### July 2011 Vol. XI No. III

# **LIGHT**the official SLETTER of the indian society of lighting engineers

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## FROM THE PRESIDENT'S DESK

This will be the last column from me since by the time the October issue goes to press there will be a new President in place.

I would like to thank all the Governing Body members for their help over the last four years in guiding the Society. In particular I would like to thank the office bearers in ensuring the smooth functioning in spite of personal and professional commitments.

I have written before about the progress ISLE has made over the first 25 years of its existence so I will not go over that again. I would however, like to repeat that though much has been achieved there is much, much more to be done. And I am confident that the new Governing Body will set us on that path. Looking back we see the financial support that our activities have received not only from industry, but from BEE, Science and Technology, MNRE and BIS. This is a reflection of the technical stature of ISLE.

One of the areas that we need to do more is in the field of education and training. Efforts have been made in this direction - The LRC courses, discussions with the Lighting Education Trust in the UK, collaboration with Philips in developing an internet enabled education programme etc. Education and research are two important areas in which our Society has built its image and reputation and the continuance of these are vital if we are to be taken seriously. There is a need to devote more attention to research in cooperation with the government on the one hand and with industry on the other. I am sure that the new team will take this forward.

From the long term point of view two very important things have happened in the past few months. We booked our office in the NCR and now have a full time General Manager in our Delhi office. The full time GM will go a long way in making ISLE more effective to meet its objectives and to serve its members.



I would like to make an observation on a little touched upon area of our functioning. And that is professional conduct within our Society. I am greatly disappointed to see that some members have recently resorted to slandering others in publications intended for wide circulation. Apart from the fact that the allegations are not correct, this is a serious breach of professional etiquette. It is to be hoped that this was a momentary lapse of reason and will not be repeated.

Lighting continues to be an exciting field where the pace of change is really amazing. I see a bright future for all lighting related activities in the forseeable future; for practitioners, for manufacturers, for educationists and of course, for users as well and look forward to being part of this as Past President of ISLE.

> Avinash D. Kulkarni President <u>dradk@hotmail.com</u>

## **EDITORIAL**

The launch of the National Lighting Code at the beginning of the year has been followed by seminars to spread awareness of this important document. Reports on these seminars are included in this issue.

The MP State Centre continues to hold its monthly lecture programmes and reports on the last three Sunday lectures are given here.

This issue also gives details of the projects done by the students to whom scholarships were awarded.

We are covering some of the IALD award winning projects in this issue. Many members will recall that in his Masterclass Lecture at Lii2005 Mr. Kaoru Mende spoke of his Delhi project which has won an award of excellence this year.

For the benefit of members I give below a report on my impressions of the CIE Session in South Africa.

H.S. Mamak Editor

### 27th Session of CIE - Sun City, South Africa

I had the good fortune of attending the 27th Quadrennial Session of CIE in South Africa. Experts and lighting enthusiasts from the 5 continents of the world converged to South Africa to present, to exchange information, to network and of course to learn.

It was disappointing to notice that from India only CIE Vice President, Mr. Venkataramani and the undersigned were the only two participants. I do admit that the visit was personally expensive, but it was indeed worthwhile for anyone with a genuine interest in lighting. India is a booming 'lighting' country and a very important representative of the Developing Countries. Its experience and guidelines would surely contribute to a more complete understanding of global requirements.

### Observation

The Conference had 3 Sessions running at the same time and therefore it was impossible to attend all the Sessions. I had to make a selection of sessions of interest and my report therefore is an incomplete coverage of the wide canvas of the Conference and of subjective interest.

### Day 1

### Divison 3 : Chaired by Jan Ejhed SE

Technical papers on Daylighting on the first day removed any doubt regarding its contribution to energy saving and performance improvement. Examples were presented on residential influences by John Mardaljevic of Great Britain; on the influence of ambient light in performance and mood with school children by Tommy Govén of Sweden; and on climate influence on architecture features by Lo Verso of Italy.

This was followed by a workshop on standardisation of Solid State Lighting. Several ideas were offered on the criteria of importance while determining specifications on LEDs. The methods of testing against specifications were also discussed.

### Day 2

My selection was for the Technical papers on CIE Division 5 which was chaired by Nigel Pollard of Great Britain.

There were four extremely interesting papers based on a diagnosis of outdoor lighting measurement by Cyril Chain of France; a technical comparison of CIE and LiTG (German Lighting Association) methods of minimising obtrusive glare from outdoor lighting installations by Andreas Walking of Germany; analysis on measuring lighting parameters by Tomas Novak of the Czech Republic; and the criteria that should be considered for a lighting Master Plan by Lidija Djokic of Serbia.

The highlight of this session was the importance given to reduction of glare in outdoor lighting and how to measure this in accordance to CIE guidelines. The Master Plan presentation was extremely interesting because it was most relevant to India as well where there is a strong need to draw a Master Plan for each city. A comparison of light design parameters were discussed along with cost implications.

What I missed out but understand were two excellent papers on Mesopic Lumen - fact or fiction? by Teresa Goodman of UK and Individual Control over Light Sources Spectrum by Jennifer Veitch of Canada.

Among the presented posters I found two papers of interest; Discomfort glare evaluation with LEDs by Tashiro Tomonori of Japan; New approach to determination of luminaire maintenance factor by Dionyz Gasparovsky of Russia.

The workshop under the Chairmanship of Jennifer Veitch on Light and Health was interesting, but a bit too technical for me to understand fully. Japan's Yasuko Koga presented a pilot experiment on Spectral Response sensitivity. Hiroki Noguchi of Japan presented a paper on the effects of dawn simulation on quality of life in the elementary school children. Finally Luke Price of UK presented a Performance Assessment of Commercial Circadian Personal Exposure Devices.

### Day 3

I attended Division 4 under the chairmanship of Ron Gibbon of USA on Road Lighting.

Giuseppe Rossi of Italy gave an example of optimisation of Energy Consumption in Road Lighting; Peter Schwarz of Hungary delivered a paper on Energy Efficiency Indicators in Street Lighting Applications. Cyril Chain of France spoke about Road Surface reflection parameters.

It was also interesting to notice that street lighting continues to be a focus of attention and new approaches are being devised to ensure energy conservation, glare reduction and quick response needs of the user.

I also attended two presented posters on The Measurement of Road Luminance irrespective of pavement surface condition by Alexey Korobko of Russia and Tunnel Lighting by Kenji Ueda of Japan.

In the forenoon I attended the workshop on Lighting for the elderly and the visually impaired. It was amazing how much of work has been done to ensure light output requirements and colour. CIE has drawn some guidelines which may be a bit futuristic for India at present but should be kept in mind with larger numbers of Indians growing "greyer".

### Day 4

I continued with Division 4 chaired by Carl Anderson of USA. There were 4 papers, all of great interest. Steve Fotios of Great Britain proposed UK guidelines for lighting in residential roads. It was interesting to notice that energy saving, security and colour played an important role. Whereas LEDs were prominent, light sources was not the focus; it was the light delivery that was important.

Ronald Gibbons of USA gave examples of 3 US cities and the emphasis here was on LEDs. He did warn that

pay-back could be as long as 7 years. Miomir Kostic of Serbia presented a Paper that showed that LEDs was not the economic preference in their study (this Newsletter is publishing this paper since it is of great relevance).

Christoph Schiller of Germany presented the latest LED projects and made a strong case for LEDs for energy saving and lighting quality in street lighting and interior lighting.

I also attended the workshop on Discomfort Glare. This was an open-house discussion and several new ideas came up on defining discomfort of glare and its measurement. The Japanese delegates presented several test results to demonstrate controls. It was also indicated that not enough study has been done on glare implications of LEDs where shadow effect is a danger.

### Day 5

Federico Favero of Sweden presented a paper on Natural Light and suggested a methodology for designing Daylight and artificial light for future spaces. This was very relevant for Developing Countries who enjoy abundant daylight and therefore need to evolve a method of combining daylight and artificial light in common spaces.

Janos Schanda of Hungary presented an excellent and thought provoking paper on Brightness and Visual Comfort and Task Performance. Keeping energy conservation in mind the priority is on task performance requirements and visual comfort which both render sought out results.

### **Divisional Meetings**

During my visit to CIE Session I dropped in one some of the Divisional Meetings

### Division 1 : Vision & Colour

- A comparison between different light sources induced glare on perceived contrast a research in Italy.
- Sample selection of colour fidelity index -a study by Pannonia University in Hungary
- Discomfort glare evaluation of white LEDs by Japan

### Division 2 : Measurement of Light and Radiation

- Measurement for OLEDs Optical properties by Germany
- Characterisation and measurement of LED light sources with dynamic control China

### Division 3 : Interior Environment and Lighting Design

- Definition of lighting quality
- Assessment of discomfort glare from windows with Venetian blinds
- Light and health in factories

### Division 4 : Lighting and Signaling for Transport

- Research and development of basic lighting for tunnels
- Cost analysis of LEDs in road lighting

Division 5 : Exterior lighting and other applications

• Lighting design research in public space - a holistic approach

### Lux Pacifica Meeting

July 12, 2011, South Africa

As a Board Member I had the pleasure of attending the Lux Pacifica Board Meeting at Sun City in South Africa. The other member countries that participated were from Australia, USA, China, Japan, Russia, Korea, Taiwan and Hong Kong. Some of the highlights of the meeting are given below:

- Dr. Kevin Houser will represent IESNA while Mr. James Jewell will remain on the Board a Chairman Emeritus from USA.
- Hong Kong has applied to be a member independent of China which was accepted
- Korea has joined Lux Pacifica
- Taipei (Taiwan) has applied for membership to Lux Pacifica and was accepted. (China did not raise any objections which goes to show the friendly relations between members of Lux Pacifica)
- Members shared information on activities within each country. There is a strong interest to receive information from member countries. The Chairman, Dr. Warren Julian announced that the Lux Pacifica webpage would be happy to receive information from members on their activities and publish this.
- A special mention was made on Lii2011 in Chennai
- The next Lux Pacifica Board Meeting and Conference will be held in Thailand in 2013
- I raised issues such as Mercury recycling and disposal in lamps and radiation from high intensity gas discharge lamps. Members confirmed that both these issues have not become a problem with policy makers so far.
- The Chairman indicated that Lux Pacifica is interested in Lighting and not just light.

## OBITUARY

### V. D. P. Sastri 1930-2011

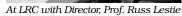
It is with great sadness that we inform you of the passing away of Dr. V.D.P. Sastri on July 28, 2011 at his son's house in the US. An internationally acknowledged eminent scientist at the National Physical Laboratory in New



Delhi, he was an active Fellow member of ISLE for several years.

At NPL he mainly worked on the colour and photometric characteristics of tropical daylight, polycrystalline silicon solar cell technology, cinema arc carbon technology, and spectro-chemical analysis. He studied daylight as a renewable source of light and included both photometric and colour characteristics. He got his Ph.D. Degree from the University of Madras in 1972 for a thesis on Studies on Daylight.

Dr. Sastri had to his credit, the development of a Spiraling Sky Scanner for the measurement of luminance distribution of the sky, and also a simple device for time-resolved spectra in spectrochemical analysis. During



1966-67 he also developed a Fisheye field Spectrograph for remote sensing applications while working in a Remote Sensing Project, at the German Aerospace Center on a Post-Doctoral Fellowship.

He was a Fellow of the Optical Society of India, and also a Member of the Optical Society of America. He also received the NPL Merit Award in 1978.

His papers were widely published (J Opt Soc Amer; Light Res Technol; J Quant Rad Transfe; Planet Space Sci; Indian J Pure Appl Phys; Pure Appl Geophys; J Inst Electron Telecom Engnrs; J Sci Ind Res etc).

Dr. Sastri was selected to be the Secretary of the International Daylight Measurement Programme in India at the IDMY Conference in New Delhi in October 1991during the Prakash'91 International Conference and Exhibition, ISLE was a joint sponsor of this programme as its first research project. During the course of the project Dr. Sastri was in regular touch with Dr. B.K. Saxena at CBRI Roorkee where the project was headquartered.

He was an enthusiastic and energetic Secretary of Delhi State Centre for 2 terms in the 90s. Dr. Sastri presented impressive papers at the international conferences held by ISLE. He made an invaluable contribution to the formulation of the National Lighting Code in the early years of work on this project.

He was invited to Korea on behalf of ISLE to present a paper at the International Symposium on Advanced Daylighting and Artificial Lighting Systems in Seoul in November 2002. In 2004 he made a visit to the Lighting Research Centre at the Rensselaer Polytechnic Institute



*In discussion with Dr. Warren Julion and Prof. Ashok Lall at Prakash' 99* in the US to explore the possibilities of enhancing the cooperation between LRC and ISLE.

He greatly enhanced the value of the ISLE Newsletter through his insightful R&D Update column.

The advent of health problems some years ago resulted in a reduction in his participation in ISLE activities and eventually led to his moving with his wife to the US to live with their son.

He will be greatly missed both as a scientist as well as a friend.

## **ISLE ACTIVITY**

### **Election for the Governing Body**

The Hon. General Secretary issued a call for nomination for election to the Governing Body on February 10, 2011.

The Scrutiny Committee consisting of Mr. N. Nagarjan, Convener, Mr. M. H. Sabhnani and Mr. P K Garg met on 26.03.2011 to receive the nomination forms from the Hon. Gen. Secretary. 22 nominations were received.

The Committee convened a meeting on 01.04.2011 to scrutinise the nomination forms. Two nominations were found invalid.

On 06.04.2011 a letter was sent out to all candidates informing them about the validity of their nomination and also to enable them to withdraw their nominations if they desire before 21.04.2011. One candidate withdrew his nomination. Thus there were 19 candidates as follows:

- Mr. Gulshan Aghi Mr. I.M. Asthana Mr. Prakash Barjatia Mr. J.N. Bhavani Prasad Mr. Satyabrata Chakraborty
- Mr. Prakash Kumar Chatterjee

Mr. Bipin Dattani Mr. V.K. Gupta Mr. A.K. Jain Mr. C.L. Jindal Mr. Dilip Kumbhat Mr. Pradip Kumar Majumdar Mr. Prakash V. Mavinkurve Mr. Harabandhu Mukherjee Ms. Sudeshna Mukhopadhyay Mr. Arvind Achyut Mule Mr. K. Naveen Mr. Vijay Panse

Mr. Rajat Roy

Ballot papers were sent out on 03.05.2011 to all regular members by registered post. Duplicate ballots were sent to those members who indicated that the original ballots were not received.

On June 17 at 5 pm the Scrutiny Committee met at the ISLE Delhi office. After allowing half an hour grace period the ballot box was sealed at 5.30 pm.

On 18.06,2011 the Scrutiny Committee met at the ISLE office at 11 am.

The ballot box was unsealed and opened in the presence of the candidates and their authorised representatives who were present and the ballot papers examined. A total of 550 ballots were received. Out of these 24 ballots were declared invalid. 19 ballots were kept under sealed cover pending disposal of a dispute referred by a candidate. The balance 507 ballots were counted as per their preferences marked in detailed sheets.

The following observers were present: Mr. Bipin Dattani, Mrs. Nitasha Kapoor on behalf of Mr. Gulshan Aghi and Mr. Ashutosh Kumar on behalf of Mr. Dilip Kumbhat.

The dispute being on the validity of their membership was referred to the Hon. Gen. Secretary as per the bye-laws and their terms sorted out by the committee nominated by him with the approval of President. The decision of the committee was intimated to the GB and after the settlement of the dispute the 19 ballots kept under sealed cover were opened and counted on 30th June in the presence of the candidates present.

The results were thereafter given to the Hon. Gen. Secretary. The results were announced at the Governing Body meeting in Bangalore. The results were also sent to all the candidates by email and courier as per directions of Hon. Gen. Secretary. The following candidates have been declared elected: Mr. G Aghi Mr. P. Barjatia Mr. J. N Bhavani Prasad Mr. S. Chakraborty Mr. B. Dattani Mr. A K Jain Mr. D. Kumbhat Ms. S. Mukhopadhyay Mr. Rajat Roy

## **KOLKATA STATE CENTRE**

### **Student Awards and Technical Lecture** July 20, 2011

The Kolkata State Centre organised a function to handover the cheques and certificates to the 14 students selected for scholarships for the year 2009-10. The function was held at the Seminar Room of the Electrical Department at Jadavpur University.

The Secretary of the Kolkata State Centre, Mr. A.K. Das Chowdhury welcomed the 50 guests that included ISLE members and students. Prof. Saswati Mazumdar was requested to preside over the function.



Students receiving their certificates and cheques

Following the conferring of awards there was a technical lecture by Mr. Rainer Heid'kamp from the University of Applied Science, Hagen, Germany on Application of New Illumination Technology with LEDs. He gave several examples of the R&D work in Germany in this field including studies on the effectiveness of lighting in child education programmes to increase brainpower. He also showed examples of the special LED street lighting fixtures being developed in Germany.

Mr. Bipin Dattani, former Chairman KSC gave the vote of thanks. The function concluded with refreshments.

A brief note on each project is given below. Except for the group of five students (3rd prize UG) who are from the

# TESTING INSTRUMENTS FOR LAMPS, LEDS & LIGHTING





Academy of Technology, Aedconnagar, all other students are from Jadavpur University.

### First Prize of UG Level

Lighting Design of a Library Room Using DIALux

In case of lighting design, Co-efficient of Utilisation is generally available for the horizontal plane; so, it's not possible to design some practical fields which incorporate vertical planes for observation by using Lumen Formulae. That is why the lighting design software DIALux is used. In this design, IS recommendation [IS 3646 (Part I): 1992] is followed and the required lux levels are selected. Two types of luminaires are used in the design: TCS 306/136 & TCS 306/236. With both types of luminaires, calculation is carried out to determine the amount of investment to be made by using electronic ballast, as well as, magnetic ones and a comparison is brought out between these two types of ballast. Finally, by calculating pay-back period, the decisions are made to select the type of ballast and number of lamps to be placed per luminaire.

Avishek Sengupta

### Second Prize of UG Level

Comparative Study of Design of Emergency Lighting at the Triguna Sen Auditorium of Jadavpur University with and without Solar Cells

Emergency lighting, required when normal lighting fails, is used to enable normal human activities to continue and it also ensures that the routes of escape can be safely and effectively used. In case of a power failure much time is required for the human eyes to adapt to the dark environment. Importance of emergency lighting lies in the fact that the human eyes undergo a transition from lighted environment to semi-illuminated one. Horizontal illuminance level on the centre line of any escape route should lie between one-tenth and one-fiftieth of the normal lighting level with a minimum value of 1 lux. The normal practice is to use a basic battery inverter system which supplies power to the various light sources. The light sources to be used should be energy efficient like compact fluorescent lamps (CFLs) and light emitting diodes (LEDs). The battery is charged using the power from the mains supply. However, much energy from the mains supply could be saved if the charging of the battery is done using solar photovoltaic cells. This is a step taken towards using renewable energy. Though the cost of the project increases, it greatly reduces the power consumption thereby leading to energy saving. However, the utilisation could be increased manifold if the solar power is used not only for the purpose of emergency lighting but also for general lighting.

Jayita Sarkar

#### **3rd Prize of UG Level**

Design of an Automatic Light Switch

Energy is fundamental to the quality of all lives. It is known that energy demand will increase significantly in the future. But the resource of energy is limited. The only way to solve this problem is evolution of energy in a green way and its utilisation in a clean way. From this point of view, a system has been developed which restricts the wastage of energy.

Street lights are provided for lighting the streets at night. But sometimes by some mistake or carelessness, it remains on in the day time also. A system has thus been designed which can switch the lamps off during the day time automatically. So the wastage of electricity can be restricted when sun light is present.

The system contains a light detecting resistor, which can easily detect the light and dark condition and accordingly switches the bulb on or off. Not only at night, but on cloudy days or during solar eclipse also. If it is dark enough to reach the threshold voltage limit, the lamp will switch on.

The circuit has been developed for the market use but it supports only one LDR at the moment. To make it effectively available for the market there is a need to alter the circuit a bit and tweet with the resistors present, which can restrain more current and help to support more LDRs together to have its effect considerably in the street lamps. The power supply for the IC 741 is provided by a 12V step down transformer followed by a rectifier. The potentiometer is calibrated over a wide range adjusting the sensitivity from very light to high light.

According to some calculations and assumptions, replacing these LDR lamps with the present street lamps will save up to a massive 13140KW of power annually. Thus this circuit can provide the solution for present energy wastage due to street lamps.

Arnab Banik, Deepmalya Das, Paramita Basu Roy Chaudhuri, Sagnika Ghosh, Srija Saha Under the Guidance of Ms. Debadyuti Banerjee

# DOHA – QATAR

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### 1st Prize PG Level

### Museum Lighting

In museum lighting different kinds of lamps should be used to serve different purposes as mentioned by IS standards the lux levels should also be maintained according to the susceptibility of objects to light. In that respect different louvres, lenses, filters, dimmers are used to protect museum objects from excessive heat and humidity, chemical attack, air-borne pollutants and also certain conservation and maintenance rules should be followed. Use of fiber optics lighting system in museum lighting is a very good option as it is free from above mentioned problems and especially helpful for lighting of large 3D objects, lighting in vertical surface displayed objects. This system can provide a superior aesthetic environment in the museum and also meet the conservation requirements of the museum.

The case study of Indian Museum reveals very poor lighting as well as poor maintenance and conservation and the recommendations of IS standards are not also followed.

#### Chaitali Chakraborty

### 2nd Prize PG Level

### Stage Lighting Design

The aim of stage lighting is not to render the stage or any of the technical equipment it comprises visible; what the audience has to perceive is changing scenes and moods - light alone can be applied on the same set to create the impression of different times of day, changes in the weather, frightening or romantic atmospheres.

After surveying the currently available lighting possibilities it is concluded that as energy consumption is a burning issue, we should keep in our mind that only the Tungsten and Halogen lamps for their colour effect and high intensity discharge lamp like Metal halide should not be our last choice. High wattage CFL is already widely available in our market, not only that, they are available in different colors also. So we can replace the Tungsten and Halogen with golden CFL. We should use electronic ballast in place of electromagnetic ballast to reduce the ballast loss and to reduce the flicker effect. For future development we can introduce new ideas about the control part of the stage lighting. There are existing methods of controlling the moving lights and luminaires, control of each channel etc, but in future we should introduce new control strategies, for example, time scheduling instead of scene presetting. As already the idea about Memory console has been developed and also highly accepted, we can use the same technology for our new control strategy. Instead of writing only the control programs for the luminaire particular to a scene, we can write the time scheduling program (getting the idea from the rehearsal time) in addition to the control program. Then the total system will be fully automatic, no operator interference and no changeover of the slider will be required. As the complexity of the program will be higher, accuracy of the control system will be higher. Thus we can introduce new ideas and can do the future modifications. As this is a most flexible design field, there are huge opportunities for experiments, play with the new innovative ideas and future developments.

Priyanka Samanta

### 2nd Prize PG Level

Automatic Controlled & Dimmable HID System

The system is designed to control the HID lamp automatically and also to dim it when required. A 250W SON is made to glow with a 250W ballast which contains two extra windings of 150W SON ballast. These two extra windings are not connected at first when the lamp glows. They are connected one by one when required to dim the lamp to the necessary level. A Timer circuit is used to connect these two windings in series with the lamp through relays. A photosensor or Light Dependent Resistor (LDR) is used to detect the presence of daylight. In absence of daylight, its resistance increases and the 555 Timer gives the output. Based on it, the Timer circuit is turned on and also the lamp glows as the Phase terminal of supply line is connected with lamp. The system is designed so that the lamp will give full light output for first 3 hours. Then the first winding of 150W ballast is connected in series to reduce the light output by 60% of its maximum value. After another 2 hours the next winding will be connected and the light output will reduce to 30% of its maximum value. At daytime, in presence of daylight, the resistance of LDR will decrease and the 555 Timer will give output. The phase terminal of the supply line will be disconnected with the lamp and it will extinguish. The Timer circuit will also stop counting and it will be reset.

### Atanu Chakraborty

# The Lighting Project of Budge Budge Generating Station of Unit #1 and Unit Control Room-1.

The lighting project includes measurement of lighting level at different elevations of unit #1 boiler and also comparison of the measured light level with the recommendations as per Indian Standards (I.S. 6665-1972) in Lux at the different positions of the boiler area.

It also includes how the electrical power is getting distributed from power supply to the different lighting loads i.e. to the different luminaries at different locations in the boiler area.

The measurement of light level at different positions of unit control room-1 (UCR-1) was also performed. A software

simulation has done on the same project with existing luminaires at the existing position and condition.

The simulation result indicates what the present status of the boiler is. It also indicates accuracy of the simulation software with the reality.

Recommendations for improvement were made.

Gopal Ghoshal

### Road Lighting Design

The road lighting design is mainly based upon few design criteria like adequate luminance/illuminance level, high degree of uniformity, limitation of glare, effective visual guidance etc.

There are several International and National Standards available for the road lighting design, which can be consulted as recommendations.

The project encompasses a detailed survey of Road lighting on the Jadavpur University Campus.

Finally the redesigning of all streets of Jadavpur University main campus has also been done in this project. The increase of light level as well as saving of electricity as a result of energy conservation has been shown in the report also.

Good road lighting must result in fewer accidents, good night time vision and use less energy.

### Bibekananda Roy

Studies and Development of a High-Flux White LED Based Lighting System having Hand-Driven Charger back-up and also Continuous Monitoring & Controlling of Load.

Here in this project some experiments have been done with LEDs because LEDs have very high efficacy and very low power loss. Some new types of LED lighting system has also been designed which includes High-Flux LEDs. These high flux LEDs differ from 5mm LEDs with respect to physical as well as electrical properties. The light output is very high for these high- flux LEDs. Studies on various LED drivers finally led to implement a new LED driver circuit using a Driver chip called VIPER12A, make STMicroelectronics. This LED driver can drive 3-16pcs of 1w LED and its loss is nominal. In another circuit high frequency switching is being implemented by a 555 Astable Multivibrator for boost converter drivers at high frequency. The frequency has been set up to 1 kHz to switch the LED luminaire. Testing of some other 3W/4W LED luminaires is also another part of the project. LED light output depreciation has also been checked for a long time. Some new installations of LED luminaires have also been done and some design proposals have been made for future installation in the Jadavpur University Campus.

Again, a hand driven battery charger has also been implemented to charge the 4.8V battery to drive a small LED lighting system. High rated batteries can also be charged with a minor change in its circuit only. For this hand driven battery charger a regulator circuit of 5V is being added so that the charging voltage and current may not fluctuate.

Piyali Das

### SPV Based Lighting System

The electronic components in an SPV system are the charge controller, maximum power trackers, linear current booster and inverters. All of these components handle a relatively large amount of current. The charge controller must shut down the load when the battery reaches a prescribed state of discharge and must shut down the PV array when the battery is fully charged. Linear current boosters (LCB) are special purpose maximum power trackers designed for matching the PV array characteristics to the characteristics of dc motors designed for daytime operation, such as in pumping applications. Inverter selection will depend on whether the inverter will be a part of grid connecter or stand alone system. Inverter failure remains one of the primary causes of PV system failure. The SPV lantern presently being disseminated in India consists of a PV module, a storage battery, a charge regulator, a light source (generally a compact fluorescent lamp, CFL) with fitting, an inverter, cables, switches. The charge regulator is used to protect the battery from overcharging/deep discharge and also to prevent reverse flow of current. In India, SPV lanterns are normally manufactured using 5 watt or 7 watt CFLs. The battery is generally made of fiber reinforced plastic. The size of the SPV lantern, in principle, can be specified either in terms of the Power rating of the module/CFL or the capacity of the storage battery. In this work the power rating of CFL has been used to specify the size of the lantern and it is assumed that the module and battery are sized for a given duration of lighting (in hours, h) on a daily basis. As per the existing practice of SPV lantern manufacturers in India, mono-crystalline silicon solar cell modules of ratings between 9-15 peak watts are supplied with CFLs of 5-9 watt rating.

Sanchita Sarkar

### **MUMBAI STATE CENTRE**

# Road Show / Networking Meet at Mumbai & Pune

ISLE Mumbai State Centre is one of the supporting associations to Chemtech Foundation's forthcoming event 'Urban Infra World Expo 2011' scheduled from the 19th-22nd October 2011 at Bombay Exhibition Centre, Mumbai. It will be a landmark event for infrastructure activities which are on the rise and has support from various Indian and International Associations. Mr. Saugata Roy, Minister of State for Urban Development, Govt. of India has agreed to be the Patron for the event.

As part of the pre-event promotional activity, two Road Show/Networking Meets were organised in association with ISLE Mumbai State Centre. The first in Mumbai on July 5, 2011 drew a crowd of 85 professionals from the Lighting and related sectors like Udhe India, Godrej Properties, Aker Solutions, Bajaj Electricals, Crompton Greaves, Reliance Infrastructure, International Copper Promotion Council to the networking meet. The 5th July event was graced by the presence of Mr. K. Naveen, General Manager & Head-Lighting Design, Bajaj Electricals, who gave an in-depth and engaging presentation on the pros and cons of LED Lighting. Thereafter, Mr. Abhijit Salunke, Beuno Lighting Design, Pune was felicitated for receiving the "Recreational Architecture Principle Award" from Architecture + Design & Spectrum Foundation Architecture Awards 2010. He also gave a very creative presentation on how light can be used efficiently and artistically to create a desired mood for a given surrounding through the example of Malhar Machi, a resort in the Sahyadris. Dr. Prakash Barjatia, Chairman, ISLE Mumbai State Centre invited all present to become members of ISLE and also to actively participate in the UIWE 2011.

Subsequently, another Road Show/Networking Meet was organised at Pune on 22 July 2011. In keeping with its core value of offering not just Conferences and Expo update, this road show again featured a presentation on 'Aspects of Recreational Lighting - A Case Study - Malhar Machi Resort'. The Chief Guest for the evening was Er. K.K. Taparia, Deputy Managing Director, Universal Construction Machinery & Equipment whilst the Guest of Honour was Dr. Avinash Kulkarni, President, ISLE.



Mr. Barjatia addressing the roadshow in Mumbai



Roadshow in Pune

The other guests were Dr. Prakash Barjatia, Chairman, ISLE Mumbai State Centre and Mr. Diwakar Neemkar, Past President, Architects, Engineers and Surveyors Association - AESA underlined the association's major role in supporting the infrastructure sector.

ISLE Mumbai State Centre is organising a Lighting Pavilion to showcase the latest lighting products and technologies which will get an excellent exposure to the visitors, builders, architects, designers and consultants, who will be visiting the Expo.

For further details contact:

Dr.Prakash Barjatia Chairman, MSC Mob.: 09850630326 <u>dr.prakash.b@hotmail.com</u>

> Mr.Stan Alvares Hon.Secretary, MSC Mob.: 9820602362 marketec@vsnl.com

### **CHENNAI STATE CENTRE**

### Seminar on National Lighting Code July 1, 2011, Chennai

A seminar was organised in collaboration with the Bureau of Indian Standards on July 1, 2011 on 'Lighting and the National Lighting Code' at Hotel GRT Grand. The seminar focussed on spreading the message and creating awareness about the National Lighting Code (NLC) among the target audience across user organisations such as PWD, CPWD, Airport, Railways, Port Trust Corporation, ICF and others including leading architects, electrical consultants and ISLE members. Mr. Anbarasu, Deputy Director General of BIS; Mr. Dilip Khumbat, Chairman, ISLE Chennai State Centre; Mr. R.K. Trehan, Scientist of BIS; Mr. P.K. Bandyopadhyay, Chairman of the NLC Committee; Mr. S. Chakraborty, Vice President Technical, Surya Roshni; Ms. Sudeshna Mukhopadhyay, Director Marketing Education, Philips India; Mr. Makarand Sainis, Vice President Technology, CNI Group, Wipro Lighting and Mr. R. Balasubramanian, Secretary, ISLE Chennai State Centre, were present.

"In the light of end users and consumers having no access to accurate and reliable information on what represents a safe, reliable and efficient lighting system, the lighting code across the country becomes vital. Hence, the new National Lighting Code," said Mr. Anbarasu."Green concept for a greener world, is the manthra of the present and the standardisation with a code gains much more importance," he added.

"In the backdrop of economic development over the last few years, the lighting industry has received a major boost. An estimated 17 percent of the energy consumption in India is due to lighting. Quality lighting can help save energy and standardisation is the only way to achieve this," said Mr. Dilip Kumbhat. He added that Standardisation and implementation of quality can be achieved only through a Code with a statutory force. "The intent of this Code is to encourage good lighting practices and systems which would minimise light pollution, glare, light trespass and conserve energy while maintaining safety, security, utility and productivity."

Mr. P.K. Bandyopadhyay, presented an overview of the NLC.

Mr. S. Chakraborty detailed the provisions for the interior and street lighting in the NLC.

Ms. Sudeshna Mukhopadhyay gave a different dimension to lighting through her lecture on light and rhythm.



Messrs. Anbarasu, D. Kumbhat, R.K. Trehan and P.K.



Mr. Kumbhat felicitating Mr. Anbarasu

Mr. Makarand Sainis lectured about the factors regarding the quality of lighting and how they are addressed in the NLC.

Mr. Goswami presented the various stages of formulation of codes and standards by BIS and how they ensure public and stakeholder participation in the process.

The seminar was attended by seventy five participants

R. Balasubramanian Secretary Dilip Kumbhat Chairman ISLE Chennai State Centre

## KARNATAKA STATE CENTRE

### Seminar on National Lighting Code June 30, 2011, Bengalooru

ISLE-KSC organised a one-day seminar on the National Lighting Code in association with BIS (Bureau of Indian Standards). The program was facilitated by the Institution of Engineers (India) Karnataka Centre and the National Design Research Forum.

The programme started with an invocation by Ms. Smruthi daughter of ISLE member, Mr. Manjunath. Mr. M.G. Sathyendra, Hon. Secretary. ISLE KSC was the Master of Ceremonies for the Inaugural function.

The Inauguration of the Seminar was done by Padmashree Dr. H.C.Visvesvaraya and Dr. Muralikrishna Reddy, Director, NDRF, welcomed the Dignitaries and the Delegates for the Seminar.

The Keynote address was given by Mr. Himamshu Prasad, CEO, Lighting & Industrial Division GE (India). He addressed the issue of energy and the possibility of enhanced efficiency through the use of LEDs with solar, electronics and controls in commercial buildings,



L to R: Mr. M.G. Sathyendra, M.S.N. Swamy, Padmashree Dr. H.C. Visvesvaraya, Himamshu Prasad, Dr. Avinash Kulkarni, R.K. Trehan, Dr. Muralikrishna Reddy and Padmashree Dr. R.M. Vasagam.

integration of natural and artificial lighting and traffic density linked control systems for street lighting.



Mr. Trehan, Scientist 'F' and Head HRD BIS highlighted the importance of the National Lighting Code and the objectives of the programme, He thanked the Committee headed by Mr. P.K. Bandyopadhyay for putting together this important document.

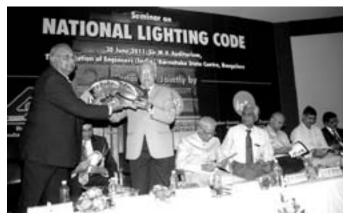
Mr. R.K. Trehan

Padmashree Dr. Vasagam Chairman

NDRF emphasised the need for educating the future decision makers with the introduction of Lighting as a subject in the technical courses. He offered the partnership of NDRF with ISLE KSC in working out a scheme for the safe disposal of discharge lamps.

Dr. Avinash Kulkarni, President, ISLE released the Souvenir "Towards Green Lighting" brought out on the occasion, highlighting the Silver Jubilee Celebrations as well as a number of innovative programmes of the State Centre to spread awareness of lighting issues over the past 14 years.

Mr. Rajendra, Director BIS Bangalore read out the message of Mr. Alinda Chandra IFS, ADG, BIS.



Release of the Souvenir by Dr. Kulkarni.

Padmashree Dr. H.C.Visvesvaraya in his Presidential Address expressed the importance of integrating day light with artificial light. Further he emphasised the need for involvement of lighting engineers right from the beginning of a project not only save energy and light pollution, but to preempt problems like the Richmond flyover.

Mr. M.S.N. Swamy Chairman, ISLE KSC, outlined the various innovative programmes undertaken by the State Centre including publishing a book on Lighting for the common man and outreach programmes for Industries, Establishments, Institutions, Govt. Departments and rural areas. Mr. Swamy proposed the vote of thanks and handed over mementos to the Dignitaries.

#### **Technical Session Highlights**

The technical session consisting of lectures by experts involved in the drafting of the NLC was presided over by Mr. Bhavani Prasad, former DG(W), CPWD CPWD and Member of MC, ISLE-KSC.

Mr. P. K. Bandyopadhyay Chairman and Convener of the Panel for the National Lighting Code, presented an overview of the National Lighting Code and its scope of utilisation.



Mr. Bandyopadhyay

Mr. K. Naveen, General Manager and Head, Lighting Design, Bajaj Electricals, while presenting his paper on Interior

Lighting and Street Lighting, touched upon the benefits of using the National Lighting Code as a guide.

Ms. Sudeshna Mukhyopadhyay, Director, Marketing - Education, Philips India, presented a paper on Light and the Rhythm of Life, underlining the role Light plays in our day to day life including the effects on human health and behavior.

Mr. Makarand Sainis, Vice President, Technology-CNI Group, WIPRO Lighting, in his presentation touched upon the Quality of Lighting, and how the National Lighting Code can help avoid compromising on the quantity or quality of Light.

Mr. D. Goswami, Director, BIS, Delhi spoke on the Importance of Standards and in particular about standards for LEDs. He indicated that the first draft had been published on the website and they are processing the suggestions and feedback received and working towards the publication of a standard.

The participation of the delegates and the quality of questions raised was very interesting and is a measure of how this event was a success.

The programme was attended by 178 delegates including Practicing Architects, Electrical Consultants,

Continued on page 21





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#### **LIGHTING DESIGN**

ANDREAS SCHULZ, IALD FLORIAN AMANNT STEPHAN THIELE THOMAS MÖRITZ LICHT KUNST LICHT AG

## PHOTOGRAPHY

© LUKAS ROTH



# **TELEKOMBRIDGE IN BONN, GERMANY**

In early 2009, Europe's largest telecommunications company, Deutsche Telekom AG, built a pedestrian bridge connecting two office blocks across a major traffic pathway in Bonn. The deck of the bridge stretches over 74 meters, forming one grand curve above the busy road.

Supported by five slim steel columns, the slender footpath bridges the road in a smooth, generous sweep at seven meters above ground. The footbridge ends on both sides in 11-meter-high elevator towers.

Visibility on the bridge's circulation area is provided by neutral white light from linear LED profiles. This lighting component is incorporated in all handrails. The strongly directional illumination of the light-colored flooring creates a strong contrast with the relatively low lighting levels of the surroundings. This evokes the impression of a floating ribbon, creating an architectural link between the two building complexes. A narrow beam and precise adjustment of luminaires eliminates glare to drivers when approaching the bridge.

Judges praised the project's clear relationship to its surroundings. "This project clearly shows the influence of light in the public space, and the trend to create new urban structures that, by night, convey a powerful visual meaning," praised another award judge. "The application of light becomes a manner of communication that fosters a social experience."

Both longitudinal sides of the bridge are clad with a string of custom-made exterior-rated SMD LED video display modules seamlessly arranged to form one bespoke media screen. Due to their very high luminous density of over 7,000 cd/m<sup>2</sup>, the media content is also visible during the day. At night the brightness of the LEDs is reduced to 30 percent of its maximum level. Great care was taken to fully integrate all control gears, power supplies and cabling into the section of the bridge slab so the LED modules were flush with the balustrade. All components are accessible from the bridge top for maintenance.

The towers are filled with light from neutral white LED profiles mounted to the top and bottom edge, grazing the gap behind the opal glass cladding, emanating a diffuse glow while lending visual depth to the architectural volume.



## **AMAN NEW DELHI**

The traditional Indian screen known as jaali is prominently featured in the architecture of the New Delhi Aman Resort. Artistically presenting the jaali was integral to the success of the Lighting Planners Associates design team.

"The screens are the key architectural feature of this project, and the designer has used both light and shadow successfully," one IALD awards judge commented of the project. "Skillful placement of luminaires enhances textured wall surfaces and balance well with the silhouette of screens, while others are uplit, creating a sheer, ethereal effect, or have luminous backlighting – it is a nice combination."

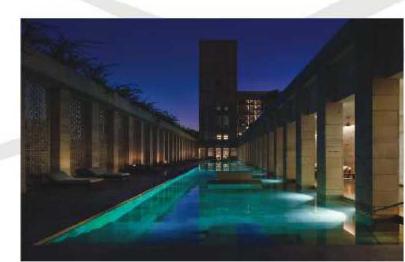
After leaving the bustle of New Delhi behind, guests walk through the gate to Aman. The entrance jaali is softly uplit, with ambient light reflecting off of the driveway canopy. In contrast, a "welcome mat" of gentle light graciously ushers in guests on the opposite side of the driveway. The minimalist design is controlled, featuring shadows that naturally catch the eye, creating a strong brand image for the hotel's inaugural property. Shadows change constantly with the sun's movement, and the reversal of night and day elements creates an appealing iconic design.

Instead of downlights, all guestrooms are installed with L-shaped wall sconces to uplight the ceiling with ambient light. The designers intended to highlight the contrasting beauty of the dark interior hues and white ceiling. All guestrooms are also equipped with a relaxation pool. Initially, only the underwater luminares were incorporated into the finishing, however all of the fixtures in this space, including the underwater luminares, have been incorporated so they are invisible to guests.

### **LIGHTING DESIGN**

KAORU MENDE, IALD KENTARO TANAKA, ASSOCIATE IALD TAKEO SUGAMATA LIGHTING PLANNERS ASSOCIATES

PHOTOGRAPHY © TOSHIO KANEKO





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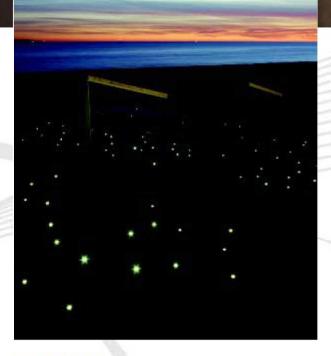
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#### **LIGHTING DESIGN**

ALLAN RUBERG CHRISTIAN KLINGE FRIDA NORDMARK FREDERICK W. BORELLO ÅF — HANSEN & HENNEBERG

### PHOTOGRAPHY

© MARTIN KRISTIANSEN © ULF CELANDER

## HELSINGBORG WATERFRONT

The lighting of the Helsinborg Waterfront, which includes recreational urban spaces, a promenade and a street, needed to tackle the challenges associated with lighting areas near water, including avoiding unwanted water reflection and preserving the free view of the night sky and ocean. Light intensity and level of staging gradually decreases towards the water, leaving the beach unspoiled.

"Forget floodlighting, obnoxious dropped lenses from streetlights, light trespass and the unnatural feeling so many outdoor public promenades have – this project is a playground!" one judge exclaimed. "The lighting, by itself, takes charge of setting the stage for unique human interactions."

The purpose of the design concept was to create an inviting and beautiful waterfront to facilitate an active evening life in the area. Gobo projections with specially designed patterns and fiber light points recessed into the concrete surface create a visual experience in reference to the locality. Gobo projectors are mounted on wooden poles to further support the overall maritime design theme. The projectors are well-shielded and adjusted to ensure glare-free lighting and visual comfort, creating a pleasing play of light and shadow.

"The unexpected use of projected shadow patterns and lighting effects add interest and a dynamic quality to this exterior area, generating a new urban space," another judge praised of the design.

#### Continued from page 14

Electrical Contractors, IT Industry, MECON, representatives from Government organisations such as BESCOM, BBMP, KREDL, KPC, KPTCL, ISRO, BSNL, SSI, ICEAS, Railways, Educational Institutions such as RNSIT, UVCE, Impact, etc.; Lt.Gen(R) Sundaram, Brig. (R) Tyagi, Shri Ravi, CEO, Nichia (India), Shri Pushkal Raj Verma of Accenture, Mr. Prem Sunder, Lighting & Industrial Division GE (India), Dr. H. Nagana Gowda KPCL, Ar. Bharkatulha, GB Members, etc.

The event was well covered by National TV, E-Tv, U-Sri, TV-9 and the Hindu, Indian Express, E-Nadu, Kannada Prabha, Vijaya Karnataka Etc.

> M.S.N. Swamy Chairman, ISLE KSC

## **MP STATE CENTRE**

### Lecture on Energy Efficient Lighting April 24, 2011, Indore

At ISLE MP State Centre a presentation was made on 24th April by Er. Umesh Bhatia, of Shri Sai Electricals, a Consultant to Lamp and component manufacturing units in India and abroad on "Energy Efficient Lighting to Save Energy & Money ".



Er. Umesh Bhatia

Emphasis was laid on making users aware that use of Incandescent Lamps which are most inefficient lamps should be stopped. In the Fluorescent Lamp group use of T5 and CFLs should be increased to save energy and money. He also suggested that replacement of lamps and the use of LEDs where appropriate should be encouraged. Though presently LED lamps are costly, soon it should be possible to get LED lamps at better prices which would be cost effective in the long run. Further it was conveyed that apart from saving money, saving energy is need of the day and essential to help nation by reducing the demand of electricity for Lighting.

The Chairman, Mr. Akhilesh Jain addressed the gathering. This was followed by an interesting Question

and Answer session. Mr. Kadam, also recited a poem to suit the occasion. The vote of thanks was given by Hon. Sec. Er. Dinesh Wadhwa.

## Lecture on Challenges in Lighting in Textile Industry

May 29, 2011, Indore

Yet another Sunday on 29th May 2011, witnessed the 20th consecutive lecture meeting, and marked a very application oriented presentation by Er. S. K. Biyani, Vice President Engineering, Pratibha Syntex Group of



Er. S.K. Biyani answering questions

companies, Pithampur, a stalwart in the field of Textile manufacturing. His focus on lighting started with the fact that the textile industry works mostly on artificial light even during the day time, because of other more critical constraints of dust, atmospheric and climatic unevenness and humidity control.

He explained in detail through a set of powerpoint slides, photographs and videos taken by him personally, the arrangement of different types of lights, optimum use of emergency lighting systems and matrix/symmetrical grid type of roof lighting for spinning and weaving units. Other aspects that he covered on the topic were the constraints of roof height on the shop floor, economising of light by proper initial design and layout, difficult maintenance of installed lighting fixtures and consumables and hence the need of good quality lighting systems for longer maintenance-free life.

This was elaborated by him in great detail by mentioning how the lighting fixtures and the light affect the machines, the operators and most importantly the aesthetics of the plant.

The appropriately and perfectly tailor-made presentation for the occasion by Shri Biyani was well received by an impressive audience, present in large numbers with lots of questions.

The programme was conducted by one of the pillars of ISLE MPSC, Shri Rajendra Raje, the welcome address

given by Chairnan, Er. Akhilesh Jain and the vote of thanks was proposed by Hon. Sec. Er. Dinesh Wadhwa. The executive committee meeting followed, as usual at the end of the enlightening event.

## Lecture on Lighting in Public Places

June 26, 2011, Indore

Another of the successful monthly meetings was held on Sunday 26th June 2011, with an eminent speaker and electrical consultant, Er. Sandeep Mathur, on the topic of Lighting in Public Places. In a very interesting session he started with some basic concepts of Lighting including Luminous Intensity, difference between Illuminance and Luminance, color rendering index, uniformity ratio, space to height ratio, room index, specific luminous flux, light output ratios, utilisation factor and glare prevention.



Messrs. Akhilesh Jain, Sandeep Mathur, Dinesh Wadhwa and Vivek Barve

He switched over to Public Lighting and concentrated on the specific intricacies of Street Lighting and Landscape Lighting, through the projects that he has undertaken, namely, BRTS and Pipliya Pala Regional Park, Indore. Through a very impressive slide show, layouts and actual site pictures, he described the challenges faced by his team in lighting of both the projects. He was very appreciative of the quality of questions raised by the audience. This was the 21st monthly meeting in a row.

Anchoring was done by Er. Vivek Barve, the welcome address given by the Chairman, Akhilesh Jain and the vote of thanks was proposed by Hon. Sec. Er. Dinesh Wadhwa.

> Akhilesh Jain Chairman M P State Centre

## **CIE ACTIVITY**

### 27th Session of CIE & the Board of Administration Meetings held in Sun City – South Africa

 $27 {\rm th}$  Session of the CIE General Assembly was held on the 10 {\rm th} July and the CIE Board Meetings were held the

9th and 16th July. Besides transacting routine business matters such as Budgets, reports of the different Vice Presidents and Divisional Directors etc., the main take away from the meetings is the image makeover, which CIE will go through in the coming months/period based on the earlier brain storming sessions of the Board. With a view to becoming a more relevant and vibrant Organization in the Lighting domain CIE will work towards a focussed "Professional Stake Holders Management". CIE has been instrumental in the formation of an "International Lighting Network" (ILN) comprising of "Global Lighting Forum (GLF) which represents the Industry, IEC, ISO, CIE and other connected Lighting Bodies. CIE will have MOU with all the partners on scope etc. on under banner of "Lighting Quality & Energy Efficiency".

I am pleased inform that I have been re-elected as Vice President in the CIE Board for the current term 2011 to 2015 with responsibility for Marketing.

The Lighting Conference that took place between 11th and 15th July covered many very interesting Topics. Noticeable was the large presence of Chinese/Taiwanese delegates and the number of papers and posters presented by them.

The next CIE Midterm will be held in Paris in April 2013, to coincide with the Centenary year of CIE.

S. Venkataramani Director, CIE Committee

### **OTHER NEWS**

# Two New Post Graduate Lighting Courses at Jadavpur University

During my recent visit to the School of Illumination Science, Engineering & Design (SISED), Jadavpur University, I learnt that two new PG Lighting courses would be introduced by the University from the new academic year commencing in August 2011. Both these courses will be conducted by SISED as evening courses.

In the current millennium Jadavpur University has been rated among the best five universities and engineering institutes regularly by government and non-government agencies in India. Jadavpur University was the first to start a full-fledged Illumination Engineering Laboratory, headed by Prof. Sunil Ranjan Bandyopadhyay as part of the Electrical Engineering Department. Illumination Engineering was introduced as an Elective subject for the undergraduate students of the Electrical Engineering Department in their final year from 1984.

Finally, in 2004 the AICTE gave the approval to start a day-time 2 year M.E. course in Illumination Engineering.

Today this is the only course for proper Illumination related higher study. This course is conducted mainly by the Illumination Engineering Section of the Electrical Engineering Department. The intake of the students per year was 18 so far. Seeing the success of this course the University has decided to increase the intake to 20 from the forthcoming academic year 2011-2012.

With such a successful ongoing PG degree course, I raised the obvious questions to the Director, SISED, Prof. Dr. (Mrs) Saswati Mazumdar, why two more PG courses and why in the evening?

With the success of day-time ME (Illumination) course many ex-students of the BEE course of Jadavpur and other engineers working in the field of Lighting and allied disciplines in government departments, Public Sector Undertakings, industries and consultancy firms have appealed for the introduction of a post graduate degree course in the evening, so that they could upgrade their technical knowledge as a step for career advancement.

Jadavpur University has decided to start an evening M.Tech course in Illumination Technology & Design to be conducted by SISED. This will be a 3-year (6-semester) course and the intake will be 18 students.

Candidates with BE/B.Tech/B.Arch from any discipline or M.Sc. in Physics/Electronics/ Computer Science and employed/self-sponsored professionals are eligible for admission. AICTE approval is pending.

At the same time the University has decided that those prospective students, who will not be able to study for three years, can apply for a 1-year Post Graduate Diploma evening course in Lighting Application & Management. The course curriculum and requirements of teaching materials and support are being finalised by the university.

Prof. Saswati Mazumdar then gave me the subjects to be taught in M.Tech. course curriculum. There will be 10 papers such as :

- i) Fundamentals of Illumination Science & Technology;
- ii) Light Sources & Luminaires;
- iii) Lighting Codes & Energy Efficient Lighting Systems;
- iv) Lighting Economics, Audit & Management;
- v) Renewable Energy-based Lighting System;
- vi) Indoor Lighting Design;
- vii) Laser Lighting Animation & Creative Lighting;
- viii) Outdoor & Landscape Lighting;
- ix) Lighting Power Conditioning, Monitoring & Control, or Daylighting Design & Analysis;
- x) Lighting & Architecture, or Lighting & Biological Factors.

These papers will be covered in the first 4 semesters. There will be sessionals on Laboratory and Assignments in the first 2 semesters; on Seminar in semester 3 and on Term Paper leading to Thesis in semester 4. Semester 5 and 6 will be wholly devoted to Project Thesis.

It is interesting to note that SISED introduced some new papers in the M.Tech. course compared to the existing ME course (modifying the existing curriculum of the University follows a time consuming procedure). New papers are III,V,VII, Landscape Lighting in VIII and Lighting & Architecture in option X.

#### National Lighting Code

All these are welcome additions but paper III is inspired by the National Lighting Code, which is very satisfying for me personally (though for most of the other papers as well, the NLC will be an important reference).

#### Laser Animation Laboratory

Paper VII has been made possible, as Mr.Manick Sorcar, a well-known name in the world of entertainment through his brand of magic with laser light (he is the elder son of renowned magician Late P.C. Sorcar) has donated the necessary equipment worth Rs. 50 lakhs from his company in the USA (Sorcar Engineering Inc.) and helped in setting up a laser laboratory, which has been named the "Manick Sorcar Laser Animation Laboratory". Jadavpur University also approved Rs.34 lakhs for the construction of a 1500 sft laboratory at the top floor of the Electrical Engineering building adjacent to the Photometry laboratory. This will not only be India's first course on laser animation technology, but this will be the first ever that a course on this subject will be taught in a University.



Inaugural ribbon being cut by Prof. S. Dutta, Pro-Vice Chancellor of Jadavpur University in the presence of Prof. A.K. Chakraborty, Outstanding Scientist, DRDO, and Assoc. Director, DRDL, Hyderabad, Prof. N. Chakraborti, Dean-Faculty of Engineering & Technology, Prof. A. Mukherjee, Head of Electrical Engineering Dept., and Prof. Saswati

Mazumdar, Director, SISED, JU

In this context, Mr. Sorcar said, "this cutting edge technology can be used for digital artistry, animation, live shows, magic shows, and large-scale theatrical effects, theme parks, planetariums, museums, and architectural applications etc., opening up new, exciting career opportunities - limited only by imagination. What you experience in my show is only a small example; our students will now take it to infinity".

Gradually this subject will be included in the other post-graduate and graduate courses on illumination engineering and electrical engineering. During his visit to JU on March 25-26, 2011, Mr. Sorcar also taught faculty members on how to use the technology to create laser animation. He has also promised to continue the process during his subsequent visits.



(Left) Prof. Dutta delivers his inaugural speech; (Right) Mr. Sorcar speaks about the laboratory

A well-organised inaugural ceremony, and two seminars on "Laser Technology and its Applications" and "Advances in Laser Research and Applications" were held on these two days. At

the end of each day there was a "Laser-Live-Animation Extravaganza" by Manick Sorcar and group.

The School of Illumination Science, Engineering & Design (SISED) has been entrusted with the task of running these courses as a result of what the School has achieved since its inception in the year 2000. Given below are some of the highlights:

#### Development of Laboratory and Testing Equipment

The Illumination Engineering Laboratory has been the nucleus for the development and growth of Lighting activities in JU. This laboratory together with the Electrical



Scenes from the show

Engineering Department was responsible for the success of the ME Course. SISED has received funds from many funding agencies such as World Bank Technical Education Quality Improvement Programme (TEQIP), Department of Science & Technology, University Grants Commission (XIth plan period) etc.

This laboratory has the following sections: Advanced Photometry Lab; Artificial Sky Laboratory and Computerized Light Control Lab; Ballast Testing Lab; Laser Animation Lab;

- Lighting Simulation Lab; and
- Lighting Power Conditioning Lab.

These laboratories contain the following major testing equipment:

CFL life measuring system	LED characteristics & life measuring system						
Chromameter	Luminance meter						
Data logger system	Mirror distribution photometer						
Digital storage oscilloscope	Power meter						

Environmental test chamber	Programmable power source & analyzer
Goniophotometer	Solar irradiance and illuminance meter
High precision LCR meter	Solar pyranometer
Integrating spheres	Spectroradiometer
Laser animation system	UV meter for measuring UV A,B,C

### Library Facilities

There are about 350 books. Journals of all leading International Lighting Societies are available. New facilities have been added for 6 e-Journals.

#### Testing & Consultancy Work

Manufacturers from Eastern Region, M.P., Delhi etc. get their products certified from the Illumination Laboratory of JU regularly. Experts of JU provide necessary consultancies on all types of lighting related problems, be it design or electronic circuit, luminaire photometry or any other.

#### **Research work**

Thrust areas for the past two years cover cost effective and energy-effective lighting applications - both interior and exterior - with emphasis on villages, solar power, integration of daylight and new products like CFL, LED etc. A very recent research work received with financial support from the UGC XIth Plan allocation is a good example, which is "Deployment of Solar Powered Retrofit CFL System to Non-electrified Areas".

#### Short-term course

Advanced Wireman Course- Wiring & Lighting,

### Workshops and Seminars

Many workshops and seminars have been organised over the last few years. Practically all the programmes of Kolkata State Centre of ISLE were organised jointly with SISED at JU.

I was extremely happy to review the above and am now proud to report all these in the Newsletter for the benefit of ISLE members and readers for two reasons:

- 1. It shows how studying lighting courses has become popular with the young professionals and students. Dissemination of knowledge in lighting is one of the main objectives of ISLE. It is heartening to see that the country has reached this stage since the inception of ISLE 28 years ago.
- 2. It has been achieved mainly by the following members of SISED: Prof. Saswati Mazumdar, Director; Dr. Suchandra Bardhan, Jt.Director; Dr. Biswanath Roy, immediate past Jt.Director; Prof.

Somen Chakraborty, First Director; Prof. Kushalendu Goswami, first Jt. Director and Prof. Dr. Sunil Ranjan Bandyopadhay, Advisor (Engineering). Also among the teachers are Mrs. Kamalika Ghosh and Mr. Suddhasatwa Chakraborty. All of them are ISLE members.

I hope this will help all ISLE members to recognise that, there are many young professionals all over the country eager to learn more about lighting. From 1989-90, ISLE was organising short-term courses, workshops and seminars all over the country. This may be the right time to organise more educational programmes in every State/Local Centre with some regularity in a more structured manner.

> Pranab Kumar Bandyopadhyay Advisor (Design), SISED-JU Past UGC Visiting Professor Illumination Engineering, JU Past President, ISLE

# All India Seminar on National Lighting Code 2010

April 7-8, 2011, Kolkata

A seminar on the National Lighting Code was organised jointly by The Institution of Engineers (India), West Bengal State Centre, and the Bureau of Indian Standards, New Delhi at Jadavpur University, Kolkata.

This was the first seminar for promotion of the National Lighting Code 2010 after it was launched in New Delhi at the end of January 2011. BIS selected the West Bengal State Centre of The Institution of Engineers (India) in view of the good experience of earlier joint activities.

### On 7th April Inaugural Session

Mr. Archan Kumar Majumder, Chairman, West Bengal State Centre, IE(I) gave the Welcome Address giving information on the activities and involvement of IE(I) both at home and abroad. Mr. Gautam Ray, Chairman, Electrical Engineering Division, WBSC, IE(I) narrated the programmes already conducted by his Division and announced the forthcoming events including the 27th All India Convention of Electrical Engineers to be held on 10-12 November 2011. Mr. R.K. Trehan, Scientist F, Deputy Director General and Head, Electro Technical Division (ETD), BIS, was the Guest-in-Chief and gave an overview on the 2-day programme. Mr. P.K. Bandyopadhyay, Chairman, BIS Sectional Committee ET24 & NLC Panel, Mumbai delivered the key-note address on the genesis and future prospects of NLC. Prof. Siddhartha Datta, Pro-Vice Chancellor, Jadavpur University was the Guest of Honour and addressed the audience informing them of the excellent educational and research activities of Jadavpur University indicating the unique contribution in the field of Illumination Engineering, JU. The vote of thanks was conveyed by Mr. Nirmal Das, Hony. Secy, WBSC, IEI.

### On 8th April Technical Sessions

There were three Technical Sessions.

Technical Session-I was chaired by Mr. P.K. Bandyopadhyay. He explained the relevance of NLC 2010. Mr. D. Goswami, Scientist E & Director ETD, BIS, New Delhi appraised the contents of the Code itself and the process through which such an important code had been prepared. Mr. S. Chakraborty, Vice President (Technical), Surya Roshni, highlighted the present mode of Interior Lighting through his thoughtful and well illustrated presentation and how the NLC would be useful for this application area.

Technical Session-II was chaired by Mr. S. Roychoudhuri, Co-Chairman, Electrical Engineering Division, WBSC, IE(I) who in his opening remarks explained the objectives of energy conservation. Dr. S. Garg, Energy Economist, Bureau of Energy Efficiency, New Delhi, further elaborated on importance of energy saving and how it could be done specifically in lighting. Ms. Sudeshna Mukhopadhyay, Director-Marketing, Lighting, Philips Electronics India and a leading illumination engineer of our country, through her unique presentation discussed Lighting and Health, which created immense curiosity among the gathering.

Technical Session-III was chaired by Mr. S. Chakraborty. Dr. B. Roy, Associate Professor, Electrical Engineering Dept., Jadavpur University, explained the importance of Photometry for designing energy efficient lighting. As speaker for Sports lighting Ms. Sudeshna Mukhopadhyay made a beautiful presentation on her favourite subject giving a comprehensive insight on how this lighting application is handled today.

The Chairman of the Concluding Session, Mr. P.K. Mukherjee, Ex Dy. Director General, BIS, New Delhi informed the audience about the background and the need for preparing NLC 2010. The questions raised by the audience were answered by speakers.

The vote of thanks was proposed by Dr. B. Roy, Coordinator, Organising Committee. On both the days the auditorium was full with about 120 participants.

> Mr. Manik Ghosh Convenor, Electrical Engineering Divisional Committee, WBSC, IE(I)

> > and

Dr. B. Roy Associate Professor, Electrical Engineering Dept. Jadavpur University

### LEDs IN STREET AND AMBIENT LIGHTING - TWO CASE STUDIES

M. Kostic, L. Djokic, A. Kostic, M Kremic

### Abstract

A comprehensive techno-economic analysis was performed regarding efficiency, maintenance and financial aspects of the use of LEDs in street and ambient lighting. It was shown that the energy savings (if any) when using LED instead of high-pressure sodium (HPS) luminaires in street lighting are frequently negligible. In addition, the total costs of LED lighting solutions are 1,5 to over 5 times higher than those of the comparative HPS lighting solutions. It was therefore concluded that LEDs are not yet appropriate for street lighting. The results of the research also showed that in each case of ambient lighting a techno-economic analysis is needed in order to make the right choice between LED and metal-halide luminaires.

Keywords: Street and ambient lighting, LEDs, Technoeconomic analysis.

### Introduction

Nowadays the lighting community is facing an aggressive promotion of LED technology. The leading LED manufacturers try to convince the lighting designers and potential investors that the fast development of LEDs reached a point when they can successfully be used instead of conventional lamps in urban lighting. Numerous realisations confirm that attractive effects can be achieved in architectural lighting by using LED luminaires (mostly due to their small size, controlled light beam, production of all imaginable colours and possibilities for dynamic lighting). However, the analysis of the justification of the use of LEDs in street and ambient lighting (where photometric requests are dominant or represent one of the most important aspects) must predominantly include high efficiency and a very long life of LED luminaires (50,000 hours, as usually declared), a very good colour rendering of white LED chips, as well as maintenance and financial aspects. In order to achieve this goal, special attention must be given to the fact that the LED luminous flux significantly depends on the junction temperature.

During the declared LED life of 50,000 hours a lumen depreciation factor of 80% (considered as standard at present) can only be achieved if the junction temperature does not exceed 70 C (ILE, 2009). Since the LED luminous flux is generally declared at the junction temperature of 25 C, in case of white LEDs it should be reduced by 10% if the junction temperature equals 70 C (CREE, 2011). Note that very often the junction temperature is above this value, causing a higher reduction in LED luminous efficacy.

### LEDs in street and roadway lighting - case study

An analysis of the effectiveness of the application of neutral white LED lamps in street and roadway lighting was carried out by comparison of two lighting solutions, one realized by the most efficient conventional, high-pressure sodium (HPS), and the other by LED luminaires. All relevant road lighting classes {M1-M6 (CIE, 2010)} and lighting layouts were taken into account, assuming the standard reflection class R3. Note that the lighting solutions had to fulfil all of the requirements regarding luminance level, overall and longitudinal luminance uniformities, and threshold increment (CIE, 2010). A software Ulysse (Version 2.1), developed by Schreder, which is intended for outdoor lighting design, was used.

The common input data for all of the considered lighting solutions included:

- lane width of 3.5 m,
- central reservation width of 3 m,
- distance between the lighting post and the carriageway of 1 m (1.5 m for the central layout),
- type of HPS lamp: SON-T Plus (Philips Lighting),
- luminous flux of LED chips: 90 lm/W (as explained in Section 1, the usually declared luminous flux of neutral white LEDs of 100 lm/W is reduced by 10 %), and
- types of luminaire: ONYX 2 for HPS lamps, and SENSO 1 (58, 65 and 74 W) and SENSO 2 (101 and 115 W) for LEDs (Schreder), with a glass protector (IP65).

The luminaire maintenance factor is equal to the lamp lumen depreciation (LLD) factor multiplied by the luminaire dirt depreciation (LDD) factor. While the adopted LLD factor for LED lamps is 0,80 (see Section 1), the LLD factor for high performance HPS lamps, determined assuming their usual lifetime of 16,000 hours (4 years), amounts to 0,94 (Kostic, Djokic, 2009). For the luminaire degree of protection of IP6X, which is (or is becoming) most frequently requested in urban lighting, and assuming a medium atmospheric pollution and a cleaning period of 4 years, the LDD factor for both HPS and LED luminaires equals 0,85 (BSI, 1992). Therefore, the maintenance factor was determined to amount 0,80 for HPS and 0,68 for LED luminaires.

For city streets mounting height of the luminaire, H, was limited to 8 m, with the only exception being the central layout where H = 10 m was determined as the upper limit. For highways the mounting heights of 12 m and 13 m were considered.

For each of the considered cases Tables 1 and 2 present the best lighting solution regarding each of the following two criteria: the minimum installed power,  $P_{\rm min}$ , and the minimum number of posts (the longest spacing between adjacent posts,  $s_{\rm max}$ ). The presented lighting solutions are determined by varying lamp power, luminaire height,

overhang (*o*) and tilt angle (*a*), as well as the postition of the lamp within the HPS luminaire. It is obvious that the lighting solutions also depend on the lamp luminous flux and luminaire type (its luminous intensity table and IP degree of protection). However, lamps and luminaires produced by leading manufacturers have similar relevant characteristics, so that the results presented in Tables 1 and 2 can help to reach some general conclusions.

Comparing the corresponding installed powers  $(N_1 P_1)$  in Tables 1 and 2, it can be concluded that when using LED instead of HPS luminaires the energy savings amount between +29,9 % and -79,3 %. In the case of single-sided, staggered and opposite layouts average energy savings of 9,8 %, 5,3 % and 0,1 %, respectively, are obtained (on average, the energy savings corresponding to these layouts amount to 4,6 %). However, in the case of a central layout with 3 lanes the electricity consumption when using LEDs is (considerably) higher than when HPS luminaires are applied (39 % in city streets, and 70 % on highways).

The results also show that LED luminaires are not yet suitable for M1 lighting class. In addition, Table 2, related to LED luminaires, supports the unfavourable subjective feeling of the observers regarding glare - the TI values are close to the allowed limits (CIE, 2010).

The conducted analysis showed that the possible energy savings when using LED instead of HPS luminaires (without taking into account mesopic effects) are negligible or negative. This conclusion is backed by the following results, not deviating much from those presented above: for collector roads ( $L_{\rm av} = 0.6$  cd/m<sup>2</sup>), on average, the LED streetlights require 1 % (a staggered layout) and 10 % (a single-sided layout) less power than the HPS streetlights (NLPIP, 2010).

# The economic comparison of HPS and LED luminaires

The economic comparison of HPS and LED luminaires applied in street and roadway lighting was made using the

Layout	Lighting	Criterion	s	н	о	α	L <sub>av</sub>	U	U	ті	Plamp	N <sub>1</sub> P <sub>1</sub>
	class		(m)	(m)	(m)	(°)	(cd/m <sup>2</sup> )	(%)	(%)	(%)	(W)	(W)
	M3	S <sub>max</sub>	37	8	0,0	10	1,02	62,5	61,6	11,4	150	14145
	M3	P <sub>min</sub>	34	8	0,5	10	1,09	40,8	64,0	14,8	100	10232
Single-sided	M4	S <sub>max</sub>	37	8	0,5	10	0,73	54,8	58,2	10,2	100	9430
2 lanes	M4	P <sub>min</sub>	28	7	0,5	5	0,73	47,2	63,3	9,7	70	8694
	M5	S <sub>max</sub>	44	8	0,5	10	0,63	40,3	40,8	10,8	100	7935
	M5	P <sub>min</sub>	41	8	0,0	5	0,48	51,2	42,3	9,7	70	5957
	M6	s <sub>max</sub> / P <sub>min</sub>	44	8	0,5	10	0,39	41,3	40,8	9,1	70	5555
	M3	S <sub>max</sub>	42	8	0,0	10	0,97	45,5	62,3	8,0	100	16445
	M3	P <sub>min</sub>	34	7	0,5	10	0,96	40,3	64,8	9,4	70	14249
Staggered	M4	S <sub>max</sub>	50	8	0,5	10	0,83	39,2	58,2	8,2	100	13915
3 lanes	M4	P <sub>min</sub>	42	8	0,0	10	0,72	39,8	63,1	8,5	70	11512
	M5	S <sub>max</sub>	72	8	0,0	10	0,60	40,5	39,2	11,3	100	9660
-	M5	P <sub>min</sub>	68	8	0,5	10	0,48	41,5	39,7	9,6	70	7165
	M2	s <sub>max</sub> / P <sub>min</sub>	31	8	-0,5	5	1,57	49,2	70,3	10,0	100	22310
Opposite	M3	S <sub>max</sub>	36	8	0,0	10	1,14	49,9	60,3	11,9	100	19320
3 lanes	M3	P <sub>min</sub>	33	8	0,0	5	0,96	50,8	60,9	10,5	70	14651
	M4	s <sub>max</sub> / P <sub>min</sub>	36	8	0,5	10	0,85	44,0	59,0	11,6	70	13524
	M1	S <sub>max</sub>	30	8	0,0	10	1,95	51,0	68,3	10,0	150	34845
	M1	P <sub>min</sub>	24	8	0,5	10	1,95	51,1	76,1	9,5	100	28980
Opposite	M2	S <sub>max</sub> / P <sub>min</sub>	28	8	0,0	10	1,54	59,1	71,1	9,9	100	24840
4 lanes	M3	S <sub>max</sub>	36	8	0,0	10	0,98	40,5	61,1	11,2	100	19320
	M3	P <sub>min</sub>	28	7	0,5	5	0,98	40,8	63,8	11,1	70	17388
Central	M1	s <sub>max</sub> / P <sub>min</sub>	38	10	1,0	10	2,14	41,5	70,9	10,0	250	45425
3 lanes (city streets)	M2	S <sub>max</sub> / P <sub>min</sub>	32	10	1,0	10	1,44	40,9	81,7	8,5	150	32430
Central	M1	s <sub>max</sub> / P <sub>min</sub>	45	13	1,0	10	1,93	39,7	75,0	8,8	250	38525
3 lanes (highways)	M2	S <sub>max</sub> / P <sub>min</sub>	55	13	0,5	10	1,44	39,3	70,2	9,7	250	31625

 Table 1. Principal data of the HPS street and roadway lighting solutions

Note:  $N_1$  represents the number of luminaires along a considered road section of 3 km,  $P_1$  the wattage of the lamp and ballast (15 % higher than the lamp wattage,  $P_{lamp}$ ), and s the spacing between adjacent posts on one side of the street.

Layout	Lighting	Criterion	s	н	0	α	L <sub>av</sub>	U	U	TI	Plamp	N <sub>1</sub> P <sub>1</sub>
	class		(m)	(m)	(m)	(°)	(cd/m <sup>2</sup> )	(%)	(%)	(%)	(W)	(W)
	M3	S <sub>max</sub>	34	8	0,7	0	0,97	53,1	73,2	13,5	115	11259
	M3	P <sub>min</sub>	24	7	0,5	0	0,97	41,8	84,1	14,4	74	10256
Single-sided	M4	S <sub>max</sub>	40	8	0,7	5	0,73	49,8	59,7	13,8	115	9614
2 lanes	M4	P <sub>min</sub>	30	7	0,5	0	0,74	41,9	68,3	14,9	74	8221
	M5	S <sub>max</sub>	50	8	0,2	5	0,52	46,6	39,1	14,9	115	7717
	M5	P <sub>min</sub>	47	8	0,5	0	0,50	46,1	39,8	15,0	74	5210
	M6	s <sub>max</sub> / P <sub>min</sub>	50	8	-0,5	5	0,29	52,8	42,3	15,2	58	3892
	M3	S <sub>max</sub>	48	8	0,7	10	0,99	41,0	63,3	14,4	115	15939
	M3	P <sub>min</sub>	36	8	0,5	0	1,00	46,7	72,5	12,3	74	13594
Staggered	M4	S <sub>max</sub>	48	8	0,7	10	0,84	45,5	61,7	15,0	101	13999
3 lanes	M4	P <sub>min</sub>	46	8	-0,5	5	0,72	47,4	59,1	15,0	74	10663
	M5	S <sub>max</sub>	86	8	0,7	10	0,52	41,9	39,1	14,9	115	8855
	M5	P <sub>min</sub>	66	8	0,5	0	0,48	34,5	40,5	14,3	65	6507
	M2	s <sub>max</sub> / P <sub>min</sub>	20	8	0,5	0	1,44	55,4	87,2	9,9	65	21593
Opposite	M3	S <sub>max</sub>	43	8	0,2	5	1,04	40,2	59,6	14,9	115	17710
3 lanes	M3	P <sub>min</sub>	37	8	0,5	0	0,97	43,9	64,5	13,6	74	13350
	M4	s <sub>max</sub> / P <sub>min</sub>	40	8	0,5	0	0,72	40,3	66,1	13,5	65	10868
	M1	S <sub>max</sub>	19	8	0,2	0	1,95	62,3	89,7	10,0	115	39974
Opposite	M1	P <sub>min</sub>	14	7	-0,5	0	1,96	47,3	92,9	10,0	74	35002
4 lanes	M2	s <sub>max</sub> / P <sub>min</sub>	18	8	-0,5	0	1,50	58,0	90,2	9,9	74	27188
	M3	S <sub>max</sub>	40	8	-0,3	0	1,05	48,3	60,8	14,9	115	19228
	M3	P <sub>min</sub>	30	7	0,0	0	0,96	48,9	72,2	13,5	74	16443
Central	M1	s <sub>max</sub> / P <sub>min</sub>	12	10	1,2	0	2,02	40,6	92,9	7,5	115	63503
3 lanes (city streets)	M2	s <sub>ma</sub> x/ P <sub>min</sub>	17	10	1,2	0	1,43	40,7	94,3	7,6	115	44781
Central	M1	s <sub>max</sub> / P <sub>min</sub>	11	12	0,2	0	2,04	42,6	97,8	6,6	115	69069
3 lanes (highways)	M2	s <sub>max</sub> / P <sub>min</sub>	15	12	0,2	0	1,50	41,6	92,5	6,5	115	50853

#### Table 2. Principal data of the LED street and roadway lighting solutions

Note: Note: Note:  $N_1$  represents the number of luminaires along a considered road section of 3 km,  $P_1$  the wattage of the lamp and driver (10% higher than the lamp wattage,  $P_{lamp}$ ), and s the spacing between adjacent posts on one side of the street.

generally accepted cost-discount method (Kostic, Djokic, Pojatar, 2009). The total (life cycle) costs within the same (exploitation) period, *T*, including the initial, electricity and maintenance costs, discounted to the end of the exploitation period, were computed. Since the usual exploitation periods belong to the range of 20-30 years, a period of T = 24 years was adopted, being divisible by both the period of group HPS lamp replacement (4 years) and the period of group LED luminaire replacement (12 years).

The initial (investment) costs involve the cost of the design, the cost of material, equipment and devices, the labour cost, as well as the cost of testing the new lighting installation. Since a lot of various costs are practically equal in both cases (costs of design, transformer stations,

distribution boards, cables, etc.), only costs of poles, brackets, luminaires and lamps (including their installment) were compared (Kostic, Djokic, Pojatar, 2009).

The maintenance costs predominantly include the costs intended for luminaire cleaning (every fourth year) and for periodic lamp or luminaire replacement. The costs for the replacement of early failed HPS lamps or LED chips were not taken into account because they usually represent up to 1 % of the total costs for the HPS lighting solutions, while there is no available data for LED luminaires.

The initial costs ( $C_{in}$ ) can be calculated by using Eq. (1) (Kostic, Djokic, Pojatar, 2009):

$$C_{\rm in} = N_{\rm p} \left[ C_{\rm p} + C_{\rm b} + k \left( C_{\rm l} + C_{\rm wl} \right) + C_{\rm wp} \right], \tag{1}$$

where:

- $N_{\rm p}$  is the number of poles along the considered road section,
- $C_{p}$  is the price of the pole with the necessary equipment and accessories (electric board with fuse, wiring, base plate, anchor bolts, etc.),
- $C_{\rm b}$  is the price of a single or twin bracket,
- *k* is the number of luminaires per pole,
- *C*<sub>1</sub> is the price of the luminaire (equipped with lamp and ballast or driver),
- $C_{\rm wl}$  is the cost for luminaire installment, and
- $C_{wp}$  is the cost for pole installment, including the cost of pole foundation.

The annual electricity cost ( $C_e$ ) can be computed using Eq. (2) (Kostic, Djokic, Pojatar, 2009):

$$C_{\rm e} = k N_{\rm p} C_{\rm 1e}, \tag{2}$$

where  $C_{1e}$  is the annual electricity cost per luminaire, which can be determined by Eq. (3):

$$C_{1e} = P_1 t C_e, \tag{3}$$

where t is the annual lamp operation time (an average of t = 4000 h was adopted), and  $c_{\rm e}$  is the electricity cost rate.

Since an optimum maintenance procedure in case of HPS luminaires assumes a periodic group lamp replacement, with the luminaire cleaning taking place only when the lamp is replaced (Philips Lighting, 1993), the cost for each group lamp replacement ( $C_{\rm gr}$ ) can be calculated using Eq. (4):

$$C_{\rm gr} = k N_{\rm p} (C_{\rm l.s.} + C_{\rm g.r.l}),$$
 (4)

where  $C_{\rm l.s.}$  is the price of the lamp (light source), and  $C_{\rm g.r.l.}$  represents the vehicle and labour cost for the lamp replacement and luminaire cleaning.

In case of LED luminaires there are two types of maintenance: group luminaire cleaning (every fourth year) and group luminaire replacement (twelve years after the initial installment). The cost for each group luminaire cleaning ( $C_{\rm er,cl}$ ) can be computed using Eq. (5):

$$C_{\rm gr.cl.} = k N_{\rm p} C_{\rm cl},\tag{5}$$

where  $C_{\mbox{\tiny cl}}$  involves the vehicle and labour cost for a luminaire cleaning.

The cost for group luminaire replacement  $(C_{\rm gr.lr.})$  is determined by Eq. (6):

$$C_{\rm er.lr.} = k N_{\rm p} (0.5 C_{\rm l} + C_{\rm wl})$$
 (6)

(it is assumed that the further development of LED technology will reduce the present luminaire price for 50%).

The total and all other relevant costs (discounted to the end of the exploitation period) of photometrically comparative lighting solutions for relevant streets and roads and their lighting classes, realized by both HPS and LED luminaires, were calculated using formulas derived by Kostic, Djokic, Pojatar, 2009. The same reference also contains all equipment and labour costs used in this research, the only exception being the prices of the luminaires ONYX 2 (for HPS lamps) and SENSO 1 and SENSO 2 (both for LEDs), which are given in Table 3. All of the costs were computed assuming the following values of the discount rate (annual increase of capital): i = 5%, 7,5 % and 10 %, as well as the following values of the electricity cost rate:  $c_s = 0,06, 0,08, 0,10$  and  $0,12 \notin kWh$ . These costs are presented in 24 tables (12 for HPS and 12 for LED lighting solutions), each containing the values for a specific discount rate and a single cost electricity rate. The illustrative Table 4 only contains extracts from the HPS and LED tables which refer to i = 7,5 % and  $c_{a} = 0,1 \in /kWh$ . An analysis of those two tables showed that the ratio between the total discounted costs related to the comparative LED and HPS lighting solutions belongs to the range of 1,51 - 5,86. In some cases the total costs are lower when the criterion  $\boldsymbol{s}_{_{\rm max}}$  is applied (one of them, related to HPS lamps and M4 lighting class, can be seen in Table 4). In the case of single-sided, staggered and opposite layouts the LED lighting solutions are, on average, 1,90, 1,89 and 2,21 times, respectively, more expensive than the corresponding HPS lighting solutions. The fact that the average ratio in the case of the central layout amounts to 4,86 additionally supports the conclusion that LEDs are not appropriate for the central layout with 3 lanes. It should be noted that an average participation of the maintenance costs in the total costs amounts to 5% in case of the HPS, and  $12{,}5\%$  in case of the LED lighting solutions. An analysis of the remaining 22 tables resulted in conclusions similar to those presented above.

**Table 3.** Prices of ONYX 2, SENSO 1 and SENSO 2 luminaires(without taxes) depending on lamp power

P <sub>lamp</sub> (W)	70	100	150	250	/
ONYX 2 (€)	254	268	273	287	1
P <sub>lamp</sub> (W)	58	65	74	101	115
SENSO1 (€)	1043	1102	1170	/	1
SENSO2 (€)	1	/	/	1463	1573

#### LEDs in ambient lighting - case study

An analysis of the effectiveness of the application of LEDs in ambient lighting was also performed by comparison of two lighting solutions, both suitable for ambient lighting (white colour, excellent colour rendering and stable colour temperature) - one was realized by metal-halide (MH) lamps **Table 4.** Some illustrative examples of the initial, electricity, maintenance and total (discounted) costs ( $C_{ind}$ ,  $C_{ed}$ ,  $C_{grd}$  and  $C_{d}$ , respectively) related to the comparative HPS and LED street lighting solutions

Layout	Lighting	Criterion	Lamp	C <sub>ind</sub>	C <sub>ed</sub>	$C_{grd}$	C <sub>d</sub>
	class		type	(1000 €)	(1000 €)	(1000 €)	(1000 €)
	M3	$P_{min}$	HPS	416	255	35,9	706
Single-sided			LED	1212	256	207	1674
2 lanes	M5	$P_{min}$	HPS	338	148	28,7	516
			LED	626	130	105	861
Staggered	M4	S <sub>max</sub>	HPS	565	347	48,8	961
3 lanes			LED	1442	349	251	2042
Staggered	M4	P <sub>min</sub>	HPS	654	287	55,5	996
3 lanes			LED	1257	266	215	1738
Opposite	M2	s <sub>max</sub> / P <sub>min</sub>	HPS	869	556	78,3	1504
3 lanes			LED	2839	538	472	3849
Opposite	M2	s <sub>max</sub> / P <sub>min</sub>	HPS	1005	619	87,1	1711
4 lanes			LED	3206	678	549	4432
Central	M2	s <sub>max</sub> / P <sub>min</sub>	HPS	653	808	72,9	1534
3 lanes			LED	3841	1116	751	5708
(city streets)							

concluded that when using LED instead of MH luminaires the energy savings belong to the range between +32,8 % and -18,4 %. For 3 m wide paths the average energy savings equal 20,7 %, while for paths 6 m wide the result is negative (the average increase of the electricity consumption amounts to 6,9 %). Table 6, related to LED luminaires, supports the unfavourable subjective feeling of the observers regarding facial recognition: in order to fulfil the recently introduced requests regarding the semi-cylindrical illuminance,  $E_{\rm sc}$  (CIE, 2010), the path illuminance levels higher than necessary must frequently be achieved.

# The economic comparison of MH and LED luminaires

The prices of the luminaires used in this analysis are given in Table 7. As in the previous case study, 24 tables (12 for MH and 12 for LED lighting solutions) were made

with a ceramic discharge tube, and the other by warm white LED lamps (72 lm/W). The pedestrian path of 3 m width was considered in case of P3, P4 and P5 lighting classes, and of 6 m width in case of P1, P2 and P3 lighting classes (CIE, 2010). In all cases a single-sided layout was considered, assuming the distance of 0,5 m or 1 m between the post and the path edge. The mounting height of the luminaires was adopted to be 4 - 6 m.

The following luminaire types were used: CITEA MINI (35 and 70 W) and CITEA MIDI (70, 100 and 150 W), both with MH lamps, and CITEA MIDI LED (19,3, 38,5, 57,8 and 77 W).

The maintenance factor was adopted to be 0,71 for the MH luminaires (group lamp replacement and luminaire cleaning every second year) (Kostic, Djokic, 2009), and 0,68 for the LED luminaires (assuming luminaire cleaning every fourth year). As in the previous case study, the group LED luminaire replacement was assumed to occur in the middle of the exploitation period of 24 years.

Note that the lighting solutions had to fulfil all of the lighting criteria regarding illuminance level, the minimum horizontal illuminance, semi-cylindrical illuminance (facial recognition is necessary) and threshold increment (CIE, 2010). The obtained results are shown in Table 5 ( $P_1 = 1,15 P_{\text{lamp}}$ ) and Table 6 ( $P_1 = 1,1 P_{\text{lamp}}$ ). In all cases the luminaire tilt angle was 0°.

Comparing the corresponding values of the installed power  $(N_1 P_1)$  in Tables 5 and 6, it can be

Table 5. Principal data of the MH	nedestrian nath lighting solutions
Table 5. Fincipal data of the Will	pedesilian pain lighting solutions

				•			•	•		
Lighting class	Criterion	s (m)	H (m)	o (m)	E <sub>hav</sub> (Ix)	E <sub>hmin</sub> (Ix)	E <sub>sc</sub> (Ix)	ТI (%)	P <sub>lamp</sub> (W)	N <sub>1</sub> P <sub>1</sub> (W)
P3	S <sub>max</sub>	23	5	-0,7	25,2	8,8	1,5	23,5	100	15065
w = 3m	P <sub>min</sub>	17	5	-0,8	13,7	7,8	1,6	11,1	35	7124
P4	s <sub>max</sub>	24	5	-0,8	19,3	7,7	1,0	20,1	70	10143
w = 3m	P <sub>min</sub>	20	5	-0,8	11,6	5,0	1,0	15,3	35	6078
P5	s <sub>max</sub>	27	5	-0,8	16,7	5,6	0,6	22,3	70	9016
w = 3m	P <sub>min</sub>	23	5	-0,8	10,1	4,2	0,6	16,9	35	5273
P1	S <sub>max</sub>	18	6	-0,3	17,4	8,4	3,1	11,2	70	13444
w = 6 m	P <sub>min</sub>	11	6	-0,3	15,1	10,1	3,0	5,0	35	10988
P2	S <sub>max</sub>	22	6	-0,8	13,6	5,4	2,1	13,5	70	11029
w = 6 m	P <sub>min</sub>	15	6	-0,3	10,4	4,6	2,1	8,8	35	8090
P3	S <sub>max</sub>	25	6	-0,7	16,4	4,9	1,5	21,7	100	13915
w = 6 m	P <sub>min</sub>	18	6	-0,3	8,7	4,2	1,5	9,7	35	6722

Table 6. Principal data of the LED pedestrian path lighting solutions

Lighting class	Criterion	s (m)	H (m)	o (m)	E <sub>hav</sub> (Ix)	E <sub>hmin</sub> (Ix)	E <sub>sc</sub> (Ix)	т। (%)	P <sub>lamp</sub> (W)	N <sub>1</sub> P <sub>1</sub> (W)
P3	S <sub>max</sub>	20	5	-0,7	13,5	7,7	1,6	16,5	77	12790
w = 3m	P <sub>min</sub>	12	4	-0,7	7,7	5,0	1,6	14,1	19,3	5329
P4	S <sub>max</sub>	21	5	-0,7	9,6	5,3	1,0	16,2	57,8	9092
w = 3m	P <sub>min</sub>	15	5	-0,7	5,1	2,5	1,0	9,7	19,3	4267
P5	S <sub>max</sub>	24	5	-0,7	8,4	4,1	0,6	18,0	57,8	8011
w = 3m	P <sub>min</sub>	18	5	-0,7	4,3	2,0	0,6	11,1	19,3	3545
P1	S <sub>max</sub>	16	6	0,3	15,9	6,7	3,3	11,0	77	15924
w = 6 m	P <sub>min</sub>	10	4	0,3	15,5	7,5	2,9	16,7	38,5	12747
P2	S <sub>max</sub>	20	6	-0,7	11,6	7,8	2,1	13,4	77	12790
w = 6 m	P <sub>min</sub>	14	5	0,3	9,8	5,9	2,0	12,6	38,5	9105
P3	S <sub>max</sub>	22	6	-0,7	10,6	6,9	1,6	14,5	77	11604
w = 6 m	P <sub>min</sub>	10	4	0,3	7,7	3,8	1,5	14,6	19,3	6390

containing the total and other relevant (discounted) costs. Table 8 only contains extracts from the two tables which refer to i = 7.5 % and  $c_e = 0.1 \notin$ /kWh. An analysis of those two tables showed that the ratio between the total discounted costs related to the LED and MH lighting solutions lies between 1,08 and 1,65 (the average value: 1,36).

**Table 7**. Prices of CITEA MINI, CITEA MIDI and CITEA MIDI LED

 luminaires (without taxes) depending on lamp power

P <sub>lamp</sub> (W)	35	70	100	150
CITEA MINI (€)	573	610	/	/
CITEA MIDI (€)	1	383	417	425
P <sub>lamp</sub> (W)	19,3	38,5	57,8	77,0
CITEA MIDI LED (€)	555	747	1049	1242

**Table 8.** Some illustrative examples of the total and other relevant costs related to the comparative MH and LED pedestrian path lighting solutions

Lighting class	Criterion	Lamp type	C <sub>ind</sub> (1000 €)	C <sub>ed</sub> (1000 €)	C <sub>grd</sub> (1000 €)	C <sub>d</sub> (1000€)
P3	S <sub>max</sub>	MH	646	375	209	1230
w = 3m		LED	1451	319	261	2031
P4	P <sub>min</sub>	MH	878	151	241	1271
w = 3m		LED	1148	106	183	1438
P5	P <sub>min</sub>	MH	762	131	209	1102
w = 3m		LED	954	88	152	1194
P1	S <sub>max</sub>	MH	1025	335	267	1627
w = 6 m		LED	1860	397	325	2582
P2	S <sub>max</sub>	MH	841	275	219	1334
w = 6 m		LED	1468	319	261	2048
P3	P <sub>min</sub>	MH	990	168	267	1424
w = 6 m		LED	1737	159	274	2170

### Conclusions

A comprehensive techno-economic analysis was performed regarding efficiency, maintenance and financial aspects of the use of LEDs in street and ambient lighting. Through the two case studies all relevant influencing factors were taken into account.

Regarding street lighting, it was concluded that energy savings when using LED instead of HPS luminaires are frequently negligible. There are cases (for example, roads with M1 lighting class or with the staggered layout with 3 lanes) where the electricity consumption related to the LED lighting solution is considerably higher than when HPS luminaires are applied. The total costs of LED lighting solutions are 1,5 to over 5 times higher than those of the comparative HPS lighting solutions. Therefore, LEDs are not yet appropriate for street and roadway lighting.

As for the illumination of pedestrian paths, there are cases where the application of LEDs enables certain energy savings compared with the use of MH lamps. Even in such cases LED lighting solutions seem to be more expensive (up to 1,65 times). Therefore, each case should particularly be evaluated.

It was also shown that in addition to the usually applied criterion of the minimum installed power the criterion of the maximum luminaire spacing should also be considered in order to achieve optimal lighting solutions.

#### References

- 1. BSI 1992. BS 5489, Part 2. Code of Practice for Traffic Routes. London: BSI.
- 2. CIE 2010. CIE 115:2010. Lighting of Roads for Motor and *Pedestrian Traffic.* Vienna: CIE.
- 3. CREE 2011. Cree/X Lamp/XP-E LEDs Data Sheet. <www.cree. com>.
- 4. ILE 2009. Understanding LEDs. Rugby: ILE.
- KOSTIC, M., DJOKIC, L. 2009. Recommendations for Energy Efficient and Visually Acceptable Street Lighting. *Energy*, 34, 1565-1572.
- KOSTIC, M., DJOKIC, L., POJATAR, D., STRBAC-HADZIBEGOVIC, N. 2009. Technical and Economic Analysis of Road Lighting Solutions Based on Mesopic Vision. *Building and Environment*, 44, 66-75.
- NLPIP 2010. NLPIP Specifier Reports 13/1. Streetlights for Collector Roads. Troy: NLPIP.
- PHILIPS LIGHTING 1993. Lighting Manual, 5<sup>th</sup> ed. Eindhoven: Philips Lighting.

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### ERRATA

In the last issue we had inadvertently given an incorrect email address for the new ISLE General Manger, Mr. Tapan K. Chattopadhyay incorrectly. The correct address is:

tapanisle@yahoo.co.in

The error is regretted.

Mr. Chattopadhyay is available at the following address: A 274 Defence Colony 1st Floor, New Delhi 110 024

Tel.: 46562981/82

## **NEWS ABOUT MEMBERS**

# KSC Members Conduct Failure Analysis of Richmond Road Flyover LED Street Lights

Members of ISLE Karnataka State Centre have been appointed by the Bureau of Energy Efficiency, Govt of India Delhi to go through this Pilot Project of LED Street Lighting on Richmond Road flyover and give their observations and the reasons for the failure.

They have had two sittings on 18th and 19th of March 2011 and have given an interim report with their observations and the possible reasons for the failure. Further documents and information from the department are awaited to enable them to have one more Joint Inspection to analyse the reasons for the failure and to give a detailed report.

It is hoped that this will give the State Centre members an opportunity to associate themselves with other projects at the initial stages.

The project is now being handled by Mr.M.S.N. Swamy and Mr. J.N. Bhavani Prasad supported by Mr. Ravi Rao and M.G. Sathyendra.

## WEBWATCH

### Magsaysay for India's Solar Lighting Pioneer

Harish Hande, the IITian (IIT-Kharagpur) and University of Massachusetts doctorate and founder of Selco gets the coveted Ramon Magsaysay Award 2011 for his pioneering efforts to provide solar-based lighting solutions in rural India.

The lantern for the program comes from Dr. H. Harish Hande's Solar Electric Light Company (Selco) India, a social enterprise founded by him in 1995 to electrify rural India using innovative solar power technologies. Dr. Hande was a member of the jury for Technology Review India's Grand Challenges 2010 program to pick innovative technology solutions relevant to India.

In the last few years, the program has caught on with the involvement of civil society groups and philanthropic organizations, and micro finance institutions in the states of Karnataka, Gujarat and Kerala. Selco, founded as a social enterprise, works with these groups to provide innovative lighting solutions in rural areas. More than 125,000 households in these states have benefited from the Selco program so far.

Link:

http://www.technologyreview.in/blog/post. aspx?bid=371&bpid=27039

### Studies Published on Minimizing Flicker from SSL Systems; ASSIST to Release Related Recommendation

Flicker and stroboscopic effects have been a concern with solid-state lighting (SSL), and industry and the ENERGY STAR program have debated recently the effects of frequency and other driving modes on the perception and acceptability of flicker. To provide further data and guidance in this area, the LRC has conducted human factors studies of flicker that were recently published in the Lighting Research and Technology journal.

Link:

http://www.lrc.rpi.edu/resources/newsroom/pr\_ story.asp?id=205

# Recommendations for Evaluating Street and Roadway Luminaires

Outdoor lighting is a critical component for communities because it can provide visibility, promote a sense of security, deter crime and attract economic activity. Its selection and implementation have to be carefully considered, however, to optimise energy efficiency while minimising undesirable effects, such as glare. Because new light source technologies promising greater efficiency are now coming to market for outdoor lighting applications, including LEDs and induction lamps, municipalities and businesses are re-evaluating what type of lighting works best outdoors.

In 2009, ASSIST published an alternative method for evaluating outdoor luminaires designed for parking lot lighting. The ASSIST metric, called luminaire system application efficacy (LSAE), is based on the concept of application efficacy in which efficacy is measured by the amount of luminous flux reaching the task plane that meets the application's photometric requirements rather than all the lumens exiting the luminaire. For a parking lot luminaire, this meant counting the lumens reaching the parking lot ground that conformed to recommended illuminance and uniformity guidelines, and discounting everything falling outside the application area or not conforming to photometric requirements. This new volume of ASSIST recommends extends the parking lot LSAE metric to street and roadway luminaires.

A detailed description of ASSIST's street and roadway luminaire evaluation method can be found online.

Link:

http://www.lrc.rpi.edu/programs/solidstate/ assist/recommends/roadway.asp.

# Recommendations for Estimating Discomfort Glare

Because outdoor lighting is utilised at relatively low light levels and because outdoor lighting equipment (e.g., lamps and luminaires) tends to be relatively bright, there is a substantial potential for discomfort glare in outdoor lighting applications. This volume of ASSIST recommends describes a calculation method for predicting discomfort glare from outdoor lighting systems, based on an existing rating scale and a published discomfort glare model.

Discomfort glare is defined as the annoying or even painful sensation from viewing a bright light, whereas disability glare is the reduction in visibility that a bright light might cause. "Disability glare and its mechanisms have been well understood for a long time, but discomfort glare is something less well known and no accurate method of measurement or prediction has existed," said LRC senior research scientist John Bullough, Ph.D., lead author of the ASSIST volume. Current assessments typically use a subjective rating scale developed in the 1960s, called the De Boer rating scale. Recent LRC research has shown that De Boer ratings of discomfort glare are much more strongly related to the glare source's illuminance than to its luminance. With this finding, the LRC published a model of discomfort glare in 2008 as part of an outdoor site-lighting performance system for assessing the potential of an outdoor lighting installation to produce light pollution.

The ASSIST calculation method is an extension of this model that incorporates the source luminance, resulting in improved predictions of the De Boer rating for a given lighting system.

A detailed description of ASSIST's discomfort glare calculation method can be found online.

Link:

http://www.lrc.rpi.edu/programs/solidstate/assist/ recommends/discomfortglare.asp.

## MEMBERSHIP APPLICATIONS APPROVED BY GOVERNING BODY

#### New Members Admitted on 14<sup>th</sup> June 2011

M. No	Name & Addresses	Grade	Centre
I.0155	Sarja Electrical & Engineering Service 82, Amarsanjay Society In front of Allahabad Bank Manish Nagar, Wardha Road Nagpur 440 015	Institutional	Mumbai
IM.0155	Bhupendra Bhoyar Sarja Electrical & Engineering Service 82, Amarsanjay Society In front of Allahabad Bank Manish Nagar, Wardha Road Nagpur 440 015	Institutional Representative	Mumbai

F(L).0724	Ramesh Srikonda Plot No. 12 Road 1 RTC Colony Near Sai Baba Mandir Vijaywada 520 008	Follow (Life)	Chennai	
M(L).1622	Nagaraju Kaja 2nd Floor, Annapurna Nilayam D.No. 23-14-14 Gadiyaram Vari Street S.N. Puram Vijaywada-520 011 Andhra Pradesh	Member (Life)	Chennai	
M(L).1623	Samir Balkrishna Shah Power Smart Technologies 312, Abhishree Building Satellite Road Ahmedabad 380 015	Member (Life)	Mumbai	
M(L).1624	Aditya Trivedi Bajaj Electricals Ltd 3rd Floor, Commerce House 7 Race Course Road Indore	Member (Life)	M P	
M(L).1625	Vinayak Vipat KTP Consultants & Engineering Services 205, Lokmanya Nagar RTO Office Road Indore 452 009	Member (Life)	M P	
M(L).1626	Nimit Badjatya B 68/69 Nemi Nagar Jain Colony Indore	Member (Life)	M P	
M(L).1627	Shirish Purandare Alpha Corporation 8-B Kalyan Vishranti Graha Opp. Railway Station Indore	Member (Life)	М Р	
M(L).1628	Rishikesh Vinchurkar Alpha Corporation 8-B Kalyan Vishranti Graha Opp. Railway Station Indore	Member (Life)	ΜР	
M(L).1629	Pavitra Agal Shreedhar, 10-A BJ Vihar, Nemawar Road Behind SBI Indore	Member (Life)	МΡ	
M(L).1630	Sanjay Sharma 59, Swami Vivekanand Nagar Kanadia Road Indore	Member (Life)	M P	
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A(L).1069	Himanshu Singh Thorn Lighting India Pvt Ltd A-274, First Floor Defence Colony New Delhi 110 024	Associate (Life)	Delhi	
A.1070	Bijoy Raha Room No. B-603 S S Enclave, Beta-II Greater Noida (U P)	Associate	Delhi	
A(L).1071	Nidhi Mohta G-12 Kanchan Vihar 45 Kanchan Bagh Indore 452 001	Associate (Life)	M P	
A(L).1072	Adnan Manasawala Eagle Techsec Communications (I) M-23/24, New Siyagan VIP Road No. 1 Indore	Associate (Life	M P	
S.0617	Amit Suresh Closepet # 1155, 22nd Cross BSR 2nd Stage Bangalore 560 070	Student	Karnataka	

S.0618	K. Gowtham Chakravarthy	Student	Chennai	New Memi	bers Admitted on 20th July 20	011	
H.No. 3-37 Andhra Bank Road, Ibrahimpatnam Krishna (A P)			F(L).0729	Pradeep Ramchandra Mahajan H-1/1003 Vanarati Heights	Fellow (Life)	Mumbai	
New Mem	bers Admitted in 4 <sup>th</sup> July 2011				Rambaug Colony, Paud Road Pune 411 038		
F(L).0725	Arvind Kaul 90 (B), Shiv Shakti Nagar (B) Jagatpura Road Jaipur 302 017	Fellow (Life)	Rajasthan	F(L).0730	Pradeep Kumar Bhagat House No. 1601 Sector - 18 D Chandigarh 160 018	Fellow (Life)	Delhi
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1 (2)101 21	Faircon Electricals (I) E-303/304, Remi Bizcourt Veera Desai Road Andheri (W)	(Life)		M(L).1442	New Delhi 110 049 Pradeep Kumar Dua 18/13, Second Floor Ashok Nagar	Member (Life)	Delhi
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M(L).1631	Amardeep M. Dugar 204 Rajendra Apts Beracah Road Kellys, Secretariat Colony Chennai 600 010	Member (Life)	Chennai	M(L).1635	Dist. Baroda Gujerat 391 430 Ketan Amrutlal Desai Lighting Division	Member (Life)	Mumbai
M(L).1632	Narayanaswamy Ramakrishnan GE Lighting India Industrial Plot No. 42/1 & 45/14 Electronic City Phase II	Member (Life)	Karnataka		Crompton Greaves Ltd Padra Jambusar Road Vill. Kural, Tal. Padra, Dist. Baroda Gujerat 391 430		
A(L).1073	Bangalore 560 100 M.S. Sridhar Optimum Design Solutions No. 42, Srinivas, 6th Main Between 13th & 15th Cross Malleshwaram Bangalore	Associate (Life)	Karnataka	M(L).1636	Parag Sumangal Wani Lighting Division Crompton Greaves Ltd Padra Jambusar Road Vill. Kural, Tal. Padra, Dist. Baroda Gujerat 391 430	Member (Life)	Mumbai
A(L).1074	Kiran Moras Promptec Renewable Energy Solutions Shibra Farms, Nagasandra Main Road Near 8th Mile Tumkur Road	Associate (Life)	Karnataka	M(L).1637	Prashant Kudrya Lighting Division Crompton Greaves Ltd Padra Jambusar Road Vill. Kural, Tal. Padra, Dist. Baroda Gujerat 391 430	Member (Life)	Mumbai
A(L).1075	Bangalore 560 073 L.V.S. Murthy Reflections # 186/1, Raghavendra Plaza 1st Cross, Hosur Road,	Associate (Life)	Karnataka	A(L).1081	M. Karthikeyan A Designs Fortify B-Block # 6, 15th Cross Street Indira Nagar, Adayar Chennai 600 020	Associate (Life)	Chennai
A(L).1076	Wilson Garden Bangalore 560 027 Anand Bhatia	Associate	Karnataka	A.1082	Rashmi Kulshrestha 53- Yamah Vihar Sector-49	Associate	Delhi
	Bird Electronics 71 & 72 Royal Enclave Srirampura Village, Takkur Post Yelahaka Hobli Bangalore 560 064	(Life)		A.1083	Noida Ankit Kapoor IX/2379 Street No.12 Kailash Nagar	Associate	Delhi
A(L).1077	M.R. Shashidhara 377, 19th (New 5th) Main Srinagar Bangalore 560 050	Associate (Life)	Karnataka	A(L).1084	Delhi 110 031 K. Nabeel "Amaana" Railway Line Road	Associate (Life)	Chennai
A(L).1078	Pushkal Raj Verma Pine 704, SJR Park Vista Harlur Road, Off Sarjapur Road Bangalore 560 056	Associate (Life)	Karnataka	A.1085	Arakkinar, Kozhikode Kerela 673 004 Jaya Kumar # 18/40 Habibulle Street, 2nd Lane	Associate	Chennai
A(L).1079	Sreevidya Prasad Pine 704, SJR Park Vista Harlur Road, Off Sarjapur Road Bangalore 560 056	Associate (Life)	Karnataka	Transfe	Triplicane Chennai r of Grade		
A(L).1080	R.V. Girish Maxrite Impex Pvt Ltd 842/21, 1st Floor 7th Cross, 9th Main, Srinagar Bangalore	Associate (Life)	Karnataka	F(L).0731	Praveen Kumar Sood Regnant Lighting B - 167 Freedom Fighters Enclave New Delhi 110 068	Fellow (Life) from M(L).0997	Delhi

# PERLA 🌮 LED LIGHTING DIFFERENT AND INTELLIGENT LIGHTING FOR THE CITY



ign: Michel Torte

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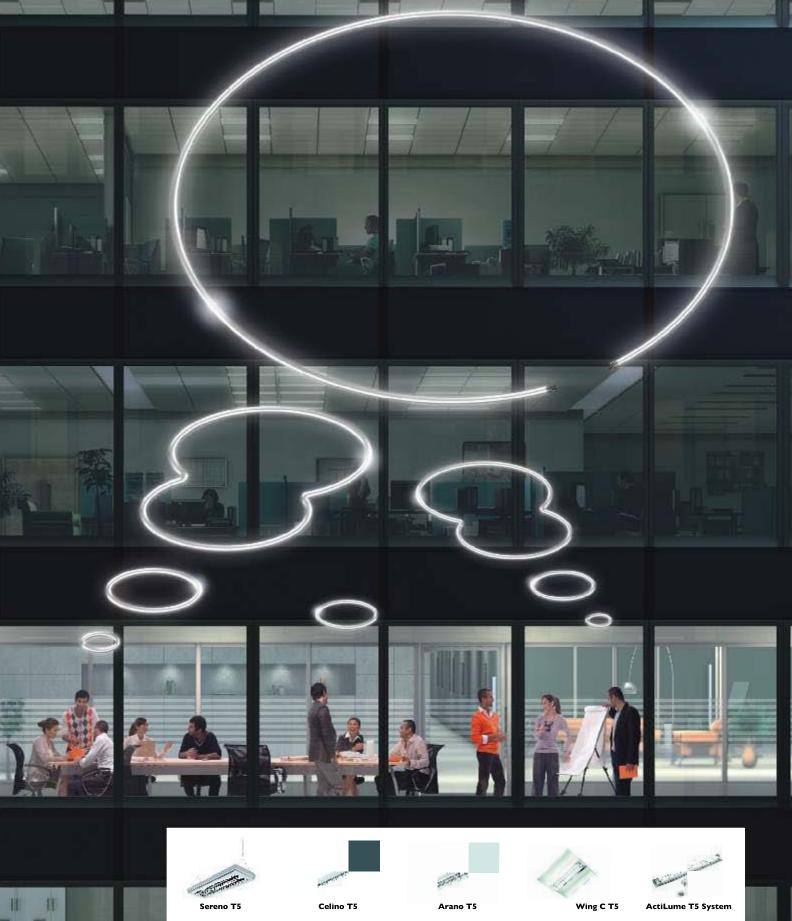
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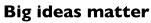


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