Term of Reference

The SEDA Malaysia Low Energy and Demonstration Office in Likas Square

(SEDA LEO)

Branch of SEDA Malaysia Office in Kota Kinabalu

(1, Lorong Likas Square, Jalan Istiadat Likas, 88400 Kota Kinabalu, Sabah.)

Office Area : 1,182 ft^2

Introduction

The Sustainable Energy Development Authority of Malaysia (SEDA Malaysia) is a statutory body formed under the Sustainable Energy Development Authority Act 2011 [Act 726]. The key role of SEDA is to administer and manage the implementation of the feed-in tariff mechanism which is mandated under the Renewable Energy Act 2011 [Act 725]. Now SEDA Malaysia 's office is located at Galeria PjH, Presint 4 Putrajaya.

In the early January 2014, SEDA Malaysia will opens its new branch office in Kota Kinabalu, Sabah, to extend better services related to sustainable energy in Sabah. **This new office will be developed as SEDA's Low Energy Office (SEDA LEO) which demonstrates integration of best available energy efficient measures, optimised towards achieving effective energy efficient solutions**.

The 1,182 ft^2 SEDA LEO, will be show case for energy efficiency with low environmental impact. An ambitious goal as set for the energy efficient office to achieve energy savings more than 40% on lighting and equipment compared to conventional air-conditioned office building in Malaysia.

The existing Level 2 of Likas Square building from beginning is architecturally having quite good façade. The window facades are facing due north, and there is sufficient exterior shading, so that direct sun will only penetrates into the building very rarely. The window area is relatively large and the glazing is clear glass that allows ample diffuse daylight into the building. Penetrations of direct sunlight is avoided, thereby avoiding increased cooling load and avoiding excessive glare.

This SEDA Malaysia's new branch office will illustrate the following features;

i. **Energy Efficient space planning, with light colour interiors and use of daylight deep into the office spaces;**
ii. **Use of natural daylight to offset electric lighting;**
iii. **Intelligent and efficient electric lighting, controlled according to occupancy and daylighting level;**
iv. **Energy efficient office equipment;**
v. **Monitoring and display of energy saving for lighting and office equipment.**

Beyond being an early showcase of energy efficient building in Sabah, this new office has another very important function. It demonstrates how existing office spaces can be retrofitted to be energy efficient and provide good interior working conditions.

The office will be used as an exhibition for academicians and professionals to monitor, evaluate and study the outcome of energy efficient features in an office building, and the office will be used as exhibition and training/awareness ground for architects, engineers and academicians in Sabah on the applicability of appropriate interior design and advanced lighting system in existing and new buildings.

1.0 Space Planning

The layout plan in **Appendix 1** shows the space layout concept of the proposed SEDA LEO office. The general scope for the space planning of this office is the same as the one being implemented in KeTTHA LEO Building and GreenTech Malaysia GEO Building;

i. **Along the perimeter priority is given to permanent working areas (workdesks), wheras secondary function are in the interior building (meeting room and store room);**
ii. **The offices along the parameter have primarily glazed partition walls towards the inner parts of the building, such that daylight will penetrate into those area also;**
iii. **Inner areas should also have some direct access to daylight and view by leaving some areas along the parameter open towards the interior of the office.**

The advantages of this space planning concepts are that electric lighting can be saves, and that user comfort and productivity will be increased. Independent and scientifically validated research from US shows that people perform better in day lit space than the artificial lit areas only.

The open office concept also allows closer contact between staff and between staff with visitor. This is believed to be a positive feature and it is in the line with the prevailing modern management, opens and transparent working principles.

Interior design colour: to be selected colour scheme (normally light and fair colour) to promote better reflection of light s and use less energy for artificial lighting.

2.0 Innovative Lighting System.

Innovative lighting system with special lighting control strategy will be incorporated into the design of SEDA LEO office. The optimization of lighting design is to adopt some parameters in order to reduce the energy losses and heat losses of the building.

Some parameters that emphasized upon are:

i. Combination of high efficiency lighting T5 fixtures with electronic ballast and LED is for technical and decorative lighting fitting. Some fittings may have conventional magnetic ballast for comparison such as in the store and pantry;
ii. Daylight photocell sensors (daylight system) is deployed at the parameter of the office area and rooms to control switching of the light fitting for the purpose of energy savings;
iii. Combination of photocell sensors (for room at the façade), occupancy sensor, programmable or automatic switching control from then local component provides better control management system and save energy (also air conditioning) especially when the rooms are not occupied; and
iv. Zoning of lighting circuits to match daylight penetration within the building (especially at external perimeter) so as to permit switching off the circuit when adequate daylight prevails.

Typical office area (and rooms) near the façade (with widows)

The lighting system for the area and room near the façade has combination of:

i. Natural daylighting
ii. Artificial lighting

The area located at the parameter of the façade have opportunities to utilise daylight as primer source of lighting. The use of daylight can reduce the lighting energy consumption thus can contribute to energy saving of the office.

The areas have special lighting system which consists of;

i. Momentary switch or also known as the Manual On/Off Switch
ii. Photo sensors and occupancy sensors (Infrared and ultrasonic type).
iii. Each lighting zone have two separate lighting circuits; one near façade and one in the depth of the area/room.
iv. Intelligent light control system with digital input/output link to controller

Mode of operating for lighting

The control philosophy of the lighting system is based on;

i. Daylight has preference, and electric lighting is added only when daylight alone is insufficient;
ii. Artificial lighting is controlled as “manual on and automatic off”

The electric lighting system is in each zone / room separated into lights along the parameter and lights in the depth of the zone / room. A lighting sensor monitors the total lighting level, daylight plus electric light. Once the daylighting level alone can satisfy the required illumination level, electric lighting along the parameter is turned off. At one of the zone near the facade, electric lighting is dimmed according to daylight availability instead of being controlled on/off. If daylighting alone later becomes insufficient, then the system will automatically add electric lighting.

When the user enters the area or room, he or she will switch on the light if the daylight lighting level is felt to be insufficient. Artificial lighting can be switched

on in the depth of the office area and meeting room. The meeting room should have minimum two lighting zoning with dimming capabilities. If only part of the meeting room is occupied then users are be able to switch on one of the circuit. During presentation, the lighting can be dimmed down.

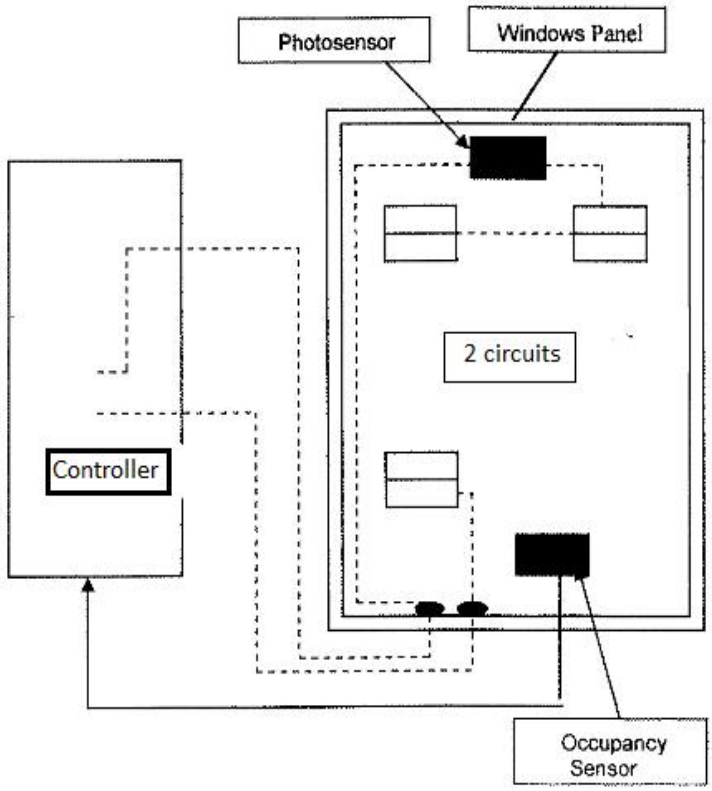
Furthermore, the occupancy sensor of the room will signal to the control system that the room is occupied.

When daylight may exceed the set illumination level in working area, the electric lighting in parameter zone will be turned off or dimmed, as mentioned earlier.

When the user leaves the room, the occupancy sensor will start a delay timer of 5-15 minutes, and upon expiry the controller will switch off the lighting in the office area and rooms.

The desired lighting level is set permanently at installation. If for some reasons a higher or lower light level is wanted, it can be adjusted at the controller located above the ceiling panels of the area and rooms.

Typical Lighting Control Scheme (for rooms with facade windows)

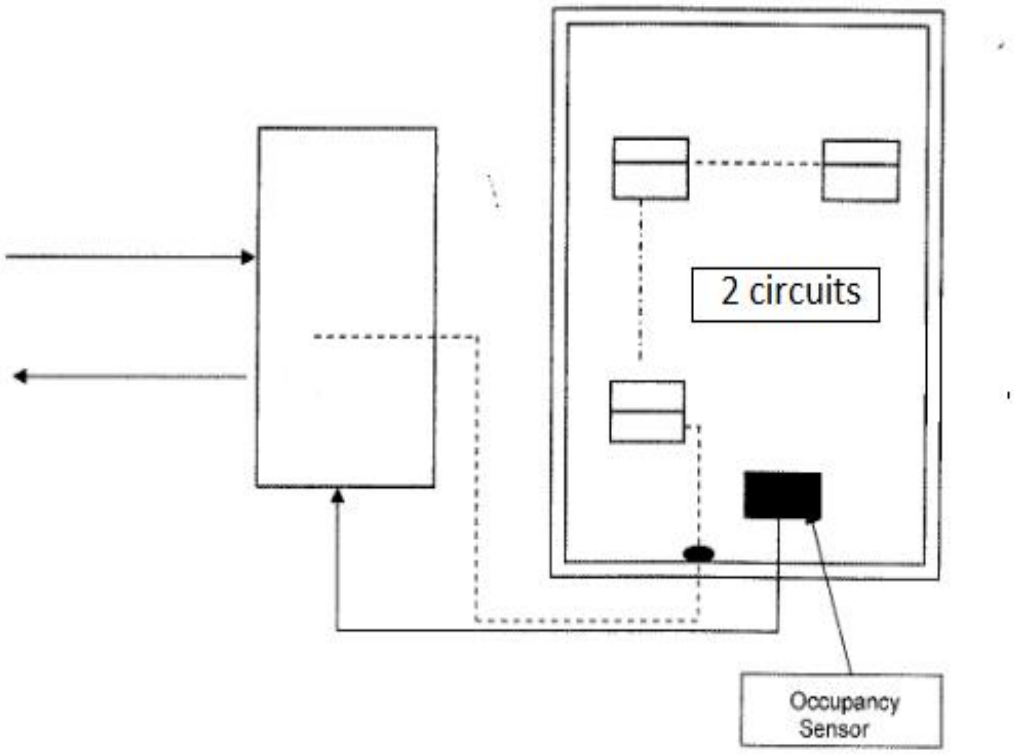


Typical internal room (away from façade)

The internal rooms without windows also have the same design of innovative lighting features, except there is no daylight responsive control of then electric lighting.

The light in the rooms is manually switched on by user. When the occupancy sensor detects that nobody (movement) is in the room within the timer period, all lights will be automatically be switched off by the lighting control system.

Typical Lighting Control Scheme (for rooms away from the facade)



3.0 Metering For Power and Energy Consumption

The SEDA LEO demonstration office will have its own energy monitoring system for lighting and small power (office appliances and general equipment). The metering system is able to measure and monitor the lighting parameters which are required to monitor and analyse the building energy performance from the 3 phase digital meter.

The recorded parameters are;

i. Power demand (kW) and Power Index (Watt/m2) for all the phases.
ii. Energy consumption (kWh) & carbon emission (kgCO2)
iii. Power factor
iv. Current (amp) and voltage (volt)
v. Building Energy Index (BEI) [kWh/m2/year].

For this purpose, the electrical power cabling and distribution design should meet the purpose.

4.0 Metering For Small Power

The electrical supply for small power plugs must be designed separately from the lighting system, so that the electricity consumption can be measured separately. Similar to the lighting metering system, the small power usage can be monitored and measured by the energy monitoring system based on total and zone basis (one zone typically two offices).

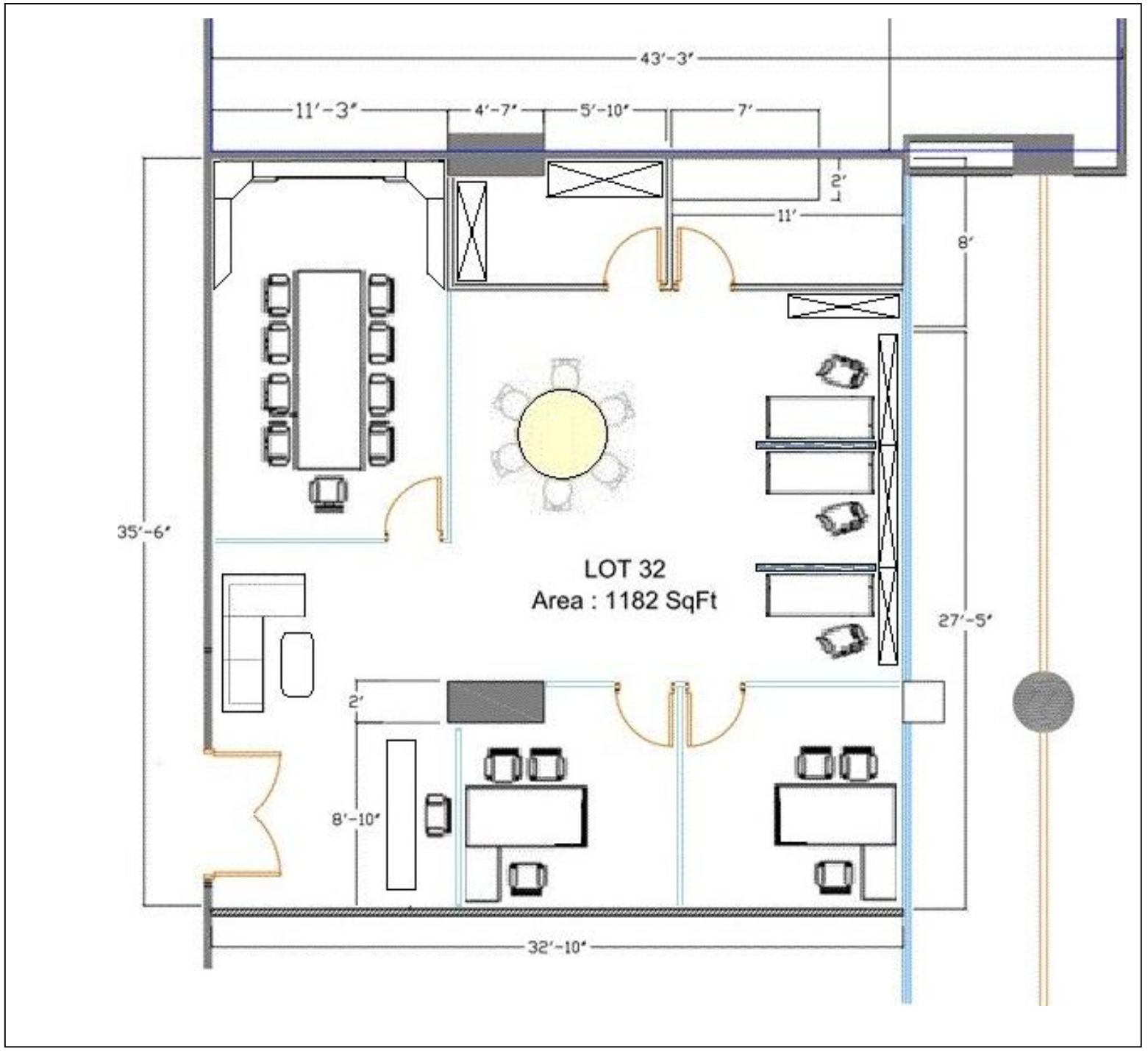
5.0 Office appliances loads (Energy Efficient Office Equipment)

One of the factors identified to contribute in achieving significant saving is the use of energy efficient office equipment. The electrical load imposed by the normal office appliances (computers, printers, photocopying machines and facsimiles machines) consume large amount of energy.

Energy efficient office equipment in place of conventional equipment provide both energy saving and improve the working condition. Purchasing EE equipment are made easy with the available Eco-lables in the markets such as Energy Star rating by Energy Commission.

The SEDA LEO Demonstration Office will adopted the Energy Efficient Procurement Guideline Strategy and so only EE equipment such as LED flat screens, laptops and Energy star rated products are to be used in the office. The demonstration office displays EE office equipment and the energy consumption can measured.

APPENDIX 1:
PROPOSED CONCEPTUAL LAYOUT PLAN


43'-3"
11'-3"
4'-7"
5'-10"
7'
2'
11'
8'
35'-6"
LOT 32
Area : 1182 SqFt
27'-5"
2'
8'-10"
32'-10"