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

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STATE OF NEW YORK STANDARD SCHOOL PLAN TYPE D-2, ONE-STORY JUNIOR-SENIOR HIGH SCHOOL 1000 EXPANDABLE TO 1200 PUPILS.

NEW YORK STATE EDUCATIONAL RADIO AND TV ASSN.
PERKINS AND WILL, ARCHITECTS, CHICAGO, ILL.

EDRS PRICE MF-$0.25 HC-$1.24 29P.

DESCRIPTORS- *HIGH SCHOOL DESIGN, *SCHOOL LOCATION, SCHOOL CONSTRUCTION, SCHOOL EXPANSION, SCHOOL SPACE, SCHOOL STUDY CENTERS,

THE PROGRAM FOR A JUNIOR-SENIOR HIGH SCHOOL FACILITY REQUIRED A ONE-STORY BUILDING FOR 1000 PUPILS WITH THE POTENTIAL FOR ACCOMMODATING AN INCREASE OF 200 PUPILS. EMPHASIS WAS TO BE PLACED ON--(1) SHARED SPACES, WHICH WOULD OFFER EVERY GRADE LEVEL COMPLETE PHYSICAL EDUCATION, AUDITORIUM, SCIENCE, ARTS, AND LIBRARY FACILITIES, (2) SEPARATION OF JUNIOR AND SENIOR HIGH CLASSROOMS, (3) SEPARATION OF ACADEMIC AREA CIRCULATION FROM THAT OF PUBLIC AND COMMUNITY USAGE AREAS, (4) PROVISION OF ADAPTIVE FLEXIBILITY FOR INDIVIDUAL SCHOOL DESIGN, AND (5) STANDARDIZATION OF MATERIALS AND METHODS TO ACHIEVE ECONOMY. FLEXIBILITY WAS ACHIEVED THROUGH THE USE OF A FIVE BAY UNIT. SIX OF THESE UNITS PROVIDE THE CAPACITY FOR VARYING ARRANGEMENTS AROUND THE AUDITORIUM-GYMNASIUM MASS. OUTDOOR TEACHING COURTS ARE THEN FORMED ADJACENT TO THE STUDY-RESOURCE CENTER SEPARATING THE JUNIOR AND SENIOR HIGH CLASSROOMS. PROJECT AREAS EMPHASIZED ARE--(1) CONSTRUCTION DATA, (2) STRUCTURAL SYSTEMS, (3) MATERIAL CONSIDERATIONS, AND (4) MECHANICAL SYSTEMS. A FLOOR PLAN, ELEVATION, AND PERSPECTIVE ARE INCLUDED. (MH)

STATE OF NEW YORK
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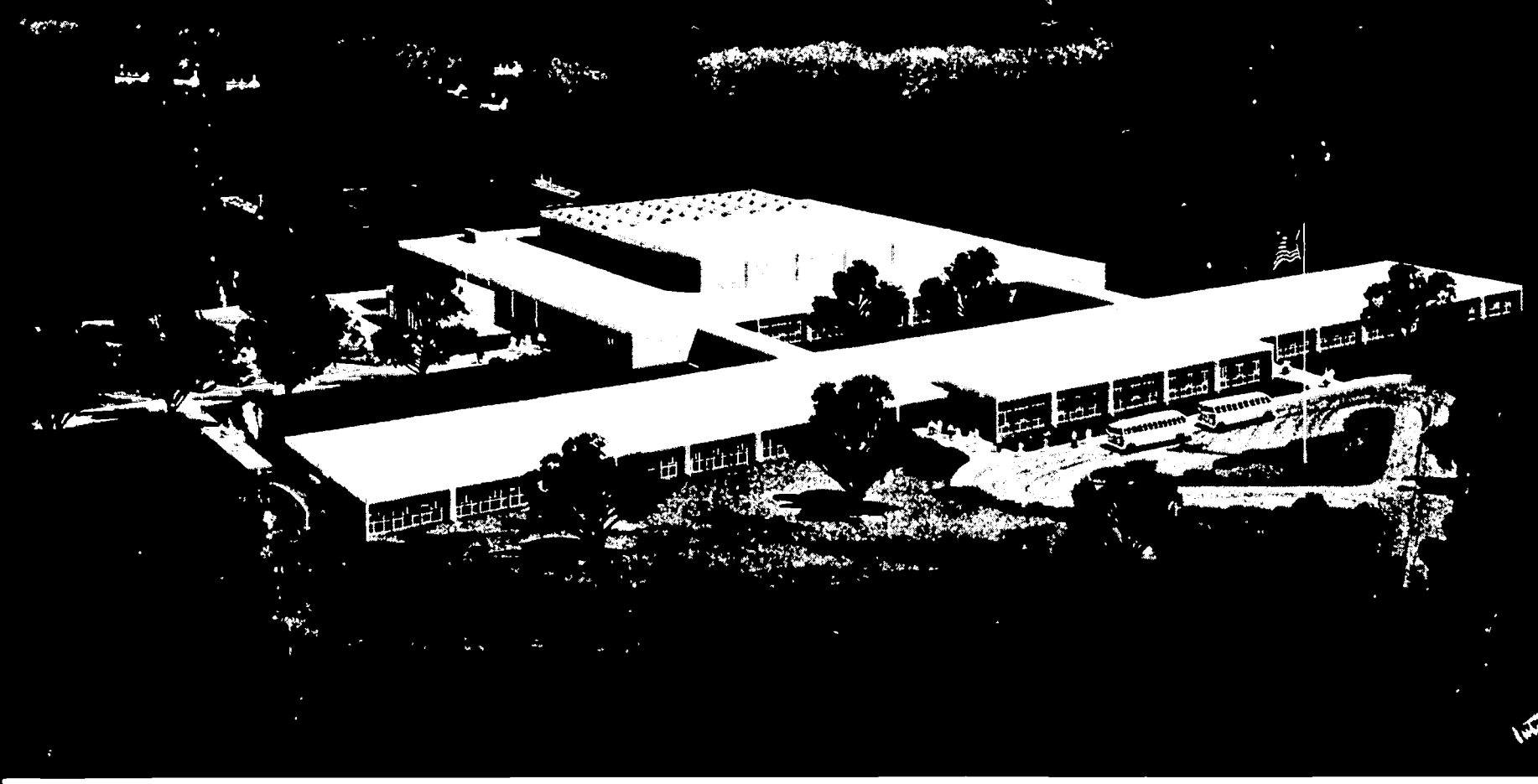
TYPE D-2



EXPANDABLE JUNIOR-SENIOR H. S. 1000 TO 1200 PUPILS • ONE-STOR

STATE OF NEW YORK

STANDARD SCHOOL PLAN

TYPE D-2, ONE-STORY

JUNIOR - SENIOR HIGH SCHOOL

1000 EXPANDABLE TO 1200 PUPILS

-REPORT-

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N.Y.S. Standard School
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THE ARCHITECTURAL PROBLEM presented by the state program for the Type D-2 school was to design a one-story building to house a Junior and Senior High School population of 1,000 pupils, utilizing the following suggested space requirement schedule provided by the University of the State of New York, the State Education Department, Division of School Buildings and Grounds. The design will accommodate an additional expansion of 200 pupils and takes into consideration, to the greatest extent possible, the varying site conditions found in New York State.

(Fig.1)

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EDUCATIONAL FACILITIES AS PROVIDED IN PLAN TYPE D-2

These correspond satisfactorily to the recommendations of the State Education Department, and as modified in conference with other educational and architectural advisors.

TEACHING SPACES

No.	Title or Use	Comments
2	Industrial Arts	Storage Additional
3	Homemaking	
2	Art	Storage in Rooms
1	Drawing	
5	Science	Storage Additional
1	Music	Suite
2	Business Education	
22	Classrooms	Varying in Size
1	Library	Related Area
2	Study Rooms	
1	Auditorium	Capacity - 700 Seats
1	Triple Gymnasium Showers, Lockers	

FOR FUTURE EXTENSION

4	Senior Classrooms	
2	Junior Classrooms	
1	Industrial Arts	
1	Music	

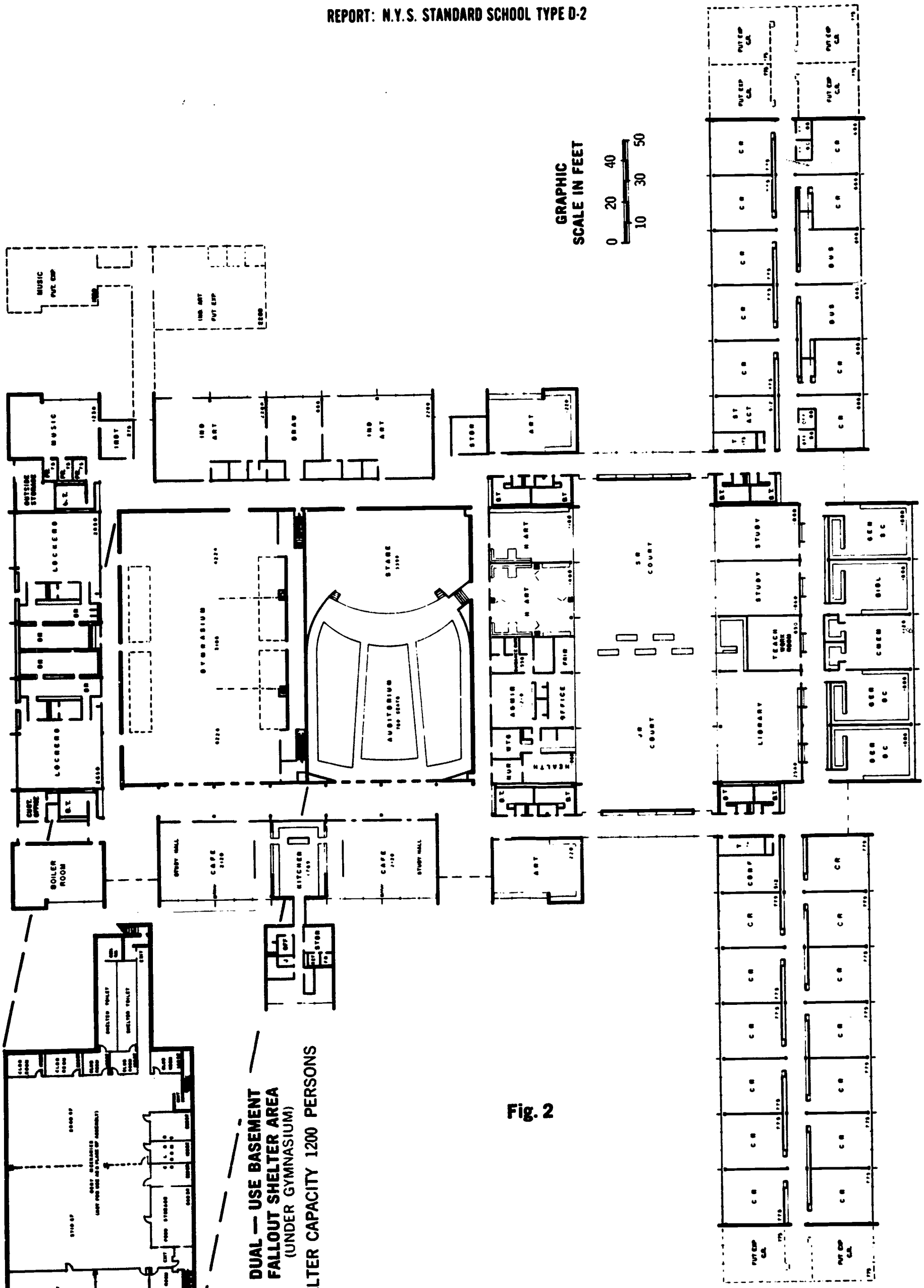
ADMINISTRATIVE, PERSONNEL & COMMUNITY SPACES

No.	Title or Use	Comments
1	Administration	Suite
1	Health	Suite
1	Guidance	Suite
2	Teachers' Rooms	
1	Teachers' Work Room	
1	Conference	
1	Student Activity	
2	Cafeteria	2 Study Halls
1	Kitchen	Related Areas

DUAL USE SHELTER AREA

2	Toilets	
1	Generator Room	
8	School Club Rooms	
1	Body Mechanics Area	
1	Conference Room	
1	Meeting Room	
1	Community Activities Area	
1	Food Storage	

NOTE: The areas of all spaces noted above can be found in the floor plans.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H ART
ADMIN
OFFICE
GIRLS
BOYS
FOUN
JR COURT
STUDY
TEACH WORK ROOM
LIBRARY
SCIENCE
BIOL
CHEM
SCIENCE
BOILER ROOM
STUDY HALL
CAFE
KITCHEN
CAFE
STUDY HALL
ART
CONF
CR
SHELTER TOILET
SHELTER TOILET
5000 SF
5110 SF
FOOD STORAGE
COMMUNITY ACTIVITIES ROOM
DUAL — USE BASEMENT
FALLOUT SHELTER AREA
(UNDER GYMNASIUM)
SHELTER CAPACITY 1200 PERSONS

Fig. 2

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PART I -- THE PROGRAM

In designing this school, the age difference in the junior high school group (grades 7, 8 and 9) and senior high school pupils (grades 10, 11 and 12) influenced the separation of the two classroom areas. The junior high school pupils have their own school and court which may be used as an outdoor teaching area, as do the senior groups. Starting with the junior high school level and continuing to the senior high school, the building is designed to house an educational program with these general aims:

1. Development of fundamental skills.
2. Preparation for future education.
3. Preparation for successful living.
4. Appreciation of literature, art and music.
5. Maintenance of good mental and physical health.
6. Recognition of the rights and duties of citizenship.
7. A proper use of leisure time.
8. Development of an understanding of one's environment.
9. Intelligent participation in economic life as a consumer and as a producer.

All the facilities of a comprehensive high school are available to both groups -- a decided benefit to the junior high school pupils. The shared facilities -- such as the physical education and auditorium -- are more complete than would ordinarily be possible if the junior high school were in a remote building of its own. This same advantage is true of the facilities for science, arts, library, and so on.

The main educational and design considerations were the separation of the Junior High classroom element from the Senior High classroom element, provision for as much flexibility as possible without extensive changes by the adapting architect, and an attempt to achieve a great degree of economy through the use of standardized materials and methods.

The junior and senior high school classroom areas are visualized as placed at the "front" of the site. It is here the buses will load and unload. Other traffic will be directed to the parking facilities closer to the administration, cafeteria, and gymnasium areas. Hence, there is a minimum of traffic at the bus loading area, visitors do not have to pass through the academic areas to reach the public or office facilities, and when the building is utilized for community use, most of the academic areas can be closed off.

--- DESIGN DEVELOPMENT

In order to provide real flexibility in this design, a Unit was developed, consisting of five bays consistent in size and structural layout. Each bay has four corner columns whose center line dimensions are 27'-0" in width by 39'-6" in depth.

All of the following Units consist of five bays:

1. Library and Study Halls
2. Science Department
3. Administration, Health, Guidance and Home Arts Departments.
4. Cafeteria and Kitchen
5. Lockers and Shower Rooms
6. Industrial Arts Department

It was concluded that the best solution was to locate the Library and Study Hall Unit, and the Science Department Unit between the Junior High Classrooms and the Senior High Classrooms, because these Units serve both Junior and Senior High a greater percentage of the school day than the other Units listed.

The Administration, Health, Guidance and Home Arts Department Unit has been located directly across an open court from the Library and Study Hall Unit and on one side of the Auditorium Gymnasium. The other three Units, namely, the Cafeteria and Kitchen Unit, the Lockers and Shower Rooms Unit, and the Industrial Arts Department Unit are disposed around the other three sides of the large Auditorium-Gymnasium mass.

However, it is possible to effect a great degree of flexibility in plan to satisfy specific local educational and/or site requirements.

Any of the six, five-bay units can be interchanged in the positions around the Auditorium-Gymnasium mass or between the Junior High classroom element and the Senior High classroom element, as long as certain relationships are preserved. The Kitchen Service area must always be located to provide service by an access road. Delivery access, to a lesser degree, affects the location of the Industrial Arts Unit. The relationship of the Locker Rooms to the Gymnasium and also to the playing fields should be preserved when adapting this school to accommodate local site or educational needs.

The outside corners of the lower mass around the Auditorium-Gymnasium consist of: (1) Boiler Room, (2) Music Department, (3) and (4) Arts and Crafts. These four units can also be interchanged to meet conditions of a specific school district.

The Library-Study Hall offers an opportunity for the local school to utilize the space to meet the local educational program. With the library used as the school's Study-Resource Center, the rooms indicated as "Study" could be utilized as individual and group study areas, electronic teaching laboratories, or for any number of new and changing teaching tools. The rate of change in this country's scientific and technological achievements has turned yesterday's flight of imagination into today's reality. Even though ability to adapt inventions to useful and productive ends often lags behind mechanical inventiveness, the present rate of technological progress virtually assures that the mechanical aids now being used in the schools will be greatly different twenty years from now. Judging from the

rate of growth in new educational media and their assimilation into the processes of education, it is essential that provisions for flexibility, expansibility, and ease of alteration be understood by school districts contemplating this standard plan. With the inclusion of the two "Study" rooms in the Library complex as uncommitted space, the adapting school district is free to use this as a nucleus for a variety of educational programs and teaching techniques.

The Industrial Arts area was purposely placed in proximity to the stage. In this location, it makes a logical area for set design, permitting those more interested in behind-the-scenes activities to be exposed to the other elements of the theater. Its location facilitates delivery of supplies and equipment.

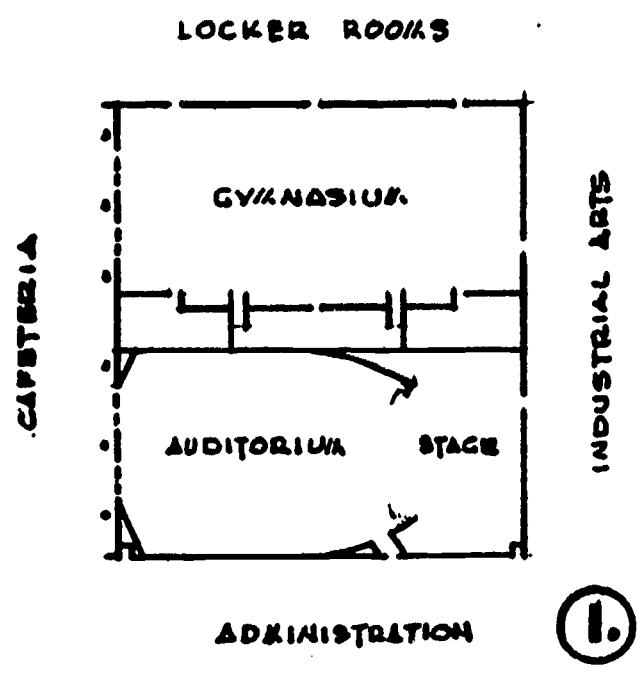
The cafeteria is planned to accommodate two eating groups and four teaching stations. It is visualized this plan, with the kitchen between, will be utilized with the Junior High School using one cafeteria area, the Senior High School the other. A movable partition in each eating area gives flexibility in teaching station arrangement -- large room for large groups; two smaller rooms for small groups. The cafeteria areas are also planned for intermission and half-time use for auditorium or gymnasium events.

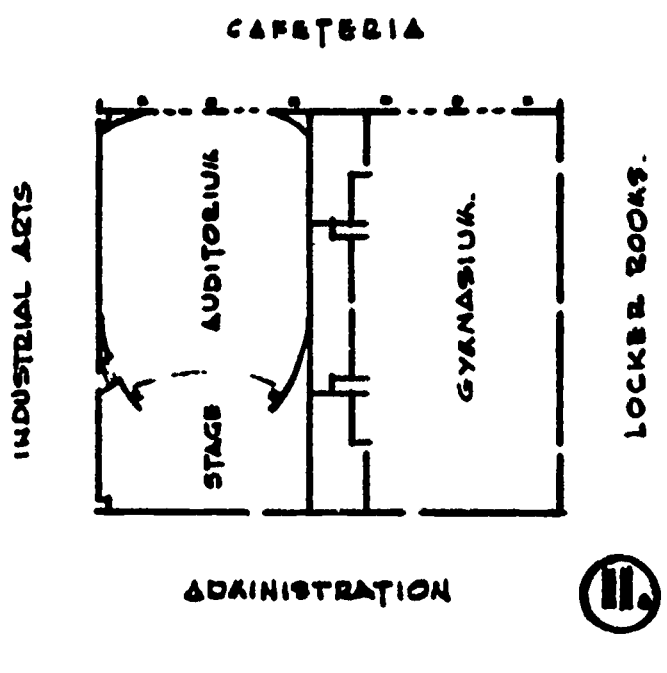
Note, too, how these facilities are planned for ease of use by the Community. Parking is immediately adjacent to the cafeteria making these facilities self-contained and separate from the academic units.

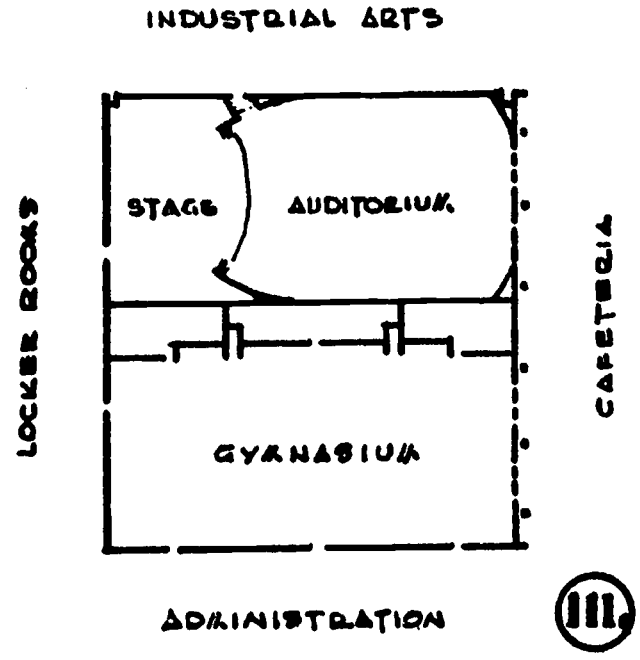
It should be noted that the maximum amount of mechanical lines are located above the bottom of steel joists. Care has been exercised to conceal as much of this work as is possible within reasonable economic limits. It is possible that the adapting architect will find that this condition could be better handled by locating most of the mechanical lines in a peripheral pipe trench under the slab on grade.

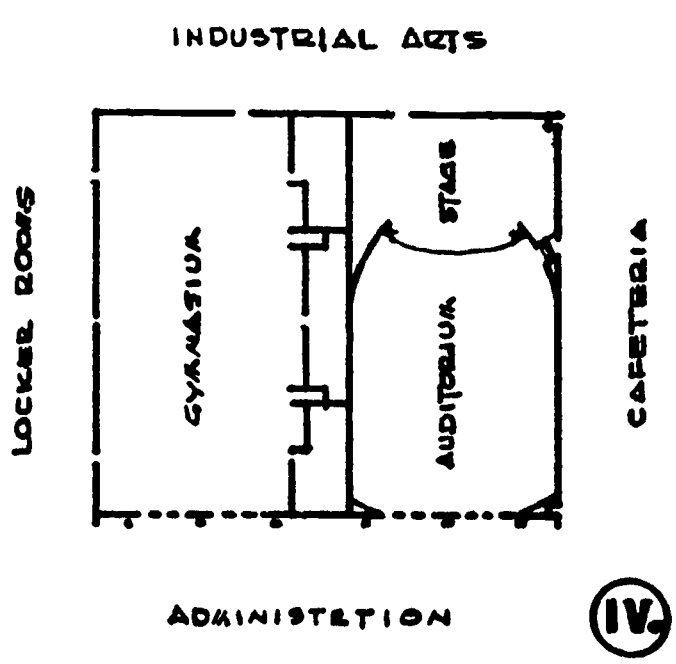
Recognizing that economy can be effected greatly by the design of a school building, it was assumed that if other factors were equal, a school board would choose a site which would reflect economies in construction. Therefore, the remaining important elements which will achieve an economical building are basically the choice of materials and the installation of these materials. This latter factor becomes increasingly critical. To accomplish this objective, as few different materials as is possible are used, while still maintaining selections consistent with accepted good practice and their proper installation. These materials are well known throughout the state. All methods are simple, direct, and without any tricks. The overall result will provide the contractors the opportunity to purchase materials in volumes warranting low prices, and also receive the maximum production possible from their work crews. Building construction time will be at a minimum which of course should reflect savings realized by the contractor in financing the project.

The Auditorium-Gymnasium could be turned to occupy three other positions in addition to the one shown on the working drawings.









(Fig. 3)

--- OTHER DESIGN CONSIDERATIONS

A campus type plan was rejected because this type of solution requires an extremely careful study of the site on which it is to be located. Sites vary considerably throughout the state, and a campus plan would be extremely arbitrary and the time spent adapting it by the Architect would serve to minimize the advantages of a standard plan.

Careful considerating was given to the "team teaching" concept, and the possibility of designing a school which would be compatible with this education method. However, this solution was also rejected. Although there is the possibility that "team teaching" will be accepted and used to a greater extent in the schools of New York State in the future, the entire idea of the Standard School and indeed the program itself requires a solution which would find broad acceptance within the projection of a reasonable period of time. It should be emphasized that the school shown does not preclude the possibility of economical alteration to satisfy the space requirements of team teaching as it has been developed educationally at this time.

The design of this Junior-Senior High School is consistent with certain general goals of all good educational programs. The formative years of a child's life include those spent in grades 7 through 12, especially the junior high school. This building was designed to aid a program which assumes the responsibility to:

1. Assure a gradually increasing freedom as the child demonstrates his ability to practice self-discipline.

2. Provide opportunities for the child to make choices and assume responsibilities which a democracy imposes on its citizens.

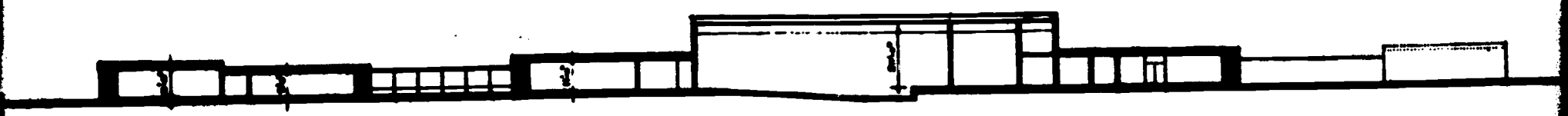
3. Give practice in the give and take of group planning, living and evaluation.

4. Maintain an atmosphere so each child has a feeling of security and worth as an individual.

5. Help the student body develop personal and social values.

6. Stimulate spiritual values to help the child act toward others with intelligence and understanding.

PART II -- TECHNICAL INFORMATION



SECTION A-A

(Fig. 5)

A. GENERAL

Drawings and Specifications - There are certain general items which the adapting architect should consider. The General Conditions of the Specifications should be reviewed. If local custom or use indicate, those articles affected should be revised to better conform to the local conditions.

In addition, the adapting architect must complete the working drawings and specifications in respect to fitting the building to the site by providing sub-grade structure, as well as connections from the public or private service utilities to and from the building.

We have presented a plan with great flexibility and suggest that the adapting architect use his good judgment in using this flexibility, to best accommodate the various site requirements.

The plans and specifications represent a school as economical as possible, commensurate with reasonable maintenance. The adapting architect should analyse various suggested alternates or others of his own choosing which might better satisfy a specific school site, locale, or consideration.

The adapting architect must also provide certain documents such as "Invitation and Instruction to Bidders", as well as "Proposal Forms" which should include the Base Proposal and a list of Alternates to the Base Proposal which are to be required by the particular Board of Education. He must advise the Board of Education on acceptance of bids and supervise the work during the construction period.

Physically Handicapped - Facilities for physically handicapped children have been incorporated in the drawings and specifications. A wheelchair toilet stall and water closet has been provided in one boys' toilet room and one girls' toilet room. All lavatories and drinking fountains are installed at heights amenable to the physically handicapped. All of the single main entrance doors are 36 inches wide and have level entrances except for a 3/4-inch threshold.

Provisions for Fallout Protection - The dual use fallout shelter included in this school was developed by the D.P.W. in cooperation with the Education Department and can be utilized in a variety of ways to augment the school program and the affairs of the community. Suggested functions which the shelter space might serve are: meetings of scouts groups on all age levels, meetings of other community organizations and school purposes such as student government quarters, publications rooms, recreation, areas for a variety of remedial purposes, administrative offices, large group instruction and audio-visual activities.

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The plans for the shelter are architecturally and mechanically complete with the exception of the structural design for the sub-grade work. This work is to be completed by the adapting architect to meet whatever the existing soil conditions might be.

The size of shelter space, the capacity of the mechanical systems, and the provisions for food and water storage are based upon the expanded capacity of the school with a proper allowance for teachers and staff. Any special conditions which will affect the capacity of the school will require changes in these factors of the fallout shelter design.

The location of the shelter under the building was made to obtain the best protection at the lowest possible cost. A change in the location of the shelter will necessitate additional shielding design. Shielding has been obtained by both separating with distance and with mass, the planes on which radioactive particles will rest in relation to the shelter area. It is to be noted that any dimensional or material changes in the area above the fallout shelter may affect the shelter design. For this reason the minimum mass of the interior partitions, floor construction, and total overhead construction upon which the shelter calculations have been based are indicated on the drawings. If materials of lesser mass than the tabulated values are used redesign of shelter will be required. It also has been assumed in the calculations, that finish grade is never below the bottom of the first floor slab around the shelter area. It is, therefore, necessary to maintain this grade in order to avoid redesign of shelter.

The shelter plan indicates emergency water supply in a group of tanks within adjacent crawl space. Wherever an adequate supply of well water can be obtained it is suggested that the adapting architect substitute it as the fallout shelter water supply. Use slab on grade construction in place of crawl space. The plans show self-contained toilet facilities in the form of sanitary tanks fitted with toilet seats. Wherever a septic tank and leaching field are available and the supply from the well is adequate, it is suggested the adapting architect substitute a system using periodic flushing of waste. Generator capacity should be checked, however, to be sure that an adequate power supply is made available, during the emergency period, for these possible substitutions.

The shelter area is designed for a minimum protection factor of 100 by use of "Design and Review of Structures for Protection from Fallout Gamma Radiation", an official Office of Civil Defense, Department of Defense Publication. In this respect it meets requirements of the New York State Civil Defense Commission.

Any changes to the shelter as specified and shown on the drawings should be discussed with and approved by the New York State Civil Defense Commission.

Modular Method - In order to achieve uniformity for the whole program as well as an organized method of use and dimensioning on this school, the modular method was used. This method can best be described as a 4-inch grid overlay on the entire building. Many manufacturers have set up their dimensional manufacturing process to fit their product into this 4-inch module. The dimensioning used with this system is to identify any point which is located on the 4-inch grid with an arrow and any other point by a dot. The purpose of the method is to achieve economy of manufacture and particularly of installation through the use of "modular" materials. It will increase in effectiveness as more and more manufacturers subscribe to the principle.

Expansion - Central facilities have been provided in the school to handle an increased enrollment of 200 students (20%). This increase in population would be as indicated on the block plan (see Fig. 2, page 3), as follows: 2 Junior High teaching stations could be added to the Junior High Wing, 4 Senior High teaching stations could be added to the Senior High Wing, and a connecting unit would house one Industrial Arts teaching station, one music teaching station and one teaching station for Junior or Senior High School Agriculture.

Sound Insulation - Sound insulation in this school is accomplished in several ways. By design, we separated those elements which are generally noisy from the quieter areas. By installation of materials, we have prevented noise, of intensities which might disturb, from passing from one area to another and have absorbed noise or reinforced it depending on the requirement. We have used gypsum lath and plaster partitions between teaching space and other areas, which obstructs the passage of sound. Classrooms and the gymnasium have exposed absorptive decks; corridors, administration areas, and other special teaching areas have acoustical tile ceilings. Their purpose is to absorb noise and prevent a carom of sound energy back into the area. The auditorium ceiling, to the contrary, is a curved hard surface, as are the side walls, to reinforce and obtain good sound mixing. The back wall of the auditorium is constructed of sound absorbing material to prevent "echoing". Music practice room walls are non-parallel and of absorptive material. The public telephone alcoves, off the corridor near the auditorium, have sound absorptive walls to satisfy the requirements of the use of this space.

B. CONSTRUCTION

Roof Deck - A $2\frac{1}{2}$" and 3" insulated deck is specified in all areas except the Boiler Room, to provide sound absorption in those areas of exposed deck, as well as an integral heat loss barrier. Although this installation might result in condensation problems in those portions of the state which normally register low temperatures during the winter months, the resultant savings of the exposed deck is a strong factor of consideration for the greatest portion of the state. We also considered the additional cross bracing strength obtained from the

bulb tee deck supports which are attached to each open web joist in passing. The deck material is light in weight and easily handled from ground to roof. This factor provides fast installation and the numerous advantages realized when the building cover is installed early in the construction period.

The boiler room roof deck specified is a $2\frac{1}{2}$" concrete plank clipped to the open web joists. This provides a deck level with surrounding areas and when included with a vermicu'.te plaster ceiling under the joists, results in a reduced premium for fire insurance coverage.

A poured gypsum deck, or a metal deck were considered. If a gypsum deck were to be used, the overall thickness of the base material plus the insulation would result in an increase of 1" in thickness.This will require a larger metal cap at the fascias or a larger and very uneconomical size of the asbestos-cement board fascia. The dry out time of a poured gypsum deck was also considered as well as the complications that inclement weather conditions can cause if this material were used.

A metal roof deck has many advantages. It provides rapid roof erection and is an extremely strong system in as much as the welding of deck to the joists result in a diaphragm type structure. This increases the strength in each bay and ties the whole roof together in a much stronger manner than if other methods and materials had been used. However, its use must be considered in conjunction with required acoustical work. If acoustical tile ceilings not used, then sprayed on acoustical materials must be applied. The resultant costs of either of these acoustical applications must be evaluated by the adapting architect to decide whether the metal deck roof insulation and the acoustical material should be substituted for the bulb tee and structural insulated deck specified.

Roof Insulation - If a metal deck is used, the thickness of insulation must be determined. This determination can be made by an investigation of two main factors. The first is to locate the dimensional position of the Dew Point based on the thickness of insulation. The purpose of this investigation is to ensure that the Dew Point will fall above the vapor barrier and as a result, provide a dry interior surface on the metal deck. It was determined, that for the temperatures normally encountered throughout the state, one inch of insulation satisfied the requirements, if the overall roof construction "U" factor is .15.

The second investigation involved checking the amount of fuel savings in dollars that are possible with insulation thickness greater than one inch. Using a figure of 6900 degree days and a price of $.10 a gallon for fuel oil for a general consideration, it would take 60 years of fuel savings to cover the additional cost of 2-inch roof insulation, and approximately 40 years of fuel savings to cover the additional cost of 1-1/2 inch roof insulation. As these time periods are substantially beyond the usual 30-year bond period for most school districts, it is suggested that this addition of insulation thickness is uneconomical beyond the one-inch specified.

Gravel Stop-Fascia Flashing - One of the requirements for this material is that it should provide a positive visual division between building and horizon. It should also be easily workable without showing "waves" as a result of installation; nor should it "bleed" down over the fascia. This "bleeding" would require extra painting maintenance. Vinyl coated zinc fulfills all of these requirements.

In those locations where "bleeding" is not a problem or where the metal is not in normal visual comparison with other metals - the curtain wall for instance - the use of copper is recommended.

Skylights - A domed type skylight seems most appropriate because of a proven condensation ring which adequately handles the accumulated water. Experience with the integral type of insulated curb has been particularly good and results have been superior to those installations in which a "job built" curb was used. Stripping in the flange of these integrated curbs into the plies of roofing felts is simple and effective.

Fascias and Soffits - The two most important factors to consider when selecting any material to be installed on the exterior of a building, are the material's impermeability and durability. Cement-asbestos board was selected for the fascias and soffits of this building because it is fireproof, waterproof, and easily maintained. In addition, it is an extremely dimensionally stable material and as such is practically immune to cracks in its surface caused by changes in temperature or from weathering. It can be cut with a carpenter's saw and drilled for nail or screw attachment with a wood drill. As a result, installation is rapid and only average skill is required to obtain a good finish. Because this board is made from asbestos fiber and Portland cement, no special work is required at exposed edges.

There are other materials which could be substituted for the cement-asbestos board, but it is suggested that, if any of the following described materials are to be used, serious consideration should be given to the points covered in this report in regard to them.

Plywood for use on the exterior of a building should have its veneers glued together with an exterior grade resorcinol type glue. All edges must be protected from the weather, and although not absolutely necessary, experience suggests that plywood with a plastic coated face receives paint better and is of course protected from excessive "weathering".

Cement Plaster could be used as a substitute for the cement-asbestos board, particularly for the soffit finish. However, special care must be exercised to prevent cracks in the surface which would then render the area permeable. Expansion-contraction joints must be used to prevent this condition.

If Porcelain Enameled Panels are used, care must be exercised to provide proper attachment of the panels to the blocking. It is recommended that a concealed method of attachment is much more satisfactory than the exposed surface method which pierces the exterior finish and thereby subjects the panels to possible surface "crazing" and/or erosion.

Cast or rib-reinforced aluminum metal panels provide the durability required, but checking of all joint detailing is necessary. Cost analysis is desirable if a tight budget is the target.

Exterior Curtain Wall - Steel frames are indicated for the curtain wall in the interests of economy and the unlimited choice of finish color. Although aluminum frame curtain wall has a higher first cost, maintenance would be lower. If selected for use we would suggest that similar profiles be utilized and that stainless steel backer inserts be incorporated for the attachment of all hardware.

The center panels of the curtain wall are either fixed glass or casement type vents, except in the locker rooms where the upper panels are either fixed glass or casement type vents. Opening vents is accomplished by means of a manual crank at stool level for those in the center panels and by means of an extension crank for vents in upper panels.

It should be noted that the typical lower and upper panels of the curtain wall are shown in a cement asbestos board installed in the frames with metal stops. The interior backup is made up of an insulation board-plywood panel. Cement asbestos board was selected for its low maintenance and weathering ability. From a design standpoint the possible color combination on the cement asbestos board has many pleasing advantages.

There are other materials which could be used in these locations. A plastic faced plywood or an opaque tempered glass exterior panel could be "stopped-in", using the interior backup panel referred to above. A flanged sandwich panel could be inserted into the frames. These sandwich panels could be made up of a plastic coated plywood or a cement-asbestos board exterior face with insulation board and interior finish face of hardwood plywood to make up balance of the sandwich. Porcelain enameled panels with insulation between the outer flanged metal sheet and the interior metal sheet would also be a good substitute for these typical upper and lower curtain wall panels.

Regardless of the panel material, no deviation should be made from the installation by metal stops. Putty or glazing compound is not satisfactory for this specific work.

Interior Partitions - Steel studs, with rock or wire lath and plaster were selected for interior partitions. Of all possible incombustible partitions, this type will provide the greatest flexibility for wall installations of mechanical, and particularly electrical work. This advantage is not restricted to the work during the original

construction period, but applies to even a greater extent for required electrical or sound installations that might be incorporated at a future date. This latter point is a very important consideration inasmuch as the educational use of audio-visual equipment is being expanded at a tremendous rate.

This type of partition is also excellent in its sound insulation qualities. This attribute is of particular consequence in controlling sound transmission between classrooms. As an example of this quality, the system is rated approximately 10 decibels better in sound insulation than a standard 6-inch concrete block partition, over an average of five different frequencies.

If these considerations prove to be undesirable in a specific school district, the dimensional requirements for a change to 6-inch block partition require no adapting and the detail changes are insignificant.

Hollow Metal Frames - The choice of metal instead of wood for the interior frames was made for two reasons. Both of these reasons were based on a continuous attempt to achieve a consistent pattern of selection throughout a fairly large building complex. With the exception of cabinet work and equipment, an attempt is made to keep all materials of an incombustible nature. Although there are those that would argue the question, there seems to be a consensus which would advocate the use of metal for frames for lower maintenance possibilities.

If wood frames should be substituted for the hollow metal types, it is strongly recommended that the same hardwood selected for the cabinet work be utilized for this purpose. Adapting details for the use of wood would be minimal if the same concept of profile detailing were followed. It is to be noted that there are a minimum number of different shapes and units to be shop manufactured. The interchangeability of these units in the field creates the diversity required of the many different functions.

Cabinet Work - In order to achieve a degree of contrast and increase the feelings of warmth in various spaces, hardwood, finished to utilize its natural grain is recommended.

An option is provided to the contractor to enable him to utilize the economies and craftsmanship of the locality of the school. Although birch or cherry are listed as choices of equally good selections, the choice could be extended to include white oak, maple, beech or ash. Red oak is susceptible to moisture. With elm, it is difficult to prevent excessive warpage and shrinkage. It is recommended that as much fabrication as possible be accomplished in a cabinet shop. This condition applies to the application of cabinet hardware and the finishing of cabinets.

Ceilings - The requirement for ceiling sound absorption in schools is an accepted fact. We have used acoustical tile in corridors, lobbies, library, administration areas, home arts areas, and the cafeterias. This was done for two main reasons. The primary reason is that the areas so treated are those requiring the greatest sound absorption. Secondly, these particular areas have the greatest amount of mechanical equipment which would become a major maintenance factor if left exposed. The tile should be of either mineral or glass fiber to achieve the savings and protection of a low fire insurance premium. It is important to consider the attachment of tile, as many tiles, although excellent in themselves, are subject to bad appearance due to the system of installation.

Toilet Rooms, Shower Rooms, Drying Rooms, and Kitchen have plastered ceilings because of the usual conditions to be found in these areas. The Boiler Room has a vermiculite plaster ceiling to obtain the savings and protection of low premium fire insurance.

All other spaces have an exposed structural insulative deck. This type of deck provides a sound absorption surface, adequate for the areas where it has been used.

Floor Finish - There is a requirement in school buildings to provide floors for four generally different conditions. The first, or typical condition, is that of the flooring for classrooms. These locations generally contain the most square footage of the building and therefore provide the best opportunity to achieve economy. It was mainly for this reason that asphalt tile was selected for installation in the major portion of this general use area. It is to be noted, however, that vinyl asbestos tile, another resilient floor covering, is selected for corridors or other circulation areas. This product costs only slightly more than the asphalt tile and is more economical to maintain. Its use is limited to those areas which require this additional durability.

The second condition which requires solution is that posed by the function of a Gymnasium and that of an Auditorium stage. Wood flooring is specified in both cases, but different methods are used which best suit the required function. For the Gymnasium Floor, the hardwood floor is applied over a cork base. This method achieves the "liveliness" or "response" necessary for active physical education. Research points out that most players and instructors favor this type of wood floor when they have had the opportunity to compare it with others.

The Auditorium stage presents a different problem. Strip hardwood flooring is selected for that portion in front of the main curtain which is used without sets or other stage craft. Maple was specified for both this location and the Gymnasium because of its durability and easy maintenance. On the portion of the stage behind the main curtain, Douglas Fir, a soft wood, is recommended. Whenever attachment of sets, flats, or other stage craft to the floor are necessary, this softwood

makes the task relatively simple compared with the problems involved in attachment to hard wood. The strip softwood flooring is specified to match the face width of the hardwood for better appearance. Installing vertical grain softwood flooring will provide a smoother surface and easier attachment and subsequent removal without objectionable splitting.

The third condition which requires a different material and method is in locations of dampness or wet floors. The shower and drying areas as well as the toilet areas and kitchen are examples of this condition. These spaces also require a great deal of care to achieve an acceptable degree of cleanliness. In order to provide an impermeable floor and one which is easy to keep clean, a ceramic mosaic unglazed floor tile is specified. If should be noted that the tile floors are installed using an adhesive. This method should not be changed. The adhesive has waterproof qualities which adds to the permanence of this type of installation.

The shops, Boiler Room, Auditorium and Locker Room floors present the fourth condition. An integrally treated concrete floor is appropriate for these spaces. If the shops were all for woodworking, a wood block floor might have been selected, but these shops are diversified so a material was selected which could be standard to all machines. If a particular treatment should be needed at a particular station, it could be installed, but the general recommendation was made to be compatible with the provision to have as flexible a layout for different stations as is possible.

The Boiler Room floor is easiest to keep in order and maintain with the concrete floor. The type of dirt which accumulates in this area has less effect on concrete than any material in a comparable price range.

The Auditorium floor presents a different problem, but for economic reasons is best solved by a concrete floor. All aisles, whether tile or concrete, should have a grit at the surface to prevent slipping. All maintenance personnel should be alerted to forego waxing this portion of the floor. If grit is not used, a runner should be provided to prevent accidents.

Equipment - There are three groups of equipment in this school. Group I equipment consists of permanently located units - for example: gym equipment and auditorium seating, lockers, folding doors, fire extinguisher cabinets, toilet room accessories, sound consoles and speakers, and unit ventilators. This group of equipment must be included in base proposals of the contract because of the nature of its permanent location.

Group II equipment is that which requires coordination of trades and contracts for its proper installation. It is covered in this school by devoting separate sections of the drawings and specifications to the following: a) Laboratory Equipment, b) Home Arts Equipment, c) Arts and Crafts Equipment, and d) Food Service Equipment.

It should be noted that the mechanical and electrical installation required for this equipment is performed under the regular contracts for Heating and Ventilating, Sanitary, and Electrical. By this method, the most flexible arrangement possible is provided for the Board of Education for each school district. This equipment can be bid as part of the base contract, as an alternate to the base contract, or removed from the documents and bid separately after the base contract bidding. Each one or all of the four listed can be handled in this manner which provides the numerous ways of solving different local conditions.

Group III equipment is that type of furniture, fixtures, and shop machinery which is completely separated from the base contract and is purchased separately by the Board of Education of the school district. Desks, chairs, seats, and tables require no coordination and can therefore be handled best under separate purchase plan. Shop machinery has been indicated as to position on the drawings, but as programs can vary so greatly in different districts, it is more appropriate the equipment for these programs should be done by separate purchase plan.

C. STRUCTURAL

Floor Slab - A slab on grade was selected for all floor areas except for that floor over the dual purpose basement shelter. In this latter area we have shown a framed slab of sufficient thickness and density to provide the necessary protection.

The adapting Architect should review the possibility of using an alternate method of a cast in place concrete framing system utilizing metal pan forms. This system would provide continuous crawl space and access to all mechanical lines which would be located below the floor slab if this system were to be used.

If the location of the project is near a precast concrete plant and available labor is experienced in handling this type of material, the possibility of using a precast joist and slab system could be given consideration.

Structural Steel Frame - A structural steel frame was specified because it is economical, flexible, and consists of incombustible materials. It is also the most standardized system throughout the state, is quickly erected, readily available, and is not affected by weather during construction.

All steel beams and columns are standard rolled shapes and the connections are extremely simple. The standard and long span steel joists are kept to a minimum of different sizes and are immediately available as well as quickly installed.

The open web joists easily accommodate installations of mechanical and electrical systems and provide an excellent means for direct attachment of the runners for the acoustical tile ceiling. Particular attention is drawn to the fact that the top and bottom flanges of these joists should be composed of angle or tee shapes to provide the best surface for the runner attachment.

A bearing wall system of support was rejected, as knowledge of sub-surface conditions must be available if this system were to be considered.

A concrete frame is not economical in a one-story structure and was not acceptable for this reason.

Laminated wood was considered but discarded because of the size of members which did not conform to design requirements. First costs as well as maintenance costs would be higher for exposed members in this quantity and the mechanical and electrical installations would be severely complicated if this type of structural system were to be used on this building. Insurance costs might be affected by the use of wood.

D. HEATING AND VENTILATING

Hot Water Heating System - The selection of the hot water system rather than a steam system for this school is based on careful study. A hot water system can be reset lower in mild weather which provides better control, and effects substantial savings. It has greater thermal storage which results in a longer period of protection against freeze-up. This system can be installed at a lower first cost and can be maintained easier because traps are eliminated. Unit ventilators can be installed in series which results in savings, when compared with a system of individually fed rooms. Space requirements are less with hot water as pipes can be run level, whereas steam supply and return mains must be pitched. This last consideration is important because site conditions could affect available space.

Boilers - The decision was made to install two boilers. Each boiler is sized to handle the minimum load in any weather, the two together being capable of handling approximately 25% more than full load. "Minimum" load would include all transmission and infiltration losses, but not those loads which could be turned off, i.e. domestic hot water and ventilation. Therefore, it would not be necessary to close school in cold weather if one boiler were off for maintenance or repair.

Packaged fire tube, sectional cast iron, water tube boilers and International water tube boilers were compared. The water tube boilers should have a longer life and possibly lower maintenance, however,

these boilers are much higher in height and require lowering the boiler room floor. In areas where a high water table exists this could incur considerable cost to maintain a water-tight condition. The packaged fire tube boilers are considerably lower in height and would obviate the necessity of lowering the floor. On this basis it was decided to recommend the packaged fire tube boilers.

Heating and Ventilating Systems - These systems were resolved by considering the type which would best fit a specific condition. In the classrooms, unit ventilators and auxiliary finned tube radiation are used. The unit ventilators supply the fresh air for these rooms and relief is accomplished by gravity through the corridor roofs. The advantages of this system is the desirability in classrooms for an individual room ventilation control and the assurance of freedom from drafts. Since the major problem of classrooms is cooling rather than heating, this is well handled by the unit ventilator and its controls.

The Locker Rooms; Administration area, including Health and Guidance and Industrial Arts are all served by heating and ventilating supply units plus auxiliary finned tube radiation. Mechanical exhaust is provided from all of these areas. Space for the supply units, ducts to these areas and returns to the fans is available, which makes the method feasible.

Between the Gymnasium and Auditorium and over the storage areas, an adequate area is provided for heating and ventilation supply units to handle the heat and ventilation to the Gymnasium, Auditorium. These spaces do not require auxiliary radiation, and the mechanical exhaust is returned through this fan room to the exhaust fans.

The Cafeteria, since it is basically two areas, separated by the Kitchen, is best suited with unit ventilation, rather than a central fan system. The unit ventilator system will afford individual area occupancy with ventilation control.

It should also be noted that all occupied areas are separately exhausted. This is particularly important when those areas are toilet rooms or showers.

Fuel Oil & Preheating - With an installed boiler capacity of approximately 350 horsepower, the savings in operating cost using #6 fuel oil will pay for the higher initial costs of an automatic electrical preheating system in a very few years. However, if the local conditions suggest the use of #4 or #5 fuel oil, the preheating system could be eliminated.

In an area where natural gas proves less expensive than oil or if local preference is for the use of gas, the burners need only be changed to a combination gas-oil or a straight gas type. The necess-

ary piping and controls would have to be added, but the overall adaption process would be simple and direct.

Temperature Controls - Two fundamental controls are provided in the specifications. That which is sometimes referred to as the "rough" control is the hot water reset based on outside temperature. This control provides savings on fuel, assists the local control and is set for a single zone override.

The second control is often referred to as the "refinement" control. This is an individual room control which allows for separate room temperatures based on individual preferences or location. Based on initial economy, we recommend single temperature thermostats, rather than dual "day-night" thermostats. Night set back to be accomplished by zoning a series of classrooms with an electric thermostat, Asco switch, and time clock. However, a dual "day-night" control system can be adapted if so desired.

These two basic controls provide the school with the necessary mechanical checks and balances to provide safe, economical and healthy environment for school activity.

E. SANITARY

Water Supply - It was necessary to make some basic assumptions in this area. A street main carrying potable water has pressure of 40 p.s.i., and acidity pH of 7.0. There exists a 6-inch service to fire hydrant within 300 ft. of the service entry to the building. All pipe sizing within the building is based upon .5 p.s.i./100 ft. pressure drop for mains and 6 f.p.s. maximum velocity in mains and branches.

If the water supply is by one or more wells, the pressure should be increased to a minimum of 60 p.s.i. and changes be incorporated to adapt this pressure.

A water analysis should be made to ascertain the necessity of treating the water to reduce wear or other erosive effects on the water piping system as well as the boilers and heating pipes.

Storm Drainage - In order to design this system, it was assumed that a terminal headwall existed at a nearby stream. If this facility or a storm sewer is not available, leaching dry wells could be used. In the event that municipal storm or combined storm-sanitary sewer is available for the storm drainage, traps will be required.

Sanitary Drainage - It was assumed a municipal street sanitary sewer main is available for sanitary drainage from this building. The building sewers exist at several locations around the building perimeter. Inasmuch as the site will have a bearing on this installation, it is

recommended that a check be made and modifications made to adapt to the local condition, which might result because of necessary pitch in a lower invert than that of the existing sewer.

If a sewage disposal system is required, changes should be made to omit the building sewer traps and fresh air inlets. The local code should be examined to ascertain if these omissions are permissible.

Gas - An assumption is made that there is an existing natural gas main at the street. It was also assumed that this natural gas would have a 6-inch water column pressure and contain 1000 B.T.U. per cubic foot.

If the supply should be propane gas, the piping should be revised to smaller sizes to suit 2550 B.T.U. per cubic foot and provision must be made for storage tank and accessories.

Plumbing Fixtures - Plumbing fixtures are white vitreous china with chrome plated cast brass trim. Each fixture has a shut off stop. Water closets are siphon jet models with flush valves and vacuum breakers, have solid plastic seats, and are floor mounted. Urinals are wash-out models with flush valves and vacuum breakers, and are wall mounted. Lavatories are wall mounted, have combination faucets and are either flat top without a ledge or a ledge type. Drinking fountains are wall type, face mounted or semi-recessed at chases. Showers have the water temperature controlled thermostatically for safety and the heads have integral volume control for water economy.

F. ELECTRICAL

Service - The final design requires a transformer vault outside the building. It is strongly recommended that the adapting architect investigate the possibilities of an interior transformer room either above or below ground. The local utility and the site conditions will govern whether changes are either required or advantageous to the local school district.

Power Distribution - Consideration was given to the employment of a 480/277 volt distribution system with all lighting and large motor loads supplied directly at this voltage. This would require local dry type transformers at each panel location to step down to 120/208 volt for convenience outlets and incandescent lighting load.

However, this consideration of the higher voltage system was discarded for three main reasons. Because the main switchgear is located close to the 120/208 volt centers, i.e. Auditorium, Cafeteria, Kitchen, and Shops, the economies to be obtained through the utilization of higher

voltage are substantially less. Space requirements for the individual dry type transformers are severely limited and to provide the extra space would cost far more than the economies provided from the higher voltage system.

Lighting - Consideration of higher lighting levels was studied. It was then decided that in view of economy and standardization that those levels of lighting incorporated into this building are correct. They are higher than State minimums and after carefully considering the problems of direct and indirect glare, light leakage and comfort characteristics of the fixtures used, will result in a school with a good general standard of lighting.

Sound System - The possibility of installing a separate dial intercom telephone system was considered, but was rejected on the basis of economy. The system selected provides a multi-use facility of (a) public address system, (b) programming system, (c) intercom system, and (d) air raid alarm system. Provision has been made to meet the requirements of the Civil Defense Agency so that the school will have available matching funds under the applicable Federal legislation.

Clocks and Programming - Two different systems were considered for use. The electronic system was rejected and a synchronous wired system was incorporated. Although the electronic system usually has greater flexibility of adding or removing clocks, in this particular school this condition is overcome because of the nature of the partition, ceiling and floor construction. The synchronous wired system is widely used and would therefore make maintenance easier and more economical as custodial personnel would be more likely to understand its operation and be able to service it. The electronic system is more susceptible to inadvertent interruption of supply to clocks, due to custodial or maintenance staff operation of local panel circuit breakers supplying clock circuits. Reliable reports show that it is relatively simple to upset the operation of this system.

Fire Alarm System - A standard system for schools is provided. Students are advised, by continuous ringing bells, to leave the school in an orderly fashion, upon actuation of any fire alarm station.

Television System - A complete system of empty conduit is provided for future installation of a T.V. master antenna system. This provision is generally recommended due to the extensive and increasing use of educational television. Should the adapting architect wish to include the antenna cable, the conduit system will accommodate same.

Variable AC/DC System - The Science Department requires a system for providing variable voltage at student stations. This requirement is

to be satisfied by individual power pack units rather than the installations of central AC/DC distribution. This decision is based on the limited usage and economy involved. The proposed installation does not in any way preclude that the trend toward requiring the students to develop the current and voltage characteristics they require from a standard 120 Volt source is not possible.

Emergency Lighting - Because of the close proximity of Auditorium, Gymnasium and Cafeteria regardless of the flexible plan suggestions, a completely centralized emergency system is possible. The economy of this system is substantial, and further, individual battery units with attached sealed beam lighting heads is a maintenance problem for the custodial staff and is difficult to treat architecturally.

Stage Lighting System - The two scene preset type of dimming equipment has been replaced with manually operated autotransformer type dimmers, and the total number of dimmers has been reduced, in the interests of economy in initial installation costs. However, the stage lighting layout is such that it is readily expandable at a later date, and with the evolution of more sophisticated theatrical techniques, the type and extent of dimming equipment can be readily altered or increased.

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