SUPPORTING DOCUMENT FOR 7.1.6

QUALITY AUDITS ON ENVIRONMENT AND ENERGY REGULARLY UNDERTAKEN BY THE INSTITUTION.

INDEX

GREEN AUDIT

The Green Beans Society conducted **a tree biodiversity index study** where the variety of trees present in the College were catalogued.

Botanical Audit

We at Kamala Nehru College through the Green Beans Society and the Department of Environment Sciences work for the awareness and sensitisation of students towards contemporary environmental issues that goes a long way in making environmentally conscious citizens. Issues like conservation of energy and water, solid waste management and biodiversity study are the key issues to focus. We have conducted an energy audit of the College in 2014 and initiated the solid waste system as well in the past. The birds and trees on campus have already been accounted for. Such studies have helped in raising the students' awareness towards biodiversity and its importance in maintaining ecological balance. We stepped forward in the second phase of the project Botanical Audit in the session 2017-2018. The project was undertaken by the students of the society under the guidance of Dr. Sarita Ghai and Dr. Akansha Mishra. The interested students of the society enrolled themselves for the project. Biodiversity is the variety of living forms present in an area. Not only a biodiversity rich area increases the aesthetic value, it plays a crucial role in maintaining the ecological balance of any given ecosystem. Any given species inhabits an area where all its requirements are fulfilled. Hence the species are particularly specific to the area/region and climate where they are found. This gives a unique characteristic biodiversity pattern to a given area with certain climatic conditions. In this study we are trying to analyse the floristic biodiversity present in our college excluding trees. Study area

The study area for this project remains the premises of Kamala Nehru College campus.

Sampling and Analysis The sampling of plants for conducting this biodiversity study or Botanical audit is multi-layered. To begin with, all the plants are classified based on their size. The three major categories are herbs, shrubs and trees. The description of each of the categories is given below: Herbs: Plants which have soft, green and perishable stems are called herbs. They are generally smaller in size, they are not more than one metre in height and may live for 1-2 seasons. Shrubs: Plants with woody stems, and branches of almost equal size arising from the stem immediately above the soil are called shrubs. They look like bushes and are medium sized plants. They survive for many years through less than trees. Examples: china rose, lemon, jasmine etc. Trees: The trees are tall and big plants. They have one hard, woody stem called trunk. It bears woody branches, twigs and leaves at some distance above the ground. Trees generally survive for many years. Examples: mango, neem, banyan etc. Botanical Audit of Trees (the updated information) The biodiversity study for the trees has been conducted last year in which it was found that there are a total of 32 species of trees all of which have been identified to species as well as to the genus level. A total number of 247 trees were found in the college campus. Upon calculating the Biodiversity Index for the same we have inferred that the Biodiversity of trees in our college is quite rich. The value of D ranges from 0 to 1 and the biodiversity index (D) of trees in the college ecosystem is 0.88. This figure is a direct as well as indirect reflectance of the diverse species of trees present here. Second Phase of the Study: Herbs, shrubs and grasses.

A comprehensive study of the herbs and shrubs of the winter season was conducted by the students. For this the entire green area of the campus was divided into several zones (a rough thematic map for the same is attached herewith). Within each zone the variety and number of shrubs were counted and documented. The same procedure was followed for the herbs of measurable size above the ground. To reflect the microcosm of the college we have catalogued few varieties of shrubs, herbs and grasses:

1. Category : Shrub

Scientific name – Duranta erecta "Gold" / Duranta repens

Common Names – Duranta Gold, Golden Dewdrop, Golden Skyflower, Golden Pigeon Berry

Family – Verbenaceae

Description – It is a vigorous large broadleaf evergreen shrub and is widely cultivated as an ornamental plant intropical and subtropical gardens and has become naturalized in many places. It attracts butterflies and hummingbirds.

Fig.1 **Duranta Gold**

Source: Primary Field Survey

2. Category: Herb

Fig.2 **Ganda**

Source: Primary Field Survey

Scientific Name – Calendula officinalis

Other names – Garden Marigold, Gold bloom Local name – Ganda

Family – Calenduleae

Description – A native of Southern USA and Mexican regions it is a multi-purpose herb. They produce one of the most beautiful flowers in the plant kingdom.

3. Category : Herb

Scientific Name – Lobularia maritime

Common Names – Alyssum, Sweet Alyssum, Carpet Flower

Description – It is a delicate carpet of tiny flowers with a subtle, sweet scent with narrow, lance-shaped, slightly hairy gray-green leaves. It is a cool season flower.

Fig.3 **Carpet Flower**

Source: Primary Field Survey

Fig. 4 **Sweet Pea**

Source: Primary Field Survey

.Category : Herb

Scientific name – Lathyrus odoratus L.

Common Name – Sweet pea Family – Fabaceae

Description – It is an annual climber which can grow up to 2 m at a fast rate. The leaves are pinnate with two leaflets and a terminal tendril, which twines around supporting plants and structures, and thus helps the plant to climb

2. ENERGY AUDIT REPORT

3. ENVIRONMENT AUDIT

DRAGONFLY COUNT

The Green Beans Society, in association with WWF (World wide fund for nature) and BNHS (Bombay Natural History Society) has organised dragonfly count. It was held on 7th August, 2018, in association with WWF during the Dragonfly Festival 2018.

Campus Count of Dragon Flies on 7th August, 2018

As part of the Kamala Nehru College environment Club, the Green Beans Society's biodiversity initiative, a campus count of Dragonflies was organised in association with WWF. The College was

part of the WWF's celebration of India's Dragonfly Festival. The month-long celebrations, starting from 3rd August were aimed at creating awareness about dragonflies and their importance for humans.

In order to conduct the Campus count, Ms. Geeta from BNHS, Ms. Nazneen, a well- known dragonfly expert and Mr. Santosh were invited. Before conducting the campus count in the college fields, Ms. Geeta and Ms. Nazneen gave a presentation on dragonflies discussing about the morphology, life cycle and the ecological importance of dragon flies.

A field survey was conducted after the presentation during which all the green areas of the campus were covered. This was done because dragonflies breed during the rains. But to spot them, a sunny day is ideal.

On the basis of our count, only one species of dragonfly was found in the campus. The species found is known as *Pantala*. It is an orange colored, migratory species from South Africa. *Pantala* is the genus of dragonfly in the family Libellulidae, commonly called as the rain pool gliders. They are found almost worldwide.

Ms Nazneen giving the presentation and during the survey in College grounds.

Results:

S.No.	Description	Image

1	ScientificName: *Pantala* CommonName: Rainpool Gliders Family: Libellulidae	

2. ENERGY AUDIT REPORT

January 2020

Auditor report & Assessment study on Energy Consumption & Lighting Intensity

Prepared For

Kamala Nehru College University of Delhi August
KrantiMarg, New Delhi 110049

Project No.: ITPL19-R-4012

Issued By:

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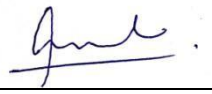
Checked by	AVM	20th January 2020	Consultant	
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CHAPTER 1 OBJECTIVES, PREAMBLE,

METHODOLOGY& EXECUTIVE SUMMARY

1.1 Introduction& Objectives

A Walk through audit and assessment study has been carried out in accordance to the Work order (KNC/ 2019) dated 30th December 2019 issued by Kamala Nehru College to assesscurrent Electrical energy consumption scenario in the campus & to suggest measures that may be adopted by them for improving energy efficiency including recommendations for Renewable energy sources.

Another objective is to assessilluminance level in various classrooms, Tutorial rooms, Seminar rooms, Laboratories, offices& other sections of the academic and non- academic buildings & suggest recommendation for improvement using energy efficient lighting system.

In compliance to the Work order requirement of performingthis assignment by a BEE certified auditor, our team including **Mr. A. C. Verma** (BEE certified auditor) conducted a Walkthrough audit of the college premises on 3rdand 7 thJanuary 2020.

1.2 Preamble

Kamala Nehru College was established on 20 th July, 1964. At that t ime, it was known as 'Government College for Women' and was located in Defence Colony. The College ini t ially offered courses only in Humanities but later the Commerce stream was added.

In 1966 - 67, the College was renamed as 'Modern College for Women . ' On 21 stNovember 1972, the foundation stone for a new building was laid by then President Shri. V. V. Giri. The college was given a new name and i t became Kamala Nehru College i n 1974, on the occasion of its Founder's Day.

The college has a beautiful auditorium which was built through sincere contribution made by the staff and students through fund raising campaigns. Today, the college has well maintained computer laboratories, sports ground, gymnasium and eco - friendly classrooms (bamboo rooms apart from the main building).

The library is well stacked and has a separate audio visual section. The college is differently- abled friendly and is under constant CCTV surveillance.

The Placement Cell, NSS, NSO, NCC and Counselling Cell function for the overall wellbeing of the students. Kamala Nehru College has several extra- curricular societies that cover the whole gamut of personality development aspects by providing plural avenues to students for self- discovery. The long- standing commitment of the college towards excellence was rewarded in the form of an ' A' grade by the National Assessment and Accreditation Council in 2016 .

Today the college stands tall as one of the best ' All Women College' in the University of Delhi striving sincerely to shine on all fronts — be it academics, culture and sports.

Indohaan Technologies Pvt Ltd offers a comprehensive Health, Safety, Environmental and Risk management consultancy services for commercial buildings, manufacturing uni ts, large industrial plants, educational institutions and office premises. Our key services include consulting and training in:

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- Process Hazard Analysis
- Occupational Health
- Energy and Environment
- Sustainability

1.3 Methodology Adopted

To achieve the objectives stated in clause 1. 1 above, the following methodology was adopted:

1. Inventory data of Lighting luminar ies, Fans/ Exhaust units, Window/ Split Air conditioners, Computers/ UPS, Laboratory equipment, Pumps, Transformer & all related Equipment for Electric distribution system and the areas occupied by the

buildings was collected by a site visit &discussion held with concerned electrical technician, coordinator & the Principal of the college

2. BSES Energy bills were collected for Winter & Summer monthsfrom December 2018 to December 2019
3. I lluminance (Lux) measurement was carried out in selected sections of the College, Labs, Offices, Canteen etc

1.4 Assessment Study Team

Following were the members of Audit/ assessment team, who visited the College premises on 3rd and 7 thJanuary 2020 for a Walk throughaudit, data collection and Lux measurement:

- Mr. A. C. Verma –BEEcertified Auditor
- Ms. Deepika Soorma
- Ms. Kritika Mathur
- Mr. Ashok Grover (Partly)

1.5 Executive Summary

Summaryof the major f indings during Walk through in the college campus is presented below:

i. Based on the energy bill collected and the details of the various building areas, approximate Energy Performance Index (EPI) was found to be below 25 k Wh/ sqmt/ year. This is good and far below the limit of 90 k Wh/ sqmt/ year as specified by GRIHA for educational buildings. Refer Table - 4 for more details.

ii. Based on the availability of clear sky space on the roof of the college building, harnessing of solar energy for lighting and fan loads be done. **As a minimum the college should plan 50 Kwp solar panels** .

iii. . Lighting level measured in most of the classrooms and office spaces is low. Hence, to improve lux levels and making it energy efficient, replacement of l ighting f ixtures with LED l ighting to be carried out in a phased manner. This will also improve Indoor Environment Quality (IEQ).

iv. Wherever existing electrical device/ appliances such as fans , ACs, etc need replacement, replacement with energy efficient models should be done.

CHAPTER 2

AUDITING TEAM OBSERVATIONS

& REPORT

2.1 Auditing team observation report

In this Chapter, we have presented observation & recommendations by Mr . A. C. Verma –BEE certifiedauditor and team based on the Walk through visit to the college:

i. The Orientation of the college building is North- East. Windows of the class rooms on both sides of the central corridor of the building face either to north- east or south- west direction. There is glazing through- out on the external wall of the class- rooms. Hence the windows have been provided with curtains which normally remain drawn on the windows . See Chapter 3 for further details.

In Bamboo class rooms, there is not much daylight through windows due to tree-shades. Hence, there is no natural light in these class- rooms and the entire l ighting has to be artificial l ighting during college hours.

To reduce the operational hours of l ighting , alternate arrangement to curtain such as reflectivefilm on window glazingetc. is suggested to prevent the heat ingress but allow the daylight in. In some places, daylight sensors may be tried to integrate the day- l ighting with artificial lighting and reduce the demand for artificial l ighting.

ii. Notwithstanding the orientation, l ighting level measured in most of the classrooms and office spaces is low. See Chapter 4 for complete evaluation on l ighting performance.

iii. . Major electrical load in the college during the winter months is l ighting load and for summer months it is load due to air - conditioning and fans. 90% of the 578 nos. tube l ights are T- 5 Tube- lights of 38 W. These lightsbe replaced with energy- efficient LED tube- l ights/ lights in a phased manner. The resultant energy saving can be utilizedto improve the lighting level in the class- rooms by installing additional 200 plus LED lights.

iv. Almost 400 nos. of 75 W Ceiling fans are installed in college buildings. As part of continuous energy efficient improv ement efforts, whenever the need to buy new or replace fans for installation arises, it should be done using 28- 35 W super- efficient BLDC fans.

v. To improve the lighting levels on the blackboards in class - rooms, curved downward type l ight f ixture be provided.

vi. Occupancy sensors be used in wash rooms, offices and class rooms to switch- off the l ights and fans during non- occupancy hours.

vii. Computer rooms lighting needs to be improved. Computers on sleeping mode waste energy, so cut- off switch should be provided. Also the computer users be encouraged to switch off the machines when not in use or leaving for the day.

viii. To reduce the space cooling demand, the roof of the college may be covered with the heat- reflecting materials. See Chapter 3 for more details.

ix. 16 nos. window type ACs are installed in various rooms, which may be replaced progressively, whenever the t ime comes for improving energy efficiency with star labeled inverter type ACs.

x. Based on the availability of clear sky space on the roof of the college building, harnessing of solar energy for lighting and fan loads be done. The college can partly or fully offset the electric supply from BSES and has potential to generate additional revenues by supplying the generated energy to the electricity grid. See Chapter 4 for more details. **As a minimum the college should plan 50 Kwp solar panels.**

xi. Energy meters on individual feeders / services be provided to assess and monitor the energy consumption in various areas for long term improvement.

xii. Water meters be provided on the 10 HP Tube - well & 5 HP Sump water pumping system to assess the water and pumping energy consumption and to reduce the wastage of underground and municipal water.

xiii. Presently, auditorium air- conditioning system uptototal 100 KW work on the electricity supply from DG Sets. Electricity generated through DG sets is almost two to two & half t imes costlier than electricity from the BSES. In any case, currently, there is also a ban on use of DG sets. Hence, the air- conditioning system should be connected to the existing mains supply. I t will reduce the college's energy bills and avoid air - pollution due to DG sets.

xiv. Condition of some of the 8. 5 TR air- conditioning systemsinstalled in the auditorium appears to be poor. While 4 Airconditioners have been

replaced many of the system componentsof other ACs have reached their end of service l ife and need replacement. The same be done with energy efficient ACs. A detailed performance review be carried out during the summer and remedial measures be implemented . The Maximum demand of the college did not go beyond 120 KVA during the year for which the bills were provided and is much below the contract demand of 226 KVA. Hence the contract demand needs to be reviewed to reduce the f ixed charges payment in electricity bills. I t is understood that there is a plan to expand the college by adding additional building. The differential demand may be estimated based on proposed expansion and suitable actions taken as needed depending on the schedule.

xv. The college has strength of almost 2700 students and 300 teaching & non- teaching staff. The effectiveness of energy - efficiency measures depends on the energy- consciousness of the building occupant s. Hence, college should regularly organize lectures and campaigns to educate the students and staff about energy conservation and environmental issues as needed.

Annual Energy Expenditure- Approx. Rs. 25 Lakh to BSES andRs. 3. 25 Lakh expenditure on Diesel Fuel as informed during audit. See Table 2b in Chapter 3 for more details. The Diesel expenditure will not be incurred now. However, The BSES powerbill shall be higher.

Potential for Energy Saving – 15- 20% saving is feasible with implementation of above measures & improvement in operational practices. This saving may be used to improve lighting levels in the college which are below NBC norms. The energy saving can go up to 35% or more with installation of rooftop solar panels.

CHAPTER 3

ENERGY CONSUMPTIONOBSERVATIONS, ANALYSIS &RECOMMENDATIONS

3.1 Energy consumption –Analysis&Recommendations

3.1.1 Observation based on Walk through by Auditing team

Based on the Walk through observations, the auditing teamhas furnished their recommendations which are detailed out in the previous Chapter 2. The Overall energy consumption is well withinGRIHA norms for

educational institutions for 8 hours working. Table 4 may be referred for more details for basis.

3.12 2 Analysis based on Inventory data

As part of the detailed assessment, we have analysed the inventorydata& corresponding name plate rating of equipment vis a vis BSES Energy& Diesel fuel bills and our observations are provided in a tabular form. See Table 1 , 2 a & 2b on page 21onwards.

We have further analysed the observation & have proposed following recommendation, which are also elaborated & quantified in Table 3 on page 22.

i. *Connecting Auditorium load to electrical main supply*
ii. *Replacement of remaining of 578 nosofexisting Tube l ights to energy efficient LED l ights @ 20 - 23 W or similar in phased manner..*
iii. *. Installation of additional LED l ights for substantial Lux level improvement in class- rooms to say around 200- 300 lux for IEQ improvement.*
iv. *Installation of 50k Wp Solar PV plant*

The tangible benefits corresponding to each of the above recommendations; in terms of energy conservation & monetary savings are also highlighted in the same Table 3.

We suggest following action point in the short, mid & long term perspective in order to move forward in implementation of the suggested measures

- *Internally review immediately connecting Auditorium loads & / or future loads if planned to the Main electrical supply & accordingly decide whether to take up with BSES for lowering of contract demand of 226 KVAtooptimize f ixed energy cost.*
- *Review Chapter 4 on current Lighting performance &recommendation thereof for Energy saving & improvement of lux level and as an immediate action initiate action for replacement*

of all existing tube l ights with 20 to 23W or similar energy- efficient LED l ights.

- Internally review possible wrong use, misuse or lack of awareness in switching on- off appliances l ike l ights, fans, ACs, room heaters

or any other appliances which are kept on standby mode etc although it was found that some awareness already exists even though students were not present on the days of the audit .

- Arrive quickly on the decision to install 50 k WpSolar power plant based on saving potential specified in Table 3. Further o n a preliminary survey of the rooftop of the academic building, it is found that adequate open space with access to direct sun light for most part of the year is already available to adequately meet the foot print requirement of the PV panels and the associated equipment.

313 3 Inventory and Energy demand calculation of installed equipment

Table 1 Inventory of installed Electrical appliances and Energy demand calculations

Table 1- Inventory of Electrical appliances & Energy demand calculations											
Room No /Description	No off.						Room continued	No off.			
	Indoor Tube Light T5 38W	Fan @ 75W	AC 1.5 TR @1.5 KW	AC 8.5 TR @ 11 KW	Misc. items as noted			Indoor Tube Light T5 38W	Fan @ 75W	AC 1.5 TR @1.5 KW	Misc items as noted
College Area											
L-001	2	1					T-001	2	1		
L-002	7	5					T-102	2	1		
L-003	7	5					T-103	2	1		
L-004	7	7					T-104	2	1		
L-005	8	7					T-105	2	1		
L-007	4	2					T-106	1	1		
L-008	4	2					T-107	2	1		
L-101	3	5					T-108	2	1		
L-102	3	5					T-109	2	1		
L-103	3	4					T-110	2	1		
L-104	3	5					T-111	2	1		
L-105	2	1					T-201	2	1		
L-106	2	1					T-202	2	1		
L-107	3	5					T-203	1	1		

L-108							T-204	2	1		
L-109	5	7					T-205	2	1		
L-110	9	8					T-206	1	1		
L-111	3	5					T-207	2	7		
L-112	5	4					T-208	2	8		
L-113	6	3					T-209	3	4		
L-114	4	3					Psychology lab-1	5	4		
L-115	4	2					Psychology lab-2	5	4		
L-201	4	4					Psychology lab office	2	2		
L-202	4	5					Staff room-1	6	6		1 Refrigerator
L-203	4	5									1 Water cooler
L-204	4	5					Staff room-2	3	2		
L-205	2	1					Staff room-3	6	2		
L-206	2	1					Staff room (J dept)	2	1		
L-207	5	7					French Lab	5	5		
L-208	9	8					Geo Lab1	5	5		
L-209	3	4					Geo Lab2	5	4		
L-210	4	5					Geo office	4	2		
L-211	3	4					Counsellor room	2	1		
L-212	4	5					A/c office	12	7		1 Refrigerator
Old Seminar room	12	4	3		1 Water Cooler		Exam office	6	2		

New Seminar room	14	10	4				Admin office	10	7		1 Refrigerator
Library	106	74	1		1 Water Cooler		Photo copy room	3	2		
Computer Lab-1	10	6			Total 120 Computers + 5 Printers @ 250 W each are considered		Committee room	11	5		
Computer Lab-2	10	6					Medical room	4	2		
Computer Lab-3	8	2					NCC room	4	2		
Server room	2	1					A.O office	2	1	1	
Student common room	6	4					A.O office (S.S)	4	1	1	
Music room	4	2					Principal office	7	2	2	
Gym room	6	4	1				Vice Principal office	4	1	1	
Sports room	4	1	1								
IQAC room	2	2	1								
Quantity of Appliances	326	257	11	0	125+2 WC			155	106	5	+ 3 Refg& 1 WC
Common Area											
Canteen	26	8			2 nos Refrigerator						
Auditorium	8	8	3	13	48 nos stage lights@ 1 KW & 2KW		About 143 KW Load for running 8.5 TR AC's in the Auditorium are currently connected to an independent ------- KVA DG set.				
Audi. Foyer	6	9									
Corridor -Ground Floor	14				1 Water Cooler						
Corridor -First Floor	10				1 Water Cooler						
Corridor -Second Floor	10				1 Water Cooler						

Toilet- Ground Floor	3	2										
Toilet -First Floor	4	2										
Toilet -Second Floor	4	2										
Outdoor					25 nos Outdoor lights are powered by 300 kw Solar panel, which is a very good initiative & should be adopted for the entire campus							
	10				10 LED@ 23 W							
	2				2 Halogen@ 100 W							
Quantity of Appliances	97	31	3	13	2							
Residential area (Beyond Audit scope)												

Table 2a- Calculated Energy demand based on Name plate rating

											Total	Units
i) Calculated demand for Lighting in KW	17.7				0.2			6.5			24.4	KW
ii) Calculated demand for Air conditioning in KW			23.1							8.25	31.4	KW
iii) Calculated demand for Fan running in KW		20.7							8.7		29.5	KW
iv) Calculated demand for Computers, printers etc 125 nos.@250 watts each											31.3	KW
v) Calculated demand for Misc items in KW (assumed @ 10% of total of above)											8.5	KW
vi) Calculated demand, which is expected to be consumed in Summer months -**See Note 1**	All the above demand are assumed to be running during Summer months & are therefore added to arrive at the total demand										125.0	KW
vii) Calculated demand in Winter months with full lighting load+ Misc load &assuming few AC +refrigerators running (eg in Computer /Server lab) - **See note 1**	Demand for Full lighting+ Misc + say 2 AC's running for lab										69.1	KW

viii) Estimated load of running all the 13 AC's in the Auditorium on DG set in KW - **See Note 3**		143.0	KW

Table 2b- Energy Consumption details as per BSES Bill & Diesel fuel bill		
i) Maximum demand indicator MDI recorded Sept 2019 in KW	120	KW
ii) MDI average value for Summer months in KW -**See Note 1**	107	KW
iii) MDI Average value for Winter months in KW -**See Note 1**	58	KW
iv) Yearly consumption of units Jan to Dec 2019 -in kWH -**See Note 2**	211000	KWH
v) Yearly Billed amount Jan to Dec 2019 -in INR -**See Note 2**	₹ 25,37,956	INR
vi) Contract demand (available from BSES) converted to KW based on pf =0.994	225	KW
vii) Spare demand available (=Contract demand -maximum MDI recorded in Sept 2019)	105	KW
viii) As per information collected during the audit, 400 Litres of Diesel is consumed per event in the Auditorium & accordingly total Diesel cost considering Rs. 68/- per Litre will be **INR -See Note 3**	₹ 3,26,400	INR

Notes:

1.Refer calculated demand as per Name plate rating for Summer (Point no vi/Table 2a) & Winter months (Point no vii/Table 2a) & note that these calculations are in good co-relation with the MDI recorded in BSES bills & averaged for respective seasons (Point no ii & iii /Table 2b)

2. As per the current contract Demand & usage pattern, the average unit rate charged by BSES is Rs.12/- per unit. Plus the college incurs approx. Rs. 3.26 Lakhs on Diesel cost for running Air conditioning in the Auditorium during 12 events in a year

3. Refer point no a)/Table 3 proposing Energy conservation measures for connecting AC load of Auditorium to the BSES Electrical main supply based on monetary saving & to avoid environmental nuisance due to Diesel burning

Table 3-Suggested Energy conservation measures with Quantification		
a) Recommendation related to Auditorium		
As per information collected during the audit, 400 Litres of Diesel is consumed per event & therefore total Diesel cost considering Rs 68/- per Litre in INR will be equal to	₹ 3,26,400	INR
Assuming 12 events in a year each running for 8 hours, expected electrical consumption of the Audtorium for all the 13 Nos 8.5 TR AC will be	13728	KWH
It is proposed to connect the AC's of the Auditorium with BSES supply & the resultant electricity expense (considering average BSES rate of Rs 12/- per unit) will be equal to	₹ 1,64,736	INR
Therefore, expected % Saving due to proposed switch over of Auditorium load from DG to the Electrical main supply will be equal to	**50%**	%
Further, Annual monetary saving due to this switch over will be equal to	**5.6**	%
However, as per the spare demand contract demand calculated in point vi) /Table 2 b, all the 13 AC's of 8.5 TR cannot be connected to the Electrical mains. Number of AC's that can operated in the current demand scenario will be =	8	Nos.
b) Recommendation for replacement of all existing Tube lights to energy efficient LED lights @23W		
Expected %age power loadreduction if all 578 existing tube lights are converted to LED @ 23 W is as noted below :		
For lighting only on yearly basis	**35.5%**	%
Expected overall saving in the bill for Summer months	**6 to 7 %**	%
Expected overall saving in the bill for Winter months	**11 to 12%**	%
c) Recommendation for Installation of additional LED lights with fixtures for substantial Lux level improvement to say around 200 – 300 lux		
Estimated additional LED fixtures that may be required to improve illuminancerequirement to meet NBC code	say 500	Nos.
Increase in **lighting consumption** on yearly basis due to additional 500 fixtures will be	13%	%
Impact (increase) on overall Energy consumption on yearly basis due to above will be	4.5 to 8%	%

d) Recommendation for installation of 50kWp Solar PV plant		
A 50 kWp Solar power plant is expected to generate approx 70,000 units renewable energy units per annum	**70000**	KWH
Estimated contribution of Renewable energy upon installation of 50 kWP solar plant wrt the overall BSES bill	**33.2%**	%
Based on the differential pricing between average rate charged by BSES (=@ Rs 12 /- per unit) & assumed outgo to the Solar power producer (= Rs 6/- per unit), the expected monetary saving in electricity billwould be 4,20,000/- i.e.	**16.6%**	%
Installation of 50 kWp Solar PV panel with its estimated monetary saving of 16.6% will more than offset the impact of increase in overall energy consumption due to provision of additional LED fixtures to improve illuminance levels. Moreover the use Renewable energy & its contribution by about 33 % to total consumed electrical energy will a set a good bench mark on eco-friendliness & sustainability aspects.		

TABLE – 4 Evaluation of EPI as per GRIHA

Evaluation of Energy Performance Index as per Green Rating for Integrated Habitat Assessment (GRIHA)		
Section wise	**Values**	**Unit of Measurement**
Area Academic block (Permanent)	7478.26	Sqmt
Area Academic block (Temporary)	1192.19	Sqmt
Total area	8670.45	Sqmt
Annual power consumption	211000	kWh/ year
Energy Performance Index (EPI)	**24.34**	kWh/sqmt/year

GRIHA criteria for EPI for academic buildings for 8 hours of working (Criteria 8 of GRIHA Manual Version 2015)	**90**	kWh/sqmt/year

*Note values are approximate as per data provided

CHAPTER 4 EVALUATION OF LIGHTING PERFORMANCE& RECOMMENDATIONS

4.1 Lighting-Energy Saving &Lux improvement measures

411 1 Implementation of LED system for energy saving

LED Luminaire system provides superior luminous efficiency > 100 lumens / Watt & when selected / installed by professional experts can achieve the allowable limit of Lighting power density (LPD) = 9 W/ m 2 as set out in ECBC 2016 code for University /Schools

As per Auditor team recommendations & also as quantified under clause b / Table 3 , i t is suggested to take up conscious measures to implement LED light system for all the location in the college, which will result in net energy saving 6 – 7% in summers and 11 to 12% in winters.

I t is noteworthy to mention that the College has already taken lead in this direction & have started f ixing LED lights on case to case basis when the existing T5 tube l ights (38 W) reach their end of l ife and need replacement. They have discontinued further procurement of T5 lights, but at the same t ime would l ike to utilize the available quantity with discretion t i l l it is stocked out, which is a prudent approach to follow

412 2 Luximprovement measures – Short term & Immediate

Referring to Table 4 on page 27, it is observed that at almost areas, the Lux levels is far below the i llumination norms prescribed by the National Building Code & we suggest mitigation actions to be taken at the earliest. *In addition, we suggest that wall colors in computer & class rooms may be changed preferably to white or l ight color .*

413 3 Lux level improvement – Mid / Long term measures

As mentioned in preceding paragraphs, though LED replacement will certainly lead to energy saving due to their superior energy performance but in our assessment, there will not be much

improvement in i l luminance unless the current numbers of f ixtures are increasedin most of the areas.

- *Referring to clause c) Table 3, we can suggest that additional 500 LED l ights may have to be installed to reach Lux level somewhat close to the NBC requirement, of course the correct locations & appropriate f ixtures require detailed engineering assessment. The additional f ixtures would impact the overall demand, which will increase by 4. 5 to 8 %.*
- *This increase in demand can be met by instal lation of 50 k Wp Solar plantwhich can more than cover the increased wattage & thus completely fulfilling all the objectives set for this assignment. i . e Meeting bench mark levels of il luminance& at the same t ime substantial contribution coming from rene wable sources.*

- *As an intermediate step, t il l such t ime the Solar plant option is not f inalized & in place, approximately 250 additional LED lights may be installed in priority areas l ike low l ight sections of the Library, Laboratories, Computer rooms, Bamboo rooms & Account section, within the available contract demand .*

.

Table 5 - Table showing i Iluminance (Lux measurement)& comparison with NBC code

Room description	Remarks		Measured Lux (Average)	NBC illuminance requirement Table 4 Section 8 Part 1	Room description	Remarks	Measured Lux (Average)	NBC illuminance requirement Table 4 Section 8 Part 1
amboo Room	**Non reflective dark paint on walls, 50% Qty changed to LED**				***Staff room -1 - Sitting area**	**with fabric curtain**	170	300
L-002			85	300	***Staff room -1 Locker area**		91	
L-003			114		***Staff room -2**	**with fabric curtain**	107	
L-005			105		***Staff room -3**		224	
cture rooms	**LCD projector & with Chik curtain**	**Window toward**			***Vice Principal office**		108	300
L-104		South	76	300	***Principal office**		111	
L-110		South	172		***Account office**		156	
L-111			172		***Exam office**		140	
L-112		South	83		***Admin office**		103	
L-208		South	101					
					***Committee room**	**With Venetian blinds**	124	300
utorial room	**No curtain**			300	***Old seminar room**	**With fabric curtain**	62	300
T-105			67					
T-106			69		***Sports room**		87	300

sychology lab-1			109	300	***Computer Lab-1**	**with fabric curtain**	60	500
sychology lab office			110		*** Geology lab-2**		171	500
***Library**	Reading area	1st Floor	Not taken	300 -500	*** Corridor**	Ground Floor	118	100
		2nd Floor	50			Ground Floor	37	
		3rd Floor	66			Ground Floor	60	
	Book shelf area	1st Floor	27			First Floor	41	
		2nd Floor	118					
		3rd Floor	214					
	Research area	2nd Floor	37					
	Librarian area	1st Floor	117					
					Legend	OK wrt NBC Code		
						All other area	Need improvement	

.

CHAPTER 5

LUX MEASUREMENT SKETCHES

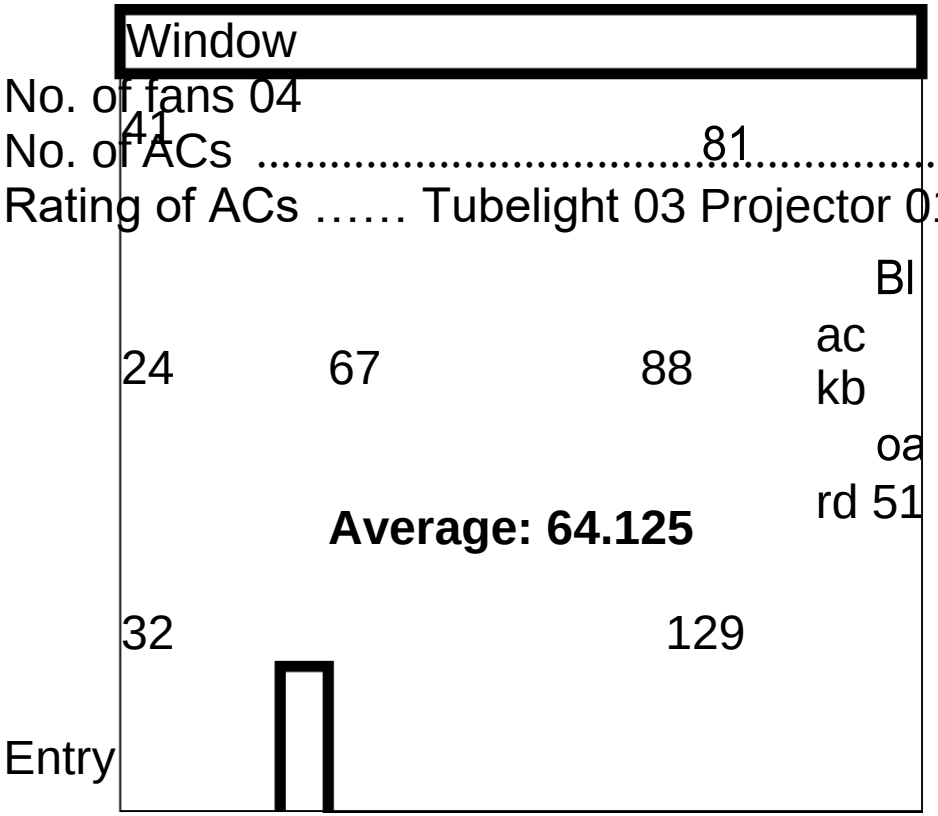
5.1 LuxMeasurements sketches

- All units are in Lux as measured by Lux Meter (AMPROBE make LM-100)
- The measurements are done at the working plane level
- In this annexure sketches are shown for **some typical** rooms/labs/library as an example of measurment pattern
- The diagrams which are typical may be used as guidance for installation of additional light fittings to improve luxlevel

1. **Lecture room (L – 104)**

BUILDING .....

ROOM L – 104 (Seating – 32) Floor First

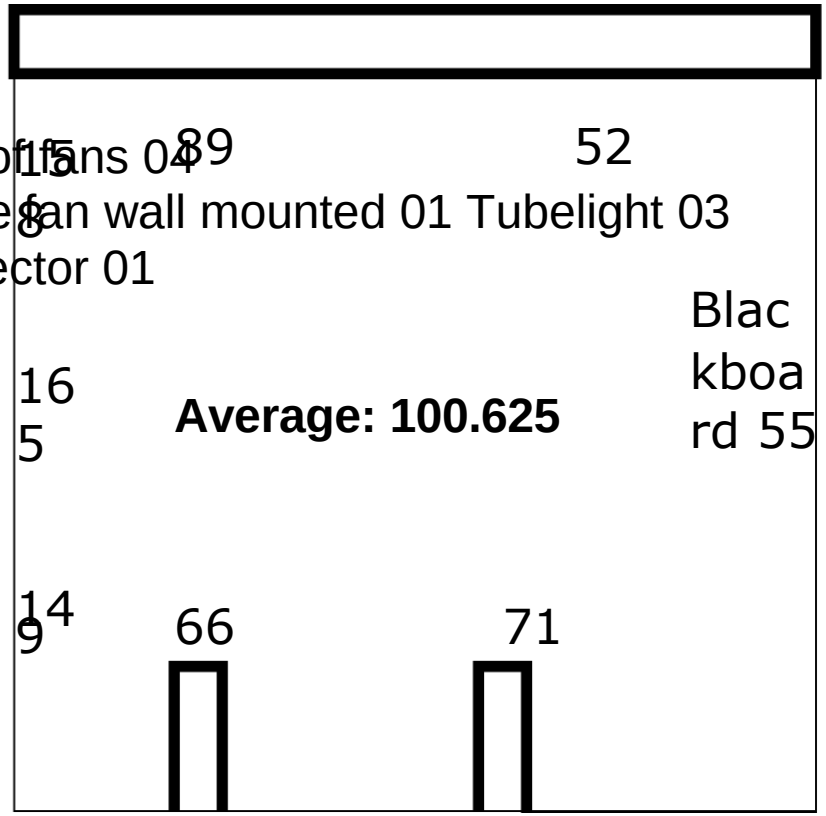


2. Lecture room (L – 208)

BUILDING .....

ROOM L – 208

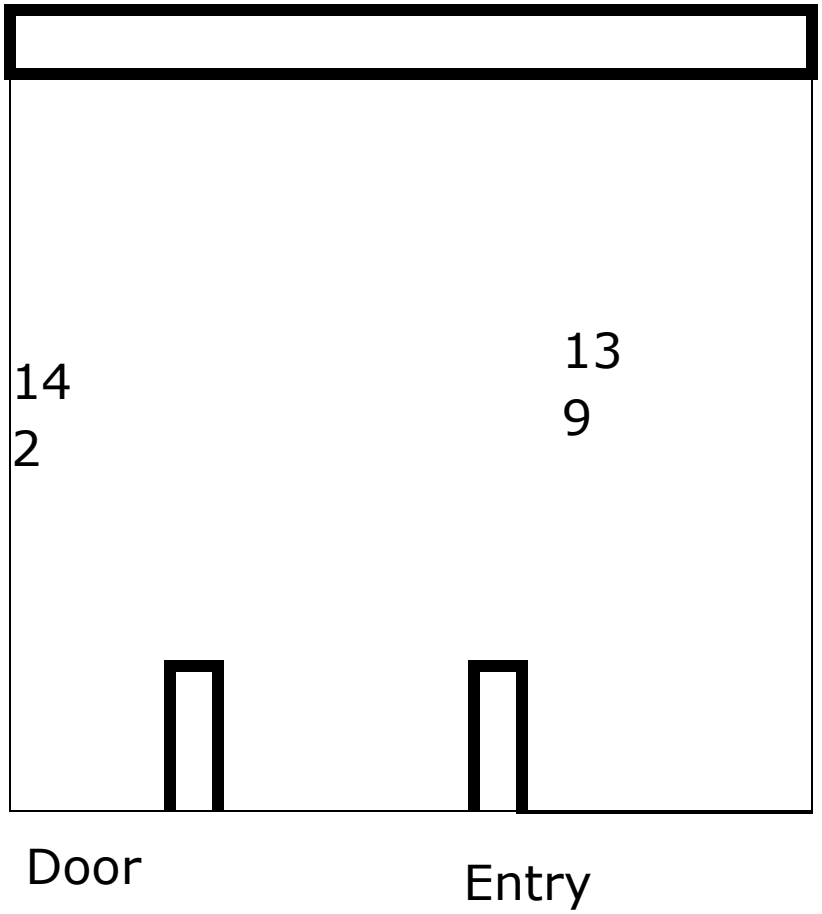
Floor Second



3. Lecture room (L – 111)

BUILDING .....

ROOM L – 111 (Seating – 32) Floor First



Corridor

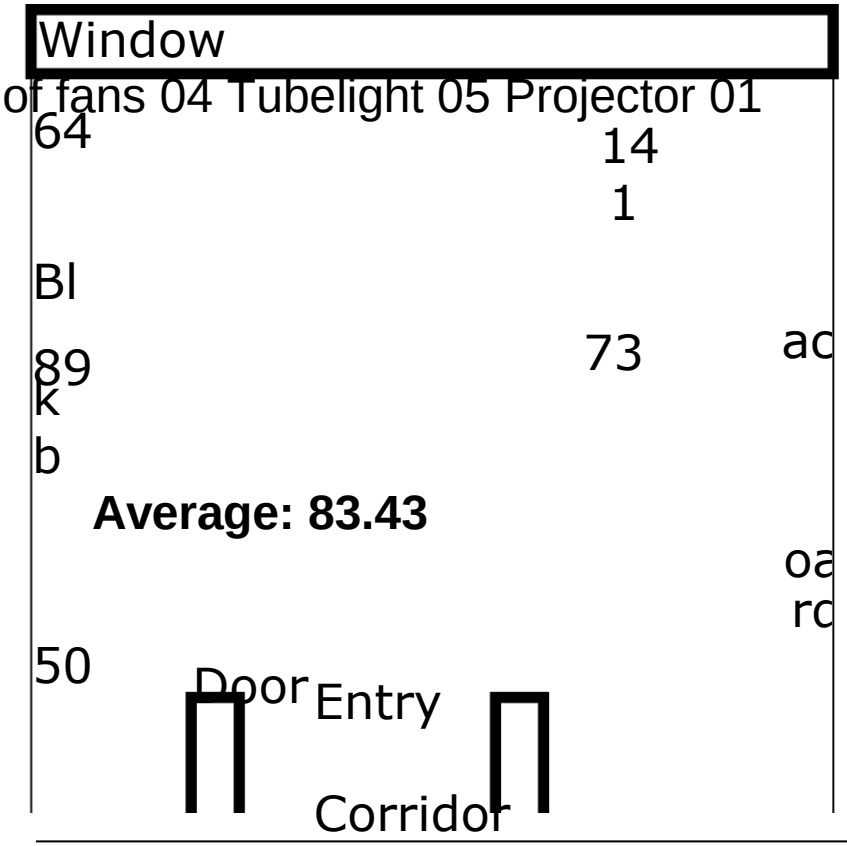
34 14 **Average: 41.33**

76

4. Lecture room (L-112)

BUILDING .....

ROOM L – 112 (Seating – 31) Floor First



5. **Lecture room (L - 104)**

BUILDING .....

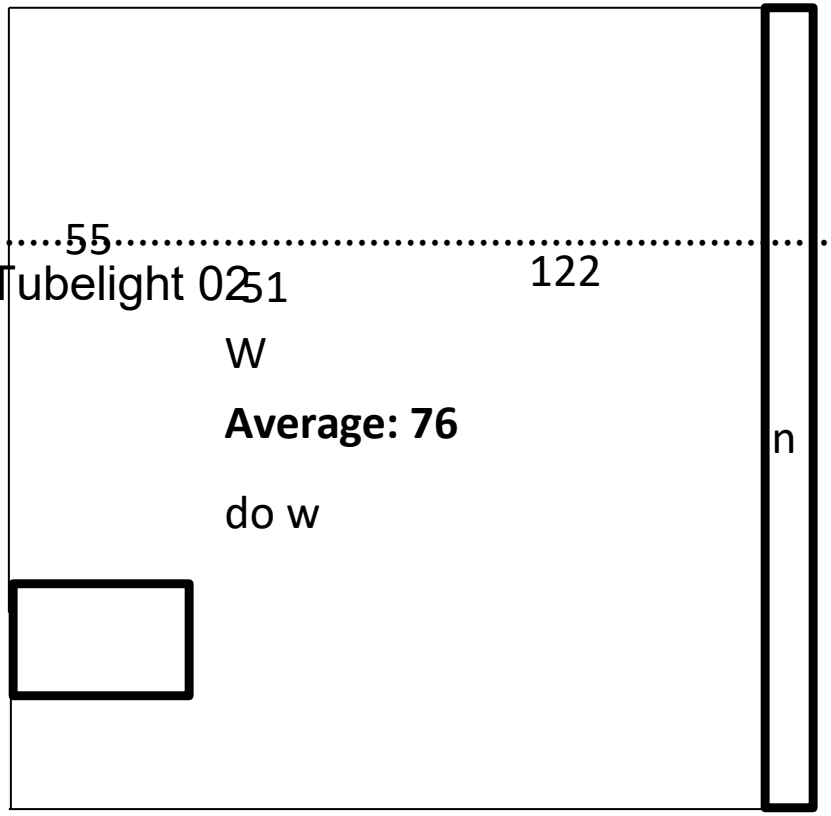
ROOM L - 104

Floor First (Sanskrit/ Punjabi room)

No. of fans 01

No. of ACs .....

Rating of ACs …… Tubelight 02

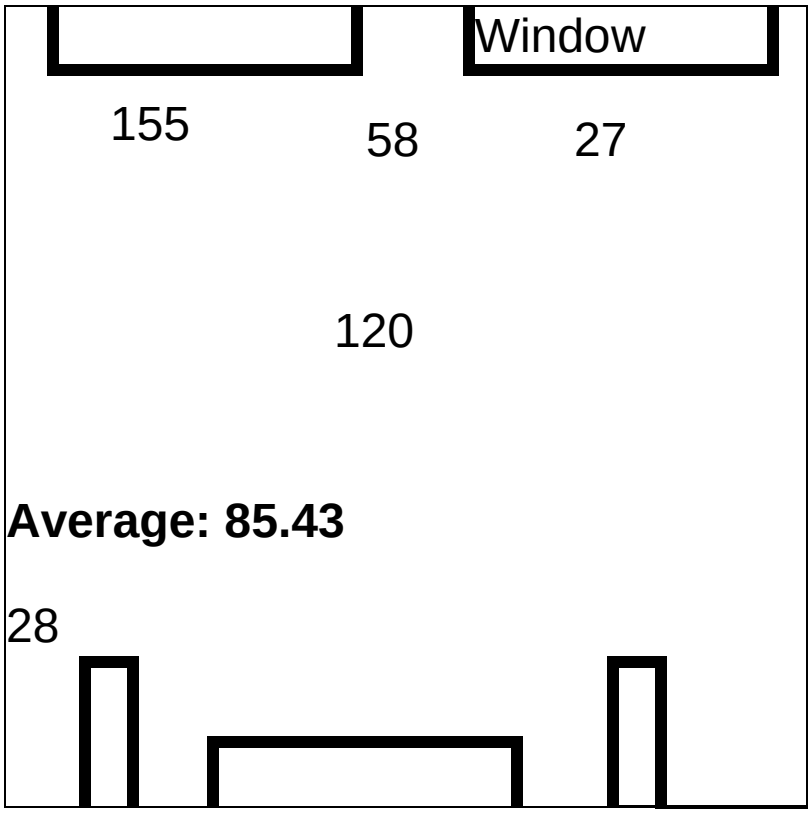


Door

6. Bamboo room (L-002)

BUILDING .....

ROOM L – 002 Bamboo classroom Floor Ground

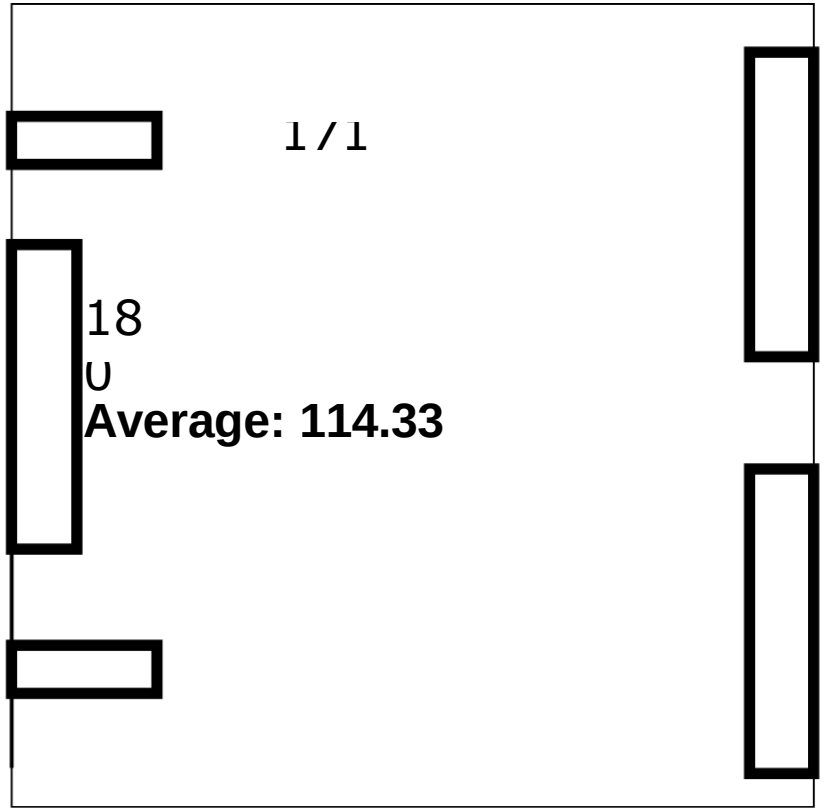


7. Bamboo room (L – 003)

BUILDING .....

ROOM L – 003 Bamboo classroom Floor

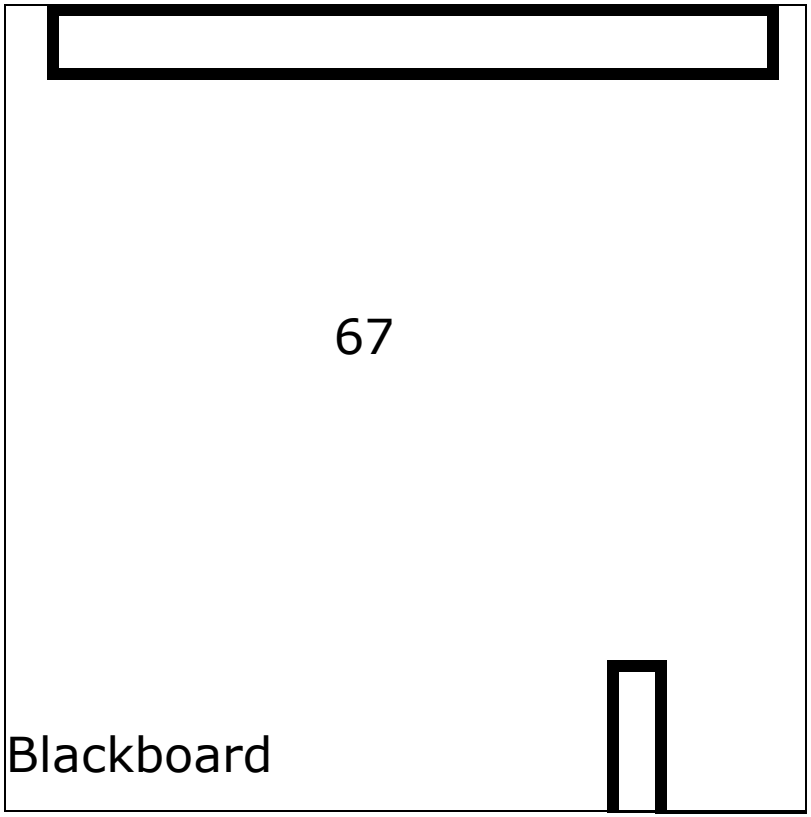
Ground Floor



8. Tutorial room (T – 105)

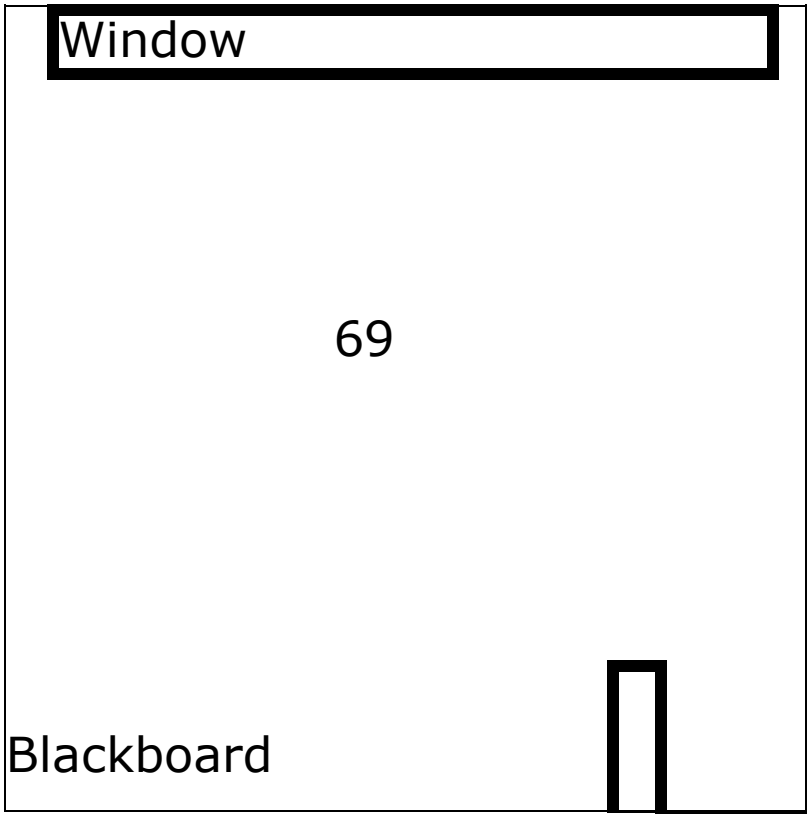
BUILDING .....

ROOM T – 105 for Philosophy Floor First



Entr y

9. Tutorial room (T – 106)


Window
69
Blackboard
Entr y

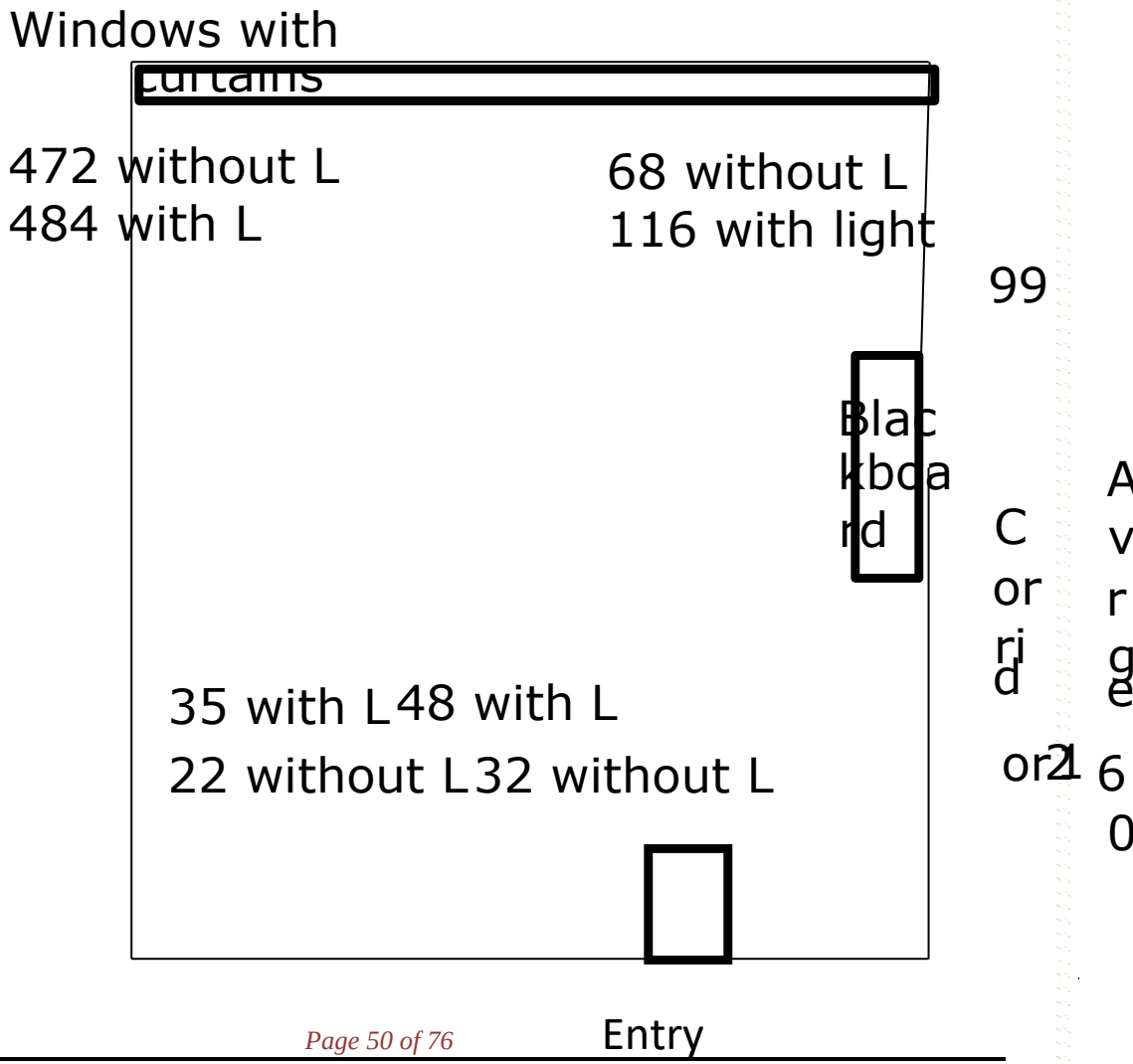
10. Geography lab

BUILDING .....

ROOM Geography Lab – II (3:11 PM)

Floor Second

No. of fans 04 ceiling fans 01 table fan wall mounted

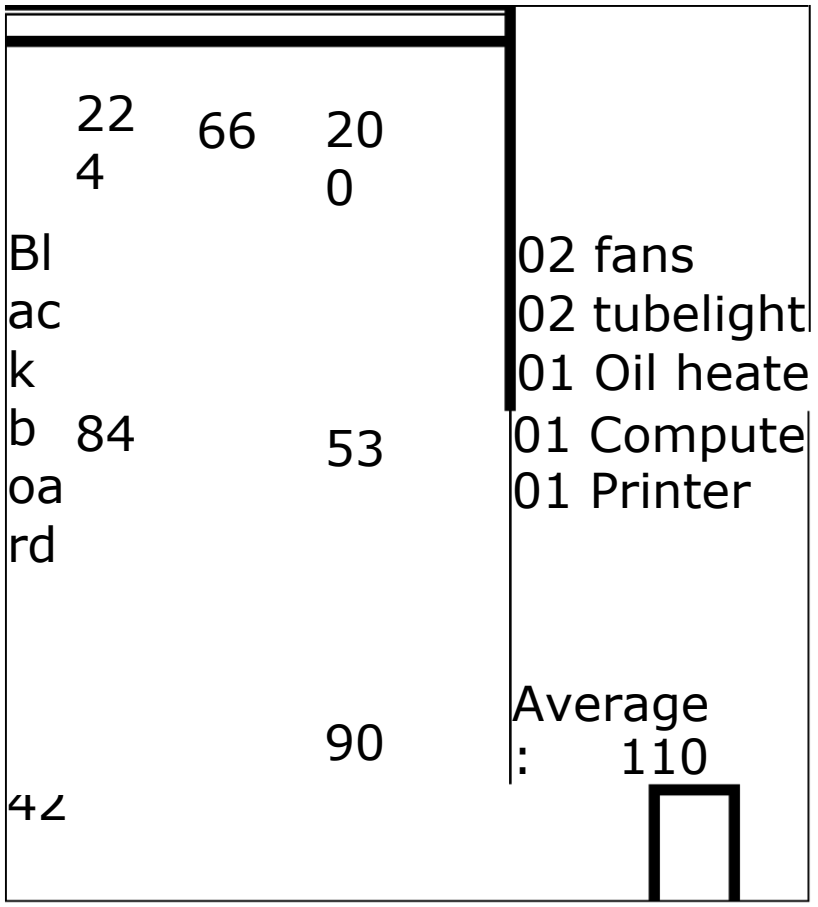


11. Psychological lab

BUILDING .....
ROOM Psychological Lab - 1
Floor First

No. of fans 04 ceiling fans

List of other electrical equipment
Tubelight 05
Projector 01
Blower 01 Hot case
01 Speaker 04



12. Computer lab - 1

BUILDING .....

ROOM COMPUTER LAB – 1

Computer lab 2 has similar things 42 computers

Computer lab 3 is small having 12 computers

Floor Ground Floor

No. of fans 04 ceiling fans

01 table fan wall mounted

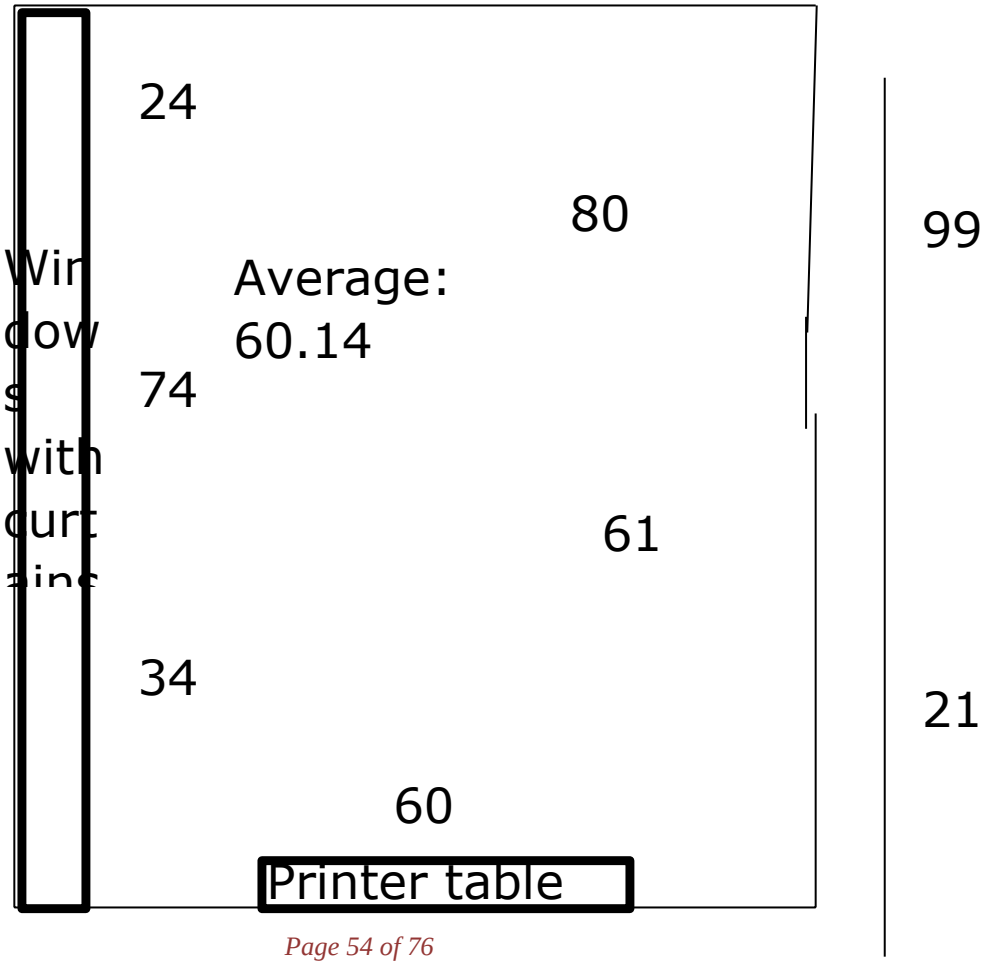
No. of ACs 02 Window

Rating of ACs 2 star

List of other electrical equipment

39 PCs

02 Printer



13. Staff room – 1

BUILDING .....

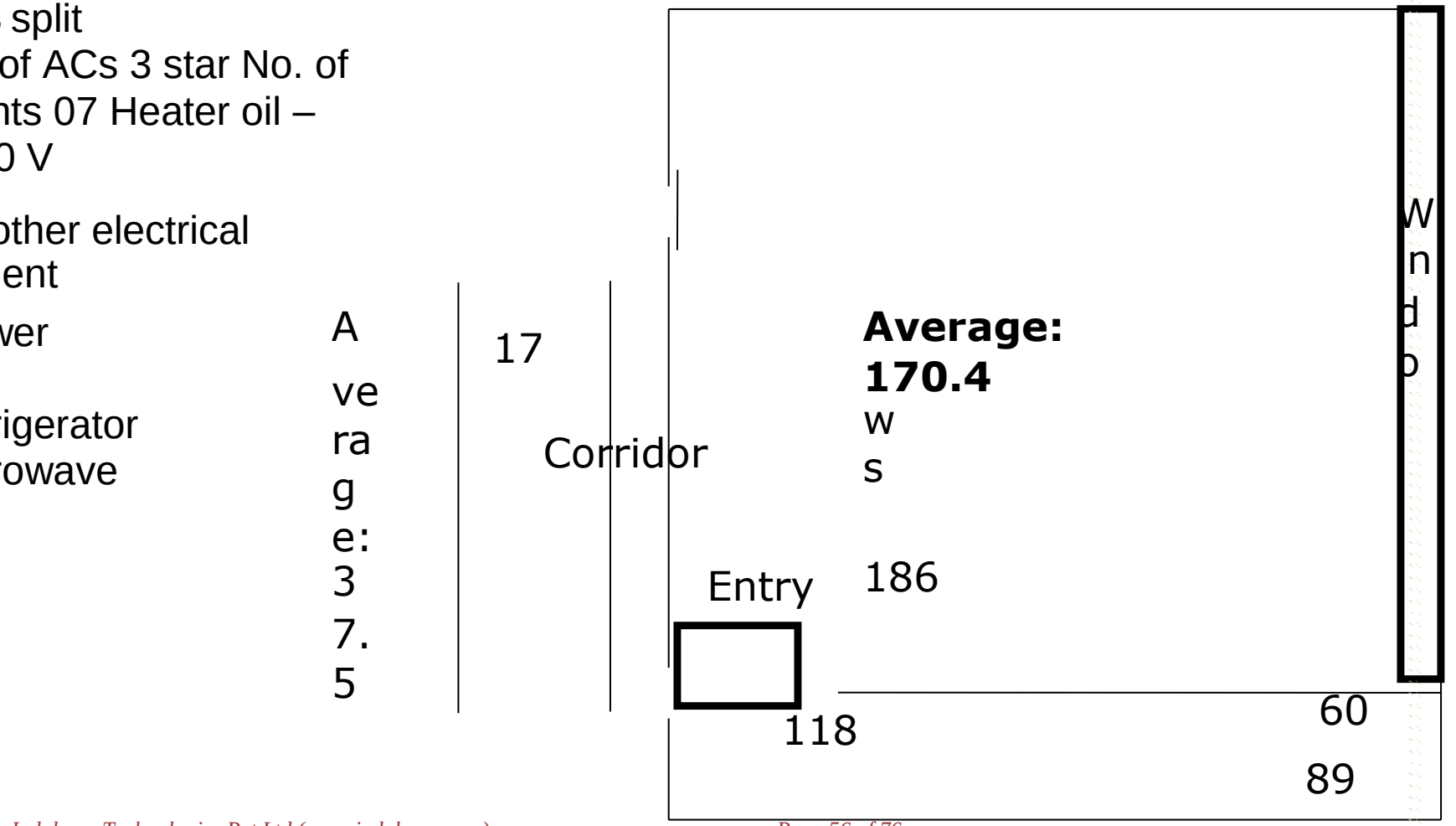
ROOM STAFF ROOM - 1

Floor Ground

No. of fans - 06 No. of ACs 03 split
Rating of ACs 3 star No. of tubelights 07 Heater oil – 02 2000 V

List of other electrical equipment

01 Blower
01 RO
01 Refrigerator
01 Microwave



14. Staff room – 2

BUILDING .....

ROOM STAFF ROOM - 2

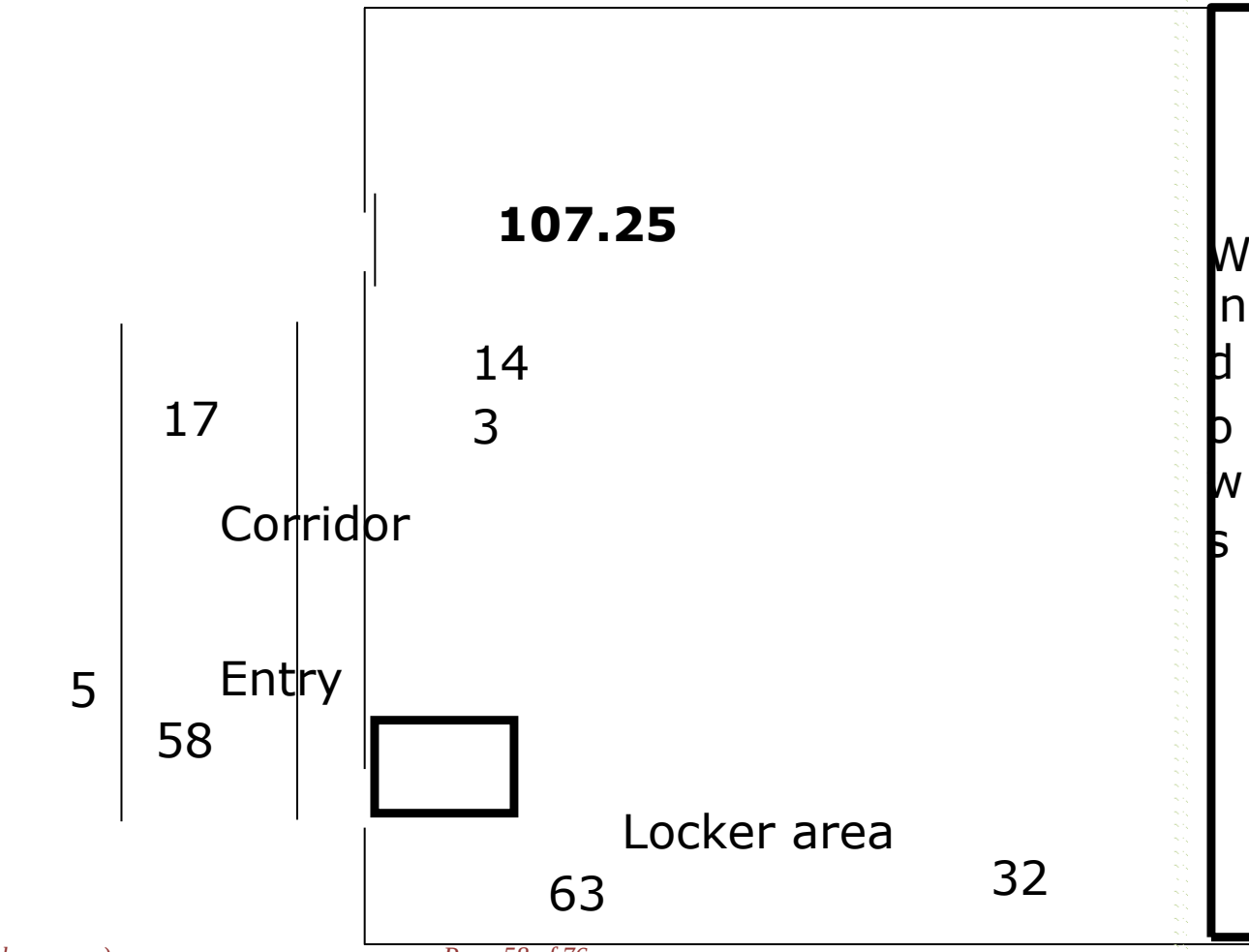
Floor Ground

No. of fans - 02 No. of ACs 01 split
Rating of ACs 3 star No. of tubelights 03

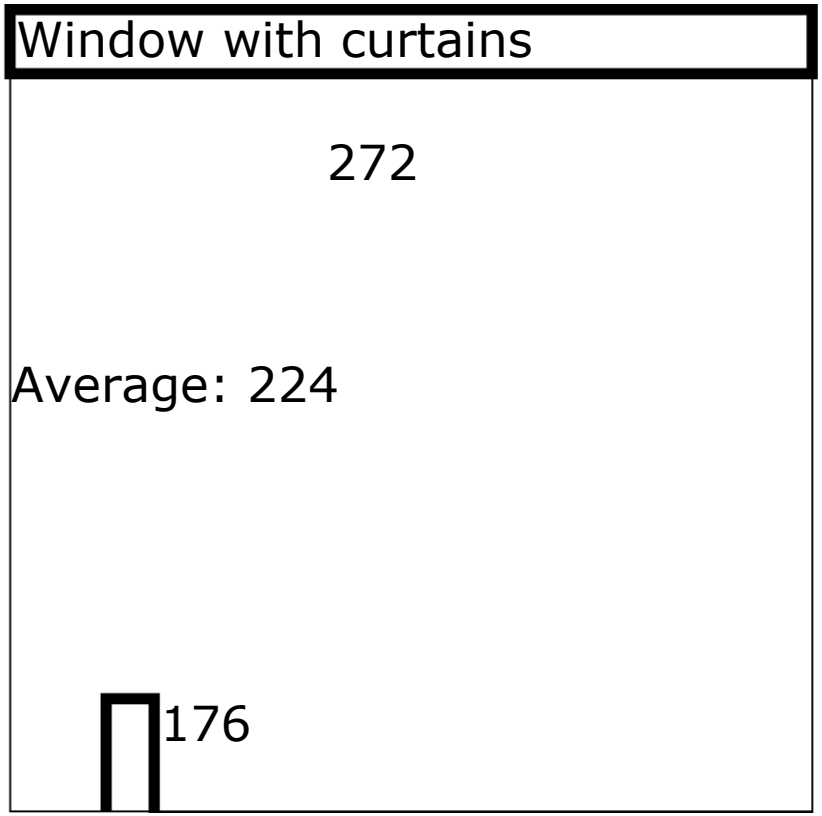
Average:

List of other electrical equipment 01 Blower
01 OTG
01 Digital watch

Average: 37.



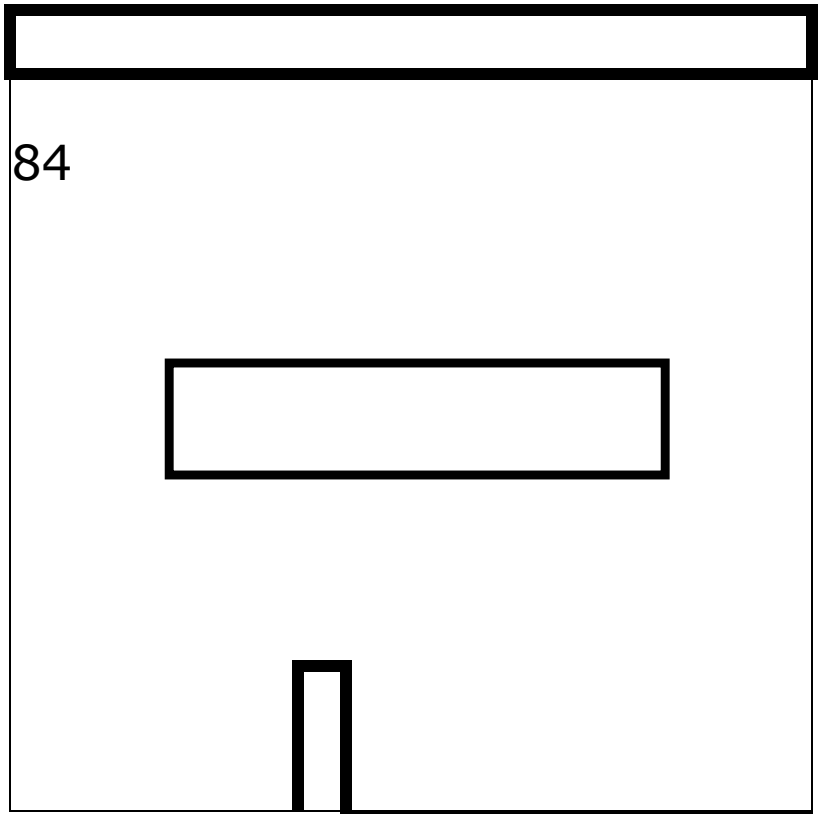
15. Staff room – 3



No. of fans 02 Tubelight 05

Entry

16. Committee room



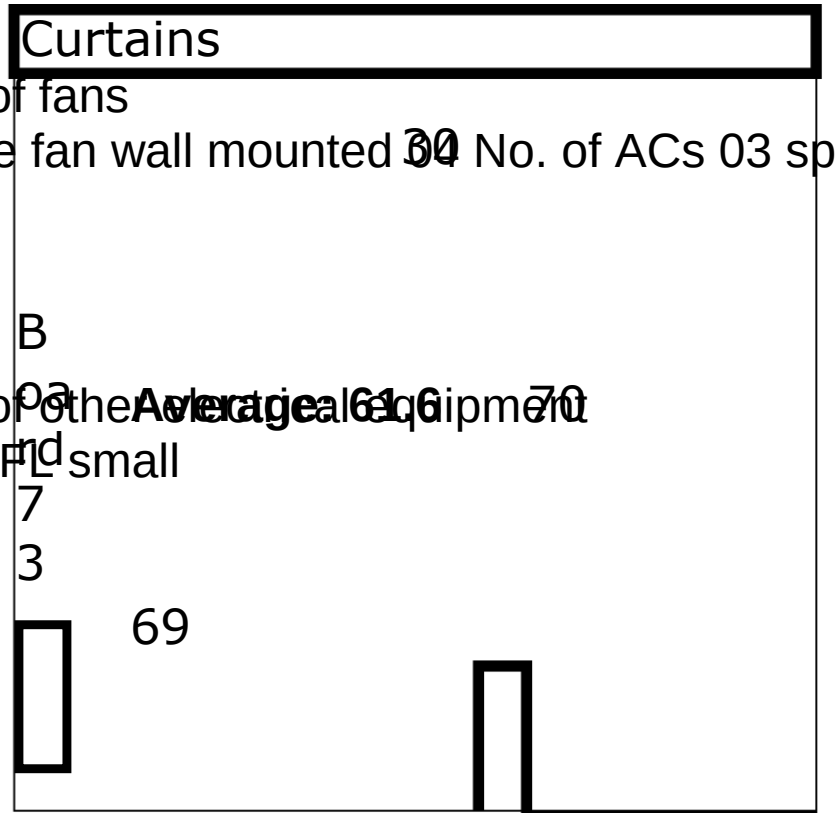
Corridor Average: 118.25

32 56 75

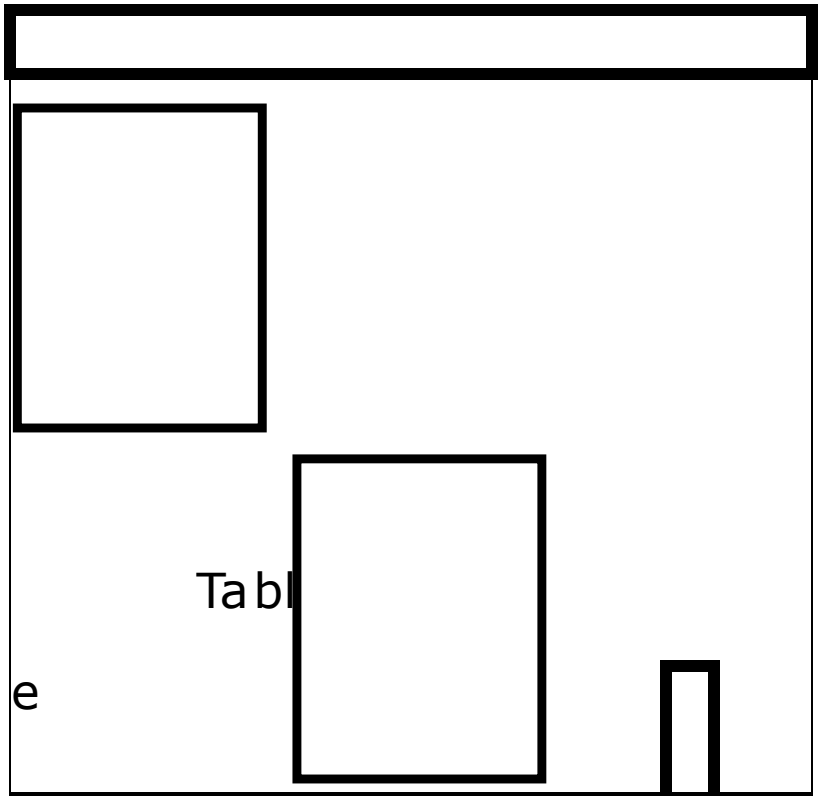
17. Old Seminar Room

BUILDING .....

ROOM Old Seminar room Floor First



18. Vice Principal room


Tabl
e

19. Principal room

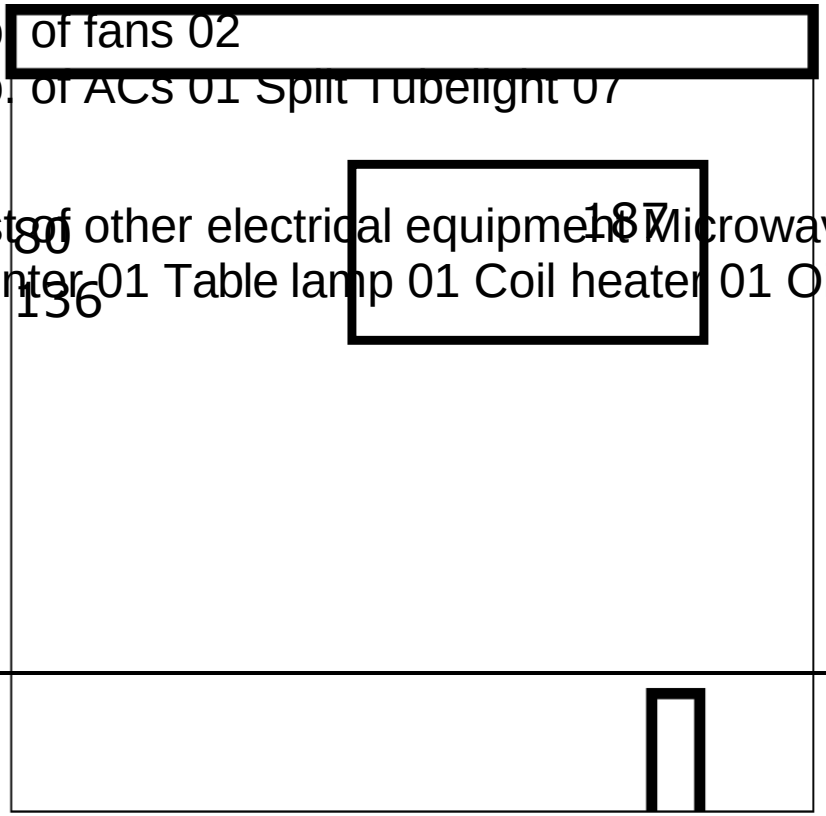
BUILDING .....

ROOM Principal room Floor First

No. of fans 02

No. of ACs 01 Split Tubelight 07

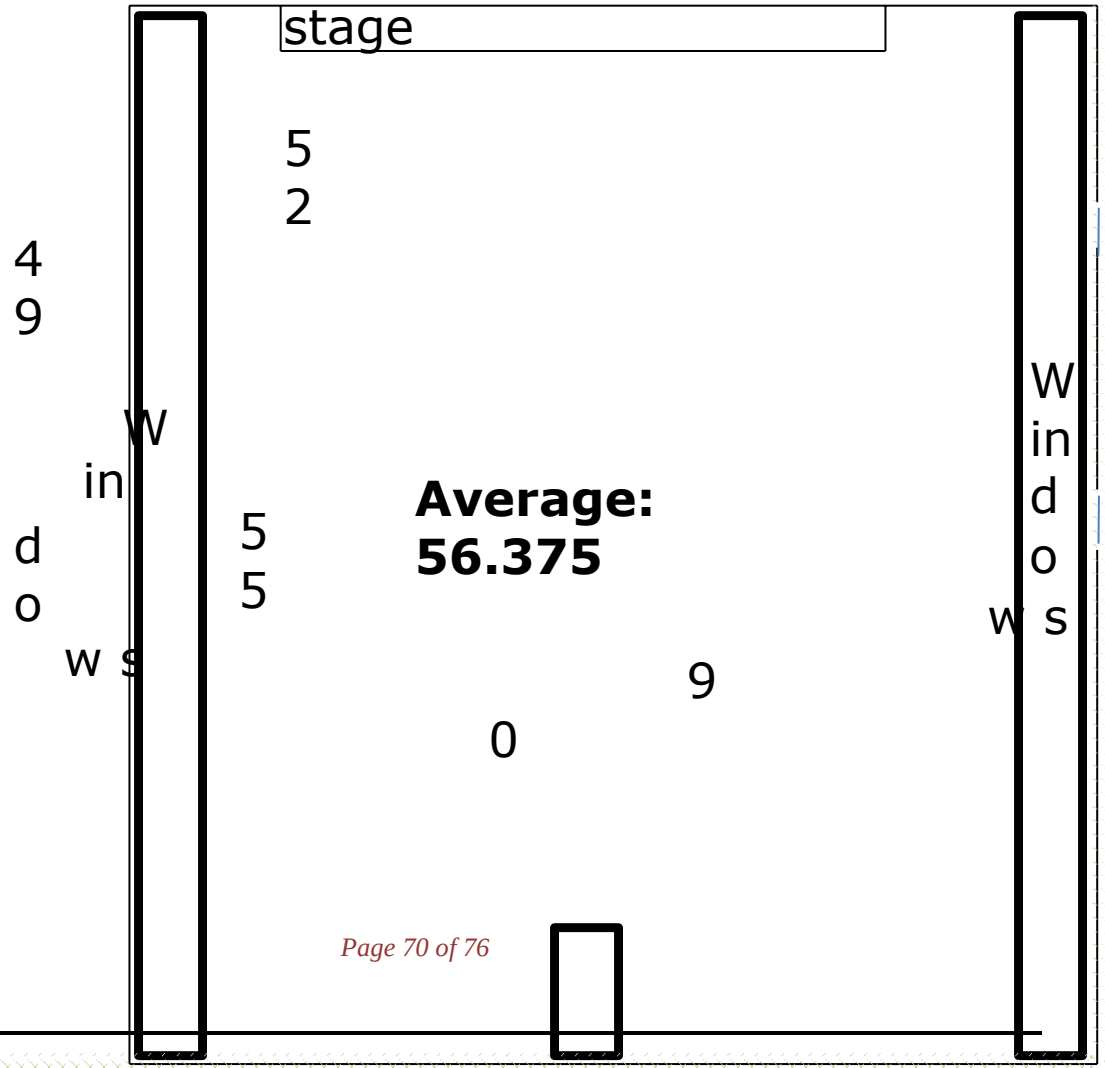
List of other electrical equipment Microwave 01 Computer 01 Printer 01 Table lamp 01 Coil heater 01 Oil heater 01



20. New Seminar room

No. of fans 08 ceiling fans No. of ACs 04 window

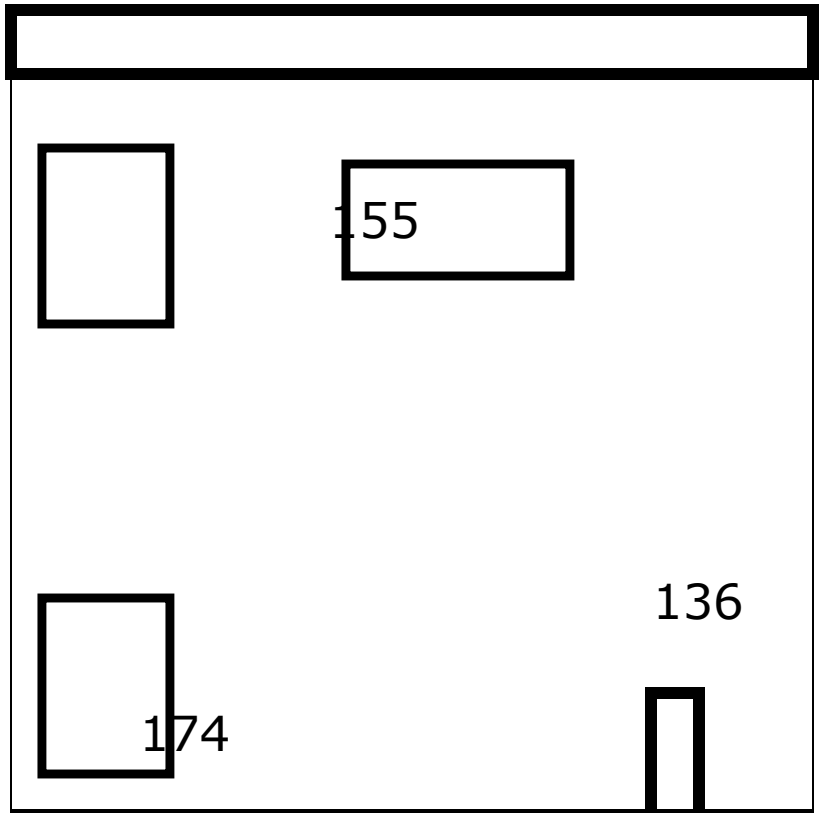
List of other electrical equipment
14 tubelight
02 table fan wall mounted
04 Speaker
01 Sound system



21. Accounts room

BUILDING .....

ROOM Accounts department Floor Ground



22. Examination room

BUILDING .....

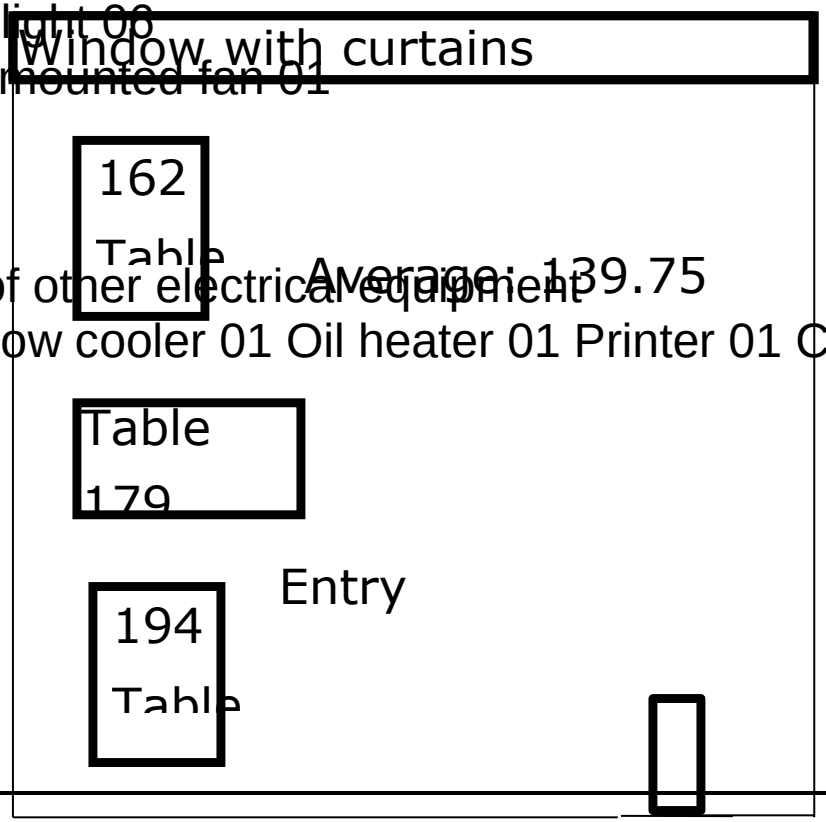
ROOM Examination room

Floor Ground

No. of fans 01

Tubelight 06

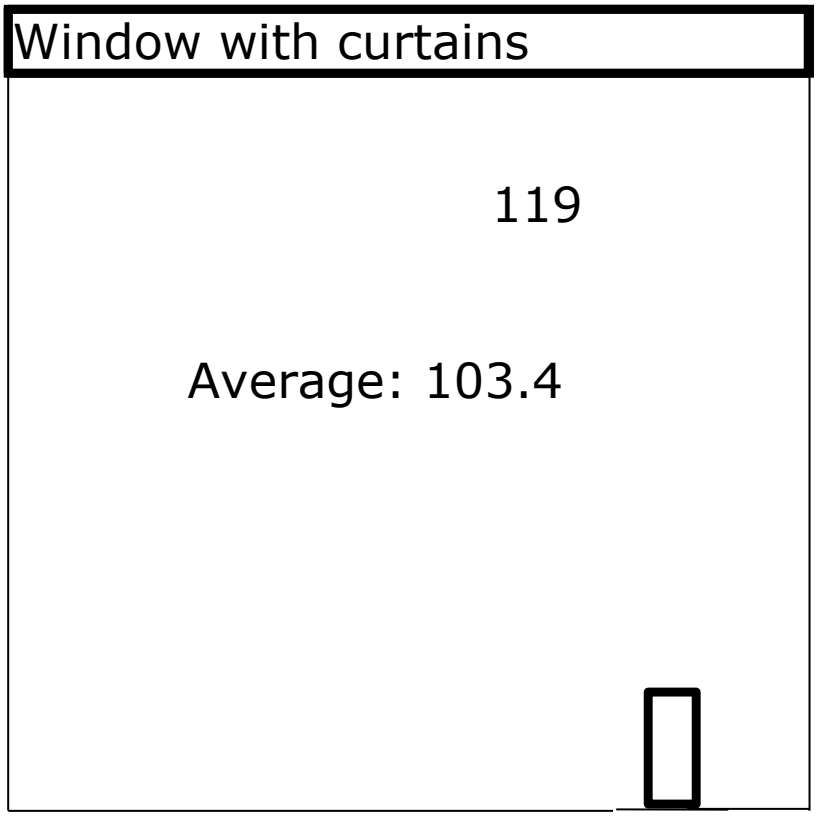
Wall mounted fan 01



List of other electrical equipment

Window cooler 01 Oil heater 01 Printer 01 Computer 01 Speakers 02

23. Administration office


Window with curtains
119
Average: 103.4
Entry

B. Campus Count of Butterflies

As part of the biodiversity on campus initiative of the Green Beans Society of Kamala Nehru College, a Butterflies count (identification) was organised on 11th September, 2018. It was organised during the Delhi Butterfly Month observed from 1st to 30th September every year. The aim of the count is to create awareness about butterflies and their ecological importance.

In order to conduct the Campus count, Ms. Geeta and Mr. Lakhan Kohli from Bombay Natural History Society (BNHS) and Mr. Abhishek Gulshan, founder of NINOX-Owl About Nature (a Nature Education and Awareness initiative that aims to develop ecological consciousness among youth and citizens) were invited. The event was marked by the presence of around 30 students of the Green Beans Society.

The students were first made familiar with the life-cycle of butterflies and their ecological importance in a presentation made by the guests before conducting the campus count on fields. The presentation also discussed crucial topics like differences between moths and butterflies and the common species of butterflies found in Delhi.

Students attending presentation and conducting field survey during the butterfly count.

During the field survey, all the green areas of the College campus were covered. The survey was conducted in the morning as the best time to watch out for butterflies is before noon and the best months for watching them in Delhi are March to November. On the basis of the field survey, we found ten butterfly species in our campus. The list of the butterflies is as follows:

1.	Common Name: Common Jay Scientific Name: *Graphium doson* Family: Papiliondae (Swallowtail) Host Plant: Ashoka tree	
2.	Common Name: Lime Butterfly Scientific Name: *Papilio demoleus* Family: Papiliondae (Swallowtail) Host Plant: Lemon, lime	
3.	Common Name: Small Grass Yellow Scientific Name: *Eurema brigitta* Family: Pieridae (Whites and Yellow) Host Plant: Cassia kleinii	

4.	Common Name: Common Grass Yellow Scientific Name: *Eurema hecabe* Family: Pieridae (Whites and Yellows) Host Plant: Cassia fistula, Acacia sp.	
5.	Common Name: Dark Grass Blue Scientific Name: *Zizeeria karsandra* Family: Lycaenidae (Blues) Host: Grasses	
6.	Common Name: Pale Grass Blue Scientific Name: *Pseudozizeeria maha* Family: Lycaenidae (Blues) Host: Grasses	
7.	Common Name: Plains Cupid Scientific Name: *Chilades pandava* Family: Lycaenidae (Blues) Host: Small grasses	

8.	Common Name: Small Cupid Scientific Name: *Chilades parrhassius* Family: Lycaenidae (Blues) Host: Small grasses	
9.	Common Name: Plain Tiger Scientific Name: *Danaus chrysippus* Family: Nymphalidae (Brush Footed) Host: Milkweed	
10.	Common Name: Common Emigrant Scientific Name: *Catopsilia pomona* Family: Pieridae (Whites and Yellows) Host: Cassia fistula, Albizia sp.	

The Butterflies species have specific host plants on which they live and complete a major part of their life cycle. Their numbers in College campus can further be increased if we more of hosts plants to different species.

Ms Gurleen Kaur
MishraStudents' Convener (II year)

Dr. Akanksha
Teacher Convene

Green Beans Society

BEYOND THE CAMPUS ENVIRONMENTAL PROMOTION ACTIVITIES

A. Swachh Bharat Abhiyan'

8 th & 9 th Aug.-Begumpur visit

It's so strange that a place just a few kilometres from our college seems like a completely different world. When we went for a survey for 'The Clean India Mission' to 'Begumpur Slums' we were astonished to see the condition in which the people are living. Sights such as dirty stagnant water, clogged drains, narrow lanes, cramped houses and heaps of garbage welcomed us. Seeing us (maybe we seemed as strange to them as they seemed to us), the residents gathered all around us telling us about their grievances. We tried telling them that we are just a bunch of students who are here for a survey regarding The Clean India Mission. When we talked to people we were shocked to know that most of the women didn't know about the 'Swachh Bharat Abhiyan'. These were the major problem they told us, first of all the garbage. We could see garbage dumped everywhere. The dumped waste emanate foul odour and at the same time becomes breeding ground for flies and mosquitoes which carry several diseases with them. Also children were playing near the garbage dumps oblivious of the fact that they may get infected with some fatal disease. Water! A major problem they talked about was of water. Being the rainy season there was standing water everywhere. People told that they don't have toilets at their homes so they have to use public toilet of their area. The toilet there was in pathetic conditions. There were cramped houses. It's difficult to even imagine the living conditions of the houses there unless and until you actually experience this nightmare. Six to eight people share a cramped room and only they know as to how so many people fit in such a small room. Also they told us that the municipal dustbin of their area is never cleaned the garbage is thrown on the roads. The streets are narrow and the sewage water stagnates in open surface drains, which emits very bad smell. Seeing small kids living in those conditions was heart breaking. Just a few hours in those slums made me feel suffocated. Imagine people spending their whole lives there. We may have criticised Slumdog Millionaire, a lot about how it showed just the bad side of India, but aren't we just trying to cover the reality that the bad side does exist? Slum development needs to work on a better level. It's clear that The Clean India Mission is a failure over there.

7th Aug. - Rally to Masjid Moth area, Gautam Nagar, Niti Bagh

We interacted with the people around the Masjid Mor, taking their views on a green and clean India.

A man working at a nearby vegetable shop spoke to us about the fact that he would like to support the project but at the moment he does not make an active effort to do so. We informed him about how he could separate his

EVENT: Rally for Cleanliness with South Delhi Municipal Corporation

DATE: 30th January 2018

Along with our teacher convenor, Dr Minakshi Sethy, NSS team members **accompanied SDMC workers to Hudco Place** and spread awareness about keeping our surroundings clean. We distributed pamphlets and chanted slogans through the slum area

B. **JNU-Disaster Research Programme Initiative**

Introduction

A disaster is defined as any disruption in the community or society involving large scale loss of human lives, adverse economic, material and environmental impacts that exceed the ability of the community to cope with its own resources. It can either be natural or man-made. A disaster can strike anywhere and anytime; important is the time and efficiency with which a community responds and overcomes it. India has faced many disasters since historical times.

With time, what has changed is the level of preparedness to cope with the disasters. With increasing urbanisation and population density, the scale of damage caused by a disaster increases manifold and hence the vulnerability of a community to a disaster.

Vulnerability is a variable dependent on factors like poverty, insecurity and isolation within a community. People differ in their exposure to risk because of their social group, gender, ethnic or other identity, age and other factors. Similarly, the ability of individuals, communities, organisations and states to adapt to shocks, stresses and disasters without compromising the long-term prospects of development is called its resilience. Like vulnerability, resilience of a community towards a disaster depends on the social, economic, educational, geographical and other factors and varies from community to community.

As part of the bigger project conferred to Jawaharlal Nehru University-Disaster Research Programme, Centre for Excellence in Disaster Management, a group of colleges from University of Delhi were selected to conduct Disaster Vulnerability and Community

Resilience study in various parts of Delhi. Kamala Nehru College was one of the cluster Colleges participating in the Programme.

Objectives

The study was conducted in two phases covering residential/commercial and institutional areas with the objectives of identifying disaster prone areas due to land use changes, the compliance of construction codes and the community resilience factors.

Methodology

The areas were studied from the perspective of vulnerability to disasters like flood, earthquake and fire. Physical vulnerability of the area was highlighted depending on overcrowding, infrastructural density, availability of escape routes and the construction material used. Factors like economic status, literacy levels, social equity and nature of livelihoods were accounted for in social vulnerability. To understand these factors, an open- ended questionnaire was designed to inquire about perceptions and occurrence of disaster and resilience to vulnerability created by

them. A dedicated team of young student researchers filled in the questionnaires and observed the ground reality.

Study Area

In the first phase, the areas selected included Anand Lok, an upper end residential colony; Sadiq Nagar, a middle class structured colony of government officials; Gautam Nagar, a lower middle-class locality with mushrooming PGs, overcrowded lanes and encroached pavements and South extension and Hauz Khas market area, placed low on vulnerability index. In phase II, the study was carried out in a unique set up of urban village called Shahpur

Jat surrounded by upper-end localities like Panchsheel, Siri Fort Complex. Hauz Khas

Institutional Area and ASIAD village complex.

The faculty members involved in the first and second phase of the project were Dr Sarita Ghai (Department of Geography), Dr Neena Bansal (Department of Political Science), Dr Akanksha Mishra (Department of Environmental Science) and Dr. Chetan Chauhan (Department of Geography).

Major Findings

Strong correlations were observed between the economic status of the residents and their

vulnerability to disasters. Rather it was proved that community resilience to disasters is directly proportional to social and demographic variables like levels of literacy, nature of employment and living standards. Areas like Gautam Nagar and Shahpur Jat are even more vulnerable to disasters like fire as no building construction codes are followed along with heavy electrical wires lying overhead. Completely based on a Community Outreach approach and Participant Appraisal, the study forms a strong basis of identifying zones strongly prone to disasters.

We wish to take the study further to create a Resilience Atlas for the localities covered by us,

to make our college a nodal centre in case a disaster strikes.

2. Inter-college panel discussion on the environmental activities

In September 2017, the Society was approached by WWF (World Wide Fund for nature) India, to send two representatives of the eco club of college for an Inter-college panel discussion on the environmental activities that different colleges have taken up. It was followed by a panel discussion on 26th of September where representatives from the Environment society of Ramjas College, Satyawati College, Shaheed Bhagat Singh College, Hindu College and Sri Guru Nanak Dev Khalsa College were also present and presented their work.

C, CLEAN GANGA MISSION/GANGA UTSAV

Ganga Utsav In Collaboration with National Mission for Clean Ganga Ministry of Jal Shakti, Government of India 4th November 2019 National Mission for Clean Ganga was organised on 4th November 2019 at the Dhyanchand National Stadium by the Ministry of Jal Shakti, Government of India. It was conducted to spread awareness about the depleting conditions of river Ganga. NSS KC was honoured to be a part of this enlightening seminar. The hues of nature and especially the 'Ganga' was the main attraction in the paintings. Various games like the ganga version of Snakes and Ladders, Quiz, Puzzle, Storytelling enthralled the children from all around. The school children were actively involved in the activities. There were films on River Ganga, Danube and

Rhine playing on a screen. The exhibition of the rivers - Ganga, Danube, and Rhine. The water testing and the river projects' models were also setup. The event was extremely interactive and fun session and was a great way to trigger the young minds to think about innovative ways to protect the river, along with our natural habitat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गंगे
Block 4
Activities