

7.1.6 - 1. Certificate from the auditing agency attested  
by the Principal.

**SIES Graduate School of Technology, Nerul, Navi Mumbai**

**Quality Audit Report 2019-20**

**About the College**

The SIES Graduate School of Technology (GST) is established in the year 2002 at Nerul, Navi Mumbai with a view of promoting technical education and be a pioneer in the field of Engineering and Technology Education. Right from its inception, the underlying vision has been to excel through high-quality programs in teaching, learning, research, and development. We rank amongst the best Engineering Colleges in Navi Mumbai and Thane region, and we are known for our discipline and integrity.

The institute has well-developed infrastructure, green and clean conducive learning environment. Each department at the Institute possesses highly advanced state-of-the-art laboratories. We have a blend of young and accomplished teaching faculty members with many of them having doctoral qualifications and with deep professional and consulting experiences. The collective experience of our faculty members – in academics, industry, and research helps in imparting higher education in an interesting way that is both enjoyable and scholastic.

SIES Graduate School of Technology, offering four year Bachelor of Engineering courses in Electronics and Telecommunication Engineering, Electronics & Computer Science, Computer Engineering, Information Technology, Printing & Packaging Technology and Mechanical Engineering. We have total of 1683 students, 80 faculty, 54 non-teaching staff, 14 essential service staff.

Good education helps in the formation of character, strengthens the mind and intellect, and hones the skills of the students. Thus the college believes in imparting education to students for their all-round development to create ideal citizens of the nation. Also the college seeks to take initiatives to make the green and environmental sustainable campus which is also in line with the Mission 2025 of SIES.

**Vision of the Institution:**

“To be a centre of excellence in Education and Technology committed towards Socio-Economic advancement of the country”

**Mission of the institution**

1. To impart advanced knowledge in Engineering and Technology.
2. To transform young minds towards professional competence by inculcating values and developing skills.
3. To promote research and ensure continuous value addition among students and employees.
4. To strengthen association with industry, research organizations and alumni to enhance knowledge on current technologies.
5. To promote next generation technocracy and nurture entrepreneurial culture for social-economic growth.



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S. I. E. S. GRADUATE SCHOOL OF TECHNOLOGY  
Sr. Chandrasekarendra Saraswathy Vidyapuram  
Sector - V, Nerul, Navi Mumbai - 400706

## Objectives of the Audit

Quality Auditing is a management tool comprising systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing, with the aim of helping safeguard the environment by:

- (i) Facilitating management control of environmental practices.
- (ii) Assessing compliance with various policies which would include meeting regulatory requirements.
- (iii) Sensitizing students about the growing environmental issues.

There are various Audits carried out at the institute which stimulates the environmental sustainability and evaluation.

1. Green Audit
2. Energy Audit
3. Environment Audit



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## 1. Green Audit

The Green Audit of an institution is of a paramount importance these days for self-assessment of the institute, which reflects the role of the institute in mitigating the negative impacts of carbon emission. The institute has been putting efforts to reduce the emissions from electricity consumption by replacing conventional lights to LED, star rated equipments and instruments and by installing solar panel for electricity generation.. The purpose of the green audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards of Intergovernmental Panel of Climate Change (IPCC).

### Objectives of the Green Audit:

The main objectives of carrying out Green Audit are:

- To monitor and document the carbon emission from electricity consumption.
- To record the diversity of plants and birds, total green area and potential of carbon sequestration from tree plantations.

### a) Calculation of Carbon Emissions from Electricity Consumption

| Sr. no. | Particulars  | Observed value | Units     |
|---------|--|----------------|-----------|
| 1       | Total energy consumption/ day                        | 53890.70       | kWh/ hr   |
| 2       | Total energy consumption/month                       | 1185595.20     | kWh/month |
| 3       | Total energy consumption/year                        | 10670356.90    | kWh/year  |
| 4.      | Solar power generation from the facility of 189 kWp* | 175736         | kWh/year  |
| 5.      | Gross Energy Requirement through Grid /year          | 10494620.90    | kWh/year  |

\*Only 20% of total solar energy generation is utilized

### b) Green Cover Around the Institute

| Sr. No | Name of the Plant                  | Habit  | Family         |
|--------|------------------------------------|--------|----------------|
| 1      | <i>Citrus reticulata</i>           | Shrubs | Rutaceae       |
| 2      | <i>Hamelia patens</i>              | Shrubs | Rubiaceae      |
| 3      | <i>Syzygium cumini</i>             | tree   | Myrtaceae      |
| 4      | <i>Crinum asiaticum L.</i>         | Herb   | Amaryllidaceae |
| 5      | <i>Mangifera indica L.</i>         | Tree   | Anacardiaceae  |
| 6      | <i>Furcraea Foetide (L).</i>       | Shrubs | Agavaceae      |
| 7      | <i>Ravenala Madagascariensis</i>   | tree   | Strelitziaceae |
| 8      | <i>Portulaca oleracea (L).</i>     | Shrubs | Portulacaceae  |
| 9      | <i>Tecoma stans</i>                | Shrubs | Bignoniaceae   |
| 10     | <i>Eucalyptus globulus Labill.</i> | Tree   | Myrtaceae      |
| 11     | <i>Ficus religiosa L.</i>          | Tree   | Moraceae       |
| 12     | <i>Caesalpinia pulcharrima (L)</i> | Shrubs | Fabaceae       |
| 13     | <i>Psidium guajava L.</i>          | Tree   | Myrtaceae      |
| 14     | <i>Fraxinus excelsior L.</i>       | Tree   | oleaceae       |
| 15     | <i>Canna indica L.</i>             | Shrubs | Cannaceae      |

|    |   |            |                 |
|----|---|------------|-----------------|
| 18 | <i>Jasminum sambac (L) Aiton</i>        | Shrubs     | Oleaceae        |
| 19 | <i>Camellia Japonica L.</i>             | Shrubs     | Theaceae        |
| 20 | <i>Epipremnum pinnatum (L)</i>          | Hurb       | Araceae         |
| 21 | <i>Syngonium Podophyllum Schott</i>     | herbaceous | Araceae         |
| 22 | <i>Tabernaemontana divaricate (L)</i>   | Shrubs     | Apocynaceae     |
| 23 | <i>Cadiaecum Variegatum (L) A. Juss</i> | Shrubs     | Euphorbiaceae   |
| 24 | <i>Ocimum basilicum L.</i>              | Shrubs     | Lamiaceae       |
| 25 | <i>Nerium Olander L.</i>                | Shrubs     | Apocynaceae     |
| 26 | <i>Cocos Nucifera L.</i>                | Shrubs     | Arecaceae       |
| 27 | <i>Gleditsia Triacanthos L.</i>         | Tree       | Fabaceae        |
| 28 | <i>Curcuma Longa</i>                    | Shrubs     | Zingiberaceae   |
| 29 | <i>Robinia Pseudoacacia L.</i>          | Tree       | Fabaceae        |
| 30 | <i>Viburnum opulus L.</i>               | Shrubs     | Caprifoliaceae  |
| 31 | <i>Hibiscus rosasinensis L.</i>         | Hurb       | Malvaceae       |
| 32 | <i>Calotropis procera</i>               | Hurb       | Asclepiadaceae  |
| 33 | <i>Caria papaya L.</i>                  | Tree       | Caricaceae      |
| 34 | <i>Plumeria obtusa L.</i>               | Shrubs     | Apocynaceae     |
| 35 | <i>Polyalthia longifolia</i>            | Tree       | Annonaceae      |
| 36 | <i>Agave americana L.</i>               | Shrubs     | Agavaceae       |
| 37 | <i>Ficus elastica Roxb. ex Hornem</i>   | Shrubs     | Moraceae        |
| 38 | <i>Pittosporum undulatum Vent</i>       | Tree       | Pittosporaceae  |
| 39 | <i>Aglaonema Commutatum schott</i>      | Shrubs     | Araceae         |
| 40 | <i>Colocasia esculenta (L). Schott</i>  | Shrubs     | Araceae         |
| 41 | <i>Nephrolepis exaltata (L) schott</i>  | Shrubs     | Pryopteridaceae |
| 42 | <i>Albizia julibrissin</i>              | Tree       | Fabaceae        |

#### Bird Diversity around the Institute

Along with the plant diversity, study on bird diversity in the campus of SIES Nerul was done, over a period of one year. A total 25 number of bird species were observed. In the Campus different species of butterflies were observed and planning for recording the diversity of butterflies in future so that biodiversity index of the campus can be identified. Following are the Bird's species observed

|    | Common Name of Bird       | Scientific Name              |
|----|---------------------------|------------------------------|
| 1  | House Sparrow             | <i>Passer domesticus</i>     |
| 2  | House crow                | <i>Corvus splendens</i>      |
| 3  | Common myna               | <i>Acridotheres tristis</i>  |
| 4  | Asian koel                | <i>Eudynamis scolopaceus</i> |
| 5  | Greater coucal            | <i>Centropus sinensis</i>    |
| 6  | White-throated kingfisher | <i>Halcyon smyrnensis</i>    |
| 7  | Black drongo              | <i>Dicrurus macrocerus</i>   |
| 8  | Common tailorbird         | <i>Orthotomus sitorius</i>   |
| 9  | Oriental magpie-robin     | <i>Copsychus saularis</i>    |
| 10 | Red-whiskered bulbul      | <i>Pycnonotus jocosus</i>    |
| 12 | Red-vented bulbul         | <i>Pycnonotus cafer</i>      |
| 13 | Common iora               | <i>Aegithina tiphia</i>      |
| 14 | Asian pied starling       | <i>Gracupica contra</i>      |
| 15 | Purple-rumped sunbird     | <i>Leptocoma zeylonica</i>   |
| 16 | Purple sunbird            | <i>Cinnyris asiaticus</i>    |

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|    |                       |                                 |
|----|-----------------------|---------------------------------|
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| 14 | Asian pied starling   | <i>Graecopica contra</i>        |
| 15 | Purple-rumped sunbird | <i>Leptocoma zeylonica</i>      |
| 16 | Purple sunbird        | <i>Cinnyris asiaticus</i>       |
| 17 | Coppersmith barbet    | <i>Psilopogon haemacephalus</i> |
| 18 | Green bee-eater       | <i>Merops orientalis</i>        |
| 19 | Rose-ringed parakeet  | <i>Psittacula krameri</i>       |
| 20 | Cattle egret          | <i>Bubulcus ibis</i>            |
| 21 | Pond heron            | <i>Ardeola grayii</i>           |
| 22 | Black Kite            | <i>Milvus migrans</i>           |
| 23 | Indian golden oriole  | <i>Oriolus kundoo</i>           |
| 24 | White wagtail         | <i>Motacilla alba</i>           |
| 25 | Domestic pigeon       | <i>Columba livia domestica</i>  |

#### Potential of Carbon Sequestration from Green Cover around the Institute:

| Sr. No. | Particulars  | Observed Value | Unit        |
|---------|--|----------------|-------------|
| 1.      | Total carbon emissions from electricity consumption at institute | 9069.80        | tonnes/year |
| 2.      | Total No. Of Trees around the institute                          | 170            | No.         |
| 3.      | CO <sub>2</sub> Sequestration from trees                         | 108.74         | tonnes/year |
| 4       | Net carbon emissions in institute (1- 3)                         | 8961.06        | tonnes/year |

#### Recommendations:

- The gross energy consumption from grid is 10494620.9 kWh/ year. Total carbon emission from electricity is 9069.80 tonnes/year. From plantation data recorded from the campus, the CO<sub>2</sub> sequestration is 108.74 tonnes/year. Hence, net carbon emissions from college campus is 8961.06 tonnes/year. It is recommended that carbon emissions reduction can further be done by usage of energy efficient lighting system, appliances and sensor based switches (smart switches). Further, plantation and installation of renewable energy system viz. solar power will reduced the emissions.
- The total build up area of institute is 15113.82 square meters and green area is 2205.33 square meters that is around 14.59 % of the total area. It exhibits that green area should be increased around the institute. The tree's are located only in 48.12 square meters area that is having potential for carbon sequestration. Plantation of more flowering trees and shrubs is recommended around the institute to improve the biodiversity of butterfly and birds.
- Emissions from official or un official transportation of staff can also be included to get overall emissions.
- Tree plantation around institute is accounted in the calculation. The consideration of total plantation around the campus may have further reduced the emissions.
- CO<sub>2</sub> sequestration from soil can be included after getting total area of college campus in (hectares).

*Konker*  
13/11/2020  
Mr. Omkar Lehaole  
(Lab Assistant)



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13/11/2020  
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Director

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## 2) Energy Audit

### Energy Assessment and Audit

This indicator addresses energy consumption, energy sources, energy monitoring, lighting and appliance. Use of Energy is clearly an important aspect of campus sustainability and thus requires no reason for its inclusion in the assessment.

- The methodology adopted focuses on understanding the existing energy consumption by various electric appliances in the college.
- A walk through survey was carried out to understand the nature of the installed energy devices (fans, tube lights, AC, etc.)
- A total count of all the energy consuming devices/equipment was done.

Energy source utilized by all the departments and common facility centers and generation of Solar energy by installed solar panels of 189.7 kWp is audited in the report. The total electricity utilization of the college for different purposes is 10670356.90 kWh/year.. Energy saving is achieved through the replacement of tube lights with LED light and has been proved to be a good energy management for the institute. The CFL tube lights were reused in the college campus by replacing with the damaged tube lights. In addition solar street lamps are also installed in the campus as a non-conventional energy source. All Computers are used with power saving mode. Staff, students and the house keeping team are encouraged to switch off the lights, monitors and other equipment when not in use. All the computer labs have been facilitated with fans for reducing the use of Air Conditioners. Regular maintenance of Air Conditioners is carried out. Awareness boards are displayed to save energy.

### Objectives of Energy Audit

The Energy audit is an effective tool in defining and pursuing comprehensive energy management programmes. It helps in energy cost optimization, pollution control, safety aspects and suggests the methods to improve the operating and maintenance practices of the system. It is instrumental in coping with the situation of variation in energy cost, availability and reliability of energy supply, decision on appropriate energy mix, decision on using improved energy conservation measures and technology.

#### a) Energy consumption

Table: Details of Energy Consumption in various facilities of institute

| Energy Consumption of SIESGST |                 |                      |                   |                       |                      |          |         |  |  |
|-------------------------------|-----------------|----------------------|-------------------|-----------------------|----------------------|----------|---------|--|--|
| Sr. No                        | Equipments      | Power used in (watt) | Power used in kWh | Usage per day (hours) | Number of appliances | Watt/hrs | kWh/hrs | Average kWh per day (kWh /hrs× No of appliances) | Average kWh per month (Average kWh per day×22) |
| 1                             | Tube lights     | 100                  | 0.1               | 8                     | 480                  | 800      | 0.8     | 384.0  | 8448.0   |
| 2                             | LED tube lights | 22                   | 0.022             | 8                     | 129                  | 176      | 0.176   | 22.7   | 499.5  |
| 3                             | LED panel Light | 20                   | 0.02              | 8                     | 170                  | 160      | 0.16    | 273.3  | 6012.2   |



|    |                           |      |        |     |     |        |        |       |           |
|----|---------------------------|------|--------|-----|-----|--------|--------|-------|-----------|
| 10 | AC 1.5 T                  | 1120 | 1.12   | 5   | 6   | 5600   | 5.6    | 33.6  | 739.2     |
| 11 | AC 2 T                    | 2300 | 2.3    | 5   | 36  | 11500  | 11.5   | 414.0 | 9108.0    |
| 12 | AC 2.5 T                  | 2800 | 2.8    | 5   | 58  | 14000  | 14     | 812.0 | 17864.0   |
| 13 | AC 2.75 T                 | 3000 | 3      | 5   | 5   | 15000  | 15     | 75.0  | 1650.0    |
| 14 | AC 3 T                    | 3500 | 3.5    | 5   | 3   | 17500  | 17.5   | 52.5  | 1155.0    |
| 15 | AC 4.6 T                  | 6000 | 6      | 6   | 6   | 36000  | 36     | 216.0 | 4752.0    |
| 16 | Server                    | 250  | 0.25   | 24  | 9   | 6000   | 6      | 54.0  | 1188.0    |
| 17 | Switch / Panel            | 30   | 0.03   | 24  | 86  | 720    | 0.72   | 61.9  | 1362.2    |
| 18 | laptops                   | 50   | 0.05   | 8   | 8   | 400    | 0.4    | 3.2   | 70.4      |
| 19 | Computer                  | 170  | 0.17   | 6   | 652 | 1020   | 1.02   | 665.0 | 14630.9   |
| 20 | Smart boards              | 200  | 0.2    | 3   | 32  | 600    | 0.6    | 19.2  | 422.4     |
| 21 | Printers                  | 50   | 0.05   | 2   | 42  | 100    | 0.1    | 4.2   | 92.4      |
| 22 | Xerox Machine             | 1000 | 1      | 6   | 4   | 6000   | 6      | 24.0  | 528.0     |
| 23 | TV                        | 120  | 0.12   | 6   | 3   | 720    | 0.72   | 2.2   | 47.5      |
| 24 | Water cooler              | 1200 | 1.2    | 10  | 6   | 12000  | 12     | 72.0  | 1584.0    |
| 25 | Refrigerator              | 150  | 0.15   | 24  | 4   | 3600   | 3.6    | 14.4  | 316.8     |
| 26 | LCD projector             | 800  | 0.8    | 3   | 43  | 2400   | 2.4    | 103.2 | 2270.4    |
| 27 | Speakers                  | 100  | 0.1    | 0.5 | 40  | 50     | 0.05   | 2.0   | 44.0      |
| 28 | CCTV DVR                  | 30   | 0.03   | 24  | 5   | 720    | 0.72   | 3.6   | 79.2      |
| 29 | cctv camera Dome          | 2.5  | 0.0025 | 24  | 100 | 60     | 0.06   | 6.0   | 132.0     |
| 30 | cctv camera Bulleter      | 2.5  | 0.0025 | 24  | 1   | 60     | 0.06   | 0.1   | 1.3       |
| 31 | cctv camera Bullet        | 2.5  | 0.0025 | 24  | 22  | 60     | 0.06   | 1.3   | 29.0      |
| 32 | shredder                  | 146  | 0.146  | 0.5 | 1   | 73     | 0.073  | 0.1   | 1.6       |
| 33 | Weighing Balance          | 10   | 0.01   | 1   | 2   | 10     | 0.01   | 0.0   | 0.4       |
| 34 | Lathe machine             | 745  | 0.745  | 32  | 20  | 242870 | 2428.7 | 48574 | 1068628.0 |
| 35 | Shaping machine           | 1120 | 1.12   | 88  | 2   | 98560  | 98.56  | 197.1 | 4336.6    |
| 36 | Radial drilling           | 745  | 0.745  | 12  | 1   | 95360  | 95.36  | 95.4  | 2097.9    |
| 37 | Power saw                 | 1120 | 1.12   | 19  | 1   | 215040 | 215.04 | 215.0 | 4730.9    |
| 38 | Surface grinding          | 745  | 0.745  | 34  | 1   | 25330  | 25.33  | 25.3  | 557.3     |
| 39 | Universal milling         | 745  | 0.745  | 28  | 1   | 20860  | 20.86  | 20.9  | 458.9     |
| 40 | Bench grinder             | 745  | 0.745  | 12  | 2   | 95360  | 95.36  | 190.7 | 4195.8    |
| 41 | Portable Welding machine  | 4000 | 4      | 32  | 1   | 128000 | 128    | 128.0 | 2816.0    |
| 42 | Electric furnace          | 2500 | 2.5    | 20  | 1   | 50000  | 50     | 50.0  | 1100.0    |
| 43 | Portable Drill machine    | 500  | 0.5    | 20  | 1   | 10000  | 10     | 10.0  | 220.0     |
| 44 | Portable grinding machine | 600  | 0.6    | 30  | 1   | 18000  | 18     | 18.0  | 396.0     |
| 45 | Load Cell                 | 20   | 0.02   | 8   | 1   | 160    | 0.16   | 0.2   | 3.5       |



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|----|-------------------------------|---------|----------|---|---|----------|----------|------|-------|
| 46 | Calibration of tachometer     | 44.74   | 0.04474  | 1 | 1 | 44.74    | 0.04474  | 0.0  | 1.0   |
| 47 | Electro Pnuematic Trainer Kit | 1491.39 | 1.49139  | 1 | 1 | 1491.39  | 1.49139  | 1.5  | 32.8  |
| 48 | Elctro hydraulic Trainer kit  | 1491.39 | 1.49139  | 1 | 1 | 1491.39  | 1.49139  | 1.5  | 32.8  |
| 49 | CNC Lathe                     | 3700    | 3.7      | 8 | 1 | 29600    | 29.6     | 29.6 | 651.2 |
| 50 | CNC Milling                   | 3200    | 3.2      | 8 | 1 | 25600    | 25.6     | 25.6 | 563.2 |
| 51 | Rope brake Dynamometer        | 180     | 0.18     | 1 | 1 | 180      | 0.18     | 0.2  | 4.0   |
| 52 | Cam Analysis                  | 180     | 0.18     | 1 | 1 | 180      | 0.18     | 0.2  | 4.0   |
| 53 | Motorrised Gyroscope          | 120     | 0.12     | 1 | 1 | 120      | 0.12     | 0.1  | 2.6   |
| 54 | Universal Governor            | 372.884 | 0.372884 | 1 | 1 | 372.884  | 0.372884 | 0.4  | 8.2   |
| 55 | Jominy & Quench               | 372.884 | 0.372884 | 3 | 1 | 1118.652 | 1.11865  | 1.1  | 24.6  |
| 56 | Fatigue testing m/c           | 440     | 0.44     | 3 | 1 | 1320     | 1.32     | 1.3  | 29.0  |
| 57 | Furnace                       | 2500    | 2.5      | 3 | 1 | 7500     | 7.5      | 7.5  | 165.0 |
| 58 | Abrasive belt Grinder         | 186.42  | 0.18642  | 3 | 1 | 559.26   | 0.55926  | 0.6  | 12.3  |
| 59 | Double Disc Polishing m/c     | 186.42  | 0.18642  | 3 | 1 | 559.26   | 0.55926  | 0.6  | 12.3  |
| 60 | Universal Testing m/c         | 1491.39 | 1.49139  | 8 | 1 | 11931.12 | 11.9311  | 11.9 | 262.5 |
| 61 | Torsion Testing m/c           | 559.27  | 0.55927  | 8 | 1 | 4474.16  | 4.47416  | 4.5  | 98.4  |
| 62 | Universal Vibration           | 559.27  | 0.55927  | 1 | 1 | 559.27   | 0.55927  | 0.6  | 12.3  |
| 63 | Static & Dynamic Balancing    | 120     | 0.12     | 1 | 1 | 120      | 0.12     | 0.1  | 2.6   |
| 64 | Whirling shaft                | 120     | 0.12     | 1 | 1 | 120      | 0.12     | 0.1  | 2.6   |
| 65 | Series and Parallel machine   | 372.84  | 0.37284  | 8 | 1 | 2982.72  | 2.98272  | 3.0  | 65.6  |
| 66 | Centrifugal Pump              | 559.27  | 0.55927  | 8 | 1 | 4474.16  | 4.47416  | 4.5  | 98.4  |
| 67 | Gear Pump                     | 372.84  | 0.37284  | 8 | 1 | 2982.72  | 2.98272  | 3.0  | 65.6  |
| 68 | Reciprocating pump            | 745.369 | 0.745369 | 8 | 1 | 5962.952 | 5.96295  | 6.0  | 131.2 |
| 69 | Air compressor test rig       | 1491.39 | 1.49139  | 8 | 1 | 11931.12 | 11.9311  | 11.9 | 262.5 |
| 70 | Francis Turbine               | 3700    | 3.7      | 8 | 1 | 29600    | 29.6     | 29.6 | 651.2 |
| 71 | Pelton Wheel                  | 3700    | 3.7      | 8 | 1 | 29600    | 29.6     | 29.6 | 651.2 |
| 72 | Air Conditioning Test Rig     | 1000    | 1        | 8 | 1 | 8000     | 8        | 8.0  | 176.0 |
| 73 | Refrigration Test Rig         | 1000    | 1        | 8 | 1 | 8000     | 8        | 8.0  | 176.0 |
| 74 | Ice Plant Test Rig            | 400     | 0.4      | 8 | 1 | 3200     | 3.2      | 3.2  | 70.4  |

|     |                               |         |         |    |    |             |         |       |        |
|-----|-------------------------------|---------|---------|----|----|-------------|---------|-------|--------|
| 75  | Absorption Test Rig           | 100     | 0.1     | 8  | 1  | 800         | 0.8     | 0.8   | 17.6   |
| 76  | Venturimeter                  | 372.84  | 0.37284 | 8  | 1  | 2982.7<br>2 | 2.98272 | 3.0   | 65.6   |
| 77  | Bernollis theorem             | 372.84  | 0.37284 | 8  | 1  | 2982.7<br>2 | 2.98272 | 3.0   | 65.6   |
| 78  | Measure and minor loss        | 372.84  | 0.37284 | 8  | 1  | 2982.7<br>2 | 2.98272 | 3.0   | 65.6   |
| 79  | Compisite wall                | 100     | 0.1     | 2  | 1  | 200         | 0.2     | 0.2   | 4.4    |
| 80  | Lag pipe                      | 100     | 0.1     | 2  | 1  | 200         | 0.2     | 0.2   | 4.4    |
| 81  | Insulating poder              | 100     | 0.1     | 2  | 1  | 200         | 0.2     | 0.2   | 4.4    |
| 82  | Free convection               | 100     | 0.1     | 2  | 1  | 200         | 0.2     | 0.2   | 4.4    |
| 83  | Force convection              | 100     | 0.1     | 2  | 1  | 200         | 0.2     | 0.2   | 4.4    |
| 84  | Shell and tube heat exchanger | 100     | 0.1     | 2  | 1  | 200         | 0.2     | 0.2   | 4.4    |
| 85  | Radiation heat transfer       | 100     | 0.1     | 2  | 1  | 200         | 0.2     | 0.2   | 4.4    |
| 86  | Critical heat flux            | 100     | 0.1     | 2  | 1  | 200         | 0.2     | 0.2   | 4.4    |
| 87  | Heat transfer iffrent fins    | 100     | 0.1     | 2  | 1  | 200         | 0.2     | 0.2   | 4.4    |
| 88  | Unsteady state heat tranfer   | 100     | 0.1     | 2  | 1  | 200         | 0.2     | 0.2   | 4.4    |
| 89  | Bench drill Machine           | 372.84  | 0.37284 | 20 | 1  | 7456.8      | 7.457   | 7.5   | 164.0  |
| 90  | Spot welding machine          | 8000    | 8       | 10 | 1  | 80000       | 80      | 80.0  | 1760.0 |
| 91  | Welding machine               | 4900    | 4.9     | 30 | 2  | 147000      | 147     | 294.0 | 6468.0 |
| 92  | Bench saw machine             | 1491.39 | 1.49139 | 10 | 1  | 14913.<br>9 | 14.91   | 14.9  | 328.1  |
| 93  | Wood turning lathe            | 372.84  | 0.37284 | 15 | 1  | 5592.6      | 5.593   | 5.6   | 123.0  |
| 94  | Water Pump                    | 372.84  | 0.37284 | 14 | 1  | 5219.7<br>6 | 5.220   | 5.2   | 114.8  |
| 95  | Abel's Apparatus              | 150     | 0.15    | 3  | 6  | 450         | 0.45    | 2.7   | 59.4   |
| 96  | Redwood Viscometer            | 1000    | 1       | 3  | 10 | 3000        | 3       | 30.0  | 660.0  |
| 97  | Hot Air Oven                  | 3000    | 3       | 3  | 1  | 9000        | 9       | 9.0   | 198.0  |
| 98  | Cathode Ray Oscilloscope      | 40      | 0.04    | 3  | 7  | 120         | 0.12    | 0.8   | 18.5   |
| 99  | Diode Laser                   | 35      | 0.035   | 3  | 5  | 105         | 0.105   | 0.5   | 11.6   |
| 100 | Fiber Optics Trainer Kit      | 35      | 0.035   | 3  | 5  | 105         | 0.105   | 0.5   | 11.6   |
| 101 | Function Generator            | 15      | 0.015   | 3  | 76 | 45          | 0.045   | 3.4   | 75.2   |
| 102 | Hall Effect Apparatus         | 35      | 0.035   | 3  | 5  | 105         | 0.105   | 0.5   | 11.6   |
| 103 | Planck Constant Apparatus     | 35      | 0.035   | 3  | 1  | 105         | 0.105   | 0.1   | 2.3    |
| 104 | Sodium Vapour Lamp Apparatus  | 35      | 0.035   | 3  | 3  | 105         | 0.105   | 0.3   | 6.9    |
| 105 | Blown Film                    | 3.25    | 0.00325 | 4  | 1  | 13          | 0.013   | 0.0   | 0.3    |

|     |   |      |         |    |     |       |         |      |       |
|-----|---|------|---------|----|-----|-------|---------|------|-------|
| 5   | extrusion                                   |      |         |    |     |       |         |      |       |
| 106 | Injection Molding                           | 1.5  | 0.0015  | 4  | 1   | 6     | 0.006   | 0.0  | 0.1   |
| 107 | Thermoforming                               | 0.55 | 0.00055 | 4  | 1   | 2.2   | 0.0022  | 0.0  | 0.0   |
| 108 | Vertical From Fill Seal Machine (VFFS)      | 0.55 | 0.00055 | 2  | 1   | 1.1   | 0.0011  | 0.0  | 0.0   |
| 109 | Roll-On-Pilfer-Proofing machine             | 0.55 | 0.00055 | 2  | 1   | 1.1   | 0.0011  | 0.0  | 0.0   |
| 110 | Universal Testing Machine                   | 0.55 | 0.00055 | 4  | 1   | 2.2   | 0.0022  | 0.0  | 0.0   |
| 111 | Oven  | 0.55 | 0.00055 | 2  | 1   | 1.1   | 0.0011  | 0.0  | 0.0   |
| 112 | Offset Printing Machine                     | 0.6  | 0.0006  | 6  | 1   | 3.6   | 0.0036  | 0.0  | 0.1   |
| 113 | Fridge                                      | 0.5  | 0.0005  | 24 | 1   | 12    | 0.012   | 0.0  | 0.3   |
| 114 | Cutting Machine                             | 0.75 | 0.00075 | 1  | 1   | 0.75  | 0.00075 | 0.0  | 0.0   |
| 115 | Stitching/Book binding                      | 0.5  | 0.0005  | 1  | 1   | 0.5   | 0.0005  | 0.0  | 0.0   |
| 116 | Light Exposing Unit                         | 0.75 | 0.00075 | 1  | 1   | 0.75  | 0.00075 | 0.0  | 0.0   |
| 117 | 3D Printer                                  | 50   | 0.05    | 8  | 1   | 400   | 0.4     | 0.4  | 8.8   |
| 118 | Electronics Instrumentation and control kit | 10   | 0.01    | 4  | 24  | 40    | 0.04    | 1.0  | 21.1  |
| 119 | Analog communication kit                    | 10   | 0.01    | 4  | 43  | 40    | 0.04    | 1.7  | 37.8  |
| 120 | TV trainer and pattern generator            | 45   | 0.045   | 4  | 12  | 180   | 0.18    | 2.2  | 47.5  |
| 121 | RF trainer kit                              | 10   | 0.01    | 4  | 2   | 40    | 0.04    | 0.1  | 1.8   |
| 122 | DSO   | 30   | 0.03    | 4  | 8   | 120   | 0.12    | 1.0  | 21.1  |
| 123 | Rf generator                                | 15   | 0.015   | 4  | 1   | 60    | 0.06    | 0.1  | 1.3   |
| 124 | Signal generator                            | 15   | 0.015   | 4  | 2   | 60    | 0.06    | 0.1  | 2.6   |
| 125 | Pulse generator                             | 15   | 0.015   | 4  | 1   | 60    | 0.06    | 0.1  | 1.3   |
| 126 | CRO   | 35   | 0.035   | 4  | 64  | 140   | 0.14    | 9.0  | 197.1 |
| 127 | Electronic Trainer kits                     | 10   | 0.01    | 4  | 337 | 40    | 0.04    | 13.5 | 296.6 |
| 128 | 1 phase load bank                           | 5000 | 5       | 6  | 1   | 30000 | 30      | 30.0 | 660.0 |
| 129 | 1 phase transformer                         | 1000 | 1       | 6  | 2   | 6000  | 6       | 12.0 | 264.0 |
| 130 | 3 phase load bank                           | 1000 | 1       | 6  | 1   | 6000  | 6       | 6.0  | 132.0 |

|         |   |      |       |   |     |       |       |                      |                        |
|---------|---|------|-------|---|-----|-------|-------|----------------------|------------------------|
| 13<br>1 | Amitek make<br>Radar training<br>Lab                          | 88   | 0.088 | 4 | 1   | 352   | 0.352 | 0.4                  | 7.7                    |
| 13<br>2 | Banch type<br>Digital<br>Multimeter                           | 10   | 0.01  | 4 | 12  | 40    | 0.04  | 0.5                  | 10.6                   |
| 13<br>3 | Bread Board<br>with power<br>Supply                           | 10   | 0.01  | 4 | 26  | 40    | 0.04  | 1.0                  | 22.9                   |
| 13<br>4 | Digital banch<br>type Multimeter                              | 10   | 0.01  | 4 | 5   | 40    | 0.04  | 0.2                  | 4.4                    |
| 13<br>5 | IC Tester   | 24   | 0.024 | 4 | 2   | 96    | 0.096 | 0.2                  | 4.2                    |
| 13<br>6 | LAMBDA make<br>klystron based<br>test Bench set<br>model 2100 | 10   | 0.01  | 4 | 5   | 40    | 0.04  | 0.2                  | 4.4                    |
| 13<br>7 | lamp load bank  | 3000 | 3     | 6 | 3   | 18000 | 18    | 54.0                 | 1188.0                 |
| 13<br>8 | Logic Trainer<br>Kit  | 10   | 0.01  | 4 | 1   | 40    | 0.04  | 0.0                  | 0.9                    |
| 13<br>9 | Microwave Test<br>benches                                     | 10   | 0.01  | 4 | 4   | 40    | 0.04  | 0.2                  | 3.5                    |
| 14<br>0 | PCB Art<br>Etching<br>Machine                                 | 50   | 0.05  | 4 | 5   | 200   | 0.2   | 1.0                  | 22.0                   |
| 14<br>1 | PCB Drilling  | 50   | 0.05  | 4 | 1   | 200   | 0.2   | 0.2                  | 4.4                    |
| 14<br>2 | PCB UV<br>Exposure  | 50   | 0.05  | 4 | 1   | 200   | 0.2   | 0.2                  | 4.4                    |
| 14<br>3 | power supply  | 24   | 0.024 | 4 | 23  | 96    | 0.096 | 2.2                  | 48.6                   |
| 14<br>4 | Electronic Kits   | 10   | 0.01  | 2 | 117 | 20    | 0.02  | 2.3                  | 51.5                   |
|         |   |      |       |   |     |       |       | 53890<br>.7          | 1185595.2<br>0         |
|         |   |      |       |   |     |       |       | <b>Total</b>         | <b>11855<br/>95.2</b>  |
|         |   |      |       |   |     |       |       | <b>kWh/yea<br/>r</b> | <b>10670<br/>356.9</b> |

\*Electricity consumption data is for 9 months except for administrative office and exam cell.

#### b) Energy Generated from Solar panels

SIESGST has installed a grid connected solar energy system inside its campus. Phase-1 is installed in the year 2016 of 100 kWp, and phase-2 is installed in the year 2018 of 89.7kWp. Altogether giving around 20% of campus's electricity demand. So far both solar energy systems have given around 219670 kWh of electrical energy. Only 20% of solar energy generated in the campus is proportioned in the institute consumption. Since it is grid connected, wheeling is done automatically at free of cost whenever less demand is there in the campus because of no installation of net metering.

**Annual Reading for SIES Nerul from 100 kWp (2019- 2020):**

| Month  | Reading in MWh for Nerul 100 kWp |
|--------|----------------------------------|
| Jul-19 | 5340                             |
| Aug-19 | 6960                             |
| Sep-19 | 5920                             |
| Oct-19 | 8060                             |
| Nov-19 | 9610                             |
| Dec-19 | 10290                            |
| Jan-20 | 1189                             |
| Feb-20 | 11230                            |
| Mar-20 | 14470                            |
| Apr-20 | 13710                            |
| May-20 | 12170                            |
| Jun-20 | 10960                            |

**Annual Reading for SIES Nerul for 89.7 Kwp:**

| Month  | Reading in Mwh for Nerul 89.7 Kwp (kWh) |
|--------|---|
| Jul-19 | 5150                                    |
| Aug-19 | 6590                                    |
| Sep-19 | 5800                                    |
| Oct-19 | 8870                                    |
| Nov-19 | 7600                                    |
| Dec-19 | 7130                                    |
| Jan-20 | 8770                                    |
| Feb-20 | 9300                                    |
| Mar-20 | 12470                                   |
| Apr-20 | 10870                                   |
| May-20 | 9520                                    |
| Jun-20 | 699                                     |

**Energy Audit Report of SIES GST**

| Sr. no. | Particulars  | Observed value | Units     |
|---------|--|----------------|-----------|
| 1       | Total energy consumption/ day                          | 53890.70       | kWh/ hr   |
| 2       | Total energy consumption/month                         | 1185595.20     | kWh/month |
| 3       | Total energy consumption/year                          | 10670356.90    | kWh/year  |
| B       | Solar power generation from the facility of 189.7 kWp* | 175736.00      | kWh/year  |
| C       | Gross Energy Requirement through Grid /year            | 10494620.9     | kWh/year  |

\*Only 20% of total solar energy generation is utilized

**Conclusion-**

From auditing of the data provided, it is observed that the total energy consumption is 10670356.90 kWh/year. The energy generation from the solar power plant facility at the site is 175736 kWh/year. Hence, gross energy requirement from grid is 10494620.9 kWh/year.

**Recommendations-**

1. The electricity consumption can further be reduced by replacing tubelights with LED tubes, installing smart switches and procuring star rated electrical and electronic appliances in future.

**Remarks-**

1. The auditing of electricity bills of last 3 financial years will further help in the identification of potential electricity loads and losses.

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*Mishra*  
*13/11/2020*  
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### 3) Environmental Audit

This is a management tool comprising systematic, documented, periodic and objective evaluation of how well the institute is performing with the aim of helping to safeguard the environment by facilitating management control of practices and assessing compliance with the policies, which would include regulatory requirements and standards applicable.

#### Objectives:

Environmental audit is done to safeguard the environment and minimize risks to human health. The key objectives of an environmental audit are to:

- a) Determine how well the environmental management information systems and equipment are performing
- b) To monitor water usage and consumption.
- c) To implement waste management system.
- d) To monitor ambient environmental condition of air, water and noise in the campus.
- e) Verify compliance with the relevant national, local or other laws and regulations.
- f) Minimize human exposure to risks from environmental, health and safety problems

#### Areas of Environmental Audit

There are various categories where the environment conditions can be evaluated and audited.

##### a) Design Specification and Layout

This includes the infrastructure design to accommodate necessary measures for pollution control. Distributed Green area is available in the campus for controlling the pollution and refresh the air. The distant location of the campus from highway is one of the default measures in the same.

##### b) Resource management

This includes air, water and energy management.

- i) Solar panel: Availability of Solar panel in the process of energy creation and consumption is producing eco-friendly environment
- ii) E-waste and solid waste management: Institute provides waste management in the form of E-waste reuse and solid waste management. Use of e-submission and other waste paper management is one of the measure for recycle and re-use.
- iii) Covered Dust bins: Dust bins are covered with facility of dry and wet.
- iv) Rain water Harvesting
- v) Well ventilated infrastructure
- vi) Eco-friendly bins made by students in the classrooms
- vii) Tree plantation is done every year. In and outside the campus. There are total 349 trees planted in the campus.
- viii) Reuse, Recycle and Reduce the use of papers.

##### c) Emergency plan and Safety system

- i) Fire extinguishers and Emergency exit
- ii) Special Provisions for handicapped students.

##### d) Medical and Health Facility

- i) First aid facility

- ii) Regular medical camps for ensuring good health of student and staff.
- iii) Professional counsellor in campus

### Resource Wise Report for Environmental Audit

#### Drinking Water Quality

Institute has 4 water coolers located on every floor. The water to these coolers is supplied from UV water filters for drinking purpose. Drinking water is analyzed regularly as per IS 10500:2012 drinking water specification. It is observed to be safe for drinking from samples collected from all four filters and it is free from coliform bacterial contamination. The drinking water in institute campus is maintained by regular cleaning and disinfection of water tanks.

#### Drinking water analysis report

| Sr. No | Parameters      | Water filter 1 | Water filter 2 | Water filter 3 | Water filter 4 | Acceptable Limit as per IS 10500: 2012 |
|--------|-----------------|----------------|----------------|----------------|----------------|--|
| 1      | Odour           | Agreeable      | Agreeable      | Agreeable      | Agreeable      | Agreeable                              |
| 2      | pH Value        | 6.70           | 7.22           | 7.28           | 7.26           | 6.5 to 8.5                             |
| 3      | Conductivity    | 89             | 86             | 87             | 87             | 300                                    |
| 4      | Turbidity (NTU) | 1              | 0.3            | 1.2            | 0.7            | 1                                      |
| 5      | TSS(mg/Lit)     | 180            | 80             | 220            | 20             | 500 mg/l                               |
| 6      | TDS(mg/Lit)     | 40             | 78             | 80             | 80             | 500                                    |
| 7      | MPN Index       | Negative       | Negative       | Negative       | Negative       | Negative                               |

#### Water usage and Consumption

The study observed that municipal water supply and bore well are the two major sources of water. Water is used for drinking purpose, toilets, cleaning, laboratory and gardening. On an average the total usage of water at the institute is 67,801 liters/day, which includes 65,251 liters/day for institute purposes, 2000 liters/day for gardening and 250 liters/day for laboratories. One, rain water harvesting unit is also functional for recharging ground water.

For gardening purpose bore well water has been used. Gardens are watered by using sprinkler irrigation system to save water. There are 9 washrooms with 33 toilets. There are total 61 taps altogether including laboratories and washrooms. There are 39 wash basins and the flush tank capacity of 10 liters per flush tank in each toilet.

#### Water Consumption

| Activity               | Average liters of water used per activity (liters) | Average Number of times activity done per day | Average water used per person per day (liters) | Number of users in the College | Total water consumption per day |
|------------------------|--|---|--|--------------------------------|---------------------------------|
| Washing hands and face | 1.5  | 3   | 4.5  | 1831                           | 4.5X1831=8240L                  |





|   |      |   |      |      |                    |
|---|------|---|------|------|--------------------|
| Toilet flushing                           | 10   | 3 | 30   | 1831 | 30X1831=<br>54930L |
| Drinking (cup)                            | 0.5  | 2 | 1    | 1831 | 1831L              |
| Laboratory                                |      |   |      |      | 250L               |
| Leaking/dripping tap (1 drop/second /day) |      |   |      |      | NIL                |
| For gardening                             | 2000 | 1 | 2000 |      | 2000L              |
| Cleaning/Mopping of floor                 | 550  | 1 | 550  |      | 550L               |
| Total                                     |      |   |      |      | 67801L             |

### Rain water harvesting

Institute has installed rain water harvesting system in the campus. It is a recharge pit having 14 feet deep ring well, containing 13 rings. Capacity of recharge pit is 7000 liters. With this facility the flooding due to heavy rains at the basement area in the campus can be avoided. This also has helped in reduction of pH of borewell water from 8.5 to 7.3.

### Recommendations:

From rainwater recharging pit situated in the campus around 7000 L of water is generated / day that can be utilized in toilet flushing after disinfection. The waste water generated from washing hands and face and laboratory can be treated for reuse in toilet flushing.

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~~Mishra~~  
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### Solid Waste Management System

Unscientific handling of solid waste can create threats to everyone. This addresses waste production and disposal of different wastes like paper, plastic, biodegradable waste, glass, e- waste, dust etc. and also recycling. Solid waste generation and management is an important issue. Survey focuses on volume, type and recent management practice of solid waste generated in the campus

- i) The total solid waste collected in the campus is 40 kg/day on an average. For waste collection, dustbins are provided in each classroom and corridor. The waste is segregated at source by providing separate dustbins for Bio-degradable and Non-biodegradable waste. Waste generation from tree droppings and lawn management is a major solid waste generated in the campus.
- ii) Single sided used papers reused for writing and printing in all departments. Important and confidential reports/ papers are shredded and sent for recycling after completion of their maintenance period.
- iii) Metal waste, wooden waste, glass waste and plastic waste is stored and given to Municipal waste collection centres.
- iv) The biodegradable waste from college campus is used for compost processing. The institute has 5 compost pits. The college has generated 500kg compost till date since its inception. The main purpose of this is to reduce disposable waste in the college campus. After completion of the process, compost is used as manure in the garden, lawns and distributed to the students, staff and visitors of the campus.
- v) E- Waste generated is collected at the common facility in the campus and disposed to a certified E waste management agency.
- vi) Two Sanitary Pad Incinerators have been installed in Girls washroom for sanitary pads to be hygienically disposed
- vii) **Solid Waste Management:**  
Various types of waste generated like papers, wet waste etc. are documented and attached here for the reference. The graphical representation of stationary expenditure shows the decrease in the usage.

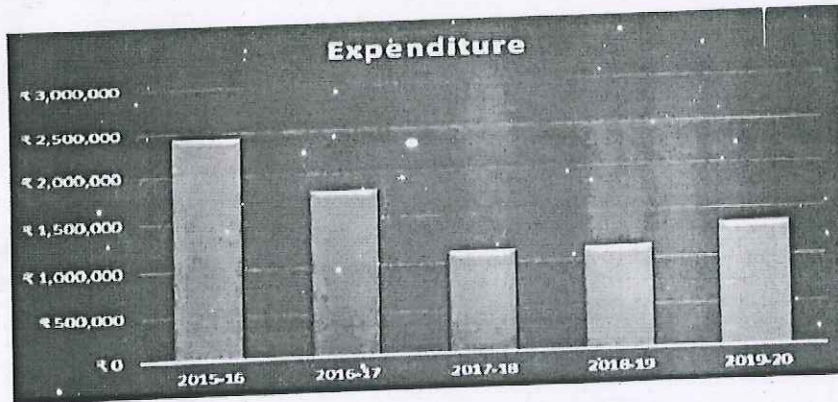


Figure: Reduction in expenditure of paper purchase by promoting reuse of paper from waste

### Recommendations:

The management of all streams of waste is properly planned and managed by the institute. However, systematic waste generation report for different categories of waste can be prepared by involving students that will be useful in proper projection of data and auditing.

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### The ambient environmental condition of air and noise in the campus

1. Air and noise Quality control: The location of the Campus is 1.5 km from the main highway. The classrooms are also sufficient distance the main road.
2. Restricted vehicles for parking: College has provided the restricted vehicles entry by providing stickers to keep track of vehicles in the campus.
3. Distributed parking space: The campus has parking space at multiple locations.
4. The institute has locational advantage of being well connected through local trains, state transport and hence most of the students/ staff commute through public transport.
5. Encouragement of Carpooling: As there is restriction on entry of vehicles, students and staff prefer vehicle pooling.
6. Noise Level measurement

The noise level measurements were carried out using Noise level meter. The noise level survey was carried out at seven locations, at outside as well inside the study area. The Noise levels monitored in the college campus as well as in side the classroom and found the noise level within the permissible limit.

#### Noise Levels at various locations of the Institute:

| Sr. No | Location         | Minimum Reading in dB | Maximum Reading in dB |
|--------|------------------|-----------------------|-----------------------|
| 1      | Entrance         | 57.7                  | 64.8                  |
| 2      | Office           | 56.2                  | 63.1                  |
| 3      | Library          | 50.2                  | 52.4                  |
| 4      | Inside Classroom | 50.5                  | 55.7                  |
| 5      | Corridor         | 53.2                  | 64.9                  |
| 6      | IT Lab           | 50.3                  | 55.9                  |

\*Standard limits for Noise level as per The Noise Pollution (Regulation And Control) Rules, 2000 50dB (During day time)

#### Recommendations:

As per the standard limit (Noise Pollution (Regulation and Control) Rules, 2000) noise level 50 decibel is recommended in educational institutions. As per that noise level is slightly high near entrance and office. It is recommended to put green potted plants for reducing the noise level.

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