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# Insufficient Daylighting in a Residence in New Delhi

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## Abstract

Adequate daylighting in residential buildings provides several physiological and psychological benefits, especially in terms of improving visual comfort. Setbacks and window sizes are important factors in how much daylighting can enter dwellings. However, due to improper setbacks, insufficient windows, and their sizes, many interior spaces commonly experience inadequate daylighting. This paper will evaluate a case study of a residential floor in New Delhi by measuring the lux levels in all the rooms and comparing it with the required lux levels as given in the Unified Building Byelaws and NBC.

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## Introduction

This paper discusses the daylighting laws given in the Unified Building By-laws and NBC and conducts a case study for a residential area in Vikram Nagar, New Delhi.

## Aim

The aim of this paper is to study daylighting by measuring lux levels inside a residential floor in Vikram Nagar.

## Objectives

To record lux levels at different spots inside and outside the residential floor.

To read the daylighting laws and find out the lighting requirements in different rooms in a residence.

To analyze from the collected data if the required lux levels are being achieved by the given number of openings and windows.

## Literature Review

Good lighting is necessary for all buildings and has three primary aims. The first aim is to promote work and other activities carried out within the building; the second aim is to promote the safety of the people using the building; and the third aim is to create, in conjunction with the structure and decoration, a pleasing environment conducive to the interest of the occupants and a sense of their well-being (NATIONAL BUILDING CODE , 2016)

In occupations where the visual demands are small, the levels of illumination derived from a criterion of visual performance alone may be too low to satisfy the other requirements. For such situations, therefore, illuminance recommendations are based on standards of welfare, safety and amenity judged appropriate to the occupations; they are also sufficient to give these tasks brightness which ensured that the visual performance exceeds the specified minimum. Unless there are special circumstances associated with the occupation, it is recommended that the illuminance of all working areas within a building should generally be 150 lux.

## Daylighting

The primary source of lighting for daylighting is the sun. The light received by the earth from the sun consists of two parts, namely, direct solar illuminance and sky illuminance. For the purposes of daylighting design, direct solar illuminance shall not be considered and only sky illuminance shall be taken as contributing to the illumination of the building interiors during the day

**Table 4 Recommended Values of Illuminance**  
(Clauses 4.1.3.1, 4.1.4, 4.1.4.2, 4.3.2 and 4.3.2.1)

Sl No.	Type of Interior or Activity	Range of Service Illuminance (See Note) lux	Quality Class of Direct Glare Limitation (See Note)	Remarks
<b>23</b>	<b>GENERAL BUILDING AREAS</b>			
<b>23.1</b>	<b>Entrance</b>			
<b>23.1.1</b>	Entrance halls, lobbies, waiting rooms	150-200-300	2	Localized lighting may be appropriate
<b>23.1.2</b>	Enquiry desks	300-500-750	2	
<b>23.1.3</b>	Gatehouses	150-200-300	2	
<b>23.2</b>	<b>Circulation Areas</b>			
<b>23.2.1</b>	Lifts	50-100-150		
<b>23.2.2</b>	Corridors, passageways, stairs	50-100-150	2	
<b>20.5.5</b>	Bed rooms	30-50-100		Supplementary local lighting at the bed head, writing table should be provided
<b>20.5.6</b>	Bathroom	50-100-150		Supplementary local lighting near the mirror is desirable
<b>20.5.7</b>	Food preparation and stores, cellars, lifts and corridors			See 'General Building Areas'
<b>23.5.3</b>	<b>Food preparation and cooking</b>	<b>300-500-750</b>	<b>2</b>	

Fig. 1. Recommended Values of Illuminance

Source: NBC 2016 Vol. 2

## Aims of Good Lighting

Good lighting is necessary for all buildings and has three primary aims. The first aim is to promote work and other activities carried out within the building; the second aim is to promote the safety of the people using the building; and the third aim is to create, in conjunction with the structure and decoration, a pleasing environment conducive to the interest of the occupants and a sense of their well-being. (NATIONAL BUILDING CODE , 2016)

## Sky Component (SC)

The sky component for a window of any size is computed by the use of the appropriate table of Annex B. a) The recommended sky component level should be ensured generally on the working plane at the following positions:

- 1) At 3 m to 3.75 m from the window along the central line perpendicular to the window,
- b) The daylight area of the prescribed sky component should not normally be less than half the total area of the room (NBC,2016).

## Lighting and Ventilation of Habitable Rooms

All habitable rooms shall have for the admission of sun/natural light and air, one or more apertures, such as windows,

glazed doors, and fan lights, opening directly to the external air or into an open veranda not more than 2.40 m in width.

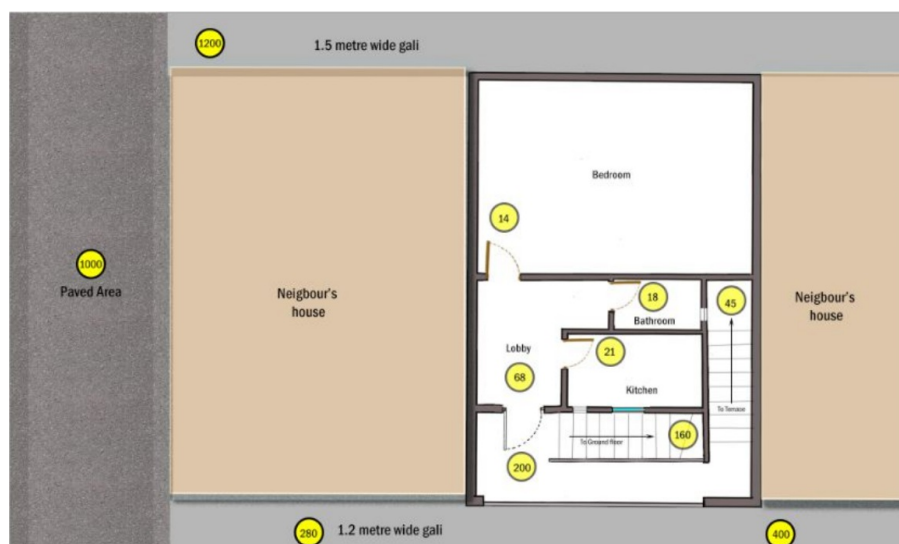
Where the lighting and ventilation requirements are not fully met through daylighting and natural ventilation, the same shall be further ensured through artificial lighting and mechanical ventilation as given in part-VII building services (Section-1 lighting and Ventilation of National Building Code of India). The latest version of the National Building Code of India shall be considered at the time of enforcement of these Building Byelaws. Notwithstanding the above, the minimum aggregate area of openings of habitable rooms and kitchens excluding doors shall not be less than 1/10 of the floor area. No portion of a room shall be assumed to be lighted if it is more than 7.50 m from the opening assumed for lighting that portion (Delhi Development Authority, 2016).

## Methodology

A residential floor is identified, and an application is used to measure lux levels in different rooms during the daytime from 10 am to 11 am.

## Observations

The lux levels that were measured are shown on the plan shown in Fig.2.



**Fig. 2.** Plan of residential floor showing lux levels during daytime

Source: Author

## Findings

- There is no setback given from the road and the width of the road is 1.2 m.
- There are no windows in the bedroom.
- There is 1 window in the kitchen.

Sno	Name of space	Required lux reading	Recorded lux reading
1	Bedroom	30-50-100	14
2	Washroom	50-100-150	18
3	Kitchen	300-500-750	21
4	Lobby	150-200-300	68
5	Balcony	-	200

## Conclusion

The recorded lux levels are less than the recommended lux levels and artificial lights are used during the daytime as well. There is no window in the bedroom which has the least lux level out of all the rooms.

## References

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Delhi Development Authority. (2016). Unified Building Bye Laws for Delhi 2016.

<https://www.wbdg.org/resources/daylighting>

<https://www.whitesales.co.uk/daylighting>