer. Indeed this is the case in many communities. Authorities agree almost universally that physical deterioration is only one factor in the final determination of a school building's fate.

Educational usefulness. Herrick, McLeary, Clapp, and Bogner emphasize repeatedly that the school plant should be designed to fit a desired program and that a lack of attention to the relationship of program to plant may well be a glaring weakness within the building.³

McConnell in the same vein of thought concludes the weakest link in a school building is the lack of recognizing the need to fit educational requirements to the existing structure. He points out that, formerly, the teacher was conceived of as a regimented person in charge of rows of children at fixed desks.

¹A.A.S.A. School Building Commission, "Rehabilitating Existing School Buildings," Planning America's School Buildings, Washington 6, D.C.: American Association of School Administrators, 1960), p. 202.

²Roger A. Freeman, School Needs in the Decade Ahead (Washington 5, D.C.: The Institute for Social Science Research, 1958), p. 186.

³John H. Herrick, Ralph D. McLeary, Wilfred F. Clapp, Walter F. Bogner, From School Program to School Plant (New York: Henry Holt and Company, 1956).

The teaching method consisted largely of drill and the recitation of bits of factual material, and all youngsters were expected to learn the same way. The classroom and the facilities were planned with these methods and purposes in mind.¹

He implies that our concept of the purposes of education has broadened so that method is largely concerned with activity and experience. "Needless to say, the old classroom, with its fixed seats and outmoded facilities, does not suffice for education today."²

Heffernan and Bursch, in dealing with the problem of fitting curriculum to the school plant, say that ideally "a school building is a background for an activity and it accentuates or complements what goes on. The perfect room or building is one which is apparent only to the extent that it facilitates the conduct of a desired activity or process."³

It is interesting to note that one author suggested in his educational philosophy that:

A school which proposes the development of the child intellectually, socially, emotionally, and physically will require more comprehensive educational specifications for a school plant than would be required if the educational philosophy proposes a continuation of the traditional concept of education.⁴

We could ask ourselves at this point whether or not many of our massive institutional structures are capable of a program that people desire for their children.

Referring to obsolescence in school buildings, Viles indicates that:

¹James D. MacDonnell, Planning for School Buildings (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1957), p. 171.

²Ibid., p. 173.

³Helen Heffernan, Charles Bursch, Curriculum and the Elementary School Plant (Washington 6, D. C.: National Education Association, 1958), p. 8.

⁴National Council on Schoolhouse Construction, Elementary School Plant Planning (East Lansing, Michigan: College of Education, Michigan State University, 1958), p. 4.

Dynamic educational programs are ever changing, and buildings should be adaptable to changing programs without too much effect on the basic structure. Such flexibility or adaptability contributes to maximum utilization and ultimate housing economy and may delay obsolescence.¹

The Twenty-Seventh Yearbook of the American Association of School Administrators, in speaking about obsolescence as applied to the school plant, stated:

This term is used to designate buildings that structurally are in such condition that they would probably stand for another fifty years or more, but from the point of view of housing an educational program are generally unsatisfactory.²

In Detroit, Michigan, it would not be difficult to find many buildings such as those described previously. Numerous buildings constructed of combustible materials nevertheless have satisfactory foundations, walls, and roofs that would assure full use of the facility for many years. However, due to age in these same buildings, basement classrooms, poor lighting, and inadequate toilet facilities often exist. It is small wonder that increased pressure is being felt by school authorities to abandon such structures in favor of buildings more able to provide a satisfactory educational program.

Bergstrom completed a research study in Detroit, Michigan, in 1961 which measured the impact of program modifications in selected elementary schools of different ages. Bergstrom arrived at the following conclusions:

1. Where major modifications occur, the educational adequacy of old school plants tends to be reduced significantly more than new school plants.

¹N. E. Viles, "Maintaining and Replacing Schools," American School Board Journal, Vol. 139 (July, 1959), 22-25.

²American Association of School Administrators, "American School Buildings," Twenty-Seventh Yearbook (Washington, D. C., 1949), p. 267.

2. Where major program modifications occur, the educational adequacy of middle-age school plants tends to be reduced slightly more but not significantly more than new school plants.¹

The implications of this study tend to show that program changes are not adaptable to old buildings. Bergstrom further implies that even with modernization of an old plant, enough loss of certain educational values still exists to seriously question the cost of rehabilitation. Too often, due to limitations imposed by outmoded school buildings, educators are forced to remain with a traditional curriculum and a rigid and authoritarian methodology.

Human values. John Lyon Reid has been a foremost exponent of the importance of considering human values in school architecture. He has written numerous articles dealing with color schemes and the importance of esthetic values to the growth and learning experience of children. He charges that:

Most unfortunately, precious little attention is paid to teaching programs to learning opportunities inherent in esthetic values of a building. Good architecture has a deep significance as a mark of our culture. Good architecture in schools is an indispensable necessity because of learning and development opportunities it provides for children.²

Pawley asks us to remember the words of the Chinese philosopher Lao-tsze when he stated 2,500 years ago: "The reality of a room is not in the four walls but in the space enclosed."³ Apparently the designers

¹Carl T. Bergstrom, "An Analysis of the Impact of Program Change on School Plants" (unpublished Doctor's dissertation, Department of Education, Michigan State University, 1961), p. 83.

²John Lyon Reid, "Color for Schools," School Plant Studies, (Washington 6, D.C.: American Institute of Architects, BT 1-18, January-February, 1955).

³Eric Pawley, "What is Good School Architecture?" School Plant Studies, (Washington 6, D.C.: American Institute of Architects, BT 1-13, April, 1954).

of schools previous to the end of World War II did not follow this axiom.

Since 1950 a more conscious effort has been made by architects to make school buildings more esthetically attractive and stimulating. Even so, as Pawley points out, we should be spending more money to create an environment pleasing to teachers and pupils. Germany, for example, requires by law that all public buildings must spend at least 1 per cent of the total construction cost for art incorporated in, on, or about the building. Individuals should not be expected to swap institutional efficiency for drabness. Ideally, the school should be comfortable and architecturally appealing as well as functional.

Perkins believes that a school architect must not only provide the physical facilities for the task of developing young minds and personalities but most importantly, "He must create the atmosphere, the environment that contributes most to the full growth of each child's mental, physical, and spiritual potentials." ¹

Only in the surroundings that a child is placed will he truly have the ability to appreciate physical beauty. Should not our school buildings contribute toward his feeling of beauty? In the words of Neutra, good architecture

. . . Becomes an instrument of human fate because it not only caters to requirement but also shapes and conditions our responses. It can be called reflective because it mirrors a program of conduct and living. At the same time this art of a planned environment does more, it also programs our daily conduct and our entire civilized life. It modifies and often breaks earlier established habits. ²

¹Lawrence B. Perkins, Work Place for Learning (New York: Reinhold Publishing Corporation, 1957), p. 6.

²Richard Neutra, Survival Through Design (New York: Oxford University Press, 1954), p. 314.

An article in the New York Times magazine stresses:

The ability to see is as important as the ability to read and write, and it, too, must be taught. The training of the eye to perceive and appreciate all the aspects of the world around us, from the accidental designs of nature to the man-made patterns of architecture, is a fundamental factor of learning.¹

An A.A.S.A. commission compared the merits of a good school building to ones with which we are familiar from our own experience:

These structures may meet the requirements of the material comforts necessary to the injection of knowledge, but they fail to touch the deeper emotions, and to lend the satisfactions so essential in stirring imaginations and inculcating lasting values. In a sense, these buildings are little more than educational parking garages. Good school buildings have a capacity for attracting beauty unto themselves and then transmitting it into the lives of those who have been intimately associated with them.²

Sharp charges that "school authorities sometimes fall into the trap of designing spaces so lacking in human appeal that they actually bring out what might be called negative impulses."³

When we read the mounting statistics pointing to obsolete school buildings in our country today, is it any wonder that we ask ourselves such questions as: Can we expect children coming from ugly buildings and basement classrooms to be able as adults to assume civic responsibility, to participate in cultural undertakings, and to recognize the finer attributes of a civilized society?

True, it is possible to take one ugly four-sided classroom and remove the fixed seats, replace the lighting to satisfy standards, sand

¹Ada Louise Huxtable, "The Art We Cannot Afford to Ignore--But Do," New York Times Magazine, (May 4, 1958), p. 86.

²A.A.S.A. School Building Commission, "Beauty: A Basic Ingredient," Planning America's School Buildings, (Washington, D.C.: American Association of School Administrators, 1960), p. 78.

³J. S. Sharp, "Human Factor in Building Maintenance," American School Board Journal, Vol. 142 (February, 1961), p. 38.

the floors, put in a new door, add a chalk board here and there and call it a renovated room. In reviewing the literature this is the sum total of rehabilitation in many school systems.

A re-evaluation of current ideas in renovation design is past due if an enlargement of objectives is to include children's emotional and spiritual needs. Beauty is one of the basic educational needs in a child's life. What better place to meet the need than in the schools where the children can be taught to understand and appreciate it?

Maintenance and operation. As pointed out in the presentation of the problem in Chapter 1, operation and maintenance costs of school buildings are two important factors conditioning a decision to rehabilitate or abandon school facilities.

A research study sponsored by the New York State Education Department in 1958 reveals that costs of maintenance and operation account for approximately 10 per cent of the annual budget which is larger than generally realized. Data gathered in New York State by the research group indicates that annual operation and maintenance expenses almost equal the cost of original construction. The authors point out that too few taxpayers realize that:

If some benevolent "angel" were to give them their school buildings at no cost whatever, their tax rate would be, on the average, only 12 per cent lower. The annual cost of maintenance and operation of their buildings is almost as much as they are paying annually in the form of debt-service for the retirement of building bonds toward the costs of the buildings themselves.¹

Viles has figures from a sampling of 538 cities that show:

Maintenance costs by groups range from 3.8 to 5.8 per cent of current costs or from about \$7.65 to \$21.41 per pupil

¹State Education Department, Potential Economics in School Building Construction, A Report of Research (Albany: University of the State of New York, 1958), p. 2.

in A. D. A. [Average Daily Attendance]. Operating costs are generally nearly twice the maintenance costs.¹

In looking for ways to save money, most of the attention has been directed to purchase costs while the upkeep costs have been largely taken for granted. In fact, Viles further states:

High maintenance costs are sometimes knowingly accepted, to "worry about later, " if the contract price can be reduced in the process.²

It will, no doubt, require an educational effort to recognize the fallacy of this philosophy. A building poorly designed with faulty materials can sometimes be a drain on the taxpayer's pocketbook for the next sixty to one hundred years.

Baker points out that the original cost of a building is soon forgotten but the annual costs are apt to increase over the years. "School buildings are never short-lived and too frequently a 75 or 100 year old structure is patched and painted for just one more year."³

The Research and Publications Committee created by the National Council on Schoolhouse Construction, writing in 1953 about the economy of school plants, stated:

One should not be hoodwinked, however, by low initial costs of school buildings. . . . It is the long-range cost that really counts. Initial saving may soon be more than lost through abnormal costs for maintenance, replacement and insurance.⁴

One does not wonder then at the total expenditures for maintenance

¹Viles, op. cit., p. 49.

²Ibid., p. 23.

³M. R. Baker, "Maintenance Savings Must Be Planned into New Buildings," Nation's Schools, Vol. 66 (1954), 2.

⁴Research and Publication Committee, Thirteen Principles of Economy in School Plant Planning and Construction (National Council on Schoolhouse Construction, 1954), p. 2.

of school plants in 1955-56 which amounted to almost 320 million dollars.¹ Add to this expenditure the more than 750 million dollars spent during the same period for operation of school plant, and the total cost for the two services reaches a staggering total.

It is interesting to note that in 1949-50, expenditures for maintenance of plant amounted to 3.7 per cent of the total expenditures for public elementary and secondary schools. By 1955-56 the percentage expended for maintenance had dropped to 2.9 per cent.² Unfortunately, these figures mean little in a given locality. The answer, as suggested by some authorities lies in long-range accurate records and systematic inspection. For budget planning, an average cost of maintenance over a long period of years is better than a year-to-year estimate. The yearly estimate is too frequently based on the previous year's expenditures.

Writing about replacement costs Baron alludes to the importance of records:

Obsolescence and inadequacy should be considered as well as exhaustion and excessive cost of a repair. These factors can only be computed from accurate records.³

Viles stresses the importance of maintenance records but quickly points out the problems.

Attempts to measure maintenance costs as a percentage of building values break down as the buildings age, and as maintenance is stepped up or deferred in keeping with local financial conditions.⁴

¹U. S. Department of Health, Education, and Welfare, Office of Education, Statistical Summary of State School Systems, 1955-56 (Washington, D.C.: Superintendent of Documents, Government Printing Office, 1956), p. 9.

²Ibid., pp. 8-9.

³J. Baron, "How to Establish a Preventive Maintenance Program," American School Board Journal, Vol. 141 (December, 1960), 28.

⁴Viles, op. cit., p. 25.

Caudill points to three major factors included in the cost of a school plant:

- (a) original cost, (b) the cost of financing, and
- (c) maintenance cost.¹

He suggests that each school system must work out a balance in terms of the educational and financial conditions prevailing in that system.

Sumption and Landes also allude to the matter of economy in both maintenance cost and initial expenses. A public is often willing to pay for a cheap building at the risk of rapid deterioration dating from the time of construction. It is possible that "over a period of time, in addition to the hazard, unsightliness, and inconvenience which result, this cost may exceed the differential between the cost of low and high quality provision." ²

Viles repeatedly stresses that there is no valid formula or measure for determining maintenance and replacement budgets in schools. Significantly, one of his assumptions states:

Building deterioration and obsolescence are usually matters of degree and the rates will vary for different parts of the building. There is no valid rule-of-thumb measure for when a building should be replaced.³

Viles draws a comparison between the decision to replace a school and the decision to buy a new car. "If finances permit and pressures of various sorts are sufficient, the trade-in is made. If not, one drives or uses the older model for a while." ⁴

¹William W. Caudill, Toward Better School Design (New York: F. W. Dodge, 1954), p. 20.

²Merle R. Sumption, Jack L. Landes, Planning Functional School Buildings (New York: Harper and Brothers, 1957), pp. 281-282.

³Viles, op. cit., p. 22.

⁴Ibid., p. 49.

SUMMARY

Much has been written in the past decade about the shortage of classrooms, our aged and deteriorating school buildings, the importance of esthetic values in fostering the full development of our children, and the extremely high cost of maintaining and operating our school plants.

In this chapter the writer reviewed rather carefully the literature and research concerned with educational usefulness, human values, and maintenance and operation of school facilities. There is concern that old buildings often do not provide an adequate program because of structural limitations. There is further concern that the appearance of many old buildings are unacceptable to parents and school pupils. Various authors suggest that a child's ability to learn is greatly enhanced in a pleasant and comfortable atmosphere.

The current literature also seems to indicate that maintenance and operating costs tend to increase as school plant facilities age. However, not once did a school plant authority commit himself to the belief that a building should be rehabilitated or abandoned in favor of new construction based on excessive maintenance and operating costs alone. Other factors need to be considered before making a final judgment as to the building's further use. For this reason, it is the author's intent to discuss in later chapters of this study several of the major objectives which assist in determining when school plant facilities should be abandoned or rehabilitated.

CHAPTER III

METHOD OF THE STUDY

This chapter is concerned with creating an understanding of the basic method of research and the methods and procedures used in conducting the present study. A description of the population, sample, and randomization procedures will be included in the methods and procedures. The present chapter also contains a discussion of the collection and recording of data.

METHOD OF RESEARCH

The basic method of research used in this study relates closely to patterns of descriptive investigations as outlined by Van Dalen in which he classifies the numerous possible types of descriptive studies under three arbitrary headings: (1) survey studies, (2) interrelationship studies, and (3) developmental studies. These are not rigid categories, since many studies have characteristics of more than one area. However, all descriptive studies have certain common elements of agreement and objectives. They depict current status and sometimes identify relationships that exist among developing phenomena or trends. Occasionally, the studies attempt to make predictions about future events. As in any reputable study, investigators seek more than bare description. Rather than simply tabulating facts, competent researchers collect evidence on the basis of some hypothesis or theory, tabulate and summarize the data, and then thoroughly analyze it in an endeavor to draw meaningful generalizations.

Scientific methods of research require scholars to make "intelligent guesses" which will solve problems and to test whether hypotheses present accurate explanations of phenomena. Regarding the use of hypotheses in descriptive studies, Van Dalen indicates that:

If descriptive studies present hypotheses, they are usually of a somewhat lower order than those found in explanatory studies. In the latter, the hypotheses offer general explanations of why certain phenomena behave as they do. Descriptive studies simply portray the facts--they describe what exists but rarely seek to account for why the present state of affairs has occurred. Descriptive studies may describe the rudimentary grouping of things by comparing and contrasting likenesses and differences in their behavior. They may classify, order, and correlate data seeking to describe relationships that are discoverable in phenomena themselves. But they do not penetrate deeply into knowledge that lies beyond that which can be gained directly from the events or conditions. They do not fully analyze and explain why these relationships exist. Seeking higher-order meanings is left to explanatory hypotheses.¹

Certainly, descriptive research is limited in that it contributes to science primarily by building a foundation of facts upon which explanatory hypotheses can be constructed. Science begins with descriptions of singular, unique events; but it does not remain at this level. Ideally, the ultimate objective of science is to establish universal laws with predictive power to control decisions. Obviously, descriptive research does not possess great predictive power. Most of its findings are applicable only within relatively short limits of time. However, this does not mean that descriptive research is any less important or does not contribute to a better understanding of educational problems. Van Dalen emphasizes the value of descriptive research by stating:

¹Deobold B. Van Dalen and William J. Meyer, Understanding Educational Research: An Introduction (New York: McGraw-Hill Book Company, Inc., 1962), p. 215.

Descriptive studies that obtain accurate facts about existing conditions or detect significant relationships between current phenomena and interpret the meaning of the data provide educators with practical and immediately useful information. Factual information about existing status enables members of the profession to make more intelligent plans about future courses of action and helps them interpret educational problems more effectively to the public. Pertinent data regarding the present scene may focus attention upon needs that otherwise would remain unnoticed. They may also reveal developments, conditions, or trends that will convince citizens to keep pace with others or to prepare for probable future events. Since existing educational conditions, processes, practices, and programs are constantly changing, there is always a need for up-to-date descriptions of what is taking place.¹

The design. The selected operating and maintenance cost figures cover a four-year period of time beginning with the fiscal year July 1, 1956, and ending with the fiscal year June 30, 1960. Considered in the study are building and site maintenance cost data, electrical and heating operating cost data, and custodian salary and custodial supply cost data.

For each of the thirty school plants being studied, square-foot computations were made of the building area. The size of the school plant is expressed in acres.

The school plants were assigned to three groups as a stratified random sample. One group was designated the "recent" group for plants ranging in age from four to ten years inclusive. A second group was designated the "middle-aged" group for plants ranging in age from thirty to forty-eight years inclusive. The third group was designated the "old" for plants ranging in age from fifty-four to seventy-three years inclusive.

The population. All of the subjects in the present investigation are elementary schools of the Detroit, Michigan, Public School System in use in 1960. There are 223 school plants in the population. Typically,

¹Ibid., p. 212.

the plants consist of grades K-6 or K-8 organization. They are located in all areas of the city and vary in pupil population from less than 150 to more than 2,000. Some plants are located on small sites containing less than an acre, while others are found on sites adjacent to spacious city parks. Some plants house pupils in portable, temporary buildings and churches in addition to a named building.

The sample. The school plants termed "recent" were selected from the population of school plants erected from 1950 to date, inclusive. Within this ten-year span there were twenty school plants erected. One plant was eliminated from the sample because it contained a grade classification above K-8. To reduce the variables to a minimum, only plants using coal-fired furnaces were included in this study. Therefore, five plants were eliminated because they used oil for heat and two were eliminated because they used commercially purchased fuel. The samples of ten recent plants were thus selected at random from the remaining twelve school plants.

The "middle-aged" plants were selected from the school plants erected from 1912 to 1930 inclusive. One hundred and twenty elementary plants were erected during this period. Ten plants were eliminated from the sample because they contained a grade or grades less than K-6. Seventeen were eliminated because they contained a grade or grades above K-8. The ten middle-aged plants for the present study were randomly selected from the remaining group of ninety-three plants.

The school plants termed "old" were selected from the elementary plants erected from 1887 to 1905 inclusive. Thirty-nine plants were erected during this period and constitute the total population of old plants for this study. Five plants were eliminated from the sample because they contained grades less than K-6; one plant was eliminated because it contained a grade above K-8. Thus, thirty-three plants remained from which ten were randomly selected for the present study.

The designated periods of time for the three age groups, 1950-1960, 1912-1930, and 1887-1905, were selected as representative of Handler's rationale in describing the life cycle of school buildings.¹

Handler indicates that in the life cycle of buildings, some deterioration begins to occur almost immediately. This, however, is minimal during the first twenty years depending upon the care given the building. In the next thirty-to-fifty year period the number of defects become marked and the process of deterioration continues. During this time the issue of educational obsolescence may already have been suggested. Somewhere between the ages of fifty and seventy, a large number of schools are abandoned. For those remaining in use, there is a steadily increasing pattern of maintenance costs and a decline in the serviceability of the building.

In addition to the above rationale, a number of other factors were considered in the selection of buildings during the designated periods of time. The ten-year span from 1950 to 1960 was selected because it represents the most recent group of school buildings constructed in Detroit. The beginning year of the middle group was set at 1912 because a City of Detroit ordinance was effected in that year which limited construction to only fire-resistive plants. The old group is representative of Detroit's dated school plant facilities being used for educational purposes.

The thirty school plants in the total sample are included in the list of Detroit Public Schools by year of original construction. These are listed in Appendix A. The data on construction dates of elementary school plants were obtained from the Architectural Planning Department, Detroit Board of Education. The grade designations were

¹A Report from Educational Facilities Laboratories, The Cost of a Schoolhouse (New York: Educational Facilities Laboratories, Inc., 1960), pp. 60-61.

obtained from the Directory, Detroit Public Schools, Detroit, Michigan, 1959-60.

The randomization procedures referred to in this section will be described in the following section.

The stratified randomization procedures. Three distinct groups were selected as representative of the classifications of recent, middle-aged, and old school plants. All of the information on elementary school plants erected during these periods was obtained from records of the Architectural Planning Department. These plants were checked from grade levels. Only K-6 or K-8 plants were retained in each group. The name of each remaining school plant in each group was placed on a card which was placed in serial order. The plants to be utilized for this study were then selected by the numbers supplied by a table of random numbers.¹ No bias was introduced by this method as each plant in each group had an equal chance of being selected.

Collection and recording of the data. After selection of the school plants by the stratified random procedure, two steps were necessary to obtain and record the data. For each of the thirty buildings a computation of the total square-foot area was obtained from the Architectural Planning Department of the Detroit Board of Education. In order to eliminate potential bias, the current American Institute of Architects Standard formula was utilized in computing the area for each building. Further, to eliminate possible error in computing the individual buildings, it was deemed advisable to utilize the computations of one architect in determining the square footage for the sample of thirty plants.

¹Wilfred J. Dixon and Frank J. Massey, Jr., Introduction to Statistical Analysis (New York: McGraw-Hill Book Company, Inc., 1957), pp. 366-370.

The precise site size was obtained from the files of the Architectural Planning Department, Detroit Board of Education.

Prior to visiting the Tabulating Department of the Business Affairs Office, a folder for each plant in the sample was prepared. This folder contained information necessary for gathering complete cost data for the selected factors to be studied.

A recording sheet for each school was utilized to tabulate a total cost figure for each of the following factors: heating cost, building maintenance costs, and site maintenance costs. The cost figures were recorded for a four-year period starting July 1, 1956, and ending June 30, 1960. Additional notes were made at the time of recording, indicating items that would possibly account for large cost differences in buildings of similar age. Costs for each of the six factors were totaled for each individual plant and an average cost for the four-year period was determined. A "mean" and "range" for each of the six factors being measured was determined for the three different age groups. The mean was utilized to indicate a measure of central tendency, and the range was beneficial in determining variability of high and low cost figures for plants of similar age vintage. The mean and the range for each of the six factors within the three groups were then compared one with another. For example, the building maintenance cost mean and range of the recent group, the middle-aged group, and the old group were compared and analyzed for square-foot cost differences. The remaining five factors were measured and studied in the same manner.

SUMMARY

The design of the present study assigned school plants to three groups: recent, middle-aged, and old. For each school plant within these groups, selected operating and maintenance cost figures covering

a four-year period were analyzed and compared. Obtaining a mean and a range of the selected cost figures for each of three groups was the main statistical method utilized. The means of the three groups were then evaluated and compared for significant differences. The population, sample, and randomization procedures were fully elaborated.

The following chapter provides an analysis of the data secured for the present study.

CHAPTER IV

EVALUATION OF COST DATA

In this chapter the expenditures for maintenance and operating factors of selected school buildings are presented. The expenditures for operation of the selected buildings include a four-year average annual cost for salaries of custodians, custodial supplies, heating costs, and electrical costs. The upkeep of the grounds and buildings is tabulated to determine maintenance plant expenditures for each selected building. The cost for maintenance and operation of each plant reflects a continuous expenditure for each of the selected buildings. In other words, the reported costs are the actual amounts spent in cash of the selected accounts.

In computing costs of school buildings, several methods are commonly used, such as pupils in average daily attendance, pupil capacity, cubic footage, and square footage. The wide range of age and the variance in size of each selected building seems to make the use of square footage the best common denominator. The total number of square feet for each selected building is presented. The total number of years studied for each of the three groups of school plants--old, middle-aged, and recent--were identified.

To make these data meaningful, an analysis of each factor--building and site maintenance cost, heating, electrical, custodial salaries, custodial supplies, and operation costs--within each of the three groups of school plants is presented and compared.

Tables 7 through 24 present the cost data for each of the six selected operating and maintenance factors for the three groups of school plants.

Column 1 of each table identifies the school plant as old, middle-aged, or recent. Column 2 shows the age of the original plant and Column 3, the age of any addition to the original building. Column 4 lists the average annual operation or maintenance cost for each of the identified plants. Column 5 indicates the square footage for each plant, and Column 6 gives the cost per square foot.

To better analyze the data presented in Tables 7 through 24, a series of figures graphically illustrates the differences in square foot costs of the selected buildings in each of the three groups--old, middle-aged, and recent.

Building and site maintenance expenditures:

A United States Department of Health, Education, and Welfare publication on financial accounting defines maintenance of plants:

Maintenance cost consists of activities that are concerned with keeping the grounds, buildings, and equipment at their original condition of completeness or efficiency. Reported here are expenditures for repair and replacement of school property. Expenditures for total replacement of a building or for additions to existing structures are not classified as "Maintenance," they are considered Capital Outlay.¹

This includes the equipment and sites as well as the buildings. A complete unit of equipment which is replaced by another complete unit of equipment is charged to maintenance costs, but expenditures for initial or additional equipment are not charged to maintenance. Likewise, costs for repairs to building structures which do not alter partitions, walls, or roof structures are charged to cost of maintenance.

In analyzing Figure 6, it is noted that building maintenance costs in facilities fifty-four to seventy-three years old have varied from a high of \$0.2090 per square foot to a low of \$0.1376 per square foot.

¹Reason and Tankard, loc. cit.; see also, Reason and White, loc. cit.

Table 7. An Analysis of Building Maintenance Costs of Ten Old Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Maintenance Cost ¹	Square Footage ²	Cost Per Square Foot
1-Old	73	70	\$ 3,745.00	17,916	\$.2090
2-Old	73	61	5,486.20	20,915	.1774
3-Old	73	53	11,938.80	76,620	.1558
4-Old	71		7,646.40	39,895	.1916
5-Old	70	57	6,047.60	37,500	.1612
6-Old	62	51	5,704.10	32,468	.1756
7-Old	59		4,707.60	32,045	.1469
8-Old	58		5,606.20	33,308	.1683
9-Old	57		8,549.50	62,104	.1376
10-Old	55		9,387.40	49,714	.1888

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

Table 8. An Analysis of Building Maintenance Costs of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Maintenance Cost ¹	Square Footage ²	Cost Per Square Foot
1-M*	48		\$ 3,495.17	36,995	\$.0944
2-M	45		5,010.10	41,280	.1213
3-M	44		5,864.22	43,973	.1333
4-M	37		5,049.58	59,046	.0855
5-M	36		4,668.37	33,214	.1405
6-M	34		3,891.14	68,598	.0567
7-M	33		4,644.98	66,787	.0695
8-M	32		5,386.27	29,982	.1796
9-M	30		4,236.92	60,994	.0694
10-M	30		5,897.81	55,150	.1069

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education

*Middle-aged

Table 9. An Analysis of Building Maintenance Costs of Ten Recent Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Maintenance Cost ¹	Square Footage ²	Cost Per Square Foot
1-Recent	9		\$ 841.03	26,941	\$.0312
2-Recent	8		1,365.00	31,515	.0433
3-Recent	7	5	3,431.40	59,653	.0575
4-Recent	6		1,445.50	29,277	.0493
5-Recent	5		999.40	39,638	.0252
6-Recent	5		735.75	23,545	.0312
7-Recent	5		1,833.40	41,323	.0443
8-Recent	4		2,711.75	71,695	.0378
9-Recent	4		1,316.00	62,281	.0211
10-Recent	4		1,254.33	36,565	.0343

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education

Table 10. An Analysis of Site Maintenance Costs of Ten Old Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Site Maintenance Cost ¹	Size of Site (Acre) ²	Cost Per Acre
1-Old	73	70	\$ 207.30	0.36	575.83
2-Old	73	61	1,034.30	1.29	801.78
3-Old	73	53	777.70	2.09	372.10
4-Old	71		589.20	1.07	550.65
5-Old	70	57	613.10	0.95	645.37
6-Old	62	51	1,048.90	1.61	651.49
7-Old	59		659.50	1.09	605.04
8-Old	58		1,127.20	1.05	1,073.52
9-Old	57		1,521.10	2.75	553.13
10-Old	55		661.20	1.64	403.17

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education

Table 11. An Analysis of Site Maintenance Costs of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Site Maintenance Cost ¹	Size of Site (Acre) ²	Cost Per Acre
1-M*	48		\$ 911.14	1.55	\$587.83
2-M	45		1,191.23	3.86	308.60
3-M	44		991.84	1.87	530.39
4-M	37		1,389.62	3.85	360.94
5-M	36		481.19	.99	486.05
6-M	34		1,174.34	6.36	184.64
7-M	33		1,570.41	6.85	229.25
8-M	32		1,037.08	2.14	484.61
9-M	30		1,020.12	3.74	272.75
10-M	30		893.72	2.16	413.75

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

* Middle-aged

Table 12. An Analysis of Site Maintenance Costs of Ten Recent Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Site Maintenance Cost ¹	Size of Site (Acre) ²	Cost Per Acre
1-Recent	9		\$ 415.01	2.24	\$185.27
2-Recent	8		644.28	4.89	131.75
3-Recent	7	5	892.40	3.20	278.87
4-Recent	6		454.67	1.63	278.94
5-Recent	5		462.60	2.12	218.21
6-Recent	5		246.50	1.20	205.42
7-Recent	5		477.60	1.62	294.81
8-Recent	4		1,113.75	2.29	486.35
9-Recent	4		760.00	3.46	219.65
10-Recent	4		540.67	2.97	182.04

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

Table 13. An Analysis of Heating Operating Costs of Ten Old Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Heating Costs ¹	Square Footage ²	Cost Per Square Foot
1-Old	73	70	\$ 601.30	17,916	\$.0335
2-Old	73	61	1,260.40	30,915	.0407
3-Old	73	53	3,101.50	76,620	.0404
4-Old	71		1,656.10	39,895	.0415
5-Old	70	57	1,299.30	37,500	.0346
6-Old	62	51	1,581.60	32,468	.0487
7-Old	59		1,062.10	32,045	.0331
8-Old	58		1,283.90	33,308	.0385
9-Old	57		3,267.80	62,104	.0526
10-Old	55		2,362.00	49,714	.0475

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

NOTE: Type of fuel--coal.

Table 14. An Analysis of Heating Operating Costs of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956-June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Heating Costs ¹	Square Footage ²	Cost Per Square Foot
1-M*	48		\$1,227.17	36,995	\$.0331
2-M	45		1,459.35	41,280	.0353
3-M	44		1,470.42	43,973	.0334
4-M	37		2,386.47	59,046	.0404
5-M	36		1,536.90	33,214	.0462
6-M	34		2,603.83	68,598	.0379
7-M	33		2,515.70	66,787	.0376
8-M	32		1,346.69	29,982	.0449
9-M	30		2,075.41	60,994	.0340
10-M	30		2,433.38	55,150	.0441

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

NOTE: Type of fuel--coal.

*Middle-aged

Table 15. An Analysis of Heating Operating Costs of Ten Recent Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Heating Costs ¹	Square Footage ²	Cost Per Square Foot
1-Recent	9		\$1,080.25	26,941	\$.0400
2-Recent	8		1,082.94*	31,515	.0343
3-Recent	7	5	1,707.20*	59,653	.0286
4-Recent	6		907.59	29,277	.0310
5-Recent	5		1,351.66	39,638	.0341
6-Recent	5		781.69	23,545	.0332
7-Recent	5		1,094.20*	41,323	.0264
8-Recent	4		2,136.24	71,695	.0325
9-Recent	4		1,395.27	62,281	.0330
10-Recent	4		1,157.00*	36,565	.0316

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

NOTE: Type of fuel--coal.

* Cost of coal for temporary units are excluded from totals.

Table 16. An Analysis of Electrical Operating Costs of Ten Old Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Elect. Operating Costs ¹	Square Footage ²	Cost Per Square Foot
1-Old	73	70	\$ 385.10	17,916	\$.0214
2-Old	73	61	668.70	30,915	.0216
3-Old	73	53	1,464.50	76,620	.0191
4-Old	71		1,350.30	39,895	.0338
5-Old	70	57	849.30	37,500	.0226
6-Old	62	51	1,476.10	32,468	.0454
7-Old	59		947.20	32,045	.0295
8-Old	58		923.10	33,308	.0277
9-Old	57		1,089.50	62,104	.0175
10-Old	55		1,334.20	49,714	.0268

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

Table 17. An Analysis of Electrical Operating Costs of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Elect. Operating Costs ¹	Square Footage ²	Cost Per Square Foot
1-M *	48		\$ 843.91	36,995	\$.0228
2-M	45		933.84	41,280	.0226
3-M	44		1,001.34	43,973	.0227
4-M	37		1,416.09	59,046	.0239
5-M	36		1,365.18	33,214	.0411
6-M	34		2,029.76	68,598	.0295
7-M	33		1,982.56	66,787	.0296
8-M	32		1,203.14	29,982	.0401
9-M	30		1,633.22	60,994	.0267
10-M	30		2,058.19	55,150	.0373

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

*Middle-aged

Table 18. An Analysis of Electrical Operating Costs of Ten Recent Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Elect. Operating Costs ¹	Square Footage ²	Cost Per Square Foot
1-Recent	9		\$1,033.37	26,941	\$.0383
2-Recent	8		1,465.28*	31,515	.0464
3-Recent	7	5	2,460.20*	59,653	.0412
4-Recent	6		1,528.17	29,277	.0521
5-Recent	5		2,297.80	39,638	.0579
6-Recent	5		1,414.25	23,545	.0600
7-Recent	5		1,467.00*	41,323	.0355
8-Recent	4		3,439.25	71,695	.0479
9-Recent	4		2,315.25	62,281	.0371
10-Recent	4		1,333.67*	36,565	.0364

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

*Electrical costs for temporary units are excluded from totals.

Table 19. An Analysis of Custodial Operation Salaries of Ten Old Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Custodial Salaries ¹	Square Footage ²	Cost Per Square Foot
1-Old	73	70	\$ 8,799.41	17,916	\$.4911
2-Old	73	61	13,192.98	30,915	.4267
3-Old	73	53	31,105.62	76,620	.4059
4-Old	71		16,293.76	39,895	.4084
5-Old	70	57	16,574.39	37,500	.4419
6-Old	62	51	16,895.08	32,468	.5203
7-Old	59		14,554.08	32,045	.4541
8-Old	58		14,695.18	33,308	.4411
9-Old	57		24,001.64	62,104	.3864
10-Old	55		20,886.46	49,714	.4201

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

Table 20. An Analysis of Custodial Operation Salaries of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Custodial Salaries ¹	Square Footage ²	Cost Per Square Foot
1-M*	48		\$16,721.74	36,995	\$.4520
2-M	45		18,229.24	41,280	.4416
3-M	44		18,952.36	43,973	.4310
4-M	37		26,175.09	59,046	.4433
5-M	36		14,822.76	33,214	.4462
6-M	34		26,245.59	68,598	.3826
7-M	33		25,619.50	66,787	.3836
8-M	32		14,325.37	29,982	.4777
9-M	30		21,195.41	60,994	.3475
10-M	30		22,291.63	55,150	.4042

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

* Middle-aged

Table 21. An Analysis of Custodial Operation Sslaries of Ten Recent Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Custodial Salaries ¹	Square Footage ²	Cost Per Square Foot
1-Recent	9		\$12,770.38	26,941	\$.4739
2-Recent	8		19,150.26	31,515	.6076
3-Recent	7	5	24,340.25	59,653	.4080
4-Recent	6		14,751.25	29,277	.5038
5-Recent	5		16,256.13	39,638	.4101
6-Recent	5		14,600.95	23,545	.6201
7-Recent	5		16,675.70	41,323	.4035
8-Recent	4		21,371.79	71,695	.2980
9-Recent	4		18,994.79	62,281	.3049
10-Recent	4		16,305.79	36,565	.4459

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

Table 22. An Analysis of Custodial Supplies Costs of Ten Old Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Custodial Sup-plies Costs ¹	Square Footage ²	Cost Per Square Foot
1-Old	73	70	\$27.56	17,916	\$.0015
2-Old	73	61	31.20	30,915	.0010
3-Old	73	53	81.51	76,620	.0010
4-Old	71		25.25	39,895	.0006
5-Old	70	57	83.30	37,500	.0022
6-Old	62	51	31.32	32,468	.0009
7-Old	59		29.88	32,045	.0009
8-Old	58		36.01	33,308	.0010
9-Old	57		85.35	62,104	.0013
10-Old	55		81.15	49,714	.0016

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

Table 23. An Analysis of Custodial Supplies Costs of Ten Middle-Aged Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Custodial Supplies Costs ¹	Square Footage ²	Cost Per Square Foot
1-M*	48		\$132.51	36,995	\$.0035
2-M	45		55.01	41,280	.0013
3-M	44		189.03	43,973	.0042
4-M	37		60.01	59,046	.0010
5-M	36		22.50	33,214	.0006
6-M	34		89.09	68,598	.0012
7-M	33		55.73	66,787	.0008
8-M	32		40.15	29,982	.0013
9-M	30		114.80	60,994	.0018
10-M	30		30.98	55,150	.0005

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning, Department, Detroit Board of Education.

* Middle-aged

Table 24. An Analysis of Custodial Supplies Costs of Ten Recent Detroit Elementary Schools. July 1, 1956--June 30, 1960.

School Plant	Age of Original Plant	Age of Addition	Average Annual Custodial Supplies Costs ¹	Square Footage ²	Cost Per Square Foot
1-Recent	9		\$126.74	26,941	\$.0047
2-Recent	8		35.04	31,515	.0011
3-Recent	7	5	141.84	59,653	.0023
4-Recent	6		101.60	29,277	.0034
5-Recent	5		230.20	39,638	.0058
6-Recent	5		50.41	23,545	.0021
7-Recent	5		90.94	41,323	.0022
8-Recent	4		154.58	71,695	.0021
9-Recent	4		92.56	62,281	.0014
10-Recent	4		37.29	36,565	.0010

Source: ¹Business Affairs Office, Tabulating Department, Detroit Board of Education.

²Architectural Planning Department, Detroit Board of Education.

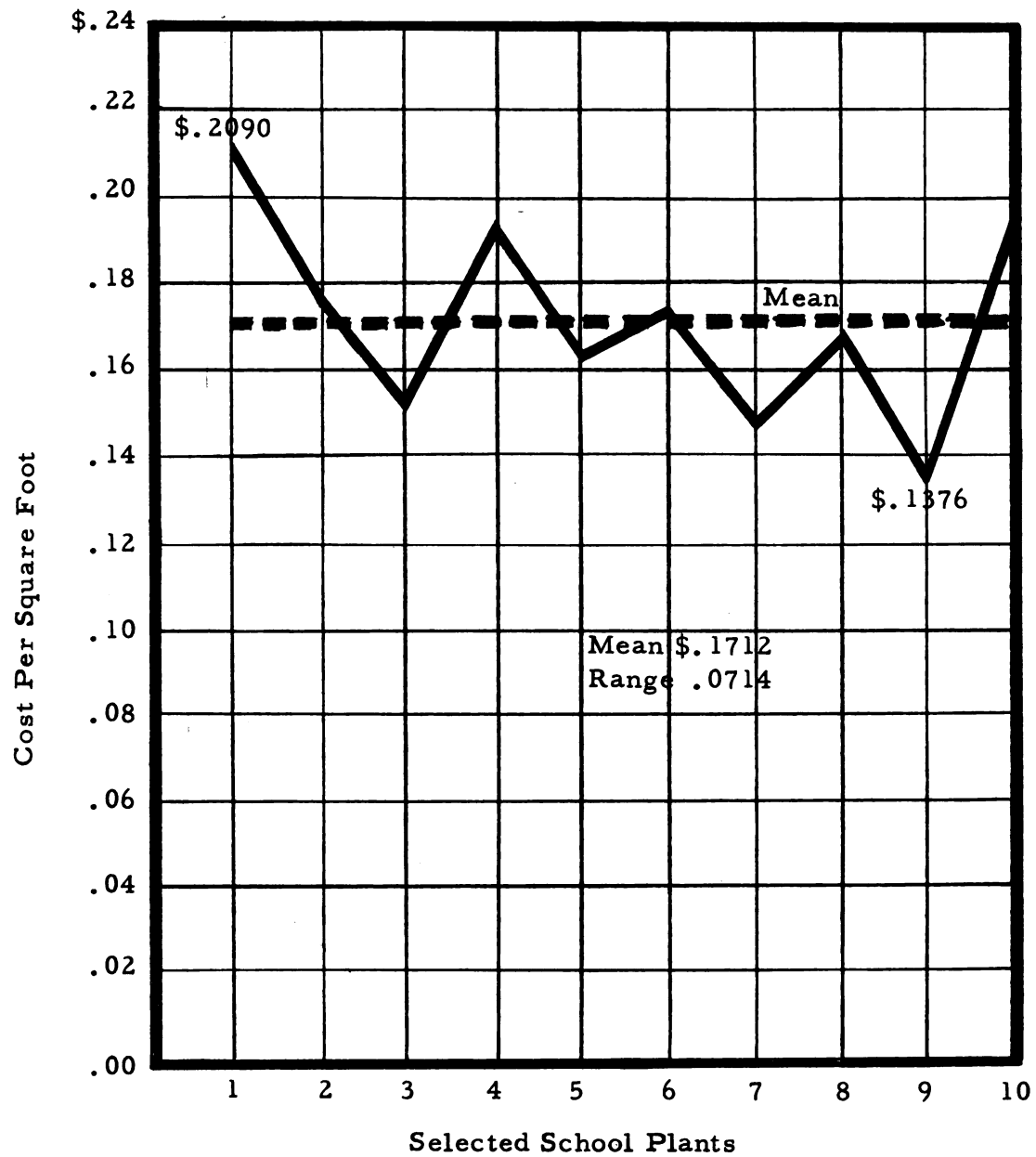


Figure 6. A four-year average of annual building maintenance costs in ten selected Detroit elementary school plants, 54-73 years old.

The mean cost was \$0.1712. In terms of average annual maintenance cost, the most expensive building was \$0.0714 per square foot more expensive than the least expensive building.

In 1958 the high-cost building had extensive roof repair and structural work involving expenditures not experienced by the low-cost plant. Buildings 4 and 10 as indicated in Figure 6 both had major floor repairs during the reporting period, which would account for a similar high expenditure. The low-cost building, while not subjected to any high-cost repairs, nevertheless had a number of repairs involving the boiler and machinery room, cleaning of the attic, weatherstripping, and some interior and exterior structural repair work. All of the plants in the old group required varying amounts of repair work during the four-year period, July 1, 1956, to June 30, 1960.

In analyzing Figure 7, it is noted that building maintenance costs in facilities thirty to forty-eight years old have varied from a high of \$0.1796 per square foot to a low of \$0.0567 per square foot. The mean cost was \$0.1057. In terms of average annual maintenance cost, the most expensive building was \$0.1229 per square foot more expensive than the least expensive building.

It is observed from Figure 7 that the sample of buildings selected for the middle-aged group had a greater fluctuation of maintenance costs than the old group. The high-cost buildings in this group had extensive brick work and outside structural repairs during the four-year reporting period, July 1, 1956, to June 30, 1960. The low-cost buildings in the middle-aged group had kinds of repair work similar to those recorded for the old group, but in a lesser amount.

In Figure 8, it is observed that building maintenance costs in facilities four to ten years old have varied from a high of \$0.0575 per square foot to a low of \$0.0211 per square foot. The mean cost was \$0.0375. In terms of average annual maintenance cost, the most

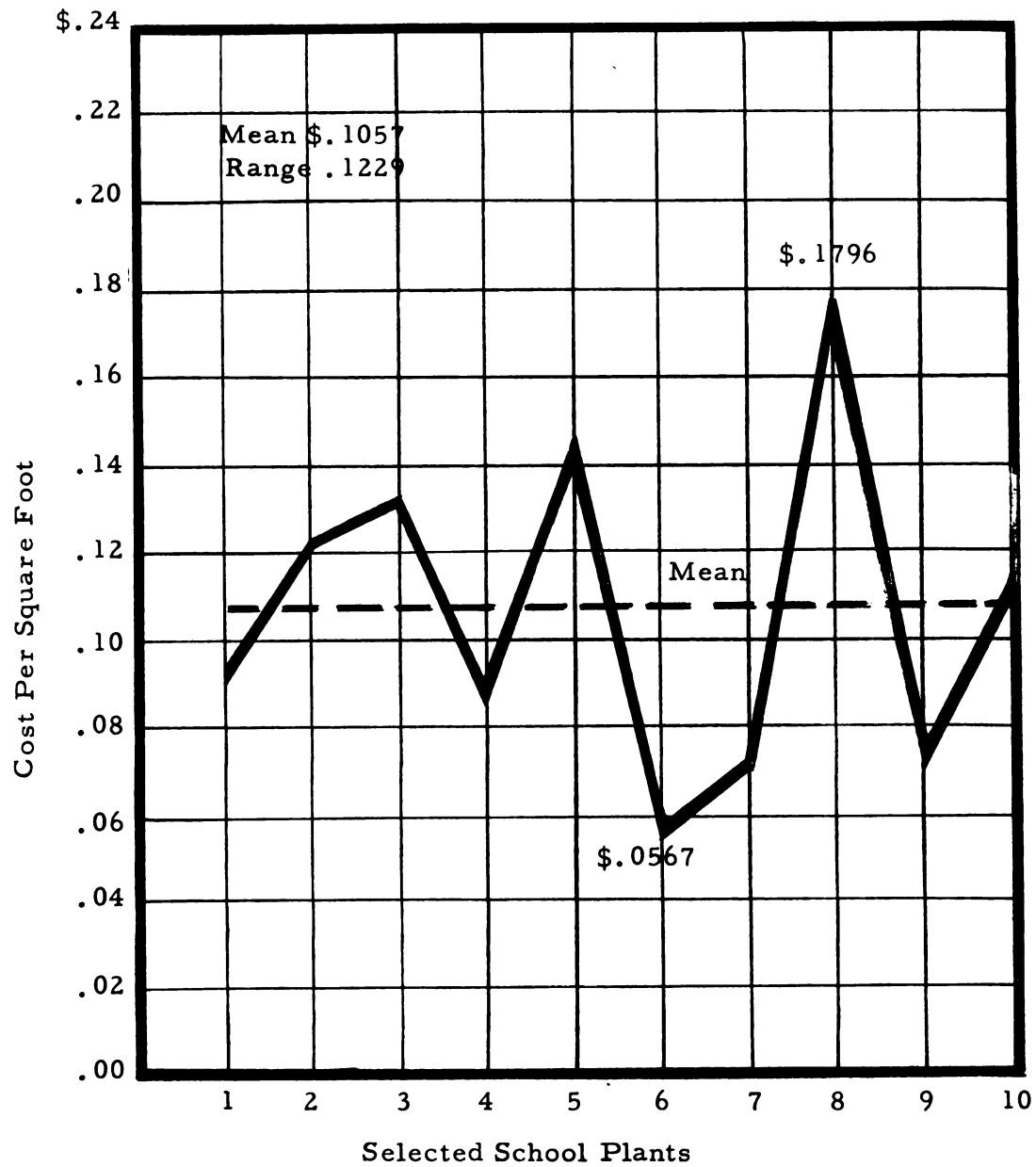


Figure 7. A four-year average of annual building maintenance costs in ten selected Detroit elementary school plants, 30-48 years old.

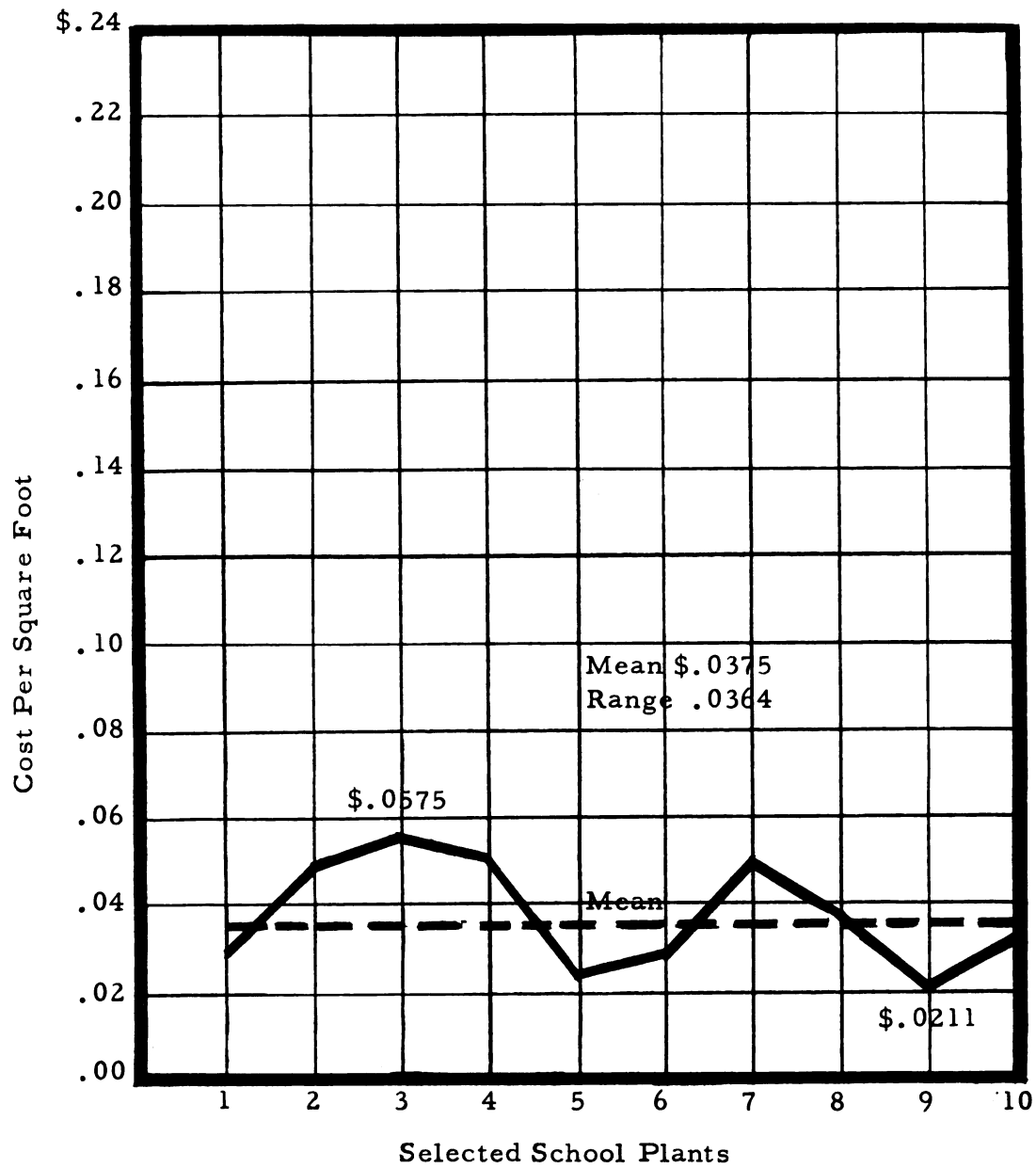


Figure 8. A four-year average of annual building maintenance costs in ten selected Detroit elementary school plants, 4-10 years old.

expensive building was \$0.0364 per square foot more expensive than the least expensive building. The building maintenance expenditures in the recent buildings tend to have a lower range of cost difference than either of the other two groups.

A listing of the major requests for repairs will give the reader some idea of the wide range of work performed, as reflected by the average costs in Figures 6, 7, and 8. It is not to be concluded that each selected building in the sample of thirty plants required work from each listed item. In other words, some buildings required work which others did not and some buildings, while receiving repairs from the same listed category, received such aid in larger or lesser amounts, dependent upon the severity of the problem.

The listed items represent the nature of work and repairs performed in the sample of thirty elementary schools from July 1, 1956, to June 30, 1960: brickwork, weatherproofing, washing and painting interior of building; major roof repair; major floor repair; interior and exterior structural repairs; boiler and machinery room repairs; floors; cupboards; shelving; slateboard conversion to cork; relight and relamp; repair to bells, alarms, outlets, and clocks; electrical and mechanical work necessary to classroom repair and conversion; sewers; drains; plumbing; cleaning of attics; smoke indicator repair; repair to ventilation, radiators, and convectors; freight elevator repair; installation of equipment; gutters; downspouts; foundation repairs; window repairs; plastering; door repairs; locks; keys; stairwells; steps; toilets; fountains; lockers; furniture and furnishings.

Regarding the site maintenance costs in selected elementary school plants, the mean and range data are reflected in cost per acre rather than cost per square foot.

In analyzing Figure 9, it is noted that site maintenance costs in plants fifty-four to seventy-three years old have varied from a high of

\$1,073.52 per acre to a low of \$372.10 per acre. The mean cost was \$623.21. In terms of average annual site maintenance cost, the most expensive plant was \$701.42 per acre more expensive than the least expensive plant. The extreme range of cost reflected in Figure 9 is due in part to the nature of work performed at the high-cost plant during the reporting period. It was reported that an old concrete service drive was replaced and sidewalks surrounding the play area had extensive repairs. The low-cost school had expenditures for minor fence repairs, sidewalks, trimming shrubbery, and general care of the grounds.

In analyzing Figure 10, it is observed that site maintenance costs in plants thirty to forty-eight years old have varied from a high of \$587.83 per acre to a low of \$184.64 per acre. The mean cost was \$384.98. In terms of average annual site maintenance cost, the most expensive plant was \$403.19 per acre more expensive than the least expensive plant. The two high-cost plants in Figure 10 are forty-eight and forty-four years old respectively. The low-cost plant is thirty-four years old. Both high-cost plants had similar major repair to concrete service drives, also reported for the high-cost plant in the old group.

In analyzing Figure 11, it is observed that site maintenance costs in plants four to ten years old have varied from a high of \$486.35 per acre to a low of \$131.75 per acre. The mean cost was \$248.13. In terms of average annual site maintenance cost, the most expensive plant was \$354.60 per acre more expensive than the least expensive plant. In this sample of school plant sites, the facility that is four years old is the most costly, while the least expensive site is eight years old. The records indicate that the high-cost site had a large expenditure for resurfacing the playground area.

As in building maintenance expenditures, the recent plants have a lesser range of cost difference than either of the other two groups.

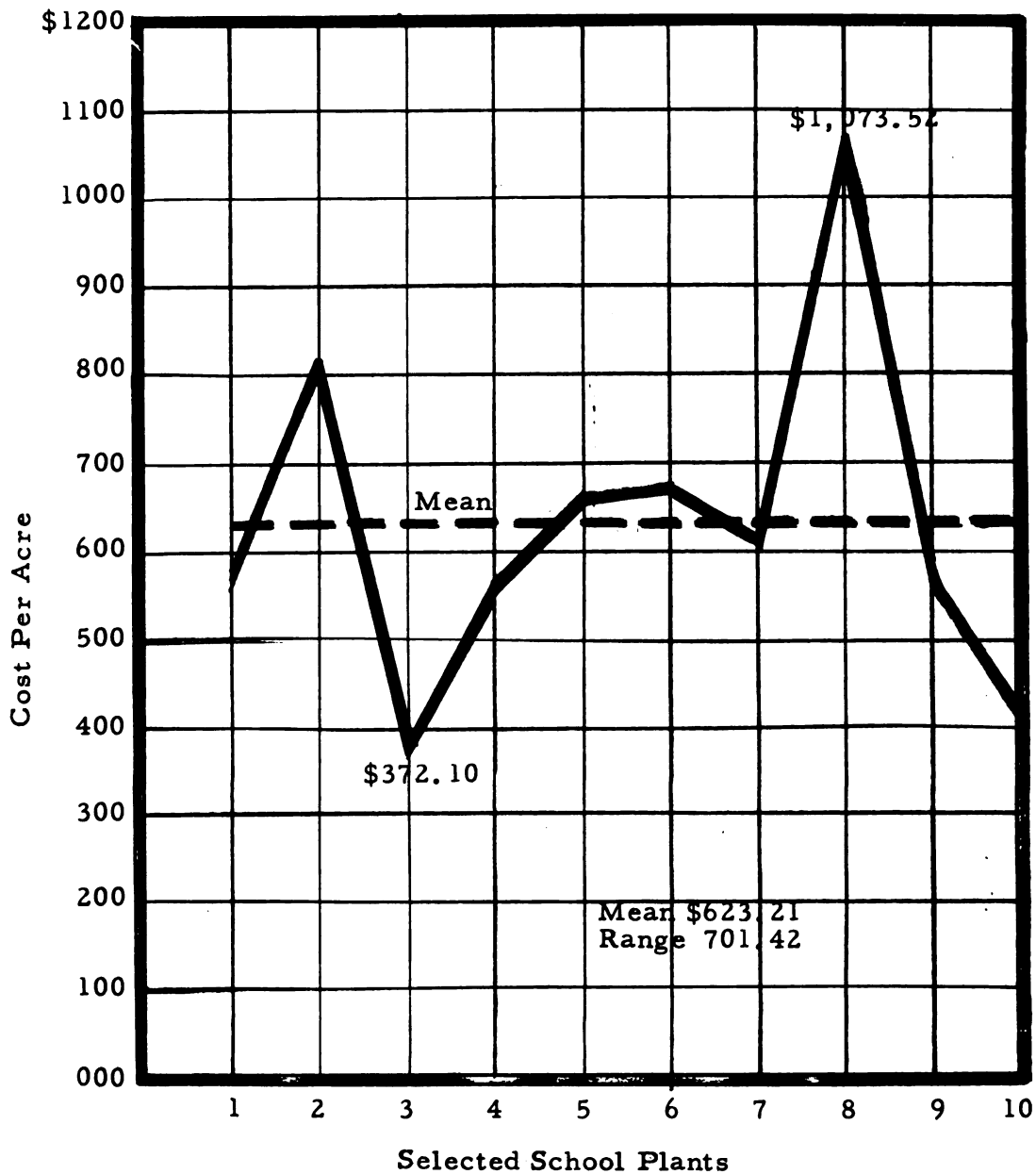


Figure 9. A four-year average of site maintenance costs in ten selected Detroit elementary school plants, 54-73 years old.

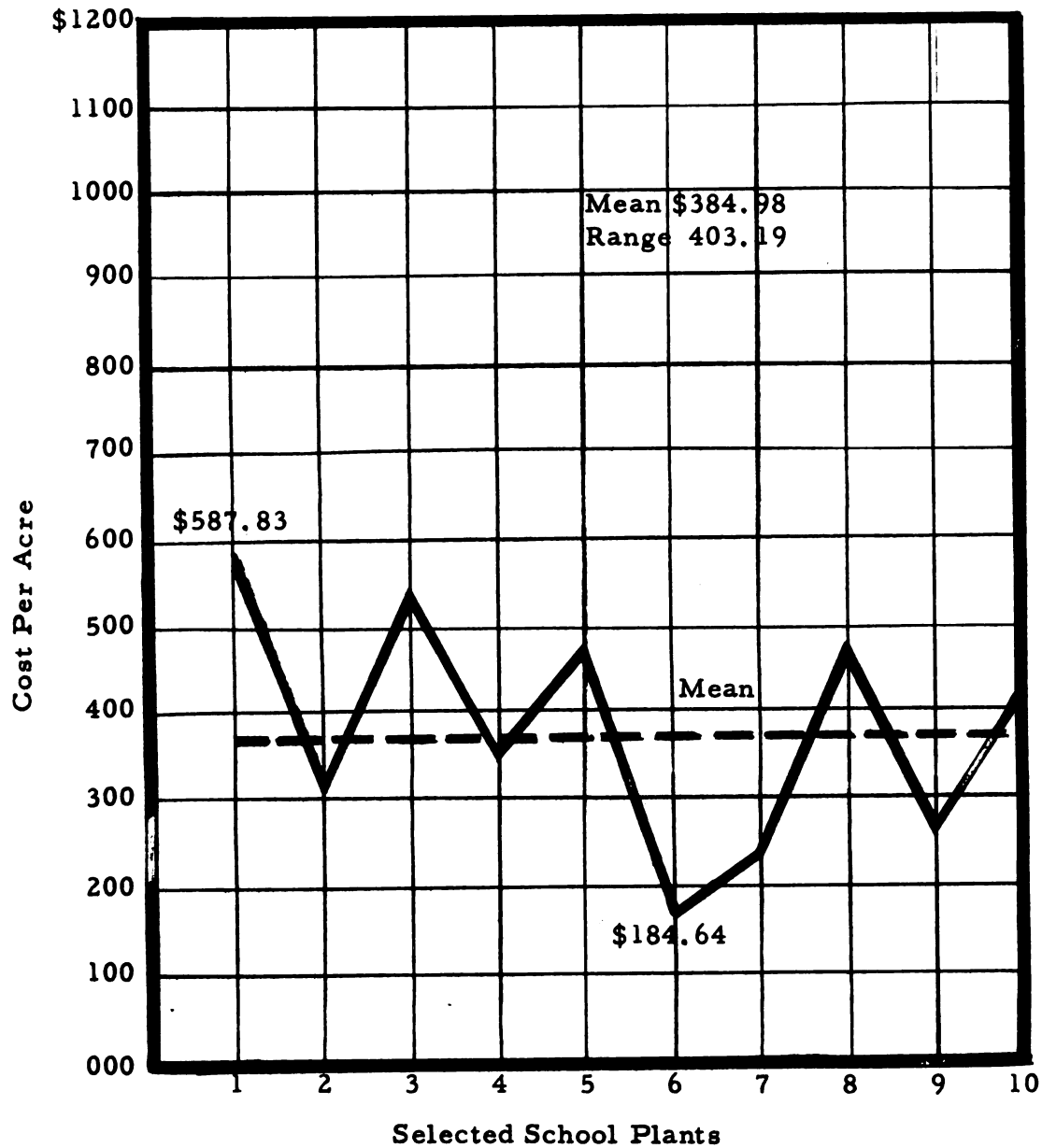


Figure 10. A four-year average of site maintenance costs in ten selected Detroit elementary school plants, 30-48 years old.

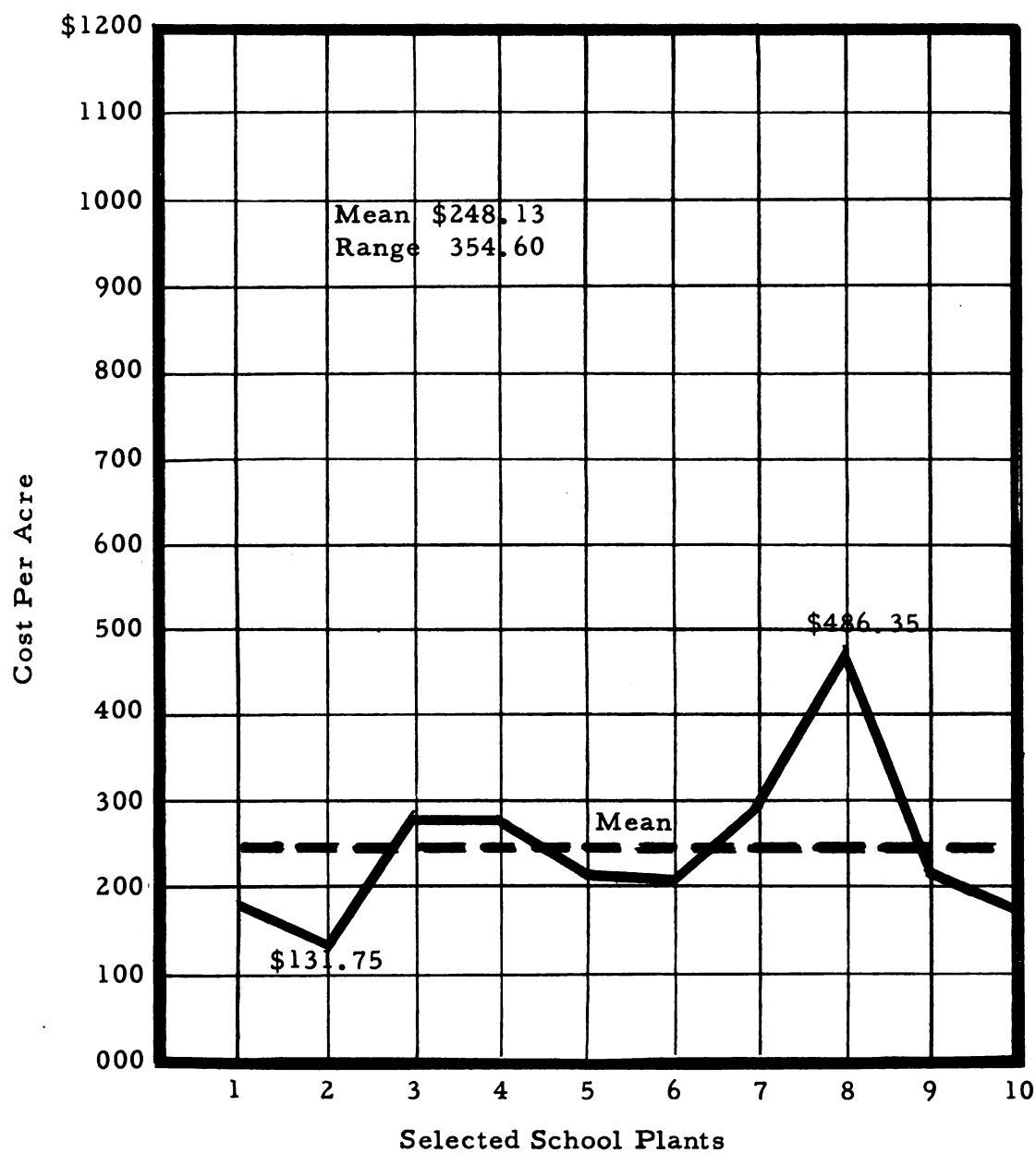


Figure 11. A four-year average of site maintenance costs in ten selected Detroit elementary school plants, 4-10 years old.

The items listed below reflect the nature of work and repairs performed in the sample of thirty elementary school plant sites from July 1, 1956, to June 30, 1960; repair and replacement of concrete drives, approaches, and sidewalks; fence repair and replacement; resurfacing and reconditioning of playground areas; maintenance of parking space; tile work and drainage problems; general upkeep of grounds which would include care of flower gardens, trimming shrubbery and trees, planting grass seed, fertilizing and care of the lawn.

Heating expenditures:

Heating costs include:

Expenditures for all coal, steam, electricity, gas, gasoline, fuel, oil, and wood used for heating, including transportation costs involved in securing them, except direct heating expenses for Pupil Transportation, Food Services, Student-Body Activities, and Community Services.¹

For the purposes of comparing heating operation costs within the three groups of selected buildings, it will be observed that the fuel utilized in each case is coal. During the period July 1, 1956, to June 30, 1960, the price of coal per ton remained fairly constant. In 1956 the Detroit schools bought coal for \$10.23 per ton; in 1957, \$10.76; in 1958, \$10.23; and in 1959 the price of coal was \$10.17. Over the four-year period this would average \$10.35 per ton. In any comparison of coal prices with other communities, it should be pointed out that the Detroit Board of Education pays from 10 to 20 per cent less, presumably because of location and purchasing power.²

In analyzing Figure 12, it is observed that the average annual heating operation costs in plants fifty-four to seventy-three years old have

¹Reason and Tankard, loc. cit.; see also Reason and White, loc. cit.

²Data collected from a report to the Detroit Board of Education, Fuel Selection--New School Buildings (February 24, 1961), pp. 1-2.

varied from a high of \$0.0526 per square foot to a low of \$0.0331 per square foot. The mean cost was \$0.0411. In terms of average annual heating expenditures the most expensive plant was \$0.0195 per square foot more expensive than the least expensive plant.

In analyzing Figure 13, it is observed that the average heating operating costs in plants thirty-to forty-eight years old have varied from a high of \$0.0462 per square foot to a low of \$0.0331 per square foot. The mean cost was \$0.0387. In terms of average annual heating expenditures the most expensive plant was \$0.0118 per square foot more expensive than the least expensive plant.

In analyzing Figure 14, it is observed that the average heating operating costs in plants four to ten years old have varied from a high of \$0.0400 per square foot to a low of \$0.0286 per square foot. The mean cost was \$0.0324. In terms of average annual heating expenditures, the most expensive plant was \$0.0136 per square foot more expensive than the least expensive plant.

It should be pointed out that the variance of heating expenditures per square foot among buildings of similar age may be due to storage space and price of coal per ton during any given year. For example, a building might have sufficient space to store coal over a two- or three-year period. The Detroit Board of Education purchased coal in 1955 for \$8.54 and two years later in 1957 paid \$10.76 per ton. This obviously would reflect a difference in square foot costs among the affected plants. One can speculate that during a ten-year period this cost difference would stabilize and the range of difference between high and low cost buildings of similar age would be negligible.

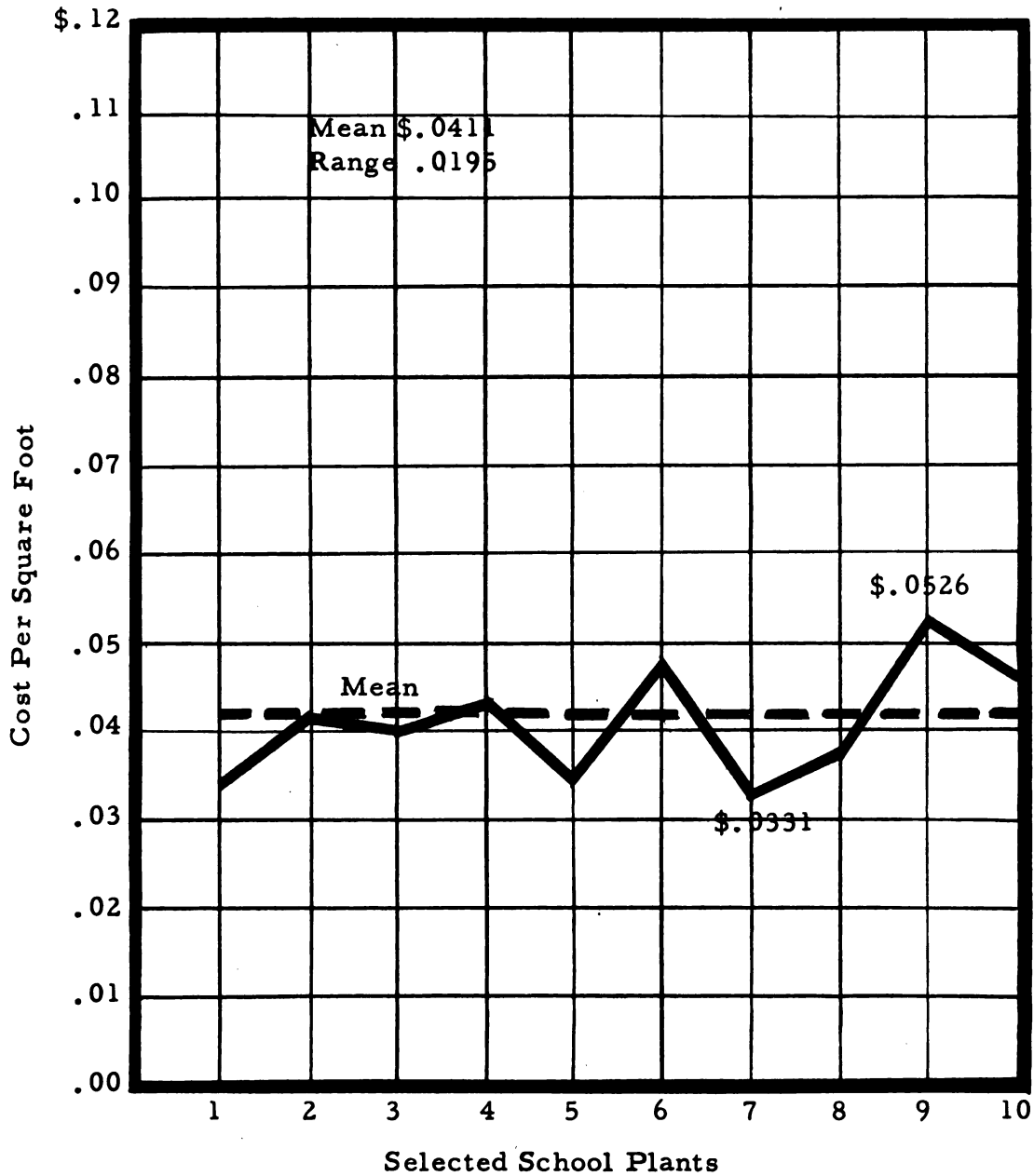


Figure 12. A four-year average of annual heating operation costs in ten selected Detroit elementary school plants, 54-73 years old.

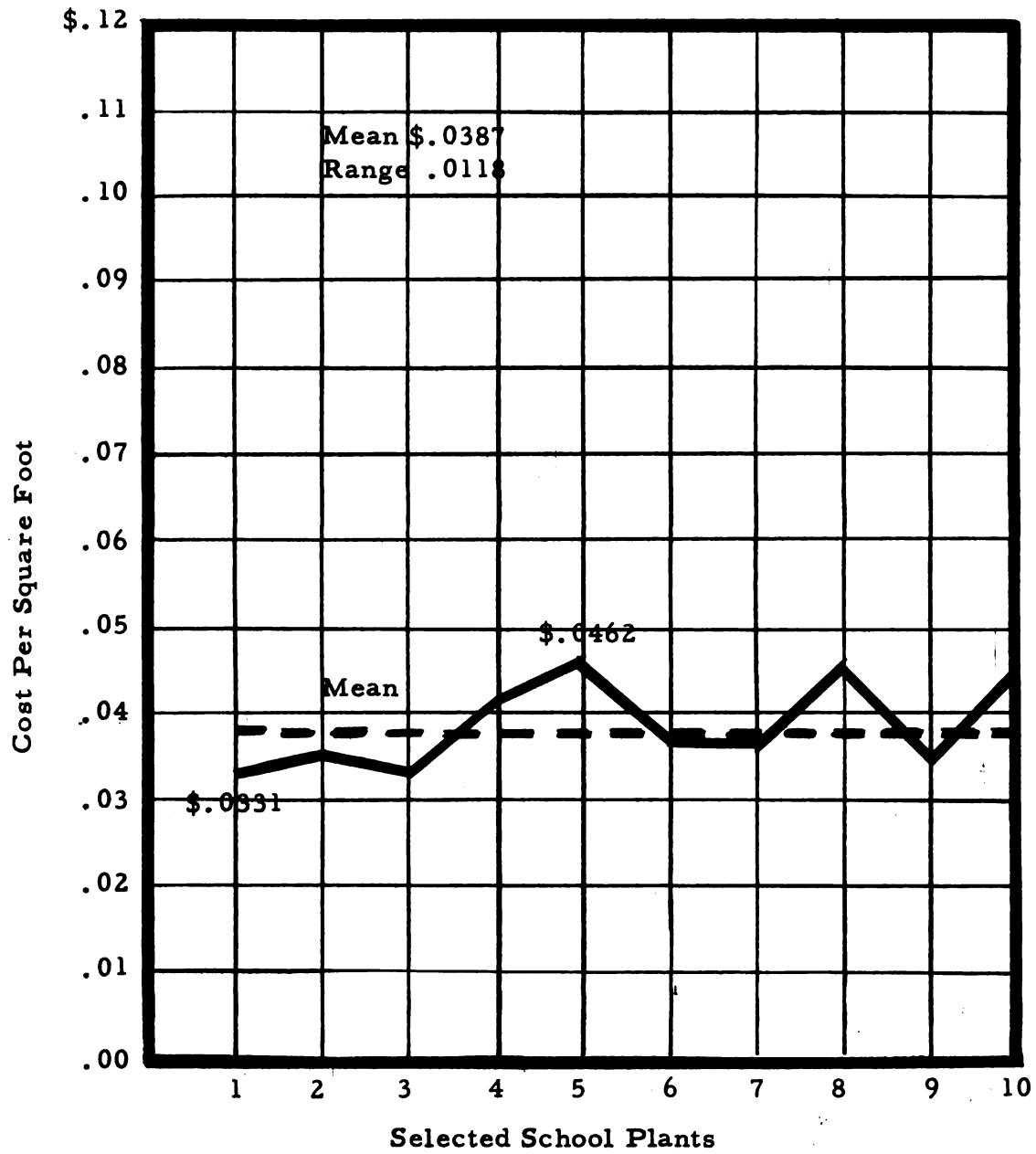


Figure 13. A four-year average of annual heating operation costs in ten selected Detroit elementary school plants, 30-48 years old.

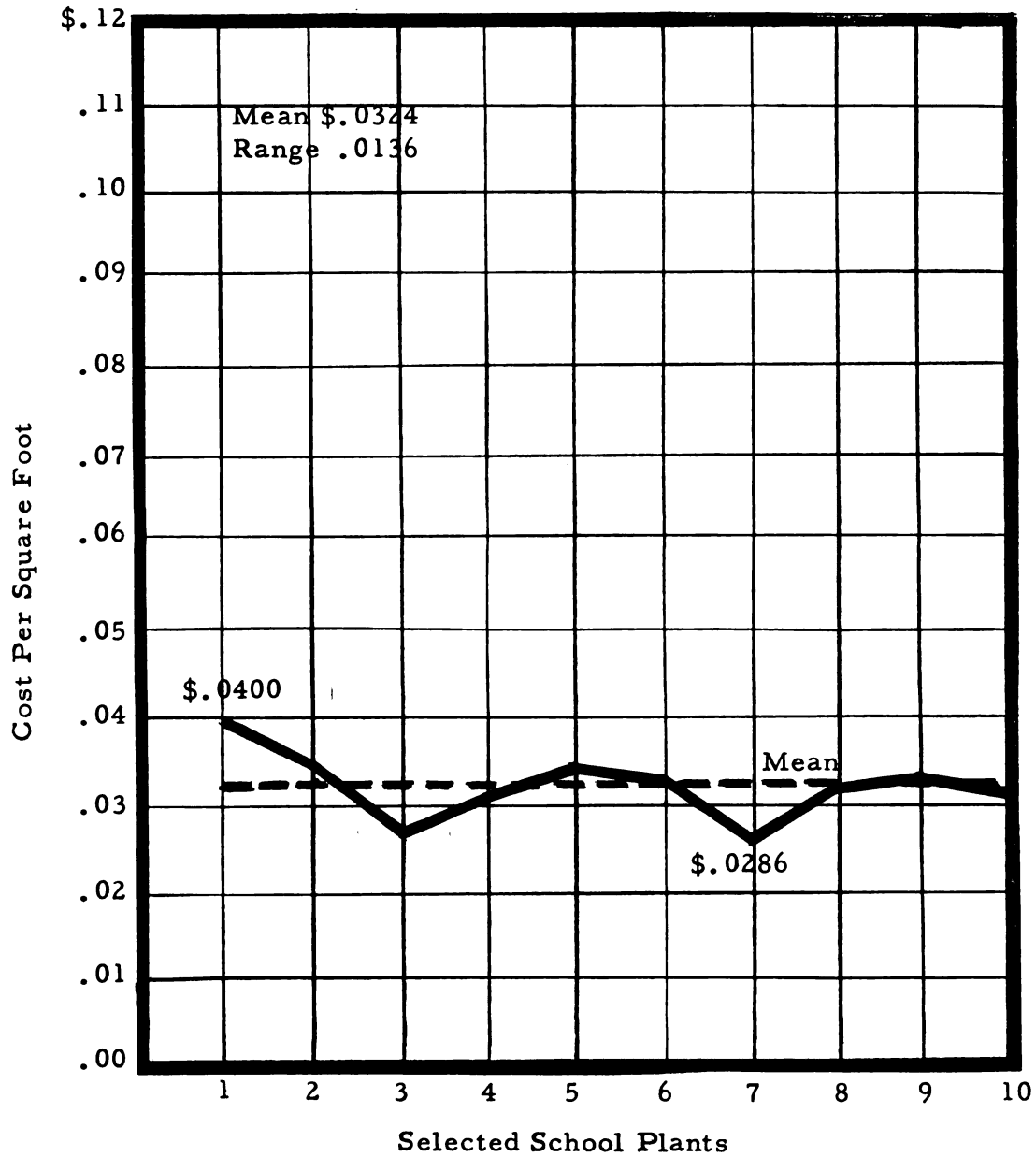


Figure 14. A four-year average of annual heating operation costs in ten selected Detroit elementary school plants, 4-10 years old.

Electrical expenditures:

Electrical costs include:

Expenditures for electricity, for artificial lighting and power, except for heating buildings, for all purposes except direct expenses for Pupil Transportation, Food Services, Student-Body Activities, and Community Services.¹

In any analysis of electrical operation costs, one must be aware of the fact that the Detroit Public Schools use a wide variety of electrical light fixtures ranging from incandescent globes to many types of hot and cold tube fluorescent lamps. Other variable components that would affect the cost of electricity are such factors as hand-wound clocks vs. electric clocks, the amount of power machinery and appliances found in shops and homemaking rooms, intercommunication systems, additional electrical receptacles, and the use of electricity by teachers and other staff members. It can be stated with assurance that some teachers use artificial lighting almost continuously in the classroom while others seldom bother to turn on the lights.

In analyzing Figure 15, it is observed that the electrical operating costs in plants fifty-four to seventy-three years old have varied from a high of \$0.0454 per square foot to a low of \$0.0175 per square foot. The mean cost was \$0.0265. In terms of average annual electrical operation costs, the most expensive plant was \$0.0279 per square foot more expensive than the least expensive plant.

In analyzing Figure 16, it is observed that electrical operating costs in plants thirty to forty-eight years old have varied from a high of \$0.0411 per square foot to a low of \$0.0226 per square foot. The mean cost was \$0.0296. In terms of average annual electrical operation expenditures, the most expensive plant was \$0.0185 per square foot more than the least expensive plant.

¹Reason and Tankard, loc. cit.; see also, Reason and White, loc. cit.

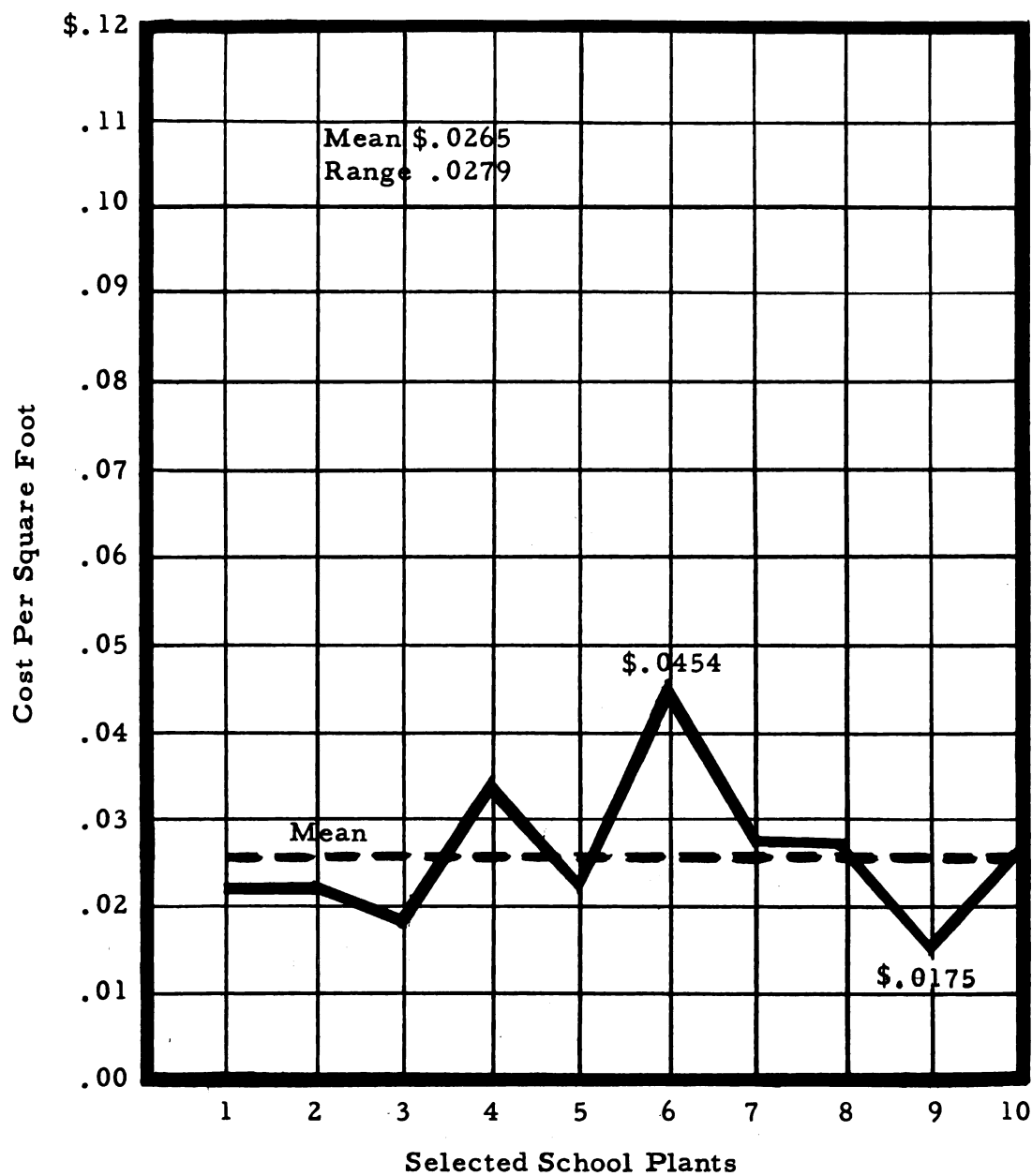


Figure 15. A four-year average of annual electrical operation costs in ten selected Detroit elementary school plants, 54-73 years old.

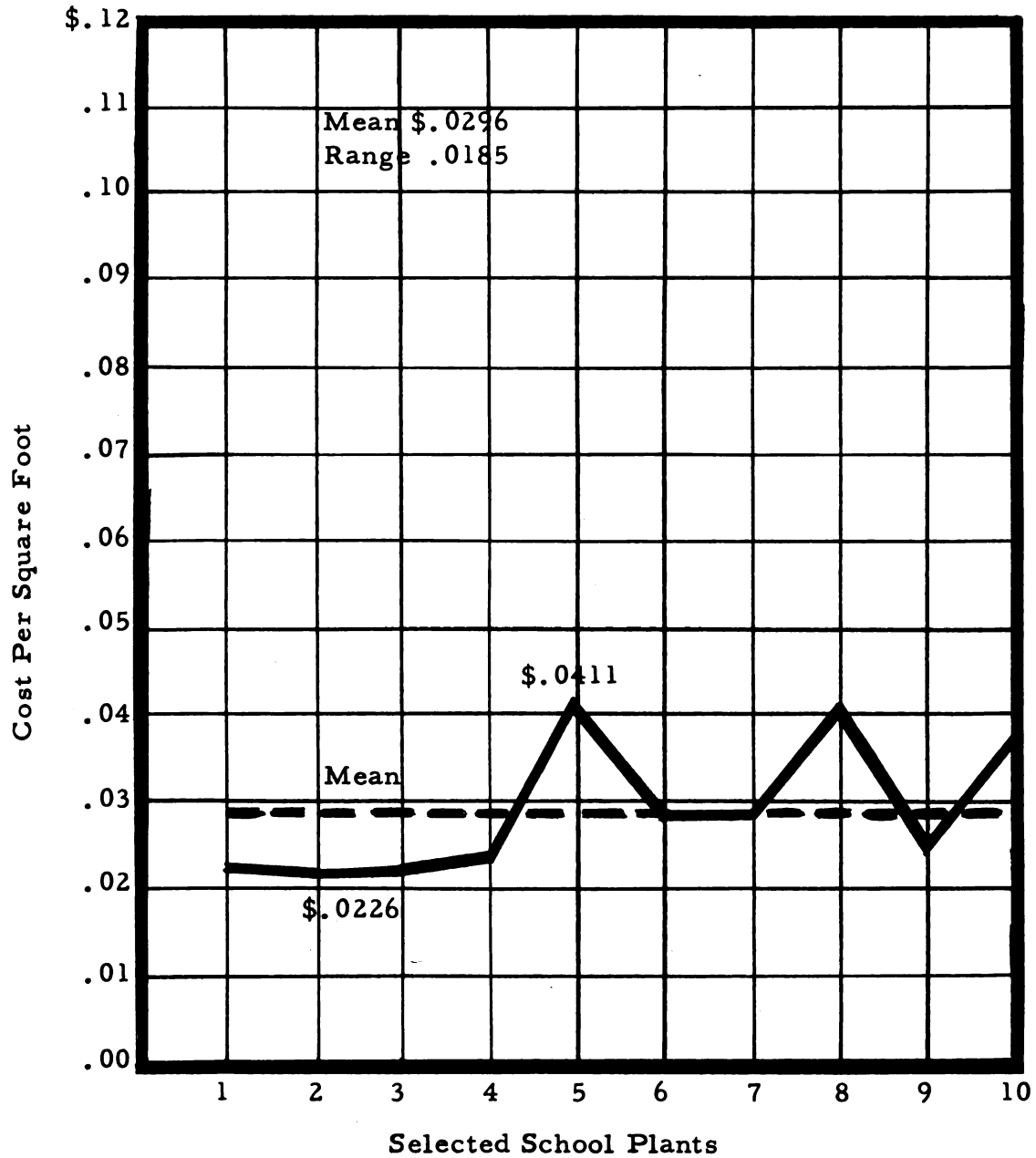


Figure 16. A four-year average of annual electrical operation costs in ten selected Detroit elementary school plants, 30-48 years old.

In analyzing Figure 17, it is observed that the electrical operating costs in plants four to ten years old have varied from a high of \$0.0600 per square foot to a low of \$0.0355 per square foot. The mean cost was \$0.0453. In terms of average annual electrical operation expenditures, the most expensive plant was \$0.0245 per square foot more than the least expensive plant.

Notwithstanding the many variables mentioned that could affect the cost of electricity in school buildings, Figure 17 clearly shows that more money is spent for utilization of electrical power in recent buildings than in either of the other two groups. In old buildings natural light is often restricted by either too few windows or by windows inadequate to provide light for all areas of the room. In these same buildings are found outdated fixtures with limited ability to provide the proper foot candles of light. Obviously, in old buildings where the need for adequate lighting and electrical equipment is great, often are found the most limited electrical facilities. More and better quality lights are found in buildings four to ten years old than in the middle-aged and old groups. Furthermore, a greater variety of electrical equipment and appliances is found in the recent group of buildings.

Salaries for custodial services:

The full-time, part-time, and prorated portions of salaries of custodians, firemen, custodian helpers, matrons, general utility men, dairymen, night watchmen, and other such personnel who sweep, clean, polish, mop, care for buildings and livestock, operate the heating and ventilating systems, and perform any other housekeeping duties, for all purposes except expenses for Pupil Transportation, Food Services, Student-Body Activities, and Community Services.¹

¹Reason and Tankard, loc. cit.; see also, Reason and White, loc. cit.

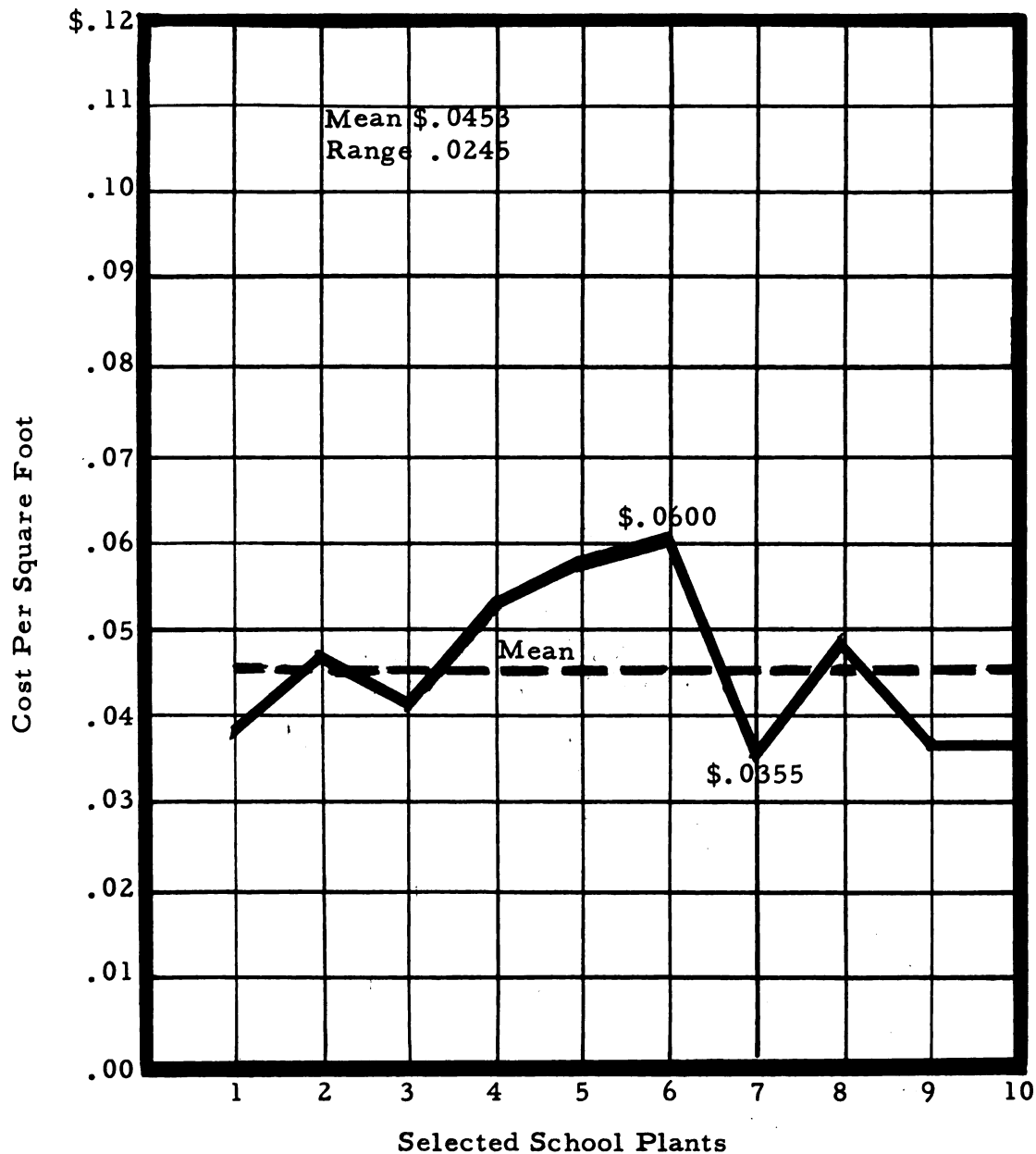


Figure 17. A four-year average of annual electrical operation costs in ten selected Detroit elementary school plants, 4-10 years old.

In analyzing Figure 18, it is observed that the custodial operation salary costs in plants fifty-four to seventy-three years old have varied from a high of \$0.5203 per square foot to a low of \$0.3864 per square foot. The mean cost was \$0.4396. In terms of average annual custodial operation salary expenditures, the most expensive plant was \$0.1339 per square foot more expensive than the least expensive plant.

In analyzing Figure 19, it is observed that the custodial operation salary costs in plants thirty to forty-eight years old have varied from a high of \$0.4777 per square foot to a low of \$0.3475 per square foot. The mean cost was \$0.4401. In terms of average annual custodial operation salary expenditures, the most expensive plant was \$0.1302 per square foot more expensive than the least expensive plant.

In analyzing Figure 20, it is observed that the custodial operation salary costs in plants four to ten years old have varied from a high of \$0.6201 per square foot to a low of \$0.2980 per square foot. The mean cost was \$0.4476. In terms of average annual custodial operation salary expenditures, the most expensive plant was \$0.3221 per square foot more expensive than the least expensive plant.

A possible explanation for the wide range of custodial salaries differences in plants of similar age appears to be correlated with size of the building. For example, the high-cost building in the recent group has 23,545 total square feet of space and the two low-cost buildings in the recent group have 71,695 and 62,281 square feet respectively. In the middle-aged group the high-cost building has 29,982 square feet of space and the low-cost building has 60,994 square feet. In the old group of buildings the high cost facility has 32,468 square feet of space and the low-cost plant has 62,104 square feet.

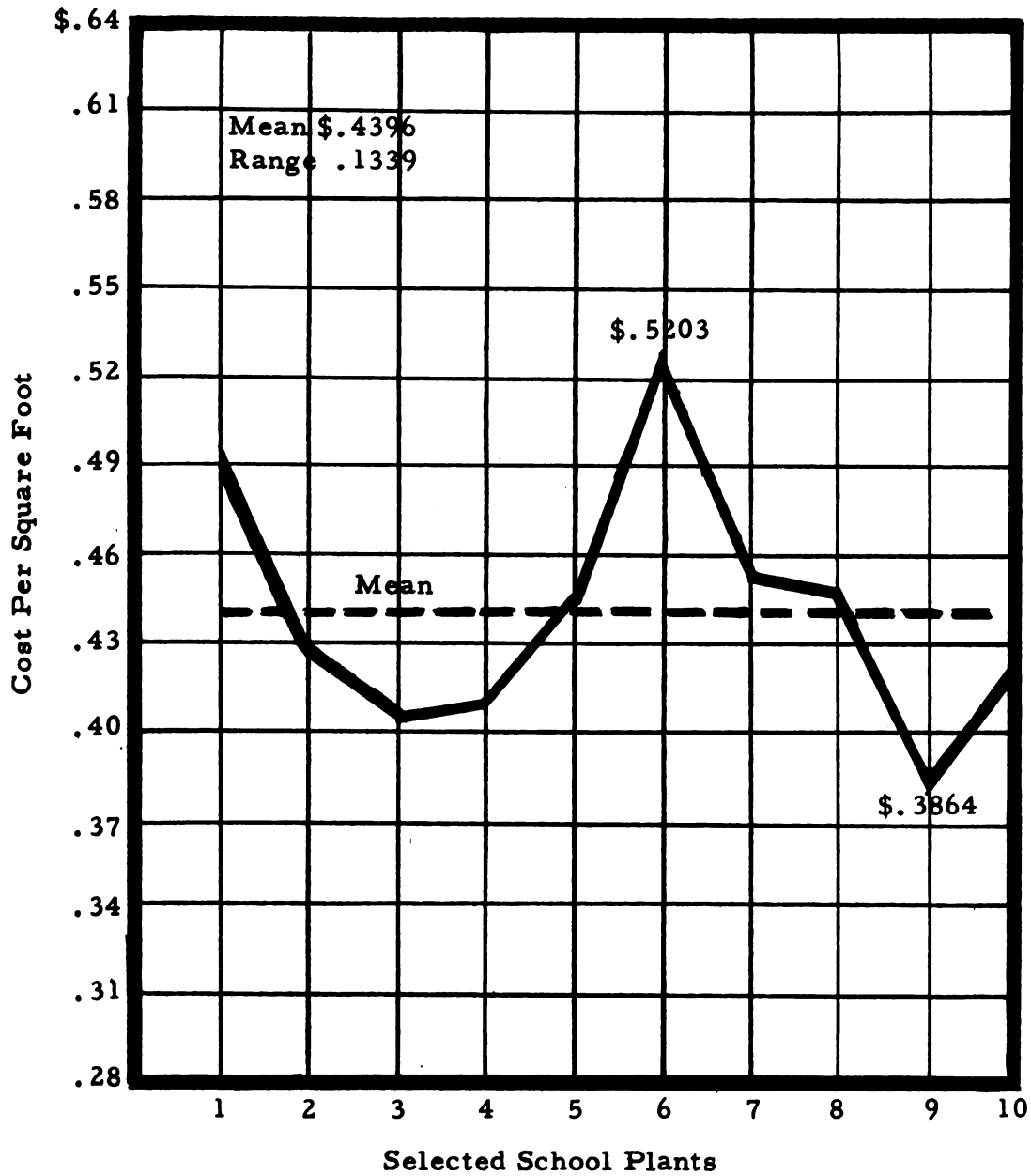


Figure 18. A four-year average of annual custodial operation salary costs in ten selected Detroit elementary school plants, 54-73 years old.

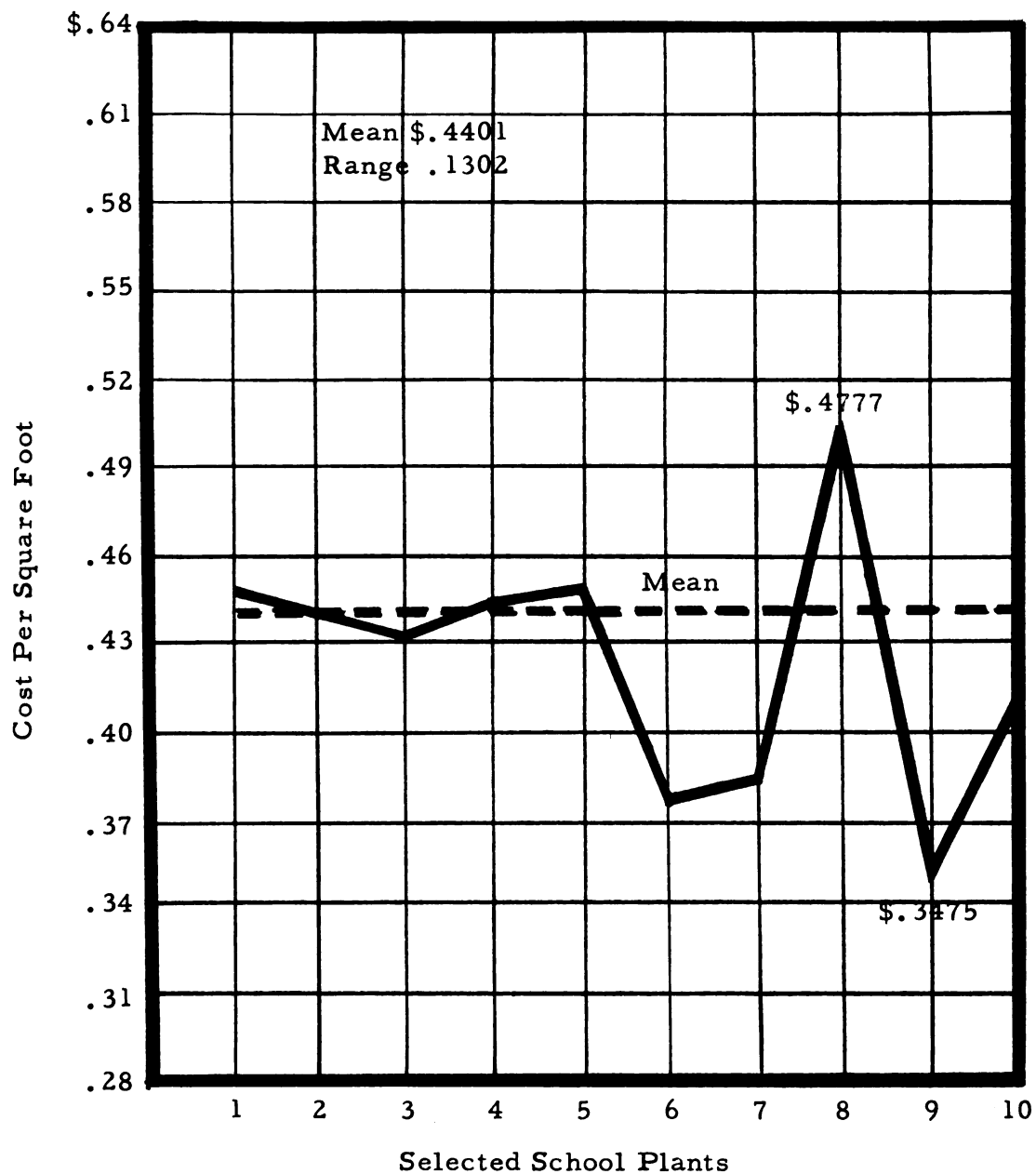


Figure 19. A four-year average of annual custodial operation salary costs in ten selected Detroit elementary school plants, 30-48 years old.

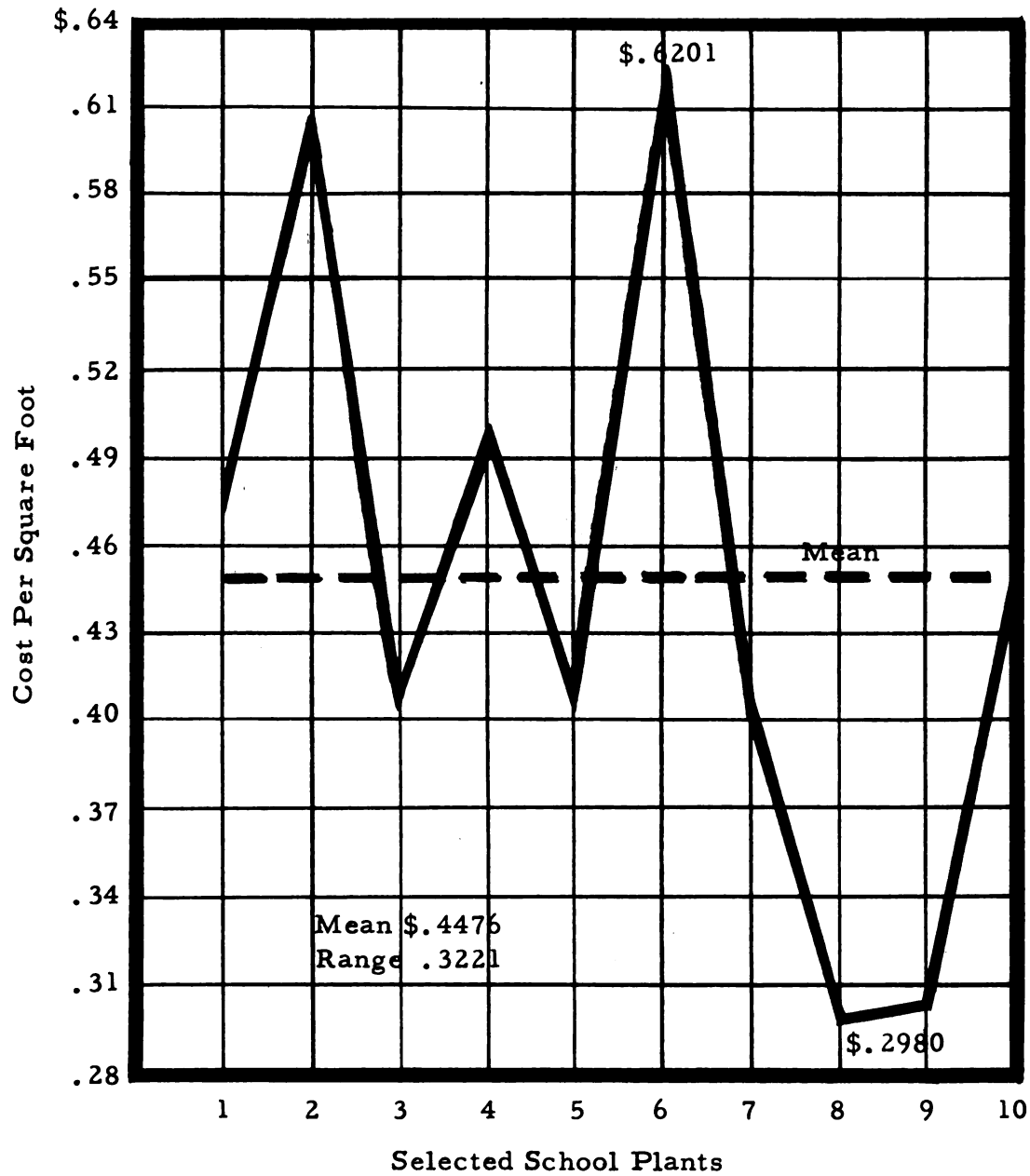


Figure 20. A four-year average of annual custodial operation salary costs in ten selected Detroit elementary school plants, 4-10 years old.

Custodial supplies:

Expenditures for custodial supplies include all items necessary in the routine housekeeping care of the building, such as mops, brushes, brooms, pails, cleaning compounds, wax, towels, soap, stepladders, and other tools and supplies which are used by students and school district employees.

In analyzing Figure 21, it is observed that the custodial supplies in plants fifty-four to seventy-three years old have varied from a high of \$0.0022 per square foot to a low of \$0.0006 per square foot. The mean cost was \$0.0012. In terms of average annual custodial supplies expenditures, the most expensive plant was \$0.0016 per square foot more expensive than the least expensive plant.

In analyzing Figure 22, it is observed that the custodial supplies costs in plants thirty-to forty-eight years old have varied from a high of \$0.0042 per square foot to a low of \$0.0005 per square foot. The mean cost was \$0.0016. In terms of average annual custodial supplies expenditures, the most expensive plant was \$0.0037 per square foot more expensive than the least expensive plant.

In analyzing Figure 23, it is observed that the custodial supplies costs in plants four to ten years old have varied from a high of \$0.0058 per square foot to a low of \$0.0010 per square foot. The mean cost was \$0.0026. In terms of average annual custodial supplies expenditures, the most expensive plant was \$0.0048 per square foot more expensive than the least expensive plant.

Obviously, from examination of Figures 22 and 23 there is a great range of cost difference for custodial supplies in school plants of similar age. The range of cost difference in old buildings is much less apparent than the other two groups. Some possible explanation of cost differences would be: (1) kinds of constructional materials found in buildings of varying age requiring different kinds and variety of supplies,

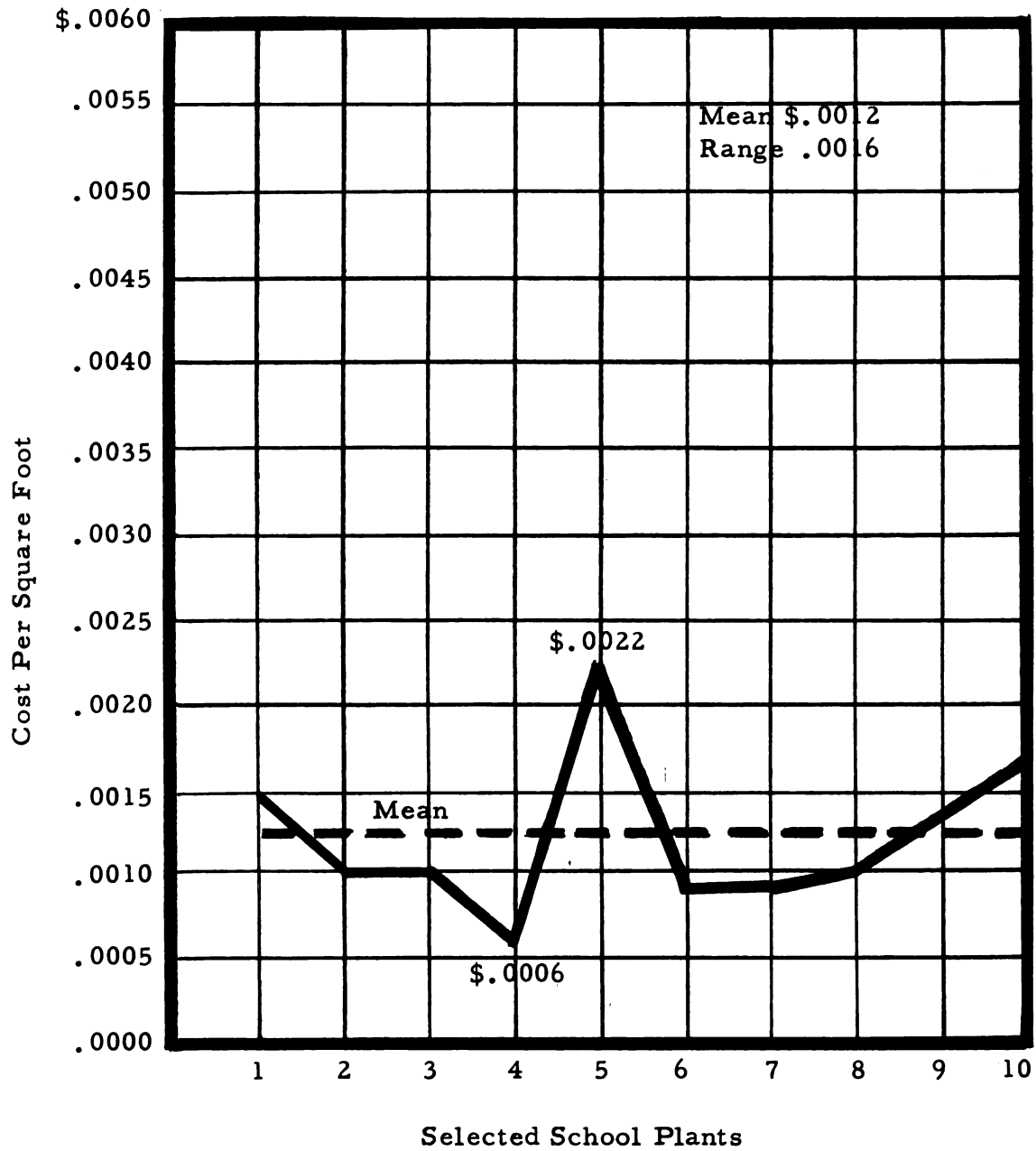


Figure 21. A four-year average of annual custodial supplies costs in ten selected Detroit elementary school plants, 54-73 years old.

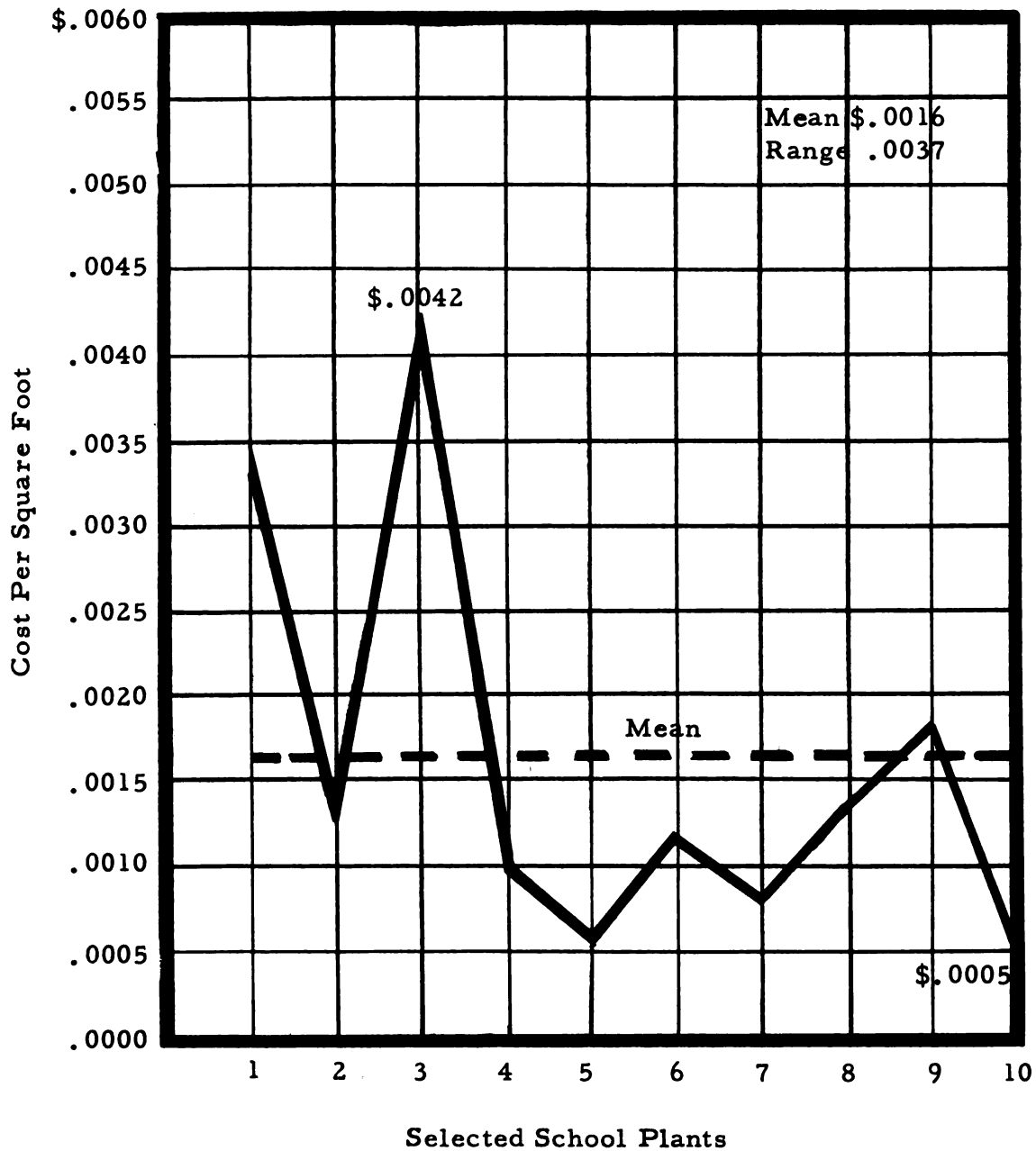


Figure 22. A four-year average of annual custodial supplies costs in ten selected Detroit elementary school plants, 30-48 years old.

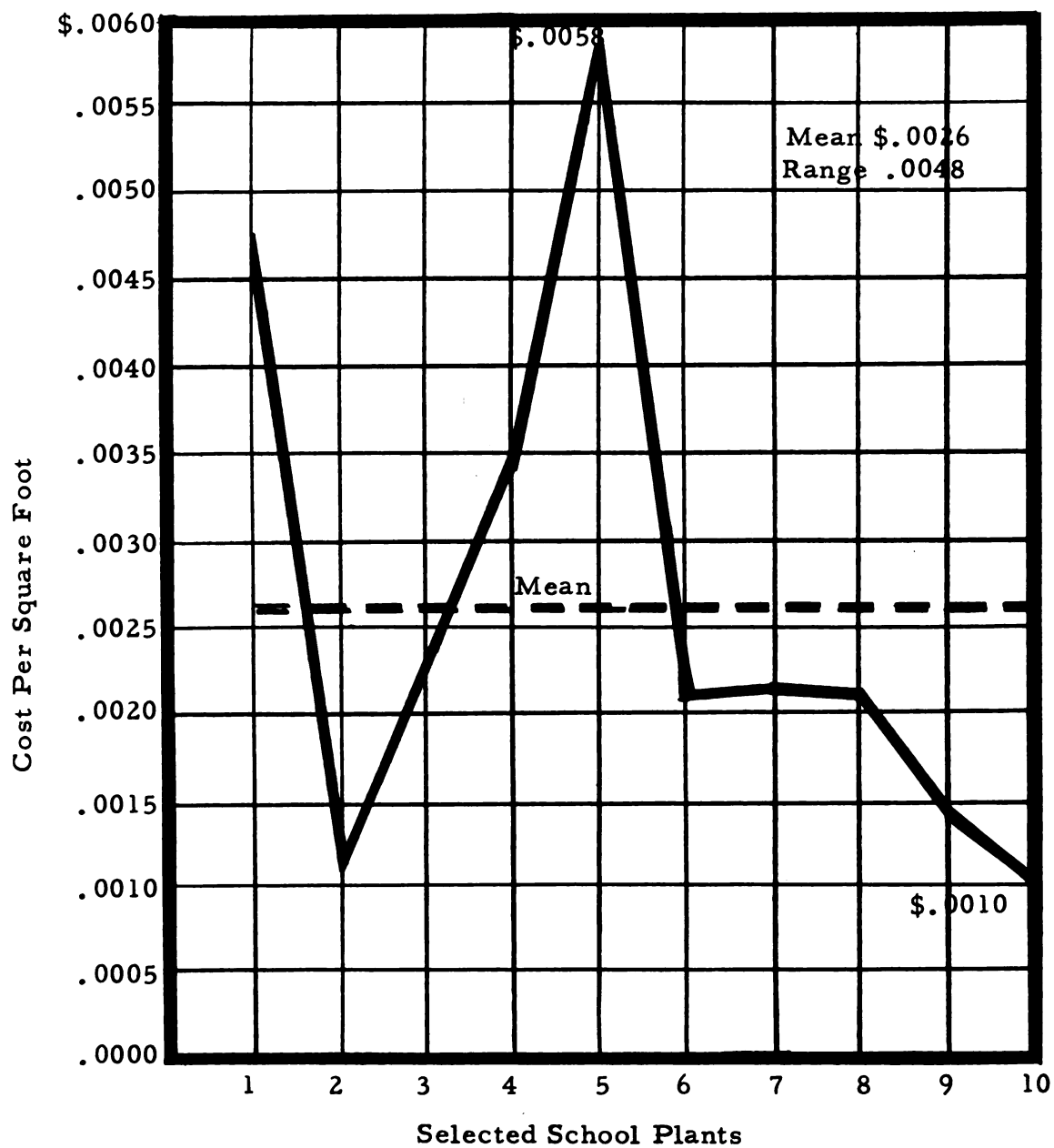


Figure 23. A four-year average of annual custodial supplies costs in ten selected Detroit elementary school plants, 4-10 years old.

(2) proper and improper use of custodial supplies which would result in savings or waste, (3) availability of supplies when requested, (4) amount of available storage in individual buildings, and (5) loss through carelessness and misappropriation.

The basic data for each individual plant, including the average annual maintenance and operating costs, square-foot measurements, and cost per square foot have been recorded and listed in a series of tables. The school plants in similar age groups, representative of the six cost factors, were then plotted as a series of figures. An analysis of the school plants within similar age groups was completed by determining the mean and range for each maintenance and operation factor. Further, it was recognized that cost differences exist between plants of comparable vintage by reporting the reasons for the varied expenditures.

The hypothesis for this study can now be evaluated.

Statement of hypothesis: A relationship exists between selected operating and maintenance costs of varying aged Detroit school buildings and sites.

1. Old buildings are expensive to operate and maintain.
2. Middle-aged buildings are less expensive to operate and maintain.
3. Recent buildings are least expensive to operate and maintain.

To substantiate this hypothesis a simple comparison of the mean average maintenance and operating costs per square foot of old, middle-aged, and recent school plants will be made. Table 25 indicates the results of such a comparison for school plant maintenance and operating expenditure.

Table 25. A Comparative Relationship of Maintenance and Operation Costs of Old, Middle-Aged, and Recent Detroit School Plants.

Cost Factors	Mean Average Costs Per Square Foot		
	Old	Middle-Aged	Recent
Building Maintenance	\$ \$0.1712	\$ \$0.1057	\$ \$0.0375
Site Maintenance	623.21*	384.98*	248.13*
Heating Operation	0.0411	0.0387	0.0324
Electrical Operation	0.0265	0.0296	0.0453
Custodial Salaries	0.4396	0.4401	0.4476
Custodial Supplies	0.0012	0.0016	0.0026

* Mean cost per acre

Review of Table 25 indicates some notable cost differences between school plants of varying age. It is noted that:

1. Old plants cost \$0.0655 more to maintain than middle-aged plants and \$0.1337 more than recent plants. For this sample of buildings, old plants cost four and one-half times more to maintain than recent facilities. Middle-aged plants cost \$0.0682 more than recent plants to maintain. It is noted that the difference of cost between old and middle-aged and between middle-aged and recent are about equal.
2. Site maintenance costs for old plants average \$238.23 more per acre than for middle-aged plants and \$375.08 than for recent plants. Middle-aged plants cost \$136.85 per acre more than recent plants. Site maintenance costs for old plants were two and one-half times greater than per acre costs of recent plants.
3. Old plants expended \$0.0024 more per square foot than middle-aged plants for fuel and \$0.0087 more than recent plants.

Middle-aged plants had a \$0.0063 greater expenditure per square foot than recent plants. It is noted that there is less than one cent per square-foot difference among the three groups for heat operation costs.

4. Old plants expended \$0.0188 less for electricity than recent plants and \$0.0031 less than middle-aged plants. Middle-aged plants cost \$0.0157 less per square foot for electrical operation than recent plants. It is observed that the old and middle-aged expenditures are closely related and that recent plants cost one and one-half to almost two cents more per square foot for electricity than the other two groups.
5. The difference of square foot cost for custodial salaries between the three groups of plants is less than one cent. Recent plants cost \$0.0080 more than old facilities and \$0.0075 more than middle-aged plants. Salary costs for the middle group average only \$0.0005 more than for the old group.
6. Old plants expended \$0.0014 less for custodial supplies than recent facilities and \$0.0004 less than middle-aged plants. Middle-aged plants cost \$0.0010 less per square foot for custodial supplies than recent buildings.

Conclusion. A direct relationship exists between selected operating and maintenance costs of varying aged Detroit school buildings and sites. The data depicted in Table 25 clearly reveals that when comparing the selected cost factors of the three groups, a relationship does exist.

Accept the hypotheses that old buildings are expensive to operate and maintain; middle-aged buildings are less expensive to operate and maintain; and recent buildings are least expensive to operate and maintain.

It is noted from Table 25 that in three of the cost factors-- building maintenance, site maintenance, and heating operation costs-- old buildings have higher expenditures than either middle-aged or recent facilities. Middle-aged plants for the same three cost categories are more expensive to operate and maintain than recent plants. However, recent buildings in the sample of thirty plants included in this study have higher electrical, custodial salaries, and custodial supplies expenditures than either the old or middle-aged plants. A compilation of the square-foot costs for the five categories within the three groups show that old plants have a total cost of \$0.6796; middle-aged plants, \$0.6157; recent plants, \$0.5654. The total cost difference between the old and middle-aged plants is approximately six and one-half cents per square foot and between the old and recent facilities approximately eleven and one-half cents per square foot. The costs for middle-aged plants are approximately five cents greater per square foot than recent buildings. In addition, the sixth factor--site maintenance--also reveals a similar pattern with old plants being the most expensive and recent plants the least expensive.

The following and concluding chapter states the conclusions, implications, and highlights of this study. In addition, a section will be devoted to major objectives that help determine when a school building should be abandoned or rehabilitated.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND MAJOR OBJECTIVES OF REHABILITATION OR ABANDONMENT OF SCHOOL FACILITIES

The present study concerns itself with a comparison of selected operating and maintenance costs that condition decisions leading to rehabilitation or abandonment of school facilities. This chapter will summarize the problem, the review of literature, and methodology followed by an evaluation of the hypothesis. Conclusions will be stated and recommendations made which evolve from the results of the research. A final section will define major objectives that could lead to a decision of rehabilitation or abandonment of a school facility.

SUMMARY

Rehabilitation or abandonment of obsolete school buildings is a major problem facing communities throughout the nation. It has been estimated that over ten million American school children are in school buildings more than thirty-five years old and that 10 to 12 per cent of the total number of pupils in school are in buildings over fifty years old.

Detroit has 300 school buildings. Over 100, or one-third, of these buildings are over forty years old. Over 125,000, or approximately 45 per cent, of Detroit's public school children receive their formal education in these buildings. To replace all of these aging buildings in Detroit would require an expenditure in excess of 200 million dollars. This figure does not include the cost of schools to

accommodate the increase in school enrollment or needed improvement and additions to more recent structures. Obviously, the question of rehabilitation or replacement of obsolete school buildings is a major problem--a problem facing many school districts in the United States. Appendix B presents the number of school plants forty years and older in Detroit's nine school districts.

It was stated in Chapter I that many factors condition a decision to rehabilitate or abandon a school plant. The complexity of the problem required considerable delimitation of the buildings and sites to be studied and data to be collected in order to reduce variability and achieve maximum comparability. In conducting the study, selected maintenance and operating factors were designated as the most feasible concept for comparing school plants of varying age. Definitions, delimitations, and hypotheses were established to provide a frame of reference within which this study was conducted.

In Chapter II, a review of the literature for this study recognized that existing school buildings to house educational programs of today and tomorrow offer one of the most critical and perplexing problems facing communities of the nation. The problem is aggravated and made more critical by the fact that school buildings become obsolete not only from age but also from improvements and change in educational programs. Today's school program is quite different from that of past generations. Improved services and activities demand more space and different facilities. Many older buildings designed for the traditional school program are structurally sound but are obsolete and should be replaced or completely rehabilitated.

It is further observed from the literature that authorities recognize the tremendous amounts of money which are expended annually by boards of education without realizing the full impact their decisions make upon the long-range costs of housing school children. Authorities

estimate that the annual expenditure for school facilities is about one-fourth the total school budget, and all responsible predictions indicate the need for school space will continue to mount at an increasing rate.

The review of literature concerning educational usefulness emphasized repeatedly that the school plant should be designed to fit a desired program and be constructed with sufficient flexibility to adequately meet future program change. Any lack of attention to the relationship of program to plant may well be a weakness. Educators face the difficult but inescapable task of adapting existing facilities for an educational program to meet the needs of all the children. In obsolete buildings school authorities are continually faced with the question as to whether existing facilities can be adapted to current needs, or whether extensive alterations and structural changes will be required.

As pointed out in Chapter II, Bergstrom found that program changes are not adaptable to old buildings and he further implied that even with modernization of an old plant there is a loss of educational value.

A further review of the literature examined the importance of human values in school architecture. Authorities agree that there are many situations in which the physical environment is a decisive factor in a child's behavior. The writer believes that students should perceive space in ways that make them feel happy, at ease, or at times stimulated. These feelings are basic influences upon the student's ability to do his best learning and upon the teacher's ability to do his best teaching. One of the major questions one is asked to consider is whether educators and other citizens in a community should continue to be satisfied with big, ugly fortress-like buildings lacking exhibit space, flexibility, and designed atmosphere of beauty. Children deserve something better than a damp basement classroom, or a classroom with a high ceiling, poor lighting, operational windows for ventilation, unattractive windows

and shades, space-wasting radiators, and fixed desks. The atmosphere and environment of a school plant must be such that it contributes to the full growth of each pupil's mental, physical, and spiritual potentials.

The review of literature for maintenance and operation of school plants was concentrated upon the annual expenditures for these two items in a school district's total budget. It was indicated in the review that approximately 10 per cent of a school district's annual budget is expended on maintaining and operating school plants. School plant authorities say that the annual cost of maintenance and operation of buildings in many communities is almost as much as annual payment (in the form of debt-service for the retirement of building bonds) toward the costs of the buildings themselves.

In Detroit, Michigan, during the school year, 1957-58, the schools expended 11.9 per cent of their total budget per pupil in average daily attendance for operation of plant and 4.8 per cent for maintenance of plant.¹ This is a considerably higher percentage of the total budget than indicated for many communities. As pointed out in Chapter I, Detroit has a high percentage of old buildings and this reflects the increased cost of operation and maintenance in Detroit schools.

The design and methodology of this study were described in Chapter III. Three groups of elementary school plants were selected in Detroit, Michigan. The first group was labeled "old" plants for those plants fifty-four to seventy-three years old; the second group of "middle-aged" plants represent plants thirty to forty-eight years old; the third group of "recent" plants represent those plants four to ten years old. Appendix C locates on a map of Detroit the sample of thirty plants used in the study. For each of these plants, square-foot computations were made of the

¹Current Expenditures Per Pupil in Public School Systems (Washington 25, D.C.: U. S. Department of Health, Education, and Welfare; Office of Education, 1959), Circular No. 595, p. 16.

building area. Selected operating and maintenance cost figures covering a four-year period were obtained for each plant and an average mean and range cost per square foot were described. The plan of the design, rationale for selection of buildings, statistical treatment, population, sample, and the randomization procedure were discussed and developed. The operation and maintenance cost differences for the three groups of buildings were reported and analyzed in Chapter IV.

The analysis of the results began with an identification of expenditures for maintenance and operating factors of the selected buildings through the use of a series of tables. Also identified within the tables was the date of original construction for each plant and the date of any additions to the original building, the total square footage for each plant, number of acres in the site, and the cost per square foot and per acre for each plant. By using figures, the cost differences were graphically illustrated for the selected plants in each of the three groups--old, middle-aged, and recent. Within each figure the expenditures per square foot and per acre for each plant were easily identified, as well as the average mean and range of cost differences between the high and low cost facilities.

Table 25 which showed a simple comparison of mean average expenditures for each of the six selected maintenance and operating factors for old, middle-aged, and recent school facilities indicated the cost differences within the three groups of plants.

The following section contains the conclusions which are drawn from the preceding research.

CONCLUSIONS

The following concluding statements with respect to a comparison of selected operating and maintenance cost factors of old, middle-aged, and recent school plants seem to be substantiated by this study.

- I. There are notable operation and maintenance cost differences between old, middle-aged, and recent school plants.
- II. The total expenditures for operating and maintaining old plants are greater than the cost for maintaining and operating middle-aged or recent plants.
- III. Middle-aged buildings expend more money for maintenance and operation than recent buildings.
- IV. Although the total costs are correspondingly higher for middle-aged and old facilities than for recent plants, it should be pointed out that exceptions exist in the cost differences of individual operation and maintenance factors, and in the following order:
 - A. Old plants expend more money for building and site maintenance and fuel than either of the other two age categories.
 - B. Middle-aged plants have higher fuel operation and building and site maintenance costs than recent plants.
 - C. Recent plants have higher electrical operation, custodial salaries, and custodial supplies expenditures than either the middle-aged or old facilities.
 - D. Middle-aged plants have higher electrical operation, custodial salaries, and custodial supplies expenditures than old facilities.
- V. Cost differences between school plants of similar age do exist.

RECOMMENDATIONS

The adequacy of aging school plants and the economy of operation and maintenance are dependent upon the use of sound principles, judgments, and decisions by the specialists charged with the responsibility of creating and maintaining the learning environment. It is the responsibility of these professional people who understand the goals and purposes, as well as the economies, in the functional administration of a school program to provide this leadership. Sufficient funds, adequate facilities, and a professionally trained staff are necessary to bring about an understanding of the true economies in housing school children. Knowledge of the information is dependent upon public interest, support, and cooperation which may not only provide the basic ingredients for a good educational program, but also one which may have many sound inherent economies.

Implications of the study could extend into many areas of education, such as community relations, curriculum, sociological and economic climate of the community, and planned economy in new construction. Based upon the evidence and conclusions submitted in this study, some of the more obvious recommendations are cited:

- I. Additional investigation of detailed operation and maintenance costs in aging school plant facilities is needed. Further study should be made to identify and isolate specific high-cost areas where economies can be effected.
- II. Make provision for requiring a more uniform system of school housing-cost accounting in conjunction with the existing financial accounting system, to obtain a more adequate evaluation of expenditures. A complete operation and maintenance cost record should be available by individual plants.

- A. This would reveal in a quick review that one building is a high-cost facility and a comparable plant is a low-cost facility. High-cost maintenance factors could be easily isolated and brought under study.
 - B. Trends and patterns would be discernible, aiding the decision on whether to rehabilitate or abandon a school plant.
 - C. An up-to-date record of maintenance costs, coordinated with preventive and planned maintenance changes, would assume the formation of a realistic annual budget.
- III. Recognition of preventive maintenance as a continuous, integrated, and coordinated program.
 - IV. Encouragement of more standardization of equipment and materials in an effort to reduce the total cost of maintenance and operation costs.
 - V. School districts should direct their attention to a program of planned replacement of obsolete school facilities.
 - VI. Since a majority of the cost in the maintenance of school buildings is labor expenditures, adequate staffing and training of the staff are musts to assure economical maintenance programs.
 - VII. Develop a positive approach toward solving the problem of housing school children in a sound educational environment.
 - VIII. Responsible school authorities should keep the lay public informed with respect to those elements constituting adequate, safe, healthy, and economical school facilities, equipment, and supplies.

MAJOR OBJECTIVES OF REHABILITATION OR ABANDONMENT OF SCHOOL FACILITIES

There has been a long-standing contention that it is possible to predetermine the age of school plants to be rehabilitated or abandoned. Age alone does not present a clear picture of the adequacy or inadequacy of a structure since subsequent remodeling can often prolong the life of a building by many years. Neither can any arbitrary age date be set at which a building becomes obsolete, since all buildings do not age at the same rate.

School buildings tend to assume individual characteristics. This is true of buildings planned identically in size, design, and educational specifications, as well as buildings with dissimilarly planned features. Similarly planned school buildings, while under construction, reflect the attitudes, personalities, and work habits of planning coordinators, architects, building trade contractors, and individual workers. Moreover, similarly planned school buildings are subjected to a variety of weather conditions, differences in construction materials, and different kinds of soil conditions.

As the building ages, the characteristic individuality of facilities tends to heighten by a variety of factors such as structural changes, replacement of equipment, wear and tear of the facility by building occupants, general maintenance care, unequal deterioration of construction materials, and additions to the original structure. While age can serve as an index of expected obsolescence, it is but one factor in determining whether to rehabilitate or abandon school facilities. Even with adequate maintenance, the educational usefulness of many old buildings becomes seriously impaired. While poor plumbing, fire hazards, and other physical deficiencies usually are the first shortcomings to attract public notice, a more common deficiency is the inability of a

school structure to be compatible with contemporary curriculum and teaching methods.

Even though there are no valid formulas applicable to all districts, it seems essential for each school district to plan rehabilitation or abandonment of school facilities on a scheduled, rather than an emergency, basis. For this purpose, certain local major objectives can be developed. Before the decision for rehabilitation or abandonment is reached, these objective criteria should be examined:

I. Needs.

- A. Is the present pupil population likely to increase or decrease in the next few years which would result in the building being too large or too small?
- B. Will the need for a school cover the period of time necessary to fully amortize rehabilitation costs?
Will an urban renewal program affect the need? Will planned expressway construction, industrial development, or rezoning affect retaining the building at the present location?

II. Community characteristics.

- A. Would a rehabilitated building fit with the neighborhood environment, be acceptable to the community, encourage people to be more conscious of neighborhood cooperation, or help to establish the school as a community center for the neighborhood?

III. Educational program implications.

- A. What are the educational goals for the pupils to be housed in the rehabilitated building?
- B. Does the existing space conform to educational standards for the pupils?

- C. To what extent should the present site and building be altered?
- D. Will rehabilitation of the structure permit further flexibility for program change?

IV. Site.

- A. Is the site of sufficient size for present and future enrollments?
- B. If the site is small, can it profitably be expanded?
- C. Would the cost of site expansion be justified in terms of life expectancy of a rehabilitated building?
- D. Is the site centrally located in the community?
- E. Is the site coordinated with total future master plans of the area?

V. Condition of the building.

A. Soil condition.

- 1. Is the building located on soil that has created problems of settling, sagging, or floating of the facility?
- 2. Does the present soil condition present problems of inadequate drainage, flooding of basement and engineering spaces, or excessive dampness in sub-basement and basement spaces?

B. Structural deficiencies that involve excessive expense.

- 1. Replacement or major repair of the roof.
- 2. Brickfacing.
- 3. Wood joists and subflooring uneven due to wear and tear and in a deteriorated condition.
- 4. Extensive deterioration of wood and overhangs, framing around windows, etc.
- 5. Deteriorating gables and cupolas; redesign or replacement would create problems of ventilating educational spaces.

6. Deteriorating foundations.
7. All of the above conditions would imply that the building is not weathertight, which in turn creates problems within the building such as:
 - a) Excessive dampness and water leakage throughout the building.
 - b) Extreme cracking of ceiling and wall surfaces.
 - c) Frequent plaster repair work and painting.
 - d) Added mechanical and equipment expense.
 - e) Increased fuel costs.
 - f) Unsatisfactory environment for building occupants.

C. Mechanical and service deficiencies that involve excessive expense.

1. Boiler replacement (estimated cost in Detroit-- \$90,000 to \$135,000).
2. Condition of fuel pipe and line system.
3. Condition of ventilating system.
4. Condition and distribution of hot and cold water pipes.
5. Condition of pumps and machinery.
6. Many older buildings utilizing basement space for educational instruction have extreme problems since very often machinery rooms and fresh air shafts interfere with the free flow of pupil traffic.

D. Electrical deficiencies that involve excessive expense.

1. Deteriorated and brittle wiring. This frequently occurs in an old building equipped with surface-mounted incandescent fixtures.
 - a) Low ceilings, narrow walls and deteriorating internal structure members all offer expensive obstacles to rewiring a building.

2. Additional lights, outlets and greater electrical capacity.
3. Relighting to meet present-day standards.

E. Additional obstacles that may preclude rehabilitation.

1. Fixed interior bearing walls that seriously restrict or prevent changes in interior layout.
2. Exterior wall dimensions and shapes which prevent efficient interior layouts and provisions for safety.
3. Location and orientation of building on a site which prevents or limits expansion.
4. Type of construction which would involve extensive remodeling to add facilities or utilities.

VI. Health and safety criteria involving great expense but necessary to conform with code regulations.

A. Buildings constructed with combustible materials require extensive installation of sprinkler systems and fire detection equipment.

1. A possible problem in an old building would be a limited amount of water for sprinklers due to inadequate entry lines.
2. Piping water to building attics for a sprinkler system is expensive.

B. Replacement of wood stairwells, landings, steps, and entry doors.

C. Elimination of unsafe spaces within the building.

D. Installation of fire doors and fire walls between engineering spaces and educational spaces.

E. Required additional ventilation of certain spaces.

F. Installation of toilet facilities on all floors.

VII. Economics affecting the decision.

A. What is the estimated length of time the facility will be needed?

1. It has been estimated that a rehabilitated fifty-year old building would be satisfactory for an additional fifteen-year period at which time the cost of rehabilitation would be repeated.

B. What has been the history of major maintenance and operation costs involved in maintaining the facility?

1. Would rehabilitation correct the present trend of repair costs?

C. What are the estimated insurance costs following rehabilitation?

D. Will the educational advantages of a contemplated rehabilitation project best meet the demands of a well-conceived long-range school building program for the area?

E. What could profitably be salvaged from the old facility to reduce the cost of replacement?

F. What would be the total replacement cost of an old facility with a new building?

G. Would the present site satisfy space requirements for a new building?

The disposal of old school plants is not an easy problem to solve. It is not possible to form concluding judgments about old buildings based on age alone. Each building and site should be viewed and examined in the light of its individual characteristics before its future is decided. It is strongly recommended that a team of knowledgeable men be utilized in determining what that decision will be. The team would include school plant personnel and consultants, architects, engineers, curriculum specialists, and laymen. The use of instruments and checklists by members

of the team are useful in making decisions and keeping records of assigned responsibilities regarding the survey, planning, development of technical data, coordination of contract work, and orientation and evaluation of a school plant being considered for rehabilitation.

Appendix D presents a recommended School Building Rehabilitation Check Form.

When a program of rehabilitation and abandonment of school facilities cover an extended period of time, school authorities should be permitted a degree of flexibility regarding the final decision. Circumstances and requirements sometimes change drastically, requiring a constant re-evaluation of the planned decision. In the final analysis, the immediate availability and amount of funds will often be the determining factor which conditions decisions to rehabilitate existing school facilities or to abandon the school in favor of new construction.

It is hoped that this final section will stimulate authorities responsible for those decisions regarding old buildings to make detailed studies and analysis of their problems. They could then base their decision to rehabilitate or abandon on factual evidence and sound judgments, rather than the falsely economical belief that the initial cost of a rehabilitated building is less than new construction.

BIBLIOGRAPHY

- American Association of School Administrators, School Building Commission. "Rehabilitating Existing School Buildings," Planning America's School Buildings. Washington 6, D.C.: American Association of School Administrators, 1960.
- _____. The Twenty-Seventh Yearbook of the A.A.S.A. "American School Buildings." Washington 6, D.C.: American Association of School Administrators, 1949.
- _____. "Beauty: A Basic Ingredient," Planning America's School Buildings. Washington 6, D.C.: American Association of School Administrators, 1960.
- American School Board Journal. "Classroom Shortage." An editorial. Vol. 142 (March, 1961), 42.
- _____. "Rehabilitation of School Buildings." Vol. 121 (July, 1950), 48.
- Architectural Planning Department. List of schools by year of original construction date gathered from existing records of the Detroit Board of Education, November, 1960.
- Baker, M. R. "Maintenance Savings Must Be Planned into New Buildings," Nation's Schools, Vol. 66 (December, 1960), 70-73.
- Balluff, L. N. "School Additions Versus Remodeling," School Executive, Vol. 73 (February, 1954), 72-75.
- Baron, J. "How to Establish a Preventive Maintenance Program," American School Board Journal, Vol. 141 (December, 1960), 28.
- Bergstrom, Carl T. "An Analysis of the Impact of Program Change on School Plants." Unpublished Doctor's dissertation, Department of Education, Michigan State University, 1961.
- Carnes, F. T. "Before and After," American School Building Journal, Vol. 138 (May, 1959), 43-44.

- Castaldi, Basil. The Road to Better Schools, New England School Development Council. Massachusetts: Spaulding House, 20 Oxford Street, Cambridge 38, Mass., 1955.
- Caudill, William W. Toward Better School Design. New York: F. W. Dodge, 1954.
- Caylor, M. L. "Classroom in a Coal Bin," American Teachers Magazine, Vol. 39 (April, 1955), 5-6+.
- Childhood Education. "What Can Be Done About Old Buildings?" Vol. 30 (March, 1954), 308-13.
- Citizen's Advisory Committee on School Needs. Findings and Recommendations. Detroit, Michigan (November, 1958).
- _____. Highlights of Factual Data. Detroit Board of Education, City of Detroit (November, 1958).
- Cocking, Walter D. "The School Building Situation," Our Schools. New York: School Executive Magazine, Vol. 20, No. 11, November, 1957.
- Colbert, C. R. "Old Buildings Can Be An Educational Asset," Nations Schools, Vol. 51 (February, 1953), 74-77.
- Darby, Francis C. "How to Talk School Building Costs," School Executive, (October, 1956), 58-59.
- Detroit Board of Education, School Housing Division. Site--Planning--Construction Status Report, 1960.
- Detroit Department of Health. Resident Births. Detroit, Michigan, 1949-1959.
- Dixon, Wilfred J. and Massey, Jr., Frank J. Introduction to Statistical Analysis. New York: McGraw-Hill Book Company, Inc., 1957.
- Douglas, F. "We Didn't Wait for a New School," Childhood Education, Vol. 34 (April, 1958), 364-66.
- Engelhardt, Sr., N. L.; Engelhardt, Jr., N. L.; Teggett, Stanton. School Planning and Building Handbook. New York: F. W. Dodge Corp., 1956.

Educational Facilities Laboratories, Inc., The Cost of a Schoolhouse. New York, 1960.

Finchum, R. N. Organizing the Maintenance Program. Washington, D. C.: U. S. Government Printing Office, 1960.

Freeman, Roger A. School Needs in the Decade Ahead. Washington 5, D. C.: The Institute for Social Science Research, 1958.

Fuel Selection - New School Buildings. A Report to the Detroit Board of Education, February 24, 1961.

Gaffney, M. W. "Abandon or Rebuild?" American School Board Journal, Vol. 128 (February, 1954), 53-56.

Goleman and Rolfe. Environment for Learning. Syracuse, N.Y.: Carrier Corporation, February, 1960.

Handler, Benjamin. Economic Planning for Better Schools. Ann Arbor, Michigan: Department of Architecture, Research Publication, University of Michigan, 1960.

Harvard Graduate School of Education, Center of Field Studies. Look to the Schoolhouses. Report of Study Made at Request of Boston School Committee, Cambridge, Mass., 1953.

Heffernan, Helen and Bursch, Charles. Curriculum and the Elementary School Plant. Washington 6, D.C.: National Education Association, 1958.

Herrick, John H. and McLeary, Ralph D. and Clapp, Wilfred F. and Bogner, Walter F. From School Program to School Plant. New York: Henry Holt and Company, 1956.

House of Representatives, Committee for the White House Conference on Education. Federal Aid to States for School Construction, Hearings Before a Sub-Committee of the Committee on Education and Labor, 85th Congress, 1st Session, 1954-55.

Huxtable, Ada Louise. "The Art We Cannot Afford to Ignore--But Do," New York Times Magazine, (May 4, 1958), 86.

Jordan, Marion and Jackson, David M. "The Schools We Already Have," Elementary School Buildings Design for Learning, The National Elementary Principal, Vol. 39, No. 1 (September, 1959), 181.

Lange, C. H. "Modernizing Without Remodeling," School Executive. Vol. 73 (February, 1954), 64-65.

Leu, Parker, and Glass. "School Facility Obsolescence Survey," East Lansing: Michigan State University, College of Education, 1960.

Lienhard, R. H. "When Not to Plan an Addition," American Schools and Universities, (1958), 57-60.

Linn, H. H. "You Can Modernize the Old School," New York State Education, Vol. 38 (June, 1951), 641-44.

_____. "Modernizing School Buildings," American Schools and Universities, (1952), 401-405.

MacConnell, James D. Planning for School Buildings. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1957.

McQuade, Walter. Schoolhouse. New York: Simon and Schuster, 1958.

Michigan State University, Bureau of Educational Research. Planning for School-Community Development, Highland Park. East Lansing, Michigan, January, 1957.

Miller, G. R. "School Building Modernization Program," American Schools and Universities. (1955), 365-70.

Moehlman, Arthur B. Public Education, Detroit Growth of City Schools and American Ideals. Bloomington, Illinois: Public School Publishing Company, 1921).

National Citizens Commission for the Public Schools. What Are Our School Building Needs? 2 West 45th Street, New York 36, New York, August, 1955.

_____. What Are the Alternatives to Building? 2 West 45th Street, New York 36, New York, August, 1955, 19-25.

National Council on Schoolhouse Construction. Elementary School Plant Planning, 1958. Copies available from F. G. Parker, Council Secretary, College of Education, Michigan State University, East Lansing, Michigan.

- National Council on Schoolhouse Construction. Thirteen Principles of Economy in School Plant Planning and Construction, 1954. Copies available from Council Secretary. See preceding reference.
- National Education Association Proceedings. (1912).
- Neutra, Richard. Survival Through Design. New York: Oxford University Press, 1954.
- New York State Commission on School Buildings. What to Do About Old School Buildings. Modernization vs. Replacement Handbook. Albany, New York, State Capitol, January, 1954.
- Nichols, R. A. "How We Modernized an Older School," American School Board Journal, Vol. 136 (May, 1958), 48-50.
- Pawley, Eric. "What is Good School Architecture?" School Plant Studies. Washington 6, D.C.: American Institute of Architects, BT 1-13, April, 1954.
- Perkins, Lawrence B. Work Place for Learning. New York: Reinhold Publishing Corporation, 1957.
- Perry, Dorothy M. "Patterns of Selected Innovations in Detroit Public Schools, 1895-1945." Unpublished Ph.D. dissertation, Wayne State University, 1950.
- Pierce, David A. Saving Dollars in Building Schools. New York: Reinhold Publishing Corporation, 1959.
- Porter, C. H., Aldrich, D. and Shirley. "Modernizing That Old Elementary School Building," American Schools and Universities, Vol. 175 (1954), 175-80.
- Quinn, Robert J. "What Must Be Done for Fire Safety?" American School Board Journal, (March, 1959), 32-34.
- Reason, Paul and Tankard, George. Property Accounting for Local and State School Systems. Washington, D.C.: U. S. Government Printing Office, 1959; U. S. Department of Health, Education, and Welfare, Office of Education.
- Reason, Paul and White, Aopheus L. Financial Accounting for Local and State School Systems. Washington, D.C.: U. S. Government Printing Office, 1957; U. S. Department of Health, Education, and Welfare, Office of Education.

- Reid, John Lyon. "Color for Schools," School Plant Studies. Washington 6, D.C.: American Institute of Architects, BT 1-18, January-February, 1955.
- Sargent, Cyril G. "Urban Schools," School Plant Studies. Washington 6, D.C.: American Institute of Architects, BT 1-20, May-June, 1955.
- Sharp, J. S. "Human Factor in Building Maintenance," American School Board Journal, Vol. 142 (February, 1961), 38.
- Smith, L. W. "How to Plan an Addition to Your School," Plan School Executive, Vol. 76 (June, 1957), 58-61.
- Spain, Charles L. The Platoon School. New York: The Maxmillan Company, 1924.
- State Education Department. Potential Economies in School Building Construction. A Report of Research. Albany: University of the State of New York, 1958.
- Sumption, Merele R. and Landes, Jack L. Planning Functional School Buildings. New York: Harper and Brothers, 1957.
- Telford, Marion. "Lessons From December's Disaster," Nation's Schools, (February, 1959), 53-56.
- Traver, E. A. "When Does It Pay to Remodel?" American School Board Journal, Vol. 140 (February, 1960), 41+.
- U. S. Department of Commerce, Bureau of Census. Seventeenth United States Census Reports, 1950.
- _____. Michigan 1960 Census of Population.
- U. S. Office of Education. National Goals in the Staffing and Construction of Public Elementary and Secondary Schools, April, 1960.
- _____. School Buildings: Remodeling, Rehabilitation, Modernization, Repair. Bul. 17, 1950.
- _____. School Housing Section. School Facilities Survey. Washington 25, D.C.: 1952.

U. S. Department of Health, Education, and Welfare: Office of Education, Statistical Summary of State School Systems, 1955-56. Washington, D.C.: Superintendent of Documents, Government Printing Office, 1956.

_____. Current Expenditures Per Pupil in Public School Systems. Washington 25, D.C.: Superintendent of Documents, Government, Printing Office, Circular No. 595, 1959.

Van Dalen, Deobold and Meyer, William J. Understanding Educational Research: An Introduction. New York: McGraw-Hill Book Company, Inc., 1962.

Viles, N. E. "Maintaining and Replacing Schools," American School Board Journal, Vol. 139 (July, 1959).

Wilson, G. A. "Old Shell Houses New High School," Nation's Schools, Vol. 64 (October, 1959), 71-75.

Wolleneveber, W. I. "Remodeling Is One Answer to the Problem of Lack of Classroom Space," Nation's Schools, Vol. 50 (September, 1952), 104.

APPENDICES

APPENDIX A

The following chart depicts a description of Detroit Public Schools listed by year of original construction. September, 1960.

Plant	Year Erected	Years of Additions	Grades	Sept., 1960 Enrollment
1. Riverside	1874	1885, 1906	K-6A Spec.	551
2. Norvell	1879	1894	K-6A Spec.	795
3. Owen	1879	1901, 1902	K-5B	817
4. Farrand	1882	1897	Ungraded	118
5. Irving	1882		K-6A	401
6. Brownson	1887	1894	K-3A	338
7. Field	1887	1894	K-5B	928
8. Hancock	1887	1891	K-6A Spec.	580
9. Hubbard	1887	1895		
10. Rose	1887	1899	K-6A	640
11. Russell	1887	1900, 1913 1917	K-8A Spec. Health Unit	1073
12. Tilden	1887	1897	K-6A	752
13. Trowbridge	1889	1919	K-6A Spec.	485
14. Palmer	1890	1901, 1903	K-6A	747
15. Berry	1892		K-6A	627
16. Columbian	1892	1908, 1917	K-6; 6 Spec.	1116
17. Campbell	1894	1906	K-6A Spec.	801
18. Preston	1894		K-4A	248
19. Van Dyke	1894		K-6A Spec.	716
20. Amos	1895	1898	K-6A Spec.	777
21. McMillan	1895	1923	K-8A Spec.	581
22. Beard	1896	1900	K-6A	718
23. Estabrook	1896	1920	K-6A Spec.	1099
24. Harris	1896		K-6A	858
25. Poe	1896	1922	K-6A Spec.	1041
26. Alger	1898	1916, 1919	K-6A	728
27. Campau	1898		K-6A Spec.	723
28. Garfield	1898	1912, 1915 1922	K-6A; 7B- 9A, Spec.	462 424, 216
29. Scripps	1898		K-4A	820
30. Bellevue	1899	1910	K-6A Spec.	816

Continued

Plant	Year Erected	Years of Additions	Grades	Sept., 1960 Enrollment
31. Franklin	1899	1912, 1921	K-8A Spec. Health Unit	1563
32. McGraw	1899		K-6A	753
33. Parke	1900	1919	K-6A Spec.	597
34. Cary	1901	1912	K-8B	714
35. Craft	1901		K-6A	651
36. Eastern	1901	1908, 1926 1929	9B - 12A Job-upgrad.	2498
37. Gillies	1901		K-6A Spec.	557
38. Pingree	1902		K-6A Spec.	872
39. Morley	1903	1923	K-8A	850
40. Smith	1903	1955		
41. Goldberg	1904	1915	K-6A Spec.	1399
42. Chandler	1905	1921	K-6A Spec.	883
43. Lillibridge	1905	1908, 1912 1922	K-6A Spec.	1134
44. McKinstry	1905		K-6A	606
45. Monteith	1905		K-6A Spec.	611
46. Sill	1905		K-6A	630
47. Thomas	1905		K-6A	978
48. Jones	1906		K-5A	802
49. St. Clair	1906	1914	K-6A	1101
50. Wingert	1906	1921	K-6A	963
51. Bishop	1907	1908, 1916	K-8A Spec.	1048
52. Moore	1907	1912, 1919	K-6A Spec. Ungraded	637 230
53. Commerce	1908	1910	9B - 12A	1606
54. Doty	1908	1920	K-6A Spec.	1144
55. D. Houghton	1908	1920	K-8A Spec.	614
56. Greusel	1908	1917, 1919	7B - 9A	1024
57. Maybury	1909		K-6A Spec.	633
58. Clippert	1910	1921	K-8A Spec.	831
59. Nichols	1910	1919	K-8A	1037
60. Bennett	1911	1930	K-6A Spec.	878
61. Crosman	1911	1920	K-5A; 6A	1515
62. George	1911	1920	K-6A Spec.	659
63. Ives	1911		K-8A	538
64. Sampson	1911	1919, 1920	K-8A Spec.	1300
65. Barstow	1912	1922	K-6A Spec.	803

Continued

Plant	Year Erected	Years of Additions	Grades	Sept., 1960 Enrollment
66. Burton	1912	1921	K-6A Spec.	813
67. Hillger	1912		K-6A Spec.	1038
68. Lincoln	1912	1916, 1920	K-6A Spec.	1142
69. Marcy	1912	1921	K-6A Spec.	823
70. Northwestern	1912	1921, 1924	9B - 12A Job Upgrad. Spec.	2734
71. Dwyer	1913	1919	K-8A Spec.	1086
72. Howe	1913		K-4A	1103
73. Majeske	1913	1920, 1955		
74. Marr	1913	1920	K-6A Spec.	988
75. Stephens	1913	1917, 1921	K-6A, Spec. Deaf	738 119
76. Condon	1914	1919, 1922 1924, 1927	7B - 9A	965
77. Ellis	1914	1919	K-6A Spec.	583 128
78. Greenfield Union	1914	1930	K-6A Spec.	486
79. Joyce	1914		K-6A Spec.	940
80. Lynch	1914	1916, 1921	K-6A Spec.	488
81. Marxhausen	1914	1920	K-6A Spec.	881 209
82. Northeastern	1914		9B - 12A Job Upgrad. Trade	2128
83. Northern	1914	1925	9B - 12A Job Upgrad. Nurs.	1912 100
84. Southeastern	1914	1928-1929	10B - 12A Job Upgrad.	2435
85. Thirkell	1914	1920	K-4B; 6 Spec.	1550
86. Trombly	1914	1917, 1920	K-4B Trade - Boys	402 247
87. Turner	1914		K-4A	233
88. Breitmeyer	1915		K-6A Spec.	781
89. Building Trades	1915			
90. Carstens	1915	1919, 1920	K-6A Spec.	1465
91. Harms	1915		K-6A Spec.	556
92. A. L. Holmes	1915		K-6A Spec.	1336
93. Hunter	1915		K-7A Spec.	952
94. Lingemann	1915		K-6A	802
95. Pierce	1915	1920, 1951	K-7B Spec.	457

Continued

Plant	Year Erected	Years of Additions	Grades	Sept., 1960 Enrollment
96. Southwestern	1915	1920	8B - 12A	1713
97. Angell	1916	1919	Job Upgrad. K-3; 4A - 5B 6, Spec.	1967
98. Davison	1916	1919, 1920	K-6A Spec.	1219
99. Greenfield Pk.	1916	1917, 1920 1921, 1926	K-8A Spec.	1608
100. Hanneman	1916		K-8A Spec.	719
101. Kennedy	1916		K-5B Spec.	889
102. Longfellow	1916	1924	K-6A Spec.	1769
103. Maybee	1916	1921	K-6A Spec.	819
104. McMichael	1916	1921	7B - 9A Spec.	1665
105. Neinas	1916	1922, 1924	7B - 9A Spec.	741
106. Wilson	1916	1927	7B - 9A Spec.	962
107. Cass	1917	1918, 1920	9B - 12A Spec.	4235 284
108. Grayling	1917	1928	K-6A Spec.	533
109. O. W. Holmes	1917	1921, 1930	K-8A Spec.	758
110. Hutchinson	1917	1922	K-6A Spec.	1051
111. Leland	1917	1920	K-9A	330
112. Birdhurst	1918	1921	Spec.	41
113. Balch	1919	1949	K-6A Spec.	870
114. Cadillac	1919	1924, 1930 1954	K-3A 7B - 9A	216 603
115. Hanstein	1919	1923	K-6A	166
116. Keating	1919	1922, 1924	K-7A Spec.	1924
117. Miller	1919	1930, 1949	7B - 9A Spec.	1558
118. Pattengill	1919	1920	K-6A	2025
119. Barbour	1920		7B - 9A Spec.	2120
120. Brady	1920	1922	K-3; 5-6 Spec.	1637
121. Cooper	1920		K-6A Spec.	1541
122. Custer	1920	1924	K-8A Spec.	1529
123. Hutchins	1920	1929	7B - 9A Spec.	1861
124. Noble	1920	1922	K-7A	1143
125. White	1920	1924, 1929	K-6A Spec.	1213
126. Winterhalter	1920	1923	K-6A Spec.	1348
127. Courville	1921	1925, 1929	K-6A Spec.	1579
128. Edison	1921	1929, 1951	K-7A Spec.	625
129. Guyton	1921	1924	K-8A	1018

Continued

Plant	Year Erected	Years of Additions	Grades	Sept., 1960 Enrollment
130. Hosmer	1921	1924	K-6A Spec.	760
131. Hubert	1921	1929, 1953	K-6A	754
			7B-9A	554
132. DuBois	1922		1B-4B Spec.	167
133. Duffield	1922		K-6A Spec.	1819
134. Ferry	1922		K-6A Spec.	1199
135. Guest	1922	1929, 1930	K-7A Spec.	794
136. Jefferson	1922	1960	7B-9A Spec.	1452
137. Ruddiman	1922	1955	7B-9A	1169
138. School for Deaf	1922		Nursery - 9A	225
139. Stratford	1922		1B-3B	Included in Cervený Mem.
140. Burns	1923	1929	K-8B Spec.	1034
141. Cervený	1923	1929, 1930	K; 3A-6	710
			7B-9A	597
142. Harding	1923	1930	K; 2A-6A	1143
			7B-9A Spec.	615
143. Monnier	1923		K-8A Spec.	767
144. Priest	1923	1924, 1930	K-8A Spec.	1208
145. Robinson	1923	1925	K-7A Spec.	771
146. Sherrard	1923		7B-9A Spec.	766
147. Sherrill	1923	1925, 1930	K-8A	1672
148. Western	1923	1935	9B-12A	1754
149. Wilkins	1923	1925	K-7A Spec.	897
150. Burroughs	1924		7B-9A Spec.	1512
151. Central	1924	1925	10B-12A Spec.	2189
152. Foch	1924		7B-9A	1940
153. Holcomb	1924	1925, 1928 1948	K-8A	1157
154. T. Houghton	1924	1926, 1954	K-8A Spec.	1074
155. Leslie	1924	1951	K-8A	764
156. Roosevelt	1924	1929	K-6A Spec.	2319
157. Ruthruff	1924		K-6A Spec.	634
158. VanZile	1924	1949	K-8B	1123
159. Washington	1924		K-6A	907
			Boys Trade	322
160. Boynton	1925	1926	K-6A	1374
161. Burgess	1925	1954	K-8A	685
162. Burt	1925	1948, 1953	K-6A	860
			7B-9A	350

Continued

Plant	Year Erected	Years of Additions	Grades	Sept., 1960 Enrollment
163. Chadsey Trade	1925		Ungraded	
164. Clark	1925	1926	K-7B Spec.	856
165. Clinton	1925	1927	K-6A Spec.	792
166. Coffey	1925	1955	K-2A	379
			7B-9A	647
167. Cooke	1925	1937, 1952	K-6A	583
			7B-9A	378
168. Coolidge	1925	1927, 1940 1950	K-8A Spec.	1175
169. Davison Open Air	1925		Ungraded	
170. Fitzgerald	1925	1926, 1929	K-6A	1107
			Spec. B Boys	
171. Ford Elem.	1925	1941, 1951	K-8A Spec.	818
172. Gardner	1925	1949	K-6A	669
173. Goodale	1925	1926	K-6A	616
			7B-9A	388
174. Law	1925	1944, 1954	K-7A Spec.	423
175. Logan	1925		K-8A	607
			Spec. B Girls	137
176. MacCulloch	1925	1930	K-6A Spec.	1977
177. McFarlane	1925	1930, 1951	K-8A Spec.	828
178. Mettetal	1925	1955	K-6A; 7B-9A	444
179. Schulze	1925	1939, 1942 1948, 1952	K-8A	969
180. Vetel	1925	1930, 1940 1948, 1953	K-8A Spec.	993
181. Cleveland	1926	1928	7B-9A	1475
182. Durfee	1926	1927, 1929	7B-9A Spec.	2139
183. Grant	1926	1930, 1951	K-7B	433
			7A-9A	529
184. Hamilton	1926	1936	K-6A Spec.	956
185. Higginbotham	1926	1944, 1946	K-8A Spec.	942
186. McKerrow	1926		K-6A Spec.	1867
187. Nolan	1926	1930	7B-9A	1584
188. Parker	1926		K-8A Spec.	1087
189. Yost	1926		K-3A	196
190. Atkinson	1927	1930	K-6A	837
191. Cooley	1927	1929, 1930	9B-12A	2733
192. Hally	1927		K-8A	1142

Continued

Plant	Year Erected	Years of Additions	Grades	Sept., 1960 Enrollment
193. Jackson	1927	1930	7B-9A Spec.	1777
194. Mackenzie	1927	1929, 1930 1938, 1950	9B-12A, Spec. Job Upgrad.	3001
195. Newberry	1927		K-3A, 6	602
196. Shurly	1927		K-3B	Included in Harding Mem.
197. Stellwagen	1927	1940, 1953	K-8A Spec.	443
198. Columbus	1928	1930, 1940 1952	K-6A 7B-9A	575 512
199. Finney	1928	1930, 1947 1955	K-6A 7B-9A	408 356
200. Hampton	1928	1929, 1937 1954	K-8A	894
201. Macomb	1928		K-7A Spec.	505
202. Marshall	1928	1930	K-6A Spec.	967
203. Newton	1928	1948, 1950	K-8A	1095
204. Oakman	1928	1929	K-9A	366
205. Richard	1928	1930	K-6A; 7B-9A	339
206. Tappan	1928	1929, 1930	7B-9A	1458
207. Williams	1928		K-6A	837
208. Bagley	1929	1930, 1937	K-6A	879
209. Denby	1929	1930, 1938	10B-12A, Spec. Job Upgrad.	2726
210. Pershing	1929	1930, 1939 1945, 1949	10B-12A, Spec. Job Upgrad.	2789
211. VonSteuben	1929	1930, 1943 1949	K-6A 7B-9A	660
212. Wayne	1929	1930, 1939 1940, 1947	K-6A 7B-9A	588 385
213. Wright Voc.	1929	1941, 1952	10B-12A	978
214. Arthur	1930		K-8A Spec.	504
215. Burbank	1930	1942, 1947	K-6A 7B-9A	612 445
216. Chadsey	1930		7B-12A, Spec. Job Upgrad.	2718
217. Chaney	1930		K-5A Spec.	1406
218. Dixon	1930	1945, 1950	K-6A 7B-9A	640 609
219. Higgins	1930		K-6A Spec.	799

Continued

Plant	Year Erected	Years of Additions	Grades	Sept., 1960 Enrollment
220. Jacoby	1930		Ungraded	166
221. King	1930	1948	K-7A	318
222. Lyster	1930		Ungraded	277
223. Mason	1930	1944, 1951	K-6A	761
224. Pasteur	1930	1949, 1954	K-8A	1214
225. Post	1930	1954	7B-9A Spec.	1546
226. Redford	1937	1947, 1953	10B-12A Job Upgrad.	2913
227. Crary	1938	1940, 1948 1955	K-8A	849
228. MacDowell	1940	1943, 1945 1948, 1950	K-8A	1222
229. Parkman	1940	1946, 1953	K-8A Spec.	740
230. Herman	1942	1943, 1948 1954	K-6A Spec.	1619
231. Mann	1942	1946, 1949	K-8A	928
232. Pulaski	1942	1946, 1949 1954	K-8A	1178
233. Winship	1942	1946, 1950 1954	K-6A 7B-9A	775
234. Trix	1944	1949	K-8A	795
235. Barton	1945		K-6A	408
236. Carleton	1945	1950, 1955	K-8A	851
237. Vernor	1945	1949	K-8A	1367
238. Ann Arbor Trail	1946	1954	K-6A 7B-9A	699 359
239. Pitcher	1946	1950	K-6A	891
240. Emerson	1947	1949, 1953	K-6A 7B-9A	1212 600
241. Everett	1947	1949	K-8A	1181
242. Mumford	1948	1949, 1951 1954	9B-12A	3831
243. Bow	1949	1950	K-6A Spec.	1421
244. Dossin	1949	1954	K-7A	641
245. Healy	1949		K-6A	551
246. Marquette	1949	1951, 1956	K-8A	911
247. McColl	1949		K-6A	667
248. Cody	1950	1952, 1954	9B-12A Job Upgrad.	3492

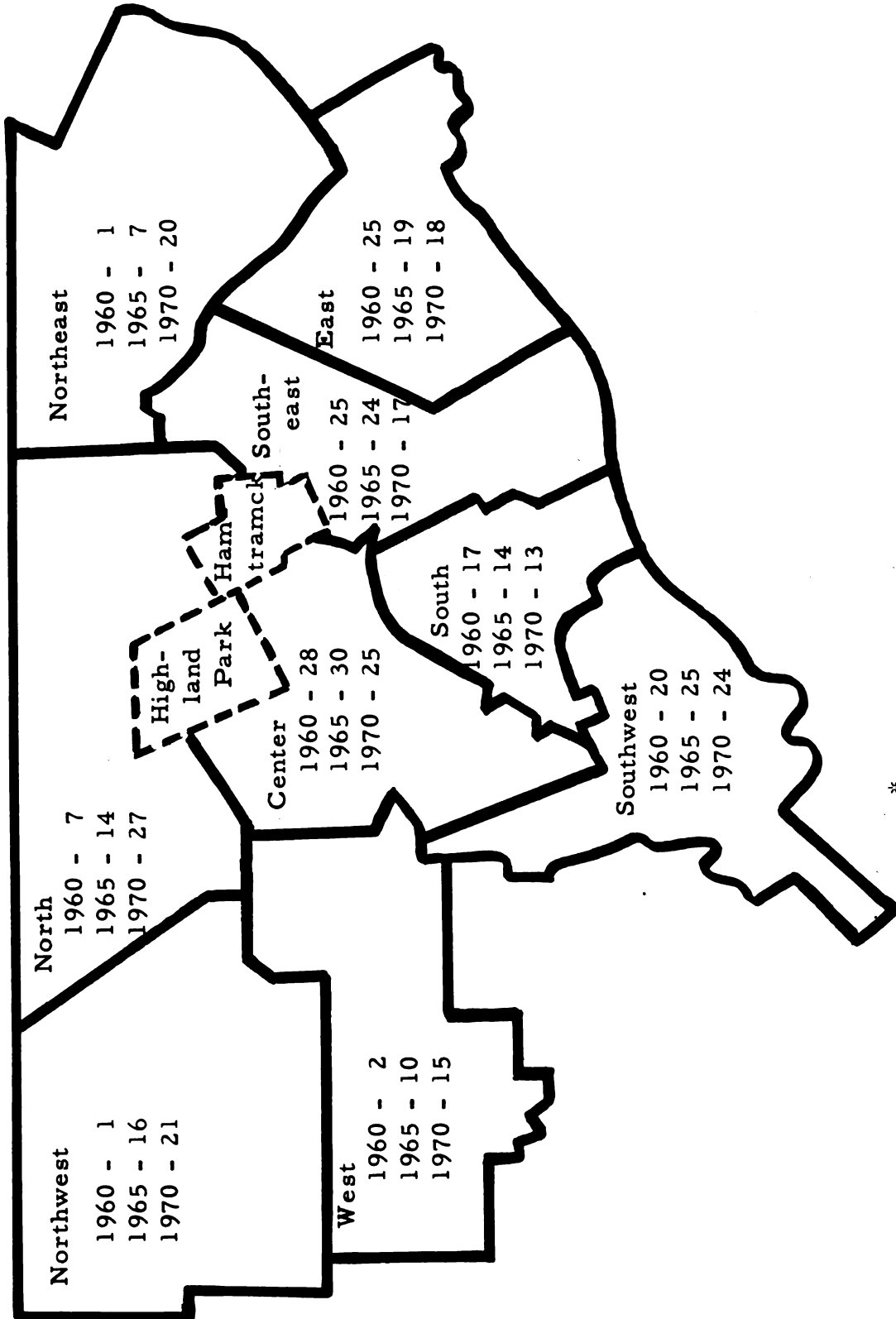
Continued

Plant	Year Erected	Years of Additions	Grades	Sept., 1960 Enrollment
249. Lodge	1950		K-8A	609
250. McKenny	1950	1952	K-6A	1521
251. McLean	1951		K-6A	360
252. Dow	1952	1956	K-6A	544
			7B-9A	861
253. Jeffries	1952		K-5B	738
254. McGregor	1952		K-6A	491
255. Carver	1953	1955	K-6A	908
256. Vandenberg	1953		K-8A	582
257. Gompers	1954		K-6A	607
258. Larned	1954		K-6A	304
259. Bunche	1955		K-6A Spec.	1396
260. Couzens	1955		K-6A Spec.	1149
261. Fairbanks	1955		K-4B; 6 Spec.	763
262. Kosciusko	1955		K-6A	801
263. Marsh	1955		K-8A Spec.	398
264. Potter	1955		K-2A	228
265. Weatherby	1955		K-8A	435
266. Webster	1955		K-8A Spec.	1136
267. Edmonson	1956		K-6A	1154
268. Ford High School	1956		10B-12A Spec.	1494
269. Foster	1956		K-5A Spec.	844
270. Osborne	1956		10B-12A Spec.	1733
271. Fisher	Transportable		K-2A	312
272. Fox	Transportable		1B	48
273. Jamieson	Transportable		1A	Included in
			2A-3B	Angell Mem.
274. Mark Twain	Transportable		K-2B	188
275. San Francisco	Purchased		Special	119
276. Aero Mechanics	Purchased		Ungraded	209
277. Apprentice Trans.	Purchased		Ungraded	287
278. Herman Kiefer Hospital			Hospitalized	41
279. Northville	Maybury Sanatorium		Hospitalized	66
280. Youth Home School			Pupils in Detention	Membership counted at Home School

APPENDIX B

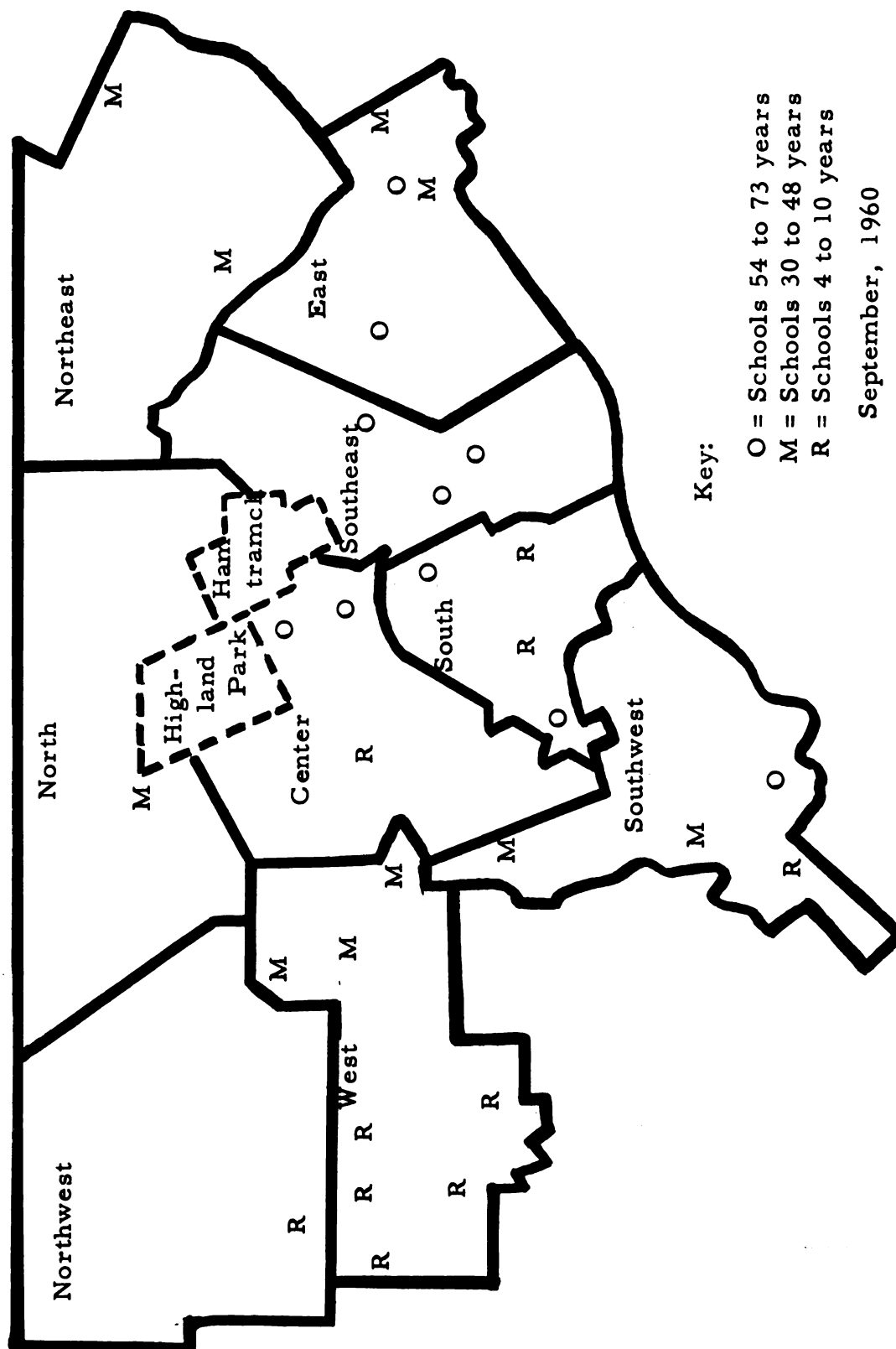
DETROIT PUBLIC SCHOOLS FORTY YEARS OR OLDER

Totals: 1960 - 126; 1965 - 159*; 1970 - 180*



* 1965 and 1970 numbers based on Construction Status Report, School Housing Division, Detroit Board of Education, December 27, 1960.

DETROIT PUBLIC SCHOOL DISTRICTS - SELECTED ELEMENTARY SCHOOLS



September, 1960

SCHOOL BUILDING REHABILITATION CHECK FORM

Name of Building _____	Address _____
Principal _____	Rehabilitation Coordinator _____
Type of Structure _____	Number of Stories _____
Year Erected _____	Date of Addition _____

Date Project was Started _____

Grades Housed _____ Current Enrollment _____ Capacity _____

Building Area (Square Feet) _____ Site Area _____

Estimated Total Cost of Project _____

Date Project was Completed _____ Length of Time _____
 Grades Housed _____ Current Enrollment _____ Capacity _____
 Building Area (Square Feet) _____ Site Area _____
 Total Cost of Project _____

STAGE I

THE SURVEY

1. Initial Survey of the Building to Establish Desirability of Rehabilitation.
Date _____ By _____
Committee / School Housing Personnel
2. Evaluation of the Building in Terms of Need.
Date _____ Planning and Building Studies _____
 - a. Present Enrollment _____ Predicted Enrollment _____
Present Capacity _____
 - b. Rehabilitated Building Will Satisfy Health and Safety Code Regulations.
Signed _____
 - c. Rehabilitated Building Will Meet Acceptable Educational Standards.
Signed _____
 - d. Estimated Cost of the Project Warrants Rehabilitation.
Signed _____
3. School Facility Obsolescence Survey. Date _____
Rehabilitation Coordinator _____
4. Coordinator Complete Information Brochure.
 - a. Photograph
 - b. Site detail plan
 - c. Scaled building plan
 - d. District area map
 - e. Attendance area map
 - f. Enrollment and capacity data
 - g. Community socio economic data
 - h. School facility obsolescence survey
 - i. Summary findings
5. School Housing Director's Approval to Proceed with Rehabilitation of the Building. Date _____
6. Visual Record of Pre-Rehabilitation Project: Pictures, Films, etc.
Date _____

7. School Housing Department List Component Parts of the Building and Site Needing Rehabilitation.

a. Architectural:	Date _____	Estimated Cost _____
b. Mechanical :	Date _____	Estimated Cost _____
c. Electrical :	Date _____	Estimated Cost _____
d. Site :	Date _____	Estimated Cost _____

8. Total Capital Outlay Expenditure Approved for the Project. _____
Date _____

9. Additional Money From Operating and Maintenance Accounts Approved for the Project.

a. Architectural	_____
b. Mechanical	_____
c. Electrical	_____
d. Site	_____

10. Cost of Engineering and Draftsman Fees _____

11. Additional Cost Involving Purchase of Furnishings, Fixtures, etc.

12. Total Expenditure Approved for the Project. _____

Date _____

13. Estimated Cost to Replace Planned Rehabilitation Project with New Construction.

STAGE II

PLANNING THE PROJECT

1. Project Committee Organized to Approve the Preliminary Proposals.

Date _____

a. Members of the Committee

School Administrator	_____	Coordinator	_____
District Administrator	_____	Architectural	_____
Other School Personnel	_____	Mechanical	_____
	_____	Electrical	_____
Citizens	_____	Grounds	_____
	_____	Planning	_____
	_____	Others	_____
	_____		_____

b. Date of Subsequent Meetings

_____	Comments	_____
_____	Comments	_____
_____	Comments	_____

2. Priority of Rehabilitation Components Determined by the Departments.

Architectural: Date	_____	Cost	_____
Mechanical : Date	_____	Cost	_____
Electrical : Date	_____	Cost	_____
Grounds : Date	_____	Cost	_____

3. Architectural Planning Draws Up Preliminary Sketch Plans Reflecting

Departments Priority of Components. Draftsmen _____

Date Started _____ Completed _____

4. Project Receives Tentative Approval. Date _____

School Housing Director _____

5. Architectural Planning Finalizes Working Drawings. Date _____
6. Coordinator Completes Preliminary Design Manual for the Housing Director and Superintendent Approval Prior to Board of Education Action. Date _____
 - a. Project Advisory Committee Members
 - b. Introduction
 - c. Evaluation of the Building
 - d. Analysis of Factors to Determine the Need of the Building
 - e. School Facility Obsolescence Survey and Analysis of Building Components Considered for Rehabilitation
 - f. Estimated Cost of Items Needing Improvement
 - g. Recommended Rehabilitation Program
 - h. Photograph of the Building
 - i. Property Description and Summary of Design
 - j. Comprehensive Preliminary Drawings
 - k. Preliminary Site Development Drawings
 - l. Project Schedule
7. Approval of the Preliminary Design Manual
 - Housing Director : Date _____
 - Superintendent : Date _____
 - Board of Education : Date _____

STAGE III

DEVELOPMENT OF TECHNICAL DATA

1. Preparation of the Proposals.

2. Preparation of the Specifications.

Architectural: Date Completed _____

Mechanical : Date Completed _____

Electrical : Date Completed _____

3. Proposals and Specifications Advertised for Bids.

Date _____

Bids must be submitted within a thirty day period.

4. Submitted Bids for Contract Work Officially Opened in the Schools
Business Affairs Office.

Date _____ Coordinator _____

5. Evaluation of the Bids and Final Selection of the Contractors.

Architectural: Date _____ Contract Price _____

Name of the Contractor _____

Mechanical : Date _____ Contract Price _____

Name of the Contractor _____

Electrical : Date _____ Contract Price _____

Name of the Contractor _____

6. Approval of Construction and Equipment Bids.

Housing Director : Date _____

Superintendent : Date _____

Board of Education : Date _____

STAGE IV

COORDINATION OF CONTRACT WORK

1. Architectural Planning Coordinator _____
Coordinates Work Between Contractors and the Architectural,
Mechanical, and Electrical Departments.
2. Rehabilitation Coordinator _____
Coordinates Schedule of Work by Contractors and the School to
Provide a Minimum of Inconvenience to the Regularly Scheduled
School Program.
3. Periodic Inspections by School Housing Director
Date _____
Date _____
4. Visual Record of Construction Work in Progress. Pictures, Films,
etc.
Date _____
5. Final Inspection and Acceptance of Completed Work.
Housing Director : Date _____
Superintendent : Date _____
Board of Education : Date _____
6. Visual Record of Completed Project. Pictures, Films, etc.
Date _____

STAGE V

ORIENTATION AND EVALUATION

1. Project Committee's Final Meeting.
 - a. Orientation of the Spaces and Site.
 - b. Evaluation of the Completed Work. Date _____
2. Building Administrator and Rehabilitation Coordinator Hold an Orientation and Evaluation Meeting with the Building Staff.
Date _____
3. School-Community Public Relations Night Open House:
Date _____
4. Submission of Evaluation Reports to the School Housing Director.

Rehabilitation Coordinator:	Date	_____
Architectural Planning Coordinator	:	Date _____
Building Administrator	:	Date _____
Architectural Department	:	Date _____
Mechanical Department	:	Date _____
Electrical Department	:	Date _____
Grounds Department	:	Date _____
5. Completion of the Rehabilitation Project.
Date _____
Rehabilitation Coordinator _____

ROOM USE ONLY

~~FEB~~ ROOM USE ONLY

JUL 19 65

9-115

MICHIGAN STATE UNIVERSITY LIBRARIES



3 1293 03061 4675