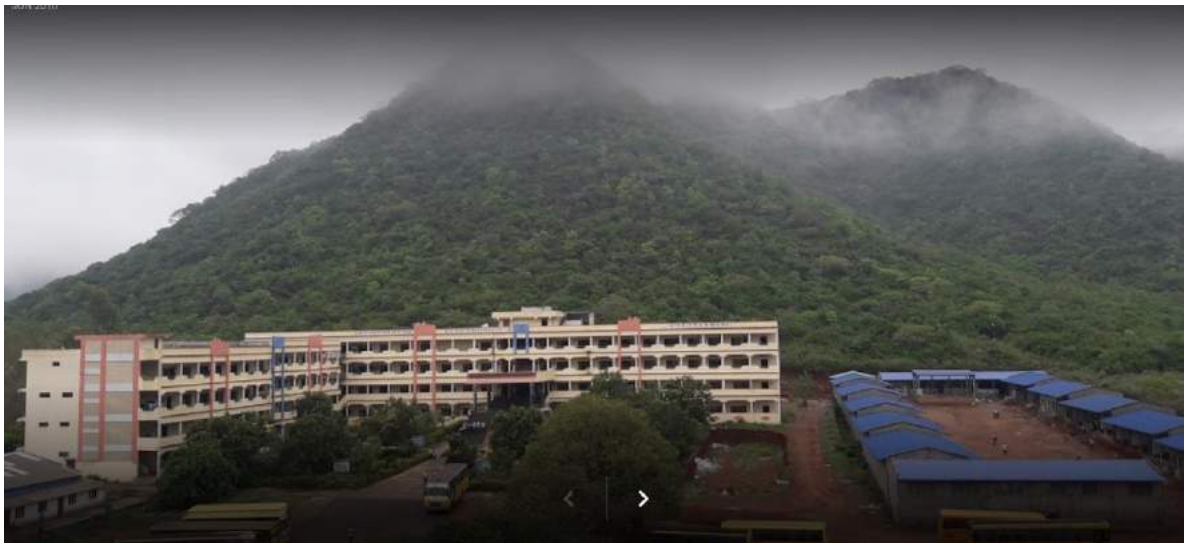
REPORT

ON

ENERGY, GREEN &ENVIRONMENT

AUDIT STUDIES



Conducted at

VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY,
NUNNA VILLAGE, VIJAYAWADA
ANDHRA PRADESH - 521212

CONDUCTED BY
SRINIVASA RAO MOTUPALLI
CERTIFIED ENERGY AUDITOR
EA – 14488

MARCH 2020

ENERGY, GREEN & ENVIRONMENT AUDIT STUDIES

COMPLETION CERTIFICATE

TO WHOMSOEVER IT MAY CONCERN

Name of the Institution	Vikas College of Engineering & Technology
Details of the facilities audited	All Departments, Laboratories, Library, Hostels, Mess etc..
Date of Audit	16th March 2020
Name of Certified Energy Auditor	Srinivasa Rao Motupalli
Certificate Number	Energy Auditor-14488
Name of the Green Auditor	Ar. P.Sitha MahaLakshmi, ECBC TPA, IGBC AP, GRIHA CP,GEM CP
CoA license number	CA/2012/57214
IQAC coordinator	T Mastanaiah

T Mastanaiah
IQAC Coordinator

PVL DESIGN STUDIO
•ARCHITECTURE •INTERIORS
•GREEN CONSULTANCY

Ar. P.Sitha MahaLakshmi,
ECBC TPA, IGBC AP, GRIHA CP, GEM CP

SRINIVASA RAO MOTUPALLI
EA-14488

Srinivasa Rao Motupalli
BEE Certified Energy Auditor

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I. Acknowledgement

I, Srinivasa Rao Motupalli, appreciates the keen interest shown by the management of **VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY,** in getting Audit done for conservation of energy, green and environment.

I express my sincere thanks to the management of "VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY" for their trust and entrusting the assignment of Energy, Green & Environment Audit studies.

I also sincerely thank Prof. Shri. K.K.D.VARA PRASADA RAO (HOD-CIVIL DEPARTMENT) , Prof. Shri B .LAKSHAMANA NAYAK (HOD-EEE DEPARTMENT), Mr. G.VADDIKASULU (Asst. Professor-EEE), Ms. V ANUSHA (Civil), Mr. RAO (AO) , Mr. M MANOJ (Electrician) and all the staff participated for their initiative and active participation in the Energy, Green and Environment audit studies.

Srinivasa Motupalli
Certified Energy Auditor, BEE, Govt. of India
Charted Engineer, IEI
EA-14488

II. Executive summary

Energy Auditor was entrusted for carrying out Energy, Green and Environment Audit (walk through) studies in M/s.VCET, NUNNA VILLAGE, and VIJAYAWADA for reducing the energy consumption by identifying energy saving opportunities in the facility. In this connection, we has visited the facility for collection of data and measuring few energy consumption parameters for analysis and finding energy saving opportunities.

The major energy inputs for the plant are electricity and Diesel oil. Electricity is used for operating electrical appliances. DG SET is being used for during emergency / power outage. A study was carried out with an objective to identify and prioritize the cost effective energy conservation recommendations to decrease the energy consumption and energy costs in the plant.

This report highlights 4 Numbers of cost effective energy conservation recommendations and couple of no-cost conservation methods for reducing the energy bills. The following table provides energy saving potential identified in the plant.

Sl. No	Energy from Grid kVAh/Year	Net Solar Energy used after export to grid	Total Annual energy consumption	Savings Identified KVAH/year	(%) Savings
1	789899	Zero	789899	30096	3.8%

III. List of energy conservation recommendations:

Sl. No.	Energy Saving Recommendations	Electricity Savings (kVAh/year)	Monetary Savings (Rs./year)	Capital Investment (Rs.)	Payback (Months)
1	Replacing FTLs of 36 W with LED Tube Lights	27790	212593	174680	9.8
2	Replacing Incandescent of 60 W with 9W LED Lights	892.5	6827	800	1.5
3	Replace Ceiling Fans with Energy Efficient BLDC Fans by Atomberg Technologies	851	744263	2382800	50
4	Replace Zero Watt Bulbs with 0.5 Watt LED	750	5738	1800	4
Total		30096	967986	2560082	31

IV. Important information

Name and Address of the Institute	M/s VIKAS COLLEGE OF ENGINEERING TECHNOLOGY NUNNA, VIJAYAWADA – 521212 Andhra Pradesh. India,
Name of Contact Person and Contact	T Mastanaiah, IQAC Coordinator VCET, NUNNA VILLAGE, IJAYAWADA. Phone No: 7382053817
Date of Audit	16.03.2020
Contracted Maximum Demand (CMD)	160 kVA
Maximum Recorded Demand (RMD)	211.4 kVA (May-2019)
Minimum Recorded Demand (RMD)	135.6 kVA (Feb-2019)
Power factor (PF)	1

Energy Consumption & their cost details :

Table1 : Electricity Consumption

S. N	PARTICULARS	UNIT	VALUE
Electricity Details for Feb-19 to Jan-2020			
Cost of Electricity : Rs. 7.65/ Unit			
Demand Charges : Rs. 475/ kVA			
1	Monthly Avg. Consumption of Electricity	kVAh/Month	65824.9
2	Monthly Avg. Cost of Electricity including Demand charges	Rs./ Month	628756
3	Yearly Consumption of Electricity	kVAh/Year	789899
4	Yearly Cost of Electricity including Demand Charges	Rs./ Year	7545079
5	Maximum Electricity Consumption (APRIL-19)	kVAh /Month	79273
6	Minimum Electricity Consumption (FEB-19)	kVAh /Month	40162

1. Introduction

1.1 General details

The Vikas College of Engineering & Technology was established in the year 2008 by Sri N.NARSI REDDY M.Sc., B.Ed., a great educationalist and a reformer with a great vision. The institution was approved by AICTE and affiliated JNTUK in the year 2008.the institution offer Under Graduate, Post Graduate and MBA. The aim is to help the students to be successful in their disciplines and become effective leaders in their society so that they can face the challenges of challenging world. The core values of our institution are leadership, excellence, and respect for traditions, diversity, integrity and social responsibility. The institution is offering education to nearly 3000 students in the under graduate & post graduate and MBA courses.

The institution is at the forefront to provide world class education. The institution is nestled at the foot hills of beautiful lush green mountains surrounded by mango grooves in a serene atmosphere spread over 10.8 acres ideally suited for technical education. The young elite team of management driving the group in the right direction in order to fulfill their long cherished goals. The motto of Vikas College of Engineering & Technology is recreating, reinventing and implementing innovative methods by imparting wide range of education to the students in all aspects.

Vikas College of Engineering & Technology is a one stop solution for aspirants who would like to pursue higher level of education. It strives hard to promote quality education affordable to all sectors of the society through its regular up gradation of standards which matches the best in the field.

VIKAS a name that reckons to Encourage, Educate and empower the students about the sustainable development in their career. "It is our Passion & Commitment to empower our Students to realize their dreams come true in life"

1.2 Audit team

Audit Team consist of Energy auditor and SVIST staff:

Name of the Member	Designation
M. Srinivasa Rao	Team Leader: Certified Energy Auditor -EA14488 Chartered Engineer - 016378
Ar.P. Sitha MahaLakshmi	ECBC TPA, IGBC AP, GRIHA CP, GEM CP
Prof. Shri. B .Lakshamana Nayak	HOD- EEE Department
Prof. Shri. K.K.D.VARA PRASADA RAO	HOD- CIVIL Department
Shri.G.VADDIKASULU	Asst.Prof - EEE Department
Ms. V ANUSHA	CIVIL Department
Shri. RAO	A.O
Shri. MANOJ	Electrical Technician

1.3 Energy audit instruments used

- ✓ Power Analyzer
- ✓ Lux Meter
- ✓ TDS Meter

1.4 Methodology adopted

Auditor has conducted the walk through on 16th March -2020. As part of the audit, a team comprising of energy auditor and staff from VCET did walk through on the facility, took some measurements and monitoring the energy consumption of all key equipment with energy audit instrumentation. The methodology followed:

i. Collection of operating data

ii. Discussions with concerned personnel to take note of operating practices and to identify specific problem areas and bottlenecks if any with respect to energy consumption.

iii. Measurement of energy related parameters of various Equipment

iv. Identification of energy wastage areas and quantification of energy losses.

v. Preparations of cost benefit analysis for recommended measures.

1.5 Energy use and areas

The facility has 5 blocks - A, B, C, D AND E and a girls hostels. It is equipped with utilities like Lighting, Fans, RO system, Computers, projectors and pumps.

Detailed list of appliance used are given here:

Sl.no	Name of the Load	Total No	Rating	Power rating/ each(W)	Total power (W)	operating hours
1	Fluorescent Tube Lights	794		40	17468	7
2	Fans	851		80	68080	7.5
3	Projectors	17		150	2550	3
4	Mike	0			0	
5	Speakers	4			0	
6	Computers	437		171	74727	6
7	Lifts	0			0	
8	AC 1.5 ton	10	3 STAR	1104	11040	6
9	AC 2 ton	5	3 STAR	1741	8705	6

10	Water Coolers	8		110	880	
11	Printer	13		230	2990	3
12	Switches	4278			0	
13	Sockets	1861		1150	2140150	
14	Xerox M/c	5		930	4650	4
15	Inverters	4			0	
16	Battery (12 V)	46			0	
17	CC cams	36		50	1800	
18	CC TV monitors	2		75	150	
19	Water motor 7.5 HP	1		5595	5595	
20	Water motor 1.5 HP	2		1119	2238	
21	ATM	1		2500	2500	
22	Biometric	2		5	10	
23	Cash count Machine	1		80	80	
24	LED Lamp	8		10	80	
25	CFL Lamp	1		60	60	
26	wall fans	10		100	1000	
27	UPS (10 KVA)	3		8000	24000	
28	UPS (20 KVA)	1		16000	16000	
29	UPS (3 KVA)	2		2600	5200	
30	UPS (30 KVA)	2		24000	48000	
31	UPS (30 KVA)	1		24000	24000	
32	MECHANICAL LABS				332	
33	ECE LABS				880	
34	ELECTRICAL LABS				74730	
35	CIVIL LABS				2260	
36	AGRI LABS				0	

BLOCK WISE electrical appliance details are also available but not includes here in this report. Facility also has RO plant-capacity 1000 liter per hour.

2. Energy systems

2.1 Energy systems description

The major inputs for the facility are

- Electricity
- Electrical energy is used to operate equipment like acs, water pumps, motor, lighting appliances, computers etc.
- They have proposal for solar Power Plant of Capacity 160 kwp.
- DG Set.

2.1.1. Electrical energy and its analysis

The electricity is sourced from SPDSL. The following are the details of the electrical supply.

- The Facility has a Maximum Contract Demand (CMD) of 160 kVA.
- The Facility has installed 1 no's of Transformers of capacity 200 kVA (11/0.433kV)
- Grid supply is available at 11 kV and is stepped down to 433 V. The average power factor is maintained at 0.99(avg.)

The recorded maximum demand varied from 211.4 kVA in MAY-2019 to 135.6 kVA Feb - 2019 and the monthly average maximum demand recorded is 175.13 kVA. The month-wise energy consumption, actual demand, billed units (kVAh) and electricity bills are presented in Table below.

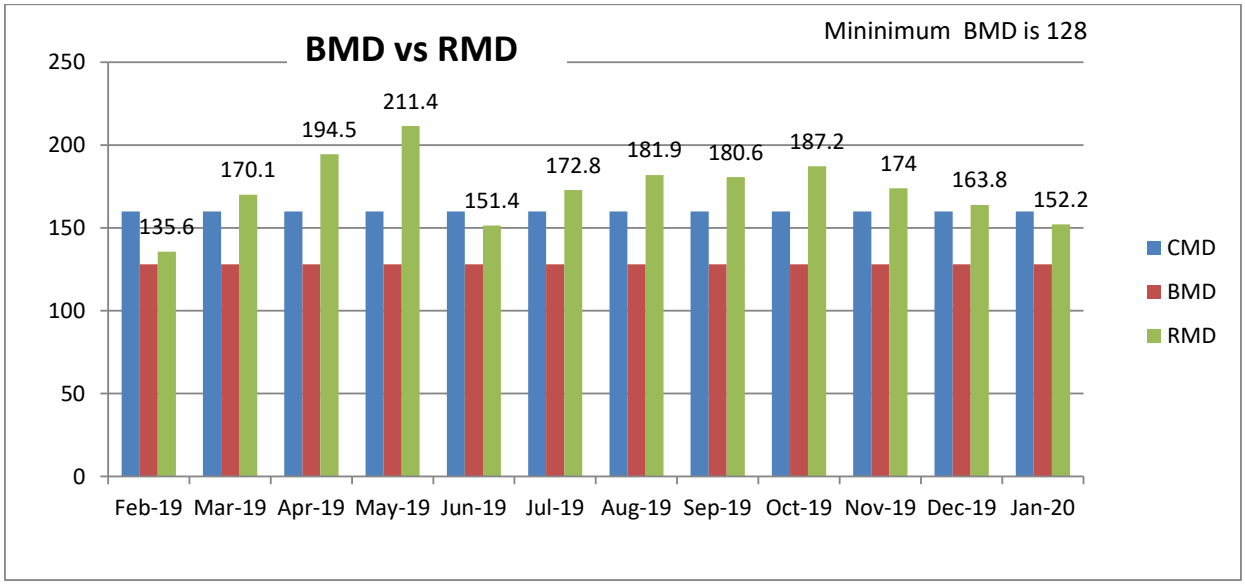
Table2 : Monthly Electricity Consumption

Bill Month	CMD	BMD	RMD	Energy Consumption (KVAh)	Energy Consumption (kWh)	Power Factor (PF)	Demand Charges (INR)	Energy Charges (INR)	Solar KWH share	Total Bill Amount (INR)
Feb-19	160	128	135.6	40162	39908	0.9936	64410	307641.11	0	383526
Mar-19	160	128	170.1	64250	63760	0.9923	76000	492155	0	595819
Apr-19	160	128	194.5	79273	78548	1	76000	607231	0	830982
May-19	160	128	211.4	67166	66873	1	76000	513919	0	688275
Jun-19	160	128	151.4	68213	67915	1	76000	534571	0	609919
Jul-19	160	128	172.8	52893	52737	1	77400	433501	0	510901
Aug-19	160	128	181.9	77625	74909	1	96305	593831	0	714427
Sep-19	160	128	180.6	64027	63684	1	95570	489753	0	602063
Oct-19	160	128	187.2	74330	74030	1	76000	568624	0	758943
Nov-19	160	128	174	65024	64702	1	89300	497433.6	0	604407
Dec-19	160	128	163.8	69908	69637	1	79160	512764	0	636590
Jan-20	160	128	152.2	67028	66659	1	72295	512764	0	609227
Total				789899	783362		954440	6064187.71	0	7545079
Average	160	128	172.9	65824.9	65280.16	0.99875	79536.66	505348.97	0	628756
Maximum	**160**	**128**	211.4	79273	78548	1	96305	607231	0	**714427**
Minimum	**160**	**128**	135.6	40162	39908	0.9923	644190	307641	0	**383526**

2.1.2. Recorded maximum demand pattern:

The below is the recorded demand pattern of the plant from feb-2019 to Jan-2020.

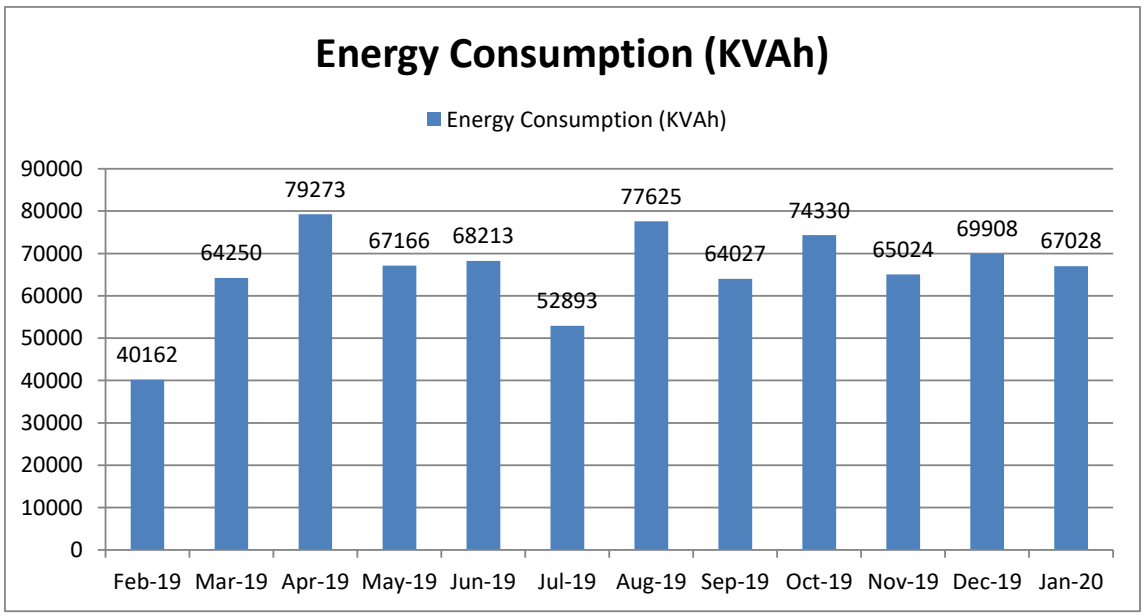
Figure 1: Recorded kVA



2.1.3. Electricity consumption pattern:

The following is the electricity consumption pattern for the plant from April-2018 to March-2019.

Figure 2: Recorded kVAh

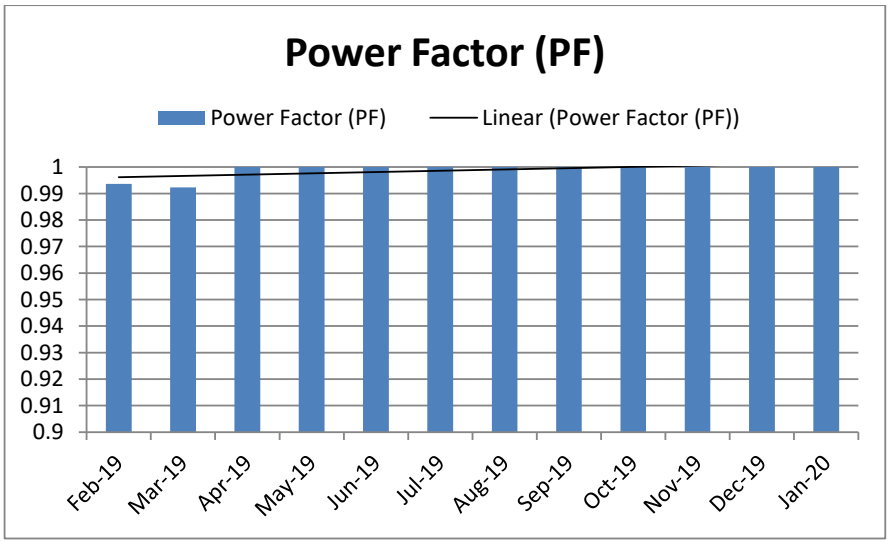


2.1.4. Power factor pattern:

It was found from electricity bills that the average operating PF is 0.99 with min. PF at 0.99 and max. PF at 1.0.

Power Factor is maintained very well. It is still recommend the installation of APFC is near the main PCC.

Figure 3: Recorded Power Factor



2.1.5. Earthing checking

All earth pit are maintained well and are in good condition. Earth Resistance is not checked during the audit.

It is recommended to check the earth resistance and should be kept below the acceptable values as given below

S. No.	Location of Earthpit	Observed value	Acceptable value	Pass/ Fail
1	Transformer		Less Than 5 Ohms	
2	Admin Block		Less Than 5 Ohms	
3	EEE Block		Less Than 5 Ohms	
4	ECE Block		Less Than 5 Ohms	
5	Computer Block		Less Than 5 Ohms	
6	Civil Block		Less Than 5 Ohms	
7	Agri		Less Than 5 Ohms	

Earthpit

3. Electrical distribution system & power quality

3.1 Electrical distribution system

Electricity to the facility is supplied by APEPDCL Sub-station. The plant is supplied electricity at 11 kV level through APEPDCL Metering unit consisting of CT & PT units, which are located in the plant premises. The Present "Contracted Maximum Demand" (CMD) is 160 kVA. From this APSPDCL Metering unit the power is taken to 200 kVA, 11/0.433 kV transformer. The details of the transformer is given below.

Please note SLD is not provided to auditors and it was not possible verify the connected load.

Table 3: Transformer Details

Transformer	Capacity (kVA)	Ratio	Connected Load (kW)	Capacitor Banks kVAr
Transformer - 1	200	11/0.433 kV	300	95kVAr

3.2 Power quality

The IEEE defines POWER QUALITY as the ability of a system or equipment to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.
For economic operation of a power system, the level of power quality should be properly maintained. For reference the standard limits are mentioned as under.

Following Measurement are provided by the college technician as given below.

3.4.1. Voltage & current

VOLTAGE	**R**	**Y**	**B**
Minimum	420	413	425
Average	430.	436	430
Maximum	440.0	439	435

Observations:

1. Voltage is in the range of 413 V to 440V near the transformer. Sometimes, it is going even higher. Reading in the Night should be monitored.
2. Transformer has Auto Tap settings at the lowest level. Current Transformer doesn't support automatic tap settings.
3. From the bills max. KVA is 211 kVA. Transformer is overloaded and most of the time running 80% capacity. It is recommend to run the transformer at optimum capacity of 50% as recommended by Bureau of Energy Efficiency.
4. It is recommended to increase the enhance the transformer capacity.

4. Pump/motor sets for water pumping

Electric Motors are used in this facility mainly for pumping ground water from bore well for domestic usage, even a 2 to 3% reduction in consumption can significantly save plant's energy bill.

4.1 Details of pumpset

Table4: Pump set details, rating with rewinding history

Sl.no	Manufacturer	Type	Rating	Rewinding history	Location
1	TEXMO	submersible	1.5 HP(3 phase)	Twice	Main block
2	TEXMO	submersible	7.5 HP		Main block
3	TEXMO	submersible	1.5 HP(3 phase)		Main block

4.2 Observations and findings

1. Motors are primarily used for pumping water.
2. Capacity of the motors are 7.5 HP and 2 nos. Of 1.5 HP.
3. Running hours of motors is around 12 to 14 hours per day.
4. There are old motor installed in 2008 and rewinding history is not known.
5. Recommend to new motors if rewinding is done more than 2 times as per BEE norms.
6. New motors with IE2 or higher Efficiency should be purchased for future requirements. It is recommended to maintain a Capacitor bank near Panel connected to the individual loads / motors so that electrical distribution network is healthy.

5. Diesel Generator:

The facility has 1 DG sets.

DG Sets is operational during power outage. Details of DG Set are given below.

Table5: DG SET DETAILS

DG	Make	Capacity (KVA)
DG set - 1	KIRLOSKAR	82.5 KVA

5.1 Observations, findings & recommendations:

1. DG is used during power cuts. It was informed that power outages is not frequent.
2. Power outage is for about 1 time for a total duration of 1 hour's maximum during day time.
3. Log books are not maintained for the fuel consumption.
4. Energy Generation is not recorded.

Auditors suggested Technician to record the energy meter reading on the DG in the DG and fuel consumption log books.

5. As Per Technician, Monthly DG consumption is around 200 liters.
6. DG Set is regularly maintained
7. It is also informed to Auditor that DG Set - 82.5KVA consumes 10 liters per hour on full load.
8. Measurements couldn't be taken during audit.

6. Lighting systems:

The plant uses lighting in different production shop floors, Admin building and general areas like cafeteria, offices, street lighting. The type of luminaries deployed includes Florescent Tube Lights (FTLs), Compact Florescent Lights (CFL's), LEDs and few sodium vapour lamps.

6.1 Details of lighting system

The following are the lighting appliances installed in all the different rooms.

Table6 : Lighting Source details

Lighting Appliance Details			
S.No	**Item**	**Wattage (W)**	**Quantity**
1	**Florescent Tube Lights - 36w with electronic choke**	40	794
2	**LED Lamp**	10	8
3	**GLS**	60	10
4	**Zero watt**	8 - 15	40

6.2 Study of lighting systems & fans

The Lighting system study involves:

- This facility has about 130 rooms used for different purposes like computer & others labs, staff rooms, e-class rooms, auditorium, lecture class rooms, library.

- Random sampling of different Rooms measurement of Lux levels
- Lux meter is used to measure the lighting levels in randomly selected rooms and the same is compared with standards.

The Lux levels measured for various locations are presented below

Table7: Details of the Lux Levels

Rooms	LUX level	Min. LUX	Max. LUX	Avg. LUX
E Class Room	148,78,158,90	90	158	118.5
Electrical machine Lab	98,58,44,23	23	98	56
Admin office	29,31,39,23	23	39	30
ECE HOD Cabin	114,185,228,154	114	228	171
Library (reading section)	96,260,60,380	60	380	199
Computer Lab-1 A block	22,28,46,32	22	46	32
Computer Lab-2 B Block	13,10,26,50	10	50	24.75
Computer lab for civil	26,30,38,40	26	40	33.5
digital library	25,18,30,48	18	48	30.25

6.3 Observations and findings

- Natural lighting is used in most of the room.

- The average illuminations levels are found to be at 20 - 199 lux in different rooms as given above.
- Lux level is good in library and staff rooms.
- Lux level in computer labs and class rooms can be improved.
- MAJORITY OF THE LIGHTING IS Fluorescent Tube lights. Recommended to switch over to LED.
- CFL BULBS are also in not used.
- It is also observed that single switch is used to operate more than one light.
- Few Incandescent bulbs of 60 watts are in use.
- Hostel rooms have zero watt bulb with consume more than 10 watts are used.
- Lights and fans are to be switched off when not required.
- Fans rating of 80 watt is currently in use. Recommended to use energy efficient fans or BLDC Fans. Recommendation for the same is given.
- Switching over to LED lights will reduce Demand by 12 KVA to18KVA.
- Switching over to BLDC fans will reduce Demand by 20 KVA to 28 KVA
- Over all of 32kVA to 40 KVA can be reduced if LED and BLDC Fans are used resulting in good energy and Monterey saving.

6.4 Lighting Standards

As per BIS: 3636, part 1 -1992 standard, the required lux level for such education activity should be between 300 – 500 lux and same is given below.

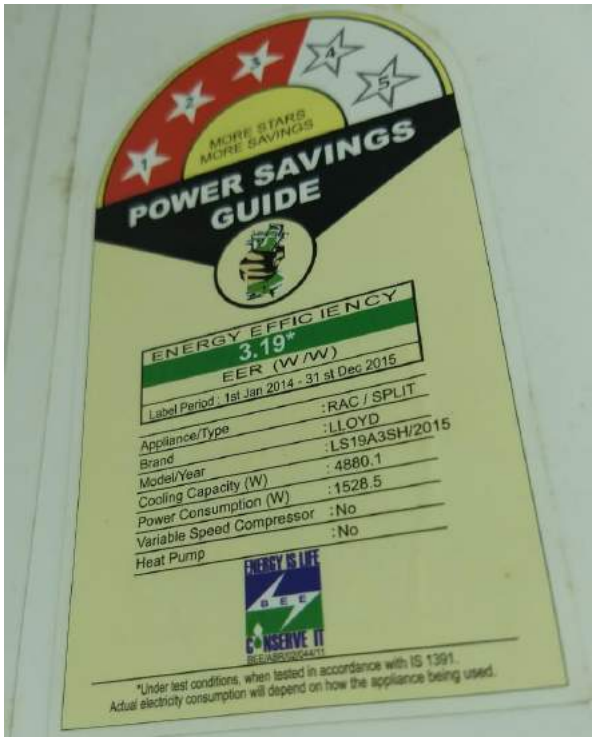
			coverage
21 EDUCATION			
21.1 Assembly Halls			
21.1.1 General	200-300-500	3	
22.1.2 Platform and stage	—	—	Special lighting to provide emphasis and to facilitate the use of the platform/ stage is desirable
21.2 Teaching Spaces			
General	200-300-500	1	
21.3 Lecture Theatres			
21.3.1 General	200-300-500	1	
21.3.2 Demonstration benches	300-500-750	1	Localized lighting may be appropriate
21.4 Seminar Rooms	300-500-750	1	
21.5 Art Rooms	300-500-750	1	
21.6 Needlework Rooms	300-500-750	1	
21.7 Laboratories	300-500-750	1	
21.8 Libraries	200-300-500	1	
21.9 Music Rooms	200-300-500	1	
21.10 Sports Halls	200-300-500	1	
21.11 Workshops	200-300-500	1	

Figure 4 Lighting standards at various places.

7. Air Conditioners

This facility has about 15 conditioners. Most of the AC's are 3 star rated installed in 2014 and operated during day time for 6 hours.

Air Conditioners(2 Ton)	5
Air Conditioners(1.5 Ton)	10



7.1 Observations & Findings:

1. AC's are periodically maintained by the maintenance staff.
2. AC temperature is set to 20 - 24 Deg C.
3. At such temperature, the energy consumption is very high.
4. Recommend to operate AC's at 24 or 25 Deg C and use Fan for circulation if required.
   The norm is for every 1 Deg C reduction, energy saving is about 2-3%. By increasing the temperature from 16 to 24, Energy saving of 16% can be achieved
5. We also recommend use of Airtron AC sensor which are pre-programmed for all climate conditions. Payback period is about 6 months to one year depending on the running hours.

6. This product is tested, certified and recommended by CII and EESL. Vendor details are given in the supplier section. Refer to https://www.magnatron.in/ for more details.

8. Energy conservation recommendations

8.1 Recommendation – 1

Table8: Replacing FTLs of 36 W with LED Tube Lights

A: Title of Recommendation	:	**Replacing FTLs of 36 W with LED Tube Lights**
B: Description of Existing System and its operation	:	Existing luminaries are Fluorescent Tube lights (T8) of 36 W
C: Description of Proposed system and its operation	:	Replace T8 Tube Light's with energy efficient LED Tube Lights to reduce the energy consumption. The LED Tube Lights will consume 20W without compromising on the illumination levels.
D: Energy Saving Calculations		
Present No. of FTLs		794
Present Fixture Consumption of T8(W)	:	36
Present Fixture Consumption of T8(W) along with ballast consumption		40
Proposed Consumption of LED Tube Light(W)	:	20
Achievable power savings(W)	:	20
Annual Operating Hours (@ 7 hrs/day & 250D/Y)	:	1750
Total Energy Savings kWh/year	:	27790
Total Energy Savings kVAh/year	:	27790
E: Cost Benefits		
Energy Saving Potential kVAh/ year	=	27790
Annual Cost Savings @ Rs. 7.65/kVAh	=	212595
Investment (@ Rs. 220/LED)	=	174680
Payback Period in months	=	9.8 months, say 10 months.

8.2 Recommendation – 2

Table9: Replacing Incandescent of 60 W with LED Lights

A: Title of Recommendation	:	**Replacing Incandescent of 60 W with LED Lights**
B: Description of Existing System and its operation	:	Existing luminaries are Incandescent of 60 W
C: Description of Proposed system and its operation	:	Replace Incandescent of 60 W's with energy efficient LED Lights to reduce the energy consumption. The LED bulb will consume 9 W without compromising on the illumination levels.
D: Energy Saving Calculations		
Present No. of Bulbs		10
Present Fixture Consumption		60
Proposed Consumption of LED Light(W)	:	9
Achievable power savings(W)	:	51
Annual Operating Hours (@ 7 hrs/day & 250D/Y)	:	1750
Total Energy Savings kWh/year	:	892.5
Total Energy Savings kVAh/year	:	892.5
E: Cost Benefits		
Energy Saving Potential kVAh/ year	=	892.5
Annual Cost Savings @ Rs. 7.65/kVAh	=	6828
Investment (@ Rs. 80/LED)	=	800
Payback Period in months	=	1.5

8.3 Recommendation – 3

Table10: Replace Ceiling Fans with Energy Efficient Fans by Atomberg Technologies

A: Title of Recommendation	:	**Replace Ceiling Fans with Energy Efficient Fans by Atomberg Technologies**
B: Description of Existing System and its operation	:	Existing Ceiling Fans consumes about 80W.
C: Description of Proposed system and its operation	:	Replace existing ceiling fans with energy efficient Fans to reduce the energy consumption. The Energy Efficient fans with 30 W of demand can substitute the present system without compromising the air delivery.
D: Energy Saving Calculations		
Present No. of Ceiling Fans		851
Present Consumption of existing Ceiling Fan(W)	:	80
Power consumption of proposed Energy Efficient BLDC Fan (W)	:	30
Achievable power savings(W)	:	50
Operating Hours (@7.5 hrs/day & 250 Days /Year)	:	1750
Total Energy Savings/Year(kWh)	:	74462
Total Energy Savings/Year(kVAh)	:	74462
E: Cost Benefits		
Energy Saving Potential/ year (kVAh)	=	74462
Annual Cost Savings @ Rs. 7.65/kVAh	=	569638
Investment on Star Fan @ INR 2800 per Piece	=	2212600
Payback Period Months	=	46

8.4 Recommendation – 4

Table11: Replacing Zero watt bulb of 10 W with 0.5 watt LED Bulb

A: Title of Recommendation	:	**Replacing Zero watt bulb of 10 W with 0.5 watt LED Bulb**
B: Description of Existing System and its operation	:	Existing Zero watt bulb consumes 10 W
C: Description of Proposed system and its operation	:	Replace Zero watt bulb with energy efficient LED bulb to reduce the energy consumption. The LED bulb will consume 0.5 W without compromising on the illumination levels.
D: Energy Saving Calculations		
Present No. of Zero watt bulb		40
Present Fixture Consumption	:	8
Proposed Consumption of LED Tube Light(W)	:	0.5
Achievable power savings(W)	:	10
Annual Operating Hours (@ 10 hrs/day & 250D/Y)	:	2500
Total Energy Savings kWh/year	:	750
Total Energy Savings kVAh/year	:	750
E: Cost Benefits		
Energy Saving Potential kVAh/ year	=	750
Annual Cost Savings @ Rs. 7.65/kVAh	=	5737
Investment (@ Rs. 45/BULB)	=	1800
Payback Period in months	=	3.7 months. say 4 months

8.5 Use of Solar PV System for power Generation

VSCT has proposal for 160kwp solar power plant. They already have net meter installed. Currently college is evaluating solar power plant proposals and is planning to install in coming months.

This is connected to gird using grid-tie inverters.
Excess energy after utilization is **wheeled** to the grid, APSPDCL through net meter.

9. Initiatives by College towards Sustainable Environment

1.1. Energy conservation Awareness programmes.

Energy conservation & Energy Efficiency awareness programme are conduct for the college. Session covers topic on Energy Conservation, Energy Efficiency and use of Renewable, global warming and the climate changes indicators.

Unfortunately, due to rise in COVID Pandemic, Auditors was not able to conduct the programme.

10. GOOD ENERGY PRACTICES BEING FOLLOWED IN-HOUSE

- Lot of Greenery, fields in outdoor plant to create ambient and healthy atmosphere.
- Replacements of LED lights.
- AMCs for all the utility equipment as Air Conditioners.
- Regular preventive maintenance is carried out.
- Use of RO water for drinking and Canteen.

POINTS TO BE IMPROVED:

- Lighting Lux level can be improved.
- Housekeeping can be improved.
- Air conditioners more than 10 years old to be replaced by efficient 5 star rated Air conditioners.
- Remote is used to switch off the ACs. It is recommended to Switch off AC Main Supply to the Stabilizer. This will save substantial amount of energy.
- Auto water lever controller to be provided in the pump house pumps.
- Area around the bore well pumps is to be cleaned and unnecessary material to be removed.
- To provide PIR sensors in the Toilets to switch off the lighting.
- Individual energy meter to be provided to all the individual buildings.
- Voltage stabilizers is recommend to improve the voltage range.

WATER MANAGEMENT SYSTEM:

- There are 5 bore well used for water suppliers.
- There 5 rainwater harvesting pits. Rainwater collect the roof top water to the pits to improve the water table so that ground water table level is increased.
- Rain water can also be collected in the storage tanks through filter and can be used for all purposes to avoid pumping cost.

- There are two numbers of 1000 Liters each RO plants, bore water is used in RO plants. Resulting in higher wastage of water.
- Water meters to be provided to the bore wells to know the quantity of water being utilized.

11. Addresses of suppliers

1. **LED Supplier :**

   EESL - East Godavari District
   Mobile 90593 33788

2. **Energy Efficient Fan Supplier:**
   Gorilla Fan
   Atomberg Technologies
   Mumbai
   https://atomberg.com/gorilla-fans/ceilingfan.php

3. **PIR Sensor Suppliers**
   SURMOUNT ENERGY SOLUTIONS PVT. LTD.
   B-003-004, Platform level, 1st floor, Tower#10,
   ITC, Belapur Station Complex CBDBelapur,
   Navi Mumbai – 400 614
   Phone: 022-61340340/350
   E-mail: sales@buildtrack.in

4. **SINICON Water Level Controller System**
   M/s. Agarwal Trading Corporation
   5-1-14, R P Road,
   Secunderabad
   Ph: 040-66331140, 9248300482.
   For More information, visit:
   https://sinicon.net/WaterSwitch_System_IA_and_IIA

5. **AIRTRON Suppliers**

   - ✓ MAGNATRON INTERNATIONAL
     801, K.C. Dey sarani, Block – P,
     New Alipore,
     Kolkata – 700 053,
     W.B., India.
     Ph: +91 7595052890
     Mobile: +91 9748727966
     E-mail: indiaenergysavers@gmail.com

GREEN AUDIT REPORT
VIKAS ENGINEERING COLLEGE, NUNNA

Carried on

17th February 2020

Carried out by

PVL Design Studio,

Architecture, Interiors, ECBC Certification,

Green Spaces Design, Constructions and Audit

Web: www.pvl-group.com,
Email: psmahalakshmi@pvl-group.com

Ltr.No: PVLA066/P052/GA-01/GAC/AP/2019-20

DESIGN STUDIO

Audit Certificate

This is to certify that Vikas college of Engineering and Technology, Nunna, Andhra Pradesh, has conducted "Green Audit" in March 2020 to assess the green initiative planning, efforts, activities implemented in the college campus like Daylighting, Ventilation, Water audit, Solid waste management, Ambient air quality, Environmental Audit – Carbon Sequestration , Green cover inventory and green practices Such as vehicle free campus area, Provision of public transport, planting native species, beyond environmental promotional activities. This green audit is also aimed to assess impact of green initiatives for realising eco-friendly campus.

Place: Nunna
Date: 16th March, 2020

Mr. KKD VARA PRASADA RAO
Committee Member

SRINIVASA RAO MOTUPALLI
EA-14488

Mr. Srinivasa Rao Motupalli
Certified Energy Auditor

Dr. M.M.Raju
Committee Co-ordinator

Head of Department
Dept of Science & Humanities
VIKAS COLLEGE OF ENGG. & TECH
NUNNA, VIJAYAWADA RURAL
KRISHNA DIST.,

Dr. B. Ramana
Committee Chairman

PRINCIPAL
VIKAS COLLEGE OF ENGG.&TECH
NUNNA, VIJAYAWADA RURAL
Krishna Dt., A.P.

PVL DESIGN STUDIO
•ARCHITECTURE •INTERIORS
•GREEN CONSULTANCY

Ar.P.Sitha MahaLakshmi
Sustainability Auditor
PVL Design Studio

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Chapter 1: Green Audit

1.1 What is Green Audit

Green auditing is a means of assessing environmental performance (Welford, 2002). It is a systematic, documented, periodic, and objective review by regulated entities of facility operations and practices related to meeting environmental requirements (EPA, 2003). It is otherwise the systematic examination of the interactions between any operation and its surroundings. Green Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments.

1.2 Goals

- Identification and documentation of green practices followed by university.
- Identify strength and weakness in green practices.
- Conduct a survey to know the ground reality about green practices.
- Analyze and suggest solution for problems identified from survey.
- Assess facility of different types of waste management.
- Increase environmental awareness throughout campus.
- Identify and assess environmental risk.
- Motivates staff for optimized sustainable use of available resources.
- The long term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issue before they become problem.

1.3 Objectives of green Auditing

- To examine the current practices which can impact on environment such as of resource utilization, waste management etc.
- To identify and analyze significant environmental issues.
- Setup goal, vision and mission for Green practices in campus.
- Establish and implement Environmental Management in various departments.
- Continuous assessment for betterment in performance in green practices and its evaluation.

1.4 Advantages

- Can help determine the areas of maximum usage of water and energy
- Can support on decision making for implementation of changes, alterations, upgradations resulting in savings
- Can help determine the type and volume of waste generated on site

- Can support in analysing the recyclable waste minimizing waste generation promoting environmental awareness.
- Promotes health consciousness, environmental awareness, values and ethics.
- Staff and students shall be equipped with better understanding of Green impact on campus

Thus it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green Campus for the institutes which will lead for sustainable development and at the same time reduce a sizable amount of atmospheric carbon-di-oxide from the environment. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

1.5 Green Audit Internal Committee

The college proposed for an internal committee which is proactive and enthusiastic who truly believes in the concept of green. This committee shall comprises of both faculty and students who work hand in hand.

1.5.1 Committee responsibility frame work

- The committee regularly monitors the greenness and cleanliness of the college campus and helps to keep the environment on the campus pollution free.
- The Committee is responsible for maintaining the green campus with plantations and ponds, facilitating waste management and taking measures for energy conservation.
- The Committee should work on creating environmental awareness among students by involving the NSS and the hostel boarders in its activities.
- The Committee organizes seminars on environmental awareness and sustainable development and encourages both students and faculty for environmental conservation.

1.6 Eligibility Criteria for NAAC

Higher Education Institutions (HEIs), with a record of at least two batches of students graduated, or been in existence for six years, whichever is earlier, are eligible to apply for the process of Assessment and Accreditation (A&A) of NAAC

Autonomous colleges /Constituent Colleges / Affiliated Colleges (affiliated to universities recognised by UGC as an affiliating University)

- Provided the Colleges are affiliated to a University recognised by UGC for the purposes of affiliation. Constituent colleges of a Private and Deemed- to be Universities are considered as the constituent units of the University and thus will not be considered for A&A independently. Such constituent colleges need to come along with the University

- Provided the colleges / institutions not affiliated to a University are offering programmes recognized by Statutory Professional Regulatory Councils and have been recognised by Association of Indian Universities (AIU) or other such Government agencies concerned, as equivalent to a degree programme of a University

1.7 Benefits of NAAC Accreditation

- Institution to know its strengths, weaknesses, and opportunities through an informed review process
- Identification of internal areas of planning and resource allocation
- Collegiality on the campus
- Funding agencies look for objective data for performance funding
- Institutions to initiate innovative and modern methods of pedagogy
- New sense of direction and identity for institutions
- The society look for reliable information on quality education offered
- Employers look for reliable information on the quality of education offered to the prospective recruits
- Intra and inter-institutional interactions

1.8 Criteria No.7.1 Environmental Consciousness and sustainability.

This criteria has be subcategorized into seven subcategories. This report aims at addressing the requirements of criteria no. 7.1.6

1.9 Members of audit committee of college.

Table 1 Members of audit comittee of college.

S.no	Name	Department	Designation
1.	Dr.B Ramana	Principal	Chairman
2.	Dr.M Raju	S & H	Co-ordinator
3.	Mr. V Rami Reddy	Civil	Member
4.	Mr. G. Vaddikasulu	EEE	Member
5.	Mrs. L Bindu	MECH	Member
6.	Mr P V L N Phani	ECE	Member
7.	Mr. K Sai Sandeep	EEE	Student member
8.	Ms. M Manojna	Agriculture	Student member
9.	Mr. N Sobhanadri	Mechanical	Student member
10.	Mr. M Sarath Surya	S & H	Student member

Chapter 2: Vikas College of Engineering and Technology

2.1 Introduction

Vikas College of Engineering & Technology (VCET) is run by Saraswathi Vidya Peetam educational society which is the destination for high quality education comprising almost all areas of studies such as School, XII, UG, PG, B.Ed., D.Ed., D.Pharmacy, B. Pharmacy, Polytechnic, MBA and MCA. VCET strives to make quality education affordable through its regular up gradation of standards which match the best in the field. Our campus offers B.Tech in CSE, ECE, EEE, Mechanical, Civil and Agricultural Engineering, M.Tech in CSE, Structural Engineering, Embedded systems, PEED, Machine design, thermal Engineering and Systems & Signal Processing and MBA. Also, offering diploma in EEE, ME and Civil Engineering

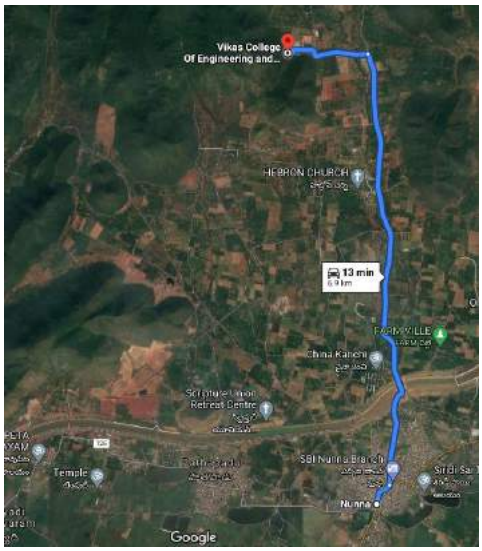

Figure 1 Location of the college- ^ kms from Nunna Bus stand, Andhra Pradesh

2.1.1 Environmental setting

The campus is situated at a location which shall be a dream come true location amidst surrounding mountains, mango and palm plantations with clean and surprising bio-diversity.

Figure 2 Environmental setting of the college.

2.1.2 Vision

To be a premier educational institution for knowledge and skill development.

2.1.3 Mission

- Inculcate self-learning abilities and impart value based education.
- Promote knowledge sharing and innovation with mutual partnerships.
- Involve in activities, trainings for the overall development of the stakeholders.
- Provide an ambience conducive for building engineers, entrepreneurs and administrators.
- Inspire and make the rural youth ready for the competitive world with values and ethics

2.1.4 Quality Policy

The college quality policy is to impart value based education and strives for continuous improvement by adopting modern training methodologies with quality infrastructure, human resources that meet the needs of society

.

A centre of excellence with quality infrastructure, experienced faculty and industrial exposure, imparting value based education on par with international standards by adopting modern training methodologies and fulfilling the expectations of students and parents towards continuous improvement in education and placement. Utmost care is taken to maintain all types of accreditations.

2.1.5 Objectives

- To educate, train & develop students to learn, seek and grow in academic and ethical aspects.
- To provide conducive environment for creativity & research.
- To have a constant dialogue between the institution and industry this makes the organization to reach new heights.
- To develop innovative ideas and thoughts which helps a student to be an entrepreneur.

2.1.6 Departments

The following are the list of various departments in the college with course being offered at Diploma, Undergraduate and post graduate levels.

- Computer science and Engineering
- Electronics communication Engineering
- Electrical and Electronics Engineering
- Civil Engineering
- Mechanical Engineering
- Agricultural Engineering
- Basic Engineering

- Masters of business administration.

2.2 Campus infrastructure details

The campus is comprised of the following spaces with their share of percentage in the site.

Table 2 Area classification of infrastructure of the college.

S.no.	Building name	No. of floors	Plinth area (sq.m.)	Built up (sq.m)
1.	Block -A	4	878	3512
2.	Block -B	4	1260.8	5043.2
3.	Block -C	4	596.2	2384.8
4.	Block -D	1	2455.7	2455.7
5.	Block -E	1	1577	1577

2.2.1 Library

The Vikas College of Engineering & Technology Central Library encourages every student to use the library that has been carefully built up since the inception of the college. It has about 23819 Volumes, 5025 titles and about 455 Back volumes of periodicals and subscribes regularly to over 150 specialized journals and periodicals of which 48 are foreign print format journals. The Library, at present, caters to the needs of under graduate, post graduate students and staff of the institution. It is being developed to meet the needs of the doctoral candidates as well in future.

Every student is expected to observe silence and follow the rules of conduct while in the library and reading room. The library follows the open access system, encouraging the user to browse freely in the stack area. Standard text books and books by authors of repute in all the fields of Engineering and Sciences are stocked. The college follows a policy of buying multiple copies of prescribed books and makes them available to a large number of students. Sufficient numbers of books are procured on the demand and the suggestion of the faculty members from time to time. Thus, students are not likely to be handicapped for want of reference materials at any time.

Library is completely automated by using NEWGENLIB (a Library Software for automating library services) software, while circulation transactions were made using Bar Code technology. Library opens from 8.45 a.m. to 7.00 p.m. without break on all working days. Library is a member of DELNET, which provides lot of services to the students and staff and Inter Library Loan is one among them.

Digital Library:

Digital Library is well equipped with 10 systems for browsing the internet at free of cost and Multimedia systems are provided for using the CD's like GRE, GMAT, and TOEFL etc. Two systems are provided for Housekeeping purpose and one system for maintaining Library Database.

Chapter 3: Methodology

3.1 Purpose

The purpose of the green audit is to ensure that the practices followed in the campus are in accordance with the Green Policy adopted by the institution. The methodology include: preparation and filling up of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations

3.2 Areas of study

For Green Audit following 13 major areas (including their subsections) were covered and compliance/ initiatives under these areas. Were verified/ validated.

- Good Daylight Design and Ventilation
- Water Efficiency
- Wastewater Management
- Indoor Air Quality
- Waste Management
- Universal Access and Efficient Operation and Maintenance of Building
- Green Belt
- Green Programs (Green initiatives)

3.3 Data collection methods

The audit process was carried out in three phases.

- At first, all the secondary data required for the study was collected from various sources, like concerned departments as engineering, garden etc.
- A broad reference work was carried out to clear the idea of green auditing.
- Different case studies and methodologies were studied and the following methodology was adopted for present audit.
- Third party test reports were collected.

The methodology of present study is based on onsite visits, the personal observations and onsite questionnaires to students, staff and faculty.
Secondary data has been collected from the college website, articles, records and college data base. Initially, based on data requirement, questionnaires were random and information was collected. The generated data is subsequently gathered and used for further analysis. From the outcome of the overall study, a final report is prepared.

Figure 3 Methodoly of Audit.

Chapter 4: Daylight and Ventilation

4.1 Significance of Daylight

A college with insufficient light can reduce a student's ability to learn due to the effect lighting has on physiology. Poor spectral light can create eyestrain, leading to decreased information processing and learning ability and causing higher stress levels. Providing the appropriate level of
Illumination, with uniform distribution of light with ungeared effect are essential for comfortable classroom indoor environment. Lighting of classroom should be in the level that is sufficient for student activities such as writing and reading on the study tables and blackboards or boards on the wall. Glare control is a key consideration in the classroom, particularly in the direct sunlight penetration to classrooms.

4.2 Design strategies for good daylight in the college.

4.2.1 Passive strategies

- Corridors are wide with good ceiling height. All the corridors receive good daylight.
- Class rooms, labs and library have large windows. Windows are kept open to receive adequate daylight.
- Ventilators provided above the lintel level are kept open with grill also acts as light shelves allowing light into inner ends of the spaces.
- Classroom walls, corridors and labs are painted in bright warm colours, this enhances the daylight received.
- Curtains and binds are provided on some of the windows to avoid glare.
- Stair cases receive daylight through open corridors running through put at various levels.

Figure 4 Class rooms with larger windows , open ventilators , led tubelights and painted in light brigh colours for better dayligh and ventilationt

4.2.2 Active strategies

- Classroom are provided with ample amount of LED lights.
- These lights are placed at strategic locations with respective to each classroom for aiding in times of days of maximum cloud cover.

4.3 Importance of ventilation

Effective ventilation is extremely important in providing good indoor air quality especially to ensure effective ventilation in colleges. Many studies have proven that well ventilated clean air can lead to better student performance by maintaining student alertness and maintaining health.

Whether sufficient Natural ventilation or Mechanical ventilation, the level of Carbon Dioxide should be monitored to not exceed the recommended level of 5000 parts per million (ppm) in a teaching day. The level can be reduced throughout the day by introducing fresh air to the room.

4.3.1 Passive strategies

- Laboratories are provided with exhaust fans to disperse heat, fumes and odours.
- Corridors are wide with good ceiling height that enables free floor of natural ventilation
- Class rooms, labs and library have large windows and also ventilators above for the escape of hot air

Figure 5 Classrooms opening in to wider corridors with windows and ventilators allowing for better ventilation

4.3.2 Active strategies

- Class rooms are provided with ample no of fans vs to the volume of the classrooms to aid in better ventilation.

Figure 6Class rooms with ample number of fans for ventilation

4.4 Test Report

4.4.1 Ambient air quality

Annoor Envirochem And Food Analytical Laboratory
(ISO : 17025:2005, CERTIFIED ORGANISATION)
AN NABL ACCREDITED LABORATORY

REF: AEFAL/VEC/AAQ/2021 Date: 16-03-2020

TEST REPORT

AMBIENT AIR QUALITY DATA

Name of the Industry : **M/s. VIKAS ENGINEERING COLLEGE.,**
Nunna
Krishna (Dt)

Date of Monitoring : 23-03-2021
Ambient Temperature : 37° C
Atmospheric condition : clear sky

Sl. No.	Location	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_x (µg/m³)
1.	Near C- Block Entrance	52	18	5	13
2.	Near D- Block Entrance	49	16	6	14
3.	A.P.P.C.B Limits	100	60	80	80

PM_{10} : Particulate Matter (size less than 10 µm)
$PM_{2.5}$: Particulate Matter (size less than 2.5 µm)
SO_2 : Sulphur Dioxide
NO_x : Oxides of Nitrogen

VIJAYAWADA

Authorized Signatory
Name: Mr.K.Manohar
Designation: Quality Manager

K.V.S.R.Siddhartha College Of Pharmaceutical Sciences, Pinnamaneni Polyclinic Road, SPIIC Block-3rd Floor,
Siddhartha Nagar, VIJAYAWADA- 520 010. A.P. Cell : 6301959631, 6301959632.
info@accuratelabs.in, aefal.labs@gmail.com

4.4.2 Stack Monitoring

Annoor Envirochem And Food Analytical Laboratory
(ISO : 17025:2005, CERTIFIED ORGANISATION)
AN NABL ACCREDITED LABORATORY

REF: AEFAL/VEC/SM/2021 Date: 16-03-2020

TEST REPORT

STACK MONITORING DATA

Name of the Industry : **M/s. VIKAS ENGINEERING COLLEGE.,**
Nunna
Krishna (Dt)

Sample Particulars	: Stack attached to 82.5 KVA D.G.Set
Date of Monitoring	: 23-03-2021
Time of Monitoring	: 10.30 A.M.
Flue gas Temperature	: 194° C
Stack Diameter (m)	: 0.06
Stack Cross Sectional Area (sqm)	: 0.002
Exit Velocity of flue gases (m/sec)	: 11.92
Flow rate (Nm^3/hr)	: 54.76

S.No	Emission Data (mg/Nm^3)			Limits
1.	Suspended Particulate Matter	:	112.9	115

Annoor Envirochem And Food Analytical Laboratory VIJAYAWADA

Authorized Signatory
Name: Mr.K.Manohar
Designation: Quality Manager

K.V.S.R.Siddhartha College Of Pharmaceutical Sciences, Pinnamaneni Polyclinic Road, SPIIC Block-3rd Floor, Siddhartha Nagar, VIJAYAWADA- 520 010. A.P. Cell : 6301959631, 6301959632.
info@accuratelabs.in, aefal.labs@gmail.com

Chapter 5: Water Audit

5.1 Significance of Audit

Water which is precious natural national resource available with fixed quantum. The availability of water is decreasing due to increasing population of nation, as per capita availability of utilizable water is going down. Due to ever rising standard of living of people, industrialization, urbanization, demand of fresh water is increasing day by day. The unabated discharge of industrial effluent in the available water bodies is reducing the quality of these ample sources of water continuously. Hence, the national mission on water conservation was declared by the then Hon. Prime Minister Narendra Modi as 'Jal Shakti Abhiyan' and appealed to all citizens to collectively address the problem of water shortage, by conserving every drop of water and suggested for conducting water audit for all sectors of water use.

Water audit can be defined as a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing and recycling of water. Water Audit is nothing but an effective measure for minimizing losses, optimizing various uses and thus, enabling considerable conservation of water in irrigation sector, domestic, power and industrial as well. A water audit is a technique or method which makes possible to identify ways of conserving water by determining any inefficiencies in the system of water distribution. The measurement of water losses due to different uses in the system or any utility is essential to implement water conservation measures in such an establishment

5.2 Importance of water Audit

- Systematic process
- May yield some surprising results
- Easier to work on solutions when the problems are identified.
- A tracking mechanism can be put into place.

It is observed that a number of factors like climate, culture, food habits, work and working conditions, level and type of development, and physiology to determine the requirement of water.

The community which has a population between 20,000 to 1,00,000 requires 100 to 150 liters per person (capita) per day. The communities with a population can consume over 1, 00,000 requires 150 to 200 liters person (capita) per day. As per the standards provided by WHO Regional office for South East Asia Schools require 2 liters per student; 10-15 liters per student if water-flushed toilets, Administration requires (Staff accommodation not included) 50 liters per person per day, Staff accommodation requires 30 liters per person per day and for sanitation purposes it depends on technology

5.3 Water Audit

Water usage can be defined as water used for all activities which are carried out on campus from different water sources. This includes usage in all residential halls, academic buildings, on campus and on grounds. Wastewater is referred as the water which is transported off the campus. The wastewater includes sewerage, residence, hall water used in cooking, showering, clothes washing as well as wastewater from chemical and biological laboratories which ultimately going down in sink or drainage system.

5.4 Water Audit Methodology

Figure 7 Water audit methodology

5.5 Sources of water

- Ground water.-Bore well.- no.s.5
- Rejected water from RO plant.
- Rainwater

5.5.1 Ground water

Ground water is used for all the purposes in the campus such as drinking, cleaning, flushing, and also in hand wash.

5.5.2 Rejected water from RO plat

This water is being used to recharge the wells and especially it is also used for washing and cleaning of college busses on a quarterly basis.

5.5.3 Rainwater.

Rainwater from the roof tops is directed to rainwater harvesting pits provided at regular intervals. Rainwater on ground is directed towards proposed recharge tank.

5.5.4 Farm ponds

These ponds are created towards the lowest altitude of the site taking the advantage of the natural slope. They are separated by series of bunds. These ponds are created in such a manner to collect water serially one after the other and are connected to each other through RCC pipes.

5.6 Observations

The following observations were made in the site.

Figure 8 Observations about water usage made on site

s.no.	Observations	
1.	Aerators to water taps	Proposed
2.	Automatic toilet flushes	Nil
3.	Drip Irrigation for plant watering	Proposed
4.	Dual Flush toilets with cistern	Nil
5.	Sewage treatment for sewage recycle	Proposed
6.	Rain water harvesting pits (5.nos.)	Yes
7.	Regular maintenance for leakage	Yes
8.	Use of low flow urinals	Proposed
9.	Rain water Recharge	Yes
10.	RO Reject water reuse	Yes
11.	Farm ponds for rainwater storage	Yes
12.	Sedimentation tanks	Yes
13.	Retaining bunds avoiding soil erosion	yes
14.	Sustainable water practices	Yes
15.	Using drip irrigation for plants	Yes

16.	Rejected RO water- watering plants, Cleaning vehicles, Recharge bore wells.	yes

5.7 Sustainable water practices

- Using the Rejected RO water to recharge bore wells.
- Using rejected RO water to water the plants
- Using drip irrigation to water the plants
- Using rejected RO water to recharge bore wells
- Using farm ponds for sedimentation and storage of rainwater.
- Using rainwater harvesting pits harvesting rain water from the roof.

5.7.1 Precautionary measures:

- College should consider following precautionary measures for improving campus environment.
- Non-teaching staff or peons in the concerned section should take responsibility of monitoring the overflow of water tanks.
- Water is wasted during the practical process in Science laboratories. Designs of small water recycle system helps to reuse of water.
- Producing distilled water in the laboratories required large amount of water to distillate. To produce 1 litre of distilled water required more than 33 litres of water. To avoid more wastage college should design common distillation plant for Science Department.
- Reduce chemical waste formation in Chemistry laboratory, adopt the principles of green chemistry to reduce chemical waste.
- Pipes, overhead tanks and plumbing system should be maintained properly to reduce leakages and wastages of water.
- Water meters to be provided to the bore wells to meter the water usage.
- Rain water can also be collected in the storage tanks through filter and can be used for all purposes to avoid pumping cost.

5.8 Test report

Annoor Envirochem And Food Analytical Laboratory

(ISO : 17025:2005, CERTIFIED ORGANISATION)

AN NABL ACCREDITED LABORATORY

AEFAL

TEST REPORT

Name of the Industry: M/S. Vikas College of Engineering & Technology # Nunna, Vijayawada (Rural).			
Reg. No.	2003048	URL:	TR16032020004
Date of Registration	10.03.2020	Date of Reporting	16.03.2020
Sample Name	Bore Water	Start Date	10.03.2020
Quantity	1.0 Lit	Completed Date	16.03.2020
Sample Submitted by	Mr. N. Satyanarayana Reddy 8500669271	Sample Details	NA

TEST RESULTS

S.No.	Test Parameters	Test Method	Unit of Measurement	Result	As per IS 10500	
					Acceptable Limit	Permissible Limit
1.	E.coli	IS 15185 :2016	/100ml	Absent	Absent	Absent
2.	Total coliforms	IS 15185 :2016	/100ml	Absent	Absent	Absent
3.	Colour	IS 3025 (Part 4) :1983	Colour Units	< 1.0	Max. 5	Max. 15
4.	Odour	IS 3025 (Part 5) :2018	---	Agreeable	Agreeable	Agreeable
5.	Taste	IS 3025(Part 8 :1984	---	Agreeable	Agreeable	Agreeable
6.	Turbidity	IS 3025 (Part 10) :1984	NTU	< 1.0	Max. 1	Max. 5
7.	Total Dissolved Solids	IS 3025 (Part 16) :1984	mg/l	630	Max. 500	Max. 2000
8.	pH	IS 3025 (Part 11) :1983	---	6.55	6.0 - 8.5	6.0 - 8.5
9.	Aluminium	IS 3025 (Part 2) :2004	mg/l	< 0.01	Max. 0.03	Max. 0.2
10.	Ammonia as N	IS 3025 (Part 34) :1988	mg/l	0.23	Max. 0.5	Max. 0.5
11.	Boron as B	IS 3025 (Part 2) :2004	mg/l	< 0.01	Max. 0.5	Max. 1.0
12.	Calcium as Ca	IS 3025 (Part 2) :2004	mg/l	75.30	Max. 75	Max. 200
13.	Chloride as Cl	EPA-300.0 :1993	mg/l	98.23	Max. 250	Max. 1000
14.	Copper	IS 3025 (Part 2) :2004	mg/l	< 0.01	Max. 0.05	Max. 1.5
15.	Fluoride as F	EPA-300.0 :1993	mg/l	0.62	Max. 1.0	Max. 1.5
16.	Residual free chloride	IS 3025 (Part 26) :1986	mg/l	< 0.1	Max. 0.2	Max. 1.0
17.	Iron as Fe	IS 3025 (Part 2) :2004	mg/l	< 0.01	Max. 0.3	Max. 0.3
18.	Magnesium as Mg	IS 3025 (Part 2) :2004	mg/l	27.22	Max. 30	Max. 100
19.	Nitrate as NO3	EPA-300.0 :1993	mg/l	31.16	Max. 45	Max. 45
20.	Sulphate as SO_4	EPA-300.0 :1993	mg/l	29.62	Max. 200	Max. 400
21.	Sulphide as H_2S	IS 3025 (Part 29) :1986	mg/l	< 0.05	Max. 0.05	Max. 0.05
22.	Alkalinity as $CaCO_3$	IS 3025 (Part 23) :1986	mg/l	190.45	Max. 200	Max. 600
23.	Total Hardness as $CaCO_3$	IS 3025 (Part 21) :2009	mg/l	215.83	Max. 200	Max. 600
24.	Chromium as Cr	IS 3025 (Part 2) :2004	mg/l	< 0.01	Max. 0.05	Max. 0.05

Remarks: The above submitted sample is suitable for human consumption

Signature of Analyst
Name: Mr. K. Prasad
Designation: Microbiologist

Signature of Analyst
Name: Mr. S.N. Chakra Babu
Designation: Sr.Chemist

VIJAYAWADA

Authorized Signatory
Name: Mr. K.Manohar
Designation: Quality Manage

Page 1 of 1

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Annoor Envirochem And Food Analytical Laboratory

(ISO : 17025:2005, CERTIFIED ORGANISATION)

AN NABL ACCREDITED LABORATORY

AEFAL

TEST REPORT

Name of the Industry:	M/S. Vikas College of Engineering & Technology // Nunna, Vijayawada (Rural).		
Reg. No.	2003049	URL:	TR16032020006
Date of Registration	10.03.2020	Date of Reporting	16.03.2020
Sample Name	Drinking Water	Start Date	10.03.2020
Quantity	1.0 Lit	Completed Date	16.03.2020
Sample Submitted by	Mr. N. Satyanarayana Reddy 8500669271	Sample Details	NA

TEST RESULTS

S.No.	Test Parameters	Test Method	Unit of Measurement	Result	As per IS 10500	
					Acceptable Limit	Permissible Limit
1.	E.coli	IS 15185 :2016	/100ml	Absent	Absent	Absent
2.	Total coliforms	IS 15185 :2016	/100ml	Absent	Absent	Absent
3.	Colour	IS 3025 (Part 4) :1983	Colour Units	< 1.0	Max. 5	Max. 15
4.	Odour	IS 3025 (Part 5) :2018	---	Agreeable	Agreeable	Agreeable
5.	Taste	IS 3025(Part 8) :1984	---	Agreeable	Agreeable	Agreeable
6.	Turbidity	IS 3025 (Part 10) :1984	NTU	< 1.0	Max. 1	Max. 5
7.	Total Dissolved Solids	IS 3025 (Part 16) :1984	mg/l	301	Max. 500	Max. 2000
8.	pH	IS 3025 (Part 11) :1983	---	6.90	6.0 - 8.5	6.0 - 8.5
9.	Aluminium	IS 3025 (Part 2) :2004	mg/l	< 0.01	Max. 0.03	Max. 0.2
10.	Ammonia as N	IS 3025 (Part 34) :1988	mg/l	0.2	Max. 0.5	Max. 0.5
11.	Boron as B	IS 3025 (Part 2) :2004	mg/l	< 0.01	Max. 0.5	Max. 1.0
12.	Calcium as Ca	IS 3025 (Part 2) :2004	mg/l	30.30	Max. 75	Max. 200
13.	Chloride as Cl	EPA-300.0 :1993	mg/l	101.0	Max. 250	Max. 1000
14.	Copper	IS 3025 (Part 2) :2004	mg/l	< 0.01	Max. 0.05	Max. 1.5
15.	Fluoride as F	EPA-300.0 :1993	mg/l	0.22	Max. 1.0	Max. 1.5
16.	Residual free chloride	IS 3025 (Part 26) :1986	mg/l	< 0.1	Max. 0.2	Max. 1.0
17.	Iron as Fe	IS 3025 (Part 2) :2004	mg/l	< 0.01	Max. 0.3	Max. 0.3
18.	Magnesium as Mg	IS 3025 (Part 2) :2004	mg/l	0.24	Max. 30	Max. 100
19.	Nitrate as NO3	EPA-300.0 :1993	mg/l	3.09	Max. 45	Max. 45
20.	Sulphate as SO_4	EPA-300.0 :1993	mg/l	3.30	Max. 200	Max. 400
21.	Sulphide as H_2S	IS 3025 (Part 29) :1986	mg/l	< 0.05	Max. 0.05	Max. 0.05
22.	Alkalinity as $CaCO_3$	IS 3025 (Part 23) :1986	mg/l	11.75	Max. 200	Max. 600
23.	Total Hardness as $CaCO_3$	IS 3025 (Part 21) :2009	mg/l	125.2	Max. 200	Max. 600
24.	Chromium as Cr	IS 3025 (Part 2) :2004	mg/l	< 0.01	Max. 0.05	Max. 0.05

Remarks: The above submitted sample is suitable for human consumption.

VIJAYAWADA

Signature of Analyst	Signature of Analyst	Authorized Signatory
Name: Mr. K. Prasad	Name: Mr. S.N. Chakra Babu	Name: Mr. K.Manohar
Designation: Microbiologist	Designation: Sr.Chemist	Designation: Quality Manage

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Chapter 6: Solid waste Management

6.1 Importance of Solid waste management

Solid waste management (SWM) is one of the basic services arranged and administered by the municipal authorities in the country to enhance the cleanliness of the urban centres. The main objectives of SWM are the maintenance of clean and hygienic conditions and reduction in the quantity of solid waste (SW), which is disposed of in the sanitary landfill facility (SLF) of the area after recovery of material and energy from it however, mostly the service is inefficient and weak due to lack of scientific methods and new approaches, low population coverage, and marginalization of the poor. Poor management of waste leads to littering and thus unsanitary living conditions

The average rates (0.5–0.99 kg per person per day) of waste generation are higher in India as compared to those (0.1–0.49 kg per person per day) in low-income countries worldwide and much lower than the developed economies (greater than 1.5 kg per day) of the world.

6.2 SWM in higher education institutes

Higher education institute (HEI) campuses replicate a city's characteristics on a small level, producing similar environmental impacts. Therefore, they can be considered as small cities. Thus these campuses can demonstrate and influence the local neighbourhoods to adopt and successfully implement sustainable practices. The ever-growing global concern about environmental sustainability in HEI campuses has accelerated the concept of sustainable campuses. SWM is one of the basic parameters of environmental sustainability.

A dedicated SWM program on the campus

- Will sensitize and build the consciousness of the campus occupants toward waste management
- Increase the productivity and performance of students and employees by providing clean and healthy workplace
- Influence the local community by creating a difference in the level of cleanliness between the campus and the local environment
- The campus occupants, through practice, and the neighbourhood communities, through influence, thus become the direct beneficiaries of the concept.
- The community can be sensitized about the benefits of SWM through awareness programs, motivational interactions, web portal and sharing information on the issues along with the community participation

6.3 Observations on site

- Wet waste and dry waste segregation is practised in the premises'
- Separate bins are provided for wet biodegradable and dry recyclable waste.
- Biodegradable waste is mainly generated in canteen

- The Biodegradable waste is kept in forest area and over period of time it is converted into manure.
- Scrapped benches are repaired and reused.
- Various dustbins for wet, dry and e-waste have been provided iin every floor in every block.

6.4 Preventive measure by university

- Paper waste is generated by all departments. Especially, building Block B is using more one side papers for printing and writing which is a good practices.
- Answer sheets, old bills and confidential reports are sent for shredding, pulping and recycling after completion of their preservation period.
- University has banned signal use plastic for any administrative as well as other purpose and therefore very less amount of plastic waste is generated in the University.
- Metal scrap is segregated separately by respective departments and sent for recycling.
- Biodegradable waste is a major solid waste generated in campus is mostly from canteen, Canteen waste is collected and some biodegradable waste is treated by composting process.
- Glass waste is generated from laboratory mainly in the form of bottles; Many times bottles are reused for storing of other chemicals.

6.5 Future scope

- The campus has been strategically located amidst the hills around.
- Campus being away from the municipality for a daily collection of waste.
- Hence the college has to look in to the scope of providing a solid waste management system in the campus.

Chapter 7: Ambient air quality

7.1 National ambient air quality program (NAAQM)

Central Pollution Control Board, New Delhi initiated National Ambient Air Quality Monitoring (NAAQM) programme in the year 1984 to get spatial and temporal variation of ambient air concentrations for a wide range of pollutants that are considered relevant for evolving strategic management plan. The program was subsequently renamed as NAMP (National Air Quality Monitoring Program). Under NAMP, three air pollutants viz., Sulphur dioxide (SO2), Nitrogen dioxides (NO2) and Respirable Suspended Particulate Matter (RSPM/PM10) have been identified for regular monitoring at three locations.

7.2 Need for ambient air quality monitoring

Apart from the primary objective of providing high-quality education, it is an equal responsibility of the college administration to provide a safe and healthy environment to study and grow. This helps the college to aid their primary objective.

7.2.1 Effects of bad air quality

Failing to provide good air quality can lead to an increase in long term and short term health problems for students and staff such as

- Cough
- Eye irritation
- Headache
- Allergic reactions
- Increased severity to students and staff already suffering from breathing-related issues
- In rarer cases, life-threatening conditions such as Legionnaire's disease, or Carbon Monoxide poisoning

UNICEF and WHO have stated that young lungs are more susceptible to air pollution. This is because they breathe higher volumes of air relative to their body weights and their tissues and organs are actively growing. Exposure to polluted air when the immune system is weaker may lead to permanent respiratory health issues such as asthma and lung cancer. This renders air monitoring essential in and around the campus. Also, today everybody is aware of the global issue of air pollution. The parents are eager to know what steps administrators are taking to quantify the problem and to handle the effects.

The larger objective is to educate and create awareness among the future generations of this fatal environmental problem. Learning about it at an early age can teach them about its severity and find a way to cope with it and find a better solution for the pollution menace.

7.3 Air Quality monitoring helps in

- Inform about the pollution level – Air monitoring devices can help in precisely providing pollution data of the vicinity
- Identify the major pollution source – Through the data generated, the major source of pollution can be detected
- Educating students – This provides a better way of educating students about air pollution, how it occurs, its reasons, how to read air pollution data, how to tackle it, and how to be safe.
- Making an informed decision – Active administrations can take this opportunity to take corrective actions and reduce pollution by installing air purifiers inside the campus.
- Detecting the pollution source can also help in identifying any flaws in the college system, such as the landscape design or its cleanliness.
- Daily real-time air quality monitoring helps in finding out the gaps and taking actions to modify the existing system and implement a more efficient **and cleaner campus.**

7.4 Test reports

7.4.1 Ambient air quality monitoring

Annoor Envirochem And Food Analytical Laboratory
(ISO : 17025:2005, CERTIFIED ORGANISATION)
AN NABL ACCREDITED LABORATORY

REF: AEFAL/VEC/AAQ/2021 Date: 16-03-2020

TEST REPORT

AMBIENT AIR QUALITY DATA

Name of the Industry : **M/s. VIKAS ENGINEERING COLLEGE.,**
Nunna
Krishna (Dt)

Date of Monitoring : 23-03-2021
Ambient Temperature : 37° C
Atmospheric condition : clear sky

Sl. No.	Location	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_x (µg/m³)
1.	Near C- Block Entrance	52	18	5	13
2.	Near D- Block Entrance	49	16	6	14
3.	A.P.P.C.B Limits	100	60	80	80

PM_{10} : Particulate Matter (size less than 10 µm)
$PM_{2.5}$: Particulate Matter (size less than 2.5 µm)
SO_2 : Sulphur Dioxide
NO_x : Oxides of Nitrogen

Annoor Envirochem and Food Analytical Laboratory VIJAYAWADA

Authorized Signatory
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7.4.2 Stack monitoring data

Annoor Envirochem And Food Analytical Laboratory

(ISO : 17025:2005, CERTIFIED ORGANISATION)

AN NABL ACCREDITED LABORATORY

REF: AEFAL/VEC/SM/2021 Date: 16-03-2020

TEST REPORT

STACK MONITORING DATA

Name of the Industry : **M/s. VIKAS ENGINEERING COLLEGE.,**
Nunna
Krishna (Dt)

Sample Particulars	: Stack attached to 82.5 KVA D.G.Set
Date of Monitoring	: 23-03-2021
Time of Monitoring	: 10.30 A.M.
Flue gas Temperature	: 194° C
Stack Diameter (m)	: 0.06
Stack Cross Sectional Area (sqm)	: 0.002
Exit Velocity of flue gases (m/sec)	: 11.92
Flow rate (Nm^3/hr)	: 54.76

S.No	Emission Data (mg/Nm^3)			Limits
1.	Suspended Particulate Matter	:	112.9	115

Annoor Envirochem and Food Analytical Laboratory VIJAYAWADA

Authorized Signatory
Name: Mr.K.Manohar
Designation: Quality Manager

7.4.3 Ambient noise

Annoor Envirochem And Food Analytical Laboratory
(ISO : 17025:2005, CERTIFIED ORGANISATION)
AN NABL ACCREDITED LABORATORY
AEFAL

REF: AEFAL/VEC/NL/2021 Date: 16-03-2020

TEST REPORT

NOISE LEVELS

Name of the Industry : **M/s. VIKAS ENGINEERING COLLEGE.,**
Nunna
Krishna (Dt)

Sample Particulars : **Noise Levels**
Date of Monitoring : 23-03-2021

S.No	Location	Noise Levels dB(A)	
		Day	Night
1.	Main Gate	58.4	48.0
2.	Generator ON	71.2	69.5
3.	Generator OFF	60.0	49.2

Limiting Standards of A.P.P.C.B. : Day Time =75dB(A), Night Time= 70dB(A)

Authorized Signatory
Name: Mr.K.Manohar
Designation: Quality Manager

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Chapter 8: Carbon sequestration and green cover inventory.

8.1 Carbon sequestration

Carbon is the basis of life on mother Earth. It is incorporated into the plants through photosynthesis, consumed by animal species through the food, present in the form of carbon dioxide (CO2) the atmosphere, locked into the rocks as limestone and compressed into the different fossil fuels such as coal and oil. As CO2 level in the atmosphere continue to increase, most climate designs or project that the oceans of the world and trees will keep soaking up more than half CO2 . The plants on land and in the sea, taken up carbon by over many years increased the percentage discharged during decay, and this increased carbon became locked away as fossil fuels beneath the surface of the planet.

The starting of the 21st century brought growing concern about global warming, climate change, food security, and poverty and population growth. In the 21st century more carbon has been released into the atmosphere than that has been absorbed. CO2 is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40 % from preindustrial levels to more than 390 parts per million CO2. On this background it is a need of time to cover the research areas interrelated with climate change.

The "Carbon Sequestration and Green cover inventory" is a current status of tree cover and vegetation carbon storage assessment of area in the campus. In an era of climate change and global warming carbon emission, carbon footprints, carbon sequestration, adaptations, mitigation are the keywords in academia. Carbon sequestration is a process of converting atmospheric carbon i.e. CO2 in to other sinks of carbon such as vegetation, soil, ocean etc. in various forms to mitigate global warming audit is one of the important clauses of Kyoto Protocol.

8.2 Need for study

It is a social and environmental responsibility of education institutions, National and International Organizations to respond positively for various global issues at local level and should percolate the generated knowledge in to the society. Global warming and climate change are current environmental issues need to be addressed scientifically and efficiently.

8.3 Objectives

1. To study woody green cover of the campus.
2. To study species diversity of woody vegetation in the campus.
3. To understand biomass and carbon stock accumulated by woody vegetation in the campus.
4. To explore carbon sequestration potential of woody vegetation in the campus.

5. To explore potential of woody vegetation of the campus as an oxygen source.
6. To measure canopy cover of the trees on the campus

8.4 Methodology

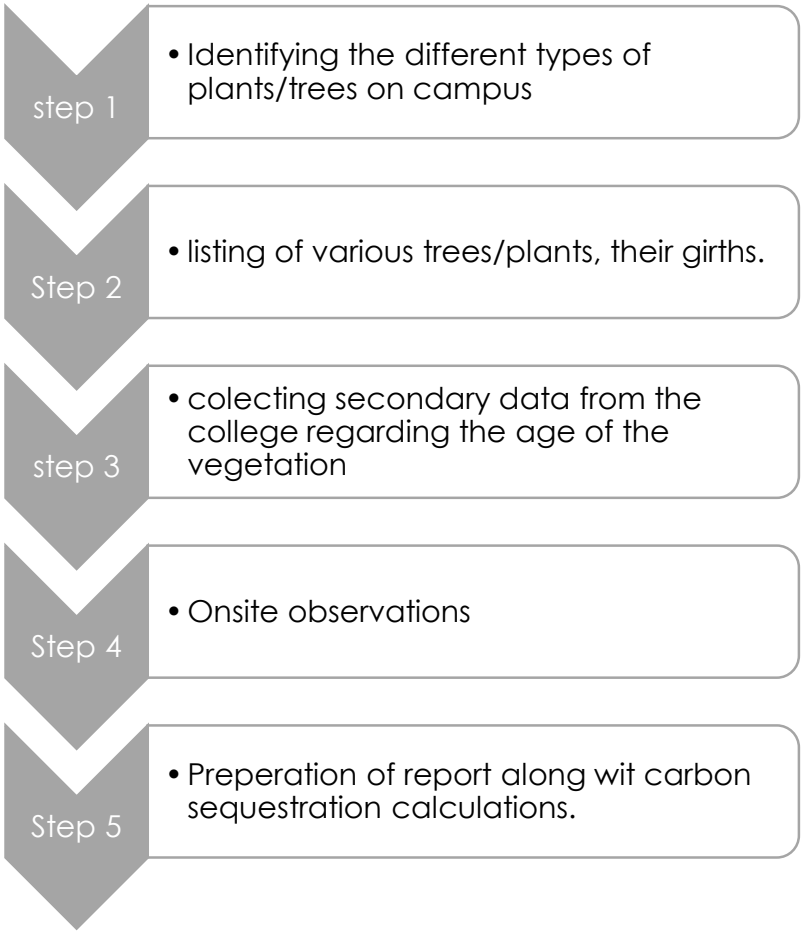

Figure 9 Methodology of green cover audit

8.5 Bio mass- carbon sequestration potential

Biomass is renewable organic material that comes from plants and animals. Biomass was the largest source of total annual U.S. energy consumption until the mid-1800s. Biomass continues to be an important fuel in many countries, especially for cooking and heating in developing countries. The use of biomass fuels for transportation and for electricity generation is increasing in many developed countries as a means of avoiding carbon dioxide emissions from fossil fuel use. In 2019, biomass provided nearly 5 quadrillion British thermal units (Btu) and about 5% of total primary energy use in the United States.

Biomass contains stored chemical energy from the sun. Plants produce biomass through photosynthesis. Biomass can be burned directly for heat

or converted to renewable liquid and gaseous fuels through various processes.

8.6 Biomass sources for energy include

- Wood and wood processing wastes—firewood, wood pellets, and wood chips, lumber and furniture mill sawdust and waste, and black liquor from pulp and paper mills
- Agricultural crops and waste materials—corn, soybeans, sugar cane, switchgrass, woody plants, and algae, and crop and food processing residues
- Biogenic materials in municipal solid waste—paper, cotton, and wool products, and food, yard, and wood wastes
- Animal manure and human sewage

8.7 Carbon sequestration potential.

The phenomenon of global warming has become a vital issue in the present 'era', which is keenly related to emission of carbon dioxide from varied sectors of human civilization ranging from household activities to industries. Even the shifting of the land use pattern generates considerable amount of carbon dioxide in the atmosphere. Trees play an important role in the global carbon cycle. Considering the extent and expansion rate of urban development coupled with industrialization, the safe guarding of the environment is a key issue. This can be achieved cost-effectively by carbon sequestering through plantation and ecorestoration of the dumping areas of cities and towns.

A plantation or a forest may be a "source" or a "sink" of carbon depending on the volume and relative density of the tree species, microbial load of the soil and climatic condition of the area.

8.8 Listing of all the trees

Sl No	Notationn	Tree	Scientific Name	Count	Canopy (m	Height (cm	Wood Density g/cm^3	Girth (cm)	Dia = G (dia) / Pi	Volume of Bimass (cm3) = DBH * H	AgB = Volume of biomass (cm^3) x wood density (g / cm3)	BgB=0.26*AgB	Total Biomass= AgB + BgB	Carbon sequestration = Total biomass/2 (t /Ha)
1		MANGO TREE	Mangfera indica	12	4- 10m	1500	0.72	200	63.69426752	95541.40127	68789.80892	17885.35032	86675.15924	43337.57962
2		APRICOT TREE	Prunus armeniaca	16	4-7m	1000	0.745	40	12.7388535	12738.8535	9490.44586	2467.515924	11957.96178	5978.980892
3		NEEM TREE	Azadirachta indica	503	5- 20m	2500	0.93	200	63.69426752	159235.6688	148089.172	38503.18471	186592.3567	93296.17834
4		BOTTLE PALM TREE	Hyophorbe lagenicaulis	10	3 - 4m	800	1.125	60	19.10828025	15286.6242	17197.45223	4471.33758	21668.78981	10834.3949
5		BOUGAINVILLIEA TREE	Bougairwilleaglabra	5	2 - 5m	600	0.56	20	6.369426752	3821.656051	2140.127389	556.433121	2696.56051	1348.280255
6		GUAVA TREE	Psidium guajava	4	3 - 7m	700	0.67	30	9.554140127	6687.898089	4480.89172	1165.031847	5645.923567	2822.961783
7		GUNNERA TREE	Gunnera tinctoria	3	2 - 3m	2500	0.24	10	3.184713376	7961.783439	1910.828025	496.8152866	2407.643312	1203.821656
8		SHOW TREE	Erythrina Indica	3	6 - 12m	3000	0.65	80	25.47770701	76433.12102	49681.52866	12917.19745	62598.72611	31299.36306
9		AMLA TREE	Phyllanthus emblica	2	3 - 5m	2000	0.73	60	19.10828025	38216.56051	27898.08917	7253.503185	35151.59236	17575.79618
10		ALMOND TREE	Prunus dulcis	12	3- 4m	800	0.68	40	12.7388535	10191.0828	6929.936306	1801.783439	8731.719745	4365.859873
11		CYCAS	Cycas circinalis	12	3 - 5m	600	0.22	30	9.554140127	5732.484076	1261.146497	327.8980892	1589.044586	794.522293
12		EUCALYPTUS	Eucayptus globulus	10	6 - 12m	4000	0.495	300	95.54140127	382165.6051	189171.9745	49184.71338	238356.6879	119178.3439

8.9 Landscape site plan indicating various trees

S No.	DESCRITPTION	SIGN
1	EXISTING BUILDINGS	
2	EXIST ROAD	
3	CULVERT	
4	FOREST BOUNDARY	
5	TREES	
6	ELECTRICAL POLE	
7	BORE	
8	FENCE / COMPOUND WALL	

Sl No	Notationn	Tree	Scientific Name	Count	Canopy (m)	Height (cm)	Wood Density g/cm³	Girth (cm)	Dia. = G (dia) / PI	Volume of Bimass (cm3) = DBH * H	AgB = Volume of biomass (cm³) × wood density (g/cm³)	BgB=0.25*AgB	Total Biomass= AgB + BgB	Carbon sequestration = Total biomass/2 (t /Ha)
1		MANGO TREE	Mangifera indica	12	4-10m	1500	0.72	200	63.69426752	95541.40127	68789.80892	17885.33032	86675.15924	43337.57962
2		APRICOT TREE	Prunus armeniaca	18	4-7m	1000	0.745	40	12.7388535	12738.8535	9490.44586	2467.515924	11957.96178	5978.980891
3		NEEM TREE	Azadirachta indica	505	5-20m	2500	0.93	200	63.69426752	159235.6688	148089.172	38503.18471	186592.3567	93296.17834
4		BOTTLE PALM TREE	Hyophorbe lagenicaulis	10	3 - 4m	800	1.125	60	19.10828025	15286.6242	17197.45223	4471.33758	21668.78981	10834.3949
5		BOUGAINVILLIEA TREE	Bougainvillea glabra	5	2 - 5m	600	0.56	20	6.369426752	3821.656051	2140.127389	556.433121	2696.56051	1348.280255
6		GUAVA TREE	Psidium guajava	4	5 - 7m	700	0.67	30	9.554140127	6687.898089	4480.89172	1165.031847	5645.923567	2822.961783
7		GUNNERA TREE	Gunnera tinctoria	5	2 - 3m	2500	0.24	10	3.184713376	7961.783439	1910.828025	496.8152866	2407.643312	1203.821656
8		SHOW TREE	Erythrina indica	5	6 - 12m	3000	0.65	80	25.47770701	76433.12102	49681.52866	12917.19745	62598.72611	31299.36306
9		AMLA TREE	Phyllanthus emblica	1	3 - 5m	2000	0.73	60	19.10828025	38216.56051	27898.08917	7253.503185	35151.59236	17575.79618
10		ALMOND TREE	Prunus dulcis	12	3- 4m	800	0.68	40	12.7388535	10191.0828	6929.936306	1801.783439	8731.719745	4365.859873
11		CYCAS	Cycas circinalis	12	3 - 5m	600	0.22	30	9.554140127	5732.484076	1261.146497	327.8980892	1589.044586	794.522293
12		EUCALYPTUS	Eucayplus globulus	10	6 - 12m	4000	0.495	300	95.54140127	382165.6051	189171.9745	49184.71338	238356.6879	119178.5459

Chapter 9: Green Practices

9.1 Vehicle free zone

- The college has made an attempt to cut down air and sound pollution by making the campus area vehicle free to certain extent.
- The visitors vehicles parking is provided at the entrance gate and the college shuttles and staff parking is provided near the gate and the rest of the campus if demarcated as vehicle free zone.
- This strategy not only helps reduce air and sound pollution but as is an attempt to conserve fossil fuel and also eradicate soil pollution as well due to vehicular movement.

9.2 Public transport

- The college facilitates students and staff with transportation facility through college busses.
- This helps interactive time between students and faculty
- This strategy can also help in reduction of accidents
- This strategy also helps in reduction of fossil fuel usage as 40 people take one single bus to reach the college.

9.3 Pedestrian friendly campus

- The parking facility and vehicular movement is restricted to the parking space near the entrance.
- This is an attempt to reduce unwanted scenarios in the campus
- This also help encourage people to reach their respective class room on foot
- Pedestrian pathways/pavements which are partially covered by roofing, vegetation has been proposed in the campus

9.4 Use of renewable energy

- Considering the usage hike during the college working hours roof top solar panels have been proposed.
- This can help generate energy and can assist in reducing the stress on grid for supply of energy
- The same solar panels have been proposed for water motor to provide energy needed for water extraction from the bore well.

9.5 Barrier free design

- Ramps have been provided to enable specially abled for better circulation without second person`s help or assistance
- However, toilet facilities have not been provided. The college team stated that the proposal for redesign of collage bank is in vogue and the toilets for specially abled shall be built.

- The college team plans on installing lift as well that have guard rails, voice enabled assistive panel inside the lift carriage, braille enabled control panel etc.

9.6 Planting of native species

- The college team was committed to increase the vegetation.
- This was planned out by sowing various types of native species such as neem, alma, guava, mango etc.,
- Planting of native species directly reduces the stress on water requirement.
- These species sustain in harsh weather of that respective native areas.
- Bing capable of withstanding to changes in the weather, native species are said to be less maintain ace, less energy consuming strategies in landscape decision making.

9.7 Less paved area –Maximum pervious surface.

- The college team has consciously decided to have minimal paved area
- This minimum paved area accounts for the road for movement of vehicles+ the pavement beside.
- Rest all areas are not paved left open to earth and plants.
- This strategy helps reduce urban flooding
- Helps in maximum percolation of rainwater with minimum time.
- Helps increase the level of the underground water table.

Chapter 10: Beyond the campus environmental promotion activities.

10.1 Adoption of villages

10.1.1 Awareness talks to the people on reduction of waste generation and recycled use of possible materials.

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(Sponsored by SARASWATHI VIDYA PEETAM)
(Approved by AICTE, New Delhi, Affiliated to JNTUK, KAKINADA)
NUNNA, Vijayawada Rural, Krishna District, Andhra Pradesh - 521212.

NATIONAL SERVICE SCHEME

A.Y: 2019 – 2020

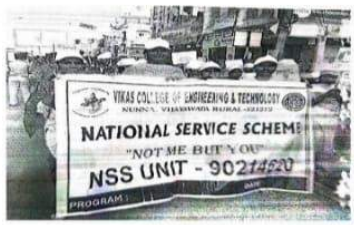
BAN of Plastic in the College Premises and Adopted Village Date: 11.02.2020

VENUE: **ADOPTED VILLAGE & COLLEGE PREMISES.**

Report:

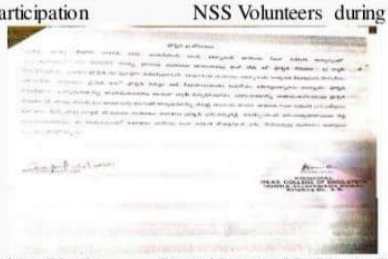
Before the advent of poly-bags, people did shop, buy things, bring eatables from the market, and did the same marketing as is done now. How did they did it? The raw material for the bag was decided by its usage. Cloth bags for lighter items, Gunny bags/Jute bags for voluminous and heavier goods. The cost did not justify use and discard attitude. These bags were washable and reusable lasting for six months to a year. The hazards plastics pose are numerous. The land gets littered by plastic bag garbage presenting an ugly and unhygienic seen. The "Throw away culture" results in these bags finding their way in to the city drainage system, the resulting blockage cases inconvenience, difficult in maintaining the drainage with increased cost, creates unhygienic environment resulting in health hazard and spreading of water borne diseases. This littering also reduces rate of rain water percolating, resulting in lowering of already low water levels in our cities. The soil fertility deteriorates as the plastic bags form part of manure remains in the soil for years. In this event the total no.of students actively participated are 120 members.

Circular for the NSS Volunteers for Participation



NSS Volunteers during Rally

Bringing the Awareness due to harm caused by Plastic



Press Note on No Plastic Day

CO-ORDINATOR
Mr.N.GOPALA KRISHNA, M.Tech.,
NSS Program Officer
Vikas College of Engg & Tech, Nunna
Cell: 9494940540

PRINCIPAL
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VIKAS COLLEGE OF ENGG.&TECH
NUNNA,VIJAYAWADA RURAL
Krishna Dt., A.P.

10.2 Swatch Baharat- Cleaning roads – Yr 2016

VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY
(Sponsored by SARASWATHI VIDYA PEETAM)
(Approved by AICTE, New Delhi, Affiliated to JNTUK, KAKINADA)
NUNNA, Vijayawada Rural, Krishna District, Andhra Pradesh - 521212.

****

NATIONAL SERVICE SCHEME

A.Y: 2015-2016

SWACH BHARATH-ROAD CLEANING DATE: 04.04.2016

VENUE: **VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY, NUNNA.**

REPORT

Swachh Bharat Mission (SBM), Swachh Bharat Abhiyan, or Clean India Mission is a country-wide campaign initiated by the Government of India in 2014 to eliminate open defecation and improve solid waste management. Phase 1 of the mission lasted till October 2019. Phase 2 will be implemented between 2020–21 and 2024-25.

Initiated by the Government of India, the mission aimed to achieve an "open-defecation free" (ODF) India by 2 October 2019, the 150th anniversary of the birth of Mahatma Gandhi. The objectives of the first phase of the mission also included eradication of manual scavenging, generating awareness and bringing about a behavior change regarding sanitation practices, and augmentation of capacity at the local level. The second phase of the mission aims to sustain the open defecation free status and improve the management of solid and liquid waste. In this event the total no.of students actively participated are 120 members.

VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY, NUNNA

CIRCULAR

Date: 02.04.2016

Sub: ROAD CLEANING UNDER SWACHH BHARATH

It is happy to announce that college NSS wing has planned to organize road cleaning program at nunna on 04.04.2016.

As such, it is advised that the interested students are invited to this event and make it grand success.

Principal

Distribution:

1.NSS Members, 2. Notice Boards, 3. HOD's 4. Nunna panchayat

తేదీ:04/04/2016

స్వచ్ఛ భారత్

CO-ORDINATOR

PRINCIPAL

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10.3 Swatch Baharat- Cleaning roads – Yr 2017

VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY
(Sponsored by SARASWATHI VIDYA PEETAM)
(Approved by AICTE, New Delhi, Affiliated to JNTUK, KAKINADA)
NUNNA, Vijayawada Rural, Krishna District, Andhra Pradesh - 521212.

NATIONAL SERVICE SCHEME

A.Y: 2016-2017

SWACH BHARATH-ROAD CLEANING DATE: 11.03.2017

VENUE: **VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY, NUNNA.**

REPORT

Swachh Bharat Mission (SBM), Swachh Bharat Abhiyan, or Clean India Mission is a country-wide campaign initiated by the Government of India in 2014 to eliminate open defecation and improve solid waste management. Phase 1 of the mission lasted till October 2019. Phase 2 will be implemented between 2020–21 and 2024-25.

Initiated by the Government of India, the mission aimed to achieve an "open-defecation free" (ODF) India by 2 October 2019, the 150th anniversary of the birth of Mahatma Gandhi. . The second phase of the mission aims to sustain the open defecation free status and improve the management of solid and liquid waste. The mission is aimed at progressing towards target 6.2 of the Sustainable Development Goals Number 6 established by the United Nations in 2015. In this event the total no.of students actively participated are 218 members.

VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY, NUNNA

CIRCULAR

Date: 02.04.2016

Sub: ROAD CLEANING UNDER SWACHH BHARATH

It is happy to announce that college NSS wing has planned to organize road cleaning program at nunna on 04.04.2016.

As such, it is advised that the interested students are invited to this event and make it grand success.

Principal

Distribution:
1.NSS Members, 2. Notice Boards, 3. HOD's 4. Nunna panchayat.

తేదీ:04/04/2016

స్వచ్ఛ భారత్

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10.4 Swatch Baharat- Cleaning roads – Yr 2019

VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY
(Sponsored by SARASWATHI VIDYA PEETAM)
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NATIONAL SERVICE SCHEME

A.Y: 2018-2019

SWATCH BHARATH-ROAD CLEANING DATE: 12-03-2019

VENUE: **VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY, NUNNA.**

REPORT

A clean India would be the best tribute India could pay to Mahatma Gandhi on his 150 birth anniversary in 2019," said Shri Narendra Modi as he launched the Swachh Bharat Mission at Rajpath in New Delhi. On 2nd October 2014, Swachh Bharat Mission was launched throughout length and breadth of the country as a national movement.

While leading the mass movement for cleanliness, the Prime Minister exhorted people to fulfil Mahatma Gandhi's dream of a clean and hygienic India. Shri Narendra Modi himself initiated the cleanliness drive at Mandir Marg Police Station. Picking up the broom to clean the dirt, making Swachh Bharat Abhiyan a mass movement across the nation, the Prime Minister said people should neither litter, nor let others litter. He gave the mantra of 'Na gandagi karenge, Na karne denge.' Shri Narendra Modi also invited nine people to join the cleanliness drive and requested each of them to draw nine more into the initiative. In this event the total no.of students actively participated are 296 members.

VIKAS COLLEGE OF ENGINEERING & TECHNOLOGY, NUNNA

CIRCULAR

Date: 11.03.2019

Sub: ROAD CLEANING UNDER SWACHH BHARATH

It is happy to announce that college NSS wing has planned to organize road cleaning program at nunna on 12/03/2019.

As such, it is advised that the interested students are invited to this event and make it grand success.

Principal

Distribution:

1.NSS Members, 2. Notice Boards, 3. HOD's 4. Nunna panchayat.

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Krishna Dt., A.P.

Circular for Information

Press Note on Swatch Bharath

BANNER for the Program

Students Cleaning the Premises of Nunna Village

CO-ORDINATOR
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10.5 World Environment day creating awareness – Yr 2019

Figure 10 Students and staff celebrating world environment day

Chapter 11: Summary and conclusions

11.1 Summary

Green Audit is one of the important tool to check the balance of natural resources and its judicial use. Green auditing is the process of identifying and determining whether institutional practices are eco-friendly and sustainable. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area.

The main objective to carry out green audit is to check the green practices followed by college and to conduct a well-defined audit report to understand whether the college is on the track of sustainable development.

After completing the audit procedure of college for green practices, there are following conclusions, recommendations and which can be followed by university in future for keeping campus environment friendly.

11.2 Possible improvements on campus

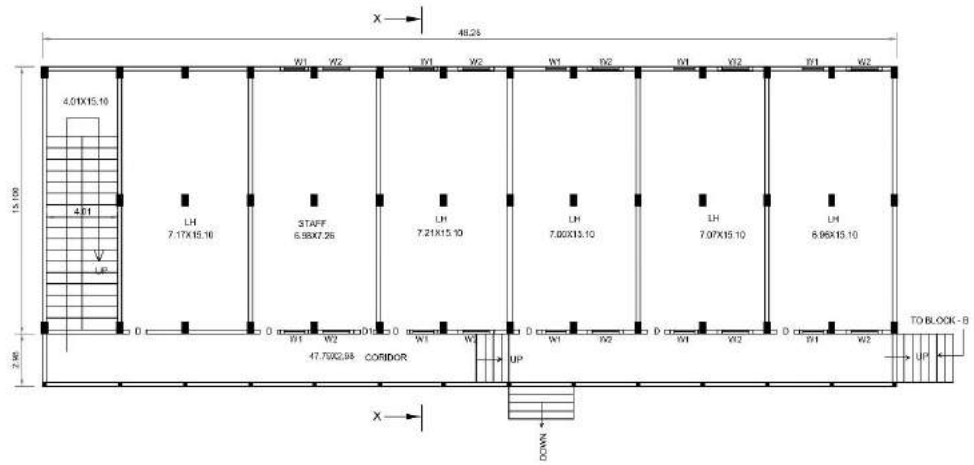
- College takes efforts to dispose majority waste by proper methods.
- Biodegradable waste is used efficiently for composting and vermicomposting. There is a scope to utilize the organic matter for biogas generation or manure production.
- Proposal of Installation of solar panels would provide ample amount of electricity. Such solar modules should be installed wherever possible in the campus
- Use of LED lamps and Tube Lights is minimum and is to be encouraged.
- The watershed management program appears to be valuable with few more though process invited in to it
- A continuous counter trench (CCT) has given good results on percolation of water and for filling up of lakes on campus. Roof top rain water harvesting has proved beneficial.
- Toilets and bathrooms are consuming more water in the departments. The replacement of old taps can be beneficial for solving this issue
- Pedestrian friendly campus proves to be one of the good practice to save the fuel and help for green and clean environment on the campus.
- The overall ambient air quality on the campus is good while some air quality issues may arise due to developmental activities on the campus should be addressed.
- The sound levels on the campus is good except due to some transportation and construction activities.
- E-waste and biomedical waste segregation, handling and disposal are properly should be done.

11.3 Recommendations

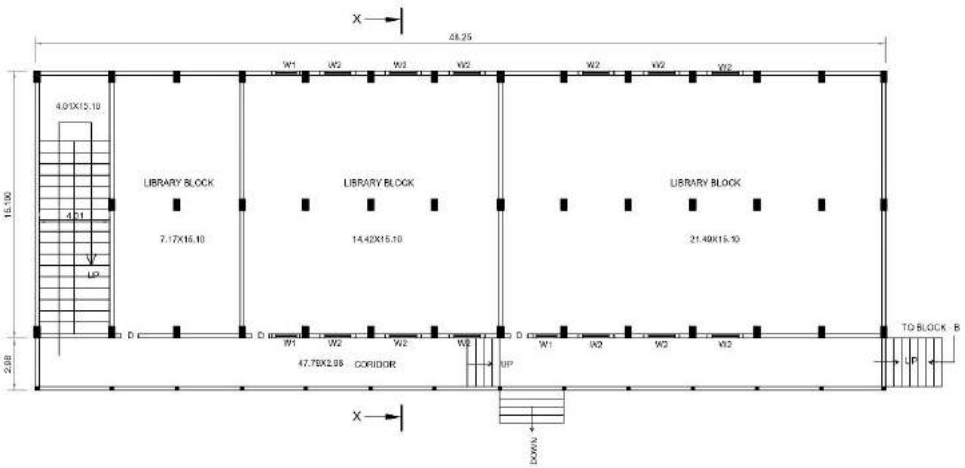
- Following are some of the key recommendation for improving campus environment:
- An environmental policy document has to be prepared with all the recommendations and current practice carried by college.
- A frequent visit should be conducted to ensure that the generated waste is measured, monitored and recorded regularly and information should be made available to administration.
- The college should develop internal procedures to ensure its compliances with environmental legislation and responsibility should be fixed to carry out it in practice
- The solid waste should be reused or recycled at maximum possible places. The biodegradable waste is generated in more amounts in hostels which should be properly utilized for manure preparation or biogas generation.
- Reuse of glass bottles for storage of chemicals should be encouraged or the bottles should be sent to again suppliers for reuse.
- Electrification of street lights by solar power should be encouraged.
- Installation of sensor based electrification items like fans, lights, etc. can save electricity.
- Installation of solar panels and rain water harvesting system to every terrace of building will be useful in conserving the natural resources.
- Regular check-ups and maintenance of pipes, overhead tanks and plumbing system should be done by engineering section to reduce overflow, leakages and corrosions.
- Science laboratories large amount of water goes waste during the process of making distilled water; the system should developed to reuse this water for other purposes. The solar distillation unit be installed at the earliest.

Appendix A: Site plan with landscape layout

Appendix B: Block –A, floor plans, elevations, sections



EXISTING THIRD FLOOR PLAN



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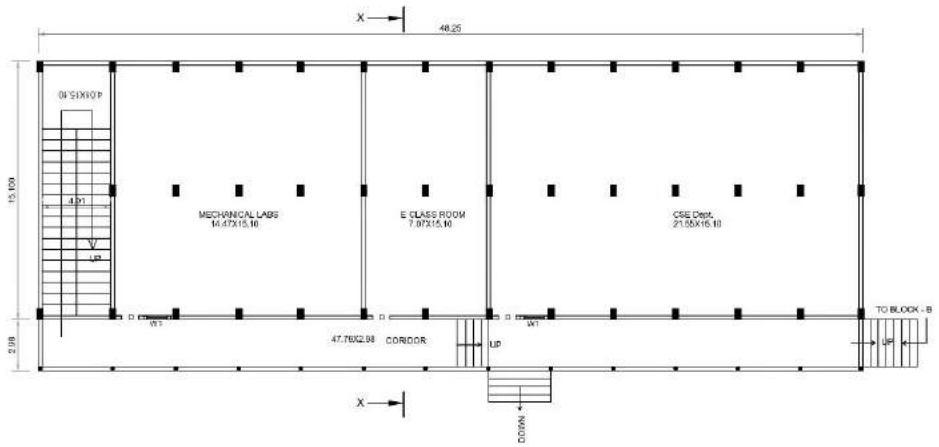
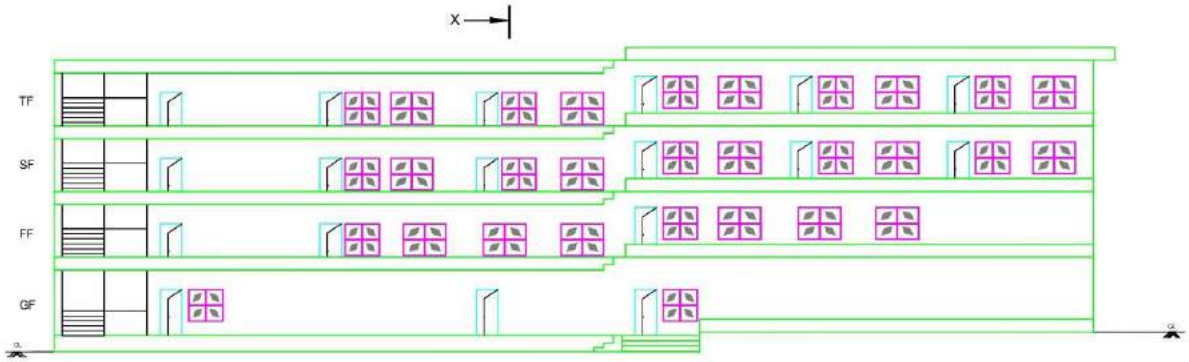
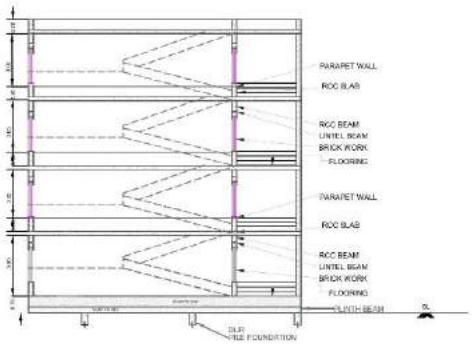


EXISTING GROUND FLOOR PLAN

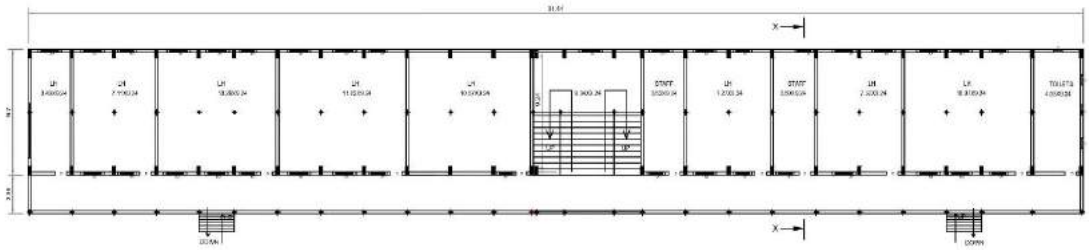


ELEVATION BLOCK A

SECTION - XX



Appendix C: Block –B- floor plans, elevations, sections



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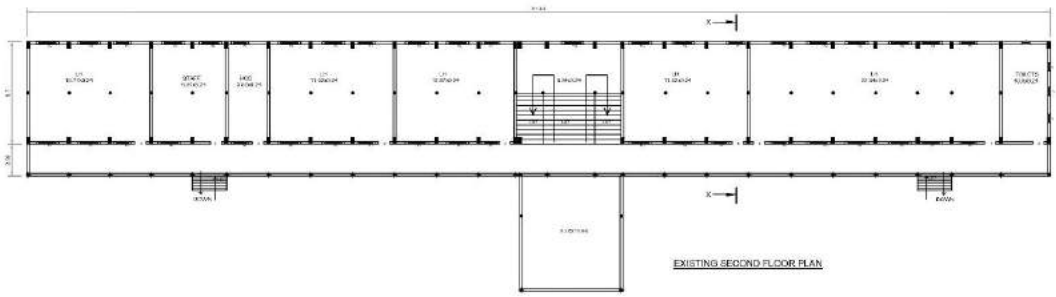

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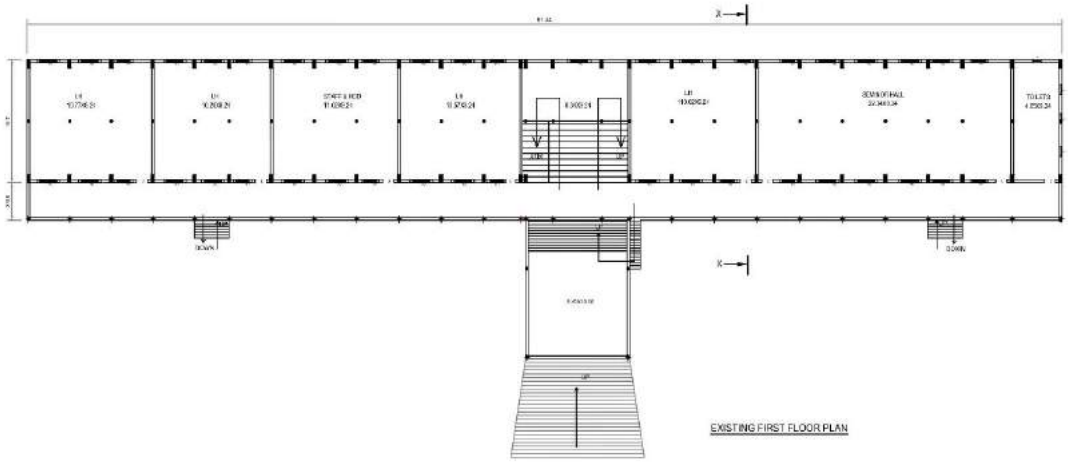

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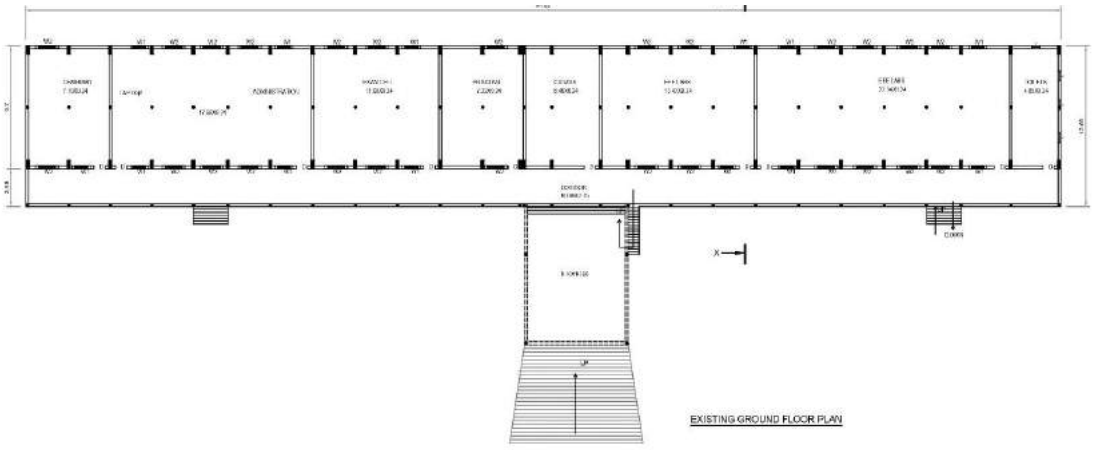

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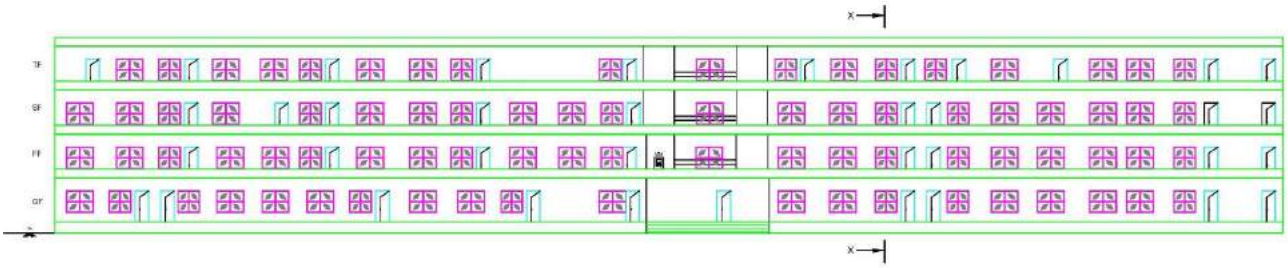
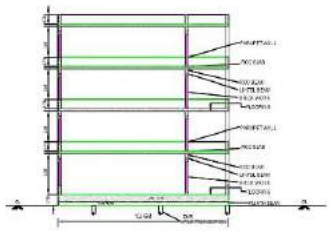
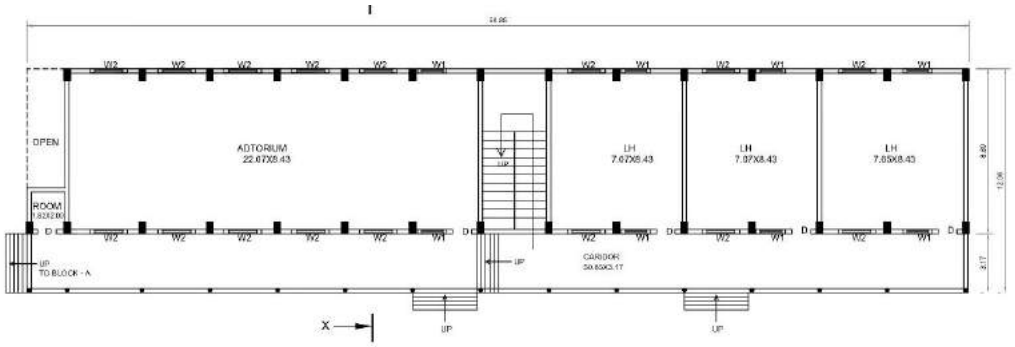


ELEVATION

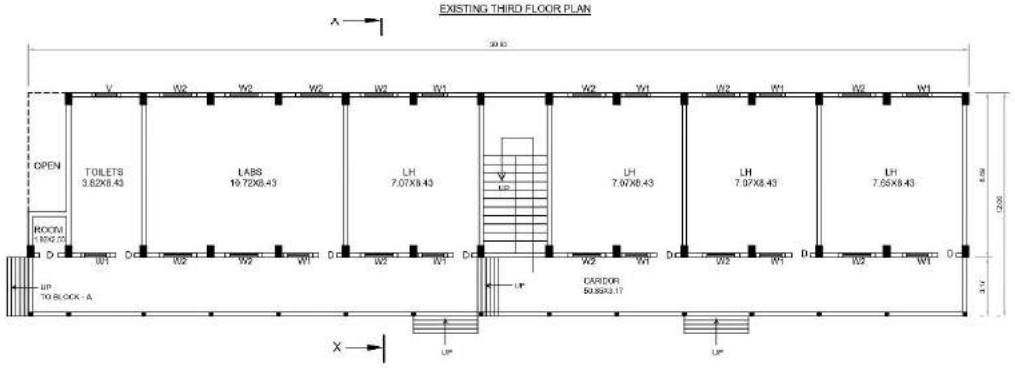
SECTION - XX



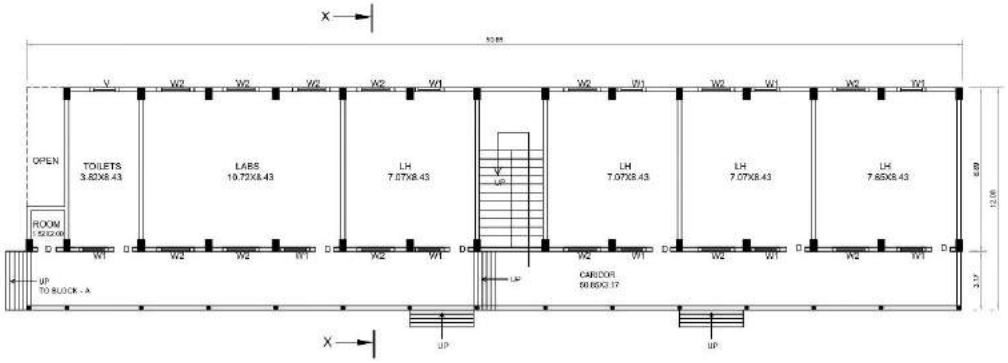
Appendix D: Block –C- floor plans, elevations, sections



BLOCK - C
EXISTING THIRD FLOOR PLAN



BLOCK - C
EXISTING SCOND FLOOR PLAN



BLOCK - C
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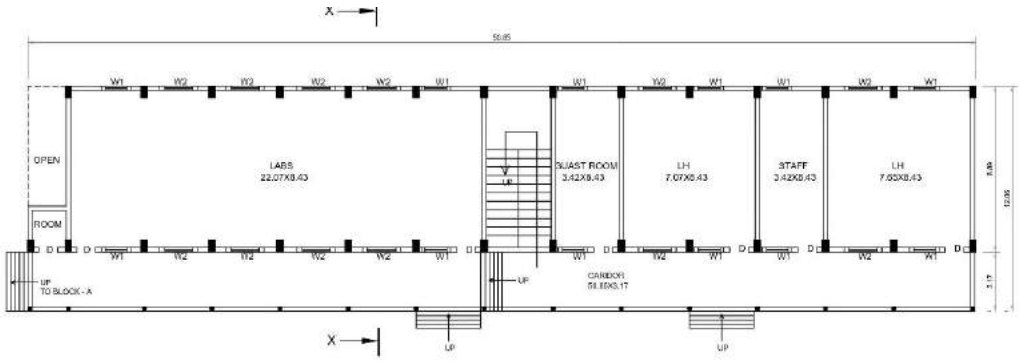
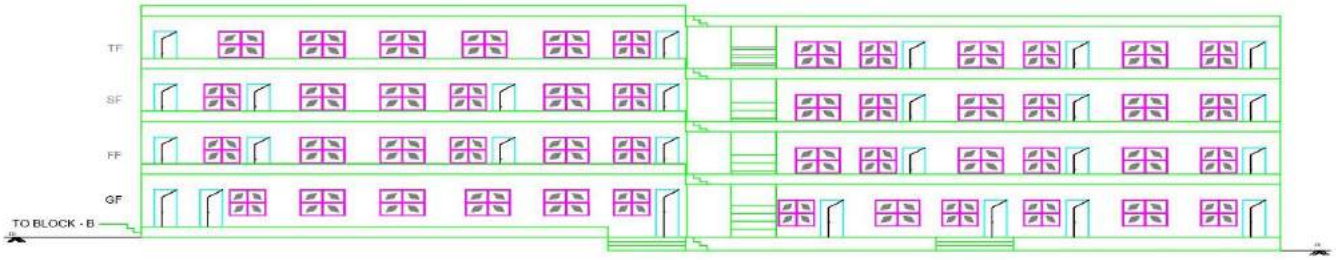
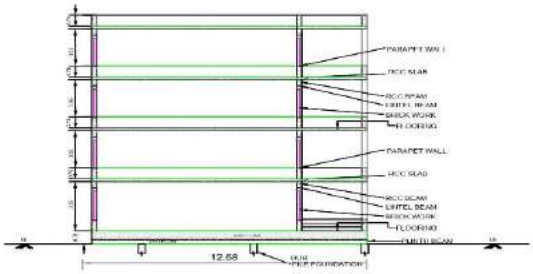


BLOCK - C
EXISTING GROUND FLOOR PLAN

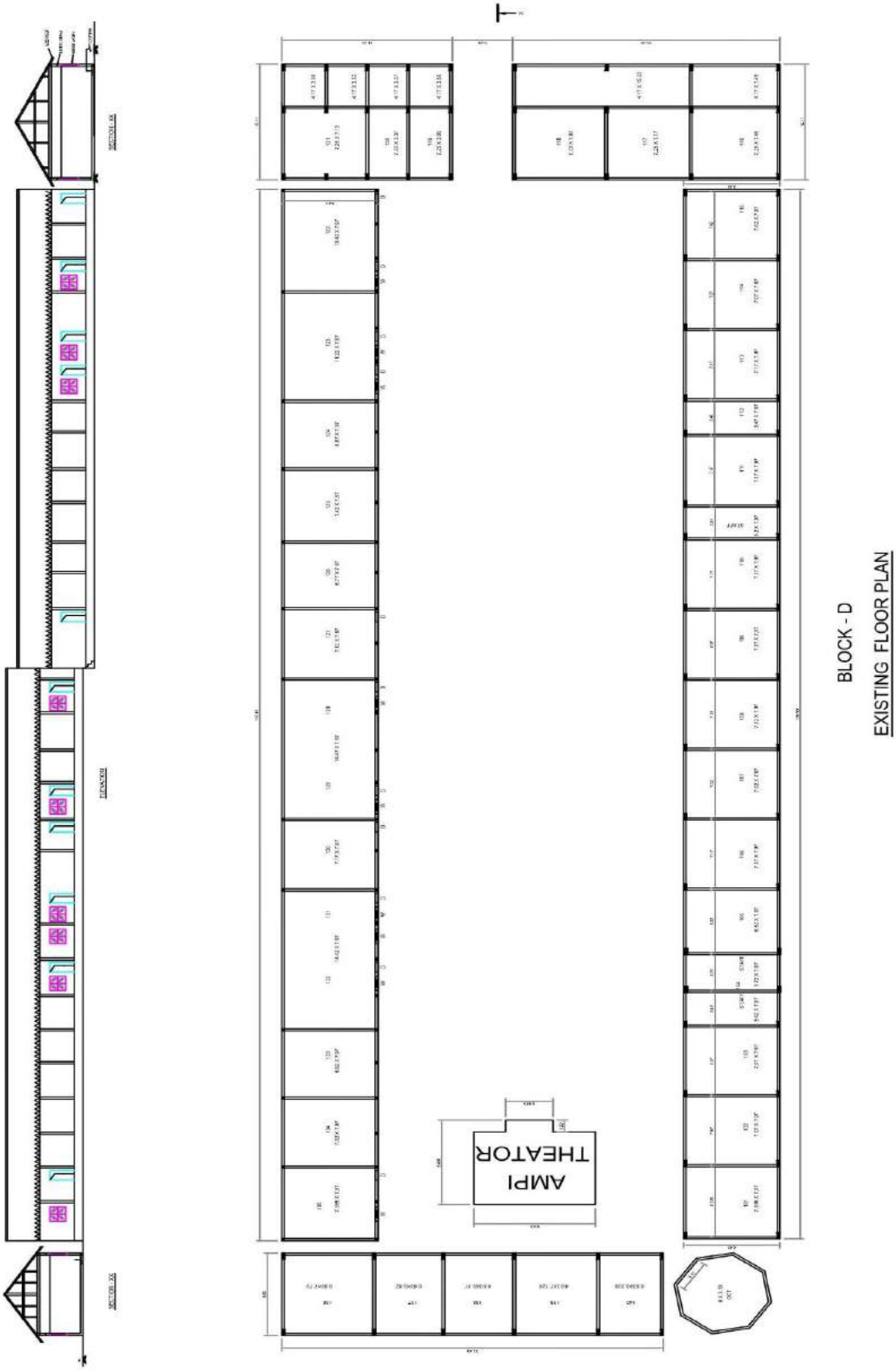


ELEVATION

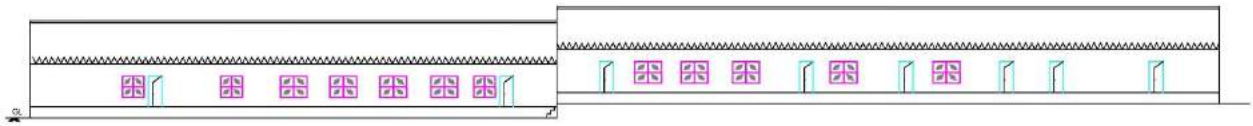
SECTION - XX



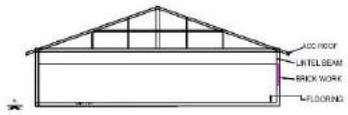
Appendix E: Block –D- floor plans, elevations, sections



Appendix F: Block –E- floor plans, elevations, sections



ELEVATION



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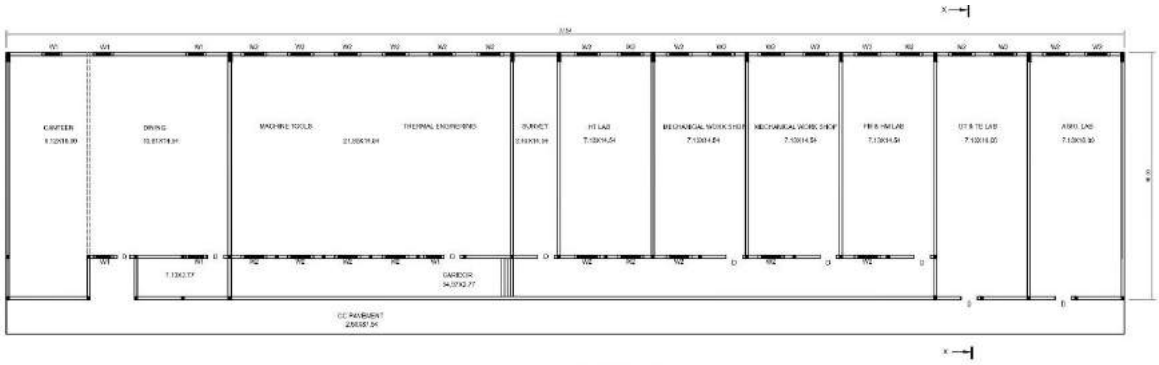

BLOCK - E

EXISTING FLOOR PLAN