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ABSTRACT

A study carried out on primary school buildings in Roorkee, India, with a view to effecting economies in the cost of such buildings, is reported. Suggestions are made concerning substantial economies in overall space requirements, by increasing the use-efficiency of school space as a result of systematic operational research on the timetable and the school curriculum. (FS)

COST REDUCTION IN PRIMARY SCHOOL BUILDINGS

(Use-efficiency method)

CENTRAL BUILDING RESEARCH INSTITUTE
ROORKEE (U.P.)

FOREWORD

The report describes a study carried out on primary school buildings with a view to effecting economies in the cost of such buildings. It has been possible to suggest substantial economies in overall space requirements by increasing the use-efficiency of school space as a result of systematic operational research on the time table and school curriculum. Practical trials on the revised time table were successfully carried out in a large number of primary schools around Roorkee with the active collaboration of the District Education Authorities.

The study was carried out by Shri R. D. Srivastava, Scientist C.B.R.I.

The cost and educational aspect of the study was conducted by Shri Surendra Singh Scientist, C.B.R.I. and Dr. B. M: Gupta, District Inspector of Schools, Saharanpur respectively. I would like to express my appreciation of the interest shown by the U. P. Education Department in this study.

DINESH MOHAN
Director
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Roorkee.

Roorkee.
15th Feb. 1967.

INTRODUCTION

In India there exists a continuously increasing demand for new school places and better teaching facilities with very limited available funds. Millions of school going children are required to be housed in school buildings to meet the national target of compulsory primary schooling. This would naturally require a huge number of school buildings. It is, therefore, necessary that every possible economy be achieved in the planning and architectural, physical and structural designing of new schools. All concerned have also to ensure that no unused spaces are included in the future plans of schools and also all avilable existing spaces are used to their maximum.

In India very little information is available regarding cost indices and space and construction standards for various types of school buildings The need for such data having been realised it was decided to conduct research and investigations on school buildings at the Central Building Research Institute. To start with, basic information for standards on teaching spaces, storage and site spaces for primary schools were formulated, keeping in view the educational and functional reqirements of the schools.

To achieve further economy a study on use-efficiency of school spaces and comparative cost indices was taken up. The former is aimed at findirg out how economies in spaces could be affected through careful planning of school buildings and continuous use of space throughout the school day.

USE-EFFICIENCY

There are several ways of estimating the relative economy of a building

a. By comparison between the gross area available for teaching and the remaining area of the school.

b. By comparison of a number of schools in respect of areas of different spaces.

c. By comparison of covered area per pupil considering various functions.

d. By comparison of cost per student place.

None of the above methods indicate the degree to which the spaces are used. It was, therefore, necessary to study the teaching time table in relation to the plan of the building. From this it was possible to express the actual use of each space in relation to the length of the school day during which the building was in use. The use-efficiency was defined as the ratio between the actual and ideal use per sq. ft per hour. The actual use was area of space used multiplied by time and the ideal use was total area of space multiplied by total school time.

A typical school building plan of five class rooms (Fig. 1) was related to the time table being followed in local primary schools. The time table in terms of outdoor and indoor periods is also indicated in the figure. The $5\frac{1}{4}$ hours (10-00 A. M. to 3-15 P. M.) teaching day with eight periods of forty minutes each (including one lunch period) was the general pattern. The study revealed that the use-efficiency of school building was 52 per cent and the occupancy of verandah and headmaster room was as low as 25 per cent. The use efficiency of classes ranged from 51 to 76 per cent.

To achieve economy in buildings, the increased use-efficiency was attained by eliminating less used spaces; and by rational application of t aching periods in the school plan. By eliminating verandah and head master room use-efficiency of school building increased to 63 per cent and an economy of 25 per cent in space was obtained. These spaces may be desirable features of schools but since their elimination do not strictly affect education, they may be left out till more funds are made available. In an effort to achieve optimum use of class room spaces, the time table was analysed and rearranged The rational application of the time table to school building plan (Fig. 2) indicated that a primary school could well function within three class rooms only. It increased use-efficiency to 85 per cent and also economised 40 per cent in the overall teaching space requirements.

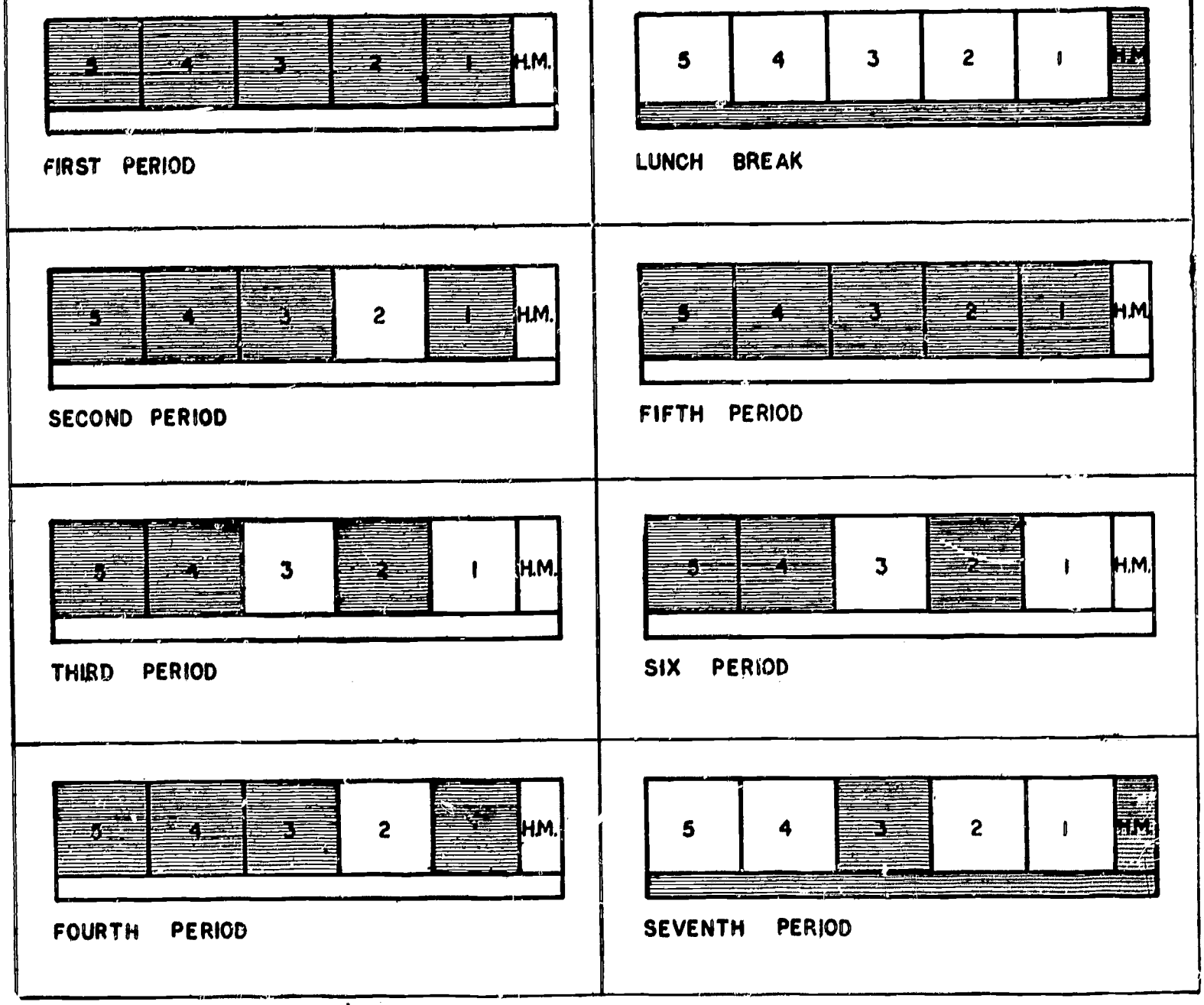
STUDY OF EDUCATIONAL PROBLEMS

Before any final conclusion could be drawn out of the above study it was considered necessary to study that the standard of instruction should not suffer on account of this economy. With this in view, the study of educational efficiency was undertaken in collaboration with education officials of the education department of Saharanpur district (U.P.). During the first stage of study an effort was made to identify the subjects which could easily be taught in open spaces on the basis of actual performance of instructional practices. It was observed that the activity programme such as physical culture including games for lower classes; basic crafts such as clay work, gardening, art and local crafts etc; and teaching of multiplication tables to lower classes through clay balls, sticks and other activity methods could easily be taught in open or in sheltered spaces.

In the existing common pattern of instructions, cass I and II are required to attend schools at 10 A.M. and continue upto closure of school. It is a long and strenuous period for a child of six and seven years of age. In the new time table grades one and two were let off in the last period.

ACTUAL TRIALS IN SCHOOLS

Having identified the subjects which could be taught in open and after studying other educational problems, it was considered necessary to study the implications by actual obser-



TEACHING PERIODS

CLASS	INSIDE PERIODS	OUTSIDE PERIODT
I	4	4 (INCLUDING ONE LUNCH PERIOD)
II	4	4 ,, ,, ,, ,,
III	5	3 ,, ,, ,, ,,
VI	6	2 ,, ,, ,, ,,
V	6	2 ,, ,, ,, ,,

AREA OF EACH CLASS ROOM 7.32×6.1 M $= 44.55$ M²
AREA OF VERANDAH 39.62×1.52M $= 60\ 22$ M²
AREA OF HM. ROOM 3.05×6.1 M $= 18.60$ M²

USE EFFICIENCY OF SPACES

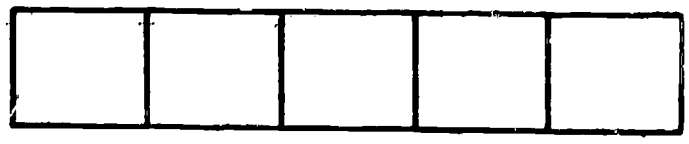
CLASS I ACTUAL USE 44 55 M² USED FOR 2.7 HOUR = 120.40M² HOURS
IDEAL USE 44 55 M² FOR 5.25 HOUR = 234.11 M² HOURS
USE EFFICIENCY $\frac{120.40}{234.11}$

U. E.
,, ,, CLASS I =0 51
,, ,, CLASS II =0 51
,, ,, CLASS III =0.63
,, ,, CLASS IV =0.76
,, ,, CLASS V =0.76
,, ,, VERANDAH =0.25
,, ,, HM. ROOM =0 25

USE EFFICIENCY OF THE SCHOOL=0.52

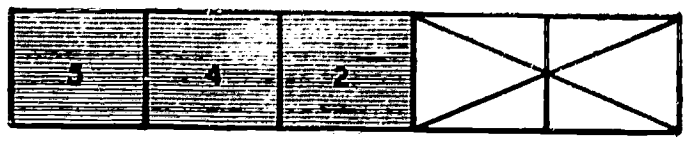
FIG. 1

FIRST PERIOD

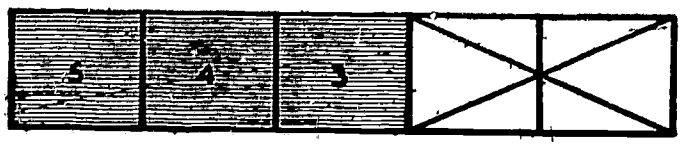


LUNCH PERIOD

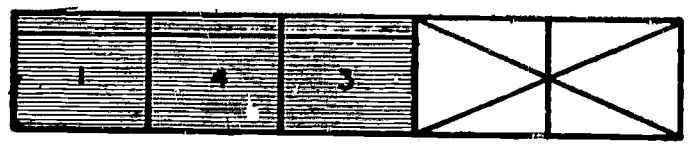
SECOND PERIOD



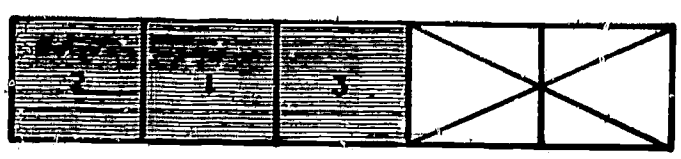
FIFTH PERIOD



THIRD PERIOD

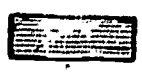


SIXTH PERIOD

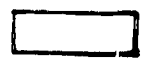


FOURTH PERIOD

SEVENTH PERIOD



ROOMS OCCUPIED



ROOMS UNOCCUPIED

TEACHING PERIODS

CLASS	INSIDE PERIODS	OUTSIDE PERIODS
I	3	4 INCLUDING I LUNCH BREAK
II	3	4 " " " "
III	5	3 " " " "
IV	5	3 " " " "
V	5	3 " " " "

USE EFFICIENCY

ACTUAL USE 133.77 M^2 USED FOR 4.6 HOURS=615.34 M^2 HOURS
IDEAL USE 133.77 M^2 USED FOR 5.25 HOURS=702.3 M^2 HOURS

USE EFFICIENCY $= \frac{615.34}{702.3}$
$=0.85$

FIG. 2

vations in forty schools in and around Roorkee having basic education curriculum. The experiments were conducted on rainy days and on clear days.

EXPERIMENTS ON RAINY DAYS

Since outdoor teaching was not possible, it became necessary to accommodate all students in the building itself. Two classes had to be combined, keeping in view their teaching standards. Combination of class I with class II was always troublesome because of greater number of children in each class and also because of their childish habits. Combination of class IV and V and III and IV worked tolerably well. Evidently, normal time table was suspended during these days of class combination and certain work was undertaken which could sustain interest of both the classes. For example, in language periods recitation and composition could be taught easily. In Arithmetic period re-capitulation of multiplication tables and mental arithmetic processed on well. In social study period narration of simple stories and re-capitulary questions did well. It was felt to be a poor compensation for the normal teaching work but the number of such days being very small against the economy in huge amount to be spent on construction of school buildings, it was felt that the system could be made workable. The use-efficiency of the spaces were found to be 85 per cent.

Effort was also made to achieve 100 per cent use-efficiency of spaces during school day by staggering mid-day lunch time but this did not find favour with the teachers. The time table was therefore finally revised with the following considerations:—

a. The mid-day lunch break to be the same for all classes.

b. Three classes to be inside the building and two classes for outdoor teaching to have the same subject such as gardening, physical training, crafts work or games.

c. The number of shifting of classes to be kept to minimum.

d. No space to remain unused.

OBSERVATIONS

a. Some space was required for keeping *bastas* (satchels) of students while changing classes.

b. During bright sun outdoor teaching activities were uncomfortable.

c. Outdoor lessons for activity and creative work necessiated physical movement and the students felt refreshed and vigorated to receive the next lesson.

d. On an average five minutes were spent in changing classes.

e. A great responsibility fell upon the teachers to plan their lessons ingeniously so as to finish it in time.

A solution to some of the above problems could be found in providing some device to keep *bastas* outside on *tat-patti* with marked numbers. Some sheltered spaces should also be provided for outdoor activities during inclement and hot weather. The students could be taught to move in a line in a disciplined manner which would minimise the time in shifting of classes.

FINDINGS OF THE STUDY

(1) Three class room with a sheltered space, instead of five, are adequate.

(2) Optimum use of spaces is attained with 85 per cent use-efficiency.

(3) Students learn more activity programme, which, though included in the curriculum, is not adopted in practice.

(4) Standard of instruction improves.

(5) Students take more interest in their lessons.

TIME TABLE

A typical time table has been prepared to

indicate the adjustment of the outdoor and indoor periods in relation to the plan of the school buildings. The time table will vary as per local conditions and limitations of the schools. The subject "craft" in the time table includes art work, clay work, spinning, weaving, paperwork, needle work, knitting work, drawing and modelling etc.

DEVELOPMENT OF SCHOOL BUILDING PLAN

On the basis of the above study, several alternate plans for Schools of various enrolments both for rural and urban areas and also for different elimates have been developed. For further economy rationalised construction and design specifications have been worked out for self help project, possibilities of partial prefabrication have also been exploited. School building plans for rural areas have been prepared with due consideration of technical know-how, limited financial provision and locally available materials.

SPECIFICATION AND COST

The specification and cost of school building will vary from locality to locality depending upon the availability and cost of materials and labour in those places. A typical set of specifications has been prepared. (Annexure 2) In Roorkee a school based on proposal No. 6 has recently been constructed by Roorkee Municipal Board. It covers a plinth area of 2050 sft, and has been constructed for Rs 13200.00. This works out to be 6.50 per sq ft. It provides for an enrolment of 200 students with furniture in class rooms 20 x 24 ft. in size. If the same school is designed for squatting the class room sizes can be reduced to 16 x 20 ft. and cost of construction can be kept within Rs. 10000.00. The specifications and detailed costing has been given in (Annexure 3 & 3 A)

(Annexure 1)

SUGGESTED TIME TABLE FOR PRIMARY SCHOOLS

Class		Ist period	2nd period	3rd period	4th period		5th period	6th period	7th period
V	PRAYER	Regional language	G. Science & Agriculture	Maths.	Games and P.T. (outside)	MID DAY LUNCH BREAK	English or other language	Craft (outside)	Social study
IV		Regional language	Craft (outside)	English or other language	Games and P.T. (outside)		Maths.	Social study	General Science
III		Social study	Craft (outside)	Regional language	Maths		Games and P. T. (outside)	English or other language	General Science
II		Craft (outside)	Maths	Games and P.T. (outside)	Regional language		Social study	Counting & tables (outside)	—
I		Craft (outside)	Regional language	Social study (outside)	Regional language		Games and P. T. (outside)	Maths	—

(Annexure 2)

TYPICAL SPECIFICATIONS

ELEMENT	SPECIFICATION
Foundation Plinth	Cement concrete 1:5:10 (1 cement, 5 local sand, 10 stone or brick ballast) OR Lime concrete 1:2:8 (1 lime, 2 surkhi, 8 brick ballast) Brick work in cement mortar 1:6 (1 cement, 6 local sand) OR Brick work in lime mortar 1:2 (1 lime, 2 surkhi) OR Square rubble masonry covered in cement mortar 1:6. Damp proof course 1 in. thick of cement concrete 1:2:4 with a coat of hot bitumen. OR Damp proof course 3/4 in. thick of cement mortar 1:2 with water proofing material.
Superstructure	Brick work in mud mortar. Columns, jambs of doors and windows, 6" above plinth level, and below roof level brickwork to be in cement mortar 1:6. OR Sun dried brick work in panels, with columns and masonry upto sill level in cement mortar 1:6. OR Random rubble masonry in cement mortar 1:6. Lintel and chajja with RCC precast, or reinforced brick.
Roof	(1) Flat Reinforced brick;or jack arch; or brick tiles on wooden rafters; or stone slabs resting on precast beams or precast cored unit (CBRI) or D. C. tiles (CBRI). (ii) Sloping Corrugated asbestos cement sheet or thatch supported on bamboo or wooden rafters or slate tiles.
Doors and windows	Battened and braced doors; glazed windows in local wood or wooden louvered windows.
Floor	Brick on edge flooring with joints grouted with cement mortar 1:4. OR Stone tile flooring over 1/2" thick base of cement mortar. OR C.C. flooring.
Finishes	Cement plaster 1:6 and white wash. OR Brick pointing outside in cement mortar 1:4 outside and cement plaster with white wash inside. All wood work to be nil painted.

Annexure 3

SPECIFICATIONS OF SCHOOL BUILDING PROPOSAL No. 6

Foundation & Plinth	Cement concrete 1:5:10 with stone ballast; brick work in cement mortar 1:6, 3/4 in. thick damp proof course in cement mortar 1:4 with water proofing compound.
Superstructure	Brick work in mud mortar except in columns, jambs of doors and windows, 6 in. above plinth level and below roof level wherein brick work in cement mortar 1:6. R B work in lintels and chajjas.
Roof	Reinforced brick work in cement mortar 1:3 with lime concrete terrace (1:2:8).
Doors & windows	Sal wood frames, Deodar wood battened door and glazed windows.
Floors	1 in thick cement concrete 1:2:4 laid in panels over consolidated brick ballast.
Finishes	Cement plastar 1:6, white washed inside. Flush pointing outside in cement mortar 1:4; all wood work oil painted.
Fittings	$1\frac{1}{2}$" thick precast RCC shelves 1:2:4; chalk Boards of cement mortar 1:3 finished with black-Japan. Local wood almirahs.

Annexure 3 A

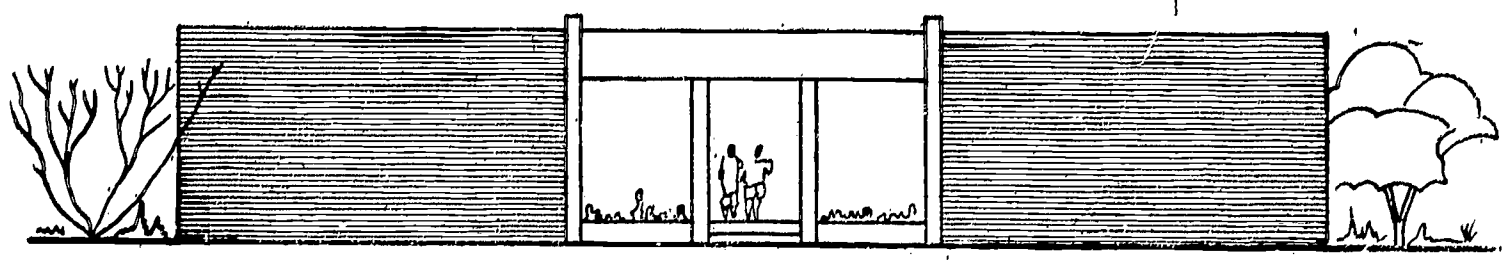
Details of cost of School Building under Proposal No. 6.

S. No.	Item	Qty.	Rate/unit Rs	Amount Rs
	Foundation & Plinth			
1.	Earthwork in excavation in ordinary soil	948 cft	25.00 %	23.70
2.	Cement concrete 1:5:10 with stone ballast	187 cft	150 00 %	280 50
3.	Second class brick work in cement mortar	589 cft	115.00 %	677.35
4.	3/4" damp proof course in cement mortar 1:4 with water proofing compound	175 cft	50.00 %	87.50
	Superstructure			
5.	Brickwork in cement mortar 1:6	503 cft	130.00 %	653.90
6.	Brickwork in mud mortar	1164 cft	80.00 %	931.20
7.	RB work in lintels and chhajjas	33 cft	2.50 cft	82.50
	Roof			
8	RB roof in cement mortar 1:3 including cement plaster 1:3 in ceiling	1971 sft	1 20 sft	2365 20
9.	4" thick lime concrete terracing 1:2:8	1971 sft	0.46 sft	906.66
10	Mild steel reinforcement in RB work	4500 lbs.	0.50 lb.	2250 00
11.	painting top of roof with hot bitumen using 35 lbs. per 100 sft	1971 sft	0.20 sft	394.20
12.	providing and fixing 5/8" dia fan hooks	12 nos.	2.00 each	24 00
13.	RCC 1:2:4 in beams	195 cft	4.50 cft	877.50
	Doors & Windows			
14.	Sal wood frames	11 8 cft	16.00 cft	188.80
15.	M.S. holdfasts	48 nos.	2.00 each	96.00
16.	Deodar wood glazed shutters	137 sft	4.00 sft	548.00
17.	Deodar wood panelled shutters	38 sft	4.50 sft	171.00
	Floors			
18.	1" cement concrete 1:2:4 laid over consolidated brick ballast 3" thick	1850 sft	52.00 %	962 00
19.	Earth work in filling under floors	1400 cft	100.00 %	140.00
	Finishes			
20.	Cement plaster 1:6	4650 sft	17.00 sft	790.50
21.	Cement pointing 1:4	650 sft	13.00 sft	84.50
22.	Priming and two or more coats of oil painting on wood work	400 sft	17.00 sft	68.00
23.	White washing	6650 sft	1.00 %	66.50
	Fittings			
24.	RCC 1½" precast shelves	18 cft	4.80 cft	86 40
25.	Construction of blackboards	3 nos.	20.00 each	60.00
26.	Local wood almirahs	5 nos.	75.00 each	375 00
	Total			Rs 13190 91

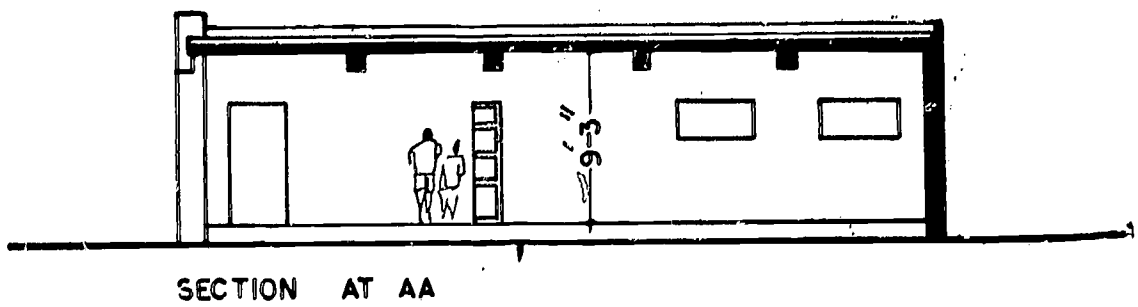
plinth area 2050 sft

Cost per sft Rs $\frac{13200.00}{2050}$ = Rs 6.44

Say Rs 6.50



FRONT ELEVATION



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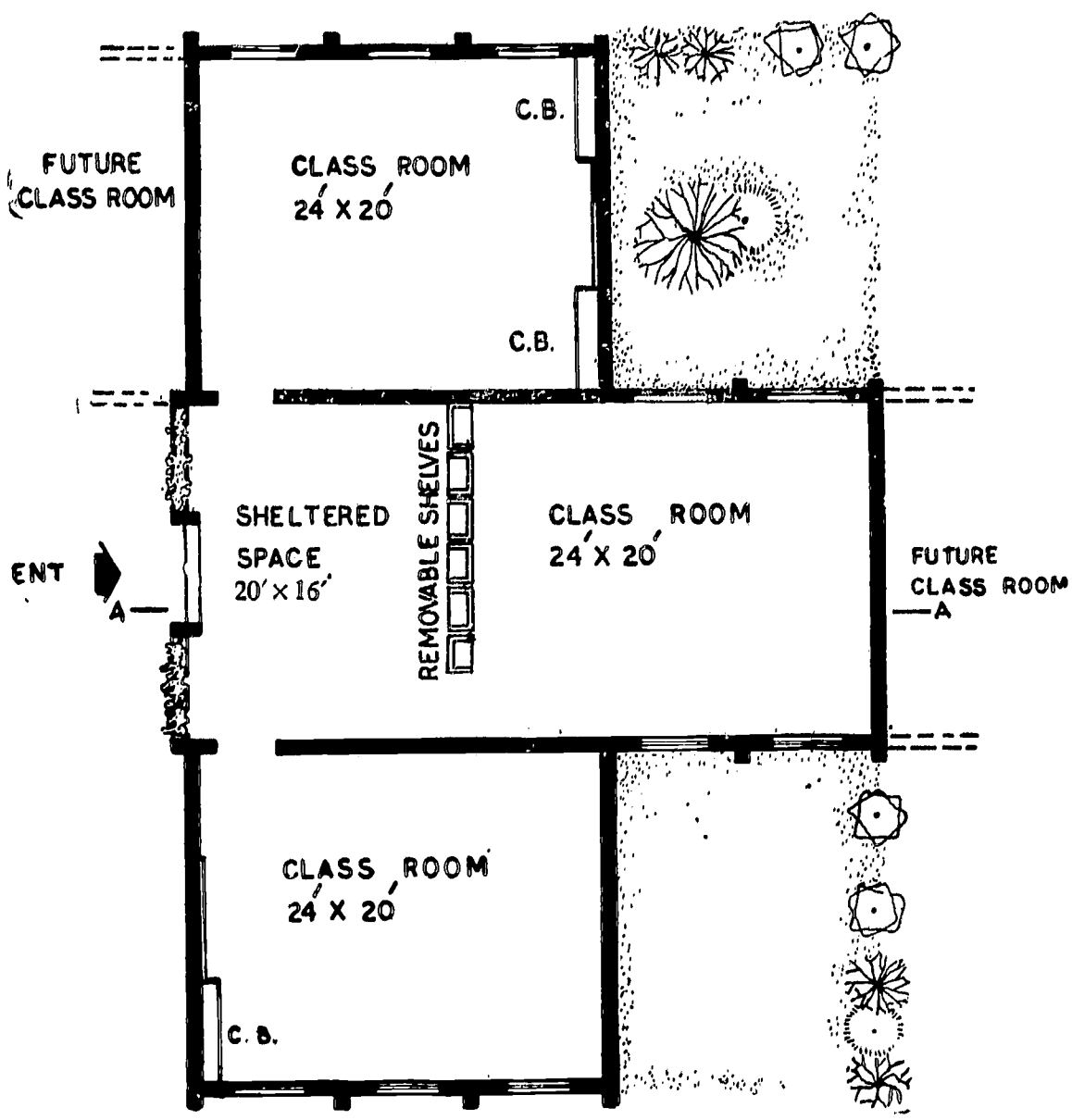


PLAN

0 8 16 32

PROPOSAL No. 1

NOTE:—

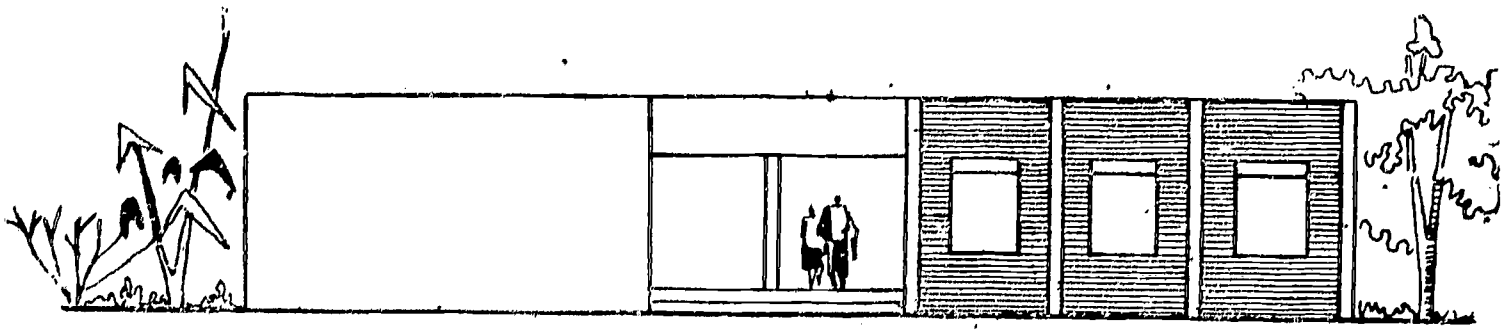
The class room size 24'—0" x 20'—0" is suitable for furniture arrangement.

The class room size for squatting arrangement would be 20'—0" x 16'—0".

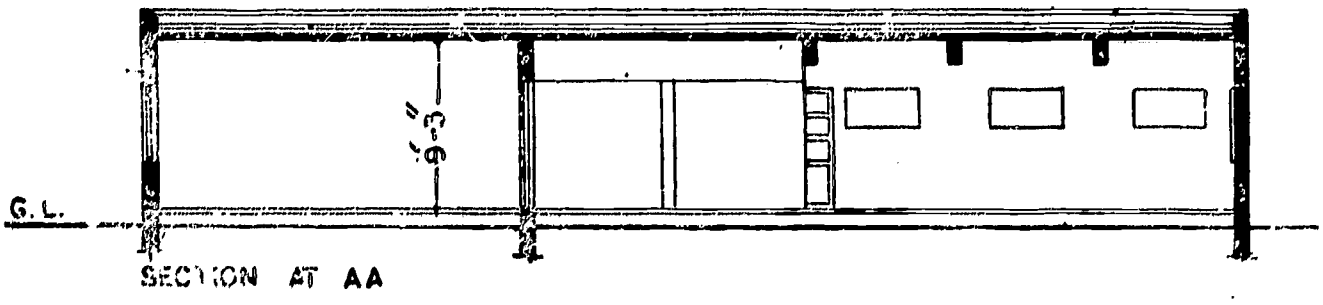
Minor adjustments in plans may be made according to climate and availability of local materials.

The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH INSTITUTE ROORKEE	
PRIMARY SCHOOL 200 ENROLMENTS	
DELT S. NAGPAL	ARCHITECT
TRACED T. PRAEHAD.	R.D. SRIVASTAVA N.D.ARCH.A.I.I.A.



FRONT ELEVATION



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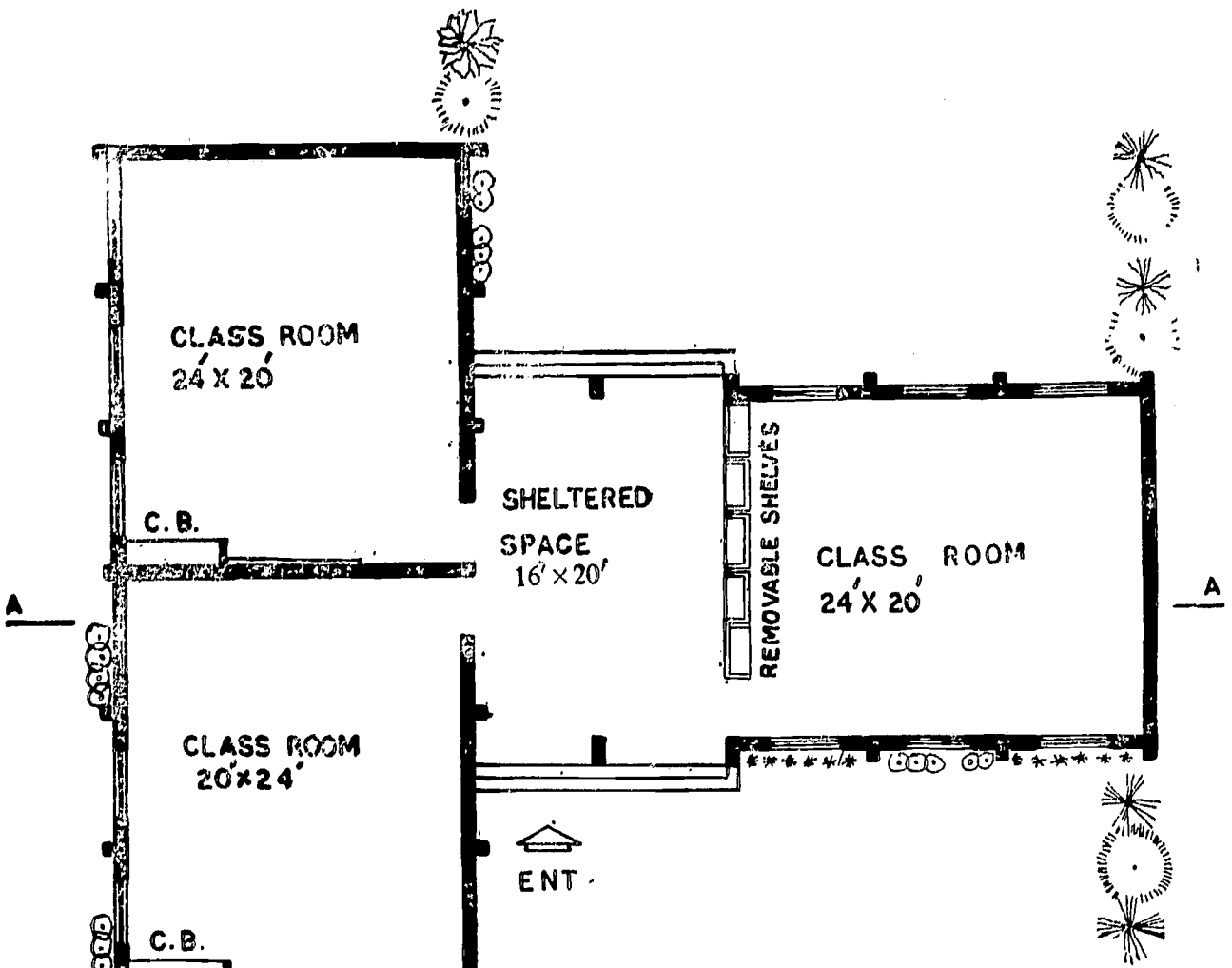


PLAN

0 8 16 32

PROPOSAL No. 2

NOTE:—

The class room size 24'—0" x 20'—0" is suitable for furniture arrangement.

The class room size for squatting arrangement would be 20'—0" x 16'—0".

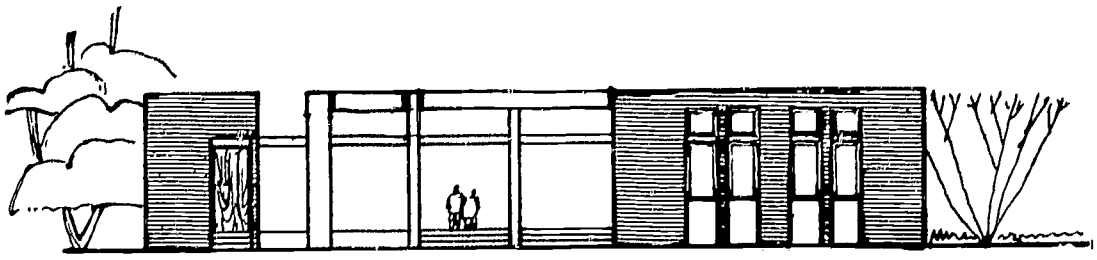
Minor adjustments in plans may be made according to climate and availability of local materials.

The lavatory block shall be adjusted on site.

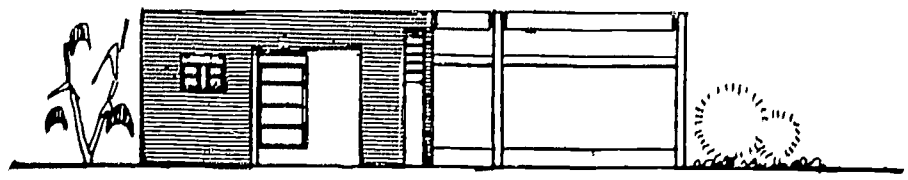
CENTRAL BUILDING RESEARCH INSTITUTE ROORKEE

PRIMARY SCHOOL
200 ENROLMENTS

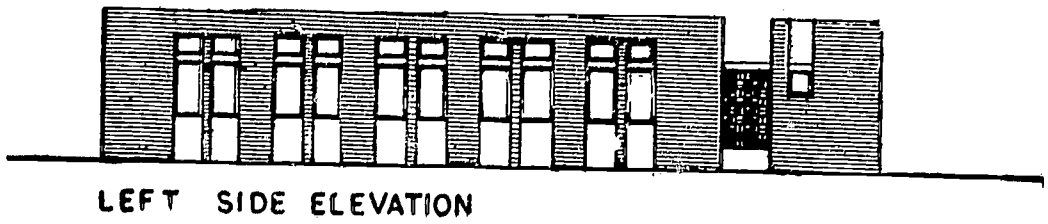
DELT S. NAGPAL	ARCHITECT
TRACED T. CHAND.	R.D.SRIVASTAVA N D ARCH A.I.I.A.



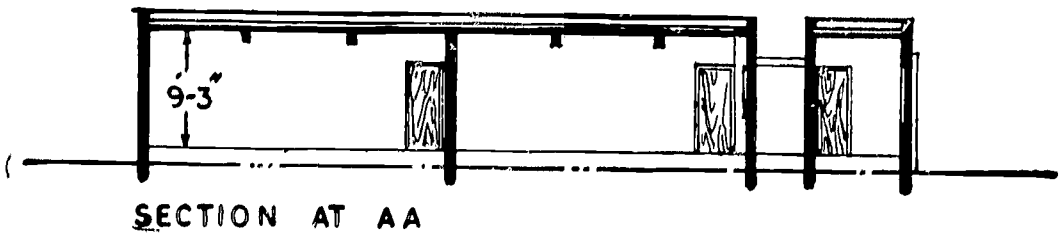
SIDE ELEVATION



FRONT ELEVATION



LEFT SIDE ELEVATION



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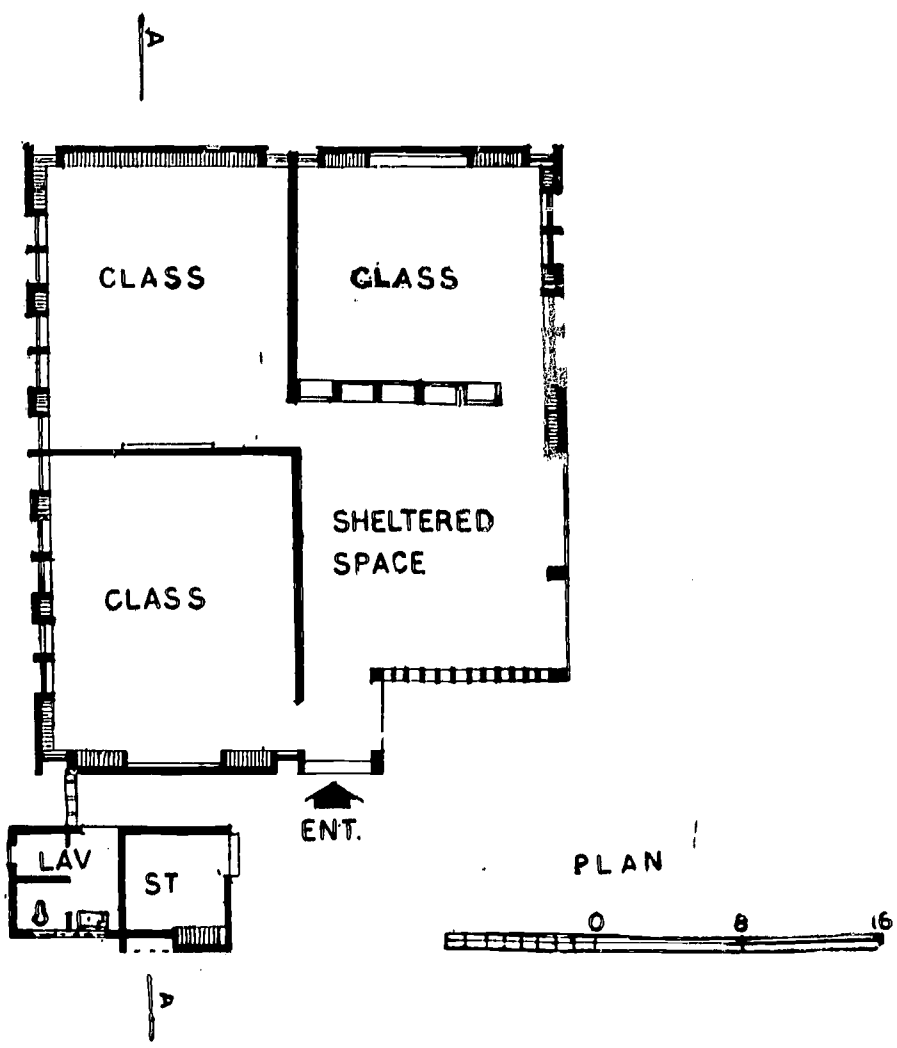


PLAN

0 8 16

PROPOSAL No. 3

NOTE:–

The class room size 24′—0″ x 20′—0″ is suitable for furniture arrangement.

The class room size for squatting arrangement would be 20′—0″ x 16′—0″.

Minor adjustments in plans may be made according to climate and availability of local materials.

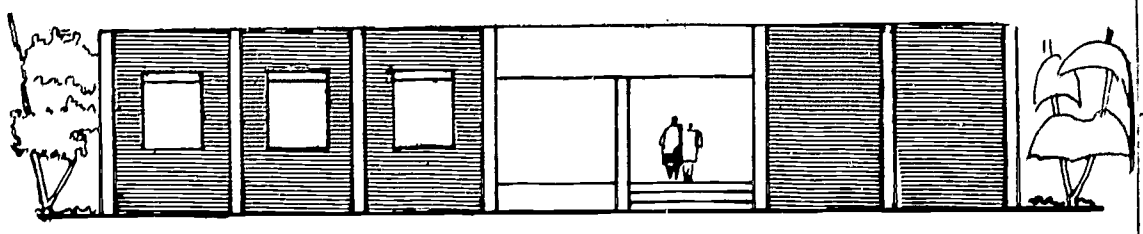
The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH INSTITUTE ROORKEE

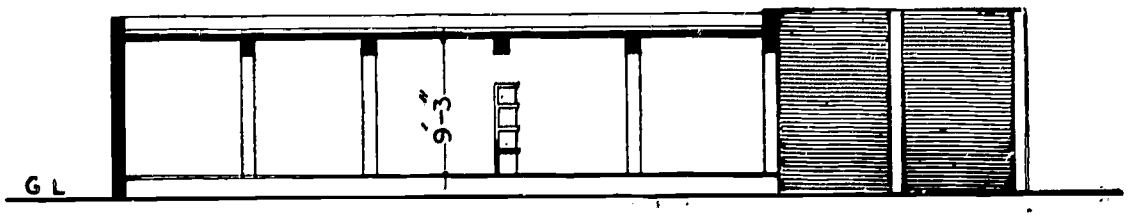
PRIMARY SCHOOL

200 ENROLMENTS

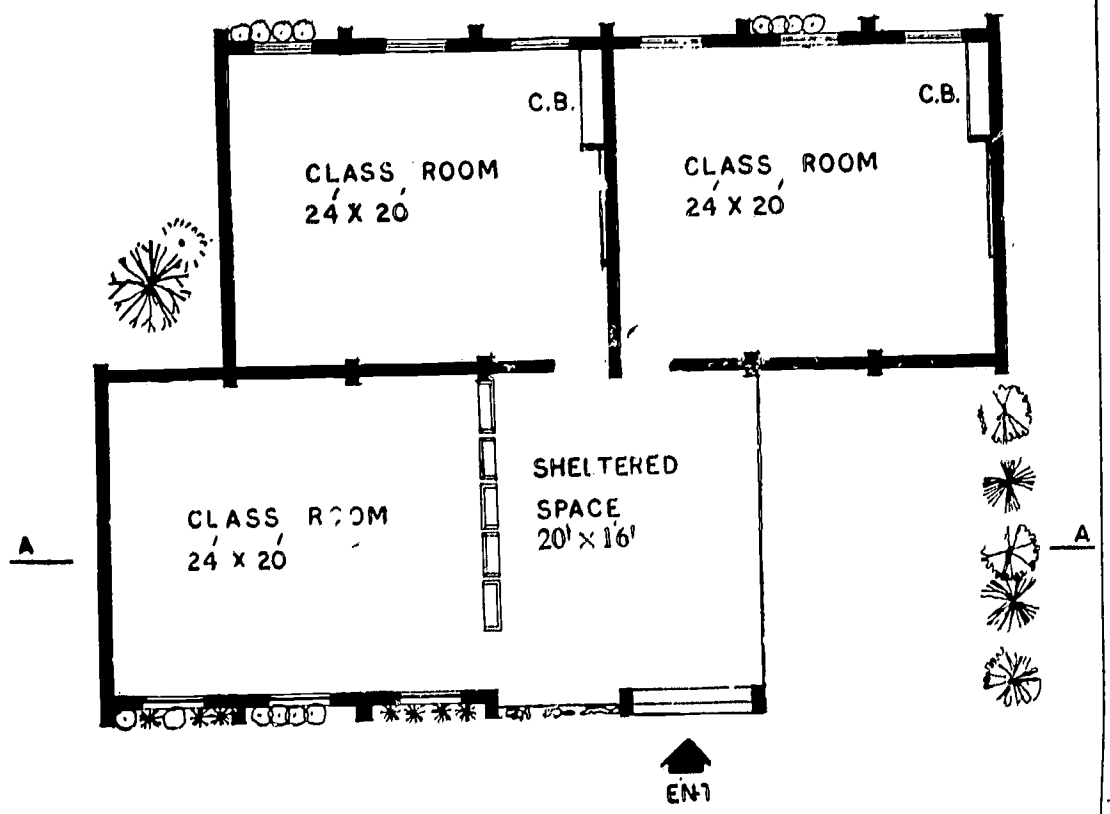
DELT S. NAGPAL	ARCHITECT
TRACED T. PRASHAD	R.D. SRIVASTAVA N.D.ARCH.A.I.I.A.



FRONT ELEVATION



SECTION AT A A



PLAN

0 8 16

PROPOSAL No. 4

NOTE:–

The class room size 24'—0" x 20'—0" is suitable for furniture arrangement.

The class room size for squatting arrangement would be 20'—0" x 16'—0".

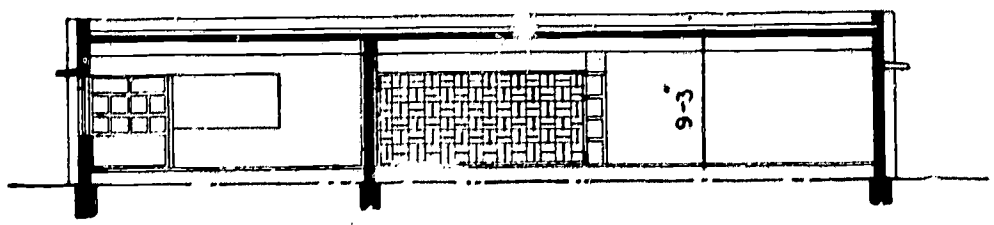
Minor adjustments in plans may be made according to climate and availability of local materials.

The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH INSTITUTE ROORKEE

PRIMARY SCHOOL
200 ENROLMENTS

DELT	ARCHITECT
S. NAGPAL	
TRACED	R.D.SRIVASTAVA
T CHAND.	N.D ARCH A.I.I.A.



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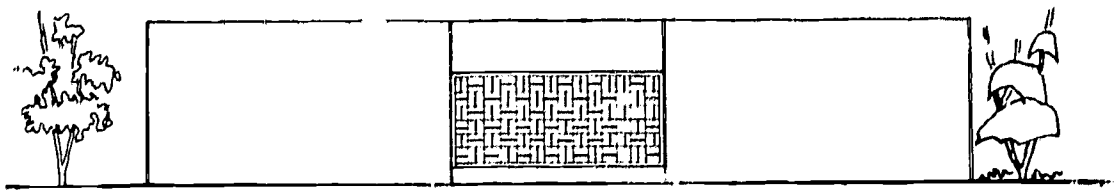

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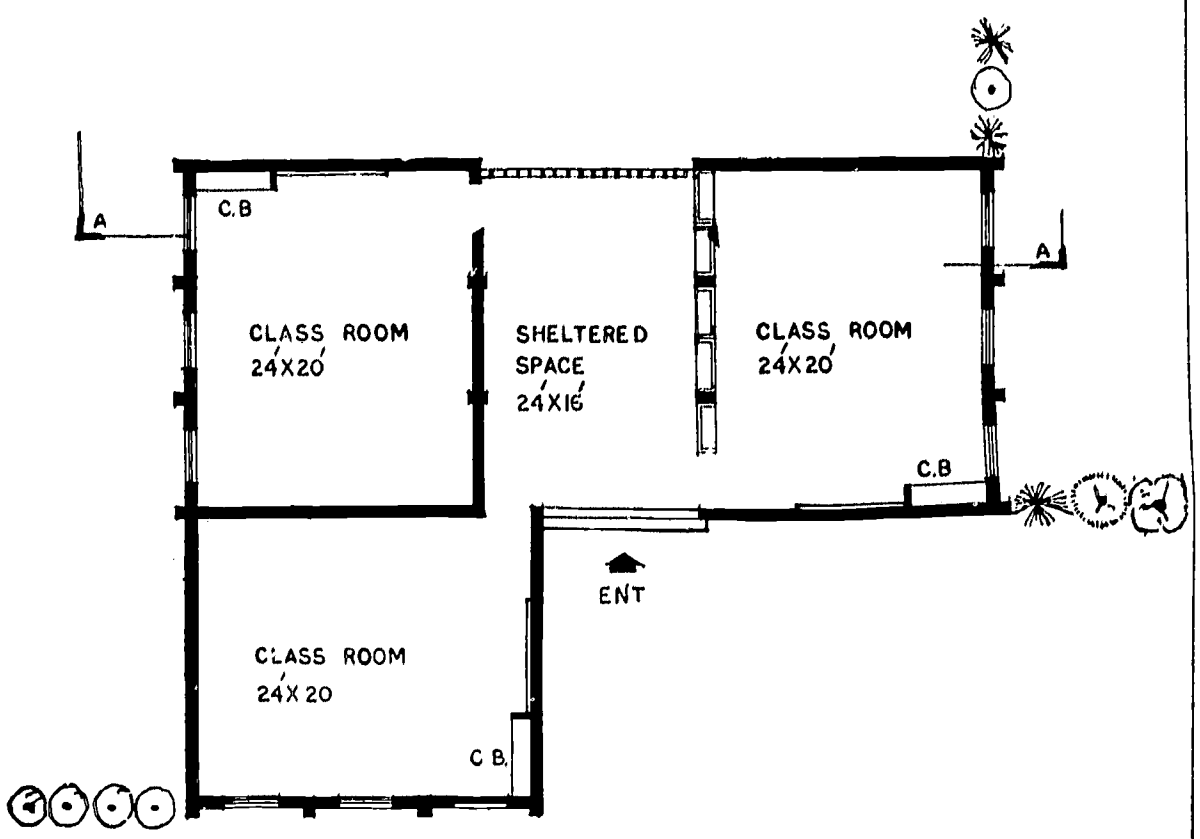


PLAN

PROPOSAL No. 5

NOTE:—

The class room size 24'—0" x 20'—0" is suitable for furniture arrangement.

The class room size for squatting arrangement would be 20'—0" x 16'—0".

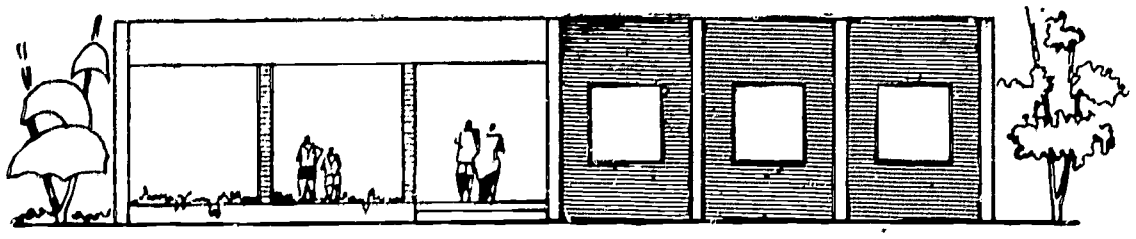
Minor adjustments in plans may be made according to climate and availability of local materials.

The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH INSTITUTE ROORKEE

PRIMARY SCHOOL
200 ENROLMENTS

DELT	ARCHITECT
S. NAGPAL	
TRACED	R.D.SRIVASTAVA
T CHAND.	N.D ARCH.A.I.I.A.



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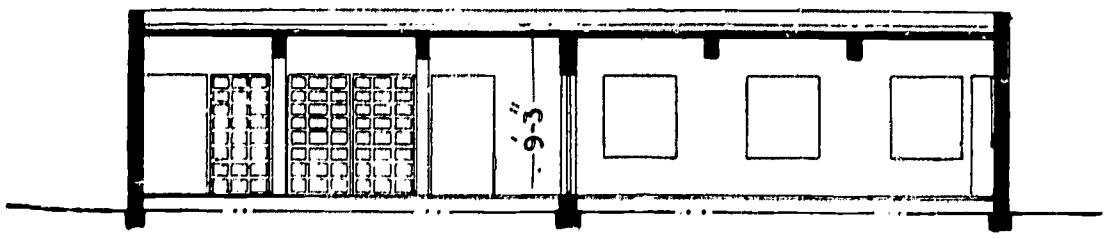

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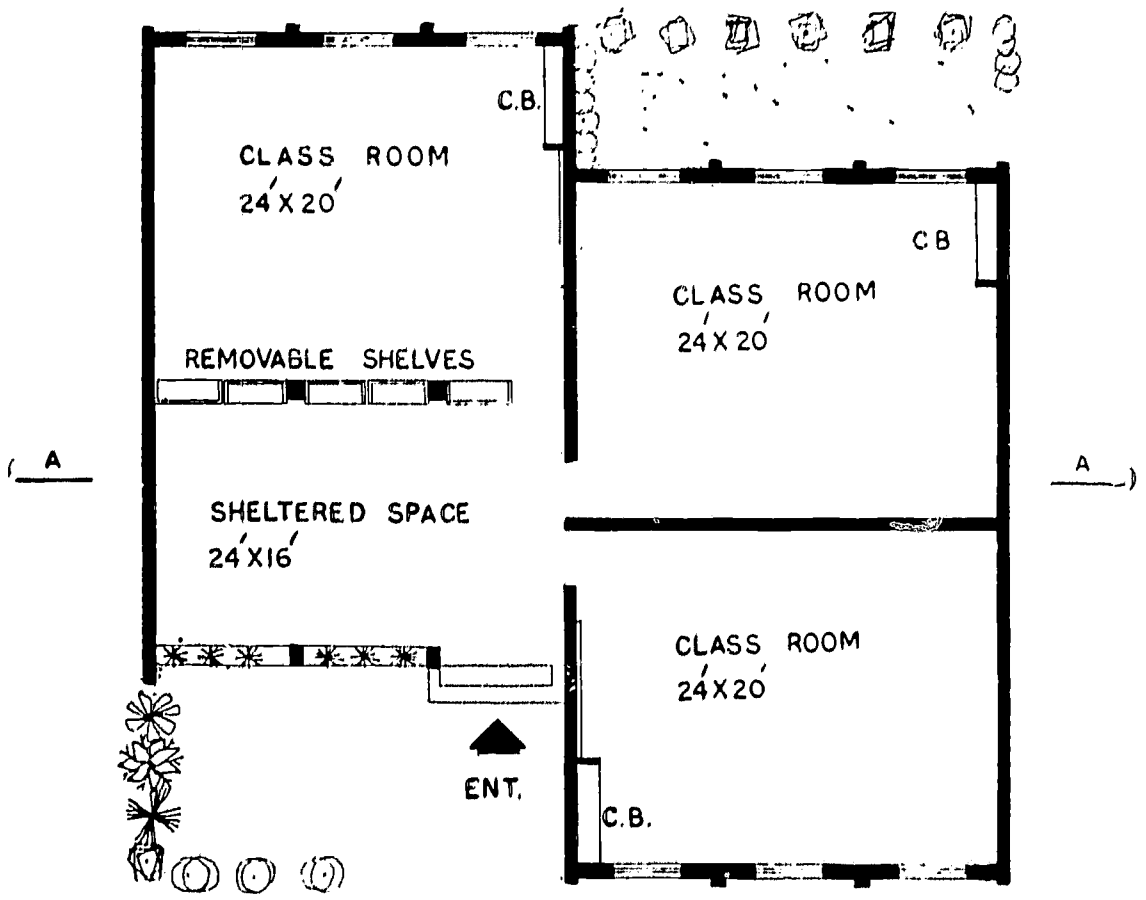


PLAN

PROPOSAL No. 6

NOTE:–

The class room size 24′—0″ x 20′—0″ is suitable for furniture arrangement.

The class room size for squatting arrangement would be 20′—0″ x 16′—0″.

Minor adjustments in plans may be made according to climate and availability of local materials.

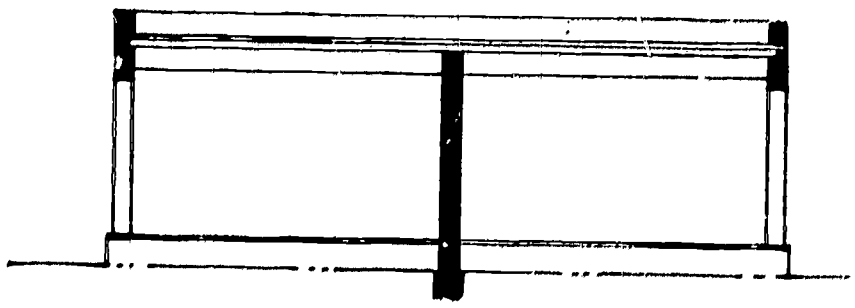
The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH INSTITUTE ROORKEE

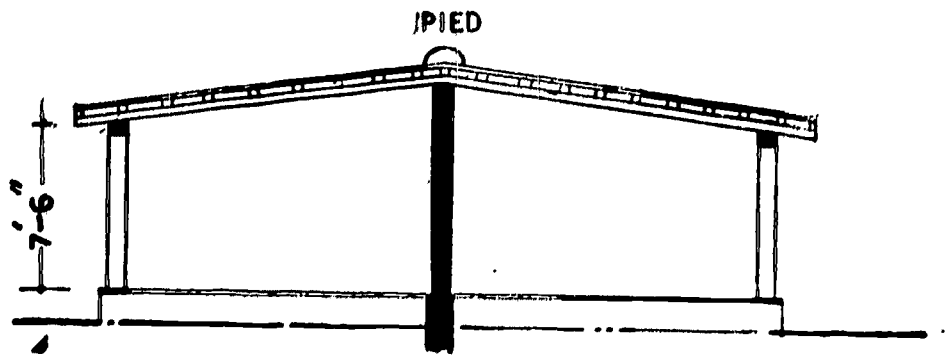
PRIMARY SCHOOL

200 ENROLMENTS

DELT R. SAHIJPUAL	ARCHITECT
TRACED T. PRASHAD	R.D. SRIVASTAVA N.D.ARCH.A.I.I.A.



ALTERNATE SECTION AA



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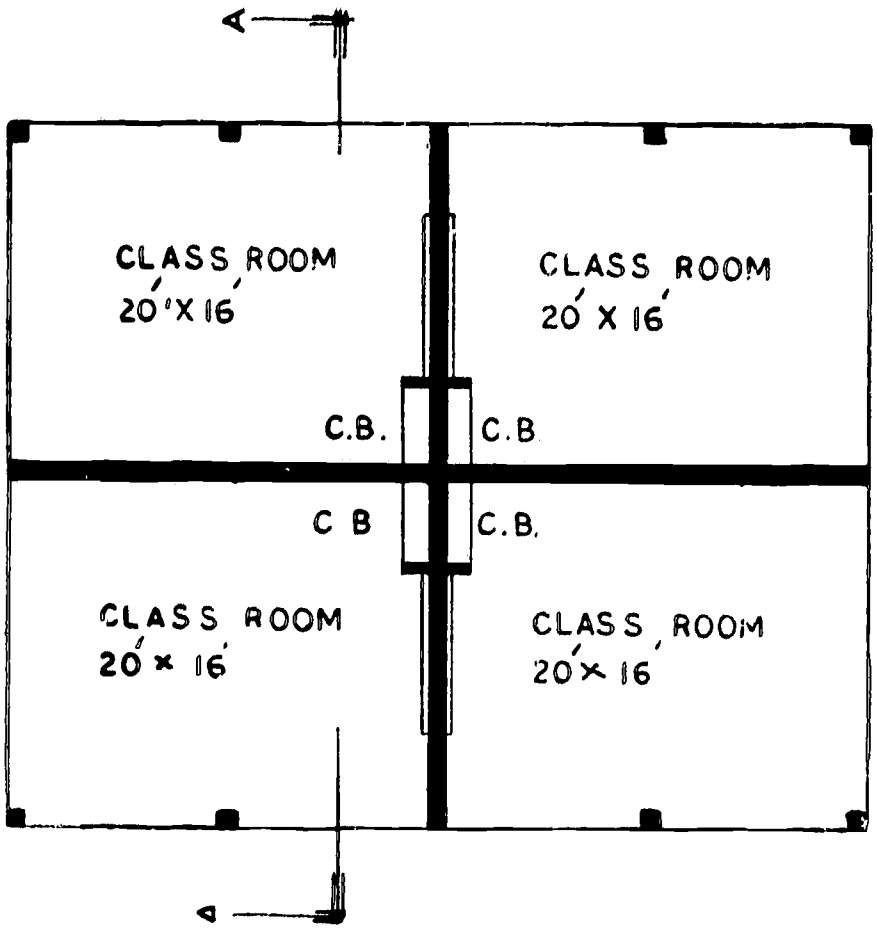
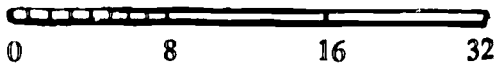


PLAN



PROPOSAL No. 7

NOTE:—

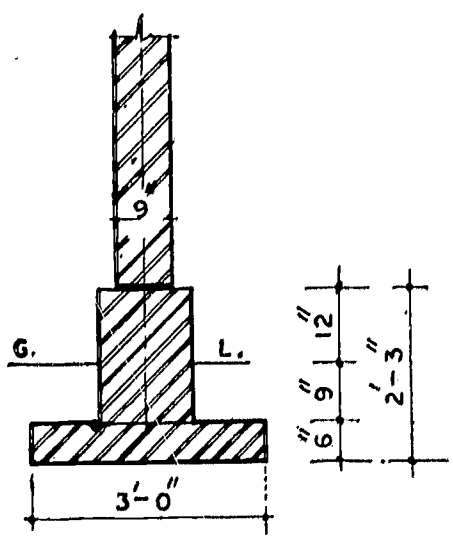
The material and other detalis will change according to regionail variations

CENTRAL BUILDING RESEARCH INSTITUTE ROORKEE

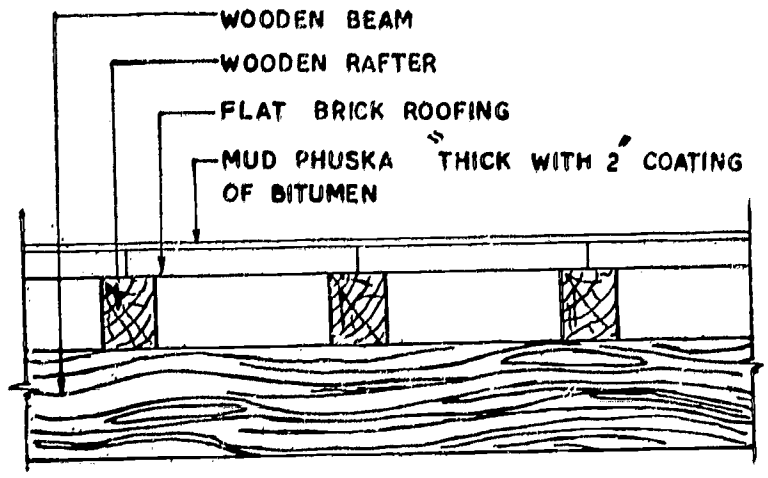
VILLAGE PRIMARY SCHOOL

DELT S. NAGPAL	
DELT S. NAGPAL	R.D. SRIVASTAVA N.D ARCH, A.I.I.A.

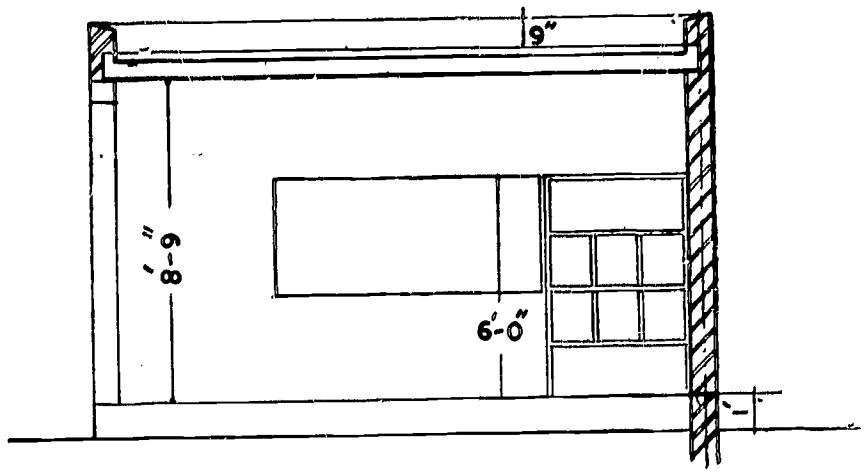
PROPOSAL No. 8



DETAIL OF FOUNDATION ON HARD SURFACE



DETAIL OF ROOFING



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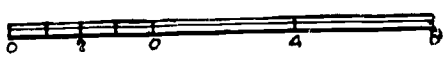
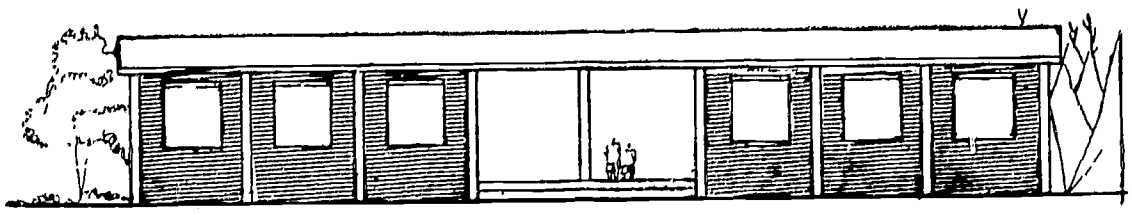


CENTRAL BUILDING RESEARCH INSTITUTE ROORKEE

VILLAGE SCHOOL DETAIL

DELT S NAGPAL	
DELT S.NAGPAL	R.D.SRIVASTAVA N.D ARCH, A.I.I.A.

PROPOSAL No. 9



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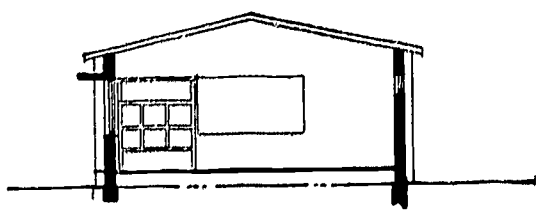

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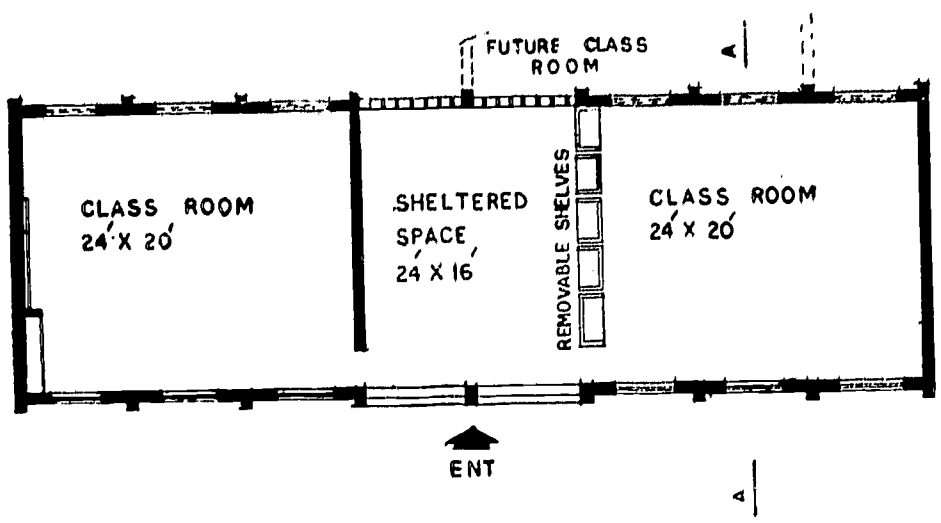

PLAN

NOTE:—

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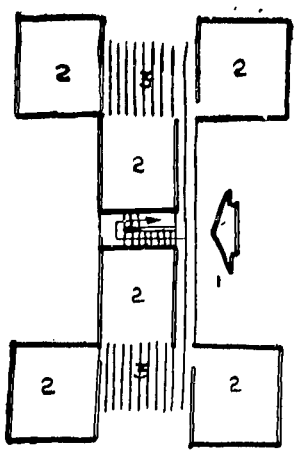
CENTRAL BUILDING RESEARCH INSTITUTE ROORKEE

PRIMARY SCHOOL

200 ENROLMENTS

DELT S. NAGPAL	ARCHITECT
TRACED T. CHAND	R.D. SRIVASTAVA N.D.ARCH.A.I.I.A.



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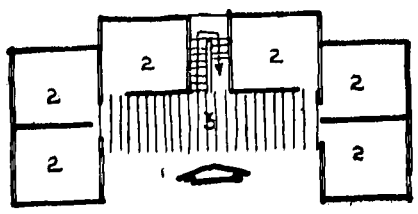
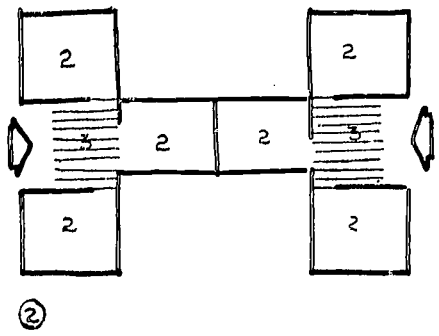


(2)

SCHOOLS FOR 800 ENROLMENTS IN TWO FLOORS



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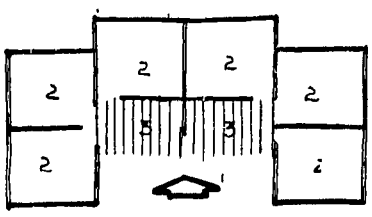

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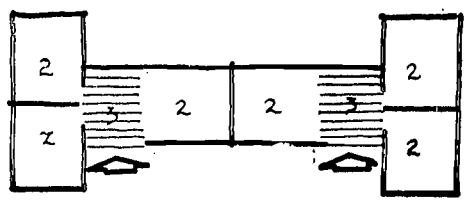


(3)

SCHOOLS FOR 400 ENROLMENTS

PROPOSAL No. 10

LEGEND

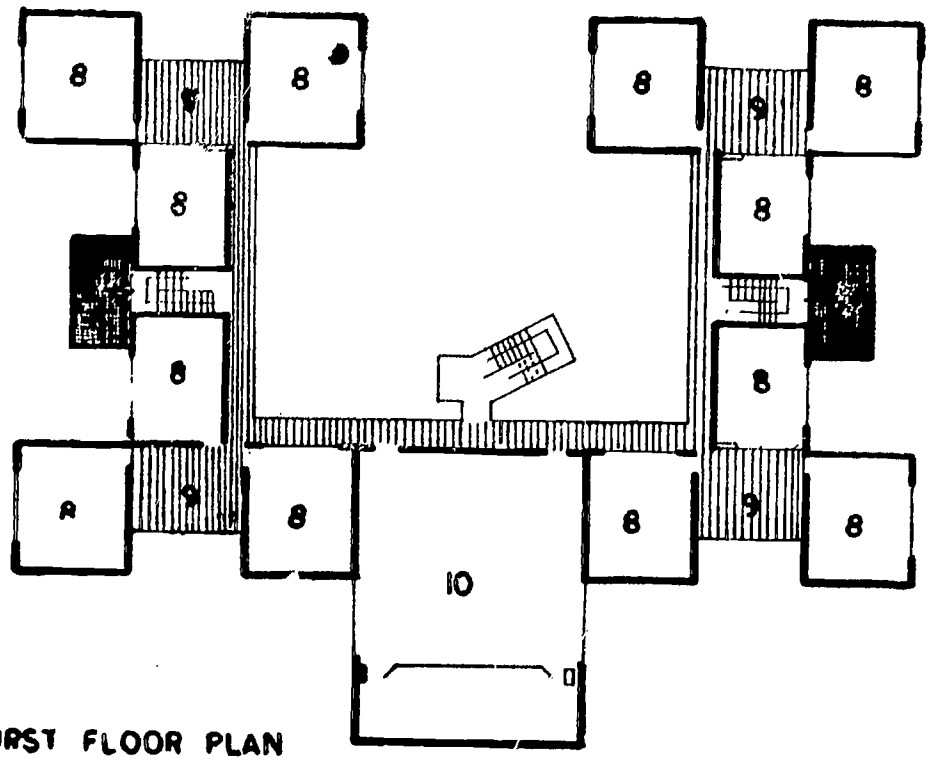
1. ENTRANCE
2. CLASS ROOM
3. SHELTERED SPACE

CENTRAL BUILDING RESEARCH INSTITUTE ROORKEE

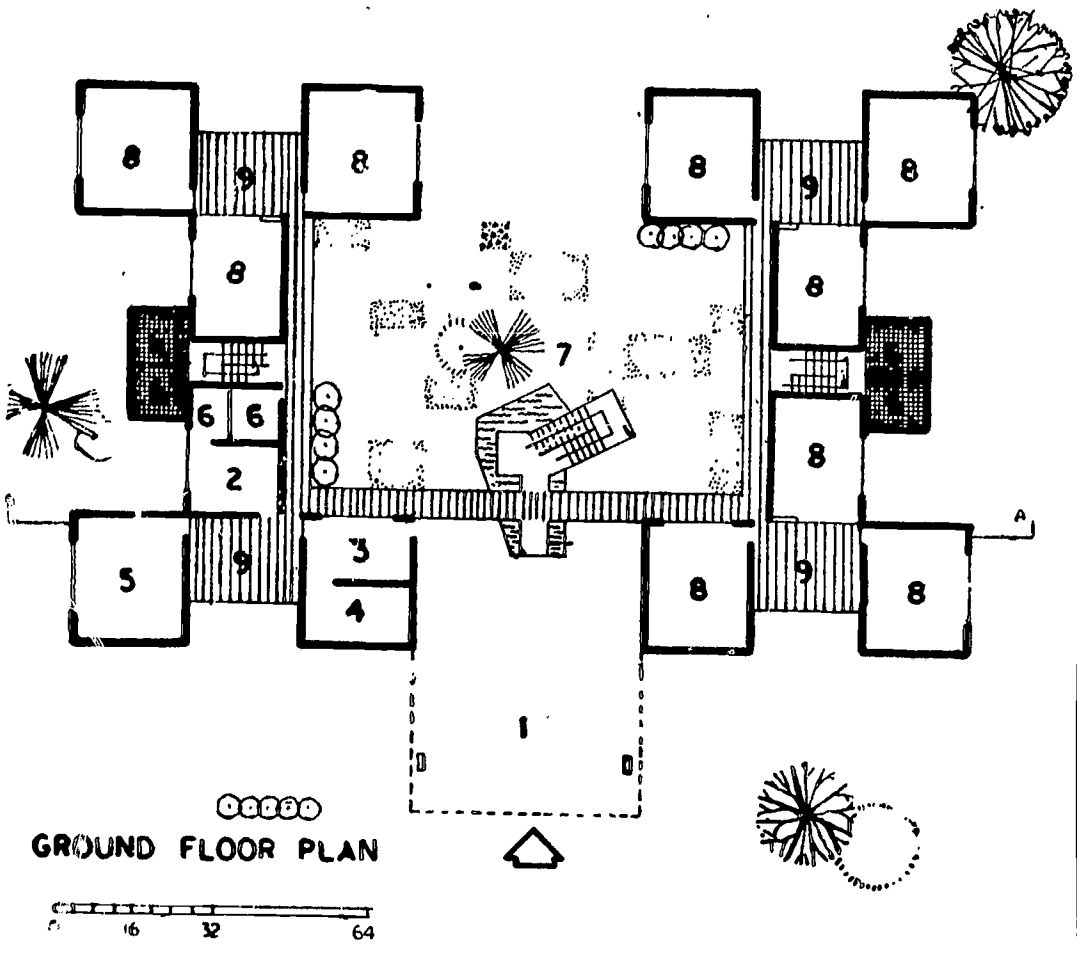
SCHEMETIC PLANS OF PRIMARY SCHOOLS FOR 400 & 800 ENROLMENTS

ARCHITECT

R. D. SRIVASTAVA
N.D.ARCH A.I.I.A.



FIRST FLOOR PLAN



GROUND FLOOR PLAN

0 16 32 64

MULTI STOREYED PRIMARY SCHOOL
FOR 3500 STUDENTS

PROPOSAL No. II

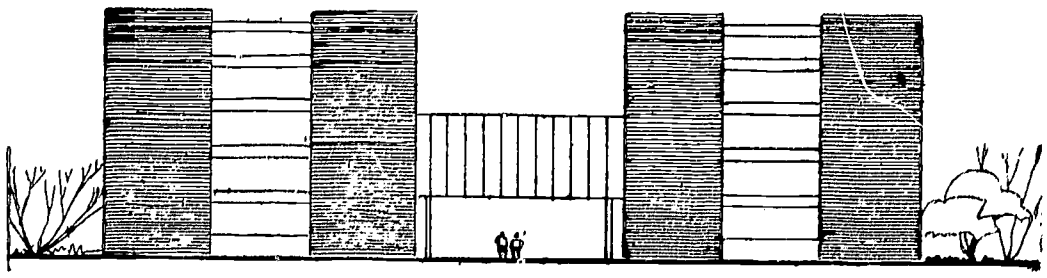
LEGEND

1. ENTRANCE
2. PRINCIPAL'S ROOM
3. GENERAL OFFICE
4. RECORDS
5. TEACHERS COMMON ROOM
6. LAVATORY
7. OPEN
8. CLASS ROOM
9. SHELTERED SPACE
10. MULTIPURPOSE HALL

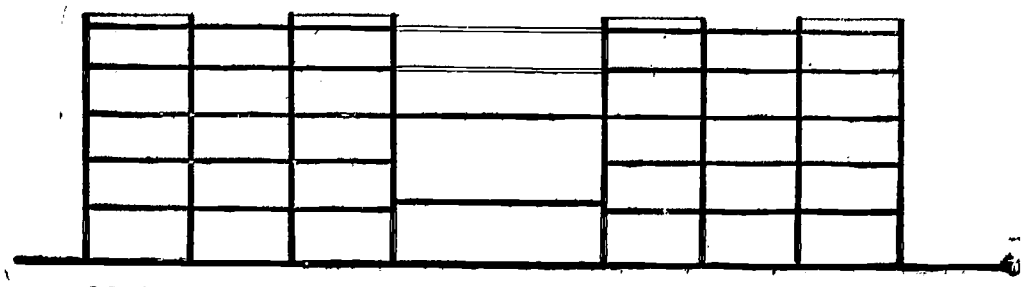
NOTE—
SIZE OF CLASS ROOM 24 × 20
SIZE OF SHELTERD SPACE 24′ × 16′

C B.R I. ROORKEE

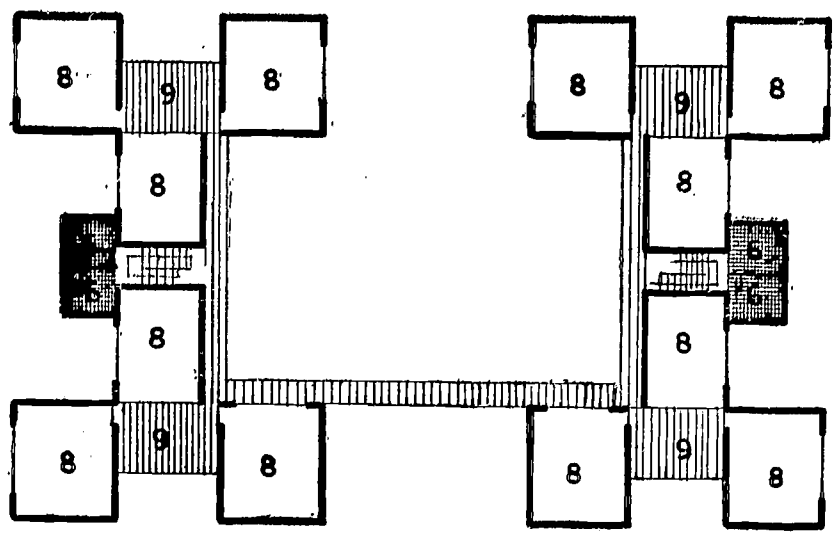
ASSTT. ARCHITECT	ARCHITECT
V K.MATHUR B.ARCH.	R.D SRIVASTAVA N D ARCH A.I.I.A.



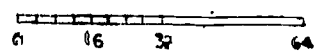
FRONT ELEVATION



SECTION AA



TYPICAL FLOOR PLAN



PROPOSAL No. 11 (A)

LEGEND

6. LAVATORY
8. CLASS ROOM
9. SHELTERED SPACE

NOTE

Clear height of the rooms shall be 9'3."

C. B. R. I. ROORKEE

ASSTT. ARCHITECT	ARCHITECT
V.K. MATHUR B. ARCH	R.D. SRIVASTAVA N.D.,ARCH.A.I.I.A.