Role of Lighting in Sports Building

MOHAMMAD FAIZAN[1], AR. SHARDA SHIRSAT[2]
[1]*Mohammad Faizan, P R patil college of architecture, Amravati, Maharashtra*
[2]*Ar. prof. Sharda Shirsat, P R patil college of architecture, Amravati, Maharashtra*

Abstract— Natural light plays a major role in sports buildings. Natural lighting and ventilation systems modify the internal spaces in different dramatic ways. Daylight is a source which can save the energy and able to create a pleasant visual environment for occupants instead of mechanical ventilation. It is necessary to select correct type of ventilation system for the specific building. Yet these ventilation systems get influenced by the external environment and climate of the building. These ventilation systems also controls the thermal effect felt by the end user inside the building. And it is one of the important factors that influences the comfort of the users.

In some sports hall the benefits natural light is neglected. It is important how natural light is important part of sports facilities. Natural light is good for health of human beings. Research will be observes best approach to optimise natural light in sports buildings and how it helps to reduce energy consumption to a building.

Indexed Terms-- Daylight, Artificial light, Sports hall daylight standard, Integrated daylight strategies.

I. INTRODUCTION

Based on the rising climatic changes, lessening vitality consumption of buildings has ended up an critical issue within the final decades. Expansive buildings such as indoor stadiums, swimming pools, fields etc. are strong consumers of energy and also energy consumer for high comfort level for spectator and athletes.

The natural value of daylight is progressively being recognized. Many thinks about emphasize the significance and benefits of daylight both for wellbeing and for economic and natural reasons. Whereas a enormous portion of energy can be saved by giving natural rather than mechanical ventilation, in case of huge volume buildings extra challenges emerge when it comes to controlling airflow and temperatures in numerous zones. These measures exceedingly depend on the shape, development and ventilation openings of such expansive envelopes, which are generally chosen within the early plan stages.

Other than the common acknowledgment that the presence of daylight in buildings includes a positive impact on the wellbeing and well-being of users, in general, more than 30% of the overall municipal energy utilize in in sports buildings.

II. LIGHTING ELEMENTS

A. Light quantity:

Advice on lux levels is given by the relevant professional body and this should be taken after when designing master facilities. Be that as it may, the larger part of halls are multi-purpose and a few compromise is required. Within the case of multi-purpose halls, it is advisable to plan the lighting to meet the requirements of badminton because it is one of the most prevalent indoor sports and particularly sensitive to suitable lighting. On the off chance that the criteria for badminton have been met, at that point for most recreational and preparing guidelines of play the majority of other sports needs will by and large be satisfied as well.

B. Light Requirments :

Buildings should use daylight as much as conceivable. However,electric lighting will be required on gloomy days and at night. The source of artificial light for a sports hall will influence its longterm energy utilization.Lux level depends upon different sports activity.Some sports requires 200 Lux and some fast moving sports like squash reuires 300 lux. For sports competitition it requires 500 lux.

C. Visibility :

Sunlight glare should be taken consideration. Contrast of high and low brightness feels dazzling which affects the vision. Managment of the glare should be done. Glare affects the observation of the athletes. object and background colour contrast should be differ or it should have some brightness contrast. Opposite brightness contrast can affect the people vision.

D. Uniformity :

It is of the important factor should be consider in sports hall. It prevents from sudden lighting levels breaks, which can cause player distraction. Precaution should be taken that player can understand the opponents movements and able to see accurate ball direction.

E. Maintenance :

Lighting is provided at height so care should be taken to maintain it properly . Led light has less maintenance, which can exceeds 50,000 hours. Daylight can helps to increase exceeds level of led light.

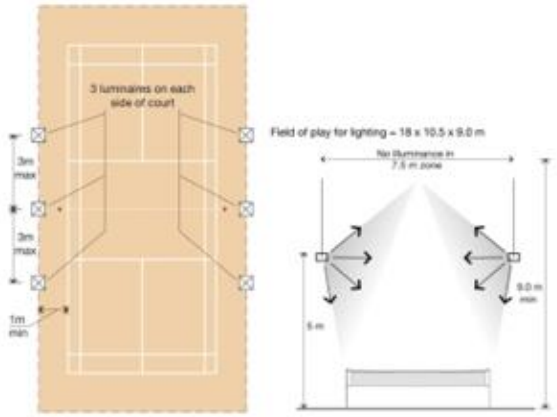
F. Daylight factor :

It is the ratio of amount of light present in indoor to the light present in outdoor with the same period under overcast sky.it is calculated in percentage.i.e DF=EIxEo X 100(%). It helps comparision natural light penetration on different climate condition.It has some certain limitation.It takes under CIE standard.It depend upon orientation and location of the building.Roof shape to be design to penetrate daylight which is simple and fast method.It is depend upon the time series of light inside the building.And it is depend upon the annual solar data of the building.

G. Example :

Badminton Hall :

Plan night time illuminance for a least of 300 lux. Uniform, glare free light is imperative. Point for high illuminance levels on all surfaces. Consistency should be high to prevent vacillations in brightness from one portion of the hall to another. Vertical illuminance should be indeed as the shuttlecock needs to be obvious at height. Artificial lighting should be parallel with the length of the court but exterior the boundary lines to avoid glare. There should be no lighting past the end of the court. Divider wraps up should be matt. Thought should be given to giving a ceiling as shinning, or brighter, than other surfaces. Daylighting should be coordinates into this scheme. Dividers and ceilings should not have solid designs. To supply good daylight in designed to maintain a strategic distance from solid visual designs showing up from reflected sun on roof structure and other components.



Ref: Artificial sports lighting guidance2012

Tollcross park leisure Centre glagrow. sports Ref: Artificial sports lighting guidance2012

III. DESIGN STRATEGIES

A: An meet with development physicist Vincent Vallenduuk working at the building material science office Deerns shown that within the case of multi-purpose halls, it is ideal to plan the lighting to meet the requirements of badminton because it is one of the indoor sports most touchy to suitable lighting (Vallenduuk, 2017). Hence, badminton is regularly taken as the reference when it comes to decide the controls given that they have the most elevated necessities of indoor sports with respect to lighting, but as well roof structure, height, foundation divider and ceiling colours to help shuttle visibility.

B: Lighting can helps to maintain contrast. With the help of cover which is opaque to the lamp which helps spread of the light. Which makes the light spread to athletic field instead of metope, which makes playground brighter and background darker.

C: Lighting such as led high bay light and linear bay light. It not only creats comfortable environment but also salable lightings products and keeps energy consumption low.

Ref:Evans,B H(1981).Daylight in architecture. Page 93

D: In common, there are no contrasts between light from the north sky which from the south, east or west sky but in concentrated and commitment from the coordinate sun. The same diffuse and delicate daylight condition from the north sky can be accomplished with any other introduction, in any case this requires intelligent utilize (e.g. costly sun shading systems) of proper daylight control.

IV. CASE STUDY

Tall cross leisure cecntre , Glasgow :

It was opened in 1996 and was planned by the City Council's architects.

Estimations- Date: 15/2/01 Time: 11:00 - 14:00- Climate: Cloudy with a few sun afterward on.- Daylight Variables within the hall were measured between 1.8to 2.3.- Normal daylight illuminance: 212 lux.- Normal completely lit illuminance: 445 lux

Ref:understanding daylighting of sports hall

The central rooflight gives a sensible level of daylight into the hall, because it isn't shaded. Sunlight isn't assumed to reach the players because it is blocked by the geometry of the rooflight and roof shape. In any case, during late evenings in winter and lunchtime within the summer, players have complained approximately the sunlight.

Elements:-

- Length - 34.1 m, Width - 32 m, Stature - 7 to 8.75 m.-
- Window introduction is southeast to northwest, length ways.-
- Orientated with the width confronting southeast/northwest.- Steel outline with profiled sheet metal cladding to roof and walls.-
- Inner walls have MDF lining for bounce back boards, painted turquoise, up to 4 m over floor leveland white steel sheet and plasterboard over.-
- Ceiling is white painted profiled sheet, with white trusses and unpainted galvanized purlins.-
- The rooflight may be a obvious aluminum, double-glazed framework, with dull blue outlines and a solarcontrol tint. –
- Rooflight 3m tall and 4.5m wide.

Hall with the daylight only – looking southwest.
Ref: understanding daylighting of sports hall

V. METHODOLOGY

- Literature study to understand natural light in sports building
- Study of analysis of thermal and air flow to understand the ventilation technique
- The study of artificial lighting elements in sports building
- Literature case study to understand natural light impact inside sports building

CONCLUSION

- In this paper a daylight region of at slightest 5% of the floor surface should be met in in case the sports accommodation is utilized for educational purposes.
- Direct daylight should be avoided in sports halls. Diffuse daylight get to within the roof or façade, is permitted.
- On the basis of the literature study it can be concluded that northern light is no distinctive from that of the south, east, or west sky expect in intensity and contribution from the direct sun
- To control light from the south more expensive sun shading frameworks are required for proper daylight control. An case of such an active framework is the Sports hall in Berlin planned by Ludloff+Ludloff Architekten
- The materialisation of the sports hall too has an impact on the daylight level of the hall
- Another alternative is instead of selecting for windows within the walls, only allow light within the space from north orientated sheds within the roof. In this way it meets the requirement of achieving an normal illumination of at least 300 lux per division of the sports hall.
- It can be concluded that a north oriented roof framework is the leading option.
- Energy consumption reduce by optimizing natural light in sports hall rather that provide only artificial lighting (led light). Natural light also helps to increase exceed level of led light which is cost effective.

REFERENCES

[1] Baker, N., & Steemers, K. (2002). Daylight design of buildings. London: James & James (Science Publishers) Ltd
[2] https://studylib.net/doc/18551736/understanding-daylighting-of-sports-halls
[3] Research paper optimasation of daylight in sports halls
[4] Research Natural ventilation strategies for nearly-Zero Energy Sports Halls
[5] Daylighting ,natural light in architecture .derek phillips