



Rayat Shikshan Sanstha's
Karmaveer Bhaurao Patil College of Engineering, Satara

Criterion 7 – Institutional Values and Best Practices

Key Indicator - 7.1 Institutional Values and Social Responsibilities

7.1.3 Alternate Energy initiatives such as:

Percentage of annual power requirement of the Institution met by the renewable energy sources (current year data)

7.1.3.1: Annual power requirement met by renewable energy sources (in KWH)

Sr.No.	Documentary Evidences / Sample Documents	Page No.
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2	Energy Audit Report.	2-15
3	Dead Stock Register Copy of Solar Water Heater System.	16-16

7.1.3 Alternate Energy initiatives such as:

Percentage of annual power requirement of the Institution met by the renewable energy sources

Power requirement met by renewable energy sources	Total power requirement	Renewable energy source	Renewable energy generated and used	Energy supplied to the grid
15.25 kW	65.27 kW	Solar water heater	15.25 kW	Nil

Er. Dr. EA. Dhananjay Bhagawandas Devi

M.Tech. (Energy Tech.), B.E. (Electrical); D.C.S.; N.D.; M.I.E.; L.M.I.S.T.E.

B.E.E Certified Energy Auditor (EA-6470)

Plot No. 23, Omkar, Rangole Colony, Gendamal, Satara-415002

Date-02/12/2018

Ref. No. KBPCOES/ DBD/EE/2018-19/29

To,

Incharge Principal,

Karmaveer Bhaurao Patil College of Engineering, Satara

Subject- Energy Audit Report of your institute

Ref. - 1) Your various emails & communications

Resp. Sir,

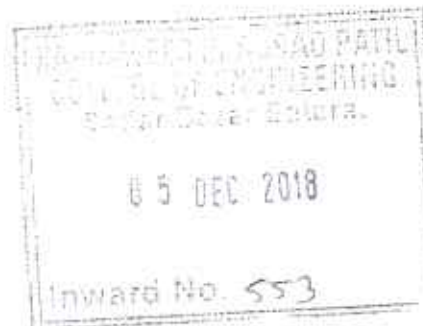
As per your communication; please find enclosed the energy audit report of your institute prepared by us.

We would like to thank you for this Energy Audit facility availed from us & hope to have similar interaction in future.

Yours faithfully



Enclosed: Energy Audit Report



To,

05/12/2018

05/12/18

Energy Audit Report
For
Rayat Shikshan Sanstha's
Karmaveer Bhaurao Patil College of Engineering,
Satara- 415001

By



Er. Dr. EA. Dhananjay B. Devi
M. Tech. (Energy Tech.), B.E. (Electrical), DCS, ND, MIE,
Certified Energy Auditor (EA6470)

Satara

Date: 02/12/2018

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I Acknowledgement

The Energy Audit report is submitted for the electrical installations at various department of Karmaveer Bhaurao Patil College of Engineering, Satara- 415001

The most of energy installations & hence utilization is in the form of electrical energy. Hence Electrical Energy Audit is a primary focused area.

The objective of this Energy Audit is to assess the electrical installations in the building and suggest energy saving majors & potentials.

It is reported that either the electrical installations or its electrical power utilization of this institute had not been either assessed from any certified energy auditor since establishment. Considering this background this energy audit is carried out.

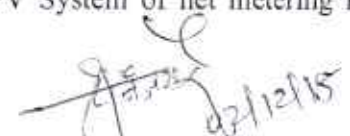
During this Energy audit the energy consumptions of various electrical equipment, laboratory equipment and lighting systems are reviewed using power analyzer.

The energy audit carried out as per the actual load connected at the time of energy audit stage.

Summary of recommendations:

It is recommended that

- Considering the infrastructure available with the institute; the Institute should prepare detailed electrical schematic, from electrical supply point to end load point.
- All earth points be checked periodically & get it salt treated or latest Chemical powder earthing to improve earthing.
- Conventional Fluorescent fittings, Incandescent Lamps be replaced by Electronics Ballast operated & LED lighting.
- IP65/ IP66 grade 100W LED light flood eight fittings or 50W IP65/ IP66 grade LED flood light sixteen fitting be installed. It is recommended that minimum 12 to 15, IP65/IP66 grade 25W street light fittings be fitted in the southern & eastern side of the college.
- Considering the environmental conditions & the cost of the solar lighting, it is highly recommended to opt for Grid Connected solar PV System of net metering having minimum 10 KW capacity.


Er. Dr. EA. Dhananjay B. Devi

M. Tech. (Energy Tech.), B.E. (Electrical), DCS, ND, MIE.

Certified Energy Auditor (EA6470)

II Executive Summary

Energy Audit Options at a Glance & Recommendations

The most of energy installations & hence utilization are in the form of electrical energy. Hence energy audit is primary focused area of the said institute.

The objectives of this energy are to assess the electrical installations in the building and suggest energy saving majors and potentials.

It is reported that either the electrical installations or its electrical power utilizations of this institute had not been either assessed from any certified energy auditor since establishment. Considering this background this energy is carried out.

During this energy audit the energy consumptions of various electrical equipment, laboratory equipment and lighting systems are reviewed using power analyzer. The sample tests are conducted during the month from May 2018 till Oct 2018 and preliminary per audit stage sample survey visit was carried out.

The energy audit carried out as per the actual load connected at the time of energy audit stage

Summary of recommendations:

It's recommended that:

1. The contract demand, the maximum demand has to be increased from 50 KVA to 65 KVA (The actual calculations has to be done by the energy management team considering future expansion in the terms of laboratory equipment as per AICTE/University norms. From the MSEDCL bills it appears that the bill demand is charged as per actual KVA utilized, but in normal routine practices the bill demand is charged as per the contract demand). Hence it is recommended to get it clarified from the concerned.
2. From the billing pattern it is not cleared whether institute had paid any delayed payment charges.
3. First aid charts to be display at prominent places & to place first-aid boxes in workshops & departmental offices. Earthing at MSEB neutral & bus bar unit is not in good order. This earthing needs to be improved.
4. Minimum eight LED flood light fittings of IP65/IP66 grade 100W be fitted in college open spaces. It is recommended that minimum 12 to 15, IP65/IP66 grade 25W street light fittings be fitted in the southern & eastern side of the college.
5. The institute should prepare detailed electrical schematic, from electrical supply point to end load point and all earth points be checked periodically and get it salt treated to improve quality of earthing.
6. The detail fuel (oil, water) consumption charts should be kept ready and updated to monitor the consumption month wise and year wise
7. Considering the various laboratories and the electrical fittings it is recommended to phase out all conventional polyester /copper ballast & old type of box type of Fluorescent tube fittings as & when possible.
8. Considering the environmental conditions & the cost of the solar lighting, it is highly recommended to opt for Grid Connected solar PV System of net metering having minimum 10 KW capacities.

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1. Introduction about the Institute

1.1 General details of the institute & descriptions:

Karmaveer Bhaurao Patil College of Engineering, Behind Zilla Parishad, Near RTO, Sadarbazsar, Satara 415001 is established in providing education in the faculty of Engineering.

It is grown up with the need of time. The buildings were constructed as needed time to time while growing up. The sections, departments and laboratories are established per requirements. Electrical energy is the major source of energy used for operations. It became necessary to review the electrical installations and equipment's from electrical power consumption and efficiency assessment point of view.

The intention of this energy audit is to have assessment of electrical installations and energy and to seek expert opinion to exploit possibilities of energy saving potential.

Rayat Shikshan Santha's Karmaveer Bhaurao Patil College of Engineering, Satara was established in 1983. It is located in the heart of the satara city. This institute has created its unique identity by way of offering multiple opportunities to students for acquiring quality education and making all round development of their inner traits. The institute is approved by AICT, New Delhi, recognized by Govt. of Maharashtra and affiliated to Dr. Babasaheb Ambedkar Technology University, Lonere w.e.f. 2017-18. Institute offer undergraduate programme as well as postgraduate programmes.

1.2 Energy Audit Team

1.2.1. Energy Auditor

Er. Dr. EA. Dhananjay Bhagawandas Devi

1.2.2. Energy Management Team

1. Prof. S.S Mane Associate Professor & In charge Electrical maintenance,
2. Mr. V.L Suryvanshi, Tech Lab Ass.
3. Mr. R.A Patil, Tech Lab Ass.
4. Mr. Ashok Patil, Lab Ass.

The scope of Energy Audit is limited to audit with the intention to identify possible opportunities for revision and modifications to improve energy efficiency, pertaining to electrical power utilization. Major energy used is electrical energy for lighting, equipment's, etc.

Date - 02/12/15
Er. Dr. EA. Dhananjay B. Devi
Associate Professor

1.3 Component of Energy Cost

- 1) Major electrical power is available through a HT connection from MSEDCL as Listed below:

Consumer number	Sanctioned Electrical in KW	Date of Connection
190569007325	111 KW	24/12/1993

The average energy consumption per month for the year 2015 is 7314 (Seven Thousand Three Fourteen units), for the year 2016 is 8062 (Eight Thousand Sixty Two Units) and for the year 2017 is 7820 (Seven Thousand Eight Hundred Twenty units) and for the half year of 2018 is 8248 (Eight Two Hundred Forty Eight Units). The yearly consumption for the year 2015 to the year 2017 is 87771 (Eighty Seven Thousand Seven Hundred Seventy One units) , 96743 (Ninety Six Thousand Seven Hundred Forty Three units) , and 93841 (Ninety Three Thousand Eight Hundred Forty One units) and for the half year is 49489 (Forty Nine Thousand Four Hundred Eighty Nine) respectively.

The institute has maintained power factor almost to unity & received power factor subsidy. This is an admirable status.

From January 2015 till June 2018 institute has received power factor subsidy of Rs.1,81,739/00 (Rs. One Lakh Eighty One Thousand Seven hundred Thirty Nine Only)

The contract demand is of 50KVA & the connected load of 111 KW.

The maximum demand enjoyed by the institute varies between 28KVA to 63KVA.

After assessing the energy base from Jan 2015 to June 2018, it is observed that the maximum demand charges paid three times from Jan 2015 to June 2018 are higher because of higher maximum demand while sanctioning load.

- **Power backup is provided through a generator set:**
 - DG set: Kirloskar make, Engine model 4R-1040-TA-0400365 , 1500 rpm , with alternator of 82.5KVA, 415 V, 114.8 A three phase, 50Hz self excited , self regulated (Alternator Machine no. 22-S-3-MO-04-E0744) : purchased in August 2006
 - Generator has run for 4216 (Four Thousand Two Hundred Sixteen hours) from its installation.
 - Electrical Energy generated by 26781 (Twenty Six Thousand Seven Hundred Eighty units).
 - Average Fuel consumption is 7.095 Lit/h.(From Jan 2015- Jun 2018) (Diesel 2980 (Two Thousand Nine Hundred Eighty Litres) Total hours 420 (Four Hundred Twenty Hours)
- Measurements are available of Earth resistance at each earth point (measured in summer). The details of resistance tests carried out which are annexed herewith.

However potential difference between neutral and earth point is noted which is varying between 2 to 8 volts at various points. Earthing at MSEB neutral & bus bar unit is not in good order.

- Laboratory and Library equipments (in majority computers) are used as per requirements of students and its usage is random. Usage is dependent on students' experimentation and activities.
- Usage of lighting is seasonal, but has scope for more effective utilization. Most of the lighting is used is in day time in the institute.
- Schematic (Detailed connection diagram) of Electrical distribution, control, protections and load connections is not available. Diagram showing location of electrical control gears and supply points should be prepared and displayed to enable easy access in case of emergency.
- Six UPS are installed at various places (3*10 KVA, 2*8 KVA & 1*5 KVA) for Computers back up with sealed maintenance free lead acid batteries.
- Computer LAN network cabling is in good order at some places. At certain places LAN cabling needs to be in good order.

2. Electrical Energy consumption process

Electrical energy & diesel consumption data is made available from the institute and verified locally by physically. Water & Oil Consumption data is not made available hence it cannot be assessed..

Ratings of lighting system, equipment's and installations are verified and confirmed with Volt Amp meters wherever necessary.

Available data is further analyzed to find out the discrepancies and opportunities to improve performance and effective utilization of electrical energy.

3. Energy & Utility System Description

3.1 Summary sheet of MSEDCL Jan 2015 to June 2018 (Annexure 1)

3.2 Megger Test, Earth resistance test, Earth test DG (Annexure 2)

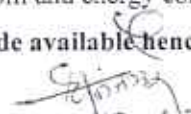
3.3. Details of Load Connected at various places) (Annexure 3)

3.4. Copy of Usage registers Diesel Generator Set (Annexure 4)

3.5 Water

Institute is having a well within the campus; separate portable water connection is also availed. A submersible 1.0 KW Single Phase Pump is used to lift the water from northern side to Potable water tank. A 1.5 KW three phase water pump is used to pump the water from well. All pumps are connected in College grid; hence water bill and energy conservation cannot be separately analyzed.

The details of water bills were not made available hence cannot be audited & justified.

Er. Dr. 
Date - 02/12/2018

Ka. 
of Engg. Satara - 415002.

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3.23 Diesel & Oil

For Diesel Generator set, Average Fuel consumption is 7.095 Lit/h. (From Jan 2015- Jun 2018) (Diesel 2980 (Two Thousand Nine Hundred Eighty Litres) Total hours 420 (Four Hundred Twenty Hours) . Considering the electricity consumption the diesel consumption is within limits & is unavoidable.

The details of oil bills were not made available hence cannot be audited & justified.

4. Energy Efficiency in utility & Process System

4.1 Electric load analysis

Considering 42 (Forty two) months electrical energy bills supply to us and some readings taken on various energy utilities, following is the load analysis:

1. The contract demand, the maximum demand is 111Kw which is the submission at the time of applying the connection.
2. From the billing pattern it is not cleared whether institute had paid any delayed payment charges.

4.2 Lighting

1. Majority of lighting load is of conventional type of fluorescent tube light fittings and ceiling fans.
2. It is found that a 1000W halogen lamp fitting has been installed at the entrance of ground which consumes major power.
3. Outdoor lighting is not sufficient & speaks unfair security at night

5.0 Energy Conservation Options & Recommendations

5.1 List of options in terms of No cost/ Low Cost, Medium Cost & High Investment Cost, Annual Energy & Cost savings & payback,

No cost/ Low Cost Options

a. Electrical Load

1. **MSEDCL:** The contract demand, the maximum demand has to be increased from 50 KVA to 65 KVA (The actual calculations have to be done by the energy management team considering future expansion in the terms of laboratory equipment as per AICTE/University norms. Form the MSEDCL bills it appears that the bills demand is charged as per actual KVA utilized, but in normal routine practices the bill demand is charged as per the contract demand). Hence recommended to get it clarified from the concerned.

2. Payment Pattern :

From the billing pattern it is not cleared whether institute had paid any delayed payment charges. If any delayed payment charges are paid it is recommended that bills be paid in time hence bill be paid in time.

Date: 02/12/2018 8 | Page

Prof. Dr. E.A. Dhondiraj B. Sawi
Associate Professor
Karmaveer Bhaurao Patil College
of Engg. Sptara - 415002.

3. First Aid Awareness: It is recommended to display first aid charts to improve awareness of first aid support in case of electrical accident. It is also recommended to place first-aid boxes in workshop & departmental offices.

1. Medium Cost & High Investment Cost, Annual Energy & Cost saving & Payback period

1. It is found that 1000 W halogen lamp fittings has been installed at the entrance of ground which consumes major power to illuminate the area. Considering the environmental condition & more light output, less power consumption, better security & better lighting it is recommended to replace minimum 8 (Eight) LED flood light fittings of IP65/IP66 grade 100W be fitted in college open spaces.
2. It is recommended that minimum 12 (Twelve) to 15 (Fifteen), IP65/IP66 grade 25W street light fittings be fitted in the southern & eastern side of the college for better security.
3. Considering the environmental conditions & the cost of the solar lighting, it is highly recommended to opt for Grid Connected solar PV System of net metering having minimum 10 KW capacities.

The annual saving, payback period, cost savings are under

1. (a.) **Flood Lighting: Energy units:** 584 (Five Hundred Eighty Four) units annually for Eight LED Lamps having average consumption of 100 W lighting of eight hour per day. (100W IP65/IP66 grade LED eight flood light)

(b.) **Payback period:** Ten month for IP65/IP66 Grade 100W LED flood light fitting considering lamp cost of Rs.5000/00 to 6000/00 per lamp with zero maintenance.

(c.) **Cost saving:** As Institute is using halogen lamp of 1000 W, it generates heat. As halogen lamp is used it also generates carbon. At the same time it is observed that the halogen tube is either fused out or the contacts of the lamps has to be replaced. For illuminating the open space we are using only one lamp which is neither giving required illumination level nor provides full coverage to the various open spaces. The issue of security should be address properly which will be sorted out if the same is implemented.

2. It is observed that LED flood fittings of 30W (Seven nos.) & 10W LED flood fitting (One.) are connected which are mostly of old type & not in working condition. Five street light fittings of old 1200 mm type are also not in working condition. Hence it is recommended that minimum 12 (Twelve) to 15 (Fifteen), IP65/IP66 grade 25W street light fittings be fitted in the southern & eastern side of the college.

Date - 22/12/2018

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Er. Dr. EA. Dhananjay S. Daul

Associate Professor

Karmaveer Bhaurao Patil College
of Engg. Satara - 415002.

Street Lighting :(a) Energy Units (b.) Payback Period (c.), Cost savings:
As the security of the surrounding is prime importance the above calculations though can be done cannot be a substitutive for security.

3. (a.) **Solar PV: Energy Units:** For 300 (Three hundred) sunny days in year a 10KW Solar PV system generates minimum 12000 (Twelve thousand Units) . The cost of these units as per present rate is Rs. 156000/00 (One Lakh Fifty Six Thousand Only)

(b.) **Payback period:** The initial cost of the installation is Rs. 7 Lakhs. Payback period Fifty four months in terms of present monetary value. If the rate increase in MSEDCL & onetime investment is considered this investment promotes green energy which is having an additional ranking in terms of any accreditation norms.

(C.) **Cost saving:** As solar energy is a future energy & onetime investment once system is installed the cost saving is for additional ten years as system is supposed to have minimum twenty years life.

5.2 Implementation plan for energy saving measures/ projects.

a. Electric load:

The necessary application & process for increasing in contract demand is be initiated by calculating the all concerned charges. If delayed payment charges are paid it is recommended to pay the electrical bills in time.

b. Lighting:

1. IP65/ IP66 grade 100W LED light flood eight fittings or 50W IP65/ IP66 grade LED flood light sixteen fitting be installed.
2. It is recommended that minimum 12 to 15, IP65/IP66 grade 25W street light fittings be fitted in the southern & eastern side of the college.
3. It is highly recommended to opt for Grid Connected solar PV System of net metering having minimum 10 KW capacities.
4. Schematic (Detailed connection diagram) of Electrical distribution, control, protections and load connections is not available. Diagram showing location of electrical control gear and supply point should points be prepared and displayed to enable easy access in case of emergency.
5. First aid charts to be display at prominent places & to place first-aid boxes in workshops & departmental offices. Earthing at MSEB neutral & bus bar unit is not in good order. This earthing needs to be improved.

Date - 24/12/2018
Er. Dr. EA. Dhananjay B. Devi | Page
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of Engg. Satara - 415002.

6. All earth points be checked periodically and get it salt treated to improve quality of earthing.

5.3 Conclusion & Recommendations

1. The audit conducted is a detailed energy audit and noted that some more focus is to be given on following points.

2. The Average annual energy utilization is of high which is from Eighty Seven Thousand units to almost Ninety Five Thousand units.

The alternative source of power available is three phase Diesel Generator. Data on utilized units of energy since installation is available. Engine is run for more than 4216 hrs. Engine service record is available. It is observed that the generator utilization log book registering of the said the period of usage, energy generated and utilized in kWh (units) and fuel consumed during this period is maintained properly. .

3. It is observed that provision of updated fire extinguisher is provided at all places.

4. Proper control gear and protection should be provided at point of supply. Rewiring and renovation of control panel / board is necessary where supply points are older than 10 years.

5. All the earth points need to be maintained by salting and watering regularly. It is required that earth resistance should be maintained less than one Ohm.

Institute must install Earth Leakage circuit breakers (ELCB) / Residual current Circuit breakers (RCCB) in electrical Engg Lab, Hydraulics Laboratory & every circuit where high voltage work is in progress to reduce possible shock hazards. Two ELCB's are installed at Workshop others need to be installed.

6. It is recommended to display first aid charts to improve awareness of first aid support in case of electrical accident.

7. It is recommended to replace fluorescent light fittings including CFL by LED lighting, gradually, when need repairs. The fan regulators currently of ballast (resistance) type to be replaced by electronic fan regulators.

8. Diagram showing location of electrical control gears and supply points should be prepared and displayed to enable easy access in case of emergency. Detailed electrical schematic diagram should be prepared with load details. To enable further detailed audit.

9. Electrical load distribution needs to be balanced for generator as well as for supply points.

10. Computer LAN network cabling should proper structured cabling. Use of DIN Racks is recommended for mounting of switches, routers etc.

11. Considering the environmental conditions & the cost of the solar lighting, it is highly recommended to opt for Grid Connected solar PV System of net metering having minimum 10 KW capacities.

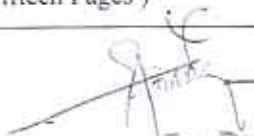
Date - 02/12/2018

Er. Dr. EA. Dhananjay S. Devi 11 | Page
Associate Professor

Karmaveer Bhaurao Patil College
of Engg. Satara - 415002.

Annexure

Sr. No.	Title
1	Summery sheet of MSEDCL Jan 2015 to June 2018 (Two pages)
2	Megger Test, Earth resistance test, Earth test DG (Three pages)
3	Details of Load Connected at various places (Fifteen Pages)
4	Usage register Diesel Generator set (Fifteen Pages)


Date - 04/12/2018
Er. Dr. EA. Dhananjay S. Devi
Associate Professor
Karnaveer Bhauroo Patil College
of Engg. Satara - 415002.

OMKAR SYSTEMS
HOUSE OF ELECTRICAL
& ELECTRONIC CONTROL SYSTEMS

AN ISO 9001 : 2008 CERTIFIED COMPANY
GOVT. LIC. ELE. CONTRACTOR M.C. NO. : 24969

WORKS / OFFICE : H-3/7, M.I.D.C. Ambad,
Nashik - 422 010 ☎ : (0253) 6614992
E-mail : omkarsystems.nilesh@gmail.com

Date :- 02/02/2018

MEGGER TEST TRANSFORMER SET 150KVA

TO

Principle:- K.B.P College of Engineering
Camp Area, Sadar bazar,
Satara : 415001

KVA :150KVA
V/R :22/0.433KV
TRSR No :3

Sr.No.	Description	Resistance In Ohms.
1	LV/E	180 M Ohms
2	HV/E	350 M Ohms
3	LV/HV	400 M Ohms

TEST EQUIPMENT - MAKE:- MOTWANE DIGITAL MEGGER
TEST VOLTAGE - 1000 VOLTS



Lab Incharge (Electrical Engg. Lab)
Incharge Electrical Maintenance & Installation



डेड स्टॉक किंवा जंगम वस्तूंचे रजिस्टर

रयत-२४

सूचना : या रजिस्टरमध्ये नोंदलेला माल श्री. सेक्रेटरी र. शि. संस्था यांचे परवानगीशिवाय कमी करू नये. कमी करताना कॉलम ९ मध्ये कमी करण्यास परवानगी मिळालेल्या पत्राचा नंबर, तारीख तसेच मॅ. कॉ. ठ. नं. व तारीख लिहावी.

अ. नं.	नाव	खरेदीची तारीख	संख्या किंवा परिमाण	किंमत		वृत्तीचर नंबर	शाखा प्रमुखाची सही	अखेरची व्यवस्था		वसूल झालेली रक्कम व ती जमा केल्याची तारीख	बुडोत खाती टाकलेली रक्कम		शाखा प्रमुखाची सही	शेरा
				रुपये	पैसे			किती संख्येचा किंवा परिमाणाची व कशा प्रकारची व्यवस्था लागली ते	अधिकारपत्र		रुपये	पैसे		
१	२	३	४	५	६	७	८	९	१०	११	१२	१३	१४	१५
१५३१	Rashmi narse ISI marked FPC type basic solar water heating system consisting of flat plate collectors each of 2 sq.m area total No. of collectors 24 and 3000 litre capacity hot water tank made up of SS 304 flat plate collectors are conforming to I.S. 12932 (part I & II). Hot water tanks 500 LPS - 2 Nos 1000 LPS - 2 Nos Total hot water tanks capacity - 3000 LPS	25/02/09	01	3,80,000/-										
१५३२	AM - CLASSIC Aurangabad water pumps Serial No 1013109096021824 Receipt No 004068	14/10/09	01	7190/-										

शेरा
25/02/09

RECTOR
Boys' Hostel
K. B. P. College of Engg. & Polyt. Satara.



शेरा
14/10/09
RECTOR
Boys' Hostel
K. B. P. College of Engg. & Polyt. Satara.

म. नं. (१३) वर ख. नं. (1954) ने नोंद केली आहे.