Template for Evidence(s)
UI GreenMetric Questionnaire

University : Mahasarakham University
Country : Thailand
Web Address : MSU green university l Mahasarakham University

[2] Energy and Climate Change (EC)

[2.1] Energy efficient appliances usage are replacing conventional appliances

Mahasarakham University has a policy to design the school building to be a green building in order to maximize the efficiency of indoor energy and control the energy consumption automatically, as well as the rules and procedures for energy management in the controlled school building. Mahasarakham University has recognized the benefits of In other words, it will enable the organization to use energy efficiently, concretely, and continuously, so there is a scope of the assembly list to be effective for materials and equipment replacement with higher efficiency. Or install new equipment to achieve higher overall system performance by selecting fiber-saving labeling device materials. 5 No stars or with stars must be valuable SEER **(Seasonal Energy Efficiency Ration)**High is a value that measures the energy efficiency of an air conditioner is also a value that is measured according to the season. It is also installed according to all industry standards and equipment. (https://www.tisi.go.th/website/standardlist/comp_thai/th) materials and equipment, as well as electrical installations. If none are defined in any way or at any one Must meet the requirements of one of the following standards by equipment, materials, construction, assembly and testing in the project electrical system, and integrated cut-off switch cabinet and motor control switch cabinet (if any). Medium Voltage Electrical Switch Board Panel Cabinet The manufacturer must have experience in assembly. Testing and servicing of electrical switchboards The manufacturer must have products in accordance with industrial product standards. **TIS 1436- 2564** and must be the same product that has passed the test standard according to IEC 61439-1&2. Assembly for electrical control Low force, IEC62271-200, IEC 62271-202 and buswer according to IEC 61439-6 or UL 857 or international standards at the Thai Industrial Standards Institute. The producer must be a manufacturer that complies with the regulations in the specified specifications, but must not be contrary to the regulations and standards of the Local Electricity Authority. Manufacturing and installation standards are important references to the design. STANDARD OF PRODUCTION AND INSTALLATION: BOTH THE SPECIFIED STANDARDS AND REFERENCE FOR USE IN THE PROJECT MUST BE IN ACCORDANCE WITH THE INSTALLATION CHARACTERISTICS AND TOPOGRAPHY, ETC., AND SHALL BE IN ACCORDANCE WITH ENGINEERING PRINCIPLES AND NOT CONTRARY TO THE ELECTRICAL INSTALLATION STANDARDS FOR THAILAND. In carrying out installation work, the correct and up-to-date standards and regulations referenced shall be adhered to by adhering to the requirements of correct and up-to-date IEC standards as the main standards, unless they are fixed in the form or details. If there is a conflict between drawings and standards, or between reference standards and All equipment must be designed, assembled and tested, as well as how standards are installed.

BS - BRITISH STANDARDS
NEC - NATIONAL ELECTRICAL CODE
NEMA - NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
IEC - INTERNATIONAL ELECTROTECHNICAL COMMISSION
UL - NDERWRITERS LABORATORIES
ANSI - AMERICAN NATIONAL STANDARD INSTITUTE
ASA - AMERICAN STANDARD ASSOCIATION
IEEE - INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEER
JIS - JAPAN INDUSTRIAL STANDARD
DIN - DEUTSCHE INDUSTRIE NORM
EIT - ENGINEERING INSTITUTE OF THAILAND
MEA - METROPOLITAN ELECTRICITY AUTHORITY
PEA - PROUINCIAL ELECTRICITY AUTHORITY
NFPA - NATIONAL FIRE PROTECTION STANDARD
FM - FACTORY MANUAL
IES - ILLUMINATION ENGINEERING SOCIETY
TIS - THAI IND“STRIAL STANDARD INSTITUTE
VDE - ERBAND DENTSHER ELECTRO TECHNICAL LOCAL CODE AND REGULATION
EN - EUROPE NORM
ISO - INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
EIA - ELECTRONIC IND“STRIES ALLIANCE
TIA - TELECOMMUNOCATION INDUSTRY ASSOCIATION
TOT - TELEPHONE ORGANIZATION OF THAILAND

The university has completed renovations of the Central Canteen (Talad Noi), Dome 1 and Dome 2 in 2021 - 2022. (https://food.trueid.net/detail/M6eb1xnZXBOv) originally from metal halite lamps. 400 - 700 W Change lighting system within the project to use LED HIGH BAY factory lamps 200 W CCT 5000K (Optional 6500K, 4000K,3000K) Lumen Efficiency 150 lm/W ± 5% Luminous Flux 30000~34000 lm CRI Ra 70, Ra 80 Recommended installation height 10~15 metre (m) Distance between LED luminaires 6 meters (m) Beam Angle 90, 120 degree The product is certified to industry standards. TIS 1955-2008 Automatic control of electric lighting system by using a timer device to set the on-off lamp according to the needs of the application.
(**https://www.bovigastore.com/collections/led-high-bay**)



Implemented the installation of 100 W LED lobay in 2021-2022

Installation of 200 W Ho Bay Lamp in 2021-2022

4" LED recessed round downlight Tube LED 18 w Bulb Terminal G5 , 110-240 VAC 50HZ

Features of 18 Watt LED Tube

- Luminous flux value not less than 1,900 lumens
- Has the luminous effectiveness of lamps. not less than 110 lm/W
- Can support voltage up to 230 volts ± 10 volts Frequency 50 Hz
- Power Factor not less than 0.90
- Total Hamonics Current Distortion (THDi) not exceeding 15%
- Lamp diffusion angle (Beam Angle) not less than 150 degrees
- Color Rendering Index (CRI) not less than 80
- LED driver board is installed inside the lamp with a momentary overvoltage protection device. (Surge Protection) not less than 1,000 volts
- LED TUBE can operate at ambient temperature between 0 degrees Celsius. Chias to 45°C
- LED Chip has a lifespan of not less than 50,000 hours, which retains the luminous flux. Not less than 70% with attached documents certifying luminosity test results according to IES LM-80 standard



Central cafeteria lighting control cabinet
The lighting system is automatically controlled using a timer to turn it off.

The university has installed 64 sets of solar cell UFO lamps and 10 sets of 120 W LED lamps with single branches. Auto on-off control with light switch On-campus street thoroughfares






and reinforced concrete road construction projects. Mahasarakham University Line – Donyom Reinforced concrete road, 0.20 meters thick, 4 traffic lanes, 17 meters wide, including 1 meter central island . The 1,920-meter lighting system has been upgraded from a 400-watt High Pressure Sodium Lamp and a 400-watt Metal Haline Lamp to a 196-200 W LIGHT LUMINAIRE. Luminance greater than or equal to 28,560 lm-34,000 lm 4,000° 6,500°K/ Ra>70 / 100,000 Hr It has a dust-water

protection class of IP 65. It has an IK08 shock rating, which has a luminous value close to a 400-watt High Pressure Sodium Lamp and a 400-watt metal haline lamp, which uses power.
Over electricity and automatic lighting control with solar circuit The number of lamps can be set according to the actual usage without having to turn on the lamps all night.

Don Yom Road and the thoroughfare within the university college set the time to turn on and off automatically.

LED Street Lamp 150 W

Material of automatic lighting control equipment on the road of traffic within Mahasarakham University.

Commemoration Building on the auspicious occasion of Her Majesty the Queen HRH Princess Maha Chakri Sirindhorn's 60th Birthday Anniversary (2 April 2015)

The electrical system and installation method of installation of sub-power switches, switches, sockets, lamps and accompanying equipment must be made in accordance with the rules stipulated in the "Notification of the Ministry of Interior", "Local Electricity Regulations" and UL or NEC standards. Features of LED TUBE bulb LED TUBE bulbs use a total power of not more than 9 watts. Luminous flux value Not less than 1,000 lumens It has the luminous effectiveness value of the lamp. Not less than 110 lm/W, can support voltage at 230 volts. ± 10 volts Frequency 50 Hz Power Factor not less than 0.90 Total

Hamonics Current Distortion (THDi) not more than 15% Lamp diffusion angle Not less than 150 degrees Color Rendering Index: CRI not less than 80 electric current driver It is installed inside the tube, with a momentary overvoltage fire protection device. Not less than 1000 volts The LED TUBE unit can operate at an ambient temperature between 0 degrees Celsius and 45 degrees Celsius. LED beads have a lifespan of not less than 50,000 hours, which retains the luminous flux. Attach a certificate certifying the luminosity test result according to IES LM-80 standard and calculate the age according to IES TM-21 standard from the pellet manufacturer. LED bulb is G13 type with opaque white cover. LED TUBE MUST ALSO PASS OPTICAL AND ELECTRICAL TESTS ACCORDING TO IES LM-79 STANDARD. Standard instruments of measurement systems from domestic efficient and reliable institutions. LED TUBE lamps must clearly and permanently display the name of the manufacturer or factory producing or registered trademark. The LED TUBE must be packed in a box or enclosure that prevents scratches of the lamp body and the display of its information. light bulb LED TUBE is certified to lighting and similar service standards: Radio interference limit 1955 (TIS 1955-2551) Lamp Set LED TUBE must comply with RoHS (Restriction of Hazardous Substances) standard.

(https://campus.campus-star.com/variety/144779.html)

Lighting and Sound Control Room in the Convention Center, 3rd Floor

Outdoor lighting




อาคารเฉลิมพระเกียรติเนื่องในโอกาสมหามงคลของสมเด็จพระนางเจ้าฯ พระบรมราชินีนาถ วันเฉลิมพระชนมพรรษาสมเด็จพระเทพรัตนราชสุดาฯ สยามบรมราชกุมารี (2 เมษายน 2558)

(https://campus.campus-star.com/variety/144779.html)

Faculty of Medicine Staff Residence 1, Mahasarakham University













Within the residential building of Faculty of Medicine personnel, the lighting system was designed and equipped with electric lamps. LED T8 Air Conditioner System Inverter Internal Electrical Appliances Received Energy Saving Labeling Standard No. 5 certified by the Department of Electricity Generating (EGAT) to install electrical control cabinet. Automatic outdoor lighting control using solar and Internet communication CCTV, fire alarm system, and inverter air conditioner have data recording on electricity consumption (assembly list, condominium housing staff, Faculty of Medicine, Mahasarakham University)

Faculty of Medicine and Sutavej Hospital, OPD









Internal Control System of the Faculty of Medicine and Sudhavej Hospital









The Faculty of Medicine, Mahasarakham University was designed and install LED lamps to illuminate the school buildings and hospitals, control the lighting and power systems with the power management program with the program, and the operation of the air conditioner, the VRF air conditioning system management program both of the building of the Faculty of Medicine and Sudhavej Hospital. (F:\OPD 2564\รายการประกอบแบบ 2564\รายละเอียดประกอบแบบก่อสร้าง) (https://med.msu.ac.th/web/?p=6084)

Construction of substation for Sutthavet Hospital Mahasarakham University has made preparations to provide inpatient services in 2022 and will increase the number of inpatients to 108 beds in 2027 to offer health medicine students as well as support research. Urban areas receive electricity from the Provincial Electricity Authority's distribution system, which is shared with other power users. This causes power outages and outages on a regular basis. As a result, electrical equipment and medical equipment are defective due to such problems. In addition, there are plans to construct more new buildings, resulting in higher electricity consumption. Therefore, there is

a need to construct substations to meet the increasing demand for electricity. This includes improving the distribution system in the area to be more stable in order to solve the problem of power outages that affect the operation of hospitals and universities. Mahasarakham University constructed a 115 kv power station. The amount of electrical construction will cover the detailed design, procurement, and installation of equipment as shown in the Conceptual Design 115 kV. Disconnecting switch with grounding switch





115 kv power substation for Sutthavet Hospital Talat Subdistrict, Mueang Mahasarakham District, Mahasarakham Province

- Power Transformer 115/22 kV 3 phase ONAN/ONAF 25/30 MVA TP, OLTC
- 108 kV Lightning arrester & counter on TP
- 145 kV Circuit breaker
- 115 kV Disconnecting switch with Grounding Switch
- 115 kV Current Transformer with Junction box
- 123 kV Inductive Voltage Transformer with Junction box
- 22 kV Indoor AIS (1 In / 5 Out / 1 TS)
- 115 kV Protection and Control boards ,AC/DC Auxiliary ,and etc panel
- 115 kV Take off structure and steel support of 115 kV Equipment
- Switchyard Conduit and accessories

- 22/0.4 kV, Station service transformers
- Battery & Battery Charger

Power Transformer Quality System ISO 9001 Certified ISO 14001 Environmental Management System ISO/OHSAS 18001 Occupational Health and Safety Management System TLS 8001 Quality System ISO 17025 Test and Calibration Laboratory Quality System ISO 50001 Energy Management System

Faculty of Applied Arts, Mahasarakham University

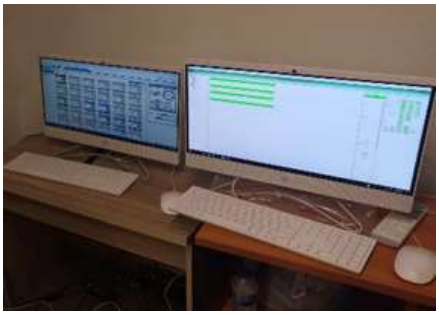



Faculty of Arts and Applied Culture, Mahasarakham University designed and improved electrical systems.To use LED lamps indoors and control the external lighting system with solar circuits. The internet and air conditioning systems have been improved, all electrical appliances that have been used for more than 10 years.

The cabinet of the lighting control, and the energy consumed measurement

Faculty of Science (Scientific Laboratory Center)

The Faculty of Science designed to use LED lamps and VRF air conditioning systems.
(https://science.msu.ac.th/?p=4037) (https://science.msu.ac.th/?p=4325)



(https://science.msu.ac.th/?p=4155)

The Faculty of Science measures energy consumption, fire alarm systems, variable refrigerant flow. Certification VRF โดย ISO 9001-2015, ISO 14001-2015

Boromrajkumari Building

The president's building has been upgraded with a Variable Refrigerant Flow (VRF) air conditioning control system with 5 SEER fiber saving efficiency according to the 2019 criteria from the Electricity Generating Authority of Thailand. (EGAT) and certified to industrial standards. TIS 2134-2553 from Thai Industrial Standards Institute (TIS) Certified ISO 9001:2015 .ISO 14001:2015, OHSAS 18001:2007 and adapted to use LED lamps.

Academic Resource Center Building A, B,C, and D

Mahasarakham University's approach to lighting system design and installation of LED lamps to illuminate all parts of this building is automatically controlled. LED Lamp Control

The fire alarm system must be Presignal Non Code System, 2-Wire Loop with End of Line Resistance, the system and equipment used must comply with the requirements of the National Fire Protection Association or Japanese Fire Service Law or the requirements of other institutions accepted by the employer and installation according to the rules of such institution. , Electricity and NEC Article 760

Faculty of Informatics, Mahasarakham University

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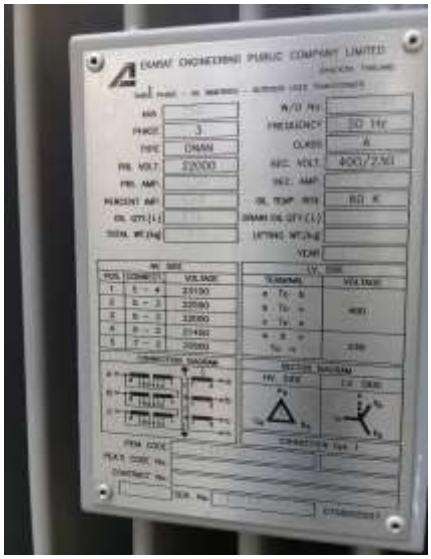

Appliance	Total Number	Total number of energy-saving appliances and current retrofit	Percentage
LED Lamp	134,257	134,257	100 %
Air conditioner	5657	6,233	100%
Exhaust Airfan	353	428	100%
Water Heater	125	450	100%
transformer	88	239	100%
Electric motor	351	459	100%
Passenger elevator	50	62	100%
escalator		4	100%
Average Percentage			100%

Mahasarakham University has replaced the bulbs with 100% LED lamps and for air conditioners.The university has chosen R410A and R32 to save energy and the environment together with the invert.ISO ISO9001 or control system .

Assembly list, drawings and details of electrical equipment materials

Additional evidence link : Msu Green University