THESIS REPORT ON

Employees' State Insurance Corporation Hospital SIDCUL, UTTARAKHAND, INDIA

Thesis submitted to the Department of SCHOOL OF ARCHITECTURE AND PLANING , BBDU , Lucknow
In partial fulfillment for the award of the degree of

BACHELOR OF ARCHITECTURE

BY

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UNDER THE GUIDANCE OF **Ar. Mohit Sachan**

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UTTAR PRADESH, INDIA

BBD UNIVERSITY

CERTIFICATE

It is certified that the work contained in this B.Arch thesis entitled “EMPLOYEES STATE INSURANCE CORPORATION HOSPITAL , SIIDCUL , HARIDWAR , U.K. , INDIA”, by AASIM FAROOQUI (1140101003), for the award of Bachelor of Architecture from BABU BANARSI DAS UNIVERCITY ,LUCKNOW , UTTAR PRADESH, has been carried out under my supervision at SCHOOL OF ARCHITECTURE & PLANNING, FAIZABAD ROAD , LUCKNOW, UTTAR PRADESH and that this work has not been submitted elsewhere for a degree.

(Signature)
Ar. Mohit Sachan
Thesis guide

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LUCKNOW, UTTAR PRADESH

I hereby recommend that the project under my supervision by AASIM FAROOQUI (1140101003) entitled “EMPLOYEES STATE INSURANCE CORPORATION HOSPITAL , SIIDCUL , HARIDWAR , U.K. , INDIA” be accepted in partial fulfillment of the requirements for the degree of Bachelor of Architecture.

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ACKNOWLEDGMENT

My thesis represents not only my hard work on the sheets and paper, it is also reflection of my research efforts in the planning of ESIC HOSPITAL .

This work would not have been possible without the support numerous hands at every moment. Foremost, I would like to express my sincere gratitude to my thesis guide “Ar. MOHIT SACHAN ” and co-guide . My sincere thanks also goes to Ar. ANSHUL SINGH , Ar. ARVIND , and rest of faculty members associated with Architecture Department.

I am grateful to all of those with whom I had the pleasure to work with discussions during thesis. Where Architects of my friend circle like AR. SUSMITA SINGH , AR. MOHD ALI KHAN have provided me extensive personal and professional guidance, on the other side my dear friend's ABHISHEK KUMAR , ABHISHEK BANERJEE ,HAMZA AFTAB , HIMANSHU CHAUBEY , YASHASVI , ANOOP , AYUSH KHARE , APOORVE PANDIT juniors like AMIR ABBAS , INSIA MIRZA , have helped enthusiastically in binding thesis.

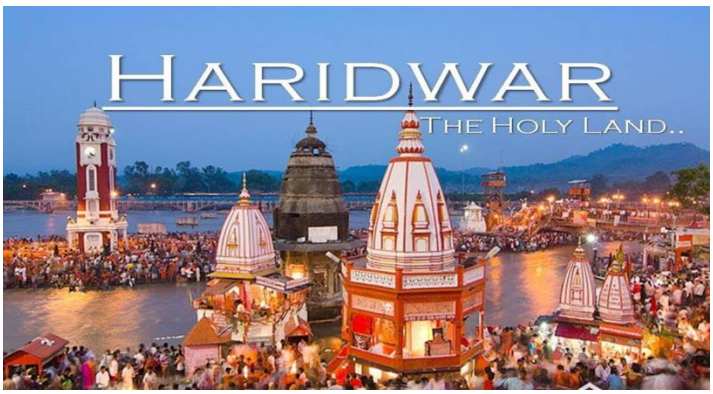
I owe a special thanks to Ar. PUSHPENDRA KUMAR for his encouragement to dare the dream of today and have been supportive of career goals.

SITE STUDY

Brief about HARIDWAR (SIDCUL)

The State Industrial Development Corporation of Uttarakhand Limited (SIDCUL) is a government of Uttarakhand enterprise which promotes industries and develops industrial infrastructure in the State

Haridwar is an ancient city and important Hindu pilgrimage site in North India's Uttarakhand state, where the River Ganges exits the Himalayan foothills. The largest of several sacred ghats (bathing steps), Har Ki Pauri hosts a nightly Ganga Aarti (river-worshipping ceremony) in which tiny flickering lamps are floated off the steps. Worshipers fill the city during major festivals including the annual Kanwar Mela.



Elevation: 314 m

Area: 12.3 km²

Weather: 12 °C, Wind N at 2 km/h , 89% Humidity
Population: 2.29 lakhs (2011)

GENERAL INTRODUCTION HOSPITAL

A hospital is a health care institution providing patient treatment with specialized medical and nursing staff and medical equipment.[1] The best-known type of hospital is the general hospital, which typically has an emergency department to treat urgent health problems ranging from fire and accident victims to a sudden illness. A district hospital typically is the major health care facility in its region, with many beds for intensive care and additional beds for patients who need long-term care. Specialized hospitals include trauma centers, rehabilitation hospitals, children's hospitals, seniors' (geriatric) hospitals, and hospitals for dealing with specific medical needs such as psychiatric treatment (see psychiatric hospital) and certain disease categories. Specialized hospitals can help reduce health care costs compared to general hospital

A teaching hospital combines assistance to people with teaching to medical students and nurses. A medical facility smaller than a hospital is generally called a clinic. Hospitals have a range of departments (e.g. surgery and urgent care) and specialist units such as cardiology. Some hospitals have outpatient departments and some have chronic treatment units. Common support units include a pharmacy, pathology, and radiology.

Hospitals are usually funded by the public sector, health organisations (for profit or nonprofit), health insurance companies, or charities, including direct charitable donations. Historically, hospitals were often founded and funded by religious orders, or by charitable individuals and leaders

ESIC as an institution has to respond to changing social environment attitudes, advancements in medicine, therapy and diagnosis and technology. Each department of ESIC has own identity. its very good combination of private and public space. above all these things makes its planning a very complex composition. Beside it, in todays hospital engineering department and support services have assumed best in ESIC throughout the country . Thus as a students of architecture, I take this opportunity to explore and learn the complexities of designing ESIC proposal with own efforts following the all related standards with a little bit different perspective from my side.

AIMS

To create healing environment in a sustainable campus by via design Process in Architectural context.

The objective of this project is to improve the health environment , development profile and social profile of the Province -

- ✓ To study about the required medical units proposed by the government authorities.
- ✓ To study about the functionality and design parameters required for an ESIC.
- ✓ To provide a rich learning environment through Campus architecture.
- ✓ To provide a Master plan with proper zoning of concerned spaces
- ✓ Applications of smart hospital facilities in present technological context.

SIGNIFCANCE OF STUDY

It will provide an improvement in the health ratio of the province, and will produce a good number of qualified doctors. As number of doctors will increase the health profile of the district and province will improve as well. It will also explain about the Campus Architecture. The purpose of design this structure with various Architectural elements that define nature of the building and the active environment about the learning and exploring the new horizons

Theme of study

Theme of study is “Interactive and healthy Spaces & Learning Environment”. It’s a visible architecture that makes an educational space more successful, to obtain a functional academic institute performing as a successful medical sidcul haridwar . The main focus of study is campus architecture and its utilization in my design project.

How architecture contributes

Architecture creates a great influence on a person’s observation. The environment impacts the nature of the structure and the way of thinking. The more functional space creates the better learning and interactive environment.

Scope of study

An educational institute plays a vital role in a developing a student and also and nation. In the proposal , we will investigate how a medical institute should be design with proper learning environment. The study will focus on the development of a hospital with form and functional composition in sustainable environmental campus.

Limitations of study

As the study design is about the certain interactive spaces and learning environment of a campus which will be provided for the students. Due to the limitation of time, planning of residential units for staff and students would not be the part of project but will be included in master planning. The limits of this study design are about the spaces of the hospital campus and its users.

Project Details

Name of the project - ESIC HOSPITAL (EMPLOYEES STATE INSURANCE CORPORATION

LOCATION - PLOT NO. 5 , SEC. 3 , IIE SIDCUL , BHEL TOWNSHIP , HARIDWAR , UTTARA KHAND ,249403

TOTAL LAND AREA - 5.5 ACRE

TOPOGRAPHY - Site is a plain land with no contours, the site is suitable for massive construction.

Climate - composite **Soil condition -** CLAY

COORDINATES - 29.9671 N, 78.0596 E

SWOT Analysis

Strength -

• The location of the site offers people of Haridwar Good level of medical care
• Trust of our community
• Affordable Services
• Ethical work with compassion
• The site has neat boundaries. Roads with sufficient widths for the traffic generated and also provide ample frontage.
• Availability of different modes of public and transit system makes it easily accessible.

Weakness

▪Untreated sewage drain in close proximity which can give rise to water borne disease and adds to poor odor.
▪Industrial building right across the main road.
▪No special views from the site except of the park.

Opportunities

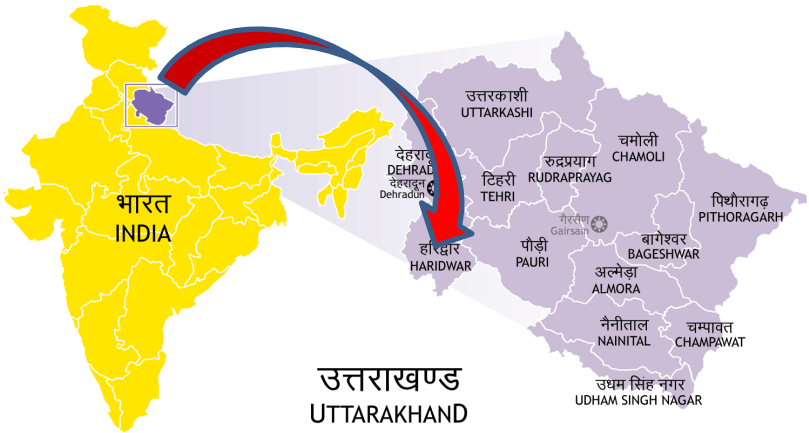
▪ Developing protocols:
  – Medical and administratively
  – Straight forward, well thought, routinely checked and clearly reported
▪Developing incentives/approaches to retain staff
▪Improving income by:
  – Improving our efficiency
  – Increasing our patient income
  – Becoming more donor attractive

Threat

▪With the advancement in construction on the road the traffic is likely to increase in future.
▪Development of many recreational projects in future will depreciate it.

SITE PHOTOGRAPHS

LOCATION & APPROACH



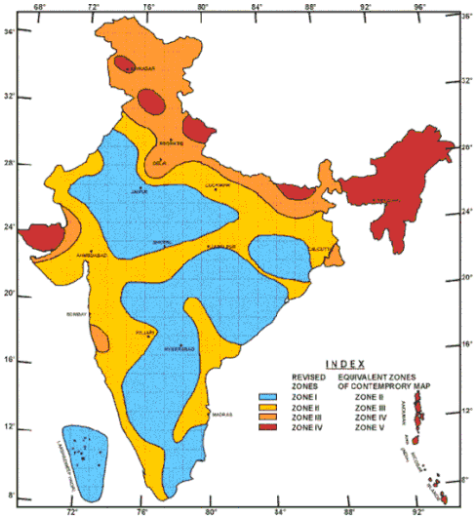
Jolly Grant airport Dehradun TO Haridwar
DISTANCE - 38.1 KM NH 7 & NH 43

BUS STAND
16KM

RAILWAY STATION
13.8 KM

GANGA GHAT
12.5KM

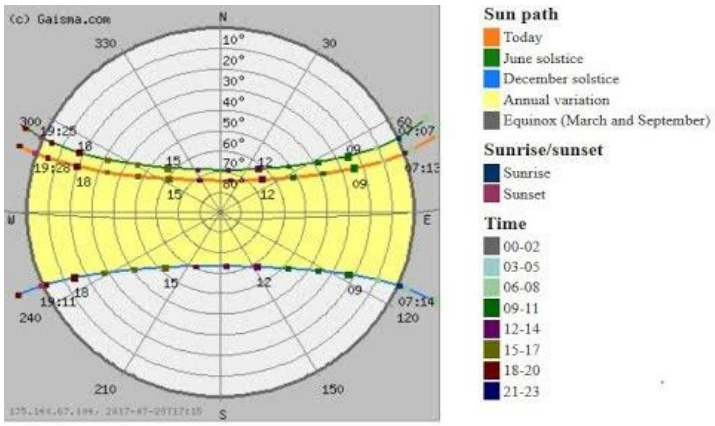
CLIMATE ANALYSIS



Indian Seismic Zone Map As Per IN-1893 (Part-1), 2002

About 59 % of land area of India is liable to seismic hazard damage.

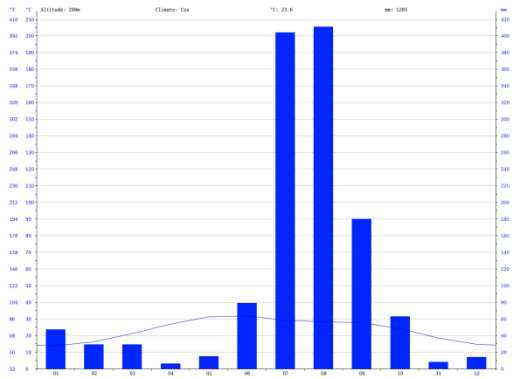
HARIDWAR district lies in Zone IV (High Risk Zone)



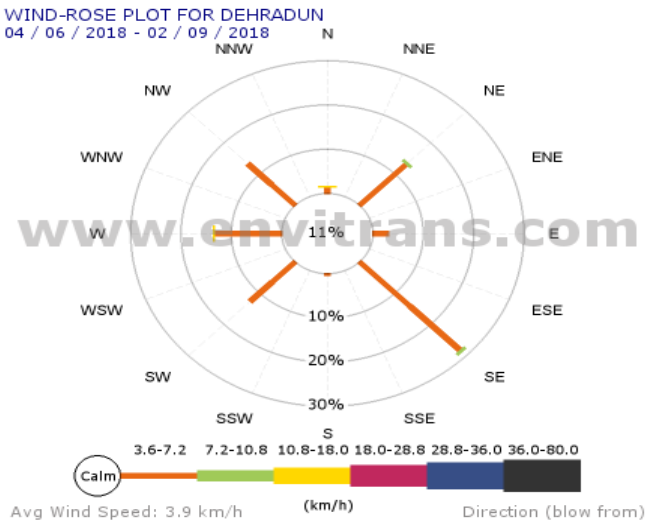
SUN PATH DIAGRAM

CLIMATE

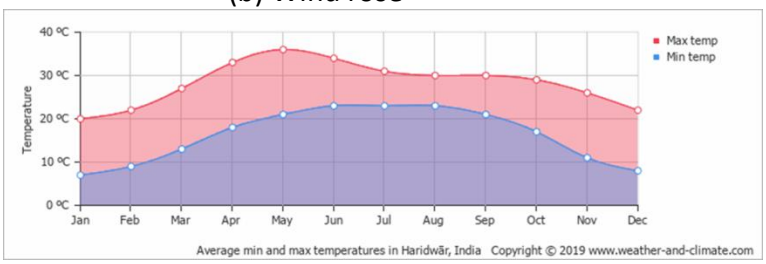
Average Weather in Haridwar India. In Haridwar, the wet season is hot and oppressive, the dry season is warm, and it is mostly clear year round. Over the course of the year, the temperature typically varies from 50°F to 102°F and is rarely below 45°F or above 109°F



AVERAGE MEAN TEMPERATURE



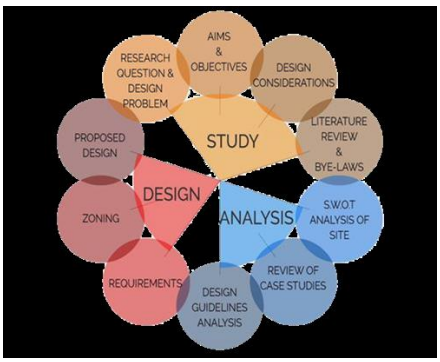
(b) Wind rose



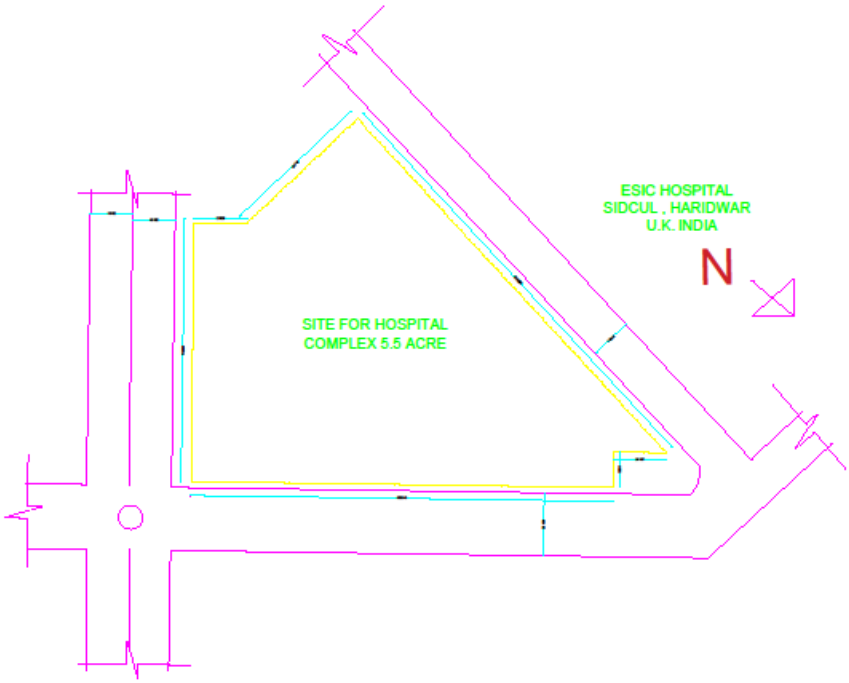
(a) Average precipitation in mm

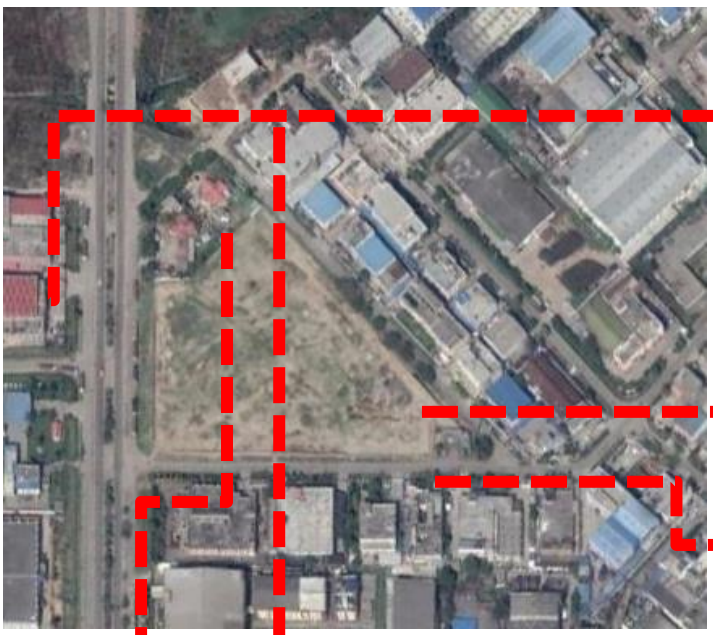
METHODOLOGY

Methodology is three step process, and can be divided into STUDY,ANALYSIS & Design



SITE ANALYSIS





CREATIVE INDUSTRIES

FOUR LANE ROAD FRONT

POLICE STATION

ELECTRIC SUB- STATION

ON SITE

Literature study

Separate all departments, yet keep them all close together, separate types of traffic, yet save steps for everybody. That is all there is to hospital planning. AUTH. - Emerson Goble

Hospital Planning Principles

Hospital is a complex institute on and contains within itself many things. Ervin Putsep said, "The architect has the task of designing a highly complex structure for a very complex organization but his design has to have sufficient clarity of form to be understood by all who use it. In addition he has to design individual territories, the departments for each of the groups whose successful interaction is the basis of the work of the hospital". The planner of medical facility should consider men inner most needs, the aspiration of people, social structure values and attitude towards human life. But the substance of physical planning is mostly technical. It deals with the stringent function requirements of medicine, a highly involved and specialized complex of scientific disciples. The primary assignment of designers, on all levels is to explore institutional physical relationships that will actively co-ordinate the various diverse services and make them work together purposefully and cohesively and not as a patch work. A hospital may be defined as a building in which patients are cared for, nursed and treated. Architects are dealing with the two main aspects of hospital.

1. The building normally structure which is permanent and difficult to change once constructed

2. The patient care system a continually and rapidly changing system due to development in science and technology.

Therefore, architect has to create a building which satisfies medical and spatial requirements hat during the period in which the design is made are only partially formed and which after completion of the building science and technology lead to change to the building, he must also study staffing pattern and thus strive for such a building method in such a layout that will make it possible for the building to be used and maintained by minimum of staff Hospital is a very technical building with very specific set of requirements and a definite way of functioning. Circulation, servicing, and flexibility are the chief considerations in hospital planning.

NBC Recommendations For Hospital Planning

- ✓ Min. Corridor Width: 2.4 mts
- ✓ Min. Doors width for Patient movement: 1.5 mts
- ✓ Air Changes / hr in wards: 3-6
- ✓ Pass. Lift Speed should be min 1.5 m/sec
- ✓ Bed Lifts
- ✓ Normal Route: .5m/sec
- ✓ Long Routes: 1m/sec
- ✓ Water Requirement: 450 L/Per/Day for more than 100 beds
- ✓ For Staff quarters: 135 L/Per/Day.

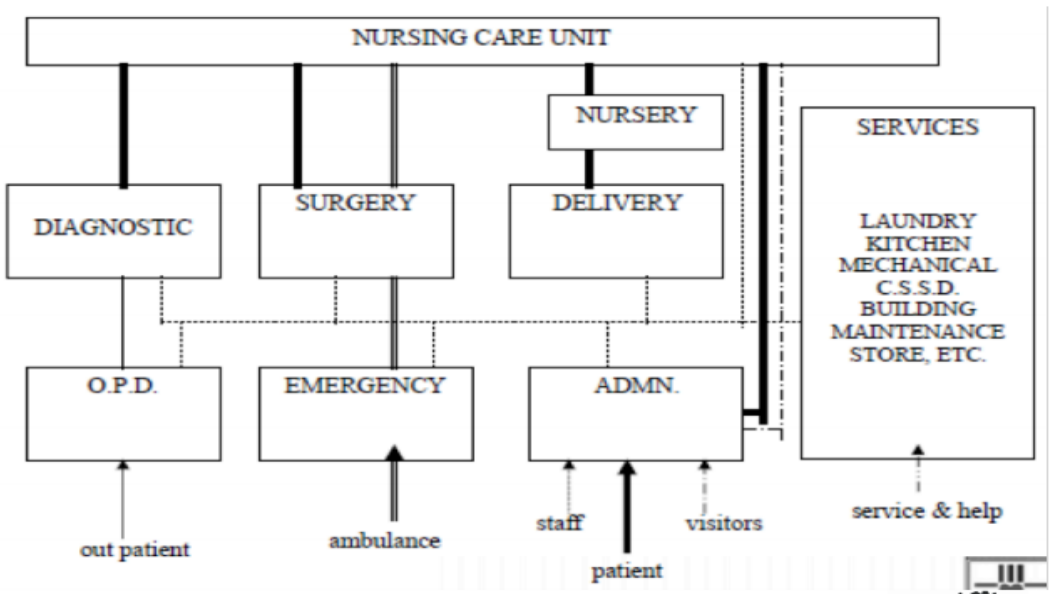
Literature study

Features

➢ Circulation

"Separate all departments, yet keep them all close together, separate types of traffic, yet save steps for everybody; thats all there is to hospital planning." : **Emerson Goble**

- There is the need for proper integration of the many departments so that different types of traffic through the building get separated as much as possible, traffic routes are short and important function is protected against intrusion.



Circulation

- The skill with which circulation is handled will determine the efficiency of the hospital for all years of its use. Protection of the patient is the primary principle of circulation schemes. Too much traffic in the nursing unit corridor will disturb the patient; will involve excessive risk of contamination, or at least of confused and inefficient care.
- Any unwanted traffic in the surgical suite means dilution of the effectiveness of aseptic technique. Short traffic routes, become the second principle of circulation. Short routes save the steps for everybody concerned with hospital care. Separation of dissimilar activities is another principle. Separate the clean and dirty operations. Separate different types of patients. Separate quiet and noisy operations. Separate pleasant and unpleasant functions.
- Control is a fourth general objective. No matter how much control may be inherent in good separation, in good disposition of functions, places like nursing unit and operating suite must have positive control. In general, there are five rather characteristic and homogeneous area which have to be arranged so that the inter-departmental circulation flow is kept reasonable.

Literature study

- The in-patient area houses the residential patients and this is where their medicoclinical routes are followed. The medical performance or clinical service area contains the surgical department, including the maternity section, diagnostic and therapeutic section.
- The out-patient dept. has the consultation, examination, diagnostic and treatment facilities for the non-residential patients; independent emergency department is also there.
- These three areas are subdivided, articulated, and organized to respond to the various requirements, patterns and aspects of medical work. The non-clinical service area includes catering, housekeeping, maintenance, central
- sterilization and supply services, stores and the laundry, Administration ,publicandsta facilities form another group.

➢ Growth and chance

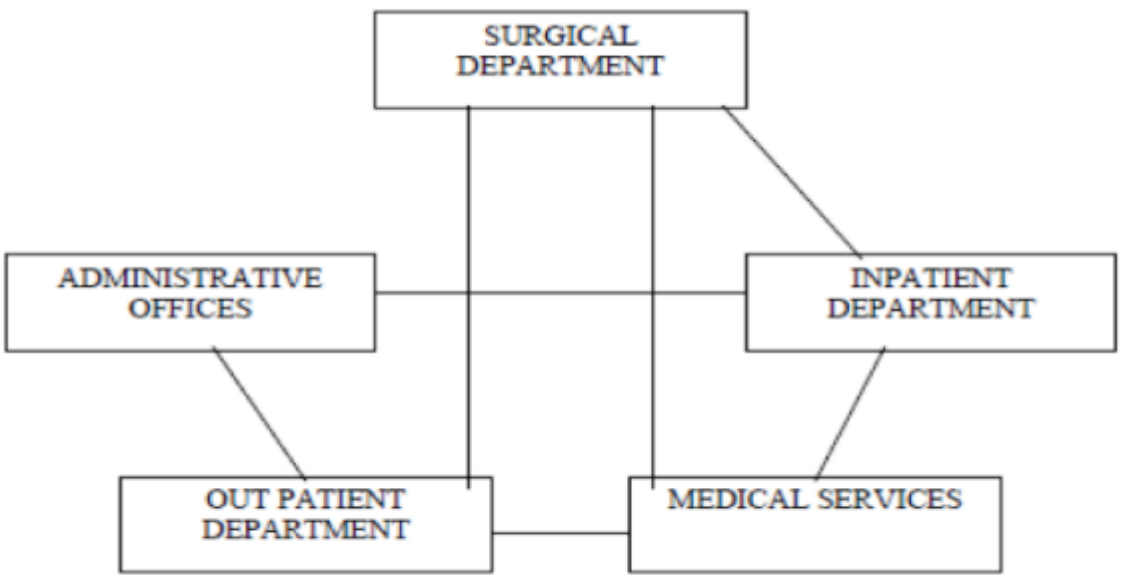
For the past few decades it has been seen that medical technology has been undergoing revolutionary change. This trend is likely to continue. It would be necessary to pre-conceive the inevitability of alterations and additions during the normal life span of a modern hospital. Therefore, from the onset the physical organization of the hospital building should be conceived with change in mind. A fundamental concept consists of a linear and enclosed hospital street. Independent departments for various functions can be attached to this, each having one end connected to the street and the unobstructed so that it can be extended at some future data, as necessary, with this kind of planning strategy, construction and commissioning of the building by stages is facilitated. Each unit is physically independent and subsequent addition or change in one department does not have a ripple effect in contiguous department. A design anticipation change means a design for stability. To meet the future needs of functional balance and spatial growth, after the initial period of equilibrium the hospital design has to be above all anticipatory. The design process is often overwhelmed by the functional have potential for continual change, the architect must also remember that advances in medical needs of the medical science and too often, the sole of the patient is completely overlooked while the body is treated. There is a need to move past the perceived tyranny of the hospital program in order to explore the full potential of space and design in the e ort to aid the healing process. Hence environment becomes an important aspect of hospital design.

Literature study

➢ Environment

The first principle is to achieve clearing of massing and organization. It is important to create a hierarchy of public spaces and entries, which may be easily navigated. The circulation and organization within the hospital must be equally clear and perceptible from both the interior and exterior of the building. Use of urban design principles such as galleries and courtyards to establish hierarchy within internal as well as external circulation can be made. Second principle is to provide significant events in the circulation and massing within the hospital. These may be highlighted with the introduction of natural light by means of courtyards, open-ended corridors, clear stories, skylights, etc. The third principle is a strong relationship between indoor and outdoor spaces. Only life can generate hope in the hearts of mentally agitated patients. The best means of representing life are plants and greenery. Properly maintained landscape provides a pleasant experience.

Therefore, a close relation of indoor spaces to the outdoor landscaped spaces is important in hospital design . The hospital must provide a strong sense of care and service. A patient must feel that the Staff is available to take care of both physical and psychological needs. The ‘ design must enhance communication with staff both visually and aurally.



HOSPITAL ZONING

HOSPITAL ZOANING

Literature study

➢ Colors

Human being is widely floured with traces of pink, brown, black and yellow. Skin, hair and eye pigmentation vary from person to person and from race to race. The warm colors, yellow through orange to red are seen as aggressive advancing. The cool colors green through blue to violet are generally considered receding or passive and are less clearly focused by the eye than the warm colors. In fact, laboratory experiments have shown that the color red decidedly stimulates the nervous system, blood pressure rises and respiration rate and heart beat both speeds up. By contrast it has been found that the blue has the opposite effect. In a blue room a persons blood pressure falls slightly, and the rates of heart beat and breathing slows down.

Feeling of a pleasant space can be made by the right choice of colors; light colors do give a feeling of safety. Hence, in almost all hospitals, flooring is of Kota stone, Mosaic or Marble. Walks of the hospital should be painted with white or any light shade except in radiography department. White gives the full intensity of light. Rooms and windows should be provided with glazed shutters for easy cleanliness and it does not allow to collect germs.

➢ Doors

Minimum clear openings required for a doorway are: For stretcher : 1100 mm. For general purpose 800 mm. For wheel chair : 900 mm. Door hardware should be designed with a single lever action with provision of door closer in order to avoid a potential noise source.

➢ Windows

The ability to look out is extremely important. A good view consists a portion of both the ground as well as the sky. Window size is always a compromise between a satisfying view and the need to conserve energy used in A/C, if provided. Otherwise windows area means of providing natural ventilation in buildings. Due care through must be taken to place the patients parallel to the windows and not perpendicular to them in order to avoid glare from the sky. Metal casement windows are long lasting and also e active ventilators since they can scoop air into the building if opened in the right direction. Insect proofing must always be used.

➢ Noise

Hospitals traditionally should be as quite as libraries. Through certain sounds at low pitch can be comforting, in general excessive noise causes irritation, distraction, as well as fatigue. Within the hospital, different materials may be used in partition walls to achieve the degree of sound insulation required in any particular department. Equipment should be of rubber or plastic wherever possible. Wards should invariably be located away from the potential noise sources like busy roads, workshops, etc.

➢ Lighting

Well-designed lighting, either artificial or natural, is essential to create an esthetically pleasing environment for the patients, staff and visitors. Both natural and artificial lighting should come from several sources as it is generally fatiguing to work between areas of greatly varying intensities. Direct lighting is important for special tasks like examination, reading, writing, etc. abrupt changes in lighting levels or types must always be avoided with necessary precautions to keep it glare free.

Literature study

➢ Ventilation

The comfort criteria encompasses temperature, humidity control as well as proper ventilation to avoid spread of odors and air borne infections. The comfort range lies between 22-26C with relative humidity varying between 30-60. Ventilation can be natural or mechanical. In case of natural ventilation there should be adequate provision of cross ventilation with top hung windows at a high level to allow air inlet without the draught affecting the patients. The fear of air infections often lead to the choice of A/C which should be so selected as to minimize noise and draft with enough supply of fresh air to avoid stiffness.

➢ Orientation

View is the most important criteria for deciding the orientation of a ward building, since the patient is confined to his bed for nearly 24 hours a day during his stay, the view he gets is his only link with the outside. The next important factor is that the windows should ace north or south direction to overcome the problem of glare.

➢ Fire safety

This is a very important factor to be kept in mind while planning a building. While some patients may be able to walk unaided to the fire escape, others may not. Escape at ground level is easy but not so in multi-storied ward buildings. Means of escape must be provided at the ends and at the centre. There should be fire-fighting doors, which could be used to divide the floor into fire resistant compartments.

➢ Auxiliary electrical system

Several auxiliary electrical systems must be incorporated in order to provide safety and comfort for the patients as well as the staff such as : Smoke Detectors & Fire Alarm System

➢ Signage & Graphics

This is must for proper orientation of an individual. Signage must be clear and consistent. It is generally recommended to have the characters in a white set against dark background. ignage used in wards is of two types:

- ❑ Room identification these are placed outside the door to be identified
- ❑ Emergency exit direction this should be prominently displayed showing the nearest emergency exit

Various areas of a hospital are grouped together for ease of functioning and from the point of administrative control.

The hospital can broadly be divided into two distinct sections:

- The medical section, and
- The non medical section

These two sections are further sub-divided into department/sub-departments, which in themselves contain room and spaces which are functionally related to each other

Literature study

- **Medical Section**

The medical section deals mainly with areas most of which are used by the public and comprises of out-patient facilities, diagnostic and therapeutic departments and inpatient wards

➢ Outpatient Department

The main functions of O.P.D. are

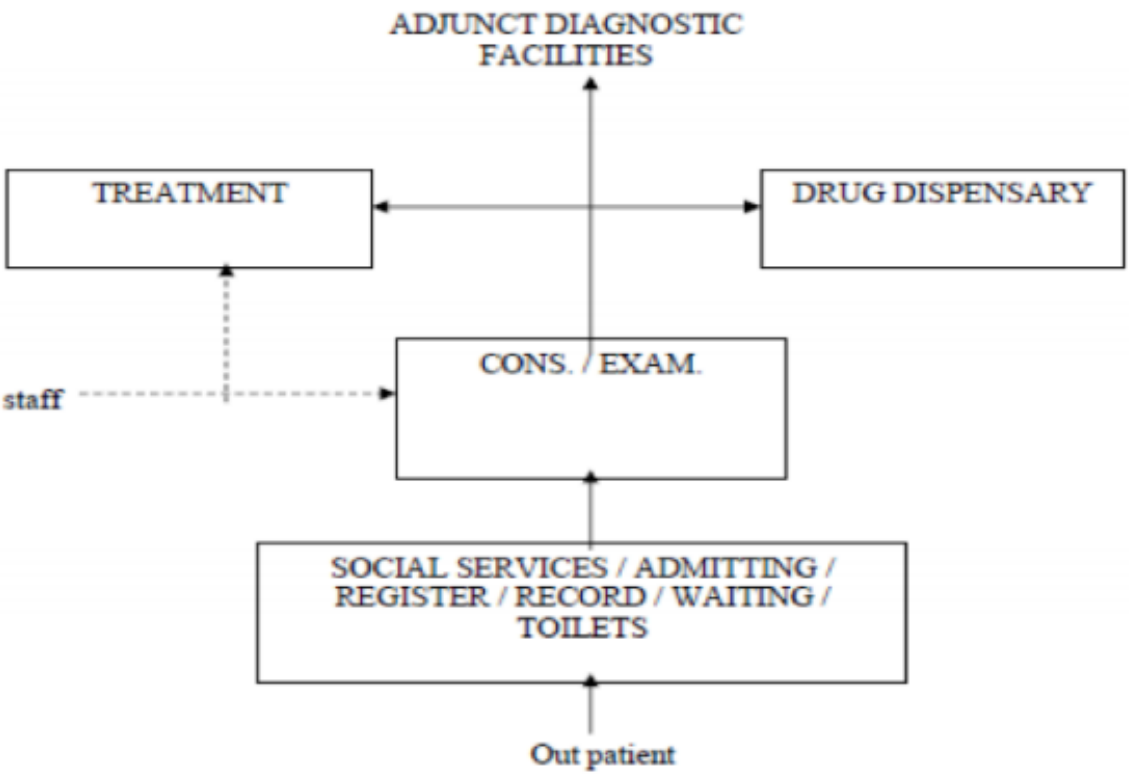
- ❑ To diagnose and treat patients at an early stage
- ❑ To follow up treatments after discharge from hospital.
- ❑ To institute health educational programs and to educate public in environment hygiene

➢ Location

Easily reached by both the walking public and vehicles ;

- ❑ Close to public transport routes
- ❑ Separate entrance is desirable

This should not e located too near the reception point for ambulance and accident or other departments, which are likely to have disturbing associations



Outpatient Department Location

Literature study

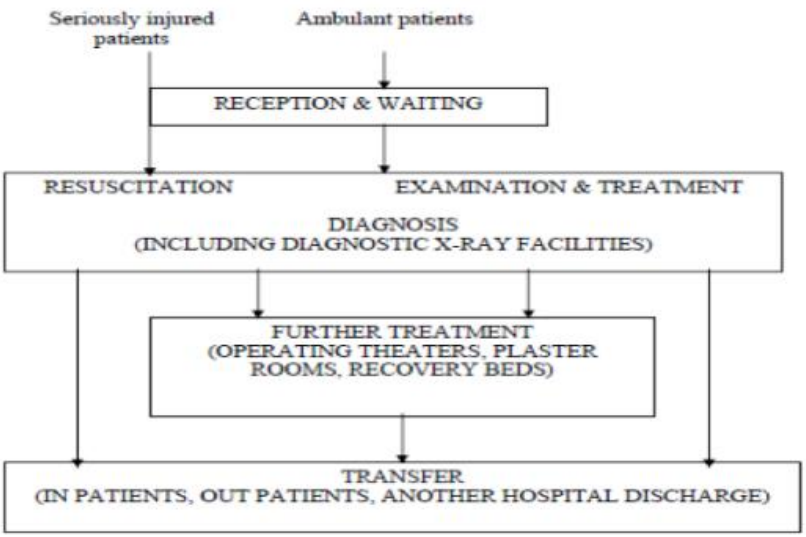
Out patients should not have to pass through any other part of the hospital to reach the department. It is an advantage if the outpatient can entirely be at one level, for some patients may ind the movement difficult .There should be a direct link between the O.P.D. and other departments like Radiology, Physiotherapy, Pathology, etc. Patients normally arrive on foot, by bicycles or by any other transport. Inside the building he pattern consists of reporting at the reception point, egistering, finding the way to the correct consultation room and waiting again till examined by the doctor . It may also involve moving to the examination rooms during consultation and after onsultation perhaps receiving treatment in a different room. And finally, on the way out, visiting the reception point again may be a necessity.

It is worth noting that people, who are unfamiliar with the building like to leave it by the same route as that by which they entered and the staff need a way in and out in dependent of that used by the patients. The reception point needs to adjoin the patients record store and is sometimes combined with it. The reception area should be immediately apparent and welcoming on entering the centre. It should be arranged so that easy conversation can take place between the patient and the receptionist and it should be close to the distribution point for medicines. Apart from the general waiting area, sub-waiting spaces adjacent to the doctors examination rooms are preferred and this would also help to reduce the risk of cross infection. It is important that the route from the reception point to the consultation rooms should be short and should not involve crossing busy hospital circulation routes. There are various kinds of disciplines having their own clinics like Medical, Surgical, Orthopedic, Eye, ENT, Dental, etc.

- **Accident & emergency department**

All hospitals must be able to deal with the casualties and emergencies, round the clock, without mixing them with other patients. The department works throughout the day and night. After examination, a patient may be treated and discharged within a few hours or may be transferred to the wards .The department requires an independent entrance from the outside for ambulant patientsas well as those brought by ambulance. It requires a waiting space, examination and treatment, a small operation-theater and a few beds for recovery.

Examination A patient brought into the hospital would immediately be examined in this area. Initial treatment would be administered and the patient would then either be discharge or admitted for further diagnosis or treatment or both



Examination at Accident & emergency department

Literature study

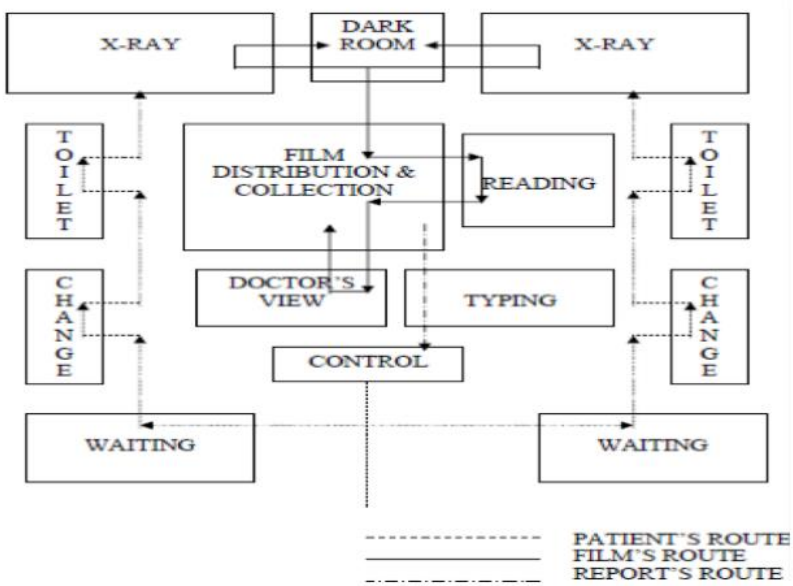
Diagnosis A patient brought into the hospital would immediately be examined in this area. Initial treatment would be administered and the patient would then either be discharge or admitted for further diagnosis or treatment or both

Casualty O.T A 24-hour casualty O.T. would be necessary for handling casualty cases Underm observation, and those requiring hospitalization would be admitted to the casualty wards till they can either be discharged or sniffed to the general hospital wards. This is a short stay unit equipped with the usual ward ancillaries on a reduced scale. Patients are unlikely to stay here longer than twenty-four hours

➢ Radiology Department

- ❑ Process the film, and
- ❑ Provide facilities for interpretation and storage.

Patients may arrive on foot, wheelchairs or trolleys. After registration they may need to wait, to change their clothes, or to undergo preparatory procedures before their X-Ray, and following their X-Ray they may need to wait for a short period for observation



Radiology

This department receives In-patients, Out-patients and patients from the Accident and Emergency department. Its functions are:

Location

- ❑ The department should be located close to the O.P.D. and with convenient access from the wards and Accident and Emergency department.
- ❑ Preferably not placed in basement, reason being that the moisture is dangerous when dealing with voltages.
- ❑ Pre-eminence of outside walls is preferable. Outside walls generally do not require lead shielding.

- Close to the elevators and other diagnostic facilities. X-Ray rooms are equipped with photographic machinery of considerable sophistication. Some of which is large and heavy and incorporates moving parts needing floor tracks and ceiling support. The X-Ray rooms need dark rooms nearby for the processing of the film. Rooms must be shielded against the escape of rays by means of lead protection or concrete. Min. 1.5 mm. thick lead shields or 120 mm. thick concrete is required. Exterior walls need not be shielded if there is a 6 m. deep courtyard outside the walls. The partitions and doors should be shielded up to 2.1 m. height.

Pathology Department

This essential function of this department is to carryout diagnostic tests on specimens from in-patients and out-patients. It involves microscopic examination of tissues and cells, the study of blood, the study of living tissues and fluids and the study of microorganisms .It I s mainly diagnostic in function and depending on the bed strength of the hospital, the department comprises of laboratories like, Biochemistry, Microbiology Clinical Pathology, Histology, Cytology and Serology. Each laboratory should be provided with 600 mm. wide and 800-mm. high bench of about 2m length

Location: Should be easily accessible by both I.P.D. and O.P.D. Although each division of the pathology department carries out a different kind of work and needs particular ancillary accommodation, the boundaries between them tend to become blurred. Some techniques may be shared, and the basic laboratory bench requirement does not different essentially from one another. A standardized modular plan and a system of service spurs feeding relatively deep bays at right angles to a corridor.

Physiotherapy Department

The function of this department is the rehabilitation of patients. It includes exercise, massage, thermal treatment and electrotherapy. The patient may be assigned a routine including any or all of these. Each department may take considerable time, and hence this department, while often a busy one does not handle a large number of patients daily. The facilities for physical therapy are not complicated or necessarily extensive. An exercise room with various kind of gymnasium equipment; several tables or plinths for massage and manipulation of the patient, machines for infra-red heat and ample storage for bulky equipment and liner, an office for physiotherapist, a small waiting area form the constituents of this department. It is desirable for this department to have an access to some protected space out of doors, without intervening steps

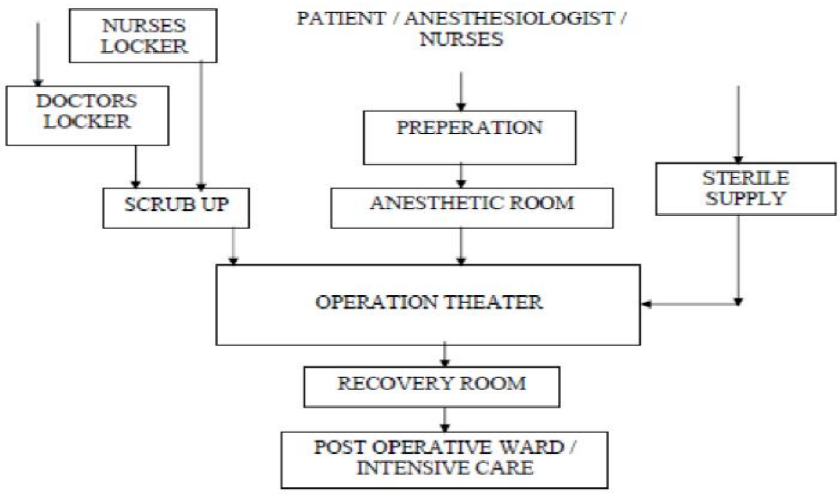
Location:

It should be in proximity to the in-patient elevators and should also be easily assessable by the out-patients.
Availability of natural light, fresh air and adequate ventilation are of extreme importance for this department

Literature study

➢ Operation Theatre Department

The function of this department is to receive patients from wards and emergency, after diagnosis, to anesthetize them before or after transfer to the operating table, to operate and to supervise their post operative condition before returning them to their wards. The department consists of one or more operating suits which share ancillary facilities such as staff changing and rest rooms, arrangement for reception and preparation, facilities for supply of sterile material and disposal of soiled material. The operating suite consists of the theatre, the anesthetic room, the scrub-up in which those working in the theater can wash and gown, and the supply preparation or lay-up room through which instruments and materials are passed into the theatre. The suite is flanked on one side by a clean area from which patients, staff and sterile supplies reach the suite, and on the other side by a dirty area or disposal route through which soiled or infected material leaves it. Theatre staff enters the clean area through changing rooms. To minimize the risk of infection, the method of artificial ventilation should ensure that there is a supply of pure air sufficient to reduce the bacterial count to below the critical level. There should be positive pressure in the theatre to provide a flow of air from the clean to the less clean areas. When there are more than one operating suites in the department, each should have its own self-contained ventilation system in order to reduce the risk of cross- infection. There should be n movement of air from one suite to another



Operation Theatre

Location:

The department should be located such that the communication route from all the wards should be direct, easy and if possible short. The department should be on the cul-de-sac so that the access to it can be strictly controlled. Other important factors are:

- ❑ Quite environment,
- ❑ Freedom from noise and disturbance, and
- ❑ Freedom from contamination and possible cross-infection

Literature study

➢ Intensive Care Unit

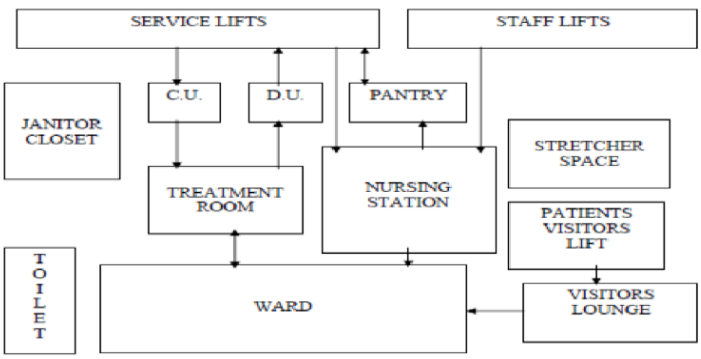
This is the unit where medical care is provided to critically ill patients. In this unit, critically ill patients requiring highly skilled life saving medical aid and nursing care are concentrated . This unit shall not have less than 4 beds and not more than 12 beds. This unit will also need all the specialized services such as piped suction and medical gases, continuous electric supply, heating, ventilation, air-conditioning and efficient lift services. A good natural light and pleasant environment should also be of great helps to the patients and staff as well. All beds in this unit are to be arranged in glazed cubicles with centrally located nurses station.

Location: The I.C.U. should be located close to the operation theatre and should have an easy access from the accident and emergency department.

➢ IN - Patient Department

Patients needing specialized attention, care and treatment are placed under the care of a nursing sister and her team of nurses. The ward consists of both clinical and housekeeping facilities. The clinical facilities includes the treatment room, clean utility, dirty utility, pantry, store, nurses station, etc. the housekeeping facilities include toilet facilities for the patients and day spaces, relative waiting areas, etc. Aims of the entire patient care unit are:

- ❑ Maximum care and supervision for actually ill patients.
- ❑ Efficient and low cost operation and the use of personnel.
- ❑ Minimum disturbance of the patients by the outsiders.
- ❑ Patients privacy and comfort.
- ❑ Control of cross-infection.
- ❑ Control of visitors



Inpatient Department

To achieve all these aims:

- ❑ The size of the patients care unit should not be more than 30-32.
- ❑ The greatest number of beds should be easily observed by the nursing station and when going about the ward, one routine procedure.
- ❑ There should be single rooms for isolation reason and for privacy.
- ❑ Nurses working area should be grouped together and should also be closely related to the bed areas to avoid long walking.
- ❑ The patient care unit should fulfill the medical needs, nursing needs and the patients needs.

Literature study

➢ Medical Needs

- Sufficient space for examination and treatment of patient in privacy both in immediate bed area and in separate treatment room.
- Facilities for isolating patients whose condition demands it.
- Ease of access to individual patient and short walking distance between groups of patients.

➢ Nursing Needs

- Observability is the most essential nursing need. If the nursing station is placed centrally and includes a compact group of utility services, the observability is bound to increase.
- Easy and short walking distance between bed patients and the main ancillary rooms.

➢ Patients Needs

- The facilities of speaking to nurses as they move to and fro.
- Privacy during periods of medical and nursing care.
- Space to sit-up for ambulant patients.

➢ Obstetric & Gynecology Department

This department can be broadly classified into two closely related divisions, one concerned with labor and birth, and the other with accommodation suitable for caesarian operations. Both sections can share examination and preparation areas. The labour room should be located close to the delivery room, with wash and scrub facilities similar to that of the surgical O.T.s Patients often arrive in a state of immediate delivery, and this unit would often remain open during the night. Delivery rooms shall be of the following types:

- Clean delivery room for normal deliveries, and
- Operating delivery room for caesarian.

➢ Non-medical Section

The non-medical section comprises of:

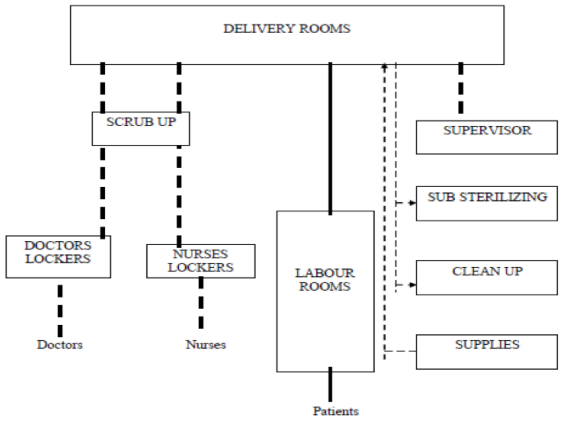
- Administration services including general administration, Medical records, staff facilities and rooms for specialists .
- Hospital services like the kitchen, laundry, control services stores, workshop, CSSD, pharmacy, manifold, incinerator, etc., and
- Engineering services like A.C. plant, electric substation and pump house

Literature study

➢ Hospital Administration

The administrative department looks after an organized group of people, patients and resources in order to provide best patient care. It deals with the over all upkeep of the hospitals along with day-to- day problems of the staff and patients.

Location The department may be located as convenient, as it does not require any speedy link with any other department of the hospital.



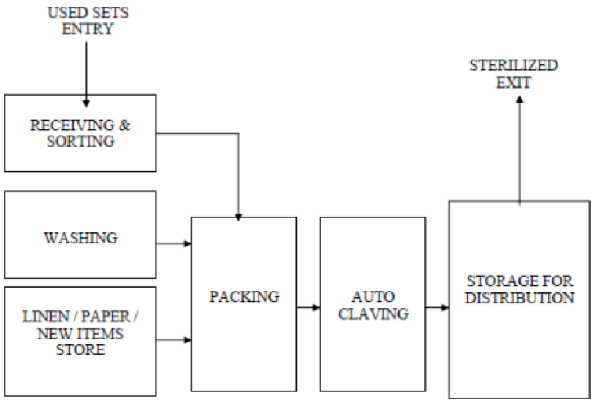
Hospital Admin

➢ Central Sterile Supply Department (C.S.S.D.)

Any hospital requires a large quantity of new material that requires sterilization before use. It also processes other material that has to be cleaned and sterilized before it can be used again. The purpose of the CSSD is to supply sterile material to all other department of the hospital. The department receives clean material from the laundry, new material stored in the central stores and soiled reusable material from all department of the hospital.

Location:

It should be located along with the other service departments, with a good communication route to most of the other departments. Material within the hospital has a one-way flow, from receipt to preliminary cleaning to autoclaving, to sterile store to supply



Central Sterile Supply Department

➢ Medical Records

It is customary and compulsory for hospitals to store case records of all patients who have used the hospital facilities. Records are maintained for a specified time period.

➢ Incinerator

It is for incinerating and completely destroying soiled and infected waste generated in the form of used dressings and bandages etc

➢ Manifold

The manifold area is concerned with the supply of the following piped services: oxygen, nitrous oxide, compressed air and vacuum

Literature study

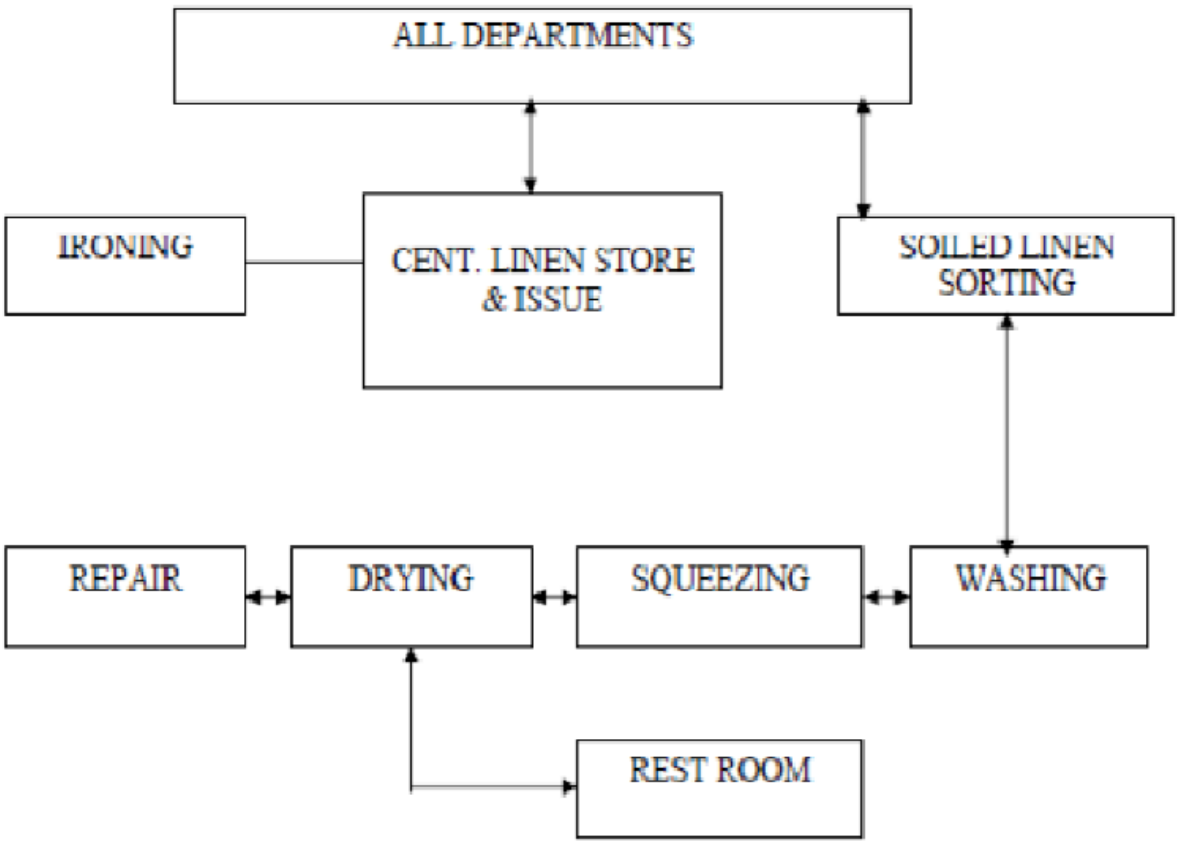
➢ Kitchen

The hospital kitchen is responsible for production and supply of well-cooked, appetizing and nutritious food under the guidelines of a dietitian. It aids in the rapid recovery of patients thereby reducing their stay in the hospital. The department needs direct service access as fresh food may be supplied almost daily, within the hospital, it should be located such that it is away from public circulation but linked directly to the main circulation for ease in speedy delivery of food to wards.

➢ Laundry

The unit provides facilities for cleaning the dirty linen of the hospital. There are two means of cleaning

- The linens are given to the washer man on contract basis. They take away the linen, wash it, press it, and return to the store. The linen is washed in the hospital laundry only by mechanical means. This costs comparatively high. it is advantageous only in the case of big hospital where machines can be run round the clock.



Laundry

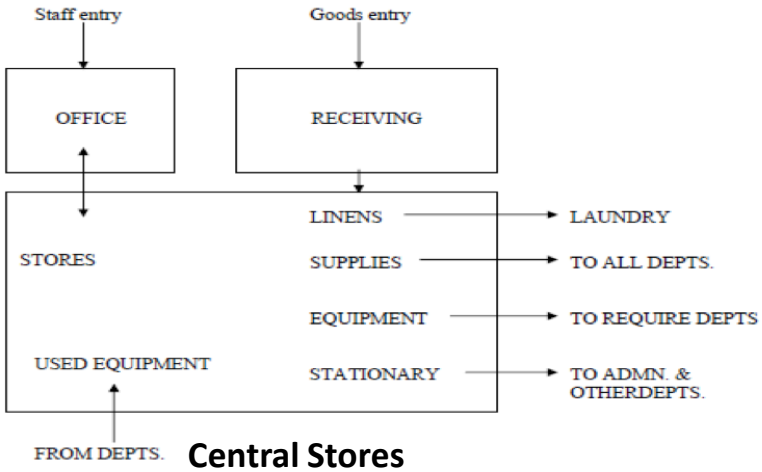
Literature study

➢ Central Stores

Hospital stores provide medicine, linen, furniture and other supplies to various areas of the hospital and are grouped into two sections ;

- ❑ Medical stores for storage of medicines, x-ray films, dressing material etc.
- ❑ Non-medical stores for storage of linen, furniture, equipment, stationery, miscellaneous articles.

It is desirable to have a small workshop in every hospital for day-to-day repairs and maintenance of hospital furniture and equipment.



Central Stores

➢ Air-Conditioning Plant Room

Air-conditioning of certain key axis like the operation theatres, delivery suites, I.C.U. etc, is essential to the functioning of that department. This could be economically achieved by a central air-conditioning plant room.

➢ Hospital Emergency Codes

Hospital Emergency Codes are used in hospitals worldwide to alert staff to various emergencies. The use of codes is intended to convey essential information quickly and with minimal misunderstanding to staff , while preventing stress and panic among visitors to the hospital. These codes may be posted on placards throughout the hospital, or printed on employee identification badges for ready reference.

Hospital emergency codes may denote different events at different hospitals, including nearby ones. Because many physicians work at more than one facility, this may lead to confusion in emergencies, so uniform systems have been proposed.

"Code Blue" is generally used to indicate a patient requiring resuscitation or otherwise in need of immediate medical attention, most often as the result of a respiratory arrestor cardiac arrest. When called overhead, the page takes the form of "Code Blue, (floor), (room)" to alert the resuscitation team where to respond. Every hospital, as a part of its disaster plans, sets a policy to determine which units provide personnel for code coverage. In theory any medical professional may respond to a code, but in practice the team makeup is limited to those with Advanced Cardiac Life Support or other equivalent resuscitation training.

Literature study

RULES OF THUMB

Requirements	
• OT	1 OT for every 50 general inpatient beds and 1 OR for every 25 surgical beds
• ICU beds	5 – 10% of total beds
• Floor space for each ICU bed	25 to 30 m^2/bed
• Floor space for each pediatric ICU bed	12 m^2/bed
• Floor space for high dependency unit	20 to 24 m^2/bed
• Floor space for hospital bed	15 to 18 m^2/bed
• Bed space in wards	7 m^2/bed
• Clearance at foot end of each bed	1200 mm
• Minimum distance between centers of two beds	2500 mm
• Waiting area in OPD	0.5 to 1 m^2/patient with minimum of 60 m^2
• Electrical requirement/bed/day	3 to 5 KW
• Water requirement/bed/ day (excluding requirement for A/C, fire fighting, gardening and steam)	450- 500 litres
• Hospital waste/bed/day	1.5 to 2 kg
• Infectious waste	10-15% of hospital waste
• Dietary department	1.5 to 2.0 m^2/bed
• CSSD	0.7 to 1 m^2/bed
• Blood bank department	1 m^2/bed
• Laundry	1 to 1.5 m^2/bed
• Hospital linen/bed/day	4 kg
• OT linen/operation	8 kg
• Storage requirement for pharmaceutical products	0.5 m^2/bed
• OPD registration space is @	0.5 m^2/bed.

- **Door opening**
  - Minimum dimensions of clear door openings of patient bedrooms – 1500 mm wide and 2100 mm high.
  - Clear door opening to rooms that may be accessed by stretchers, wheeled bed stretchers, wheelchairs or handicapped persons should be 900 mm.
- **Corridors**
  - Corridor widths in which there is frequent bed stretcher and trolley movement, e.g. inpatient units, OTs, obstetric units, ICUs 2100 to 2400 mm
  - Corridor widths where infrequent trolley or bed movement is expected 1800 mm
  - Corridor widths where no patient transportation is required and where corridor rooms are no longer than 12 meters (such as offices) 1200 mm
  - Major inter departmental arterial corridors and public corridors 2100 mm
- **Ceiling heights**
  - Minimum ceiling height in occupied area, corridors, passages and recesses 2400 mm
  - Ceiling height – Therapy rooms, conference room, intensive care, kitchen 2700 mm
  - Ceiling height of X-ray room, operating rooms 3000 mm (Height should comply with equipment manufacturers requirement)
- **Medical records**
  - The admission and enquiry office should be 15-20 m^2; with waiting areas @ 0.5 m^2/bed for smooth flow of patients/attendants at the counter.
  - The medical record office should be @ 1.0 m^2/bed, but would also depend upon status of computerization of the hospital.
  - Storage should be 15-50 m^2 with compactors to store more no. of files in same space.
- **Mortuary services**
  - Requirement of cabinets can be assessed from the mortality rates in the hospital. Generally, there is one death per bed per year, and 4 mortuary cabinets are required for every 100 beds.
  - There should be 2 autopsy tables for 400 beds; with one additional table for every 200 beds.
  - Temperature in a mortuary cabinet should be maintained at 4°C ± 2°C.

Filing space for medical records

$$\text{Indoor} = \frac{\text{No. of beds} \times \%\text{Bed occupancy} \times 365 \text{ days} \times \text{No. of years of storage decided by hospital}}{\text{ALS} \times \text{Avg. thickness of file}}$$

$$\text{Outdoor} = \frac{\text{No. of new patients per year} \times \text{No. of years of storage decided by hospital}}{\text{Avg. thickness of file}}$$

MANIFOLD SERVICES

Colour coding of medical gas pipeline system

• Oxygen	- Yellow
• Nitrous Oxide	- Navy Blue
• Compressed Air	- Sky Blue
• Vacuum	- Sky Blue

Quality of compressed medical air:

The air should contain no more than :-

• water	- 115 mg/m^3
• dry particulate matter	- 0.01 mg/m^3
• oil mist	- < 0.001 mg/m^3
• oil vapour	- <0.03 mg/m^3
• CO	- 5.0 mg/m^3 or 5 ppm v/v
• CO_2	- 450 mg/m^3 or 500 ppm v/v

Location of pressure vessels

Each vessel shall be located with respect to the nearest building or group of buildings or line of adjoining property which may be built on and with respect to other vessels in accordance with the distances specified below.

Minimum safety distances for flammable, corrosive and toxic gases

Water capacity of vessel (in liters)	*Minimum distance from building or group of buildings or line of adjoining property*	*Minimum distance between pressure vessels*
Not above 2000	5 meters	1 meter
Above 2000 but not above 10,000	10 meters	1 meter
Above 1000 but not above 20,000	15 meters	1.5 meters
Above 20,000 but not above 40,000	20 meters	2 meters
Above 40,000	30 meters	2 meters

Minimum safety distances for non-toxic gases

Water capacity of vessel (in liters)	*Minimum distance from building or group of buildings or line of adjoining property*	*Minimum distance between pressure vessels*
Not above 2000	3 meters	1 metre
Above 2000 but not above 10,000	5 meters	1.5 metre
Above 1000 but not above 20,000	10 meters	2 meters
Above 20,000	15 meters	Diameter of large vessel

Notes:

- If the aggregate water capacity of a multi-vessel installation is 40,000 liters or more, the above minimum safety distances should apply to the aggregate storage capacity.
- The number or storage vessels in one installation should not exceed six. In case there are more than one installation, the safety distance between two installations should be the same as the distance between the vessels and the property line in accordance with safety distance for flammable, corrosive and toxic gases.
- The distances specified above are required to be measured from the nearest point on the periphery of the vessel.
- The distances specified above may be reduced by the Chief Controller in cases where he is of the opinion that additional safety measures have been provided.

Cylinder of medical gases

The colour coding of cylinders is laid down by the Standards Association of Australia. The valve colours are also accepted by British Compressed Gas Association 2005 as per BSEN-1089-3; 2004. International Standards are being developed for full harmonization by ISO under ISO 32.

Name of gas	*Symbol*	*Valve color*	*Body color*
Oxygen	O_2	White	Black
Nitrous oxide	N_2O	Blue	Navy blue
Oxygen + Nitrous oxide	$O_2 + N_2O$	White and blue	Blue
Medical air	—	White and black	Grey
Carbon dioxide	CO_2	Grey	Grey
Mixture of Oxygen and Carbon dioxide	$O_2 + CO_2$	White and grey	Black
Nitrogen	N_2	Black	Black
Helium	He	Brown	Brown
Cyclopropane	C_3H_6	Grey	Grey
Ethylene	C_2H_4	Violet	Violet
Helium and oxygen	He and O_2	White and brown	
Mixture of oxygen and Nitrogen (O_2 < 20%)	$O_2 + N_2$	Bright green	

RECOMMENDED AREA FOR ELECTRICAL SUB-STATION

The minimum sub-station and transformer room area required for different capacities are tabulated below for general guidance. Actual area will, however, depend upon the particular layout, equipment and site constraints.

- The clear height required for sub-station equipment should be a minimum of 3.6 meters upto 100 KW.
- The clear height required for sub-station equipment should be a minimum of 4.5 meters above 100 KW.
- The design should cater for augmentation of equipment if required.

Area for generator sets

Additional area that is required for one generator is given below:

Capacity	*Area*
25 KW	56 sqm
48 KW	56 sqm
100 KW	65 sqm
150 KW	72 sqm
248 KW	100 sqm

The clear minimum height required for the generator room is of 3.6 m upto 100 KW capacity and 4.57 for higher capacities.

Area for sub-station

Sub-station with transformer capacity of	*Total transformer room area required (sqm)*	*Total sub-station area required incl HVMV panels transformers but without generators (sqm)*	*Suggested minimum face width (m)*
2 X 500 KVA	36.00	130.00	14.5
3 X 500 KVA	54.00	172.00	19.0
2 X 800 KVA	39.00	135.00	14.5
3 X 800 KVA	58.00	181.00	19.0
2 X 1000 KVA	39.00	149.00	14.5
3 X 1000 KVA	58.00	197.00	19.0

Dumb waiters

Capacity – 50 kg
Clear door opening – 800 mm × 900 mm (high)

Details of service buildings

Size of central plant room including weather maker	10 m^2 + 0.8 m^2 per ton (Clear height not less than 3.75 meters below soffit of beam)
Site of central plant room excluding weather maker	5 m^2 + 0.5 m^2 per ton
Size of weather maker room	5 m^2 + 0.03 m^2 per ton (Height not less than 3.0 meters below soffit of beam), (above 150 tons 0.5 m^2 per ton)
Fresh air opening in weather maker room	0.03 m^2 per ton
Main supply and return duct (taken together)	0.10 m^2 per ton
Supply grills (Height 20 cm to 25 cm)	0.10 m^2 per ton
Return grills (Height 20 cm to 25 cm)	0.12 m^2 per ton
Cooling tower: natural draft	0.40 m^2 per ton
Cooling tower: induced draft	0.15 m^2 per ton
Cooling pond (depth 1.5 mtr) (Water consumption)	1.0 m^2 per ton 20 litres per ton per hour
Make up water tank	12 hr/8 hr respectively storage capacity for 24 hr/ 12 hr. operation. Bottom level shall be 2 meter above the cooling tower-sump.

Bed/service lifts

Capacity	1360 kg for 20 passengers
Clear door opening	1200 mm (w) × 2000 mm (ht)
Car dimensions	1300 mm × 2400 mm (deep)
Speed	0.375 m to 1 meter/second
Door opening/closing time	0 to 16 sec

Passenger lifts

Capacity	544 kg for 8 passengers
Clear door opening	800 mm (w) × 2000 mm (ht)
Car dimensions	1300 mm × 1100 mm (deep)

HOSPITAL HOUSEKEEPING AND BIOMEDICAL WASTE MANAGEMENT

- Average quantity of bio-medical waste generated per bed per day in India in tertiary level hospitals is 1.5 to 2.0 kg.
- Statutory provision according to Bio-medical Waste (Management and Handling Rules 1998) schedule V : Standards for treatment and disposal of BMW.

Standard for incinerators

All incinerators shall meet the following operating and emission standards:

A. Operating standards

- Combustion efficiency (CE) shall be at least 99.0%
- The combustion efficiency is computed as follows :

$$CE = \frac{\%\ CO_2}{\%\ CO_2 + \%\ CO} \times 100$$

- The temperature of the primary chamber shall be 800 ± 50°C
- The secondary chamber gas residence time shall be at least 1 (one) second at 1050 ± 50°C, with a minimum of 3% Oxygen in the stack gas.

B. Emission standards

Parameters	Concentration mg/nm^3 at (12% CO_2 correction)
– Particulate matter	150
– Nitrogen oxides	450
– Hydrogen chloride	50

- Minimum stack height shall be 30 meters above ground.
- Volatile organic compounds in ash shall not be more than 0.01%.

Note:

- Suitably designed pollution control devices should be installed/retrofitted with the incinerator to achieve the above emission limits, if necessary.
- Wastes to be incinerated shall be chemically treated with any chlorinated disinfectant.
- Chlorinated plastics should not be incinerated.
- Toxic metals in incineration ash should be limited within the regulatory quality and quantities as defined under the Hazardous Waste (Management and Handling) Rules 1989.
- Only low sulfur fuel like LDO/LSHS/Diesel should be used as fuel in the incinerator.

Standards of microwaving

- Microwave treatment shall not be used for cytotoxic, hazardous or radioactive waste, contaminated animal carcasses, body parts and large metal items.
- The microwave system shall comply with the efficacy test/ routine tests and performance guarantee may be provided by the supplier before operation of the unit.
- The microwave should completely and consistently kill the bacteria and other pathogenic organism that is ensured by approved biological indicator at the maximum design

Standards for waste autoclaving

The autoclave should be dedicated for the purpose of disinfecting and treating bio-medical waste.

- When operating a gravity flow autoclave, medical waste should be subjected to:
  - A temperature of not less than 121°C and pressure of 15 pounds per square inch (psi) for an autoclave residence time of not less than 60 minutes; or
  - A temperature of not less than 135°C and a pressure of 31 psi for an autoclave residence time of not less than 45 minutes ; or
  - A temperature of not less than 149°C and a pressure of 52 psi for an autoclave residence time of not less than 30 minutes.
- When operating a vacuum autoclave, medical waste shall be subjected to a minimum of one pre-vacuum pulse to purge the autoclave of all air. The waste shall be subjected to the following:
  - A temperature of not less than 121°C and a pressure of 15 psi per an autoclave residence time of not less than 45 minutes; or
  - A temperature of not less than 135°C and a pressure of 31 psi for an autoclave residence time of not less than 30 minutes;
  - Medical waste should not be considered properly treated unless the time, temperature and pressure indicators indicate that the required time, temperature and pressure were reached during the autoclave process. If for any reason, time temperature or pressure indicator indicates that the required temperature, pressure or residence time was not reached, the entire load of medical waste must be autoclaved again until the proper temperature, pressure and residence time were achieved.
- *Recording of operational parameters :* Each autoclave shall have graphic or computer recording devices which will automatically and continuously monitor and record dates, time of day, load identification number and operating parameters throughout the entire length of the autoclave cycle.
- *Validation test:* Spore testing – the autoclave should completely and consistently kill the approved biological indicator at the maximum design capacity of each autoclave unit. Biological indicator for autoclave shall be *Bacillus stearothermophilus* spores using vials or spore strips, with at least 1×10^4 spores per milliliter. Under no circumstances will an autoclave have minimum operating parameters less than a residence time of 30 minutes, regardless of temperature and pressure, a temperature less than 121°C or a pressure less than 15 psi.
- *Routine Test:* A chemical indicator strip/tape that changes color when a certain temperature is reached can be used to verify that a specific temperature has been achieved. It may

Literature study

Standards for liquid waste

The effluent generated from the hospital should conform to the following limits:

Parameters	*Permissible limits*
pH	6.5-9.0
Suspended solids	100 mg/l
Oil and grease	10 mg/l
BOD	30 mg/l
COD	250 mg/l
Bio-assay test	90% survival of fish after 96 hours in 100% effluent.

These limits are applicable to those hospitals which are either connected with sewers without terminal sewage treatment plant or not connected to public sewers. For discharge into public sewers with terminal facilities, the general standards as notified under the Environment (Protection) Act, 1986 shall be applicable.

Standards for deep burial

- A pit or trench should be dug about 2 meters deep. It should be half filled with waste, then covered with lime within 50 cm of the surface, and the rest of the pit with soil.
- It must be ensured that animals do not have any assess to burial sites. Covers of galvanized iron/wire meshes may be used.
- On each occasion, when wastes are added to the pit, a layer of 10 cm of soil shall be added to cover the wastes.
- Burial must be performed under close and dedicated supervision.
- The deep burial site should be relatively impermeable and no shallow well should be close to the site.
- The pits should be distant from habitation, and sited so as to ensure that no contamination occurs of any surface water or ground water. The area should not be prone to flooding or erosion.
- The location of the deep burial maintains a record of all pits for deep burial.
- The institution shall maintain a record of all pits for deep burial.

Guidelines for housekeeping and disinfectant use in hospital

Area / Item	*Disinfection method*	*Frequency*	*Other considerations*
• Floors	Chlorophore cleanser Pesticide spray	Thrice in each nursing shift and as required. Once a week	Do not sweep or do dry dusting. Do not use cidex. All holes and crevices in the floors, walls, ceilings should be sealed.
• Walls	Pesticide spray 2% glutaraldehyde and formaldehyde	Once daily wiping (weekly spraying) Once in 2 weeks	
• Fans	Wet mop with water	Once in 2 weeks	
• Air Conditioner (Window)	2% glutaraldehyde and formaldehyde spray Vacuum cleaning	Once a week around window A/c Once in 2 weeks	Before restarting A/c after a long period of non-use, call plant technician for cleaning after dismantling
• Refrigerator	Defrosted and cleaned with soap solution	Once in 2 weeks Once in 2 weeks	
• Sinks • Buckets	Cleansing solution (e.g. Vim) Soap and water	Daily in morning shift	After cleaning and drying, line with polythene sheets daily, which can be changed after emptying as required.

Weight of materials

Item	*Dead Weight*	*Item*	*Dead Weight*
Bituminous substances	1550 kg/m^3	Glass	2560 kg/m^3
Heavy charcoal	530 kg/m^3	Limestone	2650 kg/m^3
Coaltar	1200 kg/m^3	Sandstone	2800 kg/m^3
Excavated materials		Steel	7800 kg/m^3
Clay (dry)	1600 kg/m^3	Timber	570-720 kg/m^2
Clay (damp, plastic)	1760 kg/m^3	**Structural items, ceilings finishes, etc.**	
Earth (dry, loose)	1200 kg/m^3	A.C. Sheets	17 kg/m^2
Earth (packed)	1520 kg/m^3	Brick masonry	1920 kg/m^2
Sand (dry, loose)	1440-1700 kg/m^3	Brick wall, 6 in. thick	295 kg/m^2
Sand (dry, packed)	1600-1900 kg/m^3	Brick wall, 9 in. thick	440 kg/m^2
Building materials		Cement plaster, 2.5 cm. thick	44 kg/m^2

DEPARTMENT : OT		ROOM : Operating Room
ARCHITECTURE	Floor	Self leveling joint less epoxy/Vinyl (anti bacterial) static dissipative, joints thermo sealed
	Ceiling Min. clear height.3.0 m	Anti bacterial paint
	Walls	Modular GI/Stainless steel panels, joints sealed with epoxy, finish with anti bacterial paint
	Doors (min size 1.8 M) /Windows	Anodised Aluminium frame/Pre/post laminated door shutters
DIMENSION : min 42 m^2	Circulation Space : 30%	
ENGINEERING	HVAC	Temp : 22°C ± 2 R H : 45 ± 5% Min. air changes 15 Independent ducting/100% fresh air
	Medical Gasses	Oxygen, Nitrous/suction through pendent
	Plumbing	Hot and cold water in scrub sink/ flash autoclave and wash area
	Electrical	Lux level : 300 in surrounding OT table 100000 lux. Socket with dedicated earthing for medical equipments
	Communication	Telephone/Intercom/Computer/Internet Cable for CCTV and music system
RELATIONSHIP	Primary	Casualty/CSSD
	Secondary	ICU
REMARKS :	Restricted entry through change room with air curtain at entry and an ante room for change of shoes.	

DEPARTMENT : Laboratory		ROOM : Laboratory Area
ARCHITECTURE	Floor	Self leveling joint less epoxy/Vinyl (anti bacterial) joints; thermo sealed/vitrified jointless
	Ceiling Min. clear height.3.0 m	Anti bacterial paint
	Walls	Vitrified tiles/dado/acrylic emulsion/ anti bacterial paint
	Doors (min size 1.8 M) /Windows	Anodised Aluminium frame/Pre/post laminated door shutters
DIMENSION : min 24 m^2	Circulation Space : 30%	
ENGINEERING	HVAC	Temp : 23°C ± 2 R H : 50 ± 5% Min. air changes 10 Proper exhaust for fume hood cupboard
	Medical Gasses	LPG supply compressed air
	Plumbing	Hot and cold water in lab sink/wash area
	Electrical	Lux level : 500 socket with 32 and 64 amp 3 phase with dedicated earthing for laboratory equipments
	Communication	Telephone/Intercom/Computer/Internet
RELATIONSHIP	Primary	OPD/Wards/ICU
	Secondary	Medical Records
REMARKS :	Modular lab furniture with seamless epoxy coated top to be linked through HIS for online reporting.	

HOSPITAL HOUSEKEEPING AND BIOMEDICAL WASTE MANAGEMENT

- Average quantity of bio-medical waste generated per bed per day in India in tertiary level hospitals is 1.5 to 2.0 kg.
- Statutory provision according to Bio-medical Waste (Management and Handling Rules 1998) schedule V : Standards for treatment and disposal of BMW.

Standard for incinerators

All incinerators shall meet the following operating and emission standards:

A. Operating standards

- Combustion efficiency (CE) shall be at least 99.0%
- The combustion efficiency is computed as follows :

$$CE = \frac{\%\ CO_2}{\%\ CO_2 + \%\ CO} \times 100$$

- The temperature of the primary chamber shall be 800 ± 50°C
- The secondary chamber gas residence time shall be at least 1 (one) second at 1050 ± 50°C, with a minimum of 3% Oxygen in the stack gas.

B. Emission standards

Parameters	Concentration mg/nm^3 at (12% CO_2 correction)
– Particulate matter	150
– Nitrogen oxides	450
– Hydrogen chloride	50

- Minimum stack height shall be 30 meters above ground.
- Volatile organic compounds in ash shall not be more than 0.01%.

Note:

- Suitably designed pollution control devices should be installed/retrofitted with the incinerator to achieve the above emission limits, if necessary.
- Wastes to be incinerated shall be chemically treated with any chlorinated disinfectant.
- Chlorinated plastics should not be incinerated.
- Toxic metals in incineration ash should be limited within the regulatory quality and quantities as defined under the Hazardous Waste (Management and Handling) Rules 1989.
- Only low sulfur fuel like LDO/LSHS/Diesel should be used as fuel in the incinerator.

Standards of microwaving

- Microwave treatment shall not be used for cytotoxic, hazardous or radioactive waste, contaminated animal carcasses, body parts and large metal items.
- The microwave system shall comply with the efficacy test/ routine tests and performance guarantee may be provided by the supplier before operation of the unit.
- The microwave should completely and consistently kill the bacteria and other pathogenic organism that is ensured by approved biological indicator at the maximum design

Standards for waste autoclaving

The autoclave should be dedicated for the purpose of disinfecting and treating bio-medical waste.

- When operating a gravity flow autoclave, medical waste should be subjected to:
  - A temperature of not less than 121°C and pressure of 15 pounds per square inch (psi) for an autoclave residence time of not less than 60 minutes; or
  - A temperature of not less than 135°C and a pressure of 31 psi for an autoclave residence time of not less than 45 minutes ; or
  - A temperature of not less than 149°C and a pressure of 52 psi for an autoclave residence time of not less than 30 minutes.
- When operating a vacuum autoclave, medical waste shall be subjected to a minimum of one pre-vacuum pulse to purge the autoclave of all air. The waste shall be subjected to the following:
  - A temperature of not less than 121°C and a pressure of 15 psi per an autoclave residence time of not less than 45 minutes; or
  - A temperature of not less than 135°C and a pressure of 31 psi for an autoclave residence time of not less than 30 minutes;
  - Medical waste should not be considered properly treated unless the time, temperature and pressure indicators indicate that the required time, temperature and pressure were reached during the autoclave process. If for any reason, time temperature or pressure indicator indicates that the required temperature, pressure or residence time was not reached, the entire load of medical waste must be autoclaved again until the proper temperature, pressure and residence time were achieved.
- *Recording of operational parameters :* Each autoclave shall have graphic or computer recording devices which will automatically and continuously monitor and record dates, time of day, load identification number and operating parameters throughout the entire length of the autoclave cycle.
- *Validation test:* Spore testing – the autoclave should completely and consistently kill the approved biological indicator at the maximum design capacity of each autoclave unit. Biological indicator for autoclave shall be *Bacillus stearothermophilus* spores using vials or spore strips, with at least 1 × 10^4 spores per milliliter. Under no circumstances will an autoclave have minimum operating parameters less than a residence time of 30 minutes, regardless of temperature and pressure, a temperature less than 121°C or a pressure less than 15 psi.
- *Routine Test:* A chemical indicator strip/tape that changes color when a certain temperature is reached can be used to verify that a specific temperature has been achieved. It may

CASE STUDY 1 – SAHARA HOSPITAL, LUCKNOW

A Centre for Tertiary Care
Location : Gomti Nagar, Lucknow
In technical Collaboration with
Apollo Hospitals

Client : **Sahara India Parivar**, in **Technical collaboration with**
Apollo Hospitals
Design Team :**M/s Architect Hafeez Contractor**(Design and Concept), M/s Archimedes Consultants (Present)

Total Site : **27 Acres**
Built Up Area : **74,000 sq m** (approx)
Cost : **Rs 400 Crores** (approx.)
F.A.R:2
E.C.S:100
Year of Completion : **2008**

LOCATION:-

• Situated in Gomti Nagar, a newly developed area in Lucknow.

• 31 acres of prime land, corner plot in which 27 acres is used in hospital.

• On back side is railway line.

• Other side is occupied by traditional built form of institute.

• Situated on walking distance from Hanneyman chauraha.

GENERAL FEATURES OF BUILDING:

• A Hospital with **350 beds expandable to 500 beds.**
State-of-the-art, multi-specialty, tertiary care.

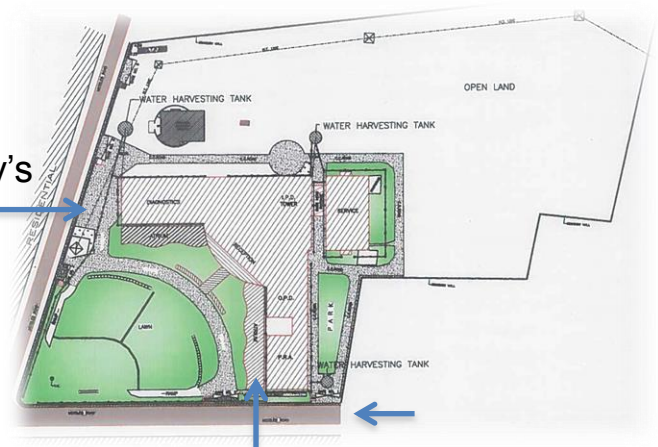
• hospital providing **7-star facilities Hospital** is broken into two blocks of different heights connected by an atrium.

• Estimated to care for the needs of almost **3 lakh** people with its **outpatient department and 50,000 patients** through its inpatient facility annually.

• The "L' shaped 4-floor high block houses the diagnostics zone in one arm and an outpatient section in another.

• The 13-storey high in patient tower rises from the centre and is fronted by a double volume entrance lobby, which functions as a common foyer to all the zones.

Sahara Hospital



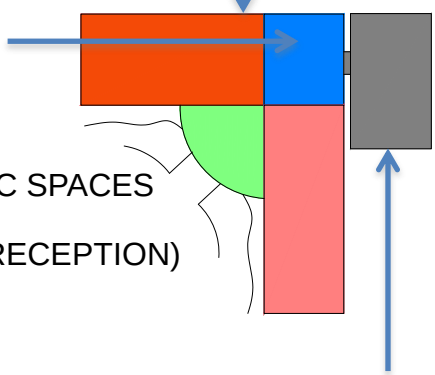
Common Entry's
(Gate no. 3)

SEMI PUBLIC SPACES

(IPD)

PRIVATE SPACES
(O.T,ICU,EMERGENCY)

Exit
(Gate no.2)



PUBLIC SPACES

(ATRIUM,RECEPTION)

- Main Access is from

24 mts wide roads from two sides.

- Across the road is the Gomti Nagar commercial area. Embarked with number of small malls in the area. Other vicinity is flooded by residential sector.
- **Two entry from main road** which serves The **Service block and OPD**, will serve general public and Doctors.
- Other **separate entry for Emergency area.**

LOCATION : **Gomti Nagar, Lucknow**
SURROUNDING :Commercial,Residential
ROAD: **24mts. Wide Road** From **Two Sides**
BUS STOP : Heinemann Chauraha 850 Mts.
CHARBAGH BUS STATION: **12.6 km** takes **40 minutes**,buses available every 15 minutes
AIRPORT :**23.7km** takes **1hour 39minutes** from Heinemann
RAILWAY STATION **: 12.5 km** away from heinemann takes **55 minutes** from **bus via route no. 45** and it takes **25 minutes from car**

DIAGNOSTIC BLOCK ADMIN AREA

EMERGENCY ENTRY

PROPOSED LAND GATE NO.3

ACCESS TO G.F

SERVICE BLOCK

IPD TOWER

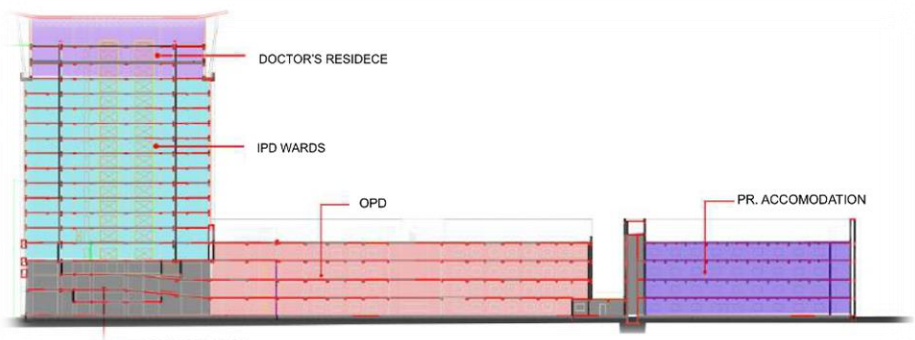
OPD

LAWN

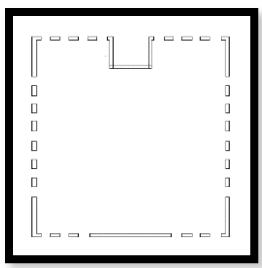
PRA

UNIQUE FEATURES OF THE HOSPITAL:-

- A **Hyperbaric Oxygen therapy** centre which is a specialised
- Centre to treat diseases caused by **ischemia** (**Oxygen depletion in tissues).**
- Sahara Hospital will have the most modern delivery system –
- **"Pneumatic Tube"** to achieve efficient & safe transportation of drugs, pathological samples.

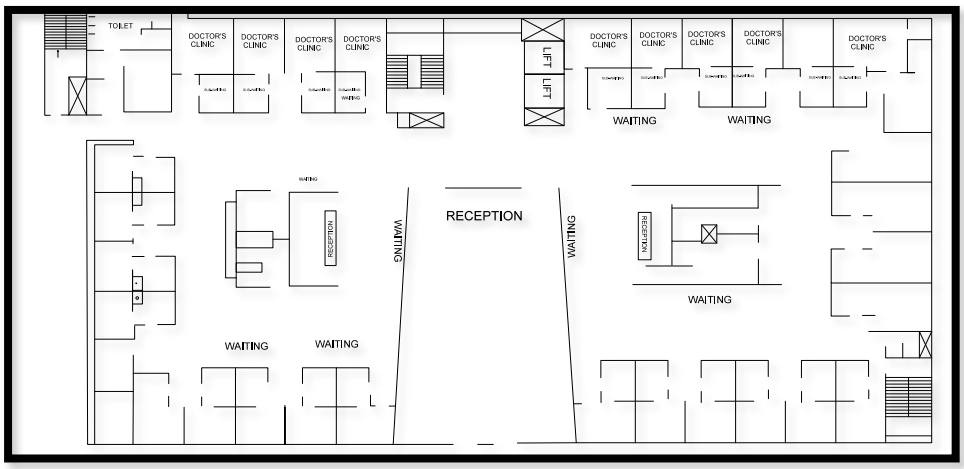


SECTION

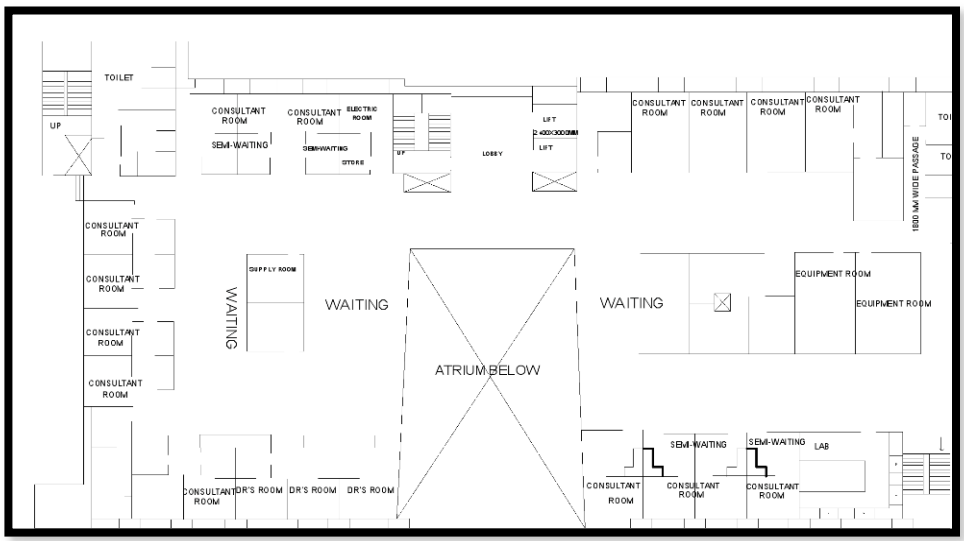


IPD STUCTURE LAYOUT

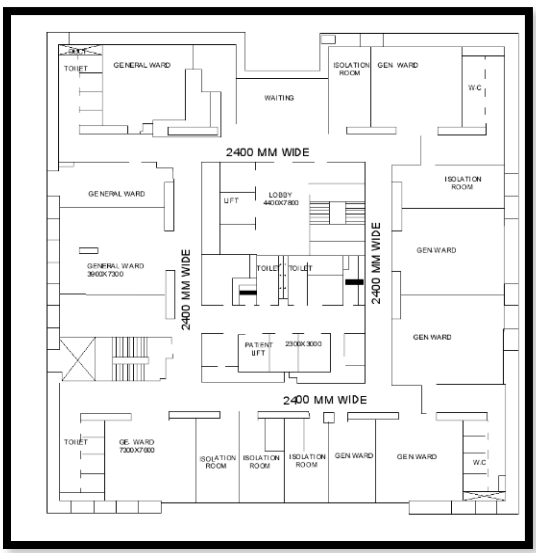
O
P
D



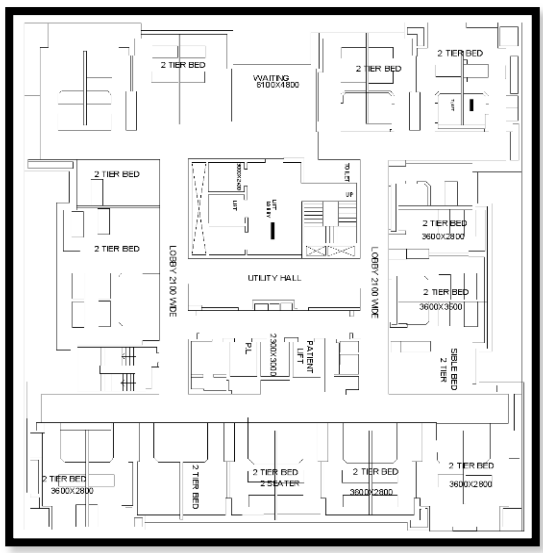
GROUND FLOOR PLAN



FIRST FLOOR PLAN

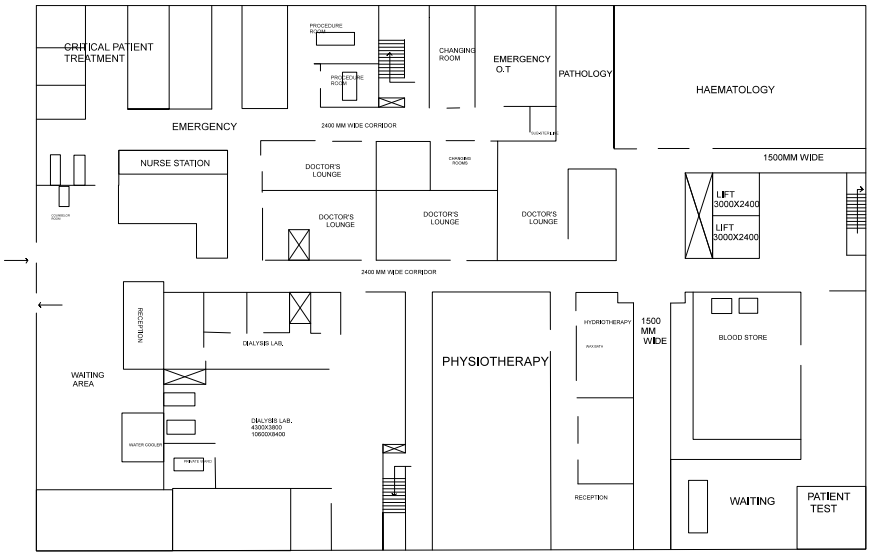


LEV.01 IPD



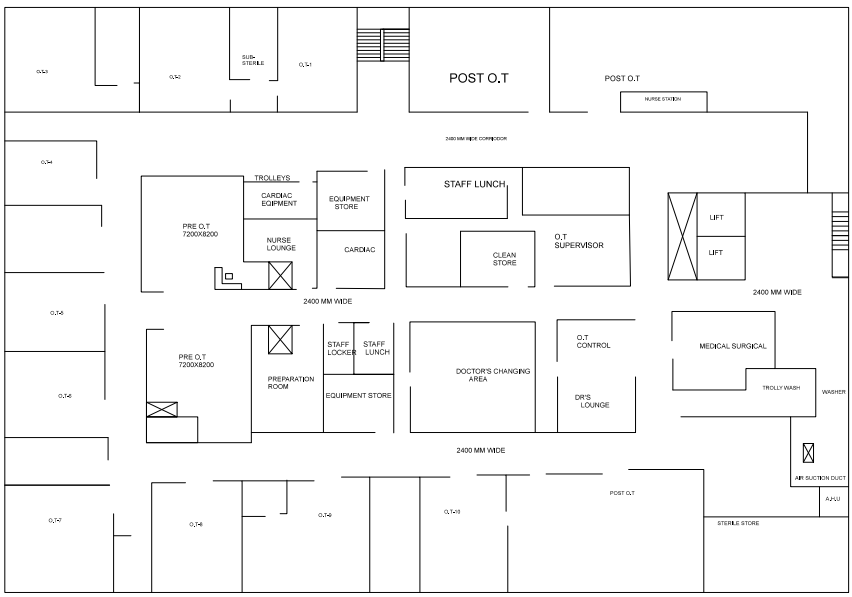
LEVEL 03 IPD

• DIAGNOSTIC BLOCK



GROUND FLOOR PLAN

FIRST FLOOR PLAN



- • Multiple entrances of all diagnostics areas.
- • Linear block consists of three major zones on Ground floor-
- A) Emergency- O.T., triage room, plaster and consultant's room.
- B) Diagnosis- radiology, C.T. scan, pathology labs, etc. And administration area
- C) IPD tower .
- D) Services Block
- • Minor OT is provided in this area.
- • All three are approachable by different entries.
- • Lifts are provided at the middle and end of the corridor.
- • 10 O.T.'s and I.C.U.'s are placed on First floor.

SERVICE BLOCK

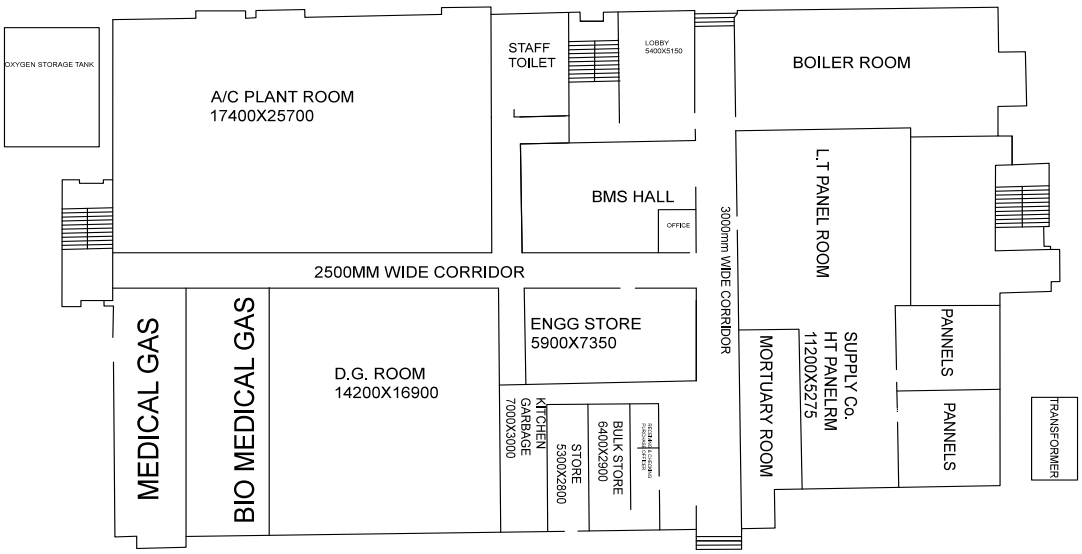
- Service Block in the rear of the main hospital building.
- Separate service entry through one separate gate
- Almost whole of the block is double height (6m).
- Block abutting the service court accommodates

1. L.T. and H.T.,
2. Food receiving areas,
3. water treatment plant,
4. Telephone exchange,
5. Store
6. gas manifold room
7. L.P.G. stores,
8. D.G. set, workshop,
9. change rooms,
10. A.C. plant room,
11. Linen store,
12. Laundry, Boiler,
13. Mortuary.

• These services travel the vertical distance by ducts and then span the horizontal distance running through ducts underground and covered by concrete slab.

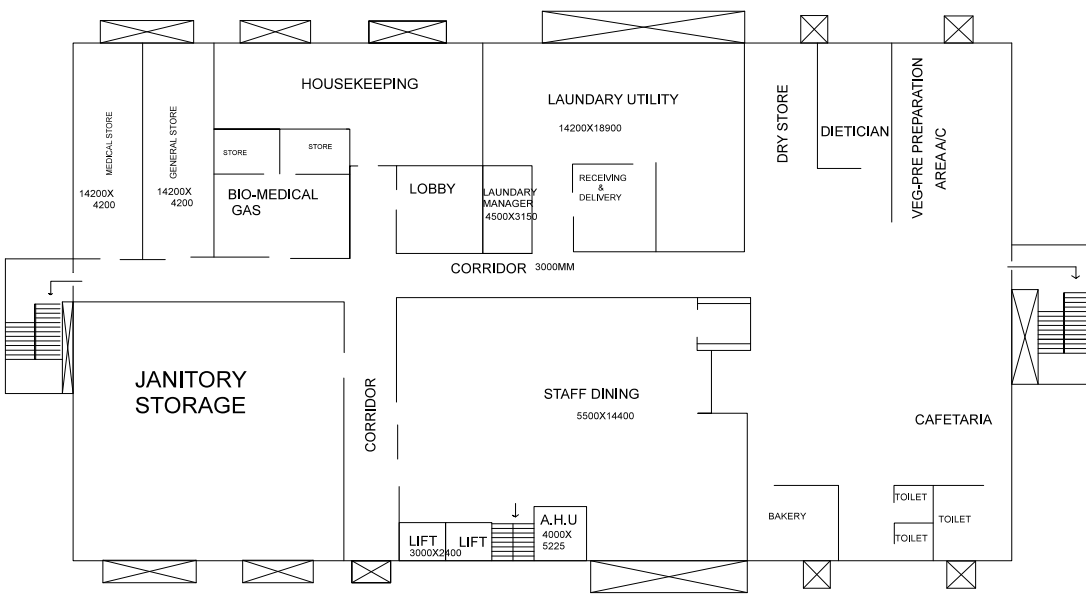
- Basements are largely for the parking and security control room.

- SERVICE BLOCK FLOOR PLAN



GROUND FLOOR PLAN

KITCHEN CYLINDER



FIRST FLOOR PLAN

CASE STUDY 2 – ESIC MODEL HOSPITAL , BASAI DARA , NEW DELHI

Objective

The objective of carrying this case study is to analysis an existing, planning setup of a ESIC MODEL HOSPITAL , BASAI DARA , NEW DELHI similar in functions and requirements as the one to be designed. The expected outcome is a set of guidelines that will be used in the planning and structuring of the proposed project.

Why this case study?

- First ESIC MODEL HOSPITAL in India.
- Situated in same type of topography and climate.
- To find out current issues /Problems.
- Architecture of Healing.
- Vernacular architecture are same.
- Situated in NEW DELHI
- Climate responsive architecture.

NEW DELHI

Delhi, the capital of India has a strong historical background. It was ruled by some of the most powerful emperors in Indian history.

The history of the city is as old as the epic Mahabharata. The town was known as **Indraprastha** , where **Pandavas** used to live. In due course eight more cities came alive adjacent to **Indraprastha : Lal Kot**, **Siri, Dinpanah**, **Quila Rai Pithora**, **Ferozabad**, **Jahanpanah , Tughlakabad** and **Shahjahanabad** . The NCT covers an area of 1,484 square kilometres. According to 2011 census, Delhi's city population was about **11 million**, the second highest in India after Mumbai, while the whole NCT population was about **16.8 million**, making it the world's 3rd largest city proper by population.

INTRODUCTION

Employees' State Insurance (abbreviated as ESI) is a self-financing social security and health insurance scheme for Indian workers. The fund is managed by the Employees' State Insurance Corporation (ESIC) according to rules and regulations stipulated in the ESI Act 1948. ESIC is a Statutory Body and Administrative Ministry is Ministry of Labour and Employment, Government of India.

History

In March 1943, Prof. B.P.Adarkar was appointed by the Government of India to create a report on the health insurance scheme for industrial workers. The report became the basis for the Employment State Insurance (ESI) Act of 1948. The promulgation of Employees' State Insurance Act, 1948 envisaged an integrated need based social insurance scheme that would protect the interest of workers in contingencies such as sickness, maternity, temporary or permanent physical disablement, death due to employment injury resulting in loss of wages or earning capacity. The Act also guarantees reasonably good medical care to workers and their immediate dependents. Following the promulgation of the ESI Act the Central Govt. set up the ESI Corporation to administer the Scheme. The Scheme thereafter was first implemented at Kanpur and Delhi on 24 February 1952. The Act further absolved the employers of their obligations under the Maternity Benefit Act, 1961 and Workmen's Compensation Act 1923. The benefits provided to the employees under the Act are also in conformity with ILO conventions

ESI Act

Employees' State Insurance Corporation (ESIC), established by ESI Act, is an autonomous corporation under Ministry of Labor and Employment, Government of India. As it is a legal entity, the corporation can raise loans and take measures for discharging such loans with the prior sanction of the central government and it can acquire both movable and immovable property and all incomes from the property shall vest with the corporation. The corporation can set up hospitals either independently or in collaboration with state government or other private entities, but most of the dispensaries and hospitals are run by concerned state governments

Benefits

For all employees earning {{INRConvert|21000|} or less per month as wages, the employer contributes 3.25% and the employee contributes 0.75%, total share 4%. This fund is managed by the ESI Corporation (ESIC) according to rules and regulations stipulated there in the ESI Act 1948, which oversees the provision of medical and cash benefits to the employees and their family. ESI scheme is a type of social security scheme for employees in the organized sector

The employees registered under the scheme are entitled to medical treatment for themselves and their dependents, unemployment cash benefit in certain contingencies and maternity benefit in case of women employees. In case of employment-related disablement or death, there is provision for a disablement benefit and a family pension respectively . 67 Outpatient medical facilities are available in 1418 ESI dispensaries and through 1,678 registered medical practitioners. Inpatient care is available in 145 ESI hospitals and 42 hospital annexes with a total of 19,387 beds. In addition, several state government hospitals also have beds for the exclusive use of ESI Beneficiaries. Cash benefits can be availed in any of 830 ESI centres throughout India.

Recent years have seen an increasing role of information technology in ESI, with the introduction of Pehchan smart cards as a part of Project Panchdeep.In addition to insured workers, poor families eligible under the Rashtriya Swasthya Bima Yojana can also avail facilities in ESI hospitals and dispensaries. ESI Corporation also runs medical, nursing and paramedical schools in some ESI hospitals across India.

New Amendment

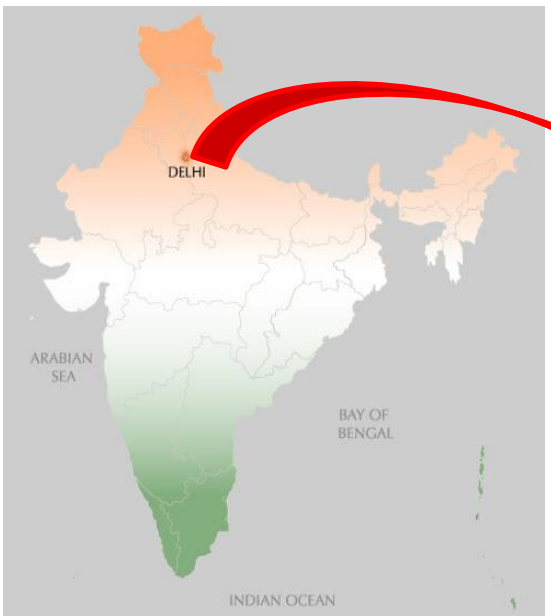
The Employees' State Insurance Corporation (ESIC) raised the monthly wage limit to Rs. 21,000 from the existing Rs. 15,000, for coverage with effect from 1 January 2017 [11] The rate of contribution was reduced from 6.5% to 4% (employer's share 3.25% and employee's share 0.75%) effective from 1july 19 .

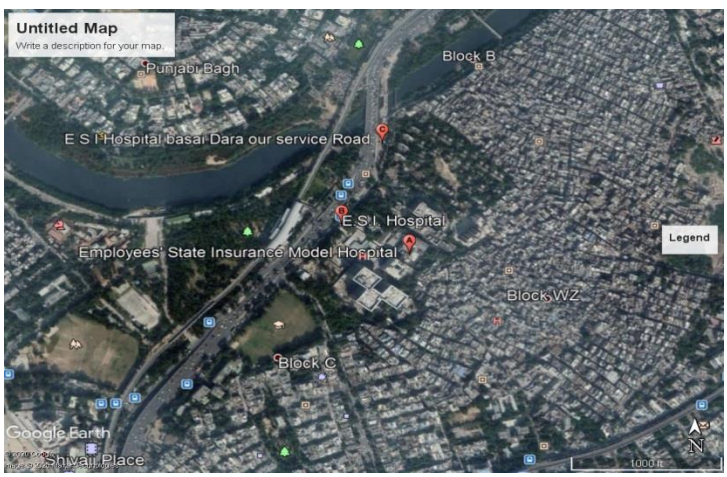
CASE STUDY 2 – ESIC MODEL HOSPITAL , BASAI DARA , NEW DELHI

LOCATION – Bsai dara pur , ring road , NEW DELHI
CO-ORDINATES – 28.7041° N, 77.1025° E
TOTAL LAND AREA – 31 ACRES
CLIMATE - COMPOSITE

400 BEDED HOSPITAL

Climate data, Location & Approach





Climate data for Delhi													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	30	34.1	40.6	45.6	47.2	46.7	45	42	40.6	39.4	36.1	29.3	47.2
Average high °C (°F)	21	23.5	29.2	36	39.2	38.8	34.7	33.6	34.2	33	28.3	22.9	31.2
Daily mean °C (°F)	14.3	16.8	22.3	28.8	32.5	33.4	30.8	30	29.5	26.3	20.8	15.7	25.1
Average low °C (°F)	7.6	10.1	15.3	21.6	25.9	27.8	26.8	26.3	24.7	19.6	13.2	8.5	19
Record low °C (°F)	−0.6	1.6	4.4	10.7	15.2	18.9	20.3	20.7	17.3	9.4	3.9	1.1	−0.6
Average precipitation mm (inches)	19	20	15	21	25	70	237	235	113	17	9	9	790
Average relative humidity (%)	63	55	47	34	33	46	70	73	62	52	55	62	54
Mean monthly sunshine hours	214.6	216.1	239.1	261	263.1	196.5	165.9	177	219	269.3	247.2	215.8	2,684.60

ESIC HOSPITAL SITE PLAN

BASEMENT PARKING

GATE NO. 2

D 3 BLOCK

HIGHT EXTENTION LINE

SITE PLAN

D1 BLOCK

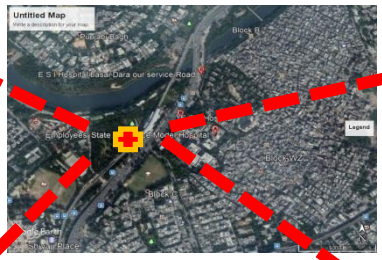
OLD BLOCK

INFRONT OLD BLOCK

OPEN PARKING

BLOOD BANK

KIRTI NAGAR – 3 KM



AIRPORT – 13.5 KM

ISBT -9.5 KM

NEW DELHI RAILYWAY STN. - 11.5 KM

HVAC

- 5 CENTRIFUGAL CHILLER PLANT
- 5 CONTROL PANEL
- 704 KW CHILLER PLANT POWER WITH 3000 RPM
- SECONDARY PUMP FOR PRESSUR
- 174 AHU (45-50 PER FLOOR)

FIRE FIGHTING AND PUMP ROOM

ELECTRICAL detail

2750 KV (SIX TRANSFARMER)

WATER TREATMENT

BEHIND OLD W.T.P AND NEW PROPOSED NEAR GATE NO. 1

- **4 NO. OF LIFT**
- **3 PASSENGER IIFT**
- **1 PATITENT LIFT**
- 2 STAIR CASE (1 FIRE EXIT)
- EVERY 30MT FIRE FIGHTING
- MORTURY on GATE NO. 1 (6 BOX)
- 3 GATE

OLD BLOCK

➢ D 1 BLOCK + 5

- **G . F. – MAIN kitchen , laundry , Medical store**
- **F . F . – eye ward**
- **S . F . -- BLANK**
- **T. F – BLANK**

➢ D 2 BLOCK

- **G . F. – blank**
- **F . F . – General ward**
- **S . F . - General ward**
- **T. F – general ward**

➢ D 3 BLOCK

- **1st , 2nd , 3rd , 4th floor - EMERGENCY , O.P.D**
- **4TH -- DIALYSYS + E.N.T**

➢ ADMINISTRATIVE BLOCK

- **G.F -- REGISTRATION COUNTER (10 COUNTER) + BANK + CANTEEN**
- **1 ST FLOOR – I .O . D . + GYNO**
- **2ND FLOOOR – SURGERY + PEEDS + AYURVEDIC**
- **3RD FLOOR – SST CELL + MEDICINE + CARDIOLOGY**
- **4TH FLOOR --- LAP PROPOSED**
- **5TH FLOOOR - D.M. O**
- **6TH FLOOR – M.S OFFICE + ACCOUNT BRANCH + ADMIN DEPARTMENT**
- **NO. OF LIFT – 8 LIFT (ONLY 4 LIFT IN RUNNING)**
- **STAIR --- 6 STAIR (2 EMERGENY STAIR)**

LITERATURE STUDY - 1

INDRAPRASTHA APOLLOHOSPITAL DELHI

Location

Mathura Rd, Pocket B, Sarita Vihar, New Delhi, Delhi 110076

•Situated onDelhi-Mathura Highway

• Faces SWof the road 7 minutes drive from Ashram Chowk

•In proximity to the Okhla and Nizamuddin railway stations, so easily approachable by trains.

PROJECT DETAILS

- ❑ Area, 6,75,000 sq.ft.
- ❑ Completed, 1996
- ❑ Largest corporate hospital in India
- ❑ •Fourth largest inthe world
- ❑ •652 beds including 138 ICU beds
- ❑ •14 Operation Theatres

Built up area of 675,000 sq.ft

- ❑ This mocomplexity normaly inherent in such large institutional spaces.
- ❑ A different concept has been dwelt upon for the different functional areas, such as the out- patient department, the medical facilities and the in-patient wards.
- ❑ dern edifice aims to breakdown the

DEPARTMENTS OF HOSPITAL

•General OPDservices
- Emergency department
- General medicine
- General surgery
- Dentistry
- ENT
- Obstetrics and Gynecology

•Orthopaedics

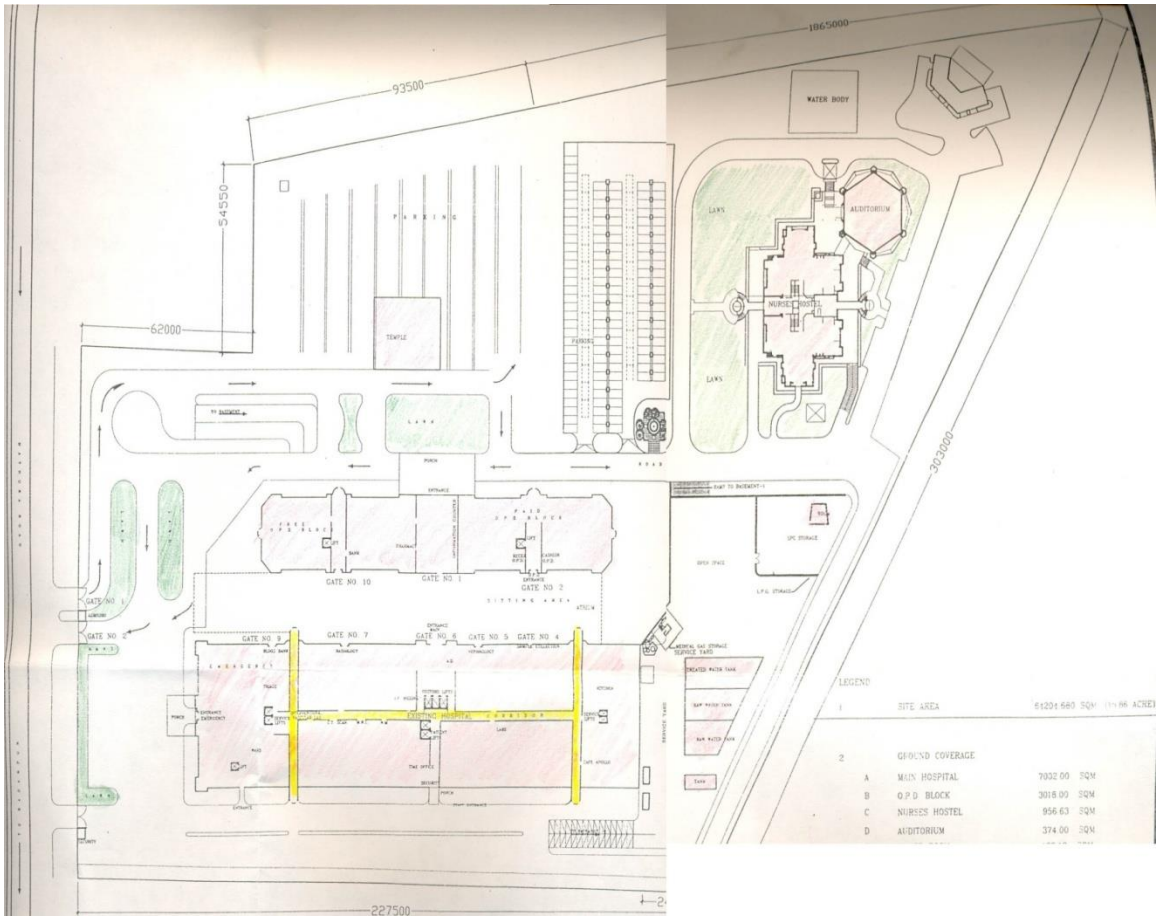
•Paediatrics

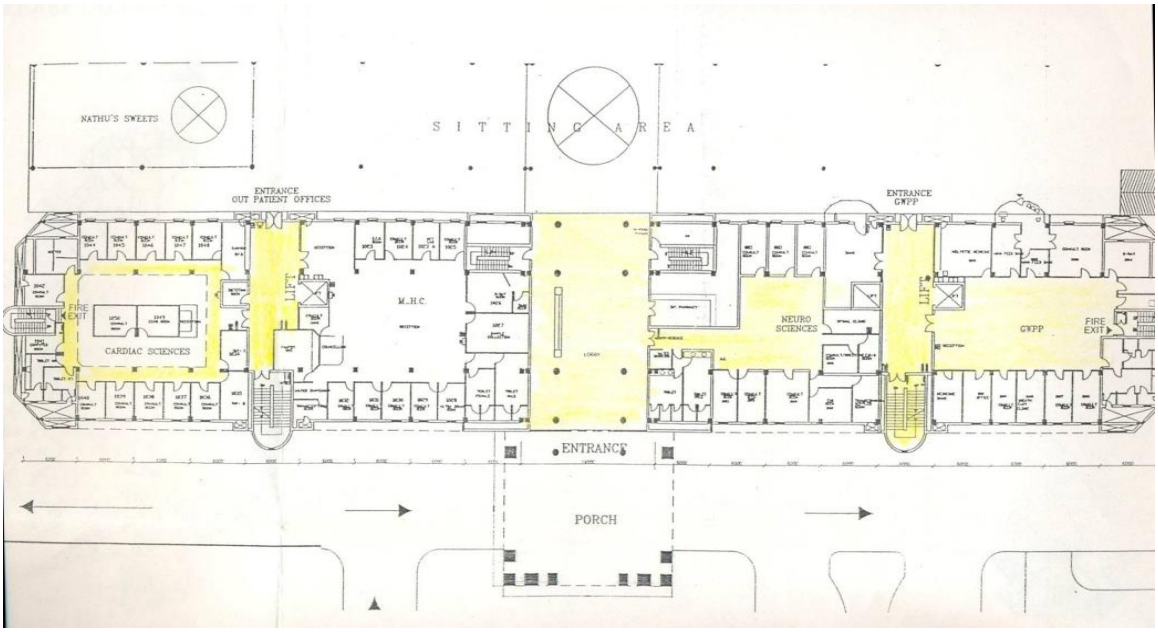
•Psychiatry

•Tuberculosis and respiratory diseases

- Eye care
- Physiotherapy
- Community medicine
- Forensic medicine

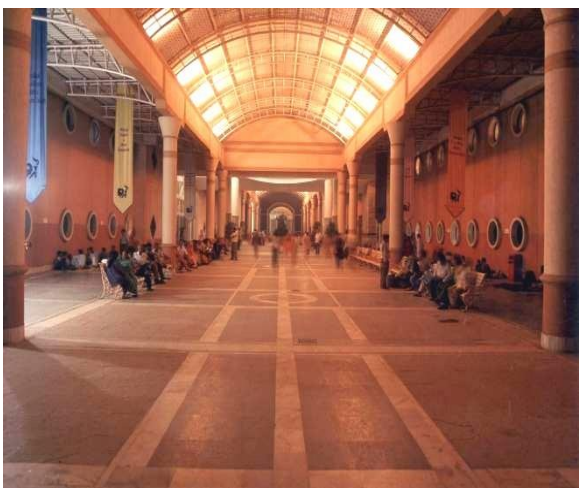
- For the in-patient wards, several criteria had to be satisfied : provision of cross-ventilation in every room; every bed to have a view of the outside; a minimum walking distance from the nurses station to the rooms and also al owing a sense of visual check; flexibility for the future so that any floor could be converted from wards to rooms and vice-versa : as the floors progress, the configuration for the hierarchy of the rooms to get established.
- The in-patient wards are grouped reassuringly around a central nurse's station and are placed above the clinical zone in the podium. Throughout the complex the aim has been to de-institutionalize the spaces by the use of bold, vibrant colours and patterns , thereby, creating a cheerful atmosphere and a feeling of home away from home.





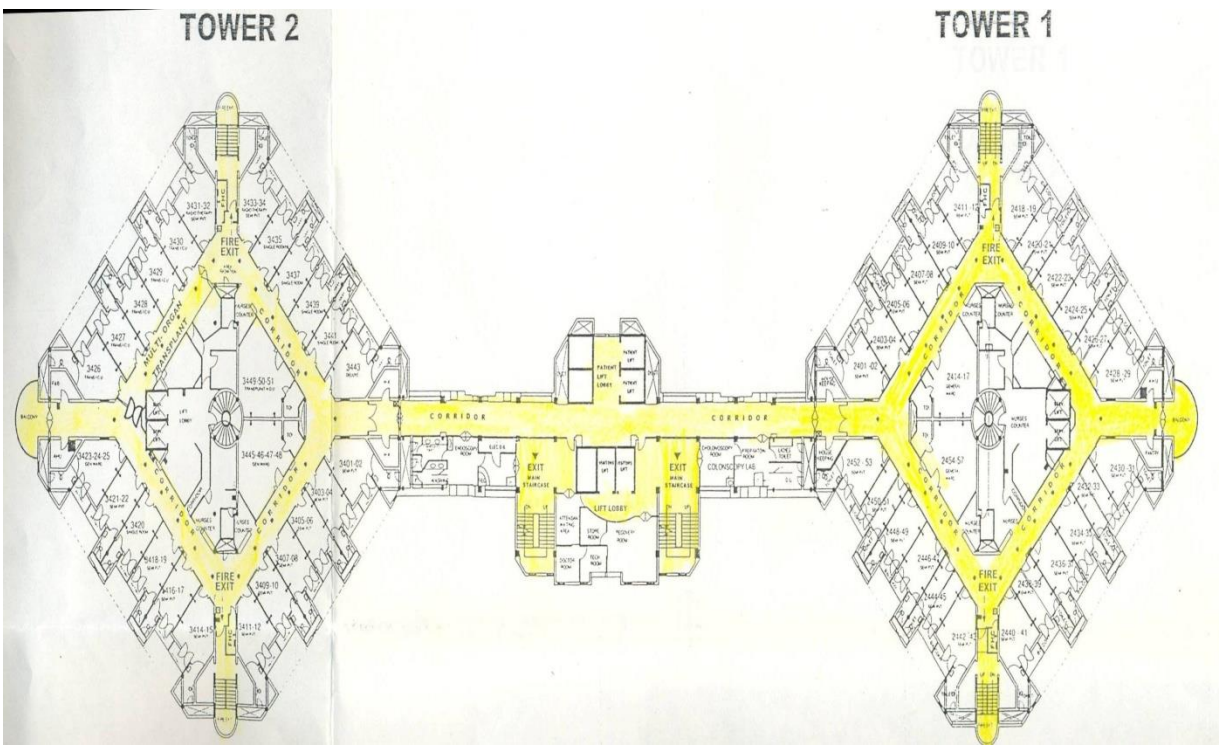
GROUND FLOOR PLAN

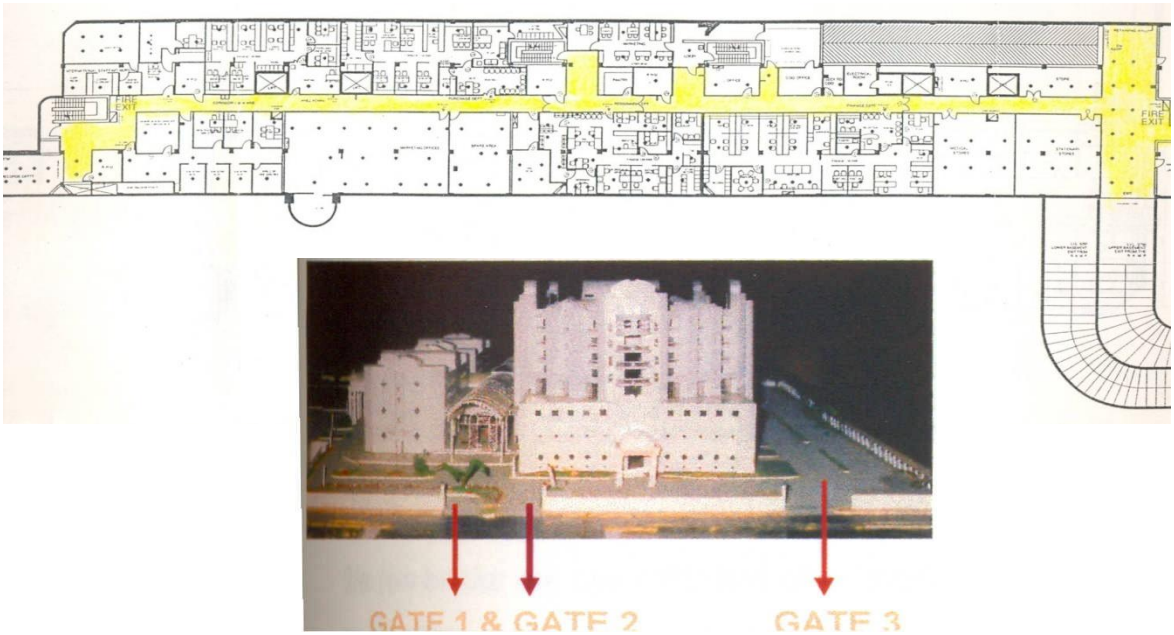
The concept for the OPD generated from the need to accommodate the people who would wait. while the departments have definite spaces for waiting, the general waiting area has an atrium with a directional visual communication



The less complex out-patient department is separated by a pedestrian atrium space from the complex acute care, diagnostic and in-patient areas. The large atrium serves to enliven the environment and provide a street-like atmosphere from within which the various facilities are accessed.

- Entry of the hospital is through 3 gates namely Gate 1, Gate 2, and Gate 3. Gate 1 is the main entry leading to OPO and parking area whereas gate 2 is exit gate opening to the red lights. Gate 3 is service entry serving as doctors and staff entry leading to the main building block and finally to the service yard from the ramp to the base.



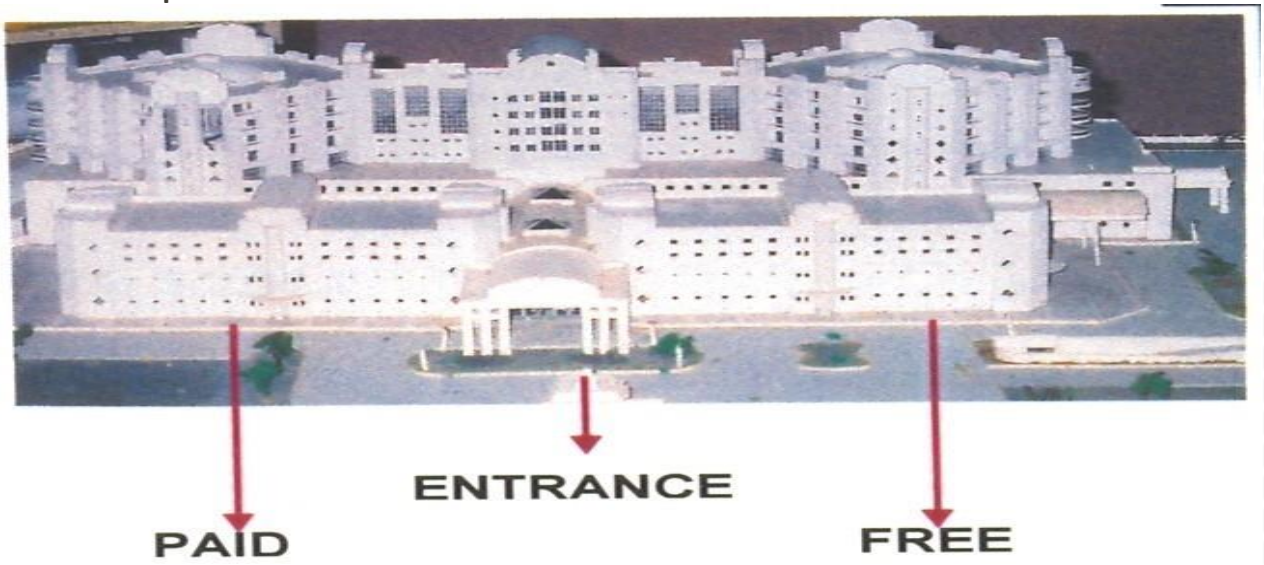


POSITIVE

- Grand atrium which acts as waiting hal gives street like appearance, hence a source of attraction.
- Overal circulation is reduced with the help of atrium.
- Proper care of the cross ventilation and outward view has been taken in designing of the wards
- Proper services are laid out
- Wards are designed in the towers to minimize services

NEGATIVE

- *Gives hotel like appearance.
- *Tower like structure not
- recommended for area lying in
- earthquake zone 4



LITERATURE STUDY - 2

EMC Hospital, Delhi) Green Avenue,ASR

LOCATION DETAILS

- Located at midst of the residential area of Green Avenue.
- Corner based location.

OVER VIEW

BRIEF HISTORY

- Accquired by Emergency Medical Care group of hospitals in year 2007
- Earlier it was known as KAKKAR HOSPITAL
- 2 floors were expanded by the management just after it was accquired by the EMC group.

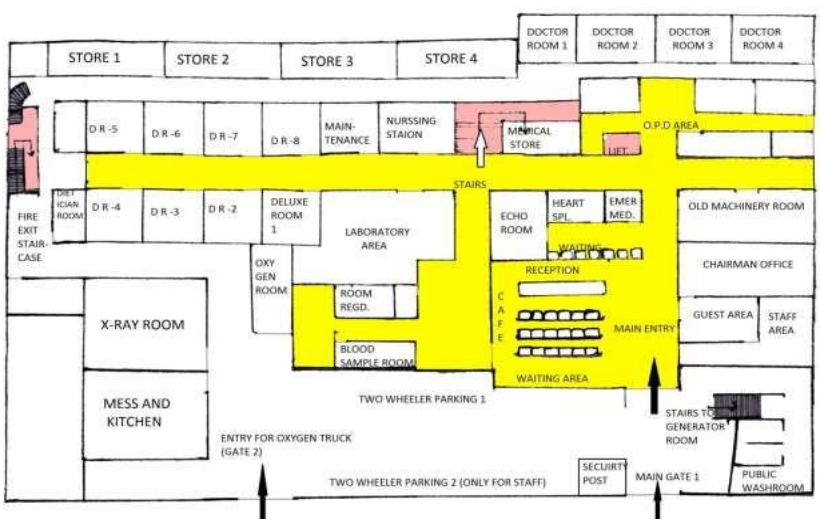
- It provides patient services in:

onuclear medicine and cardiac imaging,
o labs andscans
ointerventional cardiology,
ocardiac pacing and electrophysiology,
oneurosciences,
oorthopedics,
ogynecology and obstetrics,
opediatrics,
omaternity services
ogeneral surgery,
onephrology,
ogastroenterology

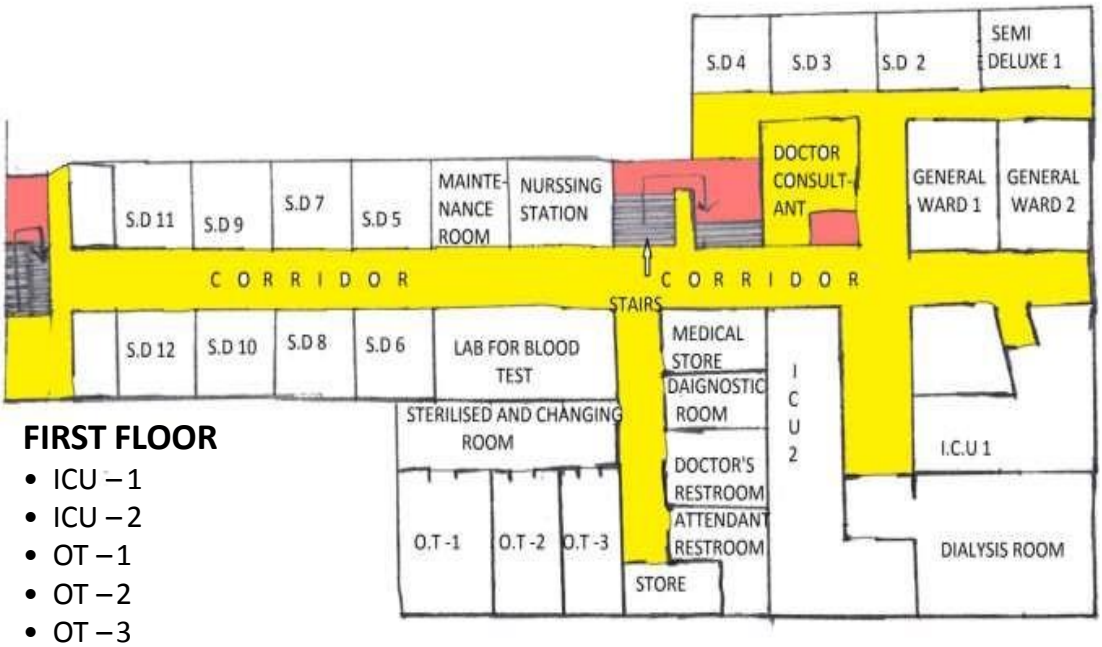
IV. ZONING AND PLANNING

The hospital vastly divided into East block and West block

GROUND FLOOR



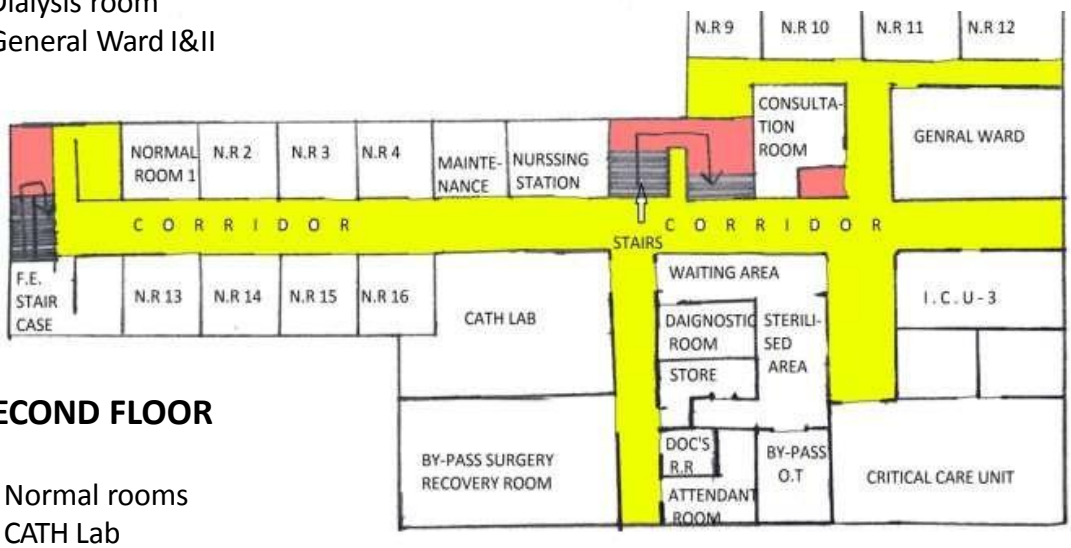
- Deluxe/VIP rooms
- Laboratory
- Blood Sampling
- X-Ray
- Dietician Room
- Chairman's Office
- Staff kitchen and mess
- Oxygen supply room
- Power Back (50 KVA genset)
- General supply stores
- All OPDs
- Pre cardiac diagnosis



FIRST FLOOR

- ICU – 1
- ICU – 2
- OT – 1
- OT – 2
- OT – 3
- Blood testing lab
- Semi Deluxe rooms
- Dialysis room
- General Ward I&II

FIRST FLOOR PLAN



SECOND FLOOR

- Normal rooms
- CATH Lab
- CCU
- ICU – 3
- By Pass surgery centre
- By Pass OT
- By Pass recovery room
- General Ward

SECOND FLOOR PLAN

LIGHTING

- The hospital spots huge glazing on the exterior that acts as a light source, there is a subtle lighting through the sky lighting. This acts a source of illumination for the adjacent corridors

- The areas such as the wards where the patient prefers lighting is provided with enough natural source of light.

- The entrance area and reception is well lit using artificial lighting. No problems such as glaring or glazing were observed.

VENTILATION

- Proper ventilation is provided in every room and ward.
- Proper isolation of OTs and ICUs
- AHUs and exhaust system provided in the hospital complex.

INFERENCES

MERITS

- INTER DEPARTMENT CONNECTIVITY IS NOT COMPLEX. WHICH PROVIDE FREE FLOW OF MOVEMENT FOR PATIENT AND STAFF.
- WELL CO-ORDINATED STAFF AND MANAGEMENT
- THE QUALITY OF ROOM AND FOOD IS VERY WELL MAINTAINED

DEMERITS

- THERE WHERE NO SMOKE DETECTOR AND WATER SPRINKLE FOR FIRE SAFETY.
- EMERGENCY EXIT ON SECOND IS BLOCKED.
- THERE IS ONLY ONE LIFT WHICH IS USED AS SERVICE AND ALSO FOR PATIENTS.
- THERE IS NO EMERGENCY WARD AT GROUND FLOOR

CIRCULATION

- No separate Entrances
- Service entrance at back
- The waste was taken out of the building through the lift

only, which was used asd patient lift.

•The main clean corridors are of approximately 3m wide.

•The sterile corridors and dirty corridors weren't separated from the main corridor.

Reception cum Waiting with Cafe

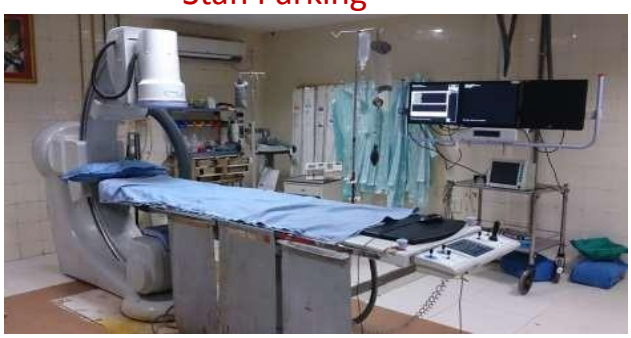
ICU – I

Bypass Surgery Theatre

Oxygen Supply Area

Power Back Up (50 KVA genet

Staff Parking



Cardiac OT

Scrub Area

COMPARITIVE ANALYSIS

1. OPD BLOCK

S.NO	SPACE Required	StandadSIZE (sq.m)	Sahara Hospital (sq.m)	ESIC (sqm)	My Prefrence (sqm)
1.	Entrance Hall,Cash Counter, Record	180	230	150	200
2.	Officer-in-charge	18	12	30	20
3.	Nurse-in-charge	20	12	--	20
4.	Sanitory Inspector Room	16	24	14	20
5.	OPD Record Room	35	48	24	48
6.	Examination Room and Consulation	18	22	24	30
7.	Sub-Waiting	6	6	--	6
8.	Recovery Room	14	26	54	18
9.	Toilet cum Changing	14	10	--	14
10.	Clinical Laboratory	18	24		
11.	Dark Room	18	18	17.5	24
12.	Treatment	17.5	24	24	24
13.	Blood Bank	440	280	240	500
14.	Circulation Area	40%	40%	30%	40%
15.	Pharmacy	190	400	240	350

2.ACCIDENT & EMERGENCY DEPARTMENT

S.NO.	Space Required	Standard Size (Sqm)	Sahara Hospital (Sqm)	ESIC (sqm)	My Prefrence (sqm)
17.	ECG Room	18	30	14	24
18.	Fracture Prepration	17.5	17.5	17.5	20
19.	Dirty Wash	10.5	--	12	--
20.	X-Ray Room	35	30	24	30
21.	Injection Room	14	14	12	14
22.	Doctor's Lounge	30	24	20	30
23.	Resuscition Room	25	42	60	42
24.	Nurse Station+Toilet	35	42	30	30
25.	Instrument Sterlisation	10.5	12	12	18
26.	Reception,waiting, police bay ETC.	250	180	--	300
27.	Circulation Area	35%	30%	20%	35%
28.	O.T	35	42	45	45

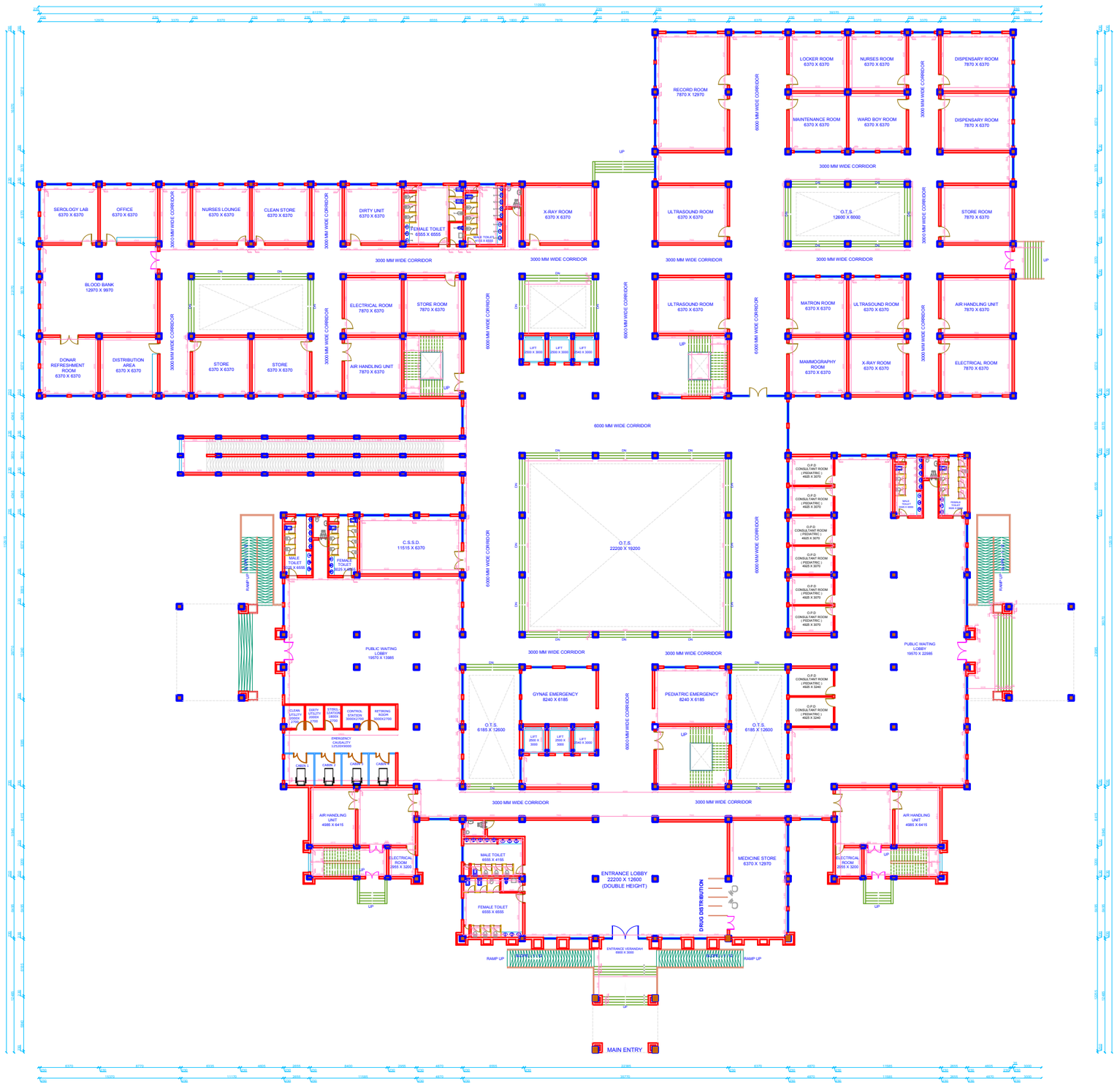
COMPARITIVE ANALYSIS

3. IPD

29.	Ward Rooms-Private Rooms	14	17.8	12	17.5
	Semi-Private(1)2beds	20	14	18	24
	General (1)-8bedded	80	70.4	60	75
	General(2)-4bedded	40	25.2	30.8	40
30.	Circulation Area	40%	35%	40%	40%
31.	Nurse Station with Toilet	40	24	18	32
32.	Doctor's Duity	24	20	12	20

4.SERVICE BLOCK

33.	CSSD	300	360	120	360
34.	Laundry	380	400	150	400
35.	Mortuary	100	44	---	60
36.	Central Kitchen Area	600	480	290	600
37.	D.G Room	250	238	200	300
38.	AC PLANT	400	425	---	400
39.	L.T Pannel	150	180	60	150
40.	Medical Gas	60	56	30	60
41.	Support Facilities	350	500	240	400



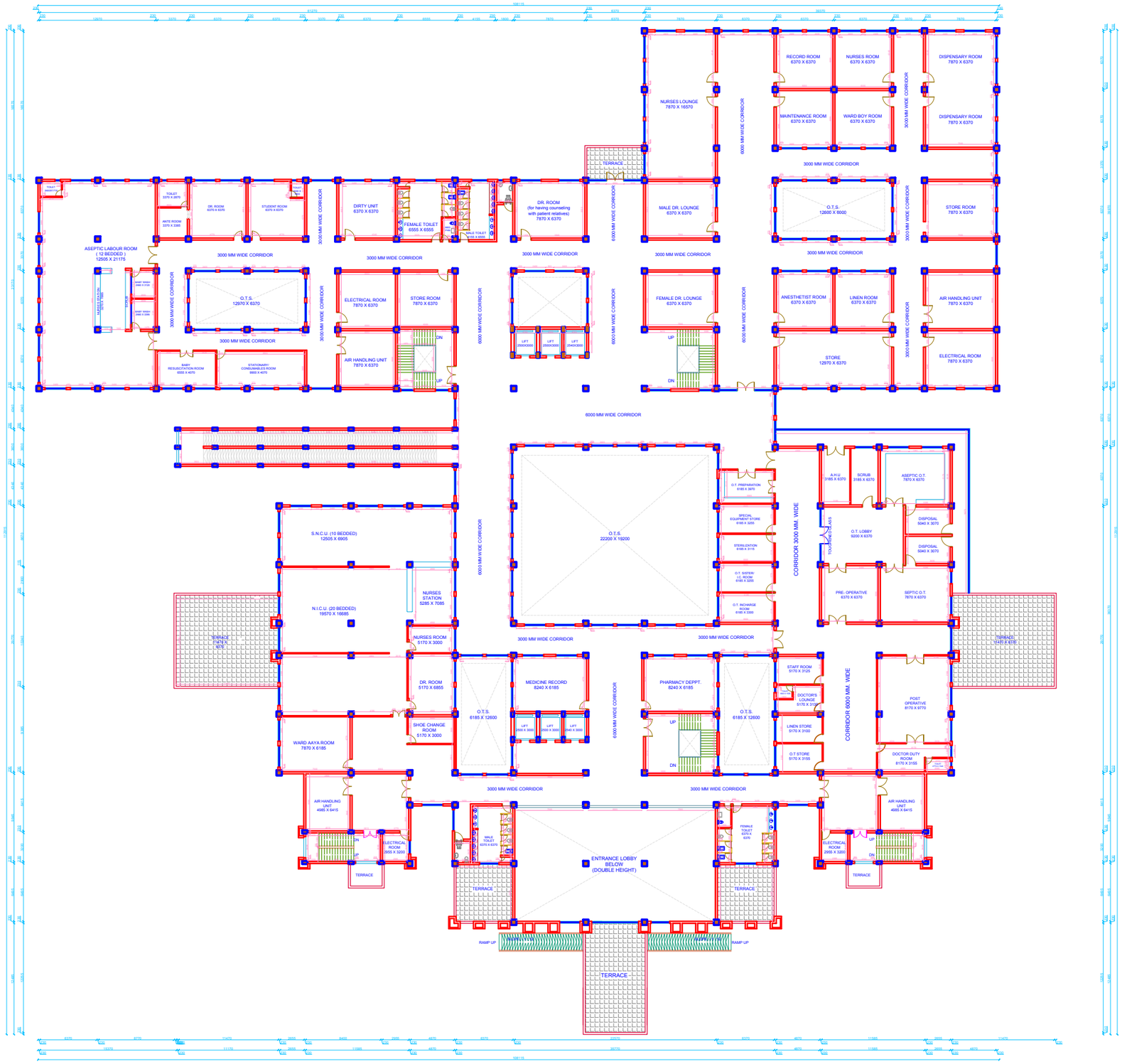
GROUND FLOOR PLAN
(SCALE -1:200)

ESIC HOSPITAL SIIDCUL , HARIDWAR , U. K.

SCALE: AS NOTED

SUBMITTED BY:

AASIM FAROOQUI
1140101003
B.B.D.U



FIRST FLOOR PLAN
(SCALE -1:200)

ESIC HOSPITAL SIIDCUL , HARIDWAR , U. K.

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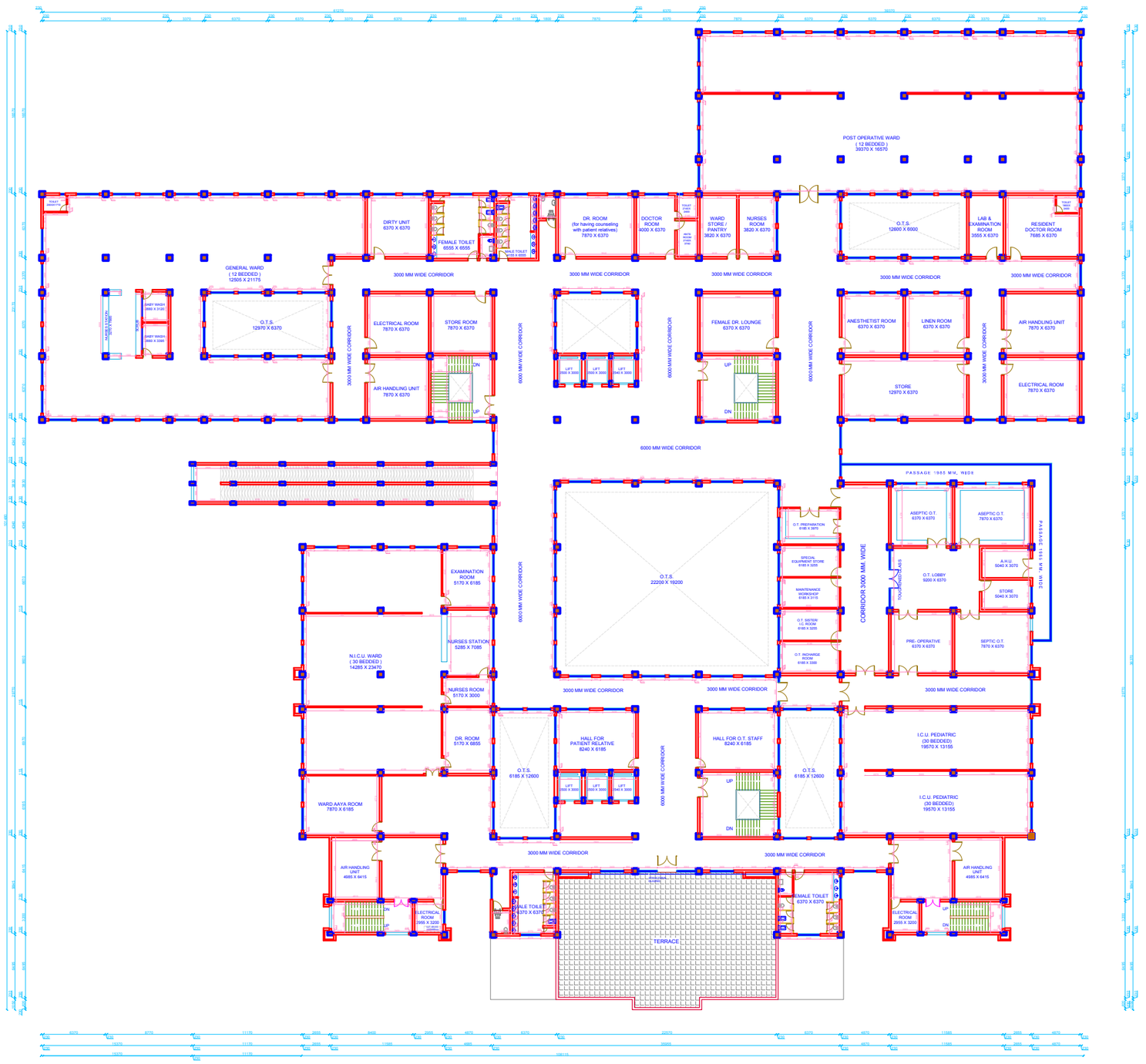

SECOND FLOOR PLAN
(SCALE -1:200)

ESIC HOSPITAL SIIDCUL , HARIDWAR , U. K.

SCALE: AS NOTED

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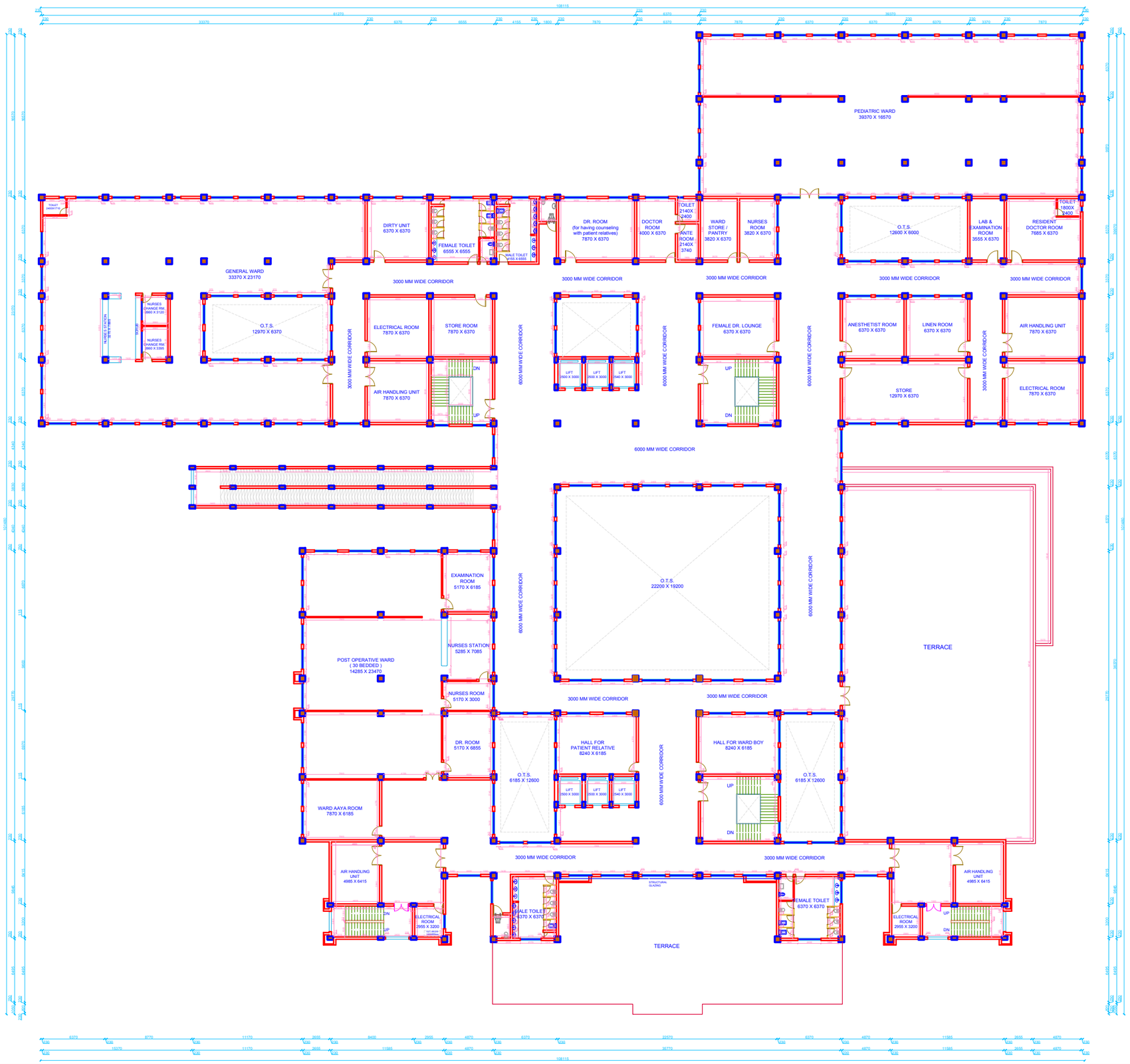

THIRD FLOOR PLAN
(SCALE -1:200)

ESIC HOSPITAL SIIDCUL , HARIDWAR , U. K.

SCALE: AS NOTED

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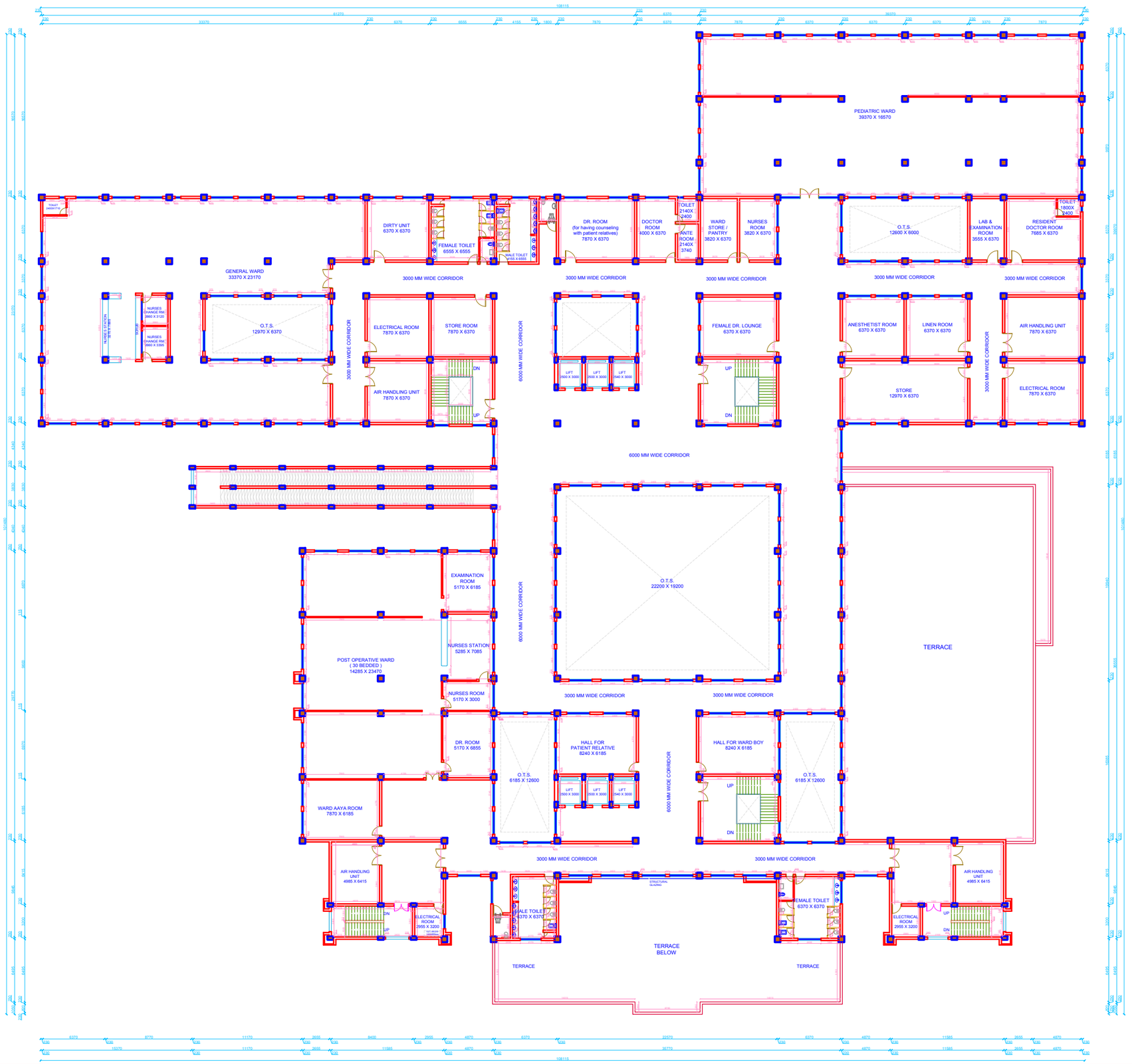

FOURTH TO SIXTH FLOOR PLAN
(SCALE -1:200)

ESIC HOSPITAL SIIDCUL , HARIDWAR , U. K.

SCALE: AS NOTED

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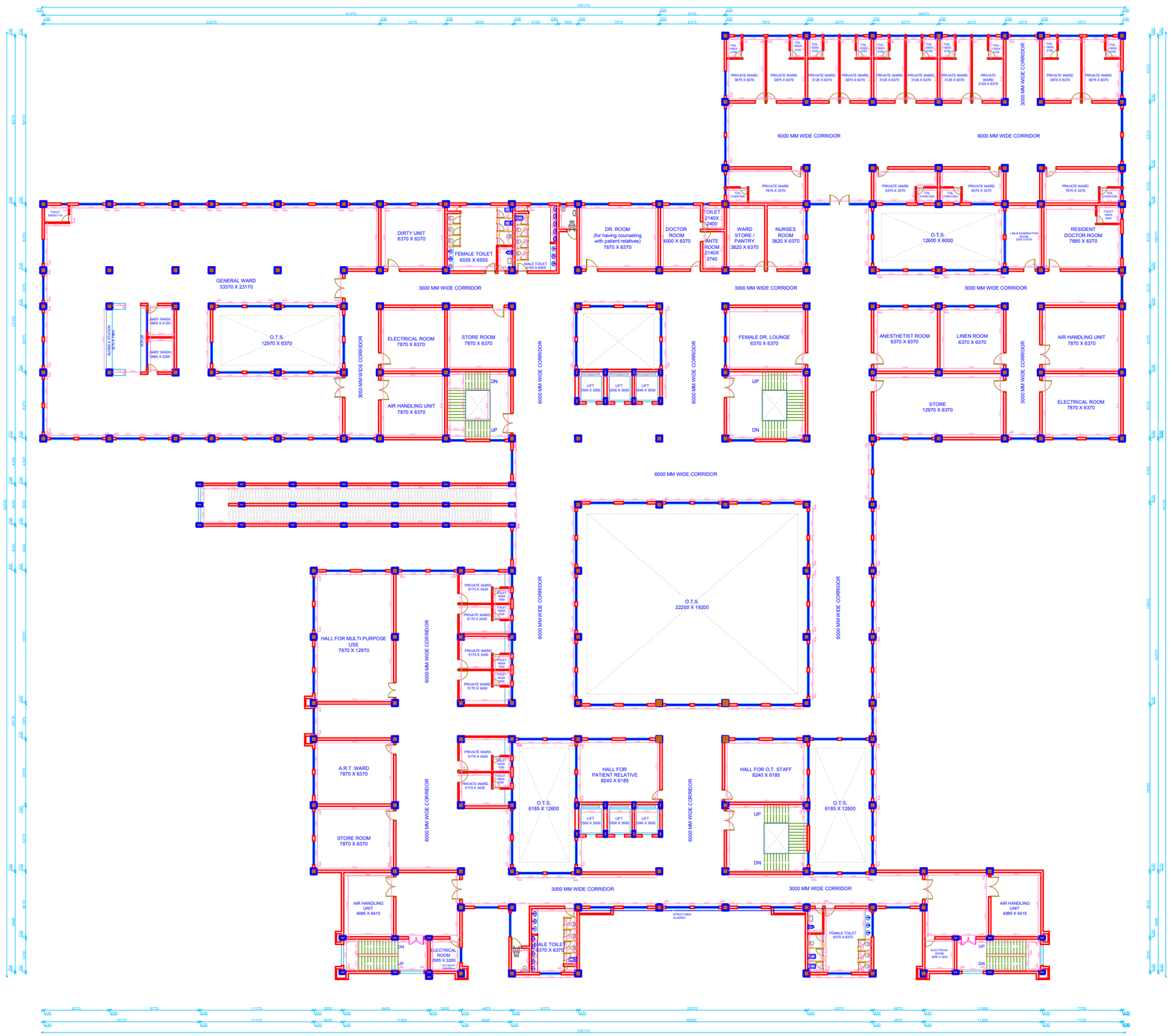

SEVENTH FLOOR PLAN
(SCALE -1:200)

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SCALE: AS NOTED

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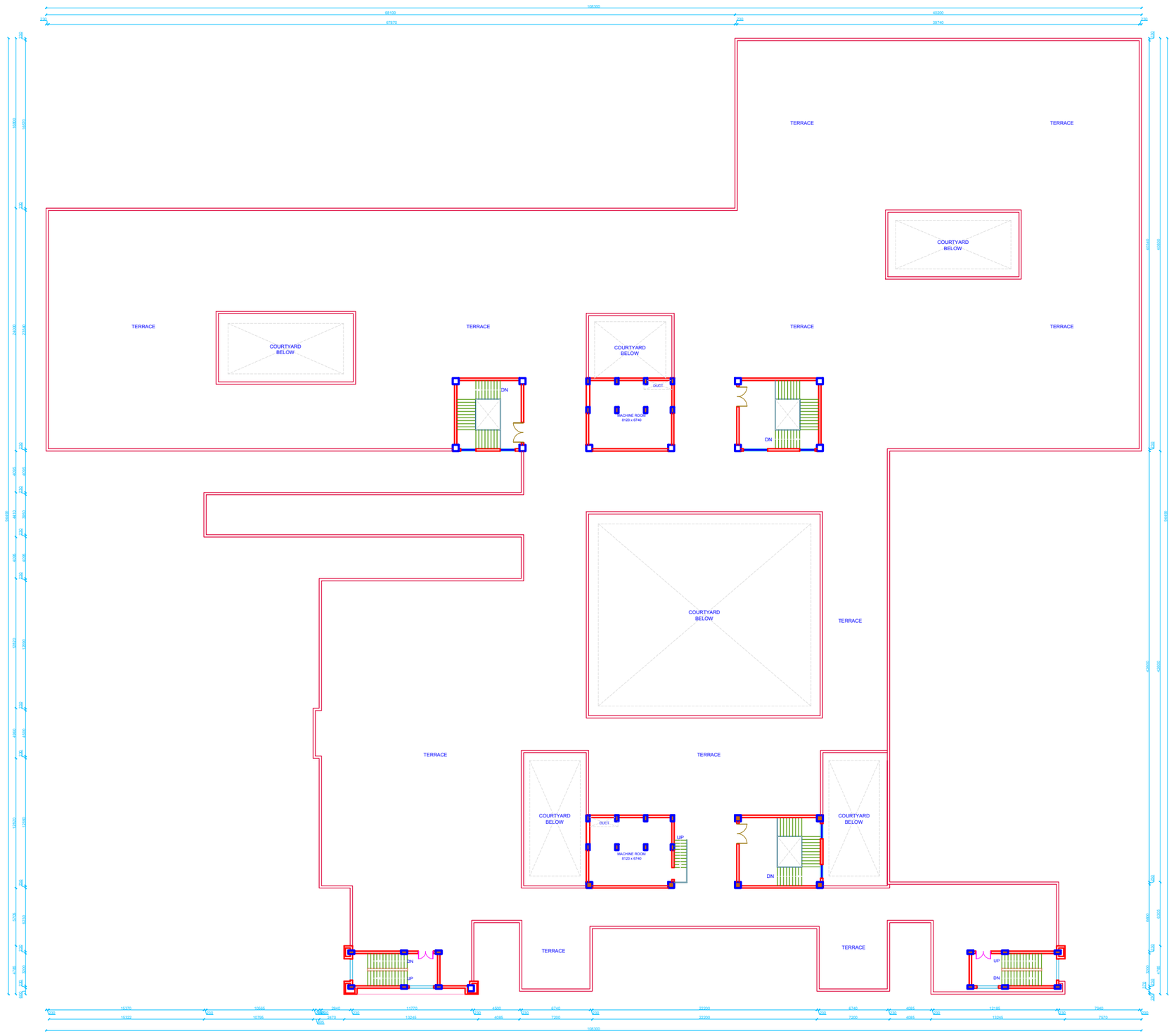

TERRACE PLAN
(SCALE -1:200)

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SCALE: AS NOTED

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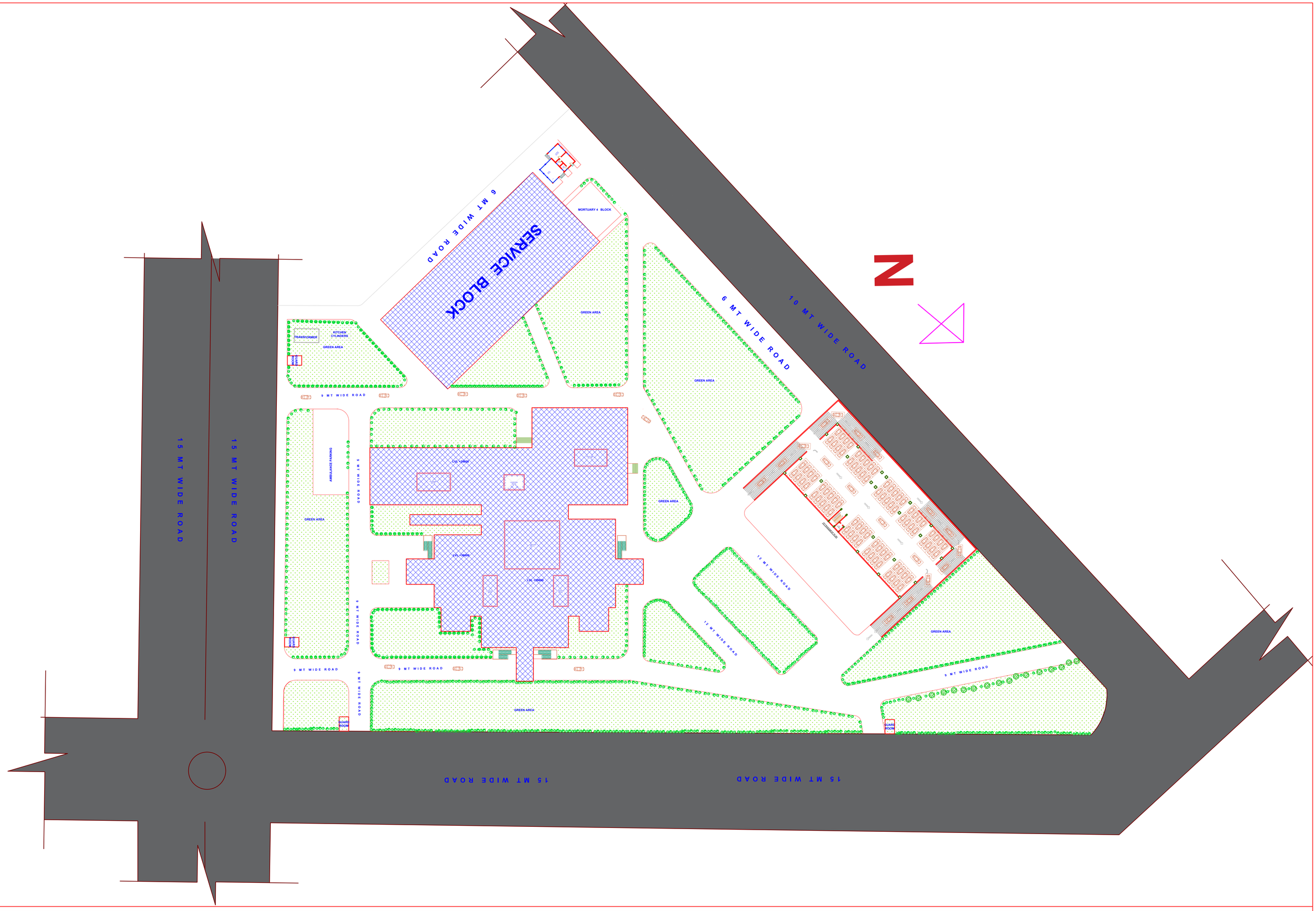

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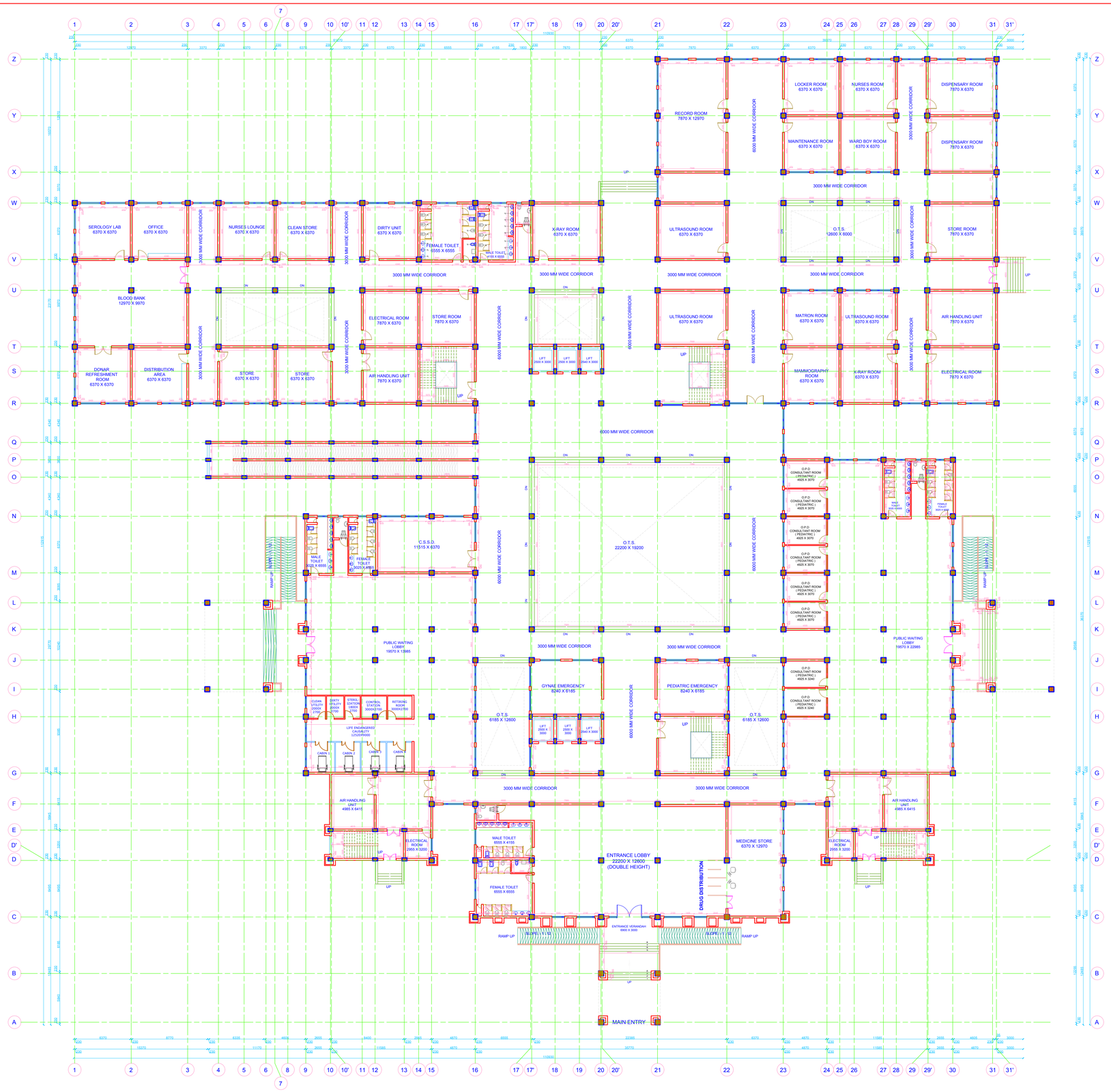


GROUND FLOOR PLAN
(SCALE -1:200)

ESIC HOSPITAL SIIDCUL , HARIDWAR , U. K.

SCALE: AS NOTED

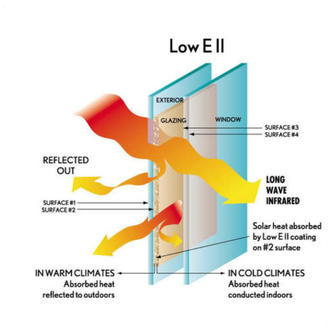
SUBMITTED BY:

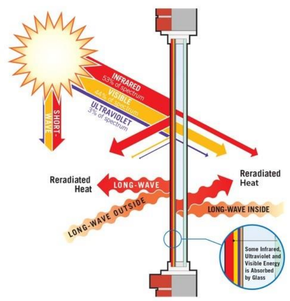
AASIM FAROOQUI
1140101003
B.B.D.U

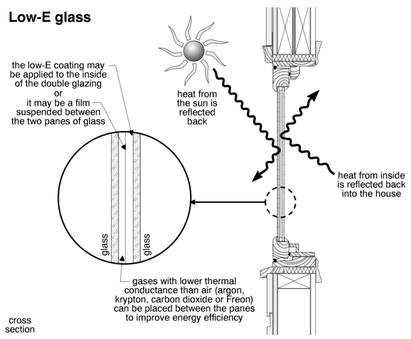
CONSTRUCTION TECHNOLOGY

1. LOW-EMISSIVITY

Energy-efficient glazings , such as Low-e glass block a portion of the UV and infrared light, while allowing a high percentage of visible light to come through. The result is less nedd for artificial lighting, a reduction is long-wave heat gain/loss ,increased comfort/productivity for building occupants and an overall reduction in energy usage.



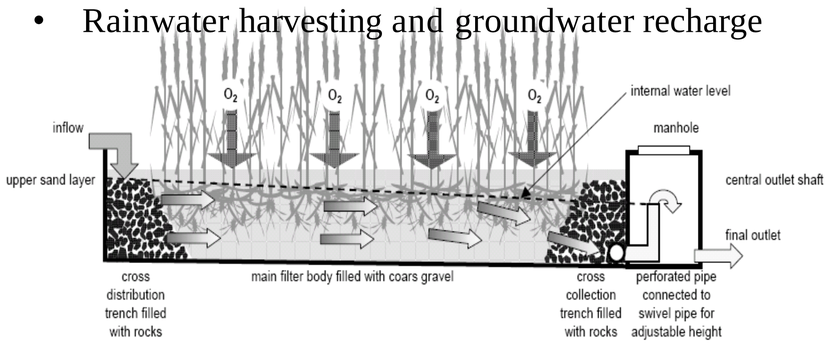


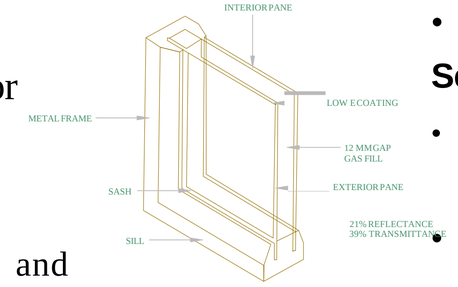


2. RAIN WATER HARVESTING

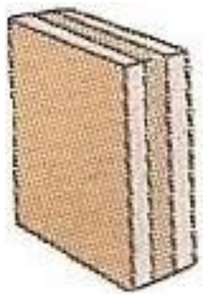
Water conservation measures are essential for

- Adopt policy of zero water discharge
- Recycle water after treatment
- Reuse for toilet flushing, air-conditioning and eventually, for horticulture
- Rainwater harvesting and groundwater recharge

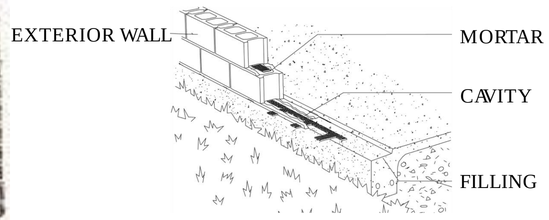




3. FLY-ASH BRICKS



Double walls filled with glass or mineral wood to reduce heating.

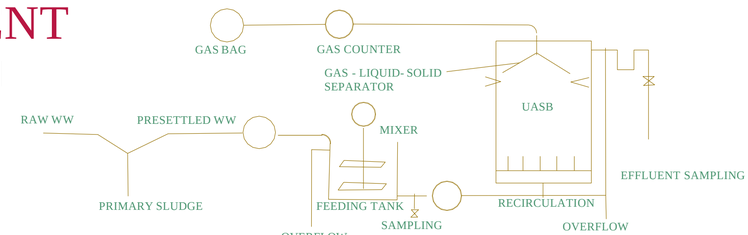


- The **fly ash bricks** carries High compressive strength.
- Its provide good thermal insulation than red clay **bricks**, **fly ash bricks** cheaper as compared to clay **bricks**
- **Fly ash bricks** are environment friendly.

4.WATER WASTE MANAGEMENT

Waste water to be treated by mechanical

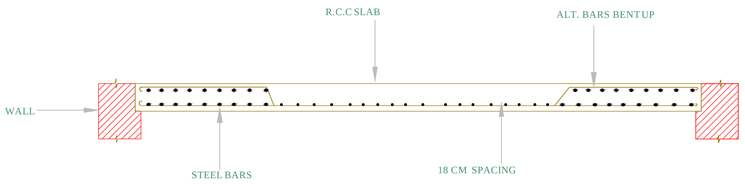
- Utilise existing water body on site
- Minimise power consumption
- Multiple treatment levels achieved at minimal cost



Sewerage:

- Sewage treatment to use mechanical as well as alternative (constructed wetland) technology for multilevel treatment
- Sewer line to follow natural slopes. ETP(Effluent Treatment Plant) siting at low end of site
- Reuse treated sewage water for flushing/horticulture

5. R.C.C SLAB



R.C.C SLAB SECTION

- Slab supported on two sides and bending takes place predominantly in one direction only is called One Way Slab.
- On the other hand, when slab is supported on all four sides and bending take place in two directions are said to be Two Way Slab.