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A booklet designed to assist and advise local districts on procedures and standards involved in obtaining state aid, and to encourage new ideas in school construction. The suggested planning process begins with an analysis of the area and the total population to be served. A consultant is recommended to examine the problems of optimum district size and to project future school populations based on present trends. Once these parameters have been determined, limits can be set on the size and scope of the proposed school. Curriculum planning, including other community uses for the school, follows. The second stage of the planning involves evaluation of present facilities, suggestions for selection of an architect and a site, and financial considerations with respect to state aid and local cost. Guidelines for libraries, classrooms, and a variety of curriculum specialities are suggested as are standards for a number of facilities services. An accompanying chart carries recommended minimum standards for vocational and industrial art education departments. (FPO)

U S DEPARTMENT OF HEALTH EDUCATION & WELFARE
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BUILDING BETTER SCHOOLS FOR VERMONT

INTRODUCTION

The Department of Education hopes to serve two general purposes in making this pamphlet available to you.

The first purpose is to explain how state aid can be obtained by local districts for constructing new schools or renovating old school plants, for to become eligible for state school building aid a community must follow certain procedures and meet certain minimum standards.

While the Department does not envision its major role as regulatory, the public must be assured that its taxes are spent toward the greatest good of Vermont, and more specifically, that the funds provided for education are disbursed on the basis of standards which will promote excellence in the education of Vermonters. Toward this end, the Department's major role is to offer technical advice and consultation on education and school construction to those communities desiring our services.

The second purpose in producing this pamphlet is to encourage new ideas in school construction. The Department's hope herein is that you will be interested not only in the minimal standards but also in what is considered the optimal advantages of today's educational facility. The overall purpose, then, is to assist, advise, and encourage people interested in school construction.

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Foreword

What is frequently overlooked in the rush to build a school is the basic idea that a building should provide the space and facilities to make the teaching and learning process proceed effectively. School boards and superintendents should never ask an architect to plan a building without a detailed curriculum plan.

A school building has a long life. Its cost is a relatively small part of the total dollars that will be spent by the district, the state, and the Federal government in educating students over the life span of the building. For these reasons therefore, good initial planning will result in a building that can be adapted to new functions and uses over the years.

We strongly urge that everyone involved in a school district reorganization study or planning for a new elementary or secondary school building, read and discuss this publication. It represents the best advice that we could glean from superintendents, architects, and such national centers for school building ideas as Educational Facilities Laboratories. For this assistance we express our appreciation.

I wish especially to thank the members of the Department staff who have worked hard to make this publication possible.

Richard A. Gibboney
Commissioner of Education

June 1966

BUILDING BETTER SCHOOLS FOR VERMONT

CHAPTER I

Initiating A Program

A program of construction or renovation cannot start simultaneously with the inspiration for it; once a project is conceived a considerable amount of time and energy must be invested before physical pr ress begins. Let us examine the usual procedure followed at t. s point by a locality.

First of all, a person or persons within the community, a special interest group, or members of the school system foresee a problem or discover that a problem already exists. The group then approaches the district's school board and presents them with the problem. If the local school board recognizes that the problem, as presented to them, do s exist they take action as follows.

They should first appoint a study committee, made up of at least five members, to examine the problem and to submit a written report to the local district school board with recommendations for the solution of the problem. If the study committee foresees the need for new construction or the extensive renovation of an existing school plant, the local district school board should appoint a series of subcommittees, responsible both to the school board and the study committee. Each of these subcommittees should be assigned to handle one phase of the project or a particular problem associated with it: legal problems, publicity, curriculum plan, site, transportation, building needs, and building construction. The text of this pamphlet will suggest the need for other subcommittees, and individual local conditions may require the formation of others. The following pages will suggest the order in which each subcommittee should engage in its part of the project.

In order for a district to be eligible for state aid for school construction or renovation, it must follow the procedures outlined below. The school board is responsible for seeing that the prescribed format is followed in the correct order.

Procedure to be Followed to Obtain State Aid

1. Meet with the Department of Education to discuss the problem and the curriculum plan. The curriculum plan must be submitted in writing at least two weeks prior to this meeting. This meeting will be with staff members of the Department, by appointment, at the Department's office in Montpelier.

2. Conference on community building needs for education with the staff of the Department of Education.

3. Conference on preliminary plans. For this very important meeting, the superintendent of schools, other local repre-

sentatives, if desired, architects, and members of the Department will meet at the Department by appointment. A set of preliminary plans should be in the hands of the Department for study at least two weeks prior to this conference.

4. Submission of final plans and specifications to the Department of Public Health.

5. Submission of final plans and specifications to the Department of Public Safety.

6. Submission of final plans for sewage disposal to the Department of Water Resources if necessary.

7. Submission of application for state assistance, a copy of final plans and specifications, and approvals of same from the Department of Health, the Department of Public Safety and the Department of Water Resources, if applicable. If a secondary school project, a copy of agreement with State Board of Education relative to tuition pupils is to be included. This step should precede the conference on final plans (Step 8) by at least two weeks in order to give ample time for the staff of the Department of Education to study plans and specifications.

8. Conference on final plans and specifications with members of the department. This conference must be held at least two weeks prior to the meeting of the State Board of Education to study plans and specifications.

After the above eight steps have been completed, the project is ready for presentation to the State Board of Education for action. **Construction of the project must not start until local officials have been notified of its approval by the Board, and no changes in plans or specifications, after approval by the State Board of Education, shall be made without express approval in writing by the Department. (Construction may begin after the application is received by the Department, provided that the district is willing to assume the entire cost of the project if the State Board of Education does not approve the project)**

9. When a notarized statement from a local school official is received by the department stating that construction of the project has started, a certificate for the first award will be presented to the Board for certification to the Division of Finance of the State Administration Department.

10. Final inspection of the completed project. The date for the final inspection will be set for the convenience of all interested parties. Local authorities will be responsible for seeing that a copy of the plans and specifications, as approved by the State Board of Education, and subsequent changes thereto, as approved in writing by the department, are available at the project for reference at the time of the inspection.

11. Notification in writing that all changes and additions listed at the time of final inspection have been made and the project is completed.

12. Notification of readiness for an audit of the project for final payment of state aid. This should be sent when all payments are made and all work is completed of the project. Cancelled checks and invoices should be brought together for the audit.

Following completion of the audit the State Board of Education will certify for payment, to the Division of Finance of the State Administration Department, the final amount due the school district.

CHAPTER II

Planning: First Stage

Planning is the most critical element in any school construction or renovation project. Without realistic planning it is quite likely that money will be spent poorly or improperly in terms of the needs of the district, and in the long run the expense of implementing the unplanned school project may be twice or triple what it might have been had planning been utilized.

A community should not steer away from planning because it feels that planning will indicate needs which will cost more than the district is prepared to pay. Many of the investments indicated during planning need not be made at the completion of the planning program but may be relegated to a date in the future, and good planning will indicate the right order for future expenditures.

The first step in planning involves a thorough consideration of the area to be served. A town should look not only at its own needs but also at those of its neighbors and, in turn, may well profit from a cooperative planning effort. Many people are aware of school districts which have joined with other school districts in order to meet their educational needs. Generally, it can be said that schools which serve large areas are less expensive both initially and operationally on a per pupil basis than those serving smaller areas. Not only are they cheaper, but the educational opportunities which are offered are usually better because the larger facility can offer a program of greater depth and scope. For these reasons, before a school district decides to build its own school, it might well consider the benefits of a regional school.

Once the area to be served by the school has been designated, the number of people within that area may be determined. While it is a simple matter to determine the number of students within a given area, to project the future student population in that area requires a consideration of at least three complicated factors:

1) the size and age distribution of the present population; 2) the birth and death rates in the area and the dropout rate in the school; and 3) in and out migration. A careful examination of present and future numbers of students to be served by a school is very important. Building too large a school would obviously not be wise, but building one too small may lead to equally unnecessary expenses.

Generally a school district is not equipped with personnel who have the time or training necessary to examine the problems of finding the optimum district size and projecting future school population, even over the span of the next five years. For this reason, it may be advisable for the school board, possibly in conjunction with other communities, to utilize the services of an out-

side consultant to solve these problems. A consultant also has the advantage of being able to look objectively at a community and its needs without involving politics and personal opinion in his findings and the solution he offers.

Curriculum Planning

Once the size of the district and the student population (both present and future) have been established, limits can be set on the size and scope of the proposed school. At this point the most critical part of the planning process can begin: curriculum planning, planning for the entire teaching learning process of the children to be served. This planning should include everything from athletics to foreign language study. Minimal regulations are set forth by the State Board of Education and they should indicate only a part of what must be contained in a curriculum plan.

A curriculum planning report must be presented to the Department of Education if state aid is to be obtained. In small projects this requirement may be waived at the option of the Executive Director of Special Services. The final written report should take into consideration the needs of every kind of student: the student interested in languages, athletics, science, social sciences, industrial arts, or business. It should be all inclusive, indicating various courses of instruction and the space facilities needed. It should indicate what special arrangements are to be made for the talented, the average, the retarded, and the physically handicapped. Special features that are neither academic nor athletic but still essential to schools should not be overlooked. These include food service facilities, health facilities, and administrative services. The Department, through its specialists, offers technical advice on any aspect of curriculum planning.

Curriculum planning should also indicate other uses for the school. Such plans might include use by adults in educational retraining programs, summer use by kindergartens, and use for such community activities as concerts, workshops, and lectures. An efficiently planned school will be used as many hours during the day as is possible, in the evenings, and during the summer months. It will be of direct concern and of educational value to the whole community.

CHAPTER III

Planning · Second Stage

Once the size of the optimum school attendance area is decided upon, the student population is ascertained, and the curriculum report is completed, the second stage of the planning can ulum report is completed, the second stage of the planning can be initiated.

Evaluation

Some educational buildings are already in existence in every school district. It would be wasteful to build a new school if the old buildings could be made to serve the needs of the curriculum plan. Renovation of the existing buildings should be considered in the light of information gained in stage one of the planning process. And also from the vantage point of several academic factors. A study subcommittee working with an architect should examine the existing buildings.

The first question to ask is: does the existing building or buildings provide a structurally adequate space for the curriculum plan to be effectively carried out? If the answer is no, then the existing building must either be retired, added onto or renovated. If renovation or additions are to be considered, then the question must once again be asked: will the course of action chosen answer the curriculum needs? In most cases existing buildings do not answer the needs brought out in stage one of the planning. If renovations or additions are not the answer, then the buildings should be examined for other possible uses. Retired school buildings may have other civic uses.

Often the renovation of existing buildings will solve the needs of curriculum, size and present number of students, but will not afford the cheapest method of solving the problem in the long run.

For this reason economics plays a key role in the decision of whether to build or renovate. In examining the economics of both possibilities, one must be able to answer the following questions:

1. Can long range goals be completely achieved through the proposed remodeling or additions, or will long range needs involve further expense?

2. What are the costs to the taxpayer of renovation as compared to new construction?

3. What will the operation and maintenance costs be over the next fifteen years?

4. How much state assistance will be granted for these expenses?

5. Can interior flexibility be achieved in the old buildings or are most of the interior walls bearing walls, thus limiting present and future interior changes?

6. Is the site of the old building adequate for play grounds, future expansion, and parking? If the site is too small, can more land be purchased?

7. Is the cost of adding reasonable, or would it be cheaper to build a separate building and then eventually remove the older building and add to the new building as more funds become available?

8. Can the old building meet health and safety regulations cheaply and easily?

9. Are the old buildings structurally sound?

Generally it has been found that older buildings do not meet the academic and physical requirements necessary in the district. Added to this is the fact that renovation is usually not as economical in the long or possibly even the short run as a new school.

The Role of the Architect

When stage one of the planning program has been completed and stage two begun, thought should be given to retaining an architect. Regardless of the scope of a project of building or renovation, an architect must be employed to supervise the design and construction of the project. (This requirement may be waived upon approval of the State Board of Education.)

If reasonable assurance of public approval is indicated, the architect may be hired to proceed with preliminary planning and rough design; if support has not yet jelled, a competent architect may be of great assistance in explaining the project and its costs to the voters. Another vital role of the architect in the preliminary stages is in the selection of the site. He can save thousands of dollars with his advice on optimal site location and on orienting and locating the building. He may also prove helpful in the evaluation stage of planning.

The architect's first step in actual design is to study the curriculum plan, for it embodies the scope and philosopy of the program to be housed in the plant. For this reason the architect must be familiar with educational programs as well as modern architectural design and developments in school construction. He must, of course, be aware of relative costs and be able to prepare clear, complete specifications and to provide or secure engineering and other consultant services. Flexibility of mind, an ability to work with others, accuracy, and promptness are qualities which the architect should possess. In large projects the size of the architect's staff may have some bearing on how rapidly a project may be designed. The amount and type of supervision

which the architect can and will give to the project should be a consideration, and he should have demonstrated in the past an ability to draw up contracts and to build economically while utilizing new ideas.

The Department of Education can provide a list of competent architects, who have built schools in the New England region, but this list should not be considered exhaustive. While it is not required that the architect have built a school in the past, he must understand and be capable of dealing with the special problems associated with school construction.

Questionnaires should be sent to the architects whom the building subcommittee feels possess most of the desirable attributes. It will then prove useful to examine some of the buildings designed by those architects who appear, from the questionnaire, to have the desirable qualifications. When examing these schools, the teachers, superintendents, contractors, and others involved in the construction and use of the building should be interviewed. Once the candidates for the job are narrowed down to two or three, interviews should be conducted: care should be exercised in basing one's whole decision on the interview, in that it is possible that an architect who sells himself better than another may be less qualified for the job.

When the decision to hire a particular architect is made, a contract between the architect and the School District should be drawn up. Usually this contract is an American Institute of Architects standard form. If the district has not yet voted to finance the project, the contract should state what the remuneration is to be if the district rejects the proposed project. All contracts should answer the following questions:

1. What is the basic rate for the architect's services?
2. How are the architect's services defined?
3. Are the services of necessary engineers included in the architect's fee?
4. Is extra pay provided for unusual extra work required of the architect?
5. How and when are payments due the architect?
6. What surveys and tests are to be provided and who pays for them?
7. If a clerk of the work is employed, who selects him, who pays him, and what are his lines of responsibility?
8. How many sets of plans and specifications will the architect provide without charge?
9. Will this agreement be binding on successors, partners, etc?

Choosing the Site

The school should be situated as close to the students as is feasible. In our mobile society it is not always possible to accomplish this, since student density changes with migration patterns within, into and out of the district. On the other hand, a point on a map showing the geographic center of the student population is not always the most desirable place for a school to be built. For instance, to enable shared use of existing public facilities, in certain situations it may be advantageous to locate a school near a public library, a park, a play-ground or other public facility. Moreover, the student population center may be within an urban area, which may be undesirable from the point of view of availability and the cost of land. Such areas as commercial zones, poorly developed neighborhoods or areas associated with excessive noise, obnoxious odors, or danger should obviously be avoided.

Requirements of minimum site size are set forth by the Department of Education. For kindergartens and elementary school, the minimum is six acres for less than one hundred pupils, with one acre to be added for each additional hundred pupils within the school. In addition, one acre must be added for each hundred pupils in the seventh or eighth grades if those grades are to be included in the elementary school. Secondary schools must have a minimum of twenty-one acres for under one hundred pupils, with one acre added for each additional hundred. Minimum site sizes do not include area to be occupied by buildings and areas which cannot be used by the students, such as swamps or particularly rough areas. These regulations are minimal, and it is recommended that two or three times the minimum be acquired for the site so that future expansion or innovation is not limited. In districts in which zoning does not exist, it is recommended that the site size be particularly generous in order to prevent encroachment on the school area by any undesirable development.

Aerial, topographic and soil conservation maps may greatly facilitate the choice of a site. These maps may bring to light useful areas previously considered unavailable and disclose drainage, sewage, subsoil and water availability problems. The availability of public service facilities should be carefully considered. Power companies can provide maps of power lines, and the Highway Department can be of assistance in helping to locate a school in proper relation to existing road systems, and in giving cost advice if a road must be built. When the site has been chosen the district should utilize the services of a lawyer and a surveyor to prepare deeds, make a title search, and survey the school site. The Department of Education does not grant state aid for site purchase, but it does give assistance in site preparation and landscaping.

Financing the School

Most people accept the importance of education and the need for good teaching facilities. Accepting the need for education and

school plants is, however, not always tantamount to a willingness to pay the cost of education and a new or remodeled plant.

Children are society's most valuable and exhaustible undeveloped resource. Education affords us the opportunity to develop these resources so that they can become productive members of society. From a negative viewpoint, unemployment and low incomes are most frequently associated with the under educated. Unless we provide the facilities to educate our children, we can only expect in the future to pay for our oversight with the loss of these valuable resources and with larger welfare payments.

The responsibility of educating children belongs to the whole society and not just to the parents of the children. If the children of today are properly educated they will add to a productive society tomorrow, and if not, they may continue to be society's children for their entire lives.

State Aid Helps

The financial responsibility for school construction can rest partially with the local district involved and partially with the state. Admittedly the state aid program is supported by the state taxes we all pay. The state school building aid program merely shifts a portion of the financial burden of school construction from the local property tax to the taxes we pay to the state.

Provided that the conditions and procedures set forth in this pamphlet are followed, the state will assume 30% of the cost of construction and site development for new schools including fixed equipment and, under certain circumstances, 30% of the costs of renovations or additions made to old schools. While it is the responsibility of the local district to see that these conditions are met, the State Department of Education will advise and assist the district of the ramifications.

Local Effort

The local district must assume 70% of the cost of construction as well as the full cost of acquiring the site. For even the smallest school plant, this is an impressive cost. Since most school districts do not have a building fund and cannot possibly assume the full cost of the construction project in one year, the district involved usually floats bonds of varing lengths of maturity, normally spanning a twenty year period. A bond is simply a note promising to pay a sum of money, with interest, at a predetermined time in the future. The bond is secured with real property. When the bond has been sold on the market, the district receives a sum of money.

Before a bond issue may be sold, however, a prospectus of the school district should be drawn up by an attorney and pub-

lished, so that the prospective buyer of the bonds will know something about the history and the financial status of the district. Great care must be used in drawing up the prospectus, as it will affect the speed with which the bonds are purchased and their interest rate. Care should also be taken to put the bonds on the market at a time when interest rates are favorable. A twenty year bond issue sold at a time of slightly higher interest rates will cost substantially more than if it were sold at a favorable time. Care should also be used when selling short term (five year) bonds, particularly if the bonds must be refinanced at the end of five years, because it is virtually impossible to predict what the interest rate level will be five years hence. It is also important, not to issue bonds at times when other districts are selling bonds, in that it is possible to glut the market, driving interest rates upward.

There follows a chart showing the effect of varying interest rates on bonds of different maturities. It should be noted that an increase of 1½% in the interest rate nearly doubles the cost of money over a 30 year period.

The Cost of One Million Dollars *

Interest Rate	Years to Amortize	Cost
3%	20	$315,000
3%	30	$468,000
4%	20	$420,000
4%	30	$624,000
4½%	20	$472,500
4½%	30	$702,000

Before a district may float a bond issue to cover the district's share of the cost of construction, the voters in the district must approve the bond issue by vote. Except where the charter of an incorporated or city school district requires a two-thirds majority, a simple majority is all that is necessary for passage. A bond issue vote is always by Australian ballot. Before steps are taken to hold a bond vote, competent legal counsel should be retained to insure that the proper legal procedure is followed. One should also remember that the normal statutory debt limit of ten times the grand list, minus outstanding obligations, does not apply as a limit on the amount of bond issues sold to finance school projects that will be constructed using state school building aid.

What Does This Mean for the Taxpayer?

Through the use of bonds, the taxpayer is not required to pay the entire cost in a single year, but may pay for the school over the period of fifteen, twenty or, with special enabling legislation, thirty years.

* On the basis of equal annual payments of principal, except that the thirty year issue matures 33,000 each year for the first twenty years, and 34,000 each year for the final ten years.

Calculating the additional tax revenue needed to finance a new school, in terms of tax on the grand list, is not a difficult procedure. Another calculation should be undertaken to show how much each district taxpayer will have to pay on a yearly basis for the proposed school. Of course, if the total tax due from each taxpayer is to be calculated, certain adjustments must be made in the old tax rate before the tax rate derived from the construction costs are added to the old tax rate. Allowances must be made for the difference between the operational and maintenance expenses associated with the old school as compared with the new school. Beyond the property tax there does exist one other source of local revenue for school construction. The special poll tax may provide a desirable method of equalizing the costs of construction of a school in the community. Another factor which may defray some of the construction expenses is the possibility of selling the old schools and sites if they are no longer to be used.

Under certain circumstances the federal government will share part of the costs of school construction, interior furnishing and learning materials. During the planning stage the study committee should inquire of the Department of Education, what federal assistance programs are available. Financially, it is often worthwhile to formulate plans around the series of federal assistance programs available, rather than attempt to fit a federal assistance program into dogmatic plans.

A FEW THINGS TO CONSIDER

The Danger of Comparative Costs

Much too large an issue is made over comparative costs of schools. It is extremely difficult for the non-professional to compare the cost of one school with the cost of another, particularly on a square foot basis. 1, No two schools are the same, in that they are not located on the same terrain, do not serve the same number of pupils, and do not answer the same needs. 2, Figures often quoted on a cost per square foot basis, give little indication of what that cost includes, such as a gymnasium, built-in furniture, landscaping, etc. 3, Initial cost is not a true measure of economy. Low quality, cheap construction utilizing poor materials may save money initially but may result in exceptionally high maintenance costs in the future. 4, The main function of a school plant is to serve as an educational tool, and if the tool does not fit the curriculum plan, it is not economical, regardless of its price. 5, Inflation makes each school more expensive than the last. From this point of view, it does not make sense to wait longer than necessary before building, or acquiring the site.

The Importance of Public Support for a Venture

Informal group gatherings as well as a series of informative public meetings probably provide the best method of gaining public support for new school construction. In these meetings a careful analysis of the problems and their solutions should be sought. The greatest danger in any public venture is to ask the voters to vote in favor of it before they understand the venture and its alternatives; for once an idea is initially defeated, its chances of gaining subsequent approval may be reduced. It is suggested that an informal poll of the community feeling be taken to ascertain the public sentiment; if acceptance of the venture seems unlikely, the official vote should be postponed until any faulty understanding of the project is repaired. Nothing is more frustrating than expending considerable time and energy on a project, only to have the voters defeat it because not quite enough time was spent explaining the project.

CHAPTER IV

General Provisions Applying to All Schools

Expandability: Every school should be built in such a way that extension or expansion is feasible at reasonable cost and with as little damage to the original building as possible. Some areas of the school should be constructed on a scale to permit serving any foreseeable future need. Such areas include the gymnasium, the auditorium, the kitchen, the cafeteria and the administration offices. Other areas should be planned for expansion whether or not a future enlargement of these facilities is contemplated. These areas include the library, and the classroom and laboratory complex. Service facilities, heat, water, sewage, electricity and ventilation systems must be made large enough initially to handle any future expansion.

Flexibility: Flexibility is the most overused and misunderstood word in the construction business. When the Department of Education talks about flexibility, it is referring to modular interior design, non-load bearing interior walls, and a heating, ventilating and electrical system which lends itself to change or modification. It is virtually impossible to predict what the teaching learning system will call for twenty or thirty years hence. If a school is not to be antiquated in twenty years, allowances must be made for changes when it is built. The main reason some of our older schools are being replaced is that they did not allow for future change. Allowances for the future can be made by using clear-span type construction so that interior walls are not load bearing. Interior dimensions should be standard in size and parts should be of standard design, thus making a change in wall or fixtures easier in the future. The service features of the building should lend themselves to change or modification by being built around permanent walls and ceilings, rather than around walls that might later be moved.

Convenience: Careful analysis of floor plans should be made to determine the administrative convenience of the plant. This factor increases in importance as the size of the school increases. Corridors and stairways should be of sufficient size to take peak loads efficiently under the various conditions of use. Noise, public use, age of pupils and ease of supervision are other factors that enter into the test for convenience. The location of building elements, such as the administrative facilities, library, gymnasium and kitchen, in relation to other elements and to the school as a whole is always an important factor in the convenience and efficiency of the plant.

All schools must take into consideration the special interests and limitations of the people using them. Allowances should be made for exceptional children and must be made for the physi-

cally handicapped who may use the school. This means ramps must be provided for at least one entrance of the school and allowances must be made within the school for use by students and visitors confined to wheelchairs.

In multiple storied schools the Department of Education requires that at least one elevator be supplied for the convenience and use of non-ambulatory students. Design provisions also must be made for stair railings, stairs, telephone booths and toilet facilities so that they may be used by the physically handicapped.*

* See: **Making Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped** — National Society for Crippled Children and Adults, Inc. Chicago 1961.

CHAPTER V

The Library

The library and its supporting facilities are the center of the teaching learning process. The library is unique in that it in itself offers an environment conducive to learning. Great care should be given to the design of the library and, if financing the school presents a problem, under no circumstances should library facilities be cut back.

Considerable amount of interrelationship should exist between the library and the curriculum. The library should serve and supplement the curriculum, and, in turn, the curriculum should incorporate a full use of the library. One must relegate to history the traditional view that libraries are book depositories and only in certain circumstances places where the learning process may be pursued.

The modern library should be a pivotal center where students may do research, study, discuss ideas and have conferences. To this end, in order that the library be readily accessible to students and teachers, it should be placed at, or close to, the geometric center of the school, preferably forming a core around which the school is built and where educational processes converge. Classrooms and laboratories should radiate from the library, but it should be so situated that later expansion of facilities can be easily and economically made. The library should be isolated from noise producing areas such as vocational shops, gymnasiums and corridors. As the library will probably be open before and after school (as well as during school hours) the library should be accessible from outside so it may be opened without opening the whole school.

The library and its associated facilities must be consistent with the capacity and program of the school. Ideally the library should seat 30% of the student body. State minimum space requirements, well below this optimum level, are as follows:

Elementary Schools

1 - 4 classrooms	—	Storage large enough for 15 library books per pupil.
More than 4 classrooms and up to 300 pupils	—	750 square feet of usable floor area plus an office, a workroom, and a storage area. One room must be large enough for visual-aid previewing.
Over 300 pupils	—	1500 square feet of usable floor area plus an office, a workroom and a storage area. One room must be large enough for visual-aid previewing.

A reading room or rooms seating at least 10% of the enrollment at 30 usable square feet per pupil.

A workroom of 200 square feet.

An audio-visual room of 200 square feet or combined with the workroom at 400 square feet.

An office of 200 square feet.

Storage of 300 square feet.

The library usually has certain subsidiary facilities closely associated with it. There should be an office for the librarian. Depending upon the size of the library, this might be a room large enough for both the librarian and a secretary, as well as filing cabinets and adjustable shelving. There should be a workroom equipped with shelving and cabinets as well as a work-counter complete with sink and hot and cold running water. In libraries of all sizes there should be one or, preferably, more than one classroom opening directly off the library, so that classes involving research and teaching can be conducted in conjunction with library facilities. There should be a storage area for audio-visual materials and damaged books. An audio-visual laboratory should be provided, and the length of this room should be such that visual aid previewing is possible. The workroom may be combined with the audio-visual laboratory, provided that there is no reduction in the minimum spaces. It will also prove useful to have at least one conference or seminar room directly off the library where students may meet with other students or teachers. These rooms have a minimum of 120 square feet.

The layout of the library should be such that a student entering the library is faced with the card catalog, checkout desk and librarian's office. To get to the study area, the student should then pass through at least part of the book shelving system. The study area may be one large room with appropriate chairs and tables, or preferably, it may incorporate the more modern approach of individual study carrels, interspersed with group study tables. This mixture of individual and group study areas is preferred, as it more nearly approaches the needs of the students. Some students prefer semi-privacy while some perform better in group situations. Up to 60% of the seating capacity may be in the form of carrels.

The state recommends that a minimum of 3,000 books and requires that at least 15 books per pupil, be shelved in the library. The state further requires one book per pupil be added each year. Shelving and cataloging provisions for the required number of books as well as back periodicals, and provisions for future expansion must be made.

The interior design and decoration of the library is critical to its success as a learning center. The conduct of students, hence

the amount of disciplinary supervision necessary, is directly dependent upon the atmosphere of the room. A room that is non-institutional, warm and homelike, which does not elicit the icy silence traditionally associated with the library, but where the noise level is not too great, seems to be the best situation to lead toward a high degree of use, efficiency, and good conduct.

A desirable library environment is achieved through good design which is exciting and refreshing. Good special relationships and aesthetic sense are important. Design, acoustics and flooring should be left to the architect; however, the use of carpeting should be seriously considered as it is pleasing, enables younger children to sit on the floor, exudes warmth and has good acoustical properties. The initial expense of carpeting is higher, but its long run maintenance costs often make it cheaper than resilient flooring.

The Classroom

The classroom is a tool of the teacher, in that it provides an area where the discipline of teaching can occur. The effectiveness of the teacher is directly dependent upon the classroom, its aesthetic design, and most important, its shape.

Obviously the classroom must be large enough for the students and teachers to operate efficiently and comfortably. For this reason kindergartens must supply 50 square feet per student. Elementary and secondary schools must provide at least 30 square feet per pupil. From this point of view a kindergarten must contain, as a minimum, a thousand square feet of usable floor area. Elementary and general secondary classrooms must provide a minimum of 750 square feet of usable floor area. The minimum sizes of classrooms are to be considered general regulations. Special classrooms may be of variable size to meet the needs of the curriculum.

Traditionally, classrooms have been designed in a rectangular shape but this may not always be the most desirable shape. Square, round, or hexagonal rooms might be considered. Regardless of the shape, the room should be integrated into the curriculum, so that it serves the curriculum and not tradition.

All classrooms should be equipped with storage cabinets, and if another area is not provided for the teacher's clothing, a lockable teacher's clothing closet should be provided. Each classroom should be equipped with shelving for the storage of books. Studies show that the presence of books tends to increase the amount of reading students do and to stir their innate curiosity. Classrooms should be equipped with light-eliminating shades so that the room may be darkened to enable the use of visual aids.

In designing the classroom complex, some recent innovations in classroom design should be considered, such as the use of fold-

ing or accordion walls between some of the classrooms. What this means is that two or more classrooms may be thrown together thus allowing large group instruction. Consideration might also be given to providing the teacher with a soundproofed, glass-encased office within the classroom. The office would allow the teacher to supply special, private instruction or conferences outside the main class area while still maintaining classroom supervision.

The walls of the classroom must be designed with durability and attractiveness in mind. The floors should be light colored and durable. Resilient type flooring or carpeting provide suitable floor covering. All classrooms must provide a minimum of 16 lineal feet of chalkboard and 16 lineal feet of tackboard. If possible these should be attached to the walls in a semi-permanent fashion. Semi-permanency will allow vertical adjustment and the substitution of one type of board for another.

Science Laboratories and Related Facilities

Facilities for teaching science should be planned carefully to suit the curriculum plan and the number of students to be accommodated. All secondary schools must have science facilities, and many elementary schools are now including science laboratories.

The laboratories of a science program should contain a minimum of 900 square feet of floor area. Each laboratory must have an adjacent storage and preparation area of at least 150 square feet. If the room is used as a combination laboratory and recitation room it must have at least 1200 square feet.

Careful consideration should be given the following elements in planning science facilities: location for economy in plumbing and electrical service, necessary special wiring for 220 volt outlets and possibly a converter for direct current; location for the most desirable natural light (southern exposures favored for general science and biology); provision for darkening the rooms; type of furniture used, need for photographic darkroom; ventilation; bookcases, chalkboard, tackboard and display cases.

Since ventilation in the laboratory is of critical importance, a fume hood over a demonstration table, in addition to regular ventilation, may be necessary. The storage-preparation area should be equipped with its own ventilator duct and should not depend on ventilators serving the adjoining classroom.

The number and kind of student experiment tables and demonstration tables to be installed should depend on needs generated by the curriculum plan. Table tops should be made of resin impregnated stone of solid resin to prevent damage by spilled chemicals. Storage space in the laboratory rooms should be provided with cabinets and shelving. Care should be taken to

insure that the strength of drawers and shelves is sufficient to bear the weight of rocks, minerals, and heavy laboratory equipment. Space should be allocated for a refrigerator, a small stove with an oven, and a still.

Six or eight sinks equipped with hot and cold running water should be available for student use in biology, physics, and all other science laboratories. Sinks may be conveniently located on the wall of the laboratory. In chemistry laboratories, a sink should be available for the use of each student. One sink may serve up to four students provided that simultaneous use of the sink may be made by each student without interference with another student's use.

Consideration might also be given to providing a terrarium and an animal case for biological study. The case should be heated and well ventilated. A green house has proven very useful in some science programs, particularly those requiring fresh vegetation and flowers for study during the winter months.

Between classes, students' projects might be stored on trays and placed on mobile racks. These racks should be kept in the storage area between classes, thus enabling a project to continue from day to day without interfering with valuable classroom space.

Language Laboratories and Classrooms

A foreign language program is a required part of the curriculum of the secondary level, and foreign language study is being increased at the elementary level. The facilities needed depend upon the number of students to be served and the curriculum plan.

Classrooms for foreign language study should be of the same size and equipped in the same way as regular classrooms. In certain large language programs the use of one or two smaller seminar rooms may be approved if their need can be shown.

Most new secondary schools in Vermont are including language laboratories in their school plants. The language laboratory is used to help the student gain skill through practice in listening, comprehension and speaking.

Two basic types of language laboratory installations are available, and preferably both should be included in the language facilities. If, however, only one type is chosen, the choice should be based on the teaching philosophy of the language department. The two types of language laboratories are:

1. An electronically equipped classroom developed from any conventionally equipped classroom. Ordinary students' desks are supplied with a microphone and earphones and a taped program is supplied from the teacher's console, which is usually located

in the rear of the classroom. One of the advantages of the electronically equipped classroom is that it may also be used for conventional teaching when the electronic equipment is stored away.

2. The fixed laboratory differs from the electronic classroom in two respects. Students sit in semi-private listening booths similar to library carrels rather than regular desks. Booths are equipped with microphones and earphones and often with their own tape decks, enabling students to change their own tape programs. If tape decks are not supplied within the booths, they are located in the teacher control console. The console should be located in the rear of the classroom to permit the teacher visual contact with the students. This type of laboratory should be located between two classrooms and should contain no more than twenty-five listening stations. A standard size classroom will supply sufficient space for the booths. The teacher's console may be either an exposed desk-cabinet area on a raised platform or a separate room with glass walls to permit visual contact between the student and the teacher.

Regardless of the type of language laboratory used, an adjacent work-storage area must be provided. This area must be ventilated to eliminate excessive heat and soundproofed to permit preparation of tape programs. Ventilation throughout the language laboratory may have to be increased above the average classroom level to handle the extra amount of heat generated by the electronic equipment. A single switch should turn off all of the electronic equipment within the laboratory with the exception of the overhead lights. Care should be taken throughout the language laboratory area that related electronic equipment and fluorescent lighting are designed in such a way that they do not damage or interfere with efficient use of the magnetic tapes and electronic equipment.

Industrial Arts Facilities

Industrial arts is a part of general education and cannot be defined as trade or vocational education since it does not train a student for a particular vocation. The role of industrial arts is to expose all students to manipulative skills in the use of tools and materials and to give them a basic understanding of machinery. An industrial arts curriculum might include general metals, electronics, mechanical drawing, graphic arts, power mechanics and woodwork.

The size of the industrial arts shop is dependent upon the number of students enrolled in the school. It may vary from 2,400 square feet in a small secondary school to over 3,200 square feet in a large high school. Provisions must be made for teachers' offices, storage, classrooms and special service facilities tailored around the equipment to be installed.

The Music Area

Because of the growing importance of music in secondary education and the increasing number of pupils who participate in it, new school buildings are including either separately or in combination the following facilities: chorus room, orchestra or band room, all-purpose general music room, appreciation classroom, small practice rooms, instrument storage room, a robe and uniform storage area, music library room and a director's office. In each school plan, analysis based on the curriculum plan will disclose to what extent the facilities listed above are to be included.

In some schools the use of the auditorium or lunchroom for some functions may prove satisfactory, and when this is the case, conveniently located and ample storage facilities (not the stage wings) must be included. The problems of noise interfering with the music program or noise generated by the music must also be considered.

Art Facilities

In the elementary school the art class may customarily be carried on in the regular classroom, provided the classroom design is adequate for this purpose. In junior and senior high schools a special area designated for art will better serve the purpose. In locating the art room, a northern orientation is much to be preferred, and there may be some advantages in locating this room near the home economics and shop units so that tools common to these disciplines may be shared. In addition to storage facilities within the classroom, a large storage closet is needed to provide for the storage of pupils' unfinished projects, art materials and finished projects. Apparatus for display — tackboard and lighted cases — are necessary, and these are often located to decorate corridors and lunchrooms. Removable chalkboard, bookcases, a work sink, an ample number of electrical outlets, a teacher's closet, and provisions for darkening the room must also be provided.

CHAPTER VI

Business, Vocational and Homemaking Education Facilities

For about 50% of our youth a high school education represents the completion of formal education; furthermore, of those who do go on to advanced training only half complete the additional training. By and large those of our youth who do not obtain a higher degree are unprepared and unsuitably trained for the jobs through which they must earn their livings. It is the responsibility of the public educational system to see that the student is properly guided into the field in which he may be the most productive and happy. It should be the foremost goal of every school not only to guide the student in intellectual discipline but also to prepare and train him so that he may enter an occupation.

Recently it has been suggested that vocational and business training is of little use, since the prospective employer will—and would rather—train the job applicant. This theory is not entirely accurate since it is the unskilled and untrained segment of the population which is experiencing the highest level of unemployment. This is largely due to the fact that, although employers will train a person with basic skills, it is not practical for them to train a totally unskilled person. To offset unemployment, then, it is necessary that public schools provide their students with basic skills. It must be remembered that unemployment has far-reaching implications for society as a whole. It invites low productivity, poor living conditions, dependency on the support of public assistance, unhappiness and hopelessness.

A comprehensive secondary school offers courses in business education, vocational education and homemaking as well as academic. The larger the high school, the better and more complete the courses of instruction may be. A well-rounded vocational education program may be offered to a school population of at least 800 students, and a school of 1,000 is preferred. If the high school is smaller than 800 students, consideration must be given to allowing students desiring vocational education to obtain it in another school.

In the following three sections we will discuss facilities for business education, vocational education and homemaking education in the secondary school.

Business Education

A business education classroom should be like the regular school classroom, except that the floor area should sometimes be increased to allow for the use and storage of office machines. Since part of the business course will include class instruction and part will include machine operation, two classrooms may be desirable, one for each of these purposes. Storage for the

various office machines not in use must be supplied, in addition to the normal class storage areas. Acoustics, particularly within the machine instructional areas must be carefully designed. Electrical supply must be of sufficient amount and be conveniently located. Many schools are using roll-up electrical tapes to supply electricity to each machine. These tapes are particularly good in that they allow easy rearrangement of the room to suit teaching needs; moreover, the mobility of the machine affords such easy conversion of the room that the need for another room may be obviated.

Vocational Education Facilities

Facilities for vocational education should generally be located on the ground floor for easy access to supply and to the people who may use the facilities after school hours. Consideration might also be given to locating these facilities in a separate building in order to reduce the transmission of noise into quiet areas of the school. If a separate building is considered, the problems and costs of extra heating, ventilation and plumbing should be carefully studied.

The recommended floor areas for the various shops enrolling 16 students per class are as follows:

1. Machine shop	3200	square feet
2. Auto mechanics shop	3200	" "
3. Cabinet making, carpentry and multi-work	3200	" "
4. Cosmetology laboratory	1200	" "
5. Drafting room	1200	" "
6. Electrical, radio and television shop	1600	" "
7. Plumbing, heating and sheet metal shop	2400	" "
8. Power stitching shop	1200	" "
9. Practical Nurse Laboratory	1400	" "
10. Printing shop	2400	" "
11. Agricultural shop	2400	" "
12. Food trades shop	1800	" "

Vocational education should be considered as a school within a school in that, many of the facilities found within the school should also be found within the vocational facilities. Classrooms will be needed, equipped with the facilities listed in the section entitled **Classrooms.** Instructors' offices with access to the shops and classrooms will be necessary and should contain 135 square feet of floor area. Toilets, washrooms and lockers should be provided for the convenience of the students. Showers should be provided for the automotive and agricultural students and others, when appropriate, to answer the needs of personal hygiene.

The need for special finishing rooms within the shop areas should be examined. Special rooms would be called for in auto painting, wood finishing, etc. The drafting facility should be

located in a quiet area of the vocational section and preferably it should have a northern orientation.

Each shop has its own special problems of lighting, ventilation, electrical service, safety, plumbing and dust exhaust. These problems should be dealt with carefully.

Storage of new materials and storage of partially completed projects must be provided within each department. A storage area of 200 to 250 square feet will be adequate for most departments.

Laboratories should be included as an integral part of some vocational shops such as the agricultural and food trades shops. These laboratories should be of standard classroom size and equipped as dictated by curriculum requirements.

Homemaking Education and Family Life Education Facilities

This area of education includes child development and family relationships, housing and home furnishing, foods and nutrition, clothing and textiles, home management, consumer education, and family health.

Again, if the department can be located on the ground floor in an area which can be isolated from the rest of the building, the facilities will be more suitable for adult night and summer classes. Small children from the play school should be able to enter the building and go to and from the playground without disturbing other classes.

The facilities and the amount of space required is dependent upon the curriculum plan and how much of the other facilities found in the school can be used to supplement the homemaking division.

If a single classroom department is planned, an area of 1200 square feet will be required as a minimum. If the school intends in the future, to enlarge the homemaking department with additional classrooms, the feasibility of building the additional classrooms should be considered at the time of construction.

Regardless of the space planned, considerable judgment and care must be used to make sure that the spaces provided are used efficiently and that their uses are a planned part of the curriculum.

A considerable amount of help and advice may be obtained in the planning stage, from Specialists in Business, Vocational, and Homemaking Education in the Department of Education. These personnel may also be helpful in establishing the necessary space requirements for each area of the curriculum.

CHAPTER VII

The Auditorium and Stage

The size of an auditorium should be governed by probable future enrollment and the projected amount of community use. The auditorium proper should contain six or seven square feet for each person to be seated. A sloping floor is recommended and the entrance to the auditorium should be on the ground level. A public entrance which can be closed off from the rest of the school is essential. It may be desirable to eliminate all natural light, thus eliminating the problem of providing darkening shades. Except for the purposes of stage lighting, balconies are not recommended. The lobby should contain public toilets, a ticket booth and a cloak room.

The stage must be of sufficient size for plays, movies and teaching. In auditoriums of less than 200 people in capacity, the stage should be from 20 feet to 30 feet in depth, the proscenium opening from 24 to 40 feet wide, and the proscenium height from 16 feet to 20 feet. In auditoriums of 200 to 300 capacity, the clear width of the stage should equal the width of the auditorium. In auditoriums which have a capacity of over 300, the width should increase up to 68 feet. The wings of the stage should be unobstructed space, articulated with corridors.

Careful study should be given to storage rooms, dressing rooms, built-in radio and public address systems, scenery supports and curtains, stage lighting and electrical equipment.

The Gymnasium and Related Facilities

The gymnasium should be located so that noise from its use will not interfere with the other activities of the school and so that it may be opened independently of the rest of the school. It should be adjacent to the outdoor play areas to permit convenient use of shower and locker facilities. If it is in a separate building, provision must be made for its supervision.

The size of the gymnasium is dependent upon the instructional and athletic program and the number of students to be served. The official basketball court for high school use is 50 feet by 84 feet, and the minimum Junior high court size is 42 feet by 74 feet. The total floor area must exceed the court size to permit spectator seating. This seating should be of the fold-up variety and a careful projection of the number of spectators who may attend athletic events should be made to insure that more seating than spectators is not provided. The gymnasium should be divisible in the center by one or more folding partitions to permit simultaneous classes for boys and girls. The clear ceiling height should be at least 20 feet and a height of 22 feet is recommended.

A public entrance, possibly in conjunction with the auditorium entrance, should be considered, and the lobby should contain public toilet rooms and possibly a ticket booth.

Directors' offices for both men and women instructors should be conveniently located for supervision and for accessibility for students. Toilets, lavatory, and closet space are essential, and a private shower for each office may be desirable.

Storage facilities should be carefully planned. Space for equipment used indoors and out, team uniforms, and towel supply should be of ample size and located so as to be functionally convenient.

Facilities for changing clothes and taking showers after an activity are required for a junior and senior high school program for physical education. Since playing in street clothes is not economical and is not in accord with the formation of good living practices, the provision of shower and dressing facilities is recommended for elementary schools beginning at about grade four. To accommodate both boys and girls, separate units for each must be provided. Since it is difficult and expensive to increase the size of these facilities once they have been constructed, adequate space should be provided in the original plant to serve any anticipated increase in enrollment.

If pupils are to develop favorable attitudes toward play, a properly ventilated, temperature controlled dressing room with adequate space for changing clothes, storing of play clothes when not in use, and storing of street clothes during play is necessary. Proper ventilation of stored clothes is essential.

Ideally the location of the locker rooms should be adjacent to, and on the same level with, the areas they serve. They should be immediately adjacent to the shower rooms and should provide direct communication to indoor and outdoor play areas. The type of locker system used, the size of the peak load to be accommodated and the type of group to be served are the key factors in determining the size of the locker rooms.

In addition to the space required for lockers, a dressing space of 12 to 14 square feet for each pupil during the peak load or largest class, plus 10%, is a minimum provision. If the locker room is to be used as a team room for football, an additional space of 24 inches for each football locker should be included. However, congestion can be eliminated by providing a team room which is separate from the locker room and accessible to the shower room. Provision should also be made for visiting teams. The arrangement of locker rooms should be such that travel to and from lockers, toilets and showers is reduced to a minimum and cross traffic is, if possible, eliminated. Any arrangement should minimize the possibility of dirt and sand being brought into the corridor leading from showers and lockers.

The gymnasium is the basic physical education facility, it however, does not answer the needs and interests of all the students in the secondary school. Other physical education facilities should also be considered. Many high schools are now building swimming pools. These should be located next to the locker and shower facilities in the gymnasium so that these facilities may be shared. Outdoor athletic areas such as football fields and baseball diamonds should be carefully planned so that they are convenient to the gymnasium. Other facilities now becoming more popular include rifle ranges, tennis and handball courts, wrestling rooms, archery ranges, and hockey rinks.

The Multi-Purpose Room

A multi-purpose room can provide a good solution for the small school which does not plan to build a gymnasium, auditorium or cafeteria at the time of construction. As its name implies, the room will be used for many purposes, including the above uses, and perhaps as a classroom and a community center.

For schools of 60 or less students, 1200 square feet are required. For schools larger than 60 students, 2400 square feet are required as a minimum. In a larger multi-purpose room a stage may be useful, but the stage area may not be included in the minimum amount of space required. In all multi-purpose rooms the ceiling height should be at least 12 feet. Provision should be made for the storage of chairs, tables and other equipment. Preferably this storage space should be so located to facilitate the rapid clearing of furniture.

In some units the multi-use room will be used as a dining area, and this would require an adjacent kitchen. Proper acoustical control must be provided with special attention to the walls and floor. Preferably the multi-purpose room should be located on the ground level and be accessible to the public without opening the whole school building.

Food Service Facilities

Food service facilities should be planned in terms of the type of school, the type of lunch to be served, the size of the school, and most important the use anticipated for the future. Schools are encouraged to serve a complete meal to students and teachers at noon. A good noon meal increases students' afternoon productivity and well-being. In planning, the key consideration should be to enable smooth working, efficient service under sanitary conditions.

The food service facilities should be located on the ground level, accessible to the public without opening the rest of the building. The kitchen area, including dishwashing, will require one and a half to two square feet per meal served, with a minimum of 300 square feet. The food storage area should be cool, well ventilated, insect and rodent proof, and lockable. A minimum of

60 square feet or one half square foot per meal will be necessary for storage.

The dining area should have 10 to 12 square feet of dining area per person in the largest meal shift. The wall between the kitchen and dining room should be so designed as to eliminate the transmission of sound from the kitchen to the dining area. If properly soundproofed, the dining area may be used as an instructional area for educational television, visual aids or lectures. The type of floor, storage for lunch furniture and general decor of the room should be considered carefully so that the dining area may be used for more than dining.

Teachers Rooms

A lounge and preparation room is required in all schools for the sole use of teachers. In larger schools a room for teachers of each sex may be required. Teachers' rooms should contain storage space for clothing, unless provided elsewhere, shelving for books, and a work area consisting of tables or carrels. Toilet and lavatory facilities should be provided off a nearby corridor.

Guidance and Counseling

Space for guidance and counseling is required for elementary schools of more than 150 pupils and for every high school. These facilities should be located near the administrative offices so that access may be had to student records. The unit should consist of a counseling room of about 130 square feet and a waiting room or alcove. In schools of more than 300 pupils, more than one room will be needed. In elementary schools of less than 150 pupils provisior for guidance should be made in the school plant in connection with some other function providing privacy, storage facilities for records, and convenience to instructional rooms.

Health Facilities

Facilities are necessary for the isolation of children who become sick during the school day, and for conducting health examinations. In secondary schools this area is usually placed in conjunction with the physical education facilities. In elementary schools, allowance is made for a waiting room, restroom, an examination room large enough for testing vision, private dressing booths, and toilet, lavatory, and storage closets. Provision should also be made for a nurse's office, which may be placed in one of the above facilities.

Storage Area for Students' Personal Possessions

There is no general agreement as to the best method of providing for the storage of pupils' clothing, books and other personal articles during the school session. In the elementary school a storage closet within the classroom is commonly used. In the high school the individual student locker is the acceptable standard. These are placed either in corridors or in alcoves. Whichever method is adopted, it should be in consonance with the general organization of the school, and designed to waste as little space as necessary.

Administrative Section

The size and type of administrative facilities should be appropriate to the size and type of the school and should be centrally located. Areas for the public, for the general office, and for the various administrative workers will need to be delineated, though not necessarily by providing separate rooms. Toilet and washing facilities for the offices are desirable in all except the smallest schools. Storage space should be adequate, and a vault for records and money is essential. An exit from the principal's office, in addition to one through the central office, is recommended. Lighting and decoration should receive special attention. The public area of the administrative space might include display cases for student projects and tackboard for posting administrative and community notices.

Janitorial and Maintenance Facilities

If high standards of building operation and upkeep are to be maintained, it is essential that adequate facilities for this work be incorporated into the building plan. Conveniently located custodians' closets with service sinks with hot and cold running water are required on each floor. Space for the repair of equipment and for other maintenance work, for the storage of paints and cleaning compounds, toilet and dressing rooms for the custodians and an outdoor tool storage shed are important elements in any school. General storage areas for books, supplies, and unused furniture and equipment are essential in every building.

CHAPTER VIII

Natural and Artificial Lighting

All schools must be equipped with good artificial lighting. Proper lighting can be achieved only if it is tailored to the area to be illuminated and the tasks to be performed within that area. Quantity, quality, and psychological effects will play a role. For these reasons, no general specifications can be written for good lighting. It is possible, however, to require minimum levels of light and indicate what type of quality and psychological effects one should strive for. The architect is responsible for producing a design which effects good lighting, and, his final plans must indicate the maintained minimum amount of light in all areas of the school plant.

A. Quantity provides a standard from which to start in engineering the lighting system. The Department of Education requires the following minimum foot candle levels of maintained light on the task:

1. Drafting, typing and sewing rooms	75 Foot Candles
2. On desks and chalkboards in classrooms, study halls, lecture rooms, art rooms, shops, laboratories and libraries	50 Foot Candles
3. Reception rooms, gymnasiums and swimming rooms	25 Foot Candles
4. Auditoriums (if not used for study), cafeteria, locker rooms, wash rooms, corridors containing lockers and stairways	20 Foot Candles
5. Open corridors and storerooms	10 Foot Candles

These standards should be considered minimum. Some areas, such as drafting rooms and sewing rooms, may under certain circumstances, require much more light than the minimum level.

B. The quality of light is almost as important as the quantity. Generally either filament or fluorescent lighting may be used. All light must be glare-free. Glare can be controlled in two places, at the source of the light and at the task (the object being looked at). To control at the source, baffles or equivalent are used in such a way that the direct light from the source will not be visible to the student engaged in normal activities. Glare can be controlled at the task by avoiding glossy paint on walls and ceilings and the use of glossy finishes on furniture.

A student's powers of concentration are reduced if there are areas of strong contrast within his vision. For this reason, even levels of lighting should be provided throughout a work area.

Since raw sunlight can cause acute visual strain, the amount of sunlight entering a room should be controllable. Northern exposures are best for classrooms and most laboratories, but if a northern orientation is not possible,, sunlight must be controlled with large roof overhangs, curtains, shades, or gray tinted glass. Venetian blinds may be used but their high maintenance costs detract from their good qualities.

C. The psychological effects of lighting are manifold. High lighting is exciting and tends to spotlight the task. Low lighting tends to be more intimate and might be preferred in counseling and conference rooms. Lights which dim can change the attitude of a room, and classrooms in which visual aids are to be used should be equipped with dimmers or some other method of lowering the level of light. Lighting should be used to call attention to some of the better or more exciting features found in the school, such as display counters or cabinets and the library.

Electrical Needs — Equipment and Supply

The school plant requires electricity for several important needs other than lighting. The fire alarm system is handled electrically and should be both visible and audible. The alarm system should be capable of being activated from various stations within the school as well as from the administrative offices, and should be operable even if a power failure should occur. The alarm system should come off the main line ahead of the main service switch.

A separate bell system should be supplied to signal the end of class periods. Preferably this system should be in the form of a chime, rather than the harsh buzzer type commonly used. The signal system should be an integral part of the clock system and should function automatically from a pre-punched card.

In order to solve the transmission problem attractively and with the least danger, current should be brought into the school via underground cables. Stepdown transformers should be located in vaults outside the school building. All transformers, rheostats, switches, control panels, circuit panels and breakers should be installed for easy maintenance. A certain amount of empty space should be left in all circuits for future expansion. Vocational shops, kitchens and laboratories often have need for two or three levels of voltage, and appropriate transformers must be supplied to serve these uses.

Heating and Ventilation

Our climate makes it necessary to provide for both heating and ventilating the school plant. Many types of heating plants are available and satisfactory for schools. Some factors which should be considered in choosing a heating system include:

adequacy for Vermont's climate; type of fuel in relation to its cost and availability; simplicity in operation and regulation; availability of service in case of breakdown; degree to which the system is free from the attention of teachers; adaptability to future alterations and additions; responsiveness to outside change in weather; amount of noise in operation; and absence of objectionable drafts in its operation.

Mechanical ventilation is required in all new school plants. The ventilating system must control the amount of fresh outside air introduced in the school plant in quantities specified by the Department of Health. This device may include unit ventilators or air-conditioning systems. Although air-conditioning may seem extravagant in Vermont, it is not extravagant when the school is to be used in summer months. The additional expense of air-conditioning, if supplied as an integral part of the heating system, is often negligible compared to the extra comfort obtained.

Sanitary and Water Services

All schools must provide conveniently located drinking fountains, adequate for use by the public and the students. Fountains should be supplied not only to classrooms but also to laboratories, libraries, gymnasiums, multi-purpose rooms, cafeterias and auditoriums.

Lavatories with hot and cold running water should be located in connection with all toilet rooms. In grades K through 3 faucets should be equipped with automatic water mixers, producing only tepid water.

Both sinks and fountains should be installed in such a way as to enable later adjustments in heights, in the event that the age group of the user is changed.

Toilet facilities must be supplied in proper proportion to the number of students enrolled in the school. Urinals may replace some of the required toilets, but are not recommended below grade four. Toilets should be wall mounted and of a height suitable for the students that are to be served. The Department of Health is responsible for setting the required number of toilets in the school. There is a trend toward toilet rooms which serve one or two elementary school classrooms. In classrooms serving kindergarten through the second grade, consideration should be given to supplying separate toilet facilities for each classroom. These facilities should be located within the classroom, but there need not be separate facilities for each sex below grade three.

Classroom work sinks are essential in elementary schools and kindergartens, and one should be supplied for each classroom. The sink should be set in a durable, heat and stain resistant counter, and the area beneath the sink may be used as a storage cabinet. Analysis of activities within the classroom may suggest the need for work sinks on the secondary level.

Care should be used in the design of the sewage and water supply systems. If future expansion of facilities is anticipated, both the sewage and water supply systems should be made large enough initially to handle the future expansion. Other considerations must, of course, be kept in mind, such as the use of acid proof sewage pipes in laboratories, sanitation facilities for office employees, maintenance personnel and the public. Public facilities should be supplied near the entrance of the school around the auditorium and the gymnasium.

All students should be provided the opportunity to take showers following physical education periods or athletic activities. Showers are required on the secondary level and recommended on the elementary level above grade four. The shower rooms should be designed with efficiency in mind so that as little time as possible is expended in their use. For this reason, one shower head for each four girls and one shower head for six boys participating in a sports program is recommended. Shower heads should be no more than 60 inches from the floor. Twelve to fifteen square feet should be allowed for each shower head. Gang showers, of either the walk around or the individual type are recommended, as they save space. Most new schools have installed gang showers for all boys and gang showers combined with a few individual shower stalls for girls.

Educational Television in Schools

E. T. V. (educational television) is already being utilized in some schools in Vermont, and in the future it will probably be a standard part of the curriculum of all schools. For the skeptic, it should be made clear that E. T. V. does not and cannot replace the teacher, but supplements the program and assists the teacher in order to improve the quality of the teaching learning process. Toward this end E. T. V. can be used to expose students to expert teachers in a particular field and to people, ideas, and concepts beyond Vermont's borders.

Although E. T. V. may not yet be included as a part of the present curriculum plan and hence not as a part of the proposed school, some allowance should be made so that future installation can be made cheaply and easily. The architect must make minimum allowances for television supply cables within the proposed plant. The usual method of accomplishing this is to supply vacant conduit, perhaps running parallel to an electrical supply line, from a central point to all classrooms, laboratories, the library, the auditorium and the cafeteria.

If E. T. V. is to be installed at the time of construction, special consideration must be given to its role in the curriculum and its effects on building design. To be effective, special care must be exercised in classroom design, acoustics, ventilation, etc.

Acoustical Treatment

A considerable amount of thought must be given to the acoustics of each room within the school plant. The noise levels within the plant are related to three factors: 1) noise coming from outside into the building; 2) noise generated by students and teachers within the structure; and 3) noise generated through the operation of the plant itself.

First of all, the school should be situated away from noise producing areas such as highways, commercial and industrial zones. Unavoidable noise flowing into the building from without can be controlled by the judicious planting of grass, trees and shrubs. Noise generated within the building can be controlled by good acoustical applications; carpeting and sound absorbing ceilings are helpful. Isolating noise producing areas from quiet areas is also important. Since it is virtually impossible to eliminate all the transmission of sound from one room to another, good judgment on the part of teachers is also necessary. In recent years a considerable amount of innovation has found its way into the field of acoustics. Even so, if acoustical control is to be achieved, all of the parts of the building should be designed to conform to the desired acoustical solution. Acoustical tile and carpeting help control sound levels, but unless the heating, lighting and ventilating systems are also silent, the desired effect may be lost.

Special acoustical treatment must be given to the auditorium, the gymnasium, the shops, the library, the cafeteria and language laboratories. It is the architect's responsibility to solve the individual acoustical problems of each area.

Landscaped Architecture

Architecture implies the planned, efficient use of all space within and without a building. Planning the space outside a school building is just as important as planning the building itself. In landscape architecture, three factors should be considered: 1) The site should be landscaped in such a way that a person moving from the outside of the building to the inside should hardly be aware of the transition; that is, the landscape and the building should be designed to be a part of each other. 2) The site should be planned for use. Paths, walkways, parking lots, etc. must be designed for attractiveness and efficiency. 3) Athletic and play areas must be developed so that athletics can be safely and profitably pursued.

In the past, the contractor has been responsible only for grassing a small border around the school building, leaving the landscaping to the local district. Because of the complexities and costs of landscaping, the district has usually been unable to finish the job. To insure a complete job, the Department of Education requires that the architect submit a landscape plan with

the building plans in order for the project to be eligible for State Aid. Fulfillment of the landscape plan must be included in the general contract. As a minimum, all areas around the school must be planted to grass or used for another purpose, and parking lots, paths and walkways must be paved. Playgrounds must be developed in such a way as to be consistent with the curriculum plan.

Beyond these basic requirements, a minimum amount must be spent for the purchase and planting of trees, shrubs and gardens. For all schools costing less than $200,000, at least $1,000 must be spent. For schools costing more than $200,000, but less than one million dollars, one half of 1% of the total school cost must be spent on landscaping. For schools costing over one million dollars. at least $5,000 must be spent. Regardless of the amount spent, landscaping should achieve the three goals previously mentioned. Most large trees, because of their age and size are irreplaceable. From this point of view it is advisable, in planting and locating the school building, to retain as many as possible of the trees and shrubs on the site.

Walkways should be designed so that they may be easily used by people in wheelchairs. Parking lots should be accessible and convenient to the administrative offices, library, auditorium, and gymnasium. A series of smaller units may be more desirable than one large lot.

The development of a natural area of a few acres should be considered. This could be used by geology, botany and biology classes doing field work. The possibility of developing an area for an outdoor classroom should also be explored.

CHAPTER IX

Department of Public Safety

Most people do not like to think of the dangers of fire and explosion and, indeed, generally do not give consideration to these problems until after disaster occurs. Unfortunately the danger of fire and explosion is always present in a school. These dangers can cause the tragedy of the loss of life and the attendant problem of social and economic loss if a building is destroyed.

In order to answer the needs of safety, the Department of Public Safety and the Fire Marshal have promulgated codes, rules, and regulations, applicable to all public buildings. Insofar as the construction of school plants is concerned, the Department of Public Safety must approve all final plans; it should be consulted during the planning stage in order to avoid unforeseen expenses, complications, and misunderstandings.

The Fire Marshal and the Department of Public Safety regulate almost all areas of construction. Some of the more salient regulations concern corridors, exits, furnaces and furnace rooms, fire fighting equipment, electrical distribution, and storage areas.

CHAPTER X

The Departments of Health and Water Resources

The Department of Health should be consulted before making the final site choice, for their assistance can be invaluable in solving sewage and waste disposal problems, as well as in orienting the building. (At the same time the **Department of Water Resources** should be consulted on the matter of sewage disposal when there may be a pollution problem.)

The Department of Health should be consulted on many facets of construction. Examples are: ventilation, toilet and lavatory supply, food facilities, and heating levels.

The Department of Health should be consulted during the planning stage to enable the district and the architect to comply easily with Department of Health regulations, copies of which may be obtained from the Department in Burlington.

Selected Bibliography

Educational Facilities Laboratories publications are available without cost to interested groups and citizens. Write to: Educational Facilities Laboratories, 477 Madison Avenue, New York 22, New York.

Recommended titles are as follows:

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American Standard Guide for School Lighting, 1962: New York, Illuminating Engineering Society.

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Hayes, **Language Laboratory Facilities-New Media for Instruction,** U.S. Department of Health, Education, and Welfare Office of Education GPO 1963. (50 cents).

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Jones and Fitzgerald, **Planning a School—A Sequential Program** 1966: H. I. Newell, Inc., Amherst, Mass. ($2.00).

Modern School Shop Planning, 1965, Praldien Publications, Inc. ($3.75).

National Art Education Association, **Planning Facilities for Art Instruction,** National Education Association, Washington, D.C.

National Council on School House Construction, **Guide for Planning School Plants,** 1965, Michigan State University.

State of Illinois, **Guide for the One and Two Teacher Business Education Department,** 1955, Springfield, Illinois.

U.S. Department of Agriculture, **A Guide For Planning and Equipping School Lunchrooms,** 1962 G.P.O. (35 cents).

U.S. Department of Health, Education, and Welfare, **Planning Functional Facilities for Home Economics Education,** Office of Education, G.P.O. (45 cents).

It is also recommended that the study committee and subcommittees obtain copies of the Vermont Statutes pertinent to school building aid, district re-organization, bond vote. etc. These are to be found in Title 16 V.S.A. copies of which can be obtained through the district school board or superintendent.

RECOMMENDED MINIMUM STANDARDS CHART FOR VOCATIONAL AND INDUSTRIAL ART EDUCATION DEPARTMENTS

	Air Conditioning Refrigeration	Auto Body	Auto Mechanics	Carpentry Cabinet making Millwork	Distributive Education	Drafting	Electricity, Electronics, Radio, TV	Food Trades	Health Occupations, Home Economics Wage Earning	Industrial Arts
Floor Area 40'x80' 3200		X *	X *	X *					X	X *
Floor Area 40'x60' 2400	X *									
Floor Area 30'x60' 1800							X *			
Floor Area 40'x40' 1600								X *		
Floor Area 30'x50' 1500						X *				
Floor Area 30'x40' 1200					X					
Floor Area 30'x30' 900										
Ceiling Height 15'		X	X	X						X
Ceiling Height 12'	X							X	X	X
Area Ventilator	X	X	X	X	X				X	X
Bock Shelves	X	X	X	X	X	X	X		X	X
Cabinets, Built-in	X				X	X	X	X	X	X
Chalk & Bulletin Boards	X	X	X	X	X	X	X	X	X	X
Compressed Air	X	X	X				X			X
Dark Room										X
Door, Double										
Door, Overhead		X	X	X						
Door, Personnel		X	X	X						X
Dust Collecting System				X						
Exhaust System	X	X	X							X
Finishing Room				X						X
Ventilator for Above				X				X		X
Floor Drain		X	X					X	X	X
Gas Supply	X									
Office-Conference Room	X	X	X	X	X	X	X	X	X	X
Project Storage				X						X
Spray Booth		X								
Supply Storage	X	X	X	X	X	X	X	X	X	X
Toilet & wash room	X	X	X	X				X	X	X
Tool Storage	X	X	X	X			X			X
Unit Kitchen									X	
Wiring 110 V	X	X	X	X	X	X	X	X	X	X
Wiring 220-440 V	X	X	X	X			X	X	X	X
Water Line										

*This space does not include such supporting space as storage, teachers office and locker rooms.

RECOMMENDED MINIMUM STANDARDS CHART FOR VOCATIONAL AND INDUSTRIAL ART EDUCATION DEPARTMENTS

	Machine Shop	Office Machine Repair	Painting Decorating	Plumbing. Heating	Power Stitching	Printing	Sheet Metal	Special Ed. (Voc.)	Special Needs (Voc.)	Stone Trades	Trowel Trades
Floor Area 40'x80' 3200	X *									X *	X *
Floor Area 40'x60' 2400			X *	X *		X *	X *	X *			
Floor Area 30'x60' 1800									X *		
Floor Area 40'x40' 1600					X *						
Floor Area 30'x50' 1500		X *									
Floor Area 30'x40' 1200											
Floor Area 30'x30' 900										X **	
Ceiling Height 15'							X				X
Ceiling Height 12'	X		X	X			X		X	X	X
Area Ventilator	X	X	X	X	X	X	X	X	X		X
Book Shelves	X	X	X	X	X	X	X	X	X		X
Cabinets (Built-in)	X	X	X	X	X	X	X	X	X	X	X
Chalk & Bulletin Boards	X	X		X			X	X	X	X	
Compressed Air	X	X				X					
Dark Room											
Door, Double	X			X		X			X		
Door, Overhead										X	X
Door, Personnel										X	X
Dust Collecting System										X	
Exhaust System											
Finishing Room											
Ventilator for Above											
Floor Drain				X			X			X	X
Gas Supply	X			X			X		X		
Office-Conference Room	X	X	X	X	X	X	X	X	X	X	X
Project Storage				X			X	X	X		
Spray Booth											
Supply Storage	X	X	X	X	X	X	X	X	X	X	X
Toilet & wash room	X		X	X		X	X	X	X	X	X
Tool Storage	X	X	X	X		X	X	X	X	X	X
Unit Kitchen								X			
Wiring 110 V	X	X	X	X	X	X	X	X	X	X	X
Wiring 220-440 V	X			X	X	X	X	X	X	X	X
Water Line				X			X	X		X	X

*This space does not include such supporting space as storage, teachers office and locker rooms

**Story and one half