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OPTIMIZATION OF DAY LIGHTING IN HIGH RISE BUILDING THROUGHDECLINATION ANGLE AND REFLECTING DEVICE

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ABSTRACT

Improving daylighting strategy is a mandatory pace to achieve visual pleasure and energy reduction in buildings. Daylighting optimization make surethat indoor healthier rooms, reduceselectric light consumption as well as cuts the risk of glare. Natural light is irreplaceable ever since it is a fullspectrumlights, it changes during the day in addition to differ every day of the year. A variableillumination all through the day, in terms of intensityas well as colour temperature, creates dynamic indoorenvironments so as toare more pleasant meant forhuman being.To improve the qualityof light, of visual comfort advanced daylightingsystems along with external shadings using.Architect can design in favour of their building alone. If nearbyan additional building located means that angle as well as distance will affect our building neither we cannot predict or control that. Consequently in this research, reflecting angles setup designed in different point of view by means of Artificial Neural Networks.

KEYWORDS: *Artificial Neural Networks (ANN), Shading device, Energy saving, Illuminance (lux), Latitude, Daylight*

INTRODUCTION

According to the most recent policies, towards promoting lowcarbon solutions, Green Building, Eco Friendlyas well as to avoid the depletion of naturalresources, in case of new buildings as well as inrefurbishment action, one of the most significantstrategies is towards considering daylight as a mean to maximizethe entry of sunlight.It is also well known that maximizing the sunlight penetration in indoor spaces can be extremely effective interms of energy savings, to cut off electricityconsumption along with in terms of thermal loads reduction,particularly in Mediterranean regions.Even though the design as well as constructive premises areclearly oriented towards the definition ofmultidisciplinary strategies to assist saving energy, themajor issue to deal by means of is succeeding in an efficientas well as green integration of daylighting strategies in everydesign step, involving retro commissioning actions.

A lot ofstudies have demonstrated that if daylight is themain source of lighting, there is a hugeenhancement in productivity, performance as well as wellbeingin common.The daylighting performance of a building depends on complex interactions of a large number of design features as well as elements similar to functional, behavioural, structural as well

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aseconomical requirements. Therefore, computer simulations have been developed to save time and try dissimilar design options towards accelerating optimization of daylighting along with lighting design whereas providing scientifically realistic evaluations. Energy saving methods meant for technical design in buildings are more as well as more widely used. For instance, the use of shading devices has led towards practical applications for improving energy performance. Shading and daylight mustall the time be optimized in order to consider both the energy saving as well as environmental aspects of design. In this research new as well as economic plan implemented for adjustable, interlinked as well as shading device meant for high rise buildings.

OBJECTIVES:

- To evaluate the impact of shading devices on the illuminance levels of inside the investigated rooms.
- According to latitude find out the varies parameters to optimize day light.
- To evaluate the lighting efficiency commencing from day lighting by means ofa few types of lighting control systems.
- To evaluate the energy efficiency as well as sustainability through some dynamic day light metrics.

DESIGN CONSIDERATION

The design specifications of the shading device are aessential part of the design's long term performance. The design specifications that were considered all through the design process of the shading device as well as can be summarized as follows:

1. The application have to be practical
2. The entireparticularshave to be improved (Design process, Generation)
3. The design must be extensively used
4. It must as wellhold the function of building security
5. It must containthe entire facts relevant towards the product maintenance

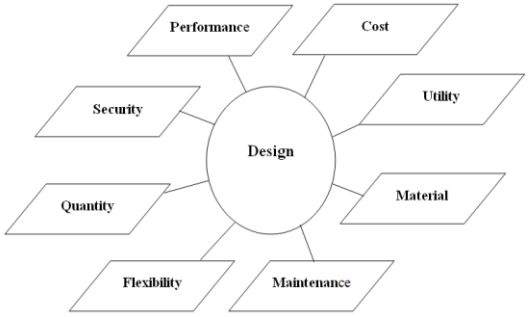

Figure 1: Design specifications of the shading device

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Daylight Factor (DF):

External shading devices encompass always been a simple as well as lowcost device used towards controling the heating effect of natural light. In the earlier period, a variety of studies have suggested so as to use of shading devices might represent a way towards improving energy consumption as well as increase user comfort in buildings. The current challenge is to develop integrated approaches meant for the implementation as well as control of such devices, whereas considering both visual comfort as well as energy performance in the design. The majority of these tools have been developed towards optimizing the function of external shading devices commencing from different viewpoints.

Movement of Earth:

One of the significant characteristics of the Earth is its movement. Seeing the Sun travel through the sky is a consequence of the fact so as to the Earth rotates on its axis. As by means ofthe entire planets in our Solar System, the Earth orbits or else moves around the Sun. The Earth's axis is to some extent tilted by means of respect to its orbit around the Sun, resultant in the transformation of seasons. The Earth as well follows the Sun in its motion all the way through space. A variety of motions result in days, seasons and years.

Calculating Solar Angles

These equations have to be used keeping the entire of the angles in radians though by means ofa few of the equations it does not matter whether degrees or else radians are used.

Declination Angle

The equation used towards calculating the declination angle in radians on any given day is:

$$\delta = 23.45\frac{\pi}{180}\sin\left[2\pi\left(\frac{284+n}{36.25}\right)\right]$$

Where: δ = declination angle (rads); n = the day number, such that n = 1 on the 1st January.

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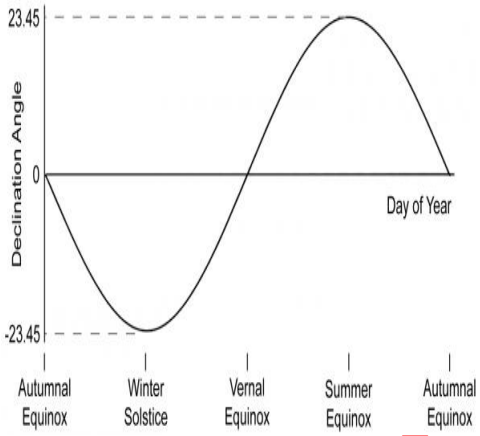

Figure 2: The variation in the declination angle throughout the year

The declination angle is the similarintended for the whole globe on any specified day. Figure 3.1 shows the change in the declination angle throughout a year. Since the period of the Earth's complete revolution around the Sun does not coincide exactly by means of the calendar year the declination vary slightly on the similar day commencing from year to year.

METHODOLOGY OF THE RESEARCH

The methodology of this research article is focused on investigation of a real high-rise residential case study commencing from daylighting strategies, sunlight availability. The common outline of thepresent study concentrates on, Analyzing the settlement design as of the aspect of neighbourhoodplanning,Evaluating the daylight availability in flats by means ofdissimilar heights in a lot obstructed environment, One of the high rise residential blocks in the investigated settlement so as to is heavily obstructed by means of its surrounding, is chosen as a case study building depending on performed shading analysis meant for this settlement. A measure of the daylight availability in this building is evaluated in terms of five different flat types A,B,C,D and E

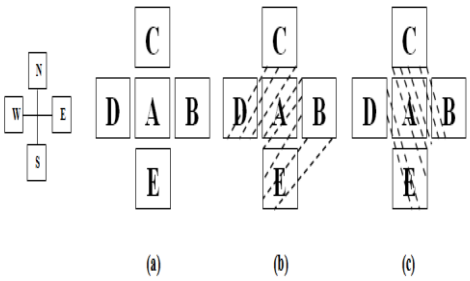

Figure 3: Building Shades of adjacent sides of building blocks ((a). Apartment's location, (b). Sun-Rise Shading, (c). Sun-Set Shading)

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The case building is divided into 5 main zones due towards the height of the selected floors for daylighting analyses as well as the daylight levels are calculated for particular representative days as well as hours. All design process comprised of distinct stages so as torepresented a complete sequence of design activities based on perceived user requirements. The configuration of the shading device was the consequence of a variety of design processes so as toare shown in Figure. 4.

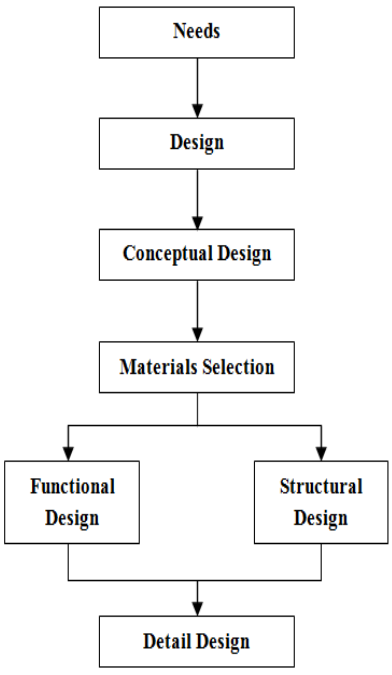

Figure 4: Design processes involved within the shading device

LIGHTING CONTROL SYSTEMS (FUNCTIONAL AND STRUCTURAL DESIGN)

Good shading device settings would fiddle with the design of form towards adapting to facade orientation as well as opening shape. Though, it is as wellsignificanttowards considering other conditions, such as daylighting as well as ventilation. According to the above description as well as the results, the rotation mechanism of the slats in facing a variety of orientations towards considering both for minimizing solar heat gain as well as maximizing daylighting along with ventilation. The panel would be installed into two driving and rotating mechanisms to matching up two types of the location of the building. Furthermore, this design considers the correlation among the driving mechanism as well as water level control of buoyancy along with includes an analysis of the components of the linkage design. The generallynecessary design function relates towards the rotating panels, in particular how they could be installed in relation towards the location of windows. Adissimilar rotation system as well as metal frame structure fixed based on reguirements. It

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supported the rotating mechanism, the outline frame as well as rotating members were the most significant structural part of the new external shading device. The external shading device comprises of three parts: the outline frame, drive device as well as floatingprovided liquid compartment. The frame is equipped by means of sun shading panels so as to turn by means of the upward force of the floating boards as well as provide the appropriate amount of shade according towardsdissimilar sunshine angles.

Materials Selection:

The materials were divided into two types, depending on the part so as tobe utilized. The materials utilizedmeant for the frame of the proposed design integrated aluminum alloy as well as acrylic-plastic. There were four key reasons meant for the selection of these materials intended for use in the design:

Security requirement	Security is a main factor to be considered while selecting materials. The strength of the design in this area is significant given its, security function; the shading device provides shelter as well as replaces the traditional method.
Weather resistance	It is hardtowards maintainingas well as keeping clean while an external shading device is used, particularlywhile it is installed outside the building. Though, both weather resistant design as well as resilient materials be able to resolve this problem.
Construction	The shading device have to be easy towards constructingas well as be tailor-made in accordance by means of the size of the window. This aspect should not influence the function along with quality of design under construction.
Cost-effectiveness and flexibility	Considering user requirements, the proposed device is a great dealadditional flexible in comparison towards a fixed shading device. Due towards it cost-effectiveness, the use of the automatic shading device be able to increase user satisfaction.

Table 1: Basic Requirements for selecting Materials

Daylighting and energy efficiency in high rise residential buildings:

Optimum usage of natural light in buildings as well as integrating it by means of electric lighting systems be able todecrease the energy consumption intended for lighting in buildings. For optimum daylighting systems, buildings have to be designed by means of taking into account natural as well as physical design parameters which are stated below,

- Light distribution as well as brightness of sky
- The position of the sun, its brightness with lighting impact

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- Light reflection of the ground
- Dimensions, locations along with light reflection of exterior natural or else artificial obstructing
- Orientation of the windows
- Dimensions, geometry, location furthermore material of the windows
- Room geometry moreover internal material selection

In high rise buildings, the effects caused by means of these parameters differ depending on the storey height. The position of the sun, density of the natural as well as artificial surrounding environment, light reflections of outdoor surfaces, window dimensions with glazing materials have an effect on the amount of daylight penetration keen on the space. Dissimilarity in the angular relationship by means of the surrounding buildings reason both different shadow situations as well as differentiated lighting levels intended for the rooms which are on unlike storeys. Since of the difference of design parameters depending on storey height; light transmittance of glazings, dimensions of shading devices as well as interior surface colors have to be defined particularlydesigned forevery room.

Daylight requirements as well as viewing-out needs in the rooms are important on the orientation of the buildings. Daylight is usually admitted towards the interior through vertical openings as it might not be effective to use horizontal openings akin to skylight, clerestory or else roof monitor in high-rise residential buildings. Therefore, the significance of orientation, building geometry as well as window design in this type of buildings additional increases. Building envelope have to be designed cautiouslyin sequencetowards avoiding

visual discomfort inconvenience such as glare. It is suggested to encompass homogenous daylight distribution in interior places similar to living room, kitchen, bedroom as well as working room. North windows endow with diffused daylight whereas south windows obtain into direct sunlight next to the diffused daylight.Shading elements reminiscent of balconies or else overhangs have to be designed towards preventing the direct sunlight for south, east as well as west orientations. These all of the research as well as discussions going depend on their own single building, if new building rising close by means, so as to will affect our own existing building by means of that new building shades, consequently architecture have to be with precaution towards observing and utilize day lights at any stage.

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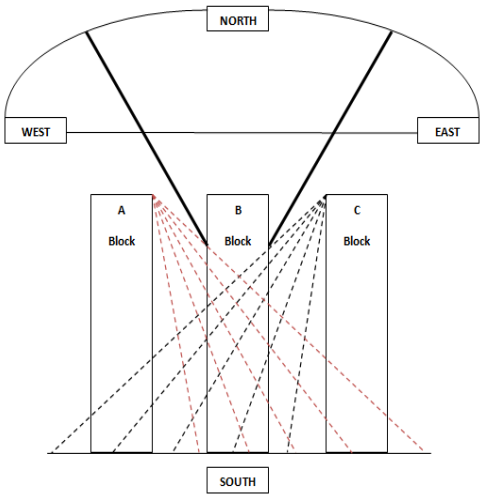
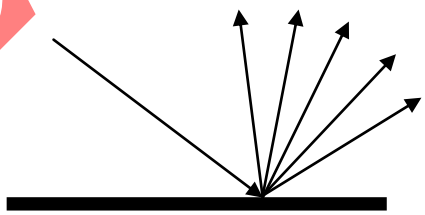


Figure 5: Shade affecting in nearby building in high rise residential buildings

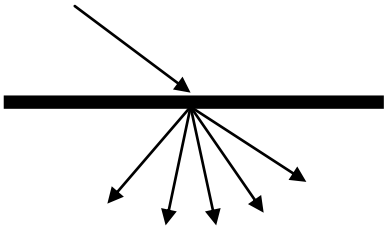
SHADING ANALYSIS OF THE SETTLEMENT DESIGN

Glossy Reflection and Glossy Transmission:

The glossy reflection component is alikeheaded for the **mia_material** reflection shading, this glossy reflection component adopts the use of roughness, rather than glossiness used through the mia_material. In particular, provide a easy specular reflection component separately below meant for perfectly smooth surface components requiring mirror-like

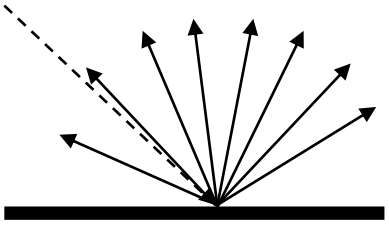


Translucent surfaces can both reflect in addition to transmit light. Light is pread in a lot of direction in



Diffuse Reflection off a baffle:

Diffuse reflections scatter the light in the entire directions. In a diffuse reflection, the original light source can not be seen. The angle at which the light source is placed does not matter since the reflection is the similaras ofthe entire angles.



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Illuminance in the work planes:

The amount of light coming as of a light source is luminous flux (lumens), the amount of light falling on a surface is illuminance (lux), as well as the amount of light reflected off a surface is luminance (cd/m2). These quantities are dissimilar since the beyond a surface is from a light source the less light so as to falls on the surface as well as the darker a surface is, the fewer incident light it reflects. This is since light follows the inverse square law. In this reflecting device architecture, Glossy Reflection & Glossy Transmission (combin and fix), Diffuse Reflection off a baffle.

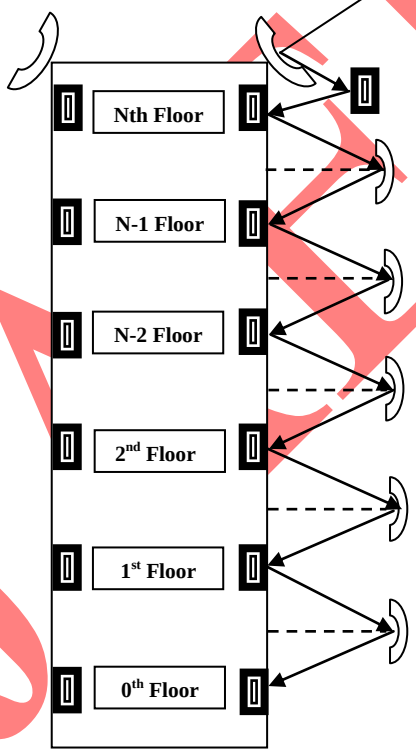

Figure 6: Architecture for shading and sun light reflection

CONCLUSION

Daylight availability have to be taken into account in architectural design of high-rise residential buildings appeared in dense settlements. Daylight is present at a particular location, towards some degree, whenever the sun is on top of the horizon at that location. However, this study gave a economic implementation architecture meant for utilize sun light sourceamong other high rise residential building.

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