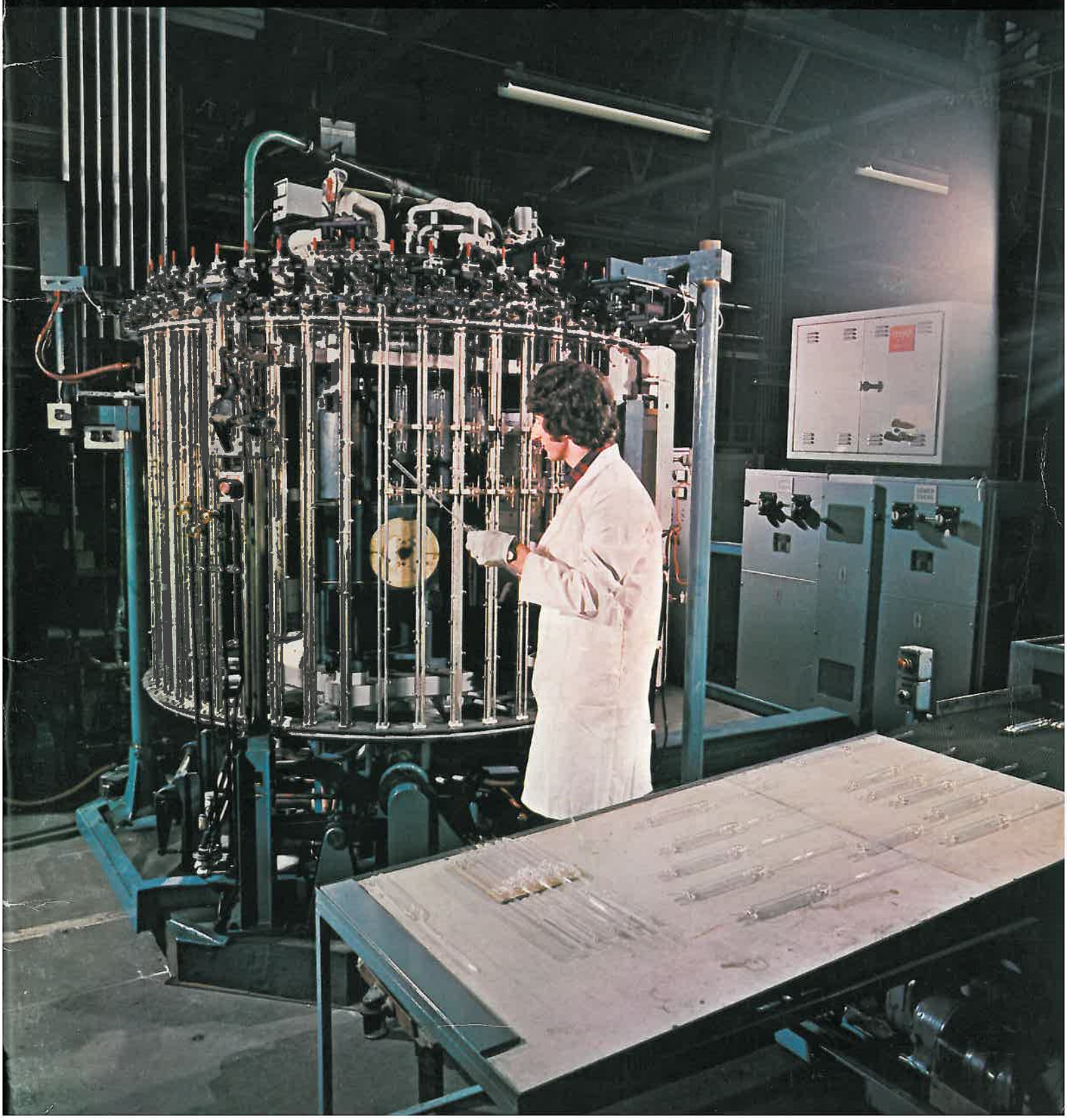
Lighting Journal 14



Above are two Thorn Arena (Programme 1) ceilings installed in the Emeralda Warehouse store at Cardiff and the office of Rank Xerox at Mitcheldean, Glos. A description of the planning techniques involved in Programme 2, the latest stage in integrated ceiling design, appears in this issue.

Our cover picture shows a process in the manufacture of low pressure sodium lamps at Leicester. These lamps have an efficacy of over 150 lm/W.

Lighting Journal 14

Autumn 1975

EDITORIAL—

The world-wide emphasis on conservation of raw materials and the necessity for reduction of installation costs almost everywhere has led to a reassessment of lighting techniques and given fresh impetus to the drive for more efficient lamps and lighting equipment.

In this issue of the Lighting Journal we see that Thorn is by no means behind in this work. Research into new fluorescent phosphors and gas fillings has led to greatly improved lamp efficacies with no loss of colour-rendering properties and new types of tube are appearing which will extend the range of fluorescent lamps. An entirely new approach to the problems of installation and maintenance of luminaires has led to the development of the 'Clipper' range and the recently launched 'Programme 2' integrated ceiling system is beginning to make its mark.

Thorn Lighting is equally active in the international field. An article describes lighting techniques in Australia, where we play a leading part, and another the rehabilitation of the only theatre in Rotterdam that survived the war. Illustrations of installations in Sweden and Spain complement those from the United Kingdom.

None of this would be possible without the backing of extensive research and engineering design. With the completion of the Jules Thorn Lighting Laboratories at Enfield, almost all aspects of lighting research and development will be brought together under one roof. A building specifically designed for such a purpose poses a number of architectural problems which are discussed in this issue. A more detailed account of the operation of the new laboratories is planned for Spring 1976.

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Problems & Solutions

Rogan Gale-Brown

The low profile of the Thorn Phosphor and Fluorescent tube factories in the Cambridge Road, Enfield, has recently been broken by an austere brick building that rises some fifty feet above them. This houses the new Jules Thorn Lighting Laboratories, which provide special, possibly unique, facilities for lighting research and which bring together the new Thorn Lighting Test House, the electrical and electronic engineering departments, fluorescent and tungsten halogen lamp research departments and the phosphor research laboratory. The architects, Messrs. Farmer and Dark have designed the building specifically to perform these functions. In this article, Mr Rogan Gale-Brown, the associate in charge of the project explains how these requirements affected their designs.

Most people think that the external appearance of a building is the main preoccupation of the architect. This has never, in fact, been entirely true, although in the centuries following the Renaissance the appearance of the facade was a prime consideration and sometimes had very little connection with the building behind it. In spite of this, in all good modern building, as well as in the great buildings of the past, the architectural form is always governed by its function.

This is determined not only by the use to which the building will be put but also by the nature of the site, its relationship to other buildings, the restrictions imposed by local planning authorities and the method of construction favoured by the architect. The architect's function is to resolve all these problems and produce a building which not only "works", providing a satisfactory environment for those using it, but expresses its function in its appearance.

The Jules Thorn Research Laboratories lie between two existing parts of the Thorn Lighting factory, with access from a private road on the West side. A long corridor from the Lincoln Road Entrance to the site provides a staff entrance to the North, on the East side are existing laboratories and to the South the Fluorescent Lamp works. The local Planning Authority insisted on extra parking space and provision had also to be made for large vehicles to pass under the building to the eastern parts of the site.

These considerations determined the structural grid of 6 metres which was selected to suit the needs both for uninterrupted spans of this dimension at ground floor level to give room for parking cars, and the need to co-ordinate the building into a 300 mm modular framework to suit the sizes of ceiling tiles and demountable partition positions. The location of the car-park under the building satisfied the Town Planning Requirement for additional parking spaces within the curtilage of the site, while 'van aisles' are provided at the north and south ends of the building to give access for fire engines and large delivery vehicles to the buildings behind the new laboratories, and to provide off-loading bays within the area. These rise through the first floor to second floor level, so that the area of the first floor is less than that of those above it.

The position of the primary core was established by the need for both vertical and horizontal links between the existing laboratories and the new ones, while maintaining a lobbied fire separation between them, and the need to maintain an existing corridor in the building to the North of the New Laboratory. The requirement for a direct link between the Lampworks to the South and the research facilities and the need to transport components of a particular size between these two, determined the size and position of the goods lift and the secondary core of the building.

The low ceiling of the parking area created a problem. The main entrance is located under it in the front of the building and is connected by a

staircase in a tile-clad drum to the Reception Area above. To avoid the risk of producing a squat and insignificant element sandwiched into the reduced height of the parking garage, the drum is carried up from the ground to the full height of the first floor. This expresses the connection between the two, and increases the scale of the main entrance.

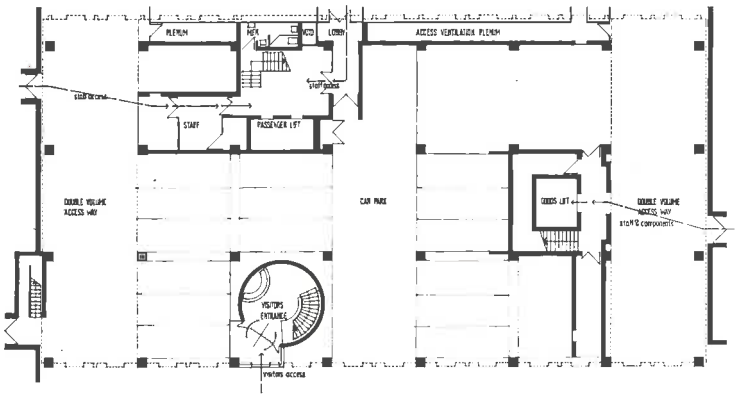
Part of the first floor was planned to accommodate a self-contained prestige Reception Suite with Lecture/ Conference facilities, and an ability to provide refreshments, and is air-conditioned. The remainder of this and the floors above it were designed as flexible laboratory spaces but can also accommodate related offices on a regular grid formed of demountable partitioning and fitted with suspended ceilings where necessary.

The top floor of the building was designed to contain the Life-Test and Machine Rooms, since the considerable amount of hot air generated by these activities could then be extracted directly through the roof. The roof itself is paved to allow for outdoor testing; on it is erected the Plant Room, which is in the form of a large 'shell' designed to provide maximum flexibility for the varying machinery which will occupy it.

The heights of the floors were determined by the activities within them, and vary between 5.2 m on the second floor where mezzanine facilities are required, to 3.4 m on the 3rd and 4th floors where the activities are bench based. Two 9 m high spaces had also to be formed within the building to accommodate optical measuring equipment, and this has been achieved by allowing the enclosures for polar photometers to rise through the ceiling of the second floor to the full height of the third floor.

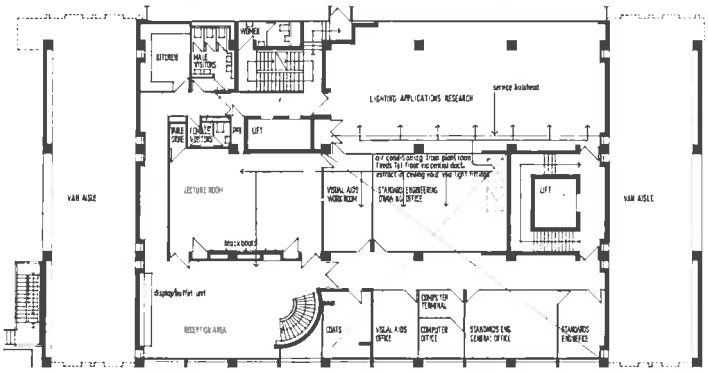
On the second floor two modules of the structures have been specially strengthened to accommodate special facilities for experiments on sound measurements and air movements. An irregularly shaped double-skinned chamber has been constructed on a resiliant rubber foundation to isolate it completely from the main structure of the building so that all externally generated noise and vibration is excluded.

An important design feature was that all partitions should be demountable, in order to give complete flexibility in use, and this had already determined the modular unit size. Consequently the soffits of the coffered structural floor slabs on all floors are designed with their ribs on the partition module, to enable full height partitions to be erected within the lab-spaces. The rib positions are also co-ordinated with the suspended ceilings, and with all structural elements on the external walls. This ensures complete flexibility, in the



Ground floor plan

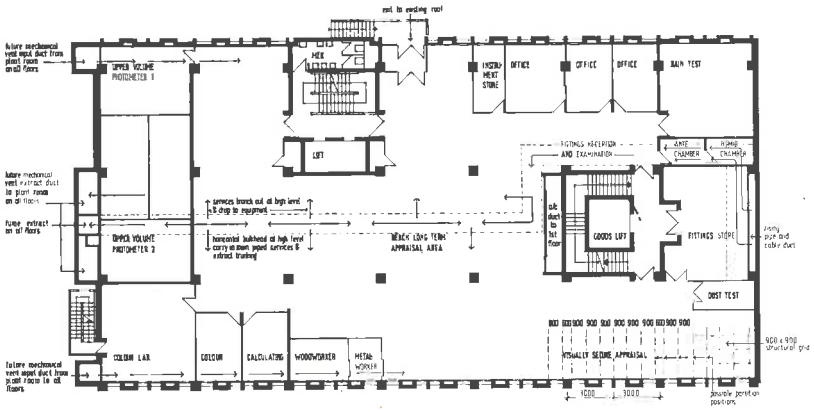
NEW LIGHTING LABORATORY
ENFIELD
Farmer and Dark



First floor plan

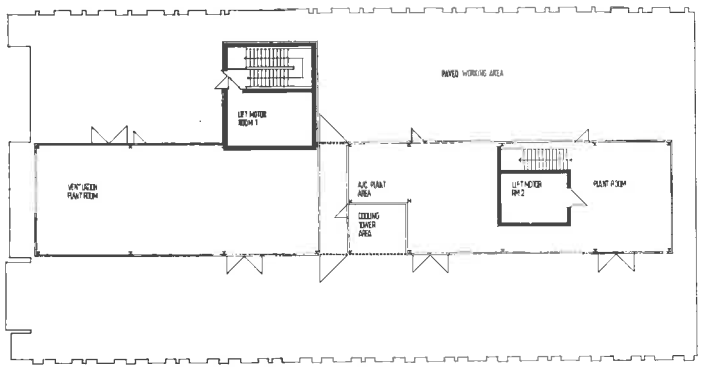
NEW LIGHTING LABORATORY
ENFIELD
Farmer and Dark

The ground-floor and first floor plans of the Laboratories showing the ***'van*** *aisles' to* ***the*** *North and South and the access staircase* ***to*** *the First Floor.*
Below is a typical laboratory floor and the plan of the roof.



Third floor plan

NEW LIGHTING LABORATORY
ENFIELD
Farmer and Dark



Sixth floor plan

NEW LIGHTING LABORATORY
ENFIELD
Farmer and Dark

relationship of partitions to suspended ceilings, the structural soffit and the external wall, essential to the use of the Laboratory. Inserts were designed into the structural soffit on a regular grid to enable the user to suspend services, ceilings, lighting and experimental equipment in any position on each floor.

The system gives an extremely wide range of possible room sizes, but it also raises the problem of the provision of ducting for all the necessary services. It was decided to install vertical ducts at modular centres along the East and West walls: this solution was to have a very marked effect on the appearance of the building.

The external appearance of the majority of buildings is largely governed by their fenestration. In this case, the considerable variation in the heights of the storeys and the need to limit the area of glass, imposed very severe constraints on the design, and it was felt that the windows would have to be given a subordinate place. In addition to this, where experimentation with artificial lighting is taking place, natural light is generally excluded, and this limited the window area in the laboratory areas to 30% of the East and West facades. The North and South walls have been left blank for the future extension of the fluorescent lamp works and photo-flash building. Furthermore it was necessary to shield the windows from direct sunlight to reduce solar gain in the early mornings and late afternoons.

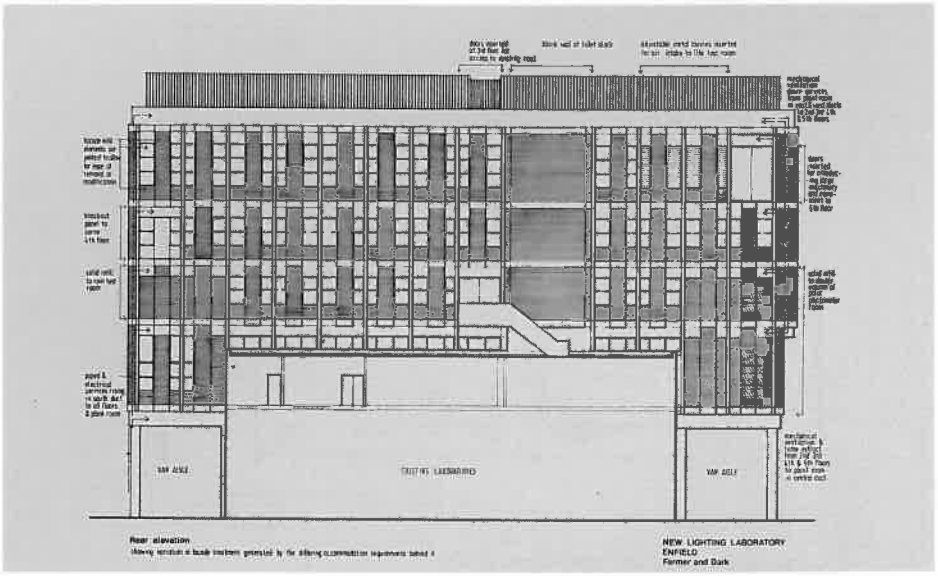
These requirements have been met by placing the structural columns and the vertical service ducts between them, on the external faces of the walls, thus giving a vertical emphasis to the front and rear elevations which minimises the considerable variation in floor to floor heights and reduces the facades to a single scale. It is possible, also to remove or 'brick in' the window or the spandrel infil between the 'wall ducts' if complete darkness is required inside. This has been done where the external walls enclose the lamp test and polar photometer rooms.

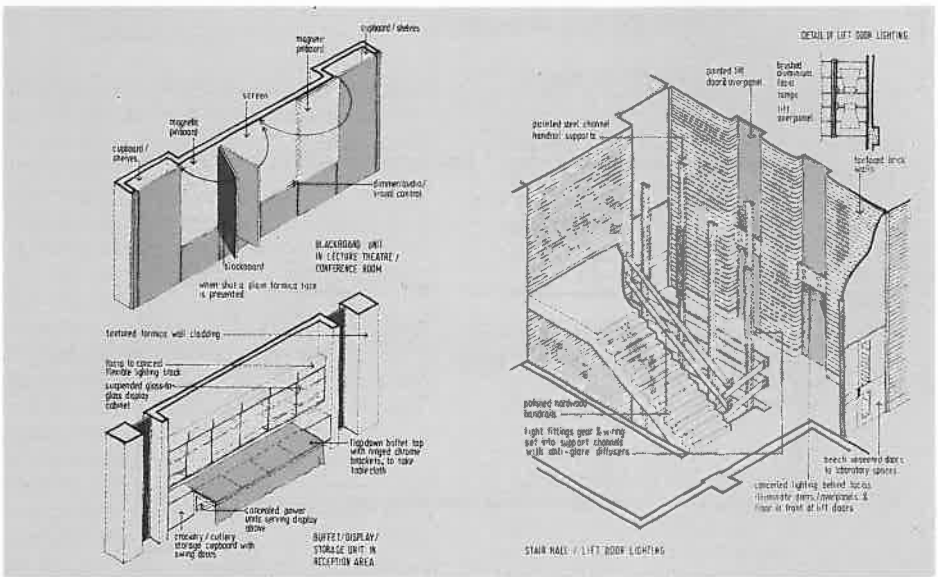
The first floor has received a different treatment, with large windows giving a predominately horizontal effect below the laboratory floors. The 'curtain wall' at the first floor level expresses the special function of that floor, and 'lines through' with the projecting 'curtain walled' first floor of the Lamp Works, uniting the two buildings visually.

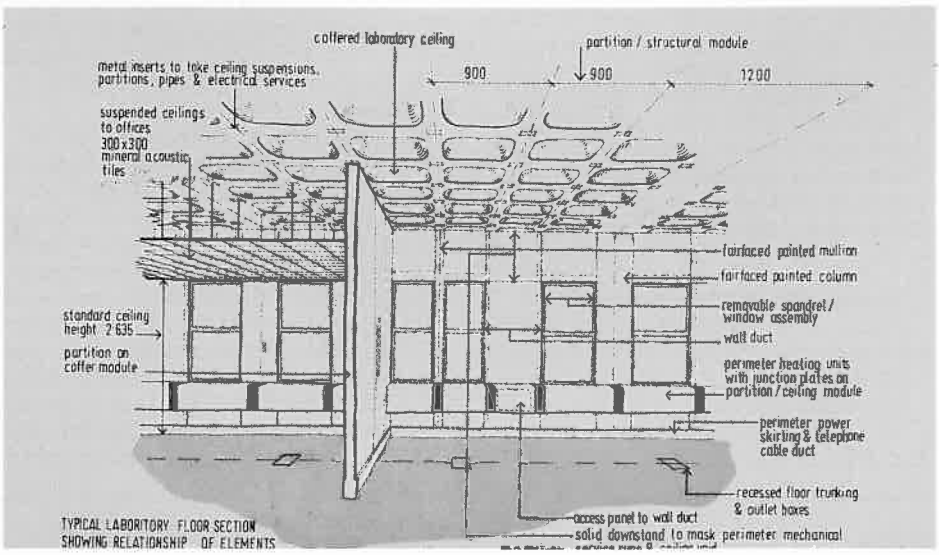
The horizontal concrete 'dropped beams' behind the wall ducts at each floor level express the suspended ceiling voids behind them on the 1st, 3rd, 4th and 5th floors and will screen the future mechanical ventilation ducting when it is installed. The vertical ducts on the North wall will house future extract systems and pipe services running from the Plant Room on the roof to the upper floors of the building. These will be installed as the requirements of the building become more complicated.

No large building is satisfactory if it is not a 'good neighbour' to the surrounding structures both in scale and material. As described above, the lower parts of the West facade are visually linked to the buildings on either side; but on the opposite side of the Cambridge road are large blocks of flats, and it was felt that since the new work was similar in scale it should be in sympathy with them as well as with the factory buildings. This accounts for the choice of brick, both to reduce the scale of the facade elements and to be in sympathy with the many brick buildings on and near the site. The 'Dapple Light' brick selected has been used a great deal in the Enfield area and appears on the buildings opposite.

The architects wish to acknowledge the work of Messrs. Brown and Biddis, the Quantity Surveyors and A.G. Crowe and Partners, the Structural Engineers. The main contractor was Kyle Stewart and the electrical contractor was Agate Electrical Engineering Ltd.







The Alchemy of Fluorescent Tubes

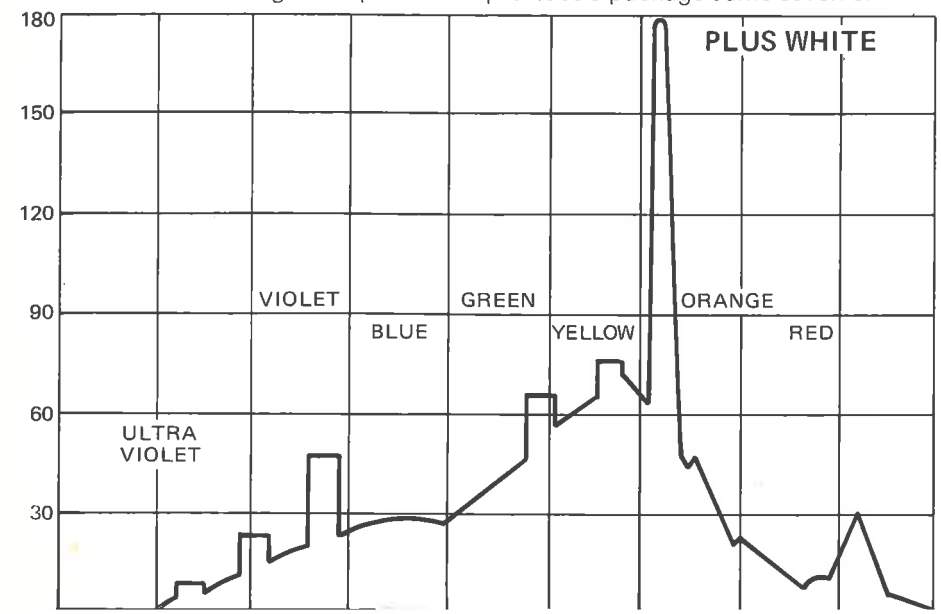
J. W. Bessant

Mr. Bessant is Product Manager for Light Sources at Thorn Lighting Ltd.

The Atomic Absorption Spectrophotometer. This analyses the chemical composition of phosphors.

Introduction — Forty Years On

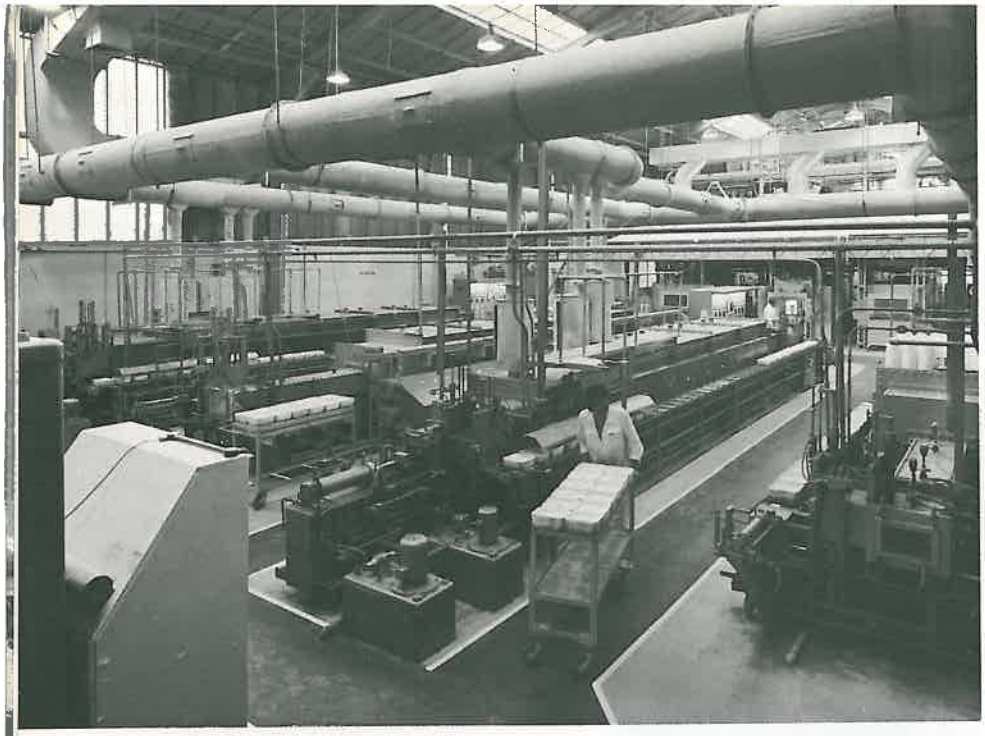
Despite its extensive use for more than 30 years the fluorescent tube remains a mystery to its millions of users — the majority of whom have for long taken for granted these long straight cylinders of light that seem to be available in almost any length, diameter or colour. Few would describe it as a piece of complex electronic equipment, so commonplace has it become, and even those sufficiently informed to realise that there is no simple filament connected between the end-caps, probably know little of the other mysterious ingredients that contribute to the most remarkable growth pattern the world has ever known. It is in fact the outcome of the research and development efforts of a number of teams of scientists ranging over the fields of electronics, chemistry, glass technology and molecular physics, among which those of Thorn Lighting play a leading part. As a result of this and quite apart from continued improvements in colour, life and the range of shapes and sizes, the efficacy of the modern fluorescent tube is now over 70 Lm/W compared to 35 Lm/W when it was first introduced in 1940 and its 'life' has been extended from 2000 to 7500 hours. In short, it now provides a package some seven or eight times better in terms of lumen-hours than the product which first brought the concept of shadow free lighting to the war-time "shadow factories" of Britain.



Liaison at all stages of development

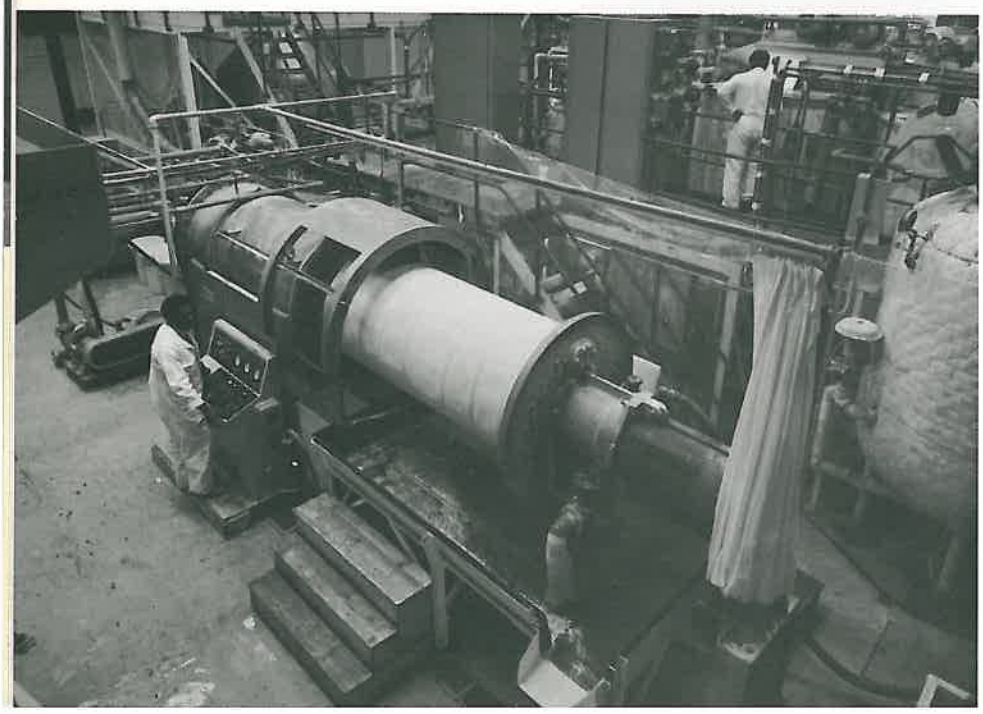
Simultaneous areas of development, each of which is accorded equal importance, are those of phosphor research, electrical circuitry and lamp technology. Thorn Lighting is placed in an unique position to take advantage of developments in any one of these areas since the fluorescent lamp factory is flanked on one side by a modern well-equipped laboratory and on the other by one of the largest chemical factories in Europe devoted exclusively to the manufacture of phosphors.

The great advantage of the close proximity of these fundamental resources can be seen in the day to day liaison between scientists and production experts. Not only is there constant monitoring of current production but the development, manufacture and proving of lamps embracing any new principle or substance is carried on continually. Research in the various fields benefits from the specialisation within each department and the immediate co-operation of other allied departments — in the form of advice or of the confirmation of assumptions made during experimental work. This liaison extends through each of the development stages, from the initial concept to the final introduction of a new product — which can originate from any one of the three fields previously mentioned. Examples of three recent developments which have followed this course are given below — each one of great significance in the constant search for more effective use of energy.

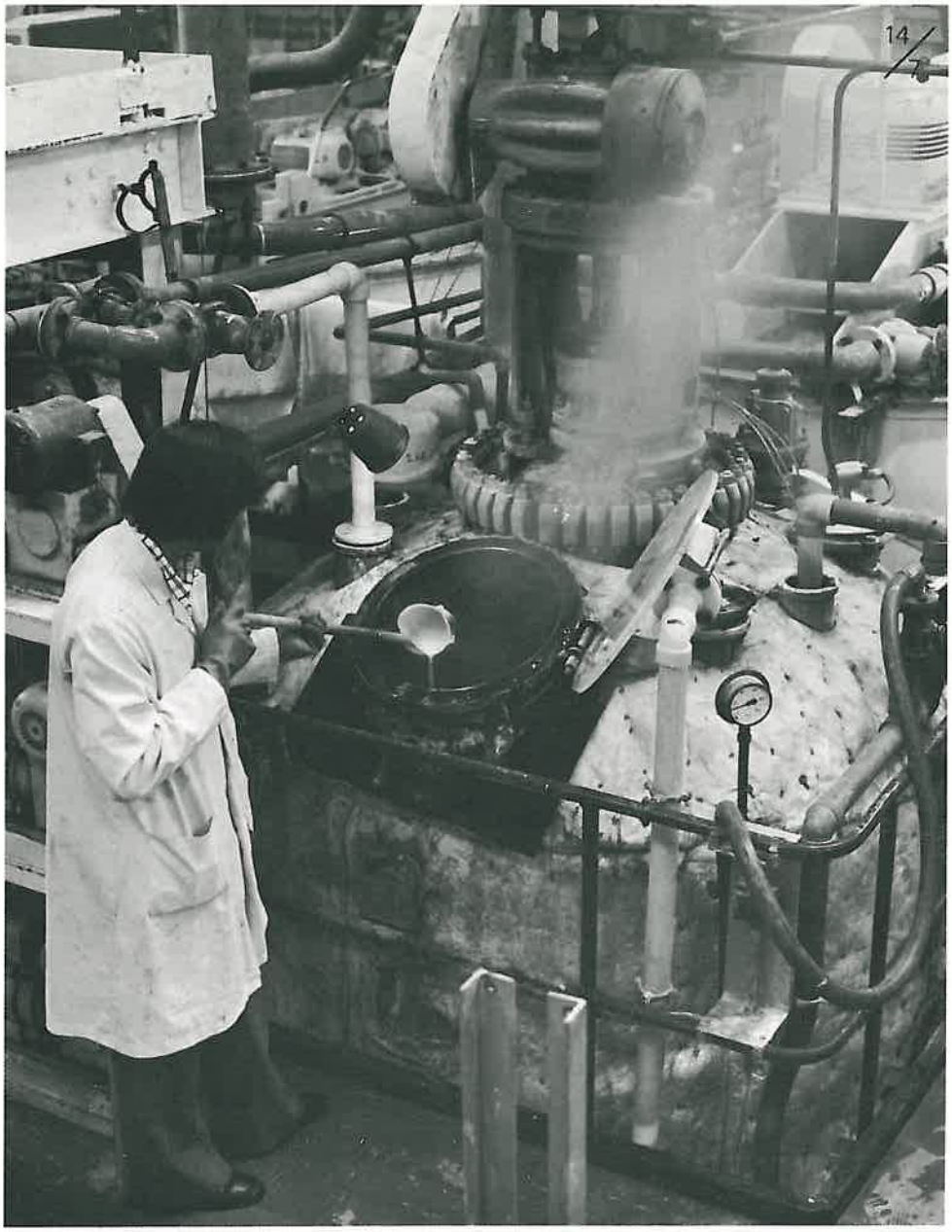


A general view of the Thorn Lighting Phosphor Factory at Enfield. In the foreground can be seen the rows of retorts in which phosphors are baked as part of the initial process of manufacture.

The temperatures of the retorts must be very accurately maintained and recorded. Here one of the supervisors is replacing the roll of paper in the control panel of the retort room.



A sophisticated filter made by V.C. Filters Ltd is used in the final chemical processes. The phosphor is deposited on the outer surface of the rotating drum which is here shown retracted from its casing.



A quality control technician takes a sample from a reactor for test. This testing by the quality control team takes place at every crucial stage of the processing. One of these tests can be seen in the illustration on page 5.

Phosphor Research — The Plus White Tube

The phosphors used in fluorescent tubes, most of which are based on halophosphates, undergo even more critical processes than many products of the pharmaceutical industry — since contaminants of less than one part in a million can produce significant changes in light output and colour appearance.

Research into countless materials, over many years, backed up by some of the most modern techniques such as X-ray crystallography and flame absorption spectroscopy, has led to the production of a range of phosphors for tubes of the colour rendering properties or colour appearance suited to most commercial needs.

For many years — even before the discovery of the halophosphates — it was known that europium-activated alkaline earth silicates could be used to emit light in relatively narrow bands of the visible spectrum. Groups of such phosphors could be used in combination to produce high light-output of considerably better colour than conventional halophosphates. For a long time the high costs of these narrow-band phosphors held back their commercial introduction — until recent research by Thorn produced a combination which could be manufactured at what was considered a more acceptable cost.

The name given to the fluorescent lamp based on these phosphors is Plus-White. It has a high luminous efficacy putting it in the same general category as established high efficacy tubes, but with better colour rendering properties. Its colour appearance is similar to the Thorn "White" tube, in the region of 3500 K, which has proved very popular in temperate latitudes.

The customers' choice had long fallen between high efficacy tubes such as White, Warm-White or Daylight and "deluxe" tubes such as Natural, Northlight or Kolorite, with considerably lower luminous efficacy, but more acceptable colour rendering properties. There were heavy cost penalties in terms of both capital and energy costs, both much in excess of the expenditure on the tube itself, due to the significantly lower efficacy of "de luxe" tubes.

Now for applications where good colour-rendering is considered essential, the user is faced only with the moderate initial increase of the cost of the Plus-White tubes.

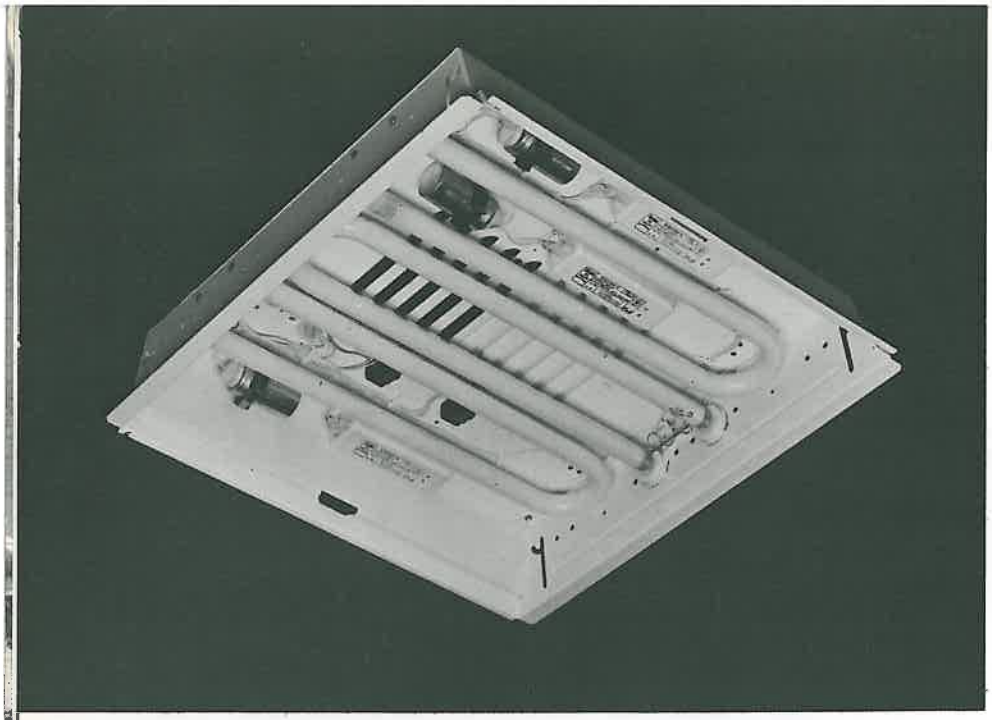
The effect of tube dimensions — the T8 U tube

Generally speaking, and obviously within practical limits, the luminous efficacy of fluorescent tubes increases with length — since the cathode fall (the volts drop at the cathodes) remains approximately constant irrespective of tube length and thus becomes a less significant factor in the longer tube. For this reason neither the 600 mm 20W nor 600 mm 40W tubes have every really been popular for general lighting purposes since the total lumens per circuit watt are considerably lower than for the longer tubes.

Despite this adverse factor, architects and interior designers have long favoured the 600 mm square recessed or surface modular luminaire, primarily because it offers greater freedom of layout and occupies a far lower proportion of available ceiling area than luminaires of 1200 mm or 1500 mm length.

The use of U tubes — where nominal 1200 mm or 1500 mm tubes have been formed into a U shape in order to utilise the greater lamp efficacy of the longer tube, was initiated in the USA and has since become a minor trend in some European countries. Until recently, however, since the shortest of the U tubes available was 570 mm (excluding lamp pins) it was still necessary to increase the overall luminaire length to above 600 mm in order to cater for lampholders and to allow room for lamp removal. In addition, because of the problems of bending 38 mm dia glass tubes into a smooth U, it was customary to use thick lead glass tubing so that the total weight of tubes of this large diameter can be almost four times greater than the straight tubes they have replaced.

Ideally, the U tube should be short enough to fit into a 600 mm ceiling grid, slender enough to be formed without increasing glass weight and electrically compatible with existing circuits for 1200 mm tubes. This is precisely what Thorn has produced and the solution is likely to achieve tremendous popularity because it is based on T8 (25 mm) glass tubing already used extensively in 450 mm, 900 mm and 1500 mm lengths. The new tube weighs only 0.17 kg compared with 0.65 kg for the lead



In the upper picture three 40w U-tubes fit neatly into the lamp housing of a 600 mm x 600 mm 'New Format' luminaire.

Below, the Thorn U-tube (centre) is contrasted with that of another manufacturer which is almost as long as one of the two 20w tubes it replaces.

glass types, and has an overall length of 520 mm so that it can be accommodated easily into any standard luminaire suitable for a 600 mm ceiling grid.

Because of its slender proportions it lends itself to all sorts of applications, e.g. signs and decorative surface fittings as well as for exhibition and shopfitting. With a normal rating of 40W the U tube is capable of operation on standard 40W switch-start or starterless circuits. Undoubtedly, in terms of lumens per area 'flashed' the shape of the new U tube will lead to its almost ubiquitous use.

KRYPTON — a further development story

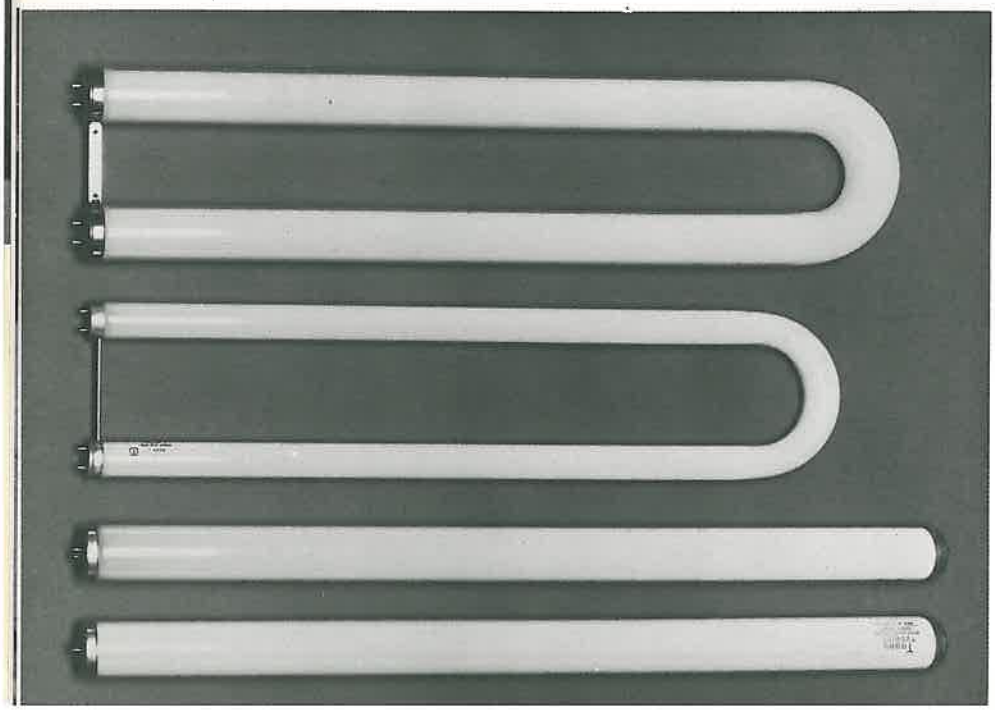
Lamp Engineers, when speaking of fluorescent tubes almost invariably use the expression "a discharge in mercury vapour . . ." although they are well aware that the tube also contains argon, or some other inert gas at low pressure in order to assist starting. Variations in gas pressure have a marked effect on starting characteristics and tube life, hence this is carefully controlled in production, but alternative gas fillings are available and may be employed for specific reasons. A mixture of neon and argon, for example, enables a tube to be operated at a higher voltage thus increasing the total lumen output for a given length of tube. Krypton — the gas which enables a filament lamp to operate at a higher luminous efficacy — can also be used with advantage in a fluorescent tube, where once again, it is responsible for improved performance under certain conditions.

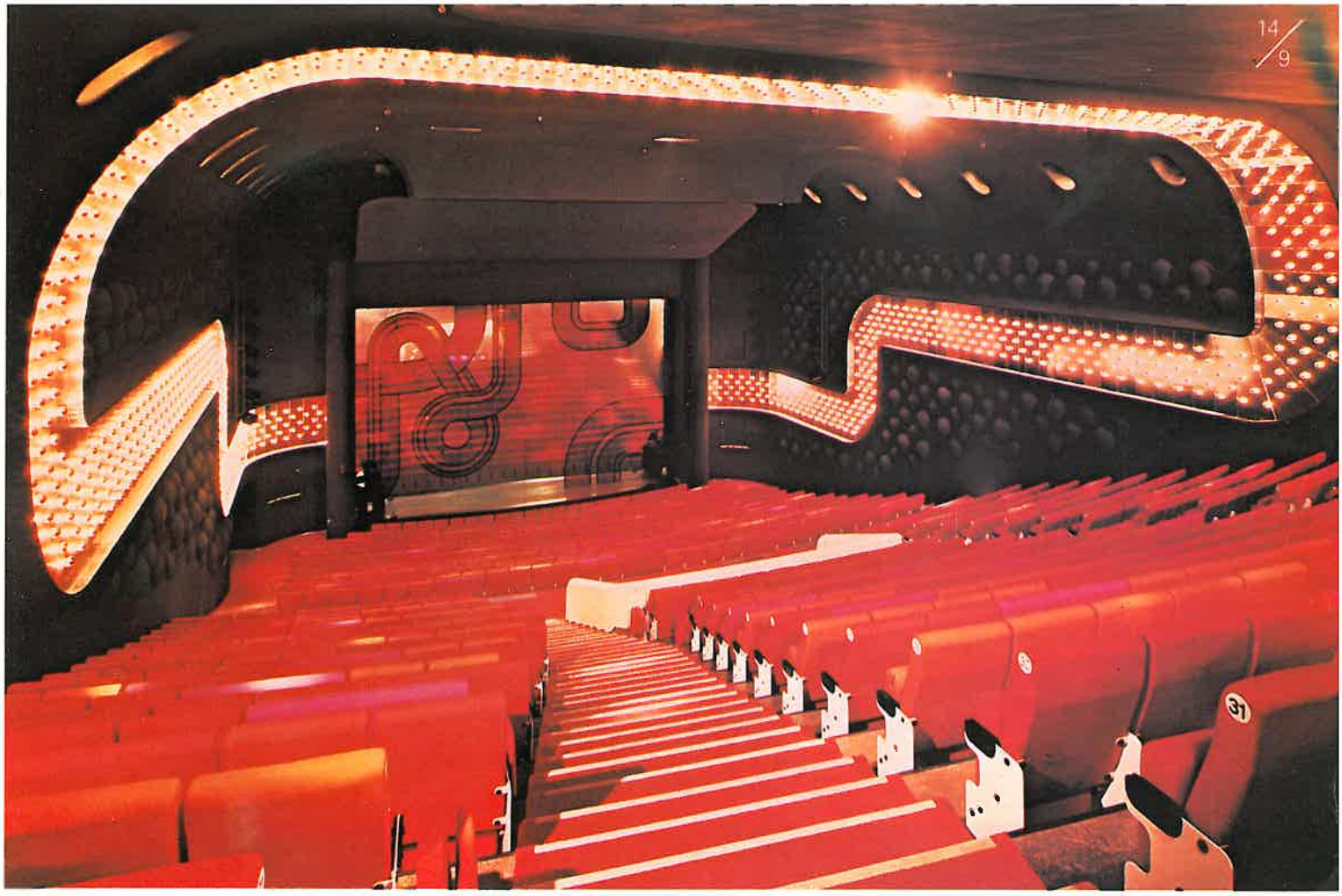
The 125W 2400 mm fluorescent tube, used in large numbers for both commercial and industrial applications, is generally operated on a leading starter-switch circuit, with a choke and capacitor in series. This circuit provides an inexpensive method of starting long tubes on a nominal 240v supply — and has the additional advantage of being a "constant-current" circuit, capable of coping with considerable mains supply variations whilst maintaining the current through the tube at a constant value. If a 2400 mm tube is Krypton filled and operated on a "leading" circuit it has the effect of lowering the tube voltage — ***and the total circuit watts*** — without significantly changing the tube current. Thus it is possible to change the circuit rating, merely by changing the fluorescent tube without any circuit modifications whatever. There is no risk of the permanent damage to control gear associated with some "plug-in" high pressure sodium lamps. On the contrary — not only is the gear performance unaffected but the lamp performance, in terms of lumens per watt, is considerably improved. The extent of the improvement depends on the commercially acceptable ratio of krypton to argon in the final gas filling. Argon is invariably employed for flushing during manufacture; and it would be impracticable to exhaust this fully before the introduction of Krypton. Even with a 90%/10% Krypton-Argon mixture, a gain of 9-10% in luminous efficacy can be obtained.

It is thus possible to reduce lamp loading from a nominal value of 125W to 100W, without a corresponding reduction in lumen output so that on a 240v supply it is possible to obtain a 20% drop in lamp watts, for a reduction of only 9% in light output. This means that for all practical purposes, industrial and commercial users are given the opportunity of reducing lighting load with negligible change of initial illuminance and such a minor change during life that visual performance is unlikely to be affected.

Krypton-filled 8ft lamps are suitable only for leading (starter-switch) circuits but attempts to use the lamp in 85W circuits or on 125W quickstart circuits will merely result in failure to strike, without damage either to lamp or control gear. The great majority of 125W tubes installed during the past 20 years are on 'leading' starter — switch circuits so a considerable proportion of industrial and commercial users will be able to benefit from this development.

Innovations in lamp technology are not confined to any one type of lamp. Thorn has long been in the forefront of fluorescent tube development as well as in such fields as tungsten halogen and the new types of discharge lamp, but it is the user who reaps the greatest benefit from these activities.





An Aged Beauty Restored

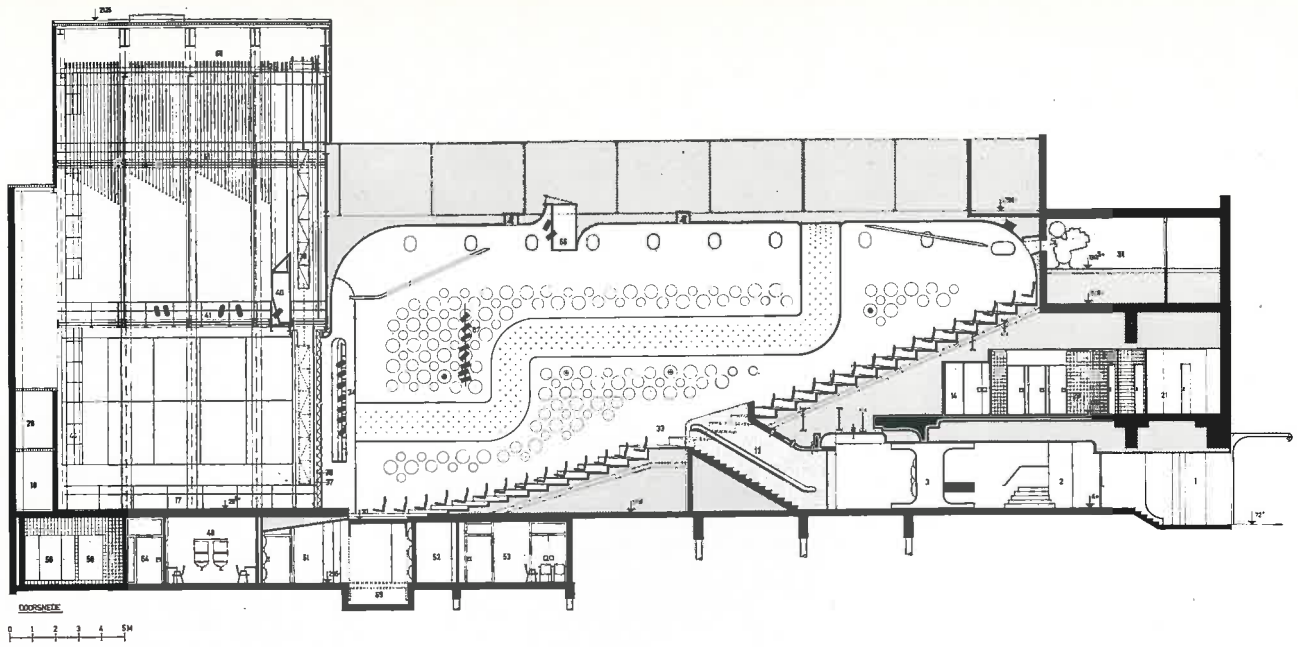
J. J. M. Hoogervorst

Mr Hoogervorst is a Lighting Consultant in Rotterdam and Director of Interdesign B V Egmond.

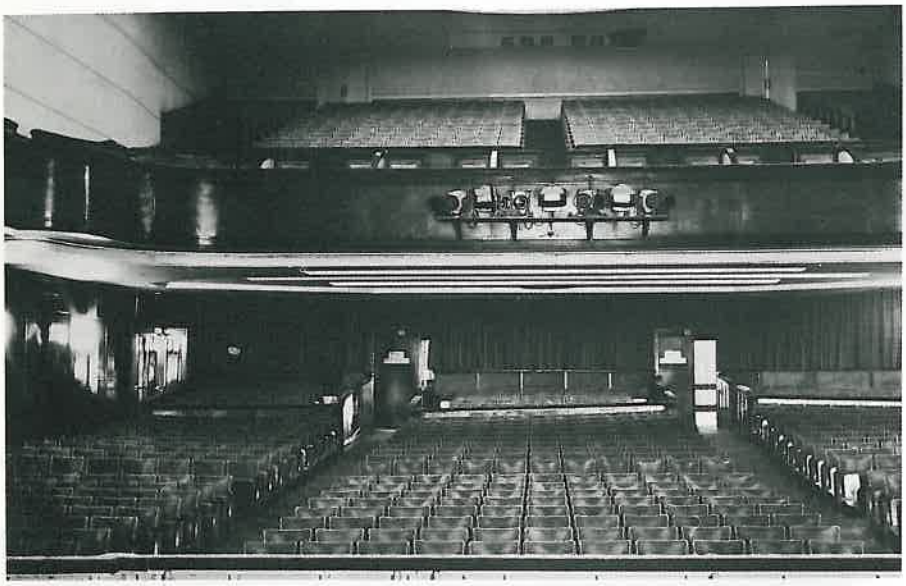
The Luxor theatre was built in 1927 as a cinema with limited stage facilities; under the name 'Luxor Palace' it was one of the typical UFA cinemas. It was the only cinema left in Rotterdam after the 1940 bombing, so in 1946 it was bought by the Municipality of Rotterdam and converted into a theatre. However the stage was too small and had to be rebuilt to produce a larger acting area, resulted in a reduction of the size of the Auditorium by about 200 seats to 1100. Not only was this seen to be a bad solution, but the sight-lines from the Balcony were much worse than before.

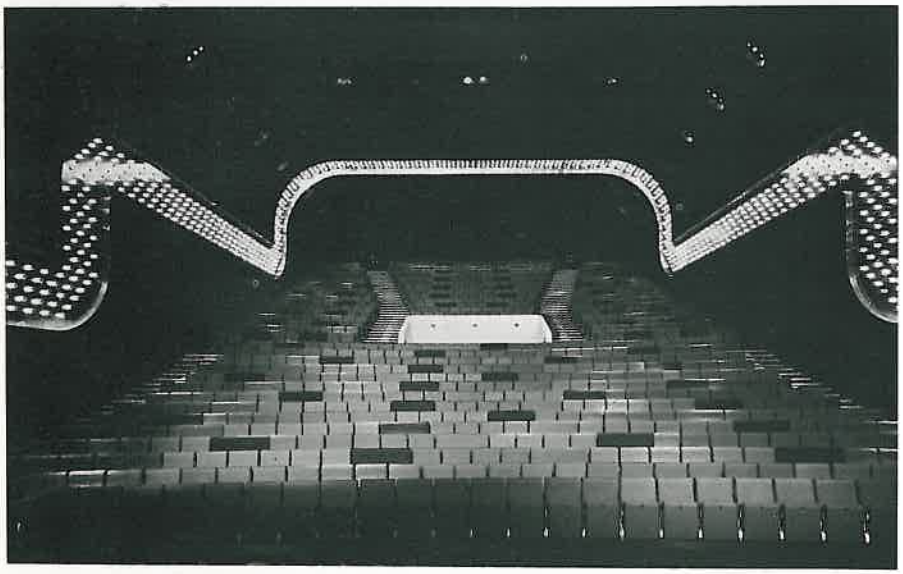
When in 1947 the ''Rotterdam Schouwburg'' was ready, the Luxor theatre had already been fitted up as a cinema and intimate theatre. In the winter it put on Revues, Operettas, variety and one-man shows, in the Summer, films. Its high-point was the great American production of 'Porgy and Bess' in 1956. Since 1960 Rotterdam has seen all the great musicals, and 'My Fair Lady' and 'Oliver' were both staged there in the Dutch language.

Light is concentrated on the posters on the walls of the entrance hall.



Above is a section through the auditorium showing the lighting systems, below it can be seen how it appeared from the stage before restoration and how it looks now. Note the complete disappearance of the gallery, and the increased rake of the seating.





Gradually, however, it became apparent that the theatre was deteriorating. The floor of the auditorium, built on piles, began to sink and also the theatre was no longer up to date. So in 1972 the Luxor was closed for a radical rebuilding. In less than a month the whole interior had been ripped out and only the outer structure which could not be altered remained. Because of the hazards to adjoining buildings, the solid walls and columns were left standing, but inside everything removable was torn out and in 1972 the auditorium hall looked like a landscape from the moon. To ensure a firm foundation for stage and amphitheatre once and for all, some 100 piles of 30 m length were driven in the steak and kidney pie-like substance that the Rotterdammers lovingly call their soil. Unfortunately the shape of the auditorium and stage had to remain as before so an attempt had to be made to produce better room proportions by the applied interior arrangements. This was partially achieved by removing the balcony, so that walking up the steps to the auditorium hall, one finds oneself right in the middle of it on a wide platform, which divides the upper and lower part of the amphitheatre. This has made a considerable visual improvement as it masks the bad proportions of the hall. Placing the seating accommodation on shallow curves instead of straight lines also helped; the rest has been done by special lighting.

Close co-operation with Architect Carel Wirtz from the planning stage, allowed the lighting design to be integrated with the whole architectural conception. To break up the long ceiling, an enormous "caterpillar" of light was constructed, crossing the ceiling and meandering down the walls towards the proscenium. It is about 100 m long and 180 cm wide and around 1000 Crown mirrored 100 mm diameter

The small pictures show how the tungsten filament spotlights are focussed through portholes in the plaster vault and a close-up of the Q-file console at the back of the auditorium.

Decor Lamps were used, mounted against a reflecting background of glossy material (aluminised foil on sheet metal). The problems of fitting the prefabricated units into the reserved recesses and aligning the lampholders at the back with the holes in the sheetmetal were solved thanks to the accuracy of the building people and the generous time of preparation.

Fading is not done in the usual static way, nor by switching, but dynamically from the ceiling centre. A double wedge-like group of 10 lamps lights up at the ceiling centre and ripples, gradually increasing, out- and downwards until the whole "caterpillar' ' is alight. It then fades out in the opposite direction. This device is controlled by 100 interconnected triac dimmers with a choice of three speeds.

The real auditorium lighting comes from 75 tungsten halogen low voltage spotlights (DTLV 50 and 100w) mounted in threes on Trakline 1200 and concealed in deep slits at the curved margin of the ceiling and walls. They are mainly aimed at the sides, the gangways, the platform and elsewhere carefully directed to enhance the random pattern of the 3 hues of red of the seatcovers. A tulipfield-like effect has thus been achieved. Lighting of the 276 steps is done by Minipacks recessed in the risers and protected by metal hoods. These double as emergency lights. Other emergency lights throughout the building are Thorn "Nomad" fittings operating from a 24v D.C. supply.

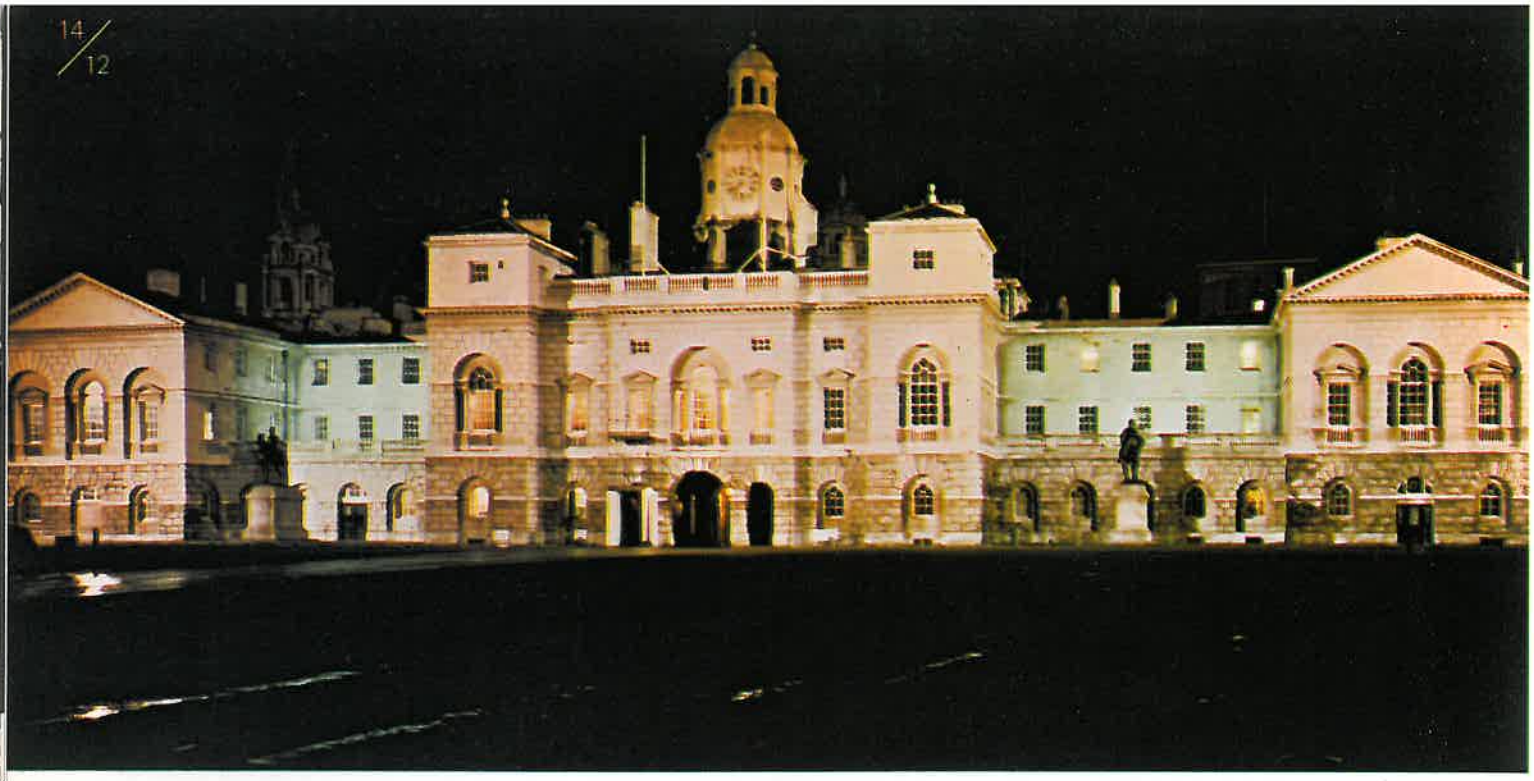
In front of the curtain hangs a huge lightweight panel of aluminized plastic, decorated in a bold design, reflecting in a nicely blurred way colours and movements in the auditorium. This feature greatly enhances the festive atmosphere before "Curtain up". A leading Dutch newspaper commented "This is by far the most beautiful and festive Theatre in Holland".

The building committee realized very early that a good looking theatre demands first class stage equipment and so Interdesign saw an opening to bring Thorn's Theatre Lighting Division into play and Derek Gilbert was appointed as stage lighting consultant. This resulted in Thorn supplying not only all the luminaires and accessories but most important of all — an 80 circuit, 100 intensity memories Thorn Q-Master, one of the very first off the production line. The amazingly simple operating facilities of this marvellous system and its accuracy in recalling instantly the most complex lighting schemes did not fail to have their effect. In Rotterdam alone, 4 more theatres followed suit and there are many others throughout the country.

Well soundproofed, the actors' facilities and canteen are located directly below the stage. The latter is lighted by a number of VHB 100's on Trakline to ensure changeability. An orchestra podium allows four alternatives: one an enlargement of the stage, one to enlarge the room for the orchestra, a divided orchestra-area, or a much enlarged area with capacity for 35 seats. Air conditioned changing-rooms are in the basement, the artists' entrance and circulation area being under the stage and well sound insulated. A modern sound system with two 100W stereo outlets and capacity for tapes, discs and sixteen microphones gives complete coverage for the whole house.

This complete transformation of the old cinema into a first-class modern theatre is very much to the credit of the architects Carel Wirtz of Rotterdam and Van Klooster of Utrecht, and it is not too much to claim that the lighting plays a major part in the success of the operation.

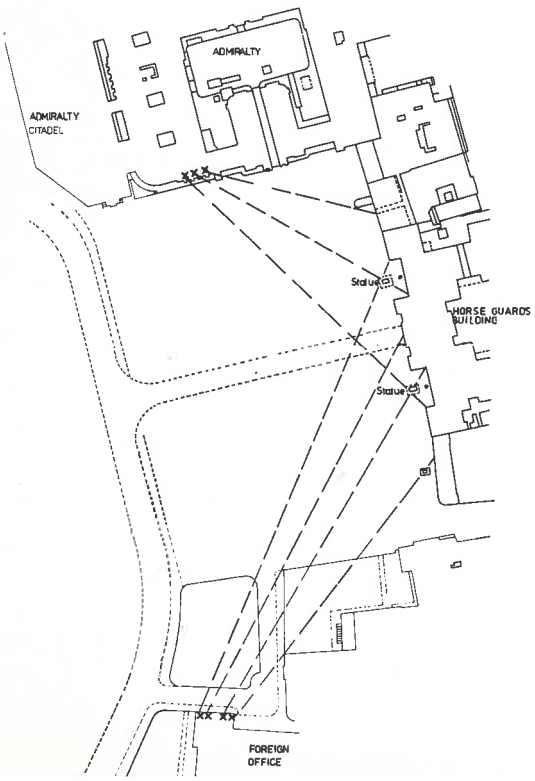
Highlighting the walls in the staff canteen below the stage helps to reduce the claustrophobic effect of a windowless room.



CSI Light Two Major Landmarks

The Horse Guards Parade in Whitehall is a major London tourist attraction. Originally floodlighted by two batteries of five 5kW and five 1kW tungsten filament lamps in concentrating floodlight projectors mounted on the roofs of the Admiralty Building and the Foreign Office, it has now been relighted by the Property Services Agency of the Department of the Environment. Seven Thorn 1kW CSI floodlights are mounted on the roofs of the buildings as shown in the plan below giving maximum 'throws' of about 200 m. The lighting of the recesses in the facade on either side of the archway is augmented by 400W Kolorlux lamps in Area Floods. The total load has been reduced from 30kW to 7.9kW and the illuminance slightly increased.

An equally well-known landmark North of the Border is the Wallace Memorial at Stirling. Here the difficulties of the terrain — there is a precipice on one side of the tower and a wood on the other — were overcome by the use of CSI floodlights. Throws of up to 250 m were needed to light the upper stories of the Tower, the lower part of which is lighted by KolorSON lamps in Area Floods mounted close to the base. The open stone lantern, a typically Scottish feature, is highlighted by a single KolorSON lamp mounted inside it. The installation was designed by Thorn Lighting engineers and installed by Stirling City Council. The total load is just over nine kilowatts.



Programme 2 Gets off the Ground

A. Wilcock and H. John

Mr John an architect employed in the systems planning department Thorn Ceiling Systems Division at Slough.

This article describes the planning of a large integrated ceiling installation, work on which will commence at about the date of publication of this issue of Lighting Journal. It is hoped to illustrate the completed scheme in a subsequent issue.

Pictured above is a prototype Programme 2 ceiling installed at Slough. The deep moulded coffers each support a four-lamp fluorescent fitting. Air handling and lighting trunking, telephone cables and an exit sign are accommodated in the supporting frame.

Below is one of the prototype rooms described in this article.

Programme 2

Programme 2, the second integrated ceiling system marketed by Thorn Lighting Ltd, was launched in 1975. Its design and introduction was prompted by the success of the first system then called Arena and now designated Programme 1, reinforced by a market survey which showed the need for a more sophisticated modular ceiling system. Programme 1 (Arena) was described in *Lighting Journal* No. 8 and in issue No. 12 its application to three different installations was described in detail.

Programme 2, like its predecessor, imposes a simple installation procedure on the various trades involved in a scheme, but it does not limit the orientation of lighting equipment. It is based on two modules, of 1200 mm and 1500 mm square which can be made to conform with both 300 mm and 500 mm building modules. The basic framework, an extruded aluminium twin tee grid, supports all components including ceiling panels. In the slot between the tees can be installed air diffusers, lighting trunking, telephone and inter-com equipment.

A variety of ceiling treatments is available from conventional flat acoustic tiles to specially designed deeply moulded and linear coffers which support lighting and air-extract equipment. The lighting equipment consists of standard recessed Thorn Lighting luminaires, housing fluorescent or discharge lamps and a linear fluorescent luminaire specially designed for Programme 2. All these are fed from above by a separate wiring system and are suitable for air handling if required. Programme 2 is the most comprehensive and sophisticated ceiling system on the market today.

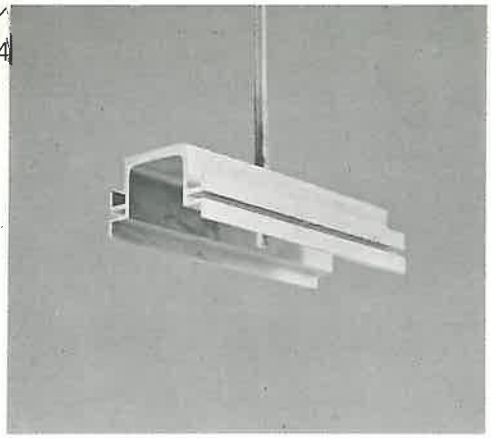
Some Design Considerations

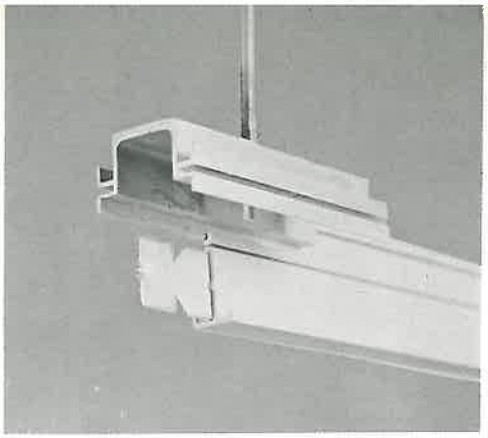
The design of the building has often been decided upon long before the suspended ceilings are considered and in such cases as well as in existing buildings the designer is faced with making the system fit into an existing framework. The choice of two ceiling modules together with the variety of ceiling treatments allows great flexibility in planning. Detailed drawings must be prepared and the way in which the system may affect other parts of the installation studied and modifications made as required before orders are placed on the manufacturer. The operatives of the various trades concerned must always be carefully briefed by the architect so that all may follow a preconceived plan.

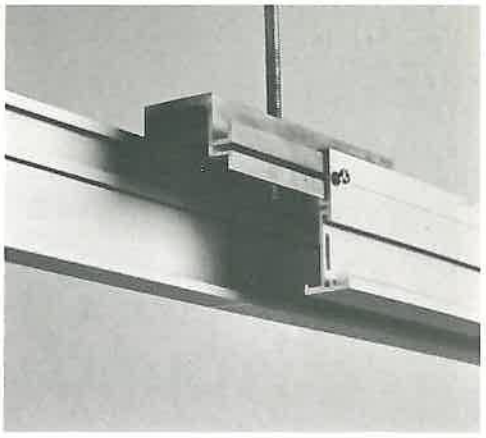
The sort of problems that occur and the way in which they are tackled vary very considerably, but some idea of their nature can be gained from the study of the planning stage of an actual installation and such a study is the purpose of this article.

The Scottish Amicable Project

When Thorn Lighting were invited by King Main and Ellison, the architects of the Scottish Amicable project, to submit proposals for integrated suspended ceilings in the office areas of their new buildings, the design of the building had already been completed, including the lighting and air diffuser layouts.







Three stages in the erection of the basic grid.
i. The hanger is suspended from the structural slab.
ii. One side of the suspension channel is slid into place.
iii. The other side is added, and secured by the bolt at the top, and the first member of the next section of the grid slid into place.

The new building is in the business centre of Glasgow bounded on the south side by St. Vincent Street and on the west by Wellington Street. The east perimeter of the site adjoins existing properties while the north side is bordered by a narrow lane. The building covers the whole site, posing some problems of on-site storage and access.

It was clear that the 1500 mm square module of Programme 2 was ideally suited both to the architects' planning module and the partitioning requirements. From the range of flat ceiling treatments available the architect chose the one-piece felt asbestos base moulded panel which gave the appearance he desired. However he specified use of the deep moulded coffer in one of the special areas of the building — the exhibition area — to provide a contrasting treatment and, to add interest, asked Thorn Lighting to supply the aluminium support grid in a polished anodised finish rather than the standard satin treatment.

In the 8-storey building Programme 2 is to be installed on part of the ground and first floors and the whole of the 2nd, 3rd, 4th and 5th floors. The basement is a car park, the 6th floor is Directors' Suites and Boardrooms, where decorative ceilings are to be used. Programme 2 extends over the whole of each floor, except for the S.E. corner of the ground and 1st floors which form a 2-storey Exhibition Hall. The 5th floor is identical to the 2nd-4th, except that the S.E. corner of the building is cut back to line up with the mansard roof of adjacent property.

The client's brief called for a flat ceiling throughout the offices with facilities to incorporate partitions either in the 4.5 m deep perimeter zone or in internal areas. Future changes in the clients organisational structure might require different office layouts, so the partitions were required to be fully demountable, but the appearance of the ceiling was not to be disturbed.

Lighting Requirements

The engineering consultants J. Roger Preston & Partners called for 800 lux from fluorescent lamps. Recognising the need for partitioning, they envisaged a luminaire in every 1500 mm module of ceiling, a requirement being met by the use of the Thorn New Format Troffer, housing two fluorescent U tubes of the type described elsewhere in this issue. This unit, like its 2ft 20W lamp counterpart has been specifically included in the Programme 2 system. All luminaires were required to be airhandling, so the lighting controller is supported in a slotted frame allowing air to pass into the body of the troffer and thence into the negative pressure plenum above.

Air Handling Details

The air diffusion layout was also affected by partitioning requirements. The consultants called for a two- or three-slot continuous linear diffuser running along the perimeter of the building. This would supply air to the perimeter zone whatever office layout was adopted. Internally, small plug-in diffusers were required to cover an area of 3.0 metres square areas, seen to be the smallest possible size of partitioned office. A mixture of 800 mm and 1000 mm long standard Programme 2 modular diffusers met the demands of the internal zone but the perimeter unit had to be a "special". Modifying a standard one-inch multiple slot linear diffuser makes it compatible with Programme 2 and the diffuser not only supplies air but also acts as the perimeter grid of the system.

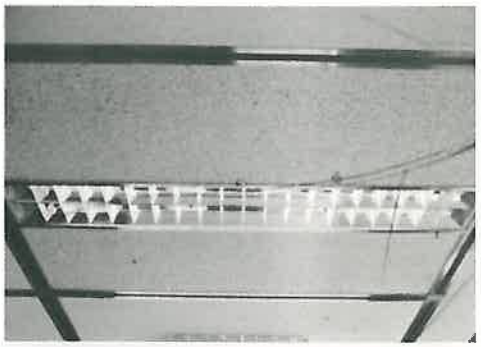
The air-conditioning system is designed to supply variable volumes of air, control boxes being mounted in the void above the suspended ceiling.

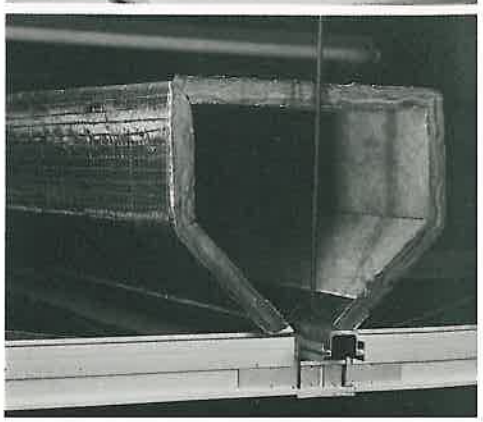
Approvals and Briefing

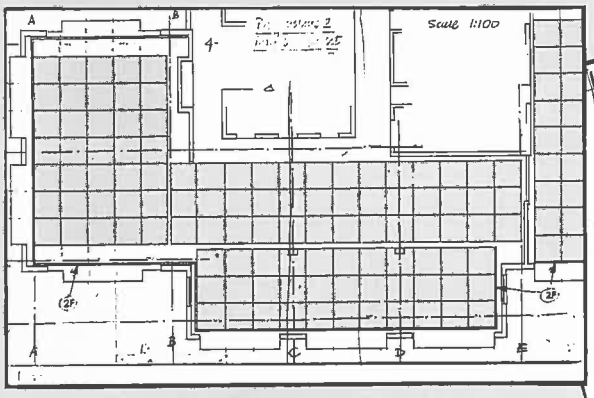
The first contacts took place some 20 months ago when Programme 2 was in its final design stages. Discussions took place between the Architect and Thorn Lighting, and the architects inspected a typical installation at Slough.

The basic principles of the installation having been approved by architect and consultant, Thorn Lighting was asked to prepare outline design drawings exploring ways in which the system would be incorporated into the building. These 1:50 plan drawings and sketch details were completed in the late summer of 1974 and submitted to the architect and consultant, who then selected and briefed the contractors who were to erect the grid and ceiling panels, the air

Some of the alternative lighting and ventilating options in a Programme 2 ceiling. Top and centre show a low-brightness fluorescent luminaire mounted in a flat and a coffered ceiling and at the bottom is a continuous fibreglass duct which can be used to replace a linear air diffuser where a more diffuse air-flow is required.







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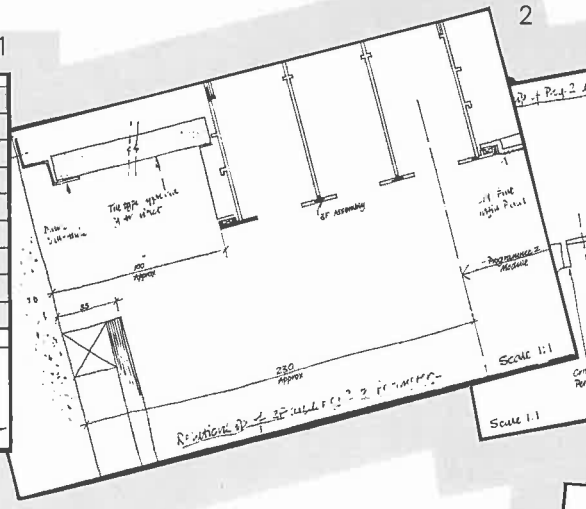

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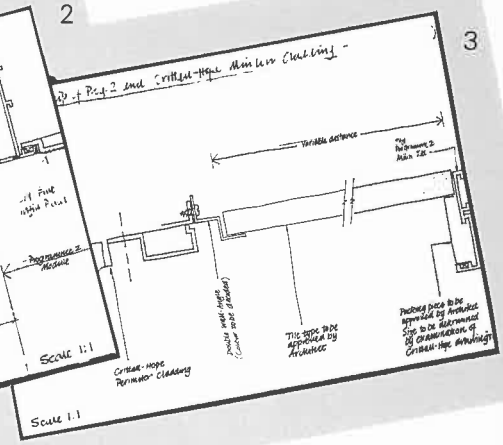

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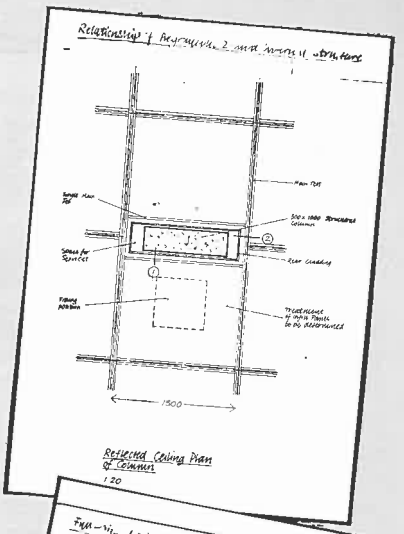

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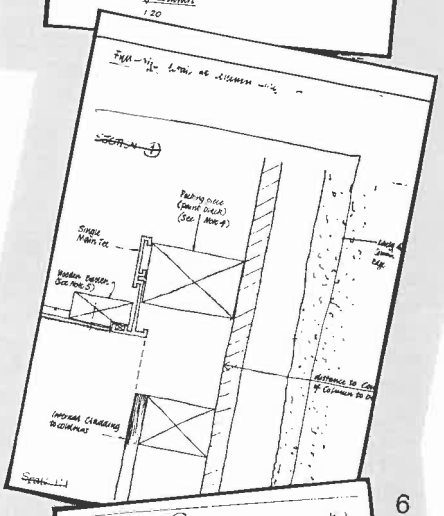

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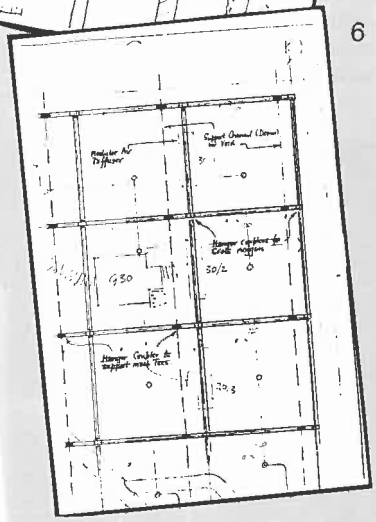

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diffusers and luminaires. Briefing was quite detailed and included information not only on the layout and detailing of the ceilings but also on the installation procedure. The successful tenderer, Exactaceil Limited, erected a second mock-up, more extensive than the first, incorporating a section of the curtain walling, perimeter ceiling and four modules of Programme 2 and this was completed in January 1975. Concurrently with these operations further 1:20 plan drawings of all the areas into which Programme 2 would be installed were prepared, and were completed by the end of February.

Some Design Details

The care taken by the architect to match the Programme 2 ceiling system into the building can be seen in the number of detail drawings produced. Some of the problems which had to be solved were peculiar to the building. For example a design constraint on the Programme 2 areas was that the window mullions should align with the Programme 2 centre-lines, but when the window mullions did not occur at multiples of 1500 mm, but at say 1625 mm the Programme 2 "moved out of step" and produced an inconsistency. This was overcome by making "islands" of Programme 2 as shown on Fig. 1 with gaps of about 125 mm between them.

A further requirement of the architect was that because of the climate of Glasgow and the S.W. orientation of the building Flowline should occur at the edge of the Programme 2 "islands" adjacent to window walls (See Figure 1). Details of the Flowline were prepared showing the standard flat infill panel resting on the three-slot Flowline in the same way as a Standard Main Tee (Figure 2). This drawing also shows the relationship of the Flowline to the perimeter.

A similar detail showing the relationship of the Programme 2 to the Crittall-Hope windows is shown on Figure 3. The "variable distance" shown might span a window bay or be a simple narrow strip of infill up to a flat area of glazing.

Figure 4 shows how the Programme 2 ceiling is related to structural features (in this case a column). It will be seen from the section (Figure 5) that on the long edge of the column the infill panels are machine cut and the straight edge is supported on a single Main Tee by means of a wooden batten. On the short edge of the columns the Main Tees run straight through.

A further complication in fixing the Programme 2 is caused by the primary fixing positions. For structural reasons the engineers cast in the uni-struts forming the primary supporting grid at 800 x 800 mm centres, allowing every other row to support the suspended ceiling. This gives a 1600 x 1600 mm module with the result that the channels gradually move out of step with the 1500 module. This complication was overcome by running the main tees at 90° to the Support Channel substituting a 3 m main tee for the standard 1.5 m length and including additional Hanger Couplers to take the threaded rod as shown in Figure 6.

On the ground floor the Support Channels run in the other direction (East-West) so that the threaded rod "drops" will not interfer with the positioning of the Modular Air Diffusers in the Programme 2 grid.

Final Arrangements

All this preparatory work having been finished, the architect called his first full sub-contractors meeting at Slough, instead of on site. Following the meeting, a number of final alterations were made to the drawings to incorporate the latest modifications made by the architect, and by the structural and engineering consultants.

Most of the material is now on order, the first deliveries being due in September, but a really satisfactory integration of lighting, ceiling design and air-conditioning involves more than the provision of the materials. It requires and indeed depends upon close co-operation between architect, consultant and manufacturer and the various trades employed in its construction.

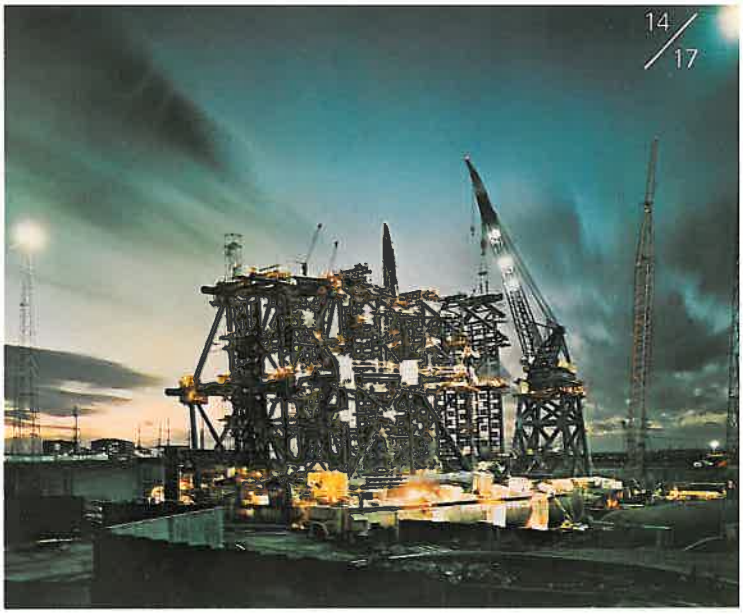
Although at first glance the lighting installation shown in the two upper pictures on this page look very much alike, in fact their resemblance is accidental and the result of quite different lighting and environmental requirements. In the two lower pictures, on the other hand, a similar technique has been used to produce very much the same effect.

The top left-hand picture shows an office floor of the new Halifax Assurance Building in Halifax, Yorkshire. Here an illuminance of 100 lux was required in the large open-plan offices, and air handling facilities were also specified. An important requirement was that the colour of carpets should not be reflected on the ceiling, so that white light had to be cast on it from the luminaires. Consequently the lighting equipment had to be mounted below ceiling level instead of recessed into it, and this raised air-handling problems. The architects' solution was to provide a luminous grid consisting of special louvred air-handling luminaires suspended over the whole area, clean air being injected through the cylindrical air diffusers which can be seen in the centres of some of the squares.

Some Interesting Comparisons

In the school outside Gotheburg, illustrated beside it, the large classrooms are divided for group work and the suspended squares of louvred fluorescent luminaires are used to express these divisions. As at the Halifax, air diffusers are positioned in the centres of the squares, but the luminaires themselves are not used for air-handling.

The use of indirect lighting from 'Sunfloods' to supplement decorative filament lighting is very common in Scandinavia; as can be seen in this assembly hall at the police school at Stockholm, where they are mounted on the beams to light the wooden roof. A similar technique was used in the upper floor of Smalleys, a chemists at Ipswich, to emphasise the heavily beamed ceiling.



Floodlighting Costs and Comparisons

(MAKING THE WATTS WORK)

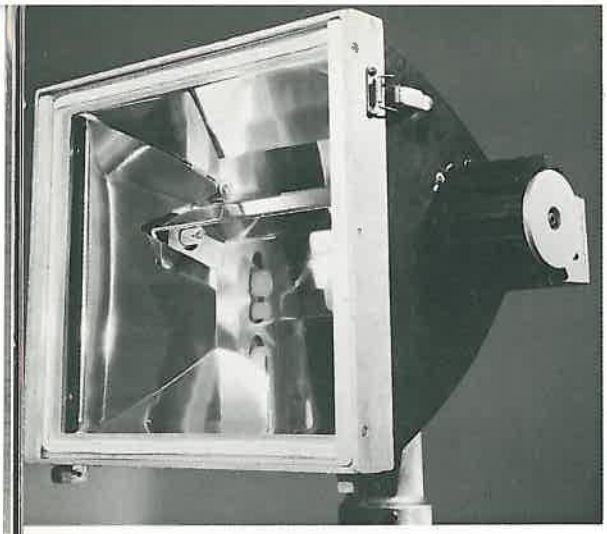
R C Aldworth

Mr Aldworth is a senior lighting engineer in Thorn Lighting Ltd and an acknowledged authority on exterior lighting.

SON lamps in M25 symmetrical floodlight projectors were mounted on high towers to light the marshalling yards at Crewe. At the BP oil rig at Greythorpe 1600 MBI lamps were used. Both there and at the North Sea Gas terminal at Partington, the use of high towers not only reduced the number of lighting points required but limited the area of shadow cast by the complex plant found on these sites.

Attempts to establish the proportion of total energy consumed by lighting all indicate that throughout the world it is very small indeed. This fact is apparently recognised in British Government circles as the current energy restrictions are applied only to daytime advertising and display. It would be wrong however to conclude from this that lighting watts can be squandered with an easy conscience; the ever increasing cost of energy alone provides sufficient incentive to exercise economy. Nevertheless to achieve savings by not using light, presupposes that there are no benefits to be achieved with good lighting and this is not the case. The importance of achieving effective lighting with the efficient use of energy applies equally to interiors and exteriors but as there is a tendency to link floodlighting with luxury and wanton extravagance it is worthwhile to look more closely on what outdoor lighting can achieve as well as considering it in terms of cost saving.

Wherever work is done out of doors, on building and civil engineering sites, docks and in industry, the working day is lengthened giving improved productivity and reducing accidents. The cost of mishaps due to poor seeing conditions apart from loss of man hours, can involve damage to plant and premises, compensation, sickness benefits and medical charges. The incidence of theft and vandalism is also reduced by good lighting with resultant savings. In commercial areas, too, many of these benefits apply with the added bonus of increased trade by the advertising function. Well lighted premises attract the attention of potential customers and this can be linked with the sense of well-being they enjoy by being able to move with confidence in a well lighted area, while the advantages of purely decorative lighting of civic and historic buildings, public precincts and parks, are no less significant.



The Thorn ON1600 Floodlight

There is little scope for considering reduced standards of illuminance for exterior lighting for reasons of economy as, generally speaking, the currently acceptable levels are little more than adequate. Light source efficiency ought to be the first, but unfortunately is often the only factor considered in floodlighting design. The developments in discharge lighting with metal halide and high pressure sodium lamps which have taken place in the last few years are obviously of major importance, but these advances are often negated either by using new lamps in inefficient luminaires or more commonly, using floodlights with the wrong beam pattern. Both of these result in low utilisation of the lamp lumens, and such installations are also characterised by excessive glare which further reduces the effectiveness of the lighting.

Maximum lamp efficiency is not necessarily the major consideration; careful selection of lamps with the characteristics to give accurate light control when used in the correct floodlights is fundamental to achieving the lowest overall costs linked with high system efficiency.

For example the low pressure sodium has the highest lumen efficacy of any lamp but this relatively large light source does not lend itself to providing narrow beam distribution and is therefore of little use for lighting large areas with long throw projectors. The monochromatic yellow light from this lamp also rules it out for applications where colour discrimination is required. A more acceptable colour rendering is given by the high pressure sodium lamp which operates at efficacies in excess of 100 l/w but the relatively long and slim arc tube is more effectively used in trough reflectors, giving fan shaped light distributions, than in symmetrical projector floodlights.

A clear example of the advantage of selecting a lamp and floodlight combination to suit the requirements of a specific project can be seen in the use of the recently introduced 400 watt linear high pressure sodium (SON/TD) lamp. This can operate in the same floodlight as the 1500 watt Tungsten Halogen lamp, giving 25% more light for one third of the electrical load with three times the lamp life, (Lighting Journal No 13 page 26). But the SON/TD can also be operated in the ON 1600 floodlight and due to the more controlled beam and higher efficiency of this unit some area lighting loads can be reduced by about 20% compared with the same lamp in the Tungsten Halogen Haline floodlight. The higher cost of the ON 1600 unit can thus be covered by savings in electricity costs in little more than 2000 hours operation (see figure 1.)

This can be carried a stage further when it is considered that the ON 1600 unit was originally designed to house the linear 1600 watt MBIL metal halide lamp. In some cases, as for example when lighting large areas from high towers, even though the high pressure sodium lamp is some 30% more efficient than the MBIL lamp in terms of lumens per watt, the latter can give total annual costs which are 70% of the costs using 400W SON/TD equipment, because fewer fittings are required (see figure 2.)

In both examples shown below 400w SON.TD lamps are used but in different types of floodlight. To achieve the same illuminance, scheme 'b' would require 24% less floodlights than scheme 'a'. The improved uniformity of scheme 'b' can be seen in diagram 'c'.

Figure 1

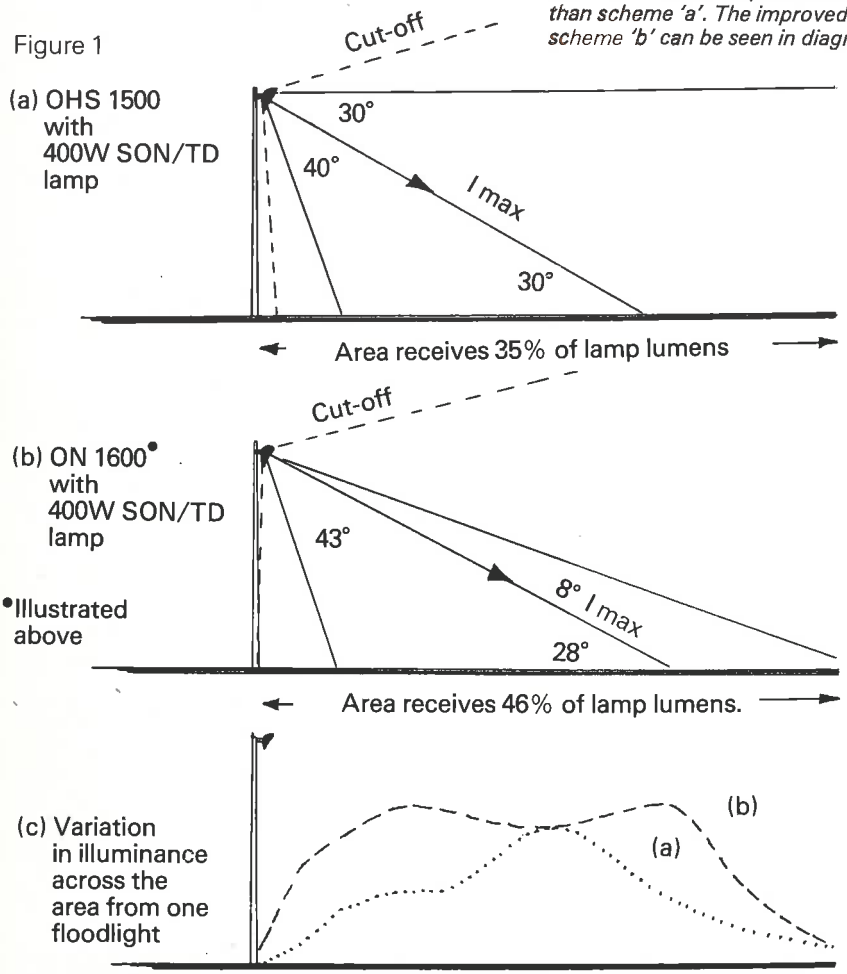
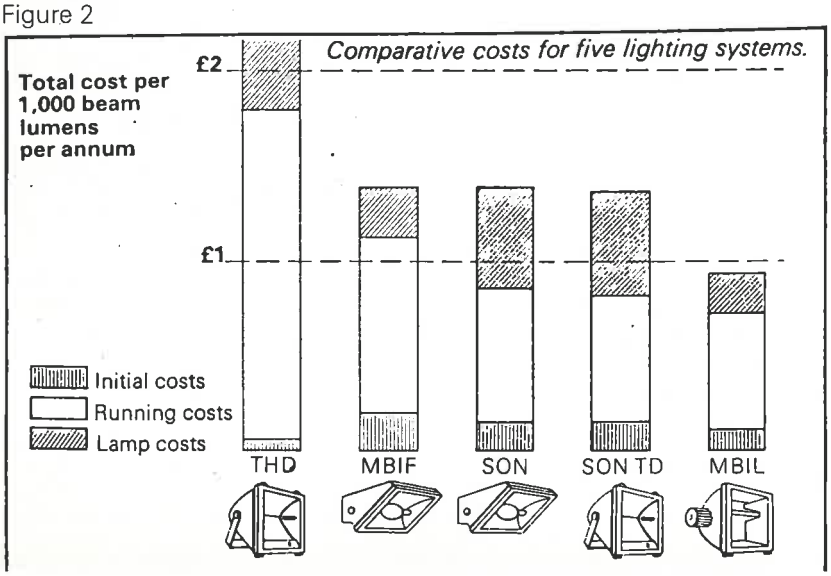
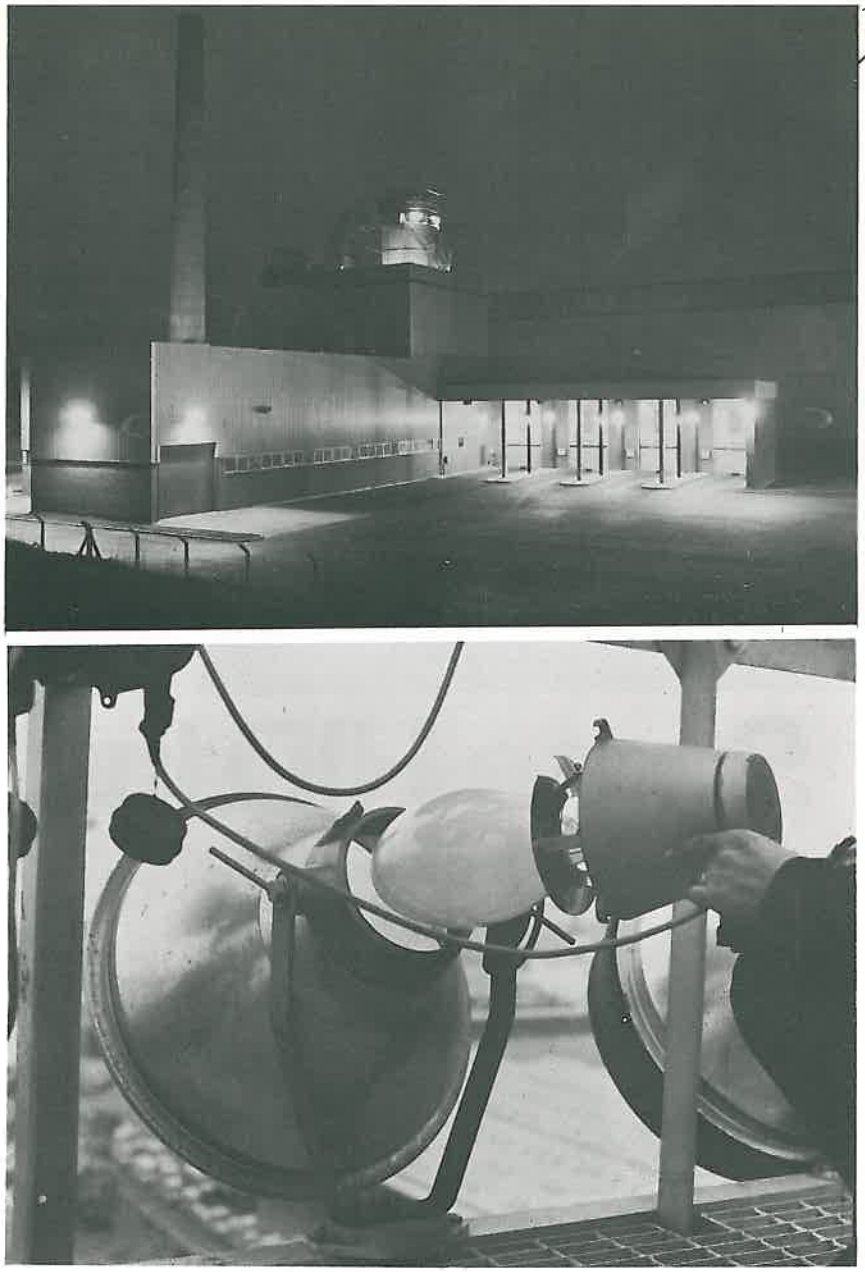


Figure 2



Where a large area, such as a loading bay, must be flooded with light, discharge lamps in area floods provide an economical solution.

The care with which reflectors can be cleaned and lamps replaced is an important design factor. Floodlights may be serviced from a catwalk as shown or lowered to ground level.



Metal halide lamps are available in a wide range of arc tube constructions ranging from linear lamps to very compact high brightness sources all having colour rendering properties superior to any of the sodium lamps with only slightly lower efficacies. Different types of lamp and floodlight combinations can result in significantly different system efficiences even though the lamp efficacies are similar.

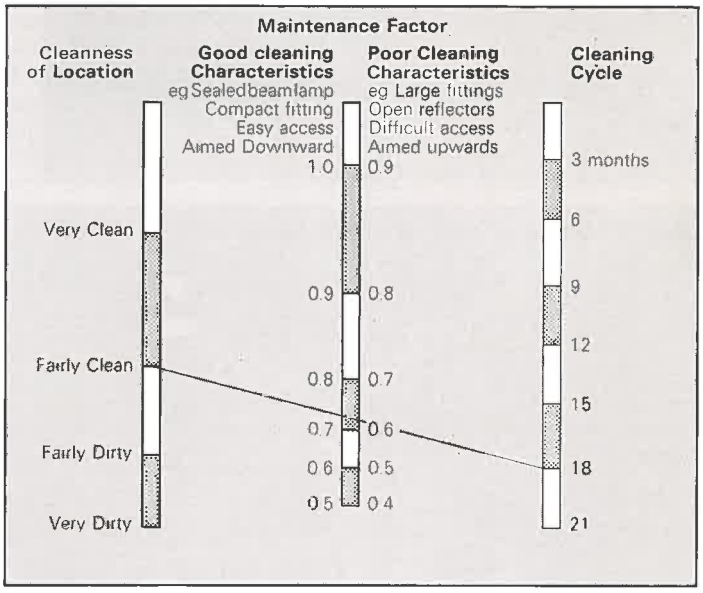
One method of comparing the relative system efficiency of areas of similar size is to express the performance of the installation in lux per kW. For example the floodlighting of Wolverhampton Wanderers in 1969 using jacketted 1000W metal Halide lamps in conventional projector floodlights gave 700 lux horizontal illuminance for an installed load of 224 kW. In 1970 1000 W CSI (Compact Source Sealed Beam) metal halide floodlights were used at West Ham United Football Ground to provide a horizontal illuminance of 1600 lux for an installed load of 324 kW. Thus these two installations have a relative system efficiency of 3.1 and 4.9 lux/kW respectively so that the West Ham installation was more than 50% more effective. The difference in utilisation is entirely due to the more accurate and efficient control of the light by the sealed beam reflector.

Experience gained in floodlighting sports arenas can be related to other applications of exterior lighting. The cost saving achieved with the CSI lamp in the film and television industry was described in the last issue of *Lighting Journal.*

Whatever the application, energy and cost savings of the magnitude covered by these examples can be achieved so long as lamp and fittings are not haphazardly selected from the catalogue. The floodlighting design must include careful calculations using reliable photometric data and detailed cost comparisons of the different systems must also be carried out.

Even when the most suitable lamp and floodlighting combination has been selected, the energy costs can still be reduced by regular maintenance. Figure 3 shows the relationship of maintenance factor and the cleaning cycle for different location conditions. In the example shown, by halving the period between cleaning operations from 18 months to 9 months, a maintenance factor of 0.73 could be increased to 0.87 which would result in a 15% reduction in the installed load and would also lower the installation costs.

Figure 3

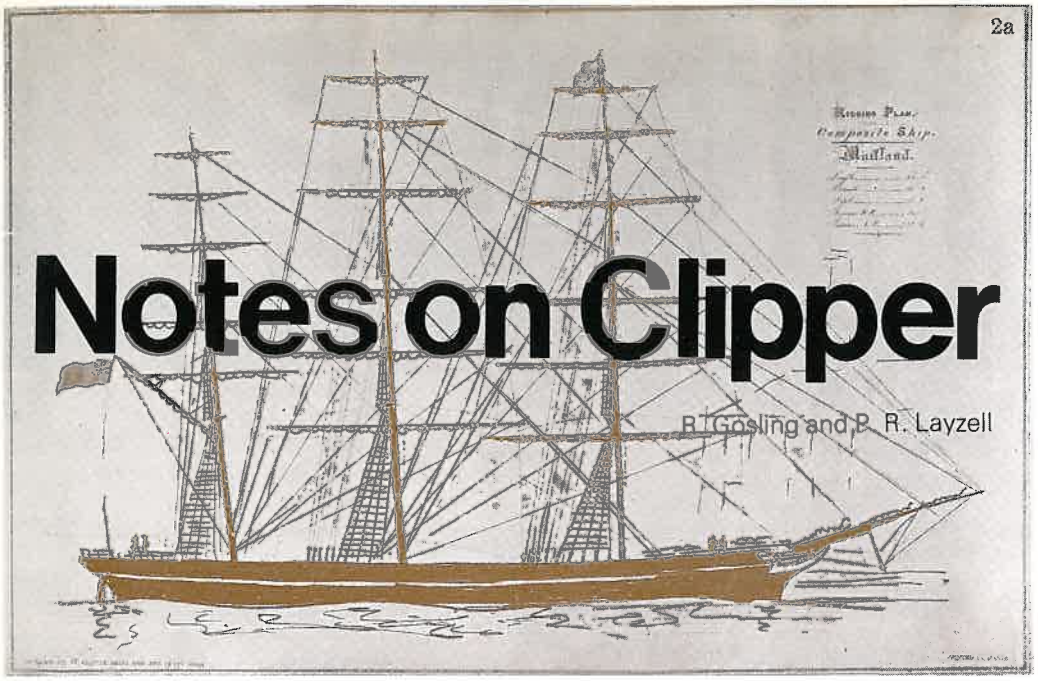


The reward for all this effort will be cost and energy savings which will benefit the individual user and the general economy without reducing exterior lighting standards in any way. There is nothing objectionable per se in consuming watts. The lesson to be learned is to save energy by giving detailed attention to lighting design at the planning stages of a project. Switching off part of an installation which was devised by the "rules of thumb", which are the bane of effective and high efficiency floodlighting, is no solution. All the equipment and lighting design know-how is readily available now. There is no excuse for lighting which wastes energy.

Some HID Installations

Marks and Spencers new store at Ayre (1) that of Fine Fare at Stirling (2) and a large covered sports centre at Largs (4) are all brilliantly lighted by 400W MBIF "Kolorarc" lamps in Kolorformat luminaires.

Carringtons new bottling plant at Runcorn uses the same type of lamp in high-bay reflectors. Because of the high efficacy and good colour-rendering properties of these lamps they are being used in an increasing number of applications.



Notes on Clipper

R. Gosling and P. R. Layzell

Mr Gosling is Fittings Design Manager for Thorn Lighting Ltd and Mr Layzell is one of his senior managers.

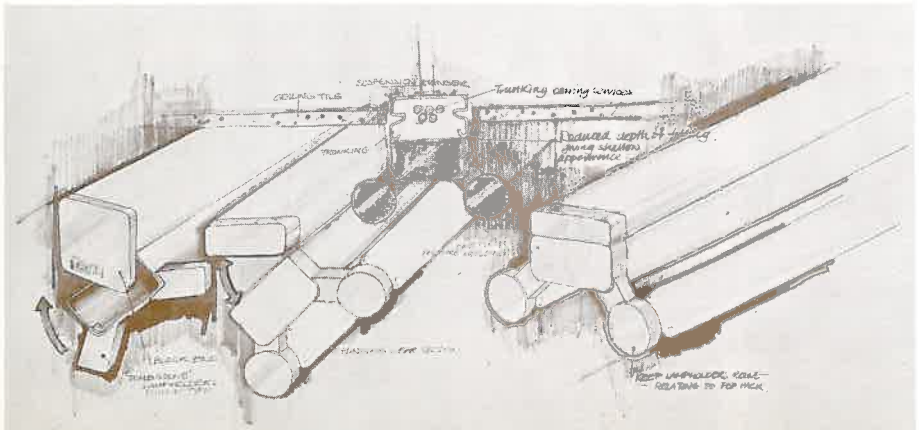
This is the history of the design of a new range of fluorescent fittings, springing from the combination of Thorn's design and manufacturing expertise and a real customer requirement.

The Department of the Environment, one of our most important customers, were convinced that the cost of installing a fluorescent fitting was more than that of the fitting itself. They suggested that an entirely new approach should be made to the problem. Instead of the luminaire being regarded as a separate item which was added to an already completed installation, it should form part of the wiring system. The electrician would no longer install standard wiring, finishing at BESA boxes or their equivalent at approximately the correct spacing, for luminaires which would be specified and fixed later, but would terminate his wiring at a plug and socket and suspension device designed to form part of the luminaire. The final installation of the luminaire would thus be an easy job and could be done at a later stage if required.

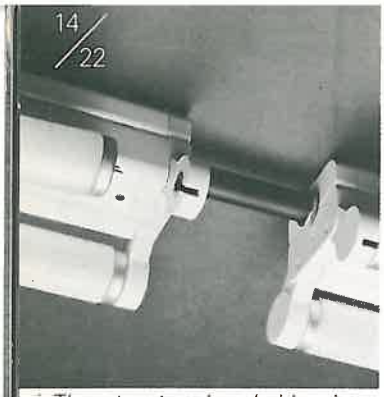
This idea was in line with the Thorn policy of integrated design to save labour costs on site, and clearly had considerable possibilities, but if we were to make a range of fittings to meet the Department's requirements it was obvious that for cost and availability it must become part of the standard Thorn range. This has of course influenced our thinking at the design and production stages.

The design objectives were simplicity of installation, combined with robust construction, good lighting performance and attractive appearance. We examined existing systems and decided that none fully met the requirements of Thorn and the DoE. The basic principal was to make a backplate which could be used instead of a standard BESA box or alternatively, where fittings were butted end to end, would allow through wiring. The spine assembly containing gear, lampholders and diffuser supports is hooked on to this backplate and secured by a simple latch. No tools are required for this operation and electrical connections are made by a plug and socket, the latter attached to a bracket mounted inside the backplate. A further advantage of separating the backplate from the spine assembly is that the latter can be stored safely until required, reducing risk of damage on site. It may even be ordered and delivered as a separate item, so that it does not appear until the rough work is finished, and thus can avoid heavy initial capital outlay. Backplates can be linked by short lengths of conduit, still further reducing wiring costs.

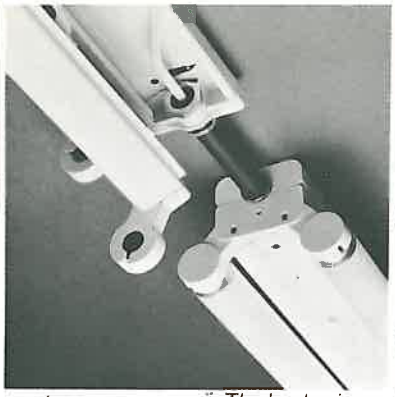
It immediately became evident that a trunking system could be substituted where needed for the backplate. This



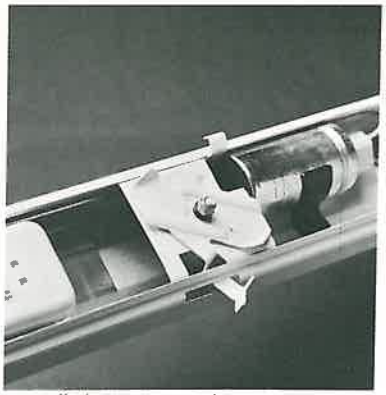
Stages in the installation of the Clipper fitting.
i. The backplate is fixed to the ceiling
ii. Wiring the three pin socket is simplified by the shallow backplate
iii. Lampholders, choke and capacitor are all mounted on the spine assembly.
iv. The spine assembly is hung on to the backplate, plugged in and swung into place.



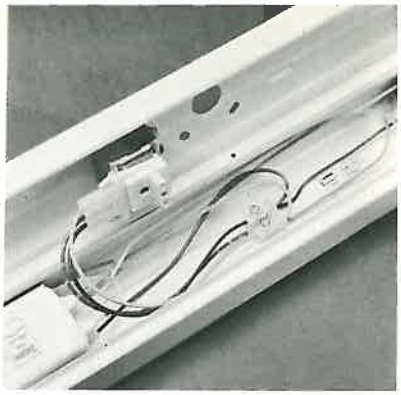
i. The rotary type lampholder gives complete electrical protection, and allows luminaires to be butted end to end.



ii. The backspines can easily be connected to reduce wiring costs.



iii. The simple but positive latch required no tools.



iv. All electrical connections are made by the three-way plug and socket.

would have to be of a deeper cross-section than the latter to facilitate extra wiring, hanger suspension etc. and to provide mechanical strength. Regular meetings were held with the DoE engineers who showed great interest in our design proposals. Prototypes were made and accepted as showing the correct line of approach.

The initial idea had been sparked off by the need to reduce installation costs. It is obviously cheaper to install a backplate at the same time as the conduit and then offer the spine assembly to it than to finish at a BESA box and subsequently fix and connect a fluorescent fitting. However the ease of maintenance possible by the new method was soon seen to be equally, if not more important. For example, one can easily remove a faulty spine assembly, complete with gear and lamp, and replace it with another unit which is known to be functioning correctly. The faulty unit can be repaired at leisure on the work-bench and put in store for future use. Another point made by the DoE engineers was that when redecoration had to take place, the spine assembly could easily be taken down to allow the ceiling to be painted or resprayed.

The trunking system multiplies these advantages still further. Since it replaces the conduit runs in a conventional installation it still further reduces initial wiring costs and where continuous lines of fittings are required the system has a marked cost advantage over the conventional mounting of fittings on trunking and ensures accurate alignment. It was decided to leave a deliberate gap between individual fittings in a line because a continuous line of light was not envisaged. It was felt that this was the preferred aesthetic solution to the problem of dark shadows cast by the ends of the lamp on a continuous diffuser. It also eliminates the difficulties of alignment, joining and hinging down of diffusers which are inherent in a continuous diffuser system.

Where fittings are more widely spaced, or where the trunking is used on its own, a black PVC capping was proposed. Initially the trunking was to be made only in straight lengths with end caps which could be adapted to connect to conduit or conventional trunking systems. Tees, elbow and cross-over joints would follow in due course. Other accessories, such as cable hangers, terminal block assemblies, fused outlets for places where the cable cross-section is reduced to feed a lighting fitting or other piece of electrical equipment, an adaptor plate capable of taking tungsten fittings and some conventional fluorescents would also be provided.

Design details

The final design has a modern soft-edged appearance and a number of interesting features. The unusually shallow profile of the backplate allows easy access to the mains socket. This is an important consideration since electrical connections must be made at ceiling level, an awkward job in most conventional fittings. The lampholders have been specially designed for the fitting and are injection-moulded in engineering plastic to form a combined twist grip lampholder and end plate. This type of lampholder was chosen with special attention to the requirements of European markets. The lampholders are pre-wired and packed with the spine and are easily and firmly secured in position by a wire clip. Where a reflector-tube is used it can easily be rotated and clicks into place in the desired position. In order to present no problem to the electrician who may have to replace a broken lampholder, in spite of the fact that he will be working on a bench and not at the top of a ladder, push-wire terminals are used.

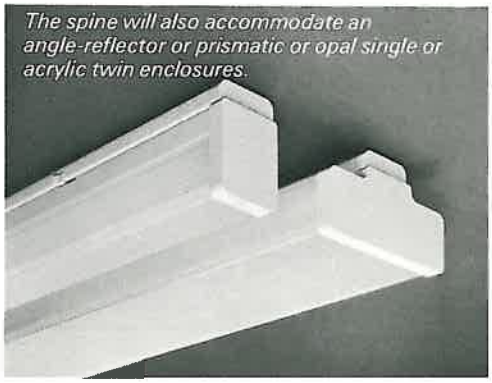
The Clipper has its own range of acrylic diffusers and controllers, which have unusually high light-transmitting and directing properties, but it can also accept the standard Pop Pack attachments already used extensively by the DoE. This does not include metal trough and angle reflectors which are attached to the spine assembly before offering it up to the backplate.

The simplicity of the latches is a measure of the careful design consideration they have received. They conform to the sleek lines of the spine assembly, but are strong enough to carry five times its weight. In addition to locking the spine assembly to the backplate or trunking where they replace the conventional tee-bolts they allow it to be hooked on to one side and hinged down while the electrical connections are being made. This makes single-handed installation very easy. Anyone who has installed a conventional fluorescent fitting while standing on top of a shaky ladder will appreciate the advantage of this. The backplate is provided with injection-moulded engineering plastics ends secured to it by spring steel clips which also provide earth continuity. They are sleeved to accept 20 mm dia. electrical conduit and a knock-out diaphragm closes them when conduit entry is not required. The choke is mounted on a metal channel to assist heat dissipation and provide a cool wire-way for through wiring. Push wire connections are again provided. An advantage of mounting the control gear on the spine assembly is that it allows a substantial air-gap between the choke and the ceiling, limiting temperatures of the supply cable and the supporting surfaces. Thus it complies with the more stringent requirements likely to be introduced in the BS in the future, and with those of the German F mark system.

Tests and Comparisons

Very stringent testing is of course axiomatic where all Thorn equipment is concerned, but in the case of the Clipper, not only had British Standards to be satisfied, but those of all other

Single or twin lamp spines can be mounted on the same backplate or trunking.



The spine will also accommodate an angle-reflector or prismatic or opal single or acrylic twin enclosures.

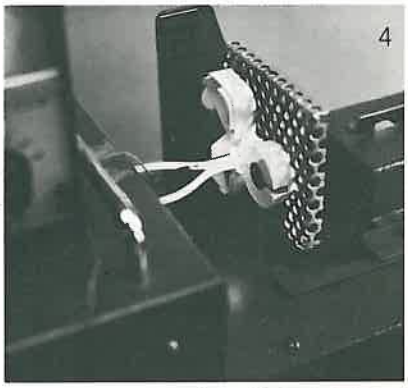
countries in which it was likely to be marketed. Consequently the Thorn development team drew up a set of standards based on the most demanding published requirements to be found anywhere in the world. Components were tested individually and within the fittings, and in conformity with the international testing requirements tests on production samples will continue.

Photometric tests have shown that the use of high reflectance paints and the wide spacing of fluorescent tubes in the twin-lamp version gives a high LOR, while the specially designed acrylic prismatic controllers have an even higher performance than was expected.

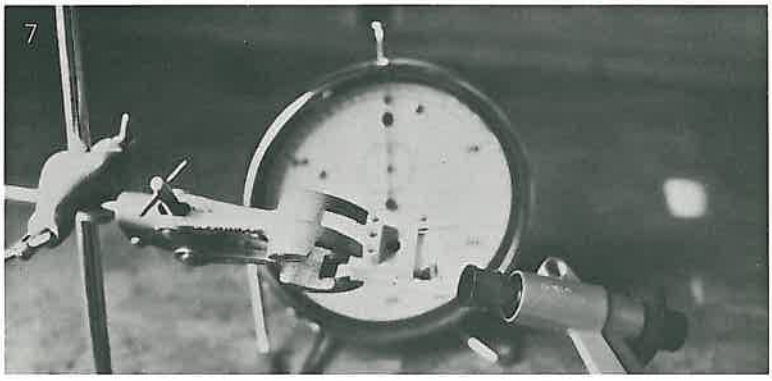
In addition to the normal photometric, mechanical and other tests carried out by the Thorn laboratories, the DoE carried out a test to compare the relative cost of installation of the Clipper fitting and a conventional fluorescent fitting. This was evaluated in terms of the time taken by an electrician of average performance to fix to the ceiling, wire, connect, lamp and switch on a fitting of either type. Because the use of 'Clipper' spine assemblies reduces the initial wiring time, by eliminating conduit boxes and reducing the conduit runs to short linking pieces between the backspines, the average time taken to fix and wire the "Clipper" compared to a conventional fitting was very much reduced and it took only half a minute to attach the spine assembly and switch on. The DoE has adopted the resultant saving in labour costs in favour of Clipper as the figure to use in any relevant calculations. This advantage can be even greater where trunking takes the place of conduit on the ceiling: the advantages where maintenance is concerned have already been outlined.

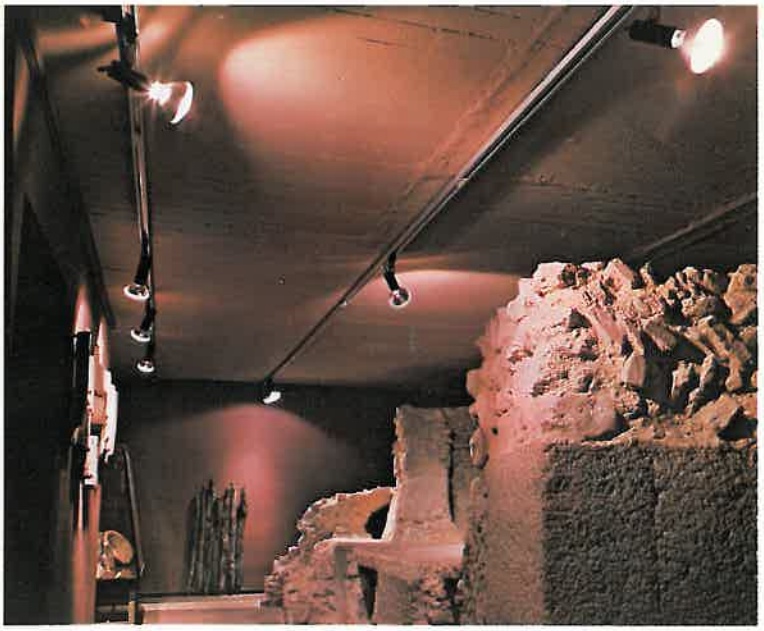
Conclusion

Designed from the onset with customer needs as a prime requirement Clipper is a worthwhile addition to the range of commercial and industrial fittings. In addition to the obvious applications in offices, shops and factories it has a very special place in the design of plank and coffered ceiling where continuous rows of fittings are desirable. We are grateful to the engineers of the DoE whose help and close co-operation has been of significant value in the development of this new range.



Some items in the exhaustive testing programme at the Enfield laboratories. Here can be seen (1 and 2) the fitting being installed in the polar-curve photometer and the integrator to measure its light distribution and light-output ratio: (3). An enlarged shadow check of the acrylic prismatic controller; (4 & 5) heat test on the lampholder and 'finger test' on all live parts. In tests for thermal safety thermo-couples are connected to all 'hot spots' (6) and a needle-flame test (7) ensures non flammability of the glass filled nylon plastic mains terminal socket.



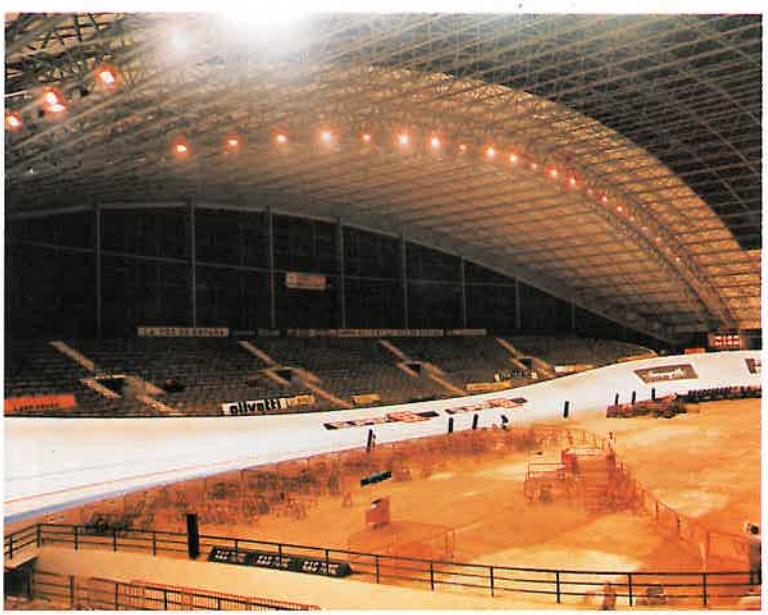


Lighting Miscellany

Something of the diversity of purposes to which Thorn Lighting equipment is put all over the world can be seen in the pictures on this page. The top left-hand picture shows PAR 38 lamps mounted on Trakline being used to light a priceless collection of Chinese ceramics at Sussex University. The technique of lighting from outside museum showcases allows great freedom of arrangement of displays.

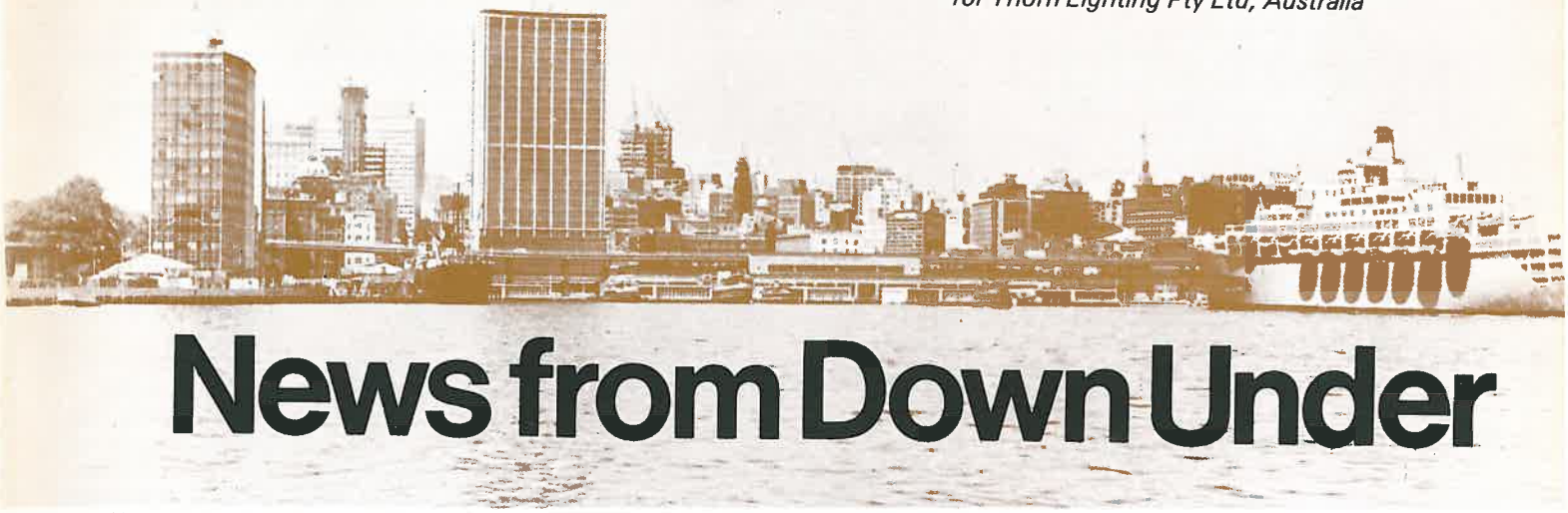
Next to it a similar technique has been used to light the remains of the Roman Camp at Vienna. Bottom right is the Velodrome of Arosta at San Sebastian in Spain where the cycle track in the gigantic covered Stadium is lit to a level of 500 lux by means of 2000W and 1000W tungsten halogen lamps in Haline projectors mounted below the square opening in the ceiling. The great parabolic roof-trusses span over 110 m, with a maximum ceiling height of 24 m. This installation provides conditions which comply with the requirements of the World Federation of Racing Cyclists; it was installed by C & G Carandini of Madrid and Barcelona.

Two hundred Thorn Haline 1000 and 1500W floodlights lighted the two "Condeep" concrete oil rigs built at Stavanger. They used over 350,000 tons of concrete and are considered the largest towing job in the world. Above them can be seen one of the Thorn Lighting fleet of delivery vans, fitted with marker lamps while the printers of this delightful view of Mulford Sound, New Zealand, (Fotocentre Ou.) Ltd of Oamura) used a Thorn linear metal halide printing lamp for the first time in New Zealand.



R. F. Steward

Mr Steward is Chief Lighting Engineer for Thorn Lighting Pty Ltd, Australia



News from Down Under

The Harbour Front at Sydney, as it is now (right) and ten years ago (above). The rate of growth needs no further comment.

The difference in sky line viewed from Sydney harbour over the last 10 years tells a story of astonishing commercial growth, reflected all over Australia. The island continent of Australia is a land of remarkable achievement. It is worth remembering that it is only 200 years since the first white settlers came here to start a new life in the uncompromising bushland. From small beginnings technology, building, culture, education and medicine in Australia now compare favourably with the rest of the world.

Commercial Lighting Techniques

Lighting of commercial buildings is the subject of Australian standard (CA 30-1965) which covers commercial and public buildings, schools and industrial buildings. Lighting layout designs are prepared by consultants or in the case of Government Departments, by their electrical design departments. The role of lighting companies is thus confined to the design, manufacture and marketing of lighting equipment. Each state has its own government body and electrical authority and at the moment there are no fewer than seven different government specifications and countless individual standard specifications by large users and consultants. The lighting manufacturer who wants to sell in all areas of Australia must comply with all of them.

Air handling troffers are widely used, usually 4' 0'' x 16''. Here Australian practice differs from British as it is normal to use ''specials'' designed to conform with the performance specification and the type of air boot to be employed. It is left to the lighting company to liaise with the air conditioning and ceiling contractor to ensure a total installation acceptable to the architect and there is often a clause in the specification 'that the lighting fitting manufacturer shall accept full responsibility'. Consequently, great care is taken in the design stage to relate lighting fitting details to air handling equipment. In all cases prototypes of fittings and air boots are tested and approved before bulk production. In general a quantity of say 2,000 troffers would be considered a fair sized project with some going to 3,000 off and a few a lot more than that. In these troffers prismatic panels are commonly used, but quite a number of more prestigious or special application buildings use the aluminium low-brightness reflector system for efficiency and low luminance.

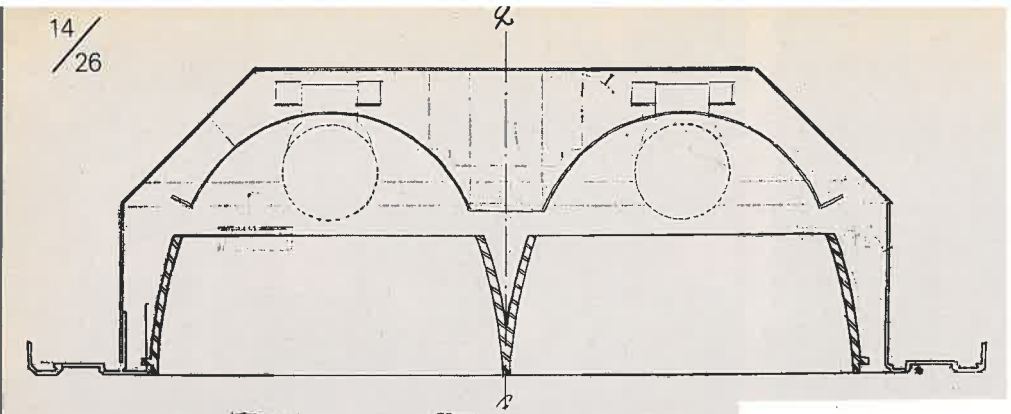
Some new developments

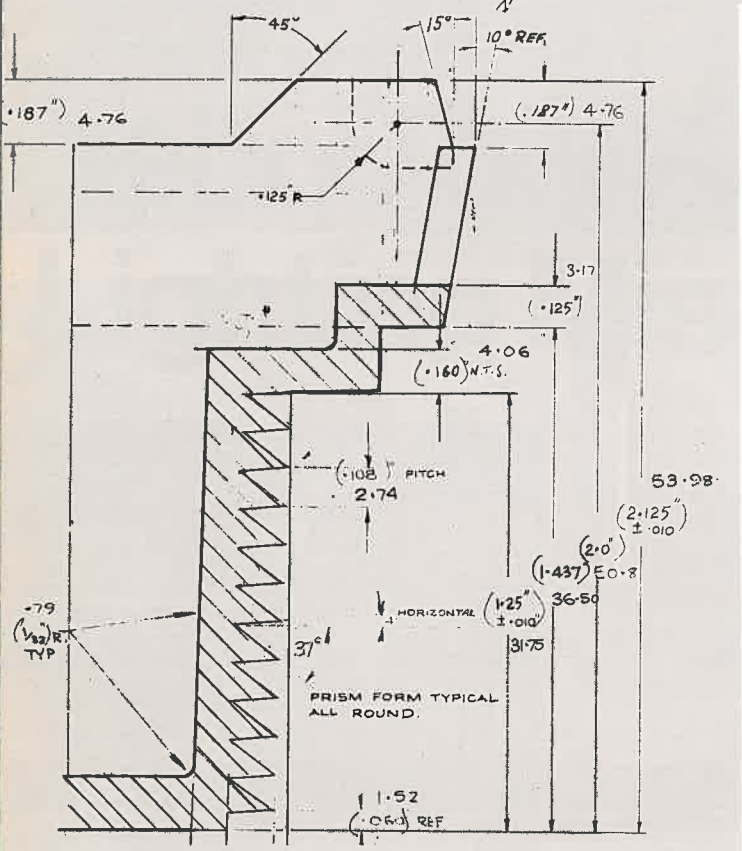
Of course, we leaned heavily, at first, upon the Mother Country and since the war, on America for technical guidance. For example for commercial lighting purposes, Australians share the American preference for the 4' 40w fluorescent tube rather than the 5' 65w. This is probably due to the predominance of recessed troffers in high rise buildings, although the Thorn 8' 85w lamp is beginning to be used in some installations. In hazardous areas such as coal mines, oil refineries etc. where the American choice would be pressurised light fittings, the flameproof type of unit is specified ''down under'' following British practice and using the longer tubes. In some cases the techniques learned have even been improved upon by application, and lighting is no exception to this general rule.

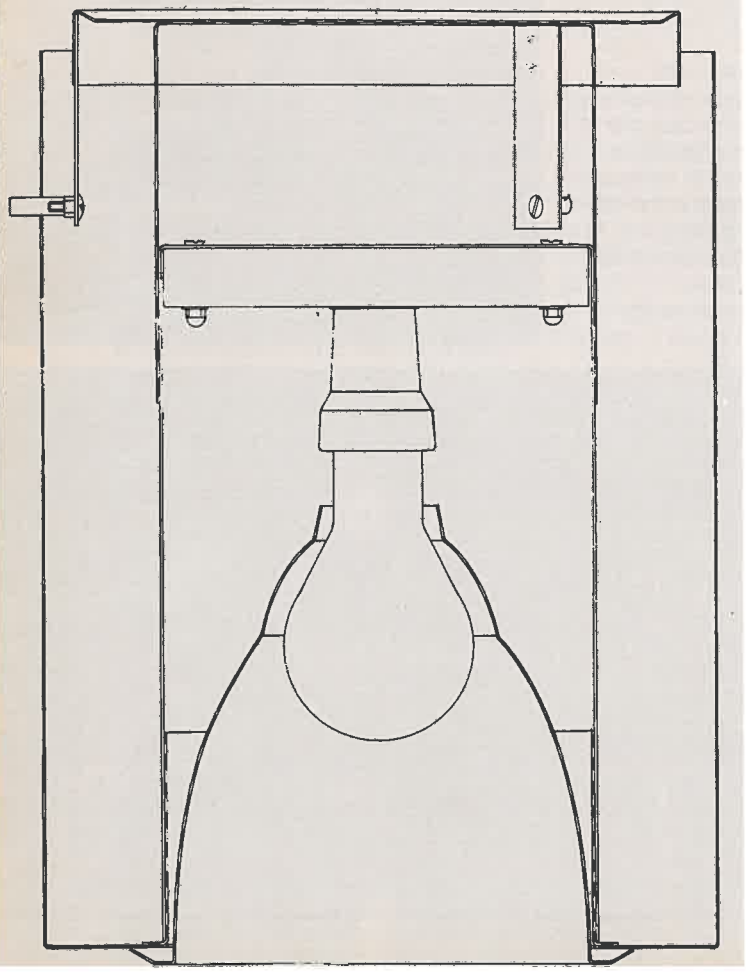
A scheme recently designed by Thorn for a Government office block in Belconnen, a new suburb of Canberra, A.C.T., is a case in point. Here, troffers fitting into a 1200 mm modular ceiling recess, have supply air boots and a return air facility through the low brightness louvers. Instead of using the traditional method of fabricating the louver with aluminium, Thorn decided to take a more modern approach and designed it to be injection moulded in plastic.

The louver is made up of four sections fixed together to form the complete optical systems. The process of injection moulding ensures the accuracy desirable in such light control. The mouldings are metalised in a vat producing a mirror-like finish with a consistency almost impossible in aluminium which of course has to be brightened, mechanically polished and then anodised for protection. This approach produced a more economic product of greater efficiency.

The ordinary prismatic panel has also been improved upon in the Thorn







Some of the original designs coming from Thorn's in Australia. At the top is a low-brightness louver, injection-moulded in polystyrene and metalized to produce a mirror finish. These louvers are made in four sections to fit in a recessed modular luminaire. The centre design is a detail of the side and end reflecting prisms in the improved Thorn Greendale lens dish, while at the foot of the page is a downlighter taking a 125W Kolorlux lamp designed for the examination rooms in Sydney eye hospital.

The Thorn Greendale 'collegiate' luminaire was originally designed for and is extensively used in schools. It is seen opposite in a wool sorting shed, where a high illuminance with good glare control is required and the quantity of greasy fluff present demands easy maintenance.

Below, in the Commonwealth Bank of North Sydney, specially designed recessed fluorescent luminaires have thick clear acrylic visors with diffusing sides.

Greendale lens dish which has a sophisticated male prism base with side and end refracting prisms. The side and end prisms direct light on to the ceiling thereby reducing ceiling/fitting contrast and the base prisms, whilst being very efficient, reduce reflected glare and have a lower luminance group.

Testing the design of such a product is difficult as it cannot easily be prototyped, but some check to the calculations is very necessary when one considers the high tooling investment. The Thorn designers, having made their calculation, made individual prism segments 20 times full size and highly polished on all surfaces from clear acrylic. It was then possible to place the prisms on paper in the dark room and measure the angle of refraction using an ordinary torch bulb. In this way the efficiency of the end product was reasonably assured. This acrylic dish is locally injection moulded, and is being used in several commercial projects and throughout the 650 bed extension of the Royal North Shore Hospital in Sydney to great effect.

Hospitals

Australia has a large hospital building programme and some hospitals are using the low brightness system. There is no Government recommendation for hospital lighting but hospital applications obviously have more environmental considerations than others including reflected glare from the highly polished floors which has been overcome by the use of this dish. Various tubes are used in the fittings of a colour appropriate to the task being performed. Naturally colour was considered very important in recovery rooms and all fittings are permanently labelled inside indicating the tube to be inserted at replacement time.

The examination rooms in the Sydney Eye Hospital are lighted by special Thorn downlighting fittings; 125w Kolorlux lamps were used with a reflector system mounted inside an 18" x 12" dia bronze anodised aluminium drum. The fittings are surface mounted and provide a good level of illumination without the light source being visible at normal viewing angles. There is therefore no distraction to patient or doctor.

Fittings for schools and specialised purposes

The schools programme is tremendous and the various State Public Works departments pay particular attention to the lighting of these important buildings. Modern schools in Australia are very well equipped which is made evident by the high standard of education in this country. The lighting fitting most commonly used for schools is the Thorn Greendale "Collegiate". This is chosen for its extremely high

efficiency, a light/output ratio of 86%, its low maintenance and the low luminance rating achieved by the injection moulded acrylic louver, again moulded locally.

Although originally designed for use in schools this fitting has a very wide range of applications. The open louver is virtually self cleaning and has therefore been used successfully in industrial as well as commercial installations. An unusual application was in a wool shed, where sheep skins are visually checked for quality by wool experts, in a fairly clean environment. The Collegiate provided a high level of shadow-free illumination with a complete absence of glare.

In the offices of an insurance firm the louver only was mounted in a continuous recessed 65w troffer. The timber edging to the fitting 'regressed' the louver and the result was very good. One of the nicest things said about the installation was by one of the office workers, who when asked, replied that the lighting was just right and when questioned on the lighting fitting itself replied "I have never noticed them". This installation was commended by the IES.

Some special designs

Australian architects depart from the norm in the same way as their equivalents in Britain and this is quite often seen in lighting. The Commonwealth Bank of North Sydney was lighted particularly effectively using recessed fluorescent fittings with a projecting 2" thick clear acrylic block. The acrylic was etched on the edges to give an 'edge lighted' appearance, and mounted continuously. The light source is not visible but the edges of the acrylic glow giving the lines of fittings a floating look. Although they are fairly narrow the fittings are reasonably efficient and give a good working level of illumination. This installation was the subject of an IES award.

Downlights were used in one of the lounges of the International Terminal buildings of Sydney Airport. These were incorporated in a square tile also used for air conditioning and P.A. Systems. The Wentworth Hotel, Sydney was the first building to incorporate Australian made downlights where they are used to great effect throughout the huge foyer and other public parts of the hotel.

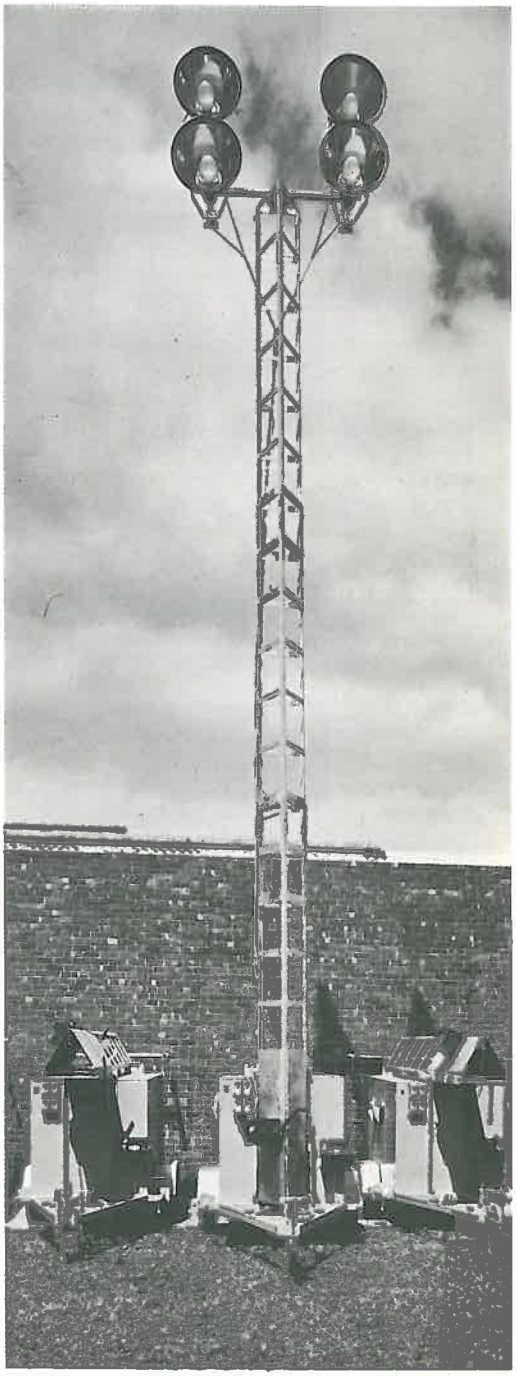
Outdoor and street lighting

Statistics show that on average Sydney has sunshine 340 days out of the 365 days per annum and the minimum temperature is 12° C. It is not surprising therefore that a large amount of time is spent outdoors by New South Welshmen, thus influencing the development of outdoor lighting. This year might well confound the Australian Bureau of Statistics, as far as weather is concerned, however, one has to accept that this is an exception rather than the rule.

To cope with the requirements of outside colour television broadcasts the Cranbourne Greyhound track in Victoria was lighted with ON 1600 units mounted upon 7 metre poles at 10 metre centres providing 1500 lux. The first Australian installation of H.P.S. Area floods was at the department of Main Roads Control centre in Brisbane which, while quite a small project, marked a pace forward in the technology of area lighting. The National Capital of Canberra in the Australian National Territory has very wide straight double carriageway roads reaching like the spokes of a wheel to the hub centre of Canberra, where Government buildings majestically surround the man-made lake named after the designer, Burley Griffin. Two of these roads, Kings Avenue and Commonwealth Avenue are lighted with High Tower Lanterns using 100w Kolorlux lamps on 35 metre and 40 metre masts. The total scheme design was computer aided. The Australian IES has made a number of lighting awards, one of which was recently won by Thorn for the lighting of Kemp Place tunnel in Brisbane, Queensland, using 158 special 8' 0" 85w weatherproof and hoseproof fluorescent fittings, with an aluminium body and prismatic visor giving a light output ratio of 59% for the twin lamp and 50% for the three lamp version. Mounted in four continuous rows, the fittings are switched, so all four rows operate during daylight hours whilst only the two outer rows are used at night. Both these installations were

In the centre of Canberra an area of Parkland surrounds the artificial Lake Burley Griffin, from which great roads radiate like the spokes of a wheel. The Thorn high-tower lighting system consorts well with the monumental scale of its surroundings.

Below, a mobile high tower system, in which MBF lamps are mounted in M25 floodlights at the top of a telescope pylon, illustrates the innovating ingenuity of the Australian engineer.



illustrated in the last issue of ***Lighting Journal.***

In another, the Brisbane Bus Tunnel, two hundred twin 65w Thorn Invincible fittings were used, and switched to permit varying lighting levels to cope with the various ambient lighting levels.

Street lighting varies dramatically from well-engineered expressways with lighting of international standards, to some busy suburban traffic routes lighted to a standard one would expect in a back alley of an under-developed country. It is not uncommon for a busy road to be 'lighted' by a single 40w tubular fluorescent fitting every 100 metres on one side only. One has to appreciate however that Sydney has 670 sq. miles compared to London's 620 and a population of only three million. Main roads are generally lighted effectively with 400w MBF/U lanterns, not much sodium being used although, at the time of writing, considerable interest is being taken by local authorities in sodium and high pressure lamps in general.

Metrication

The Australian government have appointed a Metrication Board and have decided upon a 'hard' conversion rather than a protracted changeover. The policy is also to go 'Metric modular' and this includes windows and doors being treated as building sub-assemblies i.e. the windows plus the frame as an assembly must measure a multiple of 300 mm so that the builder leaves a modular aperture in which the assembly can be fitted. Both the steel industry and the building industry have announced their 'equivalents', and consequently the ceiling module for a recessed 40w troffer is 1200mm. This does not really bother lighting fitting manufacturers because in recessed fittings the existing 4' 40w fluorescent tube plus lampholders has been overlapping 'T' bars for years.

Public meetings organised by the IES have been held to discuss lighting and metrication and at one such meeting it was agreed that if a new lamp was to be produced, it would have to come from overseas first since Australia would only want to produce a lamp with international acceptance.

The Illuminating Engineering Societies of Australia are very active, with corporate bodies in every state except Tasmania, where they have chapters of the Victorian Society. The New South Wales Society is the largest, with a chapter in Newcastle — an industrial city about 100 miles north of Sydney. The Societies run technical lighting courses in conjunction with the education authorities in various states and take an active part in the function of the Australian Standards Association (SAA) in lighting matters. Recently, ASC 1158 (street lighting) was revised with the help of the IES (Aust.) and they also played a prominent role in the introduction of ASC 137 1969 (lighting fittings) which was the first real lighting fitting safety standard in Australia. This publication is a minimum safety standard and does not pretend to cover the wider scope of BS 3820 and its subsequent development.

Conclusion

Australia is a country with an awe-inspiring potential development and we shall be busily employed if we are to satisfy this every-increasing demand. Although world shortage of raw materials causes difficulties at times to manufacturers all over Australia to keep up with demand and at the same time maintain the standard, companies belonging to international groups are better equipped to cope and are able to be of greater service to advance lighting techniques in Australia. Backed by factories such as the Thorn units in Victoria and N.S.W. we are able to look up from down under with a degree of optimism for the future.

PROBLEME UND LÖSUNGEN DER BAU NEUEN FORSCHUNGSLABORS VON THORN LIGHTING IN ENFIELD 2

Rogan Gale-Brown

Bei der Planung dieses Gebäudes mußten die Architekten mehrere Spezialprobleme lösen. Grundriß und 6-m-Bauraster wurden von der Notwendigkeit des Zugangs von Norden und Süden her bestimmt – bzw. von der Notwendigkeit für freien Durchgang für große Fahrzeuge zum dahinterliegende Gebiet mit Wagenparkmöglichkeiten darunter auf Erdgeschoßniveau. Die primären und sekundären Verkehrsverbindung wurden so angeordnet, daß sie eine Verbindung mit der Versuchtfertigung und der Hauptfabrik für Leuchtstoffröhren herstellen.

Das erste Stockwerk ist vom Erdgeschoß über eine Wendeltreppe erreichbar und nimmt die in sich geschlossene Empfangssuite mit Vortrags- und Konferenzeinrichtungen auf. Um den ziemlich unscheinbaren Eindruck dieses Eingangs unter dem niedrigen Dach des Parkplatzes im Erdgeschoß aufzuheben, ist der verflieste Treppenschacht voll sichtbar ausgeführt, und zwar über die ganze Höhe des ersten Stocks.

Die Höhen der Geschosse variieren je nach dem Zweck, dem die Räume dienen: wc zum Beispiel für fotometrische Apparaturen eine außergewöhnlich hohe lichte Höhe erforderlich ist, reichen die entsprechenden Räume durch die Decke in das obere Stockwerk hinein. Der Kassettenboden ist für in regelmäßigen modularen Abständen angeordnete Trennwände ausgelegt; in die Plattenunterseiten wurden Einsatzstücke eingelassen, an denen Energieversorgungen, Decken, Beleuchtungssysteme oder Versuchsausrüstungen an jeder beliebigen Stelle über dem Boden befestigt werden können.

Alle Trennwände sind demontierbar und auf die modularen 300-mm-Baurastermaß der Kassettendecken abgestimmt, woraus sich eine extrem große Vielfalt möglicher Raumgrößen ergibt.

Wegen der unterschiedlichen Bodenhöhen wird den Fenster eine untergeordnete Rolle in der Hauptfassade zugeordnet und an der vorderen und hinteren Front eine überwegend vertikale Linienführung betront, und zwar durch Anbringen der Gebäudepfeiler und Versorgungskanäle an der Außenfläche der Mauren. Nur im Erdgeschoß und ersten Stockwerk wird von diesem Prinzip abgegangen und statt dessen verblendete Fertigwände verwendet, um einen harmonischen Eindruck mit den Nachbargebäuden zu schaffen. Hellbraune Ziegel wurden gewählt, um mit anderen großen Gebäuden in der Nähe der Labors zu harmonieren.

DIE ALCHIMIE DER Lichterzeugung 5

J. W. Bessant

Die moderne Leuchstofflampe ist uns zwar allen vertraut, jedoch nichtsdestoweniger eine komplexe elektronische Ausrüstung – und das Ergebnis von Forschungs Entwicklungsarbeiten von Wissenschaftlern auf den Gebieten der Elektronik, Chemie, Glastechnick und Molekularphysik. In den fünfunddreißig Jahren seit ihrer Einführung ist die Leuchtstoffröhre mindestens siebenmal preiswerter geworden als andere Lichtquellen.

Forschungsarbeiten auf dem Gebiet der Phosphorstoffe, die mit den modernsten Methoden ausgeführt wurden, haben bei Hinzusetzung bestimmter von Europium aktivierten erdalkalischen Silikaten zu Halophosphatpulvern, geführt, die in Hochleistungsröhren verwendet werden. Die auf diesen Phosphorsubstanzen beruhende Lampe nennt sich 'Plus White' und erzielt eine hohe Lichtausbeute bei gleichzeitig guten Farbwiedergabeeigenschaften, wie sie früher nur mit der 'de luxe' Serie von Röhren von niedrigerer Leistung erreicht wurden.

Die Länge einer Leuchtstoffröhre beeinflußt ihren Wirkungsgrad, da die Wirkung des Kathodenabfalls mit zunehmender Länge der Röhre abnimmt. Daher sind die zwar bei Architekten aus ästhetischen Gründen beliebten 600 mm Leuchstoffröhren zwangsläufig weniger leistungsstark als 1200- oder 1500-mm Röhren. Das Problem wurde nun durch Biegen der längeren Röhre in eine U-Form überwunden, und dies ließ sich bei der Thorn Lampe unter Verwendung einer Glasröhre mit 25 mm Durchmesser erfolgreich erzielen, was eine beträchtliche technische Leistung darstellt. Die neue Röhre ist eine 40W Lampe und wiegt nur ein Drittel des Gewichtes herkömmlicher U-Röhren. Ihre Gesamtlänge beträgt 520 mm gegenüber den konventionellen 600 mm, so daß sie sich, abgesehen von vielen anderen Verwendungszwecken, in einem modularen 600 mm Raster unterbringen läßt. Sie ist für den Betrieb mit serienmäßigen Startern oder starterlosen Stromkreisen für 240-V oder 220-V ausgelegt.

Einer der den Stromverbrauch von Leuchtstoffröhren beeinflussenden Faktoren ist das Gas, das zum Zünden des Lichtbogens eingesetzt wird. Seit langem wird Argon für diesen Zweck verwendet, doch die Hinzufügung von etwas Krypton wirkt sich reduzierend auf die Lampenspannung aus und verbessert damit die Wirtschaftlichkeit. Eine neue 125 W röhre von 2,4 m Lange mit einem kleinem Anteil von Krypton in der Gasfüllung arbeitet mit 100 W in einem 125 W Stromkreis ohne Verlust an Lebensdauer und nur verhältnismäßig geringer Einbuße an Lichtausbeute. Auf diese Weise läßt sich eine Verminderung der Leistungsaufnahme erzielen, ohne daß das Beleuchtungsniveau arnstlich beeinträchtigt wird oder irgendwelche Modifizierungen an der Leuchte notwendig wären.

DAS WIEDERERBAUTE LUXOR-THEATER IN ROTTERDAM 9

J. J. M. Hoogervorst

Als Rotterdam 1940 bombardiert wurde, blieb als einziges Theater das Luxor stehen, ein Kino mit begrenztem Bühnenraum. Es wurde von den Stadtbehörden von Rotterdam im Jahre 1946 übernommen, die Bühne vergrößert und der Zuschauerraum verkleinert, doch 1972 entschloß man sich nach mehreren erfolgreichen Aufführungen, das Theater neu aufzubauen, da sich Anzeichen eines Absackens des Gebäudes bemerkbar machten.

Das Vorhandensein von Nachbargebäuden machte die Vergrößerung de Zuschauerraums unmöglich, so daß zusätzlicher Raum durch die Entfernung des Balkons und Änderung der Sitzreihen gefunden werden mußte. Um die monotonie der langen Decke zu unterbrechen, erstreckt sich eine lange 'Lichtraupe' über die Länge des Zuschauerraums und schlängelt sich an den Wänden entlang zum Proszenium. In dieser 'Lichtraupe' befinden sich 1000 an der Kopfverspiegelte Lampen, die von 100 miteinander verbundenen Triac-Abblendwiderständen so gesteuert werden, daß sich das Licht vom Zentrum nach außen bzw. nach unten ausbreitet. Die allgemeine Beleuchtung stammt von 75 Wiedervolt-Halogen-Punktscheinwerfern die auf 'trakline'-Schienen montiert und in tiefen Vouter an den gekrümmten Rändern der Decke montiert sind, sowahl Farben als auch Bewegungen werden in den leichten Platten mit aufgedampfter Aluminium vor dem Vorhang reflektiert. Das Theater wurde als das schönste in Holland beschrieben.

Ein 'Q-Master' mit 100 Speicherkreisen von Thorn regelt die Bühnenbeleuchtung und die benachbarten Flächen sind ebenfalls gut ausgeleuchtet sowie mit Klimaanlage versehen. Der komplette Umbau des alten Theaters ist den Architekten Carel Wirtz von Rotterdam und Van Klooster von Utrecht zu danken, und es ist wohl nicht zu viel gesagt, daß die Beleuchtung eine entscheidende Rolle beim Erfolg des Theaters spielt.

PLANUNG EINES INTEGRIERTEN DECKENSYSTEMS NACH PROGRAMME 2 13

A. Wilcock und H. John

Programme 2, das zweite von Thorn Lighting hergestellte und vertriebene integrierte Deckensystem, folgte dem Arena System und wurde gegen Ende 1974 auf den Markt gebracht. Es gründet sich auf zwei Module von 1200 bzw. 1500mm und besteht aus einem Grundrahmen, welcher Beleuchtungs- und Deckenbauteile trägt und Luftverteiler, Beleuchtungskabel und andere Energieversorgungen beherbergt.

Obwohl die Pläne für die neuen Büros von Scottish Amicable bereits fertiggestellt waren, als Thorn um Vorschläge für integrierte Decken ersucht wurde, war es von vornherein klar, daß Programm 2 in jeder Hinsicht gesignet sein würde.

Die Architekte, King, Main und Ellison, forderten flache Decken in allen Büroräumen mit der Möglichkeit des Einbaus von Trennwänden, die ohne störende Auswirkungen demontiert werden können. Ein kleiner Ausstellungsraum sollte eine Kassettendecke erhalten. Vorgeschrieben war eine Beleuchtungsstärke von 800 Lux – mit einer Leuchte im Zentrum jedes 500-mm-Deckenbauteiles. Die Deckeneinbau-Lauchte 'New Format Troffer', welche mit zwei Leuchstoff-U-Röhren bestükt wird und für Luftaustausch ausgelegt ist, wurde gewählt.

Ein linearer, durchgehender Spezialluftverteiler mit zwei oder drei Schlitzen, angeordnet am Rand jedes Feldes, wird die periphere Zone mit Luft versorgen, während serienmäßige modulare Programme-2-Verteiler dem Luftbedarf der internen Zone gerecht werden. Verteilerkästen im Hohlraum über der Hängedecke regain das Volumen der Luftströmung.

Nicht nur arbeiteten die Architekten sorgfältigst detaillierte Zeichnungen mehrerer Teile der Installation aus, sondern es wurden auch der Decken- und die Elektroinstallateure zu Anfang des Projektes bzw. zum Abschluß der detaillierten Beurteilung der Probleme genauestens unterrichtet. Der erfolgreiche Angebotsteller, Exactaceil Ltd., stellte einen maßstabsgetreuen Prototyp eines Teils der Decke her, um die Pläne zu prüfen, und das erste Treffen zwischen allen Zulieferanten wurden in den Büros von Thorn Lighting in Slough abgehalten. Die Baustoffe wurden bestellt, und man hofft, die Konstruktion der Decken Anfang September in Angriff nehmen zu können.

DIE WIRTSCHAFTLICHKEIT VON AUßENBLELEUCHTUNG 17

R. C. Aldworth

Beleuchtung ist nur ein so kleiner Teil des Gesamtenergieverbrachs, daß sie kaum ins Gewicht fällt. Doch soll dies kein Grund zur Verschwendung sein. Die Bedeutung, sine wirkungsvolle Beleuchtung zu erzielen, gilt sowohl für Innen- als auch Außenräume, und dies wird durch die Vorteile guter Sichtverhältnisse in Fabriken und Hoch- und Tiefaustellen in Form von weniger Unfällen, höherer Produktion und geringeren Schäden an Anlagen und Material unterstrichen.

Die Helligkeitsnormen bei Außenbeleuchtung sind bereits so niedrig, daß das Hauptaugenmerk der Wirksamkeit eines Belenchtungskörpers gewidmet werden muß, sollen Ersparnisse überhaupt möglich werden. Um dies zweckmäßig in Angriff zu nehmen, ist es notwendig, die Leistung der Lampen und die Eignung der Reflektoren gemeinsam zu betrachen, denn viel Licht geht verloren, wenn diese beiden Bestandteile nicht richtig aufeinander abgestimmt sind. In den letzten Jahren wurden bedeutende Fortschritte auf dem Gebiet der Leistung von Entladungslampen gemacht, doch gleichen Lichtverluste im Lichtstrahl und verstärkte Blendwirkung diese Vorteile weitgehend aus, wenn Beleachtungskörper verwendet werden, die ursprünglich für andere Lichtquellen entwickelt wurden.

Die Wirksamkeit einer Flutlichtanlage hängt von der sorgfältigen Wahl von Lampen und Reflektorvorrichtungen ab. Genaue photometrische Daten sind verfügbar und sollten verwendet werden, gleichzeitig sollten sorgfältige Kostenvergleiche angestellt werden. Die Wartung von Lampen und Leuchten darf nicht vernachlässigt werden eine Halbierung der Reinigungsperiode kann zu einem höheren Wartungsfaktor fuhren, der seinerseits eine reduzierte Last bewirkt.

Es ist keineswegs unpatriotisch, Energie zu verbrauchen solange disse einem guten Zweck dient. Ein sorgfältiges Durchdenken im Planungsstadium eines Projektes ist besser als das willkürliche Abschalten von Teilen einer bereits existierenden Installation. Es gibt keine Rechtfertigung für Beleuchtung, die Energie verschwendet.

BEMERKUNGEN ZUR CLIPPER-SERIE 21

R. Gosling & P. R. Layzell

Die neue Clipper-Serie von Leuchtstofflampenleuchten von Thorn wurde ursprünglich entwickelt, um den Anforderungen des Umweltministeriums zu genügen. Die Ingeneure des Umweltministeriums waren davon Überzeugt daß die Installationskosten für eine konventionelle Leuchte samt Verdrahtung so groß waren wie der Preis der Leuchte selbst. Die Nachfrage war groß genug, um eine neue Konstruktionsausführung zu rechtfertigen; da sie jedoch in der Lage sein wollten, direkt ab Lager zu bestellen, war es notwendig, die Konstruktion auf dem freien Markt verkaufen zu können.

Das Grundprinzip der Clipper-Serie bestand darin, eine Deckenblech zu fertigen, das anstelle der serienmäßigen Abzeigdose verwendet wird und an das man den Leuchtenkörper samt Vorschältgerät Lampenfassungen und Abdeckwamen aufhängen konnte, die elektrisch über einen Stecker samt Steckdose verbunden sind. Ein Tragscheinen-system größeren Querschnitts als das Deckenblech wurde entwickelt, um für mechanische Festigkeit und noch geringere Installationskosten zu sorgen.

Obwohl dieses System eindeutig Installationskosten verringern könnte, wobei die Leuchte als Teil des Verdrahtungssystems geplant ist, wurde es bald klar, daß der Gesichtspunkt müheloser Wartung ebenso wichtig war. Ein Leuchtenkörper mit schadhaften Vorschaltgerät könnte mühelos als eine einzige Einheit ersetzt, in der Werkstatt repariert und zur künftigen Verwendung auf Lager gehalten werden.

Ein wichtiges Konstruktionsmerkmal ist die einfache Sperre, welche den Leuchtenkörper an Deckenblech befestigt und gleichzeitig das Herunterklappen zuläßt, während der elektrische Anschluß hergestellt wird, wodurch die Installation leicht durch eine einzige Person ausgeführt werden kann. Ein weiterer Vorteil besteht darin, daß die Montage der Vorschaltgeräte an den Leuchtenkörper einen beträchtlichen Abstand zwischen Drosselspule und Decke ermöglicht und damit einen Sicherheitsfaktor schafft, der den strangsten Anforderungen gerecht wird. Vom Umweltministerium angestellte Tests haben den Wert dieser Neuerungen einwandfrei nachgewiesen, und es ist daher zu hoffen, daß sich diese Neuerung bald durchsetzen wird.

SCHLAGLICHT AUF DIE AUSTRALISCHE SZENE 25

R. F. Steward

Die letzten zehn Jahre haben ein erstaunliches wirtschaftliches Wachstum in Australien mit sich gebracht, das die Geschwindigkeit technologischer Fortschritte reflektiert, und dies läßt sich auch gleichermaßen auf dem Beleuchtungssektor feststellen.

Die Beleuchtung von kommerziellen und öffentlichen Gebäuden, Schulen und Fabriken wird von der australischen Norm CA 30-1965 erfaßt. Beleuchtungsprojekte werden von beratenden ingenieuren ausgearbeitet, so daß der Hersteller seine Arbeit nur auf die Konstruktion der Beleuchtungsausrüstung beschränkt, welche äußerst zahlreichen örtlichen öffentlichen Vorschriften sowie natürlich auch den Erfordernissen der Kunden entsprechen muß. In der Regel sieht man eingehaute Leuchten mit Lufteustauch mit 1200 mm 40-W-Röhren, und man erwartet von den Beleuchtungs-, Klimaanlagen und Deckenherstellern, daß sie volle Verantwortung für die Konstruktion übernehmen. Sowohl Prismenwannen als auch matte Reflektoren stehen zu allgemeiner Verwendung.

Obwohl Australien ursprünglich von britscher und amerikanischer Technologie abhängig war, leistet das Land nun seine eigenen technologischen Beiträge, und des läßt sich deutlich an einer kürzlichen Installation in Belconnen, Canberra, erkennen, wo 42-W-Röhren von 1050 mm Länge zum ersten Mal in Raster-Beleuchtungskörpern geringer Blendung verwendet werden. Die Raster niedriger Blendung werden im Spritzgußverfahren hergestellt und mit einer Metallschicht überzogen, um eine genaue Spiegeloberfläche von einer Konstanz zu erzielen, die mit Aluminium nicht zu erreichen ist.

Verbesserungen wurden auch auf dem Gebiet prismatischer Leuchten erzielt, und die in Australien entwickelte, gefertige und abgesetzte Thorn-Greendale Prisma wird nunmehr in mehreren kommerziellen Projekten sowie in einem 650 Betten beherbergenden Anbau des Royal North Shore Krankenhauses in Sydney verwendet.

Zur Zeit ist eine äußerst großes Bauprogramm an Krankenhäusern und Schulen im Gang, die beide besondere Probleme aufwerfen. Die Verwendung der Greendale Prisma hat das Problem der von hochpolierten Böden zurückgeworfenen Blendung gelöst. Die empfohlene Röhrenfarbe wird innerhalb der Beleuchtungskörper gezeigt, die in besonderen Gebieten verwendet werden. In Schulen ist der gebäuchlichste Beleuchtungskörper de 'Collegiate' von Thorn, der seiner hohen Wirkungsgrad (er hat einen Wirkungsfactor von 86%), seiner geringen Wartungskosten und niedrigen Leuchtdichte wegen gewählt wurde.

Außen- und Straßenbeleuchtung folgt dem üblichen europäischen Gebrauch, und mehrere Tunnel-Beleuchtungsprojekte wurden erfolgreich abgeschlossen. Infolge der äußerst großen Flächenausdehnung von Städten wie Sydney und der gleichzeitig geingen Bevölkerungszahl sind Seitenstraßen häufig nur ungenügend beleuchtet. Quecksilberdampflampen werden häufiger angetroften als Natriumdampflampen.

Das metrische Maßsystem basiert auf einem modularen System mit einer Grundeinheit von 300 mm, welche Fenster, Türen und andere Öffnungen mit einschließt. Da die 1200 mm langen, versenkt eingebauten Leuchten in Australien praktisch zu einer serienmäßigen Ausrüstung geworden sind, treten hier nicht mehr viele Probleme auf. Die Australian Illuminating Engineering Societies, die in jedem von Staat veranstalteten technischen Schulungskursus in Zusammenarbeit mit den Unterrichtsbehörden tätig sind, stehen in enger Verbindung mit der Australian Standards Association (dem australischen Normenverband), um den ASC 137-1969 zu erstellen, die erste wahre Beleuchtungssicherheitsnorm in Australien.

Australiens Entwicklungspotential ist ungeheuer groß, und Beleuchtungshersteller, die zu internationalen Konzernen wie beispielsweise Thorn gehören, sind gut in der Lage, den Forderungen dieser Entwicklung gerecht zu werden.

PROBLÈMES ET SOLUTIONS
CONSTRUCTION DES NOUVEAUX LABORATOIRES DE RECHERCHE DE THORN LIGHTING À ENFIELD 2
Rogan Gale-Brown

Au cours de l'étude de ce bâtiment, les architectes ont dû résoudre un certain nombre de problèmes spéciaux. Le plan au sol et la grille de structure de 6 m ont été déterminés par le besoin d'accès par le nord et le sud et pour le libre passage des véhicules poids lourds dans la zone située derrière le bâtiment avec installations de garage de voitures en dessous, au niveau du rez-de-chaussée. La partie centrale primaire et la partie centrale secondaire ont été situées de façon à offrir une liaison avec l'usine pilote et avec l'usine principale de tubes fluorescents.

Du rez-de-chaussée, on atteint le premier étage par un escalier en spirale et on trouve au premier étage un ensemble luxueux de réception indépendant avec installations pour cours et conférences. Pour éviter un aspect insignifiant à cette entrée située sous le toit du garage du rez-de-chaussée, le carrelage de la cage d'escalier est exposé à la vue et s'élève sur toute la hauteur du premier étage.

La hauteur des étages varie selon les activités qu'ils abritent; lorsqu'une hauteur sous plafond exceptionnelle est nécessaire ou pour les appareils photométriques, ces superficies se prolongent à l'étage supérieur. Les dalles de plancher coffrées ont été étudiées pour accepter des cloisonnements sur des centres modulaires et des éléments rapportés ont été formés dans les cintres de structure pour la suspension des canalisations, des plafonds, de l'éclairage ou des équipements expérimentaux dans n'importe quelle position au-dessus du plancher.

Toutes les cloisons sont démontables et sont reliées au module de 300 mm des nervures de structure des plafonds coffrés, ce qui offre une gamme extrêmement large de dimensions possibles pour les pièces.

Du fait des hauteurs diverses des étages, les fenêtres ont reçu une place secondaire dans la façade principale et on a accentué essentiellement les lignes verticales sur les élévations devant et derrière en installant les colonnes de structure et les canalisations sur les faces extérieures des murs. C'est seulement au rez-de-chaussée et au premier étage que l'on a traité différemment le problème en utilisant des murs-écrans pour les associer aux bâtiments existants de chaque côté. On a choisi une brique brun clair pour que l'ensemble s'harmonise avec les autres grands bâtiments situés près des laboratoires.

L'ALCHIMIE DE LA PRODUCTION DE LUMIÈRE 5
J. W. Bessant

La lampe fluorescente moderne, aussi courante soit-elle, est néanmoins un ensemble complexe d'équipement électronique, le résultat de travaux de recherche et de mise au point effectués par des hommes de science dans les domaines de l'électronique, de la chimie, de la technologie du verre et de la physique moléculaire. Au cours des trente-cinq ans qui ont suivi son lancement, la valeur du tube fluorescente a été multipliée par sept.

Les travaux de recherche effectués sur les phosphores, au moyen des techniques les plus modernes, ont conduit à l'addition de certains silicates de terre alcalins activés à l'europium aux poudres d'halophosphates utilisées dans les tubes de grande efficacité. La lampe qui repose sur ces phosphores porte le nom de 'Plus White' et donne un grand rendement de lumière avec les bonnes caractéristiques de rendement des couleurs précédemment associées à la série de tubes 'de luxe' de moindre efficacité.

La longueur d'un tube fluorescent affecte son efficacité, parce que l'effet de la chute de tension à la cathode décroît à mesure que la longueur croît. En conséquence, les tubes fluorescents de 600 mm, bien que populaires auprès des architectes pour des raisons esthétiques, sont, de manière inhérente, moins efficaces que les tubes de 1200 ou de 1500 mm. On a circonvenu le problème en courbant le tube plus long en U et, avec la lampe Thorn, on a pu obtenir ce résultat en utilisant un tube de verre d'un diamètre de 25 mm – ce qui représente une réussite technique considérable. Le nouveau tube est étalonné à 40W et pèse le tiers du poids des lampes tubulaires classiques en U. Sa longueur hors tout est de 520 mm au lieu des 600 mm, de sorte qu'il peut être inscrit dans une grille modulaire de 600 mm tout en offrant de nombreuses autres applications. Il a été étudié pour fonctionner sur un système à amorçage à commutation standard ou un ensemble sans système d'amorçage, pour alimentations de 240v ou 220v.

L'un des facteurs qui affectent la consommation de courant des tubes fluorescents est le gaz utilisé pour amorcer l'arc. L'argon a longtemps été utilisé à cette fin, mais l'addition d'un peu de krypton a pour effet de réduire les volts de la lampe et, ainsi, d'améliorer l'efficacité. Un nouveau tube de 125W de 2400 mm avec un pourcentage de krypton dans le remplissage gazeux fonctionnera à 100 watts sur un circuit de commutation d'amorçage principal classique de 125w sans diminution de la durée utile et avec peu de réduction relative du rendement lumineux. De la sorte, on peut obtenir une réduction sensible de la consommation d'électricité sans réduire sérieusement les niveaux d'éclairage et sans aucune modification à l'accessoire d'éclairage.

RECONSTRUCTION DU LUXOR A ROTTERDAM 9
J. J. M. Hoogervorst

Après le bombardement de Rotterdam en 1940, le seul établissement de spectacles qui restait était le Luxor, une salle de cinéma aux possibilités de représentations limitées. La municipalité de Rotterdam le prit en charge en 1946: la scène fut agrandie au détriment des dimensions de la salle de spectacles, mais en 1972 après quelques productions couronnées de succès, il fut décidé de la reconstruire car il accusait des signes d'effondrement. La présence d'immeubles voisins rendait impossible l'agrandissement de la grande salle de spectacles; il fallut donc gagner de la place en supprimant le balcon et en changeant la disposition des sièges. Pour rompre la monotonie du long plafond, une énorme "chenille" lumineuse coiffe la salle de spectacle et redescend sinueusement les parois vers l'avant-scène. Là, 1000 lampes à calotte argentée sont commandées par 100 gradateurs interconnectés pour permettre à la lumière d'onduler vers l'extérieur et vers le bas à partir du centre. L'éclairage général est fourni par 75 projecteurs basse tension, à incandescence et contenant un halogène, montessur glissière et dissimulés dans des fentes profondes pratiquées dans les bords incurvés du plafond; les couleurs et le mouvement sont réfléchis dans des panneaux aluminisés légers disposés devant le rideau. Cette salle de spectacles a été signalée comme la plus belle de Hollande.

Un système Q-master Thorn à 100 mémoires assure la commande et la régulation de l'éclairage de la scène, et les emplacements et zones auxiliaires sont climatisés et bien éclairés. La transformation complète du vieux Luxor est due aux architectes Carel Wirtz de Rotterdam et Van Klooster, d'Utrecht, et il ne serait pas exagéré d'affirmer que l'éclairage joue un rôle important dans cette réussite.

LE LANCEMENT DU PROGRAMME 2 13
PLANIFICATION D'UN SYSTÈME DE PLAFOND INTÉGRÉ CONFORME AU PROGRAMME 2
A. Wilcock et H. John

Le programme 2, le second système de plafonds intégrés produit et commercialisé par Thorn Lighting a succédé au système Arena et a été lancé à la fin de 1974. Il repose sur deux modules de 1200 mm et 1500 mm et est constitué par un bâti de base supportant les éléments de plafond et d'éclairage et abritant les diffuseurs d'air, les branchements d'éclairage et les autres canalisations de distribution.

Bien que l'étude des nouveaux bureaux de la Scottish Amicable ait déjà été terminée lorsqu'il fut demandé à Thorn de soumettre des propositions pour des plafonds intégrés, il apparut clairement que le Programme 2 serait parfaitement approprié.

Les architectes, King, Main et Ellison, demandaient des plafonds plats dans toutes les sections administratives avec la possibilité d'incorporer à l'ensemble des cloisons démontables. Une petite salle d'exposition devait comporter un plafond coffré. Un éclairement de 800 lux était demandé par le cahier des charges avec un appareil d'éclairage au centre de chaque module de 500 mm du plafond. La gouttière de Nouveau Format, abritant deux lampes fluorescentes à tubes en U et adaptée pour la circulation de l'air, a été choisie.

Un diffuseur d'air linéaire continu spécial à deux ou trois rainures courant le long du bord de chaque plancher fournira l'air à la zone périmétrique, tandis que des diffuseurs modulaires du Programme 2 de type standard répondront aux demandes de la zone interne. Des boîtes dans le vide situé au-dessus du plafond suspendu assureront la régulation du volume d'air en circulation.

Non seulement les architectes apportèrent le plus grand soin à la préparation des plans détaillés d'un certain nombre d'éléments de l'installation, mais encore les entrepreneurs chargés de la réalisation des plafonds et de l'installation électrique recurent des instructions précises au début du projet et à la fin de l'évaluation détaillée des problèmes. Le soumissionnaire choisi, Exactacail Ltd., réalisa un prototype grandeur nature d'une partie d'un plafond pour vérifier les plans d'étude et la première réunion de tous les sous-traitants eut lieu dans les bureaux de Thorn Lighting, à Slough. Le matériel a maintenant été commandé et on espère entreprendre la construction des plafonds au début de Septembre.

ECONOMIE DE L'ECLAIRAGE EXTERIEUR 17
R. C. Aldworth

L'éclairage représente une si faible partie de l'énergie totale à consommer que l'on n'aurait pas à craindre de consequences importantes, mais ce n'est pas une raison pour le gaspiller. l'importance qu'il y a de réaliser un éclairage efficace est valable, tant pour l'éclairage intérieur que pour l'éclairage extérieur, étant donné que les avantages que présentent de bonnes conditions de visibilité dans les usines, sur les chantiers de construction et de travaux du génie civil se traduisent par une réduction du nombre d'accidents, un accroissement de la production et moins de détérioration concernant les installations et le matériel.

Les normes d'éclairement dans l'éclairage extérieur sont déjà peu importantes et, de ce fait, si l'on veut réaliser une économie l'attention doit s'attacher à l'efficacité de l'appareillage d'éclairage. Pour obtenir de bons résultats il faut tenir compte globalement de l'efficacité des lampes et de l'applicabilité des projecteurs car on peut perdre beaucoup de lumière s'ils ne sont pas adaptés correctement. Au cours de ces dernières années, on a réalisé des progrès considérables en ce qui concerne le rendement des lampes à décharge mais si on utilise le matériel conçu initialement pour d'autres sources lumineuses, les pertes de lumière du faisceau et l'accroissement de lueur peuvent plus que compenser ces avantages.

L'efficacité d'un système de projecteurs dépend de la sélection méticuleuse des lampes et du matériel de projection. On dispose de données photométriques précises qu'il y a lieu d'utiliser et il convient de procéder à des comparaisons de coûts soigneusement étudiées. Il ne faut pas négliger l'entretien des lampes et des luminaires: la réduction de moitié de la période de nettoyage peut se traduire par une augmentation du facteur d'entretien et entraîner une charge réduite.

Il n'y a rien de répréhensible à utiliser de l'énergie tant qu'elle sert un but utile. Une attention particulière apportée au stade de la conception d'un projet vaut mieux que la mise hors service d'une installation concueau jugé.

Il n'y a pas d'excuses pour un éclairage qui gaspille de l'énergie.

NOTES RELATIVES A LA GAMME CLIPPER:
R. Gosling & P. R. Layzell 21

La nouvelle gamme Thorn Clipper de luminaires fluorescents a été produite initialement pour repondre aux besoins du Département de l'Environnement. Les ingénieurs et techniciens de ce Ministère étaient convaincus que le coût du montage d'un luminaire conventionnel, y compris son câblage, atteignait celui du luminaire lui-même. Leurs besoins étaient assez importants pour justifier une nouvelle conception mais ils voulaient être en mesure de passer des commandes à partir du stock: il fallait donc que la nouvelle réalisation soit vendable sur le marché libre.

Le principe fondamental à l'origine de la gamme Clipper consistait à réaliser une contre-plaque pouvant prendre la place d'une boîte de dérivation standard sur laquelle on pourrait suspendre un ensemple-support comportant un ballast, des douilles de lampes et diffuseurs, connectés électriquement par fiche et douille. La nouvelle conception comporte également un système de liaison à section transversale plus profonde que la contre-plaque pour conférer une résistance mécanique, ce qui réduit encore davantage les coûts d'installation.

Bien que ce système puisse manifestement réduire les coûts d'installation dans les cas où les luminaires sont conçus en tant que partie intégrante du système de cablage, il s'est révélé rapidement que la facilité d'entretien ainsi obtenue constituait un facteur tout aussi important. C'est ainsi qu'un ensemble-support contenant un mécanisme défectueux est facilement remplacable en tant que bloc standard, réparé sur l'établi et stocké pour réutilisation ultérieure.

Un élément de conception important est le verrou, simple, assurant la fixation de l'ensemble-support au contre-support et permettant de rabattre celui-ci pendant l'exécution de la connexion électrique, ce qui facilite une mise en place par une seule personne. Un autre avantage est le montage du ballast sur l'ensemble-support ce qui permet de disposer d'un espace libre notable entre le ballast et le plafond, ce qui assure un coefficient de sécurité apte à répondre aux conditions les plus rigoureuses. Des essais effectués par le Département de l'Environnement ont confirmé la valeur de ces innovations et il y a lieu d'espérer que les graines qu'ils ont semées donneront naissance à des récoltes très saines.

"ECLAIRONS LA LANTERNE" SUR LA SCÈNE AUSTRALIENNE! 25
R. F. Stewart

Au cours de ces dix dernières années, on a assisté à une croissance commerciale étonnante en Australie, croissance parallèle au rythme du progrès technologique, tout aussi manifeste dans le domaine de l'éclairage.

L'éclairage des bâtiments commerciaux et publics, ainsi que des écoles et des usines relève de la Norme australienne (CA 30-1965). Les plans d'éclairage sont préparés par des ingénieurs-conseils, si bien que le rôle des fabricants se limite à l'étude et la conception du matériel d'éclairage qui doit nécessairement être conforme à de très nombreuses spécifications gouvernementales et à des impératifs de la part des clients.

Il est normal de voir des systèmes Troffers recevant des tubes de 1200 mm, 40 W, dont toute la responsabilité de conception doit incomber aux fabricants du matériel d'éclairage, de climatisation et des plafonds. On utilise communément des dispositifs de commande prismatiques et des réflecteurs à faible brillance.

Bien que dépendant à l'origine de la technologie britannique et américaine, les Australiens sont actuellement en mesure d'apporter leurs propres contributions techniques, comme on peut le voir dans une installation récente, à Belconnen, Canberra, où des tubes de 1050 mm, 42W, sont utilisés pour la première fois dans des appareils à écran de faible brillance. Ces écrans de faible brillance sont moulés par injection dans du plastique et métallisés pour produire une surface réfléchissante et une constance exacte, impossibles à obtenir avec de l'aluminium.

Des panneaux prismatiques ont fait également l'objet de perfectionnements et le réflecteur à lentille Thorn Greendale, conçu, réalisé et commercialisé en Australie est appliqué actuellement à de nombreux projects commerciaux et à l'annexe de 650 lits du Royal North Shore Hospital, à Sydney. Un programme très important est en cours en ce qui concerne les hôpitaux et les écoles et chaque type présente des problèmes particuliers: celui de la lueur réfléchie par des planchers fortement polis a été résolu par l'adoption du réflecteur à lentille Greendale. La couleur de tube recommandée est indiquée à l'intérieur des luminaires utilisés dans des secteurs spécialisés. Dans les écoles, le luminaire utilisé le plus fréquemment est le Thorn "Collegiate", choisi en raison de son rendement élevé (facteur d'efficacité=86%), son coût d'entretien bas et sa série de basse luminance.

L'éclairage extérieur et de rues conforme à la pratique européenne normale et plusieurs projets d'éclairage de tunnels ont été menés à bien. Etant donné la très grande superficie de villes telles que Sydney et la répartition clairsemée de la population, les routes latérales sont souvent insuffisamment éclairées. Dans de tels cas, on rencontre plus souvent des lampes à décharge de mercure que des lampes au sodium.

La métrification a pour base un système modulaire comportant un module fondamental de 300 mm comprenant des fenêtres, portes et autres ouvertures. Etant donné que le système "troffer" de 1200 mm constitue un élément pratiquement standard en Australie, cela ne soulève pas de nombreux problèmes. Les Associations d'équipements d'éclairage australiennes, s'occupant activement de tous les cours techniques organisés par le gouvernement, en liaison avec les autorités de l'enseignement, collaborent étroitement avec l'Australian Standards Association pour produire l' ASC 137 1969, qui est à vrai dire la première norme de sécurité d'éclairage de l'Australie.

Les perspectives de développement de l'Australie sont très impressionnantes et les fabricants de matériels d'éclairage appartenant à des groupes internationaux tels que Thorn sont bien équipés pour répondre auxbesoins de ce pays.

PROBLEMAS Y SOLUCIONES 2

Construcción de los nuevos laboratorios de investigación de Thorn Lighting en Enfield.
Rogan Gale-Brown

Para el diseño de este edificio los arquitectos tuvieron que resolver varios problemas especiales. La planta del edificio y la cuadrícula estructural de 6m se determinaron por la necesidad de tener que obtener acceso desde el norte y el sur, y paso libre para grandes vehículos a la superficie que queda detrás con espacio de aparcamiento debajo del nivel del suelo. Los núcleos primario y secundario se situaron de tal forme que conseguían enlaces con la planta piloto y con la fábrica principal de tubos fluorescentes.

Por una escalera de caracol se llega al prime piso donde se halla un local de recepción de prestigio, independiente de la sala de conferencias. Para evitar la apariencia un tanto insignificante de esta entrada debajo del tejado de poca altura del aparcamento de la planta baja, el centro embaldosado de la escalera queda a la vista y sube hasta la altura total del primer piso.

Las alturas del suelo varían según las actividades a que se dedican; cuando se requieren techos excepcionalmente altos, para aparatos fotométricos, por ejemplo, las superficies en cuestión atraviesan el techo y llegan al piso de más arriba. Las losas de los suelos encofrados se han diseñado para que se puedan hacer tabiques de centros modulares y se han hecho inserciones en el zócalo estructural para la suspensión de servicios, techos, alumbrado o equipo experimental en cualquier posición sobre el suelo.

Todos los tabiques son desmontables y corresponden con el módulo de 300 mm de las nervaduras estructurales de los techos encofrados, permitiendo una extensa gama de posibles tamaños de habitación. Debido a las diferentes alturas del piso se da a las ventanas un papel secundario en la fachada principal, y se da un énfasis predominantemente vertical a los levantamientos delantero y trasero colocando columnas estructurales y conductos de servicio en las caras exteriores de las paredes. Este tratamiento sólo se cambia en la planta baja y en el primer piso, mediante el empleo de paredes de cortina para que concuerden con los edificios existentes a ambos lados. La elección de ladrillos de color marrón claro se hizo para que concuerden, asicuermo, con otros grandes edificios cerca de los laboratorios.

LA ALQUIMIA DE LA PRODUCCIÓN DE LUZ 5

J. W. Bessant

La lámpara fluorescente moderna, con todo lo familiar que nos resulta, es sin embargo un complejo equipo electrónico, resultado de la investigación y desarrollo de científicos en los campos de la electrónica, química, tecnología del vidrio y física molecular. En los treinta y cinco años que han transcurrido desde su introducción, el tubo fluorescente ha llegado a ser como mínimo siete veces más económico.

La investigación en fósforos, empleando las técnicas más modernas, han couducado a la adición de ciertos silicatos alcalinotérreos activados con europio a los polvos de halofosfato utilizados en tubos de gran eficiencia. La lámpara basada en estos fósforos se designa "Plus White" y da una elevada emisión de luz con propiedades de huena repproducción de los colores previamente relacionados con la gama de tubos "de luxe" de menor eficiencia.

La longitud de un tubo fluorescente afecta a su eficacia a causa de que se reduce la importancia de la caída de voltaje en el cátodo al aumentar la longitud. Por consiguiente, los tubos fluorescentes de 600 mm., si bien son populares entre los arquitectos por razones de estética, son intrínsicamente menos eficientes que los tubos de 1200 o 1500 mm. El problema se ha superado dando forma de 'U' al tubo de mayor longitud y en el coso de Thorn se ha logrado esto con buen éxito utilizando un tubo de vidrio de 25 mm. de diámetro, lo cual supone una proeza técnica considerable. El nuevo tubo tiene un régimen de 40 W y su peso es la tercera parte del de las lamparas en 'U' convencionales. Su longitud total es de 520 mm., comparado con los 600 mm. de las otras lámparas, con lo cual podrá alojarse en una rejilla modular de 600 mm. y emplearse en muchas otras aplicaciones. Está diseñado para funcionar con cebador de interruptor totalmente normalizado o con mecanismos sin cebador para tensione de 240 o 220 voltios.

Uno de los factores que afectan al consumo de corriente en los tubos fluorescentes es el gas utilizado para la formación del arco. Para este fin se ha venido utilizando el argón durante mucho tiempo, pero la adición de Criptón tiene el efecto de reducir el voltaje de la lámpara, con lo cual se mejora su eficacia. Un nuevo tubo de 125 W y 8 pies de iongitud con una proporción de criptón en el gas podrá funcionar a 100 W con un circuito de cebado convencional de 125 W sin que disminuya su duración y con una reducción relativamente pequeña de la emisión de luz. Se logra con esto una reducción importante en el consumo de electricidad sin reducir en forma importante los niveles de alumbrado y sin precisar modificaciones en las lámparas.

EL TEATRO LUXOR DE ROTTERDAM RECONSTRUÍDO 9

J. J. M. Hoogervorst

Durante los bombardeos de Rotterdam en 1940, el único teatro que quedó en pie fue el Luxor, en Cinema con facilidades limitadas para teatro. En 1946 se hizo cargo de él la Municipalidad de Rotterdam y se amplió el escenario, reduciendo la capacidad y tamaño de la sala, pero en 1972 después de cierto número de representaciones de gran éxito, se decidió reconstruirlo, pues mostraba señales de hundimiento.

Los edificios de su alrededor hacían imposible que se pudiese ampliar la sala del auditorio, de modo que habia que buscar nuevo espacio quitando los palcos y reorganizando las butacas. Para romper la monotonía del extenso techo una enorme 'luciérnaga' de luz se extiende sobre la sala y baja por las paredes hasta el proscenio. Tiene 1000 lámparas de corona plateada controladas por 100 amortiguadores de luz Triac interconectados que permiten que la luz rice hacia fuera y hacia abajo desde el centro. El alumbrado general se obtiene con 75 proyectores de luz de tungsteno-halógeno de bajo voltaje montados en carriles y ocultos en las ranuras profundas de los rebordes curvados del techo, y los colores y el movimiento se reflejan en paneles iluminados de poco peso delante del telón. Se ha descrito como el más bello teatro de Holanda.

El alumbrado del escenario se controla mediante un "100-memory Thorn Q-master" y las áreas auxiliares están aeroacondicionadas y bien iluminadas. La transformación total del antiguó teatro es un triunfo de los arquitectos Carel Wirtz de Rotterdam y Van Klooster de Utrecht, y no es exagerar si se dice que el alumbrado contribuye en no poca medida a su éxito.

INICIACIÓN DEL PROGRAMA 2 13

Planificación de un sistema de techo integrado Programa 2

A. Wilcock a H. John

El Programa 2 es el segundo sistema de techo integrado fabricado y explotado por Thorn Lighting. Fue continuación del sistema Arena y se lanzó al mercado en 1974. Se basa en dos módulos de 1200 mm y de 1500 mm y consiste de una armazón básica que soporta los componentes del alumbrado y del techo y del alojamiento a los difusores de aire, a los conductos de alumbrado y a otros servicios.

Aunque el diseño de las nuevas oficinas de la compañía Scottish Amicable ya se había finalizado cuando se pidió a Thorn que presentase propuestas de techos integrados, era evidente que el Programa 2 hulvera sido enteramente utilizable.

Los arquitectos, King, Main y Ellison, pidieron techos planos en toda la superficie de oficinas con possibilidad para poder incorporar tabiques desmontables sin dificultad. Una pequeña superficie de la sala de exposición tenia que llevar techo encofrado. Se especificó una iluminación de 800 lux con una lámpara en el centro de cada módulo del techo de 600 mm. Se eligió el nuevo formato Troffer que aloja dos tubos en 'U' de lámparas fluorescentes y adaptado para conduccion de aire.

Un difusor de aire lineal continuo especial de dos o tres ranuras a lo largo del borde de cada suelo suministraría aire a la zona del perímetro mientras que los difusores modulares normales del Programa 2 alimentarían la zona interior. El volumen de flujo de aire se controlaría mediante cajas en el espacio vacío encima del techo suspendido.

Los arquitectos no solo pusieron mucho esmero en la preparación de planos detallados de varias partes de la instalación sino que se instruyó con precisión al contratista del techo y a los contratistas eléctricos tanto al principio del proyecto como al final del estudio detallado de los problemas. El licitante que sacó la contrata, Exactaceil Ltd., hizo un prototipo a toda escala de parte del techo para verificar los planos del diseño y la primera reunión de todos los contratistas se celebró en las oficinas de Thorn Lighting en Slough. Ya se han pasado los pedidos de materiales y se espera comenzar la construcción de los techos a principios de septiembre.

ECONOMÍA DEL ALUMBRADO AL AIRE LIBRE 17

R. C. Aldworth

El alumbrado representa una parte tan pequeña del total de energía consumida que esto no tendrá un efecto considerable A pesar de todo no hay razón ninguna para que se malgaste. La importancia de conseguir alumbrado eficaz se aplica tanto a interiores como a exteriores, puesto que las ventajas de poder ver bien en fábricas y en obras de ingeniería civil y de construcción representan menos accidentes, producción aumentada y menos daños causados a la planta y a los materiales.

Los stándards de iluminación del alumbrado en el exterior son ya bastante bajos de por sí, de modo que si se quiere conseguir una economía se deberá concentrar la atención en la eficacia de los aparatos de alumbrado. Para que esto surta efecto deberán considerarse conjuntamente la eficacia de las lámparas y la idoneidad de los proyectores, pues se puede perder mucha luz si no concuerdan correctamente. En años recientes se han mejorado considerablemente la eficacia de las lámparas de descarga, pero si se usa aparatos diseñados originalmente para otras fuentes de luz, la pérdida de luz en el haz y el aumento de deslumbramiento pueden contrarrestar con creces estas ventajas.

La eficacia de los sistemas de alumbrado intensivo con proyectores depende de la selección cuidadosa tanto de las lámparas como del equipo de proyección. Se dispone de datos fotométricos de precisión que deberán usarse al mismo tiempo que se realizan minuciosas comparaciones de los costos. El mantenimiento de las lámparas y luminarias no deberá descuidarse, reduciendo a la mitad el período entre limpiezas se puede tener como resultado un factor de mantenimiento más alto resultante en una carga reducida.

El consumo de energía no es un acto antipatriótico siempre que cumpla un fin útil. La atención cuidadosa en la etapa de confección de un proyecto es mejor que apagar parte de la instalación diseñada a 'ojo de buen cubero'. No se puede excusar al alumbrado que derroche energía.

NOTAS SOBRE CLIPPER 21

R. Gosling y P. R. Layzell

La nueva gama Thorn Clipper de luminarias fluorescentes se fabricó originalmente para satisfacer los requerimientos del Departamente del Medio Ambiente. Los ingenieros del Departamento estaban convencidos de que los costos de instalación de los accesorios convencionales, incluyendo el cableado, resultaban tan altos como los accesorios mismos. Sus requerimientos eran lo suficientemente grandes para justificar un nuevo diseño, pero como querían poder obtener los pedidos de existencias en almacén, el diseño tenia que venderse también en el mercado libre.

El principio básico en que se funda la gama 'Clipper' es fabricar una placa de apoyo que pudiera sustituir a la caja de derivación normal en la que se pudiera colgar un conjunto central que contuviera el equipo, portalámparas y difusores, conectado eléctricamente mediante un enchufe. También se diseñó un sistema de línea principal, de sección transversal más profunda que la placa de apoyo para conseguir resistencia mecánica, con lo que se reducen aun más los costos de instalación.

Aunque este sistema podía indudablemente reducir los costos de instalación en los casos en que los accesorios se planearan como parte del sistema de cableado, pronto se hizo evidente que la simplicidad de mantenimiento peruntida era también de la misma importancia. Un conjunto central con un dispositivo averiado se podía sustituir como una sola unidad, para repararlo en el taller y almacenarlo para uso futuro.

Una característica de diseño importante es el simple fiador que no solamente sujeta el conjunto central al apoyo posterior, sino que además, puede bascularse hacia abajo mientras se hace la conexión eléctrica, facilitando la instalación por una sola persona. Otra ventaja es que el montaje del dispositivo de control al conjunto central deja un espacio libre considerable entre reductor y techo, proporcionando un factor de seguridad que satisface los requerimientos más exigentes. Las pruebas realizadas por el Departamento del Medio Ambiente han probado suficientemente el valor de estas innovaciones y parece razonable esperar que la semilla sembrada se convertirá en una planta saludable.

ALGUNAS OBSERVACIONES SOBRE LA ESCENA AUSTRALIANA 25

R. F. Steward

En los últimos diez años se ha producido un extraordinario crecimiento comercial en Australia, reflejando la celeridad del avance tecnológico, y esto es también evidente en el campo del alumbrado.

El alumbrado de edificios comerciales y públicos, escuelas y fábricas está regulado por la norma australiana (CA 30-1965). Los planes de alumbrado son preparados por consultores de modo que el fabricante se limita al diseño del equipo de alumbrado, que tiene que conformar con un gran número de especificaciones gubernamentales locales y también con los requerimientos de los clientes. A menudo se pueden ver conductos empotrados ventilados para tubos de 1200 mm 40w y se espera que los fabricantes de accesorios de alumbrado, acondicionamiento de aire y de techos acepten la responsabilidad para el diseño completo. Se emplean comúnmente tanto los difusores prismáticos como los reflectores de bajo brillo.

Aunque los australianos dependían originalmente de la tecnología británica y americana, actualmente realizan sus propias contribuciones tecnológicas, y esto se puede observar en instalaciones recientes en Belconnen, Camberra donde se emplean tubos de 1050 mm 42w por primera vez en aparatos de rejilla de bajo brillo. Las rejilles de bajo brillo son de plástico moldeado por inyección y metalizado para obtener una superficie de precisión especular y una consistencie imposible de obtener usando aluminio.

También se han realizado mejoras en lo que se refiere a paneles prismáticos y el platillo de lente Thorn Greendale, diseñado, fabricado y lanzado al mercado en Australia, se usa en cierto número de proyectos comerciales y en la ampliación de 650 camas del Hospital Royal North Shore de Sydney.

Existe un programa de construcción muy amplio tanto de hospitales como de escuelas, cada uno de los cuales representa un problema especial. El uso del platillo de lente Greendale ha resuelto el problema de deslumbramiento reflejado en los pisos muy pulidos. El color de tubo recomendado se muestra dentro del aparato empleado en sitios especializados. En las escuelas el aparato usado más corrientemente es el Thorn 'Collegiate', escogido por su gran eficacia (tiene un LOR del 86%), por su bajo costo de mantenimiento y bajo régimen de luminancia.

El alumbrado exterior y de calles signe la prática normal europea y varios proyectos de alumbrado de túneles se han llevado a cabo con éxito. Debido a las grandes superficies de ciudades tales como Sydney, las carreteras secundarias está a menudo insuficientemente alumbradas. Las lámparas de descarga de mercurio se ven más corrientemente que las de sodio en estas circunstancias.

La conversión al sistema métrico decimal se basa en un sistema modular con un módulo básico de 300 mm que incluye ventanas, puertas y otras aberturas. Como el conducto de 1200 mm es prácticamente normal en Australia, esto no representa ningún problema. Las Sociedades de Ingeniería del Alumbrado australianas, activas en todos los cursos técnicos patrocinados por el Estado en colaboración con las Autoridades de Educación, trabajan en estrecha cooperación con la Asociación de Normas Australianas para producción de la Norma ASC 137 1969, la primera norma de seguridad de alumbrado netamente australiana.

El desarrollo potencial de Australia es inmenso y los fabricantes de equipo de alumbrado pertenecen a grupos internacionales tales como Thorn y están bien equipados para satisfacer las demandas.

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