

Report

On

GREEN AUDIT

For

**SPDT Lions Juhu College of Arts, Commerce and Science
Andheri, Mumbai**

Prepared

By

**Senergy Consultants Pvt Ltd
Mumbai**

March 2020

Helping You to Conserve Energy

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I Introduction

Green Audit was undertaken at SPDT Lions Juhu College of Arts, Commerce and Science, Andheri, Mumbai, during the month of February 2020.

The organization is very keen to promote green culture wherever possible, as a commitment towards better environment and conservation of energy. To further optimize consumption and identify saving opportunities, M/s Senergy Consultant Private Limited was assigned to carry out Green Audit of the premises.

This Audit Report presents the analysis of the data collected, observations made at the facility and is governed by the objectives, scope of work, methodology etc. discussed in the ensuing paragraphs.

Team:

The team members of the audit study.

- Mr. Ravindra Datar - Director
- Mr. Nitesh Kharche - Project Manager
- Mr. Chirag Patel - Project Engineer
- Mr. Swapnil Jadhav - Project Engineer

Instruments:

The following instruments were utilized for measurement during the energy audit study.

1. Power Analyzer
2. Hygro-temp meter
3. Vane Type Anemometer
4. Lux meter
5. Environmental meter
6. Measuring Tape
7. 10 A & 20 A Plug-in Meter

Acknowledgment:

We would like to express our gratitude towards Dr Trishla Mehta, and Green Audit Team for given us the opportunity for conducting the study and the support provided during the study.

We are also thankful to the entire team for extending the necessary help and co-operation from their side.



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SENERGY Consultants (P) Ltd

Ref: SCPL-PL-724-201104
Date: March 17, 2020

Yours faithfully,
For **SENERGY CONSULTANTS PVT LTD**



Tushar Kamble
(Project coordinator)



PRINCIPAL
SHRI RAJASTHANI SEVA SANGH
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II Executive Summary

The premises were evaluated against the various criteria laid down by the National Assessment and Accreditation Council (NAAC). The major observations are

1. Lighting & Ventilation

- Energy efficient light fittings has not been installed at all the places.
- Illumination level is within the norm, but for the few places where it is marginally lower than the standard level.
- The ventilation is adequate, and the carbon dioxide as well as the Volatile Organic Matter contents are within a limit for almost all the classrooms and other premises.
- The possibility of replacing the fans with high efficiency fans may be ascertained; especially while making new purchases.
- The fans & lights are switched off when not in use.

2. Water Quality & Conservation

- The water supplied by the Municipal Corporation is used for drinking after purification.
- Water Purifier is provided at convenient locations.
- The specific water consumption is within the nominal range.

3. Waste Management

- The generation of waste is minimized through use of electronic communication and effective waste management system.
- The wastewater is disposed of through Municipal system; this is a common practice in Mumbai city area.
- The solid waste is segregated; while organic waste is converted into manure in a composting pit, the non-organic waste is disposed of through the Municipal system.

4. Infrastructure usage

- Movement on-campus is distributed with multiple entrances.
- The adequate parking space is available and provisions for bike parking are made for staff and students. However, many prefer public transport due to proximity to bus stops / station.
- There are adequate fire extinguishers located in key areas.
- The draining system for washrooms is efficient and effective.
- Seepages were not observed in the building premises.

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5. Green IT culture

- a. Energy efficient computers and monitors have been procured.
- b. In most of the cases, the computers are switched off, when not in use.
- c. Energy efficient air conditioners with higher star rating have been procured during recent purchases.
- d. The air conditioners are switched off, when not in use.
- e. The performance of the air conditioners was observed to satisfactory.
- f. Electronic communication is encouraged to minimize usage of papers.
- g. Most of the papers are reused for doubled sided printing.

6. Renewable Energy

- a. Roof-top Solar Panels have not been installed.

Potential Saving Area:

The savings can be achieved by replacing conventional tube-lights with LED lights.

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III

Electrical System & Bill

Electricity Bill

The electricity for the entire premises is supplied by Tata Power low tension (LT) connection. The details of energy consumption with costs are as under.

Description	Unit	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19
Consumer No.: 900000144187		Category: LT II (A): LT-Commercial 0-20					
Meter No.: ST069089							
Energy Consumption	kWh	7073	9789	9306	9235	9816	9136
Demand Charges	Rs	NA	NA	NA	NA	NA	NA
Total Metered Units	kWh	6487	8994	8554	8489	9023	8398
Energy Charges	Rs	NA	NA	NA	NA	NA	NA
Bill	Rs	89381	121927	109997	109867	118283	109611
Cost	Rs/kWh	12.64	12.46	11.82	11.90	12.05	12.00

Description	Unit	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Average
Consumer No.: 900000144187		Category: LT II (A): LT-Commercial 0-20					
Meter No.: ST069089							
Energy Consumption	kWh	8850	10082	8433	11534	7639	9172.09
Demand Charges	Rs	365	365	365	365	365	365.00
Total Metered Units	kWh	8135	9267	7752	10602	7022	8429.36
Energy Charges	Rs	52215	59483.8	49754.7	68050.6	45070.1	54914.84
Bill	Rs	107510	121510	105171	135152	91455	110896.7
Cost	Rs/kWh	12.15	12.05	12.47	11.72	11.97	12.11

The present cost of power is Rs 12.11/- per kWh.

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Light fittings:

The details are as under:

Location	Operation		LED		TFL-EB	
			24 W		40 W	
	Hr/D	D/M	F	W	F	W
A Wing						
Room No-102	10	280	4	4	6	6
Room No-101	10	280	4	4	6	6
Room No-202	10	280	7	7	3	1
Room No-201	10	280	4	4	3	1
Room No-301	10	280	0	0	7	3
Room No-302	10	280	4	4	6	5
Room No-401	10	280	3	3	4	2
Room No-402	10	280	7	7	2	2
Room No-501	10	280	1	1	4	3
Room No-502	10	280	6	6	1	1
Room No-602	10	280	4	3	3	2
Room No-601	10	280	1	1	2	1
Room No-702	10	280	2	2	9	8
B Wing						
Room No-104	10	280	0	0	7	6
Room No-203	10	280	8	8	11	10
Room No-204	10	280	5	5	2	2
Room No-303	10	280	6	6	7	6
Room No-304	10	280	2	2	4	3
Room No-305	10	280	1	1	3	2
Room No-403	10	280	5	5	9	5
Room No-404	10	280	0	0	8	5
Room No-405	10	280	2	2	1	1
Room No-502	10	280	0	0	4	4
Room No-503	10	280	0	0	15	15
Room No-504	10	280	2	2	5	4
Total			78	77	132	104

Abbreviations:

F: fitted

W: Working

TFL-EB: Tubular Fluorescent Light – Electronics Ballast

LED: Light Emitting Diode Lamp

Number of places have been found where Tubular Fluorescent Lights are installed. It is recommended to replace the Tubular Fluorescent Lights with LED lamps for better savings in terms of cost and energy.

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LED Lamps:

The saving details are as under,

Description	Unit	TL
		36 W
Rating of the lamp	Watt	36
Rating of the switchgear	Watt	5
Power consumption of the lamp	Watt	41
Number of lamps	No	104
Operating period	Hr/Month	250
Total consumption	kW	4.264
	kWh/Month	1066
Alternative Lamp: LED Lamp		
Rating of the lamp	Watt	20
Rating of the switchgear	Watt	2
Power consumption of the lamp	Watt	22
Number of lamps	No	104
Operating period	Hr/Month	250
Total consumption	kW	2.288
	kWh/Month	572
Saving Potential		
Cost of power	Rs/kWh	12.11
Energy Saving	kWh/Month	494
	Rs/Month	5982
Economics		
Investment	Rs	104000
Payback period	Month	17.4

The saving potential shall be around 5.93 MWh or Rs 0.72 lakh per year.

The investment shall be around Rs 1.04 Lakh.

The payback period shall be around 17.4 Months

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Power Consumption:

The power consumption of some of the gadgets is as under.

Sr No	Description	Operation		Voltage	Current	Power	Power Factor
		Hr/Day	Day/Year	V	A	Kw	
Computers							
Room No.301 Computer Lab							
1	PC-03	6	280	238.1	0.45	0.07	0.63
2	PC-08	6	280	238.8	0.37	0.05	0.59
3	PC-10	6	280	239.4	0.29	0.04	0.62
4	PC-13	6	280	237.6	0.36	0.05	0.55
5	PC-18	6	280	236.2	0.48	0.08	0.68
6	PC-20	6	280	237.7	0.44	0.07	0.70
Room No.601 Computer Lab							
7	PC-02	6	280	236.4	0.63	0.09	0.61
8	PC-05	6	280	238.8	0.52	0.09	0.69
9	PC-06	6	280	239.2	0.48	0.07	0.58
Air Conditioners							
10	Room-301 Computer Lab AC-2	4	280	231.6	5.80	1.30	0.98
11	Room-301 Computer Lab AC-3	4	280	231.7	6.00	1.31	0.97
12	Room-101 Faculty Room AC-1	6	280	234.8	4.40	1.10	0.98
13	Management Room AC-2	6	280	237.3	7.70	1.77	0.99
14	Principal Cabin	6	280	236.5	10.80	2.30	0.94
15	Hotel Management	6	280	238.4	4.60	0.98	0.91
16	Geography Lab	6	280	235.3	9.30	2.10	0.94
17	Music Room	4	280	234.3	9.40	2.10	0.98
18	Auditorium	4	280	235.3	9.80	2.20	0.96

Fan Fittings:

The details are as under:

Location	Rating	Quantity	Operation	
	W	No	Hr/Day	Days/Year
A Wing				
Room No-102	60	6	8	280
Room No-101	60	9	8	280
Room No-202	60	9	8	280
Room No-201	60	7	8	280
Room No-301	60	6	8	280
Room No-302	60	9	8	280
Room No-401	60	7	8	280
Room No-402	60	8	8	280

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Location	Rating	Quantity	Operation	
	W	No	Hr/Day	Days/Year
A Wing				
Room No-501	60	7	8	280
Room No-502	60	8	8	280
Room No-602	60	14	8	280
Room No-601	60	2	8	280
Room No-702	60	14	8	280
B Wing				
Room No-104	60	6	8	280
Room No-203	60	15	8	280
Room No-204	60	5	8	280
Room No-303	60	7	8	280
Room No-304	60	4	8	280
Room No-305	60	3	8	280
Room No-403	60	10	8	280
Room No-404	60	7	8	280
Room No-405	60	3	8	280
Room No-502	60	1	8	280
Room No-503	60	10	8	280
Room No-504	60	4	8	280
Total		75		

Opportunity for Conservation of energy:**Energy Efficient Fans:**

The possibility of replacing the fans with energy efficient new fans may be evaluated. These fans can save 50 to 60% energy while delivering similar air flows.

The expected saving works out to about Rs 700/- per year per fan.

The investment shall be in the range of Rs 3,500/- per fan, giving a payback period of 60.0 months

The installation of energy efficient fans may be considered for new purchases.

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IV

Energy Management & Efficiency

Illumination & Lighting

The illumination level was measured at various locations; the details are as under.

Location	Illumination Level (Lux)		
	Minimum	Maximum	Average
A Wing			
Room-701 (F.Y.B.B.I.)	80	300	198
Biology Lab 7th Floor	100	280	192
Room-602 (F.Y.B.M.S.)	90	250	174
Room-603 (F.Y.B.M.S.)	80	270	182
Room-604 (S.Y.B.B.I.)	70	300	182
Room-502 (F.Y.B.COM D)	90	380	201
Room-501 (F.Y.B.COM C)	70	320	202
Room-402 (F.Y.B.COM B)	90	350	206
Room-401 (F.Y.B.COM A)	80	300	198
Room-302 (T.Y.B.COM C)	85	370	235
Room-301 (Computer Lab 1)	100	350	232
Room-202 (T.Y.B.COM B)	90	230	164
Room-201 (T.Y.B.COM A)	95	350	223
Room-102 (Staff room)	50	450	252
Room-101 (Faculty & Office Room)	20	250	129
Ground Floor Management Room	40	100	69
Principal cabin	30	80	56
Dr V.S. Valecha Pricipal Cabin	60	250	168
Geography Lab	90	400	242
Hotel Management Room	100	390	252
G5	170	700	470
Chemistry Lab	90	600	338
Physics Lab	400	1800	1066
B Wing			
Music Room	170	320	252
6th Floor Room-1	90	400	242
7th Floor Room-2	100	360	238
8th Floor Room-3	120	350	217
9th Floor Room-4	100	380	236
Room-503	170	700	404
Room-505	250	1500	826
Room-504	300	1000	664
Room-403	220	1400	814

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Location	Illumination Level (Lux)		
	Minimum	Maximum	Average
B WING			
Room-405	120	1400	834
Room-404	140	1500	682
Room-303	170	1400	814
Room-305	180	1500	920
Room-304	100	1400	644
NAAC room	90	980	468
Room-203 (Library)	195	300	247
Room-205 (F.Y.B.A.)	100	800	405
Room-204	200	1400	794
Room-104	100	450	285
G4 Degree Office	250	675	410
Seminar room	100	900	484
Auditorium room	110	1100	538

Observations:

- The illumination level is generally as per the norms; however, illumination level is low at some places.
- The lamps should be strategically located to optimize usage of day light.
- The use of daylight has been maximized through windows.
- The practice of switching off the lamps in the unoccupied areas has been followed.
- There is no major improvements/saving potential in this area.
- It is not economical to provide occupancy sensors for the class-rooms due to lesser light fitting and practice of switching off the lamps during the unoccupied area.

Ventilation & Air Quality:

The air quality was checked by measuring carbon dioxide & VOC contents at various locations in the classrooms as well as administrative areas. The details are as under.

Location	Carbon Dioxide (ppm)			VOC (ppm)		
	Minimum	Maximum	Average	Minimum	Maximum	Average
A Wing						
Room-701 (F.Y.B.B.I.)	450	454	452	120	128	124
Biology Lab 7th Floor	601	603	602	140	146	143
Room-602 (F.Y.B.M.S.)	900	956	928	114	128	121
Room-603 (F.Y.B.M.S.)	450	458	454	125	129	127
Room-604 (S.Y.B.B.I.)	526	450	488	120	126	123
Room-502 (F.Y.B.COM D)	427	453	440	125	129	127
Room-501 (F.Y.B.COM C)	450	456	453	122	130	126
Room-402 (F.Y.B.COM B)	430	450	440	115	125	120

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Location	Carbon Dioxide (ppm)			VOC (ppm)		
	Minimum	Maximum	Average	Minimum	Maximum	Average
A Wing						
Room-401 (F.Y.B.COM A)	450	542	496	123	127	125
Room-302 (T.Y.B.COM C)	461	475	468	125	131	128
Room-301 (Computer Lab 1)	970	1000	985	370	400	385
Room-202 (T.Y.B.COM B)	450	460	455	127	131	129
Room-201 (T.Y.B.COM A)	441	455	448	125	133	129
Room-102 (Staff room)	460	478	469	130	132	131
Room-101 (Faculty & Office Room)	870	900	885	240	270	255
Ground Floor Management Room	550	600	575	170	174	172
Principal cabin	570	592	581	130	140	135
Dr V.S. Valecha Principal Cabin	480	500	490	125	135	130
Geography Lab	690	700	695	170	190	180
Hotel Management Room	700	734	717	420	428	424
G5	780	800	790	220	228	224
Chemistry Lab	770	792	781	180	200	190
Physics Lab	620	638	629	175	189	182
B Wing						
Music Room	650	680	665	180	190	185
6th Floor Room-1	470	492	481	133	139	136
7th Floor Room-2	450	470	460	130	136	133
8th Floor Room-3	480	500	490	135	141	138
9th Floor Room-4	520	530	525	137	141	139
Room-503	680	700	690	190	210	200
Room-505	750	754	752	200	208	204
Room-504	600	618	609	165	171	168
Room-403	620	636	628	168	176	172
Room-405	610	614	612	162	170	166
Room-404	650	674	662	180	188	184
Room-303	680	694	687	185	189	187
Room-305	720	740	730	180	210	195
Room-304	730	748	739	100	108	104
NAAC room	710	730	720	190	200	195
Room-203 (Library)	980	1000	990	430	450	440
Room-205 (F.Y.B.A.)	850	800	825	200	220	210
Room-204	940	966	953	250	268	259
Room-104	850	860	855	230	238	234
G4 Degree Office	890	900	895	270	290	280
Seminar room	450	470	460	150	160	155
Auditorium room	430	460	445	125	131	128

Observations:

- The carbon dioxide and VOC level are within the limit at most of the places. The standard norm is to maintain the carbon dioxide level below 1000 ppm & VOC level below 400 ppb.

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V Water Management

Consumption Pattern:

The water supplied by the municipal corporation is used for drinking & other applications like toilets, washing of utensils and other requirements. The incoming water from the municipal corporation is metered.

The consumption pattern was analyzed by the water bills. The details are as under.

Connection No- KEJ2810026				
Period	Days	Consumption	Bill Amount	Cost
		KL	Rs	Rs/KL
24/01/19 to 23/04/19	89	106	9189.00	86.69
23/04/19 to 24/07/19	92	100	9028.00	90.28
24/07/19 to 24/10/19	92	101	9106.00	90.16

Connection No- KEK0280000				
Period	Days	Consumption	Bill Amount	Cost
		KL	Rs	Rs/KL
24/01/19 to 23/04/19	89	1142	10047.00	8.80
24/07/19 to 24/10/19	92	616	5467.00	8.88
24/10/19 to 24/01/20	92	747	7117.00	9.53

Connection No- KEJ2810002				
Period	Days	Consumption	Bill Amount	Cost
		KL	Rs	Rs/KL
24/01/19 to 23/04/19	89	725	6273.00	8.65
24/07/19 to 24/10/19	92	469	4432.00	9.45

Specific Water Consumption:

The specific water consumption details are as under.

Connection No- KEJ2810026				
Period	Days	Consumption	Total No. Of Person	Water Consumption
		KL		L/Person/Day
24/01/19 to 23/04/19	89	106	1572	0.76
23/04/19 to 24/07/19	92	100	1572	0.69
24/07/19 to 24/10/19	92	101	1572	0.70

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Connection No- KEK0280000				
Period	Days	Consumption	Total No. Of Person	Water Consumption
		KL		L/Person/Day
24/01/19 to 23/04/19	89	1142	1572	8.16
24/07/19 to 24/10/19	92	616	1572	4.26
24/10/19 to 24/01/20	92	747	1572	5.17

Connection No- KEJ2810002				
Period	Days	Consumption	Total No. Of Person	Water Consumption
		KL		L/Person/Day
24/01/19 to 23/04/19	89	725	1572	5.18
24/07/19 to 24/10/19	92	469	1572	3.24

There are around 1536 students and 40 teaching & non-teaching staff and other Visitor members.

The specific water consumption is within the nominal range against the typical values of 6 to 8 Liters per person.

The possibility of providing low flow taps/flushing system at major locations may also be evaluated.

Water Purifiers:

The water purifiers are installed floor wise within the premises and bottled water is not used in the campus. As such quality of municipal water is quite satisfactory.

Rainwater Harvesting:

Rainwater harvesting is not been practiced in the premises.

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VI Waste Generation & Management

Sewage & Wastewater:

The sewage is fed into the municipal drainage. This is a common practice and the municipal corporation which charges less towards the sewage charges.

Solid Waste:

The organic, as well as inorganic waste, is segregated in the college premises. The organic waste is used to generate manure by composting. The non-organic waste is collected in garbage bins and disposed of through Municipal system.

E-Waste:

Electronic waste donation is been implemented for E-waste Management Organization.

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VII Infrastructure & Safety

Movement on-campus (Distributed / non-distributed leading to crowds)

The premises are provided with multiple entrances to ensure quick and effective movement in normal as well as emergency conditions.

Parking space:

The adequate parking space is available and provisions for bike parking are made for staff and student. However, many prefer public transport due proximity to bus stops / station.

Firefighting & fire escape system:

The fire extinguishers have been installed at various places in the premises & Laboratories, which are checked/refilled as per the stipulated frequency.

The premise is provided with requisite entrances to ensure quick and effective movement in emergency conditions.

Draining system:

The drains from the washrooms are connected to the municipal drainage, which is a common practice in the colleges in Maharashtra.

The municipal corporation charges cess for water disposal.

Seepage in the building:

The premise was visually inspected for seepages.

Seepages were not observed in the building premises.

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VIII

Air Conditioners

Air conditioning system is basically provided to maintain comfortable ambience inside the premises by maintaining the temperature (and relative humidity, at times) at appropriate levels. The performance of human being is optimal at the temperature of $24 \pm 2^\circ\text{C}$ and at relative humidity (RH) of $60 \pm 5\%$.

The warmer and humid air from the premises is drawn and fed to the Air Conditioning System by a circulating fan. This air is chilled in an evaporator by vaporizing the refrigerant and is distributed throughout the conditioned area. The refrigerant is pressurized by a compressor and subsequently cooled and condensed by an air-cooled condenser. The compressor and condenser are placed in an outdoor unit, located on the external side of the premise. While the circulating fan and evaporator are placed in an indoor unit located inside the premises.

Performance:

The performance as well as chilling (or Air Conditioning) effect delivered by the air conditioner (represented as TR – Ton of Refrigeration) is computed by measuring

- Air Velocity along with the cross-sectional area of flow to determine the flow rate and subsequently mass flow rate.
- Temperature and relative humidity of the air at the inlet of the evaporator coil to determine the enthalpy of the air.
- Temperature and relative humidity of the air at the outlet of the evaporator coil to determine the enthalpy of the air.
- Power drawn by the air conditioning unit

The chilling effect can be computed as under,

Flow Rate of Air (kg/hr)
= Average Air velocity (M/s) x Cross sectional area of the air flow (M^2) x Specific Gravity of Air

Chilling or Air Conditioning Effect (TR)
= Air flow rate (kg/hr) x Enthalpy difference between the air at inlet & outlet of the evaporator coil (kJ/kg) / (4.18×3024)

Chilling or Air Conditioning Effect (kW)
= Air flow rate (kg/hr) x Enthalpy difference between the air at inlet & outlet of the evaporator coil (kJ/kg) / 3600
= $3.5112 \times \text{Chilling Effect (TR)}$

Specific Power Consumption (kWh/TR) =
Power consumption (kW) / Air Chilling Effect (TR)

Energy Efficiency Ratio – EER (W of cooling / W of input power)
= Power consumption (kW) / Air Chilling Effect (kW)
= $3.5112 / \text{Specific Power consumption (kW/TR)}$

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Green Audit Report

SPDT Lions Juhu college of Arts, Commerce and Science, Andheri, Mumbai

The performance of a few of the randomly selected air conditioning units (of different make, capacity and age) were carried out as described above.

Description	Unit	301 Computer Lab		101 Faculty Room	Management Room	Principal Cabin
		AC-2	AC-3	AC-1	AC-2	AC
Design Parameters						
Make		Midea	Midea	Daikin	Napoleon	LG
Model		NA	NA	NA	NA	NA
Rating (Capacity)	TR	1.05	1.05	1.11	1.8	2.0
Star Rating		2	2	3	5	NA
E E R		2.87	2.87	3.65	3.51	NA
Power	kW	1.1	1.1	NA	1.5	2.5
Actual parameters						
Operation	Hr/D	4	4	6	6	6
	D/Y	280	280	280	280	280
Indoor Unit						
Supply air - Temp	°C	10.5	9.8	11.3	11.3	12.1
Supply air - RH	%	74.6	77.8	80.2	77	80
Return air - Temp	°C	25.8	25.2	26.3	25.8	24.8
Return air - RH	%	46	47	45.3	45.8	53.2
Velocity	M/s	2.2	2.1	2.6	3.5	3.9
Area	M²	0.057	0.057	0.053	0.061	0.067
Air flow - Supply	M³/Sec	0.123	0.121	0.138	0.215	0.264
	M³/hr	441	437	496	772	950
	kg/hr	549	545	615	958	1176
Supply Enthalpy	kJ/kg	25.5	24.7	28.2	27.5	29.9
Return Enthalpy	kJ/kg	49.4	49.3	51.1	50.1	51.4
Enthalpy drop	kJ/hr	13118.5	13410.3	14092.8	21655.2	25279.8
	TR	1.04	1.06	1.11	1.71	2.00
Key parameter						
AC Output	TR	1.04	1.06	1.11	1.71	2.00
	% Rated	98%	101%	100%	97%	100%
Power	kW	1.30	1.31	1.10	1.77	2.30
Specific Power	kWh/TR	1.25	1.24	0.99	1.03	1.15
E E R		2.80	2.84	3.55	3.39	3.05
Hall Temperature						
Maximum	°C	25.8	25.3	25.5	25.5	25.9
Minimum	°C	25.2	24.4	24.9	24.7	25.4
Average	°C	25.5	24.9	25.2	25.1	25.7
Variation - Room	°C	0.6	0.9	0.6	0.8	0.5
	%	2.4%	3.6%	2.4%	3.2%	1.9%

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Description	Unit	Hotel Management	Geography Lab	Music Room	Auditorium
		AC-1	Ground Floor	AC-1	AC-1
Design Parameters					
Make		Daikin	LG	Mitsubishi	Voltas
Model		NA	NA	NA	NA
Rating (Capacity)	TR	1.11	2.0	2.12	2.12
Star Rating		3	NA	3	3
E E R		3.65	Na	3.17	3.12
Power	kW	NA	2.3	2.0	2.1
Actual parameters					
Operation	Hr/D	6	6	4	4
	D/Y	280	280	100	100
Indoor Unit					
Supply air - Temp	°C	7	10	12.8	6
Supply air - RH	%	90.6	80.6	79	71
Return air - Temp	°C	21.9	25.6	29.4	27
Return air - RH	%	53.8	47.6	42.8	49.2
Velocity	M/s	3.4	3.4	3.7	2.2
Area	M²	0.036	0.050	0.066	0.064
Air flow - Supply	M³/Sec	0.121	0.169	0.243	0.138
	M³/hr	436	610	874	498
	kg/hr	549	760	1079	630
Supply Enthalpy	kJ/kg	21.2	25.5	31.2	16.3
Return Enthalpy	kJ/kg	44.4	50.6	56.0	55.1
Enthalpy drop	kJ/hr	12735.7	19068.8	26765.1	24439.4
	TR	1.01	1.51	2.11	1.93
Key parameter					
AC Output	TR	1.01	1.51	2.11	1.93
	% Rated	91%	75%	100%	91%
Power	kW	0.98	2.10	2.10	2.20
Specific Power	kWh/TR	0.97	1.39	0.99	1.14
E E R		3.61	2.52	3.54	3.08
Hall Temperature					
Maximum	°C	21.9	25.6	26.0	27.0
Minimum	°C	21.1	25.0	25.0	26.3
Average	°C	21.5	25.3	25.5	26.7
Variation - Room	°C	0.8	0.6	1.0	0.7
	%	3.7%	2.4%	3.9%	2.6%

Observations:

- The performance of air conditioning units is satisfactory except geography lab AC Unit. It is suggested to overhaul the geography lab air conditioning unit.

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- The star rating of most of the air conditioning units is two or three stars. It is suggested to purchase five energy star air conditioning unit, while purchasing new air conditioning Unit.

Hall temperature:

The average room temperature was observed to be around 25 °C; which is maintained as per the standard value.

It may be noted that the overall energy consumption of air conditioning goes up by 5% for each 1 °C drop in the room temperature.

There are no major savings are expected in this area.

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IX Green Culture

The power consumption of some of the personal computers is as under

Sr No	Description	Operation		Voltage	Current	Power	Power Factor
		Hr/Day	Day/Year	V	A	Kw	
Computers							
Room No.301 Computer Lab							
1	PC-03	6	280	238.1	0.45	0.07	0.63
2	PC-08	6	280	238.8	0.37	0.05	0.59
3	PC-10	6	280	239.4	0.29	0.04	0.62
4	PC-13	6	280	237.6	0.36	0.05	0.55
5	PC-18	6	280	236.2	0.48	0.08	0.68
6	PC-20	6	280	237.7	0.44	0.07	0.70
Room No.601 Computer Lab							
7	PC-02	6	280	236.4	0.63	0.09	0.61
8	PC-05	6	280	238.8	0.52	0.09	0.69
9	PC-06	6	280	239.2	0.48	0.07	0.58

Observations:

1. The LED / LCD monitors have been procured, which are energy efficient.
2. These monitors are not only energy efficient but also generate minimal heat and cut down on air conditioning load.

Recommendations:

The following steps may be initiated to further enhance efficiency of various PCs

1. An efficient power management system may be incorporated to
 - a. Switch off the display if not in use.
 - b. Put the computer in Sleep mode / switching off the machines, if not used for a prolonged period.
2. Optimize brightness of the screen.
3. Discourage use of screen savers, which has similar power consumption.

Paper-less communication:

The major internal, as well as external communication, is through an electronic medium.

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Re-using one sided paper for printing:

It was observed that two side printing/printing on the back side of the used paper in more than 80% of the cases.

Environmental Awareness:

1. Various awareness programs have been carried out to promote 'Save Environment'.
2. People actively participate in Exhibitions, Seminars, Nature's trip organized by the college.

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X Renewable Energy

Solar Photovoltaic:

The Solar photovoltaic system has not been installed in the campus.

Bio-methanation:

1. The possibility of installing biogas plant to generate biogas for canteen usage from plate and canteen waste is could be initiate.
2. Vermicompost is not been practiced in the premises.



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