

Design of Illumination Scheme to Enhance Public Safety at Pune Station

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Abstract: Understand the type and efficiency of lighting fixtures, and the lighting design and lighting system of the station and other areas. Formerly, the lighting systems used on railways are incandescent bulbs, fluorescent tubes, HPMV lamps, metal halide lamps and HPSV lamps. Lighting systems are one of the key areas of railway energy consumption. Today, LEDs are widely used for lighting in stations, service buildings, residential premises and more. The first step is to look at good lighting, different lighting schemes, types of lighting fixtures, and their performance, principles of operation and key elements of efficiency. Thereafter, a lighting system design is performed, thus saving energy in the lighting system. We designed lighting schemes and install luminaries to standard illumination level to reduce/avoid accidents as well as public safety.

Index Terms – Lighting Scheme, Lighting Design, Pune Railway Station, Public Safety, LED lights.

I. INTRODUCTION

Most cities use a combination of fluorescent bulbs, CFL, high-pressure sodium or metal halide. These are not designed to meet the lighting needs of each area. We do not research or plan much about the brightness required in various areas, such as streets, railway platforms, car traffic, etc. All railroad areas must be properly designed and planned according to electricity consumption. The railway has 24/7 traffic and the necessary lighting. However, after designing this railway installation with automatic light control, the efficient cleaning of lighting equipment with lighting equipment leads to energy saving [1] [2].

II. PROBLEM STATEMENT

Lighting quality in any situation is inevitably related to economics since there is often a temptation in new office and industrial building projects and in renovations to leave lighting considerations to the very last. This can result in the installation of a cheaper lighting system to meet budgetary constraints, resulting in inferior lighting, dissatisfied personnel and reduced productivity. Looking for a low-cost lighting solution can also be false economy [2]. Over the life of a typical lighting installation, the costs of the electricity it consumes will be greater by far than the initial cost of the installation or the cost of maintenance. So, choosing a lighting system on installation costs alone may not provide the most economical system to operate in the long run. Using the most efficient light sources, which may not necessarily be the cheapest, will usually result in the lowest overall system cost.

At station accidents reported due to low illumination levels at platforms. Improper lighting can cause several problems [3]:

- Insufficient light: Insufficient light if necessary (too small).
- Glow: too bright if necessary.
- Improper contrast.
- Insufficient light distribution.
- Flashing.

Insufficient lighting can cause safety problems. The incorrect location, shape or speed of objects can cause accidents and injuries. Inadequate lighting can affect particularly high-precision situations and overall productivity. Inadequate lighting can be a health hazard: too much or too little light can cause eye fatigue, eye discomfort (such as burns) and headaches [4]. Number of accidents on Pune station platforms in 2017 and 2018 is as shown in fig. 1.

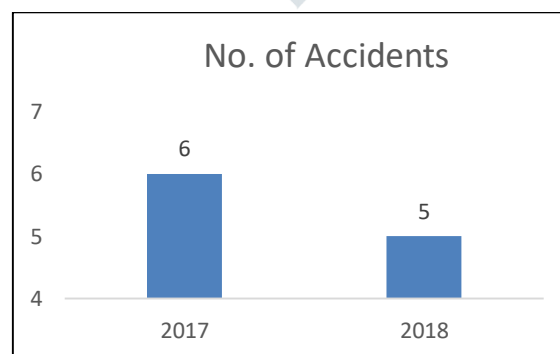


Fig. 1. No. of Accidents on Pune Station Platforms in 2017 and 2018

III. PRELIMINARY ACTIVITY

As per problem statement following preliminary activities has been completed –

Team Formation- To complete the project a team has been formed having following member- Akhilesh Singh (Project Leader), Ramesh Jagtap (tech.), Chudaman Devdikar (sr. tech.), Nagendra Sanade (tech.), Rahul Vhotkar (Helper), Shakti Thakur (helper), Sachin Begde (Helper), Sabhajit (Helper)

Meetings- Team members meeting called responsibility decided; site visit is done and existing schemes observed.

Training to Team- To carry out the project a brief training given to team member about illumination basics, selection of suitable luminary, safety while execution work.

IV. DATA COLLECTION

Existing illumination level measurement has been done by using Lux meter of station platform and other areas. Details list as under shown in table 1.

Table 1. Existing Lux Level at Pune Railway Station

Pune Station Lux Level		Old Standard	New Standard	Before Lux Level
Sr No.	Location	A1	Nsg-1, A1	
1	Concourse	150	200	130
2	Circulating Area	50	150	25,6,15
3	Waiting Hall			
4	Ladies Waiting Hall	150	200	65
5	Sleeper Waiting Hall	150	200	80-100
6	Ac Waiting Hall	150	200	110-140
7	Retiring Room	100		40-50
8	Platform			
9	Open			
10	Pf-01	50	100	25-40
11	Cop			
12	Pf-01	150	200	40-75
13	Pf-02	150	200	30-50
14	Pf-03	150	200	30-50
15	Pf-04	150	200	35-40
16	Pf-05	150	200	35-40
17	Pf-06	150	200	30-35
18	Enquiry Cum Reservation office			
19	General	150	200	90-115
20	Counter	150	200	90-300
21	Reservation Counter	150	200	300
22	Reservation Hall	150	200	125-140
23	Covered Passage Way			
24	Corridors	50	150	35-40
25	Fob			
26	Fob-1	50	150	60-87
27	Fob-2	50	150	50-95
28	Fob-3	50	150	35-65
29	Fob-4	50	150	45-50
30	Stairs	50	150	40
31	Parcel Luggage Office			
32	General	100		60-70
33	Counter	150		70
34	Time Table	200		
35	Outdoor Parking	50	50	10--25
36	Restaurant Area			
37	Kitchen	200		250-390
38	Stores	150		250
39	Dining Hall	200		250-270
40	Other Service Building At Station	200		
41	Cloak Room			
42	General	100		40-95
43	Counter	150		55
44	Public Utility Services (Toilet & Bathroom)	100		
45	Above Escalator	Na	200	80-110
46	Near Lifts	Na	200	.-

V. STANDARD ILLUMINATION LEVEL

The railway stations have been divided into 3 categories namely A1, A, B & C as shown in table 2.

Table 2. Illumination Level Recommended By RDSO at Railway Stations

Sr.No	Location	Recommended Intensity of Illumination In Lux		
		Category 'A', A1	Category 'B'	Category 'C'
1.	Booking/ Reservation Office			
	A. General	100	75	50
	B. Counter	150	150	100
2.	Parcel Office			
	A. Working Table	150	100	75
	B. Parcel Stocking Space	100	75	40
	C. Counter	150	100	75
3.	Goods Office			
	A. Working Table	150	100	75
	B. Goods Stocking Space	100	75	40
	C. Counter	150	100	75
4.	Cloak Room			
	A. Counter	150	100	75
	B. Luggage Rack	100	75	40
5.	Office			
	A. Ss/Sm/Asm }			
	B. Reservation Supervisor }			
	C. Ticket Collector }			
	D. Rpf }			
	E. Grp }			
	** Working Table	150	100	75
	General	100	75	40
6.	Rms Office			
	A. Sorting Place	150	100	100
	B. Stacking Place	100	75	75
	C. Counter	150	100	100
7.	Enquiry Office			
	A. Counter	150	100	75
	B. General	100	75	40
8.	Telegraph Office			
	A. Counter	150	100	75
	B. General	100	75	40
9.	Waiting Rooms			
	A. 1 st And 2 nd Class	100	75	40
10.	Refreshment Room			
	A. Dining Table	100	100	-
	B. Cash Counter	150	150	-
11.	Retiring Rooms			
	A. General	100	100	-
	B. Dressing Table & Bed	150	150	-
12.	Toilets And Bathrooms	75	50	30
13	Covered Platforms }	100		
	Circulating Areas }	50	30	20
	Covered Passageways }			
	Over Bridges }			
15.	Open Platforms/ Over Bridge	50	10	05
16.	Through/Sectional Carriage Siding	20	10	05
17.	Stairs Inside Building	70	50	25
18.	Lift			
	A. Car	70	40	-

	B. Landing	100	75	
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As per latest railway board guidelines metro cities railway station illumination level has to be improved up to airport level standard. In new standard major changes are illumination level of covered platform revised from 100 to 200 lux and open platform 50 to 150 lux.

VI. SELECTION OF LUMINARIES

A branded company led light fitting selected which having 2 tubes each 18 watts, means 36 watts one fitting with IP67 protection and good reflector used. Which was easy to install inside the platforms? For open platforms led flood lights 150 watts selected. And in concourse area 150 watt high bay type led fitting selected. Required luminaries for installation is shown in table 3.

Table 3. Required Luminaries for Installation

Sr. No.	Luminaries Details	Qty.
1	Havells 2*18 watt tube light fitting IP-67,	1100
2	Havells floodlights 150 watt IP-67	20
3	Havells high bay led fittings 150 watt IP-67	45

VII. DESIGNING OF ILLUMINATION SCHEME

To achieve above illumination level at Pune station as recommended by RDSO and latest railway board guidelines a new illumination scheme designing has been done. At the railway station platform area are major contributors for accidents so during designing of new illumination scheme open platform and covered platforms are focused areas. During designing care taken that maximum lumen output of luminaries has to be down word direction so that maximum output can be utilized. This will be effective and economical also. And also the maintenance factor has been taken care of.

VIII. INSTALLATION OF LUMINARIES AS PER PROPOSED ILLUMINATION SCHEME

Installation of the proposed illumination scheme implementation work started. And all covered platforms area 2*18 watt led fittings installation completed .then flood lights 150 watts installation done at open platform areas. Then in the concourse area, high bay led fittings installed. Some snaps of installation activity as shown in fig. 2.

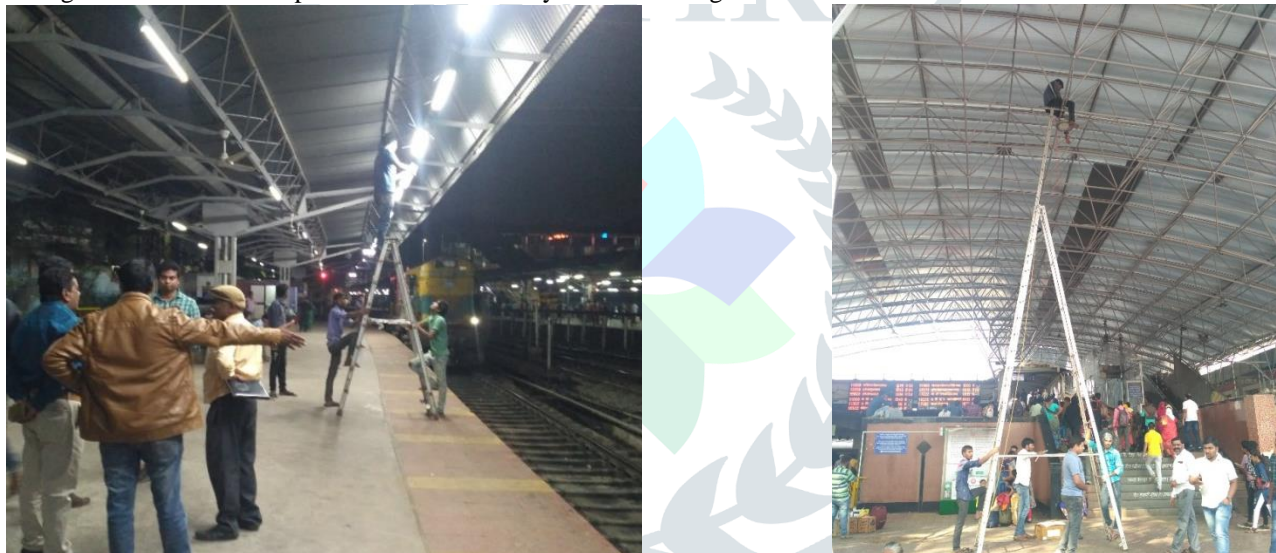


Fig. 2. Some Snaps of Installation Activity

During installation, all safety precautions have been taken care of. And installation, the connection of new luminaries has been completed within the timeline. During this activity not a single injuries reported.

IX. RESULTS AND DISCUSSIONS

After luminaries installation lux level measurement has been carried out and following results found which is shown in table 4.

Table 4. Comparative Lux Level at Pune Railway Station after Installation

Pune Station Lux Level		Standard	New Standard	Before Lux level	After Lux Level
Sr No.	Location	A1	NSG-1, A1		
1	CONCOURSE	150	200	130	325-400
2	CIRCULATING AREA	50	150	25,6,15	115- 130
3	WAITING HALL				
4	LADIES WAITING HALL	150	200	65	170-190
5	SLEEPER WAITING HALL	150	200	80-100	220-240
6	AC WAITING HALL	150	200	110-140	210-220
7	RETIRING ROOM	100		40-50	90-100
8	PLATFORM				
9	OPEN				
10	PF-01	50	100	25-40	85-120
11	COP				

12	PF-01	150	200	40-75	215-140
13	PF-02	150	200	30-50	210-230
14	PF-03	150	200	30-50	204-240
15	PF-04	150	200	35-40	200-215
16	PF-05	150	200	35-40	200-230
17	PF-06	150	200	30-35	230-260
18	ENQUIRY CUM RESERVATION OFFICE				
19	GENERAL	150	200	90-115	240
20	COUNTER	150	200	90-300	90-300
21	RESERVATION COUNTER	150	200	300	300
22	RESERVATION HALL	150	200	125-140	180-230
23	COVERED PASSAGE WAY				
24	CORRIDORS	50	150	35-40	170
25	FOB				
26	FOB-1	50	150	60-87	130-170
27	FOB-2	50	150	50-95	125-170
28	FOB-3	50	150	35-65	120-160
29	FOB-4	50	150	45-50	150-165
30	STAIRS	50	150	40	160-185
31	PARCELL LUGGAGE OFFICE				
32	GENERAL	100		60-70	110-135
33	COUNTER	150		70	250
34	TIME TABLE	200			
35	OUTDOOR PARKING	50	50	10--25	35-65
36	RESTAURANT AREA				
37	KITCHEN	200		250-390	250-390
38	STORES	150		250	250
39	DINING HALL	200		250-270	250-170
40	OTHER SERVICE BUILDING AT STATION	200			
41	CLOAK ROOM				
42	GENERAL	100		40-95	70-120
43	COUNTER	150		55	250
44	PUBLIC UTILITY SERVICES(TOILET & BATHROOM)	100			150-170
45	ABOVE ESCALATOR	NA	200	80-110	250-320
46	NEAR IFTS	NA	200	.	-

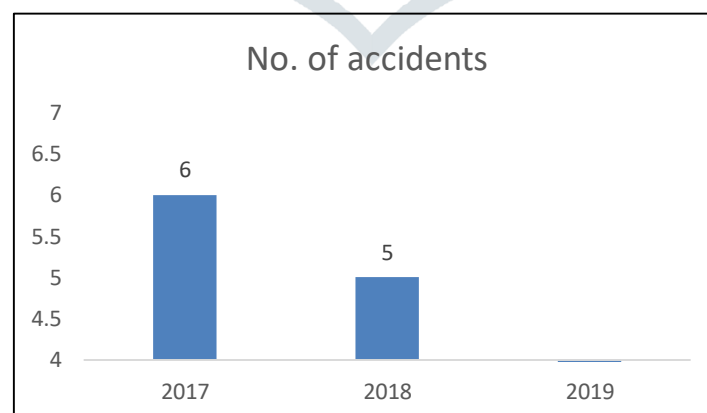


Fig. 3. No. of Accidents on Pune Station Platforms in 2019 as Compared to 2017 and 2018

After completion of the project, no accidents reported. As per standard lux level achieved at different locations of the railway station and also 100% LED conversion drive started. After achieving further illumination improvement work as well 100% led conversion drive moved towards other sub-urban stations located within Pune city, presently at 5 stations, illumination improvement work is under progress. For 100 % led conversion. Led tube and led bulb installation work started for railway colonies also. at present 17000 led tube light and 11000 led bulb installation are in progress. Number of accidents on Pune station platforms in 2019 as compared to 2017 and 2018 as shown in fig. 3.

**Before****After**

Fig. 4. Comparative Pictures of Illumination Level at Pune Railway Station

For completion of this project, I nominated for Central Railway General Manager Award for the year 2019 and also got an award of Pune division DRM Award. Comparative pictures of illumination level at Pune railway station is shown in fig. 4

X. CONCLUSION-

After completion of this project, we learn the terminology of illumination, designing of new illumination scheme of railway stations. Illumination level achieved as per standards and accidents eliminated which was occurred before due to lack of illumination. Hence brief study of illumination concept, lights, and types of luminaries, lighting schemes and related energy conservation opportunities will be helpful for us during our duties as an engineer for proper illumination and energy conservation in Indian Railway.

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