

LIGHTING

EQUIPMENT NEWS

NOVEMBER 1991

Energy saving - the European dimension

A major EC priority is to promote the efficient use of energy to reduce consumption and to minimise the effect on the environment. In August 1991, as part of its energy efficiency programme SAVE, the EC submitted a proposal for a directive on energy labelling of household appliances including light sources and luminaires.

The lighting industry has done intensive research in the last ten years and has put on the market a wide range of energy efficient lamps and lighting systems. But, because of initial investment costs and lack of information, consumers have not always made the best possible use of the new technology.

Following a meeting with the EC Energy Directorate, the European Lighting Council is to take part in a European Commission working group on the promotion of low energy appliances and will shortly be submitting definite projects to the EC.

Invitation to contribute to Lux Europa

Lux Europa, the European Lighting conference to be held in Edinburgh in April 1993, has issued a call for papers. Anyone wishing to contribute should send a 200-400 word synopsis to the organising committee, via CIBSE, no later than 31 January 1992.

The conference will cover all aspects of lighting, including daylight. Papers dealing with solutions to difficult or unusual lighting problems will be welcome, as will the results of basic research into vision and human responses and reactions. As well as formal papers, there will be poster presentations.

Lou Bedocs, past chairman of CIBSE Lighting Division, has been named as chairman of the conference organising committee.

GTE leaves lighting business

GTE Corporation is to get out of the lighting business in order to concentrate on telecommunications. This marks the end of attempts to diversify its activities which started with the acquisition of Sylvania Products in 1959.

First signs of the pending realignment of the business came in 1990 when GTE bought the Contel Corporation, making it the telephone company with the most US and overseas phone lines and the second largest player in the cellular phone business. Shortly afterwards the company broke off the much publicised discussions with EMI over the purchase of Thorn Lighting.

As a result, the company is now considering a number of strategic options for its \$2.3 billion (£1.33 billion) electrical products business, comprising both lighting and precision materials divisions. These include divestiture, a tax free spin off to shareholders and the possibility of a joint venture with another lighting supplier.

According to Vincent d'Alessandro, GTE's public affairs vice president for electrical products, the process is likely to

take between six and nine months, so the outcome is likely to be known by the middle of 1992.

In Europe, GTE is one of the three major lighting companies, with the Sylvania, Linolite, Lumiance and Claude brand names. GTE Lighting Europe, with its headquarters in Geneva, has ten plants, more than 30 sales offices and over 4000 employees.

European president Donald McCulloch stressed that the programme of introduction of new products would not be affected during this transition period. "While the various points are being explored by GTE it remains absolutely business as usual as far as we are concerned. Our objectives and commitments remain unaffected."

In the longer term the outcome was likely to be positive in that they would emerge more strongly focused as a lighting company. This view was echoed from the other side of the Atlantic by d'Alessandro, "We will become part of an operations where the primary focus is on lighting and precision material and we will be able to focus more on technologies where we have the lead."



Counting the true cost

Lighting can be a major element in factory running costs so the savings can be high. Energy saving high frequency fluorescent luminaires have been supplied by Crompton Lighting to complete the first stage in re-lighting GEC's Titchfield, Hampshire, plant.

The lighting installation follows an energy audit carried out in early 1990 by the GEC company group energy adviser. Areas pinpointed as prime targets for energy

saving within the manufacturing plant included general lighting.

The first building to be re-lit covers an area 89m long by 30m. Some 200 Crompton Channel HF fluorescent luminaires are trunking-mounted at a height of 8 m. The luminaires, each equipped with two 70W Spectra 84 tubes and fitted with open-end reflectors, are controlled by high frequency ballasts for maximum efficiency.

Since the new energy-efficient scheme was introduced, running costs have been cut by more than half. Additional zone switching has reduced lamp burning hours and savings have been calculated to provide a payback time of just over two years for capital equipment and installation costs.

(See feature on pages 17-18)

Lighting - French style

The 27th French Salon International de la Lumière is to be held at the Porte de Versailles, Paris, from 9 to 14 January 1992. The 30 000 sq m exhibition, which forms part of the Sixth World-

wide Week for Decorating and Equipping the Home, has already registered 358 exhibitors. Of these 180 are French and 178 foreign firms, underlining the fact that the international aspect of the exhibition has been growing for some years, resulting more or less in a 50:50 breakdown between French and international lighting companies.

Advanced technology centre for north east

Thorn Lighting is to invest over £2 million to create a lighting technology centre at its factory at Spennymoor, County Durham. The new 5100m² centre, converted from existing premises, will be developed for the design, engineering and testing of light fittings and electronic gear. This move, which confirms Spennymoor's more important role in the company's European organisation, involves the relocation of fittings research activities, currently carried out at Enfield in North London, at the Spennymore site. Completion is estimated for March 1992.

The new research complex will bring together under one roof three main streams of lighting research: fittings development and photometry; electronics design and engineering; and lighting applications research. A major feature of the building will be the BSI accredited standards engineering operation in which independent tests ensure that all products including electronic components safety and performance standards. The technology centre will operate under BS: 7501/EN: 45001 and will be able to provide supervised manufacturers testing on all products.

In brief...

● **Environmental Lighting** has moved to 74 Barton Road, Eccles, Manchester M30 7AE (tel 061-789 8686). The new premises include a showroom and heavy investment has been made in computerised production control equipment.

● **P4** now has exclusive sales rights in the UK for emergency lighting made by Sander Elektronik, Switzerland.

INSIDE THIS ISSUE

News	1, 2, 3, 24
New products	4, 5, 6, 23
Exterior lighting:	
Public lighting competition	9
Lighting and crime	10, 11, 12
Photography	14, 15
Lighting for energy management	17, 18
Where to buy directory	19, 20, 21, 22
Catalogue directory	23
Classified advertising	23



The longest bridge in Europe - linking Sweden with the island of Öland in the Baltic Sea - has been relit in a 600 000 Swedish krona programme. The new system has reduced energy consumption by 35 per cent and promises substantial savings in maintenance.

Nearly six hundred Thorn Jarnkonst, Streetus lanterns were chosen by Sweden's National Road Administration after a year long test, where Streetus coped with the high strains and vibrations on the 6km bridge, and the extremes of Sweden's weather better than any other manufacturers type.

The fittings have been specially designed to give long life in difficult conditions and this helps to save large sums on maintenance. Together with the energy savings, the new lighting will pay for itself in a very short period of time.

LIGHT CONTROL SYSTEMS (LCS)

HELVAR
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QUALITY ALWAYS SHINES THROUGH

NEWS

NOVEMBER

5
Lighting for offices. One-day course in London arranged by CIBSE. Details from 081-675 5211.

12
Exterior lighting design practice. One-day course in London organised by Mid Career College, 0223 880016.

6
In the light of experience. Lighting Division chairman's address. Evening meeting at British Gas, Manchester, arranged by north west region of CIBSE. Details from L Daniels 061-248 7272.

7
Lighting innovations. Evening meeting at South Wales Electricity, Cardiff, held by South Wales region of CIBSE. Details from A D Jones 0792 641182.

12
What's new in the 16th edition? Symposium in Glasgow held by the IEE. Details from 071-836 3357.

18
Lighting basics 2: lamps and luminaires. One-day course in Manchester arranged by Mid Career College, 0223 880016.

19
A quality index for lighting installations. Evening meeting in London organised by CIBSE. Details from Karl Pike 081-675 5211.

The Channel Tunnel. Evening meeting in High Wycombe arranged jointly by IEE and CIBSE London and south east region. Details from Andy Robinson 081-953 6282.

Lighting in the electronic age. Evening meeting at Liverpool University held by Merseyside and North Wales region of CIBSE. Details from R W Bell, 8a Fulwood Park, Liverpool L17 5AH.

20
Green highlights. Afternoon seminar in London arranged by National Illumination Committee of GB. Details from CIBSE 081-675 5211.

Electricity at Work Regulations 1989. Seminar in London organised by the Institution of Electronics and Electrical Incorporated Engineers, 071-836 3357.

21
Lighting basics 2: lamps and luminaires. One-day course in London held by Mid Career College, 0223 880016.

Electricity paper: Electricity and the environment. Evening meeting in London arranged by London and south east region of CIBSE. Details from Peter Bennett 0372 459066.

26
Health hazards from lighting. Evening meeting at the University of Strathclyde arranged by Scottish region of CIBSE. Details from D W Corden 041-332 3326.

27
The appearance of lighting. The Philips annual lecture. An

evening event at University College London. Details from Eve Anderson 071-387 7050.

28
Lighting controls seminar. Afternoon event in London organised by CIBSE, 081-675 5211.

DECEMBER

2
All the visual world is but a stage. The Waldram lecture 1991, at the National Museum of Photography, Film and TV, Bradford. Afternoon event arranged jointly by the ILE and CIBSE. Details from ILE, 0788 576492.

3
Effect of the intelligent controller on building services engineering. Evening meeting at Brentwood held by London and south east region of CIBSE. Details from Andrew Wincott, 071-387 9671.

Lighting for the electronic age. Evening meeting in Newcastle upon Tyne organised by north east region of CIBSE. Details from Alan Embleton 091-232 8520.

Exterior lighting design practice. One-day seminar in Birmingham organised by Mid Career College. Details from 0223 880016.

9
Lighting basics 3: lighting design calculations. One-day seminar in London organised by Mid Career College. Details from 0223 880016.

Best of Belfast. Floodlighting tour organised by Northern

Ireland region of CIBSE. Details from Jim Patton 0232 732121.

10
3D imaging-holograms: the state of the art. Technical evening and social event in London arranged by CIBSE. Details from Karl Pike, 081-675 5211.

11
Harnessing daylight. One-day seminar in London organised by Mid Career College, 0223 880016.
Lighting in the Don Valley Stadium. Evening meeting in Sheffield, arranged jointly by CIBSE Yorkshire region and IEE. Details from A M Simpson, 35 Devonshire Way, Harrogate HG1 4BH.

NEWS

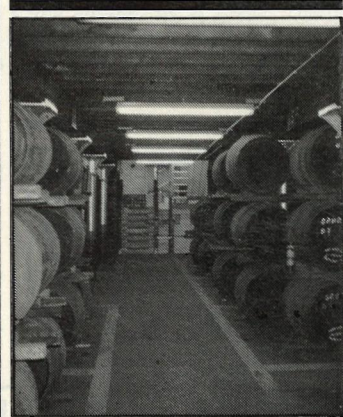
A sword for lighting designer

Ian Graves, a lighting design engineer with Philips, has won a sword. It is his prize, along with £1000, for being the outstanding student of the year on the certificate course run by the Lighting Industry Federation.

This correspondence course plus seminars takes up to three months to complete. As his final project on the course, Ian had to design a lighting scheme for all areas of a training college.

Senate Electrical Wholesalers presented the award and Ian told Senate's managing director, Jim Bamforth, that he may spend some of the award on a trip to see the lighting at Euro Disney.

Out of 93 people who completed the course, there were five other finalists: Andrew Bartlett (Moorlite), Robert Bohannon (Light Environment), Angus Cormie (Philips), Michael Flanagan (Gifford and Partners) and Jeppe Kjeldsen (Marlin). They each received an engraved Parker pen and a special certificate.



Scotch lighting

In 1893 two friends, Roderick MacDonald and Alexander Muir, established their whisky bond in underground vaults at Leith, Edinburgh. Two of the company's best known brands, Glenmorangie and Glen Moray, are stored at this site.

When the MacDonald and Muir company wanted to provide modern illumination in the vaults, which were below sea level, they discovered that the damp environment caused parts of the fittings to rust and eventually the lamps would fail to operate.

Glamox Electric suggested its GLI fitting, originally designed for use in marine applications, which could cope with damp conditions.

These luminaires proved so successful that they are now used throughout the bond.

CIBSE



The Chartered Institution of Building Services Engineers

Lighting standards must prevail over energy saving

In the past, lighting specialists have sometimes failed to grasp opportunities and have either let lighting design slip into the hands of others or, more usually, they have provided the special expertise and yet lost much of the credit for a job well done to the ceiling contractor, electrical contractor, electrical consultant, or even the energy manager. The next few years, if not the whole of the nineties, will be dominated by continuing efforts to save more and more energy.

Energy used for lighting in the UK is some 4% of total energy consumption. This may seem small, yet it represents a total annual cost of £432M and it is estimated that the potential for saving could be over £100M. For that reason, lighting has already become a target for the energy accountants.

Lighting engineers must be aware of the nature of the challenge that is likely to come, otherwise others who are less able, whose only interests are to save energy may take control, ignoring lighting standards and debasing the quality of the visual environment to the detriment of the user. The lighting engineer should be seen to provide good lighting, which is energy conscious.

If met in a professional manner, the challenge to provide effective energy efficient lighting could be the opportunity to raise the profile of lighting.

Pressure is likely to be put upon us to reduce the levels of illuminance recommended in the CIBSE *Code for Interior Lighting*. These levels are based upon considered good practice and yet have been constantly questioned and criticised by some as being excessive to the extent of causing glare. This is not new, G V Downey was doing the same in 1950, claiming that he could light a large office with a 150W tungsten lamp! However, recent work by Mark Rea of the Rensselaer Polytechnic Institute, New York, has resulted in the development of a visibility model for illuminance selection based upon visual performance using the criteria of size and contrast.

The problem is that in any area there are many tasks to be performed and the designer has to decide which one to use, and then decide what the visual task is, and the critical detail. The calculation is more lengthy than can be justified in many instances and in the end the illuminance chosen is a matter of judgement.

Nevertheless, it is reassuring to note that where the calculation has been carried out the values correspond closely to those recommended in the Code, which is both simple and easy to understand, yet frequently misquoted and misunderstood.

We will also be faced with those who are happy to quote the illuminance schedules of the Code, while disregarding all other aspects such as lighting the surround, regarding any light which does not hit the working surface as being "wasted". Such people do not realise that surround lighting has the effect of raising the eye's adaptation and improving visual performance.

Perhaps we should look at what is meant by successful, energy efficient lighting. It is that which achieves the desired functional and visual qualities in an energy efficient manner.

Energy efficient lighting should be approached in the same way as any other form of lighting: we need to decide what we are setting out to achieve, be it lighting for performance, effect, or both. To help us we can look to our Lighting Code and Guides and draw on experience. We can ask users what they want, or, if they are satisfied with what they have, simply repeat this with more efficient equipment.

This approach is not always as sound as it may appear since most people are satisfied with what they have until they experience something better. But, best of all, visit the site in day-time and at night if possible, (or a similar site if it is not possible to see that one), find out what is required and if necessary carry out some simple experiments. This will help us to understand what the users of the lighting are looking for, their position relative to what they are looking at, and when they look at it. We will also get a "feel" for the place, the daylight effect, the decorations, the scale, the environmental conditions.

With this information we are well on the way to drawing up a specification and the rest should be easy. Knowing what people are looking for will enable us to provide the right quantity, colour and diffuseness of light and to direct it to the place where it is needed. Knowing where the people are, will enable us to get the direction right. There is an unbelievable number of instances of the lighting being right when no one is using it, but as soon as someone comes to look they cannot see clearly. Knowing when people are looking will enable us to provide the light when it is required, and provide for it to be switched off when it is not. Knowing the daylight availability will enable us to make use of it. Knowing the decorations will enable us to use them or make suggestions to improve the lit effect. Knowing the conditions will enable us to plan the maintenance to keep the installation efficient so that we do not have to over-light.

Note, so far not a mention of a lamp, a luminaire, a calculator, or a computer. It is the information gathered that will enable us to make the right choice of lamp-luminaire combination; plan the layout to get the light where it is wanted and where equipment can be maintained; and arrange the switching and controls to make the best use of energy.

Remember that energy consumed is not measured in kilowatts but in kilowatt hours, but also remember that in switching lights out we must not plunge anyone into total darkness so that they are in danger. Energy efficient lighting presents the lighting professional with a challenge which no one else is better equipped to deal with; we must not let the opportunity slip away.

Alan Wilson,
Chairman, Lighting Division.

GREAT NEWS! FOR EMERGENCY LIGHTING USERS

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Capitalising on light

When the Cyprus Popular Bank took over a nineteenth century building in Birmingham as a site for their new branch, they were faced with the need for a complete refurbishment programme. Although originally used as a bank, nothing in the building complied with modern banking requirements.

Architects Wilson Phylaktis formulated an interior design which enhances the original Victorian building and Light Years were called in to design a complementary lighting scheme.

The lighting brief was to provide high levels of glare-free illumination throughout the semi-circular banking hall and slightly lower levels elsewhere, with fit-

tings which would complement the quality interior, particularly the natural surfaces and textures of the partitioning and fittings.

Ceiling heights, rising from 3m-4m high, and the need for subtle presentation, ruled out a fluorescent lighting system. Instead, lighting designers, Light Years, specified banks of low voltage recessed downlights which reduce the glare factor and give a high level of visual comfort.

The illumination levels in the cashiers' area and in the open-plan staff area of the banking hall were boosted by metal halide Lightform quarter spheres which were placed on pillars within the glass-fronted security area and additionally, inside the Corinthian

capitals which provide architectural relief on the perimeter walls of the public area. The effect is dramatic.

The quarter spheres produce a wide flood of indirect light, illuminating the brown granite and the brown leather of the writing surface immediately below, and throwing the intricate Corinthian capitals into sharp relief.

Circular low voltage fittings in brass, with 50W dichroic reflector lamps, were recessed into the false ceiling within the cashiers' area to illuminate the counter surfaces. Further lighting is provided by smaller, low voltage fittings, recessed into the vertical surfaces of the semi-circular counter fascia.

Lighting for learning

Lighting is a fundamental part of the communication process within teaching. It can be used to highlight the speaker, thus implying one way communication, or involve the audience in a more interactive manner.

But, according to Dr Tarrant, principal author of a new lighting guide on teaching spaces, "With the exception of primary schools, teaching premises are generally dim, dirty, pallid, unkempt places."

CIBSE's newly published Lighting Guide LG5: *The visual environment in lecture, teaching and conference rooms* aims to improve matters by advising on the specific problems associated with areas used for teaching. It has been produced not only for lighting designers but also with the end user in mind.

Good management is then needed to maintain the right environment. A common problem with educational establishments is that several people are involved in various aspects of looking after a teaching area but no individual has overall responsibility.

For conference and meeting rooms the versatility of lighting is stressed: it may need to reflect the solemnity of an occasion or to enhance celebration; it can define specific spaces or guide large numbers of people to one or more destinations. Again, choices have to be made and separate lighting systems within one room can highlight a working plane or give a more relaxed ambience.

Appendices cover the use of slides and overhead projectors and give advice on the use of lecture theatres and conference rooms for theatrical presentations. LG5 is available from the CIBSE Bookshop on 081 675 5211, price £38.00.

COMMENT

State of the nation

Once again the industry is aflutter – this time with the news that GTE is leaving the lighting technology field to concentrate on telecommunications. So, the restructuring phase we had expected to be at an end is definitely set to continue for another nine months or so until the future of GTE's lighting division is finally determined. The major question at this point in time is not which company would want the business – it is patently one of the market leaders – but rather what sort of company would have the money to invest on this scale in the industry.

In short, European lamp and luminaire manufacturers must be dreading the possibility of a Japanese approach, although the lighting technology companies would scarcely be large enough to put in such a bid, except in partnership with one of the Japanese multinationals.

This week's Lightfair underlined the fact that the recent multiplicity of lighting shows in the UK is undeniably acting to the detriment of the industry as a whole, especially during a recessionary period when money is tight and whether to exhibit or not becomes a major marketing decision.

All the alternatives currently offered – and a number of others in the pipeline – are good in themselves but, by splintering the market, are inevitably putting off the day when the UK will have a national equivalent of the Hanover Fair, which is what we really need. At present it is impossible even to distinguish a front runner.

Even closer to home, *Lighting Equipment News* celebrates its quarter century in January and we are preparing a bumper issue. It's a time both for retrospection and for looking forward to the future, and the features we are developing should reflect this.

Now, twenty five years is no long period of time but when – as many lamp manufacturers will boast – some 80% of light sources on sale in Europe have been on the market for less than five years, even this period has seen extensive changes in the nature of the industry.

But, if current events are anything to go by, one thing is certain – the next twenty five years bid fair to be at least as eventful as those just past.



Earls Court gets new emergency lighting

A new emergency lighting system, designed to provide automatic and sustained emergency lighting in the event of mains failure, has come into commission at Earl's Court Exhibition Centre, London.

Designed and installed by Chloride European Power Supplies and Lighting, the system comprises a 1 hour duration, 1000 Ah Chloride battery, and an Ap 180 Keith Dawson diesel generator with automatic start-up, capable of running for up to 7 days.

Both the battery and the generator can supply up to 84 kW over one hour – more than enough to cope with the centre's full emergency lighting load of 47 kW.

The new system replaces the original emergency lighting system installed in Earl's Court in 1937. The generator was original and there had been just one change of batteries, in 1966.

With batteries due for renewal again, however, it was decided to upgrade the entire system, to bring it in line with new fire and local authority regulations.

Included in the new specification was the requirement for a generator with automatic start-up to replace the old manual system which required constant supervision.

New ILE Technical Report

A revised edition of ILE Technical Report No 5 titled *Brightness of Illuminated Advertisements* has just been published. It covers recommendations for the maximum luminance of advertising signs and is in line with and complementary to the Town and Country Planning (Control of Advertisements) Regulations.

It gives statutory requirements and the methods of measurements, along with recommendations for the testing of illuminated signs. In addition there are proposals for information to be supplied with planning applications. The report, intended for lighting engineers, consultants, local authority planning officers and advertisement designers and manufacturers, is available from the Institution of Lighting Engineers price £7.50.

New controls for Kuwait TV

A contract to re-equip Kuwait TV is being handled by FSL International, Strand Lighting's distributor for the Middle East. Local Kuwaiti contractor Centronix will provide the necessary support during installation.

During the invasion by Iraq, the majority of equipment at the TV station was either removed or damaged by occupying forces. A complete survey of the damaged studios carried out by FSL resulted in Strand receiving a contract to supply 3 Galaxy lighting control systems together with luminaires and related equipment to reinstate the studio complex.

Trade literature...

- **Environmental Lighting** has produced a coloured leaflet detailing its Cache range of low voltage lighting. Tel: 061-789 8686.
- **Collingwood VLM** has a 130-page illustrated catalogue of luminaire components. Tel: 0604 495151.
- **Richmond Lighting's** latest leaflet describes its lighting control, energy management and scene management systems. Tel: 081-641 8511.
- **Gewiss UK's** 258-page coloured catalogue covers electrical

installation equipment and has an expanded section on lighting. Tel: 0249 444734.

- **Bradley Lomas Electrolok** has issued an illustrated, price list for its emergency lighting and fire alarms. Tel: 0246 436361.
- **Contactum's** 45-page catalogue gives full details of its ranges of electrical accessories. Tel: 081-452 3666.
- **BDC** has produced its second specifier's guide *Lighting the office environment*, in conjunction with Concord. This pocket-sized booklet is aimed at the installer and specifier. Tel: 081-881 2001.

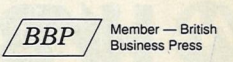
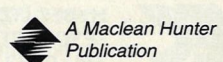
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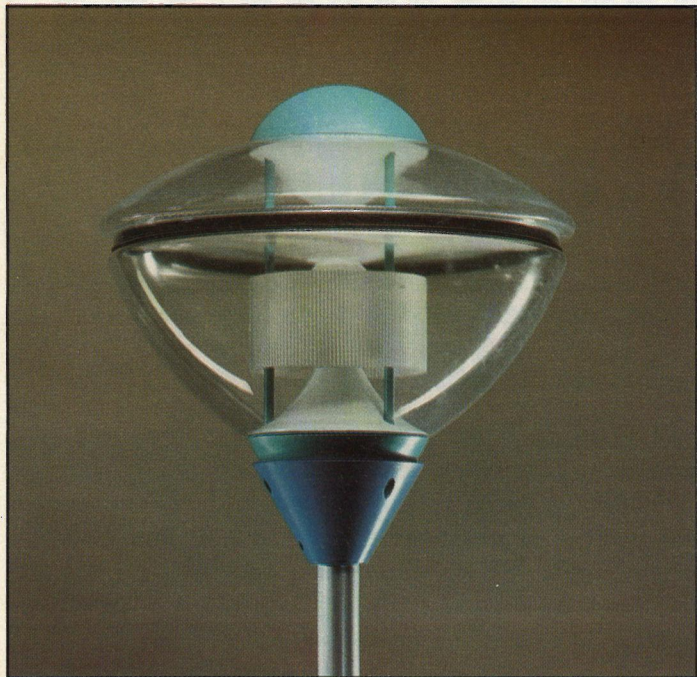
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NEW PRODUCTS



First luminaire for QL lamp

Philips has introduced a post top lantern specially designed for its 85W QL induction lamp.

The luminaire is made of clear, high impact resistant acrylic 2.5mm thick. The reflector is painted steel and around the lamp there is a moulded acrylic diffuser. A dome of diecast aluminium on top of the lantern is painted in a choice of colours. Overall height of the lantern is 690mm and it is ingress protection rated IP65.

A matching suspended version

can be used for mounting on a wall bracket, for example. The range is completed with a semi-recessed unit for lighting paths or steps. This is in a shock resistant diecast aluminium housing sealed to IP55 standard.

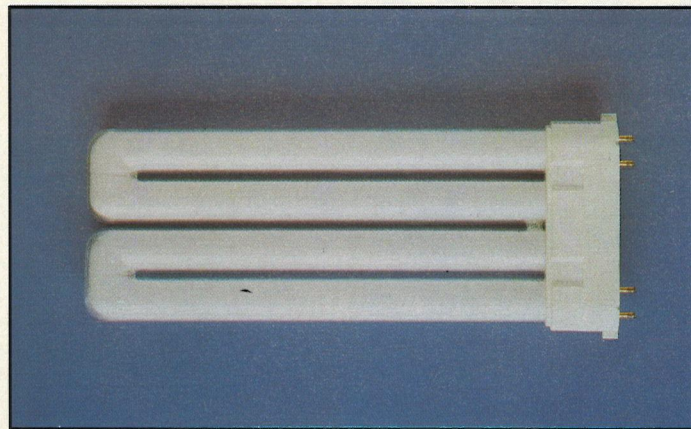
The special advantages of using the QL lamp are its 60 000 hour life, reduced maintenance requirements and energy saving. It is also stated to have excellent starting characteristics whatever the temperature.

Reader Service No 159

Compact lamp is flat

Osram has launched a flat version of its Dulux compact fluorescent lamp. The low profile of the Dulux F, 36W lamp makes it suitable for shallow fittings such as recessed luminaires for use with 300mm module suspended ceilings, and for flat, surface mounted ceiling and wall luminaires in commercial, leisure and other public buildings.

The Dulux F consists of two Dulux L 18W components, but when operated with electronic control gear it gives a luminous flux of 2600 lumens which is 13% more than two 18W L



lamps.

The lamp offers more compact dimensions for smaller luminaire designs, high luminous efficacy, easy installation and low circuit wattage. It can be used with

existing high frequency ballasts or conventional ballasts and is available with a four-pin base, 2G10, in Cool White (4000K) and Warm White (3000K) versions. Reader Service No 160

Flexible-arm inspection lights

RS Components has introduced two inspection lights with long flexible arms.

Designed to be fitted direct to machines or workbenches, these tungsten halogen spotlights are available with a choice of magnetic, screw or clamp fixing. In addition, a lamphead cover can be fitted to provide protection against moisture and dust to IP54 standard.

Available in mains and 12V a.c./d.c. versions, the lights are fitted with 2m of cable and come complete with a 20W lamp.

Reader Service No 161

Even smaller compact lamps

Philips' PLCE range of compact fluorescent lamps has been reduced in size and now operates at temperatures as low as -40°C. The shortest, the 9W lamp, at 124mm long is claimed to be the smallest retrofit compact fluorescent lamp on the market.

The 11W lamp has been reduced from 145mm to 140mm long, while the 15W lamp is down to 160mm from 172mm. There is no change to the 20W lamp. The new sizes are available in both BC and ES versions.

This miniaturisation is the result of new electronic components in the lamp base, which is now appreciably smaller. The



range maintains all the benefits of the previous PLCE lamps.

Reader Service No 162

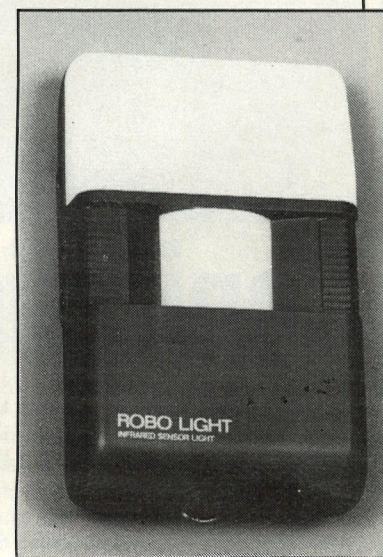
Hand held automatic light

A handy portable light with a passive infra-red sensor has been launched by Multiple Connections.

Robo Light can be used as a night-light for children or as a courtesy light for adults. It can also be placed outside to welcome visitors or positioned in storage areas.

The sensor has a 6m detection range over an angle of 60° and an adjustable light-on time of 5-60 seconds after the detection area has been vacated. A photo-electric cell ensures that the light only switches on in dark areas.

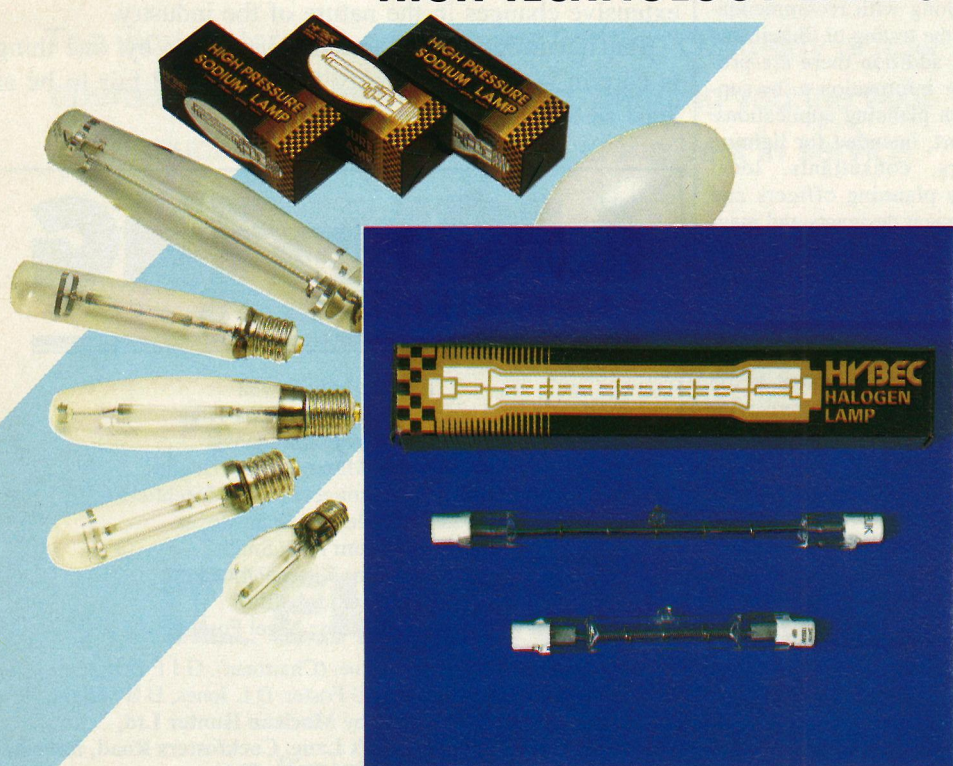
It can be hand held, placed on a table top, or wall mounted and



is powered by either 4XC alkaline batteries or connected to mains.

Reader Service No 163

HYBEC HIGH TECHNOLOGY LAMPS



U.K. MANUFACTURED LINEAR HALOGEN LAMPS

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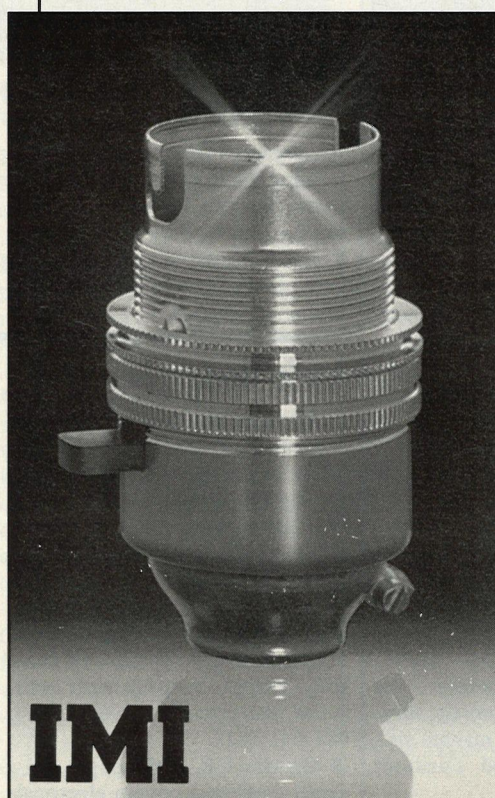
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NEW PRODUCTS

Track bends round columns

Flexitrack is a new concept in low voltage lighting from Beta Lighting. It is a self-adhesive lighting track that is highly flexible and can be used on curved surfaces with a minimum radius of 150mm, for example around columns, under arches or over domes.

It can be attached to a wide variety of surfaces, such as metal, brick, glass, plaster, wood and most plastics, and is stated to have a tensile holding power of 2kg per square centimetre. Moreover, it has an extremely low profile, approximately 2.5mm, making it very unobtrusive.

There is a choice of 14 luminaires which can be slid along the track, as with conventional lighting track, and more will be introduced. A specially designed adaptor includes a "floating" magnet to compensate for any curve of the track and maintain electrical continuity.

Couplers allow the track to be joined at angles, T junctions, around corners, or to lengths of track on different surface levels.



After the adhesive track has been pressed into position, other components simply click onto it, so installation is very quick. Applications include historic buildings and museums because it can be fixed without causing damage and removed later.

Magnetic track cover is available, for colour co-ordination with walls or ceiling, or alternatively the track can be painted.

Extension rods can be supplied

for the spotlights, and also long curved arms for use with wall mounted track to create lighting for pictures or other wall displays.

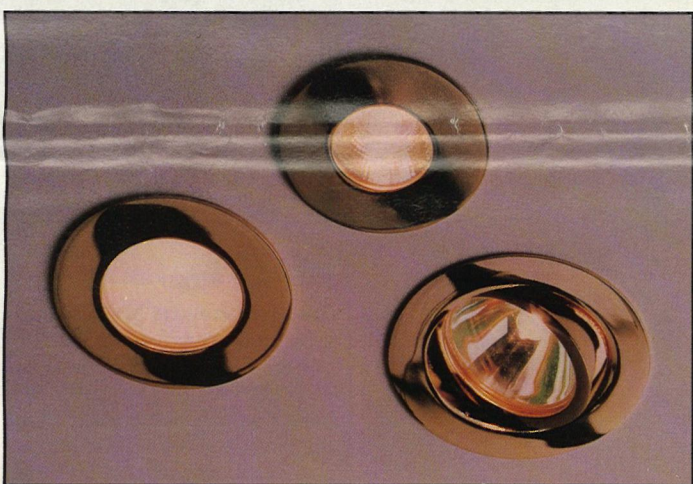
Although the system is available in either 12V or 24V versions, Beta recommends the 24V system because it offers technical advantages, such as less problems with voltage drop and up to eight 50W spotlights per wiring point.

Reader Service No 151

Inspection lights are sealed

A range of sealed, fluorescent inspection lights is available from Midland Machinery Services. These luminaires are primarily for mounting within fully enclosed machine tools, but can also be used for other inspection purposes such as in clean rooms or harsh industrial environments.

For situations where synthetic coolants are being used in a machine, or large quantities of swarf are present, an outer protective tube of Durane glass is used.



Downlights suitable for showers

Showerlight family of recessed downlights, from Electrolite, is designed for areas of high condensation, such as showers, bathrooms and exterior canopies. These low voltage luminaires are ingress protection rated IP54.

There are three models: the smaller fixed model accepts a 35mm diameter dichroic lamp,

the larger fixed version and an adjustable downlight called Showerbeam use the 50mm diameter lamp.

The integral cover is available in either clear or sandblasted glass.

Emergency lighting can be provided if required by means of a remotely positioned battery pack. In this case, an indicator light on the bezel shows the status of the emergency control gear.

Plated and painted finishes to BSI and RAL specifications are available even for one-off orders.

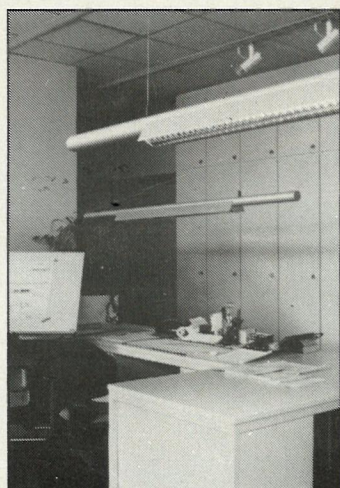
Reader Service No 154

Lighting for modern offices

Artex is a range of lighting designed by Se'lux, Germany, for modern offices. Most of the luminaires use fluorescent lamps, but some incorporate lighting track which can be either single-circuit low voltage, or three-circuit mains voltage track.

The choice of lighting control for the fluorescent fittings is between a prismatic lens and a variety of injection moulded louvres. Some of the louvres are described as double parabolic, some have convex crossblades while others have crossblades with concave lower edges.

Louvres for VDU areas are stated to control glare even at



diagonal angles.

Fluorescent luminaires giving both upward and downward light are also available.

Reader Service No 155

Commercial uplight

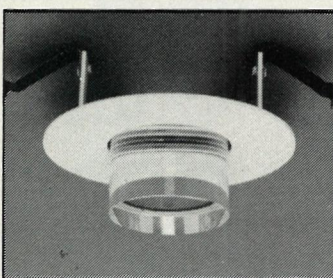
Tornado Lighting has introduced a versatile, wall mounted uplight for commercial interiors. The large, shallow, dish shape is 640mm wide by 150mm deep.

It accepts a variety of lamps including single or twin 36W compact fluorescent in the L (long) series. Other options are: metal halide 150W-250W, tungsten halogen 300W, GLS twin 100W, or three 75W low voltage tungsten halogen lamps.

Emergency lighting can also be incorporated. The white-finished aluminium housing is large enough to accept both a battery pack and a transformer, if required.

Control gear and battery pack are attached to the wall and the housing mounted separately by a keyhole fixing, to make maintenance easy.

Reader Service No. 156



Decorative downlight

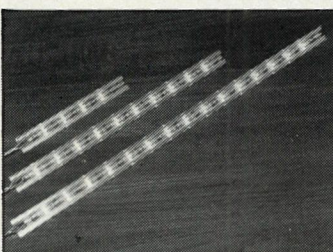
Caché CX, semi-recessed low voltage downlight, is the latest product from Environmental Lighting.

This fitting has a decorative solid glass rod below the lamp to create extra sparkle. There is a choice of a 30mm, 50mm or 100mm long rod.

The downlight is intended for use with a remote transformer. It accepts 20W or 50W lamps.

Each fitting in the Caché range is housed in a sealed can which is recessed into the ceiling. Standard finishes are white, black, chromium and gold. Special colours and finishes are available to order. The complete Caché range accepts coloured lamps or filters.

Reader Service No 157



Lighting for display cases

Showcase II is a low voltage lighting system from Light-Graphix for display cases, alcoves, and shelves. It is simple to fix by screws through the flanges anywhere along its length.

It consists of an aluminium extrusion with 5W 12V xenon festoon filament lamps mounted on brass busbars in polycarbonate insulating strips.

Showcase II is available in three stock lengths: 300mm, 600mm and 900mm but can be made to special order in any length up to 3m. Electrical connections may be made between lengths up to a maximum of 54 lamps.

Low profile transformers are available to operate the system.

Reader Service No 158

LIF LINE

Lightshow 1992: leading light for LIF

A closer relationship between the Lighting Association (formerly Decorative Lighting Association) and the Lighting Industry Federation is proving beneficial, not only in serving the interests of the associations' respective members but also in increasing the effectiveness of the UK lighting industry as a whole.

The success of this mutual cooperation has already been in evidence on the European front with the two organisations' fundamental role in establishing CELMA (Committee of EEC Luminaire Manufacturers' Associations) which serves to strengthen and develop the interests of the UK lighting industry in the single market trading place. On the home front, the continued collaboration is concentrated on developing mutual business opportunities for members.

One of the main discussions at present concerns LIF's involvement with Lightshow which, in 1992, will be re-located at the new venue Earls Court 2 from 26-29 January.

In keeping with this concentration of energies into action, both the Lighting Association and the LIF are seeking to develop Lightshow 1992 into an exhibition for the whole of the lighting community. The broader range of exhibition – from domestic/decorative through to the technical/commercial sector – will offer the visitor a complete overview of the industry and will create the potential for Lightshow to become the UK's most important lighting exhibition to match the other key European exhibitions at Hanover, Paris and Milan.

This in itself would increase the attendance numbers of continental lighting suppliers. Moreover, the definitions and types of lighting for decorative and commercial lighting are becoming increasingly blurred so it is inevitable that a merger of this nature should result to the benefit of both the organisations' members and the buyers.

In addition to actively participating in the organisation and promotion of the exhibition, LIF is currently drawing together a programme of seminars which it will stage at Lightshow 1992. The seminars will cover developments in light sources, components and controls and discuss the new legislative instruments which will affect lighting applications. It is hoped that by inviting architects, quantity surveyors and other specifiers to attend these seminars during Lightshow, where discussion can be followed by direct contact with products and exhibitors, greater benefit will be derived on all sides from the exhibition.

Future collaboration between the Lighting Association and the Lighting Industry Federation will continue to a greater degree in February 1992 when both associations assume the UK presidency and secretariat of CELMA. Mike Lippold, who holds the 1992 Chair on the LIF Council, will become president and Graham Samuel of the Lighting Association will become secretary general. The two associations will progress an agenda to develop four key areas:

- ☐ greater cross-border collaboration;
- ☐ legislation and mandated standards which bring business to the lighting industry;
- ☐ equality of business opportunity;
- ☐ exchange of market information.

Two European congresses in the UK in February 1992 and 1993 will also be hosted by the two associations during the presidential term. 1992 will therefore be an important year for the lighting industry in more ways than one.

For further information please contact either Graham Samuel at the LA (tel: 0588 4658) or Amanda Leweson at LIF (tel: 081-675 5432).

Snap-in capacitors

DNA Capacitors has added a new design to its range of products. It is a fixing device that locates the capacitor in the assembly base or gear tray without screws, clips or clamps.

This snap-in system cuts assembly time to a minimum.

Reader Service No 153

NEW PRODUCTS

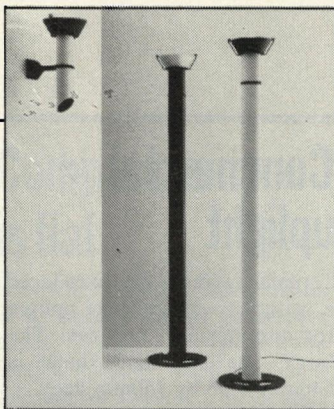
Uplights have crystal glass

Latest additions to Staff's Ellipse 45 range are free standing and wall mounted uplights incorporating a glass housing in decorative blue or white crystal glass.

The brass or painted aluminium

supporting stem is elliptical in cross section. Coloured rings around the stem not only break up the overall shape, but in the case of the wall mounted luminaire, serve as a wall fixing.

Either tungsten halogen or metal halide lamps are used. For the metal halide version the ballast and ignitor are integrated into the luminaire design.

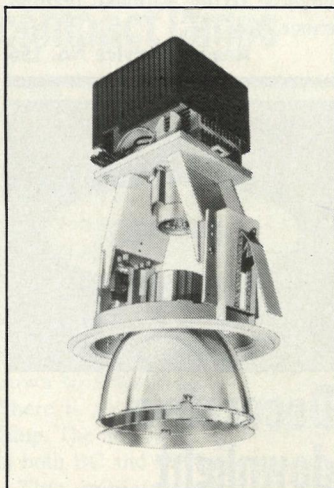


Reader Service No 164

Downlight is versatile

Chameleon is an addition to Program Lighting's downlight range. Using a standard housing it offers a choice of light sources. These include metal halide (single and double ended), 18W PLC compact fluorescent and 50W/100W White SON lamps.

The luminaire, which has a



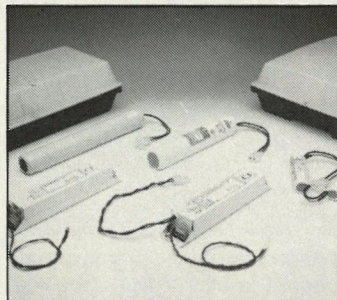
polycarbonate housing, is lightweight and semi-recessed.

Reader Service No 165

Self-testing emergency kits

Self-testing emergency lighting made in Switzerland is available from P4. It is in the form of kits for fitting to standard fluorescent luminaires up to 2400mm long. Battery packs can be either incorporated in the luminaires or remotely mounted up to 2m away.

The test programme is instigated automatically and tests lamp, batteries and electronic circuitry. If a fault is found, a visual and audible alarm is given which identifies the problem area. Manual override can be provided to allow repeat testing.

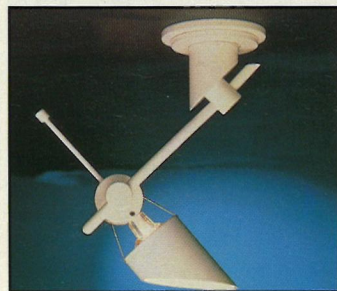


Reader Service No 166

Plug-in spotlight rotates

M3 spotlight from Lucent Lighting is part of the Sidekick range of low voltage plug-in fittings made by Waco, Belgium. It can be rotated through 360° in the socket and the lamp housing is also adjustable vertically.

MR11 dichroic lamps up to 35W, or MR16 dichroic lamps up to 50W are used.



There is a choice of white, black or sandblasted aluminium finish.

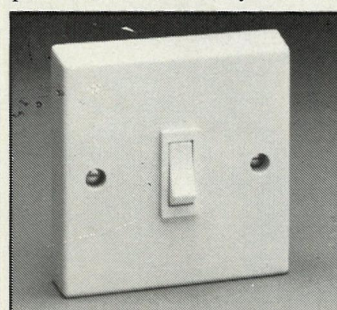
Reader Service No 167

Automatic rise-and-fade lighting control

CP Electronics has developed a continuous, slow, rise-and-fade flasher control for tungsten lighting, with integral off and override switch. One complete cycle lasts eight seconds.

The Undulator unit is designed to attract attention to window and exhibition displays, or for decorative illumination, for example of Christmas trees.

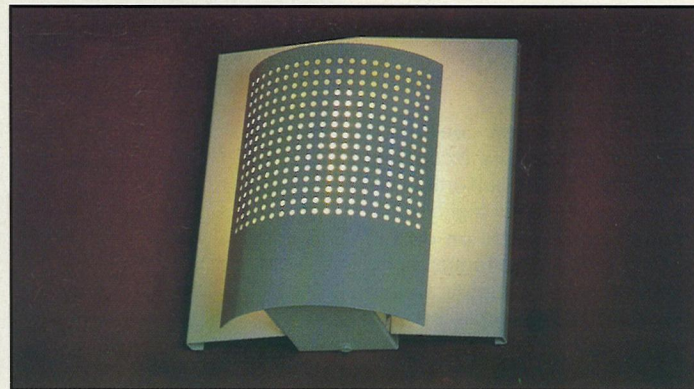
It controls lighting loads between 60W and 400W and is mounted on a white plastic front plate which fits into any standard



single-gang switch box. It is operated by a three-position rocker switch.

Reader Service No 168

Perforated metal wall light



An addition to Spectrum's fluorescent lighting is a wall mounted fitting designed to use an 18W Dulux D compact fluorescent lamp.

It is made from epoxy powder coated sheet steel, with an impact

resistant, perforated, curved metal diffuser which gives a subtle light.

The fitting is particularly suitable for use in corridors, circulation areas and on staircases.

Reader Service No 169



Transformer for LV lighting

Skot Transformers has introduced a wound transformer for low voltage lighting with a maximum electrical loading of 50W. It is housed in a cylindrical can 63mm in diameter and weighs 800g.

A combined current and temperature sensitive cut-out gives

protection against both short circuit and gradual build-up of heat due to overload. This allows greater freedom in positioning the transformer because less maintenance is required.

The low regulation of 16% means that the unit can be used with lower wattage lamps without significantly shortening the lamp life, ie. two 20W or one 35W lamp.

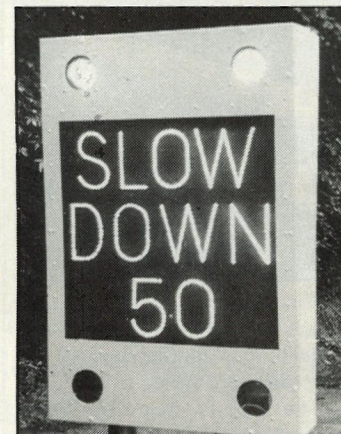
Reader Service No 170

Approval for fibre optic sign

Forest City Signs has a range of illuminated, fibre optic traffic signs that has received type approval (stage III) from the Department of Transport.

Among the designs is a speed-activated "slow down" sign. Normally blank, it lights up when a speeding vehicle is detected by microwave radar.

The Department of Transport's latest specification requires the message to be continually dimmed/brightened over the full range of ambient lighting conditions, rather than the single light/dark setting previously allowed. This has been achieved by incorporating two photo-electric cells in the sign head, one on the top and the other on the face, to automatically adjust the luminous intensity.



The DTP's requirements include self-monitoring, to safeguard against eventualities such as lamp failure or the message being displayed at an inappropriate time, manual override switch and an anti-condensation heater to prevent the face misting up.

Reader Service No 171

Electronic gear for Dulux lamps

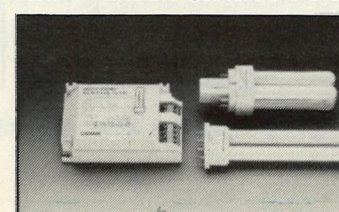
Osram's Quicktronic D/E electronic control gear is designed for Dulux type four-pin, starterless, compact fluorescent lamps.

Quicktronic model Q-T D/E 9-13W operates Dulux S/E and D/E

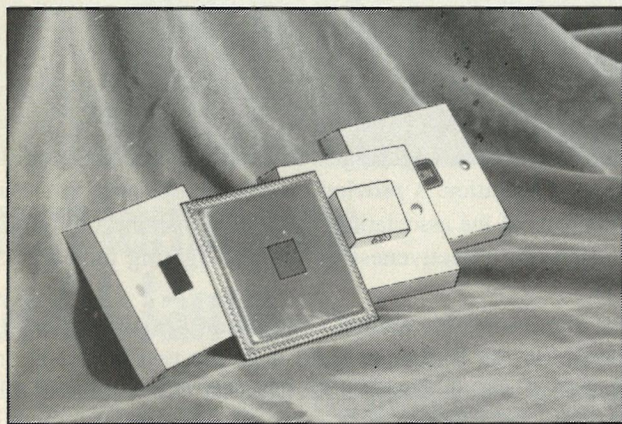
lamps from 9W to 13W. The Q-T D/E 18W and 26W operate 18W and 26W lamps respectively.

Apart from improving the quality of lighting, the Quicktronic D/E range is stated to offer savings of up to 17% in energy costs.

Reader Service No 172



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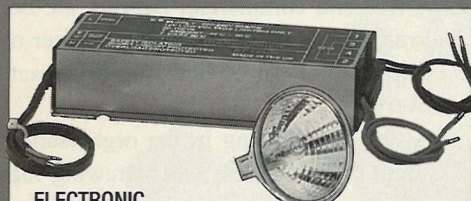
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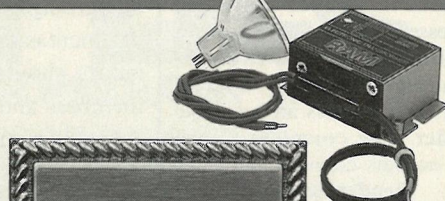
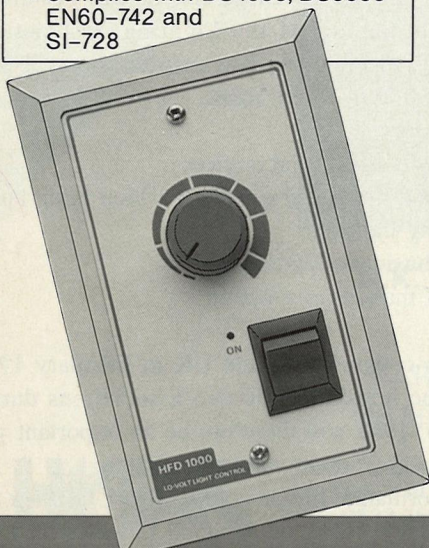
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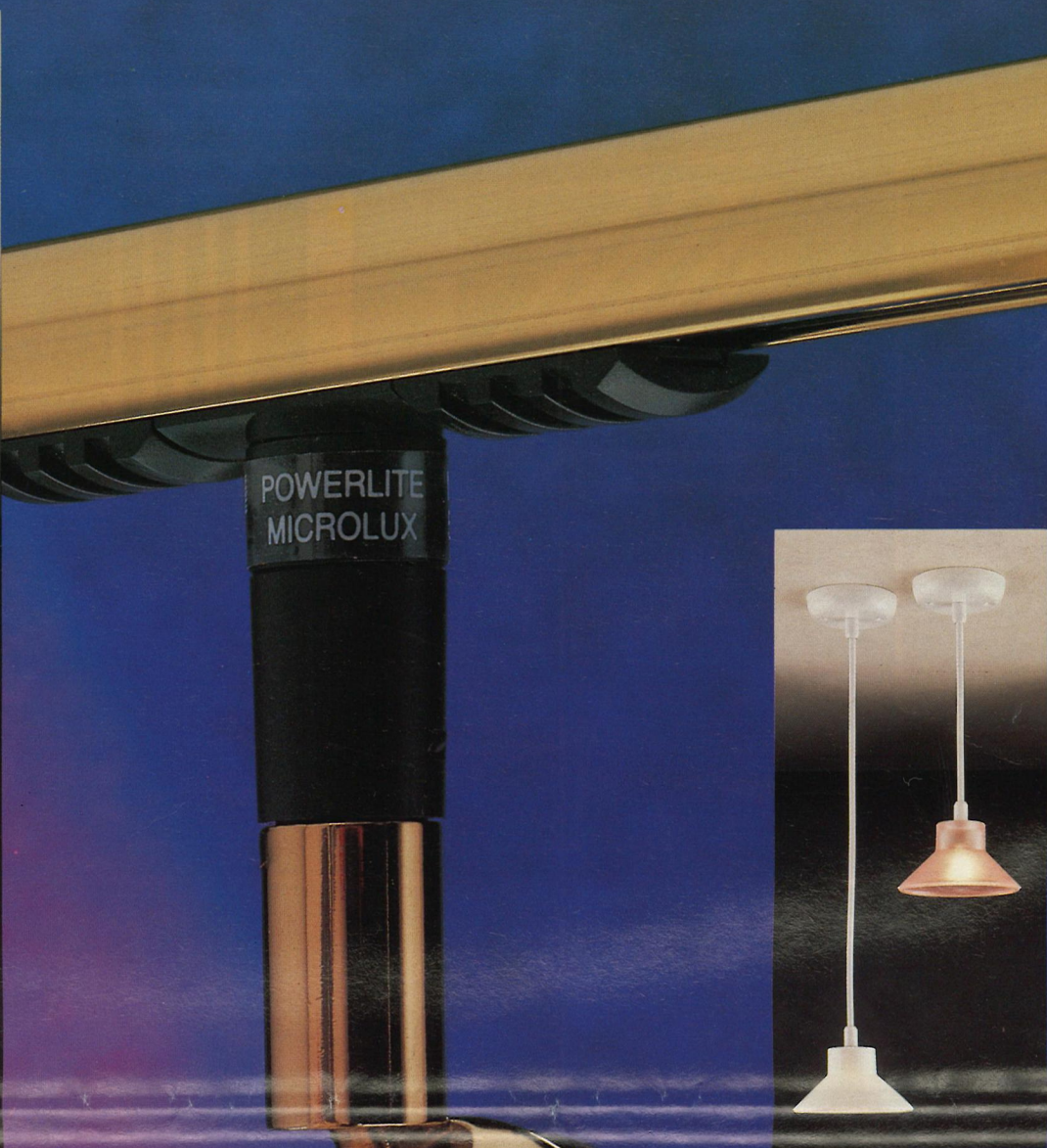
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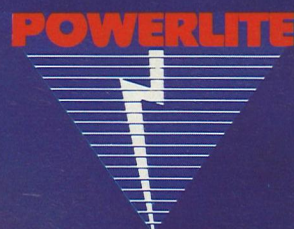
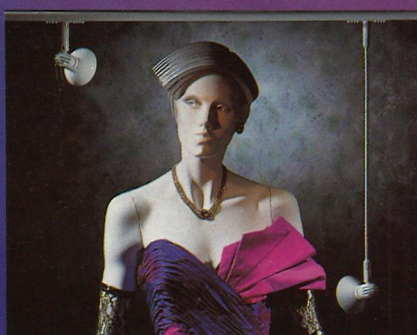
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Reader Service No. 7



la lumière c'est la vie *

9 - 14 JANUARY 1992

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* light is life

Public, street and amenity lighting makes for a more exciting night-time environment. *LEN* looks at the recent public lighting awards.

Going public

The 1991 Public Lighting Competition shows an increasing awareness of the need for better lighting on the part of public authorities. That a major winner was a lighting scheme for an ordinary, if environmentally sensitive housing road, underlines the increasing emphasis on improved street lighting and the need for a more sensitive approach to residential areas.

The competition was started over twenty years ago to stimulate public lighting design and technology among public authorities and government departments in the UK and Eire.

The scheme, held every two years, covers the three most important fields in public lighting – road lighting, public building and works, and amenity lighting. Each category is split into two sections – A and B – covering small and large projects respectively.

Design criteria

Entries are judged on eight basic criteria, including originality, appearance, both by day and night, technical merit and cost-effectiveness.

Judges, representing the sponsoring organisations, were Michael Hollinghurst, the outgoing and Graham Channon, the current presidents of the ILE, Lorenzo Apicella of the Institute of Architects and Mike Simpson of Philips Lighting.

Coventry Borough Council won Section A of the road lighting category with their scheme for lighting the section of the Kenilworth Road between the city boundary and the intersection with the A45. The busy road is environmentally sensitive as it runs through mature woodland which conceals high grade housing as well as the University of Warwick, and its lighting has consistently been opposed by conservationists. With an overall width of 28m, the two-lane carriageway occupies only 7m, the remainder being laid to grass with footpaths at the outer edges.

Appearance precluded the obvious technical solution – to mount lighting columns on the edges of the highway.

Following trials, the council erected 12m columns in the tree line, with 250W SON/T lanterns tilted at 30° to ensure road width coverage and individually

adjusted to eliminate any screening effect from the trees. An "opposing column" arrangement was needed to provide acceptable uniformity.

This unusual design provided both the required luminance and excellent uniformity as well as enhancing the security of pedestrians.

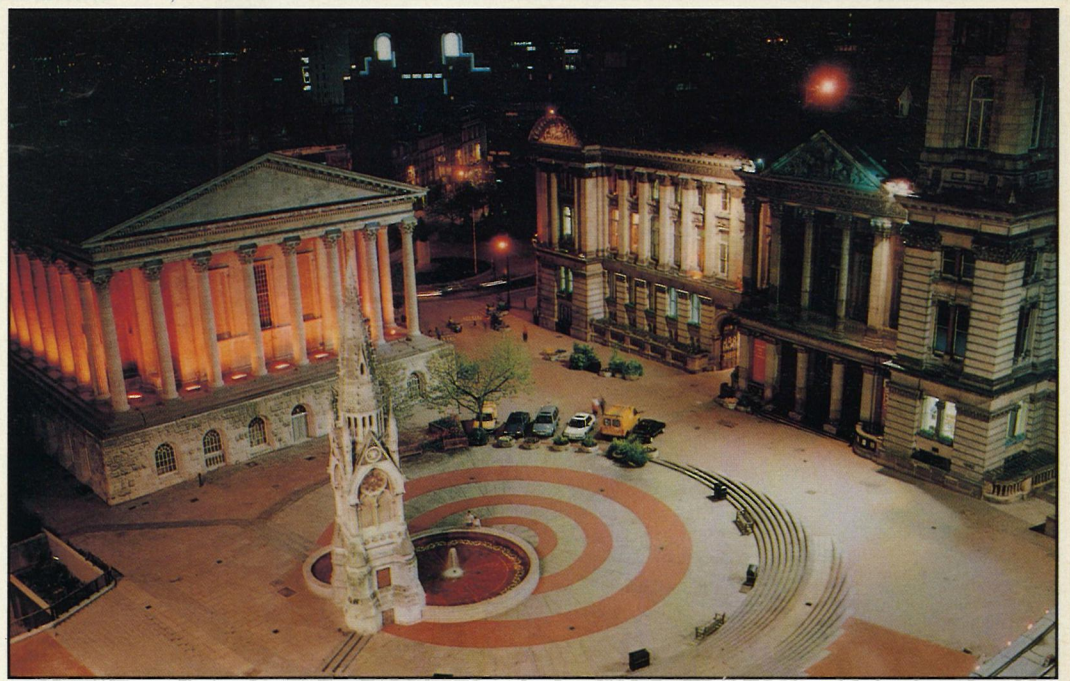
Section 1B was won by **Hereford and Worcester County Council** for their imaginative lighting of the recently-pedestrianised market place at Ross-on-Wye. The centrepiece of the area is Market House, a building dating from 1665. Its importance dictated the colour and texture of the paving chosen to the north and west of the building. The design brief of the area was extended to include lighting in keeping with the building's appearance at night.

Technically, the brief was for energy efficient lighting of a level sufficiently high to deter vandalism and to be suitable for cars

on buildings in the area and aimed to floodlight the three approaches to Market House and to give an average illuminance of 38 lux at ground level. The French columns, 3m high and mounted on sandstone plinths, are fitted with 80W mercury fluorescent fittings to contrast with the high pressure sodium floodlighting. A 70W metal halide spotlight highlights a marble plaque on Market House dedicated to the town's 17th century benefactor, John Kirle.

Ross now has a beautiful, brightly-lit market place with lighting that is not only aesthetically satisfying but also complies with BS 5489 : Part 9: Category 9.1.2. The energy consumption is no higher than the previous SOX and tungsten halogen installation, which provided a mere 0.1 lux away from the columns.

Highland Regional Council swept the board in both sections of the public lighting and works category and, with their lighting



Town centre lighting – Chamberlain Square, Birmingham.

tricity, the lighting load had to be kept small. The roof of the main cave, which is not entirely dark in daylight, is lit by SON/T floodlights. The Allt Smoo waterfall in the inner cavern has been lit from the viewing bridge by a 1.8kW metal halide floodlight to simulate the effect of sunlight flowing down the cave. Luminaires in this area are rated IP67 to withstand

bridge) fully achieves the design aim, which was to floodlight the bridge itself very softly with the warm light of high pressure sodium, in sharp contrast to the white water beneath the bridge, strongly lit by metal halide.

The **City of Birmingham** won Section 3A in the public amenity category for their lighting of Chamberlain Square. This famous city centre pedestrian thoroughfare also doubles as an arena for public events. As well as a requirement to meet BS 5489: Part 9, the design brief called for minimal visual intrusion of luminaires by daytime and prohibited their attachment to listed buildings. In addition the new scheme was not to detract from the appearance of the recently-floodlit town hall and Chamberlain fountain. The complex geometry of the square increased the problems.

The solution uses both SON/T and metal halide floodlights under the control of a central switching panel. These provide four lighting phases for the square:

- ☐ SON/T only for general night-time amenity lighting;
- ☐ metal halide only for amenity lighting requiring good colour rendering;
- ☐ both SON/T and metal halide for maximum light output (for example, to signal the end of a performance);
- ☐ and no lighting at all to maximise the effect of laser or firework displays.

Birmingham has, in fact, introduced theatrical effects into low-energy, low-maintenance amenity

lighting. The average horizontal illuminance in the square with all lighting on is 80 lux.

Finally, **Strathclyde Regional Council** won Section 3B with the installation at Scotland Street School of amenity lighting specially made under the council's direction to an original and previously unknown design by Charles Rennie Mackintosh (1868-1923). The school is, itself, a Mackintosh building, and the work was undertaken by the roads authority as a permanent memorial to the architect's work, as their contribution to Glasgow's role as European City of Culture in 1990.

Sketch design

The design, believed to date from 1918, was discovered in sketch form at the University of Strathclyde and was re-created full-size in polystyrene by Strathclyde's Department of Physical Planning. With outside assistance, the Council finalised the design to produce a product complying with today's lighting technology in terms of light distribution, the use of low energy, high intensity discharge lamps, and physical construction meeting the latest standards of vandal-resistance and durability.

Decorative columns are cast from spheroidal graphite, with hot-dip galvanised sheet steel lattice-work. The lanterns use standard 450mm diameter vandal-resistant polycarbonate spheres with internal light control refractors, galvanised steel frames and spun aluminium hoods.



Lighting a major tourist attraction – the Old Packhorse Bridge.

and pedestrians alike in the early stages of pedestrianisation. The equipment was also required to be inconspicuous and there was a need to incorporate two ornate French columns and lanterns donated by Ross-on-Wye's twin town.

The scheme uses six 150W SON/T area floodlights mounted

of Smoo Cave (Section 2A), may be able to claim to have worked on Britain's oldest tourist attraction. The cavern, formed in limestone by the acidic Allt Smoo river, is believed to be 500 million years old.

The main cavern is reached by boat from the sea and, because it is a long way from mains elec-

the damp conditions. The passageway to the furthestmost chamber, which is reached on foot, is given sparkle by low voltage tungsten halogen festoon lighting to give the appearance of an old mine, and the chimney in the chamber is floodlit by metal halide fittings.

At present, the lighting in the main cavern is controlled by time switch, which may ultimately be replaced by presence detectors, the remainder of the installation being manually switched by the guide. Installation was extremely difficult, both because of the need to conceal luminaires and cabling and because of Smoo Cave's habit of living up to its nickname of Devil's Dungeon.

Tourist attraction

The region also won Section 2B of this category with their lighting of the historic Old Packhorse humpback bridge, built in 1717, which crosses the River Dulnain at Carrbridge and is now a tourist attraction.

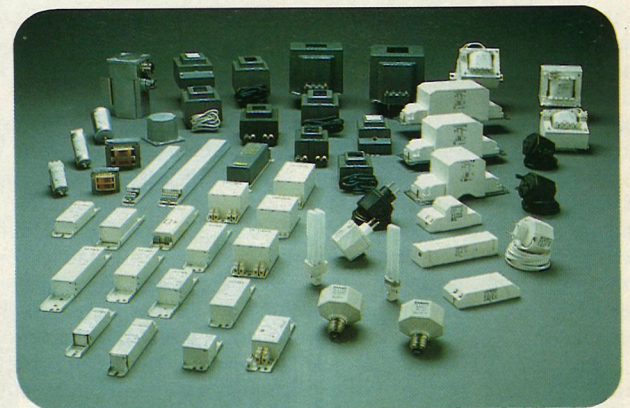
A simple but extremely effective scheme (one 100W SON/T floodlight mounted out of sight under the steps to the viewing platform and one 400W HPI/T pole-mounted projector behind the left-hand support pier of the



Road lighting winner – Kennilworth Road, Coventry.

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Reader Service No. 9



Lights up - crime down

Good lighting in residential areas is a major factor determining the quality of the environment and the feeling of safety of the local community. *LEN* reports on a study recently carried out in Leeds.

The illumination of urban areas can no longer be treated in isolation. Successfully and sympathetically incorporated into its environment, lighting has enormous potential to establish the mood of any area. It reinforces the individual's feeling of safety and security; it enhances the achievements of architecture; it vanquishes the twilight area of our open spaces and influences the activities of residents.

The effects of urban lighting are so important that illumination should be one of the main elements in any residential area. Yet in the fight against urban decay, the role of lighting is still hugely under-represented. Fortunately this is being addressed by campaigns like that which the British Parliamentary Lighting Group is currently running and on 28 October they announced the findings of five new research projects. One of the largest and most comprehensive projects, the Leeds project is worthy of discussion.

The study, by Tom Burden and Liam Murphy of the Policy Research Unit at Leeds Polytechnic, called *Street lighting - Community safety and the local environment* set out to examine the extent to which improved street lighting could enhance the quality of the environment and bring about changes in attitudes and behaviour which would improve community safety and the quality of life for residents of the area involved. The findings clearly show that better lighting does modify the perception and

behaviour of local residents.

Planning of the project began in early 1990 and involved a controlled 'before' and 'after' survey of the impact of improved street lighting on people's perceptions of the environment and community safety. The area chosen for the project was the Swarcliffe - Stanks area of north east Leeds.

Research was financed jointly by Holophane (Europe) plc and Leeds City Council and employed a multi-agency approach involving academics, the local police, the crime prevention unit from West Yorkshire Police HQ, industry (as Thorn Lighting lanterns were used throughout the relighting) and local councillors.

The site

Swarcliffe is situated about 5 miles north east of Leeds City centre. It is a large, 1960s council development containing 800 dwellings, and was chosen because it contained essential pedestrian routes and many community facilities including public houses and it also had a very high crime rate. In the previous 12 months prior to the study 40% of people questioned personally knew of residents who had been burgled and 9% knew of people who had been violently assaulted. The majority of dwellings are low rise housing except for four tower blocks, and the area under review has no through traffic routes and is completely pedestrianised. It is a network of cul-de-sac and service roads, with an extensive pattern of internal footpaths containing plenty of badly lit open space, especially in the vicinity of the

tower blocks.

Before improvement, the lighting comprised approximately 320, 35W SOX lanterns, in side entry and post top versions. Mounting height for the concrete columns was 15ft and the spacing between columns varied between 27m and 39m. The whole site

The change to high pressure sodium improved colour discrimination.

was gloomy. The grass appeared black, there were many dark patches and the scheme represented a failure in the most part to meet even the least demanding requirements of BS 5489 : Part 3. In fact, 21% of respondents identified poor lighting as a problem in the area.

In planning the new installation, economic constraints made it necessary to convert the existing columns to 6m mounting heights rather than change the column positions. Each unit was fitted with a steel extension sleeve and Thorn Beta 79 and Gamma 6 lanterns, and 70W SON BL lamps from GE Thorn were installed. The SON XL-T 70W lamp provides 40% more lumens than the 35W SOX light source and, of course, enables colour discrimination.

After relighting the requirements of the BS 5489 Part 3 :

Code of practice for lighting residential roads (Category 3/2) are substantially met over the area. Good uniformity has been achieved and more light provided, resulting in less areas of shadow and good colour rendition. This change from SOX to SON is in line with Part 3, where high pressure sodium is the preferred light source for areas in which pedestrian activities predominate or where the crime risk has to be considered. The choice of light source was also important to the respondents of the survey. There was a clear preference (59%) for the white light which can be interpreted as a desire for SON where crime is a concern. In addition, 75% of people felt the new lighting made it easier to recognise people.

The Swarcliffe project clearly shows in lighting terms that it is possible to bring an installation up to scratch by utilising the existing columns. This straightforward solution may not be possible for

every application, but is worth exploring before resorting to the radical changes of new columns or moving mounting positions.

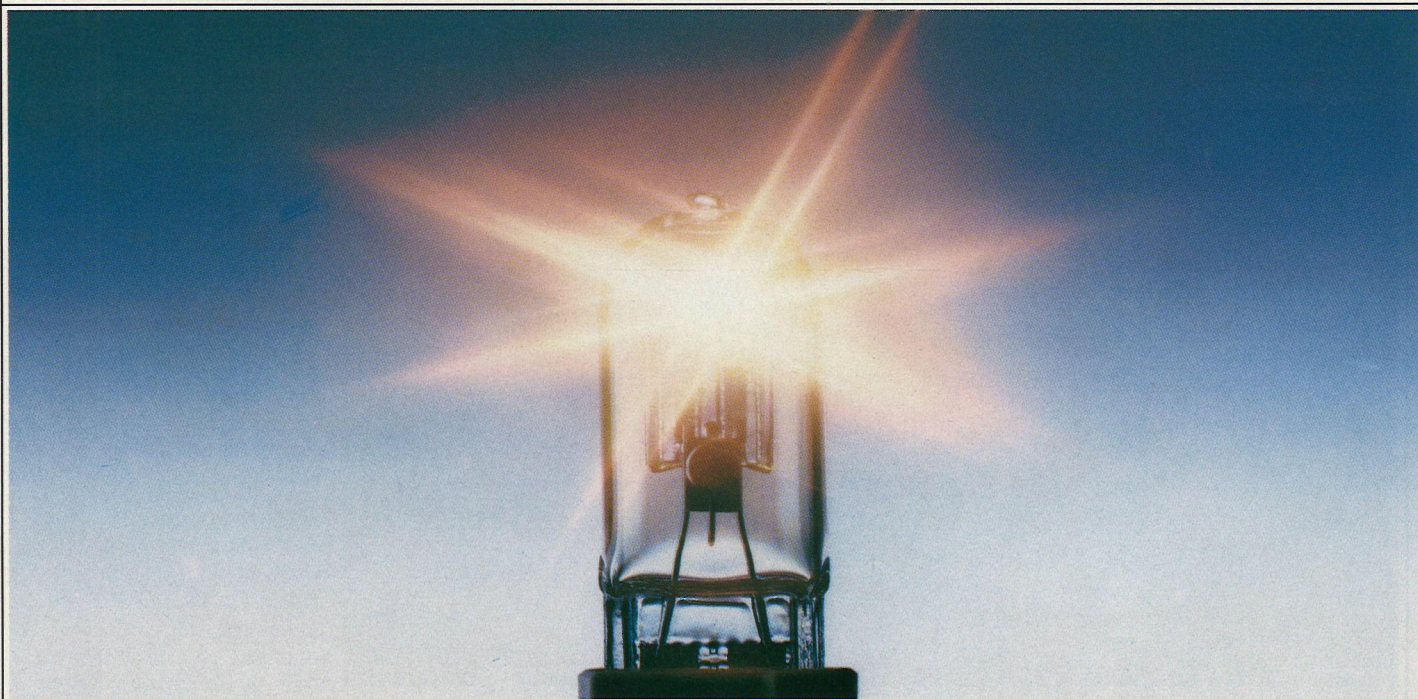
Street survey

The Swarcliffe research methodology involved using interview schedules, recorded interviews, questionnaires, observations and official police statistics. The topics covered included community safety and the local environment, crime and fear of crime. Trained interviewers were used. In the main the research concentrated on local residents who were questioned regarding their personal experiences before and after the new lighting was installed.

The interviews were conducted in two phases, 173 households (22% of the total households in the area) were spoken to in Phase 1 and 166 in Phase 2, with 84% of those interviewed originally being re-interviewed at the second stage.

Five main findings were reported:

RECORD BREAKING LIGHT:





□ The new lighting was preferred on aesthetic grounds and viewed as being brighter and rendering colour more accurately. Over 60% of respondents thought that the 'look of the area' had been improved. Over 20% of respondents thought that road safety had also improved.

□ Many people felt more secure both inside and outside their homes. Overall, a feeling of safety in the street was expressed by 44% of the people and 23% actually reported that

they felt safer inside their homes. Poor lighting made local residents feel vulnerable to violence and harassment.

□ People became more willing to go out after dark. A fifth of the people felt more confident about going out at night, with the figure rising to 27% for women.

□ Evidence of a lower level of crime than expected was found following the re-lighting. The crime figures for the research site, when compared with other areas in Leeds, indicated a

reduction in burglaries and vehicle crimes following the improvement in lighting. Certainly the number concerned about car theft fell by 30% after the re-lighting.

□ The safety of women and old people was improved.

Conclusions

Bearing in mind the limitations of the project, particularly the short-term monitoring and the possible displacement of crime to other areas, the study clearly indicates a range of ways in which percep-



tions and behaviour have been modified under the influence of the new lighting.

Certain commentators have tended recently to discount the impact of the fear of crime by simply stating that lighting does not have a significant impact on crime itself. This is a serious oversight. Police statistics do not deal with fear of crime in a community that can adversely affect the quality of life.

The quality of life is a combination of objective and subjective factors. The actual circumstances

of people's lives and how they interpret and react to them jointly determine their sense of the quality of life. Subjective factors such as fear and anxiety are as real and disabling as damage to people and property. Of those involved these subjective concerns are crucial elements in the quality of their lives.

As Swarccliffe shows, good lighting is desirable in its own right, making a vital contribution on all fronts. It improves the look of an area; it encourages people to use the streets; it enhances

Improved lighting levels make underpasses look safer by night.

community safety and it can reduce the level of crime.

In brief, better street lighting gives the public something everyone wants, that's affordable and will be appreciated, and serves a valuable purpose. One is left wondering just how many surveys and research projects will it take before the government gets the message.

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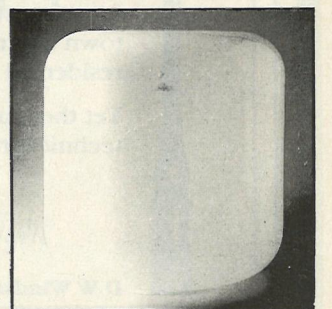
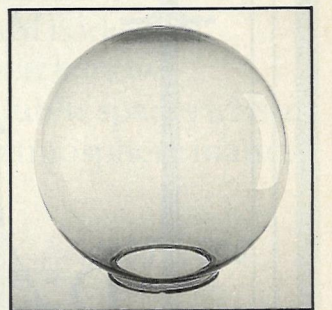
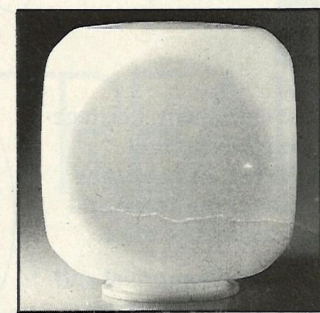
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Update on lighting and crime

New studies on crime, fear and lighting have just been released. An unexpected result of improving street lighting has emerged; it has been called the halo effect.

With the release of information at the end of October on five more studies concerning lighting and crime, there is an even greater body of evidence linking the two. The new studies are in Cardiff, Glasgow, Hull, Leeds, and Manchester.

This brings to 9 the number of independent studies conducted under the auspices of the British Parliamentary Lighting Group since 1988. In addition, four extensive street lighting surveys have been carried out by local authorities plus many smaller studies throughout the country.

As well as the link between lighting and crimes such as mugging, burglary, vandalism and car crimes, a connection is now being made between lighting and mob disorder.

Oxford joyrides

On the Blackbird Lees Estate in Oxford the immediate reaction of the local authority was to repair defective lighting and to double the lighting strength in the area of the shopping precinct where most of the problems seem to have occurred.

That had an immediate effect of cooling tempers. The joyriders did not want to be identified in the better lighting.

The first act of the looters at North Shields was to knock out an electricity sub-station supplying the area's lighting, and at Cardiff the trouble began following a power failure.

According to the British Parliamentary Lighting Group there is an even stronger link between better public lighting and reducing the fear of crime. Elderly people, children and women are



Before (top) and after relighting a street in West Hull.



The Tremorfa district of Cardiff has been the subject of a recent study. These before (top) and after views show the relighting.

believed to be particularly vulnerable to this fear.

Following improved street lighting, not only do people generally feel safer outdoors but they also have a greater feeling of security in their own homes.

Among key findings of the Cardiff survey just published is what Professor Herbert, University College Swansea, calls the "halo" effect. When the lighting in the Tremorfa district was improved, people felt much happier about a whole range of the services in their neighbourhood as well as feeling that the better, "brighter" lighting improved the look of the district.

The halo effect is reflected again in the general findings of these newly released surveys, which state: "It was clear that people felt as a result of the

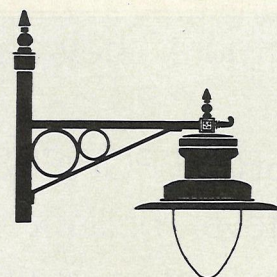
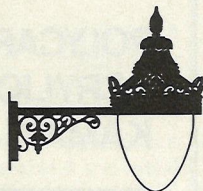
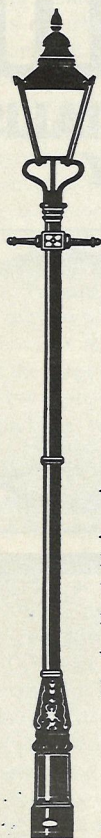
relighting that the council thought and cared about them and there was a demonstrable increase in the esteem in which local councillors were held."

Action needed

Crime is widely seen as an important and growing issue. Moreover, recent surveys have suggested that the actual amount of crime is far in excess of official crime statistics.

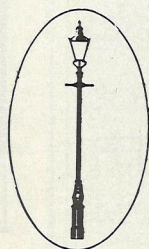
It is time, therefore, that the nettle is seized and a widespread programme of better street lighting is instigated. If the government of the day wants to be able to maintain law and order and really believes that British citizens should feel safe on the streets at night, money should be found and appropriate grants made to local authorities.

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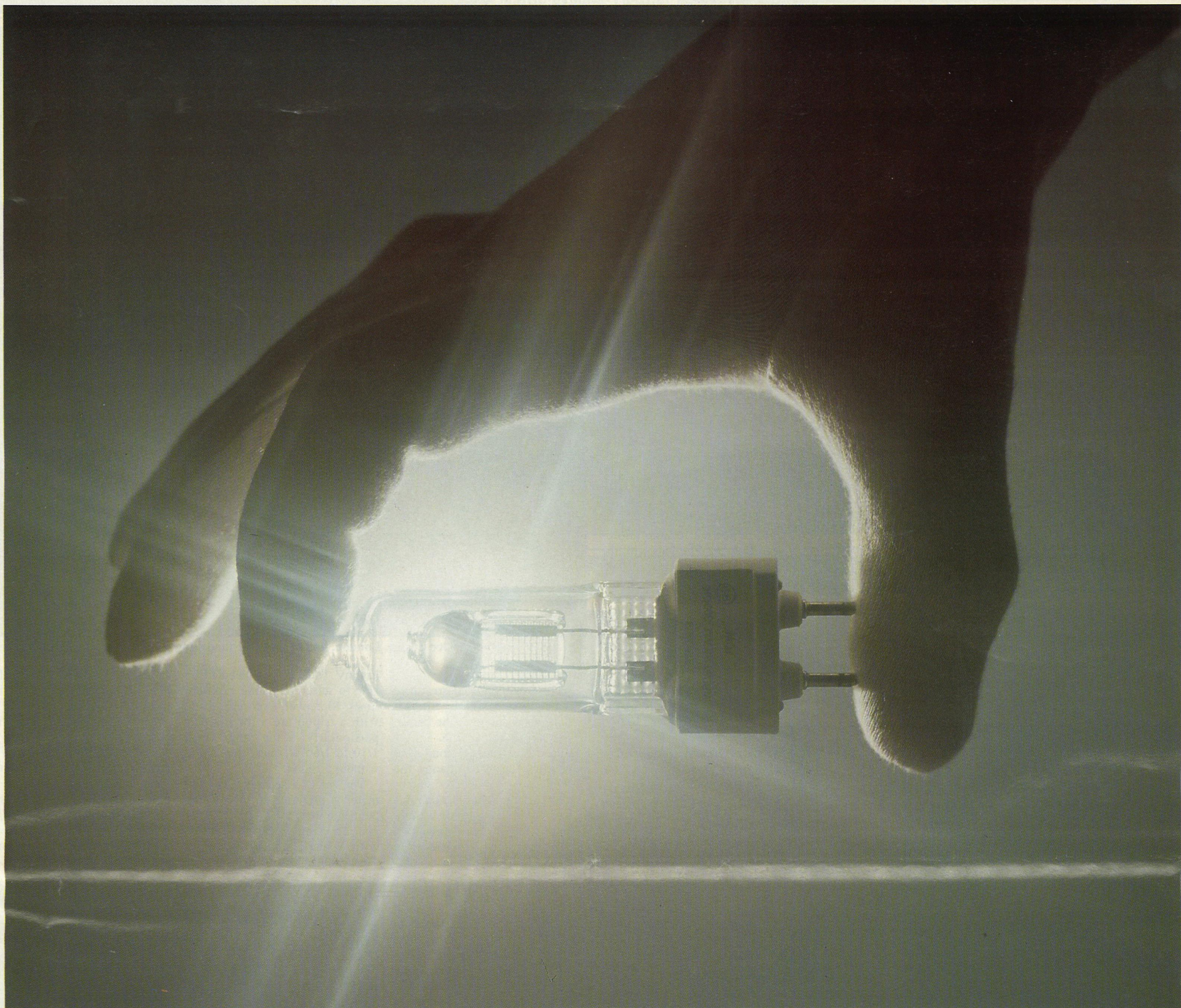
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How to photograph lighting at night

Hans van Stekelenburg of Philips is noted for his outstanding lighting photography. Here he gives advice on how to achieve better pictures.

Whether you are a professional photographer or simply take photographs for your own pleasure, night photography requires a lot of care and know-how.

The breathtaking impression you get at night, whether it is the sparkling lighting of an American city skyline or the illuminated lines of a bridge in China will not necessarily be captured in the

photograph you take with your camera.

This short introduction is an attempt to pass on some of the experience I have gained in thirty years in this field. What is the best way then to approach this kind of photography?

The most important factors influencing the photography of lighting installations are the following:

□ camera with accessories;

□ exposure time and aperture;
□ type of film;
□ camera angle.

Let's start with the camera; leaving aside professional cameras, any non-fully automatic small-format camera, with the facility for time exposures is suitable. However, cameras with exchangeable lenses are preferred.

A wide-angle lens of at least 35mm is needed to take photographs indoors. The lens with the widest possible angle which does not give any distortion is 15mm; this is an excellent lens, but very expensive.

For outdoor photography a zoom lens of 35-70mm is adequate, but you will then need to add an 80-200mm telezoom lens to complete your photographic equipment.

Zoom lenses

Why are zoom lenses so useful in lighting photography? Apart from the fact that with fewer lenses you have a wider range and can compose your picture more easily, in particular for evening photography it is important that dazzling light sources – especially those at the edge of the picture area – are reduced. These light sources may cause troublesome internal reflections.

A zoom lens can be set so that light sources of this kind are just outside the picture area, without you having to use another camera angle.

Of course, the lenses must be clean and dust free. In particular, dirty lenses may spoil the results of night photography. In addition, I would recommend you use a



This photograph of Tower Bridge, London, had to show the modelling produced by the lighting scheme.

haze filter.

I won't go into detail great here about the use of colour filters – but a good solution is the choice of the correct colour film.

I use three filters: colour compensation filters to change the overall colour balance of photographs; Kodak light balancing filters to obtain a cooler or warmer colour quality of the illumination; and Kodak conversion filters to change the colour quality of various light sources so that these lamps can be used with specific types of film.

A tripod and cable release are vital for night photography. As a professional photographer, I almost always use a tripod during the day. This enables me to compose the picture better and leaves me free to select the exposure time.

Freedom to determine exposure time is in fact particularly important in the case of night photo-

graphy. Indeed, you need to be able to select very long exposure times. Moreover, exposures made with a tripod are a lot sharper, particularly in the range from 1/10 to 1/60 seconds, than those without a tripod.

The use of a separate exposure meter is preferred to that of one built into the camera, especially if you are using an exposure meter with a small measuring angle. This enables you to measure the highlights and the darker parts separately and to select the correct average.

Exposure

Now let's go on to consider the exposure time and the aperture. An aperture which is too small results in a halo or star effect around the light sources.

Sometimes deliberate use is made of this effect. If, however, you want a lighting installation to look as natural as possible, you

shouldn't use these effects. They give the impression that the lighting used is glaring.

An open aperture, 5.6 or wider, makes the light sources look natural. In addition, the wider the aperture, the shorter the exposure time, which again reduces the blur caused by motion. A slight blur may even suggest speed, but if it is too great, the shapes are no longer recognisable and the effect is spoilt.

Objects which are moving away from or towards the camera should be photographed with longer exposure times – in other words, with less motion blur – than objects which are moving across the camera.

Traffic on a motorway is sometimes deliberately exposed for longer, so that the lights of the driving cars form long, white and red lines – this gives an impression of speed and traffic density.

Film selection is generally a compromise between good colour rendering and grain size. The faster the film, the better the colour rendering and the coarser the grain.

A 400 ASA film (37 DIN) is the correct average here. The quality of today's film is such that at this film speed the grain is barely visible.

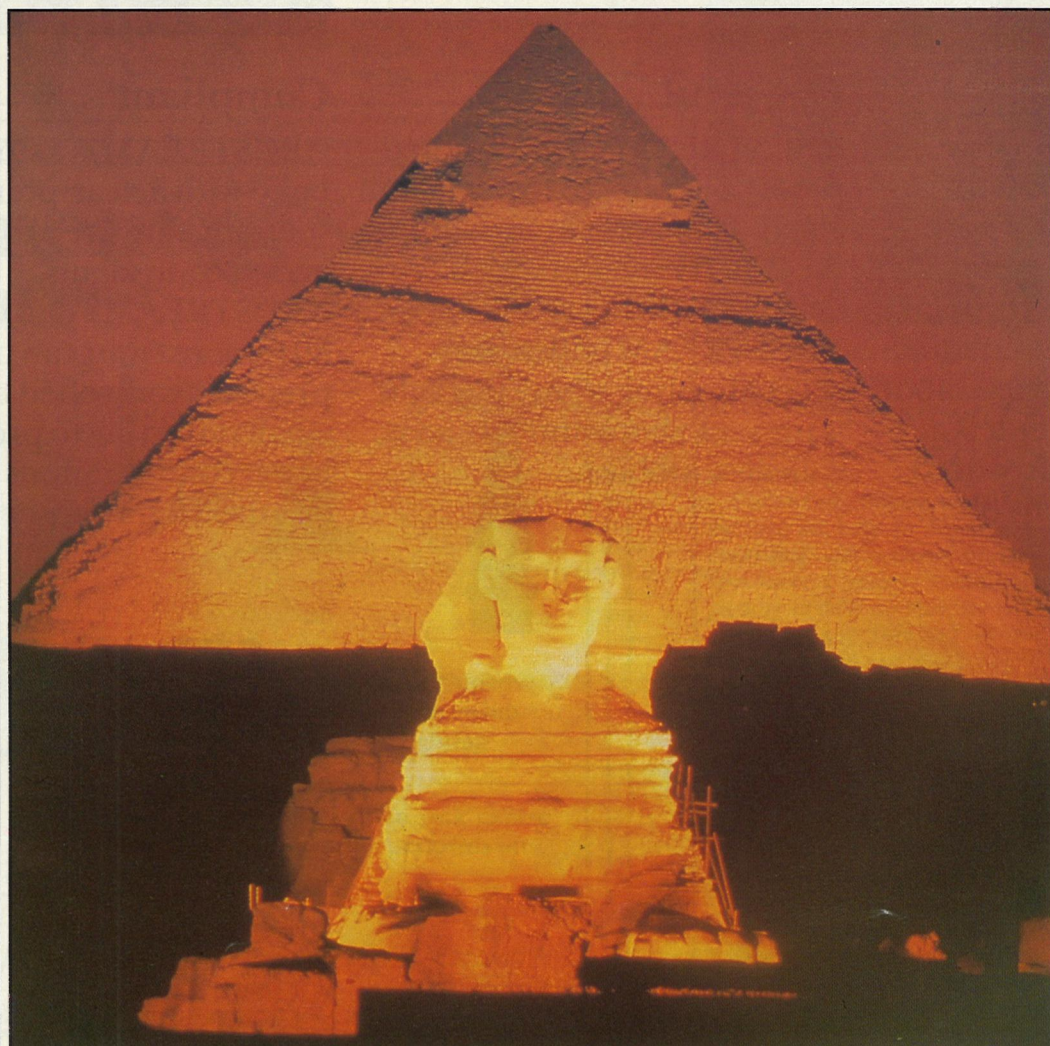
Of course, slower films can give much better results in terms of sharpness and grain size, but faster films give better contrast ratio and colour rendering.

Contrast ratios

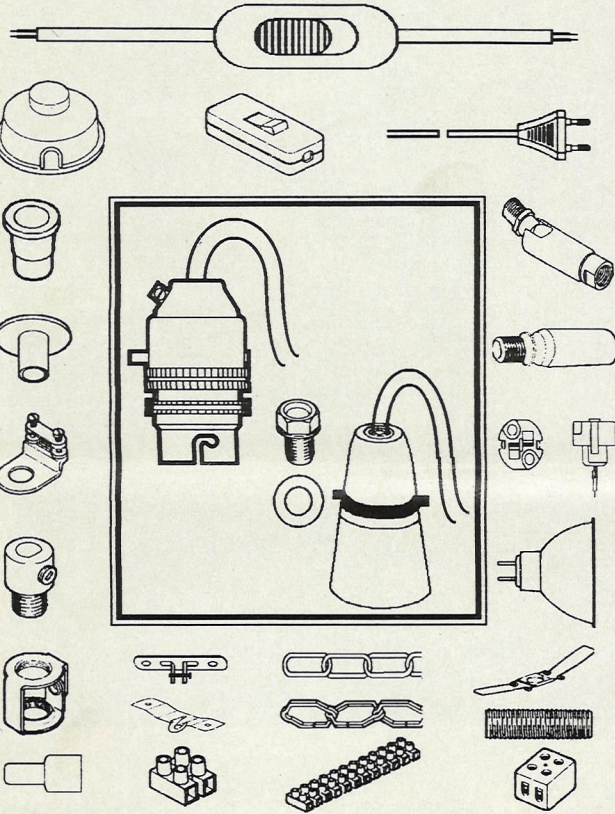
Contrast ratios are particularly important for night exposures. In fact, 1000 ASA film is too coarse for small format cameras, but the grain pattern is so regular that it can sometimes be put to good use as a special effect.

For almost all outdoor photographs the best result is achieved if they are taken at the right moment at dusk. The darker parts, such as trees, contrast well with the dome of the sky, instead of disappearing into the black of the night. Moreover, that little extra hint of daylight softens the contrasts and accentuates the warm yellow of the artificial light effects against the night blue of the sky.

The right moment at dusk is when the light from the surfaces to be illuminated – such as the road surface of a lit street or the



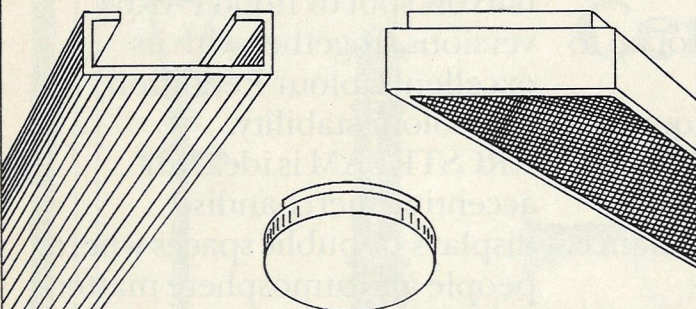
The floodlighting of the pyramid and sphinx is set off by a desert sunset.



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playing field for a stadium, is brighter than the sky, but the sky still has just enough brightness to throw the unlit buildings and trees into silhouette.

The camera angle depends on the subject you choose. An illuminated town for example is shown to advantage if you take the picture from a high level. You can then take in the whole expanse of the lighting, such as the traffic and illuminated advertisements in the streets.

By the same token, a skyline should be photographed from a low point, preferably looking over a water surface such as a river or bay, so that the reflections in the water enhance the appearance of the town.

Tips

It would be too much to try to deal with all subjects which can be illuminated in this short article. However, I should like to mention a few interesting areas.

When photographing the decorative lighting of buildings and monuments, the main factor is that the light sources will illuminate the building do not shine directly in the direction of the camera. In this situation you only want to see the effect of the lighting – and not the light sources. Do not take the photograph from the direction of the light source, but at right angles to it, so that the modelling of the building is shown to advantage. I don't need to add that the picture should be taken at dusk.

When taking a general view of a sports stadium, you should try to take the picture from as high a viewpoint as possible to avoid glare.

A wide-angle lens should be used here so that the whole playing field fits into the picture. Personally, when photographing oval-shaped stadia, I always use a



Light is used to attract the passer-by at London's Barbican Centre.

fish-eye lens – because of the rounding off you don't see the distortion of this lens.

Then you should wait for the moment when there is least movement in order to prevent blur. And use an aperture which is as wide as possible and thus gives a shorter exposure time.

Of course, you should photograph sport projects with the public and players around. An empty stadium or an empty sports hall results in an uninteresting picture.

Never use a wide-angle lens if you are taking a photograph of

street lighting; this gives a confusing result. The lamp posts will be too far apart and the closest light sources will be dazzling – resulting in the formation of halos.

On the road

A light telelens or zoom setting of 160mm gives a compact picture and does full justice to the luminaires. A high position is also recommended here, but never as high as the luminaires.

Roads lit by low pressure sodium lamps need an additional colour accent because of their monochromatic light. Always try to include other types of light source in the picture, such as traffic lights or illuminated road signs.

Finally, a word of warning. Even if you are able to put into practice all the advice I have given here there is still no guarantee of a perfect result – all the right ingredients do not necessarily make a good cook. However, I do hope I have been able to give you a good insight into the professional aspects of taking pictures of lighting installations.



The romance of an industrial object – the Eiffel Tower in Paris.

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Better lighting for efficiency and productivity

In this two part overview for the practising manager, **Bob Bell**, of **Thorn Lighting**, looks at the energy saving and productivity that can be achieved by using better lighting.

When we talk about the need for lighting to be efficient and effective some people think immediately of energy conservation or, better still, energy management. But efficient and effective lighting is much more than that.

Lighting has a job to do and it must do it well. It's not there for the benefit of the building but for the benefit of the occupants, and good lighting contributes directly to their efficiency and effectiveness. It also contributes to safety.

But let's start with energy. In the UK and other developed countries lighting accounts for less than 4% of the primary energy consumed and about 16% of total electricity consumption.

In domestic and industrial premises, lighting isn't a large

proportion of the electrical energy consumption, but in commercial premises, which include public buildings and offices it accounts for about 50%. With such a large proportion being used for lighting, it would seem, at first sight, a good target for energy reduction.

But is it? would such a cutback really be wise.

Aims

The principal purpose of lighting is to enable people to see. Unlike temperature and humidity, which must be controlled within fairly close limits for human comfort, lighting conditions can vary over an enormous range, and it's essential to match the lighting standards to the type of work to be carried out. You wouldn't for example, feel too confident about

having an operation if you heard that the lighting levels in the theatre had been reduced to save energy.

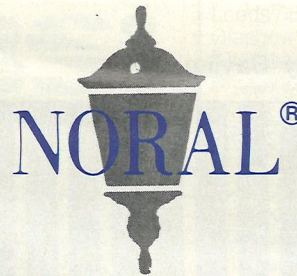
Poor lighting contributes to accidents and, more insidiously, reduces the efficiency and effectiveness with which people work. It can decrease morale, increase staff turnover and be a casual factor in industrial action. Lighting in places of work, which is insufficient or unsuitable, directly contravenes the *Health and Safety at Work etc Act*.

Not only that, but it is bad economics. Even in offices only about 0.5% of the total operating costs are spent on the lighting, with the major share, about 84% being spent on salaries and associated costs.

It is tempting to conserve energy by reducing lighting stan-



National Gallery of Scotland, a building in which energy management plays an important part.



COMPACT

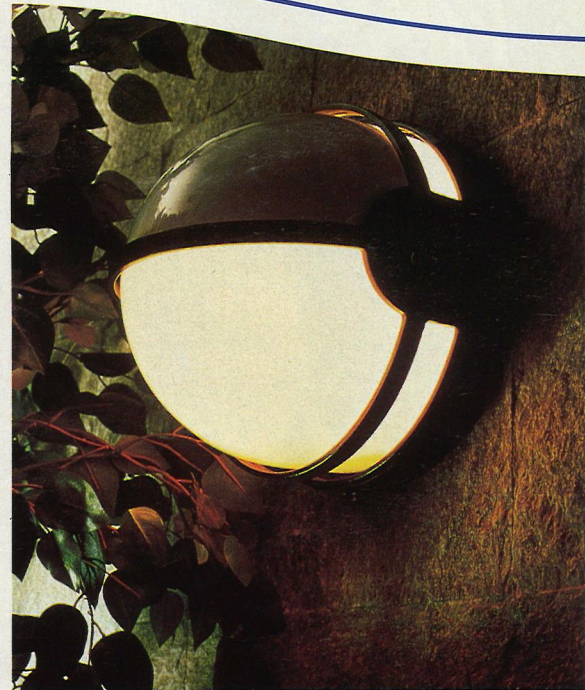
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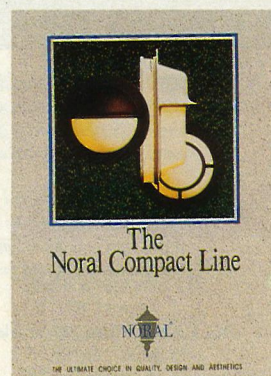
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CIBSE installed efficacy recommendations (mx/Wm⁻²)

	Room index	Lamp 1B	Colour 2	Rendering 3	Class 4
High bay	1		18-29	14-23	21-45
	2		23-37	18-29	27-55
	5		27-43	20-32	32-60
Other	1	14-23	14-23	14-23	19-31
	2	18-29	18-29	18-29	23-37
	5	20-32	20-32	20-32	26-42

Continued from Page 17

dards, but this is naive and uneconomic in real terms. Quite clearly, with most of the operating costs being on staff, any reduction in the efficiency or effectiveness of the work force would be counter-productive. What sane businessman would risk losing a percentage of 84 pence in every pound for a potential saving which is likely to be no more than about one tenth of a penny.

Correctly designed

The greatest and most worthwhile improvements are made by correctly designing lighting systems to provide the most efficient and effective solutions and by managing them so as to maintain that effectiveness. No one but a fool will spend good money to reduce

their energy consumption unless the savings offer a good return on that investment.

But even today, a great many people are short sighted and are only concerned with the capital cost of the installation, without regard to improvements that can be achieved for a slightly higher investment.

Good lighting works well and uses energy efficiently. The refurbished main gallery of the Royal Museum of Scotland is an attractive interior in which good lighting plays an important part. It was a winner of the National Lighting Award for excellence in lighting design. In other words, the lighting design was judged to be the best in its class. Yet this

installation also won the EMILAS competition for energy management. But, neither of these competitions is the real test of efficient and effective lighting.

Real test

The museum has a job to do. It must attract visitors and show the exhibits off to the best advantage. The reaction of visitors to the museum has been excellent and is demonstrated by the million people who now visit it each year. That's the real test of efficient and effective lighting.

Efficient and effective lighting means:

- ☐ Ensuring that the correct lighting standards are provided

both in terms of quantity and quality.

- ☐ Selecting the correct type of lighting system.
- ☐ Using the most suitable lighting equipment.
- ☐ Controlling the hours of use.
- ☐ Maintaining the system in efficient working order

Objectives and standards

Let's start with standards. But what are the appropriate lighting standards?

The Chartered Institution of Building Services Engineers (CIBSE) in its current Code for Interior Lighting makes sound and sensible recommendations about lighting standards and good practice, with the emphasis very strongly on the efficient and effective use of energy. It should be compulsory reading for anyone involved in the design or specification of lighting.

Lighting must set out to achieve three things:

- ☐ Firstly, people must be able to move about in safety and without risk of accident or injury. This applies at all times

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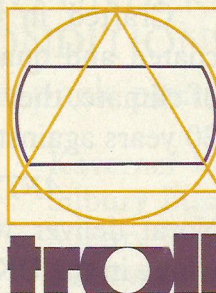
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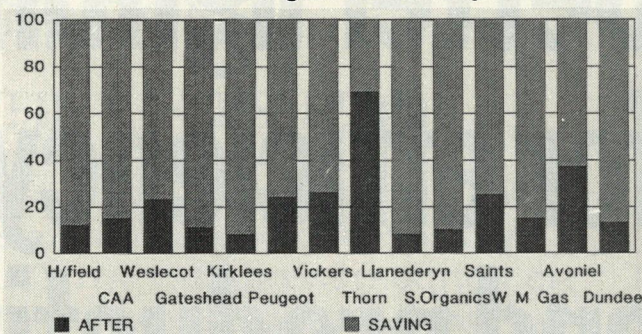
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EMILAS: Commercial

1

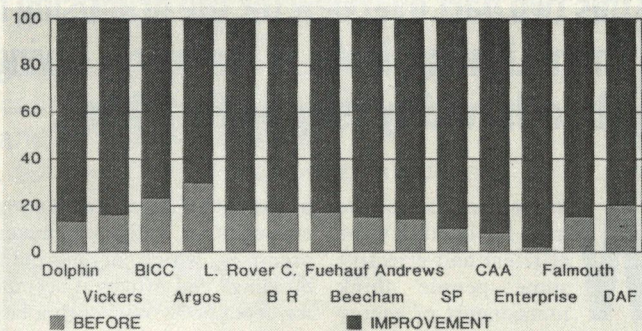
Relative gain in efficacy



EMILAS: Industrial

2

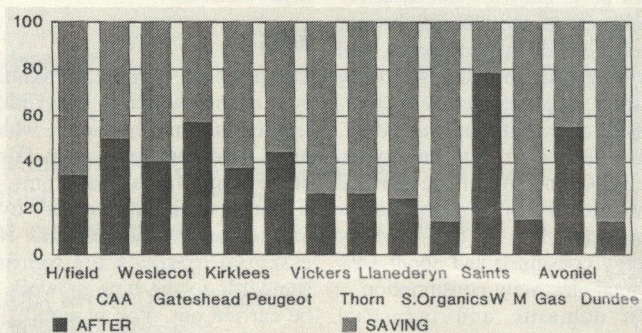
Relative Gain in Efficacy



EMILAS: Commercial

3

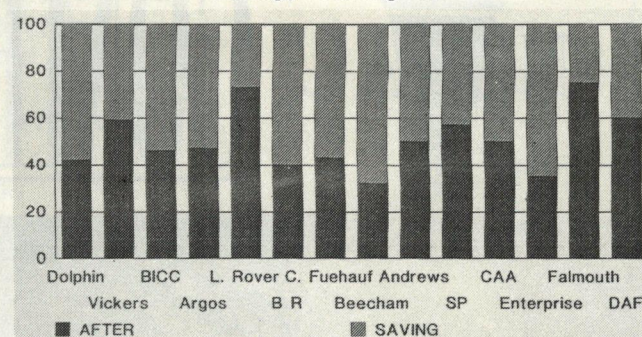
Energy Saving %



EMILAS: Industrial

4

Energy Saving %



Histograms 1 and 2 show how twenty eight industrial and commercial organisations improved their installed efficacy with better lighting. Their operating efficacy gains were even greater thanks to controls on the hours of use. These organisations all used energy savings to help fund better, improved lighting standards. Histograms 3 and 4 show the load reductions that were achieved even after lighting standards were improved. The difference in the two sets of graphs represents efficiency gains used to improve conditions and productivity.

and becomes critically important in an emergency.

☐ Secondly, the occupants have things they must see to do. They need to perform certain tasks to an acceptable level. The types of task can vary considerably as can the consequences of errors. Surgeons, for example, may have to see very fine details and an error could be fatal, whereas, watching a television programme is much less demanding.

☐ Lastly, the lighting must help to create the right appearance and atmosphere and it must create the right sense of comfort. Lighting can, for example, be used to create an intimate atmosphere in a restaurant, or a lively one in a fast-food restaurant.

It is easy to think that getting the lighting right is just a matter of achieving the right lighting level, but there is much more to it than that. There are many things that must be designed for it if the lighting is to be correct.

The uniformity of illumination, for example, affects our perception of the space and our ability to see and work efficiently and effectively. Discomfort glare determines how uncomfortable we find the lighting and this, in turn, affects our ability to work and to concentrate without distraction or fatigue, and so on down this list.

Good lighting starts with the design objectives, and if they are wrong, no amount of good equipment will compensate.

This feature was originally presented as a paper at a LIF seminar for energy managers.

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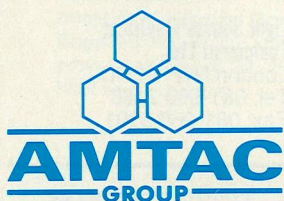
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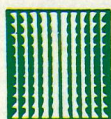


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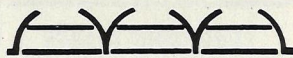
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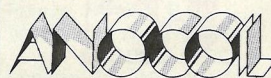
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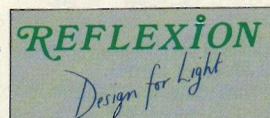


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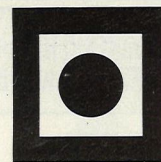
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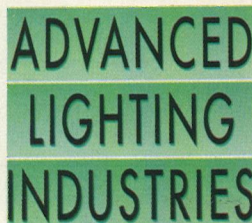
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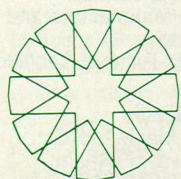
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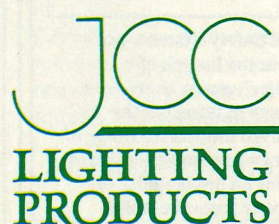
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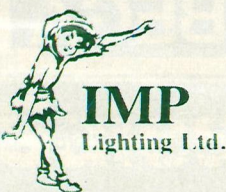


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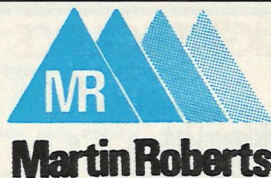
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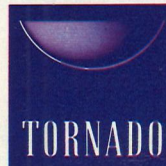
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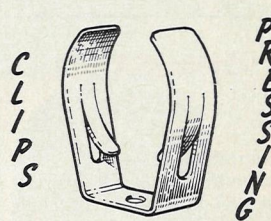


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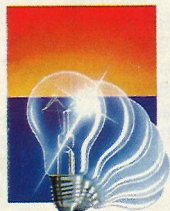
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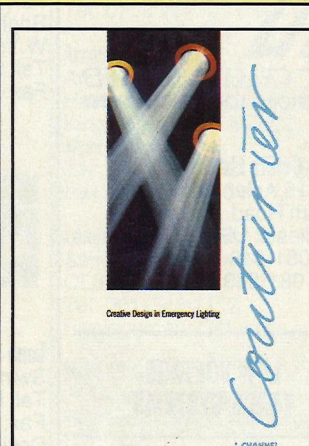
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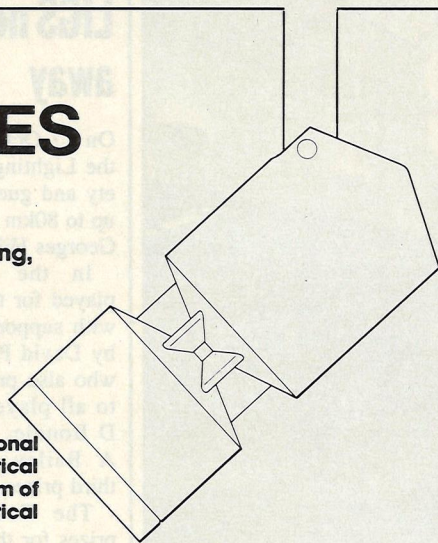
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Applicants should be qualified engineers with flair and experience in designing lighting fittings for volume production, and be familiar with the latest materials and tooling methods available for commercial use. Able to prepare manufacturing drawings using CAD.

These positions will be based at our Head Office at Uxbridge, where applicants should write enclosing personal particulars and CV to: The Sales Director - ILLUMA LIGHTING LIMITED 24-32 Riverside Way, Uxbridge, Middlesex UB8 2YF.



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NEW PRODUCTS

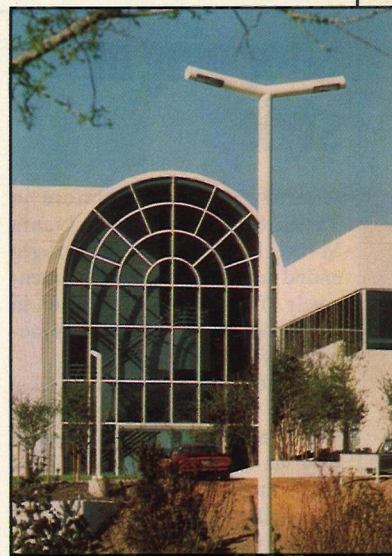
Tubular outdoor lighting

OTS Exterior Tube system is a range of amenity lighting from LDMS. Made from extruded aluminium, the luminaires have fully gasketed, borosilicate glass lenses.

There are two sizes to accept discharge lamps of different wattages: 155mm diameter for 70-250W lamps, and 203mm diameter for 150-400W lamps.

The smaller version can be mounted at heights up to 6m, while the larger model is efficient at heights up to 9m.

Reader Service No 173

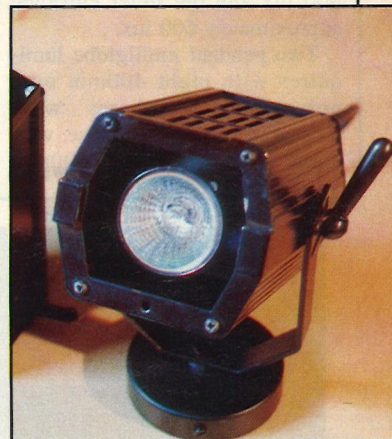


Spotlighting system with framing facility

System 2000 from Light Projects gives wide scope for display lighting in interior applications ranging from shops and reception areas to galleries and museums.

Complete with integral transformer, System 2000 takes up to 75W low voltage tungsten halogen lamps and accepts a wide range of accessories such as louvers, barndoors, and coloured glass and spread lenses that create special lighting effects.

Its most versatile accessory is a framing projector extension piece, which enables the system to produce tightly framed beams with 15°-30° angles. Moreover, it can



be used to project crisp images of gobos onto walls or other surfaces.

The framing projector also accepts a range of accessories, so extending the versatility of the system still further.

Reader Service No 174

Explosion protected lighting improved

In response to more stringent water resistance requirements by the offshore oil industry, ABB Control has enhanced its explosion protected lighting fittings by incorporating a new seal which provides IP66 water protection to the luminaire.

Recent experiences have led to changes in the testing procedures North Sea platforms undergo, one

development being an increase in deluge testing - pumping vast amounts of water over the structure.

To avoid replacing complete luminaires on platforms to comply with the new practices and safety standards, ABB has introduced an IP66 lighting bowl which is directly interchangeable with the IP65 rated predecessor in its 81 series.

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For more information on any of the products listed, circle the enquiry number on the free reader reply service card.

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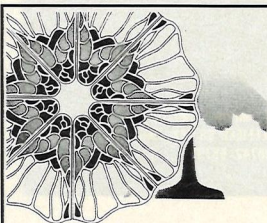
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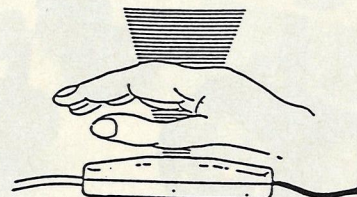
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Shopping in style

A newly opened superstore in Yeovil, Somerset uses Sylvania M100 100W MetalArc single ended metal halide lamps extensively. The light source is used in special globelike units manufactured by LB Lighting.

The design brief required a scheme which could provide illumination from the canopied walkway via the main entrance of the Leo's store in transitional steps. The walkway was specified at 30-50 lux, the side canopies at 100-200 lux, the outer canopy at 250-300 lux and the inner entrance approximately 600 lux.

Two pendant multiglobe luminaires with eight 400mm opal polycarbonate spheres were located in the main entrance, with eight wall mounted 400mm



uplighters. The entrance canopy is lit by one pendant multiglobe with four spheres, two single globes and six twin pendant globes.

The walkway was fitted with nine pendant single globe units with an 800mm drop, and twelve single globe units were mounted on the exterior wall.

LIGS nearly blown away

On 17 October, 27 members of the Lighting Industry Golf Society and guests, in winds gusting up to 80km per hour, played at St Georges Hill.

In the morning members played for the GE Thorn trophy, with supporting prizes presented by David Proctor of GE Thorn, who also presented first tee gifts to all players. The winner was D Bonnie, with G Sugden and A Bailey taking second and third prizes respectively.

The Foursomes Stapleford prizes for the afternoon competition were sponsored by Trevor Oram of OLC/Guizzini. Winners also received the Wilson Cup. The winners were J Butler and G Pursor, with M Bailey and A Bailey taking second prize. Next meeting is December 5.

Osram opens new light studio



Osram has opened a new light studio at its Wembley headquarters. The studio, incorporating a lecture theatre, will be available to customers and specifiers for product demonstrations and updates.

The studio, 120 square metres in area, contains the latest developments in lamp and electronic control gear technology with descriptions of applications, service life and product benefits such as energy saving.

Castle wins floodlighting award

Cyfartha Castle, the well known landmark high above Merthyr Tydfil, can now be seen in a new light thanks to a £3000 sponsorship by South Wales Electricity.

Once the home of the legendary ironmaster William Crawshay, the gothic building, which houses a museum, art gallery and

school, is now illuminated by a sequence of coloured floodlights. The scheme to floodlight the front of the castle was put forward by the borough council and took first prize in the Lighting Up Wales Awards. The awards, now in their second year, were launched in a bid to bring some of the treasures of Wales out of the shadows and help deter vandalism.

Other winners of this year's sponsorship grants, worth over £14 000 in total, include Pembroke Castle, Wye Bridge (Chepstow) and St David's Cathedral.

Device gives major extension of lamp life

Bulbsaver is a device for inserting in a light switch to considerably lengthen the life of ordinary tungsten lamps.

Invented by Alan Wright, an energy consultant, it arose from work he was doing on hot metal failure. It controls voltage surges and is stated also to save around 15% energy costs.

A prototype installed in Newcastle-upon-Tyne has been controlling the same lamp since 1979, i.e. for about 85 000 hours.

Miniaturisation of the Bulbsaver has been achieved with the help of a Taiwanese company, which is making the first consignment of units, but Alan Wright intends to set up his own factory in the UK.

His target retail price is about £4 and he plans to approach manufacturers of light switches and other electrical appliances to ask them to incorporate the device at the manufacturing stage.

Controls pay off

Harlow Council is predicting savings in electricity following the installation of an experimental lighting programme at its Terminus Street Car Park. The scheme involves replacing standard luminaires with high frequency lamps, controlled by Chalmor day light switches (DLS).

The fully automatic DLS units, which are housed in strong weatherproof casings, control lighting levels around the interior perimeter of the six storey car park, allowing the greatest use of natural daylight. A built-in timer prevents the units from switching

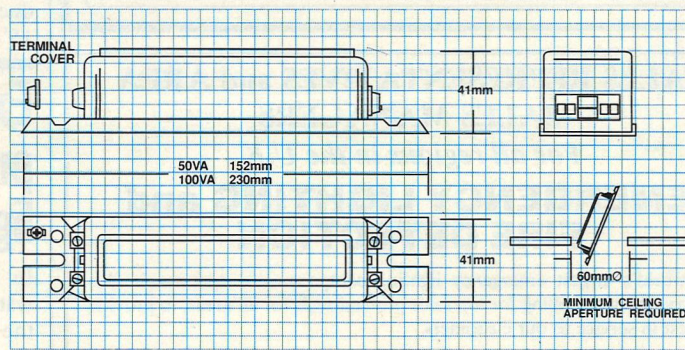
when momentary changes in light levels occur, which can be caused by the light from a car's headlights or passing clouds obstructing the sun.

The introduction of high frequency lamps has led to more luminaires being installed in the car park, providing better lighting levels. A reduction in operating and maintenance costs will help fund the additional lamps.

The new scheme is also generating additional revenue for the council. The well lit stairwells and parking bays are promoting a feeling of personal and vehicle safety, which has led to increased use of the car park.

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IN YOUR NEXT ISSUE

December is a festive month and naturally deserves a celebratory issue, so our theme for the month is theatre lighting. Disco lighting shares the same sense of excitement and drama so we also hope to look at some recent disco and

club installations. Energy saving continues to be a key concept in the industry. This issue will also include the final part of our feature for managers on energy saving in commercial and industrial buildings.