

A REPORT ON GREEN AUDIT OF I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY, JALANDHAR, DISTT. KAPURTHALA, PANJAB



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INTRODUCTION: GREEN AUDIT

BACKGROUND

Criterion 7.1.2 under Criterion 7 i.e. **"INSTITUTIONAL VALUES AND BEST PRACTICES"** Of Guidelines for National Assessment and Accreditation Council (NAAC) Accreditation checks Environmental Consciousness and Sustainability/Alternate initiative taken by the institute. Green audit is a tool which not only checks Environmental Consciousness and Sustainability/Alternate Energy initiatives but also suggests the improvement practices can be adopted

GREEN AUDIT

The last century observed increased use chemical and petroleum product lead to degradation of environment. Restoration of degraded environment and sustaining it for future generation is global challenge. Now it is time for academic leaders to take initiative setup an example for society to follow.

The academic activity of delivering and grasping knowledge through an education system need infrastructure. The infrastructure consists of building, teachers and other facility like library and laboratory. These as a whole creates conducive environment for academic activity.

The term "Green" generally misunderstood with natural greenery, eco-friendly or not damaging the environment. Whereas "Green" here green refers to sustainability i.e. using all the resources without comprising on the right to uses these resources by generation to come.

The campus Green audit has been introduced NAAC accreditation in recent years. In adherence to this requirement the University management intended to go for Green audit of the campus. A campus Green audit is both a summary and a report card for a campus and a way to evaluate where and how resources are being used. A Green audit is also the first step in being able to quantify whether or not current and/or future green efforts are actually making a difference. As such, a green audit is the beginning of the sustainability planning process. The results can be used

to quantify what kinds of impacts the campus community has on the environment and what steps the University can take to reduce these impacts.

By this exercise it is anticipated that this will serve as a guide for educating people on the current practices and resource use as well as provide direction to the user to attain sustainability.

A comprehensive Green audit will ensure planned, efficient application of capital and operational budgets for University buildings, to ensure:-

- Maximized useful life of each facility
- Protection of assets
- Cost savings over the long term
- Enhanced Public safety
- Reduced disruption of services and greater efficiencies

The process of "Green Audit" is systematic observation of system under study, identifying the gaps in system, quantifying them for recording and analysis. There is no true standard for conducting "Green Audit" each consultant differs in content as well as process.

The overall objective of Green Audit has five fold:

- To introduce management to real concerns of environment and its sustainability
- To analyze the pattern and extent of resource use on the Campus
- To establish a baseline data to assess future sustainability plans
- To make the University management a more environmentally sustainable institution of higher learning
- To bring out a status report on environmental compliance

It is hoped that the results presented in this audit will serve as a guide for educating people on the current practices and resource use at University force all the stack holders for new initiatives.

COMPONENT OF GREEN AUDIT

A Green audit involves examining a facility on many different levels and results in specific recommendations. A Greene valuation carried out to determine status of the following:

The property and Maintenance Practices

- Water management

- Energy use and its management
- Solid waste management
- Heat island impact
- Carbon accounting
- Occupational health and general safety of users

THE GENERAL CONDITION OF AN EXISTING PROPERTY

Building deteriorates with time good maintenance practices upkeep the property in its original form. A general assessment of existing properties is obtained for commercial real estate projects to determine current conditions, immediate improvement needs, and replacement reserve recommendations. The property condition analysis determines the structural and operational integrity of real estate collateral and estimates the repair, replacement and reserve requirements that impact cash flow for operating expenses and debt service coverage

TO IMPLEMENT HOUSEKEEPING AND MAINTENANCE PRACTICES AS PER GREEN BUILDING NORMS

It might be possible that the constructed property is not a Green rated property. But implementing Green practices in Housekeeping and Maintenance can enhance occupant health, happiness and well-being.

ENERGY AUDIT & ENERGY MANAGEMENT

Energy Audit will help your business in following ways

- Use less Energy
- Deferred Maintenance and Increased system Reliability
- Improve Comfort and Productivity of Staff

WATER MANAGEMENT

Water resource management is the activity of planning, developing, distributing and managing the optimum use of water resources. It is a sub-set of water cycle management. Ideally, water resource management planning has regard to all the competing demands for water and seeks to

allocate water on an equitable basis to satisfy all uses and demands. As with other resource management, this is rarely possible in practice

PURPOSE OF WORK

This work is a systematic, independent system verification process of objectively obtaining and evaluating audit evidence to determine whether institute is meeting Criterion 7.1.2 of Guidelines for National Assessment and Accreditation Council (NAAC) Accreditation, which checks Environmental Consciousness and Sustainability/Alternate initiative taken by the institute

SCOPE OF WORK

Walk-through condition study of the property to evaluate structural integrity, capacity, condition and life expectancy, and efficiency of major systems (including but not limited to: mechanical, electrical, plumbing and roof components).

- Identification of recent or on-going improvements at the property (e.g. face lifts, new windows and doors, etc.) that is completed, underway, or anticipated.
- Assessment of site conditions: maintenance, paving, curbs, sidewalks, drainage, landscaping, Fire shifty, universal design etc.
- Compliance with applicable codes, ordinances and regulatory requirements; confirmation of status of building, occupancy and applicable operating permits and licenses necessary for the intended use of the property.
- General conformance to IS 4563:1987 Recommendations for Building and Facility for physically handicapped.
- General conformance to NBC Part-4 (Vol.-1) Recommendations for Fire and lift safety.
- Identification of possible environmental concerns (e.g., the existence of asbestos in the building and plans of abatement).
- Suggestions for additional investigations or comprehensive analyses of possible concealed conditions as external observation warrants.
- Study of the existing system of Housekeeping and Maintenance practices and identification of possible improvement.
- Suggest and alter the existing system of Housekeeping and Maintenance practices with green house keeping system.
- Site Visit to understand existing energy system, process and review of facility equipment and systems with staff, collect energy usage and equipment data. The systems studied and assessed as part of the Energy Audit and Management Strategy devising process included the following:
 - HVAC Systems: Split ACs, Cassette ACs
 - Lighting Systems: TFL Lights and CFL Bulbs.
 - Equipment like computers etc.
 - Architectural Features: Glazing, Doors
 - Develop inventory of all energy use equipment grouped by process

- Use a portable power meter, data loggers and available with us to verify energy use.
- Comparison of energy use data with annual energy bills to verify data.
- Development of energy conservation strategies.
- Developing system of energy accounting and implementing the same.
- Site Visit to understand existing water supply drainage and sewage system with end use.
- Develop inventory of all water consuming areas. Grouped them according to use and disposal of water.
- Use a portable meter and other measuring system to verify water end use.
- Comparison of water use with standards.
- Development of water conservation strategies.

Developing system of water accounting and implementing the same. **Client's input**

The client will provide the following information:

- Facility O&M manuals & site drawings.
- Specification data for all major equipment (i.e. pumps curves, performance data).
- Copy of recent 12 months energy bills (electric, natural gas and fuel oil) and monthly energy bill for accounting.
- List of all major equipment with specification
- Copy of recent energy bills (electric, natural gas, water and fuel oil) and monthly energy bill for accounting.
- Insure hindrance free accessibility for site

LIMITATIONS

We rely on the accuracy of any information provided by Client in the performance of our services, and will not be held responsible for errors or inaccuracies contained in information provided to us.

Detailed building energy simulations and audit will not be performed. The study will employ techniques that rely on historical information compiled over the years from similar facilities. Individual building performance will not be modeled in great detail. Rather, building type, size and occupancy will be used to form a rough calculation model of the building (or specific equipment) energy usage for use in determining the estimated results of energy conservation measures. Likewise, costs of addition and alteration required due to this service will also be based on historic data compiled from similar installations, and engineering opinion

METHODOLOGY

The work is executed in two phase

Phase I - General introduction and Data collection

- A walk through audit was conducted to familiarize with property and its use.
- Interview of management to understand system in use.
- Bills of water and Fuel used in University along with site plan property are collected
- Photography of property was done to collect evidence of existing system.
- Portable equipment are used to check quality of electricity, status of light, ventilation, noise, Earthing and heat island effect.

Phase II - Data analysis and Recommendation

The collected data correlated with with standard regulation and/or best practices in industry. Study and recommendations were framed to improve and enhance the existing system with relevant IS code, standard regulation and/or best practices in industry.

REPORT ORGANIZATION

Submit report after each audit. This report contains

- Introduction
- Overview of Current Systems in Place
- Data analysis and findings
- Recommendations recommendations were framed to improve and enhance the existing system.

PROJECT DETAIL

I. K. Gujral Punjab Technical University (IKGPTU), previously known as **Punjab Technical University (PTU)** is a Co-ed institute situated at, Kapurthala highway, Jalandhar (Punjab), India. **IKGPTU** was Established by an Act of State Legislature on 16th January, 1997, to promote technical, management and pharmaceutical education in the state at degree level and above. The University has undertaken the task of training students to help in the development of skilled manpower in technical education in the country in general and in the state in particular. With this goal in mind, the university is promoting a number of courses in different streams in regular as well as distance education programmes. At present University have 121 AICTE and 65 UGC institutes affiliated with it.

This is a government institution and comes under the department of Technical education, govt. of Punjab. It provides an innovative, state-of-the art approach to higher education with a view to aid the growth of its students into well balanced, value oriented, socially sensitive and responsible members of the society. Housed in their own campus and the financial assistance is provided by University Grants Commission and State Government.

University started its journey with 09 Engineering & 05 Management Universitys. IKGPTU has its own learning centers under Distance Education Programme. Presently the University administrates 280 Universitys, out of which 102 are engineering, 134 are management, 30 are pharmacy, 07 are architecture and 07 are Hotel Management & Catering Technology (HMCT) with 33 regional centers. The reach of this University is not only restricted to Indian citizen but it has 1,500+ international students from 30+ countries.

The University is situated on Jalandhar Kapurthala Highway. All the basic facilities like Bus Stop, Dispensary, shopping Centers, Post Office, Bank are all located in and around the University. This makes the University an ideally located one.

INFRASTRUCTURE AND LEARNING RESOURCES

The University is housed in buildings comprised of 16 different blocks, spread over an area of 78.16 acres. Total constructed till date is 93000 sqm., whose details are as follows:

S.No.	Name of building	Area in sq.meter	no. of floors	Year of construction
1	Main Administrative Building	24130	B+G+7&3	2008
2	University Building 1	12956	G+5	30/11/2016
3	University building 2	12729	G+5	31/03/2017
4	University building 3	6635	G+2	30/06/2016
5	Library	5904	G+2	31/03/2017
6	Seminar hall (1) (140 seats)	340	Ground Floor	30/11/2016
7	Seminar Hall (2) ground floor G3 building (100 seats)	401	Ground Floor	2008
8	Hostel girl (2 No.s) PIT	4876	G+1	30/06/2016
9	Director office	258	G+1	30/06/2016
10	Staff quarter	2090	G+1	2010
11	Bank and Post office	1675	Ground Floor	31/03/2017
12	Auditorium (800 seats)	3663	G+1	Ongoing
13	Hostel Boys (1) (Kapurthala side)	10522	G+8	31/03/2019
14	Hostel Boys (2) (Kapurthala side)	6753	G+8	31/03/2019

Auditorium and a Girls Hostel is under construction in the campus

The University has its own works department to cater day-to-day maintenance problems of various departments.

COURSES OFFERED

S.No.	Department	Course	Duration of course in years	Intake in first year	Total no of students	Total no of Faculty
1	Civil Engineering	B. Tech. – Civil Engg.	4	60	240	41
		M. Tech. – Civil Engg.	2	20	40	
		(Specialization in Structural Engineering)				
2	Computer Science & Engineering	B. Tech. – Computer Engineering	4	60	240	
		B. Tech. – Computer Science & Engg.	4	60	240	
		M.Tech. – Computer Science & Engg.	2	25	50	
		B.Tech Software Engineering in collaboration with Thompson Rivers University, CANADA (course details)	4	30	120	
		BCA (Bachelors of Computer Applications)	3	40	120	
		MCA (Masters of Computer Applications)	3	25	75	
3	Electrical Engineering	B. Tech. – Electrical Engg.	4	60	240	
		M.Tech. – Electrical Engg. (Power Systems)	2	25	50	
4	Electronics & Communication Engineering	B. Tech. – Electronics & Communication Engg.	4	60	240	
		M.Tech. – ECE (Wireless Communication Engg.)	2	25	50	
5	Mechanical Engineering	B. Tech. – Mechanical Engg.	4	60	240	
		M. Tech. – Mechanical Engg.	2	25	50	

S.No.	Department	Course	Duration of course in years	Intake in first year	Total no of students	Total no of Faculty
6	Food Science & Technology	MSc Food Technology	2	25	50	
		MSc Clinical Research	2	10	20	
		M.Tech. Food Technology	2	18	36	
7	Chemical Sciences	B.Sc (Honors) Chemistry	3	45	135	
		M. Sc. – Chemistry	2	25	50	
8	Physical Sciences	B.Sc (Honors) Physics	3	30	90	19
		M. Sc. – Physics	2	25	50	
9	Mathematical Science	B.Sc (Honors) Mathematics	3	30	90	
		M. Sc. – Mathematics	2	25	50	
10	Journalism and Mass Communication	B.A. – Journalism and Mass Communication	3	25	75	5
		M.A. – Journalism and Mass Communication	2	25	50	
		M. Phil – Journalism and Mass Communication	1	10	10	
11	Management	MBA	2	60	120	9
		BBA	3	45	135	
12	Hotel Management	Bachelor of Hotel Management & Catering Technology (BHMCT) – 4 Years	4	60	240	
		Diploma in Food and Beverage Service	3	30	90	
13	Humanities, Languages and Cultural Studies	M.Phil. – English	1	4	4	3
		M.Phil. – Punjabi	1	4	4	
		M.Phil. – Political Science	1	4	4	
		Total		1075	3300	77

Data Source:-<https://www.ptu.ac.in>

STRENGTH OF UNIVERSITY

S.No.	Description	Numbers
1	Student	3300
2	Teaching staff/ Non Teaching staff/ Outsource staff	1000
3	Total	4300

PARKING FACILITIES

There are two covered parking rest of the commuter's park their vehicle under tree or in open space near respective buildings. The Buses owned by the University parks at the back side road.

OTHER FACILITIES

S.No.	Description	Numbers / capacity
1	Underground water storage tank 2 Nos.	250 KLD 100 KID
2	STP 3 Nos	2 nos 30kld each 1 no. 50 KLD
	Solar panel system	
1	G+7/3	74 S8 KW
2	AB1	26.40 KW
3	AB2	23.75 KW
4	AB3	75.34 KW
5	LIBRARY	100.32 KW
4	Substation	
1	G+7	G+7&3 auditorium stp 30 KLD
2	BAY HOSTEL	BAY HOSTEL, MARRIAGE HOSTEL, GIRLS HOSTEL
3	AB1	AB1, AB2, LIBRARY, SEMINAR HALL, PART OFFICE & BANK
4	Ap3	Ap3, girls hostel-2 no., quarters , stp (50 KLD)(30 KLD)

OBSERVATIONS

THE GENERAL CONDITION OF EXISTING PROPERTY

University is operational in this campus from 2008. The development of infrastructure is in process. The buildings are designed as per modern Architectural practice. The buildings are RCC framed structure with cement plastered brick partition wall. The building is having corridor with adjoining class room or other rooms. Exterior of the buildings are combination of exterior paint, stone cladding with glazing. Inside it is painted with light colour distemper on the walls.



Administrative building

EARTHQUAKE IMPACT ON BUILDING

The Indian sub-continent has a history of devastating earthquakes. Depending upon the intensity of earthquake India is divided into four seismic zones. Jalandhar lies in the **Zone IV** of the **seismic** zoning map of India as per IS:1893 (2002) Part 1. Zone IV is called the

High Damage Risk Zone in which magnitude of earthquake is between 5 to 5.9 on Richter scale. Visually building infrastructure look like it can sustain intensity of earthquake occurring in Zone Four.

Physical status of building

The buildings are new and robust to sustain fire and earthquakes. There is no visual distortion or seepage observed.

EVACUATION PROCESS

Although the buildings are new and robust enough to sustain fire and earthquakes but it is observed that there is hindrance at entry and exit in the buildings. Drawings and details are not provided hence difficult to comment on emergency exit situation Details not provided

CONNECTIVITY WITH CITY

The University is located at Kapurthala highway, Jalandhar. The nearest railway station and bus stand is Jalandhar City which is 15 Km from campus. All type of public conveyance are available from main gate of the campus.

PLANTATION AND GREENERY IN CAMPUS

It is a lush green campus trees planted along the building, boundary and dedicated 4 acre land inside the campus. Ample numbers of trees are planted every year by staff and students. Details are as follows:

Lawn Area (Approx) :- 22,430 SQM. + 23,000 SQM. = 45,430 SQM.



Shrubs	1800 Nos. (Approx)
Flower Pots	1200 Nos.
Hedge Area	1693 Raft.
Shrubbery Border	1691 SQM.
Flower beds	1200 SQM.
Trees	3000 Nos.

Name of Trees: - Avenue trees 'shady tree with flowers, Silver oak, Casuarinas, Krajla Magnolia, Pagoda Champa, Plumeria, Bottle brush, Sukhchain, TunKachnar, Kusham, Ficus Panda, Green ficus, Bottle Palm, Chukrassis, Moulerry, Jammon, Chinnas, Gulmohar, Amaltas, Bismarckia Palm, Jacaranda, Acutifolia, SilsAshook, Ashooka Tree, Juniperus golden, Juniperus green etc.
 Shrubs: - Chandni , VecigatedChandni, Acacia, Biflora, HaemaliaPottens, LogistoniaIndica, Cassia Gulaka, FicusVacigated, Ficus green, Ficus Block, Kalandra, Golden Bottle Palm, Phonex Palm, Gardnia etc.



FIRE SAFETY

Fire equipment are installed in the campus, whose details are as below:

Observation on Fire fighting system	
Type Fire hydrant/ Sprinkler / Mix Description	Pressurised Hydrant System wet pipe types sprinkler System

Observation on Fire fighting system	
Location	Pressurised Hydrant System in ALL Building - AB-1,2,3 KRC ANG , G+7 , G+3sprinkler System in library and ground floor of G+7 , G+3 building
Size of pipe in stack	size Dia - 4 inches
No. and size of fire tank Under ground	1x1.5 lakhLitres storage at G+7 , G+3 building
Overhead	25 X 5000 lakhLitres storage
Make up water requirement Frequency of cleaning of tank	500 LTR EACH

No comprehensive fire safety system is placed in the Institute. Although some fire extinguisher are observed at some places but no evacuation plans was observed. there is no caution boards on main electrical panel board. No records was provided regarding annual maintenance of these fire extinguishers. Material are placed at the passage which may obstruct smooth movement at the time of emergency.



The building is robust enough to take heat load of moderate capacity for more than two hours. The building has been analysed for need of evacuation. There are adequate entry points at ground floor, whereas staircase and ramps connecting upper floors can be easily approached in case of disaster. The corridors are

opening directly to outside. The ground floor height is only 10 feet from outside. Hence evacuation through windows is possible without causing heavy injury.





Staircases are naturally ventilated to avoid suffocation in case of fire. Ramps provided in buildings will help in evacuation of injured and disabled persons.

The electrical wiring is either loose or there is web of wire lead to major accident.

There is no lift or staircase shaft system in the campus.

There is thick plantation with falling leaves .There are chances of fire in dry leaves, for this is no preparedness.

Record of fire system maintenance was not provided.

UNIVERSAL ACCESSIBILITY AND USE

Various, disabilities which have been considered while preparing the guidelines for barrier free built environment are broadly classified under four categories

Non-Ambulatory : Impairments that, regardless of cause or manifestation, for all practical purposes, confine individuals to wheel & chairs.

Semi-Ambulatory : Impairments that cause individuals to walk with difficulty or insecurity. Individual using braces or crutches, amputees, arthritics, spastics & those with pulmonary & cardiac ills may be semi-ambulatory

Sight: Total blindness or impairments affecting sight to the extent that the individual functioning in public areas is insecure or exposed to danger

Hearing: Deafness or hearing handicaps that might make an individual insecure in public areas because he is unable to communicate or hear warning signals.

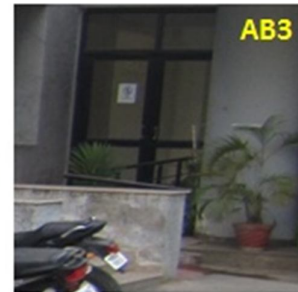
FACILITY AUDIT FOR NON-AMBULATORY AND SEMI-AMBULATORY

Corridors and doors are wide enough to provide adequate space for persons using mobility devices, e.g. wheelchairs, crutches and walkers. The floors are firm and leveled.

Lifts and ramps are there in almost all the buildings to provide accessibility. Details of lifts and ramps are as follows:

Building name	Floors	No of Ramps	No of Lift
Building G+7&3	G+7&3	2	4
AB1	G+5	1	2
AB2	G+6	1	4
Ambika Poul AB3	G+2	1	2
Library	B+G+1	0	0
Seminar hall 1	GF ONLY	0	0
Girls Hostel B1	G+2	0	0
Girls Hostel B2	G+2	0	0
DIRECTOR OFFICE	G+1	0	0
Staff Quarter B1	G+1	0	0
Staff Quarter B2	G+1	0	0
Staff Quarter B3	G+1	0	0
BANK & POST OFFICE	GF ONLY	0	0
Audit room	GF ONLY	1	0
Boys Hostel(1)	G+8	1	2
Boys Hostel(2)	G+8	0	2

Ramp Details



Lift doors are wide enough to provide actability to a person with wheel chair.

There are grab bars in lift for support.



There is no provision of handicap toilet for disabled persons nether there is any grab bars in toilets.

FACILITY AUDIT FOR BLIND PERSON:

- Sounder in lift was not in operation.
- Sign board in Braille- not located
- Guidance block for blinds - no provision

FACILITY AUDIT FOR IMPAIRED HEARING

- Sign boards are the in local language
- **Facility audit** for General facility for differently abled person
- There is no dedicated parking. Floors are slippery.

PUBLIC HEALTH

Public health aims to improve the quality of life through human activity and prevention. The pathways are open to sky. There is no physical division between motorized traffic and pedestrian. This makes campus unfriendly for pedestrians. It has been observed that people use their vehicle for short distance movement.



Sign boards showing tobacco or smoking prohibition are not visible.

HOUSE KEEPING

General cleanliness of the campus is good with clean toilets. But There is no protocol for dust suspension.



NOISE CONDITION

Studies reveal that noise effect learning ability and concentration, hence it is necessary to examine noise level in educational institute. The observation of Noise level taken in between 12 noon to 3 pm on working day with window closed. The observed noise level is in between 40 to 65 db. Details are as below:

S.No.	Location	Sound in db
	Ambika school	
	Director main office	
1	Room = 013C	53.1
2	Room = 013B	50.8
3	Room = 013A	53.1

S.No.	Location	Sound in db
4	Room = 002B	50.8
5	Room = 002A	53.5
6	Room = 002	41.3
7	Room = 003 B	56.3
8	Room = 003 G	56.3
9	Room = 003 E	51.7
10	Room = 004	51.7
11	Room = 005	57.4
12	Room = 006 (physics lab - I)	52.8
13	physics lab - II	41.3
14	physics lab - III	41.1
15	Room = 009	54.8
16	Room = 010 (Hall) (G+7) - Canteen	54.8
17	Lunch Area	53.5
18	Kitchen Area (G+7) - First Floor	53.4
19	Account Section	60.9
20	room	57.3
21	Legal cell	60.3
22	Room	53.1
23	office AB-I (Ground floor)	61.5
24	Depart of Civil (office)	61.3
25	senior assistant room	61.3
26	Assistant Register	55.2
27	canter	55.3
28	class room - A007 4th floor AB-I	56.4
29	Management department (office)	51.6
30	common room 5th floor	50.5
31	class room -A511	56.3
32	class room -A509 Library	49.1
33	I floor	48.3
34	II nd floor Ground floor	48.3
35	Seminar Hall	44.7

PEST CONTROL TREATMENT

Pest is a destructive insect or other animal that attacks crops, food, live stock and other things in the building. Basically it is harmful for humans and their health.

- Problems resulting from pests in a building can include:
- Deterioration of the building (e.g. rodents making holes, termites destroying wood).
- People developing allergies (allergies to animals such as possums and rats, or dust mites, are common).
- Pests can bring & spread diseases (e.g. flies, rodents).
- Bites (from spiders, fleas, mosquitos, etc.).

PSYCHOLOGICAL AFFECTS.

TYPES OF PESTS

Types of pests include:

- insects, such as roaches, termites, mosquitoes, aphids, beetles, fleas, and caterpillars.
- insect-like organisms, such as mites, ticks, and spiders,
- microbial organisms, such as bacteria, fungi, nematodes, viruses, and mycoplasmas,
- weeds, which are any plants growing where they are not wanted,
- mollusks, such as snails, slugs, and shipworms, and
- vertebrates, such as rats, mice, other rodents, birds, fish, and snakes

Pest control is the regulation or management of a [species](#) defined as a [pest](#), a member of the animal kingdom that impacts adversely on human activities especially in buildings.

There are traces of termite, mosquito and other rodent on the building. There is protocol for pest control in the University. Tanks lid was found open

INDOOR AIR QUALITY

Exposure to poor indoor air quality can cause short-term eye, nose and throat irritation as well as headaches, dizziness and fatigue. This effect concentration and has direct impact on learning ability. In this background air quality was checked for four parameter i.e. PM_{2.5}, volatile organic compounds (VOCs). Carbon Dioxide and Formaldehyde. Results are as follows

S.No.	Location	Air Quality			
		PM 2.5	VoC	Co2	HCHO
	Ambika school				
	Director main office				
1	Room = 013C	19.1	0.09	1109	0.01
2	Room = 013B	47.6	0.01	0400	0.01
3	Room = 013A	67.2	0.08	0921	0.01
4	Room = 002B	82.1	0.07	0400	0.01
5	Room = 002A	61.1	0.09	0400	0.01
6	Room = 002	68.7	0.07	0400	0.01
7	Room = 003 B	59.7	0.07	0400	0.01
8	Room = 003 G	74.5	0.07	0400	0.01
9	Room = 003 E	78.5	0.08	0400	0.01
10	Room = 004	52.1	0.09	0400	0.01
11	Room = 005	64.2	0.09	0901	0.01
12	Room = 006 (physics lab - I)	72.1	0.09	0791	0.01
13	physics lab - II	74.1	0.08	0400	0.01
14	physics lab - III	68.9	0.09	0400	0.01
15	Room = 009	82.1	0.09	620	0.01
16	Room = 010 (Hall)	7.85	0.01	0400	0.01
	(G+7) - Canteen				
17	Lunch Area	2.27	0.01	0400	0.01
18	Kitchen Area	7.66	0.01	0400	0.01
	(G+7) - First Floor				
19	Account Section	52.1	0.09	0400	0.01
20	room	64.2	0.09	0901	0.01
21	Legal cell	68.7	0.07	0400	0.01
22	Room	59.7	0.07	0400	0.01
	G+3 (First floor)				
23	office	82.1	0.09	620	0.01
	AB-I (Ground floor)				
24	Depart of Civil (office)	82.1	0.07	0400	0.01
25	senior assistant room	61.1	0.09	0400	0.01
26	Assistant Register	68.7	0.07	0400	0.01
27	canter	59.7	0.07	0400	0.01
28	class room - A007	47.6	0.01	0400	0.01
29	4th floor AB-I				
	Management department (office)	19.1	0.09	1109	0.01
30	common room	47.6	0.01	0400	0.01
	5th floor				
31	class room -A511	67.2	0.08	0921	0.01
32	class room -A509	59.7	0.07	0400	0.01
	Library				
33	I floor	74.1	0.08	0400	0.01

S.No.	Location	Air Quality			
		PM 2.5	VoC	Co2	HCHO
34	II nd floor	82.1	0.09	620	0.01
	Ground floor	7.85	0.01	0400	0.01
35	Seminar Hall	68.7	0.07	0400	0.01

From the above it is clear that the level of PM_{2.5}, volatile organic compounds (VOCs) and Formaldehyde is moderate. But level of Carbon Dioxide is high.



MAINTENANCE PRACTICES

Maintenance is a practice to upkeep building in its original shape. The damages observed are attended to make the facility functional. The minor defects and maintenance issues are addressed by the University itself. Buildings are new, no major defect is observed.

PARKING

At the time of visit i.e. 24.09.2019 about 700 vehicles are found parked in the campus. Maximum vehicles are parked near G+7&3 Building and AB3. Details are as follows:

Building name	Parked 2 wheel at visit time	Parked 4wheel at visit time	Covered Parking
Building G+7&3	200	140	1
AB1	4	0	0

Building name	Parked 2 wheel at visit time	Parked 4wheel at visit time	Covered Parking
AB2	0	0	0
AB3	150	120	0
Liabrary	50	40	0
Seminaar hall 1	0	0	0
Girls Hostel B1	0	0	0
Girls Hostel B2	0	0	0
DIRECTOR OFFICE	0	0	0
Staff Quarter B1	0	1	1
Staff Quarter B2	0	1	1
Staff Quarter B3	0	1	1
BANK & POST OFFICE	0	0	0
Auditotirm	0	0	0
Boys Hostel(1)	10	4	0
Boys Hostel(2)	0	0	0
Total	414	307	4

Facility of covered parking is available at G+7&3 Building, AB3 and Staff quarters.

Maximum places vehicles are parked on open parking or at road side. Even

University owned Buses are parked roadside behind G+7 building.



Parking at G+7&3 building







ENERGY AUDIT & ENERGY MANAGEMENT

OBJECTIVE OF ENERGY AUDIT EXERCISE

The objective of Energy Audit is to identify area of energy consumption and promote Energy sustainability in the Campus

- The purpose of the energy audit is to identify, quantify, describe and prioritize cost saving measures relating to energy
- Identification of areas of energy wastage and estimation of energy saving potential • Suggesting cost-effective measures to improve the efficiency of energy use.
- Identification of possible usages of co-generation and renewable sources of energy
- Rectification of energy bills and negotiation with energy supply company to reduce fix rate.

THE CAMPUS

This is a day use campus, using electricity for Lighting, HVAC system, Operation of computers and other equipment. Source of Energy is as follows:

- Electricity is supplied by **Punjab State Power Corporation Limited** through 11 KV feeder.
- High Speed Diesel (HSD) is used as a fuel for Diesel Generator which operates whenever power supply from PSPCL is not available (equipment and operational details of DG set not provided by the client).
- Solar PV plant is installed on site (Details needed)
- LPG is used for cooking in Canteen and Hostel (Details needed)

Note:-Record keeping of energy consumption need improvement.

ELECTRICITY CONSUMPTION PATTERN

GRID SUPPLIED ELECTRICAL POWER

There is only one 11 KV electrical meter installed in the campus (location need verification).

Observation from electricity bill is as follows:

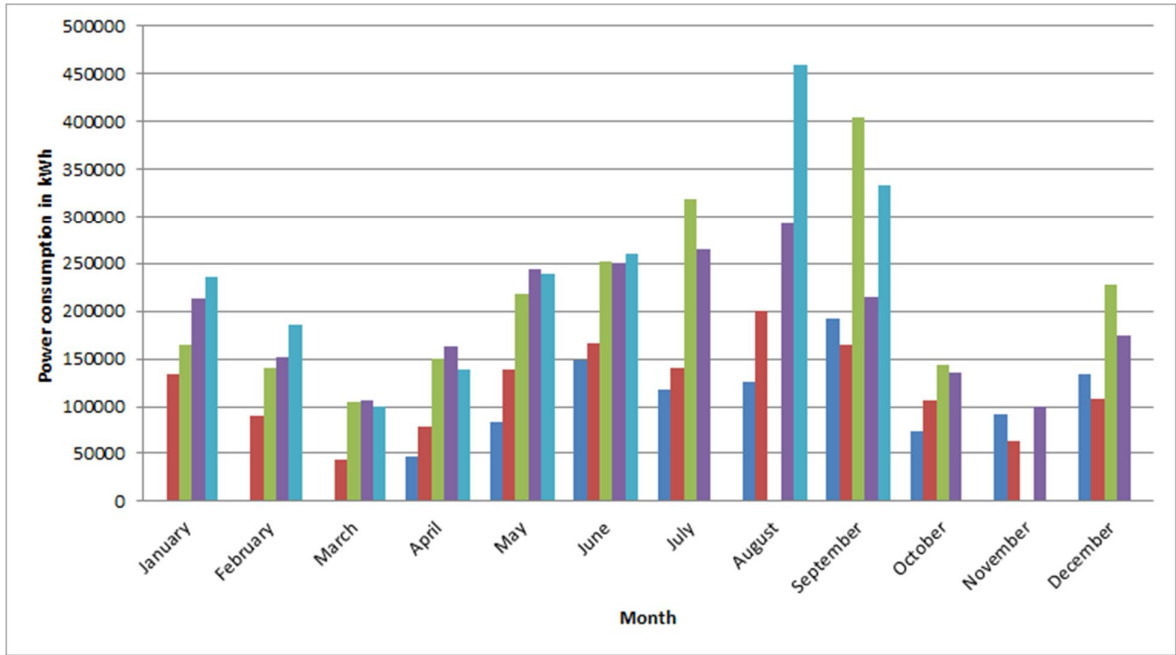
Months	2015	2016	2017	2018	2019
January		134238	164064	213330	235852
February	-	90102	139915	151318	186272

Months	2015	2016	2017	2018	2019
March	-	42563	104912	106854	100066
April	45940	78768	149885	163470	138808
May	84520	138630	218533	243638	239392
June	148620	165717	252295	249802	260418
July	118320	140935	318844	265010	-
August	125220	199593	-	293294	459931
September	192689	164686	404210	214670	332708
October	74477	106792	144300	136126	-
November	91765	63431	-	99900	-
December	134238	108339	227960	174178	-

From June 2015 till August 2017 sanctioned load and contract demand was 2000 KW and 2000 KVA respectively. But from September 2017 sanctioned load and contract demand was revised to 3056.84 KW and 3396 KVA respectively.

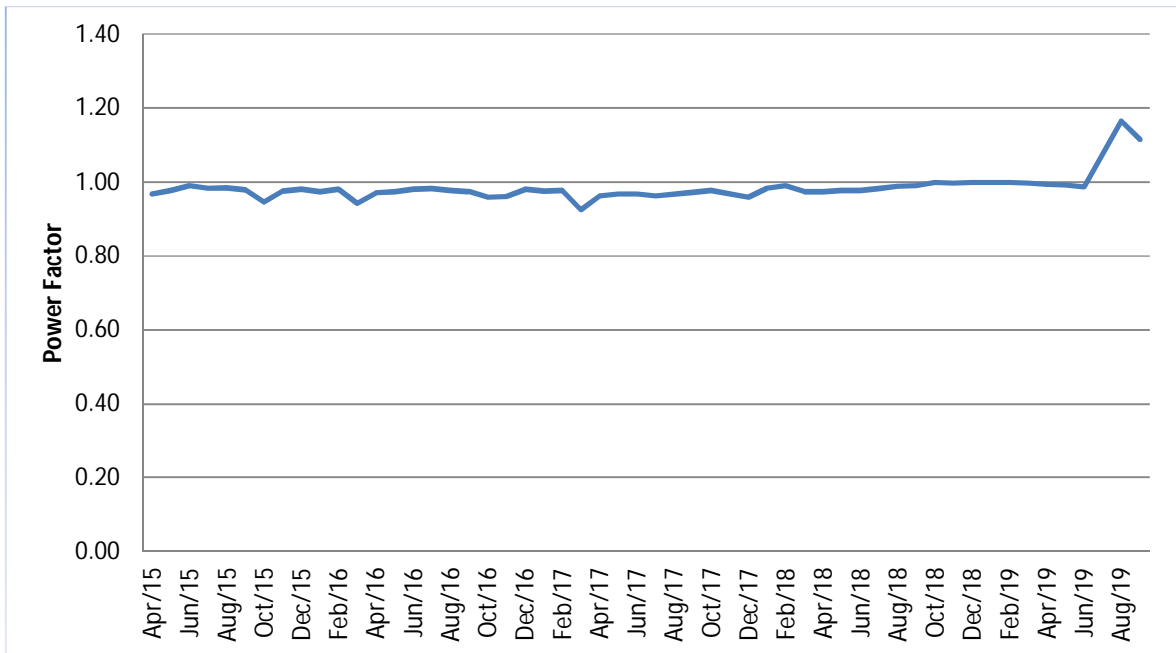
ENERGY CONSUMPTION PATTERN

From Energy consumption pattern it is clear that energy consumption is more in monsoon months i.e. August and September. Energy consumption in spring and autumn is least in all season. Electricity consumption of winters is less than summer.



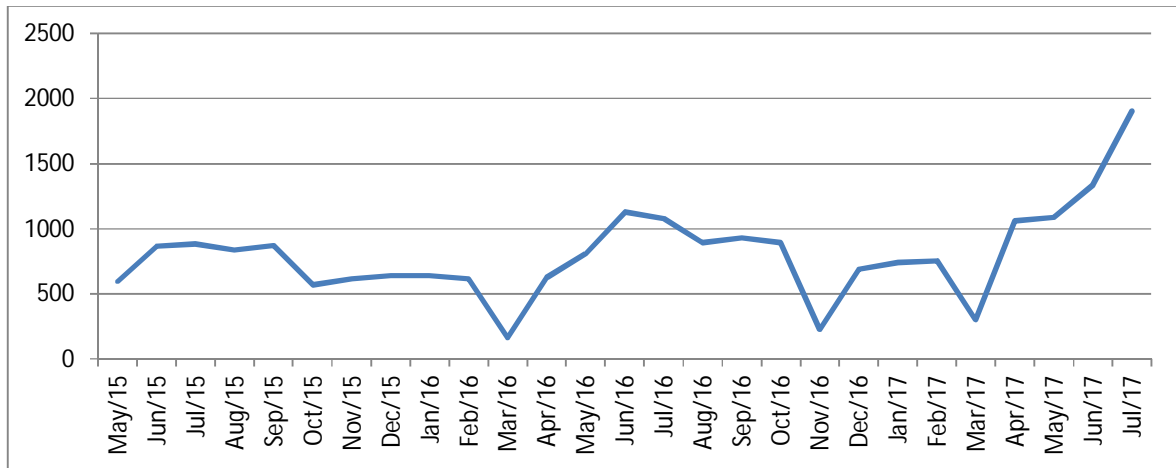
POWER FACTOR PATTERN

From Bills of April 2015 till September 2019 it is observed that PF roam around 0.96 with minimum of 0.92 and maximum more than 1 in this period. Incentive against maintaining high power factor was never claimed nor surcharged was attracted.



MAXIMUM DEMAND

Maximum demand is the highest level of electrical demand monitored in a particular period. Once the value is higher than the contracted power, the customer will pay a penalty on the electricity bill.



EFFECT OF SANCTIONED LOAD AND CONTRACT DEMAND

From June 2015 till August 2017 sanctioned load and contract demand was 2000 KW and 2000 KVA respectively. But from September 2017 sanctioned load and contract demand was revised to 3056.84 KW and 3396 KVA respectively. But the maximum demand never crossed 2000KW from June 2015. The high sanctioned load and contract demand is attracting high fixed charges. April 2019 the fixed charges was higher than energy charges.

CONDITION OF EXISTING ELECTRICAL INSTALLATION WIRING

The campus is new and the electrical system is well planned. Concealed conduit wiring is adopted for internal distribution. Care was taken at the time of planning to adhere the functional need of

the spaces. Even after diligent planning electrical power extension through open wiring has been observed at few places.

It has been learnt that there is no protocol of checking insulation of wiring

ELECTRICAL EARTHING SYSTEM

The process of transferring the immediate discharge of the electrical energy directly to the earth by the help of the low resistance wire is known as the electrical earthing. This system provide safety to human being and electrical equipment and installation.

Electrical earthing has been observed at substation as well as individual buildings. Using portable equipment random checking for continuity and insulation of wiring was conducted in the campus. The observations are as below

S.No.	Building	Observation
1	G+7	Earthing faulty
2	G+3	Earthing faulty
3	AB-1	ALL OK
4	CANTEEN	ALL OK
5	AB-2	ALL OK
6	LIBRARY	ALL OK
7	AB-3	Earthing faulty
8	Post office & Bank	L&D reversed
9	boys hostel	Earthing faulty

Over all wiring condition is good but earthing system need attention. At the time of inspection the earth pits were found dry. There was no record of watering earthing pit.





EARTHING TEST



T
EARTHING PITS



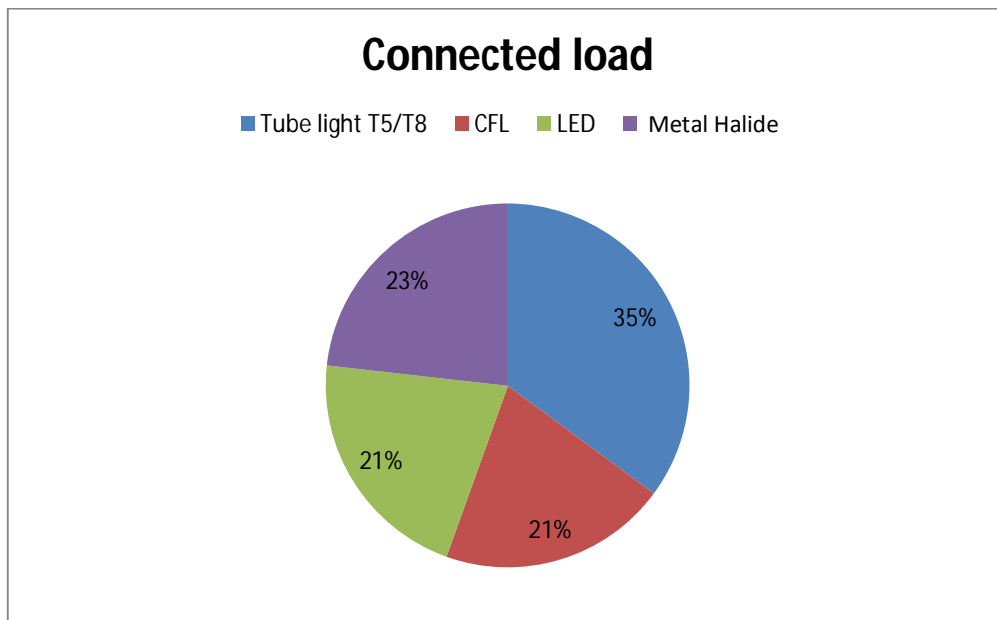
EARTHING PITS

LUMINARY

It is observed that there is no uniformity in luminary. Details of luminary are as follows:

LUMINAIRES	Connected load in KW	Connected load in %
Tube light T5/T8	139	35%
CFL	80.6	20%
LED	84.1	21%
Metal Halide	92	23%

Although Institute is in the process of phasing out system of CFL and bulb with LED bulbs.





Light and fans

DAY LIGHT CONDITION

Each and every rooms are having adequate windows. The observation of day light taken in between 12 noon to 3 pm on bright sunny day of April is more than 150 lux on lux meter.

It is observed that the window light is obstructed by putting curtains.





Day light and ventilation Condition

VENTILATION CONDITION

NATURAL VENTILATION

The buildings are fully air conditioned but for natural ventilation there are adequate amount of open able panes in windows, opening on outer side of the rooms on outer face of the building. There is no obstruction in front of windows. Doors and windows are provided on the opposite wall of the room. Doors are opening in corridor to provide proper cross ventilation. There is about 5°C temperature difference is observed in ambient air outside and inside the building with average airflow of 0.4m/s.

It is observed that windows and ventilators are permanently closed obstructing cross ventilation.

MECHANICAL VENTILATION

Fans and blowers are provided to move air inside the building to remove order, provide fresh air and to maintain thermal comfort in relatively cooler days. Fans are placed at every nick and corner of the campus to adhere respective function of the space. Details are as follows:

Type of Fan	Numbers
CEILING FAN 1400 MM	534
WALL BRACKET FAN	10
CEILING FAN 1200 MM	1161
EXHAUST FAN 300 MM	247
EXHAUST FAN 450 MM	16

Thermal Comfort condition

HVAC system is provided to maintain thermal comfort in the buildings. Details of

HVAC are as follows:

HVAC EQUIPMENT DETAIL-						
S.no	Description	Make	Model	Manufacturing year	Rated capacity in TR	Use
A	Building - AB-1 , AB-2 , SH-2 , KRC					
	VRF AC System	Voltas			1422 TR	Feeding AB-1 , AB-2 , SH-2 , KRC
B	Building - G+3 , G+7					
	Air Cooled				3X 200 TR 1X 55TR	Feeding G+3 , G+7
C	Split A.C In G+3 , G+7					
	Split A.C				2TR-24 1TR-02 1.5TR-14	Feeding G+3 , G+7
D	Split A.C In AB-3					
	Split A.C				2TR-84 1TR-07 1.5TR-50 2TR-16	Feeding AB-3
	Cassette A.C					

Comfort condition of campus was checked using portable anemometer cum thermometer. Details are as follows:

S. No	Room No.	Temperature/ humidity	Air Velocity in m/s
	Ambika school		
	Director main office		

S. No	Room No.	Temperature/ humidity	Air Velocity in m/s
1	Room = 013C	28.6 .C 40.5% rh	0.93
2	Room = 013B	27.6 .C 45.0% rh	0.13
3	Room = 013A	20.8.C 61.0% rh	0.00
4	Room = 002B	20.0.C 59.5 % rh	0.40
5	Room = 002A	28.5 .c 64.5 % rh	0.73
7	Room = 003 B	28.7 .c 52.0 % rh	0.06
8	Room = 003 G	28.2 .c 61.5 % rh	0.06
10	Room = 004	28.7 .c 57.2 % rh	0.33
11	Room = 005	28. 0 c 49.5 % rh	0.20
12	Room = 006 (physics lab - I)	27.3 c 46.7 % rh	0.13
13	physics lab - II	26.8 c 53.7 % rh	0.73
14	physics lab - III	26.5 c 48.5 % rh	0.53
	AB-I (Ground floor)		
24	Depart of Civil (office)	29.2 c 67 % rh	0.26
25	senior assistant room	29.2 c 68.5 % rh	0.73
26	Assistant Register	28.6 c 53.0 % rh	0.33
29	4th floor AB-I		
	Management department (office)	29.0 c 52.5 % rh	0.26
30	common room	28.6 c 54.2 % rh	0.33
	5th floor		
31	class room -A511	29.3 c 45.0 % rh	0.20
32	class room -A509	29.3 c 53.5 % rh	0.53
	Library		
33	I floor	30.2 c 56.2 % rh	0.13
	Ground floor	29.1 c 55.3 % rh	0.26
35	Seminar Hall	29.3 c 57.0 % rh	0.06

Ambient weather condition between 23.09.2019 to 27.09.2019 is

Day	T	TM	Tm	H
23	27.8	33.8	22.8	72
24	28.3	33.4	23.41	73
25	28.7	33.3	24.6	75
26	28.6	34	24.6	76
27	26.4	33.7	24.8	77
Monthly average				
	28.0	33.6	24.0	74.6
T	Daily Average temperature			
TM	Daily maximum temperature			
Tm	Daily minimum temperature			

Day	T	TM	Tm	H
H	Average Humidity			

For above ambient weather conditions the internal thermal comfort maintained using HVAC system is good. The HVAC system is used for reducing humidity by maintaining high temperature which is a good practice.



PUMPS AND MOTORS

Pumps are used to deliver water at different tanks placed at different terrace. Details of pumps are as follows:

S.No	Storage of water location	Pump installed for transferring of water if yes then type and capacity
1	Administrative G+7 , G+3	3x11 HP Kirloskar
2	AB-1 , AB-2 , KRC HALL	3x11 HP Kirloskar
3	AB-3 , Girls Hostel	2x11 HP kirloskar
4	Boys Hostel	1x50 Amer sine motor

There is no meter installed at pumping station to monitor regular energy performance of water supply pumps. Similarly no record is maintained for operating hours as well as quantity of water pumped.

IDENTIFICATION OF WASTAGE

Electricity is used to maintain visual and thermal condition in the buildings.

It is observed that lights are operational at places where day light condition was good and there were no occupants.

Similarly fans and AC were on in empty spaces or class rooms.





WATER AUDIT AND MANAGEMENT

FRESH WATER

WATER REQUIREMENT

Water is required for drinking, flushing of toilets, Lab works and watering of plants of Botanical garden. The anticipated water requirement is as follows:

S.No.	Description	Consumption in liters
Fresh water requirement		
1.	Domestic water for staff and student (day scholar) @25 per head considering 80% of 2733 (total enrolled students) i.e 2200 (approx.)	55000l
1.	Domestic water student (Hostel)@90 per head considering 565 students	50850 l
1.	Domestic water for visitors @5 per head considering 50 visitors per day	250 l
	Fire tank make up	400 l
	Sub total (Domestic water)	110000 l
Raw / Recycled water requirement		
2.	Flushing water for staff and student (day scholar) @20 per head considering 80% of 2733 (total enrolled students) i.e 2200 (approx.)	44000 l
	Flushing water student (Hostel) @45 per head 565 students	25425 l
2.	Flushing water for visitors @0 per head considering 50 visitors per day	250 l
3	Watering of plants Trees (3000 no.)	Not required plants are too old
	Shrubs & Flower Pots 3000 (Approx.) @ 1l per plant	3000 l
3	Hedge Area, Shrubbery Border, Flower beds 3000 SQM. (Approx.) @ 5l per SQM	15000 l
	Lawn 45000 SQM@ 5l per SQM	225000 l
	Sub total (Flushing water)	273000 l
	Total anticipated water requirement	383000 l

Source:-NBC 2016 table 1 part 9 page 12

SOURCE AND DISTRIBUTION

There are 2 tube wells and a no municipal water connection. The water is collected in under ground sump. Details are as below:

SOURCE OF WATER

S.No	Source of water	Quantity received	Storage facility
1	Tube well in Administrative Building		2.5 lakh ltr RCC UGT (1.5 lack liter is reserved for fire)
2	Tube well in AB-3 (PIT) Building		01 lakh ltr RCC UGT

The water is then transferred to individual tank placed on terrace. The water is distributed through pipe network to individual point of use. Details of terrace tanks are as below:

S.N o	Storage of water location	Tank type PVC/RCC/steel/other	Quantity stored in liters	Pump installed forz transferring of water if yes then type and capacity
1	Administrative G+7 , G+3	pvc	12x5000 ltr	3x11 HP Kirloskar
2	AB-1 , AB-2 , KRC HALL	pvc	24x5000 ltr	3x11 HP Kirloskar
3	AB-3 , Girls Hostel	pvc	12x25000 ltr	2x11 HP Kirloskar
4	Boys Hostel	pvc	5x10000 ltr	1x50 Amer sine motor

The terrace tanks are cleaned once in a year. Details are as below:

S.N o	Location	Nos. of PVC tank	Frequenc y	Last date of cleaning
1	Building G+7 , G+3	12	one year	Dec-18
2	AB-1 , AB-2 , KRE , HALL	24	one year	Dec-18
3	AB-3 , Girls Hostel	12	one year	Dec-18
4	Boys Hostel	6	one year	Dec-18

Note:-There is no meter in supply line or distribution line.

DRINKING WATER FACILITY

There are 50 drinking water point having a set of water cooler with purifier are installed. These cooler get cleaned every month. Purifiers are maintained . Details are as follows:

S.no	Storage type	Nos	Fitter with local filter or common filter	Last date of cleaning
1	water cooler	50	Branded filters	cleaning in monthly last cleaning done on 19 sep 2019



Drinking water facility

FLUSHING WATER REQUIREMENT

Waterless urinals are installed into the campus where as to flush water closets fresh water is used.

FLOOR CLEANING AND VEHICLE CLEANING

Non treated fresh water is used for floor cleaning and Vehicle cleaning as and when required. Record not maintained.

FIXTURE AND FITTING

Regular Fixture and fitting are installed in the campus.

WASTE WATER MANAGEMENT

Waste water is generated from Drinking water point, Basin and WC of toilets. The sewage so generated is conveyed to the STP whose capacity and location are as follows:

Waste water treatment system

S. no	Source of waste water Location	Quantity Generated sewage in litres	Only water or mixing of chemicals (soap/detergent/phenol/other)	Treatment system	Pump installed if yes then type and capacity
1	STP - 30 KLD X 2	There is no meter to measure	yes	STP	Details not provided
2	STP - 50 KLD X 1		yes	STP	

The waste water generated in chemical lab is also conveyed to the STP for respective building.

IRRIGATION OF GARDEN

The average lives of plants in 4.5 acre green cluster are 15 to 20 year of the plant needs almost no water. At other area irrigation is done by flooding method using mixture of fresh and recycled water. There is no meter in irrigation water supply or recycled water supply.





RAIN WATER MANAGEMENT

Water from roof and other area follow natural path of contour and flow conveyed to low lying areas.

STATUS OF MUNICIPAL / SOLID WASTE HANDLING

Dust bins and garbage bins are placed at every nick and corner of the campus. Here it is observed that all type of the Municipal waste is collected in common bin. The Non organic collected waste is then shifted to the nearest pickup point from which the waste is transported to Municipal Land fill where as organic waste is treated and converted into compost in the campus only.



SOLID CHIMICAL WASTE

There is no solid chemical waste generated in the campus.

ORGANIC WASTE

The organic waste generated in the form of food left over, leafs and tree waste all over the campus. It is treated and converted into compost using electro-mechanical composter.

ELECTRONIC WASTE

The non functioning computers are stored in a room with the intent to dispose it off to authorized vendor on later date.

RECYCLABLE WASTE

Time to time old newspapers, magazine and used papers from office are handed over to authorized vendor.

CARBON FOOT PRINT

Carbon foot print is the amount of carbon dioxide released into the atmosphere as a result of the activities of a particular individual, organization, or community. In the institute like this Carbon Dioxide is generated by burning of petroleum product like petrol, Diesel and LPG or use of electricity.

CALCULATION METHODOLOGY

Electricity = 0.85 kg CO₂ per KWh, Source: CO₂ emission factor database, version 06, CEA (Government of India), http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm .

Motor gasoline/ Petrol = 2.296 kg CO₂ per liter, Source: Emission factors are taken from the file "Emission factors from across the sector -tool", extracted from <http://www.ghgprotocol.org/calculation-tools/alltools>.

Diesel= 2.653 kg CO₂ per litre, Source: Emission factors are taken from the file "Emission factors from across the sector -tool", extracted from <http://www.ghgprotocol.org/calculation-tools/alltools>.

Liquefied petroleum gas (LPG) = 2.983 kg CO₂ per kilogram, Source: Emission factors are taken from the file "Emission factors from across the sector -tool" extracted from <http://www.ghgprotocol.org/calculation-tools/alltools>.

Public conveyance bus : Number of users per year X 0.105 (Emission Factor)**kg CO₂ per passenger/Km=** Output value in (Kg of CO₂).source <https://www.carbonfootprint.com/calculator.aspx>

Carbon Footprint : Add (1+2+3+4+5) = Output value in (Kg of CO₂)

CALCULATION OF CARBON FOOT PRINT

S.no.	Fuel type	Unit	Consumption per year	Emission Factor	Total in KG
1	Electricity	KWh	2363651	0.85	2009103
2	Motor gasoline/ Petrol	liter	42000	2.296	96432
3	Diesel	liter	614640	2.653	1630640
4	Liquefied petroleum gas (LPG)	kilogram	6300	2.983	18792.9
5	Public conveyance bus	Number of users	6499200	0.105	682416
	Total carbon foot print in KG				4437384
	Total carbon foot print in metric ton				4437.38

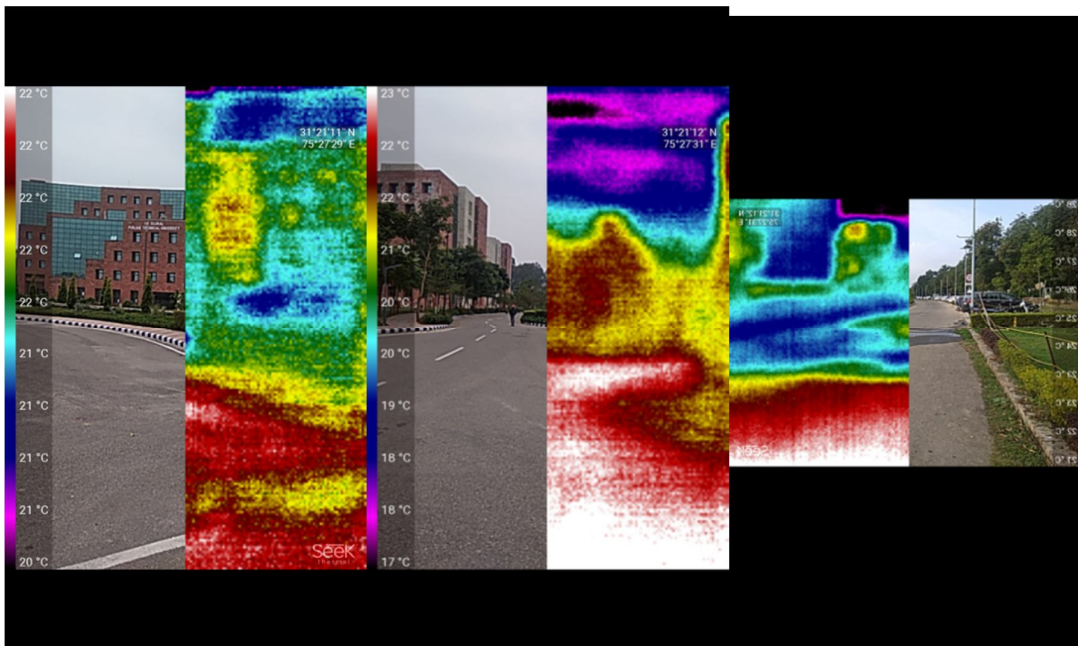
Total carbon foot print of university is 4437.38 metric ton **CO₂** per year

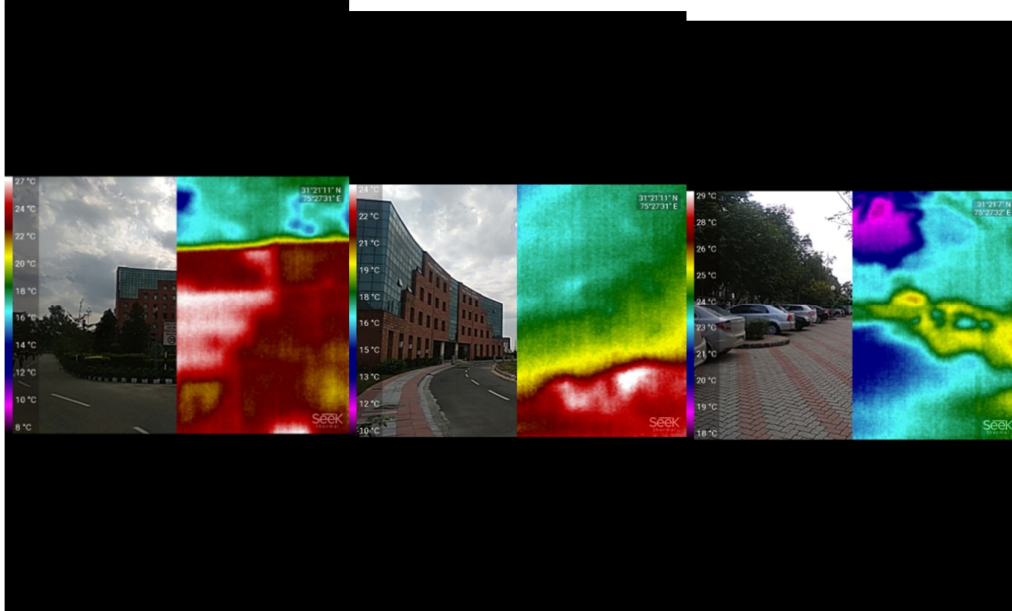
HEAT ISLAND IMPACT

The heat island effect implies to cities or metropolitan areas are transformed into islands of heat. Temperatures in these regions can get as much as 3 to 5°C higher compared to the adjacent rural areas.

The hard paved surface, Black roof top and vehicle standing outside in direct sun enhance heat island impact.

Study was conducted from 25.11.2019 using thermal camera. The average daily ambient temperature detected by nearby metrological station no 420710 was 16.4°C with average maximum temperature 24.3°C whereas minimum average temperature 9.8°C (weather data source <https://en.tutiempo.net/climate/11-2019/ws-420710.html>). It is concluded from the captured thermal camera that the temperature of roads are 5°C higher than raw land. Vehicles parked at side of road exposed to sunlight is having 10°C more temperature than raw land.





RECOMMENDATIONS

GENERAL

Based on the baseline study or the observation made earlier section, this portion outlines measures to be adopted to make campus Green.

BUILDING MAINTENANCE

Although maintenance of Building infrastructure is in owners scope even then work can be priorities for follow up. The classification of priorities and its contains are as follows

HIGH PRIORITY WORK

Definition: Work that does not qualify as an emergency, but cannot wait to be scheduled as routine maintenance and repair. Generally, these are NOT issues related to health, safety, or security but have impact on the function of the building. The Chief Custodian must put in a work order for these issues and be sure to be specific in the description of the assistance needed.

Following are typical examples of high priority work orders:

- Broken fence or gates
- Leaking or broken sprinkler heads, valves
- Broken tree limbs or fallen trees
- Leaking plumbing
- Cracked glass windows
- Street lights not working.

MEDIUM PRIORITY WORK

Definition: Medium priority work order falls into the routine maintenance work request. These work orders are the everyday repairs required to keep the building in proper working order.

Most work orders will fall into this priority for completion. The Chief Custodian must put in a work order for these issues.

Some examples can be:

- Repair electrical switch or outlet
- Replace light ballast
- Urinal stopped up
- Door closer leaking hydraulic fluid
- Black Board Painting
- Drinking water facility either cooler or filter or both are not working

LOW PRIORITY WORK

Definition: Low priority work orders are issues needed to be completed within the scheduled period of time. These items, although routine, can be scheduled and completed as a craft person becomes available.

Some examples might be:

- Playground equipment painted
- Keys (replacement keys)
- Paint parking lot stripes
- Pick up bags of leaves for disposal

SOLID WASTE MANAGEMENT SYSTEM

it is proposed to have provision for segregation and collection of biodegradable & non-biodegradable waste within the premises. Biodegradable waste will be treated in existing Organic Waste converter within the premises. Non-biodegradable waste recyclable waste shall be handed over to recyclers and non-recyclable waste shall be shifted to nearest pick up point from which it is transported to land fill ground. No burning of solid waste in open shall be prohibited in campus.

DISPOSAL OF ELECTRONIC WASTE

Electronic waste or **e-waste** describes discarded electrical or electronic devices.

Informal processing of e-waste in developing countries can lead to adverse human health effects and environmental pollution. If electronic equipment is in operational condition then donate it. This will help reduce pollution that would be generated while manufacturing a new product and therefore the pressure on natural resources. It also reduces the energy used in new product manufacturing.

Put unusable electronic equipment in a tamper proof plastic bag. Store it in leak proof containers till it is disposed off. Hand over all the e-waste to authorised recycler.

If electronic equipment are replaced by new one then hand over old one to the supplier itself.

HOUSE HOUSEKEEPING

The purpose effective housekeeping is to protect faculty, staff and students from injuries and illness by making all the area clean. Following shall be done for effective housekeeping:

- Dispose of all items in the proper labelled containers
- Anything flammable should be in a metal container and labelled
- Clean up spills immediately
- Stack Item properly make sure they cannot fall or block passages
- Avoid food and beverages in work area
- Never put liquids in an unlabelled container
- Do not remove any safe guards on equipment

ENERGY MANAGEMENT

Energy conservation is the need of the hour the first step toward energy consumption is to record the energy use. Following steps can reduce energy consumption:

- Energy record shall be maintained as per Performa enclosed
- Provide Power Factor correction method to claim incentives for maintaining better power factor.

- High efficiency electronic ballasts shall be used on all Tube lights.
- Change incandescent lamp with either CFL or LED bulbs.
- Change existing T12/T 8 Tube light with T5 Tube light.
- Change existing fans with energy efficient fans
- Open window for day light or replace at least top two window panes with transparent glass.
- Switch off all the electrical equipment when it is not in use.
- Provide solar powered LED street light.
- Provide occupancy sensor and day light sensors to switch off lights and fan when operation of this is not required.
- Maximum demand meter shall be provided.
- Electricity supply company shall be approached to revise contract demand hence accordingly fixed charges will be reduced.
- Provide proper earthing for electrical equipment and building wiring system.
- Replace present conventional earthing system with no maintenance chemical earthing.

Similarly record of LPG shall be maintained and following steps will optimize use of LPG

- Clean the burner of stove periodically
- Use small burner in place of big one
- Make all the preparation before turning on LPG stove
- Check the flame of burner. Blue flame means gas stove is operating efficiently. Yellowish flame is an indicator that the burner needs cleaning
- Use pressure cookers as much as possible
- Use lids to cover the pans while cooking & Bring items taken out of refrigerators (like vegetables, milk etc.) to room temperature before placing on the gas stove for heating.
- Turn off the stove when it is not in use.

HVAC SYSTEM

Don't over-cool. The ideal thermostat setting is between 25°C and 27°C with ceiling fan operational. Every degree you raise your thermostat can result in a 5% savings on the cost of cooling your home.

- Keep lamps, Computers and other heat sources away from the air conditioner thermostat. Heat from these sources may cause the air conditioner unit to run longer than it should.
- Make sure that no furniture or other obstacles are blocking ducts or fans. This will enable cooled air to circulate more freely.
- When selecting a central air conditioning unit, be sure to choose one that is sized appropriately and uses the minimal amount of electricity to complete its task.
- Install a ventilating fan in your attic or in an upstairs window to help dissipate hot air and cool down the spaces.

- Don't set thermostat at a colder setting than normal when you turn your air conditioner on. It will not cool the room any faster, but it will use more energy.
- Use a ceiling fan in conjunction with your air conditioner to spread cooled air to other rooms.
- Clean the outside air conditioner condenser coil once a year. Turn off the unit and spray the coils with water at a low pressure to remove dirt, dust, leaves and grime.
- Clean filter of indoor unit once in 15 days.
- Use duct tape to seal the cracks between each section of an air duct on your central air conditioning or forced heating system.
- Close your blinds, curtains and shades during the hottest part of the day. Keep out the daytime sun with vertical louvers or awnings on the outside of your windows.
- Keep lights low or off when not needed. Electric lights generate unnecessary room heat.
- Factors Affecting Energy Efficiency & Minimising Motor Losses in Operation

MOTOR PERFORMANCE

Motor performance is affected considerably by the quality of input power, that is the actual volts and frequency available at motor terminals vis-à-vis rated values as well as voltage and frequency variations and voltage unbalance across the three phases

PROPER PUMP SIZING

Pumps installed in the premises are over sized resulting in undersizing of pumps. Under-loading results in lower efficiency and power factor, and higher-than-necessary first cost for the motor and related control equipment.

MAINTENANCE

Inadequate maintenance lowers [pump system efficiency](#), causes pumps to wear out more quickly and increases costs. Better maintenance will reduce these problems and the most important – **to save energy**.

Proper maintenance includes the following:

- Replacement of worn impellers, especially in caustic or semi-solid applications.
- Bearing inspection and repair.
- Bearing lubrication replacement, once annually or semiannually.
- Inspection and replacement of packing seals.
- Inspection and replacement of mechanical seals.
- Wear ring and impeller replacement.
- Pump/motor alignment check.
- The largest opportunity is usually to avoid throttling losses.
- Typical energy savings for operations and maintenance are estimated to be **between 2% and 7% of pumping electricity use**

MONITORING

Monitoring in conjunction with operations and maintenance can be used to detect problems and determine solutions to create a more efficient system.

Monitoring can determine clearances that need be adjusted, indicate blockage, impeller damage, inadequate suction, operation outside preferences, clogged or gas-filled pumps or pipes, or worn out pumps.

Monitoring should include:

- Wear monitoring
- Vibration analyses
- Pressure and flow monitoring
- Current or power monitoring
- Differential head and temperature rise across the pump (also known as thermodynamic monitoring)
- Distribution system inspection for scaling or contaminant build-up

CONTROLS

The objective of any control strategy is to **shut off unneeded pumps or to reduce the load of individual pumps**. Remote controls enable pumping systems to be started and stopped relatively quickly and accurately, and reduce the required labor with respect to traditional control systems.

MORE EFFICIENT PUMPS

Pump efficiency may degrade 10% to 25% in its lifetime. Industry experts however point out that this degrading performance is not necessarily due to the age of the pump but can also be caused by changes in the process which may have caused a mismatch between the pump capacity and its operation.

Nevertheless, it can sometimes be more efficient **to buy a need pump**, also because newer models are more efficient.

WATER MANAGEMENT

Material which is not measured cannot be saved hence it is advisable to put a meter and check the consumption on regular basis. A record shall be maintained for tank cleaning, water cooler cleaning and purifier maintenance with water consumption. Following provision shall be implemented for water conservation:

- Providing self closing (push cock) type pillar cock and bib cock to avoid wastage of water due to not closing the pillar tap.
- Provide low flow fitting and fixtures i.e. pillar cock and bib cock with 6/3 liter flush tank.
- Providing automatic auto sensor based flushing to urinal in place of normal flushing cistern which operates 24 hours.
- Providing dual flushing cistern for water closet 3 -6 litres in place of 10 liters cistern.
- All WC ablution taps to be self closing taps.
- Consumption requirement of fresh water will be reduced by 70 % by using.
- Provide drip irrigation and high efficient sprinkler irrigation system
- Rain water harvesting shall be adopted to enhance ground water table.
- Repair leakage in water distribution system on priority.
- Develop a regular maintenance protocol.
- Plant drought resistance trees (list enclosed).

WASTE WATER MANAGEMENT

Provide neutralization tanks for chemical waste.

FIRE AND SAFETY

Following steps will make campus safe from Fire

- Evacuation plan is to be prepared and adopted.
- Provision of more fire extinguisher shall be made.
- Additional spiral stair case will make evacuation effective.
- Provide 20 kg fire extinguisher with moveable trolley to fight heavy fire and forest fire.

UNIVERSAL ACCESSIBILITY

Following steps will make property friendly for all:

- Provide more ramp at suitable location.
- Provide Tactile floor for Blind.
- Provide signage in Braille Language.
- Provision for handicap toilet can be made.

CARBON FOOT PRINT

Carbon foot print can be reduced by adopting following steps:

- Discourage driving by charging heavy parking charges and providing preferred parking for by-cyclers.
- Implement effective energy use system.
- Switch off lights, fan and equipments not in use.
- Preferred parking or charging point can be provided for electronic vehicle.
- Encourage vehicle users for pollution check and periodical check-up of air pressure of their vehicles.
- Use only energy efficient office and lab equipments.
- Maximum use of natural light and ventilation.
- Encourage users to walk by providing safe and covered pathways.

HEAT ISLAND IMPACT

Heat Island impact can be reduced by adopting following steps:

- Plant more and more trees.
- Provide light colour on hard surface.
- Shade roof using solar panel.
- Use grass pavers in place of regular pavers.
- Watering of road and other hard surface using recycle water.
- Use energy-efficient appliances and equipment

POLICIES

GREEN AUDIT POLICY

Green Audit Policy is an act of determining whether operations and practices regarding General maintenance, Energy use, Water management and Waste management are in compliance with recommendations made in Green Audit Report and industries best practices. The policy is framed to review the actions in specified period of time. A committee can be formed to monitor status of item in Green Audit compliance.

- Verify compliance with environmental regulations, internal policies, and accepted practices.
- Evaluate the effectiveness of Green "management systems" in place.
- Periodic review of records
- Identify and assess any reasonably foreseeable risks associated with hazardous conditions attributable to operations and prevent or mitigate such risks.
- An effective Green auditing program increases overall management effectiveness and comfort with the knowledge that the risks of potential exposure to adverse environmental issues are being addressed.

TOBACCO FREE POLICY

The University is committed to maintaining a safe and healthy work and academic environment, improving indoor and outdoor air quality, and promoting the comfort of students, faculty, staff, and guests. Intent of this policy is to prohibit consumption of all type of tobacco/ product contains traces of tobacco in the campus. This policy not only prohibit teaching, non-teaching staff and students but also applicable on visitors too.

The statement says that chewing, smoking or inhaling any is prohibited in all the nick and corner of the University. This is a punishable offence and the culprit will be fined Rs.500/- against this act.

POLY-BAG PROHIBITION POLICY

Through this policy management wants to enforce States policy to ban use of Poly bags. This policy will encourage staff and students to use alternative of poly bag.

NO VEHICLE POLICY

The University is committed to reduce carbon foot print and enhance academic environment, improving indoor and outdoor air quality, and promoting the comfort of students, faculty, staff, and guests. Intent of this policy is to prohibit use of private vehicle and to promote use of public conveyance, vehicle pooling etc. This policy is not only applicable to teaching, non-teaching staff and students but also applicable on visitors too.

The statement encouraging use of public conveyance and vehicle pooling will be displayed in all the nick and corner of the University. High parking fee can be levied on person using private vehicle.

BY-CYCLE POLICY

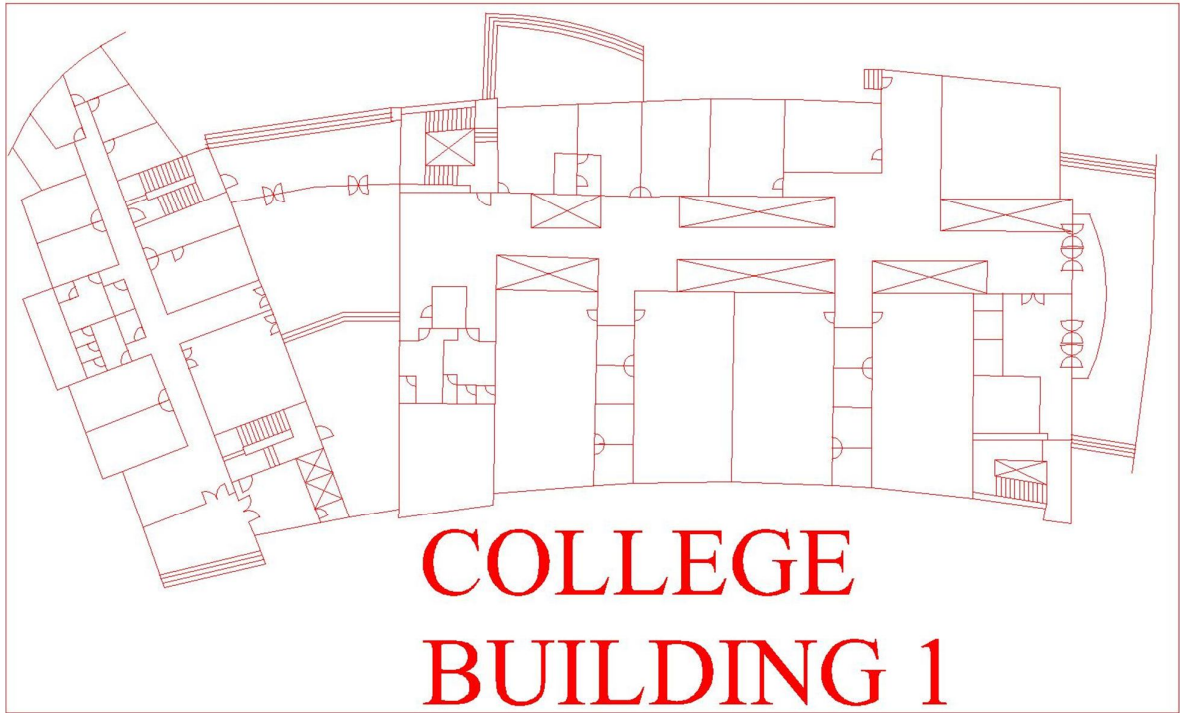
The University is committed not only to reduce carbon foot print and enhance overall health of students, faculty, staff, and guests. intent of this policy is to encourage physical activity. This policy is not only applicable to teaching, non-teaching staff and students but also applicable on visitors too.

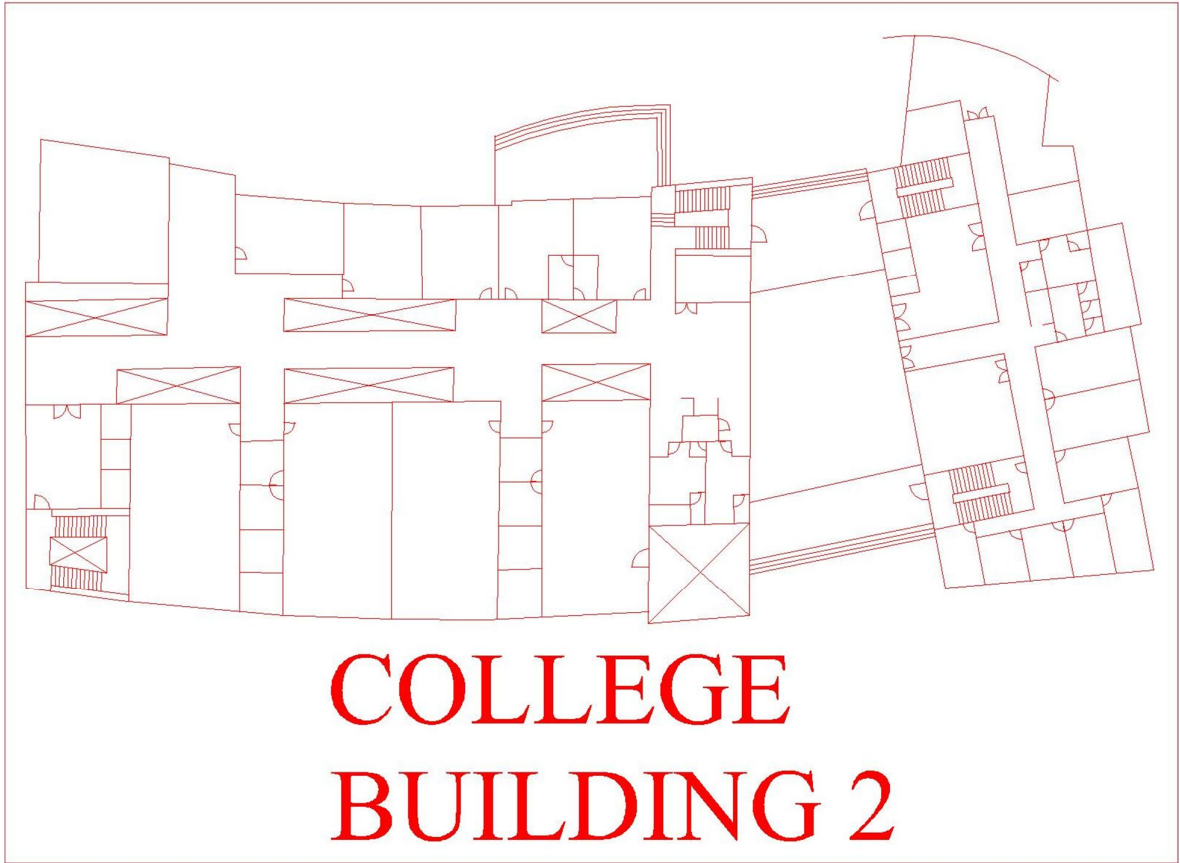
The statement encouraging use of cycle will be displayed in all the nick and corner of the University. Preferred parking will be provided near academic building for cyclists.

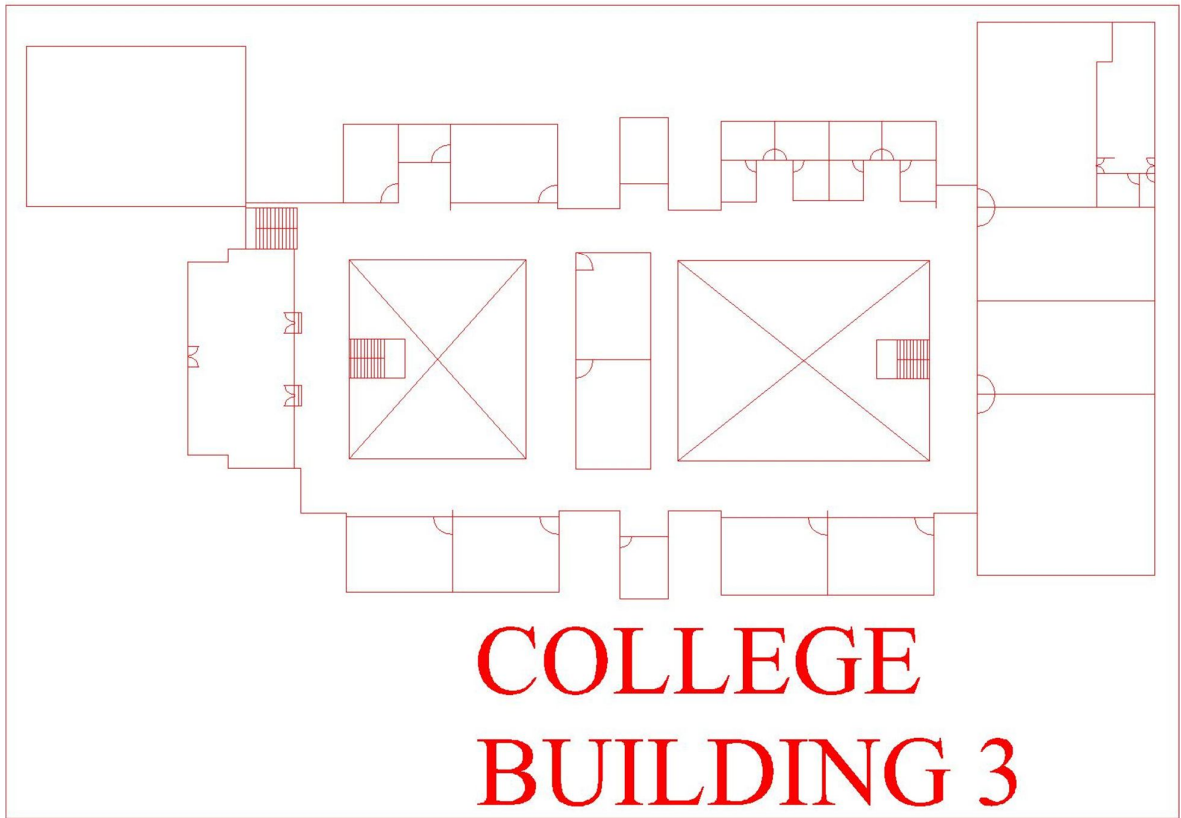
SITE PLAN ANNEXURE A

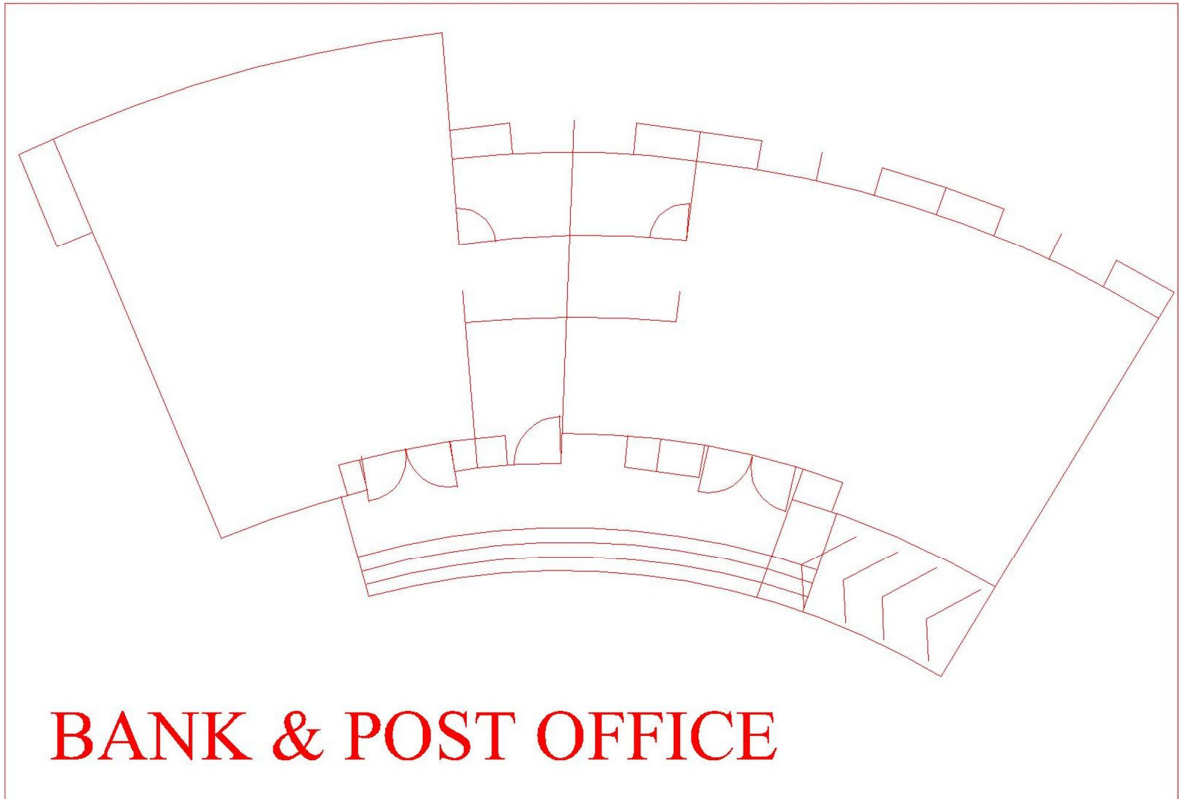
BUILDINGS GROUND FLOOR PLANS

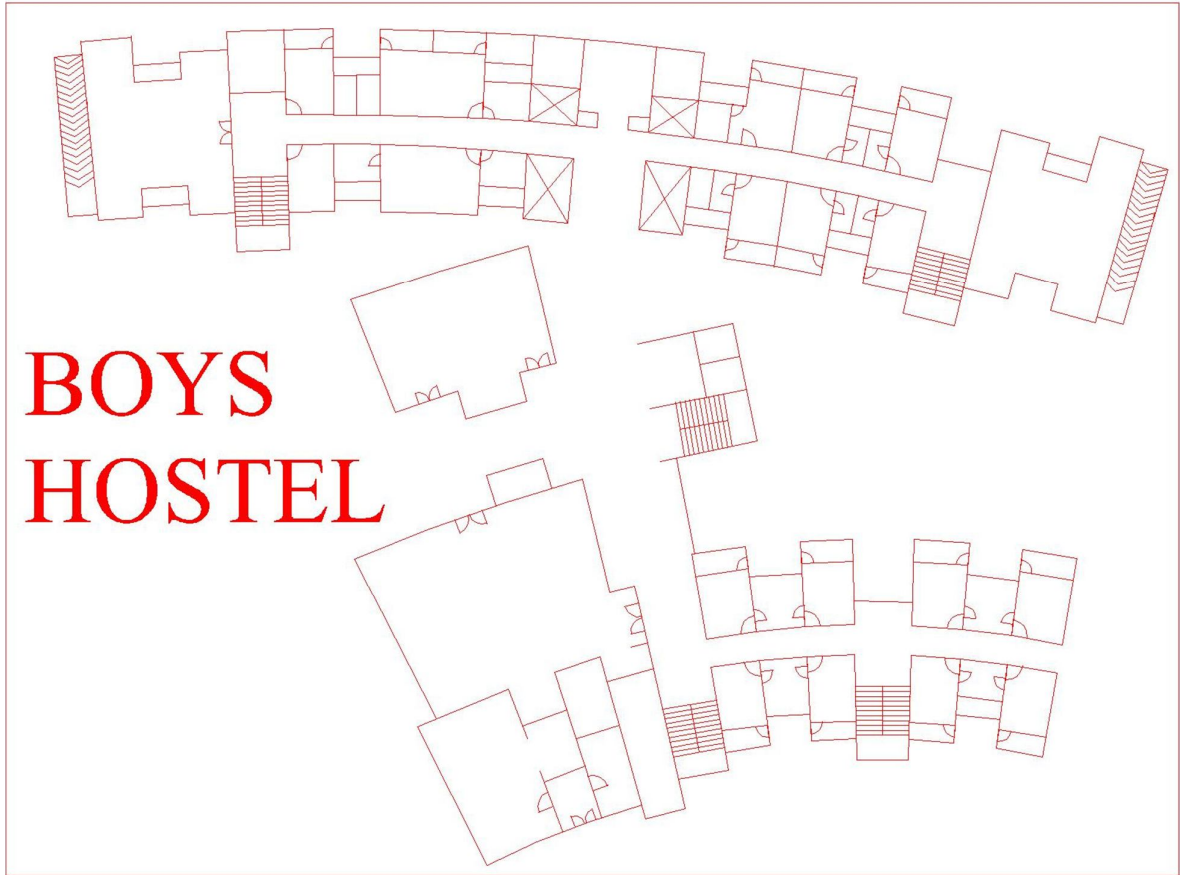


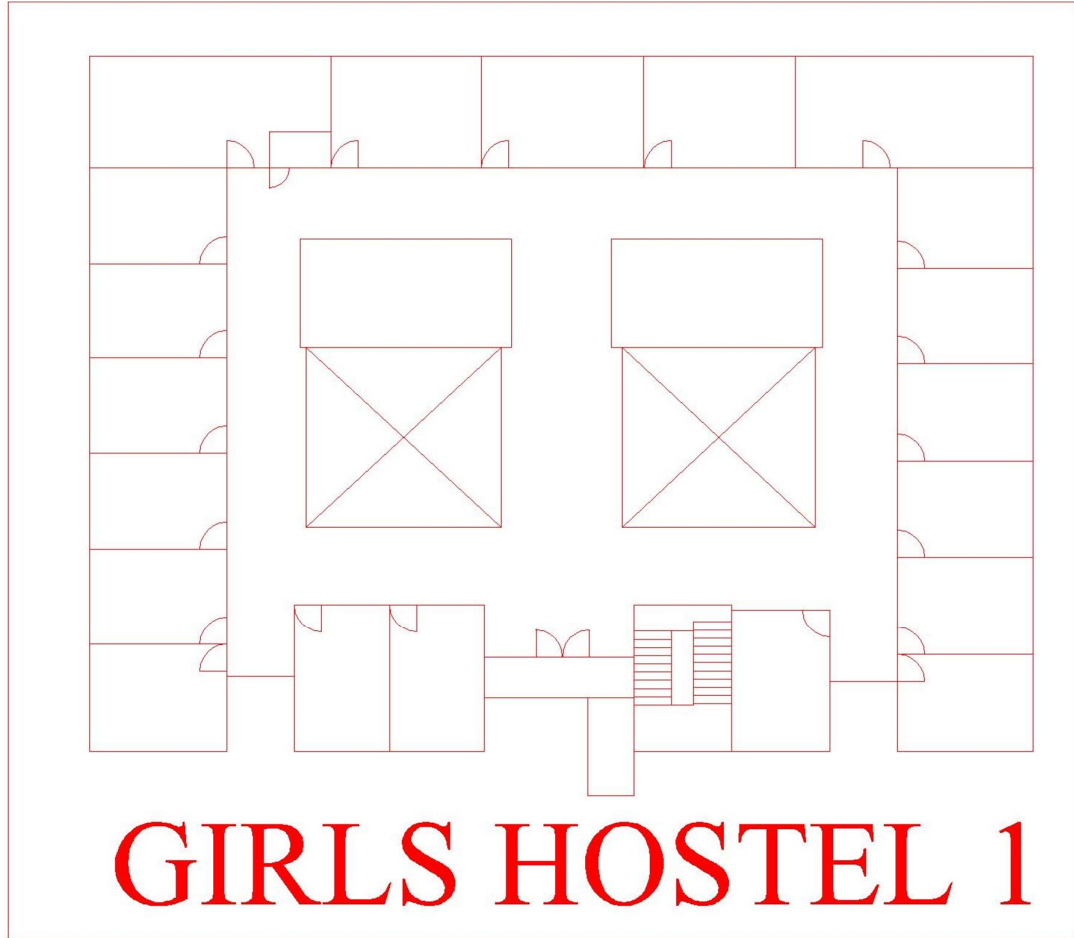


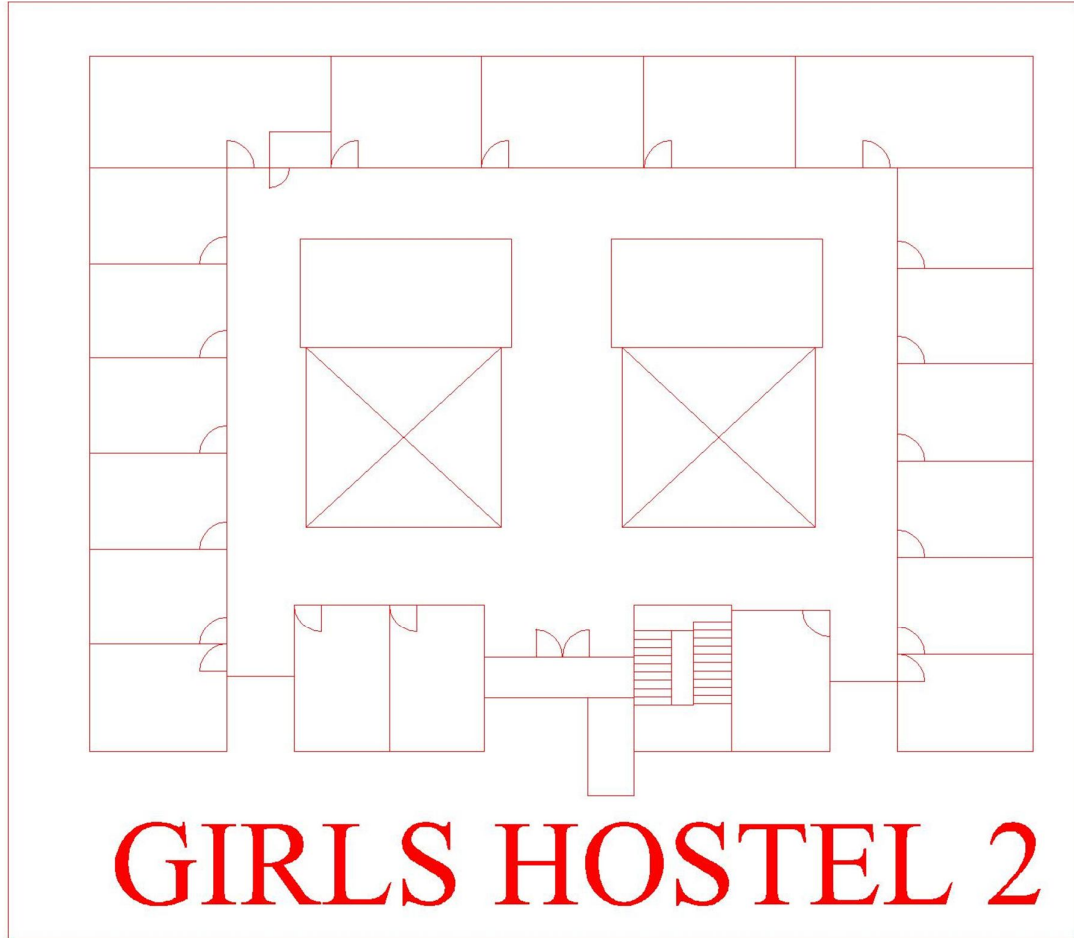


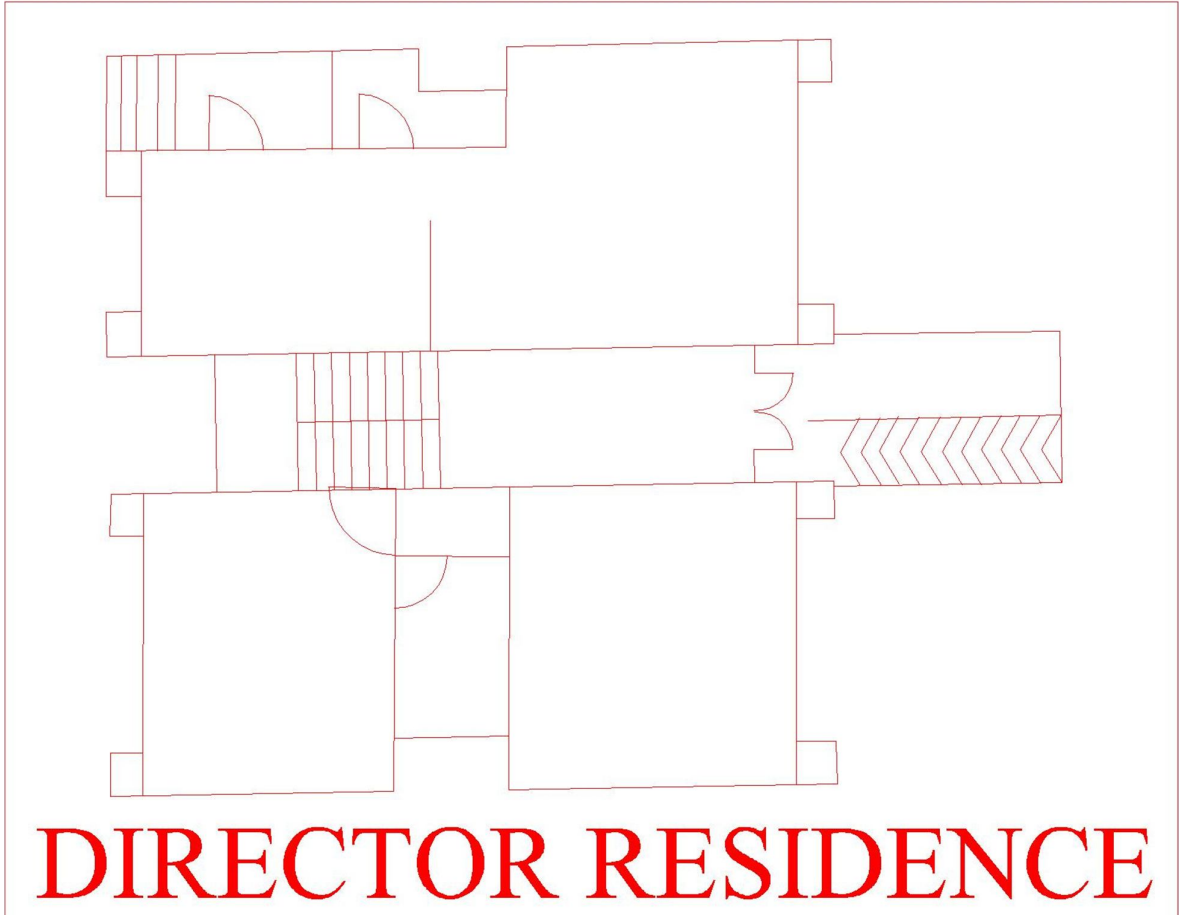


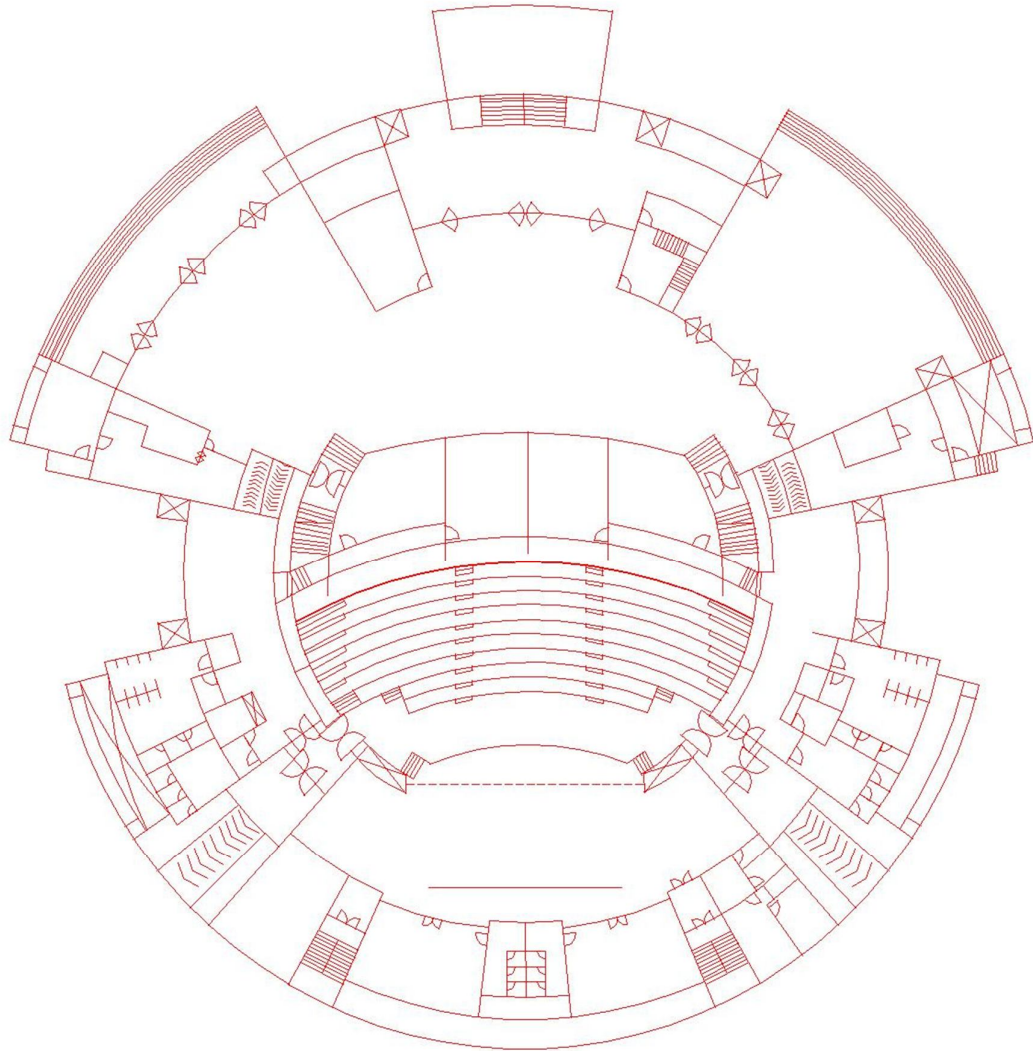




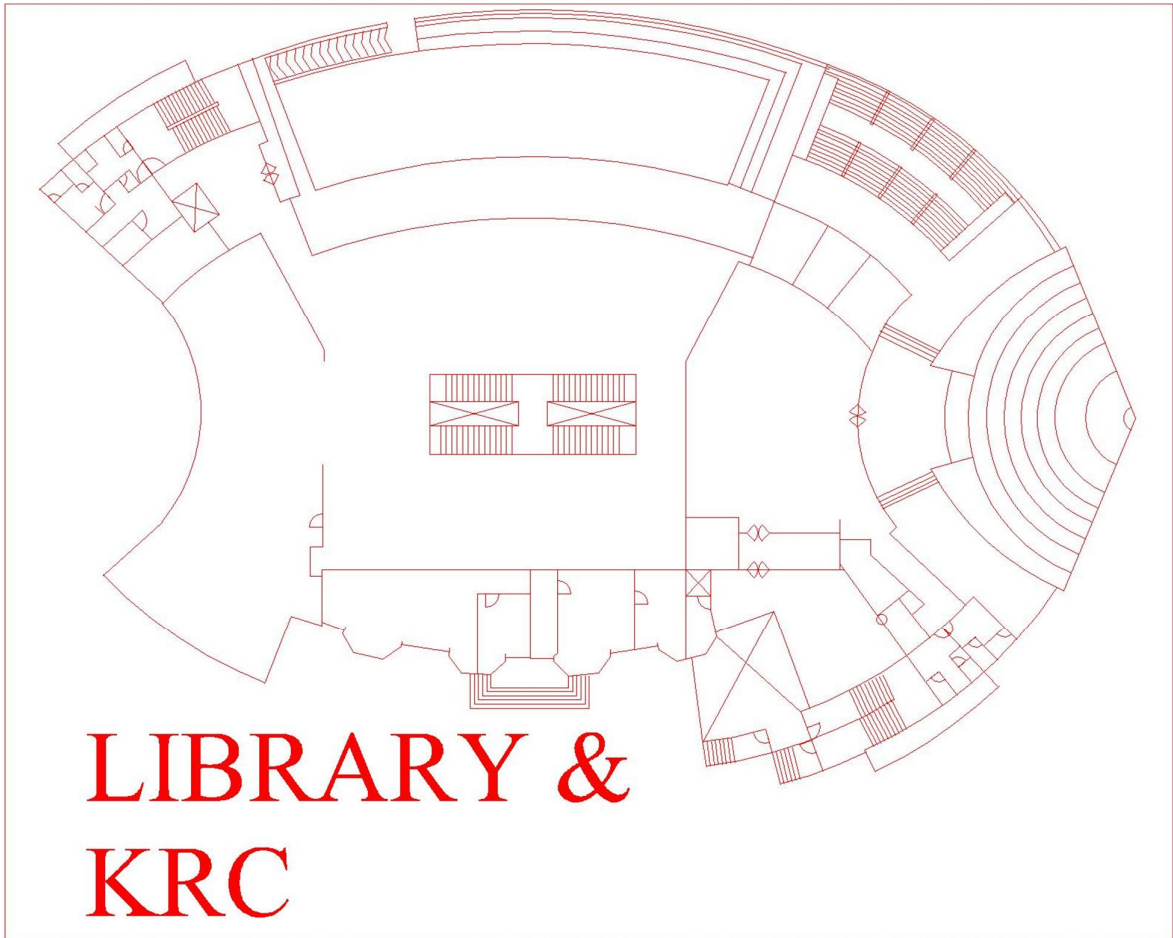


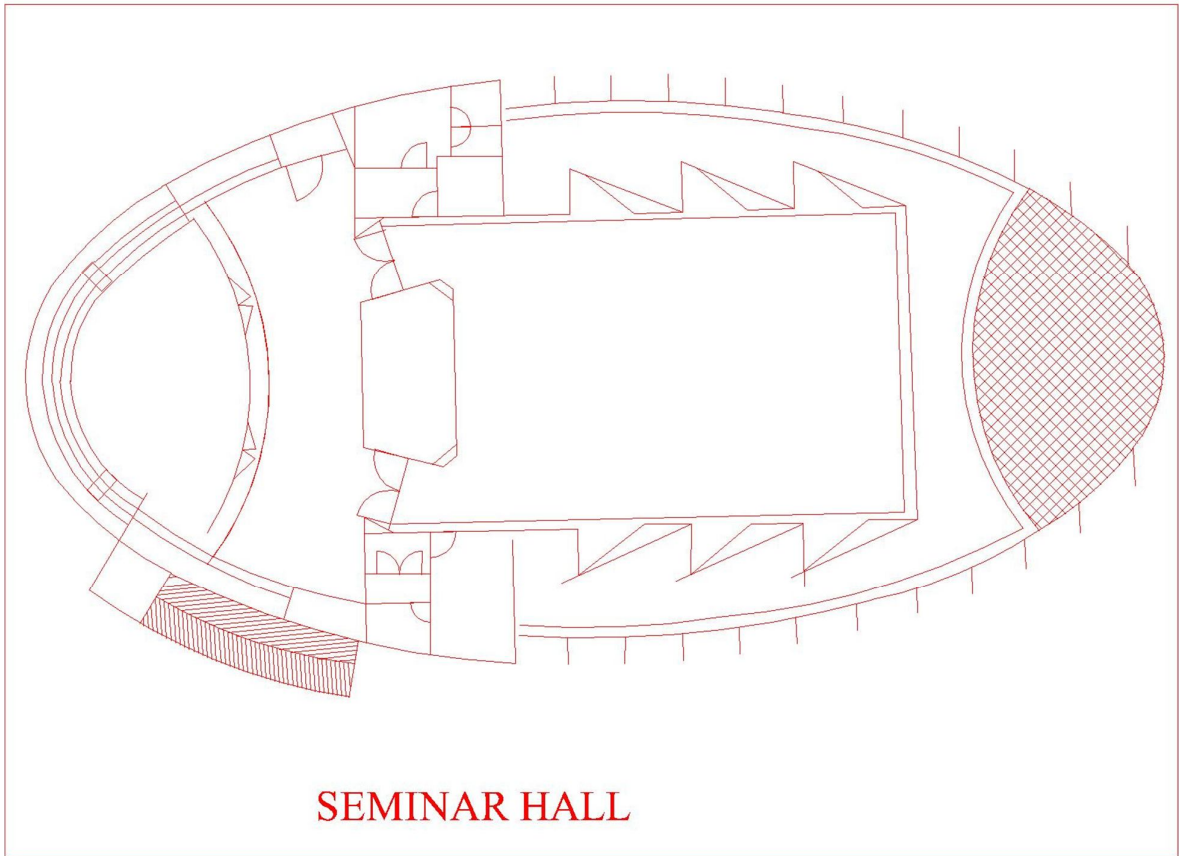


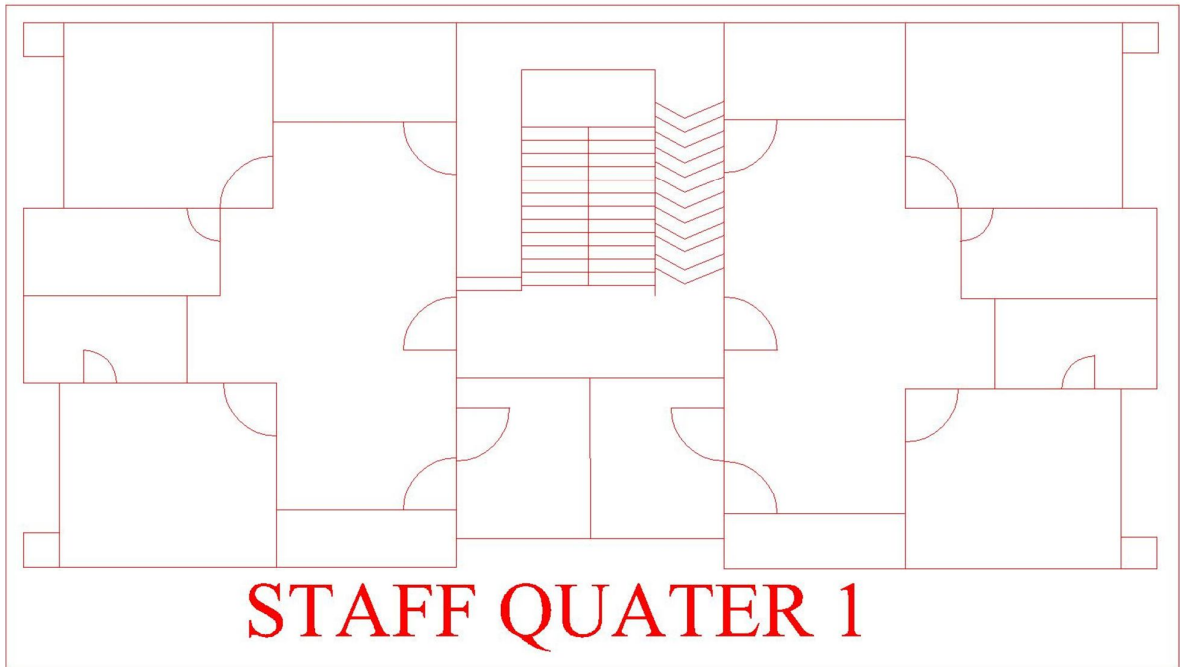


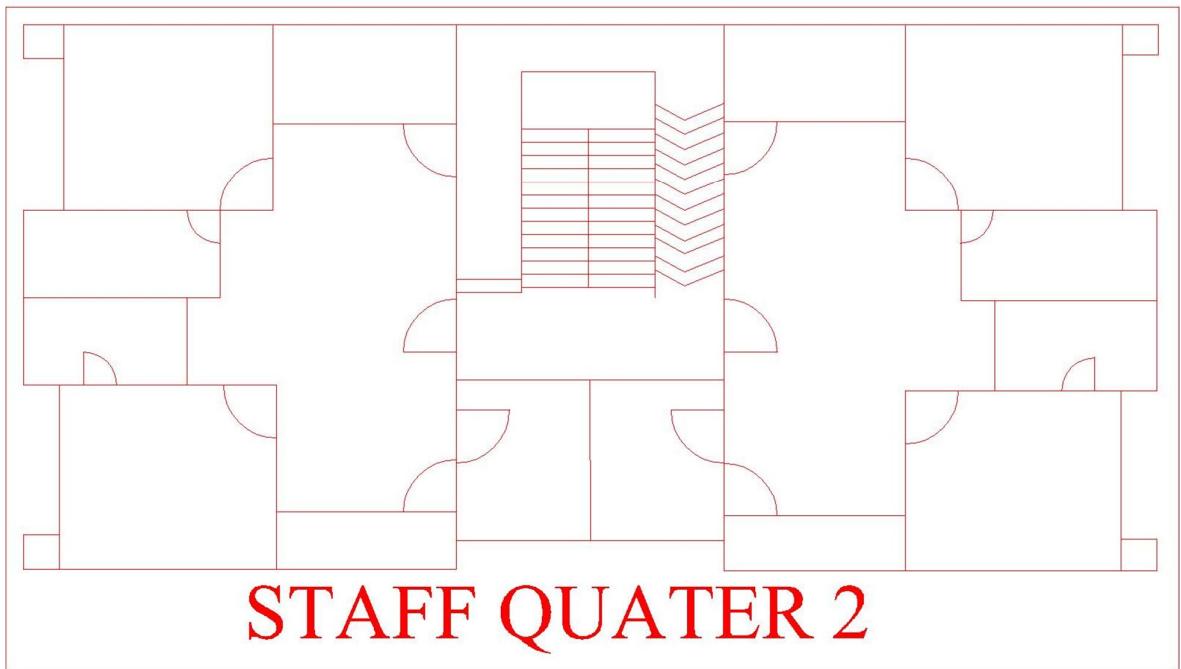


GURUNANAK AUDITORIUM

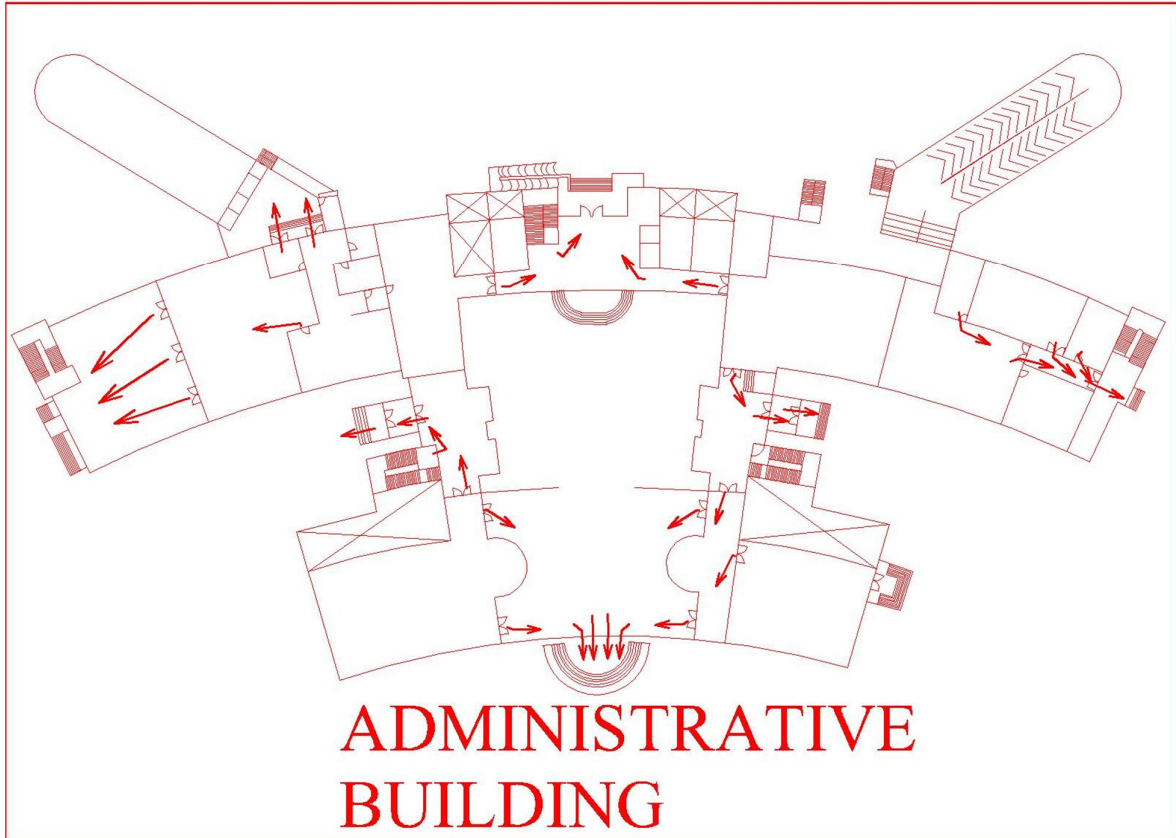


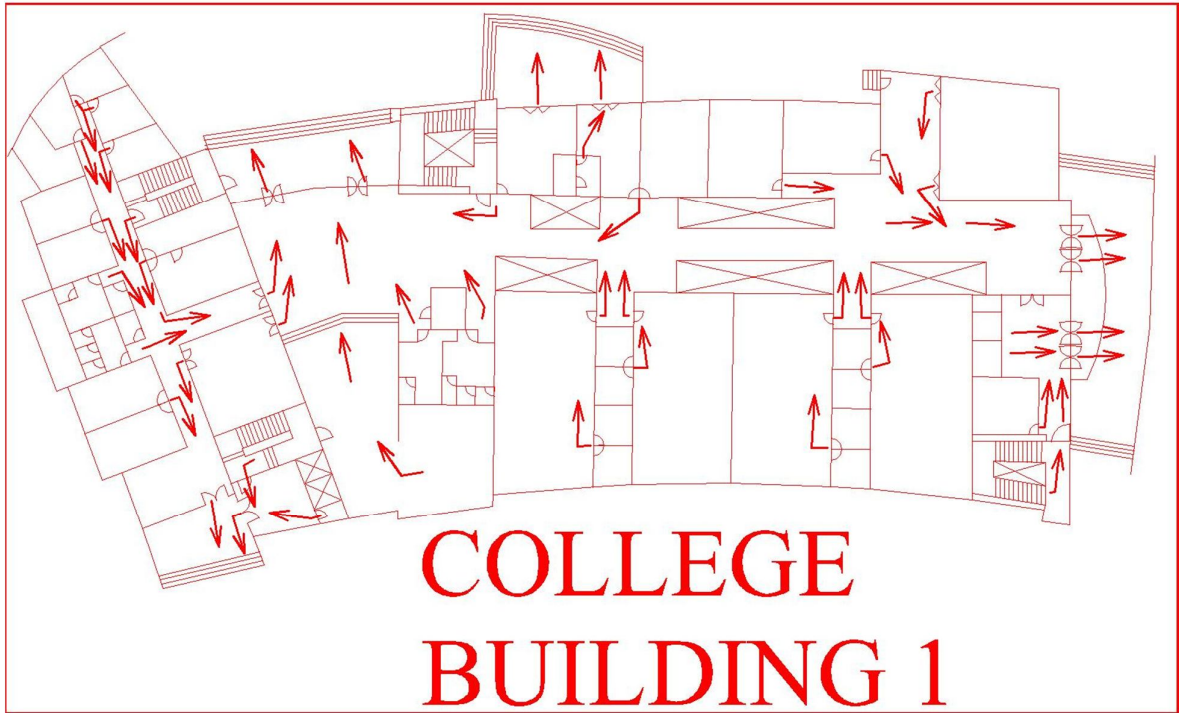


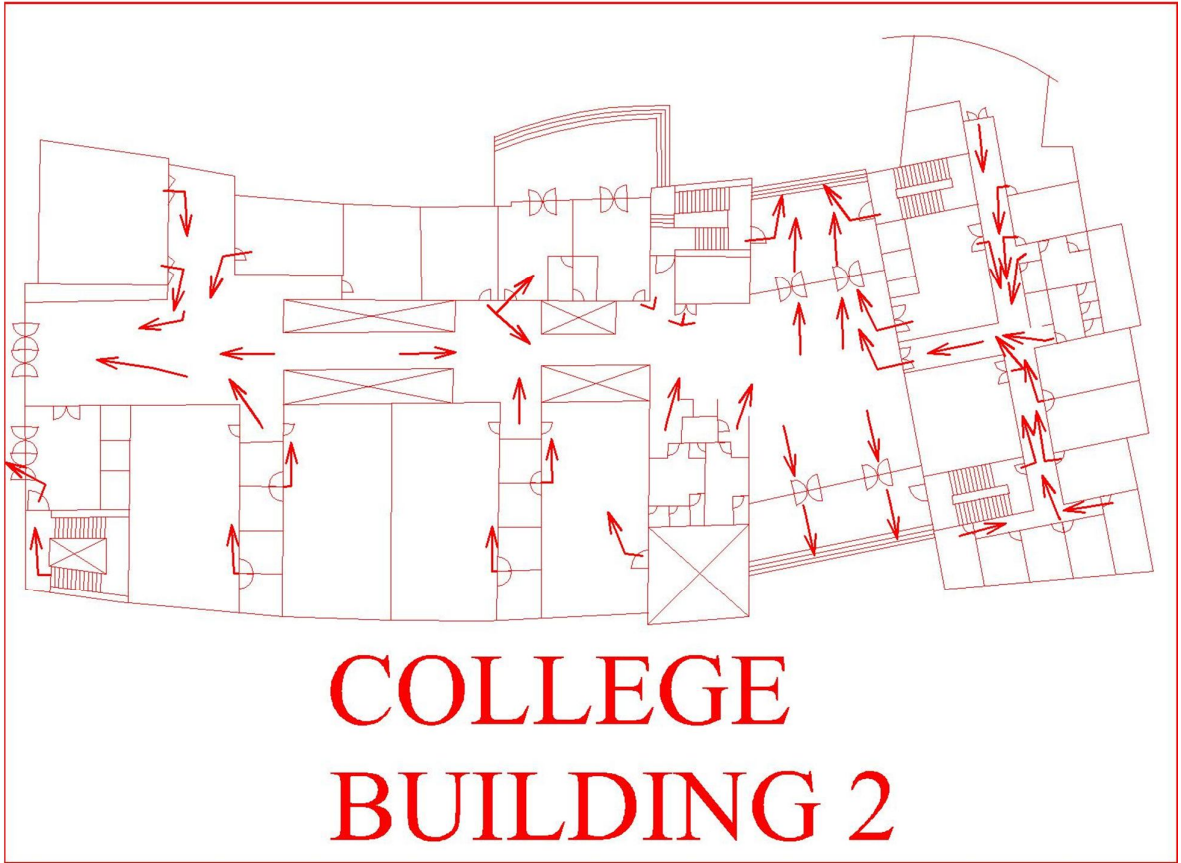


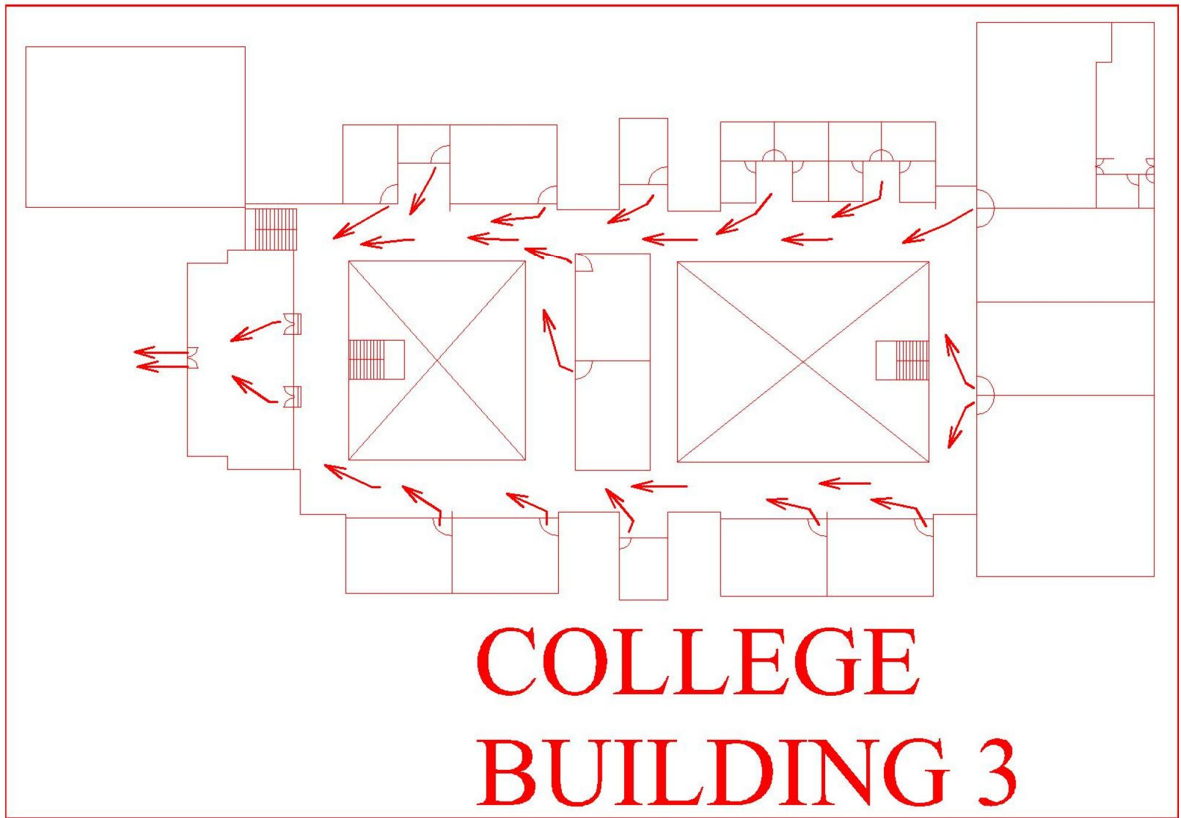


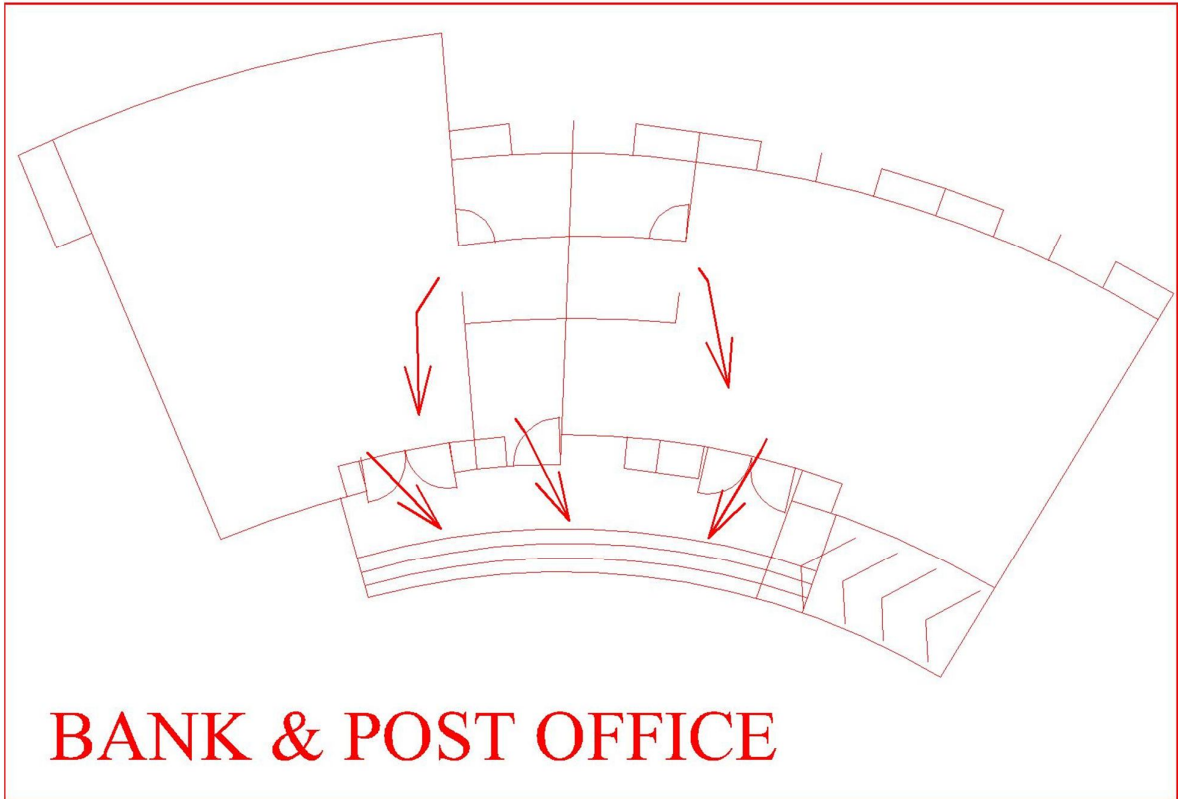
FIRE ESCAPE ROUTE

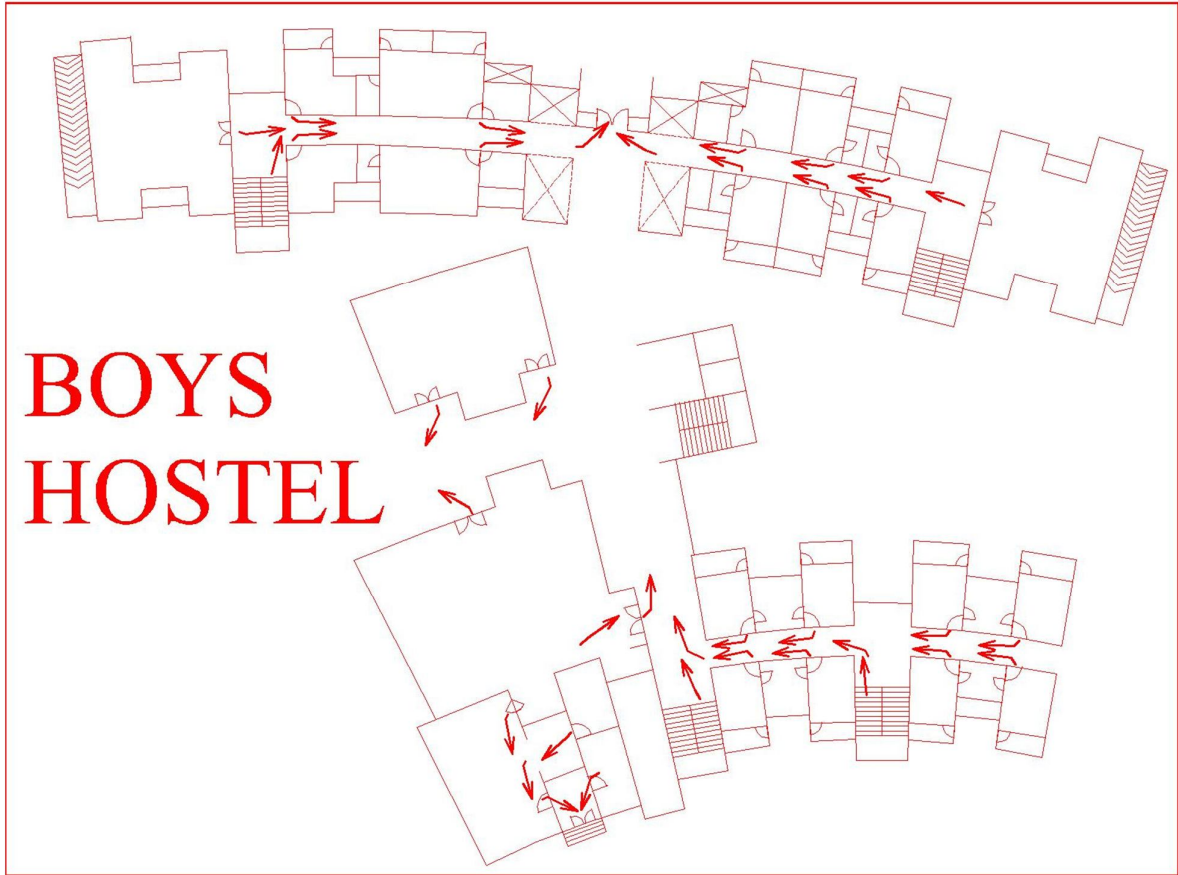




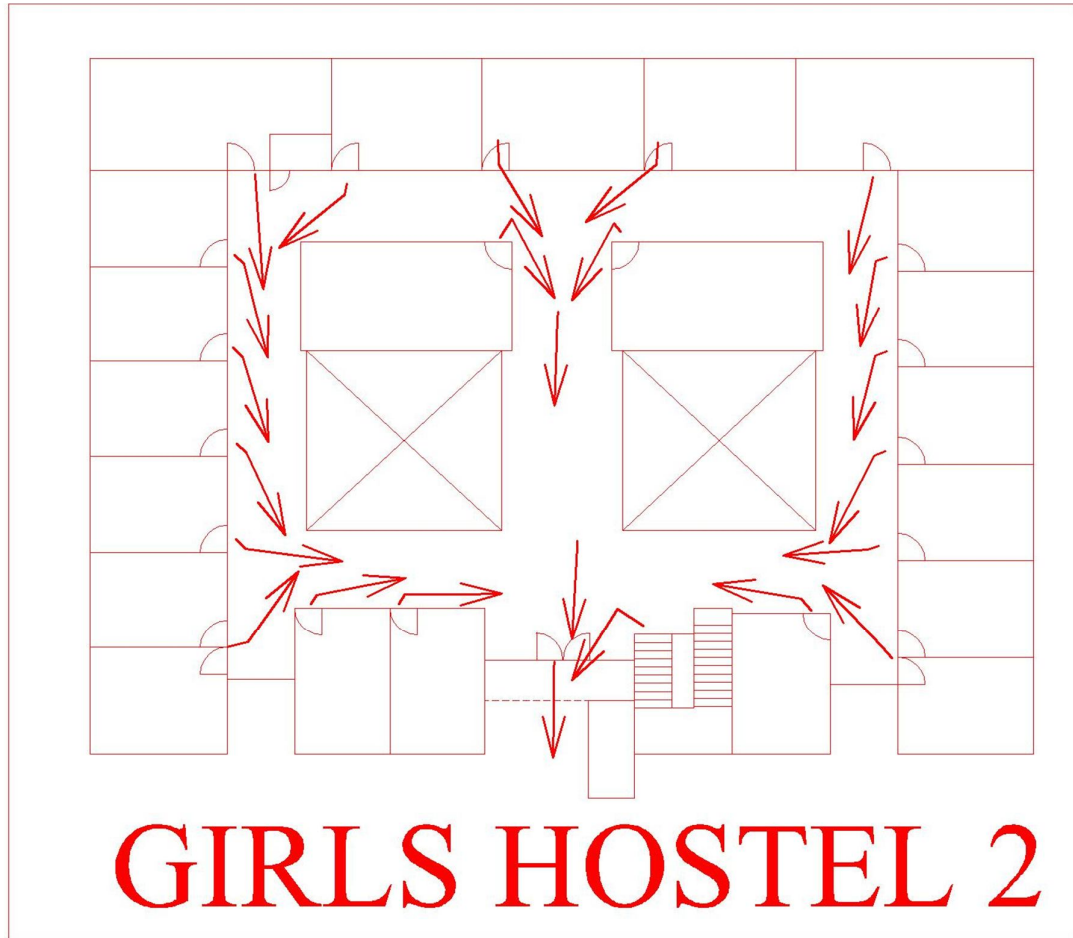


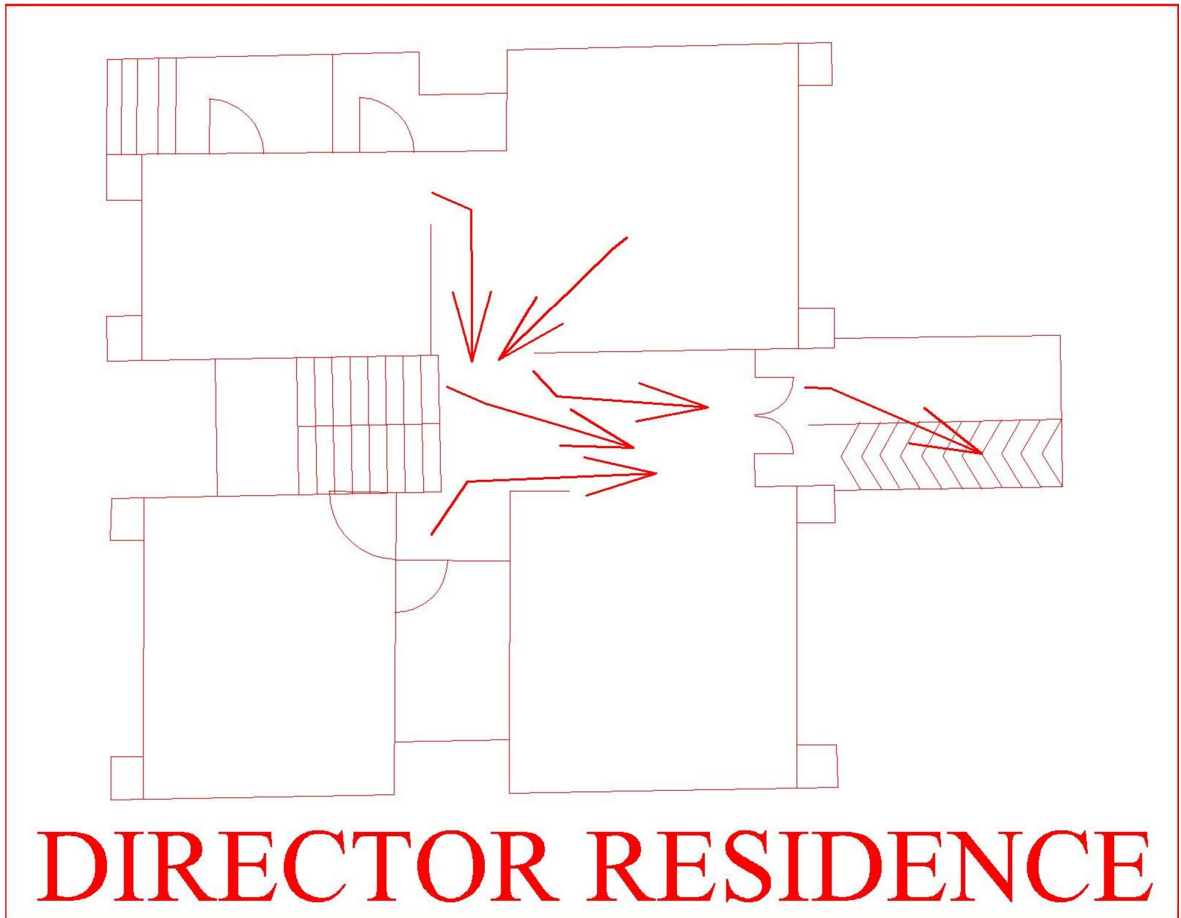


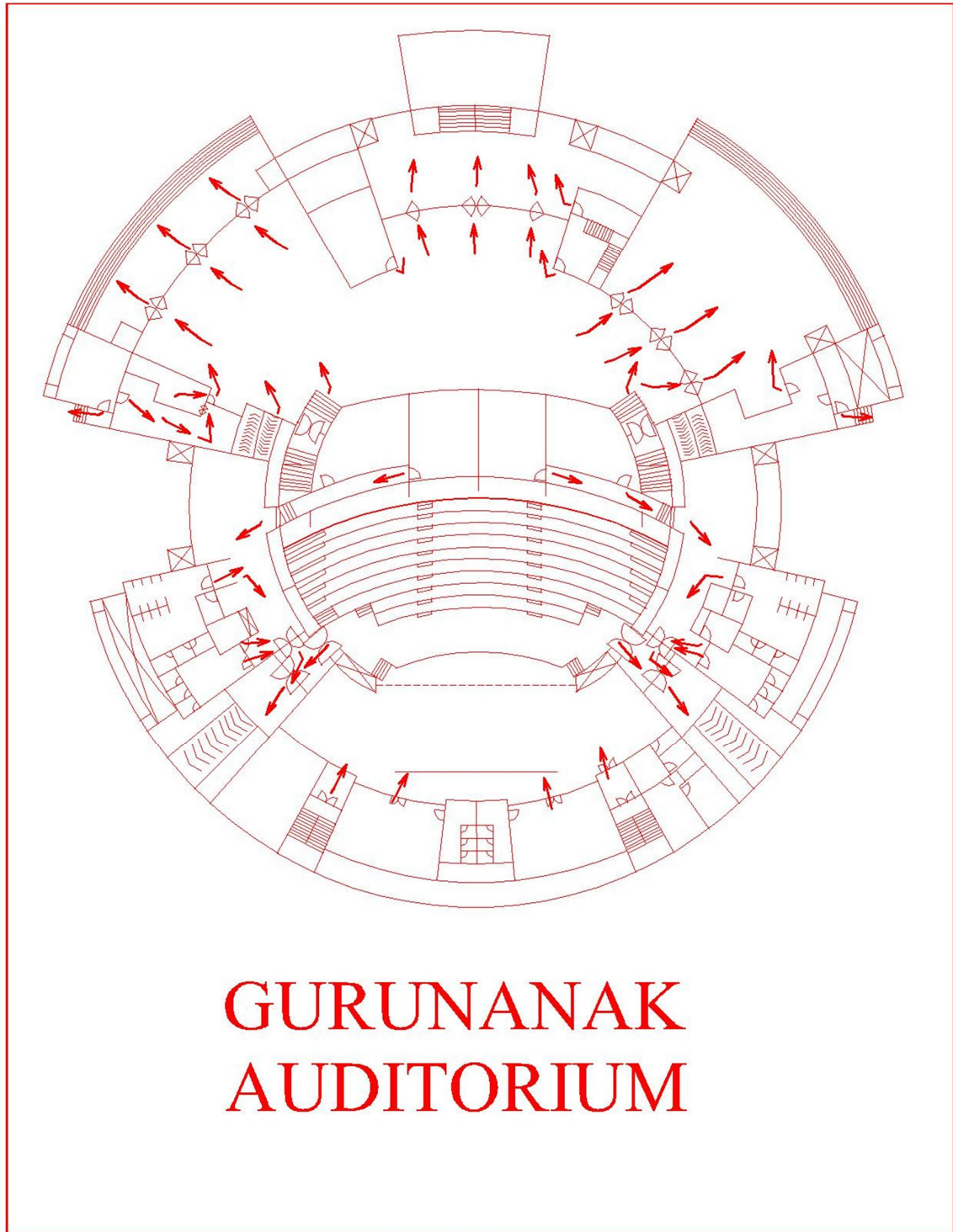


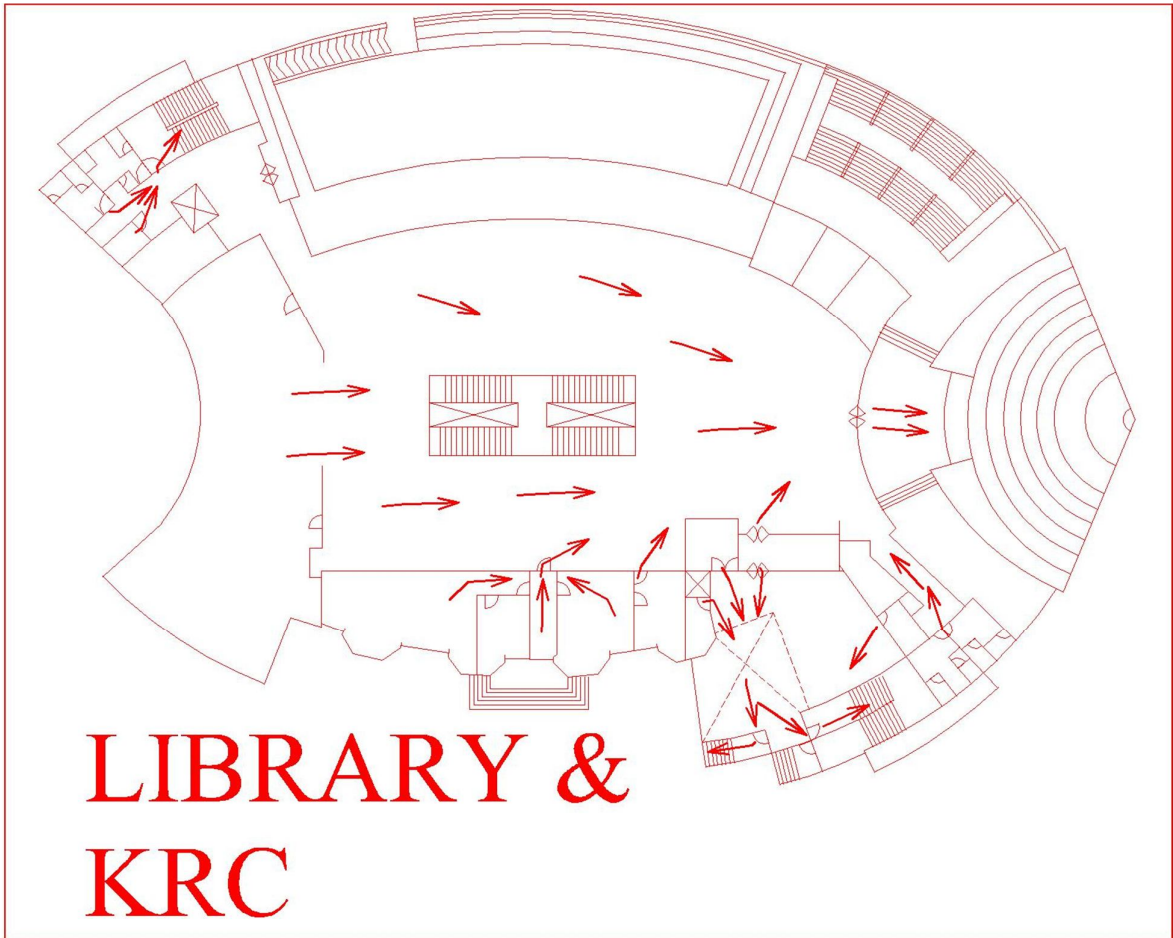


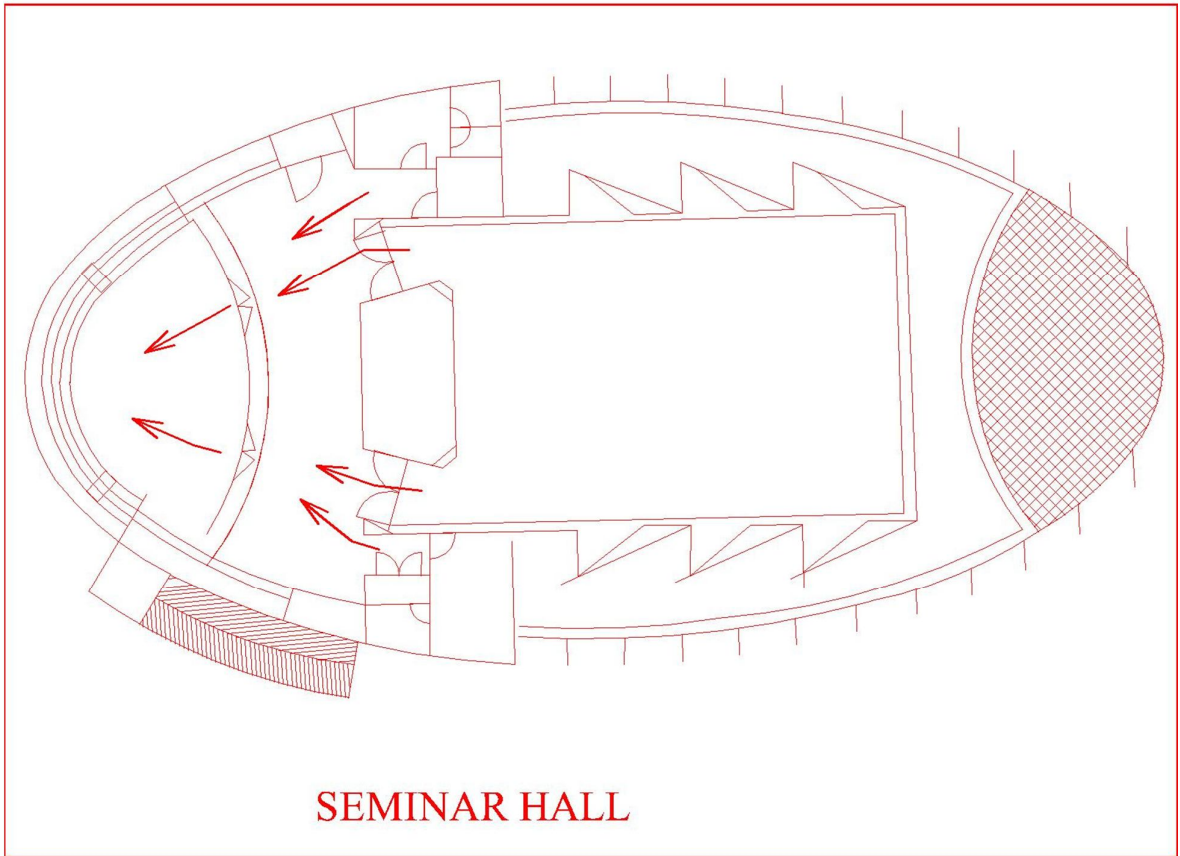


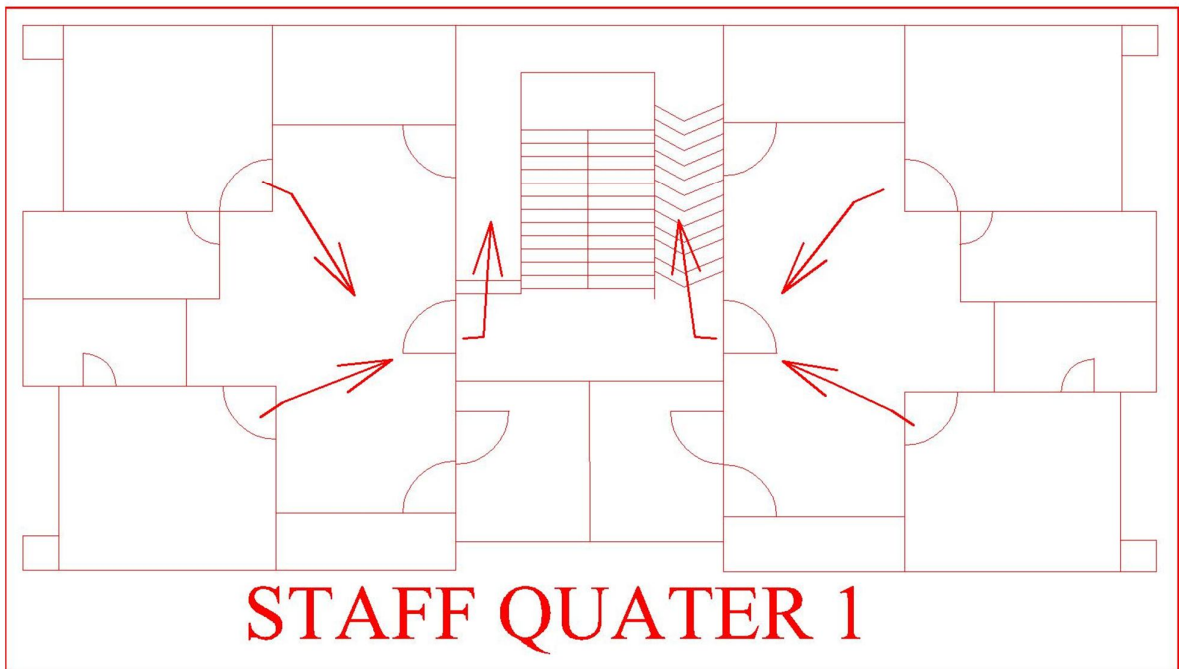


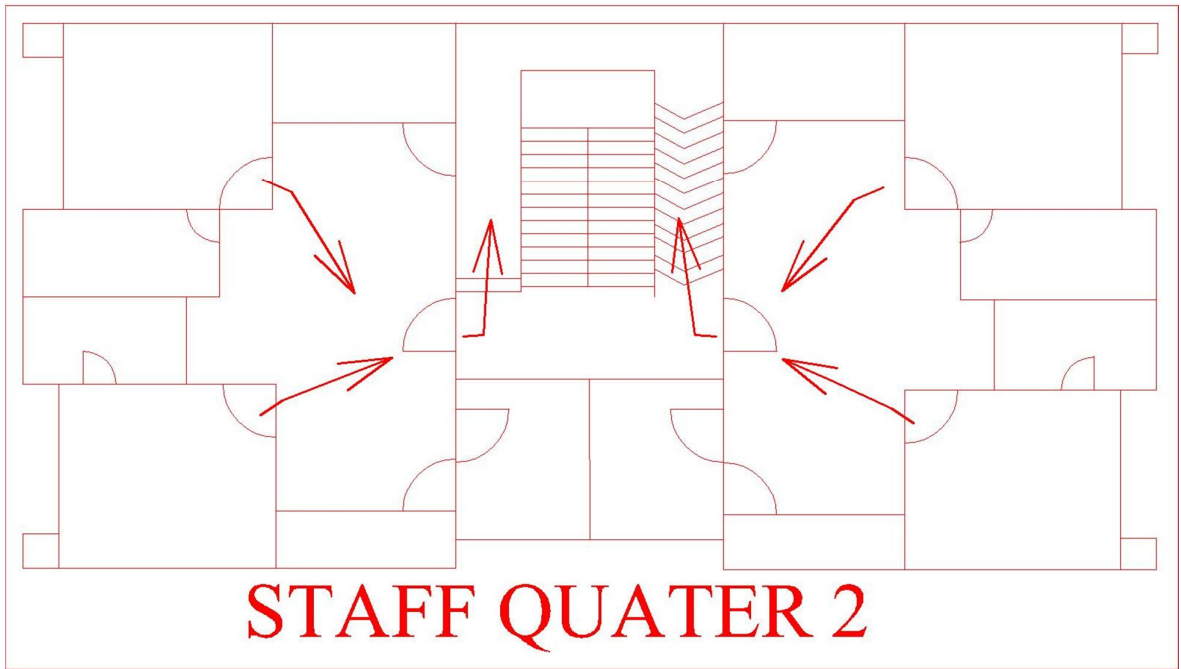












ANNEXURE B**DROUGHT RESISTANT SPECIES**

Tree species	Common Name	Tree species	Common Name
Prosopis cineraria	Khejri	Azadirachta indica	Neem
Capparis deciduas	Kiari , Caperbrush	Diospyros melanoxylon	Tendu
Tamarix aphylla		Ougeinia oojainensis	
Acacia tortillas		Commiphora caudata	
Zizyphus nummularia	Jungli Ber	Bauhinia variegata	Kachnar
Prosopis juliflora	Kikar	Eucalyptus tereticornis	
Tecomella undulata	Rugtor/Wavy leafed Tufmella	Pongamia Pinnata	Karanj
Colophospermum mopane		Casiasia meia	
Salvadora oleoides		Anacardium occidentale	Cashew
Acacia aneura		Holoptelia integrifolia	
Parkinsonia aculeate		Acacia catechu	Katha
Dichrostachys cineraria		Boswellia serrata	Lobaw
Acacia holosericea		Butea monosperma	Palash
Borassus flabellifera	Tar	Casseea fistula	Amaltas
Tree species	Common Name	Tree species	Common Name
Grewia tenax	Falsa	Albizia amara	
Commiphora wightii	Guggal	Dalbergia latifolia	Eastern Rose wood
Acacia seyal		Erythrina indica	Coral Tree
Eucalyptus	Eucalyptus	Ficus bengalensis	Banyan

Tree species	Common Name	Tree species	Common Name
camaldulensis			
Hardwickiabinnata		Ficusreligiosa	Peepal
Pithecelobiumdulce	Jungle Jalebi	Santalum album	Sandal
Celtisaustralis		Syzgiumcumini	Clove
Acacia albida		Terminalialata	
Albizialebbek	Shirish	Madhucalatifolia	Mahua
Acacia nilotica	Babul	Acacia auriculiformis	
Acacia ferruginea		Terminaliabellirica	Harad
Casuarinaequisetifolia	Jhar	Dendrocalamusstrictus	LathiBaans
Leucaenaleucocephala	Subabul	Moringaoleifera	Drumstick
Meleaazedirach		Terminaliaarjuna	Arjun
Sesbaniagrandiflora			
Tamarindusindica	Imli		
WrightiaTinctoria			
Morusindica/alba	Mulberry		

Source : Manual on norms and standards for EC of large construction projects-
MoEF

ANNEXURE C

EXPENDITURE ON GREEN INITIATIVES AND WASTE MANAGEMENT

Year wise Expenditure

Year	Expenditure on green initiatives and waste management excluding salary component (INR in Lakhs)
2013-14	
2014-15	
2015-16	
2016-17	
2017-18	

Detail breakup of expenditure

S.NO	YEAR	LIGHT	WATER	PLANTS
1	2013-14			
2	2014-15			
3	2015-16			
4	2016-17			
5	2017-18			

ANNEXURE D

STANDARD FORMAT FOR ENERGY RECORD

1. Standard format for electricity record

Meter No/ IBRS No Location

S.No.	Duration of bill	Reading in Last bill	Reading in this bill	Unit Consumed	Electricity use charges	Fixed charges	Other Charges	Power (P.F.) Factor	Payment details

2. Standard format for LPG record

Connection No.

Location of Use

S.No.	Date of Refill	Supply agency	Amount Payable in this bill	Weight of Cylinder	Date of use	Duration of use	Date and time of empty

Standard format for machine operation

S.No.	Date	Time from	Time till

ANNEXURE E

CALCULATION FOR PERCENTAGE OF ELECTRICITY CONSUMED FOR LIGHTING

BY LED

Total lighting load

S.No.	LUMINAIRES	Connected load in KW
1	Tube light T5/T8	139
2	CFL	80.6
4	LED (B)	84.1
5	Metal Halide	92
	Total energy consumption (A)	395.7
	Total energy consumption by LED	84.1
	Percentage of energy consumption by LED (C/D)x100	21.25%

ANNEXURE F

Electricity consumption from April 2015 to September 2019

Months	MDI	KWH	KVAH	PF	CD In KVA	SL In KW
Sep-19	1460	332708	298200	1.12	3396	3056.84
Aug-19	2080	459931	395160	1.16	3396	3056.84
Jul-19	-	-	-			
Jun-19	1329	260418	263882	0.99	3396	3056.84
May-19	1080	239392	241636	0.99	3396	3056.84
Apr-19	700	138808	139830	0.99	3396	3056.84
Mar-19	661	100066	100428	1.00	3396	3056.84
Feb-19	980	186272	186534	1.00	3396	3056.84
Jan-19	962	235852	236324	1.00	3396	3056.84
Dec-18	916	174178	174524	1.00	3396	3056.84
Nov-18	562	99900	100222	1.00	3396	3056.84
Oct-18	1476	136126	136376	1.00	3396	3056.84
Sep-18	1476	214670	216780	0.99	3396	3056.84
Aug-18	1627	293294	296822	0.99	3396	3056.84
Jul-18	1264	265010	270002	0.98	3396	3056.84
Jun-18	1377	249802	255558	0.98	3396	3056.84

Months	MDI	KWH	KVAH	PF	CD In KVA	SL In KW
May-18	1249	243638	249620	0.98	3396	3056.84
Apr-18	1056	163470	167794	0.97	3396	3056.84
Mar-18	636	106854	109732	0.97	3396	3056.84
Feb-18	832	151318	152828	0.99	3396	3056.84
Jan-18	1117	213330	217020	0.98	3396	3056.84
Dec-17	779	227960	237594	0.96	3396	3056.84
Nov-17	-	-	-			
Oct-17	1016	144300	147714	0.98	3396	3056.84
Sep-17	1203	404210	415843	0.97	3396	3056.84
Aug-17	-	-	-			
Jul-17	1907	318844	331643	0.96	2000	2000
Jun-17	1337	252295	260709	0.97	2000	2000
May-17	1086	218533	226120	0.97	2000	2000
Apr-17	1061	149885	155781	0.96	2000	2000
Mar-17	299	104912	113442	0.92	2000	2000
Feb-17	753	139915	143152	0.98	2000	2000
Jan-17	738	164064	168203	0.98	2000	2000

Months	MDI	KWH	KVAH	PF	CD In KVA	SL In KW
Dec-16	691	108339	110515	0.98	2000	2000
Nov-16	229	63431	66089	0.96	2000	2000
Oct-16	891	106792	111347	0.96	2000	2000
Sep-16	931	164686	169064	0.97	2000	2000
Aug-16	891	199593	204407	0.98	2000	2000
Jul-16	1079	140935	143676	0.98	2000	2000
Jun-16	1128	165717	169046	0.98	2000	2000
May-16	810	138630	142485	0.97	2000	2000
Apr-16	625	78768	81198	0.97	2000	2000
Mar-16	162	42563	45174	0.94	2000	2000
Feb-16	613	90102	91963	0.98	2000	2000
Jan-16	640	134238	137931	0.97	2000	2000
Dec-15	640	134238	136931	0.98	2000	2000
Nov-15	615	91765	94127	0.97	2000	2000
Oct-15	567	74477	78732	0.95	2000	2000
Sep-15	868	192689	197078	0.98	2000	2000
Aug-15	836	125220	127280	0.98	2000	2000
Jul-15	884	118320	120320	0.98	2000	2000

Months	MDI	KWH	KVAH	PF	CD In KVA	SL In KW
Jun-15	863	148620	150080	0.99	2000	2000
May-15	596	84520	86480	0.98	2000	2000
Apr-15	-	45940	47520	0.97		
Mar-15						
Feb-15						
Jan-15						

Abbreviations

Abbreviations	Full form		
MDI	Maximum demand (import)	PF	Power factor
KWH	kilo Watt Hour	CD	Contract Demand
KVAH	Kilo Volt Ampere Hours	SL	Sanctioned Load

ANNEXURE G**BACK GROUND CALCULATION FOR CALCULATING CARBON FOOT PRINT**

LPG consumption					
S.No	Description	Numbers	weight of Cylinder in Kg	Months for operations	Total in Kg
1	BOYS HOSTEL	68	19	68	87856
2	GIRLS HOSTEL	16	15	12	2880
		20	12	12	2880
3	canteen	15	19	12	3420
Total LPG consumption per year					6300

Calculation for diesel consumption					
S.No	Description	Numbers	Fuel consumption liters/month	Months for operations	Total in liters
	Fuel for bus				
1	Own buses				
a	42 seater	1	560	12	6720
	560 liter/month				
b	26 seater	2	250	12	6000
	250 liters/month				
	distance 35 km per day				
2	hired buses				
a	52 seater	4	450	12	21600
	450 liter/month				
	distance 40 per day				
	Private four wheeler approaching University per month (taking 20 working day in a month) with average running 20 km/day fuel efficiency 16 km/liter	100	25	12	30000
	Total diesel consumption per year by vehicle				64320

DG Set Fuel consumption

S. No	Location	Capacity in KVA	No. s.	Fuel consumption per set lt/hr	Fuel consumed in a month in lt	Months for operations	Total in liters
1	G+7	62.5	1	12	48	12	6912
2	AB 3	82.5	1	14	56	12	9408
3	AB 3	180	1	30	120	12	43200
4	G+7	380	2	55	220	12	145200
5	AB1, AB 2	500	2	80	360	12	345600
	Total diesel consumption per year by DG Set						550320

Note : operation time considering 4 hours a day

Total diesel consumption in liters per year in the campus

614640

Calculation for Petrol consumption					
S.No	Description	Numbers	Fuel consumption liters/month	Months for operations	Total in liters
1	Private four wheeler approaching University per month (taking 20 working day in a month) with average running 20 km/day fuel efficiency 16 km/liter	100	25	12	30000
2	Private Two wheeler approaching University per month (taking 20 working day in a month) with average running 20 km/day fuel efficiency 50 km/liter	125	8	12	12000
	Total diesel consumption per year				42000

Calculation for Public conveyance bus

80% of the
above 2708

S.N	number of users	Average distance covered per day	Nos.	Monthes for operations	Total no of users
1	2708	10	20	12	6499200