

The Association is not,
as a body, responsible
for the opinions ex-
pressed by individual
authors and speakers



The Association of Public Lighting Engineers

CONFERENCE : CHELTENHAM

1936



PRESIDENTIAL ADDRESS

BY

EDWARD C. LENNOX, M.I.E.E.

North-Eastern Electric Supply Co., Ltd., Newcastle-upon-Tyne

*The advance copy of this paper is issued on
the distinct understanding that the text
shall not be published prior to the date upon
which the paper is read before the Conference*



TUESDAY, SEPTEMBER 8th, 1936



A. P. L. E.
13, VICTORIA STREET
LONDON, S.W.1

Presidential Address

by EDWARD C. LENNOX, M.I.E.E.

North-Eastern Electric Supply Co., Ltd., Newcastle-upon-Tyne

GENTLEMEN,

My first feelings in addressing you are of appreciation of the honour you have conferred upon me in electing me to be President of your Association. The responsibility which this position involves is an important one, growing with the increase in the Association's membership, the widening of its activities, and the greater demand which is now being made on Public Lighting officials to meet the public need.

I am confident, however, in entering this office that I shall have the support and co-operation not only of Members of the Council but of the Members of the Association, and with their help I will do my utmost to further the interests of the Association, and to improve Street Lighting as a public service.

The past year has been eventful in the life of the Association, and I would be failing in an obvious duty if I did not bring to your notice the fact that our Past President is deserving of the best thanks of all Members for the energy and time he has given to the Association, and for the skilful guidance of its affairs through a difficult and strenuous year. The number of Sub-Committees appointed during the year and the number of meetings held have been a maximum. The matters dealt with have been of most varied character, including the appointment of a new Secretary, arrangement of new Official Journal, Education Scheme, Interim Report of the Ministry of Transport Street Lighting Committee, and in addition, the regular routine which attends any growing Association such as this.

It was with much regret that the Council received intimation from Mr. J. S. Dow of his resignation as Honorary Secretary. Mr. Dow had looked after our interests for some five years, during which the Association had grown from a membership of 180 to 290. His interest in and his knowledge of problems affecting light and lighting were well known, and this, together with his connection with kindred Institutions and Lighting Engineers in all parts of the world, were valuable assets to our Association. His decision to resign was due, however, to an increase in duties in other directions, and it became necessary to appoint another Secretary in his place.

Your Council considered themselves very fortunate when, after much consideration, they obtained the services of Mr. H. O. Davies, whose interest in Municipal affairs was already established, and whose organising ability has been of inestimable value in arranging this year's Conference and Exhibition. We look forward to many years of work with Mr. Davies, and hope that he will be happy looking after our interests.

With Mr. Davies came the production of the new official Journal of the Association—"Public Lighting and the Public Lighting Engineer," a quarterly issue (at present) which we hope will prove of value to Public Lighting officials and Lighting Committees, as a record of the proceedings of the Association, and a ready means of publishing articles of Public Lighting interest. I would appeal to all Members to make the fullest use of the new Journal by contributing articles or pithy paragraphs of interest to others. Its success depends on the active interest which Members take in it, and the amount of material they place in the hands of the Editor.

On the question of the Education Scheme, much time has been spent by the Sub-Committee appointed by the Council and, as a result of that work, it is hoped to submit a complete scheme to Members at the Annual General Meeting. This scheme, if approved, will go a long way to encouraging interest in the science of public lighting for the benefit not only of Members (present and to come), but of the authorities who administer this increasingly important service.

M.O.T. Interim Report—Street Lighting

Since our last General Meeting an Interim Report has been issued by the Ministry of Transport of the findings of the "Departmental Committee on Street Lighting," set up in June, 1934. The work of the Committee is probably as difficult as that set to any special Committee to consider problems of national interest. To decide and express in technical terms what does constitute really good roadway lighting is a problem, the complexity of which should be adequately realised by all concerned in the provision and administration of Street Lighting. The solution can only be arrived at by the closest collaboration

of the most divergent branches of science and a considerable practical experience. It is appreciated that some time must elapse before the final Report is available but, in the meantime, the Interim Report was most welcome, and should have obviated any need for delay on the part of Lighting Authorities in putting in hand much needed schemes for improvement in their Public Lighting services.

I do not propose to comment on the Report in detail as we are to have the opportunity during the Conference of a general discussion on its findings.

The issue of the Report has been followed by an increasing interest of the public in road lighting—questions have been asked in Parliament and replies have been elicited from the Minister of Transport which indicate his sympathy with our ideals.

Street Lighting has become "news" in the eyes of the public and the Press have not hesitated to publish in detail items of interest concerning it, supplemented by favourable editorial comment. The value of these "editorials" cannot be denied, being a reflection of public opinion they influence the policy of appropriate authorities. I would suggest, therefore, that Members bring to the notice of the Press details of improvement schemes they have in hand so that the general public may have knowledge of and take an opportunity of inspecting and appraising them. In this way, by giving as much publicity as possible to developments, we will find with an increased knowledge on the part of the public an appreciation of public lighting as a safeguard against accidents at night, and what we know among ourselves to be "a public need" will then become a "public demand."

Road Accident Data

Attention is still being drawn to the number of accidents on streets and highways which occur daily. Notwithstanding the most laudable efforts of the Ministry of Transport and Safety First Committees, the figures are alarmingly high and statistics continue to show that the greatest number of accidents occur—

- (a) In winter months—during the hours of 5 p.m. to 8 p.m.,
- (b) In summer months—during the hours of 10 p.m. to 11 p.m.,

that is, during the hours where artificial lighting in streets is essential. No one will question the statement that during these hours the volume of traffic is considerably less than during hours of daylight. It is naturally difficult to ascertain for various times of the year the proportion of traffic during daylight hours to dark hours.

From the details of the traffic census (which is taken each year during August) I find the following data alluding to 1928 and 1935 for various classes

of roadways. Day: 6 a.m. to 10 p.m. (16 hours); night: 10 p.m. to 6 a.m. (8 hours).

Type of Road	Percentage Day/Night Traffic		Percentage Increase in Traffic 1928/1935	
	1928	1935	1928	1935
Industrial ...	5.5	7.5	56	100
Residential ...	7.5	9.0	31	58
Seaside ...	6.0	7.4	42	75
Tourist ...	6.5	8.5	92	150
Average				
All Classes	6.3	8.8	49	107

These figures indicate:—

- (1) The small amount of night traffic as compared with that during the day. We can assume from these figures that the proportion of night to day traffic throughout the year does not exceed 33%.
- (2) The large increase in night traffic during the past seven years.

This increase in night use of roadways will bring increased accident risks.

I find that the traffic figures on a main highway during August were:—

Period	Average No. of Vehicles per day		Night/Day Traffic	Increase in Day Traffic	Increase in Night Traffic
	Day	Night			
Aug., 1930 ...	4,505	261	5.7%	—	—
Aug., 1935 ...	5,982	473	7.9%	33%	81%

i.e., similar figures to those above quoted.

Accident data for a full year on a 2-mile stretch of this roadway is given below:—

- (A) Before improved lighting installed.
- (B) After improved lighting installed.

	During Daytime			During Dark Hours		
	Accidents	Killed	Injured	Accidents	Killed	Injured
(A) ...	63	1	33	33	3	20
(B) ...	49	Nil	26	21	Nil	11
Decrease	22%	—	20%	39%	—	45%

It is rightly claimed that the greater reduction in number and severity of accidents at night, despite 81% increase in traffic, is due to the better visibility afforded by improved road lighting.

It is such figures as these which establish in the minds of the public and also of Lighting Authorities the necessity for better public lighting. Road accidents at night must have a definite relationship to (a) traffic density, and (b) visibility, and the above mentioned example is only one of many which I am certain could be produced showing that where better

visibility has been afforded—by the provision of more adequate public lighting—the accident rate during dark hours has been materially reduced.

It does not seem unreasonable to suggest that the site of all accidents occurring during dark hours should be inspected by a capable person who would report to the police his opinion of the general visibility afforded the parties concerned. The difficulty of viewing a position after an accident under possibly different weather and traffic conditions is at once apparent, but allowance for this could no doubt be made.

A special Report Sheet setting out a series of questions could be prepared and the police could have this completed by a Public Lighting official in the area. In such a way direct evidence by competent persons would be brought to the notice of Lighting Authorities, and could not help but be of value to them in their deliberations.

Complete statistics of the kind necessary to show the necessity for better public lighting are very difficult and costly to obtain. After studying such figures as were available, based on 1933 Survey of Accidents, the author arrived at the following conclusions in a Paper read before the Public Works Congress in November, 1935.*

The 1935 Survey of Accidents confirm these conclusions; the 1935 figures are shown in brackets.

- (1) Over 46% (1935—51%) of the total accidents occur during winter months—although traffic as expressed in vehicle-miles (i.e., No. of vehicles times the miles run) is probably one-half that of summer.

As the ratio of accidents winter to summer is approximately 1 : 1,

So the accident rate winter to summer is approximately 2 : 1 per vehicle mile.

This, I believe, is due mainly to increased dark hours during winter months.

- (2) Of the accidents which occur during winter months 52% occur during dark hours.

Statistics of the traffic in vehicle-miles during dark hours, as compared to daylight hours, is a matter for conjecture—but it is reasonable to suppose that the total vehicles on the roads during dark hours is only one-third of that during daytime, moreover the average miles per vehicle during dark hours is probably half that during daylight, so it is estimated that the figure for vehicle miles during dark hours is at most one-sixth of that during daylight hours—

* *Public Lighting: Its Necessity and Administration*. E. C. Lennox, A.M.I.E.E. Public Works, Roads and Transport Congress (1935).

As the proportion of accidents dark hours to daylight hours is greater than 1 : 1,

So the accident risk dark to daylight hours must be said to be greater than 6 : 1.

The Report on Fatal Road Accidents (year 1935), published by Ministry of Transport, August, 1936, shows an increase over year 1933 in accidents occurring during dark hours. The following table shows the percentage of accidents dark hours/total for various months of the year for 1933 and 1935. The figures are sufficient to show—

- (1) The increasing accident risk at night, and
- (2) The need for better street lighting.

Months	Percentage Fatal Accidents, Night/Total			
	Built-up Areas		Non-Built-up Areas	
	1933	1935	1933	1935
<i>Winter Months</i>				
January ...	58	66	62	62
February ...	51	54	46	52
March ...	30	39	32	43
October ...	41	40	47	43
November ...	60	67	67	67
December ...	67	73	66	64
Total ...	51	58	54	56
<i>Summer Months</i>				
April ...	20	25	31	27
May ...	14	16	20	22
June ...	12	10	17	21
July ...	12	13	20	16
August ...	16	22	22	28
September ...	20	26	32	38
Total ...	17	18.7	24	27
Total for Year ...	33.3	40	39	40

Other countries appear to be more definite in their statements of accident data in relation to dark and daylight hours.

From America we learn that in Cleveland, on a certain highway, despite the fact that traffic density at night is less than half that of day, there were twice as many fatalities by night as by day—ratio of accident risk night to day is therefore 4 : 1.

On certain other main traffic routes the ratio of night to day accidents per vehicle mile is—

- (a) Fatal accidents—ten to one.
- (b) Other accidents (injuries)—six to one.

The cost of lighting these main traffic routes has been estimated to be one-third of the present economic loss from preventable night accidents.

At Detroit it was found that the ratio of night to day accidents increased from approximately 1 to 1 to 2 to 1 when lighting was curtailed by 35%. (This curtailment of 35% of normal lighting probably saved only 10 to 15% of the annual costs.)

Further, it is stated that "there are approximately 50,000 miles of highway in the United States on which the night accident rate is at least six times that of the day accident rate, and on which corresponding savings can be made by the installation of safety lighting."

The total cost to Great Britain of roadway accidents is difficult to estimate—but, apart from loss of time and business and the enormous suffering involved, the cost to Insurance Companies for Motor Vehicle Insurance is estimated at £25,000,000 per annum.

The present annual cost of public lighting in Great Britain is approximately £5,000,000; if this were increased by 50%, i.e. by a 10% saving effected on Motor Insurance Costs, the lighting could be increased by at least 100%.

By these and other considerations one is forced to the conclusion that if better visibility were provided during dark hours on heavy traffic routes and in built up areas, the accident rate would decrease materially. One feels justified in believing that the economic gain due to decrease in accidents would more than meet the extra expenditure necessary to provide adequate public lighting.

Administration

I do not intend in this address to give a resumé of my work in the Street Lighting field, but I would like to refer you to the area with which I am connected to bring out one or two points on the difficulties of the present form of administration of Public Lighting.

The area over which my company have powers to supply covers 5,600 square miles. There are 124 Lighting Authorities who are providing street lighting within their respective areas.

76 are Parish Councils operating under the Lighting and Watching Act, 1833.

9 are Rural District Councils operating with Urban Powers under Section 161 of the Public Health Act, 1875.

36 are Urban District Councils or Non-County Boroughs.

3 are County Boroughs or Cities.

The lighting units in the Parochial areas vary considerably, being from 40-watt (400 lumens) type to 420-watt Mercury Vapour Electric Discharge Lamp (18,000 lumens) type. The lighting seasons vary from dusk to 9.30 p.m. six months of the year (810 hours) to dusk to dawn all the year (3,820 hours). The size and number of lighting units and hours of lighting are generally products of the type of roadway and the ability to pay for street lighting from parochial funds.

The desire for better lighting to meet present day needs is expressed in the average wattage per lamp in the Parochial or Parish areas which has increased by nearly 30% in the past five years. This average wattage per post is still less than 100 watts; this may be considered low, but is due to the difficulty in meeting additional costs, a point that will be appreciated when it is realised that the rates levied for Street Lighting purposes in these areas varies from 6d. to 1s. 10d. per £ of rateable value, the average being between 9d. and 1s.

The value of better street lighting as a means of reducing the accident rate at night is realised by many Parish Councils, and better street lighting would be a reality were it not for the impossible financial position. As an example of their efforts to preserve the safety of their parishioners one Parish Council, which has approximately 20 miles of roadway lighted, necessitating a lighting rate of 1s. 5d. per £, has to allocate 5d. per £ of this amount to provide adequate lighting on 2 miles of a main traffic route passing through the Parish area, and mainly used by "alien" vehicular traffic which contributes nothing towards the local rates. It must be hard for these parishioners to realise that the rates for the whole of the lighting in the majority of large towns from which the "alien" traffic emanates is, in most cases, not more than 5d. per £.

The time is surely overdue when the cost of lighting such traffic routes should be met by those for whom the lighting is necessary and because of whom it is provided. Apart from the financial difficulty, the present Acts authorising Street Lighting allow of too many possible Lighting Authorities.

Consider the composition of two typical counties, A and B, in the north-east coast area:

A is a comparatively densely populated county, and
B is fairly thinly populated.

County	County Boroughs	Non-County Boroughs and Urban Districts	Rural Districts	Parishes in Rural Districts		
				With Street Lighting	No Street Lighting	Total
A	5	32	13	107	105	212
B	2	20	11	31	425	456

Each Parish, in addition to the Boroughs and Urban Districts, is a potential Lighting Authority with its own ideas as to type of lighting, size of lamp, burning period, etc. It seems, therefore, impossible under present conditions to attain the ideal of uniform lighting. A Rural District Council can, with the consent of the Ministry of Health, become the lighting authority for the whole or part of its area, and in this event can pool the resources of the Parish areas included.

The benefit of this is found in an example of a Rural area which in 1932 adopted Urban powers under Section 161, Public Health Act, 1875, and undertook the responsibility for lighting in the 13 parishes in its area. Actually the "pooling" gave extra bargaining power to the Council, and full benefit of this was passed on to all villages by providing additional lighting points, bigger lamps and increased lighting hours.

Further, some Parishes in the area which had no lighting before the adoption of "pooling" are now provided with street lighting.

The principal details of the total lighting installations arising out of the "pooling" are:—

	A 1931/32	B 1935/36	Increase A/B
No. of Lamps	961	1,336	40%
Average Wattage ...	40	50	25%
Average Burning Hours	1,500	1,800	20%
Total Benefit (i.e. K.W. Hours)	57,660	120,240	100%

This has been carried out for a rate which is not more than the average paid by the several parishes at the time of "pooling."

Similarly, if the responsibility for financing lighting was vested in much larger authorities than at present, considerable improvements could be made on the present lighting conditions without material increased rating.

This point is referred to in the Interim Report of the Departmental Committee of the Ministry of Transport, and is really, so far as Urban and Rural (i.e. including Parochial) areas are concerned, the root of the present difficulties in regard to improved lighting. Until legislation is introduced which will make larger authorities the Lighting Authority, lighting in these areas will improve very slowly and certainly not with uniformity.

It is true that under Section 23 of the Road Traffic Act, 1934, the County Council may proceed with schemes for providing or improving lighting on County roads, and may spread all expenses incurred over the whole county area. Clause 3 of this Section, however, provides—

"that a road Lighting Authority who have . . . provided lighting for County roads in their area shall, if they so request, be entitled to receive from the Council of the County the amount raised by that Council in that area in respect of expenses incurred by them under this Section . . . unless the Council of the County have . . . exercised the power conferred upon them in this Section in respect of a road . . . in that area."

This indicates that any Lighting Authority now lighting a County road can, unless the roadway to be lighted by the County is within the area of the

Lighting Authority, claim back any money raised by the County Council from that area.

In practice it is found that all authorities who instal lighting do actually light the County roads in their area, and if the authorities outside the route of the particular roadway to be lighted claim back from the County the money levied by them, then the financial position is practically the same as existed before the advent of the Act. The financial burden of lighting the road in question will still be borne by the authorities on the route of the road, i.e. except that the cost is pooled it is payable by the same authorities.

I agree that the existing areas not now lighting will be called upon to pay their share, but the rateable value of these rural areas is comparatively small.

The suggestion that the cost of lighting main traffic routes should be assisted from the Road Fund would appear to be both fair and reasonable. There are many who feel that the responsibility of lighting these roadways is no longer a parochial matter but a national responsibility. The recent decision of the Government to introduce legislation for the taking over by the Ministry of Transport as Highway Authority of full responsibility for the maintenance and improvement of some 4,500 miles of the more important routes used largely by through traffic is, therefore, very welcome.

I cannot conceive that in the interests of Public Safety the matter of lighting these roadways adequately during the 46% of the year when darkness prevails can be omitted from the interpretation of the word "maintenance."

Motor Car Lighting

New regulations of the Minister of Transport which come into force on October 4th next deal with the lighting of road vehicles. Side lamps must not exceed 7 watts, and are intended to be used only to mark the presence of the vehicle. Dealing with head lamps, the regulations state that all vehicles must be fitted with an approved anti-dazzle device either of the dipping headlight or anti-dazzle lamp type. The regulations do not make it compulsory that the anti-dazzle device should be used, as there may be circumstances in which it would be dangerous to switch it on. We therefore have official recognition of the danger of dazzle from motor vehicle lighting.

The use of headlights on motor vehicles is absolutely essential on roadways where adequate lighting is not provided, but their use where such lighting exists is not only unnecessary—it definitely ruins the effect of the Public Lighting Scheme by causing discomfort glare in the eyes of oncoming drivers. Moreover, on a well lighted roadway the

vehicle driver will find that he can see much better without the use of headlights. One feels that it is in the interest of all road users that where adequate public lighting is provided, motorists should be obliged to switch off their headlights. I understand that on the Great West Road there is a notice which reads: "Motorists keep to the inside lane unless overtaking"; why not, then, on a roadway adequately lighted, a notice: "Motorists switch off headlights on this road"?

Developments

The improvements in all types of street lighting fittings and light sources continue to give the Public Lighting Engineer new equipment for his work, and we are to see demonstrations, and hear a great deal, of the latest efforts of manufacturers and the research laboratories during this Conference. Such improved efficiencies must result in improved effects.

The introduction of new types of light sources has produced a new question in Street Lighting Science—the determination of the quality of light provided. On an equal intensity of illumination basis the general opinion seems to be that visual acuity is the same with all sources—but from personal observation it would appear that, at the low intensities prevalent in street lighting, contrasts are sharper and objects more quickly detected with a monochromatic or nearly monochromatic source than light of continuous spectrum. This field offers room for much research by our scientists.

The many improvements each year in all types of street lighting apparatus has also raised a query as to the justification of Street Lighting Authorities entering into long term agreements with private companies or utility undertakings for street lighting when the agreements include for provision of capital in addition to provision of energy and maintenance.

No doubt this is the easiest method of dealing with the matter on the part of a Lighting Authority without a specialised street lighting official, but during such long term agreements the Lighting Authority is unable to obtain benefit from either reducing costs or increased efficiencies of light sources and fittings which is the subject of continual research.

A further point which should appeal to Lighting Authorities is the fact that private companies must seek a return on capital with interest sufficient to meet its trading needs, whereas they, the Lighting Authorities, can, with the consent of the Ministry of Health, obtain loans at rates of interest much below that charged by private companies with a consequent saving in annual costs. Lighting Authorities should, therefore, in my opinion, own the lighting installations in their respective areas.

B.S.I. Specification

It is hoped that one of the benefits of the Departmental Committee on Street Lighting will be a new Specification on Street Lighting which will make reference to the all-important factors, including—

- (1) Visibility, although at the moment it appears impossible to express this quantitatively, and
- (2) Roadway brightness as a factor of visibility by contrasts.

Further, the time is long overdue when we in the Lighting industry must cease talking so loosely about candle power. This figure should be accompanied by descriptive data, such as:—

Mean spherical candle power, which is the average of candle power emitted in all directions of the sphere.

Mean lower hemispherical candle power, which is the average of the candle power emitted in all directions in the lower hemisphere.

Candle power in a given direction—the direction should be stated and generally in polar diagram or in an isocandle diagram.

Unless this is done the term candle power is confusing, and is incapable of comparison with competing light sources.

The value of lighting sources should be described in lumens, which is the basic quantity, and to avoid use of numbers with a lot of digits, terms such as Kilo lumens (1,000 lumens) could be introduced. In this way the layman, who is the purchaser, could be assured that the articles he has to choose between are based on similar levels and, with suitable diagrams indicating the efficiency of the lighting fitting or lantern, he would be able to make a proper choice.

Notwithstanding my desire to obtain similar levels for comparison of various types of equipment to simplify consideration by the purchaser, I feel that the best benefit from equipment available can only be obtained by Lighting Authorities appointing capable Public Lighting Engineers who are able to put into practice their knowledge and experience for the joint benefit of the authority, the ratepayer, and the road users.

At the present time the majority of street lighting is in the hands of the Surveyors, etc., of Local Authorities. These men, as a result of general improvement in Public Services, are having an increased amount of work to shoulder and should not be expected to be experts in all branches of engineering. The Engineers of Public Utility Undertakings, Gas and Electric, are therefore expected to provide the technical data for consideration, with the result that there is often misunder-

standing. Larger towns have realised the benefit of appointing expert Lighting Engineers to control their public lighting, and I am absolutely certain that, if their example were followed extensively, it would be to the advantage of Public Lighting and the public purse.

In conclusion, I would thank you once more for the privilege of your confidence in electing me President, and also to say how much I appreciate the increasing interest which is being taken in the work of the Association. This is shown in no

uncertain degree by the increased attendance of Delegates and Members, and also by the extensive Exhibition of lighting apparatus, both inside and outside, provided by the various manufacturers.

I trust that the interest thus displayed will be nourished by the knowledge gained at this Conference for the betterment of Public Lighting, and in time will result, not only in a fuller use and improved appearance of our streets and roadways at night, but in some alleviation of the loss and distress caused by road accidents.