E N G I N E E R I N G 525-526

T H E S I S

S C H O O L A R C H I T E C T U R E

BY

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F O R W A R D

The relation of the School, as a unit, to the Community is radically changing. Systems of education are being evolved and broadened to bring the school to its proper standing amongst the nationally constructive factors.

With the evolution and extension of educational methods and the development of a further use of the school building, namely as the Community Center, it should be assumed logical for the modern school buildings to keep pace in their design and planning.

The added use of the School Building has increased the problems of School Architecture. Architects engaged in the design of schools are faced with the complex problem of correlating together the arrangement of plan according to the essentials of hygiene and sanitation; and the obligation to provide such convenient and attractive features as are possible of attainment.

It is towards helping in the solution of this problem that this thesis was prepared and presented.

MacDonald

I N T R O D U C T I O N

This thesis is an attempt to study some of the fundamental principles of school architecture; and to present the results of such study in the form of a proposed plan for a High School Building and the general lay-out of the grounds with respect to the building and other fixtures.

The subject is a very broad one, and a limitation to discussing the general principles only is imposed by the amount of time at hand.

First are presented the requirements of a High School. Then these are studied in detail as for their area and location with respect to each other. A brief description, of the nature of land scape to be sought for a school ground, precedes a study of the general Orientation and Grounds' Division. A discussion of the underlying architectural motives and materials to be used introduces the plans of a proposed School Building which, in the author's opinion, is representable of one of the branches of Post War Architecture, namely, Simple, yet Pronounced, Stream-line design for the exterior, with no sacrifice of interior usefulness or convenience.

The financial side of the questions, though of major importance, was considered as favorable throughout, but still no wasteful or unnecessary constructions were admitted.

A deep debt of gratitude is felt for Professor N. Manassah, who throughout the course of study of this problem, was of great assistance in directing my work. The profit from discussing the problem with him has been very great.

R E Q U I R E M E N T S

The following are the units assumed as being required for a 600 Boys and Girls Day High School. It should be noted that these are not fixed as such for every high school, but were chosen to represent an average of what a modern high school which is to act as a center for the adjoining community should include. The limit to these requirements is more influenced by the available finance and the educators views than by the ideas of the Architect. This list of requirements is based on my personal impression throughout my schooling and on discussions with several of those engaged in the honorable task of teaching. It seems to be a general conviction that stress should be layed on the physical and social phase of the school. Because it is in these activities that the practical side of the ideas and principles learnt in school is developed. Moreover as the school is to be used by the Community as a social Center, it should offer the public mediums of entertainment of the same standard as those installations built solely for that purpose. Otherwise the public will go to those places and abandon the school. Care should be taken not to under-esteem the school proper in the light of exagerated importance laid on the social side. A school remains a schooling center and this should be its main objective.

LIST OF REQUIREMENTS

1. Class Rooms - 10 @ 40 students capacity
   8 @ 30 students "
2. Laboratories - 2 @ 40 " "
3. Lecture Room - 1 @ 80 " " (Theater shape)
4. Assembly Hall - 600 seats capacity with gallery

5. Library - 100 seats with tables, Librarian's office, Check office and room for 10,000 books in stocks.

6. Music Center - 20-25 private practice rooms and main hall.

7. Offices - Director and Secretary, Supervisor and Secretary, Treasurer and Cashier, Bookstore, Social Director and Tickets window, Athletic Director.

8. Common Room - for Sedimentary Games or for Dancing Hall.

9. Vocational Rooms - Girls Sewing Room, Boys Manual Training.

10. Rest Rooms and Wardrobes - Teachers and Students including W.C. and water-points.

11. Metealogical Office and Observation Tower.

12. Cafeteria, Sodafountain.

13. Indoor Gymnasium - To include 1) Tennis and Basket Ball spaces,
2) Lockers and changing rooms,
3) Seating space for 400 spectators,
4) Bowling ally,
5) Ping-Pong and Billiards room.

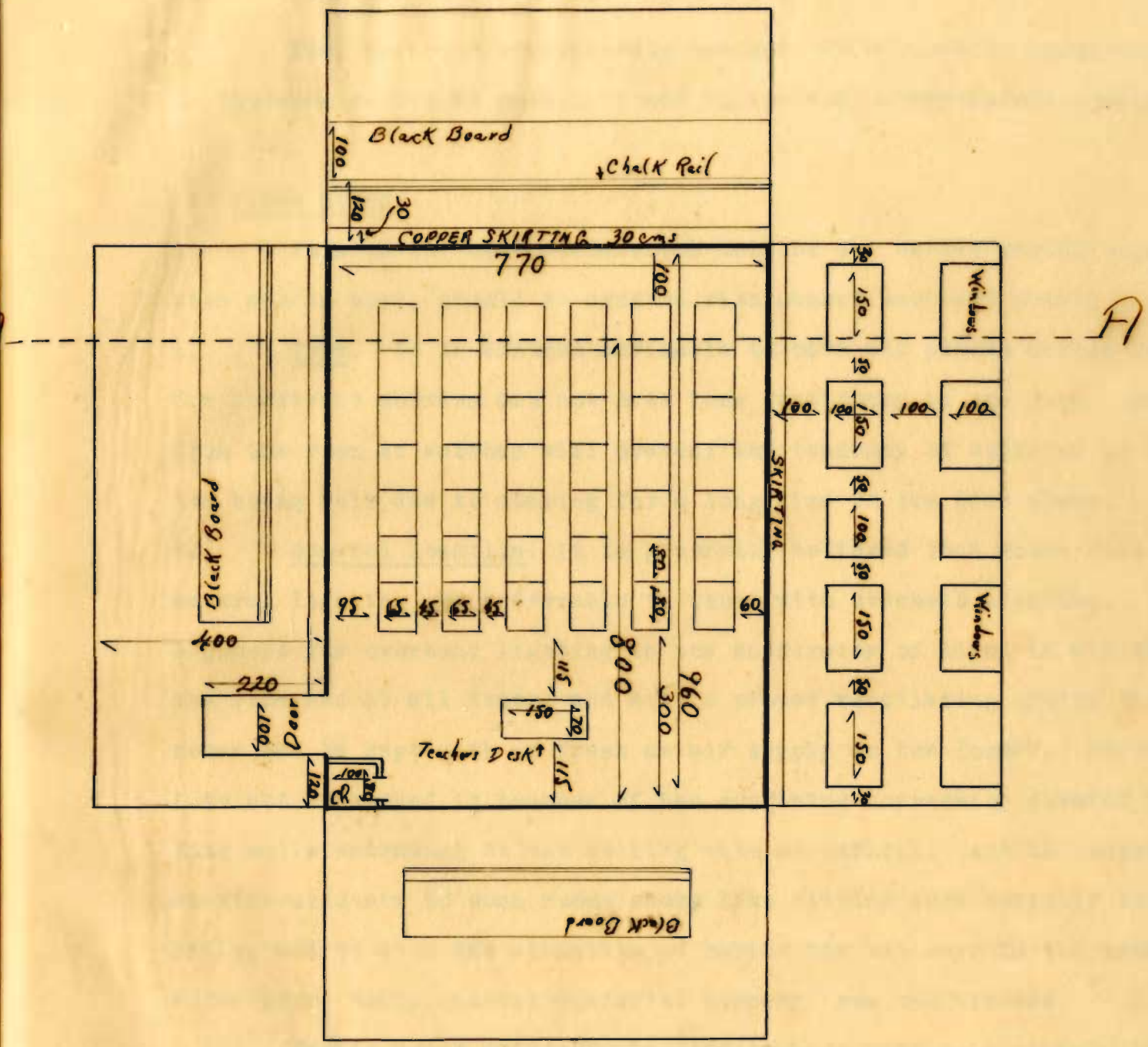
14. Skating ring.

15. Athletic Field - To include 1) Football field,
2) 1/4 mile running track,
3) A 2000 seat grand stand.

16. Games Area - Two sections - Boys and Girls, each to include 3 tennis courts, 3 basketball courts, 2 volleyball courts and free play space.

17. Gardens and Lawns.

18. Guard's, Gateman's and Janitor's rooms.



Top and Wall Views of a 42 Student Class. Room Scale 1/100

A-A Denotes Line of Cutting for 30 Student Room (Windows have different arrangement)

AREA AND LOCATION STUDY

Now, that the requirements are set, we proceed to study them as to the area needed by each unit and to its most advantageous location.

1. Class Rooms.

This is the most fundamental unit of the entire school organization and as such, should be studied with utmost care and detail

A. Type. It is assumed advisable to have the pupils change rooms for different courses and not have them stationary in one room. Changing from one room to another will prevent any tendency of dullness or boredom being felt due to staying for a long time in the same place.

B. General Location. It is generally believed that rooms that receive natural lighting are preferable to those with overhead lighting. The argument for overhead lighting is the uniformity of light in all parts of the room and at all times; and with a proper ventilating system these rooms can be kept with as fresh an air supply as the former. Personally I do not recommend it because of the confining impression created by the four walls extending to the ceiling with no outlook. And to continually confine students to such rooms seems like fitting them mentally to occupy cells; add to this the advantage of having the sun rays in the room for a few hours daily and the wonderful scenery from the windows.

Having rooms naturally lighted imposes upon us a certain limitation as to the width and height of the class room so that the sun rays may reach the entire floor of the room - this we shall discuss later.

Class rooms should be located as near each other as possible, preferably opening on the same corridor so as to make students shifting from one to another as quick and as easy as possible. It is common to have class rooms above the Main Floor as distraction from exterior

elements is reduced.

C. Size of Room.

1. Floor Area - The area of a room is determined by the number of students to occupy it and by the area allotted to each. As the number of students in every room has already been fixed we shall study the area required by each student. After a thorough study of the problem of spacing standards most American educators and architects agree on the following: (From School Architecture by J. Donnacan)

Area occupied by 1 student 65 x 80 cms.

Width of center aisles 45 cms.

" " side " 75 cms. (towards door).

" " " " 60 cms. (towards window).

Distance between back of desks and wall 100 cms.

" " front desks and wall 300 cms.

These dimensions allow an area of 1.7 sq. m. per student and the height should be such to provide 6.25 cu. m. per student.

Wide rooms are preferred to narrow ones, as the former are shallower and so make it easier for both teacher and student to talk and hear and less eye strain on those occupying the rear seats. Generally the number of rows of seats accross a room is six and never less than five. Refering to the sketch overleaf, it will be seen that a room of 42 students, according to the standards stated is 770 x 960 cm. inside dimension and a 30 student room 770 x 800 cms.

2. Height of Ceiling - In order to get proper natural light the rays of the sun should come direct from the sky at an angle of not more than 27° with the horizontal. Then if the room is not wider than twice the window head, the natural lighting is approved. Thus a height of 400 cms. which provides the required cubage of air satisfies for lighting.

3. Glass Area - The correct glass area required for a class room -

depends on the locality and the orientation of the room. However, 15-25 % of the floor area is taken as the area of masonary openings which give 10-20 % as glass area. In our climate where the sun is relatively bright and very little fog is experienced 19 % of the floor area as masonary area is ample

Or in the 42 student room

A_f = 770 x 960 = 74 sq. m.

and A_m = 19 % x 74 = 14 " "

After deducting area of frames from Am we get 12.5 sq. m. which is glass area and is equal to 17 %.

Now this area (Am = 14 sq. m.) is to be supplied by windows. My idea is to have two sets of windows each 1 meter high with 1 meter of wall in between. This requires a width of 7 meters, which is supplied by having 5 openings in the room, 4 of 150 cms. and 1 of 100 cms., separated by 50 cms. columns. This design to be followed throughout the building.

On the other hand, as the room is 770 cms and its height is 400 cms., and the window head has to be that high, and the sill not more than 100 cms. above the floor level, the window has to be 300 cms. high. And to supply the required area the width has to be 460 cms. This height, apart from looking unproportional, will give the window a narrow expression and limit its view. But by dividing the window into two parts, one at ceiling height and one at sill height, we supply the area, broden the view and introduce a feature that fits very smoothly with the general aspect of the building, which shall be discussed later.

The height of 100 cms. is chosen for the window sill as this height will prevent the rays of the sun reflected from the ground and surrounding objects from shining directly into the eyes of the pupils sitting near the window. This shining is harmfull and annoying. This height however, will not prevent the student from looking outside for a

momentary restful change. This last point is debatable, as some educators contend that this will result in distraction, while others favor giving the child this opportunity which places him on the same level with the teacher who is at liberty to throw a look outside.

4. Closets - There is a growing trend to eliminate all wardrobes from the class room and to supply a special room for wardrobe in other parts of the building. A closet for the teacher is still deemed necessary as it will be usefull for keeping stores as well.

5. Black Boards - The best boards are slate ones fixed to the wall at the time of construction. The usual width of boards is 1 meter at 120 cms from floor level with a chalk rail below. The length is usually that of the width of the room behind the teacher after accounting for what ever closets exist.

6. General Arrangement - It is widely accepted to have students sit facing the teacher, with the windows to their side. This will prevent them from sitting in their own shadow, and from having the sun rays come directly in their eyes.

7. Furniture - Although no specific design can be recommended as to another, there is a general tendency to prefer the desks that are not fixed to the floor, but which are movable at will. These render the room more flexible in it being used for more than one purpose. The attached seat and table desk forms are very popular, and when the seat ~~the seat~~ is attached to the table in front of it, these can be moved about and used in any formation with rapidity and no loss of space.

No lockers for books are to be provided, as the students will carry their books with them from room to room. No holes for ink bottles are needed as the use of the fountain-pen is getting universal.

The teacher's table, to be made of the same wood and general design as desks, is usually 120 x 80 cms. with several drawers and no attached seat to it.

8. Corridors and Stairways - Although these do not form a part of the class room proper, but are more related to it than others. They are to a building, what streets are to a city. So they should be designed wide enough to accomodate for the rush moments between classes and yet not lose very much space from the building area. The width of corridors is taken as a minimum of 300 cms. and 30 cms. added to this for every room above the sixth one that opens on it. Properly designed corridors save much of the space usually occupied by halls or waiting lobbies. Stairways are generally designed as having half the width of the leading corridor. A width of 150 cms. is recommended without a division line in the center.

2. LABORATORIES

1. Location - These should be located preferably at corner positions, they will be better lighted there and any fumes or smells not taken away by the hoods will be dissipated by the wind. They should not be located between class rooms or near the library or any of the offices. A storage room should be adjoining.

2. Fixtures - Chemistry labs desks should be separated by sinks with running water. Physics lab desks need not have these. A desk 120 cms. x 75 cms. can be used by two students. A sink 60 cms. long and 40 cms. wide is enough between desks. A distance of 135 cms. between two desks is enough for two chairs. An aisle of 120 cms. in the center of the room is enough.

3. Area - Using the above mentioned dimensions and allowing a space for teacher's table we get 1.5 sq. m./ student or

$$A = 80 \times 1.5 = 120 \text{ sq. m.}$$

This area, may seat a few more in the case of the Physics Laboratory or

may be reduced. Or, a corner of the room may be used as a dark room for experiments on light.

3. LECTURE ROOM

1. Location - This room has a double duty. First as a lecture room for the students and as such should be near their class rooms and second as a lecture room for the Community and as such should be as near the other "community used areas" as possible. Somewhere on the second floor, near the gallery seems to be suitable for both.

2. Area - This room will have the seats arranged in a half circular manner and with every row raised above the level of that in front of it. The seats should be so arranged that no one seat will be directly in front of another, along the line joining them to the demonstration table. The difference in level between two rows must be such to permit unobstructed seeing.

The area allotted to this hall will be the greater one of the following:

a) Area if it were a class room, at 1.7 sq. m. per person holding 80 persons or 136 sq. m.

or b) Area if it were considered as an Assembly hall. Then area will equal 80 x .90 + Area for demonstration table or 100 sq. m. (to be discussed in detail later).

So Area will be 136 sq. m.

A small storage room should be adjoining.

4. ASSEMBLY HALL

1. Location - This hall and the library, it may be said, are the representatives of the school towards the Public for they are the halls

visited most by outsiders. It is on their general design and furniture that a great part of the school's reputation depends. By the force of fact, the assembly hall has to occupy the main floor and the gallery the second. The entrance to the hall should be from the main entrance - unobstructed. A secondary exit should be designed, leading to another direction for use in case of danger. A ticket window should be between the main entrance and the Assembly entrance to make it easy for spectators to get their tickets on the way in without forming a crowd. Rest rooms are implied requirements of this Hall and should be adjoining the two floors. Usually a soda-fountain is placed near by for people to have a drink during the intermission. No smoking room is to be designed, but the entrance hall may be used for that purpose.

2. Area - The area allotted to this hall is determined by the area allowed per person plus the stage and aisles. The average area allowed per person is 65 x 80 cms. = .52 sq. m. to which 50 % is to be added for aisles, so it becomes .78 sq. m./person.

As the Assembly hall should hold 600 persons then A = 600 x .78 = 468 sq. m. But only two thirds will be seated on the Main Floor and one third on gallery. Then area of Main Floor = 312 sq. m. + Stage Area. This area (stage) depends on the use of the stage. In a high school Dramatic plays are common, and so a spacy stage is required as well as back stage room for changing and storage for the scenery. 90 sq. m. will allow for the stage and changing, and a room in the basement from 40-50 sq. m. will supply the storage area.

The Area of the gallery should be increased to allow for a Cinema booth. The level of each row of seats in the gallery shall be higher than the one in front of it to permit unobstructed seeing, as well as the floor of the main floor should be ~~slanting~~ sloping for the same reason.

The stage should be higher than the main floor level. An external

entrance to the stage should be made.

5. LIBRARY

1. Location - It should be on the Main Floor, not near the entrance nor very far from it. Adjoining it, the Librarian's office, book stacks and check office should be located. An exit to an adjoining balcony is very suitable as the balcony may be used as reading space in fine weather.

These offices should be near the Library, but should have no direct connection as this will cause unnecessary noises from people passing through the Library to use the book stacks. The check office should control the entrance to the book stacks.

2. Area - A table 90 x 400 cms. will seat 12 students easily if there is 180 cms. between tables. This allows 1.3 sq. m. per person. Adding to this the area required for book shelves (for books of comprehensive nature as Dictionaries, Encyclopedias, Periodicals, Year-books, Catalogues, etc.) and aisles 0.2 sq. m./person we get A = 100 x (1.3 + .2) = 150 sq. m.

The stack room is to hold 10,000 books. A common shape of stack is 40 cms. deep, 150 cms. wide and 195 cms. high. This will hold 6 rows of books on each side with 42 books each one or of total capacity equaling 500 books; therefore we need 20 such stands. An aisle of 75 cms. between each two is enough for circulation. Thus the area of this room should be from 45-55 sq. m., depending on the arrangement.

6. MUSIC CENTER

The introduction of music sections into high school buildings is relatively new, but should be encouraged, for an understanding of music helps a great deal towards a genial education and towards the fuller enjoyment of life. The Music Center is usually composed of a central room for

group practice or lecturing, and private practice rooms clustered around. A few private offices should as well be designed. It is advisable to have the walls of sound-proof material as this will help in eliminating much of the confusion experienced in music teaching resulting from the hearing of adjoining pupils' noises at the same time as ones own. This center as a unit should be as remote from the class rooms as is possible, preferably on a higher story by itself.

A room 200 x 250 cms. is a fair area for a private practice room, as it will hold a piano or as well two people playing the violin. The central room may vary from 4-6 x 5-7 m. The private offices may be satisfied by increasing the area of one or several practice rooms.

7. OFFICES

It is common practice to have offices on the main floor to save people the trouble of climbing stairs. The Treasurer's office and bookstore have in common financial relations and should be near each other. The Bookstore should be near the Librarian's office, as they have many things in common. The area of these two offices should lie with 25-35 sq. m. each to allow for storage and free motion. The director's & supervisor's office should be near each other with a space for a secretary. These may have an area of 20-25 sq. m.

8. COMMON ROOM

This hall, open to both students and community should have a free entrance. It may be used at times for balls, banquets, etc., and for such should have a cloak room near by. By the students it will be used for sedimentary games and as such should have the social office near by for check.

A balcony adjoining this hall will always be appreciated.

The area of this hall is very flexible, but should not be less than 100 sq. m..

9. VOCATIONAL ROOMS

1. Girls' Sewing Room - This room should be well lighted and ventilated and with its windows presenting pleasant sceneries. It should be located in a quiet section of the building preferably above the second floor. Being used by one class at a time an area of 40 x 1.5 = 60 sq. m. is enough to hold the sewing machines as well.

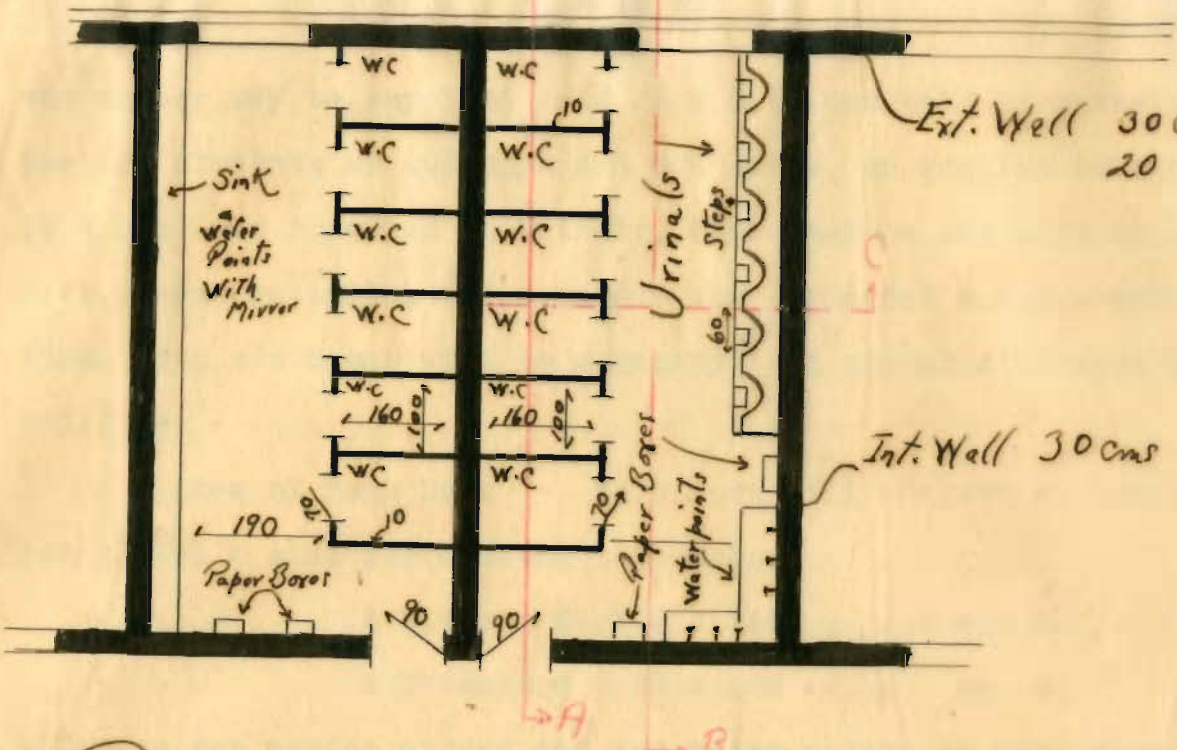
2. Boys' Manual Training - In comparison with the girls' room this should be placed in the basement as it is very noisy and usually contains heavy machinery. The area allotted to this room will depend mainly on the kind of training to be given, whether mechanical, electrical, or just carpentry and tool making. Considering 40 boys to use the room at one time and allowing every boy 2.5 sq. m. A = 100 sq. m. which seems to be enough for a workshop.

10. REST ROOMS

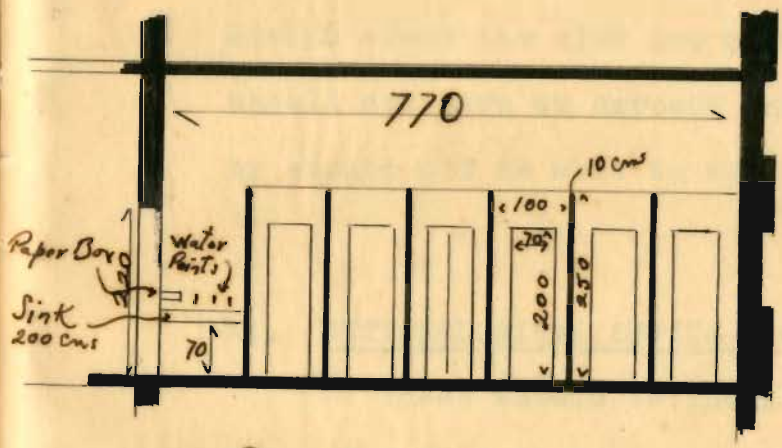
1. Teachers'.- These are rooms reserved for the use of teachers when not in class. They should include a W.C., a place for washing one's hands, a mirror and make up space, as well as a room with restfull chairs. The number of such rooms is proportional to the number of teachers. In a 600 student school 15 teachers are sufficient and for these two rooms, one for the gentlemen and one for the ladies are enough.

2. Wardrobes.- These, sometimes called cloak rooms, are rooms where the students hang their overcoats or coats on entering the classes. They should be as near the stairs leading to the class rooms as possible.

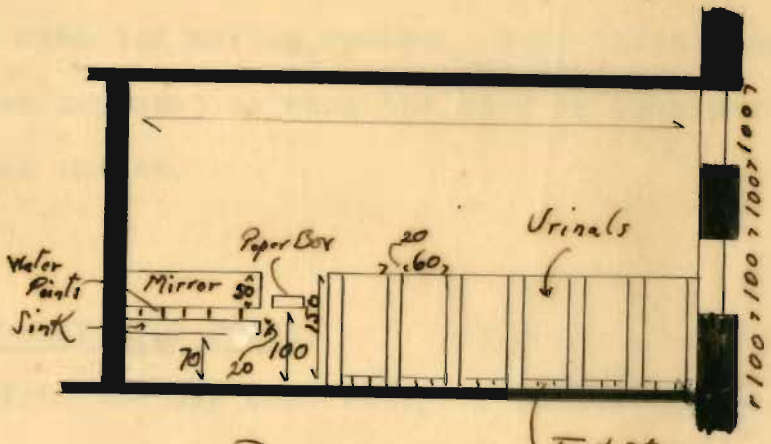
3. Lavatories - An average of 12 students require a W.C. For boys



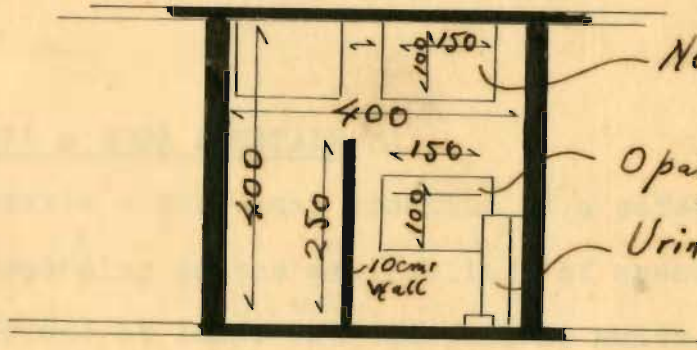
PLAN OF GIRLS AND BOYS LAVATORY ROOMS Scale 1/100



Section A-A



Section B-B



Section C-C

the number may be supplied half in W.C.s, and half in Urinals. Dividing the 600 students as 400 boys and 200 girls, we require 18 W.C.s for girls, 18 W.C.s for boys and 18 Urinals. These may be supplied in rooms called Lavt. Rooms including 6 W.C.s each for girls and 6 W.C.s and Urinals for Boys. The six rooms will be separated and put at different parts of the building.

Area of Boys Room - This room will include at least three water points and a sink for washing the hands.

6 W.C.s @ 100 x 160 = 9.6 sq. m.

6 Urinals @ 65 x 100 = 4 sq. m.

Allowing for moving around and the water points we need from 25-30 sq. m.

The girls room will be of the same dimension and include a big mirror above the sink and more area for moving around. Both these rooms should not have an exposed interior, that is when the door is open passers by should not be able to see the inside.

11. METEOROLOGICAL OFFICE & OBSERVATION TOWER.

These should be located in the top most story of the building, where the wind is unobstructed and the rain fall may be measured accurately. 20-25 sq. meters is sufficient for each of these offices.

12. CAFETERIA & SODA FOUNTAIN.

1. Cafeteria - The usual location of a cafeteria is the basement or main floor depending on the availability of areas. It should have wash rooms near by and at least two independent exits. The kitchen, supply office and a store should form an integral part of it. In a day school, where some of the students come from homes that take more than one half hour to reach, it is of custom to have the cafeteria have a capacity of

1/4 the number of students. Basing on having two shifts this will suffice 1/2 the school. Using the same dimensions of tables as the library we need 1.3 sq. m. per student. or Area of Cafeteria = 150 x 1.3 = 200 sq. m. Then allowing for the kitchen, store and office one half this area, as is common, or 100 sq. m., we get Total Area = 300 sq. m.

2. The Soda Fountain - This is to be a room of 40-50 sq. m. with a small kitchenette of 10-15 sq. m. Dividing the hall from the kitchenette an ice-cream and soda-fountain should be placed. This "soda-fountain room" as it is called, should be placed near the Assembly hall and should open on a large hall that will hold the crowd waiting to be served.

13. INDOOR GYMNASIUM.

This is the most variable unit in a school. Its area and accomodation are mainly determined by financial factors. It is true gymnasiums, in climates where it is raining most of the time, are to be more extensive than others, but there, also, the financial side is just as eminent. In our case, where the climate is of normal variation and finance favorable, the area is determined by the use demanded of it. It should hold a tennis and basket-ball court, and hold 400 spectators. The size of a tennis court with the required margins is 33m x 17m and that of a basket-ball is 30m x 16m, or the area of the floor is determined by the tennis court.

The area of the court will be used for all the other games, but all fixtures should be of a removable nature. The area for the spectators is determined by allowing each person .5 sq. m. and adding .2 sq. m. for aisles or .7 sq. m. Then area = 400 x .7 = 280 sq. m. The seats should be arranged to have proper lines of sight and the space underneath them may be used for storage if it is not earth filled.

Allowing 10 showers per changing room and making shower 100 x 160 cms. then allowing the area of 40 x 50 cms. for the locker of every student

and placing two on top of each other at 125 cms. high and allowing for an aisle of 75 cms. in between, then every 200 lockers and 10 showers need 60 sq. m. A height of 2.5 meters is sufficient. The height of the gymnasium has to be at least 5.5 m. and preferably 6. So two such rooms could be placed on top of each other.

For the boys we need an area of 60 sq. m. as they are 400, and for the girls allowing them 50 % more than the boys for moving around and fixing themselves up, an area of 45 sq. m. is required giving them two rooms at 90 sq. m.

The bowling alley should be at least 22 m. long and the width will determine the number of alleys to be made allowing 1.5 meter per alley.

The Ping-Pong and Bowling Room will be large enough to hold 8-5 tables respectively. A ping-pong table is 250 x 120 cms. allowing a space of 1.5 m. on each side the area required per table is 14 sq. m. or per 8 is 8 x 14 = 112 sq. m.

Allowing 10 sq. m. per Billiards table A = 5 x 10 = 50 sq. m.

Planning all these units that form part of the gymnasium in the basement seems to be a very suitable solution. There the noises are remotest from disturbing. The floor is strongest for the games and there is no one underneath to be annoyed by the tamping. There also the required height of 6 m. can be furnished with least cost as the foundations have to go down any way. In many cases the land to be built on is sloping and there the basement will be on the ground level at one end.

14. SKATING RING.

The gymnasium can be always used as a skating ring, in the last resort. But if some space in the open air, circular of form, could be provided it would be ideal.

15. ATHLETIC FIELD.

A foot-ball field's maximum dimensions are 60 x 120 m. Having a 1/4 mile running track around this with curved ends, will produce a form of extended ellipse.

Allowing .5 sq. m. per person in the grand stand and adding .1 sq. m. for aisles, the area of the grand stand = 2000 x .6 = 1200 sq m. The seats have to be raised, each row higher than the one preceding it and the space underneath used as showers and changing rooms.

16. GAMES AREA.

As it has been stated the area required by basket-ball courst is 32 x 16 m., by tennis court 33 x 17 m. and volley ball 15 x 7.5 m. Then the games area shall be composed of two sections each holding the required number of courst plus an area for free play.

17. GARDENS & LAWNS.

The areas to be used by these depends on the grounds provided and the division is mainly a matter of taste and will be discussed later.

18. GUARD'S etc. ROOMS.

These will be distributed among the grounds and building such as the design permits. A gateman's room and a guard's office are imperative at the entrance of the school.

A High School serving a community should be near that community, otherwise the time wasted in going to and from the school will overshadow the benefit of that school being of a higher standard than a nearer one. Usually one residential zone is not enough to support an elaborate first

class high school. The area of the grounds of a high school is not determined by the number of attendants when they are less than one thousand, and above that the increase is very slight between a 1500 and 2500 student school. This is so because the area of the grounds occupied by the buildings is very small relatively. The athletic field, of usual area is 15,000 sq. m., and this is so for a school of 500 or 300 students. Similarly, the area allotted for gardens and lawns changes very slowly as the number of students increase.

Usually a block of land which is equidistant from several residential zones is very suitable for a high school. The location has to be hygienic and remote from main highways. The lot should preferably be surrounded by open spaces such as parks or gardens.

GENERAL ORIENTATION & GROUNDS DIVISION

We are envied by the whole world nearly for having a wonderful climate. It is therefore absolete to think of any arrangement or design that does not benefit, to the utmost, from this natural treasure that is ours. In designing a school, therefore, not only should we use those designs that permit most rooms to be on the exterior side of the building and thus exposed to sunshine and air, but should also orient the building itself in such a manner to get most of it open to the sunshine sometime during the day. An elementary study of the dip of the sun at various times in the year and its general course will guide in the orientation of the building.

The prevailing winds should be studied as well and the building so oriented that those units that need be on the windy side be there, and those, that the wind should blow away through them, be on the opposite direction.

Care should be taken to determine the ~~distributions~~ disturbances surrounding the site with a consideration for future possibilities. Likewise it should be remembered that shops and garages may be located near the proposed site, so that the school be set far enough back from the street property lines, to insure quietness of study. Aside from the consideration of noises, it is advisable to have the space between the street and the school large enough so that the students will have sufficient time before they reach the street, to cool down from the excitement that usually follows dismissal.

School children like to play close to the building itself just before school opens or during recess periods. It is therefore necessary to place the building in such a manner that these surrounding play areas get sufficient sunshine for warmth and health. Every precaution should be taken to protect the child's health and the most economical is through proper planning.

The question of placing an athletic field either between the street and the building or in the rear of the building is a vital one, and should be studied in the light of local studies. The former plan provides a method of preventing noises from the street from reaching the school. The latter makes the school more easily reached especially by the public.

"Communities are awake to the possibilities of having their school grounds used at night and holidays by adults for games under supervision", remarks J. Donavan. This is true, and is helping a great deal in providing a wholesome recreation center for the community. Properly attended grounds under an intelligent supervision will improve the character of the community and cut down the expenses of running and maintaining jails and hospitals.

ARCHITECTURAL MOTIVE.

However good the plan of a school may be, or whatever the excellenc of its capability for administration and instruction, unless it is accompanied by a pleasing composition of the exterior it will soon lose its prestige and be forgotten. One of the important functions of school architecture is to sell education to the public. This is accomplished by making attractive that side of education that the public see most. Much effort is made within the school to teach children to draw accurately, paint with oils, comprehend proportions and to master other subjects that lead to the realm of art - the motive prompting this is that the child should have a sence of appreciation of the beautiful. Therefore is not appreciation greatly fostered if the building and its surroundings are executed in such a manner to give a good example?

"The exterior composition of jails, with their heavy crude walls and buildings is a punishment nearly equal to the loss of freedom within them". Similarly, ill planned schools have often created a feeling of hate and loneliness of their environments to students who otherwise would have been greatly interested. The school impressions should exert influence upon the student to impress the values of dignity, proportion and good taste. Therefore the outer appearance of schools should have the character repose and presentation befitting the important work going forward within.

The architecture of school buildings through daily inspiration developes good taste in the child. But this should not confine itself to the building, it should be continued into the grounds where it endeavours to provide the best environment for the activities that take place there. To provide an economical arrangement of these areas the unity and order of which become a source of beauty, is the function of a good design applied to school grounds.

It is true that through the treatment of the main facade an architect can give expression to the aesthetic ideals born of his profession, but the charm of the structure should be enhanced by the complimentary planting of the grounds. And it is on the proper choice of plants and flowers whose harmony lines, texture and color that fit most with the building that the success of the landscape architect depends.

Bearing all the foregoing considerations in mind, it was proceeded to design a high school satisfying the given requirements. The controlling unit in the interior planning was the class room. A 42 student class room being 770 cms. wide and allowing 300 cms. for a corridor along side and 30 cms. for an interior wall and 100 cms. for two exterior walls, the width amounted to 12 meters. This takes into consideration only one row of rooms along a corridor. This was adopted.

A narrow stemmed H-type of a building was chosen. This furnishes a well ventilated and illuminated building - it can be so oriented that all rooms receive the sun rays sometime during day time. And quite important could very neatly be rounded up to give a simple smooth expression to the building, inspiring restfullness and beauty. This was done by rounding the extremities of the stems of the H and by designing the windows in such a manner to create a continuous horizontal line motion. No vertical line, was permitted to go unobstructed for any considerable height, while a circular tower fitted into a rectangular base which is mounted on two semi circular arcs presents a variation of lines that creates an impression of geometric unconsciousness. This is most necessary for appreciation of beauty, for beauty is not something tangeable - it is a state of the individual mind, in which, through different factors, exterior and interior, the image of the perfect is neared. These are but ideas behind an architects designs which may or may not express them properly. They are no plea.

The form and width of the building chosen, it was proceeded to

proportion the lengths of the different stems. The total area required by all units that were to be supplied was found. Then deciding on having 2 full floors, one half floor and a separate part floor for music, apart from the basement, the area was divided into five parts and the length of the stems so proportioned to have the area of every floor equal to twice the area resulting from the division.

The main floor was designed to include mainly the Assembly Hall, Library and connections, Cafeteria and kitchen, Common room and Offices.

The second floor includes the gallery of Assembly Hall, Lecture room, class rooms and Laboratories.

The third floor (half floor) includes class rooms.

The Music Center was given a floor by itself above the central part of the building.

A tower was designed large enough to hold a meteorological office and observation tower.

Assuming a sloping ground, the basement included the gymnasium with an external entrance and games rooms, as well as an Engine Room which is to supply the heat during the winter.

MATERIALS OF CONSTRUCTION

In discussing the materials to be used for a school building it seems appropriate to notice the difference between Economy and Cheapness. By economy we mean the avoidance of waste in the design of the construction, the selection of materials whose durability has been tested and the employment of skilful workers with warranting experience. While cheapness means chosing materials whose price is lowest with no regard to their quality. This will result in low cost of construction, but

in high cost of maintenance. A cheaply constructed building is a liability for ever. So one should take much pains in studying the different materials before deciding which to use.

The type of construction to be used is the fire-proof frame work of reinforced concrete with concrete and brick walls. The exterior walls will be composed of 30 cms. of concrete walls to which on the part below and above the windows 20 cms. of brick will be added on the exterior side. The band in which are located the windows will be mainly composed of 50 cms. long columns with 30 cms. breadth. Into these will the window frames fit. These columns as well as the window frames will be painted with shining silver grey color, the bands above and below, with the brick pattern uncovered will be of dark brown color with the mortar of light brown color showing clearly in between. The 20 cms. of brick on the exterior add to the insulating quality of the wall while giving a pleasing variation of texture. The balustrades shall be of the same silver grey color as the window columns with the projecting cornice of dark brown.

The interior walls may be 30 cms. wide made of concrete hollow blocks to increase the sound proofing. But better still they can be of 25 cms. full cement blocks with 2 1/2cms. of sound proofing plaster. This plaster is composed of sound absorbing elements cemented together with chemically diluted wood. This plaster is still in the experimental stage.

The floors are to be of seasoned wood. The wood layer resting on a slab of reinforced concrete and hollow bricks (Hourdis). This slab with the wood on top is noise proof, which is essential in a school building.

All exterior window and door frames are to be of a light alluminium alloy. Rustless and resisting these frames will be of silver-grey shining color.

The windows, shutters and doors, except the main entrance ones, are to be made of dark brown seasoned wood, with glass of the security type.

The doors of the main entrance shall be of bright yellow copper filled in with thick opaque security glass.

All exterior stairs and balconies shall have a mosaic floor of grey and brown details.

The lavatories shall be all of white porcelain with white doors. The W.C.s seats, Urinals, sinks shall be of white ready made porcelain, while the walls will be tiled with white porcelain tiles. The floor will be of marble tiles.

All interior walls and ceilings will have a cream-brown color. The walls of the class rooms and laboratories will have a 25 cms. copper skirting, unpainted but of shining yellow color.

It goes without saying that all plumbing and carpentry work has to be of the first order in quality and in hygienic requisites.

In selecting all these materials only those whose quality guarantees minimum cost of maintenance will be considered.

C O N C L U S I O N

A school architect creates something which, if properly studied, presented and executed may be of great aid to the educator in his work with students. Thus ultimately his design is an implement for national construction. So an architect must be a man of great vision. He should study yesterday, observe today and design for tomorrow. He should have in mind a provision for his design of tomorrow that will make it fit with the image of what will be expected. The school building of tomorrow must set an example for the entire community. It shall be used by parents as well as by sons. It must therefore reveal the spirit with which it was built as well as represent an ideal. That ideal shall be democracy, free education and good will to every body entering its portals.

As these demands broaden, so will the responsibility of the architect widen. He can be helped only when architects of long experience will take the trouble to meet with educators and discuss the various problems at length. From these conferences, blended with individual creativeness and gift, will result standards of school architecture that this country lacks so much. It will be upon these standards that architects can plan and found the school of tomorrow.