

**REPORT
ON
TEMPORARY SCHOOL BUILDINGS
IN
DELHI**



सत्यमेव जयते

**COMMITTEE ON PLAN PROJECTS
GOVERNMENT OF INDIA
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INTRODUCTION

1.1. Delhi has witnessed a phenomenal rise in population, from a million to over two and a half millions, within the last 12 years. As a result, the provision of educational facilities has not been able to keep pace with the growth of population. The increase in the number of higher secondary schools has not succeeded in relieving the pressure of enrolment and the situation is likely to deteriorate with further increase in population. It is clear that more schools have to be provided and the capacity of the existing schools enhanced.

1.2. The need for schools is so great that there is no time to go in for permanent construction. Many schools are in rented accommodation or in tents. This is not a satisfactory state of affairs. Considering the need, therefore, to construct pucca structures for the existing schools as well as for those which are to be established in the future with the limited finance that is available, the Committee on Plan Projects thought it advisable to study this problem in detail, enquire into the requirements and set up rational standards.

1.3. An initial survey of some of the higher secondary schools conducted by the Committee revealed that the use co-efficient of rooms was low and the utilisation of space unsatisfactory. The problem therefore was to: (a) rationalise space requirements of higher secondary schools in order to reduce cost of construction without affecting functional efficiency, (b) prepare suggestive plans to demonstrate the principles of lay-out with a view to effecting economy in space, and (c) to replace tented accommodation for schools which leads to infructuous expenditure year after year and prepare a satisfactory scheme of construction to fit in the special requirements of Delhi i.e. capable of being dismantled and reconstructed at another site. The first two aspects have been discussed in another report recently published by the Committee on Delhi School Buildings. The third problem which relates to temporary construction is dealt with in this report.

1.4. The problem regarding temporary school buildings in Delhi is of a special nature as most of the sites at which temporary schools are located do not belong to the Education Department. Ultimately the site may have to be handed over to certain other agencies in which case the school has to be moved to another location. In such a case, it is not possible to construct permanent buildings as: (a) the Corporation authorities will not allow such buildings to be put up at the sites which do not belong to the Education Department and (b) even

if they are allowed to be put up they have to be dismantled sooner or later leading to substantial amount of infructuous expenditure which cannot and should not be allowed in the present economy. Special attention, has, therefore, to be given to the type of structure.

1.5. The report deals with the problem of space requirements and describes the type of structure recommended and adopted with success in Delhi. At the end, it deals with the method of extending the principle for adoption elsewhere in the country.

1.6. The study was carried out by the officers of the Committee on Plan Projects and an outline solution to the structural problem was first given by Sardar Sarup Singh and Dr. A. Carbone, Members of the Buildings Projects Team. It was later on developed by Shri B. L. Chadha, Architect and the Hindustan Housing Factory in consultation with the authorities of the Delhi State Government and the CPWD. The Committee on Plan Projects wishes to place on record the co-operation extended by all of them. Special mention may be made of the co-operation extended by Shri S. D. Pathak, General Manager, Hindustan Housing Factory and Shri Neki Ram Gupta, Assistant Director of Education, Delhi.

2. SPACE REQUIREMENTS AND LAY-OUT

2.1. As mentioned in the Introduction, the use co-efficient and space utilisation of rooms in a number of secondary school buildings were very low. In one case the hall with an area of 3,600 sq. ft. was used only for 35 minutes on the average per day and the laboratories were utilised for 2 to 2½ hours. The need, therefore, to consider the problem of space requirements with a view to laying down rational standards is apparent. Further the question of space has to be related to the type of structure that is proposed for temporary construction. Analysing all these factors it was decided to effect economy in space by: (a) omission of the provision for a separate hall, (b) reduction in the area of laboratories commensurate with the number of students using it at a time and the type of work to be done, and (c) reduction in the administrative area of schools such as the Principal's room, staff room, office room, record room, etc. The reduced space requirements for a temporary higher secondary school of 15 sections and having a strength of 600 students comes to 14,640 sft. as against the original requirements of 21,020 sft. effecting a saving of 30.4 per cent in carpet area. A comparative statement of figures illustrating where changes have been effected is given in Appendix I.

2.2. As can be seen from the statement in Appendix I, no reduction has been effected in the number or size of class rooms. The laboratories have been reduced in sizes after taking into account their functional requirements and preparing detailed lay-out plans. The size of rooms for elective subjects has been reduced according to the number of students to be accommodated. The hall has been omitted but the drawing room, library and staff room have been so designed with partitions in between, that these can be converted into a hall when needed. The area of administration also has been reduced as the original requirements were considered to be excessive.

2.3. It is not possible to standardise the layout as it also depends upon the size and the shape of the plot. The layout (Plate I), as prepared, after discussion with the educational authorities, is essentially suggestive, incorporating the facilities that have been discussed in the earlier report. The important point to remember, in arriving at an efficient layout, is the grouping of the various facilities in a manner that will reduce the walking distance to the minimum, and protection from noise disturbances to the maximum possible extent. Science theory room has been placed close to the laboratory and the

common room, the library, etc. have been so grouped as to be easily accessible from the entrance and separated from the class-rooms.

2.4. Obviously, there are certain inconveniences to be put up with in a construction of this type. The lack of covered passages should not impose much difficulty as the boys will be confined in the class rooms and the teachers will be moving from class room to class room mostly. In case of science subjects where the student body is to move, care has been taken to see that the travel distance is the minimum.

2.5. The orientation of the school is also so proposed that western exposure is minimised. Considering the necessity of reducing cost of construction and of shifting the building, one may have to put up with some minor inconveniences.

3. STRUCTURE, SPECIFICATIONS AND COST

3.1. As already mentioned in the Introduction, the structural arrangement of temporary schools posed a special problem in Delhi as permanent sites are not available and the structure has to be of a character that can be dismantled and shifted to other places with minimum of cost and wastage. Tented accommodation, as at present adopted, is far from satisfactory as it does not give adequate protection against weather or fire hazards. From the functional point of view also, such accommodation is highly unsatisfactory as laboratories cannot be provided in them and in the absence of such important facilities, the students have either to go over longer distances to other schools for instruction or science instruction cannot be imparted in such schools. In either case, this is highly unsatisfactory from the educational point of view. Even from the financial point of view this is unsatisfactory as the administration is incurring an infructuous expenditure of about 2.5 lacs per year on new tents and renewal of old ones. Further the tented schools are a subject of public criticism and the administration was consequently very desirous of replacing such accommodation by a suitable type of structure capable of being erected quickly and dismantled and removed to other places when needed.

3.2. One possibility that could be considered in this connection is the normal semi-permanent structure consisting of brick-in-mud walls, brick flooring, soft wood doors and windows and A. C. roofing over wooden trusses and purlins. The residual value of this structure, however, is low. Apart from this there will also be objections from the owners of land to the putting up of this type of structure. The solution to overcome these objections would be to have a construction with precast components which would have a good residual value and at the same time, capable of quick dismantling and reassembly. The Hindustan Housing Factory being nearby, where all facilities for precasting are available, this solution seemed to hold promise. The final solution was worked out by them.

3.3. The design envisages the use of precast concrete columns and panels, prestressed concrete purlins and A.C. roofing. The shape and size of the columns and those of the panels are so adjusted that they could be erected without any difficulty, providing at the same time, an architecturally pleasing exterior and an interior

reasonably protected from the effects of weather. The flooring can be either of cement concrete or dry brick on edge laid over well-rammed earth. The latter is much cheaper but not so durable and clean.

3.4. There are no corridors or verandahs, therefore, bajri or brick-paved paths are necessary. A block of WCs and urinals would be provided away from the main building.

3.5. On the structural side, several minor details have been looked into with great care resulting in the omission of frames for doors and windows and lintels over openings. The columns themselves are so shaped as to facilitate the attachment of doors and window shutters while some of the wall panels are so made as to act as lintels over openings and as window cills. Details of these are given in Plate II.

3.6. A detailed costing of the two types of construction outlined above was made and the result is tabulated in a statement given in Appendix II. The initial cost of construction, the residual value at the end of five years and the maintenance expenditure during the period are properly accounted for. The economy in the precast design is mainly due to the higher residual value and low maintenance. This will be quite apparent from the study of the cost analysis.

4. SCOPE FOR APPLICATION ELSEWHERE

4.1. The type of construction described has already been adopted for 15 schools in Delhi. Out of these, 13 have been completed and occupied. A survey conducted brings out the suitability of the structural arrangement. They are, without doubt, far superior to tented accommodation, and while meeting the essential accommodation requirements of a school, provide the additional facility of being capable of transfer to new sites. The absence of verandahs and covered passages is not proving a serious handicap. The cost is low and make it possible to provide greater number of schools within the available funds.

4.2. The guiding principles of the study have been: (a) rationalisation of requirements and (b) the evolution of a type of structure that will be cheap and fit the peculiar conditions of Delhi. The rationale of space requirements can be applied whether the structure is permanent or temporary and can be adopted elsewhere in the country as well.

4.3. The structure evolved is as good as a permanent one and the effect of temperature within can be mitigated by giving particular attention to orientation in the lay-out and by planting trees and creepers on the western side to give a shielding effect. Where a covered verandah is needed, the structure can be suitably modified. The technique involved is quite simple. Pre-stressing can be avoided if facilities for the same are not available locally. Instead of pre-stressed purlins, ordinary pre-cast purlins can be provided. This would give an economical and speedy solution for school construction everywhere.

4.4. In many of the States new schools have to be put up in far off places where ordinary construction is slow and difficult to supervise. The effect in either case is that one does not get a return commensurate with the capital spent. If the technique of pre-casting is adopted, it is possible to standardise the components, manufacture them at a central place, carry them to the site and simply assemble them there. It may not be difficult to train a gang of people in assembling such structures. By adopting this method one can achieve the double purpose of speed and economy through precasting and consequent control on quality.

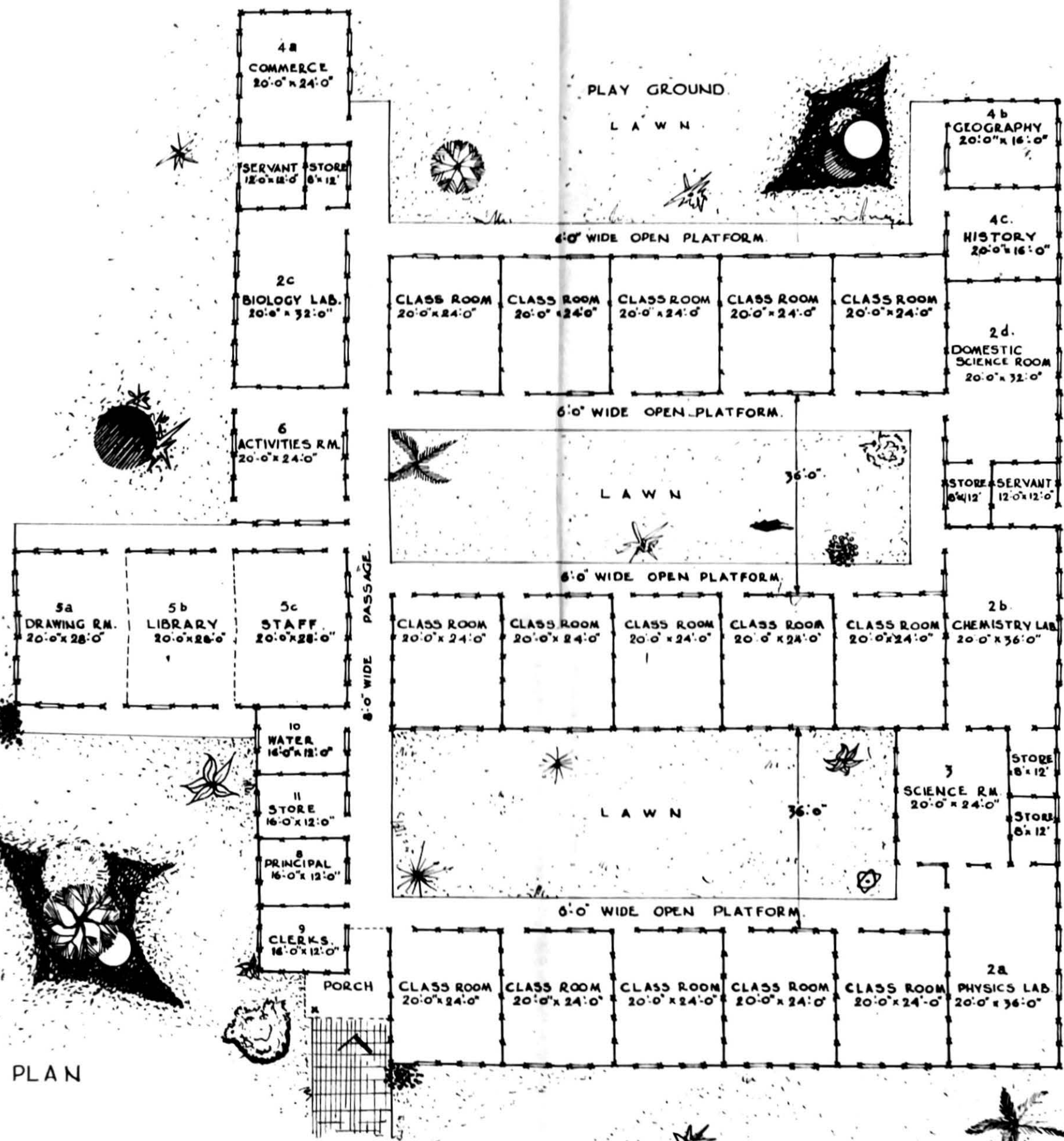
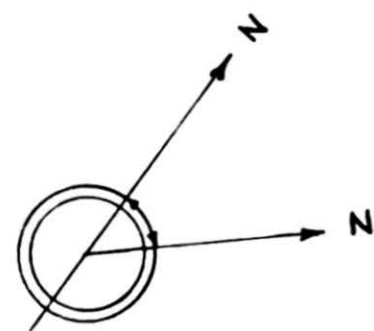
**COMPARATIVE STATEMENT OF ORIGINAL AND REVISED
REQUIREMENTS**

Higher Secondary School Building (No. of students 600 : Classes 6 : Sections 15, 3 in each middle class and 2 in each higher secondary class.)

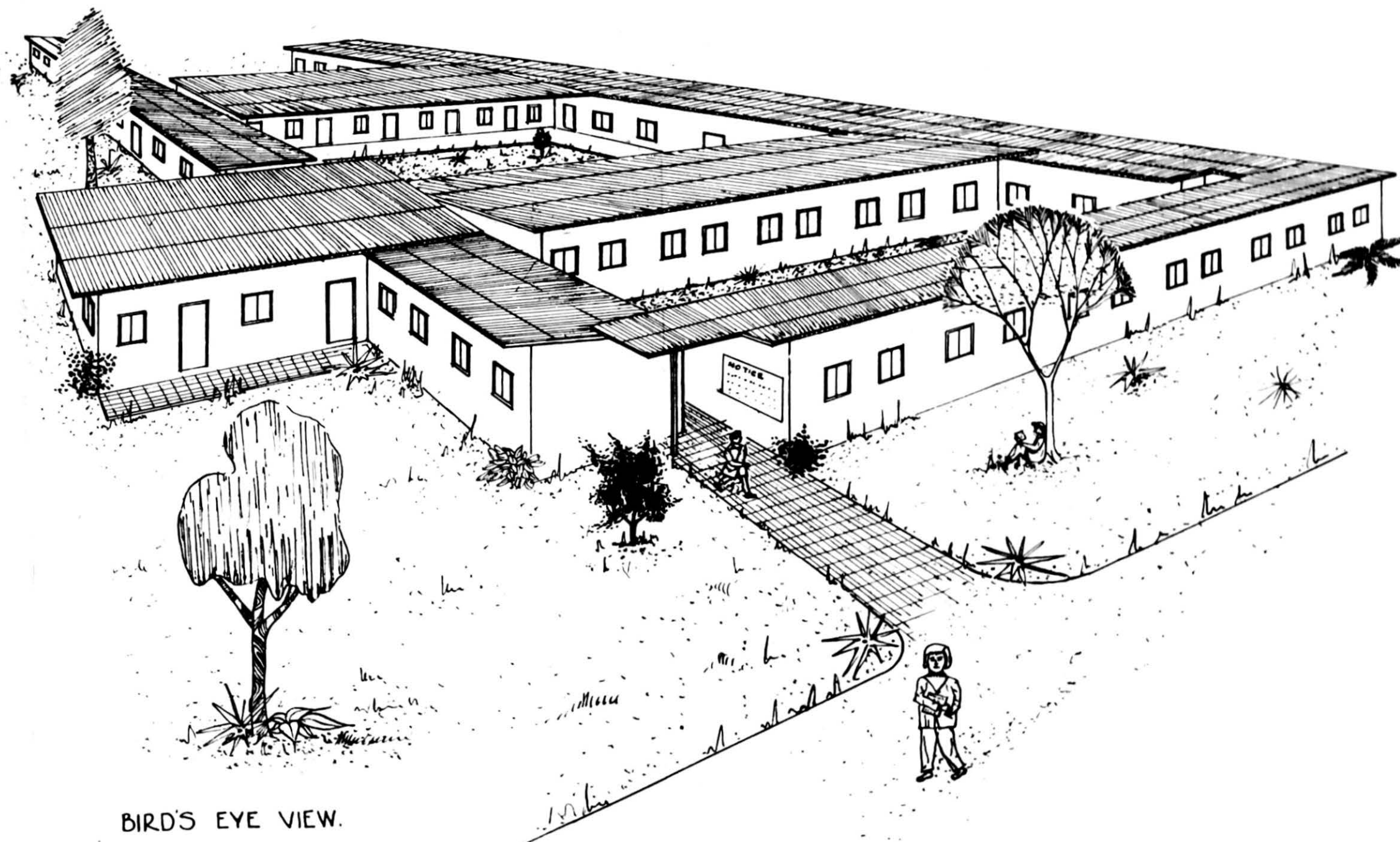
Serial No.	Description	Nos.	Original dimensions and area (Sq. ft.)	Revised dimensions and area (Sq. ft.)	Remarks
<i>Instructional</i>					
1.	Class rooms	15	24 × 20 = 7,200	24 × 20 = 7,200 (no change)	
2.	Science Block (Labs.)				
	(a) Physics Lab. Store attached	1	50 × 20 = 1,000	36 × 20 = 720 12 × 8 = 96	
	(b) Chemistry Lab. Store attached	1	50 × 20 = 1,000	36 × 20 = 720 12 × 8 = 96	
	(c) Biology Lab. Store attached	1	50 × 20 = 1,000	32 × 20 = 640 12 × 8 = 96	
	(d) Domestic Science Lib. Store attached	1	50 × 20 = 1,000	32 × 20 = 640 12 × 8 = 96	
3.	Science Theory Room (amphitheatre type with inter-communication doors to the labs.)	1	24 × 20 = 480	24 × 20 = 480 (no change)	
	(a) Science room— Middle Classe	1	24 × 20 = 480		Not considered necessary.
4.	Rooms for three elective subjects.				
	(a) Commerce	1	24 × 20 = 480	24 × 20 = 480 (no change)	
	(b) Geography	1	24 × 20 = 480	20 × 16 = 320	
	(c) History	1	24 × 20 = 480	20 × 16 = 320	
5.	(a) Art room	1	24 × 20 = 960* *(Provision for two Art rooms)	20 × 28 = 560	} To be fitted with partition panels so that the three rooms together can be used (60 × 28) as a hall when needed.
	(b) Library	1	36 × 20 = 720	20 × 28 = 560	
	(c) Staff room	1	24 × 20 = 480	20 × 28 = 560	
6.	Activities room	1	24 × 20 = 480 (no change)	24 × 20 = 480	With permanent partitions dividing the room into four sections Vide remarks against Item. 5.
7.	Hall	1	90 × 40 = 3,600	—	
<i>Administrative</i>					
8.	Principal's office	1	15 × 20 = 300	16 × 12 = 192	
9.	Clerk's office and record room	1	20 × 20 = 400	16 × 12 = 192	
10.	Store room (fitted with shelves)	1	24 × 20 = 480	16 × 12 = 192	
			Carpet Area = 21,020 Sft.	= 14,640 Sft.	
			Saving in Carpet area = 6,380 Sft. i. e., 30.4%		



FRONT ELEVATION



PLAN

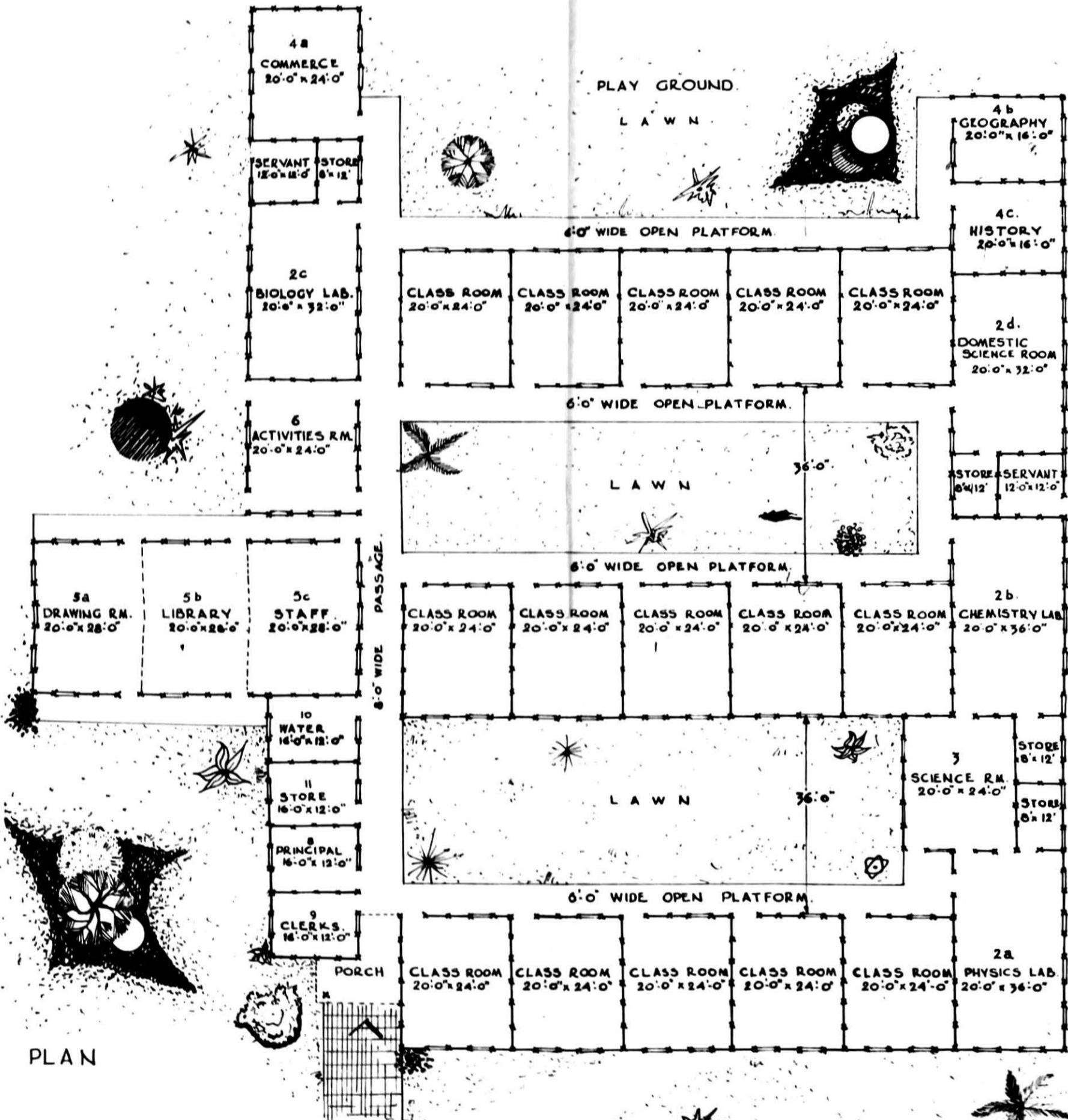
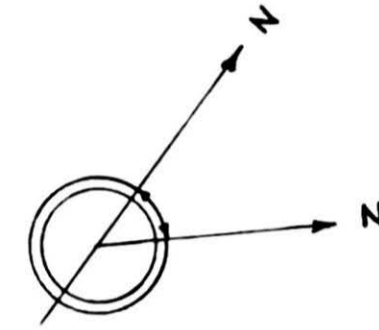


BIRD'S EYE VIEW.

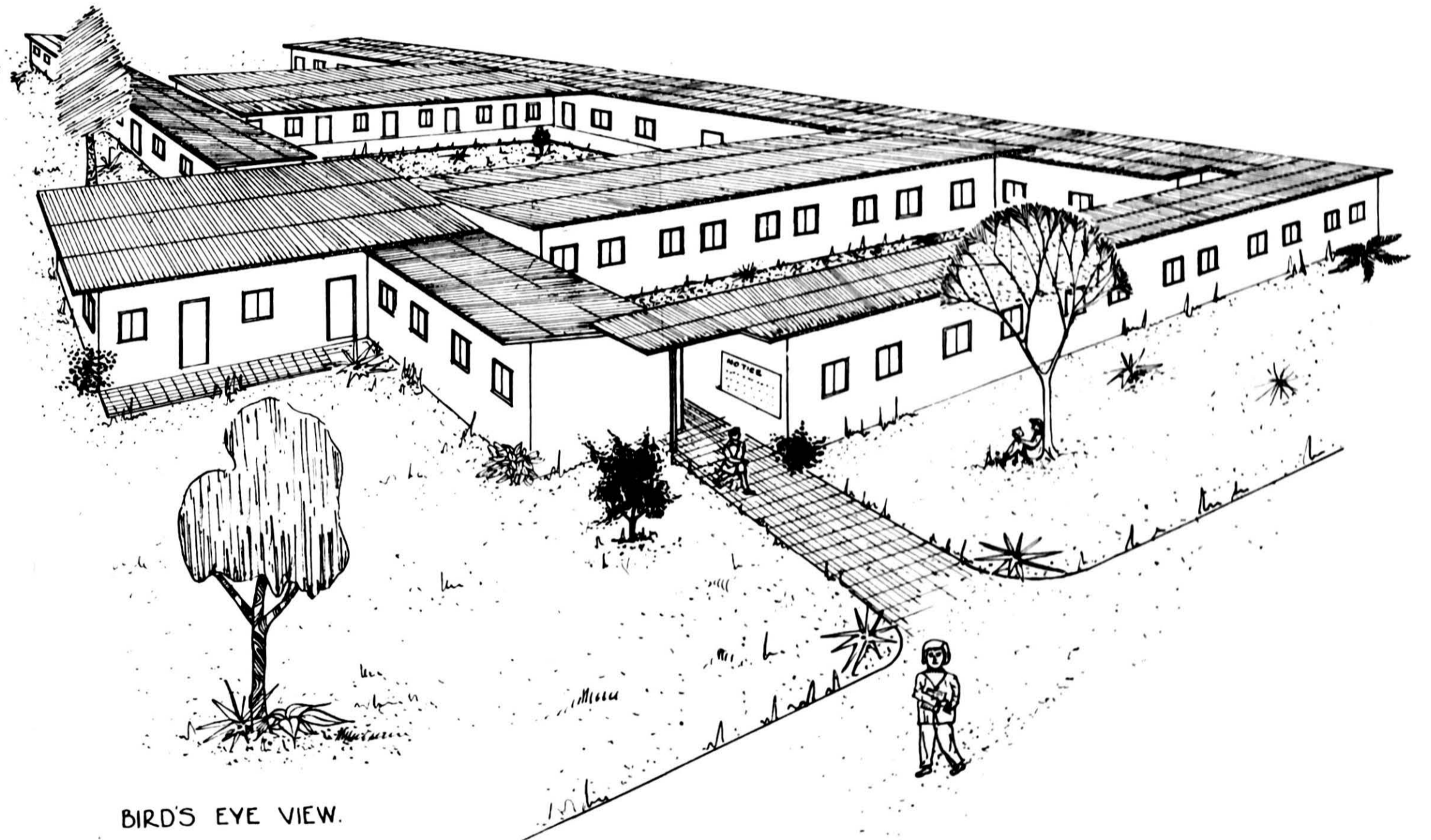
PLAN, ELEVATION AND BIRD'S EYE VIEW OF THE PREFABRICATED SCHOOL



FRONT ELEVATION

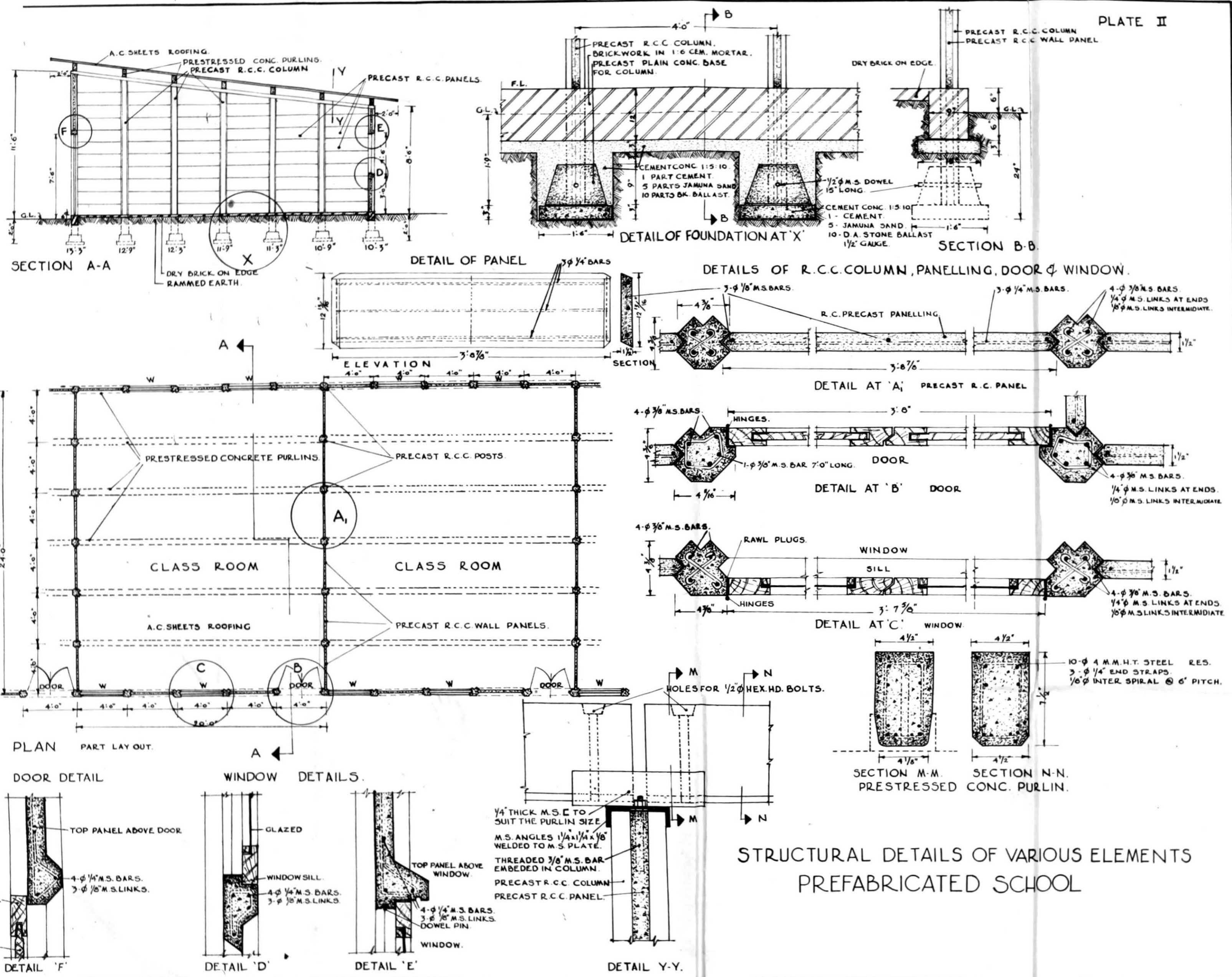


PLAN

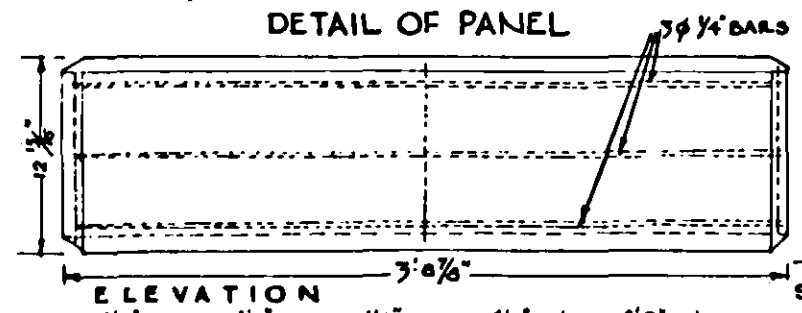
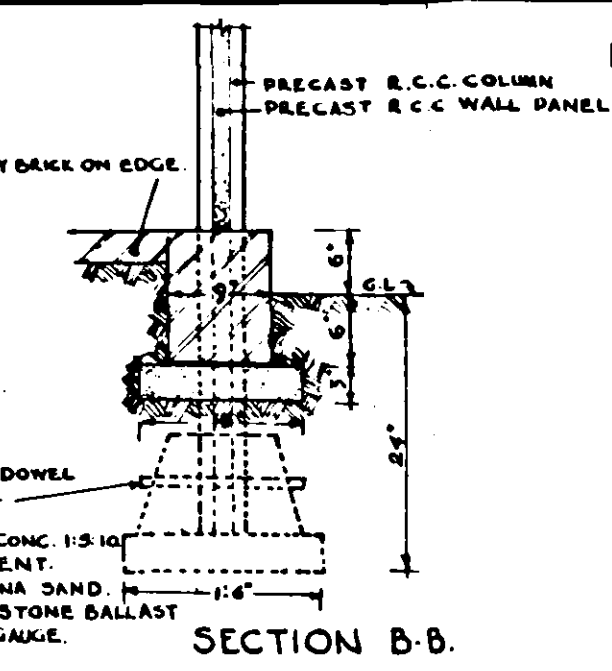
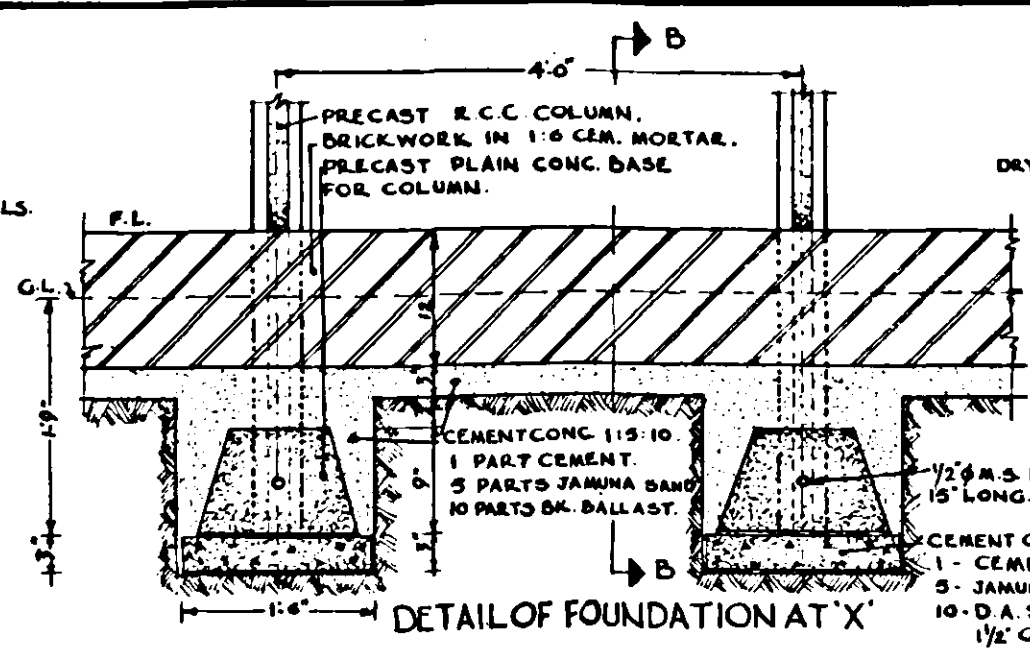
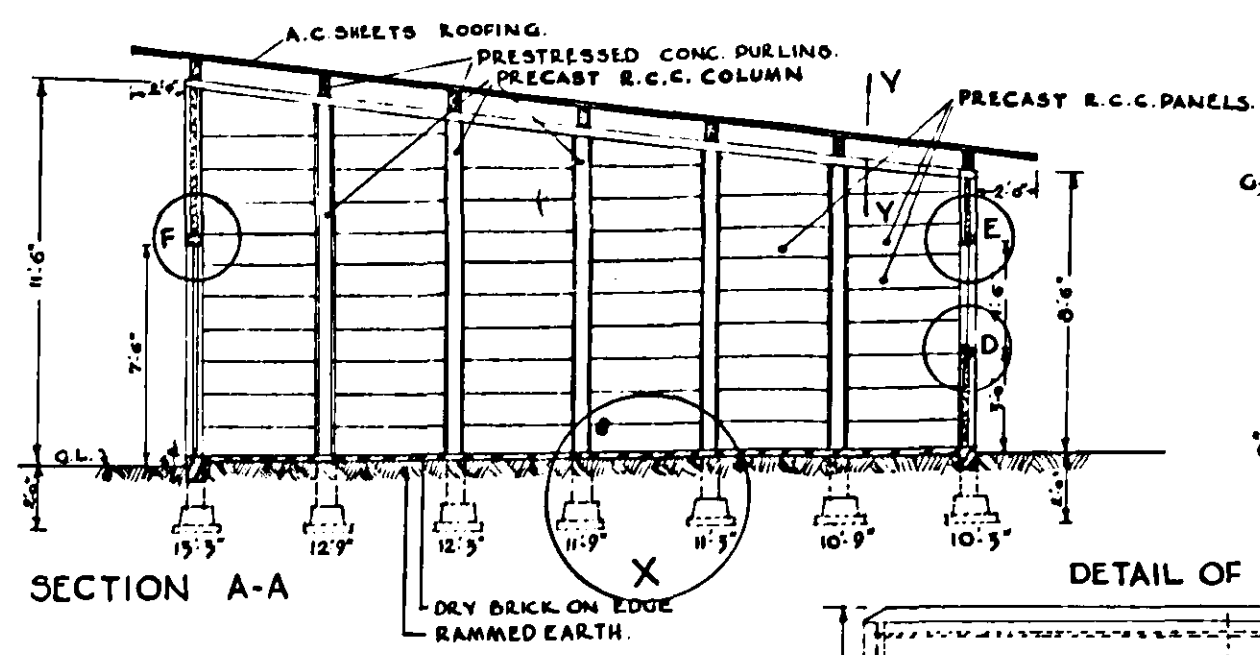


BIRD'S EYE VIEW.

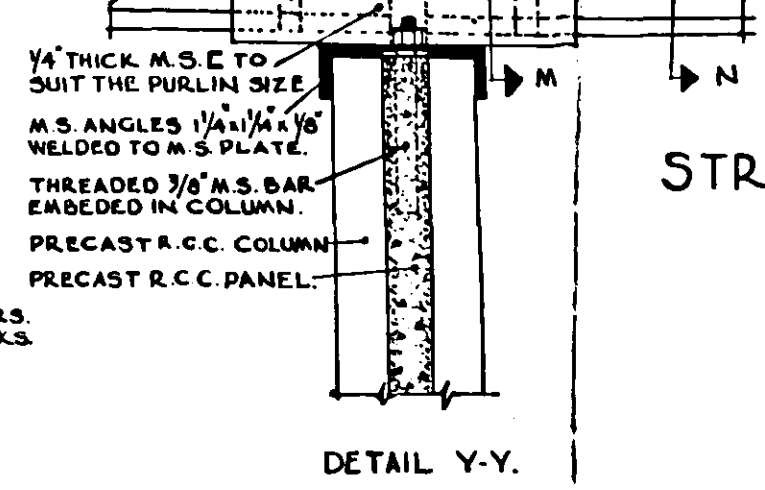
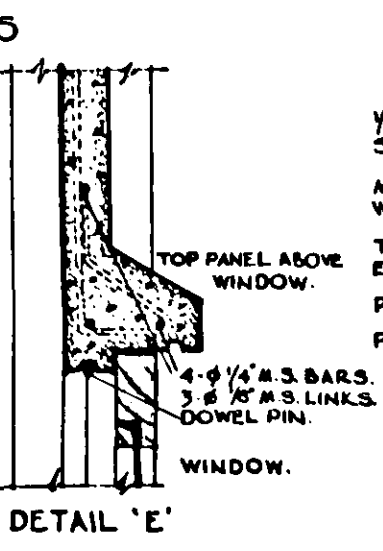
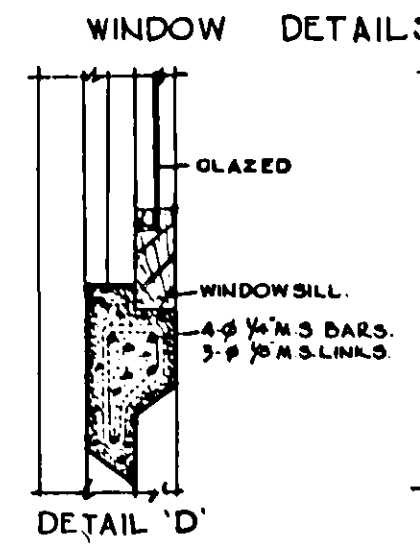
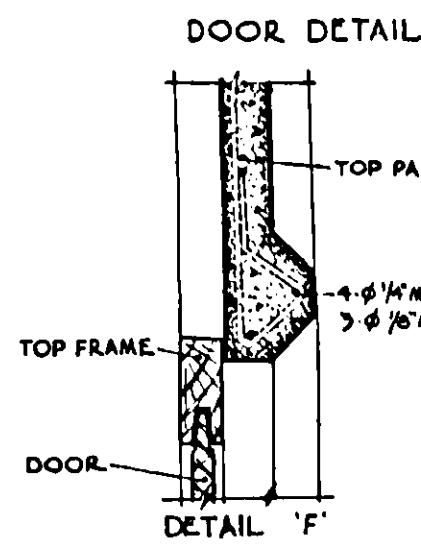
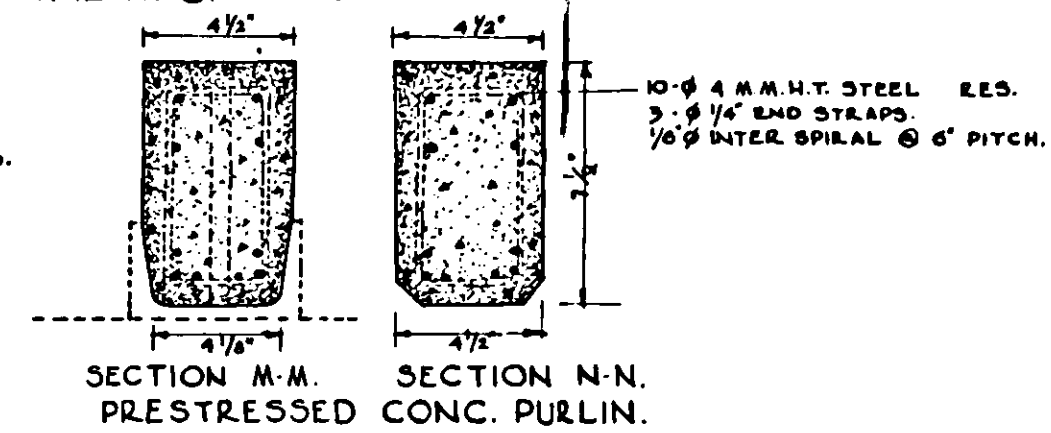
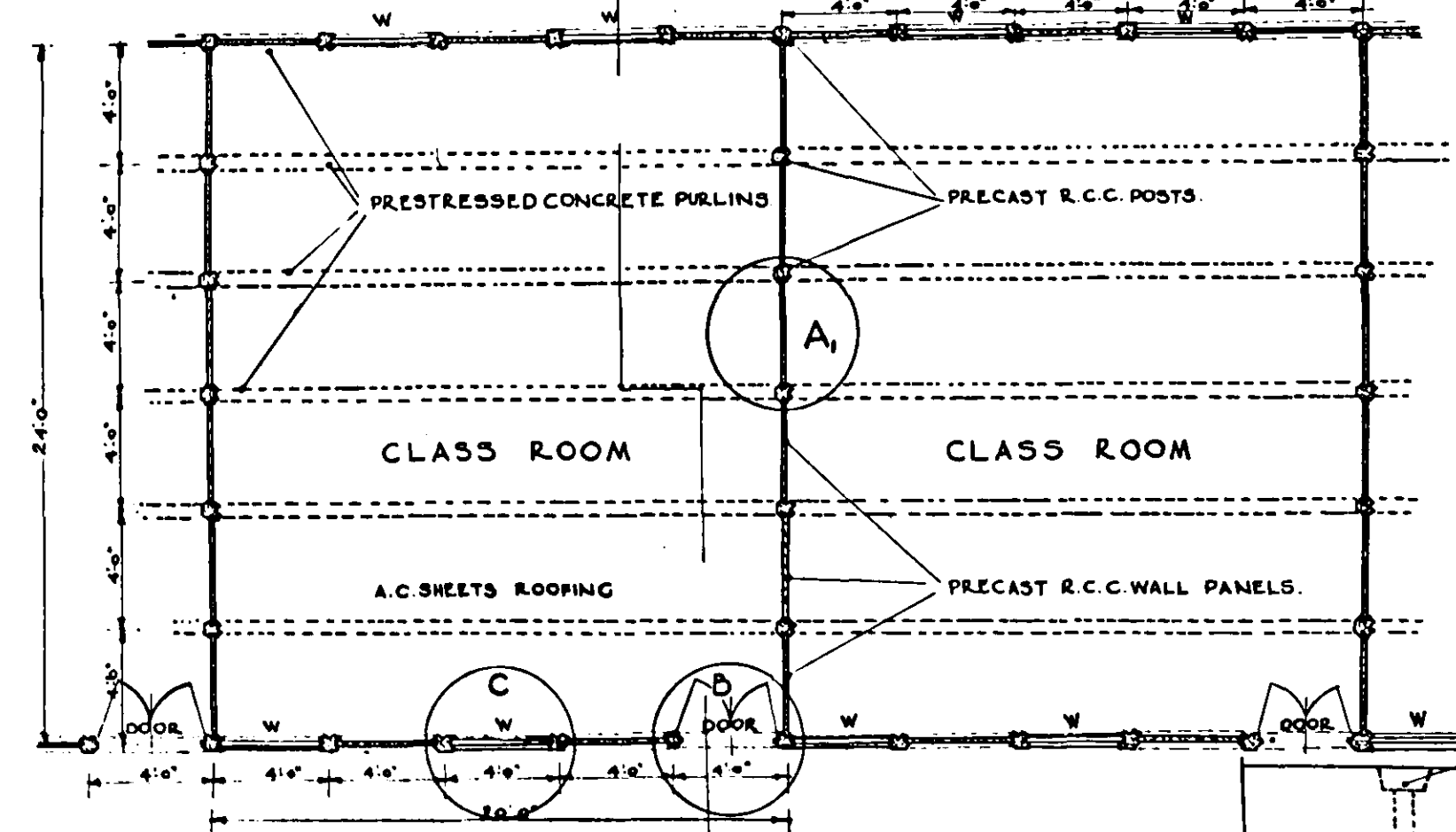
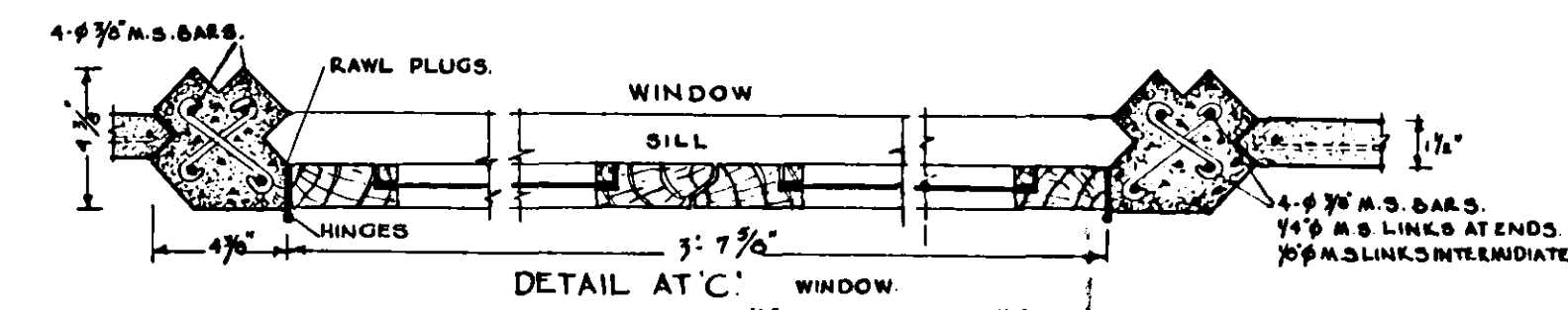
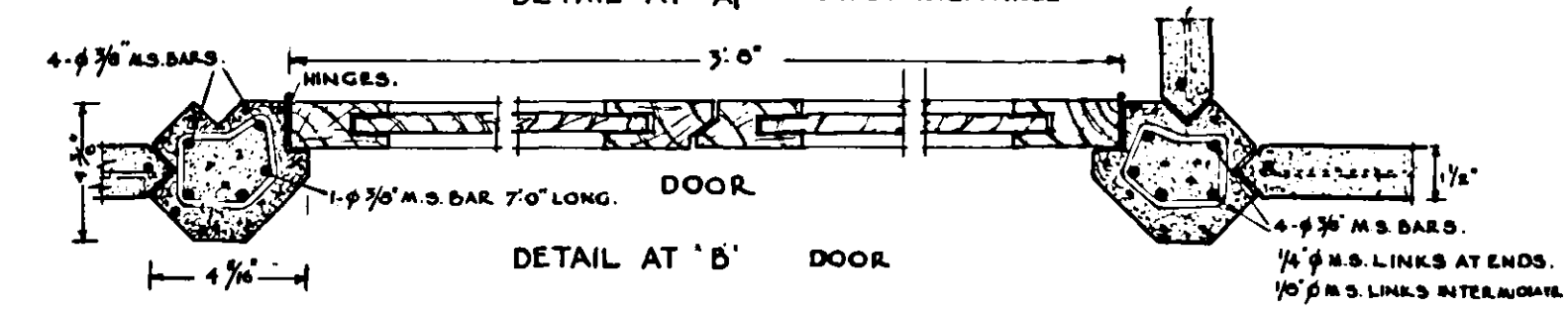
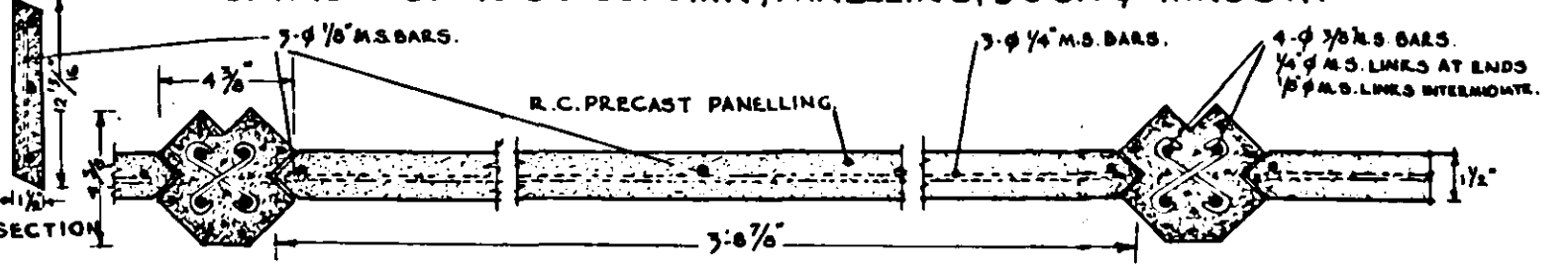
PLAN, ELEVATION AND BIRD'S EYE VIEW OF THE PREFABRICATED SCHOOL



STRUCTURAL DETAILS OF VARIOUS ELEMENTS
 PREFABRICATED SCHOOL



DETAILS OF R.C.C. COLUMN, PANNELLING, DOOR & WINDOW.



STRUCTURAL DETAILS OF VARIOUS ELEMENTS PREFABRICATED SCHOOL