CENTRAL SCHOOL BUILDINGS

NORMS AND SPECIFICATIONS

REPORT BY A SPECIAL COMMITTEE

OF

NATIONAL BUILDINGS ORGANISATION

MINISTRY OF EDUCATION
GOVERNMENT OF INDIA
1964

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INTRODUCTION

Under the "Central Schools Scheme" drawn up by the Union Ministry of Education, about 100 higher secondary schools (classes VI to XI) are to be established in the country at places where there is a concentration of such Central Government employees (including Defence personnel), as are subject to frequent transfers. The scheme has been worked out in pursuance of the Government of India's decision to provide educational facilities and subsidised hostels to the children of the above personnel on the basis of the following recommendations of the Pay Commission :

> "In the interest of the Central Government employees as well as of other floating population of the country the growth of schools with common syllabus and media of instruction and moderate fees should be encouraged."

The schools under the scheme would be of varying sizes in terms of enrolment and hostel capacity, dependent on the requirement of each place. At the initial stages of planning, the schools were expected to provide instructional facilities for 36,000 pupils and hostel seats for 12,000 students, but in the light of actual experience, after one year's working of the above scheme, it appears that these estimates will be exceeded considerably.

In view of the magnitude of the problem and its repetitive nature, the Ministry of Education considered formulation of norms and standards to guide the designs of these buildings on functional lines as an essential measure to ensure best utilisation of funds. As a Panel on School Buildings constituted by the Government of India, Ministry of Works, Housing & Rehabilitation was already working in this direction, it was considered appropriate to entrust this work to a Committee of the same Panel, assisted by concerned officers from M.E.S., C.P.W.D., Education Ministry and Planning Commission.

The Special Committee appointed at the request of the Ministry of Education, was composed of the following :

Chairman

1. Shri C. B. Patel,
   Director, National Buildings Organisation

Members

2. Shri M. M. Rana,
   Senior Architect, Central P.W.D.
3. Shri H. D. Nargolwala,
   Housing Adviser, Ministry of W.H. & R.
4. Shri H. L. Vohra,
   Representative, Association of Heads of Higher Secondary Schools, Delhi
5. Shri S. Krishnamurti,
   Superintending Engineer (Planning), E-in-Cos Branch
6. Shri Jagdish Singh,
   Member-Secretary, Education Team, COPP, Planning Commission
7. Shri P. D. Chawla,
   Superintending Surveyor of Works (I), Central P.W.D.
8. Shri N. Srinivasa Raghavan,
   Under Secretary, Ministry of Education

Member-Secretary

9. Shri J. L. Sehgal,
   Deputy Director (Designs), National Buildings Organisation

The following officers attended the meetings of the Committee by special invitation. Their contributions in the preparation of the report are gratefully acknowledged.

1. Shri M. A. Hafeez, Joint Director,
   National Buildings Organisation.
2. Shri K. L. Dutta, Assistant Director (Arch.),
   Central Buildings Research Institute,
   Roorkee.
3. Shri M. S. Mehta, Architect,
   Delhi Municipal Corporation,
   Delhi.
4. Shri Y. S. Ramaswamy,
   Superintending Engineer,
   Indian Institute of Technology,
   Madras.

The Committee is thankful to Shri N. Srinivasa Raghavan, for his valuable help in the preparation of the report which facilitated the work of the Committee considerably. The Committee is particularly grateful to Shri L. O. Joshi, Joint Secretary, Ministry of Education, for his valuable advice and guidance in the preparation of the report.

1. Main Features Of The Scheme

(i) The schools will cater to the needs of the Central Government employees (including Defence personnel), the personnel of the All-India Services, floating population and other people.

(ii) The medium of instruction in the schools will be Hindi and English and a common syllabus will be followed by all of them. The pupils will be prepared for the All-India Higher Secondary Examination of the Central Board of Higher Secondary Education.

(iii) The schools will generally be residential in character and will embody some of the good features of the public school system without raising the cost of education.

(iv) The following places where there is concentration of defence personnel and Central Government employees were suggested for establishing the schools in the first instance :

Agra, Ahmedabad, Ahmednagar, Ajmer, Allahabad, Ambala, Amritsar, Avadi, Bangalore, Bareilly, Baroda, Barrackpore, Bharatpur, Bhopal, Bombay, Calcutta, Chandigarh, Cochin, Coimbatore, Cuttack, Dehradun, Dehu Road, Delhi, Delhi Cantt., Dhanbad, Dinapur, Ferozepur, Gaya, Gwalior, Hyderabad, Indore, Jabalpur, Jaipur, Jalahalli, Jamnagar, Jhansi, Jodhpur, Jullundur, Kalaikunda, Kanpur, Karnal, Kharakvasla, Kirkee, Koraput, Kota, Kurnool, Lansdowne, Lonavala, Lucknow, Madras, Madurai, Mathura, Mandappam, Meerut, Mhow, Nagpur, Nasik Road, Nasirabad, Neemuch, Pathankot, Patna, Poona, Rajkot, Ranchi, Roorkee, Sangor, Shillong, Simla, Surat, Tambaram, Tanjore, Trichirapalli, Trimulgherry (Secunderabad), Trivandrum, Vishakapatnam and Yol.

Central Schools at other appropriate centres are also to be established, depending on the concentration of eligible categories.

2. Set-up

2.1 The schools would cover classes 6th to 11th (middle and higher secondary departments) and would provide educational and residential facilities both to boys and girls, except at places where large enrolment justifies two separate schools.

2.2 At certain places it would be necessary to provide educational facilities for primary departments also. Wherever necessary, the primary sections would be accommodated in a separate structure and for planning purposes treated as a separate school though in the same compound and under the overall administrative control of the Principal.

2.3 In the succeeding paragraph, only space requirements of higher secondary schools and hostels under the scheme have been discussed and no reference to the requirement for primary department has been made, for which a reference may be made to the "Report on Primary/Junior Basic Schools" (Part I), being published by National Buildings Organisation, New Delhi.

3. Size

3.1 Anticipated enrolment would determine the size of the school. The maximum hostel capacity and enrolment in schools, excluding primary departments, under the scheme, would be restricted to 180 seats and 720 students respectively.

3.2 At places it may become necessary to establish two or even more schools under the scheme to cater for the total requirements.

3.3 From administrative, financial and planning considerations, the schools would be of the following three sizes :

Size	Enrolment	Hostel capacity
A . . .	720 students	180 seats
B . . .	480 students	120 seats
C . . .	240 students	60 seats

4. Curriculum of Studies

4.1 In the middle department (6th to 8th) the languages Hindi, English and Sanskrit, the humanities, the sciences and crafts would be taught. At the higher secondary stage, the curriculum of studies would include :

(*i*) *Core Subjects* : (a) English, (b) Hindi, (c) Sanskrit, (d) Mathematics and General Science or Social Studies and Indian Culture and Civilization, (e) One craft-"sewing, needle work and embroidery" or "electric gadgets and their repairs".

(*ii*) *Elective Subjects* : Provision will be made for the teaching of 16 elective subjects.

4.2 For the purpose of fitting the subjects in the timetable of the schools, these 16 electives have been

classified into four bunches. A student may offer up to 4 electives, choosing not more than one from any bunch.

The bunches and the subjects under them will be as follows :

Bunch I	Bunch II	Bunch III	Bunch IV
(i) Household management & human relationship.	(i) Textiles and clothing and laundry.	(i) Food, nutrition and cookery.	(i) Home nursing, child development & mother craft.
(ii) Physics	(ii) Chemistry	(ii) Mathematics	(ii) Biology
(iii) English	(iii) Hindi	(iii) History	(iii) Economics
(iv) Elements of House Decoration	(iv) Sanskrit	(iv) Geography	(iv) Drawing & paintings.

4.3 In addition to the core subjects and the elective subjects, physical education, co-curriculur activities and supervised studies would also form an important aspect. Under co-curriculur activities, recitation, vocal and instrumental music, dramatics, painting, dancing, debates, etc., and such other activities that would be of immediate use to the students in schools or in home would be organised.

5. School

5.1 *Space Requirements*

(i) Considering the number of elective subjects and the crafts to be introduced in the curriculum of studies, the number of teaching spaces required would be much more than in an average higher secondary school. To make optimum utilisation of space and to reduce the vacancy period of teaching spaces, without effecting the smooth working of the education programme, the space requirements were examined in great detail with reference to the functions and the use co-efficient of every space according to the number of students period per subject per week.

(ii) Space requirements for three sizes of schools, worked out on the above considerations and designed to give a reasonable degree of flexibility to the Principal to work out the weekly programme of work, are given in Annexure 'A'.

(iii) The teaching space per student for size A, B and C schools would come to 2.17 sq. m. (23.50 sq. ft.), 2.60 sq. m. (28 sq. ft.) and 3.73 sq. m. (48 sq. ft.) respectively and the total floor space requirement excluding area under sanitary and circulation would work out to be 2.390 sq. m. (25.5 sq. ft.), 2.89 sq. m. (31 sq. ft.) and 4.27 sq. m. (53.5 sq. ft.) per student for size A, B and C schools respectively. It would be seen that the lower the enrolment the higher would be the cost of constructing the school and that type 'C' school would cost about twice per student as compared to type 'A' school. So from purely economical considerations, the school with high enrolment would be desirable. Smaller schools are not only costly in initial expenditure, but have also larger recurring expenditure. As such it would be necessary to reduce the number of size B and C schools as far as possible.

The number of schools of various sizes are expected to be as under :

Size A	....	45 per cent
Size B	....	45 per cent
Size C	....	10 per cent

5.2. *Space Organisation and Design Considerations*

(i) In the general composition of a school building consideration must be given simultaneously to the beauty, the environment, the site, the structural system and the physical and educational needs. In the publication "Planning Higher Secondary Schools" brought out by National Buildings Organisation, the educational, environmental, physical and emotional needs and synthesis of space have been discussed at great length. Suggestions on the layout of furniture and equipment in various activity areas and organisation of space have been illustrated by charts and model plans. As the copies of the said publication are available free from the Director, National Buildings Organisations, it is considered appropriate to omit a detailed reference to this aspect and to recommend a reference to this publication.

(ii) For planning science laboratories, a reference to the "Report on Science Laboratories and Equipment in High/Higher Secondary Schools", brought out by the Committee on Plan Projects, Planning Commission, would be helpful. The report gives norms and standards for science laboratories and equipment.

(iii) In addition to the recommendations made in the above mentioned publications, the plan should provide for the germ of growth and a certain degree flexibility. The term 'flexibility' when applied to a school building, means expansibility and convertibility. Methods of teaching are changing and new teaching aids are being introduced. A rigid plan and structure may not quite fit into the educational needs of tomorrow or enable the school to grow to the optimum economical size. A minimum provision would be to :

(a) provide two doors to some of the special teaching rooms and divide the space within, with non-load bearing low cost walls which could be pulled down and put up to increase or decrease the room sizes to re-allocate the space distribution.

(b) So plan the structure that type 'B' and type 'C' school can grow to size A in a manner that construction work does not interfere with the normal working of the school and that the additions are integrated and properly inter-related with the other spaces.

(c) It should also be possible to add six more classrooms to size 'A' school to accommodate an additional section of each class so as to raise the enrolment of size A school to 960 students.

(d) Provision for adding an assembly hall at a later date should be made either in the layout or arrangement of space. The space requirement of hall could be worked out at 0.84 sq. m. (9 sq. ft.) per seat inclusive of passages, stage etc.

(e) It would be desirable to so place the building particularly in hot dry climate that a sufficiently large space, enclosed on at least three sides (court), becomes available for morning prayers, dramatics, etc.

6. Hostels

6.1 Physical environment in which students live and work have a powerful influence on their character and attitude. The habits and the way of life acquired during the school age tend to become fixed and indirectly work in aiding or hindering progress to that degree of maturity or sense of responsibility, which education aims at. It is, therefore, essential to provide proper facilities and in manner that the pupils have all the opportunities to put theory into practice and form desirable habits.

6.2 The subject of hostel accommodation in schools has not so far been examined in great detail by the educationists and the architects to evolve a pattern suitable to our economic, social and cultural background. Therefore, the various components of a hostel building and their space requirements are examined in detail. Spaces required in a hostel are :

(a) Dormitory
(b) Study room
(c) Recreation space
(d) Dining hall and kitchen
(e) Lavatory
(f) Sick room
(g) Warden's room
(h) Office
(i) Storage
(j) Utility shop.

6.3 *Space Requirements*

(a) *Dormitory* : (i) A certain degree of freedom privacy and sense of possession is very desirable for a pupil to feel at home in the hostel and develop his personality. These considerations are as important as that of instilling in students habits of adjustment through community living. Opinions regarding the number of pupils in a dormitory and the facilities for keeping personal belongings vary considerably. Some educationists feel that pupils in school, being in the formative age group, should be subjected to strict discipline and regimentation and should be provided barrack type accommodation with 25 to 50 beds in each hall with lockers along a wall for keeping their personal belongings. Others are of the view that such an arrangement is neither conducive to study nor discipline and that dormitories, being essentially a quiet area for rest or study should not have more than 4 students and that every student should have all his needs met in a compact area. Considering these extreme views and the requirements of economy, livability and the education aspect, it is recommended that a dormitory should be planned to accommodate 10 to 12 students and that every student should have as compact a space as possible for keeping his personal belongings and for his rest and study.

(ii) The space per pupil should be enough to accommodate the essential furniture items (a bed, a table, a chair and a almirah/cup-board), his personal belongings and should provide enough movement space. Diagrammatic studies indicate that an area of 4.4 to 4.6 sq. m. (48 to 50 sq. ft.) per bed, inclusive of passage in the dormitory, would be necessary. Figure 1 illustrates a typical layout of furniture in a dormitory.

(b) *Study Room* : In a boarding school, provision of a separate study room is not considered essential. With the arrangement suggested, students would be able to do individual studies in the dormitory and, for group studies, the school classrooms can be conveniently used. However, where the hostel and the school are not located in the same compound due to some unavoidable reason, a room for group study may be provided. This room should be furnished as a reading room-*cum*-library, so that students individually may also be able to utilise it for light reading. The area of this room may be 46 sq. m. (500 sq. ft.) in size B and C hostels and 70 sq. m. (750 sq. ft.) in size A hostel.

(c) *Recreation* : For light reading, indoor games and formal discussions, provision of a common room/lounge is necessary. The panel on University Hostel Buildings in their report have suggested a total area of 46 to 60 sq. m. (500 to 650 sq. ft.) for 100 students. In a school hostel, common rooms, if provided, would have to be slightly on a liberal scale, because of the inclinations of students in teens to play and remain in groups and also because the space allotment for students in the dormitory is not enough to permit them to receive their friends there. However in view of the austerity measures, the provision of a common room is not considered essential.

(d) *Dining Room and Kitchen* : (i) In considering the size of the dining room and the kitchen, it is necessary to decide the number of students that would be taking meals at a time and the number to which meals could be served by a minimum number of kitchen staff. From both these considerations, it is recommended that the dining room and the kitchen

should be planned for 50% of the strength in a hostel block. By suitably staggering the lunch break, rush or congestion in the dining room can be avoided. Howsoever desirable it may be to provide dining space for the total strength to have uniform schedule of activity, the economic consideration do not permit the same.

(ii) The area of dining and kitchen, specially in size A and B hostels, should be so organised that it could be divided for vegetarians and non-vegetarians.

(iii) A table space of 0.5 m. (1'-8") long and 0.4 m. (1'-4") deep is necessary for dining. Considering this size and the necessary service space, an area of 0.8 to 0.9 sq. m. (9 to 10 sq. ft.) per seat is recommended. Figure II shows a typical arrangement of furniture in a dining room.

(iv) For seating, benches should be provided instead of individual chairs as these are economical and easy to keep in order. The layout of tables should be related to easy traffic in and out of the servery or food counter. Self-service should be encouraged as it is economical and ensures better service. In this case, it is important to povide an adequate length of counter and adequate circulation space adjoining the counter in which queues can stand.

(v) The size of the kitchen, stores and servery should be worked out at 0.37 sq. m. (4 sq. ft.) per dining seat provided.

(vi) The basic principles of planning an institution kitchen are not much different to those for a domestic kitchen and so need a careful consideration of all the steps involved in the preparation of a meal. Platform type *chulahs* should be provided as these are hygienic.

(e) *Sanitary Facilities* : (i) The sanitary facilities may either be centrally located for a group of dormitories housing 60 pupils or two blocks, one for 30 pupils each, may be provided. The latter arrangement is preferable, specially where a water-borne system is available, as it would reduce the travel distance and minimise traffic to the lavatory block.

(ii) The Indian Standards Institution have suggested the following provision for boarding schools (I.S. 1172-1963) which should be provided.

Fitments	For every 8 boys or part thereof	For every 6 girls or part thereof
Bath	One	One
W.C.	One	One
Urinal	One (for every 25)	—
Wash Basin	One	One
Drinking Water Fountains	One (for every 50)	One (for every 50)

N.B. : Abolution taps shall be provided in each water closet and one water tap with draining arrangements shall be provided for every 50 pupils or part thereof in the vicinity of water closets and urinals.

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(iii) The lavatory blocks should have ample cross ventilation and light, should have more than one side open to light and air, and, so as to minimise noise disturbance, should not have any wall common with a dormitory. Bath room singing coupled with a few showers playing at the same time and pulling the chain of flushing cistern, can generate a lot of noise and disturbance. Poor maintenance of fittings is not uncommon; so by adequate planning, the noise and smell nuisance should be minimised.

(f) *Sick Room* : Instead of providing a sick room for emergency and care of a pupil during illness, it is recommended that a Health Unit for prevention and treatment of disease and health education should be provided under the scheme. The unit should be common for the school and the hostel and centrally located. Space requirements of health unit are discussed ahead.

(g) *Warden's Room* : (i) One family staff quarter should be provided near the hostel for the warden's residence. Unless there are some compelling reasons such as site restrictions etc., the warden's quarter should be planned as a separate independent structure in such a way that the warden is conveniently accessible to boarders at all times and his home and social life interferes the least with the hostel discipline or working.

(ii) A floor area of 48.25 sq. m. (520 sq. ft.), plinth area 58 sq. m. (625 sq. ft. for single storey structure) is recommended for the Warden's family quarter.

(iii) In addition to the warden there would be need for a responsible person to be in closer contact with the boarders to supervise and guide their activities, administer discipline and to look to their needs. From these considerations, it would be desirable to have an Assistant Warden for a maximum group of 60 boarders housed in the hostel itself.

(iv) A floor area of 13 sq. m. (150 sq. ft.), suitably divided into bed and living, would be adequate for the residence of the Assistant Warden. This may be allotted to a single/unmarried staff member.

(h) *Office* : In type 'C' hostel, separate room for the hostel office would not be necessary as the Warden would look after the routine matters (general administration, collection of fees and the payment of salary to hostel staff etc., being dealt with in the school office). But, in size A and B hostels, it would be desirable to provide a room for a Hostel Superintendent and his office clerk. An area of 13 to 15 sq. m. (140 to 160 sq. ft.) for hostel office is recommended. This room should be near the main entrance which should be of adequate dimensions to serve as a visitor's room also.

(i) *Storage* : (i) In a hostel, mostly dead storage space would be required for storage of broken furniture items etc., till these are auctioned/repaired. For this purpose, it would be uneconomical to provide a room in the hostel. A godown in the compound, of

the size of a garage and with low cost specifications, should be provided.

(ii) In size A hostel, however, a storage of 9 sq. m. (98 sq. ft.) area may be attached to the Hostel Superintendent's office, for keeping electric bulbs, fans, stationery and records.

(j) *Circulation* : (i) Circulation space inside and outside the building is very important from the point of view of ease of working and functional efficiency, but from economic considerations the area under circulation, particularly covered and paved, should be minimised and restricted to some desirable relationship with the useful area. It is recommended that the area under verandahs, corridors, lobby, staircase and entrance hall should not be more than 30% of the total area. Efficiency of planning depends upon how the various components are inter-connected with a minimum of circulation area.

(ii) Doubly loaded corridors should not be planned, as far as possible, specially in hostel buildings, as these are noisy, make ventilation problems difficult and impart impersonal qualities so characteristic of the institutional type of buildings. The studies have revealed that without any increase in circulation area over what is necessary in a corridor type hostel, it is possible to give students adequate room to order their personal life in reasonably intimate and open surroundings.

6.4 *Space Organisation and Design Considerations*

(i) The suggestions regarding proper lighting, good audition, thermal comfort, proper sanitation and environmental and emotional aspects made in the publication, "Planning Higher Secondary Schools" apply equally in the planning of hostels. Children leaving home for the first time should find the transition easy. A kind and sympathetic approach in planning would go a long way in minimising home sickness.

(ii) The layout of various activity area would vary considerably according to whether or not boarding accommodation is attached to the main school building. When the two types of accommodation form one group of buildings (due to site limitations), the ground floor should be devoted to the teaching rooms and dining facilities and the 1st and 2nd floor, for sleeping accommodation. In this case, provision for outdoor sleeping, in hot and arid areas, should be made. This approach should, however, only be adopted, where absolutely necessary, otherwise, a separate hostel structure should be planned.

(iii) The relationship of various components of a hostel building are shown in figure III. In the general composition, consideration must be given simultaneously to the beauty of the environment, to the site, to the structural systems and, above all, to comfort and livability. In a tropical country, the building should be oriented with respect to the sun and wind, to minimise thermal discomfort. A near North-South aspect of dormitory and placing of the sanitary block, kitchen etc., on the leeward side are recommended.

7. Health Unit

7.1 Instead of providing the customary sick or doctor's room for the care and treatment of a child under the scheme a health unit would be provided in each school to help the children maintain a reasonable standard of health. This is in keeping with the recommendations of the Union Ministry of Health regarding integration of various health services at all levels.

7.2. In addition to the care and treatment of the sick, the health unit would take care of the health of the pupils of the school by means of preventive services, periodical check-ups and health education.

7.3. Space requirement of a health unit would include :

(a) A multi-purpose room;

(b) Dispensary and dressing;

(c) A two bedded sick room and for size A and B hostels, in addition, a single-bedded isolation room; and

(d) A nurse's quarter.

7.3 (a) *Multi-purpose Room.*—This room would be used by the visiting doctor for health education, medical check-up and diagnosis and treatment of disease. It should be large enough to hold a group of children, in addition to the usual furniture and fixtures required in a consultation-*cum* examination room. The room should also have lot of display space in the form of tack boards, display cabinets, etc. An area of 28 sq. m. (300 sq. ft.) for the multi-purpose room is considered essential.

7.3 (b) *Dispensary and Dressing* : The Health Unit would not be self-sufficient as regards diagnosis of treatment of disease, but would depend on the district health organisation. As such, the dispensary and dressing would only be equipped for issue of general medicines and attending to the emergency. The equipment would, therefore, include a medicine chest, a dressing table and a dressing trolly. An area of 9.5 sq. m. (103 sq. ft.) for the purpose is adequate.

7.3 (c) *Sick Rooms* : The design and detail of sick and isolation rooms would be the same as in an indoor unit of a health centre. These should be attached to the Nurses quarter, to facilitate care of the sick pupil and should have attached lavatory facilities. An area of 18.5 sq. m. (200 sq. ft.) for a double bedded sick room and an area of 9.5 to 11 sq. m. (100 to 120 sq. ft.) for the isolation room is recommended.

7.3 (d) *Nurse's Quarter* : Residential accommodation for the nurse should be attached to the Health Unit for reasons stated above. A floor area of 22.25 sq. m. (240 sq. ft.). (Plinth area 30 sq. m.) is recommended or the nurse's quarter, in which it should be possible to give her living room, a kitchenette and a bath/WC.

8. Utility Shops

8.1 It is recommended that a general merchant's shop and a utility shop may be provided in the campus. These may be located in a corner, near a public street, so as to restrict the movements of the employees/owners of the shops inside the campus and to enable the shops to have a greater clientele by catering to the public as well. This would make the shops a paying proposition and so give better service and offer a variety of merchandise.

8.2 An area of 11 sq. m. (120 sq. ft.) per shop is considered adequate.

9. Staff Residences

9.1 It is necessary to provide housing for the teaching staff and other essential staff (cooks, sweepers, chowkidars) in the campus. The number of residences that are recommended to be provided in different size schools are given below :

Size	No. of residences for			
	Principal	Teachers	Warden	Class IV
A . . .	1	17	1	7
B . . .	1	10	1	6
C . . .	1	7	1	6

9.2 Keeping in view the scale of residential accommodation for various pay scales recommended in the "Report on Residential Buildings" brought out by the Committee on Plan Projects, Planning Commission, the following scale of accommodation is suggested for various categories of staff.

	Floor Area		Plinth Area			
	Sq. m.	Sq. ft.	Double Storey Sq. m.	sq. ft.	Single sq. m.	Storey Sq. ft.
Principal .	81·75	880	105·0	1130	97·50	1050
Teacher / Warden	48·25	520	65	700	58	625
Class IV	22·25	240	34·50	370	30	325

9.3 The floor areas given above include all living service and circulation space within the house but exclude common circulation (vertical and horizontal). The plinth areas are for load bearing 9″ walls. These will have to be suitably modified when other materials or methods of construction are used.

In the floor areas recommended, it would be possible to provide the following accommodation :

(a) *Principal's residence* : One living room, two bed rooms, verandah, kitchen, store, servant room, bath and W.C. and a W.C. for servant.

(b) *Staff quarters* : Two to three rooms, kitchen, store, verandah, bath and W.C.

(c) *Class IV quarters* : A room and kitchen/ cooking verandah, bath and W.C.

9.4 *Design considerations* : The houses should be so planned, oriented and constructed that they are convenient to live in, thermally comfortable and are aesthetically pleasing. In the "Report on Residential Buildings" referred to above, these aspects have been discussed in detail. The report should be referred to and the recommendations made therein should be followed.

10. Requirements of Land

10.1 In considering the requirements of land, it would be reasonable to presume that the school, in course of time, would grow and that accommodation other than what is visualised now might be needed. Therefore any economy in land requirement might handicap expansion or improvement schemes. All the same, the area that can be acquired would depend on the availability and cost of land that is conveniently accessible and whether it has public utilities, is free from noise, smoke and foul odour nuisance and has good topography. Recommendations on land requirements are, therefore, intended to serve as a guide.

10.2 The panel in its report on Higher Secondary Schools had recommended for school sites an area of 1.2 hectares (3 acres) if community parks or open space are available in close proximity and could be used as playing fields; otherwise 2 hectares (5 acres). In the report on industrial townships, an area of 2.4 to 2.8 hectares (6 to 7 acres) has been recommended for higher secondary schools. Considering the requirements of hostels, playing fields and quarters, it is recommended that an area of 4 to 6 hectares (10 to 15 acres) should be aimed at.

10.3 Function, aesthetics and economics of land utilisation should guide the layout of structures. To conserve land for future development and save cost on road and service length, the buildings should not be dispersed on the site, but should be inter-related and woven in a harmonius pattern. To guide the development of the whole site on a scientific basis, a master plan might be prepared.

11. Building Economy

11.1 *Schools* :

(i) Design efficiency depends on the proportion of floor area under productive use to total area. In a school building, teaching areas are the main productive areas, having direct educational value, and areas under administration, sanitation, storage and circulation are subsidiary areas. The subsidiary areas should not occupy more than 40% of total area, thus, giving a design efficiency of 60%. The aim should, however, be to achieve a higher design efficiency.

(ii) The standards of other subsidiary accommodation have been recommended on an economical basis. To maintain a reasonably good proportion with the teaching area, the area under circulation would be the chief factor affecting the design efficiency. The area under circulation should, therefore, be kept as low as possible preferably not more than 25% of total area.

11.2 *Hostels* :

In hostels, the subsidiary areas should be examined with respect to the area under dormitories. It is recommended that area under dormitories should not be less than 45% of total area and the area under circulation should not be more than 30% of the total area.

11.3 *Staff Residences* :

In the report on residential buildings referred earlier, the following norms of space utilisation are suggested, which should be followed to ensure a balanced design.

Living, dinning, bed room	47-50%	For Load Bearing Construction
Kitchen, bath, w.c. . .	15-20%	
Passages, verandah . .	10-12%	
Stairs	4-7%	
Walls and columns . .	15-17%	

11.4 Planning norms lead to economical space utilisation but do not make the plan economical and efficient in operation, as this depends more on relative disposition of various areas for functional efficiency which is attained by careful analysis of functions. The norms suggested are, therefore, a tool and not the end.

12. Specification of Finish

12.1 The standards of surface finish are as important as architectural and structural planning, as these materially affect the cost of construction. Therefore, while drawing out the specification of finish, the cost and the functional requirements should be very carefully weighed. Generally the surface finish should be such that is easy to clean and maintain and capable of withstanding rough usage.

12.2 How tidy a building and its environments are, would depend to a large extent on the initiative and personality of the teachers and the Principal, but the Architect can definitely help them to keep the structure clean by well-thought-of specifications. Durable, washable flooring, smooth wall finishing and oil painted wood work would meet the requirements. All rooms should be internally white-washed, including ceiling, to increase the reflection and inter-reflection of light, unless colour washing of certain areas is necessary in the interest of aesthetics.

13. Furniture and Fixtures

13.1 In the absence of authoritative standards of height of Indian children, European standards are generally followed to work out the dimensions of furniture and equipment, fittings and fixtures.

13.2 Recognising the need, the Indian Council of Medical Research planned investigations on a country-wide basis to establish the badly needed standards of reference on growth and development of Indian children. According to the consolidated tables included in the interim report on the subject brought out by the Indian Council of Medical Research, graphs were prepared to serve as a guide in working out the heights of furniture, fittings etc. and are included in the report as figures IV and V.

13.3 Physical comfort and economy in material and labour should be the main considerations in the design of furniture. The pupil is the yardstick for school design and so all furniture, fixtures and equipment should be scaled to his size.

14. Cost Norms

14.1 The cost is the last but the most important consideration. The funds are limited and the need for the schools under the scheme at maximum number of stations is pressing. It is, therefore, absolutely necessary to adopt strict austerity measures in the construction of new school buildings. With these considerations in view, cost studies of a few designs were made to fix a ceiling on cost. The results of some of the studies are included in the discussion on building economy in the subsequent paragraph.

14.2 Ceiling on cost given below and the norms suggested earlier are the two limiting factors within which the architect/engineer would be free to work out designs, specifications of materials and methods of construction and type of structure, to suit the availability of materials and labour, the site and the climatic conditions, provided the annual maintenance cost and the special repairs do not exceed 1½ per cent and ¾ per cent respectively of the capital cost of buildings and that the structure is safe and according to the recommendations made in the report.

Description	Cost
A. School :	
Size A	Rs. 525·00 per student
Size B	Rs. 630·00 per student
Size C	Rs. 935·00 per student
B. Hostel :	
Size A	Rs. 1340·00 per seat
Size B	Rs. 1350·00 per seat
Size C	Rs. 1335·00 per seat
C. Ancilliary :	
Storage	Rs. 140·00 per sq. m. of plinth area.
Health Unit	Rs. 156·00 Do.
Shops	Rs. 156·00 Do.
D. Residences :	
Principal	Rs. 156·00 Do.
Teacher/Warden	Rs. 151·00 Do.
Class IV quarters	Rs. 140·00 Do.

(10% excess on the ceiling cost recommended above would be permissible for foundation in difficult soils).

Notes :

(i) The above norms of costs include the cost of external and internal services but exclude cost of fans in case of school and hostel and ancilliary structure, the equipment and the furniture, service connections (gas, water in laboratories), the land and its development.

(ii) The norms are based on the C.P.W.D. rates as on March, 1962 with 100 as Index. Proportionate increase for various stations should be made as given in the cost index (Annexure B) and as revised from time to time by the Central P.W.D.

(iii) The cost indexes of places not covered in the Annexure 'B' should be worked out on the basis of cost and labour and material as prevalent in the locality, in accordance with the method given in Annexure 'C'.

(iv) Break-up of plinth area rates for various structures are given in Annexure 'D' for reference.

15. Building Economy

15.1 In the buildings for education, economy cannot be regarded as an independent problem. It is concerned just as much with the pupil's education and the environment, as with the structure. The aim of the school planning should, therefore, be to achieve a trilateral balance between the three capital E's of school planning, Education—Environment—Economy.

15.2 The economy of structure comes about through very careful engineering. A few methods to cut down the cost of construction are :

(i) choose site carefully (simple foundations, easy drainage, good top soil to support vegetation).

(ii) design simple structure (minimum span schedule, nooks and corners and wall perimeter and having repetitive structural units).

(iii) make full utilisation of local materials and have the type of construction that local labour can carry out.

(iv) make use of trees and shrubs as activity barrier, for shade, to provide supplementary instructional area and to serve as screens and wind breaks.

15.3 A detailed analysis of the cost of various structural components is necessary to decide the most economical size and shape of a unit area. Cost studies of a classroom which constitute the main teaching area were made with three different arrangements as shown in Fig VI-A (case A), VI-B (case B), VI-C (case C). The specifications followed in working out the cost and the cost analysis of various sub-heads are given in Annexure 'E'. It would be seen from this Annexure that the usual arrangement of classroom as shown in case A is 2.5 per cent costlier than case B and it is 4.2 per cent costlier than case C. The excess in cost in case A is due to the increase in circulation area and the wall perimeter. From purely economical considerations the arrangement shown in Fig. VI-C (case C) is most economical but the students in the front end rows may have some difficulties in reading the blackboard without slightly turning their seats. The advantages in case C are that the students and the teacher are closer. However before recommending this for adoption a detailed study is necessary to find out the subjective reactions of teachers and the pupils. The Ministry of Education, Central Building Research Institute or National Buildings Organisation would do well in constructing prototype classrooms on an experimental basis to find out the relative performance of each type and the saving in cost. Similarly in case of laboratories also there is need for a similar investigation to fix the most economical size and shape.

15.4 Cost studies done in other countries reveal that :

(a) In case of constant height building per sq. ft. cost decreases with increase in span. As the span increases and the height remains constant, the additional roof cost is not sufficient to offset the lower resultant cost per sq. ft. of total building area.

(b) A classroom in two storey structure is 4.3 per cent costlier than a similar classroom with one storey structure. In a two storey structure, although the cost per sq. ft. of plinth area is about 5% less than a single storey structure but the cost per classroom is more. In school buildings what actually matters is the cost per classroom or teaching space and not the cost per sq. ft. plinth area. The above study is based on the cost of structure alone and does not take into consideration land values. In working out an economical solution, the cost of the land and structure should both be balanced.

15.5 Design and detail of every component part also affect cost. A 50% openable glazing is about 35% economical than a fully openable glazing of equivalent area and the same glazed area if divided into smaller fully openable units would be about 40% costly.

15.6 Inadequate attention paid to the drawing up of specifications add substantially to the cost. It will be for example incorrect to specify same quality of bricks for the entire lot of construction or cement mortar for all masonry work or same type of roofing for classrooms and connecting passages. Cheaper but durable materials consistent with functional utility should form the basis of drawing of specifications.

15.7 All construction components need equal considerations, otherwise, expenditure under one had can more than offset saving on the other. Analysis of expenditure on various heads would indicate where the money goes and would help the architect/engineer to work out the most economical solution. Although the method is time-consuming, considering the needs for more schools and the limitation of funds, it is absolutely necessary to explore all possibilities of reducing construction cost. If the architect/engineer can help by saving even small percentage of money on every school he builds, he can justify the usefulness of his profession.

15.8 In addition to the reduction in building cost by rational planning and judicious specifications of materials and methods of construction, it is important that the return from the capital investment starts accruing at as early a date as possible. It is, therefore, equally important that action is initiated in the early planning stages to ensure supply of electricity, water, gas, etc., and to order supply of equipment and furniture, so that these are available in time. Many a building remain occupied and unproductive after completion, for want of service connections, equipment or staff. A detailed work programme and proper coordination of work at all levels is, therefore, desirable to avoid loss of return.

16. Suggestive Plans

16.1 A few suggestive plans to illustrate how the norms and standards recommended in the preceding paragraphs can be realised and interpreted in terms of actual designs and to indicate few of the possibilities in synthesis of space are attached for reference. A copy of the design prepared by Indian Institute of Technology, Madras for construction of the school under the scheme in the Institute campus is also attached.

16.2 Solutions in the forms of type plans are relatively unimportant because they would apply only to few situations. All the same the plans appended would help the Education and Planning authorities in drawing out a perfect solution to suit the local requirements.

16.3 Statements showing the analysis of area, design efficiency etc., of the suggestive plans for school building is given in Annexure 'F' and the similar information on the suggestive plans for the school hostels is given in Annexure 'G'.

ANNEXURE 'A'

SCHEDULE OF SPACE REQUIREMENTS FOR RESIDENTIAL SCHOOLS UNDER THE CENTRAL SCHOOL SCHEME

I. School Buildings :

A. *Teaching* :

Description	Size A Enrolment 720			Size B Enrolment 480			Size C Enrolment 240		
	No. of rooms	Area of each room sq. m.	Total Area sq. m.	No. of rooms	Area of each room sq. m.	Total Area sq. m.	No. of rooms	Area of each room sq. m.	Total Area sq. m.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Classroom	18	44·2	795·6	12	44·2	530·4	6	44·2	265·2
2. Science Theory Room	2	44·2	88·4	2	44·2	88·4	1	44·2	44·2
3. Art Room	1	44·2	44·2	1	44·2	44·2	1	44·2	44·2
4. Craft Room	2	44·2	88·4	2	44·2	88·4	2	21·4	42·8
5. Activity Room	1	44·2	44·2	1	44·2	44·2	1	44·2	44·2
6. General Science Room	1	44·2	44·2	—	—	—	—	—	—
7. Chemistry Laboratory	1	9·8×6·05		1	9·8×6·05		1	9·8×6·05	
8. Biology Room	1	9·8×6·05		1	9·8×6·05		1	9·8×6·05	
9. Physics Laboratory	1	9·8×6·05	325·16	1	9·8×6·05	325·16	1	9·8×6·05	325·16
10. Home Science (cookery and laundry)	1	9·8×6·05		1	9·8×6·05		1	9·8×6·05	
11. Store (one with each Lab.)	4	22		4	22		4	22	
12. Home Science (needle work)	1	44·2	44·2	1	44·2	44·2	1	44·2	44·2
13. Electives	—	—	—	1	21·4	21·4	2	21·4	42·8
14. Library	1	89	89	1	66·8	66·8	1	44·2	44·2
TOTAL	35		1563·36	29		1253·16	23		896·96
Teaching area per student			2·17			2·60			3·73
B. *Administration* :									
1. Principal	1	14·8	14·8	1	14·8	14·8	1	14·8	14·8
2. Office	1	18·6	18·6	1	18·6	18·6	1	18·6	18·6
3. Staff Common Room	1	41·8	41·8	1	33·4	33·4	1	33·4	33·4
TOTAL	3		75·2	3		66·8	3		66·8
C. *Storage* :									
1. For N.C.C., A.C.C, Scouting & Games	4	11	44·00	3	11·00	33·00	3	11·00	33·00
2. General Store for broken furniture items etc. (to be provided in ancillary structure with cheaper specifications)	1	37	37·00	1	37·00	37·00	1	28·00	28·00
TOTAL	5		81·00	4		70·00	4		61·00
GRAND TOTAL			1719·56			1389·96			1024·76

Distribution of Area	Area	% of teaching area	% of total area	Area	% of teaching area	% of total area	Area	% of teaching area	% of total area
A. Teaching	1563·36	100	90·92	1253·16	100	90·11	896·96	100	87·53
B. Administration	75·2	4·04	4·37	66·8	5·33	4·86	66·80	7·45	6·52
C. Storage	81	5·18	4·71	70·00	5·58	5·03	61·00	6·80	5·95
TOTAL	1719·51		100	1389·96		100	1024·76		
Total area per student	2·39			2.19			3.27		

II. Hostel :

	Size A (1)	(180 seats) (2)	(3)	Size B (4)	(120 seats) (5)	(6)	Size C (7)	(60 seats) (8)	(9)
1. Dormitories . .	10 to 12 seats per dormitory	4·6 per seat	828·00	10 to 12 seats per dormitory	4·6 per seat	552·00	10 to 12 seats per dormitory	4·6	276·00
2. Dining-cum-common room (for 50% of the total strength).	Preferably 2	0·9 per seat	81·00	1	0·9 per seat	54·00	1	0·9	27·00
3. Kitchen, Store etc. (For 50% of the total strength).	Preferably 2	0·37 per seat	33·30	1	0·37	22·20	1	0·37	11·10
4. Warden Office . .	1	14	14	1	14	14·00	—	—	—
5. Assistant Warden Room	3 (1 for every 60)	13	39·00	2 (1 for every 60)	13	26·00	1	13	13·00
TOTAL . . .			995·30			668·20			327·00
Total area per seat . .			5·53			5·56			5·45

III. Ancillary :

(i) *Medical Unit* :

(The medical unit should be so provided that it is common for the school and the hostel)

Doctor's room . . .	1	28	28	1	28	28	1	28	28
Dispensary & Dressing .	1	9·5	9·5	1	9·5	9·5	1	9·5	9·5
Sick room . .	1	18·5	18·5	1	18·5	18·5	1	18·5	18·5
Isolation room . . .	1	11·00	11·00	1	11·00	11·00	—	—	—
Nurses quarter . .	1	22·25	22·25	1	22·25	22·25	1	22·25	22·25
(ii) *Shops*	2	11·00	22·00	2	11·00	22·00	1	11·00	11·00
			111·25			111·25			89·25

N.B. (i) Doctor's Room (Multipurpose Room) with Dispensary & Dressing, are to be added to the "School Building."

Sick Room, Isolation Room, Nurse's Quarters and Shops are to be added to the "Hostel Building".

IV. Staff Residences :

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Principal . . .	1	81·75	81·75	1	81·75	81·75	1	81·75	81·75
2. Wardens . . .	1	48·25	48·25	1	48·25	48·25	1	48·25	48·25
3. Teachers . . .	17	48·25	820·25	10	48·25	482·50	7	48·25	337·75
4. Class IV Staff . .	7	22·25	155·75	6	22·25	133·50	6	22·25	133·50
TOTAL . . .	26		1106·80	18		746·00	15		601·25

Total floor area excluding area under circulation and sanitation except staff residences :

	Size A	Size B	Size C
1. School	1719·56	1389·96	1024·76
2. Hostel	995·30	668·20	327·10
3. Medical Units and Shops	111·25	111·25	89·25
4. Staff residences	1106·00	746·00	601·25
TOTAL	3932·11	2915·41	2042·36

ANNEXURE 'B'

COST INDEX WITH REFERENCE TO C.P.W.D. RATES AT DELHI IN MARCH 1962 BASE AS 100

S. No.	Place	Cost Index	S. No.	Place	Cost Index
1.	Agra	121	30.	Kanpur	131
2.	Ahmedabad	116	31.	Karnal	120
3.	Ajmer	94	32.	Kharakvasla	103
4.	Allahabad	124	33.	Kota	117
5.	Ambala	115	34.	Kurnool	83
6.	Amritsar	111	35.	Lucknow	135
7.	Bangalore	119	36.	Madras	145
8.	Bareilly	125	37.	Madurai	130
9.	Baroda	108	38.	Mathura	90
10.	Bharatpur	99	39.	Mandappam	125
11.	Bhopal	113	40.	Meerut	122
12.	Bombay	137	41.	Nagpur	117
13.	Calcutta	144	42.	Nasik Road	118
14.	Chandigarh	117	43.	Nasirabad	111
15.	Cochin	138	44.	Pathankot	101
16.	Coimbatore	134	45.	Patna	103
17.	Cuttack	135	46.	Poona	123
18.	Dehradun	121	47.	Rajkot	106
19.	Delhi	100	48.	Ranchi	113
20.	Dhanbad	116	49.	Roorkee	91
21.	Ferozepur	111	50.	Saugar	104
22.	Gaya	103	51.	Shillong	140
23.	Gwalior	118	52.	Simla	172
24.	Hyderabad	124	53.	Surat	135
25.	Indore	126	54.	Tambaram	129
26.	Jabalpur	112	55.	Tanjore	121
27.	Jaipur	100	56.	Trichirapalli	121
28.	Jodhpur	110	57.	Trivandrum	113
29.	Jullunder	111	58.	Vishakapatnam	107

ANNEXURE 'C'

STATEMENT SHOWING CALCULATION OF BUILDING COST INDEX OF DELHI 31ST MARCH 1962 BASED ON THE C.P.W.D. DELHI SCHEDULED RATE OF 1955 AS 100

S. No.	Description	Unit	Delhi Rates at Site of Work in 1955	Delhi Rates at Site of Work in 1962	Percentage Increase or Decrease in Rate	Weightage	Cost Index
	Materials						
1.	Brick 50% Ist Class 50% 2nd Class	1000 Nos	31·50	35·00	$\frac{35·00 \times 100}{31·50} = 111$	17	18·87
2.	Sand 33·3% Coarse sand 66·6% Fine Sand	100 cft.	31·00	31·00	$\frac{31·00 \times 100}{31·00} = 100$	7	7·00
3.	Cement	Cwt.	5·12	7·40	$\frac{7·40 \times 100}{5·12} = 145$	18	26·10
4.	Aggregate 50% ¾" gauge stone 50% 1½" gauge stone	100 cft.	32·00	30·50	$\frac{30·50 \times 100}{32·00} = 96$	8	7·68
5.	Timber 2nd class C.P. Teakwood in scantling	cft.	10·00	20·00	$\frac{20·00 \times 100}{10·00} = 200$	13	26·00
6.	Mild Steel	cwt.	26·00	36·00	$\frac{36·00 \times 100}{26·00} = 138$	10	13·80
	Labour						
7.	Mason	Each	4·50	5·50	$\frac{5·50 \times 100}{4·50} = 122$	10	12·20
8.	Carpenter	Each	4·50	5·50	$\frac{5·50 \times 100}{4·50} = 122$	5	6·10
9.	Coolie	Each	1·75	2·00	$\frac{2·00 \times 100}{1·75} = 114$	12	13·68
							131·43 Say 131

ANNEXURE 'D'

BREAK-UP OF PLINTH AREA RATES

Note 1 :—Detailed estimates for a few designs on the C.P.W.D. Delhi Schedule of Rates, 1955 were prepared to work out the plinth area rates for the school and hostel buildings.

Note 2 :—For staff quarters plinth area rates being followed by Central P.W.D. have been adopted.

Note 3 :—Analysis of number of designs for schools and hostel buildings form the basis for fixing total carpet area for these building.

I. Schools and Hostels :

	Rs.
(*a*) Cost per sq. ft. of plinth area on C.P.W.D. Dehi Schedule of Rates, 1955	7·25
(*b*) Add 31% cost index for rise in prices (Refer Annexure C)	2·44
(*c*) Add 25% for services on *a* and *b*	2·37
(*d*) Add 3% contingencies on item *a*, *b* & *c*	0·35
(*e*) Total cost per sq. ft.	12·21
(*f*) Total cost per sq. m.	131·75
Say	132·00

II. *Health Unit and Principal's Residence* :

(*a*) Cost per sq. ft. of plinth area on C.P.W.D. Delhi Schedule of Rates, 1955	8·25
(*b*) Add 31% cost index for rise in prices. (Refer Annexure C)	2·56
(*c*) Add 30% for services on *a* and *b*	3·24
(*d*) Add 3% contingencies on items *a*, *b* and *c*	0·42
(*e*) Total cost per sq. ft.	14·47
(*f*) Total cost per sq. m.	155·60
Say	156·00

III. *Staff Quarters* :

(*a*) Cost per sq. ft. of plinth area on C.P.W.D. Delhi Schedule of Rates, 1955	8·00
(*b*) Add 31% cost index for rise in prices. (Refer Annexure C)	2·48
(*c*) Add 30% for services on *a* and *b*	3·14
(*d*) Add 3% contingencies on items a, b and c	0·41
(*e*) Total cost per sq. ft.	14·03
(*f*) Total cost per sq. m.	150·90
Say	151·00

IV. *Shops, Stores and Class IV Quarters* :

(*a*) Cost per sq. ft. of plinth area on C.P.W.D. Delhi Schedule of Rates, 1955	7·60
(*b*) Add 31% cost index for rise in prices (Refer Annexure C).	2·35
(*c*) Add 27½% for services on *a* and *b*	2·74
(*d*) Add 3% contingencies on items *a*, *b* and *c*	0·38
(*e*) Total cost per sq. ft.	13·07
(*f*) Total cost per sq. m.	140·40
Say	140·00

V. *Schools* :—*Cost per student*

Size A (Enrolment 720)

(*a*) Total carpet area	2474 sq. m
(*b*) Total plinth area (allowing 15% for walls)	2845 ,,
(*c*) Plinth area per student	3·96 ,,
(*d*) Cost per student at Rs. 132/- per sq. m.	523·00
Say	525·00

Size B (Enrolment 480)

(*a*) Total carpet area	1999 sq. m.
(*b*) Total plinth area (allowing 15% for walls).	2299 ,,
(*c*) Plinth area per student	4·79 ,,
(*d*) Cost per student at Rs. 132/- per sq. m.	631·00
Say	630·00

Size C

(*a*) Total carpet area	1480 sq. m.
(*b*) Total plinth area (allowing 15% for walls)	1702 ,,
(*c*) Plinth area per student	7·09 sq. m.
(*d*) Cost per student at Rs. 132/- per sq. m.	935·00

VI. *Hostels* :

Size A (180 Seats)

(*a*) Total carpet area	1590 sq. m.
(*b*) Total plinth area (allowing 15% for walls).	1830 ,,
(*c*) Plinth area per seat	10·15 ,,
(*d*) Building cost per seat at Rs. 132/- per sq. m.	1340·00

Size B (120 Seats)

(*a*) Total carpet area	1065 sq. m.
(*b*) Total plinth area (allowing 15% for walls).	1225 ,,
(*c*) Plinth area per seat	10·2 ,,
(*d*) Building cost per seat at Rs. 132/- per sq. m.	1347·00
Say	1350·00

Size C (60 Seats)

(*a*) Total carpet area	528 sq. m
(*b*) Total plinth area (allowing 15% for walls)	607 ,,
(*c*) Plinth area per seat	10·11 ,,
(*d*) Building cost per seat at Rs. 132/ per sq. m.	1335·00

ANNEXURE 'E'

ESTIMATED COST FOR THE CONSTRUCTION OF TWO CLASSROOMS IN A DOUBLE STOREY STRUCTURE

Statement showing analysis of cost of various sub-heads of work

S. No.	Sub-Head of Works	Case A(Fig. 7-A)		Case B(Fig. 7-B)		Case C(Fig. 7-C)		Remarks
		Amount of subhead (In Rs.)	As % of total	Amount of sub-head	As % of total	Amount of sub-head	As % of total	
1.	Earth Work . . .	50	0·59	49	0·59	48	0·59	(i) Case B is 2·5% economical than Case A.
2.	Concrete Work . . .	355	4·18	352	4·22	341	4·16	
3.	R.C.C. Work	3364	39·48	3255	39·08	3143	38·45	(ii) Case B is 4·2% economical than Case A.
4.	Brick Work	1855	21·77	1827	21·98	1811	22·14	
5.	Wood Work	801	9·42	801	9·62	801	9·78	(iii) Case C is 1·7% economical than Case B.
6.	Flooring	500	5·88	491	5·88	487	5·93	
7.	Roofings	476	5·60	470	5·65	464	5·64	*Notes* :
8.	Finishing	833	9·78	797	9·62	813	9·90	(i) Estimates are based on Delhi Schedule of Rates 1955.
	Miscellaneous	280	3·30	280	·36	280	3·41	
	TOTAL	8535	100	8322	100	8183	100	(ii) For drawings see Figure 6.
	Average cost of one class room .	Rs. 4267·5		Rs. 4161		Rs. 4091·5		(iii) Specifications see below.

Brief Specifications :

Foundations :

Second class brick footing in cement lime mortar 1:1:8 over a bed of cement concrete 1:6:12 up to 3 ft. depth with a 1:2:4 cement, D.P.C. at plinth level (1/6" above ground level) bitumen painted on top.

Super-Structure :

9" thick second class brick wall in 1:1:8 cement lime mortar for all load bearing walls and 1:3 cement mortar with hoop irons for 4½" non-load bearing walls.

Wood Work :

Second class deodar wood with iron fittings and fixtures and oil painted.

Flooring :

1½" thick cement concrete 1:2:4 finished with a floating coat of neat cement over a bed of 3" cement concrete 1:6:12 in the ground floor and over a bed of thick cement slurry on the first floor except in bath and W. C. which shall be of 1½" thick terrazo in grey cement with 3 ft. high dado of the same, 4" high cement plaster skirting in all rooms.

Or 4" thick 1:3:6 (1 cement:3 sand:6 ballast 1½" gauge) P.C.C. flooring, laid in panels not exceeding 8½ × 8' finished with a floating coat of neat cement.

Roofing :

R.C.C. T beams roof finished with a coat of bitumen and with 4" average mud phuska, a course of tiles grouted with 1:3 cement mortar on top.

Finishes :

All walls plastered both inside and outside with ½" cement plaster and white-washed inside and colour washed outside.

ANNEXURE 'F'

SUGGESTIVE PLANS FOR SCHOOL BUILDINGS

Statement showing analysis of areas

Proposal No.	Plinth Area (wall thickness 20 cm.)	Carpet Area (C.A.)	Carpet Area/ Student	Teaching Area	% of Teaching Area to C.A.	Admn. Area	% of Admn. Area to C.A.	Circulation Area	% of Circulation Area to C.A.	Sanitary Area	% of Sanitary Area to C.A.
I	2501 sq. m.	2276 sq. m.	3·16 sq. m.	1550 sq. m.	68·35%	79 sq. m.	3·35	543 sq. m.	23·85%	104 sq. m.	4·45%
II	2665 sq. m.	2454 sq. m.	3·41 sq. m.	1552 sq. m.	63·38%	72 sq. m.	2·87%	695 sq. m.	28·29%	135 sq. m.	5·46%
III	2526 sq. m.	2306 sq. m.	3·20 sq. m.	1583 sq. m.	68·65%	78 sq. m.	3·37%	493 sq. m.	21·38%	152 sq. m.	6·60%
IV . .	2771 sq. m.	2505 sq. m.	3·48 sq. m.	1589 sq. m.	63·50%	79 sq. m.	3·14%	743 sq. m.	29·62%	94 sq. m.	3·74%
V . .	2578 sq. m.	2327 sq. m.	3·23 sq. m.	1575 sq. m.	67·68%	60 sq. m.	2·58%	590 sq. m.	25·36%	102 sq. m.	4·38%
VI . .	2660 sq. m.	2427 sq. m.	3·37 sq. m.	1536 sq. m.	62·84%	69 sq. m.	2·98%	671 sq. m.	27·82%	151 sq. m.	6·36%
VII (I.I.T, Madras)	2197 sq. m.	1978 sq. m.	2·75 sq. m.	1208 sq. m.	61·21%	137 sq. m.	6·91%	491 sq. m.	24·72%	142 sq. m.	7·16%

ANNEXURE 'G'

SUGGESTIVE PLANS FOR HOSTEL BUILDINGS

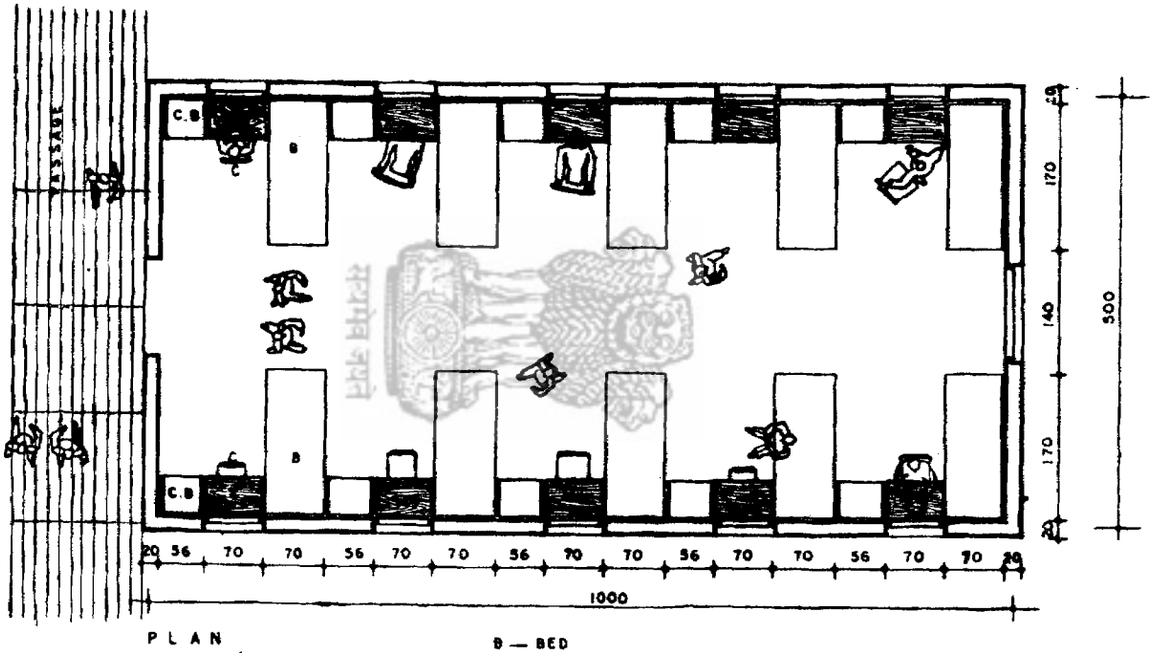
Statement showing analysis of areas

Proposal No.	Plinth Areas sq. m.	Plinth Area/ Student sq. m.	Carpet Areas sq. m. (C.A.)	Carpet Area/ Student sq. m.	Dormitory sq. m.	Percentage of Dormitory to C.A.	Subsidiary Kit, Dining, Warden, Toilet etc.	Percentage of Subsidiary to C.A.	Circulation	% of Circulation to C.A.	Remarks
1.	1326·4	11·05	1173	9·78	564·00	48·13%	290·50	24·76%	318	27·11%	Single storeyed hostel for 120 students.
2.	666·89	11·11	583·40	9·81	282·24	47·96%	144·85	24·62%	161·31	27·42%	Double storeyed hostel for 60 students
3.	632·55	10·54	559·68	9·33	282·24	50·36%	129·35	23·14%	148·09	26·50%	—Do.—

L20MofEdu/64—GIPF.

ILLUSTRATIONS

FIG. IA
DORMITORY
ARRANGEMENT OF FURNITURE



PLAN
4.70 SQ.M./STUDENT.

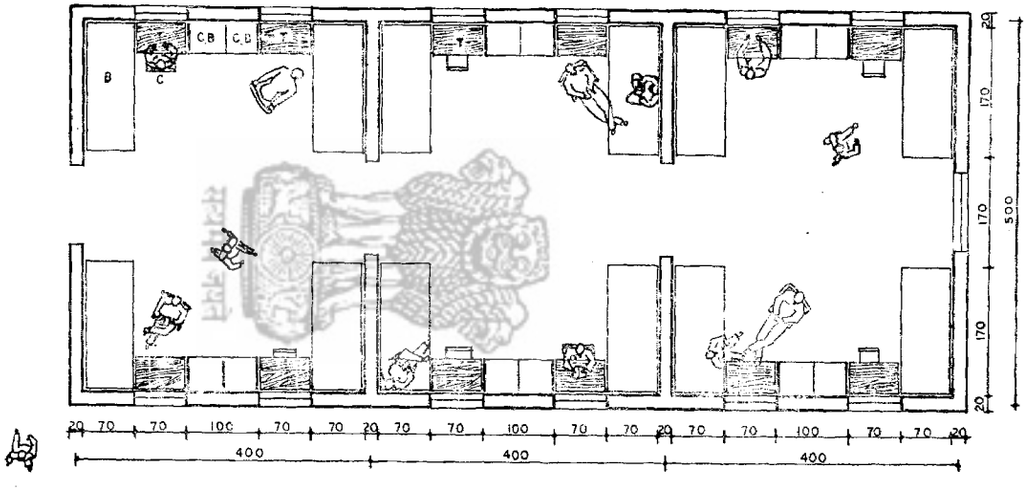
B — BED
C — CHAIR
T — TABLE
C.B — CUP-BOARD/ALMIRAH
ALL DIMENSIONS ARE IN CENTIMETRES

SUITABLE FOR JUNIOR STUDENTS

CENTRAL SCHOOL SCHEME
SCALE 1 : 50

L20Edu/64—4

FIG. 1B
DORMITORY
ARRANGEMENT OF FURNITURE



PLAN

4.56 SQ.M/STUDENT.

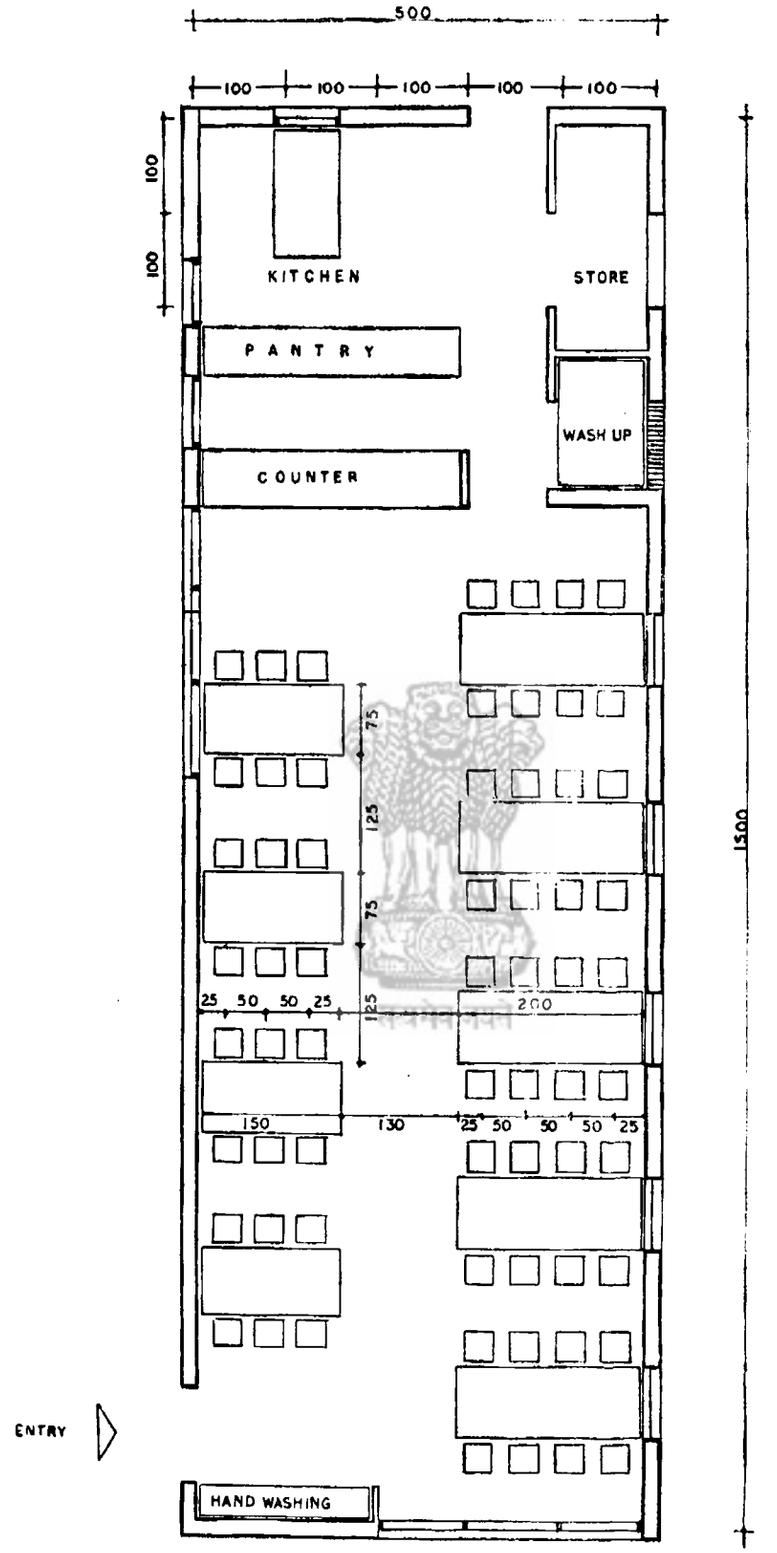
B — BED
C — CHAIR
T — TABLE
C.B — CUP-BOARD/ALMIRAH
ALL DIMENSIONS ARE IN CENTIMETRES.

SUITABLE FOR SENIOR STUDENTS

CENTRAL SCHOOL SCHEME
SCALE 1:50

FIG.II

DINING ARRANGEMENT OF FURNITURE



NOTE:-
ALL DIMENSIONS ARE IN CENTIMETRES.

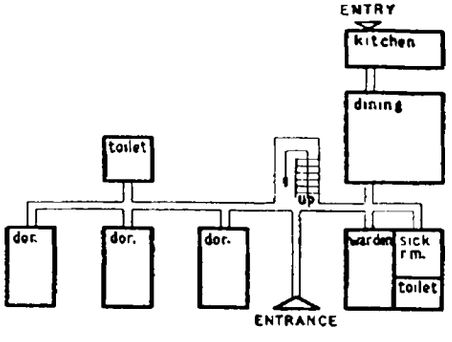
CENTRAL SCHOOL SCHEME

SCALE: 1:50

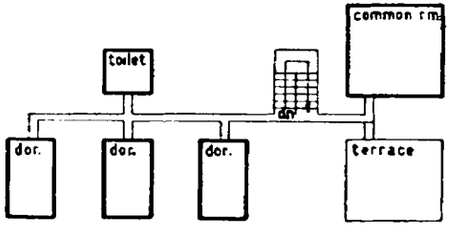
FIG. III

SCHEMATIC DIAGRAM

(HOSTEL BUILDING COMPONENTS)

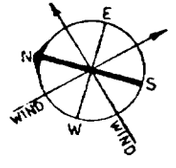


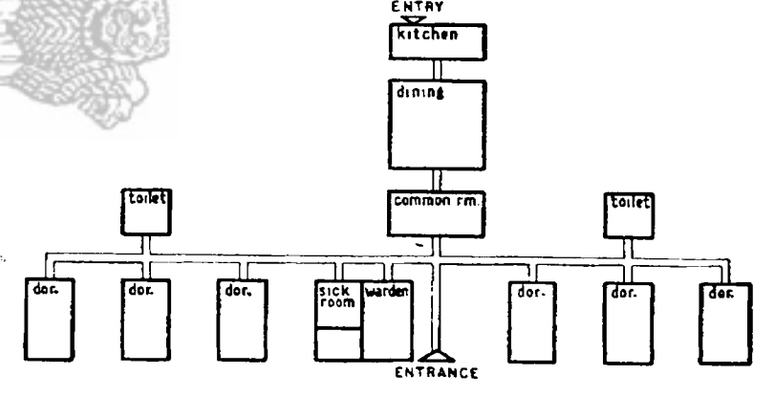
GROUND FLOOR



FIRST FLOOR

DOUBLE STOREYED STRUCTURE





SINGLE STOREYED STRUCTURE

NOTE

DIAGRAM IS NOT RELATED TO LEVELS, ASPECTS OR SIZES.

CENTRAL SCHOOL SCHEME

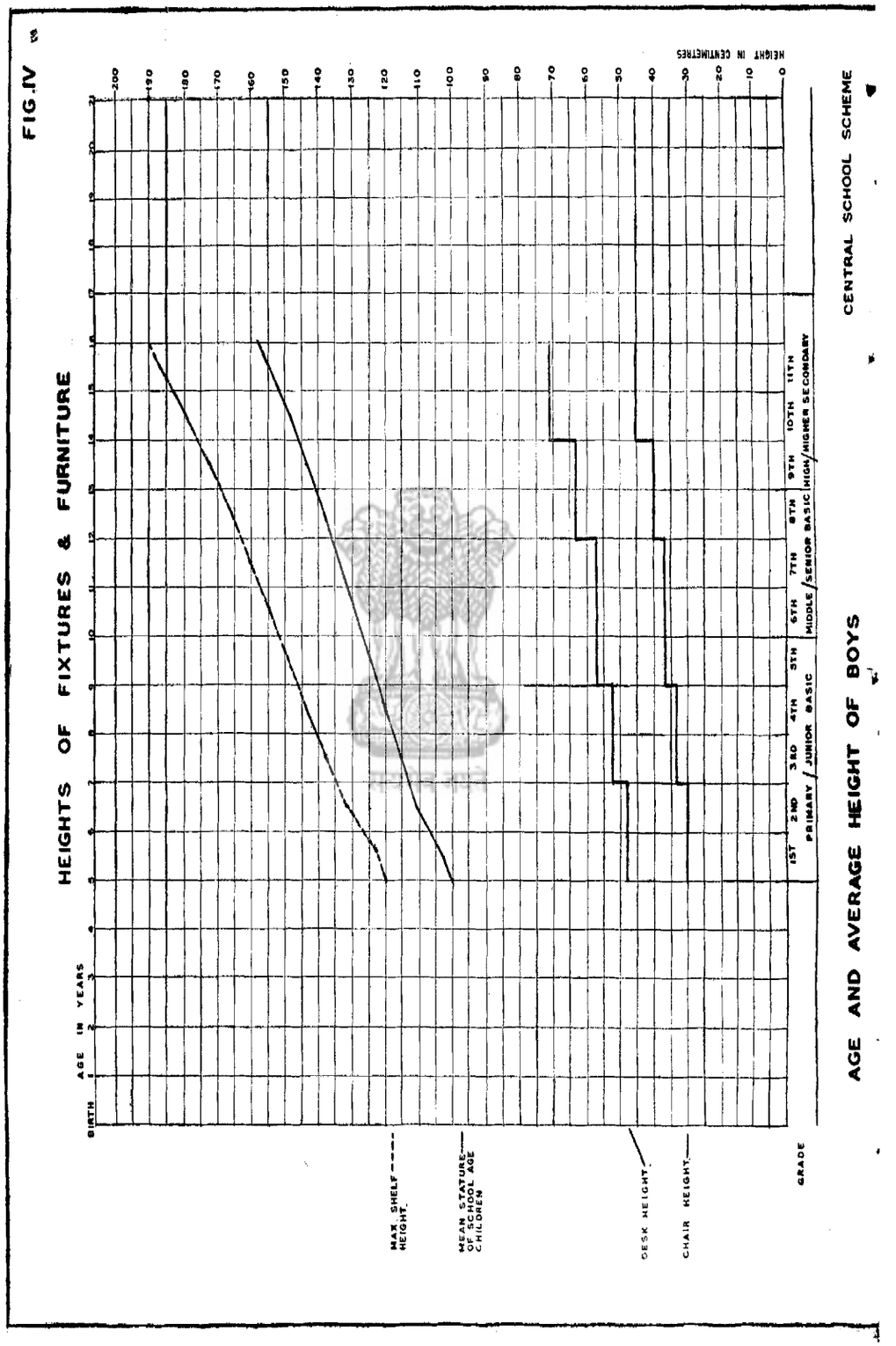
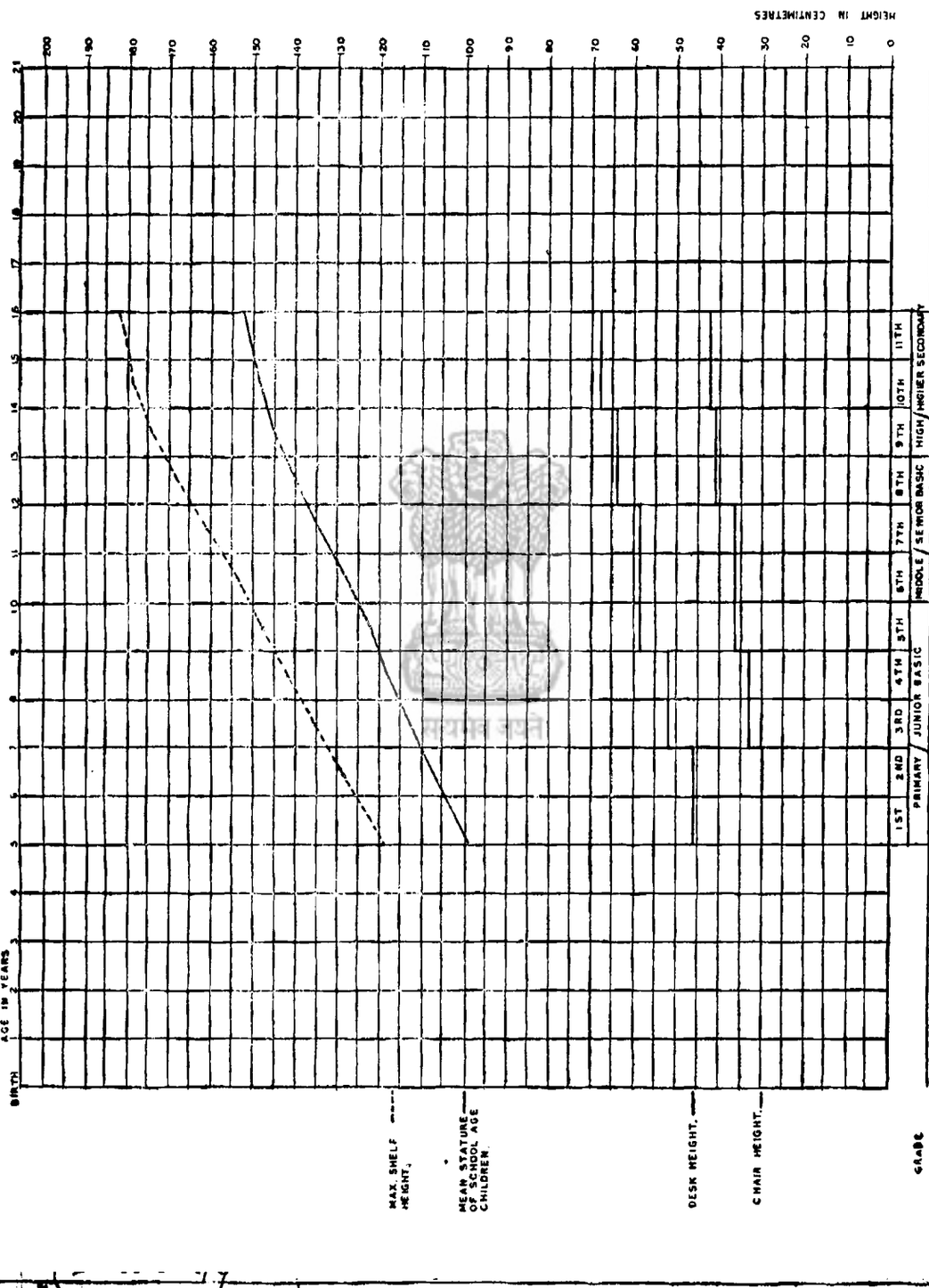


FIG.IV
HEIGHTS OF FIXTURES & FURNITURE
AGE IN YEARS
BIRTH
HEIGHT IN CENTIMETRES
MAX. SHELF HEIGHT
MEAN STATURE OF SCHOOL AGE CHILDREN
DESK HEIGHT
CHAIR HEIGHT
GRADE
1ST
2ND
3RD
4TH
5TH
6TH
7TH
8TH
9TH
10TH
11TH
PRIMARY / JUNIOR BASIC
MIDDLE / SENIOR BASIC
HIGH / HIGHER SECONDARY
AGE AND AVERAGE HEIGHT OF BOYS
CENTRAL SCHOOL SCHEME

FIG. V

HEIGHTS OF FIXTURES & FURNITURE

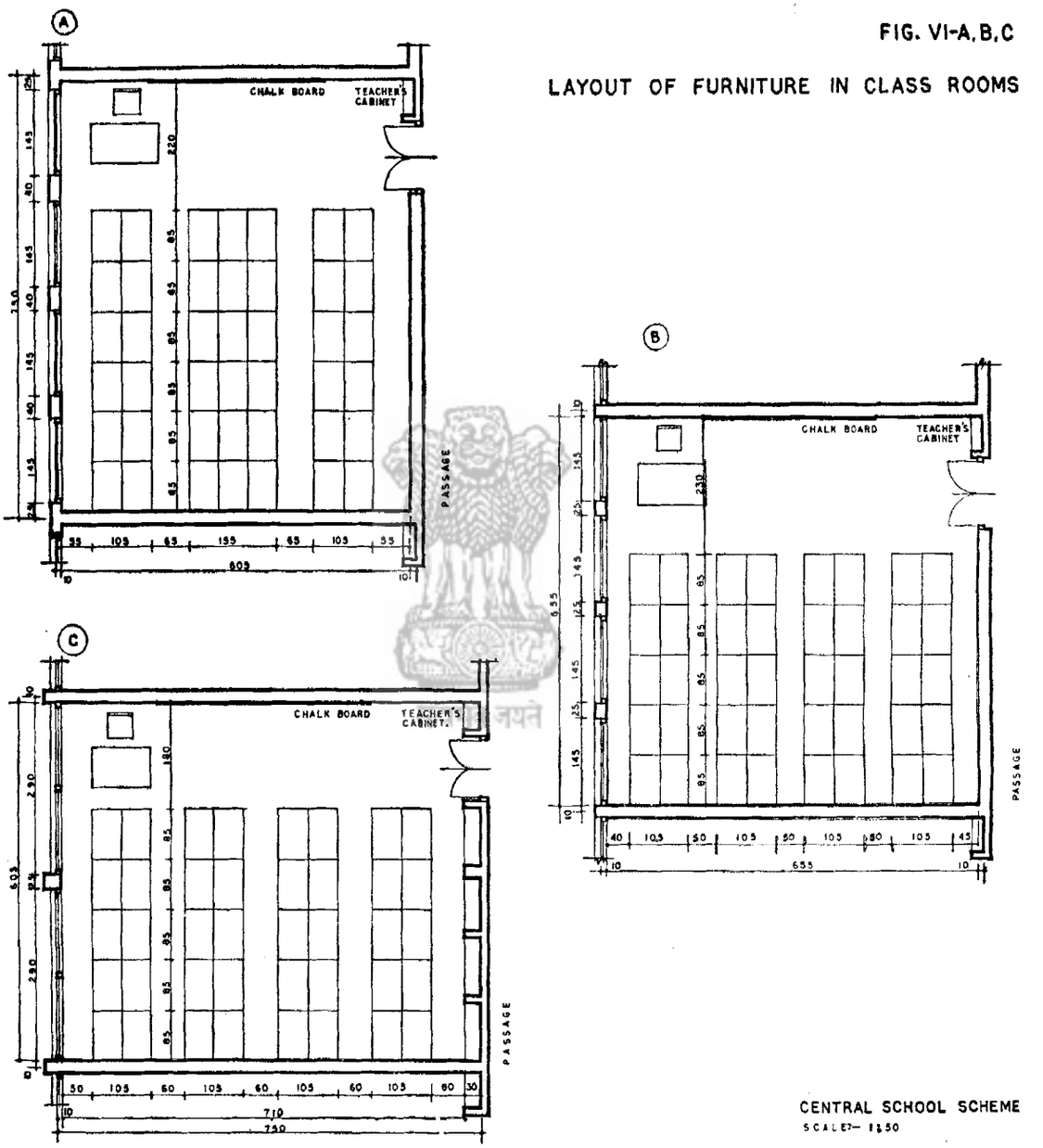


AGE AND AVERAGE HEIGHT OF GIRLS

CENTRAL SCHOOL SCHEME

FIG. VI-A, B, C

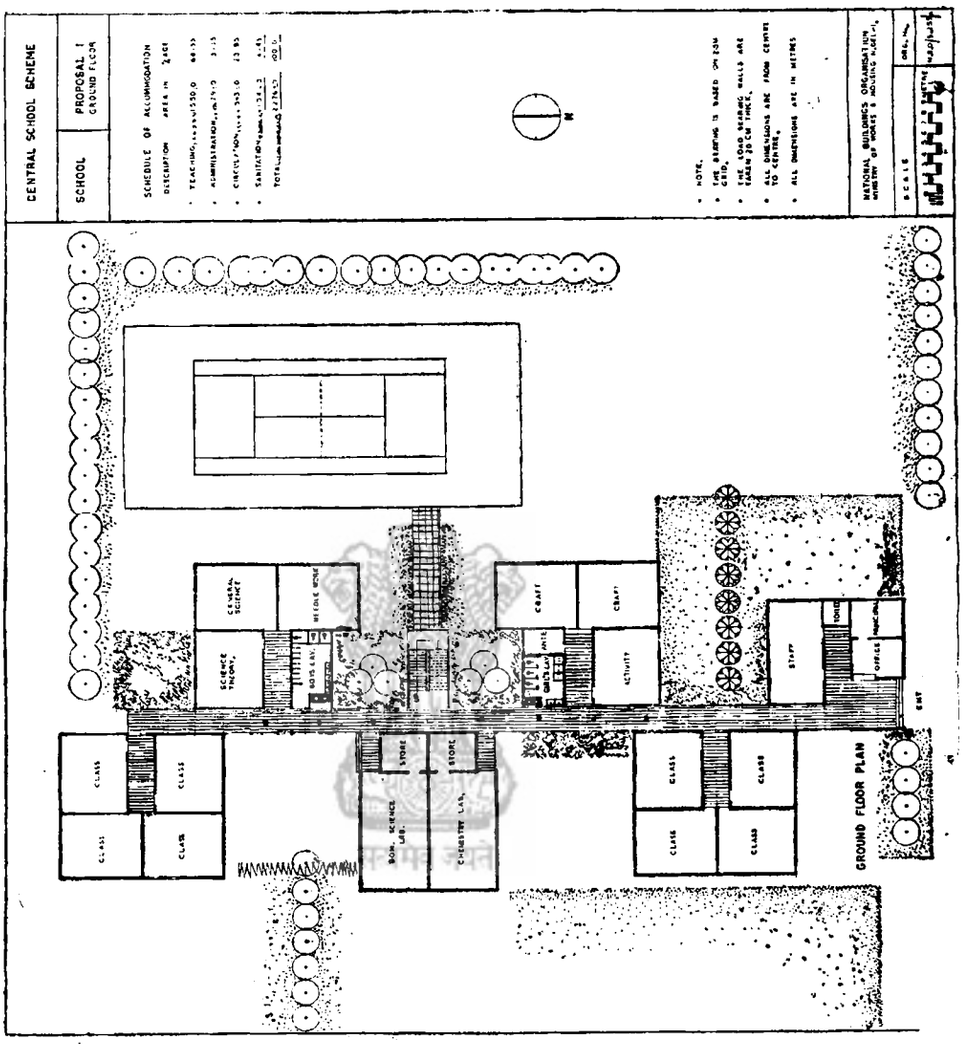
LAYOUT OF FURNITURE IN CLASS ROOMS

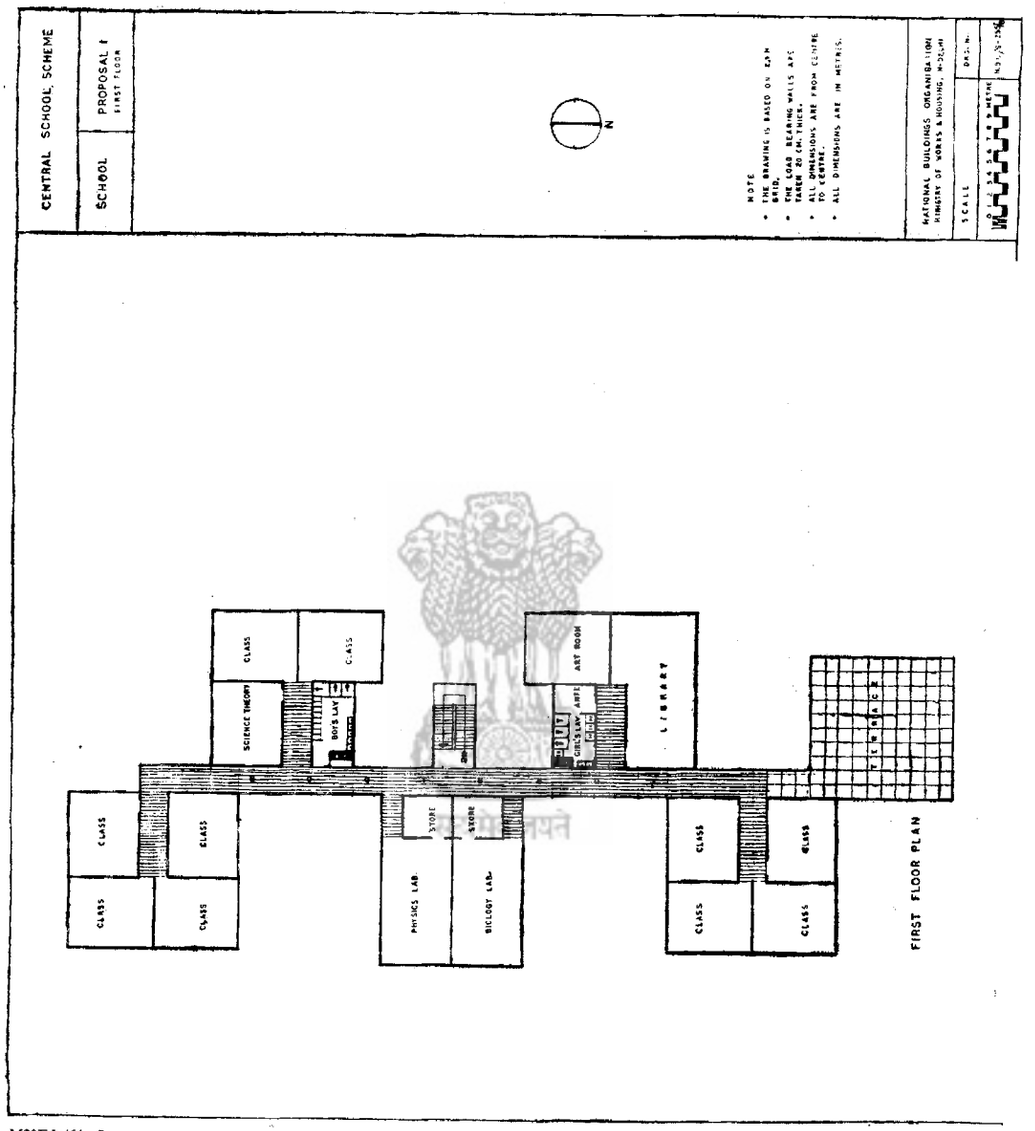


CENTRAL SCHOOL SCHEME

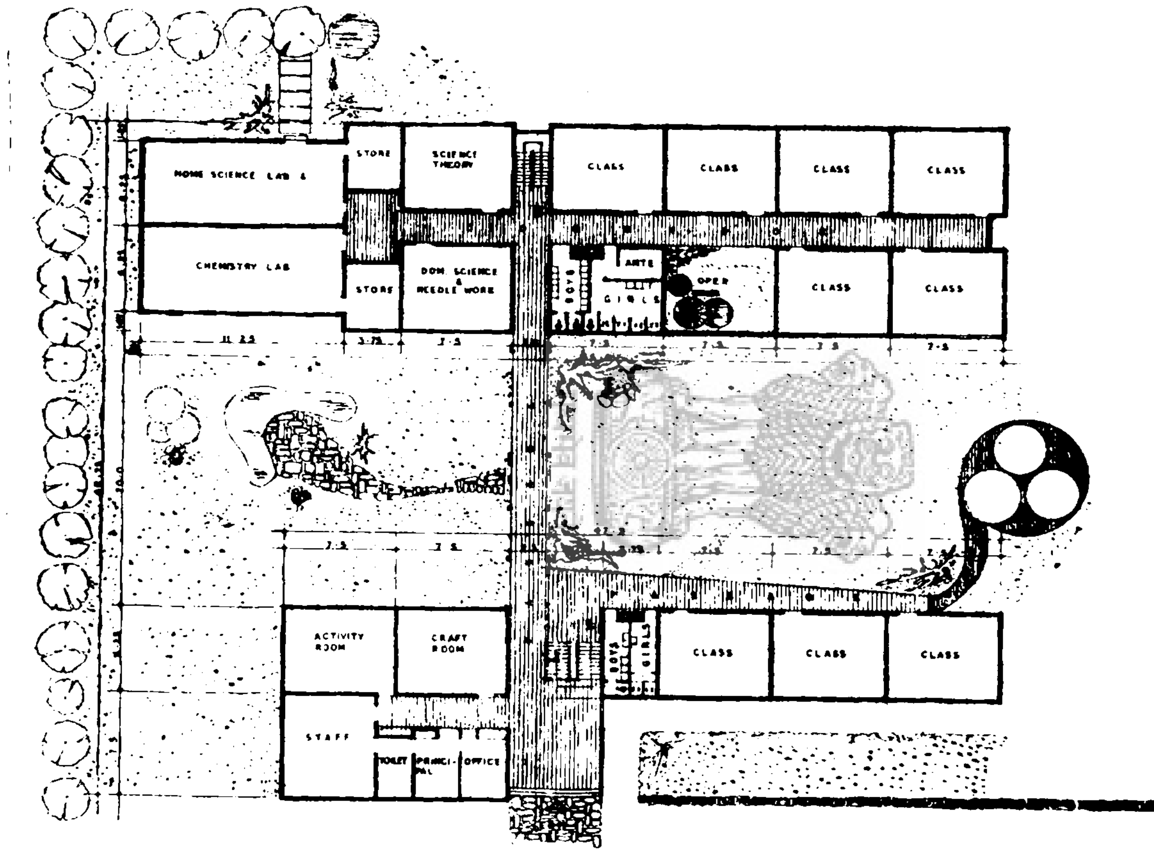
SCALE:- 1:50

SUGGESTIVE PLANS


CENTRAL SCHOOL SCHEME
SCHOOL
PROPOSAL I
GROUND FLOOR
SCHEDULE OF ACCOMMODATION
DESCRIPTION AREA IN SQ.M
TEACHING
ADMINISTRATION
CIRCULATION
SANITATION
TOTAL
NOTE.
THE DRAWING IS BASED ON 10M GRID.
THE LOAD BEARING WALLS ARE 22&33 CM THICK.
ALL DIMENSIONS ARE FROM CENTRE TO CENTRE.
ALL DIMENSIONS ARE IN METRES
NATIONAL BUILDINGS ORGANISATION MINISTRY OF WORKS & HOUSING N.DELHI.
SCALE
DRG. No.
CLASS
SCIENCE THEORY
CRAFT
ACTIVITY
STAFF
OFFICES
STORE
BOT. SCIENCE LAB.
CHEMISTRY LAB.
GROUND FLOOR PLAN


CENTRAL SCHOOL SCHEME
SCHOOL
PROPOSAL I
FIRST FLOOR
NOTE
THE DRAWING IS BASED ON 4.2M GRID.
THE LOAD BEARING WALLS ARE TAKEN 20 CM. THICK.
ALL DIMENSIONS ARE FROM CENTRE TO CENTRE.
ALL DIMENSIONS ARE IN METRES.
NATIONAL BUILDINGS ORGANISATION
MINISTRY OF WORKS & HOUSING, NEW DELHI
SCALE
DRG. NO.
CLASS
SCIENCE THEORY
BOYS LAV
ART ROOM
GIRLS LAV
LIBRARY
STORE
PHYSICS LAB.
BIOLOGY LAB.
FIRST FLOOR PLAN

M20Edu/64—5



GROUND FLOOR PLAN

CENTRAL SCHOOL SCHEME.

SCHOOL — PROPOSAL II, GROUND FLOOR

SCHEDULE OF ACCOMMODATION

DESCRIPTION	AREA IN SQ. METRES	% AGE
• TEACHING	1552.0	63.38
• ADMINISTRATION	72.0	2.87
• CIRCULATION	695.0	28.29
• SANITATION	135.0	5.46
TOTAL	2454.0	100.0

N

NOTE:—

- THE DRAWING IS BASED ON 2.5 M. GRID.
- THE LOAD BEARING WALLS ARE TAKEN 20CM THICK
- ALL DIMENSIONS ARE FROM CENTRE TO CENTRE.
- ALL DIMENSIONS ARE IN METRES

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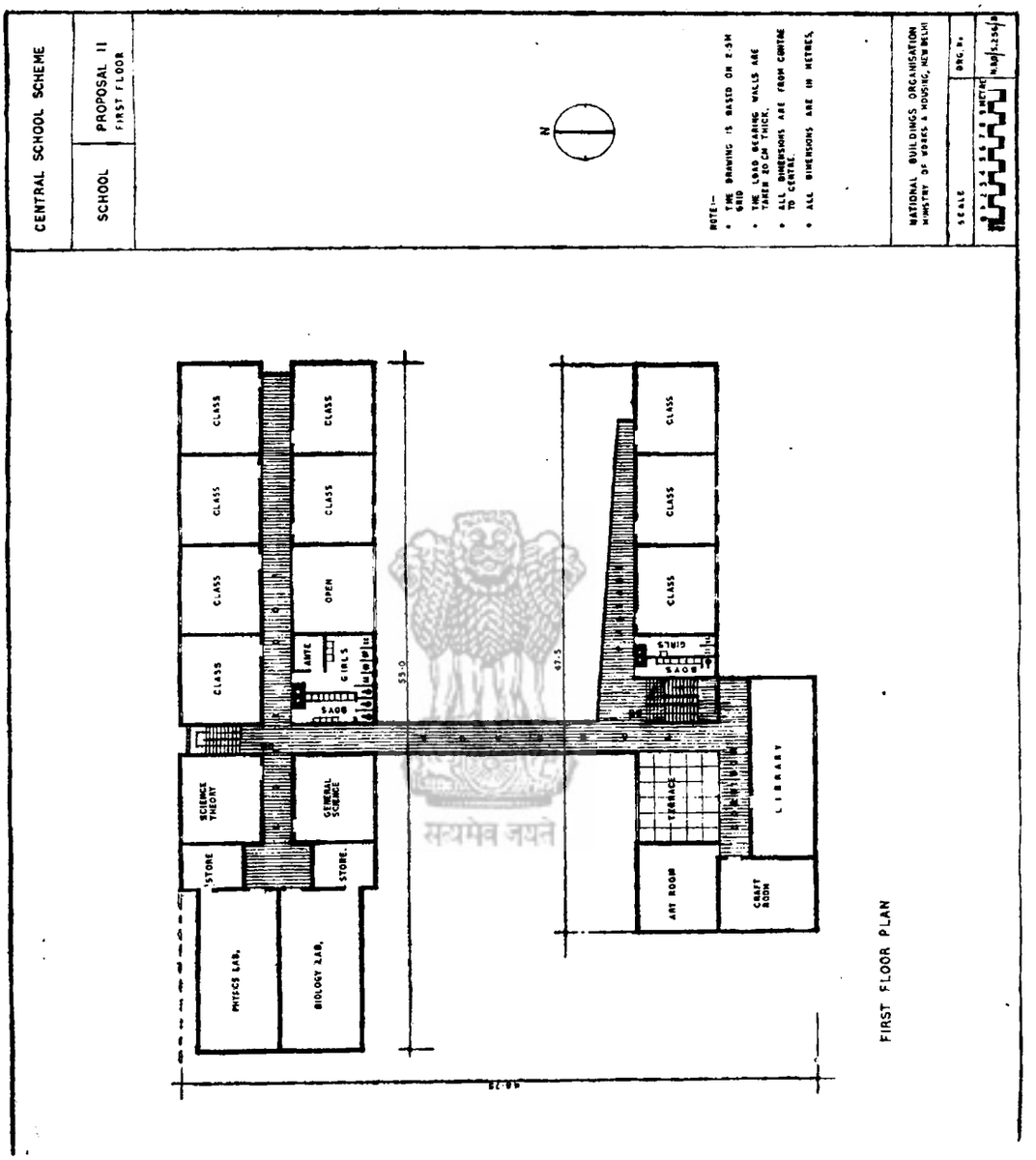
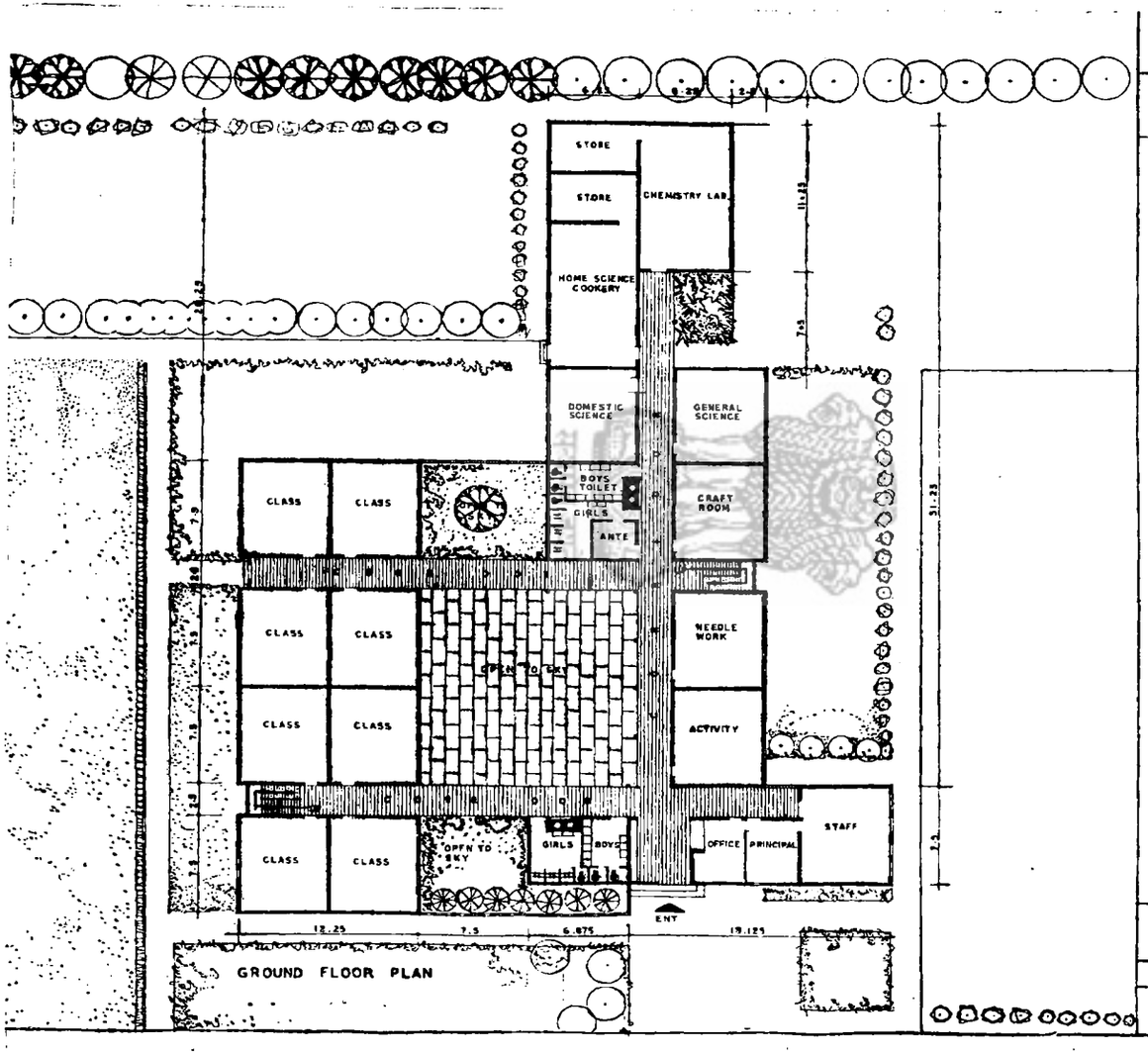
MINISTRY OF WORKS & HOUSING, NEW DELHI

SCALE. 0 1 2 3 4 5 6 7 8 9 METRE

DRG. No. N.B.O./6.264/A



FIRST FLOOR PLAN



CENTRAL SCHOOL SCHEME

SCHOOL	PROPOSAL III GROUND FLOOR

SCHEDULE OF ACCOMMODATION

DESCRIPTION	AREA IN SQ METRES	% AGE
TEACHING	1583.0	68.65
ADMINISTRATION	78.0	3.37
CIRCULATION	493.0	21.38
SANITATION	152.0	6.60
	2306.0	100.0

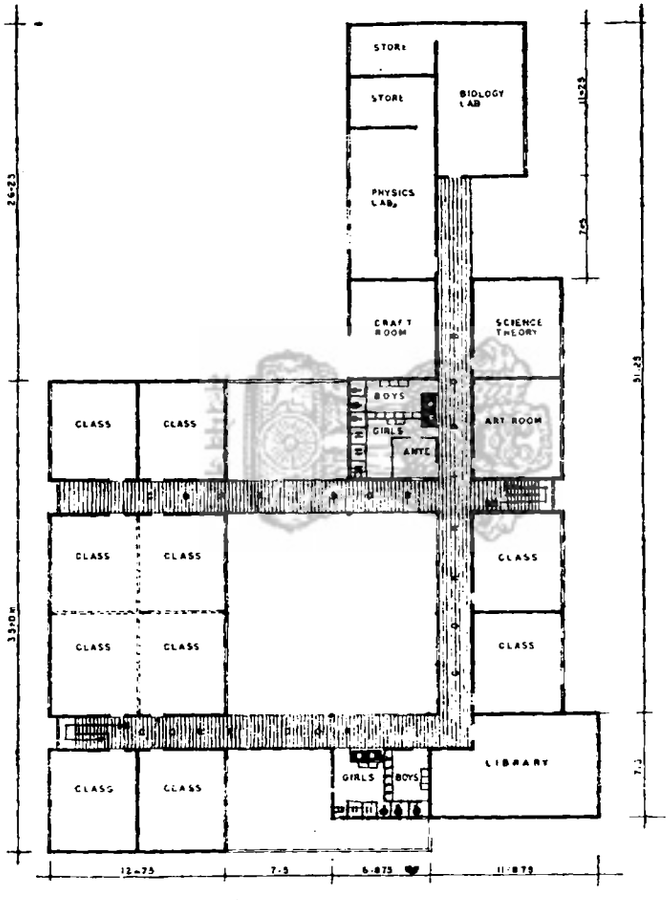
N

- NOTE
- THE DRAWING IS BASED ON 2.5M GRID
- THE LOAD BEARING WALLS ARE TAKEN 20CM THICK
- ALL DIMENSIONS ARE FROM CENTRE TO CENTRE.
- ALL DIMENSIONS ARE IN METRES

NATIONAL BUILDINGS ORGANISATION
MINISTRY OF WORKS & HOUSING, N.DELHI

SCALE 0 1 2 3 4 5 METRE

DRG. No. N.B.O/S. 25/A



FIRST FLOOR PLAN

CENTRAL SCHOOL SCHEME

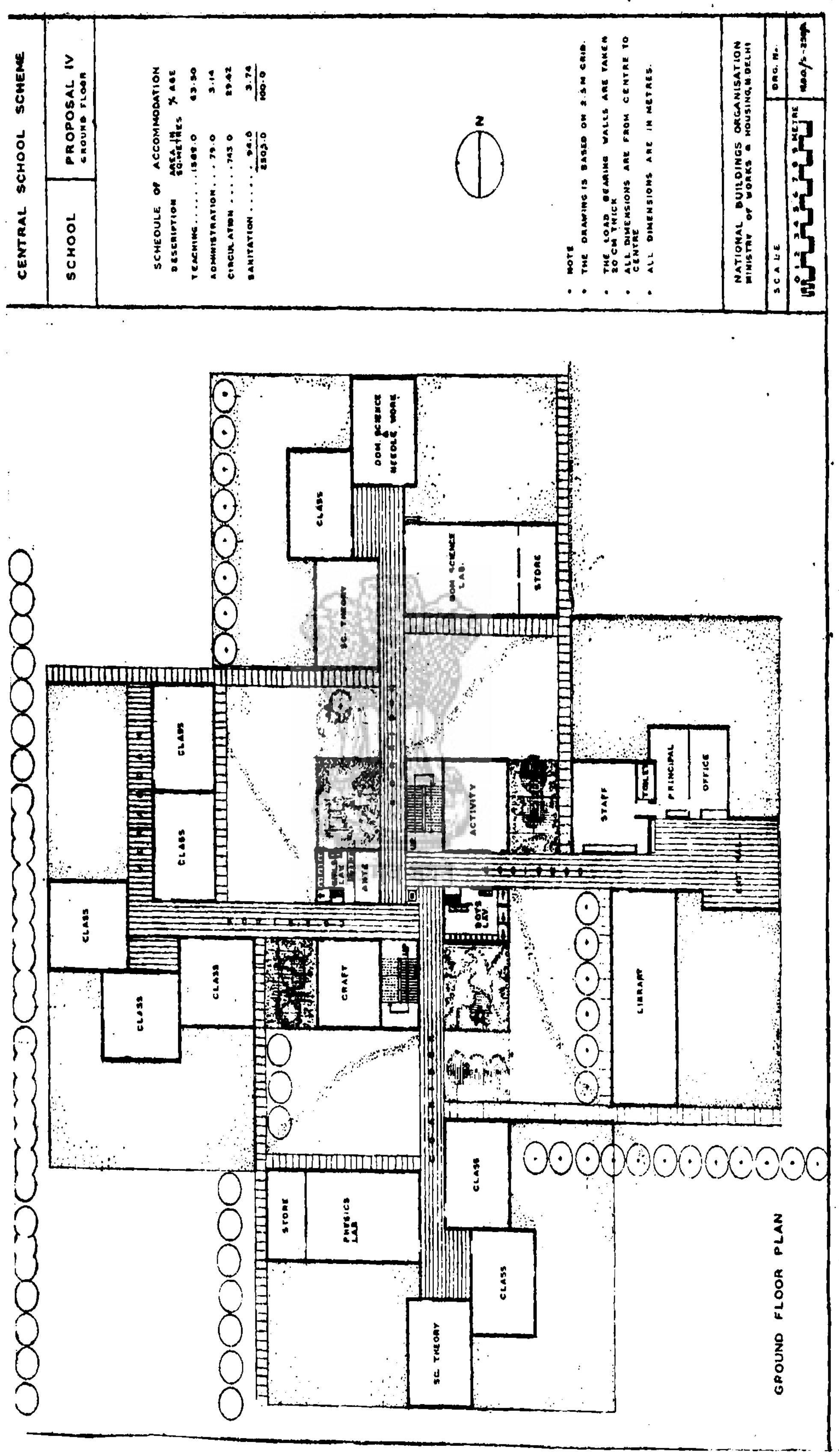
SCHOOL	PROPOSAL III FIRST FLOOR

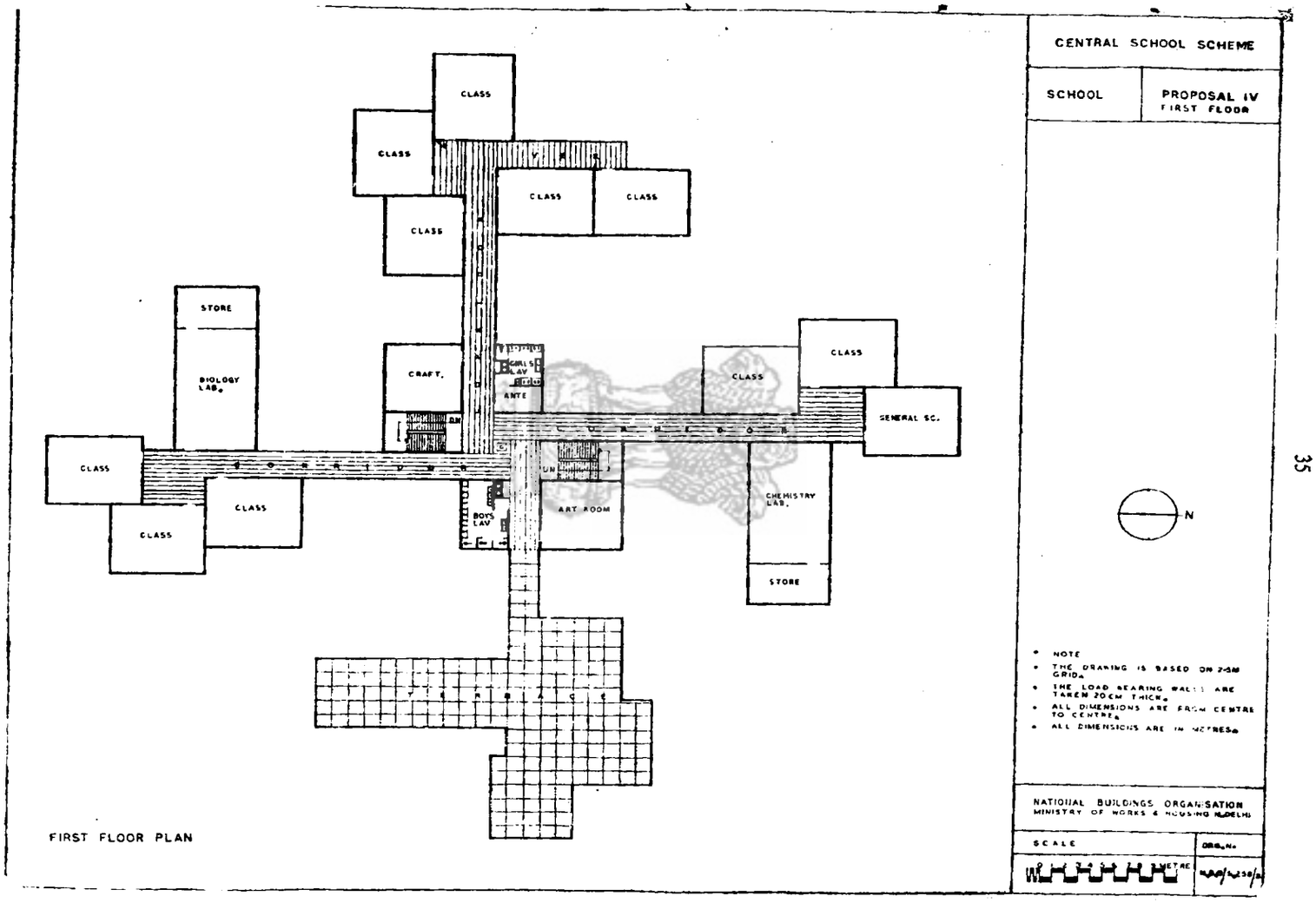
- NOTE
- THE DRAWING IS BASED ON 2·5M GRID
- THE LOAD BEARING WALLS ARE TAKEN 20CM THICK.
- ALL DIMENSIONS ARE FROM CENTRE TO CENTRE.

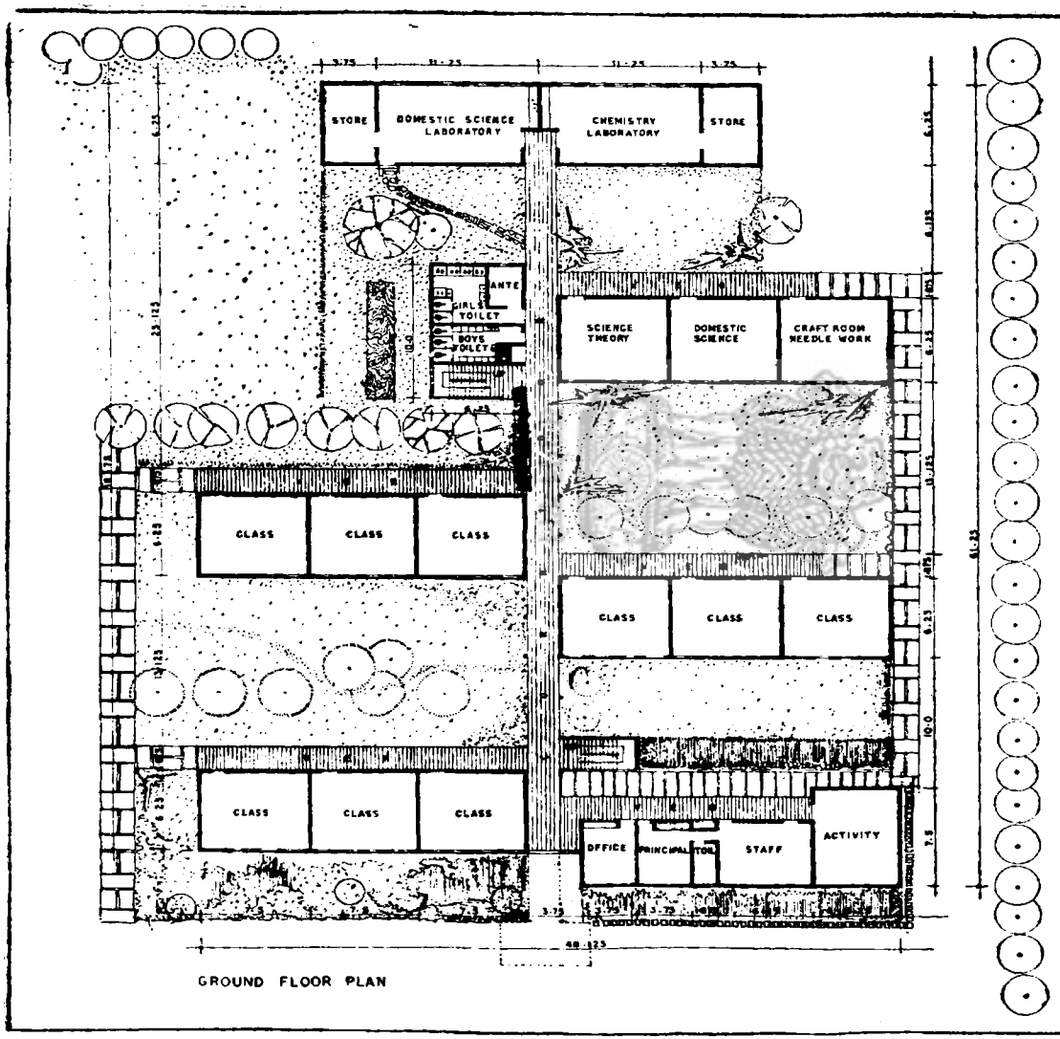
ALL DIMENSIONS ARE IN METRES

NATIONAL BUILDINGS ORGANISATION
MINISTRY OF WORKS & HOUSING N.DELHI

SCALE	ORG. No.
0 1 2 3 4 5 6 7 8 9 METRE	N.B.O/S.257/B


CENTRAL SCHOOL SCHEME
SCHOOL
PROPOSAL IV
GROUND FLOOR
SCHEDULE OF ACCOMMODATION
DESCRIPTION AREA IN SQ.METRES % AGE
TEACHING.......1589.0 63.50
ADMINISTRATION....79.0 3.14
CIRCULATION.......743.0 29.62
SANITATION........94.0 3.74
2505.0 100.0
N
NOTE
THE DRAWING IS BASED ON 2.5 M GRID.
THE LOAD BEARING WALLS ARE TAKEN 20 CM THICK
ALL DIMENSIONS ARE FROM CENTRE TO CENTRE
ALL DIMENSIONS ARE IN METRES.
NATIONAL BUILDINGS ORGANISATION
MINISTRY OF WORKS & HOUSING, N.DELHI
SCALE
0 1 2 3 4 5 6 7 8 9 METRE
DRG. No.
DOM. SCIENCE & NEEDLE WORK
CLASS
SC. THEORY
DOM. SCIENCE LAB.
STORE
CLASS
CLASS
CLASS
CLASS
CLASS
ACTIVITY
STAFF
PRINCIPAL
OFFICE
CRAFT
BOYS LAV.
LIBRARY
STORE
PHYSICS LAB
CLASS
CLASS
SC. THEORY
GROUND FLOOR PLAN


CLASS
CLASS
CLASS
CLASS
CLASS
STORE
BIOLOGY LAB.
CRAFT.
GIRLS LAV
ANTE
CLASS
CLASS
GENERAL SC.
CLASS
CLASS
CLASS
BOYS LAV
ART ROOM
CHEMISTRY LAB.
STORE
T E R R A C E
FIRST FLOOR PLAN
CENTRAL SCHOOL SCHEME
SCHOOL
PROPOSAL IV
FIRST FLOOR
N
NOTE
THE DRAWING IS BASED ON 2·4M GRID.
THE LOAD BEARING WALLS ARE TAKEN 20 CM THICK.
ALL DIMENSIONS ARE FROM CENTRE TO CENTRE.
ALL DIMENSIONS ARE IN METRES.
NATIONAL BUILDINGS ORGANISATION
MINISTRY OF WORKS & HOUSING ZLDELHI
SCALE
METRE



GROUND FLOOR PLAN

CENTRAL SCHOOL SCHEME

SCHOOL	PROPOSAL V GROUND FLOOR

SCHEDULE OF ACCOMMODATION

DESCRIPTION	AREA IN SQ. METRES	% AGE
• TEACHING	1529.0	67.68
• ADMINISTRATION	60.0	2.58
• CIRCULATION	590.0	25.36
• SANITATION	102.0	4.38
TOTAL	2327.0	100.0

N

NOTE:

- THE DRAWING IS BASED ON 2.5M GRID.
- THE LOAD BEARING WALLS ARE TAKEN 20CM. THICK.
- ALL DIMENSIONS ARE FROM CENTRE TO CENTRE.
- ALL DIMENSIONS ARE IN METRES.

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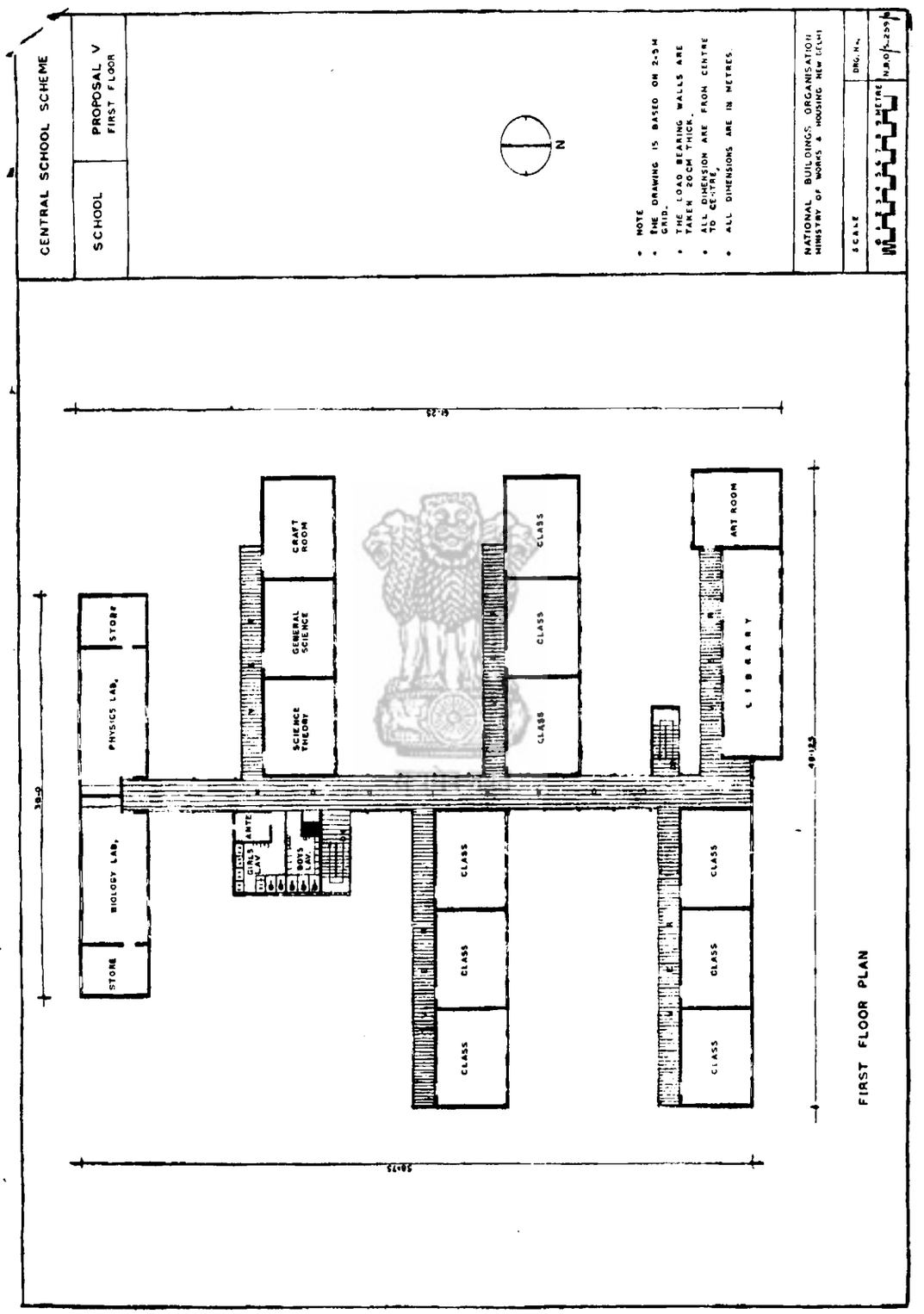
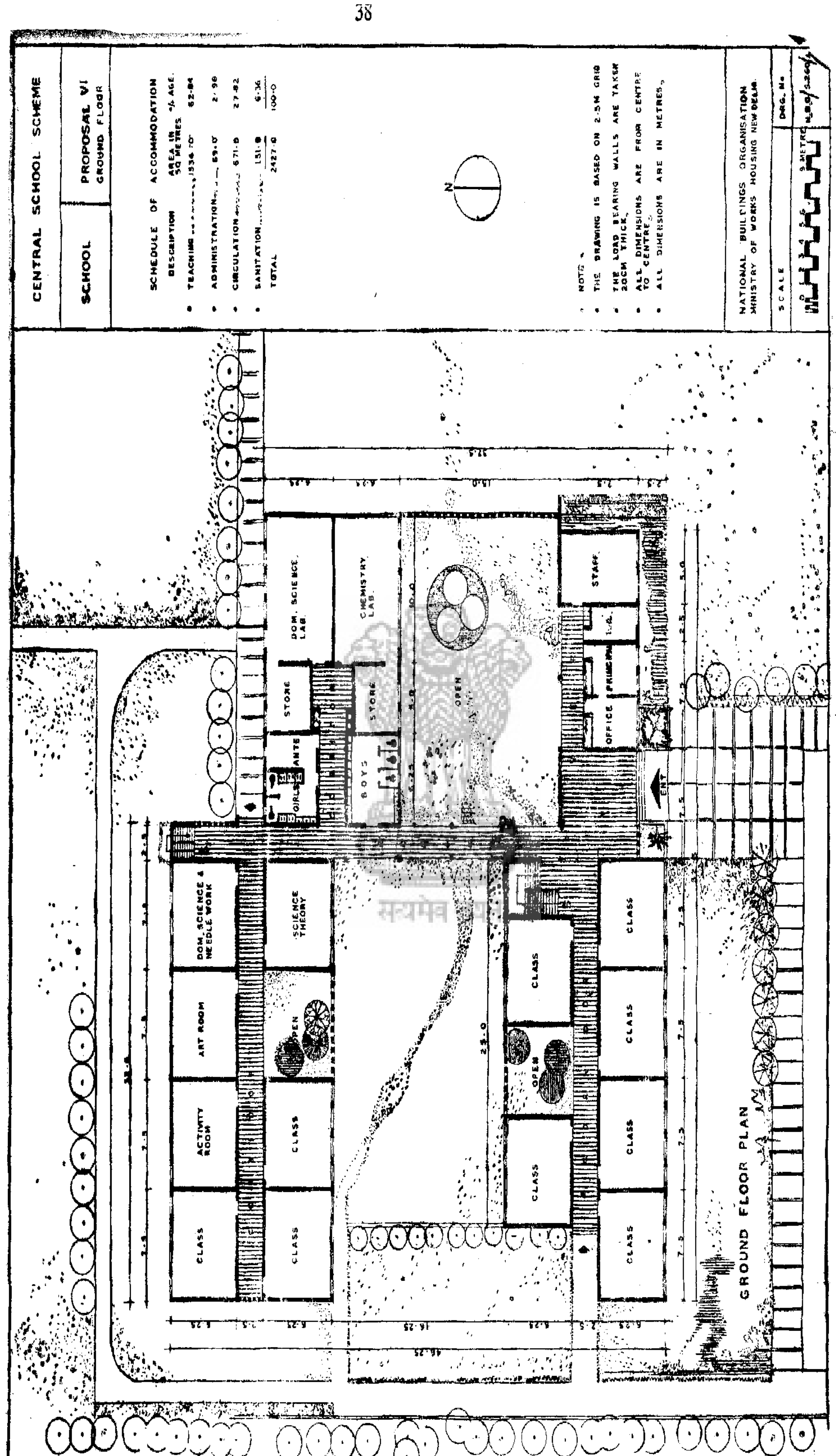
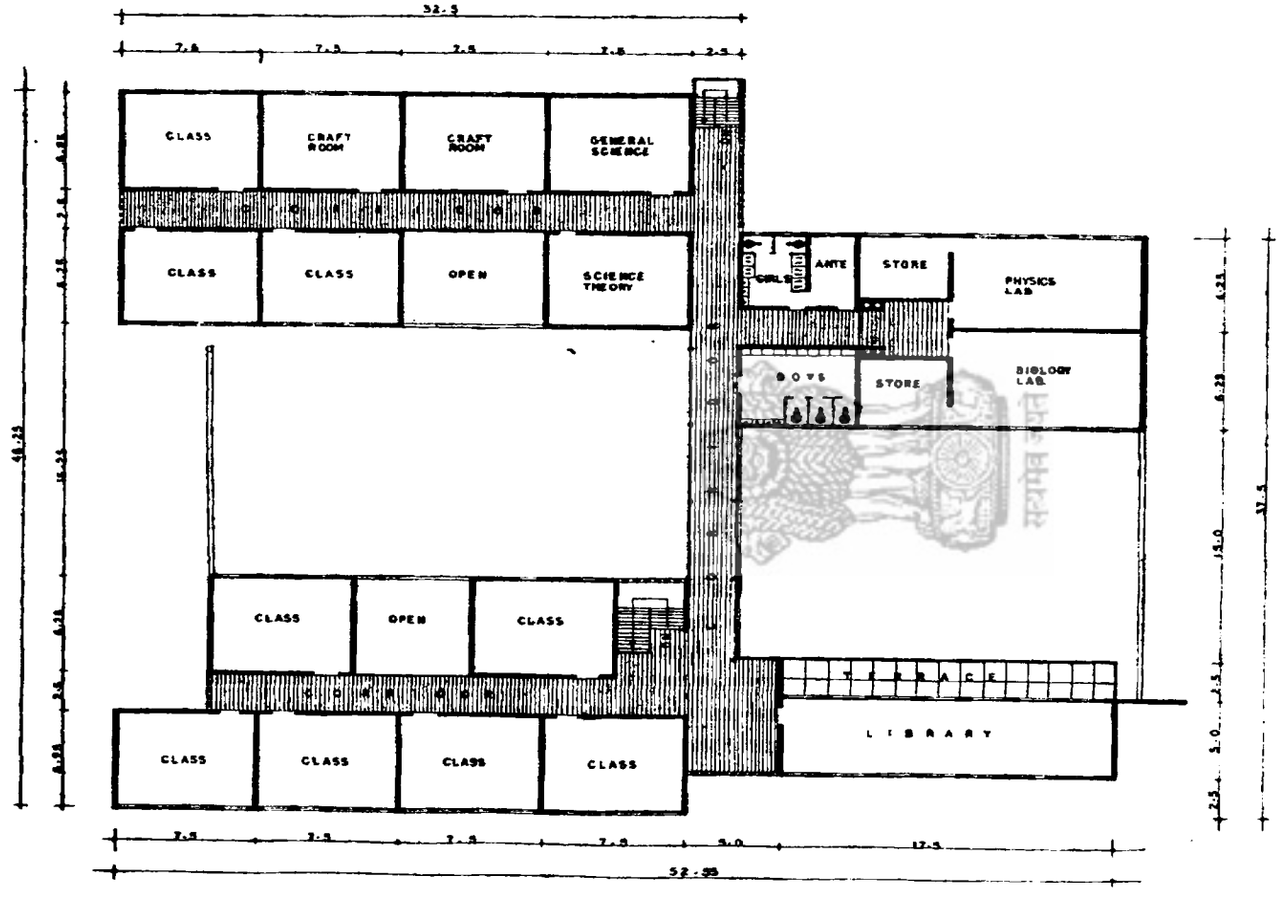
MINISTRY OF WORKS & HOUSING N. DELHI

SCALE	DRG. No.
0 1 2 3 4 5 6 7 8 METRE	N.B.O/S-259/A


CENTRAL SCHOOL SCHEME
SCHOOL
PROPOSAL V
FIRST FLOOR
NOTE
THE DRAWING IS BASED ON 2-5 M GRID.
THE LOAD BEARING WALLS ARE TAKEN 20 CM THICK.
ALL DIMENSION ARE FROM CENTRE TO CENTRE.
ALL DIMENSIONS ARE IN METRES.
N
NATIONAL BUILDINGS ORGANISATION
MINISTRY OF WORKS & HOUSING NEW DELHI
SCALE
DRG. NO.
METRE
N.B.O./S-259
PHYSICS LAB.
STORE
BIOLOGY LAB.
STORE
GENERAL SCIENCE
SCIENCE THEORY
CRAFT ROOM
GIRLS LAV
BOYS LAV
CLASS
CLASS
CLASS
CLASS
CLASS
CLASS
CLASS
CLASS
CLASS
ART ROOM
LIBRARY
FIRST FLOOR PLAN



CENTRAL SCHOOL SCHEME
SCHOOL
PROPOSAL VI
GROUND FLOOR
SCHEDULE OF ACCOMMODATION
DESCRIPTION AREA IN SQ METRES %AGE.
TEACHING 1536·0 62·84
ADMINISTRATION 69·0 2·98
CIRCULATION 671·0 27·82
SANITATION 151·0 6·36
TOTAL 2427·0 100·0
N
NOTE :-
THE DRAWING IS BASED ON 2·5M GRID
THE LOAD BEARING WALLS ARE TAKEN 20CM THICK.
ALL DIMENSIONS ARE FROM CENTRE TO CENTRE.
ALL DIMENSIONS ARE IN METRES.
NATIONAL BUILDINGS ORGANISATION
MINISTRY OF WORKS HOUSING NEW DELHI
SCALE
DRG. No
CLASS
ACTIVITY ROOM
ART ROOM
DOM. SCIENCE & NEEDLE WORK
SCIENCE THEORY
OPEN
GIRLS
ANTE
STORE
DOM. SCIENCE LAB.
BOYS
CHEMISTRY LAB.
OFFICE
PRINCIPAL
STAFF
GROUND FLOOR PLAN



FIRST FLOOR PLAN.

CENTRAL SCHOOL SCHEME

SCHOOL	PROPOSAL VI FIRST FLOOR

N

- NOTE
- THE DRAWING IS BASED ON 2.5M GRID.
- THE LOAD BEARING WALLS ARE TAKEN 20 CM THICK.
- ALL DIMENSIONS ARE FROM CENTRE CENTRE.
- ALL DIMENSIONS ARE IN METRES.

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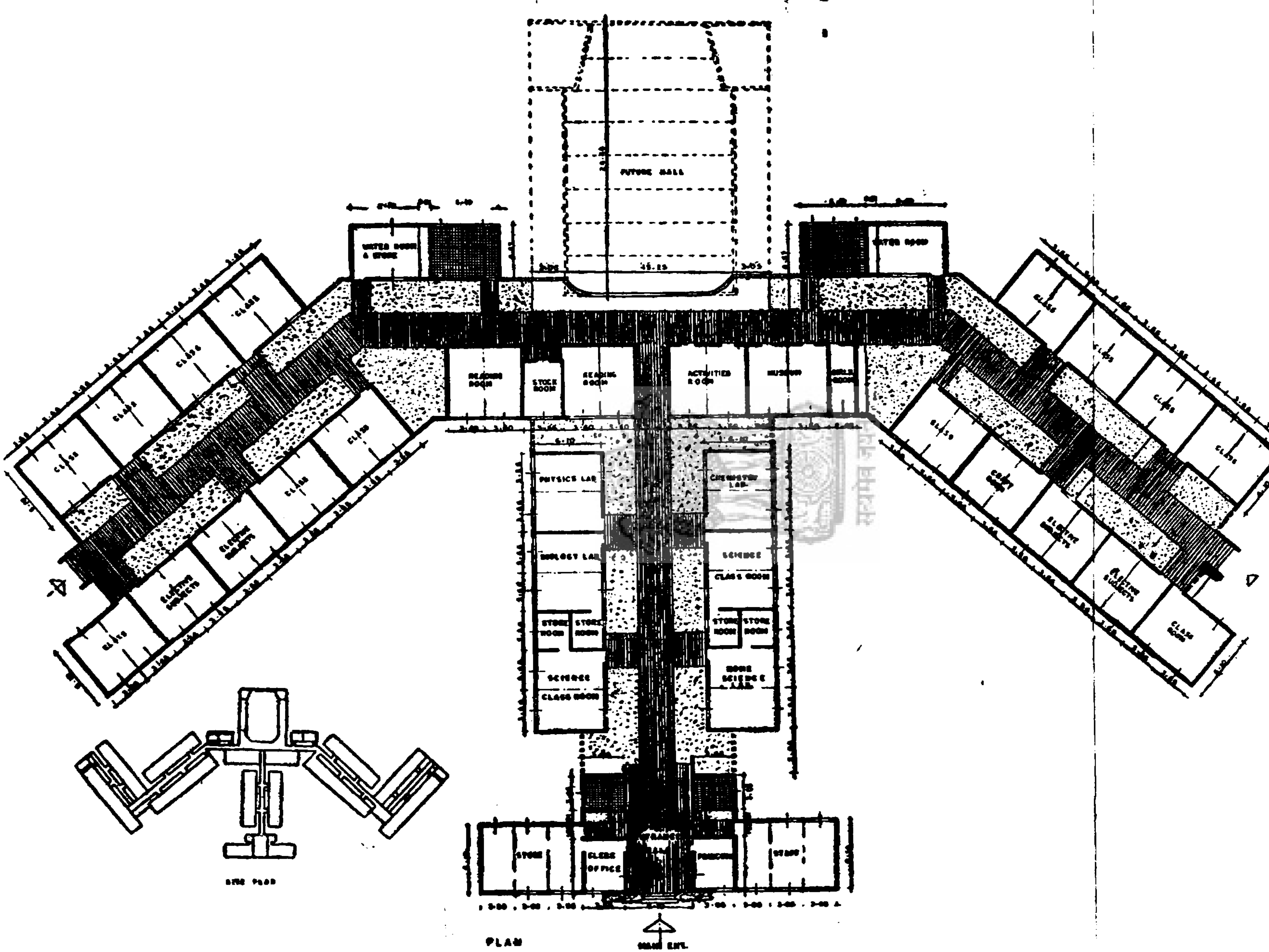
SCALE	DRG. N.
0 1 2 3 4 5 6 7 8 9 METRE	N.B.O./S.260/8

M20Edu/64—7



CENTRAL SCHOOL SCHEME

SCHOOL | **PROPOSAL VII**
I.I.T. MADRAS

[redacted]

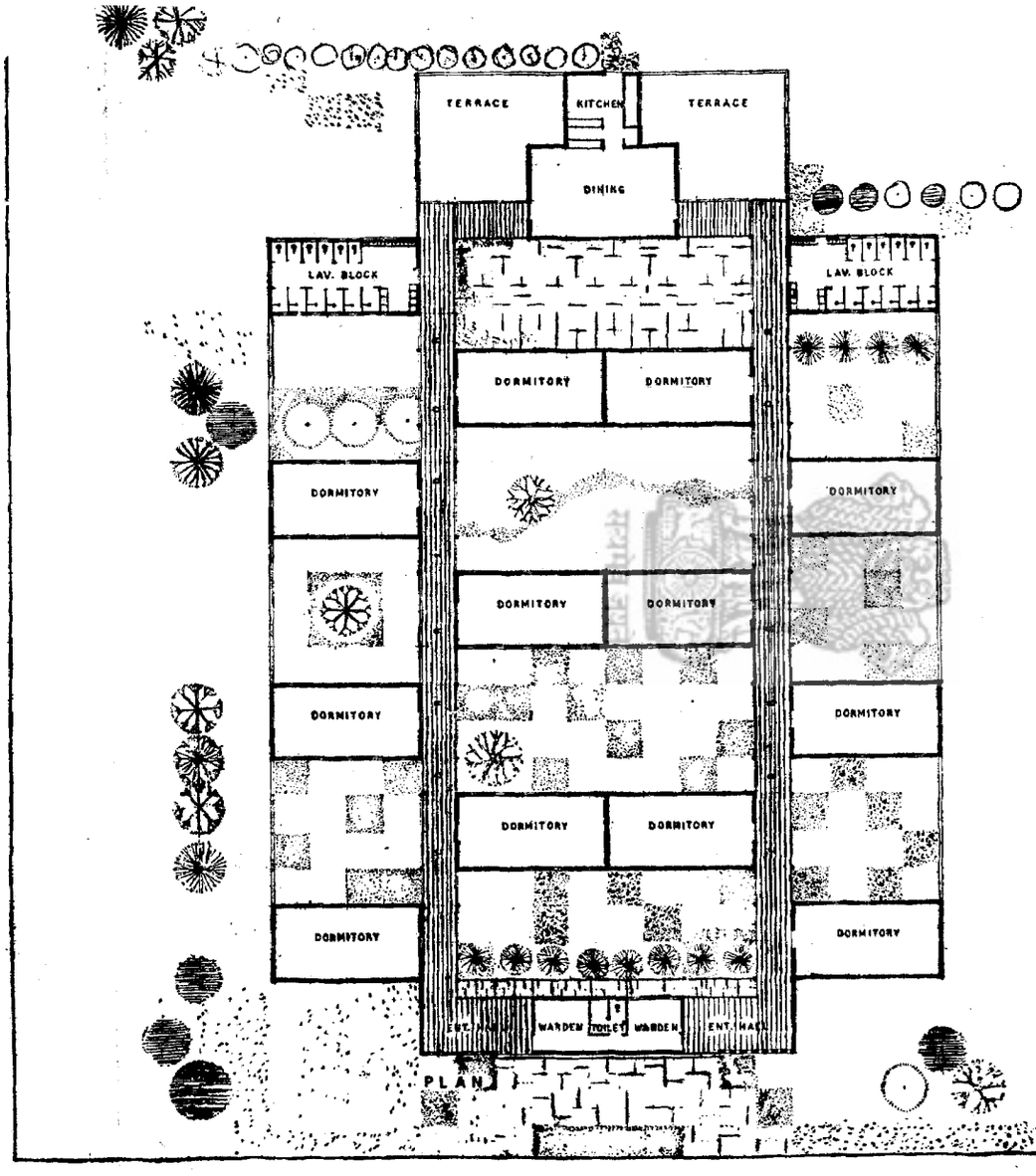
SCHEDULE OF ACCOMMODATION

DESCRIPTION	AREA IN SQ.METRES	% AGE
• TEACHING	1208·0	[illegible]
• ADMINISTRATION	137·0	6·91
• CIRCULATION	484·0	24·[illegible]
• SANITATION	142·0	7·40
TOTAL	1970·0	100·0

• NOTE
• ALL DIMENSIONS ARE FROM CENTRE TO CENTRE
• ALL DIMENSIONS ARE IN METERS

NATIONAL BUILDINGS ORGANISATION
MINISTRY OF WORKS & HOUSING, NEW DELHI

SCALE | DRG. No.



HOSTEL | PROPOSAL I

SCHEDULE OF ACCOMMODATION

DESCRIPTION	AREA IN SQ. METRES	% AGE
• DORMITORY.....	564.00	48.13
• SUBSIDIARY.....	290.50	24.76
• CIRCULATION...	318.00	27.11
TOTAL.....	1173.00	100.00

N

- NOTE
- THE DRAWING IS BASED ON 2.5M GRID.
- THE LOAD BEARING WALLS ARE TAKEN 20 CM THICK.
- ALL DIMENSIONS ARE FROM CENTRE TO CENTRE.
- ALL DIMENSIONS ARE IN METRES.

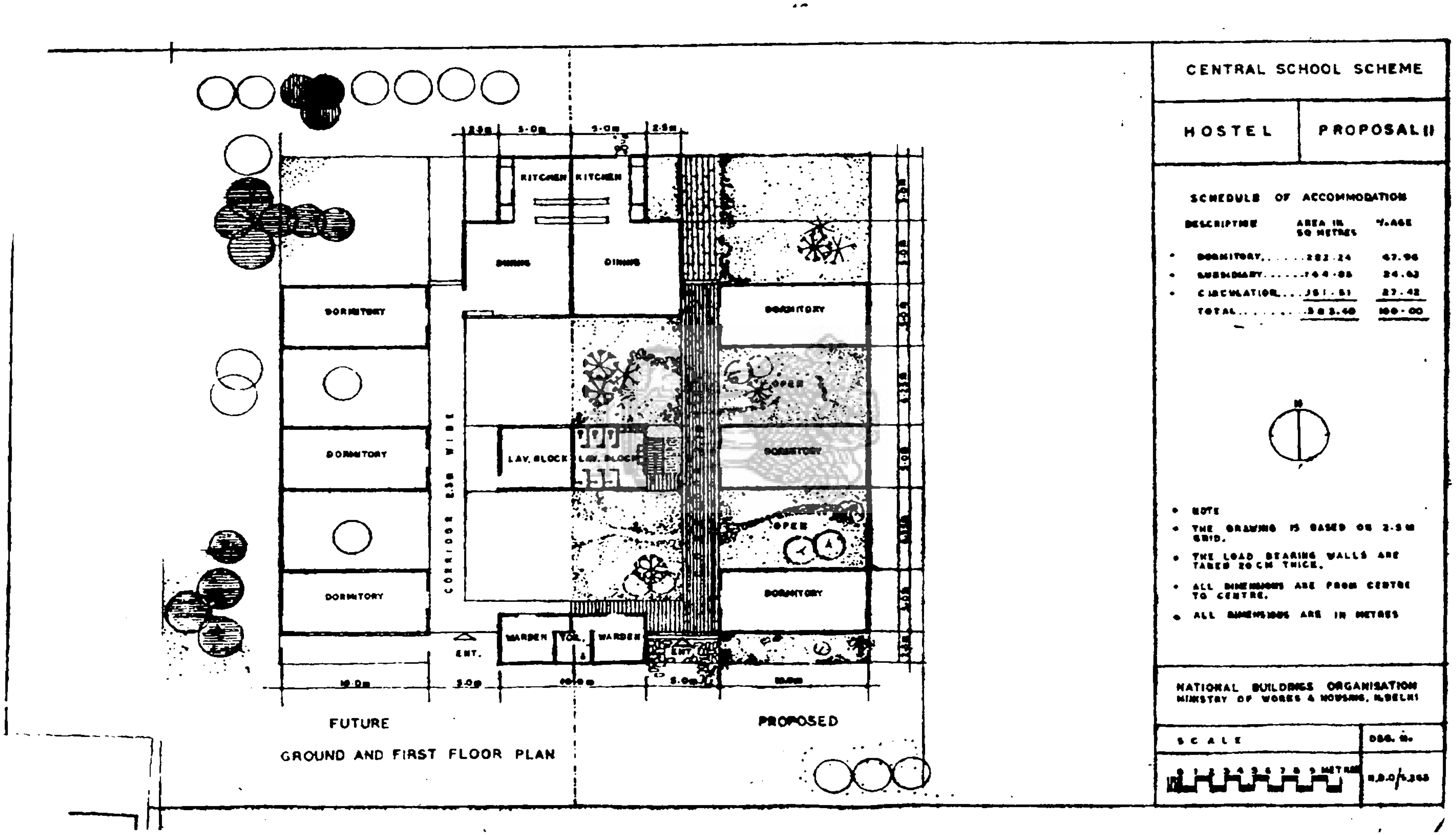
NATIONAL BUILDINGS ORGANISATION
MINISTRY OF WORKS & HOUSING, N. DELHI

SCALE

0 1 2 3 4 5 6 7 8 9 METRE

DRG. No.

N.B.O.S-262


CENTRAL SCHOOL SCHEME
HOSTEL
PROPOSAL(I)
SCHEDULE OF ACCOMMODATION
DESCRIPTION AREA IN SQ METRES %AGE
DORMITORY 282·24 47.96
SUBSIDIARY 144·05 24.62
CIRCULATION 161·51 27.42
TOTAL 100·00
N
NOTE
THE DRAWING IS BASED ON 2.5 M GRID.
THE LOAD BEARING WALLS ARE TAKEN 20 CM THICK.
ALL DIMENSIONS ARE FROM CENTRE TO CENTRE.
ALL DIMENSIONS ARE IN METRES
NATIONAL BUILDINGS ORGANISATION
MINISTRY OF WORKS & HOUSING, N.DELHI
SCALE
DRG. No.
0 1 2 3 4 5 6 7 8 9 METRES
KITCHEN
KITCHEN
DINING
DINING
DORMITORY
DORMITORY
DORMITORY
DORMITORY
DORMITORY
DORMITORY
OPEN
OPEN
LAV. BLOCK
LAV. BLOCK
CORRIDOR 2.5M WIDE
WARDEN
TOL.
WARDEN
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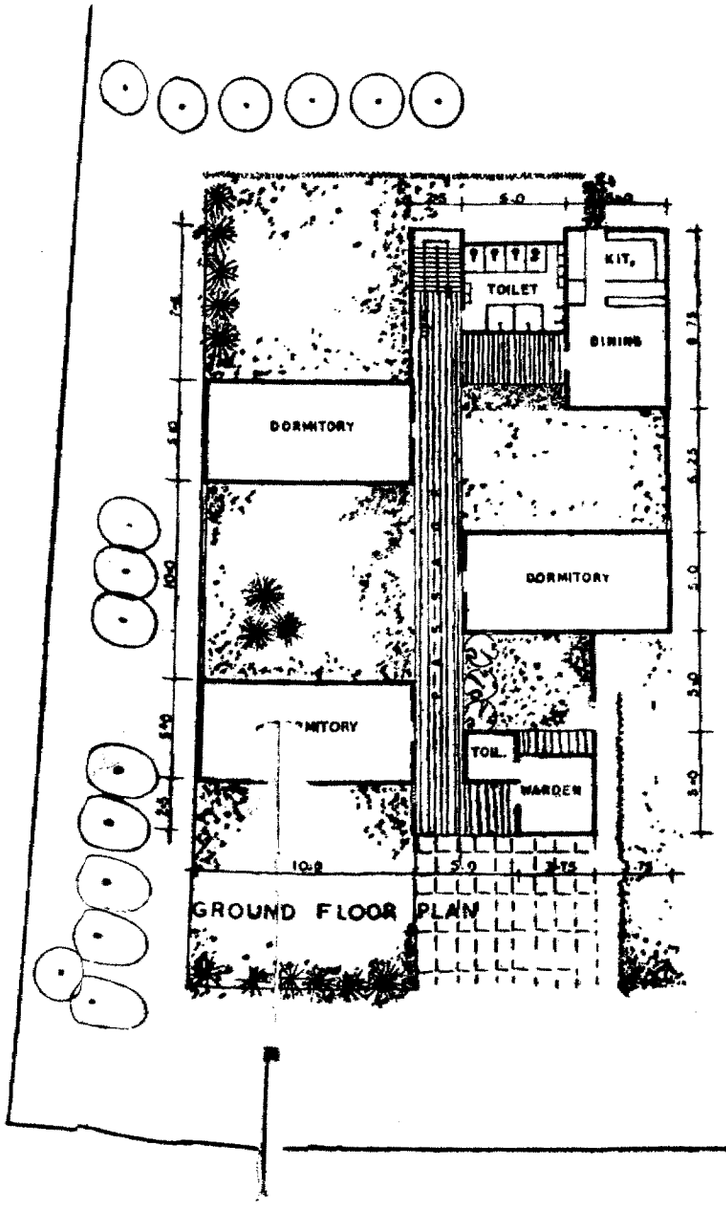
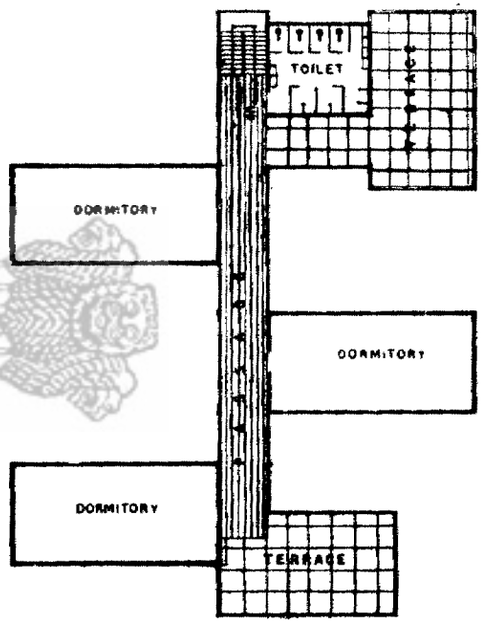
ENT.
10.0m
2.5m
5.0m
FUTURE
PROPOSED
GROUND AND FIRST FLOOR PLAN



GROUND FLOOR PLAN



FIRST FLOOR PLAN

CENTRAL SCHOOL SCHEME

HOSTEL | PROPOSAL III

SCHEDULE OF ACCOMMODATION

DESCRIPTION	AREA IN SQ.METERS	%AGE.
• DORMITORY	282.24	50.36
• SUBSIDIARY	129.35	23.14
• CIRCULATION	148.09	26.50
TOTAL	559.68	100.00

N

- NOTE
- THE DRAWING IS BASED ON 2.5 M GRID.
- THE LOAD BEARING WALLS ARE TAKEN 20 CM THICK.
- ALL DIMENSIONS ARE FROM CENTRE TO CENTRE.
- ALL DIMENSIONS ARE IN METRES.

NATIONAL BUILDINGS ORGANISATION
MINISTRY OF WORKS & HOUSING, N.DELHI

SCALE | DRG.N.

0 1 2 3 4 5 6 7 8 METRE | N.B.O/S.264