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Comparative Study on Day Lighting & Energy Modeling For Conventional and Green Building

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ABSTRACT: *A green building is a building which consumes less energy, less water and it includes proper waste management system in such a way that it utilizes maximum natural resources without .affecting the future needs. The energy consumption in a conventional building varies based on the person's metabolic condition, the circulation of fresh air and the intensity of light entering to the building. The absence of fresh air circulation and lack of natural light will lead to intense power consumption in the building. The methodology used here is basically on the working of the three software viz., velux, design builder, and equest. The velux software is used to understand the building day light factor, how the ventilations are provided and to what extent the building is consuming the natural light through these ventilations. A simulation shall be drawn to check colors the lux values inside the building and it shall be done on the basis d considering different colors and designing the building as per latitude and longitude of the building so the results are based on the weather and climatic conditions of the building topography, thermal comfort in the building, metabolic conditions and materials used . Equest software is the software used for the final analysis of the modeled energy building to determine the consumption of the energy and also the annual savings based on the model prepared in the software. The main area is on how to reduce the energy consumption in the building using the natural day light. A study on the modeled building by its appropriate orientation and a cost wise comparison between green and a conventional building are done here. The study is conducted in one of the site located at Mangalore island site for conventional building.*

Keywords: *Velux, Equest, lux, design builder*

I. INTRODUCTION

The environmental impact of the building industry is significant. Building annually consumes more than 20% of the electricity used in India. Urbanized development shifts land usage away from natural, biologically diverse habitats to landscape that is impervious and devoid of biodiversity, this has adverse effects on the occupant's health and well being. Conversely, many developments happening in virgin land tend to disrupt ecological balance and natural habitat. Such far reaching efforts on our natural environment and personal well being necessitate action to minimize its impact. Green building terms refer to the fundamental concept: improving the built environment while minimizing the impact on the natural environment. The array of terms is necessary, in that each has a slightly different connotation; in this hand- book a wide, but selective, set of terms is used to best describe the projects that are showcased.

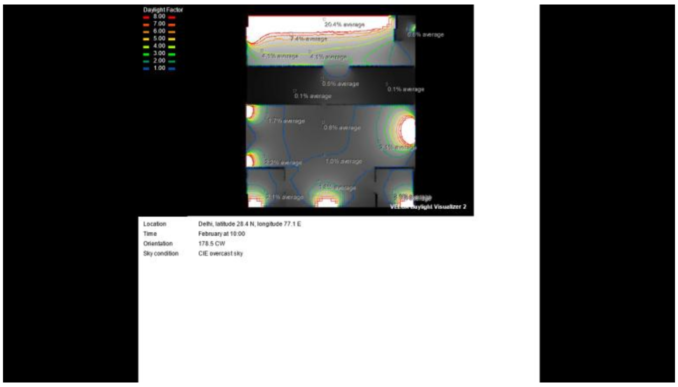
II. AIMS & OBJECTIVES

The main aim & objective of this study is 1. Design the building to understand the day light factor 2. Design the energy modeling for both type of the building and understand the energy distribution in conventional & green building. 3. Model showing how the climatic condition is also considered for the Energy Modeling.

III. INDENTATIONS AND EQUATIONS

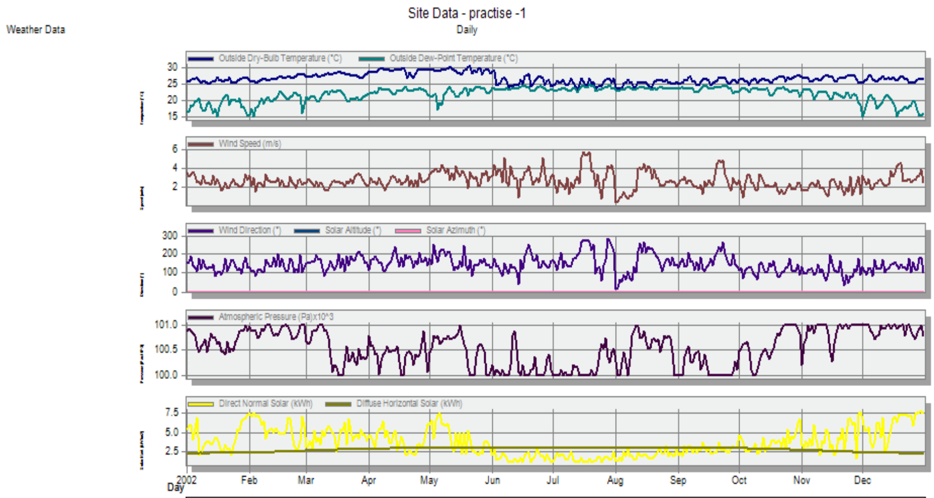
3.1TOOLS USED

Velux- It is a tool used to analyze the day lighting factor of the building to analyze the building projection and the openings that helps in the maximum consumption of light. The prime importance is given to analyze the building light appearing inside the building.



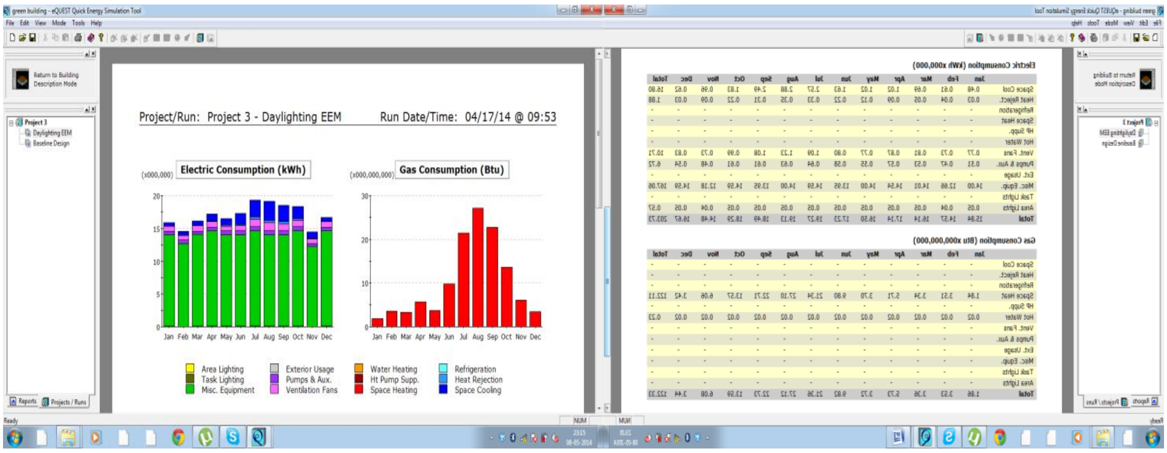
Through the contour line the average light scattering inside the building is shown. In order to obtain this, initially the building plan is done and then the plan is executed in this software the building openings are provided on the projection basis and meant for check the day light entering in various forms of mode sky light condition. The opening is adjusted to attain maximum light by keeping the building structure safe. This is operated on both type of building and checked for reflection, smoothness. Specula- reflection.

Design builder-This software is used to design the building by considering the day light values and also evaluate the performance of the site based on the latitude, longitude and on the weather condition of the site. This mainly helps to calculate the thermal comfort of the building depending on the body metabolism. It also shows the peak heat level of the building based on the wind flow, velocity, and also the solar azimuth in degree above the building. This software is used to analyze the condition of the site and how good the climatic condition. The site analysis is performed by setting the latitude and the longitude. This gives the temperature distribution, solar azimuth and the wind transmission over the site, depending on various seasons and the output is systematically shown in different month basis. This results which are obtained is considered for the next level of operation of software for the complete energy modeling.



Outside Dry-Bulb Temperature (°C)	25.65	27.35	29.49	29.75	24.83	24.87	24.31	27.25	25.79	27.75
utside Dew-Point Temperature (°C)	17.39	19.75	23.64	22.85	24.02	23.98	23.33	24.06	23.45	21.99
Wind Speed (m/s)	2.15	2.08	1.72	3.53	0.90	5.38	2.93	4.93	1.54	1.16
Wind Direction (°)	107.17	171.13	105.46	154.50	37.92	267.13	222.21	236.38	126.50	79.33
Solar Altitude (°)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Solar Azimuth (°)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Atmospheric Pressure (Pa)x10^3	100.88	101.00	100.46	100.75	100.08	100.00	100.71	100.00	101.00	101.00
Direct Normal Solar (kWh)	6.99	4.33	4.34	3.23	1.19	1.26	1.75	3.75	3.02	5.97
Diffuse Horizontal Solar (kWh)	2.42	2.71	2.93	3.01	3.01	3.00	3.03	2.99	2.81	2.50

Equest- This software is used to analyze the overall performance of the building on the energy consumption i.e. Electricity & Natural gas which is based on this program and the output is formed on annual consumption. It also shows the monthly consumption and also the savings on both the types of the building. The main aim of this software is to perform the energy simulation based on the inputs and design provided at the ground level of software like velux and energy builder, and then based on this software output the results are compared and the efficiency.



Electric consumption (KWh) chart of green building similarly the chart is obtained for the conventional building. The savings are shown in the forms of monthly basis.

IV. FIGURES AND TABLES

BUILDING ELEMENT	DESIGN INPUT	BASELINE DESIGN INPUT
Above grade wall construction	Steel-frame construction, R-19 insulation, 16 in. OC,6’’ depth, U-factor=0.109	Steel frame construction, R-13 insulation, U-factor=0.124
Below grade wall construction	Not applicable	Not applicable
Roof construction	Built up roof, insulation entirely above deck, R-30 ci, U-factor=0.032, Roof reflectivity =0.45	Insulation entirely above deck, R-15ci, u factor=0.063, roof reflectivity = 0.30
Exterior floor construction	Not applicable	Not applicable
Slab on grade construction	Un insulated, F-0.730	Un insulated, F-0.730
Window to gross wall ratio	23%	23%
Fenestration type	1.Dual pane metal frame tinted low E glass doors with thermal break 2. Dual pane metal frame low E glass window with thermal break.	1. North orientation 2.South, East, West orientation
Fenestration Assembly U-factor	0.61 0.59	0.57 0.57
Fenestration assembly SHGC	0.25 0.25	0.39 0.25
Fenestration Visual light transmittance	0.44 0.44	0.44 0.44
Fixed shading devices	None	None
Automated movable shading devices	None	None

V. CONCLUSION

The day lighting savings increased from 5% of green Building to 10% in the Conventional Building.
Indoor Air Quality increased from 7% of green Building to 9% of Conventional Building.
Paintings consisting of Wooden Flooring, Beige Paint Matt for Ceiling, Beige Paint for Wall, Roof Product as Poly Urethane and Facade Product as Poly Urethane give good Day Lighting.
Improvements in Conventional Building are 2% more than the Green Building.

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