Assignment 02 – Building Energy Analysis and Energy Management

Objective

To develop the knowledge and skills for building energy analysis and energy management.

Methodology

An Engineer is performing building energy analysis for a university building in Hong Kong and has collected the following information for the years 2013 to 2014. The building has a total gross floor area of 23,357 m^2 and the average electricity charge is HK$1.4 per kWh. This building is now used for classrooms on the floors LG1 to 2/F, offices cum classrooms on the floors LG3, LG2, 3/F to 13/F, and a staff restaurant on 14/F and 15/F. Before 2012, the floors 1/F and 2/F were used for a branch library. During 2012, the branch library has moved to another building and these two floors together with some departmental and staff offices on 3/F to 13/F have been renovated and modified.

Monthly electricity consumption (x 1000 kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	188	224	223	241	274	316	325	317	342	290	257	219
2014	205	240	258	316	320	346	380	330	348	298	270	231

Monthly mean air temperature (ºC)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	16.7	19.1	20.5	21.5	25.7	28.2	28.0	28.6	27.5	25.7	21.7	16.1
2014	16.3	15.5	18.7	22.6	26.4	29.0	29.8	29.0	29.0	26.2	22.6	16.3

Building floor plan (before 2012): http://ibse.hk/MECH4423/FPKKL.pdf

You are asked to prepare a technical report for the analysis which should include the following information.

(a) A summary of the annual total consumption and electricity cost of the building.
(b) The energy utilization index (EUI) in kWh/m^2 based on the annual consumption and gross floor area.
(c) Comparison of monthly electricity consumption and the deviations for the two years.
(d) Graph(s) to show the monthly profiles of the electricity consumption and air temperature.
(e) Evaluation to determine if the air temperature is a condition driver influencing the electricity consumption.
(f) Discussions on the main characteristics of the building and how they affect the electricity consumption.
(g) Suggestions on how to better monitor the building energy use and what other information should be collected for further energy analyses.

Report Submission

Each student shall prepare the technical report in a systematic way. The report should be not more than ten (10) A4 pages to address the above aspects. Other important issues may also be included. If appropriate, a list of references should be provided at the end of the report. The report shall be submitted in electronic format (PDF file) through Moodle. The assessment criteria of the report include quality of the content, organization, clarity of thought, and report

writing skills. A clear structure and a logical argument is important and you should provide evidence of critical thinking, originality and effective writing.

Useful References

CIBSE, 2012. *Energy Efficiency in Buildings: CIBSE Guide F*, 3rd edition, Chartered Institution of Building Services Engineers, London.

EMSD, 2021. *Code of Practice for Building Energy Audit*, Electrical and Mechanical Services Department, Hong Kong.

EMSD, 2021. *Technical Guidelines on Code of Practice for Building Energy Audit*, Electrical and Mechanical Services Department, Hong Kong.

Useful Websites

Energy Consumption Indicators and Benchmarks (EMSD) https://ecib.emsd.gov.hk/

Energy Management (EMSD)
https://www.emsd.gov.hk/en/energy_efficiency/energy_management/