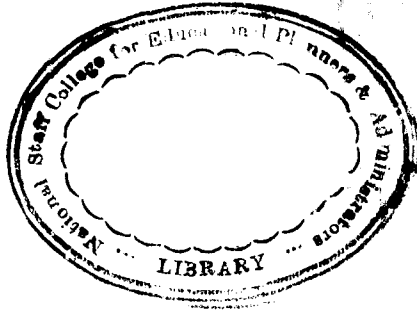


REPORT OF
THE PANEL ON UNIVERSITY BUILDINGS

HOSTELS

UNIVERSITY GRANTS COMMISSION
NEW DELHI

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FOREWORD

The setting up of the Committee on Plan Project was the result of a proposal put forward by me, in my former capacity as Union Finance Minister. I continued to take an interest in the work of the Committee and of its special Team on diverse projects, and have read most of the reports brought out by these Teams, through the courtesy of the Secretary of the Committee. A report that drew my particular attention was that on multi-storeyed buildings, and it struck me that expert investigation on similar lines, with the assistance of the Team, was very necessary in regard to construction in universities and colleges, on which a substantial portion of the allotments placed at the disposal of the University Grants Commission is spent. An assurance that such assistance would be gladly given was received by me on enquiry, and the result was the constitution of the Panel, referred to in the introduction to this report.

I am glad that the Panel selected hostel buildings as the subject for their first study and report. The figures given in the first paragraph of the introduction will testify to the vast dimensions of this section of construction, although, alas, funds of the order indicated there are not likely to be available in the near future. It should be noted, moreover, that even against the meagre allotment of less than Rs. 2 crores for hostels, the University Grants Commission sanctioned as their share nearly Rs. 3.5 crores; and there is little doubt that the assistance for hostel construction during the Third Plan Period will exceed Rs. 5 crores.

The great pains that the Panel have taken over their task will be evident from the report itself. No aspect of any importance seems to have escaped their attention. The fact that their recommendations have been formulated after inspection of many types of hostels and after a great deal of consultation with academic authorities and engineering experts enhance their value. On behalf of the University Grants Commission I therefore express the hope that this booklet will prove to be a useful guide to all authorities, including the University Grants Commission themselves.

*New Delhi,
August 30, 1960*

C. D. DESHMUKH

INTRODUCTION

0.1 During recent years, there has been rapid increase in the number of students entering our universities. The number of students in the universities and colleges at the beginning of the Second Five Year Plan was 7,12,697 and it is estimated to be 9,00,000 at the end of the Plan period. This naturally has had its effects on the standards of education. For improving the quality of college and university education, a number of measures have been taken by the University Grants Commission which include among others, improvement of buildings, libraries and laboratories, provision of more hostel facilities, etc. It was estimated that hostel facilities existed for about 15% of the university and college students at the beginning of the Second Plan. It has been the endeavour of the University Grants Commission to raise this figure at least to 20% during the Plan period. This means that about 14.3 lakh sq. ft. of hostel accommodation has to be constructed during the course of the Second Five Year Plan if the target mentioned above has to be attained. The financial implication of this can be placed at about Rs. 17.16 crores which covers only the buildings and internal services. It is expected that during the Third Plan period there will an addition of four lakhs of students in the universities, and for providing hostel accommodation for 20% of this student strength about 212 lakh sq. ft. of hostel accommodation has to be constructed during the Third Plan period involving an expenditure of about Rs. 27.5 crores.

0.2 The provision, however, for this in the Second Plan is about Rs. 5.0 crores which does not touch even the fringe of the problem. It may not be possible to allocate more funds for the construction of hostels without detriment to other essential items of development. This position makes it imperative for the authorities concerned to economise as much as possible on the actual cost of construction and see how far funds allotted for the purpose can be made to yield maximum results.

0.3 It is felt that there is a great scope for economy on buildings by improving space utilisation, rationalising design standards and specifications and by introducing, wherever possible, techniques of construction other

than the conventional ones. This is more than amply illustrated by the work done in England and by the recent work of the Buildings Projects Team in India on different types of buildings. The study conducted by the Ministry of Education in the U.K. on training college hostels is quite revealing in the sense that an organised attempt has been made to reduce cost by improved space utilisation. The proportion of the living space to the total floor area which was as low as 50% in some of the early post-war hostels has been increased to as much as 81% by intelligent space planning. The Buildings Projects Team of the Committee on Plan Projects has similarly demonstrated how by improved planning of space, economy can be achieved in multi-storeyed buildings and in industrial estates. The Chairman of the University Grants Commission considered that it was quite worthwhile to initiate this sort of study with respect to buildings in universities, such as hostels, libraries, laboratories and college buildings and set up a Panel for this purpose, consisting of the following persons :

Shri Bhailal Bhai Patel	..	<i>Chairman</i>
Shri H. Rahman, Senior Architect, C.P.W.D.	..	<i>Member</i>
Shri T.S. Vedagiri, Superintending Engineer & Secretary, Buildings Projects Team	..	„
Shri R.K. Chhabra, Administrative Officer, University Grants Commission	..	<i>Secretary</i>

Considering the imperative need for putting up more hostels and the element of repetition which is involved in hostel construction, the Commission directed that the Panel should consider the question of hostel accommodation in the first instance and submit a report giving norms and standards for future adoption. The Panel issued a questionnaire to collect technical data on the hostels recently constructed by various universities. The information received is given in a tabular form in APPENDIX I. The Panel also visited university centres in some parts of the country to acquaint themselves with the conditions prevailing in the hostels recently constructed. They had also the opportunity of discussing the various technical and administrative issues pertaining to hostel construction with the Wardens of hostels, Principals of colleges and Vice-Chancellors of universities. In the following pages the Panel has attempted to give its observations and recommendations on various aspects of planning and constructing hostels.

0.4# The Panel is highly thankful to the Vice-Chancellors, Principals and other responsible persons who have given valuable advice to the Panel and opportunities for on the spot studies and discussions. The thanks of the Panel are also due to the members of the Buildings Projects Team and Secretary of the Committee on Plan Projects who by active association with the work of the Panel have given it the benefit of their varied experience. The Panel also received many helpful suggestions and valuable guidance from the Chairman of the University Grants Commission for which they are highly indebted to him.

1. *Observations*

1.1 During its visit to a number of hostels recently constructed in the country, the Panel had observed wide divergence in the standards of accommodation, type of structure and specifications, even though some broad indications had been given by the University Grants Commission. The accommodation in single room hostels varies from 96 sq. ft. to 120 sq. ft. against 100 sq. ft. previously specified by the U.G.C. Similarly, in three seater hostels, the accommodation actually provided varies from 80 sq. ft. to 113 sq. ft. per student against the U.G.C. standard of 75 sq. ft. The total built up area per student also varies widely, the variation ranging from 2.5 times the room area per student to as much as 4 times.

1.2 The variation in cost was equally marked. The cost per seat varied from Rs. 3,000 to Rs. 5,600. The provision for internal services also was markedly different. The cost of water supply and sanitary installation was found to vary from 5.6% to 15.9% of the building cost, while that of internal electrical installation varied from 3.3% to as much as 12.9% of the building cost.

1.3 The provision made in the various hostels for common facilities, such as dining room and ancillaries, toilet blocks and common rooms also varied widely. The area of dining space provided varied from 8 sq. ft. to 27.5 sq. ft. per person while that for toilet blocks varied from 12.3 sq. ft. to as much as 33.3 sq. ft. per person. The area of common rooms provided in the hostels varied from 2.3 sq. ft. to 14.0 sq. ft. per person. In one case the area of common room was as high as 16% of the total built up area.

1.4.1 Similarly a good amount of variation was found in the type of structure as well as the specifications adopted for the various hostels. In one case studied by the Panel, all the partition walls were 18" thick. In another case costly stone flooring was used extensively. The type and number of fittings for doors and windows also varied markedly. In many cases the door and window fittings provided were too many and much over-sized.

1.4.2 The Panel has also come across cases where costly teak-wood lining has been provided for the sides and the rear of cupboards in rooms. It is wasteful to provide such specifications which do not contribute materially to the comforts of the students but add substantially to the cost.

1.4.3 "Live Load" assumptions also varied from place to place. The live load assumed for the rooms varied from 40 lbs to 100 lbs per sq. ft.

1.4.4 In a number of cases studied by the Panel, there were wide variations between the completed cost and the estimated cost. This was mainly due to modifications to drawings and specifications effected during the course of execution.

1.5 The planning of the hostels, barring a few, was defective in several respects such as the plan of the individual units, inter-relation of the various units, general circulation and orientation of the units. The rooms were arranged longitudinally in one case leading to very bad space utilisation within the room and unnecessary increase in circulation area. Back to back arrangement of rooms was resorted to in a few cases, which was not conducive either to proper space planning or to adequate cross ventilation in the rooms. In many cases, there was no attempt to plan the size of rooms in a logical way by taking into account the arrangement of furniture to be used within. These divergencies in planning only bring out the need for evolving certain norms and standards which can be adopted in future for the rational planning of hostel buildings.

2 *Planning of Hostel Buildings*

2.1 A hostel is a residential unit for community living for a large number of young men or women who are going to be responsible citizens of the future generation. The physical environment of this residence exerts a powerful influence on the character and attitudes of the young people. It is, therefore, essential that the planning and architectural expression of a hostel building should be most efficient, logical and pleasant for comfortable and cheerful living. Only a rational approach with understanding and sympathy can achieve the desired result. The planning of a hostel is not much different from the planning of a house or a flat except that it is a little more complex. A hostel usually consists of living units, common toilets, lounge, recreation room, dining hall, kitchen, pantry, stores, corridors or verandahs and stairs. The most logical approach to planning would be to arrive at an efficient and comfortable plan of each unit and then arrange

these units in their proper relation from point of view of zoning, circulation and orientation. The actual shape or pattern of the building will depend on the size of plot, contours, orientation and direction of prevailing breeze. The Panel has no intention to dictate any particular architectural expression but it strongly believes that numerous architectural expressions are possible within the limitation of standards and planning principles laid down, depending on the skill or genius of the architect.

2.2 The principles of zoning and orientation have a prominent part to play in the logical grouping of the various units in a hostel. The noisy areas such as common rooms, dining rooms, etc., must be adequately segregated from the quieter areas such as the living rooms without sacrificing much of circulation space. The living rooms are to be arranged in such a way that they get the maximum benefit of the prevailing breeze and the least amount of afternoon sun. The arrangement of toilet blocks should also take into account the direction of the prevailing wind so that offensive smells are not communicated to the living areas and at the same time they are not too far away. Great care is also called for in arranging the circulation space as this has to be kept to the minimum commensurate with other objectives mentioned earlier. Adequate attention should be paid to make the surrounding pleasant and cheerful by carefully thought out landscaping. A schematic diagram showing a desirable inter-relation of various units is given in SKETCH I.

2.3 There should not be any difficulty in following these broad directions in planning hostels in open areas. In congested towns, however, where hostels have got to be of multi-storeyed type, some of the considerations may require slight modification.

2.4.1 With these considerations in view the Panel had to recommend the unit of accommodation, its area and shape with regard to the comfort of living and study. Rooms in hostels are of the following four categories :

- (a) Single-seater-room
- (b) Two-seater-room
- (c) Three-seater-room
- (d) Rooms serving as dormitory accommodation for four to ten students.

Rooms for four students or more cannot be considered to be any way conducive to discipline or study. The choice, therefore, falls on the first three alternatives. There are objections on ethical and psychological grounds to two-seater rooms and so for three-seater rooms.

2.4.2 The Panel, however, does not want to preclude the use of two-seater rooms but on grounds of economy, it would recommend wider adoption of the combination of single and three-seater rooms in hostels. It may be desirable to give single rooms to final year students while for the rest three-seater rooms can be provided. For postgraduate students it is imperative to provide single rooms.

2.4.3 Whether single-seater or three-seater, the size and shape of a room has to be decided on the basis of the kind of life that the students are expected to lead in the particular institution. The main questions to be asked are: whether the room should be solely regarded as a bed room, big enough to accommodate a bed, a table, a chair and a built-in cupboard or as a study-cum-bed room in which the student will do much of his reading and also entertain occasionally some of his guests. If the room is big enough for the student to entertain his guests, can we altogether abolish the common room? Should the students be allowed private bath rooms or should they use a common ablution area? Can the facilities provided be of the same order for students of both sexes or should they differ? These questions have to be answered before the planner can decide on the size of rooms, their shape and their relative position with other facilities.

2.4.4 The provision of a separate bath room for students has to be ruled out for reasons of economy. Further, it is desirable to encourage community living during student life. Similarly the idea of bigger room for students in order to enable them to entertain some friends at times, however, desirable it may be, may not be practicable at this stage because of financial limitations. The objective of instilling in students habits of adjustment to community living also points towards small rooms with adequate common facilities provided for purposes of recreation, meeting together, etc.

2.4.5 The size of the room has to be fixed in the light of remarks contained in the above para. The University Grants Commission had laid down certain tentative standards for the living space that can be allowed to students. The standard prescribed was 80 sq. ft. per student in double seater rooms and 100 sq. ft. per student in single seater rooms. In three-seater rooms, the area prescribed was 70—75 sq. ft.

2.4.6 Having seen many of the hostels recently constructed and having discussed the problem of accommodation with the various authorities concerned, the Panel feels that a provision of 85-90 sq. ft. for a single-seater room, 75-80 sq. ft. per student in a two-seater and 70-75 sq. ft. for three-seater room would be adequate to meet all the normal requirements of living and study in an undergraduate hostel. In a hostel for postgraduates, room area in single-seated rooms should not exceed 100 sq. ft. It should, however, be noted that it is not the area per student that matters towards convenience of living so much as the way in which it is provided. Sketches attached to this report illustrate, how within the size and shape of rooms recommended by the Panel, sets consisting of a bed and a writing table can be arranged conveniently giving equal share of light and ventilation to all. Several arrangements are possible but the emphasis must be on locating the furniture in a proper way first and then fixing the size to suit the layout of furniture.

2.4.7 Arrangement of single-seater rooms is easier. Sketch which gives the lay-out of single-seater room shows how by proper arrangement of furniture within the room and the location of doors and windows, a comfortable living space can be given within 85 to 90 sq. ft. This may be less than the minimum of 100 sq. ft. specified by the Indian Standards Institution in their model bye-laws for a living room but it should not be forgotten that 100 sq. ft. were fixed for residential accommodation where in a room it is not uncommon to have three to four people living. In a hostel building, the case is quite different. Apart from the living room, there are special rooms provided for recreation and other facilities. As such, the provision of 85-90 sq. ft. (inclusive of built in closet) should be more than adequate. The question of issuing an amendment to the I.S.I. building bye-laws is being taken up by the Building Projects Team separately.

The shape of rooms is related to the economy of construction and the circulation area. A room rectangular in shape has better utility and it is better to have the small side facing the corridor so that it will minimise the area of circulation.

2.4.8 In certain hostels, the Panel has noticed that balconies have been provided for individual rooms. It was explained that this was due to the location of the hostel in a crowded part of the city where balconies would give opportunity for students to have some fresh air. In some cases the Panel noticed balconies provided for hostel situated in a well wooded

area where one could get as much open air living as one likes in the adjoining lawns and grounds. Such provision cannot be considered as anything but lavish. The Panel, however, cannot find much justification for the provision of balconies to individual rooms in the hostels everywhere. Provision of individual balconies adds substantially to the cost of the building. The provision of balconies even for common rooms can be justified only in a hot and humid climate. In other types of climate, it is wholly unnecessary.

2.4.9 Balconies should be restricted to places where it is absolutely essential either due to the location of the hostel in a crowded locality or the necessity of providing for semi-outdoor sleeping accommodation. Even in such cases, it need be only 4' wide projecting 3' to 4' from the outer face of the wall.* The room area in such cases should conform to the lower limits specified above. The door for the balcony should be 4' wide and it should be so designed to avoid the provision of a separate window. The door may be of four leaves type, the bottom two leaves pannelled and the top two leaves glazed.

2.5 *Size of Hostels*

2.5.1 Considerations that should weigh with the planners in deciding upon the size and shape of living rooms for hostels have been explained above. One has then to consider how many of such units of accommodation can be put in a self-contained block, which should have its own service area and common facilities. The Panel has noticed hostel blocks accommodating 50 seats to 300 seats. In certain cases, the blocks are not self-contained. They accommodate only the living rooms and the toilet blocks, while common rooms and dining rooms are provided separately in another block. Whatever may be the arrangement, the number of rooms in a block depends to a great extent upon the arrangements made by the college or the university for looking after the students. It will be desirable to have a Warden attached to each hostel block. The Panel feels that a Warden assisted by an Assistant Warden, who may be a single person, can conveniently look after about 100 students. Anything more than that may be difficult for him to have an effective control over. In certain cases where blocks of 200 to 300 are proposed, 2 or 3 Wardens are to be commissioned. But it may be preferable to limit the number of residents in a particular block of hostel to 100.

* The unit area rate of a balcony is normally taken as half of that of the rest of structure. A 12 sq. ft. balcony in effect means an addition of 6 sq. ft. to the built up area.

2.5.2 Residential accommodation for the warden may be provided as an integral part of a hostel or separately in the compound. The wardens or assistants in charge of individual blocks of a hostel, if they happen to be bachelors can be allotted two single rooms or a small suite of rooms in the hostel to serve as residential accommodation. They could perhaps mess along with the students. In case family accommodation is necessary, it is preferable to provide for it separately within easy reach of the hostel. Where, however, there is pressure on land, the warden's quarter can be an integral part of the hostel, but it should be adequately screened off from the students' rooms. The married accommodation for wardens should be governed by their pay scales. The standards of accommodation and amenities to be provided for different classes of employees of Government and other public undertakings are being dealt with by the Buildings Projects Team in their report on residential buildings.

2.6 *Service Space*

2.6.1 The service area of a hostel normally includes the kitchen, the dining hall and the toilet blocks.

2.6.2 The area within the dining space will depend upon the number of students in a block and the number that can be expected at a time to take their meals in the dining room. Experience in this country as well as elsewhere reveals that provision of dining room for 2/3rds of the strength of the hostel would meet all requirements. It is reported in certain cases that it will not be possible, as the lunch break for all classes is the same and that the full strength of the hostel would be in the dining room during that period. But the difficulty may be overcome by slightly staggering the lunch hours of the various classes. Another argument in favour of larger dining rooms put forward to the Panel by some authorities is that such large rooms are necessary for special occasions. But it appears to the Panel that providing dining rooms on a much large scale than what is required for daily purposes just to meet the demand of a few occasions in the year is not warranted. The needs of special occasion can be met if the common room is designed in such a way that it is contiguous with the dining room so that on special occasions both the rooms can be utilised.

2.6.3 The Panel, therefore, feels that dining rooms in hostels should be built to accommodate not more than 2/3rd strength at the rate of 10-112 sq. ft. per student. The kitchen, pantry and store area can be worked out

on the basis of 5-7 sq. ft. per student. These norms will hold good for a hostel of medium size, namely, for 100 students.

2.6.4 Facilities for washing utensils must be provided partly within the kitchen and partly immediately outside kitchen by the construction of open platforms with adequate drainage facilities. It is advisable to have a room with 100 sq. ft. area with adequate built-in cupboards for the use of kitchen staff. A W.C. and a bath in the area also should be provided for their use. The planning of kitchen and ancillary is a complicated job. Adequate care must be bestowed to ensure proper circulation, ample ventilation and hygienic condition within.

2.6.5 Regarding toilet blocks, the provision that has been made in the hostels examined by the Panel is as follows :

Urinals	..	1 for 4 to 8 students
W.Cs.	..	1 for 6 to 12 students
Wash basins	..	1 for 8 to 12 students
Bath rooms	..	1 for 3 to 9 students

2.6.6 In England, the suggested provision for this is one bath room and one W.C. to every five or six students. Considering the needs of a tropical country like ours, we may have to provide more urinals than W.Cs. The suggested provision, therefore, of wash basins, W.Cs. and urinals may be as follows :

Urinals	..	One per 8 students
W.C.	..	One per 10 students
Wash basins	..	One per 8 students

A bath room with a shower may be provided for every eight students. W.Cs. shall normally be provided with Indian type pans, if necessary, one or two of them may have European type pans. In hostels for women students, the provision of bath rooms may be increased to one for six students, and W.Cs. increased to one for 8 students. Women's hostels should be provided with containers for disposals required by women.

2.6.7 The exact location of the toilet blocks is a matter that should be left actually to the architect concerned but certain broad indications seem necessary. It will be advisable to put the toilets in a separate block connected to the rooms by means of a gallery or place them at corners and turns

in the building. The main precaution necessary is to screen them off adequately from the living rooms and locate them properly with regard to the direction of prevailing wind in order to ward off offensive smells. Whatever be the location, the doors of toilet blocks should not open directly into the corridors or verandahs. It is better to have a lobby through which the individual W.C. units and bath room units are approached. Within this unit, the sequence of arrangement of various fittings should be such that wash basins come first, urinals and W.Cs. after. Bath cubicles can be arranged in an adjoining area approached through a different door. For women's hostel a small dressing room attached to the bath cubicles would be an added advantage. In all toilet blocks, provision should be made for a small closet for storing brooms, brushes and other articles for cleaning the area. It is needless to say that effective ventilation should be provided for toilet blocks. This can be best arranged if these blocks are separated from the main block. In other cases, the ventilation should be augmented by having adequate number of exhaust fans. Even at the stage of planning, the arrangements for soil pipes, water supply pipes, etc., must be carefully thought of. It will be advisable to take these through shafts instead of exposing them over outer walls.

2.6.8 *Drinking Water Facilities*

Provision of water coolers in hostels for the supply of drinking water may not be possible at this stage but in planning of future hostels suitable provision may be made to facilitate the installation at a later stage.

2.7 *Common Facilities (Lounge & Recreation)*

2.7.1 Apart from the living rooms and service space, the hostel should provide adequately for the community life of students. A common room for this purpose is an important requisite. Normally the common room is utilised for light reading and for indoor games. In many cases, both the facilities have been provided for in the same room though in a few cases different rooms have been assigned to meet these requirements. The Panel feels that in a hostel for 100 students, two rooms one 200 to 250 sq. ft. area and the other of 300-400 sq. ft. should be adequate for the purpose.

2.7.2 It is preferable to have the common room located in the ground floor of the building. Distribution of common rooms on various floors which has been done in certain cases is not so desirable. As mentioned earlier, the common rooms may be planned in such a way that they are

contiguous with the dining room so that all these can be utilised together on special occasions.

2.7.3 Apart from the common room, some additional rooms may be necessary in special cases. In a women's hostel, a room about 100 sq. ft. where the students can receive visitors would be necessary. A sick bay of 100 sq. ft. to accommodate two beds is an additional necessity, in hostel blocks accommodating 100 students or more. In smaller hostels blocks, one of the single-seater rooms may be set apart for this purpose. Isolation rooms are not generally necessary in medium sized hostels. Where there is a group of hostels accommodating one thousand students or more, a small block of 2 rooms with bath room facilities can be located in a convenient place in the enclave for isolating students suffering from contagious diseases before they are removed to a regular hospital.

2.8 *Provision for Hostel Staff*

2.8.1 No uniform measures can be laid down in respect of residential accommodation for the hostel staff of different types of institution. Nevertheless, it is recognized that in the case of hostels of technical institutions the staff has to start work fairly early in the morning. This will be facilitated if the staff live in the campus. In the case of hostels of other types of institutions where the work does not start so early it may not be essential for all the staff to live in the campus. The question of providing residential accommodation for staff must therefore be decided in the light of requirements of each hostel.

2.9 *Provision for Utility Shops*

2.9.1 In hostels situated away from the town, provision may also be made for a small block of utility shops, such as, grocer's shop, hair cutting saloons, laundry etc. These can be rented out to authorised persons.

2.10 *Circulation Space*

2.10.1 The requirement of living area, service area and common rooms have been described. Efficiency of planning depends upon how these are inter-connected with minimum circulation area. Considerable amount of work has been done in the U.K. and by successive improvements the proportion of living space to the total area has been increased from 63% to as much as 81%.

2.11 *Efficiency of Planning*

2.11.1 As indicated in the opening paragraph, it is the living unit which is of most importance in a hostel. Compared to this living area per student, the total built up area in the various hostels studied by the Panel, varies from 2 to as much as 5 times.

2.11.2 Hostel blocks are planned either on the verandah or central corridor pattern. There is a tendency to prefer the former type as it is felt that the corridor pattern will not give adequate ventilation for all the rooms. But it is evident that the central corridor system would be more economical on space planning and from this point of view, the Panel would strongly recommend the adoption of central corridor system for all hostels. The problem of ventilation can be overcome by proper orientation and by the introduction of a shallow verandah in the middle of the block and on the side of the prevailing breeze as shown in SKETCH 1 at the end of report. It will also be essential to provide some ventilators in the wall between the rooms and the corridor.

The Panel would go even to the extent of saying that fans may also be provided for individual rooms sooner or later, as the extra cost of fans would not be much when compared to the saving that can be effected in the cost of the building through proper planning. A fan clamp should be installed at the stage of construction itself so that a fan can be provided at a later date.

2.11.3 Over and above this floor area, there is the question of walls, the area of which will vary according to the type of construction, size of bricks, etc. Normally for two storeyed construction, using 9" bricks, the wall area should be about 20% of the floor area. In multi-storeyed construction this can be about 10 to 12%. It should be the endeavour of architects and engineers to plan the hostel in such a way that the built up area excluding warden and servants quarters per student is generally not more than 2.3 to 2.5 times the floor area per student within the room.

3 *Design & Structural Considerations*

3.1 *Structural Arrangement*

3.1.1 Hostels need not be more than 2 to 3 storeys high normally with a floor to floor height not exceeding 11.0'. Single storeyed construction can be justified only in places where land is cheap. Even in such cases it is preferable to build two or three storeyed hostels, thereby leaving greater space for expansion as well as for other facilities playground, etc. In congested localities, where land cost is high, hostels can be 4 storeys high at the most. If on grounds of high cost of land or non-availability of land, hostels having more than 4 storeys are to be built, the extra cost that will be incurred on the installation of lifts and on framed construction will have to be properly weighed with the cost of land and its development. It is advisable to have lifts for hostels having more than 4 floors including the ground floor.

3.1.2 Upto four storeys, the construction can be of the load bearing type with brick and stone masonry walls according to the availability of materials. But in certain areas like Bombay or Calcutta where cost of bricks is very high, the load bearing construction will be as costly as framed construction. The choice in such a case will rest on the relative availability of materials. For hostels more than 4 storeys in height, it will be distinctly advantageous to go in for R.C.C. framed construction.

3.1.3 In load bearing construction, normally we have seen longitudinal walls designed as load bearing and the cross walls are either partitions resting on beams or are 9" brick walls which may be partially load bearing. Recent studies have shown that cross wall construction wherein the cross walls of rooms are taken as load bearing and the longitudinal walls as fillers would be economical and structurally better. The windows, doors and cupboards will be arranged on the longitudinal wall thereby leaving the cross walls intact. With such construction, it is possible to have the ground and first floor walls of a 4 storeyed construction $1\frac{1}{2}$ brick thick and the upper two floors one brick thick. The longitudinal walls can be even of cavity construction to give greater protection against weather. This can be easily done as this will not be load bearing. Because of these advantages, this should be preferred even though it will reduce somewhat the floor area within the room.

3.1.4 The structural aspects of a multi-storeyed hostel do not differ much from those of a similar office building. The Buildings Projects Team

has dealt with such structural as well as material aspects in great detail in the report on multi-storeyed buildings. This report should be referred to. But for ease of reference, a few of the salient points are detailed below :

3.2 *Design Considerations*

3.2.1 At present a working stress of 16,000 lbs per sq. inch is assumed for mild steel reinforcement as an appreciable part of the steel supply is of untested quality. It will be better if tested and untested varieties of steel are stored separately and used according to the designs. It may be possible to reserve tested steel, for important projects like multi-storeyed buildings. If this is assured, there will be no difficulty in assuming higher stresses in steel and thereby achieving economy.

3.2.2 Some have adopted a higher working stress for concrete. It may be pointed out that increase in the working stress of concrete alone cannot lead to economy unless the working stress in steel is also correspondingly increased.

3.2.3 Economy in R.C.C. frame-work also depends to some extent on the judicious choice of the concrete mix for the various components. The omnibus adoption of 1:2:4 mix for all components as had been done in most buildings observed by the Panel, is not conducive to economy. It is advantageous to use a mix of $1:1\frac{1}{2}:3$ or even 1:1:2 for members which are predominantly in compression. The normal 1:2:4 mix can be adopted for members subject to flexural stresses. It is, however, better to design the mix and use quality controlled concrete.

3.2.4 Frame analysis is normally done according to the well-known method of moment distribution. Several variants of this are in use, but the basic principle is the same. As against this laborious method, the procedure sometimes adopted is to ignore the continuity of the structure and to design the beams as simply-supported and the columns for direct load only. This saves time in calculations, but the procedure is technically not correct. Ignoring the rigidity of the junctions of beams and columns will not induce them to work as free members.

3.2.5 The ultimate load design is getting increasingly popular in some other countries. This method can be adopted for proportioning the members of a framed structure and is particularly advantageous in the case of compression members and doubly reinforced beams.

3.2.6 A high and consistent quality of concrete is necessary for work designed on the basis of the ultimate load theory. This should only be adopted if, at the design stage, it is decided to entrust the work to builders who can be depended upon to produce quality work. This will necessitate selective tendering.

3.2.7 The live load for the rooms may be taken as 40 lbs per sq. ft. as in residential buildings and for the corridors a live load of 60 lbs sq. ft. may be considered.

3.3 *Expansion Joints*

3.3.1 Expansion joints in R.C.C. frames are normally necessary at intervals of 60 to 100 feet. The exact location of these requires careful consideration. A joint provided on the straight face of the building may be difficult to treat architecturally. It is essential that it should be so located that it is not conspicuous. Recesses and turns in buildings are the best places for providing joints. Joints can also be concealed behind some projections. This question must be settled at the planning stage.

3.4 *Foundations*

3.4.1 In some cases the cost of foundations compared to the overall cost of the building was too high. There was no evidence in such cases of experts having been engaged before deciding upon the bearing capacity of the soil and the type of foundations to be adopted. Foundation engineering has now become a specialised study. It is our opinion that, where foundation exploration shows special features and where the structure is heavy, needing special foundation study, qualified foundation experts should be consulted. The data should be properly analysed and alternative foundation designs prepared in order to arrive at the most economical solution.

4. *Specification and Costs*

4.1 It is needless to emphasise the necessity for adopting rational specifications and using local materials in order to reduce the cost of construction. A serious attempt is being made to locate universities in rural centres with a view to reducing the cost of acquisition of land and construction of buildings but the purpose will be defeated if the specifications follow the urban pattern. Cost of reduction in such cases can be obtained only if the buildings are planned on a rural pattern using locally available materials.

The hostels in this case can be single storeyed with tile roofing. If they are double storeyed, the roofing can be tiles and the intermediate floor can be with wooden battens and stone slabs or brick tiles according to availability of materials. The point we want to emphasise is that it is not correct to specify R.C.C. construction in such rural areas, as that may be costlier there than in urban centres.

4.2 *Foundations*: The analytical study made by the Panel of the cost structure shows that the percentage cost of the various components varies widely. The cost of foundation and plinth work varies from 6.75% to 22.4% of the building cost. This should be kept within 10 to 12% of the cost of the building portion in the case of load bearing building. Where the foundation cost goes beyond this limit, it is advisable to go in for detailed soil explorations and design the foundations on a more rational basis instead of increasing the factor of safety.

4.3 *Joinery*

4.3.1 The joinery items account for nearly 16% of the building cost. In the hostels studied by the Panel the proportionate cost varies from 11.6% to 26.10%. The cost of the joinery naturally depends upon the number of doors and windows. Where a balcony has been provided for each room, the number of doors has to be doubled which adds to the cost considerably. As pointed out before, the provision of balcony should as far as possible be avoided. The area of windows as suggested by the National Building Organisation may vary between 12 to 25% of the room area. The lower limit may be adopted in the hot and dry zones and the upper limit may be adopted in the hot and humid zones. The area of windows will also include the area of ventilators provided. The Panel would recommend the provision of ventilators integrated with the doors and windows in all cases.

4.3.2 The doors and windows should be of timber available in the locality. With seasoned timber, the thickness of door and window shutters should not be more than an inch and a quarter. At present, however, there is a dearth of seasoned timber. It would be advantageous to go in for commercial type flush doors. The adoption of R.C.C. frames for doors and windows is another item which deserves consideration wherever possible.

4.3.3 The doors of living rooms of students should be of single leaf and need not exceed 2'-8" x 6'-8" without fan light and 2'-8" x 8' with fan light.

The doors of common rooms and dining halls may however be of double leaf. Fly-proof shutters may be provided for all doors and windows in the kitchen and dining area. Ventilators in this area may have fixed wire gauze.

4.3.4 Sufficient ventilation for the kitchen and the pantry is of importance and this can be arranged by the provision of fixed ventilation in the form of ventilators on the outside wall and louvers at the bottom of doors. Provision of ventilators alone will not give adequate effect if louvers or some other opening in the door on the other side are not provided.

4.3.5 Adequate thought must be given to the type and number of fitting to be adopted for various doors, windows and ventilators.

4.4 *Flooring*

4.4.1 Normally cement concrete or other locally available materials, if it is cheaper, can be adopted for major portion of the hostel excepting toilet blocks, dining and common rooms. For toilet blocks it is advisable to go in for mosaic flooring with 7 ft. mosaic dado in the shower cubicle and 3 ft. dado in other areas. For common rooms and dining room, mosaic tile flooring or terrazo can be adopted.

4.5 *Terracing*

4.5.1 Terracing is required only for flat roofs. The specifications adopted for terracing vary from place to place. Normally, lime concrete terracing with or without tile covering should be adequate. In areas like Punjab, mud "pauska" with tile covering is found to be better in performance. But the provision of this terracing over large areas has to be done with utmost care to avoid local depression. Further the slope for this type of terracing should be greater.

4.5.2 In areas with very heavy rain fall sloped roofs are to be used. In moderate rain fall areas, however, flat roofs can be adopted with adequate water proofing.

4.6 *Finishing*

4.6.1 The wood work should normally be painted. Only when teak wood is used bees-waxing can be resorted to. Special treatment such as spirit polishing can be adopted for entrance doors. The internal plastering

may be of lime mortar where lime is available in plenty. In other places a composite mortar of 1 : 2 : 9 may be adopted. The external plaster may be of the composite type. Where, however, bricks are good and rainfall is low, painting is adequate on the external side.

4.7 Services

4.7.1 The normal services that are provided for hostels are internal water supply, sanitation and electrification. The cost of the former varies from 5.7% to 16% of the building cost. The scale of sanitary fittings has already been mentioned. It will suffice to add that costly fittings such as stall urinals, etc., need not be adopted for hostel buildings.

4.7.2 The plumbing item normally accounts for half the cost of the internal water supply and sanitation. Normally the two-pipe system of plumbing, using one for soil and the other for waste is prevalent. It is high time that we shift over to the one-pipe system which will lead to an economy of 15% in plumbing. In the U.K. further research has been conducted they have even dispensed with the ventilating pipe of the one-pipe system. For hostel buildings, regardless of whether it is single or multi-storied, the one-pipe with ventilating shaft system can be conveniently adopted by properly grouping the toilet blocks and the fittings there in planning stage itself. There are, however, certain precautions to be taken such as reducing the length of connections. The cost of internal water supply and sanitation should be about 7½% of the building cost.

4.7.3 The cost of internal electrification varies from 3% to 4.1% of the cost of building in the cases studied by the Panel. Normally L. S.S. wiring system has been adopted. In certain cases wiring with cable and casing is adopted. There are a few instances where recessed conduit wiring has been resorted to. The Panel would recommend the adoption of L. S.S. wiring for hostels. The cost of electrification should be about 7½% to 10% of building cost. This will not include the cost of fans.

4.8 Furniture

4.8.1 The essential furniture needed for a student are a bed, a writing table and chair, a bookshelf, a table lamp and a wardrobe. It is also desirable to provide for an additional chair in each room. It is preferable to have the wardrobe and the bookshelf built into the wall. A suggested arrangement of a wardrobe is given in SKETCH III. As suggested earlier if

the cross wall structure is adopted with longitudinal walls in cavity construction, it will be quite easy to arrange cupboards and bookshelves conveniently. The cupboard should only consist of wooden or R.C.C. shelves provided with shutter. It should be possible to put a ceiling on cost of movable furniture per student. The Panel feels that this ceiling may be Rs. 150/- at the present rate of prices.

4.1.9 *Execution of work*

4.1.9.1 As observed earlier, the cost of several hostels had gone up due to frequent changes in drawings and specifications. There have been delays in construction due to non-supply of materials and drawings in time. The Panel is convinced that if a detailed planning is undertaken in the first instance, there will be saving in overall cost and it will also be possible to lay down target dates for completion of work in a more realistic manner. The Panel hopes that the norms and standards given in the report will help the authorities concerned in the detailed planning of hostel buildings and in finalising the architectural, structural and service details before the call of tenders. Such attention to details in the planning stage will obviate the necessity for changes during the execution and will lead to smoother and speedier execution of work ultimately resulting in overall economy.

4.1.10 *Ceiling on cost*

4.1.10. For the hostels studied by the Panel, the cost per student varies from Rs. 2,016 to Rs. 5,631. A few cases where cost per student exceeded Rs. 6,000 were also noticed by the Panel. A realistic ceiling on cost can be worked out for each place based on the norms for space utilisation and specifications outlined earlier. The ceiling will depend upon the type of hostel, the type of construction and the cost index at a particular place. The University Grants Commission may circulate from time to time the preliminary rates for different types of hostel buildings based on rates prevailing at Delhi, along with cost indices which should be applicable for various university centres.

In rural areas the cost per student should be much less than what it should be in urban centres. Buildings in rural areas must be of rural character and must correspond to rural specifications. The buildings should invariably be single storeyed with sloped roofing.

4.11 *Financial Effects of the Recommendations*

4.11.1 The Panel has laid special emphasis on planning of space in these hostels for maximum efficiency and to facilitate this, certain norms and standards have been prescribed. The adoption of these standards will lead to a saving of about 20% in the cost per place of hostel building. Apart from these norms for space utilisation the Panel has also given indications about the type of specifications to be adopted for various items of work and structural considerations that have to be borne in mind in the course of design. Adherence to these may lead to further savings in construction cost.

4.11.2 Certain norms and standards for the planning of hostels have been mentioned earlier in the report. To ensure compliance it is desirable that along with any plans and estimates for hostels, a statement (for which a proforma may be prescribed) is also sent, setting forth the norms for various items as recommended by the Panel and the extent to which they are realised in a particular case. A proforma of this type has been drawn and is given in APPENDIX II.

SUMMARY OF IMPORTANT RECOMMENDATIONS

- 2.2.2 living rooms are to be arranged in such a way that they get the maximum benefit of the prevailing breeze and avoid as much as possible of western exposure.
- 2.4.4.16 An area of 85-90 sq. ft. (7.9 to 8.4 sq. m.) for single seater room, 75-80 sq. ft. (7.0 to 7.4 sq. m.) per student for two seater and 71-75 sq. ft. (6.5 to 7.0 sq. m.) per student for a three seater room would be adequate for an undergraduate hostel. For Post-graduate and research students the room area should not exceed 100 sq. ft. per student.
- 2.6.6.12 Dining area should be designed to accommodate not more than 23rds strength of the hotel at the rate of 10-12 sq. ft. (1.0 to 1.1 sq. m.) per person and kitchen-pantry area at the rate of 5-7 sq. ft. (0.5 to 0.7 sq. m.) per student.
- 2.6.6.16 The following provisions for toilet facilities are recommended :
- | | | |
|-------------------------|-----|-------------------------|
| (i) W.C. | ... | One per 10 men students |
| | | <hr/> |
| | | 8 women students |
| (ii) Urinals | ... | One per 8 students |
| (iii) Wash basins | ... | One per 8 students |
| (iv) Bath with a shower | ... | One per 8 men students |
| | | <hr/> |
| | | 6 women students |
- 2.7.7.11 Area for common room may be 500-650 sq. ft. (46.5 to 60.4 sq. m.).

- 2.11.3 It should be the endeavour of architects and planners to plan the hostel in such a way that the built up area per student is generally not more than 2.3 to 2.5 times the floor area per student within the room.
- 3.2.2 Increase in the working stress of concrete alone cannot lead to economy unless the working stress in steel is also correspondingly increased.
- 3.2.3 Economy in R.C.C. frame work depends to some extent on the judicious choice of the concrete mix for the various components. It is advantageous to use a mix of 1 : 1½ : 3 or even 1 : 1 : 2 for members which are predominantly in compression. The normal 1 : 2 : 4 mix can be adopted for members subject to flexural stresses. It is, however, better to design the mix and use quality controlled concrete.
- 3.4.1 Where foundation exploration shows special features and where the structure is heavy, needing special foundation study, qualified foundation experts should be consulted. The data should be properly analysed and alternative foundation designs prepared in order to arrive at the most economical solution.
- 4.3.1 The area of windows may vary between 12 to 25% of the room area.
- 4.7.2 The cost of normal internal water supply and sanitation should be about 7½% of building cost.
- 4.7.3 The cost of internal electrification should be about 7½ to 10% of building cost. This will not include the cost of fan.
- 4.8.1 Ceiling cost of movable furniture may be Rs. 150 per student.
- 4.10.1 Ceiling cost for hostels may be worked out at a place on the basis of norms for space utilisation and specification outlined in the report and the prevailing cost of construction.

APPENDIX I

Cost Analysis

Sheet I

Sl. No.	Place	Cost of Building Portion	Internal water supply and sanitation as a % of Building cost	Internal electrification as a % of Building cost	Total cost per student
1.	Poona	Rs. 1,59,267	9.4	4.4	Rs. 3,021
2.	Calcutta (Ladies)	Rs. 2,75,087	7.85	6.24	Rs. 3,736
3.	Calcutta (Male)	Rs. 4,17,598	6.7	3.3	Rs. 3,765
4.	Madras	Rs. 3,05,866	6.6	3.9	Rs. 5,631
5.	Vallabh Vidhyanagar	Rs. 2,65,583	6.3	3.0	Rs. 2,016
6.	Chandigarh	Rs. 9,65,850	6.3	7.5	Rs. 3,333
7.	Dharwar	Rs. 7,37,232	15.9	4.4	Rs. 3,451
8.	Hyderabad	Rs. 3,05,834	5.9	6.4	Rs. 3,903
9.	Santiniketan	Rs. 3,35,633	5.6	12.9	Rs. 3,978

Space Analysis

DATA REGARDING VARIOUS

Sl. No.	Place	Built up area sq. ft.	Floor area sq. ft.	Area under rooms sq. ft.	Area of circulation (Horizontal & vertical) sq. ft.
1.	Poona	14,025	10,872	4,800 (S.S. 85 & T.S. 81)	2,5501
2.	Calcutta (Ladies)	20,180	17,17	11,097 (D.S. 101)	4,2398
3.	Calcutta (Male)	28,948	24,269	14,117 (D.S. 101 & T.S. 113)	8,6555
4.	Madras	20,050	16,156	7,000 (S.S. 115)	4,8300
5.	Vallabh Vidhyanagar	34,001	29,266	12,710 (D.S. 83)	8,3302
6.	Chandigarh	94,343	78,791	31,950 (S.S. 112)	35,9993
7.	Dharwar	59,934	50,027	23,292 (S.S. 108 & D.S. 84)	14,1100
8.	Hyderabad	31,695	26,96	7,812 (S.S. 110 & D.S. 86)	13,5579
9.	Santiniketan	20,621	16,843	7,328 (S.S. 110 & D.S. 84)	3,092

N.B. : Figures in bracket show area in sq. ft. per student.

S. S. : Single-Seater

D. S. : Double-Seater

T. S. : Three-Seater

Area of toilet & bath sq. ft.	Area under dining rooms sq. ft.	Area of kitchen store etc. sq. ft.	Area of common rooms sq. ft.	Built up area per student	Proportion of built up area to room area
822 (13.7)	1,649 (27.5)	964 (16.1)	138 (2.3)	234	2.9
1,676 (20.0)	938 (11.2)	818 (9.8)	726 (8.6)	240	1.8
1,497 (12.3)	1,081 (8.9)	1,105 (9.0)	638 (5.2)	237	2.0
2,000 (33.3)	900 (15.0)	700 (11.7)	750 (12.5)	334	2.9
1,353 (9.4)	1,147 (8.0)	411 (2.9)	3,962 (27.6)	236	2.7
4,540 (13.8)	3,220 (9.8)	1,440 (4.3)	1,640 (5.0)	286	2.9
4,500 (17.5)	2,500 (9.7)	680 (2.6)	3,600 (14.0)	232	2.4
1,301 (14.8)	1,156 (13.1)	3,113 (35.4)	—	360	4.0
1,868 (18.7)	1,200 (12.0)	994 (9.9)	1,200 (12.0)	206	2.8

APPENDIX II

Proforma for Hostel Buildings

Location :

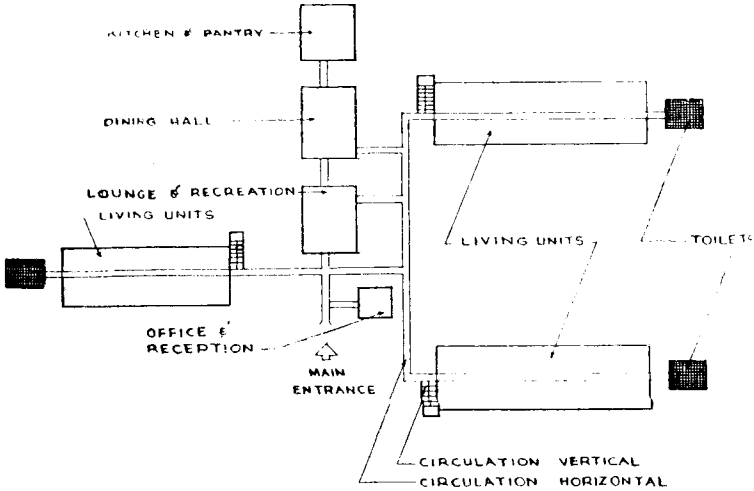
Name of University/College :

Agency for Planning and Design :

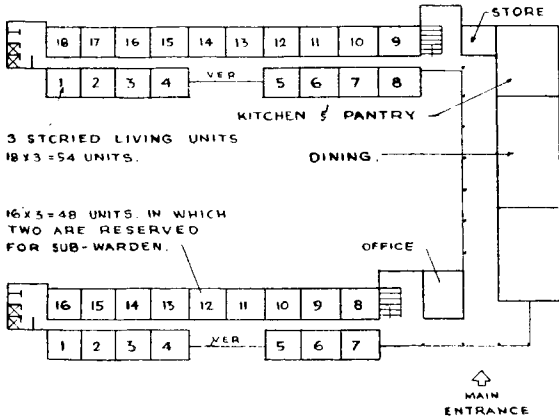
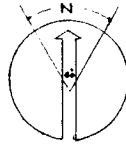
Agency of Construction :

-
1. Number of rooms in the hostel
 - a) Single-Seater
 - b) Double-Seater
 - c) Three-Seater
 2. Total built up area.
 3. Proportion of built up area per student to floor area per student within the room.
 4.
 - a) Area of common room provided.
 - b) Area of common room per head.
 5. Area of dining space per head.
 6. Area of kitchen, pantry, etc. per head.
 7. Scale of toilet facilities provided.
 - a) Number of W.Cs.
 - b) Number of Urinals
 - c) Number of Wash Basins
 - d) Number of Baths
 8. Live load assumed in design :
 9. Cost of internal water supply and sanitation as a percentage of building cost.
 10. Cost of internal electrification as a percentage of building cost.
 11. Total cost of the building including internal water supply, sanitation and electrical services.
 12. Cost per student.

SKETCH NO. I



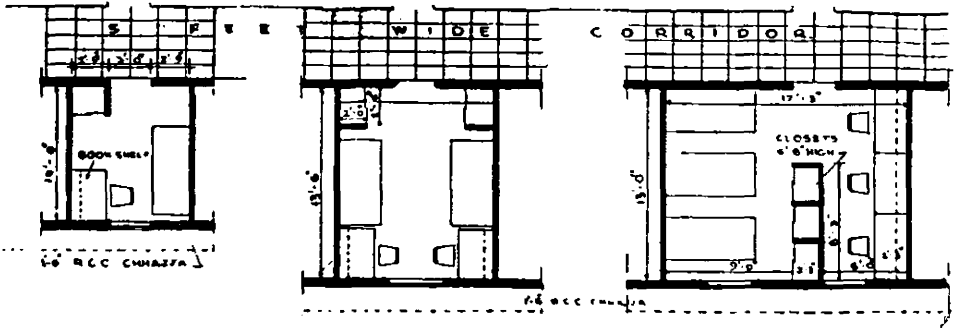
SCHEMATIC LAY-OUT OF HOSTEL.
(NOT TO SCALE)



SUGGESTED LAY-OUT OF A 100 STUDENTS' HOSTEL.

HAVING SINGLE SEATER ROOMS
FLOOR AREA AS PER STANTARD
SCALE - NOT TO SCALE.

SKETCH NO. II



SINGLE SEATER

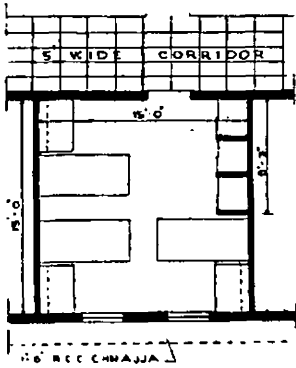
8'-6" x 9'-6"
 PERMISSIBLE AREA 85-90
 [PERMISSIBLE AREA FOR
 RESEARCH WORKERS 100-5 FT]

DOUBLE SEATER

11'-6" x 12'-6"
 PERMISSIBLE AREA / SEAT 75-80 5 FT

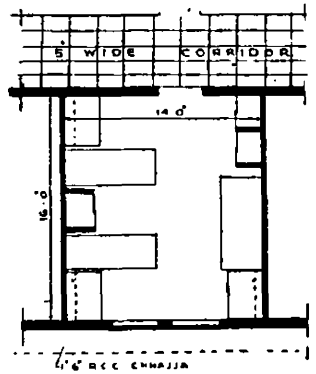
THREE SEATER

15'-0" x 17'-6"
 PERMISSIBLE AREA / SEAT 70-75 5 FT



THREE SEATER

15'-0" x 15'-0"
 PERMISSIBLE AREA / SEAT 70-75 5 FT

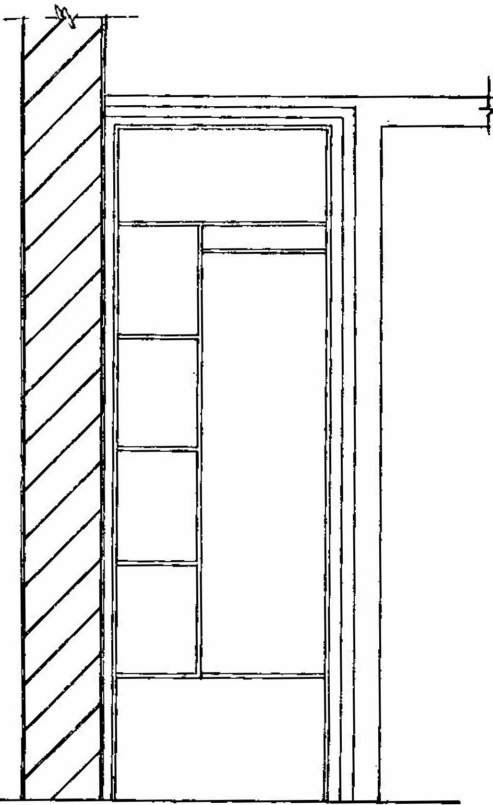


THREE SEATER

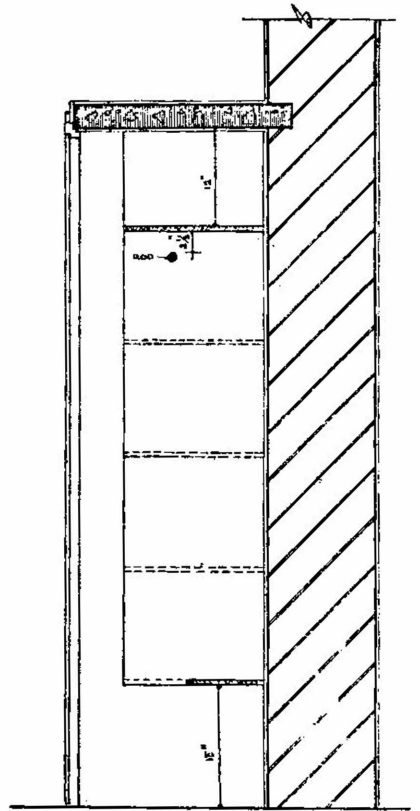
15'-0" x 14'-0"
 PERMISSIBLE AREA / SEAT 70-75 5 FT



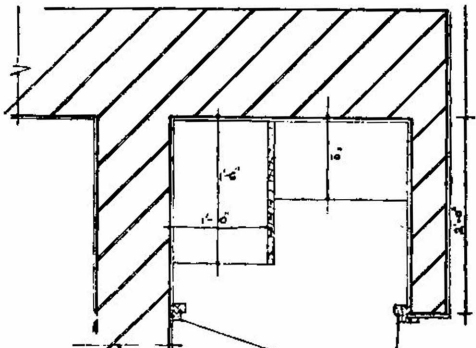
SKETCH NO. III



ELEVATION



SECTION



PLAN



SUGGESTED DETAIL OF CUPBOARD

