

# PHYSICAL PLANNING STANDARDS FOR CANTONMENT AND THEIR ENVIRONS IN HILLY TERRAIN—CASESTUDY 'X' CANTONMENT

A DISSERTATION

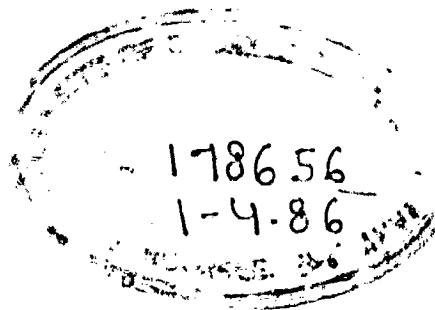
submitted in partial fulfilment of the  
requirements for the award of the degree

of

MASTER OF URBAN AND RURAL PLANNING

By

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CANDIDATE'S DECLARATION :


I hereby certify that the work which is being presented in the Dissertation entitled "PHYSICAL PLANNING STANDARDS FOR CANTONMENT AND ~~ITS~~<sup>Urban</sup> ENVIRONS IN HILLY TERRAIN-CASE STUDY 'X' CANTONMENT" in the partial fulfilment of the requirements for the award of degree of MASTER OF URBAN AND RURAL PLANNING, in the Department of Architecture and Planning, University of Roorkee, Roorkee is an authentic record of my own work carried out for a period of about ten months from January to October, 1985 under the supervision of Prof. Rattan Kumar and Prof. A.J. Contractor, Department of Architecture and Planning, University of Roorkee, Roorkee.

The matter embodied in the Dissertation has not been submitted by me for the award of any other degree or diploma.

  
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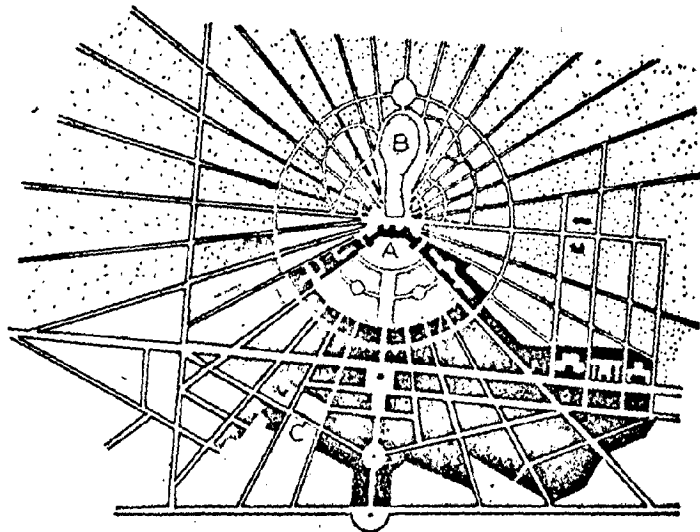
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## CHAPTER I

BASIC STUDY1.1 Introduction :

"A Cantonment can be defined as a city for Military establishment with all the urban and civic amenities necessary for comfortable living of troops, their families and necessary training area." <sup>1</sup>.

The pattern of planning in the cantonments is uniform and as old as the cantonments themselves. The location of cantonments is decided by the Government taking into consideration political and strategic aspects for the defence of the country. The cantonment, in addition, provides for supporting civilian population in civil areas including Sadar Bazar, other recreational facilities and public utilities, which is under the administrative control of cantonment boards.

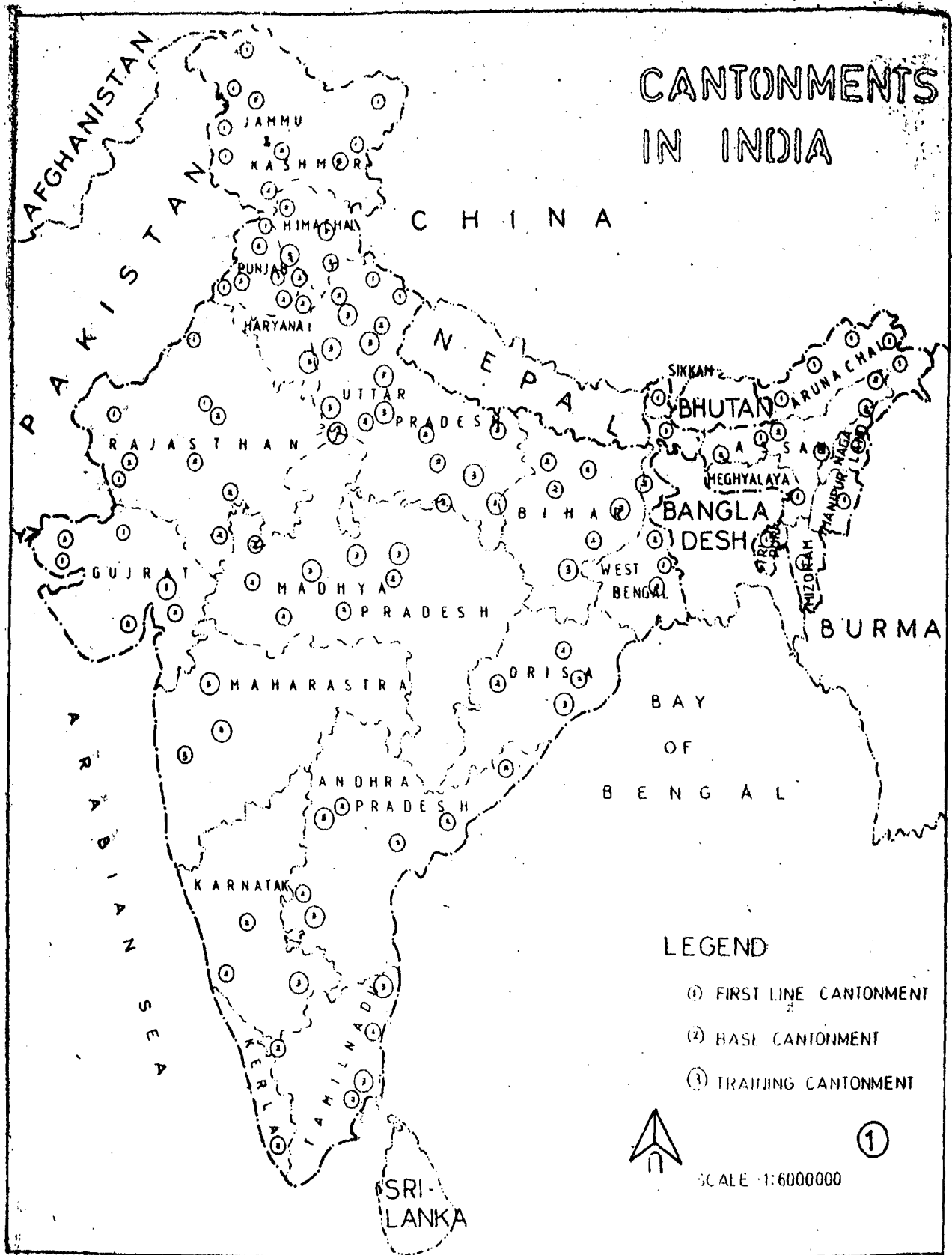
It could be seen from the hierarchy of old Military cantonments that the British set up these stations segregated from the civil developments/Towns, with physical barriers like Railway lines, Rivers, canals, hills etc. which could well define the boundaries of the cantonments. The areas occupied by the cantonments were much more, i.e. two to three times, the actual requirement. In case of cantonments located in hilly terrain, the area occupied was more than the cantonments located in plains, due to certain other factors like borrowed planning standards, more percentage of unbuildable/broken land, more land required for road communication system etc.

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<sup>1</sup> Manual on Planning of Cantonment, Ministry of Defence, Govt. of India.

On the other hand the scarcity of land is being felt at all levels, to meet the requirements of the population, which is multiplying rapidly. Fertile land is being used for human habitation instead of Agriculture. In the hills, in order to maintain the ecological balance, less interference of human activities are required. Otherwise ecological imbalance will adversely affect the whole region, in the form of changed climatic conditions, soil erosion, pollution problems etc.

To safeguard human society from these natural hazards, optimum use of land without disturbing the ecological balance, is the need of the future, which can be achieved by modifying the existing planning standards to suit our own requirements. These modified standards are likely to help us in redeveloping the existing cantonments and in planning the new cantonments of the future.



## 1.2 Identification of Problem :

India is a large country having total land area of 3,287,782 Km<sup>2</sup>. The length and breadth of the main land from West to East (distance between Westernmost tip of Gujrat to the Easternmost tip of Assam) is 3000 Km. and North to South (distance between the northernmost tip of Kashmir to Southernmost tip of Cape Comorin) is 3200 Kms. The land Frontier is 15,200 Km long running through Gujrat, deserts of Rajasthan, plains of Punjab, and the snow covered peaks of Himalyan Ranges, while the coast line is 6000 Km. running along Arabian Sea to Bay of Bengal. To protect the land frontier, the Army is responsible, and to safeguard the Coastal line the responsibility lies with the Indian Navy. Indian Air force is responsible to provide air support to both the forces in case of external threat.

Out of all cantonments existing in India, more than 30% are located in the Hills and 27% are having cantonment Boards, where civilian population is employed to help the Military Authorities.

At present two types of cantonments are existing in India

- (a) Those built during the British period or Pre-Independence period.
- (b) Those built by the Indian Government or Post-Independence period.

The organisation, functioning and planning of Indian Army is still<sup>a</sup> on the lines laid down by the British. Their physical Planning standards are also in use for planning the new cantonments. "Hand Book of Cantonment Planning, Barrack Synopsis

and Military Land Manual, published in 1947" is still the Bible for the Military Planners.

The strategic and tactical requirements of the Army were entirely different in the Pre-Independence period. The army was generally used to control the internal disturbances in the country. So cantonments were located in the big cities at a vantage point, keeping them physically segregated but utilising the infrastructural facilities of the city for the cantonment population.

But after Independence, the role of Indian Army changed, to defend the country from external threats, Aid civil power at the time of natural calamities like floods, earthquakes etc. India faced first threat in 1948 in J&K by Pakistan, then subsequently in 1962 by China. 1965 and 1971 again by Pakistan. The lesson learnt by Indian Govt. from these external threats, was firstly to increase the number of troops and secondly to construct more cantonments to accommodate these extra troops. No doubt this was a gigantic task confronting the Indian Govt.

It is very difficult for the Govt. to spend such a large amount on the construction of new cantonments, which is also a time-consuming activity. So development took place in a piece-meal manner, to accommodate larger number of troops in the existing cantonments, without having given any thought for the future requirements. This was done in a haphazard manner as and where needed, due to increased requirements. But it created chaos due to the intermingling of land uses with other allied problems, and cantonments became non-functional and affected the sub-region in an adverse manner.



The cantonments existing in hilly terrain were affected more severely, due to the induction of extra troops. It greatly burdened the existing facilities, which were not planned for such heavy load. The surrounding forests and Agricultural land got converted into residential use, or into training areas for the troops. Simultaneously ecological balance also was disturbed, due to pollution and deforestation activities, which adversely affected the surrounding environment and sub-region.

### 1.3 Scope of Study :

It is very important to mention here that the cantonment planning in itself is a full fledged topic for research and study. But due to limitation of time it would not be feasible for me to deal with the topic in its complete entity. I am therefore limiting my thesis work to, "Physical Planning Standards for Cantonments and their environs in hilly terrain between 2000 m and 3000 m above MSL. The scope of the work is to analyse the existing conditions in the following areas in X-Cantonment as a base to start with.

The main emphasis will be on the analytical review of the Planning standards of military based activities in X-Cantonment as given below :

- (a) Residential Accommodation -
  - (i) Single
  - (ii) Married
- (b) Road & Transportation system
- (c) Public recreation and open spaces
- (d) Public Utilities & Community facilities
- (e) Training areas
- (f) Planning densities.

#### 1.4 Objectives of the Study :

The following are the objectives of the study :

- (i) To collect and study the standards for cantonments meant for Infantry Training, existing in hilly terrain between 2000 m - 3000 m above MSL, prescribed by the concerned authorities.
- (ii) To check the validity of these prescribed or implied standards in the Regimental Centre, X-Cantonment, in the existing conditions.
- (iii) To identify, isolate and discuss the factors leading to discrepancies between the valid requirements, the prescribed standards and the actual conditions prevailing in Regimental centre, X-Cantonment.
- (iv) To propose and recommend planning standards drawn from logical inferences and empirical references for cantonments meant for infantry training and their environs, existing in hilly terrain between 2000 m - 3000 m above MSL.

## CHAPTER - 2

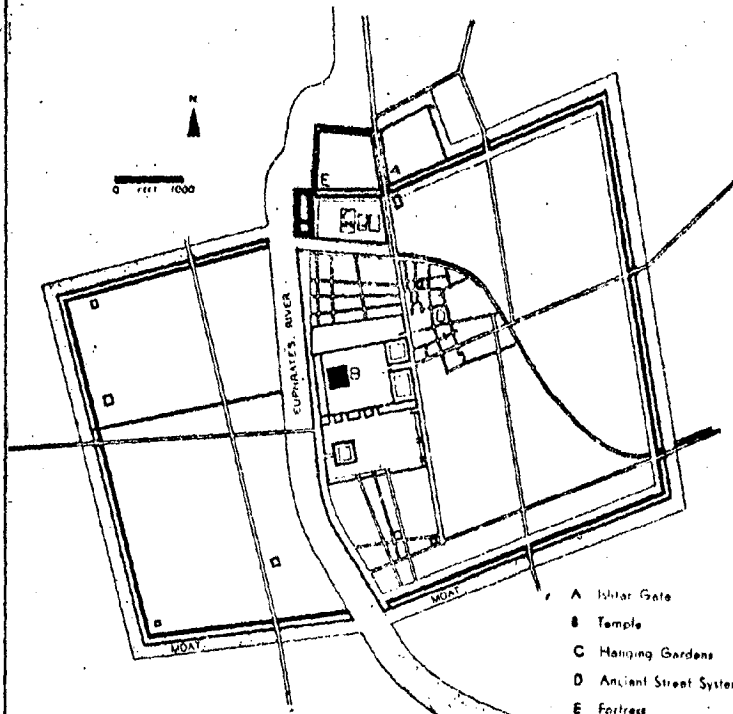
HISTORY AND DEVELOPMENT OF CANTONMENTS2.1 Historical background of Cantonments :

In the Neolithic period fortification was, provided by compact thorn hedges. Later palisades and ditches made stronger barriers.

Early civilizations spread along the fertile valleys of the Nile, Tigris, Euphrates and Indus Rivers, where food, water and transportation were easily available. These civilizations were named as River Valley Civilizations. In the sixth century B.C. Babylon was a large city spanning the Euphrates River. Surrounded by great walls and a moat, it was a monumental city of Kings, with a processional avenue leading to the magnificent Ishtar Gate, the temple and the hanging Gardens of Nebuchadnezzar's palace (Fig. 1).

The Greek and Roman cities were built by slaves. However, while the Greek cities were truly organic the Roman cities were Geometric. Roman cities were small states and part of a vast empire. Roman planning was rigid, based on axial system and the basic unit of Military camp. e.g. Tingad (Fig. 2). In due course, its conquests were carried west-wards into Spain, Britain and new cities were founded in all of these as evidence of its power. In this way many cities of a distinctive Roman type were distributed over Europe. This explains the reason why up to the ninth century European cities built fortifications and moats which became important elements of the urban settlements.

FIG 1. BABYLON



- A Ishtar Gate
- B Temple
- C Hanging Gardens
- D Ancient Street System
- E Fortress

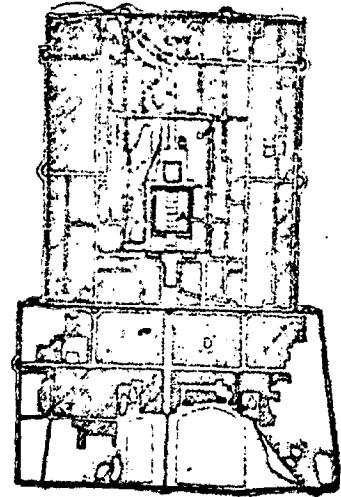


FIG 4. PEKING

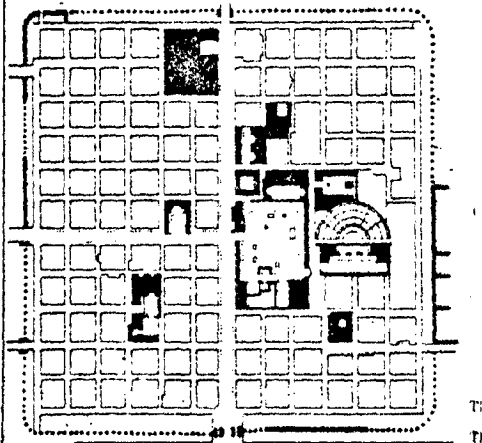
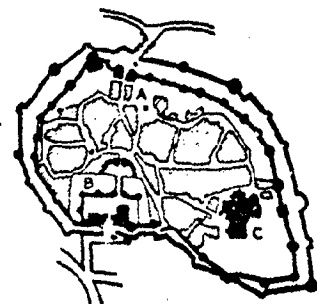


FIG 2. TIMGAD



- A Market Square
- B Castle
- C Church of St. Nazaire

FIG 3. CARCASSONNE

During the medieval period the town was limited in size, being enclosed by fortifications and the cathedral formed the hub of the community. The cathedral, the guild, the fortifications and the moat were important components of the medieval town. Carcassonne city (Fig.3) with double fortification and moat is the example of this period.

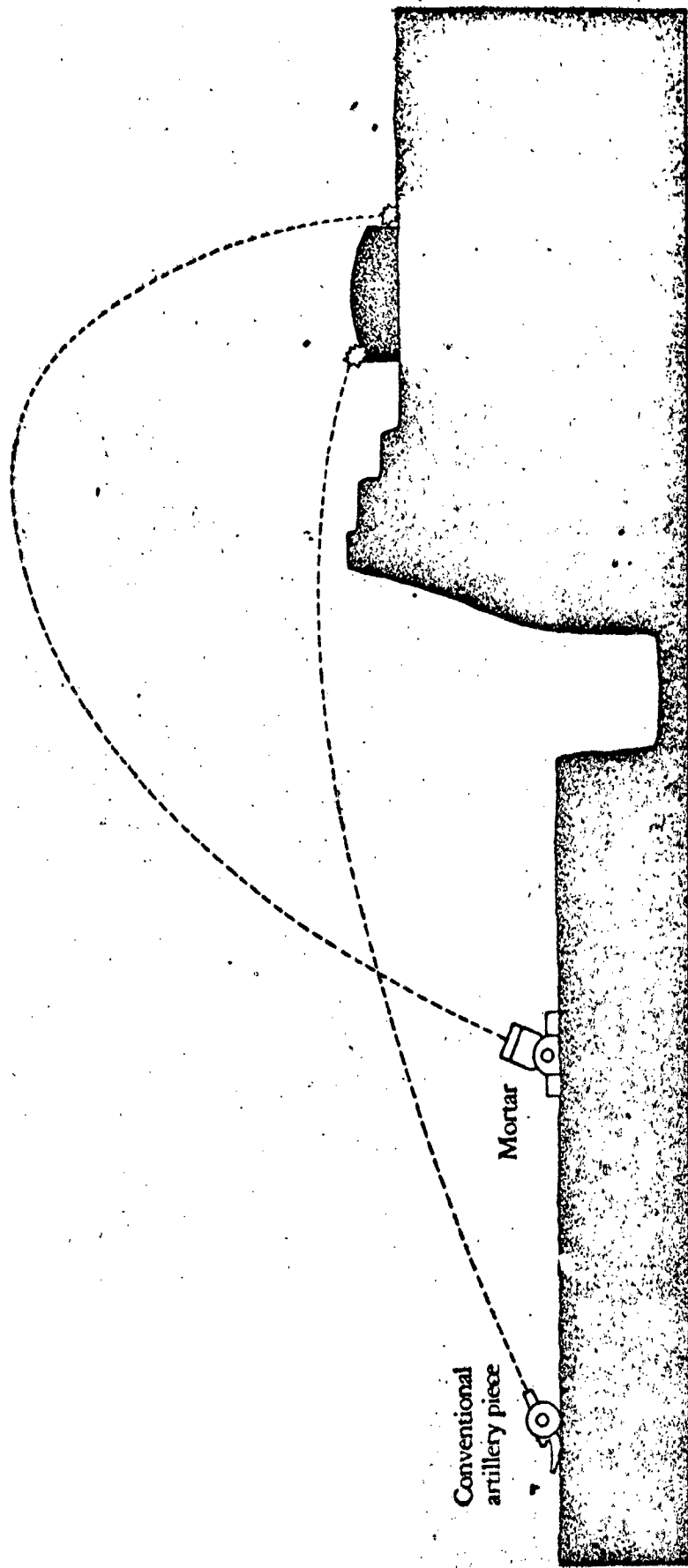
In Renaissance period cities became big, complex and dominating under the influence of powerful kings. The squared plan, the palace, the straight street for parades and the garden became dominant elements of a city e.g. Peking (Fig. 4).

In the 15th century gunpowder was invented, and new techniques of warfare were introduced. Gun-powder increased the range, power and mobility of professional soldiers. Simple and traditional devices like fortifications and moats could not stand this heavy assault. Fortifications were extended and heavy bastions, moats and outposts were built. Extension of the area occupied by the fortifications created a "no-man's land" and separation between town and country became more distinct. The powerful artillery of the late 15th century made cities highly vulnerable (Fig. 5).

The intensive developments of the technique of fortifications shifted its emphasis in building from Architecture to Engineering, from aesthetic design to material calculations.

The Baroque city was a grand city based on a dynamic concept of space. The medieval fortifications were pulled down and converted into boulevards, which along with shopping streets,

FIG. 5.



INVENTION OF GUNPOWDER

Art galleries, Museums, Parks, Zoological gardens and Army Barracks, became dominant elements of a Baroque city. e.g. KARLSRUHE (Fig. 6).

With the 19th century, came the dawn of the Machine Age. The Steam Engine was invented and developed in England, during the latter half of the 18th century. Automobile and aeroplane were also developed a little later, which improved the mobility of people and material. The extent of the city increased and spread in all the possible directions. The ideology of power dominated the world and the technique of war changed completely.

In the modern age, materialism, utter disorder and ambition to conquer space and time, by mastery over nuclear weapons, missiles and space satellites, are the ultimate aim of the world-powers. Conventional wars are a dream of past; now, fortifications and moats around the cities are not effective as they are under air and missile attacks. Today it is possible to impose casualties in hundreds of millions and to contaminate millions of square Kms. of land and water.

## 2.2 Development of Cantonment in Indian Context :

The cities of Indus Valley (Mohan-jo-daro and Harappa) dating back to 3000 B.C. were located and built so as to be secure against invasion. During the Vedic Period, Indo-Aryans laid out many cities e.g. Patliputra, Varanasi, etc. considering defence as an important aspect of town planning. These cities were built to face the enemy attack and safe guard the civilian population residing there.

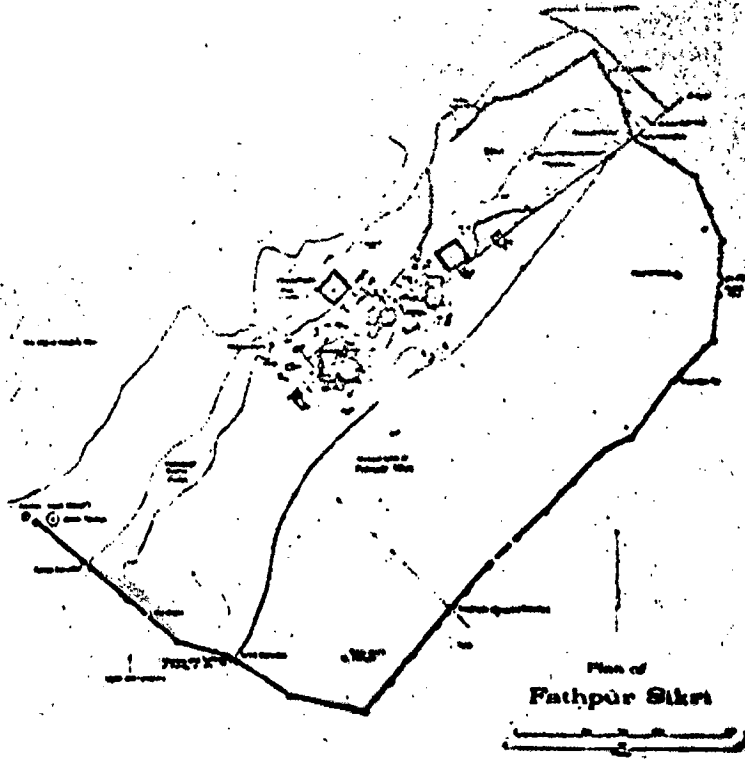


During the Buddhist period, Nalanda and Taxila were built to serve as University Towns. Defence was not the consideration at all and even in the medieval period, Indian towns developed as centres of handicrafts and small-scale industries.

In 1526 Babar won the First battle of Panipat and became the founder of the Mughal Dynasty in India. During Mughal period, for the first time, extensive gardens and parks were laid out, which imparted a new scale to Indian cities and created a dynamic spatial concept, comparable to the order which existed during the Baroque period in Europe. The Mughal rulers had to build very few new towns (except Fatehpuri Sikri and Shahjahanabad) (Fig. 7 & 8). The Mughals however, built magnificent forts to protect their towns/cities.

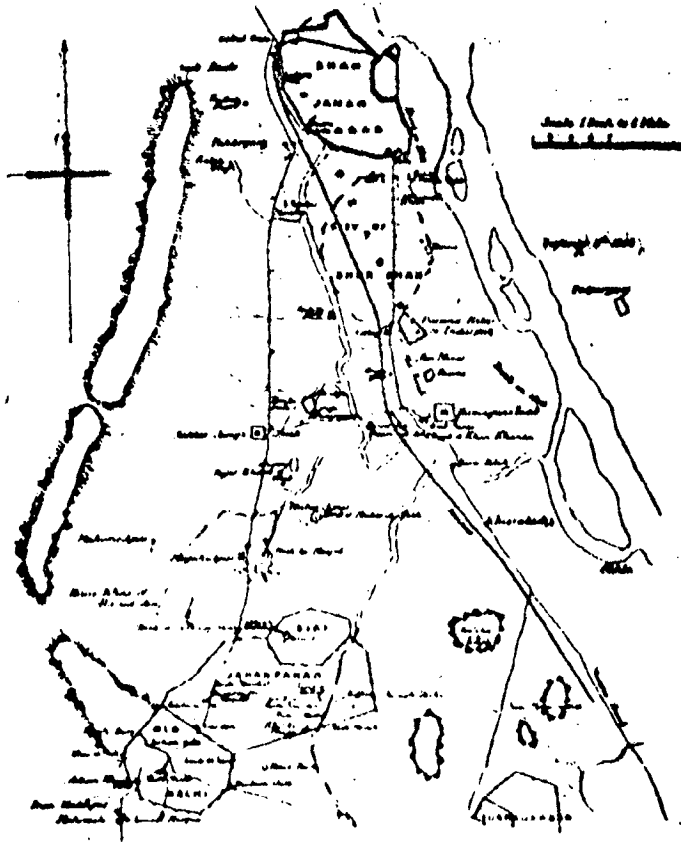
The British first came to India in 1600 AD as traders, through the Sea route during the reign of Jahangir. In 1613 they constructed one Fort in Surat with the permission of Jahangir. In 1619 AD the British were able to construct Forts in Agra, Ahmedabad and Bharoch (Gujarat). In 1639 AD they got a lease on Madras where they constructed Fort Saint George. This fort was the main centre of Trade at coromondal beach. In 1651 and 1661 AD they constructed Forts in Hoogli and Bombay respectively.

French Tradesmen also came to India and started settling down here in 1668 in the guise of colonists, which was a threat to the English tradesmen. So in 1761 British captured all the French colonies and pushed the French out of the country. This East India Company was flourishing in India day by day and got some political power also. For two centuries it was being



FATEHPUR SIKRI

FIG 7



SHAHJAHANABAD

FIG 8

controlled from England, with London as its headquarters. But in 1857, British Government took over its functions under their control and officially India came under British Govt. Control and army structure was reorganised in stages. The British were not interested in the development of this country, but they were very much interested to safe guard their property and lives. For better administration and control they constructed cantonments in all the important cities.

At present in India, there are two types of cantonments existing :-

- (a) Pre-Independence Period
- (b) Post-Independence Period.

### 2.3 Classification of Cantonments :

It is very difficult to classify the cantonments as they tend to differ from each other in one way or another. Their location, type of troops, functions and strategic importance generally play an important role in their classification. Functionally these existing cantonments can be classified into five types :

#### (a) First Line Defence Cantonments :

These cantonments are located in the border area closest to the enemy border following the International rules. The responsibility of the troops is to face the initial attack, take action according to the situation, to push the enemy back into their own territory.

(b) Second Line Defence Cantonments :

These cantonments are located away from the international borders, but are required to reinforce the first line troops in case of enemy attack. They launch attack also on the advancing enemy through the first line defence cantonments.

(c) Training cantonments or Base cantonments :

Regimental centres, Training School comes under this category, where recruits are trained and trained soldiers are getting special type of training to handle the latest weapons. In case of war these cantonments are also sending reserves to the first and second line of Defence. All kinds of facilities are available in these cantonments.

(d) Defence equipment Manufacturing factories :

These are also a part of defence establishments. Equipment factories are manufacturing defence goods for the army and saving a lot of foreign exchange as better quality of weapons, and equipment are available in the country only.

(e) Defence Research & Development :

As the technology is advancing very fast, to cope up with the latest technology is the requirement of the time, and this department is fulfilling the requirements of Armed forces by providing them new weaponry and other war equipment in time, and that's why our defence forces are keeping pace with the most modern armies of the world at present.

#### 2.4 Political, Strategic and Location Aspects of Cantonments :

All these three aspects are having their own importance in locating cantonments. Political relations with neighbouring countries and their military strength and development of Nuclear Warfare techniques are the deciding factors e.g. Pakistan and China are the countries with whom we have had wars in the past and we are not certain about the future situation. So the location of the cantonments along these borders are very important. Strategic aspects of location, types and strength, etc., are directed by the Army authorities: those who will have to fight the wars on ground, make their choice to locate the cantonments keeping in view the proximity of borders without violating the international regulations and at vantage point, to have an edge over the enemy concentration.

At the micro level locational aspects are supported to take into account factors which are in many ways similar to the ones to be considered for locating on equitable urban settlement. Such as availability of land, infrastructural facilities, public utilities, communication systems etc. In addition these cantonments have the requirements of security, although, more often cantonments are expected to be independent and self sufficient in all respects. However, because of their requirements of servicing, they inevitably interact with the local population and the surrounding region. Cognisance of this fact effects the actual location of the cantonment in relation to the existing communities and the spatial distribution of various activities within.

## 2.5 Importance of physical planning standards for the development of cantonments.

The activities in the cantonments are entirely different from other towns and thus need planning standards suited to their own special requirements. Because these standards will affect the social, economic and physical environment as well as other communities in vicinity, it is very essential that these be based on sound reasoning and appropriate basis.

## 2.6 Latest Concept of Cantonment Planning :

2.6.1 A Military station with minimum facilities for the professional activities of a limited number of civilian shop keepers, traders, workers, etc., who are not to have any civic rights and who must look for accommodation and medical, health, educational and other amenities of civil life in an existing civil town or village.

2.6.2 Concept of a cantonment as envisaged in the Hand Book of Cantonment Planning.

This concept envisages a cantonment as a Military station with a limited provision for "Military entitled personnel" and the supporting civilian population. This caters for a non-military population as three times the military population. Of this a little over 1/3rd consists of the families of military entitled personnel, supporting civilian population and their families.

2.6.3 Concept of a satellite township as an adjacent to a Cantonment.

At present this type of cantonment is not existing. But due to certain problems of civilian population and their

administration through cantonment Boards, military planners are thinking to have self contained cantonments, with a satellite township to accommodate the supporting civilian population at a reasonable distance of 5 to 8 Kms. away from the cantonment.

## 2.7 Planning & Implementing Authorities :

### 2.7.1 Cantonment Planning Cell, A.HQ., N.Delhi :

To meet the latest requirements of Armed forces in planning field the Cantonment Planning Cell, came into existence after independence under the Command of Director Cantonment Planning Cell who is directly responsible to Engineer-in-Chief of Indian Army.

The Cantonment planning cell is conducting surveys and studies in the existing cantonments to evaluate the environment there and then issue policies and guide lines for the better development of these cantonments and for new cantonments in the future, to the Command Chief-Engineer. Those who are the implementing authorities, at the time of planning and designing of new projects, these policies are always providing guidance to them.

After independence as the requirement of Armed forces increased, extra troops were inducted into almost all the cantonments, without checking the existing facilities. These facilities were not adequate for all the troops. Chaos prevailed every where in the cantonment area. Cantonments became non functional and efficiency has also gone down, which gave planners the idea to modify the environment by implementing certain schemes. That was when every one realised the importance of this cantonment Planning cell which is located at Army HQ., N. Delhi.

### 2.7.2 Military Engineer Service :

The MES establishment comprises both Military and Civilian personnel. MES is responsible for carrying out capital works and repair services for the three arms of Defence Forces and allied departments. It may also be required to carry out deposit works on behalf of Cantonment Boards, Public bodies or private persons. The Engineer-in-Chief is the head of the Corps of Engineers and of the MES.

The G.E., Incharge of a Division, is the Engineer adviser at the Sub Area/Brigade or equivalent level to the local heads of services and departments under the Ministry of Defence.

G.E. is assisted in his duties as necessary by A.G.E. (Tech), Barrack Stores Officer, Sub Divisional Officer i.e. AGE and Superintendent Grade I.

All MES offices from E in C's to G.E. have the following sections, with subjects normally dealt with by various sections as shown against each :-

<u>Section</u>	<u>Subject</u>
E <sub>1</sub>	General/Administration & Personnel
E <sub>2</sub>	Works & Barrack Services
E <sub>3</sub>	Stores
E <sub>4</sub>	Electrical & Mechanical
E <sub>5</sub>	Budget & Expenditure
E <sub>6</sub>	Drawing
E <sub>7</sub>	Contract & Technical Examination.



MES also has the Architects Branch. Chief Architect is the head of the Branch and responsible to the Director General of Works. He will be posted in the MES head quarters at Delhi. Every Command Chief Engineer is being assisted by Senior Architect.

In CWE's Office an Assistant Architect is posted to advise him on the relative matters.

### 2.7.3 Border Roads Organisation :

India has a total area of about 2,59,000 Km<sup>2</sup> covered with densely forested and thinly populated hills. In the Himalyan Region, vegetation and human habitation extends upto altitudes as high as 4250 to 4900 m above MSL but it is mostly confined to 3500 to 3650 m.

In consideration of strategic need of the country heights upto elevation of 5500 m have now been negotiated by Roads. To provide road communication in the inaccessible border area to meet the defence requirements and to accelerate the development of these regions, Border Roads Organisation was set up by Govt. of India in March 1960, under the chairmanship of Prime Minister, as a temporary organisation. However as a result of experience gained, over the years, during which the BRO gave a good account of itself, its potential and organisation was acknowledged, and it has been accorded a permanent status.

The scope of work of BRO has been enlarged to include Air Field Works, Accommodation Projects, Bridge construction, etc. Apart from the defence-oriented works the BRO is called upon to undertake works on behalf of various other Central Govt. department, State Govt. and Central Public Sector undertakings.

2.7.4 Cantonment Board :

A Cantonment Board exercises control over the civilian population which comes under the cantonment Act 1924 amended till 1983. The Commandant, who is also the Station Commander functions as the President Cantonment Board. Other members, include the elected members from amongst the residents and a nominated officer (usually the Station Staff Officer). Executive duties are performed by the Cantonment Executive Officer (CEO). The strength of official and elected members depends upon the class of cantonment. The classification of cantonment depends upon the number of Board Members in a Cantt. Board, which is directly related to the civilian population residing in the Cantt. Area.

TABLE-1

Class of Cantonment	Civilian population	Total Members	Ex-officio Members	Elected civilian members	Nominated members
I	above 10000	14	3	7	4
II	2500-10000	12	3	6	3
III	Less than 2500	3	1	1	1

In accordance with the Cantonment Act 1924 G.E. incharge of Military works in a cantonment is the Executive Engineer of the Cantonment Board also.

## CHAPTER - 3

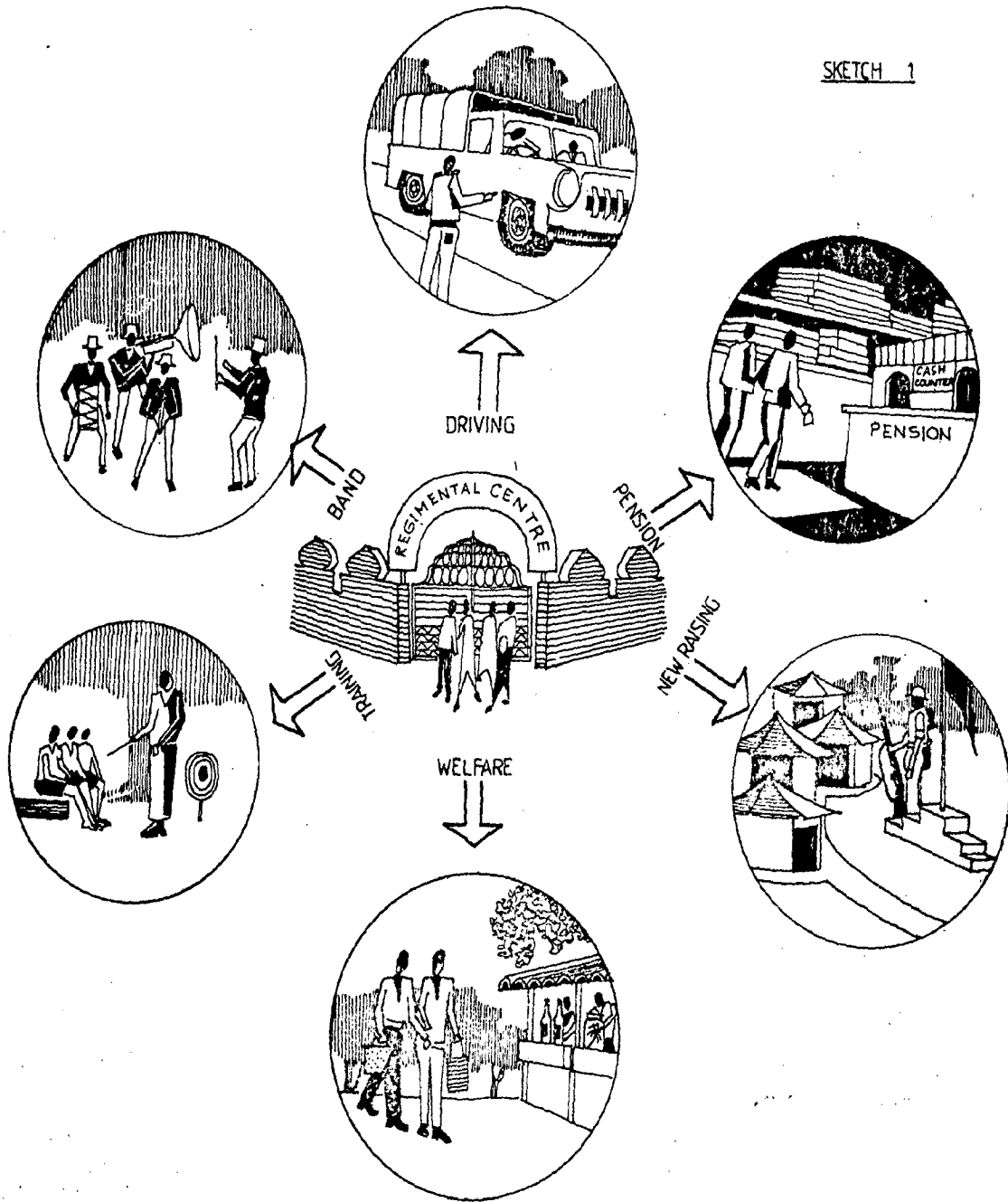
ACTIVITIES IN THE INFANTRY TRAINING CENTRES

## (Regimental Centres)

All human activities are related to space in one way or the others, and planners are supposed to do spatial planning for the community, for all the related human activities in an integrated manner to provide better physical environment and use the space optimally. In case of cantonments it is necessary to study the routine activities as well as occasional activities of troops and their families. Even though cantonment is a township for the Military Personnel, its planning basically differs from any other civilian township, due to its own peculiarities, characteristics and functioning. It mainly caters for one sort of people i.e. people in the Military service.

Different nature of training centres are required for different branches of Army such as; Engineers, Signals, Ordnance, ASC, EME, Artillery, Armoured and Infantry. Training Centres (Regimental Centres) are located in different parts of the country for strategic reasons. Some of these are located in Hills. Although the activities are in a particular centre whether located in plains or hills are same, however, their land requirements are bound to differ due to the differences in terrain, climate and their special strategic requirements. Therefore generalisation of physical planning standards for Infantry Training Centres located in Hilly areas and the areas located in plains will not be desirable. Further, because this thesis

SKETCH 1



ACTIVITIES IN THE INFANTRY REGIMENTAL CENTRE

intends to deal only with Cantonments which house Infantry Training Centres (Regimental Centres) in hilly areas between 2000 m - 3000 m above MSL hereafter, a description of the various activities and components of only such Regimental Centres is being included to develop a clear understanding of their different requirements. These centres come under permanent establishment of Army.

### 3.1 Training of Recruits :

Infantry constitutes the main fighting force in the war of course with the support and help of other arms and services. That's way special type of training is imparted to the recruits, to carry out the assigned task in war. They will have to physically hold the ground, attack the enemy to push him back as and when need arises. Troops are also deployed to man the border posts in the far flung areas in the difficult terrain and in adverse weather conditions. Our international borders are running through swamps and deserts of Gujrat and Rajasthan. Snow covered peaks of Himalyas and dense forests of Assam and Arunachal Pradesh. These trained soldiers will be working in all such areas to guard the mother land against the foreign invaders. They are thus required to undergo the following kinds of training to keep them in a perpetual state of physical and mental fitness to fight such as; Physical training, drills, weapon training, field craft, night-training, Hygine, sanitation & first aid, camp training, battle inoculation, education and map reading.

### 3.2 Running of Cadre :

To train soldiers for different functions the Infantry training centres run different types of cadre such as; Band-cadre, Drill cadre and Driving cadre.

Traditions and customs in the Armed Forces are some thing which the general public cannot quite grasp. They are simply the 'procedure' the troop follow in the course of their duties in peace and war. It encompasses the daily routine in barracks, Parade ground, in public, dealing with superiors and equals, saluating, wearing of various uniforms, etiquettes in eating places (Mess), ceremonies on local and state occasions, including honouring the dead. These all are traditions because they have come down from generation to generation. Custom because they are allowed since these have been followed for centuries. Routine after years of practice become tradition and custom.<sup>2</sup> The recruits before they are attested to become soldiers would undergo the rigorous of the aforementioned regimen for a whole one year.

To maintain Band in the centres and in the Batallions is the old traditions of Army. These Bands were being used in the Messes, ceremonies and in War also to encourage the soldiers. At present two types of Band instruments are in Army :

- (a) Pipe Band
- (b) Brass Band

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<sup>2</sup>. Traditions and Customs of Indian Armed forces

By : Maj. Gen. Chard N. Das (Retd.)

Visitor Books, New Delhi -1.

Pipe Band to Indian Army is the gift of Britishers and we are still using the same tunes with some new additions.

Regimental Bands take part in the "Republic Day Parade" and "Beating Retreat" which is a matter of pride for the Regimental Centre. To maintain high standards of the Bands training, cadets are conducted in the centre as a matter of routine.

Drill Cadre to improve the Drill of the soldiers are being conducted in the centre. Every year competition will be arranged for all the Regimental Battalions. All the Battalions are sending their Drill Parties to the centre where they will be doing rehearsals and finally taking part in the competition. These parties are coming to the centre well in advance.

To fulfill numerous needs of moving troops and supplies the Regimental Centres conduct Driving cadre which consists of training in driving of vehicles, their maintenance and upkeep.

Generally the cadre strength will be 20 and it will be held in centre twice in a year to meet the increased requirement and to refresh the knowledge of the Trained soldiers, who after training return to their respective units.

### 3.3 Pension Establishment :

A recruit who enters the centre for professional training is expected to go out as a trained soldier to a battalion. He comes back to the centre subsequently for upgradation of courses and finally going on pension to home. One company in centre acts as a pension establishment. Soldiers going on pension come to the centre near about 4 weeks prior to their retirement.

and stay in this company to perform the formalities.

#### 3.4 Record Office/Pay Account Office :

It is a separate department in the Regimental Centres to maintain the records of soldiers from the day of their recruitment and till they retire. Pay Account Office is looking after the financial aspect of the soldiers. It is a semi-military organisation. It is one of the department in cantonments where generally equal number of civilians are employed.

#### 3.5 Raising of New Battalion :

Depending upon requirements whenever a Regimental Centre gets directive from A.HQ. for raising a new battalion action is initiated by posting a skelton staff drawn from existing units for the purpose. Initially this new unit will be attached to the centre itself. Later on it will be allotted some area in the centre to run their routine activities under the tented accommodation, if proper accommodation is not available for them. After completing their training and other formalities the battalion will be shifted to its new location to carry out the assigned responsibilities.

#### 3.6 Administrative base for Dependent Units :

As it is well understood that Infantry and Artillery units are the main fighting forces of army. But for maintaining and proper functioning of these units a vast force of other ancillary unit is essential, such as : Supplies, Transport, Signals, Medical, Engineer etc. which become part and parcel of the centre according



to the authorisation. But certain other units located in the near vicinity of the centre, will also depend on the centre for supplies, Transport, Ordnance Stores etc. Centre will have to cater for their requirement and also act as their administrative base.

### 3.7 Special Regimental Activities :

Reunion of the old soldiers and Fauji Mela are some of the allied activities which these centres are supposed to perform. Nearly every six years a reunion will be arranged to meet the old soldiers and their families at the centre.

Whenever a battalion is showing extra courage and bravery in the war or war like conditions in peace time and getting large number of Gallantry awards, will be presented colour by the President of India, to honour the Unit Officers, J.CO's & OR's of that particular unit. Generally, these Colour Presentation are conducted at the Regimental Centres.

Fauji Mela is also being arranged at the centre, to attract the youth to join army by showing the development of Army and future prospects in army, which is an annual affair.

### 3.8 Welfare of Ex-Serviceman :

Yesterday's serviceman is today's Ex-serviceman and it is the responsibility of Indian army to look after their welfare in all respects to provide them better retired life. To achieve this aim Regimental Centres are meeting the requirements of Ration, Canteen services, Liquor, Medical facilities of the Ex-servicemen resides in the vicinity of the centre.

## CHAPTER - 4

EXISTING PLANNING STANDARDS IN ARMY FOR  
DIFFERENT REQUIREMENTS

At present cantonment Planning Cell has issued guide lines for the planning of new cantonments and expansion of existing cantonments. It incorporate new concepts and techniques of Town Planning. The space or the size of the plot entirely depends upon the type of accommodation, density, the forecourt and intra distance between the buildings. Accordingly in keeping with the recommendations of the Committee on Plan Projects, Corporation bye-laws and architectural dictates, the land requirements for all types of building have been computed for unit strength of 1000, 3000, 5000 and 10,000 men as indicated in (Table 2) under different titles :

- (a) Unit Areas
- (b) Training Areas
- (c) Residential Accommodation
  - (i) Accommodation for civilians of Defence
  - (ii) Accommodation for supporting civilian population.
- (d) Public Utilities & General amenities
- (e) Public Schools & Colleges
- (f) Hospitals
  - (i) Military
  - (ii) Civil
- (g) Roads, Streets, Railways, Drains, Transport, Open spaces and Parks.

EXISTING PLANNING STANDARDS IN ARMY  
for strengths 1,000 to 10,000 men

Sl. No.	Accommodation	Acreage for standard unit		Density per acre	Acreage for Units strength							
		No. Acres	4.		5.	No. Acres	No. Acres	No. Acres	No. Acres	No. Acres		
1.	2.	3.3	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
A.	<u>UNIT AREAS</u>											
1.	Barrack Blocks including sanitary conveniences, cook house & dining hall for single men/followers	100 Men	1.35	75 Men	765 Men	10 to 11	2,250 Men	30.00	3,600 Men	48.00	6,900 Men	92.00
2.	Institute for men	Bn	0.75			0.85		2.00		3.50		6 to 7
3.	M.I.Room	Bn	0.25			0.25		0.25		0.50		1.00
4.	S.H.O.	Large	2.00			-		-		2.00		2.00
5.	Darbar Shed	Large unit	0.12			0.12		0.25		0.50		1.00
6.	Sports Grounds	3	9.00			9.00		25.00		50.00		100.00
7.	Laundry & Dhobi Ghat (Drying & Ironing)	Bn	1.00			1.00		2.00		4.00		6.00
8.	Offices	Bn	1.00			1.00		2.50		4.00		7 to

Source : Cantonment Planning, A.HQ.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
9.	Instructional accn for troops	Bn	0.75			0.75 to 1		2.00		3.50		6 to 7
10.	Tech & W/Shop Accn	Bn	0.50			0.50		1.50		3.00		6.00
	(a) Storage Accn	Bn	2.25			2.50		7.00		10.00		20.00
	(b) Bulk Stores & Dumps	Large units	300/ Tons/ acre									
		Engr Stores	250 Tons/ acre									
		POL Depot	300 Tons/ acre									
		Ordnance Stores	15 Tons/ acre									
		Ammunition Depot	100 Tons/ acre									
		Supply Depot										
		100										
11.	Guard House, Armoury & SAA	Bn				1.00		2.00		3.00		5.00

AS REQUIRED

	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.												
12.	Garages/ Gun Sheds	Bn	4.00			4.00		12.00		20.00		40.00
13.	Parking Areas/ Hard standings	Bn 37 Veh.	1.00			1.00		3.00		5.00		10.00
14.	Accn for animals	100 animals	2.00			1.00		2.50		4.00		8.00
15.	Explosive Store & Magazine	Bn	1.00			1.00		2.00		3.00		5.00
<b>B. TRAINING AREAS</b>												
1.	Gymnasium	CI I	0.75			0.50		0.75		1.50		3.00
2.	Drill Shed	1 No.	0.50			0.50		0.50		1.00		2.00
3.	Assault/ Obstacle course	1 No.	2 AC each			-		2.00		2.00		4.00
4.	Parade Ground	Bn	5.00			5.00		12.00		20.00		30.00
5.	Ranges											
	(a) Classification 8 targets	Each	650.00									
	(b) Rifle	Each	0.80									
	(c) Grenade	Each	0.25									
	(d) Miniature (indoor)	Each	0.50									

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
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C. RESIDENTIAL ACCOMMODATION

1.	Married Service Officers Qrs.											
	(a) Lt Col & above	1	0.50	25 to 30	1	0.50	4	2.00	12	6.00	25	12.50
	(b) Major/Capt.	4	0.84	40 to 50	8	1.70	40	8.50	98	21.00	230	48.50
	(c) Lt, 2/Lt.	4	0.56	40 to 50	6	0.85	6	0.85	12	1.70	25	3.50
2.	Single/Nursing Officers Qr.											
	'F' Type	8	0.64	25	-	1	1		2		2	
	'G' Type	12	0.66	36	8	1.50	9	5.00	26	13.00	78	30.00
3.	Mess for officers including Servants Qrs & garages	16-22	1.40	11 to 15	17		60		150		360	
4.	Married JCOs Qrs	8	0.60	60 to 70	25	2.00	80	6.50	135	10.50	290	24.00
5.	Single JCOs Qrs	8	0.48	15 to 20	3	0.25	10	0.60	15	0.90	30	1.80
6.	Mess & Clubs for JCOs	20-40	0.50	41 to 80	28	0.50	90	2.00	150	3.00	320	6.00
7.	Married Hav & CRs Qrs	16	0.96	80	135	8.50	120	26.00	800	48	1800	112.00
8.	Married NCSE Qrs.	8	0.40	100	55	2.80	180	10.00	300	16.00	620	32.00

D. (i) ACCOMMODATION FOR CIVILIANS OF DEFENCE

	Pay range											
1. Type VI (Rs. 1300-2249)	1	0.50	25 to 30									
2. Type V (Rs. 700-1299)	4	0.84	40 to 50									
3. Type IV (Rs. 400-699)	4	0.56	40 to 50									
4. Type III (Rs. 250-399)	4	0.40	50									
5. Type II (Rs. 110-249)	4	0.32	60									
6. Type I (less than Rs. 110)	8	0.40	100									

(ii) ACCOMMODATION FOR SUPPORTING CIVILIAN POPULATION

1. Highest income group (Rs. 1200-2250)	1	0.50	25 to 30									
2. Middle income group (Rs. 400-1300)	4	0.56	40 to 50									
3. Low income group (Rs. 110-100)	4	0.32	60									
4. Working class (below Rs. 110)	8	0.40	100									

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
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E. PUBLIC UTILITIES & GENERAL AMENITIES

1.	Cinema/Lecture Hall	60 seats	1.50					1.00		1.50		3.00
2.	Film Vaults		0.75					0.75		0.75		1.50
3.	Institute for officers	100-200	1.00					-		1.00		1.30
4.	Child & Family Welfare Centre	Each	0.50							0.50		1.00
5.	(a) Swimming Pool	50 Metres	2.00					2.00		2.00		4.00
	(b) -do-	25 Metres	0.50			0.50				-		-
6.	MES Inspection Bungalow	1 No.	2 to 2.5							-		2.50
7.	Bakery	400 Lbs	0.50			0.50		1.00		1.50		2.50
8.	Butchery	6-125 Animals	1.50							1.00		1.50
		25-75 Animals	1.00					0.75		1.00		1.50
9.	* Shopping Centre	1000 men or 3000 pop with upto 30 shops	1.00			1.00		3.00		5.00		10.00



1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
10.	* Multipurpose Halls	upto 20000 population	3 to 4			1.00		2.00		3.00		5.00
11.	* Miscellaneous & other town facilities, such as Police Station, Temples, Gurdwaras, Mosques, Post-Offices, grounds for other religious users & other miscellaneous requirements.	10% of developable area.										

F. PUBLIC SCHOOLS & COLLEGES.

1.	* Nursery Schools	50-60 Students	3.00			-		3.00		6.00		9.00
2.	* Primary Schools	350-400 Students										
3.	* Secondary Schools	650-1000	6 to 8							-		14.00
4.	* Colleges	Per 15.00 1,00,000 Population										

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.

G. HOSPITALS

(i) \*MILITARY

|          |                              |       |  |  |  |  |  |  |  |  |  |  |  |
|----------|------------------------------|-------|--|--|--|--|--|--|--|--|--|--|--|
| 25 Beds  | 68-152/<br>Q3w dt.<br>7.1.61 | 5.00  |  |  |  |  |  |  |  |  |  |  |  |
| 50 Beds  |                              | 10.00 |  |  |  |  |  |  |  |  |  |  |  |
| 100 Beds |                              | 15.00 |  |  |  |  |  |  |  |  |  |  |  |
| 400 Beds |                              | 40.00 |  |  |  |  |  |  |  |  |  |  |  |

(ii) \*CIVIL

|          |  |       |  |  |  |  |  |  |  |  |  |  |  |
|----------|--|-------|--|--|--|--|--|--|--|--|--|--|--|
| 25 Beds  |  | 5.00  |  |  |  |  |  |  |  |  |  |  |  |
| 50 Beds  |  | 10.00 |  |  |  |  |  |  |  |  |  |  |  |
| 100 Beds |  | 15.00 |  |  |  |  |  |  |  |  |  |  |  |
| 400 Beds |  | 40.00 |  |  |  |  |  |  |  |  |  |  |  |

H. ROADS, STREETS  
RAILWAYS, DRAINS,  
TRANSPORT,  
OPEN SPACES AND  
PARKS

1. \* Arterial Roads 6% of developable area approx.  
For 200' wide Right of way 25 ac of Road

10.00 15.00 25.00 40.00

| 1. | 2.   | 3.                              | 4.      | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. |
|----|--|---------------------------------|---------|----|----|----|----|----|-----|-----|-----|-----|
|    | For 100' wide Right of way                     | Per mile of Road                | 12.5 ac |    |    |    |    |    |     |     |     |     |
|    | For 60' to 80' wide Right of Way               | Per mile of Road                | 8.5 ac  |    |    |    |    |    |     |     |     |     |
| 2. | * Water supply, Electricity and Drainage works | 4% of developable area approx.  |         |    |    |    |    |    |     |     |     |     |
| 3. | * Open spaces, Parks & Recreation Grounds.     | 10% of developable area approx. |         |    |    |    |    |    |     |     |     |     |

- NOTES :
1. As a general rule, evaluate the space requirement by the formula  $(L+50) (B+100)$ , where 'L' and 'B' are the length and breadth of the building and the constants denote intra-distance between buildings, roads and lanes.
  2. Assess the overall requirement of land at 2 to 2½ times the space allocations determined by unit strengths to allow for unbuildable areas, rugged hilly terrain, supporting civilian population, foreseeable future expansion and unforeseen requirements.

\* Norms for land vide COPP. (Appx- III)

Most of the standards are meant for plains with respect to the strength of military population. For planning of cantonments in hilly terrain, the document is strongly silent. The cantonments which are located in hills are very old and were established by Britishers before independence. Now cantonments in hills, it appears were planned according to the availability of land resources. There are no particular planning standards available with the army authorities for planning of cantonments in hilly terrain between 2000 m - 3000 m above sea level.

## CHAPTER - 5

EXISTING LANDUSE IN REGIMENTAL CENTREX-CANTONMENT5.1 X-Cantonment in its Regional Set up :

X-Cantonment came into existence in 1869, in a beautiful scenic hilly terrain. It is situated on a ridge of the hill ranges. In 1870 log huts were put up for the accommodation of troops. The troops worked at the making roads, cleaning and levelling the site for barracks.

District town is 59 Kms. away from this cantonment. Nearest Air port is 119 Km. and Railway station at 84 Km. which is situated on a meter gauge line. There is a net work of good road routes connecting the cantonment to nearby towns. Area of cantonment is 17.25 Km<sup>2</sup>.

5.2 Natural Environment :5.2.1 Climate and Rain fall :

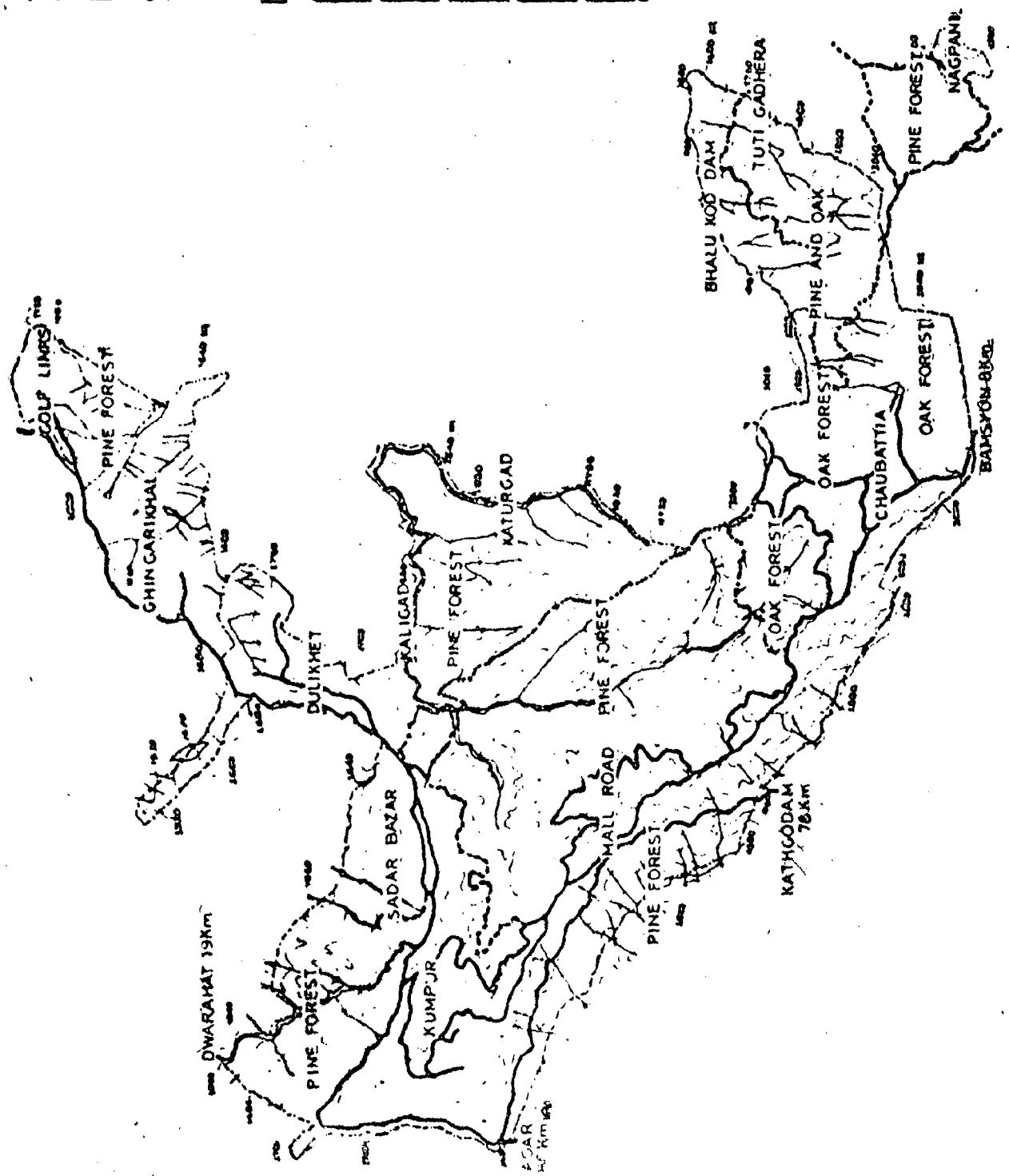
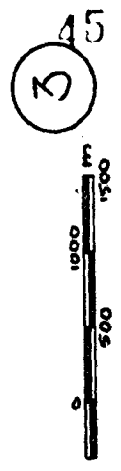
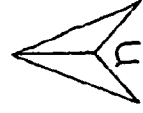
The average altitude of X-Cantonment is 2000 m. The climate is quite cold in winters. The temperature varies from 3.3°C to 7.2°C in winters and from 8.4°C to 32.2°C in summers. Snow fall occurs almost every year. Frost is common but not severe.

The average rain fall is 1537.25 mm. Light winter rains usually occur in the latter half of Dec., Jan. and Feb. during which period snow falls at higher altitudes, but does not stay for long on the ground. Thunder-storms sometimes occur in May and June, and summer monsoon rains usually began towards the end of June and last until the end of September. Severe winds are infrequent.

# X-CANTONMENT PHYSIOGRAPHICAL SETTING .

## LEGEND

|  |                |
|--|----------------|
|  | CANT. BOUNDARY |
|  | PUCCA ROAD     |
|  | KUTCHA ROAD    |
|  | TRAIL / PATH   |
|  | NALLAH / RIVER |



### 5.2.2 Vegetation :

The forest is classified as Himalayan Chir Pine forest and sub divided into Bairy Oak Forest. The forest is situated on a tract of rounded or flat ridges with subsidiary spurs and slopes of gentle to moderate gradient on the whole.

### 5.2.3 Soil :

The soil is a light sandy-loam derived mostly from mica schists and gneiss. There is a good leaf-mould layer making the soil well suited to the growth of oak and broad leafed species.

### 5.2.4 Minerals :

The under lying rocks are mainly schist with Mica almost always conspicuous. Bands of quartzite are found among the schists. Gneiss extends in a strip through X-cantonment. Both schists and Gneiss provides good building stone.

### 5.2.5 Wild Life :

- (a) Deer, jackle, wild rat, snake, leopard, hare, porcupine, flying fox, monkey etc.
- (b) Crow, vulture, kite, parrot, squirrel, owl, pigeon, eagle, bat and partiridge etc. are quite common.

### 5.2.6 Deforestation :

In the X-Cantonment it can be seen that 112.56\* acre of forest has been converted into the land till 1977-78 which is 2.1% of the total forest area. It shows that if process of deforestation continue, most of the forest land will be used for human habitation.

---

\*Working Plan for the X-Cantonment forests 1968-69 to 1977-78.

TABLE 3

DECADE WISE POPULATION VARIATION SINCE 1901  
CANTONMENT

| S No | Year | Status of town | Area Km <sup>2</sup> | Person | Decade variation | %Decade variation | Males | Females |
|------|------|----------------|----------------------|--------|------------------|-------------------|-------|---------|
| 1    | 1901 | Cantt          | 17.20                | 3246   | -                | -                 | 2279  | 967     |
| 2    | 1911 | "              | 17.20                | 5781   | + 2535           | + 78.10           | 4423  | 1358    |
| 3    | 1921 | "              | 17.20                | 3632   | - 2149           | - 37.17           | 2554  | 1078    |
| 4    | 1931 | "              | 17.20                | 3772   | + 140            | + 3.85            | 2558  | 1214    |
| 5    | 1941 | "              | 17.25                | 4894   | +1122            | +29.75            | 3308  | 1586    |
| 6    | 1951 | "              | 17.25                | 8937   | +4643            | + 82.61           | 6391  | 2546    |
| 7    | 1961 | "              | 17.25                | 10642  | +1705            | +19.08            | 7405  | 3237    |
| 8    | 1971 | "              | 17.25                | 13917  | +3275            | + 30.77           | 9445  | 4472    |
| 9    | 1981 | "              | 17.25                | 18190  | +4273            | +30.70            | 12253 | 5937    |

Source - CENSUS REPORT, 1981



### 5.3 Physical Environment :

#### 5.3.1 Demographic characteristics :

It is a Class II cantonment having population of 18190\* (civil 11049 and Military 7141). The population is on the increase (Fig 7A). In the last decade percentage of population increase has been 30.70% (Table 3). Death and Birth Rate per 1000 people during 1983 was 2.00 and 13.3 respectively (Fig. 7B).

#### 5.3.2 Housing :

Sadar Bazar area and other small pockets in cantonment belong to civilian population, those who are working in the cantt. area. The land has been leased to them for 99 years. The total area for 'civil residential' is 180.23 Hectares i.e. 10.45% of total area (Table 5). In this area houses are of double storey type. Ground floor is being used for the commercial purposes e.g. shops, restaurants etc. Local building materials have been used for their construction.

The details of civilian accommodation is given below :

|     |  |   |      |
|-----|--|---|------|
| (a) | Aprox. No. of families in self owned building            | - | 300  |
| (b) | Aprox. No. of families in rented accommodation           | - | 1500 |
| (c) | Aprox. No. of families in State Govt. accommodation      | - | 80   |
| (d) | Aprox. No. of families in Central Govt. accommodation    | - | 15   |
| (e) | Aprox. No. of families in Cantonment Board accommodation | - | 100  |
| (f) | Aprox. No. of families in Revenue Court accommodation    | - | 20   |
| (g) | Aprox. No. of families in Central School colony          | - | 30.  |

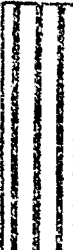

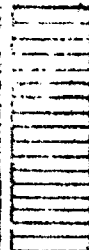

In Army area two types of buildings are existing as given below :-

- (a) OTM (Other than Married)
- (b) Married Accommodation

OTM accommodation is used for accommodating the troops and offices, stores etc. Married accommodation is used for

# X-CANTONMENT BROAD LAND USE CATEGORIES

## LEGEND

|               |   |
|---------------|---|
| LAND USE      | REPRESENTATN.   |
| MILITARY AREA |  |
| CIVILIAN AREA |  |
| FOREST AREA   |  |
| OTHER AREA    |  |

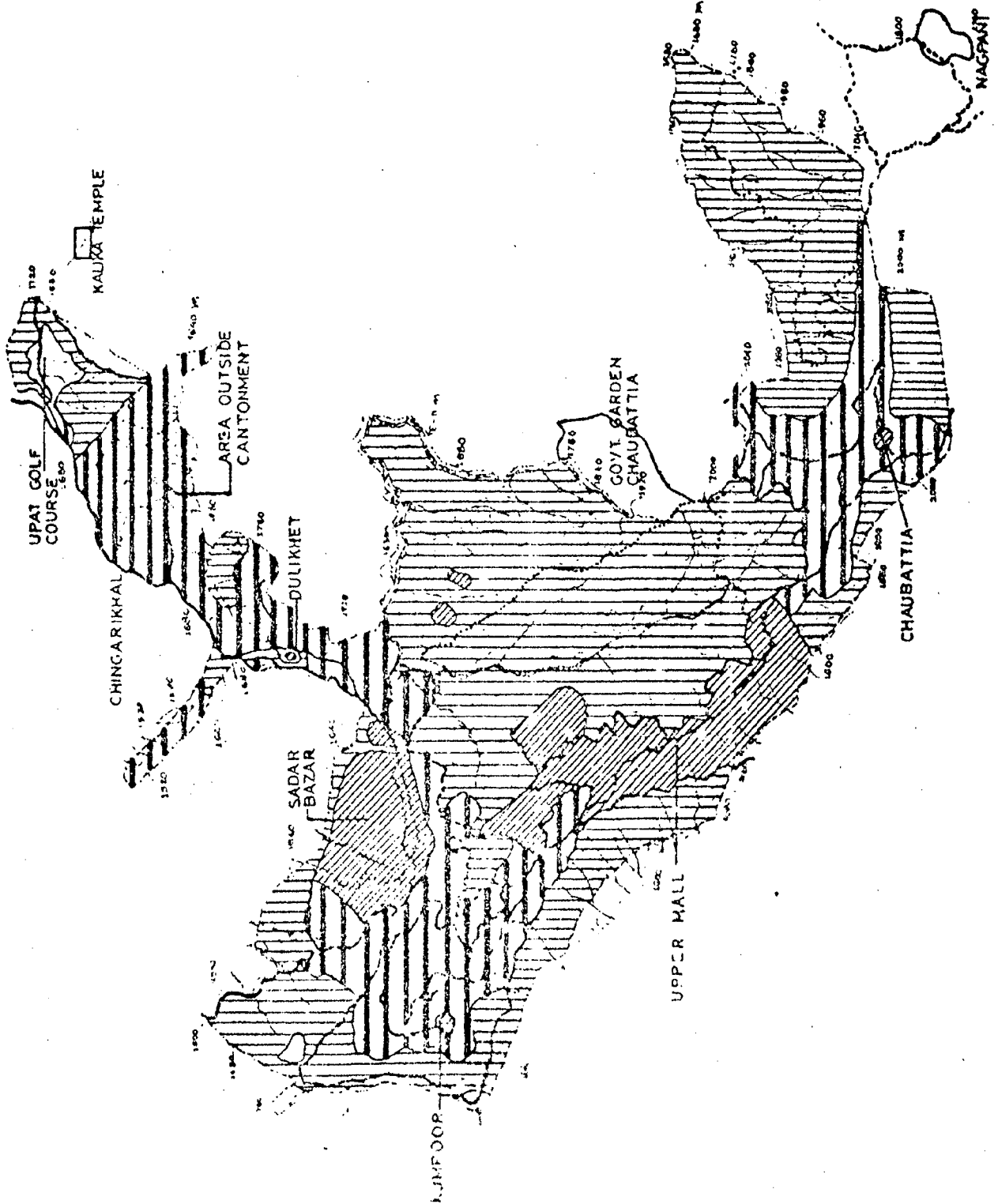
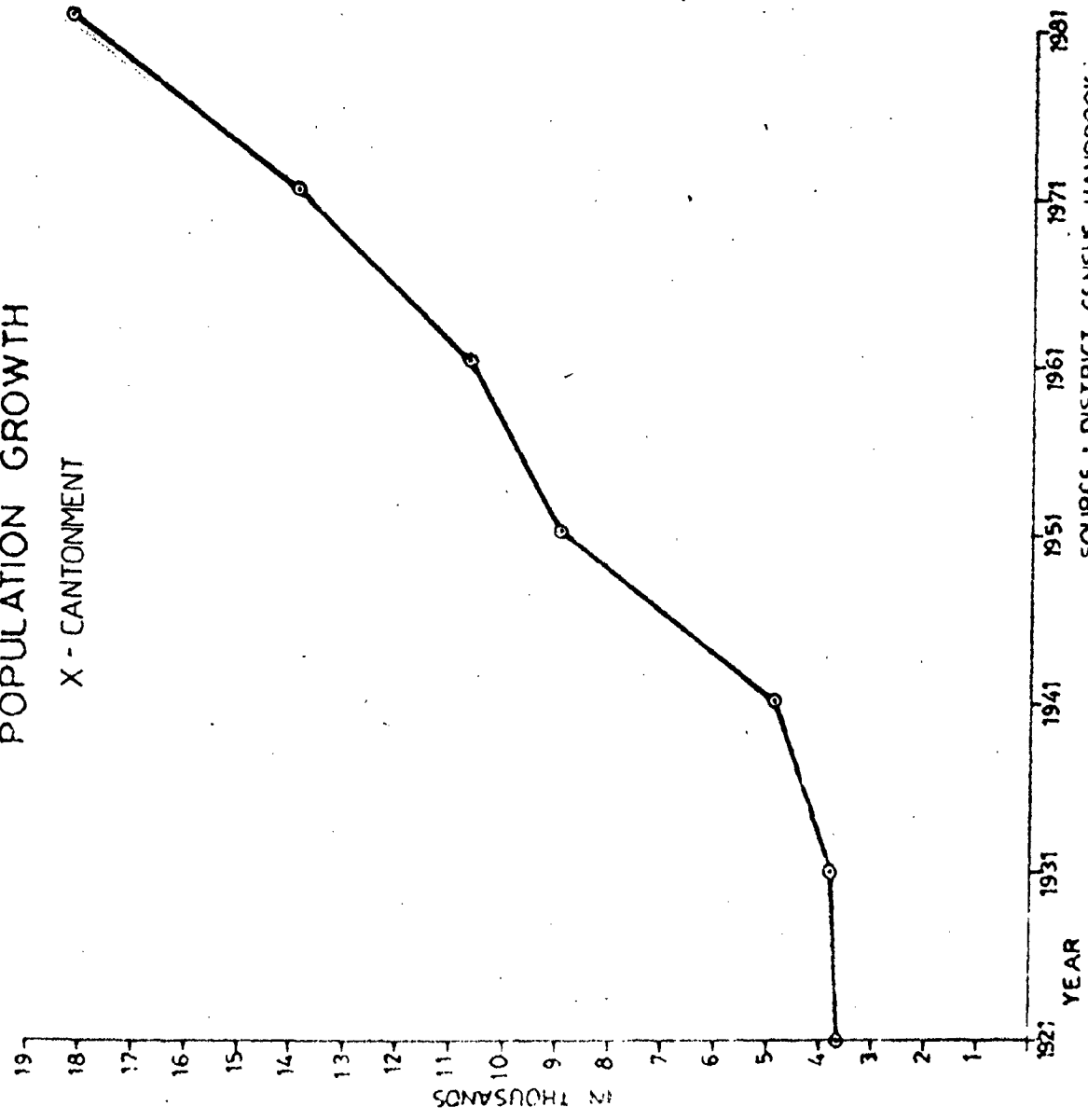


FIG 7A

POPULATION GROWTH

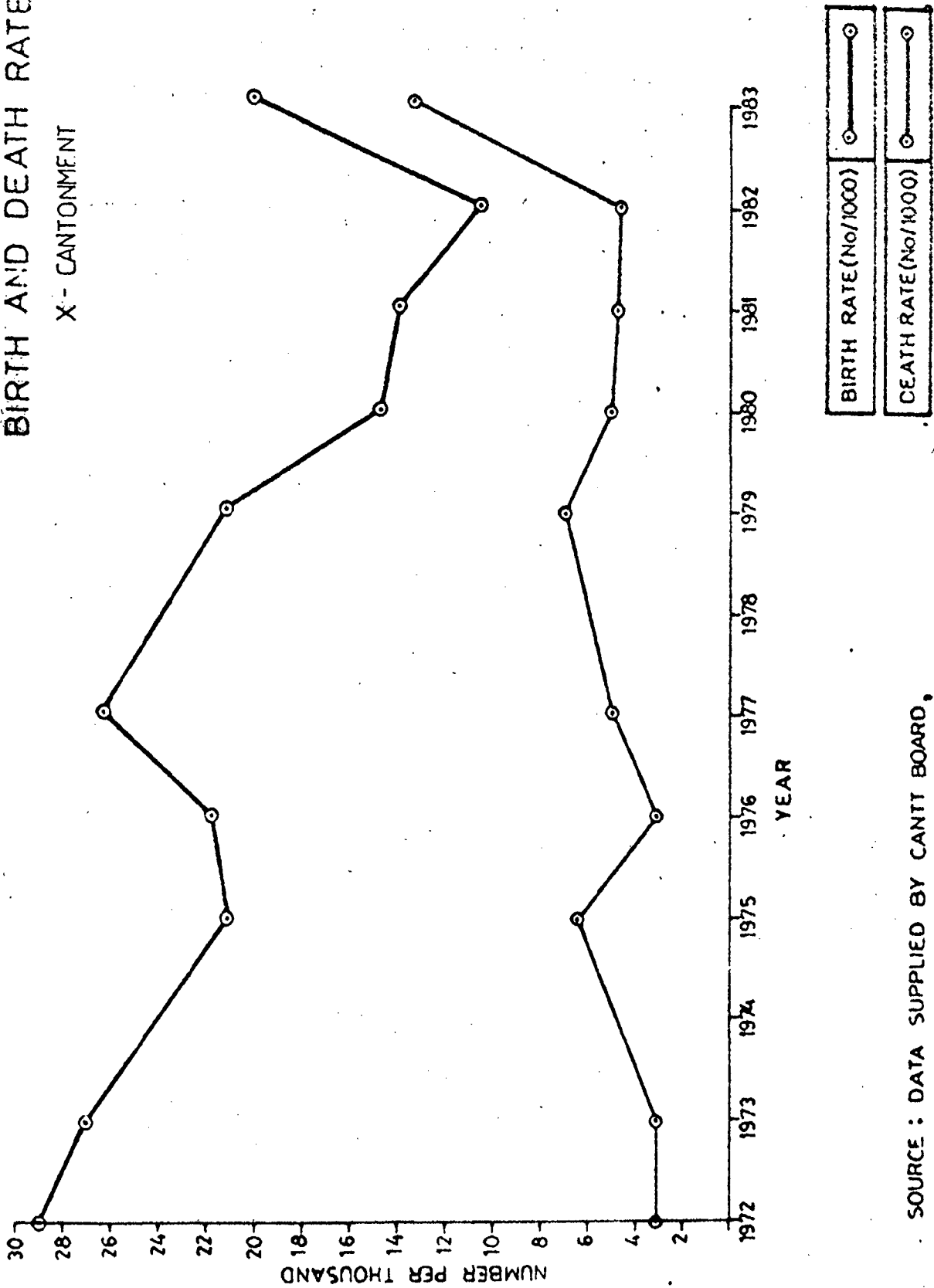
X - CANTONMENT



SOURCE : DISTRICT CENSUS HANDBOOK,

198656  
LIBRARY  
UNIVERSITY OF CALIFORNIA

FIG 7B  
**BIRTH AND DEATH RATES**  
 X - CANTONMENT



SOURCE : DATA SUPPLIED BY CANTT BOARD.

accommodating the families of military personnel according to their rank structure. OTM accommodation is in the form of barrack and Married accommodation is in proper residential buildings wherein stone and other building materials have been deployed for their construction. The roofs are slopy on both sides. Bungalow type accommodation is also existing. The details are given below

|                          |     |           |
|--------------------------|-----|-----------|
| OR's single              | ... | 4683 Nos. |
| OR'S married             | ... | 429 Nos.  |
| Separated families OR's  | ... | 48 Nos.   |
| JCO's single             | ... | 65 Nos.   |
| JCO's married            | ... | 114 Nos.  |
| Officers single          | ... | 28 Nos.   |
| Officers married         | ... | 75 Nos.   |
| Civilian Key Personnel : |     |           |
| Type II                  | ... | 4 Nos.    |
| Type III                 | ... | 4 Nos.    |

### 5.3.3 Roads and Transportation System :

At present three types of roads are existing i.e. P.W.D. Roads, Cantonment Board Roads and MES Roads (Map 10). Total length of Roads are 35 Kms.

|     |                          |     |             |
|-----|--------------------------|-----|-------------|
| (a) | PWD Roads                | ... | 9 Km.s      |
| (b) | Cantonment Board Roads   | ... | 13.855 Kms. |
|     | (i) Pucca                | ... | 2.439 Kms.  |
|     | (ii) Kutcha              | ... | 11.416 Kms. |
| (c) | MES Roads                | ... | 12.155 Kms. |
| (d) | Length of Retaining wall |     | 3.5 Kms.    |

One State bus Stand is located in the Sadar Bazar area. There is also one private bus Stand. These buses are plying only in the regional area. Other source of communication is car, Motor cycle, scooter, Taxi etc. (Map 10).

### 5.3.4 Public Utilities :

#### (a) Water Supply :

The cantonment water supply is provided through the pumping and filtering station. There is a dam at Bhala Nhad to

collect the water and the water is taken by pipes to water works. Other water supply sources are, Rivers and natural springs.

The total water available is 4.5 lacs gallon for the whole cantonment.

Army is using lion share of the available water i.e. 3.0 lacs gallons per day. It comes to 160 litres per head per day. Rest 1.5 lac gallons are being supplied to the civil population at the rate of 50 litres per head per day.

Open and covered water Reservoirs are existing in the Cantt. area. To store the water, overhead Reservoirs are also existing.

(b) Electric Supply :

The demand is met by State Electricity Board and supply of 573 MWatts per month is considered adequate for the needs of the town.

(c) Sewage Disposal :

(i) Water bound system is being deployed in the unit lines, and

(ii) Septic tank system for Married accommodation, and

(iii) Conservancy system in civil areas.

(d) Refuse Disposal :

Rubbish from the Cantonment is removed partly by tractor trollies and partly manually. Night soil is disposed off by burning in Incinerators along with the refuse. About 12% to 15% of the Night soil is disposed off by Tranching composting in trenching grounds.

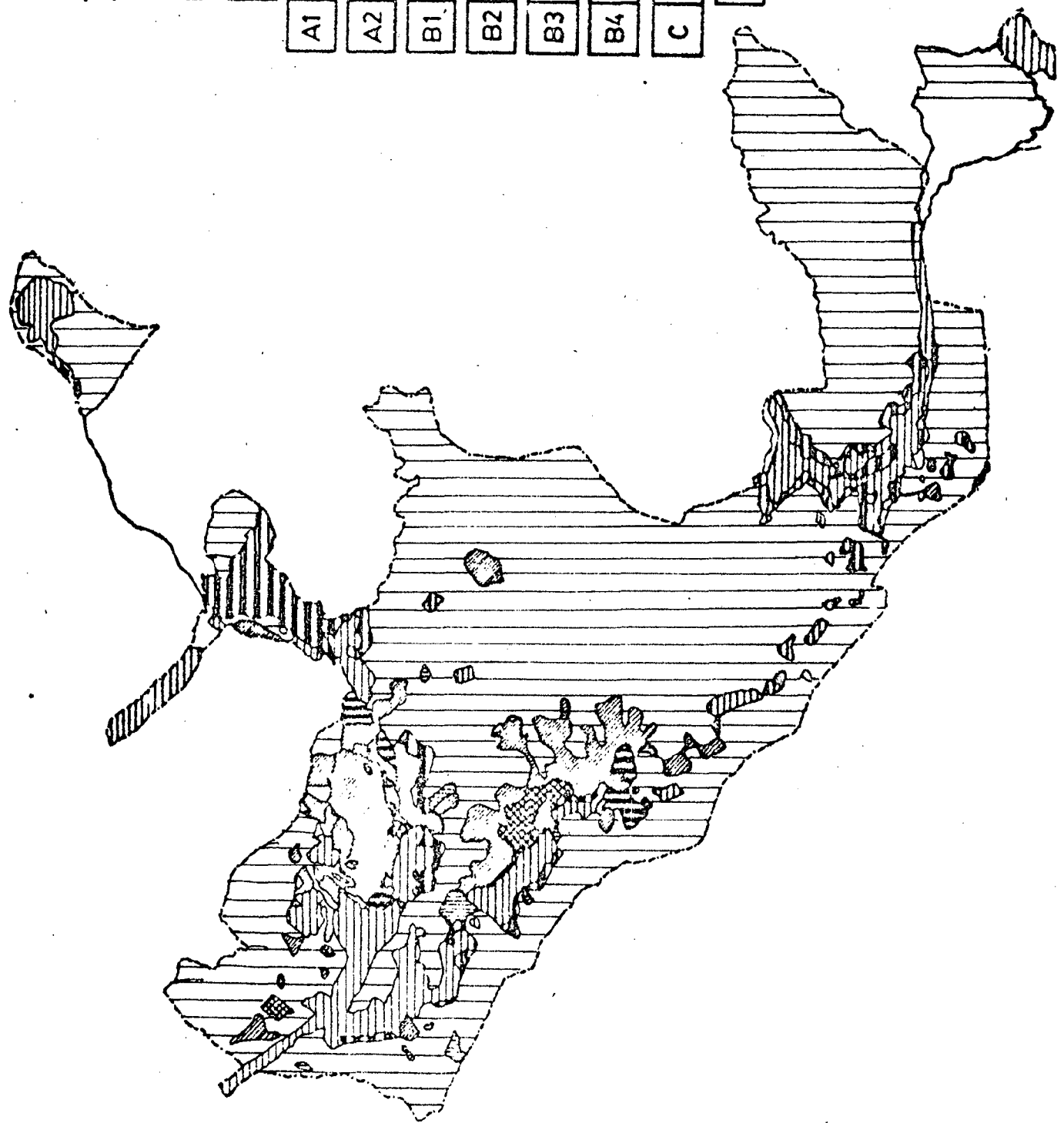
# X-CANTONMENT LAND CLASSIFICATION

## LEGEND

| CLASSIFICATION | NOTATION                                   |
|----------------|--|
| A1             | AN ACTIVE USE OF<br>ARMY ADMINISTRATION    |
| A2             | RESERVED-DEFENCE,<br>ENTRUSTED-MEQ/DEC     |
| B1             | OCCUPIED-CENTL GOVT,<br>OTHER THAN DEFENCE |
| B2             | OCCUPIED BY STATE<br>GOVT.                 |
| B3             | LEASED FOR PRIVATE<br>CONSTRUCTION         |
| B4             | NOT CLASSIFIED<br>(UNBUILDABLE)            |
| C              | OCCUPIED BY<br>CANTONMENT BOARD            |
|                | RANINMET CANTT. LIMIT                      |



5



### 5.3.5 Community Facilities :

Given below is the information regarding the number and kind of community facilities, their spatial distribution is shown in the relevant maps.

#### (i) Educational facilities :

|                               |     |       |
|-------------------------------|-----|-------|
| (a) Nursery School/Montessory | ... | 1 + 3 |
| (b) Primary School            | ... | 7     |
| (c) Higher Secondary School   | ... | 4     |
| (d) College                   | ... | 1     |
| (e) Training School           | ... | 1     |

#### (ii) Health facilities :

|                                |     |             |
|--------------------------------|-----|-------------|
| (a) Dispensaries               | ... | 2           |
| (b) Health Clinics             | ... | 3 (Private) |
| (c) Hospitals                  | ... | 2 + 1       |
| No. of beds : Sitapur Hospital |     | 25          |
| Civil Hospital                 |     | 42          |

#### (d) Military Hospital

#### (iii) Parks and Play grounds :

|                  |     |    |
|------------------|-----|----|
| (a) Parks        | ... | 11 |
| (b) Play grounds | ... | 5  |

#### (iv) Post Office

... 4

#### (v) Bank

... 6

#### (vi) Police Station

... 4

(having four police chowkies at different locations)

#### (vii) Recreation facilities :

|                  |     |   |
|------------------|-----|---|
| (a) Cinema Halls | ... | 3 |
| (b) Clubs        | ... | 3 |
| (c) Library      | ... | 2 |
| (d) Museum       | ... | 1 |

#### (viii) Commercial facilities :

In cantonment area, three military canteens are located at different places to fulfill the requirements of Military Personnel and their families. Annual turnover per month is approx. Rs.6 to 7 lacs. At Unit level also Unit canteens have been provided for the Troops in the barracks.



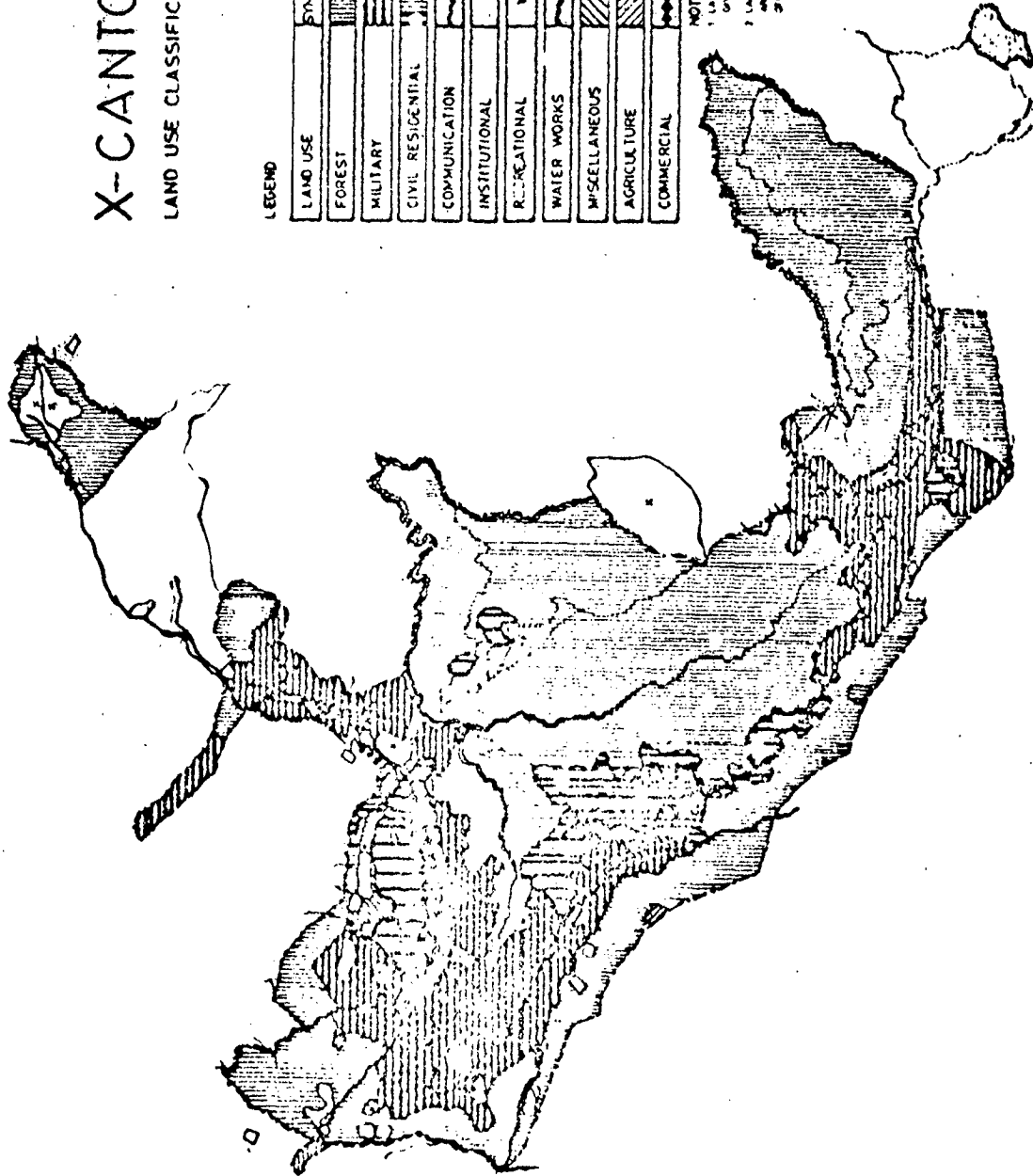
# X-CANTONMENT

## LAND USE CLASSIFICATION

LEGEND

| LAND USE          | SYMBOL | AREA    | %     |
|-------------------|--------|---------|-------|
| FOREST            |        | 5059.62 | 51.42 |
| MILITARY          |        | 332.27  | 19.26 |
| CIVIL RESIDENTIAL |        | 180.73  | 10.45 |
| COMMUNICATION     |        | 68.10   | 3.97  |
| INSTITUTIONAL     |        | 24.90   | 1.46  |
| RECREATIONAL      |        | 22.60   | 1.31  |
| WATER WORKS       |        | 18.15   | 1.11  |
| MISCELLANEOUS     |        | 17.55   | 0.73  |
| AGRICULTURE       |        | 3.70    | 0.21  |
| COMMERCIAL        |        | 1.71    | 0.10  |

NOTE:  
 1. LAND USE AREAS ARE GIVEN IN HECTARES.  
 2. LARGE AREAS OF FOREST ARE LOCATED UNDER OTHER LAND USES ALSO.



6



To meet the requirements of civilians, Sadar Bazar, Main Roads commercial strips are existing and having approx. 493 shops of various sizes from 3 m<sup>2</sup> to 40 m<sup>2</sup>.

#### 5.3.6 Training :

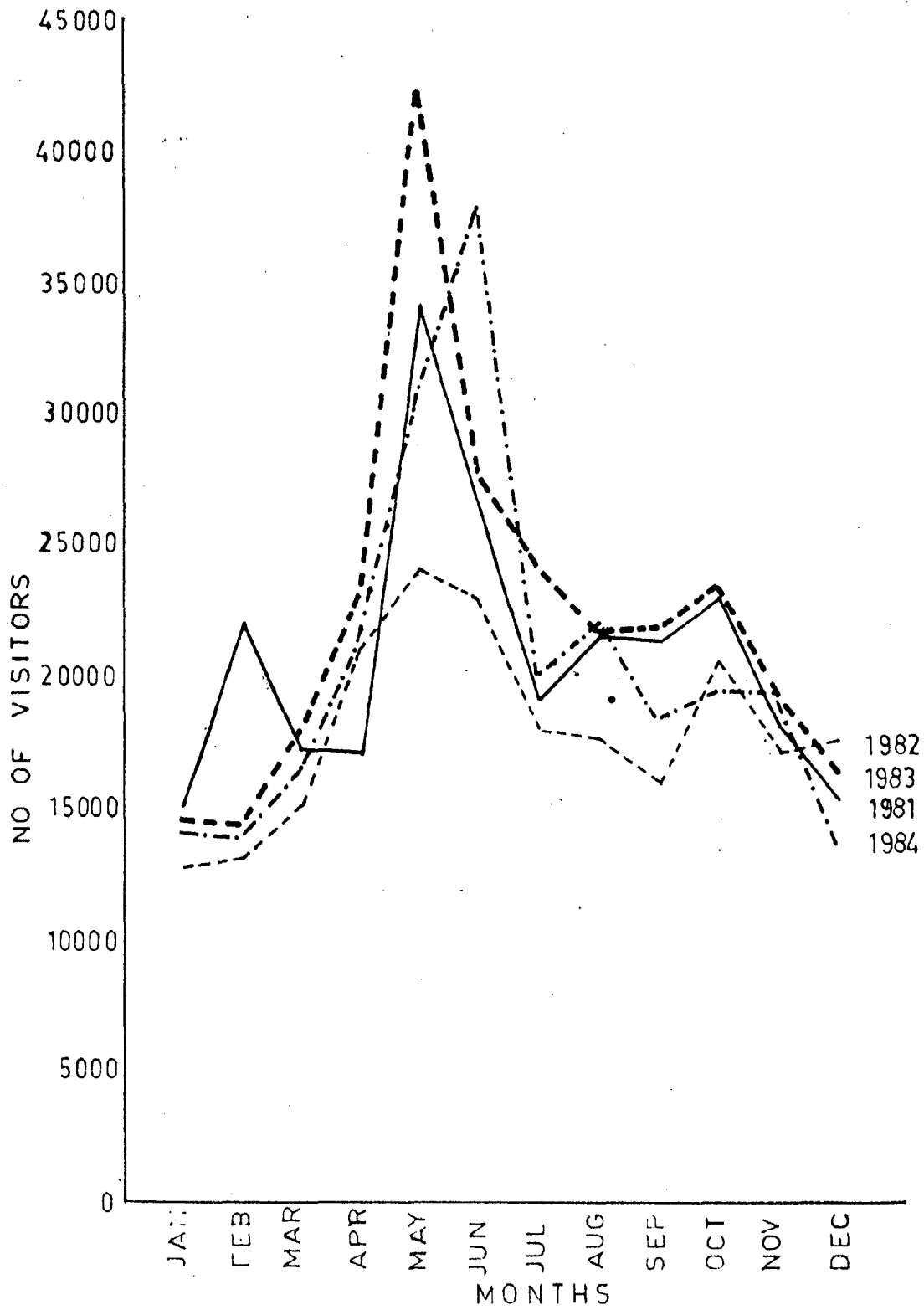
For training of the recruits, and to maintain the physical fitness and professional skills of the trained soldiers, large open areas are required, e.g. Parade Ground, Play fields, Training Ground etc. To get a large flat area in the hills is a problem. So to provide them these as training areas, lot of deforestation and grading of land is required.

#### 5.3.7 Firing Ranges :

Firing Ranges are one of the most important requirement of the Infantry Regimental centres and cantonments. Perfectness in aiming and firing, provides the confidence in war, to the soldiers. So to perform the exact drills of firing ranges and to create the environment, proper dimension of firing Ranges are required. But this much flat area is not available in the hills. So the units are using the foot hills for conducting the firing practices, which is a part of routine training and goes on, round the year, which is destroying the foot hills and chances of land slides are more. Secondly aesthetically also these patches are looking very bad. As these hill firing areas are not of any standard, it is difficult to demarcate the danger zone. Stray bullets can cause casualty in the nearby areas. Noise is another cause of pollution in the firing practices. No doubt soldiers will have to be used to this noise as they will be fighting wars in the worst conditions. But their families and nearby communities will be disturbed by these untimely rounds and noises. Sometimes

FIG 9.

# VISITORS INFLUX



the blast of big guns creates vibration in the window panes, doors and building also, which reduces the life of structures in their vicinity.

#### 5.3.8 Sewage Disposal :

No sanitation system is existing in the hills. As the effluents coming out will be flowing down the hills without any control. Since on the lower slopes human habitation is existing, it can harm their health and environment. Increase in population will increase the sewage also, thus causing land and water pollution.

#### 5.3.9 Traffic :

Due to the army establishment unit number of vehicles per 1000 person in hilly areas figures out to be much higher than otherwise in the normal conditions. Although number of vehicles plying on the roads is lower when compared to the plains, nevertheless, the maintenance of hill roads at regular intervals becomes much more urgent due to frequent land slides and the need to clear precipitation.

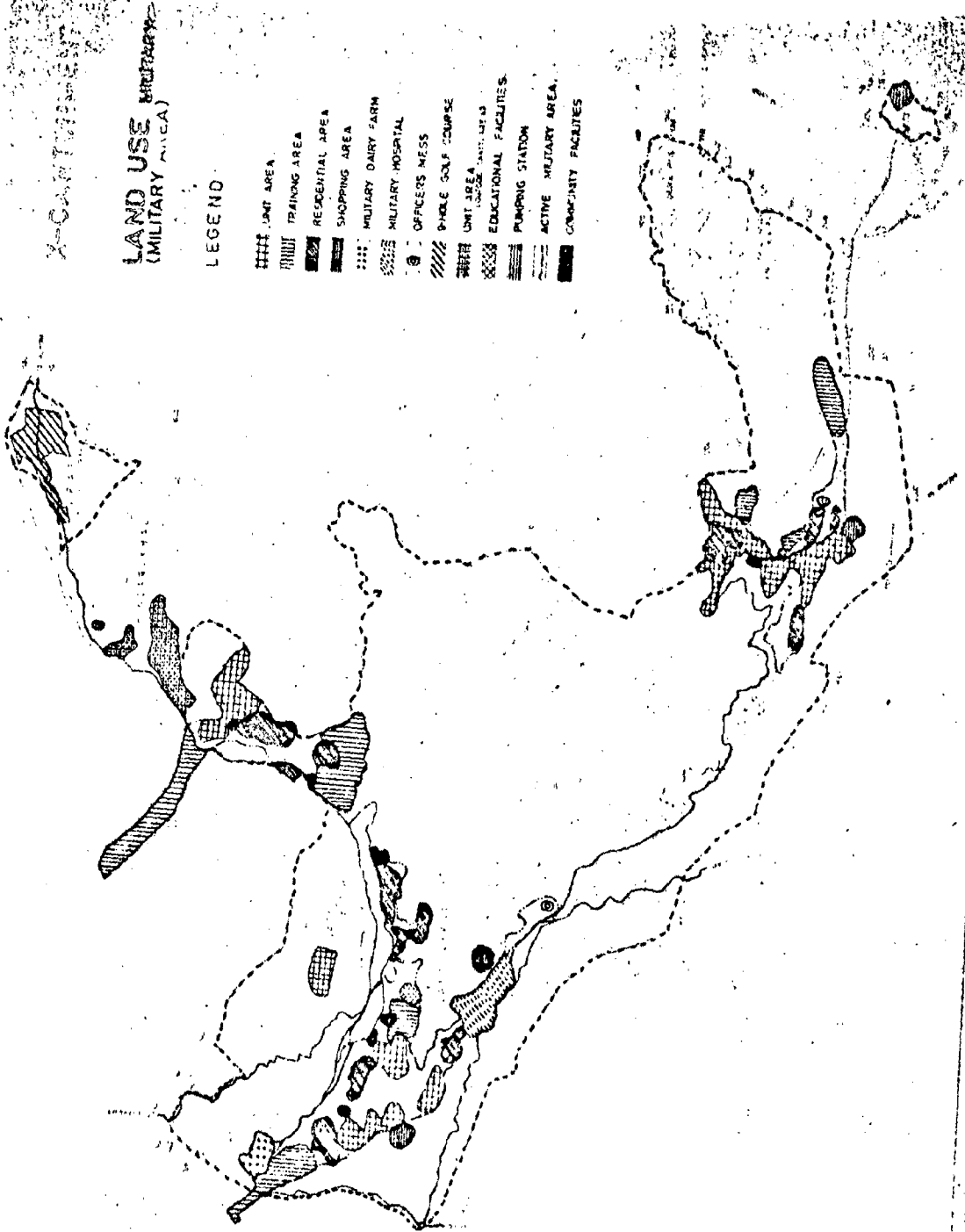
#### 5.3.10 Tourist Activity :

No doubt it is tourist resort, but secret nature of Army activities do not go together. Secondly large part of public utilities are being used by the tourist e.g. water. Civil population is already having less water i.e. 50 litres per head per day which is very less according to the standards. In summers there is further strain due to increased demand and additional population. From Tourist curve (Fig. 10) it can be seen that on the


LAND USE (MILITARY MILICA)

LEGEND

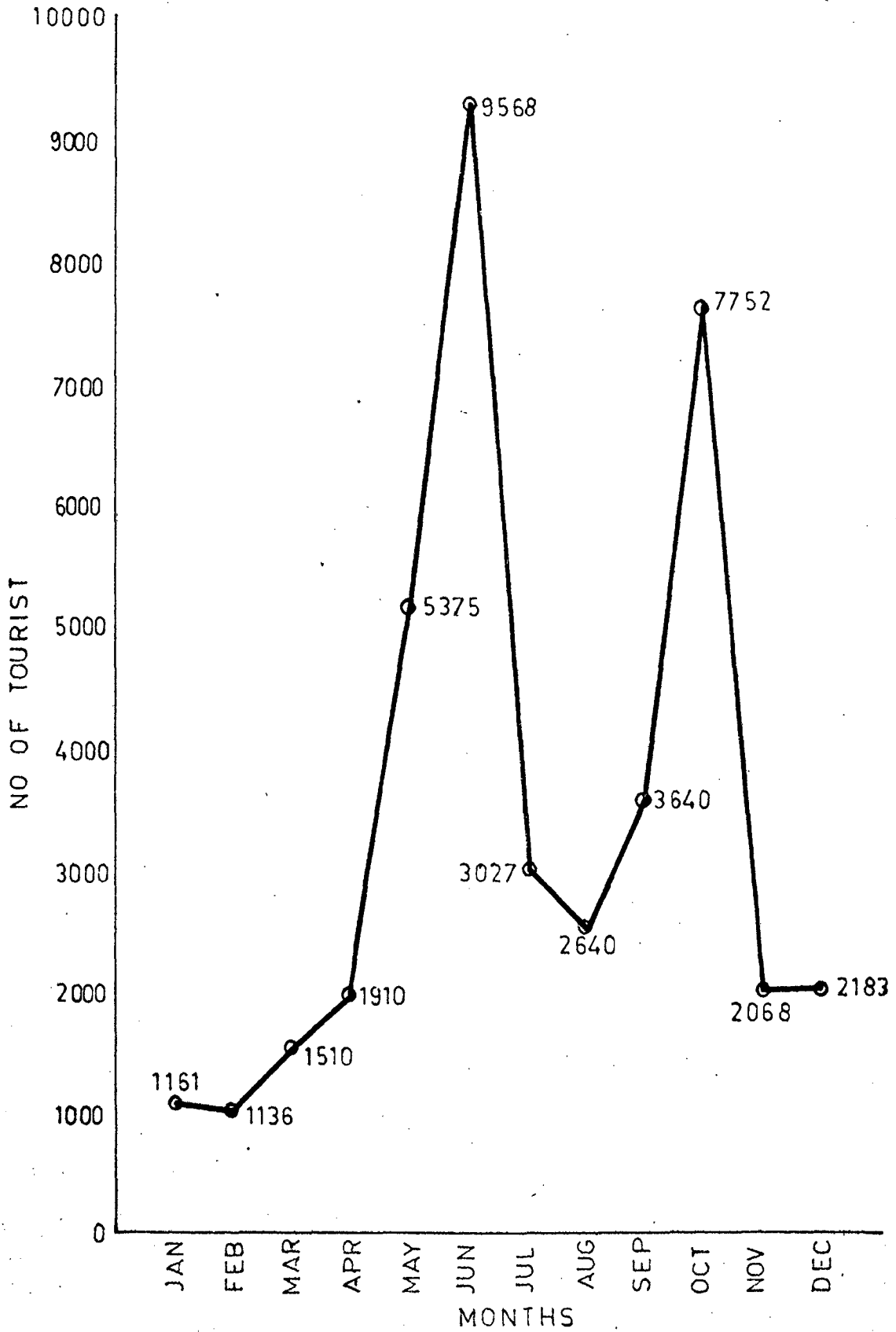
- #### UNIT AREA
- ||||| TRAINING AREA
- ▨ RESIDENTIAL AREA
- ▩ SHOPPING AREA
- ▧ MILITARY DAIRY FARM
- ▦ MILITARY HOSPITAL
- ⊙ OFFICERS MESS
- ▨ HOLE GOLF COURSE
- ▧ UNIT AREA
- ▦ EDUCATIONAL FACILITIES
- ▩ PUMPING STATION
- ▨ ACTIVE MILITARY AREA
- ▩ COMMUNITY FACILITIES



PHYSICAL PLANNING STANDARDS FOR CANTONMENTS  
 IN HILLY TERRAIN


 INDIAN INSTITUTE OF PLANNING AND MANAGEMENT  
 DEPARTMENT OF ARCHITECTURE  
 UNIVERSITY OF DELHI

# TOURIST INFLUX IN 1984





average 175 tourist are coming to this city every day, and in the month of June 84 it had gone upto 319 tourists per day, and Oct. 84 it was 250 tourists per day (Appx. 6).

#### 5.4 Local Self Government :

Station Commander is the Chairman of Cantt. Board. Cantonment Executive Officer is the administrative head of the Cantt. Board. At present Cantt. is having status of Class II cantonment having a total membership of 14 as follows :

- (a) Elected Members - 7
- (b) Ex-Officio Members - 3
- (c) Nominated Members - 4

For the smooth running of administration and for election purposes the cantonment has been divided into six wards. Ward wise areas and population is given below in Table No. 4

Table-4

#### Ward wise population & Density

| Ward No. | Area (H.A.) | Population | Density |
|----------|-------------|------------|---------|
| 1        | 8.8         | 1461       | 166.3   |
| 2        | 192.0       | 3712       | 19.2    |
| 3        | 28.0        | 2159       | 76.9    |
| 4        | 23.1        | 1952       | 84.5    |
| 5        | 1118.5      | 6033       | 5.4     |
| 6        | 353.7       | 2873       | 8.1     |

Overall density of the cantonment is 4.2 person/Acre.

Ward No.1 is densely populated and Ward No.6 is thinly populated. (Map. 8).

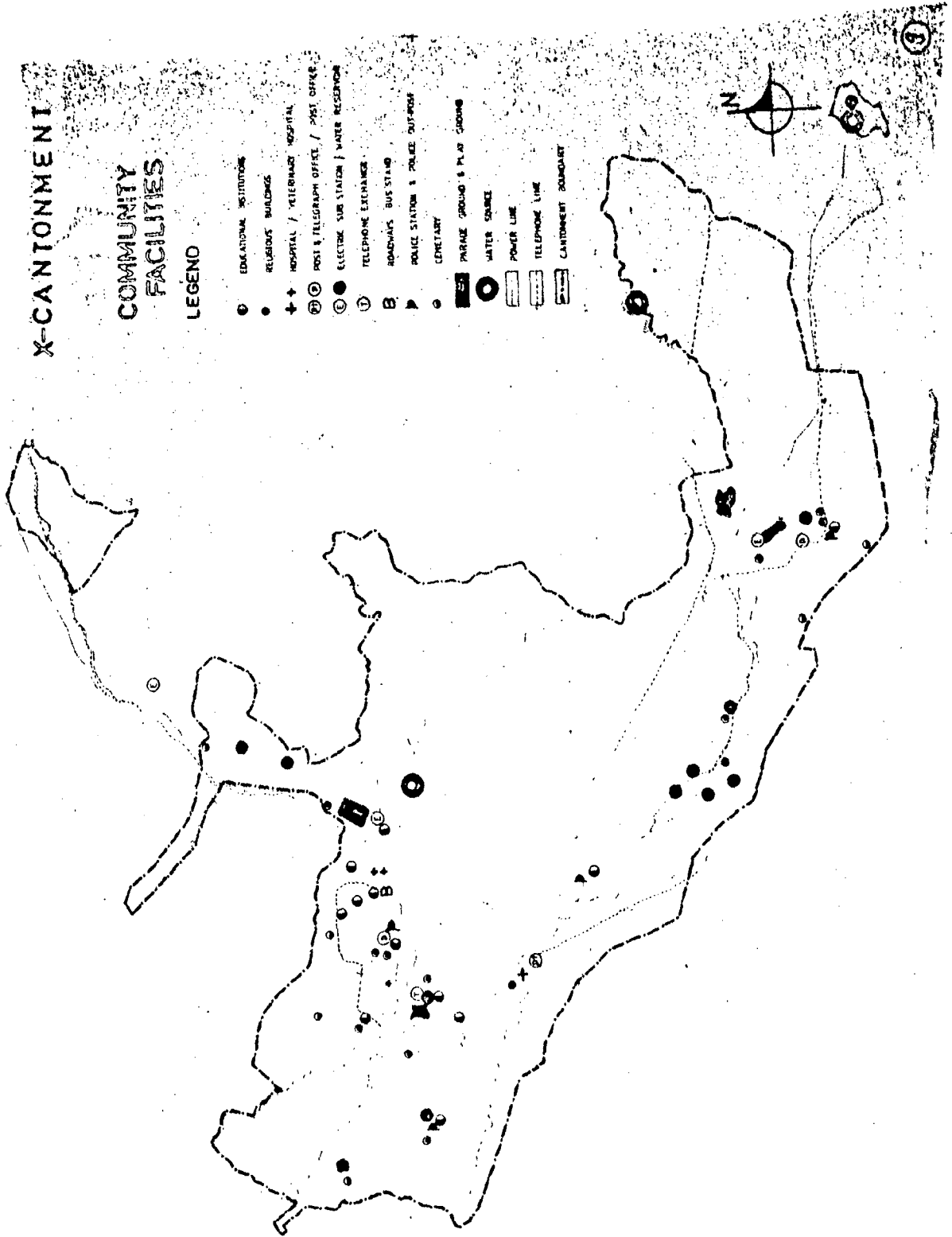


# X-CANTONMENT

## COMMUNITY FACILITIES

### LEGEND







- EDUCATIONAL INSTITUTIONS
- RELIGIOUS BUILDINGS
- + HOSPITAL / VETERINARY HOSPITAL
- Ⓜ POST & TELEGRAPH OFFICE / POST OFFICE
- Ⓢ ELECTRIC SUB STATION / WATER RESERVOIR
- Ⓣ TELEPHONE EXCHANGE
- B ROADWAYS BUS STAND
- Ⓜ POLICE STATION & POLICE OUTPOST
- CEMETARY
- Ⓜ PARADE GROUND & PLAY GROUNDS
- WATER SOURCE
- POWER LINE
- TELEPHONE LINE
- CANTONMENT BOUNDARY



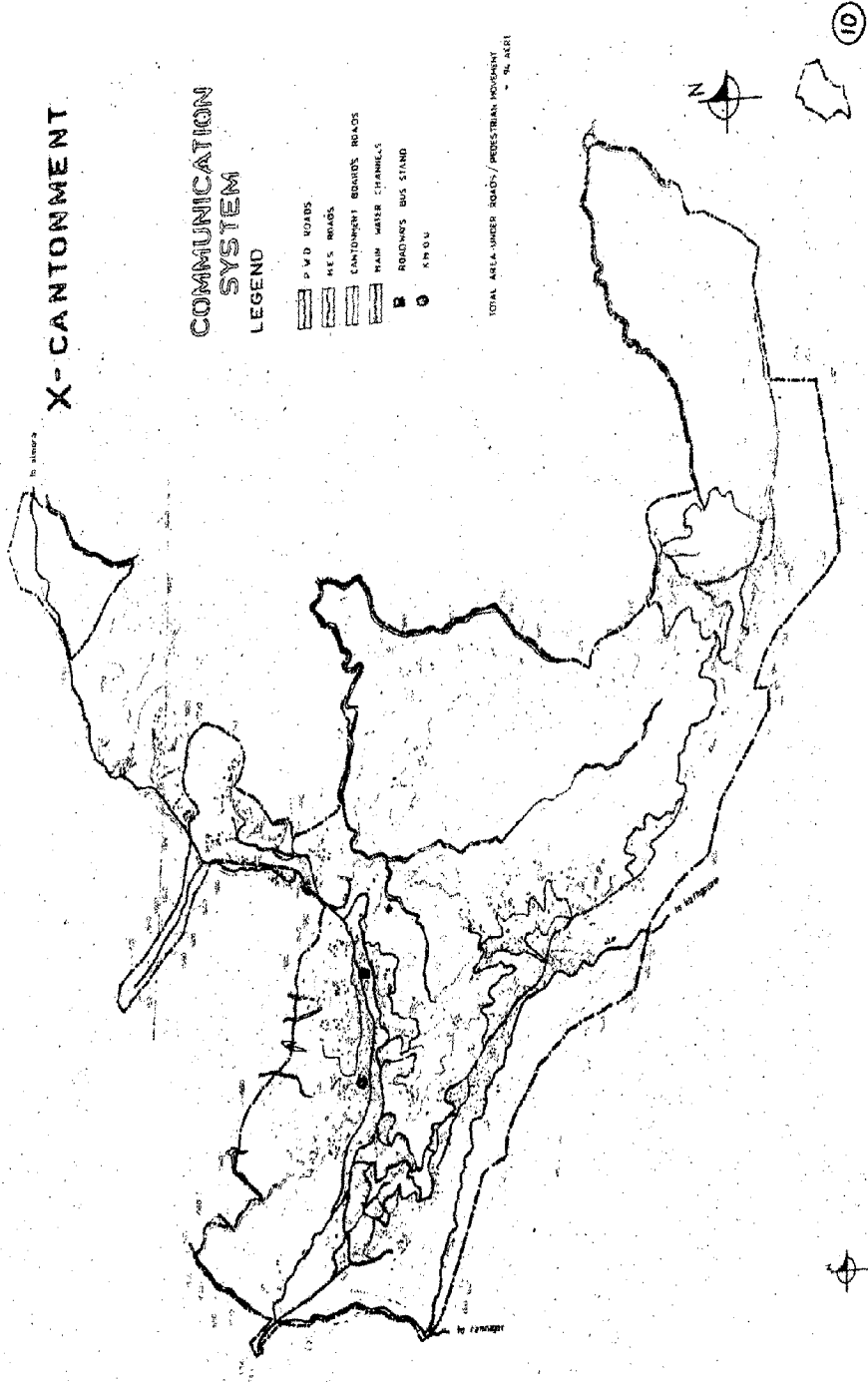
3

# X-CANTONMENT

## COMMUNICATION SYSTEM LEGEND

-  P.W.D. ROADS
-  M.E.S. ROADS
-  CANTONMENT BOUNDARY ROADS
-  MAIN WATER CHANNELS
-  REGIONAL BUS STAND
-  K.M.P.U.

TOTAL AREA UNDER ROADS / PAVED / UNPAVED



### 5.5 Land Use Configuration :

X-Cantonment is a cantonment town in the hilly area having maximum area covered by forest. Second priority goes to the military area, which is used for accommodating the military population, Training etc. Supporting civil population is also part of the town. In Table 5 the areas for different land uses with % of total area has been discussed.

Table -5

Existing Land use of X-Cantonment

| S. No.                     | Land Use           | Area in H.A. | % of Developed Area | % of Total Area |
|----------------------------|--------------------|--------------|---------------------|-----------------|
| 1.                         | Military           | 332.27       | 50.28               | 19.26           |
| 2.                         | Civil Residential  | 180.23       | 27.23               | 10.44           |
| 3.                         | Communication      | 68.40        | 10.33               | 3.96            |
| 4.                         | Institutional      | 24.80        | 3.74                | 1.43            |
| 5.                         | Recreational       | 22.60        | 3.41                | 1.31            |
| 6.                         | Water Works        | 19.15        | 2.89                | 1.11            |
| 7.                         | Miscellaneous      | 12.55        | 1.89                | 0.72            |
| 8.                         | Commercial         | 1.74         | 0.23                | 0.10            |
| TOTAL                      |                    | 661.74       | 100                 | 38.37           |
| 9.                         | Agriculture forest | 3.64         | -                   | 0.21            |
| 10.                        | Forest             | 1059.62      | -                   | 61.42           |
| Total Forest & Agriculture |                    | 1063.32      | -                   | 61.63           |
| TOTAL AREA                 |                    | 1725.06 H.A. | -                   | 100             |

Source : Based on Field Survey, Cantt. Board & GE X-Cantonment

The above land use configuration set the priorities of different land uses in the Cantonment. The total area of X-Cantonment is 1725.06 H.A. An area of 1059.62 H.A. is covered

by forests. It is more than 2/3rd of the total area. Military activities gets the first priority as it is a cantonment, which is covering 322.27 H.A. The details of the area is given separately (Table -6) in this chapter. As the supporting civil population is 11049 in the Cantonment. Residential area for them is at the third number occupying 180.23 H.A. Then Communication, Institutional, Recreational, water works, Miscellaneous, Agriculture and Commercial activities are as given in the following table .

Table -6

Existing Land use Military Areas

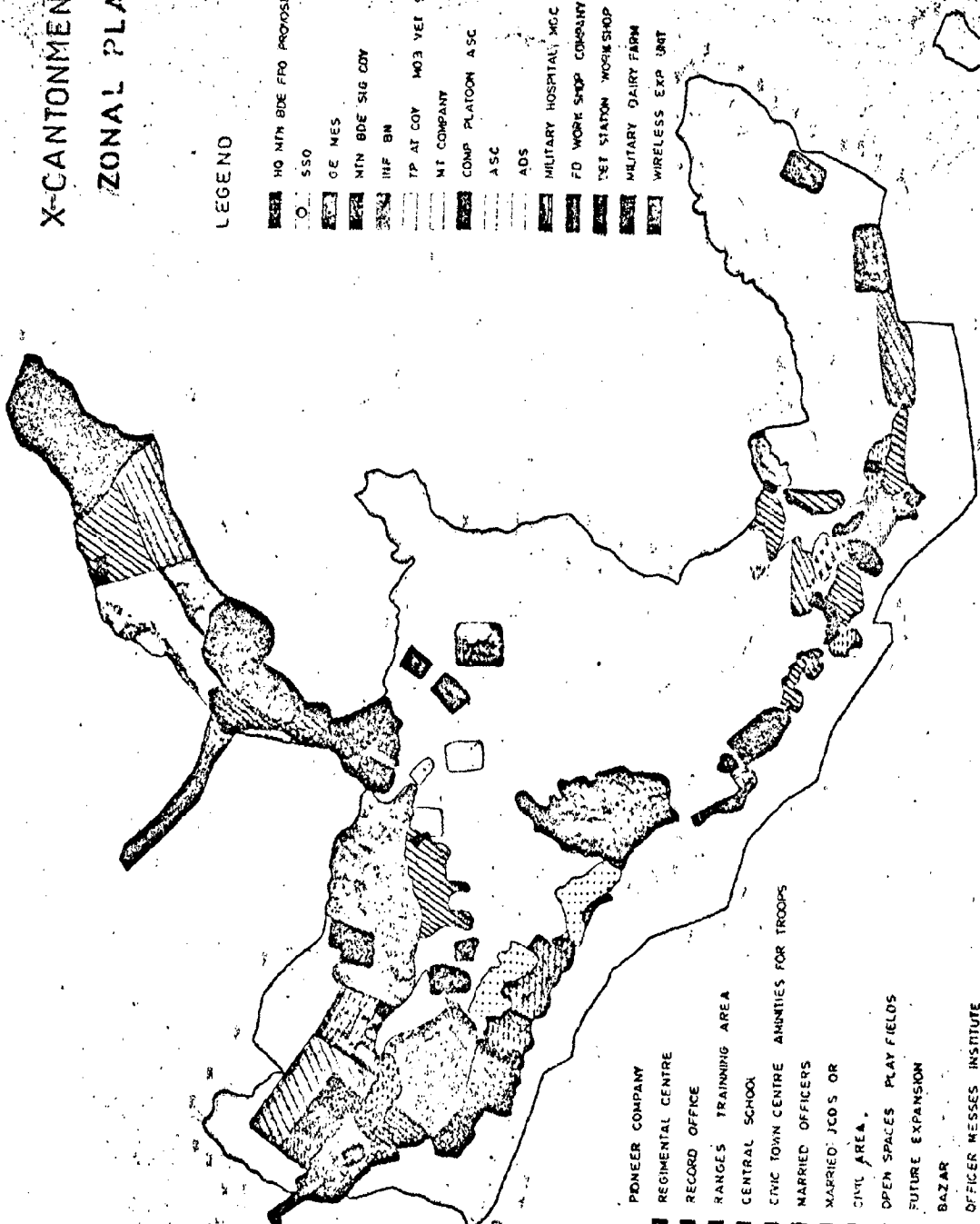
| Sl. No. | Land Use             | Area H.A. | % of Total Military Area |
|---------|----------------------|-----------|--------------------------|
| 1.      | Unit Area            | 71.4      | 21.5                     |
| 2.      | Training Area        | 63.7      | 19.2                     |
| 3.      | Residential Area     | 33.9      | 10.2                     |
| 4.      | Circulation          | 24.6      | 7.4                      |
| 5.      | Golf Course          | 19.8      | 6.2                      |
| 6.      | Community facilities | 14.6      | 4.3                      |
| 7.      | Health               | 11.2      | 3.4                      |
| 8.      | Commercial           | 10.5      | 3.2                      |
| 9.      | Officers' Mess       | 6.4       | 1.9                      |
| 10.     | Dairy Farm           | 4.8       | 1.4                      |
| 11.     | Educational          | 2.5       | 0.7                      |
| 12.     | Public Utilities     | 1.7       | 0.5                      |
| 13.     | Others               | 57.17     | 17.8                     |

The detail distribution of Military Area is very important to understand the military activities. The Unit area

# X-CANTONMENT ZONAL PLAN

## LEGEND

- HO NTH BDE FRO PROPOST OL SEC
- SSO
- GE MES
- NTH BDE SIG COY
- IHF BN
- TP AT COY MO3 YET SEC
- MT COMPANY
- COMP PLATOON A SC
- A SC
- ADS
- MILITARY HOSPITAL, MDC SHO
- FD WORK SHOP COMPANY
- YET STATION WORK SHOP
- MILITARY DAIRY FARM
- WIRELESS EXP UNIT



- PIONEER COMPANY
- REGIMENTAL CENTRE
- RECORD OFFICE
- RANGES TRAINING AREA
- CENTRAL SCHOOL
- CIVIC TOWN CENTRE AMENITIES FOR TROOPS
- MARRIED OFFICERS
- MARRIED JCO'S OR
- CIVIL AREA
- OPEN SPACES PLAY FIELDS
- FUTURE EXPANSION
- BAZAR
- OFFICER MESSES INSTITUTE
- UNBUIDABLE

GENERAL PLANNING STANDARDS FOR CANTONMENTS  
AND OTHER ENVIRONS IN MILITARY TERRITORY

A

works upto 71.4 H.A. (21.5%) of Military area. Unit area consists of Barrack blocks including Sanitary conveniences, Cook houses and Dining Hall for single Army personnel. For training the recruits/soldiers 63.7 H.A. (19.2%) area is existing at present. Residential accommodation for troops and officers is 33.9 H.A. (10.2%). Circulation covers 24.6 H.A. (7.4%) of the total area. Then subsequently other landuses are also having their areas. Golf course is the main attraction of the cantonment covering up 19.8 H.A. (6.2%) of Military area. In Military area forest/open area/unbuildable land takes up 57.17 H.A. (17.8%) of the Military area.

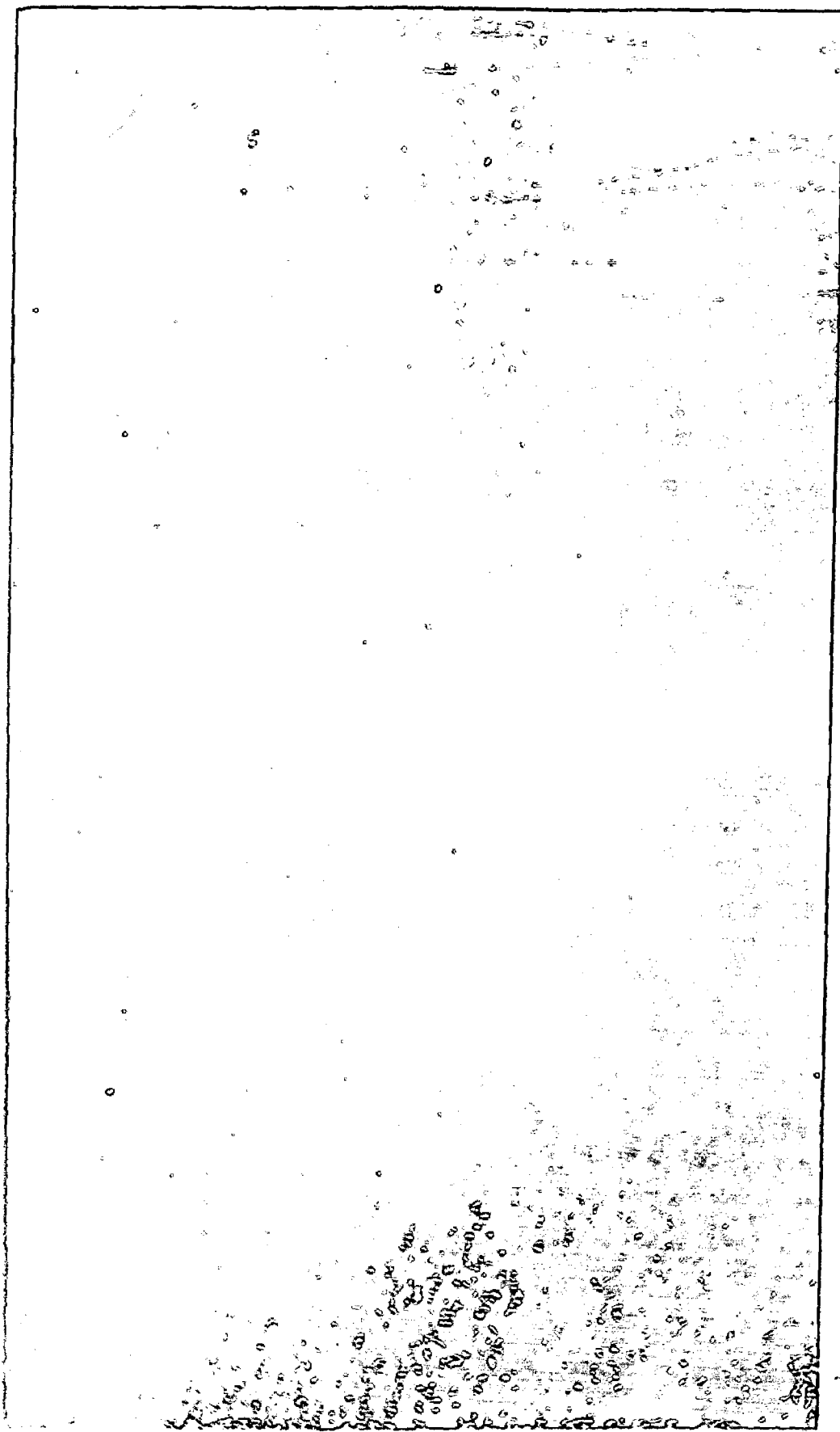
## 5.6.

## PHOTOGRAPHIC STUDY OF X-CANTONMENT

- (a) Rock and Terrain structure.
- (b) Existing Environment.
- (c) Civil Housing.
- (d) Military Area
- (e) Training Activities

# ROCK AND TERRAIN STRUCTURE



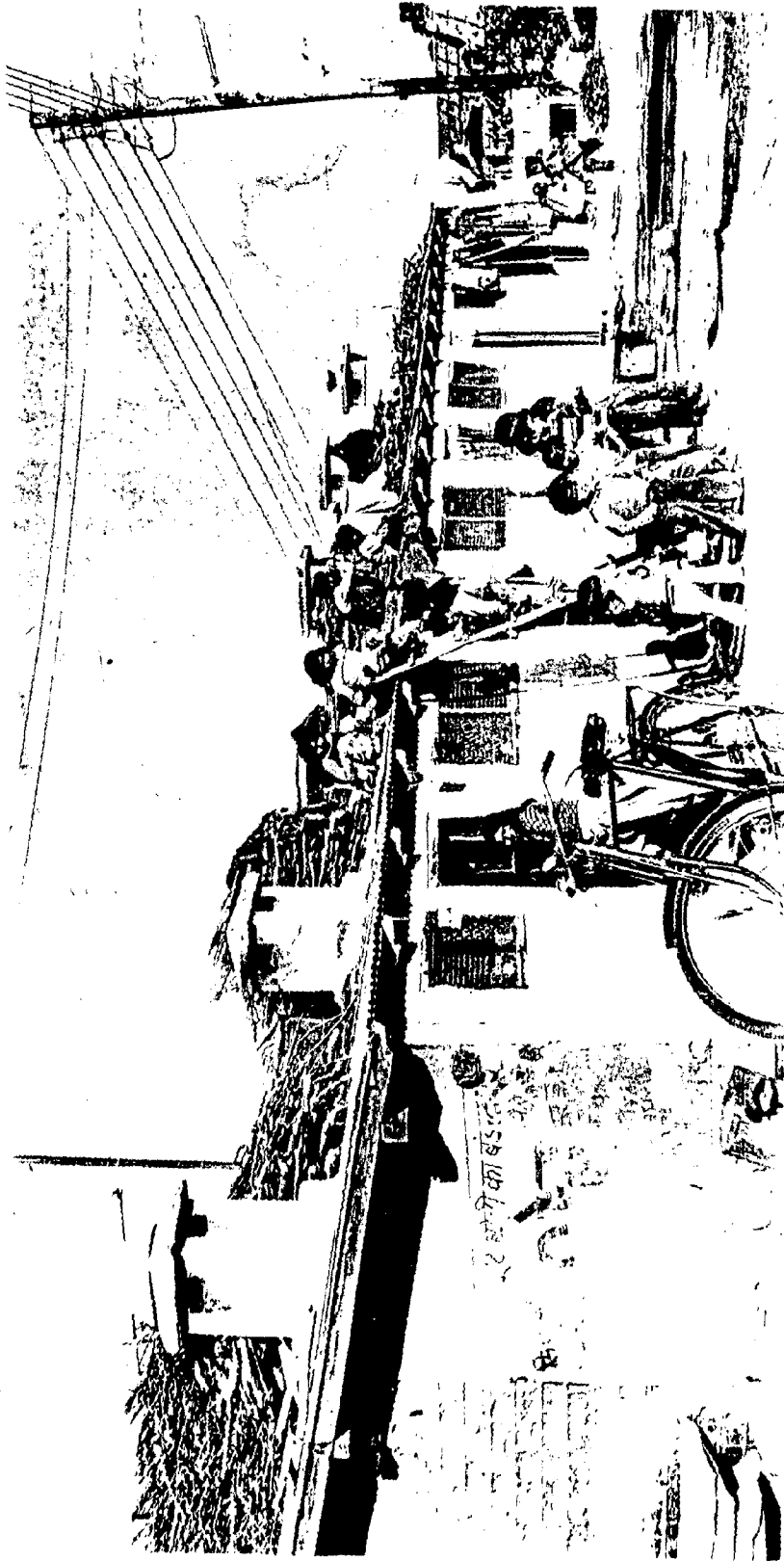


Agricultural terraces to be preserved at all costs

EXISTING ENVIRONMENT



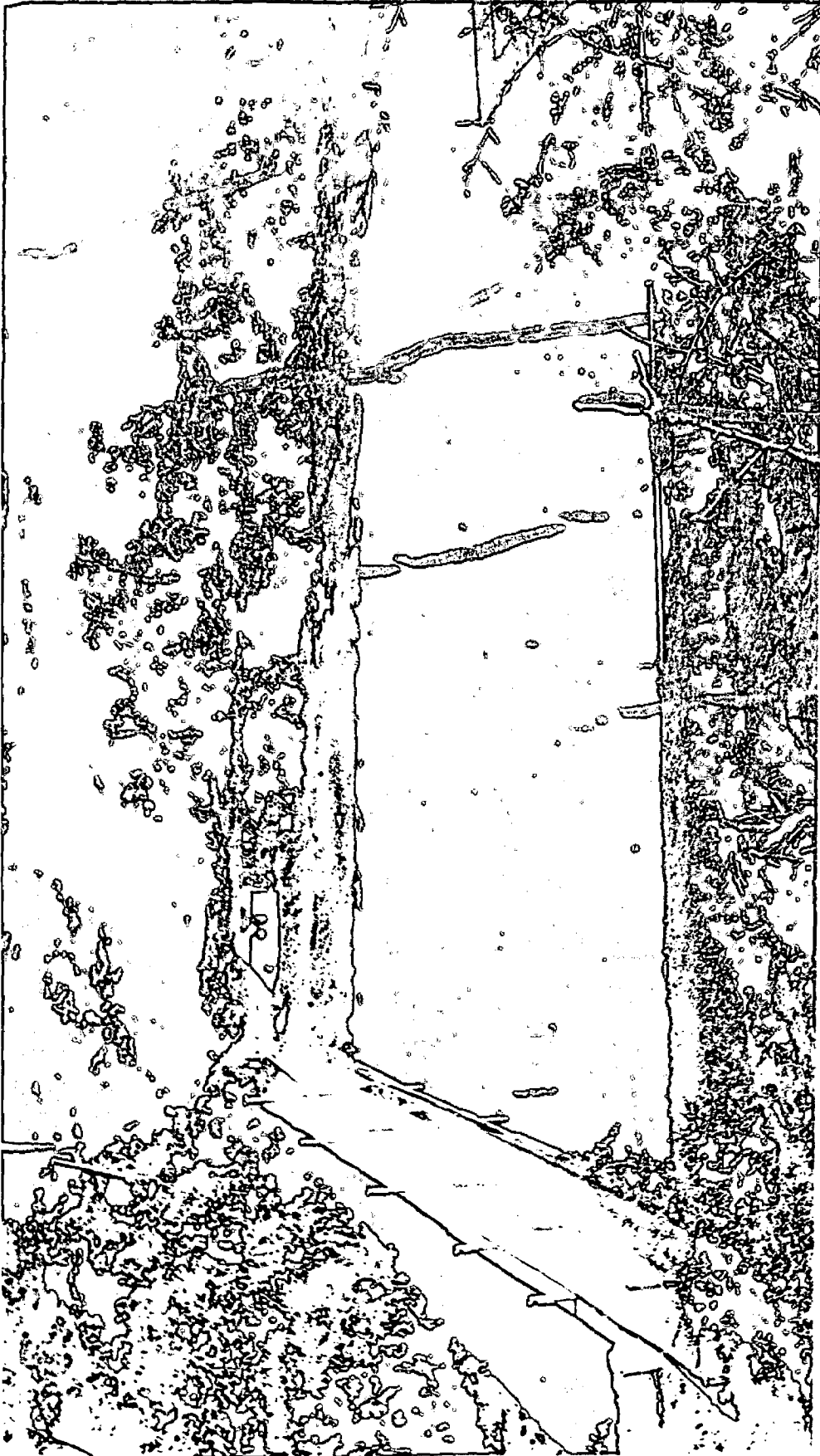
Market Scene - Urban & Rural character; place of interaction and bargaining



Deforestation - Collection and stocking of fire wood for the winter season, activates the deforestation activity



State Bus Stand - No place for parking the buses and no place for the passengers to sit at the time of inclement weather



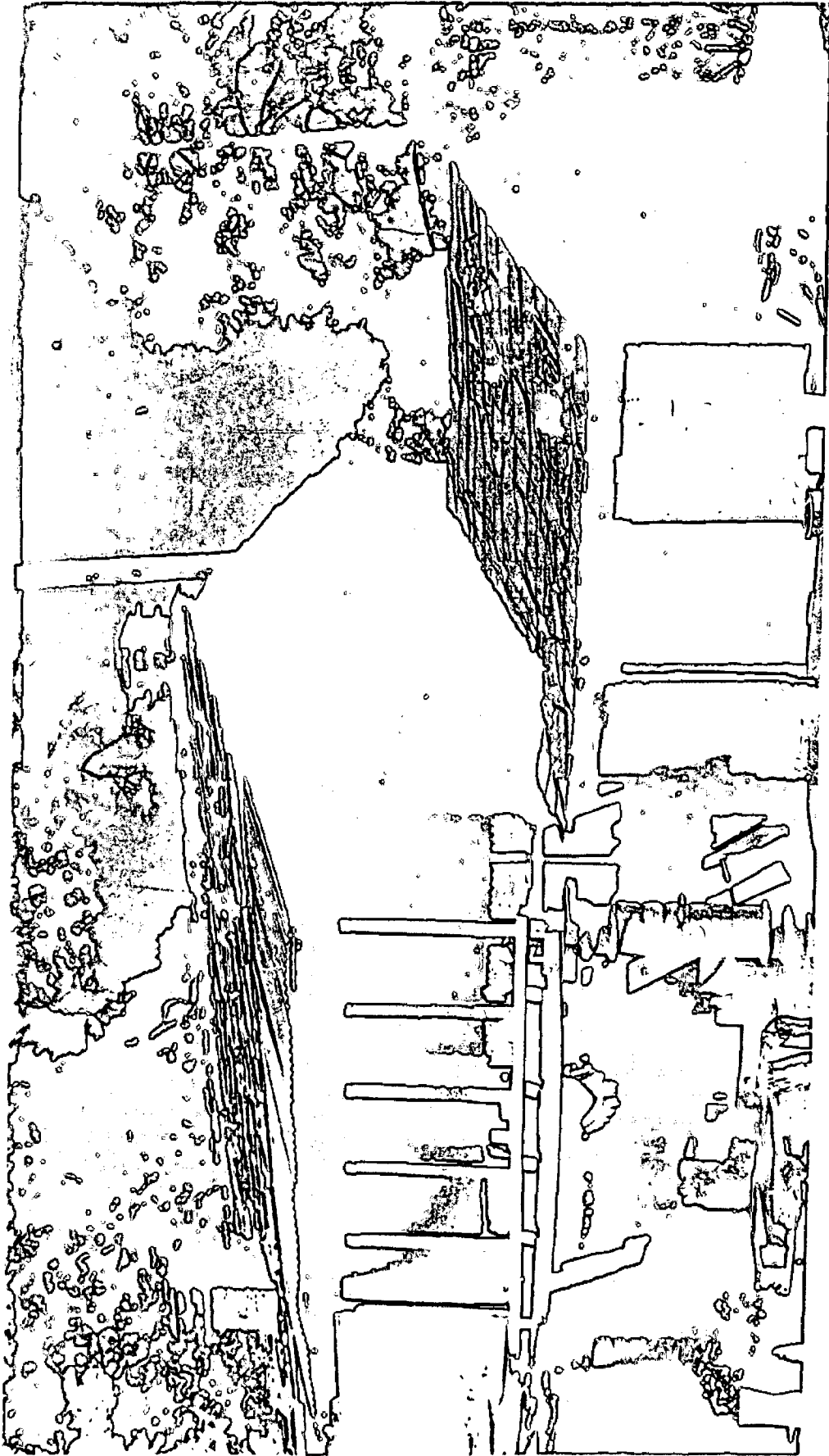
Condition of open water reservoir tells the story of water supply in the cantonment



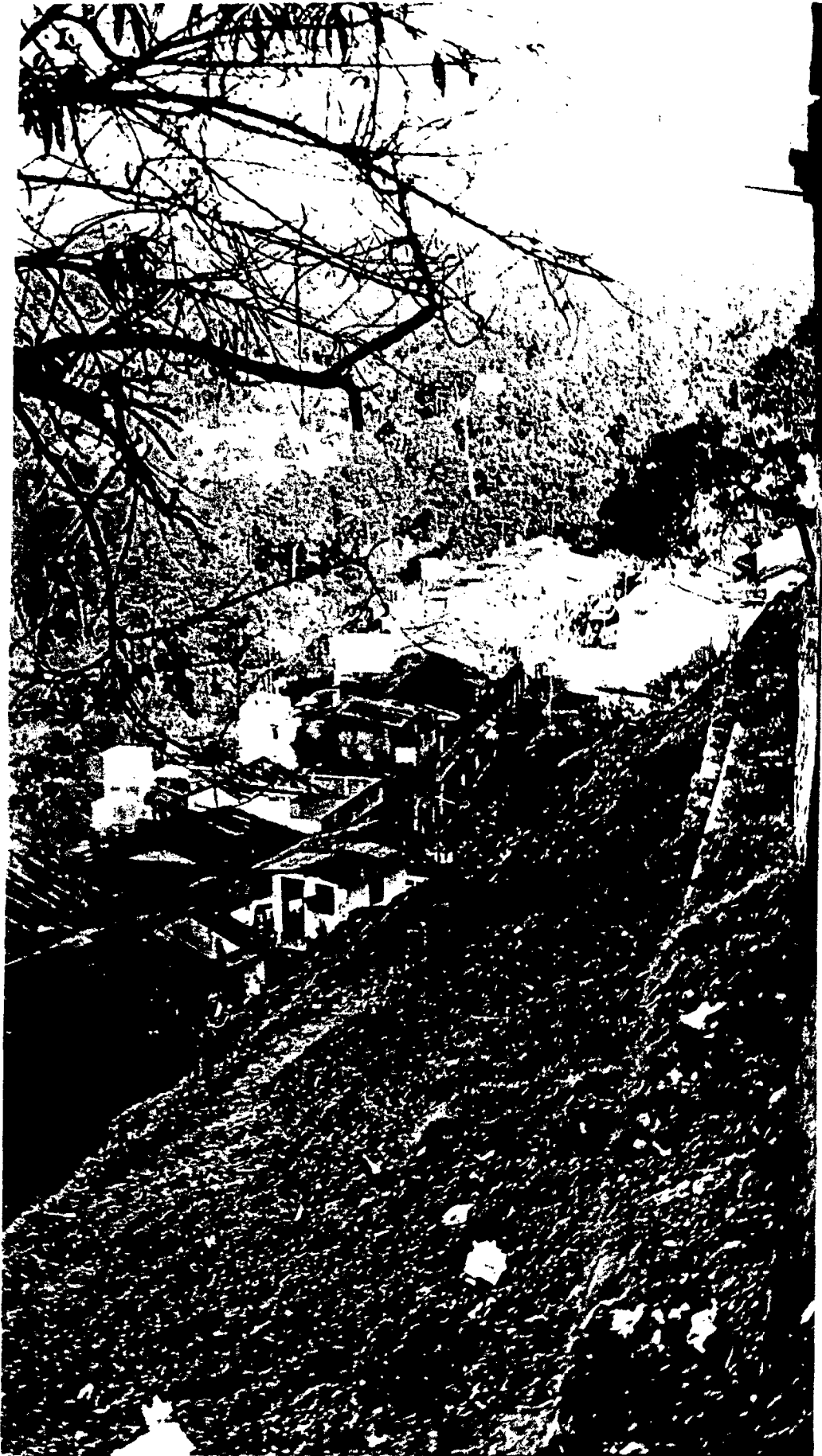
Turning of Roads and culverts in hilly terrain

CIVIL HOUSING

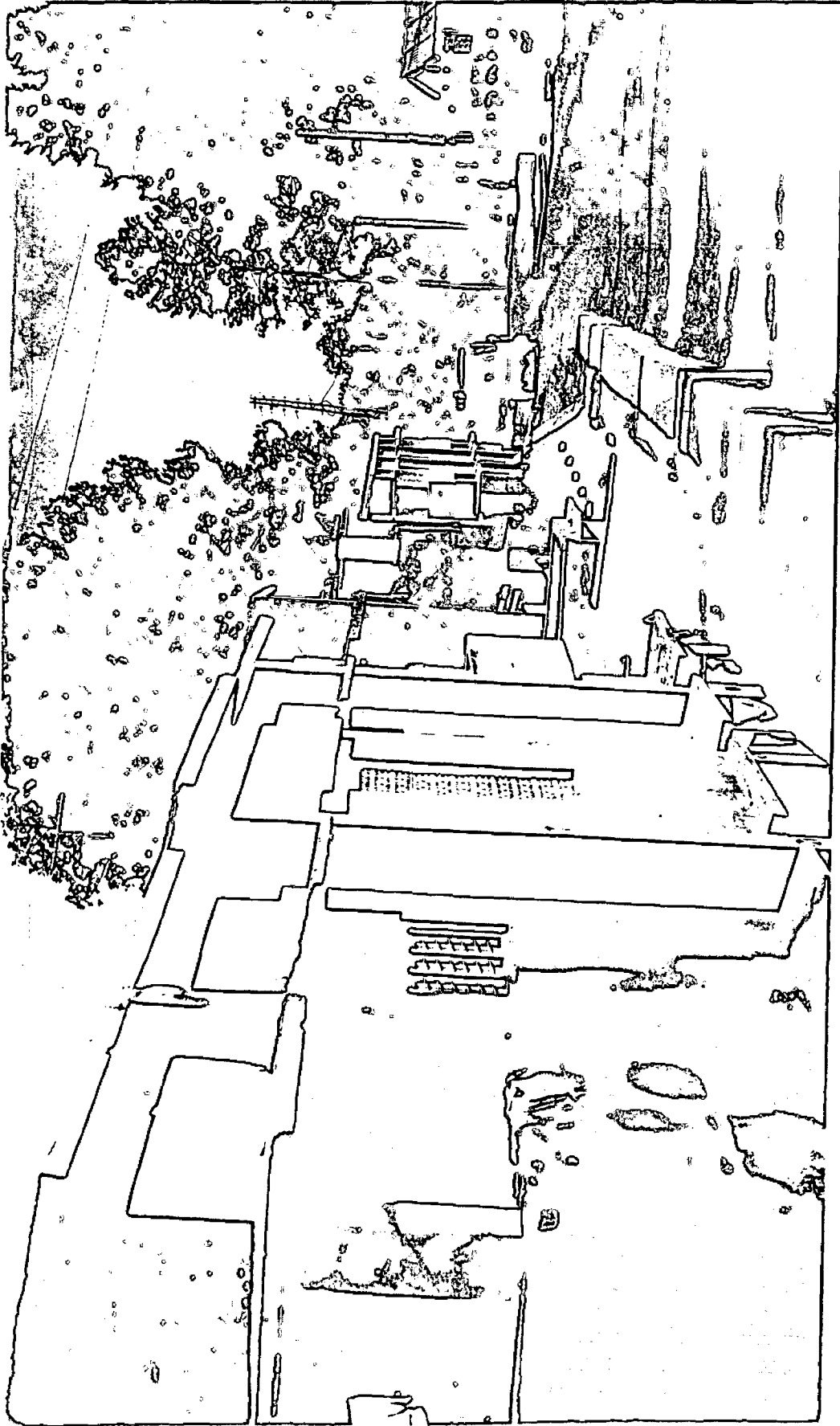




Use of local building material for house construction i.e. Stone, Wood & C.G.I. sheets in the civil area



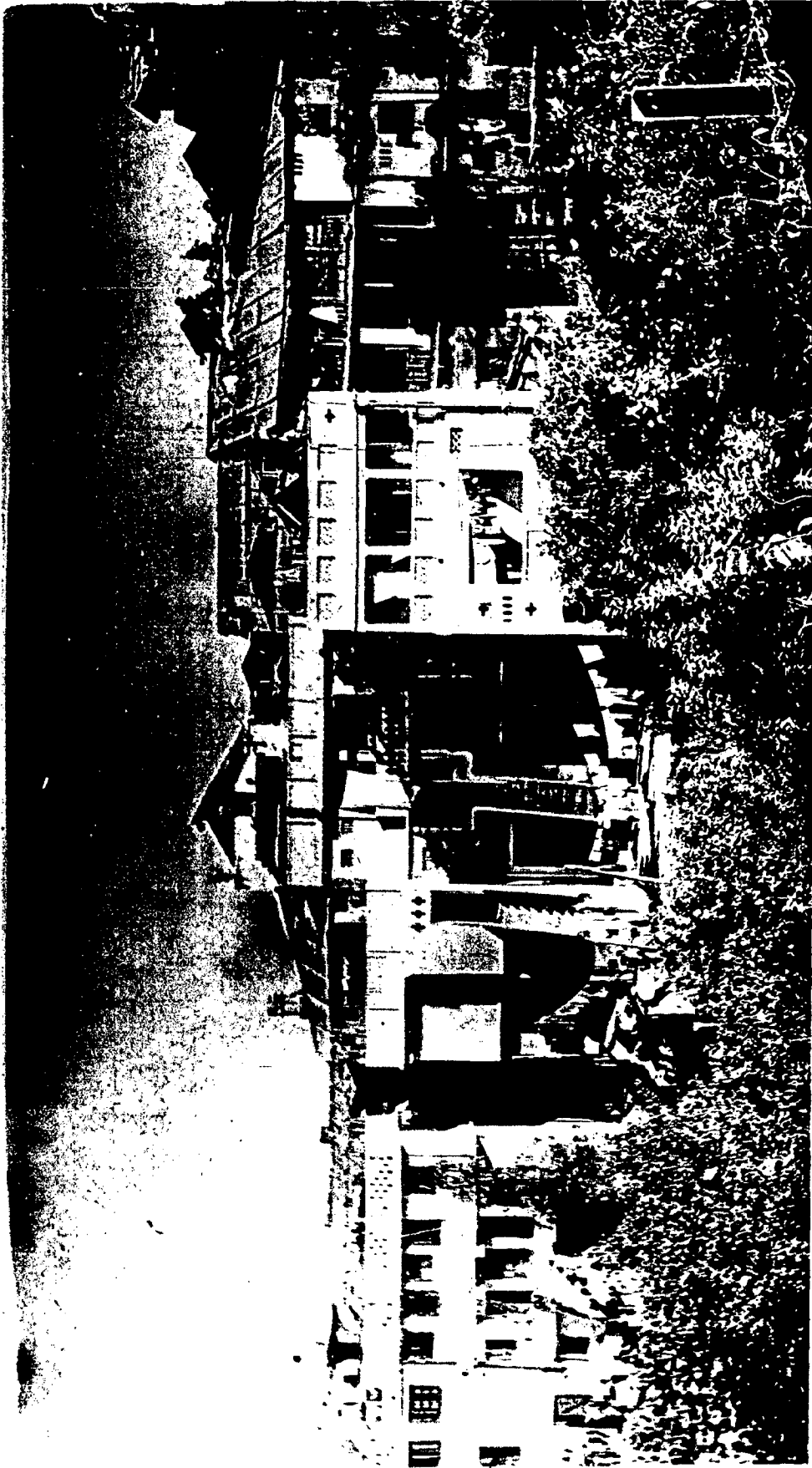
Houses are of two storey. Ground floor is being used for commercial and upper floor for residential purposes.



Style of building character changed with the use of cement and brick as a building material



Old palacious buildings are still maintaining their character, but with a sign of ageing  
require proper maintenance



Haphazard growth of houses upto four storey without any architectural control leads to degradation of environment



Slum conditions in the civil Area-root cause of environmental pollution

MILITARY AREA



Encroachment in the Military Area by constructing these Khokas, are very useful for the nearby people to meet their day to day needs, can be regularised into proper Shops/Kiosks.

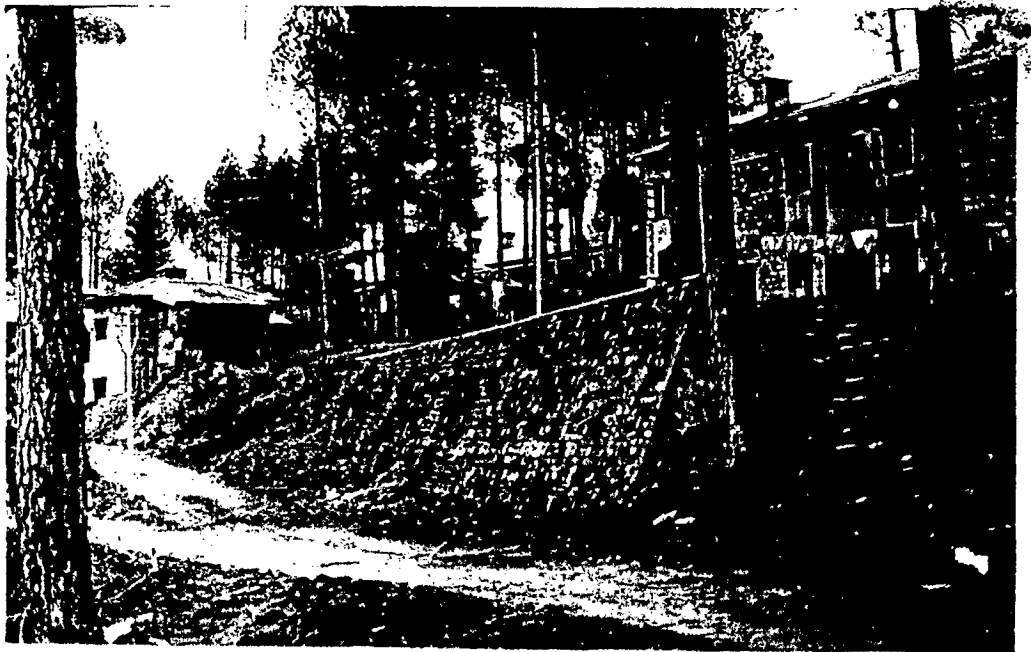


Entrance gate to the Regimentsal Centre. The Cinema Hall is also visible on the Right side.





Poor condition of retaining walls in the  
Military Area



Approach road to the houses in a pitiable  
condition. Difficult to climb by children  
and old people.



Sparse and Horizontal development of Residential Areas in Military areas



Road side parks with hanging flower pots attracts the attention of visitors. No doubt these pots are small in size, but well maintained.

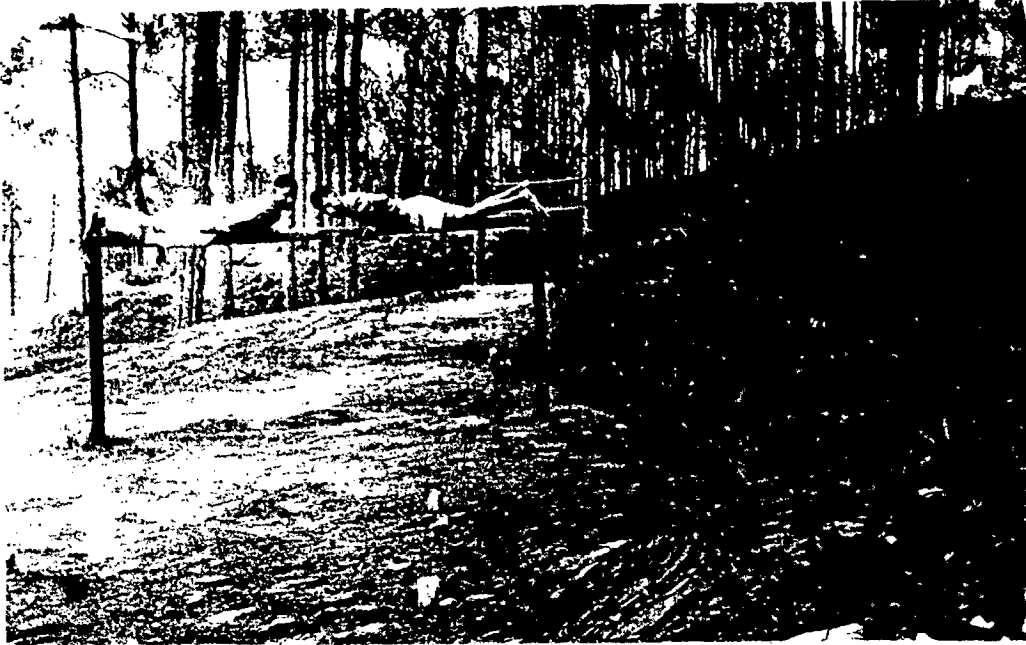
TRAINING ACTIVITIES



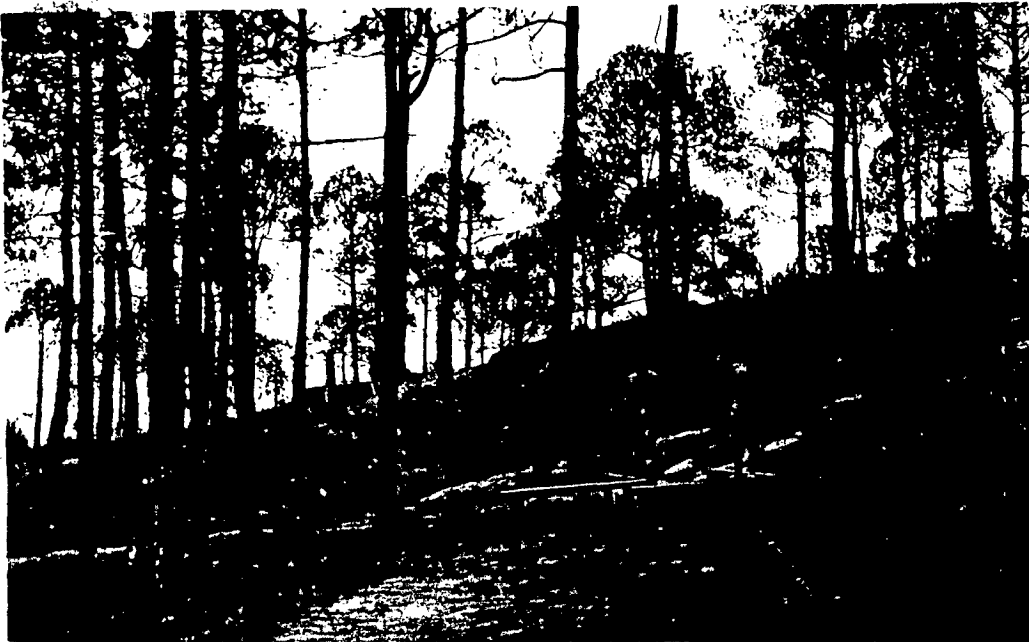
Impromised sitting places being used at the time  
of weapon training



Stadium have long flight of steps without any  
mid-landing to check the endurance of soldiers



Use of hilly terrain in the obstacle course



Balance - one of the item of obstacle course



Crossing the Ditch with the help of rope



Jumping from the tree to gain the confidence in training



#### Exercise Areas

Plinths are visible in the background. These are used to pitch the tents in outdoor exercises.



Training sheds used to train the recruits in bad weather

## CHAPTER - 6

ANALYTICAL REVIEW OF EXISTING PLANNING STANDARDS IN  
REGIMENTAL CENTRES, X-CANTONMENT

Before analysing the existing planning standards in X-Cantonment, it is necessary to understand the type of planning standards existing in the planning field.

Two categories of Planning standards are given below :-

- (a) Prescriptive or Normative e.g. Natural standard for new house building
- (b) Regulatory which relates to individual projects, and mainly to the quantifiable aspect of site development.

Normative standards have been recommended by advisory board at the National level, there is a tendency on the part of local authority planner to mechanically follow these standards without adapting them to the local conditions. In certain other cases standards have been mechanically copied from western countries and do not represent indigineous solution to the problem

An objective standard is likely to be a close approximation to human welfare and should therefore, depend upon local norms and other detailed aspects of the specific context. Standards are analysed by two essential criteria namely performance and costs. "Performance" refers to the complex of accuracy, relevance and dependability of the standards on the one hand and their comparability (hence the extent of their usefulness) on the other. Costs should include social cost also.

In X-Cantonment these standards of Plains are not satisfying the requirements due to some or the other reasons. As it



SCALE OF ACCOMMODATION FOR DEFENCESERVICE PERSONNEL (MARRIED)

(in planes)

| Sl. No. | Appointments              | Plinth area | Servants quarter | Garage | Stairs of stair landing/ common passage | Sleeping out balcony | ADC room |
|---------|---------------------------|-------------|------------------|--------|---|----------------------|----------|
|         | Units                     | FSq         | FSq              | FSq    | FSq                                     | FSq                  | FSq      |
| 1.      | Major Gen.in Staff Apptt. | 2750        | 2x240            | 225    | -                                       | -                    | 215      |
| 2.      | Major Gen.in Comd.troops  | 2750        | 2x240            | 225    | -                                       | -                    | 215      |
| 3.      | Lt. Col. & above.         | 2100        | 240              | 225    | 100                                     | 96                   | -        |
| 4.      | Major                     | 1500        | 240              | 225    | 100                                     | 96                   | -        |
| 5.      | Captain                   | 900         | -                | 125*   | 75                                      | 84                   | -        |
| 6.      | Lt./2nd Lt.               | 900         | -                | 125    | 75                                      | 84                   | -        |
| 7.      | JCOs                      | 800         | -                | -      | 75                                      | 60                   | -        |
| 8.      | Havaldars                 | 570         | -                | -      | 50                                      | 60                   | -        |
| 9.      | O.Rs                      | 570         | -                | -      | 50                                      | 60                   | -        |
| 10.     | NCSE I/NCS II             | 365         | -                | -      | 54                                      | 60                   | -        |

FOR SEPARATED FAMILIES OF DEFENCE SERVICE OFFICERS

|    |                  |      |     |      |     |   |   |
|----|------------------|------|-----|------|-----|---|---|
| 1. | Lt. Col. & above | 1500 | 180 | 125* | 100 | - | - |
| 2. | Major            | 900  | 180 | 125  | 75  | - | - |
| 3. | Captain          | 900  | 180 | -    | 75  | - | - |
| 4. | Lt./2nd Lt.      | 900  | -   | -    | 75  | - | - |
| 5. | JCOs.            | 800  | -   | -    | 75  | - | - |
| 6. | Havaldars        | 570  | -   | -    | 50  | - | - |
| 7. | O.Rs             | 570  | -   | -    | 50  | - | - |
| 8. | NCSE.I           | 365  | -   | -    | 50  | - | - |

\* HALF GARAGE

can be proved from the analysis.

### 6.1 Residential Accommodation :

In army areas single man accommodation has been provided for the living of troops, JCO's mess and Officers' messes have been provided for the Single JCO's and Officers. For troops and JCO's, residential accommodation has been provided in the unit areas in the form of barracks (6m x 18m) for 20 OR's considering 5 Sq.m. area for each OR's. On one side verandah of 2.5 m is also existing. The clear height of barrack is 3.2 m. Wooden or steel trusses has been used for spanning the roof. The C.G.I. sheets as a roof covering material (Fig. 11). The wooden cots for sleeping purpose. No storage space for storing their luggage. So luggage is being stored under the cots only. Mosquito net frame is also provided with the cots. The layout inside the barrack requires lot of improvement. The approximate area required around one barrack is 180 m<sup>2</sup>.

Table -8

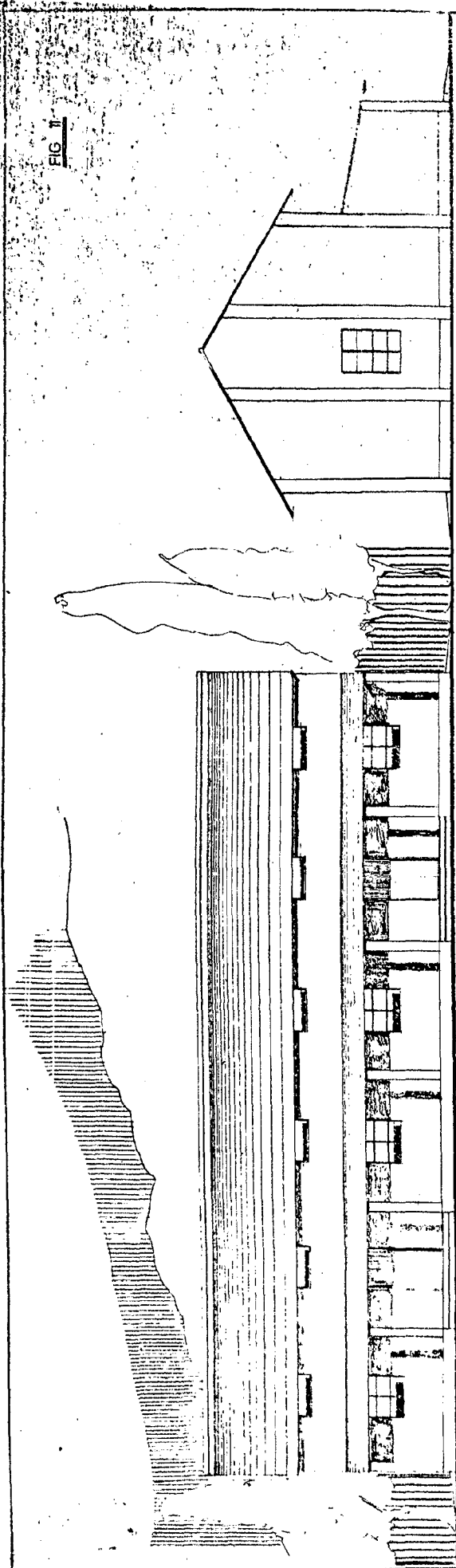
#### Area Statement of Single men/JCO/Officer recommended Accommodation

| Sl. No. | Single Accommodation | Authori-<br>sation<br>Sq.m. | No. of<br>persons | Area<br>required<br>(H.A.) |
|---------|----------------------|-----------------------------|-------------------|----------------------------|
| 1.      | OR's Single          | 5.00                        | 4683              | 2.34                       |
| 2.      | JCO's Single         | 40.00*                      | 65                | 0.26                       |
| 3.      | Officers             | 85.00**                     | 28                | 0.24                       |
|         |                      |                             |                   | <u>2.84</u>                |

\* Scooter shed also included

\*\* Servant quarter and Garage/Scooter shed included.

FIG. 11

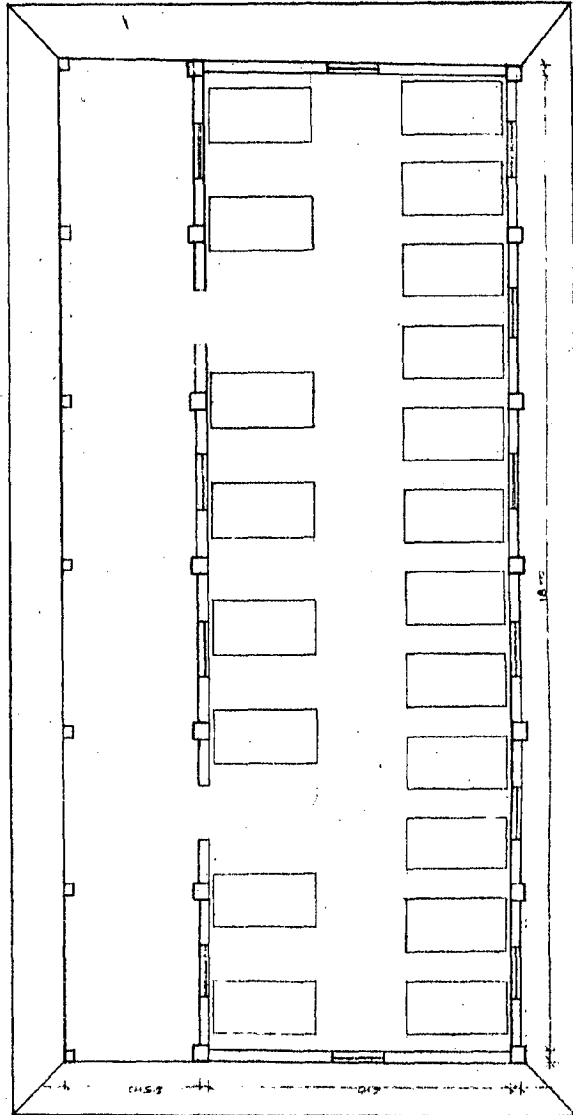


SIDE ELEVATION

FRONT ELEVATION

EXISTING PLAN

SCALE 1:50



INTERIOR

PLAN



FIG. 12

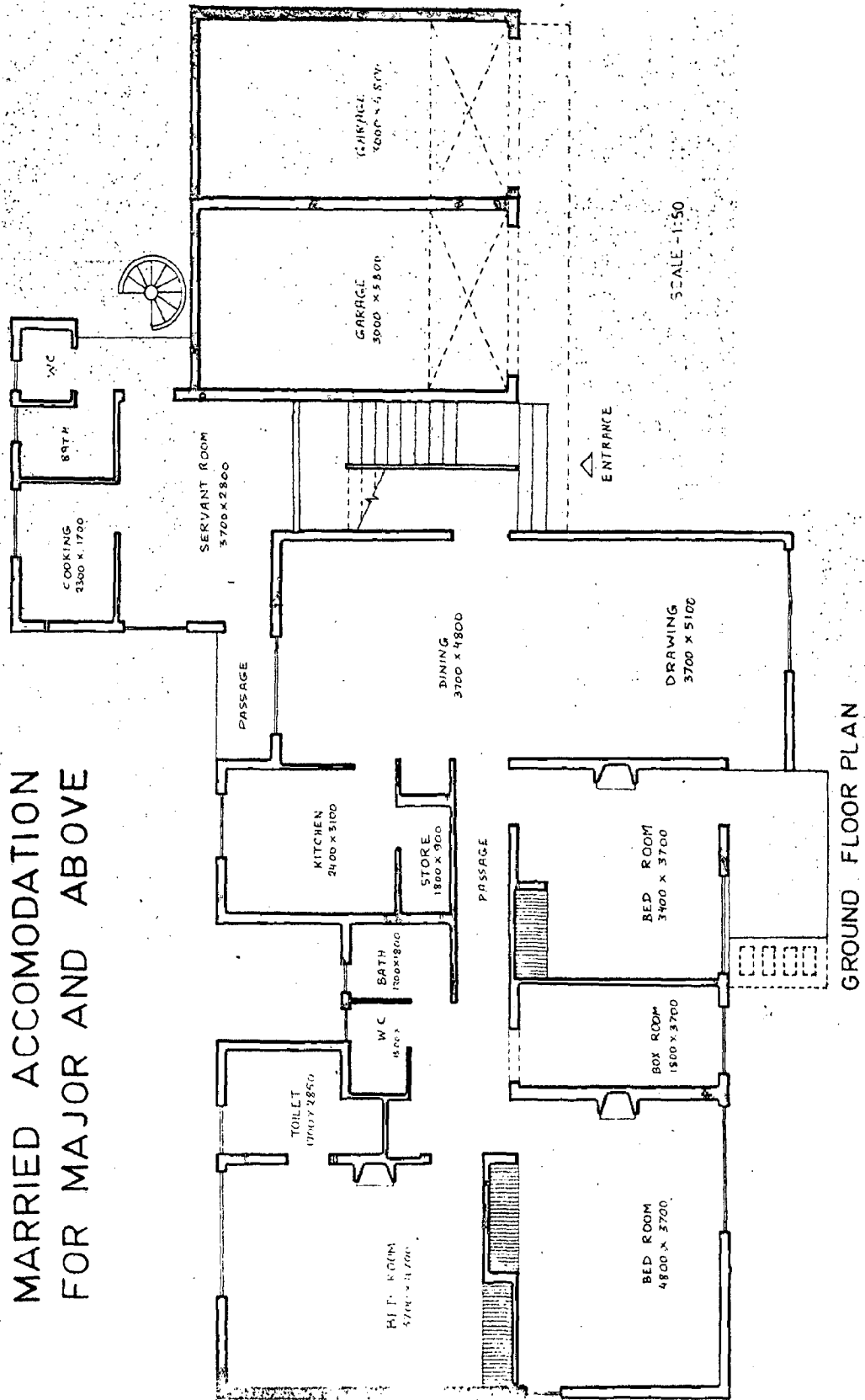
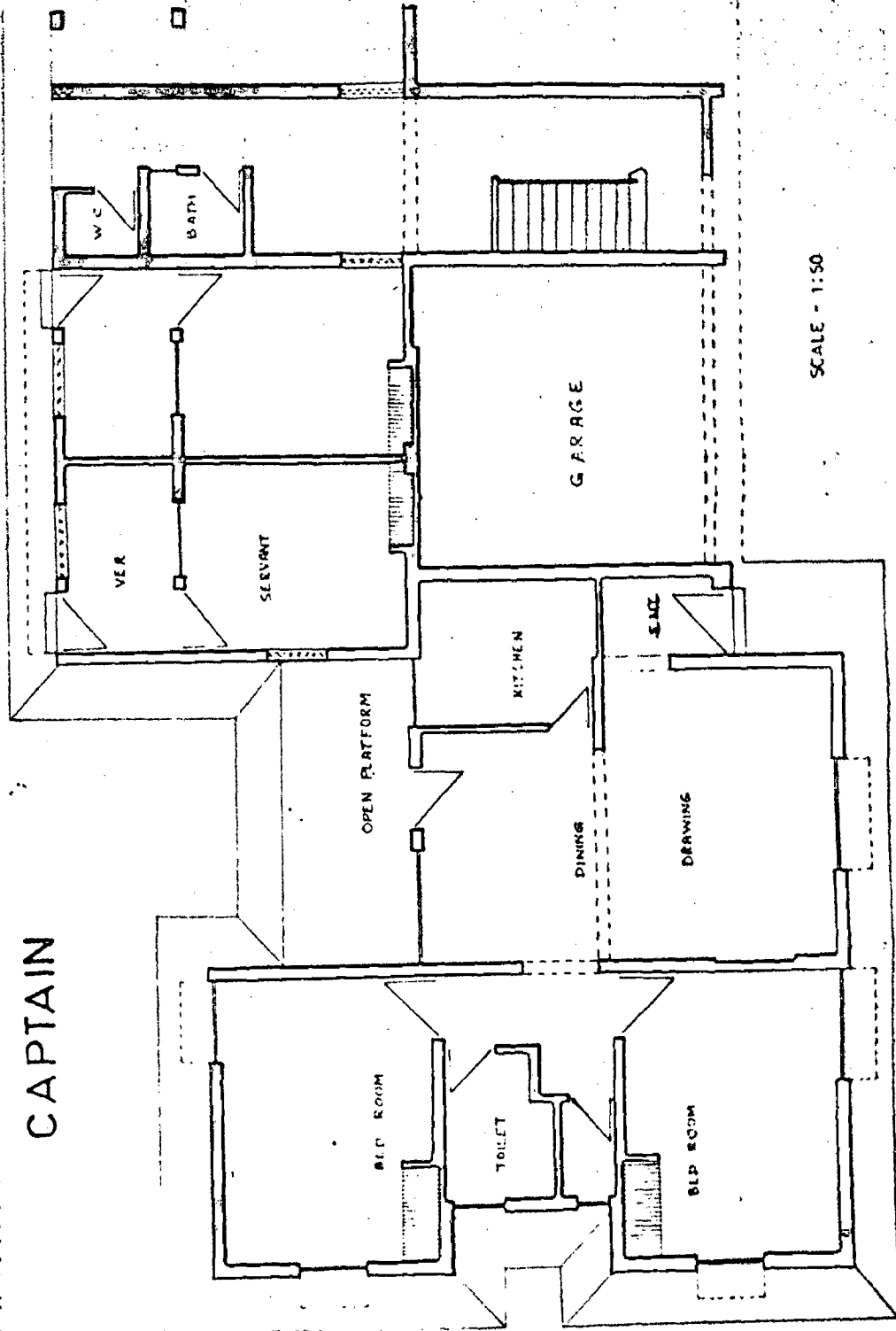


FIG. 13.

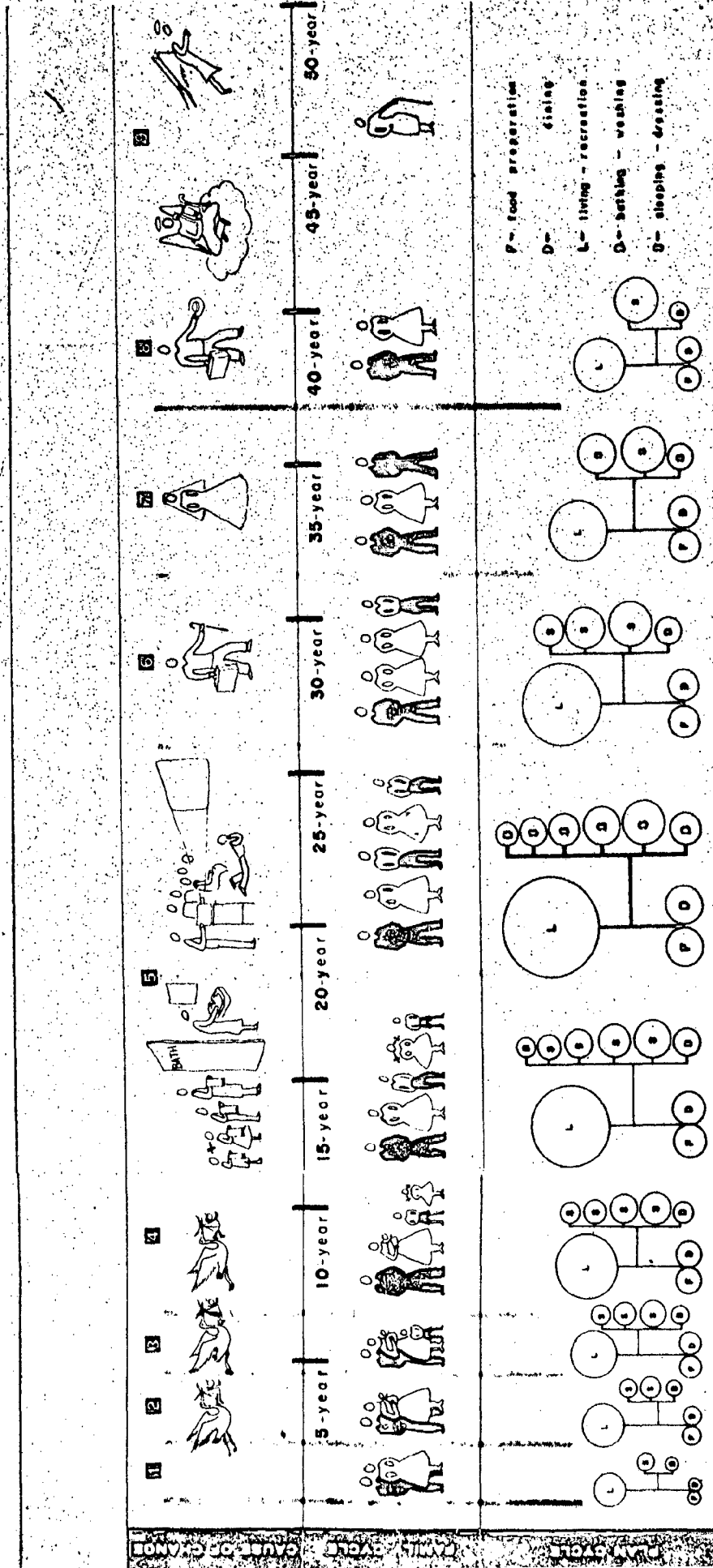
# MARRIED ACCOMMODATION FOR CAPTAIN



SCALE - 1:50

GROUND FLOOR PLAN

FIG. 13A



LIFE CYCLE OF A FIVE MEMBER FAMILY

provided in all the officers' quarters above Captain and half garage 12.5 Sq.m. for Lt. & 2/Lt. which is not being used, as no officer in the station owns car. Motor cycle/scooter is also in less number. (Fig. 12 & 13).

Two servants quarter ( 2 x 24 Sq.m.) with cooking areas have also been authorised in Generals accommodation. One servant quarter (24 Sq.m.) is authorised to Major and above (Fig. 12).

Three Bed rooms houses are authorised to all officers above Major rank. But results of analysis shows that two Bed rooms are sufficient for a family of four members (Husband, wife and two children) (Fig. ). One Bed room is extra which is generally not in use.

Drawing Dining room is Unproportionate in dimensions and area (Fig.12). Anthropometric data give the results that area for Drawing Dining should not be more than  $40\text{ m}^2$  in the oblong shape.

Area of Box room in Major and above quarters are in excess and it should be reduced by 50% of existing area.

## 6.2 Training Areas :

Training is the only activity in the cantonment which provides confidence to the recruit in his profession. These training activities requires large open areas in the form of Gymnasium, Drill shed, Assault course/obstacle course, Parade ground and firing ranges etc. For an Infantry Battalion in plains 65.80 acre area is required when office area is in double storey and single living in triple storey with Dining Hall, Quarter Master store etc. in single storey building (Appx-7). In this 38.00 acres area has been allotted for the training purposes which is 58% of the



total area. But we include play fields and open spaces in the training then it will become 80% of the total area.

In hilly areas this much area for land is not available due to shortage of flat grounds and forests. In X-Cantt. Training area is 63.7 H.A. (19.2%) of total military area. Three firing ranges are existing. They are not of any standard size. The hill slopes and foot hills have been converted into firing ranges (Fig. ). These ranges are spoiling ecological balance, polluting the environment, more number of accidents by stray bullets in the near vicinity. The authorised standard for Rifle Range is 335 Acre and Grenade Throwing ranges are of 100 Acre circular area. The actual land requirement is less but due to danger zone the more area is required, which is more than 50% of the actual requirement. Parade ground of 12.00 Acre is authorised for the existing strength of Centre with black top. But no such parade ground is existing in the X-cantonment.

### 6.3 House and Unit relationship :

As it is quite clear from the (Fig. 14) that all the Married, Bachelor officers, JCO's and OR's will be going to unit four times and coming back 5 times in a day as a routine activity. If some social get together is arranged in the unit or night duty, it will add one more trip to the unit and back. The normal distance between house and unit is 1.5 to 2 Km. It means every day all military persons will be travelling 15 to 20 Kms. The mode of conveyance is walking for OR's and JCO's and Motor cycle/scooter in case of officers.

HOUSE & UNIT RELATIONSHIP

FIG 14.

| S No | ACTIVITY     | OFFICERS |         | MODE OF CONVEYENCE | JCOS / CRS |         | MODE OF CONVEYENCE |
|------|--------------|----------|---------|--------------------|------------|---------|--------------------|
|      |              | MARRIED  | BACHLOR |                    | MARRIED    | BACHLOR |                    |
| 1    | PT/DRILL     | H → U    | OM → U  | VEH./WALKING       | H → U      | M → U   | WALKING            |
|      |              | H ← U    | OM ← U  | "                  | H ← U      | M ← U   | "                  |
| 2    | OFFICE/UNIT  | H → U    | OM → U  | "                  | H → U      | U → U   | "                  |
|      |              | H ← U    | OM ← U  | "                  | H ← U      | U ← U   | "                  |
| 3    | LUNCH        | H → U    | OM → U  | "                  | H → U      | M → U   | "                  |
|      |              | H ← U    | OM ← U  | "                  | H ← U      | M ← U   | "                  |
| 4    | GAMES        | H → U    | OM → U  | "                  | H → U      | U → U   | "                  |
|      |              | H ← U    | OM ← U  | "                  | H ← U      | U ← U   | "                  |
| 5    | NIGHT DUTY   | H → U    | OM → U  | "                  | H → U      | U → U   | "                  |
|      |              | H ← U    | OM ← U  | "                  | H ← U      | U ← U   | "                  |
|      | NO. OF TRIPS | 10       | 10      |                    | 10         | 10      |                    |

The average walking speed of a man in hills is 3 Km. per hour. It means an OR will be wasting 4 to 5 hours in travelling between house and unit. On the other hand officers will be wasting petrol which amounts to Rs.250/- to Rs.300/- per month extra expenditure. The officer Mess for bachelor officers are located far away from these residential area (Map. 7).

#### 6.4 Roads and Transportation System :

Three types of roads are existing in X-cantonment. Pucca roads (Bituminous Roads), Kutchra roads and Foot paths. The Pucca road length is 23.574 Km., Kutchra roads are 11.416 Km. and length of Foot paths are not available. The total area under communication in X-Cantt. is 68.40 H.A. (3.97% of total area). The Pucca Road is of two lanes and all other roads are one lane or less. The R of W is not possible to maintain all along the road due to hilly terrain. In hills length of approach roads will also increase by 25 to 30% due to the slope (Fig. 17) and regarding Road section in plains and hills (Fig. 15 & 16).

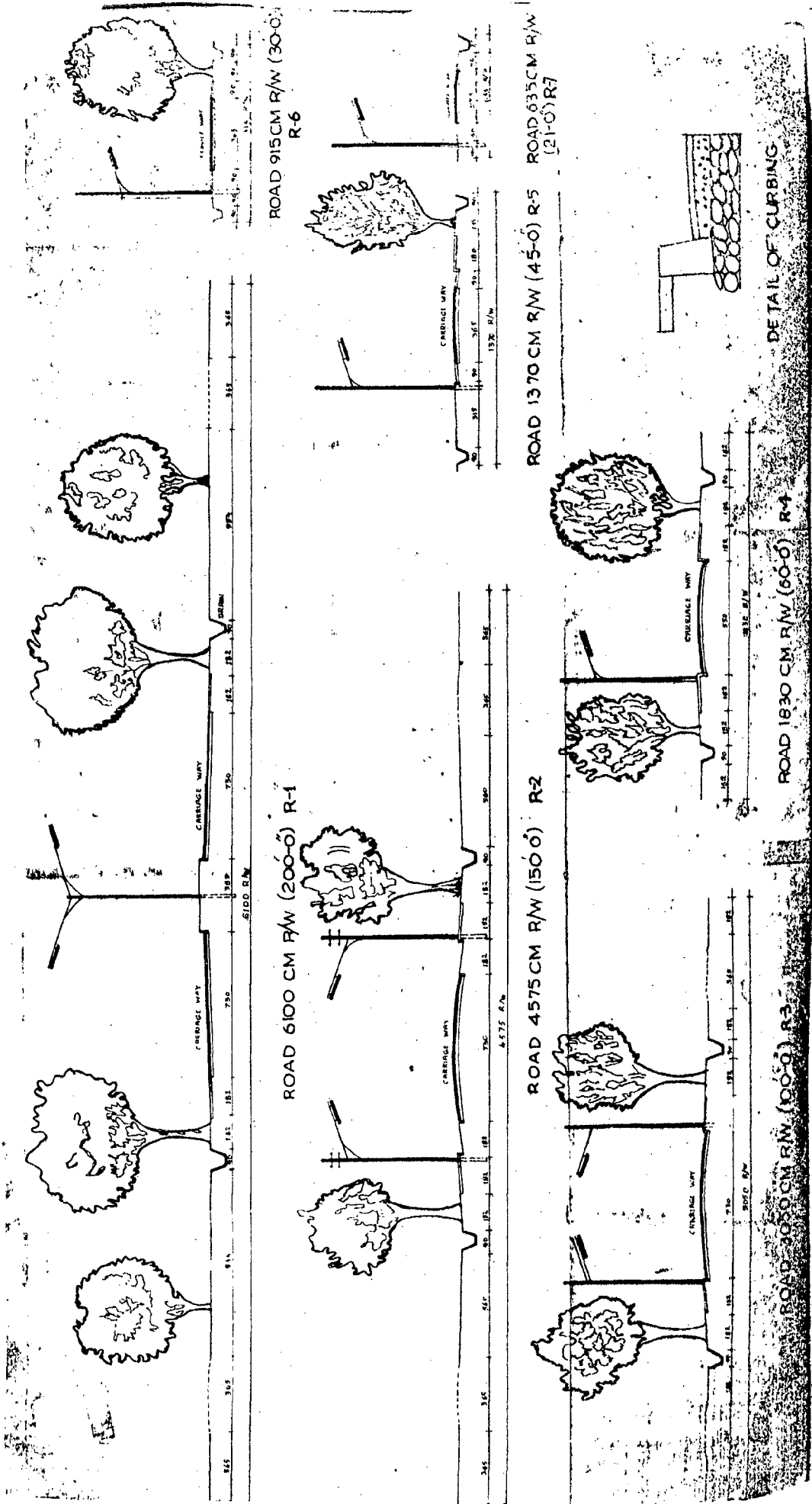
Table -10

#### Comparative Road Standards in Plains & Hills

| S.No. | Type of Road   | Plains | Hilly Area |
|-------|----------------|--------|------------|
| 1.    | R <sub>1</sub> | 61.00  | -          |
| 2.    | R <sub>2</sub> | 45.75  | -          |
| 3.    | R <sub>3</sub> | 30.50  | 30.50      |
| 4.    | R <sub>4</sub> | 18.30  | 18.30      |
| 5.    | R <sub>5</sub> | 13.70  | 13.70      |
| 6.    | R <sub>6</sub> | 9.15   | 9.15       |
| 7.    | R <sub>7</sub> | 6.35   | -          |

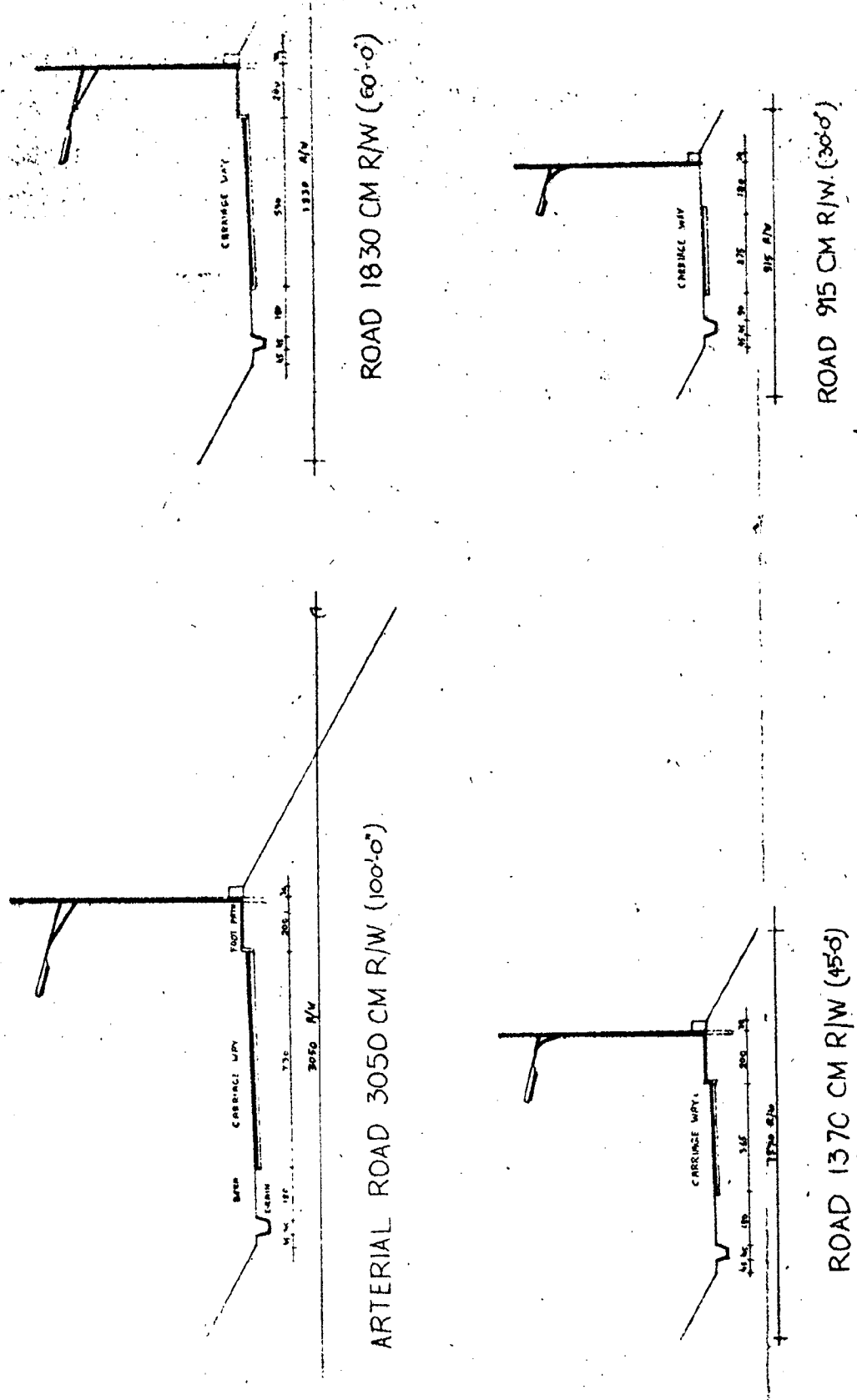
Source : MES, X-Cantonment

FIG.15



ROAD SECTIONS IN PLAINS

FIG.16



ROAD SECTIONS IN HILLS

FIG 17.

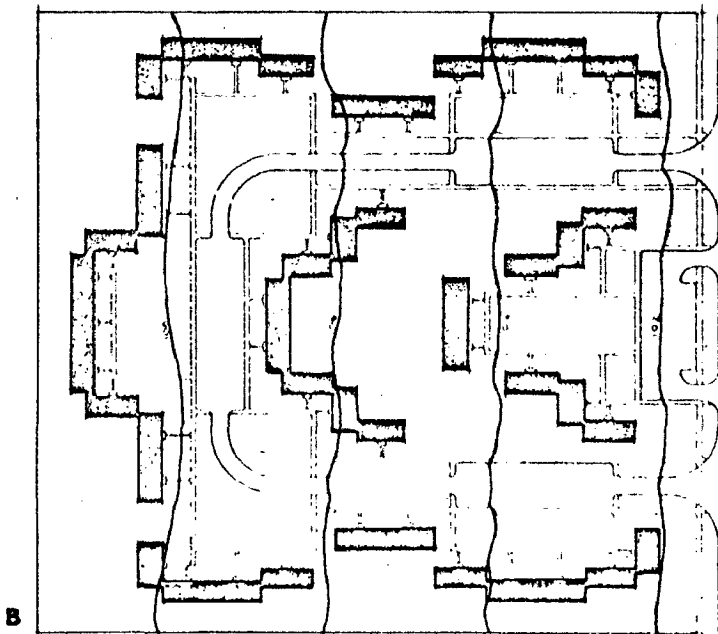
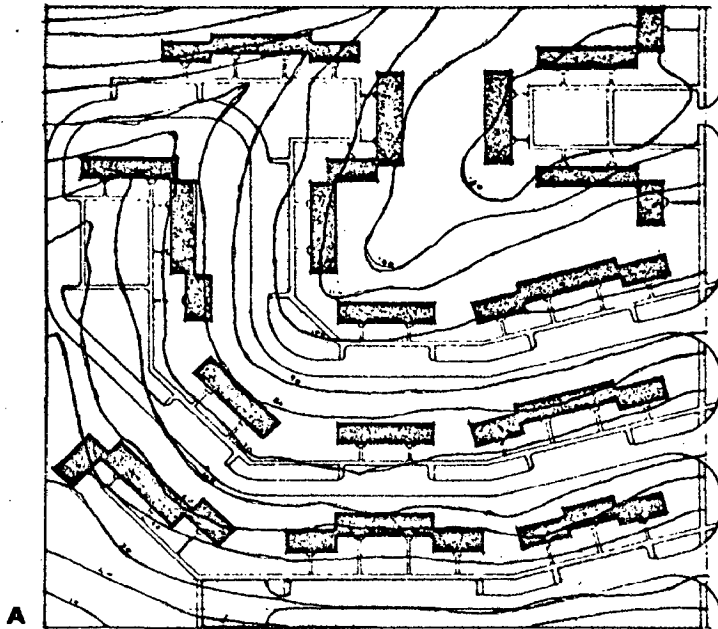


Figure 3-19 Contrasting access roads, cut and fill, and necessary surface drainage systems are shown for (a) a hilly site and (b) an almost level site.

## ACCESS ROADS

A. hill

B. plain

SOURCE:

Site planning standards.

Joseph de Chiara

Lee E. Coppelman

It is clear that 60.00 & 45.75 m R/W Roads are not possible in hills due to shortage of land. The construction cost is very high in hilly areas Rs.80/- per m<sup>2</sup> bitumen surface and maintenance cost is Rs.3,700/- per Km. (1983 rates).

#### 6.5 Public Utilities & Community facilities :

These are the services which are required to fulfill the need of the society and to provide them proper environment.

##### (a) Water Supply :

For army population 160 litres per head per day water is available. But civilian are facing shortage of water. They are getting less than the minimum standards of water supply. In all water supply is inadequate. In summer months the problem is more severe due to the rush of tourists from outside.

##### (b) Electric supply :

Electric supply is adequate to meet the requirements of the public.

##### (c) Sewage Disposal :

At present no central sanitation system is existing in X-Cantonment, which is located in the hills at 2000 m above MSL. In Married accommodation Flush type latrines have been provided with septic-tank and soakage-pit system. Septic tanks and soakage pit are serving for two to three blocks of buildings. In the unit lines, where single military personnel are living, dry sanitation system or conservancy system is existing. Night soil is burnt in the Incinerators which are located at different locations in the area. Both these systems are not suitable to the natural environment till the time no proper disposal system is adopted in the area.

### 6.6 Community Facilities :

In army area at present four schools are located with the following number of students :

|       |                                |   |             |
|-------|--------------------------------|---|-------------|
| (i)   | Garuda Convent Nursery School  | - | 52          |
| (ii)  | Conessa Convent Primary School | - | 266         |
| (iii) | Army School                    | - | 303         |
| (iv)  | Kendriya Vidyalaya             | - | 699         |
|       | Total                          |   | <u>1320</u> |

The total population of Army is 7392. The No. and distribution of school going children is given below in Table -11.

Table - 11

No. of School going children

| S.No. | Age Group year | % of Total | No. of students |
|-------|----------------|------------|-----------------|
| 1.    | 3 - 5          | 5.6        | 159             |
| 2.    | 6 - 10         | 12.5       | 327             |
| 3.    | 10 - 16        | 12.8       | 335             |
|       | Total          |            | <u>811</u>      |

As it is given above that schools are located in the Cantt. area having capacity of 1320 of all the sections till higher secondary. This educational facility is adequate in numbers.

Survey result proves that a student will have to travel on foot for 2.8 Km. to utilise educational facilities which is inadequate in terms of distance (Appx -I).



(d) Recreational Facilities :

Facilities of Cinema Halls, Clubs, Library and Museum are available in the Cantt. But average distance travelled by people is 2.75 km. as given in the survey report. As these facilities according to the standards should be within the easy reach of 1.5 km.

(e) Commercial facilities :

No. of shops according to the standards are more than required. But the quality and variety in material is not available. Canteens are meeting the requirements of the military population. The total No. of shops in Cantt. is 493.

6.7 Planning Densities :

Planning densities are varying with the varying requirements of a formation, type of units and special requirements of the units. In case of Regimental centres density for land acquisition is 5.5 person per acre but for the zonal space allocation it is 11 person per acre. In X-cantonment planning densities are as follows :

|                           |                    |
|---------------------------|--------------------|
| (i) Cantonment            | - 4.2 person/acre  |
| (ii) Total Developed Area | - 10.3 person/acre |
| (iii) Civil Area          | - 11.8 person/acre |
| (iv) Military Area        | - 8.8 person/acre. |

It can be seen from the existing planning density in Military area is less than the required density. So chances of increasing the density are still bright.

(b) Medical Facilities :

One Military Hospital is existing in the Cantt. But units are located far away from the hospital and average distance of 2.9 Km. according to survey report, a person will have to travel to avail this facility.

(c) Parks, Open space & Play Grounds :

Open spaces are of great importance to community, both hygienically and sociologically. They serve many purposes. Some of them are :

Space for exercise and leisure activities

Purifying the air

Reducing noise

Affecting the local weather

Psychological benefits

Aesthetic pleasure

All these factors prove the importance of these open spaces, play fields and Parks in the Cantt. But existing open areas are very less in the X-Cantt. as shown below in Table 12.

Table -12

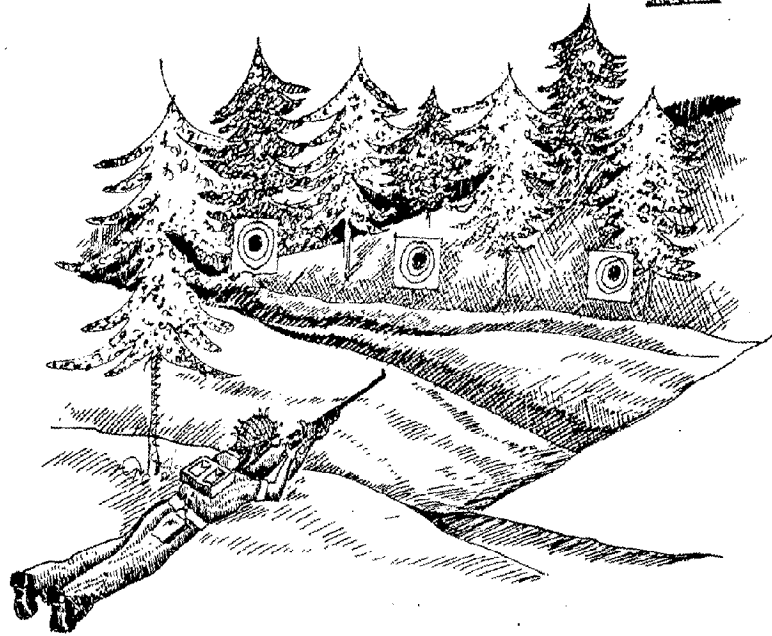
| Sl. No. | Item        | Nos. | Areas in Acres | Required    | Exist- ing | Adeq- uate | Inade- quate |
|---------|-------------|------|----------------|-------------|------------|------------|--------------|
| 1.      | Parks       | 11   | 2.20           | 10% of      |            |            |              |
| 2.      | Open space  | NA   | 1.54           | developable | 1.8%       | -          |              |
| 3.      | Play Ground | 5    | 26.94          | area.       |            |            |              |

Table - 13  
Comparative Statement of entitlement of plinth area in Army and Civil

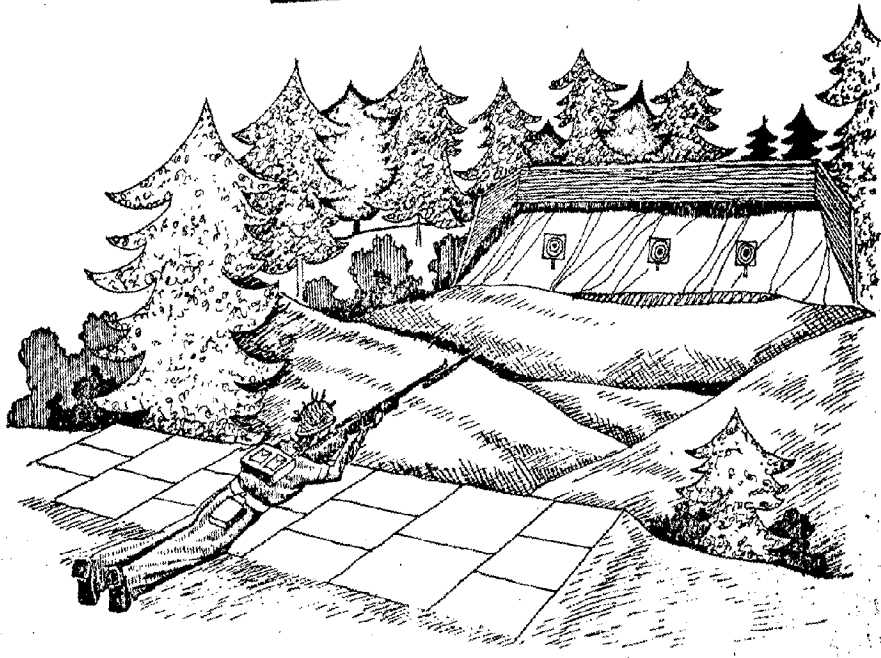
| Rank                      | Existing entitlement in Army<br>Sq.ft.           | Entitlement as per scales adopted by Ministry of Works & Housing for civilian Govt. servants on basic pay<br>Sq.ft. | Excessive Entitlement in Army<br>Sq.ft. | % of Excessive Entitlement in Army |
|---------------------------|--|---|---|------------------------------------|
| Sepoy & Lance Naik        | 520<br>B.P. Rs. 472-559                          | 484<br>B.P. Rs. 260-499   | + 36                                    | 6.9                                |
| Havaldar                  | 630<br>B.P. Rs. 523-615                          | 484<br>B.P. Rs. 260-499   | + 46                                    | 7.3                                |
| JCO                       | 800<br>B.P. Rs. 672-1070                         | 600<br>B.P. Rs. 500-922   | + 200                                   | 25                                 |
| 2/Lt & Lt                 | 900<br>B.P. Rs. 750-950                          | 600<br>B.P. Rs. 500-999   | + 300                                   | 33                                 |
| Captain                   | 900<br>B.P. Rs. 1100-1499                        | 900<br>B.P. Rs. 1000-1499   | -                                       | -                                  |
| Major                     | 1500<br>B.P. Rs. 1450-1800                       | 1500<br>B.P. Rs. 1500 and above   | -                                       | -                                  |
| Lt.Col./ Col./ Brigadier. | 2100<br>B.P. Rs. 1550-1950<br>B.P. Rs. 1950-2175 | 1500<br>B.P. Above 1500/-   | + 600                                   | 28                                 |
| Major General             | 2750<br>B.P. Rs. 2200-2400<br>B.P. Rs. 2500-2750 | 1500<br>B.P. Above Rs. 1500/-   | +1250                                   | 45.4                               |
| Lt.Gen.                   | On as required basis<br>Rs. 3000                 | 1500<br>B.P. Above Rs. 1500/-   |   |                                    |

NOTE : B.P. - Basic Pay per month.

2.  
SKETCH 3



EXISTING FIRING RANGE



PROPOSED FIRING RANGE

## 6.8 Pollution :

The British established cantonments in hills just because of two reasons one they were resident of cold countries, so they were not able to tolerate the heat of plains in India, secondly strategic aspect, hills are always providing better control over the enemy from the neolithic period till today. We are still occupying the same cantonments. These cantonments were carefully planned in those days. But the latest requirements of more number of troops have crowded these cantonments, which lead to the degradation of natural environment in the hilly cantonments. X-Cantonment is not an exceptional case. The special type of military training activities are also adding to the pollution problems. Some of them are being discussed below.

### (i) Firing Ranges :

The land requirement of the firing Ranges are very much. The area should be cleaned also for the clear sight. It leads to deforestation activity. The foot hills are also getting the jerk out of these firing practices. As standard ranges are not available in the hills. So improvised ranges are being used, foot hills are the victims of this activity. Erosion of soil, land slides, ecological imbalance and noise pollution is the by product of these firing ranges.

### (ii) Traffic & Transportation :

In hills the vehicles have to ply at a slow speed to negotiate the slope in low gear. Thereby emitting lot of smoke and in consequence polluting the atmosphere.

(iii) Sewage and Refuse Disposal :

At present no central sanitation system is existing in X-Cantonment, which is located in the hills at 2000 m above MSL. In Married accommodation Flush type latrines have been provided with septic-tank and soakage-pit system. Septic tanks and soakage pit are serving for two to three blocks of buildings. In the unit lines, where single military personnel are living, dry sanitation system or conservancy system is existing. Night soil is burnt in the Incinerators which are located at different locations in the area. Both these systems are not suitable to the natural environment till the time no proper disposal system is adopted in the area.

Septic tank is a sedimentation and digestion tank in which the contents of exereta become partly digested and are rendered innocuous by anaerohi action. The out flow from it is septic. This over flow is generally conveyed to soakage pit, from where it percolates on steps into the subsoil and if the soil is hard or rocky, drying beds are provided. This process can contaminate wells, springs, and ooziings on the hill slopes and pollutes the environment in all possible ways i.e. land, water and air.

To meet the milk requirement of cantonments, Military Dairy Farms are authorised with the cantonments, wherever it is possible. Cows are kept to get milk. But on the other hand disposal of cow dung is a problem in the hilly area. If it is in open area it becomes breeding place of mosquitoes and land pollution also.

## CHAPTER - 7

MODIFICATION REQUIRED IN PLANNING STANDARDS WITH PROPOSAL

The Planning standards prescribed by the Army authorities (Chapter 4) are not confirming to the actual requirements of Regimental centres situated between 2000 - 3000 m above MSL.

It means some modification is required in the existing planning standards, which can not be a universal modification factors for all the aspects of planning and for all types of Regimental centres in hilly terrain between 2000 m - 3000 m above MSL. It will vary with the location, natural set up and requirements of the Regimental centres.

Land requirements are intimately connected with the designs of buildings as well as with the overall Town Planning concept. Land can be utilised much more intensively and economically by rationalising the concept of cantonment as well as the new designs of buildings. Modification in the plinth area of residential buildings, improving the interior of the buildings to increase the capacity, over all designs of Building Blocks, densities, layout and proper orientation will lead to better environment in the cantonments and precious land can be saved for the prime task of Training requirements of Troops.

### 7.1 Residential Accommodation :

The location of a residential building on a site or its relationship to other buildings is extremely important. If properly situated, the building achieves harmony with the liveability is enhanced, drainage problems are minimised, and the building's functional efficiency is increased.

Siting of a building to conform with the topography will result in a minimum of necessary grading, reduce initial construction costs and eliminate continuous drainage problem.

It is not a good practice to fight against the land, yet in army, the plans of residential buildings for plains has been forced upon the hilly terrain. Some times it is not suiting to the environment and creating more problems. In X-Cantonment the standards for residential buildings has been used as authorised in plains (Table-7.).

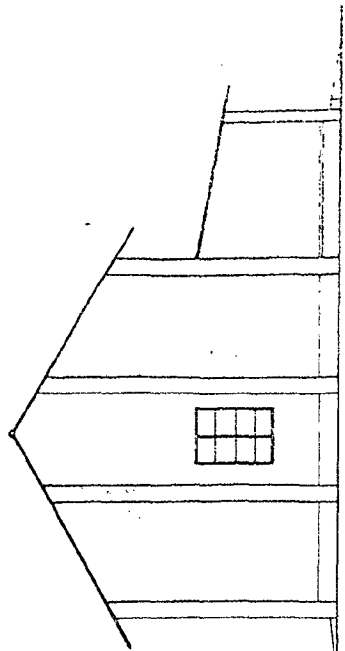
(a) Single Man Accommodation :

This is in the form of barracks for the troops living purposes. JCO's and Officers are also living in the same types of accommodation. The plinth areas are varying according to rank structure (Table -7 ).

Jawans are authorised 5 Sq.m./military man in Barracks. In one Barrack 20 Jawans are being accommodated (Fig. 11). The dimensions are 6 m x 18 m for the Barracks have been taken for the comparison of standards. The wooden cots have been provided for the sleeping purposes without any storage space. The clear height of Barrack is 3.2 m. The verandah of 2.5 m wide and 2.5 m in height has been provided on one side of the Barrack. Two doors for the circulation. The environment inside the barrack is uncomfortable. (Sketch 1). The authorisation of K-oil and fire wood is not enough to warm up the barracks in winter season. The winter season prevails here 9 months in a year. These barracks are spacious and proper sun light is not entering inside the barracks.



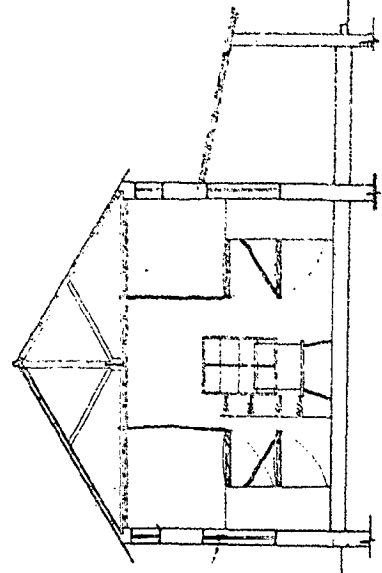
FIG. 18



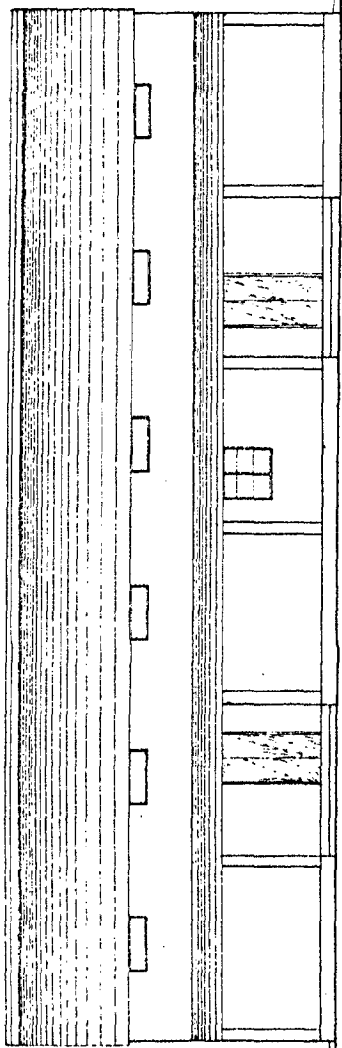
SIDE ELEVATION

PROPOSAL NO. 1

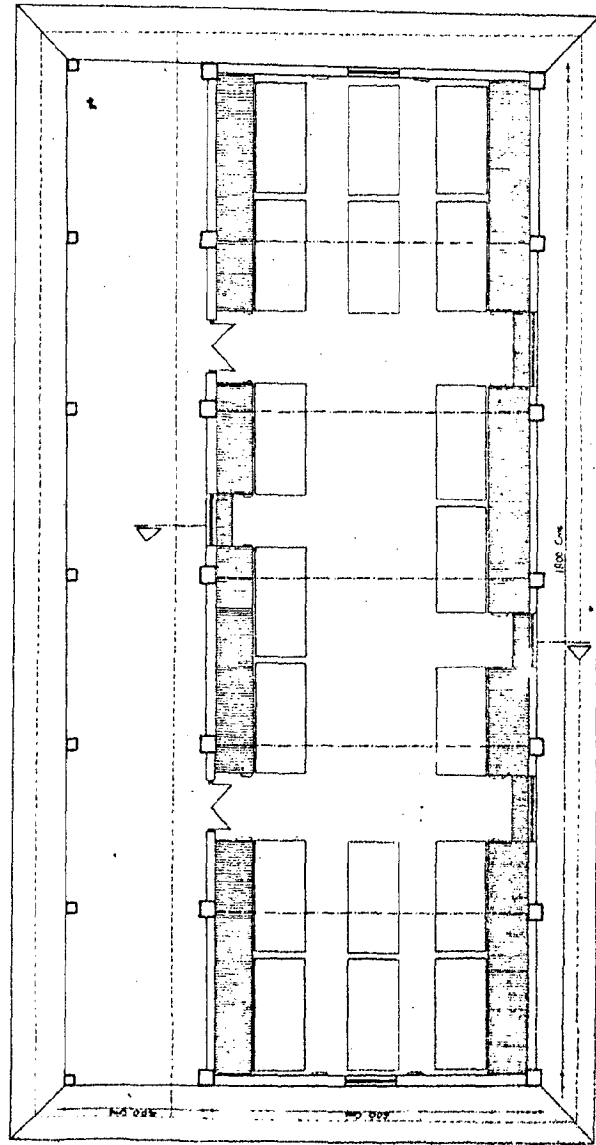
SCALE 1/8"



INTERIOR



FRONT ELEVATION



PLAN

Proposal :

To overcome the above mentioned problems and to provide better environment the proposal has been suggested with three alternatives :

Proposal I

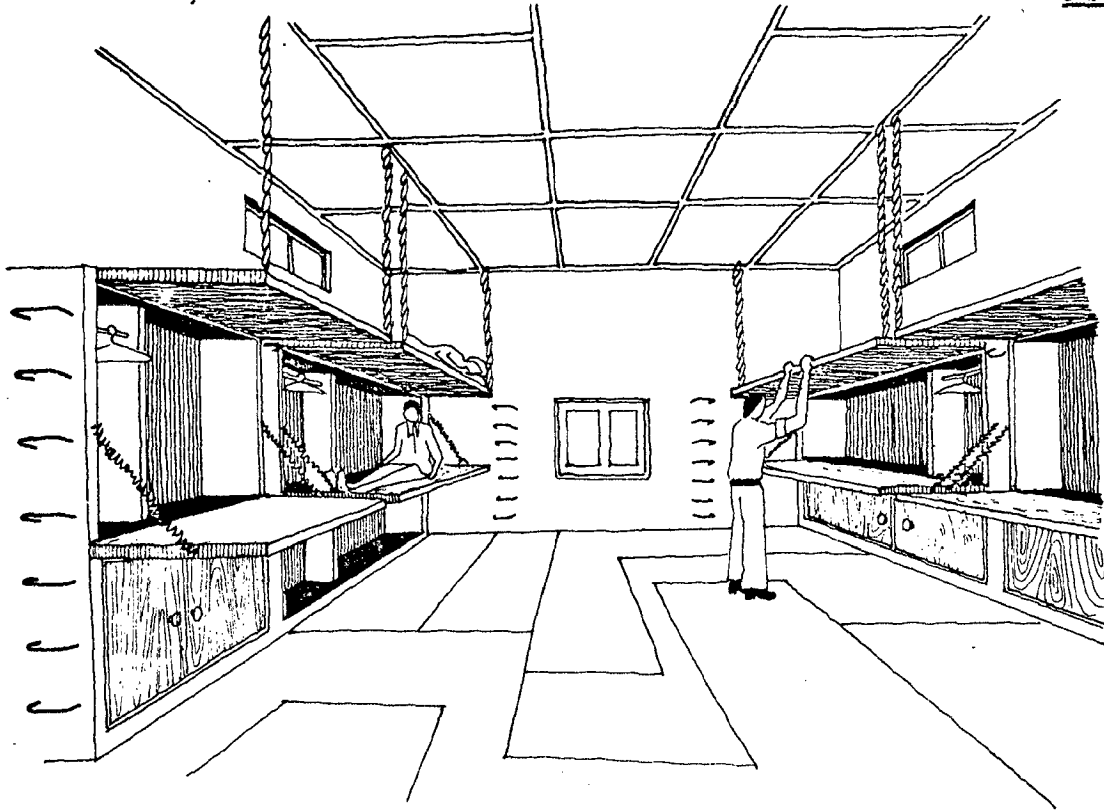
The existing dimension of barracks have been taken i.e. (6 m x 18 m x 3.2 m). But interior changes have been provided to accommodate 32 OR's instead of 20 OR's in the existing barracks. Each OR has been provided separated 4.5 Sq.m. storage area with proper locking devices. Lighting and ventilation problems have been improved and environment inside the barrack is comfortable (Sketch 1). Folding type sleeping berth has been provided to 28 OR. But to utilise the existing wooden cots the 4 cots will also be adjusted inside the barrack.

In the day time these berths will be folded and locked and the whole barrack is neat and clean. Nothing is visible outside (Sketch 1). As the weather conditions are generally cold and due to shortage of flat land the Training classes can be conducted inside the barracks.

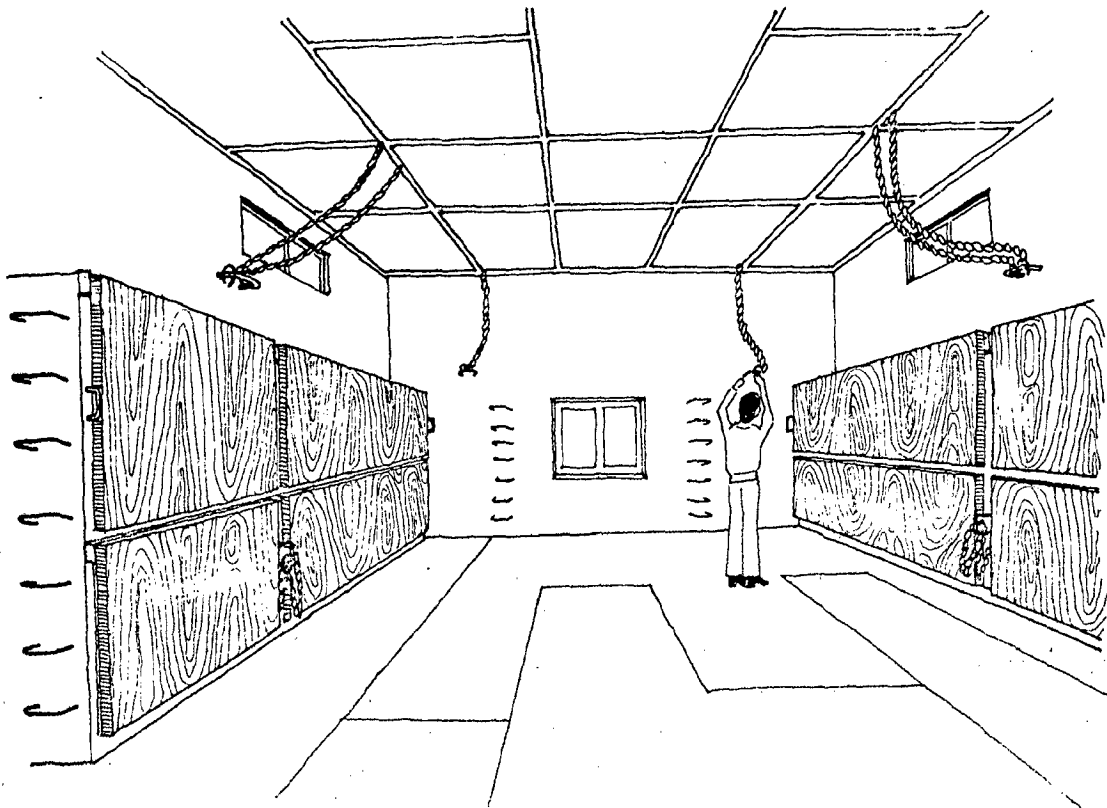
Whenever these barracks are vacant, these can be used as storage buildings. This way it is a multipurpose barrack.

Proposal II.

In this proposal the upper berth is replaced by providing the projections of 25 Cm. which will work as a sleeping berth. In the day time these berths will be closed and locked (Fig. 19).

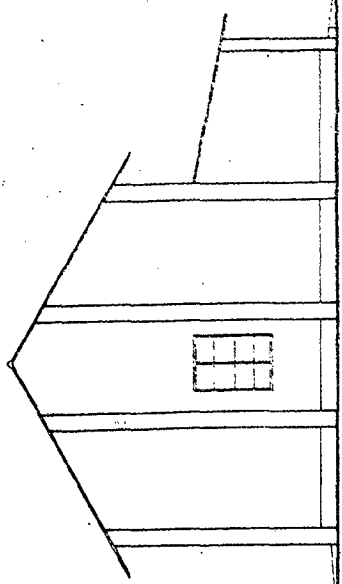


PROPOSED INTERIOR OF LIVING BARRACK - NIGHT TIME



PROPOSED INTERIOR OF LIVING BARRACK - DAY TIME

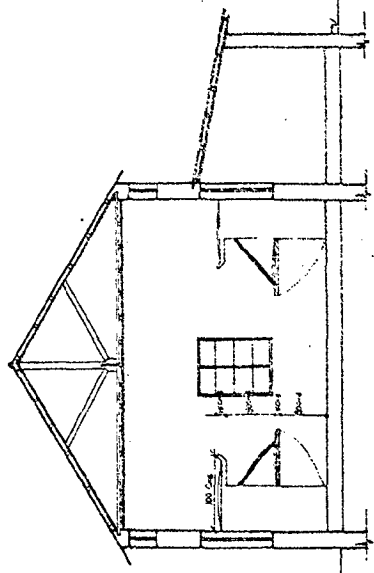
FIG. 19



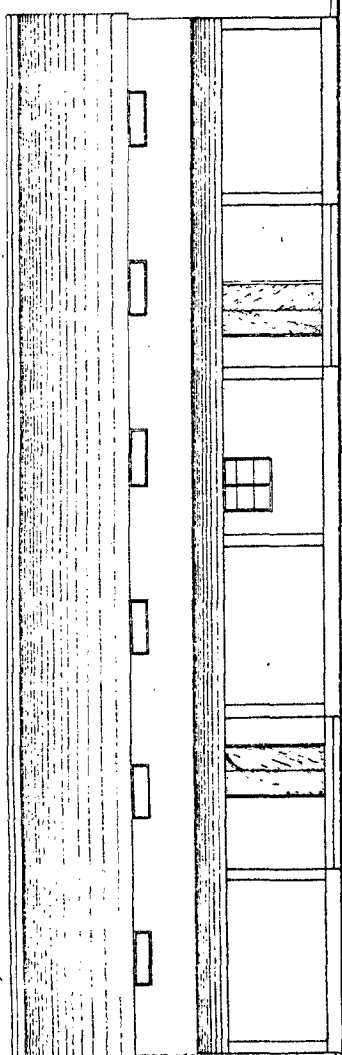
SIDE ELEVATION

PROPOSAL NO. 2

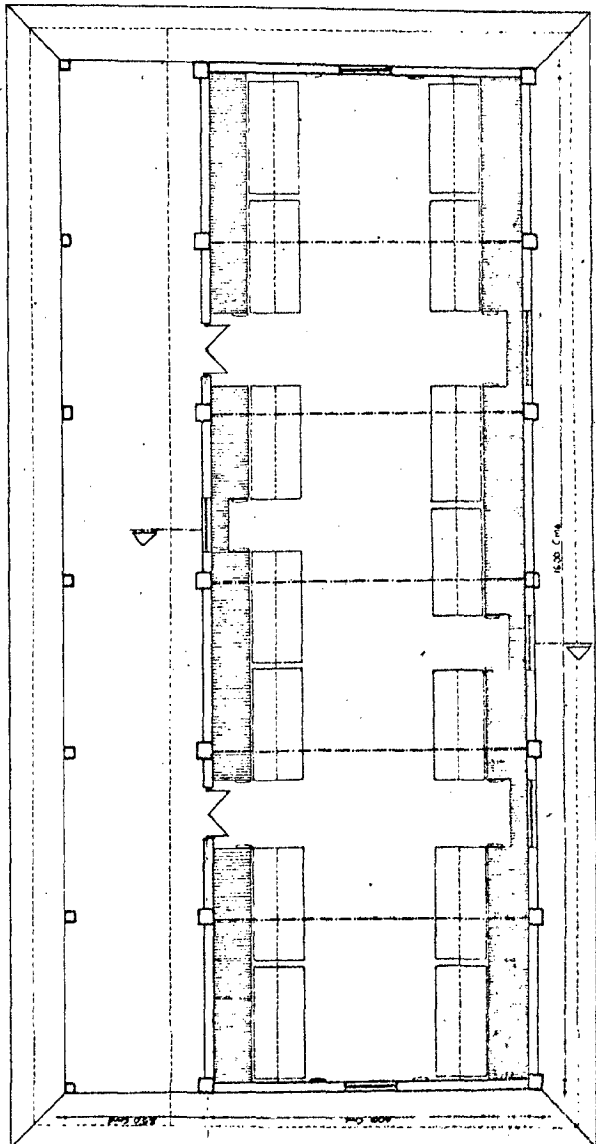
SCALE 1/8" = 1'-0"



PERSPECTIVE



FRONT ELEVATION



PLAN

Proposal III.

In this proposal of barracks the storage space have been reduced to 2.2 sq.m. per personnel. The upper berth is with the wall only and will be locked in the day time (Fig. 20).

(b) Married Accommodation :

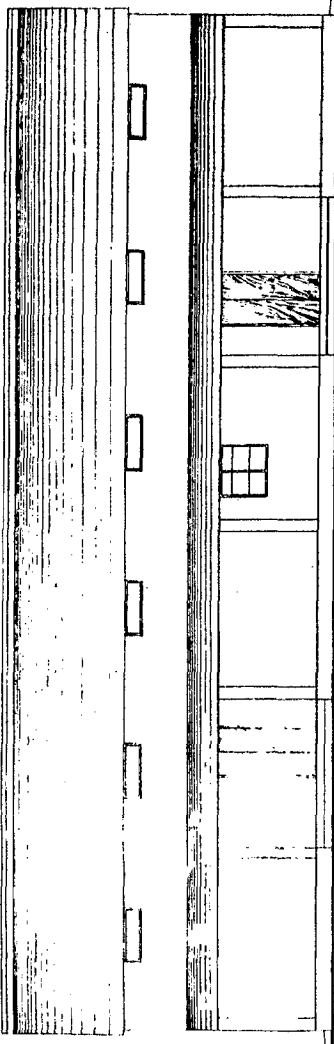
At X-Cantonment the plinth area authorisation to all the Military men, JCO's, Officers and civilian have been followed on the same scale which is being followed in cantonments located in plains. In plains plenty of buildable land is available. But in hills availability to buildable land is very less and some time it is less than 25%. Training of personnel is the main aim of the Army. This is most important activity of Army (Appendix -7). More than 80% area is allotted in a Battalion, is authorised for the training activities. Rest other things have got less priorities.

This gives the activities priority wise. Training is the first priority in the unit administration, open/play fields and so on. But in X-Cantonment first priority goes to Residential area, which is 71.4 H.A. and then comes the training area and so on.

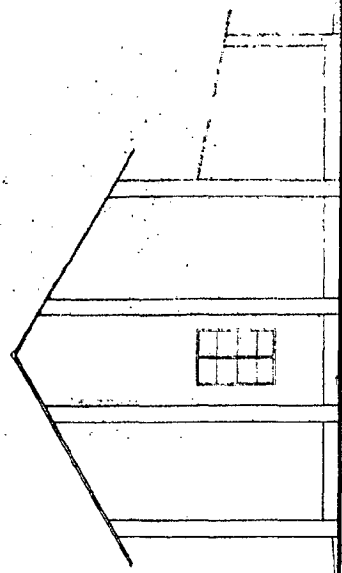
Garages have been provided for all the officers above the rank of Major in Army (Fig. 12) Survey conducted in the X-Cantonment reveals that only 3.33% are owning Scooter/Motor cycle and none are having cars. The size of garages have been provided for the cars only. The area of garages are 25 m<sup>2</sup>. But in case of Captain's the size of garages is more than 18 Sq.m. as two officers will have to share one garrage (Fig. 13).

It is concluded here that Garages should be curtailed in hills. But it cannot be deleted totally. So only 5% garages

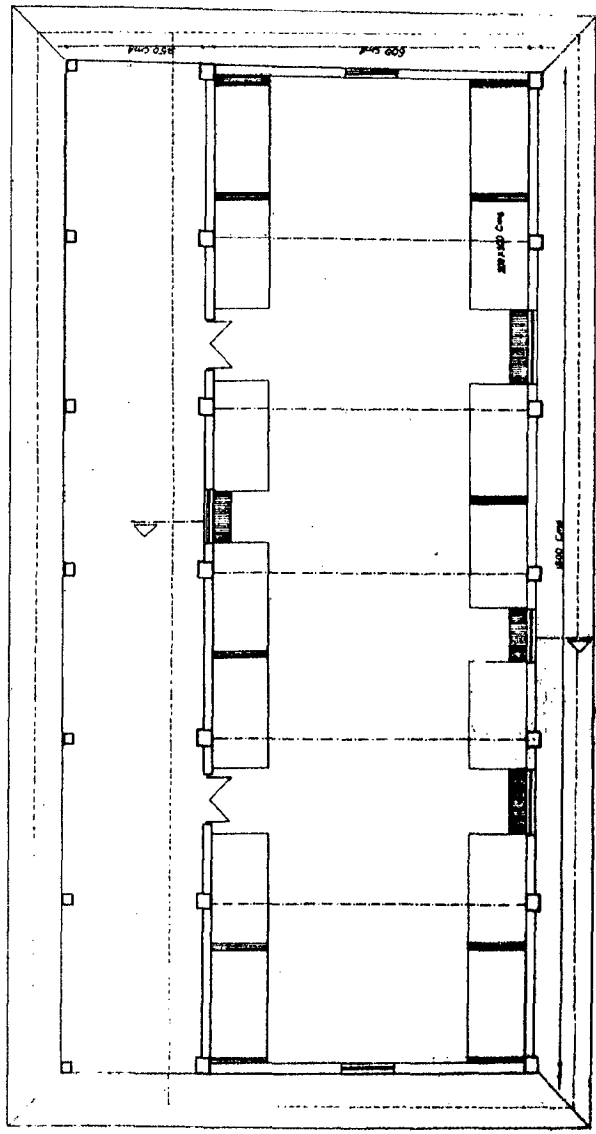
FIG. 20



FRONT ELEVATION



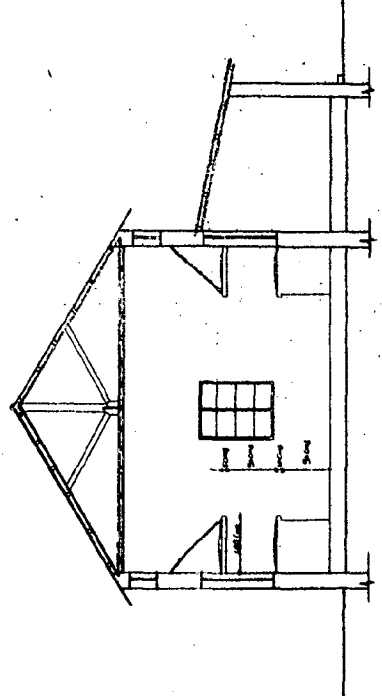
SIDE ELEVATION



PLAN

PROPOSAL NO. 2

SCALE 1/4" = 1'-0"



INTERIOR

should be provided for Major and above at community level and for the officers below Captain level should be provided Scooter/Motor cycle garages.

Servant rooms have been provided with the accommodation of Major and above and Captain having separate space for cooking. These servants are not cooking their meal in the room. But they are eating at community level Mess. So this space can also be deducted from the plinth requirement.

Three bed rooms are not required for the officers. The critical analysis show that the officers are having no requirement of Third bed room at all. The (Fig. 13A) shows that as the age and household increases the space requirement decreases.

The Drawing and Dining Room in Major and above quarters is unproportionate and excess area have been provided. It should be reduced by 10% of the total area of the room size.

(c) Authorisation scale should also be revised. As the OR's and JCO's are generally from Rural background having joint family system at home, don't prefer to bring their families to the station due to reasons mentioned below :

- (1) OR's wife is the working hand for the family occupation i.e. Agriculture.
- (2) Period of stay with family is also very less i.e. one year to two year per family.
- (3) Busy routine of OR's in training, exercises etc.
- (4) Senior officer don't like to disturb their families due to their children education.

## 7.2 Roads and Transportation System :

Arterrial Roads should be 6% of developable area. But in X-Cantonment area is 68.40 H.A. coming to 10.33% of the total developable area. The habitation is all along the communication routes and approach roads to the clusters are not existing. Unmetalled Roads and foot tracks are existing where metalled roads are not existing.

The length of roads in hills are more due to certain aspects e.g. topography, Rock structure etc. If the slope is more, the road lengths will be increased. If the Rock is very hard and difficult to cut. Then to by pass this area length of road will again increase.

To over come all these problems the standards of the road area should be increased at least by 5% and should be recommend 15% of the developable area. Passing places should be provided, wherever it is possible to facilitate the movement. Blind corners should be avoided, which is generally accident prove areas.

## 7.3 Public Utilities :

### (a) Water Supply :

Quantity of water supply per head should be increased to 120 lped in the civil area to provide the better environment.

### (b) Electric Supply :

Excessive electric supply is available and can be used properly.



(c) Sewage Disposal :

The system adopted in the X-Cantonment is not hygiene. The water consumption is more and to dispose off the cow dung also another problem. To overcome all these environmental problems a system is required in the cantonments, especially in hilly terrain, which does not pollute the environment, requires less quantity of water for flushing the laterines and disposal of night soil and cow dung.

Proposal :

Bio gas plant has been proposed taking company strength as a basic unit of 200 person. The community latrines have to be provided @ 10 person/laterine. The proper mixture of night soil and cow dung will provide cooking gas to meet 40 persons one time cooking needs. If two companies' laterines are connected in one Gas chamber the efficiency will increase to meet the 100 persons cooking requirement of one time (Appex - 10).

It will solve the sewage disposal system. Cooking gas available for the cook house and manure for the agriculture products.

At present 60% of authorisation of cantonment people (Appendix -B) is for conservancy system only. If this system is used the civil population will be reduced to the 50% of the total authorisation and help the military authorities to save the money.

Deforestation activity will also be curbed to the minimum, as cooking gas is available as a substitute of fire wood in the area.

(d) Refuse Disposal :

The collection, disposal and disinfection of garbage have become primordial urban problems. Wastes and garbage develop in increasing quantities in public buildings, streets, parks and gardens and dwelling units. They should be immediately disposed off else they will become a risk to human life and environment. Liquid wastes may be removed by a drainage system through pipes, while solid garbage by a transport. The organisation of rapid collection and disposal of garbage is of high importance but very expensive. Parking and maintenance of garbage collection vehicles need extensive area.

7.4 Community facilities :

COPP standards suggests that education facilities should be in the easy approach. But the results of survey (Appendix -I) reveals the 2.8 Km. to reach to the schools. In hills the general speed of man is 3 Km./hrs. It shows that minimum one hour on walking is required to reach to the school.

Medical facilities at a distance of 2.9 Km.

Shopping facilities at a distance of 2.8 Km.

Recreational facilities at a distance of 2.25 Km.

It can be seen that it is not feasible to place all the community facilities available to all the people in the cantonment. So either the community facilities should be scattered and put in a manner that these are easily approachable by all the residents. As only mode of conveyance is walking. It should be in 1 Km. radius or otherwise mass transportation system should be introduced on subsidised rates to provide better linkages between the houses and community facilities.

### 7.5 Open Areas & Play fields :

COPP standards suggests that 10% area should be available of developable area. But it is 1.31% of developable area. As there are more beautiful scenic places, the percentage should be reduced to 5% of developable area. That too also not flat. Picnic spots can be developed. Mountaineering and Treking should be encouraged to reduce the load on the play fields.

### 7.6 Training Areas :

Training is the most important activity of army. Training areas are required according to the needs but the flat area is not available in hills. At present it has 63.7 H.A. which is 19% of developable area. But as per (Appendix -7) for an Infantry Battalion training area is given 80% of the total area.

Firing ranges are eating away the maximum part of training area e.g. Rifle Range requires 335 Acre and Grenade Throwing ranges require 100 Acre. But more than 50% of the area is required more than 50%.

In Hills this danger zone can be saved by putting the Rifle range in the foot hills with a proper Firing Butts. (Sketch

Parade grounds and play fields can be combined and 50% of the area can be saved which gives total 40% of saving in the training areas.

### 7.7 Planning Densities :

The Planning density at present in the X-Cantonment is 4.2 person/Acre which is very low. The low densities in cantonments have been justified by the following five factors :

- (1) Climatic condition in India warranted open spacing of buildings for necessity of Air, Breeze and Light.
- (2) Prevalance of single storey construction
- (3) 100% expansion provision
- (4) Regid scales laid for planners in standards types of military building e.g.
 

|                       |                 |
|-----------------------|-----------------|
| Officers Class I & II | 1½ Acre/officer |
| Officer Class III     | 1 Acre/Officer  |
- (5) Requirement for large training areas.

These conditions are not existing now in our country and standards should also be modified accordingly. The residential buildings should go as high as possible upto 50'. It means four storey. But in hills it is not possible due to the slopes and seismic zone. But buildings can go up to three storey easily. At present two storey buildings are existing. Addition of one more storey to the building will increase the density per acre and the precious land could be saved for the more important aspect i.e. training.

Comparative Statement of Existing and Proposed Standards in the Infantry Regimental Centre located in hilly terrain between 2000 m - 3000 m above MSL.

| Sl. No. | Activity | Existing standards | Proposed standards | Modification | Remarks |
|---------|----------|--------------------|--------------------|--------------|---------|
| 1.      | 2.       | 3.                 | 4.                 | 5.           | 6       |

1. Residential Area.

(A) Single men

(i) OR's 5 Sq.m. 3.5 Sq.m. -(1.5 Sq.m.)

By increasing the occupancy in living barracks to 32 OR's

(ii) JCO 40 Sq.m. 25 Sq.m. -(15 Sq.m.)

JCO's are living in the Barrack Accommodation generally having their individual Room with attach toilets. To meet this requirement 25 Sq.m<sup>2</sup> is enough.

(iii) Officers

(a) Capt. & below 65.00 Sq.m. 40 Sq.m. -(25 Sq.m.)

One Room with attach toilet of 5m x 4m and one Servant room of 3m x 4m can be provided.

(b) Major & above 134.50 Sq.m. 100.5 Sq.m. -(34 Sq.m.)

Two room of 3x4m Bed room and 5x4m Drawing room with one servant room 3 x 4m can be provided. No separate garrage should be provided in the hilly area. These garrages can be provided at Community level

1. 2. 3. 4. 5. 6.

for all the officers those who are living in the Officers Mess.

|                      |              |             |               |  |
|----------------------|--------------|-------------|---------------|--|
| (B) Married          | 57.00Sq.m.   | 70.00Sq.m.  | +(15 Sq.m.)   | OR's authorisation needs increase in authorisation as they are having generally more children, old parents with them. They require more area for stocking fire wood, coal etc. |
| (i) OR's             |              |             |               |  |
| (ii) JCO             | 80.00 Sq.m.  | 90.00Sq.m.  | +(10 Sq.m.)   | JCO's authorisation don't require much modification as it is well suited to their requirements.  |
| (iii) Officers       |              |             |               |  |
| (a) Lt.Col & above   | 266.50 Sq.m. | 225.00Sq.m. | -(41.50Sq.m.) | One Bed room, one Servant room and Garrage should be excluded from the authorisation. The provision of 5% Garrage should be at the Community level.                            |
| (b) Major            | 206.50Sq.m.  | 165.00Sq.m. | -(41.50Sq.m.) | One Bed room, one Servant room and Garrage should be excluded from the authorisation. The provision of 5% Garrage should be at the Community level.                            |
| (c) Capt., Lt.&2/Lt. | 110.00Sq.m.  | 90.00 Sq.m. | -(20.00Sq.m.) | The authorisation requires change as half garrage is authorised to them, which is generally not in use. The Servant quarter should also be separated from the house.           |

2. Training Area

(i) Parade ground 12 Acre 5 Acre - 7 Acre

The parade ground should be centrally located for ceremonial activities. Small flat areas which should be developed as play field or PT fields, can be used for Drill purposes at Battalion level or Company level. As it is known that 20 to 30% OR's are always available for the training or Drill. Rest of them either will be on course, Leave or on Santry duty etc.

(ii) Ranges

|                                       |              |                      |
|---------------------------------------|--------------|----------------------|
| (a) Classification Range<br>8 targets | 650 Acre     |                      |
| (b) Rifle                             | 0.80         |                      |
| (c) Gernade                           | 0.25         | 350 Acre - 300 Acres |
| (d) Miniature AC/Obstacle course      | 0.50<br>2.00 |                      |

In hills it is very difficult to get such large plot of flat land, These firing Ranges can be distributed in different areas, wherever suitable location is available, in the foot hills. The high hills can be used as Butt to stop the bullets. But constant firing in the foot hills will spoil the face of hill feature. To safe guard these hill slopes Standard wall will be constructed to save the eroson and ecological imbalance.

3. Public Utilities & Community Facilities

(i) Public Utilities  
 (a) Water supply 4% of developable  
 (b) Electric supply  
 (c) Drainage Adequate

In hills, main source of water supply is natural springs, rivers and streams. Proper care is required for the Drainage system along the roads.

1. 2. 3. 4. 5. 6.

(d) Sewage & Refuse disposal      Conservancy system & septic tank system      Biogas plant should be installed at Community level.      Adequate

Due to population concentration and slopes, to maintain a central sewage system is a problem. Septic tank system has been adopted in hills in posh localities and Conservancy system in low income group areas. Both these system are hazardous to human life. Biogas plant to utilise the human excreta and cow dung in a useful manner, has been suggested at a cluster level. The area requirement is less than the area required for septic tank and providing better cooking facilities and better utilisation to sewage.

(iii) Community facilities

(a) Educational

|                        |                  |       |               |           |
|------------------------|------------------|-------|---------------|-----------|
| (i) Nursery School     | 50-60 Stu.       | 3.00  | 2.00          | 1.00 Acre |
| (ii) Primary School    | 350-400 Stu.     |       |               |           |
| (iii) Secondary School | 650-1000 Stu.    | 6to8  | 3.00          | 3.00      |
| (iv) College           | Per 100,000 Pop. | 15.00 | Per 40000 pop | 10.00     |
|                        |                  |       |               | 5.00      |

In hills the educational facilities should located in such a manner that it should serve the whole community properly. Visual distances between two areas are very less but on ground it takes hours to reach them. So taking the physical dimension into consideration the location should be fixed. Every School cannot have play grounds attached to them. So plinth area should be reduced on the ground at should go for multistorey buildings.



| 1.                       | 2.                       | 3.        | 4.   | 5.        | 6.  |
|--------------------------|--------------------------|-----------|--|-----------|---|
| (b) Medical              |                          |           |  |           |   |
| (i) Health Centre        | Per 20,000 Pop.          | 1.00      | Per 5000 pop.  | 0.5       | Health centres should be provided at a place where residents can use it without wasting any time to reach there. So it should be centrally located at the neighbourhood level. Hospital should cover the nearby region also.  |
| (ii) Hospital            | Per 20,000 Pop.          | 25.00     | Per 5000 Pop.  | 10.00     |   |
| (c) Recreational         |                          |           |  |           |   |
| (i) Open areas           | 10% of developable area. |           | 5% of developable area.                                | 5%        | Because already large stretches of land are forest reserves which take care of providing lungs to the developed area.   |
| (ii) Play fields         |                          |           |  |           |   |
| (iii) Parks              |                          |           |  |           |   |
| (iv) Swimming Pool       | International size       | 2.00 Acre | Not required   | 2.00 Acre | Due to shortage of water supply, non availability of land and cold climate.   |
| (d) Commercial           |                          |           |  |           |   |
| (i) Shopping centre      | Per 40000 pop.           | 10.00     | According to concentration of pop. 10000 Per 10000 pop | 7.5 Acres | Town centre is required in the Cantonment to provide variety of commodities and luxurious items for the population. The area of convenient shopping is adequate but these shops are required in a scattered manner to provide better facilities to the people in the near vicinity. |
| (ii) Convenient Shopping | per 1000 pop             | 0.5       | Per 1000 pop   | Adequate  |   |

4. Roads

|                     |                        |                                   |                    |  |  |
|---------------------|------------------------|-----------------------------------|--------------------|--|--|
| (i) Arterial roads  | 6% of developable area | NA                                | NA                 |  |  |
| (ii) For 61m R/W    | 25 Acre per mile       | NA                                | NA                 |  |  |
| (iii) For 30.50 R/W | 12.5 Acre per mile     | Arterial Road<br>15 Acre per mile | 2.5 Acre more land |  |  |
| (iv) For 18m R/W    | 8.5 Acre per mile      | 5.0 Acre per mile                 | 3.5                |  |  |
| (v) For 13.70 R/W   | 5.0 Acre per mile      | 6.0 Acre per mile                 | 1.0                |  |  |
| (vi) For 9.15 R/W   | 3.5 Acre per mile      | 3.5 Acre per mile                 | -                  |  |  |
| (vii) For 5.35 R/W  | 2.0 Acre per mile      | 2.0 Acre per mile                 | -                  |  |  |

In the hilly terrain arterial roads and roads of 61 metres R/W is not possible due to shortage of flat land and hard strata of hills. Some times to construct a road in hills it is necessary to by pass these rocky areas. and that will increase the length of the road. Slope is another reason of increase in road lengths. Approach roads are more in length due to the scattered pattern of human habitation.

5. Planning Densities

|                      |                |                      |                    |  |  |
|----------------------|----------------|----------------------|--------------------|--|--|
| (a) Land Acquisition | 5 person/Acre  | 15 person/Acre       | 10 Person/Acre     |  |  |
| (b) Zonal Density    | 11 person/Acre | 25 to 30 person/Acre | 14-29 persons/Acre |  |  |

At the time of calculating land for acquisition 5 persons per acre is the standard of Military Planners which is very low in our conditions. It should be increased by 3 to 4 times to meet the requirement of population, and zonal density should also be increased to 30 persons per Acre.

## CHAPTER - 8

CONCLUSION AND RECOMMENDATIONS

Stone's observations are very relevant here, "If standards are too high in one sector of the economy, other sectors will suffer unduly; and if high standards are adopted too early for the built environment, there may be insufficient resources to provide facilities at all levels, except for a minority, for years to come. If on the other hand, standards are too low, their subsequent rise will result in early obsolescence and resources will be wasted in modification or rebuilding".<sup>1</sup>

The formulation of standards, demands, imaginative, practicable and essentially indigenous solutions. Also they should not be conceived as hard and fast and once for all prescriptions. A built-in flexibility and adaptability are vital in their design as our country has undergone rapid and fundamental changes after getting independence in 1947.

Planning standards should not be conceived in a dynamic context that it is in tune with the need of the residents/users in the built environment. As the built environment is created for a long period. These planning standards should also be viewed in the same manner. A particular set of standards should not be offered to users but it should have some set of standards to provide flexibility to the users.

Considering all these factors I have suggested some guidelines for the future development of existing cantonments and planning of new cantonments between 2000 m - 3000 m above M.S.L.

---

<sup>1</sup> P.A. Stone, Urban Development in Britain, Standards, Costs and Resources 1964 - 2004, Cambridge University Press.

are given below :

8.1 Residential Accommodation :

(a) Single man Barrack :

- (1) The siting, orientation and spacing of Barracks depend on several requirements, the most important being adequate sunshine, light and aeration in the barracks. So frontage of barracks should always face sunny side to get the maximum sun light and heat.
- (2) In a sloping terrain, ribbon development in broken row may be advantageous.
- (3) Built in furniture should be provided in the barracks, to reduce the maintenance cost.
- (4) These living barracks should be designed in such a manner that it could be used for other purposes also such as; training, store, offices etc.

(b) Married Accommodation :

- (1) Special review of plinth areas authorised by the Army HQ. should be arranged by setting up a Review Committee to modify the standards for cantonments in hilly terrain between 2000 m - 3000 m MSL. As the existing standards are wasteful. The excessive standards are given below according to the rank structure of Army with their civilian counterparts.

|            |   |      |
|------------|---|------|
| OR         | - | 6.9% |
| Hav.       | - | 7.3% |
| JCO        | - | 25%  |
| 2/Lt & Lt. | - | 33%  |
| Captain    | - | -    |

|                 |   |     |
|-----------------|---|-----|
| Major           | - | -   |
| Lt. Col & above | - | 28% |

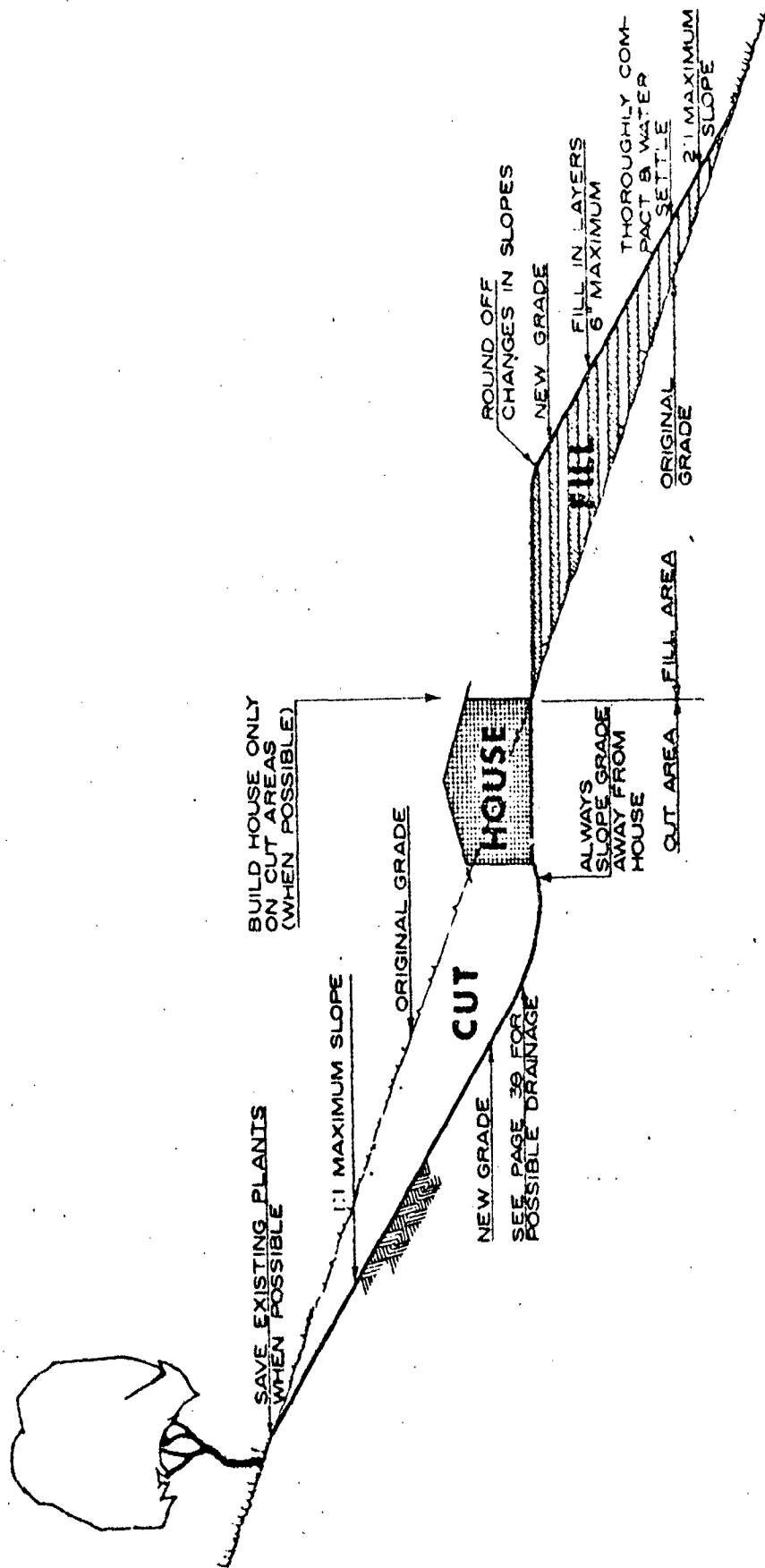
- (2) Garrages (25 m<sup>2</sup>) has been authorised to all officers till Major and half garage (12.5 m<sup>2</sup>) till 2/Lt. Survey conducted shows that only 3.33% officers are owning scooter/Motor cycles and non of the officers are owning their Private cars. But keeping in mind the future requirements garages for car can be propose to 5% of the total officers at Community level and 25% of Scooter shed should be provided at community level to save the land.
- (3) Three bed room house is authorised to the officers Major and above. But the analysis shows that third Bed room is a waste as it is not in frequent use. User might give argument that this Bed room is meant for guests. But the frequency of personal guests are very less. Even for them also Guest room in Mess or cottages at Station level are existing, which can be used by paying the nominal charges.
- (4) Two servant quarters ( 24 m<sup>2</sup>) are authorised to the officers of Generals rank and One Servant Quarter (24 m<sup>2</sup>) is authorised to Major and above with cooking space of 5 m<sup>2</sup>. It is generally seen that these servants never occupy these quarter as they are local people. Even if some requirement of these quarters are there. It can be provided separately at community level to maintain the privacy of the house and area.

- (5) Due to cold climate building design should be compact to consume heat energy and compact grouping of buildings is required.
- (6) Contour should be followed at the time of planning settlements. The building should not be placed on the fill portion (Fig. 21).
- (7) To use the land optimally, buildings should be designed upto second floor, which will increase the no. of accommodation and increase the density by 33%.
- (8) Provision for the use of solar and wind energy should be kept in buildings for future addition (Fig. 23).
- (9) As annual rain fall is 1537.25 mm proper drainage system inside the house and on roof should be provided.
- (10) Duplex type building should be encouraged to get better view and the optimal use of existing slopes.
- (11) The storages/Garage should be provided at ground floor.
- (12) Level variation between building blocks should be properly linked by approach roads.
- (13) Reconstruction of old bungalow type accommodation to accommodate more number of people in the same plot.

### 8.2 Residential area and Work Place :

Due to hilly terrain the movement of people will be generally on four wheelers, two wheelers and on foot. Cycle is not a success in hills. Officers mostly have their two wheelers but JCO's, OR's and NCE's are not capable of having two wheelers

FIG 21.



PLACEMENT OF BUILDINGS ON SLOPES

power driven vehicles. So they will be moving on foot all the times. As a routine every day an OR will have to move 6 times a day between Residential area and work place excluding his work in the unit. So if the distances are placed properly these timing of travel can be reduced. That's why OR's and JCO's Married accommodation should be as near as possible to the unit area.

Officers Married accommodation should also be planned in the same manner.

### 8.3 Training Areas :

(1) Training activities should be staggered for different units as flat patches of land is not available at one place to meet the training requirements of the centres (Sketch 5).

(i) P.T. parade for First company

(ii) Road march and run for Second company

(iii) PET for Third company

(iv) Drill for Fourth company etc.

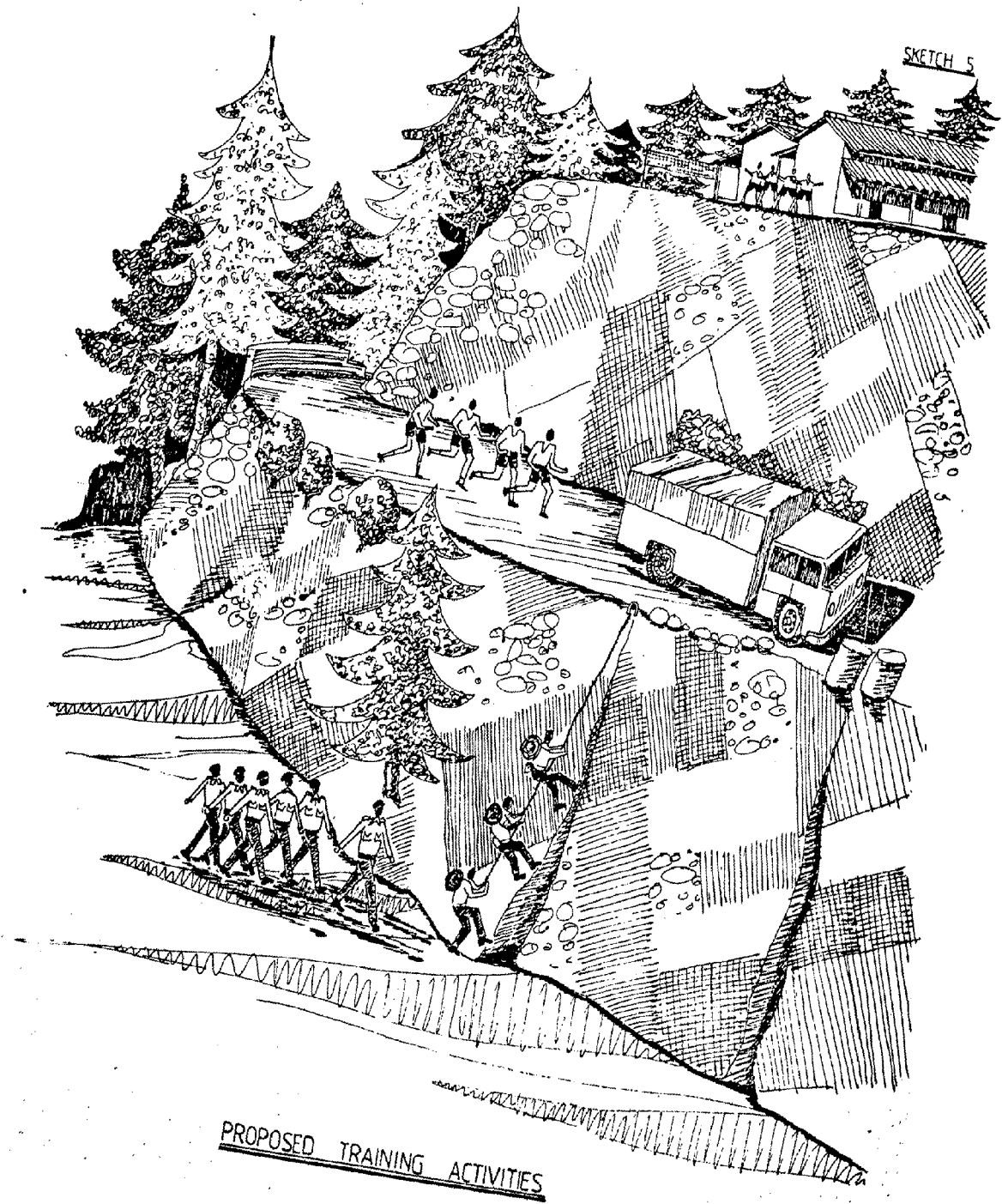
(2) Large Drill ground and play grounds should be arranged at Regimental level instead of providing at company level.

(3) Small flat patch of land should be provided at company level to perform the routine activities, e.g. Roll call, games etc.

(4) Trekking, Mountaineering and other games should be included in the programme for the training.

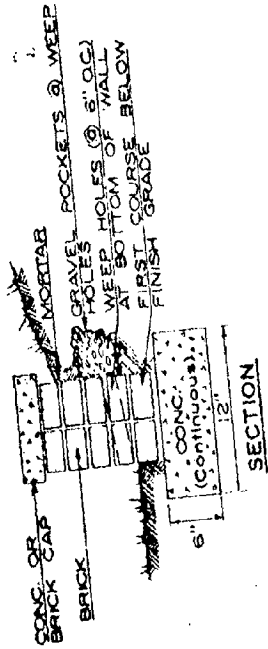
(5) Indoor games activities should be encouraged to reduce the load on the play grounds.



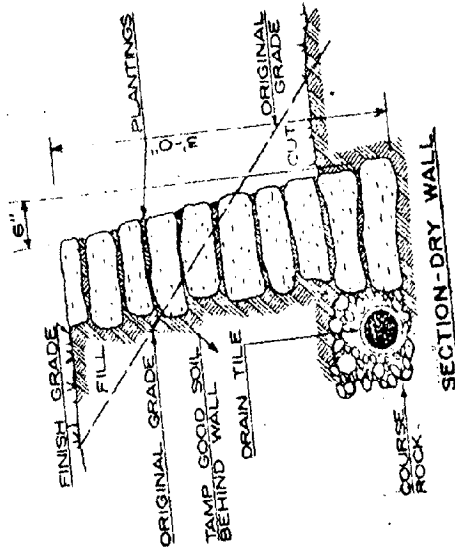


PROPOSED TRAINING ACTIVITIES

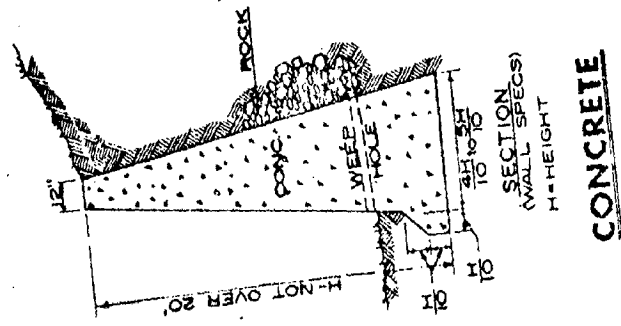
FIG 22



BRICK



STONE

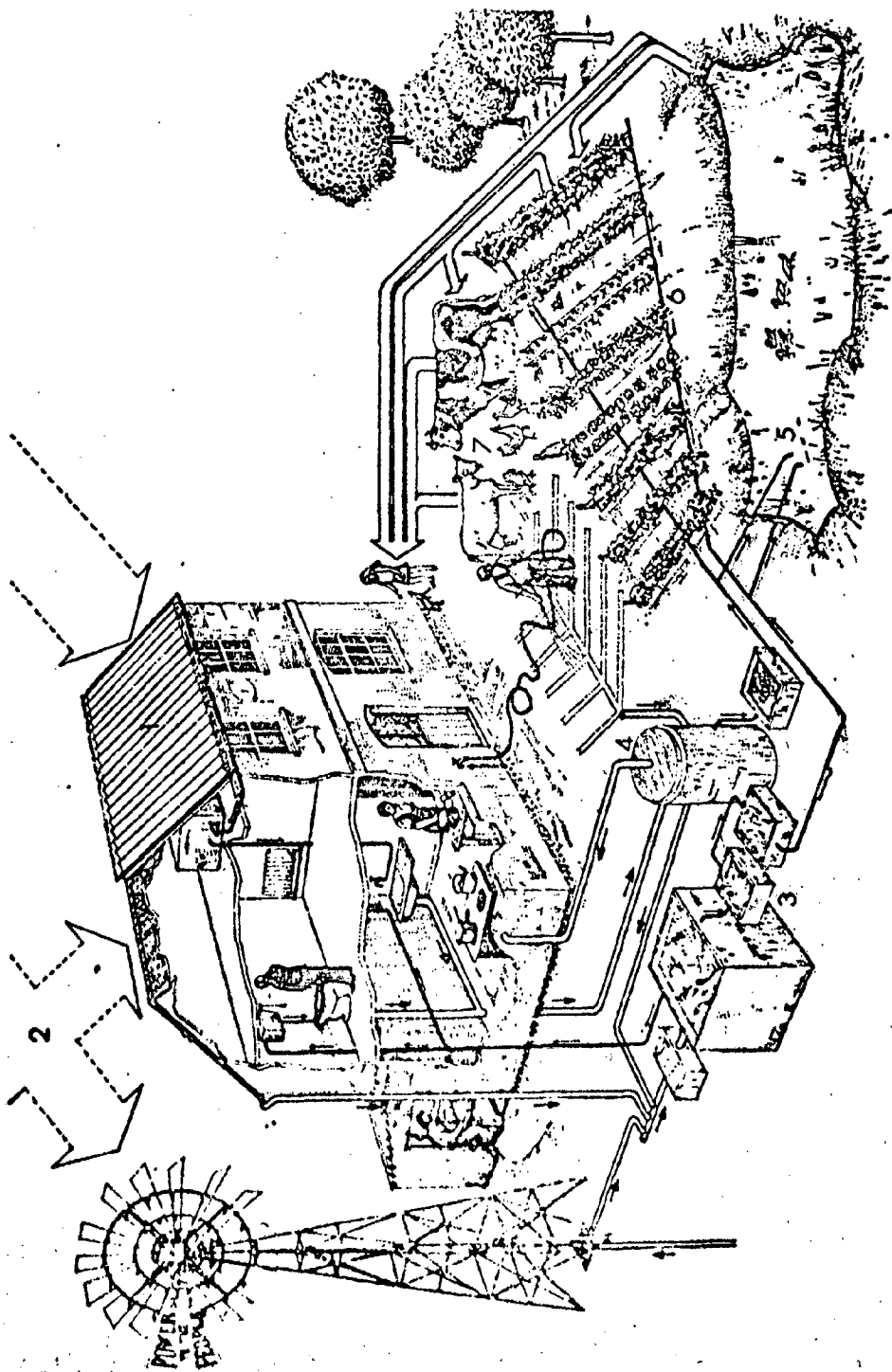


CONCRETE

TYPES OF RETAINING WALLS

FIG 23.

**A total ecological home.**  
 This dwelling emphasizes use of sun, wind, air, and wastes: 1) Solar roof captures sunlight to heat water; 2) rain water is collected for home use; wind powers windmill; 3) water is purified and stored; 4) decomposition of wastes produces methane gas for stove in house; 5) water from treatment systems flows to fish pond and 6) vegetable garden; 7) animals provide nourishment for people in house, thus completing the recycling of wastes. Copyright 1972 Chifford Harper, Epic Productions.



ECOLOGICAL HOME

- (6) Requirement of Firing Ranges are entirely different in hilly terrain, so the authorised standard should be changed. Foot hills can be used as firing butt, but the firing targets should be away from the foot hill.
- (7) Pattern of training should be more towards Mountaneous and jungle warfare.
- (8) Training areas should be in easy reach.

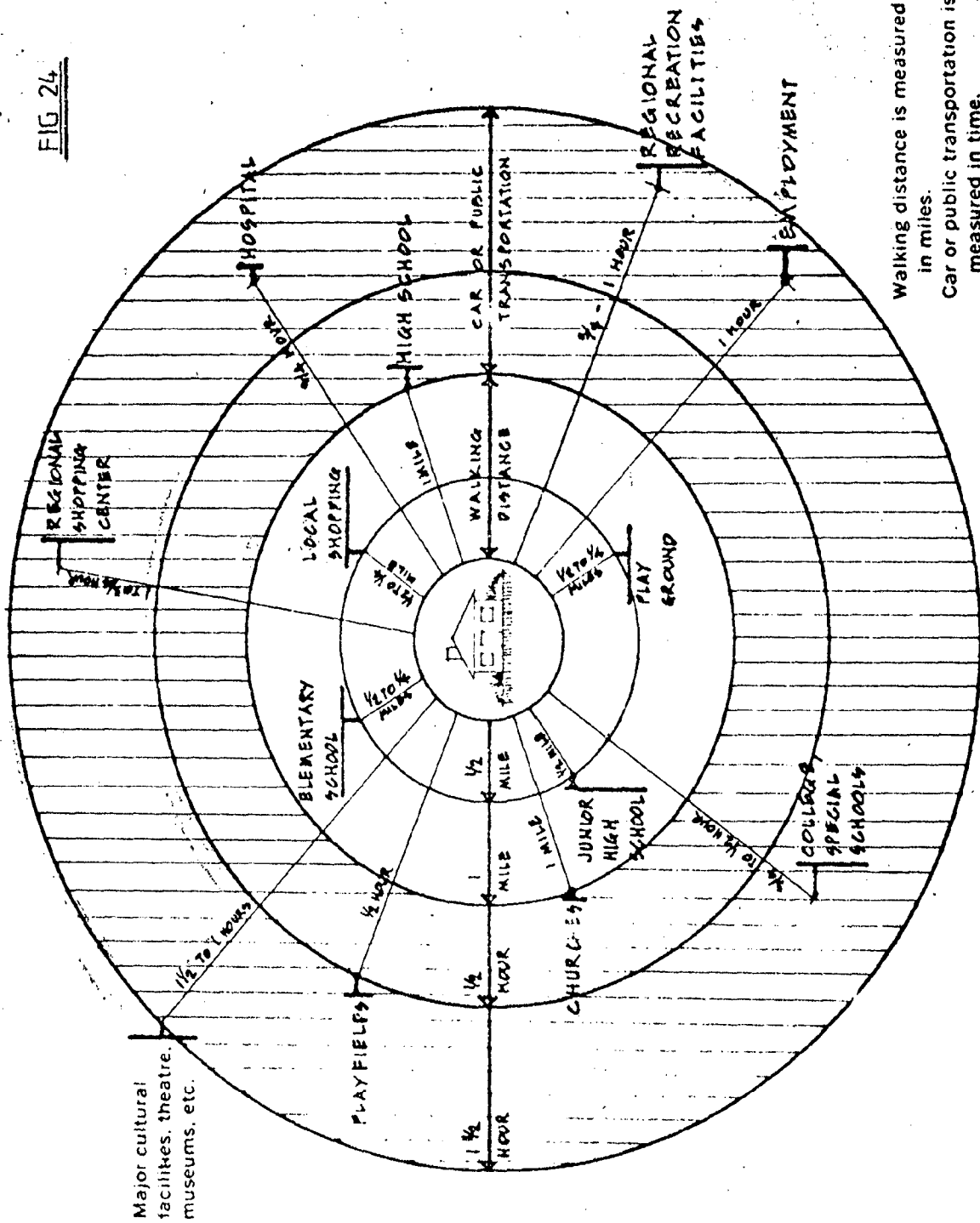
#### 8.4 Community Facilities :

1. Communities facilities should not be provided according to the regulations laid down by the authorities, but should be according to the need and the population concentration.
2. To follow neighbourhood pattern of planning is difficult in hilly terrain, so the development should take place along the communication route.

#### 8.5 Public Recreation & Open spaces :

1. Vast unmaintained open spaces are existing all around the habitation. But properly maintained open spaces for public recreations are required at community level.
2. Terraced platforms can also be developed as picnic spots.
3. Preservation of Forest area is very important for the human beings as these forests are having a variety of functions. As climate factors they improve hygenic conditions, facilitate the recreational activities.

FIG 24



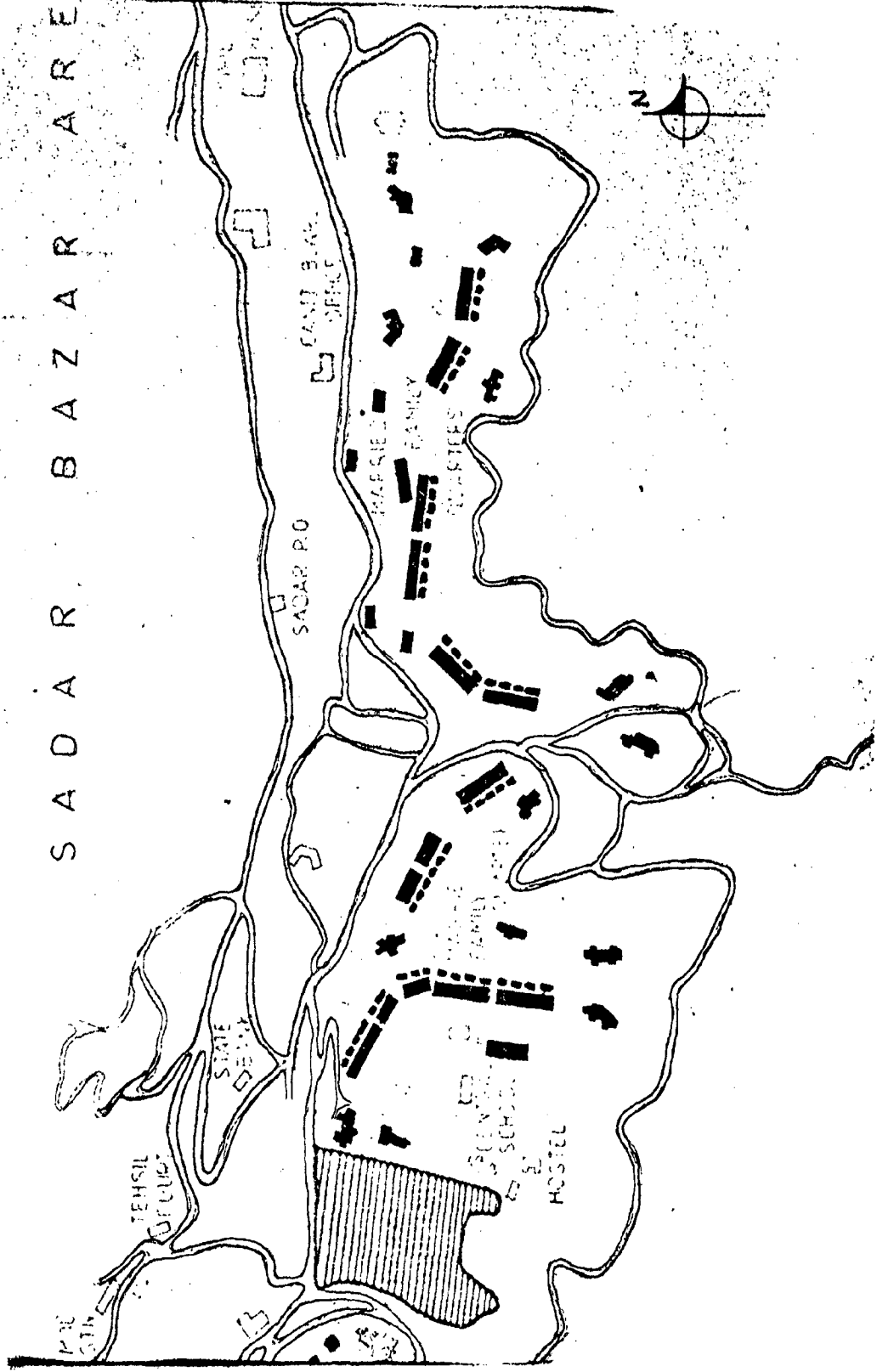
Walking distance is measured in miles.  
Car or public transportation is measured in time.

JOURNEY FROM HOUSE TO SELECTED DESTINATION

FIG. 25

CANTT SCHOOL

SADAR BAZAR ARE



ORIENTATION OF RESIDENTIAL BUILDINGS AT X - CANTONMENT

They act as wind barriers, equalising extreme climatic effects. In additions implantation absorb and dampen disturbing noises, cut the path of fire.

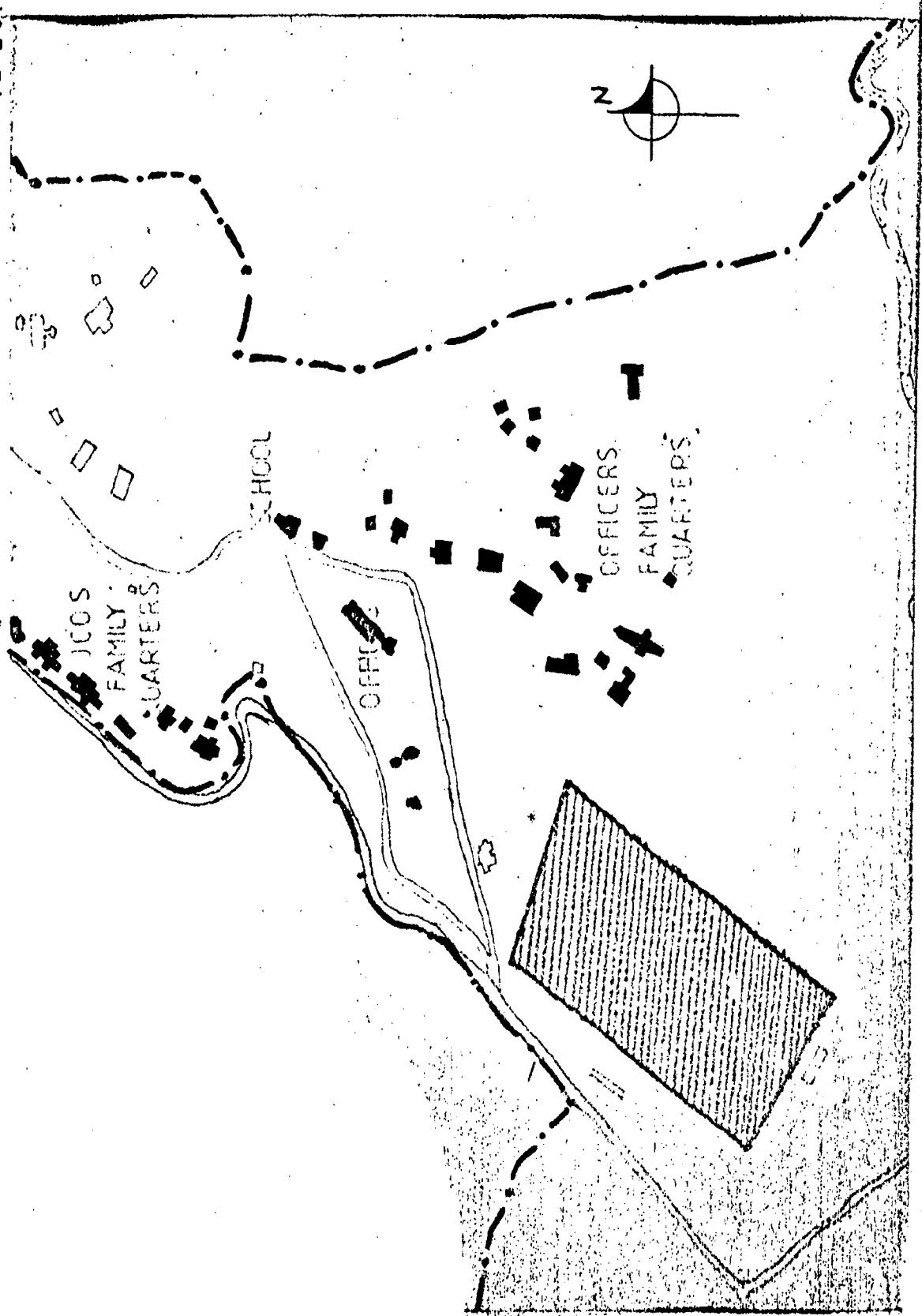
#### 8.6 Roads and Communication System :

1. Proper selection of route should be necessary for the Roads. Road is to give satisfactory service with minimum maintenance cost and interuption to traffic.
2. As we all know that water and only water is the enemy of hill roads, proper drainage system should be provided to drain the water.
3. Land slides and road blocks are the main problem in hills. Proper retaining wall or breast walls should be constructed to safeguard the road from land slides and erosion etc. (Fig. 22).

#### 8.7 Tourist Activity :

1. No..of tourist has increased in the X-Cantonment in the season from April to July and from Sept. to Nov. (Fig.10).
2. Civilian population in X-Cantonment is not able to get the minimum authorisation of water i.e. 80 lped. Increase in tourist influx will create more problems for the local population.
3. Being a cantonment town, tourist activity is a danger to the security. So this activity should not be encouraged in the cantonment.

FIG 26.

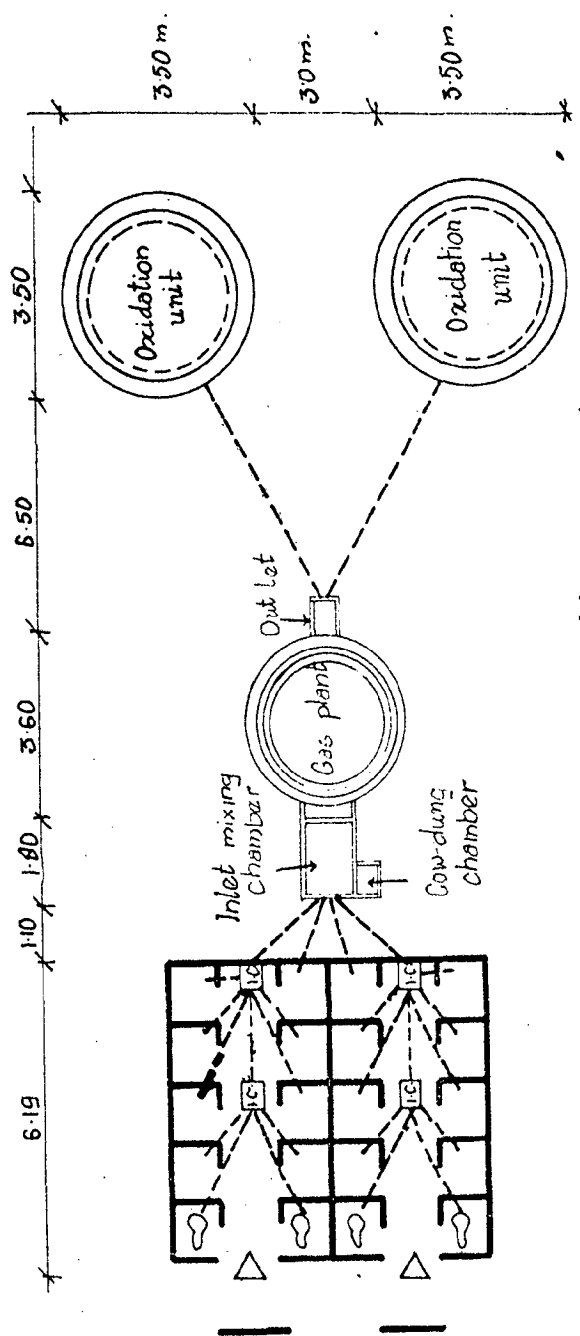


SCATTERED RESIDENTIAL BUILDINGS AT X - CANTONMENT

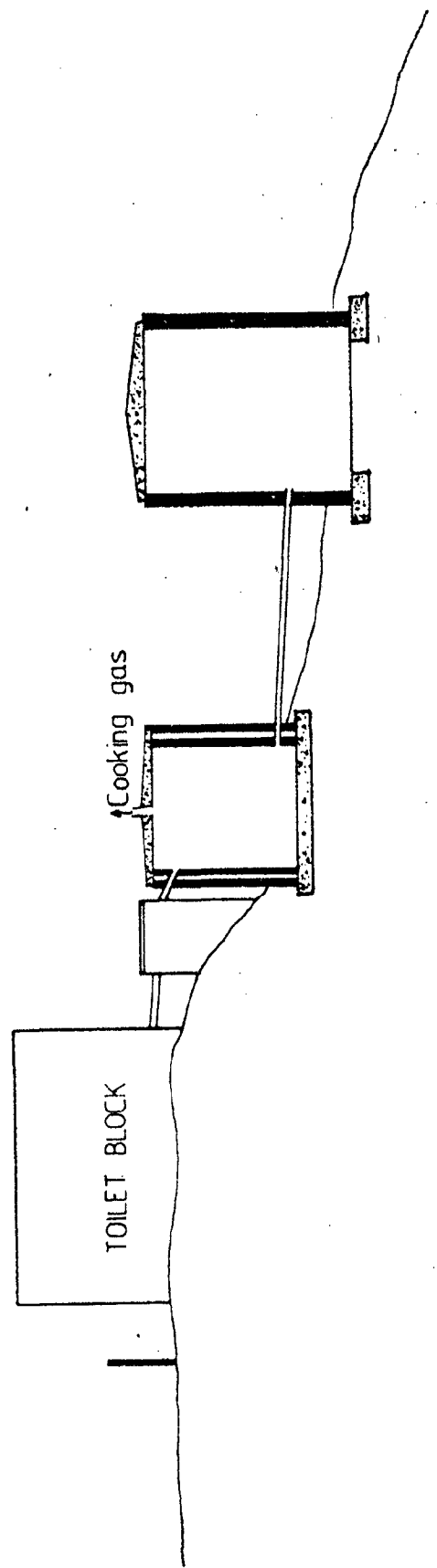




FIG 28



ONE COMPANY (200 MEN)



BOI - GAS PLANT

### 8.8 Planning Densities :

Planning densities can be low in the area where unbuildable and forest land is more but it should not be less than 5 to 6 persons per Acre. But in the developed areas excluding the Training areas/open spaces should not be less than 15 persons per Acre or even it can be more in areas where potential of development are more in future.

In the last it should be always be in mind that the planning standards existing in plains are not fit for the Infantry Regimental centres located between 2000 m to 3000 m above MSL. So the modified standards as given in report should be followed to provide the better environment in the cantonments. No doubt I was not able to handle all standards, as time restriction and certain other limitations of this project as a defence establishment. But whatever I have done hopefully will be helpful for the future planners at the time of planning cantonments in hilly areas.

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## RESULTS OF HOUSEHOLD SURVEY AT A GLANCE

| Sl. No. | Description of Item  | Army population<br>Households 90 |
|---------|--|----------------------------------|
| 1.      | Sample size  | 3.                               |
| 1.      | Average number of members/household  | 3.7                              |
| 2.      | (a) Average number of males/household                                      | 2.0                              |
|         | (b) Average number of females/household                                    | 1.7                              |
| 3.      | Average number of increasing members/household                             | 1.08                             |
| 4.      | Average household monthly income   | Rs. 927.22                       |
| 5.      | Average number of habitual rooms   | 1.89                             |
| 6.      | Percentage of households having proper waste disposal system (septic tank) | 36.67                            |
| 7.      | Percentage of households using various types of fuels for cooking :        |                                  |
|         | (a) L.P.G.   | 11.22                            |
|         | (b) Kerosene   | 26.67                            |
|         | (c) Fire wood  | 53.33                            |
|         | (d) Coal/Wood charcoal   | 20.00                            |



| 1. | 2.  | 3.                            |
|----|---|-------------------------------|
| 8. | (a) Percentage of households owning bicycles<br>(b) Percentage of households owning scooter/Motor-cycle<br>(c) Percentage of households owning car<br>(d) Percentage of households not having any vehicle | 5.56<br>8.33<br>0.00<br>91.11 |
| 9. | <u>Particulars on Use of Various Facilities :</u>   |                               |
|    | <u>I. Educational Facilities :</u>  |                               |
|    | (a) Average distance travelled by household for education   | 2.8 Km.                       |
|    | (b) Percentage of households using various modes of transport :   |                               |
|    | (i) Own vehicle   | 0.0                           |
|    | (ii) Bus service  | 0.0                           |
|    | (iii) Walking   | 100.0                         |
|    | <u>II. Medical Facilities :</u>   |                               |
|    | (a) Average distance travelled by household for medical facilities.   | 2.9 Km.                       |
|    | (b) Percentage of household using various modes of transport :  |                               |
|    | (i) Own vehicle   | 0.00                          |
|    | (ii) Bus service  | 1.15                          |
|    | (iii) Walking   | 98.85                         |

| 1.   | 2. | 3.       |
|--|----|----------|
| III. <u>Shopping Facilities :</u>                                      |    |          |
| (a) Average distance travelled by household for shopping facilities.   |    | 2.8 Km.  |
| (b) Percentage of household using various modes of transport :         |    |          |
| (i) Own vehicle  |    | 1.14     |
| (ii) Bus service   |    | 0.00     |
| (iii) Walking  |    | 98.86    |
| 9. IV. <u>Recreational Facilities :</u>                                |    |          |
| (a) Average distance travelled by household for recreational facility. |    | 1.88 Km. |
| (b) Percentage of household using various modes of transport :         |    |          |
| (i) Own vehicle  |    | 1.14     |
| (ii) Bus service   |    | 0.00     |
| (iii) Walking  |    | 98.86    |

APPENDIX - IIPROBLEMS OF RESIDENTS OF ARMY AREA

(Total No. of Responding Households = 47)

| Sl. No. | Description of Problem                          | Percentage of Households Responded | Problem Ranking |
|---------|---|------------------------------------|-----------------|
| 1.      | Inadequate Housing Facilities                   | 27.7                               | I               |
| 2.      | Very Cold Winter                                | 23.4                               | II              |
| 3.      | Inadequate Water Supply                         | 12.8                               | III             |
| 4.      | Inadequate Local Transport Facilities           | 12.8                               | III             |
| 5.      | High Cost of Living                             | 10.6                               | IV              |
| 6.      | Inadequate Educational Facilities               | 6.4                                | V               |
| 7.      | Long Distance between Residence and Facilities. | 4.3                                | VI              |
| 8.      | Problem of Fuel Supply                          | 2.1                                | VIII            |

Source : Field Survey.

SPACE STANDARDS FOR COMMUNITY FACILITIES RECOMMENDED  
BY THE COMMITTEE ON PLAN PROJECT

Community Facilities and Services :

1. Schools :

1.1 Schools

Primary

- i) One primary and nursery school of 400-500 seats per 3500 population (a neighbourhood).
- ii) Built up area of school - 11000 sft.
- iii) Land area - 3 acres.

Secondary

- i) A secondary school of 650 seats for a population of 9000 - 10000 (a sector).
- ii) The school must be capable of being expanded to thousand seats.
- iii) Built area of the school must be 45 cft. per place.
- iv) Land area 6 to 8 acres.

Academic College

- i) Provision for this may be made only when ultimate population of the town is to be about 1 lakh and a half.
- ii) Land area 15 acres.

1.2 Technical & Vocational School.

- i) One or two technical schools may be provided depending upon the size of the town.
- ii) Land area 12 to 15 acres.

- 1.3 Recreational Facilities. i) An allowance at the rate of 3 to 4 acres per thousand of population may be made for parks open space and recreational facilities according to the scales indicated below :-

| Recreational facility     | Population served | Land requirements | Location                   |
|---------------------------|-------------------|-------------------|----------------------------|
| Tot lot                   | 500               | 2000 sq.ft.       | Between residential plots. |
| Children's park           | Neighbourhood     | 5000 sq.ft.       |                            |
| Neighbourhood play ground | 2.0 acres         |                   |                            |
| Neighbourhood park        |                   | 2.5 acres.        |                            |
| Sector park               |                   | 10 to 15 acres.   |                            |
| Central park              | Whole Township    | Minimum 30 acres. |                            |

1.4 Health facilities for civilians.

- i) Number of beds in the hospital could be as follows :
- 30 beds for 10,000 population
  - 75 beds for 25,000 population
  - 125 beds for 50,000 population
  - 2 beds per thousand for one lakh and above.
- ii) The total built up area of the hospital per bed will be about :
- 720 sft. for 25 bed hospital
  - 660 sft. for a 50 bed hospital
  - 450 sft. for a 100 bed hospital
  - 400 sft. for a 200 bed hospital.
- (The standards given above include all sections of the hospital including out-patient department).
- iii) There should be one health centre for 20,000 of population. A built up area of 5,000 sft. for a health centre is adequate requiring 1.00 to 1.5 acres of land.

- iv) Land requirement for hospitals :
- | Bed strength | Land requirement |
|--------------|------------------|
| 25           | 5 acres          |
| 50           | 10 acres         |
| 100          | 15 acres.        |

- 1.5 Commercial facilities.
- i) The total number of shops in the township should be of the order of 6 shops per thousand of population.
  - ii) These should be suitably distributed in the neighbourhood, sectors and the town centres.

1.6 Roads and Streets Standards :

| Type  | Right of way  | No. of lanes   |
|---|---|--|
| Arterials with central median.                                    | 200' (61 m) on the periphery of the town otherwise 160' (49 m). | One on either side of the central median to start with and two on either side ultimately |
| Major roads (Principal traffic routes).                           | 80' - 100' (25 m to 30 m)                                       | Two lanes to start with and four lanes ultimately.                                       |
| Neighbourhood roads   | 45' to 60' (14 m to 18 m)                                       | Two lanes.   |
| Residential streets   | 30' to 45' (9 m to 14 m)  | Two lanes.   |
| Culs de sac (not to exceed 600' in length.                        | 25' to 30' (8 m to 9 m)   | Two lanes.   |
| Loops giving access to residences (with open spaces on one side). | 10' to 15' (3m to 5 m)  | -  |
| Service lanes to be provided in the case of row housing only.     | 15' to 20' (5 m to 6 m)   | -  |
| Cycle tracks  | 7' to 9' (2m to 3 m)  | -  |

## 1.7 Access : Standards for Community facilities within the neighbourhood and the Sector.

### Suggested walking distance

|                               |                                     |
|-------------------------------|-------------------------------------|
| 1. Schools :                  |                                     |
| Nursery                       | 1/4 mile (0.40 K.M.)                |
| Primary                       | 1/4 to 3/8 mile (0.40 to 0.60 K.M.) |
| Secondary                     | 1/3 to 1 mile (0.54 to 1.61 K.M.)   |
| 2. Recreation :               |                                     |
| Tot lot                       | 1/8 mile (0.20 K.M.)                |
| Children park                 | 1/4 to 1/3 mile (0.40 to 0.54 K.M.) |
| Adult's playground            | 1/2 to 1 mile (0.80 to 1.61 K.M.)   |
| Adult's park                  | 1/2 to 1 mile (0.80 to 1.61 K.M.)   |
| 3. Groceries & Local Shopping | 1/4 to 1/2 mile (0.40 to 0.80 K.M.) |
| 4. Health Centre              | 1/2 to 1 mile (0.80 to 1.61 K.M.)   |
| 5. Post Office                | 1/2 to 1 mile (0.80 to 1.61 K.M.)   |
| 6. Institutional              | 1 mile (1.61 K.M.)                  |
| 7. Service Shopping           | 1 mile (1.61 K.M.)                  |

PROVISION OF SHOPPING CENTRES AT  
NEW MILITARY STATIONS

It is recommended that for 20,000 population, we should provide shops of the following types :-

|     |                                |   |
|-----|--------------------------------|---|
| 1.  | Aerated water                  | 1 |
| 2.  | Barber                         | 2 |
| 3.  | Book/Stationary                | 2 |
| 4.  | Car/Scooter repair and service | 2 |
| 5.  | Cloth                          | 2 |
| 6.  | Chemist and druggist           | 2 |
| 7.  | Cycle                          | 2 |
| 8.  | Dry cleaner                    | 1 |
| 9.  | Fuel including gas             | 2 |
| 10. | Furniture                      | 1 |
| 11. | Crockery                       | 2 |
| 12. | Hardware                       | 1 |
| 13. | Instrument repairs             | 1 |
| 14. | Meat and Poultry               | 2 |
| 15. | Milk/dairy/bakery              | 2 |
| 16. | Photographer                   | 1 |
| 17. | Restaurant                     | 2 |
| 18. | Radio electricals              | 2 |
| 19. | Shoes                          | 2 |
| 20. | Tailors                        | 2 |
| 21. | Vegetables/fruits              | 3 |

NOTE : Size of shops = 5 m x 8 m.

Source : Army H.Q.



APPENDIX - V

COMPARATIVE VISITOR'S DATA CHART AT X- CANTONMENT

| Month | 1981   |                 |        | 1982   |                 |        | 1983   |                 |        | 1984   |                 |        |
|-------|--------|-----------------|--------|--------|-----------------|--------|--------|-----------------|--------|--------|-----------------|--------|
|       | Indian | Forei-<br>gners | Total  | Indian | Forei-<br>gners | Total  | Indian | Forei-<br>gners | Total  | Indian | Forei-<br>gners | Total  |
| Jan.  | 15100  | 3               | 15103  | 12800  | 4               | 12804  | 14300  | 3               | 14303  | 14500  | 26              | 14526  |
| Feb.  | 22000  | 8               | 22008  | 13000  | 5               | 13005  | 14000  | 14              | 14014  | 14300  | 19              | 14319  |
| March | 17200  | 8               | 17208  | 15000  | 23              | 15023  | 16200  | 23              | 16223  | 18000  | 32              | 18032  |
| April | 17000  | 31              | 17031  | 21000  | 26              | 21026  | 21500  | 34              | 21534  | 23300  | 44              | 23344  |
| May   | 34000  | 20              | 34020  | 24000  | 59              | 24059  | 31000  | 23              | 31023  | 42000  | 45              | 42045  |
| June  | 25500  | 9               | 25509  | 23000  | 25              | 23025  | 38000  | 22              | 38022  | 27700  | 26              | 27726  |
| July  | 19200  | 4               | 19204  | 18000  | -               | 18000  | 20000  | 10              | 20010  | 24000  | 28              | 24028  |
| Aug.  | 21500  | 7               | 21507  | 17968  | 12              | 17980  | 22105  | -               | 22105  | 19000  | 24              | 19024  |
| Sept. | 21000  | 25              | 21025  | 16000  | 8               | 16008  | 18500  | 8               | 18508  | 21200  | 23              | 21223  |
| Oct.  | 23000  | 11              | 23011  | 21538  | 4               | 21542  | 19400  | 25              | 19425  | 23400  | 66              | 23466  |
| Nov.  | 18000  | 6               | 18006  | 17326  | 12              | 17338  | 18000  | 15              | 18015  | 19200  | 20              | 19220  |
| Dec.  | 15300  | 11              | 15311  | 17643  | 12              | 17655  | 13500  | 14              | 13514  | 16200  | 24              | 16224  |
| TOTAL | 248800 | 143             | 248943 | 217275 | 190             | 217465 | 246505 | 191             | 246696 | 262800 | 377             | 263177 |

Source : Cantt. Board, X-Cantonment

APPENDIX - VITOURIST DATA OF 1984AT X-CANTONMENT

| Month | Tourist Office | Hotel | Dharamshala | Total | No. of tourists per day |
|-------|----------------|-------|-------------|-------|-------------------------|
| Jan.  | 104            | 1036  | 21          | 1161  | 37                      |
| Feb.  | 94             | 1042  | 28          | 1136  | 40                      |
| March | 201            | 1268  | 41          | 1510  | 49                      |
| April | 431            | 1426  | 53          | 1910  | 63                      |
| May   | 1379           | 3823  | 173         | 5375  | 179                     |
| June  | 1144           | 8288  | 136         | 9568  | 319                     |
| July  | 139            | 2852  | 36          | 3027  | 97                      |
| Aug.  | 100            | 2498  | 42          | 2640  | 85                      |
| Sept. | 304            | 3303  | 33          | 3640  | 121                     |
| Oct.  | 779            | 6898  | 85          | 7752  | 250                     |
| Nov.  | 134            | 2012  | 22          | 2168  | 72                      |
| Dec.  | 177            | 1959  | 47          | 2183  | 70                      |

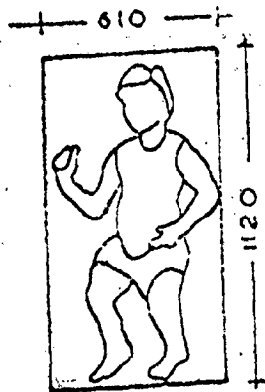
Source : Tourist Office.

BREAK DOWN DETAILS OF AREAS ALLOTTEDTO AN INFANTRY BATTALLION

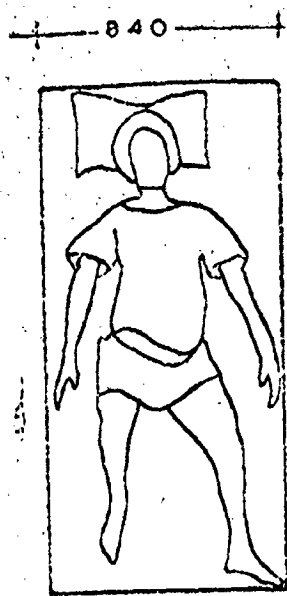
|   |                     |             |
|---|---------------------|-------------|
| 1. Built up Area -                        |                     |             |
| a) Single storeyed (guard House           | )                   |             |
| Single JOs' Cook House/Dining Hall        | )                   |             |
| Etc. Quarter Master stores)               | )                   | 7.00 acres  |
| b) Double storeyed office area            | )                   |             |
| c) Triple storeyed single living          | )                   |             |
| 2. MT Area with internal roads            |                     | 2.50 acres  |
| 3. Roads                                  |                     | 2.00 acres  |
| 4. Explosive stores including Danger Zone |                     | 1.50 acres  |
| 5. Training Area -                        |                     |             |
| a) Assault Course                         | )                   |             |
| b) Obstacle Course                        | )                   | 35.00 acres |
| c) Small Area Range                       | )                   |             |
| 6. Play fields                            |                     | 6.50 acres  |
| 7. Parade Grounds                         |                     | 3.00 acres  |
| 8. Open spaces                            |                     | 8.30 acres  |
|   |                     | <hr/>       |
|   | Total land allotted | 65.80 acres |
|   |                     | <hr/>       |

APPENDIX IX

SLEEPING



INFANT



GROWNUP



ADULT



CHILD & ADULT



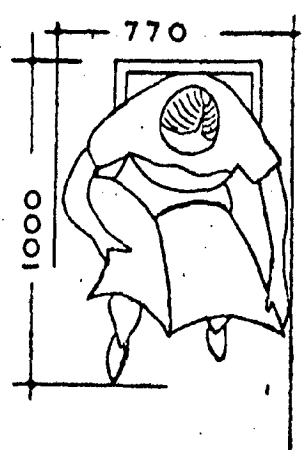
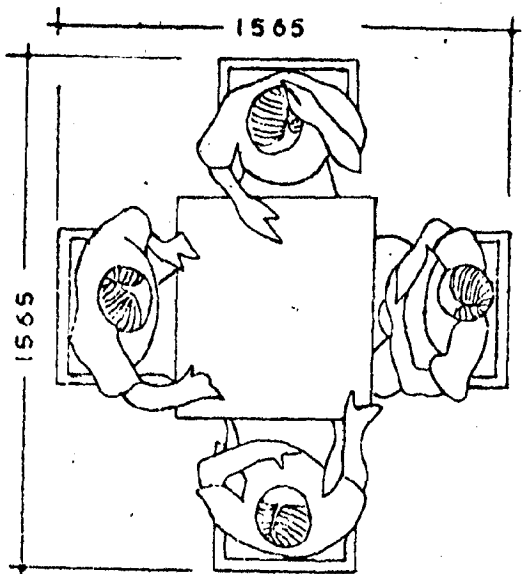
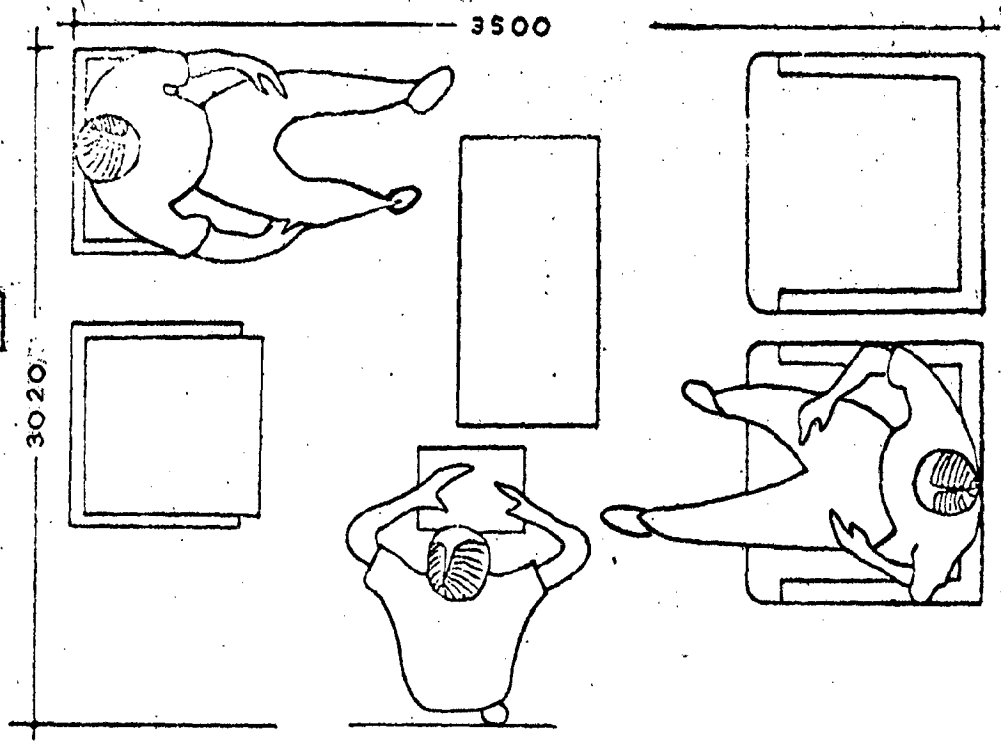
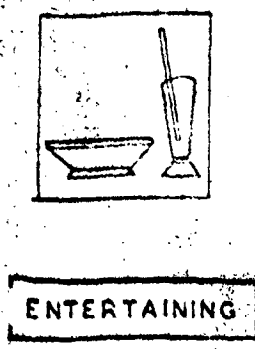
TWO ADULTS

( 24 )

ANTHROPOMETRIC STUDY

SOURCE: Architectural composition & design of houses

Saral prakashan ALIGARH



BREAK DOWN DETAILS OF AREAS ALLOTTEDTO AN INFANTRY BATTALLION

|  |                     |             |
|--|---------------------|-------------|
| 1. Built up Area -   |                     |             |
| a) Single storeyed (guard House<br>Single JOs' Cook House/Dining Hall<br>Etc. Quarter Master stores) | )<br>)<br>)         | 7.00 acres  |
| b) Double storeyed office area   | )                   |             |
| c) Triple storeyed single living   | )                   |             |
| 2. MT Area with internal roads   |                     | 2.50 acres  |
| 3. Roads   |                     | 2.00 acres  |
| 4. Explosive stores including Danger Zone  |                     | 1.50 acres  |
| 5. Training Area -   |                     |             |
| a) Assault Course  | )                   | 35.00 acres |
| b) Obstacle Course   | )                   |             |
| c) Small Area Range  | )                   |             |
| 6. Play fields   |                     | 6.50 acres  |
| 7. Parade Grounds  |                     | 3.00 acres  |
| 8. Open spaces   |                     | 8.30 acres  |
|  |                     | <hr/>       |
|  | Total land allotted | 65.80 acres |
|  |                     | <hr/>       |

APPENDIX - VIIISANCTIONED STRENGTH OF CANTT. BOARD STAFF, X-CANTONMENT

| <u>HEAD/SECTION</u>                                       |       | <u>STRENGTH</u> |
|---|-------|-----------------|
| 1. General Administration                                 | ...   | 16              |
| 2. Toll Section   | ...   | 44              |
| 3. Revenue Branch (Tax Section)                           | ...   | 3               |
| 4. P.W.D. Section   | ...   | 13              |
| 5. Fire Establishment                                     | ...   | 1               |
| 6. Library Establishment                                  | ...   | 2               |
| 7. Market Establishment                                   | ...   | 3               |
| 8. Forest Establishment                                   | ...   | 22              |
| 9. Dispensary Establishment                               | ...   | 3               |
| 10. Vaccination Establishment                             | ...   | 1               |
| 11. Civil Conservancy Establishment                       | ...   | 147             |
| 12. Water Supply Establishment                            | ...   | 8               |
| 13. Military Conservancy Establishment                    | ...   | 86              |
| 14. School Establishment, (Junior and<br>Primary Schools) | ...   | 41              |
| 15. Lighting Establishment                                | ...   | 1               |
|   | TOTAL | <u>391</u>      |

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Source : CEO, X-CANTONMENT.