

Established 1906

SRI LANKA ENGINEERING NEWS

The Newspaper of The Institution of Engineers, Sri Lanka Vol. 49, No 06, November/December 2013

Registered at the GPO as a Newspaper No. QD/24/NEWS/2013

IESL NEW SOUTH WALES CHAPTER GIFTS PARENT BODY WITH IT EQUIPMENT



Library resources at the IESL headoffice were boosted by a presentation of modern IT equipment worth around US\$ 5000/= by the IESL NSW Chapter. A delegation of the IESL NSW Chapter led by its chair, Eng. Mahinda Karunaratne officially handed over the items to President of the IESL, Eng. Shavindranath Fernando, at a simple ceremony held on 24 December, 2013 at the IESL head office in Colombo. Discussions that followed explored ways and means of expanding mutual cooperation and achievement of professional excellence and higher level of international recognition for IESL and its members. Other members of the IESL NSW delegation were Eng. Kamal Fernando (former chair), Eng. Roy Abeygoonewardana and Eng. Waruna Kaluarachchi. On behalf of the IESL parent body immediate Past President - Eng. Tilak De Silva, President-Elect, Eng. S.B.Wijekoon, Vice President – Prof. (Mrs) Niranjanie Ratnayake and Hon. Secretary – Eng. P.C.C Perera attended the ceremony and the discussion. The possibility of opening a new IESL chapter in Victoria, Australia was also discussed.

IESL Commemorate's 103rd Birth Anniversary of Late Eng. B.D. Rampala



The 103rd birth anniversary of Late Eng. B.D Rampala was commemorated by the IESL with a memorial lecture held at the Centre for Banking Studies Auditorium of the Central Bank of Sri Lanka at No.56 Sri Jayawardenapura Mawatha, Rajagiriya on 14th November, 2013.

He became the first native Chief Mechanical Engineer in 1949, of the then Ceylon Government Railways and went on to become the General Manager during

the period 1955 – 1970, in what is now Sri Lanka Railways. In 1956 the Institution of Locomotive Engineers in London had recognized him as the finest diesel engineer East of Suez at that time.

The dieselization of the country's railways, fast express train services under the popular names; 'YALDEVI' 'UDARATAMENIKE' and 'RUHUNUKUMARI', Colour Light Signalling and Centralized Traffic Control system introduced by him are enjoyed to this day by the rail commuters in the country. He was

also a distinguished past president of the IESL (1958)

The memorial lecture on the topic ' Rejuvenation of Railways through Research and Development – From Theory to Practice' was delivered by Eng. Buddhima Indraratne PhD – Professor of Civil Engineering, Faculty of Engineering and Information Sciences, University Wollongong, Australia. The Mechanical Engineering Sectional Committee of the IESL had organized the event.

PRESIDENT'S CORNER

Dear Members of the Institution of Engineers, Sri Lanka, as the year draws to a close the atmosphere is filled with the chilly air of December, the ringing and chiming of Christmas bells and the fragrance of the Christmas trees, the flowers and the Christmas cake that is baked in our homes. Invariably our minds are filled with joy and happiness and hope for a better future in the next year to come. Year 2014 is annotated to be an exciting and remarkable year for the IESL as well.

Very especially we will be vying for the full membership of the Washington Accord. It is true that some of the members have certain apprehensions whether we will get this membership or not. But of course I am confident that with the work that the Accreditation Board, specially chaired by Prof. B L Tennakoon, who has put in a lot of hard work, we will endeavor to make a very strong bid to get the full membership of the Washington Accord.

What does Washington Accord mean to us? As most of you know, to be a practicing engineer in the country and to obtain professional qualifications you have to be a member of the IESL. Therefore it is imperative that our degrees are first recognized by our Institution. Mere recognition is only one part of our story. If we are to equate our recognition with world standards it has to be bench marked against a certain standard.

Washington Accord is an accord signed by many countries, mostly developed countries and some developing countries, where some of the institutions in those countries are full members of the Washington Accord. These institutions are able to accredit degrees of their own countries and some others' as worthy of international class.

If we achieve the full membership of the Washington Accord, it means, if we accredit our own degrees then the signatories of the Washington Accord will equate the so accredited universities in par with the other institutions that they have accredited in their own countries or elsewhere. So that is very important for us as professionals either to practice engineering in other countries as well as, more importantly, to be recognized by international lending agencies and development partners as fully professionally qualified engineers worthy of being internationally accepted. That is a tremendous boon for our members. That is one aspect that we are eagerly pursuing.

In close association with that, is my intention to name the current session 2013/2014 as the Year of Professional Excellence. We have discussed certain important programmes in this regard. I have already discussed these

matters with the Professional Affairs Committee and we shall, as we go along, announce programmes that we will launch to ensure that we achieve professional excellence this year. With that hope that we will have a bright and prosperous year I wish each and every one of you and your family members the season's greetings and the very best for the new year and hope to meet you in yet another message in the digital SLEN.

**The Institution of Engineers
Sri Lanka**

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The following are the subscription fees for the year 2014:

Membership Class	Proposed Rate (Rs)
Fellow	5000
Member	4000
Associate Member	3000
Affiliate Member	2500
Associate	2500
Companion	2500
Student Member	1000

A discount of 25% will be offered to members other than Student Members who are above 60 years of age and who declare that their annual income is less than Rs 600,000/=

Executive Secretary

TENTATIVE ANNUAL EVENTS CALENDAR – 2013 / 2014

Event	Dates
◆ Eng. R H Paul Memorial Lecture	Monday-February 10, 2014
◆ New Year Family Get Together	Saturday-April 26, 2014
◆ Members Night	Friday-May 9, 2014
◆ Unveiling of the photograph of the Immediate Past President	Friday-July 4, 2014
◆ Engineering Excellence Awards Ceremony	Friday-July 25, 2014
◆ Dr. Ray Wijeyewardene Memorial Lecture	Wednesday-August 20 2014
◆ Induction and Graduation Ceremony	Friday-August 22, 2014
◆ E O E Pereira Memorial Lecture	Friday –September 12, 2014
◆ D J Wimalasurendra Memorial Lecture	Wednesday-September 17 2014
◆ Techno Exhibition	Friday- Sunday October 10-12, 2014
◆ Inauguration of the Annual Sessions	Friday- October 10, 2014
◆ Annual Sessions (FEISCA) Seminar	Saturday- October 11, 2014
◆ Annual Sessions Site Visit	Sunday-October 12, 2014
◆ Presentation of Technical Papers	Monday-Wednesday - October 13 -15, 2014,
◆ National Engineering Conference	Thursday-October 16, 2014
◆ Presentation of Technical Papers by Young Members	Friday- October 17, 2014
◆ Annual General Meeting	Saturday- October 18, 2014
◆ Dr. A N S Kulasinghe Memorial Lecture	Friday -October 24, 2014
◆ Techno Awards Ceremony	Friday – November 7, 2014

NOTICE

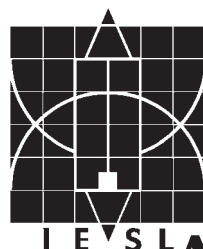
THE INSTITUTION OF ENGINEERS, SRI LANKA

EXPULSION OF Mr. P M S PUSHPAKUMARA FROM MEMBERSHIP

Notice is hereby given to the members of the Institution of Engineers, Sri Lanka and the general public that Mr. P M S Pushpakumara has been expelled from the membership of the Institution on disciplinary grounds with effect from December 6, 2013. His name has now been taken off from the list of Chartered Engineers maintained by the Institution. He will not be entitled to use the post nominal abbreviation CEng, MIE(Sri Lanka).

EXECUTIVE SECRETARY

The Institution of Engineers, Sri Lanka



Call for Papers for the

Annual Sessions 2014

Call for Papers

The Institution is pleased to call for technical papers to be presented at the Annual Sessions to be held in October 2014, which will provide a forum for engineers to share their experiences and is aimed at general advancement of science and practice of engineering in all disciplines.

The papers are invited under the following categories to be presented at the Annual Sessions and published in the Volume I of the Annual Transactions of the Institution;

- Engineering theory/research (academic) oriented technical papers,
- Technical papers based on Engineering practice/design/projects/techniques.

The paper should generally be of value and interest to Engineers and contribute in the advancement of the Profession of Engineering. It must be based on review of past practice, information of current interest, or probing into new fields of engineering activity. It should be a presentation of thought provoking study contributing to planning, analysis, design, construction/fabrication/production, management or maintenance of Engineering works. In this context, practical papers are strongly encouraged. Wherever possible, theoretical papers should include a section on practical application or additional research areas to be pursued for effective technology transfer.

Submission of Papers

Intention for submitting a paper should be conveyed to the IESL on or before 15th March 2014 with a synopsis of the proposed paper, not exceeding 300 words.

This synopsis is used by the Editorial Board as a guide to take a decision on the acceptance of the proposed publication, which will be intimated to the author/s by **31st March 2014**. Full technical paper/s with recommended modifications on the accepted synopsis, in the stipulated **format for full papers*** should be submitted on or before **30th April 2014**, in the form of two hard copies and a word-processed soft copy, to be subjected to the refereeing process. Authors are also required to give their offer to submit and present the technical paper at the Annual Sessions, by sending dully completed form*.

All papers will be refereed by at least two subject specialists. The decision of the Editorial Board on the acceptance of the Paper for publication shall be final.

It is mandatory for the authors of all accepted papers to present them at the Annual Sessions of the Institution, held in the month of October 2014.

Schedule of Key Dates

Last date for receipt of abstracts	- 15 th March 2014
Notification of acceptance	- 31 st March 2014
Last date of submission of full paper	- 30 th April 2014
Proposed dates for Annual Sessions	- 13 th to 15 th October 2014

Best Paper Award

Best paper based on the marks given by referees and judges at the presentation, will be entitled to the prestigious Prof. E.O.E. Pereira Award.

Mailing

All abstracts, full papers and other correspondence should be addressed to:

Eng. (Prof.) K.P.P. Pathirana
 Editor, Technical Papers for Annual Sessions,
 The Institution of Engineers, Sri Lanka,
 120/15, Wijerama Mawatha, Colombo 7
 Tel: 011-2698426 Ext. 232, 207, Fax: 011-2699202,
 Email: dir.pub@iesl.lk, ieslpub@gmail.com.

* available at the iesl website; www.iesl.lk or can be obtained on request from director publications: <dir.pub@iesl.lk>

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Conducted by the premier professional body for the profession, **The Institution of Engineers, Sri Lanka**

THE INSTITUTION OF ENGINEERS,
SRI LANKA

Registration of Building Services Engineers Directory of Building Services Engineers

1. Registration as a Qualified Person in the field of Building Services Engineering

As per the Urban Development Authority Law No. 41 of 1978, when Building Plans are submitted to the Urban Development Authority (UDA) for approval, the UDA can request that drawings related to the building services of such plans be prepared by a **Qualified Person in the field of Building Services Engineering**. Corporate Members of the Institution who wish to register as Qualified Persons in the field of Building Services Engineering are requested to apply for registration using the application form No: DES-BS/FO/5 available for collection from the IESL Secretariat or downloadable from our website at www.iesl.lk. The duly filled application form has to be accompanied by an application processing fee of Rs. 2,000/=. The application would be processed only if the member has settled his/her subscription fees up to and including the year 2014. The successful applicants will be requested to pay a fee of Rs. 1,500/= to get their names listed in the Directory of Building Services Engineers.

2. Directory of Building Services Engineers

Corporate Members who have registered themselves with the Institution as **Qualified Persons in the field of Building Services Engineering** can now get their names listed in the 2014 Directory of Building Services Engineers by applying for same using the application form NO: DES-BS/FO/6 available for collection from the IESL Secretariat or downloadable from our website at www.iesl.lk. The duly filled application form has to be accompanied by an application processing fee of Rs. 1,500/=. The application would be processed only if the member has settled his/her subscription fees up to and including the year 2014.

All applications in respect of 1-2 above should reach the Institution on or before February 15, 2014.

Executive Secretary

IESL UVA PROVINCIAL CENTRE AGM HELD IN HAPUTALE

The Annual General Meeting of the IESL Uva Provincial Centre for the session 2012/2013 was held from 6.00 p.m. on-wards on Thursday, November 21, 2013 at Olympus Plaza Hotel, Haputale in the presence of a large gathering of its members, distinguished guests and special invitees. The Centre has a membership strength of more than one hundred and fifty engineers in Uva province from its two districts of Badulla and Monaragala working in both public and private sectors. More than 120 members including Fellows, Corporate and Associate Members in the province participated in the event.

Eng. Shavi Fernando (President - IESL) and Eng. Tilak De Silva (Immediate Past President - IESL) graced the occasion with their presence as Guests of Honor. The Chief Guest, Eng. R. W. R. Pemasiri, Secretary – Ministry of Ports and Highways could not participate as he had to attend parliament in view of the presentation of the 2014 Budget by H E President. A message from the Chief Guest was read out instead.

The President of IESL Eng. W.J.L.S. Fernando in his speech stated that Engineers of today must keep up the good reputations built up by engineers of earlier eras through hard work and try to help improve the profession. He said that Engineers should have the necessary commitment and dedication to make their work a success. He also stated that proper coordination with Engineers in all other sections and departments before implementing major projects could save a lot of efforts and national financial resources and that by this way problems could be sorted out between engineering organizations rather than through political or 3rd party interventions. He stressed that Engineers should do their duty properly without giving explanations and reasons for not doing so.

Eng. Tilak De Silva –Immediate Past President of IESL in his address stated that members are now well connected to the institution through the Membership Management System and can obtain benefits from the IESL web site. He also conveyed his appreciations for the commendable performance by the outgoing Executive Committee under the chairmanship of Eng. S.N.B.M Padmasiri and wished success for the newly elected office bearers of the centre.

Eng. T.K.M Galappaththy who is Chief Engineer (Badulla District) Road Development Authority (RDA) was elected as Chairman, Executive Committee, 2013/2014 Sessions. He has obtained his BSc. Eng. (Civil) Degree from the University of Moratuwa in 1991 and the Charter awarded by the IESL in 2006.

Eng. Galappaththy started his professional career as an Engineer at State Development & Construction Corporation (SD&CC) in 1991 and then joined the RDA in 1992 as an Engineer. He was thereafter appointed as Executive Engineer (Tangalle) in 1996 and Executive Engineer (Bibile) in 1998. He was promoted to his current position of Chief Engineer (Badulla District) RDA in 2005. He has also worked as part time resource person at RDA Training Division from 2005 to 2011 and has undergone international training on Environmental Impact Assessment for ODA Project in Japan

The event included a raffle draw for members and fabulous dancing sessions by the Algama Dancing Academy, Bandarawela. The event concluded with cocktail and dinner party enjoying traditional music played by musicians.

M/s UltraTech Cement Lanka (Pvt) Ltd. was the main sponsor for this event.

By **Manoj Priyanga**



Seated Left to Right: Eng. Thusara Dissanayaka (Asst. Secretary), Eng. R. I. Kodagada (Secretary), Eng. T. K. M. Galappaththy (Chairman), Eng. Shavindranath Fernando (President IESL), Eng. Tilak De Silva (Immediate Past President), Eng. S. N. B. M. Padmasiri (Immediate Past Chairman Uva), Eng. Hasaranga Vidanapathirana (Treasurer),

Standing: Eng. D.M.R. Dhanapala, Eng. P.H.D. Heamachandra, Eng. D.P.Kaluarachchi, Eng. A.P. Rubasinghe (Vise Chairman), Eng. K. A. M. Priyanga (Editor), Eng. Lasantha Navarathna, Eng. R. J. R. Senadheera,



Sri Lanka Engineering News

Editorial for Digital SLEN



Accreditation of Engineering Education; Do we need it? My thoughts were swinging, as would a pendulum, from positives to negatives and vice versa on the benefits of accreditation of engineering education and later thought of sharing my views with the engineering community. Further, it has to be noted that, IESL has a certain role in accrediting engineering degrees as mentioned in the IESL Corporate Plan; **“Goal 2: Be the world recognized accreditation body for engineering education in Sri Lanka”**

There is a myth that accreditation doesn't add value to industry, academic institutions, faculty, or students. Is this true?

Accreditation helps the industry by ensuring that required educational standards to enter “the profession” are met and it aids the industry in recruiting of young graduates by guaranteeing that the baseline educational experience is covered. Further more, there is strong involvement of industrial advisory groups and professional and technical societies in guiding the educational process at the engineering faculties in the country.

Accreditation has much value to the institution and the faculty as well. The major gain is the “Third Party Recognition” of the education programmes. This can always be marketable. International recognition could gain even external funding depending on accreditation status. Therefore, institutions will be really serious and committed to improve quality while encouraging best practices of education.

Students too are getting benefits; they are well-prepared to enter the competitive profession outside the university and accreditation will ensure them with the best jobs in the industry.

I find that the above facts are justifying enough for the importance of the accreditation process of IESL. If you have different opinions, SLEN can have a discussion forum on this topic and I am expecting comments from the engineers representing both the academic and industry.

Wish you a very Happy New Year 2014!

Udeni Nawagamuwa
nawagamuwa@gmail.com

IESL LIBRARY — FACILITIES

Members of the IESL and students of the IESL College of Engineering can request for books that are not available in the library by filling out a form kept in the library for this purpose, or else you could drop an e-mail to library@iesl.lk. The Library Development Committee (LDC) will make all efforts to purchase them and will notify you when these become available.

EXECUTIVE SECRETARY

THE INSTITUTION OF ENGINEERS, SRI LANKA Registration of Structural Engineers Directory of Structural Engineers

1. Registration as Structural Engineers

As per the requirements of the Urban Development Authority (UDA), it has become necessary for the Corporate Members in the field of Civil Engineering to register with the Institution and get their names listed in the Directory of Structural Engineers that the Institution publishes annually in order to be eligible to carry out structural designs of buildings with more than 4 floors. Interested members are requested to apply for registration using the application form No: DES-SE/FO/11 available at the IESL or downloadable from the IESL website at www.iesl.lk. The duly filled application form has to be accompanied by a brief CV of the applicant and an application processing fee of Rs. 2,000/=. The application would be processed only if the member has settled his/her subscription fees up to and including the year 2014. The successful applicants will be requested to pay a fee of Rs. 1,500/- to get their names listed in the Directory of Structural Engineers.

2. Directory of Structural Engineers

Corporate Members who have registered themselves as Structural Engineers with the Institution can now get their names listed in the Directory of Structural Engineers in order to become eligible to carry out the structural designs of buildings in their respective categories for the year 2014 by applying using the application form NO: DES-SE/FO/12 available for collection from the IESL Secretariat or downloadable from our website at www.iesl.lk. The duly filled application form has to be accompanied by an application processing fee of Rs. 1,500/=. The application would be processed only if the member has settled his/her subscription fees up to and including the year 2014.

3. SEAL

It will be mandatory for structural engineers to use the seal issued by the Institution, in their official correspondence and in the certification of drawings. This seal can be obtained by using the application form NO: DES-S/FO/10 available for collection from the IESL Secretariat or downloadable from our website at www.iesl.lk. The duly filled application form has to be accompanied by an application processing fee of Rs. 2,000/=. The application would be processed only if the member has settled his/her subscription fees up to and including the year 2014.

All applications in respect of 1-3 above should reach the Institution on or before February 15, 2014.

EXECUTIVE SECRETARY

THE INSTITUTION OF ENGINEERS, SRI LANKA

Registration of Arbitrators and Adjudicators Directory of Arbitrators and Adjudicators

1. Registration as Arbitrators and/ or Adjudicators

Corporate Members of the Institution with more than 10 years of experience after becoming Corporate Members and who wish to register as Arbitrators and/or Adjudicators are requested to apply for registration using the application form No: DES-AD/FO/1 in respect of Adjudicators and application form No: DES-AB/FO/2 in respect of Arbitrators. These forms are available for collection at the IESL and they could also be downloaded from the IESL website at www.iesl.lk. The duly filled application form has to be accompanied by a brief CV of the applicant and an application processing fee of Rs. 2,000/= for registration as an Adjudicator or as an Arbitrator or as both. The application would be processed only if the member has settled his/her subscription fees up to and including the year 2014. The successful applicants will be requested to pay a fee of Rs. 1,500/- to get their names listed in the Directory of Arbitrators/Adjudicators.

2. Directory of Arbitrators and Adjudicators

Corporate Members who have registered themselves as Arbitrators and/or Adjudicators with the Institution can now get their names listed as Arbitrators or as Adjudicators or as both as the case may be, in the 2014 Directory of Arbitrators and Adjudicators by applying for same using the application form NO: DES-AB/FO/3 available for collection from the IESL Secretariat or downloadable from our website at www.iesl.lk. The duly filled application form has to be accompanied by an application processing fee of Rs. 1,500/=. The application would be processed only if the member has settled his/her subscription fees up to and including the year 2014.

All applications in respect of 1-2 above should reach the Institution on or before February 15,, 2014.

EXECUTIVE SECRETARY



Application of Energy Saving Methodology for Road Lighting in Expressways - Sri Lanka

by Eng Gehan Bandarigodage,
MSc Eng, CEng, MIE(SL), MIET

Brief Outline:

Roadway lighting standards are based almost exclusively on vehicular traffic safety considerations. Benefits of road illumination for drivers include easing of flow of traffic, reduction of night time accidents, visibility of adjacent users, and general way of finding assistance. Road lighting is used specially to highlight hazards despite the glare of headlight beams and reveal signage, in riskier environments, such as urban streets and interchanges where there are exits and entries from local roads.

Energy saving on road lighting is not only good for the environment; it is good for the per capita income of people as well, because the expenditure on energy directly relates to the cost of goods produced. High expenditure on energy decreases profit margins and raises price of goods services. Therefore reducing the cost of energy through energy saving methodology will benefit the people directly.

Finding methods and switching to more energy efficient methods to save energy without affecting the final product or outcome can be difficult, but possible. Being professionals, focusing on this aspect is very vital as it will result in tremendous savings in cost of energy. Therefore it is our duty to take measures to save energy in all aspects as it's a national requirement.

The present Government is highly focused on the Development of National Road Network in Sri Lanka under infrastructure development, as it plays a key role in the development of the country. As a result of this, Southern Expressway up to Galle has been already completed and Colombo - Katunayake Expressway is just completed. Therefore the dream of having a developed road network and transport system in Sri Lanka will become a reality in the near future.

During the construction stage of these roads I had the opportunity of providing consultancy services on road lighting systems

In the road lighting design of Southern Expressway, the average illumination level in interchange areas was considered as 1 cd/m^2 .

I tried as much as possible to adopt energy saving methodologies and maintenance aspects during the design stage of road lighting systems. On that basis I thought to analyze the consumption of electrical energy of Colombo - Katunayaka Expressway and Southern Expressway as the lighting levels adopted is same i.e, Class "ME3a" as per the CIE classifications and my report on the detailed analysis is given below.

General Design Criteria of Road Lighting:

The general design criteria for road lighting are visibility, safety, energy consumption and economics. All of these must be considered when designing the lighting system.

The criterion of visibility describes how well the lighting system performs in revealing the roadway objects within the roadway and the surroundings of the roadway to the driver.

When designing Road Lighting, following factors were taken in to considerations;

- Energy saving through selection of efficient lamp technologies & design practices.
- Safety of motorists and cyclists, security of pedestrians, improved traffic guidance and providing of a pleasant environment.
- Capital cost saving using proper spacing & placement.
- Maintenance cost saving using lamps with longer life. Proper spacing placement can reduce the maintenance cost
- Reduced glare and improved visibility by careful selection of luminaries that enhances visibility can improve the detection of pedestrians by drivers and increase signal distance
- Improved sense of security by selection of efficient systems and incorporating proper design can make an area appear safer and more secure.

Further when designing road lighting, from the Road Users point of view following factors were to be taken in to account;

Requirement of Road Users:

- Visibility of the road and its surroundings.
- Visual guidance of the shape of the road. The motorist should be clearly able to identify bends and curves and change in road widths. achieved by well designed Road Lighting System.
- Identification of obstacles.
- Entire road stretch should be without any obstacles. The appearance of the road should be such that the driver is certain that the road is clear. In other words it should provide "visual comfort" to the driver.
- Appearance of lighting of the street should be uniform and continuous.
- The visual field of the driver comprises: i) The carriageway ii) The surroundings to the road, including signs, iii) The sky, including the bright luminaries.

Analyzing of Lightning Needs :

Warrants for highways, freeways, interchanges and bridges may be undertaken using the American Association of State Highway and Transportation Officials(AASHTO) Roadway Lighting Design Guide Warranting System. AASHTO defines warrants for Continuous Freeway Lighting (CFL), Complete Interchange Lighting (CIL) and Partial Interchange Lighting (PIL) based on warrant conditions including:

- Traffic volumes
- Spacing of freeway interchanges
- Lighting in adjacent areas
- Night-to-day crash ratio

AASHTO believes it is desirable to provide lighting on long bridges in urban and suburban areas even if the approaches are not lighted. On bridges without full shoulders, lighting can enhance both safety and utility of the bridges, and is therefore recommended. Where bridges are provided with sidewalks for pedestrian movements, lighting is recommended for pedestrian safety and guidance.

The following terminology is used with respect to the amount of lighting, as determined by the warrant system:

- Full Lighting - Denotes lighting covering an intersection in a uniform manner over the traveled portion of the roadway.

- Partial Lighting - Denotes lighting of key decision areas, potential conflict points, and/or hazards in and on the approach to an intersection. Partial lighting may also guide a driver from one key point to the next, and (if sufficient luminaires are used) place the road user on a safe heading after leaving the lighted area.

- Delineation Lighting - Denotes lighting that marks an intersection location for approaching traffic, lights vehicles on a cross street or lights a median crossing.

- Based on the warrant analysis the following conditions define the need for full, partial or delineation lighting:

- If the intersection is signalized, full lighting is warranted.

- If the intersection is not signalized, the need for and the amount of lighting is indicated by comparing the point-score obtained from the warrant form categories to the following criteria:

- ◆ Full Lighting - Is warranted where a total point-score of 240 or more points.

- ◆ Partial Lighting - Is warranted where the point-score is between 151 and 239 points.

- ◆ Delineation Lighting - Is warranted where the point-score is between 120 and 150.

- ◆ No Lighting - Generally, a point-score under 120 indicates that lighting is not warranted. This score indicates that neither the critical operational warranting factor (substantial traffic volumes) nor the critical crash warranting factor (repeated nighttime crashes) is present.

Lighting may be prioritized solely on the basis of the point-scores, or in conjunction with a benefit/cost analysis. Benefits would typically be based on the potential reduction in crash frequency and severity at the intersection.

Depending on the road authority practice, costs would typically include the initial cost of the lighting system, its ongoing (electricity) costs, and its main-

tenance costs. Initial costs may be substantial if a power source is not present at the intersection.

Design Codes and Standards of Road

Lighting used:

Based on above factors the following Design Codes and Standard established on Road Lighting were used when designing.

BS 5489:1992

Road Lighting

Part 1 : Guide to

general principles

Part 2 : Code of

practice for lighting for

traffic routes

BSEN 60598-2-3:1994

Road Lighting

Luminaires

BS 5649

Lighting Columns

BSEN 60529: 1992

Degree of protection

provided by

enclosures.

BSEN 60662

High Pressure Sodium

Vapour Lamp

CIE 23: 1973

International Recom-

mendations for

Motorway lighting

CIE 30.2:1983

Calculation &

Measurement of

Luminance and

Illuminance in Road

Lighting

CIE 31:1976

Glare and uniformity in

road lighting installa-

tions

CIE 47:1976

Road Lighting for Wet

conditions

CIE 66:1981

Road surfaces and

lighting

ME Series of Lighting

Classes, established for

Different Road Types

under CIE Classification:

Apart from above, the design code BS EN 13201 : 2004) which was established under CIE Classification in 2004 defining several types of Lighting Classes for Motorways and Traffic routes was also used during the design.. These classes were defined as ME1, ME2, ME3a, ME3b and ME4a. The lighting classes against the relevant Motorways and Traffic routes are tabulated in the Table 01, as follows;

Techno Sri Lanka 2013 Awards Ceremony



Mr. Kennedy Joseph, Senior Vice President, Browns Group PLC , receiving the Gold Award for the Product with the Highest Social Impact at Techno Sri Lanka 2013, from Hon. Pavithra Wanniaracchchi , Minister of Power and Energy along with Eng. Tilak De Silva , President, IESL (Session 2012/13) & Eng. Shavindranath Fernando, President, IESL (Session 2013/14)



Mr. A A Fernando, Deputy General Manager, Access Engineering PLC , receiving Gold Award for the best Overall Performance at Techno Sri Lanka 2013 from Hon. Pavithra Wanniaracchchi , Minister of Power and Energy along with Eng. Tilak De Silva , President, IESL (Session 2012/13) & Eng. Shavindranath Fernando, President, IESL (Session 2013/14)

The awards ceremony of the Techno Sri Lanka 2013 exhibition was held in grand style at the Hotel Galadari on Friday, 1st November, 2013 amidst a large gathering of stall holders , sponsors, competitors ,judges and members of the IESL. Hon. Pavithra Wanniarachchi (Attorney at law) Minister of Power & Energy graced the occasion as the Chief Guest.

The national anthem and lighting of the oil lamp was followed by the welcome address by Eng. Tilak De Silva, President - IESL for the 2012/2013 sessions. Awards were given for the stall with the Most Innovative Local Product, the Product with the Highest Social Impact, the Best Display of Local Product, the Best Display of Imported Product, the Best Display of Engineering Service, for the overall performance, the Best Demonstration, the Best Sectional Committee Stall IESL and the Best Provincial Centre IESL, The giving away of awards was regularly interspersed by a variety of dances and music.

Tokens of appreciations were also presented to Sponsors for their contribution for Techno Sri Lanka 2013.

Winning teams of the Hackathon, CAD Eager and Spaghetti Bridge competitions organized respectively for Computer and Electronic Systems undergraduates, Mechanical Engineering undergraduates and Civil Engineering undergraduates also received their team awards amidst boisterous applause from fellow undergraduates.

The Members Raffle Draw conducted for the first time saw attractive prizes being gleefully carried away by winning members of the IESL amidst wide cheering. The 1st prize earned two Return Air Tickets to Singapore or Bangkok. The 2nd prize was a Samsung Galaxy Tab. The 3rd prize was a Weekend Packages for Two at a Star Class Hotel.

The Vote of Thanks was delivered by Eng. Shavindranath Fernando – President IESL for the 2013/2014 sessions who is also the Chairman Techno Sri Lanka – 2013 Organizing Committee.

The ceremony ended with fellowship and dinner while being entertained by music and dancing.

Electronic Club of UOM holds Sri Lankan Robotics Challenge 2013



Winners of the University category: University Of Moratuwa

Sri Lankan Robotics Challenge (SLRC) organized by the Electronic club of the University of Moratuwa was held on the 12th and the 13th of December 2013. from 8.00 AM to 5.00 PM in the Civil Auditorium, University of Moratuwa.

University of Moratuwa, a Pioneer in Sri Lankan technological higher education plays the major role in Sri Lankan robotics. The Electronic Club of University of Moratuwa has been vested with the responsibility of organizing the Sri Lankan leg of IRC (International Robotics Challenge) for the 6th consecutive year, having organized 5 competitions previously to select the best out of the best to represent Sri Lanka in the international arena. This competition has become a main event in the technology calendar of Sri Lanka and has gained the interest of island wide and international community.

Sri Lanka Robotics Challenge 2013 was focused on three major events: **Flying Dutchman** (university category), **Black Pearl** (school category) and **Endeavour** (open category). The school and open category was held on 12th of December and University category was held on 13th of December at Civil auditorium, University of Moratuwa.

SLRC University Category was of great importance since the winners were selected to participate in 'Techfest-International Robotics Challenge- 2014', which will be held in Mumbai, India. The IRC of Techfest, held for the 17th consecutive time, will be witnessed by thousands of technological enthusiasts from the 3rd of January till 5th of January 2014.

A team which represented University of Moratuwa and led by Kushan Wijesinghe won the first place of SLRC 2013 university category. Other team members were Harith Thisura, Thilina Allangasinghe, Indunil Wanigasooriya and Rajitha Hathurusinghe. Second place was also won by a team which represented University of Moratuwa led by Dimuthu Upeksha. The other team members were Maduranga Siriwardena, Chamila Wijayarathna, Supun Tharanga and Ishanga Rukshan. Third place of this category was won by a team which represented Sri Lanka Institute of Information Technology led by Dinushka Wijesooriya. The other team members were Vithakshana Pathirathna, Channa Pinnawalage, Chathushka Hendalage and Prasanga Alawatta.

The SLRC School Category Competition had been organized with the main objective of giving an opportunity to school students from all over the country to experience the only national level robot competition in Sri Lanka. These kinds of events were expected to improve the awareness and positive attitudes in school students about Robotics and connected fields. First place in this category was won by the team from St. Aloysius' College, Galle led by R.K. Prabashwara Madusanka. Second place was won by Pasan Dhamsiri of Royal College, Colombo and the third place won by the team from Rahula College, Matara led by R.J.W Samith Ashan.

The Open category, a new category introduced to the SLRC 2013 was designed to address a current issue faced by our main sponsor, Brandix, in their production line. It's open to the public. A problem statement was created and solutions have to be designed to overcome this issue. After the event, Brandix chooses the best design which suits to their production line. The first place was won by Anuruddha Tennakoon and second place won by the team with Thilanga Anuruddha, Lasantha Fernando, Prasad Wickramasinghe, Darshana Gunawardana and W. C. Deshapriya.

A LED lamp is a light-emitting diode (LED) product that is assembled into a lamp (or light bulb) for use in lighting fixtures.

by Eng. T N Kankanamge

Although electricity tariff has been modified recently; generation cost of electricity is still higher than the average selling price in Sri Lanka. Only way to reduce the electricity bill is by improving the efficiency and the effectiveness of electricity usage. Lighting is a most essential and significant electricity requirement for the day today life. Incandescent lamp, compact florescent lamp (CFL) and light emitting diode (LED) lamps are the available technologies for lighting. Incandescent lamps are very in-efficient. LED is the latest technology for lighting and LED bulbs are promoted as more energy-efficient and more durable than CFLs. Even though LED requires less wattage than CFL for the same amount of light, using CFL bulbs still is a good economic proposition considering the capital investment and the quality of the light.

LED market prices as at 01/09/2013 in Sri Lankan Rupees				
Lumens (lm)	LED (W)	German (Branded)	China (Branded)	China (Assembled)
2600	25	7,000.00	2,600.00	1,700.00
1600	16	5,000.00	2,250.00	1,450.00
1100	13	4,400.00	1,800.00	1,200.00
800	8	3,500.00	1,500.00	1,000.00
450	6	2,750.00	1,300.00	800.00

LEDs play a major role in current lighting applications because of the low power required. It is a common misconception that LEDs are substantially efficient than CFLs. Most LED products available in the local market are in the same efficacy league as the CFLs, but display about 7% efficiency gain when compared with CFLs, almost in par with the good old linear fluorescent lamps – better known as the tube lights.



An analysis involving approximate values is given below (Assumption: 60 W equivalent bulbs which are lighting 4 hours per day in 90-120 block of domestic tariff) considering both initial investment and the energy cost. According to the graphs investment made on an LED replacing an incandescent lamp will recover within around 6 months.

Considering both energy cost and life of the LED, it is worth to use LEDs for the locations where lighting is done for long hours per day.

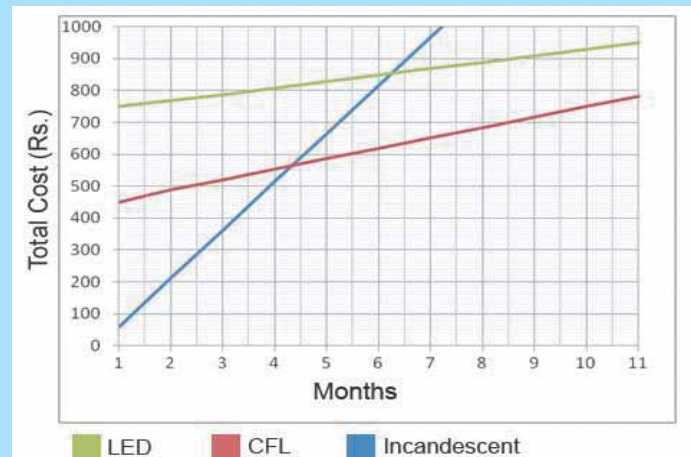
Similarly, investment made on an LED replacing a CFL will recover in around 24 months, under the same assumption. However, the payback time might vary with the wattage and the working hours per day and the tariff block.

However, this analysis was done only from the consumer's perspective. From the utility side, reducing the lighting load at system peak around 6.30 p.m. to 9.30 p.m. directly affects the generation costs. Generation cost is higher

Contd. on page 9..

Description	Incandescent (W)	CFL (W)	LED (W)
Duration (hr)	1,200/-	8,000/-	30,000/-
Payback time with replacement of LED	Around 6 months	Around 2 years	N/A

For 1600 Lumens Lamp	Incandescent (W)	CFL (W)	LED (W)
Purchase price (Rs.)	60.00	550.00	1,450.00
Electricity usage (W)	60	13	10
Efficacy (Lumens/W)	14.3	63.5	94.0



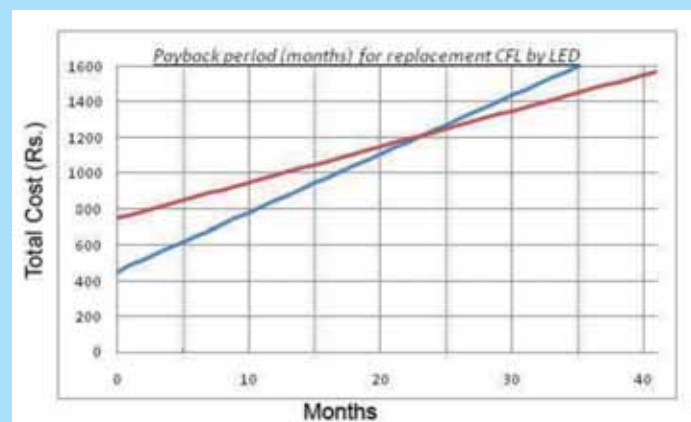
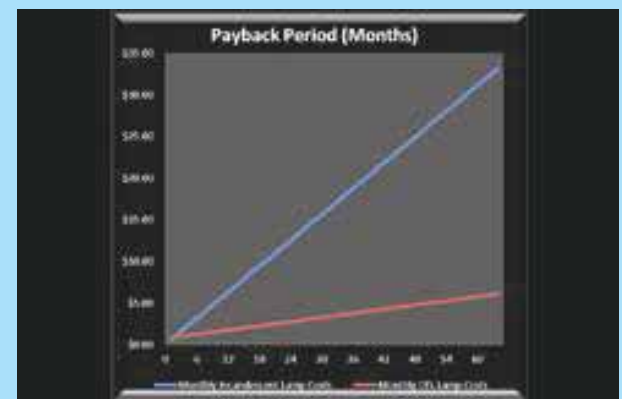
Normally incandescent lamps are cheaper than CFL and LED. But they are energy inefficient and has a short life span. In energy usage terms, the cheapest bulb is LED. LED lamps intended to be interchangeable with incandescent lamps are made in standard light bulb shapes.

have a minimum light output of 806 lumens, irrespective of whether the power is lower than 13W or not. This standard came due to different manufacturers claiming their LED bulbs are as bright as some value of incandescent lamp without mentioning the light output.

performance of the lamps during the period, especially in hot and humid climates need further investigations and experience. It is an accepted fact that LED life spans are reduced if the lamps are operated at a higher temperature than specified. Incandescent bulbs have a typical life of 1,000 hours, compared to a quoted life of a CFL which is around 6,000 to 8,000 hours. The bulbs are required to maintain output light intensity throughout their life span. Energy Star specifications require the bulbs to produce a minimum of 90% of the original lumen output after 6,000 or more hours of operation, and in the worst case not more than 15%. LED lamps are available with a variety of color properties. The higher purchase cost than other types may be more than offset by savings in energy and maintenance.

LED lamps are made to replace screw-in incandescent or CFL bulbs. Most LED lamps replace incandescent bulbs rated from 5 to 60 watts. As of 2010, some LED lamps replace higher wattage bulbs; for example, one manufacturer claims a 16-watt LED bulb as bright as a 150W halogen lamp. A standard general-purpose incandescent bulb emits light at an efficacy of about 14 to 17 lumens/W depending on its size and voltage. According to the European Union standard, an energy-efficient bulb that claims to be the equivalent of a 60W tungsten bulb, must

Some models of LED bulbs work with dimmers as used for incandescent lamps. A very important aspect of LED lamps is the directional properties of the light beam emitted by certain types. This enables LEDs to be used in a variety of task lighting solutions, with the possibility of replacing a 20W CFL with a single 6W LED. These bulbs, whilst being more efficient than CFLs offer long life spans of 30,000 or more hours. However, these quoted life spans and any decline of



THE INSTITUTION OF ENGINEERS, SRI LANKA



Competition



on

"Eco Friendly Water Infrastructure for Sustainable Development and Management

Experiences gained from Integrated Water Resources Development and Management in Sri Lanka"

Session 2013/2014

Sponsored by

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(MANUFACTURES OF ANTON PVC PIPES AND FITTINGS)

Two competitions will be held this year for the award of certificates and cash prizes. The competition soliciting original Technical Papers on research and case studies are accepted from members of IESL who are above 35 years.

There will also be another competition for members who are 35 years and below on **01 October 2014**. This competition is open to members of IESL and final year students of Faculties of Engineering of Universities in Sri Lanka who are student members of IESL or who obtain such membership before submitting their technical papers.

AWARDS & PRIZES

**ABOVE 35 YEARS
ON 2014.10.01**

**35 YEARS AND
BELOW ON 2014.10.01**

First Prize - Rs. 50,000/= **First Prize - Rs. 25,000/=**
Second Prize - Rs. 25,000/= **Second Prize - Rs. 15,000/=**
Third Prize - Rs. 10,000/= **Third Prize - Rs. 5,000/=**

The members (Fellows, Members, Associate Members, Associates, Companions and Students) who wish to participate must obtain the application forms from IESL and submit bio data & full Technical Papers to reach the Executive Secretary, The Institution of Engineers Sri Lanka, No. 120/15, Wijerama Mawatha, Colombo 07 on or before April 30, 2014.

Further information could be obtained from the Chairman, Steering Committee on Water Resources Development of The Institution of Engineers, Sri Lanka, on Tel: 077 3540350 or Publicity Officer-IESL 011-2685490, 011-2698426 or 011-2699210, ext- 232, 207, E-mail: dir.pub@iesl.lk, ieslpub@gmail.com, Fax : 011-2699202

Note: Forms and Guidelines could also be downloaded from the IESL Website, www.iesl.lk or obtained from the IESL Secretariat.



A (Concept) Theory for the Constructions on Marsh

by: Eng. S.D.S. Deshapriya ; RDA

Embankment Construction on Marsh is costly in general, that needs soft ground treatment. Ground Settlement is a very sensitive factor in soft ground which has to be arrested during construction. As far as the road construction is concerned, it is an unavoidable situation, that the structural dead weight is very much higher than the design vehicular load, which is responsible for the biggest portion of the settlement. Hence most of the cost of soft ground treatment will have to be spent not to cater the vehicular load, but to hold the embankment structure itself. In this context, only solution would be the using of light weight material for the construction, in order to reduce the settlement as well as the cost involved. **It was noted that, when the light weight material is used, additional factors are also attributed to reduce the ground settlement which were not anticipated.** This paper is to look in to the factors which affect the settlement and the theoretical and the practical aspects of the light weight construction.

Accordingly, in the light of Newton's first law, which explains about the equal & opposite reaction, it is emphasized here that not only the magnitude but the manner in which the load applies, also affects to the recipient structure. This paper is limited to consider the effect on the soft structures such as marsh & loose soil due to soft way of loading. Accordingly the soft way of loading as considered here, is in two types such as the cushioning effect & the loading gradually with time. Hence this phenomenon is developed as a Theory, to address the soft material & soft surfaces. This Theory says that the bearing capacity(BC) of a recipient surface/structure is increased with the application of load in soft manner on it. According to this Theory, bearing capacity of a soft structure, layer or soft material is increased depending on how softer & gradually the load is applied on it.

Next Theory is about the other contact surface of load transferring (donor) & it is about the effect of transferring of load from a surface in soft manner. Accordingly, this theory says that more load can be transferred by a (donor) soft surface, if it is delivered in soft manner. These two theories are really hailed

from the soft end of Mohr's Circle Theory.

Hence these theories can be harnessed for the economical constructions, on soft & marshy grounds in general & to further economize the present construction industry which uses light (weight) material. In the practical aspect, light material is not much available in Sri Lanka as gravel quarries. Hence the light (embankment) construction is very limited here. Since the cost reduction is remarkable even its' limited application would be more attractive. Light weight material proposed here are the plastic polythene & synthetic fabric waste from factories & from dwellings as well as used tyres etc. Hence these types of new concepts has to be tried empirically & on experimental basis for normal roads before on highways and in this regard the macadam or block paved roads could be tried first. Accordingly the construction using light material will impose the load in soft manner on marsh. As a result of this, BC will be increased and more weight will be borne by marsh with less settlement than anticipated according to these Theories. In this respect, the cushioning effect would be further increased due to the resilient property of tyres & the more voids there in. More bearing capacity(BC) would be excelled by marsh due to the soft way of load transferring on it through tyres.

Loading in gradual manner is the other aspect which is considered here. Any construction is a gradual process. As far as the construction on marsh is concerned, it will be more effective due to the fact that the time available during construction is sufficient for marsh to acquire higher BC before settlement. Hence the less settlement takes place & the factor of safety would be increased in marshy ground. This is an additional advantage over the direct effect of using of light weight material which contribute to less settlement obviously. Apart from these factors, since the vehicle load is applied at top level, settlement of marsh will be further reduced due to the fact that the required strength is less at the bottom (marsh) level according to Mohr's Circle Theory. There in, the height of the

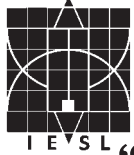
embankment will act as the medium of pushing the load further (away) to the top from marshy ground which is very weak. Summarizing the factors which attributed for less settlement & increasing BC are the (1) gradual way of loading on marsh with time (2) due to the cushioning effect as well as the bumping effect of marsh & light material (3) due to the less strength required at the bottom (marshy) level. (4) less weight imposed by the light weight material itself which used for construction

Embankment Construction could be commenced as simply as just dumping tyres in random on existing marsh for about (3m?) minimum height without any ground preparation. Some times the marshy ground will have to be excavated to maintain the minimum tyre height & top finish level. However the tyres would have to be packed & oriented by using the tied-up tyre bundles to achieve the maximum load bearing arrangement & to avoid any excessive flexibility. Further the tied-up tyres will be very effective in order to minimize any adverse effect due to buoyancy. This is followed by the 1-1.5m typical road construction using gravel, ABC etc. to match with the road finish level. Accordingly the most eminent problems such as ground settlement & the excessive flexibility will be eliminated. Further the Geo-textile membranes could be sandwiched in between two embankment material layers (ie. between tyres & gravel) for the better results. In a situation of flood, the reduction in BC of marsh would be compensated by the less weight impose on it, due to the effect of buoyancy. However an additional precaution will have to be taken to be taken in a high flood situation to withstand the adverse effect of buoyancy on the tyre embankment & washing away of material.

As far as the annual tyre usage in the country is concerned, supply of waste tyres would be sufficient for this exercise. Further, the tyre collection will not be difficult by arranging the disposal centers at RDA depots etc. to collect the waste tyres from the vehicle owners free. Hence in the other hand, it will be an environmental friendly construction since the tyre pollution is taken up completely while saving as much as the natural gravel in the other hand.

Hence the construction on marsh using tyres etc. (light material), as explained above would be more economical & the best option. In a situation where the light material is short in supply, constructing a part of the road even, using light material, would be economical.

THE INSTITUTION OF
ENGINEERS, SRI LANKA



Competition
on



“Water Resources

Planning, Development
and Management for
Future Challenges

Role of Engineer meeting Future
Challenges of Water Resources”

Session 2013 / 2014

Sponsored by
International Water
Management Institute (IWMI)

We are pleased to announce that arrangements are being made for the forthcoming Competition on Water Resources Development sponsored by IWMI towards the Annual Sessions of IESL in October 2014. The prizes will be given for the two best Technical Papers under the above mentioned theme prepared for this competition by Associate Members & Corporate Members of IESL. Jointly authored papers will be accepted, provided at least one of the authors satisfies the above criteria. Papers must be original and demonstrate the author's knowledge and experience of the subject. The award winning articles will be published in the journal, "Engineer" of the IESL.

Water is a vital input in industrial, energy, tourism, recreational, navigation, agriculture, forestry, livestock and fishery sectors. As water scarcity grows, competition among sectors and users, and between the human needs and the environment intensifies. Effective and efficient water management is therefore a prerequisite for sustainable socio-economic development.

The paper can address extraction, storage, distribution, use and disposal issues in any economic sector. It should illustrate how engineering and technology is applied in increasing productivity, in balancing supply and demand of water and/or in reducing water pollution and protecting freshwater ecosystems.

Preference will be given to papers of an empirical and analytical nature based on primary and/or secondary data although papers addressing topical issues through conceptual development may also be forwarded.

AWARDS & PRIZES

- (A) **Rs. 45,000.00** - For members of IESL over 35 years of age on 01 October 2014
- (B) **Rs. 30,000.00** - Engineering graduates holding membership of IESL and 35 years of age and below on 01 October 2014

Intention to participate in this competition should be intimated to us **along with your bio-data & the full Technical Papers on or before April 30, 2014.** IESL form IWMI/1 should be used for this purpose.

Further information could be obtained from the Chairman, Steering Committee on Water Resources Development of Institution of Engineers, Sri Lanka, on Tel: 077 3540350 or Publicity Officer-IESL 011-2685490, 011-2698426 or 011-2699210, ext- 232, 207, E-mail: dir.pub@iesl.lk, ieslpub@gmail.com, Fax : 011-2699202

Note: Forms and Guidelines could also be downloaded from the IESL Website, www.iesl.lk or obtained from the IESL Secretariat.

IESL Wayamba Centre AGM and Annual Sessions Held at Kurunegala

The Annual General Meeting of the Wayamba Provincial Centre of the Institution of Engineers, Sri Lanka (IESL) was held on Friday, 29th November, 2013 at the Seasons Hotel, Lake Round, Kurunegala from 4.30 pm onwards.

The Annual General Meeting for the 2012/2013 session was started at 4.30 pm. After the formalities, Eng. Samitha N. Jayasinghe, Executive Engineer, Anamaduwa was elected as Chairman, and Eng. K.B.V. Indrapala, Chief Engineer, Lower Daduruoya Development Project, Irrigation department, Nikaweratiya was elected as Senior Secretary for the term 2013/2014.

The annual sessions commenced at 6.30pm at the same venue where Eng. W.J.L.S Fernando – President of IESL graced the event as chief guest and Eng. Tilak De Silva – Immediate Past President of IESL was the Guests of Honor.

A large number of engineers working/ living in North Western Province attended the AGM and Annual Sessions 2013.



IESL Northern Provincial Centre Holds AGM

The Northern Province IESL caters to the professional needs of engineers in the five districts of Mannar, Vavuniya, Mullativu, Kilinochchi and Jaffna. Massive development activities are currently taking place in this province and there is a lack of experienced Engineers in these areas. Also the number of Engineers working in this province is much less compared to other provinces. Therefore the IESL activities are very essential for this Province.

The Annual General Meeting of the IESL Northern Provincial Centre (IESL- NPC) was held at the Fort Hammenhiel Resort, Karainakar, on 9th October 2013 (Wednesday) from 5.30 p.m onwards. Eng. Tilak De Silva, President of IESL for 2012/2013 session was the Chief Guest and Eng. S.B.Wijekoon, President - Elect of IESL for 2013/2014 Session was a special guest.

More than 70 members including Corporate and Associate Members in the province, attendant this event. It commenced with welcome dance followed by lighting of traditional oil lamp.

Eng. Tilak de Silva, in his speech indicated the importance of IESL in terms of the development of Northern Province, expediting the commencement of the Faculty of Engineering of the University of Jaffna at Kilinochchi and the accreditation of other Engineering educational Institutes by the IESL. He wished Good Luck for the NPC and congratulated it for being one of the best centers out of the 8 Regional Centers.

Eng. S.B Wijekoon did the presentation on the topic of 'Adjudication and Arbitration in Construction Contracts'.

Designation	Members
Chairman	Eng.T.Barathithasan
Vice Chairman	Eng.T.Thiruvarduchelvam
Secretary	Eng.N.Nantharuban
Assistant Secretary	Eng.R.Balendra
Treasurer	Eng.T.Rajagobu
Member-1	Eng.A.Robert Peries
Member-2	Eng.S.Yuganeethan
Member-3	Eng.P.Thivakaran
Member-4	Eng.N.Vijayaravi
Member-5	Eng.V.Suthahar

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A LED lamp....

during the peak since expensive thermal power plants are dispatched to meet the demand. More electricity used during peak periods results in more generation costs to the utility. Finally that added cost is reflected in the electricity tariff and the overall economy indirectly. Hence using LED has both direct and indirect benefits to the consumer.

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Application of Energy...**Table 01:** Lighting Classes for Motorways and Traffic routes (As per the BS EN 13201 : 2004):

Nr	Hierarchy description	Type of Roads	Detail description	Traffic flow vehicles per day	Lighting Class
1	Motorway	Limited access	Routes for long distance traffic, Main carriageway a) Complex interchanges b) with interchanges < 3km c) with interchange > 3km d) Emergency lane	< 40,000 > 40,000 < 40,000 > 40,000 < 40,000 > 40,000 -	ME1 ME1 ME2 ME1 ME2 ME2 ME4a
2	Strategic route	Trunk and principal roads	Route for fast moving long distance traffic, speed limits are more than 40mph a) Single carriageways b) Dual carriageways	< 15,000 > 15,000 < 15,000 > 15,000	ME3a ME2 ME3a ME2
3	Main Distributor	Major urban network	Route linking to urban network, speed limits are less than 40mph a) Single carriageways b) Dual carriageways	< 15,000 > 15,000 < 15,000 > 15,000	ME3a ME2 ME3a ME2
4	Secondary Distributor	Classified roads B and C	Route linking to urban network, speed limits are less than 40mph a) Rural areas b) Urban areas	< 15,000 > 15,000 < 15,000 > 15,000	ME3b ME3a ME3b ME2

Each ME class conclude definite values for average road surface luminance (L), Overall uniformity of the luminance (U_0), Longitudinal uniformity of the luminance (U_l), Threshold increment (TI) and Surround ratio (SR) as tabulated in the Table No.02 as follows;

Table 02: Ratings of ME series Lighting classes (As per the BS EN 13201 : 2004):

Class	Luminance of the road surface of the carriageway for the dry road surface condition			Disability glare	Lighting of surrounding
	L in cd/m ² (average maintained)	U_0 (minimum)	U_l (minimum)	TI in % (maximum)	SR(minimum)
ME1	2,0	0,4	0,7	10	0,5
ME2	1,5	0,4	0,7	10	0,5
ME3a	1,0	0,4	0,7	15	0,5
ME3b	1,0	0,4	0,6	15	0,5
ME4a	0,75	0,4	0,6	15	0,5
ME4b	0,75	0,4	0,5	15	0,5

The importance of these factors are illustrated as follows;

a) Luminance-

The most generally used approach to selecting quality criteria for lighting roads for motor traffic is based on the luminance concept. This is the minimum value to be maintained throughout the life of the installation. It is dependent on the light distribution of the luminaries, the luminous flux of the lamps, the geometry of the installation and on the reflection properties of the road surface (See Fig.1).

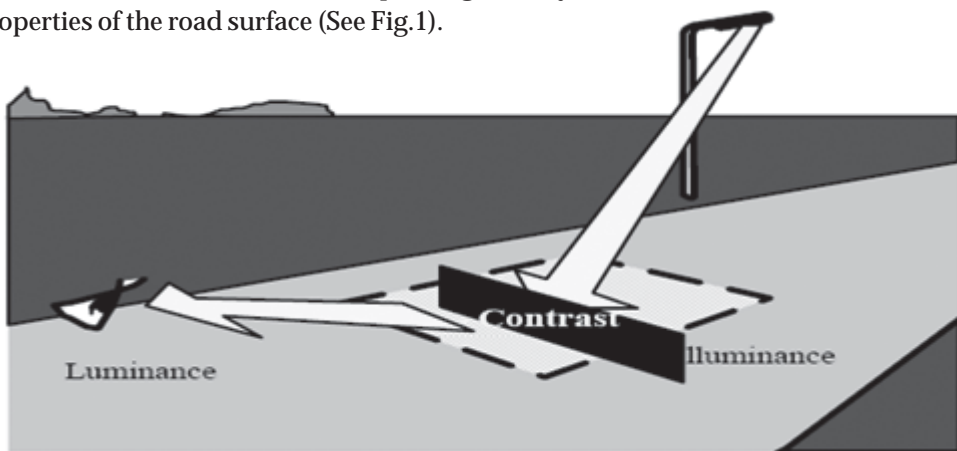


Figure 1

The road surface is a very important criterion in Road Lighting. Same illuminance may result in different visual scene because of difference in Road Surface. It is obvious that road surface luminance rather than illuminance should be the accurate measure of the effective light in a road surface. In the present state of technique and the knowledge of reflection properties of road surface, calculation and measurement of luminance is difficult. Thus illuminance values are taken as standards for road lighting. However, it shall be kept in mind, the visual appearance of a road is solely determined by the luminance values and uniformity. Same illuminance may result in different Visual Scene because of difference in Road Surface Reflectance and Uniformity.

b) Uniformity

A good overall uniformity ensures that all spots on the road are sufficiently visible.

Overall uniformity (U_0): It is the ratio of the minimum to the average road illuminance. A good overall uniformity ensures that all spots on the road are sufficiently visible.

Longitudinal uniformity (U_l): It is the lowest ratio of the minimum to the maximum road illuminance in the middle of each lane.

c) Glare

It is caused due to the sudden presence of very bright source in the visual field. Glare in public Lighting is caused by luminaries.

a) Disability glare impairs vision

b) Discomfort glare of lighting cause visual discomfort.

Glare depends on the illumination produced by the luminaire on the eye of the observer.

The light from the glare source scattered in the direction of the retina will cause a bright veil to be superimposed on the sharp image of the scene in front of the observer.

d) Threshold Increment

The percentage increase in the luminance level required to make an object equally visible as in the absence of glare. Glare Control Mark is a measure for discomfort glare in Road Lighting designs. It is calculated from certain luminaire and installation characteristics.

e) Surround ratio

It is the ratio that measures the amount of light falling on the surrounds as a proportion of that falling on the road. Surround ratio is defined as the ratio of the average illumination on street, 5m wide or lesser if space does not permit, which are adjacent to the edge of the both sides of the carriageway to the average illumination on the adjacent streets, 5m wide or half the width of the carriageway whichever is the smaller in the carriageway.

Road illumination levels recommended by International Commission on Illumination (CIE 180) are given in Table 03 below;

• **Other important factor of road lighting is selection of Road Lantern and it is elaborated as follows;**

Selection of Road Lantern:

The most important element of the illumination system is light source. The selection of light source was based on luminous flux, service life, Colour Rendering Index (CRI), color temperature, light intensity, and light efficiency. High pressure sodium lamps of 250Watt have been used in all the expressway as a road lanterns. High pressure sodium lamps have higher light efficiency, longer working life, stronger penetrability.

A so called 'semi cut off' (SCO) light distribution has been considered. SCO lighting has a lower level of beam angle and it limits the high angle light towards the driver, caused due to glare.

According to the comparative life cycle assessment of available street light technologies for sustainable Innovation it was found that LED technologies were comparable in terms of the environmental impacts of their manufacture, lower energy use, and lower maintenance costs due to long-lasting bulbs. However the efficiency of high pressure sodium technology appears to be in the maximum level, while that of LED lighting is increasing rapidly. LED lighting is increasingly emerging as a way to capture energy efficiency savings around the world. This will provide a significant cost saving for the energy consumption on expressway street lighting in near future.

LEDs are becoming a promising alternative for road lighting in near future and still reaching noteworthy improvements in their luminous efficacy. With the recent development in LED technology, the efficiency of commercial LEDs has been increased to around 100 lumens per watt, and even more efficient LEDs may be developed in the future. Nevertheless, HPS lamps still outperform LEDs efficiency wise. Further, LEDs usually involve higher initial cost and still not proven for expressways. Because of low energy consumption and low cost of maintenance, definitely there should be a conservative approach towards LED road lighting in future for all road lighting installations.

Although the power consumption of LED lamps are very low, still not being widely used and proved for illumination of expressways since there are technical issues on efficacy, glare and thermal management of LED lamps. Comparison of road lantern with 250Watt HPS Lamp and 150Watt LED are given in Table 04;

Contd. on page 11...

Contd. from page 10...

Application of Energy...

Table 03

Snr	Category	Average Level	U ₀	U ₁	T1
1	Residential areas and pedestrians	1 - 2 lux	0,2	n/a	n/a
2	Largely residential, but some motorized vehicles	4 -5 lux	0,2	n/a	n/a
3	Major access roads, distributors and minor main roads	0,5 cd/m ² (~ 8 lux)	0,4	0,5	n/a
4	Important rural and urban traffic routes	0,5 cd/m ² (~ 15 lux)	0,4	0,6	20%
5	High-speed roads, dual carriageways	0,5 cd/m ² (~ 25 lux)	0,4	0,7	15%

Under these circumstances we may have to still depend on HPS lamps in road lighting as installed in Colombo - Katunayaka Expressway and being used in Southern Expressway.

Lighting arrangements used in Sri Lankan Expressways:

For the Southern expressway, road Lighting has been provided only for the interchanges. Additional outside lighting was provided for about 300m beyond the expressway-ends of the ramps. The other side lighting was terminated at the end of ramp. All the interchanges were provided with transition lighting arrangement along both sides of the expressway.

But in Colombo - Katunayaka Expressway, road Lighting has been installed for the entire road stretch including interchanges compared to Southern Expressway. The Colombo - Katunayaka Express-

(45m) and road lantern (250W), I was able to get following technical details in accordance with ME Series Lighting Class on Colombo Katunayaka Expressway.

- 1.Average maintained Luminance
- 2.Overall Uniformity
- 3.Longitudinal uniformity
- 4.Maximum Threshold increment

The results obtained are tabulated in Table 05 as follows:

- 1.Average maintained Luminance: 1.38 cd/m²
- 2.Overall Uniformity U₀ - 0.61
- 3.Longitudinal uniformity UI - 0.74
- 4.Maximum Threshold increment TI %- 7
5. Minimum Surrounds Ratio. SR-5

Comparison of the above results with ME Series:

Assumptions : Road width- 7.5m, Distance between 02

Table 04

	Type of Lamp	250Watt HPS	150Watt LED
1	Wattage	250	150
2	Initial Lantern Lumens	25,000	13,500
3	Efficacy (Lm/W)	100	90
4	Life time (Hours)	12,000	50,000
5	Correlated Colour Temperature (K)	2700	4000 to 6000
6	Cost	100X	300X

way lighting arrangement has been installed not merely to provide road lighting but also to maintain the country image and the standard at a higher level similar to other developed countries aiming the panoramic attraction on foreign delegates and tourists at the first glance of visiting Sri Lanka.

Comparison of lighting designs of Colombo Katunayaka Expressway by using "Dialux" lighting design software:

Determining an acceptable lighting system design requires numerous iterations of calculation based on numerous variables. In this context I used the computer software called "Dialux" for lighting design analysis. From Dialux software, it is possible to generate templates for the design and to check the luminance, uniformity and other parameters by fixing the wattage of road lantern, distance between lamp post and road width.

a).Application of "Dialux" Software for lighting class ME3a:

- Data applied:
- 1) Road Width - 7.5m
 - 2) Distance between 02 lamp post - 45m
 - 3) Power of Road Lantern proposed - 250W

By applying those data ,i.e . width of the road (7.5m), distance between 02 lamp post

lamp post - 45m and road lantern-250W

b). Application of "Dialux" Software for Colombo - Katunayaka Expressway:

The Illumination requirement in the original Contract requirement of the Colombo - Katunayaka Expressway was specified as 1.5 cd/m². Therefore to match the above condition the required lighting class was ME2 and according to the International Commission on Illumination (CIE) standards, the illumination levels and other factors specified on ME2 class were used as follows;

- 1.Average maintained Luminance: 1.5 cd/m²
- 2.Overall Uniformity U₀ -0.4
- 3.Longitudinal uniformity UI - 0.7
- 4.Maximum Threshold increment TI %- 10
- 5.Minimum Surrounds Ratio SR - 0.5

Therefore the selected lighting class was ME2 and by applying all these data to "Dialux" following results were achieved inversely;

- 1) Road Width -7.5m
- 2) Distance between 02 lamp post - 35m
- 3) Power of Road Lantern proposed - 250W

Comparison of ME3a and ME2 lighting classes on economical aspects:

Since there were no complaints, about road lighting so

Test Details on Dialux:

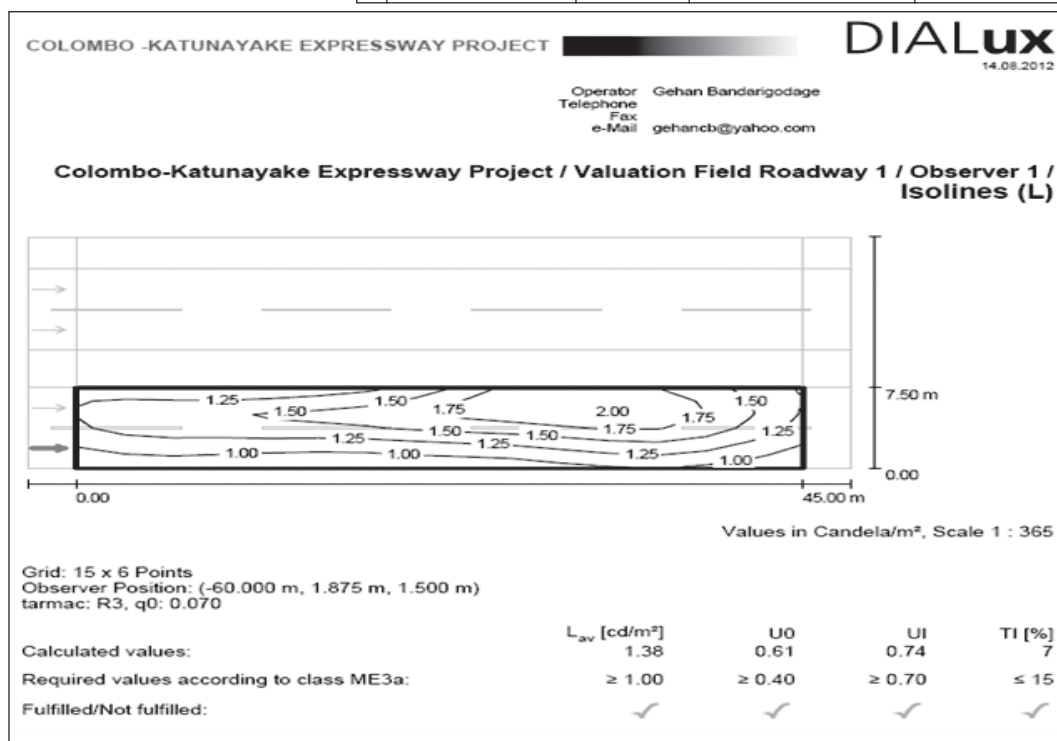


Table 05

	Results obtained	Relevant values of ME3a series (Ref. Table 2)	Equivalent ME Class
1	Average maintained Luminance	1.38 cd/m ²	ME3a
2	Overall Uniformity (U ₀)	0.61	0.40 ME3a (Minimum)
3	Longitudinal uniformity(U _I)	0.74	0.70 (Minimum) ME3a
4	Maximum Threshold increment TI %	7	15 (Maximum) ME3a
5	Minimum Surrounds Ratio SR - 0.5	5	5 (Minimum) ME3a

Feature	Average Luminance	Average Luminance
	1.5 cd/m ² (Class ME2)	1.0 cd/m ² (Class ME3a)
1	No of Road lighting columns	729 / 567
2	No of 250Watt HPS Lanterns	1458 / 1134

From above, the energy consumption/can be tabulated as follows:

	Road	Average Luminance 1.5 cd/m ²			Average Luminance 1.0 cd/m ²		
		Total kWatt	kWh per day	Cost per day, Rs	Total kWatt	kWh	Cost per day, Rs
1	CKE	364.5	4009	70,804,00	283.5	3118	55,070.00

- Operation time assumed for lights from 6.30 pm to 5.00 am(10.30 hrs)
- Assumed tariff is as follows:
 - Peak time 6.30PM to 10.30PM - 25.00 Rs per 1kWh.
 - Off peak 10.30PM to 5.00AM - 14.50 Rs per 1kWh

If the design conditions of "Southern Expressway" is adopted in "Colombo - Katunayaka Expressway" the total annual energy saving for total road length is 320,760.kWh and it is approximately equal to 5.66 Million Rupees per year. Please note that, here the maximum demand (kVA) tariff factor and fuel adjustment changes have not been considered for the comparison.

Summary:

As the summary of the abstract, I may propose followings to consider in future, when designing and implementation of Road Lighting in Sri Lanka.

- 1.In general, being Engineers we always should select the best suitable and most appropriate design methodologies when practicing Engineering in the society targeting optimum benefits out of minimum energy.
- 2.In future there should be a standardization on lighting levels on road lighting of Expressways in Sri Lanka. In my experience, lighting level 1cd/m² for Expressways in Sri Lanka is more appropriate as it saves more electricity
- 3.Provisions has to be made to replace HPS with LEDs in future for saving electricity without changing the Road Lighting columns, once the LEDs are being introduced and when the HPS luminaries are to be replaced.
- 4.Introduction of the intelligent lighting control module for the road lighting distribution panels to reduce the voltage levels at late night in order to achieve less power consumption in HPS road lanterns.
- 5.There should be a policy of standardization on Road Lighting of Expressways in Sri Lanka, in future
- 6.The amount of Energy saving depends on the Luminance value and the lighting class.



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