R E P O R T R E S U M E S

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COMPONENTS FOR SCHOOL CONSTRUCTION IN THE MID-HUDSON REGION. PROGRESS REPORT 2.

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THIS STUDY IS PART 2 OF A PROGRESS REPORT ON A FEASIBILITY STUDY TO SAMPLE APPROPRIATE ASPECTS OF SCHOOL CONSTRUCTION FACTORS IN NEW YORK STATE. THE STUDY IS TO DETERMINE WHETHER THE SCHOOL CONSTRUCTION SYSTEMS DEVELOPMENT PROCESS IS APPLICABLE TO SCHOOL CONSTRUCTION IN THE MID-HUDSON VALLEY AND TO EXPLORE POSSIBLE MEANS OF ACHIEVING SUCH SCHOOL BUILDING PROGRAMS. THE CONSTRUCTION FACTORS WERE DETERMINED BY STUDY STAFF FINDINGS IN AREAS OF EDUCATIONAL CONSIDERATIONS, COOPERATIVE ENDEAVOR, MANUFACTURERS' MARKETS, DESIGN, CONSTRUCTION PROBLEMS, LABOR PROBLEMS, STATE EDUCATION POLICIES AND BUILDING CODES AND REGULATIONS. THE STUDY ASSESSES OBJECTIVES, IMPLEMENTATION AND FINANCING IN RELATION TO THE COMPONENTS PROJECT APPROACH. THE FINAL PORTION OF THE REPORT INCLUDES EXCERPTS, QUOTATIONS, SUMMARIES, LISTS, PROVISIONS OF LAW AND GENERAL ARTICLES TO SUPPORT THE FINDINGS STATED EARLIER IN THE REPORT. (GM)

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Components for School Construction in the Mid-Hudson Region

CENTER FOR ARCHITECTURAL RESEARCH
RENSSELAER POLYTECHNIC INSTITUTE

PROGRESS REPORT 2

EF000512

work remaining

PHASE III *(one month)*

- staff formulation of conclusions and recommendations
- transmission of recommendations to the Mid-Hudson School Study Council

the final report

Final conclusions and recommendations will be presented in a summary report to the Mid-Hudson School Study Council.

PROGRESS REPORT 2

Contents ...

the study . . . .

the study

As expressed in the project statement, this is a feasibility study "to sample all appropriate aspects of the construction climate in New York State to determine whether the SCSD* process is applicable to school construction in the Mid-Hudson Valley, and explore possible ways that such school building programs might be accomplished."

* School Construction Systems Development (SCSD) is the title of a components project underway in California. It includes 13 school districts who, in concerted action, developed building components for their needs. SCSD was sponsored by Educational Facilities Laboratories, Inc.

The study is being undertaken for the Mid-Hudson School Study Council (covering some fifty districts in that part of New York State) by the Center for Architectural Research, School of Architecture at Rensselaer Polytechnic Institute. Educational Facilities Laboratories, Inc., established by The Ford Foundation, is providing support for the Study.

this progress report

This is the second Progress Report issued during the study.

PROGRESS REPORT 1, issued in July, set up the study outline and asked the questions that must be investigated before any real conclusions are drawn. It is suggested that the reader be thoroughly familiar with this Progress Report.

PROGRESS REPORT 2, with the study nearly completed, brings together the findings and thoughts of the study staff and the many persons with whom it has had an opportunity to visit and correspond.

This report is divided into three main parts,

A THE CLIMATE -- the findings of the study staff, divided for convenience into the various areas that comprise the construction climate.

B THE FUTURE -- thoughts on organizing the climate areas in order to implement some kind of concerted approach in the Mid-Hudson.

C THE TESTIMONY -- material from many sources to support, illuminate, or elaborate upon statements made in parts A and B.

work completed to date

PHASE I *(one month)*

- detailed program evolved for the Study
- review of current literature in the field
- detailed review of the SCSD project
- introductory seminar of interested persons
- issuing of PROGRESS REPORT 1

PHASE II *(three months)*

- tour of SCSD project headquarters and interviews with SCSD project staff members, architects and school administrators involved with the project
- visits to schools using components
- interviews and discussion with Mid-Hudson administrators
- questionaire of Mid-Hudson school districts to gather data on building programs, populations, and educational programs in the region
- survey of characteristics and costs of schools recently built in the region
- interviews with members of the design professions, both in the Mid-Hudson area and across the state
- questionaire soliciting general reaction from many outstanding persons in the design and construction fields
- interviews with contractors, both general and trades
- contact with state contractors association
- interviews with labor-oriented persons in the region
- interviews with manufacturers bidding on the SCSD project, both successful and unsuccessful
- interviews with manufacturers not bidding on SCSD
- discussion with officials in The State Education Department
- investigation of applicable codes and regulations
- investigation of legalities of consortium and bidding
- discussion of project goals with MHSSC Study Committee
- issuance of PROGRESS REPORT 2

work remaining

PHASE III *(one month)*

- staff formulation of conclusions and recommendations
- transmission of recommendations to the Mid-Hudson School Study Council

the final report

Final conclusions and recommendations will be presented in a summary report to the Mid-Hudson School Study Council.

A

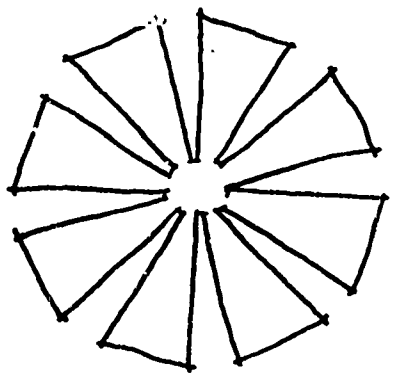
the climate / some findings and thoughts

introduction . . . .

When the study staff set out to sample all appropriate aspects of the construction climate in the Mid-Hudson area, the term "climate" was not offhandedly chosen.

When one thinks of the many forces and factors that make up meteorological "climate," it is not hard to extend the concept to construction of schools; many forces, groups, and processes act together to determine the construction "climate" in a region.

We dramatize this climate with an eight-pointed asterisk. Each of the legs represents one of the climate-areas we have indentified for discussion purposes. The meeting of all these legs in the center of the symbol points up the fact that the climate is an integration of all these parts.



AREA 1 / *educational considerations*
AREA 2 / *co-operative endeavor*
AREA 3 / *manufacturers*
AREA 4 / *design professions*
AREA 5 / *contractors*
AREA 6 / *labor*
AREA 7 / *state education department*
AREA 8 / *codes and regulations*

This Part A discusses findings in these climate-areas. Part B then pulls them together in terms of organizing a project in the Mid-Hudson.

CLIMATE
AREA 1

/ educational considerations

The first element of the school construction climate in any region is the educational scene itself. What do administrators and taxpayers think about taking concerted action to develop components? What are the basic motivations for undertaking such a project? What role does the educational program play in such a project?

administrator attitudes

The support given the feasibility study by some of the Mid-Hudson superintendents indicates that there is more than a small spark of interest in trying some kind of components approach in the area.

This is natural. The superintendent, charged with providing the best program within the limits of available resources, is willing to look into ways of better using these resources. Conditions being what they are, however, might temper the enthusiasm of some other area administrators,

- The Mid-Hudson is an area with many smaller districts under the direction of a Principal or Supervising Principal. These men are charged with running nearly all district affairs and may not have time for other activities.

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- Even the larger districts may be short-handed on administrative staff to participate heavily in a project. Most of the California districts in SCSD were larger than those in the Mid-Hudson and could afford nearly full-time contact with SCSD.

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Despite these comments, it appears that with the help of a proper "education" effort, most Mid-Hudson administrators are at least interested in carrying the project into its next phase.

taxpayer attitudes

The attitude of the taxpayer is important. Living in an old area of early settlement, the Mid-Hudson taxpayer and his forebears have seen a slow steady rise in the growth of the area and in the quality of education provided. Accompanying this steady upward growth were the school taxes he was paying.

As many parts of the region begin to surge ahead in growth (closeness to New York and the impact of a major industry are doing just this) the taxpayer is now faced with sharply rising school taxes. All of a sudden, some reaction to this begins to set in, and bond issues start getting defeated. For many reasons, this situation is not about to abruptly change,

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- High taxes are still relatively new.

- The landed and tax-paying segment of the population are the ones faced with paying the tax, but it is the young renting family with all the children that is causing the problem!

*These numbers refer to pages in the testimony.

- There are still many mansions and choice properties in the area (particularly along the river) that only tax-exempt organizations, such as religious orders, can afford to own and maintain. This causes a general tax problem in some towns.

The motivations for undertaking a components project in the region are clear, then. Quality and more-for-the-money may be important, but undoubtedly less important than somehow easing the wallet-drain on the taxpayer.

regional growth

Perhaps a comment should be made here about regional growth and its effect on undertaking a components project. Right now, many feel that the Mid-Hudson area is just heading into a rapid period of growth; while it has been gaining at a
60 rapid rate in the last two decades, the climb will be even faster. There are some important aspects to this growth, though,

- There are only a few very fast-growing districts in the region at this time. Certainly none can match some of
61 the districts in the California SCSD project. This means that there are many Mid-Hudson districts who just are not "thinking big."

- Growth has been uneven and sporadic; it is a real problem in some districts and hardly touches others.

- There is no real "sense of urgency" in the area at this time. The coming of the "war babies" has shaken up some, but not all.

effects of area educational programs

Much of the initial work that would have to go into a project in the Mid-Hudson area would have to be in the area of determining educational needs; certain concerns and requirements will lead to developing certain components. For instance, the California districts seemed worried about the future and were willing to in a sense "buy" the ability to rearrange interior space if necessary. (Many feel that this "flexibility" is the key to the whole SCSD approach; that if you do not need or want it, there is no real reason to use the components. This may be a little extreme, but it reflects the importance of the educational program in determining building requirements.)

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Some general characteristics of Mid-Hudson educational programs are presented in the Testimony. Preliminary analysis on very scanty data show quite a consistency of approach in the area, but implications for facilities are hard to draw. This would be an important aspect of the next phase of the project.

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CLIMATE
AREA 2 / co-operative endeavor

No matter how many advantages there may be to getting school districts together in concerted action, they will never be realized if there is no real "co-operative spirit" among the districts involved. There must be a willingness to work together for some common end.

co-operation in the mid-hudson

From what can be seen, it appears that the spirit of co-operation is especially strong in the Mid-Hudson Region:

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- While they undertake varying programs, and are probably regarded with varying opinion, the Boards of Co-operative Educational Services (BOCES) help to create this feeling of co-operation in the area.

- The BOCES help to strengthen what are usually already strong ties among districts in the same county. Since many of the Mid-Hudson districts are, or were, small, they have historically been under the guidance of a superintendent of a supervisory district. These supervisory districts were organized within county lines (sometimes two or three in a county) to provide this kind of direction to the smaller districts. While the supervisory districts are now being consoli-

dated and their influence diminished, their effect in bringing many districts closer together cannot be overlooked.

- The Mid-Hudson School Study Council, headquartered at the State University of New York at New Paltz, exemplifies the newer cross-county spirit. While not all MHSSC members participate in all activities, the Council has done much to foster and maintain a spirit of co-operation among its districts. Educators in the region apparantly respect MHSSC and its leaders.

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- A further spur to regional co-operation may be Title III of the Elementary and Secondary Education Act of 1965. This Title provides funds for co-operatively establishing regional services and programs; it also insists that participants other than just school districts be brought in.

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further concerted efforts

It certainly appears that further concerted efforts by schools in the Mid-Hudson area would be feasible:

- Informal arrangements for buying materials and equipment have already been tried with success. There is little doubt that it could be done again, even on a larger scale.

- The feasibility of establishing a more formal legal arrangement among districts, each with rights and obligations, will vary with the objectives of the project and the demands placed on the individual school district.

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- If the objective of a project could be flatly stated as that of saving money, the opinion is that getting districts to work together would be no problem. As objectives become hazy or esoteric, districts become wary.

- If the consortium (or legal collection of districts) demands a great deal of time and support from its members, small or medium-sized districts may not be able to afford the time or personnel required.

- If the consortium is supported entirely from local funds, there will be problems in getting all but the largest districts interested.

- Some of the problems of involving the smaller districts may not have to be reckoned with at all; these schools may find they have little to gain by joining certain types of projects.

- If the project goals smack of "standardizing" too many aspects of member districts' school buildings, the natural and healthy competition among the districts might limit interest in the project.

administrative structure

While past avenues of co-operation (such as BOCES, etc.) are logical ones to exploit when getting districts together, there is no reason why a consortium would have to adhere to any existing administrative structure. County and district boundaries should be overlooked in attempting to get school districts together with common interests and common goals.

a "guaranteed market"

As in the SCSD project, the consortium might find the need to "guarantee a market" in order to get manufacturers interested in developing components for them.

- If schools used SCSD components, other existing components, or modifications of these, there may be no need to legally "guarantee" a market.

- Development of components in other, smaller, areas of the building may not require a "guaranteed" market.

- Even development of large new component systems may not need a "guaranteed" market. In discussions with manufacturers, it was noted that SCSD's "guaranteed" market meant less to some of them than the results of surveys proving a national need for their products.

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At this moment, the MHSSC districts are anticipating about $100 million in school construction through 1972. Of course, this figure is a calculated guess, and many of the smaller districts with small building programs did not venture a guess to the kinds of projects that may be taking shape in their districts in this period.

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It might be mentioned that the pure existence of a large, "guaranteed" market does not insure the success of a components approach. The New York City Public School System, with about $ 100 million of construction going on, is a perfectly "guaranteed" market. Preliminary investigations of using components approaches there have led nowhere.

extending the consortium

In order to provide a larger "guaranteed market," or in order to implement a larger-scale program, there may be reason to expand the area covered by the consortium.

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The Mid-Hudson School Study Council already includes most of the districts - and all of the larger districts - within its confines. There would be little gained by just infilling.

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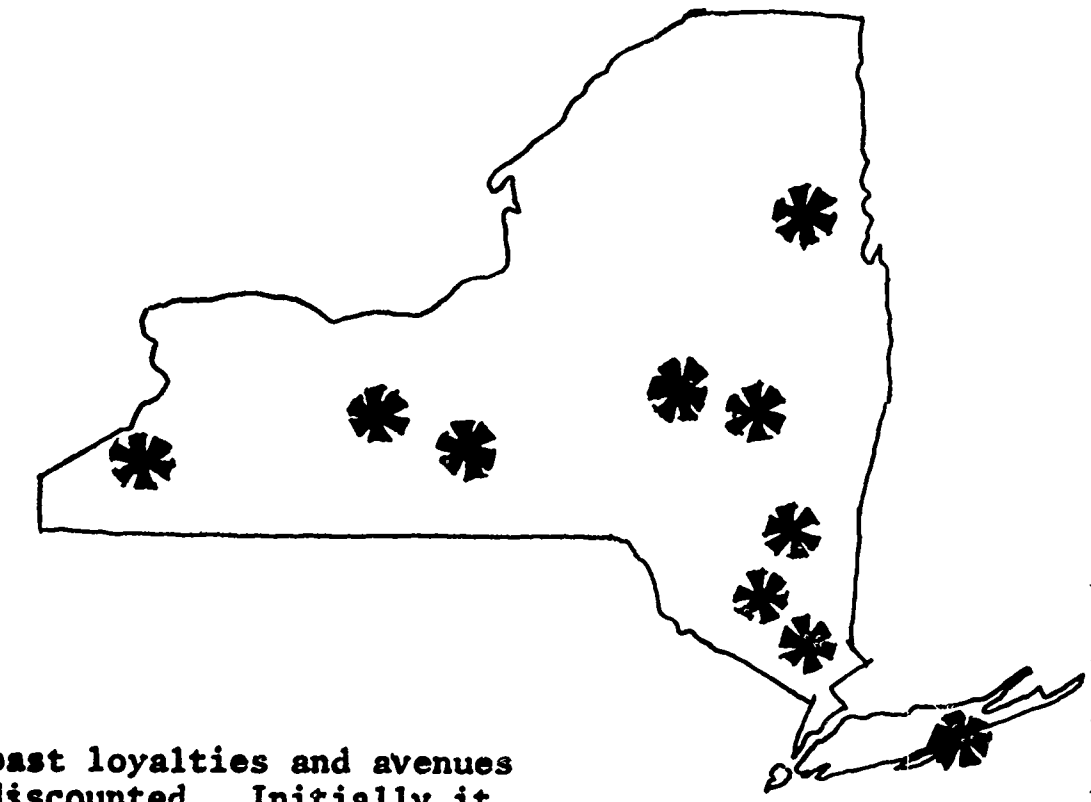
While bringing in private and parochial schools is another possibility, it is probably not an immediate one. Legal restrictions and the lack of past avenues of co-operation will delay bringing them into the consortium.

A definite possibility for extending the consortium is the addition of districts on the "fringe" of the MHSSC area. Areas in Albany, Westchester, and Rockland Counties are characterized by many fast-growing districts that might be interested in a components project. While these schools have some commitments to other School Study Councils, they may be more than willing to come in on some kind of components approach.

If there is a need to include many faster-growing districts, a consortium could start in the Mid-Hudson area and later expand to include several of these districts throughout the state. One advantage of a state-wide approach that should not be overlooked is the possibility of opening up new sources of financial aid.



In any case, the realities of past loyalties and avenues of co-operation should not be discounted. Initially it might be best to remain within the confines of MHSSC in order to utilize its leadership potential in implementing a project.

CLIMATE AREA 3 / manufacturers

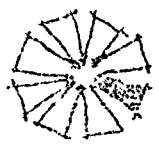
One of the reasons why the SCSD project took the direction it did was to alter the traditional role of the manufacturer in the school building process. The SCSD project staff felt that by organizing and "guaranteeing" a market, and then by making this market's desires known to manufacturers, the latter would develop components specifically for schools. A further project will have to decide (1) whether this idea is valid and workable again, and (2), if it can be accomplished in a better way.

the SCSD components

To review and set the stage for further discussion, the SCSD components included 40%-45% of the cost of the school building, and were developed in these areas:

- Structural/roof deck system
- Lighting/ceiling system
- Air conditioning system
- Demountable partitions
- Movable partitions
- Built-in cabinets and casework
- Hall lockers

manufacturer participation in SCSD



- It appears that SCSD did indeed get manufacturers to play the roles they had in mind.

- Some SCSD bidders were delighted at the idea of developing components for a specific project; they felt it gave them direction in their research efforts.

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- As a group the SCSD bidders were a particularly competent cross-section of manufacturers. This can probably be attributed to the newness of the approach in this country.

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- Many successful and unsuccessful SCSD bidders have already had success in national marketing of their component proposals.

- The effect of the "guaranteed market" that SCSD provided as an inducement to manufacturer participation is hard to judge; many admitted going in on SCSD only after taking more national market surveys. If the national need had not been there, or the performance specifications too regional in outlook, they would not have participated. It is always hard to gauge just what leads a manufacturer to entering a project such as this.

- All manufacturers, and particularly those who developed truly new products for SCSD, experienced high research and development costs. How much of these are written into components costs is hard to tell.

- Even though manufacturers were asked to provide costs on both materials and installation, many bidders intended to completely sublet the installation work. They were not interested in playing this role they felt properly done by others.

roles in a future project

Until the nature and scope of future projects is determined, it will be impossible to say just what roles manufacturers will want to play in them. As far as existing components are concerned,

- Both successful and unsuccessful SCSD bidders have marketed their components nationally; districts can choose these outright if they desire.

- Manufacturers of existing components may be willing to make major modifications, but probably only if they are satisfied that the modifications will make the components more acceptible nationally.

- Manufacturers of existing components would probably prefer to modify than to start from scratch again in the same categories. It may be a different story in other component categories.

- Because of the components already marketed, some commitments (such as the 5' planning module) are much stronger than before.

With respect to developing all new components or component types,

- Some feel that project staff-design of components will get more manufacturers to bid since research and development costs will be reduced. This may also allow for reductions in component costs.

- If smaller or less extensive components were considered, research and development costs may likewise decrease.

Finally, there will always be some manufacturers who may not want to become involved in some kinds of components approaches,

- They might not be staffed to handle product design.
- It may mean moving into fields of production to which they are unaccustomed.
- If they are prime producers (that is, they make products used by other manufacturers who convert them into other products), they may find themselves trying to compete against their own best customers.

CLIMATE AREA 4 / design professions

The role of the design professions is of special significance. Architects and engineers must be committed to the success of any approach they use; their ability to find advantages in it will be a major factor in its success in the Mid-Hudson.

importance of the design professions

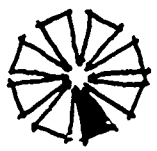
For several reasons the design professions would need to be convinced that the components approach is beneficial in the design of schools,

- The architect is selected to provide advice on building decisions by the Board of Education; his attitude will tend to be a controlling factor in making Board decisions.

- The architect and engineer must translate the components into a school building. To achieve the best results, they need to feel that the components will adapt readily to program requirements. If the designer is convinced that the components are good ones, he will take the time and effort to put them together in the most creative yet economical fashion.

- The architect and engineer are legally responsible for the work which bears their seals.

philosophical concerns



A point in favor of component systems is that they are at least a step in the direction needed to solve many of our current construction problems. Concerns about the great volume of building in the next decades has led many to see these integrated systems as a necessary construction method.

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Attempts to realize the advantages of integrated construction have been numerous and there have been many failures. The effects of some of these, such as the stock plans in New York, cannot be underestimated -- many persons seeing unhappy results in the past become suspicious of new approaches.

the question of "design freedom"

Much of the discussion the study staff has had with architects has involved the question of "design freedom", the free choice of the architect or engineer to design in accordance with his view of the need. Several points were made on this issue,

- The designer's freedom is already restricted by the many thousands of building parts that do not go together easily.

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- Many feel that components do not seriously restrict the architect in designing an individual structure for an individual client. It was pointed out, though, that components can stereotype design without necessarily placing great limitations on it.

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- Some feel that working with a module and pre-determined products helps an architect to discipline himself. This is arguable but is probably meaningful in some cases.

- Overall, the question produced mixed reactions. Some felt that components such as SCSD's placed significant restrictions on the designer; others did not.

standardization of parts

There were some adverse reactions in this area. Objections were not so much to the standardization of certain building parts *per se*, but to two by-products of this:

- Will buildings become standardized for years to come? If the details are set and the contracts written, how can architects and manufacturers seek to improve on the components?

- Will components approaches limit competition in the building industry? It is a fact that the costs of building products have not risen significantly over recent years -- something many attribute to the fierce competition seen everywhere in the industry.

reactions of architectural firms

The reaction that a components approach will get from architectural and engineering firms will vary widely,

- Some offices will find it a disruption of orderly and efficient methods developed in years of practice.

- Some will feel it a duty to investigate it; how much actual "creativity" they will bring to it in practice will vary widely.

- Some offices will consider the approach a challenge and expend unusual effort in working with it.

effects on office practice

The effects of systems approaches on office practice are difficult to determine now because of the limited number of projects completed. Some effects are noticeable, though.

- Architect and engineer time will not be saved initially. Preliminary and schematic design phases take the same time; plans, sections and elevations have to be worked out and drawn; working drawings are still complex.

- In order to use the components as efficiently as possible, engineers will spend a good deal of time in selecting and co-ordinating the wide ranges of components available to them. This selection process and the need for calculations will take as much time initially.

- It appears that checking shop drawings and supervising field operations will take even more time than usual.

- Architects and engineers working with a given system the second time are much more likely to save some time on some project phases.

- For these reasons, it is unreasonable to expect fee structures to be revised downward for components projects.

design responsibility

Architects and engineers are concerned over the question of responsibility in using pre-designed and pre-engineered systems covering large parts of the building: Who is responsible when something goes wrong? By law, the architect or engineer who puts his seal on the drawing is involved in the responsibility for all work shown on it.

If a structural roof deck is part of a project, who is responsible if it collapses: architect? engineer? manufacturer of the deck? installer of the deck? It is probable that all will be involved in the litigation.

This problem is not new to the design professions. However, as details of design are taken from the designer's hands and put into those of others (such as components manufacturers), the problem of architect and engineer involvement in faults beyond their control increases.

roles in a systems project

From discussions with architects involved in SCSD and those likely to be involved in any Mid-Hudson approach, it is evident that members of the design professions should be in on any project from the start,

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- These persons can serve as valuable advisers to identify possible problem areas, and give direction in volving them.

- By participation in the initial work, they will gain knowledge and confidence necessary for individual projects. This confidence will aid in gaining acceptance by others.

CLIMATE AREA 5 / *contractors*

It is not hard to understand the importance of the building construction contractors in a components project. A basic tenet for using components is to help solve construction difficulties by achieving some compatibility between parts; the contractor is the man most closely associated with the process.

After discussing the role and concerns of contractors, we must turn our attention to the whole process of bidding and contracting for school work and how it affects components projects.

contractor concerns

- What probably concerns a contractor most is being suddenly asked to play roles far different than he has ever played before. He does not react against these new roles as a matter of course; most contractors interviewed expressed willingness to accept new approaches as a matter of good business. The problem lies in adapting an organization used to doing things in certain ways to different ways of going about them.

- There was concern about the role of the contractor in developing a components project. SCSD did not have contractors on their advisory boards; including representatives from this field on a New York project will help both in alleviating problems before they are born, and in keeping contractors informed.

- The pre-bid and post-bid conferences used by SCSD (see page 102) seemed a good idea. As businessmen, it is only natural for contractors to include contingencies for large "unknowns." Many of these "unknowns" can be clarified through constant communication.

- There is some concern about project scheduling. Mid-Hudson contractors hope that projects will be spaced out in time and not bid in large "packages," so many contractors will have the opportunity to get work.

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construction time

One of SCSD's project objectives was to save time in the construction of schools. Whether or not this will come to pass has yet to be seen. There are several aspects to the idea of construction time that should be mentioned, though,

- The notion of wanting to build schools faster cannot be disputed. Because of our penchant for building school buildings well after they are needed (and certainly not before!) it helps to get them up in a hurry.

- Using pre-designed-for-fit components should inherently speed construction. With good project timing, they have a double-effect in New York: if there is a structural component that goes up quickly, there are

better chances for getting the building "weathered-in" for the winter, allowing work to go on.

- While these kinds of components may save construction time on many projects taken together, it is important to see that there is no guarantee that they will save time on EACH project; this will ALWAYS depend on the contractors involved.

- Too much emphasis on saving construction time may cause other problems. Scheduling crews so they are busy all the time (and not with "peaks" and "troughs" of activity) is one way the contractor can do an efficient and economical job. If there are too many of these "peaks" and "troughs" as a result of a too-fast project, costs will not go down at all.

contractor organizations

There are several avenues of approach toward securing and maintaining contractor interest and support for a project,

- General Building Contractors of New York State, Inc., (GBC) represents many general contractors in the area. The state organization is strong and well-run.

- The New York State Council of Mechanical Trades Contractors co-ordinates activities of these contractors.

- The Hudson Valley Construction Employees Association is now being operate pro tempore by the GBC.

- There are also various county associations, which do not seem to be particularly strong at the moment.

bidding and contracting systems

Keeping in mind that bidding and contracting are separate actions, there are three major ways of going about them:

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- SINGLE BID / SINGLE CONTRACT: general contractors bid for the entire job, using whatever subcontractors are necessary. The successful bidder contracts with the Owner and assumes responsibility for the complete job.

- SEPARATE BIDS / SINGLE CONTRACT: the project is broken into four contract areas (or more): general construction, heating and ventilating, plumbing and electric. Contractors in each area prepare bids and awards are made to the lowest responsible bidder in each category. The trades contractors are then assigned as subs to the general contractor and the latter assumes complete responsibility for the job.

- SEPARATE BIDS / SEPARATE CONTRACTS*: bids are again taken in each of the four main contract areas. Awards are made to the lowest bidder in each area, and each enters into contract with the Owner separately. There is no assigned overall administrative responsibility.

using these systems

All three of these broad systems, and many variations on them, are used for construction in New York. State Law requires, however, that separate contracts must be employed on public work over $50,000 in cost. Arguments for and against these systems and their variations are presented

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* These are often called multiple contracts, segregated contracts, or simply the "four contracts."

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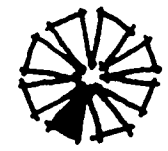
in the Testimony. There are exceptions to the four-contract mandate in New York; the State University Construction Fund and the Dormitory Authority have been recently given the option of which system to use. In their efforts to provide many buildings in the shortest time, these authorities felt somewhat hamstrung by the four-contract system. To date, they have chosen the single bid/single contract approach wherever possible.



importance of the contract system

The importance of the contract system in a components project is derived from the INTEGRATED and COMPATIBLE aspects of the systems. When it is necessary to break this integration by contract jurisdictions, the advantages of compatibility are lessened. Likewise, if the compatible system receives no field-coordination in erection of the parts, there may be no real gains in using it in the first place.

There is no real experience yet in this area. The California SCSD schools are all being built under a single contract system.

While there may be eventual possibilities of gaining some kind of option on contracting systems for school construction, the chances of depending on this for a near-future project are slim.* For this reason, it would be wise to investigate the possibilities for using components within the present four-contract system.

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* Even though the Legislature has given the "option" dispensation to the authorities mentioned, there seems to be little momentum building up to extend the choice. Many seem to be waiting to see how the option makes out.

This all does not mean that a components approach cannot be implemented within the framework of a four contract system. Certain points should be kept in mind, however,

- Using components that keep crossing contract lines will undoubtedly cause co-ordination problems.

- With many different contractors working on an integrated component, lines of responsibility are likely to become hazy.

- No one of the contractors involved can be morally asked to co-ordinate the job; this must rest with consortium representatives or in the architect's lap. The pros and cons of different ways of handling co-ordination should be discussed in great detail as the project develops.

- The importance of information flow and "public relations" between owner, architect, engineers and all contractors should not be overlooked. This will do more to create a co-operative spirit on the job than any of the so-called weapons.

- Relying on "weapons" or "clubs" to bring contractors into line (such as heavy liquidated damages) seldom works. Not only do they foster a dangerous spirit on the job, but they do not always hold up in court.

- Requiring legitimate controls, such as CPM and other advanced scheduling techniques, may make the project more manageable.

CLIMATE
AREA 6

labor

For success, any effort to make intensive use of components in schools must be accepted by organized labor in the region. This part of the construction climate does the actual building work; misunderstanding or opposition to the use of components will create grave problems.

labor's stand

Labor's stand has traditionally been one of worry about automation in all its aspects. This is only predictable, for unions are organizations of men with jobs. Components and prefabrication in general would move work done in the field by many men with few machines into the shop, with its few men and many machines.

To many, this is a kind of paradox of our society. We strive to move work out of the imperfect and unpredictable atmosphere of the field into the controlled conditions of the shop; we say that this allows us to build more and better building products. Yet, by doing this we create hardship and unemployment. While there is a kind of imbalance between means and ends here that cannot persist, we must face the situation as it stands now.

problems in the mid-hudson

- Labor in the Mid-Hudson stands opposed to any aspects of construction technology or automation which results in a loss of jobs in the building trades.

- While the problem of labor acceptance is not peculiar to the Mid-Hudson, it has been reinforced there by its proximity to New York City where labor has a strong voice.

- As the mobility of workers from New York City to the Mid-Hudson continues, Mid-Hudson unions will grow in strength.

- At present, the volume of building in the area has allowed the forces of labor and management to remain in balance.

- The feeling is that large components crossing trade jurisdictions are bound to encourage disputes. There is very little precedent in solving these disputes; a decision made in one case may be reversed in a second instance.

- While labor leaders will not wholly refuse to become involved in early investigations, they are not given to making even moral commitments until something more concrete than words or drawings are produced.

In summary, the labor question is most poignant. SCSD felt that constant involvement with labor leaders and the gaining of some moral commitments were answers to the problem. The answer in the Mid-Hudson is far more complicated.

CLIMATE AREA 7

state education department

As the educational "focus" in the state, the role of the State Education Department in any components project is an important one. Its overall attitude must be assessed in terms of (1) giving moral support to a project, and (2), assuring that the project will run smoothly to the end, not suddenly halted by some "dredged-out" policy or rule.

overall attitude

- The appropriate administrators have followed the SCSD project with interest and thoughts for using it in New York.

- There is a highly permissive attitude toward new efforts and approaches. As much encouragement as possible will be given them.

- Administratively, most of the concerns in the critical areas of implementing and financing co-operative efforts and in approving building projects fall under the direction of the Associate Commissioner for Educational Finance and Management Services. This allows effective co-ordination and alleviates the need to cross many jurisdictions in an organization as complex as the State Education Department.

role of state aid

- New York's aid for construction is apportioned on the basis of a district's "wealth" (true valuation/pupil) compared to the state average. This is different from California, where the existence of many 100%-aided districts had an effect on the philosophy of economy. *123 124*

- State aid formulas do not forbid building schools that are more expensive than the state norm, as they do in California where the SCSD schools were built.

facilities planning approvals

- Chief approval of school plans and specifications rests in the Division of Educational Facilities Planning. *125*

- The traditional role of this Division has been that of enforcing regulations, checking drawings to make sure that health and safety requirements are met. One of the newer roles being assumed by this Division is that of providing more leadership in facilities planning.

- A more permissive approach toward approving concepts which are well thought-out is being advocated by the Division. Traditional stands on interior spaces, for example, are now subject to modification if they conflict with a well-prepared educational program. *126-129*

- The project review process is not unduly complicated; it appears that using components would not significantly delay it. This is an issue, considering the extreme delays experienced in getting state-approval for the SCSD schools.

CLIMATE AREA 8 / codes and regulations

Without knowing the specific types of components the Mid-Hudson might use, adapt or develop, it is impossible to make specific judgments based on codes and regulations. An overview of the applicable regulations and the necessary approvals should help us assess the role of codes and regulations in the "climate," though.

codes applicable to school buildings

When compared to some states in the country which require several approvals of school plans and specifications, the procedure in New York is quite simple:

- Article 9, Section 408 of the Education Law gives the Commissioner of Education the power to review plans and specifications for new projects, additions, and alterations. Other provisions of this Section give him the right to waive this requirement in some cities. (Albany, Yonkers, Rochester, Syracuse, Buffalo and New York at this time).

- The arm of the Department designated by the Commissioner to review plans is the Division of Educational Facilities Planning.

- The Division has established a set of "Planning Standards for School Buildings" to be used as guidelines for schools. These Standards must be complied with and are the controlling code in every case. (A recent court test has so far upheld the authority of the Standards over local codes). In cases where the Standards do not cover the material, the State Building Construction Code applies. The only exceptions are the six large cities listed above.

- The only approvals needed other than that of the Division of Educational Facilities Planning are those of the State Department of Health (for sewage systems) and the Air Pollution Control Board (for incinerators and certain capacities of boilers).

the "planning standards"

For the first time, the State Education Department has codified its regulations and guidelines into a comprehensive manual,"Planning Standards for School Buildings." In the main, these standards are quite reasonable; many of the historic "sore points" are under review, and the door to changing some of them may be open for the first time in a number of years.

One aspect of the Standards which affects any plan for constant rearrangement of interior space is the requirement for natural lighting, and the bias against interior spaces. Again, some of these policies are now coming under hard review by the Department. 126-129

procedures

There seem to be no procedural roadblocks in the Division of Educational Facilities Planning. They request -- and often need -- one month to review plans and specifications. At this time, it seems unlikely that a components project would be delayed in this review. Since both a preliminary and a final review are used, early gross errors can be caught before final preparations of plans are begun.

state construction code

There appear to be no general provisions in the State Building Construction Code operating against components in total. Of course, each proposal will have to be checked against provisions of the code.

local building codes

Since none of the state's "big six" cities are in the study region, detailed analyses of their codes was not undertaken. As a general rule, however, they are probably somewhat more restrictive than the state code (which is official by local adoption only).

B

the future / organizing for using components in the mid-hudson

introduction . . . .

After the diverse factors contributing to the construction climate have been investigated, the next step in developing a components project in the Mid-Hudson is assessing their impact on the idea. To aid in this assessment, this Part B of the Report begins to tie these climate-areas together, drawing out inferences for the future. To guide us in this process, we might ask these questions,

- What would be the OBJECTIVES of a components approach in the Mid-Hudson? What results will a district or a group of districts be looking for as the project progresses?

- How can a components approach be IMPLEMENTED in the region? How many different ways are there of going about it?

- How will the project be FINANCED? If development work is needed, who will pay for it?

This Part will list some alternatives in each of these areas, perhaps placing some emphasis on those which appear to be most plausible in the light of the climate investigations. Conclusions, however, are not presented at this time.

THE FUTURE / objectives

Any project undertaken -- be it large or small -- will be necessarily colored by the objectives of its founders. Within the framework of knowing where the effort is heading, the appropriate decisions can be made and held to. Potential objectives of a Mid-Hudson project are,

- Reduction of construction cost,
- Reduction of project time, and,
- Production of higher quality school buildings

reducing construction cost

Most potential project objectives include in some way the desire to reduce construction cost. This is only logical. While we are definitely interested in producing fine schools with a real atmosphere for learning, the funds available are always limited.

Cost, though, is a hard issue to pin down. For instance,

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- The cost of a school covers everything from site costs to permits to the cost of the roof deck to the architect's fee. There are so many of these cost-areas that even large savings in one of them may be insignificant in terms of the whole.

- The cost of a school includes many "hidden" costs, such as financing the bond issue. Often there are greater opportunities for savings here than are realized. The Testimony lists some of these areas. 66-67

- The cost of a school includes many "coincidence" or "circumstance" costs, such as the time of the year the project is bid, and the regional labor picture at that time.

- The cost of a school includes the expense of operating and maintaining the plant for many years to come. Inexpensive materials may be so hard to maintain that, looking at them on a ten-year basis, they are really quite expensive.

All of these must be considered when we talk of cutting the cost of school buildings. Too often we fight for the opportunity to buy face brick at $ 6.25 less per thousand while letting major ineconomies escape our attention!

In terms of project objectives, cost may be considered as,

- Immediate saving of construction cost,
- Eventual saving of construction cost, or,
- Producing a high quality plant while keeping costs even.

The combination of the first and third of these objectives seems most desirable. However, getting immediate cost reductions is nearly impossible no matter what approach is taken. It is an inevitable fact that architects, engineers, contractors, labor, and manufacturers are willing to investigate new ways of saving money but they all realize that there will be little savings on a first attempt. The inclination to do a good deal of extra work (and to include contingencies for things that might go wrong) on a new project is only human nature.

What makes the combination of the second and third objectives unattractive is the wait. Even if actual savings could somehow be guaranteed, man is impatient. There is also some merit to the idea that those involved in first attempts are paying the full price, while others can wait and "cash in on the savings" later. While this kind of project is probably more realistic that the first, it must be handled carefully; it always runs the risk of failure because results are not immediate.

reducing project time

There are some possibilities for reducing the time of a school building project through concerted action. They do not lie in the "obvious" places, though. We have seen from the discussion under climate-areas 4 and 5 that components projects may or may not save architects' or contractors' time.

There are opportunities for saving time in other aspects of the building project. Guidance in writing educational specifications, programming, educational facilities to meet unique needs, project co-ordination, establishment of performance criteria, estimating and costing, original vs. ultimate cost analyses, materials research and selection are examples of the many kinds of services that a consortium could provide member schools. Not only might these services cause a reduction in project time, but they could conceivably trigger cost savings too.

In any case, the need to reduce project time is an important one that will probably become some kind of project objective.

producing higher quality schools

Instead of applying all project strength toward outright saving of construction cost, the consortium might also work in the area of helping to provide higher quality schools for the same building dollar. This, incidentally, was an overriding concern of SCSD; while their schools are costing about the same as more conventional buildings, many feel that the real gains are the "extras" such as flexibility, air conditioning, etc.

64-65

The consortium could help member schools produce higher quality schools through the types of components it works with, continuing research into the elimination of waste in the building, materials selection, etc.

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There are a multitude of detailed approaches that the Mid-Hudson districts could undertake in implementing a components project. For purposes of simplicity and discussion, we have boiled these down into five basic approaches. The final approach recommended may well be a combination of these, or more likely, an extension of one of them into fine detail.

the basic approaches

Each of these basic approaches is briefly outlined here. A more complete exploration of them, and comments on various common facets of implementation are made on pages 84-100.

83

APPROACH 1 -- Individual school districts simply get manufacturer bids on existing school components at the time each school job is bid.

This would be the simplest way of using components. Each board and architect would decide which existing parts or systems fit their needs, and buy them outright (perhaps through the state purchasing agency), or have the architect specify them in his plans. The prime disadvantages of this approach are that (1) it might be hard to find components

to fit exactly local requirements, and (2), the advantages of concerted action would be lost. In fact, this approach is the same as that used in many cases now where certain proprietary systems are specified by the architect.

104-107

APPROACH 2 -- Individual school districts bid chosen components or systems against conventional construction at the time each job is bid.

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Except to gain comparative cost data, which may or may not be meaningful, this approach seems to combine the inadequacies of the first with the introduction of complexity into the design and bidding process: the architect may have to effectively design two buildings, and the contractor may have to come up with two wholly-different bids.

APPROACH 3 -- A co-operative of districts gets bids on certain existing components before the design and bidding of individual school jobs.

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This introduces the co-operative group into the picture. This consortium gets manufacturer bids on various existing components ahead of time, and either buys them outright or includes them in the contract documents for each school job.* No matter how the group goes about securing the components, some of the advantages of group action may be realized. The bidding processes, however, are now becoming more complicated.

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* Discussions on buying components through the Division of Standards and Purchase and on the problems of specifying proprietary systems are presented in the Testimony, pages 91, 92, 100.

84 APPROACH 4 -- A co-operative of districts seeks to modify existing components before the design and bidding of individual school jobs.

88-100 This is the first approach where the districts actually move into the role of specifying their needs and desires to manufacturers. This will require some previous study of the attitudes of manufacturers toward acting on these requests.

114 115 The specification process may be by performance, actual staff design of the components desired, or a combination. Finally, many of the "unknowns" in the construction climate come into play as the districts move into new or untrodden areas.

86 APPROACH 5 -- A co-operative of districts actually seeks to develop new components before the design and bidding of individual school jobs.

88-100 This is the most involved approach of all -- the one taken by SCSD. All aspects of the construction climate will be deeply involved in all stages, and the project staff will have to devise ways of evaluating manufacturer proposals. This in addition to all the problems encountered in Approach 4.

phasing the project

A district or a group of districts can attack a components project in two basic ways. They can (1) jump in on a big effort, or (2) begin slowly, building momentum from past successes. This decision will have to be weighed carefully, for it will set the tone for the whole project.

The advantage of the first approach - typified by SCSD - is that if the construction climate is amenable, it wastes no time. No one worries about results being far off; they can be seen quickly. If there are successes, they are large ones. Incidental failures can be corrected quickly.

The advantage of the second approach is that it can be implemented slowly and positively in an area where the construction climate cannot take it in large doses.

types of components

The Mid-Hudson districts need not just consider the SCSD components or even their component categories as fixed,

- Some of the SCSD components are not particularly applicable in New York. *104-107*

- Other parts of the school building may lend themselves to a components approach.

- Perhaps SCSD should not have chosen the component categories (or some of the categories) it did.

- Perhaps the percentage of the building devoted to the components (40%-50% in SCSD) should not be so great.

- Perhaps a components project stands a better chance of success if its parts do not cross many lines of contractor or trade jurisdiction.

- Maybe some components control building design too much and should not be a part of the project.

staffing

The staff needed to carry through any project will depend heavily on the type and scope of the effort. There are two important considerations, however,

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- The project administrator should be a particularly competent person. He should have a strong educational background and should be given control over all aspects of the project.

- The types of staff members should be flexible, changing as the project changes.

design and specification

If the project moves into the area of asking manufacturers to develop or modify components, there are different ways they can make requirements known to manufacturing firms,

96-
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- Writing a performance specification setting out what the product should do rather than what it should be was the SCSD approach to the problem. The staff must be careful to spell out exact enough requirements to insure getting what it wants. It must also be careful not to overstep its legal bounds in evaluating submissions; the law is specific in its demand to award bids only to the lowest bidder meeting the specifications.

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- The staff can actually design the components or their connections and ask manufacturers to bid on them. There are mixed reactions to this idea. (see pages 114-115)

- A combination of the above can be used.

component bidding

The processes of component bidding are varied and complicated. Several points must be checked,

96-
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- Bidding must reflect the project objectives; the consortium must insure its getting the information it needs.

- Specifications or designs should be carefully constructed to avoid inconsistencies and confusion.

- Efforts must be made to keep competition open and legal. Proposal review procedures will have to be carefully devised so awards are made on the basis of cost and not opinion.

- Manufacturers should be given background information so they know what the project is attempting to do.

- There should be several alternatives to handling bid combinations between manufacturers if compatibility is desired.

- There are many different ways to handle costs, time lags and escalation of costs, bidding sequencing, etc.

mock-ups

It may be necessary or desirable, in the case of new components or new component combinations, to mock-up details, joints or even whole sections of buildings; it may be only through the mock-up that all details and problems of construction and erection can be worked out. If a large-scale mock-up is needed, it is suggested that it be put to use (such as an addition to an existing school) rather than put up and torn down.

THE FUTURE / financing

One problem that must be solved if any kind of project is to be implemented is financing. There are few precedents in this respect, for the only consortium formed to develop components so far (SCSD's First California Commission on School Construction Systems) was supported thoroughly by Educational Facilities Laboratories.

philosophy of financing

There are several points that can illustrate thinking behind a project,

- EFL cannot be expected to support a project that does what SCSD did all over again. New efforts in new fields, however, may receive Foundation support.

- If the consortium restricts itself to a regional problem, the support should be largely local in nature (such as by contribution from member districts).

- If the project has larger implications or applications, it might be treated as a "case study" and receive support from the state or federal governments.

- If the project included many districts across the state, there may be possibilities for wide state support.

avenues for financing

The project, depending on its objectives and scope, will probably have to select a combination of "avenues of financing." It should be said that the project must look for the ways and means of support for the kind of work it wants to do, rather than tailoring its operation to the kinds of support it can get. These are some of the avenues,

- Local effort is a possibility, particularly for matching or "filling out" other support. As the only means of financing, it does not give the consortium much latitude to do the things it would want to do.

- There may be support possibilities from large corporations in the region; they have quite a "stake" in the area and might be willing to help.

- The State Education Department might budget funds for a project with state-wide applications or participants.

- The foundations (particularly EFL) may support some aspects of a project.

- There may be possibilities under Title III of the Elementary and Secondary Education Act of 1965. Proposals would have to be heavily keyed to providing better services or programs to member districts.

- The Co-operative Research Act of 1954 may offer some possibilities if matching funds can be provided.

One of the first functions of any project will be a thorough search for funds. The chances are that a combination of the above approaches will be needed to carry a project out.

C

the testimony / a basis for evaluation

introduction . . . .

This Part C includes excerpts, quotes, summaries, lists, provisions of law and many general articles to reinforce, illuminate, or elaborate upon many of the points made in the first two parts.

This section is not a narrative; nor does it pretend to cover or support every point made in Parts A and B. This testimony should be used for general reference, though.

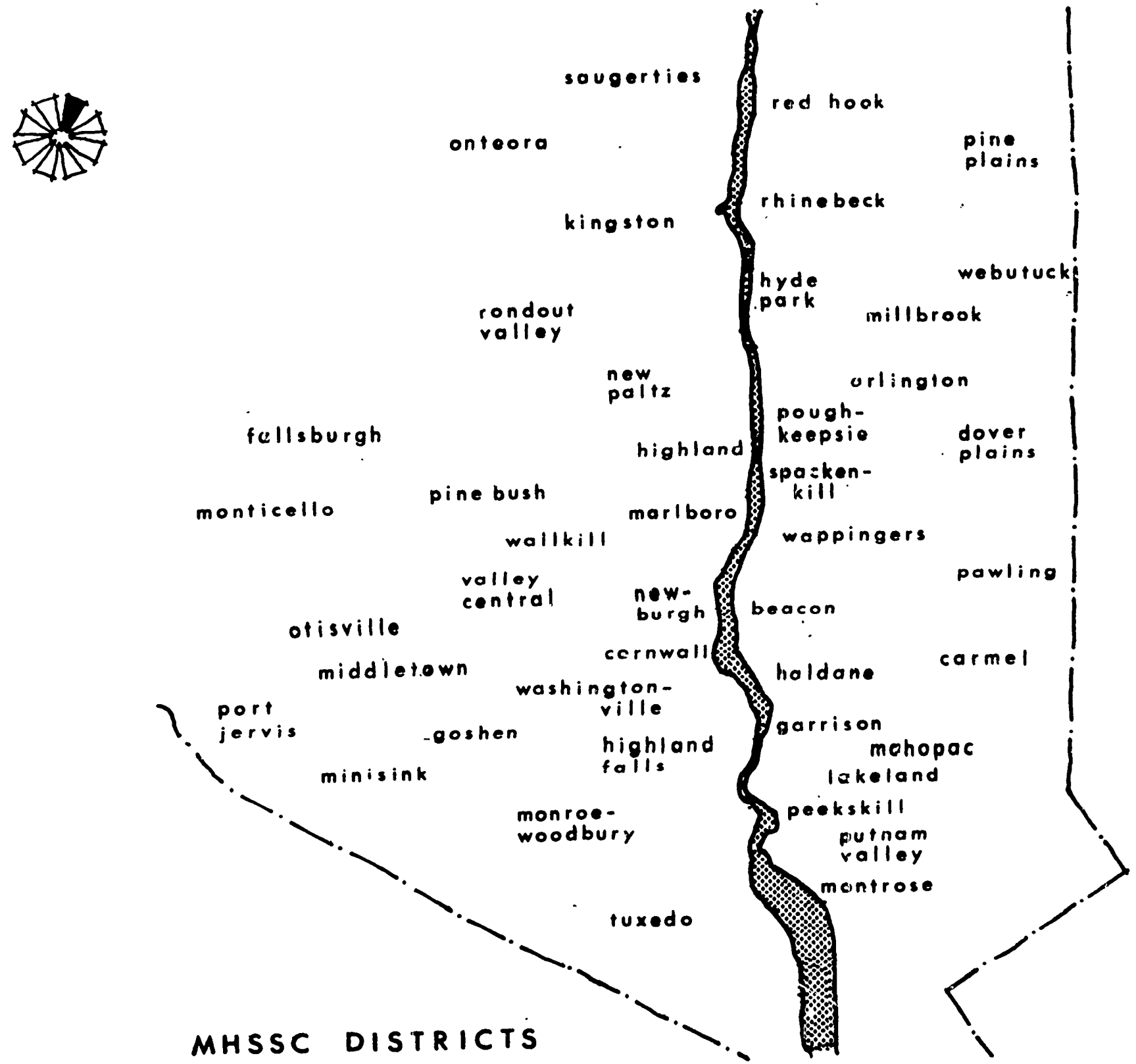
SCHOOLS IN THE MID-HUDSON SCHOOL STUDY COUNCIL

The region covered by the Mid-Hudson School Study Council (MHSSC) includes over ?,000 square miles in four New York counties (Dutchess, Orange, Putnam and Ulster) with some districts in Westchester and Sullivan counties. There are probably 600,000 residents in the area.

The overall character of the region might be classed as rural and suburban with a scattering of larger cities along the Hudson River. Poughkeepsie, Newburgh, Kingston and Middletown are the largest cities in the area; but none of these had more than 40,000 residents in 1960.

Comments on growth of this area, lying on the fast-growing "commuter and service" outskirts of New York City, are made in the next section of the Testimony.

Arlington Central (Poughkeepsie)
Beacon City Schools (Beacon)
Carmel Central (Carmel)
Cornwall Central (Cornwall)
Dover Plains Central (Dover Plains)
Fallsburgh Central (Fallsburgh)
Garrison Union Free (Garrison)
Goshen Central (Goshen)
Haldane Central (Cold Spring)
Highland Central (Highland)
Highland Falls Central (Highland Falls)
Hyde Park Central (Hyde Park)
Kingston City Schools (Kingston)
Lakeland Central (Mohegan Lake)
Marlboro Central (Marlboro)
Mahopac Central (Mahopac)
Middletown Enlarged City Schools (Middletown)
Millbrook Central (Millbrook)
Minisink School #1 (Slate Hill)
Monroe-Woodbury Central (Monroe)
Monticello Central (Monticello)
Montrose Central (Montrose)
Newburgh City Schools (Newburgh)
New Paltz Central (New Paltz)
Onteora Central (Boiceville)
Pawling Central (Pawling)
Peekskill Public Schools (Peekskill)
Pine Bush Central (Pine Bush)
Pine Plains Central (Pine Plains)
Port Jervis Central (Port Jervis)



MHSSC DISTRICTS

Otisville Central (Otisville)
Poughkeepsie Public Schools (Poughkeepsie)
Putnam Valley Central (Putnam Valley)
Red Hook Central (Red Hook)
Rhinebeck Central (Rhinebeck)
Rondout Valley Central (Accord)
Saugerties Central (Saugerties)
Spackenkill Union Free (Poughkeepsie)
Tuxedo High School (Tuxedo)
Valley Central (Montgomery)
Wallkill Central (Wallkill)
Wappingers Central (Wappingers Falls)
Washingtonville Central (Washingtonville)
Webutuck Central (Amenia)

In addition to these public school districts, the MHSSC includes some private, campus and parochial schools, and county Boards of Co-operative Educational Services (BOCES):

New Paltz Campus School (affiliated with the State University College at New Paltz)
Our Lady of Lourdes High School (Poughkeepsie)
Marist College (Poughkeepsie)
Saint Joseph's Institute (Barrytown)
Dutchess B O C E S (Millbrook)
Putnam B O C E S (Carmel)
Ulster B O C E S (New Paltz)

SOME COMMENTS ON GROWTH IN THE MID-HUDSON REGION

Here are some remarks made at a MHSSC School Board Institute on April 28, 1965, by Leland F. Sillin, Jr., President of Central Hudson Gas & Electric Company, Poughkeepsie.

"We do know that between 1940 and 1950, the seven-county Mid-Hudson area added more than 160,000 people, and thus grew at a rate which belies the rural and small-town character of the region. And even with this most recent 10-year period, the rate of population increase has accelerated markedly, largely as a result of the pull exerted by new employment opportunities in the region. The speed-up was especially noticeable in Orange, Dutchess and Ulster Counties, which experienced a combined population increase of only 10% between 1940 and 1950, but grew by almost 26% during the 1950s. This rate was almost 40% higher than the nation's, and twice as high as New York State's growth rate for the decade 1950-1960."

"Using the rather conservative New York Regional Plan Association's projections for the three southern counties of the region as a guide, we visualize a 1985 population of over 1,400,000 people. This represents an increase of about 800,000, or more than twice as many people as lived in the seven counties in 1960."

"In contrast to the decade of the fifties, a large proportion of the increased population forecast will be accounted for by the offspring of the generation now coming of age. Families and young people will continue to be drawn to the region by its attractiveness and opportunities, but the largest portion of increased population will be born and educated in this area. In fact, we may well go through a period when the labor force grows faster than the number of jobs now available."

MID-HUDSON DISTRICT GROWTH

To give a rough picture of anticipated growth in General Mid-Hudson school districts, we have made some percentage computations based on figures submitted by the districts themselves.

district	students 1960	increase 1960-65	increase 1965-70*	increase 1970-75*	increase 1975-80*
1	4320	34%	64%	62%	24%
3	1680	35%	137%	148%	
11	1445	18%	19%	20%	21%
14	8570	13%	23%	12%	
15	3954	44%	68%	118%	
17	1253	43%	5%	23%	8%
21	2250	33%	58%	51%	56%
24	6884	58%	34%	26%	26%
26	901	40%	63%	76%	111%
27	2031	38%	27%	32%	26%
30	3006	5%	9%	16%	
32	991	27%	38%	32%	
36	1100	47%	81%	136%	136%
37	975	23%	37%	37%	37%
38	2065	28%	27%	33%	34%
39	2738	29%	52%	48%	76%
41	389	6%	29%	31%	
43	1608	17%	17%	15%	13%
44	5058	108%	127%	70%	11%
45	1910	50%	79%	109%	97%
46	875	34%	21%	22%	23%
composite		35%	48%	54%	48%

* *projected*

MID-HUDSON EDUCATIONAL PROGRAMS

As part of a questionnaire distributed to administrators in the Mid-Hudson Region, some inquiries about the characteristics of local educational programs were made. The results show, in sketchy fashion, that while the region has not gone "gung-ho" over new ideas and approaches, there are many attempts and experiments in progress. Facilities will have to recognize some of these changes.

- Administrators were asked to guess how much time students spent in individual study, small (3-15) groups, classrooms and large-groups (50 or more). Almost all noted that students spent a majority of time (ranging from 65% to 100%) in the classroom. Some individual study and small group situations were being tried in many districts on elementary levels.

- While many schools are conducting team teaching experiments, few were using it on a wide basis.

- Few districts conduct after-school or Saturday classes. Perhaps a dozen districts have adult education programs.

- A surprising number of districts conduct summer school programs of one kind or another.

- Many districts attempt to individualize scheduling, but none are truly continuous-progress oriented. Some districts are looking this way, though.

- Most districts make continuous use of instructional aids (films, slides, transparencies, etc.). Perhaps half a dozen are attempting ETV.

- Most districts have language laboratories on secondary levels.

INNOVATION IN THE MID-HUDSON SCHOOLS

While "innovation" and "innovative characteristics" often do not bespeak the quality of the district educational program, the types of new programs districts in an area are undertaking often can give clues to its overall educational "creativity". This creativity, in turn, can become a factor in determining how valid the concept of "change" is in the area in the next 5-7 years. Certainly, the amount of "change" encountered or expected will have a deciding effect on facilities criteria.

These program titles were listed as innovations in MHSSC schools in "The Commissioner's 1961 Catalog of Educational Change".

CUISENAIRE RODS
SHARED-SUBJECT TEACHERS
UNGRADED PRIMARY READING PROGRAM
UNGRADED SPELLING PROGRAM
INTER-GRADE GROUPING
EDUCATIONAL TV (language instruction)
HIGH SCHOOL HONORS ENGLISH PROGRAM
LANGUAGE LABORATORY
ACCELERATED MATH AND SCIENCE
UTILITY TYPING
SMSG MATH PROGRAM
LANGUAGE LABORATORY
RUSSIAN AND CHINESE
TEAM TEACHING (10th grade)
AFTER-SCHOOL HONORS
SCIENCE SEMINAR
RESIDENT SCIENTIST
LARGE-GROUP (11th grade history)
SATURDAY SEMINAR
SPEEDING UP LANGUAGE
SCHOOLWIDE SCIENCE IMPROVEMENT

COST BREAKDOWNS ON SCSD SCHOOL PROJECTS

SCSD PROJECT "A" is a large 3,000 student complex for a fast-growing High School District in southern California. The district is adding 1,500 students a year to its system, and has been faced with building these large high school buildings every other year.

The SCSD project school resembles -- in planning, programming, types of facilities, etc. -- almost exactly a conventional 3,000 high school built in the district in 1963. The only major difference is the high degree of flexibility supplied by the SCSD school.

Both projects -- the 1963 school and the new SCSD schools -- are rambling buildings, built as four plan elements (really four almost separate buildings) arranged in campus style and connected by outside, covered circulation paths.

The costs shown on the next page were supplied by District personnel. We have applied a rough adjusting factor to help compensate for regional differences.*

While these figures are more comprehensive than any others we have, the variety of SCSD experience has been great. In no particular order, here are capsule results of three other projects already bid:

- PROJECT "B" 8% over the state aid budget; rebid.
- PROJECT "C" $3,500,000 ($15.75/sq.ft.) about 2-1/2% under the state aid budget.
- PROJECT "D" 6% over state aid budget, but included work for future phases; rebid.

SCSD Project "A" (238,000 sq.ft.)	Building Estimate	Square foot costs*		
		SCSD	NYC*	ALB*
BID COSTS	4,524,487	$18.99	$21.99	$17.00
State Aid Budgt**	4,716,691	19.80	22.92	17.71
1963 and 10% ***	4,350,929	18.27	21.15	16.44
SCSD Components:				
Structural	397,579	1.67	1.93	1.49
Lighting/Ceiling	331,580	1.39	1.61	1.24
Air Conditioning#	450,978	1.89	2.19	1.69
Demount. partitns	308,392	1.29	1.49	1.16
Accordion partitns	11,537	.05	.06	.04
Panel partitions	53,727	.23	.27	.21
Cabinetwork	225,984	.95	1.10	.85
Lockers	52,054	.22	.25	.20
Total SCSD (40.5%)	1,831,832	7.69	8.90	6.88
Non-SCSD	2,692,655	11.30	13.09	10.12

* Boeckh "Building Costs" Index, August 1965.
** Maximum cost of the building as determined by State Aid ratios in California.
*** The cost of the 1963 building plus 10% (a guess by the local Board of Education) to compensate for rising building costs.
\# Includes a 5-year maintenance contract.

OTHER POTENTIAL SAVINGS IN SCHOOL CONSTRUCTION

In any study where the cost of school buildings is a factor, there are many areas contributing to construction costs that are seldom explored.

In a report entitled "Potential Economies in School Building Construction" prepared for the New York State Education Department"*the point is underlined: "It may be possible to save more money on a school by wise financing or fortunate timing of bids than by all the design economy measures the most conscientious planning can devise".

This is not to suggest that we should stop looking for design and construction economies; the point is that there are other, perhaps overlooked areas, begging for the cost-cutter's attention. Some of these, as brought out in "Potential Economies" are,

- FINANCING: timing, scheduling of repayments and the district's credit standing are all hidden factors contributing to the total cost of buildings. The difference in cost between expensive and economical financing programs can ammount to a large area (sometimes as high as 15%) of total project cost.

- TIME ALLOWANCE FOR PLANNING: the need to move children into schools approved after many years of haggling over a bond issue often puts the architect in the position to have to rush plans. While this may lead to poorly planned buildings, it may have a cost effect, too. Poorly prepared plans and loose specifications, hastily selected materials and details, can add significantly to school building costs (sometimes as much as 5%).

* By W. F. Koppes and A. C. Green, Rensselaer, 1958

- TIME ALLOWANCE FOR BIDDING: the competent contractor needs a substantial amount of time to prepare an accurate bid for a project of any size. Chopping this time in an effort to get the project started sooner almost always will raise the bids.

- CHOICE OF BIDDING TIME: location of the work, the competing projects, seasonal factors and general economic conditions are some of the variables which together may determine the most advantageous time for taking bids. The constant change so characteristic of the area economy may make it hard to predict just when this "most advantageous" time is, but it should be recognized that this factor may be more influential in determining building cost than any other.

- ARCHITECTURAL SERVICE: the competence of the project architect, his eagerness to explore different ways of doing things, his attention to detail, and his close scrutiny of plans and specifications for conflicts, inaccuracies and problem areas can mean much in the final cost determination. Many contractors have an "architect factor," usually based on past good or bad experience with the firm, added to their bids.

CHARACTERISTICS OF MID-HUDSON SCHOOL BUILDINGS

In order to pinpoint the kinds of schools that Mid-Hudson school districts are building in the 1960s, the Study Staff made a quick survey of some 54 building projects in the area, covering years from 1961 to 1965. Data reported on application forms to the Division of Educational Facilities Planning (The State Education Department) were used.

The results of the survey can illustrate many factors that go into the school construction climate:

- *educational needs as they are translated into school facilities*
- *trends in educational needs in the area*
- *trends in construction techniques in the area*
- *trends in building costs in the area*
- *effects of construction codes and Planning Standards*

In order to give the survey some latitude, 40 of the projects were new buildings, and 14 were additions of large scope. Since the liklihood of using components in small additions and in renovations is small, and since these data are hard to assess, these types of projects were not included. These breakdowns resulted:

by grade occupancy

grades K - 6	**37 projects**
grades 4 - 6	**1 project**
grades 7 - 12	**4 projects**
grades 7 - 9	**6 projects**
grades 9 - 12 (or 10 - 12)	**4 projects**
undetermined	**2 projects**

In summary, 38 of the 54 projects were in the "elementary" category, while 14 were considered "secondary."

by year

application made in 1961 ..... 7 projects
application made in 1962 ..... 7 projects
application made in 1963 ..... 15 projects
application made in 1964 ..... 18 projects
application made in 1965 ..... 7 projects

by district

districts with 1 project 14
districts with 2 projects 4
districts with 3 projects 5
districts with 4 projects 2
districts with 9 projects 1

In summary, over half of the MHSSC districts are somehow represented in the survey.

These conclusions can be made from the data gathered in the survey:

- SIZE: the average size of new elementary school projects is in the 40,000 - 50,000 square foot range. The average size of new secondary schools is in the 120,000 - 140,000 squere foot range.

- HEIGHT: most elementary schools in the survey were 1-story (or 1 1/2 stories in some cases) in height. Only one incorporated a 3-story element. Secondary schools, on the other hand, had many predominantly 2-story elements.

- SUBSTRUCTURE: over 85% of the elementary schools were listed as "slab on grade" the remainder indicating at least a partial basement. Secondary schools were more split: 8 to 6 in favor of "slab on grade."

- SUPERSTRUCTURE: almost all schools surveyed were steel frame and masonry bearing construction. One timber structure and three concrete structures were noted.

- EXTERIOR WALL: understandably the most common outside wall treatment is brick. Curtain wall window-wall combinations are the most common infillers.

- INTERIOR WALL: almost all interior partitions are listed as masonry (concrete block). Some metal-stud walls were seen; no demountable partition systems were encountered in the schools surveyed.

- HEATING: the heating medium was split between steam and hot water, with the latter holding a slight advantage in the elementary schools and a large advantage in secondary construction. Unit ventilators and unit vent-convector systems are the most common classroom heating elements.

- AIR CONDITIONING: 1 elementary school and 4 secondary schools had made some provision for air conditioning. The administrative suite was the only one actually cooled in the projects surveyed.

Cost data are variable in accuracy since much of it is estimated. Only recently has the State Education Department begun to request actual finished construction cost figures. Some points might be noted, though:

- Despite overall rising costs (particularly in labor), square foot construction cost has remained remarkably stable in the area. The actual cost of school buildings resulting from construction contracts* has

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* General Construction, Heating and Ventilating, Plumbing and Electric contracts

varied from $17.00 per year to $18.70 per year, but not in any discernible order. A larger sample would be needed to give really meaningful information.

- The percentage of the building costs attribued to GENERAL CONSTRUCTION seems to be slowly decreasing, ranging from 67% of the cost to a little under 66% in 1965.

- ELECTRIC costs have pretty much held the line in the schools surveyed -- about 12% of total building cost.

- PLUMBING costs, ranging 7%-8% of building cost, have probably increased a little over the four-year span.

- HEATING AND VENTILATING costs have probably been taking an increasingly large portion of building cost in recent years, ranging from 13%-15%.

- There really seem to be few appreciable cost differences between elementary and secondary projects analyzed. This is a hard rule to state, however, considering the smallness of the secondary sample (14 schools) in the study.

Overall the survey seems to corroborate much of what we already know about school construction in the Mid-Hudson area -- there are patterns that repeat themselves over and over again, costs have remained rather stable over the past few years, and that there are few really experimental or "way-out" school construction projects.

"FLEXIBILITY" AND THE SCHOOL PLANT

Those involved with the SCSD project in California were convinced that its main asset is flexibility: The System's integration of moveable walls with a changeable mechanical and electrical system to back them up allows nearly complete rearrangement of interior space if this is desired. It is its flexible features that distinguish SCSD -- many feel that without them, conventional construction techniques will be less expensive to use.

"Flexibility" seems to be one of the educational catchwords of our day. Probably no other concept in planning or design means so many different things to so many different people -- it is a hard thing to pin down, and yet it is often accepted as a panacea for all modern-day educational problems.

NEEDS

The degree of "flexibility" and the kinds of "flexibility" required by Mid-Hudson schools will probably play an important part in any systems project undertaken. For this reason, it is incumbent upon all involved to learn and understand this phenomenon. To begin, there are probably three different factors that have effected the need for flexibility:

- VARIATIONS IN TEACHING METHODS. The proliferation of new teaching materials and techniques have caused us to look at the traditional learning environment. The one-room, one-kind of educational environment afforded by the self-contained classroom is being supplanted by the need to provide many different environments in the school building.

- VARIATIONS IN CLASS SIZE. Finding new concepts in teaching to be effective has led educators away from the sacred "class of thirty". As this trend becomes more and more pronounced, our current practice of laying 24 x 32 classrooms end-to-end to plan a school becomes senseless. The need to accommodate many group sizes leads to the need for "flexibility".

- PROVIDING FOR THE FUTURE. Realizing that new educational innovations -- many of which are still unproven -- may well change facility requirements in times to come, many educators and architects feel it important to provide some kind of "flexibility" in school plant design to allow it to accommodate new spaces without a great deal of expense.

KINDS

Based on these needs, there are several different "kinds" of flexibility of space:

- HOUR-TO-HOUR (or even minute-to-minute): the need to accommodate different group sizes, or to provide a variety of learning situations in the school day (or even in the school period). This type of flexibility is best accomplished by moveable panels, space dividers on rollers, folding and accordion partitions. The teachers (and possibly the students) should be able to easily operate whatever devices are used. The whole process of making the change should take no more than a minute or two at most.

- DAY-TO-DAY: the need to provide for program changes from day-to-day, or from week-to-week. The same criteria as "hour-to-hour" apply to this type of flexibility, except that there is more time to allow for relocation of heavy furniture and rearranging other contents of the spaces involved.

- TERM-TO-TERM: the need to accommodate changes in the school schedule -- more classes, fewer students, more seminar situation, etc. This is the kind of thing that varies from term-to-term, and there are a few days available to provide the new spaces. Here, demountable partitions are likely to be the answer.

- YEAR-TO-YEAR: this is really the same kind of flexibility mentioned in the paragraph above, except that there may be several months in which to provide for it. The traditional answer is knocking down block partitions, rewiring, etc.

From this it is easy to see that the educator and architect should understand the types of flexibility they <u>really</u> want to design into the school building. If the administrator is only worried about year-to-year flexibility, for example, the use of accordion partitions to provide it is not the best use of the resources available to him; these partitions are expensive and often noisy, a price that can be afforded to get hour-to-hour flexibility but not when change is less frequent.

<u>LIMITATION</u>

There are other parts of the building to be considered: simply moving walls is useless if the mechanical system cannot change with them, or if the light switches end up in another room. Also, there are many parts of a school building that do not readily lend themselves to being "flexible". Spaces that have special requirements, special services, special constructions, special sizes or shapes, may not lend themselves, nor may they ever need, change. The following list gives some support to this statement:

- SPECIAL CONFIGURATIONS: shapes for hearing and viewing, large-group spaces, gymnasiums with standard physical education "stations"

- SPECIAL CONSTRUCTIONS: storage areas, hazard areas, incinerator and boiler rooms, equipment storage areas, certain stairwells and exitways

- SPECIAL FLOOR CONDITIONS: non-slip surfaces in corridors, assembly areas, kitchens, toilets, locker areas. Drains in toilets, kitchens, shops. Impervious surfaces in these areas.

- SPECIAL MECHANICAL, VENTILATING, ELECTRICAL REQUIREMENTS AND SERVICES: science areas, art areas, homemaking, music, vocational shops, finishing areas, auditoria, gymnasiums, locker and shower areas, cafeterias, kitchens, toilets, audio-visual areas, boiler and incinerator, fuel storage and transformer areas.

- SPECIAL DRAINS AND TRAPS in science areas, art areas, and kitchens.

- SPECIAL FIRE ALARM OPERATION AND CONTROL in vocational areas, cafeteria-kitchen areas, boiler-heater areas and corridors.

Finally, there are other "design requirements" that may limit "near-total" flexibility in Mid-Hudson schools:

- LIGHTING REQUIREMENTS: New York State has natural-lighting requirements (commonly known as "vision strips") in many school spaces: classrooms, library and study areas, science, art, office practice, homemaking, music areas. In other areas, natural lighting is also required but can be obtained through skylights: cafeterias, conference areas, corridors, gymnasiums, kitchens, shower and locker areas, stairs.

- CIRCULATION REQUIREMENTS: The need to provide wide corridors within the building (combined with special construction requirements for stairs and exits) will tend to limit complete interior rearrangement.

In summary, it should be realized that providing complete flexibility -- for all types of flexibility needs -- throughout the entire building is probably impossible and certainly undesirable.

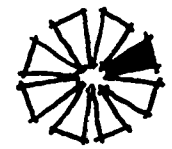
BOCES PROGRAMS IN THE MID-HUDSON AREA

Indicative of the involvement of school districts in regional shared-services is the scope of the BOCES program in the MHSSC area. For the sake of gaining an overall view of the types of services that these Boards of Co-operative Educational Services are providing, here is a list of approved teachers and programs released by the Bureau of Rural Administrative Services for 1963-1964.

Program	Dutchess	Ulster	Putnam	Orange
Art	1.6	4.0	0.8	1.7
Curriculum	0.8	1.0	-	-
Data Processing	-	1.0	-	-
Dental Hygiene	-	0.5	1.5	-
Driver Ed	-	1.0	0.3	-
Foreign Lang	2,0	-	0.5	-
Guidance	-	0.5	1.5	1.0
Handicapped	7.0	-	1.0	1.0
Homemaking	-	2.0	-	-
Industrial Art	-	1.0	-	-
Librarian	-	1.2	-	2.1
Mathematics	-	3.0	-	-
Music	0.5	4.4	2.3	1.7
Nurse	-	3.0	0.2	3.4
Psychological	2.0	4.0	2.3	2.0
Physical Ed	-	1.8	-	1.2
Pupil Personnel	-	-	1.0	-
Reading/Lang	1.0	4.0	1.0	2.6
Social Worker	-	-	1.4	-
Adjustment Cntr	-	-	1.0	-
Speech Corr	1.0	3.0	2.3	2.4
Visual Aids	-	2.0	-	1.3
Vocational	-	5.0	3.0	-

THE MID-HUDSON SCHOOL STUDY COUNCIL

As an organization that cuts across county lines, and which includes districts of many sizes and philosophies, the success of the Mid-Hudson School Study Council in promoting district co-operation cannot be underestimated.



The following is an outline list of MHSSC activities in the 1964-1965 school year -- its wide scope is indicative of the many areas of educational endeavor the Council has been involved in.

- Publications of the CHANNEL, the Council periodical distributed to each teacher, administrator and board member in the Council area. Over 7000 copies of each issue are distributed.

- Various manuals and brochures including: a Foreign Language Teachers Newsletter (6 issues), 1964 Law Conference Report, Handbook on New York State School Audit, Financial Survey of Mid-Hudson Schools.

- A research program, including a salary survey, groundwork for hiring a full-time research director, and this Feasibility Study.

- In-service education conferences, including: School Board Institutes, Leadership Weekend Conference, Annual Meetings, Administrators' Luncheons, Foreign Language Festival and Banquet, Science Fair, and Science Teachers Conference.

- A variety of speakers from local business, and other areas of professional and educational interest.

- Member School Curriculum Committees in the areas of: Language Arts, Foreign Language, Art, Physical Education,

Elementary Math, Chemistry, Kindergarten, Audio-Visual, Better Writing, Physics, Social Studies, School Business officials.

- Maintenance of a full-time staff and headquarters building (which contains a library of pamphlets and reports available to members).

OFFICERS OF THE MID-HUDSON SCHOOL STUDY COUNCIL (1965)

President: Harold Monson, Superintendent of Schools, Newburgh Public Schools, Newburgh, New York.

Vice-President: George Sullivan, Superintendent of Schools, Onteora Central Schools, Boiceville, New York

Treasurer: W. Wendell Hoover, Superintendent of Schools, Kingston City Schools, Kingston, New York

Executive Secretary, William J. Hageny, Professor of Education, State University College at New Paltz, New York.

TITLE III OF THE 1965 EDUCATION ACT AS A SPUR TO REGIONAL CO-OPERATIVE EFFORT

Title III of the Elementary and Secondary Education Act of 1965 authorizes $100,000,000 in this fiscal year for supplementary centers and services. This constitutes recognition of the need to provide for more regional efforts in more directions than ever before. All of this should have the effect of raising co-operative spirit among districts to new levels, (and may suggest areas for financial support of a components project).

SEC. 301 (a) The Commissioner shall carry out . . a program for making grants for supplementary educational centers and services, to stimulate and assist in the provision of vitally needed educational services not available in sufficient quantity or quality, and to stimulate and assist in the development and establishment of exemplary elementary and secondary educational programs to serve as models for regular school programs.

SEC. 304 (a) A grant under this title for a program of supplementary educational services may be made to a local educational agency or agencies, but only if there is satisfactory assurance that in the planning of that program there has been, and in the establishing and carrying out of that program there will be, participation of persons broadly representative of the cultural and educational resources of the area to be served. .. (These) include State educational agencies, institutions of higher education, nonprofit private schools. public and nonprofit private agencies, such as libraries, museums, musical and artistic organizations, educational radio and television, and other cultural and educational resources.

MID-HUDSON BUILDING PROGRAM ANALYSIS

Below is a list of projects anticipated by many MHSSC districts from 1966-1973. All districts did not come up with figures but the list is about 85%-90% complete. Of course, none are commitments; the data are intended to give an overall picture only.

completed in 1966

(dist)				
18	new	K-6	900	$ 2,000,000
30	new	K-6	600	1,155,000
30	add	K-6		458,000
30	add	K-6		106,000
36	new	K-6	860	1,300,000
42	new	6-8	1200	2,400,000
43	add	K-6	100	110,000
43	add	K-6	200	268,000
44	new	K-6	665	1,100,000
44	new	K-6	665	1,000,000
44	new	K-6	665	1,000,000
45	new	9-12	1000	2,710,000
46	new	4-6	350	800,000
46	add	7-12	90	100,000

completed in 1967

1	new	7-9	900	1,800,000
6	new	K-6	900	1,685,000
14	new	7-9	1000	2,500,000
17	new	7-12	1000	2,700,000
24	new	K-4	510	800,000
24	add	K-4	240	500,000
24	new	5-7	630	1,400,000
24	add	7-9	500	1,250,000
30	new	9-12	1100	3,505,000
37	alt	7-12	500	104,000
37	new	K-6	800	1,308,000
38	new	5-8	1200	2,650,000
38	add	9-12	200	350,000
38	add	K-4	75	225,000
39	new	K-6	640	1,300,000
39	add	K-6	330	600,000
41	new	K-6	400	650,000
41	alt	7-12	180	145,000
44	add	10-12	450	1,000,000

completed in 1968

1	new	K-6	900	1,500,000
1	add	9-12	500	1,300,000
3	add	K-6	200	400,000
9	new	5-8	900	2,000,000
11	new	K-6	500	750,000
14	new	K-6	500	1,000,000
15	new	K-5	825	1,500,000
18	new	K-6	700	1,500,000
21	new	9-12	1200	3,000,000
24	new			1,150,000
26	new	9-12	600	2,000,000
27	add	7-12	600	1,300,000
39	add	K-6	180	400,000
43	new	9-12	600	1,500,000
44	new	10-12	2090	5,000,000
45	new	K-6	650	1,200,000

completed in 1969

15	new	9-12	1400	3,000,000
44	new	7-9	1220	2,800,000
45	new	K-6	650	1,200,000

completed in 1970

3	new	5-8	800	1,500,000
14	new	K-6	500	1,000,000
15	new	K-5	825	1,500,000
18	add	7-9	500	1,500,000
39	new	7-9	700	1,800,000
44	new	K-6	655	1,200,000
44	new	K-6	655	1,200,000

completed in 1971

1	new	K-6	900	1,500,000
14	new	7-9	1000	2,700,000
15	new	6-8	1100	2,700,000
21	add	K-6	300	550,000
27	add	K-6	210	550,000
36	new	K-6	865	1,300,000
44	new	7-9	1220	2,800,000
45	new	5-8	650	1,500,000

completed in 1972*

18	add	10-12	500	1,500,000
21	new	K-6	600	1,200,000
38	new	K-4	500	1,000,000
44	new	K-6	655	1,200,000
46	add	7-12	100	150,000

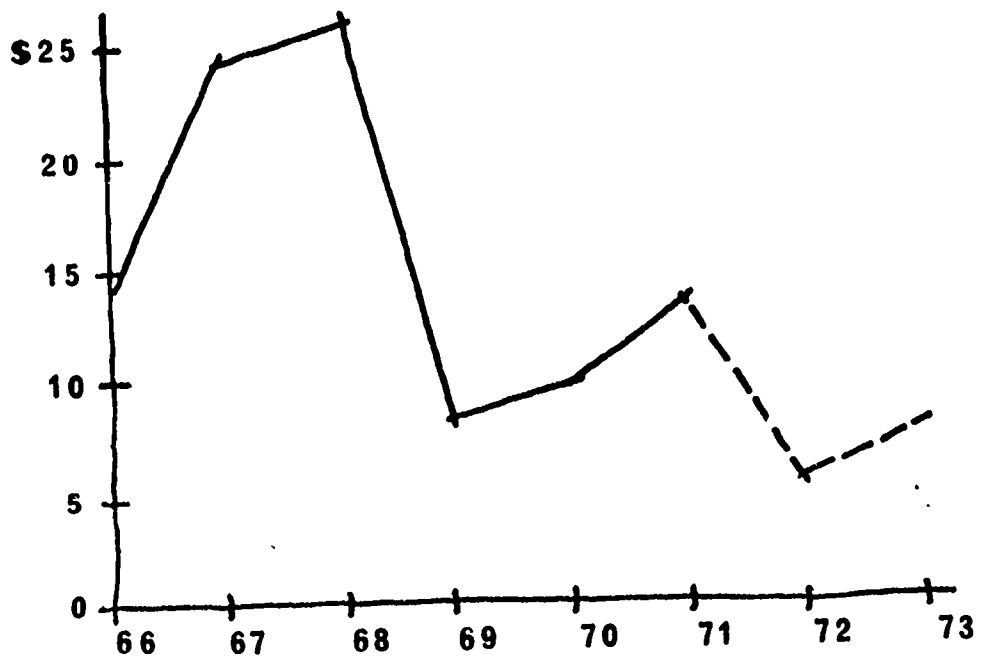
completed in 1973*

9	new	9-12	1400	3,000,000
44	new	7-12	900	2,500,000
45	new	K-6	650	1,200,000

* figures in these years are low due to incomplete projections.

construction totals

completion in 1966	$ 14,507,000
completion in 1967	24,472,000
completion in 1968	25,500,000
completion in 1969	7,000,000
completion in 1970	9,700,000
completion in 1971	13,600,000
completion in 1972	5,050,000*
completion in 1973	6,700,000*



This graph points up an interesting problem: even given the fact that projections for the later years are incomplete, the real bulk of building is anticipated in the next three years. This means that "lead time" (time between beginning and getting results) cannot be very long.

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* see note on the preceding page.

APPROACHES TO IMPLEMENTING A PROJECT

In the text, five basic approaches to using components in school construction were presented. The following illustrate how each of these would be implemented.

APPROACH I -- BIDDING EXISTING COMPONENTS AT THE TIME OF EACH SCHOOL BUILDING PROJECT

- collect information on existing components and component systems.
- assess all contributing factors, finding what kinds of components will be appropriate to district needs and to the regional "climate".
- select the appropriate components to be used as a basis for architects' plans.
- owner either purchases the chosen parts outright and includes their installation as part of the construction contract, or includes the chosen parts in the contract with the required "or equal".

APPROACH 2 -- BIDDING EXISTING COMPONENTS AGAINST A CONVENTIONAL APPROACH AT THE TIME OF A SCHOOL BUILDING PROJECT

- collect information on existing components and component systems.
- assess all contributing factors, finding what kinds of components will be appropriate to district needs and to the regional "climate".
- select the building parts or systems to be used as a basis for architects' drawings or as a basis for an

alternate solution which, in effect, would "convert" a conventional construction approach to a systems effort.

- draw building plans and write specifications in such a way to allow for bids on both construction means.
- evaluate contractor proposals and select the approach (possibly a combination approach) that best fulfills cost/time requirements.

APPROACH 3 -- BIDDING EXISTING COMPONENTS BEFORE THE INDIVIDUAL SCHOOL PROJECTS

- form a co-operative of interested districts.
- select some kind of staff to administer the project.
- survey the needs of the various districts.
- collect information on existing components and component systems.
- assess all contributing factors, finding out what kinds of components are appropriate to district needs and to the "regional climate."
- select the appropriate components to be used as a basis for architects' plans.
- take manufacturer bids on providing components or component systems.
- owners contract with component manufacturers to supply the chosen parts.
- staff testing of components for compatibility in small details. (may not be necessary)

- issue a catalog of components and details of integration to each of the district architects involved. These become a basis for his design.

- owner purchases components and includes their installation in the construction contract OR includes the components in the contract on a unit cost basis.

APPROACH 4 -- MODIFYING EXISTING COMPONENTS BEFORE THE INDIVIDUAL SCHOOL PROJECTS ARE BID

- form a co-operative of interested districts.

- select some kind of staff to administer the entire project.

- collect information on existing components and component systems.

- assess all contributing factors, finding what kinds of components are appropriate to district needs and to the "regional climate."

- discover the types of modifications of existing parts and systems that would be the most desirable.

- discover the overall attitude of manufacturers in willingness to make changes and modifications.

- select the appropriate components.

- staff writes performance specifications, OR designs the components or their connections, OR uses a combined design-performance approach, as a basis for manufacturer bids.

- take manufacturer-bids on providing components or systems. This may be done all at once, OR sequence-bidding (bidding one building part, deciding on it, and using it as a framework for the remaining bids) may be employed.

- owners contract with component manufacturers to supply the chosen parts.

- staff testing of components for compatibility in small details (may be unnecessary).

- issue a catalog of components and details of integration to each of the district architects involved as a basis for design.

- owner either buys components and includes their installation in the construction contract, OR includes components in the contract on a unit cost basis.

APPROACH 5 -- DEVELOPING SOME NEW COMPONENTS BEFORE THE INDIVIDUAL SCHOOL PROJECTS ARE BID

- form a co-operative of interested districts.

- select some kind of staff to administer the project.

- collect information on existing components and component systems.

- assess all contributing factors, finding what kinds of components are appropriate to district needs and to the "regional climate".

- on the basis of what is needed and what is available, determine the component types to

be included in the project.

- discover the attitudes and requirements of manufacturers in new-component fields. Discover the attitude of manufacturers toward modifying already-existing components what may be desired.

- select the appropriate component types.

- write performance specifications, OR design the components or their connections, OR use a combined design-performance approach, as a basis for manufacturer bids.

- take manufacturer-bids on providing components or systems. This may be done all at once OR by using sequenced-bidding.

- owners contract with component manufacturers to supply the chosen parts.

- staff tests details for compatibility.

- issue a catalog of components and details of integration to each of the district architects involved, as a basis for design.

- owner either buys components and includes their installation in the construction contract, OR includes components in the contract on a unit cost basis.

CONSORTIUMS OF SCHOOL DISTRICTS

If a consortium of school districts is formed, there are many aspects to consider. Here are some of them.

NEED: once districts plan to take group action, there may be reasons of necessity or advantage for forming a legal entity,

- if there is a need to guarantee a certain volume of building construction to entice manufacturers to develop new products or modify existing ones.
- if there is a need to hire staff, receive bids on components, or actually buy parts for member schools.

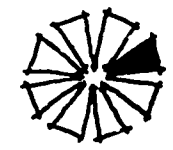
ADVANTAGES: even if it is not legally necessary to form the consortium, there may be advantages anyway,

- the group can give leadership and guidance to its members in developing educational specifications.
- the group can help its smaller, more "today-minded" members to think in terms of the future.
- the inevitable cross-fertilization and trading of ideas can benefit all districts involved.

DISADVANTAGES: if may be difficult to get a group of districts to effectively work together, however:

- petty jealousies and rivalries, if allowed to get out of hand, can kill the idea.
- districts may be so unused to working together that there are more problems than the project is worth.
- there may be fears of excessive "standardization" of school parts for years to come.

LEGAL BASIS: the legal basis for forming a consortium rests in Article 5-G, Section 119-o of the New York State General Municipal Law. A group of districts, by a 3/4 vote of each of their Boards, can form an agreement to do any of a number of things. Hiring staff, buying components, etc. can be spelled out in this agreement. Districts can be excused from the agreement only if there is a mechanism written into it for this purpose, or if there is a breach of contract. Dissolution will be provided for in the agreement, also.



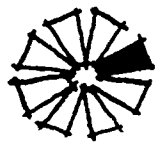
PARTICIPANTS: the number of necessary or desirable participants will depend on the reason for which the consortium is formed. Guaranteeing a certain volume of construction, for instance, may dictate a certain number of participants. In doing this there may be a need to go outside the Mid-Hudson area. (Comments on this are made on page 15.) Private and parochial schools may be considered, but many legal roadblocks may be encountered (see page 90 .).

LEADERSHIP: again the size and scope of the consortium will determine and amount and type of leadership that will be necessary to form it. The MHSSC itself might be the logical force to get it underway.

ROLES: the Consortium may play many roles in a project:

- hiring and co-ordinating staff and advisers.
- aiding in writing any necessary research proposals.
- guiding districts in writing educational specs.
- constant public relations; keeping everyone informed.
- scheduling all phases of the project.
- bidding supervision, providing standard forms, etc.
- auditing of quantity surveys, prime lists, etc.
- providing clerk-of-the-works assistance
- evaluating the entire project and making suggestions for changes or new directions.

SECTARIAN SCHOOLS AND THE NEW YORK STATE CONSTITUTION



It might be possible to include sectarian schools in the consortium, but there will probably be legal problems when it comes to financing: if state or local money is involved (either directly or as credit pledged) the NYS Constitution specifically forbids it.

The heavy involvment of federal funds in local education as a result of the Elementary and Secondary Education Act of 1965 has caused Charles Brind, Counsel of the State Education Department to give an opinion on their use in supporting programs of which sectarian schools are a part. While this opinion is presented below, we must remember that (1) it may be tested in court, and (2) it may have no bearing on using components in consortium.

CONSTITUTION, ARTICLE XI, § 3, "Neither the state or any subdivision thereof shall use its property or credit or any public money, or authorize or permit either to be used, directly or indirectly, in aid or maintenance, other than for examination or inspection, of any school or institution of learning wholly or in part under the control or direction of any religious denomination, or in which any denominational tenet or doctrine is taught, but the legislature may provide for the transportation of children to and from any school or institution of learning.

COUNSEL BRIND'S OPINION: "[From an opinion given by the State Attorney-General] it is quite evident that no state or local money, tax or otherwise, and no state or local property may be used directly or indirectly for the support and/or maintenance of any sectarian school. On the other hand, the opinion points out that if the money from the Federal Government continues to be identified as federal money then its use does not come under the....State Constitution...[therefore] it may not be commingled with other tax or public monies but must be kept in a special account.."

AUTHORIZATION FOR MATERIALS PURCHASE

Section 103, Article 5-A of the New York State General Municipal Law gives school boards the right to make large materials purchase contracts.

5. Upon the adoption of a resolution by a vote of at least two-thirds of all the members of the governing body of a political subdivision or district therein stating that, for reasons of economy or efficiency, there is need for standardization, purchase contracts for a particular type or kind of equipment, material, or supplies of more than one thousand dollars may be awarded by the appropriate officer, board or agency of each political subdivision or district therein, to the lowest responsible bidder furnishing the required security after advertisement for sealed bids therefor in the manner provided in this section. Such resolution shall contain a full explanation of the reasons for its adoption.

SECURING COMPONENTS THROUGH STATE PURCHASING

One possibility for securing components is through the Division of Standards and Purchase, Office of General Services, State of New York.

The Division of Standards and Purchase was originally set up to provide purchasing services for the various departments and agencies in the New York government. It has now been extended to serve local school districts as well.

The Division writes specifications for many products and materials, accepts and awards bids on these, and invites the agencies and districts to buy them at the bid price. The district contracts with the manufacturer separately; the agreements to sell products at the bid price lasts for a specific period of time, very often a year.

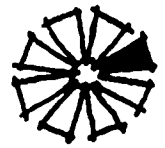
It would appear that the Division would be amenable into specifying and taking bids on components or component systems for districts in the state; one limitation is the size of its staff -- it is not in the position to undertake lengthy proposal evaluations, etc.

When soliciting bids, the Division does not necessarily include a specific quantity of material that will definitely be bought by the schools in the state. It could, however, make this specification if a consortium felt it necessary.

The primary reason for using this vehicle would be professional handling of bidding details; on some projects, the state-wide market potential might entice manufacturers to reduce prices.

STAFFING A COMPONENTS PROJECT

No matter what approach to using components is taken, someone will be charged with the responsibility for making decisions and co-ordinating efforts.



STAFF REQUIRED: this will vary according to the size and scope of project undertaken,

- Approach 1* requires little staff; work may be done by an administrator or an appointee with this specific job.
- Approach 2 requires the same staff as 1.
- Approach 3 requires that the consortium place responsibility for investigating district needs and components available to meet them in some kind of staff; someone outside the districts' regular personnel will be needed, and an architect should play a key role.
- Approach 4 is the same as 3, except the staff must now design and/or specify the modifications it wants.
- Approach 5 is the same as 3, except the staff now moves into complete design and/or specification of desired components.

NATURE OF STAFF: as projects grow in size, more full-time men with differing backgrounds will have to be brought in. In larger projects, a complete full-time staff may be needed.

PHASING: the staff can change character and size as the project changes. It may start with a small group in a college extending the feasibility study and laying groundwork, and move to a full-time group in the project area. As schools are built, the original design-oriented staff can be replaced by a more construction-oriented group, etc.

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* These approaches are spelled out on pgs. 47-49

ADMINISTRATION: in any case the administration of the project should be in the hands of a single capable person. This places responsibility in a single source and insures adequate co-ordination. This man should be an educator, or perhaps someone well-trained in the field of educational facilities. He should be responsible to some kind of policy-making board.

ADVISORY: advisory groups are important; they may be of three different kinds (or combinations of these),

- Local advisory, to keep an eye on the whole project. Might include an executive committee of the consortium, other educators, some district architects and engineers, contractors and labor representatives. This allows adequate direction for the project, and keeps all groups informed in turn.
- Technical advisory, to provide consultation in the technical aspects. Might include regional or national consultants.
- Project advisory, to provide a broad (perhaps national) perspective and criticism. This will certainly be required if the project continues to receive private or federal financial support.

STAFF DUTIES: depending on the type, size, and scope of the project, there are several kinds of duties the staff can undertake. First, in the area of getting all areas of the "construction climate" working together,

- helping to meld the consortium by constant contact with boards, administrators, business managers and taxpayers.
- helping to consolidate support from the design professions, manufacturers, labor, contractors, etc. It is possible that a full-scale education program aimed at these climate areas may be conducted by the staff or consultants to it.
- constant contact with the State Education Department and with the regulatory agencies involved.

Secondly, in the area of deciding on the basic approach to take in implementing the project,

- investigation of all the "climate" factors involved in making the decision.
- investigation of district needs
- investigation of components and systems available to meet these needs.
- correlation of needs and resources to make a decision.

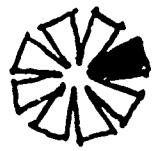
Thirdly, in the area of telling manufacturers the kinds of building components they desire,

- by actual design of components by staff members, and asking manufacturers to bid on drawings.
- by specification of performance standards the components must meet and having manufacturers design them.
- by combination design and performance specification.

Finally, in the area of carrying out the project,

- establishment of manufacturer bidding procedures.
- evaluation of proposals and awarding of bids.
- supervision of component testing and mock-up.
- preparation of standard contract forms to be used in district buying of components.
- compilation of components into "catalogs" for district architects.
- working out problems encountered in the design stages.
- supervision of contract letting for each project.
- conducting of meetings for contractors, during and after the bidding stage on each school project.
- accounting and auditing services.
- provision of construction clerks-of-the-works on request from member districts.
- evaluation of the project, and laying of groundwork for its extension, change in direction, etc.

BIDDING THE COMPONENTS



While it would be impossible to go into all the details of conducting manufacturer bidding on existing, modified, or new components, certain points should be kept in mind.

objectives

- The bidding procedures should reflect the objectives of the project; they should insure that the consortium gets what it wants.

- Specifications and instructions should be well thought out, all-encompassing, and well-worded. Poor specifications or hazy instructions will force ineconomies.

- If manufacturers are asked to come up with new products, the design staff should have a good idea of manufacturing processes. Ineconomies will result if companies are asked to do things they are not prepared to do.

- Efforts must be made to keep competition open and legal.

bidding decisions

TYPE: should the project staff take bids on all chosen components at the same time, or should it bid one or two basic ones first, requiring that later ones "fit" these?

COSTS: how will costs be handled? SCSD requested a lump sum bid from each manufacturer based on specific quantities of each component; later, manufacturers broke this sum down into unit prices anyway they wanted to, as long as the total of unit prices did not exceed the original lump sum.

TIME LAG: Another facet of cost handling is time lag. One possibility is asking manufacturers to escalate prices a certain percentage, with final prices of components to include the actual deviations from this escalation. The legalities of this in New York will have to be further checked.

REVIEW PROCESS: In developing all-new components, SCSD felt that it should continually review the proposed solutions, making recommendations for compatibility with other components where possible. They did this through reviewing manufacturer solutions with no costs attached to them. Strong feelings against limiting competition in any way in New York might force a different way of reviewing proposals.

BID COMBINATIONS: SCSD's idea of allowing manufactuers to bid in tandem for certain integrated components, or to bid in as many component categories as they wanted to, seems to have a lot of merit. Asking for an integrated system and then drawing lines between who may bid on what is not logical.

BID AWARDS: While "compatibility" of components with one another can be specified, there may be problems in awarding bids to the "lowest responsible bidder". Compatibility and meeting specifications are not always clean-cut items.

general conditions

The importance of a complete and well-thought-out set of general conditions of the contract cannot be overemphasized. They are -- in SCSD's case -- standard on every job and are given to the component manufacturer at the time he is preparing his bid. In this way, he has a complete awareness of the issues involved, the lines of responsibility, etc.

SCSD COMPONENT BIDDING: CALENDAR AND PROCEDURES

Since component bidding is necessarily a collection of many complicated details, this information on how the SCSD project staff went about the process may help us to understand its intracies.

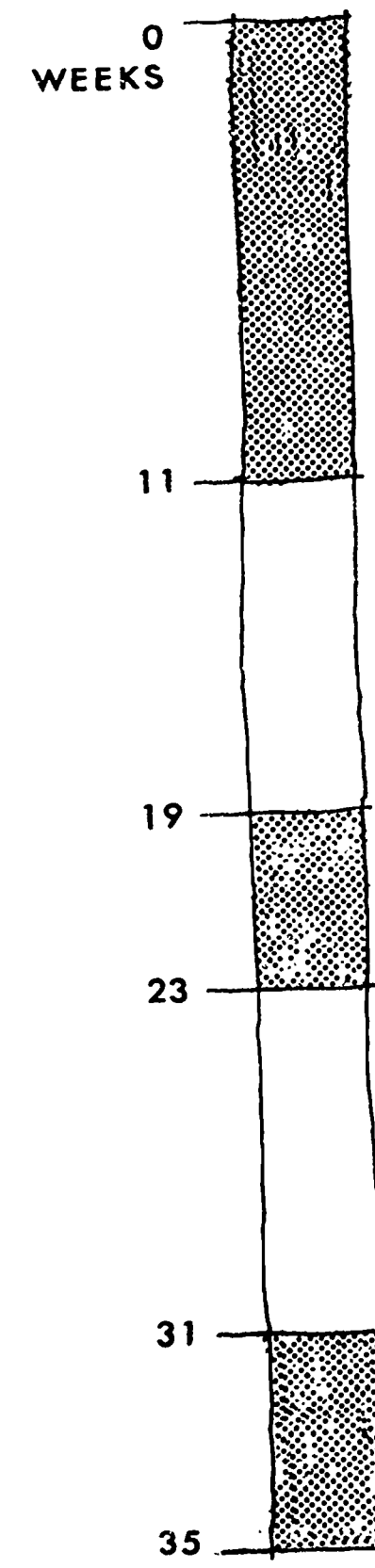
information given to manufacturer-bidders

In order to help them establish guidelines, the SCSD staff gave manufacturers a great deal of information in a comprehensive manual, some of which included:

- the types, outline areas, rough locations, and schedules of schools to be built under the project.
- the philosophy behind the project and many of the decisions that came out of it.
- a lump-sum bidding "standard" of 1,400,000 sq. ft. This would be a guaranteed minimum, with a maximum at about 2,400,000 sq. ft.
- detailed information of the procedures of evaluating proposals and awarding bids.
- detailed performance specifications in the major component areas.

manufacturer contracts

Manufacturers were to submit a lump-sum cost for their proposal to the consortium at the end of the bidding period; no contracts were entered into at that time, though. Within the following 18 months, the individual school districts were to contract with manufacturers (on a standard form) individually. Unit prices (whose total cannot exceed the lump sum bid) are to be worked out later.



Notice of Intent: Project Staff notifies manufacturers that it intends to take bids; makes outline specifications available.

Invitation to Bidders: Formal invitation to manufacturers to bid on the now-completed performance specs. Contractors given pertinent information and contract documents.

Proposal Processing: Manufacturers take the performance specifications and develop a solution in their category.

Proposal Submission: Manufacturer proposals for fulfilling the performance specs made to the Project Staff. No costs are included.

Proposal Evaluation: Project Staff and outside consultants review and comment on solutions presented. All information exchanged between the staff and the manufacturers is confidential. Staff suggests new ways and means of integrating the various proposals. Evaluations returned to bidders.

Detailed Bid Period: Manufacturers develop their proposals, using staff evaluation as a guide.

Detailed Bid Submission: Manufacturers give final solution and lump sum cost for 1,400,000 sq.ft. of construction. Bids could be submitted in any category or group of categories by one or more manufacturers.

Bid Evaluation Period: Project Staff reviews submissions.

Bid Awards: In the four major categories.

THE "OR EQUAL" CLAUSE IN SPECIFYING PRODUCTS

In writing specifications, the architect must be careful to include an "or equal" after any specific product or manufacturer he specifies. As an appendix to its "Planning Standards," The State Education Department of New York includes these statements relating to some court cases in this area.

While a municipality or school district may specify a particular article or object as a general standard it must also provide that any other manufacturer of a similar object may meet the specifications if his product is reasonably equivalent to that mentioned as the standard. [Matter of Appeal of Paul W. Hotaling, 1954, 75 St. Dept. (educ) 97]

Specifications that do not provide for equivalencies, in effect, exclude full competition. [Matter of Appeal of Coach and Equipment Sales Corporation, 1954, 75 St. Dept. (Educ) 94]

Where specifications advertised followed in every necessary detail exact description of desired product and did not provide for others to meet specifications if their products were reasonably equivalent, such advertisement was defective and did not comply with requirements of this section. [Matter of Appeal of Edward V. Gehrke, Bert Barnhart, and David K. Blachly, 1955, 75 St. Dept. (Educ) 15]

CALIFORNIA REACTION TO THE SCSD APPROACH

The purpose of the trip to California was to obtain the reactions of superintendents and architects working under the SCSD project. What follows is a consensus of thoughts about the approach as a whole; detailed reactions to specifics are found in other sections of this report. These thoughts do not, of course, reflect the thinking of everyone interviewed.

overall reactions

Most everyone shared praise for the long and hard hours put in by the SCSD staff in educating the various groups to what was going on. This education and leadership seemed to generate understanding and enthusiasm in many quarters.

As a group, school superintendents were cautiously satisfied; some would rather wait and base their opinion on actual experience. Architect reaction was more varied; those that were associated with the project since its inception may be a little more enthusiastic; they have a greater "stake" in the outcome, as it were. All admitted there were "bugs" to be worked out.

the consortium idea

Most felt that the idea of school districts doing things cooperatively was a good feature of the project. A general fear was that product design might be frozen for many years to come. Finally, many felt that the consortium (either by itself or through its project staff) could take on many other co-ordinative roles to make the project run more smoothly.

component bidding

The SCSD staff was pleased at the competence and willingness

to work of the manufacturers submitting bids; some expressed the fear that manufacturers on a future project might be less competent as a group. Many lessons were learned from the performance specifications that were written -- some turned out to be quite loose, allowing manufacturers to take many directions. The feeling of some was that tighter specs were the answer.

Another criticism of the performance specifications is their thesis that one system can satisfy the needs of all school buildings; several interviewed felt that the components (and the components criteria that guided their design) emphasized their use in complicated buildings of many spaces; simpler elementary schools then "paid a premium" for using the components. Other design problems are discussed on page 104.

mock-up and testing

Because of the newness of most of the components, and since the performance specs did not dictate jointing conditions, etc., the Project Staff felt the mock-up an important part of the project. Even though component details have been finalized, testing still goes on in the building. The structure serves as project headquarters for the SCSD staff.

bidding the individual school

Most interviewed felt that a series of bidding conferences sponsored by the SCSD staff were instrumental in getting all sides to co-operate on getting schools built:

- The PRE-BID CONFERENCE on each project was staged during the bidding period. It was designed to bring the bidding contractors up-to-date on developments and to help them with the new approach. It included SCSD staff, school administrators, school board members, architects, and bidding contractors.

- The POST-BID CONFERENCE related to more specific

details and included the successful contractor and subs, labor representatives, architect, owner representative, and SCSD staff.

Probably the most significant point to come out of the interviews, from the standpoint of the project as a whole, was constant evidence of the educational and leadership roles played by the SCSD project staff. This should not be forgotten in dealing with future efforts.

THE SCHOOL CONSTRUCTION SYSTEMS DEVELOPMENT PROJECT STAFF MEMBERS DURING THE COMPONENT BIDDING PHASES:

Ezra D. Ehrenkrantz, AIA, Project Architect
*John R. Boice, Project Co-ordinator
Charles M. Herd, Consulting Engineer
Christopher W. Arnold, Architect
Visscher Boyd, AIA, Architect
Vernon Carl Bryant, Jr., Architect
Bert E. Ray, Architect
Peter Kastl, Architectural Assistant

*Dr. James Laurits was originally Project Co-ordinator; both men are educators.

USING THE SCSD COMPONENTS IN NEW YORK STATE

If the Mid-Hudson districts were to adopt the first approach mentioned in the text -- that of simply reusing existing components -- they would be first attracted to the SCSD components. The fact is they are recently developed and highly sophisticated. This is not limited to the successful components, either; many of the unsuccessful bidders, using SCSD as a guideline, have developed competitive systems that do the job.

There are factors that make outright use of SCSD results a problem in New York. These do not arise from defects in the components themselves, but rather from differences in design criteria between California and New York. The following is a summary of the problems that would probably force modification of SCSD components in New York:

<u>one-story design</u>

- The SCSD design criteria called for less than 2% of California schools to be on a second floor. Rising land costs, urbanization, and an increased need to use land more efficiently is leading to more 2- and 3-story solutions.

- The SCSD air handling units, designed for rooftop use, work best in one-story schools. The problems of vertical risers for air complicates the SCSD unit.

- The SCSD structural components are most efficient when used on a one-story 60' span. The need to compensate for heavy upstairs floor loads in a 2-story system will cut spans down, utilizing the components less effectively. The tables at the end of this section list some of these loads (to be considered in relation to the SCSD base requirement of 20psf live loads).

campus-plan design

- For many reasons, California architects are finding that the SCSD components are leading to designing schools composed of several 15,000-20,000 square foot units rather than a compact building. The air conditioning system works best when used in the smaller buildings. There is a problem in fire areas; because of the low (1-hour) fire ratings of SCSD buildings, fire breaks have to be built after this amount of square foot area is built. Since the masonry fire walls cannot be easily accommodated in the component module, some architects are finding it easier to separate the buildings, using the fire-wall as an exterior wall.

- The California climate lends itself much more to this campus plan - outside corridor design approach. This would be impossible in New York.

horizontal planning

- SCSD components tend to give their schools a strong horizontal appearance. Since the roof is dead flat, there is no way of tilting the components to get other roof types.

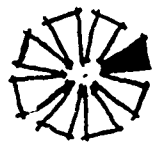
- If curves, irregular polygons, etc. are used as building shapes (as is often the case in an auditorium), the system requires a heavy horizontal soffit above the free-form.

- The problems of sloping sites (much more common in New York) are hard to handle with SCSD.

large spaces

- The SCSD system begins to fall down a little in auditoria and other large-group spaces. The air units are less efficient, and the flat ceiling does not work as well in a large group space.

- Irregular shapes, best for viewing and for acoustics, are hard to get.



roof construction

- The SCSD roof design criteria was for 20psf live loads. New York's snow problems make this an unrealistic figure for the live loads that must be accommodated on roofs - particularly flat ones. The tables at the end of this section give New York live load requirements.

- Apparently the SCSD roof must be dead flat. (If it were tilted somewhat to allow for better drainage, the ceiling would be tilted too) which may cause problems in New York.

- The policy of the State Education Department would not allow the placing of the SCSD air handling unit on the roof without special fireproofing. This probably means a concrete slab which adds heavy concentrated loads to the roof structure.

LIVE LOAD REQUIREMENTS (State Building Construction Code of New York)

	(NYS)	(SCSD)
roofs	** psf	20 psf
corridor floors	100 psf	50 psf
classroom floors	60 psf	50 psf
large-group areas (moveable seats)	100 psf	50 psf
stairways	100 psf	75 psf
kitchen areas	75 psf	
toilet areas	60 psf	
stage floors	150 psf	
workshops	80 psf	
locker areas	75 psf	

** Roof live loads

40 psf - Ulster County area, Northern Dutchess
35 psf - Northern Orange, Southern Dutchess, Southern Putnam County areas
30 psf - Southern Orange and Southern Putnam

ROLE OF MANUFACTURERS IN SYSTEMS APPROACHES

When Ezra Ehrenkrantz conducted his own feasibility study for what was to become the SCSD project, it was the opinion of the manufacturers that they needed a guaranteed market in order to develop new building components that dictated many of his subsequent actions. Now that a systems project has been attempted, the Study Staff was interested in interviewing participating and non-participating manufacturers to get their reactions to SCSD and systems in general. Here is a consensus of these interviews.

Why Some Companies Did Not Enter SCSD

While there are many reasons -- some obvious, others known only to those directly involved -- for non-participation, these were brought out:

- A reputable manufacturer interviewed did not decline to bid because of lack of interest or disagreement with SCSD principles. This is probably true of a great many other firms.

- SCSD requirements stated that work was to be bid in place. This probably "scared" away manufacturers with no experience or interest in field work.

- In some cases participation in SCSD would necessitate competing with good customers; as prime producers of building materials, some manufacturers would not want to become involved in making end products from these materials.

- Some firms are not staffed to handle product design.

Motivating Forces for Firms Entering SCSD

It becomes obvious, on interviewing both successful and unsuccessful components bidders, that all were looking beyond the SCSD market. Some made extensive national market surveys before entering the competition. The feeling was that while the $30 million SCSD market may have offered proper incentive to some types of manufacturers (such as partition and mechanical producers), it was in itself too small to warrant the development costs in other areas (structural and ceiling systems).

Certainly, most of the firms entering SCSD have been working on the mote-than-regional introduction of their products to the building market. Inland Steel, winner in the SCSD structural and ceiling fields, has built a large plant to produce the SCSD type components. The components have already been scheduled for use in non-SCSD schools.

Butler Manufacturing Company, an unsuccessful bidder on the SCSD structural, has already marketed its space-frame structural system. This has also been used in schools already under construction. Lighting-ceiling systems, manufactured by at least two other companies are compatible with the Butler structural system.

Probably the SCSD partitions, manufactured by the E. F. Hausermann Company, required the least development work. The partition was already on the market and small modifications made it available for SCSD use.

Lennox Industries, winner of the SCSD air conditioning contract, has already made plans to modify its component for Eastern use -- providing variations for hot-water, direct-fired gas, and direct-resistance electric installation. It is interesting to note, too, that Lennox sublet all ductwork in its SCSD schools; they, too, did not really want to move too far astray from their traditional role as manufacturer-supplier of construction materials. Other corporations are

now working on and manufacturing similar and competitive rooftop units.

Manufacturer Roles in Future Projects

From the interviews it was pretty well maintained that some SCSD-competing manufacturers would probably not be interested in starting in from scratch again, UNLESS they were convinced that this would be the best way to satisfy a national market. These manufacturers would, however, be interested in making such minor modifications as might be necessary to meet universal (rather than local) requirements.

It must be recognized, though, that these manufacturers cannot speak for (a) companies in product lines other than those covered by SCSD and (b) companies not at all involved in the SCSD project.

THE INEVITABILITY OF SYSTEMS

An editorial by Jan C. Rowan in the October 1964 issue of Progressive Architecture.

IDEAS ALWAYS FLOW IN CYCLES and we are back, it seems, at a period of reawakened interest in the possibilities offered by prefabrication. Our theme . . is that industrialization in the building industry - the preassembly of large components, even whole structures - is inevitable.

The early modernists were, of course, fascinated with prefabrication. Some even staked their money on it, as the whole Bauhaus group did when it financed a prefabricated house system and promptly lost its investment. But in those days in the 20s and the 30s, prefabrication and the concomitant mechanization of the design process was hailed as an illustrious and sacred goal. It was an age when technology was looked upon as a god of salvation who would relieve the suffering of mankind.

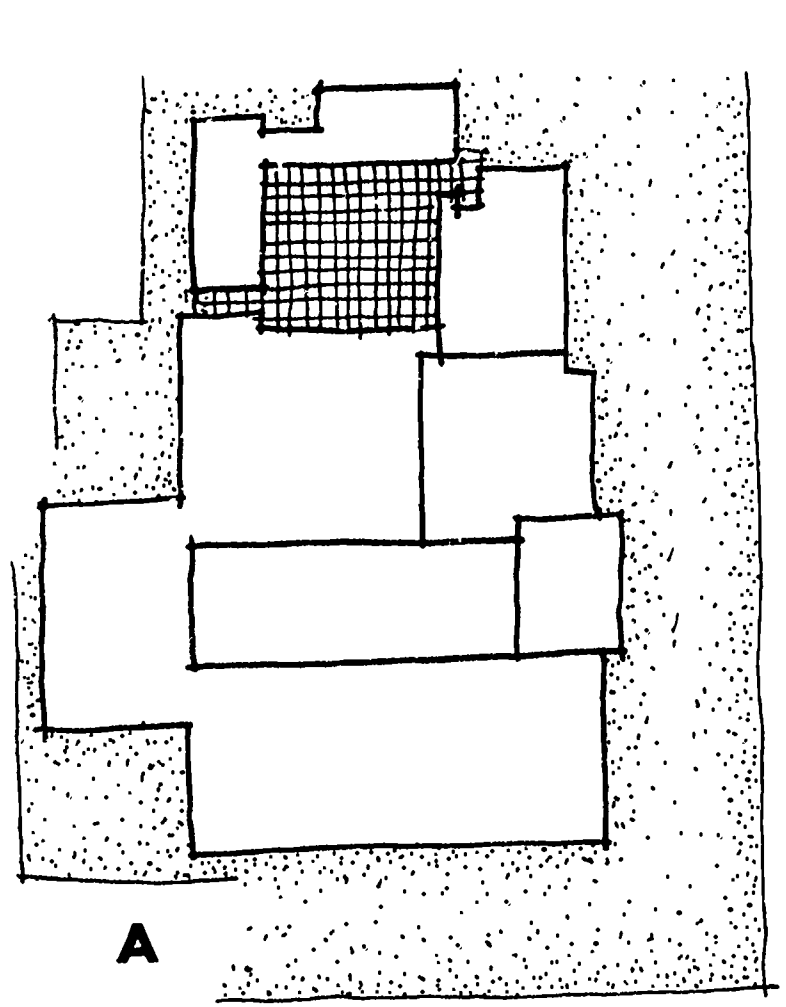
Today, we are wiser and we know that machines, by solving some problems, only create others. But we also know that the world cannot stand still. Our job, we feel, is to try and shape what inevitably has to come to our liking - to make the new worlds, as they keep coming along, more bearable than they would be otherwise. We are no longer starry eyed about the future, for it is not likely that it will be better than the best of the past, but we realize that the present methods of building design and construction are inadequate for existing and future conditions: we know that a change must be made.

For creative architects to be mere assemblers of various erector sets is not a pleasant prospect. A true work of art must be designed down to the last detail in order to be complete. Why, then, do we look favorably upon the concept of prefabricated buildings?

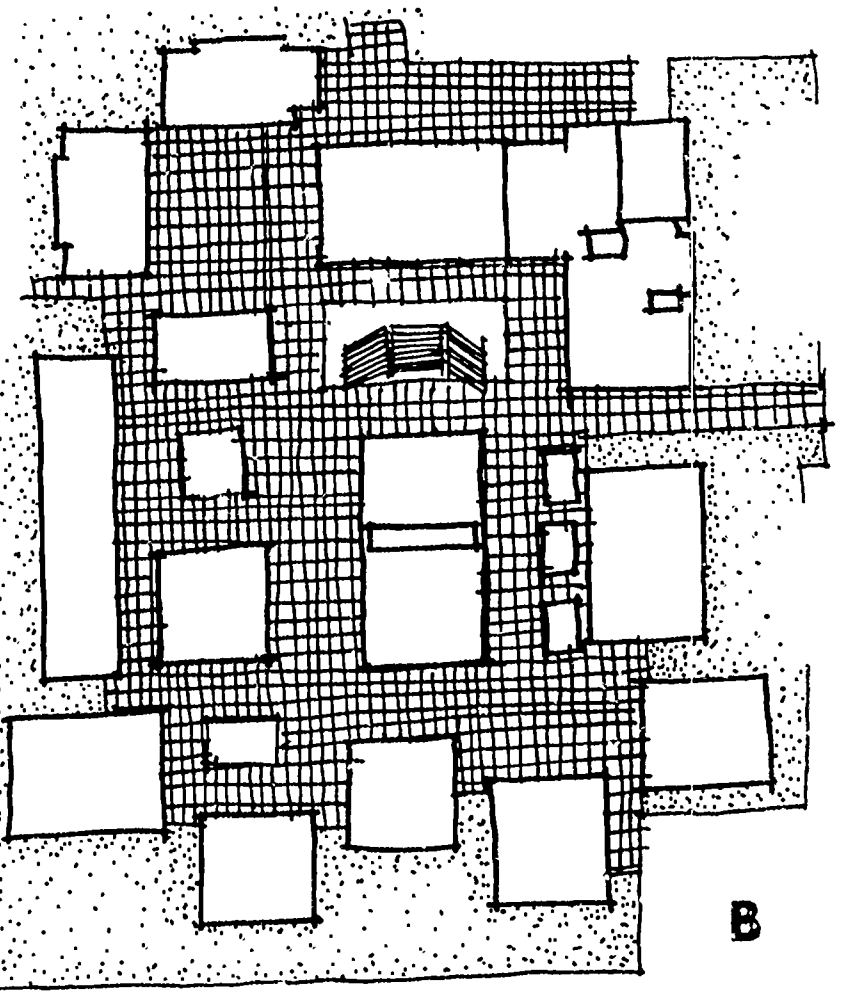
First of all, we doubt that there are enough truly creative architects who can design systems that are superior to what prefabrication could produce. Secondly, there will not be enough architects of any description who could properly design all the details of the fantastic volume of buildings that will be needed in the future. And thirdly, prefabrication might be the solution to the problems created by sylistic incoherence in our environment, because the basic bones of our cities, all the "anonymous" elements, could at last have a unity that is not achievable when individual architects constantly strive to outdo each other, although the few "foreground" buildings each community needs could still be "custom-made" by the truly gifted masters.

TWO SCSD SCHOOL PROJECTS

Below are the site plans of two school buildings being built with the SCSD components. Even though both were designed by the same architect, they represent varying planning philosophies: compact planning (A) and campus planning (B). The architect felt that the SCSD components were somewhat more adaptable for the campus-plan school; some reasons for this are discussed on pages 104-105.



A



B

REACTIONS TO ARCHITECT-INVOLVEMENT IN DESIGNING COMPONENTS

As part of the Feasibility Study, a number of practicing architects and others involved in components approaches were asked about having the project staff actually design the components. What follows are some random quotes on a point that still remains quite unsettled.

"I really think that it would be better to make it 'feasible' for the project staff to design its own components . . . This must be more economical than the California SCSD method. Far healthier in view of free market dynamics. Work and products will not be restricted to individual firms. Development costs will not remain concealed in bid prices (for years to come). Greater interest of manufacturers and unions will be maintained over the years. The "market guarantee" question drops out altogether because usefulness of a specifical product is not restricted to a region or even state".

"Do I detect an inclination . . to want to do the design work in-house? I agree that this might save ultimately a lot of R&D money. This is a typical competition situation where everybody but the winner loses money and doing the design work in-house would save all this. However, good design of such a component system requires a great deal of knowledge about materials, manufacturing techniques, marketing capabilities and so forth which might be difficult to come by. If you decided to do the design in-house I should think you would want a consulting group of representatives from the various companies that may be in on the bidding at the last".

"A project staff that would also serve as Design Team has some obvious advantages, such as control over compatibility of components, reduced research and development costs for the manufacturer, greater stress on visual appearance. On the other hand, it has a potentially fatal drawback in discouraging manufacturer interest. Losing bidders on the

package will have a hard time breaking into the 'non-consortium' market, since they would not only be trying to sell the same product as the low bidder, but presumably at a higher price".

"...I want to reiterate my strongest reaction....I think that the project staff should design the component systems for the manufacturers. The ingenuity of American industry can and will assist the project staff without the restrictions that individual company policy imposes on its R&D members, without shutting out the smaller firms lacking huge R&D ability, without creating a monopolistic situation after the awards".

NEW YORK'S REQUIREMENT OF SEPARATE CONTRACTS

Article 5-A, Section 101 of the General Municipal Law of the State of New York sets down the requirement for separate contracts on public construction work in the State:

1. Every officer, board or agency of a political subdivision or of any district therein, charged with the duty of preparing specifications or awarding or entering into contracts for the erection, construction, reconstruction or alteration of buildings, when the entire cost of such work shall exceed fifty thousand dollars, shall prepare separate specifications for the following three subdivisions of the work to be performed:

   a. Plumbing and gas fitting.
   b. Steam heating, hot water heating, ventilating and air conditioning apparatus; and
   c. Electric wiring and standard illuminating fixtures.

2. Such specifications shall be drawn so as to permit separate and independent bidding upon each of the above three subdivisions of work.

THE DISPUTE OVER SINGLE AND SEPARATE CONTRACTS

As in any real issue, there is a case to be made for either basic contracting system -- single or separate. To date, all public construction work in New York in excess of $50,000 must be handled through separate contracts made with the owner. The New York State Legislature has, however, given dispensation to the State University Construction Fund and the Dormitory Authority to choose which method of letting contracts they prefer on each project. So far, this ruling has been used to allow single contracts with the general contractor on projects run by these agencies.*

What follows is a brief summation of arguments made by both sides on the single vs separate dispute. The summary is as taken from the Report of the Special Advisory Committee on Bidding and Contracting Methods for the State University Construction Fund.**

Arguments for the Single Contract

1. The complications and interlocking of parts of a modern structure demand a single administrative authority with the power to select subordinates and enforce co-ordination; there is a benefit in time and cost in placing this administrative authority in the hands of a single general contractor.

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* General Construction, Heating & Ventilating, Plumbing and Electric.

** This Committee included Harry E. Rodman (Chairman), Norman A. Coplan, and Colonel S. H. Bingham.

2. Multiple contracts increase the owner's costs in preparing separate bidding documents and separate contracts, and in the processing of payments; there is also an increased cost to the owner in additional architect's fees for administering separate contracts.

3. The owner is protected by a single responsibility on the part of the single contractor for fulfilling the contract terms; counterclaims for damages in time or money between separate prime contractors are avoided.

Arguments for Separate Contracts

1. As subcontractors under the single contract system they do not have the protections of sealed bids, public opening of bids, and award to the lowest responsible bidder; this leads to bid-shopping and bid-peddling.

2. Studies of building practices indicate a lower cost to the owner under separate contracts.

3. There is an advantage in direct access by the mechanical trades contractors to architects and engineers.

4. There is an advantage in cost analysis and in the setting of engineer's fees in knowing the amounts of mechanical trades contracts.

5. Under a single contract, the monetary amount of the required bonds will limit the number of general contractors who can bid, and will reduce competition for the work.

6. Under the single contract, the general contractor takes unfair advantage of his position in assessing unjustified back charges and in forcing insurance coverage on a subcontractor at an unreasonable cost and with a strange carrier.

7. Pressures exerted by single general contractors will cause jurisdictional disputes and bring economic pressures on subcontractors, which are passed on to workmen.

8. Under the single contract system, general contractors are charged with the duty of administration and coordination; too often they are incapable of performing this function, and serve merely as messenger boys and brokers.

9. Under the single contract system, the difficulties of the mechanical trades contractors are such that their economic survival is jeopardized; reputable contractors will refuse to bid under these conditions and the Owner will find the work performed by marginal operators who are poorly equipped and incompetent.

10. Economic survival involves in part the financial responsibility of a general contractor. Failures or delays in payment to subcontractors are real and severe financial hazards.

VARIATIONS ON BIDDING AND CONTRACTING

The following listing of variations of methods of bidding and contracting was prepared for the State University Construction Fund by its Special Advisory Committee on Bidding and Contracting Methods. Before reviewing the list, the Committee hastened to point out that the processes of bidding and entering into contracts are really separate steps, noting that "An owner may receive a single bid and enter into a single contract, he may receive separate bids and enter into separate prime contracts, or he may receive separate bids which are formed by agreement of contractors into a single prime contract".*

Single bid - single contract

1. With no control of or participation in arrangements between the general contractor and his subcontractors.

2. With a requirement that general contractors commit themselves to subcontract arrangements and be allowed to make changes only with the approval of the Owner.

    a. Commitments to include only names of subcontractors, OR

    b. Commitments to include names and amounts of subcontracts; amounts to form basis for assuring prompt and proper payment to subcontractors;

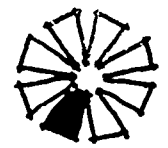
    c. Commitments made with bids on bid form, OR

    d. Commitments made by selected number of low bidders after bids are opened, but prior to award of contract, OR

    e. Commitments made by successful bidder after award of contract.

* Note: See Page 117

3. Owner supervision of bidding to general contractor to subcontractors. Bids are, however, not to the Owner, but the terms and arrangements are set by the Owner. This should include a mandated form of subcontract.



Subcontractors may choose general contractors to whom they wish to bid; general contractors have a choice of subcontract bids. General contractors must provide subcontracts names and amounts with their bids:

a. Bids are received by the Owner as sealed bids and forwarded sealed to the General Contractor. Copies held by the Owner may be opened later to check amounts with proposal of successful general contractor. This is similar to the trade-operated Bid Depository.

b. Subcontract bids received by the Owner and made public for use by the General Contractor.

Single Contract Based on Separate Bids Assigned by the Letting Agency to Successful General Contractor

1. All bids are opened at the same time.

2. Successful bidders for the subcontracting trades are first determined by the Owner, and the General contractors thereafter submit bids using such amounts of successful contractors.

Separate Bids - Separate Contracts

1. Administration and co-ordination under standard architectural agreement.

2. Specific employment of architect or other person to administer and co-ordinate, seeing to completion dates and efficient operation.

COMMENT ON BIDDING SYSTEMS AND OPEN COMPETITION

Recently there has been some reaction to the consequences of "modifying" traditional bidding systems for some end. These modifications correct "deficiencies" in the system it is true, the problem is that what is a deficiency to one is an advantage to another! The July 22 issue of Engineering News-Record presented some editorial comments representing this concern, and is worth reading. Here are some of the points made:

- Many variations and attempts to "police" the bidding process have the result of limiting competition among contractors.

- Free and natural competition among contractors is not only desirable, but it represents nothing inconsistent with the American "rule of competition in the marketplace."

- For example, bid depositories (or registries as they are sometimes called) may be legal when used for strict compilation of information, but their frequent use to curtail competition has caused them to be suspect in the courts. State and federal tribunals have already ruled against their use in some cases.

- Some types of subcontractor listings are causing suspicion for the same reason.

- As a corollary to this, the separate contracts system (which denies the owner freedom to chose to award as many or as few contracts as he sees fit) should not be required.

NEW YORK STATE AID DETERMINATION

While there are many complicated and interrelated factors that go into State Aid determinations for school construction, a quick review of New York's method can give an idea behind the philosophy of state aiding here.

The 1962 Diefendorf Formula in New York set up a "shared costs" system for allocating State Aid to construction in the state. Each district is aided according to its wealth; the way the Formula works is to relate the district's wealth (in terms of true valuation/resident pupil) to that of the state as a whole. This in turn creates a "State Aid Ratio" which is the percentage of total cost borne by the State. The terms in the Formula, and the State Aid Ratio, are re-evaluated each year.

Analysis by the State Education Department has shown that there is about $ 29,300 of true valuation behind each pupil in the average district in the State, and that this district gets 49% state aid. Using these figures as bases, the State Aid Ratio for each district can be determined,

$$\text{Aid Ratio} = 1.000 - \left[\frac{\text{valuation / pupil}}{\$\ 29{,}300} \times .51 \right]$$

This formula insures that a district which has less than average wealth will get more than 49% of its costs borne by the State, and vice versa. As far as building construction is concerned, aid can vary anywhere from just greater than 0% up to 90%. The latter is a maximum; there are no districts which are 100% state-aided.

There is one additional state aid factor operating in the case of school construction: there is a CEILING or maximum

building cost above which the state will give no aid. It will give aid at the district's aid ratio up to this ceiling; but above this point the district must bear 100% of the costs.

To determine this ceiling, the rated capacity of each building (as determined by the Division of Educational Facilities Planning) is multiplied by a "per pupil allowance." This allowance is based on the costs of average buildings and is reset monthly to compensate for changing construction costs. (Changes in the allowance are based on an index supplied by the State Department of Labor). To give an idea of these allowances, in June 1965 they were,

per pupil in grades K-6 ..... $ 1694.93
per pupil in grades 7-9 ..... $ 2471.77
per pupil in grades 7-12 ..... $ 2648.32

Of course, these figures have changed by now. This idea of a ceiling is an important one to remember, because it represents a major philosophic difference between New York and California, where the SCSD schools are being built.

California, too, has some kind of ceiling cost for school buildings. If the district is on 100% state-aid (as many are, because they are building so fast and have exceeded their debt limits), this ceiling becomes an absolute: any school costing more receives NO state aid whatsoever. While this creates a certain pressure to keep school costs down, it requires the architect to keep them down only to a point. For this reason, many California boards and architects are more interested in "getting as much value from the building dollar as possible," and not in saving money wherever possible. The latter seems to be much more important in New York.

EDUCATION DEPARTMENT ROLE IN APPROVING BUILDING PLANS

These Sections of the New York State Education Law authorize the Commissioner of Education to review plans and specifications for school construction.

ARTICLE 9, SECTION 408. (1)."No schoolhouse shall hereafter be erected, repaired, enlarged or remodeled in any school district except in a city school district in a city having seventy thousand inhabitants or more, at an expense of which shall exceed one hundred thousand dollars, until the plans and specifications thereof shall have been submitted to the commissioner of education and his approval endorsed thereon. Such plans shall show in detail the ventilation, heating and lighting of such buildings."

"In the case of a school district in a city having seventy thousand inhabitants or more, all the provisions previously set forth in this subdivision shall apply, except that the commissioner may waive the requirement for submission of plans and specifications and substitute therefor the requirement for submission of an outline of such plans and specifications for his review. Such outline shall be in a form which he may prescribe from time to time."

"In either case, the commissioner may, in his discretion, review plans and specifications for projects estimated at an expense of less than one hundred thousand dollars.

SECTION 207 of the "Regents Rules" notes that "the commissioner shall make regulations governing the requirements for the plans and specifications for the erection, repair and enlargement and remodeling of school buildings.

SECTION 165 of ARTICLE XX of the "Regulations of the Commissioner of Education" sets down the guidelines that the Department uses in reviewing plans and specifications.

STATE EDUCATION DEPARTMENT LIMITATIONS ON INTERIOR SPACE

One of the SCSD project goals was to provide a system which would allow for maximum rearrangement of interior spaces -- rearrangements that would create a variety of spaces for a variety of purposes. Many of these spaces would be small and possibly interior. There are several limitations on a concept such as this written into the "Planning Standards" used by the State Education Department. While there is no reason to believe that these standards are unchangeable, we should be aware of them as they now read.

S103-2 MAIN CORRIDORS [a] A main corridor is one which serves more than four standard classrooms or their equivalent. [b] Minimum clear widths are:

1. Without lockers or wardrobes, 8'-0" wall to wall.
2. With wardrobes with no doors or non-projecting doors on one or both sides, 8'-0" wide face of wardrobe to face of opposite wall or face of wardrobe.
3. With lockers on one side, 9'-0" face of locker to face of opposite wall.
4. With lockers on two sides, 10'-0" wide face to face of lockers.

[c] Corridor widths for large schools, particularly high schools, should be as wide as necessary for satisfactory circulation.

S103-3 SECONDARY CORRIDORS [a] A secondary corridor is one which serves four or less classrooms with not more than 150 pupils, exclusive of service areas. Consideration should be given to making these secondary corridors equal in width to main corridors for the addition of future classrooms. [b] Minimum clear width shall be 6'-0". [c] Secondary corridors are limited to 100'-0" and must terminate in an exit.

ERIC

exits

S104-1 EXIT SPACES [f] Exiting through other spaces within a building (other than through corridors) will not be allowed.

S104-5 CLASSROOM EXITS [a] Class "A" or Class "B" Heavy Timber Construction - one exit required per classroom. Door shall swing into classroom unless fully recessed. [b] Class "B" or "C" - two exits required per classroom, one of which must lead directly to the outside.*

S104-5 DIVISIBLE CLASSROOMS [e] If a classroom is planned for division into two or more separate areas by means of moveable partitions, each divided area shall have its own exit door and the doors shall be remote from each other.

S112-2 ESCAPE WINDOWS [a] Unless it has a direct exit to the outside each classroom must be equipped with at least one window of a size and design that will permit emergency egress through it. It is recommended that all classroom windows permit emergency egress. [b] The minimum clear opening are for such windows is six square feet. The minimum dimension is 24 inches. [c] Double hung, casement and sliding windows are satisfactory escape windows. [d] Escape windows are required for ground floor classrooms which face on interior closed courts designed for pupil occupancy.

window design and arrangement

S303-1 GENERAL [a] To provide a comfortable feeling for the room occupants and to bring relief to their eyes through a substantial change in focusing distance, each room used by students must be designed to allow a view to the exterior

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* Construction classes, as defined by Article 2, Section 11 of the Local Finance Law: CLASS "A": type 1 - fire resistive, type 2 - noncombustible. CLASS "B": type 3 - heavy timber, type 4 - ordinary. CLASS "C": type 5 - frame construction.

(not just the sky) from any seated position anywhere in the room. This does not apply in auditoriums, gymnasiums, and other facilities in which critical seeing conditions do not occur. [b] Glass areas should be placed and arranged to minimize brightness differences. Direct view of the sky or of bright exterior surfaces produces glare and should be avoided. [c] Classroom orientation may be in any direction. East and West orientation, however, is preferred for elementary school buildings.

S303-2 WINDOW LENGTH [a] The principal clear glass area in a classroom should be equal to, or exceed, the given percentage of glass/wall area in order to meet the following criteria:

1. If the window wall of the room is parallel to the principal axis, glass area should be 70% or more.

2. If the room is approximately square, 75% or more.

3. If the principal axis of the room is perpendicular to the window wall, 80% or more.

[b] The above percentages are the recommended percentages. The minimum accepted percentage is 50%.

S303-3 WINDOW REQUIREMENTS -- the table on the next page is extracted from that presented in the planning standards manual, and lists window requirements for various types of spaces. "Vision Strip" refers to the requirements in S303-2 above.

SPACE	VISION STRIP Reqd	VISION STRIP Recomd	NATURAL DAYLIGHT Reqd	NATURAL DAYLIGHT Recomd	NATURAL DAYLIGHT Not Req
Administration	-	-	-	X	X
Art and Drawing	X	-	-	-	-
Audio-Visual	-	-	-	-	X
Auditorium	-	-	-	-	X
Boiler Room	-	-	-	X	X
Business Classrooms	X	-	-	-	-
Cafeteria	-	X	X	-	-
Classrooms	X	-	-	-	-
Conference	-	X	-	X	-
Corridors	-	-	X	-	-
Guidance	-	-	-	X	X
Gymnasium	-	-	X	-	-
Health	-	-	-	X	X
Homemaking	X	-	-	-	-
Incinerator	-	-	-	-	X
Kitchen	-	X	X	-	-
Large Group Instruc.	-	-	-	-	X
Library	X	-	-	-	-
Conference/Office	-	-	-	X	-
Study areas	X	-	-	-	-
Work areas	-	-	-	X	-
Music Classrooms	X	-	-	-	-
Pantry, Serving	-	-	-	X	X
Pupil Activity	-	X	-	-	-
Science Rooms	X	-	-	-	-
Shower and Locker	-	-	X	-	-
Stairways, Pupil	-	-	X	-	-
Storeroom	-	-	-	X	X
Study Hall	X	-	-	-	-
Swimming Pool	-	-	X	-	-
Teachers Room	-	-	-	X	X
TV Studio	-	-	-	-	X
Toilets: Gang	-	-	X	-	-
Individual	-	-	-	X	X
Public	-	-	-	X	X
Teachers	-	-	-	X	X

Appendix . . . .

Contacts....

The following is a list of persons contributing, either in interviews with the Project Staff or by letter, their opinions and thoughts to the project. While this report attempts a consensus of views, it must be emphasized that opinions varied and specific views should not be attributed to any of these persons.

Edward Anderson, Assistant Superintendent for Business Services, Huntington Beach Union High School District, Huntington Beach, California.

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Stephen Kliment, Editor, ARCHITECTURAL AND ENGINEERING NEWS, Montclair, New Jersey.

Dr. Ernest G. Lake, Superintendent, Fullerton Joint Union High School District, Fullerton, California.

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Peter S. Levatich, Architect, Ithaca, New York.

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Herbert Paseur, Caudill, Rowlett and Scott, Architects, Houston, Texas.

Mr. Peckinpaugh, Gordon Stafford and Associates, Architects, Sacramento, California.

Bert E. Ray, Caudill, Rowlett and Scott, Architects, Houston, Texas.

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George Silverman, Fleming and Silverman, Architects, Newburgh, New York.

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Peter J. Stanley, L. H. Swenson, Inc., Contractors, Poughkeepsie, New York.

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William Sorenson, President, Building Trades Council of Dutchess, Columbia and Upper Putnam Counties, Poughkeepsie, New York.

Conway L. Todd, Architect, Rochester, New York.

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Nicholas Tomich, Architect, Sacremento, California.

Howard J. Warren, Clark and Warren, Architects, Poughkeepsie, New York.

A. J. Watt, Vice President - Marketing, United States Gypsum Company, Chicago, Illinois.

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Louis H. J. Welch, Law Division, The State Education Department, Albany, New York.

Joseph White, Vice President - Research, Inland Steel Products Company, Milwaukee, Wisconsin.

William Whitman, Rondout Electric, Inc., Contractors, Poughkeepsie, New York.

Study Committee . . . .

The study committee was established to provide guidance and direction to the study staff in carrying out the project. It includes the superintendents of three fast-growing MHSSC districts and the Executive Secretary of the Council; it is headquartered at Grimm House, State University College at New Paltz.

Dr. William J. Hageny, Professor of Education and Executive Secretary, Mid-Hudson School Study Council, State University College at New Paltz, New York. Chairman.

Dr. Harold Monson, Superintendent, Newburgh City Schools, Newburgh, New York.

Dr. E. Joseph Kegan, Superintendent, Wappingers Central Schools, Wappingers Falls, New York.

Dr. Walter Panas, Lakeland Central Schools, Mohegan Lake, New York.

Study Staff....

The study staff includes members of the faculty, Center for Architectural Research, School of Architecture, at Rensselaer Polytechnic Institute, Troy, New York.

Alan C. Green, Associate Professor and Project Co-ordinator

Wayne F. Koppes, Adjunct Professor

Harry E. Rodman, Professor

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